43-25 52ND ST

QUEENS COUNTY

WOODSIDE, NEW YORK.

SITE MANAGEMENT PLAN

NYSDEC Site Number: C241269

Prepared for:

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Woodside, NY 11377

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201-791-0075

Revisions to Final Approved Site Management Plan:

Revision No.	Date Submitted	Summary of Revision	NYSDEC Approval Date

NOVEMBER 2025

CERTIFICATION STATEMENT

I CHENGYU HANG certify that I am currently a NYS registered professional engineer as in defined in 6 NYCRR Part 375 and that this Site Management Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10) and Green Remediation (DER-31).

Chengyu Hang P.E

11-11-2025 DATE



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List of Acronyms

AS	Air Sparging
ASP	Analytical Services Protocol
BCA	Brownfield Cleanup Agreement
BCP	Brownfield Cleanup Program
BMP	Best Management Practice
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CAMP	Community Air Monitoring Plan
C/D	Construction and Demolition
CFR	Code of Federal Regulation
CLP	Contract Laboratory Program
COC	Certificate of Completion
CO2	Carbon Dioxide
CP	Commissioner Policy
DER	Division of Environmental Remediation
DUSR	Data Usability Summary Report
EC	Engineering Control
ECL	Environmental Conservation Law
ELAP	Environmental Laboratory Approval Program
ERP	Environmental Restoration Program
EWP	Excavation Work Plan
GHG	Greenhouse Gas
GWE&T	Groundwater Extraction and Treatment
HASP	Health and Safety Plan
IC	Institutional Control
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYCRR	New York Codes, Rules and Regulations
O&M	Operation and Maintenance
OM&M	Operation, Maintenance and Monitoring
OSHA	Occupational Safety and Health Administration
OU	Operable Unit
P.E. or PE	Professional Engineer
PFAS	Per- and Polyfluoroalkyl Substances
PID	Photoionization Detector
PRP	Potentially Responsible Party
PRR	Periodic Review Report
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
QEP	Qualified Environmental Professional
RAO	Remedial Action Objective
RAWP	Remedial Action Work Plan
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation/Feasibility Study

ROD	Record of Decision
RP	Remedial Party
RSO	Remedial System Optimization
SAC	State Assistance Contract
SCG	Standards, Criteria and Guidelines
SCO	Soil Cleanup Objective
SMP	Site Management Plan
SOP	Standard Operating Procedures
SOW	Statement of Work
SPDES	State Pollutant Discharge Elimination System
SSD	Sub-slab Depressurization
SVE	Soil Vapor Extraction
SVI	Soil Vapor Intrusion
TAL	Target Analyte List
TCL	Target Compound List
TCLP	Toxicity Characteristic Leachate Procedure
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank
VCA	Voluntary Cleanup Agreement
VCP	Voluntary Cleanup Program

ES EXECUTIVE SUMMARY

The following provides a brief summary of the controls implemented for the Site, as well as the inspections, monitoring, maintenance and reporting activities required by this Site Management Plan:

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Institutional Controls:	1. The property may be used for restricted-residential use as described in 6 NYCRR Part 375-1.8(g)(2)(ii), commercial use as described in 6 NYCRR Part 375-1.8(g)(2)(iii), and industrial use as described in 6 NYCRR Part 375-1.8(g)(2)(iv), although land use is subject to local zoning;
	2. All ECs must be operated and maintained as specified in this SMP.
	3. All ECs must be inspected at a frequency and in a manner defined in the SMP.
	4. The use of groundwater underlying the property is prohibited without necessary water quality treatment as determined by the New York State Department of Health (NYSDOH) or the New York City Department of Health and Mental Hygiene to render it safe for use as drinking water or for industrial purposes, and the user must first notify and obtain written approval to do so from the Department.
	5. Groundwater and other environmental or public health monitoring must be performed as defined in this SMP.
	6. Data and information pertinent to Site management must be reported at the frequency and in a manner as defined in this SMP.
	7. All future activities that will disturb remaining contaminated material must be conducted in accordance with this SMP.

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	8. Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in this SMP.
	9. Operation, maintenance, monitoring, inspection, and reporting of the mechanical or physical components of the remedy shall be performed as defined in the SMP.
Institutional Controls:	10. Access to the Site must be provided to agents, employees, or other representatives of the State of New York with reasonable prior notice to the property owner to assure compliance with the restrictions identified in the Environmental Easement.
	11. The potential for vapor intrusion must be evaluated for any new buildings developed in the area within the IC boundaries and any potential impacts that are identified must be monitored or mitigated.
	12. Vegetable gardens and farming on the Site are prohibited.
Engineering Controls:	1. Sub-Slab Depressurization System (SSDS)
	2. Soil Vapor Extraction (SVE) System

Inspections:	Frequency
1. Site-wide Inspection	Annually
2. SSDS	Quarterly (first year after COC), annually (after first year)
3. SVE System	Quarterly (first year after COC), annually (after first year)
Monitoring:	
1. SVE System Monitoring	Quarterly (first year after COC), annually (after first year)
2. Soil Vapor Intrusion Evaluation for New Buildings	As Needed

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3. SSDS Monitoring	Quarterly (first year after COC), annually (after first year)
Maintenance:	
1. SSDS Maintenance	Quarterly/As necessary
2. SVE System Maintenance	Quarterly/As necessary
Reporting:	
1. Periodic Review Report	Annually, commencing 16 months after COC
2. SVE System Monitoring Data	Quarterly (first year after COC), semi-annually (after first year)

Further descriptions of the above requirements are provided in detail in the latter sections of this Site Management Plan.

1.0 INTRODUCTION

1.1 General

This Site Management Plan (SMP) is a required element of the remedial program for the 43-25 52nd St site located in Woodside, Queens County, New York (hereinafter referred to as the "Site"). See Figure 1. The Site is currently in the New York State (NYS) New York State (NYS) Brownfield Cleanup Program (BCP), Site No. C241269, which is administered by New York State Department of Environmental Conservation (NYSDEC or Department).

43-25 52 LLC entered into a Brownfield Cleanup Agreement (BCA), Index No. C241269-04-23, on May 27, 2023 with the NYSDEC to remediate the site. A figure showing the site location and boundaries of this site is provided in Figure 2. The boundaries of the site are more fully described in the metes and bounds site description that is part of the Environmental Easement provided in Appendix A.

After completion of the remedial work, some contamination was left at this site, which is hereafter referred to as "remaining contamination". Institutional and Engineering Controls (ICs and ECs) have been incorporated into the site remedy to control exposure to remaining contamination to ensure protection of public health and the environment. An Environmental Easement granted to the NYSDEC, and recorded with the Office of the City Register of the City of New York as City Recording File Number (CRFN) 2025000188344, requires compliance with this SMP and all ECs and ICs placed on the site.

This SMP was prepared to manage remaining contamination at the site until the Environmental Easement is extinguished in accordance with ECL Article 71, Title 36. This plan has been approved by the NYSDEC, and compliance with this plan is required by the grantor of the Environmental Easement and the grantor's successors and assigns. This SMP may only be revised with the approval of the NYSDEC.

It is important to note that:

- This SMP details the site-specific implementation procedures that are required by the Environmental Easement. Failure to properly implement the SMP is a violation of the Environmental Easement, which is grounds for revocation of the Certificate of Completion (COC); and

- Failure to comply with this SMP is also a violation of Environmental Conservation Law, 6 NYCRR Part 375 and the BCA (Index No. C241269-04-23) for the site, and thereby subject to applicable penalties.

All reports associated with the site can be viewed by contacting the NYSDEC or its successor agency managing environmental issues in New York State. A list of contacts for persons involved with the site is provided in Appendix B of this SMP.

This SMP was prepared by YU & Associates Engineers, P.C., on behalf of 43-25 52 LLC, in accordance with the requirements of the NYSDEC's DER-10 ("Technical Guidance for Site Investigation and Remediation"), dated May, 2010, and the guidelines provided by the NYSDEC. This SMP addresses the means for implementing the ICs and/or ECs that are required by the Environmental Easement for the site.

1.2 Revisions and Alterations

Revisions and alterations to this plan will be proposed in writing to the NYSDEC's project manager. The NYSDEC can also make changes to the SMP or request revisions from the remedial party. Revisions will be necessary upon, but not limited to, the following occurring: a change in media monitoring requirements, upgrades to or shutdown of a remedial system, post-remedial removal of contaminated sediment or soil, or other significant change to the site conditions. All approved alterations must conform with Article 145 Section 7209 of the Education Law regarding the application of professional seals and alterations. For example, any changes to as-built drawings must be stamped by a New York State Professional Engineer. In accordance with the Environmental Easement for the site, the NYSDEC project manager will provide a notice of any approved changes to the SMP, and append these notices to the SMP that is retained in its files.

1.3 Notifications

Notifications will be submitted by the property owner to the NYSDEC, as needed, in accordance with NYSDEC's DER – 10 for the following reasons:

1. 60-day advance notice of any proposed changes in site use that are required under the terms of the BCA, 6 NYCRR Part 375 and/or Environmental Conservation Law.

2. 7-day advance notice of any field activity associated with the remedial program.

3. 15-day advance notice of any proposed ground-intrusive activity pursuant to the Excavation Work Plan. If the ground-intrusive activity qualifies as a change of use as defined in 6 NYCRR Part 375, the above mentioned 60-day advance notice is also required.

4. Notice within 48 hours of any damage or defect to the foundation, structures or EC that reduces or has the potential to reduce the effectiveness of an EC, and likewise, any action to be taken to mitigate the damage or defect.

5. Notice within 48 hours of any non-routine maintenance activities.

6. Verbal notice by noon of the following day of any emergency, such as a fire; flood; or earthquake that reduces or has the potential to reduce the effectiveness of ECs in place at the site, with written confirmation within 7 days that includes a summary of actions taken, or to be taken, and the potential impact to the environment and the public.

7. Follow-up status reports on actions taken to respond to any emergency event requiring ongoing responsive action submitted to the NYSDEC within 45 days describing and documenting actions taken to restore the effectiveness of the ECs.

Any change in the ownership of the site or the responsibility for implementing this SMP will include the following notifications:

8. At least 60 days prior to the change, the NYSDEC will be notified in writing of the proposed change. This will include a certification that the prospective purchaser/Remedial Party has been provided with a copy of the BCA, and all approved work plans and reports, including this SMP.

9. Within 15 days after the transfer of all or part of the site, the new owner's name, contact representative, and contact information will be confirmed in writing to the NYSDEC.

In-Text Table I on the following page includes contact information for the above notifications. The information on this table will be updated as necessary to provide accurate contact information. A full listing of site-related contact information is provided in Appendix B.

In-Text Table I - Notifications*

Name/Title	**Contact Information**	**Required Notification****
Javier Perez Maldonado / NYSDEC Project Manager	(518) 402-8172 javier.perez-maldonado@dec.ny.gov	All Notifications
William Bennett / NYSDEC Project Manager's Supervisor	(518) 402-9662 william.bennett@dec.ny.gov	All Notifications
Kelly A. Lewandowski / NYSDEC Site Control	(518) 402-9553 kelly.lewandowski@dec.ny.gov	Notifications 1 and 8
Daniel P Tucholski / NYSDOH Project Manager	518-402-7860 beei@health.ny.gov	Notifications 4, 6, and 7

* Note: Notifications are subject to change and will be updated as necessary.

** Note: Numbers in this column reference the numbered bullets in the notification list in this section.

2.0 SUMMARY OF PREVIOUS INVESTIGATIONS AND REMEDIAL ACTIONS

2.1 Site Location and Description

The site is located in Woodside, Queens County, New York and is identified as Block 1321 and Lot 10 (f/k/a Lots 7 and 10) on the New York City Tax Map (see Figure 1). The site is an approximately 0.207-acre area and is bounded by mixed-used residential and commercial properties and Roosevelt Avenue to the north, Queens Boulevard to the south, residential properties to the east, and 52nd St to the west (see Figure 2 – Site Layout Map). The boundaries of the site are more fully described in Appendix A –Environmental Easement. The owner of the site parcel at the time of issuance of this SMP is:

43-25 52 LLC

2.2 Physical Setting

2.2.1 Land Use

The Site consists of the following: a nine-story mixed-used commercial and residential building with a full cellar. The Site is zoned R7A with C2-3 overlay zoning (commercial district predominantly residential in character) and is currently under redevelopment. Site future occupants will include residential and retail/commercial tenants.

The properties adjoining the Site and in the neighborhood surrounding the Site primarily include commercial and residential properties. The properties immediately south of the Site include commercial and residential properties; the properties immediately north of the Site include commercial and residential properties; the properties immediately east of the Site include residential properties; and the properties to the west of the Site include commercial and residential properties.

2.2.2 Geology

The following geologic information refers to the general site conditions prior to the remediation. A geologic cross section is shown in Figure 3. Site specific boring logs are provided in Appendix C.

Lithology

Based on the soil investigation technical report prepared by Professional Solutions Group Inc. (PSG) on September 28, 2022, the site subsurface lithology is described below.

Fill

Existing fill material was encountered in each boring. It generally consisted of sand with varying amounts of silt and gravel and cobbles. This material extended to depths ranging between approximately 2 feet to 3 feet below existing site grades.

Sand

Underlying the existing fill material, each boring encountered a naturally occurring sand stratum which generally consisted of medium to fine sand with variable amounts of gravel, silt and cobbles. Boring B-2, B-3, and B-4 were terminated at depths of approximately 32 to 42 feet below existing site grades. B-1 was terminated at a depth of approximately 102 feet below existing site grades.

2.2.3 Hydrogeology

The groundwater level ranges from 60.95 ft bgs to 61.37 ft bgs based on the field gauging information. The groundwater flow direction anticipated to be northwest. The nearest surface water body is Newtown Creek.

2.3 Investigation and Remedial History

The following narrative provides a remedial history timeline and a brief summary of the available project records to document key investigative and remedial milestones for the Site. Full titles for each of the reports referenced below are provided in Section 8.0 – References.

2.3.1 Phase I Environmental Site Assessment – February 2021

A Phase I Environmental Site Assessment prepared by JR Environmental Services, Inc. dated February 2021, did not identify any RECs for former Lot 10. The following was identified:

- The subject property was identified on the regulatory database as a property with an E-Designation.
- The subject property was listed in the areas of Air Quality related to the HVAC system, potential hazardous materials, window wall attenuation and alternate ventilation and exhaust stack limitations.

2.3.2 Remedial Investigation – November 2022

A New York City Office of Environmental Remediation (NYCOER) Remedial Investigation Report was prepared by Brussee Environmental, Corp., dated November 2022, and the findings of this report are summarized below:

- The use of former Lot 7 as an auto repair facility is a REC for the Site.
- Depth to groundwater is present at 65-70 ft bgs, and the depth to bedrock at the site is greater than 100 feet.
- The stratigraphy of the site, from the surface down, consists primarily of asphalt and concrete slab/pavement. The asphalt and concrete were underlain with brown silt-sand mixtures with trace amounts of gravel and fine angular native stone to the terminal depth of 15 feet bgs. Deeper interval soils were not investigated, nor logged. No evidence of staining, odors or PID responses were detected in any of soil borings.
- One chlorinated volatile organic compound (CVOC), tetrachloroethene was detected in one shallow soil sample (SB-2 0-2 ft bgs) collected in the south-eastern portion of the Site at a concentration of 1.8 mg/kg, slightly exceeding the applicable New York State Department of Environmental Conservation (NYSDEC) Unrestricted Use Soil Cleanup Objectives (UUSCOs) but below the Restricted Residential Soil Cleanup Objectives (RRSCOs).
- One pesticide, 4,4'-DDT (at 0.0034 mg/kg in SB4 at 0-2 ft bgs), was detected above applicable UUSCOs but below the RRSCOs.
- Metals including copper (max. of 92.4 mg/kg in SB4 at 0-2 ft bgs), lead (max. of 455 mg/kg in SB4 at 0-2 ft bgs), and zinc (max. of 640 mg/kg in SB54 at 0-2 ft bgs) were detected at concentrations above their respective UUSCOs. The lead concentration also exceeded its respective RRSCOs. The maximum concentrations for metals that exceeded UUSCOs and/or RRSCOs were identified in SB4 at 0-2 ft bgs.
- Selected Semi-volatile organic compounds (SVOCs), specifically polycyclic aromatic hydrocarbons (PAHs), were detected in two of the soil samples (SB-2 and SB-7) at concentrations below the UUSCOs.

- No PCBs were detected in any soil samples throughout the Site.
- No Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS) compounds were detected in any soil samples throughout the Site.
- Groundwater samples were not collected during this RI performed by BEC in October
  2022 due to repeated refusal encountered at the Site at depths varying between 26 and 28 ft bgs.
- Soil vapor results collected during the 2022 RI were analyzed as follows:
  - Total concentrations of petroleum-related VOCs (BTEX compounds) within the seven soil vapor samples ranged from 147.96 µg/m^3 (SG3) to 640.3 µg/m^3 (SG5). Individual compound included: benzene (max. of 24.2 µg/m3 in SG5), toluene (max. of 153 µg/m3 in SG5), ethylbenzene (max. of 68.1 µg/m3 in SG5), o-xylene (max. of 168 µg/m3 in SG5), and m&p-xylene (max. of 227 µg/m3 in SG5)
  - Total concentrations of CVOCs within the six soil vapor samples ranged from 1,433.45 µg/m^3 (SG4) to 53,188.65 µg/m^3 (SG5). Individual CVOCs included 1,1,1- trichloroethane (TCA) (at 2.22 µg/m^3 in SG5), cis-1,2-dichloroethene (at 249 µg/m^3 in SG5), PCE (max. of 50,400 µg/m^3 in SG5), trichloroethene (TCE) (max. of 342 µg/m^3 in SG3) and carbon tetrachloride (max. of 0.79 µg/m^3 in SG5)

2.3.3 Remedial Investigation – July 2023

The Site was investigated in accordance with the scope of work presented in the NYSDEC-approved Remedial Investigation (RI) Work Plan dated June, 2023. The remedial investigation was conducted between July 18 and August 11, 2023.

Based upon the remedial investigation results, surface and sub-surface soils are contaminated with CVOCs, SVOCs, pesticides and metals. Soil at the Site is impacted by fill materials and the former automotive repair operations at the Site. The source of CVOCs exceedances is likely attributable to the historic on-Site uses.

Contaminants in groundwater include volatile organic compounds (VOCs), SVOCs, and metals in monitoring wells located throughout the Site. Ingestion of groundwater is not anticipated because the groundwater is not being used for drinking water source, as the area is served by the NYC DEP public water supply, and due to a local prohibition on potable and process use of groundwater without relevant authorizations. People will not come into contact with contaminated groundwater during future ground intrusive work at the Site because groundwater at depths of 60.95 ft bgs to 61.37 ft bgs is not anticipated to be encountered during excavation.

Soil vapor sample results indicate the presence of CVOCs (PCE, TCE, and cis-1,2-DCE) contamination. The elevated CVOCs levels in soil vapor are consistent with the observed CVOC contamination in soil.

2.4 Remedial Action Objectives

The Remedial Action Objectives (RAOs) for the Site as listed in the Decision Document dated March 15, 2024 are as follows:

2.4.1 Groundwater

RAOs for Public Health Protection

- Prevent ingestion of groundwater with contaminant levels exceeding drinking water standards.

2.4.2 Soil

RAOs for Public Health Protection

- Prevent ingestion/direct contact with contaminated soil.
- Prevent inhalation of or exposure from contaminants volatilizing from contaminants in soil.

RAOs for Environmental Protection

- Prevent migration of contaminants that would result in groundwater or surface water contamination.

2.4.3 Soil Vapor

RAOs for Public Health Protection

- Mitigate impacts to public health resulting from existing, or the potential for, soil vapor intrusion into buildings at a site.

2.5 Remaining Contamination

Based on the soil end-point sample results, the restricted-residential SCOs were achieved for on-site soils. Remaining contamination at the Site includes the soil, groundwater and soil vapor located beneath the building slab.

2.5.1 Soil

A Restricted-Residential Use remedy was achieved for the Site. Remaining impacts in soil were documented in the RI sample B-2 collected from beneath the remedial excavations between 60 and 62 feet bgs, where arsenic and hex chromium were detected at concentrations exceeding the UUSCOs but below the RRSCOs. Table 2 and Figure 6 summarize the results of all soil samples collected that exceed the Unrestricted Use SCOs and the restricted residential Use SCOs at the site after completion of remedial action.

2.5.2 Groundwater

Groundwater sample collected during RI indicated VOCs (chloroform), SVOCs (PAHs), natural occurring metals (chromium, lead, manganese, nickel, sodium, and selenium) and PFAS contamination above the Class GA groundwater criteria. Chloroform was not detected in any of the soil samples, the detections of chloroform in groundwater samples are likely from off-site sources. Groundwater and Site use restrictions to prevent exposure to remaining groundwater contamination are included in the Environmental Easement. Table 3 and Figure 7 summarize the results of all samples of groundwater that exceed the SCGs after completion of the remedial action.

2.5.3 Soil Vapor

Soil vapor contamination remains at the Site, as indicated by soil vapor samples collected during the July 2023 Remedial Investigation (RI). Analytical results identified the presence of CVOCs, including tetrachloroethene (PCE), trichloroethene (TCE), and cis-1,2-dichloroethene (cis-1,2-DCE), at elevated concentrations sitewide. The RI soil vapor samples were collected at depths below the current building foundation and remain representative of subsurface vapor conditions following implementation of the remedy. Therefore, the existing RI data are considered appropriate for evaluating residual soil vapor contamination. To address the potential for vapor intrusion and mitigate subsurface

impacts, a SSDS and a SVE system have been installed at the Site. These systems are designed to reduce soil vapor concentrations and prevent the migration of vapors into occupied spaces. Ongoing operation and monitoring of these systems will continue as part of the site management program. Table 4 and Figure 12 of the 2024 Remedial Investigation Report (RIR, included as Appendix D) summarize the results of all samples of soil vapor.

On June 5, 2025, three indoor air samples were collected in the apartment storage/recreation room, gym, and the laundry room of the cellar, and an outdoor ambient air sample was collected in the backyard of the first floor. At the time of the June 2025 indoor/outdoor air sampling event, the building structure was completed but there was ongoing interior work, and the heating, ventilation, and cooling system was not operating due to the outdoor temperature. The indoor air samples and the outdoor ambient air sample were collected for the duration of 24 hours. The indoor air sample analytical results were compared with the Upper Fence criteria within the Table C1 NYSDOH 2003: Study of volatile organic chemicals in air of fuel oil heated homes. Results indicated that that most CVOCs were non-detect across all samples. Low-level detections of carbon tetrachloride and tetrachloroethylene were reported in both indoor and outdoor air samples. The concentrations of these CVOCs were comparable between indoor and outdoor air, suggesting that indoor detections are attributable to background ambient air rather than vapor intrusion from subsurface sources. Additionally, all soils with contamination exceeding RRSCOs were previously removed as part of the Remedial Action.

On November 3, 2025, three indoor air samples were collected in the apartment storage room, gym, and the meter room of the cellar, and one outdoor ambient air sample was collected in the backyard of the first floor. At the time of the November 2025 indoor/outdoor air sampling event, the building development was completed, and the heating system was operating at least 24 hours prior to and during the collection of indoor air samples. The indoor air samples and the outdoor ambient air sample were collected for the duration of 24 hours. The indoor air sample analytical results were compared with the Upper Fence criteria within the Table C1. Results indicated that no CVOCs were detected across all samples. Two compounds, Isopropylbenzene (cumene) and Methyl Methacrylate (MMA), were detected in two indoor air samples at concentrations slightly above the

criteria. Given that MMA is known to spike from acrylics/plexiglass, adhesives/caulks, floor polish/finishes, and repair glues —typical indoor/background sources and marginal nature of the cumene result, and the results are not indicative of indicate a subsurface vapor intrusion condition.

These findings support the conclusion that the installed SSDS and SVE systems are effectively mitigating vapor intrusion. The sample analytical results table is shown in Table 1.

3.0 INSTITUTIONAL AND ENGINEERING CONTROL PLAN

3.1 General

Since remaining contamination exists at the site, Institutional Controls (ICs) and Engineering Controls (ECs) are required to protect human health and the environment. This IC/EC Plan describes the procedures for the implementation and management of all IC/ECs at the site. The IC/EC Plan is one component of the SMP and is subject to revision by the NYSDEC project manager.

This plan provides:

- A description of all IC/ECs on the site;
- The basic implementation and intended role of each IC/EC;
- A description of the key components of the ICs set forth in the Environmental Easement;
- A description of the controls to be evaluated during each required inspection and periodic review;
- A description of plans and procedures to be followed for implementation of IC/ECs for the proper handling of remaining contamination that may be disturbed during maintenance or redevelopment work on the site; and
- Any other provisions necessary to identify or establish methods for implementing the IC/ECs required by the site remedy, as determined by the NYSDEC project manager.

3.2 Institutional Controls

A series of ICs is required by the Decision Document to: (1) implement, maintain and monitor Engineering Control systems; (2) prevent future exposure to remaining contamination; and, (3) limit the use and development of the site to restricted-residential (inclusive of commercial and industrial) uses only. Adherence to these ICs on the site is required by the Environmental Easement and will be implemented under this SMP. ICs

identified in the Environmental Easement may not be discontinued without an amendment to or extinguishment of the Environmental Easement. The IC boundaries are shown on Figure 2. These ICs are:

- The property may be used for: restricted residential use as described in 6 NYCRR Part 375-1.8(g)(2)(ii), commercial use as described in 6 NYCRR Part 375-1.8(g)(2)(iii), and industrial use as described in 6 NYCRR Part 375-1.8(g)(2)(iv), although land use is subject to local zoning;
- All ECs must be operated and maintained as specified in this SMP;
- All ECs must be inspected at a frequency and in a manner defined in the SMP;
- The use of groundwater underlying the property is prohibited without necessary water quality treatment as determined by the NYSDOH or the New York City Department of Health and Mental Hygiene to render it safe for use as drinking water or for industrial purposes, and the user must first notify and obtain written approval to do so from the Department;
- Groundwater and other environmental or public health monitoring must be performed as defined in this SMP;
- Data and information pertinent to site management must be reported at the frequency and in a manner as defined in this SMP;
- All future activities that will disturb remaining contaminated material must be conducted in accordance with this SMP;
- Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in this SMP;
- Operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical component of the remedy shall be performed as defined in this SMP;
- Access to the site must be provided to agents, employees or other representatives of the State of New York with reasonable prior notice to the property owner to assure compliance with the restrictions identified by the Environmental Easement;
- The potential for vapor intrusion must be evaluated for any buildings developed in the area within the IC boundaries noted on Figure 2, and any potential impacts that are identified must be monitored or mitigated;
- Vegetable gardens and farming on the site are prohibited; and

3.3 Engineering Controls

3.3.1 Cover (or Cap)

Since the endpoint soil samples indicated that the restricted residential SCOs were achieved for all on-site soils, a site cover system was not required as part of the Track 2 remedy.

3.3.2 Sub-slab Depressurization System

On-site soil vapor exposure is mitigated by the active SSDS installed beneath the newly constructed building as part of the remedy. Exposure to contaminated soil vapor is mitigated by the SSDS installed beneath the newly constructed building as part of the remedy. The SSDS generates a constant vacuum in the subgrade material below the vapor barrier to evacuate vapor phase contaminants that may otherwise accumulate below the vapor barrier, eliminating the potential for these contaminants to migrate into the proposed building. The following describes components, materials, and general layout of the installed SSDS system:

- A 12-inch thickness of ASTM C-33 No.5 aggregate under the entire school building footprint as a gas permeable layer;
- Geotextile fabric below the aggregate to prevent migration of fines from sub-base material into the gas permeable layer;
- 4 SSDS suction pits filled with ASTM C-33 No.3 aggregate measuring 4 ft by 4 ft by 1 ft deep; pits were framed with concrete blocks and covered with a steel plate, and a 4-inch schedule 40 polyvinyl chloride (PVC) pipe with mesh cover and fabric wrapped was placed horizontally and terminated in the middle of the pits
- The horizontal piping extended horizontally towards the edge of building wall, and connect with a 4-inch PVC riser leg and extended through the basement slab;

- Pipe manifolds, which combine the four PVC riser legs into one 4-inch pvc pipe riser, extending to the roof of the building; A RadonAway Checkpoint Mitigation System Alarm, a RadonAway Easy Read manometer and a Georg Fischer ball valve were installed on each of the riser legs in the basement. The alarm system includes an audible alarm, a green and red LED light readout, a low voltage transformer, and tubing, power cord and screws;
- The riser pipe is run vertically up through the roof connecting with a wall-mounted blower and an exhaust stack. The blower was equipped with a variable frequency drive (VFD) to allow adjustment of the fan speeds to optimize system efficiency.
- To further enhance system performance, a booster fan was installed on the riser below the ceiling of the basement level. This booster fan increases the vacuum pressure within the SSDS piping network, supporting more effective vapor extraction from the sub-slab environment;
- Five permanent monitoring points were installed across the building slab. The monitoring point consists of a ¼ -inch stainless steel pipe penetrated into the building subbase material and terminated at 2 inches below, a threaded plug with valve, and a steel 4-inch round deck flush mounted watertight cleanout gasket.

Following initial startup of the active SSDS, a pressure test was performed at the monitoring points on May 20, 2025 and on October 9, 2025 at the three additional monitoring points as requested by NYSDEC. The gas riser indicated the vacuum readings of -0.34 inches of water. A magnehelic vacuum gauge was connected to the monitoring point and the readings ranging from -0.03 to -0.554 inches of water (in-wc). The design vacuum goal for the riser is minimum -0.1 in-wc, and for the sub-slab vacuum is minimum -0.004 in-wc. The vacuum readings obtained below the slab indicate the sub-slab depressurization system operates as designed.

Procedures for operating and maintaining the active SSDS are documented in the Operation and Maintenance Plan (Section 5.0 of this SMP). As-built drawings, signed and sealed by a PE who is licensed and registered in New York State, are included in Appendix K. Figure 4 shows the location of the ECs for the site. Any work conducted pursuant to the

SMP must also be conducted in accordance with the procedures defined in a Health and Safety Plan (HASP) for the site and provided in Appendix F.

3.3.3 Soil Vapor Extraction System

The off-site migration of residual on-site soil vapor is prevented through the operation of an SVE system. The SVE system consists of a network of eight (8) extraction wells each with a radius of influence of 25 ft, a blower, treatment units, two vacuum monitoring point, and exhaust stack. The extraction wells are constructed of the 2-inch diameter PVC with 5 feet of 0.010-inch slot pipe screened at the 15-20 ft bgs interval to match the depth of contamination at each well location based on RI results. Connected horizontal piping from each well is equipped for flow measurement. A SVE enclosure containing the blower, manifolds, moisture separator, treatment units and alarm system is installed for utilization at the Site and powered by the building's electrical infrastructure. SVE wells are connected to the enclosure's blowers and related accessories. The effluent passes through a vapor-phase granular activated carbon treatment prior to discharge via a PVC stack on the rooftop in accordance with the emission requirements set forth in 6NYCRR Part 212. Five permanent vacuum monitoring points were installed across the building slab.

Following initial startup of the SVE system, a startup testing was performed at the monitoring point on May 20, 2025. The following testing results were obtained during the start-up process:

1. **System Calibration and Equipment Check**
   All system components, including the blower, valves, and monitoring instruments, were inspected, adjusted, and calibrated as necessary. The control panel and instrumentation responded appropriately to manual testing and system commands.
2. **Visual Inspection of SVE Piping**
   A comprehensive visual inspection of all accessible SVE piping was conducted. No cracks, damage, or leaks were observed. All joints and connections were secure, and no sealing repairs were necessary.
3. **System Functionality Check**
   The system was powered on and off multiple times to confirm operational reliability. The blower initiated without delay, and all control indicators functioned as expected.
4. **Vacuum Measurements**
   Vacuum pressure was measured at the blower inlet and at the designated sub-slab monitoring point. The readings are as follows:
   a. Blower Inlet Vacuum: -110 in-wc

b. Sub-slab Monitoring Point Vacuum: -0.32 to -1.174 in-wc
The system successfully maintained sub-slab negative pressure exceeding the design goal of -0.01 in-wc.

5. **PID Readings – Carbon Vessel Efficiency**
Photoionization Detector (PID) readings were recorded to evaluate vapor concentrations before and after the activated carbon vessels:
   a. Influent (pre-carbon): 3.2 ppm
   b. Effluent (post-carbon): 0.4 ppm

Overall, the start-up testing confirmed that the SVE system was installed correctly, is operating as designed, and is achieving the performance criteria required for effective vapor mitigation. Procedures for operating and maintaining the SVE system are documented in the Operation and Maintenance Plan (Section 5.0 of this SMP). As-built drawings, signed and sealed by a PE who is licensed and registered in New York State, are included in Appendix K. Figure 5 shows the location of the ECs for the site. Any work conducted pursuant to the SMP must also be conducted in accordance with the procedures defined in a HASP for the site and provided in Appendix F.

3.4 Criteria for Completion of Remediation/Termination of Remedial Systems

Generally, remedial processes are considered completed when monitoring indicates that the remedy has achieved the remedial action objectives identified by the decision document. The framework for determining when remedial processes are complete is provided in Section 6.4 of NYSDEC DER-10. Unless waived by the NYSDEC, confirmation samples of applicable environmental media are required before terminating any remedial actions at the site. Confirmation samples require Category B deliverables and a Data Usability Summary Report (DUSR).

3.4.1 – Sub-Slab Depressurization System

The SSD system will not be discontinued unless prior written approval is granted by the NYSDEC and the NYSDOH project managers. If monitoring data indicates that the SSD system may no longer be required, a work plan to discontinue the SSD system will be submitted by the remedial party to the NYSDEC and NYSDOH project managers. The work plan must include soil vapor intrusion sampling to verify that the SSD system is no longer needed and must comply with the NYSDOH Soil Vapor Intrusion Guidance.

If the NYSDEC project manager approves termination of operation and maintenance of an SSD system, the remedial party will notify the property owner and ask whether the property owner wants to keep the SSD system. If the property owner elects to keep the system, the property owner will be responsible for the operation and maintenance of the system going forward. If the property owner wants the system removed, the remedial party will remove and dispose of the system and repair any parts of the structure that were altered or modified by the SSD system, such as holes in the basement floor or walls.

3.4.2 –Soil Vapor Extraction System

The SVE system will not be discontinued unless prior written approval is granted by the NYSDEC project manager. In the event that monitoring data indicates that the SVE system may no longer be required, a proposal to discontinue the system will be submitted by the remedial party to the NYSDEC project manager. Conditions that may warrant discontinuing the SVE system include contaminant concentrations in groundwater and/or soil that: (1) reach levels that are consistently below ambient water quality standards or the site SCGs, as appropriate; (2) have become asymptotic to a low level over an extended period of time, as accepted by the NYSDEC; or (3) the NYSDEC has determined that the SVE system has reached the limit of its effectiveness. This assessment will be based in part on post-remediation contaminant levels in groundwater collected from monitoring wells located throughout the site. Systems will remain in place and operational until permission to discontinue their use is granted in writing by the NYSDEC project manager.

4.0 MONITORING AND SAMPLING PLAN

4.1 General

This Monitoring and Sampling Plan describes the measures for evaluating the overall performance and effectiveness of the remedy. This Monitoring and Sampling Plan may only be revised with the approval of the NYSDEC project manager. Details regarding the sampling procedures, data quality usability objectives, analytical methods, etc. for all samples collected as part of site management for the site are included in the Quality Assurance Project Plan provided in Appendix G.

This Monitoring and Sampling Plan describes the methods to be used for:

- Sampling and analysis of all appropriate media (e.g., groundwater, indoor air, soil vapor, soils);
- Assessing compliance with applicable NYSDEC standards, criteria and guidance (SCGs), particularly groundwater standards and Part 375 SCOs for soil; and
- Evaluating site information periodically to confirm that the remedy continues to be effective in protecting public health and the environment;

To adequately address these issues, this Monitoring and Sampling Plan provides information on:

- Sampling locations, protocol and frequency;
- Information on all designed monitoring systems;
- Analytical sampling program requirements;
- Inspection and maintenance requirements for monitoring wells;
- Monitoring well decommissioning procedures; and
- Annual inspection and periodic certification.

Reporting requirements are provided in Section 7.0 of this SMP.

4.2 Site – wide Inspection

Site-wide inspections will be performed at a minimum of once per year. These periodic inspections must be conducted when the ground surface is visible (i.e. no snow cover). Site-wide inspections will be performed by a qualified person who directly reports to a PE who is licensed and registered in New York State. Modification to the frequency or duration of the inspections will require approval from the NYSDEC project manager. Site-wide inspections will also be performed after all severe weather conditions that may affect ECs or monitoring devices. During these inspections, an inspection form will be completed as provided in Appendix H – Site Management Forms. The form will compile sufficient information to assess the following:

- Compliance with all ICs, including site usage;
- An evaluation of the condition and continued effectiveness of ECs;
- General site conditions at the time of the inspection;
- Whether stormwater management systems, such as basins and outfalls, are working as designed;
- The site management activities being conducted including, where appropriate, confirmation sampling and a health and safety inspection; and
- Confirm that site records are up to date.

Inspections of all remedial components installed at the site will be conducted. A comprehensive site-wide inspection will be conducted and documented according to the SMP schedule, regardless of the frequency of the Periodic Review Report. The inspections will determine and document the following:

- Whether ECs continue to perform as designed;

- If these controls continue to be protective of human health and the environment;
- Compliance with requirements of this SMP and the Environmental Easement;
- Achievement of remedial performance criteria; and
- If site records are complete and up to date.

Reporting requirements are outlined in Section 7.0 of this plan.

Inspections will also be performed in the event of an emergency. If an emergency, such as a natural disaster or an unforeseen failure of any of the ECs occurs that reduces or has the potential to reduce the effectiveness of ECs in place at the site, verbal notice to the NYSDEC project manager must be given by noon of the following day. In addition, an inspection of the site will be conducted within 5 days of the event to verify the effectiveness of the IC/ECs implemented at the site by a qualified environmental professional, as defined in 6 NYCCR Part 375. Written confirmation must be provided to the NYSDEC project manager within 7 days of the event that includes a summary of actions taken, or to be taken, and the potential impact to the environment and the public. The remedial party will submit follow-up status reports to the NYSDEC within 45 days of the event on actions taken to respond to any emergency event requiring ongoing responsive action, describing and documenting actions taken to restore the effectiveness of the ECs.

The remedial party will conduct exterior inspections of all sub-slab depressurization (SSD) systems and perform comprehensive inspections quarterly for the first year after COC and annually after that. Exterior inspections will include: confirming that the fan is running correctly, determining whether there is damage to the stack or other exterior system components, and determining whether there have been structural changes, such as an addition to the structure. Comprehensive inspections include all of the activities required in the exterior inspection and an interior inspection, which includes: confirming a pressure differential on the manometer, inspecting the interior components for damage, recording vacuum readings from sub-slab vacuum monitoring points, and inspecting the basement area for cracks in the basement floors and walls that may have developed since

the SSD system was installed. The remedial party will notify the DEC project manager about any problems within three days of inspections. Inspection reports will be emailed to the DEC Project Manager and included in the next Periodic Review Reports (PRR). Any needed repairs will be made promptly according to the procedures in the Operation and Maintenance Plan (Section 5.).

4.3 Treatment System Monitoring and Sampling

4.3.1 Remedial System Monitoring

4.3.1.1 SSDS Monitoring

Monitoring of the SSDS will be performed on a routine basis, as identified in in-text Table II Remedial System Monitoring Requirements and Schedule (see below). The monitoring of remedial systems will be conducted by a qualified person who directly reports to a PE who is licensed and registered in New York State. Modification to the frequency or sampling requirements will require approval from the NYSDEC project manager. A visual inspection of the complete system will be conducted during each monitoring event. Unscheduled inspections and/or sampling may take place when a suspected failure of the SSDS has been reported or an emergency occurs that is deemed likely to affect the operation of the system. SSDS components to be monitored include, but are not limited to, the components included in in-text Table II below.

In-Text Table II – SSDS Remedial System Monitoring Requirements and Schedule

Remedial System Component	Monitoring Parameter	Operating Range[1]	Monitoring Schedule
Vacuum Blower	Vacuum Pressure/Flow Rate	0 - 4.8 in. w.c. static pressure/ 400 - 490 CFM	Upon system start-up or re-start, quarterly (first year after COC), annually (after first year)
Building Slab	Integrity / Sealing Check	No cracks or penetrations without sealant	
General System Piping	Integrity / Connection Check	Airtight, no leaks or disconnections	

Vacuum Monitoring Point	Induced Vacuum Reading	Minimum 0.004 in. w.c.	

Notes:

CFM – Cubic Feet per Minute

[1]Operating ranges for flow rate and applied vacuum may be adjusted based on system performance, balancing of riser legs, etc.

A complete list of components to be inspected is provided in the Inspection Checklist, provided in Appendix H – Site Management Forms. If any equipment readings are not within their specified operation range, any equipment is observed to be malfunctioning or the system is not performing within specifications; maintenance and repair, as per the Operation and Maintenance Plan, is required immediately.

4.3.1.2 Soil Vapor Extraction System Monitoring

Monitoring of the SVE system will be performed on a routine basis, as identified in in-text Table III SVE Remedial System Monitoring Requirements and Schedule (see below). The monitoring of remedial systems will be conducted by a qualified person who directly reports to a PE who is licensed and registered in New York State. Modification to the frequency or sampling requirements will require approval from the NYSDEC project manager. A visual inspection of the complete system will be conducted during each monitoring event. Unscheduled inspections and/or sampling may take place when a suspected failure of the SVE system has been reported or an emergency occurs that is deemed likely to affect the operation of the system. SVE system components to be monitored include, but are not limited to, the components included in in-text Table III below.

In-Text Table III – SVE Remedial System Monitoring Requirements and Schedule

Remedial System Component	Monitoring Parameter	Operating Range	Monitoring Schedule
Vacuum Blower	Vacuum Pressure	100 – 130 in. w.c. vacuum	Quarterly (first year after COC), annually (after first year)
Individual SVE Line	Flow Rate	10 – 25 CFM	
Vapor Treatment System (e.g. Carbon Vessels)	PID Reading (Influent/Effluent)	Influent > Effluent; confirm	

		breakthrough not reached	
General System Piping	Integrity / Connection Check	Airtight, no leaks or disconnections	
SVE Vacuum Monitoring Point	Induced Vacuum Reading	Minimum 0.01 inches of w.c.	
Condensate Knock-Out Tank	Water Level	10–30% of tank height	Quarterly (first year after COC), as needed (after first year)

A complete list of components to be inspected is provided in the Inspection Checklist, provided in Appendix H – Site Management Forms. If any equipment readings are not within their specified operation range, any equipment is observed to be malfunctioning or the system is not performing within specifications; maintenance and repair, as per the Operation and Maintenance Plan, is required immediately.

4.3.2 Remedial System Sampling

Confirmatory extracted soil vapor sampling will be performed following startup to assess VOC emissions calculations, and to provide baseline VOC concentrations at the onset of SVE system operation. Influent and effluent vapor samples will be collected using 1L Summa® canisters in accordance with the Quality Assurance Project Plan (QAPP) and analyzed for VOCs by EPA Method TO-15 by a NYSDOH Environmental Laboratory Approval Program (ELAP)-certified laboratory. Samples shall be collected from the SVE system on a routine basis. Sampling locations, required analytical parameters and schedule are provided in Table IV – Remedial System Sampling Requirements and Schedule below. Modification to the frequency or sampling requirements will require approval from the NYSDEC project manager.

In-Text Table IV – Remedial System Sampling Requirements and Schedule

Sampling Location	**Analytical Parameters**	**Schedule**
	VOC (EPA Method TO-15)	

SVE system Blower Influent	X	Quarterly (first year after COC), annually (after first year)
SVE system Treated Effluent	X	Quarterly (first year after COC), annually (after first year)
SVE system Extraction Well Soil Vapor Sample	X	Quarterly the first year after COC, and as needed (after first year)

Detailed sample collection and analytical procedures and protocols are provided in Appendix I – Field Sampling Plan and Appendix G – Quality Assurance Project Plan.

The remedial party will properly dispose of all wastes generated by the remedial system at off-site disposal facilities according to local, state and federal laws and regulations. Wastes will be tested before disposal to comply with the permit conditions of the disposal facility. Wastes generated at this Site include: spent activated carbon and water collected in the knockout tank of the SVE system.

Based on requirements of the disposal/recycling facility and waste disposal contractor, the spent activated carbon will be characterized through representative sampling and analyzed for hazardous constituents, including VOCs, to determine whether the material qualifies as hazardous waste under RCRA criteria. Based on analytical results, the waste will be classified and handled accordingly. All spent carbon will be placed in sealed, labeled drums or appropriate containers that meet DOT specifications for transport. A licensed waste transporter will then haul the material to a permitted treatment, storage, and disposal facility (TSDF) approved to accept this type of waste. Chain-of-custody documentation and waste manifests will be maintained throughout the process to ensure regulatory compliance and proper tracking of material from the site to final disposal.

Water collected in the SVE system's knockout tank will also be managed as a potentially contaminated waste stream. Prior to disposal, samples of the water will be collected and analyzed for VOCs and other applicable parameters to determine whether it is classified as hazardous. The water will be stored in secure, labeled containers or drums

that meet DOT specifications and transported by a licensed hauler to an approved disposal facility, such as a permitted wastewater treatment plant or TSDF, depending on its classification. All handling and transportation will comply with applicable regulations, and appropriate documentation will be maintained.

4.3.3 Monitoring and Sampling Protocol

All sampling activities will be recorded in a field book and associated sampling log as provided in Appendix H – Site Management Forms. Other observations will be noted on the sampling log. The sampling log will serve as the inspection form for the monitoring network. Additional detail regarding monitoring and sampling protocols are provided in the site-specific Field Activities Plan provided as Appendix I of this document.

5.0 OPERATION AND MAINTENANCE PLAN

5.1 General

This Operation and Maintenance Plan provides a brief description of the measures necessary to operate, monitor and maintain the mechanical components of the remedy selected for the site. This Operation and Maintenance Plan:

- Includes the procedures necessary to allow individuals unfamiliar with the site to operate and maintain the SSDS and SVE systems;
- Will be updated periodically to reflect changes in site conditions or the manner in which the SSDS and SVE systems are operated and maintained.

Further detail regarding the Operation and Maintenance of the SSDS and SVE is provided in Appendix E – Operation and Maintenance Manual. A copy of this Operation and Maintenance Manual, along with the complete SMP, is to be maintained at the site. This Operation and Maintenance Plan is not to be used as a stand-alone document, but as a component document of this SMP.

5.2 Remedial System (or other Engineering Control) Performance Criteria

The site is equipped with a SSDS and a SVE system to mitigate the potential for vapor intrusion and prevent the potential off-site migration of soil vapor contamination. The performance of these engineering controls is evaluated based on system-specific operating parameters and regulatory discharge requirements.

Minimum operating requirements for the key components of the SSDS and SVE systems, including blower flow rates, vacuum levels, and operating pressure are summarized in the table presented in Section 5.3.2 and 5.4.2 below. These parameters reflect the system design criteria established during remedial implementation and are used to guide routine operation and maintenance activities to ensure continued effectiveness.

Discharge requirements for the SVE system, including vapor-phase emissions, are described in detail in Section 5.4.1 and are based on applicable local, state, and federal regulatory thresholds. The system is configured to ensure that any vapor discharge meets all air quality standards and permit conditions.

5.3 Operation and Maintenance of SSDS

The following sections provide a description of the operations and maintenance of SSDS. Cut-sheets and as-built drawings for SSDS are provided in Appendix E – Operations and Maintenance Manual.

5.3.1 SSDS Start-Up and Testing

The SSDS has been commissioned and tested following completion of building construction and prior to building occupancy. Additional performance testing will be conducted following any future event that necessitates system shutdown and subsequent restart.

The SSDS start-up inspection includes the following procedures:

- Verification of airflow from each of the four SSDS risers through visual observation of flow sensors installed on each manifold leg and measurement using a calibrated manometer or portable vacuum gauge;

- Verification of vacuum pressure at each SSDS riser by inspecting magnehelic gauges installed on the manifold legs;
- Functionality check of system alarms, confirming that the appropriate alarm indicator is active;
- Verification of sub-slab depressurization, ensuring that a minimum vacuum of 0.004 inches of water column (in. w.c.) is achieved. This has been confirmed by manually accessing the five designated monitoring points (SSDS-MP-1 through SSDS-MP-5) and measuring vacuum levels using a calibrated manometer or portable vacuum gauge.

The system testing described above will be conducted if, in the course of the SSDS system lifetime, the system goes down or significant changes are made to the system and the system must be restarted.

5.3.2 SSDS Routine System Operation and Maintenance

The SSDS will be operated continuously and maintained in accordance with manufacturer specifications and site-specific performance goals. Routine inspections and maintenance will be performed to ensure system effectiveness and regulatory compliance. Minimum operating requirements for the key SSDS components are summarized in the in-text Table V. Each component of the SSDS will be regularly inspected and maintained to ensure that all system parameters remain within acceptable operational limits and that any signs of malfunction will be addressed promptly.

The SSDS blower, identified as RadonAway® HS5500, will be inspected quarterly to verify that the inlet vacuum pressure remains at or above 40 inches water column and that the total system airflow rate is equal to or greater than 30 CFM, or as specified in the design documentation. The system includes four risers, each of which will maintain a minimum vacuum of 5 inches water column. Readings will be taken using a calibrated pressure gauge and compared against established performance thresholds. Vacuum readings at the sub-slab monitoring points (SSDS-MP-1 through SSDS-MP-5) will also be taken quarterly by a digital manometer, with a minimum acceptable sub-slab vacuum of

0.004 inches water column. All readings will be documented and any deviations from the expected values will be investigated and corrected.

The system is equipped with a differential pressure switch designed to trigger an alarm in the event of blower failure or an unexpected drop in vacuum. This alarm will be tested quarterly to ensure proper activation in the event of blower shutdown. In addition, airflow indicators located on the manifold legs will be visually inspected on a quarterly basis to confirm that air is circulating properly through the system.

All gauges and meters installed in the system will be calibrated at least annually to ensure measurement accuracy. Filters, if present, will be cleaned or replaced semi-annually or more frequently as needed, depending on observed dust accumulation or performance impacts. During each maintenance cycle, personnel will verify that the vacuum gauges installed at the blower inlet are clean and functional, and that pressure and airflow sensors are free of debris and within acceptable ranges.

A full system functionality check will be conducted annually, as well as following any system shutdown or restart event. This check includes verification that all system performance criteria are being met and that all components are operating as designed. If deficiencies are observed, maintenance actions will be taken promptly to restore compliance. Any cleaning, adjustment, or replacement of components—such as pressure gauges, filters, or alarm systems— will be carried out in accordance with manufacturer specifications. A binder of these specifications will be maintained on-site.

Personnel performing these inspections will also evaluate the physical integrity of the SSDS components, including the blowers, alarm systems, monitoring points, piping manifolds, and any concrete slabs where the system is mounted. Observations such as structural cracks, water infiltration, disconnected piping, or corrosion will be documented and addressed immediately.

In summary, the SSDS will be maintained through a structured schedule of inspection and upkeep, as detailed in Table VII. Maintenance activities will be logged, and the system’s performance trends will be evaluated periodically to ensure optimal operation and regulatory compliance. A detailed Operations and Maintenance Manual is included in Appendix E and provides additional procedures for troubleshooting and corrective actions.

In-Text Table V – SSDS Operating Requirements and Maintenance Schedule

Component	Parameter	Minimum Requirement	Inspection / Maintenance Frequency
SSDS Blower (RadonAway® HS5500)	Inlet Vacuum Pressure	≥ 40 inches water column (in. w.c.)	Quarterly
	Total System Flow Rate	≥ 30 CFM (or per design)	Quarterly
SSDS Risers (3 total)	Vacuum at Each Riser	≥ 5 inches w.c.	Quarterly
Monitoring Points (MP-1 to MP-2)	Sub-Slab Vacuum	≥ 0.004 inches w.c.	Quarterly
System Alarm	Blower Failure Detection	Must activate upon blower shutdown	Quarterly
Flow Sensors (manifold legs)	Airflow Indication	Visual confirmation of airflow	Quarterly
Gauges / Meters	Calibration	—	Annually
Filters (if applicable)	Cleaning / Replacement	—	Semi-annually, or as needed
System Performance	Full System Functionality Check	Must meet all performance criteria	Annually, and after shutdown/restart

5.3.3 SSDS Non-Routine Operation and Maintenance

Non-routine operation and maintenance activities are those triggered by system malfunction, damage, or performance deviations beyond acceptable operating thresholds. These activities are essential to restore full functionality and ensure the continued effectiveness of the SSDS.

- **Warning Devices Initiated:**
  The SSDS is equipped with warning devices (e.g., audible/visual alarms) that are activated when blower operation is interrupted or vacuum levels fall below the design threshold. Upon alarm activation, the system will be inspected immediately to identify and correct the issue. All alarm events and corrective actions will be documented.
- **Damage:**
  Physical damage to system components—such as cracked or disconnected piping, blower housing damage, or compromised monitoring points—may impair system performance. Damaged components will be repaired or replaced promptly by qualified personnel. The system will be re-tested after repairs to confirm that all performance standards are met.

- **Reduced Effectiveness:**
  If performance monitoring indicates reduced vacuum levels, airflow imbalance, or insufficient sub-slab depressurization, the cause will be investigated. Common causes may include partial blockages, saturated filters, or system wear. Remedial actions may involve pipe cleaning, filter replacement, or system rebalancing. Post-maintenance verification will be conducted to ensure restoration of full system functionality.
- **System or Component Replacement:**
  Blowers, gauges, alarms, or other components that fail or degrade beyond repair will be replaced in-kind or with approved alternatives. Replacement activities will be conducted in accordance with manufacturer recommendations and site-specific design criteria. All replacement events will be documented, and the system will be retested following installation.

All non-routine maintenance activities will be logged and included in the system O&M records. If required, these records will be submitted as part of periodic reporting to regulatory agencies.

5.3.4 System Monitoring Devices and Alarms

The SSD system has a warning device to indicate that the system is not operating properly. In the event that warning device is activated, applicable maintenance and repairs will be conducted, as specified in the Operation and Maintenance Plan, and the SSD system will be restarted. Operational problems will be noted in the Periodic Review Report to be prepared for that reporting period.

The SSDS is equipped with monitoring devices and alarms to ensure continuous and effective operation. Blower performance and vacuum levels are tracked using magnehelic or digital gauges installed at each riser, providing real-time pressure readings and early detection of system issues such as obstructions or loss of vacuum. Flow indicators on each manifold leg allow visual confirmation of airflow and help identify any loss of function in individual branches. In the event of blower shutdown or power loss, a warning device will trigger an audible and/or visual alarm at the designated panel to alert personnel to perform corrective actions.

5.4 Operation and Maintenance of Soil Vapor Extraction System

The following sections provide a description of the operations and maintenance of SVE system. Cut-sheets and as-built drawings for SSDS are provided in Appendix E – Operations and Maintenance Manual.

5.4.1 Soil Vapor Extraction System Start-Up and Testing

The SVE system has been started up and tested in accordance with manufacturer specifications and site-specific design requirements. All procedures complies with applicable environmental and health and safety regulations.

Prior to start-up, a pre-operational inspection was conducted to verify proper installation of system components, including extraction wells, piping, valves, blower, knockout tank, and treatment units. The inspection confirmed that all mechanical connections are secure, electrical systems are operational, and safety features (e.g., warning devices and emergency shut-offs) are in place.

Baseline measurements behave been collected before system activation to establish background conditions. These measurements includes subsurface vacuum levels, and background PID readings at selected monitoring points.

Start-up testing includes a series of functional checks to confirm proper system operation. The system has been examined for air leaks along piping and manifold connections, and all well seals have been checked to confirm integrity. Backdraft conditions are evaluated to ensure airflow is directed properly through the system.

System balancing has been conducted to ensure even distribution of vacuum across all SVE legs. This involves adjusting valves or orifice plates to optimize flow. Monitoring devices and warning systems have been tested to confirm that alarms activate in the event of blower failure, power loss, or elevated moisture levels in the knockout tank.

Influent and effluent vapor streams from the SVE system carbon vessels will be field-screened quarterly during the first year of system operation after COC. The Confirmatory SVE system sampling will be conducted quarterly (first year after COC) to quantify VOC concentrations in soil vapor across the site and evaluate carbon vessel performance and longevity. Additional samples will be collected as needed after the first year. Subsequent sampling will occur annually or as needed to assess system performance and support contaminant mass removal calculations.

The system testing described above will be conducted if, in the course of the SSDS system lifetime, the system goes down or significant changes are made to the system and the system must be restarted.

5.4.2 Soil Vapor Extraction System Routine System Operation and Maintenance

The SVE system has been operated continuously and maintained in accordance with manufacturer specifications and site-specific performance criteria. Routine operation and maintenance ensures that system components remain functional and that vapor mitigation performance remains consistent over time. In-text Table VI provides a summary and schedule of routine maintenance.

The SVE blower will be inspected quarterly to confirm that the vacuum pressure at the inlet meets the manufacturer's specifications, which may range up to 130 inches of water column (in. w.c.), depending on the model. This value will be verified using the manufacturer-provided vacuum gauge installed at the blower inlet. Readings will be taken while the system is operating under stable conditions. If the vacuum pressure is below the expected range, this may indicate blockage, blower degradation, or imbalance in the extraction well network.

The system flow rate will also be measured quarterly to confirm alignment with the design specifications, typically in the range of 350–600 CFM (cubic feet per minute) for total system flow. Flow rate will be measured using a manufacturer-provided flow meter installed in the piping system. Measured values will be compared to the design documentation, and significant deviations will be investigated and corrected.

Each extraction well or manifold leg will maintain a consistent negative pressure during system operation. Quarterly inspections will include measuring vacuum at each well using a digital vacuum gauge or inclined manometer. A loss of negative pressure at any well may signal a line blockage, system leak, or blower malfunction. All readings will be recorded, and ports securely resealed after measurement.

The carbon treatment vessels will be monitored to ensure treatment effectiveness. A photoionization detector (PID) will be used to measure VOC concentrations at both the influent and effluent sampling ports. This testing will be conducted quarterly, and the effluent PID reading must be less than 25% of the influent concentration. If this threshold

is exceeded, the carbon media may be approaching exhaustion and will be replaced or regenerated according to manufacturer recommendations.

Monitoring points within the subsurface will maintain a vacuum of at least 0.01 in. w.c. during system operation. Measurements will be taken using a high-resolution digital micro-manometer capable of detecting low-pressure changes. These readings confirm that the system is exerting sufficient negative pressure beneath the slab or soil to capture vapors effectively.

The system alarm will be tested quarterly to confirm that it activates in the event of a blower or system failure. This alarm is typically triggered by a drop in vacuum pressure or blower malfunction and will produce a visible and/or audible alert. Testing will involve temporarily shutting down the blower to ensure the alarm activates, then restoring system function and verifying that the alarm resets properly.

Flow sensors, usually consisting of visual flow indicators or rotary vanes, will be inspected quarterly to confirm airflow occurring throughout all legs of the system. Lack of visible motion may suggest a blockage or blower issue and will be investigated immediately.

All gauges and meters will be calibrated annually using certified calibration equipment or as recommended by the manufacturer. Inaccurate or malfunctioning devices will be recalibrated or replaced.

If applicable, blower filters will be cleaned or replaced on a semi-annual basis, or more frequently if pressure drops or visible dust accumulation is noted. Filters are typically located at the blower inlet and can be cleaned with compressed air or replaced with a model approved by the blower manufacturer.

System balancing, which involves adjusting valves or blower settings to ensure even vacuum distribution across all wells, will be performed as needed or semi-annually. Balancing will be conducted using vacuum readings from each well and monitoring point to confirm uniform system performance.

All inspection results, measurements, and maintenance activities will be documented in the SVE System Inspection Log. A detailed Operations and Maintenance Manual is included in Appendix E and provides additional procedures for troubleshooting and corrective actions.

In-Text Table VI – SVE System Operating Requirements and Maintenance Schedule

Component	Parameter	Minimum Requirement	Inspection / Maintenance Frequency
SVE Blower	Vacuum Pressure at Inlet	Per manufacturer specification (e.g., up to 130 in. w.c.)	Quarterly
	Flow Rate	As specified in design documents (e.g., 200–225 CFM total)	Quarterly
Extraction Wells / Manifold Legs	Vacuum at Each Well	Consistent negative pressure at all wells	Quarterly
Carbon Treatment Vessels	PID Influent/Effluent	Effluent ≤ 25% of influent	Quarterly
Monitoring Points	Subsurface Vacuum	≥ -0.01 in. w.c.	Quarterly
System Alarm	Blower/System Failure Notification	Alarm must activate on failure	Quarterly
Flow Sensors	Airflow Verification	Visible or measured indication of flow	Quarterly
Gauges / Meters	Calibration	—	Annually
Blower Filters (if applicable)	Cleaning / Replacement	—	Semi-annually, or per manufacturer recommendation
System Balancing	Vacuum/Flow Adjustment	System evenly balanced	As needed or semi-annually

5.4.3 Soil Vapor Extraction System Non-Routine Operation and Maintenance

Non-routine operation and maintenance of the SVE system will be required when system alarms are triggered, physical damage occurs, system performance declines, or equipment reaches the end of its service life.

If a warning device is activated—such as an alarm indicating blower failure, high moisture in the knockout tank, or loss of vacuum—qualified personnel will inspect the

system immediately. The cause of the alarm will be identified, corrective action will be taken, and system function will be verified before resuming continuous operation.

Any physical damage to system components, including cracked or disconnected piping, damaged valves, or compromised well heads, will be repaired promptly. After repairs, vacuum levels and airflow will be rechecked to ensure the system is operating within design parameters.

Reduced effectiveness, indicated by lower-than-expected vacuum readings, imbalanced flow, or carbon breakthrough, will trigger troubleshooting procedures. Adjustments may include cleaning or replacing filters, rebalancing airflow, sealing leaks, or replacing saturated carbon media.

System or component replacement, such as replacement of a blower unit, carbon vessel, or monitoring gauge, will be conducted in accordance with manufacturer specifications. Following replacement, the system will be re-tested and rebalanced as needed to restore full functionality.

All non-routine maintenance activities, system downtime, and corrective actions will be documented and summarized in the quarterly monitoring report.

5.4.4 Soil Vapor Extraction System Monitoring Devices and Alarms

The SVE system has a warning device to indicate that the system is not operating properly. In the event that warning device is activated, applicable maintenance and repairs will be conducted, as specified in the Operation and Maintenance Plan, and the SVE system will be restarted. Operational problems will be noted in the Periodic Review Report to be prepared for that reporting period.

The SVE system includes the following monitoring devices and alarms:

- A system monitoring device and alarm notification for vacuum blower failure.
- A system monitoring device for low, high, and high-high water levels in the moisture separator (knockout tank).
- An alarm notification for high-high water level in the moisture separator.

These devices ensure continuous performance monitoring and enable prompt response to equipment malfunctions or process deviations. Alarms are either local (audible/visual) or integrated into a centralized notification system, depending on site configuration.

5.5 Fire Safety

Fire protection and life safety systems at the facility will be maintained in accordance with the Fire Code of New York State, NFPA 1584, and all applicable federal, state, and local codes. Systems include fire extinguishers, emergency lighting, sprinklers, emergency exits, alarm systems, and electrical infrastructure.

Fire extinguishers will be inspected monthly and tested annually. Emergency lighting will undergo a 90-minute functional test. Sprinkler systems will receive monthly visual inspections and annual functional testing. Emergency exits will be kept unobstructed and clearly marked at all times. Fire alarms—whether local or tied to a broadcast system—will be tested regularly to ensure functionality. The electrical system will be maintained per code, with panels accessible and wiring intact.

The remedial party will conduct an annual facility walk with the local fire chief and/or fire suppression team. The site walk will allow for the addition of the facility to any local preplanning efforts. The NYSDEC project manager will be provided with the local fire chief's/fire suppression team's recommendations as soon as they become available. Following review, the NYSDEC project manager may direct the remedial party to implement the recommendations and/or revise the SMP.

6.0 PERIODIC ASSESSMENTS/EVALUATIONS

6.1 Climate Change Vulnerability Assessment

Increases in both the severity and frequency of storms/weather events, an increase in sea level elevations along with accompanying flooding impacts, shifting precipitation patterns and wide temperature fluctuation, resulting from global climactic change and instability, have the potential to significantly impact the performance, effectiveness and protectiveness of a given site and associated remedial systems. Vulnerability assessments provide information so that the site and associated remedial systems are prepared for the impacts of the increasing frequency and intensity of severe storms/weather events and associated flooding.

This section provides a current vulnerability assessment that evaluates the vulnerability of the site and/or engineering controls to severe storms/weather events and associated flooding. This section also identifies vulnerability assessment updates that will be conducted for the site in Periodic Review Reports.

- Flood Plain:
  The site is not located within a FEMA-designated 100-year floodplain, as identified in the current Flood Insurance Rate Map dated September 5, 2007.
- Sea Level Rise:
  The site is more than 10 miles from the nearest shoreline and is not considered susceptible to storm surge or sea level rise impacts. Conditions will be re-evaluated during future reviews.
- Site Drainage and Storm Water Management:
  No flooding event have been identified after severe storm event. Drainage and stormwater infrastructure will continue to be monitored to prevent localized flooding.
- Erosion:
  No current evidence of erosion has been observed at the site, as the whole site is capped under building slab.
- High Wind:
  Above-ground components of the SVE/SSDS (e.g., risers, blower units) may be subject to damage from high winds or falling debris. These systems will be visually inspected following major wind events to identify any impact or structural concerns.
- Drought:

Regional drought conditions are not expected to impact site management. Groundwater is encountered at approximately 62 feet bgs, well below remedial features and monitoring intervals; seasonal fluctuations associated with drought are unlikely to affect well availability, sampling representativeness, or SSDS/SVE performance.

- Electricity:
  The system is powered by a utility electric connection on-site and depends on uninterrupted power to operate. Loss of electricity during storms or voltage surges (e.g., from lightning) may disrupt performance. Alarms and protective devices are in place, and the system is inspected after any power-related events.
- Spill/Contaminant Release:
  No current vulnerabilities have been identified, and storage of large amounts of fuel oil or other chemicals at the Site is not expected.
- Wildfires:
  The site is not located in a wildfire-prone area.

6.2 Green Remediation Evaluation

NYSDEC's DER-31 Green Remediation requires that green remediation concepts and techniques be considered during all stages of the remedial program including site management, with the goal of improving the sustainability of the cleanup and summarizing the net environmental benefit of any implemented green technology. This section provides an environmental footprint analysis of the remedy, as implemented at the time of this SMP. This section of the SMP also provides a summary of green remediation evaluations to be completed for the site during site management and reported in PRRs.

6.2.1 Environmental Footprint Analysis

An environmental footprint analysis was completed using SiteWise™ (available in the SURF library), an NYSDEC-accepted environmental footprint calculator. The model was populated with project-specific activities associated with the remedy and long-term O&M at this Site, including:

- Annual inspections (10-year horizon) with round-trip mileage to/from the Site;
- SSDS operation (fan/blower electricity use per the O&M plan), periodic system checks, and performance monitoring;
- Soil Vapor Extraction (SVE) system operation (blower electricity use and anticipated run-time), routine influent/effluent and system performance sampling,

and vapor-phase treatment media change-outs (e.g., GAC) and associated waste handling;

- Consumables and replacement parts (filters, GAC, fittings) and the transportation/disposal of spent media;

Using these inputs and the anticipated operating schedules for the SSDS/SVE systems, the SiteWise™ model estimated total energy use and associated air emissions (CO_2 and criteria pollutants) for up to 10 years of system operation and annual inspections. The resulting estimates are summarized in In-Text Table VII and were used to identify opportunities to minimize environmental footprint (e.g., high-efficiency equipment selection, trip consolidation). Detailed assumptions and SiteWise™ input sheets are provided in Appendix L.

In-Text Table VII - SiteWise™ Estimated Energy Use & Air Emissions

Footprint Metrics	**10 Years of Site Management Activities**
Greenhouse Gas (GHG) Emissions (metric tons CO_2e)	48.98
Total Energy Used (MMBtu)	228
Total NO_x Emissions (metric tons)	0.012
Total SO_x Emissions (metric tons)	0.0065
Total PM_{10} Emissions (metric tons)	0.0059

6.2.2 Green Remediation Components and Best Management Practices

The SMP will be implemented to provide the details necessary for the construction, operation, optimization, maintenance, and/or monitoring of the remedial program. Green remediation principals and techniques will be implemented to the extent feasible in the site management of the remedy as per DER-31. The major green remediation components are as follows:

- Considering the environmental impacts of treatment technologies and remedy stewardship over the long-term;
- Reducing direct and indirect greenhouse gases and other emissions;
- Increasing energy efficiency and minimizing use of non-renewable energy;
- Conserving and efficiently managing resources and materials;

- Reducing waste, increasing recycling and increasing reuse of materials which would otherwise be considered a waste; and
- Additionally, to incorporate green remediation principles and techniques to the extent feasible in the future development at this site, any future on-site buildings shall be constructed, at a minimum, to meet the 2020 Energy Conservation Construction Code of New York (or most recent edition) to improve energy efficiency as an element of construction.

The SMP also includes the discussion and measurement of environmental Impacts related to these green remediation components, including but not limited to the following:

- Waste Generation

  Waste generation considers the management of waste associated with SMP activities and any waste-reduction projects including, but not limited to, material reuse and recycling. Waste generation from routine SMP activities (annual Site-wide inspections and routine SSDS/SVE O&M) is expected to be limited to spent PPE and minor sampling consumables. Additional wastes may be generated during non-routine SMP activities and during SVE/SSDS maintenance, including spent granular activated carbon (GAC) or other vapor-phase media, pre-filters, knockout-tank solids, acetate liners, polyethylene sheeting used for temporary containment, and decontamination materials. When practicable, consumption/generation of such materials will be minimized. Decontamination and reuse of applicable materials will be considered where allowable. Electronic methods of data collection (e.g., tablets) will be used to reduce paper consumption when possible. Designated collection points for waste streams will be established and materials encouraged to be segregated into single-use items (metal, plastics, and glass), compostables, paper/cardboard, and other items that may be recycled locally. Spent GAC/media will be directed to regeneration or appropriate disposal per facility acceptance.
- Energy usage (electrical usage for operation of remedial systems, site lighting, security systems, etc.).

  Energy usage considers the electricity needed for SMP activities. For routine Site-wide inspections, electrical use is minimal (portable instruments and charging). By

contrast, ongoing operation of the SSDS fan(s) and the SVE blower represents the primary electrical demand at the Site, with smaller loads from controls, telemetry, and any heat-trace or enclosure ventilation. Battery-powered equipment will be turned off when not in use to limit charging. Where feasible, operating setpoints (e.g., SSDS vacuum, SVE run time/pulsing) will be optimized to meet performance objectives while reducing power consumption.

- Emissions (vapor-phase remedial system emissions, fuel usage for transportation to and from the site for inspections and/or sampling, operation of gas-powered generators, etc.).

  Emissions tracking considers (i) fuel usage for transportation of personnel to and from the Site for inspections, sampling, and O&M visits; (ii) indirect emissions associated with purchased electricity to run the SSDS/SVE systems; and (iii) process emissions from the SVE exhaust following treatment (e.g., through GAC). During non-routine SMP activities, emissions tracking will also consider trucks used for export of contaminated materials or import of backfill, equipment and laboratory couriers, and drilling/construction equipment. To reduce fuel usage and associated emissions, trucks and heavy machinery operators will be encouraged to reduce idling and shut down vehicles/equipment when not in use. Contractors will be encouraged to perform routine, on-time maintenance to improve fuel efficiency. When possible and pending availability, personnel will be scheduled based on proximity to the Site and encouraged to use public transportation. Properly maintained vapor-phase treatment (e.g., timely GAC change-outs) will be used to minimize process emissions from the SVE exhaust.

- Water usage (identify sources of decontamination water, irrigation water, etc.).

  Water usage considers sources of water for tasks such as decontamination and dust control. Water usage is not anticipated for routine Site-wide inspections beyond minor decontamination needs. Water may be required during non-routine SMP activities for decontamination and dust suppression. The public water supply will be used when water is required. In addition, SVE condensate that accumulates in the knockout tank will be periodically removed and managed in accordance with applicable regulations and disposal facility requirements. Water will only be

consumed when necessary, and consumption will be in accordance with local regulations.

- Land and/or ecosystems (describe any disturbances and restoration of land and/or ecosystems as part of implementation/operation of the remedy).

  Land and/or ecosystems consider any disturbances and restoration of land and/or ecosystems as part of the implementation/operation of the remedy. SSDS and SVE O&M activities occur within previously disturbed areas (building interior, concrete/asphalt hardscape, and designated mechanical pads), and no new ground disturbance is anticipated for routine operation. If non-routine activities requiring subsurface access are conducted under the EWP, temporary disturbances will be confined to the smallest practicable footprint and managed with appropriate erosion, dust, and noise controls. Following any such work, the Site cover system (e.g., slab, asphalt, or other approved cover) will be restored in kind and will require minimal to no additional maintenance.

6.2.3 Timing of Green Remediation Evaluations

For major remedial system components, green remediation evaluations and corresponding modifications will be undertaken as part of a formal Remedial System Optimization (RSO), or at any time that the NYSDEC project manager feels appropriate, (e.g. during significant maintenance events or in conjunction with storm recovery activities).

Modifications resulting from green remediation evaluations will be routinely implemented and scheduled to occur during planned/routine operation and maintenance activities after approval from the DER project manager. Reporting of these modifications will be presented in the PRR.

6.2.4 Remedial Systems

Remedial systems will be operated properly considering the current site conditions to conserve materials and resources to the greatest extent possible. Consideration will be given to operating rates and use of reagents and consumables. Spent materials will be sent for recycling, as appropriate. Remedial system types and associated parameters to be evaluated include:

- Soil vapor extraction wells (operating rates/locations);
- Activated carbon systems (spent carbon replacement and disposal/regeneration); and
- Wastewater collection and disposal.

6.2.5 Building Operations

Structures including buildings and sheds will be operated and maintained to provide for the most efficient operation of the remedy, while minimizing energy, waste generation and water consumption. Components to be evaluated will include:

- Heating/cooling systems and temperature set-points;
- Building skin, insulation and building use and occupancy;
- Ventilation;
- Lighting and plug loads; and
- Grounds and property management.

6.2.6 Frequency of System Checks, Sampling and Other Periodic Activities

Transportation to and from the Site, use of consumables in relation to visiting the Site in order to conduct system checks and/or collect samples, and shipping samples to a laboratory for analyses have direct and/or inherent energy costs. The schedule and/or means of these periodic activities have been prepared so that these tasks can be accomplished in a manner that does not impact remedy protectiveness but reduces expenditure of energy or resources. Consideration will be given to:

- Reduced sampling frequencies;
- Reduced site visits and system checks;

- Installation of remote sensing/operations and telemetry;
- Bundling routine system operation checks, inspections, periodic sampling and other site management activities with other nearby sites.
- Coordination/consolidation of activities to maximize foreman/labor time; and
- Use of mass transit for site visits, where available, and carpooling.

6.2.7 Metrics and Reporting

As discussed in Section 7.0 and as shown in Appendix H – Site Management Forms, information on energy usage, solid waste generation, transportation and shipping, water usage and land use and ecosystems will be recorded to facilitate and document consistent implementation of green remediation during site management and to identify corresponding benefits. A set of metrics has been developed and will be evaluated over time to ensure that green remediation actions are achieving the desired results.

6.3 Remedial System Optimization

A Remedial System Optimization (RSO) study will be conducted any time that the NYSDEC project manager or the remedial party requests in writing that an in-depth evaluation of the remedy is needed. An RSO may be appropriate if any of the following occur:

- The remedial actions have not met or are not expected to meet RAOs in the time frame estimated in the Decision Document;
- The management and operation of the remedial system is exceeding the estimated costs;
- The remedial system is not performing as expected or as designed;
- Previously unidentified source material may be suspected;
- Plume shift has potentially occurred;
- Site conditions change due to development, change of use, change in groundwater use, etc.;
- There is an anticipated transfer of the site management to another remedial party or agency; and

- A new and applicable remedial technology becomes available.

An RSO will provide a critique of a site's conceptual model, give a summary of past performance, document current cleanup practices, summarize progress made toward the site's cleanup goals, gather additional performance or media specific data and information and provide recommendations for improvements to enhance the ability of the present system to reach RAOs or to provide a basis for changing the remedial strategy.

7.0. REPORTING REQUIREMENTS

7.1 Site Management Reports

All site management inspection, maintenance and monitoring events will be recorded on the appropriate site management forms provided in Appendix H. These forms are subject to NYSDEC revision. All site management inspection, maintenance, and monitoring events will be conducted by a qualified person who directly reports to a PE who is licensed and registered in New York State.

All applicable inspection forms and other records, including media sampling data and system maintenance reports, generated for the site during the reporting period will be provided in electronic format to the NYSDEC in accordance with the requirements of in-text Table VII and summarized in the Periodic Review Report.

In-Text Table VIII - Schedule of Interim Monitoring/Inspection Reports

Task/Report	Reporting Frequency*
Inspection Report	Quarterly
Periodic Review Report	Annually, or as otherwise determined by the NYSDEC

* The frequency of events will be conducted as specified until otherwise approved by the NYSDEC project manager.

All interim monitoring/inspections reports will include, at a minimum:

- Date of event or reporting period;
- Name, company, and position of person(s) conducting monitoring/inspection activities;
- Description of the activities performed;
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents noted (included either on the checklist/form or on an attached sheet);

- Type of samples collected (e.g., sub-slab vapor, indoor air, outdoor air);
- Copies of all field forms completed (e.g., well sampling logs, chain-of-custody documentation);
- Sampling results in comparison to appropriate standards/criteria;
- A figure illustrating sample type and sampling locations;
- Copies of all laboratory data sheets and the required laboratory data deliverables required for all points sampled (to be submitted electronically in the NYSDEC-identified format);
- Any observations, conclusions, or recommendations; and
- A determination as to whether contaminant conditions have changed since the last reporting event.

Routine maintenance event reporting forms will include, at a minimum:

- Date of event;
- Name, company, and position of person(s) conducting maintenance activities;
- Description of maintenance activities performed;
- Any modifications to the system;
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents noted (included either on the checklist/form or on an attached sheet); and
- Other documentation such as copies of invoices for maintenance work, receipts for replacement equipment, etc., (attached to the checklist/form).

Non-routine maintenance event reporting forms will include, at a minimum:

- Date of event;
- Name, company, and position of person(s) conducting non-routine maintenance/repair activities;
- Description of non-routine activities performed;
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents (included either on the form or on an attached sheet); and

- Other documentation such as copies of invoices for repair work, receipts for replacement equipment, etc. (attached to the checklist/form).

Data will be reported in digital format as determined by the NYSDEC. Currently, data is to be supplied electronically and submitted to the NYSDEC EQuIS™ database in accordance with the requirements found at this link http://www.dec.ny.gov/chemical/62440.html.

7.2 Periodic Review Report

A PRR will be submitted to the NYSDEC project manager beginning sixteen (16) months after the Certificate of Completion is issued. After submittal of the initial Periodic Review Report, the next PRR shall be submitted annually to the NYSDEC project manager or at another frequency as may be required by the NYSDEC project manager. In the event that the site is subdivided into separate parcels with different ownership, a single Periodic Review Report will be prepared that addresses the site described in Appendix A - Environmental Easement. The report will be prepared in accordance with NYSDEC's DER-10 and submitted within 30 days of the end of each certification period. Media sampling results will also be incorporated into the Periodic Review Report. The report will include:

- Identification, assessment and certification of all ECs/ICs required by the remedy for the site.
- Results of the required annual site inspections, fire inspections and severe condition inspections, if applicable.
- Description of any change of use, import of materials, or excavation that occurred during the certifying period.
- All applicable site management forms and other records generated for the site during the reporting period in the NYSDEC-approved electronic format, if not previously submitted.
- Identification of any wastes generated during the reporting period, along with waste characterization data, manifests, and disposal documentation.

- A summary of any discharge monitoring data and/or information generated during the reporting period, with comments and conclusions.

- Data summary tables and graphical representations of contaminants of concern by media (groundwater, soil vapor, etc.), which include a listing of all compounds analyzed, along with the applicable standards, with all exceedances highlighted. These tables and figures will include a presentation of past data as part of an evaluation of contaminant concentration trends, including but not limited to:
  - Trend monitoring graphs that present groundwater contaminant levels from before the start of the remedy implementation to the most current sampling data;
  - Trend monitoring graphs depicting system influent analytical data on a per event and cumulative basis;
  - O&M data summary tables;
  - A current plume map for sites with remaining groundwater contamination; and
  - A groundwater elevation contour map for each gauging event.
- Results of all analyses, copies of all laboratory data sheets, and the required laboratory data deliverables for all samples collected during the reporting period will be submitted in digital format as determined by the NYSDEC. Currently, data is supplied electronically and submitted to the NYSDEC EQuIS™ database in accordance with the requirements found at this link: http://www.dec.ny.gov/chemical/62440.html.

- A site evaluation, which includes the following:
  - The compliance of the remedy with the requirements of the site-specific Remedial Action Work Plan (RAWP), ROD or Decision Document;
  - The operation and the effectiveness of all treatment units, etc., including identification of any needed repairs or modifications;
  - Any new conclusions or observations regarding site contamination based on inspections or data generated by the Monitoring and Sampling Plan for the media being monitored;
  - Recommendations regarding any necessary changes to the remedy and/or Monitoring and Sampling Plan;
  - An update to the climate change vulnerability assessment if site or external conditions have changed since the previous assessment, and recommendations to address vulnerabilities.

- A summary of the Green Remediation evaluation, including a quantitative and qualitative overview of a site's environmental impacts and recommendations to improve the remedy's environmental footprint. The PRR will include the completed Summary of Green Remediation Metrics form provided in its Appendix.

- An evaluation of trends in contaminant levels in the affected media to determine if the remedy continues to be effective in achieving remedial goals as specified by the RAWP, ROD or Decision Document; and

- The overall performance and effectiveness of the remedy.

- A performance summary for all treatment systems at the site during the calendar year, including information such as:

  - The number of days the system operated for the reporting period;

  - The average, high, and low flows per day;

  - The contaminant mass removed and the cost per pound of mass removed during the certification period and during the life of the treatment system;

  - A description of breakdowns and/or repairs along with an explanation for any significant downtime;

  - A description of the resolution of performance problems;

  - Alarm conditions;

  - Trends in equipment failure;

  - A summary of the performance, effluent and/or effectiveness monitoring; and

  - Comments, conclusions, and recommendations based on data evaluation. Recommendations must address how receptors would be impacted. Recommendations can include:

    - Proposals to address efficiency and costs such as: instituting remote operation, system changes to decrease maintenance costs and downtime, and system changes to decrease energy use; and

    - Proposals to modify or shut down a treatment system due to remediation completion, system performance or changed conditions. System shutdowns are addressed in Section 6.4 of DER-10.

7.2.1 Certification of Institutional and Engineering Controls

Following the last inspection of the reporting period, a Professional Engineer licensed to practice and registered in New York State will prepare, and include in the Periodic Review Report, the following certification as per the requirements of NYSDEC DER-10:

"*For each institutional or engineering control identified for the site, I certify that all of the following statements are true:*

- *The inspection of the site to confirm the effectiveness of the institutional and engineering controls required by the remedial program was performed under my direction;*
- *The institutional control and/or engineering control employed at this site is unchanged from the date the control was put in place, or last approved by the Department;*
- *Nothing has occurred that would impair the ability of the control to protect the public health and environment;*
- *Nothing has occurred that would constitute a violation or failure to comply with any site management plan for this control;*
- *Access to the site will continue to be provided to the Department to evaluate the remedy, including access to evaluate the continued maintenance of this control;*
- *If a financial assurance mechanism is required under the oversight document for the site, the mechanism remains valid and sufficient for the intended purpose under the document;*
- *Use of the site is compliant with the environmental easement;*
- *The engineering control systems are performing as designed and are effective;*
- *To the best of my knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the site remedial program and generally accepted engineering practices; and*
- *The information presented in this report is accurate and complete.*

I certify that all information and statements in this certification form are true. I understand that a false statement made herein is punishable as a Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law. I, [name], of [business address], am certifying as [Owner/Remedial Party or Owner's/Remedial Party's Designated Site Representative] for the site."

"I certify that the New York State Education Department has granted a Certificate of Authorization to provide Professional Engineering services to the firm that prepared this Periodic Review Report."

The signed certification will be included in the Periodic Review Report.

The Periodic Review Report will be submitted, in electronic format, to the NYSDEC project manager and the NYSDOH project manager. The Periodic Review Report may also need to be submitted in hard-copy format if requested by the NYSDEC project manager.

7.3 Corrective Measures Work Plan

If any component of the remedy is found to have failed, or if the periodic certification cannot be provided due to the failure of an institutional or engineering control or failure to conduct site management activities, a Corrective Measures Work Plan will be submitted to the NYSDEC project manager for approval. This plan will explain the failure and provide the details and schedule for performing work necessary to correct the failure. Unless an emergency condition exists, no work will be performed pursuant to the Corrective Measures Work Plan until it has been approved by the NYSDEC project manager.

7.4 Remedial System Optimization Report

If an RSO is to be performed (see Section 6.3), upon completion of an RSO, an RSO report must be submitted to the NYSDEC project manager for approval. A general

outline for the RSO report is provided in Appendix J. The RSO report will document the research/ investigation and data gathering that was conducted, evaluate the results and facts obtained, present a revised conceptual site model and present recommendations. RSO recommendations are to be implemented upon approval from the NYSDEC. Additional work plans, design documents, HASPs etc., may still be required to implement the recommendations, based upon the actions that need to be taken. A final engineering report and update to the SMP may also be required.

The RSO report will be submitted, in electronic format, to the NYSDEC project manager and the NYSDOH project manager.

8.0 REFERENCES

6 NYCRR Part 375, Environmental Remediation Programs. December 14, 2006.

NYSDEC DER-10 – "Technical Guidance for Site Investigation and Remediation".

NYSDEC, 1998. Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1. June 1998 (April 2000 addendum).

TABLE

Table 1
Indoor and Outdoor Ambient Air Results Summary
43-25 43-27 52nd Street
Queens, NY 11377
Project No. 22254

Sample ID Sampling Date Sample Matrix		NYSDOH 2006 Guidance for Soil Vapor Intrusion Upper Fence	IA-Laundry-06042025-1 6/5/2025 Indoor Ambient Air		IA-Gym-06042025-1 6/5/2025 Indoor Ambient Air		IA-Unit-06042025-1 6/5/2025 Indoor Ambient Air		OA-Backyard-06042025-1 6/5/2025 Outdoor Ambient Air	
Compound	CAS Number	unit	ug/m3		ug/m3		ug/m3		ug/m3	
		ug/m3	Result	LOD	Result	LOD	Result	LOD	Result	LOD
Volatile Organics, EPA TO15 Full List										
1,1,1,2-Tetrachloroethane	630-20-6	~	ND	0.55	ND	0.58	ND	0.62	ND	0.65
1,1,1-Trichloroethane	71-55-6	2.5	ND	0.44	ND	0.46	ND	0.49	ND	0.51
1,1,2,2-Tetrachloroethane	79-34-5	0.4	ND	0.55	ND	0.58	ND	0.62	ND	0.65
1,1,2-Trichloro-1,2,2-trifluoroethane (Freo	76-13-1	2.5	ND	0.62	ND	0.65	ND	0.69	ND	0.72
1,1,2-Trichloroethane	79-00-5	0.4	ND	0.44	ND	0.46	ND	0.49	ND	0.51
1,1-Dichloroethane	75-34-3	0.4	ND	0.33	ND	0.34	ND	0.36	ND	0.38
1,1-Dichloroethylene	75-35-4	0.4	ND	0.08	ND	0.084	ND	0.089	ND	0.093
1,2,4-Trichlorobenzene	120-82-1	0.5	ND	30	ND	31	ND	33	ND	35
1,2,4-Trimethylbenzene	95-63-6	9.8	1.1	0.4	1.7	0.42	1.1	0.44	0.97	0.46
1,2-Dibromoethane	106-93-4	0.4	ND	0.62	ND	0.65	ND	0.69	ND	0.72
1,2-Dichlorobenzene	95-50-1	0.5	ND	0.48	ND	0.51	ND	0.5	ND	0.57
1,2-Dichloroethane	107-06-2	0.4	ND	0.33	ND	0.34	**0.44**	0.36	ND	0.38
1,2-Dichloropropane	78-87-5	0.4	ND	0.37	ND	0.39	ND	0.42	ND	0.44
1,2-Dichlorotetrafluoroethane	76-14-2	0.4	ND	0.56	ND	0.59	ND	0.63	ND	0.66
1,3,5-Trimethylbenzene	108-67-8	3.9	ND	0.4	0.46	0.42	ND	0.44	ND	0.46
1,3-Butadiene	106-99-0	~	ND	0.53	ND	0.56	ND	0.6	ND	0.63
1,3-Dichlorobenzene	541-73-1	0.5	ND	0.48	ND	0.51	ND	0.54	ND	0.57
1,3-Dichloropropane	142-28-9	~	ND	0.37	ND	0.39	ND	0.42	ND	0.44
1,4-Dichlorobenzene	106-46-7	1.2	ND	0.48	ND	0.51	ND	0.54	ND	0.57
1,4-Dioxane	123-91-1	~	ND	0.58	ND	0.61	ND	0.65	ND	0.68
2,2,4-Trimethylpentane	540-84-1	~	1.1	0.19	1.1	0.2	1.2	0.21	1.8	0.22
2-Butanone	78-93-3	~	3.5	0.24	3.1	0.25	5.7	0.27	2.4	0.28
2-Hexanone	591-78-6	~	2.4	0.66	0.76	0.69	0.81	0.74	ND	0.77
3-Chloropropene	107-05-1	~	ND	1.3	ND	1.3	ND	1.4	ND	1.5
4-Methyl-2-pentanone	108-10-1	~	0.59	0.33	6.3	0.35	ND	0.37	0.39	0.39
Acetone	67-64-1	115	110	2.9	150	6	220	6.4	91	1.8
Acrylonitrile	107-13-1	~	ND	2.3	ND	2.4	ND	2.5	ND	2.7
Benzene	71-43-2	13	2.8	0.26	1.9	0.27	2.6	0.29	1.8	0.3
Benzyl chloride	100-44-7	~	ND	4.2	ND	4.4	ND	4	ND	4.9
Bromodichloromethane	75-27-4	~	ND	0.54	ND	0.57	ND	0.6	ND	0.63
Bromoform	75-25-2	~	ND	0.83	ND	0.87	ND	0.93	ND	0.97
Bromomethane	74-83-9	0.5	ND	0.31	ND	0.33	ND	0.35	ND	0.37
Carbon disulfide	75-15-0	~	ND	0.25	6.1	0.26	ND	0.28	0.29	0.29
Carbon tetrachloride	56-23-5	1.3	0.51	0.13	0.53	0.13	0.51	0.14	0.53	0.15

NOTES:

LOD=limit of detection for this analyte

ND=the analyte was not detected

D=result is from an analysis that required a dilution

~=this indicates that no regulatory limit has been established for this analyte

result exceeding the criteria

Table 1
Indoor and Outdoor Ambient Air Results Summary
43-25 43-27 52nd Street
Queens, NY 11377
Project No. 22254

Sample ID Sampling Date Sample Matrix		NYSDOH 2006 Guidance for Soil Vapor Intrusion Upper Fence	IA-Laundry-06042025-1 6/5/2025 Indoor Ambient Air		IA-Gym-06042025-1 6/5/2025 Indoor Ambient Air		IA-Unit-06042025-1 6/5/2025 Indoor Ambient Air		OA-Backyard-06042025-1 6/5/2025 Outdoor Ambient Air	
Compound	CAS Number	unit	ug/m3		ug/m3		ug/m3		ug/m3	
		ug/m3	Result	LOD	Result	LOD	Result	LOD	Result	LOD
Chloroethane	75-00-3	0.4	ND	0.21	ND	0.22	ND	0.24	ND	0.25
Chloroform	67-66-3	1.2	ND	0.39	ND	0.41	ND	0.44	ND	0.46
Chloromethane	74-87-3	4.2	1.7	0.17	3.5	0.17	1.9	0.19	2	0.19
cis-1,2-Dichloroethylene	156-59-2	0.4	ND	0.08	ND	0.084	ND	0.089	ND	0.093
cis-1,3-Dichloropropylene	10061-01-5	0.4	ND	0.36	ND	0.38	ND	0.41	ND	0.43
Cyclohexane	110-82-7	6.3	0.33	0.28	1.4	0.29	0.37	0.31	ND	0.32
Dibromochloromethane	124-48-1	~	ND	0.68	ND	0.72	ND	0.77	ND	0.8
Dichlorodifluoromethane	75-71-8	10	2.5	0.4	2.4	0.42	2.5	0.44	2.5	0.47
Ethyl acetate	141-78-6	~	13	0.58	7.8	0.61	3.3	0.65	5.9	0.68
Ethyl Benzene	100-41-4	6.4	2.3	0.35	2.3	0.37	1.9	0.39	0.66	0.41
Hexachlorobutadiene	87-68-3	0.5	ND	0.86	ND	0.9	ND	0.96	ND	1
Isopropanol	67-63-0	~	7.2	1.2	7.4	1.2	6.4	1.3	6.2	1.4
Isopropylbenzene	98-82-8	0.8	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Methacrylate	80-62-6	0.4	**5.5**	0.33	**8.5**	0.35	**9.8**	0.37	**0.5**	0.39
Methyl tert-butyl ether (MTBE)	1634-04-4	14	ND	0.29	ND	0.31	ND	0.32	ND	0.34
Methylene chloride	75-09-2	16	1.9	1.7	1.8	1.8	1.9J	1.9	2J	2
Naphthalene	91-20-3	~	ND	4.2	4.4J	4.4	ND	4.7	ND	4.9
n-Heptane	142-82-5	18	0.92	0.33	8.2	0.35	0.85	0.37	1.1	0.39
n-Hexane	110-54-3	14	0.91	0.28	1.3	0.3	0.89	0.32	0.76	0.33
o-Xylene	95-47-6	7.1	2.9	0.35	3	0.37	2.1	0.39	0.9	0.41
p- & m- Xylenes	179601-23-1	11	9.3	0.7	9.3	0.73	6.7	0.78	2.5	0.82
p-Ethyltoluene	622-96-8	~	0.87	0.4	1.2	0.42	0.88	0.44	0.7	0.46
Propylene	115-07-1	~	1.2	0.14	1.2	0.15	1.2	0.15	ND	0.16
Styrene	100-42-5	1.4	0.72	0.34	1.1	0.36	**2.1**	0.38	0.48	0.40
Tetrachloroethylene	127-18-4	2.5	1.2	0.55	0.98	0.57	1.1	0.61	1.4	0.64
Tetrahydrofuran	109-99-9	0.8	0.62	0.7	**2.9**	0.5	**0.8**	0.53	ND	0.56
Toluene	108-88-3	57	38	0.3	43	0.32	**100**	0.34	3.7	0.36
trans-1,2-Dichloroethylene	156-60-5	~	ND	0.32	ND	0.34	ND	0.36	ND	0.37
trans-1,3-Dichloropropylene	10061-02-6	NC	ND	0.36	ND	0.38	ND	0.41	ND	0.43
Trichloroethylene	79-01-6	0.5	ND	0.11	ND	0.11	ND	0.12	ND	0.13
Trichlorofluoromethane (Freon 11)	75-69-4	12	1.4	0.45	1.3	0.48	1.4	0.51	1.7	0.53
Vinyl acetate	108-05-4	~	ND	0.28	ND	0.3	ND	0.32	ND	0.33
Vinyl Chloride	75-01-4	0.4	ND	0.1	ND	0.11	ND	0.11	ND	0.12
Xylenes, Total	1330-20-7	18.1	12	1	12	1.1	8.8	1.2	3.4	1.2

NOTES:
LOD=limit of detection for this analyte
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result exceeding the criteria
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Table 1
Indoor and Outdoor Ambient Air Results Summary
43-25 43-27 52nd Street
Queens, NY 11377
Project No. 22254

Sample ID Sampling Date Sample Matrix		NYSDOH 2006 Guidance for Soil Vapor Intrusion Upper Fence	OA-Backyard-11032025-1 11/3/2025 Outdoor Ambient Air		IA-Gym-11032025-1 11/3/2025 Indoor Ambient Air		IA-Meter-11032025-1 11/3/2025 Indoor Ambient Air		IA-AptStorage-11032025-1 11/3/2025 Indoor Ambient Air	
Compound	CAS Number	unit	ug/m3		ug/m3		ug/m3		ug/m3	
		ug/m3	Result	LOD	Result	LOD	Result	LOD	Result	LOD
Volatile Organics, EPA TO15 Full List										
1,1,1,2-Tetrachloroethane	630-20-6	~	ND	0.67	ND	0.7	ND	0.74	ND	0.53
1,1,1-Trichloroethane	71-55-6	2.5	ND	0.53	ND	0.56	ND	0.59	ND	0.42
1,1,2,2-Tetrachloroethane	79-34-5	0.4	ND	0.67	ND	0.7	ND	0.74	ND	0.53
1,1,2-Trichloro-1,2,2-trifluoroethane (Freo	76-13-1	2.5	ND	0.75	ND	0.78	ND	0.83	ND	0.59
1,1,2-Trichloroethane	79-00-5	0.4	ND	0.53	ND	0.56	ND	0.59	ND	0.42
1,1-Dichloroethane	75-34-3	0.4	ND	0.4	ND	0.41	ND	0.44	ND	0.31
1,1-Dichloroethylene	75-35-4	0.4	ND	0.19	ND	0.2	ND	0.21	ND	0.15
1,2,4-Trichlorobenzene	120-82-1	0.5	ND	36	ND	38	ND	40	ND	29
1,2,4-Trimethylbenzene	95-63-6	9.8	ND	0.48	0.55	0.5	1.1	0.53	0.38	0.38
1,2-Dibromoethane	106-93-4	0.4	ND	0.75	ND	0.79	ND	0.83	ND	0.59
1,2-Dichlorobenzene	95-50-1	0.5	ND	0.59	ND	0.62	ND	0.65	ND	0.46
1,2-Dichloroethane	107-06-2	0.4	ND	0.39	ND	0.41	ND	0.44	ND	0.31
1,2-Dichloropropane	78-87-5	0.4	ND	0.45	ND	0.47	ND	0.5	ND	0.36
1,2-Dichlorotetrafluoroethane	76-14-2	0.4	ND	0.68	ND	0.72	ND	0.75	ND	0.54
1,3,5-Trimethylbenzene	108-67-8	3.9	ND	0.48	ND	0.5	ND	0.53	ND	0.38
1,3-Butadiene	106-99-0	~	ND	0.65	ND	0.68	ND	0.72	ND	0.51
1,3-Dichlorobenzene	541-73-1	0.5	ND	0.59	ND	0.62	ND	0.65	ND	0.46
1,3-Dichloropropane	142-28-9	~	ND	0.45	ND	0.47	ND	0.5	ND	0.36
1,4-Dichlorobenzene	106-46-7	1.2	ND	0.59	ND	0.62	ND	0.65	ND	0.46
1,4-Dioxane	123-91-1	~	ND	1.8	ND	1.8	ND	1.9	ND	1.4
2,2,4-Trimethylpentane	540-84-1	~	0.55	0.23	ND	0.24	ND	0.25	0.54	0.18
2-Butanone	78-93-3	~	ND	14	ND	15	ND	16	ND	11
2-Hexanone	591-78-6	~	ND	0.8	ND	0.84	ND	0.88	ND	0.63
3-Chloropropene	107-05-1	~	ND	1.5	ND	1.6	ND	1.7	ND	1.2
4-Methyl-2-pentanone	108-10-1	~	ND	0.4	1.1	0.2	ND	0.44	0.32	0.32
Acetone	67-64-1	115	ND	12	31	12	ND	13	19	9.2
Acrylonitrile	107-13-1	~	ND	11	ND	11	ND	12	ND	8.4
Benzene	71-43-2	13	0.44	0.31	ND	0.33	0.69	0.34	0.79	0.25
Benzyl chloride	100-44-7	~	ND	13	ND	13	ND	14	ND	10
Bromodichloromethane	75-27-4	~	ND	0.65	ND	0.69	ND	0.72	ND	0.52
Bromoform	75-25-2	~	ND	1	ND	1.1	ND	1.1	ND	0.8
Bromomethane	74-83-9	0.5	ND	0.38	ND	0.4	ND	0.42	ND	0.3
Carbon disulfide	75-15-0	~	ND	0.3	0.67	0.32	ND	0.34	ND	0.24
Carbon tetrachloride	56-23-5	1.3	ND	0.15	ND	0.16	ND	0.17	ND	0.12

NOTES:

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result exceeding the criteria

Table 1
Indoor and Outdoor Ambient Air Results Summary
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Queens, NY 11377
Project No. 22254

Sample ID Sampling Date Sample Matrix		NYSDOH 2006 Guidance for Soil Vapor Intrusion Upper Fence	OA-Backyard-11032025-1 11/3/2025 Outdoor Ambient Air		IA-Gym-11032025-1 11/3/2025 Indoor Ambient Air		IA-Meter-11032025-1 11/3/2025 Indoor Ambient Air		IA-AptStorage-11032025-1 11/3/2025 Indoor Ambient Air	
Compound	CAS Number	unit	ug/m3		ug/m3		ug/m3		ug/m3	
		ug/m3	Result	LOD	Result	LOD	Result	LOD	Result	LOD
Chloroethane	75-00-3	0.4	ND	0.26	ND	0.27	ND	0.28	ND	0.2
Chloroform	67-66-3	1.2	ND	0.48	ND	0.5	ND	0.53	ND	0.38
Chloromethane	74-87-3	4.2	1.1	0.2	1.1	0.21	1.2	0.22	1.3	0.16
cis-1,2-Dichloroethylene	156-59-2	0.4	ND	0.19	ND	0.2	ND	0.21	ND	0.15
cis-1,3-Dichloropropylene	10061-01-5	0.4	ND	0.44	ND	0.46	ND	0.49	ND	0.35
Cyclohexane	110-82-7	6.3	ND	0.34	0.39	0.35	ND	0.37	ND	0.27
Dibromochloromethane	124-48-1	~	ND	0.83	ND	0.87	ND	0.92	ND	0.66
Dichlorodifluoromethane	75-71-8	10	1.9	0.48	1.8	0.51	2	0.53	2.1	0.38
Ethyl acetate	141-78-6	~	ND	18	ND	18	ND	19	ND	14
Ethyl Benzene	100-41-4	6.4	ND	0.42	0.53	0.44	0.56	0.47	0.4	0.33
Hexachlorobutadiene	87-68-3	0.5	ND	1	ND	1.1	ND	1.1	ND	0.82
Isopropanol	67-63-0	~	2.2	1.4	4.8	1.5	4.1	1.6	3.7	1.1
Isopropylbenzene	98-82-8	0.8	ND	0.48	ND	0.5	**0.95**	0.53	ND	0.38
Methyl Methacrylate	80-62-6	0.4	ND	0.4	**1.1**	0.42	ND	0.44	ND	0.32
Methyl tert-butyl ether (MTBE)	1634-04-4	14	ND	0.35	ND	0.37	ND	0.39	ND	0.28
Methylene chloride	75-09-2	16	ND	2	ND	2.1	ND	2.2	ND	1.6
Naphthalene	91-20-3	~	ND	5.1	ND	5.4	ND	5.7	ND	4
n-Heptane	142-82-5	18	ND	0.4	2.2	0.42	ND	0.44	ND	0.32
n-Hexane	110-54-3	14	ND	0.34	0.69	0.36	0.42	0.38	0.38	0.27
o-Xylene	95-47-6	7.1	ND	0.42	0.8	0.44	0.7	0.47	0.44	0.33
p- & m- Xylenes	179601-23-1	11	ND	0.85	2	0.89	1.8	0.94	1.3	0.67
p-Ethyltoluene	622-96-8	~	ND	0.48	ND	0.5	ND	0.7	ND	0.38
Propylene	115-07-1	~	ND	0.17	ND	0.18	ND	0.19	ND	0.13
Styrene	100-42-5	1.4	ND	0.42	ND	0.44	**1.4**	0.46	ND	0.33
Tetrachloroethylene	127-18-4	2.5	ND	0.66	ND	0.69	ND	0.73	ND	0.52
Tetrahydrofuran	109-99-9	0.8	ND	0.58	ND	0.6	ND	0.64	ND	0.45
Toluene	108-88-3	57	1.3	0.37	1.7	0.39	1.9	0.41	1.5	0.29
trans-1,2-Dichloroethylene	156-60-5	~	ND	0.39	ND	0.41	ND	0.43	ND	0.31
trans-1,3-Dichloropropylene	10061-02-6	NC	ND	0.44	ND	0.46	ND	0.49	ND	0.35
Trichloroethylene	79-01-6	0.5	ND	0.13	ND	0.14	ND	0.14	ND	0.1
Trichlorofluoromethane (Freon 11)	75-69-4	12	0.99	0.55	0.92	0.57	1	0.61	1	0.43
Vinyl acetate	108-05-4	~	ND	0.34	ND	0.36	ND	0.38	ND	0.27
Vinyl Chloride	75-01-4	0.4	ND	0.12	ND	0.13	ND	0.14	ND	0.099
Xylenes, Total	1330-20-7	18.1	ND	1.3	2.8	1.3	2.5	1.4	1.7	1

NOTES:
LOD=limit of detection for this analyte
D=result is from an analysis that required a dilution
result exceeding the criteria
ND=the analyte was not detected
~=this indicates that no regulatory limit has been established for this analyte

Table 2
Remaining Soil Contamination Exceedance Table
43-52nd Street, Queens, New York
Project No. 22254

Sample ID Sampling Date Sample Matrix Compound	CAS Number	NYSDEC Part 375 Unrestricted Use Soil Cleanup Objectives	NYSDEC Part 375 Restricted Use Soil Cleanup Objectives-Restricted Residential	B-2 (60ft-62ft) 7/27/2023 Soil mg/Kg	
				Result	LOD
Metals, Target Analyte					
Arsenic	7440-38-2	13	16	**13.6**	1.49
Chromium, Hexavalent					
Chromium, Hexavalent	18540-29-9	1	22	**2.38**	0.594

NOTES:
= Indicates that the analyte exceeds the NYSDEC Unrestricted Use Soil Cleanup Objectve criteria

Table 3a
Remaining Groundwater Contamination Exceedance Table
43-52nd Street, Queens, New York
Project No. 22254

Sample ID Sampling Date Sample Matrix Compound	CAS Number	NYSDEC TOGS Standards and Guidance Values - GA	TW-1 8/9/2023 Ground Water ug/L		TW-2 8/8/2023 Ground Water ug/L		TW-3 8/10/2023 Ground Water ug/L	
			Result	LOD	Result	LOD	Result	LOD
VOC, 8260 LOW MASTER								
Chloroform	67-66-3	7	**36.8**	0.243	ND	0.243	**20.7**	0.243
SVOC, 8270 SIM MASTER								
Benzo(a)anthracene	56-55-3	0.002	NT		ND	0.069	**0.0645**	0.0645
Chrysene	218-01-9	0.002	NT		ND	0.069	**0.0645**	0.0645
Metals, Target Analyte, ICP								
Chromium	7440-47-3	50	NT		6.68	5.56	**144**	5.56
Lead	7439-92-1	25	NT		ND	5.56	**62.6**	5.56
Manganese	7439-96-5	300	NT		**1,470**	5.56	**3,130**	5.56
Nickel	7440-02-0	100	NT		ND	11.1	**146**	11.1
Sodium	7440-23-5	20,000	NT		16,700	556	**31,100**	556
Metals, Target Analyte, ICPMS								
Selenium	7782-49-2	10	NT		3.74	1.11	**26.5B**	1.11
Metals, Target Analyte, ICP Dissolved								
Manganese	7439-96-5	300	NT		**1,430**	5.56	**2,340**	5.56

NOTES:
ND = Not Detected
NT = Indicates the analyte was not a target for this sample
B = Analyte found in the analysis batch blank
= Indicates that the analyte exceedsd the NYSDEC TOGS Standards and Guidance Values - GA criteria

Table 3b
Remaining Groundwater Contamination PFAs Exceedance Table
43-52nd Street, Queens, New York
Project No. 22254

Sample ID Sampling Date Sample Matrix		NYSDEC TOGS Standards and Guidance Values - GA	TW-1 8/9/2023 Ground Water ug/L		TW-2 8/8/2023 Ground Water ug/L		TW-3 8/10/2023 Ground Water ug/L	
Compound	**CAS Number**		**Result**	**LOD**	**Result**	**LOD**	**Result**	**LOD**
PFAS, EPA 1633 Target List								
Perfluorooctanoic acid (PFOA)	335-67-1	0.0067	ND	0.00042	**0.0579**	0.000398	ND	0.00042
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	0.0027	**0.0038**	0.000778	**0.00302**	0.000778	ND	0.000778

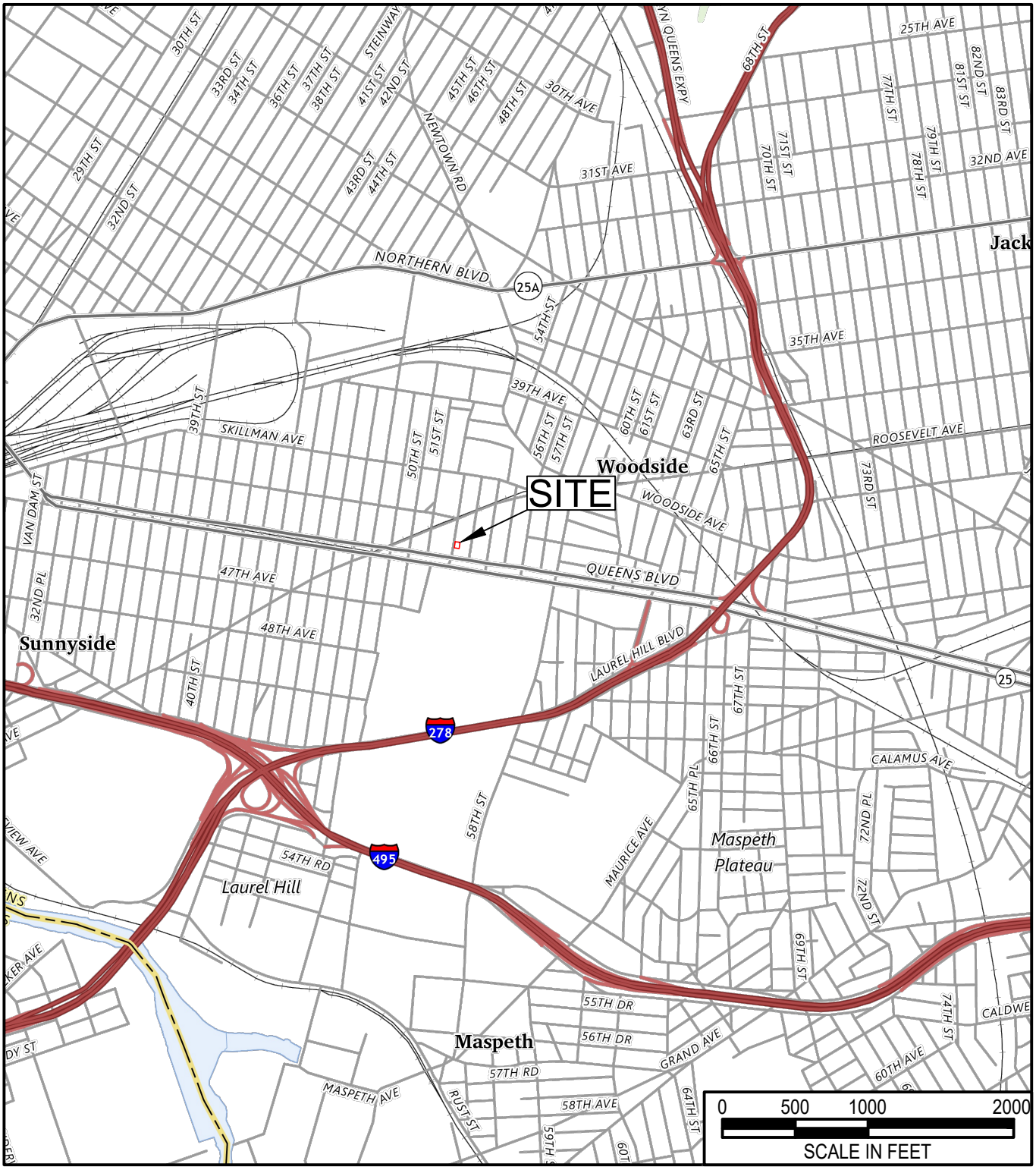
NOTES:

LOD = Limits of Detection

ND = Not Detected

= Indicates that the analyte exceeded the NYSDEC TOGS Standards and Guidance Values -GA criteria

FIGURE



Map Reference: USGS 7.5 Minute Series, 2024.

YU & Associates Engineers, P.C.
Geotechnical, Environmental and Civil Engineering

611 River Drive - 3rd Floor
Elmwood Park, NJ 07407

Tel: (201) 791-0075
Fax: (201) 791-4533

SITE LOCATION MAP
BCP Site ID# C241269
43-25 52nd STREET
WOODSIDE

QUEENS NEW YORK

JOB NO.: 22254	SCALE: As Shown	DATE: 07/17/2025	FIG. 1

P:\22\22254 (43-52nd Street)\BCP Application\Attachments\Attachment A - Section I Property Information\Figures\CAD Drawing\ 43 Drawing1.dwg Jul 16, 2025 - 5:11pm uvinod



Base Map Source: Google Earth Pro 2025

0 30 60 120

SCALE IN FEET

LEGEND:

Site Boundary

Environmental Easement Area

YU & Associates Engineers, P.C.
Geotechnical, Environmental and Civil Engineering

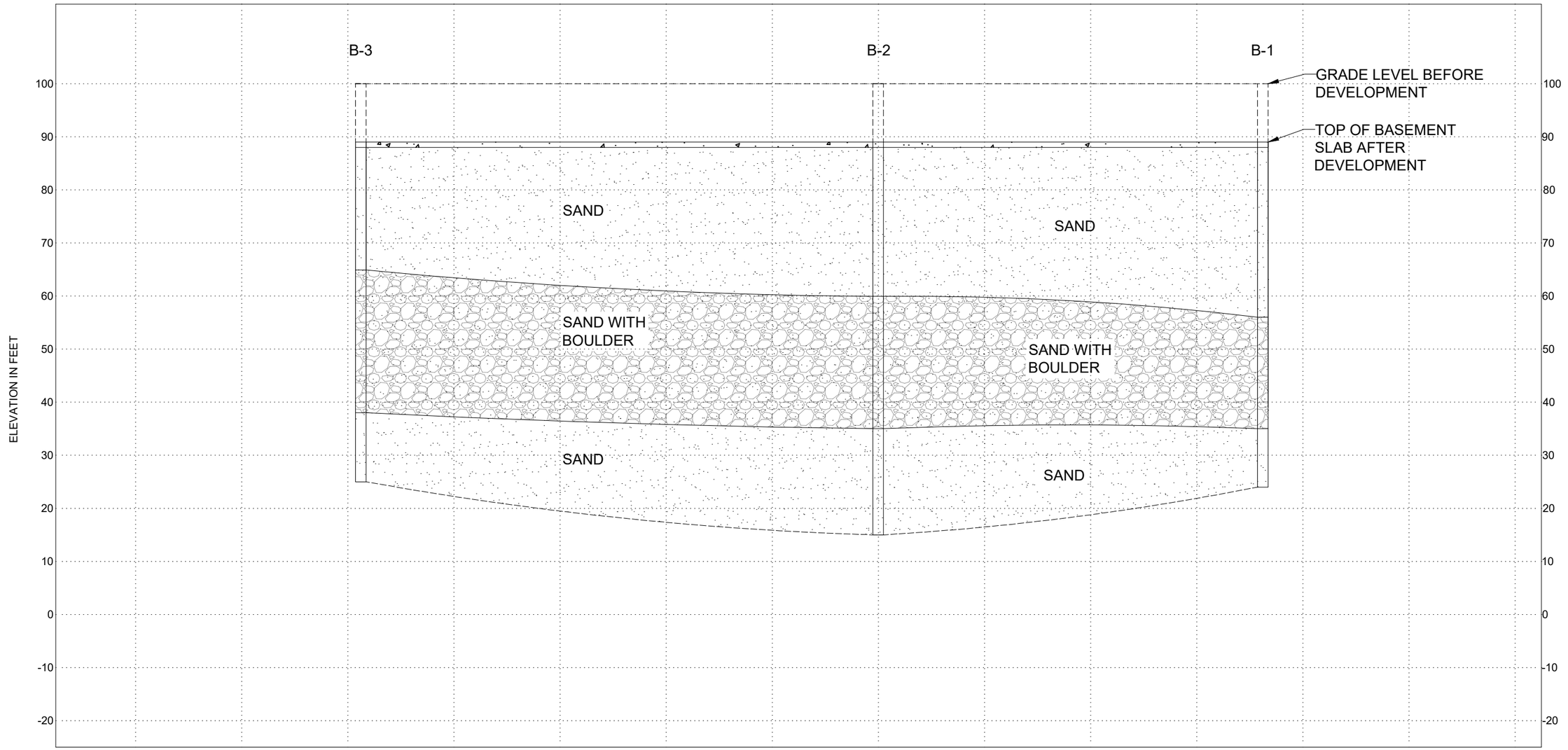
611 River Drive - 3rd Floor
Elmwood Park, NJ 07407

Tel: (201) 791-0075
Fax: (201) 791-4533

SITE PLAN
BCP Site ID# C241269
43-25 52nd STREET
WOODSIDE
QUEENS NEW YORK

JOB NO.: 22254	SCALE: As Shown	DATE: 11/06/2025	FIG. 2

P:\22\22254 (43-52nd Street)\Final Engineering Report\DWG\ Fig 4 - Sample Location Map.dwg Nov 11, 2025 - 1:26pm mrenker



Legend:

- SAND
- SAND WITH BOULDER
- CONCRETE

Note:

1. Distances are estimated based on field measurements from borings performed on July 18, 2023 through August 8, 2023.
2. The geological section information is based on the boring logs in the Remedial Investigation Report prepared by YU on September 8, 2023.

Vertical: 0 5 10 20 Feet

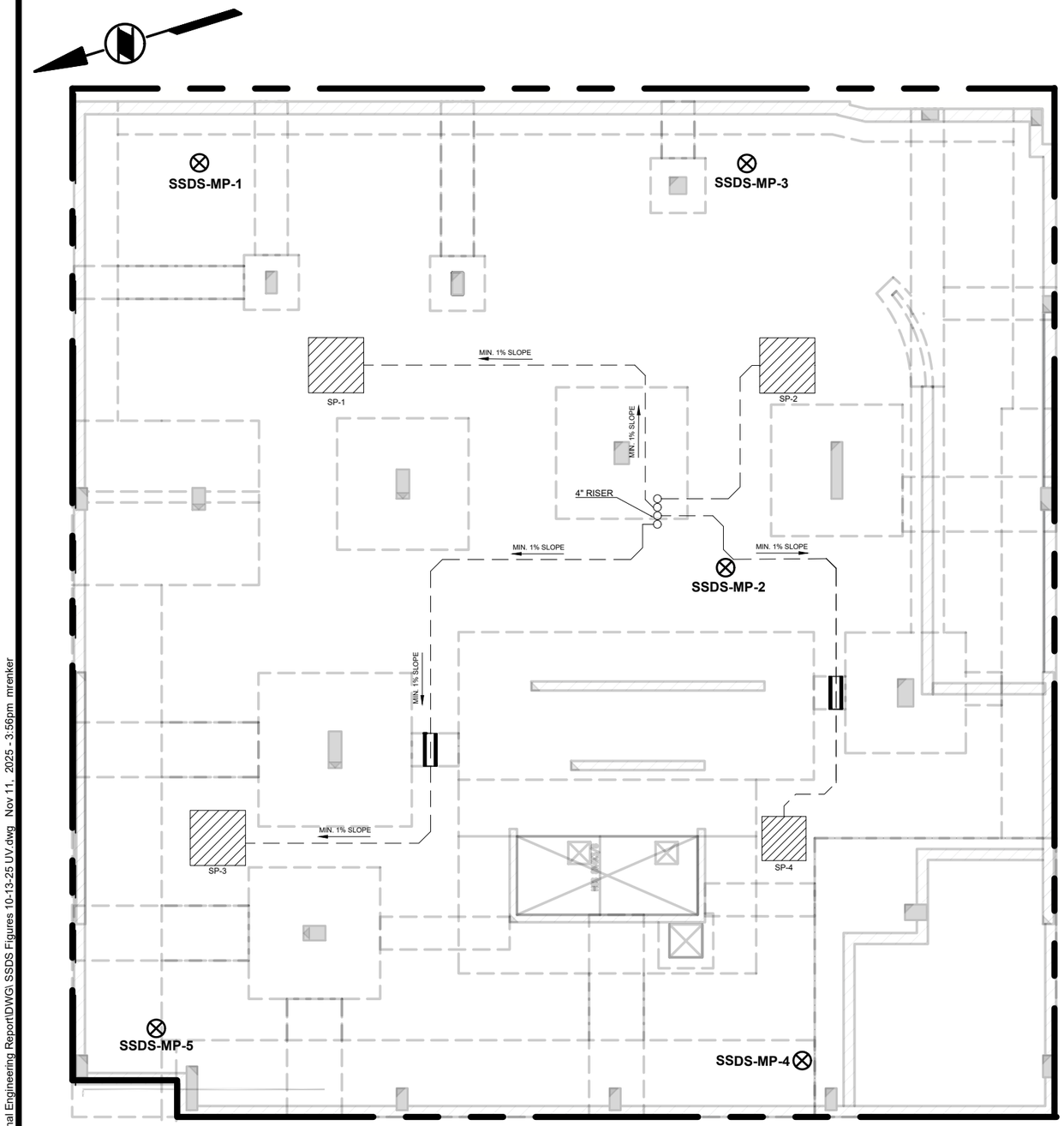
Horizontal: 0 2 4 8 Feet

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Tel: (201) 791-0075
Fax: (201) 791-4533

GEOLOGIC SECTION
BCP Site ID# C241269
43-25 52nd STREET
QUEENS WOODSIDE NEW YORK

JOB NO.: 22254	SCALE: As Shown	DATE: 11/06/2025	FIG. 3

P:\22\22254 (43-52nd Street)\Final Engineering Report\DWG\ Geologic Section.dwg Nov 06, 2025 - 4:43pm uvinod



LEGEND:

- BUILDING BOUNDARY
- 4-INCH PVC RISER PIPE
- SUB-SLAB SUCTION PIT (SP-1)
- 4-INCH PVCSUB-SLAB DEPRESSURIZATION SYSTEM UNDERGROUND PIPING
- SUB-SLAB DEPRESSURIZATION MONITORING POINT (SSDS-MP-X)
- PENETRATION SLEEVE THROUGH FOUNDATION ELEMENT

NOTES:

1. THE BASE MAP IS FROM SHORING PLAN NO. SOE - 101.00 PROPOSED BY TIMES BUILDING PC., DATED APRIL 27, 2023.
2. LOCATION OF PITS ARE BASED ON FIELD MEASUREMENTS AND ARE APPROVED.
3. SLOPE HORIZONTAL PIPE A MINIMUM OF 1/8-INCH VERTICAL PER FOOT HORIZONTAL (1% SLOPE) UNIFORMLY TOWARDS SUB-SLAB SUCTION PIT OR TO UNDERGROUND. WHEN UNDERGROUND PIPE CANNOT BE SLOPED TOWARD THE PIT, THE SYSTEM WAS INSTALLED SUCH THAT NO PORTION WILL ALLOW EXCESS ACCUMULATION OF CONDENSATE.
4. PENETRATION SLEEVE USED IS MADE OF SCHEDULE 80 PVC FOR PENETRATION THROUGH FOUNDATION BEAMS AND ELEMENTS.

STATE OF NEW YORK
CHANGYUL HANG
10838201
LICENSED PROFESSIONAL ENGINEER

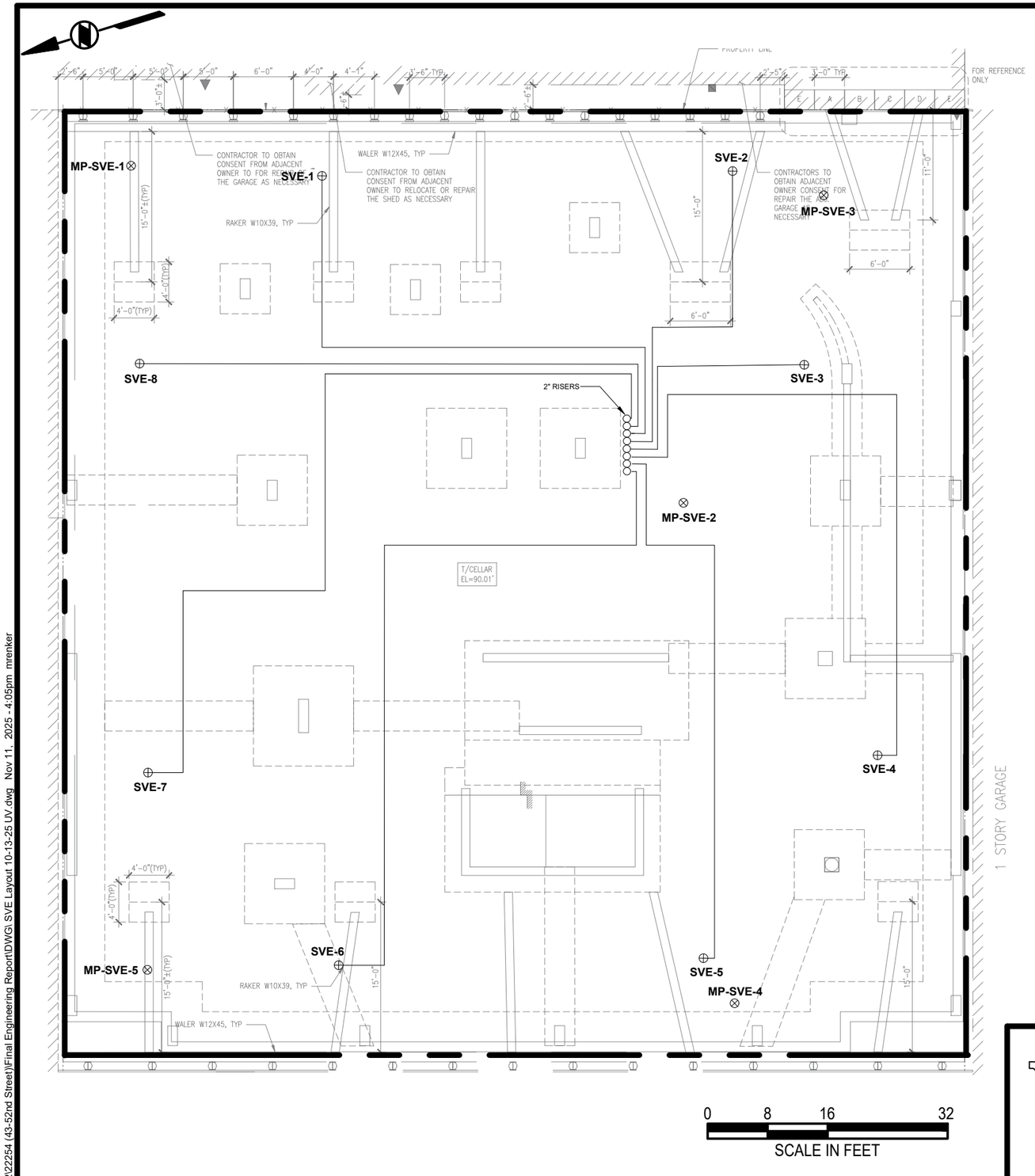
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LAYOUT OF SUB-SLAB DEPRESSURIZATION PLAN
43-25 52ND STREET
QUEENS
NEW YORK

NEW YORK

JOB NO.: 22254	SCALE: As Shown	DATE: 11/10/2025	FIG. 4

P:\22\22254 (43-52nd Street)\Final Engineering Report\DWG\ SSDS Figures 10-13-25 UV.dwg Nov 11, 2025 - 3:56pm mrenker



LEGEND:

- BUILDING BOUNDARY
- RISER PIPE
- SOLID 2-INCH SCHEDULE 40 PVC SVE PIPING
- SVE WELL LOCATION
- SVE MONITORING POINT LOCATION

NOTES:

1. THE BASE MAP IS FROM SHORING PLAN NO. SOE - 101.00 PROPOSED BY TIMES BUILDING PC., DATED APRIL 27, 2023.
2. THE SVE EXTRACTION WELL WAS INSTALLED AT 15-20 FT BELOW GROUND SURFACE (BGS) INTERVAL
3. LOCATION OF WELLS ARE BASED ON FIELD MEASUREMENTS AND ARE APPROVED.
4. EQUIPMENT SPECIFICATIONS OF SVE UNIT ENCLOSURE IS INCLUDED IN APPENDIX C OF REMEDIAL DESIGN DOCUMENT.

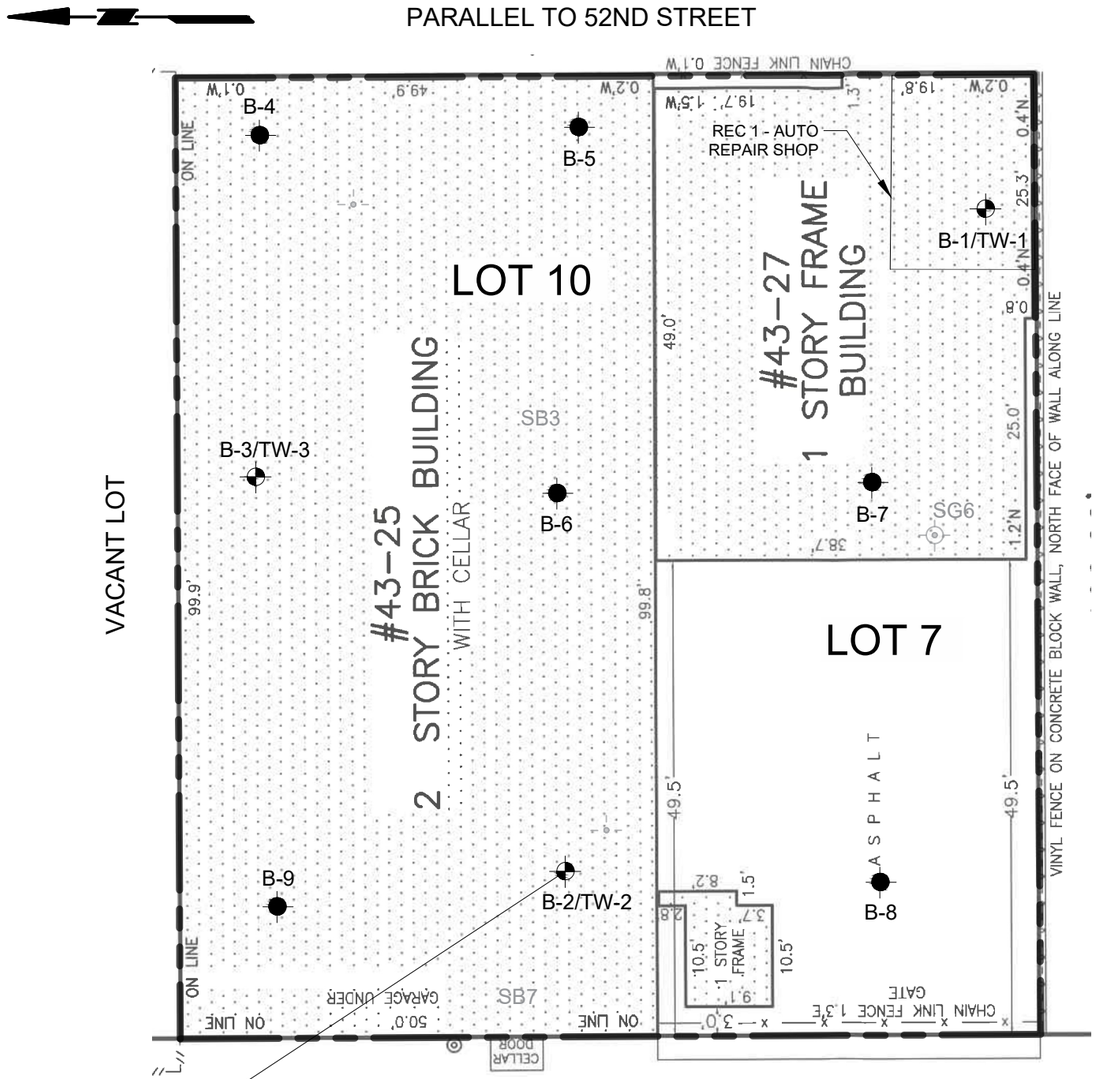
STATE OF NEW YORK
CHENGYU HANG
10838201
LICENSED PROFESSIONAL ENGINEER

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LAYOUT OF SOIL VAPOR EXTRACTION SYSTEM
43-25 52ND STREET
QUEENS
NEW YORK NEW YORK

JOB NO.: 22254	SCALE: As Shown	DATE: 11/10/2025	FIG. 5

P:\22\22254 (43-52nd Street)\Final Engineering Report\DWG\ SVE Layout 10-13-25 UV.dwg Nov 11, 2025 - 4:05pm mrenker



Sample ID	Analyte		Concentration (mg/kg)	UUSCO (mg/kg)	RRSCO (mg/kg)
B-2 (60ft-62ft)	Metals	Arsenic	**13.6**	13	16
		Hex Chromium	**2.38**	1	110

LEGEND:

Site Boundary

B-4 — Soil Boring Location

B-1/TW-1 — Soil Boring and Temporary Well Location

UUSCO = New York State Department of Environmental Conservation Unrestricted Use Soil Cleanup Objective

RRSCO = New York State Department of Environmental Conservation Restricted Use Soil Cleanup Objective - Restricted Residential

13.6 - Analyte has exceeded UUSCO

NOTES:

1. BASE PLAN WAS DEVELOPED FROM THE SURVEY MAP BY A&B ENGINEERING AND LAND SURVEYING, P.CP. DATED ON JUNE 20, 2022.
2. THE APPROXIMATE REC BOUNDARY IS FROM THE 1982 - 1989 SANBORN MAP OF THE PHASE I ESA PREPARED BY JR ENVIRONMENTAL SERVICES, INC DATED FEBRUARY 21, 2022
3. THE PROPOSED SOIL BORING B-1 THROUGH B-3 WERE ADVANCED TO 70 FT - 85 FT BGS (BELOW GROUND SURFACE). REMAINING SOIL BORING FROM SB-4 TO SB-9 WERE ADVANCED TO 9.98 - 14.98 FT BGS

0 8 16 32

SCALE IN FEET

YU & Associates
Geotechnical, Environmental and Civil Engineering
200 Riverfront Blvd. *Tel: (201) 791-0075*
Elmwood Park, NJ 07407 *Fax: (201) 791-4533*

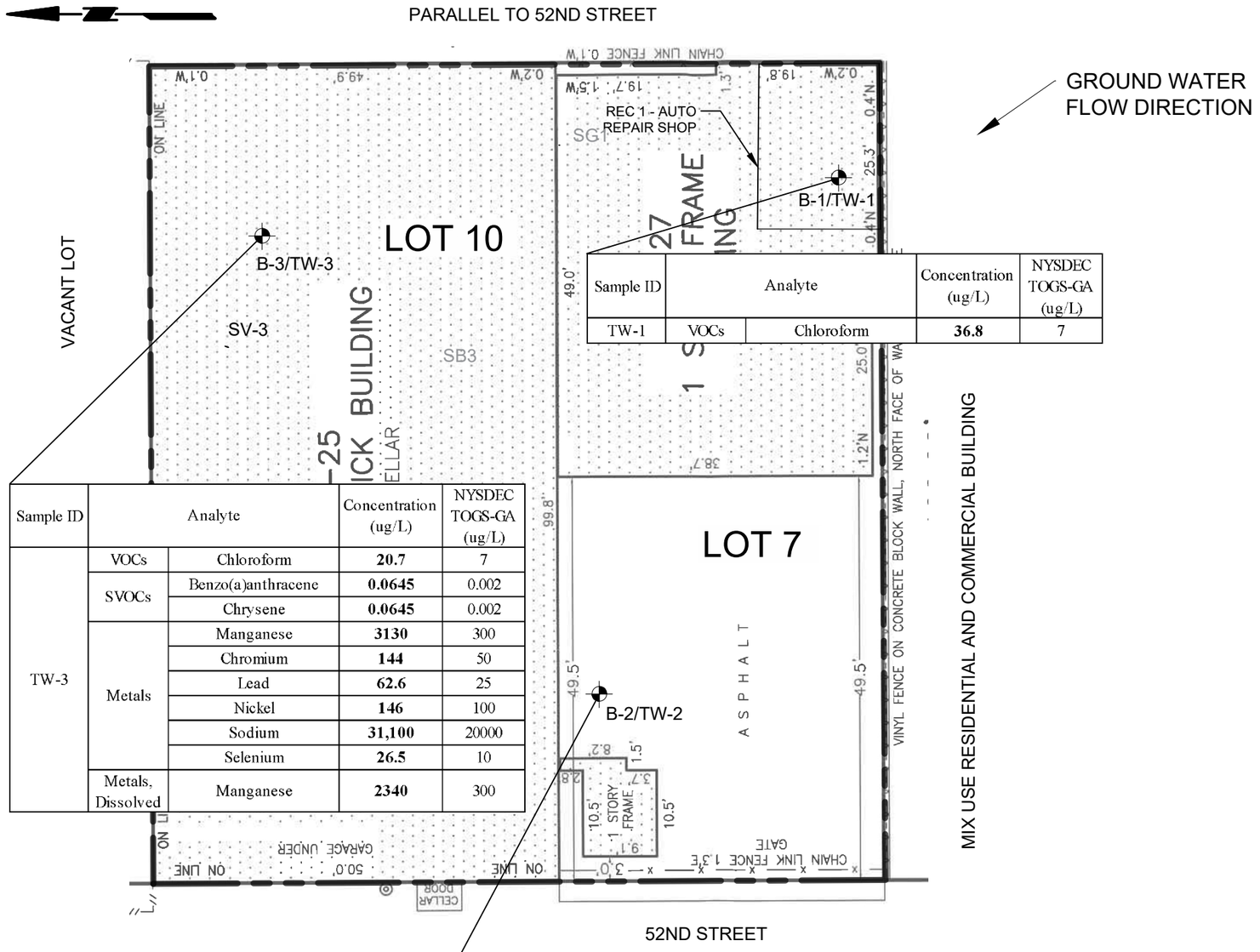
REMAINING SOIL CONTAMINATION EXCEEDANCE MAP

43-25 & 43-27 52ND STREET

WOODSIDE

QUEENS NEW YORK

JOB NO.: 22254 | SCALE: As Shown | DATE: 11/07/2025 | FIG. 6



Sample ID	Analyte		Concentration (ug/L)	NYSDEC TOGS-GA (ug/L)
TW-1	VOCs	Chloroform	**36.8**	7

Sample ID	Analyte		Concentration (ug/L)	NYSDEC TOGS-GA (ug/L)
TW-3	VOCs	Chloroform	**20.7**	7
	SVOCs	Benzo(a)anthracene	**0.0645**	0.002
		Chrysene	**0.0645**	0.002
	Metals	Manganese	**3130**	300
		Chromium	**144**	50
		Lead	**62.6**	25
		Nickel	**146**	100
		Sodium	**31,100**	20000
		Selenium	**26.5**	10
	Metals, Dissolved	Manganese	**2340**	300

Sample ID	Analyte		Concentration (ug/L)	NYSDEC TOGS-GA (ug/L)	NYDEC PFAS Remedial Program (ug/L)
TW-2	Metals	Manganese	**1470**	300	~
	Metals, Dissolved	Manganese	**1430**	300	~
	PFAs	Perfluorooctanoic acid (PFOA)	**0.0579**	~	0.01

LEGEND:

Site Boundary

B-1/TW-1

Soil Boring and Temporary Well Sample Location

NYSDEC TOGS - GA = New York State Department of Environmental Conservation Technical and Operational Guidance Series class GA

NYDEC PFAS Remedial Program = New York Department of Environmental Conservation Part 373 PFAS Remedial Program Water October 2020

36.8 = Analyte has exceeded the criterion

NOTES:

1. BASE PLAN WAS DEVELOPED FROM THE SURVEY MAP BY A&B ENGINEERING AND LAND SURVEYING, P.CP. DATED ON JUNE 20, 2022.
2. THE APPROXIMATE REC BOUNDARY IS FROM THE 1982 - 1989 SANBORN MAP OF THE PHASE I ESA PREPARED BY JR ENVIRONMENTAL SERVICES, INC DATED FEBRUARY 21, 2022
3. THE TEMPORARY WELLS WERE ADVANCED TO 10 FT BELOW GROUNDWATER LEVEL WHICH IS 75 FT TO 80 FT BGS

0 8 16 32

SCALE IN FEET

YU & Associates
Geotechnical, Environmental and Civil Engineering
200 Riverfront Blvd. *Tel: (201) 791-0075*
Elmwood Park, NJ 07407 *Fax: (201) 791-4533*

REMAINING GROUNDWATER CONTAMINATION EXCEEDANCE MAP

43-25 & 43-27 52ND STREET

WOODSIDE

QUEENS NEW YORK

JOB NO.: 22254	SCALE: As Shown	DATE: 11/11/2025	FIG. 7

APPENDIX

APPENDIX A – Environmental Easement

NYC DEPARTMENT OF FINANCE
OFFICE OF THE CITY REGISTER

This page is part of the instrument. The City Register will rely on the information provided by you on this page for purposes of indexing this instrument.The information on this page will control for indexing purposes in the event of any conflict with the rest of the document.

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RECORDING AND ENDORSEMENT COVER PAGE **PAGE 1 OF 11**

Document ID: 2025071100348001 Document Date: 07-08-2025 Preparation Date: 07-11-2025
Document Type: EASEMENT
Document Page Count: 10

PRESENTER:
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560 LEXINGTON AVENUE, 15TH FLOOR
NEW YORK, NY 10022
212-421-2150
NDUNCAN@SPRLAW.COM

RETURN TO:
SIVE PAGET & RIESEL, P.C.
560 LEXINGTON AVENUE, 15TH FLOOR
NEW YORK, NY 10022
212-421-2150
NDUNCAN@SPRLAW.COM

PROPERTY DATA

Borough	Block	Lot		Unit	Address
QUEENS	1321	7	Entire Lot		43-27 52 STREET

Property Type: OTHER Easement

Borough	Block	Lot		Unit	Address
QUEENS	1321	10	Entire Lot		43-25 52 STREET

Property Type: OTHER Easement

CROSS REFERENCE DATA

CRFN_____ *or* DocumentID_____ *or* _____ Year_____ Reel____ Page_____ *or* File Number_____

PARTIES

GRANTOR/SELLER:
43-25 52 LLC
46-02 70TH STREET, UNIT PH
WOODSIDE, NY 11377

GRANTEE/BUYER:
PEOPLE OF NEW YORK BY DEPT. ENVIRONMENTAL CONSERVA
625 BROADWAY
ALBANY, NY 12233

FEES AND TAXES

Mortgage :		
Mortgage Amount:	$	0.00
Taxable Mortgage Amount:	$	0.00
Exemption:		
TAXES: County (Basic):	$	0.00
City (Additional):	$	0.00
Spec (Additional):	$	0.00
TASF:	$	0.00
MTA:	$	0.00
NYCTA:	$	0.00
Additional MRT:	$	0.00
TOTAL:	$	0.00
Recording Fee:	$	90.00
Affidavit Fee:	$	0.00

Filing Fee:	$	100.00
NYC Real Property Transfer Tax:	$	0.00
NYS Real Estate Transfer Tax:	$	0.00

RECORDED OR FILED IN THE OFFICE OF THE CITY REGISTER OF THE CITY OF NEW YORK
Recorded/Filed 07-16-2025 15:48
City Register File No.(CRFN): **2025000188344**

City Register Official Signature

ENVIRONMENTAL EASEMENT GRANTED PURSUANT TO ARTICLE 71, TITLE 36 OF THE NEW YORK STATE ENVIRONMENTAL CONSERVATION LAW

THIS INDENTURE made this ____ day of _____, 202_, between Owner, 43-25 52 LLC, having an office at 46-02 70th, Unit PH, Woodside, County of Queens, State of New York (the "Grantor"), and The People of the State of New York (the "Grantee"), acting through their Commissioner of the Department of Environmental Conservation (the "Commissioner", or "NYSDEC" or "Department" as the context requires) with its headquarters located at 625 Broadway, Albany, New York 12233,

WHEREAS, the Legislature of the State of New York has declared that it is in the public interest to encourage the remediation of abandoned and likely contaminated properties ("sites") that threaten the health and vitality of the communities they burden while at the same time ensuring the protection of public health and the environment; and

WHEREAS, the Legislature of the State of New York has declared that it is in the public interest to establish within the Department a statutory environmental remediation program that includes the use of Environmental Easements as an enforceable means of ensuring the performance of operation, maintenance, and/or monitoring requirements and the restriction of future uses of the land, when an environmental remediation project leaves residual contamination at levels that have been determined to be safe for a specific use, but not all uses, or which includes engineered structures that must be maintained or protected against damage to perform properly and be effective, or which requires groundwater use or soil management restrictions; and

WHEREAS, the Legislature of the State of New York has declared that Environmental Easement shall mean an interest in real property, created under and subject to the provisions of Article 71, Title 36 of the New York State Environmental Conservation Law ("ECL") which contains a use restriction and/or a prohibition on the use of land in a manner inconsistent with engineering controls which are intended to ensure the long term effectiveness of a site remedial program or eliminate potential exposure pathways to hazardous waste or petroleum; and

WHEREAS, Grantor, is the owner of real property located at the address of 43-27 & 43-25 52nd Street in the City of New York, County of Queens and State of New York, known and designated on the tax map of the New York City Department of Finance as tax map parcel number: Block 1321 Lots 7 & 10, being the same as those properties conveyed to Grantor by deed dated as of September 13, 2022 and recorded in the City Register of the City of New York in City Register File No. 2022000361392 and by deed dated as of May 6, 2022 and recorded in the City Register of the City of New York in City Register File No. 2022000205476. The property subject to this Environmental Easement (the "Controlled Property") comprises approximately 0.207 +/- acres, and is hereinafter more fully described in the Land Title Survey dated March 6, 2025 prepared by Vincent Teutonico, License No. 050307, which will be attached to the Site Management Plan. The Controlled Property description is set forth in and attached hereto as Schedule A; and

WHEREAS, the Department accepts this Environmental Easement in order to ensure the protection of public health and the environment and to achieve the requirements for remediation established for the Controlled Property until such time as this Environmental Easement is

extinguished pursuant to ECL Article 71, Title 36; and

NOW THEREFORE, in consideration of the mutual covenants contained herein and the terms and conditions of Brownfield Cleanup Agreement Index Number: C241269-04-23, Grantor conveys to Grantee a permanent Environmental Easement pursuant to ECL Article 71, Title 36 in, on, over, under, and upon the Controlled Property as more fully described herein ("Environmental Easement").

1. Purposes. Grantor and Grantee acknowledge that the Purposes of this Environmental Easement are: to convey to Grantee real property rights and interests that will run with the land in perpetuity in order to provide an effective and enforceable means of encouraging the reuse and redevelopment of this Controlled Property at a level that has been determined to be safe for a specific use while ensuring the performance of operation, maintenance, and/or monitoring requirements; and to ensure the restriction of future uses of the land that are inconsistent with the above-stated purpose.

2. Institutional and Engineering Controls. The controls and requirements listed in the Department approved Site Management Plan ("SMP") including any and all Department approved amendments to the SMP are incorporated into and made part of this Environmental Easement. These controls and requirements apply to the use of the Controlled Property, run with the land, are binding on the Grantor and the Grantor's successors and assigns, and are enforceable in law or equity against any owner of the Controlled Property, any lessees and any person using the Controlled Property.

A. (1) The Controlled Property may be used for:

Restricted Residential as described in 6 NYCRR Part 375-1.8(g)(2)(ii), Commercial as described in 6 NYCRR Part 375-1.8(g)(2)(iii) and Industrial as described in 6 NYCRR Part 375-1.8(g)(2)(iv)

(2) All Engineering Controls must be operated and maintained as specified in the Site Management Plan (SMP);

(3) All Engineering Controls must be inspected at a frequency and in a manner defined in the SMP;

(4) The use of groundwater underlying the property is prohibited without necessary water quality treatment as determined by the NYSDOH or the New York City Department of Health and Mental Hygiene to render it safe for use as drinking water or for industrial purposes, and the user must first notify and obtain written approval to do so from the Department;

(5) Groundwater and other environmental or public health monitoring must be performed as defined in the SMP;

(6) Data and information pertinent to Site Management of the Controlled Property must be reported at the frequency and in a manner defined in the SMP;

(7) All future activities on the property that will disturb remaining contaminated material must be conducted in accordance with the SMP;

(8) Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in the SMP;

(9) Operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical components of the remedy shall be performed as defined in the SMP;

(10) Access to the site must be provided to agents, employees or other representatives of the State of New York with reasonable prior notice to the property owner to assure compliance with the restrictions identified by this Environmental Easement.

B. The Controlled Property shall not be used for Residential purposes as defined in 6NYCRR 375-1.8(g)(2)(i), and the above-stated engineering controls may not be discontinued without an amendment or extinguishment of this Environmental Easement.

C. The SMP describes obligations that the Grantor assumes on behalf of Grantor, its successors and assigns. The Grantor's assumption of the obligations contained in the SMP which may include sampling, monitoring, and/or operating a treatment system, and providing certified reports to the NYSDEC, is and remains a fundamental element of the Department's determination that the Controlled Property is safe for a specific use, but not all uses. The SMP may be modified in accordance with the Department's statutory and regulatory authority. The Grantor and all successors and assigns, assume the burden of complying with the SMP and obtaining an up-to-date version of the SMP from:

Site Control Section
Division of Environmental Remediation
NYSDEC
625 Broadway
Albany, New York 12233
Phone: (518) 402-9553

D. Grantor must provide all persons who acquire any interest in the Controlled Property a true and complete copy of the SMP that the Department approves for the Controlled Property and all Department-approved amendments to that SMP.

E. Grantor covenants and agrees that until such time as the Environmental Easement is extinguished in accordance with the requirements of ECL Article 71, Title 36 of the ECL, the property deed and all subsequent instruments of conveyance relating to the Controlled Property shall state in at least fifteen-point bold-faced type:

This property is subject to an Environmental Easement held by the New York State Department of Environmental Conservation pursuant to Title 36 of Article 71 of the Environmental Conservation

Law.

F. Grantor covenants and agrees that this Environmental Easement shall be incorporated in full or by reference in any leases, licenses, or other instruments granting a right to use the Controlled Property.

G. Grantor covenants and agrees that it shall, at such time as NYSDEC may require, submit to NYSDEC a written statement by an expert the NYSDEC may find acceptable certifying under penalty of perjury, in such form and manner as the Department may require, that:

(1) the inspection of the site to confirm the effectiveness of the institutional and engineering controls required by the remedial program was performed under the direction of the individual set forth at 6 NYCRR Part 375-1.8(h)(3).

(2) the institutional controls and/or engineering controls employed at such site:

(i) are in-place;

(ii) are unchanged from the previous certification, or that any identified changes to the controls employed were approved by the NYSDEC and that all controls are in the Department-approved format; and

(iii) that nothing has occurred that would impair the ability of such control to protect the public health and environment;

(3) the owner will continue to allow access to such real property to evaluate the continued maintenance of such controls;

(4) nothing has occurred that would constitute a violation or failure to comply with any site management plan for such controls;

(5) the report and all attachments were prepared under the direction of, and reviewed by, the party making the certification;

(6) to the best of his/her knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the site remedial program, and generally accepted engineering practices; and

(7) the information presented is accurate and complete.

3. Right to Enter and Inspect. Grantee, its agents, employees, or other representatives of the State may enter and inspect the Controlled Property in a reasonable manner and at reasonable times to assure compliance with the above-stated restrictions.

4. Reserved Grantor's Rights. Grantor reserves for itself, its assigns, representatives, and successors in interest with respect to the Property, all rights as fee owner of the Property, including:

A. Use of the Controlled Property for all purposes not inconsistent with, or limited by the terms of this Environmental Easement;

B. The right to give, sell, assign, or otherwise transfer part or all of the underlying fee interest to the Controlled Property, subject and subordinate to this Environmental Easement;

5. Enforcement

A. This Environmental Easement is enforceable in law or equity in perpetuity by Grantor, Grantee, or any affected local government, as defined in ECL Section 71-3603, against

the owner of the Property, any lessees, and any person using the land. Enforcement shall not be defeated because of any subsequent adverse possession, laches, estoppel, or waiver. It is not a defense in any action to enforce this Environmental Easement that: it is not appurtenant to an interest in real property; it is not of a character that has been recognized traditionally at common law; it imposes a negative burden; it imposes affirmative obligations upon the owner of any interest in the burdened property; the benefit does not touch or concern real property; there is no privity of estate or of contract; or it imposes an unreasonable restraint on alienation.

B. If any person violates this Environmental Easement, the Grantee may revoke the Certificate of Completion with respect to the Controlled Property.

C. Grantee shall notify Grantor of a breach or suspected breach of any of the terms of this Environmental Easement. Such notice shall set forth how Grantor can cure such breach or suspected breach and give Grantor a reasonable amount of time from the date of receipt of notice in which to cure. At the expiration of such period of time to cure, or any extensions granted by Grantee, the Grantee shall notify Grantor of any failure to adequately cure the breach or suspected breach, and Grantee may take any other appropriate action reasonably necessary to remedy any breach of this Environmental Easement, including the commencement of any proceedings in accordance with applicable law.

D. The failure of Grantee to enforce any of the terms contained herein shall not be deemed a waiver of any such term nor bar any enforcement rights.

6. Notice. Whenever notice to the Grantee (other than the annual certification) or approval from the Grantee is required, the Party providing such notice or seeking such approval shall identify the Controlled Property by referencing the following information:

County, NYSDEC Site Number, NYSDEC Brownfield Cleanup Agreement, State Assistance Contract or Order Number, and the County tax map number or the Liber and Page or computerized system identification number.

Parties shall address correspondence to:

Site Number: C241269
Office of General Counsel
NYSDEC
625 Broadway
Albany New York 12233-5500

With a copy to:

Site Control Section
Division of Environmental Remediation
NYSDEC
625 Broadway
Albany, NY 12233

All notices and correspondence shall be delivered by hand, by registered mail or by Certified mail and return receipt requested. The Parties may provide for other means of receiving and communicating notices and responses to requests for approval.

7. Recordation. Grantor shall record this instrument, within thirty (30) days of execution of this instrument by the Commissioner or her/his authorized representative in the office of the

recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

8. Amendment. Any amendment to this Environmental Easement may only be executed by the Commissioner of the New York State Department of Environmental Conservation or the Commissioner's Designee, and filed with the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

9. Extinguishment. This Environmental Easement may be extinguished only by a release by the Commissioner of the New York State Department of Environmental Conservation, or the Commissioner's Designee, and filed with the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

10. Joint Obligation. If there are two or more parties identified as Grantor herein, the obligations imposed by this instrument upon them shall be joint and several.

11. Consistency with the SMP. To the extent there is any conflict or inconsistency between the terms of this Environmental Easement and the SMP, regarding matters specifically addressed by the SMP, the terms of the SMP will control.

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IN WITNESS WHEREOF, Grantor has caused this instrument to be signed in its name.

43-25 52 LLC:

By: _____

Print Name: XIAO KE TANG

Title: Authorized Signatory Date: 6/20/2025

Grantor's Acknowledgment

STATE OF NEW YORK)
) ss:
COUNTY OF Queens)

On the 20th day of June, in the year 2025, before me, the undersigned, personally appeared XIAO KE TANG, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

_____
Notary Public - State of New York

JINGLU HUANG
Notary Public, State of New York
No. 01HU6410507
Qualified in Nassau County
Commission Expires Oct. 26, 2028

THIS ENVIRONMENTAL EASEMENT IS HEREBY ACCEPTED BY THE PEOPLE OF THE STATE OF NEW YORK, Acting by and Through the Department of Environmental Conservation as Designee of the Commissioner,

By: _____
David Harrington, Assistant Director
Division of Environmental Remediation

Grantee's Acknowledgment

STATE OF NEW YORK)
) ss:
COUNTY OF ALBANY)

On the 8th day of July, in the year 2025 before me, the undersigned, personally appeared David Harrington, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and acknowledged to me that he/she/ executed the same in his/her/ capacity as Designee of the Commissioner of the State of New York Department of Environmental Conservation, and that by his/her/ signature on the instrument, the individual, or the person upon behalf of which the individual acted, executed the instrument.

_____
Notary Public - State of New York

Cheryl A. Salem
Notary Public State of New York
Registration No. 01SA0002177
Qualified In Albany County
My Commission Expires March 3, 2027

SCHEDULE "A" PROPERTY DESCRIPTION

Environmental Easement Legal Description

ALL that certain plot, piece or parcel of land, with the buildings and improvements thereon erected, situate, lying and begin in the Borough and County of Queens, City and State of New York, bounded and described as follows:

BEGINNING at a point on the easterly side of 52nd Street (formerly Hancock Avenue), distant 120 feet northerly from the intersection of the northerly side of Queens Boulevard (formerly Thompson Avenue) with the easterly side of 52nd Street (formerly Hancock Avenue);

RUNNING THENCE easterly, parallel with Queens Boulevard, 100 feet;

THENCE northerly, parallel with 52nd Street, 90 feet;

THENCE westerly and again parallel with Queens Boulevard, 100 feet to the easterly side of 52nd Street;

THENCE southerly along the easterly side of 52nd Street, 90 feet to the point or place of BEGINNING.

Environmental Easement Area = 9,000 sq.ft = 0.207 acre

Recorded Deed Descriptions

Lot 7:

ALL that certain plot, piece or parcel of land, with the buildings and improvements thereon erected, situate, lying and being in the Borough and County of Queens, City and State of New York, known and designated on a certain map entitled, "Map of 276 Valuable Building Lots, situate in Woodside Heights, near the line of Long Island City in the Village of Woodside, Town of Newton, Queens County, Long Island, New York surveyed August 1885 by Cornelius Hyatt" filed in t he Office of the Clerk of the County of Queens, New York, October 4, 1886 as and by Lots Numbers 34 and 35 in Block #2 and which said lots when taken together are more particularly bounded and described as follows:

BEGINNING at a point on the easterly side of 52nd Street (formerly Hancock Avenue), distant 120 feet northerly from the corner formed by the intersection of the northerly side of Queens Boulevard (formerly Thompson Avenue) with the easterly side of 52nd Street (formerly Hancock Avenue);

RUNNING THENCE easterly, parallel with Queens Boulevard, 100 feet;

THENCE northerly, parallel with 52nd Street, 40 feet;

THENCE westerly and again parallel with Queens Boulevard, 100 feet to the easterly side of 52nd Street;

THENCE southerly along the easterly side of 52nd Street, 40 feet to the point or place of BEGINNING.

Lot Area = 4,000 sq.ft. = 0.092 acre

Lot 10:

ALL that certain plot, piece or parcel of land, with the buildings and improvements thereon erected, situate, lying and being in the Borough and County of Queens, City and State of New York, known and designated as and by Lots 32 and 33 and part of Lot 31 in Block 2 on "Map of 276 Valuable Building Lois [*sic*], situate in Woodside Heights, near the line of L.I.C.in Village of Woodside, Town of Newton, Queens County, LI., N.Y.", surveyed August 1885 by Cornelius Hyatt, Surveyor and filed in Queens County Clerk's Office 10-4-1886 as Map No. 225, bounded and described as follows:

BEGINNING at a point on the easterly side of 52nd Street, formerly called Hancock Place, distant 160 feet northerly from the corner formed by the intersection of said easterly side of 52nd Street and the northerly side of Queens Boulevard;

THENCE easterly parallel with Queens Boulevard, 100 feet;

THENCE northerly parallel with 52nd Street, 50 feet;

THENCE westerly parallel with Queens Boulevard, 100 feel [*sic*] to the easterly side of 52nd Street;

THENCE southerly along the easterly side of 52nd Street, 50 feet to the point or place of BEGINNING.

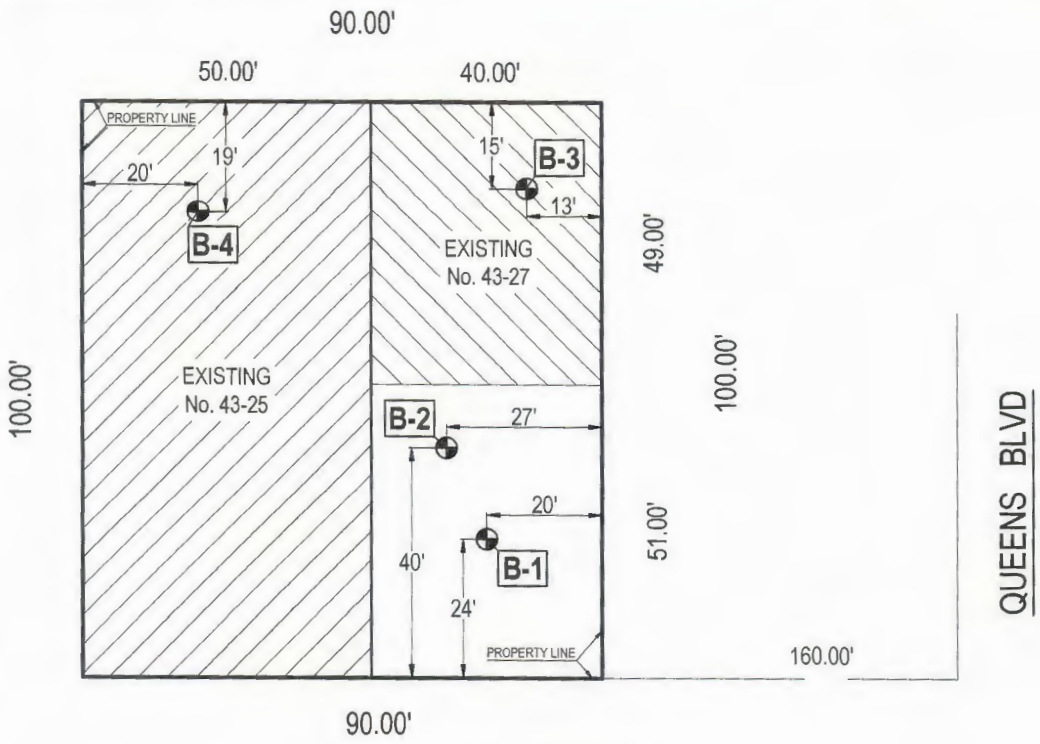
Lot Area = 5,000 sq.ft. = 0.115 acre

APPENDIX B – List of Site Contacts

APPENDIX B – LIST OF SITE CONTACTS

Name	Contact Information
Site Owner/Remedial Party 43-25 52 LLC	(646) 255-8960 jennyqu2006@yahoo.com
Qualified Environmental Professional: Sixuan Wang	(201) 899-3935 swang@yu-associates.com
Remedial Engineer: Chengyu Hang	(201) 873-7543 chang@yu-associates.com
NYSDEC DER Project Manager Javier Perez Maldonado	(518) 402-8172 Javier.perez-maldonado@dec.ny.gov
NYSDEC DER Project Manager's Supervisor William Bennett	(518) 402-9662 william.bennett@dec.ny.gov
NYSDEC Site Control Kelly A. Lewandowski	(518) 402-9553 kelly.lewandowski@dec.ny.gov
NYSDOH Project Manager Daniel P Tucholski	518-402-7860 beei@health.ny.gov
Remedial Party Attorney David Yudelson	(646) 378-7219 dyudelson@sprlaw.com

APPENDIX C – Boring Log



52ND STREET

SITE PLAN

(NOT TO SCALE)

GENERAL NOTES

1. BORING LOCATIONS ARE AS PER DIRECTIONS OF THE CLIENT. SEE SITE PLAN.
2. PROPERTY LINE DIMENSIONS ARE AS PER CLIENT AND FOR GENERAL INFORMATION PURPOSES ONLY, AND MAY NOT MATCH THOSE ON THE DEED OR TAX MAP.
3. BORINGS PERFORMED IN ACCORDANCE WITH PROCEDURES ESTABLISHED IN SECTION 1802.5 OF NYC BUILDING CODE AND COMPLY TO REQUIREMENTS OF SECTION 1704.7.4 OF NYC BUILDING CODE.
4. ◐ - DENOTES TEST LOCATION AND CARRIES A TAG CORRESPONDING TO THE PERFORMED TEST(S).
5. DEPTHS ARE SHOWN FROM THE GROUND LEVEL IN THE GIVEN POINT WHERE THE BORING WAS TAKEN. DIFFERENCES IN ELEVATION HAVE NOT BEEN CALCULATED.
6. GROUND WATER LEVEL NOTED LIKE THIS ●.
7. UNLESS A WELL POINT IS INSTALLED, WATER LEVEL REPORTED OCCURS AT THE TIME THE BORING WAS TAKEN AND MAY NOT BE THAT OF THE ACTUAL WATER TABLE. FLUCTUATIONS IN GROUND WATER LEVEL CAUSED BY TIDAL AND SEASONAL CHANGES HAVE NOT BEEN CONSIDERED.
8. IDENTIFICATIONS, DESCRIPTIONS AND CLASSIFICATIONS OF SOIL ARE TRUE TO THE BEST OF OUR KNOWLEDGE AND ARE BASED ON VISUAL EXAMINATION OF THE RECOVERED SOIL SAMPLES AT THE INDICATED LEVELS.
9. BORINGS WERE INSPECTED UNDER THE SUPERVISION OF A NEW YORK STATE LICENSED PROFESSIONAL ENGINEER AND ARE REASONABLY REPRESENTATIVE OF SUBSURFACE CONDITIONS, BUT MAY NOT NECESSARILY SHOW ACTUAL CONDITIONS BETWEEN BORINGS.

DATUM NOTE: ELEVATIONS REFER TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88), UNLESS NOTED OTHERWISE

DRAWN	GAS	CHECKED	AAS

APPROVED (SEAL)

STATE OF NEW YORK ★ SAMER M. ABOU-GHAIDA ★ 071407 PROFESSIONAL ENGINEER

PROFESSIONAL SOLUTIONS GROUP, INC.

P. O. Box 3015
Astoria, NY 11103

Office@PSGNYC.com
www.PSGNYC.com

T: 718.505.8000 F: 718.507.2224

PROJECT JN2594

SUBSURFACE INVESTIGATION AT:

43-25 & 43-27 52ND STREET
WOODSIDE, NY 11377

SITE PLAN, TEST LOCATIONS, GENERAL NOTES

DATE	SCALE	SHEET
09/28/2022	N.T.S.	1 OF 5

DRAWING No.

B - 001.00

THIS REPORT IS SUBMITTED WITH THE SPECIFIC UNDERSTANDING THAT THE SOLE LIABILITY OF PROFESSIONAL SOLUTIONS GROUP INC., IT'S ASSOCIATES, SUBCONTRACTORS, ENGINEERS AND EMPLOYEES, FOR ERRORS AND OMISSIONS IS LIMITED TO THE AMOUNT OF THE FEE PAID FOR THIS REPORT. THE USE OF THIS REPORT WILL CONSTITUTE AN ACCEPTANCE BY THE CLIENT OF THIS DISCLAIMER. THE FEE CHARGED FOR THIS REPORT IS PREDICATED UPON THIS LIMITATION OF LIABILITY, WHICH IS THE ESSENCE OF THIS AGREEMENT. IF THESE TERMS ARE NOT ACCEPTABLE, THE CLIENT MUST NOTIFY PROFESSIONAL SOLUTIONS GROUP INC , IN WRITING BY CERTIFIED MAIL - RETURN RECEIPT REQUESTED, WITHIN FIVE (5) DAYS. PROFESSIONAL SOLUTIONS GROUP INC., IT'S ASSOCIATES, SUBCONTRACTORS, ENGINEERS, EMPLOYEES DO NOT ACCEPT ANY LIABILITY OR RESPONSIBILITY FOR PERSONS OTHER THAN THE CLIENT FOR WHOM THIS WORK WAS DIRECTLY PREPARED AND ANY SUCH PERSON, FIRM OR CORPORATION RELIES ON THIS REPORT AT THEIR OWN RISK.

BORING B-1

BORING START: 09-19-2022
BORING END: 09-20-2022

ELEVATION: 1' ABOVE THE EXISTING CURB LEVEL ±

DEPTH	SOIL & ROCK DESCRIPTION & CLASSIFICATION	SAMPLE	BLOWS PER 6" OF SPOON	
	ASPHALT PAVEMENT --- FILL --- SILTY SAND - GRAVEL - COBBLES 7 Depth 3'- 0"	1	12 - 5 - 6 - 18	2.0
5				5.0
		2	14 - 14 - 14 - 12	7.0
10	MEDIUM TO FINE SILTY SAND - - LITTLE GRAVEL 3b			10.0
		3	10 - 12 - 14 - 3	12.0
15				15.0
		4	15 - 15 - 15 - 18	17.0
20	Depth 20'- 0"			20.0
		5	19 - 22 - 21 - 41	22.0
25	MEDIUM TO FINE SILTY SAND - - LITTLE GRAVEL - - COBBLES 3a			25.0
		6	23 - 23 - 28 - 25	27.0
30				30.0
		7	24 - 28 - 31 - 29	32.0
35	Depth 35'- 0"			35.0
		8	26 - 51 - 100 - R	37.0
40	MEDIUM TO FINE SILTY SAND - - GRAVEL & COBBLES - - BOULDERS 3a			40.0
		9	38 - 99 - R - R	42.0
45				45.0
		10	74 - 100 - R - R	47.0
50	Depth 50'- 0"			50.0
		11	15 - 78 - 100 - R	52.0
55				55.0
		12	32 - 35 - 24 - 81	57.0
60	COARSE TO MEDIUM SAND - - LITTLE SILT - - GRAVEL & COBBLES 3a			60.0
		13	87 - R - R - R	62.0
65				65.0
		14	32 - 41 - 41 - 90	67.0
70				70.0
		15	35 - 40 - 51 - 88	72.0
75	Depth 77'- 0"	16	11 - 15 - 19 - R	75.0 77.0
80				80.0
		17	15 - 31 - 24 - 26	82.0
85	MEDIUM TO FINE SILTY SAND - - LITTLE GRAVEL - - COBBLES 3a			85.0
		18	27 - 29 - 27 - 22	87.0
90				90.0
		19	15 - 18 - 15 - 35	92.0
95				95.0
		20	24 - 35 - 29 - 42	97.0
100	Depth 102'- 0"	21	31 - 29 - 25 - 29	100.0 102.0
105	*END OF BORING B-1* (1 OF TOTAL 4)			

NOTE:
"R" INDICATES ADVANCE WITH A ROLLER BIT

GROUND WATER LEVEL OBSCURED BY MUD DRILLING

TYPICAL EQUIPMENT	*Unless otherwise noted:*		Drilling rig	CME-45C
	Size of sample spoon	2 x 24 inches	Drilling method	mud, rotary
	Weight of spoon hammer	140 lbs.	Size of casing	3.00 inches
	Hammer drop & type	30 inches automatic	Double-tube core barrel	N size

SOIL GROUPS	UNIFIED SOIL CLASSIFICATION TYPICAL NAMES
GW	WELL GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
GP	POORLY GRADED GRAVELS OR GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
GM	SILTY GRAVELS, GRAVEL-AND-SILT MIXTURES
GC	CLAYEY GRAVELS, GRAVEL-AND-CLAY MIXTURES
SW	WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
SP	POORLY GRADED SANDS OR GRAVELLY SANDS, LITTLE OR NO FINES
SM	SILTY SANDS, SAND-SILT MIXTURES
SC	CLAYEY SANDS, SAND-CLAY MIXTURES
ML	INORGANIC SILTS & VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
CL	INORGANIC CLAYS OF LOW TO MEDIUM PLACTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS
CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
Pt	PEAT AND OTHER HIGHLY ORGANIC SOILS

ALLOWABLE BEARING PRESSURES

NYC BUILDING CODE BC1804 (Tab.1804.1)

CLASS OF MATERIALS	DESCRIPTION	MAX ALLOWABLE FOUNDATION PRESSURE TONS/SQ.FT
1a	HARD SOUND ROCK - GNEISS, DIABASE, SCHIST	60
1b	MEDIUM HARD ROCK - MARBLE, SERPENTINE	40
1c	INTERMEDIATE ROCK - SHALE, SANDSTONE	20
1d	SOFT ROCK - WEATHERED ROCK	8
2a	SANDY GRAVEL (SOIL GROUPS GW,GP) - DENSE	10
2b	SANDY GRAVEL (SOIL GROUPS GW,GP) - MEDIUM	6
3a	GRANULAR SOILS (SOIL GROUPS GC,GM,SW,SP,SM AND SC) - DENSE	6
3b	GRANULAR SOILS (SOIL GROUPS GC,GM,SW,SP,SM AND SC) - MEDIUM	3
4a	CLAYS AND CLAY SOILS (SOIL GROUPS SC, CL & CH) - HARD	5
4b	CLAYS AND CLAY SOILS (SOIL GROUPS SC, CL & CH) - STIFF	3
4c	CLAYS AND CLAY SOILS (SOIL GROUPS SC, CL & CH) - MEDIUM	2
5a	SILTS AND SILTY SOILS (SOIL GROUPS ML & MH) - DENSE	3
5b	SILTS AND SILTY SOILS (SOIL GROUPS ML & MH) - MEDIUM	1.5
6	ORGANIC SILTS, ORGANIC CLAYS, PEATS, SOFT CLAYS, LOOSE GRANULAR SOILS AND VARVED SILTS	see 1804.2.1
7	CONTROLLED AND UNCONTROLLED FILLS	see 1804.2.2 or 1804.2.3

DRAWN GAS | CHECKED AAS

APPROVED (SEAL)

STATE OF NEW YORK ★ LICENSED PROFESSIONAL ENGINEER ★ SAMER M. ABOU-GHAZALE 071407

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PROJECT JN2594

SUBSURFACE INVESTIGATION AT:
43-25 & 43-27 52ND STREET
WOODSIDE, NY 11377

BORING LOG B-1

DATE	SCALE	SHEET
09/28/2022	N.T.S.	2 OF 5

DRAWING No.
B - 101.00

BORING B-2

BORING DONE: 09-21-2022

ELEVATION: 1'- 6" ABOVE EXISTING CURB LEVEL ±

DEPTH	SOIL & ROCK DESCRIPTION & CLASSIFICATION	SAMPLE	BLOWS PER 6" OF SPOON	
	ASPHALT PAVEMENT --- FILL --- SILTY SAND - GRAVEL - COBBLES 7 Depth 2'- 6"	1	- 5 9 13	2.0
5	MEDIUM TO FINE SAND - - SOME SILT - LITTLE GRAVEL 3b Depth 6'- 0"	2	20 10 14 16	5.0 7.0
10		3	14 13 13 16	10.0 12.0
15		4	15 15 15 15	15.0 17.0
20	MEDIUM TO FINE SILTY SAND - - LITTLE GRAVEL - - COBBLES 3b	5	13 12 15 22	20.0 22.0
25		6	20 15 13 15	25.0 27.0
30		7	15 15 15 20	30.0 32.0
35	Depth 35'- 0"			35.0
	MEDIUM TO FINE SAND - - SOME SILT - - LITTLE GRAVEL - - COBBLES 3a Depth 42'- 0"	8	18 25 27 36	37.0
40		9	24 28 29 69	40.0 42.0
45	*END OF BORING B-2* (2 OF TOTAL 4)			
50				

NO GROUNDWATER LEVEL ENCOUNTERED

TYPICAL EQUIPMENT	*Unless otherwise noted:*		Drilling rig	CME-45C
	Size of sample spoon	2 x 24 inches	Hollow augers, diameter	3.25 inches
	Weight of spoon hammer	140 lbs.	Size of casing	3.00 inches
	Hammer drop & type	30 inches automatic	Double-tube core barrel	NX size

UNIFIED SOIL CLASSIFICATION TYPICAL NAMES

SOIL GROUPS	
GW	WELL GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
GP	POORLY GRADED GRAVELS OR GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
GM	SILTY GRAVELS, GRAVEL-AND-SILT MIXTURES
GC	CLAYEY GRAVELS, GRAVEL-AND-CLAY MIXTURES
SW	WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
SP	POORLY GRADED SANDS OR GRAVELLY SANDS, LITTLE OR NO FINES
SM	SILTY SANDS, SAND-SILT MIXTURES
SC	CLAYEY SANDS SAND-CLAY MIXTURES
ML	INORGANIC SILTS & VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
CL	INORGANIC CLAYS OF LOW TO MEDIUM PLACTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS
CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
Pt	PEAT AND OTHER HIGHLY ORGANIC SOILS

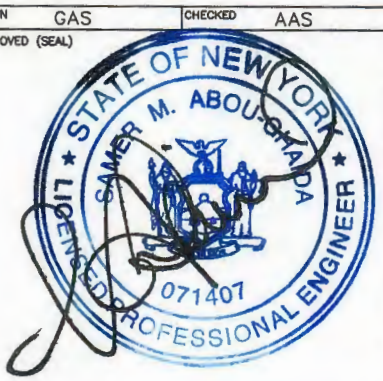
ALLOWABLE BEARING PRESSURES

NYC BUILDING CODE BC1804 (Tab.1804.1)

CLASS OF MATERIALS	DESCRIPTION	MAX ALLOWABLE FOUNDATION PRESSURE TONS/SQ.FT
1a	HARD SOUND ROCK - GNEISS, DIABASE, SCHIST	60
1b	MEDIUM HARD ROCK - MARBLE, SERPENTINE	40
1c	INTERMEDIATE ROCK - SHALE, SANDSTONE	20
1d	SOFT ROCK - WEATHERED ROCK	8
2a	SANDY GRAVEL (SOIL GROUPS GW,GP) - DENSE	10
2b	SANDY GRAVEL (SOIL GROUPS GW,GP) - MEDIUM	6
3a	GRANULAR SOILS (SOIL GROUPS GC,GM,SW,SP,SM AND SC) - DENSE	6
3b	GRANULAR SOILS (SOIL GROUPS GC,GM,SW,SP,SM AND SC) - MEDIUM	3
4a	CLAYS AND CLAY SOILS (SOIL GROUPS SC, CL & CH) - HARD	5
4b	CLAYS AND CLAY SOILS (SOIL GROUPS SC, CL & CH) - STIFF	3
4c	CLAYS AND CLAY SOILS (SOIL GROUPS SC, CL & CH) - MEDIUM	2
5a	SILTS AND SILTY SOILS (SOIL GROUPS ML & MH) - DENSE	3
5b	SILTS AND SILTY SOILS (SOIL GROUPS ML & MH) - MEDIUM	1.5
6	ORGANIC SILTS, ORGANIC CLAYS, PEATS, SOFT CLAYS, LOOSE GRANULAR SOILS AND VARVED SILTS	see 1804.2.1
7	CONTROLLED AND UNCONTROLLED FILLS	see 1804.2.2 or 1804.2.3

DRAWN GAS | CHECKED AAS

APPROVED (SEAL)



PROFESSIONAL SOLUTIONS GROUP, INC.
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PROJECT JN2594

SUBSURFACE INVESTIGATION AT:
43-25 & 43-27 52ND STREET
WOODSIDE, NY 11377

BORING LOG B-2

DATE	SCALE	SHEET
09/28/2022	N.T.S.	3 OF 5

DRAWING No.

B - 102.00

BORING DONE: 09-28-2022

BORING B-3

ELEVATION: 2' ABOVE EXISTING CURB LEVEL ±

DEPTH	SOIL & ROCK DESCRIPTION & CLASSIFICATION	SAMPLE	BLOWS PER 6" OF SPOON	
	CONCRETE FLOOR			
	--- FILL --- SAND - SILT - GRAVEL 7	1	- 16 13 14	2.0
	Depth 2'- 0"			
	MEDIUM TO FINE SAND - - SOME SILT - LITTLE GRAVEL 3b			
	Depth 4'- 0"			
5		2	21 13 14 21	5.0 7.0
10		3	15 11 13 16	10.0 12.0
	MEDIUM TO FINE SILTY SAND - - LITTLE GRAVEL - - COBBLES 3b			
15		4	15 13 12 18	15.0 17.0
20		5	14 16 20 28	20.0 22.0
	Depth 21'- 0"			
25		6	16 15 19 22	25.0 27.0
	MEDIUM TO FINE SILTY SAND - - LITTLE GRAVEL - - COBBLES 3a			
30		7	16 18 15 22	30.0 32.0
	Depth 32'- 0"			

END OF BORING B-3

(3 OF TOTAL 4)

NO GROUNDWATER LEVEL ENCOUNTERED

TYPICAL EQUIPMENT	*Unless otherwise noted:*			
	Size of sample spoon	2 x 24 inches	Size of casing	3.0 inches
	Weight of spoon hammer	140 lbs.	Weight of driver hammer	300 lbs.
	Sample hammer drop	30 inches	Casing hammer drop	18 inches

SOIL GROUPS	UNIFIED SOIL CLASSIFICATION TYPICAL NAMES
GW	WELL GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
GP	POORLY GRADED GRAVELS OR GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
GM	SILTY GRAVELS, GRAVEL-AND-SILT MIXTURES
GC	CLAYEY GRAVELS, GRAVEL-AND-CLAY MIXTURES
SW	WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
SP	POORLY GRADED SANDS OR GRAVELLY SANDS, LITTLE OR NO FINES
SM	SILTY SANDS, SAND-SILT MIXTURES
SC	CLAYEY SANDS, SAND-CLAY MIXTURES
ML	INORGANIC SILTS & VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
CL	INORGANIC CLAYS OF LOW TO MEDIUM PLACTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS
CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
P t	PEAT AND OTHER HIGHLY ORGANIC SOILS

ALLOWABLE BEARING PRESSURES

NYC BUILDING CODE BC1804 (Tab.1804.1)

CLASS OF MATERIALS	DESCRIPTION	MAX ALLOWABLE FOUNDATION PRESSURE TONS/SQ FT
1a	HARD SOUND ROCK - GNEISS, DIABASE, SCHIST	60
1b	MEDIUM HARD ROCK - MARBLE, SERPENTINE	40
1c	INTERMEDIATE ROCK - SHALE, SANDSTONE	20
1d	SOFT ROCK - WEATHERED ROCK	8
2a	SANDY GRAVEL (SOIL GROUPS GW,GP) - DENSE	10
2b	SANDY GRAVEL (SOIL GROUPS GW,GP) - MEDIUM	6
3a	GRANULAR SOILS (SOIL GROUPS GC,GM,SW,SP,SM AND SC) - DENSE	6
3b	GRANULAR SOILS (SOIL GROUPS GC,GM,SW,SP,SM AND SC) - MEDIUM	3
4a	CLAYS AND CLAY SOILS (SOIL GROUPS SC, CL & CH) - HARD	5
4b	CLAYS AND CLAY SOILS (SOIL GROUPS SC, CL & CH) - STIFF	3
4c	CLAYS AND CLAY SOILS (SOIL GROUPS SC, CL & CH) - MEDIUM	2
5a	SILTS AND SILTY SOILS (SOIL GROUPS ML & MH) - DENSE	3
5b	SILTS AND SILTY SOILS (SOIL GROUPS ML & MH) - MEDIUM	1.5
6	ORGANIC SILTS, ORGANIC CLAYS, PEATS, SOFT CLAYS, LOOSE GRANULAR SOILS AND VARVED SILTS	see 1804.2.1
7	CONTROLLED AND UNCONTROLLED FILLS	see 1804.2.2 or 1804.2.3

DRAWN	GAS	CHECKED	AAS

APPROVED (SEAL)

STATE OF NEW YORK ★ LICENSED PROFESSIONAL ENGINEER ★ SAMER M. ABOUGHAIDA 071407

PROFESSIONAL SOLUTIONS GROUP, INC.

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PROJECT JN2594

SUBSURFACE INVESTIGATION AT:

43-25 & 43-27 52ND STREET

WOODSIDE, NY 11377

BORING LOG B-3

DATE	SCALE	SHEET
09/28/2022	N.T.S.	4 OF 5

DRAWING No.

B - 103.00

BORING B-4

BORING DONE: 09-28-2022

ELEVATION: 1' ABOVE EXISTING CURB LEVEL ±

DEPTH	SOIL & ROCK DESCRIPTION & CLASSIFICATION	SAMPLE	BLOWS PER 6" OF SPOON	
	CONCRETE FLOOR --- FILL --- SILTY SAND-GRAVEL-COBBLES 7 Depth 2'- 0"	1	- 5 5 3	2.0
5	MEDIUM TO FINE SAND - - SOME SILT - - LITTLE GRAVEL 6 Depth 8'- 0"	2	2 1 2 3	5.0 7.0
10	MEDIUM TO FINE SAND - - SOME SILT - - LITTLE GRAVEL 3b Depth 12'- 0"	3	13 10 12 15	10.0 12.0
15		4	13 10 12 18	15.0 17.0
20	MEDIUM TO FINE SILTY SAND - - LITTLE GRAVEL - - COBBLES 3b	5	16 11 10 14	20.0 22.0
25		6	18 16 14 19	25.0 27.0
30	Depth 32'- 0"	7	13 15 15 19	30.0 32.0

END OF BORING B-4
(4 OF TOTAL 4)

NO GROUNDWATER LEVEL ENCOUNTERED

TYPICAL EQUIPMENT	*Unless otherwise noted:*			
	Size of sample spoon	2 x 24 inches	Size of casing	3.0 inches
	Weight of spoon hammer	140 lbs.	Weight of driver hammer	300 lbs.
	Sample hammer drop	30 inches	Casing hammer drop	18 inches

UNIFIED SOIL CLASSIFICATION
TYPICAL NAMES

SOIL GROUPS	
GW	WELL GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
GP	POORLY GRADED GRAVELS OR GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
GM	SILTY GRAVELS, GRAVEL-AND-SILT MIXTURES
GC	CLAYEY GRAVELS, GRAVEL-AND-CLAY MIXTURES
SW	WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
SP	POORLY GRADED SANDS OR GRAVELLY SANDS, LITTLE OR NO FINES
SM	SILTY SANDS, SAND-SILT MIXTURES
SC	CLAYEY SANDS, SAND-CLAY MIXTURES
ML	INORGANIC SILTS & VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
CL	INORGANIC CLAYS OF LOW TO MEDIUM PLACTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
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MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS
CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
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P t	PEAT AND OTHER HIGHLY ORGANIC SOILS

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NYC BUILDING CODE BC1804 (Tab.1804.1)

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2a	SANDY GRAVEL (SOIL GROUPS GW,GP) - DENSE	10
2b	SANDY GRAVEL (SOIL GROUPS GW,GP) - MEDIUM	6
3a	GRANULAR SOILS (SOIL GROUPS GC,GM,SW,SP,SM AND SC) - DENSE	6
3b	GRANULAR SOILS (SOIL GROUPS GC,GM,SW,SP,SM AND SC) - MEDIUM	3
4a	CLAYS AND CLAY SOILS (SOIL GROUPS SC, CL & CH) - HARD	5
4b	CLAYS AND CLAY SOILS (SOIL GROUPS SC, CL & CH) - STIFF	3
4c	CLAYS AND CLAY SOILS (SOIL GROUPS SC, CL & CH) - MEDIUM	2
5a	SILTS AND SILTY SOILS (SOIL GROUPS ML & MH) - DENSE	3
5b	SILTS AND SILTY SOILS (SOIL GROUPS ML & MH) - MEDIUM	1.5
6	ORGANIC SILTS, ORGANIC CLAYS, PEATS, SOFT CLAYS, LOOSE GRANULAR SOILS AND VARVED SILTS	see 1804.2.1
7	CONTROLLED AND UNCONTROLLED FILLS	see 1804.2.2 or 1804.2.3

DRAWN GAS | CHECKED AAS

APPROVED (SEAL)

STATE OF NEW YORK ★ SAMER M. ABOU-GHADA ★ LICENSED 071407 PROFESSIONAL ENGINEER

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PROJECT JN2594

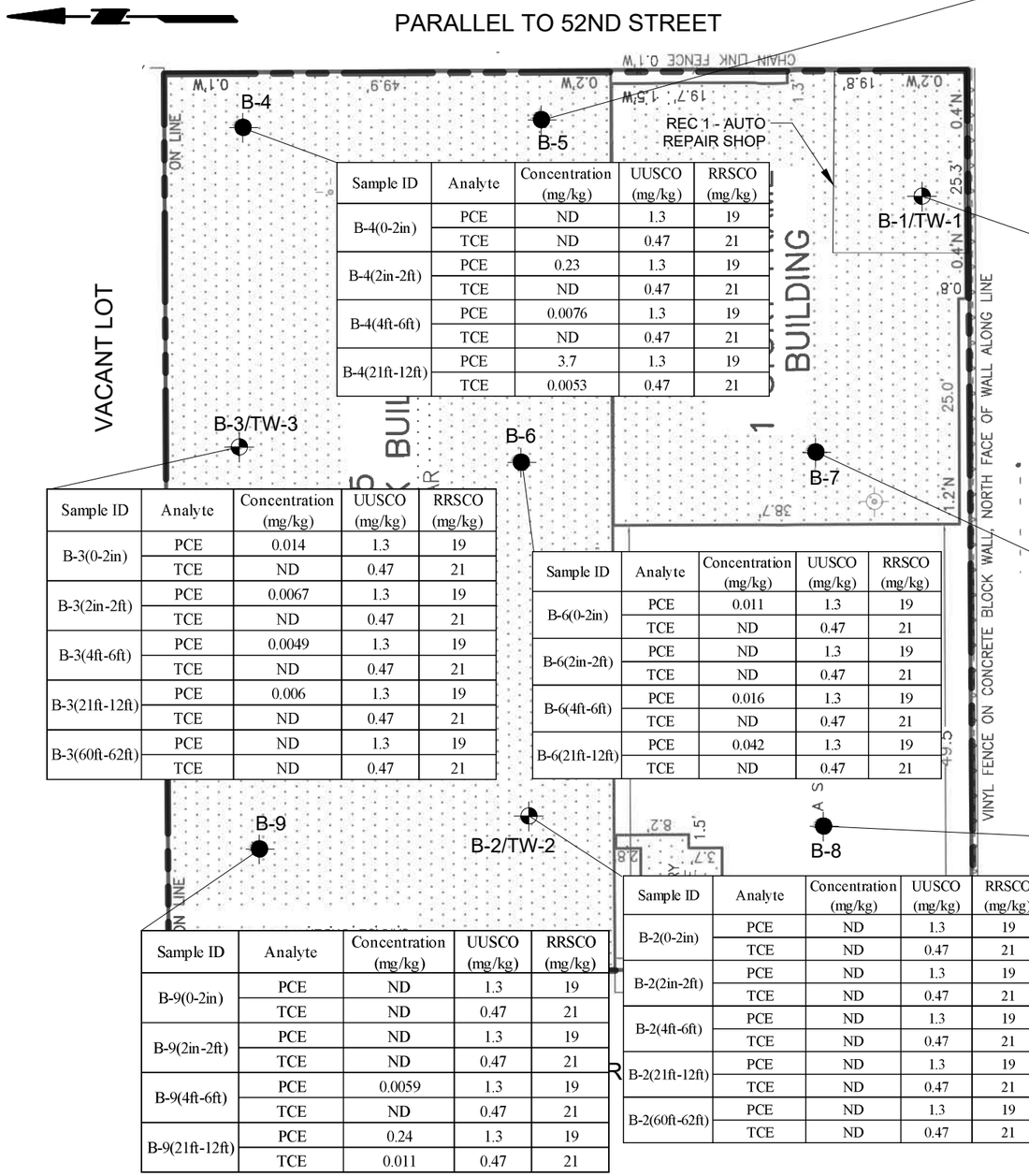
SUBSURFACE INVESTIGATION AT:
43-25 & 43-27 52ND STREET
WOODSIDE, NY 11377

BORING LOG B-4

DATE	SCALE	SHEET
09/28/2022	N.T.S.	5 OF 5

DRAWING No.
B - 104.00

APPENDIX D – Remedial Investigation Sample Results Figure and Table



Sample ID	Analyte	Concentration (mg/kg)	UUSCO (mg/kg)	RRSCO (mg/kg)
B-4(0-2in)	PCE	ND	1.3	19
	TCE	ND	0.47	21
B-4(2in-2ft)	PCE	0.23	1.3	19
	TCE	ND	0.47	21
B-4(4ft-6ft)	PCE	0.0076	1.3	19
	TCE	ND	0.47	21
B-4(21ft-12ft)	PCE	3.7	1.3	19
	TCE	0.0053	0.47	21

Sample ID	Analyte	Concentration (mg/kg)	UUSCO (mg/kg)	RRSCO (mg/kg)
B-5(0-2in)	PCE	0.058	1.3	19
	TCE	ND	0.47	21
B-5(2in-2ft)	PCE	0.12	1.3	19
	TCE	ND	0.47	21
B-5(4ft-6ft)	PCE	0.3	1.3	19
	TCE	0.005	0.47	21
B-5(21ft-12ft)	PCE	0.19	1.3	19
	TCE	ND	0.47	21

Sample ID	Analyte	Concentration (mg/kg)	UUSCO (mg/kg)	RRSCO (mg/kg)
B-1(0-2in)	PCE	0.01	1.3	19
	TCE	ND	0.47	21
B-1(2in-2ft)	PCE	0.0034J	1.3	19
	TCE	ND	0.47	21
B-1(4ft-6ft)	PCE	ND	1.3	19
	TCE	ND	0.47	21
B-1(21ft-12ft)	PCE	ND	1.3	19
	TCE	ND	0.47	21
B-1(60ft-62ft)	PCE	ND	1.3	19
	TCE	ND	0.47	21

Sample ID	Analyte	Concentration (mg/kg)	UUSCO (mg/kg)	RRSCO (mg/kg)
B-3(0-2in)	PCE	0.014	1.3	19
	TCE	ND	0.47	21
B-3(2in-2ft)	PCE	0.0067	1.3	19
	TCE	ND	0.47	21
B-3(4ft-6ft)	PCE	0.0049	1.3	19
	TCE	ND	0.47	21
B-3(21ft-12ft)	PCE	0.006	1.3	19
	TCE	ND	0.47	21
B-3(60ft-62ft)	PCE	ND	1.3	19
	TCE	ND	0.47	21

Sample ID	Analyte	Concentration (mg/kg)	UUSCO (mg/kg)	RRSCO (mg/kg)
B-6(0-2in)	PCE	0.011	1.3	19
	TCE	ND	0.47	21
B-6(2in-2ft)	PCE	ND	1.3	19
	TCE	ND	0.47	21
B-6(4ft-6ft)	PCE	0.016	1.3	19
	TCE	ND	0.47	21
B-6(21ft-12ft)	PCE	0.042	1.3	19
	TCE	ND	0.47	21

Sample ID	Analyte	Concentration (mg/kg)	UUSCO (mg/kg)	RRSCO (mg/kg)
B-7(0-2in)	PCE	ND	1.3	19
	TCE	ND	0.47	21
B-7(2in-2ft)	PCE	0.18	1.3	19
	TCE	ND	0.47	21
B-7(4ft-6ft)	PCE	ND	1.3	19
	TCE	ND	0.47	21
B-7(21ft-12ft)	PCE	ND	1.3	19
	TCE	ND	0.47	21

Sample ID	Analyte	Concentration (mg/kg)	UUSCO (mg/kg)	RRSCO (mg/kg)
B-9(0-2in)	PCE	ND	1.3	19
	TCE	ND	0.47	21
B-9(2in-2ft)	PCE	ND	1.3	19
	TCE	ND	0.47	21
B-9(4ft-6ft)	PCE	0.0059	1.3	19
	TCE	ND	0.47	21
B-9(21ft-12ft)	PCE	0.24	1.3	19
	TCE	0.011	0.47	21

Sample ID	Analyte	Concentration (mg/kg)	UUSCO (mg/kg)	RRSCO (mg/kg)
B-2(0-2in)	PCE	ND	1.3	19
	TCE	ND	0.47	21
B-2(2in-2ft)	PCE	ND	1.3	19
	TCE	ND	0.47	21
B-2(4ft-6ft)	PCE	ND	1.3	19
	TCE	ND	0.47	21
B-2(21ft-12ft)	PCE	ND	1.3	19
	TCE	ND	0.47	21
B-2(60ft-62ft)	PCE	ND	1.3	19
	TCE	ND	0.47	21

Sample ID	Analyte	Concentration (mg/kg)	UUSCO (mg/kg)	RRSCO (mg/kg)
B-8(0-2in)	PCE	0.015	1.3	19
	TCE	ND	0.47	21
B-8(2in-2ft)	PCE	ND	1.3	19
	TCE	ND	0.47	21
B-8(4ft-6ft)	PCE	ND	1.3	19
	TCE	ND	0.47	21
B-8(21ft-12ft)	PCE	ND	1.3	19
	TCE	ND	0.47	21

LEGEND:

- Site Boundary
- B-4 — Soil Boring Location
- B-1/TW-1 — Soil Boring and Temporary Well Location

UUSCO = New York State Department of Environmental Conservation Unrestricted Use Soil Cleanup Objective

RRSCO = New York State Department of Environmental Conservation Restricted Use Soil Cleanup Objective - Restricted Residential

PCE = Tetrachloroethylene

TCE = Trichloroethylene

NOTES:

1. BASE PLAN WAS DEVELOPED FROM THE SURVEY MAP BY A&B ENGINEERING AND LAND SURVEYING, P.CP. DATED ON JUNE 20, 2022.
2. THE APPROXIMATE REC BOUNDARY IS FROM THE 1982 - 1989 SANBORN MAP OF THE PHASE I ESA PREPARED BY JR ENVIRONMENTAL SERVICES, INC DATED FEBRUARY 21, 2022
3. THE PROPOSED SOIL BORING B-1 THROUGH B-3 WERE ADVANCED TO 70 FT - 85 FT BGS (BELOW GROUND SURFACE). REMAINING SOIL BORING FROM SB-4 TO SB-9 WERE ADVANCED TO 9.98 - 14.98 FT BGS

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Elmwood Park, NJ 07407
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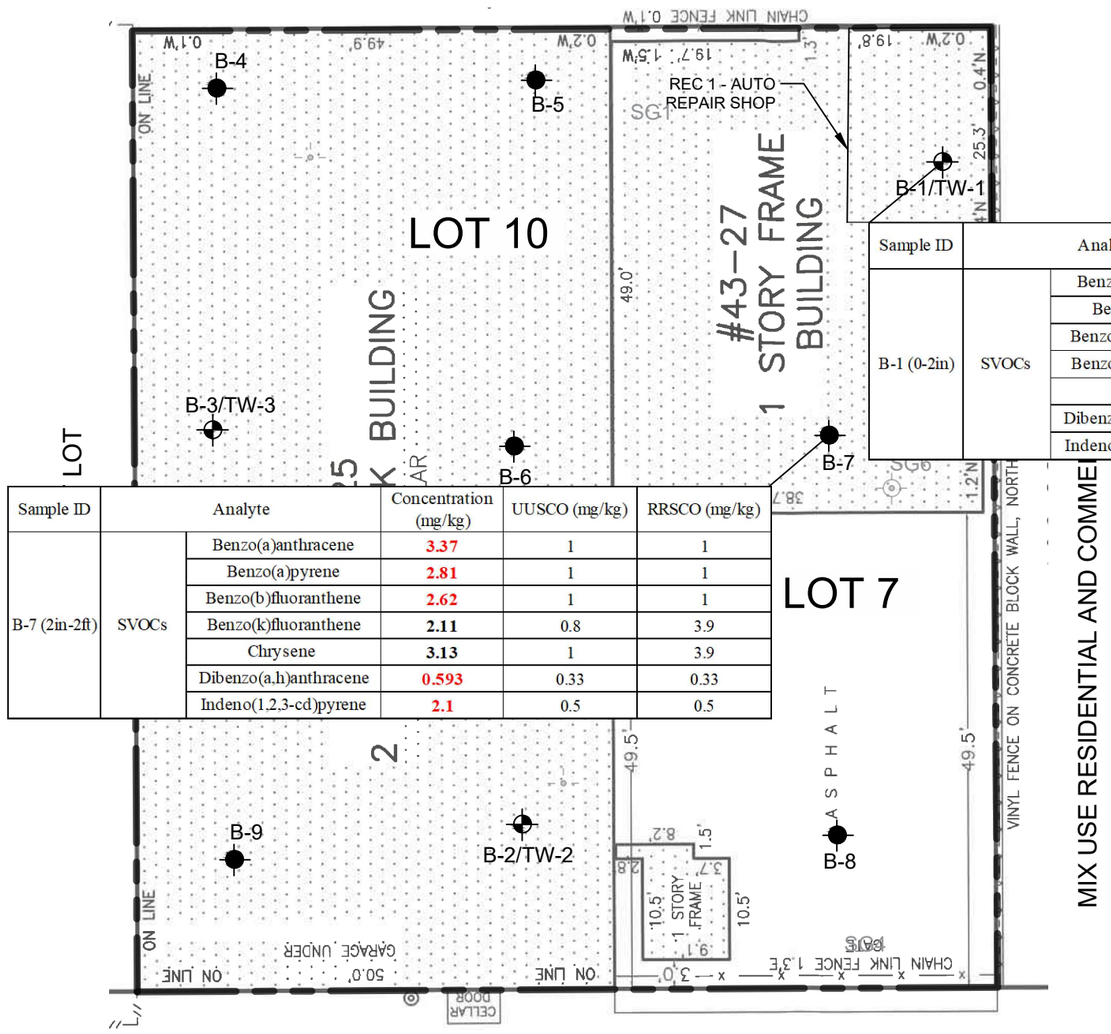
SOIL SAMPLE TCE/PCE RESULTS MAP

43-25 & 43-27 52ND STREET

WOODSIDE

QUEENS NEW YORK

JOB NO.: 22254 | SCALE: As Shown | DATE: 01/08/2024 | FIG. 4



Sample ID	Analyte		Concentration (mg/kg)	UUSCO (mg/kg)	RRSCO (mg/kg)
B-7 (2in-2ft)	SVOCs	Benzo(a)anthracene	**3.37**	1	1
		Benzo(a)pyrene	**2.81**	1	1
		Benzo(b)fluoranthene	**2.62**	1	1
		Benzo(k)fluoranthene	**2.11**	0.8	3.9
		Chrysene	**3.13**	1	3.9
		Dibenzo(a,h)anthracene	**0.593**	0.33	0.33
		Indeno(1,2,3-cd)pyrene	**2.1**	0.5	0.5

Sample ID	Analyte		Concentration (mg/kg)	UUSCO (mg/kg)	RRSCO (mg/kg)
B-1 (0-2in)	SVOCs	Benzo(a)anthracene	**5.35**	1	1
		Benzo(a)pyrene	**3.56**	1	1
		Benzo(b)fluoranthene	**4.24**	1	1
		Benzo(k)fluoranthene	**2.87**	0.8	3.9
		Chrysene	**5.11**	1	3.9
		Dibenzo(a,h)anthracene	**0.946**	0.33	0.33
		Indeno(1,2,3-cd)pyrene	**2.85**	0.5	0.5

LEGEND:

- Site Boundary
- B-4 — Soil Boring Location
- B-1/TW-1 — Soil Boring and Temporary Well Location

UUSCO = New York State Department of Environmental Conservation Unrestricted Use Soil Cleanup Objective

RRSCO = New York State Department of Environmental Conservation Restricted Use Soil Cleanup Objective - Restricted Residential

0.056 - Analyte has exceeded UUSCO

20.3 - Analyte has exceeded RRSCO

NOTES:

1. BASE PLAN WAS DEVELOPED FROM THE SURVEY MAP BY A&B ENGINEERING AND LAND SURVEYING, P.CP. DATED ON JUNE 20, 2022.
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SOIL SAMPLE SVOCS EXCEEDANCE MAP

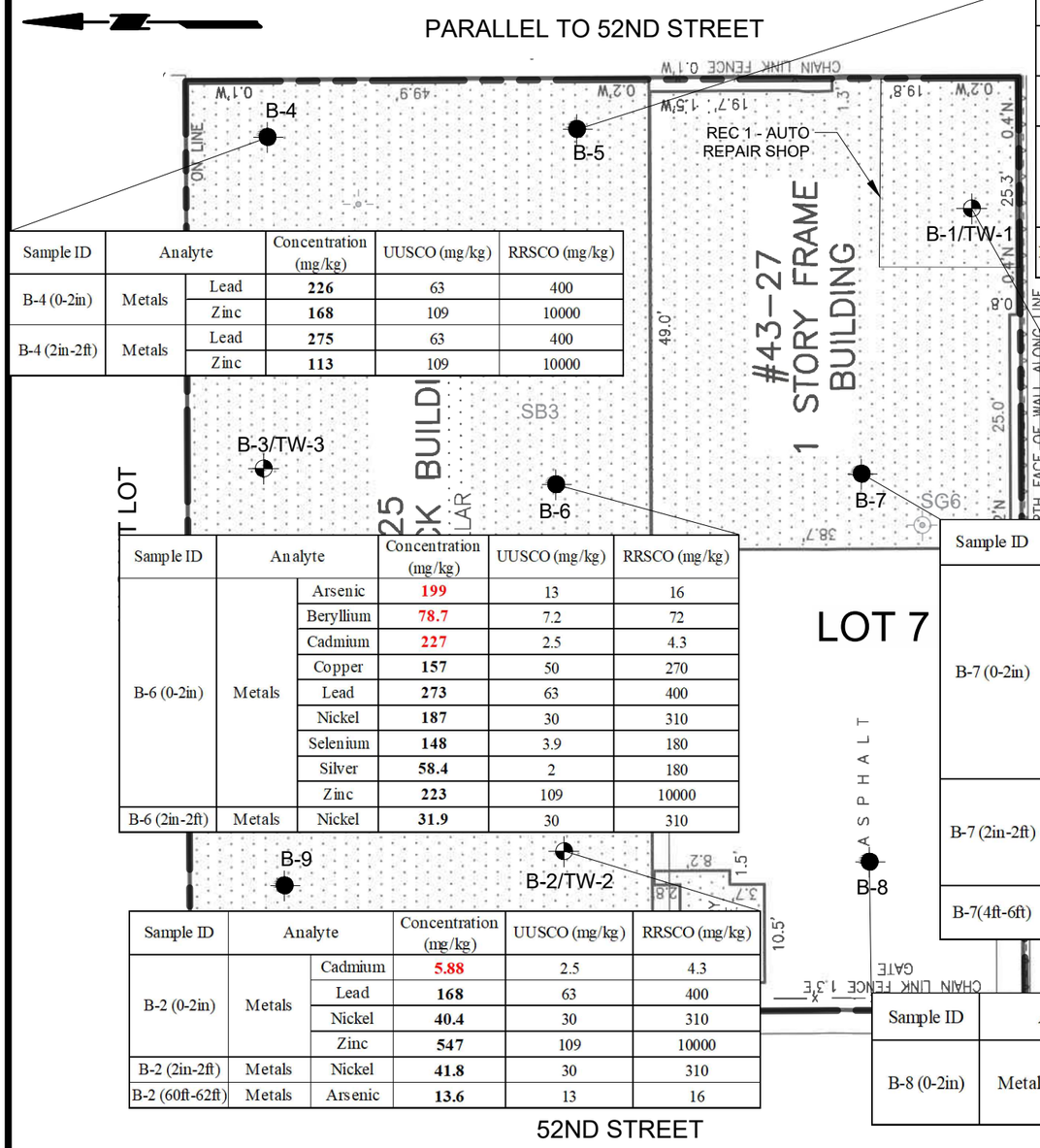
43-25 & 43-27 52ND STREET

WOODSIDE

QUEENS NEW YORK

JOB NO.: 22254	SCALE: As Shown	DATE: 01/08/2024	FIG. 5

P:\22\22254 (43-52nd Street)\Remedial Investigation\Report\DWG\ Fig 4 - Sample Location Map.dwg Jan 16, 2024 - 4:42pm morourke



Sample ID	Analyte		Concentration (mg/kg)	UUSCO (mg/kg)	RRSCO (mg/kg)
B-4 (0-2in)	Metals	Lead	**226**	63	400
		Zinc	**168**	109	10000
B-4 (2in-2ft)	Metals	Lead	**275**	63	400
		Zinc	**113**	109	10000

Sample ID	Analyte		Concentration (mg/kg)	UUSCO (mg/kg)	RRSCO (mg/kg)
B-5 (0-2in)	Metals	Lead	**164**	63	400
		Zinc	**118**	109	10000
B-5 (2in-2ft)	Metals	Lead	**144**	63	400
		Zinc	**153**	109	10000
B-5 (4ft-6ft)	Metals	Copper	**52.6**	50	270
		Lead	**190**	63	400
		Zinc	**142**	109	10000
		Mercury	**0.231**	0.18	0.81
B-5 (10ft-12ft)	Metals	Lead	**90.7**	63	400
		Zinc	**181**	109	10000

Sample ID	Analyte		Concentration (mg/kg)	UUSCO (mg/kg)	RRSCO (mg/kg)
B-1 (0-2in)	Metals	Lead	**90.2**	63	400
		Zinc	**349**	109	10000
B-1 (2in-2ft)	Metals	Zinc	**147**	109	10000

Sample ID	Analyte		Concentration (mg/kg)	UUSCO (mg/kg)	RRSCO (mg/kg)
B-6 (0-2in)	Metals	Arsenic	**199**	13	16
		Beryllium	**78.7**	7.2	72
		Cadmium	**227**	2.5	4.3
		Copper	**157**	50	270
		Lead	**273**	63	400
		Nickel	**187**	30	310
		Selenium	**148**	3.9	180
		Silver	**58.4**	2	180
		Zinc	**223**	109	10000
B-6 (2in-2ft)	Metals	Nickel	**31.9**	30	310

Sample ID	Analyte		Concentration (mg/kg)	UUSCO (mg/kg)	RRSCO (mg/kg)
B-7 (0-2in)	Metals	Arsenic	**20.3**	13	16
		Barium	**398**	350	400
		Cadmium	**6.43**	2.5	4.3
		Copper	**146**	50	270
		Lead	**3360**	63	400
		Nickel	**34.9**	30	310
		Selenium	**8.6**	3.9	180
		Zinc	**755**	109	10000
B-7 (2in-2ft)	Metals	Copper	**110**	50	270
		Lead	**640**	63	400
		Selenium	**4.93**	3.9	180
		Zinc	**473**	109	10000
B-7(4ft-6ft)	Metals	Lead	**161**	63	400
		Zinc	**120**	109	10000

Sample ID	Analyte		Concentration (mg/kg)	UUSCO (mg/kg)	RRSCO (mg/kg)
B-2 (0-2in)	Metals	Cadmium	**5.88**	2.5	4.3
		Lead	**168**	63	400
		Nickel	**40.4**	30	310
		Zinc	**547**	109	10000
B-2 (2in-2ft)	Metals	Nickel	**41.8**	30	310
B-2 (60ft-62ft)	Metals	Arsenic	**13.6**	13	16

Sample ID	Analyte		Concentration (mg/kg)	UUSCO (mg/kg)	RRSCO (mg/kg)
B-8 (0-2in)	Metals	Arsenic	**13.7**	13	16
		Lead	**269**	63	400
		Zinc	**116**	109	10000

LEGEND:

- Site Boundary
- B-4 — Soil Boring Location
- B-1/TW-1 — Soil Boring and Temporary Well Location

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SOIL SAMPLE METALS AND HEX CHROMIUM EXCEEDANCE MAP

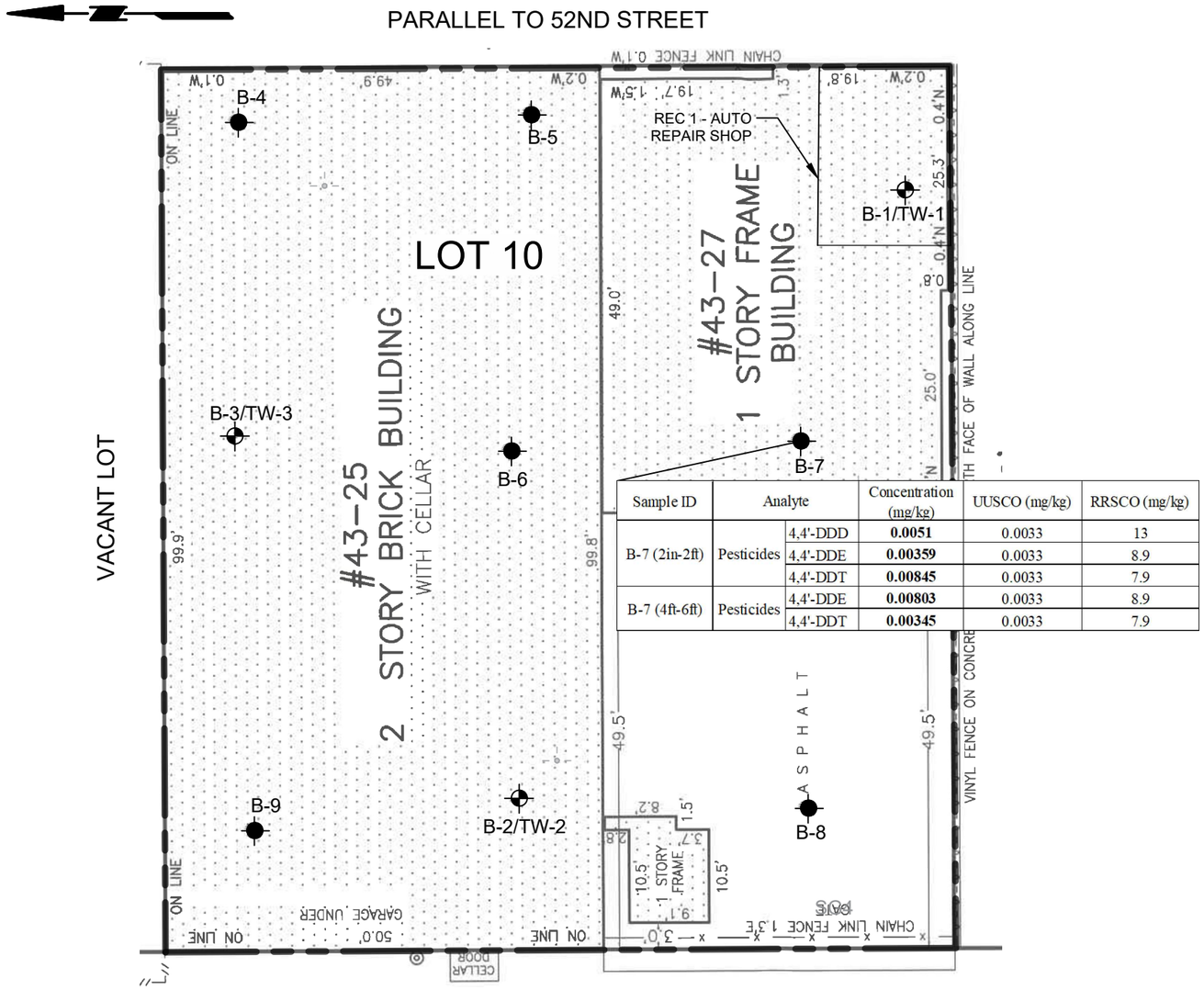
43-25 & 43-27 52ND STREET

WOODSIDE

QUEENS NEW YORK

JOB NO.: 22254	SCALE: As Shown	DATE: 01/08/2024	FIG. 6

P:\22\22254 (43-52nd Street)\Remedial Investigation\Report\DWG\ Fig 4 - Sample Location Map.dwg Nov 11, 2025 - 4:39pm mrenker



Sample ID	Analyte		Concentration (mg/kg)	UUSCO (mg/kg)	RRSCO (mg/kg)
B-7 (2in-2ft)	Pesticides	4,4'-DDD	**0.0051**	0.0033	13
		4,4'-DDE	**0.00359**	0.0033	8.9
		4,4'-DDT	**0.00845**	0.0033	7.9
B-7 (4ft-6ft)	Pesticides	4,4'-DDE	**0.00803**	0.0033	8.9
		4,4'-DDT	**0.00345**	0.0033	7.9

LEGEND:

- Site Boundary
- B-4 — Soil Boring Location
- B-1/TW-1 — Soil Boring and Temporary Well Location

UUSCO = New York State Department of Environmental Conservation Unrestricted Use Soil Cleanup Objective

RRSCO = New York State Department of Environmental Conservation Restricted Use Soil Cleanup Objective - Restricted Residential

0.056 - Analyte has exceeded UUSCO

NOTES:

1. BASE PLAN WAS DEVELOPED FROM THE SURVEY MAP BY A&B ENGINEERING AND LAND SURVEYING, P.CP. DATED ON JUNE 20, 2022.
2. THE APPROXIMATE REC BOUNDARY IS FROM THE 1982 - 1989 SANBORN MAP OF THE PHASE I ESA PREPARED BY JR ENVIRONMENTAL SERVICES, INC DATED FEBRUARY 21, 2022
3. THE PROPOSED SOIL BORING B-1 THROUGH B-3 WERE ADVANCED TO 70 FT - 85 FT BGS (BELOW GROUND SURFACE). REMAINING SOIL BORING FROM SB-4 TO SB-9 WERE ADVANCED TO 9.98 - 14.98 FT BGS

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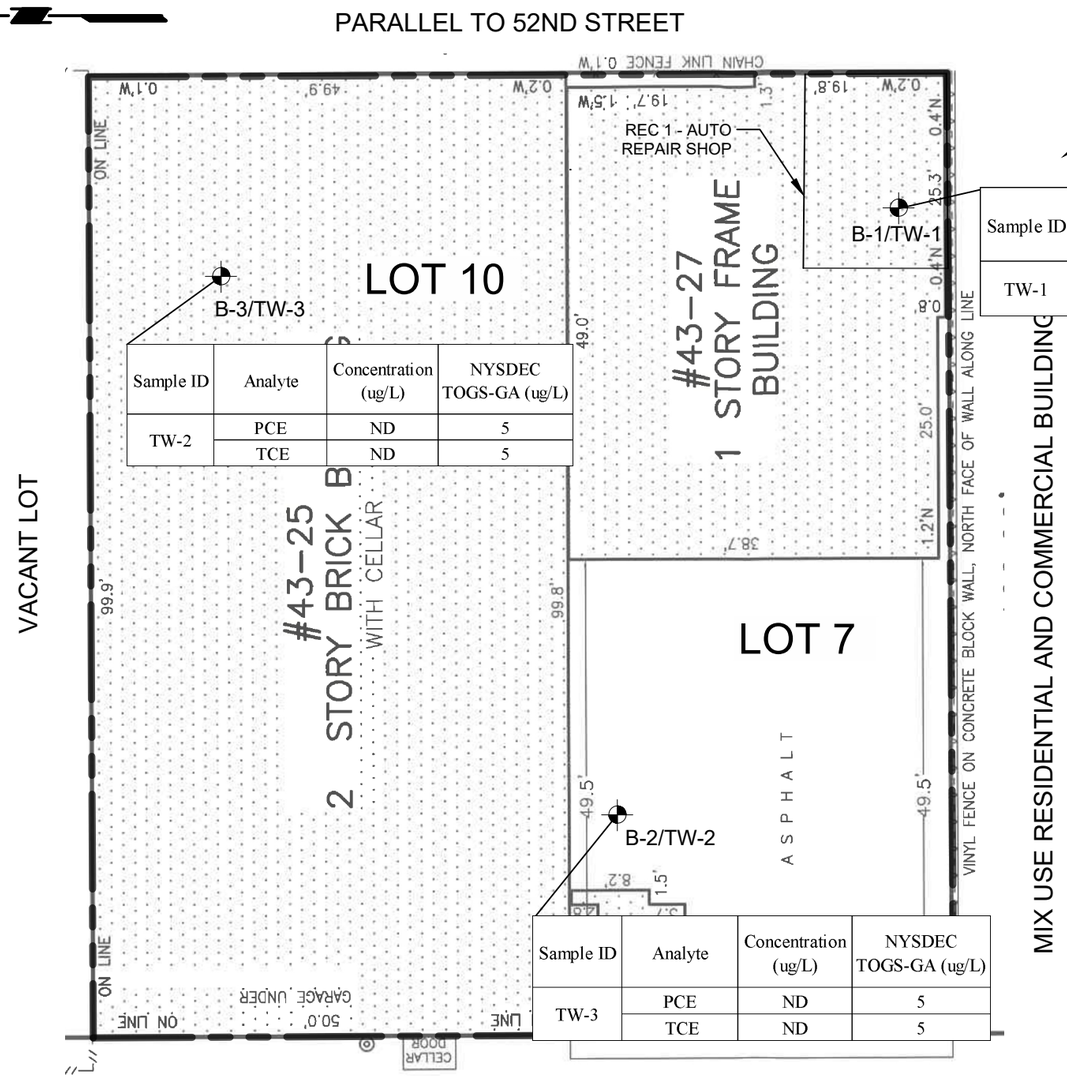
SOIL SAMPLE PESTICIDES EXCEEDANCE MAP

43-25 & 43-27 52ND STREET

WOODSIDE

QUEENS NEW YORK

JOB NO.: 22254	SCALE: As Shown	DATE: 08/08/2023	FIG. 7



Sample ID	Analyte	Concentration (ug/L)	NYSDEC TOGS-GA (ug/L)
TW-1	PCE	ND	5
	TCE	ND	5

Sample ID	Analyte	Concentration (ug/L)	NYSDEC TOGS-GA (ug/L)
TW-2	PCE	ND	5
	TCE	ND	5

Sample ID	Analyte	Concentration (ug/L)	NYSDEC TOGS-GA (ug/L)
TW-3	PCE	ND	5
	TCE	ND	5

LEGEND:

- Site Boundary
- B-1/TW-1 — Soil Boring and Temporary Well Sample Location

NYSDEC TOGS - GA = New York State Department of Environmental Conservation Technical and Operational Guidance Series class GA

ND indicates that the analyte was not detected in the sample.

TCE = Trichloroethylene

PCE = Tetrachloroethylene

NOTES:

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2. THE APPROXIMATE REC BOUNDARY IS FROM THE 1982 - 1989 SANBORN MAP OF THE PHASE I ESA PREPARED BY JR ENVIRONMENTAL SERVICES, INC DATED FEBRUARY 21, 2022
3. THE TEMPORARY WELLS WERE ADVANCED TO 10 FT BELOW GROUNDWATER LEVEL WHICH IS 75 FT TO 80 FT BGS

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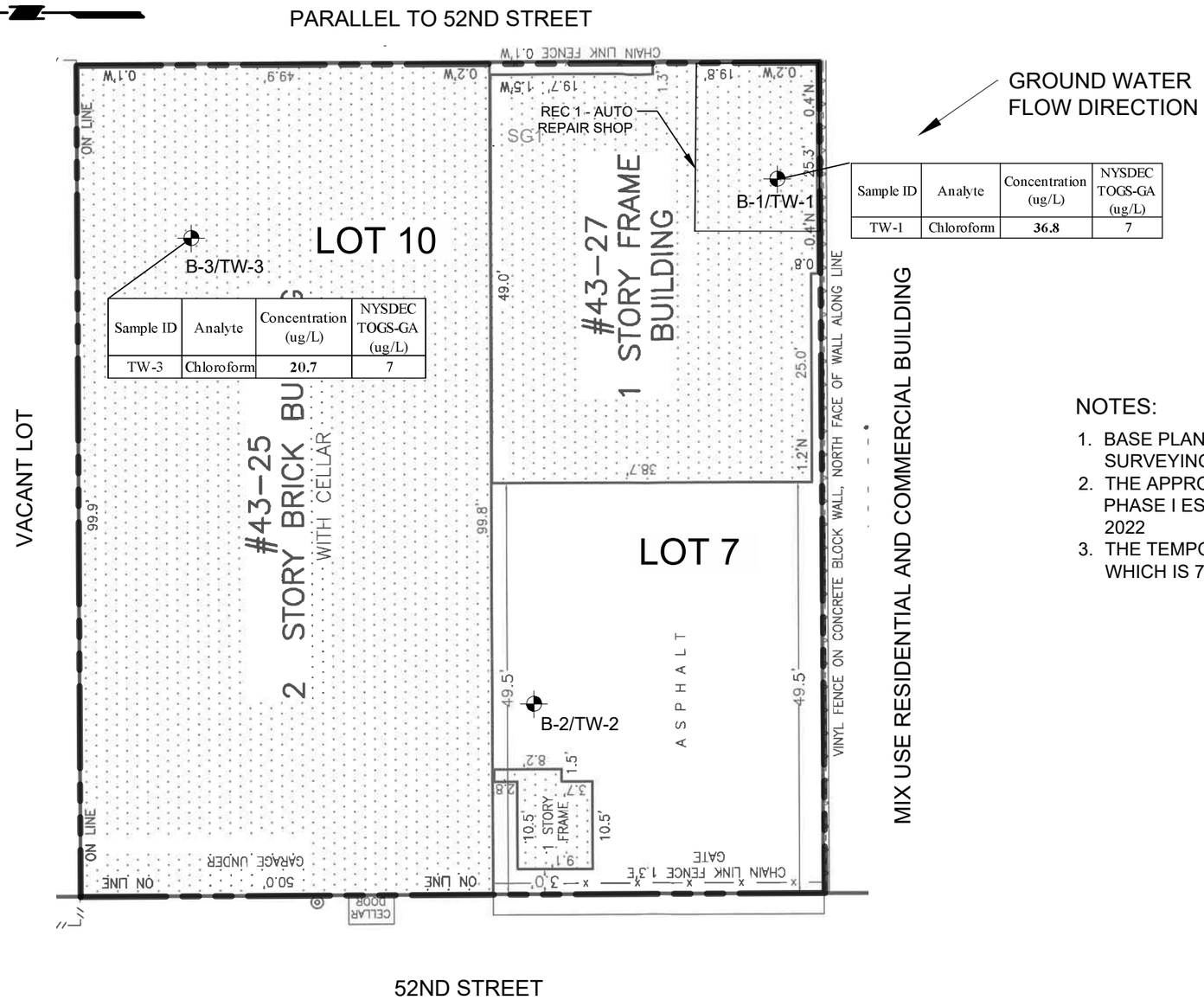
GW SAMPLE TCE PCE RESULTS EXCEEDANCE MAP

43-25 & 43-27 52ND STREET

WOODSIDE

QUEENS NEW YORK

JOB NO.: 22254	SCALE: As Shown	DATE: 09/05/2023	FIG. 8



Sample ID	Analyte	Concentration (ug/L)	NYSDEC TOGS-GA (ug/L)
TW-1	Chloroform	**36.8**	7

Sample ID	Analyte	Concentration (ug/L)	NYSDEC TOGS-GA (ug/L)
TW-3	Chloroform	**20.7**	7

LEGEND:

Site Boundary

B-1/TW-1

Soil Boring and Temporary Well Sample Location

NYSDEC TOGS - GA = New York State Department of Environmental Conservation Technical and Operational Guidance Series class GA

20.7 = Analyte has exceeded the criterion

NOTES:

1. BASE PLAN WAS DEVELOPED FROM THE SURVEY MAP BY A&B ENGINEERING AND LAND SURVEYING, P.CP. DATED ON JUNE 20, 2022.
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GW SAMPLE VOC RESULTS EXCEEDANCE MAP

43-25 & 43-27 52ND STREET

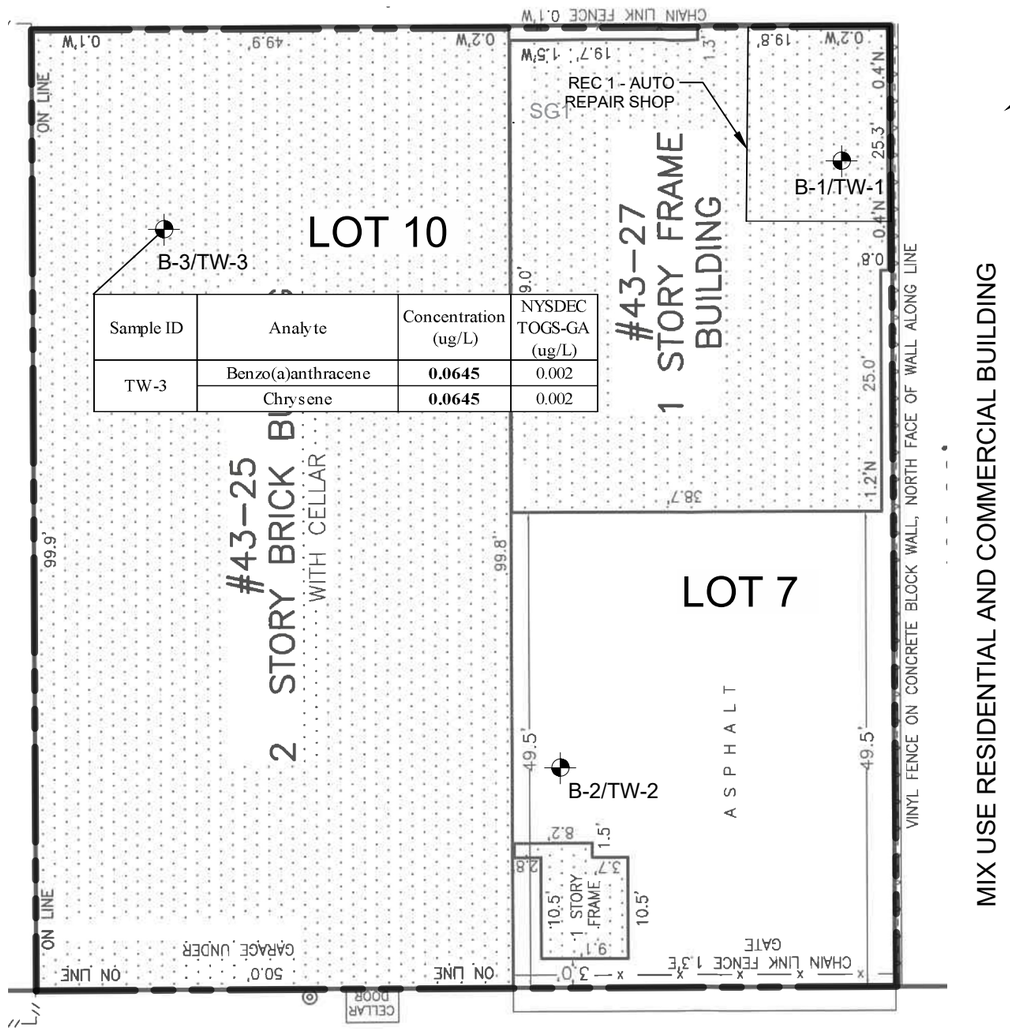
WOODSIDE

QUEENS NEW YORK

JOB NO.: 22254	SCALE: As Shown	DATE: 09/06/2023	FIG. 9

P:\22\22254 (43-52nd Street)\Remedial Investigation\Field\dwg\ Fig 4 - Soil Vapor and GW Exceedance Maps - Copy.dwg Nov 11, 2025 - 4:51pm mrenker

PARALLEL TO 52ND STREET



Sample ID	Analyte	Concentration (ug/L)	NYSDEC TOGS-GA (ug/L)
TW-3	Benzo(a)anthracene	**0.0645**	0.002
	Chrysene	**0.0645**	0.002

52ND STREET

GROUND WATER FLOW DIRECTION

LEGEND:

Site Boundary

B-1/TW-1
Soil Boring and Temporary Well Sample Location

NYSDEC TOGS - GA = New York State Department of Environmental Conservation Technical and Operational Guidance Series class GA

20.7 = Analyte has exceeded the criterion

NOTES:

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2. THE APPROXIMATE REC BOUNDARY IS FROM THE 1982 - 1989 SANBORN MAP OF THE PHASE I ESA PREPARED BY JR ENVIRONMENTAL SERVICES, INC DATED FEBRUARY 21, 2022
3. THE TEMPORARY WELLS WERE ADVANCED TO 10 FT BELOW GROUNDWATER LEVEL WHICH IS 75 FT TO 80 FT BGS

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GW SAMPLE SVOC RESULTS EXCEEDANCE MAP

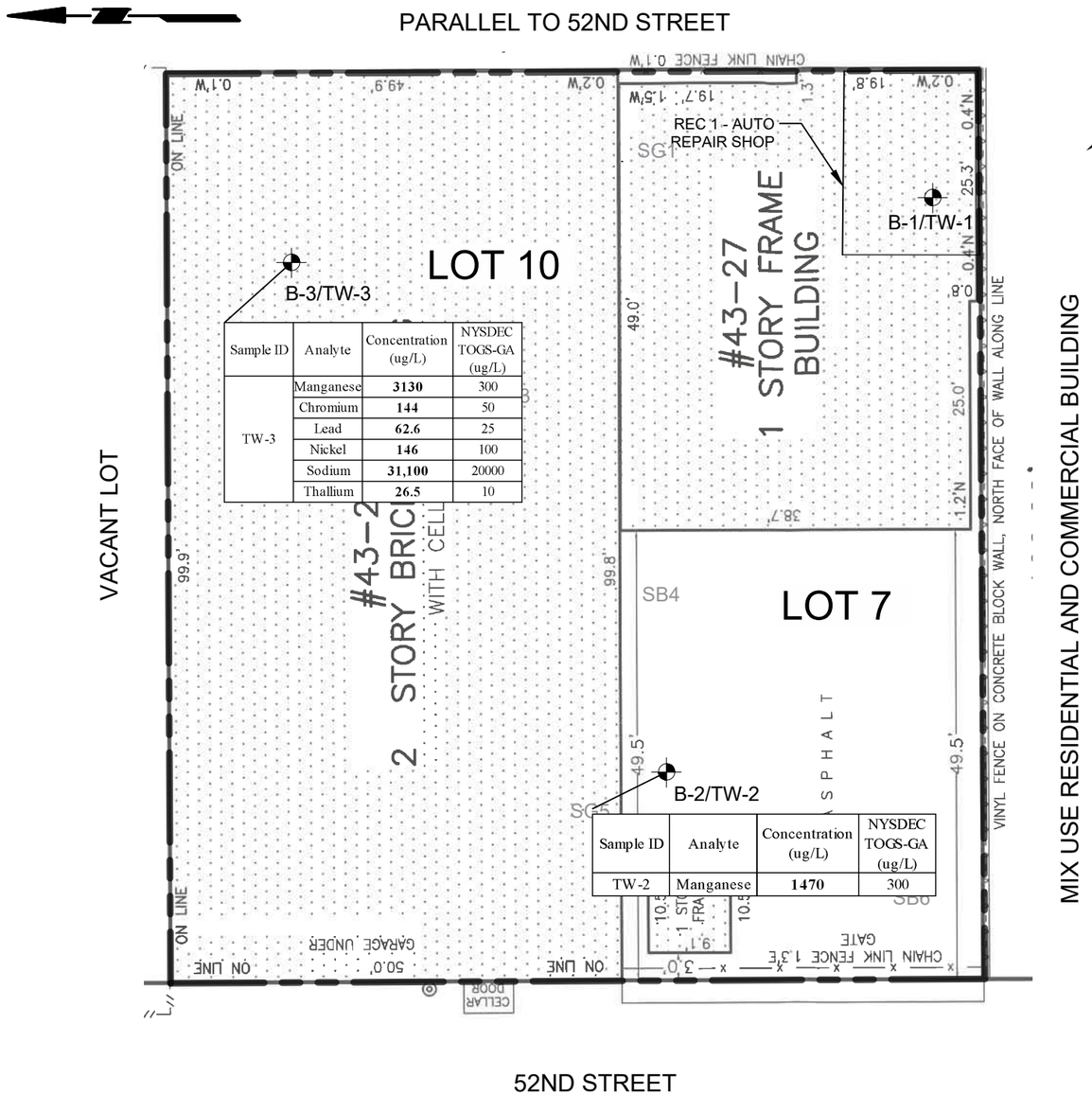
43-25 & 43-27 52ND STREET

WOODSIDE

QUEENS NEW YORK

JOB NO.: 22254	SCALE: As Shown	DATE: 09/06/2023	FIG. 10

P:\22\22254 (43-52nd Street)\Remedial Investigation\Field\dwg\ Fig 4 - Soil Vapor and GW Exceedance Maps - Copy.dwg Nov 11, 2025 - 4:53pm mrenker



Sample ID	Analyte	Concentration (ug/L)	NYSDEC TOGS-GA (ug/L)
TW-3	Manganese	**3130**	300
	Chromium	**144**	50
	Lead	**62.6**	25
	Nickel	**146**	100
	Sodium	**31,100**	20000
	Thallium	**26.5**	10

Sample ID	Analyte	Concentration (ug/L)	NYSDEC TOGS-GA (ug/L)
TW-2	Manganese	**1470**	300

LEGEND:

Site Boundary

B-1/TW-1

Soil Boring and Temporary Well Sample Location

NYSDEC TOGS - GA = New York State Department of Environmental Conservation Technical and Operational Guidance Series class GA

20.7 = Analyte has exceeded the criterion

NOTES:

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GW SAMPLE METAL RESULTS EXCEEDANCE MAP

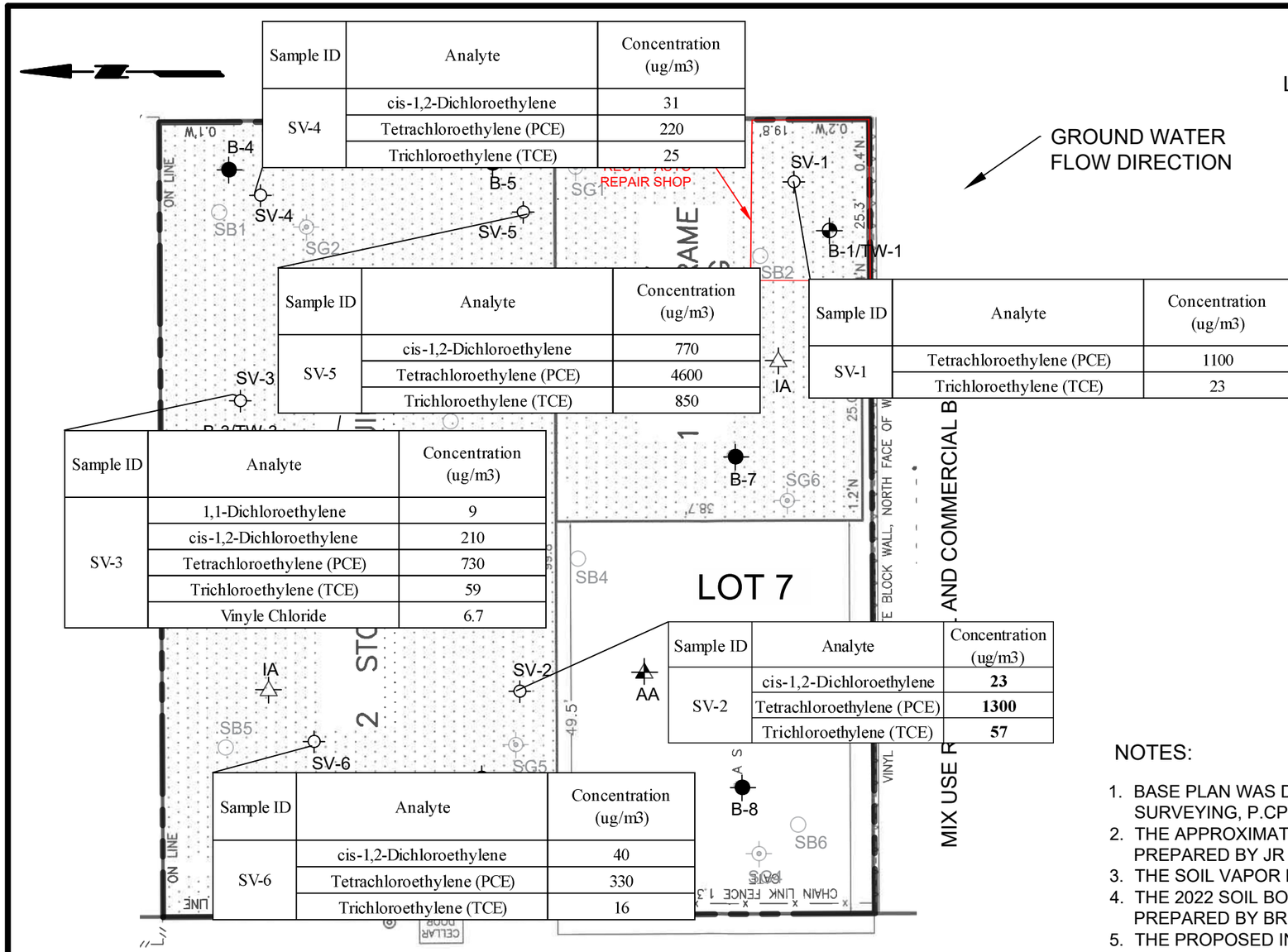
43-25 & 43-27 52ND STREET

WOODSIDE

QUEENS NEW YORK

JOB NO.: 22254	SCALE: As Shown	DATE: 09/06/2023	FIG. 11

P:\22\22254 (43-52nd Street)\Remedial Investigation\Field\dwg\ Fig 4 - Soil Vapor and GW Exceedance Maps - Copy.dwg Nov 11, 2025 - 4:54pm mrenker



Sample ID	Analyte	Concentration (ug/m3)
SV-4	cis-1,2-Dichloroethylene	31
	Tetrachloroethylene (PCE)	220
	Trichloroethylene (TCE)	25

Sample ID	Analyte	Concentration (ug/m3)
SV-5	cis-1,2-Dichloroethylene	770
	Tetrachloroethylene (PCE)	4600
	Trichloroethylene (TCE)	850

Sample ID	Analyte	Concentration (ug/m3)
SV-1	Tetrachloroethylene (PCE)	1100
	Trichloroethylene (TCE)	23

Sample ID	Analyte	Concentration (ug/m3)
SV-3	1,1-Dichloroethylene	9
	cis-1,2-Dichloroethylene	210
	Tetrachloroethylene (PCE)	730
	Trichloroethylene (TCE)	59
	Vinyle Chloride	6.7

Sample ID	Analyte	Concentration (ug/m3)
SV-2	cis-1,2-Dichloroethylene	**23**
	Tetrachloroethylene (PCE)	**1300**
	Trichloroethylene (TCE)	**57**

Sample ID	Analyte	Concentration (ug/m3)
SV-6	cis-1,2-Dichloroethylene	40
	Tetrachloroethylene (PCE)	330
	Trichloroethylene (TCE)	16

LEGEND:

- Site Boundary
- B-4 — Proposed Soil Boring Location
- B-1/TW-1 — Proposed Soil Boring and Temporary Well Location
- SV-1 — Proposed Soil Vapor Point Location
- IA — Proposed Indoor Air Sample Location
- AA — Proposed Ambient Air Sample Location
- SB1 — 2022 Soil Boring Location (Approximate)
- SG1 — 2022 Soil Vapor Point Location (Approximate)

NOTES:

1. BASE PLAN WAS DEVELOPED FROM THE SURVEY MAP BY A&B ENGINEERING AND LAND SURVEYING, P.CP. DATED ON JUNE 20, 2022.
2. THE APPROXIMATE REC BOUNDARY IS FROM THE 1982 - 1989 SANBORN MAP OF THE PHASE I ESA PREPARED BY JR ENVIRONMENTAL SERVICES, INC DATED FEBRUARY 21, 2022
3. THE SOIL VAPOR POINT LOCATION WERE ADVANCED TO 12 FT BGS
4. THE 2022 SOIL BORING AND SOIL VAPOR POINT LOCATION IS FROM THE FIGURE 5 OF THE PHASE II PREPARED BY BRUSSEE ENVIRONMNETAL CORP. DATED NOVEMBER 2022
5. THE PROPOSED INDOOR AND AMBIENT AIR SAMPLE'S WILL BE TAKEN 5 FT ABOVE GROUND SURFACE

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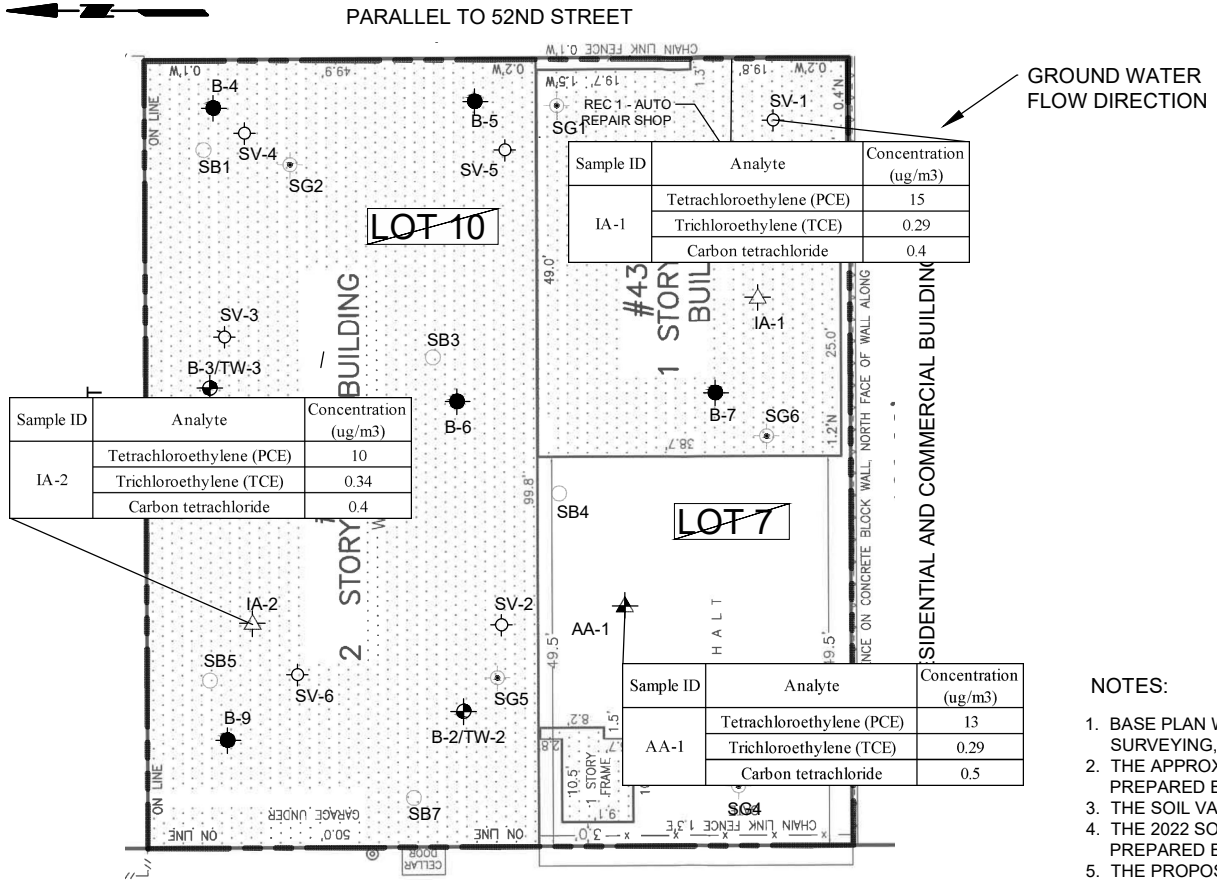
SOIL VAPOR SAMPLES RESULTS MAP

43-25 & 43-27 52ND STREET

WOODSIDE

QUEENS NEW YORK

JOB NO.: 22254	SCALE: As Shown	DATE: 01/08/2024	FIG. 12



Sample ID	Analyte	Concentration (ug/m3)
IA-1	Tetrachloroethylene (PCE)	15
	Trichloroethylene (TCE)	0.29
	Carbon tetrachloride	0.4

Sample ID	Analyte	Concentration (ug/m3)
IA-2	Tetrachloroethylene (PCE)	10
	Trichloroethylene (TCE)	0.34
	Carbon tetrachloride	0.4

Sample ID	Analyte	Concentration (ug/m3)
AA-1	Tetrachloroethylene (PCE)	13
	Trichloroethylene (TCE)	0.29
	Carbon tetrachloride	0.5

LEGEND:

- Site Boundary
- B-4 — Soil Boring Location
- B-1/TW-1 — Soil Boring and Temporary Well Location
- SV-1 — Soil Vapor Point Location
- IA — Indoor Air Sample Location
- AA — Ambient Air Sample Location
- SB1 — 2022 Soil Boring Location (Approximate)
- SG1 — 2022 Soil Vapor Point Location (Approximate)

NOTES:

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3. THE SOIL VAPOR POINT LOCATION WERE ADVANCED TO 12 FT BGS
4. THE 2022 SOIL BORING AND SOIL VAPOR POINT LOCATION IS FROM THE FIGURE 5 OF THE PHASE II PREPARED BY BRUSSEE ENVIRONMNETAL CORP. DATED NOVEMBER 2022
5. THE PROPOSED INDOOR AND AMBIENT AIR SAMPLE'S WILL BE TAKEN 5 FT ABOVE GROUND SURFACE

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INDOOR AND OUTDOOR AIR SAMPLE RESULTS MAP

43-25 & 43-27 52ND STREET
WOODSIDE
QUEENS NEW YORK

JOB NO.: 22254	SCALE: As Shown	DATE: 02/16/2024	FIG. 13

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Table 1
Remedial Investigation Sampling Program Summary
43-25 & 43-27 52nd Street
Queens, NY 11377
Project No. 22254

Sample ID	Location	Depth (ft bgs)	Matrix	Sampling Method	Testing Parameters	Date Collected
B-1 (0´-2")	B-1	0-2	Soil	Geoprobe and Grab	TCL VOCs, TCL SVOCs, PCBs and Pesticides, TAL Metals +Cyanide, Mercury and Hexavalent Chromium, PFAS	7/18/2023
B-1 (2"-2')	B-1	0-2	Soil	Geoprobe and Grab	TCL VOCs, TCL SVOCs, PCBs and Pesticides, TAL Metals +Cyanide, Mercury and Hexavalent Chromium, PFAS	7/18/2023
B-1 (4'-6')	B-1	4-6	Soil	Geoprobe and Grab	TCL VOCs, TCL SVOCs, PCBs and Pesticides, TAL Metals +Cyanide, Mercury and Hexavalent Chromium, PFAS	7/18/2023
B-1 (10'-12')	B-1	10-12	Soil	Geoprobe and Grab	TCL VOCs, TCL SVOCs, PCBs and Pesticides, TAL Metals +Cyanide, Mercury and Hexavalent Chromium, PFAS	7/18/2023
B-1 (60'-62')	B-1	60-62	Soil	Geoprobe and Grab	TCL VOCs, TCL SVOCs, PCBs and Pesticides, TAL Metals +Cyanide, Mercury and Hexavalent Chromium, PFAS	8/1/2023
B-2 (0´-2")	B-2	0-2	Soil	Geoprobe and Grab	TCL VOCs, TCL SVOCs, PCBs and Pesticides, TAL Metals +Cyanide, Mercury and Hexavalent Chromium, PFAS	7/19/2023
B-2 (2"-2')	B-2	0-2	Soil	Geoprobe and Grab	TCL VOCs, TCL SVOCs, PCBs and Pesticides, TAL Metals +Cyanide, Mercury and Hexavalent Chromium, PFAS	7/19/2023
B-2 (4'-6')	B-2	4-6	Soil	Geoprobe and Grab	TCL VOCs, TCL SVOCs, PCBs and Pesticides, TAL Metals +Cyanide, Mercury and Hexavalent Chromium, PFAS	7/19/2023
B-2 (10'-12')	B-2	10-12	Soil	Geoprobe and Grab	TCL VOCs, TCL SVOCs, PCBs and Pesticides, TAL Metals +Cyanide, Mercury and Hexavalent Chromium, PFAS	7/19/2023
B-2 (60'-62')	B-2	60-62	Soil	Geoprobe and Grab	TCL VOCs, TCL SVOCs, PCBs and Pesticides, TAL Metals +Cyanide, Mercury and Hexavalent Chromium, PFAS	7/27/2023
B-3 (0´-2")	B-3	0-2	Soil	Geoprobe and Grab	TCL VOCs, TCL SVOCs, PCBs and Pesticides, TAL Metals +Cyanide, Mercury and Hexavalent Chromium, PFAS	7/21/2023
B-3 (2"-2')	B-3	0-2	Soil	Geoprobe and Grab	TCL VOCs, TCL SVOCs, PCBs and Pesticides, TAL Metals +Cyanide, Mercury and Hexavalent Chromium, PFAS	7/21/2023
B-3 (4'-6')	B-3	4-6	Soil	Geoprobe and Grab	TCL VOCs, TCL SVOCs, PCBs and Pesticides, TAL Metals +Cyanide, Mercury and Hexavalent Chromium, PFAS	7/21/2023
B-3 (10'-12')	B-3	10-12	Soil	Geoprobe and Grab	TCL VOCs, TCL SVOCs, PCBs and Pesticides, TAL Metals +Cyanide, Mercury and Hexavalent Chromium, PFAS	7/21/2023
B-3 (60'-62')	B-3	60-62	Soil	Geoprobe and Grab	TCL VOCs, TCL SVOCs, PCBs and Pesticides, TAL Metals +Cyanide, Mercury and Hexavalent Chromium, PFAS	8/8/2023
B-4 (0´-2")	B-4	0-2	Soil	Geoprobe and Grab	TCL VOCs, TCL SVOCs, PCBs and Pesticides, TAL Metals +Cyanide, Mercury and Hexavalent Chromium, PFAS	7/19/2023
B-4 (2"-2')	B-4	0-2	Soil	Geoprobe and Grab	TCL VOCs, TCL SVOCs, PCBs and Pesticides, TAL Metals +Cyanide, Mercury and Hexavalent Chromium, PFAS	7/19/2023
B-4 (4'-6')	B-4	4-6	Soil	Geoprobe and Grab	TCL VOCs, TCL SVOCs, PCBs and Pesticides, TAL Metals +Cyanide, Mercury and Hexavalent Chromium, PFAS	7/19/2023
B-4 (10'-12')	B-4	10-12	Soil	Geoprobe and Grab	TCL VOCs, TCL SVOCs, PCBs and Pesticides, TAL Metals +Cyanide, Mercury and Hexavalent Chromium, PFAS	7/19/2023
B-5 (0´-2")	B-5	0-2	Soil	Geoprobe and Grab	TCL VOCs, TCL SVOCs, PCBs and Pesticides, TAL Metals +Cyanide, Mercury and Hexavalent Chromium, PFAS	7/19/2023
B-5 (2"-2')	B-5	0-2	Soil	Geoprobe and Grab	TCL VOCs, TCL SVOCs, PCBs and Pesticides, TAL Metals +Cyanide, Mercury and Hexavalent Chromium, PFAS	7/19/2023
B-5 (4'-6')	B-5	4-6	Soil	Geoprobe and Grab	TCL VOCs, TCL SVOCs, PCBs and Pesticides, TAL Metals +Cyanide, Mercury and Hexavalent Chromium, PFAS	7/19/2023
B-5 (10'-12')	B-5	10-12	Soil	Geoprobe and Grab	TCL VOCs, TCL SVOCs, PCBs and Pesticides, TAL Metals +Cyanide, Mercury and Hexavalent Chromium, PFAS	7/19/2023
B-6 (0´-2")	B-6	0-2	Soil	Geoprobe and Grab	TCL VOCs, TCL SVOCs, PCBs and Pesticides, TAL Metals +Cyanide, Mercury and Hexavalent Chromium, PFAS	7/20/2023
B-6 (2"-2')	B-6	0-2	Soil	Geoprobe and Grab	TCL VOCs, TCL SVOCs, PCBs and Pesticides, TAL Metals +Cyanide, Mercury and Hexavalent Chromium, PFAS	7/20/2023

Table 1
Remedial Investigation Sampling Program Summary
43-25 & 43-27 52nd Street
Queens, NY 11377
Project No. 22254

Sample ID	Location	Depth (ft bgs)	Matrix	Sampling Method	Testing Parameters	Date Collected
B-6 (4'-6')	B-6	4-6	Soil	Geoprobe and Grab	TCL VOCs, TCL SVOCs, PCBs and Pesticides, TAL Metals +Cyanide, Mercury and Hexavalent Chromium, PFAS	7/20/2023
B-6 (10'-12')	B-6	10-12	Soil	Geoprobe and Grab	TCL VOCs, TCL SVOCs, PCBs and Pesticides, TAL Metals +Cyanide, Mercury and Hexavalent Chromium, PFAS	7/20/2023
B-7 (0´-2")	B-7	0-2	Soil	Geoprobe and Grab	TCL VOCs, TCL SVOCs, PCBs and Pesticides, TAL Metals +Cyanide, Mercury and Hexavalent Chromium, PFAS	7/24/2023
B-7 (2"-2')	B-7	0-2	Soil	Geoprobe and Grab	TCL VOCs, TCL SVOCs, PCBs and Pesticides, TAL Metals +Cyanide, Mercury and Hexavalent Chromium, PFAS	7/24/2023
B-7 (4'-6')	B-7	4-6	Soil	Geoprobe and Grab	TCL VOCs, TCL SVOCs, PCBs and Pesticides, TAL Metals +Cyanide, Mercury and Hexavalent Chromium, PFAS	7/24/2023
B-7 (10'-12')	B-7	10-12	Soil	Geoprobe and Grab	TCL VOCs, TCL SVOCs, PCBs and Pesticides, TAL Metals +Cyanide, Mercury and Hexavalent Chromium, PFAS	7/24/2023
B-57 (10'-12')	B-7	Soil duplicate for B-7 (10'-12')	Soil	Geoprobe and Grab	TCL VOCs, TCL SVOCs, PCBs and Pesticides, TAL Metals +Cyanide, Mercury and Hexavalent Chromium, PFAS	7/24/2023
B-8 (0´-2")	B-8	0-2	Soil	Geoprobe and Grab	TCL VOCs, TCL SVOCs, PCBs and Pesticides, TAL Metals +Cyanide, Mercury and Hexavalent Chromium, PFAS	7/24/2023
B-8 (2"-2')	B-8	0-2	Soil	Geoprobe and Grab	TCL VOCs, TCL SVOCs, PCBs and Pesticides, TAL Metals +Cyanide, Mercury and Hexavalent Chromium, PFAS	7/24/2023
B-58 (2"-2')	B-8	Soil duplicate for B-8 (2"-12')	Soil	Geoprobe and Grab	TCL VOCs, TCL SVOCs, PCBs and Pesticides, TAL Metals +Cyanide, Mercury and Hexavalent Chromium, PFAS	7/24/2023
B-8 (4'-6')	B-8	4-6	Soil	Geoprobe and Grab	TCL VOCs, TCL SVOCs, PCBs and Pesticides, TAL Metals +Cyanide, Mercury and Hexavalent Chromium, PFAS	7/24/2023
B-8 (10'-12')	B-8	10-12	Soil	Geoprobe and Grab	TCL VOCs, TCL SVOCs, PCBs and Pesticides, TAL Metals +Cyanide, Mercury and Hexavalent Chromium, PFAS	7/24/2023
B-9 (0´-2")	B-9	0-2	Soil	Geoprobe and Grab	TCL VOCs, TCL SVOCs, PCBs and Pesticides, TAL Metals +Cyanide, Mercury and Hexavalent Chromium, PFAS	7/20/2023
B-9 (2"-2')	B-9	0-2	Soil	Well Purge/Geopump	TCL VOCs, TCL SVOCs, PCBs and Pesticides, TAL Metals +Cyanide, Mercury and Hexavalent Chromium, PFAS	7/20/2023
B-9 (4'-6')	B-9	4-6	Soil	Well Purge/Geopump	TCL VOCs, TCL SVOCs, PCBs and Pesticides, TAL Metals +Cyanide, Mercury and Hexavalent Chromium, PFAS	7/20/2023
B-9 (10'-12')	B-9	10-12	Soil	Well Purge/Geopump	TCL VOCs, TCL SVOCs, PCBs and Pesticides, TAL Metals +Cyanide, Mercury and Hexavalent Chromium, PFAS	7/20/2023
TW-1	TW-1	60-75	Groundwater	Well Purge/Geopump	TCL VOCs and PFAS	8/9/2023
TW-2	TW-2	60-75	Groundwater	Well Purge/Geopump	TCL VOCs, TCL SVOCs, PCBs and Pesticides, TAL Metals + Mercury and Hexavalent Chromium, PFAS	8/8/2023
TW-3	TW-3	60-75	Groundwater	Well Purge/Geopump	TCL VOCs, TCL SVOCs, PCBs and Pesticides, TAL Metals + Mercury and Hexavalent Chromium, PFAS	8/10/2023
TW-53	TW-53	60-75	Groundwater	Well Purge/Geopump	TCL VOCs, TCL SVOCs, PCBs and Pesticides, TAL Metals + Mercury and Hexavalent Chromium, PFAS	8/10/2023
AA-1	MW-01	5 (ABG)	Ambient Air - Outdoor	Cannister and Tubing System on a Tripod	VOCs	7/19/2023
IA-1	MW-02	6 (ABG)	Ambient Air - Indoor	Cannister and Tubing System on a Tripod	VOCs	7/19/2023
IA-2	MW-02	7 (ABG)	Ambient Air - Indoor	Cannister and Tubing System on a Tripod	VOCs	7/19/2023
SV-1	SV-1	10-12	Air	Cannister and Tubing System	VOCs	7/20/2023
SV-2	SV-2	10-12	Air	Cannister and Tubing System	VOCs	7/21/2023

Table 1
Remedial Investigation Sampling Program Summary
43-25 & 43-27 52nd Street
Queens, NY 11377
Project No. 22254

Sample ID	Location	Depth (ft bgs)	Matrix	Sampling Method	Testing Parameters	Date Collected
SV-52	SV-52	10-12	Air Duplicate for SV-2	Cannister and Tubing System	VOCs	7/21/2023
SV-3	SV-3	10-12	Air	Cannister and Tubing System	VOCs	7/21/2023
SV-4	SV-4	10-12	Air	Cannister and Tubing System	VOCs	7/20/2023
SV-5	SV-5	10-12	Air	Cannister and Tubing System	VOCs	7/20/2023
SV-6	SV-6	10-12	Air	Cannister and Tubing System	VOCs	7/21/2023

Key:
TCL: Target Compound List
TAL: Target Analyte List
VOCs: Volatile Organic Compounds
SVOCs: Semivolatile Organic Compounds
PCBs: Polychlorinated biphenyls
NA: Not Available
ft bgs: Feet Below Ground Surface
ABG:Above Ground

Table 2
Remedial Investigation Soil Sample Analytical Results Summary
43-25 & 43-27 52nd Street
Queens, NY 11377
Project No. 22254

Sample ID Sampling Date Client Matrix Compound	CAS Number	NYSDEC Part 375 Unrestricted Use Soil Cleanup Objectives	NYSDEC Part 375 Restricted Use Soil Cleanup Objectives-Restricted Residential	B-1 (0-2in) 7/18/2023 Soil mg/Kg	B-1 (2in-2ft) 7/18/2023 Soil mg/Kg	B-1 (4ft-6ft) 7/18/2023 Soil mg/Kg	B-1 (10ft-12ft) 7/18/2023 Soil mg/Kg	B-1 (60ft-62ft) 8/1/2023 Soil mg/Kg	B-2 (0-2in) 7/19/2023 Soil mg/Kg	B-2 (2in-2ft) 7/19/2023 Soil mg/Kg	B-2 (4ft-6ft) 7/19/2023 Soil mg/Kg	B-2 (10ft-12ft) 7/19/2023 Soil mg/Kg	B-2 (60ft-62ft) 7/27/2023 Soil mg/Kg	B-3 (0-2in) 7/21/2023 Soil mg/Kg	B-3 (2in-2ft) 7/21/2023 Soil mg/Kg	B-3 (4ft-6ft) 7/21/2023 Soil mg/Kg	B-3 (10ft-12ft) 7/21/2023 Soil mg/Kg	B-3 (60ft-62ft) 8/8/2023 Soil mg/Kg	B-4 (0-2in) 7/19/2023 Soil mg/Kg	B-4 (2in-2ft) 7/19/2023 Soil mg/Kg	B-4 (4ft-6ft) 7/19/2023 Soil mg/Kg	B-4 (10ft-12ft) 7/19/2023 Soil mg/Kg	B-5 (0-2in) 7/19/2023 Soil mg/Kg	B-5 (2in-2ft) 7/19/2023 Soil mg/Kg	B-5 (4ft-6ft) 7/19/2023 Soil mg/Kg	B-5 (10ft-12ft) 7/19/2023 Soil mg/Kg	B-6 (0-2in) 7/20/2023 Soil mg/Kg
VOA, 8260 MASTER																										
1,1,1,2-Tetrachloroethane	630-20-6	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	71-55-6	0.68	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	79-34-5	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113	76-13-1	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	79-00-5	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	75-34-3	0.27	26	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethylene	75-35-4	0.33	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3-Trichlorobenzene	87-61-6	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3-Trichloropropane	96-18-4	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	120-82-1	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	95-63-6	3.6	52	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dibromo-3-chloropropane	96-12-8	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dibromoethane	106-93-4	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	95-50-1	1.1	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	107-06-2	0.02	3.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	78-87-5	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3,5-Trimethylbenzene	108-67-8	8.4	52	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	541-73-1	2.4	49	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	106-46-7	1.8	13	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dioxane	123-91-1	0.1	13	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone	78-93-3	0.12	100	ND	ND	ND	ND	0.002	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Hexanone	591-78-6	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-pentanone	108-10-1	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acetone	67-64-1	0.05	100	0.058	ND	ND	ND	0.07	0.04	0.0077	ND	ND	ND	0.015	ND	ND	ND	0.1	0.22	0.056	ND	0.12	0.091	ND	ND	ND
Acrolein	107-02-8	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acrylonitrile	107-13-1	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	71-43-2	0.06	4.8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromochloromethane	74-97-5	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	75-27-4	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	75-25-2	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane	74-83-9	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon disulfide	75-15-0	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon tetrachloride	56-23-5	0.76	2.4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	108-90-7	1.1	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	75-00-3	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	67-66-3	0.37	49	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloromethane	74-87-3	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,2-Dichloroethylene	156-59-2	0.25	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,3-Dichloropropylene	10061-01-5	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cyclohexane	110-82-7	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	124-48-1	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibromomethane	74-95-3	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dichlorodifluoromethane	75-71-8	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethyl Benzene	100-41-4	1	41	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorobutadiene	87-68-3	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Isopropylbenzene	98-82-8	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methyl acetate	79-20-9	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0042	ND	ND	ND	ND	ND
Methyl tert-butyl ether (MTBE)	1634-04-4	0.93	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylcyclohexane	108-87-2	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	75-09-2	0.05	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.03	0.0062	ND	ND	ND	ND	ND	ND	ND
n-Butylbenzene	104-51-8	12	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
n-Propylbenzene	103-65-1	3.9	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
o-Xylene	95-47-6	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
p- & m- Xylenes	179601-23-1	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
p-Isopropyltoluene	99-87-6	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
sec-Butylbenzene	135-98-8	11	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Styrene	100-42-5	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
tert-Butyl alcohol (TBA)	75-65-0	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
tert-Butylbenzene	98-06-6	5.9	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethylene	127-18-4	1.3	19	0.01	0.0034J	ND	ND	ND	ND	ND	ND	ND	ND	0.014	0.0067	0.0049	0.006	ND	ND	0.23	0.0076	3.7	0.058	0.12	0.3	0.19	0.011
Toluene	108-88-3	0.7	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethylene	156-60-5	0.19	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,3-Dichloropropylene	10061-02-6	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethylene	79-01-6	0.47	21	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0053	ND	ND	0.005	ND	ND
Trichlorofluoromethane	75-69-4	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl Chloride	75-01-4	0.02	0.9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Xylenes, Total	1330-20-7	0.26	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Semi-Volatiles, 1,4-Dioxane 8270 SIM-Soil																										
1,4-Dioxane	123-91-1	0.1	9.8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SVOA, 8270 MASTER																										
1,1-Biphenyl	92-52-4	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4,5-Tetrachlorobenzene	95-94-3	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Diphenylhydrazine (as Azobenzene)	122-66-7	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,3,4,6-Tetrachlorophenol	58-90-2	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4,5-Trichlorophenol	95-95-4	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4,6-Trichlorophenol	88-06-2	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4-Dichlorophenol	120-83-2	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4-Dimethylphenol	105-67-9	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4-Dinitrophenol	51-28-5	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4-Dinitrotoluene	121-14-2	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,6-Dinitrotoluene	606-20-2	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Chloronaphthalene	91-58-7	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Chlorophenol	95-57-8	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Methylnaphthalene	91-57-6	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Methylphenol	95-48-7	0.33	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Nitroaniline	88-74-4	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Nitrophenol	88-75-5	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3- & 4-Methylphenols	65794-96-9	0.33	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3,3-Dichlorobenzidine	91-94-1	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3-Nitroaniline	99-09-2	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4,6-Dinitro-2-methylphenol	534-52-1	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Bromophenyl phenyl ether	101-55-3	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Chloro-3-methylphenol	59-50-7	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Chloroaniline	106-47-8	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Chlorophenyl phenyl ether	7005-72-3	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Nitroaniline	100-01-6	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Nitrophenol	100-02-7	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acenaphthene	83-32-9	20	100	0.12	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acenaphthylene	208-96-8	100	100	0.071	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acetophenone	98-86-2	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aniline	62-53-3	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Anthracene	120-12-7	100	100	1.11	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0551	ND	ND	ND	ND	ND	0.0634	ND	ND
Atrazine	1912-24-9	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzaldehyde	100-52-7	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzidine	92-87-5	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(a)anthracene	56-55-3	1	1	5.35	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.186	ND	ND	0.0836	ND	ND	0.184	0.0698	ND
Benzo(a)pyrene	50-32-8	1	1	3.56	ND	0.0455JD	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.168	ND	ND	0.0707	ND	ND	0.147	0.0534	ND
Benzo(b)fluoranthene	205-99-2	1	1	4.24	ND	0.054JD	0.0445JD	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.146	ND	ND	0.0677	ND	ND	0.13	0.0705	ND
Benzo(g,h,i)perylene	191-24-2	100	100	2.17	ND	0.0789JD	0.0621JD	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.102	ND	ND	ND	ND	ND	0.0732	ND	ND
Benzo(k)fluoranthene	207-08-9	0.8	3.9	2.87	ND	0.0519JD	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.124	ND	ND	0.0608	ND	ND	0.121	ND	ND
Benzoic acid	65-85-0	~	~	ND	ND	ND	ND	ND	0.0612	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzyl alcohol	100-51-6	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Table 2
Remedial Investigation Soil Sample Analytical Results Summary
43-25 & 43-27 52nd Street
Queens, NY 11377
Project No. 22254

Sample ID Sampling Date Client Matrix Compound	CAS Number	NYSDEC Part 375 Unrestricted Use Soil Cleanup Objectives	NYSDEC Part 375 Restricted Use Soil Cleanup Objectives-Restricted Residential	B-1 (0-2in) 7/18/2023 Soil mg/Kg	B-1 (2in-2ft) 7/18/2023 Soil mg/Kg	B-1 (4ft-6ft) 7/18/2023 Soil mg/Kg	B-1 (10ft-12ft) 7/18/2023 Soil mg/Kg	B-1 (60ft-62ft) 8/1/2023 Soil mg/Kg	B-2 (0-2in) 7/19/2023 Soil mg/Kg	B-2 (2in-2ft) 7/19/2023 Soil mg/Kg	B-2 (4ft-6ft) 7/19/2023 Soil mg/Kg	B-2 (10ft-12ft) 7/19/2023 Soil mg/Kg	B-2 (60ft-62ft) 7/27/2023 Soil mg/Kg	B-3 (0-2in) 7/21/2023 Soil mg/Kg	B-3 (2in-2ft) 7/21/2023 Soil mg/Kg	B-3 (4ft-6ft) 7/21/2023 Soil mg/Kg	B-3 (10ft-12ft) 7/21/2023 Soil mg/Kg	B-3 (60ft-62ft) 8/8/2023 Soil mg/Kg	B-4 (0-2in) 7/19/2023 Soil mg/Kg	B-4 (2in-2ft) 7/19/2023 Soil mg/Kg	B-4 (4ft-6ft) 7/19/2023 Soil mg/Kg	B-4 (10ft-12ft) 7/19/2023 Soil mg/Kg	B-5 (0-2in) 7/19/2023 Soil mg/Kg	B-5 (2in-2ft) 7/19/2023 Soil mg/Kg	B-5 (4ft-6ft) 7/19/2023 Soil mg/Kg	B-5 (10ft-12ft) 7/19/2023 Soil mg/Kg	B-6 (0-2in) 7/20/2023 Soil mg/Kg
Benzyl butyl phthalate	85-68-7	~	~	2.44	ND	ND	ND	ND	0.0845	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.606	ND
Bis(2-chloroethoxy)methane	111-91-1	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bis(2-chloroethyl)ether	111-44-4	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bis(2-chloroisopropyl)ether	108-60-1	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bis(2-ethylhexyl)phthalate	117-81-7	~	~	0.398	ND	ND	ND	ND	0.0546	ND	ND	ND	ND	ND	ND	ND	ND	0.0511	ND	ND	ND	ND	ND	ND	0.142	0.0462
Caprolactam	105-60-2	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbazole	86-74-8	~	~	0.533	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chrysene	218-01-9	1	3.9	5.11	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.181	ND	ND	ND	0.0814	ND	ND	0.17	0.0646	0.0462
Dibenzo(a,h)anthracene	53-70-3	0.33	0.33	0.946	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibenzofuran	132-64-9	7	59	0.0864	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Diethyl phthalate	84-66-2	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dimethyl phthalate	131-11-3	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Di-n-butyl phthalate	84-74-2	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Di-n-octyl phthalate	117-84-0	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Diphenylamine	122-39-4	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Fluoranthene	206-44-0	100	100	10.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.414	ND	ND	0.186	ND	ND	0.437	0.148	0.0669	ND
Fluorene	86-73-7	30	100	0.118	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorobenzene	118-74-1	0.33	1.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorobutadiene	87-68-3	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorocyclopentadiene	77-47-4	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexachloroethane	67-72-1	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Indeno(1,2,3-cd)pyrene	193-39-5	0.5	0.5	2.85	ND	0.0746JD	0.0607JD	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.124	ND	ND	ND	0.0487	ND	ND	0.0951	ND	ND
Isophorone	78-59-1	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Naphthalene	91-20-3	12	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nitrobenzene	98-95-3	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-Nitrosodimethylamine	62-75-9	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-nitroso-di-n-propylamine	621-64-7	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-Nitrosodiphenylamine	86-30-6	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Pentachlorophenol	87-86-5	0.8	6.7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Phenanthrene	85-01-8	100	100	5.19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.273	ND	ND	0.115	ND	ND	0.305	0.122	ND	ND
Phenol	108-95-2	0.33	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Pyrene	129-00-0	100	100	9.61	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.397	ND	ND	0.186	ND	ND	0.403	0.123	0.0587	ND
Pyridine	110-86-1	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PEST, 8081 MASTER																											
4,4'-DDD	72-54-8	0.0033	13	ND	ND	ND	ND	ND	ND	ND	ND	0.00176	ND	0.00223	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00172
4,4'-DDE	72-55-9	0.0033	8.9	0.00184	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0021
4,4'-DDT	50-29-3	0.0033	7.9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00181	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00184	ND
Aldrin	309-00-2	0.005	0.097	ND	ND	ND	ND	ND	0.00178	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00172
alpha-BHC	319-84-6	0.02	0.48	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
alpha-Chlordane	5103-71-9	0.094	4.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00181	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
beta-BHC	319-85-7	0.036	0.36	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00172
Chlordane, total	57-74-9	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
delta-BHC	319-86-8	0.04	100	0.00184	ND	ND	ND	0.00185	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00178	ND	ND	ND	ND	ND	0.00172
Dieldrin	60-57-1	0.005	0.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00223	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00172
Endosulfan I	959-98-8	2.4	24	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endosulfan II	33213-65-9	2.4	24	ND	ND	ND	ND	ND	ND	ND	0.00179	0.00176	ND	ND	ND	0.00176	0.00178	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endosulfan sulfate	1031-07-8	2.4	24	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endrin	72-20-8	0.014	11	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endrin aldehyde	7421-93-4	~	~	ND	0.00176	ND	ND	ND	ND	0.00172	ND	0.00176	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endrin ketone	53494-70-5	~	~	0.00695	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00176	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
gamma-BHC (Lindane)	58-89-9	0.1	1.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
gamma-Chlordane	5566-34-7	~	~	ND	ND	ND	ND	ND	0.0141	ND	ND	ND	ND	0.00181	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor	76-44-8	0.042	2.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor epoxide	1024-57-3	~	~	0.00184	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methoxychlor	72-43-5	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toxaphene	8001-35-2	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Metals, Target Analyte																											
Aluminum	7429-90-5	~	~	8530	8960	5420	7210	3850	10400	11700	8580	7980	10700	10900	8460	7360	5980	8710	10300	11000	10100	8750	10900	13100	12000	14400	9110
Antimony	7440-36-0	~	~	ND	3.13	ND	3.66	ND	3.87	4.76	3.55	4.36	9.76	5.72	2.82	3.17	ND	ND	ND	6.14	4.73	4.07	3.86	4.49	4.13	4.1	65
Arsenic	7440-38-2	13	16	6.62	5.98	5.16	7.68	ND	8.65	7.47	6.56	6.43	13.6	10.9	5.31	4.96	4.39	2.79	9	8.11	6.44	10.8	7.43	8.77	7.45	7.53	199
Barium	7440-39-3	350	400	99.4	30.8	32.2	36.1	24.8	115	60.2	47.6	42	50.6	52.2	23.7	46.7	39.4	46.4	157	73.9	64.6	131	78	76.1	97	78	317
Beryllium	7440-41-7	7.2	72	ND	ND	ND	ND	0.07	0.222	0.066	0.157	0.256	0.195	0.344	ND	0.125	0.07	ND	0.157	0.221	0.244	0.21	0.111	0.208	0.13	0.146	78.7
Cadmium	7440-43-9	2.5	4.3	ND	ND	ND	ND	ND	5.88	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	227
Calcium	7440-70-2	~	~	59800	2280	803	4570	6320	7330	2280	878	1470	1280	6230	522	593	1440	6500	42800	3890	1170	16800	920	1120	8820	5690	4950
Chromium	7440-47-3	~	~	13.6	17	8.43	20.4	12.3	18.2	20.9	17.4	17.6	28.8	35.5	14.1	17.5	17.2	32	15.5	15.4	16	17.7	19.6	22.5	26.3	28.6	208
Cobalt	7440-48-4	~	~	2.32	3.73	2.67	2.88	3.94	6.19	11.9	6.16	6.59	11.8	7.96	5.43	5.88	5.5	7.91	6.84	7.47	9.09	8.29	6.39	7.72	6.7	8.19	103
Copper	7440-50-8	50	270	26.9	10.5	7.75	9.92	13.3	47.8	27.7	15.3	16	27.1	16.9	14.3	13.3	11.6	36.2	37.9	20.3	16.8	42.2	18.4	30.1	52.6	24.3	157
Iron	7439-89-6	~	~	10500	10200	7340	11300	9170	12800	16700	12700	14800	29500	23000	10900	11200	10700	16700	13800	19300	14500	16600	12600	15200	13700	16500	15200
Lead	7439-92-1	63	400	90.2	11.2	5.46	13.5	3.3	168	10.5	9.18	13.4	25.4	17.4	8.66	11.7	8.4	7.69	226	44.6	11.4	275	164	144	190	90.7	273
Magnesium	7439-95-4	~	~	3720	1910	1480	3530	3520	4850	6250	1980	3290	2450	3180	1640	1840	1890	2760	6380	3380	3730	3480	2010	2380	2540	3120	2440
Manganese	7439-96-5	1600	2000	159	178	195	380	201	275	333	361	346	490	232	200	358	424	363	299	575	603	392	294	289	195	223	414
Nickel	7440-02-0	30	310	9.56	12.4B	10.2B	11.1B	9.27	40.4	41.8	11.9	13.5	16	12.3	13.1	9.93	11.5	24.1	14.1	15.9	28	17.7	12.8	13.7	13.5	16.9	187
Potassium	7440-09-7	~	~	1080	621	619	847	619B	752	1240	1330	1220	1700	894B	819B	1070B	994	1300	1640	1290	1010	2080	754	923	930	1080	2110
Selenium	7782-49-2	3.9	180	ND	ND	ND	ND	2.54	ND	ND	ND	ND	ND	ND	ND	ND	ND	7.19	ND	ND	ND	ND	ND	ND	ND	ND	148
Silver	7440-22-4	2	180	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	58.4
Sodium	7440-23-5	~	~	200	76.5	61.7	118	275B	110	380	79.5	106	137	252	115	171	144	1030	514	94.4	117	365	58.5	73.6	350	118	460
Thallium	7440-28-0	~	~	5.01	5.48B	6.42B	7.92B	ND	6.76	8.28	7.02	8.8	12.4	13.6	4.6	5.96	6.83	ND	4.92	9.71	4.15	8.39	6.04	6.14	4.36	5.5	79.8
Vanadium	7440-62-2	~	~	15.4	18.8	11.1	19	17.6	31.1	27.7	19	20.9	50.5	46.9	19.5	19.6	17.7	24.6	24.3	23.7	22.7	23.8	23.3	27.4	29.9	31.8	215
Zinc	7440-66-6	109	10000	349	147	64.2	23.5	13.1	547	30.4	15.3	19.2	37.2	27.8	17.6	21.4	19.3	21.5	168	33.3	18.6	113	118	153	142	181	223
Mercury by 7473																											
Mercury	7439-97-6	0.18	0.81	0.0556	ND	ND	ND	ND	0.068	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.114	0.039	ND	0.0835	0.039	0.0593	0.231	0.0848	ND
Chromium, Hexavalent																											
Chromium, Hexavalent	18540-29-9	1	110	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.38	0.839	ND	ND	0.649	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cyanide, Total																											
Cyanide, total	57-12-5	27	27	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Solids																											
% Solids	solids	~	~	89	92	93.5	94.1	87.5	90.4	93.4	92	93	84.1	90.6	92.6	92.3	92.4	80.5	84.2	91.2	92.4	86.2	90.1	88.7	79.9	89.5	94.4
PCB, 8082 MASTER																											
Aroclor 1016	12674-11-2	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1221	11104-28-2	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1232	11141-16-5	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1242	53469-21-9	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1248	12672-29-6	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1254	11097-69-1	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1260	11096-82-5	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0457	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total PCBs	1336-36-3	0.1	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0457	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PFAS, EPA 1633 Target List																											
11CL-PF3OUdS	763051-92-9	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1H,1H,2H,2H-Perfluorodecanesulfonic acid (8:2	39108-34-4	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1H,1H,2H,2H-Perfluorohexanesulfonic acid (4:2	757124-72-4	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1H,1H,2H,2H-Perfluorooctanesulfonic acid (6:2	27619-97-2	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3-Perfluoroheptyl propanoic acid (FHpPA)	812-70-4	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3-Perfluoropentyl propanoic acid (FPePA)	914637-49-3	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3-Perfluoropropyl propanoic acid (FPrPA)	356-02-5	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
9CL-PF3ONS	756426-58-1	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ADONA	919005-14-4	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
HFPO-DA (Gen-X)	13252-13-6	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-EtFOSA	4151-50-2	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-EtFOSAA	2991-50-6	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-EtFOSE	1691-99-2	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-MeFOSA	31506-32-8	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Table 2
Remedial Investigation Soil Sample Analytical Results Summary
43-25 & 43-27 52nd Street
Queens, NY 11377
Project No. 22254

Sample ID Sampling Date Client Matrix		NYSDEC Part 375 Unrestricted Use Soil Cleanup Objectives	NYSDEC Part 375 Restricted Use Soil Cleanup Objectives-Restricted Residential	B-1 (0-2in) 7/18/2023 Soil	B-1 (2in-2ft) 7/18/2023 Soil	B-1 (4ft-6ft) 7/18/2023 Soil	B-1 (10ft-12ft) 7/18/2023 Soil	B-1 (60ft-62ft) 8/1/2023 Soil	B-2 (0-2in) 7/19/2023 Soil	B-2 (2in-2ft) 7/19/2023 Soil	B-2 (4ft-6ft) 7/19/2023 Soil	B-2 (10ft-12ft) 7/19/2023 Soil	B-2 (60ft-62ft) 7/27/2023 Soil	B-3 (0-2in) 7/21/2023 Soil	B-3 (2in-2ft) 7/21/2023 Soil	B-3 (4ft-6ft) 7/21/2023 Soil	B-3 (10ft-12ft) 7/21/2023 Soil	B-3 (60ft-62ft) 8/8/2023 Soil	B-4 (0-2in) 7/19/2023 Soil	B-4 (2in-2ft) 7/19/2023 Soil	B-4 (4ft-6ft) 7/19/2023 Soil	B-4 (10ft-12ft) 7/19/2023 Soil	B-5 (0-2in) 7/19/2023 Soil	B-5 (2in-2ft) 7/19/2023 Soil	B-5 (4ft-6ft) 7/19/2023 Soil	B-5 (10ft-12ft) 7/19/2023 Soil	B-6 (0-2in) 7/20/2023 Soil
Compound	**CAS Number**			mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg
N-MeFOSAA	2355-31-9	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.000206	0.000286	ND	ND	ND	0.00018	ND	ND	ND	ND	ND	ND
N-MeFOSE	24448-09-7	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluoro(2-ethoxyethane)sulfonic acid (PFEESA)	113507-82-7	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluoro-1-decanesulfonic acid (PFDS)	335-77-3	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluoro-1-heptanesulfonic acid (PFHpS)	375-92-8	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluoro-1-nonanesulfonic acid (PFNS)	68259-12-1	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluoro-1-octanesulfonamide (FOSA)	754-91-6	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluoro-1-pentanesulfonate (PFPeS)	2706-91-4	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluoro-3,6-dioxaheptanoic acid (NFDHA)	151772-58-6	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluoro-4-oxapentanoic acid (PFMPA)	377-73-1	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluoro-5-oxahexanoic acid (PFMBA)	863090-89-5	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluorobutanesulfonic acid (PFBS)	375-73-5	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluorodecanoic acid (PFDA)	335-76-2	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluorododecanesulfonic acid (PFDoS)	79780-39-5	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluorododecanoic acid (PFDoA)	307-55-1	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluoroheptanoic acid (PFHpA)	375-85-9	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	~	~	0.000245	ND	ND	0.000193	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluorohexanoic acid (PFHxA)	307-24-4	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0000749	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.000133
Perfluoro-n-butanoic acid (PFBA)	375-22-4	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluorononanoic acid (PFNA)	375-95-1	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.000307	0.000314	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	0.00088	0.044	0.000588	0.00116	ND	ND	ND	0.000387	ND	0.000223	ND	ND	0.000722	0.00114	0.000378	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.000283
Perfluorooctanoic acid (PFOA)	335-67-1	0.00066	0.033	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.000281	0.000332	0.000227	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.000355
Perfluoropentanoic acid (PFPeA)	2706-90-3	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.000129
Perfluorotetradecanoic acid (PFTA)	376-06-7	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluoroundecanoic acid (PFUnA)	2058-94-8	~	~	ND	ND	ND	ND	ND	0.000557	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

NOTES:
ND - indicates that he analyte was not detected
J - indicates that the analyte was detected above the method detected limit but not above the reporting limit
B - indicates that the analyte was found in the analysis batch blank
D- indicates that dilution was required
Indicates that the analyte exceeds the NYSDEC Unrestricted Use Soil Cleanup Objective criteria
Indicates that the analyte exceeds both the above mentioned criteria

Table 2
Remedial Investigation Soil Sample Analytical Results Summary
43-25 & 43-27 52nd Street
Queens, NY 11377
Project No. 22254

Sample ID Sampling Date Client Matrix		NYSDEC Part 375 Unrestricted Use Soil Cleanup Objectives	NYSDEC Part 375 Restricted Use Soil Cleanup Objectives-Restricted Residential	B-6 (2in-2ft) 7/20/2023 Soil	B-6 (4ft-6ft) 7/20/2023 Soil	B-6 (10ft-12ft) 7/20/2023 Soil	B-7 (0-2in) 7/24/2023 Soil	B-7 (2in-2ft) 7/24/2023 Soil	B-7 (4ft-6ft) 7/24/2023 Soil	B-7 (10ft-12ft) 7/24/2023 Soil	B-57 (10ft-12ft) 7/24/2023 Soil	B-8 (0-2in) 7/24/2023 Soil	B-8 (2in-2ft) 7/24/2023 Soil	B-58 (2in-2ft) 7/24/2023 Soil	B-8 (4ft-6ft) 7/24/2023 Soil	B-8 (10ft-12ft) 7/24/2023 Soil	B-9 (0-2in) 7/20/2023 Soil	B-9 (2in-2ft) 7/20/2023 Soil	B-9 (4ft-6ft) 7/20/2023 Soil	B-9 (10ft-12ft) 7/20/2023 Soil
Compound	**CAS Number**			mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg
VOA, 8260 MASTER																				
1,1,1,2-Tetrachloroethane	630-20-6	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	71-55-6	0.68	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	79-34-5	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	76-13-1	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	79-00-5	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	75-34-3	0.27	26	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethylene	75-35-4	0.33	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3-Trichlorobenzene	87-61-6	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3-Trichloropropane	96-18-4	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	120-82-1	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	95-63-6	3.6	52	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dibromo-3-chloropropane	96-12-8	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dibromoethane	106-93-4	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	95-50-1	1.1	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	107-06-2	0.02	3.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	78-87-5	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3,5-Trimethylbenzene	108-67-8	8.4	52	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	541-73-1	2.4	49	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	106-46-7	1.8	13	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dioxane	123-91-1	0.1	13	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone	78-93-3	0.12	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Hexanone	591-78-6	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-pentanone	108-10-1	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acetone	67-64-1	0.05	100	0.0052	ND	0.012	0.014	ND	0.059	0.034	0.027	ND	0.008	ND	ND	ND	0.056	0.027	ND	0.0068
Acrolein	107-02-8	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acrylonitrile	107-13-1	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	71-43-2	0.06	4.8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromochloromethane	74-97-5	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	75-27-4	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	75-25-2	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane	74-83-9	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon disulfide	75-15-0	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon tetrachloride	56-23-5	0.76	2.4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	108-90-7	1.1	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	75-00-3	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	67-66-3	0.37	49	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloromethane	74-87-3	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,2-Dichloroethylene	156-59-2	0.25	100	ND	ND	0.0033	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.1
cis-1,3-Dichloropropylene	10061-01-5	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cyclohexane	110-82-7	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	124-48-1	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibromomethane	74-95-3	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dichlorodifluoromethane	75-71-8	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethyl Benzene	100-41-4	1	41	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorobutadiene	87-68-3	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Isopropylbenzene	98-82-8	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methyl acetate	79-20-9	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methyl tert-butyl ether (MTBE)	1634-04-4	0.93	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylcyclohexane	108-87-2	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	75-09-2	0.05	100	ND	ND	ND	ND	ND	0.0073	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
n-Butylbenzene	104-51-8	12	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
n-Propylbenzene	103-65-1	3.9	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
o-Xylene	95-47-6	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
p- & m- Xylenes	179601-23-1	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
p-Isopropyltoluene	99-87-6	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
sec-Butylbenzene	135-98-8	11	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Styrene	100-42-5	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
tert-Butyl alcohol (TBA)	75-65-0	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
tert-Butylbenzene	98-06-6	5.9	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethylene	127-18-4	1.3	19	ND	0.016	0.042	ND	0.18	ND	ND	ND	0.015	ND	ND	ND	ND	ND	0.0059	0.24	
Toluene	108-88-3	0.7	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethylene	156-60-5	0.19	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,3-Dichloropropylene	10061-02-6	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethylene	79-01-6	0.47	21	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.011
Trichlorofluoromethane	75-69-4	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl Chloride	75-01-4	0.02	0.9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Xylenes, Total	1330-20-7	0.26	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Semi-Volatiles, 1,4-Dioxane 8270 SIM-Soil																				
1,4-Dioxane	123-91-1	0.1	9.8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SVOA, 8270 MASTER																				
1,1-Biphenyl	92-52-4	~	~	ND	ND	ND	ND	0.0747J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4,5-Tetrachlorobenzene	95-94-3	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Diphenylhydrazine (as Azobenzene)	122-66-7	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,3,4,6-Tetrachlorophenol	58-90-2	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4,5-Trichlorophenol	95-95-4	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4,6-Trichlorophenol	88-06-2	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4-Dichlorophenol	120-83-2	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4-Dimethylphenol	105-67-9	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4-Dinitrophenol	51-28-5	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4-Dinitrotoluene	121-14-2	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,6-Dinitrotoluene	606-20-2	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Chloronaphthalene	91-58-7	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Chlorophenol	95-57-8	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Methylnaphthalene	91-57-6	~	~	ND	ND	ND	ND	0.241	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Methylphenol	95-48-7	0.33	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Nitroaniline	88-74-4	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Nitrophenol	88-75-5	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3- & 4-Methylphenols	65794-96-9	0.33	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3,3-Dichlorobenzidine	91-94-1	~	~	ND	ND	ND	ND	ND	ND	ND	~	ND	ND	ND	ND	ND	ND	ND	ND	ND
3-Nitroaniline	99-09-2	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4,6-Dinitro-2-methylphenol	534-52-1	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Bromophenyl phenyl ether	101-55-3	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Chloro-3-methylphenol	59-50-7	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Chloroaniline	106-47-8	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Chlorophenyl phenyl ether	7005-72-3	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Nitroaniline	100-01-6	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Nitrophenol	100-02-7	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acenaphthene	83-32-9	20	100	ND	ND	ND	ND	0.753	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acenaphthylene	208-96-8	100	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acetophenone	98-86-2	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aniline	62-53-3	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Anthracene	120-12-7	100	100	ND	ND	ND	ND	1.4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Atrazine	1912-24-9	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzaldehyde	100-52-7	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzidine	92-87-5	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(a)anthracene	56-55-3	1	1	ND	ND	ND	0.0774J	3.37	0.102	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(a)pyrene	50-32-8	1	1	ND	ND	ND	0.0577J	2.81	0.104	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(b)fluoranthene	205-99-2	1	1	ND	ND	ND	0.0626J	2.62	0.106	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(g,h,i)perylene	191-24-2	100	100	ND	ND	ND	ND	1.58	0.0739J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(k)fluoranthene	207-08-9	0.8	3.9	ND	ND	ND	0.05J	2.11	0.104	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzoic acid	65-85-0	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzyl alcohol	100-51-6	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Table 2
Remedial Investigation Soil Sample Analytical Results Summary
43-25 & 43-27 52nd Street
Queens, NY 11377
Project No. 22254

Sample ID Sampling Date Client Matrix		NYSDEC Part 375 Unrestricted Use Soil Cleanup Objectives	NYSDEC Part 375 Restricted Use Soil Cleanup Objectives-Restricted Residential	B-6 (2in-2ft) 7/20/2023 Soil	B-6 (4ft-6ft) 7/20/2023 Soil	B-6 (10ft-12ft) 7/20/2023 Soil	B-7 (0-2in) 7/24/2023 Soil	B-7 (2in-2ft) 7/24/2023 Soil	B-7 (4ft-6ft) 7/24/2023 Soil	B-7 (10ft-12ft) 7/24/2023 Soil	B-57 (10ft-12ft) 7/24/2023 Soil	B-8 (0-2in) 7/24/2023 Soil	B-8 (2in-2ft) 7/24/2023 Soil	B-58 (2in-2ft) 7/24/2023 Soil	B-8 (4ft-6ft) 7/24/2023 Soil	B-8 (10ft-12ft) 7/24/2023 Soil	B-9 (0-2in) 7/20/2023 Soil	B-9 (2in-2ft) 7/20/2023 Soil	B-9 (4ft-6ft) 7/20/2023 Soil	B-9 (10ft-12ft) 7/20/2023 Soil
Compound	**CAS Number**			mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg
Benzyl butyl phthalate	85-68-7	~	~	ND	ND	ND	1.5	0.422	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bis(2-chloroethoxy)methane	111-91-1	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bis(2-chloroethyl)ether	111-44-4	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bis(2-chloroisopropyl)ether	108-60-1	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bis(2-ethylhexyl)phthalate	117-81-7	~	~	ND	ND	ND	0.0851J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Caprolactam	105-60-2	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbazole	86-74-8	~	~	ND	ND	ND	ND	0.737	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chrysene	218-01-9	1	3.9	ND	ND	ND	0.0682J	3.13	0.122	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibenzo(a,h)anthracene	53-70-3	0.33	0.33	ND	ND	ND	ND	0.593	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibenzofuran	132-64-9	7	59	ND	ND	ND	ND	0.448	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Diethyl phthalate	84-66-2	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dimethyl phthalate	131-11-3	~	~	ND	ND	ND	ND	ND	ND	ND	~	ND	ND	ND	ND	ND	ND	ND	ND	ND
Di-n-butyl phthalate	84-74-2	~	~	ND	ND	ND	0.0612J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Di-n-octyl phthalate	117-84-0	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Diphenylamine	122-39-4	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Fluoranthene	206-44-0	100	100	ND	ND	ND	0.12	5.71	0.235	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Fluorene	86-73-7	30	100	ND	ND	ND	ND	0.749	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorobenzene	118-74-1	0.33	1.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorobutadiene	87-68-3	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorocyclopentadiene	77-47-4	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexachloroethane	67-72-1	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Indeno(1,2,3-cd)pyrene	193-39-5	0.5	0.5	ND	ND	ND	ND	2.1	0.0953	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Isophorone	78-59-1	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Naphthalene	91-20-3	12	100	ND	ND	ND	ND	0.825	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nitrobenzene	98-95-3	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-Nitrosodimethylamine	62-75-9	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-nitroso-di-n-propylamine	621-64-7	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-Nitrosodiphenylamine	86-30-6	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Pentachlorophenol	87-86-5	0.8	6.7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Phenanthrene	85-01-8	100	100	ND	ND	ND	0.0872J	4.53	0.107	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Phenol	108-95-2	0.33	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Pyrene	129-00-0	100	100	ND	ND	ND	0.103	4.67	0.206	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Pyridine	110-86-1	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PEST, 8081 MASTER																				
4,4'-DDD	72-54-8	0.0033	13	ND	ND	ND	ND	0.0051	0.00249	ND	ND	ND	ND	ND	ND	ND	ND	0.00176	0.00178	ND
4,4'-DDE	72-55-9	0.0033	8.9	ND	ND	ND	ND	0.00359	0.00803	ND	ND	ND	ND	ND	ND	ND	ND	0.00202	0.00178	ND
4,4'-DDT	50-29-3	0.0033	7.9	ND	ND	ND	0.00176	0.00845	0.00345	ND	ND	ND	ND	ND	ND	ND	ND	0.00244	0.00223	0.00178
Aldrin	309-00-2	0.005	0.097	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
alpha-BHC	319-84-6	0.02	0.48	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
alpha-Chlordane	5103-71-9	0.094	4.2	ND	ND	ND	ND	ND	0.00245	ND	ND	ND	ND	ND	ND	ND	ND	0.00176	0.00178	ND
beta-BHC	319-85-7	0.036	0.36	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlordane, total	57-74-9	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
delta-BHC	319-86-8	0.04	100	ND	0.00175	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dieldrin	60-57-1	0.005	0.2	ND	ND	0.0018	0.00228	ND	0.00333	ND	ND	ND	ND	ND	ND	ND	ND	0.00225	ND	ND
Endosulfan I	959-98-8	2.4	24	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endosulfan II	33213-65-9	2.4	24	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00176	ND	ND
Endosulfan sulfate	1031-07-8	2.4	24	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00178	ND
Endrin	72-20-8	0.014	11	ND	ND	ND	0.00176	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00176	0.00178	ND
Endrin aldehyde	7421-93-4	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endrin ketone	53494-70-5	~	~	ND	ND	ND	ND	ND	ND	ND	~	ND	ND	ND	ND	ND	ND	ND	ND	ND
gamma-BHC (Lindane)	58-89-9	0.1	1.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
gamma-Chlordane	5566-34-7	~	~	ND	ND	ND	0.00176	0.0022	0.00273	ND	ND	ND	ND	ND	ND	ND	ND	0.00176	0.00178	ND
Heptachlor	76-44-8	0.042	2.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor epoxide	1024-57-3	~	~	ND	ND	ND	ND	ND	0.00206	ND	ND	ND	ND	ND	ND	ND	ND	0.00176	ND	ND
Methoxychlor	72-43-5	~	~	ND	ND	ND	ND	ND	0.00508	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toxaphene	8001-35-2	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Metals, Target Analyte																				
Aluminum	7429-90-5	~	~	10600	7470	6990	8290	7380	6050	4560	5900	9580	8850	6850	6050	8550	8090	6350	6950	5290
Antimony	7440-36-0	~	~	4.15	2.73	ND	2.59	ND	ND	ND	4.27	2.89	3.56	3.33	2.95	4.72	ND	2.35	ND	2.94
Arsenic	7440-38-2	13	16	6.91	3.96	4.37	20.3	10.5	8.37	2.22	6.71	13.7	6.21	6.92	6.24	7.45	5.05	3.98	3.16	3.99
Barium	7440-39-3	350	400	48.8	39.1	43.7	398	271	49	29.1	27.6	51.2	45	44.7	39.9	43	44.4	41.3	41.7	35.7
Beryllium	7440-41-7	7.2	72	0.216	0.091	0.063	0.287	ND	ND	ND	ND	ND	0.101	0.081	0.099	ND	0.062	ND	ND	0.077
Cadmium	7440-43-9	2.5	4.3	ND	ND	ND	6.43	1.3	0.353	ND	ND	0.455	ND	ND	ND	ND	ND	ND	ND	ND
Calcium	7440-70-2	~	~	1170	713	7960	44800	5100	1040	779	1070	14600	993	1010	788	2130	3260	863	11000	889
Chromium	7440-47-3	~	~	31.8	13.1	14.4	57.6	21.7	16.8	10.4	14.5	17.5	12.1	10.2	13.2	17.5	12.6	14.5	14.5	11.6
Cobalt	7440-48-4	~	~	8.67	5.42	5.97	5.39	5.61	2.69	3.53	5.94	6.85	5.55	6.09	4.88	6.86	5.29	5.42	5.19	4.5
Copper	7440-50-8	50	270	15.4	10.6	13.6	146	110	24	9.24	10.1	41.3	12	17.8	10.8	15.7	14.5	18	13.7	10.5
Iron	7439-89-6	~	~	14600	10900	9940	26800	12800	7470	8310	11500	12000	11100	10900	9070	14600	9640	9200	9710	10300
Lead	7439-92-1	63	400	9.88	8.17	9.59	3360	640	161	3.62	9.03	269	8.86	8.45	7.42	12.1	12.6	10.5	8.06	8.5
Magnesium	7439-95-4	~	~	5060	1700	1920	9080	2480	1480	1380	2420	3580	2400	1710	1470	2680	2030	1780	2100	1920
Manganese	7439-96-5	1600	2000	370	284	432	178	173	56.7	199	359	188	258	304	268	348	257	230	297	300
Nickel	7440-02-0	30	310	31.9	8.92	12	34.9	18.5	7.77	8.47	11.2	17.4	11.9	11.1	8.65	15.3	12.6	9.9	10.7	9.34
Potassium	7440-09-7	~	~	925	968	1020	868	770	925	803	814	639	953	782	968	1320	976	1040B	1120B	927
Selenium	7782-49-2	3.9	180	ND	ND	ND	8.6	4.93	2.95	3.06	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Silver	7440-22-4	2	180	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Sodium	7440-23-5	~	~	258	85.6	185	351	377	150	110	75.9	643	111	123	96.6	232	171	180	289	131
Thallium	7440-28-0	~	~	8.27	4.32	4.64	ND	ND	ND	5.53	6.23	4.59	6.91	5.7	8.73	4.92	5.9	3.94	5.08	
Vanadium	7440-62-2	~	~	19.8	18.1	18.3	37.2	30.5	15.1	13	19.2	31.2	18.4	30.2	15.9	24.1	18.2	20.3	18.8	16.3
Zinc	7440-66-6	109	10000	26.8	19.4	20.2	755	473	120	14.2	21	116	25.3	19.2	15.1	23.2	19.8	19.4	24.2	16.6
Mercury by 7473																				
Mercury	7439-97-6	0.18	0.81	ND	ND	ND	0.215	0.35	0.968	ND	ND	0.0639	ND	ND	ND	ND	ND	ND	ND	ND
Chromium, Hexavalent																				
Chromium, Hexavalent	18540-29-9	1	110	ND	0.774	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.647	ND	ND	ND	0.561	ND
Cyanide, Total																				
Cyanide, total	57-12-5	27	27	ND	ND	ND	0.65	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Solids																				
% Solids	solids	~	~	93.1	93.1	91	92.3	75	91.6	93	93	97.1	94.1	96.4	92.7	73.4	92.1	92.2	92.6	92.2
PCB, 8082 MASTER																				
Aroclor 1016	12674-11-2	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1221	11104-28-2	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1232	11141-16-5	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1242	53469-21-9	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1248	12672-29-6	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1254	11097-69-1	~	~	ND	ND	ND	ND	ND	0.0536	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1260	11096-82-5	~	~	ND	ND	ND	0.0245	ND	0.0344	ND	ND	0.0179	ND	ND	ND	ND	ND	0.0372	0.0362	ND
Total PCBs	1336-36-3	0.1	1	ND	ND	ND	0.0245	ND	0.088	ND	ND	0.0179	ND	ND	ND	ND	ND	0.0372	0.0362	ND
PFAS, EPA 1633 Target List																				
11CL-PF3OUdS	763051-92-9	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1H,1H,2H,2H-Perfluorodecanesulfonic acid (8:2	39108-34-4	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1H,1H,2H,2H-Perfluorohexanesulfonic acid (4:2	757124-72-4	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1H,1H,2H,2H-Perfluorooctanesulfonic acid (6:2	27619-97-2	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3-Perfluoroheptyl propanoic acid (FHpPA)	812-70-4	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00193	ND	ND
3-Perfluoropentyl propanoic acid (FPePA)	914637-49-3	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3-Perfluoropropyl propanoic acid (FPrPA)	356-02-5	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
9CL-PF3ONS	756426-58-1	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ADONA	919005-14-4	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
HFPO-DA (Gen-X)	13252-13-6	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-EtFOSA	4151-50-2	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-EtFOSAA	2991-50-6	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-EtFOSE	1691-99-2	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-MeFOSA	31506-32-8	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Table 2
Remedial Investigation Soil Sample Analytical Results Summary
43-25 & 43-27 52nd Street
Queens, NY 11377
Project No. 22254

Sample ID Sampling Date Client Matrix		NYSDEC Part 375 Unrestricted Use Soil Cleanup Objectives	NYSDEC Part 375 Restricted Use Soil Cleanup Objectives-Restricted Residential	B-6 (2in-2ft) 7/20/2023 Soil	B-6 (4ft-6ft) 7/20/2023 Soil	B-6 (10ft-12ft) 7/20/2023 Soil	B-7 (0-2in) 7/24/2023 Soil	B-7 (2in-2ft) 7/24/2023 Soil	B-7 (4ft-6ft) 7/24/2023 Soil	B-7 (10ft-12ft) 7/24/2023 Soil	B-57 (10ft-12ft) 7/24/2023 Soil	B-8 (0-2in) 7/24/2023 Soil	B-8 (2in-2ft) 7/24/2023 Soil	B-58 (2in-2ft) 7/24/2023 Soil	B-8 (4ft-6ft) 7/24/2023 Soil	B-8 (10ft-12ft) 7/24/2023 Soil	B-9 (0-2in) 7/20/2023 Soil	B-9 (2in-2ft) 7/20/2023 Soil	B-9 (4ft-6ft) 7/20/2023 Soil	B-9 (10ft-12ft) 7/20/2023 Soil
Compound	CAS Number			mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg
N-MeFOSAA	2355-31-9	~	~	ND	ND	0.000203	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-MeFOSE	24448-09-7	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluoro(2-ethoxyethane)sulfonic acid (PFEESA)	113507-82-7	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluoro-1-decanesulfonic acid (PFDS)	335-77-3	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluoro-1-heptanesulfonic acid (PFHpS)	375-92-8	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluoro-1-nonanesulfonic acid (PFNS)	68259-12-1	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluoro-1-octanesulfonamide (FOSA)	754-91-6	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluoro-1-pentanesulfonate (PFPeS)	2706-91-4	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluoro-3,6-dioxaheptanoic acid (NFDHA)	151772-58-6	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluoro-4-oxapentanoic acid (PFMPA)	377-73-1	~	~	ND	ND	ND	ND	ND	0.000082	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluoro-5-oxahexanoic acid (PFMBA)	863090-89-5	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluorobutanesulfonic acid (PFBS)	375-73-5	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluorodecanoic acid (PFDA)	335-76-2	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluorododecanesulfonic acid (PFDoS)	79780-39-5	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluorododecanoic acid (PFDoA)	307-55-1	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluoroheptanoic acid (PFHpA)	375-85-9	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluorohexanoic acid (PFHxA)	307-24-4	~	~	0.0000604	ND	0.000126	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.000119	ND
Perfluoro-n-butanoic acid (PFBA)	375-22-4	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluorononanoic acid (PFNA)	375-95-1	~	~	ND	ND	0.000295	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	0.00088	0.044	0.000198	ND	ND	0.000367	ND	ND	ND	0.00018	ND	ND	ND	0.000276	ND	ND	0.00152	0.000299	0.000244
Perfluorooctanoic acid (PFOA)	335-67-1	0.00066	0.033	ND	0.000452	0.00036	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.000245	0.000384	ND
Perfluoropentanoic acid (PFPeA)	2706-90-3	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluorotetradecanoic acid (PFTA)	376-06-7	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluoroundecanoic acid (PFUnA)	2058-94-8	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

NOTES:
ND - indicates that he analyte was not detected
J - indicates that the analyte was detected above the method detected limit but not above the reporting limit
B - indicates that the analyte was found in the analysis batch blank
D- indicates that dilution was required
Indicates that the analyte exceeds the NYSDEC Unrestricted Use S
Indicates that the analyte exceeds both the above mentioned criteri

Table 3
Remediation Investigation Groundwater Sample Analytical Results Summary
43-25 & 43-27 52nd Street
Queens, NY 11377
Project No. 22254

Sample ID Sampling Date Client Matrix	CAS Number	NYSDEC TOGS Standards and Guidance Values - GA	TW-1 8/9/2023 GW	TW-2 8/8/2023 GW	TW-3 8/10/2023 GW	TW-53 8/10/2023 GW
Compound			ug/L	ug/L	ug/L	ug/L
VOA, 8260 LOW MASTER						
1,1,1,2-Tetrachloroethane	630-20-6	5	ND	ND	ND	ND
1,1,1-Trichloroethane	71-55-6	5	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	79-34-5	5	ND	ND	ND	ND
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	76-13-1	5	ND	ND	ND	ND
1,1,2-Trichloroethane	79-00-5	1	ND	ND	ND	ND
1,1-Dichloroethane	75-34-3	5	ND	ND	ND	ND
1,1-Dichloroethylene	75-35-4	5	ND	ND	ND	ND
1,2,3-Trichlorobenzene	87-61-6	5	ND	ND	ND	ND
1,2,3-Trichloropropane	96-18-4	0.04	ND	ND	ND	ND
1,2,4-Trichlorobenzene	120-82-1	5	ND	ND	ND	ND
1,2,4-Trimethylbenzene	95-63-6	5	ND	ND	ND	ND
1,2-Dibromo-3-chloropropane	96-12-8	0.04	ND	ND	ND	ND
1,2-Dibromoethane	106-93-4	0.0006	ND	ND	ND	ND
1,2-Dichlorobenzene	95-50-1	3	ND	ND	ND	ND
1,2-Dichloroethane	107-06-2	0.6	ND	ND	ND	ND
1,2-Dichloropropane	78-87-5	1	ND	ND	ND	ND
1,3,5-Trimethylbenzene	108-67-8	5	ND	ND	ND	ND
1,3-Dichlorobenzene	541-73-1	3	ND	ND	ND	ND
1,4-Dichlorobenzene	106-46-7	3	ND	ND	ND	ND
1,4-Dioxane	123-91-1	0.35	ND	ND	ND	ND
2-Butanone	78-93-3	50	1.21	ND	1.11	1.23
2-Hexanone	591-78-6	50	ND	ND	ND	ND
4-Methyl-2-pentanone	108-10-1	~	ND	ND	ND	ND
Acetone	67-64-1	50	4.85	ND	4.86	4.89
Acrolein	107-02-8	~	ND	ND	ND	ND
Acrylonitrile	107-13-1	~	ND	ND	ND	ND
Benzene	71-43-2	1	ND	ND	ND	ND
Bromochloromethane	74-97-5	5	ND	ND	ND	ND
Bromodichloromethane	75-27-4	50	2.88	ND	1.63	1.94
Bromoform	75-25-2	50	ND	ND	ND	ND
Bromomethane	74-83-9	5	ND	ND	ND	ND
Carbon disulfide	75-15-0	~	ND	ND	ND	ND
Carbon tetrachloride	56-23-5	5	ND	ND	ND	ND
Chlorobenzene	108-90-7	5	ND	ND	ND	ND
Chloroethane	75-00-3	5	ND	ND	ND	ND
Chloroform	67-66-3	7	**36.8**	ND	**20.7**	**23.7**
Chloromethane	74-87-3	5	ND	ND	ND	ND
cis-1,2-Dichloroethylene	156-59-2	5	ND	ND	ND	ND
cis-1,3-Dichloropropylene	10061-01-5	0.4	ND	ND	ND	ND
Cyclohexane	110-82-7	~	ND	ND	ND	ND
Dibromochloromethane	124-48-1	50	ND	ND	ND	ND
Dibromomethane	74-95-3	~	ND	ND	ND	ND
Dichlorodifluoromethane	75-71-8	5	ND	ND	ND	ND
Ethyl Benzene	100-41-4	5	ND	ND	ND	ND
Hexachlorobutadiene	87-68-3	0.5	ND	ND	ND	ND
Isopropylbenzene	98-82-8	5	ND	ND	ND	ND
Methyl acetate	79-20-9	~	ND	ND	ND	ND
Methyl tert-butyl ether (MTBE)	1634-04-4	10	ND	ND	ND	ND
Methylcyclohexane	108-87-2	~	ND	ND	ND	ND
Methylene chloride	75-09-2	5	ND	ND	ND	ND
n-Butylbenzene	104-51-8	5	ND	ND	ND	ND
n-Propylbenzene	103-65-1	5	ND	ND	ND	ND
o-Xylene	95-47-6	5	ND	ND	ND	ND
p- & m- Xylenes	179601-23-1	~	ND	ND	ND	ND
p-Isopropyltoluene	99-87-6	5	ND	ND	ND	ND
sec-Butylbenzene	135-98-8	5	ND	ND	ND	ND
Styrene	100-42-5	5	ND	ND	ND	ND
tert-Butyl alcohol (TBA)	75-65-0	~	4.24	ND	4.44	ND
tert-Butylbenzene	98-06-6	5	ND	ND	ND	ND
Tetrachloroethylene	127-18-4	5	ND	ND	ND	ND
Toluene	108-88-3	5	ND	ND	ND	ND
trans-1,2-Dichloroethylene	156-60-5	5	ND	ND	ND	ND
trans-1,3-Dichloropropylene	10061-02-6	0.4	ND	ND	ND	ND
Trichloroethylene	79-01-6	5	ND	ND	ND	ND
Trichlorofluoromethane	75-69-4	5	ND	ND	ND	ND
Vinyl Chloride	75-01-4	2	ND	ND	ND	ND
Xylenes, Total	1330-20-7	5	ND	ND	ND	ND
Semi-Volatiles, 1,4-Dioxane 8270 SIM-Aqueous						
1,4-Dioxane	123-91-1	0.35	NT	ND	ND	ND
SVOA, 8270 LOW MASTER						
1,1-Biphenyl	92-52-4	~	NT	ND	ND	ND
1,2,4,5-Tetrachlorobenzene	95-94-3	~	NT	ND	ND	ND

Table 3
Remediation Investigation Groundwater Sample Analytical Results Summary
43-25 & 43-27 52nd Street
Queens, NY 11377
Project No. 22254

Sample ID Sampling Date Client Matrix	CAS Number	NYSDEC TOGS Standards and Guidance Values - GA	TW-1 8/9/2023 GW	TW-2 8/8/2023 GW	TW-3 8/10/2023 GW	TW-53 8/10/2023 GW
Compound			ug/L	ug/L	ug/L	ug/L
1,2-Diphenylhydrazine (as Azobenzene)	122-66-7	~	NT	ND	ND	ND
2,3,4,6-Tetrachlorophenol	58-90-2	~	NT	ND	ND	ND
2,4,5-Trichlorophenol	95-95-4	1	NT	ND	ND	ND
2,4,6-Trichlorophenol	88-06-2	1	NT	ND	ND	ND
2,4-Dichlorophenol	120-83-2	5	NT	ND	ND	ND
2,4-Dimethylphenol	105-67-9	50	NT	ND	ND	ND
2,4-Dinitrophenol	51-28-5	10	NT	ND	ND	ND
2,4-Dinitrotoluene	121-14-2	5	NT	ND	ND	ND
2,6-Dinitrotoluene	606-20-2	5	NT	ND	ND	ND
2-Chloronaphthalene	91-58-7	10	NT	ND	ND	ND
2-Chlorophenol	95-57-8	1	NT	ND	ND	ND
2-Methylnaphthalene	91-57-6	~	NT	ND	ND	ND
2-Methylphenol	95-48-7	1	NT	ND	ND	ND
2-Nitroaniline	88-74-4	5	NT	ND	ND	ND
2-Nitrophenol	88-75-5	1	NT	ND	ND	ND
3- & 4-Methylphenols	65794-96-9	1	NT	ND	ND	ND
3,3-Dichlorobenzidine	91-94-1	5	NT	ND	ND	ND
3-Nitroaniline	99-09-2	5	NT	ND	ND	ND
4,6-Dinitro-2-methylphenol	534-52-1	~	NT	ND	ND	ND
4-Bromophenyl phenyl ether	101-55-3	~	NT	ND	ND	ND
4-Chloro-3-methylphenol	59-50-7	1	NT	ND	ND	ND
4-Chloroaniline	106-47-8	5	NT	ND	ND	ND
4-Chlorophenyl phenyl ether	7005-72-3	~	NT	ND	ND	ND
4-Nitroaniline	100-01-6	5	NT	ND	ND	ND
4-Nitrophenol	100-02-7	1	NT	ND	ND	ND
Acetophenone	98-86-2	~	NT	ND	ND	ND
Aniline	62-53-3	5	NT	ND	ND	ND
Benzaldehyde	100-52-7	~	NT	ND	ND	ND
Benzidine	92-87-5	~	NT	ND	ND	ND
Benzoic acid	65-85-0	~	NT	ND	ND	ND
Benzyl alcohol	100-51-6	~	NT	ND	ND	ND
Benzyl butyl phthalate	85-68-7	50	NT	ND	ND	ND
Bis(2-chloroethoxy)methane	111-91-1	5	NT	ND	ND	ND
Bis(2-chloroethyl)ether	111-44-4	1	NT	ND	ND	ND
Bis(2-chloroisopropyl)ether	108-60-1	5	NT	ND	ND	ND
Caprolactam	105-60-2	~	NT	ND	ND	ND
Carbazole	86-74-8	~	NT	ND	ND	ND
Dibenzofuran	132-64-9	~	NT	ND	ND	ND
Diethyl phthalate	84-66-2	50	NT	ND	ND	ND
Dimethyl phthalate	131-11-3	50	NT	ND	ND	ND
Di-n-butyl phthalate	84-74-2	50	NT	ND	ND	ND
Di-n-octyl phthalate	117-84-0	50	NT	ND	ND	ND
Diphenylamine	122-39-4	~	NT	ND	ND	ND
Hexachlorocyclopentadiene	77-47-4	5	NT	ND	ND	ND
Isophorone	78-59-1	50	NT	ND	ND	ND
N-nitroso-di-n-propylamine	621-64-7	~	NT	ND	ND	ND
N-Nitrosodiphenylamine	86-30-6	50	NT	ND	ND	ND
Phenol	108-95-2	1	NT	ND	ND	ND
Pyridine	110-86-1	50	NT	ND	ND	ND
SVOA, 8270 SIM MASTER						
Acenaphthene	83-32-9	20	NT	ND	ND	ND
Acenaphthylene	208-96-8	~	NT	ND	ND	ND
Anthracene	120-12-7	50	NT	ND	0.0645	ND
Atrazine	1912-24-9	~	NT	ND	ND	ND
Benzo(a)anthracene	56-55-3	0.002	NT	ND	**0.0645**	ND
Benzo(a)pyrene	50-32-8	0.002	NT	ND	ND	ND
Benzo(b)fluoranthene	205-99-2	0.002	NT	ND	ND	ND
Benzo(g,h,i)perylene	191-24-2	~	NT	ND	ND	ND
Benzo(k)fluoranthene	207-08-9	0.002	NT	ND	ND	ND
Bis(2-ethylhexyl)phthalate	117-81-7	5	NT	2.33	3.550	ND
Chrysene	218-01-9	0.002	NT	ND	**0.0645**	ND
Dibenzo(a,h)anthracene	53-70-3	~	NT	ND	ND	ND
Fluoranthene	206-44-0	50	NT	ND	0.142	0.0889
Fluorene	86-73-7	50	NT	ND	0.297	0.459
Hexachlorobenzene	118-74-1	0.04	NT	ND	ND	ND
Hexachlorobutadiene	87-68-3	0.5	NT	ND	ND	ND
Hexachloroethane	67-72-1	5	NT	ND	ND	ND
Indeno(1,2,3-cd)pyrene	193-39-5	0.002	NT	ND	ND	ND
Naphthalene	91-20-3	10	NT	0.0966	0.271	0.237
Nitrobenzene	98-95-3	0.4	NT	ND	ND	ND
N-Nitrosodimethylamine	62-75-9	~	NT	ND	ND	ND
Pentachlorophenol	87-86-5	1	NT	ND	ND	ND
Phenanthrene	85-01-8	50	NT	0.069	0.219	0.148

Table 3
Remediation Investigation Groundwater Sample Analytical Results Summary
43-25 & 43-27 52nd Street
Queens, NY 11377
Project No. 22254

Sample ID Sampling Date Client Matrix Compound	CAS Number	NYSDEC TOGS Standards and Guidance Values - GA	TW-1 8/9/2023 GW ug/L	TW-2 8/8/2023 GW ug/L	TW-3 8/10/2023 GW ug/L	TW-53 8/10/2023 GW ug/L
Pyrene	129-00-0	50	NT	ND	0.129	ND
PEST, 8081 MASTER						
4,4'-DDD	72-54-8	0.3	NT	ND	ND	ND
4,4'-DDE	72-55-9	0.2	NT	ND	ND	ND
4,4'-DDT	50-29-3	0.2	NT	ND	ND	ND
Aldrin	309-00-2	~	NT	ND	ND	ND
alpha-BHC	319-84-6	0.01	NT	ND	ND	ND
alpha-Chlordane	5103-71-9	~	NT	0.00533	ND	ND
beta-BHC	319-85-7	0.04	NT	ND	ND	ND
Chlordane, total	57-74-9	0.05	NT	ND	ND	ND
delta-BHC	319-86-8	0.04	NT	ND	0.00511	ND
Dieldrin	60-57-1	0.004	NT	ND	ND	ND
Endosulfan I	959-98-8	~	NT	ND	ND	ND
Endosulfan II	33213-65-9	~	NT	ND	ND	ND
Endosulfan sulfate	1031-07-8	~	NT	ND	ND	ND
Endrin	72-20-8	~	NT	ND	ND	ND
Endrin aldehyde	7421-93-4	5	NT	ND	ND	ND
Endrin ketone	53494-70-5	5	NT	ND	ND	ND
gamma-BHC (Lindane)	58-89-9	0.05	NT	ND	ND	ND
gamma-Chlordane	5566-34-7	~	NT	0.0133	NT	ND
Heptachlor	76-44-8	0.04	NT	ND	ND	ND
Heptachlor epoxide	1024-57-3	0.03	NT	ND	ND	ND
Methoxychlor	72-43-5	35	NT	ND	ND	ND
Toxaphene	8001-35-2	0.06	NT	ND	ND	ND
Metals, Target Analyte, ICP						
Aluminum	7429-90-5	~	NT	109	18,100	15,600
Barium	7440-39-3	1000	NT	62.4	457	440
Calcium	7440-70-2	~	NT	50600	37,900	37,400
Chromium	7440-47-3	50	NT	6.68	**144**	**130**
Cobalt	7440-48-4	~	NT	ND	49.900	48.300
Copper	7440-50-8	200	NT	ND	180	174
Iron	7439-89-6	~	NT	731	40,800	37,200
Lead	7439-92-1	25	NT	ND	**62.6**	**58.3**
Magnesium	7439-95-4	35000	NT	23500	14,100	13,500
Manganese	7439-96-5	300	NT	**1470**	**3,130**	**3,090**
Nickel	7440-02-0	100	NT	ND	**146**	**142**
Potassium	7440-09-7	~	NT	3920	6,170	5,630
Silver	7440-22-4	50	NT	ND		ND
Sodium	7440-23-5	20000	NT	16700	**31,100**	**30,800**
Vanadium	7440-62-2	~	NT	ND	48.400	44.500
Zinc	7440-66-6	2000	NT	30.6	170	165
Metals, Target Analyte, ICP Dissolved						
Aluminum	7429-90-5	~	NT	60.100	63	ND
Barium	7440-39-3	1000	NT	56.700	72.300	72.500
Calcium	7440-70-2	~	NT	48700 B	53000 B	53100 B
Chromium	7440-47-3	50	NT	ND	ND	ND
Cobalt	7440-48-4	~	NT	ND	ND	ND
Copper	7440-50-8	200	NT	ND	ND	ND
Iron	7439-89-6	~	NT	ND	ND	ND
Lead	7439-92-1	25	NT	6.070	ND	ND
Magnesium	7439-95-4	35000	NT	23,000	22,500	22,600
Manganese	7439-96-5	300	NT	**1,430**	**2,340**	**2,270**
Nickel	7440-02-0	100	NT	12.800	18.500	18.300
Potassium	7440-09-7	~	NT	4,260	4,660	4,730
Silver	7440-22-4	50	NT	ND	ND	ND
Sodium	7440-23-5	20000	NT	16,300	18,000	18,000
Vanadium	7440-62-2	~	NT	ND	ND	ND
Zinc	7440-66-6	2000	NT	36	35.900	ND
Metals, Target Analyte, ICPMS						
Antimony	7440-36-0	3	NT	ND	ND	ND
Arsenic	7440-38-2	25	NT	ND	2.170	2.180
Beryllium	7440-41-7	3	NT	ND	2.030	1.990
Cadmium	7440-43-9	5	NT	ND	ND	ND
Selenium	7782-49-2	10	NT	3.74	**26.5**	**28.5**
Thallium	7440-28-0	~	NT	ND	ND	ND
Metals, Target Analyte, ICPMS Dissolved						
Antimony	7440-36-0	3	NT	ND	ND	ND
Arsenic	7440-38-2	25	NT	ND	ND	ND
Beryllium	7440-41-7	3	NT	ND	ND	ND
Cadmium	7440-43-9	5	NT	ND	ND	ND
Selenium	7782-49-2	10	NT	4.050	3.590	2.800
Thallium	7440-28-0	~	NT	ND	ND	ND
Mercury by 7470/7471						

Table 3
Remediation Investigation Groundwater Sample Analytical Results Summary
43-25 & 43-27 52nd Street
Queens, NY 11377
Project No. 22254

Sample ID Sampling Date Client Matrix	CAS Number	NYSDEC TOGS Standards and Guidance Values - GA	TW-1 8/9/2023 GW	TW-2 8/8/2023 GW	TW-3 8/10/2023 GW	TW-53 8/10/2023 GW
Compound			ug/L	ug/L	ug/L	ug/L
Mercury	7439-97-6	0.7	NT	0.2	ND	0.600
Chromium, Hexavalent						
Chromium, Hexavalent	18540-29-9	50	NT	ND	ND	ND
Cyanide, Total						
Cyanide, total	57-12-5	200	NT	ND	ND	ND
PCB, 8082 MASTER						
Aroclor 1016	12674-11-2	~	NT	ND	ND	ND
Aroclor 1221	11104-28-2	~	NT	ND	ND	ND
Aroclor 1232	11141-16-5	~	NT	ND	ND	ND
Aroclor 1242	53469-21-9	~	NT	ND	ND	ND
Aroclor 1248	12672-29-6	~	NT	ND	ND	ND
Aroclor 1254	11097-69-1	~	NT	ND	ND	ND
Aroclor 1260	11096-82-5	~	NT	ND	ND	ND
Total PCBs	1336-36-3	0.09	NT	ND	ND	ND
PFAS, EPA 1633 Target List						
11CL-PF3OUdS	763051-92-9	~	ND	ND	ND	ND
1H,1H,2H,2H-Perfluorodecanesulfonic acid (8:2 FTS)	39108-34-4	~	ND	ND	ND	ND
1H,1H,2H,2H-Perfluorohexanesulfonic acid (4:2 FTS)	757124-72-4	~	ND	ND	ND	ND
1H,1H,2H,2H-Perfluorooctanesulfonic acid (6:2 FTS)	27619-97-2	~	0.0169	0.0361	0.00502 J	0.00619 J
3-Perfluoroheptyl propanoic acid (FHpPA)	812-70-4	~	ND	ND	ND	ND
3-Perfluoropentyl propanoic acid (FPePA)	914637-49-3	~	ND	ND	ND	ND
3-Perfluoropropyl propanoic acid (FPrPA)	356-02-5	~	ND	ND	ND	ND
9CL-PF3ONS	756426-58-1	~	ND	ND	ND	ND
ADONA	919005-14-4	~	ND	ND	ND	ND
HFPO-DA (Gen-X)	13252-13-6	~	ND	ND	ND	ND
N-EtFOSA	4151-50-2	~	ND	ND	ND	ND
N-EtFOSAA	2991-50-6	~	ND	ND	ND	ND
N-EtFOSE	1691-99-2	~	ND	ND	ND	ND
N-MeFOSA	31506-32-8	~	ND	ND	ND	ND
N-MeFOSAA	2355-31-9	~	ND	ND	ND	ND
N-MeFOSE	24448-09-7	~	ND	ND	ND	ND
Perfluoro(2-ethoxyethane)sulfonic acid (PFEESA)	113507-82-7	~	ND	ND	ND	ND
Perfluoro-1-decanesulfonic acid (PFDS)	335-77-3	~	ND	ND	ND	ND
Perfluoro-1-heptanesulfonic acid (PFHpS)	375-92-8	~	ND	ND	ND	ND
Perfluoro-1-nonanesulfonic acid (PFNS)	68259-12-1	~	ND	ND	ND	ND
Perfluoro-1-octanesulfonamide (FOSA)	754-91-6	~	ND	ND	ND	ND
Perfluoro-1-pentanesulfonate (PFPeS)	2706-91-4	~	ND	0.000934J	ND	ND
Perfluoro-3,6-dioxaheptanoic acid (NFDHA)	151772-58-6	~	ND	ND	ND	ND
Perfluoro-4-oxapentanoic acid (PFMPA)	377-73-1	~	ND	ND	ND	ND
Perfluoro-5-oxahexanoic acid (PFMBA)	863090-89-5	~	ND	ND	ND	ND
Perfluorobutanesulfonic acid (PFBS)	375-73-5	~	ND	0.00569	ND	ND
Perfluorodecanoic acid (PFDA)	335-76-2	~	ND	ND	ND	ND
Perfluorododecanesulfonic acid (PFDoS)	79780-39-5	~	ND	ND	ND	ND
Perfluorododecanoic acid (PFDoA)	307-55-1	~	ND	ND	ND	ND
Perfluoroheptanoic acid (PFHpA)	375-85-9	~	ND	0.00913	ND	ND
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	~	ND	0.00513	ND	ND
Perfluorohexanoic acid (PFHxA)	307-24-4	~	ND	0.0217	ND	ND
Perfluoro-n-butanoic acid (PFBA)	375-22-4	~	ND	0.0102	ND	ND
Perfluorononanoic acid (PFNA)	375-95-1	~	ND	0.0011	ND	ND
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	0.0027	0.0038	0.00302	ND	ND
Perfluorooctanoic acid (PFOA)	335-67-1	0.0067	ND	0.0579	ND	ND
Perfluoropentanoic acid (PFPeA)	2706-90-3	~	ND	0.0231	ND	ND
Perfluorotetradecanoic acid (PFTA)	376-06-7	~	ND	ND	ND	ND
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	~	ND	ND	ND	ND
Perfluoroundecanoic acid (PFUnA)	2058-94-8	~	ND	ND	ND	ND

NOTES:

J=analyte detected at or above the MDL (method detection limit) but below the RL (Reporting Limit) - data is estimated

B=analyte found in the analysis batch blank

ND-indicates that the analyte was not detected

NT- indicates that the sample was not taken for analysis

Indicates that the analyte exceeds the NYSDEC TOGS Standards and Guidance Values

Table 4
Remedial Investigation Soil Vapor Sample Analytical Results Summary
43-25 & 43-27 52nd Street
Queens, NY 11377
Project No. 22254

Sample ID Sampling Date Client Matrix		SV-1 7/20/2023 Soil Vapor	SV-2 7/21/2023 Soil Vapor	SV-52 7/21/2023 Soil Vapor	SV-3 7/21/2023 Soil Vapor	SV-4 7/20/2023 Soil Vapor	SV-5 7/20/2023 Soil Vapor	SV-6 7/21/2023 Soil Vapor
Compound	**CAS Number**	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3
1,1,1,2-Tetrachloroethane	630-20-6	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	71-55-6	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	79-34-5	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	76-13-1	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	79-00-5	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	75-34-3	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethylene	75-35-4	ND	ND	ND	9	ND	ND	ND
1,2,4-Trichlorobenzene	120-82-1	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	95-63-6	7.4	ND	ND	ND	ND	ND	ND
1,2-Dibromoethane	106-93-4	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	95-50-1	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	107-06-2	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	78-87-5	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorotetrafluoroethane	76-14-2	ND	ND	ND	ND	ND	ND	ND
1,3,5-Trimethylbenzene	108-67-8	ND	ND	ND	ND	ND	ND	ND
1,3-Butadiene	106-99-0	19	ND	120	ND	26	ND	190
1,3-Dichlorobenzene	541-73-1	ND	ND	ND	ND	ND	ND	ND
1,3-Dichloropropane	142-28-9	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	106-46-7	ND	ND	ND	ND	ND	ND	ND
1,4-Dioxane	123-91-1	ND	ND	ND	ND	ND	ND	ND
2-Butanone	78-93-3	34	30	26	38	22	14	34
2-Hexanone	591-78-6	7.6	8.2	ND	ND	ND	ND	ND
3-Chloropropene	107-05-1	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-pentanone	108-10-1	ND	ND	ND	ND	ND	9.9	ND
Acetone	67-64-1	510	54	64	65	50	23	59
Acrylonitrile	107-13-1	ND	ND	ND	28	ND	ND	ND
Benzene	71-43-2	8.7	13	26	23	6.8	8.9	32
Benzyl chloride	100-44-7	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	75-27-4	ND	ND	ND	ND	ND	ND	ND
Bromoform	75-25-2	ND	ND	ND	ND	ND	ND	ND
Bromomethane	74-83-9	ND	ND	ND	ND	ND	ND	ND
Carbon disulfide	75-15-0	6.7	20	16	8.7	ND	ND	11

Table 4
Remedial Investigation Soil Vapor Sample Analytical Results Summary
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Sample ID Sampling Date Client Matrix		SV-1 7/20/2023 Soil Vapor	SV-2 7/21/2023 Soil Vapor	SV-52 7/21/2023 Soil Vapor	SV-3 7/21/2023 Soil Vapor	SV-4 7/20/2023 Soil Vapor	SV-5 7/20/2023 Soil Vapor	SV-6 7/21/2023 Soil Vapor
Compound	**CAS Number**	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3
Carbon tetrachloride	56-23-5	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	108-90-7	ND	ND	ND	ND	ND	ND	ND
Chloroethane	75-00-3	ND	ND	ND	ND	ND	ND	ND
Chloroform	67-66-3	3.4	4.9	11	22	ND	ND	ND
Chloromethane	74-87-3	1.8	ND	ND	ND	ND	ND	ND
cis-1,2-Dichloroethylene	156-59-2	0.92	23	170	210	31	770	40
cis-1,3-Dichloropropylene	10061-01-5	ND	ND	ND	ND	ND	ND	ND
Cyclohexane	110-82-7	2.4	ND	6.6	ND	ND	ND	ND
Dibromochloromethane	124-48-1	ND	ND	ND	ND	ND	ND	ND
Dichlorodifluoromethane	75-71-8	3.1	ND	ND	ND	ND	ND	ND
Ethyl acetate	141-78-6	ND	ND	ND	ND	ND	ND	ND
Ethyl Benzene	100-41-4	2.5	6.7	ND	ND	8.4	8.1	7.2
Hexachlorobutadiene	87-68-3	ND	ND	ND	ND	ND	ND	ND
Isopropanol	67-63-0	16	15	ND	ND	24	25	ND
Methyl Methacrylate	80-62-6	6.1	ND	ND	ND	ND	ND	ND
Methyl tert-butyl ether (MTBE)	1634-04-4	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	75-09-2	ND	ND	12	ND	ND	ND	ND
n-Heptane	142-82-5	ND	ND	ND	ND	13	ND	ND
n-Hexane	110-54-3	14	33	92	80	20	7.2	140
o-Xylene	95-47-6	3.5	8.3	8.3	8.3	10	11	9.3
p- & m- Xylenes	179601-23-1	7.5	23	23	22	28	29	24
p-Ethyltoluene	622-96-8	5.4	4.9	ND	ND	ND	ND	ND
Propylene	115-07-1	280	150	1600	1100	1600	ND	5100
Styrene	100-42-5	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethylene	127-18-4	1100	1300	1400	730	220	4600	330
Tetrahydrofuran	109-99-9	ND	ND	ND	ND	ND	ND	ND
Toluene	108-88-3	9.4	47	45	45	55	52	48
trans-1,2-Dichloroethylene	156-60-5	ND	ND	ND	ND	ND	140	ND
trans-1,3-Dichloropropylene	10061-02-6	ND	ND	ND	ND	ND	ND	ND
Trichloroethylene	79-01-6	23	57	77	59	25	850	16
Trichlorofluoromethane (Freon 11)	75-69-4	ND	ND	ND	ND	ND	ND	ND
Vinyl acetate	108-05-4	ND	ND	ND	ND	ND	ND	ND

Table 4
Remedial Investigation Soil Vapor Sample Analytical Results Summary
43-25 & 43-27 52nd Street
Queens, NY 11377
Project No. 22254

Sample ID Sampling Date Client Matrix		SV-1 7/20/2023 Soil Vapor	SV-2 7/21/2023 Soil Vapor	SV-52 7/21/2023 Soil Vapor	SV-3 7/21/2023 Soil Vapor	SV-4 7/20/2023 Soil Vapor	SV-5 7/20/2023 Soil Vapor	SV-6 7/21/2023 Soil Vapor
Compound	**CAS Number**	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3
Vinyl bromide	593-60-2	ND	ND	ND	ND	ND	ND	ND
Vinyl Chloride	75-01-4	ND	ND	ND	6.7	ND	ND	ND

NOTES:
ND = indicates that the analyte was Not Detected.

Table 5
Outdoor and Indoor Ambient Air Sample Analytical Results Summary
43-25 & 43-27 52nd Street
Queens, NY 11377
Project No. 22254

Sample ID Sampling Date Client Matrix		AA1 7/19/2023 Outdoor Ambient Air	IA-1 7/19/2023 Indoor Ambient Air	IA-2 7/19/2023 Indoor Ambient Air
Compound	**CAS Number**	ug/m3	ug/m3	ug/m3
1,1,1,2-Tetrachloroethane	630-20-6	ND	ND	ND
1,1,1-Trichloroethane	71-55-6	ND	ND	ND
1,1,2,2-Tetrachloroethane	79-34-5	ND	ND	ND
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	76-13-1	ND	ND	ND
1,1,2-Trichloroethane	79-00-5	ND	ND	ND
1,1-Dichloroethane	75-34-3	ND	ND	ND
1,1-Dichloroethylene	75-35-4	ND	ND	ND
1,2,4-Trichlorobenzene	120-82-1	ND	ND	ND
1,2,4-Trimethylbenzene	95-63-6	7.1	ND	5.8
1,2-Dibromoethane	106-93-4	ND	ND	ND
1,2-Dichlorobenzene	95-50-1	ND	ND	ND
1,2-Dichloroethane	107-06-2	ND	ND	ND
1,2-Dichloropropane	78-87-5	ND	ND	ND
1,2-Dichlorotetrafluoroethane	76-14-2	ND	ND	ND
1,3,5-Trimethylbenzene	108-67-8	ND	1.3	ND
1,3-Butadiene	106-99-0	ND	ND	ND
1,3-Dichlorobenzene	541-73-1	ND	ND	ND
1,3-Dichloropropane	142-28-9	ND	ND	ND
1,4-Dichlorobenzene	106-46-7	ND	ND	ND
1,4-Dioxane	123-91-1	ND	ND	ND
2-Butanone	78-93-3	430	120	290
2-Hexanone	591-78-6	52	14	31
3-Chloropropene	107-05-1	ND	ND	ND
4-Methyl-2-pentanone	108-10-1	ND	ND	ND
Acetone	67-64-1	190	56	120
Acrylonitrile	107-13-1	ND	ND	ND
Benzene	71-43-2	1.8	1.8	1.9
Benzyl chloride	100-44-7	ND	ND	ND
Bromodichloromethane	75-27-4	ND	ND	ND
Bromoform	75-25-2	ND	ND	ND
Bromomethane	74-83-9	ND	ND	ND
Carbon disulfide	75-15-0	0.55	0.57	0.48
Carbon tetrachloride	56-23-5	0.5	0.4	0.4
Chlorobenzene	108-90-7	ND	ND	ND
Chloroethane	75-00-3	ND	ND	ND
Chloroform	67-66-3	ND	ND	ND
Chloromethane	74-87-3	1.4	1.2	ND
cis-1,2-Dichloroethylene	156-59-2	ND	ND	ND
cis-1,3-Dichloropropylene	10061-01-5	ND	ND	ND
Cyclohexane	110-82-7	0.67	0.63	0.63
Dibromochloromethane	124-48-1	ND	ND	ND
Dichlorodifluoromethane	75-71-8	2.4	2	2.1
Ethyl acetate	141-78-6	3.8	1.9	2.3
Ethyl Benzene	100-41-4	4.5	12	3.8
Hexachlorobutadiene	87-68-3	ND	ND	ND
Isopropanol	67-63-0	39	5.3	4.2
Methyl Methacrylate	80-62-6	ND	ND	ND
Methyl tert-butyl ether (MTBE)	1634-04-4	ND	ND	ND
Methylene chloride	75-09-2	ND	0.76	0.64
n-Heptane	142-82-5	ND	4	ND
n-Hexane	110-54-3	2.4	2.1	2.4
o-Xylene	95-47-6	6	16	5.3
p- & m- Xylenes	179601-23-1	19	49	16
p-Ethyltoluene	622-96-8	6.2	4.7	5.4
Propylene	115-07-1	ND	ND	ND
Styrene	100-42-5	ND	ND	1.1
Tetrachloroethylene	127-18-4	13	15	10
Tetrahydrofuran	109-99-9	2	0.89	1.2
Toluene	108-88-3	18	14	14
trans-1,2-Dichloroethylene	156-60-5	ND	ND	ND
trans-1,3-Dichloropropylene	10061-02-6	ND	ND	ND
Trichloroethylene	79-01-6	0.29	0.29	0.34
Trichlorofluoromethane (Freon 11)	75-69-4	1.3	1.1	1.1
Vinyl acetate	108-05-4	ND	ND	ND
Vinyl bromide	593-60-2	ND	ND	ND
Vinyl Chloride	75-01-4	ND	ND	ND

NOTES:
ND = indicates that the analyte was Not Detected.

Table 6
Remedial Investigation QA/QC Sample Analytical Results Summary
43-25 & 43-27 52nd Street
Queens, NY 11377
Project No. 22254

Sample ID Sampling Date Client Matrix		TB08092023 8/9/2023 Water	TB_08012023 8/1/2023 Water	Trip Blank 7/27/2023 Water	TB_07252023 7/25/2023 Water	TB 07212023 7/21/2023 Water	TB-20230719 7/19/2023 Water	TB08102023 8/10/2023 Water	EB 07212023-1 7/21/2023 Water	EB 07212023-2 7/21/2023 Water	EB08102023 8/10/2023 Water
Compound	**CAS Number**	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
VOA, 8260 LOW MASTER											
1,1,1,2-Tetrachloroethane	630-20-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	71-55-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	79-34-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	76-13-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	79-00-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	75-34-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethylene	75-35-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3-Trichlorobenzene	87-61-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3-Trichloropropane	96-18-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	120-82-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	95-63-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dibromo-3-chloropropane	96-12-8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dibromoethane	106-93-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	95-50-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	107-06-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	78-87-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3,5-Trimethylbenzene	108-67-8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	541-73-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	106-46-7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dioxane	123-91-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone	78-93-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Hexanone	591-78-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-pentanone	108-10-1	3.03	3.31	ND	4.01	ND	ND	ND	ND	ND	ND
Acetone	67-64-1	ND	ND	ND	ND	5.54	ND	3	ND	ND	ND
Acrolein	107-02-8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acrylonitrile	107-13-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	71-43-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromochloromethane	74-97-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	75-27-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	75-25-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane	74-83-9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon disulfide	75-15-0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon tetrachloride	56-23-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	108-90-7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	75-00-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	67-66-3	ND	ND	0.94	ND	ND	ND	ND	0.82	0.86	0.76
Chloromethane	74-87-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,2-Dichloroethylene	156-59-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,3-Dichloropropylene	10061-01-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Table 6
Remedial Investigation QA/QC Sample Analytical Results Summary
43-25 & 43-27 52nd Street
Queens, NY 11377
Project No. 22254

Sample ID Sampling Date Client Matrix		TB08092023 8/9/2023 Water	TB_08012023 8/1/2023 Water	Trip Blank 7/27/2023 Water	TB_07252023 7/25/2023 Water	TB 07212023 7/21/2023 Water	TB-20230719 7/19/2023 Water	TB08102023 8/10/2023 Water	EB 07212023-1 7/21/2023 Water	EB 07212023-2 7/21/2023 Water	EB08102023 8/10/2023 Water
Compound	**CAS Number**	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
VOA, 8260 LOW MASTER											
Cyclohexane	110-82-7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	124-48-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibromomethane	74-95-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dichlorodifluoromethane	75-71-8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethyl Benzene	100-41-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorobutadiene	87-68-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Isopropylbenzene	98-82-8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methyl acetate	79-20-9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methyl tert-butyl ether (MTBE)	1634-04-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylcyclohexane	108-87-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	75-09-2	ND	ND	ND	ND	0.59J	0.55J	0.46JB	ND	ND	ND
n-Butylbenzene	104-51-8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
n-Propylbenzene	103-65-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
o-Xylene	95-47-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
p- & m- Xylenes	179601-23-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
p-Isopropyltoluene	99-87-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
sec-Butylbenzene	135-98-8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Styrene	100-42-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
tert-Butyl alcohol (TBA)	75-65-0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
tert-Butylbenzene	98-06-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethylene	127-18-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	108-88-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethylene	156-60-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,3-Dichloropropylene	10061-02-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethylene	79-01-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane	75-69-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl Chloride	75-01-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Xylenes, Total	1330-20-7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Semi-Volatiles, 1,4-Dioxane 8270 SIM-Aqueous											
1,4-Dioxane	123-91-1	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
SVOA, 8270 LOW MASTER											
1,1-Biphenyl	92-52-4	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
1,2,4,5-Tetrachlorobenzene	95-94-3	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
1,2-Diphenylhydrazine (as Azobenzene)	122-66-7	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
2,3,4,6-Tetrachlorophenol	58-90-2	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
2,4,5-Trichlorophenol	95-95-4	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
2,4,6-Trichlorophenol	88-06-2	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
2,4-Dichlorophenol	120-83-2	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
2,4-Dimethylphenol	105-67-9	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND

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Sample ID Sampling Date Client Matrix		TB08092023 8/9/2023 Water	TB_08012023 8/1/2023 Water	Trip Blank 7/27/2023 Water	TB_07252023 7/25/2023 Water	TB 07212023 7/21/2023 Water	TB-20230719 7/19/2023 Water	TB08102023 8/10/2023 Water	EB 07212023-1 7/21/2023 Water	EB 07212023-2 7/21/2023 Water	EB08102023 8/10/2023 Water
Compound	**CAS Number**	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
VOA, 8260 LOW MASTER											
2,4-Dinitrophenol	51-28-5	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
2,4-Dinitrotoluene	121-14-2	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
2,6-Dinitrotoluene	606-20-2	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
2-Chloronaphthalene	91-58-7	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
2-Chlorophenol	95-57-8	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
2-Methylnaphthalene	91-57-6	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
2-Methylphenol	95-48-7	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
2-Nitroaniline	88-74-4	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
2-Nitrophenol	88-75-5	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
3- & 4-Methylphenols	65794-96-9	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
3,3-Dichlorobenzidine	91-94-1	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
3-Nitroaniline	99-09-2	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
4,6-Dinitro-2-methylphenol	534-52-1	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
4-Bromophenyl phenyl ether	101-55-3	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
4-Chloro-3-methylphenol	59-50-7	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
4-Chloroaniline	106-47-8	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
4-Chlorophenyl phenyl ether	7005-72-3	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
4-Nitroaniline	100-01-6	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
4-Nitrophenol	100-02-7	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
Acetophenone	98-86-2	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
Aniline	62-53-3	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
Benzaldehyde	100-52-7	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
Benzidine	92-87-5	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
Benzoic acid	65-85-0	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
Benzyl alcohol	100-51-6	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
Benzyl butyl phthalate	85-68-7	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
Bis(2-chloroethoxy)methane	111-91-1	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
Bis(2-chloroethyl)ether	111-44-4	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
Bis(2-chloroisopropyl)ether	108-60-1	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
Caprolactam	105-60-2	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
Carbazole	86-74-8	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
Dibenzofuran	132-64-9	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
Diethyl phthalate	84-66-2	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
Dimethyl phthalate	131-11-3	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
Di-n-butyl phthalate	84-74-2	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
Di-n-octyl phthalate	117-84-0	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
Diphenylamine	122-39-4	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
Hexachlorocyclopentadiene	77-47-4	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
Isophorone	78-59-1	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND

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Sample ID Sampling Date Client Matrix		TB08092023 8/9/2023 Water	TB_08012023 8/1/2023 Water	Trip Blank 7/27/2023 Water	TB_07252023 7/25/2023 Water	TB 07212023 7/21/2023 Water	TB-20230719 7/19/2023 Water	TB08102023 8/10/2023 Water	EB 07212023-1 7/21/2023 Water	EB 07212023-2 7/21/2023 Water	EB08102023 8/10/2023 Water
Compound	**CAS Number**	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
VOA, 8260 LOW MASTER											
N-nitroso-di-n-propylamine	621-64-7	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
N-Nitrosodiphenylamine	86-30-6	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
Phenol	108-95-2	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
Pyridine	110-86-1	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
SVOA, 8270 SIM MASTER											
Acenaphthene	83-32-9	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
Acenaphthylene	208-96-8	NT	NT	NT	NT	NT	NT	NT	ND	0.111	ND
Anthracene	120-12-7	NT	NT	NT	NT	NT	NT	NT	ND	0.222	ND
Atrazine	1912-24-9	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
Benzo(a)anthracene	56-55-3	NT	NT	NT	NT	NT	NT	NT	ND	0.111	ND
Benzo(a)pyrene	50-32-8	NT	NT	NT	NT	NT	NT	NT	ND	0.0667	ND
Benzo(b)fluoranthene	205-99-2	NT	NT	NT	NT	NT	NT	NT	ND	0.0667	ND
Benzo(g,h,i)perylene	191-24-2	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
Benzo(k)fluoranthene	207-08-9	NT	NT	NT	NT	NT	NT	NT	ND	0.0556	ND
Bis(2-ethylhexyl)phthalate	117-81-7	NT	NT	NT	NT	NT	NT	NT	2.87	1.51	1.16B
Chrysene	218-01-9	NT	NT	NT	NT	NT	NT	NT	ND	0.0889	ND
Dibenzo(a,h)anthracene	53-70-3	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
Fluoranthene	206-44-0	NT	NT	NT	NT	NT	NT	NT	ND	0.233	0.0947
Fluorene	86-73-7	NT	NT	NT	NT	NT	NT	NT	ND	0.189	0.0526
Hexachlorobenzene	118-74-1	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
Hexachlorobutadiene	87-68-3	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
Hexachloroethane	67-72-1	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
Indeno(1,2,3-cd)pyrene	193-39-5	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
Naphthalene	91-20-3	NT	NT	NT	NT	NT	NT	NT	0.459B	0.156B	0.253
Nitrobenzene	98-95-3	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
N-Nitrosodimethylamine	62-75-9	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
Pentachlorophenol	87-86-5	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
Phenanthrene	85-01-8	NT	NT	NT	NT	NT	NT	NT	0.0706	0.8	0.168
Pyrene	129-00-0	NT	NT	NT	NT	NT	NT	NT	ND	0.311	0.0632
PEST, 8081 MASTER											
4,4'-DDD	72-54-8	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
4,4'-DDE	72-55-9	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
4,4'-DDT	50-29-3	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
Aldrin	309-00-2	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
alpha-BHC	319-84-6	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
alpha-Chlordane	5103-71-9	NT	NT	NT	NT	NT	NT	NT	ND	0.004	0.00421P
beta-BHC	319-85-7	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
Chlordane, total	57-74-9	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
delta-BHC	319-86-8	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND

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Sample ID Sampling Date Client Matrix		TB08092023 8/9/2023 Water	TB_08012023 8/1/2023 Water	Trip Blank 7/27/2023 Water	TB_07252023 7/25/2023 Water	TB 07212023 7/21/2023 Water	TB-20230719 7/19/2023 Water	TB08102023 8/10/2023 Water	EB 07212023-1 7/21/2023 Water	EB 07212023-2 7/21/2023 Water	EB08102023 8/10/2023 Water
Compound	**CAS Number**	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
VOA, 8260 LOW MASTER											
Dieldrin	60-57-1	NT	NT	NT	NT	NT	NT	NT	0.002	ND	0.00211P
Endosulfan I	959-98-8	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
Endosulfan II	33213-65-9	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
Endosulfan sulfate	1031-07-8	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
Endrin	72-20-8	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
Endrin aldehyde	7421-93-4	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
Endrin ketone	53494-70-5	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
gamma-BHC (Lindane)	58-89-9	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
gamma-Chlordane	5566-34-7	NT	NT	NT	NT	NT	NT	NT	0.01	0.01	0.0105P
Heptachlor	76-44-8	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
Heptachlor epoxide	1024-57-3	NT	NT	NT	NT	NT	NT	NT	ND	ND	0.00421P
Methoxychlor	72-43-5	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
Toxaphene	8001-35-2	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
Metals, Target Analyte, ICP											
Aluminum	7429-90-5	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
Barium	7440-39-3	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
Calcium	7440-70-2	NT	NT	NT	NT	NT	NT	NT	174	133	262
Chromium	7440-47-3	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
Cobalt	7440-48-4	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
Copper	7440-50-8	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
Iron	7439-89-6	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
Lead	7439-92-1	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
Magnesium	7439-95-4	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
Manganese	7439-96-5	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
Nickel	7440-02-0	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
Potassium	7440-09-7	NT	NT	NT	NT	NT	NT	NT	ND	111	ND
Silver	7440-22-4	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
Sodium	7440-23-5	NT	NT	NT	NT	NT	NT	NT	671	688	924
Vanadium	7440-62-2	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
Zinc	7440-66-6	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
Metals, Target Analyte, ICPMS											
Antimony	7440-36-0	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
Arsenic	7440-38-2	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
Beryllium	7440-41-7	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
Cadmium	7440-43-9	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
Selenium	7782-49-2	NT	NT	NT	NT	NT	NT	NT	1.34B	ND	4.53B
Thallium	7440-28-0	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
Mercury by 7470/7471											
Mercury	7439-97-6	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND

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Sample ID Sampling Date Client Matrix		TB08092023 8/9/2023 Water	TB_08012023 8/1/2023 Water	Trip Blank 7/27/2023 Water	TB_07252023 7/25/2023 Water	TB 07212023 7/21/2023 Water	TB-20230719 7/19/2023 Water	TB08102023 8/10/2023 Water	EB 07212023-1 7/21/2023 Water	EB 07212023-2 7/21/2023 Water	EB08102023 8/10/2023 Water
Compound	**CAS Number**	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
VOA, 8260 LOW MASTER											
Chromium, Hexavalent											
Chromium, Hexavalent	18540-29-9	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
Cyanide, Total											
Cyanide, total	57-12-5	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
PCB, 8082 Master											
Aroclor 1016	12674-11-2	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
Aroclor 1221	11104-28-2	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
Aroclor 1232	11141-16-5	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
Aroclor 1242	53469-21-9	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
Aroclor 1248	12672-29-6	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
Aroclor 1254	11097-69-1	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
Aroclor 1260	11096-82-5	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
Total PCBs	1336-36-3	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND
PFAS, EPA 1633 Target List											
11CL-PF3OUdS	763051-92-9	NT	NT	NT	NT	NT	NT	NT	ND	ND	NT
1H,1H,2H,2H-Perfluorodecanesulfonic acid (8:2 FT	39108-34-4	NT	NT	NT	NT	NT	NT	NT	ND	ND	NT
1H,1H,2H,2H-Perfluorohexanesulfonic acid (4:2 FT	757124-72-4	NT	NT	NT	NT	NT	NT	NT	ND	ND	NT
1H,1H,2H,2H-Perfluorooctanesulfonic acid (6:2 FT	27619-97-2	NT	NT	NT	NT	NT	NT	NT	ND	ND	NT
3-Perfluoroheptyl propanoic acid (FHpPA)	812-70-4	NT	NT	NT	NT	NT	NT	NT	ND	ND	NT
3-Perfluoropentyl propanoic acid (FPePA)	914637-49-3	NT	NT	NT	NT	NT	NT	NT	ND	ND	NT
3-Perfluoropropyl propanoic acid (FPrPA)	356-02-5	NT	NT	NT	NT	NT	NT	NT	ND	ND	NT
9CL-PF3ONS	756426-58-1	NT	NT	NT	NT	NT	NT	NT	ND	ND	NT
ADONA	919005-14-4	NT	NT	NT	NT	NT	NT	NT	ND	ND	NT
HFPO-DA (Gen-X)	13252-13-6	NT	NT	NT	NT	NT	NT	NT	ND	ND	NT
N-EtFOSA	4151-50-2	NT	NT	NT	NT	NT	NT	NT	ND	ND	NT
N-EtFOSAA	2991-50-6	NT	NT	NT	NT	NT	NT	NT	ND	ND	NT
N-EtFOSE	1691-99-2	NT	NT	NT	NT	NT	NT	NT	ND	ND	NT
N-MeFOSA	31506-32-8	NT	NT	NT	NT	NT	NT	NT	ND	ND	NT
N-MeFOSAA	2355-31-9	NT	NT	NT	NT	NT	NT	NT	ND	ND	NT
N-MeFOSE	24448-09-7	NT	NT	NT	NT	NT	NT	NT	ND	ND	NT
Perfluoro(2-ethoxyethane)sulfonic acid (PFEESA)	113507-82-7	NT	NT	NT	NT	NT	NT	NT	ND	ND	NT
Perfluoro-1-decanesulfonic acid (PFDS)	335-77-3	NT	NT	NT	NT	NT	NT	NT	ND	ND	NT
Perfluoro-1-heptanesulfonic acid (PFHpS)	375-92-8	NT	NT	NT	NT	NT	NT	NT	ND	ND	NT
Perfluoro-1-nonanesulfonic acid (PFNS)	68259-12-1	NT	NT	NT	NT	NT	NT	NT	ND	ND	NT
Perfluoro-1-octanesulfonamide (FOSA)	754-91-6	NT	NT	NT	NT	NT	NT	NT	ND	ND	NT
Perfluoro-1-pentanesulfonate (PFPeS)	2706-91-4	NT	NT	NT	NT	NT	NT	NT	ND	ND	NT
Perfluoro-3,6-dioxaheptanoic acid (NFDHA)	151772-58-6	NT	NT	NT	NT	NT	NT	NT	ND	ND	NT
Perfluoro-4-oxapentanoic acid (PFMPA)	377-73-1	NT	NT	NT	NT	NT	NT	NT	ND	ND	NT
Perfluoro-5-oxahexanoic acid (PFMBA)	863090-89-5	NT	NT	NT	NT	NT	NT	NT	ND	ND	NT

Table 6
Remedial Investigation QA/QC Sample Analytical Results Summary
43-25 & 43-27 52nd Street
Queens, NY 11377
Project No. 22254

Sample ID		TB08092023	TB_08012023	Trip Blank	TB_07252023	TB 07212023	TB-20230719	TB08102023	EB 07212023-1	EB 07212023-2	EB08102023
Sampling Date		8/9/2023	8/1/2023	7/27/2023	7/25/2023	7/21/2023	7/19/2023	8/10/2023	7/21/2023	7/21/2023	8/10/2023
Client Matrix		Water	Water	Water	Water	Water	Water	Water	Water	Water	Water
Compound	**CAS Number**	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
VOA, 8260 LOW MASTER											
Perfluorobutanesulfonic acid (PFBS)	375-73-5	NT	NT	NT	NT	NT	NT	NT	ND	ND	NT
Perfluorodecanoic acid (PFDA)	335-76-2	NT	NT	NT	NT	NT	NT	NT	ND	ND	NT
Perfluorododecanesulfonic acid (PFDoS)	79780-39-5	NT	NT	NT	NT	NT	NT	NT	ND	ND	NT
Perfluorododecanoic acid (PFDoA)	307-55-1	NT	NT	NT	NT	NT	NT	NT	ND	ND	NT
Perfluoroheptanoic acid (PFHpA)	375-85-9	NT	NT	NT	NT	NT	NT	NT	ND	ND	NT
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	NT	NT	NT	NT	NT	NT	NT	ND	ND	NT
Perfluorohexanoic acid (PFHxA)	307-24-4	NT	NT	NT	NT	NT	NT	NT	ND	ND	NT
Perfluoro-n-butanoic acid (PFBA)	375-22-4	NT	NT	NT	NT	NT	NT	NT	ND	0.000452J	NT
Perfluorononanoic acid (PFNA)	375-95-1	NT	NT	NT	NT	NT	NT	NT	ND	ND	NT
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	NT	NT	NT	NT	NT	NT	NT	ND	ND	NT
Perfluorooctanoic acid (PFOA)	335-67-1	NT	NT	NT	NT	NT	NT	NT	ND	ND	NT
Perfluoropentanoic acid (PFPeA)	2706-90-3	NT	NT	NT	NT	NT	NT	NT	ND	ND	NT
Perfluorotetradecanoic acid (PFTA)	376-06-7	NT	NT	NT	NT	NT	NT	NT	ND	ND	NT
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	NT	NT	NT	NT	NT	NT	NT	ND	ND	NT
Perfluoroundecanoic acid (PFUnA)	2058-94-8	NT	NT	NT	NT	NT	NT	NT	ND	ND	NT

NOTES:
J=analyte detected at or above the MDL (method detection limit) but below the RL (Reporting Limit) - data is estimated
B=analyte found in the analysis batch blank
P=this flag is used for pesticide and PCB (Aroclor) target compounds when there is a % difference for detected concentrations that exceed method dictated limits between the two GC columns used for analysis

APPENDIX E – Operations and Maintenance Manual

ENVIRO-EQUIPMENT, INC.
10120 Industrial Drive
PINEVILLE, NC 28134
704-556-7723 - Phone
704-556-7228 - Fax
www.enviroequipment.com

SYSTEM MANUAL

6129 PAL Environmental SVE System

Enviro-Equipment, Inc.

ENVIRO-EQUIPMENT, INC.
10120 Industrial Drive
PINEVILLE, NC 28134
704-556-7723 - Phone
704-556-7228 - Fax
www.enviroequipment.com

Table of Contents

Enviro-Equipment, Inc.

SVE 6129

General System Information

SVE Blower, Motor, Filters and Silencers

Carbon Drums

Control Panel

Enclosure and Fixtures

Flowmeters and Gauges

KO Tank

Valves and Switches

Enviro-Equipment Inc.
10120 Industrial Drive
Pineville NC 28134
704-556-7723

QUCIK REFERENCE MAINTENANCE PARTS AND INTERVALS

DESCRIPTION	MFG.	PART#	Frequency
SVE Blower Dilution Filter Element	Solberg	31P	Annually or as needed
SVE Blower Intake Filter Element	Solberg	239	Annually or as needed
SVE Blower Oil	Aeon	28G23	4000 Hours
SVE Blower Belts	Gates	3VX560	Annually or as needed

ALL MAINTENANCE PARTS ARE AVAILABLE FROM ENVIRO-EQUIPMENT. PLEASE CALL US AT 704-556-7723 OR EMAIL US AT REMEDIATION@ENVIROEQUIPMENT.COM TO ORDER MAINTENANCE PARTS!

EEI JOB 6129 - Operation and Maintenance Manual

General

- FIRST - Review all manufacturer documentation.
- Perform and document routine maintenance at manufacturer recommended intervals. Documentation of routine maintenance performed at manufacturer recommended intervals must be provided when making a warranty claim. Failure to perform and document routine maintenance at manufacturer recommended intervals will void any warranty claims.
- Only qualified individuals should connect, start up, operate, maintain and decommission this system.

System Control Panel

- FIRST – Review all control panel documentation.
- A licensed electrician should bring power from the electrical service into the main system control panel.
- Check all wiring connections for proper tightness and torque before powering the system. Verify proper grounding at the control panel. Verify all selector switches are in the OFF position. Verify all valve settings on each system component are set properly for startup.
- Verify proper voltage at the top of disconnect or main terminal block in the main system control panel enclosure.
- If the system has a phase monitor, adjust the phase monitor for proper input voltage, then turn the power on. Check for steady green light on phase monitor, if incorrect, turn off all power then switch L1 and L3.
- Close and secure the enclosure then turn power on to the system.
- Turn all HOA switches to the auto position. Operating in hand mode is for testing purposes only. Damage to the system may result from continuously operating in hand mode which will void the warranty.

Alarm Descriptions

Control Device	Result Condition	Control Panel Indication
Moisture Separator High Level Alarm	Shuts down SVE Blower	Moisture Separator High Level Alarm Light Illuminates

Alarm Troubleshooting

Component	Problem	Possible Cause	Solution
Any Pump or Blower Motor	Will not run in hand	Tripped overload or Faulty Component	Check to see if overload if tripped, if not tripped, contact EEI about faulty component
SVE Blower	Blower will run in hand but not in auto	Any High Liquid Level Alarm	Drain below High Level Alarm then Reset Alarm

Soil Vapor Extraction Blower

- FIRST - Review all Soil Vapor Extraction blower documentation.
- Ensure valves are open in vacuum lines. If the system has a dilution air valve open it completely. Start the blower up under as little vacuum as possible and increase the vacuum gradually as needed once started up.

- Ensure rotation is correct by "bumping" the blower on in hand mode and then off. Check rotation against rotation arrows or see if there is suction at the vacuum connections and pressure at the exhaust outlet. If rotation is backwards, have an electrician exchange two of the power leads. Be sure to lock out and tag the main incoming power. Verify that there is not power with a multimeter. If the system has a phase monitor the rotation should already be correct and this process may not be necessary.
- Do not operate beyond maximum vacuum capacity of the blower. Vacuum relief valve should be set at maximum vacuum threshold to protect blower.
- Check air filters per manufacturer's recommendation or at least once a month. Clean and replace as necessary.
- Check belts (if any) per manufacturer's recommendation or at least once a month. Replace as necessary.
- Check and change oil per manufacturer documentation.

Moisture Separator

- FIRST - Review all moisture separator documentation.
- If the moisture separator has a clear PVC sight glass, it should be removed and cleaned at least once a month or as necessary so the liquid level can be clearly read.
- If the moisture separator has a clean out port, the inside of the moisture separator should be flushed with clean water at least once a month or as necessary to remove any dirt or debris.
- The moisture separator high level alarm float (if any) is installed so the moisture separator does not flood and allow liquid to be sucked into the vacuum blower. Dirt and debris can cause this float to not operate properly so it should be gently flushed with clean water at least once a month or as necessary.
- The moisture separator low level and high level floats (if any) operate the moisture separator transfer pump (if any) while in auto mode. The low level float turns the pump off to prevent it from running dry and the high level float turns the pump on once sufficient liquid has filled the tank. Dirt and debris can cause these floats to not operate properly so they should be gently flushed with clean water at least once a month or as necessary.
- Upon shut down, ensure all sources of water are disabled. Drain completely.

Carbon Vessels

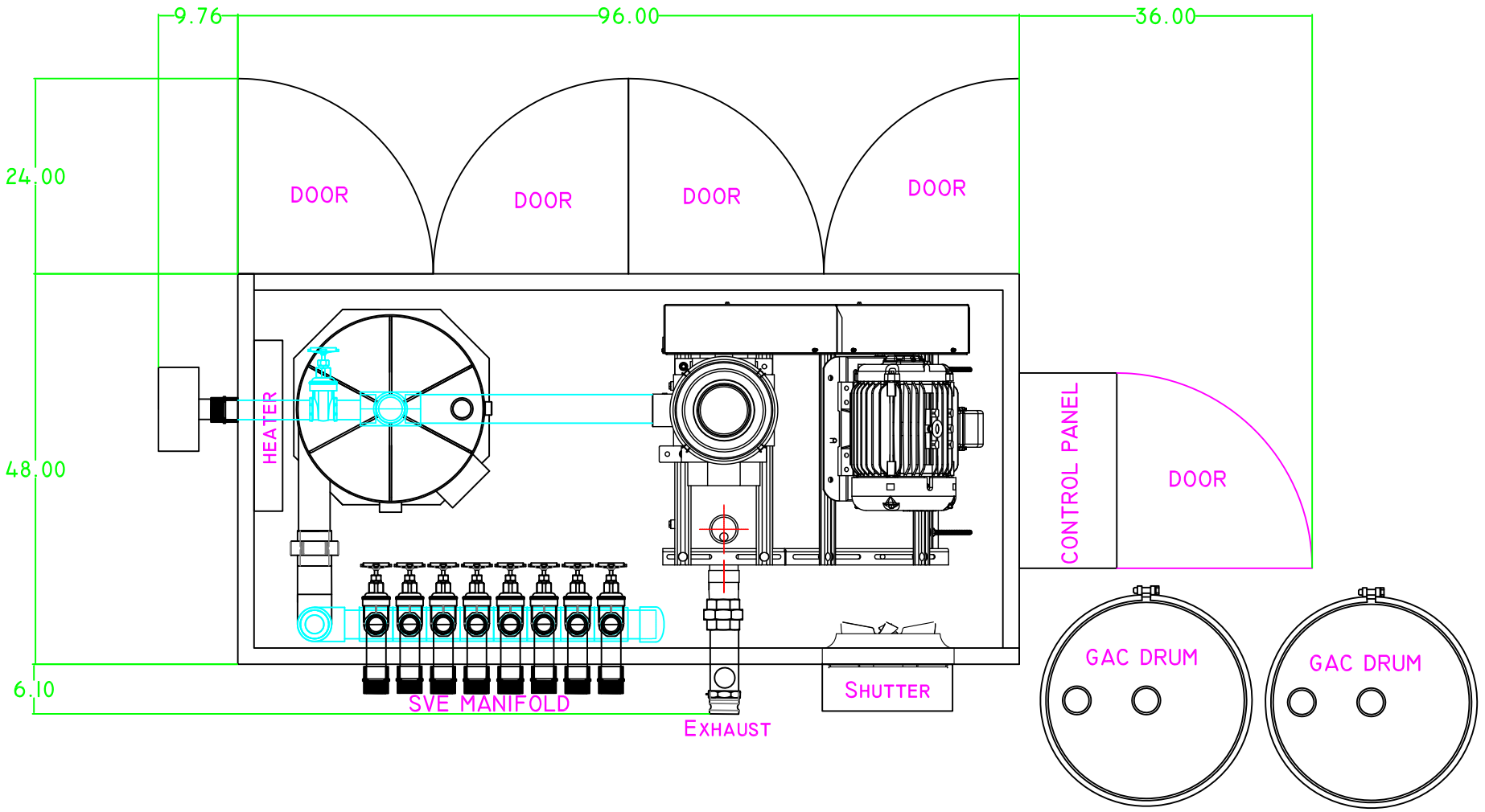
- FIRST – Review all Carbon Vessel documentation.
- Do not exceed maximum flow rate or maximum pressure rating for the vessel.
- Note the pressure before and after the vessel. An increase in differential pressure is a sign the carbon media is spent or the vessel is plugged.
- Take regular samples before and after each carbon vessel. An increase in effluent concentration is a sign the carbon media is spent.
- Remove and properly dispose of spent carbon media and replace with new carbon media as needed.

Enviro-Equipment Inc. SVE #6129 Equipment List

Extraction Equipment				
Item	**Manufacturer**	**Model Number**	**Serial Number**	**Notes**
SVE Blower	Sutorbilt	GACLCSD	S709050	4L DSL Blower
SVE Blower Motor	Baldor	EM2333T	Z2407311017	15HP 3PH 1765 RPM 254T 208-230/460V
Blower Base Frame	Solberg	BBF-300		3” Solberg Blower Base Frame with Belt Guard, Silencer
Dilution Filter	Solberg	FS-31P-200	N/A	2” Brass Gate Valve with Filter Outside
SVE Inline Vacuum Filter	Solberg	CSL-239-300C	N/A	Must remove both units to get filter element out.
Dilution Valve Filter Silencer	Solberg	FS-19P-100	N/A	Dilution Filter Silencer on 1” Brass Valve. Solberg Replacement Element 19P.
Vacuum Relief Valve	Midwest Control	NVR20-0A014	N/A	2” Vacuum Relief Valve Set for 14” HG
Inline Flow Meter	Dwyer	DS-300-4	N/A	Between Air Filter and KO Tank
Inline Flow Meter Gauge	Dwyer	2010	N/A	Pitot Tube Flow Meter Gauge for SVE Main line 0-10” WC
LRP Exhaust Pressure Gauge	EEI	PGBM60WC	N/A	0-60”WC back mount pressure gauge
Knockout Tank	EEI	AWS80-3	N/A	80 gallon aluminum KO tank with high level float in clear pvc sight glass with drain
Knockout Tank Level Float Tree	FPI	AWS80 MLP	N/A	
Knockout Tank Cleanout Plug	Fernco	8” Cap	N/A	8” Fernco Cap
Vacuum Gauges	EEI	VGBM160WC	N/A	0-160”WC Back Mount Vacuum Gauges
Manifold Flow Meters	Dwyer	DS-300-2	N/A	2” Pitot Tube in 8x Vacuum Manifold Lines
Manifold Flow Gauges	Dwyer	2001	N/A	0-1”WC Gauges Tied to Pitot Tubes in Manifold Legs

Enclosure and Fixtures				
Item	**Manufacturer**	**Model Number**	**Serial Number**	**Notes**
Enclosure	EEI	4x8x6	N/A	4x8x6' Sound Enclosure, Double Doors
Sound Foam	Polymer Technologies	PAF	N/A	1" Thick Sound Foam
Exhaust Fan	Dayton	484X53	N/A	Dayton 12" Guard Mounted Exhaust Fan with 115V Motor
Heater	Dayton	2YV13	3502-2861-000	500 watt heater with built in thermostat
Fan Thermostat	Dayton	2E340	N/A	Fan Thermostat

Control Panel and Telemetry				
Item	**Manufacturer**	**Model Number**	**Serial Number**	**Notes**
Main Control Panel	EEI	N/A	EEI-6129	New Relay Logic Control Panel. See Control Panel Component Sheet for Details.



DATE	REVISION	BY	CH'D

ENVIRO-EQUIPMENT, INC.
10120 Industrial Drive
Pineville, N.C. 28134
PHONE 704-556-7723
FAX 704-556-7728

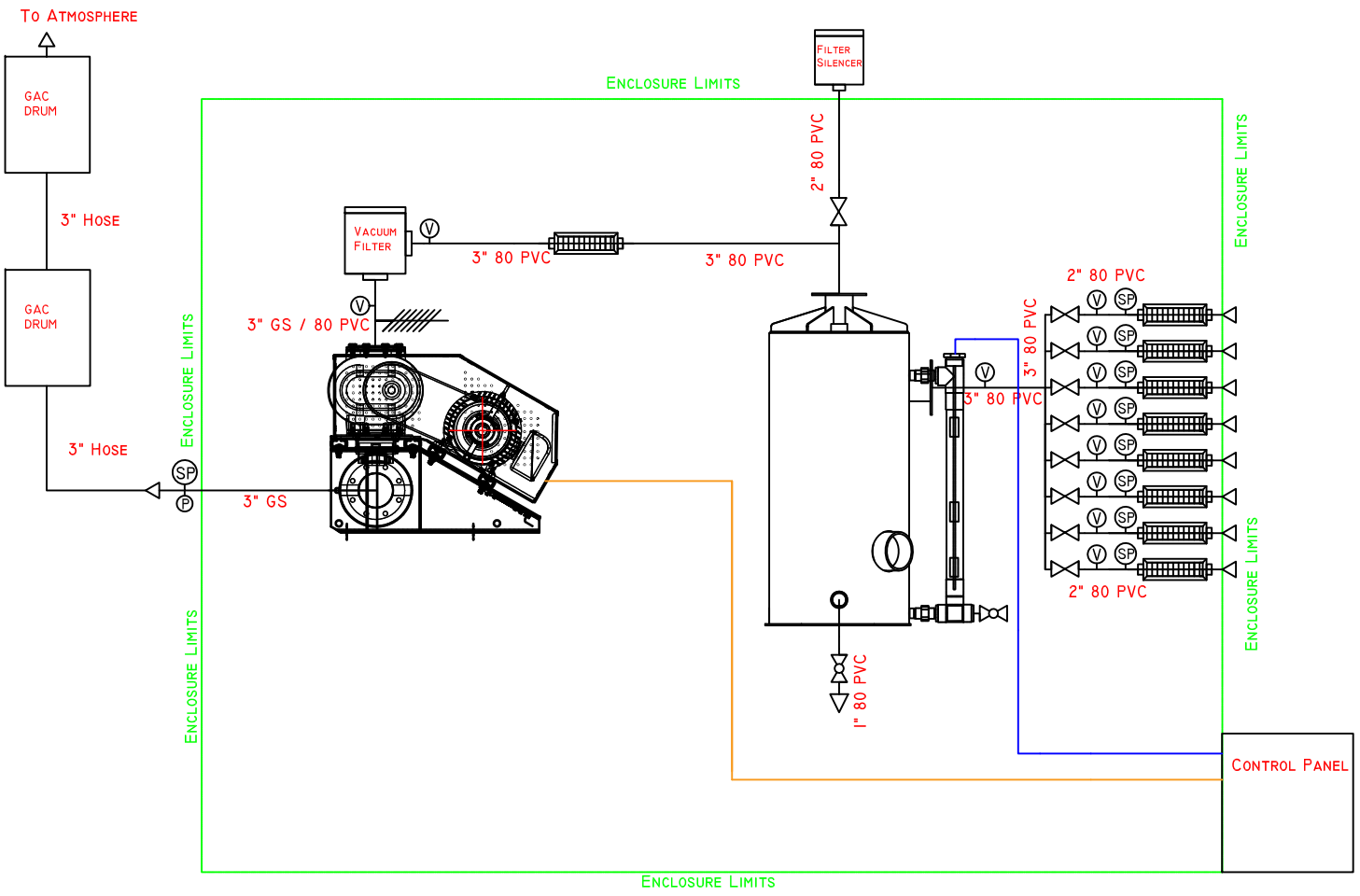
TOLERANCES (UNLESS OTHERWISE SPECIFIED)

CUSTOMER: PAL Env.

TITLE: SVE 6129
LAYOUT DRAWING

SCALE:	DRAWN BY:	CHECKED BY:	APP'D BY:
1"	EC	EC	EC

DATE:	SHEET	OF SHEETS	DRAWING NO.
8-13-2024	1	1	6129



SYMBOL	DESCRIPTION
SP	Sample Port
VT	Vacuum Transmitter
V	Vacuum Gauge
FP	Flow Port
FT	Flow Transmitter
P	Pressure Gauge
T	Temperature Gauge
	Relief Valve
	Butterfly Valve
	Wye Strainer
	Check Valve
	Gate valve
	Ball Valve
Vacuum Filter	Vacuum Filter
Filter Silencer	Filter Silencer
	Exhaust Muffler
	Flow Meter
	Transfer Pump
	Regen Blower
	Claw Compressor
	Moisture Separator
	Solberg BBF Baldor Motor Sutorbilt Blower
	Signal Wiring
	Power Wiring

DATE	REVISION	BY	CH'D

Enviro-Equipment, Inc.
10120 Industrial Drive
Pineville, N.C. 28134
PHONE 704-556-7723
FAX 704-556-7728

TOLERANCES (UNLESS OTHERWISE SPECIFIED)

CUSTOMER: PAL ENV.

TITLE: P&ID
SVE System

SCALE:	DRAWN BY:	CHECKED BY:	APP'D BY:
NTS	Evan Chew	EC	EC

DATE:	SHEET	OF SHEETS	DRAWING NO.
8-14-24	1	1	6129

QuickPik

Sutorbilt Legend - 4LDSL

Product Information

CORRECTED VALUES	ORIGINAL UNITS	ENGLISH UNITS	METRIC UNITS
Ambient Pressure	14.696 PSIA	14.696 PSIA	1.013 bar a
Elevation	0 ALTI-FT	0 ALTI-FT	0 alti-m
Inlet Pressure	110 InH2O V	-3.974 PSIG	-0.274 bar g
Inlet Pressure Loss	0.3 PSIG	0.300 PSIG	0.021 bar g
Inlet Temp	68 F	68 °F	20 °C
Inlet Flow	225 SCFM	318 ICFM	541 m³/h
Discharge Pressure	14.696 PSIA	0.000 PSIG	0 bar g
Discharge Pressure Loss	1 PSIG	1.000 PSIG	0.069 bar g
MEASURED VALUES	**ORIGINAL UNITS**	**ENGLISH UNITS**	**METRIC UNITS**
Speed	2393 RPM	2393 RPM	2393 RPM
RPM % Of Max	66	66	66
Power	10.2 HP	10.2 HP	7.606 kW
Discharge Temp	158 °F	158 °F	70 °C
Temp % of Max	60	60	60
Noise	83 dBa	83 dBa	83 dBa
Pressure % of Max	77	77	77
Adiabatic Efficiency	61.61%	61.61%	61.61%



PHYSICAL	
Weight	155 lbs.
Gear Diameter / Center Distance	4 in.
Connection Size	3i/3d in.
Case Length	8 in.
WR^2	0.924 lb-ft^2
Orientation	horizontal
PERFORMANCE	
Max Delta P	7 PSI
Max Temp	260 °F
Max Speed	3600 RPM
Min Speed	955 RPM
Max Case Pressure	25 PSIG
Max Delta T	160 °F

Created: 05-10-2024

QuickPik™

AMBIENT GAS PARAMETERS	ENGLISH UNITS	METRIC UNITS
Molecular Weight	28.867 lbm/lbmol	28.867 kg/kgmol
R Value	53.522 ft.lbf/lbm.R	0.288 kJ/kg.K
Density	0.075 lbm/ft ^{3}	1.200 kg/m^3

GAS MIX:	VOL
Air	100%

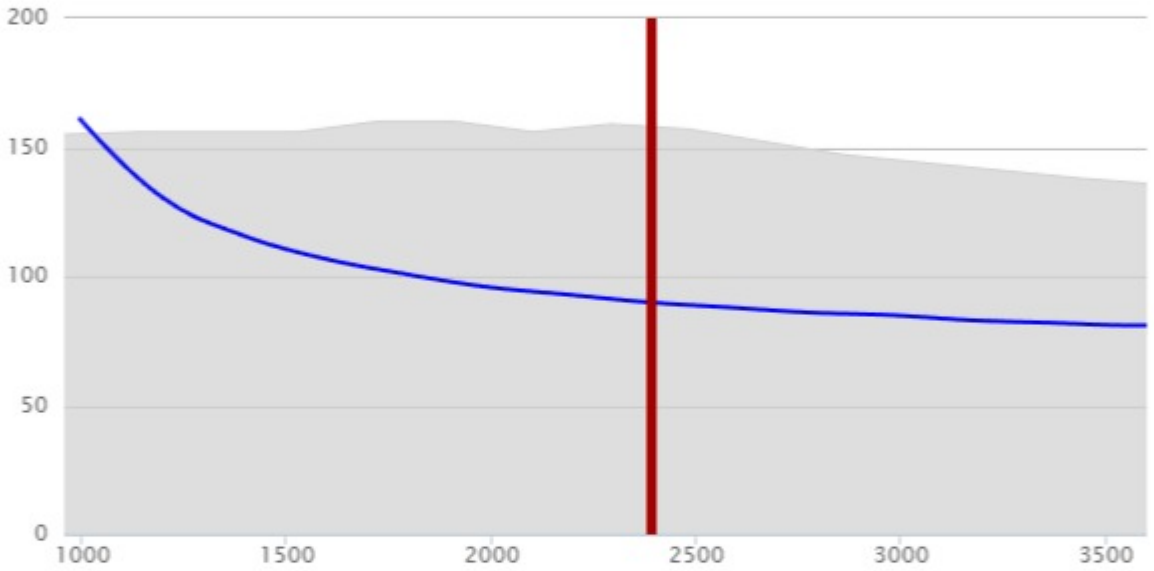
Performance Curves

Temperature Rise

DEFINED CONDITIONS
90 F

RPM
2393

Published Data
Defined Conditions

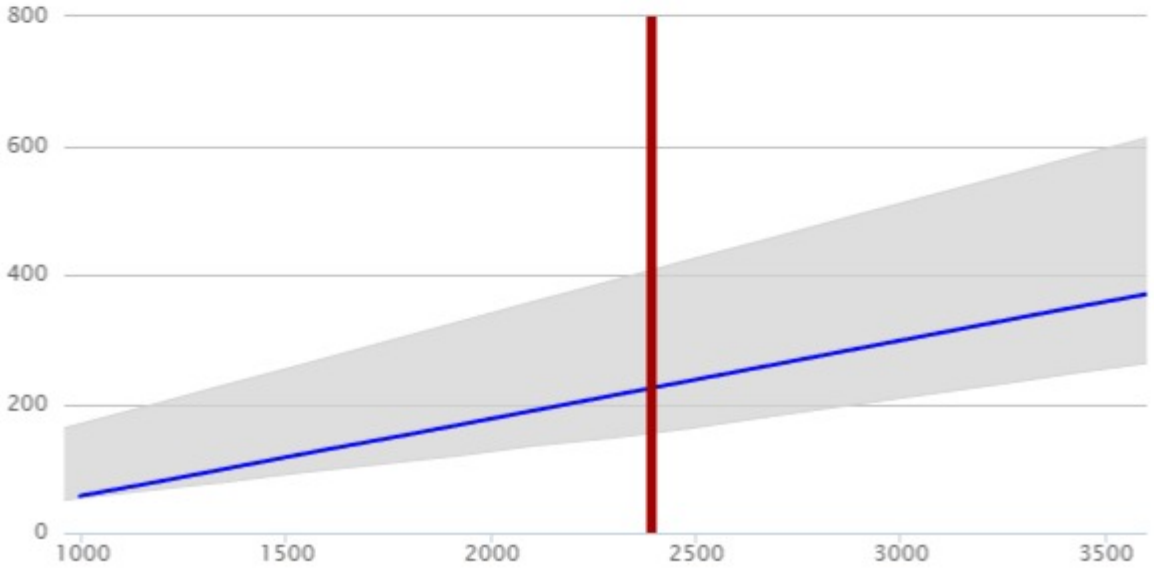


Flow

DEFINED CONDITIONS
225 SCFM

RPM
2393

Published Data
Defined Conditions



Created: 05-10-2024

QuickPik

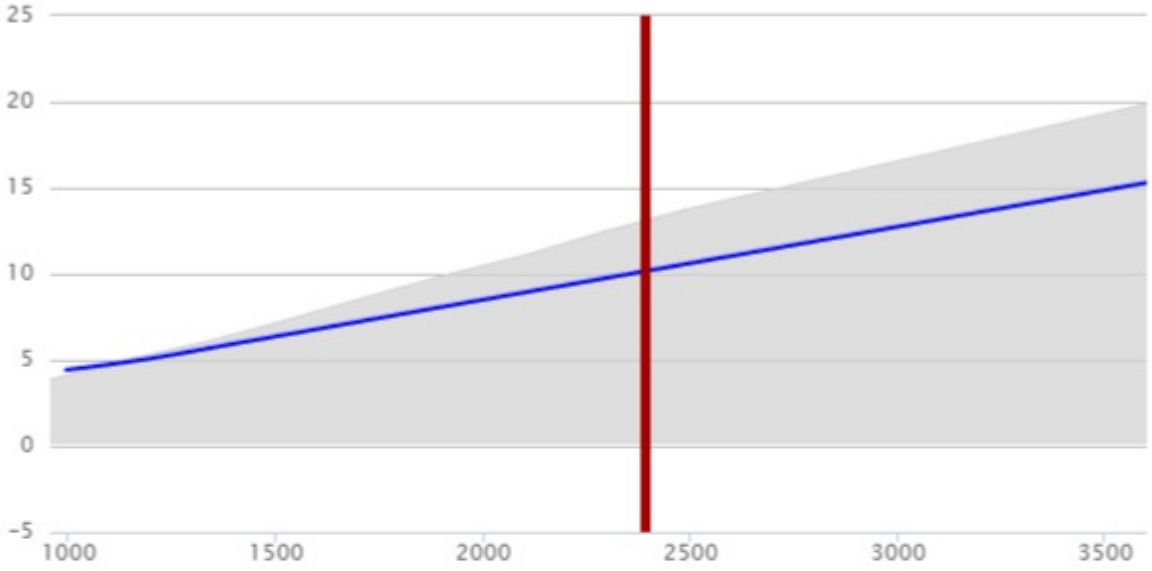
Performance Curves

Power

DEFINED CONDITIONS
10.2 HP

RPM
2393

Published Data
Defined Conditions

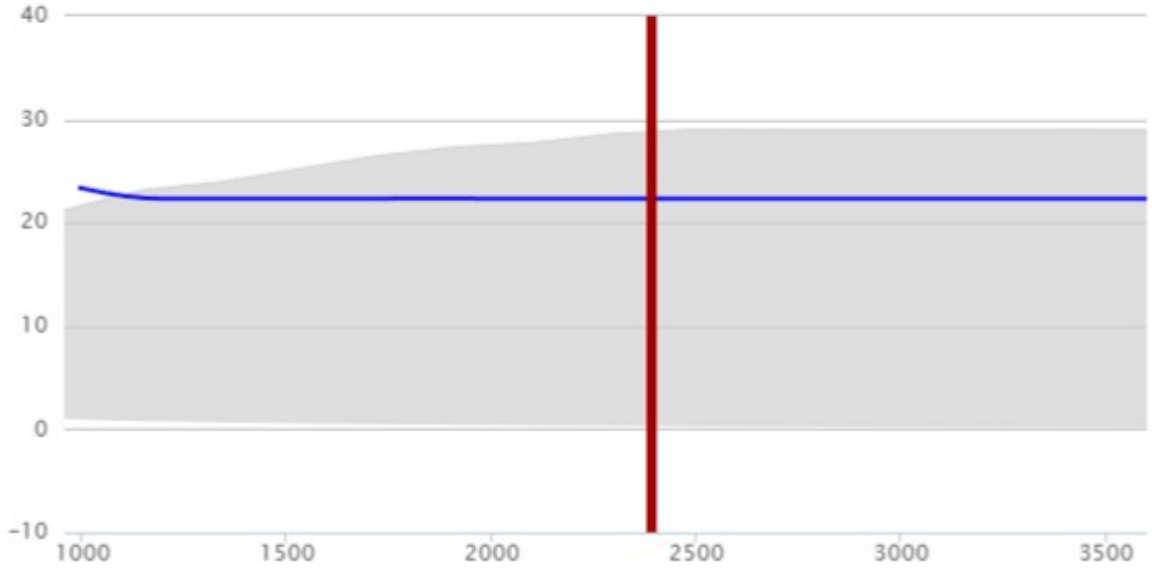


Torque

DEFINED CONDITIONS
22.4 ft-lb

RPM
2393

Published Data
Defined Conditions



Created: 05-10-2024

GARDNER DENVER
Sutorbilt

PARTS LIST
OPERATING AND SERVICE MANUAL



LEGEND
"P" SERIES BLOWERS

2" – 5" GEAR DIAMETER

Models
GAA_ _ P _
GAB_ _ P _
GAC_ _ P _
GAE_ _ P _

SB-7-621
Version 06
April 2, 2007

MAINTAIN BLOWER RELIABILITY AND PERFORMANCE WITH GENUINE GARDNER DENVER PARTS AND SUPPORT SERVICES

Factory genuine parts, manufactured to design tolerances, are developed for optimum dependability - - - specifically for your blower. Design and material innovations are born from years of experience with hundreds of different blower applications. When you specify factory genuine parts you are assured of receiving parts that incorporate the most current design advancements manufactured in our state-of-the-art blower factory under exacting quality standards.

Your AUTHORIZED DISTRIBUTOR offers all the backup you require. A worldwide network of authorized distributors provides the finest product support in the blower industry.

1. Trained parts technical representatives to assist you in selecting the correct replacement parts.

2. Complete inventory of new machines and new, genuine factory parts.

3. A full line of factory tested AEON™ PD blower lubricants specifically formulated for optimum performance in all blowers.

4. Authorized distributor service technicians are factory-trained and skilled in blower maintenance and repair. They are ready to respond and assist you by providing fast, expert maintenance and repair service.

INSTRUCTIONS FOR DETERMINING BLOWER CONFIGURATION

1. Face the blower drive shaft.
2. In a **VERTICAL** configuration, air flow is horizontal.
3. In a **HORIZONTAL** configuration, air flow is vertical.
4. In a vertical configuration, a **BOTTOM HAND** exists when the drive shaft is below the horizontal center line of the blower. A **TOP HAND** exits when the drive shaft is above the horizontal center line of the blower.
5. In a horizontal configuration, a **RIGHT HAND** exists when the drive shaft is to the right of the vertical center line of the blower. A **LEFT HAND** exists when the drive shaft is to the left of the vertical center line of the blower.

INSTRUCTIONS FOR ORDERING REPAIR PARTS

For pricing, and ordering information contact your nearest AUTHORIZED FACTORY DISTRIBUTOR. When ordering parts, specify Blower **MODEL** and **SERIAL NUMBER** (see nameplate on unit).

Rely upon the knowledge and experience of your AUTHORIZED DISTRIBUTOR and let them assist you in making the proper parts selection for your blower.

For the location of your local authorized Gardner Denver blower distributor refer to the yellow pages of your phone directory, check the Web site at www.gardnerdenver.com or contact:

Gardner Denver Compressor Division
1800 Gardner Expressway
Quincy, IL 62305
Phone: (217) 222-5400
Fax: (217) 221-8780

GARDNER DENVER LUBRICANT ORDER INFORMATION

Re--order Part Numbers for Factory--Recommended Lubricants.

Gear End

AEON PD Synthetic Lubricant or AEON PD--Food Grade Synthetic Lubricant

AEON PD Synthetic Lubricant

Description	Part Number
1 Quart	28G23
Case/12Quarts	28G24
1 Gallon Container	28G40
5 Gallon Pail	28G25
55 Gallon Drum	28G28

AEON PD--Food Grade Synthetic Lubricant

Description	Part Number
1 Quart	28H97
Case/12Quarts	28H98
1 Gallon Container	28H333
5 Gallon Pail	28H99
55 Gallon Drum	28H100

Drive End

AEON PD Grease

Description	Part Number
Case/10 Tubes	28H283

Call your local Sutorbilt Distributor to place your order for Gardner Denver lubricants. Your Authorized Gardner Denver Distributor is:

FOREWORD

Sutorbilt® blowers are the result of advanced engineering and skilled manufacturing. To be assured of receiving maximum service from this machine, the owner must exercise care in its operation and maintenance. This book is written to give the operator and maintenance department essential information for day-to-day operation, maintenance and adjustment. Careful adherence to these instructions will result in economical operation and minimum downtime.


Danger is used to indicate the presence of a hazard which will cause severe personal injury, death, or substantial property damage if the warning is ignored.


Warning is used to indicate the presence of a hazard which can cause severe personal injury, death, or substantial property damage if the warning is ignored.


Caution is used to indicate the presence of a hazard which will or can cause minor personal injury or property damage if the warning is ignored.

NOTICE
Notice is used to notify people of installation, operation or maintenance information which is important but not hazard-related.

SAFETY PRECAUTIONS

Safety is everybody's business and is based on your use of good common sense. All situations or circumstances cannot always be predicted and covered by established rules. Therefore, use your past experience, watch out for safety hazards and be cautious. Some general safety precautions are given below:

⚠ DANGER

Failure to observe these notices could result in injury to or death of personnel.

- **Keep fingers and clothing away from revolving fan, drive coupling, etc.**
- **Do not use the air discharge from this unit for breathing – not suitable for human consumption.**
- **Do not loosen or remove the oil filler plug, drain plugs, covers or break any connections, etc., in the blower air or oil system until the unit is shut down and the air pressure has been relieved.**
- **Electrical shock can and may be fatal.**
- **Blower unit must be grounded in accordance with the National Electrical Code. A ground jumper equal to the size of the equipment ground conductor must be used to connect the blower motor base to the unit base.**
- **Open main disconnect switch, tag and lockout before working on the control.**
- **Disconnect the blower from its power source, tag and lockout before working on the unit – this machine may be automatically controlled and may start at any time.**

⚠ WARNING

Failure to observe these notices could result in damage to equipment.

- **Stop the unit if any repairs or adjustments on or around the blower are required.**
- **Disconnect the blower from its power source, tag and lockout before working on the unit – this machine maybe automatically controlled and may start at any time.**
- **Do not exceed the rated maximum speed shown on the nameplate.**
- **Do not operate unit if safety devices are not operating properly. Check periodically. Never bypass safety devices.**

I

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SUTORBILT LEGEND SERIES BLOWERS
MATRIX/MENU

NOTICE TO CUSTOMER – To find the construction options for Your blower unit, FILL IN THE BALANCE OF LETTERS OR NUMBERS FROM YOUR UNIT NAMEPLATE

	G	A					P
COLUMN NUMBER:	1	2	3	4	5	6	7

FOLLOW THE LINE DOWN AND OVER FROM EACH SPACE THUS FILLED IN TO FIND THE APPROPRICATE CONSTRUCTION OPTION WITH WHICH YOUR MACHINE IS EQUIPPED.

COLUMN 1 – BASIC DESIGNATOR

COLUMN 2 – PRODUCT FAMILY

COLUMN 3 – GEAR DIAMETER

A	2”	E	5”	H	8”
B	3”	F	6”		
C	4”	G	7”		

COLUMN 4 – CASE LENGTH

L - Low Pressure
M - Medium Pressure
H - High Pressure

COLUMN 5 – CONFIGURATION

A Vertical-Top Hand -Central Timed
B Vertical-Bottom Hand – Central Timed
C Horizontal – Left Hand – Central Timed
D Horizontal – Right Hand – Central Timed

COLUMN 6 – DESIGN VERSION

COLUMN 7 – ADDITIONAL DESCRIPTION

A. Lip Seal
B. Mechanical Seal

INTRODUCTION
YOUR KEY TO TROUBLE FREE SERVICE

Thank you for investing in Sutorbilt quality. The Sutorbuilt reputation for rugged dependability has been earned by over 50 years of service in demanding, industrial operations where downtime cannot be tolerated and efficient blower performance is expected.

Your Sutorbilt blower is a precision engineered blower that has been carefully manufactured and thoroughly tested at the state-of the art Gardner Denver Blower Factory in Sedalia, Missouri.

As with other precision machinery, there are several relatively simple installation, operation and maintenance procedures that you must observe to assure optimum blower performance. There is no guesswork in the manufacture of your highly advanced Sutorbilt blower and there must be none in preparing the blower to get the job done in the field.

The purpose of this manual is to help you properly install, operate and maintain your Sutorbilt blower. It is essential that you review all sections of this manual in preparation for installing your blower. Follow the instructions for installing your blower. Follow the instructions carefully and you will be rewarded with trouble-free Sutorbilt service year in and year out.

SECTION 1
EQUIPMENT CHECK

Before uncrating, check the packing slip carefully to be sure all the parts have been received. All accessories are listed as separate items on the packing slip, and small important accessories such as relief valves can be overlooked or lost. After every item on the packing slip has been checked off, uncrate carefully.

NOTICE
Register a claim with the carrier for lost or damaged equipment.

⚠WARNING
Customers are cautioned to provide adequate protection, warning and safety equipment necessary to protect personnel against hazards involved in installation and operation of this equipment in the system or facility.

STORAGE

Your Gardner Denver Blower was packaged at the factory with adequate protection to permit normal storage for up to six (6) months.

If the unit is to be stored under adverse conditions or for extended periods of time, the following additional measures should be taken to prevent damage.

1. Store the blower in a clean, dry, heated (if possible) area.
2. Make certain inlet and discharge air ports are tightly covered to prevent foreign material from entering the air box.
3. All exposed, non-painted surfaces should be protected against rust and corrosion.
4. Provide adequate protection to avoid accidental mechanical damage.
5. In high humidity or corrosive environments, additional measures may be required to prevent rusting of the blower internal surfaces.
6. To prevent rusting of gears, bearings, etc., the oil reservoirs may be filled with normal operating oil.

⚠CAUTION
Before running the blower, drain the oil and replace to the proper operating level with clean, fresh lubricant.

7. Rotate the blower shaft (10 to 25 turns) weekly during storage. Inspect the blower shaft (near the shaft seal area) monthly and spray with rust inhibitor if needed.
8. For long term storage (over six (6) months), contact Gardner Denver Compressor Division Customer Service for recommendations.

REMOVING PROTECTIVE MATERIALS

The shaft extension is protected with rust inhibitor which can be removed with any standard solvent.

⚠CAUTION
Follow the safety directions of the solvent manufacturer.

Blower inlet and outlet are temporarily capped to keep out dirt and other contaminants during shipment. These covers must be removed before start-up.

The internal surfaces of all Sutorbilt units are mist sprayed with a rust preventative to protect the machine during shipment. Remove this film upon initial startup, using any commercial safety solvent. Position the blower so that the inlet and discharge connections are in the vertical position (vertical airflow). On vertically mounted units, it will be necessary to lay the unit on its side supporting the ends of the unit so as not to restrict the port on the bottom side. Place a shallow pan on the under side of the unit. With the blower disconnected from power, spray the solvent in the top port, rotating the impellers by spinning the shaft manually. Continue this procedure until the unit is visibly clean.



Rotating components will cause severe injury in case of personal contact. Keep hands and loose clothing away from blower inlet and discharge ports.

SECTION 2
INSTALLATION

LOCATION

Install the blower in a well lit, clean dry place with plenty of room for inspection and maintenance.

FOUNDATIONS

For permanent installation we recommend concrete foundations be provided, and the equipment should be grouted to the concrete. It is necessary that a suitable base be used, such as a steel combination base under blower and motor, or a separate sole plate under each. Before grouting, equipment must be leveled, free of all stains, and anchored so no movement will occur during setting of grout. After grout has completely hardened, a recheck is necessary to compensate for shrinkage, etc. If required, add shims under blower feet after final tightening of foundation anchor bolts to remove strain from the blower housing.

Where jack screws or wedges are used during grouting, they must be backed off and wedges removed before final tightening of anchor bolts. Refer to grouting instructions.

Where a concrete foundation is not feasible, care must be taken to insure that equipment is firmly anchored to adequate structural members, restricting movement and vibration.

MOUNTING CONFIGURATIONS

The blower flex-mount design enables horizontal and vertical mounting configurations with top or bottom hand, right or left hand shaft positioning. The units are center timed allowing rotation in either direction (refer to Figure 2-1). If converting a blower from vertical to horizontal, or horizontal to vertical mounting configuration, additional mounting feet will be required.

REPOSITIONING THE MOUNTING FEET.

1. Position the mounting feet to the desired location and snug the capscrew.

2. Place the blower on its feet on a flat surface.

3. Loosen mounting feet capscrews and level unit up. The bench or blower base flatness should be within .002 of an inch.

NOTICE
If the unit is not flat within .002 of an inch, it will be necessary to shim the blower feet at installation.

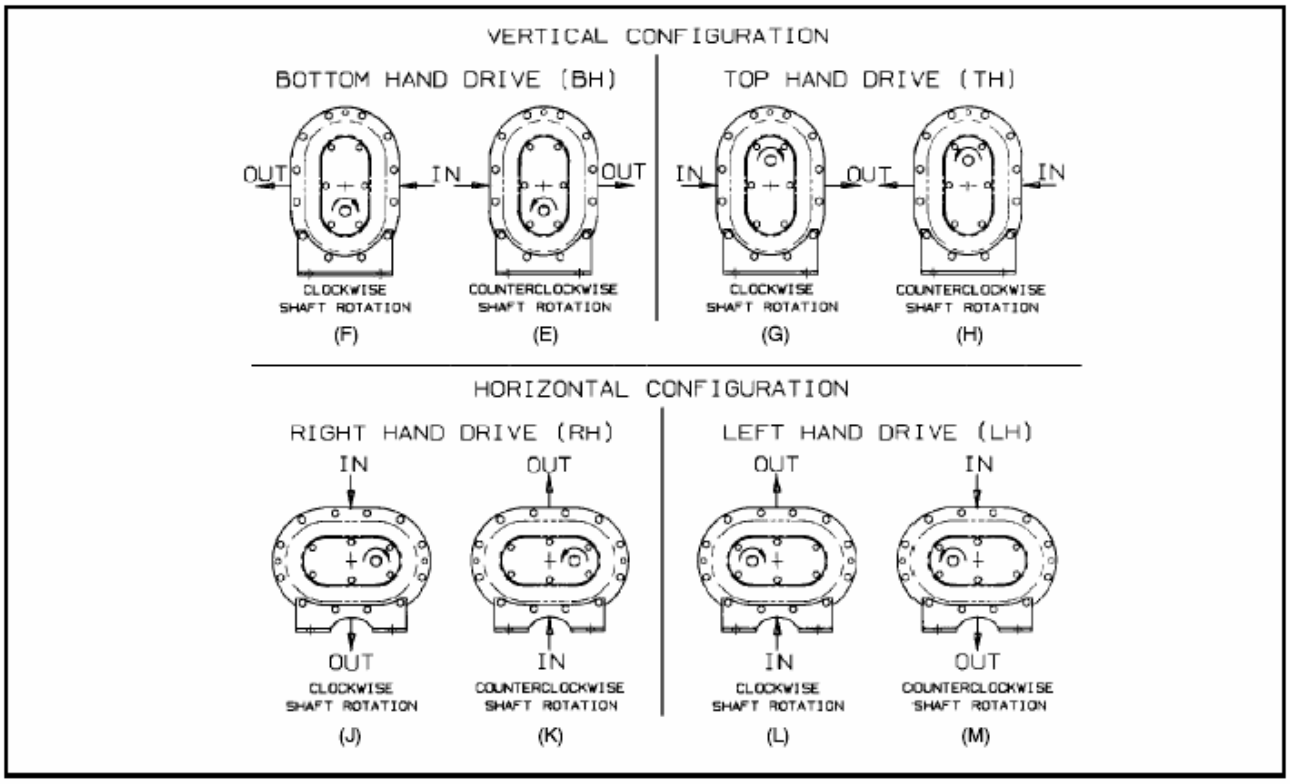


FIGURE 2-1 – BLOWER MOUNTING CONFIGURATIONS

4. Secure the mounting feet capscrews to the torque value in Figure 7-8, page 34.

NOTICE
When changing mounting configuration, it may be necessary to reposition vent plug (B), and drain plug (A). Refer to Figure 3-1, page 17, for correct location.

DRIVE INSTALLATION

When selecting a V-belt drive, check to be sure the shaft overhung load limitation is not exceeded. Refer to FIGURE 2-2, page 15, for overhung load calculations and limitations.

Belt drives must be carefully aligned. Motor and blower pulleys must be parallel to each other and in the same plane within 1/32 inch. Belt tension should be carefully adjusted to the belt manufacturer's recommendation using a belt tension gauge. Check tension frequently during the first day of operation.

⚠WARNING
Over tightening belts leads to heavy bearing loads and premature failure.

On the direct connected units, alignment and lubrication of couplings to specifications of the coupling manufacturer is very important. When mounted drives are supplied from the factory proper alignment has been established before shipment. However, during shipping, handling and installation, it is likely that the alignment has been disturbed and final adjustment must be made before startup.

⚠WARNING

Exceeding overhung load limitations leads to unwarrantable premature bearing failure and shaft breakage.

The location of the sheave on the blower shaft greatly affects the stress in the shaft. The optimum blower sheave positioning is as close as possible to the blower drive cover, not to exceed dimension “C” in Drive Shaft Illustration, FIGURE 2-2, page 15

The calculated shaft moment must not exceed the maximum allowable moment listed in Maximum Allowable Moment Chart, FIGURE 2-2 page 15. If the calculated shaft moment exceed the maximum allowable moment:

- Increase Sheave Diameters to Reduce Belt Pull
- Use Jackshaft Drive
- Use Direct Coupled or Gearbox Drive

To calculate shaft moment for a given V-Belt Drive Arrangement:

1. Use the formula for Calculation of Belt Pull, FIGURE 2-2, page 15, to calculate belt pull. Refer to Arc of Contact Factor Chart, Figure 2-2, page 15.
2. Insert the calculated belt pull into the formula for Calculation of Shaft Moment, FIGURE 2-2, page 15 to arrive at the calculated shaft moment.

PIPING

Inlet and discharge connections on all blowers are large enough to handle maximum volume with minimum friction loss. Reducing the pipe diameter on either inlet or discharge will only create additional line loss and increase the overall pressure differential. Excessive weight of piping and fittings will cause internal misalignment and premature wear. Never allow the blower to carry the weight of the pipe. If possible, a spool or sleeve-type expansion joint should be installed between the unit and the piping. Where a flexible connection is not practical, the weight of the rigid connection must be separately supported.

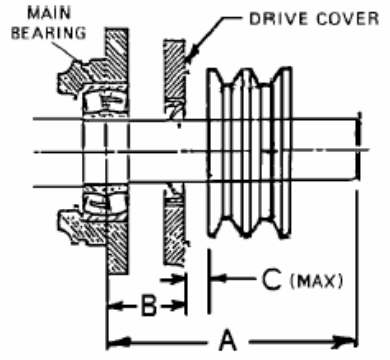
All system piping must be cleaned internally before connecting to the blower.

⚠WARNING

Sutorbilt blowers are shipped dry from the factory. Do not attempt to operate the blower before following proper lubrication instructions. Permanent damage to the gears, bearings and seals will occur.

Gear Diameter (Inches)	Dimensions (Inches)			Maximum Allowable Moment (LB-IN)
	A	B	C (Max)	
2	2.76	.80	.38	146
3	2.88	.85	.38	385
4	3.49	1.10	.38	490
5	3.90	1.40	.38	1245

MAXIMUM ALLOWABLE MOMENT



DRIVE SHAFT ILLUSTRATION

Z	Ac	Z	Ac	Z	Ac	Z	Ac	Z	Ac	Z	Ac
0.000	1.000	0.250	0.966	0.500	0.926	0.750	0.879	1.000	0.823	1.250	0.751
0.025	0.997	0.275	0.962	0.525	0.922	0.775	0.874	1.025	0.816	1.275	0.742
0.050	0.994	0.300	0.958	0.550	0.917	0.800	0.869	1.050	0.810	1.300	0.734
0.075	0.990	0.325	0.954	0.575	0.913	0.825	0.864	1.075	0.803	1.325	0.725
0.100	0.987	0.350	0.951	0.600	0.908	0.850	0.858	1.100	0.796	1.350	0.716
0.125	0.983	0.375	0.947	0.625	0.904	0.875	0.852	1.125	0.789	1.375	0.706
0.150	0.980	0.400	0.943	0.650	0.899	0.900	0.847	1.150	0.782	1.400	0.697
0.175	0.977	0.425	0.939	0.675	0.894	0.925	0.841	1.175	0.774	1.425	0.687
0.200	0.973	0.450	0.935	0.700	0.889	0.950	0.835	1.200	0.767		
0.225	0.969	0.475	0.930	0.725	0.884	0.975	0.829	1.225	0.759		

ARC OF CONTACT FACTORS

$$\text{Belt Pull} = \left[\frac{2.5 - Ac}{Ac}\right] \times \left[\frac{125954 \times Hp \times S.F.}{D \times RPM}\right]$$

Key:
- Ac = Arc of Contact Factor (Refer to Arc of Contact Factor Chart above)
- Hp = Blower Horsepower for Operating Conditions
- S.F. = Actual Drive Service Factor
- D = Blower Sheave Pitch Diameter in Inches
- RPM = Blower Sheave Speed
- Z = $\left[\frac{\text{Large Sheave Pitch Diameter (in)} - \text{Small Sheave Pitch Diameter (in)}}{\text{Sheave Center Distance (in)}}\right]$

CALCULATION OF BELT PULL

$$\text{Shaft Moment (LB-IN)} = \text{Belt Pull} \times \left[B + C + \left(\frac{\text{Sheave Width}}{2}\right)\right]$$

CALCULATION OF SHAFT MOMENT

FIGURE 2-2 – BELT DRIVE OVERHUNG LOAD CALCULATIONS

AIR FILTERS AND FILTER SILENCERS

⚠WARNING

Servicing the air filters is one of the most important maintenance operations to be performed to insure long blower life.

Servicing frequency of filter elements is not time predictable. A differential pressure indicator, with a continuous gauge reading, should be installed across the inlet filter. It will tell how much of the service life of the filter element has been used. It will also eliminate both premature filter servicing and premature blower failure due to a plugged filter when the filter pressure drop is used to establish maintenance points. In all cases refer to the filter manufacturer's service instructions. Due to the many types of filters, it is not practical to give specific instructions covering all models.

NOTICE

No matter what type of filter is used, always make sure all seats, gaskets, clamps and hose connections on the filter and inlet line are absolutely air tight. Each time the filter is serviced, inspect interior of the blower for dirt.

SECTION 3
LUBRICATION

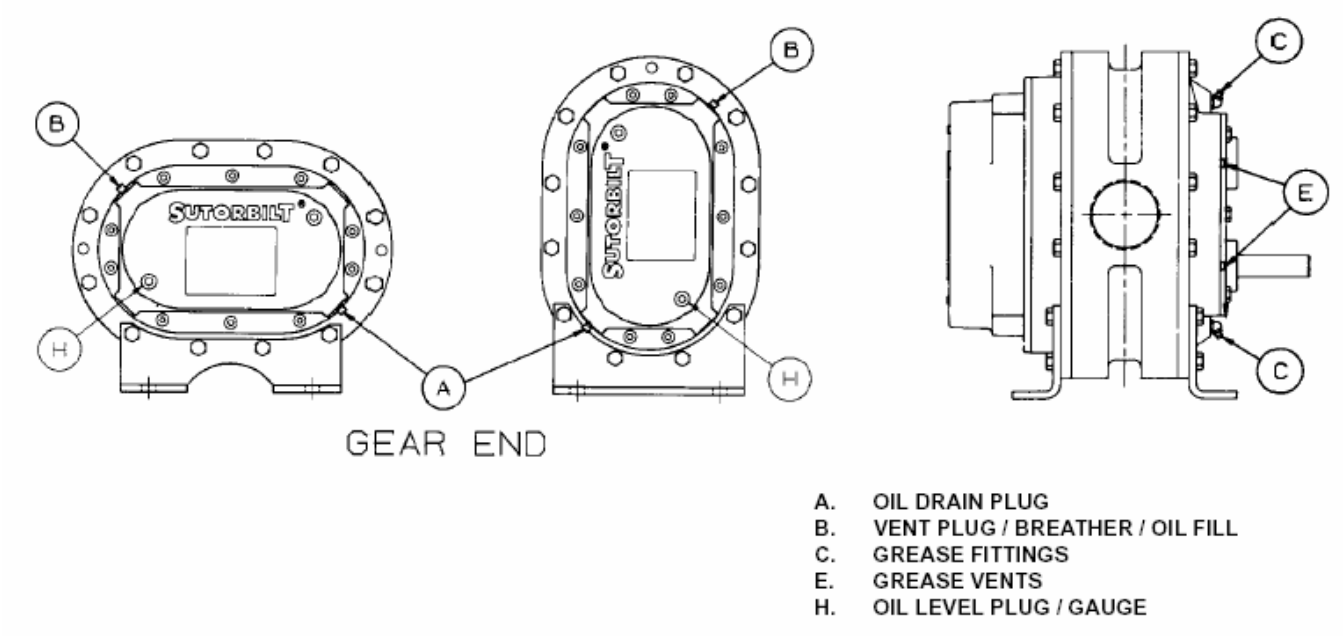


FIGURE 3-1 - LUBRICATION

DRIVE END LUBRICATION

Drive end bearings are grease lubricated at the factory with Lithium Complex based grease. **For relubrication, use Gardner Denver AEON PD Grease, Part Number 28H283.** AEON PD Grease is a high temperature, high performance grease that is formulated with antiwear additives to provide superior service under the severe operating conditions of positive displacement blowers. It contains rust inhibitors which provide excellent protection against rust and corrosion.
If you choose not to use AEON PD Grease, select compatible base grease. The grease should be NLGI Grade 2 EP, contain rust inhibitors, and be suitable for blower discharge temperatures up to 350° F (177° C). Completely clean or purge the factory--filled grease from the blower. **Do not mix different types of grease as they may not be compatible. Substitutions may cause early bearing failure.**

Re-grease bearings every 500 hours of operation. Lubricate each bearing through the grease fittings located at C in FIGURE 3-1 (2 places). When re-greasing, the old grease will be forced out of the vents (E in FIGURE 3-1). To prevent damage to seals, these vents must be open at all times.

⚠WARNING
Do not over--grease bearings as this could cause premature bearing failure.

GEAR END LUBRICATION

At the gear end, the timing gear teeth are lubricated by being partially submerged in oil. The gear teeth serve as oil slingers for gear end bearings.

Approximate oil sump capacities are listed in FIGURE 3-2, page 18.

RECOMMENDED LUBRICANT

Gear Diameter	Vertical	Horizontal
2”	1/4 PT.	1/2 PT.
3”	1/3 PT.	2/3 PT.
4”	3/4 PT.	1 PT.
5”	1 PT.	2-1/4 PT.

FIGURE 3-2 – APPROXIMATE OIL CAPACITIES

The factory recommended lubricant is AEON PD Synthetic Lubricant. AEON PD is formulated especially for positive displacement blowers to provide maximum protection at any temperature. One filling of AEON PD will last a minimum of 4 times longer than a premium mineral oil, depending on actual operating conditions. AEON PD contains a special additive package designed for greater rust and corrosion protection.

AEON PD Lubricant

Description	Part Number
1 Quart	28G23
Case/12 Quarts	28G24
1 Gallon Container	28G40
5 Gallon Pail	28G25
55 Gallon Drum	28G28

AEON PD Food Grade Lubricant

Description	Part Number
1 Quart	28H97
Case/12 Quarts	28H98
1 Gallon Container	28H333
5 Gallon Pail	28H99
55 Gallon Drum	28H100

FIGURE 3-3 – AEON PD SYNTHETIC LUBRICANT

NOTICE
Machines are shipped without oil in the sump. Do not operate before adding lubricant.

LUBRICATION INSTRUCTIONS
Filling Procedure (For 2” and 3” sizes)

Refer to FIGURE 3-1, page 17. Remove the oil level plug (H) and the square head vented oil fill plug (B) from the gear cover. Add oil to the gear case until oil drips out of the oil level hole (H). Secure plugs in their correct location.

Filling procedure (For 4” and 5” sizes)
Refer to FIGURE 3-1, page 17. Remove the breather (B) from the gear cover. Add oil to the gear case until oil reaches the center of the oil level gauge (H). Secure breather (B) in the gear cover.

Add fresh oil as required to maintain proper level. The oil level should be at the middle of the sight glass when the machine is not operating.

⚠WARNING

Do not overfill as this will tend to cause excessive heating of the gears and may damage the unit.

AEON PD Synthetic Lubricant should be drained after 6000 hours of operation. Re-fill with fresh AEON PD oil. If mineral oil is used, perform the above oil—change maintenance every 1500 hours. Recommended service intervals are for normal blower operating conditions. Severe operating conditions may warrant more frequent oil changes. Laboratory analysis of lubricant should be used to help determine the optimum oil change interval.

For best performance and equipment protection, use AEON PD Synthetic Lubricant, which has been specifically formulated for positive displacement blowers. If you choose not to use AEON PD Synthetic Blower Lubricant, select an oil with rust and oxidation inhibitors, anti-foam additives, and the viscosities listed in FIGURE 3-4, page 19. Do not use an oil that contains EP additives.

NOTICE

Flush the oil whenever a change is made from one type of oil to another.

Drain the current lubricant as thoroughly as possible. Refill with the new lubricant. Fill to normal level of the blower, which is at the middle of the sight glass when the machine is not operating. Run the blower for one hour. Shut off the blower and drain the lubricant completely. Refill the blower again with the new lubricant.

Blower Discharge Temperature	Ambient Temperature			
	Less than 10° F*	10° F to 32° F**	32° F to 90° F	Greater than 90° F
Less than 32° F (0° C)	ISO 100 ‡	ISO 100 ‡		
32° F to 100° F (0° C to 38° C)	ISO 100 ‡	ISO 100 ‡	ISO 150 ‡	
100° F to 225° F (38° C to 105° C)	ISO 100 ‡	ISO 100 ‡	ISO 150 ‡	ISO 220 ‡
225° F to 300° F (105° C to 149° C)	ISO 150 ‡	ISO 150 ‡	ISO 220 ‡	ISO 220 ‡
Greater than 300° F (149° C)			*** ‡	*** ‡

* For ambient temperatures less than 10° F, but not less than –20° F, the use of oil sump heaters, heated enclosures or synthetic lubricant is required.

** For ambient temperatures 10° F to 32° F, the use of oil sump heaters, heated enclosures or synthetic lubricant is recommended.

*** The lubricant viscosity must be 70 SUS minimum at the lubricant operating temperature.

The pour point of the lubricant should be at least 5° to 10° F below the minimum expected ambient temperature.

For continuous operation, where the lubricant temperature exceeds 200° F, synthetic lubricant is recommended.

‡ The recommended operating range for AEON PD Synthetic Lubricant.

FIGURE 3-4 – LUBRICATION RECOMMENDATION

SECTION 4
OPERATION

Future operating problems can be avoided if proper precautions are observed when the equipment is first put into service.

Before starting under power, the blower should be turned over by hand to make certain there is not binding or internal contact.

Each size blower has limits on pressure differential, running speed and discharge temperature which must not be exceeded. These limits are shown in "Maximum Operating Limitations", FIGURE 4-1, below.

⚠WARNING

Operating beyond the specified operating limitations will result in damage to the unit.

It is important that the pressures and temperatures are measured directly at the ports of the blower to avoid error that may be caused by intervening pipe runs, fittings, etc.

Relief valves must be used to protect against excessive pressure or vacuum conditions. These valves should be tested at initial startup to be sure they are adjusted to relieve at or below the maximum pressure differential rating of the blower.

NOTICE

Relief valves should be placed as close as possible to the blower inlet or discharge.

In some instances, pressure may be relieved at a lower point than the blower maximum in order to protect the motor or the equipment served by the blower.

Discharge temperature switches are recommended to protect against excessive inlet restriction or inlet temperatures. Check valves in the discharge line on pressure blowers and in the inlet line on vacuum blowers are recommended to protect the blower from motoring backwards when shut down under load.

LIMITATIONS

For information regarding limitations, refer to FIGURE 4-1, below.

MAXIMUM OPERATING LIMITATIONS

SIZE	RPM	PRESSURE PSI	VAC IN HG	DISCHARGE TEMPERATURE ° F
2LP	5275	7	14	285
2MP	5275	12	15	315
3LP	3600	7	14	260
3MP	3600	12	15	280
3HP	3600	15	16	320
4LP	3600	7	14	260
4MP	3600	10	16	285
4HP	3600	15	16	310
5LP	2850	7	14	260
5MP	2850	13	16	280
5HP	2850	15	16	300

DO NOT EXCEED THESE LIMITS

NOTICE

Blower speed, line losses, elevation, and increased inlet temperatures will affect the maximum operating limitations.

FIGURE 4-1 – MAXIMUM OPERATING LIMITATIONS

BLOWER STARTUP CHECKLIST

This startup procedure should be followed during the initial installation and after any shutdown periods or after the blower has been worked on or moved to new location. It is suggested that the steps be followed in sequence and checked off (v) in the boxes provided.

- ☐ 1. Check the unit and all piping for foreign material and clean if required.
- ☐ 2. Check the flatness of the feet and the alignment of the drive. Feet that are bolted down in a bind can cause housing distortion and internal rubbing. Misaligned V-drives can cause the rotors to rub against the headplates and cause a reduction in the volumetric efficiency of the unit. Misaligned couplings can ruin bearings.
- ☐ 3. If the blower is V-belt driven, check the belt tension and alignment. Over-tensioned belts create heavy bearing/shaft loads which lead to premature failure.
- ☐ 4. Be sure adequate drive guards are in place to protect the operator from severe personal injury and incidental contact.
- ☐ 5. Check the unit for proper lubrication. Proper oil level cannot be over-emphasized. Too little oil will ruin bearings and gears. Too much oil will cause overheating and can ruin gears and cause other damage. Insure that grease lubricated bearings are properly lubricated.
- ☐ 6. With motor electrical power locked out and disconnected, turn the drive shaft by hand to be certain the impellers do not bind.
- ☐ 7. “Jog” the unit with the motor a few times to check that rotation is in the proper direction, and to be certain it turns freely and smoothly.
- ☐ 8. The internal surfaces of all Sutorbilt units are mist sprayed with a rust preventive to protect the machine during the shipping and installation period. This film should be removed upon initial startup.
- ☐ 9. Start the unit and operate 15 minutes at no load. During this time, check for hot spots and other indications of interference.
- ☐ 10. Apply the load and observe the operation of the unit for one hour. Check frequently during the first day of operation.
- ☐ 11. If malfunctions occur, do not continue to operate. Problems such as knocking rotors can cause serious damage if the unit is operated without correction.

SAFETY PRECAUTIONS

1. Do not operate blower with open inlet or outlet port.
2. Do not exceed specified vacuum or pressure limitations.
3. Do not operate above or below recommended blower speed range.
4. Blower is not to be used where non-sparking equipment is specified.
5. Do not operate without belt guard or coupling shield.

⚠WARNING
Do not exceed sheave or coupling manufacturer's rim speed limit.

6. The blower and blower discharge piping may be extremely hot and cause skin burns on contact.

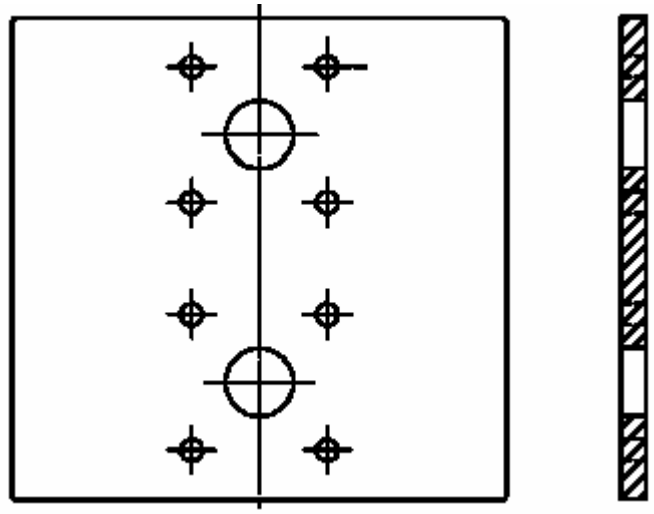
TROUBLE SHOOTING

No matter how well the equipment is designed and manufactured, there may be times when servicing will be required due to normal wear, the need for adjustment, or various external causes. Whenever equipment needs attention, the operator or repairman should be able to locate the cause and correct the trouble quickly. The Trouble Shooting Chart below is provided to assist the mechanic in those respects.

PROBLEM	POSSIBLE CAUSES	SOLUTION
Knocking	1. Unit out of time. 2. Distortion due to improper mounting or pipe strains. 3. Excessive pressure differential. 4. Worn gears. 5. Worn bearings.	1. Re-time impellers 2. Check mounting alignment and relieve pipe strains. 3. Reduce to manufacturer's recommended pressure. Examine relief valve, re-set if necessary. 4. Replace timing gears. 5. Replace bearings..
Excessive blower temperature.	1. Too much oil in gear case. 2. Too low operating speed. 3. Dirty air Filter. 4. Clogged filter or muffler. 5. Excessive pressure differential. 6. Worn impeller clearances. 7. Internal contact.	1. Reduce oil level. 2. Increase blower speed. 3. Clean or replace air filter 4. Remove cause of obstruction. 5. Reduce pressure differential across the blower. 6. Replace impeller. 7. Correct clearances.
Impeller end or tip drag.	1. Insufficient assembled clearances. 2. Case or frame distortion. 3. Excessive operating pressure. 4. Excessive operating temperature.	1. Correct clearances. 2. Check mounting and pipe strain. 3. Remove cause. 4. Remove cause
Lack of volume.	1. Slipping belts. 2. Worn clearances. 3. Dirty air filter	1. Tighten belts. 2. Re-establish proper clearances. 3. Clean or replace air filter.
Excessive bearing or gear wear.	1. Improper lubrication.	1. Correct lubrication level. Replace dirty oil.
Loss of oil.	1. Headplate, gear case or drive cover vents plugged. 2. Worn Seal.	1. Clean vents. 2. Replace seals.

SECTION 5
MAINTENANCE

ORDER SPECIAL TOOLS BY PART NUMBER. SEE PAGE 1 FOR ORDERING INSTRUCTIONS.



Unit Size	Part Number
2”	200GAA340
3”	201GAA340
4”	202GAA340
5”	203GAA340

FIGURE 5-1 – PULLER PLATE

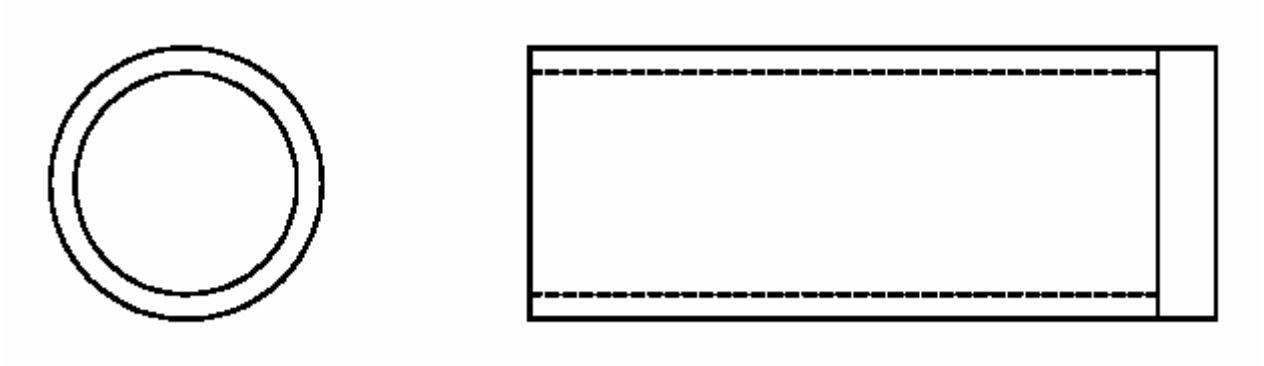
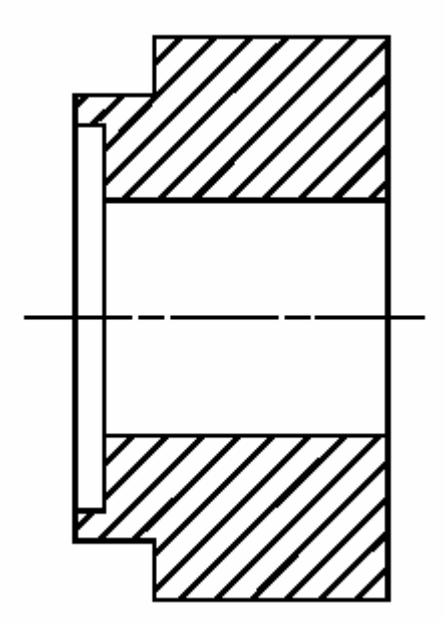
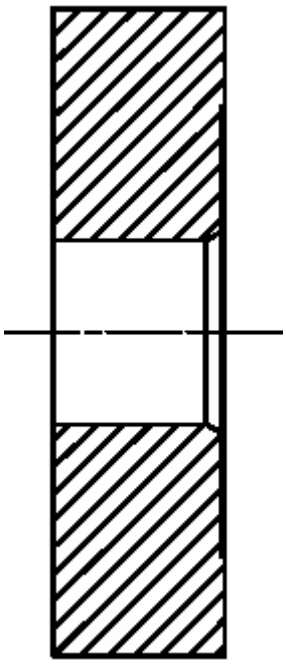


FIGURE 5-2 – GEAR DRIVER – 208GAA074



Unit Size	Part Number
2”	204GAA074
3”	205GAA074
4”	206GAA074
5”	207GAA074

FIGURE 5-3 – MECHANICAL SEAL INSTALLATION TOOL



Unit Size	Part Number
2”	200GAA074
3”	201GAA074
4”	202GAA074
5”	203GAA074

FIGURE 5-4 – BEARING PRESS TOOL – MECHANICAL SEAL UNITS

SECTION 6
DISASSEMBLY INSTRUCTIONS

NOTICE
Numbers in parentheses ( ) refer to key numbers in assembly drawings on pages 35, 37, 39 and 41.

1. Drain oil from gear case by removing drain plug (4).
2. Remove the socket head bolts (5) from the gear cover (3).
3. Remove the gear cover from the gear headplate.

NOTICE
The cover and gear headplate gasket tends to bond tightly to both surfaces. After socket head bolt removal, it is sometimes necessary to take a ball peen hammer and a blunt chisel and drive off the cover.

IMPORTANT:

MARK ALL PARTS WITH A CENTER PUNCH SO THEY CAN BE REASSEMBLED IN THE SAMEPOSITION (IMPELLERS, HEADPLATES, AND GEARS).

4. If the timing gears appear undamaged, the gear backlash must be checked to see if the gears can be salvaged.
   A. Mount a magnetic base dial indicator on the gear headplate (see FIGURE 6-1).
   B. Lock one impeller stationary by wedging a feeler gauge between the impeller and the headplate.
   C. The tip of the indicator should be placed at the center of the contact surface on a tooth of the gear on the free shaft.
   D. Rock the impeller back and forth by hand and read the total rotational movement to the nearest .0005 inches. Do this at four gear mesh positions 90 degrees apart.
   E. Permissible gear backlash is shown below.

GEAR DIA.	GEAR BACKLASH
2”	.0015 - .0025
3”	.0015 - .0025
4”	.0015 - .0025
5”	.002 - .003

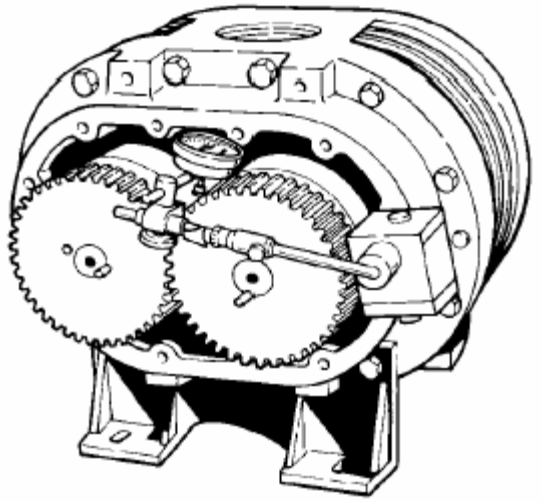


FIGURE 6-1

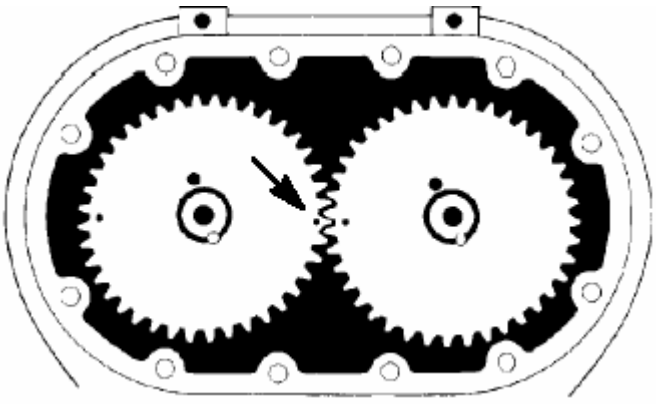


FIGURE 6-2

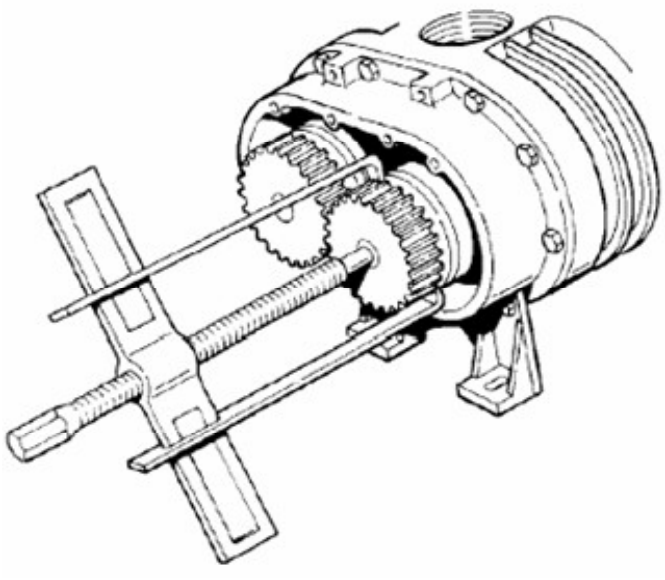


FIGURE 6-3

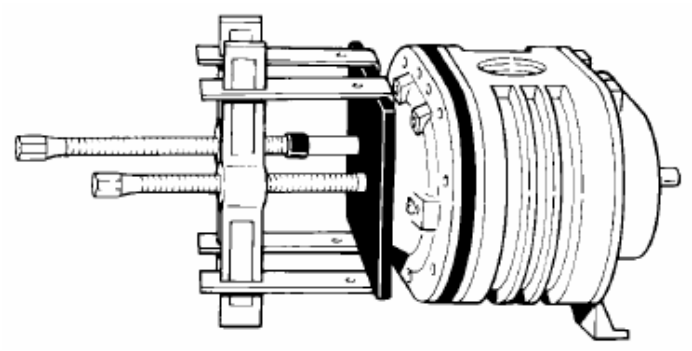


FIGURE 6-4

NOTICE
If backlash is above the specified limit, the gears are not necessarily unusable. Excessive play could be caused by worn bearings.

5. If timing gears appear to be reusable, match marktiming gear toothmesh by making small punch marks on the ends of meshing gear teeth with a pin punch and hammer (see FIGURE 6-2, page 25). The impeller tip to valley (throat) and the case to headplates should also be matchmarked to facilitate blower reassembly.
6. Using a gear puller, remove timing gears. The taper pin should back out with the gear as the gear is being removed (see FIGURE 6-3). Use caution not to damage gear teeth with puller if gears are to be used again.

NOTICE
Blowers with mechanical seals have two wavy washers (28) located between the bearings and the cover on the drive end.

7. Remove the socket head cap screws (30) from the drive end bearing cover (29) and remove the cover. Drive shaft oil seal (31) should come free when cover is removed.

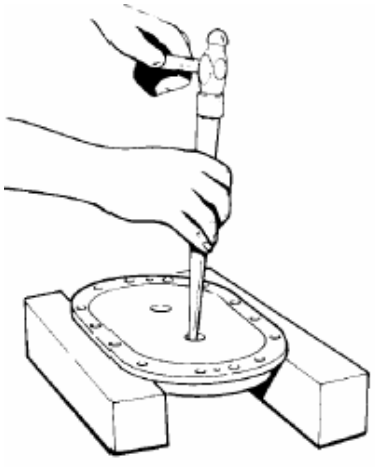


FIGURE 6-5

8. Remove mounting foot (17) from the drive headplate (24) by removing the capscrews (16).
9. Remove the capscrews (21) which secure the drive headplate (24) to the impeller case (22).
10. Using the puller plate shown on page 23, bolt to the drive headplate using the tapped holes used to secure the drive cover.
11. Install a gear puller to each shaft and attach puller arms to the plate. Turn each puller only half a revolution at a time keeping the advance of the shafts as uniform as possible (see Figure 6-4). After the headplate has been removed, detach the puller plate.
12. .Remove the two drive end bearings (15) from the drive headplate (24) using a ball peen hammer and punch (see Figure 6-5, page 26).

⚠ CAUTION
Exercise care not to damage the headplate bearing bores when removing bearings.

13. The grease seals can now be driven out of the drive headplate with hammer and punch (see Figure 6-5, page 26). Discard the seals as they will not be reused. Replace grease seals each time the headplate is removed.

NOTICE
Seals and bearings should be replaced during overhaul as a matter of service policy.

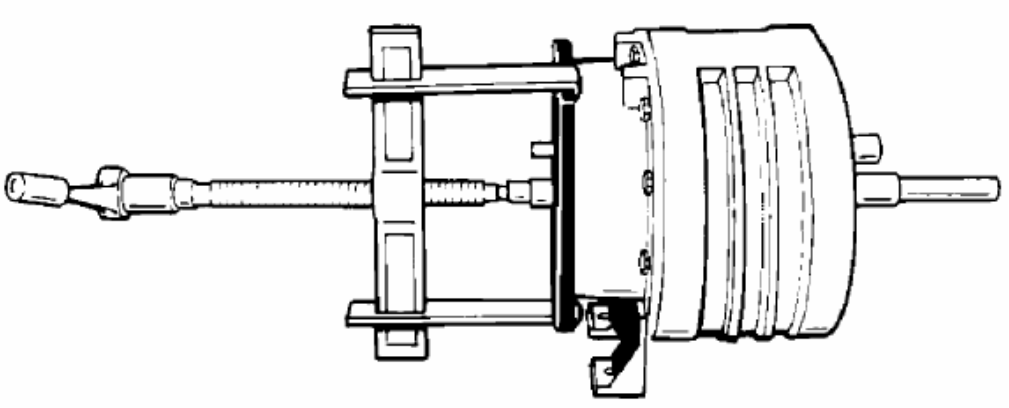


FIGURE 6-6

14. Remove the four cap screws (10), which fasten the bearing retainers (12) to the gear headplate.
15. Attach puller plate to the gear headplate using the tapped holes used to secure the bearing retainers.
16. Install a gear puller to one of the shafts and attach puller arms to the plate (see Figure 6-6).
17. Remove mounting foot (17) from the gear headplate by removing 4 capscrews (16).
18. Push the impeller shaft through the gear headplate and remove the impeller assembly(23) (see Figure 6-6). Remove the other impeller assembly following the same procedure.
19. Remove the cap screws (21) securing the gear headplate to the impeller case. Located near each dowel pin on the headplate is a threaded hole. Insert a 5/16-18 UNC capscrew into each of the threaded holes. Tighten the screws evenly until the headplate separates from the impeller case.
20. Remove the two gear and bearings (14) from the gear headplate (18) as done in step 12.
21. Remove the oil seals (15) from gear headplate (19) as done in step 13.

SECTION 7
ASSEMBLY INSTRUCTIONS

NOTICE
Numbers in parentheses ( ) refer to key numbers in assembly drawings on pages 35, 37, 39 and 41.

1. Make sure all metallic parts are clean and free of any nicks or burrs.

2. Lubricate the outside diameter of the lip seal (15) with a light oil or grease. Install seals in both the drive headplate (24) and gear headplate (18). The seal lip should always face towards the bearing or lubricant. New seals should be installed each time the headplate is removed.

NOTICE
Make sure seals are fully seated. Use extreme care when installing.

MECHANICAL SEALS ONLY

A. Lightly coat the headplate bores with assembly lubricant.

B. Refer to Figure 7-1. Install mechanical seal (A) into the headplate bore (C) using a press and the correct driver shown on page 24. Drive the seal securely on to its seat.

⚠ CAUTION
Use extreme care when installing seals in the headplate bores. Do not attempt to install the mechanical seals without the use of a press. Blows from a hammer or mallet can damage the fragile seal surface. Too much force can crush the seal casing. Make certain the seal is properly seated and undamaged before proceeding.

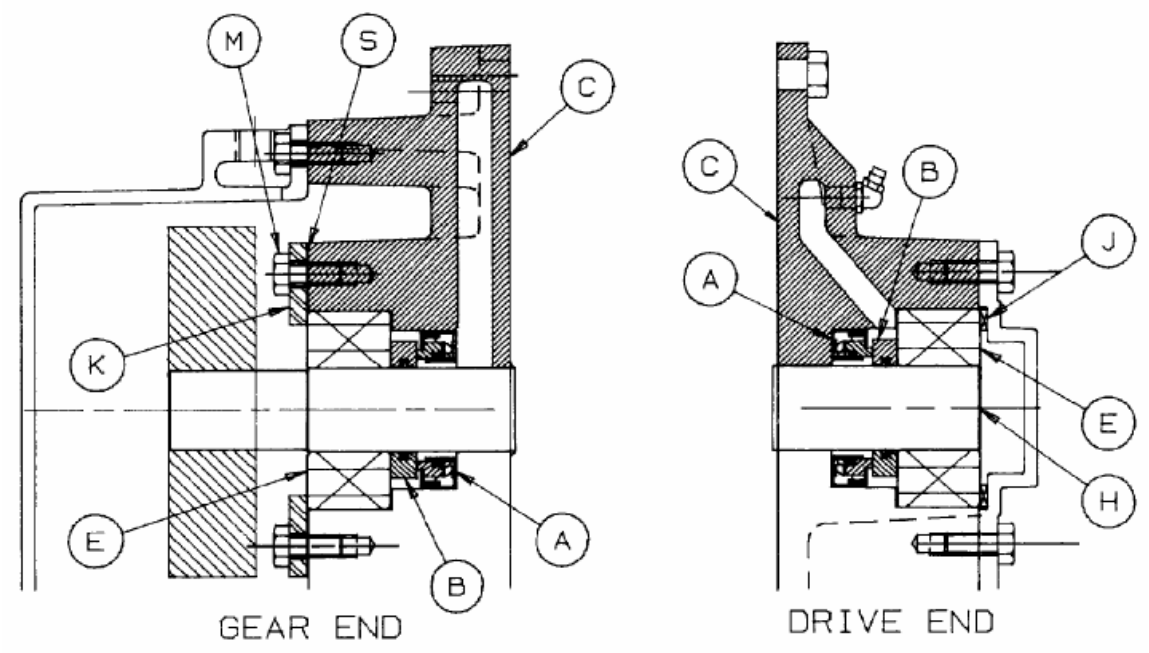


FIGURE 7-1

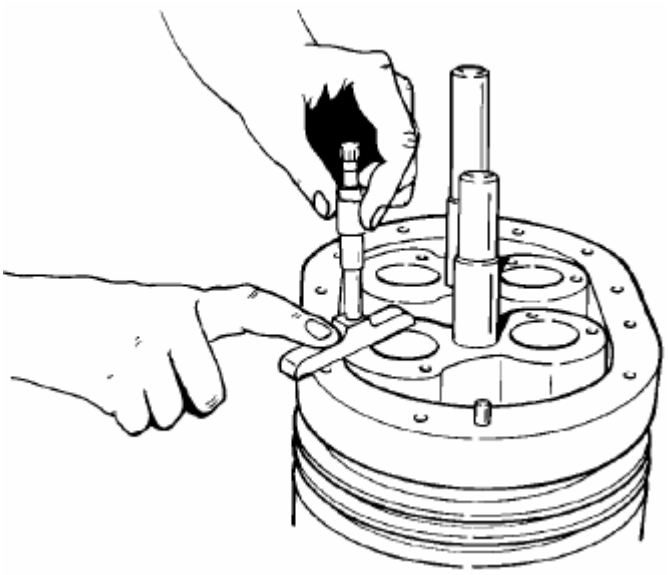


FIGURE 7-2

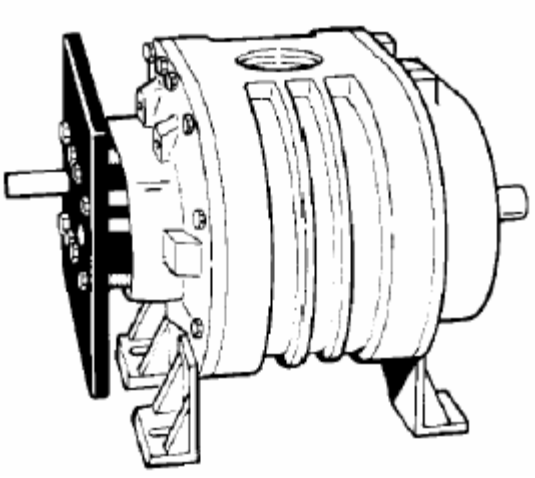


FIGURE 7-3

3. Assemble gear headplate (18) and mounting foot (17) to the impeller case with cap screws (21) and where the mounting foot is secured to the headplate use capscrews (16). The two positioning dowel pins (19) will ensure proper alignment of the headplate and impeller case. Also secure lifting lugs using capscrews (21) (see exploded assembly drawing on page 35. Refer to Figure 7-8, page 34, for torque specifications.

⚠ CAUTION
Seals are delicate; use extreme care when installing impeller shafts in the headplate bores. A piece of light shim stock wrapped around the shaft keyway will prevent cutting the seal lip.

4. Apply a light oil or grease on the shaft seal areas and the bearing areas. Insert impellers into the gear headplate using the same headplate bores as used in the original assembly.
5. Position blower so that impellers are vertical, with the drive end on top. It will be necessary to use blocks in order for the unit to set level. Measure the total end clearance using a depth micrometer (see Figure 7-2).

NOTICE
If more than .007" shim is required, put .007" on the drive end and the remaining on the gear end.

If total clearance is not within the limits specified in Figure 7-4, page 30, it may be necessary to shim the case to obtain the proper total end clearance. The shim should be placed between the drive headplate and impeller case.

6. Assemble drive headplate (24) to impeller case as in step 3 with the gear headplate. If shims were required, place shims between drive headplate and impeller case.

MECHANICAL SEALS ONLY

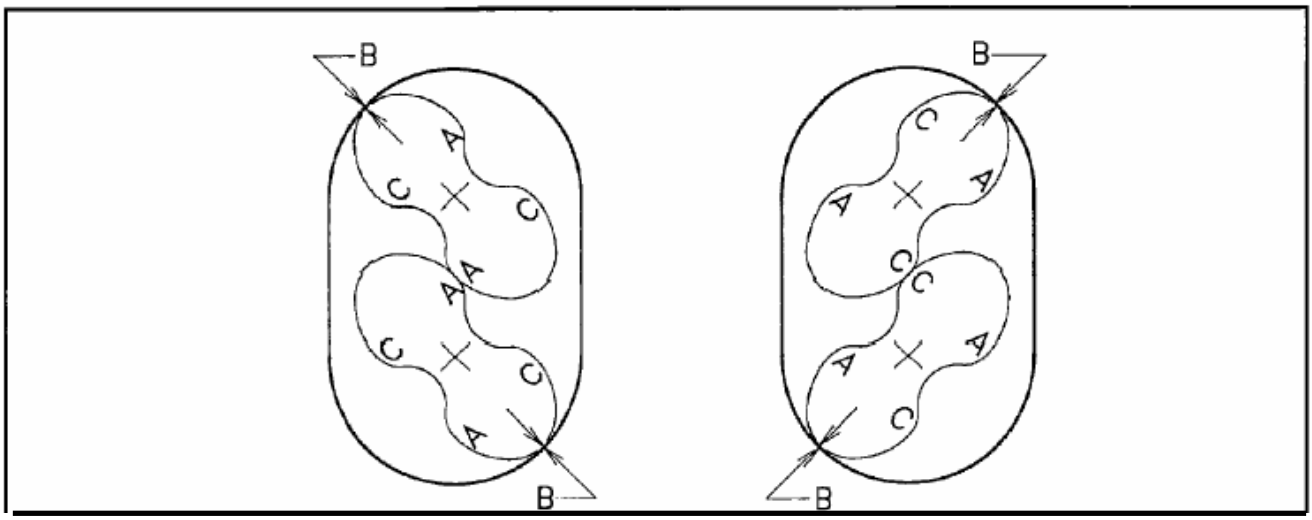
A. Refer to Figure 7-1, page 28. Lightly coat the impeller shaft (H) and the inside diameter of the mating ring (B) with assembly lubricant.

B. Install the mating ring (B) on the shaft only far enough to get the bearing (E) started on the shaft.

⚠ CAUTION
Do not drive the mating ring down to the mechanical seal, as this can damage the seal.

C. Lightly lubricate the bearing inner race (E) with a light oil or grease.

D. Using a press, install the bearing on the shaft with the bearing driver shown on page 24.



CLEARANCES FOR STANDARD UNITS ONLY

	2M	2L	3H	3M	3L	4H	4M	4L	5H	5M	5L
TOTAL END CLEARANCE	.006-.009		0.007-0.011			0.007-0.011			0.007-0.011		
IMPELLER TO GEAR HEADPLATE	.003-.004		0.003-0.005			0.003-0.005			0.003-0.005		
IMPELLER TIMING (A-A) (C-C)	.005-.008		0.005-0.007	.006-.008		0.006-0.008	.007-.010		.007-.010	.008-.010	
TIP TO CASE CLEARANCE (B-B)	0.002 min.		0.002 min.			0.002 min.			0.002 min.		

FIGURE 7-4

The bearing driver will position the mating ring (B) to the correct depth with respect to the mechanical seal (A).

7. Apply a light oil to the drive headplate bearing bore, bearing inside diameter, and shaft seat. Install the drive end bearings (14) as far as possible without force.
8. Attach the puller plate shown on page 23 to the drive headplate using the tapped holes used to secure the drive cover (see FIGURE 7-3, page 29). Tighten the bolts so that the advance of the bearings stay as uniform as possible. Bearings should be pressed until flush with the drive headplate.
9. Lubricate the gear end bearing fits with a light oil as described previously. Install gear end bearings (14) as far as possible without force. Use the plate, used to install the drive end bearings, to press the bearings on the shafts as described in Step 8. Press bearings into the gear headplate until completely seated in the bearing bore.

NOTICE
Bearings will not be flush with gear headplate bores when completely seated.

10. Impellers should now be checked for free axial movement by hitting the ends of the impeller shafts with the palm of your hand.
11. Push the impellers against the gear headplate and recheck the total end clearance between the drive headplate and the impellers (see FIGURE 7-4).
    A. If total end clearance is insufficient, loosen impeller case to headplate bolts on either headplate, and move the headplate away from the case far enough to insert a paper shim in the amount equal to the insufficient clearance. Retighten case bolts and again check the total end clearance. Refer to FIGURE 7-4 for correct clearance.
    B. Excessive end clearances normally will require new impeller assemblies, but in some circumstances the impeller case can be removed and reduced in width by machining off the amount of excess clearance.

⚠ CAUTION

These impeller-to-impeller and impeller-to-case clearances are extremely critical. Even though the blower may turn freely by hand when cold, under operating conditions, the parts expand, and the rotors are subject to slight defection.

If the clearances are not sufficient, the impellers may contact each other or the housing with destructive results. If the clearances are too great, the blower may not develop the pressure or airflow that is required to perform its function.

12. Impeller tip to case clearance should be checked at this time by inserting the correct thickness feeler gauge between the tip and the case and rotating the impeller (see FIGURE 7-4, page 30). Repeat the procedure on both impellers.

NOTICE

When checking the tip to case clearance, move the feeler gauge over the entire length of the impeller to ensure that the tips do not bind along their length.

13. INSTALLING THE TIMING GEARS

A. Apply a light grease, or oil, on the shaft area where the timing gear will be positioned.

B. Place feeler stock in the amount of 1/3 of the total end clearance between drive headplate and both impellers. This will stop the impellers from contacting the headplate while the gears are being driven on.

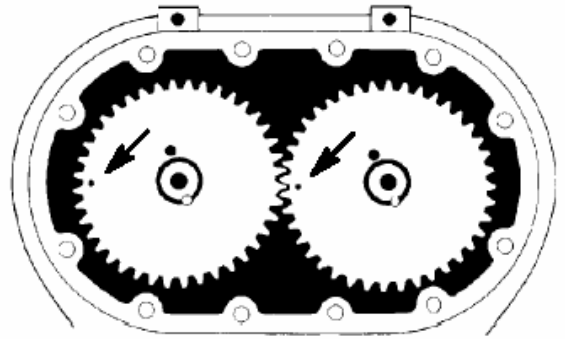


FIGURE 7-5

⚠ CAUTION

If installing gears on a blower containing mechanical seals, a press must be used to drive the gears on the shafts. Blows from a hammer or mallet will damage the seal.

C. Secure the bearing retainer plate (12) to the gear headplate using capscrews (10). Refer to FIGURE 7-8, page 34, for torque specifications.

D. If reusing the timing gears, the gears should be returned to their original positions. Use taper pin holes and matchmarks for correct positioning.

NOTICE

Replacement gears have minimum backlash marks on the outside diameter of the gear face. These marks should be located 180 degrees from each other (see FIGURE 7-5).

E. Using the driving tool shown on page 23, drive one gear flush with the end of the shaft and re-ream the original hole between the shaft and the gear if movement between the shaft and gear was negligible. If re-reaming fails to eliminate edges set up by re-timing, drill a new hole approximately 90 degrees from the original hole. Apply a thin coat of Loctite 620 to the taper pin and install the taper pin in the reamed hole between the shaft and the gear. Control the depth of the taper pin leaving approximately 1/8 in, taper pin protruding beyond the end of the shaft..

NOTICE
If gears are being replaced, taper pin holes must be drilled after the gears are correctly positioned. Be careful not to let cuttings drop behind the gears and contaminate the bearings.

⚠ CAUTION
Be careful not to let cuttings drop behind the gears and contaminate the bearings.

F. Place impellers in the position shown in FIGURE 7-4, page 30. Check to be sure impellers are in correct position as previously match marked.

G. Drive the mating gear on the other shaft within 1/2" of being flush with the end of the shaft.

H. Refer to diagram in FIGURE 7-4, page 30. Use feeler gauges to check clearances between impeller lobes at positions A--A and C--C. Add the clearances, and divide the total clearance evenly between A--A and C--C.

I. If the lobe clearance is not equal between A--A and C--C, the impellers require shifting relative to the gears. Insert a feeler gauge .010 inch larger than required clearance between the impellers at the tight spot and rotate the impellers wedging the feeler gauge between the lobes. Place the driving tool against the gear that is not flush with the end of the shaft, and strike the driver with a quick blow. This will drive the gear further onto the shaft, causing it to turn relative to the shaft due to the torque value set--up by the oversized feeler gauge wedged between the impeller lobes. Adjust so that the clearance at A--A is equal to C--C within .001 inch. Clearances must be checked on both sides of each impeller lobe over the entire length. This procedure may require repeating several times until the impeller lobe clearance is equal on both sides.

NOTICE
The gear used for adjustment should be flush with its mate on completion of the timing.

J. Check gear backlash four places at 90 degree intervals as described in the disassembly procedure (Item 4).

NOTICE
If any of the four gear backlash readings are not within the specified limits, the gears must be replaced.

14. After timing adjustments are completed, re-ream the original hole between shaft and adjustment gear if movement between the shaft and gear are negligible. If reaming fails a new hole approximately 90 degrees from the original hole. Apply a thin coat of Loctite 620 to the taper pin and install the taper pin in the reamed hole between the shaft and gear.

NOTICE
Replacement gears are not drilled. These holes must be drilled after the gears are in the proper position and the unit retimed.

15. SETTING IMPELLER END CLEARANCES

Refer to FIGURE 7-6, page 33. The outer races of the gear end bearings are clamped against the headplate (F) by the bearing retainer (B).

This is referred to as the "fixed end". The interference fit between the shaft and the bearing inner race (H) keeps the shaft from moving axially. Adjustment is by movement of the shaft through the gear end bearing inner race (H).

A. Check the total end clearance by adding the clearance between the impellers and the drive headplate to the clearance between the impellers and the gear headplate.

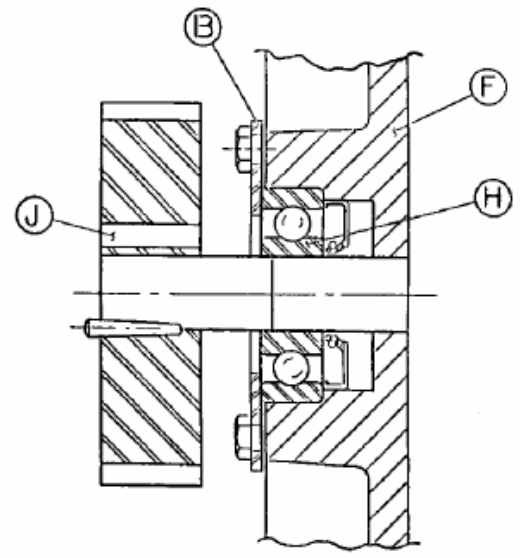


FIGURE 7-6

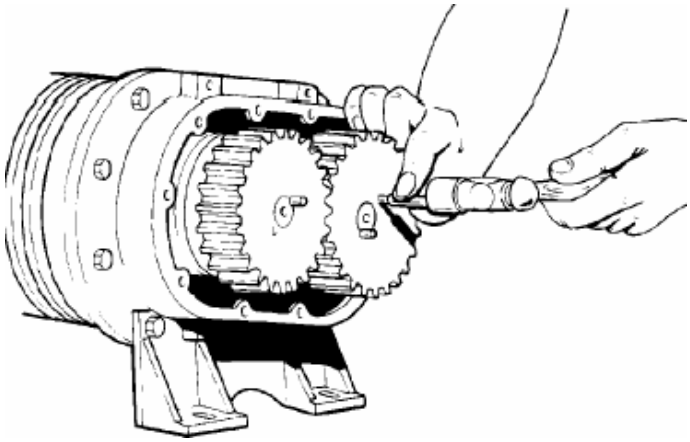


FIGURE 7-7

NOTICE
Check the clearance over the entire width of the impeller and consider the tightest spot.

B. Divide the total end clearance by 3 and distribute approximately 1/3 on the gear end and the remaining 2/3 on the drive end.

C. To move the impeller assembly toward the drive end, lightly tap the shaft at the gear end with a soft face mallet.

D. To set the fixed end, insert the feeler gauge in the amount specified in FIGURE 7-4, page 30, between the headplate and the impeller at the gear end.

E. Insert a mild steel or soft metal rod thru the small hole in the gear (9). Tap lightly until the feeler gauge is snug. Adjust both impellers using the same procedure. Rotate the impellers checking for clearance through a complete revolution (see FIGURE 7-7).

SETTING IMPELLER END CLEARANCE WITH MECHANICAL SEALS

Refer to FIGURE 7-1, page 28. The gear end bearings are held in position by the force created by the wavy spring (J) on the drive end and the bearing retainer (K) on the gear end. This is referred to as the fixed end. The interference fit between the shaft (H) and the bearing inner race (E) keeps the shaft from moving axially.

End clearance adjustment is by movement of the bearing retainer (K). Tightening the bearing retainer screws (M) moves the bearing to load the wavy spring (J), and the impeller is forced toward the drive end. Relaxing the screws allows the wavy spring to return the impeller toward the gear end.

A. Assemble drive cover to drive headplate. Refer to Step 16 with the exception of the use of wavy springs (J) installed between the drive end bearings and the drive cover.

B. Back out retainer screws (M) until both impellers are tight against the gear headplate.

C. With feeler gauge, measure the clearance between each impeller and the drive headplate. This value is the total end clearance.

D. Measure the clearance between the gear headplate and bearing retainer (K) at point (S).

E. Subtract 1/3 of the total end clearance from the clearance measured at point (S). This value is the amount of shim (13) that should be placed between the retainer and the headplate at point (S).

F. Tighten the bearing retainer screws (M) to the torque value given in FIGURE 7-8, page 34. With the retainer screws secure, approximately 1/3 of the total end clearance should be on the gear end and the remaining 2/3 on the drive end.

16. Replace drive shaft grease seal (31) in the drive end cover (29). The seal lip should always face towards the bearing or lubricant. Pack bearing cavities with recommended grease and secure drive cover with capscrews (30) to drive headplate. Refer to FIGURE 7-8 for torque specifications.

⚠ CAUTION

Exercise care not to damage the seal lip as it passes over the shaft keyway.

17. Assemble the gear cover (3) and gasket (7) to the gear headplate (18) using capscrews (5). Tighten the capscrews alternately and evenly. Refer to FIGURE 7-8 for torque specifications.

18. Place the blower on its feet on a flat surface. Loosen cap screws (16) and level the unit up. The bench or blower base flatness should be within .002 of an inch. Re--tighten cap screws (16) to the specification in FIGURE 7-8.

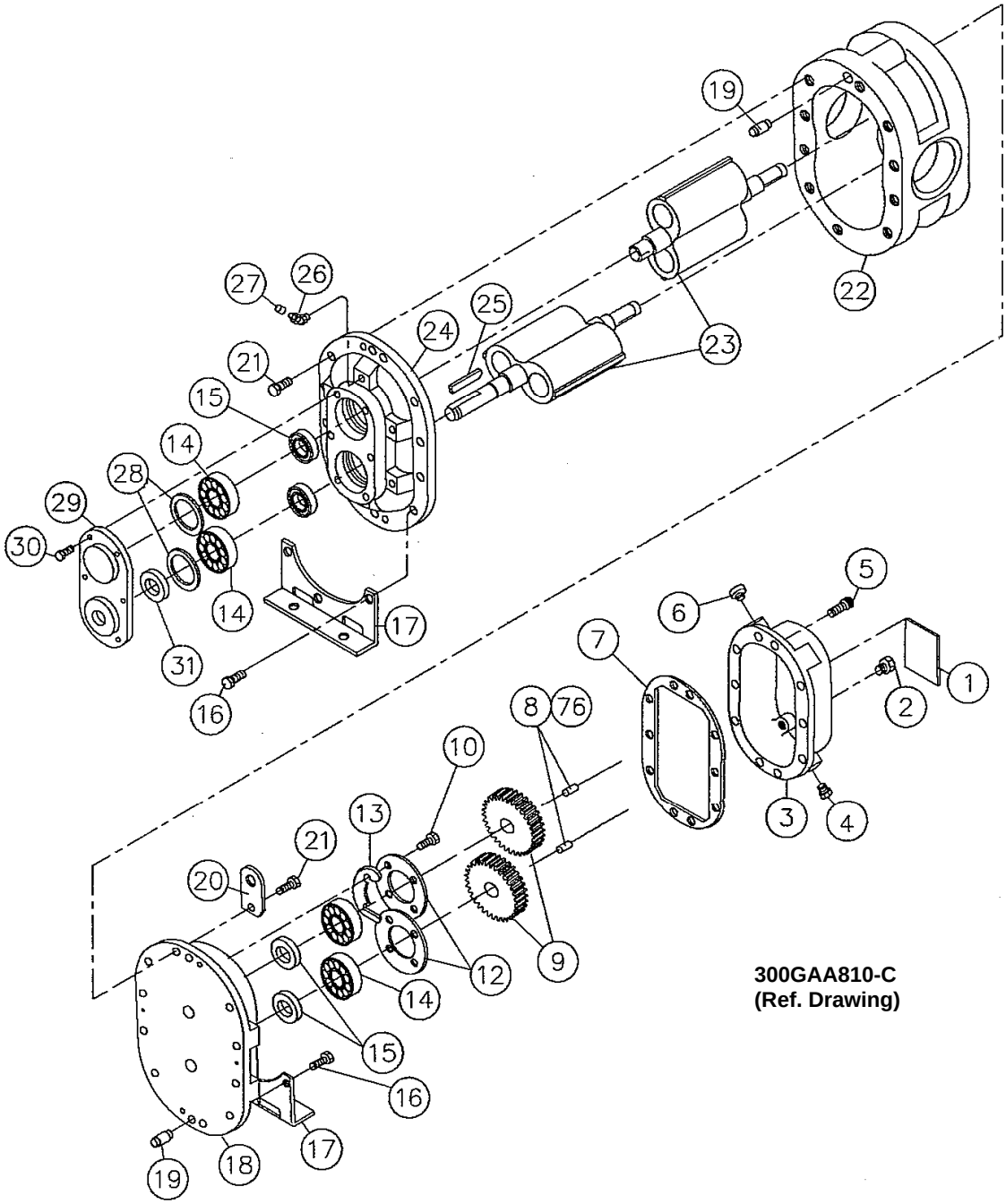
NOTICE

If the unit is not flat within .002 of an inch, it will be necessary to shim the blower feet at installation.

	GEAR DIAMETER			
FASTENERS	**2**	**3**	**4**	**5**
CAPSCREW (21)	13 – 17	23 – 30	23 – 30	23 -- 30
CAPSCREW (16)	13 – 17	23 – 30	23 – 30	23 -- 30
SOCKET HD CAPSCREW (5)	6 – 8	6 – 8	13 – 17	13 -- 17
SOCKET HD CAPSCREW (30)	6 – 8	6 – 8	13 – 17	6 -- 8
CAPSCREW (10)	6 – 8	6 – 8	13 – 17	13 -- 17

NOTE: ( ) DENOTES ITEMS IN EXPLODED VIEW DRAWINGS ON PAGES 35, 37, 39 AND 41.

FIGURE 7-8 – TORQUE (FT-LBS)

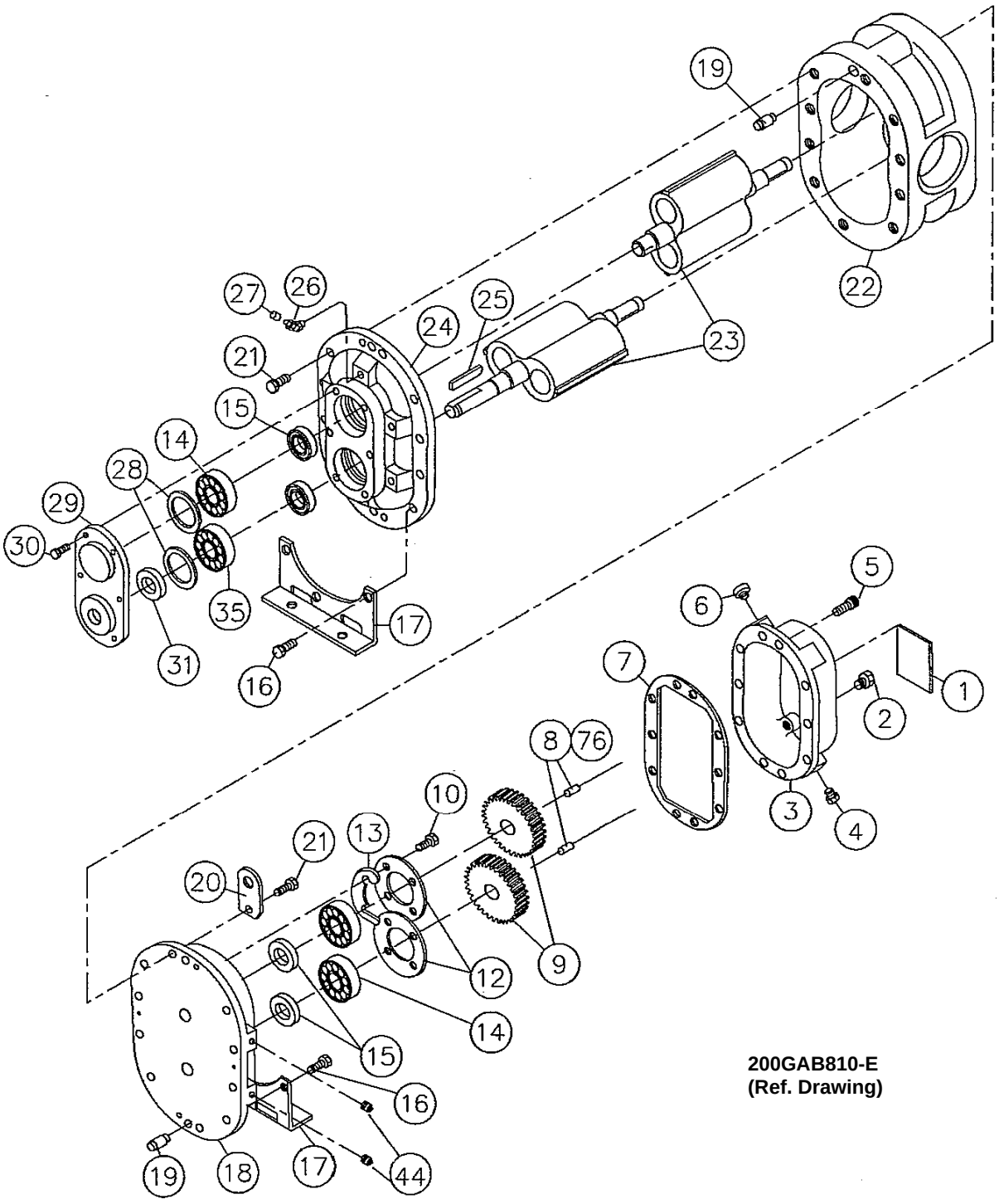


300GAA810-C
(Ref. Drawing)

Order by Part Number and Description. Reference Numbers are for your convenience only.

	Ref. No.	Description	No. Req'd	MODEL GAA Size -- 2M GAAM_P_	Size -- 2L GAAL_P_
	1	NAMEPLATE	1	302GAA496	302GAA496
	2	OIL LEVEL PLUG	2	64AC1	64AC1
	3	GEAR CASE	1	900893022801	900893022801
	4	DRAIN PLUG	1	64AC1	64AC1
	5	SCREW--GEAR CASE TO BEARING HOUSING	6	75LM224	75LM224
	6	VENT PLUG	1	900639650102	900639650102
O	7	GASKET GEAR CASE	1	200GAA715	200GAA715
O	8	TAPER PIN	2	62V73	62V73
	9	TIMING GEAR GROUP	1	200GAA6008	200GAA6008
O	10	SCREW--BEARING RETAINER TO BEARING	8	75A185N	75A185N
	12	BEARING RETAINER	2	900892021801	900892021801
+	13	SHIM SET	1	900891022900	900891022900
O	14	BEARING	4	12BA142	12BA142
O	15	MAIN SEAL--PER APPLICATION BELOW			
		LIP SEAL VERSION	4	60DD713	60DD713
		MECHANICAL SEAL VERSION	4	900871020002	900871020002
	16	SCREW--FOOT TO BEARING HOUSING	6	75A34	75A34
	17	FOOT GROUP			
		VERTICAL FOOT GROUP	1	GAA81896	GAA81896
		HORIZONTAL FOOT GROUP	1	GAA81897	GAA81897
	18	HOUSING--BEARING (GEAR END)			
		LIP SEAL	1	900894021001	900894021001
		MECHANICAL SEAL	1	204GAA006	204GAA006
	19	DOWEL PIN	4	62M48	62M48
	20	LIFTING LUG	2	200GAA451	200GAA451
	21	SCREW--BEARING HOUSINGS TO IMPELLER	14	75A34	75A34
	22	IMPELLER CASE.	1	900894021201	900894021401
	23	SHAFT ASSEMBLY GROUP (SEAL VENTS)	1	GAA81899	GAA81898
		SHAFT ASSEMBLY GROUP CONSISTS OF:			
		(1)ASSEMBLY SHAFT – LONG			
		(1) ASSEMBLY SHAFT – SHORT			
	24	HOUSING--BEARING (DRIVE)			
		LIP SEAL	1	900894020801	900894020801
		MECHANICAL SEAL	1	205GAA006	205GAA006
	25	DRIVE KEY	1	900891023101	900891023101
	26	GREASE FITTING	2	900639910304	900639910304
	27	GREASE FITTING CAP	2	40P58	40P58
+	28	WAVY SPRING	2	78W65	78W65.
	29	DRIVE COVER	1	900893021701	900893021701
	30	SCREW--DRIVE COVER TO BEARING HOUSING	6	75A185N	75A185N
O	31	DRIVE SEAL	1	900639010802	900639010802
*+	42	PLUGS REQUIRED WITH MECHANICAL SEAL	6	64AC1	64AC1
		SHIM--IMPELLER CASE			
		PAPER (.0015/.0020)	0	202GAA732	202GAA732
		PAPER (.003)	0	200GAA732	200GAA732
		ALUMINUM (.010)	0	201GAA732	201GAA732
O		OVERHAUL KIT LIP SEAL	0	200GAA6010	200GAA6010
O		OVERHAUL KIT MECHANICAL SEAL	0	201GAA6010	201GAA6010
	76	LOCTITE 620	1	25BC749	25BC749

* NOT SHOWN
o OVERHAUL KITS CONSIST OF BEARINGS, SEALS, GASKET, SHIMS, TAPER PINS AND BEARING RETAINER SCREWS.
+ MECHANICAL SEAL UNITS ONLY.

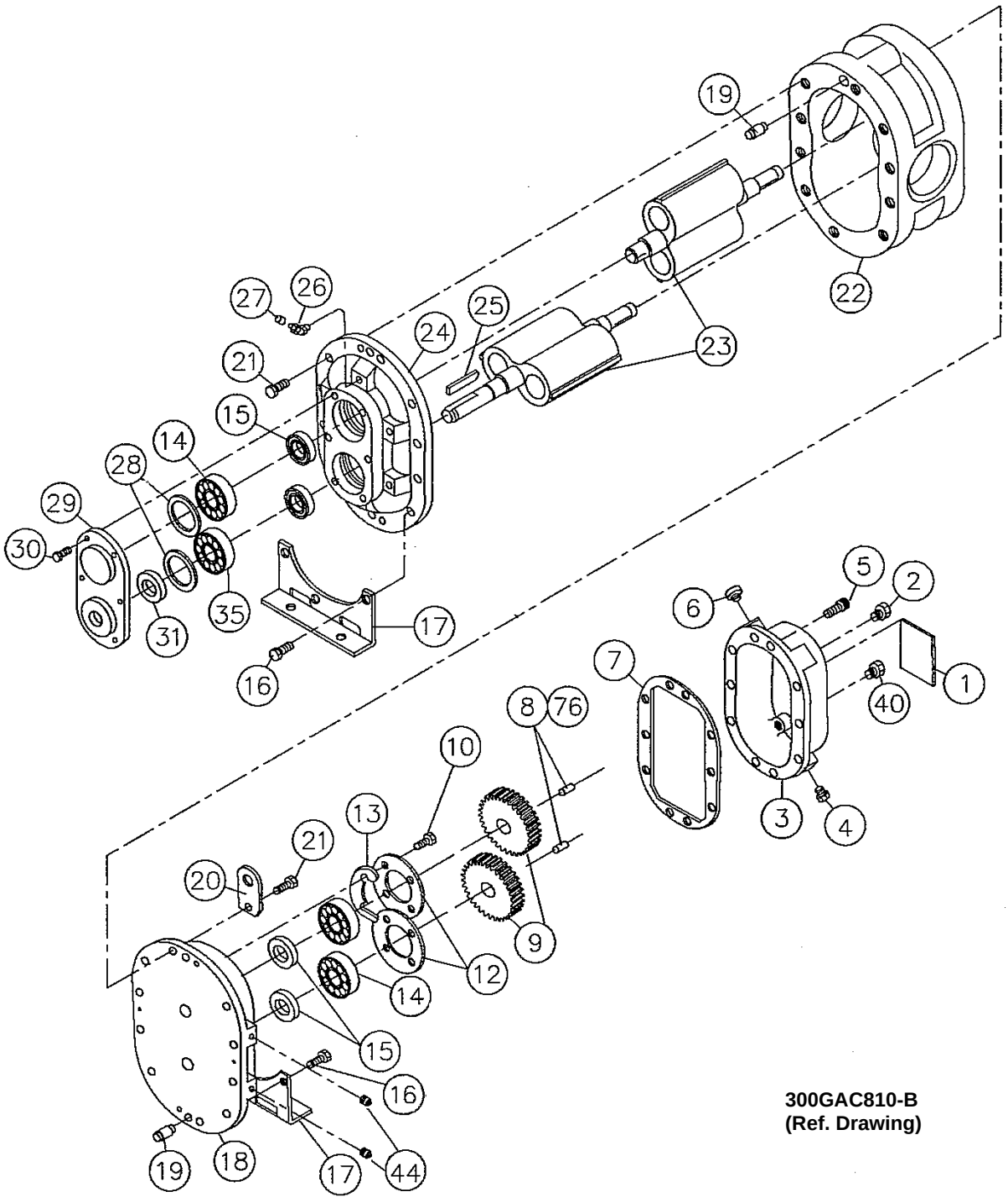


200GAB810-E
(Ref. Drawing)

Order by Part Number and Description. Reference Numbers are for your convenience only.

Ref. No.		Description	No. Req'd	MODEL GAB Size-- 3H GABH_P_	Size -- 3M GABM_P_	Size -- 3L GABL_P_
	1	NAMEPLATE	1	302GAA496	302GAA496	302GAA496
	2	OIL LEVEL PLUG	2	64AC2	64AC2	64AC2
	3	GEAR CASE	1	900873032901	900873032901	900873032901
	4	DRAIN PLUG	1	64AC2	64AC2	64AC2
	5	SCREW--GEAR CASE TO BEARING HOUSING	10	75LM224	75LM224	75LM224
	6	BREATHER	1	5L306	5L306	5L306
o	7	GASKET GEAR CASE	1	200GAB715	200GAB715	200GAB715
o	8	TAPER PIN	2	62V58	62V58	62V58
	9	TIMING GEAR GROUP	1	201GAB6008	201GAB6008	201GAB6008
o	10	SCREW--BEARING RETAINER TO BEARING HOUSING	8	75A185N	75A185N	75A185N
	12	BEARING RETAINER	2	900883031401	900883031401	900883031401
+	13	SHIM SET	1	900881032200	900881032200	900881032200
o	14	BEARING	3	12BA143	12BA143	12BA143
o	15	MAIN SEAL--PER APPLICATION BELOW				
		LIP SEAL VERSION	4	900891030601	900891030601	900891030601
		MECHANICAL SEAL VERSION	4	900871020003	900871020003	900871020003
	16	SCREW--FOOT TO BEARING HOUSING	8	655ED050	655ED050	655ED050
	17	FOOT GROUP				
		VERTICAL FOOT GROUP	1	GAB81903	GAB81903	GAB81903
		HORIZONTAL FOOT GROUP	1	GAB81904	GAB81904	GAB81904
	18	HOUSING--BEARING (GEAR END)				
		LIP SEAL	1	900873033301	900873033301	900873033301
		MECHANICAL SEAL	1	900883030101	900883030101	900883030101
	19	DOWEL PIN	4	62M48	62M48	62M48
	20	LIFTING LUG	2	200GAA451	200GAA451	200GAA451
	21	SCREW--BEARING HOUSINGS TO IMPELLER CASE	16	655ED040	655ED040	655ED040
	22	IMPELLER CASE	1	900873034301	900873033801	900873034201
	23	SHAFT ASSEMBLY GROUP	1	GAB81905	GAB81907	GAB81906
		SHAFT ASSEMBLY GROUP CONSISTS OF:				
		(1) ASSEMBLY SHAFT – LONG				
		(1) ASSEMBLY SHAFT – SHORT				
	24	HOUSING--BEARING (DRIVE END)				
		LIP SEAL	1	900873033501	900873033501	900873033501
		MECHANICAL SEAL	1	900883030301	900883030301	900883030301
	25	DRIVE KEY	1	900639910304	900639910304	900639910304
	26	GREASE FITTING	2	40E9	40E9	40E9
	27	GREASE FITTING CAP	2	40P58	40P58	40P58
+	28	WAVY SPRING	2	900669170203	900669170203	900669170203
	29	DRIVE COVER	1	900873033701	900873033701	900873033701
	30	SCREW--DRIVE COVER TO BEARING HOUSING	6	75LM224	75LM224	75LM224
o	31	DRIVE SEAL	1	60DD725	60DD725	60DD725
o	35	BEARING DRIVE END DRIVE SHAFT	1	12BA153	12BA153	12BA153
*+	42	PLUGS REQUIRED WITH MECHANICAL SEAL (Drive End)	4	64AC1	64AC1	64AC1
	44	SCREW—SET	2	76F92	76F92	76F92
*+	46	PLUGS REQUIRED WITH MECHANICAL SEAL (Gear End)	2	64AC2	64AC2	64AC2 .
		SHIM--IMPELLER CASE				
		PAPER (.0015/.0020)	0	202GAB732	202GAB732	202GAB732
		PAPER (.003)	0	200GAB732	200GAB732	200GAB732
		ALUMINUM (.010)	0	201GAB732	201GAB732	201GAB732
o		OVERHAUL KIT LIP SEAL	0	203GAB6010	203GAB6010	203GAB6010
o		OVERHAUL KIT MECHANICAL SEAL	0	204GAB6010	204GAB6010	204GAB6010
	76	LOCTITE 620	1	25BC749	25BC749	25BC749

* NOT SHOWN
o OVERHAUL KITS CONSIST OF BEARINGS, SEALS, GASKET, SHIMS, TAPER PINS AND BEARING RETAINER SCREWS.
+ MECHANICAL SEAL UNITS ONLY.

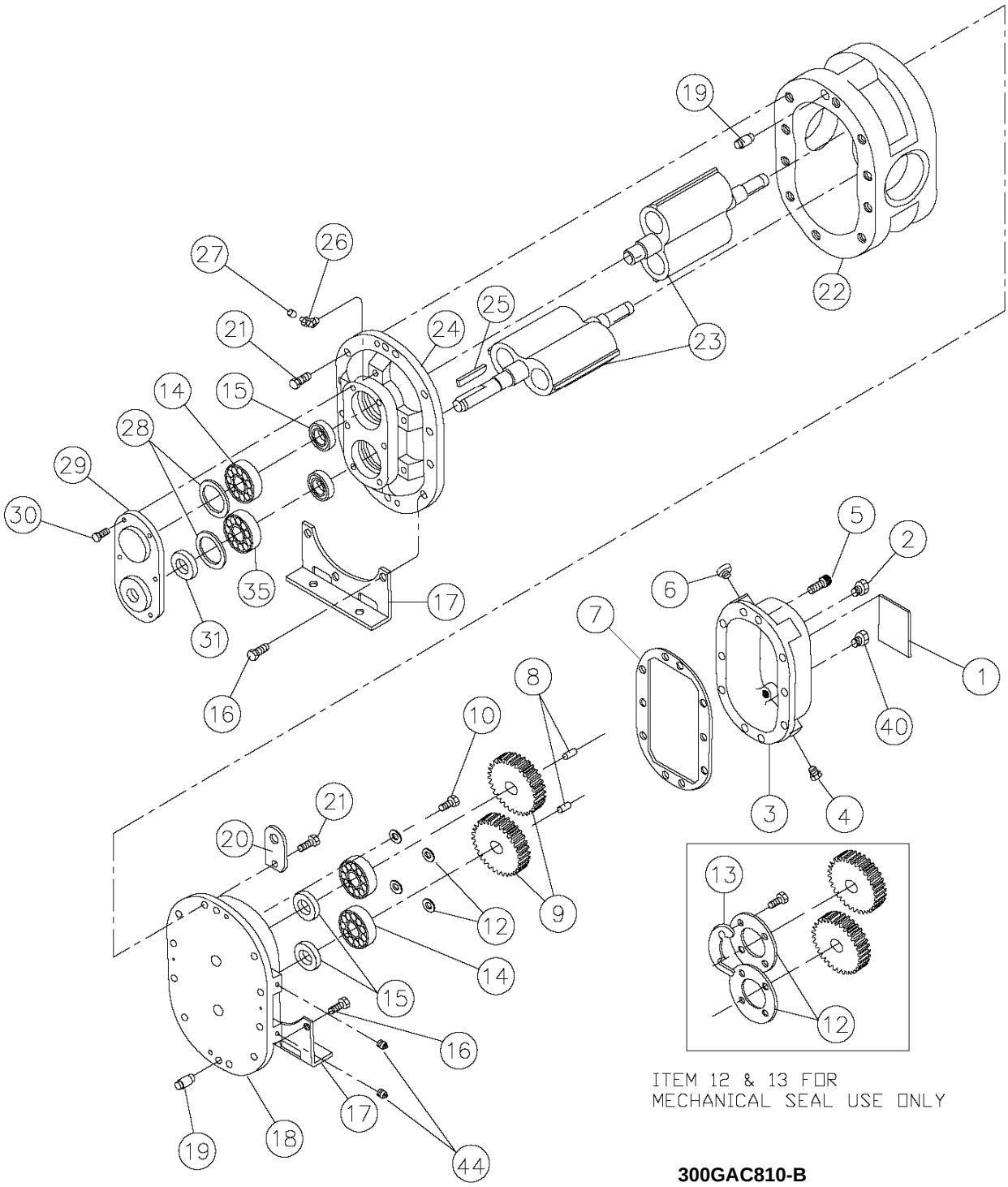


300GAC810-B
(Ref. Drawing)

Order by Part Number and Description. Reference Numbers are for your convenience only.

	Ref. No.	No. Description	Size -- 4H Req'd	MODEL GAC Size -- 4M GACH_P_	Size -- 4L GACM_P_	GACL_P_
	1	NAMEPLATE	1	302GAA496	302GAA496	302GAA496
	2	PLUG FOR ALTERNATE OIL LEVEL CONN.	1	64AC3	64AC3	64AC3
	3	GEAR CASE	1	900883040701	900883040701	900883040701
	4	DRAIN PLUG	1	64AC2	64AC2	64AC2
	5	SCREW--GEAR CASE TO BEARING HOUSING	12	75LM113	75LM113	75LM113
	6	BREATHER	1	5L306	5L306	5L306
O	7	GASKET GEAR CASE	1	200GAC715	200GAC715	200GAC715
O	8	TAPER PIN	2	62V58	62V58	62V58
	9	TIMING GEAR GROUP	1	200GAC6008	200GAC6008	200GAC6008
O	10	SCREW--BEARING RETAINER TO BEARING HOUSING	8	75A33N	75A33N	75A33N
	12	BEARING RETAINER	2	900883040201	900883040201	900883040201
+	13	SHIM SET	1	900881042900	900881042900	900881042900
O	14	BEARING	3	12BA144	12BA144	12BA144
O	15	MAIN SEAL--PER APPLICATION BELOW				
		LIP SEAL VERSION	4	60DD630	60DD630	60DD630
		MECHANICAL SEAL VERSION	4	900871020004	900871020004	900871020004
	16	SCREW--FOOT TO BEARING HOUSING	8	655ED050	655ED050	655ED050
	17	FOOT GROUP				
		VERTICAL FOOT GROUP	1	GAC81911	GAC81911	GAC81911
		HORIZONTAL FOOT GROUP	1	GAC81912	GAC81912	GAC81912
	18	HOUSING--BEARING (GEAR END)				
		LIP SEAL	1	900883040501	900883040501	900883040501
		MECHANICAL SEAL	1	900883041601	900883041601	900883041601
	19	DOWEL PIN	4	62M48	62M48	62M48
	20	LIFTING LUG	2	200GAA451	200GAA451	200GAA451
	21	SCREW--BEARING HOUSINGS TO IMPELLER CASE	16	655ED040	655ED040	655ED040
	22	IMPELLER CASE	1	900883042201	900883041801	900883042001
	23	SHAFT ASSEMBLY GROUP	1	208GAC4028	207GAC4028	206GAC4028
		SHAFT ASSEMBLY GROUP CONSISTS OF:				
		(1) ASSEMBLY SHAFT – LONG				
		(1) ASSEMBLY SHAFT – SHORT				
	24	HOUSING--BEARING (DRIVE END)				
		LIP SEAL	1	300GAC006	300GAC006	300GAC006
		MECHANICAL SEAL	1	900883041201	900883041201	900883041201
	25	DRIVE KEY 1 900639910304	1	900639910304	900639910304	900639910304
	26	GREASE FITTING	2	40E9	40E9	40E9
	27	GREASE FITTING CAP	2	40P58	40P58	40P58
+	28	WAVY SPRING	2	900669170304	900669170304	900669170304
	29	DRIVE COVER	1	900883040301	900883040301	900883040301
	30	SCREW--DRIVE COVER TO BEARING HOUSING	8	75LM113	75LM113	75LM113
O	31	DRIVE SEAL	1	60DD716	60DD716	60DD716
O	35	BEARING—ROLLER	1	12BA154	12BA154	12BA154
	40	GAUGE--OIL LEVEL	1	40P34	40P34	40P34
*+	42	PLUGS REQUIRED WITH MECHANICAL SEAL (Drive End)	4	64AC1	64AC1	64AC1
	44	SCREW—SET	2	76F92	76F92	76F92
*+	46	PLUGS REQUIRED WITH MECHANICAL SEAL (Gear End)	2	64AC2	64AC2	64AC2 .
		SHIM--IMPELLER CASE				
		PAPER (.0015/.0020)	0	202GAC732	202GAC732	202GAC732
		PAPER (.003)	0	200GAC732	200GAC732	200GAC732
		ALUMINUM (.010)	0	201GAC732	201GAC732	201GAC732
O		OVERHAUL KIT LIP SEAL	0	202GAC6010	202GAC6010	202GAC6010
O		OVERHAUL KIT MECHANICAL SEAL	0	203GAC6010	203GAC6010	203GAC6010
	76	LOCTITE 620	1	25BC749	25BC749	25BC749

* NOT SHOWN
O OVERHAUL KITS CONSIST OF BEARINGS, SEALS, GASKET, SHIMS, TAPER PINS AND BEARING RETAINER SCREWS.
+ MECHANICAL SEAL UNITS ONLY.



ITEM 12 & 13 FOR
MECHANICAL SEAL USE ONLY

300GAC810-B
(Ref. Drawing)

Order by Part Number and Description. Reference Numbers are for your convenience only.

Ref. No.	Description	No. Req'd	MODEL GAE Size -- 5H GAEH_P_	Size -- 5M GAEM_P_	Size -- 5L GAEL_P_
1	NAMEPLATE	1	301GAE496	301GAE496	301GAE496
2	PLUG FOR ALTERNATE OIL LEVEL CONN.	1	64AC3	64AC3	64AC3
3	GEAR CASE	1	900883051001	900883051001	900883051001
4	DRAIN PLUG	1	64AC2	64AC2	64AC2
5	SCREW--GEAR CASE TO BEARING HOUSING	2	75LM113	75LM113	75LM113
6	VENT PLUG	1	5L306	5L306	5L306
O 7	GASKET GEAR CASE	1	200GAE715	200GAE715	200GAE715
O 8	TAPER PIN	2	62V58	62V58	62V58
9	TIMING GEAR GROUP	1	201GAE6008	201GAE6008	201GAE6008
+O 10	SCREW--BEARING RETAINER TO BEARING HOUSING	8	75A33	75A33	75A33
10	SCREW	4	75A33P	75A33P	75A33P
+ 12	BEARING RETAINER	2	900883050501	900883050501	900883050501
12		4	95A2	95A2	95A2
+ 13	SHIM SET	1	900881052900	900881052900	900881052900
O 14	BEARING	3	8500397	8500397	8500397
O 15	MAIN SEAL--PER APPLICATION BELOW				
	LIP SEAL VERSION	4	60DD714	60DD714	60DD714
	MECHANICAL SEAL VERSION	4	900871020005	900871020005	900871020005
16	SCREW--FOOT TO BEARING HOUSING	8	655ED050	655ED050	655ED050
17	FOOT GROUP				
	VERTICAL FOOT GROUP	1	GAE81922	GAE81922	GAE81922
	HORIZONTAL FOOT GROUP	1	GAE81923	GAE81923	GAE81923
18	HOUSING--BEARING (GEAR END)				
	LIP SEAL	1	900883052101	900883052101	900883052101
	MECHANICAL SEAL	1	900883050301	900883050301	900883050301
19	DOWEL PIN	4	62M48	62M48	62M48
20	LIFTING LUG	2	200GAA451	200GAA451	200GAA451
21	SCREW--BEARING HOUSINGS TO IMPELLER CASE	24	655ED040	655ED040	655ED040
22	IMPELLER CASE	1	900883051701	900883051801	900883051901
23	SHAFT ASSEMBLY GROUP	1	207GAE4028	206GAE4028	205GAE4028
	SHAFT ASSEMBLY GROUP CONSISTS OF:				
	(1) ASSEMBLY SHAFT – LONG				
	(1) ASSEMBLY SHAFT – SHORT				
24	HOUSING--BEARING (DRIVE END)				
	LIP SEAL	1	206GAE006	206GAE006	206GAE006
	MECHANICAL SEAL	1	207GAE006	207GAE006	207GAE006
25	DRIVE KEY	1	900639910305	900639910305	900639910305
26	GREASE FITTING	2	911659990606	911659990606	911659990606
27	GREASE FITTING CAP	2	40P58	40P58	40P58
+ 28	WAVY SPRING	2	900669170405	900669170405	900669170405
29	DRIVE COVER	1	900883050401	900883050401	900883050401
30	SCREW--DRIVE COVER TO BEARING HOUSING	8	75LM113	75LM113	75LM113
O 31	DRIVE SEAL	1	60DD726	60DD726	60DD726
O 35	BEARING—ROLLER	1	12BA155	12BA155	12BA155
40	GAUGE--OIL LEVEL	1	40P34	40P34	40P34
*+ 42	PLUGS REQUIRED WITH MECHANICAL SEAL (Drive End)	4	64AC1	64AC1	64AC1
44	SCREW—SET	4	76F92	76F92	76F92
*+ 46	PLUGS REQUIRED WITH MECHANICAL SEAL (Gear End)	4	64AC2	64AC2	64AC2
	SHIM--IMPELLER CASE				
	PAPER (.0015/.0020)	0	202GAE732	202GAE732	202GAE732
	PAPER (.003)	0	200GAE732	200GAE732	200GAE732
	ALUMINUM (.010)	0	201GAE732	201GAE732	201GAE732
O	OVERHAUL KIT LIP SEAL	0	200GAE6010	200GAE6010	200GAE6010
O	OVERHAUL KIT MECHANICAL SEAL	0	203GAE6010	203GAE6010	203GAE6010
76	LOCTITE 620	1	25BC749	25BC749	25BC749

* NOT SHOWN
o OVERHAUL KITS CONSIST OF BEARINGS, SEALS, GASKET, SHIMS, TAPER PINS AND BEARING RETAINER SCREWS.
+ MECHANICAL SEAL UNITS ONLY.

Gardner Denver

WARRANTY

SUTORBILT BLOWERS
SUTORBILT LEGEND SERIES

GENERAL PROVISIONS AND LIMITATIONS

Gardner Denver (the "Company") warrants to each original retail purchaser ("Purchaser") of its new products from the Company or its authorized distributor that such products are, at the time of delivery to the Purchaser, made with good material and workmanship. No warranty is made with respect to:

1. Any product which has been repaired or altered in such a way, in the Company's judgment, as to affect the product adversely.
2. Any product which has, in the Company's judgment been subject to negligence, accident, improper storage, or improper installation or application.
3. Any product which has not been operated or maintained in accordance with normal practice and with the recommendations of the Company.
4. Components or accessories manufactured, warranted and serviced by others.
5. Any reconditioned or prior owned product.

Claims for items described in (4) above should be submitted directly to the manufacturer.

WARRANTY PERIOD

The Company's obligation under this warranty is limited to repairing or, at its option, replacing, during normal business hours at an authorized service facility of the Company, any part which in its judgment proved not to be as warranted within the applicable Warranty Period as follows.

BARE BLOWERS

Basic bare blowers, consisting of all parts within, are warranted for 18 months from date of initial use or 24 months from date of shipment to the first purchaser, whichever occurs first.

Any disassembly or partial disassembly of the blower, or failure to return the "unopened" blower per Company instructions, will be cause for denial of warranty.

OTHER COMPONENTS

All other components are warranted for 12 months from date of initial use or 18 months from date of shipment to first purchaser, whichever comes first.

The Company reserves the right to withdraw the Warranty where evidence indicates application outside the stated performance area, or where there is evidence of abuse.

LABOR TRANSPORTATION AND INSPECTION

The Company will provide labor, by Company representative or authorized service personnel, for repair or replacement of any product or part thereof which in the Company's judgment is proved not to be as warranted. Labor shall be limited to the amount specified in the Company's labor rate schedule.

Labor costs in excess of the Company rate schedule amounts or labor provided by unauthorized service personnel is not provided for by this warranty.

Transportation of Company's choice, within the continental United States, is covered by this warranty for replacement of any blower which in the Company's judgement proved not to be as warranted. For user locations outside the continental United States, the Company will provide transportation, by the carrier of its choice to and from the nearest Authorized Distributor and the Company's designated facility. The Company may require the return of any blower claimed not to be as warranted to one of its facilities as designated by the Company, transportation prepaid by Purchaser, to establish a claim under this warranty.

Replacement parts provided under the terms of the warranty are warranted for the remainder of the Warranty Period of the product upon which installed to the same extent as if such parts were original components thereof.

DISCLAIMER

THE FOREGOING WARRANTY IS EXCLUSIVE AND IT IS EXPRESSLY AGREED THAT, EXCEPT AS TO TITLE, THE COMPANY MAKES NO OTHER WARRANTIES, EXPRESSED, IMPLIED OR STATUTORY, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY.

THE REMEDY PROVIDED UNDER THIS WARRANTY SHALL BE THE SOLE, EXCLUSIVE AND ONLY REMEDY AVAILABLE TO PURCHASER AND IN NO CASE SHALL THE COMPANY BE SUBJECT TO ANY OTHER OBLIGATIONS OR LIABILITIES. UNDER NO CIRCUMSTANCES SHALL THE COMPANY BE LIABLE FOR SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES, EXPENSES, LOSSES OR DELAYS HOWSOEVER CAUSED.

No statement, representation, agreement, or understanding, oral or written, made by any agent, distributor, representative, or employee of the Company which is not contained in this Warranty will be binding upon the Company unless made in writing and executed by an officer of the Company.

This warranty shall not be effective as to any claim which is not presented within 30 days after the date upon which the product is claimed not to have been as warranted. Any action for breach of this warranty must be commenced within one year after the date upon which the cause of action occurred.

Any adjustment made pursuant to this warranty shall not be construed as an admission by the Company that any product was not as warranted.

Gardner Denver®

For additional information contact your local representative or
Gardner Denver, 1800 Gardner Expressway, Quincy, IL 62305
Customer Service Department
Telephone: (800) 682-9868 Fax: (217) 221-8780
Sales and Service in all major cities.
www.gardnerdenver.com pd.blowers@gardnerdenver.com

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BALDOR • RELIANCE

Customer information packet

EM2333T

15HP, 1765RPM, 3PH, 60HZ, 254T, 0944M, TEFC, F1
Class - None
Division - Not Applicable

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Specifications

Enclosure	TEFC
Frame	254T
Frame Material	Iron
Frequency	60.00 Hz
Haz Area Class and Group	None
Haz Area Division	Not Applicable
Motor Letter Type	Three Phase
Output @ Frequency	15.000 HP @ 60 HZ
Phase	3
Synchronous Speed @ Frequency	1800 RPM @ 60 HZ
Voltage @ Frequency	230.0 V @ 60 HZ
	460.0 V @ 60 HZ
Agency Approvals	CSA EEV
	NEMA PREMIUM
	NEMA_PREMIUM
	UR
Ambient Temperature	40 °C
Auxillary Box	No Auxillary Box
Auxillary Box Lead Termination	None
Base Indicator	Rigid
Bearing Grease Type	Polyrex EM (-20F +300F)
Blower	None
Current @ Voltage	38.000 A @ 208.0 V
	36.200 A @ 230.0 V
	18.100 A @ 460.0 V
Design Code	A
Drip Cover	No Drip Cover
Duty Rating	CONT
Efficiency @ 100% Load	92.4 %
Electrically Isolated Bearing	Not Electrically Isolated
Feedback Device	NO FEEDBACK
Front Shaft Indicator	None

Part detail

Revision	K
Type	AC
Mech. spec.	09P11
Base	
Status	PRD/A
Elec. spec.	09WGT597
Layout	09LYP011
Eff. date	03-19-2024
CD Diagram	CD0005
Poles	04
Leads	9#12
Proprietary	False
Created date	11-11-2020

Heater Indicator	No Heater
High Voltage Full Load Amps	18.1 a
Insulation Class	F
Inverter Code	Inverter Ready
KVA Code	H
Lifting Lugs	Standard Lifting Lugs
Locked Bearing Indicator	Locked Bearing
Motor Lead Quantity/Wire Size	9 @ 12 AWG
Motor Lead Termination	Flying Leads
Motor Standards	NEMA
Motor Type	0944M
Mounting Arrangement	F1
Number of Poles	4
Overall Length	23.36 IN
Power Factor	84
Product Family	General Purpose
Pulley End Bearing Type	Ball
Pulley Face Code	Standard
Pulley Shaft Indicator	Standard
Rodent Screen	None
RoHS Status	ROHS COMPLIANT
Service Factor	1.15
Shaft Diameter	1.625 IN
Shaft Ground Indicator	No Shaft Grounding
Shaft Rotation	Reversible
Shaft Slinger Indicator	Shaft Slinger
Speed	1765 rpm
Speed Code	Single Speed
Starting Method	Direct on line
Thermal Device - Bearing	None
Thermal Device - Winding	None
Vibration Sensor Indicator	No Vibration Sensor
Winding Thermal 1	None
Winding Thermal 2	None

Nameplate

NP3441LUA										
CAT.NO.	EM2333T									
SPEC	09P011T597G1									
HP	15									
VOLTS	230/460									
AMPS	36.2/18.1									
RPM	1765									
FRAME	254T	**HZ**	60	**PH**	3					
SF	1.15	**CODE**	H	**DES**	A	**CLASS**	F			
NEMA NOM. EFF	92.4	**PF**	84							
RATING	40C AMB-CONT									
CC	010A									
ENCL	TEFC	**SER**								
DE	6309	**ODE**	6208							
VPWM INVERTER READY	SFA 41/20.4									
CT6-60H(10:1)VT3-60H(20:1										
	50HZ 15HP 190/380V 42.2/21.1A									SF1.0

Accessories

Part number	Description	Multiplier
09-1309	C FACE KIT	A8

AC Induction Motor Performance Data
Record # 93306
Typical performance - not guaranteed values

Winding: 09WGT597-R001	**Type:** 0944M	**Enclosure:** TEFC

Nameplate Data			**460 V, 60 Hz: High Voltage Connection**	
Rated Output (HP)		15	**Full Load Torque**	44.59 LB-FT
Volts		230/460	**Start Configuration**	direct on line
Full Load Amps		36.2/18.1	**Breakdown Torque**	151 LB-FT
R.P.M.		1765	**Pull-up Torque**	76.5 LB-FT
Hz	60 **Phase**	3	**Locked-rotor Torque**	84.9 LB-FT
NEMA Design Code	A **KVA Code**	H	**Starting Current**	131 A
Service Factor (S.F.)		1.15	**No-load Current**	7.72 A
NEMA Nom. Eff.	92.4 **Power Factor**	84	**Line-line Res. @ 25ºC**	0.61892 Ω
Rating - Duty		40C AMB-CONT	**Temp. Rise @ Rated Load**	50°C
S.F. Amps		41/20.4	**Temp. Rise @ S.F. Load**	61°C
			Locked-rotor Power Factor	33.3

Load Characteristics 460 V, 60 Hz, 15 HP

% of Rated Load	**25**	**50**	**75**	**100**	**125**	**150**	**S.F.**
Power Factor	46	68	78	83	85	86	84
Efficiency	87.5	91.8	92.6	92.4	91.8	90.8	92
Speed	1791.8	1784.7	1777	1768.8	1759.2	1749.3	1763
Line amperes	8.82	11.3	14.6	18.3	22.4	26.9	20.8

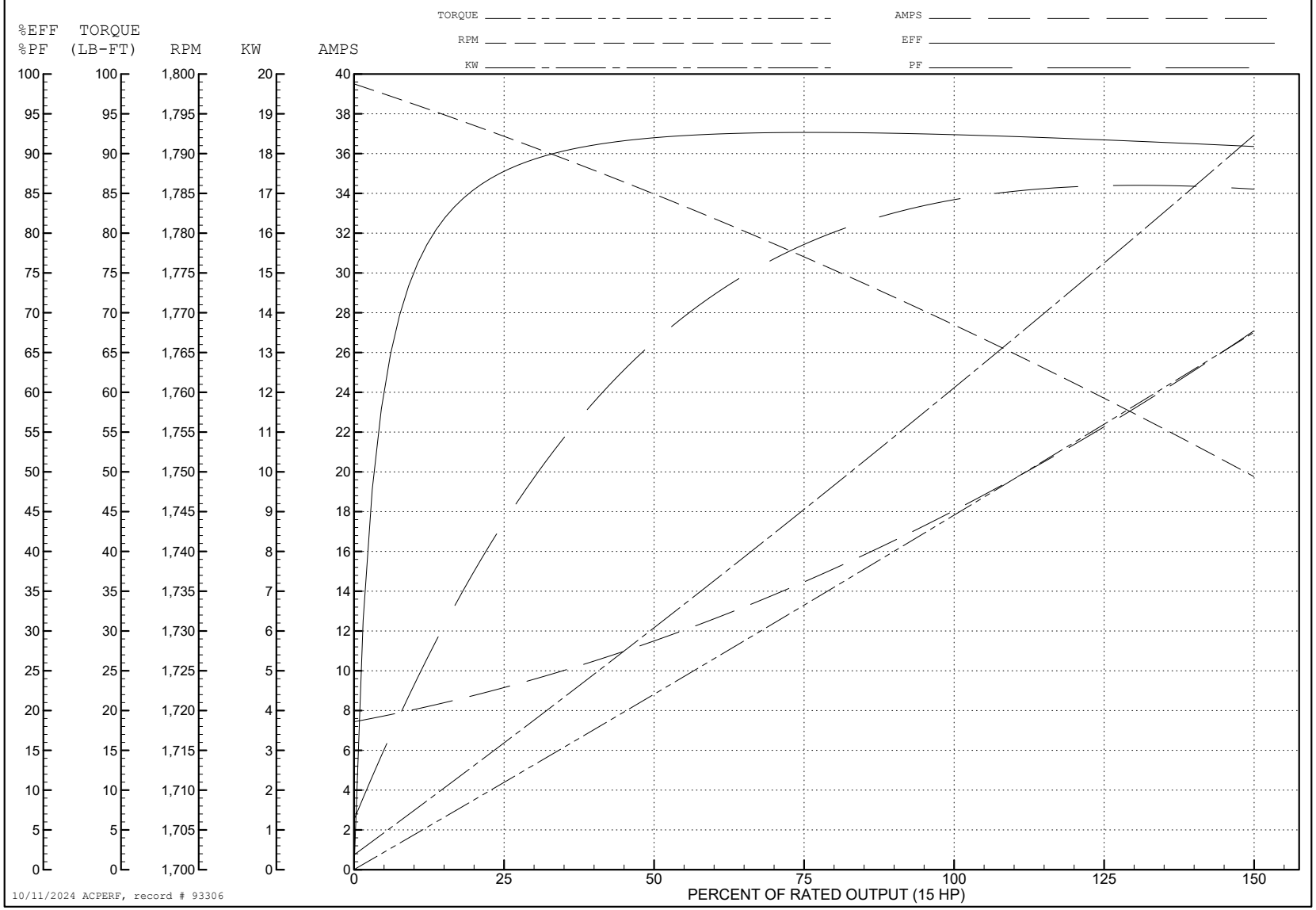
ABB Motors and Mechanical Inc.

WINDING # 09WGT597

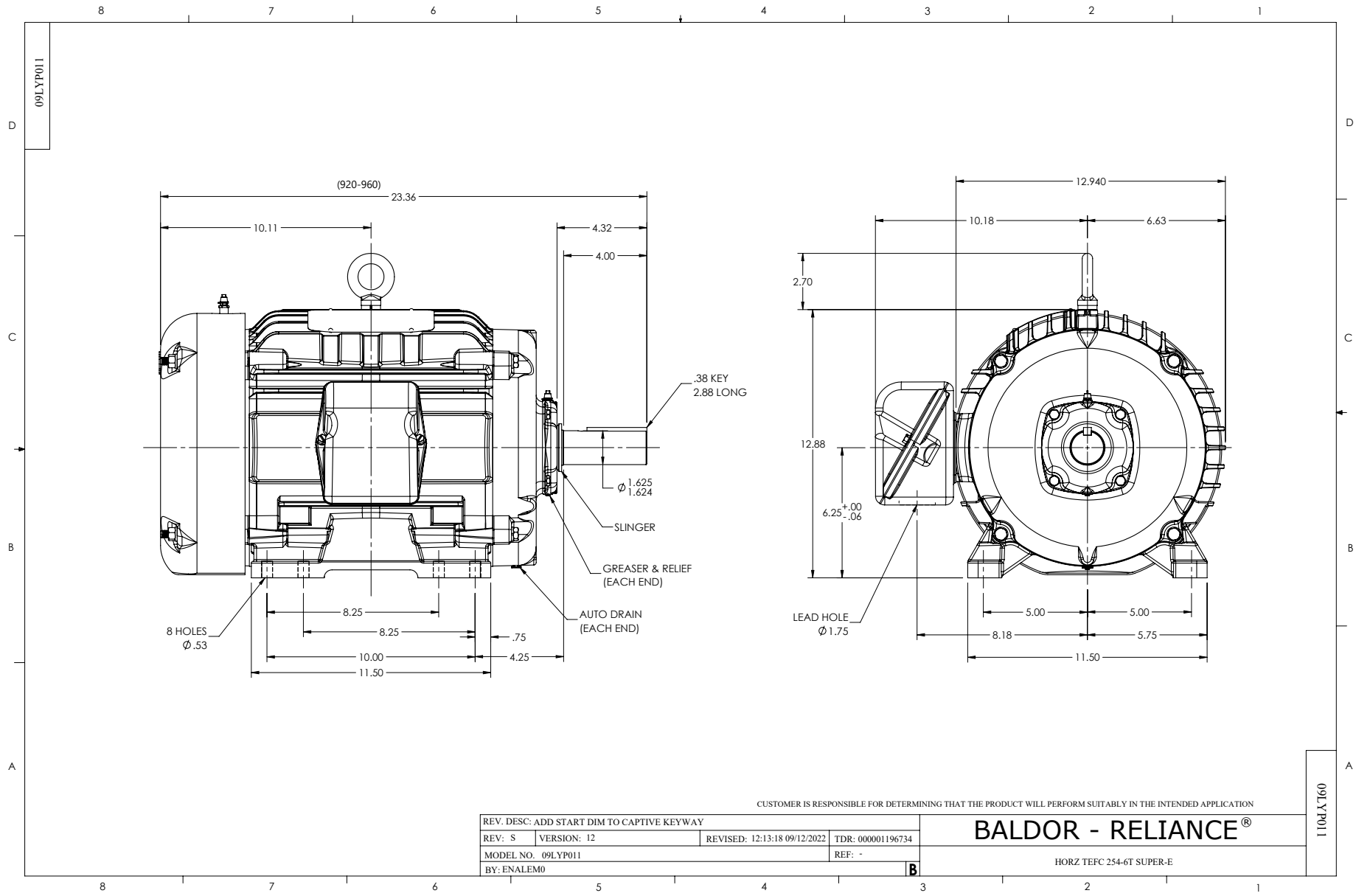
15 HP 3 PH 60 HZ 1765 RPM 460 V 0944M

Typical performance - not guaranteed values.

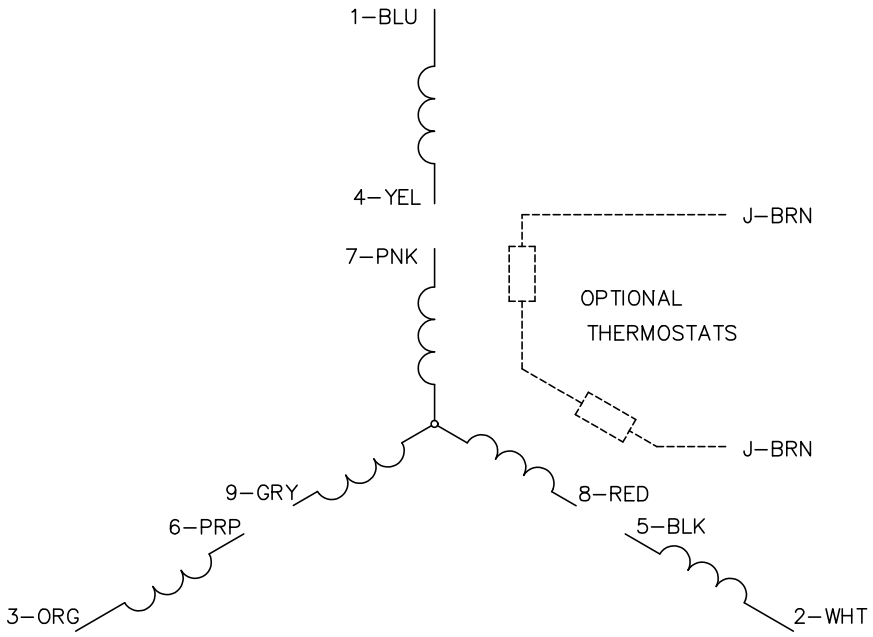
TORQUES(LB-FT): PO=151 PU=76.5 LR=84.9 LRA=131

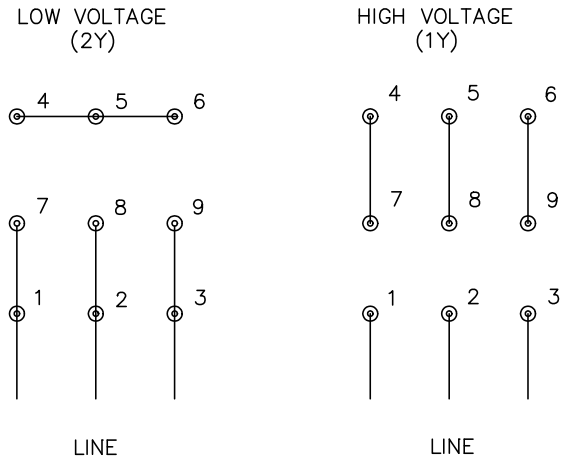


10/11/2024 ACPERF, record # 93306


09LYP011
(920-960)
23.36
10.11
4.32
4.00
.38 KEY
2.88 LONG
Ø 1.625
1.624
SLINGER
GREASER & RELIEF
(EACH END)
AUTO DRAIN
(EACH END)
8 HOLES
Ø .53
8.25
8.25
.75
10.00
4.25
11.50
12.940
10.18
6.63
2.70
12.88
6.25 +.00 -.06
LEAD HOLE
Ø 1.75
5.00
5.00
8.18
5.75
11.50
CUSTOMER IS RESPONSIBLE FOR DETERMINING THAT THE PRODUCT WILL PERFORM SUITABLY IN THE INTENDED APPLICATION
REV. DESC: ADD START DIM TO CAPTIVE KEYWAY
REV: S
VERSION: 12
REVISED: 12:13:18 09/12/2022
TDR: 000001196734
MODEL NO. 09LYP011
REF: -
BY: ENALEM0
B
BALDOR - RELIANCE®
HORZ TEFC 254-6T SUPER-E
09LYP011

CD0005





NOTES:

1. INTERCHANGE ANY TWO LINE LEADS TO REVERSE ROTATION.
2. OPTIONAL THERMOSTATS ARE PROVIDED WHEN SPECIFIED.
3. ACTUAL NUMBER OF INTERNAL PARALLEL CIRCUITS MAY BE A MULTIPLE OF THOSE SHOWN ABOVE.
4. LEAD COLORS ARE OPTIONAL. LEADS MUST ALWAYS BE NUMBERED AS SHOWN.

CD0005

REV. DESC: REVISE TO SHOW OPTIONAL COLORS			BALDOR ELECTRIC Co.
REV. LTR: E	BY: JLP	REVISED: 01/19/99 10:15	TDR: 0171435
CD0005		FILE: AAA00005140	MDL: –
		MTL: –	3PH, DV, 9 LEADS

Blower Market Solutions
BBF Series 2”- 6”

A Wise Business Decision
Cut Your Labor and Assembly Time

No Welding, Painting, Cutting, or Drilling Required

- **Maximize Productivity** - From junior to experienced technicians, assemble & ship blower packages faster with fewer resources using Solberg’s One Wrench System™
- **Significant Costs Savings** - Only one vendor needed to help you improve margins through lower labor and material handling costs, Solberg provides the complete solution
- **Engineering Support** - Design specifications and drawings are available to help you configure and present your package to your customers
- **Ultra Compact Design** - Integrated Discharge Silencer offers a low profile and small footprint
- **Build Your Sound Enclosure Competitively** - The compact design allows you to build significantly smaller and less costly enclosures to meet more stringent noise level requirements



Example of Silencer Base Frame Package

Solberg Kit Components:

Silencer Base Frame w/Pre-Assembled Rails, Easy Accessible Belt Guard, Complete Hardware Kit, Assembly Instructions, Engineering Assistance upon request









Optional Accessory

Solberg Filters and Silencers:

Protect your Investment
Premium Grade Silencer Filters /
Inlet Vacuum Filters



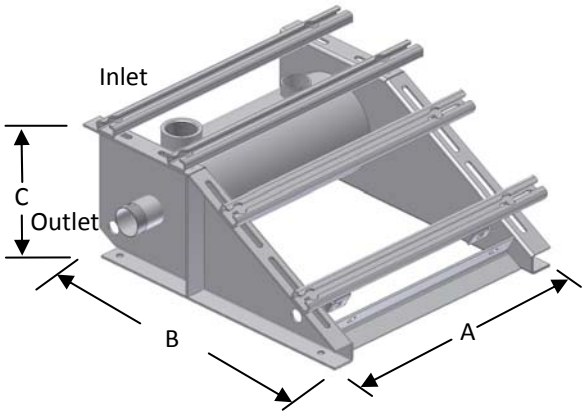




www.solbergmfg.com • sales@solbergmfg.com • Sales: 630.773.1363 • Fax: 630.773.0727

Silencer Frames for Blower Packagers
BBF Series 2”- 6”





Features

- Reactive style silencing design
- Integrated discharge silencer
- Adjustable motor supports for belt tensioning
- Pre-assembled rails to frame
- Easy sheaves accessible belt guard
- Carbon steel with baked enamel finish

Benefits

- Compact design for small blower package footprint
- Low profile allows for easier maintenance inspections
- Quick installation time
- Cost Savings (Minimal packaging, freight & storage)
- Sound enclosures are more economical due to compact frame footprint
- Engineering support provided by Solberg for sizing specifications and specific requirements

Technical Specifications

- Pressure Rating: 1 ATM
- Hardware Kit (SAE std. nuts, bolts, washers) included
- Ports for: relief valve, pressure & temperature gauges

Options

- Purpose built belt guard
- Flexible boot kit (clamp, flex adapter)
- Snubber discharge silencer for vacuum applications
- Contact factory for best Solberg filter for your package

MPT Outlet Connections

Pipe Stub Inlet	MPT Outlet	Nominal SCFM Rating	Part Number	Dimensions - inches A	B	C	Relief Valve Port	Sugg. HP Range	Approx. Wt. lbs.	Belt Guard for BBF Series Part No.	Approx. lbs.
2"	2"	135	BBF-200	23 1/2	27 1/2	11	2"	3-15+	130	DL-200	20
2 1/2"	2 1/2"	195	BBF-250	23 1/2	27 1/2	11	2"	3-20+	130	DL-200	20
3"	3"	300	BBF-300	28	35	14 3/16	2"	10-30	180	DL-300	23
4"	4"	520	BBF-400	28	35	14 3/16	2"	20-50	180	DL-300	23
6"	6" Flg	1100	BBF-600F	34 3/4	39 1/2	16	3"	40-60	398	DL-600	28

Dimension tolerance ± 1/4”

Note: Model offerings and design parameters may change without notice. See www.solbergmfg.com for most current offering.

SOLBERG®
Filtration • Separation • Silencing

Technical Data

Inlet Vacuum Filters

Applications & Equipment

- Industrial & Severe Duty
- Vacuum Pumps & Systems: Roots, Rotary Vane, Screw, Piston
- Vacuum Packaging Equipment
- Vacuum Furnace
- Blowers: Side Channel & P.D.
- Vacuum Lifters
- Intake Suction Filters
- Food Industry
- Woodworking/Routers
- Ash Handling
- Printing Industry
- Medical/Hospital
- Sterilization
- Remote Installations for Piston & Screw Compressors
- Paper Processing
- Waste Water Aeration
- Cement Processing
- Bag House Systems
- Vacuum Vent Breathers
- Chemical Processing
- Factory Automation Equipment
- Semiconductor / Solar

Identification

Standard Solberg assemblies should have an identification label/nameplate that gives the following information:

- Assembly Model #
- Replacement Element #

The part number designates the filter type, the element configuration and housing connection size. For example, the following part number identifies the filter as being a "CSL" design filter with a "235™" element, "P" prefilter and 4" flange connection size.

CSL-235P-400F

- Connection Size and Type
- Replacement Element Part Number
- Filter Type

Vacuum Service Rating Chart

Threaded vacuum filter connections must be free of defect and properly sealed to achieve deeper vacuum levels. Vacuum service levels are given for reference only and serve as a guideline for product selection. Product certification and alternative designs are available for applications requiring deeper vacuum levels and specific leak rates. Please contact factory for details.

Vacuum Level	Pressure (mbar)	Pressure (Torr)	Pressure (Pa)
Atmospheric Pressure	1013	760	$1.013x10^{+5}$
Rough Vacuum	1013 to 33	760 to 25	$1x10^{+5}$ to $3x10^{+3}$
Medium Vacuum	33 to $1.3x10^{-3}$	25 to $1x10^{-3}$	$3x10^{+3}$ to $1x10^{-1}$
High Vacuum	$1.3x10^{-3}$ to $1.3x10^{-9}$	$1x10^{-3}$ to $1x10^{-9}$	$1x10^{-1}$ to $1x10^{-7}$

Rev: US0422JR

All model offerings and design parameters are subject to change without prior notice.
Contact your representative or visit www.solbergmfg.com for the most current information.

Choosing the Best Filter for Your Equipment

A. When the connection & airflow is known:

1. Select the appropriate connection style. (i.e.: MPT, Flange, NPSC etc.)

a. Verify assembly SCFM (flow) rating. Compare with your required airflow. (Note: Assembly flow ratings are based on 6,000 FPM or 30m/sec for a given connection size to achieve low pressure drop performance. When required flow exceeds assembly flow rating, the pressure drop through the outlet connection will increase. In such cases select by element SCFM (flow) rating.)

b. Verify that the flow rating matches connection size; skip to "C. Selecting Elements".

B. When the connection size is unknown, flexible, or the required flow rating exceeds assembly flow rating:

1. Match required flow rating with the element flow rating.
2. Choose related connection size.

C. Selecting Elements: The filter performance is influenced by the actual application duty and the equipment it is installed on. Regular maintenance checks and proper servicing is required.

Application Duty Descriptions:

Industrial Duty: clean workshop or clean outdoor environment - small element sizing is sufficient.

Severe Duty: dirty workshop, wastewater – medium to large element is recommended.

Extreme Duty: cement, steel making, plastics or dusty material conveying – largest element sizing is recommended.

1. Select media required by your application. Options include:

a. Standard media

1. Polyester: all purpose; withstands pulses, moisture, and oily air
2. Paper: mostly dry, smooth flow applications

b. Special Media: for a variety of micron levels and media types, see the "Filter Media Specifications" in the Replacement Element Section or contact Solberg.

2. Select element size by matching the element with the anticipated duty and upsize accordingly.

Filter Assembly Maintenance

Request the appropriate maintenance manual for more in-depth information from your Solberg representative or on our website: www.solbergmfg.com.

Element Maintenance

Solberg elements should be replaced once the pressure drop reaches 15-20" H_2O above the initial pressure drop of the installation. Cleaning the element is also an option.

Solberg recommends replacing dirty elements for optimal performance. Any damage which results from by-pass or additional pressure drop created by element cleaning is the sole responsibility of the operator.

Note: The overall performance of a filter element is altered once cleaned. The initial pressure drop after subsequent cleanings will be greater than the original, clean pressure drop of the element. After each cleaning, the pressure drop will continue to increase. Under all circumstances, the initial pressure drop of the element needs to be maintained at less than 15" H_2O.

If the pressure drop exceeds 20" H_2O at start-up; it should be replaced with a new element. With many types of equipment, the maximum pressure drop allowed will be dictated by the ability of the equipment to perform to its rated capacity. Under all circumstances, the operator should avoid exceeding the manufacturer's recommended maximum pressure drop for their specific equipment.

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SOLBERG

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Filtration • Separation• Silencing

Inline Right Angle Vacuum Filters

CSL Series ⅜” - 4”

Overview

Solberg’s CSL Series is designed to protect equipment from contaminants carried over from a variety of industrial processes. Ideal for rough-medium vacuum service, the CSL can be utilized in systems where standard duty flanges and threaded connections are acceptable. Multiple filter element media options offer superior protection and longevity for the vacuum system.



Benefits

- Large holding capacity and easy field cleaning, especially when mounted horizontally or inverted
- Low pressure design

Features

- Seamless drawn housings
- O-ring seal
- Corrosive resistant black powder coat carbon steel
- Stainless steel torsion clips for durability

Technical Specifications

- Vacuum Rating: medium vacuum service*
- Temp (continuous): min -15°F (-26°C) max 220°F (104°C)
- Filter change out differential: 15-20” H_2O over initial ΔP
- Polyester: 99%+ removal efficiency standard to 5 micron
- Paper: 99%+ removal efficiency standard to 2 micron

Options

ATEX Available

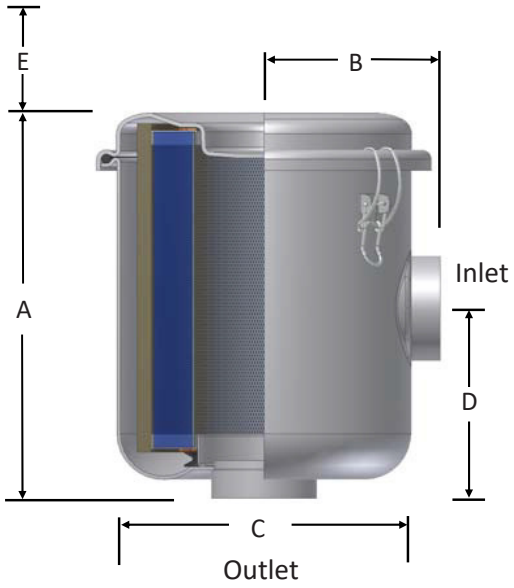
- Vacuum gauge
- Higher holding capacity configurations available (select models)
- Material/Finishes: stainless steel, epoxy coating
- Support brackets
- Alternative top-to-canister fastening system for low pressure or pulsating systems
- Stainless steel (select models)



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www.solbergmfg.com

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Inlet/Outlet Size	Type	Assembly SCFM Rating	Assembly Part Number Polyester	Paper	Dimensions - inches A	B	C	D	Suggested Service Ht. E	Approx. Weight lbs.	Replacement Element Part No. Polyester	Paper	Element SCFM Rating
⅜"	BSPP	18	CSL-825-039HCB	CSL-824-039HCB	3 ⅛	2 ⅛	3 ¾	1 ¹³⁄₁₆	3"	0.88	825	824	25
½"	NPSC	18	CSL-825-050HCB	CSL-824-050HCB	3 ½	2 ¼	3 ¾	2	3"	0.88	825	824	25
½"	NPSC	20	CSL-843-050HC	CSL-842-050HC	4	3	5 ¾	2 ½	3"	3	843	842	55
¾"	NPSC	24	CSL-825-075HCB	CSL-824-075HCB	3 ½	2 ⁵⁄₁₆	3 ¾	2	3"	0.88	825	824	25
¾"	NPSC	25	CSL-843-075HC	CSL-842-075HC	4	3	5 ¾	2 ½	3"	3	843	842	55
1"	NPSC	35	CSL-843-100HC	CSL-842-100HC	4 ¼	3 ¼	5 ¾	2 ⅝	3"	3	843	842	55
1"	NPSC	40	CSL-849-100HC	CSL-848-100HC	6 ¹¹⁄₁₆	4 ⅛	7 ⅜	4 ½	5"	5	849	848	115
1 ¼"	NPSC	55	CSL-843-125HC	CSL-842-125HC	4 ¼	3 ¼	5 ¾	2 ⅝	3"	3	843	842	55
1 ¼"	NPSC	60	CSL-849-125HC	CSL-848-125HC	6 ¹¹⁄₁₆	4 ⅛	7 ⅜	4 ½	5"	5	849	848	115
1 ½"	NPSC	80	CSL-849-150HC	CSL-848-150HC	6 ¾	4 ⅛	7 ⅜	4 ½	5"	5	849	848	115
2"	NPSC	175	CSL-851-200HC	CSL-850-200HC	10 ¼	4 ½	8 ¾	5	9"	15	851	850	290
2 ½"	FPT	210	CSL-851-250HC	CSL-850-250HC	10 ¹¹⁄₁₆	5 ⅛	8 ¾	5 ½	9"	15	851	850	290
3"	FPT	300	CSL-239-300C	CSL-238-300C	15 ¾	8 ¹³⁄₁₆	13 ¼	8 ¹¹⁄₁₆	11"	33	239™	238™	570
3"	MPT	300	CSL-2541-300B	CSL-2540-300B	15 ¾	9	13 ¼	8 ⅞	12"	30	2541	2540	800
4"	MPT	520	CSL-2541-400B	CSL-2540-400B	16 ¼	9 ½	13 ¼	9 ½	12"	32	2541	2540	800

*See Vacuum Filter Technical Data for Vacuum Service Data.

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Inline Right Angle Vacuum Filters

CSL Series 3” - 12”

Overview

Solberg’s CSL Series is designed to protect equipment from contaminants carried over from a variety of industrial processes. Ideal for rough-medium vacuum service, the CSL can be utilized in systems where standard duty flanges and threaded connections are acceptable. Multiple filter element media options offer superior protection and longevity for the vacuum system.



Benefits

- Reduce piping costs with multiple mounting configurations (mount horizontal or inverted)
- Minimize equipment pressure-drop change with low pressure-drop filter design

Features

- Heavy duty T-bolts for easy maintenance
- Corrosive resistant black powder coat carbon steel
- O-ring stays in place with unique U-channel groove
- Inlet & outlet ¼” gauge taps
- Lifting lugs
- Brackets for optional support legs
- Nameplate bracket

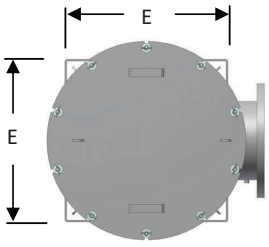
Technical Specifications

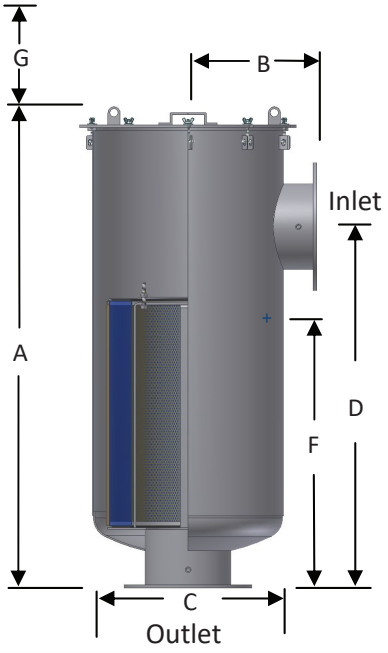
- Vacuum Rating: medium vacuum service*
- Filter change out differential: 15-20” H_2O over initial ΔP
- Polyester: 99%+ removal efficiency standard to 5 micron
- Paper: 99%+ removal efficiency standard to 2 micron

Options

ATEX Available

- Straight-through configurations
- Specialty filter media
- Stainless steel
- Various nonstandard finishes and connection styles
- ISO flange
- PN6, PN16 flange patterns
- Flange faces and internal surfaces free of paint
- Mounting housing bands





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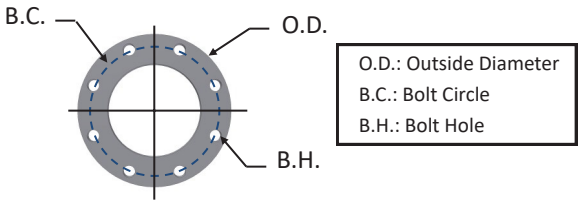
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Flanged Assemblies

Flange Inlet & Outlet	Assembly SCFM Rating	Assembly Part Number		Dimensions - inches				Suggested Service ht. E	Approx. Weight lbs	Replacement Element Part No.		Element SCFM Rating
		Polyester	Paper	A	B	C	D			Polyester	Paper	
4”	520	**CSL-235P-400F**	**CSL-234P-400F**	27 ⅜	9	14	18 ½	15”	62	235P™	234P™	570
4”	520	**CSL-335P-400F**	**CSL-334P-400F**	27 ⅜	9	14	18 ½	20”	64	335P™	334P™	800
5”	800	**CSL-245P-500F**	**CSL-244P-500F**	28 ¼	11	18 ½	19 ½	15”	88	245P™	244P™	880
5”	800	**CSL-345P-500F**	**CSL-344P-500F**	28 ¼	11	18 ½	19 ½	20”	90	345P™	344P™	1100
6”	1100	**CSL-275P-600F**	**CSL-274P-600F**	29 ¼	12	18 ½	20 ½	15”	110	275P™	274P™	1100
6”	1100	**CSL-375P-600F**	**CSL-374P-600F**	29 ¼	12	18 ½	20 ½	20”	113	375P™	374P™	1500
8”	1800	**CSL-377P-800F**	**CSL-376P-800F**	39 ⅛	14	22 ½	25 ½	20”	185	377P™	376P™	1825
10”	2900	**CSL-685P-1000F**	**CSL-384P(2)-1000F+**	57 ½	16	27	45	33”	380	685P™	384P™(2)+	6600
12”	4950	**CSL-485P(2)-1200F+**	**CSL-484P(2)-1200F+**	70 ¼	16	27	57	25”	465	485P™(2)+	484P™(2)+	9410

+Denotes 2 elements stacked in housing.

125/150# Pattern Flange	Dimensions - inches			No. of Holes	Flange Thickness inches
	O.D.	B.C.	B.H.		
4”	9	7 ½	¾	8	0.38
5”	10	8 ½	⅞	8	0.38
6”	11	9 ½	⅞	8	0.38
8”	13 ½	11 ¾	⅞	8	0.38
10”	16	14 ¼	1	12	0.38
12”	19	17	1	12	0.50



All flanges are oriented “split center”.

MPT Assemblies

MPT Inlet & Outlet	Assembly SCFM Rating	Assembly Part Number		Dimensions - inches				Suggested Service ht. E	Approx. Weight lbs	Replacement Element Part No.		Element SCFM Rating
		Polyester	Paper	A	B	C	D			Polyester	Paper	
3”	300	**CSL-235P-300**	**CSL-234P-300**	27 ⅜	9	14	18 ½	10”	47	235P™	234P™	570
3”	300	**CSL-335P-300**	**CSL-334P-300**	27 ⅜	9	14	18 ½	15”	50	335P™	334P™	800
4”	520	**CSL-235P-400**	**CSL-234P-400**	27 ⅜	9	14	18 ½	10”	52	235P™	234P™	570
4”	520	**CSL-335P-400**	**CSL-334P-400**	27 ⅜	9	14	18 ½	15”	55	335P™	334P™	800
5”	800	**CSL-245P-500**	**CSL-244P-500**	28 ¼	11	18 ½	19 ½	10”	82	245P™	244P™	880
5”	800	**CSL-345P-500**	**CSL-344P-500**	28 ¼	11	18 ½	19 ½	15”	88	345P™	344P™	1100
6”	1100	**CSL-275P-600**	**CSL-274P-600**	29 ¼	12	18 ½	20 ½	10”	95	275P™	274P™	1100
6”	1100	**CSL-375P-600**	**CSL-374P-600**	29 ¼	12	18 ½	20 ½	15”	97	375P™	374P™	1500

*See Vacuum Filter Technical Data for vacuum service data and sizing guidelines.

Rev: US0422JR

All model offerings and design parameters are subject to change without prior notice.
Contact your representative or visit www.solbergmfg.com for the most current information.

SOLBERG

Small Compact Filter Silencers
w/ Standard Filter Design
"FS" Series 1/2" - 3" MPT

APPLICATIONS & EQUIPMENT

- Industrial & Severe Duty
- Piston Compressors
- Screw Compressors
- Blowers - Side Channel & P.D.
- Hydraulic Breathers – fine filtration
- Engines
- Construction\Contractor Industry
- Workshop
- Medical\Dental Industry
- Pneumatic Conveying
- Waste Water Aeration
- Nailers and Staplers
- Vacuum Vent Breathers

FEATURES & SPECIFICATIONS

- Polyester: 99%+ removal efficiency standard to 5 micron
- Paper: 99%+ removal efficiency standard to 2 micron
- Fully drawn weatherhood - no welds to rust or vibrate apart
- Tubular silencing design - tube is positioned to maximize attenuation and air flow while minimizing pressure drop
- Durable carbon steel construction with baked enamel finish and powder coated weatherhood
- Interchangeable media: Polyester, Paper, HEPA
- Several element sizes available per given connection (safety factor)
- Temp (continuous): min -15°F (-26°C) max 220°F (104°C)
- Filter change out differential: 10"-15" H_2O over initial delta P
- Pressure drop graphs available upon request

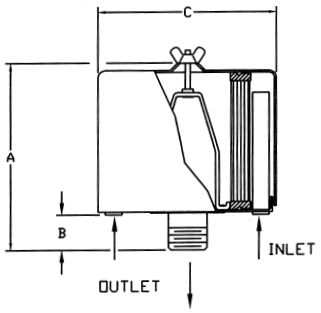
OPTIONS (Inquiries Encouraged)

- 1/8" tap holes
- Pressure Drop Indicator
- Available in ***Stainless Steel***
- Epoxy coated housings
- Various media available
- Special connections, BSPT

CONFIGURATION

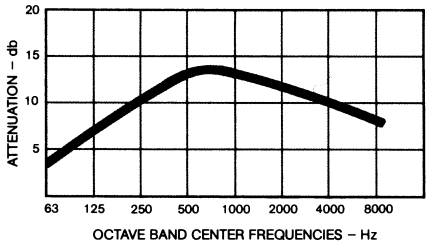


DRAWING



Dimension tolerance ± 1/4"

TYPICAL NOISE ATTENUATION – FS SERIES



- Noise attenuation may vary due to the wide range of applications and machines

I = Industrial Duty S = Severe Duty

	with Polyester Element	with Paper Element	MPT Outlet	DIMENSIONS - inches A	B	C	Rated Flow SCFM Piston	Screw, Blower, Fan	Element Rating	No. of Silencing Tubes	Approx. Wt. lbs
I	FS-15-050	FS-14-050	1/2"	4	1 1/2	6	10	10	35	1	2
I	FS-15-075	FS-14-075	3/4"	4	1 1/2	6	20	25	35	2	2
I	FS-15-100	FS-14-100	1"	4	1 1/2	6	25	35	35	3	2
S	FS-19P-100	FS-18P-100	1"	6 5/8	1 5/8	6	35	55	100	3	3
I	FS-19P-125	FS-18P-125	1 1/4"	6 5/8	1 5/8	6	55	70	100	5	3
I	FS-19P-150	FS-18P-150	1 1/2"	6 5/8	1 5/8	6	70	85	100	5	4
I	FS-31P-200	FS-30P-200	2"	7 1/4	2 1/4	10	85	135	195	5	8
S	FS-231P-200	FS-230P-200	2"	12 1/4	2 1/4	10	135	135	300	5	14
S	FS-231P-250	FS-230P-250	2 1/2"	12 1/2	2 1/2	10	195	195	300	9	15
I	FS-231P-300	FS-230P-300	3"	13	3	10	200	300	300	9	15

Note: Model offerings and design parameters may change without notice.

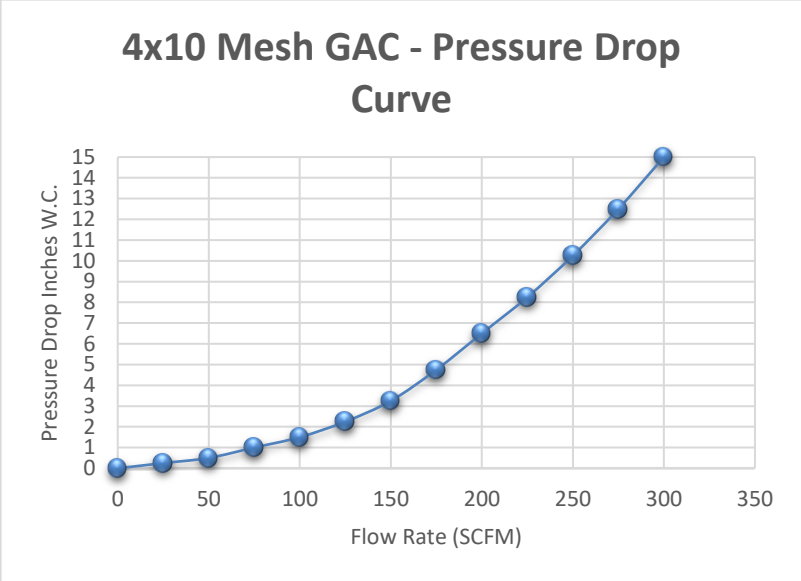
1151 Ardmore Ave. • Itasca, IL 60143 USA
Sales/Service: 630.773.1363 • Fax: 630.773.0727
E-mail: sales@solbergmfg.com • Web Site: www.solbergmfg.com

Enviro-Equipment, Inc.
Remediation Division

VPCD-85 – Vapor Phase Carbon Drum



Available as empty drums with no media or filled with reactivated carbon, virgin carbon or a variety of specialty medias upon request.



VPCD-85 Specifications			
Dimensions	3’3” Tall x 28” Diameter	Internal Piping	SCH 40 PVC
Inlet / Outlet	3” Female NPT	Internal Coating	Epoxy
GAC Fill	300 Pounds	Max Pressure / Temp	10 PSIG / 140 F
Shipping Weight	375 Pounds	Bed Depth / Volume	2.8 Feet / 9.9 cubic feet
Operational Weight	505 Pounds	Cross Sectional Bed Area	4.2 square Feet

INCOMING POWER SUPPLY
208 VAC, 3 PH, 4 WIRE
SYSTEM FLA 40 AMPS

ENVIRO-EQUIPMENT

FIELD WIRING SHALL BE LISTED 75 DEG. C COPPER WIRE FOR TERMINALS RATED LESS THAN 100.
TORQUE FIELD WIRE (I/S TERMINALS)TO 20 IN. LB. OR EQUIVALENT Nm
TORQUE FIELD WIRE(TERMINALS)TO 4.4~8.8 IN. LB. OR EQUIVALENT Nm
TORQUE FIELD WIRE(BREAKER) TO 43 IN. LB. OR EQUIVALENT Nm
TORQUE FIELD WIRE(OVERLOAD) TO 88 IN. LB. OR EQUIVALENT Nm
TORQUE FIELD(GROUND) TO 35 IN. LB. OR EQUIVALENT Nm

SET ALL MOTOR OVERLOADS TO FLA MULTIPLIED BY MOTOR SERVICE FACTOR

L1 L2 L3

DISCONNECT 60 AMP

6 AWG

DISTRIBUTION BLOCK DB

GND 12 AWG

N

BUSS

WHITE

12 AWG

CB1

M1

L1 T1 L2 T2 L3 T3

L1 T1 L2 T2 L3 T3

37 AMP

50 AMP

M

SVE BLOWER 15 HP 37 AMP FLA

14 AWG

WEATHER PROOF GFI

CB3

15 AMP

N

14 AWG

CB4

15 AMP

HEATER 500 WATT 2.4 FLA

PM

PHASE MONITOR

14 AWG

CTFMR

CONTROL TRANSFORMER

FUSE 1

1.5 AMP

250 VA 230V PRI 120V SEC

H1 H3 H4 H2

FUSE 2

3 AMP

1 X1 X2

RED

GRAY

21

SEE LINE 21

N2

SP

SURGE PROTECTOR

CB5

14 AWG

TS5

15 AMP

.7 FLA

M

VENT FAN

N

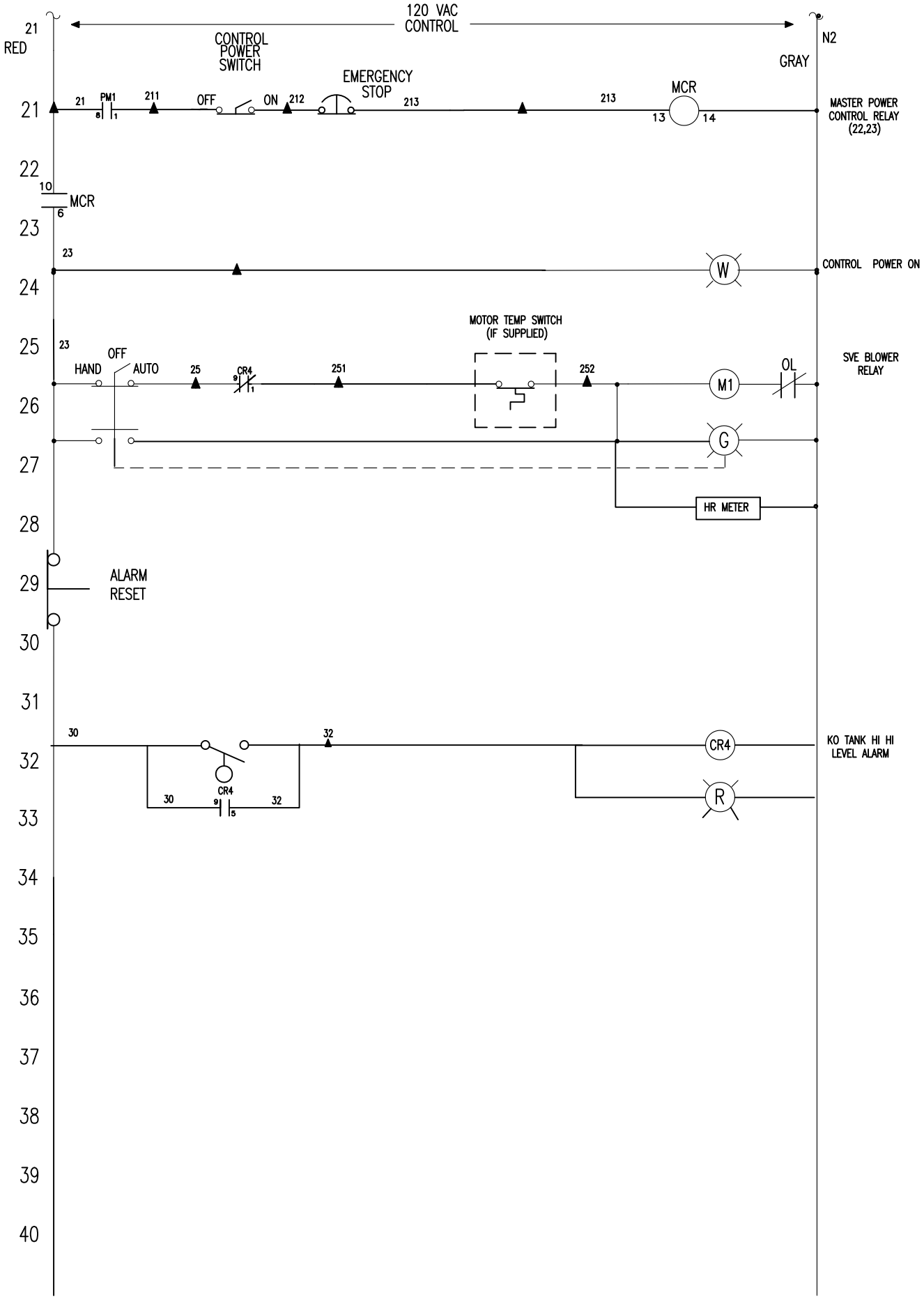
FIELD WIRING

NEUTRAL

L1 L2 L2

CB7

DATE	NAME	ENVIRO-EQUIPMENT	PAGE DESCRIPTION		
8-14-2024	DRAWN BY BAH	10120 Industrial Drive Pineville, NC 28134 704-556-7723	PROJECT: 6129	DRAWING-NO.: EEI-6129	PAGE: 1 OF 2



DATE	NAME	ENVIRO-EQUIPMENT	PAGE DESCRIPTION		
8-14-2024	DRAWN BY BAH	10120 Industrial Drive Pineville, NC 28134 704-556-7723	PROJECT: 6129	DRAWING-NO.: EEI-6129	PAGE: 2 OF 2

ENVIRO EQUIPMENT COMPONENT TRACABILITY		EEI 6129	
MET LABS SERIAL #		SN 0203	
COMPONENT	MANUFACTURER	PART NUMBER	
DISCONNECT SWITCH, ROTARY, NON FUSED, 60 AMP	EATON	R9C3060U	UL
DISCONNET SELECTOR HANDLE	EATON	SHB00N12	UL
DISCONNECT SHAFT	EATON	SF320SH5X5	UL
3 POS SELECTOR SWITCH, GREEN, 120VOLT LED	EATON	M22-WRLK3-2-G-K20-230G	UL
RED PILOT LIGHT 120 VOLT	EATON	M22-L-R-230R	UL
WHITE PILOT LIGHT 120 VOLT	EATON	M22-L-W-230W	UL
PUSH BUTTON, MOM, BLACK, FLUSH	EATON	M22-D-S-K01	UL
RELAY 4PDT, 120 VOLT COIL	IDEC	RU4S-A110	UR
RELAY SOCKET	IDEC	SY4S-05	UR
2 POS SELECTOR SWITCH	EATON	M22-WKV	UL
CONTACT BLOCK NO	EATON	M22-K10	UL
BREAKER, 3 POLE, D CURVE 50 AMP	WEG	UMBW-4D3-50	UL
DISTRIBUTION BLOCK	LITTLEFUSE	LFD0401-3	UL
HOUR METER	EATON	6-T-3H-508RPM-406	UR
SURGE PROTECTOR	EATON	SP1-208Y	UL
150 VA CONTROL TRANSFORMER	ACME	TB150N005F0	UL
2P/15A UL489 BREAKER	WEIDMULLER	BR2D15UC	UL
1.5 AMP, TYPE CC, TIME DELAY FUSE	EDISON	HCTR1.5	UL
E STOP TWIST RELEASE	EATON	M22-PVT-K01	UL
GROUND BAR KIT	EATON	GBK13	UL
MCB 489 1P D 15A ACDC	WEIDMULLER	BR1D15UC	UL
4MM TERMINAL FUSE BLOCK	EURO	DNF10 S4LH	UR
6MM TERMINAL BLOCK, 1 LEVEL	EATON	XBUT4	UR
6MM GROUND BLOCKS	EATON	XBUT4PE	UR
3 AMP, TYPE CC, TIME DELAY FUSE	EDISON	HCTR3	UL
PHASE MONITOR	EATON	D65VMLP480-B2	UL
SOCKET	EATON	D3PA2	UL
NEMA 4,12 ENCLOSURE 20 X 20 X 8	HAMMOND	EN4SD20208LG	UL
PANEL 20X20	HAMMOND	EP2020	UL
SWING PANEL 20X20	HAMMOND	ESP2020	UL
40A 120V COIL IEC CONTACTOR	EATON	XTCE040D00A	UL
24-40A THERMAL OVERLOAD	EATON	XTOB040DC1	UL
CLASS CC FUSE BLOCK	BUSSMANN	BCM603-1C	UL
IDEC FLAT DIN RAIL MOUNT SOCKET	IDEC	SR2P-06	UL
XT IEC D-G FRAME AUX 1NO-1NC	EATON	XTCEXSBN11	UL

I CERTIFY THAT THE COMPONENTS AS LISTED, OR THE ATTACHED LIST OF COMPONENTS HAVE BEEN REVIEWED FOR ACCEPTANCE UNDER THE PANEL LISTING PROGRAM. THESE COMPONENTS ARE EITHER CERTIFIED, LISTED, OR RECOGNIZED BY A COMPONENT APPROVING AGENCY. UNEVALUATED CONTROL COMPONENTS PROTECTED BY A LISTED GFCI MAY BE USED IN ACCORDANCE WITH UL5O8A FOR U.S. PANELS, HOWEVER NO UNEVALUATED COMPONENTS ARE AUTHORIZED FOR PANELS APPROVED FOR CANADA.

SIGNATURE: __ANDY HINDS_____ DATE 10/4/2024

Dayton®



Utility Guard Mounted Exhaust Fans

Models: 484X51, 484X52, 484X53, 484X54, 484X55, 484X56, 484X57, 484X58, 484X59

Dayton®

PLEASE READ AND SAVE THESE INSTRUCTIONS. READ CAREFULLY BEFORE ATTEMPTING TO ASSEMBLE, INSTALL, OPERATE OR MAINTAIN THE PRODUCT DESCRIBED.

PROTECT YOURSELF AND OTHERS BY OBSERVING ALL SAFETY INFORMATION. FAILURE TO COMPLY WITH INSTRUCTIONS COULD RESULT IN PERSONAL INJURY AND/OR PROPERTY DAMAGE! RETAIN INSTRUCTIONS FOR FUTURE REFERENCE.

PLEASE REFER TO BACK COVER FOR INFORMATION REGARDING DAYTON'S WARRANTY AND OTHER IMPORTANT INFORMATION.

Model #: _____

Serial #: _____

Purch. Date: _____

Form HV001GMF/ Printed in USA
20003351 Version 01 01/2019
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GETTING STARTED

Tools/Materials Needed:

- Saw to cut rough opening hole
- Appropriate fasteners to attach to wall
- Screwdriver or wrench to attach fasteners

Contents:

- Guard Mount Exhaust Fan (1)
- Operating Instructions and Parts Manual (1)

Inspection:

After unpacking your exhaust fan, carefully inspect for any damage that may have occurred during transit. Inspect for loose, missing or damaged parts. If there is physical damage to any parts of the fan, a freight claim must be filed with the carrier. Check to ensure that all bolts, screws and set screws are securely tightened that may have come loose during transit. Retighten as required. Rotate fan propeller by hand to be sure it turns freely.

GENERAL SAFETY INSTRUCTIONS

⚠ DANGER ***Before installing or servicing, always lock out and tag power source. Do not rely on a switch as the only means of disconnecting power. Failure to disconnect power source can result in fire, electrical shock or serious injury. Motor will restart without warning after thermal protector trips. Do not touch an operating motor as it may be hot enough to cause injury. Do not place any body parts or objects in fan propeller while fan is connected to a power source.***

⚠ WARNING Read and follow all instructions, cautions, dangers and warnings. Failure to do so could result in personal injury, death or property damage.

Make sure the electrical power source conforms to the requirements of the fan(s) as well as local codes.

Electrical connections, installation and maintenance must be performed by qualified electrical personnel in accordance with all applicable codes and ordinances. Refer to figure 3 of this manual.

Unit must be adequately grounded.

To reduce the risk of fire or electrical shock, do not expose this fan to water.

Do not touch electrically live components.

Free rotation of the fan propeller is critical. It must not touch any part of the guard or opening.

Ensure that all power cords do not come in contact with any sharp edges, hot surfaces or chemicals. Immediately replace any damaged cords.

These utility exhaust fans are for general purpose exhaust applications only. Do not use these exhaust fans in explosive or corrosive atmospheres.

⚠ CAUTION ***In the United States to reduce the risk of injury to persons, OSHA requires OSHA compliant guards when fan is installed within 7ft of the floor or working level. In Canada to reduce the risk of injury to persons, CSA complying guards are required when fan is installed below 2.5 m (8.2ft) above floor or grade level.***

Dayton

SPECIFICATIONS

Power Requirements:	115v/60hz
Mounting Orientation:	Vertical and Horizontal
Propeller Material:	Aluminum, Galvanized Steel
Guard Material:	Steel - Powder Coated
Certifications:	UL/cUL 705

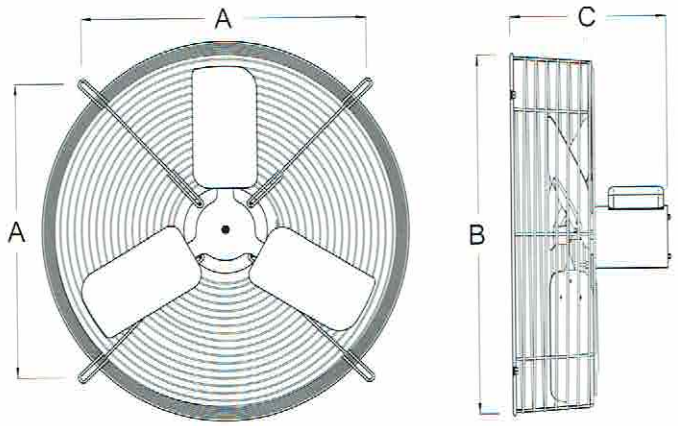


Fig.1
Models: 484X51, 484X52, 484X53, 484X54, 484X55, 484X56, 484X57

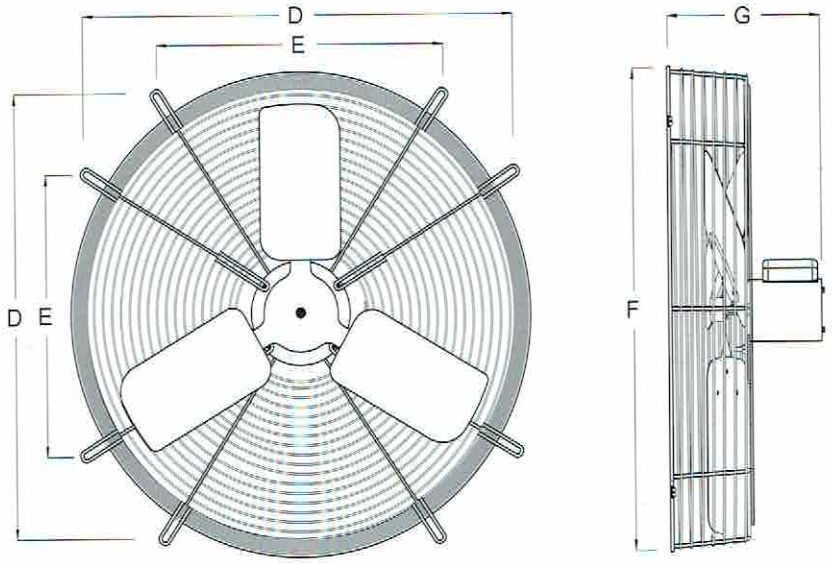


Fig.2
Models: 484X58, 484X59

Dimension (In.)										
Model	Prop Dia.	A (In.)	B (In.)	C (In.)	D (In.)	E (In.)	F (In.)	G (In.)	Suggested Wall Opening Hole Dia.	Reference
484X51	7"	7 3/8"	8 3/8"	6"	-	-	-	-	7 3/4"	Fig. 1
484X52	10"	8 3/4"	11 3/8"	6"	-	-	-	-	10 3/4"	Fig. 1
484X53	12"	10 1/4"	13 1/2"	7"	-	-	-	-	12 3/4"	Fig. 1
484X54	16"	12 15/16"	17 1/4"	7"	-	-	-	-	17"	Fig. 1
484X55	18"	15 7/16"	19 13/16"	7"	-	-	-	-	19"	Fig. 1
484X56	20"	16 3/4"	21 13/16"	12"	-	-	-	-	21"	Fig. 1
484X57	24"	19 3/4"	25 13/16"	12"	-	-	-	-	25"	Fig. 1
484X58	30"	-	-	-	28"	18 3/4"	31 3/4"	13"	31"	Fig. 2
484X59	36"	-	-	-	33"	22"	37 3/4"	13"	37"	Fig. 2

PERFORMANCE

Model	Prop Dia.	Spd	Nom. HP	Amps	Nom. RPM	Bearing Type	Sones @ 0.00 SP	CFM @ 0.00 SP	CFM @ 0.125 SP	CFM @ 0.25 SP	Recommended Speed Control
484X51	7"	Var.	1/25	0.5	1550	Ball	5.37	254	197	NA	48C172
484X52	10"	Var.	1/25	0.6	1550	Ball	6.19	625	420	NA	48C172
484X53	12"	Var.	1/15	0.6	1550	Ball	6.00	884	401	NA	48C172
484X54	16"	Var.	1/10	0.9	1550	Ball	6.39	1381	770	NA	48C172
484X55	18"	1	1/4	3.0	1550	Ball	7.28	3128	2567	2201	N/A
484X42	20"	1	1/4	2.6	1550	Ball	7.01	3223	2508	2072	N/A
484X47	24"	1	1/3	3.2	1075	Ball	7.42	4479	3428	1894	N/A
484X49	30"	1	1/3	3.8	825	Ball	7.01	5893	4288	2374	N/A
484X50	36"	1	1/2	5.7	825	Ball	8.24	8860	6828	3140	N/A

Note: Performance may vary slightly due to customer installation and operating conditions

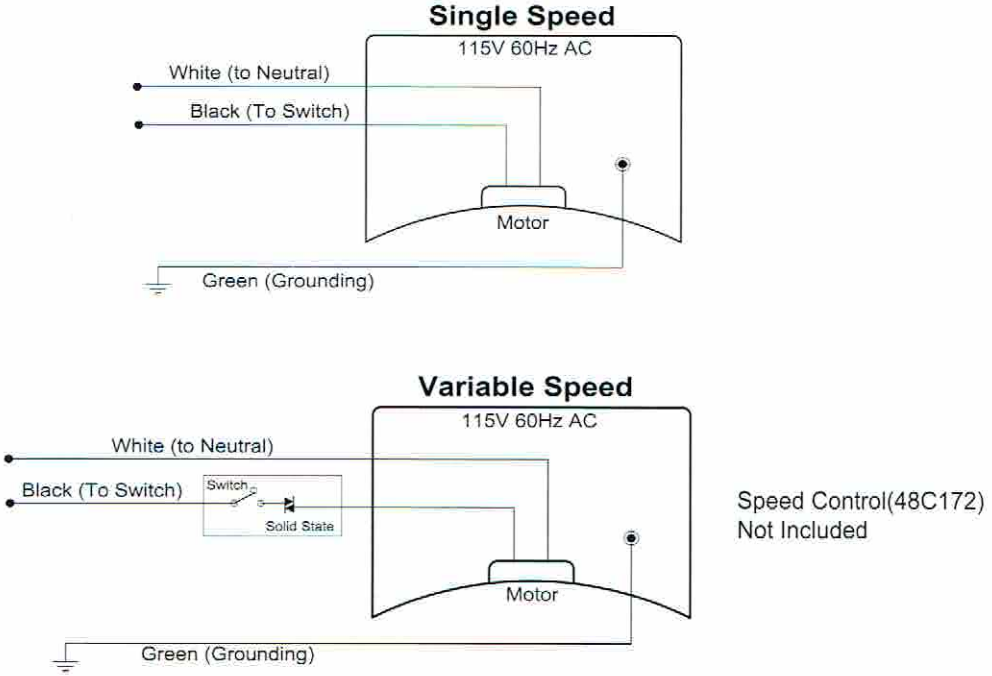
INSTALLATION INSTRUCTIONS

1. Cut hole in wall according to the suggested wall opening hole diameter shown in dimensional chart for the appropriate size exhaust fan or as required. Each installation may vary. Check and verify your specific requirements prior to cutting rough-in hole.
2. Ensure the unit is securely mounted to a rigid framework and sits flat against the wall to avoid unwanted noise or premature failure of components. Air should exhaust towards the outside of the room you are intending to remove air from.
3. Consult a qualified electrician to properly wire the exhaust fan (as well as additional controls or switches) according to the manufacturer's provided wiring diagram on the motor and control/switch.
4. Install compatible controls/switches according to wire diagrams provided by the manufacturer. Ensure your model exhaust fan is compatible with the control you have chosen.

Recommended Accessories:

Speed Control(48C172) for 484X51, 484X52, 484X53, 484X54

Fig.3: Wiring Schematics



Speed Control(48C172) Not Included

Dayton

OPERATION

⚠ CAUTION ***Before starting or operating your new fan, ensure that the propeller is properly secured and torqued to the motor shaft. Check all fasteners for tightness. Ensure propeller rotates freely.***

Fan inlet area and discharge area must be free of obstructions.

Once power is applied to fan, verify airflow is exhausting to outside of room.

Verify the amp draw does not exceed motor label amps or is not significantly less than motor label amps.

TROUBLESHOOTING GUIDE

Symptom	Possible Cause(s)	Corrective Action
Excessive noise	1. Dry motor bearings	1. Replace motor
	2. Loose propeller	2. Tighten set screws on propeller hub.
	3. Bent/damaged propeller	3. Replace propeller
	4. Loose guard assembly or motor fasteners.	4. Tighten as required to 15-20 inch/lbs.
Fan inoperative	1. Blown fuse or open circuit breaker.	1. Replace fuse or reset circuit breaker.
	2. Defective motor	2. Replace motor
	3. Switch in Off position	3. Turn switch on
Insufficient airflow	1. Blocked intake or exhaust opening	1. Clear intake and exhaust openings of any obstructions. Clean the motor, guard and propeller. Increase fresh air intake opening size.
	2. Low voltage	2. Determine cause and correct

MAINTENANCE

⚠ WARNING ***Disconnect and lockout power source before servicing. Only qualified personnel should service this equipment.***

Periodic maintenance schedules should be set to ensure reliability and performance of the fan. This maintenance should include inspection of all fasteners, propeller torque, and proper cleaning of the complete fan assembly.

Check for excessive vibration while fan is running.

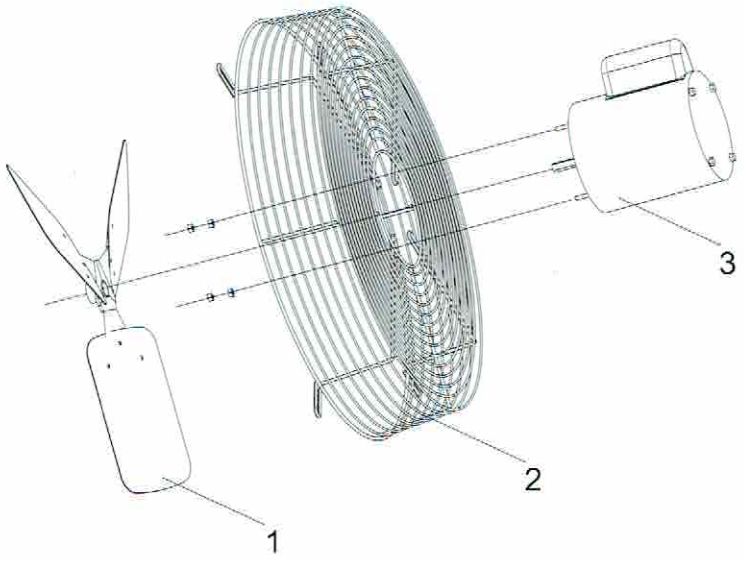
Periodically inspect and tighten all set screws and hardware.

Motors do not require further lubrication. They feature permanently sealed ball bearings.

The fan propeller should be periodically cleaned to ensure proper balance and performance.

Periodically clean fan guard to ensure optimum performance.

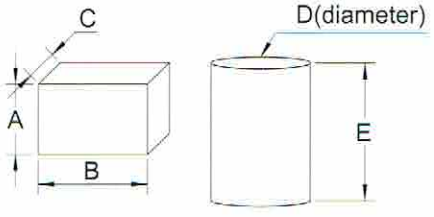
REPAIR PARTS ILLUSTRATION FOR DAYTON EXHAUST FANS



Note: Illustrations may not be representative of finished product with regards to design of fan propeller. All parts lists are accurate

Reference No.	Description	484X51	484X52	484X53	484X54	484X55	Qty.
1	Propeller	494R34	494R35	494R36	494R37	49R394	1
2	Guard	494R59	494R60	494R61	494R62	494R63	1
3	Motor	494R47	494R47	494R48	484R49	494R51	1
Reference No.	**Description**	**484X56**	**484X57**	**484X58**	**484X59**		**Qty.**
1	Propeller	494R41	494R43	494R45	494R46		1
2	Guard	494R64	494R65	494R66	494R67		1
3	Motor	494R52	494R55	494R57	494R58		1

CAPACITOR INFORMATION



SKU:	Motor Model	µF	VAC	Dim. A	Dim. B	Dim. C	Dim. D	Dim. E
484X51	494R47	6	250	1"	1 7/16"	5/8"	N/A	N/A
484X52	494R47	6	250	1"	1 7/16"	5/8"	N/A	N/A
484X53	494R48	5	250	N/A	N/A	N/A	1 3/16"	1 13/16"
484X54	494R49	10	250	N/A	N/A	N/A	1 3/16"	1 13/16"
484X55	494R51	20	450	N/A	N/A	N/A	1 9/16"	2 3/4"
484X56	494R52	20	450	N/A	N/A	N/A	1 9/16"	2 3/4"
484X57	494R55	30	370	N/A	N/A	N/A	1 3/4"	3"
484X58	494R57	25	370	N/A	N/A	N/A	1 3/4"	3"
484X59	494R58	30	370	N/A	N/A	N/A	1 3/4"	3"

For Repair Parts, call 1-800-Grainger
24 hours a day
365 days a year

Please provide following information:
-Model number
-Serial number (if any)
-Part description and number as shown in parts list

DAYTON ONE-YEAR LIMITED WARRANTY

DAYTON ONE-YEAR LIMITED WARRANTY. *All Dayton® product models covered in this manual are warranted by Dayton Electric Mfg. Co. ("Dayton") to the original user against defects in workmanship or materials under normal use for one year after date of purchase. If the Dayton product is part of a set, only the portion that is defective is subject to this warranty. Any product or part which is determined to be defective in material or workmanship and returned to an authorized service location, as Dayton or Dayton's designee designates, shipping costs prepaid, will be, as the exclusive remedy, repaired or replaced with a new or reconditioned product or part of equal utility or a full refund given, at Dayton's or Dayton's designee's option, at no charge. For limited warranty claim procedures, see "Warranty Service" below. This warranty is void if there is evidence of misuse, mis-repair, mis-installation, abuse or alteration. This warranty does not cover normal wear and tear of Dayton products or portions of them, or products or portions of them which are consumable in normal use. This limited warranty gives purchasers specific legal rights, and you may also have other rights which vary from jurisdiction to jurisdiction.*

WARRANTY DISCLAIMERS AND LIMITATIONS OF LIABILITY RELATING TO ALL CUSTOMERS FOR ALL PRODUCTS

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Dayton Electric Mfg. Co.,
100 Grainger Parkway, Lake Forest, IL 60045 U.S.A.
or call 1-888-361-8649



Thermostat, Attic Fan

- Item # 2E340
- Mfr. Model # 1A22-7
- UNSPSC # 41112209
- Shipping Weight 0.56 lbs.

- ItemLine Voltage Thermostat
- TypeCooling Only
- Switch TypeSPST
- Switch ActionClose on Rise
- Number of Switches1
- Control Range (F)80 to 130
- Differential (Deg. F)15
- Height (In.)4-9/16
- Width (In.)2-13/16
- Depth (In.)2-1/8
- Sensor TypeBimetal
- CharacteristicsCommonly Used as a Ventilation Control

- For Use WithAttic Ventilators, Fans and Dampers
- ColorBeige/Silver Face
- ApplicationCooling Only
- DisplayAnalog
- Voltage Range120 to 240VAC
- Inductive Amps @ 120V13.8
- Inductive Amps @ 240V10
- Full Load Amps @ 120V13.8
- Full Load Amps @ 240VAC10
- Locked Rotor Amps @ 120V82.8
- Locked Rotor Amps @ 240V60
- MountingStandard 2 x 4" Vertical Box

BACKDRAFT DAMPERS AND WALL SHUTTERS

HVAC/R fact sheet

BACKDRAFT DAMPERS

This model is a non-flanged horizontal mount exhaust backdraft damper. The frame is galvanized steel with aluminum blades. The blades have a felt seal on the leading edge for quiet closing and better protection from the weather. Spring assisted to allow blades to open quickly. Ideal for use in roof curbs, duct work, or wall collars when using a fan or power roof ventilator. Recommended for horizontal mount exhaust applications but it is also available for vertical mount.

Sizes available:
– 8" W x 8" H to 48" W x 60" H.
Multiple panels for sizes over 48" x 60".
Maximum free area velocity:
– 2000 FPM on sizes up to 19".
– 2250 FPM on sizes 20" and above.



2FTW8

SUPPLY FAN WALL SHUTTER

This model is a rear flanged gravity supply (intake) wall shutter. The frame and blades are mill finish aluminum with a galvanized reinforcement strip on each blade for added strength and counter balancing efficiency. The blades have a felt seal on the leading edge for quiet closing and better protection from the weather. Ideal for use with belt-driven centrifugal wall ventilators. Recommended for vertical mount supply (intake) only. The blades will pivot at the bottom and fall with gravity to open. Spring-assist to close.

Sizes available – 8" W x 8" H to 50" W x 50" H.
Maximum free area velocity – 2250 FPM.



4HX74

ECONOMY WALL EXHAUST SHUTTERS

This model is a rear flanged low velocity gravity exhaust shutter. The fra is galvanized steel with mill finish aluminum blades. The blades have a felt seal on the leading edge for quiet closing and better protection fro the weather. Ideal for use with direct-drive or belt-driven exhaust fans. Recommended for vertical mount exhaust applications only.

Sizes available – 8" W x 8" H to 24" W x 24" H.
Maximum free area velocity – 2000 FPM.



2C520

DAMPER SIZE (IN.)	OVERALL SIZE (IN.)	ITEM NO.
NO FLANGE, EXHAUST BACKDRAFT DAMPERS		
7 3/4 X 7 3/4	7 3/4 X 7 3/4	**3HHL4**
9 3/4 X 9 3/4	9 3/4 X 9 3/4	**2FTW8**
11 3/4 X 11 3/4	11 3/4 X 11 3/4	**2FTX4**
13 3/4 X 13 3/4	13 3/4 X 13 3/4	**2FTX5**
15 3/4 X 15 3/4	15 3/4 X 15 3/4	**3HHL5**
17 3/4 X 17 3/4	17 3/4 X 17 3/4	**2FTU9**
19 3/4 X 19 3/4	19 3/4 X 19 3/4	**3HHL6**
23 3/4 X 23 3/4	23 3/4 X 23 3/4	**2FTV7**
27 3/4 X 27 3/4	27 3/4 X 27 3/4	**3HHL7**
29 3/4 X 29 3/4	29 3/4 X 29 3/4	**3HHL8**
33 3/4 X 33 3/4	33 3/4 X 33 3/4	**3HHL9**
35 3/4 X 35 3/4	35 3/4 X 35 3/4	**3HHN1**
39 3/4 X 39 3/4	39 3/4 X 39 3/4	**3HHN2**
41 3/4 X 41 3/4	41 3/4 X 41 3/4	**6WRK7**
47 3/4 X 47 3/4	47 3/4 X 47 3/4	**3HHN3**
49 3/4 X 49 3/4	49 3/4 X 49 3/4	**6WRK8**
55 3/4 X 55 3/4	55 3/4 X 55 3/4	**5NKN7**
59 3/4 X 59 3/4	59 3/4 X 59 3/4	**5NKN8**
61 3/4 X 61 3/4	61 3/4 X 61 3/4	**6WRK9**
63 3/4 X 63 3/4	63 3/4 X 63 3/4	**5NKN9**
FLANGED, EXHAUST BACKDRAFT DAMPERS		
9 1/2 X 9 1/2	11 1/2 X 11 1/2	**3TZ50**
12 X 12	14 X 14	**4HX64**
15 X 15	17 X 17	**4HX65**
19 X 19	21 X 21	**4HX66**
23 X 23	25 X 25	**4HX67**
27 X 27	29 X 29	**4HX68**
35 X 35	37 X 37	**4HX69**
39 X 39	41 X 41	**4HX70**
50 X 50	52 X 52	**4HX71**
WALL MOUNT, SUPPLY BACKDRAFT DAMPERS		
8 X 8	10 3/4 X 10 3/4	**4HX72**
10 X 10	12 3/4 X 12 3/4	**4HX73**
11 X 11	13 3/4 X 13 3/4	**4HX33**
12 X 12	14 3/4 X 14 3/4	**4HX74**
13 X 13	15 3/4 X 15 3/4	**4HX75**
14 X 14	16 3/4 X 16 3/4	**4HX76**
15 X 15	17 3/4 X 17 3/4	**4HX77**
17 X 17	19 3/4 X 19 3/4	**5NKN4**
20 X 20	22 3/4 X 22 3/4	**5NKN5**
25 X 25	27 3/4 X 27 3/4	**5NKN6**

FITS FAN DIA. (IN.)	OPENING REQ. (IN.)	OVERALL SQUARE (IN.)	ITEM NO.
10	10 1/2 X 10 1/2	13	**2C517**
12	12 1/2 X 12 1/2	15	**2C518**
14	14 1/2 X 14 1/2	17	**3HHP5**
16	16 1/2 X 16 1/2	19	**2C520**
18	18 1/2 X 18 1/2	21	**2C521**
20	20 1/2 X 20 1/2	23	**2C522**
24	24 1/2 X 24 1/2	27	**2C523**

GALVANIZED STEEL FRAME WALL EXHAUST SHUTTER

This model is a rear flanged general purpose exhaust shutter. The frame is galvanized steel with mill finish aluminum blades. The blades have a galvanized steel reinforcement strip across the top of each blade for added strength and counter balancing efficiency. The blades have a felt seal on the leading edge for quiet closing and better protection from the weather. Ideal for use with direct-drive or belt-driven exhaust fans. Recommended for vertical mount exhaust applications only.

Sizes available – 10" W x 10" H to 60" W x 60" H.
Maximum free area velocity – 2500 FPM.



1C743

ALUMINUM WALL EXHAUST SHUTTER (REAR FLANGED)

This model is a rear flanged exhaust shutter for areas where corrosion may be a problem. The frame is mill finish aluminum. The blades have a white enamel finish and a galvanized reinforcement strip across the top of each blade for added strength and counter balancing efficiency. The blades have a felt seal on the leading edge for quiet closing and better protection from the weather. Ideal for use with direct-drive or belt-driven exhaust fans. Recommended for vertical mount exhaust applications only.

Sizes available – 10" W x 10" H to 60" W x 60" H.
Maximum free area velocity – 2500 FPM.



4C556

ALUMINUM WALL EXHAUST SHUTTER (FRONT FLANGED)

This model is a front flanged exhaust shutter for areas that require a flush mount. The frame and blades are mill finish aluminum. The blades have a galvanized reinforcement strip across the top of each blade for added strength and counter balancing efficiency. The blades have a felt seal on the leading edge for quiet closing and better protection from the weather. Ideal for use with cabinet fans and flush mount direct-drive or belt-driven exhaust fans. Recommended for vertical mount exhaust applications only.

Sizes available – 10" W x 10" H to 60" W x 60" H.
Maximum free area velocity – 2500 FPM.



3HHN6

FITS FAN DIA. (IN.)	OPENING REQ. (IN.) A	OVERALL SQ. (IN.) B	GALVANIZED STEEL ITEM NO.	ALUMINUM REAR FLANGE ITEM NO.	ALUMINUM FRONT FLANGE ITEM NO.
GRAVITY OPERATED, SINGLE PANEL					
10	10 1/2 X 10 1/2	13	**2C526**	**4C555**	**3HHN4**
12	12 1/2 X 12 1/2	15	**1C742**	**4C556**	**3HHN5**
16	16 1/2 X 16 1/2	19	**1C743**	**4C557**	**3HHN6**
18	18 1/2 X 18 1/2	21	**1C744**	**4C558**	**3HHN7**
20	20 1/2 X 20 1/2	23	**1C745**	**4C559**	**3HHN8**
24	24 1/2 X 24 1/2	27	**1C746**	**3C308**	**2FTW6**
30	30 1/2 X 30 1/2	33	**1C055**	**3C309**	**2FTX1**
36	36 1/2 X 36 1/2	39	**4C521**	**3C310**	**2FTW7**

FITS FAN DIA. (IN.)	OPENING REQ. (IN.) A	OVERALL SQ. (IN.) B	GALVANIZED STEEL ITEM NO.	ALUMINUM REAR FLANGE ITEM NO.	ALUMINUM FRONT FLANGE ITEM NO.
GRAVITY OPERATED, DOUBLE PANEL					
36	36 1/2 X 36 1/2	39	**1C209**	**4C835**	**3HHN9**
42	42 1/2 X 42 1/2	45	**1C210**	**3C311**	**2FTW1**
48	48 1/2 X 48 1/2	51	**1C211**	**3C312**	**2FTX3**
54	54 1/2 X 54 1/2	57	**3C115**	**3C313**	**3HHP1**
60	60 1/2 X 60 1/2	63	**3C116**	**3C314**	**3HHP2**

HIGH VELOCITY WALL EXHAUST SHUTTER

This model is a rear flanged exhaust shutter for applications that require higher velocities. The frame and blades are mill finish extruded aluminum with stainless steel tie rods. Ideal for use with direct-drive or belt-driven exhaust fans. Recommended for vertical mount exhaust applications only.

Sizes available – 12" W x 12" H to 60" W x 60" H.
Maximum free area velocity – 3250 FPM.



4FZH4

FITS FAN DIA. (IN.)	OPENING REQ. (IN.) A	OVERALL SQ. (IN.) B	ITEM NO.
GRAVITY OPERATED, SINGLE PANEL			
12	12 1/2 X 12 1/2	15	**4FZH3**
16	16 1/2 X 16 1/2	19	**4FZH4**
18	18 1/2 X 18 1/2	21	**4FZH5**
20	20 1/2 X 20 1/2	23	**4FZH6**
24	24 1/2 X 24 1/2	27	**4FZH7**
30	30 1/2 X 30 1/2	33	**4FZH8**
36	36 1/2 X 36 1/2	39	**4FZH9**

FITS FAN DIA. (IN.)	OPENING REQ. (IN.) A	OVERALL SQ. (IN.) B	ITEM NO.
GRAVITY OPERATED, DOUBLE PANEL			
42	42 1/2 X 42 1/2	45	**4FZJ1**
48	48 1/2 X 48 1/2	51	**4FZJ2**
54	54 1/2 X 54 1/2	57	**45C662**
60	60 1/2 X 60 1/2	63	**45C663**

FIBERGLASS WALL EXHAUST SHUTTER

This model is a rear flanged exhaust shutter for areas where corrosion is a known problem. The frame and blades are a heavy duty fiberglass pultrusion with stainless steel tie rods. Ideal for use with direct-drive or belt-driven exhaust fans in chemical plants and poultry/swine confinement operations. Recommended for vertical mount exhaust applications only.

Sizes available - 10" W x 10" H to 60" W x 60" H.
Maximum free area velocity – 2500 FPM.



5C212

STAINLESS STEEL WALL SHUTTER

This model is a rear flanged exhaust shutter for areas that require extreme corrosion resistance. The frame and blades are 304 stainless steel with stainless steel tie rods and hardware. Ideal for use with direct-drive or belt-driven exhaust fans in chemical plants and food processing operations. Recommended for vertical mount exhaust applications only

Sizes available – 10" W x 10" H to 36" W x 36" H.
Maximum free area velocity – 2500 FPM.



4FZJ5

FITS FAN DIA. (IN.)	OPENING REQ. (IN.) A	OVERALL SQ. (IN.) B	FIBERGLASS ITEM NO.	STAINLESS STEEL ITEM NO.
GRAVITY OPERATED, SINGLE PANEL				
10	10 1/2 X 10 1/2	13	**5C210**	**4FZJ3**
12	12 1/2 X 12 1/2	15	**5C211**	**4FZJ4**
16	16 1/2 X 16 1/2	19	**5C212**	**4FZJ5**
18	18 1/2 X 18 1/2	21	**5C213**	**4FZJ6**
20	20 1/2 X 20 1/2	23	**5C214**	**4FZJ7**
24	24 1/2 X 24 1/2	27	**5C215**	**–**
30	30 1/2 X 30 1/2	33	**5C216**	**–**
36	36 1/2 X 36 1/2	39	**5C217**	**–**

FITS FAN DIA. (IN.)	OPENING REQ. (IN.) A	OVERALL SQ. (IN.) B	FIBERGLASS ITEM NO.	STAINLESS STEEL ITEM NO.
GRAVITY OPERATED, DOUBLE PANEL				
24	24 1/2 X 24 1/2	27	**–**	**4FZJ8**
30	30 1/2 X 30 1/2	33	**–**	**4FZJ9**
36	36 1/2 X 36 1/2	39	**5C218**	**4FZK1**
42	42 1/2 X 42 1/2	45	**5C219**	**–**
48	48 1/2 X 48 1/2	51	**5C220**	**–**
54	54 1/2 X 54 1/2	57	**5C221**	**–**
60	60 1/2 X 60 1/2	63	**5C222**	**–**

AGRICULTURAL WALL EXHAUST SHUTTERS



3HHP7

ALUMINUM FRAME / PVC BLADES

This model is a rear flanged exhaust shutter for areas where corrosion is a known problem. The frame is painted extruded aluminum with UV stabilized PVC blades and yellow zinc dichromate rods running the full length of the blades. Ideal for direct-drive or belt-driven cone or slant-wall exhaust fans in poultry or swine confinement operations. Recommended for vertical mount exhaust applications only. Available in black or white.

Maximum free area velocity – 1500 FPM.

ALUMINUM FRAME / ALUMINUM BLADES

This model is a rear flanged exhaust shutter for areas where corrosion is a known problem. The frame is mill finish extruded aluminum with mill finish aluminum blades. The blades have an aluminum reinforcement strip across the top of each blade for added strength and counter balancing efficiency. The blades have a rubber seal on the leading edge for better protection from the weather. Ideal for direct-drive or belt-driven cone or slant-wall exhaust fans in poultry or swine confinement operations. Recommended for vertical mount exhaust applications only. Blades are available with a Polar White Finish.

Maximum free area velocity – 2500 FPM.

GALVANIZED FRAME / PVC BLADES

This model is a rear flanged exhaust shutter for areas where corrosion is a known problem. The frame is galvanized steel with UV stabilized PVC blades with stainless steel tie rods and fasteners. Ideal for direct-drive or belt-driven cone or slant-wall exhaust fans in poultry or swine confinement operations. Recommended for vertical mount exhaust applications only. Blades are available in black or white.

Maximum free area velocity -1500 FPM.



4TM09

FITS FAN DIA. (IN.)	OPENING REQ. (IN.)	OVERALL SQUARE (IN.)	BLADE MATERIAL	NO. OF PANELS	ITEM NO.
G-90 GALVANIZED STEEL FRAME AND TIE RODS					
36	39 1/2 H X 39 1/2 W	42	MILL FINISH ALUMINUM	1	**2FTX7**
48	51 1/2 H X 51 1/2 W	54	MILL FINISH ALUMINUM	2	**2FTX8**
48	54 H X 54 1/2 W	57 1/4	MILL FINISH ALUMINUM	2	**4GY95**
G-90 GALVANIZED STEEL FRAME AND STAINLESS STEEL TIE RODS					
36	36 1/2 H X 36 1/2 W	39	BLACK PVC	1	**3JA22**
36	36 1/2 H X 36 1/2 W	39	WHITE PVC	1	**4TM09**
36	36 1/2 H X 36 1/2 W	39	WHITE PVC	2	**4TM08**
36	39 1/2 H X 39 1/2 W	42	WHITE PVC	1	**2FTW9**
48	48 1/2 H X 48 1/2 W	51	WHITE PVC	2	**4TM10**
48	51 1/2 H X 51 1/2 W	54	WHITE PVC	2	**2FTV8**
EXTRUDED ALUMINUM FRAME WITH YELLOW ZINC DICHROMATE RODS					
16	16 3/4 H X 16 3/4 W	19	BLACK PVC	1	**3HHP6**
16	16 3/4 H X 16 3/4 W	19	WHITE PVC	1	**3HHP8**
24	24 3/4 H X 24 3/4 W	27	BLACK PVC	1	**3HHP7**
24	24 3/4 H X 24 3/4 W	27	WHITE PVC	1	**3HHP9**
36	36 3/4 H X 36 3/4 W	39	BLACK PVC	2	**4GY96**
36	36 3/4 H X 36 3/4 W	39	WHITE PVC	2	**4GY98**
36	39 3/4 H X 39 3/4 W	42	BLACK PVC	2	**2FTW5**
36	39 3/4 H X 39 3/4 W	42	WHITE PVC	2	**2FTV6**
48	51 3/4 H X 51 3/4 W	54	BLACK PVC	3	**2FTX9**
48	51 3/4 H X 51 3/4 W	54	WHITE PVC	3	**2FTW2**
48	54 3/4 H X 54 3/4 W	57	BLACK PVC	3	**4GY97**
48	54 3/4 H X 54 3/4 W	57	WHITE PVC	3	**4GY99**
EXTRUDED ALUMINUM FRAME WITH ALUMINUM BLADES					
36	39 1/2 H X 39 1/2 W	42	MILL FINISH ALUMINUM	2	**45C666**
48	51 1/2 H X 51 1/2 W	54	MILL FINISH ALUMINUM	2	**45C667**
48	54 H X 54 1/2 W	57 1/4	MILL FINISH ALUMINUM	2	**45C668**

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Please read and save these instructions. Read carefully before attempting to assemble, install, operate or maintain the product described. Protect yourself and others by observing all safety information. Failure to comply with instructions could result in personal injury and/or property damage! Retain instructions for future reference.

Dayton® Surface Mounted Utility Heater

Description

The Dayton 2YV13 utility heater is designed to provide automatic, 24 hour protection. Install where heat is needed to prevent pipes, pumps, and other water, hydraulic fluid or oil filled equipment from freezing. Set the thermostat at desired temperature and leave it. Maintenance free, there are no moving parts, and it can be left unattended all winter long. Ideal for remote locations.

Specifications

Model	Volts	Watts	Amps	Temp. Range
	240	500	2.1	
2YV13	208	376	1.8	40°-70°F
	120	500	4.2	

General Safety Information

⚠WARNING ***Read Carefully - This instruction sheet contains vital information for the proper installation, use and efficient operation of the heater. Carefully read the manual before installation, operation or cleaning of the heater. Failure to adhere to the instructions could result in fire, electric shock, death, serious personal injury or property damage. Save these instructions and review frequently for continuing safe operation and instructing future users.***

⚠WARNING ***HAZARD OF FIRE OR ELECTRICAL SHOCK***

1. To prevent a possible electric shock, disconnect all power to heater at main service panel before wiring or servicing.
2. All wiring must be in accordance with the National and Local Electrical Codes and the heater must be grounded.
3. Do not install closer than 18" (456 mm) to the floor or 12" (304 mm) from the ceiling. End of heater may be next to adjacent walls. Do not install in vertical position.
4. Heater is hot when in use. Do not install the heater behind door, behind towel rack, in closet, where curtains or drapes can touch heater or where air flow through the heater may be obstructed. Keep electrical cords, bedding, furniture and other combustibles away from heater.
5. Do not operate heater without cover in place. Cover must be secured with screws to prevent unintentional removal.
6. Do not insert or allow foreign objects to enter or touch the heater or heating element as this may cause an electric shock, fire or damage to heater.
7. Heater has hot and arcing or sparking parts inside. Do not use in areas where gasoline, paint, or flammable liquids are used or stored.
8. Do not use this heater in an environment where heater will be subjected to direct contact with water.
9. Do not use in a corrosive environment.

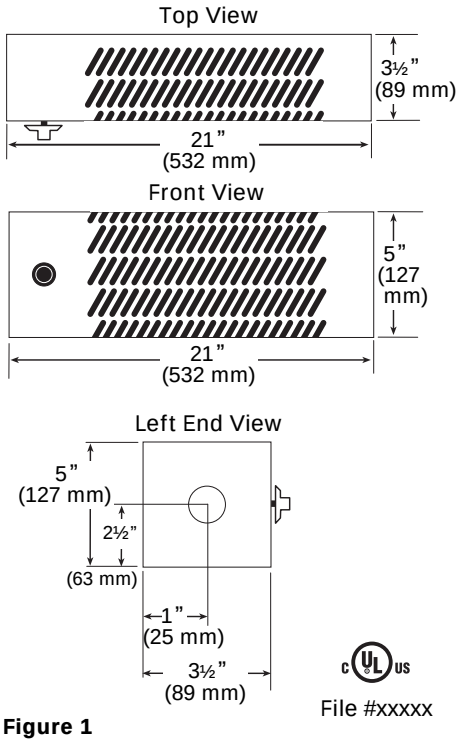


Figure 1

10. Supply voltage must be the same as heater voltage. Check heater nameplate and supply voltage before energizing.

SAVE THESE INSTRUCTIONS

IMPORTANT: The 2YV13 utility heater is designed for horizontal wall mounting only. The built-in thermostat allows for adjustment of the heat output from 40° to 70°F. The heater is factory wired for use at 240/208 volts but can be rewired for use at 120 volts.

ENGLISH

ESPAÑOL

FRANÇAIS

Dayton® Surface Mounted Utility Heater

ENGLISH

Installation

1. Remove the grille cover by removing the 2 screws on the front of the cover.
2. Position the heater on wall at desired mounting location maintaining the minimum clearances as noted in Warning 3 and as shown in Figure 2.

NOTE: The heater MUST be mounted horizontally to allow air flow freely upward through the heating element. Thermostat can be located towards either end of heater.

3. Securely fasten the heater to the wall with screws or bolts using the four (4) pre-drilled holes in the heater back.

WIRING

1. Bring power supply cable to heater and install into heater wiring compartment through the pre-punched 7/8" (22 mm) hole in the end of control box. Be sure to use cable clamp (supplied by others) on cable as required by the National Electric Code.
2. Connect the supply ground wire to the heater using the green colored ground screw.
3. To operate the heater at 208 through 240 volts, connect power supply wiring to heater wiring following the wiring diagram shown in Figure 3. DO NOT USE THE WHITE WIRE MARKED "N" FOR WIRING TO 208 THROUGH 240 VOLTS.
4. To operate the heater at 120 volts requires the heater to be re-wired as shown in Figure 4 by connecting blue L2 lead wire to wire connection of the other element blue lead wire and thermostat blue lead wire. Remove the L2 wire marker. Connect 120 volts to the black L1 lead and the white N lead. See Figure 4.

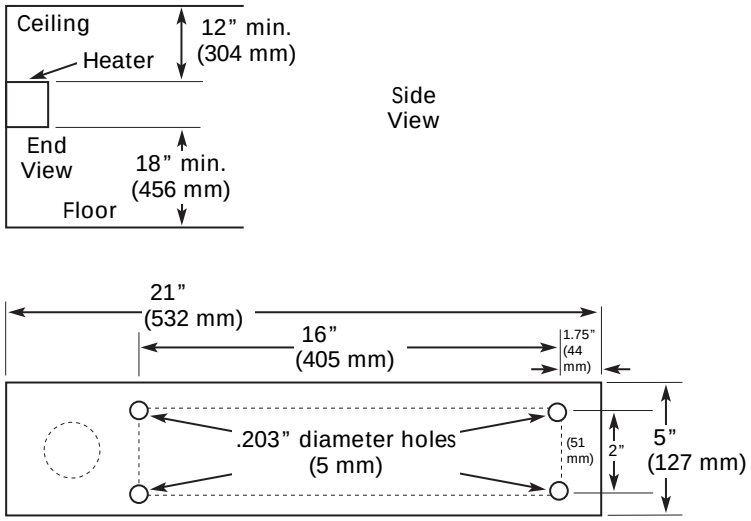
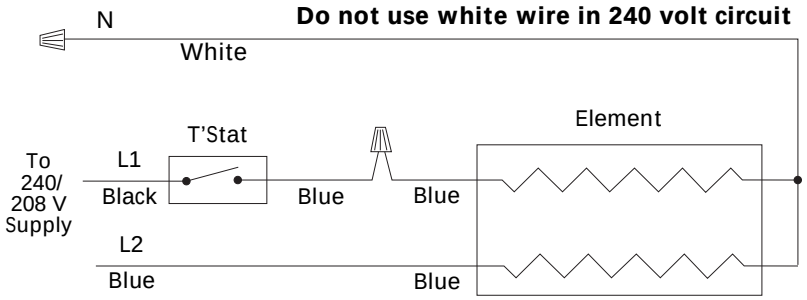
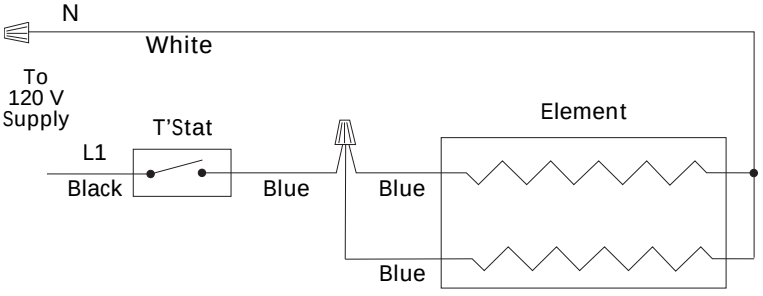


Figure 2



Factory wired for 240/208 volt operation
500 watts, 2.1 amps @ 240 V
375 watts, 1.8 amps @ 208 V

Figure 3



To rewire for 120 volt operation:

1. Connect Blue "L2" wire connection to other element Blue lead and thermostat Blue lead. Remove "L2" wire marker.
2. Connect 120 volts to Black "L1" & White "N".

Field re-wired for 120 volt operation
500 watts, 4.2 amps

Figure 4

Model 2YV13

Installation (Continued)

5. Complete the installation by replacing the grille cover using 2 screws removed earlier and 4 additional screws from parts bag. Remove thermostat knob from the parts bag and install.

Operation

1. Turn on the power supply to the heater.
2. Rotate the thermostat clockwise to the warmest setting. If the air temperature is below 70°F the heater should come on and within a few moments the heating element will become warm. If the air temperature is above 70°F, the heater will not operate. A check of the thermostat setting has to occur when the air temperature is below 70°F.
3. The thermostat range is from 40°F at full counterclockwise position to 70°F at full clockwise. Position thermostat at desired location. Thermostat will automatically cycle the heater on and off to maintain the desired temperature.

NOTE: The heater is designed to provide freeze protection and the thermostat may allow the heater to come on at the lowest setting if the space temperature drops below 40°F.

Maintenance

This heater requires no maintenance. Periodic cleaning to remove accumulated dust and dirt is recommended. This should be done using a vacuum with brush. See Warning 1.

ENGLISH

LIMITED WARRANTY

DAYTON ONE-YEAR LIMITED WARRANTY. *Dayton® Surface Mounted Utility Heater, Model covered in this manual, is warranted by Dayton Electric Mfg. Co. (Dayton) to the original user against defects in workmanship or materials under normal use for one year after date of purchase. Any part which is determined to be defective in material or workmanship and returned to an authorized service location, as Dayton designates, shipping costs prepaid, will be, as the exclusive remedy, repaired or replaced at Dayton's option. For limited warranty claim procedures, see PROMPT DISPOSITION below. This limited warranty gives purchasers specific legal rights which vary from jurisdiction to jurisdiction.*

LIMITATION OF LIABILITY. *To the extent allowable under applicable law, Dayton's liability for consequential and incidental damages is expressly disclaimed. Dayton's liability in all events is limited to and shall not exceed the purchase price paid.*

WARRANTY DISCLAIMER. *Dayton has made a diligent effort to provide product information and illustrate the products in this literature accurately; however, such information and illustrations are for the sole purpose of identification, and do not express or imply a warranty that the products are MERCHANTABLE, or FIT FOR A PARTICULAR PURPOSE, or that the products will necessarily conform to the illustrations or descriptions. Except as provided below, no warranty or affirmation of fact, expressed or implied, other than as stated in the "LIMITED WARRANTY" above is made or authorized by Dayton.*

PRODUCT SUITABILITY. *Many jurisdictions have codes and regulations governing sales, construction, installation, and/or use of products for certain purposes, which may vary from those in neighboring areas. While Dayton attempts to assure that its products comply with such codes, it cannot guarantee compliance, and cannot be responsible for how the product is installed or used. Before purchase and use of a product, review the product applications, and all applicable national and local codes and regulations, and be sure that the product, installation, and use will comply with them.*

Certain aspects of disclaimers are not applicable to consumer products; e.g., (a) some jurisdictions do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you; (b) also, some jurisdictions do not allow a limitation on how long an implied warranty lasts, consequentially the above limitation may not apply to you; and (c) by law, during the period of this Limited Warranty, any implied warranties of implied merchantability or fitness for a particular purpose applicable to consumer products purchased by consumers, may not be excluded or otherwise disclaimed.

PROMPT DISPOSITION. *Dayton will make a good faith effort for prompt correction or other adjustment with respect to any product which proves to be defective within limited warranty. For any product believed to be defective within limited warranty, first write or call dealer from whom the product was purchased. Dealer will give additional directions. If unable to resolve satisfactorily, write to Dayton at address below, giving dealer's name, address, date, and number of dealer's invoice, and describing the nature of the defect. Title and risk of loss pass to buyer on delivery to common carrier. If product was damaged in transit to you, file claim with carrier.*

Manufactured for Dayton Electric Mfg. Co., 5959 W. Howard St., Niles, Illinois 60714 U.S.A.

For Repair Parts, call 1-800-323-0620

24 hours a day – 365 days a year

Please provide following information:
-Model number
-Serial number (if any)
-Part description and number as shown in parts list

Address parts correspondence to:
Grainger Parts
P.O. Box 3074
1657 Shermer Road
Northbrook, IL 60065-3074 U.S.A.

ENGLISH

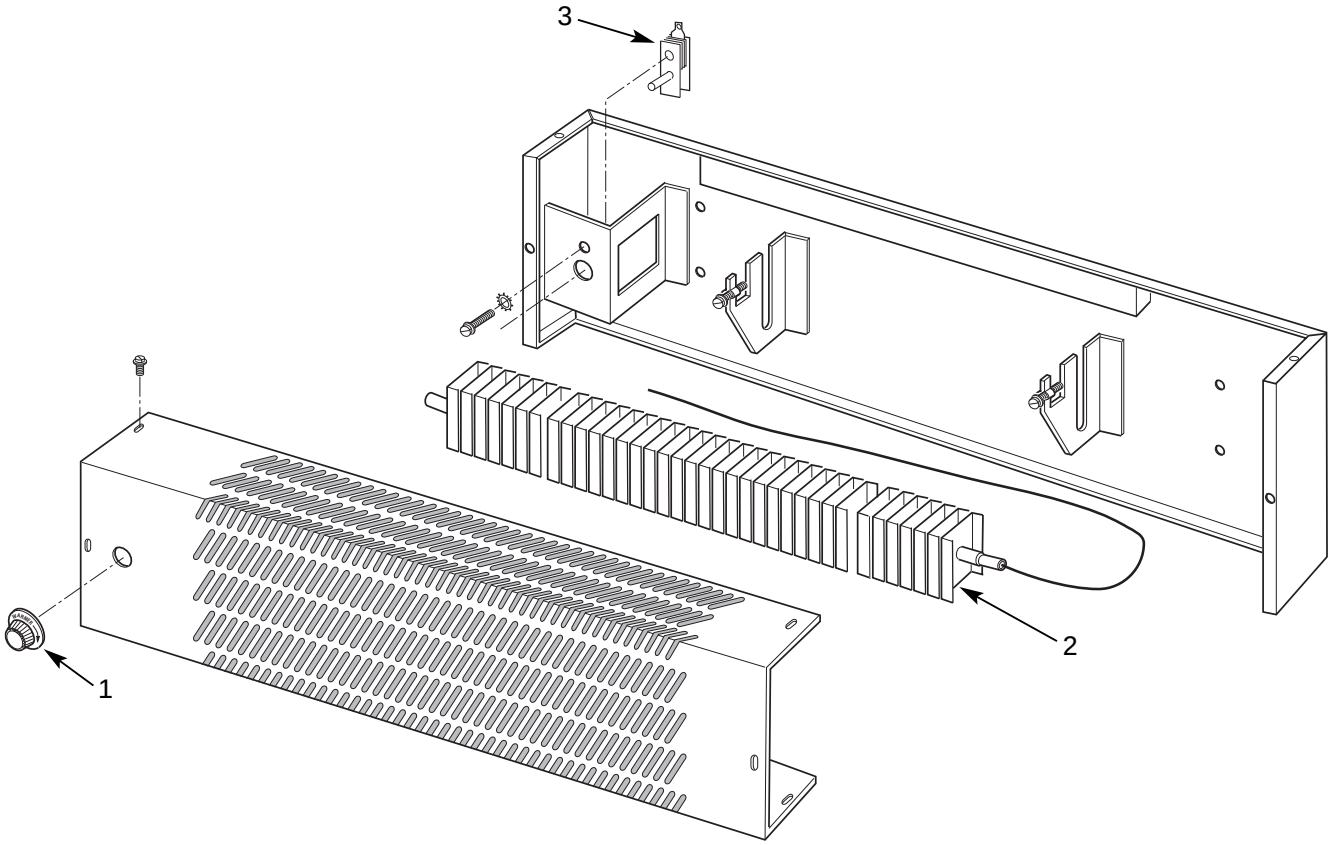


Figure 5 – Repair Parts Illustration for Surface Mounted Utility Heater

Repair Parts List for Surface Mounted Utility Heater

Ref. No.	Description	Part No.	Qty.
1	Knob	3301-2020-006	1
2	Element	1802-2091-000	1
3	Thermostat	5813-2062-000	1

Por favor lea y guarde estas instrucciones. Léalas cuidadosamente antes de tratar de montar, instalar, operar o dar mantenimiento al producto aquí descrito. Protéjase usted mismo y a los demás observando toda la información de seguridad. ¡El no cumplir con las instrucciones puede ocasionar daños, tanto personales como a la propiedad! Guarde estas instrucciones para referencia en el futuro.

Calentador de Uso General para Montaje en Superficies Dayton®

Descripción

El calentador de uso general 2YV13 Dayton está diseñado para proporcionar protección en forma automática durante las 24 horas del día. Instálelo donde se necesite calefacción para impedir la congelación de las tuberías, bombas y otros equipos que contengan agua, fluido hidráulico o aceite. Ajuste el termostato a la temperatura deseada y déjelo. No necesita mantenimiento, no tiene partes móviles, y se puede dejar desatendido durante todo el invierno. Es ideal para lugares remotos.

Especificaciones

Modelo	Voltios	Vatios	Amperios	Gama de Temp.
2YV13	240	500	2.1	4.4 a 21.1°C (40 a 70°F)
	208	376	1.8	
	120	500	4.2	

Información de Seguridad General

⚠ ADVERTENCIA ***Lea cuidadosamente - Esta hoja de instrucciones contiene información vital para la instalación y uso correctos, y el funcionamiento eficaz del calentador. Lea cuidadosamente el manual antes de instalar, operar o limpiar el calentador. El incumplimiento con las instrucciones puede resultar en incendio, choque eléctrico, la muerte, lesiones personales graves o daños a la propiedad. Guarde estas instrucciones y léalas frecuentemente para un uso seguro continuado del calentador y para instruir a los usuarios futuros.***

⚠ ADVERTENCIA ***PELIGRO DE INCENDIO O DESCARGA ELECTRICA***

1. Para evitar la posibilidad de sufrir un choque eléctrico, desconecte toda la alimentación eléctrica para el calentador en el panel principal de servicio antes de hacer cualquier trabajo de cableado o mantenimiento.
2. Todo el cableado deberá cumplir con los códigos eléctricos nacionales y locales, y el calentador debe conectarse a tierra.
3. No instale el calentador a menos de 18 pulg. (456 mm) del piso o 12 pulg. (304 mm) del cielo raso. El extremo del calentador puede quedar junto a las paredes adyacentes. No instale el calentador en posición vertical.
4. El calentador está caliente cuando se utiliza. No instale el calentador detrás de puertas, detrás de toalleros, en un guardarropa, en donde las cortinas o tapices puedan entrar en contacto con el calentador o donde el flujo de aire que pasa a través del calentador pueda estar obstruido. Mantenga todos los cordones eléctricos, ropa de cama, muebles y otros materiales combustibles lejos del calentador.
5. No haga funcionar el calentador sin la cubierta puesta. La cubierta debe fijarse con tornillos para impedir su desmontaje no intencional.
6. No inserte ni permita que objetos extraños entren en el calentador o hagan contacto con éste o con el elemento de calefacción, ya que esto podría causar un choque eléctrico, incendio o daños al calentador.
7. El calentador tiene en su interior piezas calientes y productoras de arcos eléctricos o chispas eléctricas. No utilice el calentador en las áreas donde se utilice o almacene gasolina, pintura o líquidos inflamables.

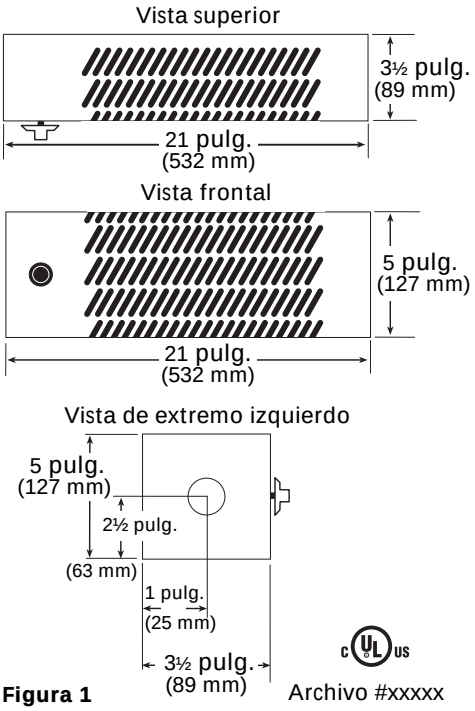


Figura 1

8. No utilice este calentador en un ambiente donde estará sujeto a un contacto directo con el agua.
9. No lo utilice en un ambiente corrosivo.
10. El voltaje de alimentación debe ser igual que el voltaje del calentador. Compruebe que el voltaje de alimentación y el voltaje indicado en la placa de identificación del calentador sean iguales antes de energizar el calentador.

CONSERVE ESTAS INSTRUCCIONES

IMPORTANTE: El calentador de uso general 2YV13 está diseñado sólo para montaje horizontal en una pared. El termostato incorporado permite regular la salida de calor desde 4.4 a 21.1°C (40 a 70°F). El calentador viene cableado de fábrica para uso a 240/208 voltios pero puede volverse a cablear para uso a 120 voltios.

ESPAÑOL

Formulario 5S5531

Impreso en EE.UU.
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MAR044
04/06
No. de Parte 5200-2724-000
PPD 077

Calentador de Uso General para Montaje en Superficies Dayton®

Instalación

1. Retire la cubierta con rejillas. Para hacer esto, extraiga los 2 tornillos en el frente de la cubierta.
2. Coloque el calentador en la pared en la posición de montaje deseada, manteniendo los espacios libres mínimos necesarios según se indica en la Advertencia 3 y se muestra en la Figura 2.

AVISO: El calentador DEBE montarse horizontalmente para permitir el flujo libre del aire hacia arriba a través del elemento de calefacción. El termostato puede situarse hacia cualquiera de los dos extremos del calentador.

3. Sujete firmemente el calentador en la pared con tornillos o pernos, usando los cuatro (4) orificios pretaladrados en la parte posterior del calentador.

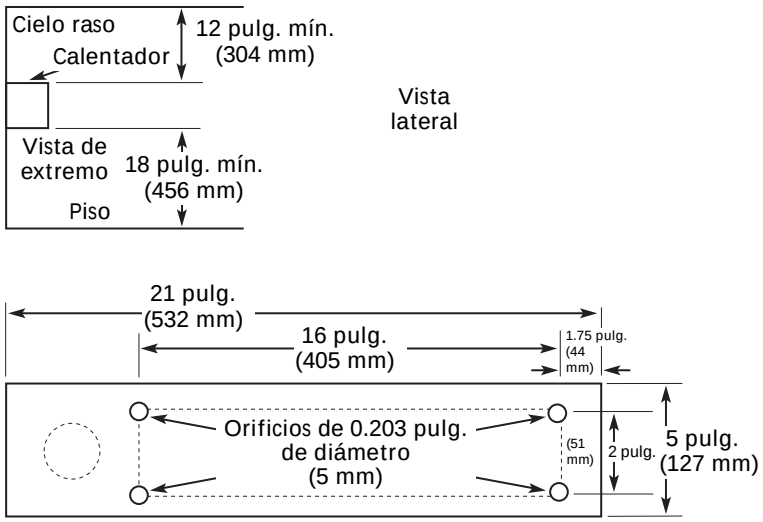
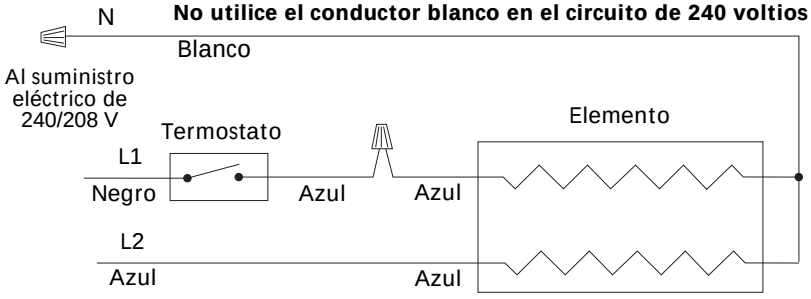


Figura 2

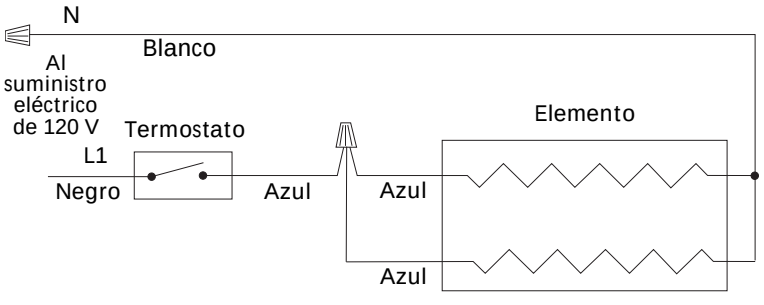
CABLEADO

1. Tienda el cable de suministro eléctrico hasta el calentador e instálelo en el compartimiento de cableado del calentador, pasando el cable a través del orificio precortado de 7/8 de pulg. (22 mm) en el extremo de la caja de control. Asegúrese de utilizar la abrazadera de cable (suministrada por otros) en el cable de acuerdo con el Código Eléctrico Nacional.
2. Conecte el conductor de tierra del cable de suministro eléctrico al calentador, usando el tornillo de conexión a tierra de color verde.
3. Para operar el calentador a una tensión de 208 a 240 voltios, conecte los conductores de suministro eléctrico al calentador de acuerdo con el diagrama de cableado mostrado en la Figura 3. NO UTILICE EL CONDUCTOR BLANCO MARCADO CON LA LETRA "N" PARA HACER LA CONEXION PARA 208 A 240 VOLTIOS.
4. Para operar el calentador a una tensión de 120 voltios, será necesario volver a cablear el calentador como se muestra en la Figura 4, donde el conductor de acometida azul L2 debe



Cableado de fábrica para funcionar a 240/208 voltios
500 vatios, 2.1 amperios a 240 V
375 vatios, 1.8 amperios a 208 V

Figura 3



Recableado en el campo para funcionar a 120 voltios
500 vatios, 4.2 amperios

Para volver a cablear para operación a 120 voltios:

1. Conecte la conexión de conductor azul "L2" al otro conductor de acometida azul del elemento y conductor de acometida azul del termostato. Retire el marcador del conductor "L2".
2. Conecte 120 voltios en los conductores "L1" negro y "N" blanco.

Figura 4

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Modelo 2YV13

Instalación (Continuación)

conectarse a la conexión de conductor del otro conductor de acometida azul del elemento y conductor de acometida azul del termostato. Retire el marcador del conductor L2. Conecte 120 voltios en el conductor de acometida negro L1 y el conductor de acometida blanco N. Consulte la Figura 4, página 2.

5. Para finalizar la instalación, vuelva a instalar la cubierta con rejillas usando los dos tornillos que extrajo anteriormente y 4 tornillos adicionales provenientes de la bolsa de partes. Saque la perilla del termostato de la bolsa de partes e instale la perilla.

Operación

1. Conecte la alimentación eléctrica para el calentador.
2. Gire la perilla del termostato en el sentido de las agujas del reloj hasta el ajuste más caliente. Si la temperatura del aire es inferior a 21.1°C (70°F), el calentador debe comenzar a funcionar y al cabo de unos cuantos minutos el elemento de calefacción se calentará. Si la temperatura del aire es superior a 21.1°C (70°F), el calentador no funcionará. Se debe producir una verificación del ajuste del termostato cuando la temperatura del aire es inferior a 21.1°C (70°F).
3. La gama de temperaturas del termostato es desde 4.4°C (40°F) a plena posición en sentido contrario a las agujas del reloj hasta 21.1°C (70°F) a plena posición en el sentido de las agujas del reloj. Coloque el termostato en el lugar deseado. El termostato apagará y encenderá automáticamente el calentador para mantener la temperatura deseada.

AVISO: El calentador está diseñado para brindar protección contra el congelamiento y es posible que el termostato permita que el calentador funcione en el ajuste más bajo si la temperatura del espacio cae por debajo de 4.4°C (40°F).

Mantenimiento

Este calentador no requiere mantenimiento. Se recomienda la limpieza periódica para eliminar las acumulaciones de polvo y suciedad. Esto debe hacerse usando una aspiradora equipada con una escobilla. Consulte la Advertencia 1.

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GARANTIA LIMITADA

GARANTIA LIMITADA DE DAYTON POR UN AÑO. *Dayton Electric Mfg. Co. (Dayton) le garantiza al usuario original que el modelo tratado en este manual del Calentador de Uso General para Montaje en Superficies Dayton® está libre de defectos en la mano de obra o el material, cuando se le somete a uso normal, por un año a partir de la fecha de compra. Cualquier parte que se encuentre defectuosa, tanto en el material como en la mano de obra, y sea devuelta a un lugar de servicio autorizado designado por Dayton, con los costos de envío pagados por adelantado, será reparada o reemplazada a la discreción de Dayton como remedio exclusivo. Para obtener la información sobre los procedimientos de reclamo cubiertos en la garantía limitada vea ATENCION OPORTUNA a continuación. Esta garantía limitada confiere a los compradores derechos legales específicos que varían de jurisdicción a jurisdicción.*

LIMITES DE RESPONSABILIDAD. *Hasta el punto que las leyes aplicables lo permitan, la responsabilidad de Dayton por los daños emergentes o incidentales está expresamente excluida. La responsabilidad de Dayton expresamente está limitada y no puede exceder el precio de compra pagado por el artículo.*

EXCLUSION DE RESPONSABILIDAD DE LA GARANTIA. *Dayton se ha esforzado diligentemente para proporcionar información sobre el producto en esta literatura en forma apropiada; sin embargo, tal información y las ilustraciones y descripciones tienen como único propósito la identificación del producto y no expresan ni implican garantía de que los productos son VENDIBLES o ADECUADOS PARA UN PROPOSITO EN PARTICULAR o que se ajustan necesariamente a las ilustraciones o descripciones. Con excepción de lo que se establece a continuación, Dayton no hace ni autoriza ninguna garantía o afirmación de hecho, expresa o implícita, que no sea estipulada en la "GARANTIA LIMITADA" anterior.*

ADAPTACION DEL PRODUCTO. *Muchas jurisdicciones tienen códigos o reglamentos que rigen las ventas, la construcción, la instalación y/o el uso del producto para ciertos propósitos que pueden variar con respecto a los aplicables a las zonas vecinas. Si bien Dayton trata de que sus productos cumplan con dichos códigos, no puede garantizar su conformidad y no puede hacerse responsable por la forma en que su producto se instala o usa. Antes de comprar y usar el producto, revise su aplicación y todos los códigos y regulaciones nacionales y locales aplicables, y asegúrese que el producto, la instalación y el uso los cumplan.*

Ciertos aspectos de limitación de responsabilidad no se aplican a los productos del consumidor; es decir (a) algunas jurisdicciones no permiten la exclusión o la limitación de daños incidentales o emergentes, de modo que las limitaciones o exclusiones anteriores puede que no se apliquen en su caso; (b) también, algunas jurisdicciones no permiten limitar el tiempo que una garantía implícita dura, por lo tanto, la limitación anterior puede que no se aplique en su caso; y (c) por ley, durante el período que dura esta Garantía Limitada, las garantías implícitas de comercialización o de adecuación para un propósito en particular aplicables a los productos del consumidor comprados por consumidores no pueden ser excluidas o no pueden excluirse de la responsabilidad en alguna otra forma.

ATENCION OPORTUNA. *Dayton hará un esfuerzo de buena fe para corregir puntualmente, o hacer otros ajustes, con respecto a cualquier producto que resulte defectuoso dentro de los términos de esta garantía limitada. En el caso de que encuentre un producto defectuoso y que esté cubierto dentro de los límites de esta garantía haga el favor de escribir primero, o llame, al distribuidor de quien compró el producto. El distribuidor le dará las instrucciones adicionales. Si no puede resolver el problema en forma satisfactoria, escriba a Dayton a la dirección a continuación, dando el nombre del distribuidor, su dirección, la fecha y el número de la factura del distribuidor y describa la naturaleza del defecto. La propiedad del artículo y el riesgo de pérdida pasan al comprador en el momento de la entrega del artículo a la compañía de transporte. Si el producto se daña durante el transporte debe presentar su reclamo a la compañía de transporte.*

Fabricado para Dayton Electric Mfg. Co., 5959 W. Howard St., Niles, Illinois 60714 EE.UU.

Para Obtener Partes de Reparación en México Llame al 001-800-527-2331 en EE.UU. Llame al 1-800-323-0620

Servicio permanente – 24 horas al día al año

Por favor proporciónenos la siguiente información:
-Número de modelo
-Número de serie (si lo tiene)
-Descripción de la parte y número que le corresponde en la lista de partes

Envíe correspondencia relacionada con pedidos de partes a:
Grainger Parts
P.O. Box 3074
1657 Shermer Road
Northbrook, IL 60065-3074 U.S.A.

ESPAÑOL

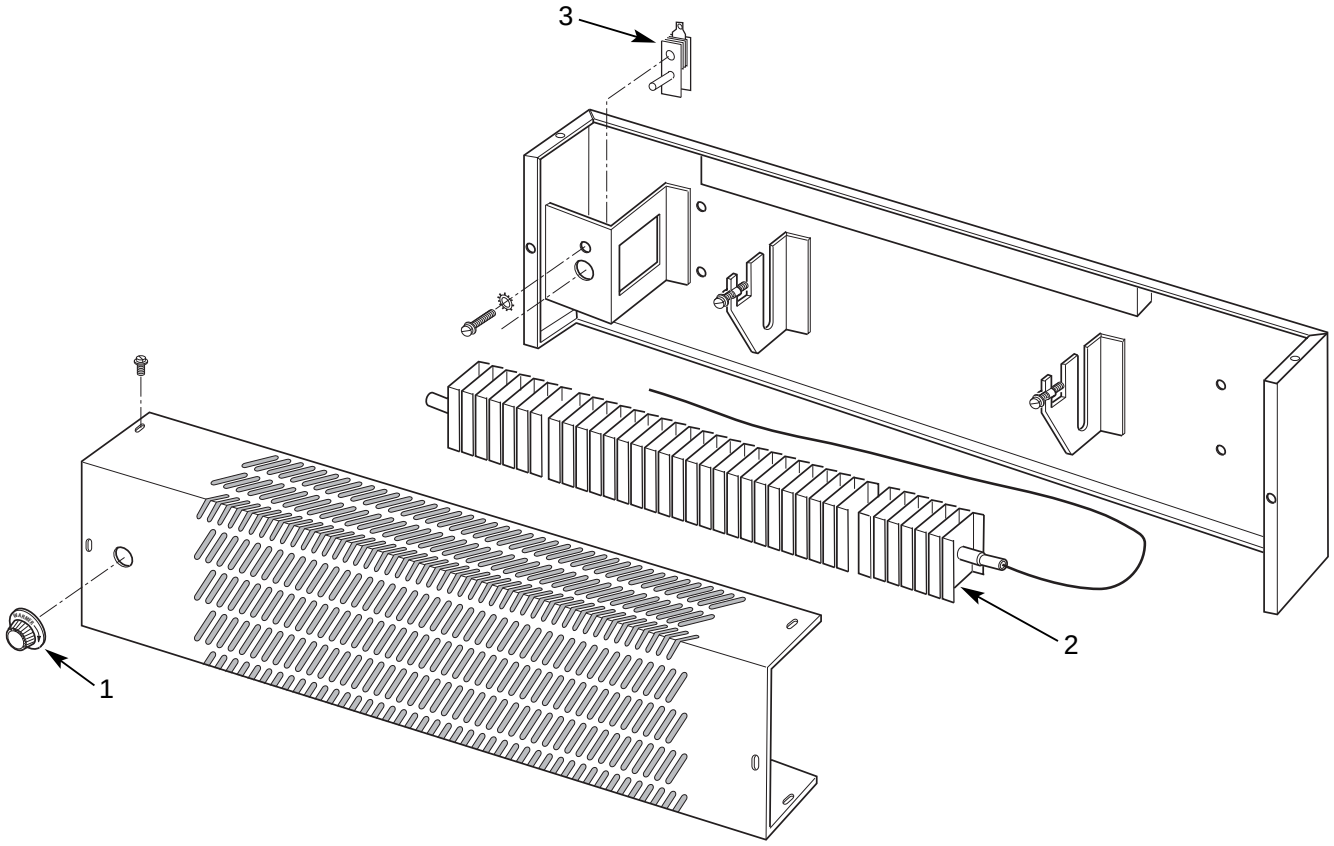


Figura 5 – Ilustración de las Partes de Reparación para el Calentador de Uso General para Montaje en Superficies

Lista de Partes de Reparación para el Calentador de Uso General para Montaje en Superficies

No. de Ref.	Descripción	No. de Parte	Cant.
1	Perilla	3301-2020-006	1
2	Elemento	1802-2091-000	1
3	Termostato	5813-2062-000	1

Veuillez lire et conserver ces instructions. Lire attentivement avant de commencer à assembler, installer, faire fonctionner ou entretenir l'appareil décrit. Protégez-vous et les autres en observant toutes les informations sur la sécurité. Négliger d'appliquer ces instructions peut résulter en des blessures corporelles et/ou en des dommages matériels ! Conserver ces instructions pour références ultérieures.

Radiateur tout usage monté en applique Dayton®

Description

Le radiateur tout usage Dayton 2YV13 a été conçu pour fonctionner automatiquement, en toute sécurité, 24 h sur 24. L'installer dans un endroit où la chaleur est nécessaire pour éviter que les conduites, pompes et autres équipements remplis de liquide hydraulique ou d'huile ne gèlent. Placer le thermostat à la position désirée, c'est tout. Sans entretien, ne contient pas de pièces en mouvement, il peut être laissé sans surveillance pendant tout l'hiver.

Spécifications

Modèle	Volts	Watts	Ampères	Température Plage
2YV13	240	500	2,1	4,4 et 21,1 ºC (40 et 70 °F)
	208	376	1,8	
	120	500	4,2	

Informations générales sur la sécurité

⚠ AVERTISSEMENT ***Lire attentivement - Cette feuille d'instructions contient des informations vitales pour l'installation correcte, l'utilisation et le fonctionnement efficace de la chaufferette. Lire attentivement le manuel avant d'installer, de faire fonctionner ou de nettoyer le radiateur. Négliger de suivre les instructions pourrait entraîner un incendie, une décharge électrique, la mort, des blessures graves ou des dommages matériels. Conserver ces instructions et les relire fréquemment pour continuer d'assurer un fonctionnement sécuritaire et pour la formation d'autres utilisateurs.***

⚠ AVERTISSEMENT ***RISQUE D'INCENDIE OU DE DÉCHARGE ÉLECTRIQUE***

1. Afin d'éviter un risque de décharge électrique, couper l'alimentation du radiateur au niveau du panneau de service principal avant d'effectuer le câblage ou l'entretien.
2. Tous les fils doivent être conformes au Code national de l'électricité et aux codes locaux; et le radiateur doit être mis à la terre.
3. Ne pas installer à moins de 456 mm (18 po) du sol ou à 304 mm (12 po) du plafond. L'extrémité du radiateur peut être près des murs adjacents. Ne pas installer en position verticale.
4. Ce radiateur est chaud lorsqu'il est utilisé. Ne pas installer le radiateur derrière une porte, un support à serviettes, dans un placard, à un endroit où le radiateur pourrait roussir des draperies ou à un endroit où son débit d'air pourrait être obstrué. S'assurer que les cordons d'alimentation, la literie, le mobilier et tout autre matériau combustible sont loin du radiateur.
5. Ne pas utiliser le radiateur si le couvercle est déposé. Le couvercle doit être fixé de façon sécuritaire avec des vis pour éviter de l'enlever involontairement.
6. Ne pas insérer ou laisser des corps étrangers pénétrer dans le radiateur ou entrer en contact avec l'élément chauffant, car il pourrait en résulter une décharge électrique, un incendie ou des dommages au radiateur.
7. Le radiateur comprend des parties chaudes, qui produisent un arc électrique ou forment des étincelles à l'intérieur. Ne pas utiliser dans des endroits où sont utilisés ou entreposés de l'essence, de la peinture ou des liquides inflammables.

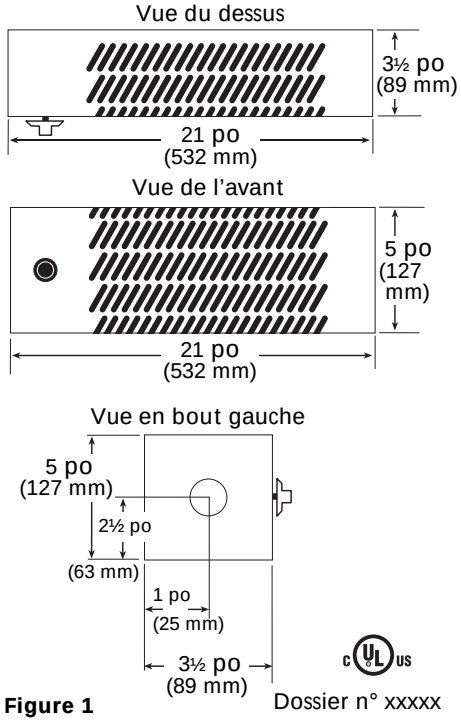


Figure 1

8. Ne pas utiliser ce radiateur dans un endroit où il peut se trouver en contact direct avec de l'eau.
9. Ne pas utiliser dans un environnement corrosif.
10. La tension d'alimentation doit être identique à la tension du radiateur. Vérifier la plaque signalétique du radiateur et la tension d'alimentation avant la mise sous tension.

CONSERVER CES INSTRUCTIONS

IMPORTANT : Le radiateur tout usage 2YV13 a été conçu pour être installé horizontalement sur un mur uniquement. Le thermostat intégré permet de régler le chauffage pour obtenir une température comprise entre 4,4 et 21,1 ºC (40 et 70 °F). Le radiateur est câblé en usine pour une tension de 240/208 volts, mais peut être recâblé pour du 120 volts.

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Brochure 5S5531

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MAR044
04/06
Nº de pièce 5200-2724-000
PPD 077

Radiateur tout usage monté en applique Dayton®

Installation

1. Enlever les 2 vis à l'avant du couvercle et déposer la grille-couvercle.
2. Placer le radiateur sur le mur à la position désirée en respectant les dégagements minima indiqués dans l'avertissement 3 et illustrés sur la Figure 2.

REMARQUE : Le radiateur DOIT être installé horizontalement pour permettre l'évacuation de l'air chaud vers le haut. Le thermostat peut être placé à l'une ou l'autre extrémité.

3. Fixer solidement le radiateur sur le mur à l'aide de vis ou de boulons en utilisant les quatre (4) trous pré-percés à l'arrière du radiateur.

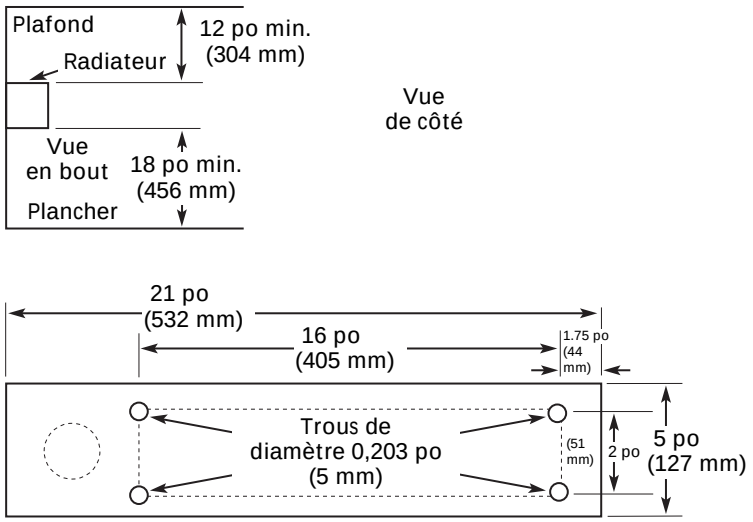
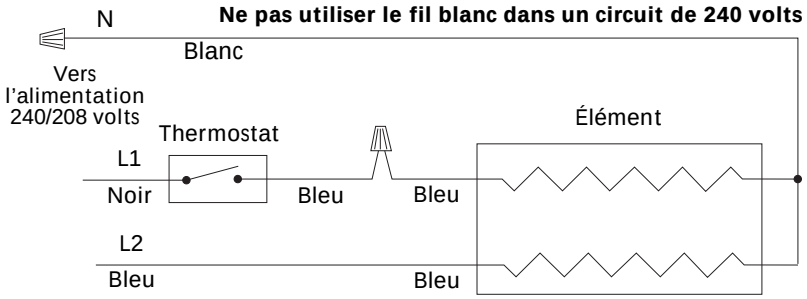


Figure 2

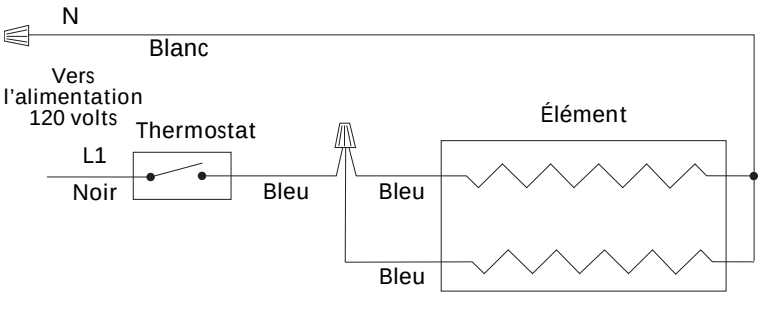
CÂBLAGE

1. Acheminer le câble d'alimentation électrique au radiateur et l'amener dans le compartiment de câblage du radiateur par l'alvéole défonçable de 22 mm (7/8 po) à l'extrémité de la boîte de commande. Ne pas oublier de mettre un collier de serrage (non fourni) sur le câble comme l'exige le Code national de l'électricité.
2. Connecter le câble de mise à la terre au radiateur par la vis de mise à la terre verte.
3. Pour utiliser le radiateur dans la plage 208/240 volts, connecter le câblage du bloc d'alimentation au radiateur en suivant les instructions du schéma de câblage à la Figure 3. NE PAS UTILISER LE FIL BLANC IDENTIFIÉ « N » POUR LE CÂBLAGE 208/240 VOLTS.
4. Il faut recâbler le radiateur pour l'utiliser à 120 volts comme il est indiqué à la Figure 4 en connectant le fil bleu L2 à la liaison par fil de l'autre fil bleu de l'élément et du fil bleu du thermostat. Enlever le marqueur de conducteur L2. Raccorder l'alimentation 120 volts au fil noir L1 et au fil blanc N. Voir la Figure 4.



Câblé en usine pour utilisation sur 240/208 volts
500 watts, 2,1 A @ 240 V
375 watts, 1,8 A @ 208 V

Figure 3



Recâblé sur le lieu d'utilisation pour fonctionnement en 120 volts
500 watts, 4,2 A

Figure 4

Recâblage pour fonctionnement sur 120 volts :

1. Connecter la liaison par fil bleue « L2 » à l'autre fil bleu de l'élément et au fil bleu du thermostat. Enlever le marqueur de conducteur « L2 ».
2. Raccorder l'alimentation 120 volts au fil noir « L1 » et au fil blanc « N ».

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Modèle 2YV13

Installation (suite)

5. Terminer l'installation en remettant la grille en place en utilisant les 2 vis enlevées précédemment et 4 vis supplémentaires se trouvant dans le sac des pièces. Sortir le bouton du thermostat du sac des pièces et l'installer.

Fonctionnement

1. Mettre l'appareil sous tension.
2. Tourner le bouton du thermostat dans le sens horaire jusqu'à la position de température la plus élevée. Si la température de l'air est inférieure à 21,1 ºC (70 °F), le radiateur doit se mettre en route et l'élément chauffant doit commencer à chauffer dans les instants qui suivent. Le radiateur ne se mettra pas en route si la température de l'air est supérieure à 21,1 ºC (70 °F). Vérifier le réglage du thermostat lorsque la température est inférieure à 21,1 ºC (70 °F).
3. La plage de température du thermostat est comprise entre 4,4 ºC (40 °F) (butée sens antihoraire) et 21,1 ºC (70 °F) (butée sens horaire). Régler le thermostat à la position désirée. Le thermostat mettra en route et arrêtera automatiquement le radiateur pour maintenir la température choisie.

REMARQUE : Le radiateur a été conçu pour protéger contre le gel et le thermostat peut enclencher le radiateur au réglage de température le plus bas si la température chute sous 4,4 ºC (40 °F).

Entretien

Ce radiateur ne nécessite aucun entretien. Il est recommandé de le nettoyer régulièrement pour éliminer la saleté et l'accumulation de poussière. Pour ce faire, utiliser un aspirateur avec une brosse. Voir avertissement 1.

GARANTIE LIMITÉE

GARANTIE DAYTON LIMITÉE À UN AN. *Le modèle couvert dans ce manuel – Radiateur tout usage monté en applique Dayton® – est garanti à l'utilisateur d'origine par Dayton Electric Mfg. Co. (Dayton), contre tout défaut de fabrication ou de matériaux, lors d'une utilisation normale, et cela pendant un an après la date d'achat. Toute pièce, dont les matériaux ou la main d'oeuvre seront jugés défectueux par Dayton, et qui sera renvoyée, port payé, à un centre de réparation autorisé par Dayton, sera, à titre de solution exclusive, soit réparée, soit remplacée, par Dayton. Pour le procédé de réclamation sous garantie limitée, reportez-vous à la clause de DISPOSITION PROMTE ci-dessous. Cette garantie limitée donne aux acheteurs des droits légaux spécifiques qui varient de juridiction à juridiction.*

LIMITES DE RESPONSABILITÉ. *La responsabilité de Dayton, dans les limites permises par la loi, pour les dommages indirects ou fortuits est expressement déniée. Dans tous les cas la responsabilité de Dayton est limitée et ne dépassera pas la valeur du prix d'achat payé.*

DÉSISTEMENT DE GARANTIE. *Dayton a fait de dilligents efforts pour fournir avec précision les informations et illustrations des produits décrits dans cette brochure ; cependant, de telles informations et illustrations sont pour la seule raison d'identification, et n'expriment ni n'impliquent que les produits sont COMMERCIALISABLES, ou ADAPTABLES À UN BESOIN PARTICULIER, ni que ces produits sont nécessairement conformes aux illustrations ou descriptions. Sauf pour ce qui suit, aucune garantie ou affirmation de fait, énoncée ou impliquée, autre que ce qui est énoncé dans la « GARANTIE LIMITÉE » ci-dessus n'est faite ou autorisée par Dayton.*

CONFORMITÉ DU PRODUIT. *De nombreuses juridictions ont des codes et règlements qui gouvernent les ventes, constructions, installation et/ou usage de produits pour certains usages qui peuvent varier par rapport à une zone voisine. Bien que Dayton essaie de s'assurer que ses produits s'accordent avec ces codes, il ne peut pas garantir cet accord, et ne peut pas être responsable de la façon dont le produit et installé ou utilisé. Avant l'achat et l'usage d'un produit, revoir les applications de ce produit, ainsi que tous les codes et réglements nationaux et locaux applicables, et s'assurer que le produit, son installation et son usage sont en accord avec eux.*

Certains aspects de désistement ne sont pas applicables aux produits pour consommateur ; ex : (a) certaines juridictions ne permettent pas l'exclusion ou la limitation des dommages indirects ou fortuits et donc la limitation ou exclusion ci-dessus peut ne pas s'appliquer dans le cas présent ; (b) également, certaines juridictions n'autorisent pas de limitations de durée de la garantie implicite, en conséquence, la limitation ci-dessus peut ne pas s'appliquer dans le cas présent ; et (c) par force de loi, pendant la période de cette Garantie Limitée, toutes garanties impliquées de commerciabilité ou d'adaptabilité à un besoin particulier applicables aux produits de consommateurs achetés par des consommateurs, peuvent ne pas être exclues ni autrement désistées.

DISPOSITION PROMPTE. *Dayton fera un effort de bonne foi pour corriger ou ajuster rapidement tout produit prouvé défectueux pendant la période de la garantie limitée. Pour tout produit considéré défectueux pendant la période de garantie limitée, contacter tout d'abord le concessionnaire où l'appareil a été acheté. Le concessionnaire doit donner des instructions supplémentaires. S'il est impossible de résoudre le problème de façon satisfaisante, écrire à Dayton à l'adresse ci-dessous, en indiquant le nom et l'adresse du concessionnaire, la date et le numéro de la facture du concessionnaire, et en décrivant la nature du défaut. Le titre et le risque de perte passent à l'acheteur au moment de la livraison par le transporteur. Si le produit a été endommagé pendant le transport, une réclamation doit être faite auprès du transporteur.*

Fabriqué pour Dayton Electric Mfg. Co., 5959 W. Howard St., Niles, Illinois 60714 États-Unis

FRANÇAIS

Commandez les pièces détachées en appelant gratuitement 1 800 323-0620

24 heures par jour – 365 jours par an

S'il vous plaît fournir l'information suivante :
-Numéro de modèle
-Numéro de série (s'il y en a un)
-Description de la pièce et son numéro
comme montré sur la liste de pièces

Adressez la correspondance concernant les pièces à :
Grainger Parts
P.O. Box 3074
1657 Shermer Road
Northbrook, IL 60065-3074 U.S.A.

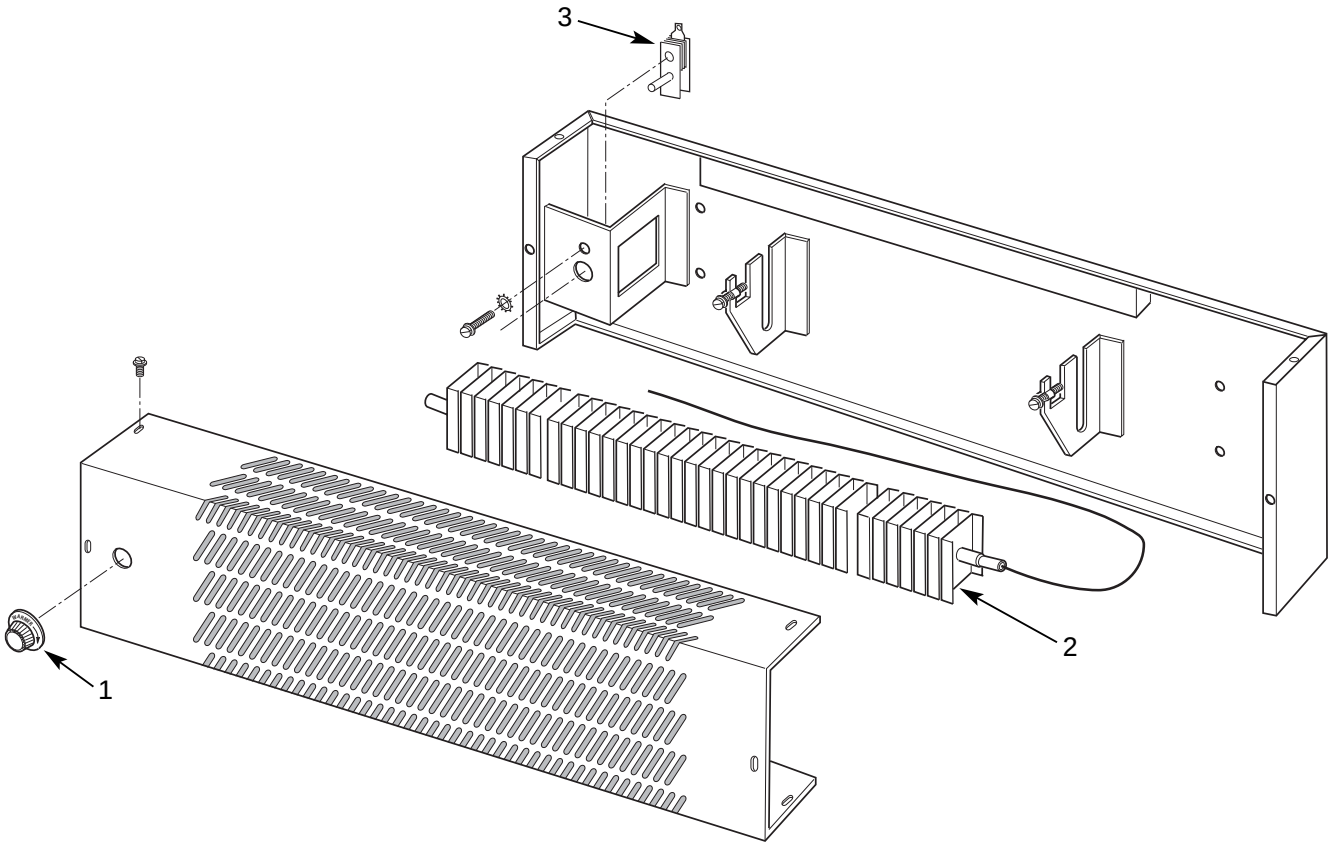


Figure 5 – Illustration des pièces détachées pour le radiateur tout usage monté en applique

FRANÇAIS

Liste des pièces détachées pour le radiateur tout usage monté en applique

N° de réf.	Description	N° de pièce	Qté
1	Bouton	3301-2020-006	1
2	Élément	1802-2091-000	1
3	Thermostat	5813-2062-000	1

Technical Data Sheet

Polymer Technologies, Inc.

MATERIAL SPECIFICATIONS FOR:
Polydamp® Acoustical Foam **(PAF)** and optional film facings

Description:

Polydamp® Acoustical Foam, **(PAF)** is an acoustical grade, open cell, flexible ether based urethane foam designed to give maximum sound absorption for a given thickness. It has excellent resistance to heat, moisture and chemicals.
Available with a variety of decorative/protective film facings such as:
-Tuffylm® urethane: Black, bone, grey and white.
- Polyester: Clear and metalized.
- RAF: Reinforced aluminum foil.

Foam Characteristics:

	Test Standard	U.S. Standard	Metric Standard
Density, nominal: (lb/ft^3-kg/m^3)	*	1.85	29
Tensile Strength: (PSI-KPa)	*	12	83
Elongation, %:	*	120	120
Tear Resistance: (lb/in - N/M)	*	1.3	227
IFD: (PSI - KN/M^2)	*	30	116
Compression Set (50%): %	*	10	10
Air Permeability (Tested at 1" thickness):			
(Rayles/M)	ASTM C-522		2500-7000
Thermal conductivity:			
(BTU/hr. ft^2, ^oF/in.)	ASTM C-177	0.25	
(K. Cal/hr.m^2, ^oC/m)	ASTM C-177		0.48
Service Temperature:			
Continuous	-45ºF (-43ºC) TO 212ºF (100ºC)		
Intermittent	250ºF (121ºC)		
Flame Resistance:	UL94	HF-1	HF-1
	FAR.853(B)	PASS	PASS
	SAEJ-369(B)	PASS	PASS
	MVSS-302	PASS	PASS
	DIN	PASS	PASS

Humidity Resistance: Excellent; no significant decrease in tensile strength or elongation after 5 hrs. of steam autoclave at 250^0F (121^0C) per ASTM D3574-86, Test J.

Chemical Resistance: Excellent; no significant change in strength after 4 weeks immersion in common solvents, alkalies, acids, and water.

Estimated Service Life: Min. 10 years at 80^oF (27^oC) and 95% R.H.

*Test Standard - *All per ASTM-D-3574-91 except where noted.

7/08

(Specifications subject to change without notice. Check with factory for latest revisions.) The Federal Trade Commission considers no existing test methods or standards regarding flammability as accurate indictors of the performance of cellular plastic materials under actual fire conditions. Results of existing test methods, such as UL-94, MVSS-302, SAE J-369, and FAR 25.853 are intended only as measurements of the performance of such materials under specific controlled test conditions. Any flammability ratings shown are not intended to reflect hazards presented by these materials under actual fire conditions. The information contained herein is based on laboratory test data developed for PTI and is believed to be reliable, but its accuracy or completeness is not guaranteed. The buyer must test any product to determine the suitability for h is specific application before use. PTI DISCLAIMS ANY RESPONSIBILITY FOR: 1) WARRANTIES OF FITNESS AND PURPOSE, 2) VERBAL RECOMMENDATIONS, 3) CONSEQUENTIAL DAMAGES FROM USE AND 4) VIOLATION OF ANY PATENTS OF TRADEMARKS HELD BY OTHERS.

420 CORPORATE BLVD., NEWARK, DE 19702 . PHONE: 302/738-9001 . FAX: 302/738-9085

TDS – PAF and optional film facings:

Surface Film Properties:	**Tuffylm**[R] (urethane)	**Mylar**[R] (polyester)	**RAF** (Reinforced Aluminum.Foil)
Color:	Black[B], White*, Gray*, Bone*	Clear, Metalized	Aluminum
Thickness, in(mm):	0.0025 (.06)[B] 0.0035 (.89)*	0.001 (.025)	0.0015(.04)
Tensile Strength, PSI (N/mm^2) ASTM D882-64:	7000 (49)	25000 (175)	
Elongation,%, ASTM D882-64:	500	120	
Tear Strength, lb/in (N/mm) ASTM D1004-61:	620 (108)	1300 (228)	
Service Temp. °F (°C) Max	300(150)	300(150)	400 (200)

Sound Absorption:

(Plain/Tuffylm) Nominal values of random incidence sound absorption coefficient per ASTM C384-77 for Plain/Tuffylm[R].

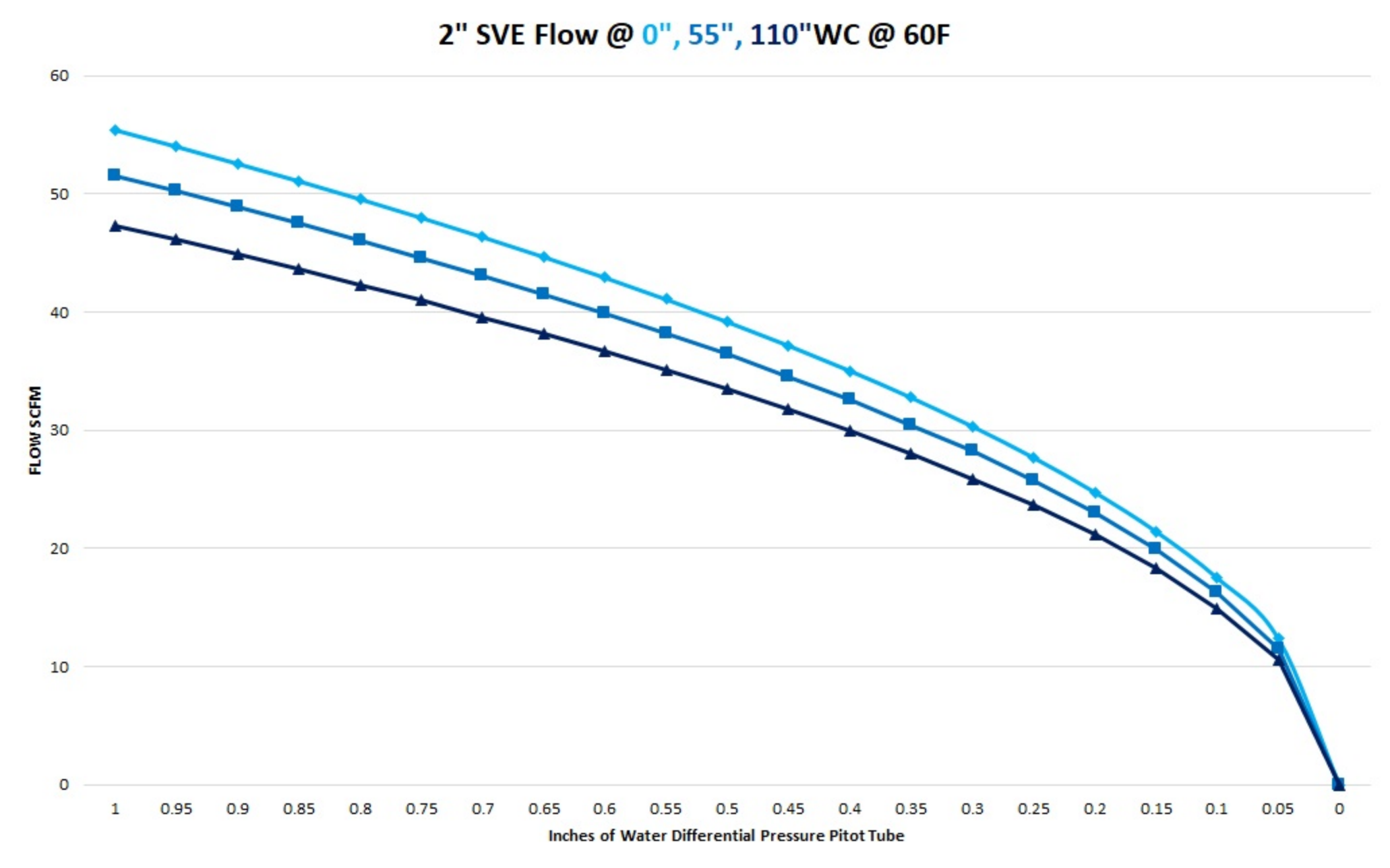
FREQUENCY (HZ)

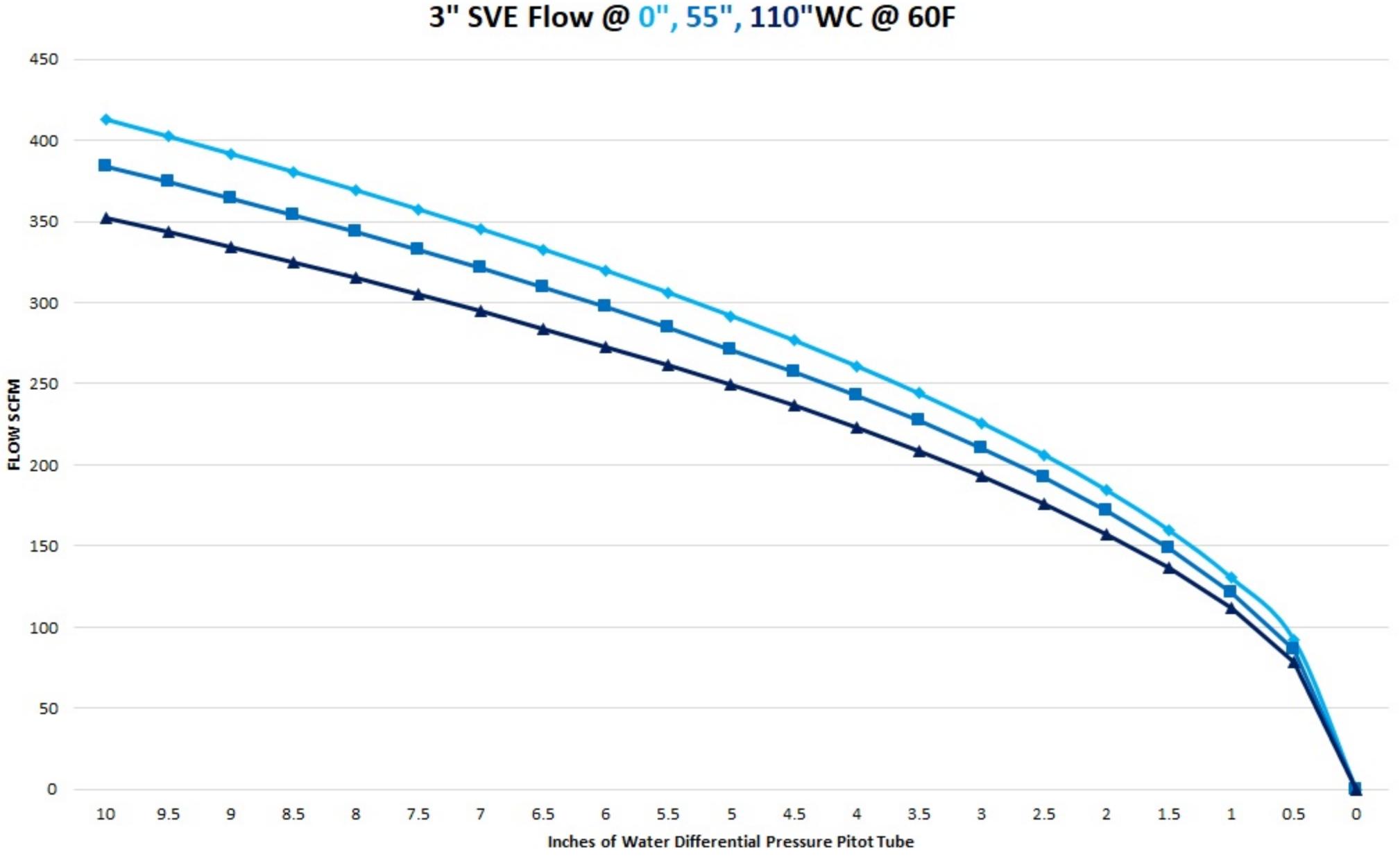
Foam Thickness	**125**	**250**	**500**	**1000**	**2000**	**4000**
(1.0 in.) 25.4 mm	10/11	15/33	30/95	55/91	85/80	95/59
(2.0 in.) 50.8 mm	20/30	40/66	90/98	100/96	98/85	100/75

7/08

(Specifications subject to change without notice. Check with factory for latest revisions.) The Federal Trade Commission considers no existing test methods or standards regarding flammability as accurate indictors of the performance of cellular plastic materials under actual fire conditions. Results of existing test methods, such as UL-94, MVSS-302, SAE J-369, and FAR 25.853 are intended only as measurements of the performance of such materials under specific controlled test conditions. Any flammability ratings shown are not intended to reflect hazards presented by these materials under actual fire conditions. The information contained herein is based on laboratory test data developed for PTI and is believed to be reliable, but its accuracy or completeness is not guaranteed. The buyer must test any product to determine the suitability for h is specific application before use. PTI DISCLAIMS ANY RESPONSIBILITY FOR: 1) WARRANTIES OF FITNESS AND PURPOSE, 2) VERBAL RECOMMENDATIONS, 3) CONSEQUENTIAL DAMAGES FROM USE AND 4) VIOLATION OF ANY PATENTS OF TRADEMARKS HELD BY OTHERS.

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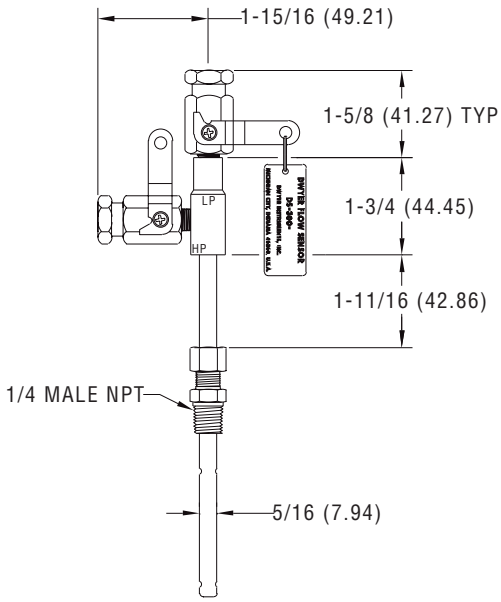

2" SVE Flow @ 0", 55", 110"WC @ 60F
FLOW SCFM
60
50
40
30
20
10
0
1
0.95
0.9
0.85
0.8
0.75
0.7
0.65
0.6
0.55
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
Inches of Water Differential Pressure Pitot Tube


3" SVE Flow @ 0", 55", 110"WC @ 60F
FLOW SCFM
450
400
350
300
250
200
150
100
50
0
10
9.5
9
8.5
8
7.5
7
6.5
6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
Inches of Water Differential Pressure Pitot Tube

Series DS-300 Flow Sensors

Installation and Operating Instructions Flow Calculations





Series DS-300 Flow Sensors are averaging pitot tubes that provide accurate, convenient flow rate sensing. When purchased with a Dwyer Capsuhelic® for liquid flow or Magnehelic® for air flow, differential pressure gage of appropriate range, the result is a flow-indicating system delivered off the shelf at an economical price. Series DS-300 Flow Sensors are designed to be inserted in the pipeline through a compression fitting and are furnished with instrument shut-off valves on both pressure connections. Valves are fitted with 1/8″ female NPT connections. Accessories include adapters with 1/4″ SAE 45° flared ends compatible with hoses supplied with the Model A-471 Portable Capsuhelic® kit. Standard valves are rated at 200°F (93.3°C). Where valves are not required, they can be omitted at reduced cost. Series DS-300 Flow Sensors are available for pipe sizes from 1″ to 10″.

INSPECTION

Inspect sensor upon receipt of shipment to be certain it is as ordered and not damaged. If damaged, contact carrier.

INSTALLATION

General - The sensing ports of the flow sensor must be correctly positioned for measurement accuracy. The instrument connections on the sensor indicate correct positioning. The side connection is for total or high pressure and should be pointed upstream. The top connection is for static or low pressure.

Location - The sensor should be installed in the flowing line with as much straight run of pipe upstream as possible. A rule of thumb is to allow 10 - 15 pipe diameters upstream and 5 downstream. The table below lists recommended up and down piping.

PRESSURE AND TEMPERATURE

Maximum: 200 psig (13.78 bar) at 200°F (93.3°C).

Upstream and Downstream Dimensions in Terms of Internal Diameter of Pipe*

Upstream Condition	Minimum Diameter of Straight Pipe		
	Upstream		Downstream
	In-Plane	Out of Plane	
One Elbow or Tee	7	9	5
Two 90° Bends in Same Plane	8	12	5
Two 90° Bends in Different Plane	18	24	5
Reducers or Expanders	8	8	5
All Valves**	24	24	5

* Values shown are recommended spacing, in terms of internal diameter for normal industrial metering requirements. For laboratory or high accuracy work, add 25% to values.

** Includes gate, globe, plug and other throttling valves that are only partially opened. If valve is to be fully open, use values for pipe size change. **CONTROL VALVES SHOULD BE LOCATED AFTER THE FLOW SENSOR.**

DWYER INSTRUMENTS, INC.
P.O. BOX 373 • MICHIGAN CITY, INDIANA 46361, U.S.A.
Phone: 219/879-8000 **www.dwyer-inst.com**
Fax: 219/872-9057 **e-mail: info@dwyer-inst.com**

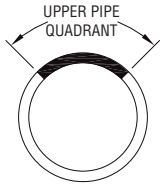
POSITION

Be certain there is sufficient clearance between the mounting position and other pipes, walls, structures, etc, so that the sensor can be inserted through the mounting unit once the mounting unit has been installed onto the pipe.

Flow sensors should be positioned to keep air out of the instrument connecting lines on liquid flows and condensate out of the lines on gas flows. The easiest way to assure this is to install the sensor into the pipe so that air will bleed into, or condensate will drain back to, the pipe.

For Air or Gas Flow

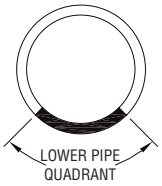
Install in upper quadrant of pipe



Condensate drains back to pipe

For Liquid or Steam Flow

Install in lower quadrant of pipe



Air bleeds back to pipe

INSTALLATION

1. When using an A-160 thred-o-let, weld it to the pipe wall. If replacing a DS-200 unit, an A-161 bushing (1/4˝ x 3/8˝) will be needed.

2. Drill through center of the thred-o-let into the pipe with a drill that is slightly larger than the flow sensor diameter.

3. Install the packing gland using proper pipe sealant. If the packing gland is disassembled, note that the tapered end of the ferrule goes into the fitting body.

4. Insert sensor until it bottoms against opposite wall of the pipe, then withdraw 1/16˝ to allow for thermal expansion.

5. Tighten packing gland nut finger tight. Then tighten nut with a wrench an additional 1-1/4 turns. Be sure to hold the sensor body with a second wrench to prevent the sensor from turning.

INSTRUMENT CONNECTION

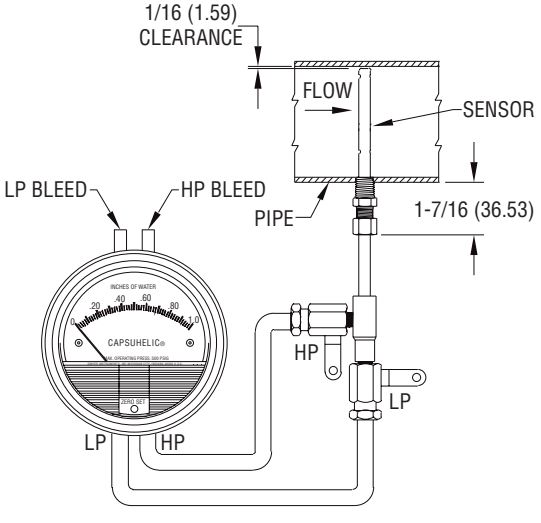
Connect the slide pressure tap to the high pressure port of the Magnehelic® (air only) or Capsuhelic® gage or transmitting instrument and the top connection to the low pressure port.

See the connection schematics below.

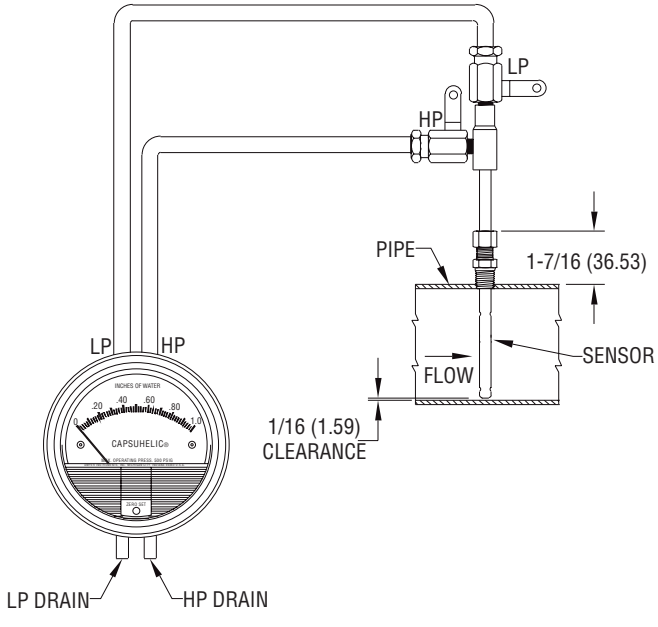
Bleed air from instrument piping on liquid flows. Drain any condensate from the instrument piping on air and gas flows.

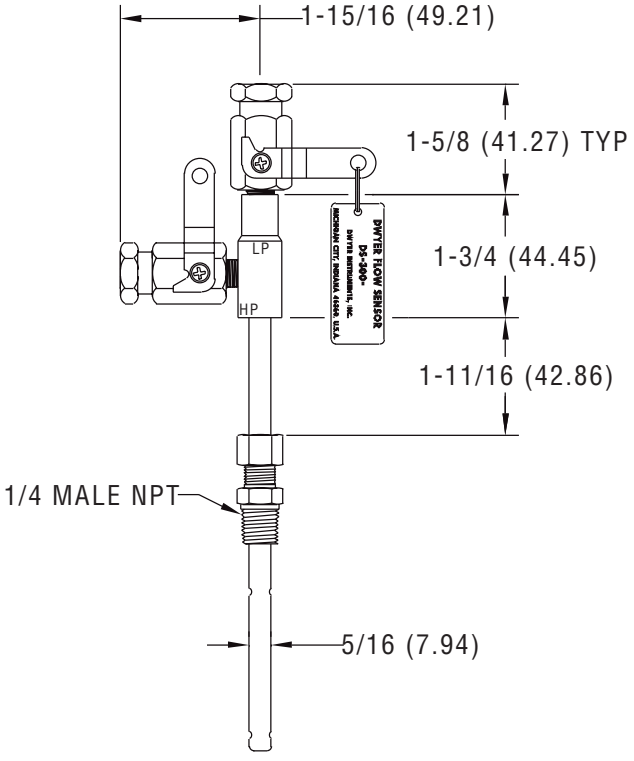
Open valves to instrument to place flow meter into service. For permanent installations, a 3-valve manifold is recommended to allow the gage to be zero checked without interrupting the flow. The Dwyer A-471 Portable Test Kit includes such a device.

Water Flow



Air or Gas Flow





Flow Calculations and Charts

The following information contains tables and equations for determining the differential pressure developed by the DS-300 Flow Sensor for various flow rates of water, steam, air or other gases in different pipe sizes.

This information can be used to prepare conversion charts to translate the differential pressure readings being sensed into the equivalent flow rate. When direct readout of flow is required, use this information to calculate the full flow differential pressure in order to specify the exact range of Dwyer Magnehelic® or Capsuhelic® gage required. Special ranges and calculations are available for these gages at minimal extra cost. See bulletins A-30 and F-41 for additional information on Magnehelic® and Capsuhelic® gages and DS-300 flow sensors.

For additional useful information on making flow calculations, the following service is recommended: Crane Valve Co. Technical Paper No. 410 “Flow of Fluids Through Valves, Fittings and Pipe.” It is available from Crane Valve Company, www.cranevalve.com.

Using the appropriate differential pressure equation from Page 4 of this bulletin,calculate the differential pressure generated by the sensor under normal operating conditions of the system. Check the chart below to determine if this value is within the recommended operating range for the sensor. Note that the data in this chart is limited to standard conditions of air at 60°F (15.6°C) and 14.7 psia static line pressure or water at 70°F (21.1°C). To determine recommended operating ranges of other gases, liquids an/or operating conditions, consult factory.

Note: the column on the right side of the chart which defines velocity ranges to avoid. Continuous operation within these ranges can result in damage to the flow sensor caused by excess vibration.

Pipe Size (Schedule 40)	Flow Coefficient “K”	Operating Ranges Air @ 60°F & 14.7 psia (D/P in. W.C.)	Operating Ranges Water @ 70°F (D/P in. W.C.)	Velocity Ranges Not Recommended (Feet per Second)
1	0.52	1.10 to 186	4.00 to 675	146 to 220
1-1/4	0.58	1.15 to 157	4.18 to 568	113 to 170
1-1/2	0.58	0.38 to 115	1.36 to 417	96 to 144
2	0.64	0.75 to 75	2.72 to 271	71 to 108
2-1/2	0.62	1.72 to 53	6.22 to 193	56 to 85
3	0.67	0.39 to 35	1.43 to 127	42 to 64
4	0.67	0.28 to 34	1.02 to 123	28 to 43
6	0.71	0.64 to 11	2.31 to 40	15 to 23
8	0.67	0.10 to 10	0.37 to 37	9.5 to 15
10	0.70	0.17 to 22	0.60 to 79	6.4 to 10

FLOW EQUATIONS

1. Any Liquid

$$Q\ (GPM) = 5.668 \times K \times D^2 \times \sqrt{\Delta P / S_f}$$

2. Steam or Any Gas

$$Q\ (lb/Hr) = 359.1 \times K \times D^2 \times \sqrt{p \times \Delta P}$$

3. Any Gas

$$Q\ (SCFM) = 128.8 \times K \times D^2 \times \sqrt{\frac{P \times \Delta P}{(T + 460) \times S_s}}$$

DIFFERENTIAL PRESSURE EQUATIONS

1. Any Liquid

$$\Delta P\ (in.\ WC) = \frac{Q^2 \times S_f}{K^2 \times D^4 \times 32.14}$$

2. Steam or Any Gas

$$\Delta P\ (in.\ WC) = \frac{Q^2}{K^2 \times D^4 \times p \times 128{,}900}$$

3. Any Gas

$$\Delta P\ (in.\ WC) = \frac{Q^2 \times S_s \times (T + 460)}{K^2 \times D^4 \times P \times 16{,}590}$$

Technical Notations

The following notations apply:

ΔP = Differential pressure expressed in inches of water column
Q = Flow expressed in GPM, SCFM, or PPH as shown in equation
K = Flow coefficient— See values tabulated on Pg. 3.
D = Inside diameter of line size expressed in inches.

For square or rectangular ducts, use: $D = \sqrt{\frac{4 \times \text{Height} \times \text{Width}}{\pi}}$

P = Static Line pressure (psia)
T = Temperature in degrees Fahrenheit (plus 460 = °Rankine)
p = Density of medium in pounds per square foot
S_f = Sp Gr at flowing conditions
S_s = Sp Gr at 60°F (15.6°C)

SCFM TO ACFM EQUATION

$$SCFM = ACFM \times \left(\frac{14.7 + PSIG}{14.7}\right) \left(\frac{520^*}{460 + °F}\right)$$

$$ACFM = SCFM \times \left(\frac{14.7}{14.7 + PSIG}\right) \left(\frac{460 + °F}{520}\right)$$

$$\text{POUNDS PER CUBIC FOOT STD.} = \text{POUNDS PER CUBIC FOOT ACT.} \times \left(\frac{14.7}{14.7 + PSIG}\right) \left(\frac{460 + °F}{520^*}\right)$$

$$\text{POUNDS PER CUBIC FOOT ACT.} = \text{POUNDS PER CUBIC FOOT STD.} \times \left(\frac{14.7 + PSIG}{14.7}\right) \left(\frac{520^*}{460 + °F}\right)$$

1 Cubic foot of air = 0.076 pounds per cubic foot at 60° F (15.6°C) and 14.7 psia.
* (520°= 460 + 60°) Std. Temp. Rankine

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Inches of Water Column Gauges

PART#	TYPE	FACE	RANGE	CONNECTION	CASE	INTERNALS	FILL
PGBM60WC	Pressure	2.5”	0-60” WC / 0-3 PSI	¼” NPT Back	Chrome Plated	Brass	DRY
VGBM60WC	Vacuum	2.5”	0-60” WC / 0-5” HG	¼” NPT Back	Chrome Plated	Brass	Dry
VGBM100WC	Vacuum	2.5”	0-100” WC / 0-8” HG	¼” NPT Back	Chrome Plated	Brass	Dry
VGBM160WC	Vacuum	2.5”	0-160” WC / 0-12” HG	¼” NPT Back	Chrome Plate	Brass	Dry



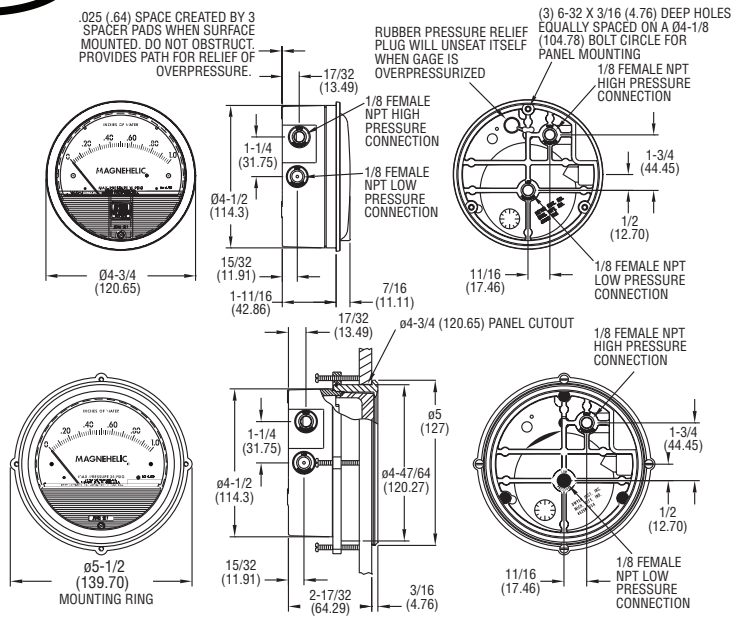






Bulletin A-27

Magnehelic® Differential Pressure Gage



**The blowout plug is not used on models above 180 inches of water pressure, medium or high pressure models, or on gages which require an elastomer other than silicone for the diaphragm.*

STANDARD GAGE ACCESSORIES: Two 1/8″ NPT plugs for duplicate pressure taps, two 1/8″ pipe thread to rubber tubing adapters and three flush mounting adapters with screws.

MP AND HP GAGE ACCESSORIES: Mounting ring and snap ring retainer substituted for 3 adaptors, 1/4" compression fittings replace 1/8" pipe thread to rubber tubing adaptors.

OVERPRESSURE PROTECTION: Standard Magnehelic® Differential Pressure Gages are rated for a maximum pressure of 15 psig and should not be used where that limit could be exceeded. Models employ a rubber plug on the rear which functions as a relief valve by unseating and venting the gage interior when over pressure reaches approximately 25 psig (excludes MP and HP models). To provide a free path for pressure relief, there are four spacer pads which maintain .023″ clearance when gage is surface mounted. Do not obstruct the gap created by these pads.

SPECIFICATIONS

Service: Air and non-combustible, compatible gases. (Natural Gas option available.)
Wetted Materials: Consult factory.
Housing: Die cast aluminum case and bezel, with acrylic cover. (MP model has polycarbonate cover).
Accuracy: ±2% of full scale (±3% on - 0, -100 Pa, -125 Pa, 10MM and ±4% on -00, - 00N, -60 Pa, -6MM ranges), throughout range at 70°F (21.1°C).
Pressure Limits: -20″ Hg to 15 psig.† (-0.677 bar to 1.034 bar); MP option: 35 psig (2.41 bar), HP option: 80 psig (5.52 bar).
Overpressure: Relief plug opens at approximately 25 psig (1.72 bar), standard gages only. The blowout plug is not used on models above 180 inches of water pressure, medium or high pressure models, or on gages which require an elastomer other than silicone for the diaphragm.
Temperature Limits: 20 to 140°F (-6.67 to 60°C). *Low temperature models available as special option.
Size: 4″ (101.6 mm) diameter dial face.
Mounting Orientation: Diaphragm in vertical position. Consult factory for other position orientations.
Process Connections: 1/8″ female NPT duplicate high and low pressure taps - one pair side and one pair back.
Weight: 1 lb 2 oz (510 g), MP & HP 2 lb 2 oz (963 g).
Agency Approvals: RoHS.

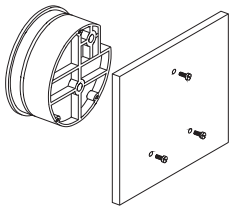
†For applications with high cycle rate within gage total pressure rating, next higher rating is recommended. See Medium and High pressure options.

Note: May be used with hydrogen when ordering Buna-N diaphragm. Pressure must be less than 35 psi.

INSTALLATION

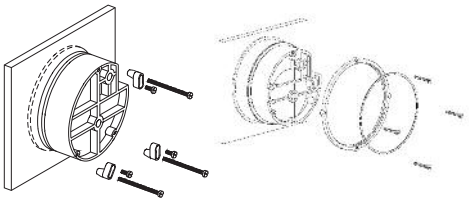
Select a location free from excessive vibration and where the ambient temperature will not exceed 140°F (60°C). Also, avoid direct sunlight which accelerates discoloration of the clear plastic cover. Sensing lines may be run any necessary distance. Long tubing lengths will not affect accuracy but will increase response time slightly. Do not restrict lines. If pulsating pressures or vibration cause excessive pointer oscillation, consult the factory for ways to provide additional damping.
All standard Magnehelic® Differential Pressure Gages are calibrated with the diaphragm vertical and should be used in that position for maximum accuracy. If gages are to be used in other than vertical position, this should be specified on the order. Many higher range gages will perform within tolerance in other positions with only rezeroing. Low range models of 0.5" w.c. plus 0.25" w.c. and metric equivalents must be used in the vertical position only.

SURFACE MOUNTING



Locate mounting holes, 120° apart on a 4-1/8" dia. circle. Use No. 6-32 machine screws of appropriate length.

FLUSH MOUNTING



Provide a 4-9/16" dia. (116 mm) opening in panel. Provide a 4-3/4" dia. (120 mm) opening for MP and HP models. Insert gage and secure in place with No. 6-32 machine screws of appropriate length, with adapters, firmly secured in place.

PIPE MOUNTING

To mount gage on 1-1/4" - 2" pipe, order optional A-610 pipe mounting kit.

TO ZERO GAGE AFTER INSTALLATION

Set the indicating pointer exactly on the zero mark, using the external zero adjust screw on the cover at the bottom. Note that the zero check or adjustment can only be made with the high and low pressure taps both open to atmosphere.

OPERATION

Positive Pressure: Connect tubing from source of pressure to either of the two high pressure ports. Plug the port not used. Vent one or both low pressure ports to atmosphere.
Negative Pressure: Connect tubing from source of vacuum or negative pressure to either of the two low pressure ports. Plug the port not used. Vent one or both high pressure ports to atmosphere.
Differential Pressure: Connect tubing from the greater of two pressure sources to either high pressure port and the lower to either low pressure port. Plug both unused ports.
When one side of the gage is vented in dirty, dusty atmosphere, we suggest an A-331 Filter Vent Plug be installed in the open port to keep inside of gage clean.

A. For portable use of temporary installation use 1/8" pipe thread to rubber tubing adapter and connect to source of pressure with flexible rubber or vinyl tubing.
B. For permanent installation, 1/4" O.D., or larger, copper or aluminum tubing is recommended.

MAINTENANCE

No lubrication or periodic servicing is required. Keep case exterior and cover clean. Occasionally disconnect pressure lines to vent both sides of gage to atmosphere and re-zero. Optional vent valves should be used in permanent installations. The Series 2000 is not field serviceable and should be returned if repair is needed (field repair should not be attempted and may void warranty). Be sure to include a brief description of the problem plus any relevant application notes. Contact customer service to receive a return goods authorization number before shipping.

WARNING

Attempted field repair may void your warranty. Recalibration or repair by the user is not recommended.

TROUBLE SHOOTING TIPS

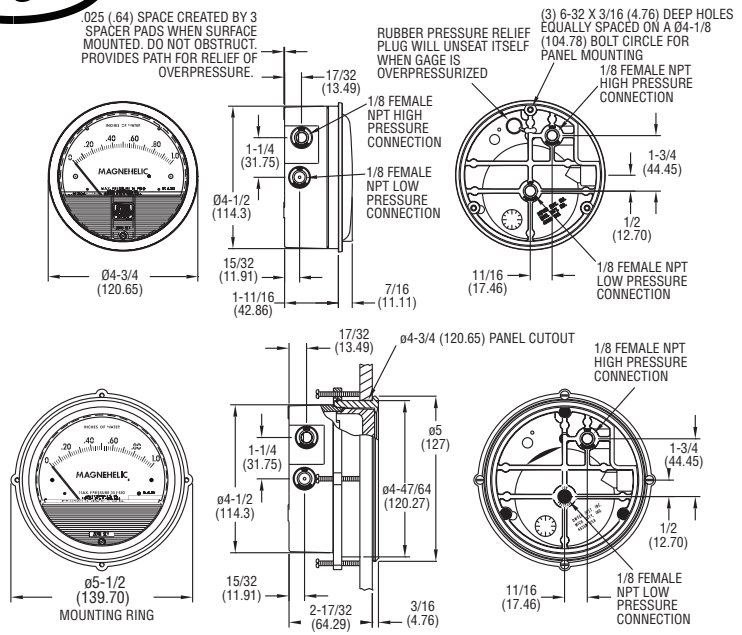
Gage won't indicate or is sluggish.

1. Duplicate pressure port not plugged.
2. Diaphragm ruptured due to overpressure.
3. Fittings or sensing lines blocked, pinched, or leaking.
4. Cover loose or "O"ring damaged, missing.
5. Pressure sensor, (static tips, Pitot tube, etc.) improperly located.
6. Ambient temperature too low. For operation below 20°F (-7°C), order gage with low temperature, (LT) option.

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Magnehelic® Differential Pressure Gage
INSTRUCCIONES Y LISTA DE PARTES



(El tapón de goma no es usado en los modelos sobre 180 pulgadas de presión de agua, modelos de presión media o alta, o en instrumentos que requieren un elastizado en cualquier otro material que no sea silicona para el diafragma.)

Accesorios: Tapones 1/8" NPT para las conexiones duplicadas, dos adaptadores de rosca 1/8" NPT a tubo de goma; y tres adaptadores para montaje al ras y tornillos.

Accesorios para Los Modelos MP y HP: El anillo de montaje y el retensor del anillo de presión son substituidos por 3 adaptadores, accesorios de compresión de 1/4" remplazan a los adaptadores de rosca 1/8" a tubo de goma.

Protección Para Sobrepresión: Los Manómetros Diferenciales Magnehelic Estándar están clasificados para una presión máxima de 15 psi y no se deberían de usar donde el límite puede excederse. Los modelos emplean un tapón de goma en el trasero que funciona como una válvula de alivio desmontándose y ventilando el interior del instrumento cuando la sobrepresión alcanza aproximadamente 25 psig. (Los modelos MP y HP son excluidos) Para proveer un camino libre para el alivio de presión, el instrumento viene con rodilleras que mantienen un espacio de .023" cuando el instrumento es montado en superficie. No bloque el espacio creado por estas rodilleras.

† Para aplicaciones con alto ciclo de velocidad dentro de la clasificación de presión total del instrumento, la próxima clasificación mas alta es recomendada. Vea las opciones de media y alta presión.

El instrumento puede ser usado con hidrogeno cuando se ordena con diafragma de Buna-N. La presion tiene que ser menos de 35 psi.

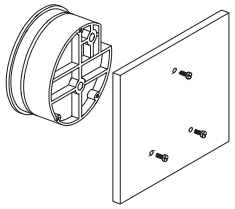
ESPECIFICACIONES

Servicio: aire y gases no combustibles, gases compatibles. (ópcion disponible para uso con gas natural).
Materiales Mojados: Consulte con la fábrica.
Carcasa: Caja y anillo de retención de aluminio fundido a presión con tapadera de acrílico. (El modelo MP tiene la tapadera de policarbonato.)
Exactitud: ±2% de fondo de escala a 21 °C
Mod. 2000-0 ±3%; Mod. 2000-00 ±4%
Límite de Presión: -20 Hg. a 15 psig. † (-0.677 bar a 1,034 bar); opción MP: 35 psig (2.41 bar), opción HP: 80 psig (5.52 bar).
Sobrepresión: El tapón de alivio se abre aproximadamente a los 25 psig, modelos estandard únicamente. El tapón de goma no es usado en los modelos sobre 180 pulgadas de presión de agua, modelos de presión media o alta, o en instrumentos que requieren un elastizado en cualquier otro material que no sea silicio para el diafragma.
Límite de Temperatura: -6.67 a 60ºC. * Modelos de baja temperatura disponibles como opción especial.
Dimensiones: diám. 120,65 mm x 55,6 prof.
Orientación de Montaje: El diafragma debe ser usado solo en posición vertical. Consulte con la fábrica para otras orientaciones de posición.
Conexiones: 1/8" NPT para alta y baja presión, duplicadas (atrás, a los lados).
Peso: 510 g, MP y HP 963 g.
Aprobación de la agencia: RoHS.

Instalacion

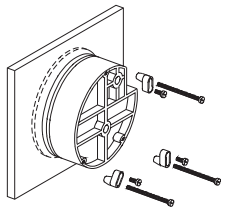
Seleccione un lugar libe de exceso de vibraciones, y donde la temperatura ambiente no supere los 60°C. Evite luz solar directa, para evitar decoloración de la cubierta plástica. Las conexiones de proceso pueden tener cualquier longitud sin afectar la exactitud, pero pueden extender el tiempo de respuesta del instrumento. Si hay pulsación de presión o vibración, consulte a fábrica sobre medios de amortiguación.
Los MAGNEHELIC han sido calibrados con el diafragma vertical, y deben ser usados en esas condiciones. Para otras posiciones, se debe especificar en la orden de provisión. Los de rango elevado pueden ser usados en diversas posiciones, pero se debe reajustar el cero. Los modelos de la serie 2000-00 y equivalentes métricos deben ser usados solo verticalmente.

Montaje en Superficie



Perfore tres orificios separados 120° sobre una circunferencia de 105 mm de diám. y sostenga el instrumento con tres tornillos 6-32 de long. apropiada.

Montaje alineado



Perfore un circulo de 115 mm de diám. en el panel, y sostenga el instrumento mediante los.

Montaje Sobre Pipa

Para montar el instrumento sobre pipas de 32 a 50 mm de diám., ordene el adaptador opcional A-610.

Puesta a Cero Después de Instalar

Deje las conexiones de presión abiertas a atmósfera y ajuste a cero desde tornillo del panel frontal.

Operacion

Presión Positiva: Conecte la tubería desde la fuente de presión a cualquiera de las dos conexiones de alta presión (HIGH), bloqueando la no usada; Las conexiones de baja (LOW) presión pueden dejarse uno o los dos abiertos a la atmósfera.
Presión Negativa: Repita el procedimiento anterior, conectado en este caso las conexiones de baja presión (LOW). Deje las otras conexiones abiertas.
Presión diferencial: Conecte el tubo correspondiente a la presión más positiva al cualquiera de los conectores de alta presión (HIGH) bloqueando el no usado, y la más baja presión o presión negativa (vacío) al conector de baja presión (LOW). Puede usarse cualquier conector de cada par, dejando siempre uno bloqueado. Si se deja una conexión abierta a la atmósfera, se recomienda el uso de un filtro tipo A-331 en el lugar correspondiente para mantener limpio el interior del instrumento. Para uso portable, o instalación temporaria, uso adapta dores para rosca de tubo de 1/89 a tubo flexible, y conecte a proceso mediante una tubería de goma, o equivalente. Para instalación permanente, se recomienda el uso de tubo de cobre o aluminio de por lo menos 1/4" de diám. exterior.

No se requiere mantenimiento específico alguno, ni lubricación. Periódicamente, desconecte el instrumento, ventee la presión acumulada, y reajuste el cero. Para instalaciones permanentes, se debe usar un juego de válvulas de montaje permanente para el venteo.
El instrumento de Serie 2000 no puede ser re parado en el campo y debería de ser regresado si reparos son necesarios (Reparos en el campo no deben de ser intentados y pueden cancelar la garantía.). Asegurarse de incluir una descripción breve del problema más cualquier notas pertinentes a la aplicación para devolución de productos antes de enviar el instrumento.

Cuidado! : La recalibración en campo puede invalidar la garantía. No se recomienda la recalibracion por parte del usuario. En caso necesario envie el instrumento con transporte pago a:

Localización De Fallas

• *El instrumento no indica, o es lento en reacción.*
1. Conexión duplicada abierta.
2. Diafragma roto por sobrepresión.
3. Tubería de conexión perforada, con pérdidas o pinchazos.
4. Anillo de retención flojo, u "O " ring dañado.
5. Conexión a proceso indebida o inadecuada.
6. Temperatura muy baja. Para este caso ordene tipos LT (baja temperatura).

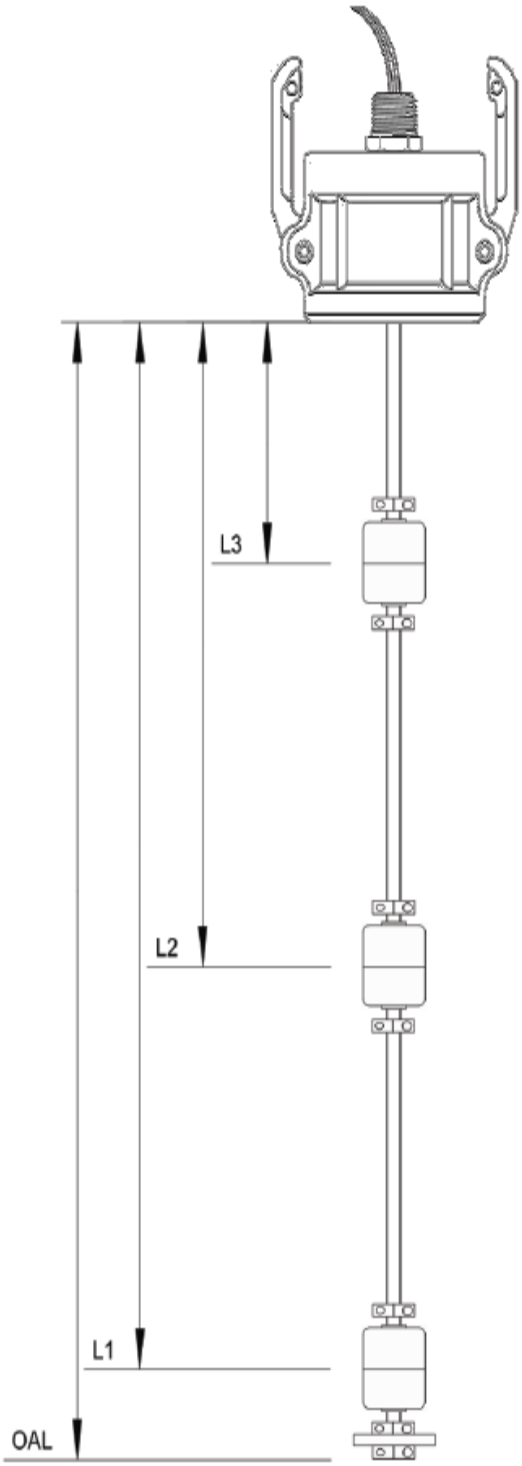
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Enviro-Equipment Inc.
10120 Industrial Drive
Pineville NC 28134

AWS80 Multi Level Probe



Description: Stainless Steel Multi Level Float Tree, 2” Poly Camlock, S1010.6 Float, Set Collars, 50W SPST, 360” Cable, 1.5” PVC Centering Disc

Mounting Fitting: 2” Poly Camlock Coupler DC

Conduit Connection: ½” MNPT

Stem: 5/16” Stainless Steel

Actuation:

Level	Actuation	Operation	Float	SG	Stops
L3	19”	NO	SS 1010	.60	Set Collar
L2	21”	NO	SS 1010	.60	Set Collar
L1	34”	NO	SS 1010	.60	Set Collar
OAL	36”				

Cable: 360” PVC 22 AWG / 6
Wiring: Individual

Level	Type	Reed Switch	Wire Colors
L3	SPST	50W-265V-1A	Blue / Brown
L2	SPST	50W-265V-1A	Green / White
L1	SPST	50W-265V-1A	Red / Black

Centering Disc: 1.5” PVC
Maximum Operating Temperature: 180 F
Maximum Operating Pressure: 300 PSI

Enviro-Equipment Inc.
Remediation Division
10120 Industrial Drive
Pineville NC 28134
704 556 7723

EEI ALUMINUM AIR WATER SEPARATORS

STANDARD AWS SPECIFCATION

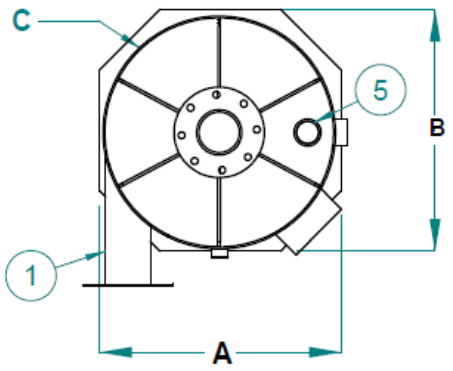
TYPE	WORKING VOLUME @(LSH)	AVAILABLE CONNECTION TYPE																CLEAN OUT PIPE	A	B	C (DIA.)	D	E	F	G	H	J
		FLANGE						MNPT					FNPT														
		2"	3"	4"	6"	8"	10"	2"	3"	4"	6"	8"	2"	3"	4"	6"	8"										
AWS30	12 GAL	X	X	X	-	-	-	X	X	X	-	-	X	X	X	-	-	6"	-	-	16 1/4"	25"	2"	19"	30"	33 1/2"	6"
AWS60	24 GAL	X	X	X	X	-	-	X	X	X	X	-	X	X	X	-	-	6"	24"	24"	23"	25"	2"	23"	30"	36 1/2"	6"
AWS80	47 GAL	X	X	X	X	-	-	X	X	X	X	-	X	X	X	-	-	8"	24"	24"	23"	39"	2"	39"	48"	54 3/4"	12"
AWS120	50 GAL	X	X	X	X	X	-	X	X	X	X	-	X	X	X	-	-	8"	24"	24"	23"	49"	2"	49"	60"	66 3/4"	12"
AWS220	107 GAL	-	X	X	X	X	X	X	X	X	X	-	X	X	X	-	-	8"	34"	34"	33 1/2"	49"	2"	49"	60"	66 3/4"	12"

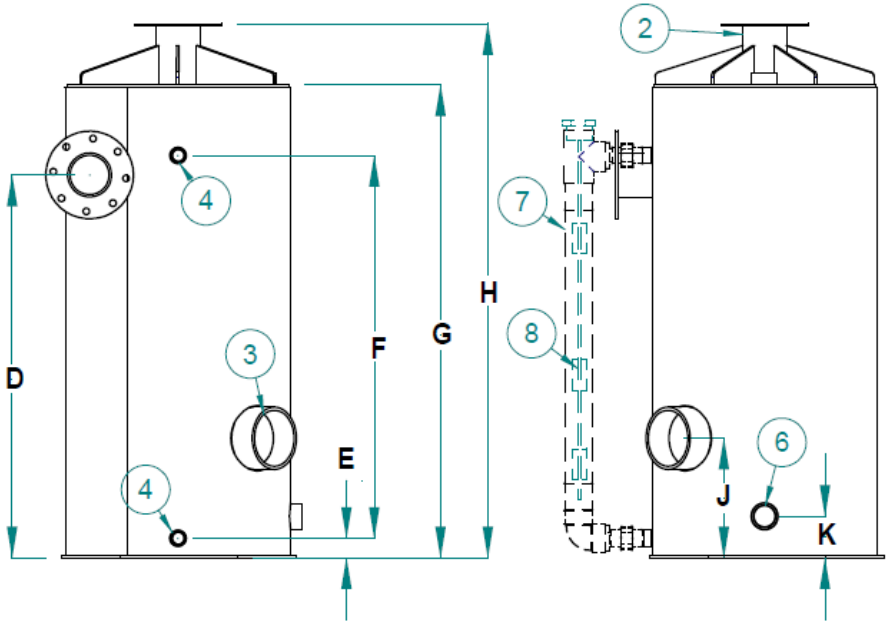
NOTES:

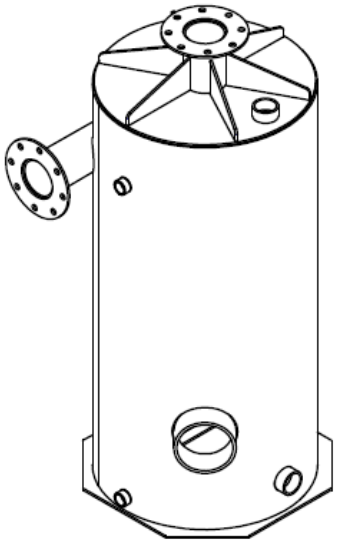
1. MATERIAL : 1/8" & 3/16" ALUMINUM SHT 5052
2. PROBE (SIGHT TUBE) : 2" CLEAR PVC
3. CUSTOM SIZES AVAILABLE

Enviro-Equipment Inc.
Remediation Division
10120 Industrial Drive
Pineville NC 28134
704 556 7723

ITEM #	DESCRIPTION
1	INLET PIPE (SEE TABLE FOR AVAILABLE SIZE AND CONNECTION TYPE)
2	OUTLET PIPE (SEE TABLE FOR AVAILABLE SIZE AND CONNECTION TYPE)
3	CLEAN OUT
4	1" FNPT (MULTI LEVEL PROBE)
5	2" FNPT
6	2" FNPT
7	SIGHT TUBE 2" CLEAR PVC
8	MULTI LEVEL PROBE







midwest control
an intech industries company

1101 Brown St.
Wauconda IL 60084
P 847-487-5599
F 847-487-0909
www.midwest-control.com

Control Devices
Safety and Vacuum Relief Valves

NBR Series Low Pressure Safety Valves

Applications

- Low Pressure, High Volume Blowers and Compressors
- Bulk Hauling Tanks, Trailers and Rail Cars
- Powdered Solids/Bulk Handling
- Pneumatic Conveying Equipment



Specifications

- Available 3 to 15 PSI
- Temperature Range: -20˚F to 400˚F
- Cast Iron Body
- Brass Inlet Fittings (Inlet, Piston, Spring Guide and Cap)
- Stainless Steel Spring and Set Screw
- Unique Seat Design Minimizes Leakage
- T-Handle for Manual Testing

Inlet/ Outlet	Part No.
2"	NBR20-0TXXX
2-1/2"	NBR25-0TXXX
3"	NBR30-0TXXX

NVR Series Vacuum Relief Valves

Applications

- High Flow Vacuum Applications
- Bulk Hauling Tanks, Trailers and Rail Cars
- Powdered Solids/Bulk Handling
- Pneumatic Conveying Equipment



Specifications

- Available 2" Hg to 25" Hg
- Temperature Range: -20˚F to 400˚F
- Cast Iron Body and Inlet
- Brass Internals (Piston, Spring Guide, Cap) and Outlet
- Stainless Steel Spring and Set Screw
- Unique Seat Design Minimizes Leakage

Inlet/ Outlet	Part No.
2"	NVR20-0AXXX
2-1/2"	NVR25-0AXXX
3"	NVR30-0AXXX

Midwest Control

Note;
See capacity charts on pages 2

Effective 6-2021 R1 12-2021
Visit www.midwest-control.com for availability and additional products

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Control Devices
NBR Series Low Pressure Safety Valve
Capacity Chart

	Part No.	Part No.	Part No.
	NBR20-0TXX	NBR25-0TXXX	NBR30-0TXXX
Inlet /Outlet	2"NPT	2-1/2 NPT	3" NPT
PSIG	SCFM		
3	350	685	802
4	463	804	1007
5	590	933	1200
6	700	989	1332
7	711	1051	1468
8	730	1100	1601
9	754	1150	1730
10	771	1193	1862
11	790	1332	1932
12	812	1458	2002
13	830	1589	2075
14	842	1722	2149
15	856	1862	2223

Notes
1. Allow 1-2 weeks for delivery
2. When ordering replace the XXX with the desired pressure setting 15 psi = 015 (pressure settings must be in whole numbers)
3. Consult Midwest Control for capacities above 15 psi

Control Device
NVR Series Vacuum Relief Valve
Capacity Chart

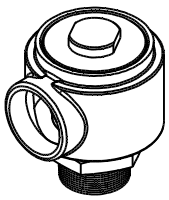
	Part No.	Part No.	Part No.
	NVR20-0AXXX	NVR25-0AXXX	NVR30-0AXXX
Inlet/Outlet	2"NPT	2-1/2 NPT	3" NPT
Relief Valve Set @ " Hg	SCFM		
2	268	300	650
3	307	375	749
4	339	430	902
5	356	450	1043
6	363	462	1061
7	371	475	1080
8	377	487	1101
9	384	499	1119
10	391	510	1138
11	399	522	1157
12	406	535	1173
13	413	548	1187
14	422	561	1204
15	430	574	1224
16	430	574	1224
17	430	574	1224
18	430	574	1224
19	430	574	1224
20	430	574	1224
21	430	574	1224
22	430	574	1224
23	430	574	1224
24	430	574	1224
25	430	574	1224

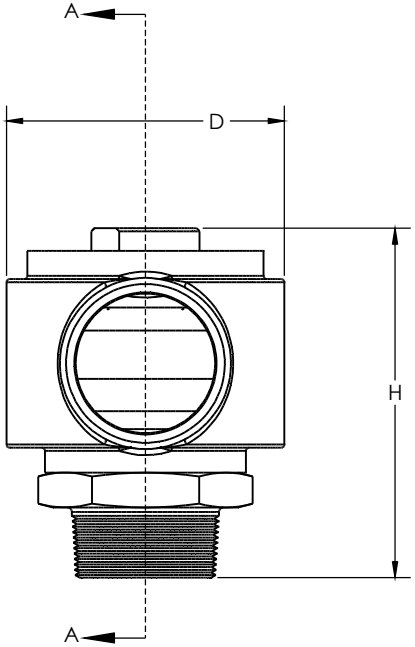
Notes
1. Allow 1-2 weeks for delivery
2. When ordering replace the XXX with the desired vacuum setting 20"Hg = 020 (vacuum settings must be in whole numbers)

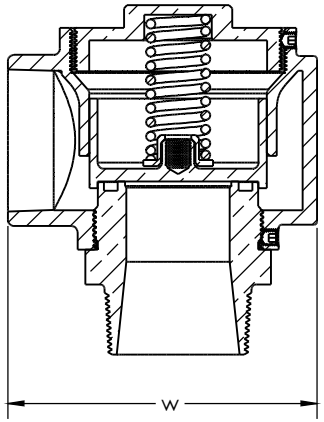
NVR

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REVISIONS			
REV.	DESCRIPTION	DATE	ECN NO.
A	RELEASE FOR PRODUCTION	12/3/18	18-896







SECTION A-A

NOTES:
1. TBD

P/N	THREAD (NPT)	D	H	W	WEIGHT (LBS)
NVR20	2	4.5	5.8	5.0	8.7
NVR25	2 1/2	5.0	7.3	5.7	12.7
NVR30	3	6.1	8.2	6.9	16.6

ITEM NO.	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MATERIAL SPECIFICATION	QTY REQD
PARTS LIST				

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ARE:
FRACTIONS ± DECIMALS .XX ±.020 .XXX±.005 ANGLES ±1°

MATERIAL

FINISH

DO NOT SCALE DRAWING

CAD GENERATED DRAWING. DO NOT MANUALLY UPDATE

APPROVALS	DATE
DRAWN	12/03/18
CHECKED	
RESP ENG	
MFG ENG	

MASS 8.415 LBS

Control Devices LLC
1555 LARKIN WILLIAMS ROAD, FENTON MO 63026

ASSY DWG, BLOWER RELIEF

SIZE B | DWG. NO. NVR | REV. A

SCALE 1:2 | SHEET 1 OF 1

control devices, LLC

MODEL: NVR

VACUUM RELIEF VALVE

DESCRIPTION

The NVR Vacuum Relief Valve is a direct acting, spring loaded relief valve. It is designed to protect vacuum systems from damage due to over pressurization.

INSTALLATION

The NVR Vacuum Relief Valve may be installed in any orientation. Install screen on inlet for safety and to prevent debris from entering the valve. Do not use reducing fittings between the NVR Vacuum Relief Valve and pressurized system. Do not install shutoff valves between the NVR Vacuum Relief Valve and pressurized system.

OPERATION

The NVR Vacuum Relief Valve is normally held closed by the force of the compression spring above the piston while control pressure is applied under the piston. When the controlling pressure exceeds the spring pressure, the piston seal is lifted off its seat, allowing flow through the discharge. Valve will reseat at 50 to 60 percent of the opening pressure.

ADJUSTMENT PROCEDURE

It is not recommended to adjust the set pressure.

DISASSEMBLY

It is not recommended to disassemble the NVR Vacuum Relief Valve.

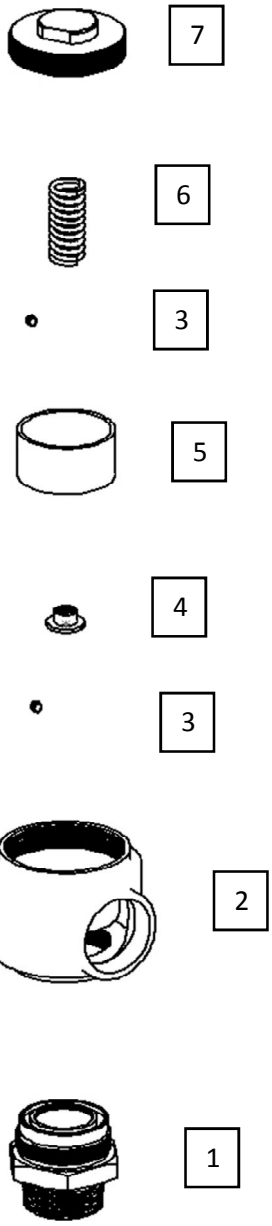
INSPECTION

Visually inspect valve for signs of damage and corrosion. To test valve, raise vacuum to the setting marked on the valve, plus two inches of mercury. If valve does not open consult the factory.

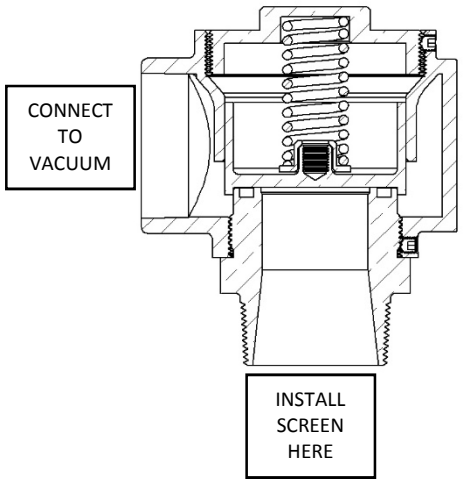
REPAIR AND REPLACEMENT

Please contact the factory for repairs or replacement valves.

Parts List:



Item	Description	Quantity
1	INLET	1
2	BODY	1
3	SET SCREW	2
4	SPRING GUIDE	1
5	PISTON	1
6	SPRING	1
7	CAP	1



Troubleshooting:

SYMPTOM	PROBABLE CAUSE	REMEDY
Fails to open	Controlling pressure too low	Raise pressure to test valve
Fails to open	Mechanical obstruction, corrosion, or scale build-up	Remove Obstruction or Contact factory for repair or replacement
Leakage from inlet	Disk or seat damaged	Contact factory for repair or replacement
Fails to close	System pressure too high	Lower pressure to below 50% of set pressure to ensure valve closes.
Fails to close	Mechanical obstruction	Remove Obstruction or Contact factory for repair or replacement

RadonAway®

The world's leading radon fan manufacturer



HS2750 and HS5500 Installation & Operating Instructions

DO NOT CONNECT POWER SUPPLY UNTIL BLOWER IS COMPLETELY INSTALLED.
MAKE SURE ELECTRICAL SERVICE TO BLOWER IS LOCKED IN "OFF" POSITION. DISCONNECT POWER BEFORE SERVICING.

1. **WARNING!** Do not use blower in hazardous environments where blower electrical system could provide ignition to combustible or flammable materials.

2. **WARNING!** Check voltage at the blower to ensure it corresponds with nameplate. See Vapor Intrusion Application Note #AN001 for important information on VI Applications. RadonAway.com/vapor-intrusion

3. **WARNING!** Normal operation of this device may affect the combustion airflow needed for safe operation of fuel burning equipment. Check for possible backdraft conditions on all combustion devices after installation.

4. All wiring must be performed in accordance with the National Fire Protection Association's (NFPA) "National Electrical Code, Standard #70"-current edition for all commercial and industrial work, and state and local building codes. All wiring must be performed by a qualified and licensed electrician.

5. **WARNING!** In the event that the blower is immersed in water, return unit to factory for service before operating.

6. **WARNING!** Do not twist or torque blower inlet or outlet piping as leakage may result.

7. **WARNING!** Do not leave blower unit installed on system piping without electrical power for more than 48 hours. Blower failure could result from this non-operational storage.

8. **WARNING!** TO REDUCE THE RISK OF FIRE, ELECTRIC SHOCK, OR INJURY TO PERSONS, OBSERVE THE FOLLOWING:

    a) Use this unit only in the manner intended by the manufacturer. If you have questions, contact the manufacturer.

    b) Before servicing or cleaning unit, switch power off at service panel and lock the service disconnecting means to prevent power from being switched on accidentally. When the service disconnecting means cannot be locked, securely fasten a prominent warning device, such as a tag, to the service panel.

    c) Do not use replacement parts that have not been recommended by the manufacturer (e.g., parts made at home using a 3D printer.)

1.0 SYSTEM DESIGN CONSIDERATIONS

1.1 INTRODUCTION

The HS2750 and HS5500 Blowers are intended for use by trained, certified/licensed, professional radon mitigators. The purpose of these instructions is to provide additional guidance for the most effective use of the HS2750 and HS5500 Blowers. These instructions should be considered supplemental to current industry standards and federal, state, county and local building codes and regulations. In the event of a conflict, those codes, practices and regulations take precedence over these instructions.

1.2 ENVIRONMENTALS

The HS2750 and HS5500 Blowers are designed to perform year-round in all but the harshest climates without additional concern for temperature or weather. For installations in an area of severe cold weather, please contact RadonAway for assistance. When not in operation, HS2750 and HS5500 Blowers should be stored in an area where the temperature is always greater than 32°F or less than 100°F. The HS2750 and HS5500 Blowers are thermally protected such that they will shut off when the internal temperature is above 185°F / 85°C. If the HS2750 or HS5500 Blower is idle in an area where the ambient temperature exceeds this shut off, it will not restart until the internal temperature falls below 75°C.

1.3 ACOUSTICS

The HS2750 or HS5500 Blower, when installed properly, operates with little or no noticeable noise to the building occupants. Recommended system design and installation considerations to minimize noise: When installing the HS2750 or HS5500 Blower above sleeping areas, select a location for mounting at the farthest possible distance. Avoid mounting near doors, fold-down stairs or other uninsulated structures which may transmit sound. Ensure a solid mounting for the HS2750 or HS5500 Blower to avoid structure-borne vibration or noise.

The velocity of the outgoing air must also be considered in the overall system design. With small diameter piping, in some cases a “rushing” sound of the outlet air may be audible. In these instances, the use of a RadonAway Exhaust Muffler (p/n 24002) is recommended.

1.4 GROUND WATER

Under no circumstances should water be allowed to be drawn into the inlet of the HS2750 and HS5500 Blowers as this may result in damage to the unit. The HS2750 or HS5500 Blower should be mounted at least 5 feet above the slab penetration to minimize the risk of filling the Blower with water in installations with occasional high water tables.

In the event that a temporary high water table results in water at or above slab level, water will be drawn into the riser pipes thus blocking air flow to the HS2750 or HS5500 Blower. The lack of cooling air will result in the Blower cycling on and off as the internal temperature rises above the thermal cutoff and falls upon shutoff. Should this condition arise, power down and disconnect the HS2750 or HS5500 Blower until the water recedes allowing for return to normal operation; then reconnect and power on to turn the Blower back on.

1.5 CONDENSATION & DRAINAGE

WARNING!: Failure to provide adequate drainage for condensation can result in system failure and damage the HS Blower.

Condensation is formed in the piping of a mitigation system when the air in the piping is chilled below its dew point. This can occur at points where the system piping goes through unheated space such as an attic, garage or outside. The system design must provide a means for water to drain back to a slab hole to remove the condensation.

The use of small diameter piping in a system increases the speed at which the air moves. The speed of the air can pull water uphill and, at sufficient velocity, it can actually move water vertically up the side walls of the pipe. This has the potential of creating a problem in the negative pressure (inlet) side piping. For HS2750 or HS5500 Blower inlet piping, the following table provides the minimum recommended pipe diameters as well as minimum pitch under several system conditions. Use this chart to size piping for a system.



Pipe Diameter	Minimum Rise per 1 Foot of Run*		
	@ 25 CFM	@ 50 CFM	@ 100 CFM
4"	1/32"	3/32"	3/8"
3"	1/8"	3/8"	1 1/2"

All exhaust piping should be 2" PVC. *Typical operational flow rates:

1.6 SYSTEM MONITOR & LABEL

A properly designed system should incorporate a "System On" indicator for affirmation of system operation. The HS2750 and HS5500 Blowers come equipped with a built-in magnehelic pressure gauge located on the front cover which serves this purpose. Other indicator products such as u-tube manometers should be mounted at least 5 feet above the slab penetration to minimize the risk of filling the gauge with water in installations with occasional high water tables. If required, place in a conspicuous location a System Label (such as RadonAway P/N 15005-20) with instructions for contacting the installing contractor for service and also identifying the necessity for regular radon tests to be conducted.

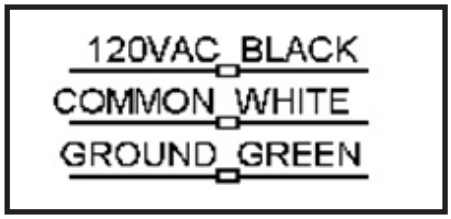
1.7 SLAB COVERAGE

The HS2750 or HS5500 Blower can provide coverage of well over 1000 sq. ft. per slab penetration. This will, of course, depend on the sub-slab aggregate in any particular installation and the diagnostic results. In general, sand and gravel are much looser aggregates than dirt and clay. Additional suction points can be added as required. It is recommended that a small pit (5 to 10 gallons in size; larger as needed) be created below the slab at each suction hole. When fine sand or dirt is present it is recommended that the pit be lined with a material such as clean gravel, size 4, 5, 56, or 6 as classified (ASTM C33).

1.8 ELECTRICAL WIRING

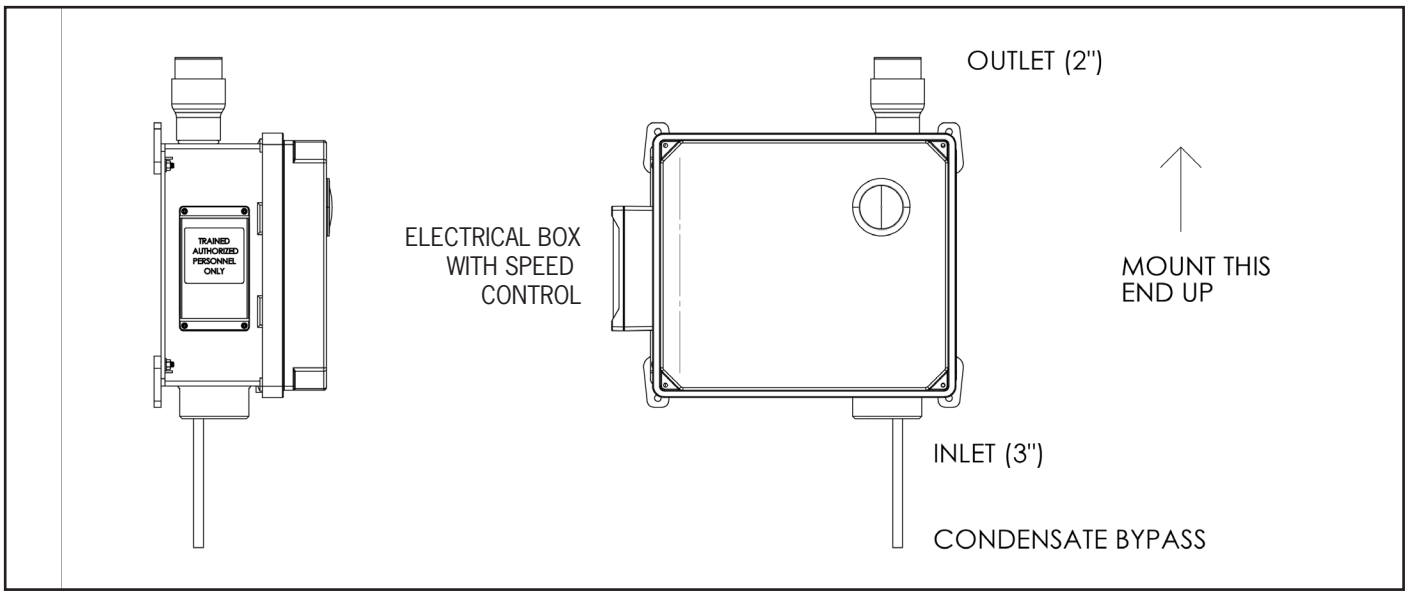
HS2750 or HSHS5500 Blower models come with an electrical switch box for hard wiring to a 120V electrical source. All wiring must be performed in accordance with the National Fire Protection Association's (NFPA)"National Electrical Code, Standard #70"-current edition for all commercial and industrial work, and state and local building codes. All wiring must be performed by a qualified and licensed electrician. Outdoor installations require the use of a UL listed watertight conduit. Ensure that all exterior electrical boxes are outdoor rated and properly caulked to prevent water penetration into the box. A means, such as a weep hole, is recommended to drain the box.

WIRING DIAGRAM



1.9 SPEED CONTROLS

The HS2750 and HS5500 have 4-speed (low, medium, high, maximum) built-in speed controls. They are not safe for use with solid state speed controls.



2.0 INSTALLATION

2.1 MOUNTING

Mount the HS2750 or HS5500 Blower to the wall studs, or similar structure, in the selected location with (4) 1/4" x 1 1/2" lag screws (not provided). Ensure the HS2750 or HS5500 Blower is both plumb and level.

2.2 DUCTING CONNECTIONS

Make final ducting connection to HS2750 or HS5500 Blower with flexible couplings. Ensure all connections are tight. Do not twist or torque inlet and outlet piping on HS2750 or HS5500 Blower or leaks may result.

NOTE: Do NOT solvent weld fittings to unit hubs.

2.3 VENT MUFFLER INSTALLATION

Install the muffler assembly in the selected location in the outlet ducting. Solvent weld all connections. The muffler is normally installed above the roofline at the end of the vent pipe.

2.4 OPERATION CHECKS & ANNUAL SYSTEM MAINTENANCE

_____ **Verify** all connections are tight and **leak-free**.

_____ **Ensure** the HS2750 or HS5500 Blower and all ducting is secure and vibration-free.

_____ **Verify** system vacuum pressure with Magnehelic. **Ensure** vacuum pressure is within normal operating range and **less than** the maximum recommended as shown below:

HS2750: 5" WC (low) / 10" WC (medium) / 15" WC (high) / 20" WC (maximum)
HS5500: 20" WC (low) / 30" WC (medium) / 40" WC (high) / 50" WC (maximum)

(Above are based on sea-level operation, at higher altitudes reduce above by about 4% per 1000 Feet.)
If these are exceeded, increase number of suction points.

_____ **Verify Radon levels** by testing to applicable current industry standards and federal, state, county and local building codes and regulations.

HS2750 and HS5500 PRODUCT SPECIFICATIONS

Model	Speed Setting (Max. Op. Pressure: "WC@Sea Level)	Typical CFM vs Static Suction WC (Recommended Operating Range)								Power* Watts @ 120VAC
		2.5"	5.0"	7.5"	10.0"	12.5"	15.0"	20.0"	25.0"	
HS2750	**Low** (5")	33	24	n/a	n/a	n/a	n/a	n/a	n/a	112-123
	Medium (10")	47	42	34	25	n/a	n/a	n/a	n/a	199-245
	High (15")	n/a	n/a	47	43	33	23	n/a	n/a	266-337
	Maximum (20")	n/a	n/a	n/a	n/a	48	43	24	n/a	361-463

Shutoff Pressure ("WC @ Sea Level): Low 7.8", Med 13.5", High 17.6", Max 22.6"

**Power consumption varies with actual load conditions*

Model	Speed Setting (Max. Op. Pressure: "WC@Sea Level)	Typical CFM vs Static Suction WC (Recommended Operating Range)								Power* Watts @ 120VAC
		5.0"	10.0"	20.0"	25.0"	30.0"	35.0"	40.0"	50.0"	
HS5500	**Low** (20")	44	39	22	n/a	n/a	n/a	n/a	n/a	243-281
	Medium (30")	n/a	n/a	53	41	36	22	n/a	n/a	372-477
	High (40")	n/a	n/a	n/a	45	39	31	22	n/a	527-625
	Maximum (50")	n/a	n/a	n/a	n/a	n/a	34	29	17	591-632

Shutoff Pressure ("WC @ Sea Level): Low 24.5", Med 34.7", High 44.6", Max 52.6"

**Power consumption varies with actual load conditions*

Number Of Speeds: 4

Volts: 120

Hz: 60

AMPS (Max): 4

Inlet: 3" PVC (3.5" OD)

Outlet: 2" PVC (2.37" OD)

Mounting: Brackets for vertical mount

Weight: HS2750, 18 lbs; HS5500, 19.25 lbs

Size: 17.5" W x 9.0" D x 18.5" H

Minimum Recommended PVC Ducting (2" / 3" / 4" / 6" / 8"): 3" Inlet; 2" Outlet

Storage Temperature Range: 32°F-100°F

Thermal Cutout: 185°F / 85°C

Locked rotor protection

LISTED
Electric Fan

Intertek

Conforms to
UL STD. 507

Certified to
CAN/CSA STD.
C22.2 No.113

IMPORTANT INSTRUCTIONS TO INSTALLER

Inspect the RadonAway® HS2750 or HS5500 Blower for shipping damage within 15 days of receipt. **Notify RadonAway® of any damages immediately.** RadonAway® is not responsible for damages incurred during shipping.

Install the HS2750 or HS5500 Blower in accordance with all current industry standards and federal, state, county and local building codes and regulations.

Provide a copy of this instruction or comparable radon system and testing information to the building occupants after completing system installation.

Warranty

RadonAway® warrants that the HS2750/HS5500 Blower (the "Blower") will be free from defects in materials and workmanship for a period of 12 months from the date of purchase or 18 months from the date of manufacture, whichever is sooner (the "Warranty Term").

RadonAway® will replace or repair any Blower which fails due to defects in materials or workmanship during the Warranty Term. This Warranty is contingent on installation of the blower in accordance with the instructions provided. This Warranty does not apply where any repairs or alterations have been made or attempted by others, or if the unit has been abused or misused. Warranty does not cover damage in shipment unless the damage is due to the negligence of RadonAway®.

The Blower must be returned (at Owner's cost) to the RadonAway® factory. Any Blower returned to the factory will be discarded unless the Owner provides specific instructions along with the Blower when it is returned regardless of whether or not the Blower is actually replaced under this warranty. Proof of purchase must be supplied upon request for service under this Warranty.

2-YEAR EXTENDED WARRANTY WITH INSTALLATION BY A FACTORY-CERTIFIED PROFESSIONAL

RadonAway® will extend the Warranty Term of the Blower to twenty-four (24) months from date of purchase or thirty (30) months from the date of manufacture, whichever is sooner, if: (1) the Blower is installed in a professionally designed and professionally installed active soil depressurization system or installed as a replacement Blower in a professionally designed and professionally installed active soil depressurization system; and (2) proof of an installer Factory Training Certificate. Upon request, proof of purchase and/or proof of professional installation may be required for service under this warranty. No extended warranty is offered outside the Continental United States and Canada beyond the standard 12 months from the date of purchase or 18 months from the date of manufacture, whichever is sooner. RadonAway® is not responsible for installation, removal or delivery costs associated with this Warranty.

EXCEPT AS STATED ABOVE, THE HS2750/HS5500 BLOWERS ARE PROVIDED WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

IN NO EVENT SHALL RADONAWAY BE LIABLE FOR ANY DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES ARISING OUT OF, OR RELATING TO, THE BLOWER OR THE PERFORMANCE THEREOF. RADONAWAY'S AGGREGATE LIABILITY HEREUNDER SHALL NOT IN ANY EVENT EXCEED THE AMOUNT OF THE PURCHASE PRICE OF SAID PRODUCT. THE SOLE AND EXCLUSIVE REMEDY UNDER THIS WARRANTY SHALL BE THE REPAIR OR REPLACEMENT OF THE PRODUCT, TO THE EXTENT THE SAME DOES NOT MEET WITH RADONAWAY'S WARRANTY AS PROVIDED ABOVE.

For service under this Warranty, contact RadonAway for a Return Material Authorization (RMA) number and shipping information. No returns can be accepted without an RMA. If factory return is required, the customer assumes all shipping costs, including insurance, to and from factory.

RadonAway®
3 Saber Way
Ward Hill, MA 01835 USA
TEL (978) 521-3703
FAX (978) 521-3964
Email to: Returns@RadonAway.com

Record the following information for your records:

Serial No. _____

Purchase Date: _____

APPENDIX F – Health and Safety Plan

APPENDIX F

HEALTH AND SAFETY PLAN/ COMMUNITY AIR MONITORING PLAN

43-25 52nd Street Site

Block 1321, Lot 10

Site ID: C241269

Submitted to:

New York State Department of Environmental Conservation

Division of Environmental Remediation

Remedial Bureau B, 12th Floor

625 Broadway

Albany, NY 12233-7016

Prepared for:

43-25 52 LLC

46-02 70th Street

Woodside, NY 11377

Prepared by:

YU & Associates Engineers, P.C.

611 River Drive

Elmwood Park, NJ 07407

November 12, 2025

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3.2 HEALTH AND SAFETY OFFICER 5
3.3 SITE HEALTH AND SAFETY OFFICER 5
3.4 SITE PERSONNEL 6

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1.0 APPROVALS

By the signatures the undersigned certify that this HASP is approved and will be utilized during the remedial work performed for the site of 43-25 52nd Street, Woodside, NY, 11377.

Chengyu Hang
YU & Associates Engineers, P.C.
Project Manager Date: _____

David Huang
YU & Associates Engineers, P.C.
Field Team Leader Date: _____

Sixuan Wang
YU & Associates Engineers, P.C.
Health and Safety Officer/Site Health and Safety Officer Date: _____

_____
Property Owner Representative Date: _____

_____
Client Representative Date: _____

_____
Agency Representative (NYSDEC) Date: _____

2.0 GENERAL

This Health and Safety Plan (HASP) has been prepared in conformance with §29 CFR 1910.120 and project requirements. It addresses the minimum requirements for implementation of Site Management Plan (SMP) activities performed in the proximity of 43-2552nd Street, Woodside, NY as they relate to activities performed in the presence of Controlled Materials, Resource Conservation and Recovery Act (RCRA) hazardous waste, New York Regulated Waste, Occupational Safety and Health Administration (OSHA) Hazardous Materials, regulated substances or otherwise environmentally sensitive conditions.

This plan will be implemented by **YU & Associates Engineers, P.C. (YU)** through the designated Health and Safety Officer (HSO) during site work. Compliance with this HASP is required of all people and third parties who perform field work for this project. This HASP is prepared for use by all persons coming into contact with contaminated groundwater, soil, and soil vapor at the Site. Other consultants and contractors working on this project should be responsible for the development of their own HASP. Assistance in implementing this HASP can be obtained from the project Health and Safety Officer (HSO) and/or the Project Manager (PM).

The health and safety practices, procedures, and personal protective equipment (PPE) requirements established for this project are based on existing information on the chemical and physical hazards known to be present at this Site. The content of this HASP may change or undergo revision based upon additional information made available to health and safety personnel, monitoring results, or changes in the technical scope of the work. Any changes proposed must be reviewed by the HSO and are subject to approval of the PM. The "HASP Field Change Request Form" provided in *Attachment I* may use to initiate such changes.

2.1 SCOPE OF WORK

The field operations that this HASP covers are:

- Visual inspection of the SSDS and SVE system components, including fans, piping, system enclosures, alarm panels, and system status indicators.
- Verification of system integrity (e.g., checking for cracks in piping, loose fittings, or corrosion).
- Inspection of accessible manholes, risers, or sampling ports.
- Inspection of exhaust points to ensure proper function and unobstructed air discharge.
- Routine maintenance of SSDS fans, SVE blowers, and associated mechanical/electrical components.
- Cleaning or replacement of inline filters (if applicable).
- Repair or replacement of worn or damaged parts (e.g., check valves, vacuum gauges).
- Resealing and tightening of joints or fittings if leaks or wear are identified.
- Ensuring signage, labels, and system diagrams remain legible and intact.
- Influent and effluent vapor sampling for the SVE system to evaluate system effectiveness and VOC mass removal.
- Sub-slab soil vapor sampling to monitor residual contaminant concentrations beneath the building slab.
- Indoor/Outdoor ambient air sampling.
- System vacuum monitoring to confirm effective sub-slab depressurization.
- Air monitoring: perimeter air quality monitoring for VOCs for the duration of field activities that would produce organic vapors, in the interest of ensuring ambient and work space air quality and providing for on-site personnel and public safety

2.2 HASP-RELATED ACTIVITIES

- Develop and implement health and safety plan according to NIOSH and the OSHA standards.
- Medical surveillance for site personnel.
- Provide information, education and training, including HAZWOPER training and certification for site personnel.
- Delineate on-site personnel responsibilities and contact information.
- Monitor air quality with a Photo Ionization Detector (PID) or MultiRAE.
- Establish a decontamination zone (also known as contamination reduction), as well as support and exclusion zones.
- Ensure proper use of PPE and hazard-measurement instruments.
- Maintain a record of work-related illnesses, injuries and accidents.
- Prepare for emergencies.

2.3 EMERGENCY CONTACTS

Project Management/Health and Safety Personnel		Phone Number
NYSDEC Project Manager	Javier Perez Maldonado	Office: (518) 402-8172
Project Manager	Chengyu Hang YU & Associates	Office: (201) 791-0075 Mobile: (201) 773-9038
Corporate Health & Safety Officer	Sixuan Wang YU & Associates	Office: (201) 791-0075 Mobile: (201) 998-3935
Field Health and Safety Officer	Chengyu Hang YU & Associates	Office: (201) 773-9628 Mobile: (412) 313-3795

EMERGENCY TELEPHONE NUMBERS:

Police Emergency	911
Fire	911
Ambulance	911
Below Ground Utilities – "CALL BEFORE YOU DIG"	811
Primary Hospital – Elmhurst Hospital Center	(718) 334-4000
Poison Control Center	(800) 222-1222
EPA National Response Center	(800) 424-8802
New York State Department of Health	(518) 402-7860
CHEMTREC	(800) 424-9300
National Pesticide Information	(800) 858-7378
NYSDEC Spill Hotline	(800) 457-7362

LOCAL HOSPITAL

Elmhurst Hospital Center
79-01 Broadway,
Queens, NY 11373

Non-Emergency Telephone: (718) 334-4000

3.0 HEALTH AND SAFETY STAFF

The responsibilities of the health and safety staff are described in the following sections.

3.1 PROJECT MANAGER

The Project Manager (PM) has the overall responsibilities for the health and safety of site personnel. The PM will also ensure that adequate resources are provided to the field health and safety staff to carry out their responsibilities as described below. The PM will ensure that all activities are conducted in accordance with the HASP, and will have the authority to suspend field activities if employees are in danger of injury or exposure to harmful agents. The PM's responsibilities include:

- Assurance that appropriate health and safety equipment and PPE are available for project personnel;
- Assurance that all personnel have received the appropriate training, and required medical examination before engaging in work activities; and
- Designation of a Health and Safety Officer (HSO) who will assist in enforcing compliance with the HASP.

3.2 HEALTH AND SAFETY OFFICER

The HSO has the responsibility to assist the PM in the implementation of this HASP. The HSO will review changes to this plan due to modification of procedures or newly proposed site activities. The HSO will assist in the resolution of any outstanding safety issues that arise during site work.

The HSO will obtain and keep a log of all personnel meetings, appropriate training, and medical qualifications for personnel involved with site work. The HSO will also maintain all personal exposure monitoring and accident/incident reports. The logs will be kept in the project file in accordance with §29 CFR 1910.1020.

3.3 SITE HEALTH AND SAFETY OFFICER

The SHSO will be responsible for directing and coordinating all health and safety monitoring activities and ensuring that proper personal protective equipment is utilized by field teams. The SHSO will conduct periodic safety briefings and ensure that the field team members comply with this HASP. The SHSO reports to the PM to provide summaries and progress of field operations. The SHSO has stop-work authorization which will be executed upon their determination of an imminent safety hazard, emergency situation, and/or other potentially dangerous situations. Authorization to proceed with work will be issued by the PM after such action. The SHSO shall initiate and execute all contact with support facilities and personnel when this action is appropriate.

The SHSO may direct the site health and safety efforts through an assistant health and safety officer approved by the PM. The assistant will be responsible for implementation of the HASP and may direct or participate in activities, as appropriate, when this does not interfere with primary HSO responsibilities. Other responsibilities of the SHSO include:

- Ensure that all field personnel and visitors in the field comply with the requirements of this HASP.

- Maintain a log of personnel on-site each day. A copy of these logs will be sent to the PM. Originals will be kept in the project file.

- Coordinate periodic safety briefings and notify PM of any changes in work conditions or tasks that may require changes to the HASP.

- Manage health and safety equipment, including monitoring instruments and PPE, and oversee decontamination procedures.

- Maintain a health and safety logbook in which daily site conditions, activities, personnel, calibration records, monitoring results and significant events will be recorded. The original logbooks will become part of the exposure records file and will be maintained by the PM.

- Delegate, if necessary and/or appropriate, some of these responsibilities to other on-site qualified employees.

3.4 SITE PERSONNEL

It is the responsibility of all site personnel to report any unsafe or potentially hazardous conditions to the SHSO. They should maintain knowledge of the information, instructions, and emergency response actions contained in this HASP. Additionally, they will comply with rules, regulations and procedures as set forth in this HASP (and subsequent revisions) and aid in preventing admittance of unauthorized personnel within the work site.

4.0 SITE HISTORY AND DESCRIPTION

4.1 SITE DESCRIPTION

The Site is located at 43-25 52nd Street, Woodside, NY, and the legal tax information for the Site is Block 1321, Lot 10 aka Lots 7 and 10.The Site covers an approximately 0.21-acre parcel of land and is bounded by Skillman Avenue to the north, Queens Boulevard to the south, residential properties to the east, and 52nd St to the west. Lot 7 was occupied by a single-story vacant commercial building with a paved parking area, which was previously used as an auto shop. Lot 10 was occupied by a two-story church building. The vicinity of the Site is surrounded by recently developed residential buildings and commercial properties including the Great Bear Tire & Auto Repair Center, Kavka Design Home Goods Store, Pins & Needles Embroidery LLC, and a U-Haul Neighborhood Dealer. The Site owner has entered the Site into a Brownfield Cleanup Agreement (BCA) with the NYSDEC to investigate and remediate, as appropriate, potential areas of Environmental Concern associated with the Site under the Brownfield Cleanup Program (BCP); the Site ID is C241269.

4.2 PROJECT BACKGROUND

A Phase I Environmental Site Assessment (ESA) for Lot 10 was prepared by JR Environmental Services, Inc. dated February 2021. According to the Phase I ESA, Lot 10 was initially developed by 1932 with a two-story commercial building, and had been used as a commercial, warehouse, storage warehouse and church since then. The review of city directory search also revealed that a drapery cleaner had occupied Lot 10 from 1970s to 1980s. Based on the review of the historical information included in the Phase I ESA, Lot 7 was initially developed by 1914 with a two-story building on the northern section and single-story shed structures on the eastern portion and utilized as a residence through at least 1932. The dwelling building and the single-story shed structures were demolished after 1932 and a single-story auto garage was constructed on the eastern portion. The auto garage had been on Site through at least 1951 and was later changed to an auto shop after 1962. The auto shop had occupied Lot 7 until 2022. Lot 7 and Lot 10 were vacant before remedial work.

The site was remediated in accordance with the RAWP prepared by YU & Associates dated February, 2024. After remediation, the restricted residential use SCOs were achieved for on-site soils and remaining contamination at the Site includes the TO-15 VOCs in the soil vapor located beneath the building slab.

5.0 HAZARD ASSESSMENT

5.1 HAZARD BY ACTIVITY ANALYSIS

The purpose of this section is to list the planned activities to be performed for this project, and identify the hazards associated with these activities. All members of the project team should be aware of the potential hazards as well as the actions taken to mitigate or remove the hazards. Where additional evaluation of potential hazards is required, the table below references additional attachments.

A safety briefing will be performed daily amongst onsite personnel and periodic inspections may be performed to ensure compliance with this HASP and to meet any additional OSHA or insurer requirements.

HAZARDS COMMON TO ALL PROJECTS				
	Activity	**Hazard**	**Actions to Mitigate or Remove Hazard**	**Frequency**
☒	Preparation of Health and Safety Plan.	Unidentified, or misidentified hazards.	Complete Activity by Hazard Analysis.	Per Project
☒	Introduction of New Worker.	Insufficient knowledge of site-specific hazards.	New employee orientation program.	Per Employee
☒	Maintenance of Work Site.	Slips, trips and falls. Fire Prevention.	Maintain a neat and organized work site.	Per Project
☒	Regulatory Inspection.	Citation or fine.	Provide proper response to and cooperation with inspectors.	Per Event
☒	Site Emergency.	Injury or loss of life.	Emergency Action Plan. (See Section 12.0)	Per Project
☒	Identification of Proper Personal Protective Equipment (PPE).	Physical injury or chemical exposure from inappropriate selection of personal protective equipment.	Identify potential chemical hazards	Per Activity
			Selection of appropriate personal protective equipment (See Section 7.3)	Per Employee
			Selection of appropriate respiratory protection.	Per Employee
☒	Work in extreme temperatures.	Heat stress and heat stroke.	Follow appropriate heat stress prevention procedures, and monitor for symptoms. (See *Attachment V*)	Per Employee
		Hypothermia and frostbite.	Wear warm clothing, prevent exposure of open skin, take frequent breaks in sheltered area, and monitor for signs of hypothermia and frostbite. (See *Attachment VI*)	Per Employee
☒	Lifting.	Back injury.	Use of proper lifting techniques.	Per Employee
☒	Noise Exposure.	Reduced hearing ability.	Hearing protection should be used when noise levels exceed 85 dBA averaged over an 8-hour day for any length of time. In absence of instrumentation, hearing protection is required	Per Employee

HAZARDS COMMON TO ALL PROJECTS				
	Activity	**Hazard**	**Actions to Mitigate or Remove Hazard**	**Frequency**
			when normal conversation is difficult at a distance of two to three feet.	
☐	Hazards Communication.	Miscommunication of hand signals resulting in physical harm, chemical exposure, or property damage.	Tailgate meeting prior to start of work to identify and discuss common signals.	Daily, Per Employee, and Upon Arrival at Site
☒	Maintenance of Personal Protective Equipment.	Physical injury or chemical exposure from inappropriate maintenance of personal protective equipment.	Regular and appropriate maintenance of personal protective equipment.	Monthly
☒	Use of Hand Tools or Other Portable Equipment.	Injury from improper use or maintenance of tools or other portable equipment.	Training in proper maintenance and use of hand tools and portable equipment.	Per Employee
☒	Operation of Heavy Equipment.	Injury to operator or ground personnel because of improper operation or maintenance of heavy equipment.	Training in proper maintenance and use of heavy equipment.	Per Employee
			Field personnel ensure that equipment operator sees them before entering the potential swing path of any operable equipment.	
☐	Drilling and Well Installation.	Underground utilities.	Obtain utility clearances before breaking ground.	Per Project
		Pinch points, airborne objects, and overhead hazards.	Wear Appropriate PPE (See Section 7.3)	Per Employee
			Follow appropriate operating procedure.	Per Employee
		Excessive noise.	Wear appropriate hearing protection during drilling.	Per Employee
		Contact with contaminated soil and ground water.	Wear appropriate personal protective equipment. (See Section 7.3)	Per Employee
		Spreading of site contaminants.	Perform equipment and personnel decontamination (See *Attachment III* and *Attachment IV*.)	Per Employee
		Physical entanglement.	No excessively loose clothing or clothing with	Per Employee

HAZARDS COMMON TO ALL PROJECTS				
	Activity	**Hazard**	**Actions to Mitigate or Remove Hazard**	**Frequency**
			draw strings should be worn near rotary operated equipment	
		Inhalation of site contaminants.	Perform air monitoring, and wear respiratory protection as appropriate. (See Section 8.0)	Per Project, Per Employee
☒	Collection of Soil Vapor Samples.	Contact with contaminated media.	Wear appropriate PPE. (See Section 7.3)	Per Employee
		Spreading of site contaminants.	Perform equipment and personnel decontamination (See Section 7.3 and Section 8.0)	Per Employee
		Inhalation of site contaminants.	Perform air monitoring, and wear respiratory protection as appropriate. (See Section 7.3 and Section 8.0)	Per Employee
		Exposure of off-site personnel to site contaminants during shipment of samples.	Adherence to required shipping procedures and regulations.	Per Project
☒	Equipment and personnel decontamination.	Contact with contaminated media.	Wear appropriate PPE. (See Section 7.3.)	Per Project
		Spreading of site contaminants.	Perform equipment and personnel decontamination (See *Attachment III* and *Attachment IV*.)	Per Project
☒		Inhalation of site contaminants.	Perform air monitoring, and wear respiratory protection as appropriate. (See Section 7.3 and Section 8.0)	Per Project
☐	Cutting, grinding, welding, and other work producing or capable of producing flame or sparks.	Fire and personal injury prevention.	Use of proper work procedures.	Per Activity

HAZARDS COMMON TO ALL PROJECTS				
	Activity	**Hazard**	**Actions to Mitigate or Remove Hazard**	**Frequency**
		Spreading of fire.	Have fire extinguisher available.	Per Activity
☒	Repair or installation of machinery, electrical components, pneumatics, hydraulics, and pressurized systems. Hazardous line openings.	Injury from unintended activation of machinery or lines, fire, and potential exposure to, or release of hazardous materials.	Follow proper lock-out/tag-out procedures.	Per Activity
☒	Use, repair or installation of electrical components and machinery.	Electrocution and fire.	Adherence to proper electrical safety procedures. Periodic inspection of work sites.	Per Employee, Per Activity
☐	Storage, handling, and use of corrosive and reactive materials.	Explosion, fire and personal injury.	Follow appropriate storage, handling, and inspection procedures.	Per Activity
☐	Storage, handling, and use of flammable and combustible liquids and gases.	Explosion, fire and personal injury.	Follow appropriate storage, handling, and inspection procedures.	Per Activity
☐	Work over, or adjacent to water.	Drowning.	Follow required safety procedures.	Per Activity
☒	Use of portable ladders.	Falling.	Follow appropriate ladder use, inspection and maintenance procedures.	Per Activity
☐	Hazardous materials Survey	Contact with contaminated media	Wear appropriate PPE	Per Employee
☐		Spreading of site contaminants	Perform equipment and personnel decontamination	Per Employee
☐		Inhalation of site contaminants	Wear appropriate respiratory protection when deemed appropriate based upon friable potential	Per Employee
☐		Exposure of off-site personnel to site contaminants during shipment of samples	Adherence to required shipping procedures and regulations	Per Project

Note in the areas where fall protection is required by OSHA as per 29CFR, 1926.500 through 503, YU will

utilize a personal fall protection system with a body harness, deceleration device and lifeline properly anchored to a secure point capable of supporting at least 5,000 pounds.

5.2 CHEMICAL HAZARDS

After remediation, endpoint soil samples indicated that on-site soils achieved restricted residential use SCOs. Ingestion of groundwater is not anticipated because the groundwater is not being used for drinking water source, as the area is served by the NYC DEP public water supply. People will not come into contact with contaminated groundwater during work at the Site because groundwater is located at 60 ft below the existing grade and not anticipated to be encountered. The contaminants of concern at this site are TO-15 VOCs in the soil vapor located beneath the building slab.

VOCs

Soil vapor sample results indicate the remaining contamination of TO-15VOCs on site. The above-mentioned contaminants are anticipated to be encountered at the Site at levels posing a minimal hazard to workers; the most likely risk is contact with contaminated soil vapor, causing potential irritation to skin and/or eyes.

PCE is the most commonly used solvent in dry cleaning. It is a clear colorless liquid with low solubility, low flammability, and very high volatility. It is considered an irritant to the skin, eyes, and respiratory tract and is harmful if swallowed, inhaled, or absorbed through the skin. PCE is identified as a suspected carcinogen. Large exposures to PCE can damage the central nervous system, liver and kidneys. As levels of contamination in the breathing zone on Site are expected to be far below both the ACGIH TLV of 25 ppm (TWA) and OSHA ST PEL of 100 ppm, site personnel should be adequately protected using Level D PPE – long sleeved pants and shirts, steel-toed boots, nitrile gloves and safety goggles, to minimize potential skin contact and irritation, and following proper sanitation procedures to minimize accidental contact or ingestion. TCE and cis-1,2-DCE are similar to PCE in potential health effects and physical properties. Precautions taken to protect personnel from PCE are also considered sufficient in protecting them from its daughter products.

5.2.1 Task Hazard Assessment

Potential exposure to site chemicals for both equipment operators and engineers/geologists (inspectors) is primarily expected to occur through inhalation and/or dermal contact and secondarily through accidental ingestion. Workers should be adequately protected with modified level D personal protective equipment (PPE) or Level C PPE, depending on the activity being carried out, and will make every effort to minimize direct contact with soil and groundwater (see Section 7.3 for details regarding PPE levels). Proper decontamination procedures and general sanitation will reduce the risk of contact or ingestion (decontamination procedures are described in Section 11.0). Work on-site will be monitored with a photo-ionization detector (PID) to determine the concentration of volatile organic compounds in the air, and workers will stop work or increase their level of PPE should airborne concentrations of volatile contaminants become too high, as laid out in section 8.2 – Action Levels.

5.3 PHYSICAL AND OPERATIONAL HAZARDS

5.3.1 General

A variety of physical hazards may be present during site activities. The most common hazards are slips, trips, falls, and heat and cold stress. Other physical hazards can be caused by motor vehicle and heavy equipment operation, the use of hand and power tools, and handling and storage of solvents and fuels. These hazards are not unique and are generally familiar to hazardous waste workers. Additional specific safety requirements may be covered during safety briefings at the project Site.

Storage of flammable and combustible liquids shall be in accordance with OSHA requirements specified in §29 CFR 1910.106. Solvents shall be stored in approved secured containers and shall be properly labeled in accordance with the requirement of §29 CFR 1910.1200. Material Safety Data Sheets (MSDS) for hazardous materials brought on Site shall be maintained by the site HSO.

Electrical cords used for hand and power tools shall be Underwriter Laboratories (UL) listed and all tools shall be properly grounded.

During servicing and maintenance of site equipment, appropriate lock-out/tag-out measures shall be implemented as required under §29 CFR 1910.147.

Personnel will be working on Site in groups and will be able to monitor each other periodically during the project.

5.3.2 Back Injuries Due to Improper Lifting

Back injuries due to improper lifting can be prevented utilizing the following:

- Use proper lifting techniques. Lift with the legs, not the back. Keep loads close to the body and avoid twisting.
- Loads heavier than 50 pounds require a second person or mechanical device for lifting.
- Use mechanical devices such as drum dollies, hand trucks, and tool hoists (for lifting augers) to lift heavy loads whenever possible.

5.3.3 Traffic

Most work on Site will be within the property boundary, but near streets. Personnel will maintain a constant awareness of traffic moving in all directions. Safety vests will be worn whenever working on or near a roadway. Equipment and work areas will be appropriately marked with cones, barriers and signage.

5.3.4 Overhead Power Lines

In some areas of the Site overhead power lines are present and may be affected during excavation. Every effort shall be made to maintain a minimum equipment clearance of 10 feet from these power lines. However, should it be necessary to breach the clearance, prior to initiating any such work in/near these areas when there is a possibility that the equipment may touch and/or may potentially fall on the lines creating not only a severe electrocution hazard, but also a situation where power distribution may be affected, the Project Manager shall contact the Power Generation/Distribution Company to notify them of such potential and will work within the guidelines provided by the Power Generation/Distribution Company for safety of personnel and property. When work may be needed to be conducted near high power lines, employees engaged in this operation will be trained appropriately to address hazards associated with high voltage.

5.3.5 Below-Ground Utilities

Prior to any invasive activities, the contractor will be responsible for coordinating a utility mark-out. Upon arrival on Site and before commencing any intrusive work, the contractor will inspect the worksite for any indication of utilities which are not appropriately marked. If unmarked utilities are suspected, no intrusive activities will take place until the location of utilities has been verified with the appropriate agencies. Either the contractor or the SHSO may at any point require verification of utility locations, or stop work if they suspect a utility hazard.

5.3.6 Weather

The SHSO will monitor for visible symptoms of heat/cold stress in workers. Ambient weather reports will be monitored by the PM, and HSO/SHSO to determine the need to implement control measures for minimizing heat/cold stress. Outdoor work will cease immediately upon the signs of impending thunderstorms and lightening, or other severe weather conditions.

5.3.7 Noise

Project activities such as excavating operations, soil mixing, injection, and backfill could necessitate the use of hearing protection due to elevated noise levels. Hearing protection will be used as directed by the SHSO. As a general rule of thumb, when conversation between workers becomes difficult and normal speech cannot be understood within an arm's length of the persons talking, then hearing protection must be worn.

5.3.8 Fire and Explosion

The HSO will identify, analyze and understand all fire and explosion hazards and associated effects that might be present at the Site. A suitable control and mitigation systems for fire and explosion hazards will be implemented and supported throughout the project duration.

6.0 TRAINING AND MEDICAL SURVEILLANCE REQUIREMENTS

6.1 GENERAL HEALTH AND SAFETY TRAINING

In accordance with the requirements of §29 CFR 1910.120, hazardous waste site workers shall, at the time of job assignment, have received a minimum of 40 hours of initial health and safety training for hazardous waste site operations unless otherwise noted in the above reference. At a minimum, the training shall have consisted of instruction in the topics outlined in the above reference. Personnel who have not met the requirements for initial training, or are not "current" in their training shall not be allowed to work at any site activities in which they may be exposed to hazards (chemical or physical). For a site worker to be considered "current" for training purposes, their date of last training (initial, refresher or manager/supervisory) must be within the last twelve months.

Completion of an accredited Health and Safety Training Course for Hazardous Waste Operations or an approved equivalent will fulfill the requirements of this section.

In addition to the required initial training, each employee will have received 3 days of directly supervised on-the-job training. This training will address the duties the employees are expected to perform, which must be documented.

6.2 MANAGER/SUPERVISOR TRAINING

In accordance with §29 CFR 1910.120, on-site management and supervisors who will be directly responsible for, or who supervise employees engaged in hazardous waste operations shall receive training as required by Section 6.1 above and at least 8 additional hours of specialized training on managing such operations at the time of the job assignment.

6.3 ANNUAL 8-HOUR REFRESHER TRAINING

Annual 8-hour refresher training will be required in accordance with §29 CFR 1910.120 of all hazardous waste site field personnel in order to maintain their qualifications for field work. The following topics will be reviewed: toxicology, respiratory protection, including air purifying and air supplied devices, medical surveillance, PPE and decontamination procedures.

6.4 SITE SPECIFIC TRAINING

Prior to commencement of field activities, all field personnel assigned to the project will be provided training that will specifically address the activities, procedures, monitoring and equipment for the site operations. It will include site and facility layout, hazards, and emergency services at the Site, and will highlight all provisions contained within this HASP. This training will also allow field workers to clarify anything they do not understand and to reinforce their responsibilities regarding safety and operations for their particular activity. In addition, topics deemed necessary by the HSO/SHSO may be added to the above list.

The Site specific training shall also provide information regarding potential health hazards specific to the Site contaminants, the likelihood of exposure and the precautionary measures including PPE, air and medical monitoring procedures to be implemented to protect against these hazards.

6.5 ON-SITE SAFETY BRIEFINGS

Project personnel and visitors will be given periodic on-site health and safety briefings by the HSO/SHSO, or designee, to assist site personnel in safely conducting their work activities. The briefings will include information on new operations to be conducted, changes in work practices or the Site's environmental conditions. The briefings will also provide a forum to facilitate conformance with health and safety requirements and to identify health and safety performance deficiencies noted during daily activities or as a result of Health and Safety (H&S) audits.

6.6 ADDITIONAL TRAINING

Additional training, if required for completion of field tasks during the project, will be identified and provided for field personnel as the work progresses.

6.7 SUBCONTRACTOR TRAINING

All field subcontractor personnel conducting work onsite that fall under the scope of this HASP will meet the requirements of §29 CFR 1910.120(e) and addressed in Sections 6.1 through 6.7 above.

6.8 MEDICAL SURVEILLANCE PROCEDURES

All site personnel performing field work at the Site under the scope of this HASP are required to have passed a complete medical surveillance examination in accordance with 29 CFR 1910.120(f) (Hazardous Waste Operations). A physicians' medical release for work will be confirmed by the PM before an employee can begin site activities. The medical examination will, at a minimum, be provided annually and upon termination of hazardous waste site work if the last examination was not within the previous six months. Additional medical testing may be recommended by the HSO/SHSO in consultation with the consulting occupational physician if an overt exposure accident occurs, or if other site conditions warrant further medical surveillance.

A medical data sheet is provided in Figure 6-1. This medical data sheet will be completed by all on-site personnel and kept at the Site. Where possible, this medical data sheet will accompany the personnel needing medical assistance or transport to hospital facilities.

FIGURE 6-1

MEDICAL DATA SHEET

This brief Medical Data Sheet will be completed by all on-site personnel and will be kept in the Command Post during the conduct of site operations. It is in no way a substitute for the Medical Surveillance Program requirements consistent with the health and safety policies established for hazardous waste operations at this Site. This data sheet will accompany any personnel when medical assistance is needed or if transport to hospital facilities is required.

PROJECT: **43-25 52nd Street HASP**

Name: _____

Home Telephone: _____

EMERGENCY CONTACT:

Name: _____

Relationship: _____

Phone number: _____

MEDICAL INFORMATION:

Allergies: _____

_____

Do you wear contact lenses: _____

Name of personal physician: _____

Telephone number: _____

7.0 SITE CONTROL, PPE AND COMMUNICATIONS

7.1 GENERAL SITE CONTROL

At all times during site operations site control will be maintained not only to prevent spread of contamination within the Site, but also to prevent unauthorized entry into the Site. Site control also includes the control of traffic to and from the Site to least impact the general population in the area.

Visitors will be required to first contact the HSO prior to allowing access to the Site.

7.2 CONTAMINATION CONTROL

A three-zone approach will be employed in order to contain the potential spread of contamination from the Site. The three zones will include the Exclusion Zone (EZ), the Contamination Reduction Zone (CRZ) and the Support Zone (SZ).

7.2.1 Support Zone

The SZ is an uncontaminated area that will be the field support area for most operations. The SZ provides for field team communications and staging for emergency response. Appropriate sanitary facilities and safety equipment will be located in this zone. Potentially contaminated personnel/materials are not allowed in this zone. The only exception will be appropriately packaged/decontaminated and labeled samples. Meteorological monitoring will be observed and noted from this zone, as well as those factors pertaining to heat or cold stress.

7.2.2 Contamination Reduction Zone

The CRZ is established between the EZ and the SZ. The CRZ contains the contamination reduction corridor and provides for an area for decontamination of personnel and portable equipment. The CRZ will be used for general site entry and egress in addition to access for heavy equipment and emergency support services.

7.2.3 Exclusion Zone

The area where contamination exists and where excavation, soil mixing, and backfill are conducted is considered to be the exclusion zone. The HSO/SHSO may establish more than one EZ where different levels of protection may be employed or different hazards exist. Personnel are not allowed in the EZ without each of the following:

- A buddy
- Appropriate personal protective equipment
- Medical authorization
- Training certification.

Any observation of activities will be conducted from an area upwind of the EZ as established by the HSO/SHSO.

7.3 PERSONAL PROTECTIVE EQUIPMENT

7.3.1 General

The level of protection worn by field personnel will be enforced by the SHSO. Levels of protection for general operations are provided below and are defined in this section. Levels of protection may be upgraded or downgraded at the discretion of the HSO/SHSO. This decision will be based on real-time air monitoring and prior site experience. Any changes in the level of protection will be recorded in the health and safety field logbook.

7.3.2 Personal Protective Equipment Selection

For tasks requiring level B personal protective clothing (PPE), the following shall be used:

- Chemical protective suit (Saran)
- Gloves, inner and outer (nitrile)
- Boots, steel toe
- Boot covers
- Hard hat
- Hearing protection (as needed)

For tasks requiring level C PPE, the following shall be used:

- Chemical protective suit (Polycoated Tyvek)
- Gloves, inner and outer (nitrile)
- Boots, steel toe
- Boot covers
- Hard hat
- Eye protection (if not wearing full face respirators)
- Hearing protection (as needed)

For tasks requiring level D PPE, the following shall be used:

- Work clothes or plain uncoated coveralls
- Work gloves
- Boots, steel toe
- Hard hat
- Hearing protection (as needed)
- Eye protection

For tasks requiring level modified level D PPE, the following shall be used:

- Work clothes or plain uncoated coveralls
- Gloves – inner and outer nitrile gloves
- Boots, steel toe
- Hard hat

- Hearing protection (as needed)
- Eye protection

For tasks requiring respiratory protection, the following equipment shall be used:

Level B:	Air supplied respirators - Airline with escape pack or SCBA
Level C:	Half-face air purifying respirator equipped with organic vapor/HEPA cartridges
Level D:	No respiratory protection

All outer gloves and boot covers shall be securely taped to the protective clothing.

7.3.3 Initial Levels of Protection

The following are the initial levels of protection that will be used for each planned field activity:

Activity	Level of Personal Protective Equipment	Level Respiratory Protection
Inspection and Maintenance of SSDS and SVE system		
Inspector	Modified D	D
Contractor	Modified D	D

7.4 SAFETY EQUIPMENT

Safety and first aid equipment will be accessible in the support vehicle/area for the field crew. The following safety equipment will be available:

- Standard Industrial First Aid Kits, fully stocked
- Portable emergency Eyewash Unit (capable of providing at least 15 minutes of continuous flushing ability)
- Field wash equipment

7.5 COMMUNICATIONS

Site personnel will have access to mobile telephones. If intrinsically safe radios are used then they will be rated as class I, division I, group c, d as defined by the National Electrical Code (NEC). The following hand signals shall be reviewed during site specific training, shall be understood by the entire field team prior to commencement of site activities, and shall be used when necessary during site operations.

Hand Signal	Meaning
Hand gripping throat	Out of air, can't breathe
Gripping partner's wrist/ place hands on waist	Leave area immediately, no debate
Hands on top of head	Need assistance
Thumbs up	OK, all right, I understand

Thumbs down	No, negative

8.0 AIR MONITORING

8.1 PERIODIC AIR MONITORING

The following monitoring instrument will be available for use during field operations:

- Photoionization Detector (PID)

The HSO/SHSO or designee will conduct periodic site air monitoring during pertinent project operations. Organic vapor concentrations will be measured using a PID during all site operations where existing site soils or water contaminated with VOCs are visually identified or otherwise suspected by the HSO/SHSO and during any site invasive operations identified in Section 2.0. Air monitoring results will be interpreted conservatively to be protective of worker health. Organic vapor concentrations will be measured upwind of the work site(s) to determine background concentrations at least twice a day, (once in the morning and once in the afternoon). Measurements will be obtained in the breathing zones of personnel as well as in the area of the source.

8.2 ACTION LEVELS

Volatile organic compounds (VOCs) will be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis or as otherwise specified. Upwind concentrations will be measured at the start of each workday and periodically thereafter to establish background conditions, particularly if wind direction changes. The monitoring work will be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment will be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment should be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

1. If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.
2. If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion 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 over background for the 15-minute average.
3. If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown.

8.3 INSTRUMENT CALIBRATION

Monitoring equipment will be calibrated and checked for proper operation daily, before the start-up of any field activities requiring monitoring. Before initiating field activities, background measurements will be obtained with each instrument upwind and away from potential site influences. Instrument calibration and background levels will be documented on daily air monitoring logs.

8.4 PERSONAL MONITORING

Personal monitoring will be initiated based on periodic monitoring data. If site-monitoring efforts indicate the presence of PCE then personal monitoring will be conducted for those individuals with the potential exposure to PCE. Personal air monitoring will be conducted using established OSHA/NIOSH protocol. Air samples, including blanks will be submitted to an American Industrial Hygiene Association (AIHA) accredited laboratory for sample analysis.

When periodic air monitoring action levels are exceeded on a routine basis, personal air monitoring will be conducted to confirm that employee exposures are within currently published occupational exposure limits and implemented site controls are adequate to continue to control worker exposures. Personal air monitoring for lead will be conducted in accordance with established NIOSH/OSHA air sampling protocols and submitted to an AIHA accredited laboratory for analysis.

TABLE 8-1 ACTION LEVELS	
Monitoring Method: PID Instrument	
Activities Requiring Monitoring: Inspection and Maintenance of SSDS and SVE system	
Monitoring Conducted By: Site Safety Officer	
Instrument Reading	Required Action
0 to 5 ppm	Level D
>5 to 25 ppm	Introduce engineering controls to reduce to background (e.g. fan) or respirator (Level C). Leave area if applicable.
> 25 ppm	Stop Work and Consult HSO/SHSO

9.0 COMMUNITY AIR MONITORING PROGRAM

Depending upon the nature of contamination, chemical-specific monitoring with appropriately-sensitive methods may be required. Depending upon the proximity of potentially exposed individuals, more stringent monitoring or response levels than those presented below may be required. Special requirements will be necessary for work within 20 feet of potentially exposed individuals or structures and for indoor work with co-located residences or facilities. These requirements should be determined in accordance with Attachment IX – Appendix 1A New York State Department of Health Generic Community Air Monitoring Protocol.

Reliance on the CAMP should not preclude simple, common-sense measures to keep VOCs, dust, and odors at a minimum around the work areas.

9.1 COMMUNITY AIR MONITORING PLAN

Depending upon the nature of known or potential contaminants at each site, real-time air monitoring for VOCs and/or particulate levels at the perimeter of the exclusion zone or work area will be necessary. This Site will involve VOC and particulate monitoring using the equipment as listed in Attachment X - Air Monitoring Equipment.

Continuous monitoring will be required for all ground intrusive activities and during the demolition of contaminated or potentially contaminated structures. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pitting or trenching, and soil mixing.

Periodic monitoring for VOCs will be required during non-intrusive activities such as the collection of soil end-point samples. “Periodic” monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while collecting the sample, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

9.2 VOC MONITORING, RESPONSE LEVELS, AND ACTIONS

Volatile organic compounds (VOCs) will be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis or as otherwise specified. Upwind concentrations will be measured at the start of each workday and periodically thereafter to establish background conditions, particularly if wind direction changes. The monitoring work will be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment will be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment should be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

4. If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.
5. If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued.

After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion 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 over background for the 15-minute average.

6. If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown.
7. All 15-minute readings must be recorded and be available for State (DEC and NYSDOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

9.3 PARTICULATE MONITORING, RESPONSE LEVELS, AND ACTIONS

Particulate concentrations will be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring will be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment must be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration will be visually assessed during all work activities.

1. If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m^3 above the upwind level and provided that no visible dust is migrating from the work area.

2. Dust suppression will be achieved though the use of a dedicated on-Site water truck for road wetting. The truck will be equipped with a water cannon capable of spraying water directly onto off-road areas including excavations and stockpiles.

3. Clearing and grubbing of larger sites will be done in stages to limit the area of exposed, unvegetated soils vulnerable to dust production.

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

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

6. If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m^3 above the upwind 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 PM-10 particulate concentration to within 150 mcg/m^3 of the upwind level and in preventing visible dust migration.

7. All readings must be recorded and be available for State (DEC and NYSDOH) and County Health personnel to review.

10.0 ADDITIONAL SAFE WORK PRACTICES

Work will be conducted in accordance with relevant OSHA regulations (1926 and 1910 CFR).

10.1 GENERAL

- Ignition sources such as open flames in the vicinity of the potentially flammable material are prohibited.
- When working in areas where flammable vapors may be present particular care must be exercised with tools and equipment that may be sources of ignition. All tools and equipment provided must be properly bonded and/or grounded.
- Approved and appropriate safety equipment as specified in Section 7.2 of this HASP shall be worn where required.
- Eye protection must be worn while working on site.
- Beards that interfere with respirator fit are not allowed for field personnel within the Site boundaries as all site field personnel may be called upon to use respirator protection in some situation, and beards do not allow for proper respirator fit.
- No smoking, eating, drinking or applying of cosmetics is allowed in the contaminated areas.
- Contaminated tools and hands must be kept away from the face. Do not unnecessarily touch a contaminated surface or allow your clothing, tools or other equipment to do so.
- Persons with long hair and/or loose fitting clothing that could become tangled in power equipment must take adequate precaution.
- Report the presence of open wounds to the HSO prior to work in contaminated areas. If a wound occurs within such an area, report immediately to HSO and attend to the wound.
- Horseplay is prohibited in the work area.
- Follow good "housekeeping" practices to minimize the amount of material and equipment that has to be decontaminated or disposed of as contaminated wastes.
- Work under the influence of intoxicants, narcotics, or controlled substances is prohibited.
- All safety equipment shall be inspected regularly to ensure proper operation.
- All respiratory protective equipment use and maintenance shall meet, at a minimum, the OSHA requirements of 29 CFR 1910.134, including prohibitions on facial hair and other face piece-seal obstructions.

- All personnel entering the Site during site operational hours shall be instructed in emergency procedures including locations of emergency equipment, procedures for site evacuation, emergency assembly areas and head count procedures, alarm systems and site communications.

- Personnel shall avoid walking directly through areas of obvious contamination and avoid handling contaminated materials directly.

- If field personnel perceive an unsafe condition or situation, the HSO or Field Operations Lead (FOL) will be notified immediately.

- All operations shall be planned and discussed with field personnel prior to beginning operations.

10.1.1 Operation of Heavy Equipment

Only trained equipment operators will be allowed to operate heavy machinery on-site. The number of personnel in the vicinity of heavy equipment operations and in contaminated areas shall be kept to a minimum. Those individuals not directly involved in work operations will be required to maintain a 30-foot distance so as not to interfere. All heavy equipment shall be properly maintained in a safe operating condition and be equipped with an audible back-up alarm.

10.2 PERSONNEL SAFETY

- Do not climb over or under obstacles.

- Always use the buddy system and line-of-sight.

- Practice contamination prevention on and off-site.

- Plan activities ahead of time.

- Apply immediate first aid to any and all cuts, scratches and abrasions.

- Report all accidents, no matter how minor, immediately to the HSO.

- Be alert to your own physical condition. Watch your buddy for signs of fatigue and/or exposure.

- Initiate a work/rest regime if ambient temperatures and protective clothing create a potential heat/cold stress situation.

- Do not proceed with work unless adequate natural light exists and appropriate supervision is present.

- Safety briefings will be held prior to the onset of remedial activities and regularly during the progress of site activities.

10.3 SAFETY PROCEDURES IN EXCLUSION ZONES

- The exclusion zone will be maintained visually by the HSO/SHSO
- Only authorized personnel will be allowed in the exclusion zone. All unauthorized persons must remain a safe distance upwind during field activities in order to prevent exposure to potential hazards.
- Line of sight and the buddy system shall be mandatory at all times.
- Prior to the start of activities in the exclusion zone, the HSO/SHSO will establish a well-defined emergency exit escape route from each operating area of the exclusion zone. The emergency escape routes shall be familiar to all field personnel involved with the operation and shall be reviewed by the HSO/SHSO at site briefings.
- The number of authorized personnel within the exclusion zone during each task will be minimized to include only those personnel essential for that task.
- The size of the exclusion area around all work locations will be determined by the HSO in and will be large enough to easily accommodate only those members of the field team actively engaged in the work, fire, emergency and site operations equipment.
- Immediate access to a source of water with sufficient volume, flow rate and pressure must be available for quick drenching in cases of emergency.
- Proper absorbent material will be available in the exclusion zone and will be used promptly in areas where spills or leaks occur.
- Instrumentation used for monitoring shall consist of those devices specified in Section 8.1. Members of the field team will not proceed with any task until the field team is wearing the task-designated personnel protective equipment specified in Section 7.2.3 (or as modified by the HSO in response to measured site conditions), all instruments present will be fully charged and properly calibrated.

11.0 DECONTAMINATION PROCEDURES

11.1 CONTAMINATION AVOIDANCE

One of the most important aspects of decontamination is the prevention of contamination. Good contamination prevention will minimize worker exposure and help ensure valid sample results by precluding cross-examination. Procedures for contamination avoidance include:

Personnel

- Do not walk through areas of obvious or known contamination
- Do not directly handle or touch contaminated materials
- Make sure that there are no cuts or tears on PPE
- Fasten all closures in suits, covering with tape, if necessary
- Particular care should be taken to protect any skin injuries
- Stay upwind of airborne contaminants
- Do not carry cigarettes, cosmetics, gum, etc., into contaminated areas

Heavy Equipment

- Care will be taken to limit the amount of contamination that comes in contact with the heavy equipment (e.g. tires)
- If contaminated tools are to be placed on non-contaminated equipment for transport to a decontamination area, plastic will be used to keep the equipment clean

11.2 PERSONNEL DECONTAMINATION

All personnel will pass through an outlined decontamination procedure when exiting the exclusion zone at each location. *Attachment IV* provides guidelines for decontamination procedures. The system will include a gross wash and rinse for all clothing and boots worn in the EZ as appropriate. All personnel will wash their hands, arms, neck and face after removing PPE in the wash facility located at the Site. Respirators, airline and any other personnel equipment that comes in contact with contaminated soils will pass through a field wash/cleaning in the CRZ and a final wash/cleaning at the end of the day.

11.3 EQUIPMENT DECONTAMINATION

Heavy equipment used at the Site, which is potentially contaminated, will be decontaminated to prevent migration of hazardous material outside the Site. All equipment will be decontaminated at a designated location in the Site. This area will provide for the containment of any wastewater from the decontamination process. The HSO/SHSO will engage designated personnel to ensure that all trucks/vehicles exiting the Site are covered, material is stabilized with no free liquid and truck tires are free of contaminated soil.

Personnel responsible for decontamination of equipment that came in contact with the PCBs contaminated soils in the north alley of the Site will use Level C PPE during decontamination.

11.4 EMERGENCY DECONTAMINATION

If emergency life-saving first aid and/or medical treatment is required, normal decontamination procedures may need to be abbreviated or omitted. The HSO/SHSO 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 safety removed, a plastic barrier between the individual and clean surfaces will be used to help prevent contaminating the inside of ambulances and/or medical personnel. Outer garments are then removed at the medical facility. No attempt will be made to wash or rinse the victim, 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. Note that heat stroke requires prompt treatment to prevent irreversible damage or death. Protective clothing must be promptly removed. Less serious forms of heat stress also require prompt attention and removal of protective clothing immediately. Unless the victim is obviously contaminated, decontamination will be omitted or minimized to allow for treatment to begin immediately.

11.5 ONSITE WASTE STORAGE AND DISPOSAL

All discarded materials, waste materials, or other objects will be handled in such a way as to preclude the potential for spreading contamination, creating a sanitary hazard, or causing litter to be left on Site. All potentially contaminated materials, e.g., clothing, gloves, etc., will be bagged or drummed as necessary, containers and/or bags properly secured, labeled and segregated for disposal.

All non-contaminated materials will be collected and bagged for appropriate disposal as normal domestic waste. The prime contractor will be responsible for disposal of all waste material at the Site following applicable DOT, OSHA and RCRA requirements.

12.0 EMERGENCY PLAN

The emergency plan outlined in this section will be known by all personnel who will be working at the Site prior to the start of work. The emergency plan will be available for use at all times during site work. As part of the onsite initial safety briefing the HSO/SHSO or designee will review this Emergency Plan with site personnel.

Various individual site characteristics will determine preliminary actions taken to assure that this emergency plan is successfully implemented in the event of a site emergency.

The HSO/SHSO will inform the site personnel about the nature and duration of work expected on the Site and the type of contaminants and possible health or safety effects of emergencies involving these contaminants. The Project Manager will make necessary arrangements to be prepared for any emergencies that could occur.

The HSO/SHSO will implement the emergency plan whenever conditions at the Site warrant such action. The HSO/SHSO will be responsible for coordination of the evacuation, emergency treatment, and emergency transport of site personnel as necessary, and notification of emergency response units and the appropriate management staff.

12.1 EVACUATION

In the event of an emergency situation, such as fire, explosion, or significant release of toxic gases, an air horn or other appropriate device will be sounded for approximately 10 seconds indicating the initiation of evacuation procedures. All personnel will evacuate and assemble near the Support Zone or a pre-determined location. The location shall be upwind of the Site where possible. For efficient and safe site evacuation and assessment of the emergency situation, the emergency coordinator will have authority to initiate action if outside services are required. Under no circumstances will incoming personnel or visitors be allowed to proceed into the area once the emergency signal has been given. The HSO/SHSO or designee must see that access for emergency equipment is provided and that all equipment has been shut down and secured once the alarm has sounded. Once the safety of all personnel is established, the emergency response groups, as necessary, will be notified by telephone of the emergency.

While working inside buildings and enclosed areas, the HSO/SHSO will ensure that all workers are familiar with the general layout of the area as well as nearest viable escape routes to minimize disorientation in the event of an emergency.

12.2 POTENTIAL OR ACTUAL FIRE

Immediate evacuation of Site (air horn will sound in 10 seconds intervals), notify local fire and police department, and other appropriate emergency response groups if an actual fire or explosion takes place.

Police	911
Fire	911

12.3 PERSONNEL INJURY

Emergency first aid will be applied on Site as deemed necessary. Then decontaminate and transport the individual to the nearest medical facility, if needed. The HSO/SHSO will supply medical data sheets to the

medical personnel and complete the accident/incident reports in accordance with Section 12.4 of the HASP (see *Attachment VII and Attachment VIII*).

The ambulance/rescue squad will be contacted for transportation to the hospital as necessary in an emergency situation. However, since some situations may require transport of an injured person by other means, the hospital route is identified below. Only in non-emergency situations shall an injured person be transported to the hospital by means other than an ambulance.

Primary hospital:

Elmhurst Hospital Center
79-01 Broadway,
Queens, NY 11373

Non-Emergency Telephone: (718) 334-4000

A map and directions to the hospital are provided in *Attachment X*.

12.4 ACCIDENT/INCIDENT REPORTING

As soon as first aid and/or emergency response needs have been met, the following parties are to be contacted by telephone:

1. Health and Safety Officer
2. Project Manager
3. The employer of any injured worker, if not an employee

Written confirmations of verbal reports are to be submitted within 24 hours by the HSO/SHSO or designee. The report form entitled "Accident/Incident Report" found in *Attachment VII* and *Attachment VIII*, is to be used for this purpose. All representatives contacted by telephone are to receive a copy of this report.

For reporting purposes, the term accident refers to fatalities, lost time injuries, spill or exposure to hazardous materials (radioactive, toxic, explosive, flammable or corrosive), fire, explosion, damage to property, or potential occurrence of the above.

Any information released from the health care provider, which is not deemed confidential patient information, is to be attached to the appropriate form. Any medical information, which is released by patient consent, is to be filed in the individual's medical records and treated as confidential.

12.5 OVERT PERSONNEL EXPOSURE

SKIN CONTACT:	Use copious amounts of soap and water. Wash/rinse affected area thoroughly, and then provide appropriate medical attention.
INHALATION:	Move to fresh air and/or, if necessary, decontaminate/transport to hospital.
INGESTION:	Decontaminate and transport to emergency medical facility.
PUNCTURE WOUND OR LACERATIONS:	Decontaminate and transport to medical facility.

12.6 ADVERSE WEATHER CONDITIONS

In the event of adverse weather conditions, the HSO/SHSO or designee will determine if work can continue without compromising the health and safety of field personnel. Some of the items to be considered prior to determining if work should continue are the following:

- Potential for heat stress and heat-related illnesses
- Potential for cold stress and cold-related illnesses
- Treacherous weather-related working conditions
- Potential for electric storms

Site activities will be limited to daylight hours (unless adequate artificial lighting is provided) and acceptable weather conditions. Inclement working conditions include heavy rain, fog, high winds, and lightning. Observe daily weather reports and evacuate if necessary in case of inclement weather conditions.

12.7 SPILL PREVENTION AND CONTROL PLAN

All small spills/environmental releases will be contained as close to the source as possible. Whenever possible, the Material Safety Data Sheet (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 will be placed directly on the substance to contain the spill and aid recovery. Any acid spills will 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. Drains or drainage areas will be blocked. All spill containment materials will be properly disposed. An exclusion zone of 50 to 100 feet around the spill area will be established depending on the size of the spill.

Construction 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 will be inspected prior to being admitted on Site. Any vehicle or piece of equipment that develops a leak while on Site will be taken out of service and removed from the job Site.

The HSO/SHSO or designee will take the following seven steps:

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 Project Manager and Health and Safety Officer.

4. Use proper PPE

5. If a flammable liquid, gas or vapor is involved, remove all ignition sources and use non-sparking and/or explosive proof equipment to contain or clean up the 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 above, onsite HSO/SHSO will coordinate activities 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; and
- Expected time of cleanup completion. If spill cleanup cannot be handled by on site personnel alone, such fact must be conveyed to the Project Manager immediately.

13.0 LOGS, REPORTS AND RECORDKEEPING

The following is a summary of required health and safety logs, reports and recordkeeping for 43-25 52nd Street, Woodside, NY.

13.1 HASP FIELD CHANGE REQUEST

In order to initiate a change to this HASP during field operations a HASP field change request must be completed. The Project Manager approval is required. The original will be kept in the project file.

13.2 MEDICAL AND TRAINING RECORDS

Medical and training records are to be maintained by the individual employer. Subcontractor employer must provide verification of training and medical qualification to the HSO/SHSO. The HSO/SHSO will keep a log of personnel meeting appropriate training and medical qualifications for site work. The log will be kept in the project file. Medical records will be maintained in accordance with §29 CFR 1910.20, Project Manager.

13.3 ON-SITE LOG

The on-site HSO/SHSO or designee will keep a daily personnel log. A copy of these logs will be sent to the Project Manager. Originals will be kept in the project file.

13.4 EXPOSURE RECORDS

Any personal monitoring results, laboratory reports, calculations and air sampling data sheets are part of an employee exposure record. These records will be kept in accordance with §29 CFR 1910.1020. The originals will be sent to the employer of the employee with a copy kept in the project file.

Employees will be notified of their personal monitoring results in accordance with applicable OSHA Standard.

13.5 ACCIDENT/INCIDENT REPORTS

An accident/incident report must be completed following procedures given in Section 11.4 of this HASP. The originals will be sent to the employer of the affected employee. A copy of the forms will be kept in the project file.

13.6 OSHA FORM 300

An OSHA Form 300 (Log of Occupational Injuries and Illnesses) will be kept at the project Site. All recordable injuries or illnesses will be recorded on this form. At the end of the project, the original will be sent to the Project Manager for filing. Subcontractor employees must also meet the requirements of maintaining an OSHA 300 Form.

13.7 HEALTH AND SAFETY FIELD LOG BOOKS

The HSO/SHSO or designee will maintain a health and safety logbook in which daily site conditions, activities, personnel, calibration records, monitoring results and significant events will be recorded. The original logbooks will become part of the exposure records file and will be maintained in the project files.

13.8 MATERIAL SAFETY DATA SHEETS

Material Safety Data Sheets (MSDS) will be obtained and kept on file at the project Site for each hazardous chemical brought to, used, or stored at the Site. MSDS for contaminants of concern are provided in *Attachment II*.

14.0 AUTHORIZATIONS

Personnel authorized to enter the Site while operations are being conducted must be approved by the HSO. Authorization will involve completion of appropriate training courses and medical examination requirements as required by OSHA 29 CFR 1910.120 and review and sign-off on this HASP.

1. Contractor and subcontractor personnel authorized to perform work at 43-25 52nd Street, Woodside, NY.

1. _____	11. _____
2. _____	12. _____
3. _____	13. _____
4. _____	14. _____
5. _____	15. _____
6. _____	16. _____
7. _____	17. _____
8. _____	18. _____
9. _____	19. _____
10. _____	20. _____

2. Other Personnel Authorized to Enter Site:

1. _____	11. _____
2. _____	12. _____
3. _____	13. _____
4. _____	14. _____
5. _____	15. _____
6. _____	16. _____
7. _____	17. _____
8. _____	18. _____
9. _____	19. _____
10. _____	20. _____

15.0 FIELD TEAM REVIEW

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

Team Members:
I have read the plan and/or been verbally advised about the plan, understand it, and agree to comply with all of its provisions. I understand that I could be prohibited from working on the project and may be subject to disciplinary actions for violating any of the safety requirements specified in the Health and Safety Plan.

Print Name	Signature	Affiliation/Title	Date

Appendices

Attachment I – Field Change Request Form

Health & Safety Plan
Change Notice

PROJECT: H&S-CN

1) HASP VERSION:_____ SECTION:_____ PAGE(s):_____

RE: __ Change to existing HASP Anticipated Revision date _____

__ Addition to existing HASP

__ Other:_____

_____CONT.___

2) PROPOSED CHANGE: _____

_____

_____

_____CONT.__

3) REASON FOR PROPOSED CHANGE(s)

__ Required by SPEC or Change Order
__ Disposition of Deficiency
__ Change in Regulatory or Other Requirement
__ Operational Experience

__ Other: _____

_____CONT.__

4) EXHIBITS ATTACHED __ NO __ YES (if YES, describe)_____

_____CONT.__

5) APPROVALS PROJECT MANAGER: _____ Date: _____

SITE MANAGER: _____ Date: _____

H&S MANAGER: _____ Date: _____

Client Approval Required __ NO __ YES (if YES, date submitted) _____.

6) CLIENT APPROVAL ___ APPROVED __ REMANDED __ REJECTED

Comments:_____

_____

_____CONT.___

Client Representative:_____ Date: _____

7) DISTRIBUTION AFTER APPROVAL

X HASP UPDATE LIST __ OTHER: _____
X CLIENT _____
X PROJECT FILES _____

8) PREPARED BY:_____ Date: _____

Title: _____

Attachment II – Material Safety Data Sheets

SAFETY DATA SHEET

Version 8.2
Revision Date 07/23/2022
Print Date 10/08/2022

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

1.1 Product identifiers

Product name : Vinylidene chloride

Product Number : 48526
Brand : Supelco
Index-No. : 602-025-00-8
CAS-No. : 75-35-4

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 Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Flammable liquids (Category 1), H224
Acute toxicity, Oral (Category 3), H301
Acute toxicity, Inhalation (Category 4), H332
Eye irritation (Category 2A), H319
Carcinogenicity (Category 2), H351
Specific target organ toxicity - repeated exposure, Inhalation (Category 1), Nose, H372
Specific target organ toxicity - repeated exposure, Oral (Category 2), Liver, H373
Short-term (acute) aquatic hazard (Category 2), H401
Long-term (chronic) aquatic hazard (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

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Pictogram	
Signal Word	Danger

Hazard statement(s)

H224	Extremely flammable liquid and vapor.
H301	Toxic if swallowed.
H319	Causes serious eye irritation.
H332	Harmful if inhaled.
H351	Suspected of causing cancer.
H372	Causes damage to organs (Nose) through prolonged or repeated exposure if inhaled.
H373	May cause damage to organs (Liver) through prolonged or repeated exposure if swallowed.
H411	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.
P210	Keep away from heat/ sparks/ open flames/ hot surfaces. No smoking.
P233	Keep container tightly closed.
P240	Ground/bond container and receiving equipment.
P241	Use explosion-proof electrical/ ventilating/ lighting/ equipment.
P242	Use only non-sparking tools.
P243	Take precautionary measures against static discharge.
P260	Do not breathe dust/ fume/ gas/ mist/ vapors/ 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.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P310 + P330	IF SWALLOWED: Immediately call a POISON CENTER/ doctor. Rinse mouth.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/ shower.
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.
P337 + P313	If eye irritation persists: Get medical advice/ attention.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
P391	Collect spillage.
P403 + P235	Store in a well-ventilated place. Keep cool.
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

May form explosive peroxides.

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SECTION 3: Composition/information on ingredients

3.1 Substances

Formula	:	C2H2Cl2
Molecular weight	:	96.94 g/mol
CAS-No.	:	75-35-4
EC-No.	:	200-864-0
Index-No.	:	602-025-00-8

Component	Classification	Concentration
1,1-Dichloroethene		
	Flam. Liq. 1; Acute Tox. 4; Eye Irrit. 2A; Carc. 2; STOT RE 1; STOT RE 2; Aquatic Acute 2; Aquatic Chronic 3; H224, H302, H332, H319, H351, H372, H373, H401, H412	<= 100 %

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

SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice
Show this material safety data sheet to the doctor in attendance.

If inhaled
After inhalation: fresh air. Immediately call in physician. If breathing stops: immediately apply artificial respiration, if necessary also oxygen.

In case of skin contact
In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower. Consult a physician.

In case of eye contact
After eye contact: rinse out with plenty of water. Call in ophthalmologist. Remove contact lenses.

If swallowed
If swallowed: give water to drink (two glasses at most). Seek medical advice immediately. In exceptional cases only, if medical care is not available within one hour, induce vomiting (only in persons who are wide awake and fully conscious), administer activated charcoal (20 - 40 g in a 10% slurry) and consult a doctor as quickly as possible.

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

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SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Water Foam Carbon dioxide (CO2) Dry powder

Unsuitable extinguishing media
For this substance/mixture no limitations of extinguishing agents are given.

5.2 Special hazards arising from the substance or mixture

Carbon oxides
Hydrogen chloride gas
Combustible.
Pay attention to flashback.
Vapors are heavier than air and may spread along floors.
Development of hazardous combustion gases or vapours possible in the event of fire.
Forms explosive mixtures with air at ambient temperatures.

5.3 Advice for firefighters

Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

5.4 Further information

Remove container from danger zone and cool with water. Suppress (knock down) gases/vapors/mists with a water spray jet. Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Advice for non-emergency personnel: Do not breathe vapors, aerosols. Avoid substance contact. Ensure adequate ventilation. Keep away from heat and sources of ignition.
Evacuate the danger area, observe emergency procedures, consult an expert.
For personal protection see section 8.

6.2 Environmental precautions

Do not let product enter drains. Risk of explosion.

6.3 Methods and materials for containment and cleaning up

Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up carefully with liquid-absorbent material (e.g. Chemizorb®). Dispose of properly. Clean up affected area.

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on safe handling
Work under hood. Do not inhale substance/mixture. Avoid generation of vapours/aerosols.

Advice on protection against fire and explosion

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Keep away from open flames, hot surfaces and sources of ignition.Take precautionary measures against static discharge.

Hygiene measures
Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions
Keep container tightly closed in a dry and well-ventilated place. Keep away from heat and sources of ignition. Keep locked up or in an area accessible only to qualified or authorized persons.

Storage stability
Recommended storage temperature
2 - 8 °C

Air and moisture sensitive. Store under inert gas.

Storage class
Storage class (TRGS 510): 3: Flammable liquids

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

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
1,1-Dichloroethene	75-35-4	TWA	5 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Not classifiable as a human carcinogen		
		Potential Occupational Carcinogen		
		PEL	1 ppm 4 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

8.2 Exposure controls

Appropriate engineering controls
Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

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). Safety glasses

Body Protection
Flame retardant antistatic protective clothing.

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Respiratory protection
required when vapours/aerosols are generated.
Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

Control of environmental exposure
Do not let product enter drains. Risk of explosion.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid, clear Color: colorless
b)	Odor	No data available
c)	Odor Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point: -122.0 °C (-187.6 °F)
f)	Initial boiling point and boiling range	30.0 - 32.0 °C 86.0 - 89.6 °F at 1,013.25 hPa
g)	Flash point	-23.0 °C (-9.4 °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: 15.5 %(V) Lower explosion limit: 6.5 %(V)
k)	Vapor pressure	667.3 hPa at 20.0 °C (68.0 °F) 2,137.4 hPa at 55.0 °C(131.0 °F)
l)	Vapor density	No data available
m)	Density	1.21 g/cm3 at 20 °C (68 °F)
	Relative density	No data available
n)	Water solubility	2.5 g/l at 20.5 °C (68.9 °F) - soluble
o)	Partition coefficient: n-octanol/water	No data available
p)	Autoignition temperature	520.0 °C (968.0 °F)
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	none

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9.2 Other safety information
No data available

SECTION 10: Stability and reactivity

10.1 Reactivity
Vapors may form explosive mixture with air.

10.2 Chemical stability
The product is chemically stable under standard ambient conditions (room temperature) .
Test for peroxide formation before using or discard after 3 months.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
Warming.

10.5 Incompatible materials
various plastics, Strong oxidizing agents

10.6 Hazardous decomposition products
In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - 1,500 mg/kg
Acute toxicity estimate Inhalation - 4 h - 11.1 mg/l - vapor

(Expert judgment)
Remarks: Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)
Dermal: No data available

Skin corrosion/irritation
Skin - reconstructed human epidermis (RhE)
Result: No skin irritation - 3 - 60 min
(Regulation (EC) No. 440/2008, Annex, B.40)

Serious eye damage/eye irritation
Eyes - Bovine cornea
Result: Causes serious eye irritation. - 10 min
(OECD Test Guideline 437)

Respiratory or skin sensitization
Local lymph node assay (LLNA) - Mouse
Result: negative
(OECD Test Guideline 429)

Germ cell mutagenicity
Based on available data the classification criteria are not met.

Test Type: comet assay
Species: Rat

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Cell type: Bone marrow
Application Route: inhalation (vapor)
Method: OECD Test Guideline 489
Result: positive

Test Type: Micronucleus test
Species: Mouse
Cell type: Bone marrow
Application Route: Inhalation
Method: OECD Test Guideline 474
Result: negative

Test Type: Micronucleus test
Species: Mouse
Cell type: Bone marrow
Application Route: Oral
Method: OECD Test Guideline 474
Result: negative

Test Type: Mutagenicity (mammal cell test): chromosome aberration.
Species: Rat
Cell type: Implant
Application Route: Inhalation
Method: OECD Test Guideline 478
Result: negative

Carcinogenicity
Suspected of causing cancer.

IARC:	2B - Group 2B: Possibly carcinogenic to humans (1,1-Dichloroethene)
NTP:	No ingredient 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

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. - Nose
Oral - May cause damage to organs through prolonged or repeated exposure. - Liver

Aspiration hazard
No data available

11.2 Additional Information

Repeated dose toxicity - Rat - female - Oral - 90 Days - NOAEL (No observed adverse effect level) - 9 mg/kg - LOAEL (Lowest observed adverse effect level) - 14 mg/kg
Remarks: (ECHA)

RTECS: KV9275000
Nausea, Headache, Vomiting, Dizziness, Drowsiness, Confusion., Incoordination., Central nervous system depression

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

After absorption:

Headache
somnolence
Unconsciousness
Coma

After absorption of large quantities:

Damage to:

Liver
Kidney
Lungs
Central nervous system

This substance should be handled with particular care.

Stomach - Irregularities - Based on Human Evidence

Stomach - Irregularities - Based on Human Evidence

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish	flow-through test LC50 - Pimephales promelas (fathead minnow) - 108 mg/l - 96 h Remarks: (ECHA)
Toxicity to daphnia and other aquatic invertebrates	static test EC50 - Daphnia magna (Water flea) - 37 mg/l - 48 h (OECD Test Guideline 202) Remarks: (ECHA)
Toxicity to algae	static test EC50 - Chlamydomonas reinhardtii (green algae) - 9.12 mg/l - 72 h Remarks: (ECHA)
	Remarks: (ECHA)
Toxicity to bacteria	EC50 - Pseudomonas putida - > 2,000 mg/l - 17 h Remarks: (IUCLID)

12.2 Persistence and degradability

Biodegradability	Result: 0 % - Not readily biodegradable. (OECD Test Guideline 301D)

12.3 Bioaccumulative potential

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Bioaccumulation	Cyprinus carpio (Carp) - 6 Weeks at 25 °C - 0.5 mg/l(1,1-Dichloroethene) Bioconcentration factor (BCF): 2.5 - 6.4 (OECD Test Guideline 305C)

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 Endocrine disrupting properties
No data available

12.7 Other adverse effects
Discharge into the environment must be avoided.

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product
Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself. See www.retrologistik.com for processes regarding the return of chemicals and containers, or contact us there if you have further questions.

SECTION 14: Transport information

DOT (US)
UN number: 1303 Class: 3 Packing group: I
Proper shipping name: Vinylidene chloride, stabilized
Reportable Quantity (RQ): 100 lbs
Reportable Quantity (RQ): 100 lbs
1) Marine pollutant: yesPoison Inhalation Hazard: No

IMDG
UN number: 1303 Class: 3 Packing group: I EMS-No: F-E, S-D
Proper shipping name: VINYLIDENE CHLORIDE, STABILIZED
Marine pollutant : yes
Marine pollutant : yes

IATA
UN number: 1303 Class: 3 Packing group: I
Proper shipping name: Vinylidene chloride, stabilized

SECTION 15: Regulatory information

SARA 302 Components
This material does not contain any components with a section 302 EHS TPQ.

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

	CAS-No.	Revision Date
1,1-Dichloroethene	75-35-4	2021-01-12

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

Reportable Quantity : D029 lbs

Massachusetts Right To Know Components
No components are subject to the Massachusetts Right to Know Act.

SECTION 16: Other information

Further information
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. 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.

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Version: 8.2 Revision Date: 07/23/2022 Print Date: 10/08/2022

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SAFETY DATA SHEET

Version 6.4
Revision Date 07/22/2022
Print Date 10/08/2022

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

1.1 Product identifiers

Product name : 1,1,1-Trichloroethane

Product Number : 235571
Brand : Aldrich
Index-No. : 602-013-00-2
CAS-No. : 71-55-6

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 Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Acute toxicity, Inhalation (Category 4), H332
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 Warning

Hazard statement(s)
H315 Causes skin irritation.

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H332	Harmful if inhaled.

Precautionary statement(s)

P261	Avoid breathing dust/ fume/ gas/ mist/ vapors/ spray.
P264	Wash skin thoroughly after handling.
P271	Use only outdoors or in a well-ventilated area.
P280	Wear protective gloves.
P302 + P352	IF ON SKIN: Wash with plenty of soap and water.
P304 + P340 + P312	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.
P332 + P313	If skin irritation occurs: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.

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

SECTION 3: Composition/information on ingredients

3.1 Substances

Synonyms	:	'Chlorothene' Methylchloroform
Formula	:	$C_2H_3Cl_3$
Molecular weight	:	133.40 g/mol
CAS-No.	:	71-55-6
EC-No.	:	200-756-3
Index-No.	:	602-013-00-2

Component	Classification	Concentration
1,1,1-Trichloroethane		
	Acute Tox. 4; Aquatic Acute 3; Ozone 1; H332, H402, H420	<= 100 %

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

SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice
Consult a physician. Show this material 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
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

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If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture
Carbon oxides
Hydrogen chloride gas

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

5.4 Further information
No data available

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Avoid breathing vapors, 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.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on safe handling
Avoid contact with skin and eyes. Avoid inhalation of vapor or mist.

Hygiene measures
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.
For precautions see section 2.2.

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7.2 Conditions for safe storage, including any incompatibilities

Storage conditions
Keep container tightly closed in a dry and well-ventilated place.

Storage class
Storage class (TRGS 510): 6.1D: 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

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
1,1,1-Trichloroethane	71-55-6	TWA	350 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Not classifiable as a human carcinogen		
		STEL	450 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Not classifiable as a human carcinogen		
		C	350 ppm 1,900 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	350 ppm 1,900 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		PEL	350 ppm 1,900 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		STEL	450 ppm 2,450 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		C	800 ppm	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
1,1,1-Trichloroethane	71-55-6	Methyl chloroform	20parts per million	In end-exhaled air	ACGIH - Biological Exposure Indices (BEI)
	Remarks	Prior to last shift of workweek			

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		Methyl chloroform	700 µg/l	Urine	ACGIH - Biological Exposure Indices (BEI)
		End of shift			

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
Do not let product enter drains.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid, clear Color: colorless
b)	Odor	No data available
c)	Odor Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	-34.99 °C (-30.98 °F)
f)	Initial boiling point and boiling range	72.0 - 75.0 °C 161.6 - 167.0 °F
g)	Flash point	()No data available

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h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	Upper explosion limit: 15 %(V) Lower explosion limit: 7.5 %(V)
k)	Vapor pressure	133.3 hPa at 20.0 °C (68.0 °F)
l)	Vapor density	No data available
m)	Density	1.34 g/cm3
	Relative density	No data available
n)	Water solubility	1.25 g/l at 23 °C (73 °F)
o)	Partition coefficient: n-octanol/water	log Pow: 2.49
p)	Autoignition temperature	537.0 °C (998.6 °F)
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information
No data available

SECTION 10: Stability and reactivity

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.
Contains the following stabilizer(s):
Low alkyl epoxide (0.05 %)

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
No data available

10.5 Incompatible materials
Strong oxidizing agents, Potassium, Magnesium, Sodium/sodium oxides, Zinc, Strong bases

10.6 Hazardous decomposition products
In the event of fire: see section 5

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SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - 9,600 mg/kg
Symptoms: Nausea, Vomiting, Risk of aspiration upon vomiting., Aspiration may cause pulmonary edema and pneumonitis.
Remarks: (RTECS)
Acute toxicity estimate Inhalation - 4 h - 19 mg/l - vapor(Calculation method)

Inhalation: absorption
Dermal: absorption

Skin corrosion/irritation
Repeated or prolonged exposure may cause skin irritation and dermatitis, due to degreasing properties of the product.

Serious eye damage/eye irritation
No data available

Respiratory or skin sensitization
Maximization Test - Guinea pig
Result: negative
(OECD Test Guideline 406)

Germ cell mutagenicity
Test Type: Ames test
Test system: Salmonella typhimurium
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 471
Result: negative

Carcinogenicity
No data available

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

11.2 Additional Information

burning sensation, Cough, wheezing, laryngitis, Shortness of breath, Headache, Nausea, Vomiting, Exposure to and/or consumption of alcohol may increase toxic effects., prolonged or repeated exposure can cause:, narcosis, Liver injury may occur., Kidney injury may occur.
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Systemic effects:

After absorption:

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Headache
Dizziness
Tiredness
narcosis
drop in blood pressure
Unconsciousness

After uptake of large quantities:

depressed respiration
cardiovascular disorders

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish	static test LC50 - Pimephales promelas (fathead minnow) - 52.8 mg/l - 96 h (US-EPA)
Toxicity to daphnia and other aquatic invertebrates	static test EC50 - Daphnia magna (Water flea) - > 530 mg/l - 48 h (US-EPA)
Toxicity to algae	static test EC50 - Pseudokirchneriella subcapitata (algae) - 41 mg/l - 72 h (OECD Test Guideline 201)
	static test NOEC - Pseudokirchneriella subcapitata (green algae) - 7.8 mg/l - 72 h (OECD Test Guideline 201)
	IC50 - Scenedesmus capricornutum (fresh water algae) - > 670 mg/l - 96 h Remarks: (Lit.)
Toxicity to bacteria	EC50 - Sewage sludge - 360 mg/l - 30 min (OECD Test Guideline 209)

12.2 Persistence and degradability

Biodegradability	Result: 0 % - Not readily biodegradable. (OECD Test Guideline 301C)

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 Endocrine disrupting properties

No data available

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12.7 Other adverse effects

Biological effects:
Hazard for drinking water supplies.
Further information on ecology
Substance which may present a danger to the structure and/or the functioning of the stratospheric ozone layer according to EC Regulation No 2037/2000 (listed in Annex I, Group V).
Discharge into the environment must be avoided.

SECTION 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.

Contaminated packaging
Dispose of as unused product.

SECTION 14: Transport information

DOT (US)
UN number: 2831 Class: 6.1 Packing group: III
Proper shipping name: 1,1,1-Trichloroethane
Reportable Quantity (RQ): 1000 lbs
Poison Inhalation Hazard: No

IMDG
UN number: 2831 Class: 6.1 Packing group: III EMS-No: F-A, S-A
Proper shipping name: 1,1,1-TRICHLOROETHANE

IATA
UN number: 2831 Class: 6.1 Packing group: III
Proper shipping name: 1,1,1-Trichloroethane

SECTION 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:

	CAS-No.	Revision Date
1,1,1-Trichloroethane	71-55-6	2020-07-14

SARA 311/312 Hazards
Acute Health Hazard

Massachusetts Right To Know Components

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	CAS-No.	Revision Date
1,1,1-Trichloroethane	71-55-6	2020-07-14

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
1,1,1-Trichloroethane	71-55-6	2020-07-14

New Jersey Right To Know Components

	CAS-No.	Revision Date
1,1,1-Trichloroethane	71-55-6	2020-07-14

SECTION 16: Other information

Further information

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Version: 6.4 Revision Date: 07/22/2022 Print Date: 10/08/2022

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SAFETY DATA SHEET

Version 6.2
Revision Date 01/15/2020
Print Date 12/10/2022

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

1.1 Product identifiers

Product name : 1,1,1,2-Tetrachloroethane

Product Number : T7209
Brand : SIGALD
CAS-No. : 630-20-6

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 Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 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 4), H332
Serious eye damage (Category 1), H318
Carcinogenicity (Category 2), H351
Short-term (acute) aquatic hazard (Category 3), H402
Long-term (chronic) aquatic hazard (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

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Hazard statement(s)	
H302 + H332	Harmful if swallowed or if inhaled.
H318	Causes serious eye damage.
H351	Suspected of causing cancer.
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.
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.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P312 + P330	IF SWALLOWED: Call a POISON CENTER/doctor if you feel unwell. Rinse mouth.
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 + P310	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER/doctor.
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

SECTION 3: Composition/information on ingredients

3.1 Substances

Formula	:	$C_2H_2Cl_4$
Molecular weight	:	167.85 g/mol
CAS-No.	:	630-20-6
EC-No.	:	211-135-1

Component	Classification	Concentration
1,1,1,2-Tetrachloroethane		
	Acute Tox. 4; Eye Dam. 1; Carc. 2; Aquatic Acute 3; Aquatic Chronic 3; H302, H332, H318, H351, H402, H412	<= 100 %

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

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SECTION 4: First aid measures

4.1 Description of first aid measures

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.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
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture
Carbon oxides, Hydrogen chloride gas

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

5.4 Further information
No data available

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures
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. Discharge into the environment must be avoided.

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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.

SECTION 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.
Storage class (TRGS 510): 6.1C: Combustible, acute toxic Cat.3 / toxic compounds or compounds which causing chronic effects

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

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Components with workplace control parameters
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
Tightly fitting safety goggles. Faceshield (8-inch minimum). Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact
Material: Fluorinated rubber
Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Splash contact
Material: Fluorinated rubber
Minimum layer thickness: 0.7 mm

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Break through time: 480 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, 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 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. Discharge into the environment must be avoided.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid, clear Colour: colourless
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	-70.2 °C (-94.4 °F)
f)	Initial boiling point and boiling range	138 °C 280 °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	18.7 hPa at 25.0 °C (77.0 °F)
l)	Vapour density	No data available

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m)	Relative density	1.598 g/cm3 at 25 °C (77 °F)
n)	Water solubility	slightly soluble
o)	Partition coefficient: n-octanol/water	log Pow: 2.66
p)	Auto-ignition temperature	No data available
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information
No data available

SECTION 10: Stability and reactivity

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
No data available

10.5 Incompatible materials
Strong oxidizing agents, Strong bases

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

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - 670.0 mg/kg
LC50 Inhalation - Rat - 4 h - 2100 ppm
Remarks: Diarrhoea
LD50 Dermal - Rabbit - 20,000 mg/kg
No data available

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Skin corrosion/irritation

Serious eye damage/eye irritation
Eyes - Rabbit
Result: Severe eye irritation - 24 h
(Draize Test)

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 (1,1,1,2-Tetrachloroethane)
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
No data available

Aspiration hazard
No data available

Additional Information
RTECS: KI8450000

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

Nerves. -

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish	LC50 - Lepomis macrochirus (Bluegill) - 16.00 - 24.00 mg/l - 96 h
Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - 17.00 - 30.00 mg/l - 48 h

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
No data available

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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.
No data available

SECTION 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.

SECTION 14: Transport information

DOT (US)
UN number: 2810 Class: 6.1 Packing group: III
Proper shipping name: Toxic, liquids, organic, n.o.s. (1,1,1,2-Tetrachloroethane)
Reportable Quantity (RQ): 100 lbs
Poison Inhalation Hazard: No

IMDG
UN number: 2810 Class: 6.1 Packing group: III EMS-No: F-A, S-A
Proper shipping name: TOXIC LIQUID, ORGANIC, N.O.S. (1,1,1,2-Tetrachloroethane)

IATA
UN number: 2810 Class: 6.1 Packing group: III
Proper shipping name: Toxic liquid, organic, n.o.s. (1,1,1,2-Tetrachloroethane)

SECTION 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.

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

Massachusetts Right To Know Components
No components are subject to the Massachusetts Right to Know Act.

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
1,1,1,2-Tetrachloroethane	630-20-6	2018-04-24

SECTION 16: Other information

Further information
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Version: 6.2 Revision Date: 01/15/2020 Print Date: 12/10/2022

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SAFETY DATA SHEET

Version 6.3
Revision Date 10/29/2022
Print Date 12/10/2022

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

1.1 Product identifiers

Product name : 1,2,4-Trimethylbenzene

Product Number : T73601
Brand : Aldrich
Index-No. : 601-043-00-3
CAS-No. : 95-63-6

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 Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Flammable liquids (Category 3), H226
Acute toxicity, Inhalation (Category 4), H332
Skin irritation (Category 2), H315
Eye irritation (Category 2A), H319
Specific target organ toxicity - single exposure (Category 3), Respiratory system, H335
Aspiration hazard (Category 1), H304
Short-term (acute) aquatic hazard (Category 2), H401
Long-term (chronic) aquatic hazard (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

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Pictogram	
Signal Word	Danger

Hazard statement(s)

H226	Flammable liquid and vapor.
H304	May be fatal if swallowed and enters airways.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H332	Harmful if inhaled.
H335	May cause respiratory irritation.
H411	Toxic to aquatic life with long lasting effects.

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.
P261	Avoid breathing dust/ fume/ gas/ mist/ vapors/ spray.
P264	Wash skin thoroughly after handling.
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P280	Wear protective gloves/ eye protection/ face protection.
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.
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.
P331	Do NOT induce vomiting.
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.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
P391	Collect spillage.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P403 + P235	Store in a well-ventilated place. Keep cool.
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

SECTION 3: Composition/information on ingredients

3.1 Substances

Formula : C_9H_{12}

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Molecular weight	:	120.19 g/mol
CAS-No.	:	95-63-6
EC-No.	:	202-436-9
Index-No.	:	601-043-00-3

Component	Classification	Concentration
1,2,4-Trimethylbenzene		
	Flam. Liq. 3; Acute Tox. 4; Skin Irrit. 2; Eye Irrit. 2A; STOT SE 3; Asp. Tox. 1; Aquatic Acute 2; Aquatic Chronic 2; H226, H332, H315, H319, H335, H304, H401, H411	<= 100 %

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

SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice
Consult a physician. Show this material 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
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Dry powder Dry sand

Unsuitable extinguishing media
Do NOT use water jet.

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5.2 Special hazards arising from the substance or mixture
Carbon oxides

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

5.4 Further information
Use water spray to cool unopened containers.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapors accumulating to form explosive concentrations. Vapors can accumulate in low areas.
For personal protection see section 8.

6.2 Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

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

6.4 Reference to other sections
For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on safe handling
Avoid contact with skin and eyes. Avoid inhalation of vapor or mist.

Advice on protection against fire and explosion
Keep away from sources of ignition - No smoking.Take measures to prevent the build up of electrostatic charge.

Hygiene measures
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions
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
Storage class (TRGS 510): 3: Flammable liquids

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

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SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
1,2,4-Trimethylbenzene	95-63-6	TWA	25 ppm 125 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	25 ppm	USA. ACGIH Threshold Limit Values (TLV)
		PEL	25 ppm 125 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

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: Fluorinated rubber
Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.4 mm
Break through time: 30 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 EC 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.

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Body Protection
Complete suit protecting against chemicals, Flame retardant antistatic protective clothing., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type 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. Discharge into the environment must be avoided.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid, clear Color: colorless
b)	Odor	No data available
c)	Odor Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	-43.7 °C (-46.7 °F)
f)	Initial boiling point and boiling range	168.0 - 169.0 °C 334.4 - 336.2 °F
g)	Flash point	48.0 °C (118.4 °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: 6.4 %(V) Lower explosion limit: 0.9 %(V)
k)	Vapor pressure	2.3 hPa at 20.0 °C (68.0 °F)
l)	Vapor density	No data available
m)	Density	0.88 g/cm3
	Relative density	No data available
n)	Water solubility	0.057 g/l at 25 °C (77 °F) - slightly soluble
o)	Partition coefficient: n-octanol/water	No data available
p)	Autoignition temperature	515.0 °C (959.0 °F)
q)	Decomposition	No data available

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temperature

r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information
No data available

SECTION 10: Stability and reactivity

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
Heat, flames and sparks.

10.5 Incompatible materials
Strong oxidizing agents

10.6 Hazardous decomposition products
In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - male - 6,000 mg/kg
Inhalation: No data available
Dermal: No data available
No data available

Skin corrosion/irritation
Remarks: No data available

Serious eye damage/eye irritation
Remarks: No data available

Respiratory or skin sensitization
No data available

Germ cell mutagenicity
Test Type: in vitro test
Test system: S. typhimurium
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 471
Result: negative

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Test Type: In vivo micronucleus test
Species: Rat
Cell type: Bone marrow
Application Route: Intraperitoneal
Method: Mutagenicity (micronucleus test)
Result: negative

Carcinogenicity

IARC: No ingredient 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 ingredient 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
No data available

Aspiration hazard
No data available

11.2 Additional Information

RTECS: DC3325000
prolonged or repeated exposure can cause:, narcosis, Bronchitis., Symptoms and signs include headache, dizziness, fatigue, muscular weakness, drowsiness and in extreme cases, loss of consciousness., To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Central nervous system -

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish	flow-through test LC50 - Pimephales promelas (fathead minnow) - 7.72 mg/l - 96.0 h
Toxicity to daphnia and other aquatic invertebrates	static test EC50 - Daphnia magna (Water flea) - 3.6 mg/l - 48 h (OECD Test Guideline 202)

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
No data available

12.4 Mobility in soil
No data available

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12.5 Results of PBT and vPvB assessment

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

12.6 Endocrine disrupting properties

No data available

12.7 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.

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging
Dispose of as unused product.

SECTION 14: Transport information

DOT (US)
UN number: 3295 Class: 3 Packing group: III
Proper shipping name: Hydrocarbons, liquid, n.o.s.
Reportable Quantity (RQ):
Poison Inhalation Hazard: No

IMDG
UN number: 3295 Class: 3 Packing group: III EMS-No: F-E, S-D
Proper shipping name: HYDROCARBONS, LIQUID, N.O.S.

IATA
UN number: 3295 Class: 3 Packing group: III
Proper shipping name: Hydrocarbons, liquid, n.o.s.

SECTION 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:

	CAS-No.	Revision Date
1,2,4-Trimethylbenzene	95-63-6	2007-07-01

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SARA 311/312 Hazards
Fire Hazard, Acute Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
1,2,4-Trimethylbenzene	95-63-6	2007-07-01

No components are subject to the Massachusetts Right to Know Act.

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
1,2,4-Trimethylbenzene	95-63-6	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
1,2,4-Trimethylbenzene	95-63-6	2007-07-01

SECTION 16: Other information

Further information

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Version: 6.3 Revision Date: 10/29/2022 Print Date: 12/10/2022

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SAFETY DATA SHEET

Version 6.5
Revision Date 09/06/2022
Print Date 12/10/2022

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

1.1 Product identifiers

Product name : 1,3-Butadiene

Product Number : 295035
Brand : Aldrich
Index-No. : 601-013-00-X
CAS-No. : 106-99-0

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 Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Flammable gases (Category 1), H220
Gases under pressure (Liquefied gas), H280
Germ cell mutagenicity (Category 1B), H340

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

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Hazard statement(s)

H220	Extremely flammable gas.
H280	Contains gas under pressure; may explode if heated.
H340	May cause genetic defects.

Precautionary statement(s)

P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P210	Keep away from heat/ sparks/ open flames/ hot surfaces. No smoking.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P377	Leaking gas fire: Do not extinguish, unless leak can be stopped safely.
P381	Eliminate all ignition sources if safe to do so.
P405	Store locked up.
P410 + P403	Protect from sunlight. Store in a well-ventilated place.
P501	Dispose of contents/ container to an approved waste disposal plant.

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

SECTION 3: Composition/information on ingredients

3.1 Substances

Formula	:	C_4H_6
Molecular weight	:	54.09 g/mol
CAS-No.	:	106-99-0
EC-No.	:	203-450-8
Index-No.	:	601-013-00-X

Component	Classification	Concentration
1,3-butadiene		
	Flam. Gas 1; Press. Gas Liquefied gas; Muta. 1B; H220, H280, H340	<= 100 %

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

SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice
Show this material safety data sheet to the doctor in attendance.

If inhaled
After inhalation: fresh air. Call in physician.

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In case of skin contact
In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower. Consult a physician.

In case of eye contact
After eye contact: rinse out with plenty of water. Call in ophthalmologist. Remove contact lenses.

If swallowed
After swallowing: immediately make victim drink water (two glasses at most). Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Water Foam Carbon dioxide (CO2) Dry powder

Unsuitable extinguishing media
For this substance/mixture no limitations of extinguishing agents are given.

5.2 Special hazards arising from the substance or mixture
Carbon oxides
Combustible.
Pay attention to flashback.
Development of hazardous combustion gases or vapours possible in the event of fire.

5.3 Advice for firefighters
Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

5.4 Further information
Remove container from danger zone and cool with water. Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures
Advice for non-emergency personnel: Do not breathe gas. Avoid substance contact. Ensure adequate ventilation. Evacuate the danger area, observe emergency procedures, consult an expert.
For personal protection see section 8.

6.2 Environmental precautions
Do not let product enter drains.

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6.3 Methods and materials for containment and cleaning up

Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Stop flow of gas, move leaking cylinder to open air if without risk.

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on safe handling

Work under hood. Do not inhale substance/mixture. Avoid generation of vapours/aerosols.

Advice on protection against fire and explosion

Keep away from open flames, hot surfaces and sources of ignition.

Hygiene measures

Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions

Tightly closed. Keep locked up or in an area accessible only to qualified or authorized persons. Keep away from combustible materials and sources of ignition.

Storage stability

Recommended storage temperature
2 - 8 °C

Contents under pressure. Air sensitive. Light sensitive. Shock or heat may detonate May explode when heated. Handle and store under inert gas.

Storage class

Storage class (TRGS 510): 2A: Gases

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
1,3-butadiene	106-99-0	TWA	2 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Suspected human carcinogen		

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		TWA	1 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		STEL	5 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Potential Occupational Carcinogen		
		PEL	1 ppm	OSHA Specifically Regulated Chemicals/Carcinogens
		OSHA specifically regulated carcinogen		
		STEL	5 ppm	OSHA Specifically Regulated Chemicals/Carcinogens
		OSHA specifically regulated carcinogen		
		PEL	1 ppm 2.2 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		STEL	5 ppm 11 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
1,3-butadiene	106-99-0	1,2 Dihydroxy-4-(N-acetylcysteinyl)-butane	2.5 mg/l	Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift (As soon as possible after exposure ceases)			
		Mixture of N-1 and N-2(hydroxybutenyl)valine	2.5picomoles per gram Hemoglobin	Hemoglobin (Hb) adducts in blood	ACGIH - Biological Exposure Indices (BEI)
		Not critical			

8.2 Exposure controls

Appropriate engineering controls
Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

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). Safety glasses

Skin protection
required

Body Protection
Flame retardant antistatic protective clothing.

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Respiratory protection
required when vapours/mists are generated. Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

Control of environmental exposure
Do not let product enter drains.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: Liquefied gas
b)	Odor	No data available
c)	Odor Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: -109 °C (-164 °F) - lit.
f)	Initial boiling point and boiling range	-4.5 °C 23.9 °F - lit.
g)	Flash point	-76 °C (-105 °F) - closed cup - Tested according to Annex V of Directive 67/548/EEC.
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	Upper explosion limit: 12 %(V) 16.3 %(V) Lower explosion limit: 2 %(V)1.4 %(V)
k)	Vapor pressure	ca.2,400 hPa at 20 °C (68 °F) 3,200 hPa at 30 °C(86 °F) 5,700 hPa at 50 °C(122 °F)
l)	Vapor density	No data available
m)	Density	0.62 g/cm3 at 20 °C (68 °F) - lit.
	Relative density	No data available
n)	Water solubility	0.5 g/l at 20 °C (68 °F) - Tested according to Annex V of Directive 67/548/EEC.
o)	Partition coefficient: n-octanol/water	log Pow: 1.85 at 23 °C (73 °F) - Bioaccumulation is not expected.
p)	Autoignition temperature	No data available
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available

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t) Oxidizing properties none

9.2 Other safety information
No data available

SECTION 10: Stability and reactivity

10.1 Reactivity
No data available

10.2 Chemical stability
The product is chemically stable under standard ambient conditions (room temperature) .
Test for peroxide formation before using or discard after 3 months.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
Heat. Polymerization occurs when exposed to white light, ultraviolet light or heat. May form peroxides of unknown stability.
no information available

10.5 Incompatible materials
Oxidizing agents, Oxygen, Copper, Copper alloys, Carbides, Halogens, Metal oxides, Metals, Strong oxidizing agents

10.6 Hazardous decomposition products
In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - 5,480 mg/kg
LC50 Inhalation - Rat - 4 h - 285 mg/l - gas

Dermal: No data available
No data available

Skin corrosion/irritation
No data available

Serious eye damage/eye irritation
No data available

Respiratory or skin sensitization
No data available

Germ cell mutagenicity
In vivo tests showed mutagenic effects
Test Type: Mutagenicity (mammal cell test): chromosome aberration.
Test system: Chinese hamster lung cells
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 473
Result: positive

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Test Type: Micronucleus test
Species: Mouse
Cell type: Bone marrow
Application Route: inhalation (gas)
Method: OECD Test Guideline 474
Result: positive

Test Type: dominant lethal test
Species: Mouse

Application Route: inhalation (gas)
Method: OECD Test Guideline 478
Result: positive

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 (1,3-butadiene)

NTP: No ingredient 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

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

11.2 Additional Information

Cholinesterase inhibitors can cause heavy salivation and secretion in the lungs, lachrymation, blurred vision, involuntary defecation, diarrhea, tremor, ataxia, sweating, hypothermia, lowered heart rate, and/or a fall in blood pressure as a result of their action at cholinergic nerve sites., narcosis, Headache, Nausea, Vomiting, Dizziness, Drowsiness, Confusion., Weakness, Muscle cramps/spasms., Change in pupil size., Tremors, Seizures., Incoordination., Convulsions, Coma, 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

SECTION 12: Ecological information

12.1 Toxicity
No data available

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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 Endocrine disrupting properties
No data available

12.7 Other adverse effects
No data available

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product
Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself. Pressurised gas bottle: dispose of only in empty condition!

SECTION 14: Transport information

DOT (US)
UN number: 1010 Class: 2.1
Proper shipping name: Butadienes, stabilized
Reportable Quantity (RQ): 10 lbs
Poison Inhalation Hazard: No

IMDG
UN number: 1010 Class: 2.1 EMS-No: F-D, S-U
Proper shipping name: BUTADIENES, STABILIZED

IATA
UN number: 1010 Class: 2.1
Proper shipping name: Butadienes, stabilized
IATA Passenger: Not permitted for transport

SECTION 15: Regulatory information

SARA 302 Components
This material does not contain any components with a section 302 EHS TPQ.

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

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SARA 311/312 Hazards
Fire Hazard, Sudden Release of Pressure Hazard, Chronic Health Hazard

Massachusetts Right To Know Components
No components are subject to the Massachusetts Right to Know Act.

SECTION 16: Other information

Further information
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. 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.

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Version: 6.5 Revision Date: 09/06/2022 Print Date: 12/10/2022

The life science business of Merck KGaA, Darmstadt, Germany
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SAFETY DATA SHEET

Version 8.3
Revision Date 07/23/2022
Print Date 12/10/2022

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

1.1 Product identifiers

Product name : 1,3,5-Trimethylbenzene

Product Number : 442236
Brand : Supelco
Index-No. : 601-025-00-5
CAS-No. : 108-67-8

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 Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Flammable liquids (Category 3), H226
Acute toxicity, Inhalation (Category 4), H332
Skin irritation (Category 2), H315
Specific target organ toxicity - single exposure (Category 3), Respiratory system, H335
Aspiration hazard (Category 1), H304
Short-term (acute) aquatic hazard (Category 3), H402
Long-term (chronic) aquatic hazard (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



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Signal Word	Danger

Hazard statement(s)

H226	Flammable liquid and vapor.
H304	May be fatal if swallowed and enters airways.
H315	Causes skin irritation.
H332	Harmful if inhaled.
H335	May cause respiratory irritation.
H402	Harmful to aquatic life.
H411	Toxic to aquatic life with long lasting effects.

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.
P261	Avoid breathing dust/ fume/ gas/ mist/ vapors/ spray.
P264	Wash skin thoroughly after handling.
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P280	Wear protective gloves/ eye protection/ face protection.
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.
P304 + P340 + P312	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/ doctor if you feel unwell.
P331	Do NOT induce vomiting.
P332 + P313	If skin irritation occurs: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
P391	Collect spillage.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P403 + P235	Store in a well-ventilated place. Keep cool.
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

SECTION 3: Composition/information on ingredients

3.1 Substances

Synonyms	:	Mesitylene 1,3,5-Trimethylbenzene
Formula	:	C_9H_{12}
Molecular weight	:	120.19 g/mol
CAS-No.	:	108-67-8
EC-No.	:	203-604-4
Index-No.	:	601-025-00-5

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Component	Classification	Concentration
mesitylene		
	Flam. Liq. 3; Acute Tox. 4; Skin Irrit. 2; STOT SE 3; Asp. Tox. 1; Aquatic Acute 3; Aquatic Chronic 2; H226, H332, H315, H335, H304, H402, H411 Concentration limits: >= 25 %: STOT SE 3, H335;	<= 100 %

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

SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice
Show this material safety data sheet to the doctor in attendance.

If inhaled
After inhalation: fresh air.

In case of skin contact
In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower.

In case of eye contact
After eye contact: rinse out with plenty of water. Remove contact lenses.

If swallowed
After swallowing: caution if victim vomits. Risk of aspiration! Keep airways free. Pulmonary failure possible after aspiration of vomit. Call a physician immediately.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Foam Carbon dioxide (CO2) Dry powder

Unsuitable extinguishing media
For this substance/mixture no limitations of extinguishing agents are given.

5.2 Special hazards arising from the substance or mixture

Carbon oxides
Combustible.

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Vapors are heavier than air and may spread along floors.
Forms explosive mixtures with air at elevated temperatures.
Development of hazardous combustion gases or vapours possible in the event of fire.

5.3 Advice for firefighters
Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

5.4 Further information
Remove container from danger zone and cool with water. Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures
Advice for non-emergency personnel: Do not breathe vapors, aerosols. Avoid substance contact. Ensure adequate ventilation. Keep away from heat and sources of ignition.
Evacuate the danger area, observe emergency procedures, consult an expert.
For personal protection see section 8.

6.2 Environmental precautions
Do not let product enter drains. Risk of explosion.

6.3 Methods and materials for containment and cleaning up
Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up carefully with liquid-absorbent material (e.g. Chemizorb®). Dispose of properly. Clean up affected area.

6.4 Reference to other sections
For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on safe handling
Work under hood. Do not inhale substance/mixture. Avoid generation of vapours/aerosols.

Advice on protection against fire and explosion
Keep away from open flames, hot surfaces and sources of ignition.Take precautionary measures against static discharge.

Hygiene measures
Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions
Keep container tightly closed in a dry and well-ventilated place. Keep away from heat and sources of ignition.

Storage class
Storage class (TRGS 510): 3: Flammable liquids

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

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SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
mesitylene	108-67-8	TWA	25 ppm 125 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	25 ppm	USA. ACGIH Threshold Limit Values (TLV)
		PEL	25 ppm 125 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

8.2 Exposure controls

Appropriate engineering controls
Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

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). Safety glasses

Skin protection
required

Body Protection
Flame retardant antistatic protective clothing.

Respiratory protection
required when vapours/aerosols are generated.
Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

Control of environmental exposure
Do not let product enter drains. Risk of explosion.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid, clear Color: colorless
b)	Odor	No data available
c)	Odor Threshold	No data available
d)	pH	No data available
e)	Melting	Melting point/range: -45 °C (-49 °F) - lit.

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	point/freezing point	
f)	Initial boiling point and boiling range	163 - 166 °C 325 - 331 °F - lit.
g)	Flash point	50 °C (122 °F) at ca.1,013.25 hPa
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	Upper explosion limit: 6 %(V) Lower explosion limit: 0.88 %(V)
k)	Vapor pressure	3.2 hPa at 25 °C (77 °F)
l)	Vapor density	No data available
m)	Density	0.864 g/cm3 at 25 °C (77 °F) - lit.
	Relative density	No data available
n)	Water solubility	0.0482 g/l at 25 °C (77 °F) - slightly soluble
o)	Partition coefficient: n-octanol/water	No data available
p)	Autoignition temperature	550.0 °C (1022.0 °F)
q)	Decomposition temperature	No data available
r)	Viscosity	0.843 mm2/s at 20 °C (68 °F) - 0.630 mm2/s at 50 °C (122 °F) -
s)	Explosive properties	No data available
t)	Oxidizing properties	none

9.2 Other safety information

Surface tension	27.55 mN/m at 25 °C (77 °F)

SECTION 10: Stability and reactivity

10.1 Reactivity
Vapor/air-mixtures are explosive at intense warming.

10.2 Chemical stability
The product is chemically stable under standard ambient conditions (room temperature) .

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
Heating.

10.5 Incompatible materials
Strong oxidizing agents

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10.6 Hazardous decomposition products

In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - male - 6,000 mg/kg
(EC Directive 92/69/EEC B.1 Acute Toxicity (Oral))
LC50 Inhalation - Rat - male and female - 4 h - 10.2 mg/l - vapor

Remarks: (ECHA)
Inhalation: Irritating to respiratory system.
LD50 Dermal - Rat - male and female - > 2,000 mg/kg
Remarks: (ECHA)

Skin corrosion/irritation

Skin - Rabbit
Result: Irritating to skin. - 4 h
(Regulation (EC) No. 440/2008, Annex, B.4)

Serious eye damage/eye irritation

Eyes - Rabbit
Result: No eye irritation
(OECD Test Guideline 405)
Remarks: (in analogy to similar products)

Respiratory or skin sensitization

Maximization Test - Guinea pig
Result: negative
(OECD Test Guideline 406)
Remarks: (in analogy to similar products)

Germ cell mutagenicity

Test Type: Ames test
Test system: S. typhimurium
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 471
Result: negative

Test Type: Micronucleus test
Species: Mouse
Cell type: Red blood cells (erythrocytes)
Application Route: Intraperitoneal
Method: OECD Test Guideline 474
Result: negative

Carcinogenicity

IARC: No ingredient 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 ingredient 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.

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Reproductive toxicity
No data available

Specific target organ toxicity - single exposure
May cause respiratory irritation. - Respiratory system

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
May be fatal if swallowed and enters airways.

11.2 Additional Information

Repeated dose toxicity - Rat - male and female - Oral - 90 Days - NOAEL (No observed adverse effect level) - 600 mg/kg

RTECS: OX6825000
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

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish	flow-through test LC50 - Carassius auratus (goldfish) - 12.52 mg/l - 96 h Remarks: (ECHA)
Toxicity to daphnia and other aquatic invertebrates	static test LC50 - Daphnia magna (Water flea) - 6 mg/l - 48 h (OECD Test Guideline 202)
Toxicity to algae	static test ErC50 - Desmodesmus subspicatus (green algae) - 53 mg/l - 48 h (DIN 38412)
Toxicity to bacteria	static test NOEC - activated sludge - 24.2 mg/l - 28 h Remarks: (ECHA)

12.2 Persistence and degradability

Biodegradability	aerobic Theoretical oxygen demand - Exposure time 28 d Result: 61 % - Readily biodegradable. (OECD Test Guideline 301F) Remarks: The 10 day time window criterion is not fulfilled.

12.3 Bioaccumulative potential
No data available

12.4 Mobility in soil
No data available

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12.5 Results of PBT and vPvB assessment

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

12.6 Endocrine disrupting properties

No data available

12.7 Other adverse effects

No data available

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product

Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself. See www.retrologistik.com for processes regarding the return of chemicals and containers, or contact us there if you have further questions.

SECTION 14: Transport information

DOT (US)

UN number: 2325 Class: 3 Packing group: III
Proper shipping name: 1,3,5-Trimethylbenzene
Reportable Quantity (RQ):
1) Marine pollutant: yesPoison Inhalation Hazard: No

IMDG

UN number: 2325 Class: 3 Packing group: III EMS-No: F-E, S-D
Proper shipping name: 1,3,5-TRIMETHYLBENZENE
Marine pollutant : yes
Marine pollutant : yes

IATA

UN number: 2325 Class: 3 Packing group: III
Proper shipping name: 1,3,5-Trimethylbenzene

SECTION 15: Regulatory information

SARA 302 Components

This material does not contain any components with a section 302 EHS TPQ.

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

Fire Hazard, Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

No components are subject to the Massachusetts Right to Know Act.

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SECTION 16: Other information

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. 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.

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Version: 8.3 Revision Date: 07/23/2022 Print Date: 12/10/2022

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SAFETY DATA SHEET

Version 6.6
Revision Date 10/30/2021
Print Date 12/10/2022

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

1.1 Product identifiers

Product name : 1,4-Dichlorobenzene

Product Number : D56829
Brand : Aldrich
Index-No. : 602-035-00-2
CAS-No. : 106-46-7

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 Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Eye irritation (Category 2A), H319
Carcinogenicity (Category 2), H351
Short-term (acute) aquatic hazard (Category 1), H400
Long-term (chronic) aquatic hazard (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

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Hazard statement(s)

H319	Causes serious eye irritation.
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.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P337 + P313	If eye irritation persists: 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

SECTION 3: Composition/information on ingredients

3.1 Substances

Formula	:	$C_6H_4Cl_2$
Molecular weight	:	147.00 g/mol
CAS-No.	:	106-46-7
EC-No.	:	203-400-5
Index-No.	:	602-035-00-2

Component	Classification	Concentration
1,4-dichlorobenzene		
	Eye Irrit. 2A; Carc. 2; Aquatic Acute 1; Aquatic Chronic 1; H319, H351, H400, H410 M-Factor - Aquatic Acute: 1	<= 100 %

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

SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice
Show this material safety data sheet to the doctor in attendance.

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If inhaled
After inhalation: fresh air. Call in physician.

In case of skin contact
In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower. Consult a physician.

In case of eye contact
After eye contact: rinse out with plenty of water. Call in ophthalmologist. Remove contact lenses.

If swallowed
After swallowing: immediately make victim drink water (two glasses at most). Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Water Foam Carbon dioxide (CO2) Dry powder

Unsuitable extinguishing media
For this substance/mixture no limitations of extinguishing agents are given.

5.2 Special hazards arising from the substance or mixture
Nature of decomposition products not known.
Combustible.
Development of hazardous combustion gases or vapours possible in the event of fire.

5.3 Advice for firefighters
Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

5.4 Further information
Suppress (knock down) gases/vapors/mists with a water spray jet. Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures
Advice for non-emergency personnel: Avoid inhalation of dusts. Avoid substance contact. Ensure adequate ventilation. Evacuate the danger area, observe emergency procedures, consult an expert.
For personal protection see section 8.

6.2 Environmental precautions
Do not let product enter drains.

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6.3 Methods and materials for containment and cleaning up

Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up dry. Dispose of properly. Clean up affected area. Avoid generation of dusts.

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on safe handling

Work under hood. Do not inhale substance/mixture.

Hygiene measures

Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions

Tightly closed. Dry.

Storage class

Storage class (TRGS 510): 11: Combustible Solids

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
1,4-dichlorobenzene	106-46-7	TWA	10 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Confirmed animal carcinogen with unknown relevance to humans		
		Potential Occupational Carcinogen		

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		TWA	75 ppm 450 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	75 ppm 450 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		STEL	110 ppm 675 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		PEL	10 ppm 60 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		C	200 ppm	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		STEL	110 ppm 675 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

8.2 Exposure controls

Appropriate engineering controls
Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

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). Safety glasses

Skin protection
This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).
Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:KCL 741 Dermatril® L

This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).
Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:KCL 741 Dermatril® L

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Body Protection
protective clothing

Respiratory protection
required when dusts are generated. Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

Control of environmental exposure
Do not let product enter drains.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: solid Color: colorless
b)	Odor	No data available
c)	Odor Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/freezing point: 53.3 °C (127.9 °F)
f)	Initial boiling point and boiling range	174.1 °C 345.4 °F at 1,013 hPa
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)	Vapor pressure	8.8 hPa at 50.0 °C (122.0 °F)
l)	Vapor density	No data available
m)	Density	1.46 g/cm3 at 20 °C (68 °F)
	Relative density	1.46 at 20 °C (68 °F)
n)	Water solubility	82.9 mg/l at 25 °C (77 °F) - slightly soluble
o)	Partition coefficient: n-octanol/water	log Pow: 3.37 at 25 °C (77 °F) - Bioaccumulation is not expected.
p)	Autoignition temperature	> 500 °C (> 932 °F)Information taken from reference works and the literature.
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	none

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9.2 Other safety information
No data available

SECTION 10: Stability and reactivity

10.1 Reactivity
The following applies in general to flammable organic substances and mixtures: in correspondingly fine distribution, when whirled up a dust explosion potential may generally be assumed.

10.2 Chemical stability
The product is chemically stable under standard ambient conditions (room temperature) .

10.3 Possibility of hazardous reactions
Exothermic reaction with:
Alkali metals
Alkaline earth metals
Oxidizing agents
Nitric acid
Risk of explosion with:
Nitric acid
with
sulfuric acid

10.4 Conditions to avoid
no information available

10.5 Incompatible materials
Aluminum

10.6 Hazardous decomposition products
In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - male and female - > 2,000 mg/kg
(OECD Test Guideline 401)
LC50 Inhalation - Rat - male and female - 4 h - > 5.07 mg/l - vapor

(OECD Test Guideline 403)
LD50 Dermal - Rat - male and female - > 2,000 mg/kg
(OECD Test Guideline 402)
No data available

Skin corrosion/irritation
Skin - Rabbit
Result: No skin irritation
(OECD Test Guideline 404)

Serious eye damage/eye irritation
Causes serious eye irritation. Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

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Respiratory or skin sensitization
Maximization Test - Guinea pig
Result: negative
(OECD Test Guideline 406)

Germ cell mutagenicity
Test Type: Ames test
Test system: Salmonella typhimurium
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 471
Result: negative

Test Type: Micronucleus test
Species: Mouse
Cell type: Bone marrow
Application Route: Oral

Result: negative
Remarks: (ECHA)

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 (1,4-dichlorobenzene)
NTP:	No ingredient 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

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

11.2 Additional Information

RTECS: CZ4550000
Produces:, methemoglobin, Nausea, Vomiting, Increased pulse rate, Headache, Impairment of vision
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish	flow-through test LC50 - Salmo gairdneri - 1.12 mg/l - 96 h

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Remarks: (ECHA)

Toxicity to daphnia and other aquatic invertebrates	static test EC50 - Daphnia magna (Water flea) - 0.7 mg/l - 48 h Remarks: (ECHA)
Toxicity to algae	static test ErC50 - Pseudokirchneriella subcapitata (green algae) - 1.6 mg/l - 96 h (US-EPA)

12.2 Persistence and degradability

Biodegradability	aerobic - Exposure time 28 d Result: 100 % - Readily biodegradable. (OECD Test Guideline 301C)

12.3 Bioaccumulative potential

Bioaccumulation	Jordanella floridae - 5 d at 25 °C - 2.68 µg/l(1,4-dichlorobenzene) Bioconcentration factor (BCF): 296

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 Endocrine disrupting properties

No data available

12.7 Other adverse effects

No data available

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product

Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself. See www.retrologistik.com for processes regarding the return of chemicals and containers, or contact us there if you have further questions.

SECTION 14: Transport information

DOT (US)

UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (1,4-dichlorobenzene)
Reportable Quantity (RQ): 100 lbs
Reportable Quantity (RQ): 100 lbs
1) Marine pollutant: yesPoison Inhalation Hazard: No

IMDG

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UN number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (1,4-dichlorobenzene)
Marine pollutant : yes

IATA
UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (1,4-dichlorobenzene)

SECTION 15: Regulatory information

SARA 302 Components
This material does not contain any components with a section 302 EHS TPQ.

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

	CAS-No.	Revision Date
1,4-dichlorobenzene	106-46-7	2020-07-14

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

Reportable Quantity : D027 lbs

Massachusetts Right To Know Components
No components are subject to the Massachusetts Right to Know Act.

SECTION 16: Other information

Further information
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. 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.

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Version: 6.6 Revision Date: 10/30/2021 Print Date: 12/10/2022

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SAFETY DATA SHEET

Creation Date 13-Feb-2015 **Revision Date** 24-Dec-2021 **Revision Number** 4

1. Identification

Product Name **2-Hexanone**

Cat No. : **AC146880000; AC146880025; AC146881000; AC146885000**

CAS No 591-78-6
Synonyms Butyl methyl ketone; Methyl butyl ketone

Recommended Use Laboratory chemicals.
Uses advised against Food, drug, pesticide or biocidal product use.

Details of the supplier of the safety data sheet

Company

Fisher Scientific Company
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)

Flammable liquids	Category 3
Reproductive Toxicity	Category 2
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Central nervous system (CNS).	
Specific target organ toxicity - (repeated exposure)	Category 1
Target Organs - Central nervous system (CNS), Peripheral Nervous System (PNS).	

Label Elements

Signal Word
Danger

Hazard Statements
Flammable liquid and vapor
May cause drowsiness or dizziness

Suspected of damaging fertility
Causes 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
Do not breathe dust/fume/gas/mist/vapors/spray
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
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
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)
None identified
WARNING. Reproductive Harm - https://www.p65warnings.ca.gov/.

3. Composition/Information on Ingredients

Component	CAS No	Weight %
2-Hexanone	591-78-6	98

4. First-aid measures

General Advice Show this safety data sheet to the doctor in attendance. Immediate medical attention is required.

Eye Contact Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. In the case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

Skin Contact	Wash off immediately with plenty of water for at least 15 minutes. Immediate medical attention is required.
Inhalation	Remove to fresh air. If not breathing, give artificial respiration. 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. Immediate medical attention is required.
Ingestion	Do NOT induce vomiting. Call a physician or poison control center immediately.
Most important symptoms and effects	Difficulty in breathing. Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting
Notes to Physician	Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media	CO_2, dry chemical, dry sand, alcohol-resistant foam. Water mist may be used to cool closed containers.
Unsuitable Extinguishing Media	No information available
Flash Point	23 °C / 73.4 °F
Method -	No information available
Autoignition Temperature	423 °C / 793.4 °F

Explosion Limits

Upper	8.00 vol %
Lower	1.2 vol %
Sensitivity to Mechanical Impact	No information available
Sensitivity to Static Discharge	No information available

Specific Hazards Arising from the Chemical
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. Thermal decomposition can lead to release of irritating gases and vapors. Keep product and empty container away from heat and sources of ignition.

Hazardous Combustion Products
Carbon monoxide (CO). Carbon dioxide (CO_2).
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. Thermal decomposition can lead to release of irritating gases and vapors.

NFPA

Health	Flammability	Instability	Physical hazards
2	2	0	N/A

6. Accidental release measures

Personal Precautions	Use personal protective equipment as required. Ensure adequate ventilation. Keep people away from and upwind of spill/leak. Evacuate personnel to safe areas. Remove all sources of ignition. Take precautionary measures against static discharges.
Environmental Precautions	Should not be released into the environment. See Section 12 for additional Ecological Information.
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/face protection. Do not get in eyes, on skin, or on clothing. Use only under a chemical fume hood. Do not breathe mist/vapors/spray. Do not ingest. If swallowed then seek immediate medical assistance. Keep away from open flames, hot surfaces and sources of ignition. Use only non-sparking tools. Take precautionary measures against static discharges.

Storage.

Keep containers tightly closed in a dry, cool and well-ventilated place. Keep away from heat, sparks and flame. Flammables area. Incompatible Materials. Strong bases. Reducing Agent.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
2-Hexanone	TWA: 5 ppm STEL: 10 ppm Skin	(Vacated) TWA: 5 ppm (Vacated) TWA: 20 mg/m³ TWA: 100 ppm TWA: 410 mg/m³	IDLH: 1600 ppm TWA: 1 ppm TWA: 4 mg/m³	TWA: 5 ppm STEL: 10 ppm

Legend

ACGIH - American Conference of Governmental Industrial Hygienists
OSHA - Occupational Safety and Health Administration
NIOSH IDLH: NIOSH - National Institute for Occupational Safety and Health

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

Physical State	Liquid
Appearance	Light yellow
Odor	pungent
Odor Threshold	No information available
pH	No information available
Melting Point/Range	-57 °C / -70.6 °F
Boiling Point/Range	127 °C / 260.6 °F
Flash Point	23 °C / 73.4 °F
Evaporation Rate	No information available
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	8.00 vol %
Lower	1.2 vol %

Vapor Pressure	20 @ 10 mmHg °C
Vapor Density	3.5 (Air = 1.0)
Specific Gravity	0.810
Solubility	No information available
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	423 °C / 793.4 °F
Decomposition Temperature	No information available
Viscosity	No information available
Molecular Formula	C6 H12 O
Molecular Weight	100.16

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. Incompatible products.

Incompatible Materials Strong bases, Reducing Agent

Hazardous Decomposition Products Carbon monoxide (CO), Carbon dioxide (CO_2)

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
2-Hexanone	LD50 = 2590 mg/kg (Rat)	LD50 = 4840 mg/kg (Rabbit)	LC50 = 8000 ppm (Rat) 4 h

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation No information available

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS No	IARC	NTP	ACGIH	OSHA	Mexico
2-Hexanone	591-78-6	Not listed	Not listed	Not listed	Not listed	Not listed

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 Central nervous system (CNS) Peripheral Nervous System (PNS)

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 The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity

This product contains the following substance(s) which are hazardous for the environment.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
2-Hexanone	Not listed	LC50: = 428 mg/L, 96h flow-through (Pimephales promelas)	Not listed	Not listed

Persistence and Degradability Persistence is unlikely

Bioaccumulation/ Accumulation No information available.

Mobility . Will likely be mobile in the environment due to its water solubility.

Component	log Pow
2-Hexanone	1.38

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 UN1224
Proper Shipping Name KETONES, LIQUID, N.O.S.
Hazard Class 3
Packing Group III

TDG

UN-No UN1224
Proper Shipping Name KETONES, LIQUID, N.O.S.
Hazard Class 3
Packing Group III

IATA

UN-No UN1224
Proper Shipping Name KETONES, LIQUID, N.O.S.*
Hazard Class 3
Packing Group III

IMDG/IMO

UN-No UN1224
Proper Shipping Name KETONES, LIQUID, N.O.S.
Hazard Class 3
Packing Group III

15. Regulatory information

United States of America Inventory

Component	CAS No	TSCA	TSCA Inventory notification - Active-Inactive	TSCA - EPA Regulatory Flags
2-Hexanone	591-78-6	X	ACTIVE	S

Legend:
TSCA US EPA (TSCA) - Toxic Substances Control Act, (40 CFR Part 710)
X - Listed
'-' - Not Listed
S - Indicates a substance that is identified in a proposed or final Significant New Use Rule.

TSCA 12(b) - Notices of Export

Component	CAS No	**TSCA 12(b)** - Notices of Export
2-Hexanone	591-78-6	Section 5

International Inventories
Canada (DSL/NDSL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Japan (ISHL), Australia (AICS), China (IECSC), Korea (KECL).

Component	CAS No	DSL	NDSL	EINECS	PICCS	ENCS	ISHL	AICS	IECSC	KECL
2-Hexanone	591-78-6	X	-	209-731-1	X	X	X	X	X	KE-19818

KECL - NIER number or KE number (http://ncis.nier.go.kr/en/main.do)

U.S. Federal Regulations

SARA 313 Not applicable

SARA 311/312 Hazard Categories See section 2 for more information

CWA (Clean Water Act) Not applicable

Clean Air Act Not applicable

OSHA - Occupational Safety and Health Administration Not applicable

CERCLA Not applicable

California Proposition 65 This product contains the following Proposition 65 chemicals.

Component	CAS No	California Prop. 65	Prop 65 NSRL	Category
2-Hexanone	591-78-6	Developmental Male Reproductive	-	Developmental

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
2-Hexanone	X	X	X	-	X

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

Authorisation/Restrictions according to EU REACH

Component	REACH (1907/2006) - Annex XIV - Substances Subject to Authorization	REACH (1907/2006) - Annex XVII - Restrictions on Certain Dangerous Substances	REACH Regulation (EC 1907/2006) article 59 - Candidate List of Substances of Very High Concern (SVHC)
2-Hexanone	-	Use restricted. See item 75. (see link for restriction details)	-

https://echa.europa.eu/substances-restricted-under-reach

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

Component	CAS No	OECD HPV	Persistent Organic Pollutant	Ozone Depletion Potential	Restriction of Hazardous Substances (RoHS)
2-Hexanone	591-78-6	Not applicable	Not applicable	Not applicable	Not applicable

Component	CAS No	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Major Accident Notification	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Safety Report Requirements	Rotterdam Convention (PIC)	Basel Convention (Hazardous Waste)
2-Hexanone	591-78-6	Not applicable	Not applicable	Not applicable	Not applicable

16. Other information

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

Creation Date 13-Feb-2015
Revision Date 24-Dec-2021
Print Date 24-Dec-2021
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

Version 8.4
Revision Date 11/11/2020
Print Date 10/08/2022

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

1.1 Product identifiers

Product name : 4-Ethyltoluene

Product Number : E49800
Brand : Aldrich
CAS-No. : 622-96-8

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 Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Flammable liquids (Category 3), H226

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)
H226 Flammable liquid and vapor.

Precautionary statement(s)
P210 Keep away from heat/ sparks/ open flames/ hot surfaces. No

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	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.
P280	Wear protective gloves/ eye protection/ face protection.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
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

SECTION 3: Composition/information on ingredients

3.1 Substances

Formula	:	C_9H_{12}
Molecular weight	:	120.19 g/mol
CAS-No.	:	622-96-8
EC-No.	:	210-761-2

No components need to be disclosed according to the applicable regulations.

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

SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice
Show this material safety data sheet to the doctor in attendance.

If inhaled
After inhalation: fresh air.

In case of skin contact
In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower.

In case of eye contact
After eye contact: rinse out with plenty of water. Remove contact lenses.

If swallowed
After swallowing: make victim drink water (two glasses at most). Consult doctor if feeling unwell.

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

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SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Carbon dioxide (CO2) Foam Dry powder

Unsuitable extinguishing media
For this substance/mixture no limitations of extinguishing agents are given.

5.2 Special hazards arising from the substance or mixture

Nature of decomposition products not known.
Combustible.
Vapors are heavier than air and may spread along floors.
Forms explosive mixtures with air at elevated temperatures.
Development of hazardous combustion gases or vapours possible in the event of fire.

5.3 Advice for firefighters

In the event of fire, wear self-contained breathing apparatus.

5.4 Further information

Remove container from danger zone and cool with water. Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Advice for non-emergency personnel: Do not breathe vapors, aerosols. Ensure adequate ventilation. Keep away from heat and sources of ignition. Evacuate the danger area, observe emergency procedures, consult an expert.
For personal protection see section 8.

6.2 Environmental precautions

Do not let product enter drains. Risk of explosion.

6.3 Methods and materials for containment and cleaning up

Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up with liquid-absorbent material (e.g. Chemizorb®). Dispose of properly. Clean up affected area.

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on protection against fire and explosion
Keep away from open flames, hot surfaces and sources of ignition.Take precautionary measures against static discharge.

Hygiene measures
Change contaminated clothing. Wash hands after working with substance.
For precautions see section 2.2.

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7.2 Conditions for safe storage, including any incompatibilities

Storage conditions
Keep container tightly closed in a dry and well-ventilated place. Keep away from heat and sources of ignition.
Storage class (TRGS 510): 3: Flammable liquids

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

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters
Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Appropriate engineering controls
Change contaminated clothing. Wash hands after working with substance.

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). Safety glasses

Skin protection
This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).
Full contact
Material: Viton®
Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).
Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.4 mm
Break through time: 10 min
Material tested:Camatril® (KCL 730 / Aldrich Z677442, Size M)

Body Protection
Flame retardant antistatic protective clothing.

Respiratory protection
required when vapours/aerosols are generated. Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

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Control of environmental exposure
Do not let product enter drains. Risk of explosion.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: clear, liquid Color: light yellow
b)	Odor	characteristic
c)	Odor Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point: -62 °C (-80 °F)
f)	Initial boiling point and boiling range	162 °C 324 °F - lit.
g)	Flash point	43 °C (109 °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: 7 %(V) Lower explosion limit: 1.2 %(V)
k)	Vapor pressure	No data available
l)	Vapor density	No data available
m)	Relative density	0.861 g/cm3 at 25 °C (77 °F)
n)	Water solubility	0.0949 g/l at 25 °C (77 °F) - (experimental)
o)	Partition coefficient: n-octanol/water	log Pow: 3.63 - (Lit.), Bioaccumulation is not expected.
p)	Autoignition temperature	No data available
q)	Decomposition temperature	No data available
r)	Viscosity	0.812 mm2/s at 20 °C (68 °F) -
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information
No data available

SECTION 10: Stability and reactivity

10.1 Reactivity
Vapor/air-mixtures are explosive at intense warming.

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10.2 Chemical stability
The product is chemically stable under standard ambient conditions (room temperature) .

10.3 Possibility of hazardous reactions
Risk of ignition or formation of inflammable gases or vapours with:
Strong oxidizing agents
combustible substances

10.4 Conditions to avoid
Heating.

10.5 Incompatible materials
Oxidizing agents, Strong oxidizing agents

10.6 Hazardous decomposition products
In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - 4,850 mg/kg
Remarks: (RTECS)
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 sensitization
No data available

Germ cell mutagenicity
No data available

Carcinogenicity

IARC:	No ingredient 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 ingredient 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

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

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Aspiration hazard
No data available

11.2 Additional Information
RTECS: XT2550000

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

SECTION 12: Ecological information

12.1 Toxicity
No data available

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
No data available

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects
No data available

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product
Waste material must be disposed of in accordance with the national and loc No mixing with other waste. Handle uncleaned containers like the product See www.retrologistik.com for processes regarding the return of chemicals and containers, or contact us there if you have further questions.

SECTION 14: Transport information

DOT (US)
UN number: 3295 Class: 3 Packing group: III
Proper shipping name: Hydrocarbons, liquid, n.o.s.
Reportable Quantity (RQ):
Poison Inhalation Hazard: No

IMDG
UN number: 3295 Class: 3 Packing group: III EMS-No: F-E, S-D
Proper shipping name: HYDROCARBONS, LIQUID, N.O.S.

IATA

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UN number: 3295 Class: 3 Packing group: III
Proper shipping name: Hydrocarbons, liquid, n.o.s.

SECTION 15: Regulatory information

SARA 302 Components
This material does not contain any components with a section 302 EHS TPQ.

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
Fire Hazard

Massachusetts Right To Know Components
No components are subject to the Massachusetts Right to Know Act.

No components are subject to the Massachusetts Right to Know Act.

Pennsylvania Right To Know Components

4-Ethyltoluene	CAS-No. 622-96-8	Revision Date

New Jersey Right To Know Components

4-Ethyltoluene	CAS-No. 622-96-8	Revision Date

SECTION 16: Other information

Further information
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. 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.

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Version: 8.4 Revision Date: 11/11/2020 Print Date: 10/08/2022

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SAFETY DATA SHEET

Version 6.7
Revision Date 06/07/2021
Print Date 12/10/2022

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

1.1 Product identifiers

Product name : 4-Methyl-2-pentanone

Product Number : 360511
Brand : SIGALD
Index-No. : 606-004-00-4
CAS-No. : 108-10-1

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 Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 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
Acute toxicity, Inhalation (Category 4), H332
Eye irritation (Category 2A), H319
Carcinogenicity (Category 2), H351
Specific target organ toxicity - single exposure (Category 3), Respiratory system, H335

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

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word Danger

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Hazard statement(s)

H225	Highly flammable liquid and vapor.
H319	Causes serious eye irritation.
H332	Harmful if inhaled.
H335	May cause respiratory irritation.
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.
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.
P261	Avoid breathing dust/ fume/ gas/ mist/ vapors/ 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.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/ shower.
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.
P337 + P313	If eye irritation persists: Get medical advice/ attention.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P403 + P235	Store in a well-ventilated place. Keep cool.
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

Repeated exposure may cause skin dryness or cracking.
May form explosive peroxides.

SECTION 3: Composition/information on ingredients

3.1 Substances

Synonyms	:	Isobutyl methyl ketone Methyl isobutyl ketone Isopropylacetone
Formula	:	$C_6H_{12}O$
Molecular weight	:	100.16 g/mol

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CAS-No. : 108-10-1
EC-No. : 203-550-1
Index-No. : 606-004-00-4

Component	Classification	Concentration
4-methylpentan-2-one		
	Flam. Liq. 2; Acute Tox. 4; Eye Irrit. 2A; Carc. 2; STOT SE 3; H225, H332, H319, H351, H335 Concentration limits: 20 %: STOT SE 3, H335;	<= 100 %

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

SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice
Show this material safety data sheet to the doctor in attendance.

If inhaled
After inhalation: fresh air.

In case of skin contact
In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower.

In case of eye contact
After eye contact: rinse out with plenty of water. Call in ophthalmologist. Remove contact lenses.

If swallowed
After swallowing: immediately make victim drink water (two glasses at most). Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Carbon dioxide (CO2) Foam Dry powder

Unsuitable extinguishing media
For this substance/mixture no limitations of extinguishing agents are given.

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5.2 Special hazards arising from the substance or mixture

Carbon oxides
Combustible.
Pay attention to flashback.
Vapors are heavier than air and may spread along floors.
Risk of dust explosion.
Development of hazardous combustion gases or vapours possible in the event of fire.
Forms explosive mixtures with air at ambient temperatures.

5.3 Advice for firefighters

In the event of fire, wear self-contained breathing apparatus.

5.4 Further information

Remove container from danger zone and cool with water. Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Advice for non-emergency personnel: Do not breathe vapors, aerosols. Avoid substance contact. Ensure adequate ventilation. Keep away from heat and sources of ignition.
Evacuate the danger area, observe emergency procedures, consult an expert.
For personal protection see section 8.

6.2 Environmental precautions

Do not let product enter drains. Risk of explosion.

6.3 Methods and materials for containment and cleaning up

Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up with liquid-absorbent material (e.g. Chemizorb®).
Dispose of properly. Clean up affected area.

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on safe handling
Work under hood. Do not inhale substance/mixture. Avoid generation of vapours/aerosols.

Advice on protection against fire and explosion
Keep away from open flames, hot surfaces and sources of ignition.Take precautionary measures against static discharge.

Hygiene measures
Change contaminated clothing. Preventive skin protection recommended. Wash hands after working with substance.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions
Keep container tightly closed in a dry and well-ventilated place. Keep away from heat and sources of ignition.
Storage class (TRGS 510): 3: Flammable liquids

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7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
4-methylpentan-2-one	108-10-1	STEL	75 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Confirmed animal carcinogen with unknown relevance to humans		
		TWA	50 ppm 205 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		STEL	75 ppm 300 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		TWA	100 ppm 410 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	20 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Confirmed animal carcinogen with unknown relevance to humans		
		ST	75 ppm 300 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	50 ppm 205 mg/m3	USA. NIOSH Recommended Exposure Limits
		PEL	50 ppm 205 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		STEL	75 ppm 300 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
4-methylpentan-2-one	108-10-1	methyl isobutyl ketone	1 mg/l	Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift (As soon as possible after exposure ceases)			

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8.2 Exposure controls

Appropriate engineering controls
Change contaminated clothing. Preventive skin protection recommended. Wash hands after working with substance.

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). Safety glasses

Skin protection
This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).
Splash contact
Material: butyl-rubber
Minimum layer thickness: 0.7 mm
Break through time: 240 min
Material tested:Butoject® (KCL 898)

Body Protection
Flame retardant antistatic protective clothing.

Respiratory protection
required when vapours/aerosols are generated. Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

Control of environmental exposure
Do not let product enter drains. Risk of explosion.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid Color: colorless
b)	Odor	characteristic
c)	Odor Threshold	0.1 ppm
d)	pH	at 20 °C (68 °F)neutral
e)	Melting point/freezing point	Melting point/range: -80 °C (-112 °F) - lit.
f)	Initial boiling point and boiling range	117 - 118 °C 243 - 244 °F
g)	Flash point	14 °C (57 °F) - closed cup - DIN 51755 Part 1
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower	Upper explosion limit: 8 %(V)

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	flammability or explosive limits	Lower explosion limit: 1.2 %(V)
k)	Vapor pressure	20 hPa at 20 °C (68 °F)
l)	Vapor density	3.46 - (Air = 1.0)
m)	Relative density	No data available
n)	Water solubility	14.1 g/l at 20 °C (68 °F) - OECD Test Guideline 105 - completely soluble
o)	Partition coefficient: n-octanol/water	log Pow: 1.9 - Bioaccumulation is not expected.
p)	Autoignition 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

Surface tension	23.6 mN/m at 20 °C (68 °F)
Relative vapor density	3.46 - (Air = 1.0)

SECTION 10: Stability and reactivity

10.1 Reactivity
Stable under recommended storage conditions.
Vapors may form explosive mixture with air.

10.2 Chemical stability
The product is chemically stable under standard ambient conditions (room temperature) .
Stable under recommended storage conditions.
Test for peroxide formation before distillation or evaporation. Test for peroxide formation or discard after 1 year.

10.3 Possibility of hazardous reactions

Vapors may form explosive mixture with air.

10.4 Conditions to avoid
May form peroxides on contact with air.
Warming.

10.5 Incompatible materials
rubber, various plastics, Copper

10.6 Hazardous decomposition products
In the event of fire: see section 5

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SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - 2,080 mg/kg
(OECD Test Guideline 401)
LC50 Inhalation - Rat - male - 4 h - 11.6 mg/l
(OECD Test Guideline 403)
Dermal: No data available
No data available

Skin corrosion/irritation
Skin - Rabbit
Result: No skin irritation - 4 h
(OECD Test Guideline 404)

Serious eye damage/eye irritation
Eyes - Rabbit
Result: Causes serious eye irritation. - 72 h
(OECD Test Guideline 405)
(Regulation (EC) No 1272/2008, Annex VI)

Respiratory or skin sensitization
Maximization Test - Guinea pig
Result: negative
(OECD Test Guideline 406)

Germ cell mutagenicity
Test Type: Ames test
Test system: Salmonella typhimurium
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 471
Result: negative
Test Type: Mutagenicity (mammal cell test): chromosome aberration.
Test system: rat hepatocytes
Metabolic activation: without metabolic activation
Method: OECD Test Guideline 473
Result: negative
Test Type: In vitro mammalian cell gene mutation test
Test system: mouse lymphoma cells
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 476
Result: negative

Test Type: Micronucleus test
Species: Mouse
Cell type: Bone marrow
Application Route: Intraperitoneal
Method: OECD Test Guideline 474
Result: negative

Carcinogenicity

IARC: 2B - Group 2B: Possibly carcinogenic to humans (4-methylpentan-2-one)

NTP: No ingredient of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

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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

Specific target organ toxicity - single exposure
May cause respiratory irritation. - Respiratory system

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

11.2 Additional Information

Repeated dose toxicity - Rat - male and female - Oral - 90 d - NOAEL (No observed adverse effect level) - 250 mg/kg - LOAEL (Lowest observed adverse effect level) - 1,000 mg/kg
Remarks: Subchronic toxicity

RTECS: SA9275000
Blurred vision, Dermatitis
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

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish	static test LC50 - Danio rerio (zebra fish) - > 179 mg/l - 96 h (OECD Test Guideline 203)
Toxicity to daphnia and other aquatic invertebrates	static test EC50 - Daphnia magna (Water flea) - > 200 mg/l - 48 h (OECD Test Guideline 202)

12.2 Persistence and degradability

Biodegradability	aerobic - Exposure time 28 d Result: 83 % - Readily biodegradable. (OECD Test Guideline 301F)
Theoretical oxygen demand	2,720 mg/g Remarks: (Lit.)

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

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12.6 Other adverse effects

No data available

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product

Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself. See www.retrologistik.com for processes regarding the return of chemicals and containers, or contact us there if you have further questions.

SECTION 14: Transport information

DOT (US)

UN number: 1245 Class: 3 Packing group: II
Proper shipping name: Methyl isobutyl ketone
Reportable Quantity (RQ): 5000 lbs
Poison Inhalation Hazard: No

IMDG

UN number: 1245 Class: 3 Packing group: II EMS-No: F-E, S-D
Proper shipping name: METHYL ISOBUTYL KETONE

IATA

UN number: 1245 Class: 3 Packing group: II
Proper shipping name: Methyl isobutyl ketone

SECTION 15: Regulatory information

SARA 302 Components

This material does not contain any components with a section 302 EHS TPQ.

SARA 313 Components

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

	CAS-No.	Revision Date
4-methylpentan-2-one	108-10-1	2007-03-01

SARA 311/312 Hazards

Fire Hazard, Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

No components are subject to the Massachusetts Right to Know Act.

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SECTION 16: Other information

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. 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.

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Version: 6.7 Revision Date: 06/07/2021 Print Date: 12/10/2022

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SAFETY DATA SHEET

Version 6.7
Revision Date 10/19/2022
Print Date 12/10/2022

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

1.1 Product identifiers

Product name : Acetone

Product Number : 179124
Brand : SIGALD
Index-No. : 606-001-00-8
CAS-No. : 67-64-1

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 Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 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
Eye irritation (Category 2A), H319
Specific target organ toxicity - single exposure (Category 3), Central nervous system, H336

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

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Hazard statement(s)

H225	Highly flammable liquid and vapor.
H319	Causes serious eye irritation.
H336	May cause drowsiness or dizziness.

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.
P261	Avoid breathing mist or vapors.
P264	Wash skin thoroughly after handling.
P271	Use only outdoors or in a well-ventilated area.
P280	Wear protective gloves/ eye protection/ face protection.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P304 + P340 + 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.
P337 + P313	If eye irritation persists: Get medical advice/ attention.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P403 + P235	Store in a well-ventilated place. Keep cool.
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

Repeated exposure may cause skin dryness or cracking.

SECTION 3: Composition/information on ingredients

3.1 Substances

Formula	:	C_3H_6O
Molecular weight	:	58.08 g/mol
CAS-No.	:	67-64-1
EC-No.	:	200-662-2
Index-No.	:	606-001-00-8

Component	Classification	Concentration
acetone		
	Flam. Liq. 2; Eye Irrit. 2A; STOT SE 3; H225, H319, H336 Concentration limits: >= 20 %: STOT SE 3, H336;	<= 100 %

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

SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice
Show this material safety data sheet to the doctor in attendance.

If inhaled
After inhalation: fresh air. Call in physician.

In case of skin contact
In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower.

In case of eye contact
After eye contact: rinse out with plenty of water. Call in ophthalmologist. Remove contact lenses.

If swallowed
After swallowing: immediately make victim drink water (two glasses at most). Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Carbon dioxide (CO2) Foam Dry powder

Unsuitable extinguishing media
For this substance/mixture no limitations of extinguishing agents are given.

5.2 Special hazards arising from the substance or mixture
Carbon oxides
Combustible.
Pay attention to flashback.
Vapors are heavier than air and may spread along floors.
Development of hazardous combustion gases or vapours possible in the event of fire.
Forms explosive mixtures with air at ambient temperatures.

5.3 Advice for firefighters
In the event of fire, wear self-contained breathing apparatus.

5.4 Further information
Remove container from danger zone and cool with water. Prevent fire extinguishing water from contaminating surface water or the ground water system.

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SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Advice for non-emergency personnel: Do not breathe vapors, aerosols. Avoid substance contact. Ensure adequate ventilation. Keep away from heat and sources of ignition.
Evacuate the danger area, observe emergency procedures, consult an expert.
For personal protection see section 8.

6.2 Environmental precautions

Do not let product enter drains. Risk of explosion.

6.3 Methods and materials for containment and cleaning up

Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up with liquid-absorbent material (e.g. Chemizorb®).
Dispose of properly. Clean up affected area.

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on safe handling
Work under hood. Do not inhale substance/mixture. Avoid generation of vapours/aerosols.

Advice on protection against fire and explosion
Keep away from open flames, hot surfaces and sources of ignition.Take precautionary measures against static discharge.

Hygiene measures
Change contaminated clothing. Preventive skin protection recommended. Wash hands after working with substance.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions
Keep container tightly closed in a dry and well-ventilated place. Keep away from heat and sources of ignition.

Storage class
Storage class (TRGS 510): 3: Flammable liquids

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
acetone	67-64-1	TWA	250 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Not classifiable as a human carcinogen		

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		STEL	500 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Not classifiable as a human carcinogen		
		TWA	250 ppm 590 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	1,000 ppm 2,400 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		C	3,000 ppm	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		PEL	500 ppm 1,200 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		STEL	750 ppm 1,780 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
acetone	67-64-1	Acetone	25 mg/l	Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift (As soon as possible after exposure ceases)			

Predicted No Effect Concentration (PNEC)

Compartment	Value
Soil	33.3 mg/kg
Sea water	1.06 mg/l
Fresh water	10.6 mg/l
Sea sediment	3.04 mg/kg
Fresh water sediment	30.4 mg/kg
Onsite sewage treatment plant	100 mg/l

8.2 Exposure controls

Appropriate engineering controls

Change contaminated clothing. Preventive skin protection recommended. Wash hands after working with substance.

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). Safety glasses

Skin protection

This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).

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Full contact
Material: butyl-rubber
Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested:Butoject® (KCL 898)

This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).
Splash contact
Material: Latex gloves
Minimum layer thickness: 0.6 mm
Break through time: 10 min
Material tested:Lapren® (KCL 706 / Aldrich Z677558, Size M)

Body Protection
Flame retardant antistatic protective clothing.

Respiratory protection
required when vapours/aerosols are generated.
Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

Control of environmental exposure
Do not let product enter drains. Risk of explosion.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: clear, liquid Color: colorless
b)	Odor	pungent, weakly aromatic
c)	Odor Threshold	0.1 ppm
d)	pH	5 - 6 at 395 g/l at 20 °C (68 °F)
e)	Melting point/freezing point	Melting point/range: -94 °C (-137 °F) - lit.
f)	Initial boiling point and boiling range	56 °C 133 °F at 1,013 hPa - lit.
g)	Flash point	-17.0 °C (1.4 °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: 13 %(V) Lower explosion limit: 2 %(V)
k)	Vapor pressure	245.3 hPa at 20.0 °C (68.0 °F)

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l)	Vapor density	No data available
m)	Density	0.791 g/cm3 at 25 °C (77 °F) - lit.
	Relative density	No data available
n)	Water solubility	soluble, in all proportions
o)	Partition coefficient: n-octanol/water	No data available
p)	Autoignition temperature	465.0 °C (869.0 °F)
q)	Decomposition temperature	Distillable in an undecomposed state at normal pressure.
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	none

9.2 Other safety information

Conductivity	0.01 µS/cm at 20 °C (68 °F)
Surface tension	23.2 mN/m at 20.0 °C (68.0 °F)

SECTION 10: Stability and reactivity

10.1 Reactivity

Vapors may form explosive mixture with air.

10.2 Chemical stability

The product is chemically stable under standard ambient conditions (room temperature) .

10.3 Possibility of hazardous reactions

Risk of ignition or formation of inflammable gases or vapours with:
chromosulfuric acid
chromyl chloride
ethanolamine
Fluorine
Strong oxidizing agents
strong reducing agents
Nitric acid
chromium(VI) oxide
Risk of explosion with:
nonmetallic oxyhalides
halogen-halogen compounds
Chloroform
nitrating acid
nitrosyl compounds
hydrogen peroxide
halogen oxides
organic nitro compounds
peroxi compounds
Exothermic reaction with:
Bromine

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Alkali metals
alkali hydroxides
Halogenated hydrocarbon
Sulfur dichloride
phosphorous oxichloride

10.4 Conditions to avoid
Warming.

10.5 Incompatible materials
rubber, various plastics

10.6 Hazardous decomposition products
In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - female - 5,800 mg/kg
Remarks: (ECHA)
LC50 Inhalation - Rat - 4 h - 76 mg/l - vapor

Remarks: Unconsciousness
Drowsiness
Dizziness
(External MSDS)
LD50 Dermal - Rabbit - 20,000 mg/kg
Remarks: (IUCLID)
No data available

Skin corrosion/irritation
Skin - Rabbit
Result: Mild skin irritation - 24 h
(Draize Test)
Remarks: (RTECS)

Serious eye damage/eye irritation
Eyes - Rabbit
Result: Eye irritation - 24 h
(Draize Test)
Remarks: (RTECS)

Respiratory or skin sensitization
Maximization Test - Guinea pig
Result: Not a skin sensitizer.
Remarks: (ECHA)
Chronic exposure may cause dermatitis.

Germ cell mutagenicity
Test Type: Mutagenicity (mammal cell test): chromosome aberration.
Test system: Chinese hamster ovary cells
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 473
Result: negative

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Test Type: Ames test
Test system: Salmonella typhimurium
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 471
Result: negative
Test Type: In vitro mammalian cell gene mutation test
Test system: Mouse lymphoma test
Metabolic activation: without metabolic activation
Method: OECD Test Guideline 476
Result: negative

Carcinogenicity

IARC: No ingredient 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 ingredient 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

Specific target organ toxicity - single exposure
Inhalation - May cause drowsiness or dizziness. - Narcotic effects

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

11.2 Additional Information

RTECS: AL3150000
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

After absorption:

Headache
Salivation
Nausea
Vomiting
Dizziness
narcosis
Coma

Other dangerous properties can not be excluded.

Handle in accordance with good industrial hygiene and safety practice.

Kidney - Irregularities - Based on Human Evidence

Skin - Dermatitis - Based on Human Evidence

Kidney - Irregularities - Based on Human Evidence

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Skin - Dermatitis - Based on Human Evidence

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish	flow-through test LC50 - Pimephales promelas (fathead minnow) - 6,210 mg/l - 96 h (OECD Test Guideline 203)
Toxicity to daphnia and other aquatic invertebrates	static test LC50 - Daphnia pulex (Water flea) - 8,800 mg/l - 48 h Remarks: (ECHA)
Toxicity to algae	static test NOEC - M.aeruginosa - 530 mg/l - 8 d (DIN 38412) Remarks: (maximum permissible toxic concentration) (IUCLID)
Toxicity to bacteria	static test EC50 - activated sludge - 61.15 mg/l - 30 min (OECD Test Guideline 209)
Toxicity to daphnia and other aquatic invertebrates(Chronic toxicity)	flow-through test NOEC - Daphnia magna (Water flea) - 2,212 mg/l - 28 d Remarks: (ECHA)

12.2 Persistence and degradability

Biodegradability	aerobic - Exposure time 28 d Result: 91 % - Readily biodegradable. (OECD Test Guideline 301B)
Biochemical Oxygen Demand (BOD)	1,850 mg/g Remarks: (IUCLID)
Chemical Oxygen Demand (COD)	2,070 mg/g Remarks: (IUCLID)
Theoretical oxygen demand	2,200 mg/g Remarks: (Lit.)

12.3 Bioaccumulative potential

Does not bioaccumulate.

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 Endocrine disrupting properties

No data available

12.7 Other adverse effects

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SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product
Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself.

SECTION 14: Transport information

DOT (US)
UN number: 1090 Class: 3 Packing group: II
Proper shipping name: Acetone
Reportable Quantity (RQ): 5000 lbs
Poison Inhalation Hazard: No

IMDG
UN number: 1090 Class: 3 Packing group: II EMS-No: F-E, S-D
Proper shipping name: ACETONE

IATA
UN number: 1090 Class: 3 Packing group: II
Proper shipping name: Acetone

SECTION 15: Regulatory information

SARA 302 Components
This material does not contain any components with a section 302 EHS TPQ.

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
Fire Hazard, Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components
No components are subject to the Massachusetts Right to Know Act.

SECTION 16: Other information

Further information
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. 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

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SAFETY DATA SHEET

Benzene

Section 1. Identification

GHS product identifier : Benzene

Chemical name : benzene

Other means of identification : benzene, purebenzol; cyclohexatriene; phenyl hydride; phene; coal naphtha; pyrobenzol

Product type : Liquid.

Product use : Synthetic/Analytical chemistry.

Synonym : benzene, purebenzol; cyclohexatriene; phenyl hydride; phene; coal naphtha; pyrobenzol

SDS # : 001062

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 LIQUIDS - Category 2
SKIN IRRITATION - Category 2
EYE IRRITATION - Category 2A
GERM CELL MUTAGENICITY - Category 1
CARCINOGENICITY - Category 1
SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) - Category 1

GHS label elements

Hazard pictograms :



Signal word : Danger

Hazard statements : Highly flammable liquid and vapor.
Causes skin irritation.
Causes serious eye irritation.
May cause genetic defects.
May cause cancer.
Causes damage to organs through prolonged or repeated exposure.
May form explosive mixtures with air.

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.

Prevention : Obtain special instructions before use. Wear protective gloves. Wear protective clothing. Wear eye or face protection. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Use explosion-proof electrical, ventilating or lighting equipment. Use non-sparking tools. Take action to prevent static discharges. Keep container tightly closed. Do not breathe vapor. Do not eat, drink or smoke when using this product. Wash thoroughly after handling.

Section 2. Hazards identification

Response : IF exposed or concerned: Get medical advice or attention. Take off contaminated clothing and wash it 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 or attention.

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

Disposal : Dispose of contents and container in accordance with all local, regional, national and international regulations.

Hazards not otherwise classified : None known.

Section 3. Composition/information on ingredients

Substance/mixture : Substance

Chemical name : benzene

Other means of identification : benzene, purebenzol; cyclohexatriene; phenyl hydride; phene; coal naphtha; pyrobenzol

Product code : 001062

CAS number/other identifiers

CAS number : 71-43-2

Ingredient name	%	CAS number
benzene	100	71-43-2

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 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. Wash contaminated clothing thoroughly with water before removing it, or wear gloves. 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. 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

Section 4. First aid measures

Eye contact : Causes serious eye irritation.

Inhalation : No known significant effects or critical hazards.

Skin contact : Causes skin irritation.

Frostbite : Try to warm up the frozen tissues and seek medical attention.

Ingestion : No known significant effects or critical hazards.

Over-exposure signs/symptoms

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.

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, CO_2, water spray (fog) or foam.

Unsuitable extinguishing media : Do not use water jet.

Specific hazards arising from the chemical : Highly flammable liquid and vapor. Runoff to sewer may create fire or explosion hazard. 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. Vapors may accumulate in low or confined areas or travel a considerable distance to a source of ignition and flash back.

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. 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.

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. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

Section 6. Accidental release measures

For emergency responders : If specialized 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. Use spark-proof tools and explosion-proof equipment. 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. Use spark-proof tools and explosion-proof equipment. 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 get in eyes or on skin or clothing. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Use only non-sparking tools. Take precautionary measures against electrostatic discharges. Do not ingest. Empty containers retain product residue and can be hazardous. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Do not reuse container. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Do not breathe vapor or mist. Avoid exposure - obtain special instructions before use. Do not handle until all safety precautions have been read and understood.

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 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. Eliminate all ignition sources. Store locked up. Separate from oxidizing materials. 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. See Section 10 for incompatible materials before handling or use.

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Section 8. Exposure controls/personal protection

Ingredient name	Exposure limits
benzene	**ACGIH TLV (United States, 3/2019).** **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, 10/2016).** STEL: 1 ppm 15 minutes. TWA: 0.1 ppm 10 hours. **OSHA PEL (United States, 5/2018).** STEL: 5 ppm 15 minutes. TWA: 1 ppm 8 hours. **OSHA PEL 1989 (United States, 3/1989).** STEL: 5 ppm 15 minutes. TWA: 1 ppm 8 hours. **OSHA PEL Z2 (United States, 2/2013).** AMP: 50 ppm 10 minutes. CEIL: 25 ppm TWA: 10 ppm 8 hours.

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: 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. 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.

Section 8. Exposure controls/personal protection

Respiratory protection : Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use.

Section 9. Physical and chemical properties

Appearance

Physical state : Liquid. [Watery liquid.]

Color : Colorless. Yellowish.

Odor : Characteristic.

Odor threshold : Not available.

pH : Not available.

Melting point : 5.49°C (41.9°F)

Boiling point : 80.09°C (176.2°F)

Critical temperature : 288.95°C (552.1°F)

Flash point : Closed cup: -11°C (12.2°F)

Evaporation rate : 3.5 (butyl acetate = 1)

Flammability (solid, gas) : Not available.

Lower and upper explosive (flammable) limits : Lower: 1.2%
Upper: 7.8%

Vapor pressure : 10 kPa (75.01 mm Hg) [room temperature]

Vapor density : 2.7 (Air = 1)

Specific Volume (ft ^{3}/lb) : 1.1403

Gas Density (lb/ft ^{3}) : 0.877 (20°C / 68 to °F)

Relative density : 0.88

Solubility : Not available.

Solubility in water : 1.88 g/l

Partition coefficient: n-octanol/water : 2.13

Auto-ignition temperature : 498°C (928.4°F)

Decomposition temperature : Not available.

Viscosity : Dynamic (room temperature): 0.6 mPa·s (0.6 cP)

Flow time (ISO 2431) : Not available.

Molecular weight : 78.12 g/mole

Aerosol product

Heat of combustion : -40611960 J/kg

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

Section 10. Stability and reactivity

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

Product/ingredient name	Result	Species	Dose	Exposure
benzene	LC50 Inhalation Gas. LD50 Oral	Rat Rat	10000 ppm 930 mg/kg	7 hours -

Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation
benzene	Eyes - Moderate irritant Eyes - Severe irritant Skin - Mild irritant Skin - Mild irritant Skin - Moderate irritant	Rabbit Rabbit Rat Rabbit Rabbit	- - - - -	88 mg 24 hours 2 mg 8 hours 60 Ul 24 hours 15 mg 24 hours 20 mg	- - - - -

Sensitization

Not available.

Mutagenicity

Not available.

Carcinogenicity

Not available.

Classification

Product/ingredient name	OSHA	IARC	NTP
benzene	+	1	Known to be a human carcinogen.

Reproductive toxicity

Not available.

Teratogenicity

Not available.

Specific target organ toxicity (single exposure)

Not available.

Specific target organ toxicity (repeated exposure)

Name	Category	Route of exposure	Target organs
benzene	Category 1	-	-

Aspiration hazard

Not available.

Information on the likely routes of exposure : Not available.

Section 11. Toxicological information

Potential acute health effects

Eye contact : Causes serious eye irritation.

Inhalation : No known significant effects or critical hazards.

Skin contact : Causes skin irritation.

Ingestion : No known significant effects or critical hazards.

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

Not available.

General : Causes damage to organs through prolonged or repeated exposure.

Carcinogenicity : May cause cancer. Risk of cancer depends on duration and level of exposure.

Mutagenicity : May cause genetic defects.

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

Product/ingredient name	Result	Species	Exposure
benzene	Acute EC50 29000 µg/l Fresh water	Algae - Pseudokirchneriella subcapitata	72 hours
	Acute EC50 1600000 µg/l Fresh water	Algae - Selenastrum sp.	96 hours
	Acute EC50 9.23 mg/l Fresh water	Daphnia - Daphnia magna - Neonate	48 hours
	Acute LC50 21 mg/l Marine water	Crustaceans - Artemia salina	48 hours
	Acute LC50 5.28 ul/L Fresh water	Fish - Oncorhynchus gorbuscha - Fry	96 hours
	Chronic EC10 >1360 mg/l Fresh water	Algae - Scenedesmus subspicatus	96 hours
	Chronic NOEC 98 mg/l Fresh water	Daphnia - Daphnia magna	21 days
	Chronic NOEC 1.5 to 5.4 ul/L Marine water	Fish - Morone saxatilis - Juvenile (Fledgling, Hatchling, Weanling)	4 weeks

Section 12. Ecological information

Persistence and degradability

Not available.

Bioaccumulative potential

Product/ingredient name	$LogP_{ow}$	BCF	Potential
benzene	2.13	11	low

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. 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. Vapor from product residues may create a highly flammable or explosive atmosphere inside the container. Do not cut, weld or grind used containers unless they have been cleaned thoroughly internally. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

United States - RCRA Toxic hazardous waste "U" List

Ingredient	CAS #	Status	Reference number
Benzene (I,T)	71-43-2	Listed	U019

Section 14. Transport information

	DOT	TDG	Mexico	IMDG	IATA
UN number	UN1114	UN1114	UN1114	UN1114	UN1114
UN proper shipping name	BENZENE	BENZENE	BENZENE	BENZENE	BENZENE
Transport hazard class(es)	3 	3 	3 	3 	3 
Packing group	II	II	II	II	II
Environmental hazards	No.	No.	No.	No.	No.

"Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product."

Section 14. Transport information

Additional information

DOT Classification : **Reportable quantity** 10 lbs / 4.54 kg [1.3675 gal / 5.1767 L]. Package sizes shipped in quantities less than the product reportable quantity are not subject to the RQ (reportable quantity) transportation requirements.
Limited quantity Yes.
Quantity limitation Passenger aircraft/rail: 5 L. Cargo aircraft: 60 L.

TDG Classification : Product classified as per the following sections of the Transportation of Dangerous Goods Regulations: 2.18-2.19 (Class 3).
Explosive Limit and Limited Quantity Index 1
Passenger Carrying Road or Rail Index 5

IATA : **Quantity limitation** Passenger and Cargo Aircraft: 5 L. Cargo Aircraft Only: 60 L. Limited Quantities - Passenger Aircraft: 1 L.

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 IMO instruments : Not available.

Section 15. Regulatory information

U.S. Federal regulations : **TSCA 8(a) CDR Exempt/Partial exemption**: Not determined
Clean Water Act (CWA) 307: benzene
Clean Water Act (CWA) 311: benzene

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

Composition/information on ingredients

No products were found.

SARA 304 RQ : Not applicable.

SARA 311/312

Classification : Refer to Section 2: Hazards Identification of this SDS for classification of substance.

SARA 313

	Product name	CAS number	%
Form R - Reporting requirements	benzene	71-43-2	100
Supplier notification	benzene	71-43-2	100

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.

Section 15. Regulatory information

New York : This material is listed.

New Jersey : This material is listed.

Pennsylvania : This material is listed.

California Prop. 65

⚠ **WARNING**: This product can expose you to Benzene, which is known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.

Ingredient name	No significant risk level	Maximum acceptable dosage level
Benzene	Yes.	Yes.

International regulations

Chemical Weapon Convention List Schedules I, II & III Chemicals

Not listed.

Montreal Protocol

Not listed.

Stockholm Convention on Persistent Organic Pollutants

Not listed.

Rotterdam Convention on Prior Informed Consent (PIC)

Not listed.

UNECE Aarhus Protocol on POPs and Heavy Metals

Not listed.

Inventory list

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 : **Japan inventory (ENCS)**: This material is listed or exempted.
Japan inventory (ISHL): This material is listed or exempted.

New Zealand : This material is listed or exempted.

Philippines : This material is listed or exempted.

Republic of Korea : This material is listed or exempted.

Taiwan : This material is listed or exempted.

Thailand : Not determined.

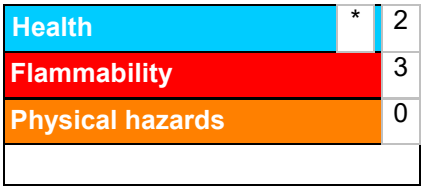
Turkey : This material is listed or exempted.

United States : This material is active or exempted.

Viet Nam : This material is listed or exempted.

Section 16. Other information

Hazardous Material Information System (U.S.A.)



Section 16. Other information

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 and the associated label are not required on SDSs or products leaving a facility 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 trademark and service mark of the American Coatings Association, Inc.

The customer is responsible for determining the PPE code for this material. For more information on HMIS® Personal Protective Equipment (PPE) codes, consult the HMIS® Implementation Manual.

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

Classification	Justification
FLAMMABLE LIQUIDS - Category 2	Expert judgment
SKIN IRRITATION - Category 2	Expert judgment
EYE IRRITATION - Category 2A	Expert judgment
GERM CELL MUTAGENICITY - Category 1	Expert judgment
CARCINOGENICITY - Category 1	Expert judgment
SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) - Category 1	Expert judgment

History

Date of printing : 6/1/2020

Date of issue/Date of revision : 6/1/2020

Date of previous issue : No previous validation

Version : 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
MARPOL = 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.

SAFETY DATA SHEET

Version 6.4
Revision Date 08/06/2021
Print Date 12/10/2022

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

1.1 Product identifiers

Product name : Bromomethane

Product Number : 295485
Brand : Aldrich
Index-No. : 602-002-00-2
CAS-No. : 74-83-9

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 Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Gases under pressure (Liquefied gas), H280
Acute toxicity, Oral (Category 3), H301
Acute toxicity, Inhalation (Category 3), H331
Acute toxicity, Dermal (Category 2), H310
Skin irritation (Category 2), H315
Eye irritation (Category 2A), H319
Germ cell mutagenicity (Category 2), H341
Specific target organ toxicity - single exposure (Category 3), Respiratory system, H335
Specific target organ toxicity - repeated exposure (Category 2), Central nervous system, H373
Short-term (acute) aquatic hazard (Category 1), H400
Long-term (chronic) aquatic hazard (Category 1), H410

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Hazardous to the ozone layer (Category 1), H420

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)

H280	Contains gas under pressure; may explode if heated.
H301 + H331	Toxic if swallowed or if inhaled.
H310	Fatal in contact with skin.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H335	May cause respiratory irritation.
H341	Suspected of causing genetic defects.
H373	May cause damage to organs (Central nervous system) through prolonged or repeated exposure.
H410	Very toxic to aquatic life with long lasting effects.
H420	Harms public health and the environment by destroying ozone in the upper atmosphere.

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/ vapors/ 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.
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P310 + P330	IF SWALLOWED: Immediately call a POISON CENTER/ doctor. Rinse mouth.
P302 + P350 + P310	IF ON SKIN: Gently wash with plenty of soap and water. Immediately call a POISON CENTER or doctor/ physician.
P302 + P352	IF ON SKIN: Wash with plenty of soap and water.
P304 + P340 + P311	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/ doctor.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
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.
P391	Collect spillage.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P405	Store locked up.
P410 + P403	Protect from sunlight. Store in a well-ventilated place.
P501	Dispose of contents/ container to an approved waste disposal plant.

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P502	Refer to manufacturer/ supplier for information on recovery/ recycling.

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

SECTION 3: Composition/information on ingredients

3.1 Substances

Synonyms : Methyl bromide

Formula : CH3Br
Molecular weight : 94.94 g/mol
CAS-No. : 74-83-9
EC-No. : 200-813-2
Index-No. : 602-002-00-2

Component	Classification	Concentration
Bromomethane		
	Press. Gas Liquefied gas; Acute Tox. 3; Acute Tox. 2; Skin Irrit. 2; Eye Irrit. 2A; Muta. 2; STOT SE 3; STOT RE 2; Aquatic Acute 1; Aquatic Chronic 1; Ozone 1; H280, H301, H331, H310, H315, H319, H341, H335, H373, H400, H410, H420 M-Factor - Aquatic Acute: 1 - Aquatic Chronic: 1	<= 100 %

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

SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice
Consult a physician. Show this material 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.

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If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture
Carbon oxides
Hydrogen bromide gas
Combustible.

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

5.4 Further information
Use water spray to cool unopened containers.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures
Wear respiratory protection. Avoid breathing vapors, 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. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up
Clean up promptly by sweeping or vacuum.

6.4 Reference to other sections
For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on safe handling
Avoid contact with skin and eyes. Avoid inhalation of vapor or mist.

Hygiene measures
Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

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For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions
Keep container tightly closed in a dry and well-ventilated place.

Contents under pressure. Refrigerate before opening.

Storage class
Storage class (TRGS 510): 2A: Gases

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

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Bromomethane	74-83-9	TWA	1 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Not classifiable as a human carcinogen Danger of cutaneous absorption		
		Potential Occupational Carcinogen		
		C	20 ppm 80 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Skin designation		
		TWA	5 ppm 20 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		Skin notation		
		PEL	1 ppm 3.88 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		
		C	20 ppm	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		

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).

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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: Fluorinated rubber
Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Splash contact
Material: Fluorinated rubber
Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, 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 EC 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
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: Liquefied gas
b)	Odor	sweet
c)	Odor Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: -94 °C (-137 °F) - lit.
f)	Initial boiling point and boiling range	4 °C 39 °F - lit.

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g)	Flash point	< -30 °C (< -22 °F) - liquid
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	Upper explosion limit: 20 %(V) Lower explosion limit: 8.6 %(V)
k)	Vapor pressure	1,900 hPa at 20 °C (68 °F)
l)	Vapor density	3.28
m)	Density	3.3 g/cm3 at 25 °C (77 °F) - lit.
	Relative density	No data available
n)	Water solubility	17.5 g/l at 20 °C (68 °F)
o)	Partition coefficient: n-octanol/water	log Pow: ca.1.99 at 25 °C (77 °F) - Bioaccumulation is not expected.
p)	Autoignition temperature	No data available
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	none

9.2 Other safety information

Relative vapor density	3.28

SECTION 10: Stability and reactivity

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
No data available

10.5 Incompatible materials
Strong oxidizing agents

10.6 Hazardous decomposition products
In the event of fire: see section 5

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SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - male and female - 104 mg/kg
(US EPA Test Guideline OPP 81-1)
LC50 Inhalation - Rat - male - 4 h - 1.46 mg/l
Remarks: (ECHA)
Symptoms: mucosal irritations, Cough, Shortness of breath, Possible damages:, damage of respiratory tract, Inhalation may lead to the formation of oedemas in the respiratory tract.
Inhalation: Irritating to respiratory system.
Acute toxicity estimate Inhalation - 701 ppm
(Expert judgment)
LD50 Dermal - Rat - 135 mg/kg
Remarks: (ECHA)

Skin corrosion/irritation
Causes skin irritation. (Regulation (EC) No 1272/2008, Annex VI)

Serious eye damage/eye irritation
Causes serious eye irritation. (Regulation (EC) No 1272/2008, Annex VI)

Respiratory or skin sensitization
No data available

Germ cell mutagenicity
Suspected of causing genetic defects.
Test Type: Ames test
Test system: Salmonella typhimurium
Result: positive
Remarks: (National Toxicology Program)

Carcinogenicity

IARC:	No ingredient 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 ingredient 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

Specific target organ toxicity - single exposure
May cause respiratory irritation.

Specific target organ toxicity - repeated exposure
May cause damage to organs through prolonged or repeated exposure. - Central nervous system

Aspiration hazard
No data available

11.2 Additional Information

RTECS: PA4900000

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Nausea, Dizziness, Headache, Anorexia., Vomiting, Weakness, Blurred vision, Confusion., Tremors, Convulsions, Pulmonary edema. Effects may be delayed., Cyanosis, Coma., possibly death
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

After absorption:

Headache
Nausea
Convulsions
Cyanosis
CNS disorders
narcosis

Symptoms in:

After a latency period:

Kidney
Liver
Lungs

This substance should be handled with particular care.

Kidney -

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish	LC50 - Oncorhynchus mykiss (rainbow trout) - 3.9 mg/l - 96 h (US-EPA)
	LC50 - Poecilia reticulata (guppy) - 0.8 mg/l - 96 h Remarks: (ECOTOX Database)
Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - 2.6 mg/l - 48 h (US-EPA)
Toxicity to algae	IC50 - Chlorella pyrenoidosa - 5 mg/l - 48 h Remarks: (ECOTOX Database)

12.2 Persistence and degradability

Biodegradability	Result: 17 % - Not readily biodegradable. Remarks: (IUCLID)

12.3 Bioaccumulative potential

No data available

12.4 Mobility in soil

No data available

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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.

SECTION 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.

Contaminated packaging
Dispose of as unused product.

SECTION 14: Transport information

DOT (US)
UN number: 1062 Class: 2.3
Proper shipping name: Methyl bromide
Reportable Quantity (RQ): 1000 lbs
Poison Inhalation Hazard: Hazard Zone C

IMDG
UN number: 1062 Class: 2.3 EMS-No: F-C, S-U
Proper shipping name: METHYL BROMIDE
Marine pollutant : yes

IATA
UN number: 1062 Class: 2.3
Proper shipping name: Methyl bromide
IATA Passenger: Not permitted for transport
IATA Cargo: Not permitted for transport

SECTION 15: Regulatory information

SARA 302 Components
The following components are subject to reporting levels established by SARA Title III, Section 302:

	CAS-No.	Revision Date
Bromomethane	74-83-9	2013-02-08

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

	CAS-No.	Revision Date

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Bromomethane	74-83-9	2013-02-08

Massachusetts Right To Know Components
No components are subject to the Massachusetts Right to Know Act.

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Bromomethane	74-83-9	2013-02-08

SECTION 16: Other information

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.

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Version: 6.4 Revision Date: 08/06/2021 Print Date: 12/10/2022

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SAFETY DATA SHEET

Version 6.5
Revision Date 09/01/2022
Print Date 12/10/2022

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

1.1 Product identifiers

Product name : Carbon disulfide

Product Number : 335266
Brand : Sigma-Aldrich
Index-No. : 006-003-00-3
CAS-No. : 75-15-0

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 Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 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
Acute toxicity, Inhalation (Category 4), H332
Skin irritation (Category 2), H315
Eye irritation (Category 2A), H319
Reproductive toxicity (Category 2), H361
Specific target organ toxicity - repeated exposure (Category 1), Peripheral nervous system, Central nervous system, Cardio-vascular system, Eyes, H372
Short-term (acute) aquatic hazard (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

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Pictogram	
Signal Word	Danger

Hazard statement(s)

H225	Highly flammable liquid and vapor.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H332	Harmful if inhaled.
H361	Suspected of damaging fertility or the unborn child.
H372	Causes damage to organs (Peripheral nervous system, Central nervous system, Cardio-vascular system, Eyes) through prolonged or repeated exposure.
H401	Toxic to aquatic life.

Precautionary statement(s)

P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P210	Keep away from heat/ sparks/ open flames/ hot surfaces. No smoking.
P233	Keep container tightly closed.
P240	Ground/bond container and receiving equipment.
P241	Use explosion-proof electrical/ ventilating/ lighting/ equipment.
P242	Use only non-sparking tools.
P243	Take precautionary measures against static discharge.
P260	Do not breathe mist or vapors.
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.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P304 + P340 + 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.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
P403 + P235	Store in a well-ventilated place. Keep cool.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

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

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SECTION 3: Composition/information on ingredients

3.1 Substances

Formula	:	CS_2
Molecular weight	:	76.14 g/mol
CAS-No.	:	75-15-0
EC-No.	:	200-843-6
Index-No.	:	006-003-00-3

Component	Classification	Concentration
Carbon Disulfide		
	Flam. Liq. 2; Acute Tox. 4; Skin Irrit. 2; Eye Irrit. 2A; Repr. 2; STOT RE 1; Aquatic Acute 2; H225, H332, H315, H319, H361, H372, H401 Concentration limits: >= 1 %: Repr. 2, H361fd; >= 1 %: STOT RE 1, H372; 0.2 - < 1 %: STOT RE 2, H373;	<= 100 %

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

SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice
Show this material safety data sheet to the doctor in attendance.

If inhaled
After inhalation: fresh air. Immediately call in physician. If breathing stops: immediately apply artificial respiration, if necessary also oxygen.

In case of skin contact
In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower. Consult a physician.

In case of eye contact
After eye contact: rinse out with plenty of water. Call in ophthalmologist. Remove contact lenses.

If swallowed
After swallowing: immediately make victim drink water (two glasses at most). 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

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SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Water Foam Carbon dioxide (CO2) Dry powder

Unsuitable extinguishing media
For this substance/mixture no limitations of extinguishing agents are given.

5.2 Special hazards arising from the substance or mixture

Carbon oxides
Sulfur oxides
Flash back possible over considerable distance., Container explosion may occur under fire conditions., Vapors may form explosive mixture with air., May explode when heated.
Combustible.
Pay attention to flashback.
Vapors are heavier than air and may spread along floors.
Development of hazardous combustion gases or vapours possible in the event of fire.
Forms explosive mixtures with air at ambient temperatures.

5.3 Advice for firefighters

Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

5.4 Further information

Remove container from danger zone and cool with water. Suppress (knock down) gases/vapors/mists with a water spray jet. Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Advice for non-emergency personnel: Do not breathe vapors, aerosols. Avoid substance contact. Ensure adequate ventilation. Keep away from heat and sources of ignition.
Evacuate the danger area, observe emergency procedures, consult an expert.
For personal protection see section 8.

6.2 Environmental precautions

Do not let product enter drains. Risk of explosion.

6.3 Methods and materials for containment and cleaning up

Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up carefully with liquid-absorbent material (e.g. Chemizorb®). Dispose of properly. Clean up affected area.

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on safe handling
Work under hood. Do not inhale substance/mixture. Avoid generation of vapours/aerosols.

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Advice on protection against fire and explosion
Keep away from open flames, hot surfaces and sources of ignition.Take precautionary measures against static discharge.

Hygiene measures
Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions
Keep container tightly closed in a dry and well-ventilated place. Keep away from heat and sources of ignition. Keep locked up or in an area accessible only to qualified or authorized persons.

Refrigerate before opening.

Storage class
Storage class (TRGS 510): 3: Flammable liquids

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

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Carbon Disulfide	75-15-0	TWA	1 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Not classifiable as a human carcinogen Danger of cutaneous absorption		
		TWA	1 ppm 3 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential for dermal absorption		
		ST	10 ppm 30 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential for dermal absorption		
		TWA	20 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		CEIL	30 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Peak	100 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		PEL	1 ppm 3 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		

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		STEL	12 ppm 36 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		
		C	30 ppm	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Carbon Disulfide	75-15-0	2-Thiothiazolidine-4-carboxylix acid (TTCA)	0.5mg/g Creatinine	Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift (As soon as possible after exposure ceases)			

8.2 Exposure controls

Appropriate engineering controls
Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

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). Safety glasses

Skin protection
This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).
Full contact
Material: Viton®
Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).
Splash contact
Material: butyl-rubber
Minimum layer thickness: 0.7 mm
Break through time: 30 min
Material tested:Butoject® (KCL 898)

Body Protection
Flame retardant antistatic protective clothing.

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Respiratory protection
required when vapours/aerosols are generated. Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

Control of environmental exposure
Do not let product enter drains. Risk of explosion.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: clear, liquid Color: colorless
b)	Odor	odorless
c)	Odor Threshold	Not applicable
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: -112 - -111 °C (-170 - -168 °F)
f)	Initial boiling point and boiling range	46 °C 115 °F
g)	Flash point	-30 °C (-22 °F) - c.c.
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	Upper explosion limit: 60 %(V) Lower explosion limit: 1 %(V)
k)	Vapor pressure	274 hPa at 25 °C (77 °F) - OECD Test Guideline 104
l)	Vapor density	No data available
m)	Density	1.266 g/mL at 25 °C (77 °F)
	Relative density	No data available
n)	Water solubility	2.9 g/l at 20 °C (68 °F) - OECD Test Guideline 105 - soluble
o)	Partition coefficient: n-octanol/water	log Pow: 2.7 at 25 °C (77 °F) - OECD Test Guideline 117 - Bioaccumulation is not expected.
p)	Autoignition temperature	No data available
q)	Decomposition temperature	415 °C (779 °F), 89.7 kJ/mol -
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	none

9.2 Other safety information

Surface tension	71.9 mN/m at 1g/l at 19.5 °C (67.1 °F) - OECD Test Guideline

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SECTION 10: Stability and reactivity

10.1 Reactivity
Vapors may form explosive mixture with air.

10.2 Chemical stability
The product is chemically stable under standard ambient conditions (room temperature) .

10.3 Possibility of hazardous reactions
Risk of explosion with:
nitrogen oxides
permanganic acid
Oxidizing agents
halogen-halogen compounds
halogen oxides
Iron
ferric oxide
Chlorine
hydrazines
powdered aluminium
chlorine oxides
Potassium
potassium permanganate
Lithium
sodium
nitrogen dioxide
azides
Risk of ignition or formation of inflammable gases or vapours with:
Fluorine
phosphorus
sulfur
Activated charcoal
Powdered metals
Reducing agents
Exothermic reaction with:
Zinc
Acids

10.4 Conditions to avoid
Warming.

10.5 Incompatible materials
rubber, various plastics

10.6 Hazardous decomposition products
In the event of fire: see section 5

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SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - female - > 2,000 mg/kg
(OECD Test Guideline 423)
LC50 Inhalation - Rat - male and female - 4 h - 10.35 mg/l - vapor

(OECD Test Guideline 403)
Dermal: No data available

Skin corrosion/irritation
Skin - Rabbit
Result: Severe irritations
Remarks: (Regulation (EC) No 1272/2008, Annex VI)
(IUCLID)

Serious eye damage/eye irritation
Eyes - Human
Result: Severe irritations
Remarks: (Regulation (EC) No 1272/2008, Annex VI)
(IUCLID)

Respiratory or skin sensitization
Local lymph node assay (LLNA) - Mouse
Result: negative
(OECD Test Guideline 429)

Germ cell mutagenicity
Test Type: In vitro mammalian cell gene mutation test
Test system: mouse lymphoma cells
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 476
Result: negative

Test Type: Micronucleus test
Species: Mouse
Cell type: Red blood cells (erythrocytes)
Application Route: inhalation (vapor)
Method: OECD Test Guideline 474
Result: negative

Carcinogenicity

IARC: No ingredient 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 ingredient 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
Suspected of damaging the unborn child. Suspected of damaging fertility.

Specific target organ toxicity - single exposure
No data available

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Specific target organ toxicity - repeated exposure
Causes damage to organs through prolonged or repeated exposure. - Peripheral nervous system, Central nervous system, Cardio-vascular system, Eyes
Remarks: Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

Aspiration hazard
No data available

11.2 Additional Information

RTECS: FF6650000
May cause convulsions.
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

After uptake of large quantities:

inebriation
agitation, spasms
Unconsciousness
narcosis
Cyanosis
drop in blood pressure

After long-term exposure to the chemical:

Tiredness
muscular symptoms

After a latency period:

Stomach/intestinal disorders
psychoses
Changes in the blood count
Cardiac irregularities

Damage to:

Liver
Kidney

This substance should be handled with particular care.

Liver - Irregularities - Based on Human Evidence

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish	semi-static test LC50 - Danio rerio (zebra fish) - 3 mg/l - 96 h (OECD Test Guideline 203)
Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - 2.1 mg/l - 48 h (OECD Test Guideline 202)

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Toxicity to algae	static test EC50 - Chlorella pyrenoidosa - 21 mg/l - 96 h (OECD Test Guideline 201)
Toxicity to bacteria	static test EC50 - Bacteria - 13 mg/l - 24 h Remarks: (ECHA)

12.2 Persistence and degradability

Biodegradability	aerobic - Exposure time 28 d Result: > 80 % - Readily biodegradable. (OECD Test Guideline 301D)
Chemical Oxygen Demand (COD)	1.47 mg/g Remarks: (IUCLID)

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 Endocrine disrupting properties

No data available

12.7 Other adverse effects

Additional ecological information	Hazard for drinking water supplies. Discharge into the environment must be avoided.
Stability in water	- > 1 yr Remarks: (IUCLID)

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product

Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself. See www.retrologistik.com for processes regarding the return of chemicals and containers, or contact us there if you have further questions.

SECTION 14: Transport information

DOT (US)

UN number: 1131 Class: 3 (6.1) Packing group: I
Proper shipping name: Carbon disulfide
Reportable Quantity (RQ): 100 lbs
Reportable Quantity (RQ): 100 lbs
Poison Inhalation Hazard: No

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IMDG
UN number: 1131 Class: 3 (6.1) Packing group: I EMS-No: F-E, S-D
Proper shipping name: CARBON DISULPHIDE

IATA
UN number: 1131 Class: 3 (6.1)
Proper shipping name: Carbon disulphide
IATA Passenger: Not permitted for transport
IATA Cargo: Not permitted for transport

SECTION 15: Regulatory information

SARA 302 Components

	CAS-No.	Revision Date
Carbon Disulfide	75-15-0	2008-11-03

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

	CAS-No.	Revision Date
Carbon Disulfide	75-15-0	2008-11-03

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

Reportable Quantity : F005 lbs

Massachusetts Right To Know Components
No components are subject to the Massachusetts Right to Know Act.

SECTION 16: Other information

Further information
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. 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.

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Version: 6.5 Revision Date: 09/01/2022 Print Date: 12/10/2022

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operates as MilliporeSigma in the US and Canada

The life science business of Merck KGaA, Darmstadt, Germany
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SAFETY DATA SHEET

Version 8.3
Revision Date 04/05/2022
Print Date 12/15/2022

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

1.1 Product identifiers

Product name : Carbon tetrachloride

Product Number : C5331
Brand : Sigma
Index-No. : 602-008-00-5
CAS-No. : 56-23-5

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 Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 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 3), H331
Acute toxicity, Dermal (Category 3), H311
Skin sensitization (Sub-category 1B), H317
Carcinogenicity (Category 2), H351
Specific target organ toxicity - repeated exposure, Inhalation (Category 1), Liver, Kidney, H372
Short-term (acute) aquatic hazard (Category 3), H402
Long-term (chronic) aquatic hazard (Category 3), H412
Hazardous to the ozone layer (Category 1), H420

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

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2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word: Danger

Hazard statement(s)

H301 + H311 + H331	Toxic if swallowed, in contact with skin or if inhaled.
H317	May cause an allergic skin reaction.
H351	Suspected of causing cancer.
H372	Causes damage to organs (Liver, Kidney) through prolonged or repeated exposure if inhaled.
H412	Harmful to aquatic life with long lasting effects.
H420	Harms public health and the environment by destroying ozone in the upper atmosphere.

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/ vapors/ 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 must not be allowed out of the workplace.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P310 + P330	IF SWALLOWED: Immediately call a POISON CENTER/ doctor. Rinse mouth.
P302 + P352 + P312	IF ON SKIN: Wash with plenty of water.Call a POISON CENTER/ doctor if you feel unwell.
P304 + P340 + P311	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/ doctor.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P333 + P313	If skin irritation or rash occurs: 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.
P502	Refer to manufacturer/ supplier for information on recovery/ recycling.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS

Rapidly absorbed through skin.

SECTION 3: Composition/information on ingredients

3.1 Substances

Formula	:	CCl_4
Molecular weight	:	153.82 g/mol

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CAS-No. : 56-23-5
EC-No. : 200-262-8
Index-No. : 602-008-00-5

Component	Classification	Concentration
Carbon tetrachloride		
	Acute Tox. 3; Skin Sens. 1B; Carc. 2; STOT RE 1; Aquatic Acute 3; Aquatic Chronic 3; Ozone 1; H301, H331, H311, H317, H351, H372, H402, H412, H420 Concentration limits: >= 1 %: STOT RE 1, H372; 0.2 - < 1 %: STOT RE 2, H373;	<= 100 %

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

SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice
First aiders need to protect themselves. Show this material safety data sheet to the doctor in attendance.

If inhaled
After inhalation: fresh air. Immediately call in physician. If breathing stops: immediately apply artificial respiration, if necessary also oxygen.

In case of skin contact
In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower. Call a physician immediately.

In case of eye contact
After eye contact: rinse out with plenty of water. Call in ophthalmologist. Remove contact lenses.

If swallowed
If swallowed: give water to drink (two glasses at most). Seek medical advice immediately. In exceptional cases only, if medical care is not available within one hour, induce vomiting (only in persons who are wide awake and fully conscious), administer activated charcoal (20 - 40 g in a 10% slurry) and consult a doctor as quickly as possible.

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

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SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

Unsuitable extinguishing media
For this substance/mixture no limitations of extinguishing agents are given.

5.2 Special hazards arising from the substance or mixture

Carbon oxides
Hydrogen chloride gas
Not combustible.
Ambient fire may liberate hazardous vapours.

5.3 Advice for firefighters

Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

5.4 Further information

Suppress (knock down) gases/vapors/mists with a water spray jet. Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Advice for non-emergency personnel: Do not breathe vapors, aerosols. Avoid substance contact. Ensure adequate ventilation. Evacuate the danger area, observe emergency procedures, consult an expert.
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

Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up carefully with liquid-absorbent material (e.g. Chemizorb®). Dispose of properly. Clean up affected area.

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on safe handling
Work under hood. Do not inhale substance/mixture. Avoid generation of vapours/aerosols.

Hygiene measures
Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.
For precautions see section 2.2.

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7.2 Conditions for safe storage, including any incompatibilities

Storage conditions
Tightly closed. Keep in a well-ventilated place. Keep locked up or in an area accessible only to qualified or authorized persons.

Storage class
Storage class (TRGS 510): 6.1A: 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

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Carbon tetrachloride	56-23-5	TWA	5 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Suspected human carcinogen Danger of cutaneous absorption		
		STEL	10 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Suspected human carcinogen Danger of cutaneous absorption		
		ST	2 ppm 12.6 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen		
		TWA	10 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		CEIL	25 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Peak	200 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		C	200 ppm	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		
		PEL	2 ppm 12.6 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		
		STEL	10 ppm 63 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		

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8.2 Exposure controls

Appropriate engineering controls
Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

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). Safety glasses

Skin protection
This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).
Full contact
Material: Viton®
Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).
Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.4 mm
Break through time: 240 min
Material tested:Camatril® (KCL 730 / Aldrich Z677442, Size M)

Body Protection
protective clothing

Respiratory protection
required when vapours/aerosols are generated. Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

Control of environmental exposure
Do not let product enter drains.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid Color: colorless
b)	Odor	sweet
c)	Odor Threshold	No data available

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d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: -23 °C (-9 °F)
f)	Initial boiling point and boiling range	77 °C 171 °F at 1,013 hPa
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)	Vapor pressure	45 hPa at 0.3 °C (32.5 °F) 120 hPa at 19.8 °C(67.6 °F) 14,549 hPa at 24 °C(75 °F)
l)	Vapor density	No data available
m)	Density	1.59 g/cm3 at 20 °C (68 °F)
	Relative density	No data available
n)	Water solubility	0.8461 g/l at 20 °C (68 °F)
o)	Partition coefficient: n-octanol/water	log Pow: 2.83 at 25 °C (77 °F)
p)	Autoignition temperature	No data available
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	none

9.2 Other safety information

Surface tension	26.7 mN/m at 20 °C (68 °F) 19.5 mN/m at 80 °C (176 °F)

SECTION 10: Stability and reactivity

10.1 Reactivity
No data available

10.2 Chemical stability
The product is chemically stable under standard ambient conditions (room temperature) .

10.3 Possibility of hazardous reactions
Risk of explosion with:
Alkali metals

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powdered aluminium
Barium
Boranes
calcium silicide
halogen-halogen compounds
peroxi compounds
Fluorine
powdered magnesium
Powdered metals
sodium amide
silanes
silver perchlorate
nitrogen dioxide
alkenes
Oxygen
(as liquefied gas)
Oxygen
with
alkali hydroxides
calcium hypochlorite
with
heat
Violent reactions possible with:
Alkaline earth metals
Dimethylformamide
aluminium chloride
with
triethylaluminium

10.4 Conditions to avoid
no information available

10.5 Incompatible materials
various plastics, Light metals, metal alloys, Metals

10.6 Hazardous decomposition products
In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - 2,350 mg/kg
Remarks: (RTECS)
LC50 Inhalation - Rat - 4 h - 8000 ppm - vapor

LD50 Dermal - Rabbit - > 20,000 mg/kg
No data available

Skin corrosion/irritation
Skin - Rabbit
Result: Mild skin irritation - 24 h

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(Draize Test)

Serious eye damage/eye irritation
Eyes - Rabbit
Result: Mild eye irritation - 24 h
(Draize Test)

Respiratory or skin sensitization
- Mouse
Result: The product is a skin sensitizer, sub-category 1B.
(OECD Test Guideline 429)

Germ cell mutagenicity
No data available

Carcinogenicity
Suspected of causing cancer.

IARC:	2B - Group 2B: Possibly carcinogenic to humans (Carbon tetrachloride)
NTP:	No ingredient 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

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. - Liver, Kidney

Aspiration hazard
No data available

11.2 Additional Information

RTECS: FG4900000
Vomiting, Diarrhea, Abdominal pain, Nausea, Dizziness, Headache, Damage to the eyes., Liver injury may occur., Kidney injury may occur., Exposure to and/or consumption of alcohol may increase toxic effects., Contact with skin can cause:, Pain, Erythema, hyperemia
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish	mortality LC50 - Danio rerio (zebra fish) - 24.3 mg/l - 96 h
Toxicity to daphnia and other aquatic invertebrates	Immobilization EC50 - Daphnia magna (Water flea) - 35 mg/l - 48 h (OECD Test Guideline 202)

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Toxicity to algae	Growth inhibition EC50 - Algae - 20 mg/l - 72 h (OECD Test Guideline 201)

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential

Bioaccumulation	Lepomis macrochirus (Bluegill) - 21 d - 52.3 µg/l(Carbon tetrachloride)
	Bioconcentration factor (BCF): 30

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 Endocrine disrupting properties
No data available

12.7 Other adverse effects
No data available

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product
Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself. See www.retrologistik.com for processes regarding the return of chemicals and containers, or contact us there if you have further questions.

SECTION 14: Transport information

DOT (US)
UN number: 1846 Class: 6.1 Packing group: II
Proper shipping name: Carbon tetrachloride
Reportable Quantity (RQ): 10 lbs
Reportable Quantity (RQ): 10 lbs
Reportable Quantity (RQ): 10 lbs
Poison Inhalation Hazard: No

IMDG
UN number: 1846 Class: 6.1 Packing group: II EMS-No: F-A, S-A
Proper shipping name: CARBON TETRACHLORIDE
Marine pollutant : yes

IATA
UN number: 1846 Class: 6.1 Packing group: II
Proper shipping name: Carbon tetrachloride

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SECTION 15: Regulatory information

SARA 302 Components
This material does not contain any components with a section 302 EHS TPQ.

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

	CAS-No.	Revision Date
Carbon tetrachloride	56-23-5	2007-07-01

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

Reportable Quantity : D019 lbs

F001 lbs

Massachusetts Right To Know Components
No components are subject to the Massachusetts Right to Know Act.

SECTION 16: Other information

Further information
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. 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.

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Version: 8.3 Revision Date: 04/05/2022 Print Date: 12/15/2022

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SAFETY DATA SHEET

Version 6.3
Revision Date 04/18/2021
Print Date 12/10/2022

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

1.1 Product identifiers

Product name : Chloroform

Product Number : 288306
Brand : Sigma-Aldrich
CAS-No. : 67-66-3

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 Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 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
Skin irritation (Category 2), H315
Eye irritation (Category 2A), H319
Carcinogenicity (Category 2), H351
Reproductive toxicity (Category 2), H361
Specific target organ toxicity - single exposure (Category 3), Central nervous system, H336
Specific target organ toxicity - repeated exposure (Category 1), Liver, Kidney, H372
Short-term (acute) aquatic hazard (Category 3), H402
Long-term (chronic) aquatic hazard (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

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Pictogram	
Signal word	Danger

Hazard statement(s)

H302	Harmful if swallowed.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H331	Toxic if inhaled.
H336	May cause drowsiness or dizziness.
H351	Suspected of causing cancer.
H361	Suspected of damaging fertility or the unborn child.
H372	Causes damage to organs (Liver, Kidney) through prolonged or repeated exposure.
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/ vapors/ 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.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P312 + P330	IF SWALLOWED: Call a POISON CENTER/ doctor if you feel unwell. Rinse mouth.
P302 + P352	IF ON SKIN: Wash with plenty of soap and water.
P304 + P340 + P311	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/ doctor.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
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

SECTION 3: Composition/information on ingredients

3.1 Substances

Synonyms	:	Trichloromethane Methylidyne trichloride
Formula	:	$CHCl_3$

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Molecular weight : 119.38 g/mol
CAS-No. : 67-66-3

Component	Classification	Concentration
Chloroform		
	Acute Tox. 4; Acute Tox. 3; Skin Irrit. 2; Eye Irrit. 2A; Carc. 2; Repr. 2; STOT SE 3; STOT RE 1; Aquatic Acute 3; H302, H331, H315, H319, H351, H361, H336, H372, H402 Concentration limits: 20 %: STOT SE 3, H336;	<= 100 %

ethanol		
	Flam. Liq. 2; Eye Irrit. 2A; H225, H319 Concentration limits: >= 50 %: Eye Irrit. 2A, H319;	>= 1 - < 5 %

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

SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice
Consult a physician. Show this material 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

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SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture

Carbon oxides
Hydrogen chloride gas
Not combustible.

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Wear respiratory protection. Avoid breathing vapors, 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. Discharge into the environment must be avoided.

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.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on safe handling
Avoid contact with skin and eyes. Avoid inhalation of vapor or mist.

Hygiene measures
Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions
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): 6.1D: Non-combustible, acute toxic Cat.3 / toxic hazardous materials or hazardous materials causing chronic effects

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7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Chloroform	67-66-3	TWA	10 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Confirmed animal carcinogen with unknown relevance to humans		
		ST	2 ppm 9.78 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen		
		C	50 ppm 240 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		PEL	2 ppm 9.78 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
ethanol	64-17-5	TWA	1,000 ppm 1,900 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		TWA	1,000 ppm 1,900 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		STEL	1,000 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Confirmed animal carcinogen with unknown relevance to humans		
		TWA	1,000 ppm 1,900 mg/m3	USA. NIOSH Recommended Exposure Limits
		PEL	1,000 ppm 1,900 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

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).

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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: Fluorinated rubber
Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Splash contact
Material: Fluorinated rubber
Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, 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 EC 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
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid, clear Color: colorless
b)	Odor	sweet
c)	Odor Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: -63 °C (-81 °F) - lit.
f)	Initial boiling point	60.5 - 61.5 °C 140.9 - 142.7 °F - lit.

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	and boiling range	
g)	Flash point	() - Regulation (EC) No. 440/2008, Annex, A.9does not flash
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapor pressure	210 hPa at 20 °C (68 °F)
l)	Vapor density	4.12 - (Air = 1.0)
m)	Relative density	No data available
n)	Water solubility	8.7 g/l at 23 °C (73 °F) - OECD Test Guideline 105
o)	Partition coefficient: n-octanol/water	No data available
p)	Autoignition temperature	No data available
q)	Decomposition temperature	Distillable in an undecomposed state at normal pressure.
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information

Solubility in other solvents	organic solvent at 20 °C (68 °F) - miscible
Relative vapor density	4.12 - (Air = 1.0)

SECTION 10: Stability and reactivity

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.
Contains the following stabilizer(s):
ethanol (>=0.5 - <=1 %)

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
No data available

10.5 Incompatible materials
various plastics, RubberStrong oxidizing agents

10.6 Hazardous decomposition products
In the event of fire: see section 5

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SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
No data available

LD50 Oral - Rat - male - 908 mg/kg
(OECD Test Guideline 401)

Inhalation: No data available

Acute toxicity estimate Inhalation - Expert judgment - 4 h - 3.1 mg/l

Dermal: No data available

Dermal: No data available
No data available
No data available

Skin corrosion/irritation
No data available

Skin - Rabbit
Result: Irritating to skin. - 24 h
Remarks: (ECHA)
Drying-out effect resulting in rough and chapped skin.
Skin - Rabbit
Result: slight irritation
Remarks: (IUCLID)

Serious eye damage/eye irritation
No data available
Eyes - Rabbit
Result: Irritating to eyes.
Remarks: (ECHA)
(Regulation (EC) No 1272/2008, Annex VI)

Respiratory or skin sensitization
No data available
Maximization Test - Guinea pig
Result: negative
(Regulation (EC) No. 440/2008, Annex, B.6)

Germ cell mutagenicity

No data available

Test Type: Ames test
Test system: Escherichia coli/Salmonella typhimurium
Metabolic activation: with and without metabolic activation
Result: negative
Remarks: (ECHA)

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Test Type: unscheduled DNA synthesis assay
Test system: Liver
Metabolic activation: without metabolic activation
Result: negative
Remarks: (ECHA)

Test Type: Micronucleus test
Species: Rat
Cell type: Red blood cells (erythrocytes)
Application Route: Oral
Method: OECD Test Guideline 474
Result: negative

Test Type: unscheduled DNA synthesis assay
Species: Rat
Cell type: Liver cells
Application Route: Oral
Method: OECD Test Guideline 486
Result: negative

Test Type: in vivo assay
Species: Mouse

Application Route: Inhalation

Result: negative
Remarks: (ECHA)

Carcinogenicity
Suspected of causing cancer.

IARC:	2B - Group 2B: Possibly carcinogenic to humans (Chloroform)
NTP:	No ingredient 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
Suspected of damaging the unborn child.
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

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11.2 Additional Information

Repeated dose toxicity - Rat - female - Oral - NOAEL (No observed adverse effect level) - 34 mg/kg
Not available

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

Vomiting, Cough, irritant effects, Shortness of breath, respiratory arrest, narcosis, Dizziness, Nausea, agitation, spasms, inebriation, Headache, Stomach/intestinal disorders, ataxia (impaired locomotor coordination), cardiovascular disorders
Drying-out effect resulting in rough and chapped skin.
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

SECTION 12: Ecological information

12.1 Toxicity

No data available

Toxicity to algae	static test ErC50 - Chlamydomonas reinhardtii (green algae) - 13.3 mg/l - 72 h Remarks: (ECHA) (Chloroform)
Toxicity to bacteria	Remarks: (ECHA) (Chloroform)

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.
No data available

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SECTION 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.

SECTION 14: Transport information

DOT (US)
UN number: 1888 Class: 6.1 Packing group: III
Proper shipping name: Chloroform
Reportable Quantity (RQ): 10 lbs
Reportable Quantity (RQ): 10 lbs
Poison Inhalation Hazard: No

IMDG
UN number: 1888 Class: 6.1 Packing group: III EMS-No: F-A, S-A
Proper shipping name: CHLOROFORM

IATA
UN number: 1888 Class: 6.1 Packing group: III
Proper shipping name: Chloroform

SECTION 15: Regulatory information

SARA 302 Components
The following components are subject to reporting levels established by SARA Title III, Section 302:

	CAS-No.	Revision Date
Chloroform	67-66-3	2008-11-03

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

	CAS-No.	Revision Date
Chloroform	67-66-3	2008-11-03

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

Reportable Quantity : D022 lbs

Massachusetts Right To Know Components
No components are subject to the Massachusetts Right to Know Act.

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SECTION 16: Other information

Further information

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Version: 6.3 Revision Date: 04/18/2021 Print Date: 12/10/2022

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SAFETY DATA SHEET

Version 6.6
Revision Date 09/06/2022
Print Date 12/10/2022

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

1.1 Product identifiers

Product name : Chloromethane

Product Number : 295507
Brand : Aldrich
Index-No. : 602-001-00-7
CAS-No. : 74-87-3

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 Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Flammable gases (Category 1), H220
Gases under pressure (Liquefied gas), H280
Carcinogenicity (Category 2), H351
Reproductive toxicity (Category 2), H361
Specific target organ toxicity - repeated exposure, Inhalation (Category 2), Central nervous system, Liver, Urogenital tract, 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



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Signal Word	Danger

Hazard statement(s)

H220	Extremely flammable gas.
H280	Contains gas under pressure; may explode if heated.
H351	Suspected of causing cancer.
H361	Suspected of damaging fertility or the unborn child.
H373	May cause damage to organs (Central nervous system, Liver, Urogenital tract) 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.
P210	Keep away from heat/ sparks/ open flames/ hot surfaces. No smoking.
P260	Do not breathe gas.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P377	Leaking gas fire: Do not extinguish, unless leak can be stopped safely.
P381	Eliminate all ignition sources if safe to do so.
P405	Store locked up.
P410 + P403	Protect from sunlight. Store in a well-ventilated place.
P501	Dispose of contents/ container to an approved waste disposal plant.

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

SECTION 3: Composition/information on ingredients

3.1 Substances

Synonyms	:	Methyl chloride
Formula	:	CH_3Cl
Molecular weight	:	50.49 g/mol
CAS-No.	:	74-87-3
EC-No.	:	200-817-4
Index-No.	:	602-001-00-7

Component	Classification	Concentration
methyl chloride		
	Flam. Gas 1; Press. Gas Liquefied gas; Carc. 2; Repr. 2; STOT RE 2; H220, H280, H351, H361, H373	<= 100 %

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

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SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice
Show this material safety data sheet to the doctor in attendance.

If inhaled
After inhalation: fresh air. Call in physician.

In case of skin contact
In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower. Consult a physician.

In case of eye contact
After eye contact: rinse out with plenty of water. Call in ophthalmologist. Remove contact lenses.

If swallowed
After swallowing: immediately make victim drink water (two glasses at most). Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Water Foam Carbon dioxide (CO2) Dry powder

Unsuitable extinguishing media
For this substance/mixture no limitations of extinguishing agents are given.

5.2 Special hazards arising from the substance or mixture

Carbon oxides
Hydrogen chloride gas
Combustible.
Pay attention to flashback.
Development of hazardous combustion gases or vapours possible in the event of fire.

5.3 Advice for firefighters

Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

5.4 Further information

Remove container from danger zone and cool with water. Suppress (knock down) gases/vapors/mists with a water spray jet. Prevent fire extinguishing water from contaminating surface water or the ground water system.

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SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Advice for non-emergency personnel: Do not breathe gas. Avoid substance contact. Ensure adequate ventilation. Evacuate the danger area, observe emergency procedures, consult an expert.
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

Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Stop flow of gas, move leaking cylinder to open air if without risk.

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on safe handling
Work under hood. Do not inhale substance/mixture. Avoid generation of vapours/aerosols.

Advice on protection against fire and explosion
Keep away from open flames, hot surfaces and sources of ignition.

Hygiene measures
Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions
Tightly closed. Keep away from combustible materials and sources of ignition.

Contents under pressure. Moisture sensitive.

Storage class
Storage class (TRGS 510): 2A: Gases

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
methyl chloride	74-87-3	TWA	50 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Not classifiable as a human carcinogen		

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		Danger of cutaneous absorption		
		STEL	100 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Not classifiable as a human carcinogen Danger of cutaneous absorption		
		Potential Occupational Carcinogen		
		TWA	100 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		CEIL	200 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Peak	300 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		STEL	100 ppm 210 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		C	300 ppm	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		PEL	50 ppm 105 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

8.2 Exposure controls

Appropriate engineering controls
Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

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). Safety glasses

Body Protection
Flame retardant antistatic protective clothing.

Respiratory protection
required when vapours/mists are generated. Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

Control of environmental exposure
Do not let product enter drains.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: compressed liquefied gas
b)	Odor	No data available

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c)	Odor Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: -97 °C (-143 °F) - lit.
f)	Initial boiling point and boiling range	-24.2 °C -11.6 °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	Upper explosion limit: 17.4 %(V) Lower explosion limit: 7 %(V)
k)	Vapor pressure	5,060.9 hPa at 20.0 °C (68.0 °F)
l)	Vapor density	No data available
m)	Density	0.915 g/cm3 at 25 °C (77 °F) - lit.
	Relative density	No data available
n)	Water solubility	5.32 g/l at 25 °C (77 °F) - soluble
o)	Partition coefficient: n-octanol/water	log Pow: 0.91 at 25 °C (77 °F) - Bioaccumulation is not expected., (ECHA)
p)	Autoignition temperature	632.0 °C (1169.6 °F)
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information

Surface tension	0.02 mN/m at 20 °C (68 °F)

SECTION 10: Stability and reactivity

10.1 Reactivity
No data available

10.2 Chemical stability
The product is chemically stable under standard ambient conditions (room temperature) .

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
Heat, flames and sparks.
no information available

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10.5 Incompatible materials
Strong oxidizing agents, Iron

10.6 Hazardous decomposition products
In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
Oral: No data available
LC50 Inhalation - Rat - male and female - 4 h - > 21,800 mg/m3 - vapor

(OECD Test Guideline 403)
Dermal: No data available

Skin corrosion/irritation
No data available

Serious eye damage/eye irritation
No data available

Respiratory or skin sensitization
No data available

Germ cell mutagenicity
Test Type: gene mutation test
Test system: human lymphoblastoid cells
Metabolic activation: without metabolic activation
Method: OECD Test Guideline 476
Result: positive

Carcinogenicity
Limited evidence of a carcinogenic effect.

IARC:	No ingredient 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 ingredient 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
Suspected human reproductive toxicant Suspected of damaging fertility. Suspected of damaging the unborn child.

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
Inhalation - May cause damage to organs through prolonged or repeated exposure. - Central nervous system, Liver, Urogenital tract

Aspiration hazard
No data available

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11.2 Additional Information

RTECS: PA6300000
Dizziness, Drowsiness, Incoordination., Blurred vision, Headache, Nausea, Vomiting

Stomach - Irregularities - Based on Human Evidence

Stomach - Irregularities - Based on Human Evidence

SECTION 12: Ecological information

12.1 Toxicity

No data available

Toxicity to daphnia and other aquatic invertebrates	semi-static test EC50 - Daphnia magna (Water flea) - 200 mg/l - 48 h (OECD Test Guideline 202)

12.2 Persistence and degradability

Biodegradability	aerobic - Exposure time 28 h Result: 100 % - Readily biodegradable. Remarks: (ECHA)

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 Endocrine disrupting properties

No data available

12.7 Other adverse effects

No data available

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product

Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself. Pressurised gas bottle: dispose of only in empty condition!

SECTION 14: Transport information

DOT (US)

UN number: 1063 Class: 2.1

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Proper shipping name: Methyl chloride
Reportable Quantity (RQ): 100 lbs
Poison Inhalation Hazard: No

IMDG
UN number: 1063 Class: 2.1 EMS-No: F-D, S-U
Proper shipping name: METHYL CHLORIDE

IATA
UN number: 1063 Class: 2.1
Proper shipping name: Methyl chloride
IATA Passenger: Not permitted for transport

SECTION 15: Regulatory information

SARA 302 Components
This material does not contain any components with a section 302 EHS TPQ.

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

	CAS-No.	Revision Date
methyl chloride	74-87-3	2013-02-08

SARA 311/312 Hazards
Fire Hazard, Sudden Release of Pressure Hazard, Chronic Health Hazard

Massachusetts Right To Know Components
No components are subject to the Massachusetts Right to Know Act.

SECTION 16: Other information

Further information
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. 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.

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Version: 6.6 Revision Date: 09/06/2022 Print Date: 12/10/2022

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SAFETY DATA SHEET

Version 6.8
Revision Date 10/19/2022
Print Date 12/10/2022

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

1.1 Product identifiers

Product name : *cis*-1,2-Dichloroethylene

Product Number : D62004
Brand : Aldrich
Index-No. : 602-026-00-3
CAS-No. : 156-59-2

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 Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 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
Acute toxicity, Oral (Category 4), H302
Acute toxicity, Inhalation (Category 4), H332
Skin irritation (Category 2), H315
Short-term (acute) aquatic hazard (Category 3), H402
Long-term (chronic) aquatic hazard (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



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Signal Word	Danger

Hazard statement(s)

H225	Highly flammable liquid and vapor.
H302 + H332	Harmful if swallowed or if inhaled.
H315	Causes skin irritation.
H412	Harmful to aquatic life with long lasting effects.

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.
P261	Avoid breathing mist or vapors.
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.
P280	Wear protective gloves/ eye protection/ face protection.
P301 + P312 + P330	IF SWALLOWED: Call a POISON CENTER/ doctor if you feel unwell. Rinse mouth.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P304 + P340 + P312	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/ doctor if you feel unwell.
P332 + P313	If skin irritation occurs: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
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

SECTION 3: Composition/information on ingredients

3.1 Substances

Synonyms	:	cis-Acetylene dichloride
Formula	:	$C_2H_2Cl_2$
Molecular weight	:	96.94 g/mol
CAS-No.	:	156-59-2
EC-No.	:	205-859-7
Index-No.	:	602-026-00-3

Component	Classification	Concentration
cis-Dichloroethylene		
	Flam. Liq. 2; Acute Tox. 4; Skin Irrit. 2; Aquatic Acute 3; Aquatic Chronic 3;	<= 100 %

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	H225, H302, H332, H315, H402, H412	

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

SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice
Show this material safety data sheet to the doctor in attendance.

If inhaled
After inhalation: fresh air. If breathing stops: mouth-to-mouth breathing or artificial respiration. Oxygen if necessary. Immediately call in physician.

In case of skin contact
In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower.

In case of eye contact
After eye contact: rinse out with plenty of water. Remove contact lenses.

If swallowed
After swallowing: immediately make victim drink water (two glasses at most). Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Water Foam Carbon dioxide (CO2) Dry powder

Unsuitable extinguishing media
For this substance/mixture no limitations of extinguishing agents are given.

5.2 Special hazards arising from the substance or mixture
Carbon oxides
Hydrogen chloride gas
Combustible.
Pay attention to flashback.
Vapors are heavier than air and may spread along floors.
Development of hazardous combustion gases or vapours possible in the event of fire.
Forms explosive mixtures with air at ambient temperatures.

5.3 Advice for firefighters
Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

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5.4 Further information

Remove container from danger zone and cool with water. Suppress (knock down) gases/vapors/mists with a water spray jet. Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Advice for non-emergency personnel: Do not breathe vapors, aerosols. Avoid substance contact. Ensure adequate ventilation. Keep away from heat and sources of ignition.
Evacuate the danger area, observe emergency procedures, consult an expert.
For personal protection see section 8.

6.2 Environmental precautions

Do not let product enter drains. Risk of explosion.

6.3 Methods and materials for containment and cleaning up

Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up with liquid-absorbent material (e.g. Chemizorb®). Dispose of properly. Clean up affected area.

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on safe handling
Work under hood. Do not inhale substance/mixture. Avoid generation of vapours/aerosols.

Advice on protection against fire and explosion
Keep away from open flames, hot surfaces and sources of ignition.Take precautionary measures against static discharge.

Hygiene measures
Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions
Keep container tightly closed in a dry and well-ventilated place. Keep away from heat and sources of ignition.

Handle and store under inert gas. Air and moisture sensitive. Light sensitive.

Storage class
Storage class (TRGS 510): 3: Flammable liquids

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

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SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
cis-Dichloroethylene	156-59-2	TWA	200 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Central Nervous System impairment Eye irritation		

8.2 Exposure controls

Appropriate engineering controls
Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

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). Safety glasses

Skin protection
required

Body Protection
Flame retardant antistatic protective clothing.

Respiratory protection
required when vapours/aerosols are generated.
Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

Control of environmental exposure
Do not let product enter drains. Risk of explosion.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid Color: light yellow
b)	Odor	No data available
c)	Odor Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: -80 °C (-112 °F) - lit.
f)	Initial boiling point and boiling range	60 °C 140 °F - lit.
g)	Flash point	6.0 °C (42.8 °F) - closed cup

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h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapor pressure	No data available
l)	Vapor density	No data available
m)	Density	1.284 g/cm3 at 25 °C (77 °F) - lit.
	Relative density	No data available
n)	Water solubility	No data available
o)	Partition coefficient: n-octanol/water	No data available
p)	Autoignition temperature	No data available
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	none

9.2 Other safety information
No data available

SECTION 10: Stability and reactivity

10.1 Reactivity
Vapors may form explosive mixture with air.

10.2 Chemical stability
The product is chemically stable under standard ambient conditions (room temperature) .

10.3 Possibility of hazardous reactions
Violent reactions possible with:
Oxidizing agents

10.4 Conditions to avoid
Warming.

10.5 Incompatible materials
No data available

10.6 Hazardous decomposition products
In the event of fire: see section 5

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SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - 770 mg/kg
Remarks: (RTECS)
Acute toxicity estimate Inhalation - 4 h - 11.1 mg/l - vapor

(Expert judgment)
Remarks: Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)
Dermal: No data available

Skin corrosion/irritation
Skin - Rabbit
Result: Moderate skin irritation - 24 h
Remarks: (RTECS)

Serious eye damage/eye irritation
No data available

Respiratory or skin sensitization
No data available

Germ cell mutagenicity
No data available

Carcinogenicity

IARC: No ingredient 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 ingredient 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

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

11.2 Additional Information

RTECS: KV9420000
narcosis
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

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SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish	LC50 - Lepomis macrochirus (Bluegill sunfish) - 140 mg/l - 96 h Remarks: (ECOTOX Database)

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 Endocrine disrupting properties
No data available

12.7 Other adverse effects
No data available

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product
Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself.

SECTION 14: Transport information

DOT (US)
UN number: 1150 Class: 3 Packing group: II
Proper shipping name: 1,2-Dichloroethylene
Reportable Quantity (RQ):
Poison Inhalation Hazard: No

IMDG
UN number: 1150 Class: 3 Packing group: II EMS-No: F-E, S-D
Proper shipping name: 1,2-DICHLOROETHYLENE

IATA
UN number: 1150 Class: 3 Packing group: II
Proper shipping name: 1,2-Dichloroethylene

SECTION 15: Regulatory information

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SARA 302 Components
This material does not contain any components with a section 302 EHS TPQ.

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
Fire Hazard

Massachusetts Right To Know Components
No components are subject to the Massachusetts Right to Know Act.

SECTION 16: Other information

Further information
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. 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.

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Version: 6.8 Revision Date: 10/19/2022 Print Date: 12/10/2022

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SAFETY DATA SHEET

Halocarbon R-12 (Dichlorodifluoromethane)

Airgas
an Air Liquide company

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 type : Gas.

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

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 : 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 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. Store in a well-ventilated place.

Disposal : Refer to manufacturer or supplier for information on recovery or recycling.

Hazards 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 : 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 code : 001018

CAS number/other identifiers

CAS number : 75-71-8

Ingredient name	%	CAS number
Methane, dichlorodifluoro-	100	75-71-8

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. 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. 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 : 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.

Section 4. First aid measures

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.

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. Avoid breathing gas. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : If specialized 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). 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. Avoid breathing gas. 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.

Avoid release to the environment. Refer to special instructions/safety data sheet. Avoid contact with eyes, skin and clothing. Empty containers retain product residue and can be hazardous.

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). 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). Keep container tightly closed and sealed until ready for use. See Section 10 for incompatible materials before handling or use.

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
Methane, dichlorodifluoro-	**ACGIH TLV (United States, 3/2017).** TWA: 4950 mg/m³ 8 hours. TWA: 1000 ppm 8 hours. **NIOSH REL (United States, 10/2016).** TWA: 4950 mg/m³ 10 hours. TWA: 1000 ppm 10 hours. **OSHA PEL (United States, 6/2016).** TWA: 4950 mg/m³ 8 hours. TWA: 1000 ppm 8 hours. **OSHA PEL 1989 (United States, 3/1989).** TWA: 4950 mg/m³ 8 hours. TWA: 1000 ppm 8 hours.

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.

Section 8. Exposure controls/personal protection

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. 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 : Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use. 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. [Compressed gas.]

Color : Colorless.

Odor : Characteristic.

Odor threshold : Not available.

pH : Not available.

Melting point : -158°C (-252.4°F)

Boiling point : -29.8°C (-21.6°F)

Critical temperature : 111.85°C (233.3°F)

Flash point : [Product does not sustain combustion.]

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 (ft^3/lb) : 3.1746

Gas Density (lb/ft^3) : 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.

Viscosity : Not applicable.

Flow time (ISO 2431) : Not available.

Molecular weight : 120.91 g/mole

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.

Incompatible materials : No specific data.

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

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 : Not available.

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.

Section 11. Toxicological information

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

Product/ingredient name	$LogP_{ow}$	BCF	Potential
Methane, dichlorodifluoro-	2.16	6.17	low

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.

United States - RCRA Toxic hazardous waste "U" List

Ingredient	CAS #	Status	Reference number
Dichlorodifluoromethane; Methane, dichlorodifluoro-	75-71-8	Listed	U075

Section 14. Transport information

	DOT	TDG	Mexico	IMDG	IATA
UN number	UN1028	UN1028	UN1028	UN1028	UN1028
UN proper shipping name	DICHLORODIFLUOROMETHANE OR REFRIGERANT GAS R 12	DICHLORODIFLUOROMETHANE; OR REFRIGERANT GAS R 12	DICHLORODIFLUOROMETHANE OR REFRIGERANT GAS R 12	DICHLORODIFLUOROMETHANE (REFRIGERANT GAS R 12)	DICHLORODIFLUOROMETHANE
Transport hazard class(es)	2.2 	2.2 	2.2 	2.2 	2.2 
Packing group	-	-	-	-	-
Environmental hazards	No.	No.	No.	No.	No.

"Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product."

Additional information

DOT Classification : **Reportable quantity** 5000 lbs / 2270 kg. Package sizes shipped in quantities less than the product reportable quantity are not subject to the RQ (reportable quantity) transportation requirements.
Limited quantity Yes.
Quantity limitation Passenger aircraft/rail: 75 kg. Cargo aircraft: 150 kg.
Special provisions T50

TDG Classification : 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
Passenger Carrying Road or Rail Index 75

IATA : **Quantity limitation** Passenger and Cargo Aircraft: 75 kg. Cargo Aircraft Only: 150 kg.

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.

Section 14. Transport information

Transport in bulk according to Annex II of MARPOL and the IBC Code : Not available.

Section 15. Regulatory information

U.S. Federal regulations : **TSCA 8(a) CDR Exempt/Partial exemption**: Not determined

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 : Refer to Section 2: Hazards Identification of this SDS for classification of substance.

SARA 313

	Product name	CAS number	%
Form R - Reporting requirements	dichlorodifluoromethane	75-71-8	100
Supplier notification	dichlorodifluoromethane	75-71-8	100

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.

International regulations

Chemical Weapon Convention List Schedules I, II & III Chemicals

Not listed.

Montreal Protocol (Annexes A, B, C, E)

Ingredient name	Status
CFC 11	Annex A, Group I

Stockholm Convention on Persistent Organic Pollutants

Not listed.

Rotterdam Convention on Prior Informed Consent (PIC)

Not listed.

UNECE Aarhus Protocol on POPs and Heavy Metals

Section 15. Regulatory information

Not listed.

Inventory list

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 : **Japan inventory (ENCS)**: This material is listed or exempted.
Japan inventory (ISHL): Not determined.

Malaysia : Not determined.

New Zealand : This material is listed or exempted.

Philippines : This material is listed or exempted.

Republic of Korea : This material is listed or exempted.

Taiwan : This material is listed or exempted.

Thailand : Not determined.

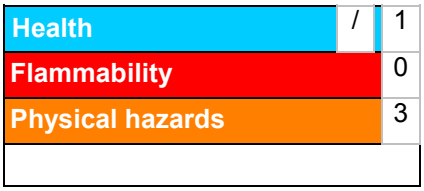
Turkey : Not determined.

United States : This material is listed or exempted.

Viet Nam : Not determined.

Section 16. Other information

Hazardous Material Information System (U.S.A.)



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 and the associated label are not required on SDSs or products leaving a facility 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 trademark and service mark of the American Coatings Association, Inc.

The customer is responsible for determining the PPE code for this material. For more information on HMIS® Personal Protective Equipment (PPE) codes, consult the HMIS® Implementation Manual.

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

Classification	Justification
GASES UNDER PRESSURE - Liquefied gas HAZARDOUS TO THE OZONE LAYER - Category 1	Expert judgment On basis of test data

Section 16. Other information

History

Date of printing	:	10/18/2018
Date of issue/Date of revision	:	10/18/2018
Date of previous issue	:	3/18/2018
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 MARPOL = 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.
Other special considerations	:	WARNING: Contains (Dichlorodifluorométhane), a substance which harms the public health and environment by destroying ozone in the upper atmosphere.

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

Version 6.8
Revision Date 05/25/2021
Print Date 12/10/2022

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

1.1 Product identifiers

Product name : Ethyl Alcohol, pure

Product Number : 459836
Brand : Sigma-Aldrich
Index-No. : 603-002-00-5
CAS-No. : 64-17-5

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 Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 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
Eye irritation (Category 2A), H319

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 vapor.

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H319	Causes serious eye 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): 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.
P337 + P313	If eye irritation persists: Get medical advice/ attention.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
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

SECTION 3: Composition/information on ingredients

3.1 Substances

Synonyms	:	Absolute alcohol
Formula	:	C_2H_6O
Molecular weight	:	46.07 g/mol
CAS-No.	:	64-17-5
EC-No.	:	200-578-6
Index-No.	:	603-002-00-5

Component	Classification	Concentration
ethanol		
	Flam. Liq. 2; Eye Irrit. 2A; H225, H319 Concentration limits: >= 50 %: Eye Irrit. 2A, H319;	<= 100 %

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

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SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice
Show this material safety data sheet to the doctor in attendance.

If inhaled
After inhalation: fresh air.

In case of skin contact
In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower.

In case of eye contact
After eye contact: rinse out with plenty of water. Call in ophthalmologist. Remove contact lenses.

If swallowed
After swallowing: immediately make victim drink water (two glasses at most). Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Water Foam Carbon dioxide (CO2) Dry powder

Unsuitable extinguishing media
For this substance/mixture no limitations of extinguishing agents are given.

5.2 Special hazards arising from the substance or mixture

Carbon oxides
Combustible.
Pay attention to flashback.
Vapors are heavier than air and may spread along floors.
Development of hazardous combustion gases or vapours possible in the event of fire.
Forms explosive mixtures with air at ambient temperatures.

5.3 Advice for firefighters

In the event of fire, wear self-contained breathing apparatus.

5.4 Further information

Remove container from danger zone and cool with water. Prevent fire extinguishing water from contaminating surface water or the ground water system.

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SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Advice for non-emergency personnel: Do not breathe vapors, aerosols. Avoid substance contact. Ensure adequate ventilation. Keep away from heat and sources of ignition.
Evacuate the danger area, observe emergency procedures, consult an expert.
For personal protection see section 8.

6.2 Environmental precautions

Do not let product enter drains. Risk of explosion.

6.3 Methods and materials for containment and cleaning up

Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up with liquid-absorbent material (e.g. Chemizorb®). Dispose of properly. Clean up affected area.

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on protection against fire and explosion
Keep away from open flames, hot surfaces and sources of ignition.Take precautionary measures against static discharge.

Hygiene measures
Change contaminated clothing. Wash hands after working with substance.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions
Keep container tightly closed in a dry and well-ventilated place. Keep away from heat and sources of ignition.

Hygroscopic.
Storage class (TRGS 510): 3: Flammable liquids

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters

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Component	CAS-No.	Value	Control parameters	Basis
ethanol	64-17-5	TWA	1,000 ppm 1,900 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		TWA	1,000 ppm 1,900 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		STEL	1,000 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Confirmed animal carcinogen with unknown relevance to humans		
		TWA	1,000 ppm 1,900 mg/m3	USA. NIOSH Recommended Exposure Limits
		PEL	1,000 ppm 1,900 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

8.2 Exposure controls

Appropriate engineering controls
Change contaminated clothing. Wash hands after working with substance.

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). Safety glasses

Skin protection
This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).
Full contact
Material: butyl-rubber
Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested:Butoject® (KCL 898)

This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).
Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.4 mm
Break through time: 120 min
Material tested:Camatril® (KCL 730 / Aldrich Z677442, Size M)

Body Protection
Flame retardant antistatic protective clothing.

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Respiratory protection
required when vapours/aerosols are generated. Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

Control of environmental exposure
Do not let product enter drains. Risk of explosion.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid Color: colorless
b)	Odor	pungent
c)	Odor Threshold	0.1 ppm
d)	pH	7.0 at 10 g/l at 20 °C (68 °F)
e)	Melting point/freezing point	Melting point/range: -114 °C (-173 °F)
f)	Initial boiling point and boiling range	78 °C 172 °F
g)	Flash point	13 °C (55 °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: 13.5 %(V) Lower explosion limit: 2.5 %(V)
k)	Vapor pressure	0.57 hPa at 19.6 °C (67.3 °F)
l)	Vapor density	1.6
m)	Relative density	No data available
n)	Water solubility	1,000 g/l at 20 °C (68 °F) - completely miscible
o)	Partition coefficient: n-octanol/water	log Pow: -0.35 at 24 °C (75 °F) - Bioaccumulation is not expected.
p)	Autoignition temperature	455 °C (851 °F) at 1,013 hPa - DIN 51794
q)	Decomposition temperature	Distillable in an undecomposed state at normal pressure.
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information

Conductivity	< 1 µS/cm
Surface tension	72.75 mN/m at 20 °C (68 °F)

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Relative vapor density	1.6

SECTION 10: Stability and reactivity

10.1 Reactivity

Vapors may form explosive mixture with air.

10.2 Chemical stability

The product is chemically stable under standard ambient conditions (room temperature) .

10.3 Possibility of hazardous reactions

Risk of explosion/exothermic reaction with:
hydrogen peroxide
perchlorates
perchloric acid
Nitric acid
mercury(II) nitrate
permanganic acid
Nitriles
peroxi compounds
Strong oxidizing agents
nitrosyl compounds
Peroxides
sodium
Potassium
halogen oxides
calcium hypochlorite
nitrogen dioxide
metallic oxides
uranium hexafluoride
iodides
Chlorine
Alkali metals
Alkaline earth metals
alkali oxides
Ethylene oxide
silver
with
Nitric acid
silver compounds
with
Ammonia
potassium permanganate
with
conc. sulfuric acid
Risk of ignition or formation of inflammable gases or vapours with:
halogen-halogen compounds
chromium(VI) oxide
chromyl chloride
Fluorine
hydrides
Oxides of phosphorus
platinum

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Nitric acid
with
potassium permanganate

10.4 Conditions to avoid
Warming.
Warming.

10.5 Incompatible materials
rubber, various plastics

10.6 Hazardous decomposition products
In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - male and female - 10,470 mg/kg
(OECD Test Guideline 401)
LC50 Inhalation - Rat - male and female - 4 h - 124.7 mg/l
(OECD Test Guideline 403)
Dermal: No data available
No data available

Skin corrosion/irritation
Skin - Rabbit
Result: No skin irritation - 24 h
(OECD Test Guideline 404)

Serious eye damage/eye irritation
Eyes - Rabbit
Result: Causes serious eye irritation.
(OECD Test Guideline 405)

Respiratory or skin sensitization
Maximization Test - Guinea pig
Result: negative
(OECD Test Guideline 406)
Remarks: (in analogy to similar products)
The value is given in analogy to the following substances: Methanol

Germ cell mutagenicity
Test Type: Ames test
Test system: Salmonella typhimurium
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 471
Result: negative
Test Type: In vitro mammalian cell gene mutation test
Test system: mouse lymphoma cells
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 476
Result: negative

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Test Type: dominant lethal test
Species: Mouse

Application Route: Oral
Method: OECD Test Guideline 478
Result: Positive results were obtained in some in vivo tests.

Carcinogenicity
No data available

IARC: 1 - Group 1: Carcinogenic to humans (ethanol)

NTP: No ingredient 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

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

11.2 Additional Information

Repeated dose toxicity - Rat - male - Oral - NOAEL (No observed adverse effect level) - 1,730 mg/kg - LOAEL (Lowest observed adverse effect level) - 3,200 mg/kg

RTECS: KQ6300000
irritant effects, respiratory paralysis, Dizziness, narcosis, inebriation, euphoria, Nausea, Vomiting
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

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish	flow-through test LC50 - Pimephales promelas (fathead minnow) - 15,300 mg/l - 96 h (US-EPA)
Toxicity to daphnia and other aquatic invertebrates	static test LC50 - Ceriodaphnia dubia (water flea) - 5,012 mg/l - 48 h Remarks: (ECHA)
Toxicity to algae	static test ErC50 - Chlorella vulgaris (Fresh water algae) - 275 mg/l

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	- 72 h (OECD Test Guideline 201)
Toxicity to bacteria	static test IC50 - activated sludge - > 1,000 mg/l - 3 h (OECD Test Guideline 209)

12.2 Persistence and degradability

Biodegradability	aerobic - Exposure time 15 d Result: ca.95 % - Readily biodegradable. (OECD Test Guideline 301E)
Biochemical Oxygen Demand (BOD)	930 - 1,670 mg/g Remarks: (Lit.)
Theoretical oxygen demand	2,100 mg/g Remarks: (Lit.)

12.3 Bioaccumulative potential

Due to the distribution coefficient n-octanol/water, accumulation in organisms is not expected.

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

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product

Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself. See www.retrologistik.com for processes regarding the return of chemicals and containers, or contact us there if you have further questions.

SECTION 14: Transport information

DOT (US)

UN number: 1170 Class: 3 Packing group: II
Proper shipping name: Ethanol
Reportable Quantity (RQ):
Poison Inhalation Hazard: No

IMDG

UN number: 1170 Class: 3 Packing group: II EMS-No: F-E, S-D
Proper shipping name: ETHANOL

IATA

UN number: 1170 Class: 3 Packing group: II
Proper shipping name: Ethanol

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SECTION 15: Regulatory information

SARA 302 Components
This material does not contain any components with a section 302 EHS TPQ.

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
Fire Hazard, Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
ethanol	64-17-5	1993-04-24

No components are subject to the Massachusetts Right to Know Act.

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
ethanol	64-17-5	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
ethanol	64-17-5	1993-04-24

SECTION 16: Other information

Further information
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. 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.

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Version: 6.8 Revision Date: 05/25/2021 Print Date: 12/10/2022

The life science business of Merck KGaA, Darmstadt, Germany
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Safety Data Sheet

according to Regulation (EC) No. 1907/2006 (REACH)

Ethylbenzene

Version number: GHS 1.0 Date of compilation: 2020-07-02

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

1.1 Product identifier

Identification of the substance	**Ethylbenzene**
Registration number (REACH)	01-2119489370-35-xxxx
CAS number	100-41-4
Alternative name(s)	ethylbenzene
Article number	A0251309

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

Relevant identified uses	General use

1.3 Details of the supplier of the safety data sheet

Chemos GmbH & Co. KG
Sonnenring 7
84032 Altdorf
Germany

Telephone: +49 871-966346-0
Telefax: +49 871-966346-13
e-mail: chemos@chemos.de
Website: http://www.chemos.de/

e-mail (competent person)	chemos@chemos.de

1.4 Emergency telephone number

Emergency information service	+49 89 1 92 40

Poison centre

Country	Name	Postal code/ city	Telephone	Telefax
United Kingdom	National Poison Information Centre Medical Toxicology Unit	SE14 5ER London	+44 171 635 91 91	

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Classification according to Regulation (EC) No 1272/2008 (CLP)

Section	Hazard class	Category	Hazard class and category	Hazard statement
2.6	flammable liquid	2	Flam. Liq. 2	H225
3.1I	acute toxicity (inhal.)	4	Acute Tox. 4	H332
3.9	specific target organ toxicity - repeated exposure	2	STOT RE 2	H373
3.10	aspiration hazard	1	Asp. Tox. 1	H304
4.1C	hazardous to the aquatic environment - chronic hazard	2	Aquatic Chronic 2	H411

For full text of abbreviations: see SECTION 16.

The most important adverse physicochemical, human health and environmental effects

Delayed or immediate effects can be expected after short or long-term exposure. The product is combustible and can be ignited by potential ignition sources. Spillage and fire water can cause pollution of watercourses.

2.2 Label elements

Labelling according to Regulation (EC) No 1272/2008 (CLP)

- Signal word danger

- Pictograms

GHS02, GHS07, GHS08, GHS09



- Hazard statements

H225	Highly flammable liquid and vapour.
H304	May be fatal if swallowed and enters airways.
H332	Harmful if inhaled.
H373	May cause damage to organs through prolonged or repeated exposure.
H411	Toxic to aquatic life with long lasting effects.

- Precautionary statements

P210	Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P260	Do not breathe dust/fume/gas/mist/vapours/spray.
P301+P310	IF SWALLOWED: Immediately call a POISON CENTER/doctor.
P331	Do NOT induce vomiting.
P370+P378	In case of fire: Use sand, carbon dioxide or powder extinguisher to extinguish.
P403+P235	Store in a well-ventilated place. Keep cool.

2.3 Other hazards

Results of PBT and vPvB assessment

According to the results of its assessment, this substance is not a PBT or a vPvB.

SECTION 3: Composition/information on ingredients

3.1 Substances

Name of substance	Ethylbenzene
Identifiers	
REACH Reg. No	01-2119489370-35-xxxx
CAS No	100-41-4
EC No	202-849-4
Index No	601-023-00-4
Molecular formula	C8H10
Molar mass	106.2 $^{g}/_{mol}$

SECTION 4: First aid measures

4.1 Description of first aid measures

General notes

Do not leave affected person unattended. Remove victim out of the danger area. Keep affected person warm, still and covered. Take off immediately all contaminated clothing. In all cases of doubt, or when symptoms persist, seek medical advice. In case of unconsciousness place person in the recovery position. Never give anything by mouth.

Following inhalation

If breathing is irregular or stopped, immediately seek medical assistance and start first aid actions. Provide fresh air.

Following skin contact

Wash with plenty of soap and water.

Following eye contact

Remove contact lenses, if present and easy to do. Continue rinsing. Irrigate copiously with clean, fresh water for at least 10 minutes, holding the eyelids apart.

Following ingestion

Rinse mouth with water (only if the person is conscious). Do NOT induce vomiting.

4.2 Most important symptoms and effects, both acute and delayed

Symptoms and effects are not known to date.

4.3 Indication of any immediate medical attention and special treatment needed

none

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media

Water spray, BC-powder, Carbon dioxide (CO_2)

Unsuitable extinguishing media

Water jet

5.2 Special hazards arising from the substance or mixture

In case of insufficient ventilation and/or in use, may form flammable/explosive vapour-air mixture. Solvent vapours are heavier than air and may spread along floors. Places which are not ventilated, e.g. unventilated below ground level areas such as trenches, conduits and shafts, are particularly prone to the presence of flammable substances or mixtures.

Hazardous combustion products

Carbon monoxide (CO), Carbon dioxide (CO_2)

5.3 Advice for firefighters

In case of fire and/or explosion do not breathe fumes. Co-ordinate firefighting measures to the fire surroundings. Do not allow firefighting water to enter drains or water courses. Collect contaminated firefighting water separately. Fight fire with normal precautions from a reasonable distance.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

For non-emergency personnel

Remove persons to safety.

For emergency responders

Wear breathing apparatus if exposed to vapours/dust/spray/gases.

6.2 Environmental precautions

Keep away from drains, surface and ground water. Retain contaminated washing water and dispose of it. If substance has entered a water course or sewer, inform the responsible authority.

6.3 Methods and material for containment and cleaning up

Advice on how to contain a spill

Covering of drains

Advice on how to clean up a spill

Wipe up with absorbent material (e.g. cloth, fleece). Collect spillage: sawdust, kieselgur (diatomite), sand, universal binder

Appropriate containment techniques

Use of adsorbent materials.

Other information relating to spills and releases

Place in appropriate containers for disposal. Ventilate affected area.

6.4 Reference to other sections

Hazardous combustion products: see section 5. Personal protective equipment: see section 8. Incompatible materials: see section 10. Disposal considerations: see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Recommendations

- Measures to prevent fire as well as aerosol and dust generation

Use local and general ventilation. Avoidance of ignition sources. Keep away from sources of ignition - No smoking. Take precautionary measures against static discharge. Use only in well-ventilated areas. Due to danger of explosion, prevent leakage of vapours into cellars, flues and ditches. Ground/bond container and receiving equipment. Use explosion-proof electrical/ventilating/lighting/equipment. Use only non-sparking tools.

- Specific notes/details

Places which are not ventilated, e.g. unventilated below ground level areas such as trenches, conduits and shafts, are particularly prone to the presence of flammable substances or mixtures. Vapours are heavier than air, spread along floors and form explosive mixtures with air. Vapours may form explosive mixtures with air.

Advice on general occupational hygiene

Wash hands after use. Do not eat, drink and smoke in work areas. Remove contaminated clothing and protective equipment before entering eating areas. Never keep food or drink in the vicinity of chemicals. Never place chemicals in containers that are normally used for food or drink. Keep away from food, drink and animal feedingstuffs.

7.2 Conditions for safe storage, including any incompatibilities

Managing of associated risks

- Explosive atmospheres

Keep container tightly closed and in a well-ventilated place. Use local and general ventilation. Keep cool. Protect from sunlight.

- Flammability hazards

Keep away from sources of ignition - No smoking. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Take precautionary measures against static discharge. Protect from sunlight.

- Ventilation requirements

Keep any substance that emits harmful vapours or gases in a place that allows these to be permanently extracted. Use local and general ventilation. Ground/bond container and receiving equipment.

- Packaging compatibilities

Only packagings which are approved (e.g. acc. to ADR) may be used.

7.3 Specific end use(s)

See section 16 for a general overview.

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Occupational exposure limit values (Workplace Exposure Limits)

Country	Name of agent	CAS No	Identifier	TWA [ppm]	TWA [mg/m³]	STEL [ppm]	STEL [mg/m³]	Ceiling-C [ppm]	Ceiling-C [mg/m³]	Notation	Source
EU	ethylbenzene	100-41-4	IOELV	100	442	200	884				2000/39/EC
GB	ethylbenzene	100-41-4	WEL	100	441	125	552				EH40/2005

Notation

Ceiling-C	ceiling value is a limit value above which exposure should not occur
STEL	short-term exposure limit: a limit value above which exposure should not occur and which is related to a 15-minute period (unless otherwise specified)
TWA	time-weighted average (long-term exposure limit): measured or calculated in relation to a reference period of 8 hours time-weighted average (unless otherwise specified)

Human health values

Relevant DNELs and other threshold levels

Endpoint	Threshold level	Protection goal, route of exposure	Used in	Exposure time
DNEL	77 mg/m³	human, inhalatory	worker (industry)	chronic - systemic effects
DNEL	293 mg/m³	human, inhalatory	worker (industry)	acute - local effects
DNEL	180 mg/kg bw/day	human, dermal	worker (industry)	chronic - systemic effects

Environmental values

Relevant PNECs and other threshold levels

Endpoint	Threshold level	Organism	Environmental compartment	Exposure time
PNEC	0.1 mg/l	aquatic organisms	freshwater	short-term (single instance)
PNEC	0.01 mg/l	aquatic organisms	marine water	short-term (single instance)
PNEC	9.6 mg/l	aquatic organisms	sewage treatment plant (STP)	short-term (single instance)
PNEC	13.7 mg/kg	aquatic organisms	freshwater sediment	short-term (single instance)

Relevant PNECs and other threshold levels				
Endpoint	**Threshold level**	**Organism**	**Environmental compartment**	**Exposure time**
PNEC	1.37 $^{mg}/_{kg}$	aquatic organisms	marine sediment	short-term (single instance)
PNEC	2.68 $^{mg}/_{kg}$	terrestrial organisms	soil	short-term (single instance)

8.2 Exposure controls

Appropriate engineering controls

General ventilation.

Individual protection measures (personal protective equipment)

Eye/face protection

Wear eye/face protection.

Skin protection

- Hand protection

Wear suitable gloves. Chemical protection gloves are suitable, which are tested according to EN 374. Check leak-tightness/impermeability prior to use. In the case of wanting to use the gloves again, clean them before taking off and air them well. For special purposes, it is recommended to check the resistance to chemicals of the protective gloves mentioned above together with the supplier of these gloves.

- Other protection measures

Take recovery periods for skin regeneration. Preventive skin protection (barrier creams/ointments) is recommended. Wash hands thoroughly after handling.

Respiratory protection

In case of inadequate ventilation wear respiratory protection.

Environmental exposure controls

Use appropriate container to avoid environmental contamination. Keep away from drains, surface and ground water.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

Appearance

Physical state	liquid
Colour	various
Odour	characteristic

Other safety parameters

pH (value)	not determined
Melting point/freezing point	-94.9 °C at 101.3 kPa
Initial boiling point and boiling range	136.1 °C at 1,013 mbar
Flash point	23 °C at 1,013 hPa
Evaporation rate	not determined

Flammability (solid, gas)	not relevant, (fluid)
Explosive limits	not determined
Vapour pressure	9.52 mbar at 20 °C
Density	not determined
Vapour density	this information is not available
Relative density	information on this property is not available

Solubility(ies)

- Water solubility	0.2 $^{g}/_{l}$ at 25 °C

Partition coefficient

- n-octanol/water (log KOW)	3.6 (pH value: 7.84, 20 °C) (ECHA)
Auto-ignition temperature	430 °C at 101.3 kPa (ECHA) (auto-ignition temperature (liquids and gases))

Viscosity

- Kinematic viscosity	0.773 $^{mm^2}/_{s}$ at 20 °C
Explosive properties	none
Oxidising properties	none

9.2 Other information

Surface tension	71.2 $^{mN}/_{m}$ (23 °C) (ECHA)
Solvent content	100 %
Temperature class (EU, acc. to ATEX)	T2 (maximum permissible surface temperature on the equipment: 300°C)

SECTION 10: Stability and reactivity

10.1 Reactivity

Concerning incompatibility: see below "Conditions to avoid" and "Incompatible materials". It's a reactive substance. The mixture contains reactive substance(s). Risk of ignition.

If heated:

Risk of ignition

10.2 Chemical stability

See below "Conditions to avoid".

10.3 Possibility of hazardous reactions

No known hazardous reactions.

10.4 Conditions to avoid

Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.

Hints to prevent fire or explosion

Use explosion-proof electrical/ventilating/lighting/equipment. Use only non-sparking tools. Take precautionary measures against static discharge.

10.5 Incompatible materials

Oxidisers

10.6 Hazardous decomposition products

Reasonably anticipated hazardous decomposition products produced as a result of use, storage, spill and heating are not known. Hazardous combustion products: see section 5.

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Classification according to GHS (1272/2008/EC, CLP)

Acute toxicity

Harmful if inhaled.

GHS of the United Nations, annex 4: May be harmful if swallowed.

- Acute toxicity estimate (ATE)

Inhalation: vapour 11 $^{mg}/_{l}$/4h

Skin corrosion/irritation

Shall not be classified as corrosive/irritant to skin.

Serious eye damage/eye irritation

Shall not be classified as seriously damaging to the eye or eye irritant.

Respiratory or skin sensitisation

Shall not be classified as a respiratory or skin sensitiser.

Germ cell mutagenicity

Shall not be classified as germ cell mutagenic.

Carcinogenicity

Shall not be classified as carcinogenic.

Reproductive toxicity

Shall not be classified as a reproductive toxicant.

Specific target organ toxicity - single exposure

Shall not be classified as a specific target organ toxicant (single exposure).

Specific target organ toxicity - repeated exposure

May cause damage to organs through prolonged or repeated exposure.

Aspiration hazard

May be fatal if swallowed and enters airways.

SECTION 12: Ecological information

12.1 Toxicity

Toxic to aquatic life with long lasting effects.

Aquatic toxicity (chronic)			
Endpoint	**Value**	**Species**	**Exposure time**
LC50	3.6 $^{mg}/_{l}$	aquatic invertebrates	7 d

12.2 Persistence and degradability

Data are not available.

12.3 Bioaccumulative potential

Data are not available.

n-octanol/water (log KOW)	3.6 (pH value: 7.84, 20 °C) (ECHA)
BCF	1 (ECHA)

12.4 Mobility in soil

Data are not available.

12.5 Results of PBT and vPvB assessment

Data are not available.

12.6 Other adverse effects

Data are not available.

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Waste treatment-relevant information

Solvent reclamation/regeneration.

Sewage disposal-relevant information

Do not empty into drains. Avoid release to the environment. Refer to special instructions/safety data sheets.

Waste treatment of containers/packagings

It is a dangerous waste; only packagings which are approved (e.g. acc. to ADR) may be used. Completely emptied packages can be recycled. Handle contaminated packages in the same way as the substance itself.

Remarks

Please consider the relevant national or regional provisions. Waste shall be separated into the categories that can be handled separately by the local or national waste management facilities.

SECTION 14: Transport information

14.1	**UN number**	1175
14.2	**UN proper shipping name**	ETHYLBENZENE
14.3	**Transport hazard class(es)**	
	Class	3 (flammable liquids) (environmentally hazardous)
14.4	**Packing group**	II (substance presenting medium danger)
14.5	**Environmental hazards**	hazardous to the aquatic environment

14.6 Special precautions for user

Provisions for dangerous goods (ADR) should be complied within the premises.

14.7 Transport in bulk according to Annex II of MARPOL and the IBC Code

The cargo is not intended to be carried in bulk.

Information for each of the UN Model Regulations

Transport of dangerous goods by road, rail and inland waterway (ADR/RID/ADN)

UN number	1175
Proper shipping name	ETHYLBENZENE
Class	3
Classification code	F1
Packing group	II
Danger label(s)	3, fish and tree



Environmental hazards	yes (hazardous to the aquatic environment)
Excepted quantities (EQ)	E2
Limited quantities (LQ)	1 L
Transport category (TC)	2
Tunnel restriction code (TRC)	D/E
Hazard identification No	33
Emergency Action Code	3YE

International Maritime Dangerous Goods Code (IMDG)

UN number	1175
Proper shipping name	ETHYLBENZENE
Class	3
Marine pollutant	yes (hazardous to the aquatic environment)
Packing group	II
Danger label(s)	3, fish and tree



Special provisions (SP)	-
Excepted quantities (EQ)	E2
Limited quantities (LQ)	1 L
EmS	F-E, S-D
Stowage category	B

International Civil Aviation Organization (ICAO-IATA/DGR)

UN number	1175
Proper shipping name	Ethylbenzene
Class	3
Environmental hazards	yes (hazardous to the aquatic environment)
Packing group	II
Danger label(s)	3



Excepted quantities (EQ)	E2
Limited quantities (LQ)	1 L

SECTION 15: Regulatory information

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

Relevant provisions of the European Union (EU)

Deco-Paint Directive (2004/42/EC)

VOC content	100 %

Directive on industrial emissions (VOCs, 2010/75/EU)

VOC content	100 %

National inventories

Country	Inventory	Status
AU	AICS	substance is listed
CA	DSL	substance is listed
CN	IECSC	substance is listed
EU	ECSI	substance is listed
EU	REACH Reg.	substance is listed
JP	CSCL-ENCS	substance is listed
KR	KECI	substance is listed
MX	INSQ	substance is listed
NZ	NZIoC	substance is listed
PH	PICCS	substance is listed
TR	CICR	substance is listed

Country	Inventory	Status
TW	TCSI	substance is listed
US	TSCA	substance is listed

Legend

AICS	Australian Inventory of Chemical Substances
CICR	Chemical Inventory and Control Regulation
CSCL-ENCS	List of Existing and New Chemical Substances (CSCL-ENCS)
DSL	Domestic Substances List (DSL)
ECSI	EC Substance Inventory (EINECS, ELINCS, NLP)
IECSC	Inventory of Existing Chemical Substances Produced or Imported in China
INSQ	National Inventory of Chemical Substances
KECI	Korea Existing Chemicals Inventory
NZIoC	New Zealand Inventory of Chemicals
PICCS	Philippine Inventory of Chemicals and Chemical Substances
REACH Reg.	REACH registered substances
TCSI	Taiwan Chemical Substance Inventory
TSCA	Toxic Substance Control Act

15.2 Chemical Safety Assessment

No Chemical Safety Assessment has been carried out for this substance.

SECTION 16: Other information

Abbreviations and acronyms

Abbr.	Descriptions of used abbreviations
2000/39/EC	Commission Directive establishing a first list of indicative occupational exposure limit values in implementation of Council Directive 98/24/EC
ADN	Accord européen relatif au transport international des marchandises dangereuses par voies de navigation intérieures (European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways)
ADR	Accord européen relatif au transport international des marchandises dangereuses par route (European Agreement concerning the International Carriage of Dangerous Goods by Road)
BCF	Bioconcentration factor
CAS	Chemical Abstracts Service (service that maintains the most comprehensive list of chemical substances)
Ceiling-C	Ceiling value
CLP	Regulation (EC) No 1272/2008 on classification, labelling and packaging of substances and mixtures
DGR	Dangerous Goods Regulations (see IATA/DGR)
DNEL	Derived No-Effect Level
EC No	The EC Inventory (EINECS, ELINCS and the NLP-list) is the source for the seven-digit EC number, an identifier of substances commercially available within the EU (European Union)
EH40/2005	EH40/2005 Workplace exposure limits (http://www.nationalarchives.gov.uk/doc/open-government-licence/)
EINECS	European Inventory of Existing Commercial Chemical Substances
ELINCS	European List of Notified Chemical Substances
EmS	Emergency Schedule
GHS	"Globally Harmonized System of Classification and Labelling of Chemicals" developed by the United Nations
IATA	International Air Transport Association

Abbr.	Descriptions of used abbreviations
IATA/DGR	Dangerous Goods Regulations (DGR) for the air transport (IATA)
ICAO	International Civil Aviation Organization
IMDG	International Maritime Dangerous Goods Code
index No	The Index number is the identification code given to the substance in Part 3 of Annex VI to Regulation (EC) No 1272/2008
IOELV	Indicative occupational exposure limit value
LC50	Lethal Concentration 50%: the LC50 corresponds to the concentration of a tested substance causing 50 % lethality during a specified time interval
MARPOL	International Convention for the Prevention of Pollution from Ships (abbr. of "Marine Pollutant")
NLP	No-Longer Polymer
PBT	Persistent, Bioaccumulative and Toxic
PNEC	Predicted No-Effect Concentration
ppm	Parts per million
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals
RID	Règlement concernant le transport International ferroviaire des marchandises Dangereuses (Regulations concerning the International carriage of Dangerous goods by Rail)
STEL	Short-term exposure limit
TWA	Time-weighted average
VOC	Volatile Organic Compounds
vPvB	Very Persistent and very Bioaccumulative
WEL	Workplace exposure limit

Key literature references and sources for data

Regulation (EC) No 1272/2008 on classification, labelling and packaging of substances and mixtures. Regulation (EC) No. 1907/2006 (REACH), amended by 2015/830/EU.

Transport of dangerous goods by road, rail and inland waterway (ADR/RID/ADN). International Maritime Dangerous Goods Code (IMDG). Dangerous Goods Regulations (DGR) for the air transport (IATA).

List of relevant phrases (code and full text as stated in chapter 2 and 3)

Code	Text
H225	Highly flammable liquid and vapour.
H304	May be fatal if swallowed and enters airways.
H332	Harmful if inhaled.
H373	May cause damage to organs through prolonged or repeated exposure.
H411	Toxic to aquatic life with long lasting effects.

Disclaimer

This information is based upon the present state of our knowledge. This SDS has been compiled and is solely intended for this product.

SAFETY DATA SHEET

Version 6.20
Revision Date 08/27/2022
Print Date 12/10/2022

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

1.1 Product identifiers

Product name : Ethyl acetate

Product Number : 270989
Brand : Sigma-Aldrich
Index-No. : 607-022-00-5
CAS-No. : 141-78-6

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 Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 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
Eye irritation (Category 2A), H319
Specific target organ toxicity - single exposure (Category 3), Central nervous system, H336

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

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Hazard statement(s)

H225	Highly flammable liquid and vapor.
H319	Causes serious eye irritation.
H336	May cause drowsiness or dizziness.

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.
P261	Avoid breathing mist or vapors.
P264	Wash skin thoroughly after handling.
P271	Use only outdoors or in a well-ventilated area.
P280	Wear protective gloves/ eye protection/ face protection.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P304 + P340 + 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.
P337 + P313	If eye irritation persists: Get medical advice/ attention.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P403 + P235	Store in a well-ventilated place. Keep cool.
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

Repeated exposure may cause skin dryness or cracking.

SECTION 3: Composition/information on ingredients

3.1 Substances

Formula	:	$C_4H_8O_2$
Molecular weight	:	88.11 g/mol
CAS-No.	:	141-78-6
EC-No.	:	205-500-4
Index-No.	:	607-022-00-5

Component	Classification	Concentration
ethyl acetate		
	Flam. Liq. 2; Eye Irrit. 2A; STOT SE 3; H225, H319, H336 Concentration limits: 20 %: STOT SE 3, H336;	<= 100 %

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

SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice
Show this material safety data sheet to the doctor in attendance.

If inhaled
After inhalation: fresh air. Call in physician.

In case of skin contact
In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower.

In case of eye contact
After eye contact: rinse out with plenty of water. Call in ophthalmologist. Remove contact lenses.

If swallowed
After swallowing: immediately make victim drink water (two glasses at most). Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Carbon dioxide (CO2) Foam Dry powder

Unsuitable extinguishing media
For this substance/mixture no limitations of extinguishing agents are given.

5.2 Special hazards arising from the substance or mixture
Carbon oxides
Combustible.
Pay attention to flashback.
Vapors are heavier than air and may spread along floors.
Development of hazardous combustion gases or vapours possible in the event of fire.
Forms explosive mixtures with air at ambient temperatures.

5.3 Advice for firefighters
In the event of fire, wear self-contained breathing apparatus.

5.4 Further information
Remove container from danger zone and cool with water. Prevent fire extinguishing water from contaminating surface water or the ground water system.

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SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Advice for non-emergency personnel: Do not breathe vapors, aerosols. Avoid substance contact. Ensure adequate ventilation. Keep away from heat and sources of ignition.
Evacuate the danger area, observe emergency procedures, consult an expert.
For personal protection see section 8.

6.2 Environmental precautions

Do not let product enter drains. Risk of explosion.

6.3 Methods and materials for containment and cleaning up

Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up with liquid-absorbent material (e.g. Chemizorb®).
Dispose of properly. Clean up affected area.

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on safe handling
Work under hood. Do not inhale substance/mixture. Avoid generation of vapours/aerosols.

Advice on protection against fire and explosion
Keep away from open flames, hot surfaces and sources of ignition.Take precautionary measures against static discharge.

Hygiene measures
Change contaminated clothing. Preventive skin protection recommended. Wash hands after working with substance.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions
Keep container tightly closed in a dry and well-ventilated place. Keep away from heat and sources of ignition.

Storage class
Storage class (TRGS 510): 3: Flammable liquids

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters

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Component	CAS-No.	Value	Control parameters	Basis
ethyl acetate	141-78-6	TWA	400 ppm	USA. ACGIH Threshold Limit Values (TLV)
		TWA	400 ppm 1,400 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	400 ppm 1,400 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		PEL	400 ppm 1,400 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

Derived No Effect Level (DNEL)

Application Area	Routes of exposure	Health effect	Value
Workers	Inhalation	Acute systemic effects	1468 mg/m3
Workers	Inhalation	Acute local effects	1468 mg/m3
Workers	Skin contact	Long-term systemic effects	63mg/kg BW/d
Workers	Inhalation	Long-term systemic effects	734 mg/m3
Workers	Inhalation	Long-term local effects	734 mg/m3
Consumers	Inhalation	Acute local effects, Acute systemic effects	734 mg/m3
Consumers	Skin contact	Long-term systemic effects	37mg/kg BW/d
Consumers	Inhalation	Long-term systemic effects	367 mg/m3
Consumers	Ingestion	Long-term systemic effects	4.5mg/kg BW/d
Consumers	Inhalation	Long-term local effects	367 mg/m3

Predicted No Effect Concentration (PNEC)

Compartment	Value
Soil	0.24 mg/kg
Sea water	0.026 mg/l
Fresh water	0.26 mg/l
Sea sediment	0.125 mg/kg
Fresh water sediment	1.25 mg/kg

8.2 Exposure controls

Appropriate engineering controls

Change contaminated clothing. Preventive skin protection recommended. Wash hands after working with substance.

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). Safety glasses

Skin protection

This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).

Splash contact

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Material: butyl-rubber
Minimum layer thickness: 0.7 mm
Break through time: 120 min
Material tested:Butoject® (KCL 898)

Body Protection
Flame retardant antistatic protective clothing.

Respiratory protection
required when vapours/aerosols are generated. Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

Control of environmental exposure
Do not let product enter drains. Risk of explosion.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: clear, liquid Color: colorless
b)	Odor	No data available
c)	Odor Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: -84 °C (-119 °F)
f)	Initial boiling point and boiling range	76.5 - 77.5 °C 169.7 - 171.5 °F
g)	Flash point	-4 °C (25 °F) - closed cup
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	Lower explosion limit: 2.2 %(V)
k)	Vapor pressure	No data available
l)	Vapor density	No data available
m)	Density	0.90 g/cm3 at 20 °C (68 °F)
	Relative density	No data available
n)	Water solubility	No data available
o)	Partition coefficient: n-octanol/water	No data available
p)	Autoignition temperature	No data available
q)	Decomposition temperature	No data available

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r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	none

9.2 Other safety information
No data available

SECTION 10: Stability and reactivity

10.1 Reactivity
Vapors may form explosive mixture with air.

10.2 Chemical stability
The product is chemically stable under standard ambient conditions (room temperature) .

10.3 Possibility of hazardous reactions
Risk of ignition or formation of inflammable gases or vapours with:
Exothermic reaction with:
Fluorine
chlorosulfonic acid
Strong oxidizing agents
fuming sulfuric acid
Risk of explosion with:
lithium aluminium hydride
Alkali metals
hydrides
Alkaline earth metals
Violent reactions possible with:
Strong acids and strong bases

10.4 Conditions to avoid
Warming.

10.5 Incompatible materials
various plastics, Strong oxidizing agents

10.6 Hazardous decomposition products
In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - 5,620 mg/kg
Remarks: (RTECS)
Inhalation: No data available
LD50 Dermal - Rabbit - male - > 20,000 mg/kg
Remarks: (ECHA)
No data available

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Skin corrosion/irritation
Skin - Rabbit
Result: No skin irritation
Remarks: (IUCLID)

Serious eye damage/eye irritation
Causes serious eye irritation. Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

Respiratory or skin sensitization
Maximization Test - Guinea pig
Result: negative
(OECD Test Guideline 406)

Germ cell mutagenicity
Test Type: UDS (Unscheduled DNA synthesis assay)
Test system: Escherichia coli
Metabolic activation: with and without metabolic activation
Method: US-EPA
Result: negative
Test Type: Ames test
Test system: Salmonella typhimurium
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 471
Result: negative
Test Type: Chromosome aberration test in vitro
Test system: Chinese hamster ovary cells
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 473
Result: negative

Test Type: Micronucleus test
Species: Chinese hamster
Cell type: Red blood cells (erythrocytes)
Application Route: Oral
Method: OECD Test Guideline 474
Result: negative

Carcinogenicity
This product is or contains a component that is not classifiable as to its carcinogenicity based on its IARC, ACGIH, NTP, or EPA classification.

IARC: No ingredient 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 ingredient 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

Specific target organ toxicity - single exposure
May cause drowsiness or dizziness. - Central nervous system
Remarks: Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

Specific target organ toxicity - repeated exposure
No data available

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Aspiration hazard
No data available

11.2 Additional Information

Repeated dose toxicity - Rat - male and female - Oral - 92 Days - NOAEL (No observed adverse effect level) - 900 mg/kg - LOAEL (Lowest observed adverse effect level) - 3,600 mg/kg

RTECS: AH5425000
Inhalation of high concentrations may cause:, Headache, Drowsiness, Dizziness, Vomiting, narcosis, anemia, Central nervous system depression
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Kidney - Irregularities - Based on Human Evidence

Kidney - Irregularities - Based on Human Evidence

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish	flow-through test LC50 - Pimephales promelas (fathead minnow) - 230 mg/l - 96 h (US-EPA)
Toxicity to algae	static test NOEC - Desmodesmus subspicatus (green algae) - > 100 mg/l - 72 h (OECD Test Guideline 201)

12.2 Persistence and degradability

Biodegradability	aerobic - Exposure time 20 d Result: ca.69 % - Readily biodegradable. Remarks: (ECHA)
Theoretical oxygen demand	1,820 mg/g Remarks: (Lit.)

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 Endocrine disrupting properties
No data available

12.7 Other adverse effects
No data available

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SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product
Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself. See www.retrologistik.com for processes regarding the return of chemicals and containers, or contact us there if you have further questions.

SECTION 14: Transport information

DOT (US)
UN number: 1173 Class: 3 Packing group: II
Proper shipping name: Ethyl acetate
Reportable Quantity (RQ): 5000 lbs
Poison Inhalation Hazard: No

IMDG
UN number: 1173 Class: 3 Packing group: II EMS-No: F-E, S-D
Proper shipping name: ETHYL ACETATE

IATA
UN number: 1173 Class: 3 Packing group: II
Proper shipping name: Ethyl acetate

SECTION 15: Regulatory information

SARA 302 Components
This material does not contain any components with a section 302 EHS TPQ.

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
Fire Hazard, Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components
No components are subject to the Massachusetts Right to Know Act.

SECTION 16: Other information

Further information
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. 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

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www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

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Version: 6.20 Revision Date: 08/27/2022 Print Date: 12/10/2022

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SAFETY DATA SHEET

Version 6.7
Revision Date 06/10/2021
Print Date 12/10/2022

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

1.1 Product identifiers

Product name : Heptane

Product Number : H2198
Brand : SIGALD
Index-No. : 601-008-00-2
CAS-No. : 142-82-5

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 Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 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
Specific target organ toxicity - single exposure (Category 3), Central nervous system, H336
Aspiration hazard (Category 1), H304
Short-term (acute) aquatic hazard (Category 1), H400
Long-term (chronic) aquatic hazard (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



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Signal word	Danger

Hazard statement(s)

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

Precautionary 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.
P261	Avoid breathing dust/ fume/ gas/ mist/ vapors/ spray.
P264	Wash skin thoroughly after handling.
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P280	Wear protective gloves/ eye protection/ face protection.
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.
P304 + P340 + P312	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/ doctor if you feel unwell.
P331	Do NOT induce vomiting.
P332 + P313	If skin irritation occurs: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
P391	Collect spillage.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P403 + P235	Store in a well-ventilated place. Keep cool.
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

SECTION 3: Composition/information on ingredients

3.1 Substances

Formula	:	C_7H_{16}
Molecular weight	:	100.20 g/mol
CAS-No.	:	142-82-5
EC-No.	:	205-563-8
Index-No.	:	601-008-00-2

Component	Classification	Concentration
n-heptane		
	Flam. Liq. 2; Skin Irrit. 2; STOT SE 3; Asp. Tox. 1;	<= 100 %

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	Aquatic Acute 1; Aquatic Chronic 1; H225, H315, H336, H304, H400, H410 Concentration limits: 20 %: STOT SE 3, H336; M-Factor - Aquatic Acute: 10	

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

SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice
Show this material safety data sheet to the doctor in attendance.

If inhaled
After inhalation: fresh air. Call in physician.

In case of skin contact
In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower.

In case of eye contact
After eye contact: rinse out with plenty of water. Remove contact lenses.

If swallowed
After swallowing: caution if victim vomits. Risk of aspiration! Keep airways free. Pulmonary failure possible after aspiration of vomit. Call a physician immediately.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Carbon dioxide (CO2) Foam Dry powder

Unsuitable extinguishing media
For this substance/mixture no limitations of extinguishing agents are given.

5.2 Special hazards arising from the substance or mixture

Carbon oxides
Flash back possible over considerable distance.
Combustible.
Pay attention to flashback.
Vapors are heavier than air and may spread along floors.
Development of hazardous combustion gases or vapours possible in the event of fire.
Forms explosive mixtures with air at ambient temperatures.

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5.3 Advice for firefighters
Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

5.4 Further information
In case of fire: Evacuate area. Fight fire remotely due to the risk of explosion.Remove container from danger zone and cool with water. Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures
Advice for non-emergency personnel: Do not breathe vapors, aerosols. Avoid substance contact. Ensure adequate ventilation. Keep away from heat and sources of ignition.
Evacuate the danger area, observe emergency procedures, consult an expert.
For personal protection see section 8.

6.2 Environmental precautions
Do not let product enter drains. Risk of explosion.

6.3 Methods and materials for containment and cleaning up
Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up carefully with liquid-absorbent material (e.g. Chemizorb®). Dispose of properly. Clean up affected area.

6.4 Reference to other sections
For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on safe handling
Avoid generation of vapours/aerosols.

Advice on protection against fire and explosion
Keep away from open flames, hot surfaces and sources of ignition.Take precautionary measures against static discharge.

Hygiene measures
Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions
Store under inert gas.
Keep container tightly closed in a dry and well-ventilated place. Keep away from heat and sources of ignition.
Storage class (TRGS 510): 3: Flammable liquids

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

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SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
n-heptane	142-82-5	TWA	85 ppm 350 mg/m3	USA. NIOSH Recommended Exposure Limits
		C	440 ppm 1,800 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	500 ppm 2,000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	400 ppm 1,600 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		STEL	500 ppm 2,000 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		PEL	400 ppm 1,600 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		STEL	500 ppm 2,000 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		TWA	400 ppm	USA. ACGIH Threshold Limit Values (TLV)
		STEL	500 ppm	USA. ACGIH Threshold Limit Values (TLV)

8.2 Exposure controls

Appropriate engineering controls

Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

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). Safety glasses

Skin protection

This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).
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)

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This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).
Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.2 mm
Break through time: 60 min
Material tested:Dermatril® P (KCL 743 / Aldrich Z677388, Size M)

Body Protection
Flame retardant antistatic protective clothing.

Respiratory protection
required when vapours/aerosols are generated. Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

Control of environmental exposure
Do not let product enter drains. Risk of explosion.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid
b)	Odor	No data available
c)	Odor Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: -91 °C (-132 °F)
f)	Initial boiling point and boiling range	98 °C 208 °F
g)	Flash point	-4 °C (25 °F) - c.c.
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	Upper explosion limit: 7 %(V) Lower explosion limit: 1.1 %(V)
k)	Vapor pressure	111 hPa at 37.7 °C (99.9 °F) 53.3 hPa at 20.0 °C(68.0 °F)
l)	Vapor density	No data available
m)	Relative density	No data available
n)	Water solubility	insoluble
o)	Partition coefficient: n-octanol/water	log Pow: > 3 - Bioaccumulation is not expected.
p)	Autoignition	223.0 °C (433.4 °F)

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	temperature	
q)	Decomposition temperature	No data available
r)	Viscosity	0.64 mm2/s at 20 °C (68 °F) -
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information
No data available

SECTION 10: Stability and reactivity

10.1 Reactivity
Vapors may form explosive mixture with air.

10.2 Chemical stability
The product is chemically stable under standard ambient conditions (room temperature) .

10.3 Possibility of hazardous reactions
Risk of ignition or formation of inflammable gases or vapours with:
Strong oxidizing agents
phosphorus
in the presence of:
Chlorine

10.4 Conditions to avoid
Warming.

10.5 Incompatible materials
rubber, various plastics

10.6 Hazardous decomposition products
In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - male and female - > 5,000 mg/kg
(OECD Test Guideline 401)
Remarks: (in analogy to similar compounds)
The value is given in analogy to the following substances: isooctane
LC50 Inhalation - Rat - male and female - 4 h - > 29.29 mg/l
(OECD Test Guideline 403)
LD50 Dermal - Rabbit - male and female - > 2,000 mg/kg
(OECD Test Guideline 402)
Remarks: The value is given in analogy to the following substances: isooctane

Skin corrosion/irritation
Skin - Rabbit
Result: Irritating to skin. - 24 h

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(OECD Test Guideline 404)
Remarks: The value is given in analogy to the following substances: isooctane
Repeated or prolonged exposure may cause skin irritation and dermatitis, due to degreasing properties of the product.

Serious eye damage/eye irritation
Eyes - Rabbit
Result: No eye irritation
(OECD Test Guideline 405)
Remarks: The value is given in analogy to the following substances: isooctane

Respiratory or skin sensitization
Maximization Test - Guinea pig
Result: negative
(OECD Test Guideline 406)
Remarks: **Germ cell mutagenicity**
Test Type: Ames test
Test system: Escherichia coli/Salmonella typhimurium
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 471
Result: negative
Test Type: Chromosome aberration test in vitro
Test system: rat hepatocytes
Method: OECD Test Guideline 473
Result: negative

Carcinogenicity
This product is or contains a component that is not classifiable as to its carcinogenicity based on its IARC, ACGIH, NTP, or EPA classification.

IARC: No ingredient 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 ingredient 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

Specific target organ toxicity - single exposure
May cause drowsiness or dizziness.
Remarks: Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
May be fatal if swallowed and enters airways.
Aspiration hazard, Aspiration may cause pulmonary edema and pneumonitis.

11.2 Additional Information

RTECS: MI7700000
Prolonged or repeated exposure to skin causes defatting and dermatitis., Central nervous system depression, narcosis, Damage to the lungs.
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

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Stomach - Irregularities - Based on Human Evidence

Stomach - Irregularities - Based on Human Evidence

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to daphnia and other aquatic invertebrates	static test EC50 - Daphnia magna (Water flea) - 1.50 mg/l - 48 h Remarks: (ECHA)

12.2 Persistence and degradability

Biodegradability	aerobic - Exposure time 10 d Result: 70 % - Readily biodegradable. Remarks: (ECHA)
Biochemical Oxygen Demand (BOD)	1,920 mg/g Remarks: (IUCLID)
Theoretical oxygen demand	3,500 mg/g Remarks: (Lit.)
Ratio BOD/ThBOD	55 % Remarks: (Lit.)

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

Additional ecological information	Do not empty into drains. Avoid release to the environment.

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product

Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself. See www.retrologistik.com for processes regarding the return of chemicals and containers, or contact us there if you have further questions.

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SECTION 14: Transport information

DOT (US)
UN number: 1206 Class: 3 Packing group: II
Proper shipping name: Heptanes
Reportable Quantity (RQ):
1) Marine pollutant: yesPoison Inhalation Hazard: No

IMDG
UN number: 1206 Class: 3 Packing group: II EMS-No: F-E, S-D
Proper shipping name: HEPTANES
Marine pollutant : yes
Marine pollutant : yes

IATA
UN number: 1206 Class: 3 Packing group: II
Proper shipping name: Heptanes

SECTION 15: Regulatory information

SARA 302 Components
This material does not contain any components with a section 302 EHS TPQ.

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
Fire Hazard, Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components
No components are subject to the Massachusetts Right to Know Act.

SECTION 16: Other information

Further information
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. 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.

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SAFETY DATA SHEET

Version 6.11
Revision Date 10/19/2022
Print Date 12/10/2022

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

1.1 Product identifiers

Product name : Hexane

Product Number : 296090
Brand : Sigma-Aldrich
Index-No. : 601-037-00-0
CAS-No. : 110-54-3

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 Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 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
Reproductive toxicity (Category 2), H361
Specific target organ toxicity - single exposure (Category 3), Central nervous system, H336
Specific target organ toxicity - repeated exposure, Inhalation (Category 2), Nervous system, H373
Aspiration hazard (Category 1), H304
Short-term (acute) aquatic hazard (Category 2), H401
Long-term (chronic) aquatic hazard (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

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Pictogram	
Signal Word	Danger

Hazard statement(s)

H225	Highly flammable liquid and vapor.
H304	May be fatal if swallowed and enters airways.
H315	Causes skin irritation.
H336	May cause drowsiness or dizziness.
H361	Suspected of damaging fertility or the unborn child.
H373	May cause damage to organs (Nervous system) through prolonged or repeated exposure if inhaled.
H411	Toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P210	Keep away from heat/ sparks/ open flames/ hot surfaces. No smoking.
P233	Keep container tightly closed.
P240	Ground/bond container and receiving equipment.
P241	Use explosion-proof electrical/ ventilating/ lighting/ equipment.
P242	Use only non-sparking tools.
P243	Take precautionary measures against static discharge.
P260	Do not breathe mist or vapors.
P264	Wash skin thoroughly after handling.
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
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.
P304 + P340 + P312	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/ doctor if you feel unwell.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P331	Do NOT induce vomiting.
P332 + P313	If skin irritation occurs: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
P391	Collect spillage.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P403 + P235	Store in a well-ventilated place. Keep cool.
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

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SECTION 3: Composition/information on ingredients

3.1 Substances

Synonyms : n-Hexane

Formula : C_6H_{14}
Molecular weight : 86.18 g/mol
CAS-No. : 110-54-3
EC-No. : 203-777-6
Index-No. : 601-037-00-0

Component	Classification	Concentration
n-Hexane		
	Flam. Liq. 2; Skin Irrit. 2; Repr. 2; STOT SE 3; STOT RE 2; Asp. Tox. 1; Aquatic Acute 2; Aquatic Chronic 2; H225, H315, H361, H336, H373, H304, H401, H411 Concentration limits: >= 5 %: STOT RE 2, H373; >= 20 %: STOT SE 3, H336;	<= 100 %

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

SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice
Show this material safety data sheet to the doctor in attendance.

If inhaled
After inhalation: fresh air. Call in physician.

In case of skin contact
In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower. Consult a physician.

In case of eye contact
After eye contact: rinse out with plenty of water. Call in ophthalmologist. Remove contact lenses.

If swallowed
After swallowing: caution if victim vomits. Risk of aspiration! Keep airways free. Pulmonary failure possible after aspiration of vomit. Call a physician immediately.

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

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SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Carbon dioxide (CO2) Foam Dry powder

Unsuitable extinguishing media
For this substance/mixture no limitations of extinguishing agents are given.

5.2 Special hazards arising from the substance or mixture

Carbon oxides
Combustible.
Pay attention to flashback.
Vapors are heavier than air and may spread along floors.
Development of hazardous combustion gases or vapours possible in the event of fire.
Forms explosive mixtures with air at ambient temperatures.

5.3 Advice for firefighters

Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

5.4 Further information

Remove container from danger zone and cool with water. Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Advice for non-emergency personnel: Do not breathe vapors, aerosols. Avoid substance contact. Ensure adequate ventilation. Keep away from heat and sources of ignition.
Evacuate the danger area, observe emergency procedures, consult an expert.
For personal protection see section 8.

6.2 Environmental precautions

Do not let product enter drains. Risk of explosion.

6.3 Methods and materials for containment and cleaning up

Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up carefully with liquid-absorbent material (e.g. Chemizorb®). Dispose of properly. Clean up affected area.

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on safe handling
Work under hood. Do not inhale substance/mixture. Avoid generation of vapours/aerosols.

Advice on protection against fire and explosion

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Flash back possible over considerable distance.Container explosion may occur under fire conditions.Keep away from open flames, hot surfaces and sources of ignition.Take precautionary measures against static discharge.

Hygiene measures
Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions
Keep container tightly closed in a dry and well-ventilated place. Keep away from heat and sources of ignition.

Storage class
Storage class (TRGS 510): 3: Flammable liquids

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

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
n-Hexane	110-54-3	TWA	50 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Danger of cutaneous absorption		
		TWA	50 ppm 180 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	500 ppm 1,800 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		PEL	50 ppm 180 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
n-Hexane	110-54-3	2,5-Hexanedione	0.5 mg/l	Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift			

8.2 Exposure controls

Appropriate engineering controls
Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

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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). Safety glasses

Skin protection
This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).
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)

This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).
Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 10 min
Material tested:KCL 741 Dermatril® L

Body Protection
Flame retardant antistatic protective clothing.

Respiratory protection
required when vapours/aerosols are generated. Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

Control of environmental exposure
Do not let product enter drains. Risk of explosion.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid Color: colorless
b)	Odor	hydrocarbon-like
c)	Odor Threshold	No data available
d)	pH	7.0
e)	Melting point/freezing point	Melting point/range: -95 °C (-139 °F)
f)	Initial boiling point and boiling range	69 °C 156 °F

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g)	Flash point	-22 °C (-8 °F) - c.c.
h)	Evaporation rate	15.8
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	Upper explosion limit: 8.1 %(V) Lower explosion limit: 1.0 %(V)
k)	Vapor pressure	175.98 hPa at 20.0 °C (68.0 °F)
l)	Vapor density	No data available
m)	Density	0.659 g/mL at 25 °C (77 °F)
	Relative density	No data available
n)	Water solubility	0.01 g/l at 25 °C (77 °F) - slightly soluble
o)	Partition coefficient: n-octanol/water	log Pow: ca.4 at 20 °C (68 °F) - (Lit.), Potential bioaccumulation
p)	Autoignition temperature	225 °C (437 °F) at 1,013 hPa
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	none

9.2 Other safety information

No data available

SECTION 10: Stability and reactivity

10.1 Reactivity

Vapors may form explosive mixture with air.
Vapors may form explosive mixture with air.

10.2 Chemical stability

The product is chemically stable under standard ambient conditions (room temperature) .
The product is chemically stable under standard ambient conditions (room temperature) .

10.3 Possibility of hazardous reactions

Risk of explosion with:
Violent reactions possible with:
Strong oxidizing agents
nitrogen oxides
halogens
rubber
various plastics
Risk of ignition or formation of inflammable gases or vapours with:
Peroxides
(sodium salt)

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10.4 Conditions to avoid
Exposure to moisture may affect product quality.
Warming.

10.5 Incompatible materials
No data available

10.6 Hazardous decomposition products
In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - male and female - 16,000 mg/kg
(OECD Test Guideline 401)
LC50 Inhalation - Rat - 4 h - 172 mg/l - vapor

Remarks: (RTECS)
LD50 Dermal - Rabbit - male - > 2,000 mg/kg
(OECD Test Guideline 402)
Remarks: (ECHA)

Skin corrosion/irritation
Skin - Rabbit
Result: Skin irritation - 24 h
(OECD Test Guideline 404)
Remarks: (Regulation (EC) No 1272/2008, Annex VI)

Serious eye damage/eye irritation
Eyes - Rabbit
Result: No eye irritation - 72 h
(OECD Test Guideline 405)

Respiratory or skin sensitization
Local lymph node assay (LLNA) - Mouse
Result: negative
(OECD Test Guideline 429)

Germ cell mutagenicity
No data available
Test Type: Ames test
Test system: Salmonella typhimurium
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 471
Result: negative

Test Type: dominant lethal test
Species: Mouse

Application Route: inhalation (vapor)

Result: negative
Remarks: (ECHA)

Carcinogenicity

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No data available

IARC: No ingredient 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 ingredient 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
Overexposure may cause reproductive disorder(s) based on tests with laboratory animals.
Suspected human reproductive toxicant Suspected of damaging fertility.
Suspected of damaging fertility.

Specific target organ toxicity - single exposure
May cause drowsiness or dizziness. - Central nervous system
Remarks: Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

Specific target organ toxicity - repeated exposure
Inhalation - May cause damage to organs through prolonged or repeated exposure.
- Nervous system
Remarks: Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

Aspiration hazard
May be fatal if swallowed and enters airways.
Aspiration hazard, Aspiration may cause pulmonary edema and pneumonitis.

11.2 Additional Information

Repeated dose toxicity - Rat - male - Oral - NOAEL (No observed adverse effect level) - 6.6 mg/kg
Remarks: (ECHA)

RTECS: MN9275000
Drowsiness, irritant effects, somnolence
narcosis, Nausea, Tiredness, CNS disorders, paralysis symptoms
Risk of corneal clouding.
It generally applies for aliphatic hydrocarbons with 6 - 18 carbon atoms that they may cause pneumonia, in some cases also pulmonary oedema, upon direct inhalation, i.e. in conditions that can occur only in very special circumstances (nebulizations, spraying, inhalation of aerosols and similar). After absorption of very large quantities: narcosis.
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Testes. - Irregularities - Based on Human Evidence

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish	LC50 - Pimephales promelas (fathead minnow) - 2.5 mg/l - 96 h Remarks: (ECOTOX Database)
Toxicity to daphnia and other aquatic	EC50 - Daphnia magna (Water flea) - 2.1 mg/l - 48 h Remarks: (Lit.)

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invertebrates

12.2 Persistence and degradability

Biodegradability aerobic - Exposure time 28 d
Result: 98 % - Readily biodegradable.
(OECD Test Guideline 301F)
Remarks: (in analogy to similar products)

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 Endocrine disrupting properties

No data available

12.7 Other adverse effects

No data available

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product

Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself.

SECTION 14: Transport information

DOT (US)

UN number: 1208 Class: 3 Packing group: II
Proper shipping name: Hexanes
Reportable Quantity (RQ): 5000 lbs
Poison Inhalation Hazard: No

IMDG

UN number: 1208 Class: 3 Packing group: II EMS-No: F-E, S-D
Proper shipping name: HEXANES
Marine pollutant : yes
Marine pollutant : yes

IATA

UN number: 1208 Class: 3 Packing group: II
Proper shipping name: Hexanes

SECTION 15: Regulatory information

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SARA 302 Components
This material does not contain any components with a section 302 EHS TPQ.

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

	CAS-No.	Revision Date
n-Hexane	110-54-3	2020-07-14

Massachusetts Right To Know Components
No components are subject to the Massachusetts Right to Know Act.

SECTION 16: Other information

Further information
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. 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.

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Version: 6.11 Revision Date: 10/19/2022 Print Date: 12/10/2022

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SAFETY DATA SHEET

Version 6.8
Revision Date 02/02/2021
Print Date 12/10/2022

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

1.1 Product identifiers

Product name : 2-Propanol

Product Number : 278475
Brand : Sigma-Aldrich
Index-No. : 603-117-00-0
CAS-No. : 67-63-0

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 Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 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
Eye irritation (Category 2A), H319
Specific target organ toxicity - single exposure (Category 3), Central nervous system, H336

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

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Hazard statement(s)

H225	Highly flammable liquid and vapor.
H319	Causes serious eye irritation.
H336	May cause drowsiness or dizziness.

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.
P261	Avoid breathing dust/ fume/ gas/ mist/ vapors/ spray.
P264	Wash skin thoroughly after handling.
P271	Use only outdoors or in a well-ventilated area.
P280	Wear protective gloves/ eye protection/ face protection.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P304 + P340 + 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.
P337 + P313	If eye irritation persists: Get medical advice/ attention.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P403 + P235	Store in a well-ventilated place. Keep cool.
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

May form explosive peroxides.

SECTION 3: Composition/information on ingredients

3.1 Substances

Synonyms	:	sec-Propyl alcohol Isopropyl alcohol Isopropanol
Formula	:	C3H8O
Molecular weight	:	60.10 g/mol
CAS-No.	:	67-63-0
EC-No.	:	200-661-7
Index-No.	:	603-117-00-0

Component	Classification	Concentration
2-Propanol		
	Flam. Liq. 2; Eye Irrit. 2A; STOT SE 3; H225, H319, H336	<= 100 %

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	Concentration limits: >= 20 %: STOT SE 3, H336;	

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

SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice
Show this material safety data sheet to the doctor in attendance.

If inhaled
After inhalation: fresh air. Call in physician.

In case of skin contact
In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower.

In case of eye contact
After eye contact: rinse out with plenty of water. Call in ophthalmologist. Remove contact lenses.

If swallowed
After swallowing: immediately make victim drink water (two glasses at most). Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Carbon dioxide (CO2) Foam Dry powder

Unsuitable extinguishing media
For this substance/mixture no limitations of extinguishing agents are given.

5.2 Special hazards arising from the substance or mixture
Carbon oxides
Combustible.
Pay attention to flashback.
Vapors are heavier than air and may spread along floors.
Development of hazardous combustion gases or vapours possible in the event of fire.
Forms explosive mixtures with air at ambient temperatures.

5.3 Advice for firefighters
In the event of fire, wear self-contained breathing apparatus.

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5.4 Further information

Remove container from danger zone and cool with water. Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Advice for non-emergency personnel: Do not breathe vapors, aerosols. Avoid substance contact. Ensure adequate ventilation. Keep away from heat and sources of ignition.
Evacuate the danger area, observe emergency procedures, consult an expert.
For personal protection see section 8.

6.2 Environmental precautions

Do not let product enter drains. Risk of explosion.

6.3 Methods and materials for containment and cleaning up

Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up with liquid-absorbent material (e.g. Chemizorb®). Dispose of properly. Clean up affected area.

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on safe handling
Avoid generation of vapours/aerosols.

Advice on protection against fire and explosion
Keep away from open flames, hot surfaces and sources of ignition.Take precautionary measures against static discharge.

Hygiene measures
Change contaminated clothing. Wash hands after working with substance.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions
Keep container tightly closed in a dry and well-ventilated place. Keep away from heat and sources of ignition.

Handle and store under inert gas. hygroscopic
Storage class (TRGS 510): 3: Flammable liquids

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters

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Component	CAS-No.	Value	Control parameters	Basis
2-Propanol	67-63-0	TWA	200 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Not classifiable as a human carcinogen		
		STEL	400 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Not classifiable as a human carcinogen		
		TWA	400 ppm 980 mg/m³	USA. NIOSH Recommended Exposure Limits
		ST	500 ppm 1,225 mg/m³	USA. NIOSH Recommended Exposure Limits
		TWA	400 ppm 980 mg/m³	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	400 ppm 980 mg/m³	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		STEL	500 ppm 1,225 mg/m³	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		PEL	400 ppm 980 mg/m³	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		STEL	500 ppm 1,225 mg/m³	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
2-Propanol	67-63-0	Acetone	40 mg/l	Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift at end of workweek			

8.2 Exposure controls

Appropriate engineering controls
Change contaminated clothing. Wash hands after working with substance.

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). Safety glasses

Skin protection
This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).
Full contact

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Material: Nitrile rubber
Minimum layer thickness: 0.4 mm
Break through time: 480 min
Material tested:Camatril® (KCL 730 / Aldrich Z677442, Size M)

This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).
Splash contact
Material: Chloroprene
Minimum layer thickness: 0.65 mm
Break through time: 120 min
Material tested:KCL 720 Camapren®

Body Protection
Flame retardant antistatic protective clothing.

Respiratory protection
required when vapours/aerosols are generated. Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

Control of environmental exposure
Do not let product enter drains. Risk of explosion.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid Color: colorless
b)	Odor	alcohol-like
c)	Odor Threshold	1 ppm
d)	pH	at 20 °C (68 °F)neutral
e)	Melting point/freezing point	Melting point/range: -89.5 °C (-129.1 °F)
f)	Initial boiling point and boiling range	82 °C 180 °F
g)	Flash point	12.0 °C (53.6 °F) - closed cup
h)	Evaporation rate	3.0
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	Upper explosion limit: 13.4 %(V) Lower explosion limit: 2 %(V)
k)	Vapor pressure	43 hPa at 20 °C (68 °F)
l)	Vapor density	2.07
m)	Relative density	0.785 g/mL at 25 °C (77 °F)

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n)	Water solubility	soluble
o)	Partition coefficient: n-octanol/water	log Pow: 0.05 - Bioaccumulation is not expected.
p)	Autoignition temperature	425.0 °C (797.0 °F)
q)	Decomposition temperature	Distillable in an undecomposed state at normal pressure.
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information

Minimum ignition energy	0.65 mJ
Conductivity	< 0.1 µS/cm
Surface tension	20.8 mN/m at 25.0 °C (77.0 °F)
Relative vapor density	2.07

SECTION 10: Stability and reactivity

10.1 Reactivity

Vapors may form explosive mixture with air.

10.2 Chemical stability

Reacts with air to form peroxides.
The product is chemically stable under standard ambient conditions (room temperature) .
Test for peroxide formation before distillation or evaporation. Test for peroxide formation or discard after 1 year.
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions

Vapors may form explosive mixture with air.

10.4 Conditions to avoid

Warming.

10.5 Incompatible materials

rubber, various plastics, oils

10.6 Hazardous decomposition products

In the event of fire: see section 5

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SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - 5,840 mg/kg
(OECD Test Guideline 401)
LC50 Inhalation - Rat - male and female - 4 h - 37.5 mg/l
(OECD Test Guideline 403)
LD50 Dermal - Rabbit - 12,800 mg/kg
Remarks:
(RTECS)
No data available

Skin corrosion/irritation
Skin - Rabbit
Result: No skin irritation - 4 h
(OECD Test Guideline 404)

Serious eye damage/eye irritation
Eyes - Rabbit
Result: Eye irritation
(OECD Test Guideline 405)
(Regulation (EC) No 1272/2008, Annex VI)

Respiratory or skin sensitization
Buehler Test - Guinea pig
Result: negative
(OECD Test Guideline 406)

Germ cell mutagenicity
Ames test
Salmonella typhimurium
Result: negative
In vitro mammalian cell gene mutation test
Chinese hamster ovary cells
Result: negative
OECD Test Guideline 474
Mouse - male and female - Bone marrow
Result: negative

Carcinogenicity
This product is or contains a component that is not classifiable as to its carcinogenicity based on its IARC, ACGIH, NTP, or EPA classification.

IARC: No ingredient 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 ingredient 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

Specific target organ toxicity - single exposure
Inhalation, Oral - May cause drowsiness or dizziness. - Central nervous system
Remarks:

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Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)
Acute inhalation toxicity - Central nervous system

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

11.2 Additional Information

RTECS: NT8050000

Central nervous system depression, prolonged or repeated exposure can cause:, Nausea, Headache, Vomiting, narcosis, Drowsiness, Overexposure may cause mild, reversible liver effects., Aspiration may lead to:, Lung edema, Pneumonia
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

After absorption:

Headache
Dizziness
inebriation
Unconsciousness
narcosis

After uptake of large quantities:

Coma

Handle in accordance with good industrial hygiene and safety practice.

Kidney - Irregularities - Based on Human Evidence

Kidney - Irregularities - Based on Human Evidence

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish	flow-through test LC50 - Pimephales promelas (fathead minnow) - 9,640 mg/l - 96 h (OECD Test Guideline 203)
Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - 13,299 mg/l - 48 h Remarks: (IUCLID)
Toxicity to algae	IC50 - Desmodesmus subspicatus (green algae) - > 1,000 mg/l - 72 h Remarks: (IUCLID)
Toxicity to bacteria	EC5 - Pseudomonas putida - 1,050 mg/l - 16 h

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Remarks: (Lit.)

12.2 Persistence and degradability

Biodegradability	aerobic - Exposure time 5 d Result: 53 % - Readily biodegradable. (Directive 67/548/EEC, Annex V, C.6)
Theoretical oxygen demand	2,400 mg/g Remarks: (Lit.)
Ratio BOD/ThBOD	49 % Remarks: (IUCLID)

12.3 Bioaccumulative potential

No bioaccumulation is to be expected (log Pow <= 4).

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

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

12.6 Other adverse effects

No data available

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product

Waste material must be disposed of in accordance with the national and loc No mixing with other waste. Handle uncleaned containers like the product See www.retrologistik.com for processes regarding the return of chemicals and containers, or contact us there if you have further questions.

SECTION 14: Transport information

DOT (US)

UN number: 1219 Class: 3 Packing group: II
Proper shipping name: Isopropanol
Reportable Quantity (RQ):
Poison Inhalation Hazard: No

IMDG

UN number: 1219 Class: 3 Packing group: II EMS-No: F-E, S-D
Proper shipping name: ISOPROPANOL

IATA

UN number: 1219 Class: 3 Packing group: II
Proper shipping name: Isopropanol

SECTION 15: Regulatory information

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SARA 302 Components
This material does not contain any components with a section 302 EHS TPQ.

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

	CAS-No.	Revision Date
2-Propanol	67-63-0	2007-03-01

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

Massachusetts Right To Know Components
No components are subject to the Massachusetts Right to Know Act.

SECTION 16: Other information

Further information
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. 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.

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Version: 6.8 Revision Date: 02/02/2021 Print Date: 12/10/2022

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Lead

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Date of issue: 12/15/2014 Revision date: 12/15/2014 Version: 1.1

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

1.1. Product identifier

Product form : Substance

CAS No : 7439-92-1

Formula : Pb

Synonyms : C.I. 77575, in massive state / elemental lead, in massive state / glover, in massive state

BIG no : 10073

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

Use of the substance/mixture : Solder
Battery: component
Construction
Electrodes

1.3. Details of the supplier of the safety data sheet

GSC International, Inc.
1747 N. Deffer Drive
Nixa,
MO 65714
United States of America

Tel: 417-374-7431
Fax: 417-374-7442
Email: info@gscinternationalinc.com

1.4. Emergency telephone number

Country	Organization/Company	Address	Emergency number
MEXICO	Servicio de Informacion Toxicologica Sintox	Tintoreto #32 Edif. a Desp. Col. Nochebuena Mixcoac México, D.F.	1 800 009 2800 +52 55 5611 2634 /+52 55 5598 9095
UNITED STATES OF AMERICA	American Association of Poison Control Centers		1-800-222-1222

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

Classification (GHS-US)

Acute Tox. 4 (Oral)	H302
Acute Tox. 4 (Inhalation)	H332
Carc. 1B	H350
Repr. 1A	H360
STOT RE 2	H373
Aquatic Acute 1	H400
Aquatic Chronic 1	H410

Full text of H-phrases: see section 16

2.2. Label elements

GHS-US labeling

Hazard pictograms (GHS-US) :



GHS07 GHS08 GHS09

Signal word (GHS-US) : Danger

Hazard statements (GHS-US) : H302+H332 - Harmful if swallowed or if inhaled
H350 - May cause cancer
H360 - May damage fertility or the unborn child
H373 - May cause damage to organs through prolonged or repeated exposure

H400 - Very toxic to aquatic life
H410 - Very toxic to aquatic life with long lasting effects

Precautionary statements (GHS-US) : P201 - Obtain special instructions before use
P202 - Do not handle until all safety precautions have been read and understood
P260 - Do not breathe dust, fume
P264 - Wash hands thoroughly after handling
P270 - Do not eat, drink or smoke when using this product
P273 - Avoid release to the environment
P304+P340 - If inhaled: Remove person to fresh air and keep comfortable for breathing
P308+P313 - If exposed or concerned: Get medical advice/attention
P314 - Get medical advice/attention if you feel unwell
P501 - Dispose of contents/container to a licensed hazardous-waste disposal contractor or collection site except for empty clean containers which can be disposed of as non-hazardous waste

2.3. Other hazards

No additional information available

2.4. Unknown acute toxicity (GHS-US)

Not applicable

SECTION 3: Composition/information on ingredients

3.1. Substance

Name	Product identifier	%	Classification (GHS-US)
Lead (Main constituent)	(CAS No) 7439-92-1	> 99,9	Acute Tox. 4 (Oral), H302 Acute Tox. 4 (Inhalation), H332 Carc. 1B, H350 Repr. 1A, H360 STOT RE 2, H373 Aquatic Acute 1, H400 Aquatic Chronic 1, H410

Full text of H-phrases: see section 16

3.2. Mixture

Not applicable

4.1. Description of first aid measures

First-aid measures general : If you feel unwell, seek medical advice. IF exposed or concerned: Get medical advice/attention. Call a poison center/doctor/physician if you feel unwell.

First-aid measures after inhalation : Remove person to fresh air and keep comfortable for breathing. Not applicable. Call a poison center/doctor/physician if you feel unwell.

First-aid measures after skin contact : Not applicable. Wash skin with plenty of water.

First-aid measures after eye contact : Not applicable. Rinse eyes with water as a precaution.

First-aid measures after ingestion : Not applicable. Rinse mouth. Call a poison center/doctor/physician if you feel unwell.

4.2. Most important symptoms and effects, both acute and delayed

Symptoms/injuries after inhalation : No effects known.

Symptoms/injuries after skin contact : No effects known.

Symptoms/injuries after eye contact : No effects known.

Symptoms/injuries after ingestion : No effects known.

Chronic symptoms : No effects known.

4.3. Indication of any immediate medical attention and special treatment needed

Treat symptomatically.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media : Adapt extinguishing media to the environment.

Unsuitable extinguishing media : No unsuitable extinguishing media known.

5.2. Special hazards arising from the substance or mixture

Fire hazard : DIRECT FIRE HAZARD. Non combustible.

Explosion hazard	:	DIRECT EXPLOSION HAZARD. No data available on direct explosion hazard. INDIRECT EXPLOSION HAZARD. No data available on indirect explosion hazard.
Reactivity	:	On burning: formation of metallic fumes. Oxidizes on exposure to air.

5.3. Advice for firefighters

Precautionary measures fire	:	Exposure to fire/heat: keep upwind. Exposure to fire/heat: consider evacuation. Exposure to heat: have neighborhood close doors and windows.
Firefighting instructions	:	Dilute toxic gases with water spray. Take account of toxic fire-fighting water. Use water moderately and if possible collect or contain it.
Protection during firefighting	:	Heat/fire exposure: compressed air/oxygen apparatus. Do not attempt to take action without suitable protective equipment. Self-contained breathing apparatus. Complete protective clothing.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

6.1.1. For non-emergency personnel

Protective equipment	:	Gloves. Protective clothing. See "Material-Handling" to select protective clothing.
Emergency procedures	:	Mark the danger area. No naked flames.

6.1.2. For emergency responders

Protective equipment	:	Do not attempt to take action without suitable protective equipment. For further information refer to section 8: "Exposure controls/personal protection".

6.2. Environmental precautions

Avoid release to the environment. Prevent soil and water pollution. Prevent spreading in sewers. Notify authorities if product enters sewers or public waters.

6.3. Methods and material for containment and cleaning up

For containment	:	Not applicable. Collect spillage.
Methods for cleaning up	:	Recover mechanically the product. Pick-up the material. Take collected spill to manufacturer/competent authority. Notify authorities if product enters sewers or public waters.
Other information	:	Dispose of materials or solid residues at an authorized site.

6.4. Reference to other sections

For further information refer to section 13.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling	:	Meet the legal requirements. Do not discharge the waste into the drain. Handle unclean empty containers as full ones. Observe strict hygiene. Measure the concentration in the atmosphere. Carry out operations in the open/under local exhaust/ventilation or with respiratory protection. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Do not breathe dust, fume. Use only outdoors or in a well-ventilated area. Take all necessary technical measures to avoid or minimize the release of the product on the workplace. Limit quantities of product at the minimum necessary for handling and limit the number of exposed workers. Provide local exhaust or general room ventilation. Wear personal protective equipment. Floors, walls and other surfaces in the hazard area must be cleaned regularly.
Hygiene measures	:	Separate working clothes from town clothes. Launder separately. Do not eat, drink or smoke when using this product. Always wash hands after handling the product.

7.2. Conditions for safe storage, including any incompatibilities

Technical measures	:	Does not require any specific or particular technical measures. Comply with applicable regulations.
Storage conditions	:	Store locked up. Store in a well-ventilated place. Keep cool.
Incompatible materials	:	Strong acids, strong bases and oxidation agents.
Heat-ignition	:	KEEP SUBSTANCE AWAY FROM: heat sources.
Prohibitions on mixed storage	:	KEEP SUBSTANCE AWAY FROM: oxidizing agents. Strong acids. Strong bases.
Storage area	:	Meet the legal requirements.
Special rules on packaging	:	SPECIAL REQUIREMENTS: closing. correctly labeled. meet the legal requirements. Secure fragile packaging in solid containers.

7.3. Specific end use(s)

No additional information available

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Lead (7439-92-1)		
ACGIH	ACGIH TWA (mg/m³)	0,05 mg/m³
ACGIH	Remark (ACGIH)	CNS & PNS impair
OSHA	Not applicable	

8.2. Exposure controls

Appropriate engineering controls : Provide adequate general and local exhaust ventilation. Ensure good ventilation of the work station.

Personal protective equipment : Protective goggles. Gloves.



Materials for protective clothing : GIVE EXCELLENT RESISTANCE: No data available. GIVE GOOD RESISTANCE: butyl rubber. PVC. GIVE LESS RESISTANCE: No data available. GIVE POOR RESISTANCE: No data available.

Hand protection : protective gloves.

Eye protection : Safety glasses.

Skin and body protection : Not required for normal conditions of use.

Respiratory protection : Wear respiratory protection.

Environmental exposure controls : Avoid release to the environment.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state : Solid

Appearance : Metal.

Molecular mass : 207,20 g/mol

Color : White to blue-grey

Odor : Odorless

Odor threshold : No data available

pH : No data available

Relative evaporation rate (butyl acetate=1) : No data available

Melting point : 327 °C

Freezing point : No data available

Boiling point : 1740 °C

Flash point : Not applicable

Auto-ignition temperature : No data available

Decomposition temperature : No data available

Flammability (solid, gas) : No data available

Vapor pressure : < 0,1 hPa

Relative vapor density at 20 °C : No data available

Relative density : 11,3

Specific gravity / density : 11340 kg/m³

Solubility : insoluble in water. Substance sinks in water. Soluble in nitric acid. Insoluble in organic solvents. Water: < 0,1 g/100ml

Log Pow : 0,73 (Estimated value)

Log Kow : No data available

Viscosity, kinematic	:	Not applicable
Viscosity, dynamic	:	No data available
Explosive properties	:	No data available
Oxidizing properties	:	No data available
Explosive limits	:	No data available

9.2. Other information

VOC content : Not applicable (inorganic)

SECTION 10: Stability and reactivity

10.1. Reactivity

On burning: formation of metallic fumes. Oxidizes on exposure to air.

10.2. Chemical stability

Unstable on exposure to air.

10.3. Possibility of hazardous reactions

No additional information available

10.4. Conditions to avoid

No additional information available

10.5. Incompatible materials

Acids. Bases.

10.6. Hazardous decomposition products

Thermal decomposition generates : fume.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity : Oral: Harmful if swallowed. Inhalation: Harmful if inhaled.

Lead (\f)7439-92-1	
LD50 oral rat	> 2000 mg/kg body weight (Rat; Weight of evidence)
LD50 dermal rat	> 2000 mg/kg body weight (Rat; Experimental value; OECD 402: Acute Dermal Toxicity)
ATE US (oral)	500,000 mg/kg body weight
ATE US (gases)	4500,000 ppmV/4h
ATE US (vapors)	11,000 mg/l/4h
ATE US (dust, mist)	1,500 mg/l/4h
Additional information	Lead massive metal is not considered to be acutely toxic. It is not easily inhaled or ingested, and if it is accidentally ingested normally passes through the gastrointestinal system without significant absorption into the body. Lead is not easily absorbed through the skin.

Skin corrosion/irritation : Not classified
(Based on available data, the classification criteria are not met)

Serious eye damage/irritation : Not classified
(Based on available data, the classification criteria are not met)

Respiratory or skin sensitization : Not classified
(Based on available data, the classification criteria are not met)

Germ cell mutagenicity : Not classified
(Based on available data, the classification criteria are not met)

Carcinogenicity : May cause cancer.

Lead (7439-92-1)	
Additional information	There is some evidence that inorganic lead compounds may have a carcinogenic effect, and they have been classified by IARC as probably carcinogenic to humans. However, it is considered that this classification does not apply to lead in articles, given the very low bioavailability of metallic lead. Carcinogenicity studies of lead metal powder have been negative. Epidemiology studies of workers exposed to inorganic lead compounds have found a limited association with stomach cancer. IARC has concluded that lead metal is possibly carcinogenic to humans (Group aB).
IARC group	2B - Possibly carcinogenic to humans
National Toxicology Program (NTP) Status	3 - Reasonably anticipated to be Human Carcinogen

Reproductive toxicity : May damage fertility or the unborn child.

Specific target organ toxicity (single exposure) : Not classified

(Based on available data, the classification criteria are not met)

Specific target organ toxicity (repeated exposure) : May cause damage to organs through prolonged or repeated exposure.

Lead (7439-92-1)	
Additional information	Lead is a cumulative poison and may be absorbed into the body through ingestion or inhalation. Although inhalation and ingestion of lead in massive form are unlikely, poor hygiene practises may result in hand to mouth transfer which maybe significant over a prolonged period of time. Inorganic lead compounds have been documented in observational human studies to produce toxicity in multiple organ systems and body function including the haemotopoetic (blood) system, kidney function, reproductive function and the central nervous system.

Aspiration hazard : Not classified

(Based on available data, the classification criteria are not met)

Symptoms/injuries after inhalation : No effects known.

Symptoms/injuries after skin contact : No effects known.

Symptoms/injuries after eye contact : No effects known.

Symptoms/injuries after ingestion : No effects known.

Chronic symptoms : No effects known.

SECTION 12: Ecological information

12.1. Toxicity

Ecology - general : Dangerous for the environment. Very toxic to aquatic life with long lasting effects.

Ecology - air : Not dangerous for the ozone layer (Regulation (EC) No 1005/2009). Not included in the list of fluorinated greenhouse gases (Regulation (EC) No 842/2006). TA-Luft Klasse 5.2.2/II.

Ecology - water : No water pollutant (surface water). Maximum concentration in drinking water: 0.010 mg/l (lead) (Directive 98/83/EC). Highly toxic to aquatic organisms.

Lead (7439-92-1)	
LC50 fish 1	2,8 (0,44 - 542) mg/l (96h) Coughlan, D.J., S.P. Gloss, and J. Kubota 1986. Acute and Sub-Chronic Toxicity of Lead to the Early Life Stages of Small mouth Bass (Micropterus dolomieui). Water Air Soil Pollut. 28(3/4):265-275
EC50 Daphnia 1	4,46 (0,53 - 5,1) mg/l (48h) Govindarajan, S., C.P. Valsaraj, R. Mohan, V. Hariprasad, and R. Ramasubramanian 1993. Toxicity of Heavy Metals in Aquaculture Organisms: Penaeus indicus, Perna viridis, Artemia salina and Skeletonema costatum. Pollut.Res. 12(3):187-189

12.2. Persistence and degradability

Lead (7439-92-1)	
Persistence and degradability	Biodegradability: Not applicable. No (test)data available on mobility of the substance.
ThOD	Not applicable (inorganic)

12.3. Bioaccumulative potential

Lead (7439-92-1)	
Log Pow	0,73 (Estimated value)
Bioaccumulative potential	Low bioaccumulation potential (Log Kow < 4).

12.4. Mobility in soil

No additional information available

12.5. Other adverse effects

Effect on ozone layer :

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Waste disposal recommendations : Dispose in a safe manner in accordance with local/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. Reuse or recycle following decontamination. Remove to an authorized dump (Class I). Do not discharge into surface water (2000/60/EC, Council decision 2455/2001/EC, O.J. L331 of 15/12/2001).

Additional information : LWCA (the Netherlands): KGA category 05. Hazardous waste according to Directive 2008/98/EC.

SECTION 14: Transport information

In accordance with DOT

Transport document description : UN3077 Environmentally hazardous substances, solid, n.o.s. Lead(7439-92-1), 9, III

UN-No.(DOT) : UN3077

Proper Shipping Name (DOT) : Environmentally hazardous substances, solid, n.o.s.
Lead(7439-92-1)

Department of Transportation (DOT) Hazard Classes : 9 - Class 9 - Miscellaneous hazardous material 49 CFR 173.140

Hazard labels (DOT) : 9 - Class 9 (Miscellaneous dangerous materials)



DOT Symbols : G - Identifies PSN requiring a technical name

Packing group (DOT) : III - Minor Danger

DOT Special Provisions (49 CFR 172.102)	:	8 - A hazardous substance that is not a hazardous waste may be shipped under the shipping description “Other regulated substances, liquid or solid, n.o.s.”, as appropriate. In addition, for solid materials, special provision B54 applies. 146 - This description may be used for a material that poses a hazard to the environment but does not meet the definition for a hazardous waste or a hazardous substance, as defined in 171.8 of this subchapter, or any hazard class as defined in Part 173 of this subchapter, if it is designated as environmentally hazardous by the Competent Authority of the country of origin, transit or destination. 335 - Mixtures of solids that are not subject to this subchapter and environmentally hazardous liquids or solids may be classified as “Environmentally hazardous substances, solid, n.o.s,” UN3077 and may be transported under this entry, provided there is no free liquid visible at the time the material is loaded or at the time the packaging or transport unit is closed. Each transport unit must be leak-proof when used as bulk packaging. A112 - Notwithstanding the quantity limits shown in Column (9A) and (9B) for this entry, the following IBCs are authorized for transportation aboard passenger and cargo-only aircraft. Each IBC may not exceed a maximum net quantity of 1,000 kg: a. Metal: 11A, 11B, 11N, 21A, 21B and 21N b. Rigid plastics: 11H1, 11H2, 21H1 and 21H2 c. Composite with plastic inner receptacle: 11HZ1, 11HZ2, 21HZ1 and 21HZ2 d. Fiberboard: 11G e. Wooden: 11C, 11D and 11F (with inner liners) f. Flexible: 13H2, 13H3, 13H4, 13H5, 13L2, 13L3, 13L4, 13M1 and 13M2 (flexible IBCs must be sift-proof and water resistant or must be fitted with a sift-proof and water resistant liner). B54 - Open-top, sift-proof rail cars are also authorized. IB8 - Authorized IBCs: Metal (11A, 11B, 11N, 21A, 21B, 21N, 31A, 31B and 31N); Rigid plastics (11H1, 11H2, 21H1, 21H2, 31H1 and 31H2); Composite (11HZ1, 11HZ2, 21HZ1, 21HZ2, 31HZ1 and 31HZ2); Fiberboard (11G); Wooden (11C, 11D and 11F); Flexible (13H1, 13H2, 13H3, 13H4, 13H5, 13L1, 13L2, 13L3, 13L4, 13M1 or 13M2). IP3 - Flexible IBCs must be sift-proof and water-resistant or must be fitted with a sift-proof and water-resistant liner. N20 - A 5M1 multi-wall paper bag is authorized if transported in a closed transport vehicle. T1 - 1.5 178.274(d)(2) Normal..... 178.275(d)(2) TP33 - The portable tank instruction assigned for this substance applies for granular and powdered solids and for solids which are filled and discharged at temperatures above their melting point which are cooled and transported as a solid mass. Solid substances transported or offered for transport above their melting point are authorized for transportation in portable tanks conforming to the provisions of portable tank instruction T4 for solid substances of packing group III or T7 for solid substances of packing group II, unless a tank with more stringent requirements for minimum shell thickness, maximum allowable working pressure, pressure-relief devices or bottom outlets are assigned in which case the more stringent tank instruction and special provisions shall apply. Filling limits must be in accordance with portable tank special provision TP3. Solids meeting the definition of an elevated temperature material must be transported in accordance with the applicable requirements of this subchapter.
DOT Packaging Exceptions (49 CFR 173.xxx)	:	155
DOT Packaging Non Bulk (49 CFR 173.xxx)	:	213
DOT Packaging Bulk (49 CFR 173.xxx)	:	240
DOT Quantity Limitations Passenger aircraft/rail (49 CFR 173.27)	:	No limit
DOT Quantity Limitations Cargo aircraft only (49 CFR 175.75)	:	No limit
DOT Vessel Stowage Location	:	A - The material may be stowed ‘‘on deck’’ or ‘‘under deck’’ on a cargo vessel and on a passenger vessel.

Additional information

Other information : No supplementary information available.

ADR

No additional information available

Transport by sea

UN-No. (IMDG)	:	3077
Proper Shipping Name (IMDG)	:	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.
Class (IMDG)	:	9 - Miscellaneous dangerous compounds
Packing group (IMDG)	:	III - substances presenting low danger

Air transport

UN-No.(IATA)	:	3077
Proper Shipping Name (IATA)	:	Environmentally hazardous substance, solid, n.o.s.
Class (IATA)	:	9 - Miscellaneous Dangerous Goods
Packing group (IATA)	:	III - Minor Danger

SECTION 15: Regulatory information

15.1. US Federal regulations

Lead (7439-92-1)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory Listed on United States SARA Section 313 Not listed on the United States SARA Section 313	
RQ (Reportable quantity, section 304 of EPA's List of Lists)	10 lb

15.2. International regulations

CANADA

No additional information available

EU-Regulations

No additional information available

Classification according to Regulation (EC) No. 1272/2008 [CLP]

Repr. 1A	H360Df
Acute Tox. 4 (Inhalation)	H332
Acute Tox. 4 (Oral)	H302
STOT RE 2	H373
Aquatic Acute 1	H400
Aquatic Chronic 1	H410

Full text of H-phrases: see section 16

Classification according to Directive 67/548/EEC [DSD] or 1999/45/EC [DPD]

Repr.Cat.1; R61
Repr.Cat.3; R62
Xn; R20/22
R33
N; R50/53

Full text of R-phrases: see section 16

15.2.2. National regulations

Lead (7439-92-1)
Listed on IARC (International Agency for Research on Cancer) Listed as carcinogen on NTP (National Toxicology Program)

15.3. US State regulations

No additional information available

SECTION 16: Other information

Revision date	:	12/15/2014

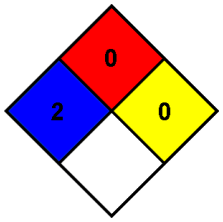
Full text of H-phrases:

Acute Tox. 4 (Inhalation)	Acute toxicity (inhalation) Category 4
Acute Tox. 4 (Oral)	Acute toxicity (oral) Category 4
Aquatic Acute 1	Hazardous to the aquatic environment - Acute Hazard Category 1
Aquatic Chronic 1	Hazardous to the aquatic environment - Chronic Hazard Category 1
Carc. 1B	Carcinogenicity Category 1B
Repr. 1A	Reproductive toxicity Category 1A
STOT RE 2	Specific target organ toxicity (repeated exposure) Category 2
H302	Harmful if swallowed
H332	Harmful if inhaled
H350	May cause cancer
H360	May damage fertility or the unborn child
H373	May cause damage to organs through prolonged or repeated exposure
H400	Very toxic to aquatic life
H410	Very toxic to aquatic life with long lasting effects

NFPA health hazard : 2 - Intense or continued exposure could cause temporary incapacitation or possible residual injury unless prompt medical attention is given.

NFPA fire hazard : 0 - Materials that will not burn.

NFPA reactivity : 0 - Normally stable, even under fire exposure conditions, and are not reactive with water.



HMIS III Rating

Health : * Chronic Hazard - Chronic (long-term) health effects may result from repeated overexposure

Flammability : 0 Minimal Hazard

Physical : 0 Minimal Hazard

Personal Protection : B

SDS US (GHS HazCom 2012)

This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product

SAFETY DATA SHEET

R6KH29

Section 1. Identification

Product name : Solvent Methyl Ethyl Ketone (MEK)

Product code : R6KH29

Other means of identification : Not available.

CAS # : 78-93-3

Product type : Liquid.

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

Not applicable.

Manufacturer : THE SHERWIN-WILLIAMS COMPANY
101 W. Prospect Avenue
Cleveland, OH 44115

Supplier : Compania Sherwin-Williams S.A. de C.V.
Poniente 140 No.595
Col. Industrial Vallejo, Del. Azcapotzalco
C.P. 02300, Ciudad de México, México

Emergency telephone number of the company : US / Canada: (216) 566-2917
Mexico: SETIQ 01-800-00-214-00 / (52) 55-5559-1588 24 hours / 365 days a year

Product Information Telephone Number : US / Canada: Not Available
Mexico: Not Available

Regulatory Information Telephone Number : US / Canada: (216) 566-2902
Mexico: Not Available

Transportation Emergency Telephone Number : US / Canada: (800) 424-9300
Mexico: SETIQ 01-800-00-214-00 / (52) 55-5559-1588 24 hours / 365 days a year

Section 2. Hazards identification

Classification of the substance or mixture : FLAMMABLE LIQUIDS - Category 2
SKIN CORROSION/IRRITATION - Category 2
SERIOUS EYE DAMAGE/ EYE IRRITATION - Category 2A
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Narcotic effects) - Category 3
SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) - Category 2

GHS label elements

Hazard pictograms :



Signal word : Danger

Section 2. Hazards identification

Hazard statements : H225 - Highly flammable liquid and vapor.
H319 - Causes serious eye irritation.
H315 - Causes skin irritation.
H335 - May cause respiratory irritation.
H336 - May cause drowsiness or dizziness.
H373 - May cause damage to organs through prolonged or repeated exposure.

Precautionary statements

Prevention : P280 - Wear protective gloves. Wear eye or face protection.
P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P241 - Use explosion-proof electrical, ventilating, lighting and all material-handling equipment.
P242 - Use only non-sparking tools.
P243 - Take precautionary measures against static discharge.
P233 - Keep container tightly closed.
P271 - Use only outdoors or in a well-ventilated area.
P260 - Do not breathe vapor.
P264 - Wash hands thoroughly after handling.

Response : P314 - Get medical attention if you feel unwell.
P304 + P340 + P312 - IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER or physician if you feel unwell.
P303 + P361 + P353 - IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower.
P302 + P352 + P362+P364 - IF ON SKIN: Wash with plenty of soap and water. Take off contaminated clothing and wash it before reuse.
P332 + P313 - If skin irritation occurs: Get medical attention.
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P337 + P313 - If eye irritation persists: Get medical attention.

Storage : P405 - Store locked up.
P403 - Store in a well-ventilated place.
P235 - Keep cool.

Disposal : P501 - Dispose of contents and container in accordance with all local, regional, national and international regulations.

Supplemental label elements DELAYED EFFECTS FROM LONG TERM OVEREXPOSURE. Contains solvents which can cause permanent brain and nervous system damage. Intentional misuse by deliberately concentrating and inhaling the contents can be harmful or fatal. FOR INDUSTRIAL USE ONLY.

Please refer to the SDS for additional information. Keep out of reach of children. Do not transfer contents to other containers for storage.

Hazards not otherwise classified : None known.

Section 3. Composition/information on ingredients

Substance/mixture : Substance

Other means of identification : Not available.

CAS number/other identifiers

CAS number : 78-93-3

Ingredient name	% by weight	CAS number
Methyl Ethyl Ketone	100	78-93-3

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

Section 3. Composition/information on ingredients

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 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 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.

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 necessary, call a poison center or physician. 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 : Can cause central nervous system (CNS) depression. May cause drowsiness or dizziness. May cause respiratory irritation.

Skin contact : Causes skin irritation.

Ingestion : Can cause central nervous system (CNS) depression.

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
nausea or vomiting
headache
drowsiness/fatigue
dizziness/vertigo
unconsciousness

Skin contact : Adverse symptoms may include the following:
irritation
redness

Section 4. First aid measures

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.

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 dry chemical, CO_2, water spray (fog) or foam.

Unsuitable extinguishing media : Do not use water jet.

Specific hazards arising from the chemical : Highly flammable liquid and vapor. Runoff to sewer may create fire or explosion hazard. 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. Vapors may accumulate in low or confined areas or travel a considerable distance to a source of ignition and flash back.

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. 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.

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. Shut off all ignition sources. No flares, smoking or flames in hazard area. 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 specialized 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

Section 6. Accidental release measures

Small spill : Stop leak if without risk. Move containers from spill area. Use spark-proof tools and explosion-proof equipment. 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. Use spark-proof tools and explosion-proof equipment. 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 breathe vapor or mist. Do not ingest. Avoid contact with eyes, skin and clothing. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. 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. Take precautionary measures against electrostatic discharges. 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 a segregated and approved area. 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. Store locked up. Eliminate all ignition sources. Separate from oxidizing materials. 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. See Section 10 for incompatible materials before handling or use.

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits (OSHA United States)

Ingredient name	Exposure limits
Methyl Ethyl Ketone	**ACGIH TLV (United States, 3/2016).** TWA: 200 ppm 8 hours. TWA: 590 mg/m³ 8 hours. STEL: 300 ppm 15 minutes. STEL: 885 mg/m³ 15 minutes. **NIOSH REL (United States, 10/2016).** TWA: 200 ppm 10 hours. TWA: 590 mg/m³ 10 hours. STEL: 300 ppm 15 minutes. STEL: 885 mg/m³ 15 minutes. **OSHA PEL (United States, 6/2016).**

	TWA: 200 ppm 8 hours. TWA: 590 mg/m³ 8 hours.

Occupational exposure limits (Canada)

Ingredient name	Exposure limits
Methyl Ethyl Ketone	**CA Alberta Provincial (Canada, 4/2009).** 15 min OEL: 300 ppm 15 minutes. 8 hrs OEL: 200 ppm 8 hours. 8 hrs OEL: 590 mg/m³ 8 hours. 15 min OEL: 885 mg/m³ 15 minutes. **CA British Columbia Provincial (Canada, 7/2016).** TWA: 50 ppm 8 hours. STEL: 100 ppm 15 minutes. **CA Ontario Provincial (Canada, 7/2015).** TWA: 200 ppm 8 hours. STEL: 300 ppm 15 minutes. **CA Québec Provincial (Canada, 1/2014).** TWAEV: 50 ppm 8 hours. TWAEV: 150 mg/m³ 8 hours. STEV: 100 ppm 15 minutes. STEV: 300 mg/m³ 15 minutes. **CA Saskatchewan Provincial (Canada, 7/2013).** STEL: 300 ppm 15 minutes. TWA: 200 ppm 8 hours.

Occupational exposure limits (Mexico)

Ingredient name	Exposure limits
Methyl Ethyl Ketone	**NOM-010-STPS-2014 (Mexico, 4/2016).** TWA: 200 ppm 8 hours. STEL: 300 ppm 15 minutes.

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: chemical splash goggles.

Skin protection

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 : Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use.

Section 9. Physical and chemical properties

Appearance

Physical state : Liquid.

Color : Not available.

Odor : Not available.

Odor threshold : Not available.

pH : Not available.

Melting point : Not available.

Boiling point : 78°C (172.4°F)

Flash point : Closed cup: -7°C (19.4°F) [Tagliabue Closed Cup]

Evaporation rate : 5.6 (butyl acetate = 1)

Flammability (solid, gas) : Not available.

Lower and upper explosive (flammable) limits : Lower: 1.8%
Upper: 10%

Vapor pressure : 12.1 kPa (90.6 mm Hg) [at 20°C]

Vapor density : 2.48 [Air = 1]

Relative density : 0.8

Solubility : Not available.

Partition coefficient: n-octanol/water : Not available.

Auto-ignition temperature : Not available.

Decomposition temperature : Not available.

Viscosity : Kinematic (40°C (104°F)): >0.205 cm^2/s (>20.5 cSt)

Molecular weight : Not applicable.

Aerosol product

Heat of combustion : 30.9 kJ/g

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

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

Product/ingredient name	Result	Species	Dose	Exposure
Methyl Ethyl Ketone	LD50 Dermal LD50 Oral	Rabbit Rat	6480 mg/kg 2737 mg/kg	- -

Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation
Methyl Ethyl Ketone	Skin - Mild irritant Skin - Moderate irritant	Rabbit Rabbit	- -	24 hours 14 milligrams 24 hours 500 milligrams	- -

Sensitization

Not available.

Mutagenicity

Not available.

Carcinogenicity

Not available.

Reproductive toxicity

Not available.

Teratogenicity

Not available.

Specific target organ toxicity (single exposure)

Name	Category	Route of exposure	Target organs
Methyl Ethyl Ketone	Category 3	Not applicable.	Respiratory tract irritation and Narcotic effects

Specific target organ toxicity (repeated exposure)

Section 11. Toxicological information

Name	Category	Route of exposure	Target organs
Methyl Ethyl Ketone	Category 2	Not determined	Not determined

Aspiration hazard

Not available.

Information on the likely routes of exposure : Not available.

Potential acute health effects

Eye contact : Causes serious eye irritation.

Inhalation : Can cause central nervous system (CNS) depression. May cause drowsiness or dizziness. May cause respiratory irritation.

Skin contact : Causes skin irritation.

Ingestion : Can cause central nervous system (CNS) depression.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : Adverse symptoms may include the following:
pain or irritation
watering
redness

Inhalation : Adverse symptoms may include the following:
respiratory tract irritation
coughing
nausea or vomiting
headache
drowsiness/fatigue
dizziness/vertigo
unconsciousness

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

Not available.

General : May cause damage to organs through prolonged or repeated exposure.

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

Route	ATE value
Oral	2737 mg/kg

Section 12. Ecological information

Toxicity

Product/ingredient name	Result	Species	Exposure
Methyl Ethyl Ketone	Acute EC50 >500000 µg/l Marine water Acute EC50 5091000 µg/l Fresh water Acute LC50 3220000 µg/l Fresh water	Algae - Skeletonema costatum Daphnia - Daphnia magna - Larvae Fish - Pimephales promelas	96 hours 48 hours 96 hours

Persistence and degradability

Product/ingredient name	Aquatic half-life	Photolysis	Biodegradability
Methyl Ethyl Ketone	-	-	Readily

Bioaccumulative potential

Not available.

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. 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. Vapor from product residues may create a highly flammable or explosive atmosphere inside the container. Do not cut, weld or grind used containers unless they have been cleaned thoroughly internally. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Section 14. Transport information

	DOT Classification	TDG Classification	Mexico Classification	IATA	IMDG
UN number	UN1193	UN1193	UN1193	UN1193	UN1193
UN proper shipping name	Methyl Ethyl Ketone	Methyl Ethyl Ketone	Methyl Ethyl Ketone	Methyl Ethyl Ketone	Methyl Ethyl Ketone
Transport hazard class(es)	3 	3 	3 	3 	3 
Packing group	II	II	II	II	II
Environmental hazards	No.	No.	No.	No.	No.
Additional information	- **ERG No.** 127	**ERG No.** 127	- **ERG No.** 127	-	**Emergency schedules** F-E, S-D

Special precautions for user : Multi-modal shipping descriptions are provided for informational purposes and do not consider container sizes. The presence of a shipping description for a particular mode of transport (sea, air, etc.), does not indicate that the product is packaged suitably for that mode of transport. All packaging must be reviewed for suitability prior to shipment, and compliance with the applicable regulations is the sole responsibility of the person offering the product for transport. People loading and unloading dangerous goods must be trained on all of the risks deriving from the substances and on all actions in case of emergency situations.

Transport in bulk according to Annex II of MARPOL and the IBC Code : Not available.

Proper shipping name : Not available.

Ship type : Not available.

Pollution category : Not available.

Section 15. Regulatory information

SARA 313

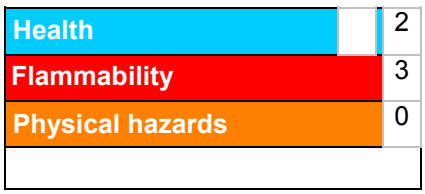
SARA 313 (40 CFR 372.45) supplier notification can be found on the Environmental Data Sheet.

California Prop. 65

Not applicable.

Section 16. Other information

Hazardous Material Information System (U.S.A.)



Section 16. Other information

The customer is responsible for determining the PPE code for this material. For more information on HMIS® Personal Protective Equipment (PPE) codes, consult the HMIS® Implementation Manual.

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 and the associated label are not required on SDSs or products leaving a facility 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 trademark and service mark of the American Coatings Association, Inc.

Procedure used to derive the classification

Classification	Justification
FLAMMABLE LIQUIDS - Category 2	On basis of test data
SKIN CORROSION/IRRITATION - Category 2	Calculation method
SERIOUS EYE DAMAGE/ EYE IRRITATION - Category 2A	Calculation method
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3	Calculation method
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Narcotic effects) - Category 3	Calculation method
SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) - Category 2	Calculation method

History

Date of printing : 9/7/2017

Date of issue/Date of revision : 9/7/2017

Date of previous issue : 4/24/2017

Version : 3

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 = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
UN = United Nations

Notice to reader

It is recommended that each customer or recipient of this Safety Data Sheet (SDS) study it carefully and consult resources, as necessary or appropriate, to become aware of and understand the data contained in this SDS and any hazards associated with the product. This information is provided in good faith and believed to be accurate as of the effective date herein. However, no warranty, express or implied, is given. The information presented here applies only to the product as shipped. The addition of any material can change the composition, hazards and risks of the product. Products shall not be repackaged, modified, or tinted except as specifically instructed by Sherwin-Williams, including but not limited to the incorporation of non Sherwin-Williams products or the use or addition of products in proportions not specified by Sherwin-Williams. Regulatory requirements are subject to change and may differ between various locations and jurisdictions. The customer/buyer/user is responsible to ensure that his activities comply with all country, federal, state, provincial or local laws. The conditions for use of the product are not under the control of the manufacturer; the customer/buyer/user is responsible to determine the conditions necessary for the safe use of this product. The customer/buyer/user should not use the product for any purpose other than the purpose shown in the applicable section of this SDS without first referring to the supplier and obtaining written handling instructions. Due to the proliferation of sources for information such as manufacturer-specific SDS, the manufacturer cannot be responsible for SDSs obtained from any other source.

SAFETY DATA SHEET

Creation Date 27-Jan-2010 **Revision Date** 24-Dec-2021 **Revision Number** 8

1. Identification

Product Name **Methylene chloride**

Cat No. : **D37-1; D37-4; D37-20; D37-200; D37-200LC; D37-500; D37FB-19; D37FB-50; D37FB-115; D37FB-200; D37POP-19; D37POPB-50; 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; NC1641358; XXMECLDOW2000; XXMECLDOW200LI; NC1870181; D37ETSS1350; XXD37ET200LI; NC1948847; D37SS-19; NC2047457; NC1561768**

CAS No 75-09-2
Synonyms Dichloromethane; DCM

Recommended Use Laboratory chemicals.
Uses advised against Food, drug, pesticide or biocidal product use. This chemical/product is not and cannot be distributed in commerce (as defined in TSCA section 3(5)) or processed (as defined in TSCA section 3(13)) for consumer paint or coating removal.

Details of the supplier of the safety data sheet

Company
Fisher Scientific Company
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)

Skin Corrosion/Irritation	Category 2
Serious Eye Damage/Eye Irritation	Category 2
Carcinogenicity	Category 1B

Specific target organ toxicity (single exposure) Target Organs - Central nervous system (CNS).	Category 3
Specific target organ toxicity - (repeated exposure) Target Organs - Liver, Kidney, Blood.	Category 2

Label Elements

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)

Other hazards
Contains a known or suspected endocrine disruptor.
WARNING. Cancer - https://www.p65warnings.ca.gov/.

3. Composition/Information on Ingredients

Component	CAS No	Weight %
Methylene chloride	75-09-2	>99.5

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 Remove 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 . Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting: Causes central nervous system depression: Continued or high exposures by inhalation will cause anaesthetic effects. This may result in a loss of consciousness and could prove fatal: Causes formation of carbon monoxide in the blood. Carbon monoxide may cause adverse effects on the cardiovascular system and the central nervous system

Notes to Physician Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media Water spray, carbon dioxide (CO2), dry chemical, alcohol-resistant foam.

Unsuitable Extinguishing Media No information available

Flash Point No information available
Method - No information available

Autoignition Temperature 556 °C / 1032.8 °F

Explosion Limits
Upper 23 vol %
Lower 13 vol %
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. Keep product and empty container away from heat and sources of ignition.

Hazardous Combustion Products
Carbon monoxide (CO). Carbon dioxide (CO_2). Phosgene. Hydrogen chloride gas.
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health	Flammability	Instability	Physical hazards
2	1	0	N/A

6. Accidental release measures

Personal Precautions Use personal protective equipment as required. Ensure adequate ventilation.

Environmental Precautions Should not be released into the environment.

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/face protection. Do not get in eyes, on skin, or on clothing. Avoid ingestion and inhalation. Vapors are heavier than air and may spread along floors. Handle product only in closed system or provide appropriate exhaust ventilation. Reacts with aluminum and its alloys.

Storage. Keep containers tightly closed in a dry, cool and well-ventilated place. Do not store in aluminum containers. Incompatible Materials. Strong oxidizing agents. Strong acids. Amines.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
Methylene chloride	TWA: 50 ppm	(Vacated) TWA: 500 ppm (Vacated) STEL: 2000 ppm (Vacated) Ceiling: 1000 ppm TWA: 25 ppm STEL: 125 ppm	IDLH: 2300 ppm	TWA: 50 ppm

Legend

ACGIH - American Conference of Governmental Industrial Hygienists
OSHA - Occupational Safety and Health Administration
NIOSH IDLH: NIOSH - National Institute for Occupational Safety and 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 Wear appropriate protective gloves and clothing to prevent skin exposure.

Respiratory Protection Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Hygiene Measures Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Liquid
Appearance	Colorless
Odor	sweet
Odor Threshold	No information available
pH	No information available
Melting Point/Range	-97 °C / -142.6 °F

Boiling Point/Range	39 °C / 102.2 °F
Flash Point	No information available
Evaporation Rate	No information available
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	23 vol %
Lower	13 vol %
Vapor Pressure	350 mbar @ 20°C
Vapor Density	2.93 (Air = 1.0)
Specific Gravity	1.33
Solubility	No information available
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	556 °C / 1032.8 °F
Decomposition Temperature	No information available
Viscosity	0.42 mPas @ 25°C
Molecular Formula	C H2 Cl2
Molecular Weight	84.93

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Stable under normal conditions. Decomposes on exposure to light.

Conditions to Avoid Excess heat. Protect from direct sunlight.

Incompatible Materials Strong oxidizing agents, Strong acids, Amines

Hazardous Decomposition Products Carbon monoxide (CO), Carbon dioxide (CO_2), Phosgene, Hydrogen chloride gas

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions Forms a detonable mixture with nitric acid.

11. Toxicological information

Acute Toxicity

Product Information

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Methylene chloride	> 2000 mg/kg (Rat)	> 2000 mg/kg (Rat)	53 mg/L (Rat) 6 h 76000 mg/m³ (Rat) 4 h

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.

Component	CAS No	IARC	NTP	ACGIH	OSHA	Mexico
Methylene chloride	75-09-2	Group 2A	Reasonably Anticipated	A3	X	A3

IARC (International Agency for Research on Cancer)

NTP: (National Toxicity Program)

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	*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 occured 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

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: Causes central nervous system depression: Continued or high exposures by inhalation will cause anaesthetic effects. This may result in a loss of consciousness and could prove fatal: Causes formation of carbon monoxide in the blood. Carbon monoxide may cause adverse effects on the cardiovascular system and the central nervous system

Endocrine Disruptor Information No information available

Other Adverse Effects Tumorigenic effects have been reported in experimental animals.

12. Ecological information

Ecotoxicity

.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Methylene chloride	EC50:>660 mg/L/96h	Pimephales promelas: LC50:193 mg/L/96h	EC50: 1 mg/L/24 h EC50: 2.88 mg/L/15 min	EC50: 140 mg/L/48h

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.

Component	log Pow
Methylene chloride	1.25

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.

Component	RCRA - U Series Wastes	RCRA - P Series Wastes
Methylene chloride - 75-09-2	U080	-

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

United States of America Inventory

Component	CAS No	TSCA	TSCA Inventory notification - Active-Inactive	TSCA - EPA Regulatory Flags
Methylene chloride	75-09-2	X	ACTIVE	R

Legend:
TSCA US EPA (TSCA) - Toxic Substances Control Act, (40 CFR Part 710)
X - Listed
'-' - Not Listed
R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.

Section 6(a) of the Toxic Substances Control Act (TSCA) This chemical/product is not and cannot be distributed in commerce (as defined in TSCA section 3(5)) or processed (as defined in TSCA section 3(13)) for consumer paint or coating removal.

TSCA - Per 40 CFR 751, Regulation of Certain Chemical Substances & Mixtures, Under TSCA Section 6(h) (PBT) Not applicable

TSCA 12(b) - Notices of Export Not applicable

Component	CAS No	**TSCA 12(b)** - Notices of Export
Methylene chloride	75-09-2	Section 6

International Inventories
Canada (DSL/NDSL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Japan (ISHL), Australia (AICS), China (IECSC), Korea (KECL).

Component	CAS No	DSL	NDSL	EINECS	PICCS	ENCS	ISHL	AICS	IECSC	KECL
Methylene chloride	75-09-2	X	-	200-838-9	X	X	X	X	X	KE-23893

KECL - NIER number or KE number (http://ncis.nier.go.kr/en/main.do)

U.S. Federal Regulations

SARA 313

Component	CAS No	Weight %	SARA 313 - Threshold Values %
Methylene chloride	75-09-2	>99.5	0.1

SARA 311/312 Hazard Categories See section 2 for more information

CWA (Clean Water Act)

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Methylene chloride	-	-	X	X

Clean Air Act

Component	HAPS Data	Class 1 Ozone Depletors	Class 2 Ozone Depletors
Methylene chloride	X		-

OSHA - Occupational Safety and Health Administration

Component	Specifically Regulated Chemicals	Highly Hazardous Chemicals
Methylene chloride	125 ppm STEL 12.5 ppm Action Level 25 ppm TWA	-

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)

Component	Hazardous Substances RQs	CERCLA EHS RQs
Methylene chloride	1000 lb 1 lb	-

California Proposition 65 This product contains the following Proposition 65 chemicals.

Component	CAS No	California Prop. 65	Prop 65 NSRL	Category
Methylene chloride	75-09-2	Carcinogen	200 µg/day 50 µg/day	Carcinogen

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Methylene chloride	X	X	X	X	X

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

Authorisation/Restrictions according to EU REACH

Component	CAS No	REACH (1907/2006) - Annex XIV - Substances Subject to Authorization	REACH (1907/2006) - Annex XVII - Restrictions on Certain Dangerous Substances	REACH Regulation (EC 1907/2006) article 59 - Candidate List of Substances of Very High Concern (SVHC)
Methylene chloride	75-09-2	-	Use restricted. See item 59.	-

			(see link for restriction details) Use restricted. See item 75. (see link for restriction details)	

https://echa.europa.eu/substances-restricted-under-reach

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

Component	CAS No	OECD HPV	Persistent Organic Pollutant	Ozone Depletion Potential	Restriction of Hazardous Substances (RoHS)
Methylene chloride	75-09-2	Listed	Not applicable	Not applicable	Not applicable

Component	CAS No	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Major Accident Notification	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Safety Report Requirements	Rotterdam Convention (PIC)	Basel Convention (Hazardous Waste)
Methylene chloride	75-09-2	Not applicable	Not applicable	Not applicable	Annex I - Y45

16. Other information

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

Creation Date 27-Jan-2010
Revision Date 24-Dec-2021
Print Date 24-Dec-2021
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

Creation Date 26-Sep-2009 **Revision Date** 24-Dec-2021 **Revision Number** 6

1. Identification

Product Name **m-Xylene**

Cat No. : **AC180860000; AC180860010; AC180860025; AC180860100; AC180862500; AC18086N219**

CAS No 108-38-3
Synonyms 1,3-Dimethylbenzene

Recommended Use Laboratory chemicals.
Uses advised against Food, drug, pesticide or biocidal product use.

Details of the supplier of the safety data sheet

Company
Fisher Scientific Company
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)

Flammable liquids	Category 3
Acute dermal toxicity	Category 4
Acute Inhalation Toxicity - Vapors	Category 4
Skin Corrosion/Irritation	Category 2
Serious Eye Damage/Eye Irritation	Category 2
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Respiratory system.	
Aspiration Toxicity	Category 1

Label Elements

Signal Word
Danger

Hazard Statements
Flammable liquid and vapor
May be fatal if swallowed and enters airways
Causes skin irritation
Causes serious eye irritation
Harmful in contact with skin or if inhaled
May cause respiratory irritation



Precautionary Statements
Prevention
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
Wash face, hands and any exposed skin thoroughly after handling
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
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
Call a POISON CENTER or doctor/physician if you feel unwell
If skin irritation occurs: Get medical advice/attention
IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
Wash contaminated clothing before reuse
Eyes
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
If eye irritation persists: Get medical advice/attention
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 cool
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

Component	CAS No	Weight %
m-Xylene	108-38-3	>95

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 Remove to fresh air. If not breathing, give artificial respiration. Get medical attention if symptoms occur. Risk of serious damage to the lungs (by aspiration).

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 and effects None reasonably foreseeable. Symptoms of overexposure may be 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, alcohol-resistant foam. Water mist may be used to cool closed containers.

Unsuitable Extinguishing Media No information available

Flash Point 25 °C / 77 °F

Method - No information available

Autoignition Temperature 465 °C / 869 °F

Explosion Limits

Upper 7.0%

Lower 1.1%

Sensitivity to Mechanical Impact No information available

Sensitivity to Static Discharge No information available

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 (CO_2).

Protective Equipment and Precautions for Firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health	Flammability	Instability	Physical hazards
3	3	0	N/A

6. Accidental release measures

Personal Precautions Use personal protective equipment as required. Ensure adequate ventilation. Remove all sources of ignition. Take precautionary measures against static discharges.

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. Remove all sources of ignition. Use spark-proof tools and explosion-proof equipment.

7. Handling and storage

Handling Wear personal protective equipment/face protection. 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. Take precautionary measures against static discharges.

Storage. Keep containers tightly closed in a dry, cool and well-ventilated place. Flammables area. Keep away from heat, sparks and flame. Incompatible Materials. Strong oxidizing agents. Strong acids.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
m-Xylene	TWA: 100 ppm STEL: 150 ppm		IDLH: 900 ppm TWA: 100 ppm TWA: 435 mg/m³ STEL: 150 ppm STEL: 655 mg/m³	TWA: 100 ppm STEL: 150 ppm

Legend

ACGIH - American Conference of Governmental Industrial Hygienists
NIOSH IDLH: NIOSH - National Institute for Occupational Safety and Health

Engineering Measures Ensure that eyewash stations and safety showers are close to the workstation location. Ensure adequate ventilation, especially in confined areas. Use explosion-proof electrical/ventilating/lighting equipment.

Personal Protective Equipment

Eye/face Protection Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin and body protection Wear appropriate protective gloves and clothing to prevent skin exposure.

Respiratory Protection Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Hygiene Measures Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Liquid
Appearance	Colorless
Odor	aromatic
Odor Threshold	No information available
pH	No information available
Melting Point/Range	-48 °C / -54.4 °F
Boiling Point/Range	138 - 139 °C / 280.4 - 282.2 °F
Flash Point	25 °C / 77 °F
Evaporation Rate	0.7

Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	7.0%
Lower	1.1%
Vapor Pressure	8 mbar @ 20 °C
Vapor Density	3.66
Specific Gravity	0.864
Solubility	Slightly soluble in water
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	465 °C / 869 °F
Decomposition Temperature	No information available
Viscosity	0.62 mPa.s at 20 °C
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, Strong acids

Hazardous Decomposition Products Carbon monoxide (CO), Carbon dioxide (CO_2)

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
m-Xylene	LD50 = 5 g/kg (Rat)	LD50 = 12.18 g/kg (Rabbit)	LC50 = 27124 mg/m³ (Rat) 4 h

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 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.

Component	CAS No	IARC	NTP	ACGIH	OSHA	Mexico
m-Xylene	108-38-3	Not listed	Not listed	Not listed	Not listed	Not listed

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 Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting

Endocrine Disruptor Information No information available

Other Adverse Effects The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity

The product contains following substances which are hazardous for the environment. Contains a substance which is:. Toxic to aquatic organisms.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
m-Xylene	EC50: = 4.9 mg/L, 72h static (Pseudokirchneriella subcapitata)	LC50: = 12.9 mg/L, 96h semi-static (Poecilia reticulata) LC50: = 8.4 mg/L, 96h semi-static (Oncorhynchus mykiss) LC50: 14.3 - 18 mg/L, 96h flow-through (Pimephales promelas)	EC50 = 0.0084 mg/L 24 h	EC50: 2.81 - 5.0 mg/L, 48h Static (Daphnia magna)

Persistence and Degradability Persistence is unlikely

Bioaccumulation/ Accumulation No information available.

Mobility Will likely be mobile in the environment due to its volatility. Is not likely mobile in the environment due its low water solubility.

Component	log Pow
m-Xylene	3.2

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 UN1307
Proper Shipping Name XYLENES
Hazard Class 3
Packing Group III

TDG

UN-No UN1307
Proper Shipping Name XYLENES
Hazard Class 3
Packing Group III

IATA

UN-No UN1307
Proper Shipping Name XYLENES
Hazard Class 3
Packing Group III

IMDG/IMO

UN-No	UN1307
Proper Shipping Name	XYLENES
Hazard Class	3
Packing Group	III

15. Regulatory information

United States of America Inventory

Component	CAS No	TSCA	TSCA Inventory notification - Active-Inactive	TSCA - EPA Regulatory Flags
m-Xylene	108-38-3	X	ACTIVE	-

Legend:
TSCA US EPA (TSCA) - Toxic Substances Control Act, (40 CFR Part 710)
X - Listed
'-' - Not Listed

TSCA 12(b) - Notices of Export Not applicable

International Inventories
Canada (DSL/NDSL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Japan (ISHL), Australia (AICS), China (IECSC), Korea (KECL).

Component	CAS No	DSL	NDSL	EINECS	PICCS	ENCS	ISHL	AICS	IECSC	KECL
m-Xylene	108-38-3	X	-	203-576-3	X	X	X	X	X	KE-35428

KECL - NIER number or KE number (http://ncis.nier.go.kr/en/main.do)

U.S. Federal Regulations

SARA 313

Component	CAS No	Weight %	SARA 313 - Threshold Values %
m-Xylene	108-38-3	>95	1.0

SARA 311/312 Hazard Categories See section 2 for more information

CWA (Clean Water Act)

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
m-Xylene	X	-	-	-

Clean Air Act

Component	HAPS Data	Class 1 Ozone Depletors	Class 2 Ozone Depletors
m-Xylene	X		-

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)

Component	Hazardous Substances RQs	CERCLA EHS RQs
m-Xylene	1000 lb	-

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

U.S. State Right-to-Know

Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
m-Xylene	X	X	X	X	-

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

Authorisation/Restrictions according to EU REACH

Component	REACH (1907/2006) - Annex XIV - Substances Subject to Authorization	REACH (1907/2006) - Annex XVII - Restrictions on Certain Dangerous Substances	REACH Regulation (EC 1907/2006) article 59 - Candidate List of Substances of Very High Concern (SVHC)
m-Xylene	-	Use restricted. See item 75. (see link for restriction details)	-

https://echa.europa.eu/substances-restricted-under-reach

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

Component	CAS No	OECD HPV	Persistent Organic Pollutant	Ozone Depletion Potential	Restriction of Hazardous Substances (RoHS)
m-Xylene	108-38-3	Listed	Not applicable	Not applicable	Not applicable

Component	CAS No	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Major Accident Notification	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Safety Report Requirements	Rotterdam Convention (PIC)	Basel Convention (Hazardous Waste)
m-Xylene	108-38-3	Not applicable	Not applicable	Not applicable	Not applicable

16. Other information

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

Creation Date 26-Sep-2009
Revision Date 24-Dec-2021
Print Date 24-Dec-2021
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

Creation Date 15-Jun-2010 **Revision Date** 24-Dec-2021 **Revision Number** 8

1. Identification

Product Name **o-Xylene**

Cat No. : **O5081-4; O5081-4LC; O5081-500; O5081FB-200; DO5081-500**

CAS No 95-47-6
Synonyms 1,2-Dimethylbenzene (Certified)

Recommended Use Laboratory chemicals.
Uses advised against Food, drug, pesticide or biocidal product use.

Details of the supplier of the safety data sheet

Company
Fisher Scientific Company
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)

Flammable liquids	Category 3
Acute dermal toxicity	Category 4
Acute Inhalation Toxicity - Vapors	Category 4
Skin Corrosion/Irritation	Category 2
Serious Eye Damage/Eye Irritation	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
Target Organs - Liver.	
Aspiration Toxicity	Category 1

Label Elements

Signal Word
Danger

Hazard Statements
Flammable liquid and vapor
May be fatal if swallowed and enters airways
Causes skin irritation
Causes serious eye irritation
May cause respiratory irritation
May cause drowsiness or dizziness
May cause damage to organs through prolonged or repeated exposure
Harmful in contact with skin or if inhaled



Precautionary Statements
Prevention
Wear protective gloves/protective clothing/eye protection/face protection
Use only outdoors or in a well-ventilated area
Wash face, hands and any exposed skin thoroughly after handling
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
Get medical attention/advice if you feel unwell
Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Call a POISON CENTER or doctor/physician if you feel unwell
Skin
Call a POISON CENTER or doctor/physician if you feel unwell
If skin irritation occurs: Get medical advice/attention
IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
Wash contaminated clothing before reuse
Eyes
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
If eye irritation persists: Get medical advice/attention
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

Component	CAS No	Weight %
o-Xylene	95-47-6	>95

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 Remove to fresh air. If not breathing, give artificial respiration. Get medical attention if symptoms occur. Risk of serious damage to the lungs (by aspiration).

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 and effects Difficulty in breathing. Symptoms of overexposure may be 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, alcohol-resistant foam. Water mist may be used to cool closed containers.

Unsuitable Extinguishing Media Do not use a solid water stream as it may scatter and spread fire

Flash Point 31 °C / 87.8 °F

Method - No information available

Autoignition Temperature 465 °C / 869 °F

Explosion Limits

Upper 6.7 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

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 (CO_2).

Protective Equipment and Precautions for Firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health	Flammability	Instability	Physical hazards
3	3	0	N/A

6. Accidental release measures

Personal Precautions Use personal protective equipment as required. Ensure adequate ventilation. Remove all sources of ignition. Take precautionary measures against static discharges.

Environmental Precautions Should not be released into the environment. See Section 12 for additional Ecological Information. Avoid release to the environment. Collect spillage. 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. Remove all sources of ignition. Use spark-proof tools and explosion-proof equipment.

7. Handling and storage

Handling Wear personal protective equipment/face protection. 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. Take precautionary measures against static discharges.

Storage. Keep containers tightly closed in a dry, cool and well-ventilated place. Keep away from heat, sparks and flame. Flammables area. Incompatible Materials. Strong oxidizing agents. Strong acids.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
o-Xylene	TWA: 100 ppm STEL: 150 ppm		IDLH: 900 ppm TWA: 100 ppm TWA: 435 mg/m³ STEL: 150 ppm STEL: 655 mg/m³	TWA: 100 ppm STEL: 150 ppm

Legend

ACGIH - American Conference of Governmental Industrial Hygienists
NIOSH IDLH: NIOSH - National Institute for Occupational Safety and Health

Engineering Measures Ensure that eyewash stations and safety showers are close to the workstation location. Ensure adequate ventilation, especially in confined areas. Use explosion-proof electrical/ventilating/lighting equipment.

Personal Protective Equipment

Eye/face Protection Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin and body protection Wear appropriate protective gloves and clothing to prevent skin exposure.

Respiratory Protection Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Hygiene Measures Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State Liquid
Appearance Colorless

Odor	aromatic
Odor Threshold	No information available
pH	Not applicable
Melting Point/Range	-25 °C / -13 °F
Boiling Point/Range	143 - 145 °C / 289.4 - 293 °F
Flash Point	31 °C / 87.8 °F
Evaporation Rate	0.7
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	6.7 vol %
Lower	0.9 vol %
Vapor Pressure	882 Pa @ 25 °C
Vapor Density	3.7
Specific Gravity	0.884
Solubility	No information available
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	465 °C / 869 °F
Decomposition Temperature	No information available
Viscosity	0.81 mPas @ 20°C
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, Strong acids

Hazardous Decomposition Products Carbon monoxide (CO), Carbon dioxide (CO_2)

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
o-Xylene	LD50 = 3608 mg/kg (Rat)	14100 mg/kg (Rabbit)	LC50 = 4330 ppm (Rat) 6 h

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.

Component	CAS No	IARC	NTP	ACGIH	OSHA	Mexico
o-Xylene	95-47-6	Not listed	Not listed	Not listed	Not listed	Not listed

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 Liver

Aspiration hazard Category 1

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 The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity

Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. Do not empty into drains. The product contains following substances which are hazardous for the environment.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
o-Xylene	EC50: = 4.7 mg/L, 72h static (Pseudokirchneriella subcapitata)	LC50: 16.1 mg/L/96h (Lepomis macrochirus) LC50: 13 mg/L/24h (Carassius auratus)	EC50 = 0.0084 mg/L 24 h	EC50: 0.78 - 2.51 mg/L, 48h Static (Daphnia magna) EC50: 2.61 - 5.59 mg/L, 48h Flow through (Daphnia magna) EC50: = 3.2 mg/L, 48h (Daphnia magna)

Persistence and Degradability Insoluble in water Persistence is unlikely based on information available.

Bioaccumulation/ Accumulation No information available.

Mobility Will likely be mobile in the environment due to its volatility.

Component	log Pow
o-Xylene	3.12

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 UN1307
Proper Shipping Name XYLENES
Hazard Class 3
Packing Group III

TDG

UN-No UN1307
Proper Shipping Name XYLENES
Hazard Class 3
Packing Group III

IATA

UN-No UN1307

Proper Shipping Name Xylenes
Hazard Class 3
Packing Group III

IMDG/IMO

UN-No UN1307
Proper Shipping Name Xylenes
Hazard Class 3
Packing Group III

15. Regulatory information

United States of America Inventory

Component	CAS No	TSCA	TSCA Inventory notification - Active-Inactive	TSCA - EPA Regulatory Flags
o-Xylene	95-47-6	X	ACTIVE	-

Legend:
TSCA US EPA (TSCA) - Toxic Substances Control Act, (40 CFR Part 710)
X - Listed
'-' - Not Listed

TSCA 12(b) - Notices of Export Not applicable

International Inventories
Canada (DSL/NDSL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Japan (ISHL), Australia (AICS), China (IECSC), Korea (KECL).

Component	CAS No	DSL	NDSL	EINECS	PICCS	ENCS	ISHL	AICS	IECSC	KECL
o-Xylene	95-47-6	X	-	202-422-2	X	X	X	X	X	KE-35429

KECL - NIER number or KE number (http://ncis.nier.go.kr/en/main.do)

U.S. Federal Regulations

SARA 313

Component	CAS No	Weight %	SARA 313 - Threshold Values %
o-Xylene	95-47-6	>95	1.0

SARA 311/312 Hazard Categories See section 2 for more information

CWA (Clean Water Act)

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
o-Xylene	X	-	-	-

Clean Air Act

Component	HAPS Data	Class 1 Ozone Depletors	Class 2 Ozone Depletors
o-Xylene	X		-

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)

Component	Hazardous Substances RQs	CERCLA EHS RQs
o-Xylene	1000 lb	-

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

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
o-Xylene	X	X	X	X	-

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

Authorisation/Restrictions according to EU REACH

Component	REACH (1907/2006) - Annex XIV - Substances Subject to Authorization	REACH (1907/2006) - Annex XVII - Restrictions on Certain Dangerous Substances	REACH Regulation (EC 1907/2006) article 59 - Candidate List of Substances of Very High Concern (SVHC)
o-Xylene	-	Use restricted. See item 75. (see link for restriction details)	-

https://echa.europa.eu/substances-restricted-under-reach

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

Component	CAS No	OECD HPV	Persistent Organic Pollutant	Ozone Depletion Potential	Restriction of Hazardous Substances (RoHS)
o-Xylene	95-47-6	Listed	Not applicable	Not applicable	Not applicable

Component	CAS No	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Major Accident Notification	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Safety Report Requirements	Rotterdam Convention (PIC)	Basel Convention (Hazardous Waste)
o-Xylene	95-47-6	Not applicable	Not applicable	Not applicable	Not applicable

16. Other information

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

Creation Date 15-Jun-2010
Revision Date 24-Dec-2021
Print Date 24-Dec-2021
Revision Summary SDS sections updated. 11. 16.

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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

Propylene

Section 1. Identification

GHS product identifier : Propylene

Chemical name : Propylene

Other means of identification : propylene; 1-Propene; propylene in gaseous state, impure; propylene liquefied, impure; propene, pure; propylene, pure; Methylethene; Methylethylene; prop-1-ene; 1-Propylene; R 1270

Product type : Gas.

Product use : Synthetic/Analytical chemistry.

Synonym : propylene; 1-Propene; propylene in gaseous state, impure; propylene liquefied, impure; propene, pure; propylene, pure; Methylethene; Methylethylene; prop-1-ene; 1-Propylene; R 1270

SDS # : 001046

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.
Contains gas under pressure; may explode if heated.
May displace oxygen and cause rapid suffocation.
May form explosive mixtures with air.

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. In case of leakage, eliminate all ignition sources.

Storage : Protect from sunlight. Store in a well-ventilated place.

Disposal : Not applicable.

Hazards 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 : Propylene

Other means of identification : propylene; 1-Propene; propylene in gaseous state, impure; propylene liquefied, impure; propene, pure; propylene, pure; Methylethene; Methylethylene; prop-1-ene; 1-Propylene; R 1270

Product code : 001046

CAS number/other identifiers

CAS number : 115-07-1

Ingredient name	%	CAS number
propylene	100	115-07-1

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.

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.

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.

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 specialized 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 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. 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.

Use only non-sparking tools. Avoid contact with eyes, skin and clothing. Empty containers retain product residue and can be hazardous. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment.

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. 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). Keep container tightly closed and sealed until ready for use. See Section 10 for incompatible materials before handling or use.

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
propylene	**ACGIH TLV (United States, 3/2019).** TWA: 500 ppm 8 hours. **ACGIH TLV (United States, 1/2005).** TWA: 500 ppm 8 hours. Form: All forms

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.

Skin protection

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 : Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use. 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. [Compressed gas.]

Color : Colorless.

Odor : Mild.

Odor threshold : Not available.

pH : Not available.

Melting point : -185°C (-301°F)

Boiling point : -48°C (-54.4°F)

Critical temperature : 91.85°C (197.3°F)

Flash point : Closed cup: -107.78°C (-162°F)

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: 2%
Upper: 11%

Vapor pressure : 136.6 (psig)

Vapor density : 1.5 (Air = 1)

Specific Volume (ft ^{3}/lb) : 9.0909

Gas Density (lb/ft ^{3}) : 0.11 (25°C / 77 to °F)

Relative density : Not applicable.

Solubility : Not available.

Solubility in water : 0.2 g/l

Partition coefficient: n-octanol/water : 1.77

Auto-ignition temperature : 455°C (851°F)

Decomposition temperature : Not available.

Viscosity : Not applicable.

Flow time (ISO 2431) : Not available.

Molecular weight : 42.09 g/mole

Aerosol product

Heat of combustion : -45803592 J/kg

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

Not available.

Irritation/Corrosion

Not available.

Sensitization

Not available.

Mutagenicity

Not available.

Carcinogenicity

Not available.

Classification

Product/ingredient name	OSHA	IARC	NTP
propylene	-	3	-

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 : Not available.

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

Product/ingredient name	$LogP_{ow}$	BCF	Potential
propylene	1.77	-	low

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

	DOT	TDG	Mexico	IMDG	IATA
UN number	UN1077	UN1077	UN1077	UN1077	UN1077
UN proper shipping name	PROPYLENE	PROPYLENE	PROPYLENE	PROPYLENE	PROPYLENE
Transport hazard class(es)	2.1 	2.1 	2.1 	2.1 	2.1 
Packing group	-	-	-	-	-
Environmental hazards	No.	No.	No.	No.	No.

"Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product."

Additional information

DOT Classification : **Limited quantity** Yes.
Quantity limitation Passenger aircraft/rail: Forbidden. Cargo aircraft: 150 kg.
Special provisions 19, T50

TDG Classification : 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 Vessel Index Forbidden
Passenger Carrying Road or Rail Index Forbidden
Special provisions 29

IATA : **Quantity limitation** Passenger and Cargo Aircraft: Forbidden. Cargo Aircraft Only: 150 kg.

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.

Section 14. Transport information

Transport in bulk according to IMO instruments : Not available.

Section 15. Regulatory information

U.S. Federal regulations : **TSCA 8(a) CDR Exempt/Partial exemption**: Not determined

Clean Air Act (CAA) 112 regulated flammable substances: Propylene

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 : Refer to Section 2: Hazards Identification of this SDS for classification of substance.

SARA 313

	Product name	CAS number	%
Form R - Reporting requirements	Propylene	115-07-1	100
Supplier notification	Propylene	115-07-1	100

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 not listed.

New Jersey : This material is listed.

Pennsylvania : This material is listed.

California Prop. 65

This product does not require a Safe Harbor warning under California Prop. 65.

International regulations

Chemical Weapon Convention List Schedules I, II & III Chemicals

Not listed.

Montreal Protocol

Not listed.

Stockholm Convention on Persistent Organic Pollutants

Not listed.

Rotterdam Convention on Prior Informed Consent (PIC)

Not listed.

Section 15. Regulatory information

UNECE Aarhus Protocol on POPs and Heavy Metals

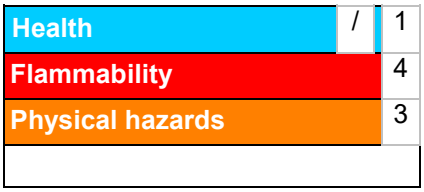
Not listed.

Inventory list

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	:	**Japan inventory (ENCS)**: This material is listed or exempted. **Japan inventory (ISHL)**: This material is listed or exempted.
New Zealand	:	This material is listed or exempted.
Philippines	:	This material is listed or exempted.
Republic of Korea	:	This material is listed or exempted.
Taiwan	:	This material is listed or exempted.
Thailand	:	Not determined.
Turkey	:	This material is listed or exempted.
United States	:	This material is active or exempted.
Viet Nam	:	This material is listed or exempted.

Section 16. Other information

Hazardous Material Information System (U.S.A.)



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 and the associated label are not required on SDSs or products leaving a facility 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 trademark and service mark of the American Coatings Association, Inc.

The customer is responsible for determining the PPE code for this material. For more information on HMIS® Personal Protective Equipment (PPE) codes, consult the HMIS® Implementation Manual.

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

Classification	Justification
FLAMMABLE GASES - Category 1 GASES UNDER PRESSURE - Liquefied gas	Expert judgment Expert judgment

Section 16. Other information

History

Date of printing	:	11/5/2020
Date of issue/Date of revision	:	11/5/2020
Date of previous issue	:	11/30/2017
Version	:	1.01
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 MARPOL = 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.

SAFETY DATA SHEET

Creation Date 24-Mar-2014 **Revision Date** 28-Dec-2021 **Revision Number** 5

1. Identification

Product Name **p-Xylene**

Cat No. : **AC445680000, AC445680010, AC445680025, AC445681000**

CAS No 106-42-3
Synonyms 1,4-Dimethylbenzene

Recommended Use Laboratory chemicals.
Uses advised against Food, drug, pesticide or biocidal product use.

Details of the supplier of the safety data sheet

Company

Fisher Scientific Company
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)

Flammable liquids	Category 3
Acute dermal toxicity	Category 4
Acute Inhalation Toxicity - Vapors	Category 4
Skin Corrosion/Irritation	Category 2
Serious Eye Damage/Eye Irritation	Category 2
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Central nervous system (CNS), Respiratory system.	
Aspiration Toxicity	Category 1

Label Elements

Signal Word
Danger

Hazard Statements

Flammable liquid and vapor
May be fatal if swallowed and enters airways
Causes skin irritation
Causes serious eye irritation
May cause respiratory irritation
Harmful in contact with skin or if inhaled



Precautionary Statements
Prevention
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
Wash face, hands and any exposed skin thoroughly after handling
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
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
Call a POISON CENTER or doctor/physician if you feel unwell
If skin irritation occurs: Get medical advice/attention
IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
Wash contaminated clothing before reuse
Eyes
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
If eye irritation persists: Get medical advice/attention
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

Component	CAS No	Weight %
p-Xylene	106-42-3	>95

4. First-aid measures

Eye Contact Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Immediate medical attention is required.

Skin Contact Wash off immediately with plenty of water for at least 15 minutes. Immediate medical attention is required.

Inhalation Remove 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. Immediate medical attention is required. Risk of serious damage to the lungs (by aspiration).

Ingestion Aspiration hazard. Do NOT induce vomiting. Call a physician or poison control center immediately. If vomiting occurs naturally, have victim lean forward.

Most important symptoms and effects Difficulty in breathing. . Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting

Notes to Physician Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media CO_2, dry chemical, dry sand, alcohol-resistant foam. Water mist may be used to cool closed containers.

Unsuitable Extinguishing Media Water may be ineffective

Flash Point 25 °C / 77 °F

Method - No information available

Autoignition Temperature 465 °C / 869 °F

Explosion Limits

Upper	7.0 vol %
Lower	1.1 vol %
Sensitivity to Mechanical Impact	No information available
Sensitivity to Static Discharge	No information available

Specific Hazards Arising from the Chemical

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. Thermal decomposition can lead to release of irritating gases and vapors. Keep product and empty container away from heat and sources of ignition.

Hazardous Combustion Products

Carbon monoxide (CO). Carbon dioxide (CO_2). Hydrocarbons. Aldehydes.

Protective Equipment and Precautions for Firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health	Flammability	Instability	Physical hazards
3	3	0	N/A

6. Accidental release measures

Personal Precautions Use personal protective equipment as required. Remove all sources of ignition. Take precautionary measures against static discharges. Avoid contact with skin, eyes or clothing.

Environmental Precautions Avoid release to the environment. See Section 12 for additional Ecological Information. Do not flush into surface water or sanitary sewer system. Collect spillage.

Methods for Containment and Clean Up Remove all sources of ignition. Soak up with inert absorbent material. Keep in suitable, closed containers for disposal. Use spark-proof tools and explosion-proof equipment.

7. Handling and storage

Handling Use only under a chemical fume hood. Use spark-proof tools and explosion-proof equipment. Wear personal protective equipment/face protection. Do not get in eyes, on skin, or on clothing. Do not breathe mist/vapors/spray. Do not ingest. If swallowed then seek immediate medical assistance. Keep away from open flames, hot surfaces and sources of ignition. Take precautionary measures against static discharges. Use only non-sparking tools.

Storage. Keep containers tightly closed in a dry, cool and well-ventilated place. Keep away from heat, sparks and flame. Flammables area. Incompatible Materials. Strong oxidizing agents. Strong acids. Strong bases.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
p-Xylene	TWA: 100 ppm STEL: 150 ppm		IDLH: 900 ppm TWA: 100 ppm TWA: 435 mg/m³ STEL: 150 ppm STEL: 655 mg/m³	TWA: 100 ppm STEL: 150 ppm

Legend

ACGIH - American Conference of Governmental Industrial Hygienists
NIOSH IDLH: NIOSH - National Institute for Occupational Safety and Health

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. 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

Physical State	Liquid
Appearance	Colorless
Odor	aromatic
Odor Threshold	No information available
pH	Not applicable
Melting Point/Range	13 °C / 55.4 °F

Boiling Point/Range	138 °C / 280.4 °F
Flash Point	25 °C / 77 °F
Evaporation Rate	No information available
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	7.0 vol %
Lower	1.1 vol %
Vapor Pressure	8 mbar @ 20 °C
Vapor Density	3.7 (Air = 1.0)
Specific Gravity	0.866
Solubility	No information available
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	465 °C / 869 °F
Decomposition Temperature	No information available
Viscosity	0.648 mPa.s (20°C)
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, Strong acids, Strong bases

Hazardous Decomposition Products Carbon monoxide (CO), Carbon dioxide (CO_2), Hydrocarbons, Aldehydes

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
p-Xylene	LD50 = 4029 mg/kg (Rat)	LD50 = 12126 mg/kg (Rabbit)	LC50 = 4740 ppm (Rat) 4 h

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.

Component	CAS No	IARC	NTP	ACGIH	OSHA	Mexico
p-Xylene	106-42-3	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects No information available

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 Central nervous system (CNS) Respiratory system
STOT - repeated exposure None known

Aspiration hazard Category 1

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 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. Contains a substance which is:. Toxic to aquatic organisms.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
p-Xylene	EC50: = 3.2 mg/L, 72h static (Pseudokirchneriella subcapitata)	LC50: = 8.8 mg/L, 96h semi-static (Poecilia reticulata) LC50: = 2.6 mg/L, 96h static (Oncorhynchus mykiss) LC50: = 2.6 mg/L, 96h (Oncorhynchus mykiss) LC50: 7.2 - 9.9 mg/L, 96h static (Pimephales promelas)	EC50 = 5.7 mg/L 30 min	EC50: 3.55 - 6.31 mg/L, 48h Static (Daphnia magna)

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.

Component	log Pow
p-Xylene	3.15

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 UN1307
Proper Shipping Name XYLENES
Hazard Class 3
Packing Group III

TDG

UN-No UN1307
Proper Shipping Name XYLENES
Hazard Class 3
Packing Group III

IATA

UN-No	UN1307
Proper Shipping Name	XYLENES
Hazard Class	3
Packing Group	III

IMDG/IMO

UN-No	UN1307
Proper Shipping Name	XYLENES
Hazard Class	3
Packing Group	III

15. Regulatory information

United States of America Inventory

Component	CAS No	TSCA	TSCA Inventory notification - Active-Inactive	TSCA - EPA Regulatory Flags
p-Xylene	106-42-3	X	ACTIVE	-

Legend:
TSCA US EPA (TSCA) - Toxic Substances Control Act, (40 CFR Part 710)
X - Listed
'-' - Not Listed

TSCA 12(b) - Notices of Export Not applicable

International Inventories
Canada (DSL/NDSL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Japan (ISHL), Australia (AICS), China (IECSC), Korea (KECL).

Component	CAS No	DSL	NDSL	EINECS	PICCS	ENCS	ISHL	AICS	IECSC	KECL
p-Xylene	106-42-3	X	-	203-396-5	X	X	X	X	X	KE-35430

KECL - NIER number or KE number (http://ncis.nier.go.kr/en/main.do)

U.S. Federal Regulations

SARA 313

Component	CAS No	Weight %	SARA 313 - Threshold Values %
p-Xylene	106-42-3	>95	1.0

SARA 311/312 Hazard Categories See section 2 for more information

CWA (Clean Water Act)

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
p-Xylene	X	-	-	-

Clean Air Act

Component	HAPS Data	Class 1 Ozone Depletors	Class 2 Ozone Depletors
p-Xylene	X		-

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)

Component	Hazardous Substances RQs	CERCLA EHS RQs

p-Xylene	100 lb	-

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

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
p-Xylene	X	X	X	X	-

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 Moderate risk, Grade 2

Authorisation/Restrictions according to EU REACH

Component	REACH (1907/2006) - Annex XIV - Substances Subject to Authorization	REACH (1907/2006) - Annex XVII - Restrictions on Certain Dangerous Substances	REACH Regulation (EC 1907/2006) article 59 - Candidate List of Substances of Very High Concern (SVHC)
p-Xylene	-	Use restricted. See item 75. (see link for restriction details)	-

https://echa.europa.eu/substances-restricted-under-reach

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

Component	CAS No	OECD HPV	Persistent Organic Pollutant	Ozone Depletion Potential	Restriction of Hazardous Substances (RoHS)
p-Xylene	106-42-3	Listed	Not applicable	Not applicable	Not applicable

Component	CAS No	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Major Accident Notification	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Safety Report Requirements	Rotterdam Convention (PIC)	Basel Convention (Hazardous Waste)
p-Xylene	106-42-3	Not applicable	Not applicable	Not applicable	Not applicable

16. Other information

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

Creation Date 24-Mar-2014
Revision Date 28-Dec-2021
Print Date 28-Dec-2021
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

Version 8.4
Revision Date 10/19/2022
Print Date 12/10/2022

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

1.1 Product identifiers

Product name : Tetrachloroethylene

Product Number : 371696
Brand : Sigma-Aldrich
Index-No. : 602-028-00-4
CAS-No. : 127-18-4

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 Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 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
Skin sensitization (Category 1), H317
Carcinogenicity (Category 2), H351
Specific target organ toxicity - single exposure (Category 3), Central nervous system, H336
Short-term (acute) aquatic hazard (Category 2), H401
Long-term (chronic) aquatic hazard (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

The life science business of Merck KGaA, Darmstadt, Germany
operates as MilliporeSigma in the US and Canada

Pictogram	
Signal Word	Warning

Hazard statement(s)

H315	Causes skin irritation.
H317	May cause an allergic skin reaction.
H319	Causes serious eye irritation.
H336	May cause drowsiness or dizziness.
H351	Suspected of causing cancer.
H411	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.
P261	Avoid breathing mist or vapors.
P264	Wash skin thoroughly after handling.
P271	Use only outdoors or in a well-ventilated area.
P272	Contaminated work clothing must 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.
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.
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.
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

SECTION 3: Composition/information on ingredients

3.1 Substances

Synonyms	:	Perchloroethylene PCE
Formula	:	C_2Cl_4
Molecular weight	:	165.83 g/mol
CAS-No.	:	127-18-4
EC-No.	:	204-825-9
Index-No.	:	602-028-00-4

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Component	Classification	Concentration
Tetrachlorethylene		
	Skin Irrit. 2; Eye Irrit. 2A; Skin Sens. 1; Carc. 2; STOT SE 3; Aquatic Acute 2; Aquatic Chronic 2; H315, H319, H317, H351, H336, H401, H411 Concentration limits: >= 20 %: STOT SE 3, H336;	<= 100 %

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

SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice
Show this material safety data sheet to the doctor in attendance.

If inhaled
After inhalation: fresh air. Call in physician.

In case of skin contact
In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower. Consult a physician.

In case of eye contact
After eye contact: rinse out with plenty of water. Call in ophthalmologist. Remove contact lenses.

If swallowed
After swallowing: immediately make victim drink water (two glasses at most). Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Water Foam Carbon dioxide (CO2) Dry powder

Unsuitable extinguishing media
For this substance/mixture no limitations of extinguishing agents are given.

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5.2 Special hazards arising from the substance or mixture

Carbon oxides
Hydrogen chloride gas
Combustible.
Development of hazardous combustion gases or vapours possible in the event of fire.

5.3 Advice for firefighters

Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

5.4 Further information

Suppress (knock down) gases/vapors/mists with a water spray jet. Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Advice for non-emergency personnel: Do not breathe vapors, aerosols. Avoid substance contact. Ensure adequate ventilation. Evacuate the danger area, observe emergency procedures, consult an expert.
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

Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up with liquid-absorbent material (e.g. Chemizorb®). Dispose of properly. Clean up affected area.

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on safe handling
Work under hood. Do not inhale substance/mixture. Avoid generation of vapours/aerosols.

Hygiene measures
Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions
Tightly closed. Keep in a well-ventilated place. Keep locked up or in an area accessible only to qualified or authorized persons.

Storage class
Storage class (TRGS 510): 6.1C: Combustible, acute toxic Cat.3 / toxic compounds or compounds which causing chronic effects

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

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SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters
Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Appropriate engineering controls
Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

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). Safety glasses

Skin protection
This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).
Full contact
Material: Viton®
Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).
Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.4 mm
Break through time: 240 min
Material tested:Camatril® (KCL 730 / Aldrich Z677442, Size M)

Body Protection
protective clothing

Respiratory protection
required when vapours/aerosols are generated. Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

Control of environmental exposure
Do not let product enter drains.

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SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid, clear Color: colorless
b)	Odor	No data available
c)	Odor Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: -22 °C (-8 °F) - lit.
f)	Initial boiling point and boiling range	121 °C 250 °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)	Vapor pressure	25.3 hPa at 25.0 °C (77.0 °F) 17.3 hPa at 20.0 °C(68.0 °F)
l)	Vapor density	No data available
m)	Density	1.623 g/cm3 at 25 °C (77 °F) - lit.
	Relative density	No data available
n)	Water solubility	0.15 g/l at 25 °C (77 °F)
o)	Partition coefficient: n-octanol/water	log Pow: 2.53 at 23 °C (73 °F) - Bioaccumulation is not expected.
p)	Autoignition 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

Surface tension	32.1 mN/m at 20 °C (68 °F)

SECTION 10: Stability and reactivity

10.1 Reactivity

No data available

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10.2 Chemical stability
The product is chemically stable under standard ambient conditions (room temperature) .

10.3 Possibility of hazardous reactions
Risk of explosion with:
Alkali metals
Aluminum
sodium amide
Barium
nitrogen dioxide
Oxygen
with
alkali hydroxides
Exothermic reaction with:
strong alkalis
Alkaline earth metals
strong alkalis
Light metals
Powdered metals
Oxidizing agents
Strong acids
Strong bases
nitrous gases
Risk of ignition or formation of inflammable gases or vapours with:
zinc oxide
with
Aluminum

10.4 Conditions to avoid
no information available

10.5 Incompatible materials
various plastics

10.6 Hazardous decomposition products
In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - male and female - 3,420 mg/kg
(OECD Test Guideline 401)
Remarks: (ECHA)
Inhalation: No data available
Dermal: No data available
No data available

Skin corrosion/irritation
Skin - Rabbit
Result: Skin irritation - 4 h
(OECD Test Guideline 404)
Remarks: (ECHA)

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Serious eye damage/eye irritation
Eyes - Rabbit
Result: Mild eye irritation - 24 h
(Draize Test)
Remarks: (RTECS)

Respiratory or skin sensitization
Local lymph node assay (LLNA) - Mouse
Result: May cause sensitization by skin contact.
(OECD Test Guideline 429)
Remarks: (ECHA)

Germ cell mutagenicity
Test Type: Chromosome aberration test in vitro
Test system: Chinese hamster ovary cells
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 473
Result: negative
Remarks: (ECHA)
Test Type: Ames test
Test system: Salmonella typhimurium
Metabolic activation: without metabolic activation
Method: OECD Test Guideline 471
Result: negative
Remarks: (ECHA)

Test Type: Micronucleus test
Species: Mouse

Application Route: Intraperitoneal
Method: OECD Test Guideline 474
Result: negative
Remarks: (ECHA)

Carcinogenicity
Suspected of causing cancer.

IARC:	No ingredient 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 ingredient 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

Specific target organ toxicity - single exposure
May cause drowsiness or dizziness.

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

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11.2 Additional Information

Repeated dose toxicity - Mouse - female - Oral - LOAEL (Lowest observed adverse effect level) - 390 mg/kg

RTECS: KX3850000
narcosis, Liver injury may occur., Kidney injury may occur.

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish	flow-through test LC50 - Oncorhynchus mykiss (rainbow trout) - 5 mg/l - 96 h Remarks: (ECHA)
Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - 7.50 mg/l - 48 h
Toxicity to algae	ErC50 - Chlamydomonas reinhardtii (green algae) - 3.64 mg/l - 72 h Remarks: (ECHA)
Toxicity to fish(Chronic toxicity)	flow-through test NOEC - Jordanella floridae - 1.99 mg/l - 10 d Remarks: (ECHA)
Toxicity to daphnia and other aquatic invertebrates(Chronic toxicity)	semi-static test NOEC - Daphnia magna (Water flea) - 0.51 mg/l - 28 d Remarks: (ECHA)

12.2 Persistence and degradability

Biodegradability	aerobic - Exposure time 28 d Result: 11 % - Not readily biodegradable. (OECD Test Guideline 301C)

12.3 Bioaccumulative potential

Bioaccumulation	Lepomis macrochirus (Bluegill) - 21 d - 0.00343 mg/l(Tetrachlorethylene) Bioconcentration factor (BCF): 49

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 Endocrine disrupting properties

No data available

12.7 Other adverse effects

No data available

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SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product
Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself.

SECTION 14: Transport information

DOT (US)
UN number: 1897 Class: 6.1 Packing group: III
Proper shipping name: Tetrachloroethylene
Reportable Quantity (RQ):
Poison Inhalation Hazard: No

IMDG
UN number: 1897 Class: 6.1 Packing group: III EMS-No: F-A, S-A
Proper shipping name: TETRACHLOROETHYLENE
Marine pollutant : yes

IATA
UN number: 1897 Class: 6.1 Packing group: III
Proper shipping name: Tetrachloroethylene

SECTION 15: Regulatory information

SARA 302 Components
This material does not contain any components with a section 302 EHS TPQ.

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
No components are subject to the Massachusetts Right to Know Act.

SECTION 16: Other information

Further information
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. 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

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Version: 8.4 Revision Date: 10/19/2022 Print Date: 12/10/2022

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SAFETY DATA SHEET

Version 6.16
Revision Date 07/23/2022
Print Date 12/10/2022

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

1.1 Product identifiers

Product name : Tetrahydrofuran

Product Number : 401757
Brand : Sigma-Aldrich
Index-No. : 603-025-00-0
CAS-No. : 109-99-9

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 Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 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
Acute toxicity, Oral (Category 4), H302
Eye irritation (Category 2A), H319
Carcinogenicity (Category 2), H351
Specific target organ toxicity - single exposure (Category 3), Respiratory system, Central nervous system, H335, H336

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

2.2 GHS Label elements, including precautionary statements

Pictogram



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Signal Word	Danger
Hazard statement(s)	
H225	Highly flammable liquid and vapor.
H302	Harmful if swallowed.
H319	Causes serious eye irritation.
H335	May cause respiratory irritation.
H336	May cause drowsiness or dizziness.
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.
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.
P261	Avoid breathing dust/ fume/ gas/ mist/ vapors/ 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.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P312 + P330	IF SWALLOWED: Call a POISON CENTER/ doctor if you feel unwell. Rinse mouth.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/ shower.
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.
P337 + P313	If eye irritation persists: Get medical advice/ attention.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P403 + P235	Store in a well-ventilated place. Keep cool.
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

May form explosive peroxides.
May form explosive peroxides.

SECTION 3: Composition/information on ingredients

3.1 Substances

Synonyms : THF

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Formula	:	C_4H_8O
Molecular weight	:	72.11 g/mol
CAS-No.	:	109-99-9
EC-No.	:	203-726-8
Index-No.	:	603-025-00-0

Component	Classification	Concentration
Tetrahydrofuran		
	Flam. Liq. 2; Acute Tox. 4; Eye Irrit. 2A; Carc. 2; STOT SE 3; H225, H302, H319, H351, H335, H336 Concentration limits: >= 25 %: Eye Irrit. 2, H319; >= 25 %: STOT SE 3, H335;	<= 100 %

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

SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice
Show this material safety data sheet to the doctor in attendance.

If inhaled
After inhalation: fresh air. Call in physician.

In case of skin contact
In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower. Consult a physician.

In case of eye contact
After eye contact: rinse out with plenty of water. Call in ophthalmologist. Remove contact lenses.

If swallowed
After swallowing: immediately make victim drink water (two glasses at most). Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Carbon dioxide (CO2) Foam Dry powder

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Unsuitable extinguishing media
For this substance/mixture no limitations of extinguishing agents are given.

5.2 Special hazards arising from the substance or mixture
Carbon oxides
Combustible.
Pay attention to flashback.
Vapors are heavier than air and may spread along floors.
Development of hazardous combustion gases or vapours possible in the event of fire.
Forms explosive mixtures with air at ambient temperatures.

5.3 Advice for firefighters
Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

5.4 Further information
Remove container from danger zone and cool with water. Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures
Advice for non-emergency personnel: Do not breathe vapors, aerosols. Avoid substance contact. Ensure adequate ventilation. Keep away from heat and sources of ignition.
Evacuate the danger area, observe emergency procedures, consult an expert.
For personal protection see section 8.

6.2 Environmental precautions
Do not let product enter drains. Risk of explosion.

6.3 Methods and materials for containment and cleaning up
Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up carefully with liquid-absorbent material (e.g. Chemizorb®). Dispose of properly. Clean up affected area.

6.4 Reference to other sections
For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on safe handling
Work under hood. Do not inhale substance/mixture. Avoid generation of vapours/aerosols.

Advice on protection against fire and explosion
Keep away from open flames, hot surfaces and sources of ignition.Take precautionary measures against static discharge.

Hygiene measures
Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions

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Keep container tightly closed in a dry and well-ventilated place. Keep away from heat and sources of ignition.

Test for peroxide formation periodically and before distillation.

Storage class
Storage class (TRGS 510): 3: Flammable liquids

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

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Tetrahydrofuran	109-99-9	TWA	50 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Confirmed animal carcinogen with unknown relevance to humans Danger of cutaneous absorption		
		STEL	100 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Confirmed animal carcinogen with unknown relevance to humans Danger of cutaneous absorption		
		ST	250 ppm 735 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	200 ppm 590 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	200 ppm 590 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		PEL	200 ppm 590 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		STEL	250 ppm 735 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Tetrahydrofuran	109-99-9	Tetrahydrofuran	2 mg/l	Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift (As soon as possible after exposure ceases)			

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8.2 Exposure controls

Appropriate engineering controls
Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

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). Safety glasses

Skin protection
This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).
Splash contact
Material: butyl-rubber
Minimum layer thickness: 0.7 mm
Break through time: 10 min
Material tested:Butoject® (KCL 898)

Body Protection
Flame retardant antistatic protective clothing.

Respiratory protection
required when vapours/aerosols are generated. Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

Control of environmental exposure
Do not let product enter drains. Risk of explosion.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid, clear Color: colorless
b)	Odor	ether-like
c)	Odor Threshold	No data available
d)	pH	ca.7
e)	Melting point/freezing point	Melting point: -108.44 °C (-163.19 °F) at 1,013.25 hPa - (ECHA)
f)	Initial boiling point and boiling range	65 °C 149 °F at 1,013 hPa
g)	Flash point	-21.2 °C (-6.2 °F) - closed cup - DIN 51755 Part 1
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available

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j)	Upper/lower flammability or explosive limits	Upper explosion limit: 11.8 %(V) - (THF) Lower explosion limit: 1.8 %(V) - (THF)
k)	Vapor pressure	170 hPa at 20.0 °C (68.0 °F)
l)	Vapor density	ca.2.5 at 25 °C(77 °F) - (Air = 1.0)
m)	Density	0.88 g/cm3 at 25 °C (77 °F)
	Relative density	No data available
n)	Water solubility	miscible
o)	Partition coefficient: n-octanol/water	log Pow: 0.45 at 25 °C (77 °F) - Bioaccumulation is not expected.
p)	Autoignition temperature	215 °C (419 °F) at 1,013 hPa - DIN 51794
q)	Decomposition temperature	No data available
r)	Viscosity	0.518 mm2/s at 25 °C (77 °F) -
s)	Explosive properties	No data available
t)	Oxidizing properties	none

9.2 Other safety information

Surface tension	26.4 mN/m at 25 °C (77 °F)
Relative vapor density	ca.2.5 at 25 °C (77 °F) - (Air = 1.0)

SECTION 10: Stability and reactivity

10.1 Reactivity

Formation of peroxides possible.
Vapors may form explosive mixture with air.

10.2 Chemical stability

The product is chemically stable under standard ambient conditions (room temperature) .
Stable under recommended storage conditions.
Test for peroxide formation before distillation or evaporation. Test for peroxide formation or discard after 1 year.

10.3 Possibility of hazardous reactions

Vapors may form explosive mixture with air.

10.4 Conditions to avoid

Heat, flames and sparks.
Warming.
Moisture.

10.5 Incompatible materials

rubber, various plastics, Tin

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10.6 Hazardous decomposition products

Peroxides
In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - male and female - 1,650 mg/kg
Remarks: (ECHA)
Symptoms: Irritation of mucous membranes
Inhalation: Irritating to respiratory system.
Symptoms: mucosal irritations, Cough, Shortness of breath, Possible damages:, damage of respiratory tract
Dermal: No data available

Skin corrosion/irritation
Repeated or prolonged exposure may cause skin irritation and dermatitis, due to degreasing properties of the product.

Serious eye damage/eye irritation
Eyes - Rabbit
Result: Eye irritation
Remarks: (IUCLID)

Respiratory or skin sensitization
Sensitisation test: - Guinea pig
Result: negative
Remarks: (IUCLID)
Human experience
Result: negative
Remarks: (IUCLID)

Germ cell mutagenicity
Test Type: Ames test
Result: negative
Remarks: (IUCLID)

Carcinogenicity
Suspected of causing cancer.

IARC:	2B - Group 2B: Possibly carcinogenic to humans (Tetrahydrofuran)
NTP:	No ingredient 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

Specific target organ toxicity - single exposure
May cause respiratory irritation. - Respiratory system
May cause drowsiness or dizziness.

Specific target organ toxicity - repeated exposure
No data available

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Aspiration hazard
No data available

11.2 Additional Information

RTECS: LU5950000
irritant effects, Cough, Shortness of breath, narcosis, somnolence

In high doses:

somnolence
narcosis

Other dangerous properties can not be excluded.

This substance should be handled with particular care.

Stomach - Irregularities - Based on Human Evidence

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish	flow-through test LC50 - Pimephales promelas (fathead minnow) - 2,160 mg/l - 96 h (OECD Test Guideline 203)
Toxicity to daphnia and other aquatic invertebrates	static test EC50 - Daphnia magna (Water flea) - 3,485 mg/l - 48 h (OECD Test Guideline 202)
Toxicity to algae	Cell multiplication inhibition test IC5 - Scenedesmus quadricauda (Green algae) - 3,700 mg/l - 8 d Remarks: (maximum permissible toxic concentration)
Toxicity to bacteria	static test IC50 - activated sludge - 460 mg/l - 3 h (OECD Test Guideline 209)

12.2 Persistence and degradability

Biodegradability	aerobic Biochemical oxygen demand - Exposure time 28 d Result: 39 % - 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 Endocrine disrupting properties

No data available

The life science business of Merck KGaA, Darmstadt, Germany
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12.7 Other adverse effects

No data available

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product

Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself. See www.retrologistik.com for processes regarding the return of chemicals and containers, or contact us there if you have further questions.

SECTION 14: Transport information

DOT (US)

UN number: 2056 Class: 3 Packing group: II
Proper shipping name: Tetrahydrofuran
Reportable Quantity (RQ): 1000 lbs
Poison Inhalation Hazard: No

IMDG

UN number: 2056 Class: 3 Packing group: II EMS-No: F-E, S-D
Proper shipping name: TETRAHYDROFURAN

IATA

UN number: 2056 Class: 3 Packing group: II
Proper shipping name: Tetrahydrofuran

SECTION 15: Regulatory information

SARA 302 Components

This material does not contain any components with a section 302 EHS TPQ.

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

Fire Hazard, Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

No components are subject to the Massachusetts Right to Know Act.

SECTION 16: Other information

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the

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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.

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Version: 6.16 Revision Date: 07/23/2022 Print Date: 12/10/2022

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SAFETY DATA SHEET

Version 6.13
Revision Date 08/10/2021
Print Date 06/18/2022

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

1.1 Product identifiers

Product name : Toluene

Product Number : 244511
Brand : Sigma-Aldrich
Index-No. : 601-021-00-3
CAS-No. : 108-88-3

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 Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 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
Reproductive toxicity (Category 2), H361
Specific target organ toxicity - single exposure (Category 3), Central nervous system, H336
Specific target organ toxicity - repeated exposure (Category 2), Central nervous system, H373
Aspiration hazard (Category 1), H304
Short-term (acute) aquatic hazard (Category 2), H401
Long-term (chronic) aquatic hazard (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

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Pictogram	
Signal word	Danger

Hazard statement(s)

H225	Highly flammable liquid and vapor.
H304	May be fatal if swallowed and enters airways.
H315	Causes skin irritation.
H336	May cause drowsiness or dizziness.
H361	Suspected of damaging fertility or the unborn child.
H373	May cause damage to organs (Central nervous system) through prolonged or repeated exposure.
H401	Toxic to aquatic life.
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.
P210	Keep away from heat/ sparks/ open flames/ hot surfaces. No smoking.
P233	Keep container tightly closed.
P240	Ground/bond container and receiving equipment.
P241	Use explosion-proof electrical/ ventilating/ lighting/ equipment.
P242	Use only non-sparking tools.
P243	Take precautionary measures against static discharge.
P260	Do not breathe dust/ fume/ gas/ mist/ vapors/ spray.
P264	Wash skin thoroughly after handling.
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
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.
P304 + P340 + P312	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/ doctor if you feel unwell.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P331	Do NOT induce vomiting.
P332 + P313	If skin irritation occurs: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P403 + P235	Store in a well-ventilated place. Keep cool.
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

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SECTION 3: Composition/information on ingredients

3.1 Substances

Formula	:	C_7H_8
Molecular weight	:	92.14 g/mol
CAS-No.	:	108-88-3
EC-No.	:	203-625-9
Index-No.	:	601-021-00-3

Component	Classification	Concentration
Toluene		
	Flam. Liq. 2; Skin Irrit. 2; Repr. 2; STOT SE 3; STOT RE 2; Asp. Tox. 1; Aquatic Acute 2; Aquatic Chronic 3; H225, H315, H361, H336, H373, H304, H401, H412 Concentration limits: 20 %: STOT SE 3, H336;	<= 100 %

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

SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice
Show this material safety data sheet to the doctor in attendance.

If inhaled
After inhalation: fresh air. Call in physician.

In case of skin contact
In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower. Consult a physician.

In case of eye contact
After eye contact: rinse out with plenty of water. Call in ophthalmologist. Remove contact lenses.

If swallowed
After swallowing: caution if victim vomits. Risk of aspiration! Keep airways free. Pulmonary failure possible after aspiration of vomit. Call a physician immediately.

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

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SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Carbon dioxide (CO2) Foam Dry powder

Unsuitable extinguishing media
For this substance/mixture no limitations of extinguishing agents are given.

5.2 Special hazards arising from the substance or mixture

Carbon oxides
Combustible.
Pay attention to flashback.
Vapors are heavier than air and may spread along floors.
Development of hazardous combustion gases or vapours possible in the event of fire.
Forms explosive mixtures with air at ambient temperatures.

5.3 Advice for firefighters

Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

5.4 Further information

Remove container from danger zone and cool with water. Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Advice for non-emergency personnel: Do not breathe vapors, aerosols. Avoid substance contact. Ensure adequate ventilation. Keep away from heat and sources of ignition.
Evacuate the danger area, observe emergency procedures, consult an expert.
For personal protection see section 8.

6.2 Environmental precautions

Do not let product enter drains. Risk of explosion.

6.3 Methods and materials for containment and cleaning up

Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up carefully with liquid-absorbent material (e.g. Chemizorb®). Dispose of properly. Clean up affected area.

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on safe handling
Work under hood. Do not inhale substance/mixture. Avoid generation of vapours/aerosols.

Advice on protection against fire and explosion
Keep away from open flames, hot surfaces and sources of ignition.Take precautionary measures against static discharge.

Hygiene measures

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Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions
Keep container tightly closed in a dry and well-ventilated place. Keep away from heat and sources of ignition.

Handle and store under inert gas.

Storage class
Storage class (TRGS 510): 3: Flammable liquids

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

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Toluene	108-88-3	TWA	100 ppm 375 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		STEL	150 ppm 560 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		TWA	200 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
	Remarks	Z37.12-1967		
		CEIL	300 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.12-1967		
		Peak	500 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.12-1967		
		TWA	20 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Visual impairment Female reproductive Pregnancy loss 2019 Adoption Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen		

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		TWA	100 ppm 375 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	150 ppm 560 mg/m3	USA. NIOSH Recommended Exposure Limits

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Toluene	108-88-3	Toluene	0.02 mg/l	In blood	ACGIH - Biological Exposure Indices (BEI)
	Remarks	Prior to last shift of workweek			
		Toluene	0.03 mg/l	Urine	ACGIH - Biological Exposure Indices (BEI)
		End of shift (As soon as possible after exposure ceases)			
		o-Cresol	0.3mg/g Creatinine	Urine	ACGIH - Biological Exposure Indices (BEI)
		End of shift (As soon as possible after exposure ceases)			

Derived No Effect Level (DNEL)

Application Area	Routes of exposure	Health effect	Value
Workers	Inhalation	Acute systemic effects	384 mg/m3
Workers	Inhalation	Acute local effects	384 mg/m3
Workers	Skin contact	Long-term systemic effects	384mg/kg BW/d
Workers	Inhalation	Long-term systemic effects	192 mg/m3
Workers	Inhalation	Long-term local effects	192 mg/m3
Consumers	Inhalation	Acute systemic effects	226 mg/m3
Consumers	Inhalation	Acute local effects	226 mg/m3
Consumers	Skin contact	Long-term systemic effects	226mg/kg BW/d
Consumers	Inhalation	Long-term systemic effects	56.5 mg/m3
Consumers	Ingestion	Long-term systemic effects	8.13mg/kg BW/d

Predicted No Effect Concentration (PNEC)

Compartment	Value
Soil	2.89 mg/kg
Sea water	0.68 mg/l
Fresh water	0.68 mg/l
Sea sediment	16.39 mg/kg
Fresh water sediment	16.39 mg/kg
Sewage treatment plant	13.61 mg/l
Aquatic intermittent release	0.68 mg/l

8.2 Exposure controls

Appropriate engineering controls

Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

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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). Safety glasses

Skin protection
This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).
Full contact
Material: Viton®
Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).
Splash contact
Material: Viton®
Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Body Protection
Flame retardant antistatic protective clothing.

Respiratory protection
required when vapours/aerosols are generated. Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

Control of environmental exposure
Do not let product enter drains. Risk of explosion.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid
b)	Odor	benzene-like
c)	Odor Threshold	0.2 ppm
d)	pH	Not applicable
e)	Melting point/freezing point	Melting point/range: -93 °C (-135 °F)
f)	Initial boiling point and boiling range	110 - 111 °C 230 - 232 °F
g)	Flash point	4.0 °C (39.2 °F) - c.c.
h)	Evaporation rate	No data available

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i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	Upper explosion limit: 7.1 %(V) Lower explosion limit: 1.2 %(V)
k)	Vapor pressure	30.88 hPa at 21.1 °C (70.0 °F)
l)	Vapor density	3.18
m)	Density	0.865 g/mL at 25 °C (77 °F)
	Relative density	No data available
n)	Water solubility	0.58 g/l at 25 °C (77 °F) - partly soluble
o)	Partition coefficient: n-octanol/water	log Pow: 2.73 at 20 °C (68 °F) - Bioaccumulation is not expected.
p)	Autoignition temperature	535.0 °C (995.0 °F)
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	none

9.2 Other safety information

Conductivity	< 0.01 µS/cm
Surface tension	27.73 mN/m at 0.516g/l at 25 °C (77 °F)
Relative vapor density	3.18

SECTION 10: Stability and reactivity

10.1 Reactivity

Vapors may form explosive mixture with air.
Vapors may form explosive mixture with air.

10.2 Chemical stability

The product is chemically stable under standard ambient conditions (room temperature) .
The product is chemically stable under standard ambient conditions (room temperature) .

10.3 Possibility of hazardous reactions

Risk of explosion with:
fuming sulfuric acid
Nitric acid
silver
perchlorates
nitrogen dioxide
nonmetallic halides
acetic acid
halogen-halogen compounds
uranium hexafluoride
organic nitro compounds

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Violent reactions possible with:
Strong acids
Strong oxidizing agents
sulfur
with
Heat.

10.4 Conditions to avoid
Warming.
Warming.

10.5 Incompatible materials
rubber, various plastics

10.6 Hazardous decomposition products
In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - male - 5,580 mg/kg
(Tested according to Directive 92/69/EEC.)
LC50 Inhalation - Rat - male and female - 4 h - 25.7 mg/l
(OECD Test Guideline 403)
LD50 Dermal - Rabbit - > 5,000 mg/kg
Remarks: (ECHA)
No data available

Skin corrosion/irritation
Skin - Rabbit
Result: irritating - 4 h
Remarks: (ECHA)

Serious eye damage/eye irritation
Eyes - Rabbit
Result: slight irritation
(OECD Test Guideline 405)

Respiratory or skin sensitization
Maximization Test - Guinea pig
Result: negative
(Regulation (EC) No. 440/2008, Annex, B.6)

Germ cell mutagenicity
Test Type: In vitro mammalian cell gene mutation test
Test system: Mouse lymphoma test
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 476
Result: negative
Test Type: Ames test
Test system: S. typhimurium
Metabolic activation: with and without metabolic activation
Method: Mutagenicity (Salmonella typhimurium - reverse mutation assay)
Result: negative

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Test Type: Chromosome aberration test
Species: Rat
Cell type: Bone marrow
Application Route: i.p.

Result: negative
Remarks: (ECHA)

Carcinogenicity
No data available

IARC: No ingredient 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 ingredient 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
Suspected of damaging the unborn child.

Specific target organ toxicity - single exposure
May cause drowsiness or dizziness. - Central nervous system

Specific target organ toxicity - repeated exposure
May cause damage to organs through prolonged or repeated exposure. - Central nervous system

Aspiration hazard
Aspiration hazard, Aspiration may cause pulmonary edema and pneumonitis.

11.2 Additional Information

RTECS: XS5250000
Drowsiness, irritant effects, Dizziness, Convulsions, Headache, Nausea, Vomiting, Circulatory collapse, somnolence, inebriation, Unconsciousness, respiratory arrest, CNS disorders, respiratory paralysis, death
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Stomach - Irregularities - Based on Human Evidence

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish	flow-through test LC50 - Oncorhynchus kisutch (coho salmon) - 5.5 mg/l - 96 h Remarks: (ECHA)
Toxicity to daphnia and other aquatic invertebrates	EC50 - Ceriodaphnia dubia (water flea) - 3.78 mg/l - 48 h (US-EPA)
Toxicity to bacteria	static test EC50 - Bacteria - 84 mg/l - 24 h

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Remarks: (ECHA)

12.2 Persistence and degradability

Biodegradability aerobic - Exposure time 20 d
Result: 86 % - Readily biodegradable.
Remarks: (IUCLID)

12.3 Bioaccumulative potential

Bioaccumulation Leuciscus idus (Golden orfe) - 3 d
- 0.05 mg/l(Toluene)

Bioconcentration factor (BCF): 90

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

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product

Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself. See www.retrologistik.com for processes regarding the return of chemicals and containers, or contact us there if you have further questions.

SECTION 14: Transport information

DOT (US)

UN number: 1294 Class: 3 Packing group: II
Proper shipping name: Toluene
Reportable Quantity (RQ): 1000 lbs
Poison Inhalation Hazard: No

IMDG

UN number: 1294 Class: 3 Packing group: II EMS-No: F-E, S-D
Proper shipping name: TOLUENE

IATA

UN number: 1294 Class: 3 Packing group: II
Proper shipping name: Toluene

SECTION 15: Regulatory information

The life science business of Merck KGaA, Darmstadt, Germany
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SARA 302 Components
This material does not contain any components with a section 302 EHS TPQ.

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

	CAS-No.	Revision Date
Toluene	108-88-3	2007-07-01

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

Massachusetts Right To Know Components
No components are subject to the Massachusetts Right to Know Act.

SECTION 16: Other information

Further information
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. 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.

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Version: 6.13 Revision Date: 08/10/2021 Print Date: 06/18/2022

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SAFETY DATA SHEET

Version 6.5
Revision Date 09/06/2022
Print Date 12/10/2022

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

1.1 Product identifiers

Product name : trans-1,2-Dichloroethylene

Product Number : D62209
Brand : Aldrich
Index-No. : 602-026-00-3
CAS-No. : 156-60-5

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 Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 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
Acute toxicity, Inhalation (Category 4), H332
Short-term (acute) aquatic hazard (Category 3), H402
Long-term (chronic) aquatic hazard (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

The life science business of Merck KGaA, Darmstadt, Germany
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Hazard statement(s)

H225	Highly flammable liquid and vapor.
H332	Harmful if inhaled.
H412	Harmful to aquatic life with long lasting effects.

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.
P261	Avoid breathing mist or vapors.
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P280	Wear protective gloves/ eye protection/ face protection.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P304 + P340 + P312	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/ doctor if you feel unwell.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
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

SECTION 3: Composition/information on ingredients

3.1 Substances

Synonyms	:	trans-1,2-Dichloroethene trans-Acetylene dichloride
Formula	:	$C_2H_2Cl_2$
Molecular weight	:	96.94 g/mol
CAS-No.	:	156-60-5
EC-No.	:	205-860-2
Index-No.	:	602-026-00-3

Component	Classification	Concentration
trans-Dichloroethylene		
	Flam. Liq. 2; Acute Tox. 4; Aquatic Acute 3; Aquatic Chronic 3; H225, H332, H402, H412	>= 90 - <= 100 %

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

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SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice
Show this material safety data sheet to the doctor in attendance.

If inhaled
After inhalation: fresh air. If breathing stops: mouth-to-mouth breathing or artificial respiration. Oxygen if necessary. Immediately call in physician.

In case of skin contact
In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower.

In case of eye contact
After eye contact: rinse out with plenty of water. Remove contact lenses.

If swallowed
After swallowing: make victim drink water (two glasses at most). Consult doctor if feeling unwell.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Water Foam Carbon dioxide (CO2) Dry powder

Unsuitable extinguishing media
For this substance/mixture no limitations of extinguishing agents are given.

5.2 Special hazards arising from the substance or mixture
Carbon oxides
Hydrogen chloride gas
Combustible.
Pay attention to flashback.
Vapors are heavier than air and may spread along floors.
Development of hazardous combustion gases or vapours possible in the event of fire.
Forms explosive mixtures with air at ambient temperatures.

5.3 Advice for firefighters
In the event of fire, wear self-contained breathing apparatus.

5.4 Further information
Remove container from danger zone and cool with water. Suppress (knock down) gases/vapors/mists with a water spray jet. Prevent fire extinguishing water from contaminating surface water or the ground water system.

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SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Advice for non-emergency personnel: Do not breathe vapors, aerosols. Avoid substance contact. Ensure adequate ventilation. Keep away from heat and sources of ignition.
Evacuate the danger area, observe emergency procedures, consult an expert.
For personal protection see section 8.

6.2 Environmental precautions

Do not let product enter drains. Risk of explosion.

6.3 Methods and materials for containment and cleaning up

Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up with liquid-absorbent material (e.g. Chemizorb®). Dispose of properly. Clean up affected area.

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on safe handling
Work under hood. Do not inhale substance/mixture. Avoid generation of vapours/aerosols.

Advice on protection against fire and explosion
Keep away from open flames, hot surfaces and sources of ignition.Take precautionary measures against static discharge.

Hygiene measures
Change contaminated clothing. Preventive skin protection recommended. Wash hands after working with substance.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions
Keep container tightly closed in a dry and well-ventilated place. Keep away from heat and sources of ignition.

Light sensitive. Air and moisture sensitive. Refrigerate before opening.

Storage class
Storage class (TRGS 510): 3: Flammable liquids

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters

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Component	CAS-No.	Value	Control parameters	Basis
trans-Dichloroethylene	156-60-5	TWA	200 ppm	USA. ACGIH Threshold Limit Values (TLV)

8.2 Exposure controls

Appropriate engineering controls
Change contaminated clothing. Preventive skin protection recommended. Wash hands after working with substance.

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). Safety glasses

Skin protection
required

Body Protection
Flame retardant antistatic protective clothing.

Respiratory protection
required when vapours/aerosols are generated.
Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

Control of environmental exposure
Do not let product enter drains. Risk of explosion.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid, clear Color: light yellow
b)	Odor	No data available
c)	Odor Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: -50 °C (-58 °F) - lit.
f)	Initial boiling point and boiling range	48 °C 118 °F - lit.
g)	Flash point	6.0 °C (42.8 °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: 12.8 %(V) Lower explosion limit: 9.7 %(V)

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k)	Vapor pressure	No data available
l)	Vapor density	No data available
m)	Density	1.257 g/mL at 25 °C (77 °F) - lit.
	Relative density	No data available
n)	Water solubility	No data available
o)	Partition coefficient: n-octanol/water	No data available
p)	Autoignition temperature	No data available
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	none

9.2 Other safety information
No data available

SECTION 10: Stability and reactivity

10.1 Reactivity
Vapors may form explosive mixture with air.

10.2 Chemical stability
The product is chemically stable under standard ambient conditions (room temperature) .

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
Warming.

10.5 Incompatible materials
Oxidizing agents, Bases

10.6 Hazardous decomposition products
In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
Oral: No data available
Inhalation: No data available
Dermal: No data available

Skin corrosion/irritation
No data available

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Serious eye damage/eye irritation
No data available

Respiratory or skin sensitization
No data available

Germ cell mutagenicity
No data available

Carcinogenicity

IARC: No ingredient 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 ingredient 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

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

11.2 Additional Information

RTECS: KV9400000

SECTION 12: Ecological information

12.1 Toxicity
No data available

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
No data available

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Endocrine disrupting properties
No data available

12.7 Other adverse effects
No data available

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SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product
Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself. See www.retrologistik.com for processes regarding the return of chemicals and containers, or contact us there if you have further questions.

SECTION 14: Transport information

DOT (US)
UN number: 1150 Class: 3 Packing group: II
Proper shipping name: 1,2-Dichloroethylene
Reportable Quantity (RQ): 1000 lbs
Poison Inhalation Hazard: No

IMDG
UN number: 1150 Class: 3 Packing group: II EMS-No: F-E, S-D
Proper shipping name: 1,2-DICHLOROETHYLENE

IATA
UN number: 1150 Class: 3 Packing group: II
Proper shipping name: 1,2-Dichloroethylene

SECTION 15: Regulatory information

SARA 302 Components
This material does not contain any components with a section 302 EHS TPQ.

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
Fire Hazard

Massachusetts Right To Know Components
No components are subject to the Massachusetts Right to Know Act.

SECTION 16: Other information

Further information
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. 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

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Version: 6.5 Revision Date: 09/06/2022 Print Date: 12/10/2022

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SAFETY DATA SHEET

Version 6.4
Revision Date 05/31/2021
Print Date 12/10/2022

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

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, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Hazardous to the ozone layer (Category 1), H420

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)
H420 Harms public health and the environment by destroying ozone in the upper atmosphere.

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Precautionary statement(s)

P502	Refer to manufacturer/ supplier for information on recovery/ recycling.

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

SECTION 3: Composition/information on ingredients

3.1 Substances

Synonyms	:	Fluorotrichloromethane CFC-11
Formula	:	CCl3F
Molecular weight	:	137.37 g/mol
CAS-No.	:	75-69-4
EC-No.	:	200-892-3

Component	Classification	Concentration
Trichlorofluoromethane		
	Ozone 1; H420	<= 100 %

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

SECTION 4: First aid measures

4.1 Description of first-aid measures

In case of skin contact
In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower.

In case of eye contact
After eye contact: rinse out with plenty of water. Remove contact lenses.

If swallowed
After swallowing: make victim drink water (two glasses at most). Consult doctor if feeling unwell.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

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Unsuitable extinguishing media
For this substance/mixture no limitations of extinguishing agents are given.

5.2 Special hazards arising from the substance or mixture
Carbon oxides
Hydrogen chloride gas
Hydrogen fluoride
Not combustible.
Ambient fire may liberate hazardous vapours.

5.3 Advice for firefighters
In the event of fire, wear self-contained breathing apparatus.

5.4 Further information
Suppress (knock down) gases/vapors/mists with a water spray jet. Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures
Advice for non-emergency personnel: Do not breathe vapors, aerosols. Avoid substance contact. Ensure adequate ventilation. Evacuate the danger area, observe emergency procedures, consult an expert.
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
Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up with liquid-absorbent material (e.g. Chemizorb®). Dispose of properly. Clean up affected area.

6.4 Reference to other sections
For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions
Tightly closed.

Storage stability
Recommended storage temperature
2 - 8 °C

Contents under pressure.
Storage class (TRGS 510): 10: Combustible liquids

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

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SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Trichlorofluoromethane	75-69-4	C	1,000 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Not classifiable as a human carcinogen		
		C	1,000 ppm 5,600 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	1,000 ppm 5,600 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		C	1,000 ppm 5,600 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

8.2 Exposure controls

Appropriate engineering controls
Change contaminated clothing. Wash hands after working with substance.

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). Safety glasses

Respiratory protection
Not required; except in case of aerosol formation.

Control of environmental exposure
Do not let product enter drains.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid, clear Color: colorless
b)	Odor	No data available
c)	Odor Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: -111.0 - -110.0 °C (-167.8 - -166.0 °F)
f)	Initial boiling point and boiling range	23.7 °C 74.7 °F - lit.
g)	Flash point	()Not applicable
h)	Evaporation rate	No data available
i)	Flammability (solid,	No data available

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gas)

j)	Upper/lower flammability or explosive limits	No data available
k)	Vapor pressure	885.7 hPa at 20.0 °C (68.0 °F)
l)	Vapor density	No data available
m)	Relative density	No data available
n)	Water solubility	1 g/l
o)	Partition coefficient: n-octanol/water	log Pow: 2.53 - Bioaccumulation is not expected.
p)	Autoignition 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

Surface tension 18.0 mN/m at 25.0 °C (77.0 °F)

SECTION 10: Stability and reactivity

10.1 Reactivity
No data available

10.2 Chemical stability
The product is chemically stable under standard ambient conditions (room temperature) .

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
no information available

10.5 Incompatible materials
Strong oxidizing agents, Sodium/sodium oxides, Potassium, Magnesium, Aluminum, Zinc

10.6 Hazardous decomposition products
In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - > 15,000 mg/kg
Inhalation: No data available
Dermal: No data available
No data available

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Skin corrosion/irritation
No data available

Serious eye damage/eye irritation
No data available

Respiratory or skin sensitization
No data available

Germ cell mutagenicity
No data available

Carcinogenicity

IARC: No ingredient 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 ingredient 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

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

11.2 Additional Information

RTECS: PB6125000
Nausea, Dizziness, Headache, Vomiting, Diarrhea, Abdominal pain, Weakness, Unconsciousness
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

SECTION 12: Ecological information

12.1 Toxicity
No data available

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
No data available

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

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12.6 Other adverse effects

No data available

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product

Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself. See www.retrologistik.com for processes regarding the return of chemicals and containers, or contact us there if you have further questions.

SECTION 14: Transport information

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
Reportable Quantity (RQ): 10 lbs
Poison Inhalation Hazard: No

IMDG

Not dangerous goods

IATA

Not dangerous goods

SECTION 15: Regulatory information

SARA 302 Components

This material does not contain any components with a section 302 EHS TPQ.

SARA 313 Components

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

	CAS-No.	Revision Date
Trichlorofluoromethane	75-69-4	2007-07-01

SARA 311/312 Hazards

Acute Health Hazard

Reportable Quantity : F002 lbs

Massachusetts Right To Know Components

No components are subject to the Massachusetts Right to Know Act.

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SECTION 16: Other information

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. 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.

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Version: 6.4 Revision Date: 05/31/2021 Print Date: 12/10/2022

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SAFETY DATA SHEET

Revision Date 24-Dec-2021 **Revision Number** 4

1. Identification

Product Name **1,1,2-Trichloro-1,2,2-trifluoroethane**

Cat No. : **T178-1; T178-4**

Synonyms Fluorocarbon 113; Freon 113; 1,1,2-Trichlorotrifluoroethane

Recommended Use Laboratory chemicals.
Uses advised against Food, drug, pesticide or biocidal product use.

Details of the supplier of the safety data sheet

Company
Fisher Scientific Company
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
Classification under 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

This chemical is not considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Label Elements
None required

Hazards not otherwise classified (HNOC)
None identified

3. Composition/Information on Ingredients

Component	CAS No	Weight %

1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	99

4. First-aid measures

Eye Contact Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Get medical attention.

Skin Contact Wash off immediately with plenty of water for at least 15 minutes. Get medical attention immediately if symptoms occur.

Inhalation Remove to fresh air. Get medical attention immediately if symptoms occur.

Ingestion Clean mouth with water and drink afterwards plenty of water. Get medical attention if symptoms occur.

Most important symptoms and effects Difficulty in breathing. Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting

Notes to Physician Treat symptomatically

5. Fire-fighting measures

Unsuitable Extinguishing Media No information available

Flash Point No information available
Method - No information available

Autoignition Temperature 770 °C / 1418 °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
Keep product and empty container away from heat and sources of ignition.

Hazardous Combustion Products
No information available.
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health	Flammability	Instability	Physical hazards
1	0	0	N/A

6. Accidental release measures

Personal Precautions Ensure adequate ventilation. Use personal protective equipment as required.
Environmental Precautions Do not flush into surface water or sanitary sewer system.

Methods for Containment and Clean Up Sweep up and shovel into suitable containers for disposal.

7. Handling and storage

Handling Wear personal protective equipment/face protection. Ensure adequate ventilation. Avoid contact with skin, eyes or clothing. Avoid ingestion and inhalation.

Storage. Keep containers tightly closed in a dry, cool and well-ventilated place. Incompatible Materials. Strong acids. Finely powdered metals.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
1,1,2-Trichloro-1,2,2-trifluoroethane	TWA: 1000 ppm STEL: 1250 ppm	(Vacated) TWA: 1000 ppm (Vacated) TWA: 7600 mg/m³ (Vacated) STEL: 1250 ppm (Vacated) STEL: 9500 mg/m³ TWA: 1000 ppm TWA: 7600 mg/m³	IDLH: 2000 ppm TWA: 1000 ppm TWA: 7600 mg/m³ STEL: 1250 ppm STEL: 9500 mg/m³	TWA: 1000 ppm TWA: 1600 mg/m³ STEL: 1250 ppm

Legend

ACGIH - American Conference of Governmental Industrial Hygienists
OSHA - Occupational Safety and Health Administration
NIOSH IDLH: NIOSH - National Institute for Occupational Safety and Health

Engineering Measures None under normal use conditions.

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 No protective equipment is needed under normal use conditions.

Hygiene Measures Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Liquid
Appearance	Clear
Odor	aromatic
Odor Threshold	No information available
pH	No information available
Melting Point/Range	-36 °C / -32.8 °F
Boiling Point/Range	47 - 48 °C / 116.6 - 118.4 °F
Flash Point	No information available
Evaporation Rate	> 1.0 (Ether = 1.0)
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	23 hPa @ 20 °C
Vapor Density	6.5 (Air = 1.0)
Specific Gravity	1.47 @ 21°C
Solubility	Insoluble in water
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	770 °C / 1418 °F
Decomposition Temperature	No information available
Viscosity	No information available
Molecular Formula	C2Cl3F3

Molecular Weight 187.38

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Stable under normal conditions.

Conditions to Avoid Incompatible products.

Incompatible Materials Strong acids, Finely powdered metals

Hazardous Decomposition Products No information available

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information
Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
1,1,2-Trichloro-1,2,2-trifluoroethane	LD50 = 43 g/kg (Rat)	Not listed	LC50 = 38000 ppm (Rat) 4 h

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation No information available

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS No	IARC	NTP	ACGIH	OSHA	Mexico
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure None known
STOT - repeated exposure None known

Aspiration hazard No information available

Symptoms / effects,both acute and delayed Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting

Endocrine Disruptor Information No information available

Other Adverse Effects The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity

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.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
1,1,2-Trichloro-1,2,2-trifluoroethane	Not listed	LC50: 7 - 14 mg/L, 96h static (Brachydanio rerio) LC50: = 6240 mg/L, 96h (Oryzias latipes) LC50: = 1250 mg/L, 96h (Pimephales promelas)	Not listed	EC50: = 71 mg/L, 48h (Daphnia magna)

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.

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

14. Transport information

DOT Not regulated
TDG Not regulated
IATA Not regulated
IMDG/IMO Not regulated

15. Regulatory information

United States of America Inventory

Component	CAS No	TSCA	TSCA Inventory notification - Active-Inactive	TSCA - EPA Regulatory Flags
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	X	ACTIVE	-

Legend:
TSCA US EPA (TSCA) - Toxic Substances Control Act, (40 CFR Part 710)
X - Listed
'-' - Not Listed

TSCA 12(b) - Notices of Export Not applicable

International Inventories

Canada (DSL/NDSL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Japan (ISHL), Australia (AICS), China (IECSC), Korea (KECL).

Component	CAS No	DSL	NDSL	EINECS	PICCS	ENCS	ISHL	AICS	IECSC	KECL
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	X	-	200-936-1	X	X	X	X	X	KE-34104

KECL - NIER number or KE number (http://ncis.nier.go.kr/en/main.do)

U.S. Federal Regulations

SARA 313

Component	CAS No	Weight %	SARA 313 - Threshold Values %
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	99	1.0

SARA 311/312 Hazard Categories See section 2 for more information

CWA (Clean Water Act) Not applicable

Clean Air Act

Component	HAPS Data	Class 1 Ozone Depletors	Class 2 Ozone Depletors
1,1,2-Trichloro-1,2,2-trifluoroethane	-	X	-

OSHA - Occupational Safety and Health Administration Not applicable

CERCLA Not applicable

Component	Hazardous Substances RQs	CERCLA EHS RQs
1,1,2-Trichloro-1,2,2-trifluoroethane	5000 lb	-

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

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
1,1,2-Trichloro-1,2,2-trifluoroethane	X	X	X	-	X

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

Authorisation/Restrictions according to EU REACH

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

Component	CAS No	OECD HPV	Persistent Organic Pollutant	Ozone Depletion Potential	Restriction of Hazardous Substances (RoHS)
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	Listed	Not applicable	Annex I (Group I substance) : ODP = 0.8 Annex A - Group I : ODP = 0.8	Not applicable

Component	CAS No	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Major Accident Notification	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Safety Report Requirements	Rotterdam Convention (PIC)	Basel Convention (Hazardous Waste)
1,1,2-Trichloro-1,2,2-trifluoroet	76-13-1	Not applicable	Not applicable	Not applicable	Annex I - Y45

hane					

16. Other information

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

Revision Date 24-Dec-2021
Print Date 24-Dec-2021
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

Vinyl Chloride

Airgas
an Air Liquide company

Section 1. Identification

GHS product identifier : Vinyl Chloride

Chemical name : vinyl chloride

Other means of identification : chloroethylene; Ethene, chloro-; Chloroethene; Vinyl chloride, monomer; Ethene, chloro- (vinyl chloride); Vinyl chloride monomer; Monochloroethylene; Monochloroethene; Ethylene monochloride; VCM; VC

Product type : Gas.

Product use : Synthetic/Analytical chemistry.

Synonym : chloroethylene; Ethene, chloro-; Chloroethene; Vinyl chloride, monomer; Ethene, chloro- (vinyl chloride); Vinyl chloride monomer; Monochloroethylene; Monochloroethene; Ethylene monochloride; VCM; VC

SDS # : 001067

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
CARCINOGENICITY - Category 1
SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) (liver) - Category 2

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.
May cause cancer.
May cause damage to organs through prolonged or repeated exposure. (liver)

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 : Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Wear protective gloves. Wear eye or face protection. Wear protective clothing. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Do not breathe gas.

Section 2. Hazards identification

Response : Get medical attention if you feel unwell. IF exposed or concerned: Get medical attention. 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. 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 : 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 : vinyl chloride

Other means of identification : chloroethylene; Ethene, chloro-; Chloroethene; Vinyl chloride, monomer; Ethene, chloro-(vinyl chloride); Vinyl chloride monomer; Monochloroethylene; Monochloroethene; Ethylene monochloride; VCM; VC

Product code : 001067

CAS number/other identifiers

CAS number : 75-01-4

Ingredient name	%	CAS number
vinyl chloride	100	75-01-4

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 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. Continue to rinse for at least 10 minutes. Get medical attention. 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

Section 4. First aid measures

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.

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 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
halogenated compounds

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 specialized 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".

Section 6. Accidental release measures

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. Do not get in eyes or on skin or clothing. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. 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.

Use only non-sparking tools. Empty containers retain product residue and can be hazardous. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Do not breathe gas. Avoid exposure - obtain special instructions before use. Do not handle until all safety precautions have been read and understood.

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. 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). Store locked up. Keep container tightly closed and sealed until ready for use. See Section 10 for incompatible materials before handling or use.

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
vinyl chloride	**ACGIH TLV (United States, 3/2017).** TWA: 1 ppm 8 hours. **OSHA PEL (United States, 6/2016).** STEL: 5 ppm 15 minutes. TWA: 1 ppm 8 hours. **OSHA PEL 1989 (United States, 3/1989).** STEL: 5 ppm 15 minutes. TWA: 1 ppm 8 hours.

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. 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 : Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use. 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. [COLORLESS GAS OR LIQUID (BELOW 7 F) WITH A PLEASANT ODOR AT HIGH CONCENTRATIONS. [NOTE: SHIPPED AS A LIQUEFIED COMPRESSED GAS.]

Color : Colorless.

Odor : Characteristic.

Odor threshold : Not available.

pH : Not available.

Melting point : -153.8°C (-244.8°F)

Boiling point : -13.4°C (7.9°F)

Critical temperature : 158.45°C (317.2°F)

Flash point : Closed cup: -78°C (-108.4°F)
Open cup: -78°C (-108.4°F)

Evaporation rate : Not available.

Flammability (solid, gas) : Not available.

Lower and upper explosive (flammable) limits : Lower: 3.8%
Upper: 29.3%

Section 9. Physical and chemical properties

Vapor pressure : Not available.

Vapor density : 2.2 (Air = 1)

Specific Volume (ft ^{3}/lb) : 6.25

Gas Density (lb/ft ^{3}) : 0.16129 (21.1°C / 70 to °F)

Relative density : Not applicable.

Solubility : Not available.

Solubility in water : 1.1 g/l

Partition coefficient: n-octanol/water : 1.38

Auto-ignition temperature : 472°C (881.6°F)

Decomposition temperature : Not available.

Viscosity : Not applicable.

Flow time (ISO 2431) : Not available.

Molecular weight : 62.5 g/mole

Aerosol product

Heat of combustion : -18924336 J/kg

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

Not available.

Irritation/Corrosion

Not available.

Sensitization

Not available.

Mutagenicity

Not available.

Carcinogenicity

Not available.

Section 11. Toxicological information

Classification

Product/ingredient name	OSHA	IARC	NTP
vinyl chloride	+	1	Known to be a human carcinogen.

Reproductive toxicity

Not available.

Teratogenicity

Not available.

Specific target organ toxicity (single exposure)

Not available.

Specific target organ toxicity (repeated exposure)

Name	Category	Route of exposure	Target organs
vinyl chloride	Category 2	Not determined	liver

Aspiration hazard

Not available.

Information on the likely routes of exposure : Not available.

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 : May cause damage to organs through prolonged or repeated exposure.

Carcinogenicity : May cause cancer. Risk of cancer depends on duration and level of exposure.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Section 11. Toxicological information

Numerical measures of toxicity

Acute toxicity estimates

Not available.

Section 12. Ecological information

Toxicity

Not available.

Persistence and degradability

Not available.

Bioaccumulative potential

Product/ingredient name	$LogP_{ow}$	BCF	Potential
vinyl chloride	1.38	-	low

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.

United States - RCRA Toxic hazardous waste "U" List

Ingredient	CAS #	Status	Reference number
Vinyl chloride; Ethene, chloro-	75-01-4	Listed	U043

Section 14. Transport information

	DOT	TDG	Mexico	IMDG	IATA
UN number	UN1086	UN1086	UN1086	UN1086	UN1086
UN proper shipping name	VINYL CHLORIDE, STABILIZED	VINYL CHLORIDE, STABILIZED	VINYL CHLORIDE, STABILIZED	VINYL CHLORIDE, STABILIZED	VINYL CHLORIDE, STABILIZED

Section 14. Transport information

Transport hazard class(es)	2.1 	2.1 	2.1 	2.1 	2.1 
Packing group	-	-	-	-	-
Environmental hazards	No.	No.	No.	No.	No.

"Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product."

Additional information

DOT Classification : **Reportable quantity** 1 lbs / 0.454 kg. Package sizes shipped in quantities less than the product reportable quantity are not subject to the RQ (reportable quantity) transportation requirements.
Limited quantity Yes.
Quantity limitation Passenger aircraft/rail: Forbidden. Cargo aircraft: 150 kg.
Special provisions 21, B44, T50

TDG Classification : 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 Road or Rail Index Forbidden

IATA : **Quantity limitation** Passenger and Cargo Aircraft: Forbidden. Cargo Aircraft Only: 150 kg.

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 and the IBC Code : Not available.

Section 15. Regulatory information

U.S. Federal regulations : **TSCA 8(a) CDR Exempt/Partial exemption**: Not determined
Clean Water Act (CWA) 307: vinyl chloride
Clean Air Act (CAA) 112 regulated flammable substances: vinyl chloride

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

Composition/information on ingredients

No products were found.

SARA 304 RQ : Not applicable.

Section 15. Regulatory information

SARA 311/312

Classification : Refer to Section 2: Hazards Identification of this SDS for classification of substance.

SARA 313

	Product name	CAS number	%
Form R - Reporting requirements	vinyl chloride	75-01-4	100
Supplier notification	vinyl chloride	75-01-4	100

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 can expose you to Vinyl chloride, which is known to the State of California to cause cancer. For more information go to www.P65Warnings.ca.gov.

Ingredient name	No significant risk level	Maximum acceptable dosage level
Vinyl chloride	Yes.	-

International regulations

Chemical Weapon Convention List Schedules I, II & III Chemicals

Not listed.

Montreal Protocol (Annexes A, B, C, E)

Not listed.

Stockholm Convention on Persistent Organic Pollutants

Not listed.

Rotterdam Convention on Prior Informed Consent (PIC)

Not listed.

UNECE Aarhus Protocol on POPs and Heavy Metals

Not listed.

Inventory list

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 : **Japan inventory (ENCS)**: This material is listed or exempted.
Japan inventory (ISHL): This material is listed or exempted.

Malaysia : This material is listed or exempted.

New Zealand : This material is listed or exempted.

Philippines : This material is listed or exempted.

Republic of Korea : This material is listed or exempted.

Taiwan : This material is listed or exempted.

Thailand : Not determined.

Turkey : This material is listed or exempted.

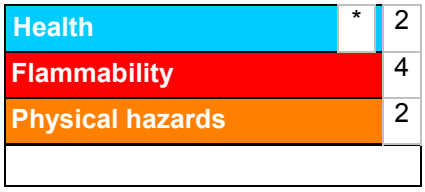
Section 15. Regulatory information

United States : This material is listed or exempted.

Viet Nam : Not determined.

Section 16. Other information

Hazardous Material Information System (U.S.A.)



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 and the associated label are not required on SDSs or products leaving a facility 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 trademark and service mark of the American Coatings Association, Inc.

The customer is responsible for determining the PPE code for this material. For more information on HMIS® Personal Protective Equipment (PPE) codes, consult the HMIS® Implementation Manual.

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

Classification	Justification
FLAMMABLE GASES - Category 1	Expert judgment
GASES UNDER PRESSURE - Liquefied gas	Expert judgment
CARCINOGENICITY - Category 1	Expert judgment
SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) (liver) - Category 2	Expert judgment

History

Date of printing : 7/9/2018

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Version : 0.02

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 = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
UN = United Nations

Section 16. Other information

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.

Attachment III – Decontamination Procedures

Sample Decontamination Procedures for Three Typical Levels of Protection[a]

F.S.O.P. No. 7

Process: DECONTAMINATION PROCEDURES

INTRODUCTION

1.1 The objective of these procedures is to minimize the risk of exposure to hazardous substances. These procedures were derived from the U.S. Environmental Protection Agency, Office of Emergency and Remedial Response's (OERR), "Interim Standard Operating Safety Guides (revised Sep. 82)". This version of the guides is in a format that is more appropriate for use in the field.

1.2 Protective equipment must be worn by personnel when response activities involve known or suspected hazardous substances. The procedures for decontaminating personnel upon leaving the contaminated area are addressed for each of the EPA, OERR designated levels of protection. The procedures given are for the maximum and minimum amount of decontamination used for each level of protection.

1.3 The maximum decontamination procedures for all levels of protection consist of specific activities at nineteen stations. Each station emphasizes an important aspect of decontamination. When establishing a decontamination line, each aspect should be incorporated separately or combined with other aspects into a procedure with fewer steps (such as the Minimum Decontamination Procedures).

1.4 Decontamination lines are site specific since they are dependent upon the types of contamination and the type of work activities on site. A cooling station is sometimes necessary within the decontamination line during hot weather. It is usually a location in a shaded area in which the wind can help to cool personnel. In addition, site conditions may permit the use of cooling devices such as cool water hose, ice packs, cool towels, etc. When the decontamination line is no longer required, contaminated wash and rinse solutions and contaminated articles must be contained and disposed of as hazardous wastes in compliance with state and federal regulations.

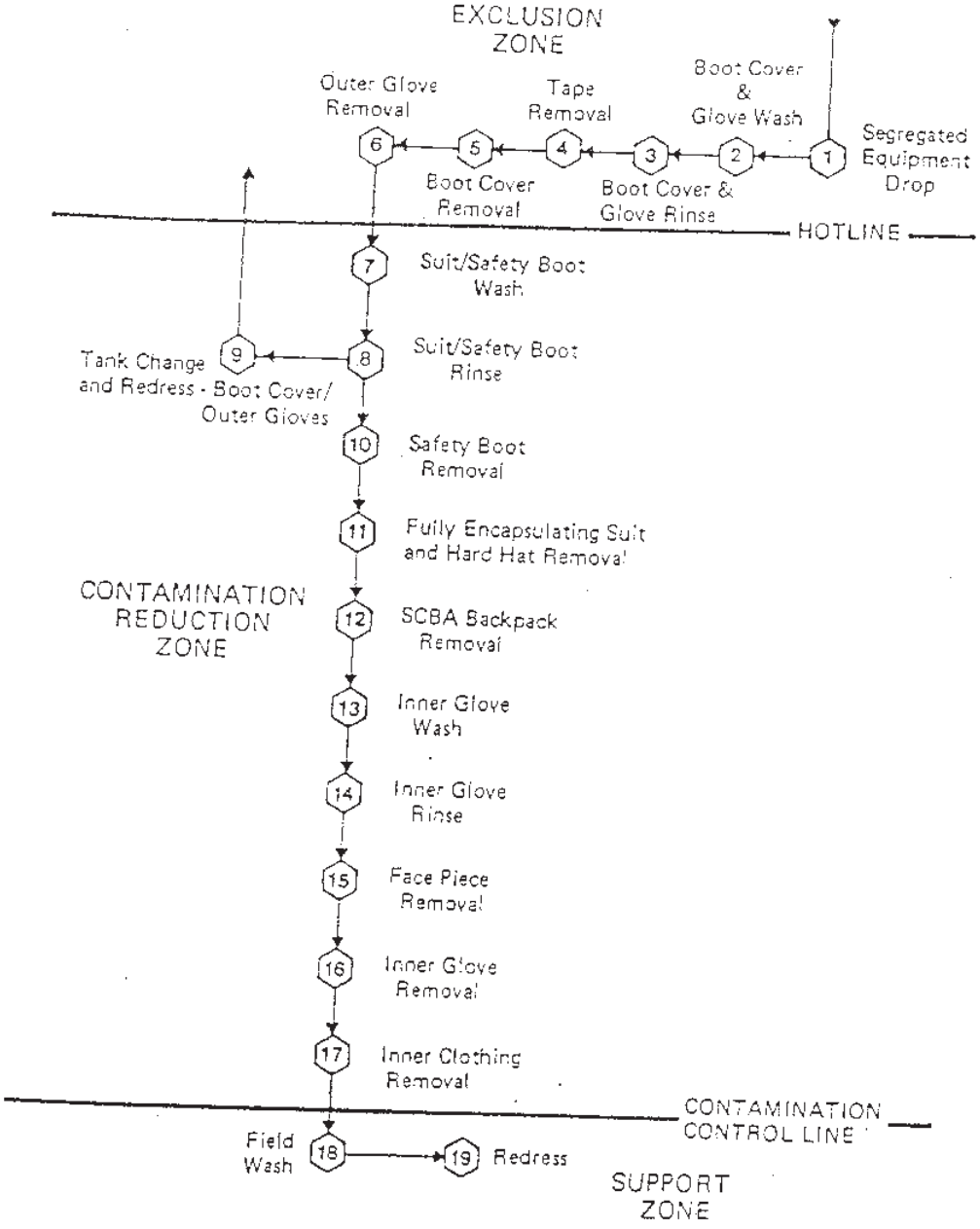
[a] Source: Excerpted from *Field Standard Operating Procedures for the Decontamination of Response Personnel (FSOP 7)*. EPA Office of Emergency and Remedial Response, Hazardous Response Support Division, Washington, DC. January 1985.

P.S.O.P. No. 7

PROCESS DECON PROCEDURES

MAXIMUM DECONTAMINATION LAYOUT

LEVEL A PROTECTION

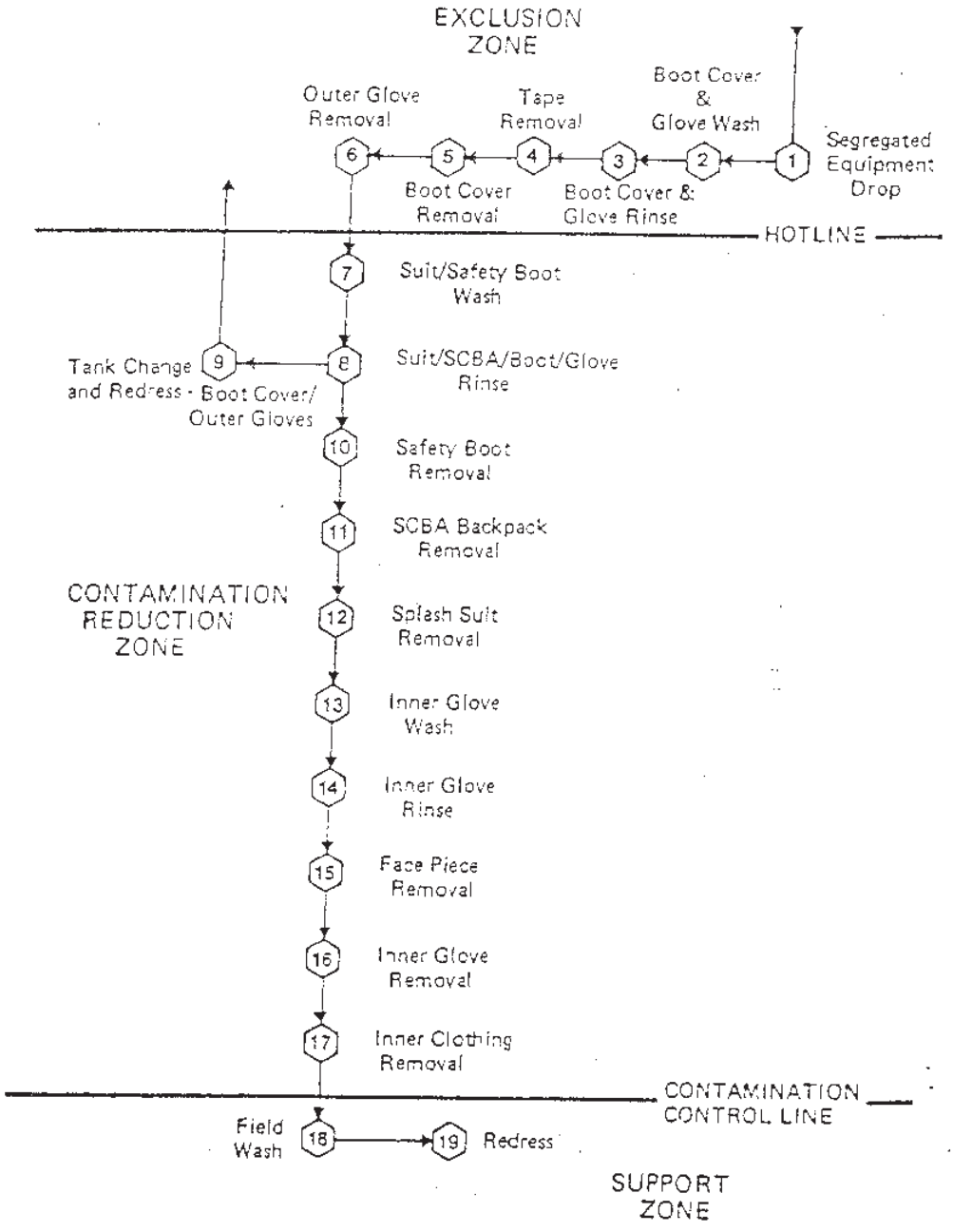


F.S.O.P. No. 7

PROCESS DECON PROCEDURES

MAXIMUM DECONTAMINATION LAYOUT

LEVEL B PROTECTION

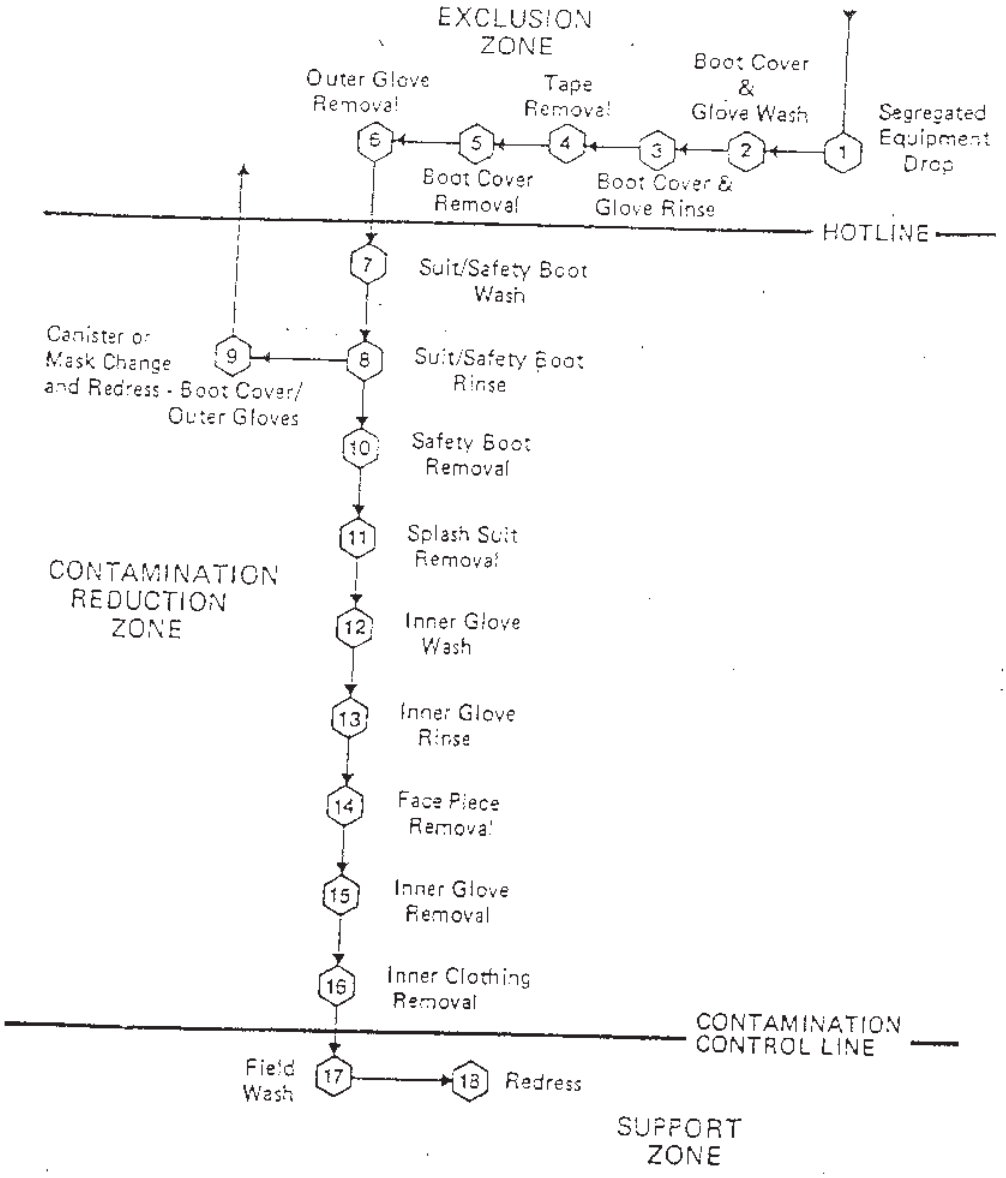


F.S.O.P. No. 7

PROCESS DECON PROCEDURES

MAXIMUM DECONTAMINATION LAYOUT

LEVEL C PROTECTION

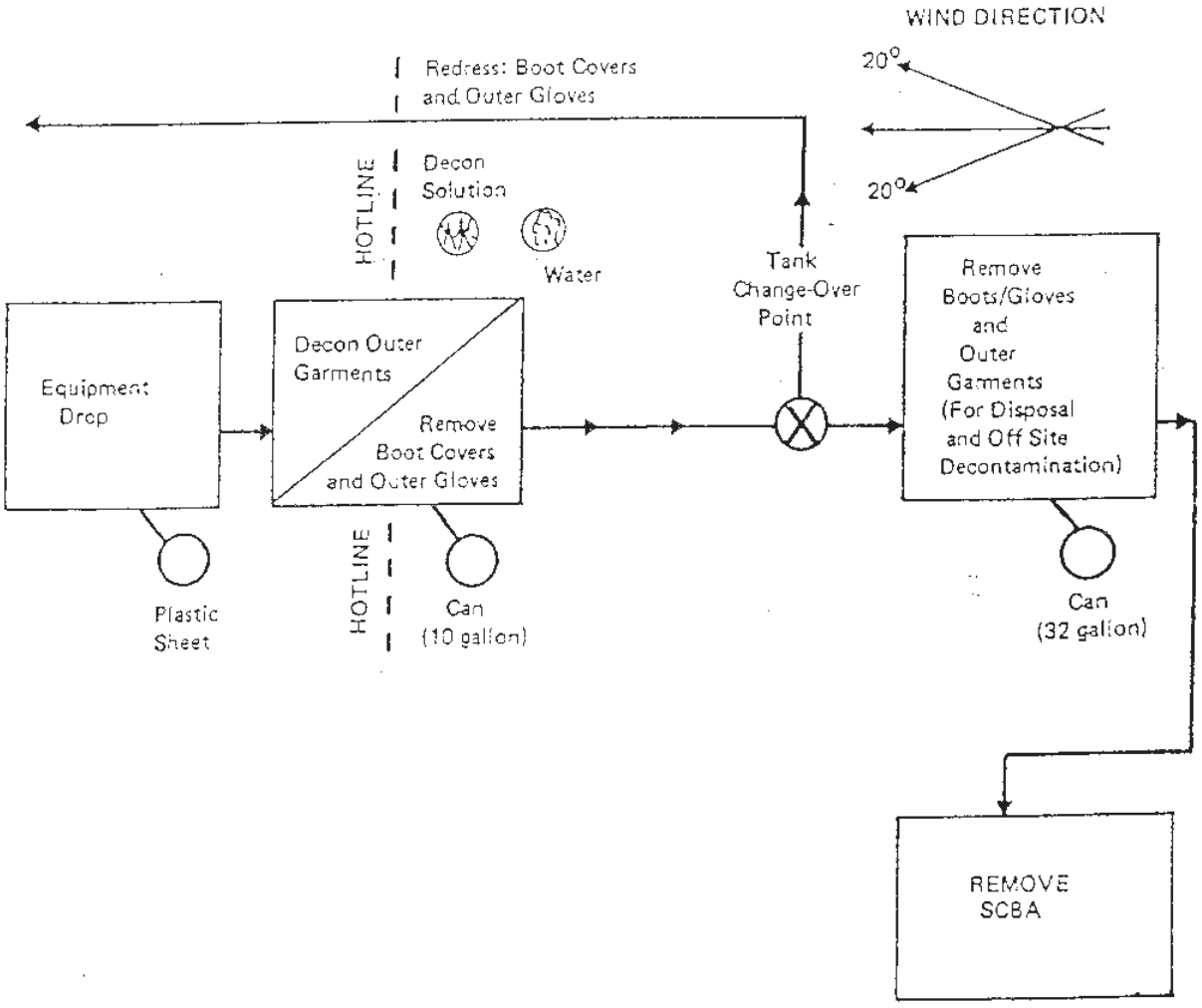


P.S.O.P. No. 7

PROCESS DECON PROCEDURES

MINIMUM DECONTAMINATION LAYOUT

LEVELS A & B PROTECTION

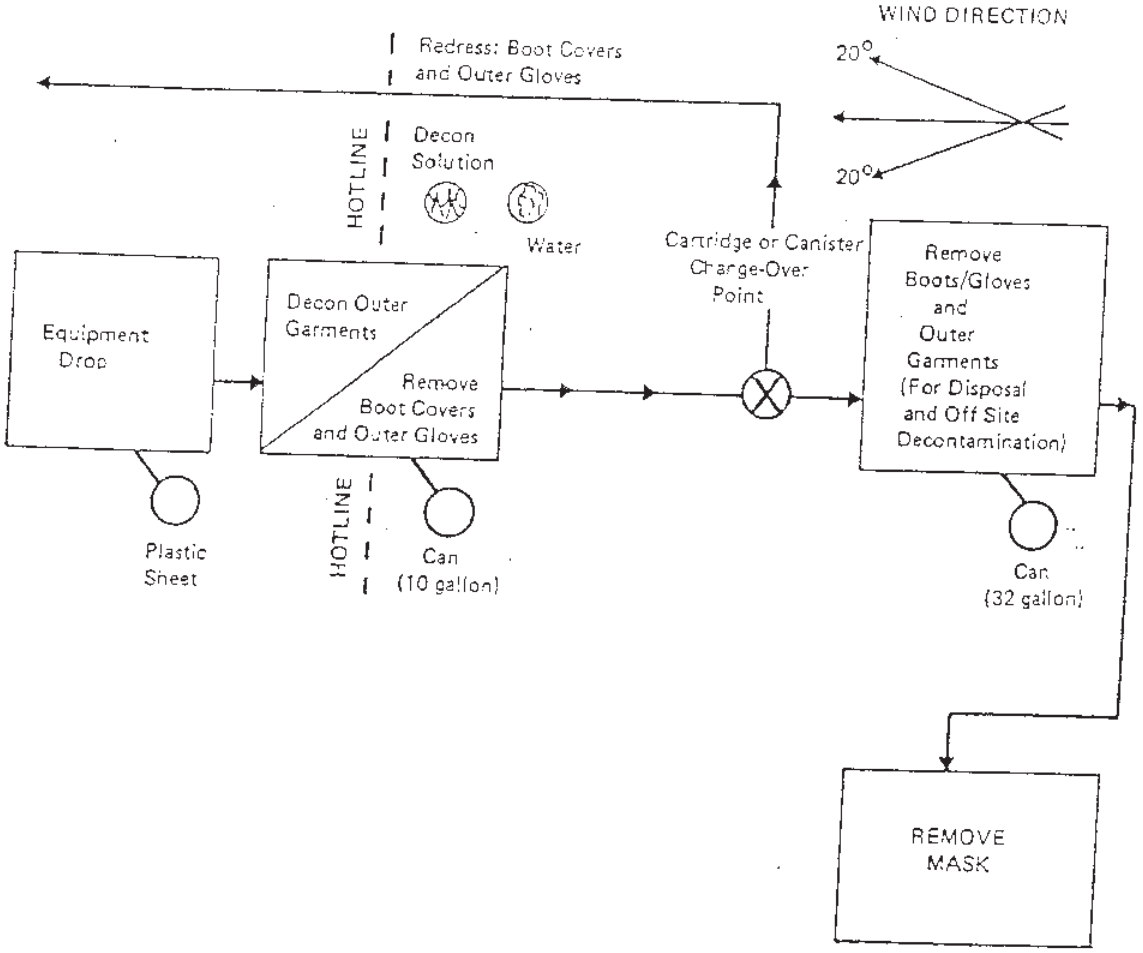


F.S.O.P. No. 7

PROCESS DECON PROCEDURES

MINIMUM DECONTAMINATION LAYOUT

LEVEL C PROTECTION



EQUIPMENT NEEDED TO PERFORM MAXIMUM DECONTAMINATION MEASURES FOR LEVELS A, B, AND C

Station 1:
a. Various Size Containers
b. Plastic Liners
c. Plastic Drop Cloths

Station 2:
a. Containers (20-30 Gallons)
b. Decon Solution or Detergent Water
c. 2-3 Long-Handled, Soft-Bristled Scrub Brushes

Station 3:
a. Containers (20-30 Gallons)
OR
High-Pressure Spray Unit
b. Water
c. 2-3 Long-Handled, Soft-Bristled Scrub Brushes

Station 4:
a. Containers (20-30 Gallons)
b. Plastic Liners

Station 5:
a. Containers (20-30 Gallons)
b. Plastic Liners
c. Bench or Stools

Station 6:
a. Containers (20-30 Gallons)
b. Plastic Liners

Station 7:
a. Containers (20-30 Gallons)
b. Decon Solution or Detergent Water
c. 2-3 Long-Handled, Soft-Bristled Scrub Brushes

Station 8:
a. Containers (20-30 Gallons)
OR
High-Pressure Spray Unit
b. Water
c. 2-3 Long-Handled, Soft-Bristled Scrub Brushes

Station 9:
a. Air Tanks or Face Masks and Cartridge Depending on Level
b. Tape
c. Boot Covers
d. Gloves

Station 10:
a. Containers (20-30 Gallons)
b. Plastic Liners
c. Bench or Stools
d. Boot Jack

Station 11:
a. Rack
b. Drop Cloths
c. Bench or Stools

Station 12:
a. Table

Station 13:
a. Basin or Bucket
b. Decon Solution
c. Small Table

Station 14:
a. Water
b. Basin or Bucket
c. Small Table

Station 15:
a. Containers (20-30 Gallons)
b. Plastic Liners

Station 16:
a. Containers (20-30 Gallons)
b. Plastic Liners

Station 17:
a. Containers (20-30 Gallons)
b. Plastic Liners

Station 18:
a. Water
b. Soap
c. Small Table
d. Basin or Bucket
e. Field Showers
f. Towels

Station 19:
a. Dressing Trailer is Needed in Inclement Weather
b. Tables
c. Chairs
d. Lockers
e. Cloths

EQUIPMENT NEEDED TO PERFORM MINIMUM DECONTAMINATION MEASURES FOR LEVELS A, B, AND C

Station 1:
a. Various Size Containers
b. Plastic Liners
c. Plastic Drop Cloths

Station 2:
a. Containers (20-30 Gallons)
b. Decon Solution
c. Rinse Water
d. 2-3 Long-Handled, Soft-Bristled Scrub Brushes

Station 3:
a. Containers (20-30 Gallons)
b. Plastic Liners
c. Bench or Stools

Station 4:
a. Air Tanks or Masks and Cartridges Depending Upon Level
b. Tape
c. Boot Covers
d. Gloves

Station 5:
a. Containers (20-30 Gallons)
b. Plastic Liners
c. Bench or Stools

Station 6:
a. Plastic Sheets
b. Basin or Bucket
c. Soap and Towels
d. Bench or Stools

Station 7:
a. Water
b. Soap

FSOP 7: MAXIMUM MEASURES FOR LEVEL A DECONTAMINATION

Station 1: Segregated Equipment Drop	1. Deposit equipment used on site (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths or in different containers with plastic liners. During hot weather operations, a cool down station may be set up within this area.
Station 2: Boot Cover and Glove Wash	2. Scrub outer boot covers and gloves with decon solution or detergent/water.
Station 3: Boot Cover and Glove Rinse	3. Rinse off decon solution from station 2 using copious amounts of water.
Station 4: Tape Removal	4. Remove tape around boots and gloves and deposit in container with plastic liner.
Station 5: Boot Cover Removal	5. Remove boot covers and deposit in container with plastic liner.
Station 6: Outer Glove Removal	6. Remove outer gloves and deposit in container with plastic liner.
Station 7: Suit and Boot Wash	7. Wash encapsulating suit and boots using scrub brush and decon solution or detergent/water. Repeat as many times as necessary.
Station 8: Suit and Boot	8. Rinse off decon solution using water. Repeat as many times as necessary.
Station 9: Tank Change	9. If an air tank change is desired, this is the last step in the decontamination procedure. Air tank is exchanged, new outer gloves and boot covers donned, and joints taped. Worker returns to duty.
Station 10: Safety Boot Removal	10. Remove safety boots and deposit in container with plastic liner.
Station 11: Fully Encapsulating Suit and Hard Hat Removal	11. Fully encapsulated suit is removed with assistance of a helper and laid out on a drop cloth or hung up. Hard hat is removed. Hot weather rest station maybe set up within this area for personnel returning to site.
Station 12: SCBA Backpack Removal	12. While still wearing facepiece, remove backpack and place on table. Disconnect hose from regulator valve and proceed to next station.
Station 13: Inner Glove Wash	13. Wash with decon solution that will not harm the skin. Repeat as often as necessary.
Station 14: Inner Glove Rinse	14. Rinse with water. Repeat as many times as necessary.
Station 15: Face Piece Removal	15. Remove face piece. Deposit in container with plastic liner. Avoid touching face with fingers.
Station 16: Inner Glove Removal	16. Remove inner gloves and deposit in container with liner.

FSOP 7: MAXIMUM MEASURES FOR LEVEL A DECONTAMINATION

Station 17: Inner Clothing Removal	17. Remove clothing and place in lined container. Do not wear inner clothing off-site since there is a possibility that small amounts of contaminants might have been transferred in removing the fully-encapsulating suit.
Station 18: Field Wash	18. Shower if highly toxic, skin-corrosive or skin-absorbable materials are known or suspected to be present. Wash hands and face if shower is not available.
Station 19: Redress	19. Put on clean clothes.

FSOP 7: MINIMUM MEASURES FOR LEVEL A DECONTAMINATION

Station 1: Equipment Drop	1. Deposit equipment used on-site (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths. Segregation at the drop reduces the probability of cross contamination. During hot weather operations, cool down stations maybe set up within this area.
Station 2: Outer Garment, Boots, and Gloves Wash and Rinse	2. Scrub outer boots, outer gloves and fully-encapsulating suit with decon solution or detergent and water. Rinse off using copious amounts of water.
Station 3: Outer Boot and Glove Removal	3. Remove outer boots and gloves. Deposit in container with plastic liner.
Station 4: Tank Change	4. If worker leaves Exclusion Zone to change air tank, this is the last step in the decontamination procedure. Worker's air tank is exchanged, new outer gloves and boot covers donned, joints taped, and worker returns to duty.
Station 5: Boot, Gloves and Outer Garment Removal	5. Boots, fully-encapsulating suit, inner gloves removed and deposited in separate containers lined with plastic.
Station 6: SCBA Removal	6. SCBA backpack and facepiece is removed (avoid touching face with fingers). SCBA deposited on plastic sheets.
Station 7: Field Wash	7. Hands and face are thoroughly washed. Shower as soon as possible.

FSOP 7: MAXIMUM MEASURES FOR LEVEL B DECONTAMINATION

Station 1: Segregated Equipment Drop	1. Deposit equipment used on site (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths or in different containers with plastic liners. Segregation at the drop reduces the probability of cross-contamination. During hot weather operations, cooldown stations may be set up within this area.
Station 2: Boot Cover and Glove Wash	2. Scrub outer boot covers and gloves with decon solution or detergent and water.
Station 3: Boot Cover and Glove Rinse	3. Rinse off decon solution from station 2 using copious amounts of water.
Station 4: Tape Removal	4. Remove tape around boots and gloves and deposit in container with plastic liner.
Station 5: Boot Cover Removal	5. Remove boot covers and deposit in container with plastic liner.
Station 6: Outer Glove removal	6. Remove outer gloves and deposit in container with plastic liner.
Station 7: Suit and Safety Boot Wash	7. Wash chemical-resistant splash suit, SCBA, gloves and safety boots. Scrub with long-handle scrub brush and decon solution. Wrap SCBA regulator (if belt mounted type) with plastic to keep out water. Wash backpack assembly with sponges or cloths.
Station 8: Suit, SCBA, Boot, and Glove Rinse	8. Rinse off decon solution using copious amounts of water.
Station 9: Tank Change	9. If worker leaves exclusion zone to change air tank, this is the last step in the decontamination procedure. Worker's air tank is exchanged, new outer gloves and boot covers donned, and joints taped. Worker returns to duty.
Station 10: Safety Boot Removal	10. Remove safety boots and deposit in container with plastic liner.
Station 11: SCBA Backpack Removal	11. While still wearing facepiece, remove backpack and place on table. Disconnect hose from regulator valve.
Station 12: Splash Suit Removal	12. With assistance of helper, remove splash suit. Deposit in container with plastic liner.
Station 13: Inner Glove Wash	13. Wash inner gloves with decon solution.
Station 14: Inner Glove Rinse	14. Rinse inner gloves with water.
Station 15: Face Piece Removal	15. Remove face piece. Deposit in container with plastic liner. Avoid touching face with fingers.
Station 16: Inner Glove Removal	16. Remove inner gloves and deposit in container with liner.

FSOP 7: MAXIMUM MEASURES FOR LEVEL B DECONTAMINATION

Station 17: Inner Clothing Removal	17. Remove inner clothing. Place in container with liner. Do not wear inner clothing off-site since there is a possibility that small amounts of contaminants might have been transferred in removing the fully-encapsulating suit.
Station 18: Field Wash	18. Shower if highly toxic, skin-corrosive or skin-absorbable materials are known or suspected to be present. Wash hands and face if shower is not available.
Station 19: Redress	19. Put on clean clothes.

FSOP 7: MINIMUM MEASURES FOR LEVEL B DECONTAMINATION

Station 1: Equipment Drop	1. Deposit equipment used on-site (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths. Segregation at the drop reduces the probability of cross contamination. During hot weather operations, cool down station may be set up within this area.
Station 2: Outer Garment, Boots, and Gloves Wash and Rinse	2. Scrub outer boots, outer gloves and chemical-resistant splash suit with decon solution or detergent water. Rinse off using copious amounts of water.
Station 3: Outer Boot and Glove Removal	3. Remove outer boots and gloves. Deposit in container with plastic liner.
Station 4: Tank Change	4. If worker leaves exclusive zone to change air tank, this is the last step in the decontamination procedure. Worker's air tank is exchanged, new outer gloves and boot covers donned, joints taped, and worker returns to duty.
Station 5: Boot, Gloves and Outer Garment Removal	5. Boots, chemical-resistant splash suit, inner gloves removed and deposited in separate containers lined with plastic.
Station 6: SCBA Removal	6. SCBA backpack and facepiece is removed. Avoid touching face with finger. SCBA deposited on plastic sheets.
Station 7: Field Wash	7. Hands and face are thoroughly washed. Shower as soon as possible.

FSOP 7: MAXIMUM MEASURES FOR LEVEL C DECONTAMINATION

Station 1: Segrated Equipment Drop	1. Deposit equipment used on site (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths or in different containers with plastic liners. Segregation at the drop reduces the probability of cross contamination. During hot weather operations, a cool down station may be set up within this area.
Station 2: Boot Cover and Glove Wash	2. Scrub outer boot covers and gloves with decon solution or detergent and water.
Station 3: Boot Cover and Glove Rinse	3. Rinse off decon solution from station 2 using copious amounts of water.
Station 4: Tape Removal	4. Remove tape around boots and gloves and deposit in container with plastic liner.
Station 5: Boot Cover Removal	5. Remove boot covers and deposit in containers with plastic liner.
Station 6: Outer Glove Removal	6. Remove outer gloves and deposit in container with plastic liner.
Station 7: Suit and Boot Wash	7. Wash splash suit, gloves, and safety boots. Scrub with long-handle scrub brush and decon solution.
Station 8: Suit and Boot, and Glove Rinse	8. Rinse off decon solution using water. Repeat as many times as necessary.
Station 9: Canister or Mask Change	9. If worker leaves exclusion zone to change canister (or mask), this is the last step in the decontamination procedure. Worker's canister is exchanged, new outer gloves and boot covers donned, and joints taped worker returns to duty.
Station 10: Safety Boot Removal	10. Remove safety boots and deposit in container with plastic liner.
Station 11: Splash Suit Removal	11. With assistance of helper, remove splash suit. Deposit in container with plastic liner.
Station 12: Inner Glove Rinse	12. Wash inner gloves with decon solution.
Station 13: Inner Glove Wash	13. Rinse inner gloves with water.
Station 14: Face Piece Removal	14. Remove face piece. Deposit in container with plastic liner. Avoid touching face with fingers.
Station 15: Inner Glove Removal	15. Remove inner gloves and deposit in lined container.

FSOP 7: MAXIMUM MEASURES FOR LEVEL C DECONTAMINATION

Station 16: Inner Clothing Removal	16. Remove clothing soaked with perspiration and place in lined container. Do not wear inner clothing off-site since there is a possibility that small amounts of contaminants might have been transferred in removing the fully-encapsulating suit.
Station 17: Field Wash	17. Shower if highly toxic, skin-corrosive or skin-absorbable materials are known or suspected to be present. Wash hands and face if shower is not available.
Station 18: Redress	18. Put on clean clothes.

FSOP 7: MINIMUM MEASURES FOR LEVEL C DECONTAMINATION

Station 1: Equipment Drop	1. Deposit equipment used on-site (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths. Segregation at the drop reduces the probability of cross contamination. During hot weather operations, a cool down station may be set up within this area.
Station 2: Outer Garment, Boots, and Gloves Wash and Rinse	2. Scrub outer boots, outer gloves and splash suit with decon solution or detergent water. Rinse off using copious amounts of water.
Station 3: Outer Boot and Glove Removal	3. Remove outer boots and gloves. Deposit in container with plastic liner.
Station 4: Canister or Mask Change	4. If worker leaves exclusive zone to change canister (or mask), this is the last step in the decontamination procedure. Worker's canister is exchanged, new outer gloves and boot covers donned, joints taped, and worker returns to duty.
Station 5: Boot, Gloves and Outer Garment Removal	5. Boots, chemical-resistant splash suit, inner gloves removed and deposited in separate containers lined with plastic.
Station 6: Face Piece Removal	6. Facepiece is removed. Avoid touching face with fingers. Facepiece deposited on plastic sheet.
Station 7: Field Wash	7. Hands and face are thoroughly washed. Shower as soon as possible.

Attachment IV– Heat Stress

Heat Stress Prevention Program

1.0 Purpose

This Heat Stress Prevention Program has been developed to provide workers with the training and equipment necessary to protect them from heat related exposures and illnesses.

2.0 Training

All employees who are or may be exposed to potential heat related illnesses will receive training on the following:

- The environmental and personal risk factors that cause heat related illnesses;
- The employer's procedures for identifying, evaluating and controlling exposures to the environmental and personal risk factors for heat illness;
- The importance of frequent consumption of small quantities of water, up to 4 cups per hour under extreme conditions of work and heat;
- The importance of acclimatization;
- The different types of heat illness and the common signs and symptoms of heat illness;
- The importance of immediately reporting to the employer, directly or through the employee's supervisor, symptoms or signs of heat illness in themselves, or in co-workers.
- The employer's procedures for responding to symptoms of possible heat illness, including how emergency medical services will be provided should they become necessary;
- Procedures for contacting emergency medical services, and if necessary, for transporting employees to a point where they can be reached by an emergency medical service provider;
- How to provide clear and precise directions to the work site.

3.0 Supervisor Responsibilities

- All supervisors will be provided a copy of this program and training documents prior to assignment of employees working in environments where heat exposures may occur.
- Supervisors will be provided the procedures to follow to implement the applicable provisions of this program.
- Supervisors will be provided the procedures to follow when an employee exhibits symptoms consistent with possible heat illness, including emergency response procedures.

4.0 Provision of Water

Employees shall have access to potable water. Water shall be provided in sufficient quantity at the beginning of the work shift to provide one quart per employee per hour for drinking the entire shift

for a total of 2 gallons per employee per 8-hour shift. Employees may begin the shift with smaller quantities of water if effective procedures for replenishment of water during the shift have been implemented to provide employees one quart or more per hour.

5.0 Access to Shade

Employees suffering from heat illness or believing a preventative recovery period is needed shall be provided access to an area with shade that is either open to the air or provided with ventilation or cooling for a period of no less than five minutes. Such access to shade shall be permitted at all times. Shade areas can include trees, buildings, canopies, lean-tos, or other partial and/or temporary structures that are either ventilated or open to air movement. The interior of cars or trucks are not considered shade unless the vehicles are air conditioned or kept from heating up in the sun in some other way.

6.0 Heat Stress Disorders

6.1 Heat Rash (Prickly Heat)

Symptoms:
- Red blotches and extreme itchiness in areas persistently damp with sweat.
- Prickling sensation on the skin when sweating occurs.

Treatment:
- Cool environment.
- Cool shower.
- Thorough drying.

Heat rashes typically disappear in a few days after exposure. If the skin is not cleaned frequently enough the rash may become infected.

6.2 Heat Cramps

Symptoms:
- Loss of salt through excessive sweating.
- Cramping in back, legs and arms.

Treatment:
- Stretch and massage muscles.
- Replace salt by drinking commercially available carbohydrate/electrolyte replacement fluids.

6.3 Heat Exhaustion

Heat exhaustion occurs when the body can no longer keep blood flowing to supply vital organs and at the same time send blood to the skin to reduce body temperature.

Symptoms:
- Weakness.
- Difficulty continuing work.
- Headache.
- Breathlessness.
- Nausea or vomiting.
- Feeling faint or actually fainting.

Treatment:
- Call 911.

Help the victim to cool off by:
- Resting in a cool place.
- Drinking cool water.
- Removing unnecessary clothing.
- Loosening clothing.
- Showering or sponging with cool water.

It takes 30 minutes to cool the body down once a worker becomes overheated and suffers heat exhaustion.

6.4 Heat Stroke

Heat stroke occurs when the body can no longer cool itself and body temperature rises to critical levels.

Symptoms:
- Confusion.
- Irrational behavior.
- Loss of consciousness.
- Convulsions.
- Lack of sweating.
- Hot, dry skin.
- Abnormally high body temperature.

Treatment:
- Call 911.

Provide immediate, aggressive, general cooling.
- Immerse victim in tub of cool water or;
- Place in cool shower; or
- Spray with cool water from a hose; or
- Wrap victim in cool, wet sheets and fan rapidly.
- Transport victim to hospital.

Do not give anything by mouth to an unconscious victim.

7.0 Safe Work Procedures

7.1 Supervisors Responsibilities

Supervisors are responsible for performing the following:

- Give workers frequent breaks in a cool area away from heat.
- Adjust work practices as necessary when workers complain of heat stress.
- Oversee heat stress training and acclimatization for new workers and for workers who have been off the job for a period of time.
- Monitor the workplace to determine when hot conditions arise.
- Increase air movement by using fans where possible.
- Provide potable water in required quantities.
- Determine whether workers are drinking enough water.
- Make allowances for workers who must wear personal protective clothing (welders, etc.) and equipment that retains heat and restricts the evaporation of sweat.
- Schedule hot jobs for the cooler part of the day; schedule routine maintenance and repair work in hot areas for the cooler times of the day.
- Make available to all workers, cooling devices (hard hat liners/bibs/neck bands) to help rid bodies of excessive heat.

7.2 Workers

Workers are responsible for performing the following:

- Follow instructions and training for controlling heat stress.
- Be alert to symptoms in yourself and others.
- Determine if any prescription medications you're required to take can increase heat stress.
- Wear light, loose-fitting clothing that permits the evaporation of sweat.
- Wear light colored garments that absorb less heat from the sun.
- Drink small amounts of water – approximately 1 cup every 15 minutes.
- Avoid beverages such as tea or coffee.
- Avoid eating hot, heavy meals.
- Do not take salt tablets unless prescribed by a physician.
- Review Attachment 1 for additional information.

8.0 Program Review

The Safety Director will periodically review this program for compliance with all applicable regulatory standards. Updates will be provided to all employees.

Attachment 1

Heat Illness Prevention
Guidance for Workers

Awareness of heat illness symptoms can save your like or the life of a co-worker. The following provides valuable information concerning heat-related illnesses and preventative measures.

- If you are coming back to work from an illness or an extended break or you are just starting a job working in the heat, it is important to be aware that you are more vulnerable to heat stress until your body has time to adjust. Let your employer know you are not used to the heat. It takes about 5-7 days for your body to adjust.

- Drinking plenty of water frequently is vital for workers exposed to the heat. An individual may produce as much as 2 to 3 gallons of sweat per day. In order to replenish that fluid, you should drink 3 to 4 cups of water every hour starting at the beginning of your shift.

- Taking your breaks in a cool shaded area and allowing time for recovery from the heat during the day are effective ways to avoid a heat-related illness.

- Avoid or limit the use of alcohol and caffeine during periods of extreme heat. Both dehydrate the body.

- If you or a co-worker start to feel symptoms such as nausea, dizziness, weakness or unusual fatigue, let your supervisor know and rest in a cool shaded area. If symptoms persist or worsen seek immediate medical attention.

- Whenever possible, wear clothing that provides protection from the sun but allows airflow to the body. Protect your head and shade your eyes if working outdoors.

- When working in the heat pay extra attention to your co-workers and be sure you know how to call for medical attention.

Attachment V – Cold Stress

Cold Stress Prevention

Definitions

Hypothermia: a condition where a person's body loses heat faster than it can be produced. If body temperature drops to 95° F uncontrollable shivers occur. If cooling continues, other symptoms may occur:

- Vague, slow, slurred speech
- Forgetfulness, memory lapses
- Inability to use hands
- Frequent stumbling
- Drowsiness
- Impairment of judgement

Frostbite: A condition where part of the body is frozen. Some of the symptoms include:

- Loss of sensations of touch, pressure and pain (may occur without awareness of any numbness or other sensation)
- Just before freezing, the skin becomes bright red
- At freezing, small patches of white appear on skin
- Skin becomes more elastic

General Requirements

Cold, wet, windy conditions make prime hypothermia weather. Precautions must be taken to keep warm.

In cold environments employees will test for symptoms of hypothermia and frostbite often and wear clothing that is loose and does not restrict the flow of blood to the limbs.

If an employee suspects a co-worker has experienced frostbite, they will seek medical attention immediately.

Workers will wear warm clothing, such as mittens, heavy socks, etc. when the air temperature is below 45° F. Chemical protective clothing, if required on the project, may be used to partially protect the employee from the cold.

When the air temperature is below 30 to 40° F (depending on the employee comfort), clothing for warmth, in addition to chemical protective clothing where necessary must be worn. This would include insulated suits, thermal underwear, wool socks or polypropylene socks to keep the moisture off the feet; insulated gloves, insulated boots, and insulated head cover, such as knit caps.

At air temperatures below 35° F, the following work practices will apply:

- If the outer layer of clothing could become wet then the outer layer of clothing will be an impermeable layer.

- If an employee's underclothing becomes wet then the employee will change into dry clothing immediately.
- When possible, employees will be provided a warm (65° F or above) break area and place to change out of work clothing.
- If appropriate, space heaters will be provided in the work area to warm the hands, feet, etc. Necessary fire and electrical safety practices will be observed when using space heaters. Space heaters will be shut off when the site is not occupied.
- The buddy system will be practiced at all times. An employee observed with severe shivering will leave the cold area immediately.
- Employees will avoid overdressing when going into warm area or when performing activities that are strenuous. This could lead to heat stress.
- Employees handling volatile liquids (gasoline, acetone, alcohol etc.) will take special precautions to avoid soaking clothing or gloves with the liquids to avoid the effect of evaporative cooling.
- Work will be conducted to avoid sitting or standing for long periods of time.

Attachment VI–Accident/Incident Report

ACCIDENT/INCIDENT REPORT

DATE OF REPORT:_____

INJURED: _____

EMPLOYER: _____

SITE:_____SITE LOCATION: _____

REPORT PREPARED BY: _____ _____

Signature Title

ACCIDENT/INCIDENT CATEGORY (check all that apply)

___Injury	___Illness	___Near Miss
___ Properly Damage	___Fire	___Chemical Exposure
___Onsite Equipment	___Motor Vehicle	___Electrical
___Mechanical	___Other	

DATE AND TIME OF ACCIDENT/INCIDENT: Narrative Report of Accident/Incident: Identify: 1) actions leading to or contributing to the accident/incident; 2) the accident/incident occurrence; and 3) actions following the accident/incident.

_____

_____

_____

_____

_____

_____

_____

_____

_____

WITNESS TO ACCIDENT/INCIDENT:

1. Name_____ Company:_____

   Address:_____

   Phone No.:_____

2. Name_____ Company:_____

   Address:_____

   Phone No.:_____

INJURED - ILL

Name: _____

Address:_____

SSN: _____ Age:_____

Length of Service: _____Time on Present Job: _____

Title/Classification: _____

SEVERITY OF INJURY OR ILLNESS:

___Disabling ___Non-disabling ___Fatality

___Medical Treatment ___First Aid Only

ESTIMATED NUMBER OF DAYS AWAY FROM JOB:_____

NATURE OF INJURY OR ILLNESS:_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

CLASSIFICATION OF INJURY:

___Abrasions	___Dislocations	___Punctures
___Bites	___Faint/Dizziness	__ Radiation Bums
___Blisters	___Fractures	___Respiratory Allergy
___Bruises	___Frostbite	___Sprains
___Chemical Bums	___Heat Burns	___Toxic Resp. Exposure
___Cold Exposure	___Heat Exhaustion	___Toxic Ingestion
___Concussion	___Heat Stroke	___Dermal Allergy
___Lacerations		

Part of Body Affected: _____

Degree of Disability:_____

Date Medical Care was Received: _____

Where Medical Care was Received:_____

Address (if off-site):_____

(If two or more injuries, record on separate sheets)

PROPERTY DAMAGE

Description of Damage: _____

_____

_____

Estimated cost of damage: $_____

ACCIDENT/INCIDENT LOCATION:_____

ACCIDENT/INCIDENT ANALYSIS: Causative agent most directly related to accident/incident (Object, substance, material, machinery, equipment, conditions): _____

_____

_____

_____

_____

_____

Was weather a factor? : _____

Unsafe mechanical/physical/environmental condition at time of accident/incident (Be specific):__

Personal factors (Attitude, knowledge or skill, reaction time, fatigue): _____

ON SITE ACCIDENTS/INCIDENTS

Level of personal protection equipment required in Site Safety Plan:

Modifications:_____

Was injured using required equipment? :_____

If not, how did actual equipment use differ from plan? : _____

ACTION TAKEN TO PREVENT RECURRENCE: (Be specific. What was or will be done? When will it be done? Who is the responsible party to insure that the correction is made?)_____

ACCIDENT/INCIDENT REPORT REVIEWED BY:

HSO Name Printed HSO Signature

OTHERS PARTICIPATING IN INVESTIGATION:

Signature Title

Signature Title

Signature Title

ACCIDENT/INCIDENT FOLLOW-UP Date:

Outcome of accident/incident:

Physician's recommendations:_____

_____

_____

_____

_____

_____

Date injured returned to work:_____

Follow-up performed by:

_____ _____

Signature Title

ATTACH ANY ADDITIONAL INFORMATION TO THIS FORM

Attachment VII – OSHA Form

U.S. Department of Labor
Occupational Safety and Health Administration

OSHA
Forms for Recording
Work-Related Injuries and Illnesses

Dear Employer:

This booklet includes the forms needed for maintaining occupational injury and illness records. Many but not all employers must complete the OSHA injury and illness recordkeeping forms on an ongoing basis. Employers in State Plan States should check with their State Plan to see if the exemptions below apply.

Employers with 10 or fewer employees throughout the previous calendar year do not need to complete these forms. Said another way, if there are more than 10 employees at any time during that calendar year, the employer may come under the requirement. When counting employees, you must include full-time, part-time, temporary, and seasonal workers. This exemption is based on the employment of the entire company rather than the establishment. For example, if a company has two establishments, one with 5 employees and one with 7 employees, the company must fill out the forms for each establishment because the company employment is greater than 10.

In addition to the small employer exemption, there is an exemption for establishments classified in certain industries. For example, the forms do not need to be completed for restaurants, banks, and medical offices. A complete list of exempt industries can be found on the OSHA web page at www.osha.gov.

Establishments normally exempt from keeping the OSHA forms must complete the forms if they are informed in writing to do so by the Bureau of Labor Statistics or OSHA. Also, exempt establishments must report to OSHA within 8 hours any work-related fatality or within 24 hours any work-related in-patient hospitalization, amputation, or loss of an eye.

The Occupational Safety and Health Administration shares with you the goal of preventing injuries and illnesses in our nation's workplaces. Accurate injury and illness records will help us achieve that goal.

Occupational Safety and Health Administration
U.S. Department of Labor

What's Inside...

In this package, you'll find everything you need to complete OSHA's *Log* and the *Summary of Work-Related Injuries and Illnesses* for the next several years. On the following pages, you'll find:

- *An Overview: Recording Work-Related Injuries and Illnesses* — General instructions for filling out the forms in this package and definitions of terms you should use when you classify your cases as injuries or illnesses.
- *How to Fill Out the Log* — An example to guide you in filling out the *Log* properly.
- *Log of Work-Related Injuries and Illnesses* — Several pages of the *Log* (but you may make as many copies of the *Log* as you need.) Notice that the *Log* is separate from the *Summary*.



- *Summary of Work-Related Injuries and Illnesses* — Removable *Summary* pages for easy posting at the end of the year. Note that you post the *Summary* only, not the *Log*.



- *Worksheet to Help You Fill Out the Summary* — A worksheet for figuring the average number of employees who worked for your establishment and the total number of hours worked.
- *OSHA's 301: Injury and Illness Incident Report* — A copy of the OSHA 301 to provide details about the incident. You may make as many copies as you need or use an equivalent form.



Take a few minutes to review this package. If you have any questions, visit us online at www.osha.gov or call your local OSHA office. We'll be happy to help you.

U.S. Department of Labor
Occupational Safety and Health Administration

An Overview: Recording Work-Related Injuries and Illnesses

The Occupational Safety and Health (OSH) Act of 1970 requires certain employers to prepare and maintain records of work-related injuries and illnesses. Use these definitions when you classify cases on the Log. OSHA's recordkeeping regulation (see 29 CFR Part 1904) provides more information about the definitions below.

The *Log of Work-Related Injuries and Illnesses* (Form 300) is used to classify work-related injuries and illnesses and to note the extent and severity of each case. When an incident occurs, use the *Log* to record specific details about what happened and how it happened. The *Summary* — a separate form (Form 300A) — shows the totals for the year in each category. At the end of the year, post the *Summary* in a visible location so that your employees are aware of the injuries and illnesses occurring in their workplace.

Employers must keep a *Log* for each establishment or site. If you have more than one establishment, you must keep a separate *Log* and *Summary* for each physical location that is expected to be in operation for one year or longer.

Note that your employees have the right to review your injury and illness records. For more information, see 29 Code of Federal Regulations Part 1904.35, *Employee Involvement.*

Cases listed on the *Log of Work-Related Injuries and Illnesses* are not necessarily eligible for workers' compensation or other insurance benefits. Listing a case on the *Log* does not mean that the employer or worker was at fault or that an OSHA standard was violated.

When is an injury or illness considered work-related?

An injury or illness is considered work-related if an event or exposure in the work environment caused or contributed to the condition or significantly aggravated a preexisting condition. Work-relatedness is presumed for injuries and illnesses resulting from events or exposures occurring in the workplace, unless an exception specifically applies. See 29 CFR Part 1904.5(b)(2) for the exceptions. The work environment includes the establishment and other locations where one or more employees are working or are present as a condition of their employment. See 29 CFR Part 1904.5(b)(1).

Which work-related injuries and illnesses should you record?

Record those work-related injuries and illnesses that result in:

- death,
- loss of consciousness,
- days away from work,
- restricted work activity or job transfer, or
- medical treatment beyond first aid.

You must also record work-related injuries and illnesses that are significant (as defined below) or meet any of the additional criteria listed below.

You must record any significant work-related injury or illness that is diagnosed by a physician or other licensed health care professional. You must record any work-related case involving cancer, chronic irreversible disease, a fractured or cracked bone, or a punctured eardrum. See 29 CFR 1904.7.

What are the additional criteria?

You must record the following conditions when they are work-related:

- any needlestick injury or cut from a sharp object that is contaminated with another person's blood or other potentially infectious material;
- any case requiring an employee to be medically removed under the requirements of an OSHA health standard;
- tuberculosis infection as evidenced by a positive skin test or diagnosis by a physician or other licensed health care professional after exposure to a known case of active tuberculosis;
- an employee's hearing test (audiogram) reveals 1) that the employee has experienced a Standard Threshold Shift (STS) in hearing in one or both ears (averaged at 2000, 3000, and 4000 Hz) and 2) the employee's total hearing level is 25 decibels (dB) or more above audiometric zero (also averaged at 2000, 3000, and 4000 Hz) in the same ear(s) as the STS.

What is medical treatment?

Medical treatment includes managing and caring for a patient for the purpose of combating disease or disorder. The following are not considered medical treatments and are NOT recordable:

- visits to a doctor or health care professional solely for observation or counseling;

What do you need to do?

1. Within 7 calendar days after you receive information about a case, decide if the case is recordable under the OSHA recordkeeping requirements.
2. Determine whether the incident is a new case or a recurrence of an existing one.
3. Establish whether the case was work-related.
4. If the case is recordable, decide which form you will fill out as the injury and illness incident report.

   You may use *OSHA's 301: Injury and Illness Incident Report* or an equivalent form. Some state workers compensation, insurance, or other reports may be acceptable substitutes, as long as they provide the same information as the OSHA 301.

How to work with the Log

1. Identify the employee involved unless it is a privacy concern case as described below.
2. Identify when and where the case occurred.
3. Describe the case, as specifically as you can.
4. Classify the seriousness of the case by recording the **most serious outcome** associated with the case, with column G (Death) being the most serious and column J (Other recordable cases) being the least serious.
5. Identify whether the case is an injury or illness. If the case is an injury, check the injury category. If the case is an illness, check the appropriate illness category.

- diagnostic procedures, including administering prescription medications that are used solely for diagnostic purposes; and
- any procedure that can be labeled first aid. (*See below for more information about first aid.)*

What is first aid?

If the incident required only the following types of treatment, consider it first aid. Do NOT record the case if it involves only:

- using non-prescription medications at non-prescription strength;
- administering tetanus immunizations;
- cleaning, flushing, or soaking wounds on the skin surface;
- using wound coverings, such as bandages, BandAids™, gauze pads, etc., or using SteriStrips™ or butterfly bandages;
- using hot or cold therapy;
- using any totally non-rigid means of support, such as elastic bandages, wraps, non-rigid back belts, etc.;
- using temporary immobilization devices while transporting an accident victim (splints, slings, neck collars, or back boards);
- drilling a fingernail or toenail to relieve pressure, or draining fluids from blisters;
- using eye patches;
- using simple irrigation or a cotton swab to remove foreign bodies not embedded in or adhered to the eye;
- using irrigation, tweezers, cotton swab or other simple means to remove splinters or foreign material from areas other than the eye;
- using finger guards;
- using massages;
- drinking fluids to relieve heat stress.

How do you decide if the case involved restricted work?

Restricted work activity occurs when, as the result of a work-related injury or illness, an employer or health care professional keeps, or recommends keeping, an employee from doing the routine functions of his or her job or from working the full workday that the employee would have been scheduled to work before the injury or illness occurred.

How do you count the number of days of restricted work activity or the number of days away from work?

Count the number of calendar days the employee was on restricted work activity or was away from work as a result of the recordable injury or illness. Do not count the day on which the injury or illness occurred in this number. Begin counting days from the day **after** the incident occurs. If a single injury or illness involved both days away from work and days of restricted work activity, enter the total number of days for each. You may stop counting days of restricted work activity or days away from work once the total of either or the combination of both reaches 180 days.

Under what circumstances should you NOT enter the employee's name on the OSHA Form 300?

You must consider the following types of injuries or illnesses to be privacy concern cases:

- an injury or illness to an intimate body part or to the reproductive system,
- an injury or illness resulting from a sexual assault,
- a mental illness,
- a case of HIV infection, hepatitis, or tuberculosis,
- a needlestick injury or cut from a sharp object that is contaminated with blood or other potentially infectious material (see 29 CFR Part 1904.8 for definition), and
- other illnesses, if the employee independently and voluntarily requests that his or her name not be entered on the log.

You must not enter the employee's name on the OSHA 300 *Log* for these cases. Instead, enter "privacy case" in the space normally used for the employee's name. You must keep a separate, confidential list of the case numbers and employee names for the establishment's privacy concern cases so that you can update the cases and provide information to the government if asked to do so.

If you have a reasonable basis to believe that information describing the privacy concern case may be personally identifiable even though the employee's name has been omitted, you may use discretion in describing the injury or illness on both the OSHA 300 and 301 forms. You must enter enough information to identify the cause of the incident and the general severity of the injury or illness, but you do not need to include details of an intimate or private nature.

What if the outcome changes after you record the case?

If the outcome or extent of an injury or illness changes after you have recorded the case, simply draw a line through the original entry or, if you wish, delete or white-out the original entry. Then write the new entry where it belongs. Remember, you need to record the most serious outcome for each case.

Classifying injuries

An injury is any wound or damage to the body resulting from an event in the work environment.

Examples: Cut, puncture, laceration, abrasion, fracture, bruise, contusion, chipped tooth, amputation, insect bite, electrocution, or a thermal, chemical, electrical, or radiation burn. Sprain and strain injuries to muscles, joints, and connective tissues are classified as injuries when they result from a slip, trip, fall or other similar accidents.

U.S. Department of Labor
Occupational Safety and Health Administration

Classifying illnesses

Skin diseases or disorders

Skin diseases or disorders are illnesses involving the worker's skin that are caused by work exposure to chemicals, plants, or other substances.

Examples: Contact dermatitis, eczema, or rash caused by primary irritants and sensitizers or poisonous plants; oil acne; friction blisters, chrome ulcers; inflammation of the skin.

Respiratory conditions

Respiratory conditions are illnesses associated with breathing hazardous biological agents, chemicals, dust, gases, vapors, or fumes at work.

Examples: Silicosis, asbestosis, pneumonitis, pharyngitis, rhinitis or acute congestion; farmer's lung, beryllium disease, tuberculosis, occupational asthma, reactive airways dysfunction syndrome (RADS), chronic obstructive pulmonary disease (COPD), hypersensitivity pneumonitis, toxic inhalation injury, such as metal fume fever, chronic obstructive bronchitis, and other pneumoconioses.

Poisoning

Poisoning includes disorders evidenced by abnormal concentrations of toxic substances in blood, other tissues, other bodily fluids, or the breath that are caused by the ingestion or absorption of toxic substances into the body.

Examples: Poisoning by lead, mercury, cadmium, arsenic, or other metals; poisoning by carbon monoxide, hydrogen sulfide, or other gases; poisoning by benzene, benzol, carbon tetrachloride, or other organic solvents; poisoning by insecticide sprays, such as parathion or lead arsenate; poisoning by other chemicals, such as formaldehyde.

Hearing Loss

Noise-induced hearing loss is defined for recordkeeping purposes as a change in hearing threshold relative to the baseline audiogram of an average of 10 dB or more in either ear at 2000, 3000 and 4000 hertz, and the employee's total hearing level is 25 decibels (dB) or more above audiometric zero (also averaged at 2000, 3000, and 4000 hertz) in the same ear(s).

All other illnesses

All other occupational illnesses.

Examples: Heatstroke, sunstroke, heat exhaustion, heat stress and other effects of environmental heat; freezing, frostbite, and other effects of exposure to low temperatures; decompression sickness; effects of ionizing radiation (isotopes, x-rays, radium); effects of nonionizing radiation (welding flash, ultra-violet rays, lasers); anthrax; bloodborne pathogenic diseases, such as AIDS, HIV, hepatitis B or hepatitis C; brucellosis; malignant or benign tumors; histoplasmosis; coccidioidomycosis.

When must you post the Summary?

You must post the *Summary* only — not the *Log* — by February 1 of the year following the year covered by the form and keep it posted until April 30 of that year.

How long must you keep the Log and Summary on file?

You must keep the *Log* and *Summary* for 5 years following the year to which they pertain.

Do you have to send these forms to OSHA at the end of the year?

No. You do not have to send the completed forms to OSHA unless specifically asked to do so.

How can we help you?

If you have a question about how to fill out the *Log*,

- visit us online at www.osha.gov or
- call your local OSHA office.

U.S. Department of Labor
Occupational Safety and Health Administration

Optional

Calculating Injury and Illness Incidence Rates

Note: You can type input into this form and save it. Because the forms in this recordkeeping package are "fillable/writable" PDF documents, you can type into the input form fields and then save your inputs using the free Adobe PDF Reader. In addition, the forms are programmed to auto-calculate as appropriate.

What is an incidence rate?

An incidence rate is the number of recordable injuries and illnesses occurring among a given number of full-time workers (usually 100 full-time workers) over a given period of time (usually one year). To evaluate your firm's injury and illness experience over time or to compare your firm's experience with that of your industry as a whole, you need to compute your incidence rate. Because a specific number of workers and a specific period of time are involved, these rates can help you identify problems in your workplace and/or progress you may have made in preventing work-related injuries and illnesses.

How do you calculate an incidence rate?

You can compute an occupational injury and illness incidence rate for all recordable cases or for cases that involved days away from work for your firm quickly and easily. The formula requires that you follow instructions in paragraph (a) below for the total recordable cases or those in paragraph (b) for cases that involved days away from work, *and* for both rates the instructions in paragraph (c).

(a) *To find out the total number of recordable injuries and illnesses that occurred during the year,* count the number of line entries on your OSHA Form 300, or refer to the OSHA Form 300A and sum the entries for columns (G), (H), (I), and (J).

(b) *To find out the number of injuries and illnesses that involved days away from work,* count the number of line entries on your OSHA Form 300 that received a check mark in column (H), or refer to the entry for column (H) on the OSHA Form 300A.

(c) *The number of hours all employees actually worked during the year.* Refer to OSHA Form 300A and optional worksheet to calculate this number.

You can compute the incidence rate for all recordable cases of injuries and illnesses using the following formula:

Total number of injuries and illnesses X *200,000* ÷ *Number of hours worked by all employees = Total recordable case rate*

(The 200,000 figure in the formula represents the number of hours 100 employees working 40 hours per week, 50 weeks per year would work, and provides the standard base for calculating incidence rates.)

You can compute the incidence rate for recordable cases involving days away from work, days of restricted work activity or job transfer (DART) using the following formula:

(Number of entries in column H + Number of entries in column I) X *200,000* ÷ *Number of hours worked by all employees = DART incidence rate*

You can use the same formula to calculate incidence rates for other variables such as cases involving restricted work activity (column (I) on Form 300A), cases involving skin disorders (column (M-2) on Form 300A), etc. Just substitute the appropriate total for these cases, from Form 300A, into the formula in place of the total number of injuries and illnesses.

What can I compare my incidence rate to?

The Bureau of Labor Statistics (BLS) conducts a survey of occupational injuries and illnesses each year and publishes incidence rate data by various classifications (e.g., by industry, by employer size, etc.). You can obtain these published data at www.bls.gov/iif or by calling a BLS Regional Office.

Worksheet

Total number of injuries and illnesses			Number of hours worked by all employees		Total recordable case rate
_____	X 200,000	÷	_____	=	_____

Number of entries in Column H + Column I			Number of hours worked by all employees		DART incidence rate
_____	X 200,000	÷	_____	=	_____

Save Input Reset

U.S. Department of Labor
Occupational Safety and Health Administration

How to Fill Out the Log

Note: Because the forms in this recordkeeping package are "fillable/writable" PDF documents, you can type into the input form fields and then save your inputs using the free Adobe PDF Reader. In addition, the forms are programmed to auto-calculate as appropriate.

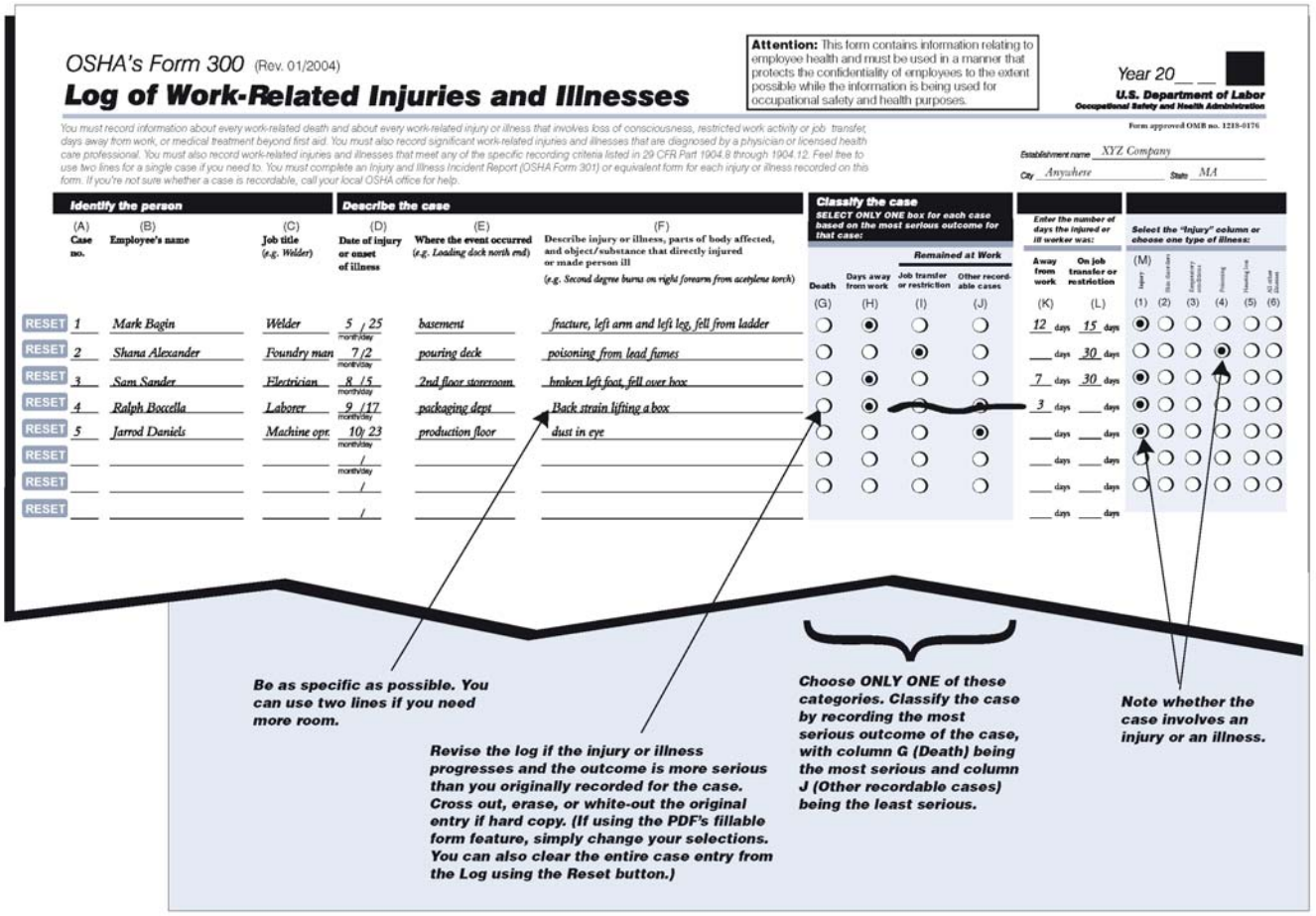
The *Log of Work-Related Injuries and Illnesses* is used to classify work-related injuries and illnesses and to note the extent and severity of each case. When an incident occurs, use the *Log* to record specific details about what happened and how it happened.

If your company has more than one establishment or site, you must keep separate records for each physical location that is expected to remain in operation for one year or longer.

If you need additional copies of the *Log*, you may photocopy the printout or insert additional form pages in the PDF, and then use as many as you need.

The *Summary* — a separate form — shows the work-related injury and illness totals for the year in each category. At the end of the year, count the number of incidents in each category and transfer the totals from the *Log* to the *Summary*. Then post the *Summary* in a visible location so that your employees are aware of injuries and illnesses occurring in their workplace.

You don't post the Log. You post only the Summary at the end of the year.



OSHA's Form 300 (Rev. 01/2004)

Log of Work-Related Injuries and Illnesses

Note: You can type input into this form and save it. Because the forms in this recordkeeping package are "fillable/writable" PDF documents, you can type into the input form fields and then save your inputs using the free Adobe PDF Reader. In addition, the forms are programmed to auto-calculate as appropriate.

Attention: This form contains information relating to employee health and must be used in a manner that protects the confidentiality of employees to the extent possible while the information is being used for occupational safety and health purposes.

Year 20 ___

U.S. Department of Labor
Occupational Safety and Health Administration

You must record information about every work-related death and about every work-related injury or illness that involves loss of consciousness, restricted work activity or job transfer, days away from work, or medical treatment beyond first aid. You must also record significant work-related injuries and illnesses that are diagnosed by a physician or licensed health care professional. You must also record work-related injuries and illnesses that meet any of the specific recording criteria listed in 29 CFR Part 1904.8 through 1904.12. Feel free to use two lines for a single case if you need to. You must complete an Injury and Illness Incident Report (OSHA Form 301) or equivalent form for each injury or illness recorded on this form. If you're not sure whether a case is recordable, call your local OSHA office for help.

Form approved OMB no. 1218-0176

Establishment name _____

City _____ State _____

Identify the person			Describe the case			Classify the case (SELECT ONLY ONE box for each case based on the most serious outcome for that case:)				Enter the number of days the injured or ill worker was:		Select the "Injury" column or choose one type of illness:					
(A) Case no.	(B) Employee's name	(C) Job title (e.g., Welder)	(D) Date of injury or onset of illness (e.g., 2/10)	(E) Where the event occurred (e.g., Loading dock north end)	(F) Describe injury or illness, parts of body affected, and object/substance that directly injured or made person ill (e.g., Second degree burns on right forearm from acetylene torch)			Remained at Work				(M)					
						Death (G)	Days away from work (H)	Job transfer or restriction (I)	Other record-able cases (J)	Away from work (K)	On job transfer or restriction (L)	Injury (1)	Skin disorder (2)	Respiratory condition (3)	Poisoning (4)	Hearing loss (5)	All other illnesses (6)
Reset			___/___ month / day			○	○	○	○	___ days	___ days	○	○	○	○	○	○
Reset			___/___ month / day			○	○	○	○	___ days	___ days	○	○	○	○	○	○
Reset			___/___ month / day			○	○	○	○	___ days	___ days	○	○	○	○	○	○
Reset			___/___ month / day			○	○	○	○	___ days	___ days	○	○	○	○	○	○
Reset			___/___ month / day			○	○	○	○	___ days	___ days	○	○	○	○	○	○
Reset			___/___ month / day			○	○	○	○	___ days	___ days	○	○	○	○	○	○
Reset			___/___ month / day			○	○	○	○	___ days	___ days	○	○	○	○	○	○
Reset			___/___ month / day			○	○	○	○	___ days	___ days	○	○	○	○	○	○
Reset			___/___ month / day			○	○	○	○	___ days	___ days	○	○	○	○	○	○
Reset			___/___ month / day			○	○	○	○	___ days	___ days	○	○	○	○	○	○
Reset			___/___ month / day			○	○	○	○	___ days	___ days	○	○	○	○	○	○
					Page totals ▶	___	___	___	___	___	___	___ Injury (1)	___ Skin disorder (2)	___ Respiratory condition (3)	___ Poisoning (4)	___ Hearing loss (5)	___ All other illnesses (6)

Public reporting burden for this collection of information is estimated to average 14 minutes per response, including time to review the instructions, search and gather the data needed, and complete and review the collection of information. Persons are not required to respond to the collection of information unless it displays a currently valid OMB control number. If you have any comments about these estimates or any other aspects of this data collection, contact: US Department of Labor, OSHA Office of Statistical Analysis, Room N-3644, 200 Constitution Avenue, NW, Washington, DC 20210. Do not send the completed forms to this office.

Save Input | Add a Form Page

OSHA's Form 300A (Rev. 01/2004)

Summary of Work-Related Injuries and Illnesses

Note: You can type input into this form and save it.
Because the forms in this recordkeeping package are "fillable/writable" PDF documents, you can type into the input form fields and then save your inputs using the free Adobe PDF Reader.

Year 20 ___

U.S. Department of Labor
Occupational Safety and Health Administration

Form approved OMB no. 1218-0176

All establishments covered by Part 1904 must complete this Summary page, even if no work-related injuries or illnesses occurred during the year. Remember to review the Log to verify that the entries are complete and accurate before completing this summary.

Using the Log, count the individual entries you made for each category. Then write the totals below, making sure you've added the entries from every page of the Log. If you had no cases, write "0."

Employees, former employees, and their representatives have the right to review the OSHA Form 300 in its entirety. They also have limited access to the OSHA Form 301 or its equivalent. See 29 CFR Part 1904.35, in OSHA's recordkeeping rule, for further details on the access provisions for these forms.

Number of Cases

Total number of deaths	Total number of cases with days away from work	Total number of cases with job transfer or restriction	Total number of other recordable cases
_____	_____	_____	_____
(G)	(H)	(I)	(J)

Number of Days

Total number of days away from work	Total number of days of job transfer or restriction
_____	_____
(K)	(L)

Injury and Illness Types

Total number of . . .	(M)		
(1) Injuries	_____	(4) Poisonings	_____
(2) Skin disorders	_____	(5) Hearing loss	_____
(3) Respiratory conditions	_____	(6) All other illnesses	_____

Post this Summary page from February 1 to April 30 of the year following the year covered by the form.

Public reporting burden for this collection of information is estimated to average 50 minutes per response, including time to review the instructions, search and gather the data needed, and complete and review the collection of information. Persons are not required to respond to the collection of information unless it displays a currently valid OMB control number. If you have any comments about these estimates or any other aspects of this data collection, contact: US Department of Labor, OSHA Office of Statistical Analysis, Room N-3644, 200 Constitution Avenue, NW, Washington, DC 20210. Do not send the completed forms to this office.

Establishment information

Your establishment name _____

Street _____

City _____ State _____ Zip _____

Industry description (*e.g., Manufacture of motor truck trailers*)

_____

Standard Industrial Classification (SIC), if known (*e.g., 3715*)

_____

OR

North American Industrial Classification (NAICS), if known (e.g., 336212)

_____

Employment information *(If you don't have these figures, see the Worksheet on the next page to estimate.)*

Annual average number of employees _____

Total hours worked by all employees last year _____

Sign here

Knowingly falsifying this document may result in a fine.

I certify that I have examined this document and that to the best of my knowledge the entries are true, accurate, and complete.

_____ _____
Company executive Title

Phone _____ - _____ - _____ Date _____ / _____ / _____

Save Input

U.S. Department of Labor
Occupational Safety and Health Administration

Optional

Worksheet to Help You Fill Out the Summary

Note: You can type input into this form and save it. Because the forms in this recordkeeping package are "fillable/writable" PDF documents, you can type into the input form fields and then save your inputs using the free Adobe PDF Reader. In addition, the forms are programmed to auto-calculate as appropriate.

At the end of the year, OSHA requires you to enter the average number of employees and the total hours worked by your employees on the summary. If you don't have these figures, you can use the information on this page to estimate the numbers you will need to enter on the Summary page at the end of the year.

How to figure the average number of employees who worked for your establishment during the year:

❶ *Add* the total number of employees your establishment paid in all pay periods during the year. Include all employees: full-time, part-time, temporary, seasonal, salaried, and hourly.

The number of employees paid in all pay periods = ❶ _____

❷ *Count* the number of pay periods your establishment had during the year. Be sure to include any pay periods when you had no employees.

The number of pay periods during the year = ❷ _____

❸ *Divide* the number of employees by the number of pay periods.

❶ _____ / ❷ _____ = ❸ _____

❹ *Round the answer* to the next highest whole number. Write the rounded number in the blank marked *Annual average number of employees.*

The number rounded = ❹ _____

For example, Acme Construction figured its average employment this way:

In this pay period . . .	**Acme paid this many employees . . .**
1	10
2	0
3	15
4	30
5	40
▼	▼
24	20
25	15
26	+10
	830

❶ Number of employees paid = 830

❷ Number of pay periods = 26

❸ 830 / 26 = 31.92

❹ 31.92 rounds to 32

32 is the annual average number of employees

How to figure the total hours worked by all employees:

Include hours worked by salaried, hourly, part-time and seasonal workers, as well as hours worked by other workers subject to day to day supervision by your establishment (e.g., temporary help services workers).

Do not include vacation, sick leave, holidays, or any other non-work time, even if employees were paid for it. If your establishment keeps records of only the hours paid or if you have employees who are not paid by the hour, please estimate the hours that the employees actually worked.

If this number isn't available, you can use this optional worksheet to estimate it.

Optional Worksheet

_____ *Find* the number of full-time employees in your establishment for the year.

X _____ *Multiply* by the number of work hours for a full-time employee in a year.

_____ This is the number of full-time hours worked.

+ _____ *Add* the number of any overtime hours as well as the hours worked by other employees (part-time, temporary, seasonal)

_____ *Round* the answer to the next highest whole number. Write the rounded number in the blank marked *Total hours worked by all employees last year*.

Save Input Reset

OSHA's Form 301

Injury and Illness Incident Report

Note: You can type input into this form and save it. Because the forms in this recordkeeping package are "fillable/writable" PDF documents, you can type into the input form fields and then save your inputs using the free Adobe PDF Reader. In addition, the forms are programmed to auto-calculate as appropriate.

Attention: This form contains information relating to employee health and must be used in a manner that protects the confidentiality of employees to the extent possible while the information is being used for occupational safety and health purposes.

U.S. Department of Labor
Occupational Safety and Health Administration

Form approved OMB no. 1218-0176

This *Injury and Illness Incident Report* is one of the first forms you must fill out when a recordable work-related injury or illness has occurred. Together with the *Log of Work-Related Injuries and Illnesses* and the accompanying *Summary,* these forms help the employer and OSHA develop a picture of the extent and severity of work-related incidents.

Within 7 calendar days after you receive information that a recordable work-related injury or illness has occurred, you must fill out this form or an equivalent. Some state workers' compensation, insurance, or other reports may be acceptable substitutes. To be considered an equivalent form, any substitute must contain all the information asked for on this form.

According to Public Law 91-596 and 29 CFR 1904, OSHA's recordkeeping rule, you must keep this form on file for 5 years following the year to which it pertains.

If you need additional copies of this form, you may photocopy the printout or insert additional form pages in the PDF, and then use as many as you need.

Completed by _____

Title _____

Phone ___ - ___ - ____ **Date** ___ ___ ____ (Month Day Year)

Information about the employee

1) Full name _____

2) Street _____

3) City _____ **State** _____ **ZIP** _____

4) Date of birth ___ ___ ____ (Month Day Year)

5) Date hired ___ ___ ____ (Month Day Year)

○ **Male**
○ **Female**

Information about the physician or other health care professional

6) Name of physician or other health care professional

_____

7) If treatment was given away from the worksite, where was it given?

Facility _____

Street _____

City _____ **State** _____ **ZIP** _____

8) Was employee treated in an emergency room?
○ **Yes**
○ **No**

9) Was employee hospitalized overnight as an in-patient?
○ **Yes**
○ **No**

Information about the case

10) Case number from the *Log* _____ *(Transfer the case number from the Log after you record the case.)*

11) Date of injury or illness ___ ___ ____ (Month Day Year)

12) Time employee began work _____ ○ **AM** ○ **PM**

13) Time of event _____ ○ **AM** ○ **PM** ○ **Check if time cannot be determined**

14) *What was the employee doing just before the incident occurred?* **Describe the activity, as well as the tools, equipment, or material the employee was using. Be specific. *Examples:* "climbing a ladder while carrying roofing materials"; "spraying chlorine from hand sprayer"; "daily computer key-entry."**

15) *What Happened?* **Tell us how the injury occurred. *Examples:* "When ladder slipped on wet floor, worker fell 20 feet"; "Worker was sprayed with chlorine when gasket broke during replacement"; "Worker developed soreness in wrist over time."**

16) *What was the injury or illness?* **Tell us the part of the body that was affected and how it was affected; be more specific than "hurt," "pain," or "sore." *Examples:* "strained back"; "chemical burn, hand"; "carpal tunnel syndrome."**

17) *What object or substance directly harmed the employee? **Examples:*** **"concrete floor"; "chlorine"; "radial arm saw." *If this question does not apply to the incident, leave it blank.***

18) *If the employee died, when did death occur?* **Date of death** ___ ___ ____ (Month Day Year)

Save Input | Add a Form Page | Reset

Public reporting burden for this collection of information is estimated to average 22 minutes per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Persons are not required to respond to the collection of information unless it displays a current valid OMB control number. If you have any comments about this estimate or any other aspects of this data collection, including suggestions for reducing this burden, contact: US Department of Labor, OSHA Office of Statistical Analysis, Room N-3644, 200 Constitution Avenue, NW, Washington, DC 20210. Do not send the completed forms to this office.

U.S. Department of Labor
Occupational Safety and Health Administration

If You Need Help...

If you need help deciding whether a case is recordable, or if you have questions about the information in this package, feel free to contact us. We'll gladly answer any questions you have.

- Visit us online at www.osha.gov
- Call your OSHA Regional office and ask for the recordkeeping coordinator

or

- Call your State Plan office

Federal Jurisdiction

Region 1 - 617 / 565-9860
Connecticut; Massachusetts; Maine; New Hampshire; Rhode Island

Region 2 - 212 / 337-2378
New York; New Jersey

Region 3 - 215 / 861-4900
DC; Delaware; Pennsylvania; West Virginia

Region 4 - 678 / 237-0400
Alabama; Florida; Georgia; Mississippi

Region 5 - 312 / 353-2220
Illinois; Ohio; Wisconsin

Region 6 - 972 / 850-4145
Arkansas; Louisiana; Oklahoma; Texas

Region 7 - 816 / 283-8745
Kansas; Missouri; Nebraska

Region 8 - 720 / 264-6550
Colorado; Montana; North Dakota; South Dakota

Region 9 - 415 / 625-2547

Region 10 - 206 / 553-5930
Idaho

State Plan States

Alaska - 907 / 269-4957

Arizona - 602 / 542-5795

California - 415 / 703-5100

*Connecticut - 860 / 566-4380

Hawaii - 808 / 586-9100

*Illinois - 217 / 782-6206

Indiana - 317 / 232-2688

Iowa - 515 / 281-3661

Kentucky - 502 / 564-3070

Maryland - 410 / 527-4465

Michigan - 517 / 322-1848

Minnesota - 651 / 284-5050

Nevada - 702 / 486-9020

*New Jersey - 609 / 984-1389

New Mexico - 505 / 827-4230

*New York - 518 / 457-2574

North Carolina - 919 / 807-2875

Oregon - 503 / 378-3272

Puerto Rico - 787 / 754-2172

South Carolina - 803 / 734-9669

Tennessee - 615 / 741-2793

Utah - 801 / 530-6901

Vermont - 802 / 828-2765

Virginia - 804 / 786-6613

*Virgin Islands - 340 / 772-1315

Washington - 360 / 902-5554

Wyoming - 307 / 777-7786

*Public Sector only

U.S. Department of Labor

Occupational Safety and Health Administration

Have questions?

If you need help in filling out the *Log* or *Summary,* or if you have questions about whether a case is recordable, contact us. We'll be happy to help you. You can:

- Visit us online at: www.osha.gov
- Call your regional or state plan office. You'll find the phone number listed on the previous page.

Attachment VIII– Hospital Maps

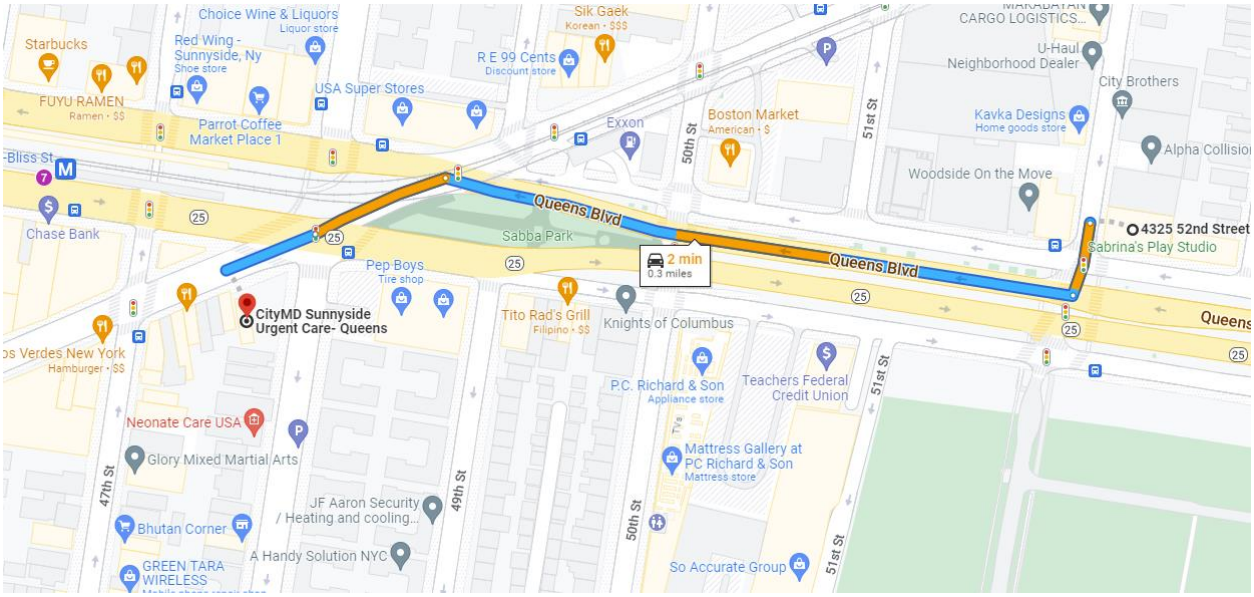
DRIVING DIRECTIONS TO THE HOSPITAL

CityMD Sunnyside Urgent Care - Queens

Start out going SOUTH on 52nd St towards Queens Blvd	112 ft
Turn RIGHT at 2nd cross street onto Queens Blvd	0.2 mi
Take a slight LEFT onto Roosevelt Ave	210 ft
Continue onto Greenpoint Ave	144 ft

Destination will be on the left

End at 47-16 Greenpoint Ave Suite 101, Queens, NY 11104



Attachment IX– Appendix 1A New York State Department of Health Generic Community Air Monitoring Protocol

Appendix 1A
New York State Department of Health
Generic Community Air Monitoring Plan

Overview

A Community Air Monitoring Plan (CAMP) requires real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of each designated work area when certain activities are in progress at contaminated sites. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that work activities did not spread contamination off-site through the air.

The generic CAMP presented below will be sufficient to cover many, if not most, sites. Specific requirements should be reviewed for each situation in consultation with NYSDOH to ensure proper applicability. In some cases, a separate site-specific CAMP or supplement may be required. Depending upon the nature of contamination, chemical- specific monitoring with appropriately-sensitive methods may be required. Depending upon the proximity of potentially exposed individuals, more stringent monitoring or response levels than those presented below may be required. Special requirements will be necessary for work within 20 feet of potentially exposed individuals or structures and for indoor work with co-located residences or facilities. These requirements should be determined in consultation with NYSDOH.

Reliance on the CAMP should not preclude simple, common-sense measures to keep VOCs, dust, and odors at a minimum around the work areas.

Community Air Monitoring Plan

Depending upon the nature of known or potential contaminants at each site, real-time air monitoring for VOCs and/or particulate levels at the perimeter of the exclusion zone or work area will be necessary. Most sites will involve VOC and particulate monitoring; sites known to be contaminated with heavy metals alone may only require particulate monitoring. If radiological contamination is a concern, additional monitoring requirements may be necessary per consultation with appropriate DEC/NYSDOH staff.

Continuous monitoring will be required for all ground intrusive activities and during the demolition of contaminated or potentially contaminated structures. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pitting or trenching, and the installation of soil borings or monitoring wells.

Periodic monitoring for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. “Periodic” monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or

overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) must be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions, particularly if wind direction changes. The monitoring work should be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment should be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment should be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

1. If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.

2. If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion 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 over background for the 15-minute average.

3. If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown.

4. All 15-minute readings must be recorded and be available for State (DEC and NYSDOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

Particulate Monitoring, Response Levels, and Actions

Particulate concentrations should be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring should be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment must be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

1. If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m^3 above the upwind level and provided that no visible dust is migrating from the work area.

2. If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m^3 above the upwind 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 PM-10 particulate concentration to within 150 mcg/m^3 of the upwind level and in preventing visible dust migration.

3. All readings must be recorded and be available for State (DEC and NYSDOH) and County Health personnel to review.

December 2009

Attachment X – Air Monitoring Equipment

DUSTTRAK™ II AEROSOL MONITORS MODELS 8530, 8530EP AND 8532

DESKTOP OR HANDHELD UNITS FOR ANY ENVIRONMENT, ANY APPLICATION



DustTrak™ II Aerosol Monitors are battery-operated, data-logging, light-scattering laser photometers that give you real-time aerosol mass readings. They use a sheath air system that isolates the aerosol in the optics chamber to keep the optics clean for improved reliability and low maintenance. From desktop and desktop with external pump models to a handheld model, the DustTrak II offers a suitable solution for harsh industrial workplaces, construction and environmental sites and other outdoor applications, as well as clean office settings. The DustTrak II monitors measure aerosol contaminants such as dust, smoke, fumes and mists.

Features and Benefits

All Models

+ Real-time mass concentration readings and data-logging allow for data analysis during and after sampling
+ Measure aerosol concentrations corresponding to PM1, PM2.5, Respirable, and PM10 size fractions, using a variety of inlet conditioners
+ Easy-to-use graphical user interface with color touch-screen for effortless operation

Handheld Model (8532)

+ Long life internal pump for continuous sampling
+ Single-point data collection for walk through surveys
+ Lightweight design with ergonomic handle for portable applications

Desktop Models (8530 and 8530EP)

+ Energy-efficient, long lasting external pump for continuous, unattended, 24/7, outdoor monitoring applications (Model 8530EP only)
+ Long life internal pump for shorter work-shift or IAQ sampling applications (Model 8530)
+ Gravimetric reference sampling capability for custom reference calibrations
+ Automatic zeroing (with optional zero module) to minimize the effect of zero drift
+ STEL alarm setpoint for tracking 15-minute average mass concentrations
+ Environmental protected and tamper-proof secure (with an optional environmental enclosure)
+ Inlet sample conditioning (with optional heated inlet sample conditioner) to reduce the effect of humidity on photometric mass measurements (for use with an environmental enclosure)
+ Cloud Data Management System as hosted by Netronix™

TSI®

UNDERSTANDING, ACCELERATED

Desktop Models: Ideal for Long-Term Surveys and Remote Monitoring Applications

The DustTrak II is offered as a standard desktop (Model 8530), as well as a desktop with external pump (Model 8530EP.) Both models have manual and programmable data logging functions, making them ideal for unattended applications. The standard desktop model is most suitable for indoor, continuous monitoring, while the desktop with external pump is designed for 24/7 unattended, remote monitoring outdoors.

The DustTrak II desktop models come with USB (device and host), Ethernet, and analog and alarm outputs allowing remote access to data. User adjustable alarm setpoints for instantaneous or 15-minute short-term excursion limit (STEL) are also available on desktop models. The alarm output with user-defined setpoint alerts you when upset or changing conditions occur.

The DustTrak II desktop monitors have several unique features:

+ Measure aerosols in high concentrations up to 400 mg/m3.
+ External pump (Model 8530EP) with low power consumption for continuous, unattended monitoring in remote outdoor locations.
+ Gravimetric sampling capability using a 37-mm filter cassette which can be inserted in-line with the aerosol stream allowing you to perform an integral gravimetric analysis for custom reference calibrations.
+ Zeros automatically using the external zeroing module. This optional accessory is used when sampling over extended periods of time. By zeroing the monitor during sampling, the effect of zero drift is minimized.
+ STEL alarm feature for tracking 15-minute average mass concentrations when alarm setpoint has been reached for applications like monitoring fugitive emissions at hazardous waste sites.
+ Provide for environmental protection and tamper-proof security using an environmental enclosure. This optional accessory encloses the instrument within a waterproof, lockable, custom-designed case.
+ Condition the sample air stream before entering the instrument optics using a heated inlet sample conditioner (designed for use with an environmental enclosure.) This optional accessory is used in humid environments. By conditioning the sample, the humidity and water vapor are minimized, reducing elevated measurements.

Handheld Models: Perfect for Walk-Through Surveys and Single-Point Data Collection Applications

The DustTrak II Handheld Model 8532 is lightweight and portable. It is perfect for industrial hygiene surveys, point source location monitoring, indoor air quality investigations, engineering control evaluations/validation, and for baseline trending and screening. Like the desktop models, it has manual and programmable data logging functions. In addition, the handheld model also has a single-point data logging capability. Single-point data collection is used for walk-through industrial hygiene surveys and indoor air quality investigations.

Applications	Desktop	Handheld
Aerosol research studies	+	+
Baseline trending and screening	+	+
Engineering control evaluations		+
Engineering studies		+
Epidemiology studies	+	+
Indoor air quality investigations	+	+
Industrial/occupational hygiene surveys	+	+
Point source monitoring		+
Outdoor environmental monitoring	+	
Process monitoring	+	+
Remote monitoring	+	
Battery Performance		
Models 8530 and 8530EP (Typical) 6600 mAH Li-Ion Battery Pack (P/N 801680)	1 Battery	2 Batteries
Battery runtime (hours)	Up to 6	Up to 12
Charge time* (hours) in DustTrak	4	8
Charge time* (hours) in external battery charger (P/N 801685)	4	8

Model 8532 (Typical) 3600 mAH Li-Ion Battery Pack (P/N 801681)	Battery
Battery runtime (hours)	Up to 6
Charge time* (hours) in DustTrak	4
Charge time* (hours) in external battery charger (P/N 801686)	4

* Of a fully depleted battery



DustTrak II Aerosol Monitor Features

All Models

+ Li-Ion rechargeable batteries
+ Internal and external battery charging capabilities
+ Outlet port for isokinetic sampling applications
+ User serviceable sheath flow and pump filters
+ Logged test pause and restart feature
+ Logged test programming
  + Color touch screen–either manual mode or program mode
  + TrakPro™ Data Analysis Software via a PC
+ User adjustable custom calibration settings
+ Instantaneous alarm settings with visual and audible warnings
+ Real-time graph display
+ View statistical information during and after sampling
+ On-screen instrument status indicators: FLOW, LASER and FILTER
+ Filter service indicator for user preventative maintenance

Desktop Models (8530 and 8530EP)

+ Long life external pump (8530EP)
+ Internal pump (8530)
+ Hot swappable batteries
+ Gravimetric reference sample capability
+ STEL alarm setpoint

Optional Accessories

+ Auto zeroing module
+ Protective environmental enclosure (8535 and 8537)
+ Heated inlet sample conditioner (for use with an environmental enclosure)
+ Cloud Data Management System as hosted by Netronix™

Handheld Model (8532)

+ Long life internal pump
+ Single-point data collection for walk through surveys

Easy to Program and Operate

The graphical user interface with color touch-screen puts everything at your fingertips. The easy-to-read display shows real-time mass concentration and graphical data, as well as other statistical information along with instrument pump, laser and flow status, and much more. Perform quick walk-through surveys or program the instrument's advanced logging modes for long-term sampling investigations. Program start times, total sampling times, logging intervals, alarm setpoints and many other parameters. You can even set up the instrument for continuous unattended operation.

TrakPro™ Software Makes Monitoring Easier than Ever

TrakPro™ Data Analysis Software allows you to set up and program directly from a PC. It even features the ability for remote programming and data acquisition from your PC via wireless communication options or over an Ethernet network. As always, you can print graphs, raw data tables, and statistical and comprehensive reports for record keeping purposes.



Desktop Monitor with
External Pump, Model 8530EP



SPECIFICATIONS

DUSTTRAK™ II AEROSOL MONITORS
MODELS 8530, 8530EP AND 8532

Sensor Type
90° light scattering

Particle Size Range
0.1 to 10 µm

Aerosol Concentration Range

8530 Desktop	0.001 to 400 mg/m³
8530EP Desktop with External Pump	0.001 to 400 mg/m³
8532 Handheld	0.001 to 150 mg/m³

Resolution
±0.1% of reading or 0.001 mg/m³, whichever is greater

Zero Stability
±0.002 mg/m³ per 24 hours at 10 sec time constant

Flow Rate
3.0 L/min set at factory, 1.40 to 3.0 L/min, user adjustable

Flow Accuracy
±5% of factory set point, internal flow controlled

Temperature Coefficient
+0.001 mg/m³ per °C

Operational Temp
32 to 120°F (0 to 50°C)

Storage Temp
-4 to 140°F (-20 to 60°C)

Operational Humidity
0 to 95% RH, non-condensing

Time Constant
User adjustable, 1 to 60 seconds

Data Logging
5 MB of on-board memory (>60,000 data points)
45 days at 1 minute logging interval

Log Interval
User adjustable, 1 second to 1 hour

Physical Size (H x W x D)

Handheld	4.9 x 4.8 x 12.5 in. (12.5 x 12.1 x 31.6 cm)
Desktop	5.3 x 8.5 x 8.8 in. (13.5 x 21.6 x 22.4 cm)
External Pump	4.0 x 7.0 x 3.5 in. (10.0 x 18.0 x 9.0 cm)

Weight

Handheld	2.9 lb (1.3 kg), 3.3 lb (1.5 kg) with battery
Desktop	3.5 lb (1.6 kg), 4.5 lb (2.0 kg)-1 battery, 5.5 lb (2.5 kg)-2 batteries
External Pump	3.0 lb (1.4 kg)

Communications

8530	USB (host and device) and Ethernet. Stored data accessible using flash memory drive
8530EP	USB (host and device) and Ethernet. Stored data accessible using flash memory drive plus, cable assembly for external pump
8532	USB (Hose and device). Stored data accessible using flash memory drive

Power-AC
Switching AC power adapter with universal line cord included, 115-240 VAC

Analog Out

8530/8530EP	User selectable output, 0 to 5 V or 4 to 20 mA. User selectable scaling range

Alarm Out

8530/8530EP	Relay or audible buzzer Relay Non-latching MOSFET switch + User selectable set point + -5% deadband + Connector 4-pin, Mini-DIN connectors
8532	Audible buzzer

Screen

8530	5.7 in. VGA color touchscreen
8532	3.5 in. VGA color touchscreen

Gravimetric Sampling

8530/8530EP	Removable 37 mm cartridge (user supplied)

CE Rating

Immunity	EN61236-1:2006
Emissions	EN61236-1:2006

Specifications are subject to change without notice.

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MINIRAE® 3000 +

Portable Handheld VOC Monitor



The MiniRAE 3000 + is a comprehensive handheld VOC (Volatile Organic Compound) monitor that uses a third-generation patented PID technology to accurately measure one of the highest levels of ionizable chemicals available on the market.

It provides full-range measurement from 0 to 15,000 ppm of VOCs. The MiniRAE 3000 + has a built-in wireless modem that allows realtime data connectivity with the command center located up to 2 miles (3 km) away through a Bluetooth connection to a RAELink 3* portable modem or optionally via Mesh Network.



Workers can quickly measure VOCs and wirelessly transmit data

- Highly accurate VOC measurements
- Reflex PID Technology™
- Low maintenance — easy access to lamp and sensor
- Low cost of ownership
- 3-year 10.6eV lamp warranty
- BLE module & dedicated APP for Enhanced Datalogging capability

APPLICATIONS

- Oil and Gas
- HazMat
- Industrial Safety
- Civil Defense
- Environmental and Indoor Air Quality

FEATURES AND BENEFITS

- Third-generation patented PID technology
- Reflex PID Technology™
- VOC detection range from 0 to 15,000 ppm
- 3-second response time
- Humidity compensation with built-in humidity and temperature sensors
- Six-month datalogging
- Highly connectivity capability through multiple wireless module options
- Large graphic display with integrated flashlight
- Multi-language support with 10 languages encoded
- IP- 67 waterproof design

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Minirae® 3000 + Technical Specifications

INSTRUMENT SPECIFICATIONS	
Size	10" L x 3.0" W x 2.5" H (25.5 cm x 7.6 cm x 6.4 cm)
Weight	26 oz (738 g)
Sensors	Photoionization sensor with standard 10.6 eV or optional 9.8 eV or 11.7 eV lamp
Battery	• Rechargeable, external field-replaceable Lithium-Ion battery pack • Alkaline battery adapter
Running time	16 hours of operation (12 hours with alkaline battery adapter)
Display Graphic	4 lines, 28 x 43 mm, with LED backlight for enhanced display readability
Keypad	1 operation and 2 programming keys, 1 flashlight on/off
Direct Readout	Instantaneous reading • VOCs as ppm by volume (mg/m³) • High values • STEL and TWA • Battery and shutdown voltage • Date, time, temperature
Alarms	95dB at 12" (30 cm) buzzer and flashing red LED to indicate exceeded preset limits • High: 3 beeps and flashes per second • Low: 2 beeps and flashes per second • STEL and TWA: 1 beep and flash per second • Alarms latching with manual override or automatic reset • Additional diagnostic alarm and display message for low battery and pump stall
EMC/RFI	Compliant with EMC directive (2004/108/EC) EMI and ESD test: 100MHz to 1GHz 30V/m, no alarm Contact: ±4kV Air: ±8kV, no alarm
IP Rating	• IP-67 unit off and without flexible probe • IP-65 unit running
Datalogging	Standard 6 months at one-minute intervals
Calibration	Two-point or three-point calibration for zero and span. Reflex PID Technology™ Calibration memory for 8 calibration gases, alarm limits, span values and calibrationdates
Sampling Pump	• Internal, integrated flow rate at 500 cc/mn • Sample from 100' (30m) horizontally or vertically
Low Flow Alarm	Auto pump shutoff at low-flow condition
Communication & Data Download	• Download data and upload instrument set-up from PC through charging cradle or using BLE module and dedicated APP • Wireless data transmission through built-in RF modem
Wireless Network	Mesh RAE Systems Dedicated Wireless Network
Wireless Range (Typical)	Up to 15ft (5m) for BLE EchoView Host: LOS > 660 ft (200 m) ProRAE Guardian & RAEMesh Reader: LOS > 660 ft (200 m) ProRAE Guardian & RAELink3 Mesh: LOS > 330 ft (100 m)
Safety Certifications	**US and Canada:** CSA, Classified as Intrinsically Safe for use in Class I, Division 1, Groups A, B, C, D **Europe:** ATEX II 2G EEx ia IIC T4
Temperature	-4° to 122° F (-20° to 50° C)
Humidity	0% to 95% relative humidity (non-condensing)
Attachments	Durable bright yellow rubber boot
Warranty	3 years for 10.6 eV lamp, 1 year for pump, battery, sensor and instrument
Wireless Frequency	ISM license-free band. IEEE 802.15.4 Sub 1GHz
Wireless Approvals	FCC Part 15, CE R&TTE, Others[1]
Radio Module	Supports BLE or Bluetooth or RM900

[1] Contact RAE Systems for country-specific wireless approvals and certificates.
Specifications are subject to change.

SENSOR SPECIFICATIONS			
Gas Monitor	Range	Resolution	Response Time T90
VOCs	0 to 999.9 ppm 1,000 to 15,000 ppm	0.1 ppm 1 ppm	< 3 s < 3 s

MONITOR ONLY INCLUDES:

- MiniRAE 3000 + Monitor, Model PGM-7320
- Wireless communication module built in, as specified
- Datalogging with ProRAE Studio II Package
- Charging/download adapter
- RAE UV lamp, as specified
- Flex-I-Probe™
- External filter
- Rubber boot
- Alkaline battery adapter
- Lamp-cleaning kit
- Tool kit
- Soft leather case

OPTIONAL CALIBRATION KIT ADDS:

- 100 ppm isobutylene calibration gas, 34L
- Calibration regulator and flow controller

OPTIONAL GUARANTEED COST-OF-OWNERSHIP PROGRAM:

- 4-year repair and replacement warranty
- Annual maintenance service

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APPENDIX G – Quality Assurance Project Plan

APPENDIX G

Quality Assurance Project Plan

43-25 52nd street

Block 1321, Lot 10

Site ID: C241269

Submitted to:

New York State Department of Environmental Conservation

Division of Environmental Remediation

Remedial Bureau B, 12th Floor

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Albany, NY 12233-7016

Prepared for:

43-25 52 LLC

46-02 70th Street

Woodside, NY 11377

Prepared by:

YU & Associates Engineers, P.C.

611 River Drive, 3rd Floor

Elmwood Park, NJ 07407

November 12, 2025

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1.0 INTRODUCTION

The purpose of this Quality Assurance Project Plan (QAPP) is to describe the protocols and procedures that will be followed during implementation of the Site Management Plan (SMP) at a pre-determined quality at the 43-25 52nd Street, Woodside, New York. The QAPP describes the proposed sampling and analytical methods for the SMP.

The work will be performed in accordance with New York State Department of Environmental Conservation (NYSDEC) Division of Environmental Remediation DER-10 Technical Guidance for Remedial Investigation and Remediation (May 2010), and the standards, criteria, and guidance listed in the SMP prepared by YU & Associates (YU).

1.1 SITE DESCRIPTION

The Site is located in the County of Queens, New York City, New York and is identified as Block 1321 and Lot 10 aka Lots 7 and 10 on the New York City Tax Map. The Site is situated on an approximately 0.21-acre area and is bounded by Skillman Avenue to the north, Queens Boulevard to the south, residential properties to the east, and 52nd St to the west. Lot 7 was occupied by a single-story vacant commercial building with a paved parking area, which was previously used as an auto shop. Lot 10 was occupied by a two-story church building. The vicinity of the Site is surrounded by recently developed residential buildings and commercial properties including the Great Bear Tire & Auto Repair Center, Kavka Design Home Goods Store, Pins & Needles Embroidery LLC, and a U-Haul Neighborhood Dealer. The Site owner has entered the Site into a Brownfield Cleanup Agreement (BCA) with the NYSDEC to investigate and remediate, as appropriate, potential areas of Environmental Concern associated with the Site under the Brownfield Cleanup Program (BCP); the Site ID is C241269.

A Phase I Environmental Site Assessment (ESA) for Lot 10 was prepared by JR Environmental Services, Inc. dated February 2021. According to the Phase I ESA, Lot 10 was initially developed by 1932 with a two-story commercial building, and had been used as a commercial, warehouse, storage warehouse and church since then. The review of city directory search also revealed that a drapery cleaner had occupied Lot 10 from 1970s to 1980s. Based on the review of the historical information included in the Phase I ESA, Lot 7 was initially developed by 1914 with a two-story building on the northern section and single-story shed structures on the eastern portion and utilized as a residence through at least 1932. The dwelling building and the single-story shed structures were

demolished after 1932 and a single-story auto garage was constructed on the eastern portion. The auto garage had been on Site through at least 1951 and was later changed to an auto shop after 1962. The auto shop had occupied Lot 7 until 2022.

Remedial actions were performed at the Site and based on the soil end-point sample results, the Restricted Residential Use Soil Cleanup Objectives were achieved. The remaining contamination at the Site includes the soil vapor located beneath the building slab and soil vapor sample results indicate TO-15 VOCs contamination. To prevent vapor intrusion and subsurface impacts, a sub-slab depressurization system (SSDS) and a soil vapor extraction (SVE) system were installed.

1.2 PROJECT SCOPE OF WORK

The site was remediated in accordance with the remedy selected by the NYSDEC in the RAWP prepared by YU & Associates dated February, 2024. The project has achieved a Track 2 cleanup and a SMP has been prepared for the site. The following are the field operations that covered by the SMP :

- Visual inspection of the SSDS and SVE system components, including fans, piping, system enclosures, alarm panels, and system status indicators.
- Verification of system integrity (e.g., checking for cracks in piping, loose fittings, or corrosion).
- Inspection of accessible manholes, risers, or sampling ports.
- Inspection of exhaust points to ensure proper function and unobstructed air discharge.
- Routine maintenance of SSDS fans, SVE blowers, and associated mechanical/electrical components.
- Cleaning or replacement of inline filters (if applicable).
- Repair or replacement of worn or damaged parts (e.g., check valves, vacuum gauges).
- Resealing and tightening of joints or fittings if leaks or wear are identified.
- Ensuring signage, labels, and system diagrams remain legible and intact.
- Influent and effluent vapor sampling for the SVE system to evaluate system effectiveness and VOC mass removal.
- Sub-slab soil vapor sampling to monitor residual contaminant concentrations beneath the building slab.
- Indoor/Outdoor ambient air sampling.
- System vacuum monitoring to confirm effective sub-slab depressurization

2 PROJECT ORGANIZATION

- Remedial Engineer/Project Manager: Chengyu Hang — Phone: (201)791-0075 ext. 135, Mobile: (201) 873-7543
- Quality Assurance Officer: Sixuan Wang — Mobile: (201) 988-3935
- Field Coordinator: David Huang — Mobile: (732) 567-5052

3 GENERAL QAPP PROCEDURES

In order to ensure proper sampling and analysis protocols, as well as quality assurance/quality control (QA/QC) procedures for data collection and data analysis activities at the Site, YU will follow the sampling, sample handling and storage, and sample equipment decontamination procedures specified by Appendix I – Field Sampling Plan of the SMP. Equipment functionality, chain-of-custody, and other relevant notes will be recorded in the field. Data validation activities will include the manual check of laboratory data tables and reduced data summary tables. Conclusions and/or recommendations will be reviewed by one or more qualified peers of the professional who developed them to verify their accuracy on the basis of acquired data and conducted analyses.

4 QUALITY MANAGEMENT SYSTEM

4.1 GENERAL REQUIREMENTS

YU has established, documented, implemented, maintained and is continually improving its Quality Management System (QMS) in accordance with the requirements of the ISO 9001-2008 standard. In order to implement the QMS, YU has developed the following matrix that identifies:

- The processes needed for the QMS;
- The sequence and interaction of these processes;
- The criteria and methods to ensure effective operation and control of the processes; and
- The availability of information necessary to support the effective operation and monitoring of these processes.

QUALITY PROCESS	OBJECTIVES	RISKS TO ACHIEVE OBJECTIVES	CONTROLS	INTERNAL MEASUREMENT
Design Concepts	Understand requirements of the Project / customer / Agencies	Inexperienced personnel and/or inadequate preparation. Failure to understand requirements.	Review by experienced professional.	Did you meet your project requirements?
Preparation	Prepare for Fieldwork	Subconsultant agreements not in place. Inexperienced personnel and/or inadequate preparation. Permits not obtained.	Process checklist. Customer-related processes.	Did you meet the schedule? Were scope and design criteria clearly defined?
Preliminary Design	Progress RAWP to appropriate level for review	Poor customer information. Inexperienced personnel. Failure to	Reference to DER-10. Timely review of progress	Did you meet the requirements in the Contract for technical content and

QUALITY PROCESS	OBJECTIVES	RISKS TO ACHIEVE OBJECTIVES	CONTROLS	INTERNAL MEASUREMENT
		understand requirements. Insufficient staff.	well ahead of deadline.	transmit for customer review on time?
Data Collection	Obtain all necessary data	Failure to collect important data prior to and during the fieldwork process.	Checklists and RAWP. Review by experienced professional. Reference to DER-10 and/or CP-51.	Was all necessary data collected? Does project team have adequate information to make sound judgment of existing conditions? Was the proper investigation approach selected? Were samples collected and analyzed properly? Were all in scope media (soil and groundwater) assessed? Were supplemental assessment tools needed and/or used?
Reporting	Document fieldwork and findings	Inexperienced personnel. Failure to clearly explain activities. Improper analysis. Flawed findings.	Review by experienced professional.	Does the report clearly describe the objectives of the project, the steps taken to achieve the objectives, the analyses performed, and the findings? Does the report meet NYSDEC standards for remedial action? Was the data compared to the correct screening levels?

YU will verify that quality process objectives are met and any deviations from the guidelines or procedures will be documented. Recommendations to improve the process and/or work product(s) from staff or clients will be reviewed by YU's management and addressed, as needed.

4.2 OBJECTIVES

The data quality objectives are to generate usable and valid data. Sampling will be performed to gather the necessary data to adequately assess the condition of hazardous materials on Site. Field protocols for sample collection will follow relevant standards as described in the SMP. Relevant health and safety field screening will be performed and documented in accordance with YU's Health and Safety Plan.

Samples sent to the analytical laboratory will be analyzed for parameters consistent with the project scope of work defined in the SMP. Analyses will be performed in accordance with the most current USEPA Methods or other recognized methods specified in the SMP. Satisfactory completion and compliance with the data quality objectives will be assured by performing analyses in accordance with the stated methods and by requesting QA/QC procedures and deliverables to be sufficiently comprehensive that a data validation assessment may be performed, as needed. Analytical data will be requested in electronic format.

5 SAMPLE HANDLING

5.1 SAMPLING PRECEDURES

Following the remediation of the subject property, a influent/effluent soil vapor sampling and indoor/outdoor air sampling program will be implemented. The soil vapor sampling program is to assess TO-15 VOC emissions calculations, and to provide baseline TO-15 VOC concentrations at the onset of SVE system operation.

5.1.1 Influent and Effluent Vapor Sampling

A SVE system has been installed to remove TO-15 VOC contaminant mass below the newly-constructed basement slab. Influent and effluent vapor samples will be collected using 6-Liter Summa® canister and analyzed for VOCs by EPA Method TO-15 by a NYSDOH Environmental Laboratory Approval Program (ELAP)-certified laboratory. Samples will be collected from designated sampling ports on the SVE manifold—upstream of the treatment unit for influent, and downstream of the treatment unit or stack for effluent. Prior to sampling, each port will be purged for at least three to five minutes to ensure the sample is representative of active system flow. Pre-cleaned 6-liter Summa® canister will be connected to the sampling ports using inert Teflon tubing. Samples shall be collected from the SVE system on a routine basis. Sampling locations, required analytical parameters, and schedule are provided in the SMP. Modification to the frequency or sampling requirements will require approval from the NYSDEC project manager.

5.1.2 Indoor Air and Outdoor Ambient Air Sampling

The indoor air and outdoor ambient air will be sampled on an annual basis to monitor the effectiveness of the installed SSDS and SVE systems in mitigating vapor intrusion and prove that indoor air quality is protective of human health under current site conditions. Sampling will be conducted in accordance with NYSDOH's Guidance for Evaluating Soil Vapor Intrusion in the State of New York and will take place during the heating season as defined by the NYSDOH guidance. Sampling will be performed using individually certified-clean 6-liter Summa canisters equipped with pre-calibrated, flow-restricted regulators designed to collect 24-hour time-integrated air samples at a controlled flow rate of approximately 3.5 mL/min, in accordance with EPA Method TO-15.

For indoor air sampling, canisters will be deployed in occupied spaces of the basement. Canisters will be placed at a height of 3 to 5 feet above the floor on a non-permeable surface or tripod, in an area with minimal airflow disturbance and away from HVAC supply or return vents, electrical appliances, or known sources of VOCs. Prior to sampling, building occupants will be advised to avoid the use of cleaning products, air fresheners, candles,

paints, solvents, or other VOC-generating materials for a minimum of 24 hours before and during sampling to avoid biasing the results. All doors and windows should remain in their typical use configuration during the sampling period to reflect normal indoor conditions.

Outdoor ambient air samples will be collected concurrently at a location upwind of the structure, a minimum of 10 feet from building exhaust vents, HVAC units, vehicle traffic, fuel storage, or other external VOC sources. The outdoor canister will be placed at a height similar to indoor samples, securely anchored to avoid disturbance from wind or movement during the 24-hour sampling period.

At the start of each sampling event, the vacuum of the canister will be measured and recorded to confirm acceptable initial pressure. The regulator valve will then be opened to initiate sampling. After 24 hours, the valve will be closed, and the final vacuum will be recorded to confirm proper sample collection. Each canister will be labeled with a unique sample ID, location, date, time of collection, and sampler's initials. All sampling details, environmental conditions (temperature, barometric pressure, wind direction/speed for outdoor sampling), and observations regarding building use during the sampling period will be documented in a dedicated field logbook. Chain-of-custody forms will be completed for all samples. Sampling locations, required analytical parameters, and schedule are provided in the SMP.

5.2 SAMPLING IDENTIFICATION/LABELING

Air sample containers will be labeled at the time of sampling with the following information:

- Project name and number
- Sample location ID
- Sample number
- Sample depth
- Date and time of collection
- Sampler initials
- Analysis required

For example,

Field duplicates will have the same number as the original sample, with 50 added to the sample location ID. For example, the field duplicate of EF-01 will be labeled as EF-51.

Trip blanks will be identified as "TB" followed by a six-digit date code indicating the date of shipment. For example, the trip blank shipped on November 15, 2023 will be labeled TB111523.

Pre-printed sample labels will be provided by the laboratory along with the sample containers. Sample labels will be completed and as described above. At a minimum, they will include the site name or number, sample ID, date of sample, and the analysis required.

5.3 SAMPLING PRESERVATION AND HOLDING TIME

Sample container, preservation, and holding time requirements are summarized as below.

5.3.1 Holding Time

Holding times are judged from the verified time of sample receipt (VTSR) by the laboratory. Laboratory will pick up air samples the morning after collection (e.g, Monday's samples will be picked up on Tuesday morning for laboratory delivery). Samples collected on Friday will be hand delivered to the laboratory by YU staff. For the purposes of determining holding time conformance, trip blanks will be considered to have been generated on the same day as the environmental samples with which they are shipped and delivered.

5.4 CHAIN-OF-CUSTODY AND SHIPPING

A Chain-of-Custody form will trace the path of sample containers from the Site to the laboratory. Sample/bottle tracking sheets or the Chain-of-Custody will be used to document the custody of the samples within the laboratory from sample receipt though completion of analysis. The project manager will notify the laboratory of upcoming field sampling events and the subsequent transfer of samples. This notification will include information concerning the number and type of samples and the anticipated date of arrival. Sample shipping containers (e.g., coolers) will be provided by the laboratory for shipping samples. All sample containers within each shipment will be individually labeled with an adhesive identification label provided by the laboratory. In addition, each sample shipping container will be sealed with two adhesive custody seals. The custody seals will be initialed by a member of the field sampling team.

6 DECONTAMINATION

Decontamination procedures are intended to prevent the cross-contamination of environmental samples, and minimize the exposure to individuals involved in sampling and communities living near the Site. Deionized water will be utilized for decontamination purposes and the decontamination water will be handled as investigative derived waste (IDW) and containerized in an open-top 55-gallon steel drum, properly labeled and sealed. All non-dedicated equipment and tools used to collect samples will be decontaminated prior to sampling, and between each sample interval using an Alconox rinse and deionized water rinse prior to reuse. Any excess sample soil will be included as IDW and containerized in a separate open-top 55-gallon steel drum, properly labeled and sealed. Used personal protective equipment (PPE) will be decontaminated to the extent possible and disposed of in the 55-gallon drum. Field equipment rinsate blanks will be generated and analyzed to monitor the effectiveness of field decontamination procedures.

7 DATA QUALITY REQUIREMENTS

Analytical methods and data quality requirements are discussed below. All sample containers and sample analyses will be provided by a NYSDOH ELAP-certified laboratory.

7.1 ANALYTICAL METHODS

The samples collected during remedial actions will be subject to analytical testing methodologies that follow United State Environmental Protection Agency (USEPA) SW-846 methods with an equivalent Category B deliverables package and third party data validation.
Soil vapor, indoor and outdoor ambient air samples will be analyzed using the following analytical methods:

- TO-15 VOCs by USEPA TO-15

7.2 QUALITY ASSURANCE OBJECTIVES

Data quality objectives (DQOs) for measurement data in terms of sensitivity and parameters including precision, accuracy, representativeness, comparability, and completeness (PARCC) are established so that the data collected are sufficient and of adequate quality for their intended use. Data collected and analyzed in conformance with the DQO process described in this QAPP will be used in assessing the uncertainty associated with decisions related to this Site.

7.2.1 Precision

Precision measures the reproducibility of measurements under a given set of conditions. Specifically, it is a quantitative measure of the variability of a group of measurements compared to their average value. The overall precision of measurement data is a mixture of sampling and analytical factors. Analytical precision is easier to control and quantify than sampling precision; there are more historical data related to individual method performance and the "universe" is not limited to the samples received in the laboratory. In contrast, sampling precision is unique to each site or project. Overall system (sampling plus analytical) precision will be determined by analysis of field duplicate samples. Analytical results from laboratory duplicate samples will provide data on measurement (analytical) precision.

The laboratory objective for precision is to equal or exceed the precision demonstrated for the applied analytical methods on similar samples. Precision is evaluated by the analyses of laboratory and field duplicates. Field duplicates will be collected at a frequency of one per 20 environmental samples of each type.

Relative Percent Difference (RPD) criteria are used to evaluate precision between duplicates, using the equation below:

$$RPD = 100 \times [2(X_1 - X_2) / (X_1 + X_2)]$$

where:

X_1 and X_2 are reported concentrations for each duplicate sample and subtracted differences represent absolute values.

Criteria for evaluation of laboratory duplicates are specified in the applicable methods. The objective for field duplicate precision is $\leq$ 50% RPD for all matrices. Precision is not calculable where the analyte is not detected in one or both of the sample and duplicate. The absolute difference between the results ($X_1 - X_2$) may be a more appropriate measure of analytical precision where the reported concentrations are low (i.e., less than five times the RL).

7.2.2 Accuracy

The laboratory objective for accuracy is to equal or exceed the accuracy demonstrated for the applied analytical method on similar samples. Percent Recovery Criteria, published by the NYSDEC as part of the ASP, and those determined from laboratory performance data are used to evaluate accuracy in matrix (sample) spike and blank spike quality control samples. A matrix spike and blank spike will be performed once for every sample delivery group (SDG) as specified in the ASP-CLP. Other method-specific laboratory QC samples (such as laboratory control samples and continuing calibration standards) may also be used in the assessment of analytical accuracy. Sample (matrix) spike recovery is calculated as:

$$\%R = (SSR-SR)/SA \times 100,$$

where:

SSR = Spiked Sample Result

SR = Sample Result, and

SA = Spike Added

7.2.3 Representativeness

The representativeness of data is only as good as the representativeness of the samples collected. Sampling and handling procedures, and laboratory practices are designed to provide a standard set of performance-driven criteria to provide data of the same quality as other analyses of similar matrices using the same methods under similar conditions. Representativeness is assessed qualitatively (there are no equations or numerical criteria for this data quality indicator).

7.2.4 Comparability

Comparability of analytical data among laboratories becomes more accurate and reliable when all labs follow the same procedure and share information for program enhancement. Some of these procedures include:

- Instrument standards traceable to National Institute of Standards and Technology (NIST), USEPA, or the New York State Department of Health or Environmental Conservation;
- Using standard methodologies;
- Reporting results for similar matrices in consistent units;
- Applying appropriate levels of quality control within the context of the laboratory quality assurance program; and,
- Participation in inter-laboratory studies to document laboratory performance.

By using traceable standards and standard methods, the analytical results can be compared to other labs operating similarly. The QA Program documents internal performance. Periodic laboratory proficiency studies are instituted as a means of monitoring intra-laboratory performance. Comparability is assessed qualitatively (there are no equations or numerical criteria for this data quality indicator).

7.2.5 Completeness

The goal of completeness is to generate the maximum amount possible of valid data. The highest degree of completeness would be to find all deliverables flawless, valid, and acceptable. The lowest level of completeness is excessive failure to meet established acceptance criteria and consequent rejection of data. The completeness goal is 95 percent useable data. However, it is acknowledged that this goal may not be fully achievable; for example, individual analytes may be rejected within an otherwise acceptable analysis; or some sampling locations may not be accessible. The impact of rejected or unusable data will be determined on a case-by-case basis. If the study can be completed without the missing datum or data, no further action would be necessary. However, loss of critical data may require re-sampling or reanalysis.

7.2.6 Sensitivity

Sensitivity criteria are established so that reporting limits are adequate to verify the absence of a non-detected analyte at the applicable threshold concentration (e.g., regulatory limits or guidance values). Laboratory reporting limits will be reviewed prior to sample collection to verify that limits are appropriate for the specific analytes and matrices.

7.3 FIELD QUALITY ASSURANCE

Field quality assurance/quality control samples associated with the generation of environmental data include trip blanks. The rationale and frequency are discussed below.

7.3.1 Trip Blanks

The purpose of a trip blank is to place a mechanism of control on sample container preparation, quality, and sample handling. The trip blank travels from the lab to the Site with the empty sample container and back from the Site with the collected samples. One trip blank will be submitted with each sample shipment and analyzed for VOCs.

7.4 LABORATORY QUALITY ASSURANCE

Method-required laboratory quality assurance includes an instrument performance check; calibration check; and method blank analysis for each group of 20 or fewer samples. In addition, internal standards are added to every sample (environmental samples and laboratory QA/QC samples).

Laboratories typically perform additional QC, such as spikes, laboratory duplicates, and laboratory control samples. The frequency of these analyses is specified in the laboratory's analytical standard operating procedure (SOP) for the method.

7.4.1 Instrument Performance Check

The instrument performance check verifies the operation of the gas chromatography/mass spectrometry (GC/MS) and verifies that it meets tuning and mass spectral abundance criteria prior to sample data acquisition.

7.4.2 Calibration Checks

An initial five-point calibration check must be performed after the instrument performance check but prior to the analysis of blanks and samples. Concentrations of the calibration standards should be selected to span the concentration range of interest. One of the concentrations of the initial calibration must be the same as the daily calibration check.

On a daily basis, a single-point calibration check must be analyzed (with each group of 20 or fewer samples). The percent difference (%D) for each compound in the daily calibration check should be within ±30 percent of

the response determined in the initial calibration in order to proceed with sample analysis. If the %D criteria are not met, a new five-point calibration should be performed.

7.4.3 Method Blanks

Method blanks are used to assess the background variability of the method and to assess the introduction of contamination to the samples by the method, technique, or instrument as the sample is prepared and analyzed in the laboratory.

The method blank should not contain any target analytic at a concentration greater than its quantitation level (reporting limit; typically, three times the MDL) or its action level, whichever is more stringent. Method blanks are analyzed at a frequency of one for every 20 samples analyzed, or every analytical batch, whichever is more frequent.

7.4.4 Matrix Spike/Matrix Spike Duplicate (MS/MSD)

Site-specific MS/MSD samples will be submitted during sampling at a rate of one per 20 samples.

7.4.5 Internal Standards

Internal standards (IS) are added to every sample analyzed for VOCs (in either matrix) and SVOCs. Sample-specific IS recovery should be ±40 percent of the mean response in the most recent valid calibration.

8 SUBCONTRACTOR & QA OVERSIGHT

8.1 PURCHASING PROCESS

Where sub-consultants/Subcontractors are engaged to work on projects, their capability to perform the assigned scope of services shall be evaluated by the Project Manager (PM). The PM is responsible for follow-up on identified areas of poor performance. Records of performance for the various sub-consultants/Subcontractors will be maintained by the PM. Sub-consultants with a record of poor performance will be excluded from future consideration.

8.2 PURCHASING INFORMATION

Purchase Orders and Contracts with sub-consultants/Subcontractors will define product requirements, QMS requirements, applicable procedures, processes, equipment, and personnel qualifications in sufficient detail to ensure the work performed meets the purchase order requirements. The Contract/Agreement between YU and respective sub-consultants/Subcontractors will define the above requirements in sufficient detail to verify the work performed meets the purchase order requirements.

On this Project, the sub-consultants/Subcontractors will be performing work under their own Quality Plan which shall be reviewed and approved by YU. The PM, or his designee, will perform an evaluation of the sub-consultants/Subcontractors implementation of their Quality Plan on a periodic basis as appropriate to the activities of the sub-consultants/Subcontractors. Reports of this evaluation will be maintained by the PM for the duration of the project. Any noncompliance shall be resolved to the satisfaction of the Client, and records maintained.

Verification of Purchased Product Work prepared by the sub-consultants/Subcontractors will be reviewed for conformance to Agreement/Contract requirements, accepted by the PM, and documented by written notification that the sub-consultants/Subcontractors work is in conformance with Contract requirements.

8.3 SUBCONTRACTORS/SUB-CONSULTANTS ANTICIPATED FOR THE SMP IMPLEMENTATION

It is anticipated that sub-consultants or subcontractors may be engaged by YU for the following services in the performance of the work covered by this SMP:

- Inspection of the SSDS and SVE system components, including fans, piping, system enclosures, alarm panels, and system status indicators.
- Verification of system integrity (e.g., checking for cracks in piping, loose fittings, or corrosion).
- Inspection of accessible manholes, risers, or sampling ports.
- Inspection of exhaust points to ensure proper function and unobstructed air discharge.
- Routine maintenance of SSDS fans, SVE blowers, and associated mechanical/electrical components.
- Cleaning or replacement of inline filters (if applicable).
- Repair or replacement of worn or damaged parts (e.g., check valves, vacuum gauges).
- Resealing and tightening of joints or fittings if leaks or wear are identified.
- Ensuring signage, labels, and system diagrams remain legible and intact.

9 QUALITY MANAGEMENT

A senior YU employee will serve as the Quality Assurance Officer for the project. This individual will not have direct project responsibility but will independently monitor the implementation of YU's QMS. The duties of the QAO will be:

- Monitor the project in accordance with YU's QMS.
- Review the project to ensure that goals of the project are adequately addressed.
- Record any deviation from the QMS pertaining to any aspect of the project and ensure the PM is aware of said deviation.
- Meet with the PM on an as needed basis to discuss adherence to the QMS.
- Advise the PM of findings and make recommendations on methods to improve quality.
- Coordinate activities with other sub-consultants/Subcontractors and Client.
- Verify that outside services from sub-consultants/Subcontractors meet with plan and contract requirements.

10 DATA REDUCTION, VALIDATION, AND REPORTING

Data validation activities will include the manual check of laboratory data tables and reduced data summary tables. A cycle of markup, revision, and trace checking shall be performed and a check by the PM will ensure data quality.

Conclusions and/or recommendations will be reviewed by one or more qualified peers of the professional who developed them to ensure their accuracy on the basis of acquired data and conducted analyses.

The guidance followed to perform quality data validation, and the methods and procedures outlined herein and elsewhere in the RAWP, pertain to initiating and performing data validation, as well as reviewing data validation performed by others (if applicable). An outline of the data validation process is presented here, followed by a description of data validation review summaries.

10.1 LABORATORY DATA REPORTING AND REDUCTION

The laboratory will meet the applicable documentation, data reduction, and reporting protocols as specified in the NYSDEC ASP Category B deliverable requirements. In addition to the hard copy of the data report, the laboratory will be asked to provide the sample data electronically in spreadsheet form, generated to the extent possible directly from the laboratory's electronic files or information management system to minimize possible transcription errors resulting from the manual transcription of data. The laboratory will also provide the electronic deliverable in NYSDEC "EZ-EDD" format, as described in ASP 2005 Exhibit H, Section 1.1.1.

10.2 DATA VALIDATION

A subcontractor to YU will review and validate the soil and groundwater data. The data validator will be independent of the laboratory and independent of YU. Data validation will be performed by following guidelines established in the specific USEPA Region 2 SOPs.

Where necessary and appropriate, supplemental validation criteria may be derived from the EPA Functional Guidelines (USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review, EPA 540/R-99/008; October 1999, and National Functional Guidelines for Inorganic Data Review, EPA 540/R-04-004; October 2004), as appropriate.

Validation reports will consist of text results of the review and marked up copies of Form I (results with qualifiers applied by the validator). Validation will consist of target and non-target compounds with corresponding method blank data, spike and surrogate recoveries, sample data, and a final note of validation decision or qualification, along with any pertinent footnote references. Qualifiers applied to the data will be documented in the report text. The results of the data validation will be presented in a Data Usability Summary Report (DUSR) prepared by the validation subcontractor.

10.3 DATA USABILITY

Subsequent to review of the items evaluated in the subcontractor's DUSR and accompanying tables, YU will then prepare a brief data usability summary. The data usability summary, which will be provided as part of the Final Engineering Report (FER), encompasses both quantitative and qualitative aspects, although the qualitative element is the most significant.

The quantitative aspect is a summary of the data quality as expressed by qualifiers applied to the data; the percent rejected, qualified (i.e., estimated), missing, and fully acceptable data are reported. As appropriate, this quantitative summary is broken down by matrix, laboratory, or analytical fraction or method. The qualitative element of the data usability summary is the QA officer's translation and summary of the validation reports into a discussion useful to data users. The qualitative aspect will discuss the significance of the qualifications applied to the data, especially in terms of those most relevant to the intended use of the data. The usability report will also indicate whether there is a suspected bias (high or low) in qualified data, and will also provide a subjective overall assessment of the data quality.

10.4 FIELD DATA

Field data collected during the field activity will be presented in tabular form with any necessary supporting text. Unless activities resulted in significant unexpected results, field data comments can be added as footnotes to the tables.

11 TRAINING

YU will:

- Identify competency needs for personnel performing activities affecting quality. YU has developed position descriptions for those personnel performing activities affecting quality, which identify competency requirements. The PM maintains the latest issue of such position descriptions.
- Provide training to satisfy competency needs. The PM is responsible for identifying training needs and assuring that training is performed.
- Only employ qualified personnel to execute the scope of work.

The PM is responsible for verifying that each employee assigned to the project has read and understands the QMS, and is familiar with the procedures/instructions unique to the project. Training will consist of in-house technical and non-technical seminars given by qualified and experienced senior staff members. In addition, specifically conducted meetings will be designed to review quality of work and address any corrective measures needed to correct any nonconformance discovered. Project specific staff will be required to attend. The PM will maintain training and other records of proficiency at YU's office located on the 3rd floor of 611 River Drive, Elmwood Park, NJ 07407.

12 GLOSSARY

1. “Environmental Laboratory Accreditation Program” or “ELAP” means a program conducted by the NYSDOH which certifies environmental laboratories through on-site inspections and evaluation of principles of credentials and proficiency testing. Information regarding ELAP is available at the NYSDOH Wadsworth Laboratory website.

2. "Preservation" means preventing the degradation of a sample due to precipitation, biological action, or other physical/chemical processes between the time of sample collection and analysis. The most common examples involve refrigeration at 4 degrees Celsius and lowering sample pH by the addition of acid to keep dissolved metals in solution or to reduce the biodegradation of dissolved organic analytes.

APPENDIX H – Site Management Forms

Summary of Green Remediation Metrics for Site Management

Site Name: _____ Site Code: _____
Address: _____ City: _____
State: _____ Zip Code: _____ County: _____

Initial Report Period (Start Date of period covered by the Initial Report submittal)
Start Date: _____

Current Reporting Period
Reporting Period From: _____ To: _____

Contact Information
Preparer's Name: _____ Phone No.: _____
Preparer's Affiliation: _____

I. Energy Usage: Quantify the amount of energy used directly on-site and the portion of that derived from renewable energy sources.

	Current Reporting Period	**Total to Date**
Fuel Type 1 (e.g. natural gas (cf))		
Fuel Type 2 (e.g. fuel oil, propane (gals))		
Electricity (kWh)		
Of that Electric usage, provide quantity:		
Derived from renewable sources (e.g. solar, wind)		
Other energy sources (e.g. geothermal, solar thermal (Btu))		

Provide a description of all energy usage reduction programs for the site in the space provided on Page 3.

II. Solid Waste Generation: Quantify the management of solid waste generated on-site.

	Current Reporting Period (tons)	**Total to Date (tons)**
Total waste generated on-site		
OM&M generated waste		
Of that total amount, provide quantity:		
Transported off-site to landfills		
Transported off-site to other disposal facilities		
Transported off-site for recycling/reuse		
Reused on-site		

Provide a description of any implemented waste reduction programs for the site in the space provided on Page 3.

III. Transportation/Shipping: Quantify the distances travelled for delivery of supplies and lab-supplied bottles, shipping of laboratory samples, and the removal of waste.

	Current Reporting Period (miles)	**Total to Date (miles)**
Standby Engineer/Contractor		
Laboratory Courier/Delivery Service (bottle and sample delivery)		
Waste Removal/Hauling		

Provide a description of all mileage reduction programs for the site in the space provided on Page 3. Include specifically any local vendor/services utilized that are within 50 miles of the site.

IV. Water Usage: Quantify the volume of water used on-site from various sources.

	Current Reporting Period (gallons)	**Total to Date (gallons)**
Total quantity of water used on-site (not including treated water)		
Of that total amount, provide quantity:		
Public potable water supply usage		
Surface water usage		
On-site groundwater usage		
Collected or diverted storm water usage		

Provide a description of any implemented water consumption reduction programs for the site in the space provided on Page 3.

V. Land Use and Ecosystems: Quantify the amount of land and/or ecosystems disturbed and the area of land and/or ecosystems restored to a pre-development condition (i.e. Green Infrastructure).

	Current Reporting Period (acres)	**Total to Date (acres)**
Land disturbed		
Land restored		

Provide a description of any implemented land restoration/green infrastructure programs for the site in the space provided on Page 3.

Description of green remediation programs reported above (Attach additional sheets if needed)
Energy Usage:
Waste Generation:
Transportation/Shipping:
Water usage:
Land Use and Ecosystems:
Recommendations/Other:

CONTRACTOR CERTIFICATION
I, _____ (**Name**) do hereby certify that I am _____ (**Title**) of _____ (**Contractor Name**), which is responsible for the work documented on this form. According to my knowledge and belief, all of the information provided in this form is accurate and the site management program complies with the DER-10, DER-31, and CP-49 policies. _____ **Date** **Contractor**

SITE MANAGEMENT FORM

Report No.: 22254 **BCP #:** C241269 **Date:** _____

Agency: NYSDEC

Division of Environmental Remediation
Remedial Investigation
NYSDEC BCP # C241228

Site: 43-25 52nd Street

Address: 43-25 52nd Street, Woodside, Queens, New York

Temperature: (F) _____ (am) ____(pm)

Wind Direction: _____ (am) _____(pm)

Weather: (am)

(pm)

Arrive at site: (am)

Leave site: (pm)

HEALTH & SAFETY:

Are there any changes to the Health & Safety Plan? Yes ( ) No ( )
(If yes, list the deviation under items for concern)

CHECKLISTS:

Site Sketch Attached:	Yes ( )	No ( )
Photos Taken:	Yes ( )	No ( )
Are any SMP-related site activities currently being conducted (SSDS and SVE Operation)	Yes ( )	No ( )
Building Use Still Consistent with SMP (Restricted Residential)?	Yes ( )	No ( )
SSDS/SVE inspections/monitoring	Yes ( )	No ( )

SITE MAP:

SITE DOCUMENTATION

Including updates regarding notification to NYSDEC regarding any changes to Site conditions/operations, routine reporting to NYSDEC, etc.).

Notes:

_____

SITE MANAGEMENT FORM

Report No.: 22254 **BCP #:** C241269 **Date:** _____

Evaluation of ECs

Environmental Control Type: SVE System	
Is the SVE system currently operating? If no, describe reason/alarm condition(s):	
Knockout Tank drained?	Yes ( ) No ( )
Have any problems occurred that require corrective action to the treatment system components or well access manifolds? If yes, describe:	

SVE System operations have also been documented using the applicable inspections logs (see attached) that will be provided as part of the PRR.

Environmental Control Type: SSDS
Are there any unusual odors, spills or leaks near the SSDS piping in the basement? Yes ( ) No ( ) If yes, describe source and plans for repair:
Is the SSDS blower running properly? If not, please describe: Yes ( ) No ( )
Any evidence of SSDS piping tampering, vandalism or damage on the SSDS piping or system components? Yes ( ) No ( ) If yes, describe:

SITE MANAGEMENT FORM

Report No.: 22254 **BCP #:** C241269 **Date:** _____

CONTRACTOR/SUBCONTRACTOR PERSONNEL ON SITE:

Name	Company Representing	Reason Onsite	Hours on-site

EQUIPMENT ON SITE:

Equipment	Hrs	Equipment	Hrs	Equipment	Hrs	Equipment	Hrs
					0		

1 – Active Equipment 2 – Inactive Equipment

SITE MANAGEMENT FORM

Report No.: 22254 **BCP #:** C241269 **Date:** _____

OFF-SITE WASTE TRANSPORTATION/DISPOSAL PRODUCTION:

Waste Stream	Method of Transport	Estimated Volume

ITEMS OF CONCERN:

COMMENTS:

ATTACHMENT(S) TO THIS REPORT: (photo log, sketches)

Photo Log below

ON-SITE REPRESENTATIVE/GEOLOGIST:

Name: (*signature*)

Date: _____

xc: Javier Perez-Maldonado – NYSDEC

SITE MANAGEMENT FORM

Report No.: 22254 **BCP #:** C241269 **Date:** _____

DAILY PHOTOLOG

Date	Photo ID	Description

Photo 1

SSDS MONITORING INSPECTION LOG

BCP ID:

43-25 52nd Street

Queens, NY

Project Manager: _____ ***Junior Environmental Scientist:*** _____

Senior Environmental Engineer: _____ **Date**: _____ **Tech**: _____

General

Weather: _____ *Temperature:* _____ *Barometric Pressure:* _____

When was the last rain event? _____

Are the blowers currently operating? If no, please list reason/alarm condition: _____

_____

Any evidence of system tampering, vandalism or damage in the first-floor equipment room? Is air discharging from the exhaust piping to the roof? _____

Were all cleanout/sampling port caps securely attached prior to system testing? If no, list location and contact Project Manager/Project Director. _____

Is the concrete floor slab overlying all of the SSDS piping runs intact? If no, list location and contact Project Manager/Project Director.

_____

Are there any holes, cracks, or other physical deficiencies in SSDS Piping? Are there any blockages in SSDS piping?

_____

Sub-Slab Depressurization System

SSDS Operations

Monitoring Point (MP) or Riser (R) Identification	Location	Flow Rate[1] cfm	Applied Vacuum[1] in. H2O	Induced Vacuum[2] in. H2O	Notes
MP-1	Garage (north)	NA	NA		
MP-2	Garage (center-west)	NA	NA		
R-1	SSDS/SVE Enclosure			NA	
R-2	SSDS/SVE Enclosure			NA	
R-3	SSDS/SVE Enclosure			NA	
R-4	SSDS/SVE Enclosure			NA	
Signature of Personnel Performing Inspection:					

Note:

This form must be signed, kept on file at the building location and be available on inspection.
This system protects public safety and must be operating properly to ensure the safety of occupants of the building.
If you identify any problems with this system, contact the SSDS maintenance team at YU & Associates at 201-791-0075

Inspector Note

SVE SYSTEM INSPECTION LOG

43-25 52nd Street

Queens, NY

Project Manager: _____ ***Junior Environmental Scientist:*** _____

Senior Environmental Engineer: _____ **Date**: _____ **Tech**: _____

General

Weather: _____ *Temperature:* _____ *Barometric Pressure:* _____

When was the last rain event? _____

Is the SVE blower currently operating? If no, ALERT PROJECT MANAGER and please list reason/alarm condition: _____

_____

Is condensate in the knockout tank gauge below the low-high float sensor? If no, ALERT PROJECT MANAGER and manually drain knockout tank. _____

Is 50-gallon drum full? If yes, acknowledge alarm on panel and ALERT PROJECT MANAGER.

_____

Any evidence of system tampering, vandalism or damage? If yes, ALERT PROJECT MANAGER and please note findings:

_____

Any evidence of system tampering, vandalism or damage to the exhaust stack? If yes, ALERT PROJECT MANAGER and please note findings: _____

Soil Vapor Extraction System

Arrival Status? ***Up*** ***Down*** **Departure Status?** ***Up*** ***Down***

Shed Temp Actual ____(°F) Min ____(°F) Max_____(°F) **System samples collected (Air):** ***Yes / No***

Reason for down time?

Soil Vapor Extraction (SVE) System:

SVE blower hour meter: _____hours *Re-circulation line:*_____ % open

SVE blower VFD setting: _____% *Drain KO tank:* _____gallons

Vacuum readings: **Catox Temperatures:**

*Blower Vacuum **(PI/VER4)**:* _____ inches of water (in. w. c) *T1 :* _____ °C

*Filter Vacuum **(PI/VER3)**:* _____ in. w. c *T2 :* _____ °C

*Knockout Vacuum **(PI/VER2)**:* _____ in. w. c *T3 :* _____ °C

*Influent Flow (**PI/VER1**):* _____ in. of water/dp*

Blower Effluent (before GAC): _____ in w.c.

Dilution Valve: open/closed

If open: ____ %

	Flow* (fpm)	dP* (in. w. c)	Temperature (°F)	Pressure (in. w. c)	PID (ppmv)	LEL (%)	Oxygen (%)
VAC/SVE Influent (**S-VER1**)							
Carbon Influent **(S-VC1)**							
Carbon Effluent **(S-VC2)**							

**Flow and dP can be read directly off the magnehelic gauges (top scale = dP, bottom scale = fpm)*

Monitoring Location

Monitoring Location	Vacuum in w.c.	Air Flow Reading in w.c.	Air Flow Reading in c.f.m.	Notes
SVE-01				
SVE-02				
SVE-03				
SVE-04				
MP-01				
MP-02				

Sample Log

Location	Start Time	Start Vacuum	End Time	End Vacuum	PID Field Screen	Sample ID	Notes
SVE Carbon Influent							
SVE Carbon Effluent							

Note: The SVE Inspection Log should also be completed for each sampling event. Samples to be collected and analyzed for VOCs by TO-15. Individual lines are not anticipated to be sampled in the routine sampling events. Sampling will be conducted as necessary at the discretion of the remedial engineer, in consultation with NYSDEC and NYSDOH.

Maintenance Performed:

Fire Extinguisher Inspection			
Extinguisher Location	**Gauge within range**	**Clear Nozzle**	**Pin in Place**
SVE Room	Y or N	Y or N	Y or N
Initialed Tag?	Y or N	Confirm Inspection Expiration Date	

1) Drain 1st KO tank
2) Drain 2nd KO tank (inside trailer)
3) Need to Oil Blower (217-222-5400 [Gardner Compressor Div.])
4) Need to service filter after KO tank (2nd, inside)
5) Change Broken Light Bulb

Inspector Note

Summary of Green Remediation Metrics for Site Management

Site Name: _____ Site Code: _____
Address: _____ City: _____
State: _____ Zip Code: _____ County: _____

Initial Report Period (Start Date of period covered by the Initial Report submittal)
Start Date: _____

Current Reporting Period
Reporting Period From: _____ To: _____

Contact Information
Preparer's Name: _____ Phone No.: _____
Preparer's Affiliation: _____

I. Energy Usage: Quantify the amount of energy used directly on-site and the portion of that derived from renewable energy sources.

	Current Reporting Period	**Total to Date**
Fuel Type 1 (e.g. natural gas (cf))		
Fuel Type 2 (e.g. fuel oil, propane (gals))		
Electricity (kWh)		
Of that Electric usage, provide quantity:		
Derived from renewable sources (e.g. solar, wind)		
Other energy sources (e.g. geothermal, solar thermal (Btu))		

Provide a description of all energy usage reduction programs for the site in the space provided on Page 3.

II. Solid Waste Generation: Quantify the management of solid waste generated on-site.

	Current Reporting Period (tons)	**Total to Date (tons)**
Total waste generated on-site		
OM&M generated waste		
Of that total amount, provide quantity:		
Transported off-site to landfills		
Transported off-site to other disposal facilities		
Transported off-site for recycling/reuse		
Reused on-site		

Provide a description of any implemented waste reduction programs for the site in the space provided on Page 3.

III. Transportation/Shipping: Quantify the distances travelled for delivery of supplies and lab-supplied bottles, shipping of laboratory samples, and the removal of waste.

	Current Reporting Period (miles)	**Total to Date (miles)**
Standby Engineer/Contractor		
Laboratory Courier/Delivery Service (bottle and sample delivery)		
Waste Removal/Hauling		

Provide a description of all mileage reduction programs for the site in the space provided on Page 3. Include specifically any local vendor/services utilized that are within 50 miles of the site.

IV. Water Usage: Quantify the volume of water used on-site from various sources.

	Current Reporting Period (gallons)	**Total to Date (gallons)**
Total quantity of water used on-site (not including treated water)		
Of that total amount, provide quantity:		
Public potable water supply usage		
Surface water usage		
On-site groundwater usage		
Collected or diverted storm water usage		

Provide a description of any implemented water consumption reduction programs for the site in the space provided on Page 3.

V. Land Use and Ecosystems: Quantify the amount of land and/or ecosystems disturbed and the area of land and/or ecosystems restored to a pre-development condition (i.e. Green Infrastructure).

	Current Reporting Period (acres)	**Total to Date (acres)**
Land disturbed		
Land restored		

Provide a description of any implemented land restoration/green infrastructure programs for the site in the space provided on Page 3.

Description of green remediation programs reported above (Attach additional sheets if needed)
Energy Usage:
Waste Generation:
Transportation/Shipping:
Water usage:
Land Use and Ecosystems:
Recommendations/Other:

CONTRACTOR CERTIFICATION
I, _____ (**Name**) do hereby certify that I am _____ (**Title**) of _____ (**Contractor Name**), which is responsible for the work documented on this form. According to my knowledge and belief, all of the information provided in this form is accurate and the site management program complies with the DER-10, DER-31, and CP-49 policies. _____ **Date** **Contractor**

APPENDIX I – Field Activities Plan

APPENDIX I

FIELD ACTIVITIES PLAN

43-25 52nd Street, Woodside, NY 11377

BCP# C241269

Block 1321, Lot 10

Submitted to:

BROWNFIELD CLEANUP PROGRAM

New York State Department of Environmental Conservation

Division of Environmental Remediation

Remedial Bureau B, 12th Floor

625 Broadway

Albany, New York 12233-7016

Prepared for:

43-25 52 LLC

46-02 70th Street

Woodside, NY 11377

Prepared by:

YU & Associates Engineers, P.C.

611 River Drive, 3rd Floor

Elmwood Park, NJ 07407

November, 2025

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LIST OF FIGURES

Figure 1 Site Location Map

1.0 INTRODUCTION

1.1 PURPOSE

The purpose of this Field Activities Plan (FAP) is to describe the protocols and procedures that will be followed during implementation of the Site Management Plan (SMP)at the 43-25 52nd Street site (hereafter referred to as the "Site"), to include in Site Management Plan (SMP) as one appendix. The work will be performed using the same protocols developed during the investigation phase of this project and in accordance with New York State Department of Environmental Conservation (NYSDEC) Division of Environmental Remediation DER-10 Technical Guidance for Remedial Investigation and Remediation (May 2010) and the New York State Department of Health (NYSDOH) Soil Vapor Guidance (October 2006).

The FSP provides the detailed procedures for the collection of soil vapor samples.

The quality assurance protocols applicable to this project are presented in the Quality Assurance Project Plan (QAPP), provided as Appendix G to the SMP. The health and safety plan (HASP) is provided as Appendix F to the SMP.

1.2 SITE DESCRIPTION

The Site is located at 43-25 52nd Street, Woodside, New York (Block 1321, Lot 10 aka Lots 7 and 10), see Figure 1 for the Site location. The Site covers an approximately 0.21-acre parcel of land and is bounded by Skillman Avenue to the north, Queens Boulevard to the south, residential properties to the east, and 52nd St to the west. Lot 7 was occupied by a single-story vacant commercial building with a paved parking area, which was previously used as an auto shop. Lot 10 was occupied by a single-story church building. The vicinity of the Site is surrounded by recently developed residential buildings and commercial properties including the Great Bear Tire & Auto Repair Center, Kavka Design Home Goods Store, Pins & Needles Embroidery LLC, and a U-Haul Neighborhood Dealer.

1.3 SITE ACCESS

YU obtained permissions associated with the site-wide inspection and SSDS and SVE system inspection and monitoring. Permits will be obtained to install and/or sample from the sidewalk or roadway.

1.4 FIELD ACTIVITIES PLAN (FAP) OBJECTIVES

The objective of this generic FAP is to ensure that field data collected during work assignment investigations are of suitable quality and quantity to meet the investigation objectives. To meet this objective, the following topics are presented and discussed in this FAP:

- Description and objective of field investigation procedures
- Calibration procedures

This FAP has been prepared to address field methods and sample collection procedures. In addition, this FAP addresses components that influence these processes and provides a detailed plan to ensure that decisions being made based on the field data are valid, accurate, and defensible in support of subsequent recommendations.

The results of the field activities will be used to support project decisions and meet overall project objectives. The procedures summarized in Section 2, 3 and 5 were developed to ensure that the quality of the field data is such that the data is legally and scientifically defensible and is applicable for its anticipated use. Media-specific data quality objectives, which are discussed in the generic Quality Assurance Project Plan (QAPP), have been developed based on the factors presented above. A summary of field activity methods, documentation, DQOs, and QA/QC protocols is provided in Sections 2,3 and 5.

A summary of objectives, equipment, and procedures for the following field activities is provided in this section:

- Field quality control samples
    - Matrix spike/matrix spike duplicates
    - Field duplicates
- Field measurements
    - PID Screening
    - Vacuum Reading
- Sample equipment decontamination
- Sampling
    - Soil vapor and air
    - Indoor Air and Outdoor Ambient Sampling
    - Influent and Effluent Sampling
- Community air monitoring program
- Field documentation
- Sample handling

2.0 GENERAL FIELD ACTIVITIES

The following field activities will be performed as part of the SMP:

- Influent/Effluent (IF/EF) Soil Vapor Sampling – The IF/EF sampling is conducted to evaluate the performance of the Soil Vapor Extraction (SVE) system by measuring VOC concentrations entering (influent) and exiting (effluent) the system. Samples are collected from designated ports on the SVE manifold—upstream and downstream of the treatment unit.
- Indoor and Outdoor Ambient Air Sampling – is performed to assess potential vapor intrusion into the building and to establish background TO-15 VOC levels. Indoor air samples are collected from the lowest occupied level (e.g., basement or ground floor), while outdoor ambient air samples are collected upwind of the structure, away from potential emission sources. Indoor and outdoor air sampling will be conducted in accordance with NYSDOH's Guidance for Evaluating Soil Vapor. Indoor and outdoor air sampling will take place during the heating season as defined by the NYSDOH guidance.

2.1 MOBILIZATION

Following authorization to proceed with the field investigation from NYSDEC, YU & Associates (YU) will mobilize necessary materials and equipment to the Site.

A project kick-off meeting will be held prior to initiating field work to orient field team members and subcontractors with the Site and to familiarize YU personnel and our subcontractor personnel with site background, scope of work, potential dangers, health and safety requirements, emergency contingencies and other field procedures.

2.2 DECONTAMINATION PROCEDURES AND HANDLING OF INVESTIGATION DERIVED WASTE

All dedicated equipment and tools used to collect samples for chemical analysis will be decontaminated prior to and between each sample interval using an Alconox rinse and potable water rinse prior to reuse.

A temporary decontamination area lined with polyethylene sheeting will be constructed on site for use during decontamination of the drilling and sampling equipment. Investigation derived waste (IDW) consisting of soil cuttings will be staged in appropriate containers and analyzed to determine the appropriate disposal methods. Based on the analytical results, YU will dispose of the IDW at a NYSDEC approved disposal facility.

3.0 SOIL VAPOR SAMPLING

Following the remediation of the subject property, a influent/effluent soil vapor sampling and indoor/outdoor air sampling program will be implemented. The soil vapor sampling program is to assess TO-15 VOC emissions calculations, and to provide baseline TO-15 VOC concentrations at the onset of SVE system operation.

3.1 INFLUENT AND EFFLUENT SAMPLES

A SVE system has been installed to remove TO-15 VOC contaminant mass below the newly-constructed basement slab. Influent and effluent vapor samples will be collected using 1-Liter Summa® canisters and analyzed for TO-15 VOCs by EPA Method TO-15 by a NYSDOH Environmental Laboratory Approval Program (ELAP)-certified laboratory. Samples will be collected from designated sampling ports on the SVE manifold—upstream of the treatment unit for influent, and downstream of the treatment unit or stack for effluent. Prior to sampling, each port will be purged for at least three to five minutes to ensure the sample is representative of active system flow. Pre-cleaned 1-liter Summa canisters will be connected to the sampling ports using inert Teflon tubing. Canisters will be filled to no more than 75–80% capacity to prevent overexpansion. Samples shall be collected from the SVE system on a routine basis. Sampling locations, required analytical parameters, and schedule are provided in the SMP. Modification to the frequency or sampling requirements will require approval from the NYSDEC project manager.

3.2 INDOOR AIR AND OUTDOOR AMBIENT AIR SAMPLING

The indoor air and outdoor ambient air will be sampled on an annual basis to monitor the effectiveness of the installed SSDS and SVE systems in mitigating vapor intrusion and prove that indoor air quality is protective of human health under current site conditions. Sampling will be performed using individually certified-clean 6-liter Summa canisters equipped with pre-calibrated, flow-restricted regulators designed to collect 24-hour time-integrated air samples at a controlled flow rate of approximately 3.5 mL/min, in accordance with EPA Method TO-15, and sampling will take place during the heating season as defined by the NYSDOH guidance.

For indoor air sampling, canisters will be deployed in occupied spaces of the basement. Canisters will be placed at a height of 3 to 5 feet above the floor on a non-permeable surface or tripod, in an area with minimal airflow disturbance and away from HVAC supply or return vents, electrical appliances, or known sources of VOCs. Prior to sampling, building occupants will be advised to avoid the use of cleaning products, air fresheners, candles, paints, solvents, or other VOC-generating materials for a minimum of 24 hours before and during sampling to avoid biasing the results. All doors and windows should remain in their typical use configuration during the sampling period to reflect normal indoor conditions.

Outdoor ambient air samples will be collected concurrently at a location upwind of the structure, a minimum of 10 feet from building exhaust vents, HVAC units, vehicle traffic, fuel storage, or other external VOC sources. The outdoor canister will be placed at a height similar to indoor samples, securely anchored to avoid disturbance from wind or movement during the 24-hour sampling period.

At the start of each sampling event, the vacuum of the canister will be measured and recorded to confirm acceptable initial pressure. The regulator valve will then be opened to initiate sampling. After 24 hours, the valve will be closed, and the final vacuum will be recorded to confirm proper sample collection. Each canister will be labeled with a unique sample ID, location, date, time of collection, and sampler's initials. All sampling details, environmental conditions (temperature, barometric pressure, wind direction/speed for outdoor sampling), and observations regarding building use during the sampling period will be documented in a dedicated field logbook. Chain-

of-custody forms will be completed for all samples. Sampling locations, required analytical parameters, and schedule are provided in the SMP.

3.3 COMMUNITY AIR MONITORING

Community air monitoring requires real-time monitoring for VOCs at the downwind perimeter of each designated work area when certain activities are in progress at impacted sites. The community air monitoring is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The action levels for community air monitoring require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, community air monitoring helps to confirm that work activities do not spread contamination off site through the air.

The procedures and action levels for community air monitoring are presented in the CAMP that has been prepared for the SMP.

4.0 FIELD EQUIPMENT CALIBRATION AND MAINTENANCE

The following field instruments will be used during the investigation:

- PID

4.1 PORTABLE PHOTO-IONIZATION DETECTOR (PID)

- The photo-ionization detector will be equipped with either a 10.2 or 10.6 eV lamp. In this configuration, the PID is capable of ionizing and detecting compounds that account for over 70% of the VOCs on the USEPA Target Compound List.
- Calibration must be performed at the beginning of each day of use with a standard calibration gas having a concentration of 100 parts per million of isobutylene. If the unit experiences abnormal perturbation or erratic readings, more frequent or additional calibration will be required.
- All calibration data must be recorded in the project field notebooks.
- A battery check must be completed at the beginning and end of each working day.
- All changes to the PID will be noted in the field notes (such as lamp or filter cleaning or replacement or change of instrument).

5.0 QUALITY ASSURANCE/QUALITY CONTROL PROCEDURES

5.1 CHAIN-OF-CUSTODY

- A Chain-of-Custody (COC) record will accompany the sample containers during selection and preparation at the laboratory, during shipment to the field, and during return shipment to the laboratory.
- The COC will include the sample identities of each sample container and the analytical parameters for each, and will list the field personnel that collected the samples, preservation method, the project name and number, the name of the analytical laboratory that will receive the samples, and the method of sample shipment.
- If samples are split and sent to different laboratories, a copy of the COC record will be sent with each sample shipment.
- The COC will be completed by field personnel as samples are collected and packed for shipment.
- Erroneous markings will be crossed-out with a single line and initialed by the author.
- The REMARKS space will be used to indicate if the sample is a matrix spike, matrix spike duplicate, or matrix duplicate.
- Field duplicates will be given fictitious sample IDs (e.g., by adding 50 to the sample ID of the original sample) and be submitted blind to the laboratory.
- After the samples have been collected and sample information has been listed on the COC form, the method of shipment, the shipping cooler identification number(s), and the shipper airbill number will be entered on the COC.
- A member of the sampling team will write his/her signature, the date, and time on the first RELINQUISHED BY space.
- One copy of the COC will be retained by sampling personnel. The other copy and the original will be sealed in a plastic bag and taped inside the lid of the shipping cooler.
- After the shipping cooler is closed, custody seals provided by the laboratory will be affixed to the latch and across the front and back of the cooler lid, and signed by the person relinquishing the samples to the shipper.
- The seal will be covered with clear tape, and the cooler lid will be secured by wrapping with packing tape.
- The cooler will be relinquished to the shipper, typically an overnight carrier.
- The COC seal must be broken to open the container. Breakage of the seals before receipt at the laboratory may indicate tampering. If tampering is apparent, the laboratory will contact the Project Manager, and the samples will not be analyzed until directed to do so.
- The samples must be delivered to the laboratory within 48 hours of collection.
- Sample Identification, Numbering, and labeling

Air sample containers will be labeled at the time of sampling with the following information:

- Project name and number

- Sample location ID
- Sample number
- Date and time of collection
- Sampler initials
- Analysis required

For example, if the first air sample collected at the inlet of the SVE system was collected at 1pm on February 15, 2023. The sample would be labeled as follows:

43-25 52nd Street, 22254, IF-1, 02/15/2023, 13:00. The sample ID would be IF-1-02152023, for air sample 1 collected at the SVE inlet.

Trip blanks will be identified as "TB" followed by a six-digit date code indicating the date of shipment. For example, the trip blank shipped on February 15, 2023 will be labeled TB021523.

Pre-printed sample labels will be provided by the laboratory along with the sample containers. Sample labels will be completed and as described above. At a minimum, they will include the site name or number, sample ID, date of sample, and the analysis required.

6.0 EQUIPMENT DECONTAMINATION AND IDW DISPOSAL

All non-dedicated hand equipment and tools will be decontaminated using the following procedures:

- Scrub/wash with a laboratory grade detergent (e.g., Alconox);
- Tap water rinse or distilled/de-ionized water rinse; and
- Distilled/de-ionized water rinse.

If equipment is to be stored for future use, it will be allowed to air dry, and then wrapped in aluminum foil or sealed in plastic bags.

General trash generated during the investigation (e.g., packaging materials, personal protective equipment which is not grossly contaminated) will be bagged and disposed as ordinary solid waste.

7.0 FIELD DOCUMENTATION

Field notebooks will be initiated at the start of on-site work. The field notebook will include the following daily information for all site activities (except that information that is recorded on standard forms need not be repeated in the log book):

- Date and Meteorological conditions (temperature, wind, precipitation);
- Site conditions (e.g., dry, damp, dusty, etc.);
- Identification of crew members (YU and subcontractor present) and other personnel (e.g., agency or site owner) present;

- Description of field activities and location(s) where work is performed;
- Problems encountered and corrective actions taken;
- Records of field measurements or descriptions recorded; and
- Notice of modifications to the scope of work.

APPENDIX J – Remedial System Optimization Report Outline

REMEDIAL SYSTEM OPTIMIZATION FOR 43-25 52nd Street

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1.0 INTRODUCTION
1.1 SITE OVERVIEW
1.2 PROJECT OBJECTIVES AND SCOPE OF WORK
1.3 REPORT OVERVIEW
2.0 REMEDIAL ACTION DESCRIPTION
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2.2 REGULATORY HISTORY AND REQUIREMENTS
2.3 CLEAN-UP GOALS AND SITE CLOSURE CRITERIA
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3.3 REGULATORY COMPLIANCE
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4.2.1 Maintenance Improvements
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4.3 RECOMMENDATIONS TO REDUCE COSTS

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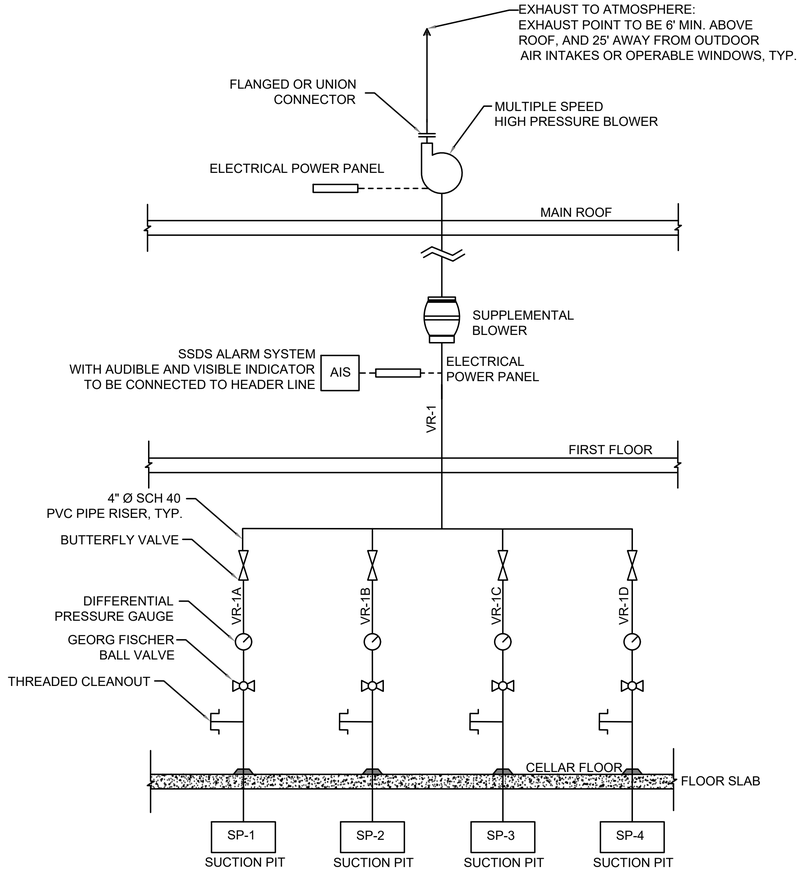
4.3.2 Process Improvements or Changes

4.3.3 Optimize Monitoring Program

4.3.4 Maintenance and Repairs

4.4 RECOMMENDATIONS FOR IMPLEMENTATION

APPENDIX K – SSDS nad SVE System As-Built Drawings



1 SSDS PROCESS FLOW DIAGRAM
SCALE: N.T.S

GENERAL NOTES:

1) DESIGN DETAILS AND DRAWINGS WERE ADAPTED FROM EPA TECHNICAL MANUAL EPA/625/R-92/016.
2) INSTALLATION OF THE SUB-SLAB DEPRESSURIZATION (SSD) SYSTEM WAS COORDINATED WITH OTHER UTILITIES.
3) ALL CONNECTIONS AT VAPOR PIPE FITTINGS AND JOINTS WERE CONSTRUCTED AIR-TIGHT IN ACCORDANCE WITH THE MANUFACTURER'S PROCEDURES.
4) REFER TO STRUCTURAL DRAWINGS FOR FOUNDATION INFORMATION AND DETAILS. REFER TO STRUCTURAL AND UTILITY DRAWINGS FOR UNDER-SLAB UTILITIES OTHER THAN THE VAPOR PIPING.
5) REFER TO ARCHITECTURAL DRAWINGS FOR ROUTING OF VAPOR PIPING ALONGSIDE BUILDING WALL(S) AND TERMINATION OF PIPING FOR EXHAUST VENTILATION.
6) FIRE STOP COLLARS WERE INSTALLED FOR ALL PENETRATIONS OF FIRE-RATED WALLS.
7) VALVES, VACUUM GAUGES, AND BLOWERS WERE INSTALLED AT ACCESSIBLE LOCATIONS.
8) VALVES AND GAUGES WERE INSTALLED AT APPROXIMATELY 5 FEET ABOVE FINISHED FLOOR ELEVATION.

BLOWER NOTES:

1) THE BLOWER INSTALLED WAS SELECTED TO EFFECTIVELY MINIMIZE SOIL VAPOR INTRUSION WHILE MINIMIZING EXCESS ENERGY USAGE, AND TO MEET REQUIREMENTS FOR SAFETY, SYSTEM PERFORMANCE INDICATION, AND NOISE REDUCTION.
2) THE BLOWER WAS NOT LOCATED IN OR BELOW A LIVABLE OR OCCUPIED AREA OF THE BUILDING.
3) THE BLOWER WAS HOUSED IN A SOUND ENCLOSURE.

SSD SYSTEM NOTES:

1) SUCTION PITS, MANIFOLD, VALVES, PORTS, PIPING, AND TYPICAL SLAB-ON-GRADE CONSTRUCTION ARE SHOWN ON CONSTRUCTION DETAIL DRAWINGS.
2) SSD SYSTEM PIPING WAS INSTALLED AS 4-INCH DIAMETER SCHEDULE 40 PVC PIPE (OR EQUIVALENT). WHERE PIPE SUPPORTS WERE REQUIRED, TYPE, PLACEMENT, AND NUMBER OF SUPPORTS WERE APPROVED BY THE MECHANICAL ENGINEER.
3) A MINIMUM 6-INCH-THICK CRUSHED STONE LAYER AND GEOTEXTILE FABRIC WERE INSTALLED CONTINUOUSLY UNDER THE ENTIRE SSD SUCTION PITS AND SUB-SLAB PIPING, AS SHOWN ON CONSTRUCTION DETAILS H103-02 & H103-07.
4) SUCTION PITS WERE LOCATED AT SAFE DISTANCES FROM COMBUSTION APPLIANCES TO AVOID BACK-DRAFTING ISSUES.
5) ALL HORIZONTAL PIPE RUNS WERE PITCHED AT A MINIMUM OF 1/8 INCH PER FOOT TOWARD THE SUCTION PITS TO ALLOW CONDENSATION WATER TO DRAIN INTO THE PIT.
6) VALVES AND GAUGES WERE MOUNTED IN TEE FITTINGS INSTALLED PARALLEL TO ADJACENT WALLS.
7) ROOF PENETRATIONS WERE INSTALLED IN ACCORDANCE WITH ARCHITECTURAL CONSTRUCTION DETAILS.
8) RAIN GUARDS/CAPS WERE INSTALLED AT THE EXHAUST POINT TO PREVENT BLOCKAGE AND REDUCE THE POTENTIAL FOR SUBSURFACE VAPOR RE-ENTRY.
9) THE SSD SYSTEM WAS TESTED TO MAINTAIN A MINIMUM NEGATIVE PRESSURE OF -0.004 INCHES WATER COLUMN (W.C.) UNDER THE SLAB.
10) FINAL SUCTION PIT LOCATIONS WERE COORDINATED AND APPROVED BY THE ENGINEER.

SYSTEM STARTUP AND CALIBRATION:

1) ALL EQUIPMENT AND ACCESSORIES SHALL BE ADJUSTED AND CALIBRATED BEFORE ANY STARTUP.
2) AFTER INSTALLATION, THE SSD SYSTEM PERFORMANCE MUST BE VERIFIED.
3) ALL MECHANICAL EQUIPMENT AND ELECTRICAL EQUIPMENT, INCLUDING RELATED CONTROL SYSTEMS, SHALL BE SUBJECTED TO PRELIMINARY OPERATION AND TESTING BEFORE THE INDIVIDUAL FACILITIES AND SYSTEMS ARE PUT INTO OPERATION. TESTS SHALL BE DONE TO DETERMINE WHETHER THE EQUIPMENT HAS BEEN PROPERLY ASSEMBLED, ALIGNED, WIRED, OR CONNECTED. REQUIRED REPAIRS SHALL BE COMPLETED ACCORDING TO MANUFACTURER'S SPECIFICATIONS.
4) COMMUNICATION TESTS SHALL BE USED TO CONFIRM THAT THE SYSTEM MAINTAINS AN ADEQUATE NEGATIVE PRESSURE UNDER THE SLAB. A MINIMUM SUB-SLAB PRESSURE OF -0.004 INCHES W.C. IS REQUIRED. A SUB-SLAB PRESSURE OF -0.01 INCHES W.C. IS RECOMMENDED. EXCESSIVE DEPRESSURIZATION SHALL BE AVOIDED TO PREVENT BACK-DRAFTING OF COMBUSTION APPLIANCES.
5) SUB-SLAB PRESSURE SHALL BE CONTROLLED BY ADJUSTING BLOWER FLOW VALVE AND/OR BLOWER SIZE. PRESSURE SHALL BE SET AT A LEVEL TO MINIMIZE SOIL VAPOR INTRUSION EFFECTIVELY WHILE MINIMIZING EXCESS ENERGY USAGE, TO AVOID COMPROMISING MOISTURE AND TEMPERATURE CONTROLS AND OTHER COMFORT FEATURES, AND TO MINIMIZE NOISE PER NEW YORK STATE DEPARTMENT OF HEALTH (NYSDOH) SOIL VAPOR INTRUSION GUIDANCE DATED OCTOBER 2006 INCLUDING UPDATES UNTIL FEBRUARY 2024.
6) SMOKE TEST SHALL BE CONDUCTED IF ADEQUATE PRESSURE IS NOT OCCURRING UNDER THE SLAB. THE LEAKING AREA SHALL BE IDENTIFIED AND RESEALED.

OPERATION, MAINTENANCE, AND MONITORING NOTES:

1. AS APPROPRIATE, PREVENTATIVE MAINTENANCE, REPAIRS AND/OR ADJUSTMENTS SHALL BE MADE TO SSD SYSTEM TO ENSURE ITS EFFECTIVENESS.
2. OPERATION, MAINTENANCE, AND MONITORING REQUIREMENT DETAILS SHALL BE DETERMINED BY ENVIRONMENTAL ENGINEER ACCORDING TO SUB-SURFACE ENVIRONMENTAL INVESTIGATION RESULTS.
3. AS A MINIMUM, THE FOLLOWING OM&M ACTIVITIES ARE REQUIRED ACCORDING TO NYSDOH SOIL VAPOR INTRUSION GUIDANCE DATED OCTOBER 2006 INCLUDING UPDATES UNTIL FEBRUARY 2024 AT A VAPOR INTRUSION SITE:
   - 3.a. VACUUM GAUGE IS REQUIRED TO BE CHECKED WEEKLY TO ENSURE ADEQUATE PRESSURE IS MAINTAINED UNDER SLAB.
   - 3.b. ROUTINE MAINTENANCE IS REQUIRED TO COMMENCE WITHIN 18 MONTHS AFTER SSD SYSTEM BECOMES OPERATIONAL AND SHALL OCCUR EVERY 12 TO 18 MONTHS THEREAFTER BY QUALIFIED ENVIRONMENTAL ENGINEER.
   - 3.c. POST-MITIGATION INDOOR AND OUTDOOR AIR SAMPLING IS REQUIRED AFTER 30 DAYS OF DEPRESSURIZATION SYSTEM INSTALLATION.
4. BLOWER MOTOR OPERATION SHALL BE VISUALLY CHECKED AT LEAST WEEKLY TO CONFIRM SYSTEM IS RUNNING.
5. CONTROL PANEL STATUS LIGHTS, SWITCHES, AND ANY INSTALLED ALARMS SHALL BE INSPECTED DURING EACH SITE VISIT AND MALFUNCTIONS ADDRESSED IMMEDIATELY.
6. SYSTEM VACUUM READINGS AND FLOW RATES AT EACH EXTRACTION POINT SHALL BE RECORDED DURING ROUTINE MAINTENANCE AND COMPARED TO BASELINE START-UP DATA.
7. FILTERS, MUFFLERS, OR MOISTURE TRAPS (IF PRESENT) SHALL BE CLEANED OR REPLACED AS NECESSARY TO MAINTAIN SYSTEM PERFORMANCE.
8. ROOF AND INTERIOR RISERS SHALL BE VISUALLY INSPECTED FOR DAMAGE, LEAKS, OR DETERIORATION AT LEAST ONCE PER YEAR, AND REPAIRS MADE AS NEEDED.
9. ALL OPERATIONAL DATA, MAINTENANCE ACTIVITIES, AND REPAIRS SHALL BE DOCUMENTED IN A SYSTEM LOGBOOK KEPT ONSITE OR WITH THE RESPONSIBLE PARTY.
10. ANY SIGNIFICANT DEVIATION FROM BASELINE OPERATING PARAMETERS SHALL PROMPT AN INVESTIGATION BY THE ENVIRONMENTAL ENGINEER TO DETERMINE THE CAUSE AND NECESSARY CORRECTIVE ACTIONS.

No.	Date	Revision

REVISIONS



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PROJECT:

43-25 52nd STREET
WOODSIDE, QUEENS

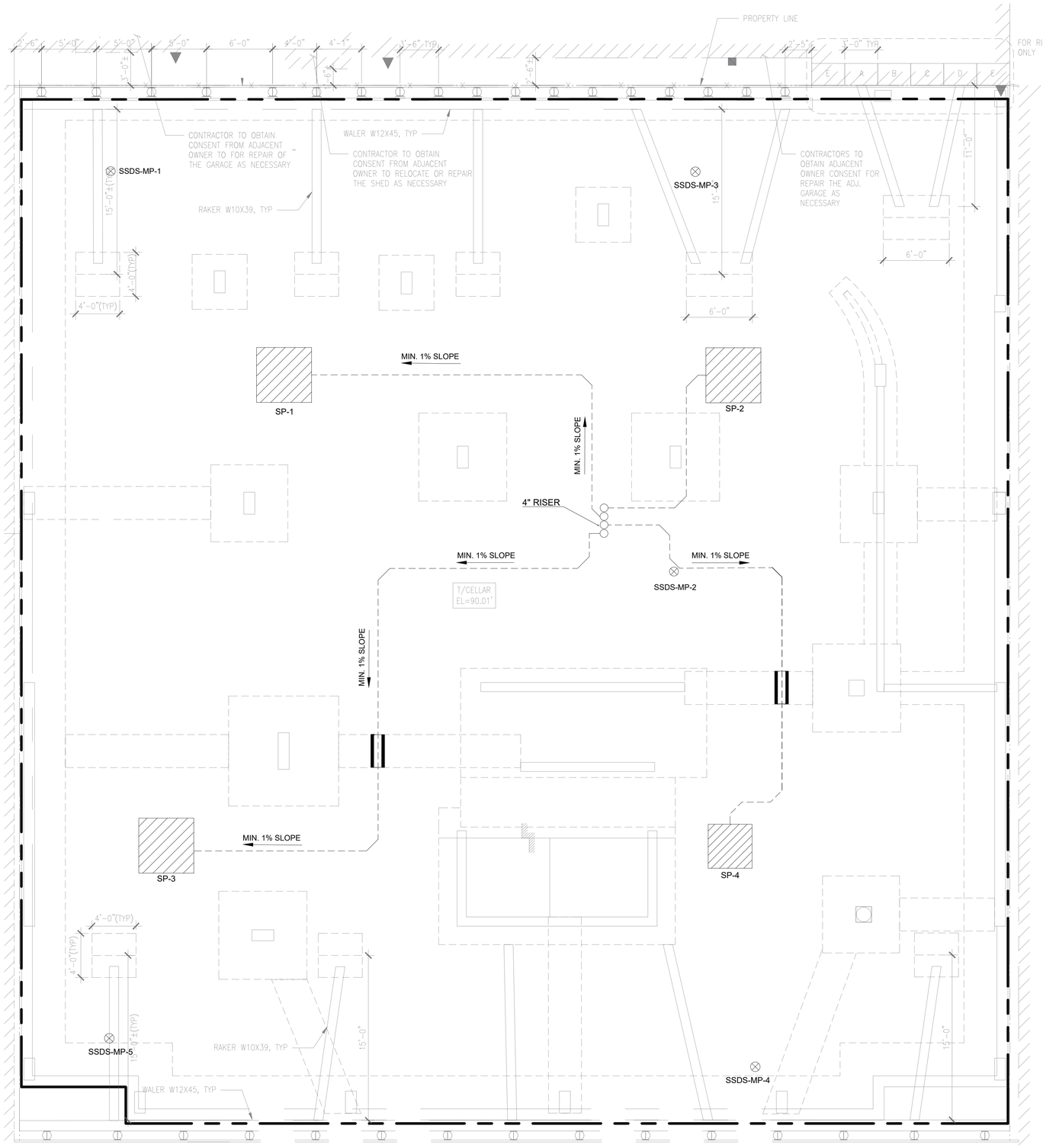
TITLE: SUB-SLAB DEPRESSURIZATION SYSTEM DIAGRAM AND GENERAL NOTES

JOB NO:	22254	DRAWING NO:	
DATE:	08/11/2024		H200.00
SCALE:	AS SHOWN		
DRAWN BY:	ND		
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NOTES:

1. THE BASE MAP IS FROM THE FOUNDATION PLAN (SEE SOE-101)
2. AS-BUILT LOCATION OF PITS ARE SHOWN. THE EXACT LOCATIONS OF THE PITS, PIPING, AND RISER PIPE WILL REQUIRE OTHER DESIGN TEAM'S APPROVAL TO ACCOMODATE BUILDING COMPONENTS OR ARCHITECTURAL DETAILS.
3. SLOPE HORIZONTAL PIPE A MINIMUM OF 1/8-INCH VERTICAL PER FOOT HORIZONTAL (1% SLOPE) UNIFORMLY TOWARDS SUB-SLAB SUCTION PIT OR TO UNDERGROUND CONDENSATE DRAIN (SEE DETAIL 2/H103.00) WHEN UNDERGROUND PIPE CANNOT BE SLOPED TOWARD THE PIT. THE SYSTEM SHALL BE INSTALLED SUCH THAT NO PORTION WILL ALLOW EXCESS ACCUMULATION OF CONDENSATE.
4. PENETRATION SLEEVE USED IS MADE OF SCHEDULE 80 PVC FOR PENETRATION THROUGH FOUNDATION BEAMS AND ELEMENTS.



② SSDS FOUNDATION PLAN
SCALE: 1" = 5'-0"

LEGEND:

- BUILDING BOUNDARY
- 4-INCH PVC RISER PIPE (SEE DETAIL 4 ON H103.00)
- SP-1 — SUB-SLAB SUCTION PIT (SEE DETAILS 1&2 ON H103.00)
- 4-INCH PVC SUB-SLAB DEPRESSURIZATION SYSTEM UNDERGROUND PIPING
- SSDS-MP-X — SUB-SLAB DEPRESSURIZATION MONITORING POINT
- PENETRATION SLEEVE THROUGH FOUNDATION ELEMENT

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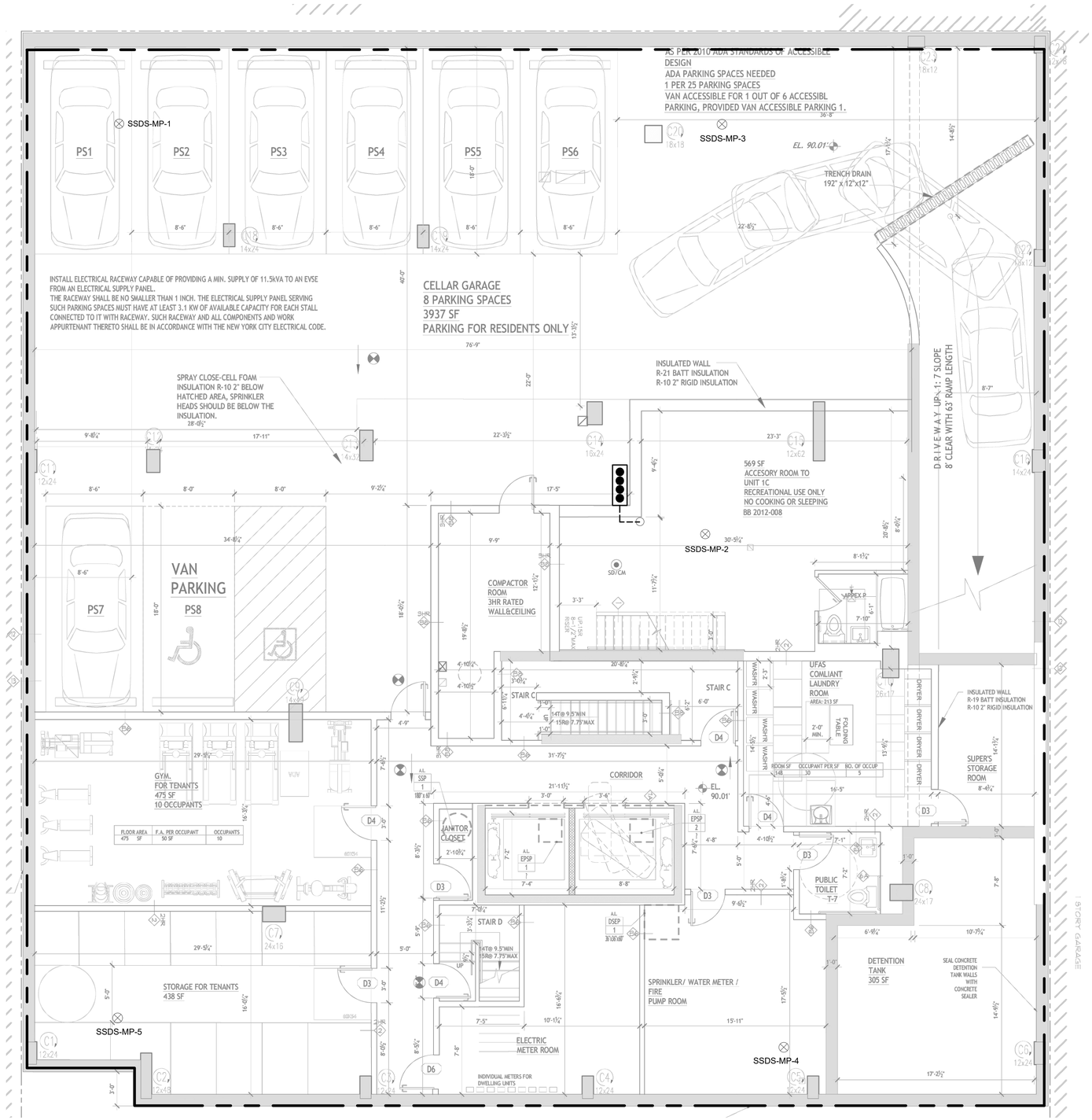
43-25 52nd STREET
WOODSIDE, QUEENS

TITLE: SUB-SLAB DEPRESSURIZATION SYSTEM LAYOUT: FOUNDATION PLAN AS-BUILT

JOB NO:	22254	DRAWING NO:	H201.00
DATE:	11/07/2025		
SCALE:	AS SHOWN		
DRAWN BY:	ND		
CHECKED BY:	CH	SHEET	2 OF 7

NOTES:

1. THE BASE MAP IS FROM THE CELLAR PLAN.
2. SLOPE HORIZONTAL PIPE A MINIMUM OF 1/8-INCH VERTICAL PER FOOT HORIZONTAL (1% SLOPE) UNIFORMLY TOWARDS SUB-SLAB SUCTION PIT OR TO UNDERGROUND CONDENSATE DRAIN (SEE DETAIL 2/H103.00) WHEN UNDERGROUND PIPE CANNOT BE SLOPED TOWARD THE PIT. THE SYSTEM SHALL BE INSTALLED SUCH THAT NO PORTION WILL ALLOW EXCESS ACCUMULATION OF CONDENSATE.
3. PENETRATION SLEEVE USED IS MADE OF SCHEDULE 80 PVC FOR PENETRATION THROUGH FOUNDATION BEAMS AND ELEMENTS.



2 SSDS CELLAR PLAN
SCALE: 1" = 5'-0"

LEGEND:

- PROPERTY BOUNDARY
- 4-INCH PVC RISER PIPE
- VERTICAL RISER OFFSET (UP / DOWN)
- SUB-SLAB DEPRESSURIZATION MONITORING POINT (SSDS-MP-X)
- PIPING MANIFOLD

No.	Date	Revision

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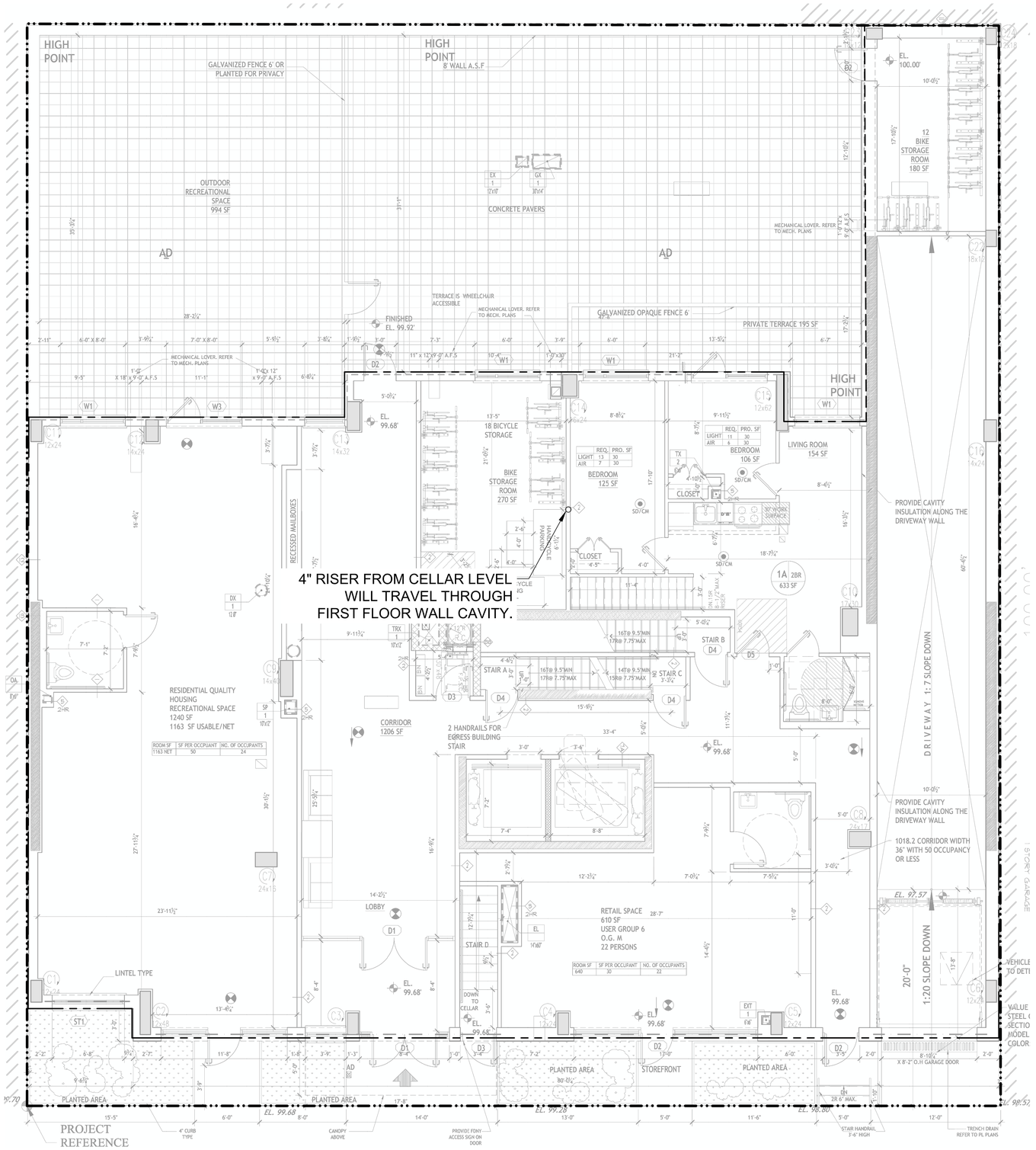
43-25 52nd STREET
WOODSIDE, QUEENS

TITLE: SUB-SLAB DEPRESSURIZATION SYSTEM LAYOUT: CELLAR PLAN AS-BUILT

JOB NO:	22254	DRAWING NO:	H202.00
DATE:	11/07/2025		
SCALE:	AS SHOWN		
DRAWN BY:	ND		
CHECKED BY:	CH	SHEET	2 OF 7

NOTES:

1. THE BASE MAP IS FROM THE ARCHITECT DRAWING M-102.00 PROPOSED FIRST FLOOR PLAN PREPARED BY ARCHITECTS STUDIO P.C., DATED APRIL 25, 2023.
2. THE AS-BUILT LOCATIONS OF PITS ARE SHOWN. THE EXACT LOCATIONS OF THE PITS, PIPING, AND RISER PIPE WILL REQUIRE OTHER DESIGN TEAM'S APPROVAL TO ACCOMODATE BUILDING COMPONENTS OR ARCHITECTURAL DETAILS.



4 SSDS FIRST FLOOR PIPING PLAN
SCALE: 1" = 5'-0"

LEGEND:

- PROPERTY BOUNDARY
- BUILDING BOUNDARY
- 4-INCH PVC RISER PIPE

No.	Date	Revision

REVISIONS

STATE OF NEW YORK · CHENGYU HUANG · LICENSED PROFESSIONAL ENGINEER · 10838201

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PROJECT:

43-25 52nd STREET
WOODSIDE, QUEENS

TITLE:

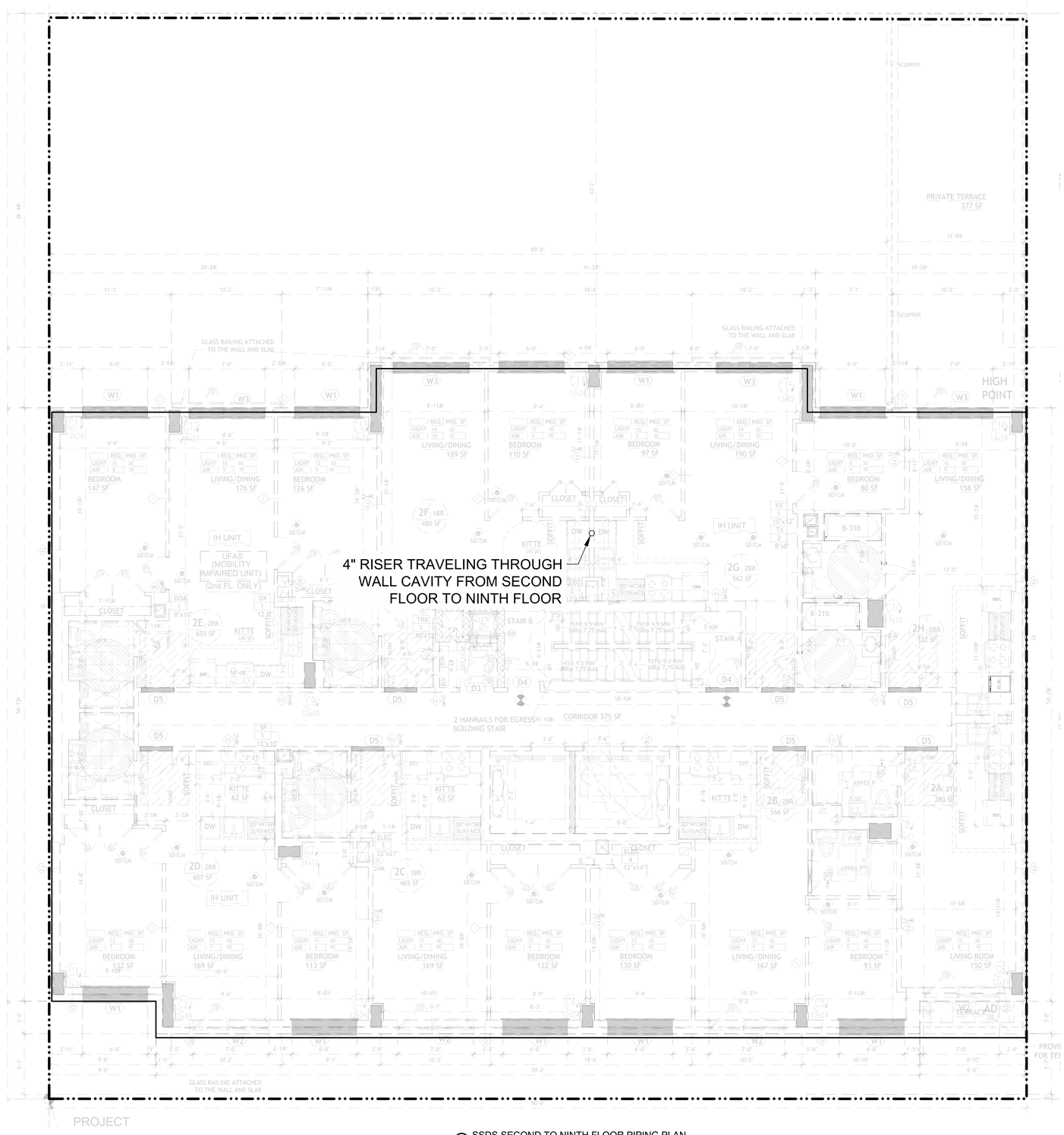
SUB-SLAB DEPRESSURIZATION SYSTEM FIRST FLOOR PLAN AS-BUILT

JOB NO: 22254	DRAWING NO: H203.00
DATE: 08/14/2025	
SCALE: AS SHOWN	
DRAWN BY: ND	
CHECKED BY: CH	SHEET 4 OF 7

P:\22\22254 (43-25nd Street)\Final Engineering Report\(AWC)_As-Built SSDS Drawings 7-18-25.dwg Aug 19, 2025 - 1:23pm chung

NOTES:

1. THE BASE MAP IS FROM ARCHITECT DRAWING NO. A-102.00 PROPOSED SECOND FLOOR PLAN PREPARED BY ARCHITECTS STUDIO P.C., DATED NOVEMBER 01, 2022
2. THE AS-BUILT LOCATIONS OF PITS ARE SHOWN. THE EXACT LOCATIONS OF THE PITS, PIPING, AND RISER PIPE WILL REQUIRE OTHER DESIGN TEAM'S APPROVAL TO ACCOMMODATE BUILDING COMPONENTS OR ARCHITECTURAL DETAILS.
3. THE AS-BUILT SECOND TO NINTH FLOOR PLANS FOLLOW A STANDARDIZED LAYOUT AND WILL CONTAIN THE SAME 4" RISER LOCATION THROUGHOUT.



5 SSDS SECOND TO NINTH FLOOR PIPING PLAN
SCALE: 1" = 5'-0"

LEGEND:

- PROPERTY BOUNDARY
- BUILDING BOUNDARY
- 4-INCH PVC RISER PIPE

No.	Date	Revision

REVISIONS

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PROJECT:

43-25 52nd STREET
WOODSIDE, QUEENS

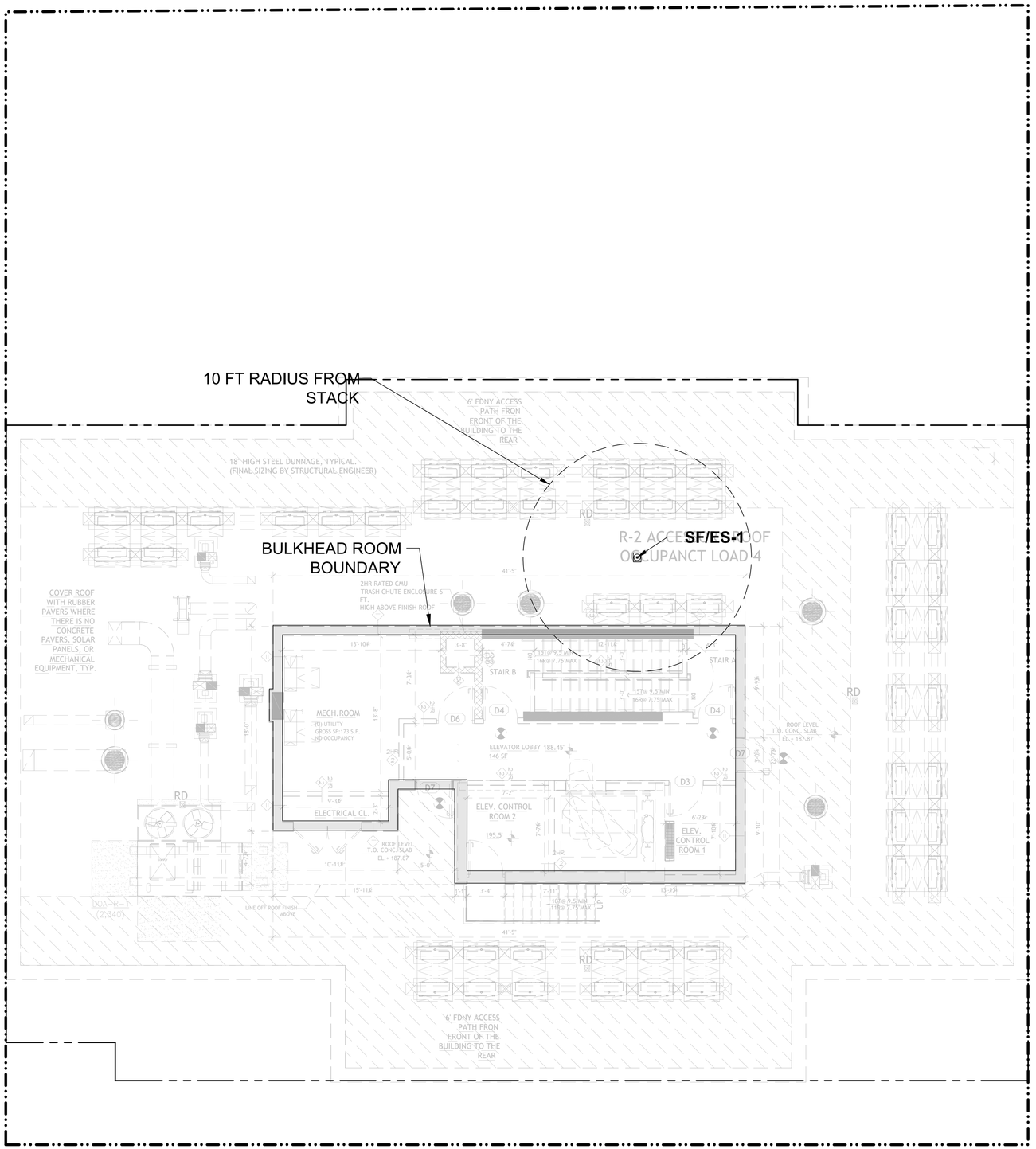
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JOB NO:	22254	DRAWING NO:	H204.00
DATE:	08/14/2025		
SCALE:	AS SHOWN		
DRAWN BY:	ND		
CHECKED BY:	CH	SHEET	5 OF 7

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NOTES:

1. THE BASE MAP IS FROM ARCHITECT DRAWING NO. A-102.00 PROPOSED ROOFTOP PLAN PREPARED BY ARCHITECTS STUDIO P.C., DATED NOVEMBER 01, 2022
2. THE AS-BUILT LOCATIONS OF PITS ARE SHOWN. THE EXACT LOCATIONS OF THE PITS, PIPING, AND RISER PIPE WILL REQUIRE OTHER DESIGN TEAM'S APPROVAL TO ACCOMMODATE BUILDING COMPONENTS OR ARCHITECTURAL DETAILS.
3. THE AS-BUILT SECOND TO NINTH FLOOR PLANS FOLLOW A STANDARDIZED LAYOUT AND WILL CONTAIN THE SAME 4" RISER LOCATION THROUGHOUT.



6 SSDS ROOF PLAN
SCALE: 1" = 5'-0"

LEGEND:

- PROPERTY BOUNDARY
- BUILDING BOUNDARY
- BULKHEAD ROOM
- RADIUS OF IMPACT
- ES-1 — EXHAUST STACK (SEE DETAIL 5 ON H106.00)
- SF-1 — SUCTION FAN (SEE DETAIL 5 ON H106.00)

No.	Date	Revision

REVISIONS

STATE OF NEW YORK
CHENGYU HANG
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10838201

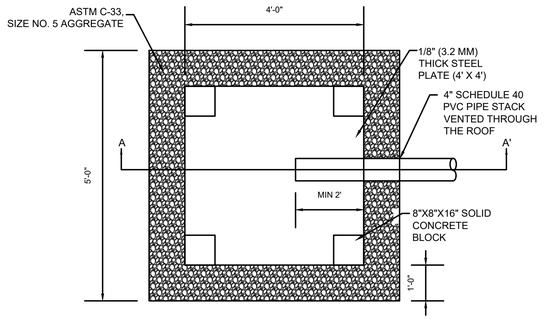
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PROJECT:

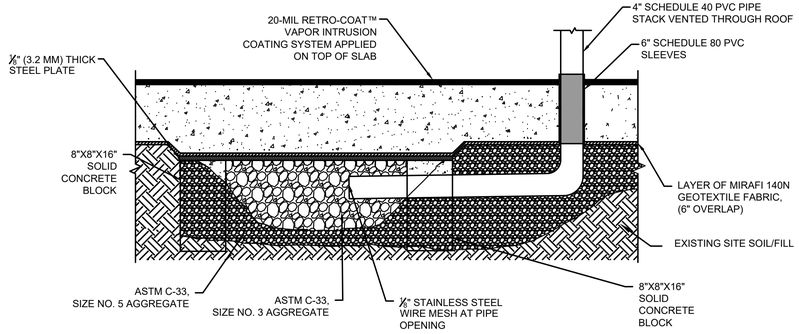
43-25 52nd STREET
WOODSIDE, QUEENS

TITLE: SUB-SLAB DEPRESSURIZATION SYSTEM LAYOUT: ROOF PLAN AS-BUILT

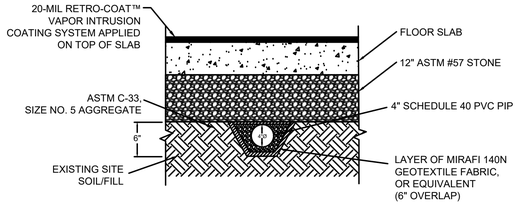
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DATE:	08/18/2025		
SCALE:	AS SHOWN		
DRAWN BY:	ND		
CHECKED BY:	CH	SHEET 6	OF 7



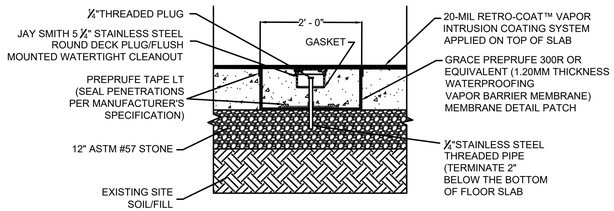
1 SSDS SUCTION PIT - PLAN VIEW
SCALE: N.T.S



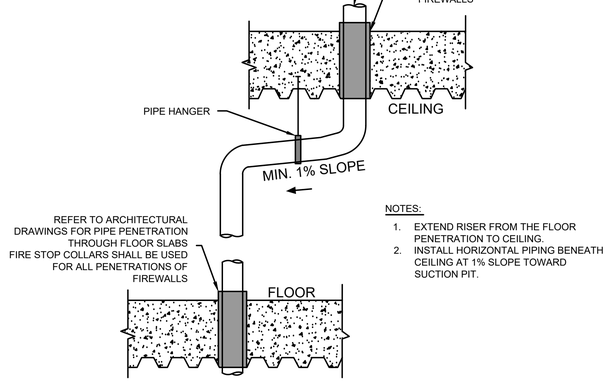
2 SSDS SUCTION PIT - SECTION A-A'
SCALE: N.T.S



3 TYPICAL SUB-SLAB PIPING PROFILE
SCALE: N.T.S



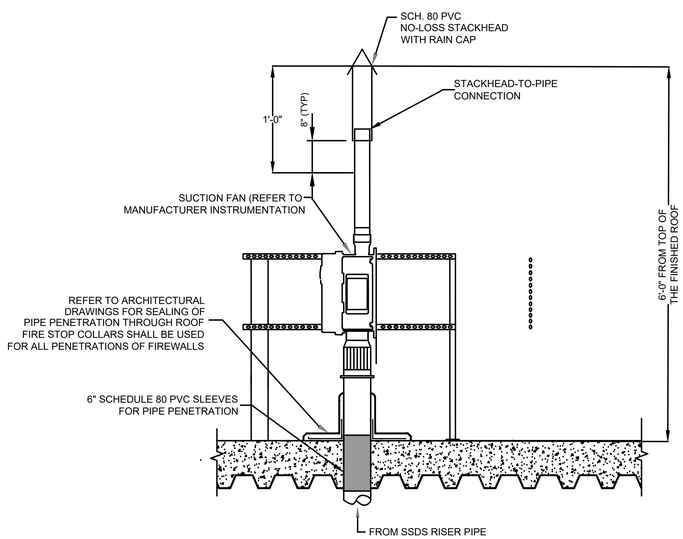
6 SSDS MONITORING POINT
SCALE: N.T.S



NOTES:

1. EXTEND RISER FROM THE FLOOR PENETRATION TO CEILING.
2. INSTALL HORIZONTAL PIPING BENEATH CEILING AT 1% SLOPE TOWARD SUCTION PIT.

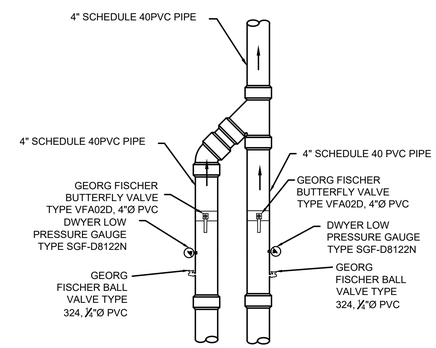
4 TYPICAL PIPING OFFSET
SCALE: N.T.S



NOTES:

1. NOT ALL REQUIRED ACCESSORIES ARE SHOWN. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.
2. ELECTRICAL WIRING AND EQUIPMENT NOT SHOWN. REFER TO ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR REQUIREMENTS.
3. PIPE AND EQUIPMENT ARRANGEMENT SHOWN FOR SCHEMATIC PURPOSES ONLY (NOT TO SCALE).
4. ALL ROOF PENETRATIONS WERE COORDINATED WITH OTHER TRADES TO ENSURE PENETRATIONS ARE SEALED IN ACCORDANCE WITH WARRANTY.
5. DISCHARGE EXHAUST STACK MINIMUM 6' ABOVE FINISHED ROOF AND MINIMUM 25' FROM ANY WINDOWS AND AIR INTAKES.
6. PROVIDE FAN MOUNTING AND VIBRATION ISOLATION TO MEET MC301.10 AND 928.3.

5 TYPICAL SUCTION FAN LAYOUT FOR STAND-ALONE EXHAUST STACK
SCALE: N.T.S



NOTE:

1. VALVES AND GAUGES SHALL BE INSTALLED AT THE HEIGHT OF 5 FEET ABOVE FINISHED FLOOR.

7 TYPICAL PIPING MANIFOLD
SCALE: N.T.S

No.	Date	Revision

REVISIONS

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PROJECT:

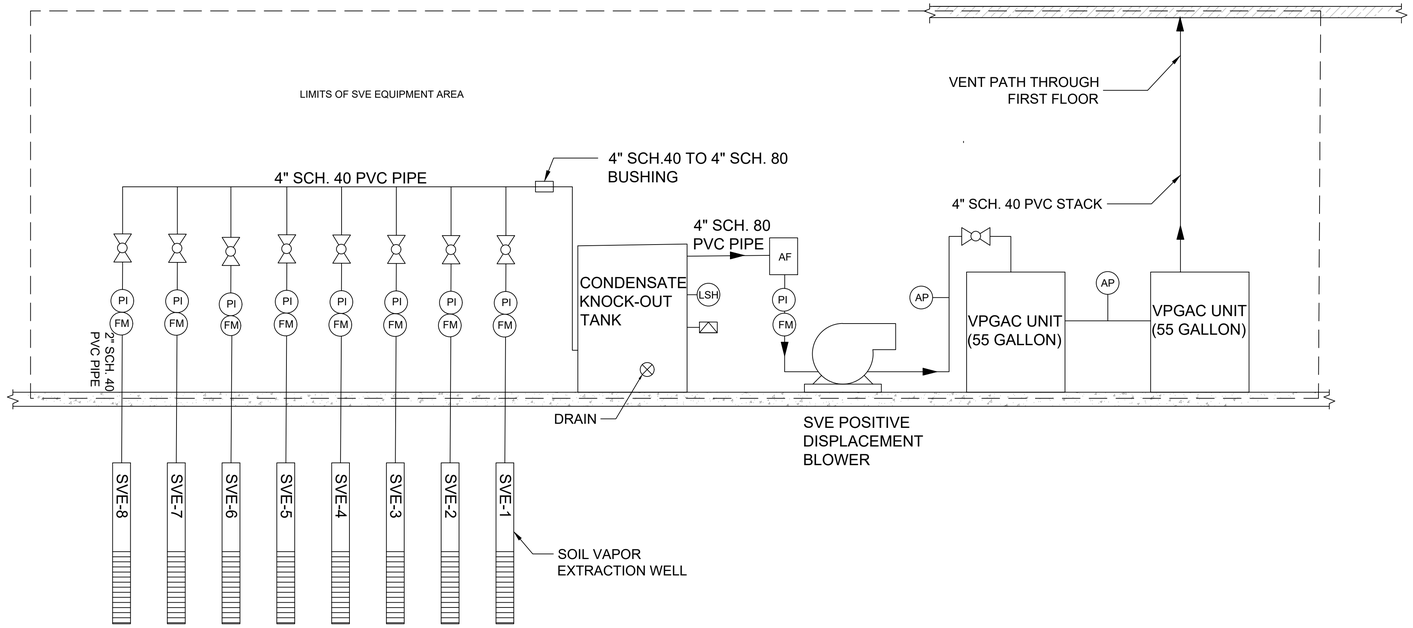
43-25 52nd STREET
WOODSIDE, QUEENS

TITLE:

SUB-SLAB
DEPRESSURIZATION
SYSTEM CONSTRUCTION
DETAILS AS-BUILT

JOB NO: 22254	DRAWING NO:
DATE: 08/17/2025	H206.00
SCALE: AS SHOWN	
DRAWN BY: ND	
CHECKED BY:	SHEET 7 OF 7

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LEGEND:

- SOLID 2" Ø SCHEDULE 40 PVC SVE PIPING
- SVE REGENERATIVE BLOWER
- (AP) ACCESS POINT FOR SAMPLING
- BALL VALVE
- (AF) AIR FILTER
- FLOW DIRECTION
- (LSH) LEVEL SWITCH HIGH
- VACUUM RELIEF VALVE
- (PI) PRESSURE INDICATOR
- (FM) FLOW MEASUREMENT PORT
- VPGAC VAPOR PHASE GRANULAR ACTIVATED CARBON

1 SOIL VAPOR EXTRACTION SYSTEM PROCESS DIAGRAM
SCALE: N.T.S

GENERAL NOTES:

1) THIS DRAWING REPRESENTS THE AS-BUILT CONDITIONS OF THE SOIL VAPOR EXTRACTION (SVE) SYSTEM AS INSTALLED IN THE FIELD.
2) ALL DIMENSIONS ARE IN FEET AND INCHES UNLESS OTHERWISE NOTED.
3) VERIFY ALL DIMENSIONS, LOCATIONS, AND ELEVATIONS IN THE FIELD PRIOR TO ANY FUTURE WORK.
4) AS-BUILT INFORMATION IS BASED ON FIELD MEASUREMENTS AND INSTALLER MARK-UPS OF CONSTRUCTION DRAWINGS.
5) ALL WORK WAS COMPLETED IN ACCORDANCE WITH THE APPROVED REMEDIAL DESIGN REPORT (RDR) DATED NOVEMBER 19, 2024, AND NYSDEC REQUIREMENTS FOR BCP SITE ID# C241269.
6) SVE SYSTEM COMPONENTS INCLUDE EXTRACTION WELLS, SUB-SLAB PIPING, MANIFOLDS, BLOWER UNIT, MOISTURE SEPARATOR, VAPOR PHASE GRANULAR ACTIVATED CARBON (VPGAC) VESSELS, AND ROOFTOP EXHAUST STACK.
7) MATERIALS AND EQUIPMENT ARE AS SPECIFIED IN THE CONTRACT DOCUMENTS UNLESS OTHERWISE NOTED.
8) ALL UNDERGROUND PIPING LOCATIONS ARE APPROXIMATE AND BASED ON INSTALLATION RECORDS.
9) REFER TO MANUFACTURER'S OPERATION AND MAINTENANCE MANUALS FOR SYSTEM OPERATION, MAINTENANCE, AND SAFETY REQUIREMENTS.
10) TWO SVE MONITORING POINTS WERE INSTALLED AT LOCATIONS SHOWN ON THE DRAWINGS. THE MONITORING POINTS ARE PROVIDED TO ALLOW ROUTINE MEASUREMENT OF SYSTEM PERFORMANCE, VERIFY VACUUM DISTRIBUTION IN THE SUBSURFACE, AND SUPPORT TROUBLESHOOTING OR ADJUSTMENTS DURING O&M ACTIVITIES.

SVE BLOWER SKID SPECIFICATIONS:

1) 15 HP, 208-230/460V, 3PH, XP MOTOR, 1765 RPM, RATED 225 CFM @ 130" W.C.
2) DIRECT DRIVE, 2" SCH80 PVC INLET, SOLBERG INLINE FILTER, 1.5" DILUTION VALVE WITH FILTER SILENCER.
3) VACUUM RELIEF VALVE, VACUUM GAUGE, DISCHARGE TEMP/PRESSURE GAUGES, DISCHARGE SAMPLE PORT.
4) 30-GALLON AIR/WATER MOISTURE SEPARATOR WITH HIGH-LEVEL ALARM SWITCH.
5) PAINTED STEEL EFFLUENT PIPING, COMMON SKID MOUNTED, FACTORY TESTED.

SVE CONTROL PANEL:

1) 230V, 60HZ, 1PH SUPPLY; MOTOR STARTER WITH ADJUSTABLE THERMAL OVERLOAD.
2) HAND–OFF–AUTO SELECTOR SWITCH; ALARM LIGHT FOR MOISTURE SEPARATOR HIGH LEVEL.
3) NEMA 4, UL698A LISTED PANEL; MOTOR CIRCUIT BREAKER AND MAIN DISCONNECT.

SYSTEM STARTUP AND CALIBRATION:

1) ALL EQUIPMENT, ACCESSORIES, INSTRUMENTATION, AND CONTROLS WERE INSTALLED, ALIGNED, WIRED, AND SECURED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
2) FOLLOWING INSTALLATION, THE SVE SYSTEM PERFORMANCE WAS VERIFIED TO ACHIEVE DESIGN FLOW RATES, VACUUM LEVELS, AND OPERATING TEMPERATURES.
3) THE BLOWER SKID, MOISTURE SEPARATOR, VACUUM RELIEF VALVE, GAUGES, AND CONTROL PANEL WERE SUBJECTED TO PRELIMINARY OPERATION AND FUNCTIONAL TESTING PRIOR TO PLACING THE SYSTEM INTO SERVICE. ANY REQUIRED REPAIRS OR ADJUSTMENTS WERE COMPLETED PER THE MANUFACTURER'S SPECIFICATIONS.
4) INITIAL FIELD TESTING CONFIRMED THAT ADEQUATE VACUUM WAS MAINTAINED AT EXTRACTION WELLS AND WITHIN THE TARGETED SUBSURFACE ZONES. A MINIMUM VACUUM OF - 0.01 INCHES W.C. AT MONITORING POINT WAS ACHIEVED DURING STARTUP TESTING.
5) SYSTEM VACUUM AND FLOW RATES WERE SET USING THE BLOWER FLOW VALVE, VACUUM RELIEF VALVE, AND/OR VARIABLE FREQUENCY DRIVE (IF EQUIPPED) TO MAINTAIN TARGET PERFORMANCE WHILE MINIMIZING ENERGY CONSUMPTION AND NOISE.

OPERATION, MAINTENANCE, AND MONITORING NOTES:

1) THE SVE SYSTEM IS OPERATED USING THE INSTALLED BLOWER SKID AND CONTROL PANEL AS PER MANUFACTURER SPECIFICATIONS.
2) VACUUM, FLOW, AND PRESSURE READINGS SHALL BE RECORDED AT EACH MONITORING POINT DURING ROUTINE INSPECTIONS TO ENSURE SYSTEM PERFORMANCE IS MAINTAINED.
3) FILTERS AND MOISTURE SEPARATORS SHALL BE CLEANED OR REPLACED AS REQUIRED BASED ON DIFFERENTIAL PRESSURE READINGS OR MANUFACTURER RECOMMENDATIONS.
4) MOTORS, BLOWERS, AND ROTATING EQUIPMENT SHALL BE INSPECTED QUARTERLY FOR EXCESSIVE VIBRATION, UNUSUAL NOISE, OR SIGNS OF WEAR.
5) ALL ELECTRICAL CONNECTIONS AT THE CONTROL PANEL SHALL BE CHECKED SEMI-ANNUALLY FOR SIGNS OF LOOSENING, OVERHEATING, OR CORROSION.
6) SYSTEM START/STOP SEQUENCES, SAFETY INTERLOCKS, AND ALARMS SHALL BE FUNCTION TESTED SEMI-ANNUALLY TO CONFIRM PROPER OPERATION.
7) THE CONDENSATE DRAIN SYSTEM SHALL BE CHECKED MONTHLY FOR BLOCKAGES, PROPER FLOW, AND POTENTIAL FREEZING CONDITIONS IN COLD WEATHER.
8) ALL SYSTEM ACCESS POINTS, PIPING CONNECTIONS, AND WELL HEADS SHALL BE INSPECTED ANNUALLY FOR LEAKS, DAMAGE, OR CORROSION, AND REPAIRED PROMPTLY AS REQUIRED.
9) MAINTENANCE ACTIVITIES SHALL BE DOCUMENTED IN A LOGBOOK, INCLUDING DATE, PERSONNEL, OBSERVATIONS, MEASUREMENTS, AND ANY REPAIRS OR ADJUSTMENTS MADE.
10) ENVIRONMENTAL PERFORMANCE SHALL BE REVIEWED ANNUALLY BY A QUALIFIED ENGINEER BASED ON MONITORING DATA, TO ASSESS IF SYSTEM SETTINGS NEED TO BE OPTIMIZED OR MODIFIED.
11) THE SYSTEM SHALL BE OPERATED TO MAINTAIN TARGET VACUUM LEVELS AT EXTRACTION WELLS AND MAINTAIN NEGATIVE PRESSURE IN ALL TARGETED AREAS.
12) ANNUAL INDOOR AIR / OUTDOOR AMBIENT AIR SAMPLING SHALL BE PERFORMED PER REGULATORY REQUIREMENTS AND SITE MANAGEMENT PLAN TO CONFIRM CONTINUED MITIGATION PERFORMANCE.

No.	Date	Revision

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PROJECT:
43-25 52nd STREET
WOODSIDE, QUEENS

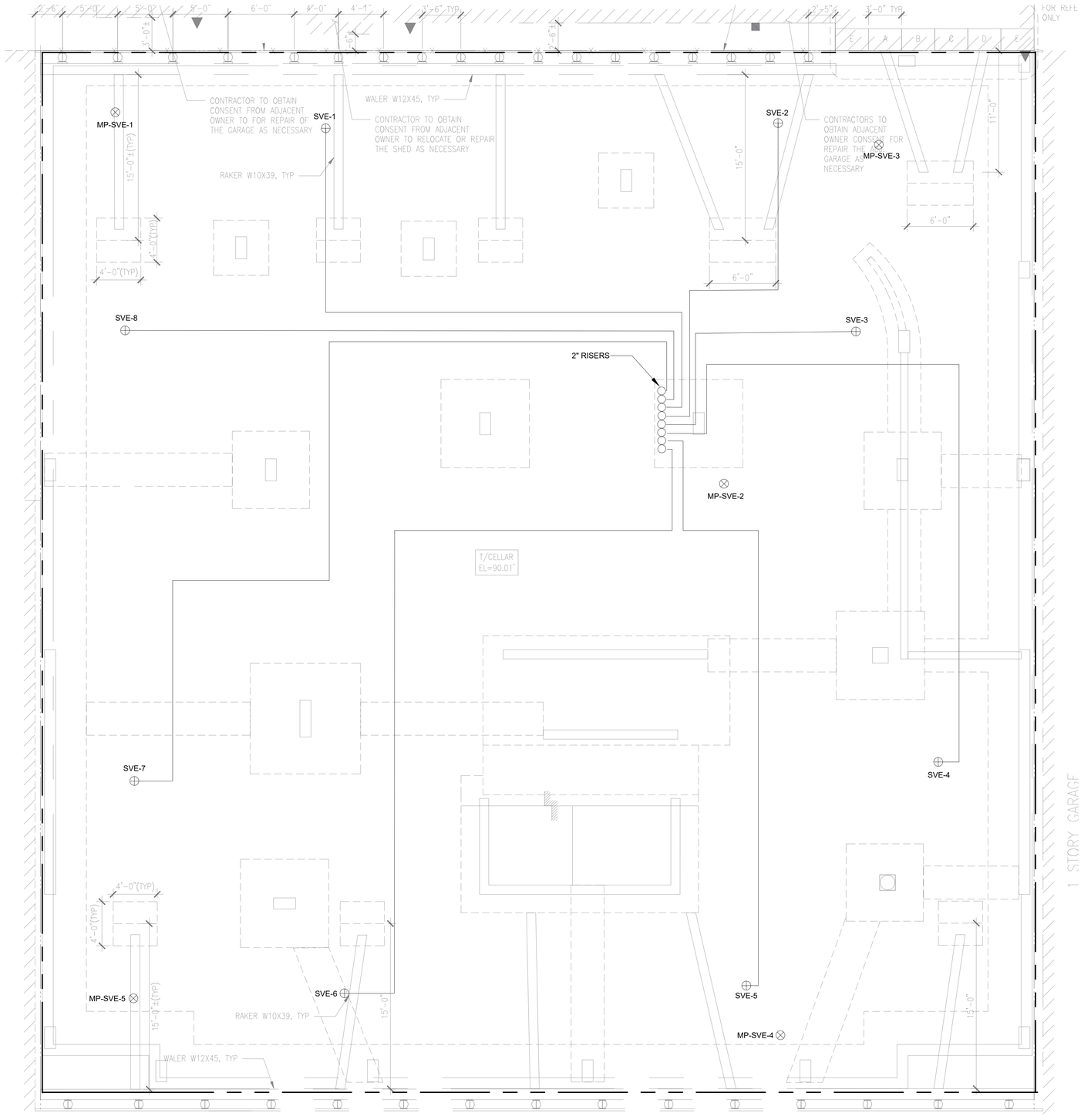
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SOIL VAPOR EXTRACTION SYSTEM DIAGRAM AND GENERAL NOTES AS-BUILT

JOB NO: 22254	DRAWING NO: H100.00
DATE: 08/11/2025	
SCALE: AS SHOWN	
DRAWN BY: DH	
CHECKED BY: CH	SHEET 1 OF 7

P:\22\22254 (43-52nd Street)\Final Engineering Report\DWG\ As-Built SVE Drawings 08-07-25.DWG Aug 15, 2025 - 11:52am dhong

NOTES:

1. THE BASE MAP IS FROM ARCHITECT DRAWING SET A101.00 THROUGH A108.00 43-25 52ND ST PREPARED BY ARCHITECTS STUDIO P.C. DATED SEPTEMBER 15, 2023.
2. THE SVE EXTRACTION WELL WERE INSTALLED AT 15-20 FT BGS INTERVAL
3. THE LOCATIONS OF THE WELLS, SVE UNIT ENCLOSURE, PIPING, AND RISER PIPE ARE APPROXIMATE AND ARE BASED ON FIELD MEASUREMENTS.
4. EQUIPMENT SPECIFICATIONS OF SVE UNIT ENCLOSURE IS INCLUDED IN APPENDIX C OF REMEDIAL DESIGN DOCUMENT.



LEGEND:

- BUILDING BOUNDARY
- RISER PIPE
- SOLID 2" Ø SCHEDULE 40 PVC SOIL VAPOR EXTRACTION (SVE) PIPING
- SVE WELL LOCATION
- SVE MONITORING POINT LOCATION

② SVE SYSTEM FOUNDATION PLAN
SCALE: 1" = 5'-0"

No.	Date	Revision

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PROJECT:
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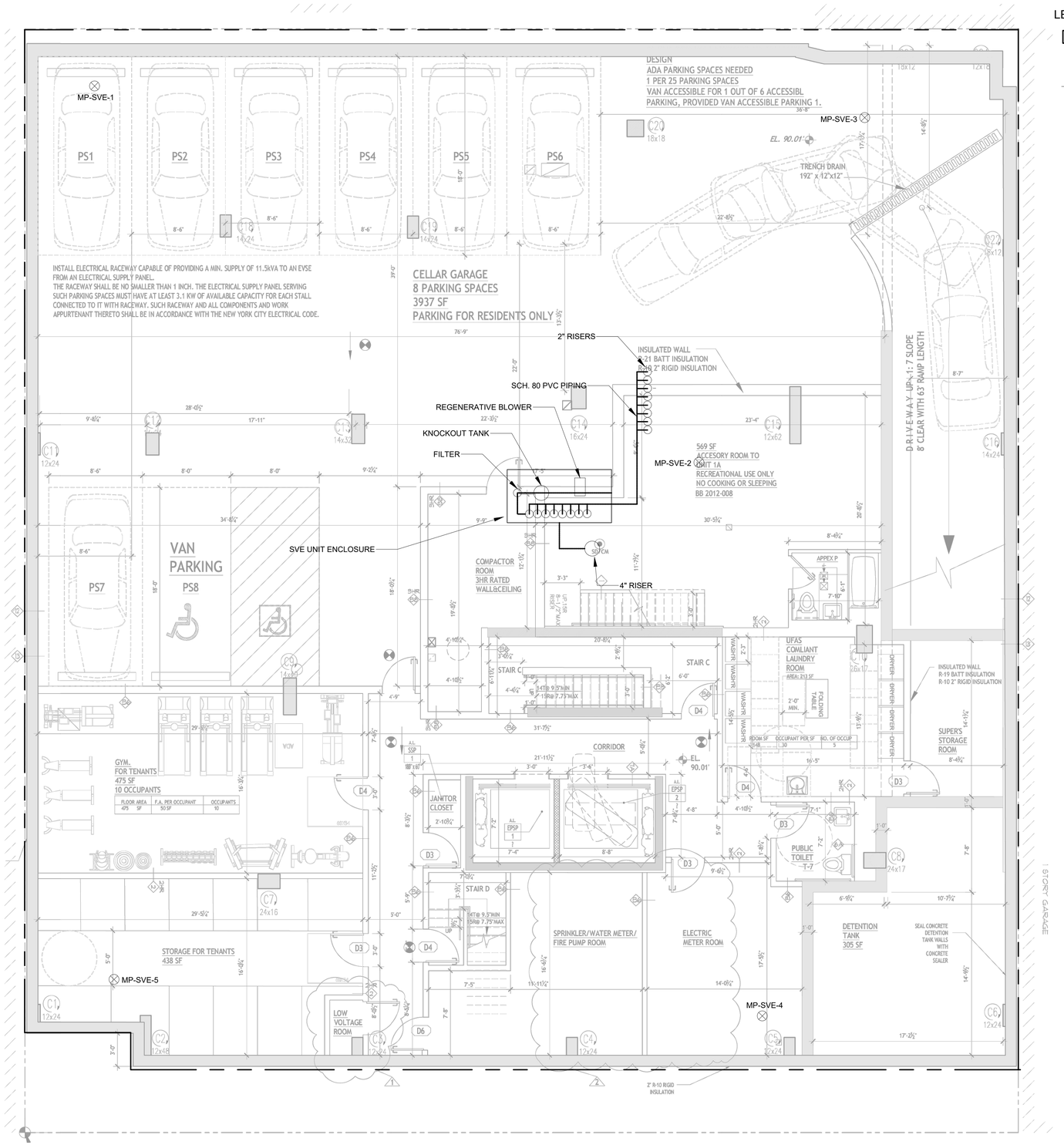
TITLE:
SOIL VAPOR EXTRACTION SYSTEM LAYOUT - FOUNDATION PLAN AS-BUILT

JOB NO: 22254	DRAWING NO: H101.00
DATE: 11/07/2025	
SCALE: AS SHOWN	
DRAWN BY: DH	
CHECKED BY: CH	SHEET 2 OF 7

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NOTES:

1. THE BASE MAP IS FROM ARCHITECT DRAWING SET A101.00 THROUGH A108.00 43-25 52ND ST PREPARED BY ARCHITECTS STUDIO P.C. DATED SEPTEMBER 15, 2023.
2. THE SVE EXTRACTION WELL WERE INSTALLED AT 15-20 FT BGS INTERVAL
3. THE LOCATIONS OF THE WELLS, SVE UNIT ENCLOSURE, PIPING, AND RISER PIPE ARE APPROXIMATE AND ARE BASED ON FIELD MEASUREMENTS.
4. EQUIPMENT SPECIFICATIONS OF SVE UNIT ENCLOSURE IS INCLUDED IN APPENDIX C OF REMEDIAL DESIGN DOCUMENT.



3 SVE SYSTEM CELLAR PLAN
SCALE: 1" = 5'-0"

LEGEND:

- BUILDING BOUNDARY
- RISER PIPE
- SOLID 2" Ø SCHEDULE 40 PVC SOIL VAPOR EXTRACTION (SVE) PIPING
- SVE WELL LOCATION
- SVE MONITORING POINT LOCATION

No.	Date	Revision

REVISIONS

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PROJECT:
43-25 52nd STREET
WOODSIDE, QUEENS

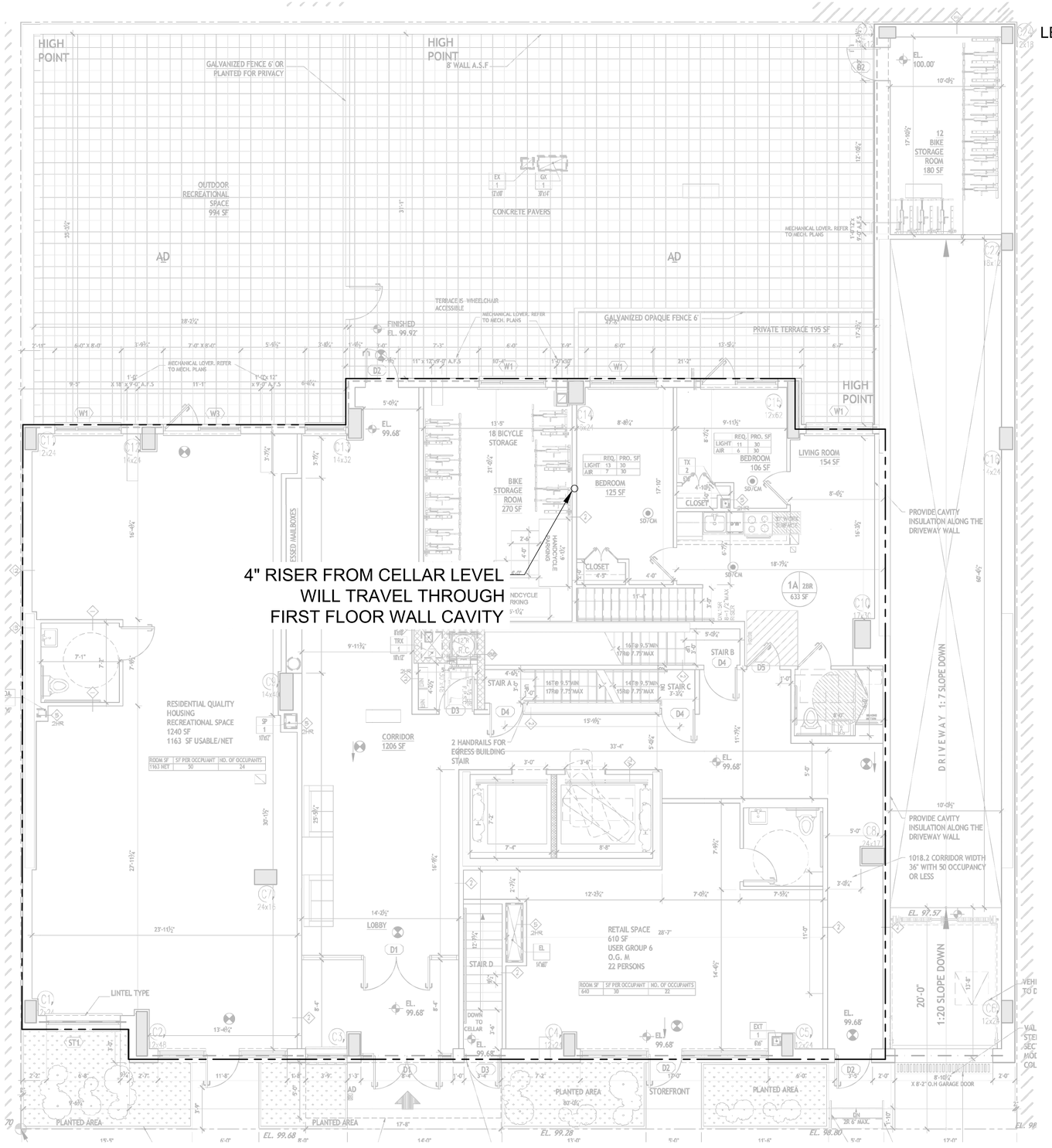
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SOIL VAPOR EXTRACTION SYSTEM LAYOUT - CELLAR PLAN AS-BUILT

JOB NO: 22254	DRAWING NO: H102.00
DATE: 11/07/2025	
SCALE: AS SHOWN	
DRAWN BY: DH	
CHECKED BY: CH	SHEET 3 OF 7

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NOTES:

1. THE BASE MAP IS FROM ARCHITECT DRAWING SET A101.00 THROUGH A108.00 43-25 52ND ST PREPARED BY ARCHITECTS STUDIO P.C. DATED SEPTEMBER 15, 2023.
2. 4" SVE RISER FROM CELLAR LEVEL ROUTED WITHIN INTERIOR WALL CAVITY, MAINTAINING CLEARANCE FROM ELECTRICAL AND PLUMBING LINES.
3. SVE RISER SHALL BE INSTALLED PLUMB AND SECURELY STRAPPED AT INTERVALS NOT EXCEEDING 6 FEET.
4. ALL PENETRATIONS THROUGH FLOORS AND WALLS SHALL BE SEALED AIRTIGHT USING FIRE-RATED, NON-SHRINK SEALANT PER LOCAL BUILDING CODE REQUIREMENTS.
5. ENSURE RISER REMAINS ACCESSIBLE FOR INSPECTION; DO NOT CONCEAL WITH NON-REMOVABLE FINISHES.
6. FINAL INSTALLATION WERE DOCUMENTED WITH PHOTOS INCLUDED IN THE FINAL ENGINEERING REPORT.



4 SVE SYSTEM FIRST FLOOR PLAN
SCALE: 1" = 5'-0"

LEGEND:

- BUILDING BOUNDARY
- RISER PIPE

No.	Date	Revision

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PROJECT:
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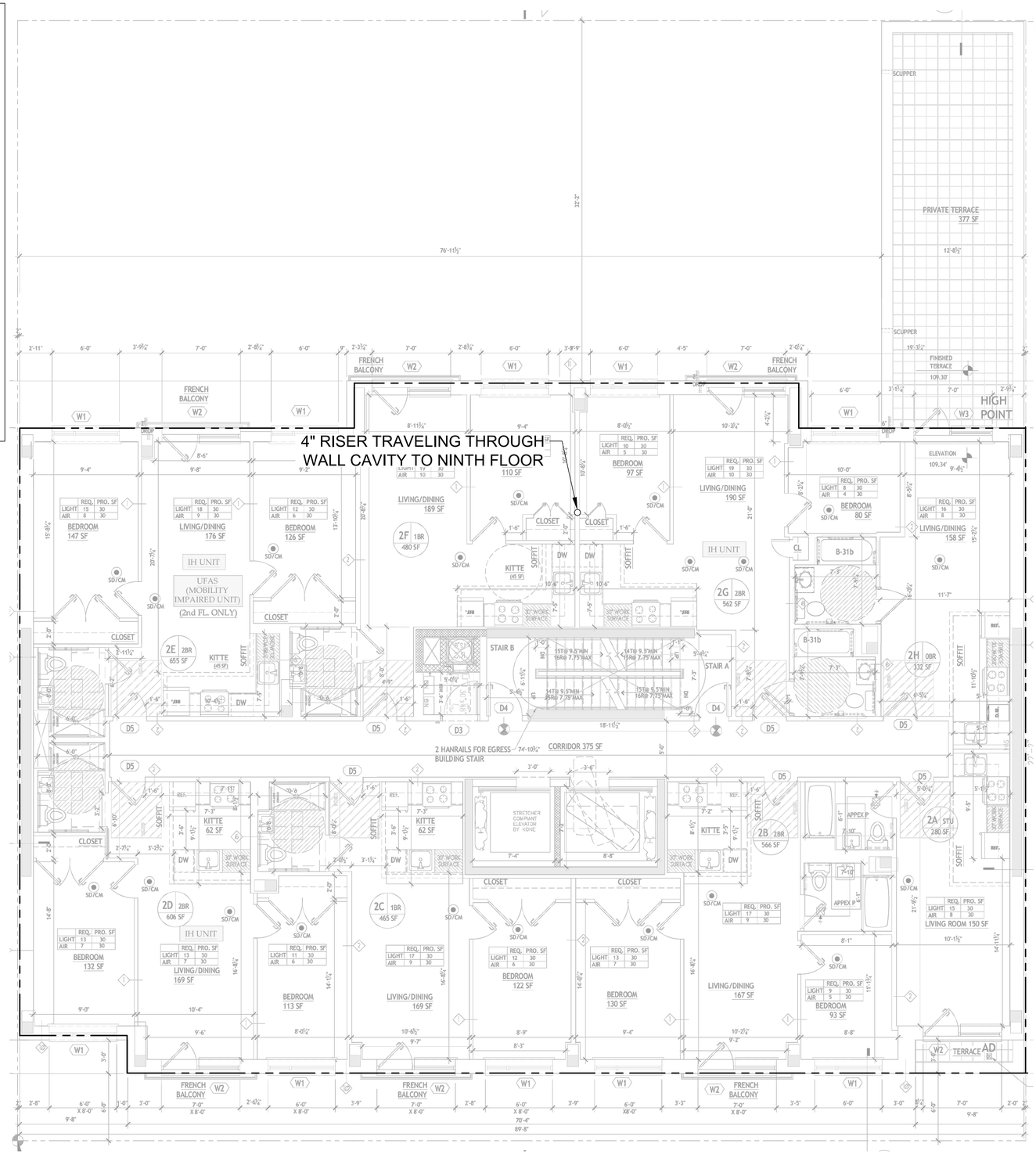
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SOIL VAPOR EXTRACTION SYSTEM LAYOUT - FIRST FLOOR PLAN

JOB NO: 22254	DRAWING NO: H103.00
DATE: 08/11/2025	
SCALE: AS SHOWN	
DRAWN BY: DH	
CHECKED BY: CH	SHEET 4 OF 7

P:\23\22254 (43-52nd Street)\Final Engineering Report\DWG\ As-Built SVE Drawings 08-07-25.dwg Aug 18, 2025 - 2:17pm cheng

NOTES:

1. THE BASE MAP IS FROM ARCHITECT DRAWING SET A101.00 THROUGH A108.00 43-25 52ND ST PREPARED BY ARCHITECTS STUDIO P.C. DATED SEPTEMBER 15, 2023.
2. 4" SVE RISER FROM CELLAR LEVEL ROUTED WITHIN INTERIOR WALL CAVITY, MAINTAINING CLEARANCE FROM ELECTRICAL AND PLUMBING LINES.
3. SVE RISER SHALL BE INSTALLED PLUMB AND SECURELY STRAPPED AT INTERVALS NOT EXCEEDING 6 FEET.
4. ALL PENETRATIONS THROUGH FLOORS AND WALLS SHALL BE SEALED AIRTIGHT USING FIRE-RATED, NON-SHRINK SEALANT PER LOCAL BUILDING CODE REQUIREMENTS.
5. ENSURE RISER REMAINS ACCESSIBLE FOR INSPECTION; DO NOT CONCEAL WITH NON-REMOVABLE FINISHES.
6. FINAL INSTALLATION WERE DOCUMENTED WITH PHOTOS INCLUDED IN THE FINAL ENGINEERING REPORT.



5 SVE SYSTEM SECOND THROUGH NINTH FLOOR PLAN
SCALE: 1" = 5'-0"

LEGEND:

- BUILDING BOUNDARY
- RISER PIPE

No.	Date	Revision

REVISIONS

STATE OF NEW YORK · CHENGYU HANG · 10838201 · LICENSED PROFESSIONAL ENGINEER

YU & Associates Engineers, P.C.
Geotechnical, Environmental and Civil Engineering
611 River Drive - 3rd Floor
Elmwood Park, NJ 07407
Tel: (201) 791-0075
Fax: (201) 791-4533

PROJECT:
43-25 52nd STREET
WOODSIDE, QUEENS

TITLE:
SVE SYSTEM LAYOUT - SECOND THROUGH NINTH FLOOR PLAN
AS-BUILT

JOB NO: 22254	DRAWING NO:
DATE: 08/11/2025	H104.00
SCALE: AS SHOWN	
DRAWN BY: DH	
CHECKED BY: CH	SHEET 5 OF 7

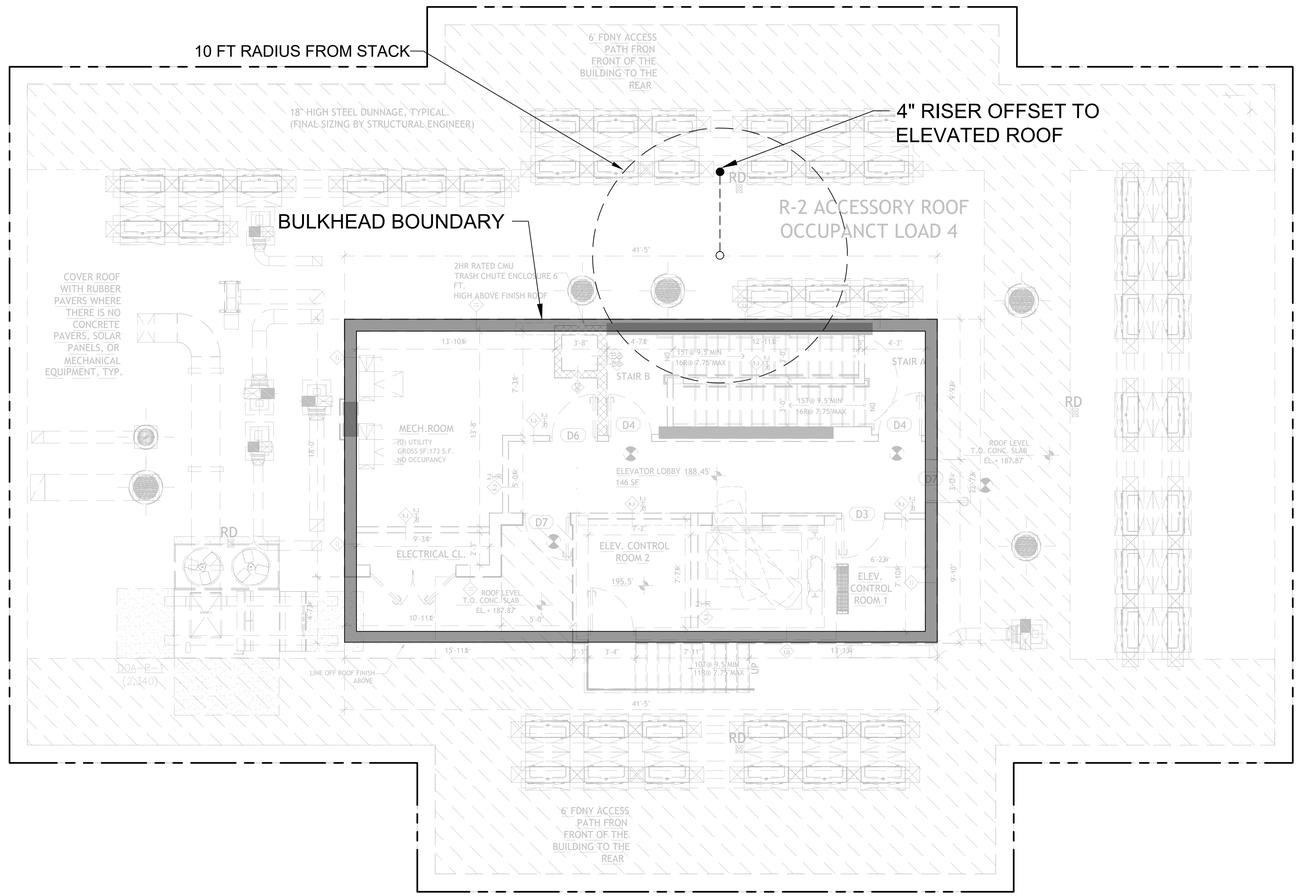
P:\22\22254 (43-52nd Street)\Final Engineering Report\DWG\ As-Built SVE Drawings 08-07-25.Dwg Aug 18, 2025 - 2:26pm chong

NOTES:

1. THE BASE MAP IS FROM ARCHITECT DRAWING SET A101.00 THROUGH A108.00 43-25 52ND ST PREPARED BY ARCHITECTS STUDIO P.C. DATED SEPTEMBER 15, 2023.
2. 4" SVE RISER FROM CELLAR LEVEL ROUTED WITHIN INTERIOR WALL CAVITY, MAINTAINING CLEARANCE FROM ELECTRICAL AND PLUMBING LINES.
3. SVE RISER SHALL BE INSTALLED PLUMB AND SECURELY STRAPPED AT INTERVALS NOT EXCEEDING 6 FEET.
4. ALL PENETRATIONS THROUGH FLOORS AND WALLS SHALL BE SEALED AIRTIGHT USING FIRE-RATED, NON-SHRINK SEALANT PER LOCAL BUILDING CODE REQUIREMENTS.
5. ENSURE RISER REMAINS ACCESSIBLE FOR INSPECTION; DO NOT CONCEAL WITH NON-REMOVABLE FINISHES.
6. FINAL INSTALLATION WERE DOCUMENTED WITH PHOTOS INCLUDED IN THE FINAL ENGINEERING REPORT.

LEGEND:

- BUILDING BOUNDARY
- RISER PIPE
- VERTICAL PIPE OFFSET (UP / DOWN)



6 SVE SYSTEM ROOFTOP PLAN
SCALE: 1" = 5'-0"

No.	Date	Revision

REVISIONS

STATE OF NEW YORK · CHENGYU HANG · 10838201 · LICENSED PROFESSIONAL ENGINEER

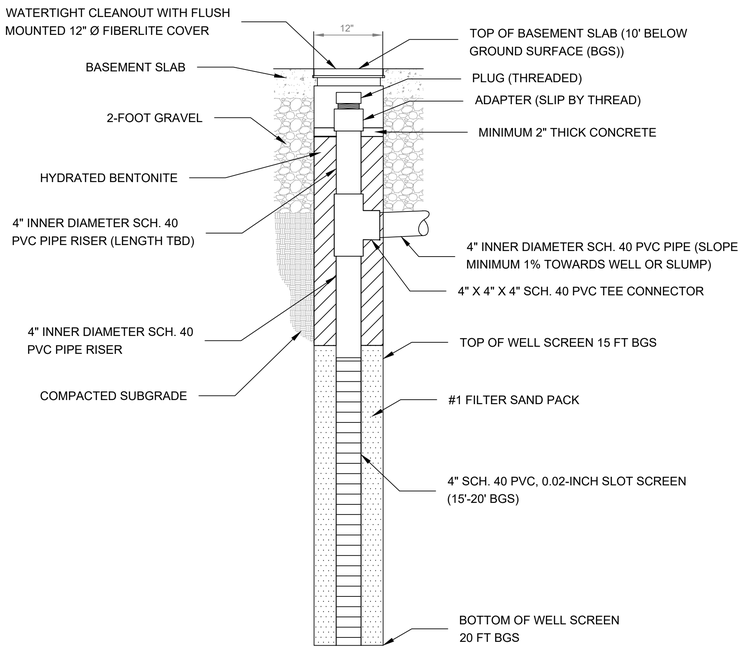
YU & Associates Engineers, P.C.
Geotechnical, Environmental and Civil Engineering
611 River Drive - 3rd Floor, Elmwood Park, NJ 07407
Tel: (201) 791-0075
Fax: (201) 791-4533

PROJECT:
43-25 52nd STREET
WOODSIDE, QUEENS

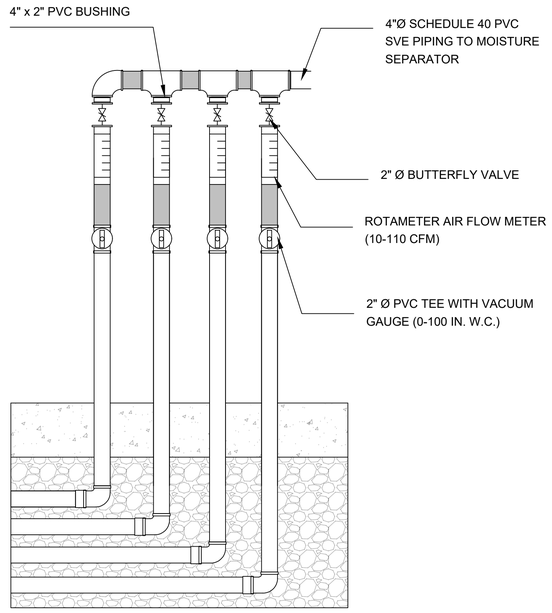
TITLE:
SOIL VAPOR EXTRACTION SYSTEM LAYOUT - ROOFTOP PLAN AS-BUILT

JOB NO: 22254	DRAWING NO: H105.00
DATE: 08/11/2025	
SCALE: AS SHOWN	
DRAWN BY: DH	
CHECKED BY: CH	SHEET 6 OF 7

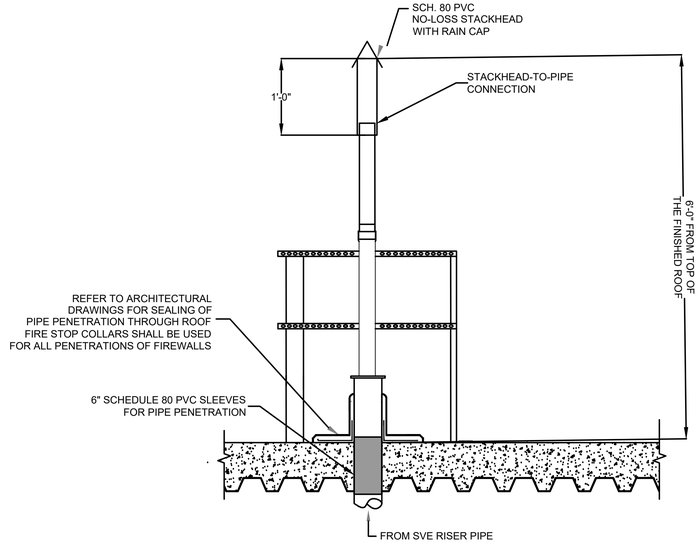
P:\22\22254 (43-52nd Street)\Prof Engineering Report\CAD\ As-Built SVE Drawings 08-07-25 CH.dwg Aug 19, 2025 - 2:32pm chong



TYPICAL SVE WELL CONSTRUCTION
SCALE: NOT TO SCALE (N.T.S)



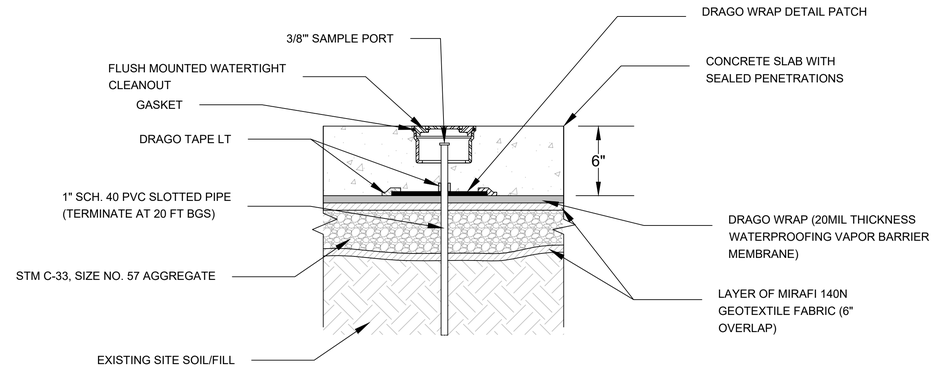
TYPICAL SVE MANIFOLDS CONSTRUCTION
SCALE: NOT TO SCALE (N.T.S)



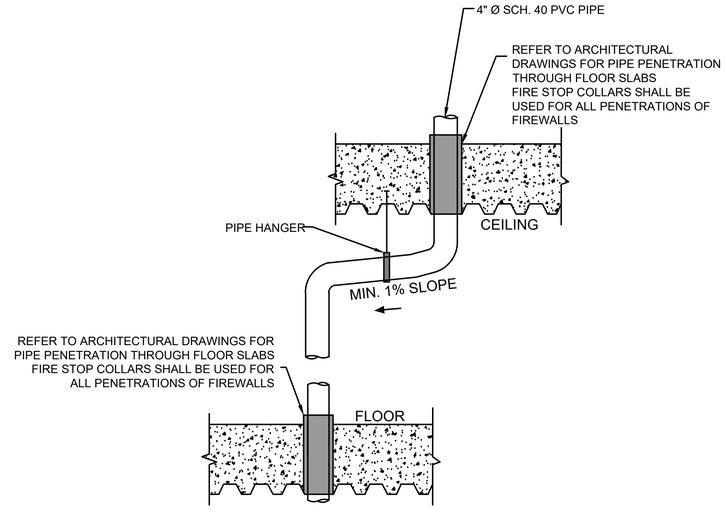
NOTES:

1. NOT ALL REQUIRED ACCESSORIES ARE SHOWN. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.
2. ELECTRICAL WIRING AND EQUIPMENT NOT SHOWN. REFER TO ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR REQUIREMENTS.
3. PIPE AND EQUIPMENT ARRANGEMENT SHOWN FOR SCHEMATIC PURPOSES ONLY (NOT TO SCALE).
4. ALL ROOF PENETRATIONS WERE COORDINATED WITH OTHER TRADES TO ENSURE PENETRATIONS ARE SEALED IN ACCORDANCE WITH WARRANTY.
5. DISCHARGE EXHAUST STACK MINIMUM 6' ABOVE FINISHED ROOF AND MINIMUM 25' FROM ANY WINDOWS AND AIR INTAKES.
6. PROVIDE FAN MOUNTING AND VIBRATION ISOLATION TO MEET MC301.10 AND 928.3.

TYPICAL SUCTION FAN LAYOUT FOR STAND-ALONE EXHAUST STACK
SCALE: N.T.S



TYPICAL MONITORING POINT
SCALE: NOT TO SCALE (N.T.S)



TYPICAL PIPING OFFSET
SCALE: NOT TO SCALE (N.T.S)

No.	Date	Revision

REVISIONS

STATE OF NEW YORK · CHUNGYU HAN · LICENSED PROFESSIONAL ENGINEER · 10838201

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611 River Drive - 3rd Floor, Elmwood Park, NJ 07407
Tel: (201) 791-0075, Fax: (201) 791-4533

PROJECT:
43-25 52nd STREET
WOODSIDE, QUEENS

TITLE:
SOIL VAPOR EXTRACTION SYSTEM CONSTRUCTION DETAILS
AS-BUILT

JOB NO: 22254	DRAWING NO:
DATE: 08/11/2025	H106.00
SCALE: AS SHOWN	
DRAWN BY: DH	
CHECKED BY: CH	SHEET 7 OF 7

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APPENDIX L - Environmental Footprint Analysis

Sustainable Remediation Summary - Site Management Plan

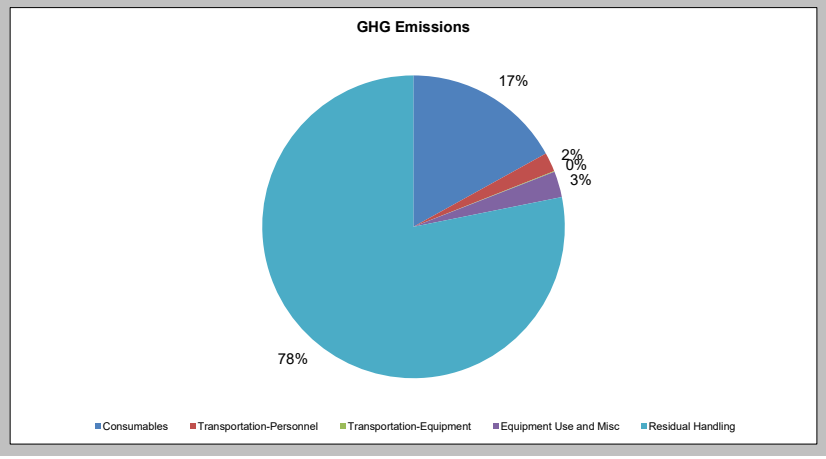
Activities	GHG Emissions	Percent Total	Total Energy Used	Percent Total	Water Consumption	Percent Total	Electricity Usage	Percent Total	Onsite NOx Emissions	Percent Total	Onsite SOx Emissions	Percent Total	Onsite PM10 Emissions	Percent Total	Total NOx Emissions	Percent Total	Total SOx Emissions	Percent Total	Total PM10 Emissions	Percent Total	Accident Risk Fatality	Percent Total	Accident Risk Injury	Percent Total
	metric ton	%	MMBTU	%	gallons	%	MWH	%	metric ton	%	metric ton	%	metric ton	%	metric ton	%	metric ton	%	metric ton	%		%		%
Consumables	8.31	17.0	4.4E+01	19.2	NA	NA	NA	NA	NA	-	NA	-	NA	-	3.0E-04	2.4	5.9E-04	9.0	1.2E-04	2.0	NA	NA	NA	NA
Transportation-Personnel	1.00	2.1	1.3E+01	5.5	NA	NA	NA	NA	NA	-	NA	-	NA	-	3.7E-04	3.0	1.3E-05	0.2	7.5E-05	1.3	1.6E-05	18.8	1.3E-03	9.9
Transportation-Equipment	0.03	0.1	4.7E-01	0.2	NA	NA	NA	NA	NA	-	NA	-	NA	-	1.1E-05	0.1	4.5E-07	0.0	9.0E-07	0.0	2.0E-07	0.2	1.6E-05	0.1
Equipment Use and Misc	1.36	2.8	1.9E+01	8.5	1.4E+00	100.0	2.8E-03	100.0	0.0E+00	-	0.0E+00	-	0.0E+00	-	6.5E-03	52.9	4.9E-03	74.8	5.4E-04	9.3	1.7E-05	20.7	7.4E-03	58.2
Residual Handling	38.27	78.1	1.5E+02	66.5	NA	NA	NA	NA	0.0E+00	-	0.0E+00	-	0.0E+00	-	5.1E-03	41.6	1.1E-03	16.0	5.1E-03	87.5	5.0E-05	60.3	4.0E-03	31.8
Total	48.98	100.0	2.28E+02	100.0	1.43E+00	100.0	2.80E-03	100.0	0.00E+00	0.0	0.00E+00	0.0	0.00E+00	0.0	1.24E-02	100.0	6.55E-03	100.0	5.88E-03	100.0	8.28E-05	100.0	1.26E-02	100.0

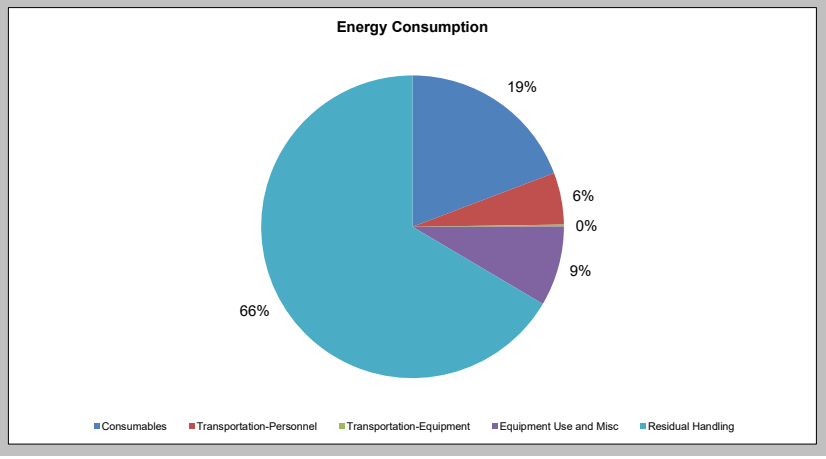
Additional Sustainability Metrics

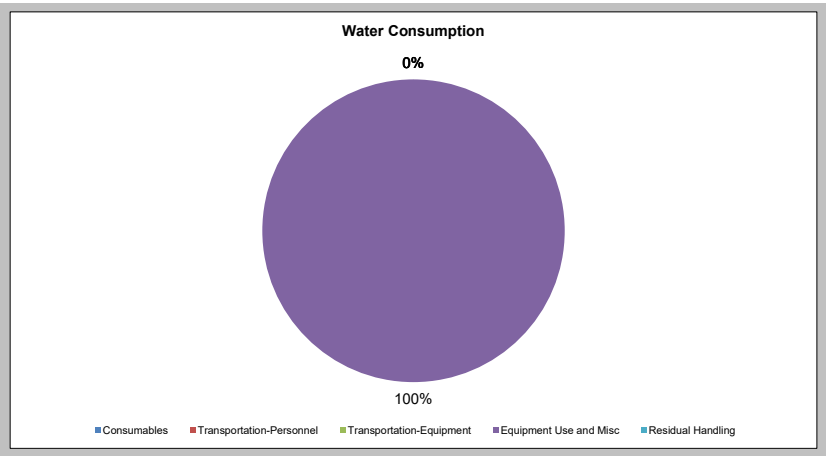
Non-Hazardous Waste Landfill Space (tons)	9.2
Hazardous Waste Landfill Space (tons)	16.0
Topsoil Consumption (yd^3)	0.0
Cost of Phase ($)	0.0
Lost Hours - Injury	0.1

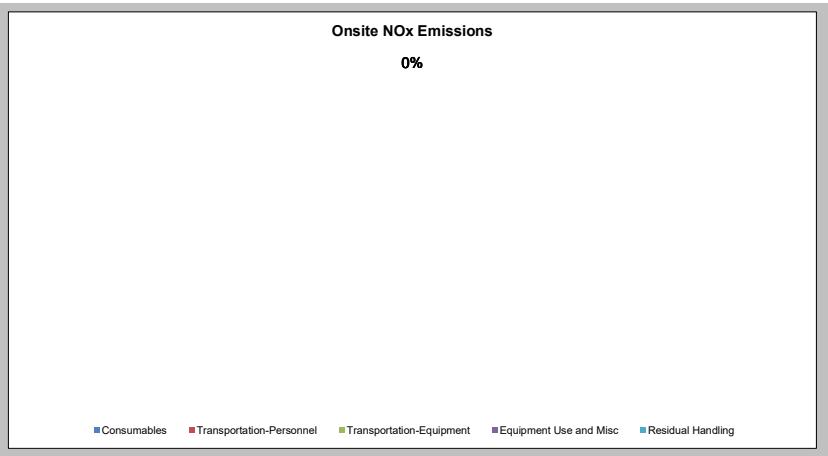
Footprint Reduction

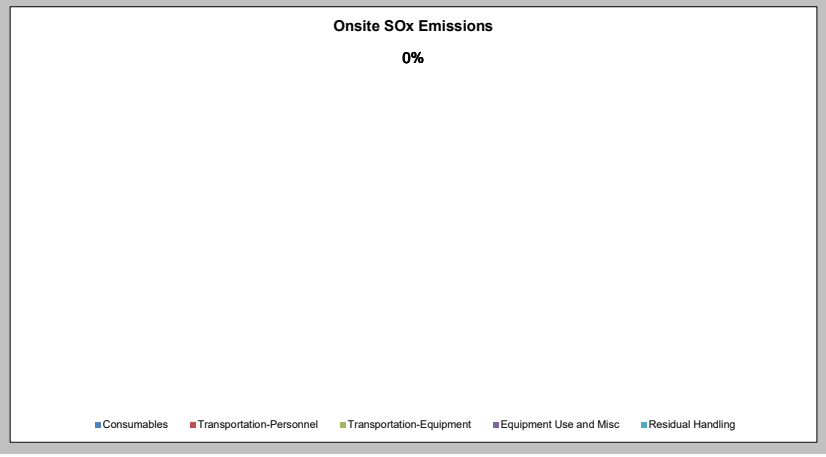
Total electricity replacement (MWh)	0.00E+00
Total electricity replacement (mmBtu)	0.00E+00
Percent electricity from renewable sources (%)	24.2%
Landfill gas reduction (metric ton CO_2 e)	0.00E+00
GHG emissions (metric ton CO2 e)	0.00E+00
NOx emissions (metric ton)	0.00E+00
SOx emissions (metric ton)	0.00E+00
PM10 emissions (metric ton)	0.00E+00

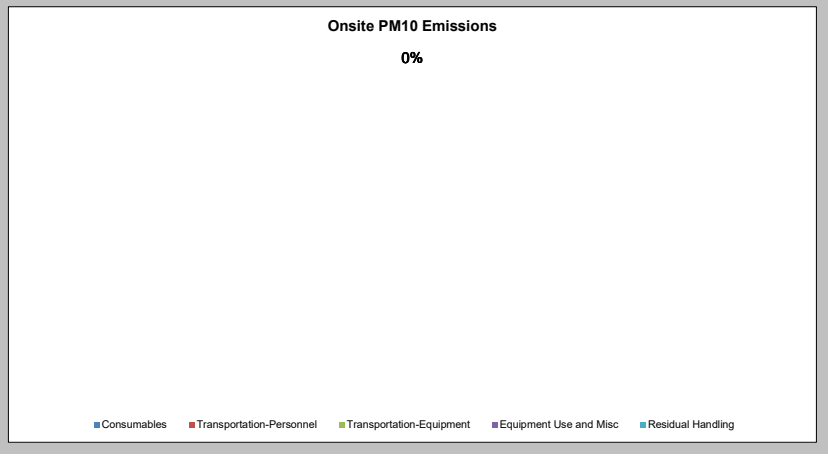


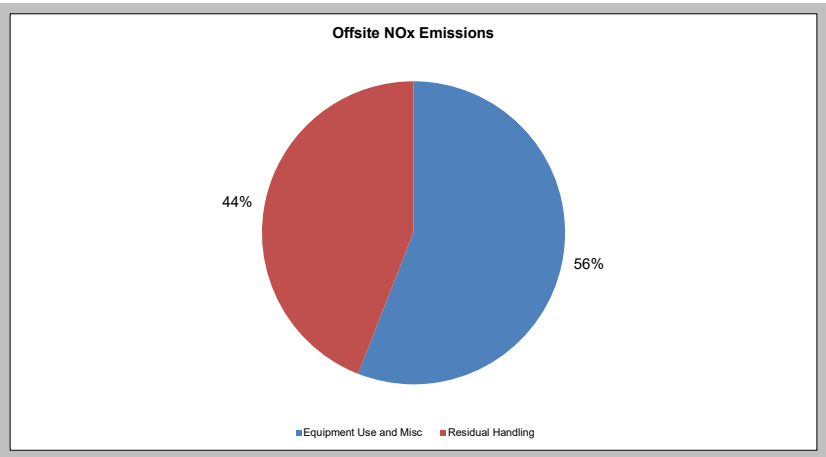


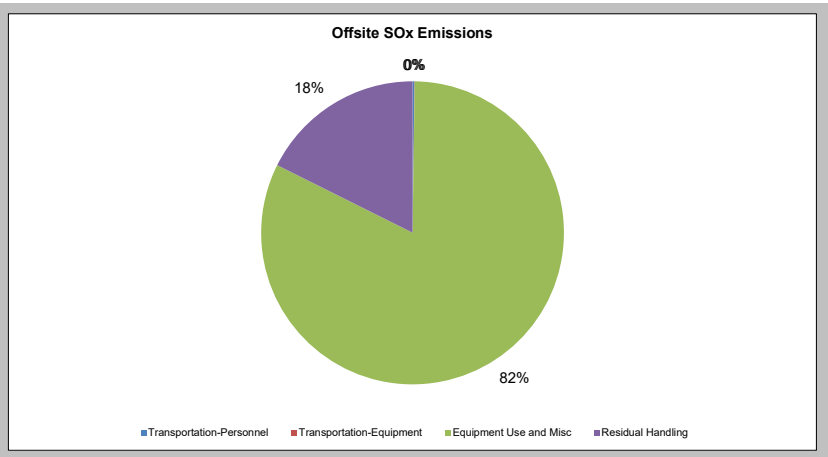

Water Consumption
0%
100%
Consumables
Transportation-Personnel
Transportation-Equipment
Equipment Use and Misc
Residual Handling

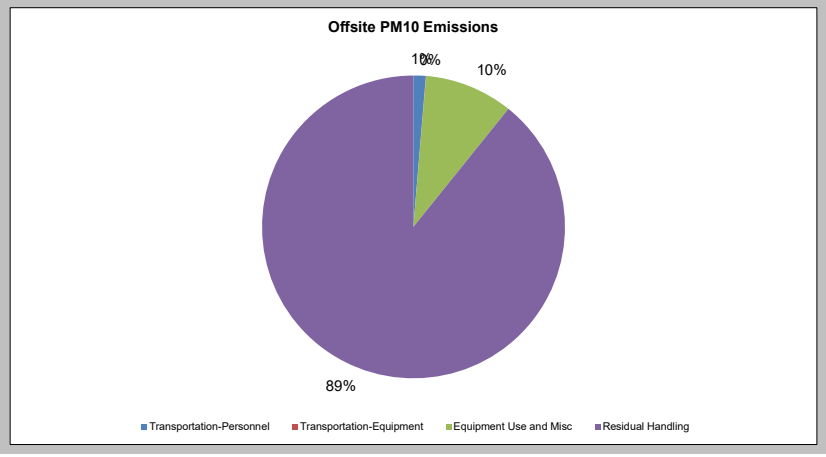

Onsite NOx Emissions
0%
Consumables
Transportation-Personnel
Transportation-Equipment
Equipment Use and Misc
Residual Handling

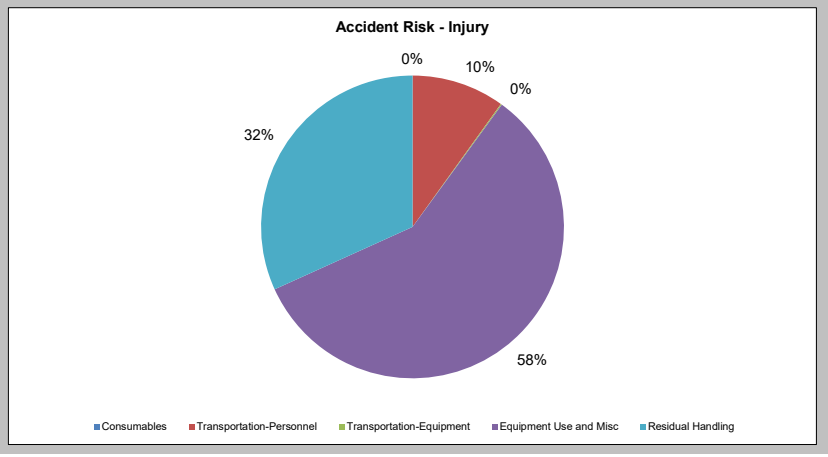

Onsite SOx Emissions
0%
Consumables
Transportation-Personnel
Transportation-Equipment
Equipment Use and Misc
Residual Handling

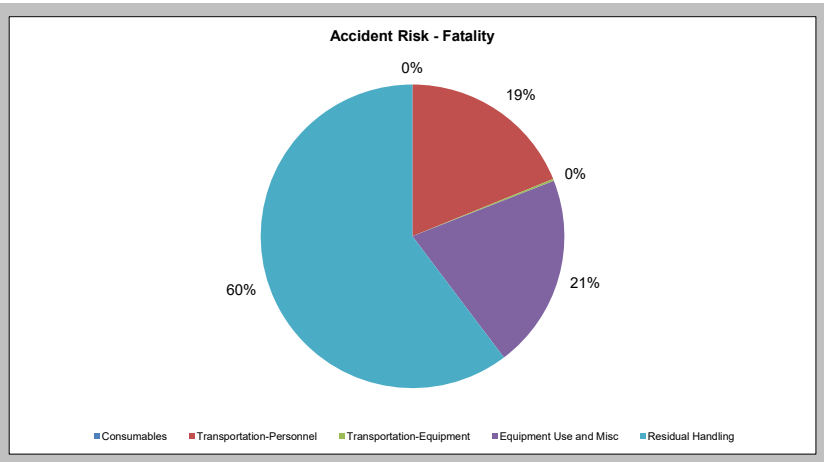

Onsite PM10 Emissions
0%
Consumables
Transportation-Personnel
Transportation-Equipment
Equipment Use and Misc
Residual Handling


Offsite NOx Emissions
44%
56%
Equipment Use and Misc
Residual Handling


Offsite SOx Emissions
0%
18%
82%
Transportation-Personnel
Transportation-Equipment
Equipment Use and Misc
Residual Handling


Offsite PM10 Emissions
1%
10%
89%
Transportation-Personnel
Transportation-Equipment
Equipment Use and Misc
Residual Handling


Accident Risk - Injury
0%
10%
0%
32%
58%
Consumables
Transportation-Personnel
Transportation-Equipment
Equipment Use and Misc
Residual Handling


Accident Risk - Fatality
0%
19%
0%
21%
60%
Consumables
Transportation-Personnel
Transportation-Equipment
Equipment Use and Misc
Residual Handling

This worksheet allows the user to calculate the environmental footprint of using electrical equipment

Yellow cells	value chosen from drop down menu on input sheet
White cells	value entered on input sheet
Orange cells	provide the output of the tool
Blue Cells	tool calculations and automatic lookups

Equipment Operation - For each type of equipment, select only one of the methods to calculate energy and GHG emissions
Enter "0" for all user input values for unused equipment columns or unused methods

		Equipment 1	Equipment 2	Equipment 3	Equipment 4	Equipment 5	Equipment 6	Equipment 7	Equipment 8	Equipment 9	Equipment 10	Equipment 11	Equipment 12
	Type of equipment	Blower	Blower	Blower	Blower	Blower	Blower	Blower	Blower	Blower	Blower	Blower	Blower
Method 1 - IF NAME PLATE SPECIFICATIONS ARE KNOWN													
	Equipment horsepower (hp)	0	0	0	0	0	0	0	0	0	0	0	0
	Number of equipments operating	0	0	0	0	0	0	0	0	0	0	0	0
	Operating time for each equipment (hrs)	0	0	0	0	0	0	0	0	0	0	0	0
	Percent of maximum speed of motor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	Equipment load	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
	Motor efficiency	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Method 2 - IF ELECTRICAL USAGE IS KNOWN													
	Equipment electrical usage, if known (KWh)	0.5	2.3	0	0	0	0	0	0	0	0	0	0
SELECT REGION													
	Region	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY
	CO_2 emission factor (lb/MWh)	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02
	N_2O emission factor (lb/MWh)	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03
	CH_4 emission factor (lb/MWh)	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00
	NOx emission factor (lb/MWh)	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01
	SOx emission factor (lb/MWh)	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01
	PM_{10} emission factor (lb/MWh)	5.07E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01
	Electricity production efficiency	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%
	ENERGY OUTPUT												
	Energy used (kWh)	5.0E-01	2.3E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Energy used (MWh)	5.0E-04	2.3E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Energy used (BTU)	3.7E+03	1.7E+04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	CO_2 OUTPUT												
	CO_2 emission (metric ton)	1.5E-04	7.0E-04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	N_2O emission (metric ton CO_2 e)	5.2E-07	2.4E-06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	CH_4 emission (metric ton CO_2 e)	7.5E-06	3.4E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	NOx and SOx OUTPUT												
	NOx emission (metric ton)	1.5E-07	7.1E-07	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	SOx emission (metric ton)	2.1E-07	9.5E-07	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	PM_{10} emission (metric ton)	1.2E-07	5.3E-07	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM ELECTRICAL EQUIPMENT OPERATION	
CO_2 e Emission (metric ton)	**8.9E-04**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**8.6E-07**
Offsite SOx Emission (metric ton)	**1.2E-06**
Offsite PM_{10} Emission (metric ton)	**6.4E-07**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**1.4E+00**
Energy Used (MMBTU)	**2.1E-02**
Energy Used (MWh)	**2.8E-03**

This worksheet allows the user to calculate the environmental footprint of residual handling

The different columns allow the user to calculate and compare the emissions for different types of residue such as soil, water, and materials

Yellow cells	value chosen from drop down menu on input sheet
White cells	value entered on input sheet
Orange cells	provide the output of the tool
Blue Cells	tool calculations and automatic lookups

RESIDUE DISPOSAL/RECYCLING

		Soil Residue	Residual Water	Material Residue	Other Residuals	Other Residuals	Other Residuals	Other Residuals	Other Residuals	Other Residuals	Other Residuals	Other Residuals	Other Residuals
	Will DIESEL-run vehicles be retrofitted with a particulate reduction technology?	No	No	No	No	No	No	No	No	No	No	No	No
	Weight of the waste transported to landfill or recycling (tons)	0.0	9.2	16.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Fuel used	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
	Total number of trips	0.0	40.0	40.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Number of miles per trip	0.0	80.0	80.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total distance traveled (miles)	0	3200	3200	0	0	0	0	0	0	0	0	0
	Fuel efficiency by weight of load (mpg)	7.4	6.5	5.8	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4
	Total fuel used (gal)	0.0	495.5	555.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	BTU per gallon fuel used	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015
	CO_2 emission factor (g/gal)	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03
	N_2O emission factor (g/gal)	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01
	CH_4 emission factor (g/gal)	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01
	NOx emission factor (g/gal)	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00
	SOx emission factor (g/gal)	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01
	PM_{10} emission factor (g/gal)	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01
	ENERGY OUTPUT												
	Energy used (BTU)	0.0E+00	6.9E+07	7.7E+07	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	CO_2 OUTPUT												
	CO_2 emission (metric ton)	0.0E+00	4.9E+00	5.5E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	N_2O emission (metric ton CO_2 e)	0.0E+00	3.2E-02	3.6E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	CH_4 emissions (metric ton CO_2 e)	0.0E+00	1.2E-01	1.4E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	NOx, SOx and PM_{10} OUTPUT												
	NOx emission (metric ton)	0.0E+00	1.6E-03	1.8E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	SOx emission (metric ton)	0.0E+00	6.6E-05	7.4E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	PM_{10} emission (metric ton)	0.0E+00	1.3E-04	1.5E-04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	ACCIDENT RISK												
	Fatality risk	0.0E+00	2.5E-05	2.5E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Injury risk	0.0E+00	2.0E-03	2.0E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM RESIDUAL HANDLING	
CO_2 e Emission (metric ton)	1.1E+01
Onsite NOx Emission (metric ton)	NA
Onsite SOx Emission (metric ton)	NA
Onsite PM_{10} Emission (metric ton)	NA
Offsite NOx Emission (metric ton)	3.4E-03
Offsite SOx Emission (metric ton)	1.4E-04
Offsite PM_{10} Emission (metric ton)	2.8E-04
Accident Risk - Fatality	5.0E-05
Accident Risk - Injury	4.0E-03
Water Used (gallons)	NA
Energy Used (MMBTU)	1.5E+02
Energy Used (MWh)	NA

This worksheet allows the user to calculate the environmental footprint of equipment and material transport

Yellow cells	value chosen from drop down menu on input sheet
White cells	value entered on input sheet
Orange cells	provide the output of the tool
Blue Cells	tool calculations and automatic lookups

EQUIPMENT TRANSPORTATION - DEDICATED LOAD ROAD

	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6	Trip 7	Trip 8	Trip 9	Trip 10	Trip 11	Trip 12
Vehicle	On road Truck	On road Truck	On road Truck	On road Truck	On road Truck	On road Truck	On road Truck	On road Truck	On road Truck	On road Truck	On road Truck	On road Truck
Will DIESEL-run vehicles be retrofitted with a particulate reduction technology?	No	No	No	No	No	No	No	No	No	No	No	No
Fuel used	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Account for an empty return trip?	No	No	No	No	No	No	No	No	No	No	No	No
Distance travelled (mi)	25	0	0	0	0	0	0	0	0	0	0	0
Weight of equipment transported (tons)	0.01	0	0	0	0	0	0	0	0	0	0	0
Fuel efficiency by weight of load (mpg)	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4
Total fuel used (gal)	3	0	0	0	0	0	0	0	0	0	0	0
BTU per gallon fuel used	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015
CO_2 emission factor (g/gal)	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03
N_2O emission factor (g/gal)	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01
CH_4 emission factor (g/gal)	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01
NOx emission factor (g/gal)	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00
SOx emission factor (g/gal)	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01
PM_{10} emission factor (g/gal)	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01
ENERGY OUTPUT												
Energy used (BTU)	4.7E+05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	3.3E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	2.2E-04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	8.3E-04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	1.1E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	4.5E-07	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	9.0E-07	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	2.0E-07	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	1.6E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM DEDICATED LOAD ROAD TRANSPORTATION	
CO_2 e Emission (metric ton)	3.4E-02
Onsite NOx Emission (metric ton)	NA
Onsite SOx Emission (metric ton)	NA
Onsite PM_{10} Emission (metric ton)	NA
Offsite NOx Emission (metric ton)	1.1E-05
Offsite SOx Emission (metric ton)	4.5E-07
Offsite PM_{10} Emission (metric ton)	9.0E-07
Accident Risk - Fatality	2.0E-07
Accident Risk - Injury	1.6E-05
Water Used (gallons)	NA
Energy Used (BTU)	4.7E+05
Energy Used (MWh)	NA

This worksheet allows the user to calculate the environmental footprint of personnel travel

Yellow cells	value chosen from drop down menu on input sheet
White cells	value entered on input sheet
Orange cells	provide the output of the tool
Blue Cells	tool calculations and automatic lookups

TRANSPORTATION - ROAD

	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6	Trip 7	Trip 8	Trip 9	Trip 10	Trip 11	Trip 12
Vehicle type	Cars	Cars	Cars	Cars	Cars	Cars	Cars	Cars	Cars	Cars	Cars	Cars
Fuel used	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Distance traveled per trip (miles)	50	0	0	0	0	0	0	0	0	0	0	0
Number of trips taken	40	0	0	0	0	0	0	0	0	0	0	0
Number of travelers	1	0	0	0	0	0	0	0	0	0	0	0
Total distance traveled (miles)	2000	0	0	0	0	0	0	0	0	0	0	0
Will DIESEL-run vehicles be retrofitted with a particulate reduction technology?	No	No	No	No	No	No	No	No	No	No	No	No
Consumption rate (MPG)	29	29	29	29	29	29	29	29	29	29	29	29
Estimated MPG (input the default if not known)	22	0	0	0	0	0	0	0	0	0	0	0
Total fuel used (gallons)	90.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon fuel used	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015
CO_2 emission factor (g/mile)	4.83E+02	3.67E+02	3.67E+02	3.67E+02	3.67E+02	3.67E+02	3.67E+02	3.67E+02	3.67E+02	3.67E+02	3.67E+02	3.67E+02
N_2O emission factor (g/mile)	2.17E-02	1.65E-02	1.65E-02	1.65E-02	1.65E-02	1.65E-02	1.65E-02	1.65E-02	1.65E-02	1.65E-02	1.65E-02	1.65E-02
CH_4 emission factor (g/mile)	5.88E-01	4.46E-01	4.46E-01	4.46E-01	4.46E-01	4.46E-01	4.46E-01	4.46E-01	4.46E-01	4.46E-01	4.46E-01	4.46E-01
NOx emission factor (g/mile)	1.86E-01	1.41E-01	1.41E-01	1.41E-01	1.41E-01	1.41E-01	1.41E-01	1.41E-01	1.41E-01	1.41E-01	1.41E-01	1.41E-01
SOx emission factor (g/mile)	6.55E-03	4.97E-03	4.97E-03	4.97E-03	4.97E-03	4.97E-03	4.97E-03	4.97E-03	4.97E-03	4.97E-03	4.97E-03	4.97E-03
PM_{10} emission factor (g/mile)	3.77E-02	2.86E-02	2.86E-02	2.86E-02	2.86E-02	2.86E-02	2.86E-02	2.86E-02	2.86E-02	2.86E-02	2.86E-02	2.86E-02
ENERGY OUTPUT												
Energy used (BTU)	1.3E+07	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	9.7E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	1.3E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emission (metric ton CO_2 e)	2.5E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	3.7E-04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	1.3E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	7.5E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	1.6E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	1.3E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM ROAD TRANSPORTATION	
CO_2 e Emission (metric ton)	**1.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**3.7E-04**
Offsite SOx Emission (metric ton)	**1.3E-05**
Offsite PM_{10} Emission (metric ton)	**7.5E-05**
Accident Risk - Fatality	**1.6E-05**
Accident Risk - Injury	**1.3E-03**
Water Used (gallons)	**NA**
Energy Used (BTU)	**1.3E+07**
Energy Used (MWh)	**NA**