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Bausch & Lomb

Site Management Plan

Former Bausch & Lomb Frame Center
Chili, New York

Site Identification Number 828061

August 2010
Revision 1, October 2013

New York State Department of Environmental Conservation
Division of Environmental Remediation, Region 8
6274 East Avon-Lima Road, Avon, New York 14414-9519
Phone: (585) 226-5353 • **Fax: (**585) 226-8139
Website: www.dec.ny.gov

Joe Martens
Commissioner

October 10, 2013

Mr. Frank Chiappone
Manager, Global Environmental Affairs
Bausch & Lomb
1400 North Goodman Street
Rochester, New York 14609

Dear Mr. Chiappone:

Subject: Former Bausch & Lomb Frame Center, Site #828061
Site Management Plan, Revision 1; October 2013
Town of Chili, Monroe County

The New York State Department of Environmental Conservation (NYSDEC) has completed its review of the October 2013 revision of the Site Management Plan (SMP) for the Former Bausch & Lomb Frame Center site prepared by Arcadis. Based on the information and representations contained in the SMP, the SMP is hereby approved.

Please distribute copies of the approved SMP as follows:

- Frank Sowers – NYSDEC, Avon (1 hardcopy); and
- Chili Public Library (1 hardcopy and remove previous versions of the SMP).

Thank you for your cooperation and please contact me at (585) 226-5357 if you have any questions.

Sincerely,

Frank Sowers

Frank Sowers, P.E.
Environmental Engineer 2

ec:
B. Putzig
J. Kenney
J. Frazer
S. Powlin
J. Molina
L. Preston
A. Butler

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Certification

I, Joseph Molina, III, P.E., certify that I am currently a NYS registered professional engineer as 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 that all activities were performed in full accordance with the DER-approved work plan and any DER-approved modifications.

Joseph Molina, III, P.E.
ARCADIS

Site Management Plan

Former Bausch & Lomb
Frame Center
Chili, New York

Site Identification Number
828061

Prepared for:
Bausch & Lomb

Prepared by:
ARCADIS
6723 Towpath Road
P.O. Box 66
Syracuse
New York 13214-0066
Tel 315.446.9120
Fax 315.446.8053

Our Ref.:
B0034221.0001.00002

Date:
August 2010
Revision 1, October 2013

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1. Introduction

1.1 Scope and Objective of the Site Management Plan

This Site Management Plan (SMP) pertains to the 89 acre parcel currently owned by Buckingham Properties, LLC that is located on the south side of Paul Road in Chili, New York (the site). This SMP presents the requirements necessary to maintain the groundwater collection and treatment system (GWCTS) and the sub-slab depressurization system (SSDS) that operate at the site.

The GWCTS was installed at the site in 2000 in accordance with the June 2000 Draft *Ground-Water Remedial Design/Remedial Action Work Plan (Work Plan)*, finalized in October 2000 (BBL, 2000a). A summary of the GWCTS construction and associated monitoring is provided in the January 2001 *Final Engineering Report, Ground-Water Remedial Design/Remedial Action* (BBL, 2001).

The SSDS was installed in 2007 in accordance with the NYSDEC-approved IRM Work Plan (ARCADIS, 2007a). A summary of the SSDS construction and associated modifications agreed upon with the on-site NYSDEC/NYSDOH personnel is presented in the IRM Final Engineering Report (IRM FER) (ARCADIS, 2008).

This SMP provides a site description, as well as information regarding the GWCTS and SSDS system components and operation, operation and maintenance, and monitoring and reporting procedures. The purpose of this SMP is to provide a guide and reference for the proper instruction necessary to maintain the GWCTS and SSDS by the operating and maintenance (O&M) provider. O&M functions will be required for the GWCTS and SSDS for the life of the system or for as long as the system is required to be in place. The duration of groundwater collection and treatment at the site will depend largely on the results of the monitoring program, as outlined in the *Work Plan*. The SSDS will be in place and operational until the systems are no longer needed to address current or potential exposures related to vapor intrusion at the site.

Two pilot tests were conducted at the site in 2011 and 2012 relating to potential changes in the GWCTS as well as related monitoring. The off-site pilot test evaluated whether the off-site component of the GWCTS could be disconnected. The Granular Activated Carbon (GAC) pilot test evaluated the potential to use GAC as an alternative treatment technology to the existing air stripper treatment. Modifications to

the GWCTS were made based on the results of both pilot tests. The pilot tests and GWCTS modifications are described in detail in Section 2.

A Health and Safety Plan (HASP) is provided as Appendix A to this SMP. The HASP provides information regarding safe work practices for the activities to be conducted under this SMP. If activities other than those identified in the HASP are to be performed, an addendum to the HASP should be prepared prior to the start of the activities and be reviewed by Bausch & Lomb.

The project contact list is included as Table 1.

1.2 Background Information

Presented below is a site description, followed by sections 2 and 3 which are dedicated to each remedy component, GWCTS and SSDS respectively, the remedial action background, system components, operation and monitoring, and reporting for each.

1.2.1 Site Description

The former Frame Center property (the site) is located on the south side of Paul Road, approximately 1.5 miles east of the intersection of State Route 33A and Paul Road in Chili, New York (Figure 1). The Frame Center property is approximately 89 acres in size and is bordered to the north by Paul Road, and an 8-foot-high chain-link fence along the southern and most of the eastern and western site boundaries (Figure 2).

The site was comprised of one main building (Building 40) located in the northern portion of the property and a smaller building (Building 41) located adjacent to and south of Building 40. Building 40 is approximately 354,000 square feet in size and housed the production area, as well as offices, cafeteria, and other associated facilities when owned by Bausch & Lomb. Building 41 is approximately 5,000 square feet in size and was used by Bausch & Lomb for vehicle maintenance and general storage.

Paved parking areas abut the western sides of both buildings, and a paved driveway runs along the eastern side of Building 40 and between Buildings 40 and 41. A small gravel-covered general parking area adjoins the southern side of the main asphalt parking area southwest of Building 41. South of the buildings and parking areas the

property is covered with open-field-type vegetation, including grasses, shrubs, and herbaceous plants.

The former Frame Center was constructed in 1961 and was enlarged in 1966. Based on site history and a review of the building construction, it was determined that the southern portion of Building 40 (i.e., the area south of column line 11) is located on a separate foundation system from the balance of the building; this area represents the 1966 addition to the original building. Historic operations at the facility included the production of plastic and metal eyeglass frames. A variety of materials, including solvents and plating metals, were used at the facility throughout its operational history for the production of eyeglass frames. The exact location of particular processes changed throughout the operational history of the facility in response to changing production and marketing needs (BBL, 1999a).

Since Bausch & Lomb sold the property (June 1998), the space within Building 40 has gradually shifted from an unoccupied large open space, to subdivided areas occupied by various tenants for use as warehousing, manufacturing and office space. Building 41 was also once unoccupied, but is now being occupied by a tenant.

1.3 Deed Restrictions

Deed restrictions for the site are included as Appendix B to this SMP.

2. Groundwater Collection and Treatment System

2.1 Remedial Action Background

In accordance with the ROD, a Pre-Design Field Investigation was performed by Bausch & Lomb from November 1997 through June 1998 to further define the extent of three groundwater volatile organic compounds (VOC) plumes at the site. The results of this Pre-Design Field Investigation were presented in a May 1999 *Remedial Design/Remedial Action Work Plan* (BBL, 1999b), developed for a source area soil removal program. Based on the results of the Pre-Design Field Investigation, the VOC plumes originating from the BL-9S and BL-16S Source Areas were well defined. However, the western edge of the plume, believed to originate from the BL-11D source area, was not sufficiently defined as concentrations of VOCs were detected above NYSDEC Class GA Standards in groundwater samples collected from monitoring points installed near the western site boundary.

Based on these analytical results, a groundwater contingency measure was constructed from June 1998 through August 1998 to address groundwater-containing VOCs near the western boundary of the site. This contingency measure consisted of installing three additional monitoring wells, two piezometers, and a groundwater collection and treatment system connected to two extraction wells (EW-1 and EW-2). Ground water from the two extraction wells and three monitoring wells was collected and analyzed for VOCs on July 25, 1998. The results of this sampling indicated concentrations of VOCs above NYSDEC Class GA Standards in groundwater at the western site boundary. Results also indicated that the VOC-plume was likely migrating off site under a portion of the adjacent Carriage House Estates Property (Figure 2).

As a result, Bausch & Lomb implemented the Western Boundary Investigation to delineate the extent of the VOC plume near the western property boundary of the site and on the Carriage House Estates Property. The results of this investigation were presented in the *Western Boundary Investigation Report* (BBL, 1999c), which was submitted to the NYSDEC in April 1999. The results of this investigation demonstrated that the off-site VOC plume extended approximately 350 feet off site and was confined to the deep overburden/weathered bedrock interface (approximately 20 to 25 feet below ground surface [bgs]).

Based on the results of the Western Boundary Investigation and the Pre-Design Field Investigation, Bausch & Lomb began evaluating groundwater remedial options for the

three VOC plumes at the site. Results of this evaluation were presented in the *Ground-Water Modeling Report* (BBL, 1999d), which was submitted to the NYSDEC in May 1999. The NYSDEC and New York State Department of Health (NYSDOH) provided their concurrence with the proposed actions discussed in the *Ground-Water Modeling Report* (BBL, 1999d) in a July 2, 1999 letter (NYSDEC, 1999b). The NYSDEC and NYSDOH also indicated in the July 2, 1999 letter that two new shallow monitoring wells should be installed in the off-site property to monitor for potential shallow groundwater contamination.

In accordance with the proposed actions discussed in the *Ground-Water Modeling Report* (BBL, 1999d) and the NYSDEC and NYSDOH July 2, 1999 letter, Bausch and Lomb installed six new extraction wells (EW-100, EW-110, EW-120, EW-140, EW-150, and EW-160), two off-site and four on-site, and two new shallow monitoring wells (to form clusters with deep overburden wells CH-5D and CH-6D) during January and February 2000 (Figure 2). In addition, a preliminary design for a new GWCTS was prepared, incorporating the use of the six new extraction wells and one existing extraction well (formerly EW-2, renamed as EW-130). Details of the six new extraction well installations and the proposed GWCTS were discussed in the *Preliminary Basis of Design* document submitted for informal review to the NYSDEC on April 24, 2000 (B&L, 2000). In a May 12, 2000 meeting at the NYSDEC offices in Albany, New York, the NYSDEC provided several specific comments on the *Preliminary Basis of Design* document, and also indicated that they accepted the overall approach and scope of the design. The finalized *Ground-Water Collection and Treatment System Design* is included in Appendix A of the *Work Plan* (BBL, 2000a).

Construction of the new GWCTS was performed at the site between July 5, 2000 and September 8, 2000. Between September 11 and October 9, 2000, the GWCTS was activated periodically to assess the system performance. On October 9, 2000, the GWCTS was activated for continuous operation with discharge to the sanitary sewer. The GWCTS construction and initial startup activities are summarized in the January 2001 *Final Engineering Report, Ground-Water Remedial Design/Remedial Action* (BBL, 2001). The construction and start-up activities for rerouting the GWCTS discharge to a storm sewer outfall were scheduled for May/June 2002. The Record Drawings included in the January 2001 *Final Engineering Report* (BBL, 2001) are included for reference in this SMP as Appendix C. Record Drawings 1, 2, and 5 in Appendix C were revised as Drawings 1A, 2A, and 5A, respectively, for discharge to the storm sewer outfall.

2.1.1 GWCTS Goals of Operations

The GWCTS has two primary functions:

- Collection and treatment of groundwater from each of the three VOC source areas at the Site.

- Collection and treatment of groundwater associated with a VOC-containing plume of groundwater migrating to the southwest and off the Frame Center property (the western boundary area) within the deep overburden/bedrock interface zone. This replaced the original system that was constructed in August 1998.

2.1.2 Groundwater Pumping Rates and Influent Groundwater VOC Concentrations

The location of the groundwater collection wells and the anticipated groundwater pumping rates of the extraction wells were defined in the *Ground-Water Modeling Report* (BBL, 1999d); and the extent of the VOC-containing plume in the off-site area was defined in the April 1999 *Western Boundary Investigation Report* (BBL, 1999c). The actual average extraction well pumping rates during system startup and the estimated average and maximum pumping rates are included in the *Basis of Design* (BBL, 2000b). Based on the information collected to date, the pumping rates appear to be somewhat higher than the rates assumed in the *Basis of Design* (BBL, 2000b); however, it is anticipated that the pumping rates will decrease somewhat as operation of the GWCTS continues.

Anticipated well pumping rates and analytical results from samples collected from the extraction wells, following well development, were used to estimate the influent VOC concentrations for design of the GWCTS (BBL, 2000b). During startup of the GWCTS, periodic grab samples were taken from the treatment system influent and effluent to assess the efficiency of the air stripper and to compare the actual concentrations to the concentrations assumed in the *Basis of Design* (BBL, 2000b). Actual VOC concentrations from the extraction wells and the equalization tank during system startup and the estimated influent VOC concentrations are included in the *Basis of Design* (BBL, 2000b). Based on this comparison, the actual concentrations are lower than the anticipated concentrations. Furthermore, the influent VOC concentrations are anticipated to decrease somewhat as operation of the GWCTS continues.

2.1.3 GWCTS Effluent Requirements

2.1.3.1 Discharge to Storm Sewer

The effluent requirements for the GWCTS discharge to the storm sewer are provided in Appendix D, Storm Sewer Discharge Correspondence.

2.1.4 Performance Goals

Specific performance goals have been established for the GWCTS as outlined below.

If circumstances require that the GWCTS be shut down, the performance goal for the system as a whole will be that the system not be offline for more than one month at a time.

The treatment efficiency goal for the system is that the treatment efficiency meets the discharge permit requirements for the receiving water body.

2.1.5 System Modifications

Modifications to the GWCTS as well as associated monitoring are detailed below. Much of the GWCTS modifications were made based on results of two pilot tests completed in 2011 and 2012 as outlined below. System modifications are depicted on the revised Record Drawings presented before the Figures.

2.1.5.1 Discharge Line Modifications

In August 2011, Op-Tech Environmental Services, Inc. (Op-Tech), Bausch & Lomb's contractor, replaced a section of discharge line from the GWCTS. The pre-existing effluent line was replaced to handle seasonal flows and was re-routed north into the parking lot, to tie into the existing storm water drainage system. Below are the details regarding replacement of the discharge line:

- An approximate one and half feet wide by three feet deep trench was excavated 320 feet from the GWCTS building to the storm sewer inlet concrete vault located in the existing asphalt parking lot. Areas of asphalt were saw-cut to expose underlying soils for excavation.

- Four inches of New York State Department of Transportation Type I Crusher Run was placed in the bottom of the trench as utility bedding for the 4-inch diameter Schedule 40 PVC pipe drain.

- Disturbed areas were restored to existing grade by using a three-inch binder system in areas of saw cut asphalt, and placing topsoil, seed, and mulch in vegetated areas.

- The old GWCTS effluent line was disconnected below grade at the GWCTS end and a PVC pipe cap was glued on prior to backfilling. The discharge end of the effluent pipe, located in the manhole for the original discharge point to the site stormwater system, was capped with a PVC pipe cap and glued on.

The modifications to the GWCTS discharge line is depicted on Record Drawing 1A.

2.1.5.2 Off-Site Well Pilot Test

An off-site well pilot test was initiated on May 17, 2011 to evaluate the potential for permanently disconnecting the two off-site pumping wells and utilities (i.e., the off-site GWCTS). The pilot test was completed, in part, because the off-site property owner, Michael Batisti, was evaluating the possibility of developing a portion of the Carriage House Estates property (the off-site property) that contains the off-site GWCTS. As part of the Carriage House Estates property development, Mr. Batisti preferred GWCTS utilities to be disconnected and removed. To that end, Bausch & Lomb proposed a pilot test for turning off power to off-site pumping wells EW-100 and EW-110 and monitor groundwater thereafter. This proposal was documented in a May 6, 2011 work plan to NYSDEC. The off-site well pilot test work plan was approved by NYSDEC in a letter dated May 16, 2011. The off-site well pilot test was scheduled to run through May 2012 or until VOC concentrations suggested the off-site wells needed to be reactivated. Regularly scheduled sampling activities were also included as part of the off-site well pilot test as outlined in the work plan. The details of the off-site well pilot test work plan are included in correspondence with NYSDEC provided in Appendix 6 to the 2011 Annual Report (ARCADIS, 2011).

Results of the off-site well pilot test were provided under separate cover in an Off-Site Pumping Well and GAC System Pilot Test Results Report dated July 9, 2012. The results supported the decision to abandon the off-site portion of the GWCTS. NYSDEC accepted the report in an August 13, 2012 letter to Bausch & Lomb, with the exception that one additional round of samples from the off-site wells be collected

in October 2012 during the semi-annual sampling, and reevaluate the analytical results at that time. Upon completion of the October 2012 sampling, and after discussions held in November 2012 with NYSDEC, ARCADIS presented the rationale and approach for abandoning the wells and GWCTS infrastructure associated with the off-site GWCTS in a November 30, 2012 letter to NYSDEC. NYSDEC approved the plans for discontinuing the off-site GWCTS operations and abandoning the off-site GWCTS system in a letter dated December 14, 2012. NYSDEC indicated that monitoring wells CH-3D, CH-6D, and CH-7 are to remain in place (or be replaced) for continued groundwater monitoring. NYSDEC approved the off-site GWCTS abandonment activities in the letter dated December 14, 2012. The 2012 off-site pilot test correspondence is presented as Appendix 6 to the 2012 Periodic Review Report (ARCADIS, 2013).

In February 2013, Bausch & Lomb's contractor, Op-Tech, permanently disconnected and abandoned the off-site GWCTS by completing the following:

- Terminating power to, and cutting and capping water transmission piping to and from the off-site extraction wells EW-100 and EW-110 as depicted on Record Drawing 1A.

- Removal of terminated power and water transmission lines on the off-site property.

- Abandon by over-drilling extraction wells EW-100 and EW-110 using 10.25-inch augers and tremie-grout the boreholes to grade in accordance with NYSDEC's Policy CP-43.

- Abandon by over-drilling monitoring wells CH-1, CH-3S, CH-4, CH-5S, CH-5D, CH-6S, CH-8S, and CH-8D using 4.25-inch augers and tremie-grout the boreholes to grade in accordance with NYSDEC's Policy CP-43.

- The three wells requested by NYSDEC to remain in place were protected during construction activities and remain on-site. If future development of the off-site property requires the abandonment of wells CH-3D, CH-6D, and CH-7, they will be re-installed and continue to be monitored during the semi-annual groundwater monitoring events. This SMP reflects the changes made to the GWCTS as outlined herein.

The NYSDEC well decommissioning forms are included as Appendix E.

2.1.5.3 GAC Pilot Test

On November 22, 2011, ARCADIS submitted a work plan to NYSDEC, on behalf of Bausch & Lomb, requesting a pilot test using GAC as an alternative treatment technology to the current air stripper used for the GWCTS. On December 14, 2011, ARCADIS submitted a revised GAC pilot test work plan based on a December 8, 2011 NYSDEC comment letter. The GAC pilot test work plan was approved by NYSDEC in a December 15, 2011 letter to Bausch & Lomb.

Bausch & Lomb began implementing the NYSDEC-approved GAC pilot test work plan the week of December 12, 2011. The work plan outlined the methodology used and design for the temporary GAC system that was installed to determine if a GAC system could be re-established as the permanent groundwater treatment method. The pilot test was conducted from December 2011 through May 2012 with regularly scheduled sampling activities, as outlined in the work plan. The GAC pilot test work plan and associated correspondence are provided in Appendix 7 to the 2011 Annual Report (ARCADIS, 2011). Results of the GAC pilot test were presented in the Off-Site Pumping Well and GAC System Pilot Test Results Report dated July 9, 2012. NYSDEC accepted the report in an August 13, 2012 letter to Bausch & Lomb, with the caveat that a New York State Professional Engineer stamped and signed Remedial Design Plan be submitted and approved by NYSDEC prior to full-scale implementation of GAC. The 2012 GAC pilot test correspondence is presented in Appendix 6 to the 2012 PRR (ARCADIS, 2012). The GAC pilot test found that GAC is a viable treatment technology for the GWCTS; however, Bausch & Lomb found the GAC to be cost prohibitive at the time. As such, Bausch & Lomb purchased and installed a smaller air stripper (NEEP 1331-P) that is better suited for the current treatment system flow.

2.1.5.4 Air Stripper Modifications

The NEEP 1331P air stripper was installed in July 2012 after it was determined from the GAC pilot study, that using carbon for groundwater treatment was cost prohibitive because the spent carbon sent for disposal was regulated hazardous waste. During installation and setup of the new NEEP 1331-P, additional discharge sampling was conducted as follows: twice the first week, weekly for the first month, and monthly thereafter for 3 months.

The pilot study was an opportune time to replace the aging (20+years, purchase used from Crossman arms), oversized air stripper used for groundwater treatment for

the previous 12 years. The unit used more electricity than necessary (7.5 hp blower) to treat a reduced influent flow (approximately 10 gpm). The NEEP 1331-P was selected for its more appropriate flow capability (15 gpm) and smaller blower. Maintenance of the unit was also determined to be easier given the smaller, plastic trays that could be replaced by one person. After cutting up and removing the old air stripper, the EQ tank pump and the bag filter were removed to facilitate installation of new ½" pressure treated plywood floor. The EQ pump and bag filter were then reinstalled in a different layout to better accommodate the new air stripper and maintenance of the bag and cartridge filter. The system was re-plumbed with 1" reinforced hose, the same as used for the GAC system. The hose is suitable for the flow rate and easier to maintain than rigid pipe. The system was assembled and tested per June 29, 2012 and July 2, 2012 email correspondence between Bausch & Lomb and NYSDEC. The NEEP 1331-P system became operational in July of 2012. In December of 2012, in preparation for new vinyl siding being put on the GWTS building, the air stripper air intake (6" PVC) and the air stripper discharge line (4" PVC) were relocated to penetrate the exterior wall closer to the equipment. A 10-foot section of 4-inch PVC pipe was extended from the previous underground location to the new wall penetration for the air stripper discharge. The air stripper trays are now serviced on a 6-8 week interval. Power washing and or abrasive brushing have replaced sandblasting as the tray cleaning methodology. All of the system controls and alarms remain the same. The system flow to filters and air stripper is throttled back (by valve) to a maximum influent rate of 13.5 – 14.0 gpm. The system downtime during the switch over from GAC to the NEEP 1331-P air stripper was approximately one week.

Changes to the air stripper treatment system are presented in the Record Drawings.

2.2 System Components and Operation

2.2.1 General

Based on influent VOC concentrations established through sampling of the extraction wells and effluent requirements as stated in the County of Monroe Sewer Use Permit for the Site, BBL and Bausch & Lomb determined that air-stripping was the optimum technology for treating groundwater collected at the site (BBL, 2000b). To minimize air stripper downtime and equalize the VOC concentrations entering the stripper, a 600-gallon equalization tank was installed prior to the air stripper. A bag filter was installed between the equalization tank pump and the air stripper inlet to prevent larger particles, which could plug the trays, from entering the air stripper.

Attached documentation relating to system components and operation are listed below:

- Major Equipment List (Table 2)
- Instrumentation List (Table 3)
- Recommended Spare Parts List (Table 4)
- Air stripper O&M manual (Appendix F)
- Submersible pump O&M manual (Appendix G)
- Equalization tank pump and sump O&M manual (Appendix H)
- Miscellaneous vender information (Appendix I)
- Well Redevelopment Procedure (Appendix J)

Details about the individual system components and their operation are presented below.

2.2.2 Groundwater Extraction Wells (EW-100 to EW-160)

As detailed in the *Ground-Water Modeling Report* (BBL, 1999d), groundwater extraction wells were installed at the three on-site VOC source areas. A fourth well was installed near the western property boundary to supplement an existing well (EW-2, renamed EW-130 as part of this design) in control of the on-site plume. Two additional wells were installed on the adjacent property to collect VOC-containing groundwater in the Western Boundary Area. These six wells were installed and developed in January and February 2000. The following table contains the well dimensions as recorded during installation:

Description	Well Number						
	EW-100**	EW-110**	EW-120	EW-130*	EW-140	EW-150	EW-160
Depth to top of screen	8'-0"	6'-0"	5'-0"	10'-0"	7'-0"	5'-0"	7'-0"
Depth to bottom of screen	27'-3"	26'-0"	30'-0"	30'-0"	26'-7"	29'-3"	32'-0"
Well depth	30'-0"	28'-0"	32'-0"	32'-0"	29'-0"	32'-0"	34'-0"
Well diameter	6"	6"	6"	6"	6"	6"	6"

* Existing well EW-2 installed and developed in June 1998.
** EW-100 and EW-110 and associated utilities were abandoned in February 2013 as part of the off-site treatment system decommissioning.

Each well is equipped with an environmental submersible pump with a single phase, ½ horsepower motor (P-100 to P-160). The pumps are designed to pump 5 or 16 gallons per minute (gpm) against a total dynamic head (TDH) of 50 feet. When in automatic mode, each pump is controlled by the water level in the well. Each pump can also be operated in manual mode from the control panel located adjacent to

each extraction well. To prevent overflow of the equalization tank, the collection well pumps are interlocked to the liquid level in the tank.

The well pumps are controlled via three-probe level controls corresponding to pump "off", pump "on", and high-level alarm. The controllers and primary start/stops for each pump are located at each well in vandal-resistant enclosures. For operational purposes, additional disconnects for the well pumps are located in the treatment building.

To allow for maintenance and future shutdowns, the wells are connected to the treatment system via three separate underground pipelines as follows:

Description	Well Numbers
Off-site western boundary area	EW-100**, EW-110**
Western property boundary	EW-120, EW-130
On-site VOC source areas	EW-140, EW-150, EW-160

** EW-100 and EW-110 and associated utilities were abandoned in February 2013 as part of the off-site treatment system decommissioning.

The electrical supply and control conduits are also separated into these three groups.

2.2.3 Groundwater Treatment

The groundwater treatment system is housed in a small building located at the southern end of the main parking area. In addition to the treatment equipment and instrumentation, the building also houses the electrical breakers and transformer for the GWCTS.

2.2.4 Equalization Tank (T-200) and Transfer Pump (P-200)

To maintain a more consistent flow (rate and composition) to the air stripper, all the collection wells pump to a 600-gallon equalization tank (T-200). The equalization tank is a 48-inch-square by 60-inch-tall, square, polypropylene tank with the following connections:

Description	Location	Size	Purpose
Inlet nozzle with fill tube	Top	2-inch diameter	Pipeline from EW-100 and EW-110**
Inlet nozzle with fill tube	Top	2-inch diameter	Pipeline from EW-120 and EW-130
Inlet nozzle with fill tube	Top	2-inch diameter	Pipeline from EW-140, EW-150, and EW-160
Nozzle with 1-inch extension	Top	2-inch diameter	Tank vent
Nozzle with 1-inch extension	Top	2-inch diameter	Liquid level probe
Nozzle with 1-inch extension	Top	2-inch diameter	High-high liquid level probe

Description	Location	Size	Purpose
Outlet nozzle with extension	Lower Side	2-inch diameter	Pump suction
Outlet nozzle with extension	Lower Side	2-inch diameter	Draining tank
Access hatch	Top	18-inch by 18-inch	Inspecting and cleaning tank

** EW-100 and EW-110 and associated utilities were abandoned in February 2013 as part of the off-site treatment system decommissioning.

The equalization tank should be checked regularly for solids build-up. If more than a few inches of solids build up on the bottom of the tank, the tank should be taken out of service and cleaned (see maintenance procedure below).

The equalization tank pump (P-200) is a Goulds NPE 1x1¼-6 (model 1ST1D4E4), designed to pump a maximum of 20 gpm against a TDH of 65 feet. The discharge valve on the pump should be throttled to maintain a constant level in the equalization tank.

The equalization tank is equipped with a three-float level control corresponding to pump “off”, pump “on”, and high-level alarm, and an independent high-high level switch which will shut down all the well pumps. The float-type high-level alarm will notify an operator of a potential problem via an autodialer notification system.

2.2.5 Bag Filter (F-300)

The bag filter (F-300) prevents solids, which may be pumped to the equalization tank, from entering the air stripper and plugging the trays. The bag filter housing is currently equipped with a 25-micron bag filter. Frequency of bag changes and bag filter size will need to be determined through operational experience.

The bag filter is equipped with inlet high pressure and high-high pressure switches. When the high-pressure setpoint is exceeded the autodialer will notify the operator that there is a restriction in the system. If the condition is not corrected and the filter inlet pressure continues to rise, the high-high pressure switch will shut down the equalization tank pump, and the blower.

2.2.6 Low-Profile Air Stripper (AS-300)

VOCs are transferred from the filtered groundwater to a vapor stream through a North East Environmental Products (NEEP) Model 1331-P low-profile air stripper (AS-300). The filtered groundwater is injected into the top of the air stripper through a nozzle. As the water travels across each tray, air is bubbled through holes in the tray. The subsequent frothing action transfers the VOCs from the water into the air.

The air stripper has three installed trays and three spare trays. Stripping air is provided by an American Fan, 3 horsepower blower (B-300), model number AF-15 Code 972069N.

The air stripper is equipped with a gravity discharge. High and low pressure switches on the air stripper, indicating possible plugging of the air stripper trays or an empty tray, respectively, will also shutdown the equalization tank pump and blower (after a 5 minute delay). After the air stripper shuts down, the well pumps will continue to pump to the equalization tank until the high-high level switch in the equalization tank is reached, at which time the interlock will disable the well pumps.

2.2.7 System Controls

The GWCTS is controlled by independent relays, timers, and controllers. All the system shutdowns notify the O&M provider via the autodialer system.

2.2.8 Flow Meters

Each well control panel is equipped with a Hayward 2000 flow sensor with a Hayward 2500 digital flow indicator/totalizer/transmitter. The flow signals are also transmitted to Precision Digital displays in the treatment building. The relative flows should be used to determine if the wells and well pumps are operating properly. If a decrease in flow is detected, follow the well and extraction pump well maintenance procedures to correct the problem.

The system influent passes through a flow meter with a totalizer on the discharge side of the bag filter before discharging to the stormwater conveyance system.

2.2.9 Autodialer

The GWCTS is equipped with a cellular phone autodialer which will notify the O&M provider of specific alarm conditions requiring operator response. The autodialer is programmed to call out in the following sequence:

Frank Chiappone	Cell phone	585.764.7556
	Office phone	585.338.5087
	Home phone	585.392.4416

See the table in Section 2.3.2 for conditions that activate the autodialer.

2.3 Operation and Maintenance

2.3.1 General

The GWCTS is designed to operate continuously with little operator assistance. The O&M provider must respond to system alarms, monitor system parameters as specified below, provide system maintenance as defined below, change bag filters as needed, and sample as required by the NYSDEC.

For operator convenience, a copy of the SMP will be placed in the treatment building. The manual will be stored on the shelving unit located in the southwest corner of the treatment building.

2.3.2 Alarm Response

The following table summarizes the system alarm and interlock points, with their corresponding action and autodialer Alarm Condition Number, where applicable.

Alarm/Interlock Point	Condition	Action	Target Response Time
Well EW-100 level** Well EW-110 level** Well EW-120 level Well EW-130 level Well EW-140 level Well EW-150 level Well EW-160 level	High	Start corresponding well pump.	3 Business days
	Low	Stop corresponding well pump.	3 Business days
Equalization tank level	High-high	Shut down all well pumps.	3 Business days
	High	Notify O&M provider (Alarm Condition 1).	3 Business days
	On	Start equalization tank pump.	3 Business days
	Off	Stop equalization tank pump.	3 Business days
Bag filter inlet pressure	High-high	Shut down equalization tank pump, and air stripper blower, and notify O&M provider (Alarm Condition 3).	3 Business days
	High	Notify O&M provider (Alarm Condition 5).	3 Business days
Air stripper pressure	High	Shut down equalization tank pump, and air stripper blower, and notify O&M provider (Alarm Condition 3).	3 Business days
	Low	Shut down equalization tank pump, and air stripper blower, and notify O&M provider (Alarm Condition 3).	3 Business days
Building wet floor	On	Shut down all well pumps, equalization tank pump, and air stripper blower, and notify O&M provider (Alarm Condition 2).	4 Hours

** EW-100 and EW-110 and associated utilities were abandoned in February 2013 as part of the off-site treatment system decommissioning.

When the O&M provider is notified of an alarm or shutdown, they shall proceed to the site and take appropriate corrective action.

2.3.3 System Monitoring

The O&M provider is required to visit the site weekly to monitor the system operation. The following monitoring and sampling activities are to be completed on the schedule outlined below:

Two to Three Days per Week

- Check the equalization tank, bag filter, air stripper, and all related piping for leaks, repair if necessary.
- Record the bag filter inlet pressure. Change the bag filter if necessary.
- Open the equalization tank manway and check for excessive sludge. If excessive sludge has built-up on the floor of the tank, schedule the tank for cleaning.
- Inspect the treatment building for general housekeeping issues and correct as necessary.

Weekly

- Record the totalized flow for the system discharge. If the flow from a well has decreased and the cause is unknown, follow the well maintenance procedure below to determine and correct the cause.
- Collect pH readings of the system discharge and record on Form 1.

Quarterly

- For discharge to the storm sewer, analyses will be performed in accordance with the requirements and effluent criteria provided in the correspondence between Bausch & Lomb and the NYSDEC (Appendix D).

Annually

- At least 10 days prior to the Annual Monitoring Inspection, notify the NYSDEC that the Annual Monitoring Inspection will be performed.
- Check the well head piping for leaks and repair as necessary.
- Operate the valves at the well heads and all valves in the GWCTS building, replace or repair if necessary.
- Verify operation of system interlocks. Inspect all flow meters, pressure gauges and switches, and level switches, repair/replace if necessary.
- Air stripper maintenance will be performed as described in Section 2.3.5.2, below.

A copy of the form to be used to log the above-described monitoring activities is included as Form 1.

2.3.4 Sampling

2.3.4.1 Discharge to Storm Sewer

Sampling will be performed in accordance with the correspondence between Bausch & Lomb and the NYSDEC (Appendix D).

2.3.5 Maintenance

To promote proper operation of the GWCTS, some maintenance activities shall be conducted. These activities are described in this subsection. O&M Manuals for the air stripper, the submersible well pumps, and the equalization tank pump are contained in Appendices E, F, and G, respectively. The GWCTS vendor information is contained in Appendix H. Table 4 contains a list of recommended spare parts to maintain on site or made available through local suppliers to minimize system downtime. A copy of the form to be used to log the GWCTS maintenance activities included as Form 2.

2.3.5.1 Extraction Well Maintenance

If a decrease in the well pumping flow rate is noted, follow the procedure below:

- Verify that the well discharge valve is in the full open position. If the valve is not in the full open position, open the valve to the full open position and monitor the flow rate.

- Listen to the well pump while running. Is this the normal sound for this pump? If it sounds like rocks are in the pump, the pump may be cavitating due to lack of water supply on the suction. Raise the low-level probe to prevent cavitation. When raising the low-level probe, do not raise this probe to, or above, the level of the high-level probe.

- Check the discharge pressure gauge, and then close back on the discharge valve while the pump is running and note the maximum ("dead-head") pressure. **Caution**: Do not leave the discharge valve completely closed for more than a few seconds because "dead-heading" the pump can cause more damage.

- If the expected discharge pressure is not achieved, schedule the pump for maintenance or replacement.

- Check pump, well casing, and discharge pipe for bacteria growth and fouling.

If the pumping flow rate has not decreased, but a decrease in the pumping frequency or duration is noted, the problem is either seasonal or the well itself. Check other wells in the area to rule out a seasonal or "dry period" as the cause. If the well is determined to be the problem, use the procedure in Appendix I to redevelop the well.

2.3.5.2 Air Stripper Maintenance

The low-profile air stripper is designed to operate with a minimal amount of maintenance. The following general maintenance should be performed on the air stripper annually (see Appendix E for more details):

- Inspect and clean, if necessary, blower motor housing.

- Inspect and clean, if necessary, blower blades.

- Lubricate blower fan and motor bearings as necessary.

- Inspect and clean, if necessary, air stripper aeration trays and sump as described in Section 2.3.5.3.

2.3.5.3 Air Stripper Cleaning

During operation of the GWCTS, dissolved minerals (e.g., iron) may precipitate out of the water onto the air stripper trays. These minerals form insoluble deposits that can foul the aeration openings in each tray. Fouling may cause higher than normal operating air pressure within the air stripper unit and/or decreased VOC removal efficiency. To prevent excessive fouling of the aeration trays, the trays are cleaned every 6 to 8 weeks.

2.4 Monitoring and Reporting

This section describes the periodic groundwater and system monitoring required for this site and the annual reporting to be completed in association with the O&M, and monitoring activities for this site.

2.4.1 Monitoring

GWCTS sampling (system influent, system effluent) for discharge to the storm sewer is to be completed on a quarterly basis.

The list below provides the set of wells for groundwater sampling and monitoring to be completed on the semi-annual basis. The wells to be sampled, as listed below, are depicted on Figure 3.

- Western Boundary Area Wells: BL-20Sr, BL-25D, BL-25S,CH-3D, CH-6D, CH-7
- BL-9S Area Wells: BL-9D, BL-9S, BL-17D
- BL-16S Area Wells: BL-14D, BL-14S, BL-16S, BL-18S
- Background Well: BL-1, BL-8r
- GWCTS Extraction Wells: EW-120, EW-130, EW-140, EW-150, EW-160

Note that the following wells have been removed from the GWCTS as part of the off-site treatment system decommissioning conducted in February 2013: EW-100, EW-110, CH-3S, CH-4, CH-5S, CH-5D, CH-6S, CH-8S, and CH-8 D.

Refer to the *Ground-Water Remedial Design/Remedial Action Work Plan* (BBL, 2000a) for specific sampling, analysis, quality control, and health and safety protocol.

2.4.2 Periodic Review Report

The Periodic Review Report (PRR), previously known as the annual report, will consist of the following:

- A brief discussion of the groundwater sampling methods and a summary of the analytical results, including a table summarizing semi-annual VOC results, and an updated 5 ppb TCE plume contour map
- Site figures showing the distribution of VOCs in the shallow and deep overburden groundwater (the preceding three years of data will be shown on the figures in addition to recent data collected)
- A chart depicting long-term effectiveness (cleanup graph) for total VOCs for wells B-16S, EW-130, and EW-140
- A groundwater elevation contour map for the shallow and deep overburden groundwater
- A brief discussion of the sampling methods used to collect the GWCTS influent and effluent, a summary table of the analytical results for the quarterly effluent sampling and the quarterly influent sampling
- A general discussion of the overall performance of the GWCTS; including:
  - Any major maintenance problems encountered during the year
  - A summary table of the combined totalized flow for the treatment system effluent
  - A listing of prolonged extraction well and treatment system downtime, the reasons for the downtime and the corrective measures completed
  - A discussion of the discharge-limit exceedences, if any, and corrective measures completed

- Copies of monitoring and maintenance reports

- Copies of laboratory analytical data sheets, and if ASP analyses were performed, the Data Usability Summary Report for these analyses

The historic data summarizing GWCTS and SSDS operations and monitoring that was previously reported on an annual basis is now included in Appendix J to this SMP as a compendium of historic data and includes the following:

- Groundwater sampling results from July 1999 – August 2009
- Groundwater elevations from July 1999 – August 2009
- GWCTS influent and effluent results from August 2001 – August 2009
- GWCTS effluent discharge summary from August 2001 – August 2009
- SSDS data summarized in Section 3.4.3

The PRR will also include a certification that the on-site institutional controls remain in place and discuss the need, or lack thereof, for institutional controls in the off-site area where VOCs are present in groundwater. The Former Frame Center site was moved to a 3-year certification period as outlined in a January 31, 2011 email from NYSDEC. The PRR will be submitted to the NYSDEC no later than January 31 for the preceding calendar year unless the PRR is including a certification, in which case the PRR will be submitted within 30 days following the end of the certification period. The PRRs will be provided to the NYSDEC as a single PDF file via email or CD.

Section 3, Sub-Slab Depressurization Systems, also includes annual reporting requirements specific to that system.

2.4.3 Data Reporting

Data presented in the PRR as well as data presented to NYSDEC in additional reports (e.g., pilot test summary report) should be provided to NYSDEC in the current NYSDEC-approved Electronic Data Deliverable format.

2.5 Startup and Shutdown Procedures

2.5.1 General

This section describes the general procedures for startup and shutdown of the GWCTS.

2.5.2 Initial System Startup/Testing

Prior to the initial system startup or startup after a prolonged shutdown, the following checks must be made:

1. Pressure test all pipelines for leakage.
2. Verify correct rotation on all pumps.
3. Verify operation of all system interlocks.
4. Operate all valves to be sure they open and close.
5. Verify calibration on discharge flow meter and totalizer.

Once the system is deemed safe and operational, proceed with system startup.

1. Check that all electrical components associated with the system are turned off (in the treatment building and at the wells).
2. Close the equalization tank outlet valve. Verify that the drain valve is also closed.
3. Open the three inlet valves to the equalization tank.
4. Place all the well pumps in “Automatic” at the controls in the treatment building.
5. At the individual wells, place each well controller in the “Hand” position and verify that the well pump will run. Once verified, return each controller to the “Off” position.
6. Once the operation of all the well pumps is verified, place all the well pumps in the “Automatic” position.
7. When the water level in the equalization tank reaches 75 percent full, place all the well pump controls in the “Off” position.
8. Close all drain valves in the system.

9. Open the equalization tank outlet valve (pump suction), the equalization tank pump discharge valve, the bag filter inlet and outlet valves, and the air stripper inlet and outlet valves.

10. Fill the air stripper sump and tray seal pots per the procedure in the air stripper O&M manual.

11. Energize the air stripper control panel and place the air stripper blower in “Automatic”.

12. Press the start switch on the air stripper blower (the blower will automatically start once all the permissives have been satisfied).

13. Set the blower damper approximately half open.

14. Place the equalization tank pump in the “On” position to start pumping to the air stripper.

15. Monitor the bag filter inlet pressure to determine the “clean” inlet pressure.

16. After the system had run for approximately five minutes, adjust the blower damper to maintain between 10 and 15 inches of water column (“wc”) air pressure on the pressure gauge.

17. Once the air stripper operation is verified, return the well pumps to the “Automatic” position and place the equalization tank pump in “Automatic”.

18. Once the entire system is operational, adjust the equalization tank pump discharge valve to maintain a continuous flow to the air stripper.

19. Return the well pumps to “Automatic” and verify that the equalization tank inlet valves are open.

2.5.3 Normal System Startup

1. Open the three inlet valves to the equalization tank.

2. Verify that the drain valves in the system are closed.

3. Place all the well pumps in “Automatic” at the controls in the treatment building.

4. Open the equalization tank outlet valve (pump suction), the equalization tank pump discharge valve, and the bag filter inlet and outlet valves.

5. Verify that the air stripper sump and tray seal pots are full.

6. Energize the air stripper control panel and place the air stripper blower in “Automatic”.

7. Press the start switch on the air stripper blower (the blower will automatically start once all the permissives have been satisfied).

8. Place the equalization tank pump in “Automatic.”

2.5.4 System Shutdown

Manual shutdown of the GWCTS may periodically be required for general maintenance. For these short shutdowns, the following procedure should be used:

1. Stop the equalization tank pump and place it in “Off”.

2. Monitor the air stripper operation through the view ports. Once the water flow has stopped on the bottom tray, turn off the blower (place it in “Off”).

3. If maintenance is required on the well pumps or the equalization tank, place the well pumps in “Off”.

4. Lock out the power supply to any equipment that will be worked on during the shutdown.

If an extended shutdown is required, all water should be drained from the system. Use the following procedure for extended shutdowns:

1. Stop all the well pumps and place them in “Off”.

2. Place the equalization tank pump in “Hand” and run until the equalization tank is empty or the pump loses suction, then place in “Off”.

3. Monitor the air stripper operation. Once the water flow has stopped on the bottom tray, turn off the blower (place it in “Off”).

4. Record the final flow reading for the all the flow totalizers (especially important if the power to the treatment building is turned off).

5. Lock out the power to all equipment at the main breakers.

6. In the event that the power to the treatment system is turned off during the cold portion of the year, provisions must be made to drain any above-grade lines (such as at the well head and the entry/exit of the lines to/from the treatment building) to prevent freezing.

If an emergency shutdown is required, place all the pumps and the air stripper in "Off". Since the blower will stop before the trays are empty, water collected in the air stripper sump during an emergency shutdown may not have been treated. This water must be pumped back to the equalization tank prior to startup. For the same reason, if a power failure occurs in the treatment building, all water in the air stripper sump must be pumped back to the equalization tank prior to startup.

2.6 Ground-Water Contingency Plan

A contingency plan will be implemented in the event that VOCs are consistently exceeding SCGs in ground water collected from a sentinel well. The specific requirements for consistently exceeding SCGs includes VOCs detected in ground water from any sentinel well at a concentration exceeding SCGs for two consecutive quarterly sampling events or for two quarterly sampling events within the previous four events. Detection of common laboratory contaminants, such as methylene chloride, will not be considered as SCG exceedances, unless these constituents have been determined to be site related. If the preceding circumstances are met, a contingency plan could proceed as follows:

For On-Site Areas (BL-9S and BL-16S)

- Following consultation with the NYSDEC, an additional well or wells will be installed downgradient of the existing sentinel well and significantly upgradient of the downgradient site boundary. The purpose of the monitoring well(s) would be to define the limits of the SCG exceedences in ground water and to serve as a new sentinel well(s).

  Based on current site data, the current furthest downgradient monitoring point in the BL-9S area (BL-17D) is approximately 700 feet from the downgradient site

boundary, when measured along an interpreted flow line. The calculated ground-water flow velocity in this area (for the overburden/bedrock interface zone [which is faster than the calculated velocity for the overburden in this area]) is approximately 50 feet per year. Assuming there will be no natural attenuation (NA) of VOCs during transport, approximately 14 years of time would be required for the VOC plume to reach the downgradient site boundary.

Similarly, the current furthest downgradient monitoring point in the BL-16S area (BL-18S) is approximately 950 feet from the property line and the calculated ground-water velocity in the overburden/bedrock interface zone is calculated to be approximately 30 feet per year. Again, assuming no NA of VOCs during transport, approximately 30 years of time would be required for the VOC plume to reach the downgradient site boundary.

Given the long flow paths between the existing downgradient monitoring wells and the property boundary, there is ample room and time for installation of additional monitoring points, if needed, downgradient of the existing monitoring network. If an additional monitoring point or points are needed, the most likely location would be in the proximity (e.g. within approximately 100 feet) of the interpreted downgradient extent of the plume. This or these locations would still be well away (a minimum of approximately 600 feet) from the downgradient site boundary for both the BL-9S and BL-16S plumes.

- Following an evaluation of the data collected from the new well(s), and in consultation with the NYSDEC, one or more actions will be taken, including continued monitoring and evaluation, and/or implementation of additional remedial technologies.

For Off-site Areas (e.g. the Plume below the Carriage House Estates Property)

- Following consultation with the NYSDEC, one or more actions will be taken to assess the impact of SCG exceedences including:
  - Continued monitoring of existing monitoring wells to further assess VOC concentration trends; or
  - Installation of an additional well or wells downgradient of, or within a different stratigraphic unit, to assess the downgradient or vertical distribution of the dissolved VOCs.

- Following an evaluation of the data collected from the existing/or new well(s), and in consultation with the NYSDEC, one or more actions will be taken, including continued monitoring and evaluation, and/or implementation of additional remedial technologies.

Bausch & Lomb will consult with, and obtain approval of, the NYSDEC in the event that a contingency plan is required to be implemented.

3. Sub-Slab Depressurization Systems

3.1 General

This section presents an overview of the remedial action activities implemented to construct the SSDSs at the former Frame Center to meet the objectives of the NYSDEC-approved IRM Work Plan (ARCADIS, 2007a). As described in Section 2 of the IRM FER (ARCADIS, 2008), the SSDSs were constructed in accordance with the NYSDEC-approved IRM Work Plan (ARCADIS, 2007a) and any field modifications agreed upon with the on-site NYSDEC/ NYSDOH personnel. The remedial action activities implemented consist of a combined approach of:

- sealing potential subsurface vapor entry points, which can significantly improve SSDS performance by reducing the flow of sub-slab vapors into a building

- installing and operating SSDSs to lower the sub-slab air pressure relative to indoor air pressure

Specifically, the remedial action activities covered in the IRM FER (ARCADIS, 2008) include the installation of SSDSs in four areas of the site:

- Building 40, former dry well area: SV-1N (with one fan for suction points SV-1NA, SV-1NB and exhaust point SV-1NX) and SV-1S (with one fan for suction points SV-1SA, SV-1SB, SV-1SC and exhaust point SV-1SX)

- Building 40, former plating pit area: SV-4N (with one fan for suction point SV-4N and exhaust point SV-4NX) and SV-4S (with one fan for suction points SV-4S and SV-4SA and exhaust point SV-4SX)

- Building 40, former wastewater treatment area: SV-13 (with one fan for suction point SV-13 and exhaust point SV-13X)

- Building 41: SV-5 (with one fan for suction point SV-5 and exhaust point SV-5X)

These areas were identified as having sub-slab soil and/or groundwater with constituents of interest (COIs) relevant to the potential vapor intrusion pathway (e.g., TCE) present at relatively elevated concentrations, based on a review of extensive historical sub-slab soil and groundwater analytical data acquired during Phase II/Supplemental ESA investigations (BBL, 1999a). An iterative sampling and RA

approach was used to initially address the areas beneath Buildings 40 and 41 most likely contributing VOCs to sub-slab vapors, followed by additional sampling to refine the SSDSs. This resulted in the sub-slab depressurization of each of these areas, as demonstrated by the pressure field extension tests described in Section 2.3 of the IRM FER (ARCADIS, 2008).

A timeline of SSDS installation and modification events is provided below:

- October 2006: An IRM Work Plan (ARCADIS, 2007a) was submitted to the NYSDEC for installing SSDSs in three areas (near sampling locations SV-1, SV-4 and SV-5).

- Fourth Quarter 2006: SSDSs were installed near SV-1, SV-4 and SV-5.

- November 2006: Initial startup of the SSDSs commenced during the first week of November. A pilot study was conducted through January 2007 to monitor system performance and to evaluate whether additional testing was needed.

- August 2007: The SSDSs were modified based on March 2007 analytical results from co-located indoor air and sub-slab vapor sampling locations.

- February 2008: One additional SSDS was installed near SV-13, based on November 2007 analytical results.

3.1.1 Description of the SSDSs

Bausch & Lomb retained Mitigation Tech (a National Environmental Health Association-certified radon mitigation contractor) to install SSDSs in four areas (initially for three areas in the immediate vicinity of SV-1, SV-4 and SV-5, and subsequently near SV-13) to mitigate potential vapor intrusion conditions. Each SSDS consists of a fan-powered vent and piping to draw vapors from sub-slab soils (i.e., essentially creating a vacuum beneath the slab) and discharging the vapors to the atmosphere. The SSDS installation included sealing expansion joints, cracks and penetrations, as well as installing and operating venting systems in accordance with the United States Environmental Protection Agency's (USEPA's) radon mitigation standard 402-R93-078. The SSDS installation and warranty information is contained in Appendix K.

3.2 SSDS Components and Operation

The SSDSs consist of four major components (see Figure 4 for a generalized system profile), which include:

- RadonAway™ GP-501 centrifugal in-line fans with an approximate 0 to 95 cubic feet per minute (cfm) flow at 0 to 4 inches of water vacuum (see Appendix L for a RadonAway™ GP Series Fans Information Sheet)

- 3-inch-diameter, Schedule 40 polyvinyl chloride (PVC) pipe installed a minimum of 1 inch below the concrete floor slab to conduct soil vapor vertically from below the slab to the in-line fan

- appropriate brackets to attach piping to building columns, walls and other areas

- manometer (u-tube type) at the suction end of the system, to obtain pressure readings

3.2.1 SSDS Installation

The SSDSs were installed at the approximate locations shown on Figure 4, consistent with the generalized system profile also shown on Figure 4. Each SSDS consists of a 3-inch-diameter PVC pipe installed a minimum of 1 inch below the concrete floor slab to conduct soil vapor vertically from below the slab to the in-line fan. Soil vapor is then carried through a 3-inch-diameter PVC discharge pipe mounted to building columns and discharged at the following approximate locations:

- 12 inches above the roof line
- 10 feet above ground level
- 10 feet away from any opening that is less than 2 feet below the exhaust point
- 10 feet from any adjoining or adjacent buildings, intakes or supply registers

In addition, the in-line fan and discharge piping were not located in or below an occupied area of the buildings.

A total of six RadonAway™ GP-501 centrifugal in-line fans were installed during the RA activities:

- five for the initial SSDSs (SV-1N and SV-1S in the former dry well area, SV-4N and SV-4S in the former plating pit area, and SV-5 for Building 41)

- one later for the SV-13 SSDS (SV-13 in former wastewater treatment area)

Multiple suction points are associated with the two fans installed in the former dry well area and for one fan in the former plating pit area. Approximate system suction locations are shown on Figure 4.

3.2.2 SSDS Startup and Continuous Operation

The SSDSs have continued to operate with minimal, if any, interruptions. Operating information through August 2007 is included in the IRM FER (ARCADIS, 2008) and the 2007 *Annual Report* (ARCADIS, 2007b). Similar documentation will be presented in subsequent annual reporting, as defined in this SMP.

3.3 SSDS Operation, Monitoring and Maintenance

This section discusses proper operation and routine and non-routine maintenance procedures for the SSDSs, based on the NYSDOH guidance (2006) and manufacturer's information (Attachments A and B). In addition to the routine OM&M activities described in this section, the building's owner will also be given information packages that explain SSDS operation, maintenance and monitoring. Therefore, at any time during SSDS operation, the building's owner or tenants may check that the SSDSs are operating properly.

3.3.1 Routine Operation

The SSDSs should run continuously and only be shut down in case of emergency. During normal operation, the u-shaped manometer should show a differential pressure (indicated by a difference in height between the two sides of the manometer) of 1 to 4 inches of water. This indicates that sub-slab depressurization is continuing to be maintained.

Each SSDS was clearly labeled to avoid accidental modifications or changes to the system that could disrupt its function. If at any time during routine operation, the owner or tenant believes that the SSDS is malfunctioning or requires maintenance, they must contact Mr. Frank Chiappone, Bausch & Lomb, at (585) 338-5087 or (585) 764-7556. Possible signs that the SSDSs may not be functioning properly include:

- Lack of adequate pressure differential, as indicated by less than 1 inch in fluid level height on the u-shaped manometer. In this way, the manometer acts as a warning device.

- Excessive noise and/or vibration, or unusual sounds (e.g., hissing from air escaping through the piping).

- System components become loose, cracked or broken.

Other conditions that may require SSDS maintenance or modification include:

- A change in the work pattern, such that the SSDS could be struck by equipment, or is otherwise in the way.
- Repairs are made to the floor or walls near any portion of the SSDSs.
- New/additional gas combustion or vented appliances are installed.
- New/additional air intake vents are installed.

3.3.2 Routine Monitoring

From November 2007 through July 2008, monitoring was performed weekly. Monitoring frequency will continue monthly. This routine monitoring will include:

- visual inspection of the equipment and piping
- inspection of exhaust points to verify that no air intakes have been located nearby
- identification and subsequent repair of any leaks
- inspection of the exhaust and discharge points to verify that air intakes are not nearby
- audible operational status check of the fan to verify the fan's operational performance
- measurement of differential pressure between the indoor air and the sub-slab to maintain a lower pressure in the sub-slab relative to indoor ambient air, as indicated by the manometer on the fan suction pipe

Forms 3 and 4 provide a checklist for SSDS monitoring.

3.3.3 Routine Maintenance

Routine maintenance will commence within 18 months after the system becomes operational, and will occur every 12 to 18 months thereafter. During routine maintenance, the following activities (at a minimum) will be conducted:

- visual inspection of the complete system (e.g., vent fan, piping, manometer, labeling on systems)
- identification and repair of leaks
- inspection of the exhaust or discharge point to verify no air intakes have been located nearby

As appropriate, preventative maintenance (e.g., replacing vent fans), repairs and/or adjustments will be made to the SSDSs to provide continued effectiveness at mitigating exposures related to vapor intrusion. The need for preventative maintenance will depend upon the life expectancy and warranty for the specific part, as well as visual observations through time. The need for repairs and/or adjustments will depend upon the results of a specific activity compared to that obtained when system operations were initiated.

If significant changes are made to the system or when the system's performance is unacceptable, the system may need to be redesigned and restarted.

3.3.4 Non-Routine Maintenance

Non-routine maintenance may also be required during operation of the SSDSs. This may include the following:

- building's owners or occupants report that the warning device (e.g., the u-shaped manometer) indicates that the SSDS is not operating properly
- SSDS becomes damaged
- building has undergone renovations that may reduce the effectiveness of the SSDS

Activities conducted during non-routine maintenance visits will vary depending upon the reason for the visit. In general, building-related activities may include examining the building for structural or HVAC system changes, or other changes that may affect the performance of the SSDS (e.g., new combustion appliances, deterioration of the concrete slab or significant changes to the building). SSDS-related activities may include examining the manometer operation and the vent fan, or the extent of sub-slab depressurization.

Repairs or adjustments will be made to the system as appropriate. If appropriate, the system will be redesigned and restarted.

3.3.5 Termination of SSDS Operations

SSDSs will remain in place and operational (except in emergency situations) until they are no longer needed to address current or potential exposures related to vapor intrusion. This determination will be based upon several factors, including the following:

- Subsurface sources (e.g., groundwater, soil) of volatile chemical contamination in subsurface vapors have been remediated based upon an evaluation of appropriate post-remedial sampling results.

- Residual contamination, if any, in subsurface vapors is not expected to affect indoor air quality significantly based upon soil vapor and/or sub-slab vapor sampling results.

- Residual contamination, if any, in subsurface vapors is not affecting indoor air quality when active mitigation systems are turned off based upon indoor air, outdoor air and sub-slab vapor sampling results at a representative number of buildings.

- There is no "rebound" effect observed for which additional mitigation efforts would be appropriate when the mitigation system is turned off for prolonged periods of time.

This determination will be based upon indoor air, ambient air and/or sub-slab vapor sampling from the building during an established time period, determined by site-specific conditions.

3.4 Reporting

This section summarizes the documentation required for the SSDS.

3.4.1 OM&M Forms

As described in Section 3.3.2, field forms (Forms 3 and 4) will be used to document the frequency and content of periodic SSDS inspections. These forms will be kept in the project files and will be included in the Periodic Review Report (PRR).

3.4.2 Annual Certification

SSDSs are considered engineering controls, and submission of an annual certification to the NYSDEC is required. Beginning in 2007, the *Annual Report* (ARCADIS, 2007b) for the existing GWCTS was revised to include the SSDSs. Specifically, the annual certification was amended to certify that on-site engineering controls (i.e., the SSDSs) remain in place, are performing properly and remain effective. The Former Frame Center site was moved to a 3-year certification period as outlined in a January 31, 2011 email from NYSDEC. The information to be included in future PRRs is listed in Section 3.4.3.

3.4.3 Periodic Review Report

In addition to the required certification described in Section 3.4.2, the PRR will also include:

- summary of the SSDS monitoring program, including frequency and relevant findings
- summary of any SSDS-related routine or nonroutine maintenance completed during the preceding year
- field forms will be included in an Appendix of the PRR

The PRR will be submitted in accordance with Section 2.4.2 of this SMP.

The historic data summarizing GWCTS and SSDS operations and monitoring that was previously reported on an annual basis is now included in Appendix J to this SMP as a compendium of historic data and includes the following:

- GWCTS data summarized in Section 2.4.2
- Sub-slab Depressurization Systems Monitoring Data Summary

3.4.4 Data Reporting

Data presented in the PRR as well as data presented to NYSDEC in additional reports (e.g., pilot test summary report) should be provided to NYSDEC in the current NYSDEC-approved Electronic Data Deliverable format.

3.5 SSDS Summary

This SMP provides the requirements for the ongoing operation, maintenance and annual inspections of the SSDSs. As stated in the NYSDOH Guidance (2006), "mitigation is considered to be an interim measure to address exposures until contaminated environmental media are remediated, or until mitigation is no longer needed to address exposures related to soil vapor intrusion." Because the SSDSs are not meant to remediate the sub-slab media, we anticipate that the systems will continue to operate until such time as remediation is conducted or further investigation shows it is not necessary, or there is a change in land use. The SSDSs will continue to operate under the SMP until further notice.

4. References

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Blasland, Bouck and Lee, Inc. (BBL). 2001. *Final Engineering Report, Ground-Water Remedial Design/Remedial Action, Former Bausch & Lomb Frame Center Site, Chili, New York*. January 2001.

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BBL. 1999a. *Phase II/Supplemental Phase II Environmental Site Assessment*, *Former Bausch & Lomb Frame Center, 465 Paul Road, Chili, New York*. April 1999.

BBL, 1999b. *Remedial Design/Remedial Action Work Plan, Former Bausch & Lomb Frame Center, 465 Paul Road, Chili, New York*. May 1999.

BBL, 1999c. *Western Boundary Investigation Report*, *Former Bausch & Lomb Frame Center, 465 Paul Road, Chili, New York*. April 1999.

BBL, 1999d. *Ground-Water Modeling Report, Former Bausch & Lomb Frame Center, Chili, New York*. May 1999.

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New York State Department of Environmental Conservation (NYSDEC), 1998a. *Record of Decision*, *Bausch & Lomb, Frame Center Site, Chili, Monroe County, New York, Site Number 8-28-061.* February 1998.

NYSDEC, 1998b. *Explanation of Significant Differences, Bausch & Lomb, Frame Center, Chili, Monroe County, New York, Registry No. 8-28-061.* October 1998.

NYSDEC, 1999a. New York State Department of Environmental Conservation, *Order on Consent* (Index #B8-0173-97-07) between the NYSDEC and Bausch & Lomb. June 21, 1999.

NYSDEC, 1999b. Letter from Mr. Dylan T. Keenan, P.E, New York State Department of Environmental Conservation, to Mr. Frank Chiappone, Bausch & Lomb. July 2, 1999.

NYSDEC, 2000. Letter from Mr. Dylan T. Keenan, P.E, New York State Department of Environmental Conservation, to Mr. Frank Chiappone, Bausch & Lomb. November 2, 2000.

NYSDEC, 2010. Letter from Mr. Frank Sowers of NYSDEC to Mr. Frank Chiappone of Bausch & Lomb. July 12, 2010.

NYSDEC. 2010. DER-10 *Technical Guidance for Site Investigation and Remediation.* May 2010.

NYSDOH. 2006. *Guidance for Evaluating Soil Vapor Intrusion in the State of New York, Decision Matricies*, October 2006 (and Draft February 2005).

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Tables

Table 1. Project Contact List, Site Management Plan, Groundwater Collection and Treatment System, Former Bausch & Lomb Frame Center, Chili, New York

Owner*	Bausch & Lomb 1 Bausch & Lomb Place Rochester, NY 14604	Frank Chiappone Manager, Global Environmental Affairs	585.338.5087 (office) 585.764.7556 (cell) 585.392.4416 (home) Frank_Chiappone@bausch.com
Agencies	New York State Department of Environmental Conservation Regional Office 6274 East Avon-Lima Road Avon, NY 14414	Frank Sowers Division of Hazardous Waste Remediation	585.226.2466 (day) 1.800.342.9296 (even.)
	New York State Department of Health Bureau of Environmental Exposure Investigation Empire State Plaza, Corning Tower, Room 1787 Albany, NY 12237	Julia M. Kenney Public Health Specialist	518.402.7860
	Monroe County Health Department 111 Westfall Road, Room 914 Rochester, NY 14620	John Frazer, P.E. Associate. Public Health Engineer	585.753.5476 JFrazer@monroecounty.gov
Emergency Response	Chili Fire Department 3231 Chili Avenue Rochester, NY		911
	Chili Sheriff's Office 4201 Buffalo Road North Chili, NY		911
	Monroe County Sheriff's Office 4201 Buffalo Road North Chili, NY		911
Remedial Contractor	ARCADIS 295 Woodcliff Drive Third Floor, Suite 301 Fairport, NY 14450	Joseph Molina, P.E. Construction Manager	585.385.0090 Joe.Molina@arcadis-us.com
Design Engineer	ARCADIS P.O. Box 66 6723 Towpath Road Syracuse, NY 13214-0066	Scott A. Powlin Project Manager	315.446.9120 Scott.Powlin@arcadis-us.com
Interior Mechanical & Electrical Subcontractor	RL Stone Company, Inc. 2570 Baird Road Penfield, NY 14526	Christopher P. Bove Jeff Bayne	585.203.1222 (office) 585.203.1226 (fax)
Air Stripper Vendor	North East Environmental Products, Inc. (BISCO Environmental) 17 Technology Drive West Lebanon, NH 03784	Don Shearouse, P.E. Sales Customer Service	603.298.7061 (office) 603.298.7063 (fax) don_shearouse@neepsystems.com
Tank Vendor/Air Stripper Maintenance	PKG Equipment, Inc. 367 Paul Road Rochester, NY 14624		585-436-4650

Note:

1. *Bausch & Lomb to be the O&M provider with support, on an as-needed basis, by ARCADIS.

Table 2. Major Equipment List, Site Management Plan, Groundwater Collection and Treatment System, Former Bausch & Lomb Frame Center, Chili, New York

Number	Description	Manufacturer	Model	Material of Construction	Capacity	Size	Speed (rpm)	Other
P-120	Well pump - EW-120	Grundfos	Redi-Flo4	304 Stainless Steel	5 gpm @ 50'	1/2 HP	3450	230V, 1P, 60Hz
P-130	Well pump - EW-130	Grundfos	Redi-Flo4	304 Stainless Steel	5 gpm @ 50'	1/2 HP	3450	230V, 1P, 60Hz
P-140	Well pump - EW-140	Grundfos	Redi-Flo4	304 Stainless Steel	5 gpm @ 50'	1/2 HP	3450	230V, 1P, 60Hz
P-150	Well pump - EW-150	Grundfos	Redi-Flo4,	304 Stainless Steel	16 gpm @ 50'	1/2 HP	3450	230V, 1P, 60Hz
P-160	Well pump - EW-160	Grundfos	Redi-Flo4	304 Stainless Steel	5 gpm @ 50'	1/2 HP	3450	230V, 1P, 60Hz
T-200	Equalization tank	PKG	-	natural polypropylene	600 gal	48"x48"x60"H	-	
P-200	Equalization tank transfer pump & Motor	Goulds	NPE 1ST1D4E4 1113007481	316L Stainless Steel	20 gpm @ 65'	1x1-1/4 - 6", 3/4 HP Impeller = 4-7/16”	3450	230V, 1P, 60Hz
F-200	Bag filter		Freedom Plastics	PVC	60 gpm @ 2psid	2" inlet/outlet	-	-
B-300	Air stripper blower	American Fan	AF-15 Code 972069N		3600 rpm	3 HP	-	230V, 3P, 60 Hz
AS-300	Air stripper	NEEP	1331-P	Rotationally molded low-density polyethylene	15 gpm	-	-	230V, 3P, 60 Hz
	Autodialer	Sensaphone	1108			8 Channel		
	Cellular Phone	Tellular	SX3e					
	Heat Tracing	Thermon	RSX-5-1BC					

Notes:

1. gpm = gallons per minute
2. ‘ = feet
3. HP = horsepower
4. P = phase
5. V = volts
6. Hz = hertz
7. Gal = gallons
8. “ = inches
9. psid = ponds per square inch differential
10. cfm = cubic feet per minute
11. “wc = inches of water column
12. Extraction wells EW-100 and EW-110 were decommissioned in February 2013. Equipment installed at these wells during operation of the off-site portion of the Groundwater Collection and Treatment System was consistent with equipment installed at EW-120.
13. AS-300 (Air Stripper) NEEP-2621 Model was replaced with a smaller model (NEEP 1331-P) in July 2012.

Table 3. Instrumentation List, Site Management Plan, Groundwater Collection and Treatment System, Former Bausch & Lomb Frame Center, Chili, New York

Number	Description	Manufacturer	Model	Range
LC-120	Well level controller - EW-120	Warrick	Series 67 with three 3W2 probes	
LC-130	Well level controller - EW-130	Warrick	Series 67 with three 3W2 probes	
LC-140	Well level controller - EW-140	Warrick	Series 67 with three 3W2 probes	
LC-150	Well level controller - EW-150	Warrick	Series 67 with three 3W2 probes	
LC-160	Well level controller - EW-160	Warrick	Series 67 with three 3W2 probes	
PI-120	Pressure indicator - EW-120	McDaniels	J	0-30 psig
PI-130	Pressure indicator - EW-130	McDaniels	J	0-30 psig
PI-140	Pressure indicator - EW-140	McDaniels	J	0-30 psig
PI-150	Pressure indicator - EW-150	McDaniels	J	0-30 psig
PI-160	Pressure indicator - EW-160	McDaniels	J	0-30 psig
FE/T-120	indicator/totalizer/ transmitter - EW-120	Hayward	FS2500MTT110	0-15 gpm
FE/T-130	indicator/totalizer/ transmitter - EW-130	Hayward	FS2500MTT110	0-15 gpm
FE/T-140	indicator/totalizer/ transmitter - EW-140	Hayward	FS2500MTT110	0-15 gpm
FE/T-150	indicator/totalizer/ transmitter - EW-150	Hayward	FS2500MTT110	0-15 gpm
FE/T-160	indicator/totalizer/ transmitter - EW-160	Omega	DP-F78-A	0-15 gpm
FE/T-120	Flow sensor - EW-120	Hayward	FLSX3 F3.00.H.01	0-15 gpm
FE/T-130	Flow sensor - EW-130	Hayward	FLSX3 F3.00.H.01	0-15 gpm
FE/T-140	Flow sensor - EW-140	Hayward	FLSX3 F3.00.H.01	0-15 gpm
FE/T-150	Flow sensor - EW-150	Hayward	FLSX3 F3.00.H.01	0-15 gpm
FE/T-160	Flow sensor - EW-160	Hayward	FLSX3 F3.00.H.01	0-15 gpm
FI-120	Flow indicator in trailer – EW-120	Precision Digital	PD 690-3-N	0-15 gpm
FI-130	Flow indicator in trailer – EW-130	Precision Digital	PD 690-3-N	0-15 gpm
FI-140	Flow indicator in trailer – EW-140	Precision Digital	PD 690-3-N	0-15 gpm
FI-150	Flow indicator in trailer – EW-150	Precision Digital	PD 690-3-N	0-15 gpm
FI-160	Flow indicator in trailer – EW-160	Precision Digital	PD 690-3-N	0-15 gpm
LSLL-200	Equalization tank low-low level float	Warrick	M-BLU-20T	1 in. db
LSL-200	Equalization tank low level float	Warrick	M-BLU-20T	1 in. db
LSH-200	Equalization tank high level float	Warrick	M-BLU-20T	1 in. db
LAHH-200	Equalization tank high-high level switch/alarm	Warrick	M-BLU-20T	1 in. db
LC-120	Well level controller - EW-120	Warrick	Series 67 with three 3W2 probes	
LC-130	Well level controller - EW-130	Warrick	Series 67 with three 3W2 probes	
LC-140	Well level controller - EW-140	Warrick	Series 67 with three 3W2 probes	
LC-150	Well level controller - EW-150	Warrick	Series 67 with three 3W2 probes	
LC-160	Well level controller - EW-160	Warrick	Series 67 with three 3W2 probes	
PI-120	Pressure indicator - EW-120	McDaniels	J	0-30 psig
PI-130	Pressure indicator - EW-130	McDaniels	J	0-30 psig
PI-140	Pressure indicator - EW-140	McDaniels	J	0-30 psig

See Notes on Page 2.

Table 3. Instrumentation List, Site Management Plan, Groundwater Collection and Treatment System, Former Bausch & Lomb Frame Center, Chili, New York

Number	Description	Manufacturer	Model	Range
PI-150	Pressure indicator - EW-150	McDaniels	J	0-30 psig
PI-160	Pressure indicator - EW-160	McDaniels	J	0-30 psig
FE/T-120	Flow sensor/indicator/totalizer/ transmitter - EW-120	Hayward	FS2500MTT110	0-15 gpm
FE/T-130	Flow sensor/indicator/totalizer/ transmitter - EW-130	Hayward	FS2500MTT110	0-15 gpm
FE/T-140	Flow sensor/indicator/totalizer/ transmitter - EW-140	Hayward	FS2500MTT110	0-15 gpm
FE/T-150	Flow sensor/indicator/totalizer/ transmitter - EW-150	Hayward	FS2500MTT110	0-15 gpm
FE/T-160	Flow sensor/indicator/totalizer/ transmitter - EW-160	Hayward	FS2500MTT110	0-15 gpm
FI-120	Flow indicator in trailer – EW-120	Precision Digital	PD 690	0-15 gpm
FI-130	Flow indicator in trailer – EW-130	Precision Digital	PD 690	0-15 gpm
FI-140	Flow indicator in trailer – EW-140	Precision Digital	PD 690	0-15 gpm
FI-150	Flow indicator in trailer – EW-150	Precision Digital	PD 690	0-15 gpm
FI-160	Flow indicator in trailer – EW-160	Precision Digital	PD 690	0-15 gpm
LSLL-200	Equalization tank low-low level float	Warrick	M-BLU-20T	1 in. db
LSL-200	Equalization tank low level float	Warrick	M-BLU-20T	1 in. db
LSH-200	Equalization tank high level float	Warrick	M-BLU-20T	1 in. db
LAHH-200	Equalization tank high-high level switch/alarm	Warrick	M-BLU-20T	1 in. db

Notes:

1. psig = pounds per square inch gauge
2. gpm = gallons per minute
3. in. db = inches of deadband
4. Extraction wells EW-100 and EW-110 were decommissioned in February 2013. Equipment installed at these wells during operation of the off-site portion of the Groundwater Collection and Treatment System was consistent with equipment installed at EW-120.

Table 4. Recommended Spare Parts List, Site Management Plan, Groundwater Collection and Treatment System, Former Bausch & Lomb Frame Center, Chili, New York

Part Description	Quantity	Manufacturer	Model
Extraction well pump	1	Grundfos	Redi-Flo4, 5E3
Equalization tank & sump pump	1	Goulds	NPE 1ST
Filter bags	25	Varys	Varys
Well level controller	1	Warrick	Series 67 with three 3W2 probes
Pressure gauge	3	McDaniels	J (0-30 psig)
Flow indicator/transmitter	1	Hayward	FS2500MTT110
Level float	1	Warrick	M-BLU-20T

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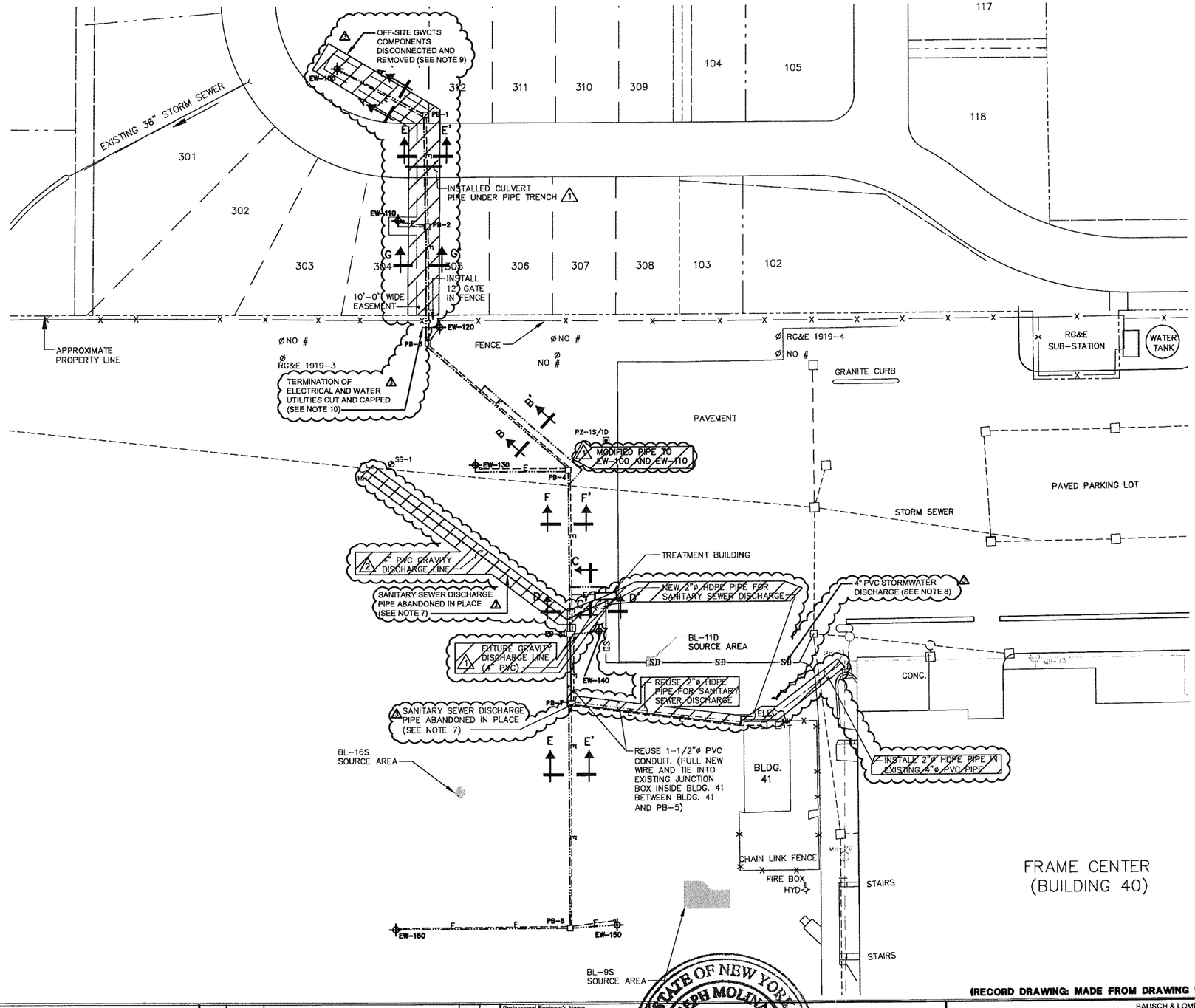
Record Drawings



LEGEND:

- MONITORING WELL INSTALLED IN SHALLOW OVERBURDEN
- MONITORING WELL INSTALLED AT BASE OF OVERBURDEN/TOP OF ROCK
- SS ⊘ STAINLESS STEEL WELL POINT
- □ CATCH BASIN
- ○ MANHOLE
- ▣ 1"ø NESTED PIEZOMETER
- ø TELEPHONE POLE
- **6" EXTRACTION WELL AND CONTROL PANEL**
- PB-1 □ **PULL BOX**
- **DISCHARGE TO SANITARY SEWER**
- EXISTING PIPE TRENCH
- **GROUNDWATER COLLECTION PIPE**
- **ELECTRIC SUPPLY**
- **CULVERT PIPE**
- APPROXIMATE ADJACENT TRACT BOUNDARY
- APPROXIMATE PROPOSED LOT BOUNDARY
- APPROXIMATE EXISTING LOT BOUNDARY
- APPROXIMATE EASEMENT BOUNDARY
- SD STORMWATER COLLECTION PIPE
- EXISTING DISCHARGE TO SANITARY SEWER
- FENCE
- SOURCE AREA
- GRAVITY LINE TO SURFACE WATER

NOTES:

1. SITE PLAN FOR THE ON-SITE AREAS COMPILED FROM EXISTING SITE PLANS PROVIDED BY BAUSCH & LOMB AND SITE SURVEYS TO LOCATE ALL MONITORING WELLS BY BBL DATED 6/17/92, REVISED 4/13/94, 8/13/98, AND 10/28-29/98.
2. LOCATIONS OF PROPERTY LINES, SUBSURFACE UTILITIES AND LIMITS OF BUILDINGS AND PARKING AREAS ARE APPROXIMATE.
3. ADJACENT PROPERTY INFORMATION FROM TRACT MAPS PREPARED BY LADIEU ASSOCIATES P.C.; LOT NUMBERS 101 TO 118 AND 201 TO 208 WERE DESIGNATED BY LADIEU ASSOCIATES P.C.; LOTS IDENTIFIED AS 301 TO 313 ARE IDENTIFIED HERE FOR CONVENIENCE ONLY. INVERT ELEVATION DATUM IS UNKNOWN.
4. LOCATIONS OF EXTRACTION WELLS AND CONTROL PANELS, PULL BOXES, TREATMENT BUILDING, GROUNDWATER COLLECTION PIPE, CULVERT PIPE, ELECTRICAL SUPPLY CONDUIT, AND FUTURE GRAVITY LINE PER BBLES SURVEY CONDUCTED AFTER CONSTRUCTION OF GROUNDWATER COLLECTION AND TREATMENT SYSTEM.

1

5. BOLD TEXT INDICATES NEW, NON-BOLD TEXT INDICATES EXISTING (REFERS TO ALL DRAWINGS IN THIS CONTRACT).
6. NEW DISCHARGE PIPE TO SURFACE WATER BEGINNING INVERT TO BE AT ELEVATION 543.64 FEET ASL. CONNECTION TO MANHOLE TO BE COMPLETED AT 537.31 ASL.

2

7. **DISCHARGE PIPING TO SANITARY SEWER WAS ABANDONED IN PLACE IN AUGUST 2011. 4" PVC DISCHARGE LINE WAS CUT AND CAPPED WITH A GLUED ON PVC PIPE CAP BELOW GRADE. 2" HDPE DISCHARGE LINE WAS CUT AND CAPPED WITH A STAINLESS STEEL CLAMP BELOW GRADE.**
8. **NEW 4" PVC STORMWATER DISCHARGE PIPE INSTALLED AUGUST 2011.**
9. **THE OFF-SITE GROUNDWATER COLLECTION TREATMENT SYSTEM EXTRACTION WELLS EW-100 AND EW-110 ASSOCIATED UTILITIES WERE DISCONNECTED AND REMOVED IN FEBRUARY 2013, FOLLOWING NYSDEC APPROVAL ON DECEMBER 14, 2012.**

3

10. **OFF-SITE GWCTS ELECTRICAL TERMINATED BELOWGRADE AND CAPPED WITH WIRE NUTS. GROUNDWATER PIPING TERMINATED BELOW GRADE AND CAPPED WITH CLAMP ON METAL AND PVC PIPE CAPS.**

RECORD DRAWINGS
TO THE BEST OF OUR KNOWLEDGE, INFORMATION AND BELIEF, THESE RECORD DRAWINGS SUBSTANTIALLY REPRESENT THE PROJECT AS CONSTRUCTED.

DATE_____BY_____

(RECORD DRAWING: MADE FROM DRAWING NO. 1A, TRACER NO. 34216070/34216B01.DWG, DATED 4/23/02)

CITY: (SYR-54) SYRACUSE, NY DIVGROUP: ENV/CAD DB: (DCC SDL) K.SARTORI PIC: PM:/TM: S. POWLIN LYR:ON=*;OFF=*REF* G:\ENVCAD\SYRACUSE\ACTIB0034221201310000\DWG\0&M34221B01.DWG LAYOUT: 1A SAVED: 7/30/2013 1:00 PM ACADVER: 18.1S (LMS TECH) PAGESETUP: PDF-D2B PLOTSTYLETABLE: PLTCONT.CTB PLOTTED: 7/30/2013 1:01 PM BY: SARTORI, KATHERINE
XREFS: 34221X00 IMAGES: PROJECTNAME: —

50' 0 50' 100'
1"=50'

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING: USE TO VERIFY FIGURE REPRODUCTION SCALE

No.	Date	Revisions	By	Ckd
			SB	SB

THIS DRAWING IS THE PROPERTY OF THE ARCADIS ENTITY IDENTIFIED IN THE TITLE BLOCK AND MAY NOT BE REUSED OR ALTERED IN WHOLE OR IN PART WITHOUT THE EXPRESS WRITTEN PERMISSION OF SAME.

Professional Engineer's Name: JOSEPH MOLINA III
Professional Engineer's No.: 072644
State: NY | Date Signed: 7/31/13 | Project Mgr: GMT
Designed by: AHL/MEE | Drawn by: DCC | Checked by: DRG/TEL

STATE OF NEW YORK JOSEPH MOLINA 072644 REGISTERED PROFESSIONAL ENGINEER

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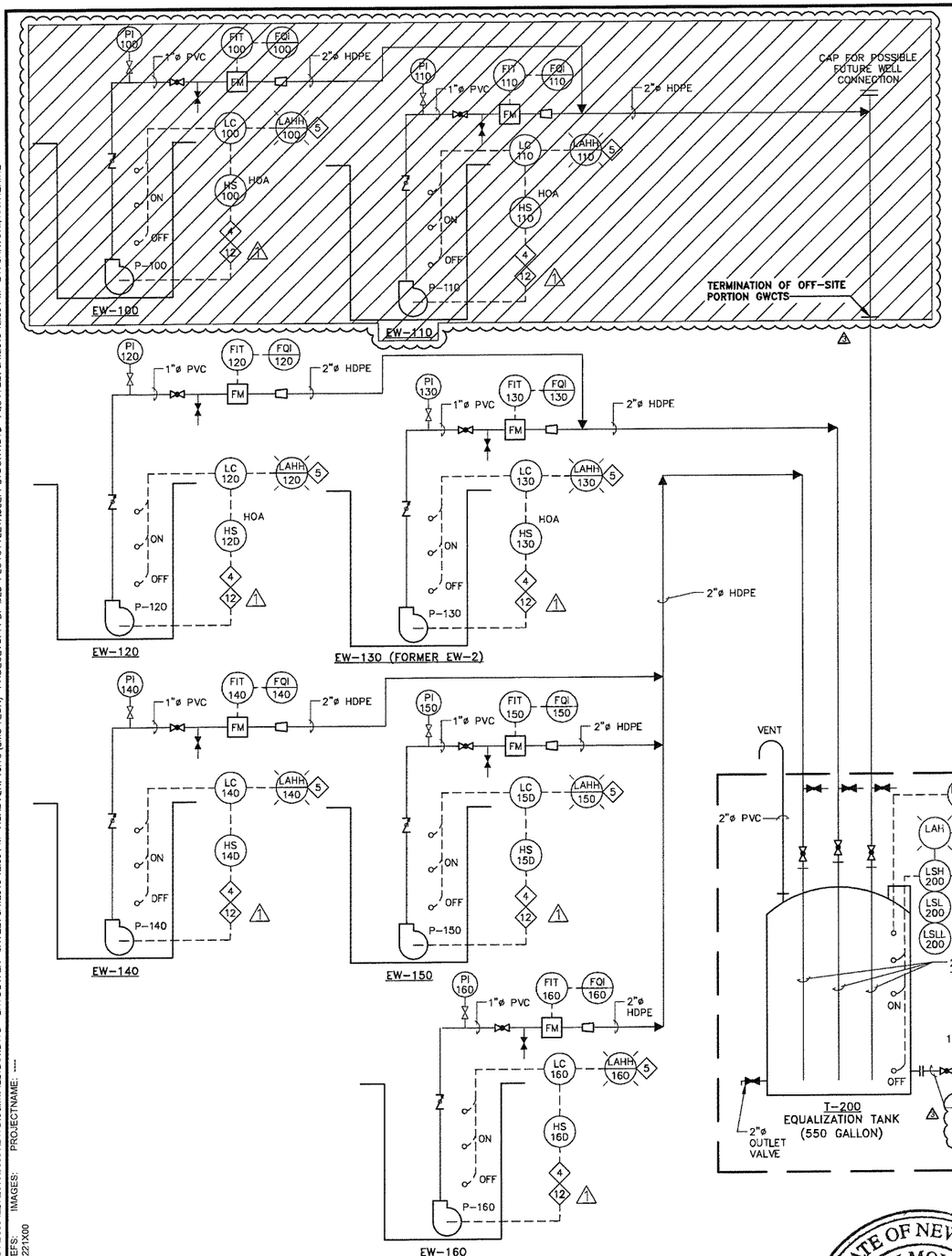
NO ALTERATIONS PERMITTED HEREON EXCEPT AS PROVIDED UNDER SECTION 7209 SUBDIVISION 2 OF THE NEW YORK STATE EDUCATION LAW

BAUSCH & LOMB INCORPORATED • CHILI, NEW YORK
GROUND-WATER COLLECTION AND TREATMENT SYSTEM

SITE PLAN

ARCADIS Project No.: 342.16.02F
Date: JULY 2013
ARCADIS
6723 TOWPATH ROAD
SYRACUSE, NY 13214-0066
TEL. 315.446.9120

1A



INSTRUMENTATION LEGEND	INDICATOR	(L) LOW (H) HIGH (HH) HIGH-HIGH SWITCH	CONTROL	INDICATING CONTROLER	(L) LOW (H) HIGH (HH) HIGH-HIGH ALARM	INTEGRATING INDICATOR	INDICATOR/TRANSMITTER
LEVEL		LS	LC	LIC	LA		
PRESSURE	PI	PS					
FLOW	FI					FQI	FIT
HAND		HS					

XX XXX — INSTRUMENT FUNCTION SEE CHART FOR FUNCTION; INSTRUMENT TAG NUMBER

INTERLOCK SCHEDULE:

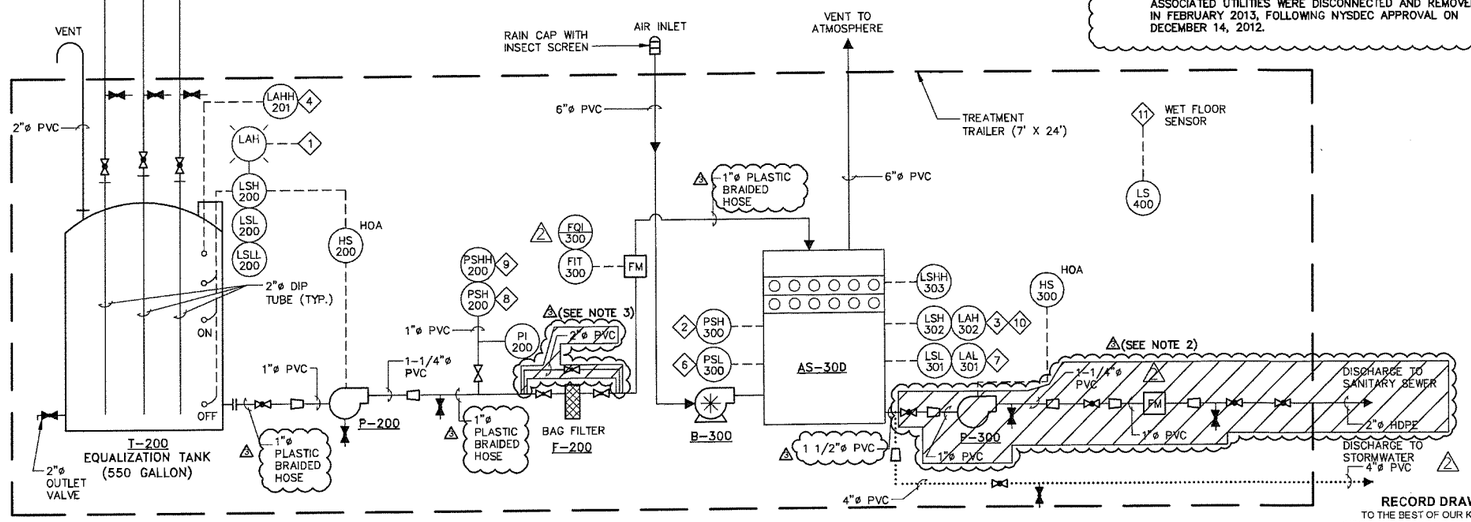
1. HIGH LEVEL ON EQUALIZATION TANK, AUTODIALER NOTIFICATION
2. BLOWER HIGH PRESSURE, SHUT DOWN P-200, P-300, AND B-300, AND AUTODIALER NOTIFICATION
3. HIGH LEVEL IN SUMP, START P-300.
4. HIGH-HIGH LEVEL ON EQUALIZATION TANK, SHUT DOWN ALL WELL PUMPS
5. HIGH-HIGH LEVEL ON EXTRACTION WELL, AUTODIALER NOTIFICATION
6. BLOWER LOW PRESSURE, SHUTDOWN P-200, P-300, AND B-300, AND AUTODIALER NOTIFICATION
7. LOW LEVEL IN SUMP, SHUTDOWN P-300.
8. HIGH INLET PRESSURE, AUTODIALER NOTIFICATION
9. HIGH-HIGH INLET PRESSURE, SHUTDOWN P-200, P-300, AND B-300, AND AUTODIALER NOTIFICATION.
10. HIGH LEVEL IN SUMP CONTINUOUS, SHUTDOWN P-200, P-300, AND B-300, AND AUTODIALER NOTIFICATION
11. WET FLOOR DETECTED, SHUTDOWN ALL WELL PUMPS, AND AUTODIALER NOTIFICATION.

LEGEND:

- PRIMARY PROCESS PIPING
- INSTRUMENTATION SIGNAL
- GRAVITY LINE TO SURFACE WATER
- REDUCER
- CHECK VALVE
- BALL VALVE
- SAMPLE DRAIN/VALVE
- PI XXX — PRESSURE GAUGE
- FM — FLOW METER
- PUMP
- BLOWER
- XX XXX — LOCAL INDICATOR (AT EQUIPMENT)
- XX XXX — REMOTE INDICATOR (AT CONTROL PANEL)

NOTES:

1. INSTALLATION OF DISCHARGE LINE TO SURFACE WATER. FIT-300 RELOCATED TO INLET OF AS-300. INSTALLATION OF MECHANICAL FLOW METER ON DISCHARGE TO SANITARY SEWER.
2. IN 2002, DISCHARGE WATER FROM THE GROUNDWATER COLLECTION AND TREATMENT SYSTEM SWITCHED FROM A DISCHARGE TO THE SANITARY SEWER TO AN UN-NAMED TRIBUTARY TO BLACK CREEK, UNDER A SPDES PERMIT. P-300 AND SANITARY DISCHARGE LINES HAD NOT BEEN OPERATIONAL SINCE 2002, AND WERE REMOVED DURING AIR STRIPPER REPLACEMENT IN JULY 2012.
3. THE OFF-SITE GROUNDWATER COLLECTION TREATMENT SYSTEM EXTRACTION WELLS EW-100 AND EW-110 AND ASSOCIATED UTILITIES WERE DISCONNECTED AND REMOVED IN FEBRUARY 2013, FOLLOWING NYSDEC APPROVAL ON DECEMBER 14, 2012.



RECORD DRAWINGS
TO THE BEST OF OUR KNOWLEDGE, INFORMATION AND BELIEF, THESE RECORD DRAWINGS SUBSTANTIALLY REPRESENT THE PROJECT AS CONSTRUCTED.

(RECORD DRAWING: MADE FROM DRAWING NO. 2A, TRACER NO. 34216070/34216D01.DWG, DATED 4/23/02) DATE_____BY_____

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XREFS: IMAGES: PROJECTNAME: ----
34221X00

NOT TO SCALE

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING: USE TO VERIFY FIGURE REPRODUCTION SCALE

No.	Date	Revisions	By	Ckd
4	7/26/13	GENERAL REVISIONS	SB	SB
3	4/17/02	DISCHARGE MODIFICATION		
2	1/24/01	GENERAL REVISIONS DURING CONSTRUCTION		
1				

Professional Engineer's Name: JOSEPH MOLINA III
Professional Engineer's No.: 072644
State: NY
Date Signed: 10/3/13
Project Mgr: GMT
Designed by: AHL/MEE
Drawn by: DCC
Checked by: DRG/TEL

STATE OF NEW YORK — JOSEPH MOLINA III — LICENSED PROFESSIONAL ENGINEER — 072644

ARCADIS
ARCADIS OF NEW YORK, INC.

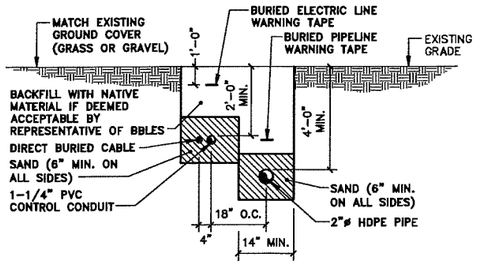
BAUSCH & LOMB INCORPORATED • CHILI, NEW YORK
GROUND-WATER COLLECTION AND TREATMENT SYSTEM

PROCESS AND INSTRUMENTATION DIAGRAM

MECHANICAL/ELECTRICAL

ARCADIS Project No. 342.16.02F
Date JULY 2013
ARCADIS 6723 TOWPATH ROAD SYRACUSE, NY 13214-0066 TEL. 315.446.9120

2A



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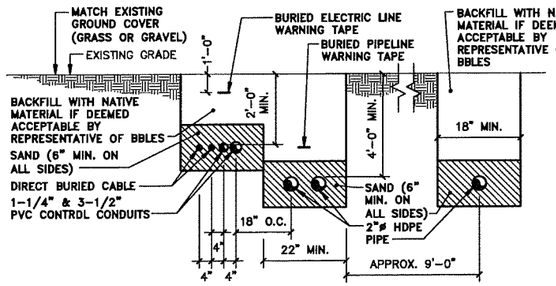
NOT TO SCALE



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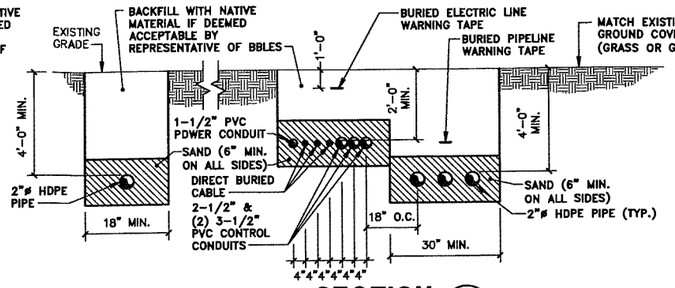
NOT TO SCALE



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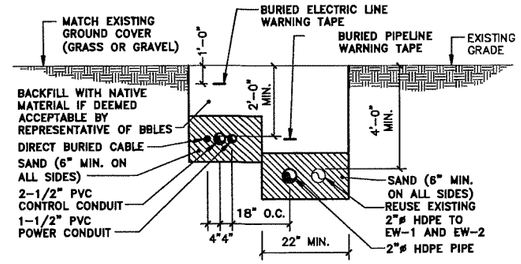

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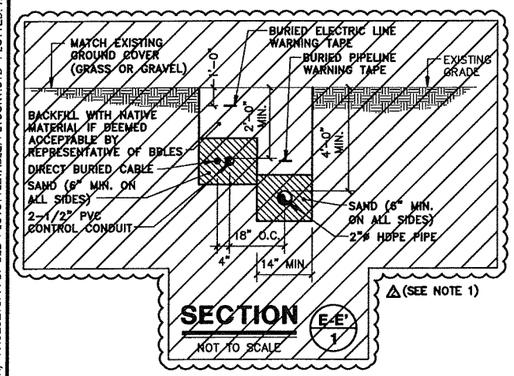

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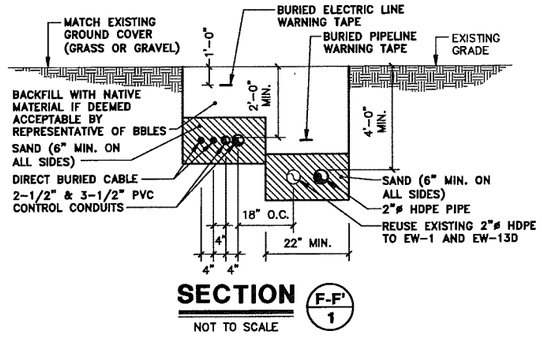

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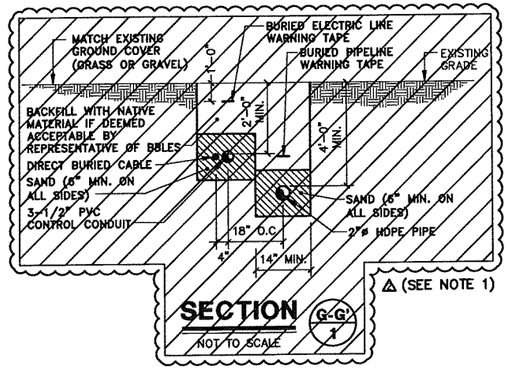
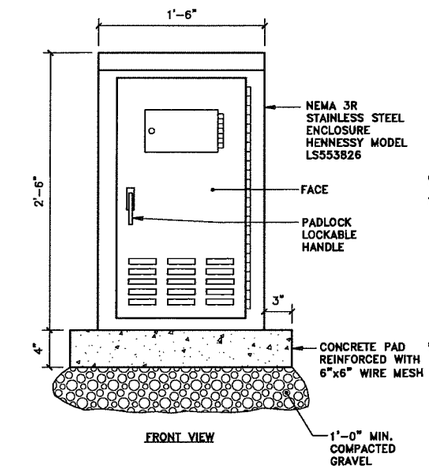


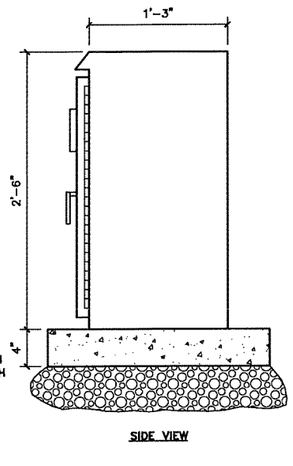
SECTION G-G' 1

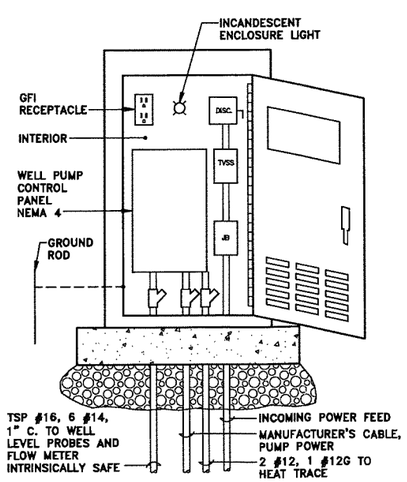
NOT TO SCALE

NOTE: ⚠

1. THE OFF-SITE PORTION OF THE GROUNDWATER COLLECTION AND TREATMENT SYSTEM WAS REMOVED IN ACCORDANCE WITH THE DECEMBER 14, 2012 APPROVAL LETTER FROM NYSDEC. UTILITIES SUPPLYING THE OFF-SITE PORTION WERE DE-ENERGIZED, REMOVED, AND THE MATERIALS EXCAVATED TO GAIN ACCESS TO THE UTILITIES WERE PLACED BACK INTO THE EXCAVATION UPON UTILITY REMOVAL.

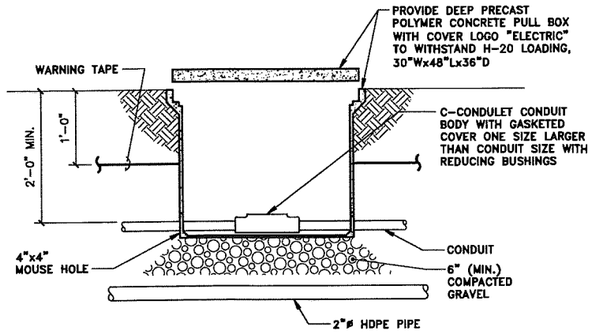






WELL PUMP CONTROL PANEL (AT EACH WELL)

NOT TO SCALE



PULL BOX DETAIL (TYPICAL)

NOT TO SCALE

RECORD DRAWINGS
TO THE BEST OF OUR KNOWLEDGE, INFORMATION AND BELIEF, THESE RECORD DRAWINGS SUBSTANTIALLY REPRESENT THE PROJECT AS CONSTRUCTED.

(RECORD DRAWING: MADE FROM DRAWING NO. 3, TRACER NO. 34216075/34216G01.DWG, DATED 1/24/01) DATE_____ BY_____

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XREFS: IMAGES: PROJECTNAME: ---
34221X00

NOT TO SCALE

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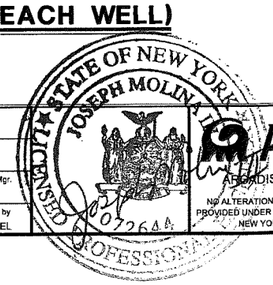
No.	Date	Revisions	By	Ckd
⚠2	7/26/13	GENERAL REVISIONS	SB	SB
⚠1	1/24/01	GENERAL REVISIONS DURING CONSTRUCTION		

Professional Engineer's Name: JOSEPH MOLINA III
Professional Engineer's No.: 072644
State: NY | Date Signed: 7/26/13 | Project Mgr: GMT
Designed by: AHL/MEE | Drawn by: DCC | Checked by: DRG/TEL



BAUSCH & LOMB INCORPORATED • CHILI, NEW YORK
GROUND-WATER COLLECTION AND TREATMENT SYSTEM

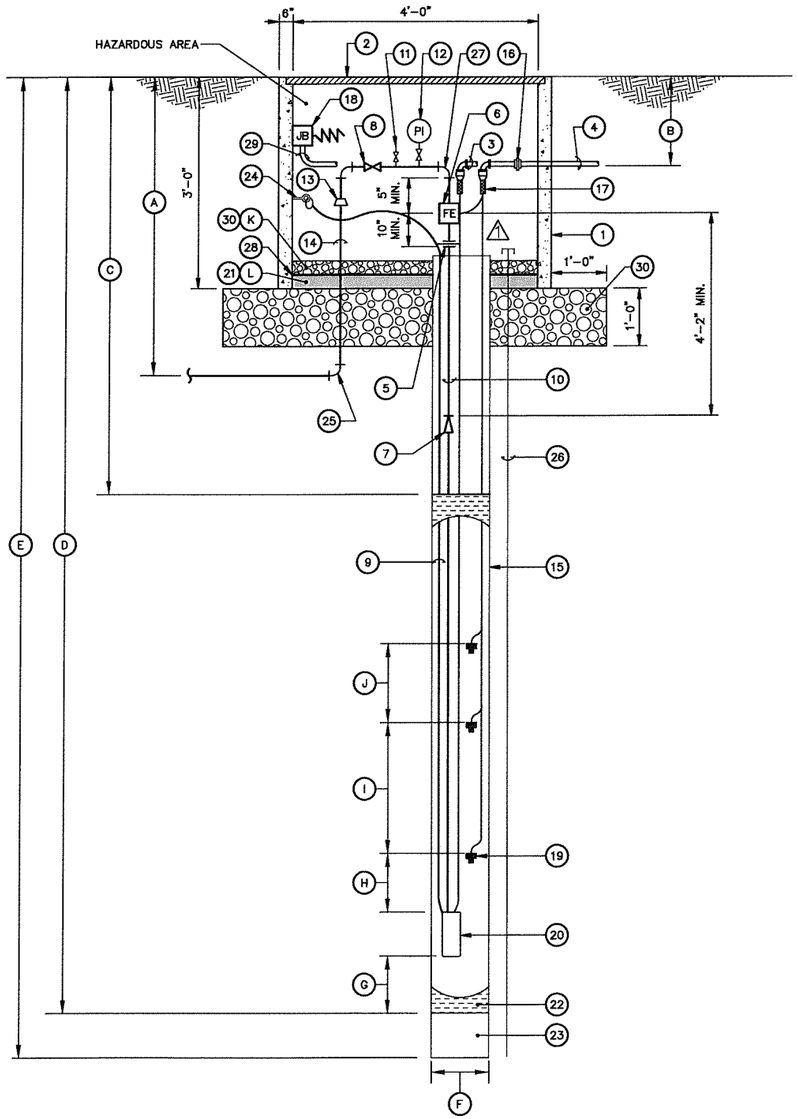
SECTIONS AND DETAILS

GENERAL

ARCADIS Project No. 342.16.02F
Date JULY 2013

ARCADIS
6723 TOWPATH ROAD
SYRACUSE, NY 13214-0066
TEL. 315.446.9120

3



NOTE:
DETAILS IN MANHOLE ROTATED FOR CLARITY.

EXTRACTION WELL DETAIL (TYPICAL)

NOT TO SCALE

DESCRIPTION – EXTRACTION WELLS	
ITEM	
1	48" X 36" X 36" DEEP 4000 PSI CONCRETE PULL BOX
2	MANHOLE FRAME AND LID AS MANUFACTURED BY NEENAH FOUNDRY CO. WITH TYPE J LOCKING DEVICE OR EQUAL. COVER TO WITHSTAND H–20 LOADING.
3	CONDUIT FOR PUMP POWER
4	CONDUIT FOR LEVEL PROBE SYSTEM AND FLOW METER
5	1"ø SCH. 80 PVC UNION
6	FLOW METER
7	1"ø SCH. 80 PVC CHECK VALVE
8	1"ø PVC BALL VALVE
9	POLYPROPYLENE WELL ROPE
10	1"ø SCH. 80 PVC PUMP DISCHARGE PIPE
11	SAMPLE TAP
12	PRESSURE GAUGE
13	2" X 1" REDUCER
14	2"ø HDPE DISCHARGE PIPE
15	EXISTING 6"ø PVC RISER
16	CONDUIT UNION
17	CABLE GRIPS
18	NEMA 7 JUNCTION BOX AND HEAT TRACE, 120V
19	LEVEL PROBE PROVIDED WITH PUMP
20	WELL PUMP
21	BENTONITE SEAL
22	EXISTING SLOTTED SCREEN
23	EXISTING SUMP
24	STAINLESS STEEL HOOK TO SIDE OF CONCRETE MANHOLE (PROVIDE 2)
25	2"ø HDPE ELBOW (90°)
26	EXISTING 1"ø PIEZOMETER
27	1"ø SCH. 80 PVC ELBOW (90°)
28	PLASTIC SHEET
29	CONDUIT FOR HEAT TRACE
30	COARSE AGGREGATE FILL

⚠1 DELETE WELL CAP

EXTRACTION WELL DIMENSIONS							
ITEM	EW–100	EW–110	EW–120	EW–130	EW–140	EW–150	EW–160
A	4'–0" MIN	4'–0" MIN	4'–0" MIN	4'–0" MIN	4'–0" MIN	4'–0" MIN	4'–0" MIN
B	2'–0" MIN	2'–0" MIN	2'–0" MIN	2'–0" MIN	2'–0" MIN	2'–0" MIN	2'–0" MIN
C	8'–0"	8'–0"	5'–0"	10'–0"	7'–0"	5'–0"	7'–0"
D	27'–3"	26'–0"	30'–0"	30'–0"	26'–7"	29'–3"	32'–0"
E	30'–0"	28'–0"	32'–0"	32'–0"	29'–0"	32'–0"	34'–0"
F	6"	6"	6"	6"	6"	6"	6"
G	1'–0"	1'–0"	1'–0"	1'–0"	1'–0"	1'–0"	1'–0"
H	1'–0"	1'–0"	1'–0"	1'–0"	1'–0"	1'–0"	1'–0"
I	4'–0"	4'–0"	4'–0"	4'–0"	4'–0"	4'–0"	4'–0"
J	2'–0"	2'–0"	2'–0"	2'–0"	2'–0"	2'–0"	2'–0"
K	3"	3"	3"	3"	3"	3"	3"
L	3"	3"	3"	3"	3"	3"	3"

⚠2

⚠2 NOTE:

1. THE OFF–SITE PORTION OF THE GROUNDWATER COLLECTION AND TREATMENT SYSTEM WAS REMOVED IN ACCORDANCE WITH THE DECEMBER 14, 2012 APPROVAL LETTER FROM NYSDEC. UTILITIES SUPPLYING THE OFF–SITE PORTION WERE DE–ENERGIZED, AND REMOVED.

RECORD DRAWINGS
TO THE BEST OF OUR KNOWLEDGE, INFORMATION AND BELIEF, THESE RECORD DRAWINGS SUBSTANTIALLY REPRESENT THE PROJECT AS CONSTRUCTED.

(RECORD DRAWING: MADE FROM DRAWING NO. 4, TRACER NO. 34216075/34216G03.DWG, DATED 1/24/01) DATE_____BY_____

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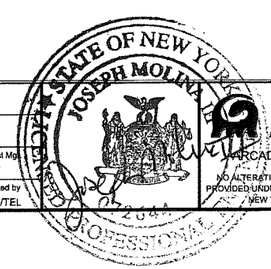
XREFS: IMAGES: PROJECTNAME: —
34221X00

No.	Date	Revisions	By	Ckd
⚠2	7/26/13	GENERAL REVISIONS	SB	SB
⚠1	1/24/01	GENERAL REVISIONS DURING CONSTRUCTION		

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING: USE TO VERIFY FIGURE REPRODUCTION SCALE

Professional Engineer's Name: JOSEPH MOLINA III
Professional Engineer's No.: 072644
State: NY | Date Signed: 7/31/13 | Project Mgr: GMT
Designed by: AHL/MEE | Drawn by: DCC | Checked by: DRG/TEL



ARCADIS
ARCADIS OF NEW YORK, INC.

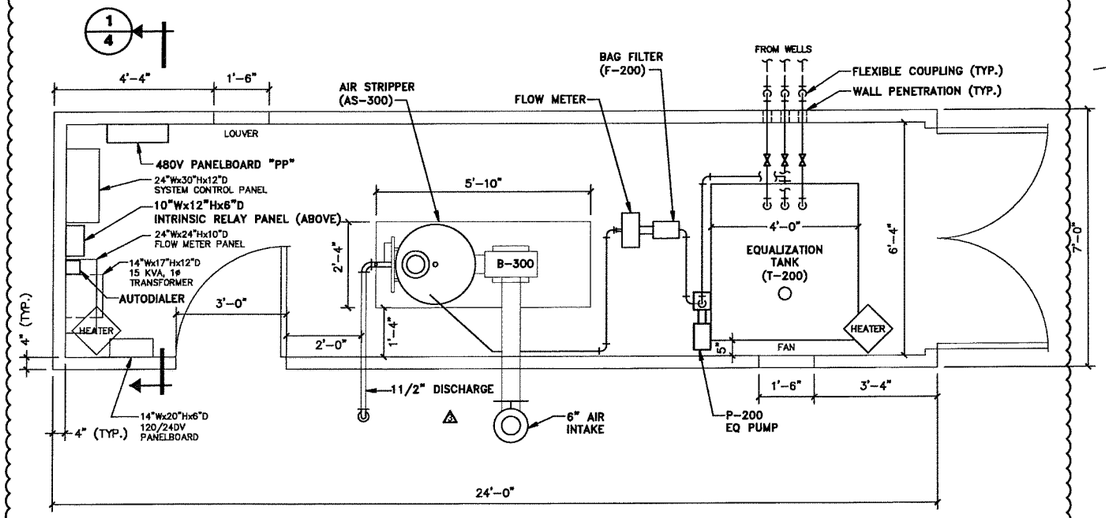
BAUSCH & LOMB INCORPORATED • CHILI, NEW YORK
GROUND-WATER COLLECTION AND TREATMENT SYSTEM

GROUND-WATER EXTRACTION WELL DETAIL

ARCADIS Project No.: 342.16.02F
Date: JULY 2013

ARCADIS
6723 TOWPATH ROAD
SYRACUSE, NY 13214-0066
TEL. 315.446.9120

4

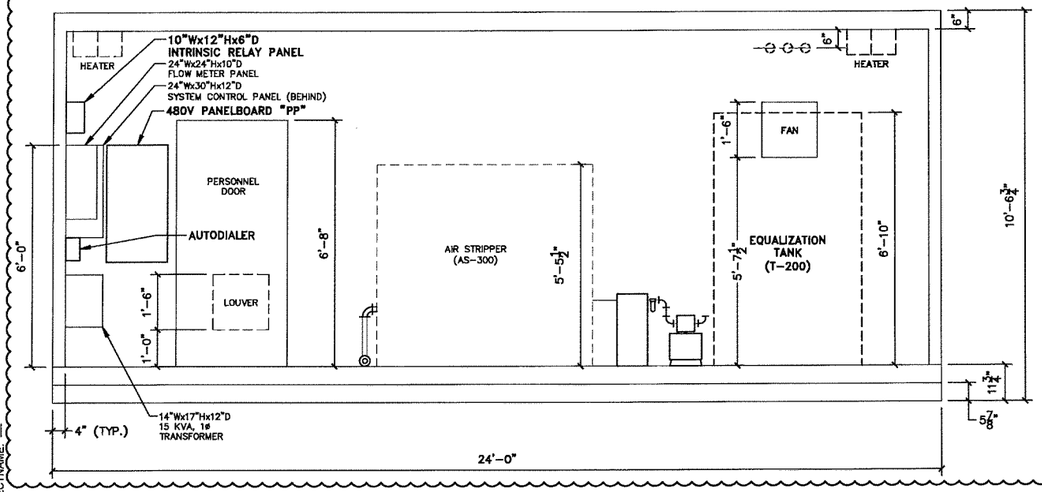


EQUIPMENT PLAN

SCALE: 1/2"=1'-0"

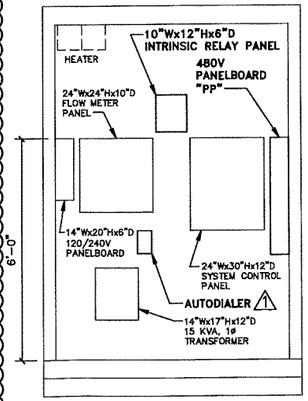
1. REVISED DIMENSIONS ON EQUALIZATION TANK; RELOCATED P-200 AND F-200; AND RELOCATED AUTODIALER.
2. INSTALL NEW DISCHARGE LINE TO SURFACE WATER.

SEE NOTE 2



EQUIPMENT ELEVATION

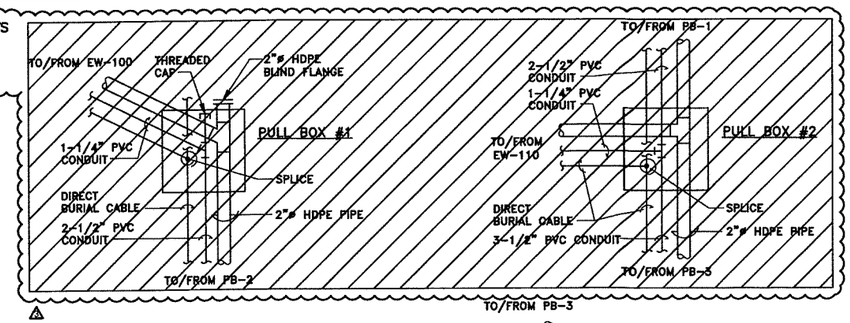
SCALE: 1/2"=1'-0"



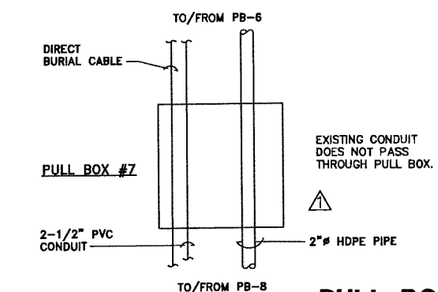
SECTION 1/4

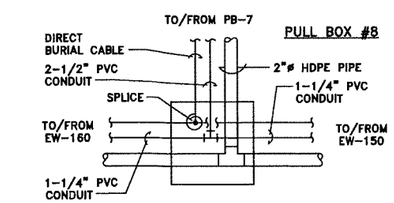
SCALE: 1/2"=1'-0"

1. OFF-SITE GWCTS COMPONENTS DISCONNECTED AND REMOVED



1. REMOVED PULL BOX #5





PULL BOX DETAIL

NOT TO SCALE

NOTES:

1. DIRECT BURIAL CABLE CAN BE PULLED AROUND OR UNDER PULL BOX WHERE IT IS NOT BEING SPLICED.
2. IN JULY 2012, THE AIR STRIPPER (AS-300) WAS REPLACED WITH A NEEP 1331-P MODEL. THE TREATMENT SYSTEM CONFIGURATION WAS MODIFIED AS SHOWN TO ACCOMMODATE THE NEW AIR STRIPPER. P-300 AND SANITARY DISCHARGE LINES WERE REMOVED DURING REPLACEMENT OF THE AIR STRIPPER. THE P-300 AND SANITARY DISCHARGE LINES HAD NOT BEEN OPERATIONAL SINCE 2002 WHEN DISCHARGE POINT CHANGED TO A PERMITTED SPDES OUTFALL.

RECORD DRAWINGS
TO THE BEST OF OUR KNOWLEDGE, INFORMATION AND BELIEF, THESE RECORD DRAWINGS SUBSTANTIALLY REPRESENT THE PROJECT AS CONSTRUCTED.

DATE_____BY_____

(RECORD DRAWING: MADE FROM DRAWING NO. 4, TRACER NO. 34216075/34216G03.DWG, DATED 1/24/01)

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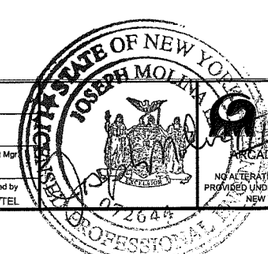
XREFS: 34221X00 IMAGES: PROJECTNAME: —

1/2"=1'-0" (2' 0 2' 4')

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING: USE TO VERIFY FIGURE REPRODUCTION SCALE

No.	Date	Revisions	By	Ckd

Professional Engineer's Name: JOSEPH MOLINA III
Professional Engineer's No.: 072644
State: NY | Date Signed: 7/31/13 | Project Mgr: GMT
Designed by: AHL/MEE | Drawn by: DCC | Checked by: DRG/TEL



ARCADIS
ARCADIS OF NEW YORK, INC.

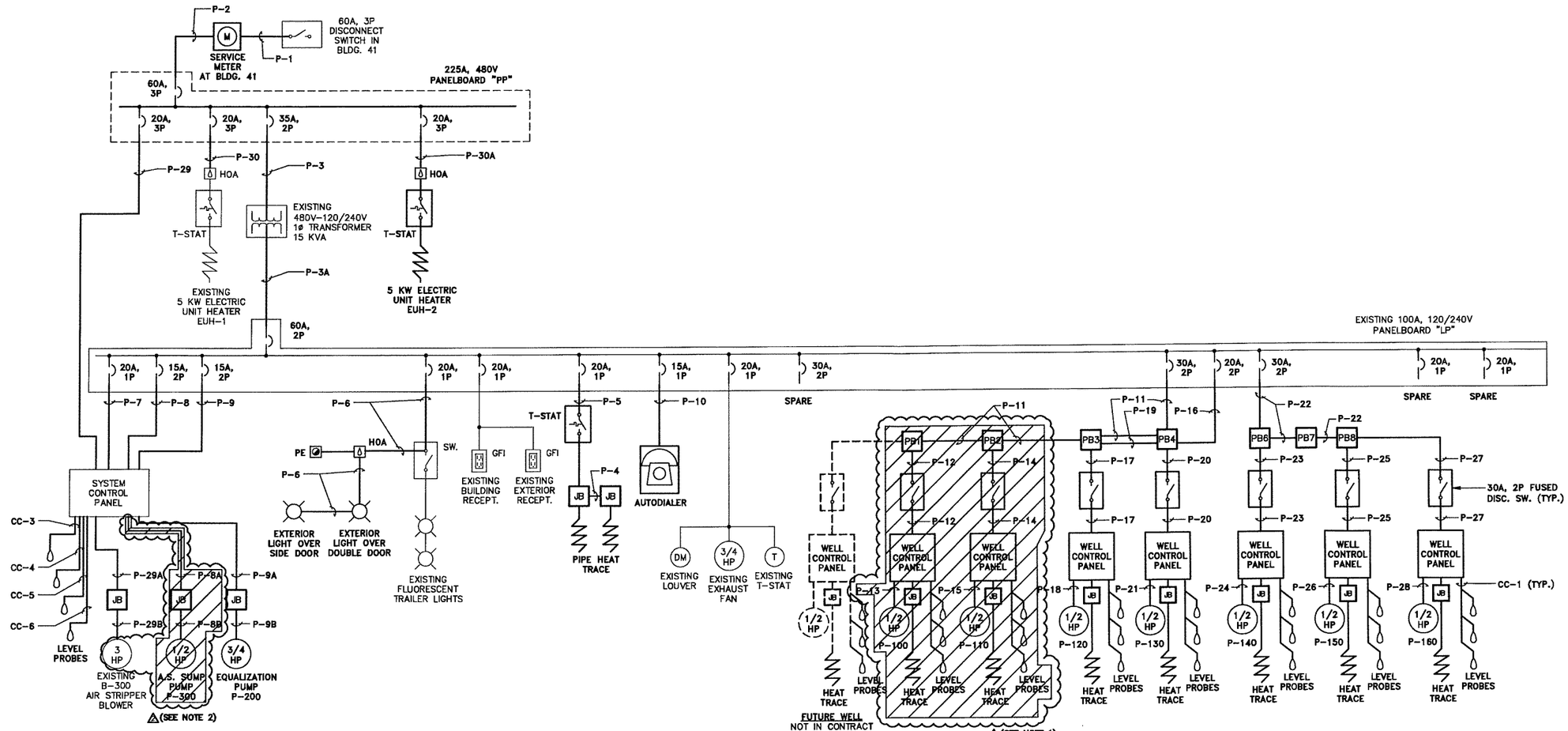
BAUSCH & LOMB INCORPORATED • CHILI, NEW YORK
GROUND-WATER COLLECTION AND TREATMENT SYSTEM

EQUIPMENT LAYOUT AND DETAIL

ARCADIS Project No. 342.16.02F
Date JULY 2013

ARCADIS
6723 TOWPATH ROAD
SYRACUSE, NY 13214-0066
TEL. 315.446.9120

5A



ELECTRICAL LEGEND:

- OL — MOTOR OVERLOAD
- CR — CONTROL RELAY
- Mx — AUXILIARY CONTACT ON MOTOR STARTER
- NORMALLY OPEN CONTACT (N.O.)
- NORMALLY CLOSED CONTACT (N.C.)
- GROUND
- TRANSFORMER
- MOTOR OVERLOAD HEATER
- FUSE
- CIRCUIT BREAKER (C.B.)
- INDICATING LIGHT (R)ED, (Y)ELLOW, (G)REEN, (W)HITE
- JB — JUNCTION BOX
- HOA — HAND-OFF-AUTO SWITCH
- PE — PHOTO ELECTRIC CELL
- RECEPTACLE
- XX HP — MOTOR (HP=HORSEPOWER)
- DUPLEX RECEPTACLE
- CONDUIT BEND DOWN
- CONDUIT BEND UP
- FLOAT SWITCH
- PRESSURE SWITCH
- DISCONNECT (OR SWITCH)
- FUSED DISCONNECT

ELECTRICAL ONE-LINE DIAGRAM

NOT TO SCALE

1 REMOVED PULL BOX #5

NOTES:

1. THE OFF-SITE GROUNDWATER COLLECTION TREATMENT SYSTEM EXTRACTION WELLS EW-100 AND EW-110 AND ASSOCIATED UTILITIES WERE DISCONNECTED AND REMOVED IN FEBRUARY 2013, FOLLOWING NYSDEC APPROVAL ON DECEMBER 14, 2012.
2. IN JULY 2012, THE AIR STRIPPER (AS-300) WAS REPLACED WITH A NEEP 1331-P MODEL. THE TREATMENT SYSTEM CONFIGURATION WAS MODIFIED AS SHOWN TO ACCOMMODATE THE NEW AIR STRIPPER.

RECORD DRAWINGS
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XREFS: 3422-1X00
IMAGES: PROJECTNAME: —

No.	Date	Revisions	By	Ckd
2	7/26/13	GENERAL REVISIONS	SB	SB
1	1/24/01	GENERAL REVISIONS DURING CONSTRUCTION		

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING: USE TO VERIFY FIGURE REPRODUCTION SCALE

Professional Engineer's Name: JOSEPH MOLINA III
Professional Engineer's No.: 072644
State: NY | Date Signed: 7/31/13 | Project Mgr.: GMT
Designed by: AHL/MEE | Drawn by: DCC | Checked by: DRG/TEL

STATE OF NEW YORK JOSEPH MOLINA 072644 LICENSED PROFESSIONAL ENGINEER

ARCADIS
ARCADIS OF NEW YORK, INC.

BAUSCH & LOMB INCORPORATED • CHILI, NEW YORK
GROUND-WATER COLLECTION AND TREATMENT SYSTEM

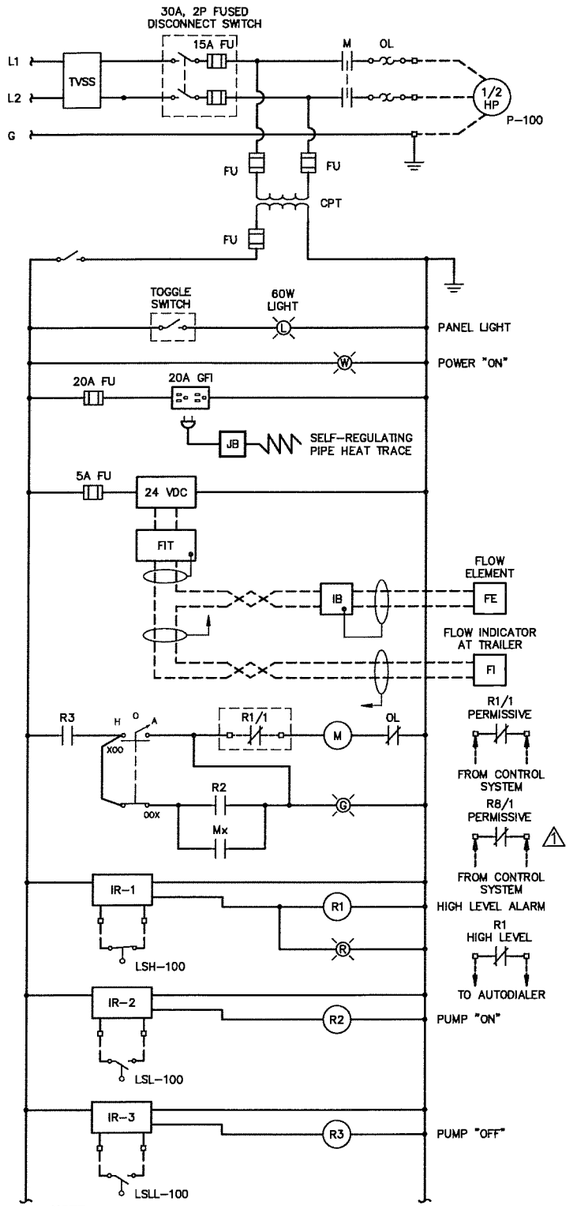
ELECTRICAL ONE-LINE DIAGRAM

ELECTRICAL

ARCADIS Project No. 342.16.02F
Date JULY 2013

ARCADIS
6723 TOWPATH ROAD
SYRACUSE, NY 13214-0066
TEL. 315.446.9120

6

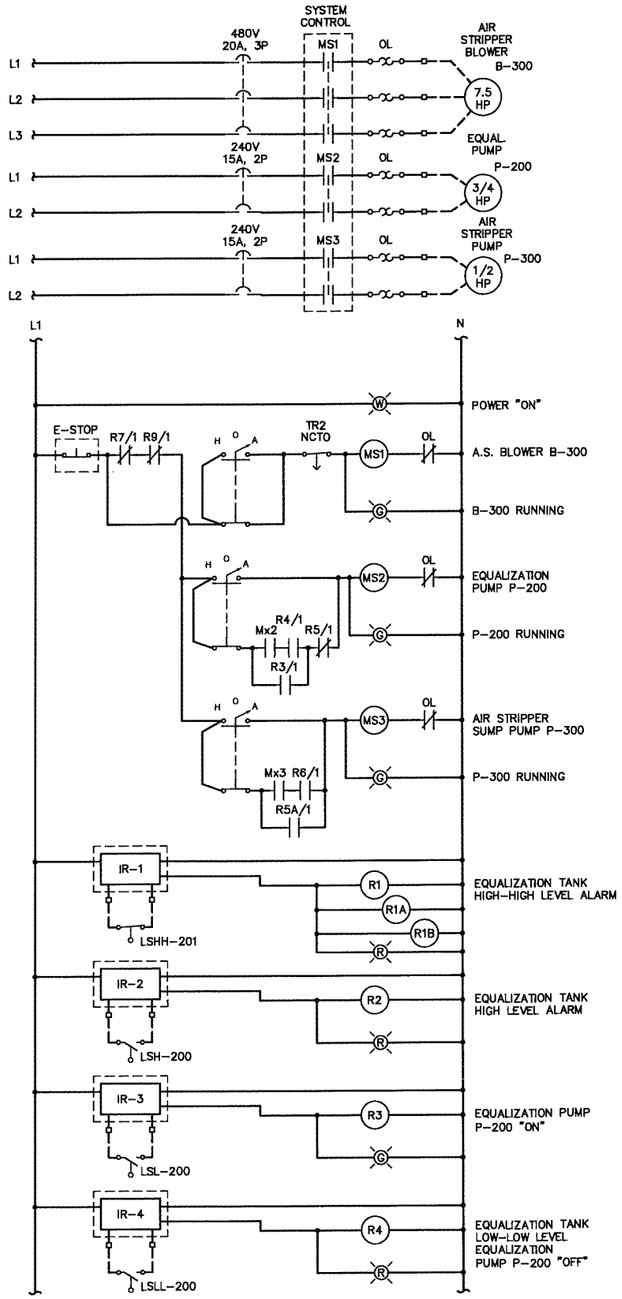


NOTE:

THERE IS A WELL PUMP CONTROL PANEL FOR EACH OF THE EIGHT WELLS. EACH WELL PUMP CONTRDL PANEL HAS A FLOW INDICATING TRANSMITTER; 4-20mA SIGNAL OUT TO TRAILER.

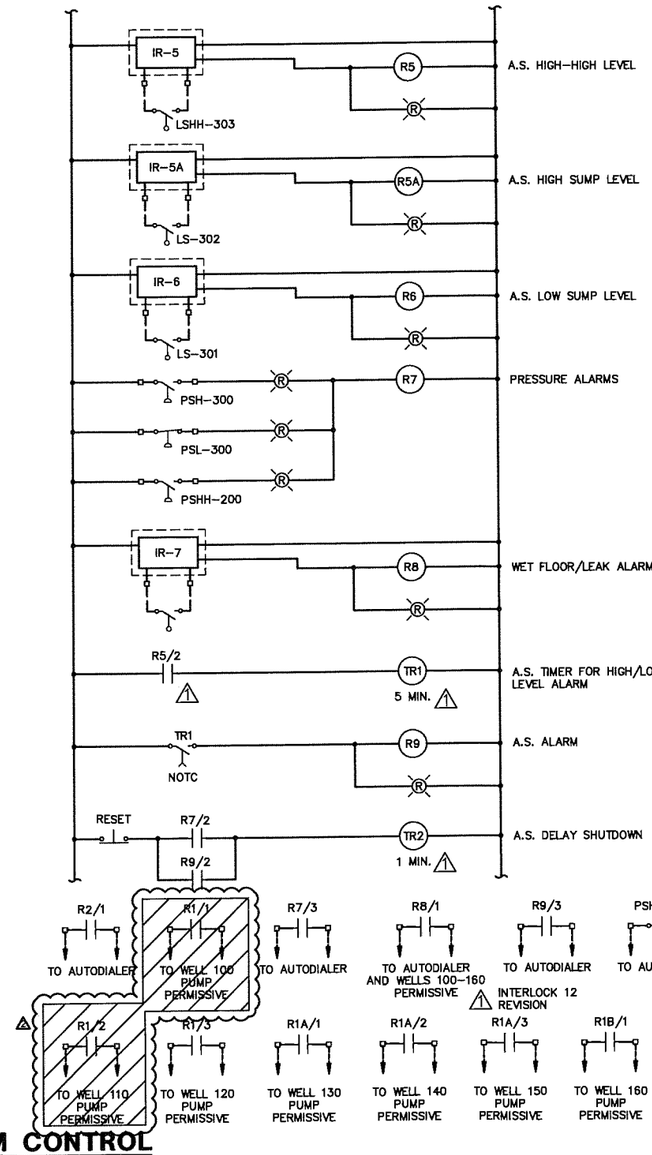
WELL PUMP CONTROL PANEL

(TYPICAL FOR ALL WELLS)
NOT TO SCALE



INTERLOCK 12 REVISION

OFF-SITE GWCTS COMPONENTS DISCONNECTED AND REMOVED



SYSTEM CONTROL

NOT TO SCALE

RECORD DRAWINGS
TO THE BEST OF OUR KNOWLEDGE, INFORMATION AND BELIEF, THESE RECORD DRAWINGS SUBSTANTIALLY REPRESENT THE PROJECT AS CONSTRUCTED.

(RECORD DRAWING: MADE FROM DRAWING NO. 7, TRACER NO. 34216075/34216E02.DWG, DATED 1/24/01) DATE_____BY_____

No.	Date	Revisions	By	Ckd
2	7/26/13	GENERAL REVISIONS	SB	SB
1	1/24/01	GENERAL REVISIONS DURING CONSTRUCTION		

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING: _____ USE TO VERIFY FIGURE REPRODUCTION SCALE

Professional Engineer's Name: JOSEPH MOLINA III
Professional Engineer's No.: 072644
State: NY | Date Signed: 7/31/13 | Project Mgr.: GMT
Designed by: AHL/MEE | Drawn by: DCC | Checked by: DRG/TEL

ARCADIS
ARCADIS OF NEW YORK, INC.

BAUSCH & LOMB INCORPORATED • CHILI, NEW YORK
GROUND-WATER COLLECTION AND TREATMENT SYSTEM

ELEMENTARY DIAGRAMS

ELECTRICAL

ARCADIS Project No. 342.18.02F
Date JULY 2013

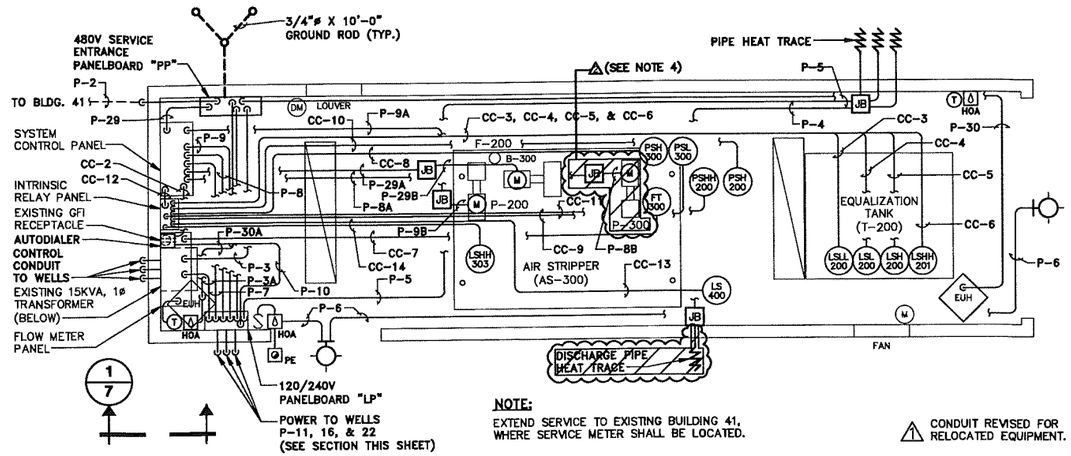
ARCADIS
6723 TOWPATH ROAD
SYRACUSE, NY 13214-0068
TEL. 315.446.9120

7

CONDUIT SCHEDULE				
CKT. NO.	CONDUIT SIZE	NO./SIZE CONDUCTORS	FROM	TO
P-1	1" PVC	3 #6, 1 #8G	EXISTING (BLDG. 41) DISC. SW.	SERVICE METER
P-2	1-1/2" PVC	3 #6, 1 #8G	SERVICE METER (BLDG. 41)	PANELBOARD "PP"
P-3	3/4" RGS	2 #10, 1 #10G	PANELBOARD "PP"	480V/120-240V TRANSFORMER
P-3A	3/4" RGS	3 #4, 1 #8G	TRANSFORMER	PANELBOARD "LP"
P-4	3/4" RGS	2 #12, 1 #12G	PIPE HEAT TRACE JB	DISCHARGE PIPE HEAT TRACE JB
P-5	3/4" RGS	2 #12, 1 #12G	PANELBOARD "LP"	HEAT TRACE JB
P-6	3/4" RGS	2 #12, 1 #12G	PANELBOARD "LP"	EXTERIOR LIGHTS
P-7	3/4" RGS	2 #12, 1 #12G	PANELBOARD "LP"	SYSTEM CONTROL PANEL
P-8	3/4" RGS	2 #12, 1 #12G	PANELBOARD "LP"	SYSTEM CONTROL PANEL
P-8A	3/4" RGS	2 #12, 1 #12G	SYSTEM CONTROL PANEL	JB
P-8B	3/4" RGS	2 #12, 1 #12G	JB	A.S. SUMP PUMP P-300
P-9	3/4" RGS	2 #12, 1 #12G	PANELBOARD "LP"	SYSTEM CONTROL PANEL
P-9A	3/4" RGS	2 #12, 1 #12G	SYSTEM CONTROL PANEL	JB
P-9B	3/4" RGS	2 #12, 1 #12G	JB	EQUALIZATION PUMP P-200
P-10	3/4" RGS	2 #12, 1 #12G	PANELBOARD "LP"	AUTODIALER
P-11	DIRECT BURIED	2 #1, 1 #6G	PANELBOARD "LP"	~~PB6, 4, 3, 2 & 1~~
P-12	DIRECT BURIED	2 #1, 1 #6G	PB1	WELL LEVEL CONTROL PANEL
P-13	DIRECT BURIED	2 #12, 1 #12G	WELL LEVEL CONTROL PANEL	PUMP P-100
P-14	DIRECT BURIED	2 #10, 1 #10G	PB2	WELL LEVEL CONTROL PANEL
P-15	DIRECT BURIED	2 #12, 1 #12G	WELL LEVEL CONTROL PANEL	PUMP P-110
P-16	DIRECT BURIED	2 #6, 1 #10G	PANELBOARD "LP"	~~PB5, 4 & 3~~
P-17	DIRECT BURIED	2 #6, 1 #10G	PB3	WELL LEVEL CONTROL PANEL
P-18	DIRECT BURIED	2 #12, 1 #12G	WELL LEVEL CONTROL PANEL	PUMP P-120
P-20	DIRECT BURIED	2 #12, 1 #12G	PB4	WELL LEVEL CONTROL PANEL
P-21	DIRECT BURIED	2 #10, 1 #10G	WELL LEVEL CONTROL PANEL	PUMP P-130
P-22	DIRECT BURIED	2 #1, 1 #6G	PANELBOARD "LP"	PB5, 6, 7, & 8
P-23	DIRECT BURIED	2 #6, 1 #10G	PB6	WELL LEVEL CONTROL PANEL
P-24	DIRECT BURIED	2 #12, 1 #12G	WELL LEVEL CONTROL PANEL	PUMP P-140
P-25	DIRECT BURIED	2 #8, 1 #10G	PB8	WELL LEVEL CONTROL PANEL
P-26	DIRECT BURIED	2 #12, 1 #12G	WELL LEVEL CONTROL PANEL	PUMP P-150
P-27	DIRECT BURIED	2 #8, 1 #10G	PB8	WELL LEVEL CONTROL PANEL
P-28	DIRECT BURIED	2 #12, 1 #12G	WELL LEVEL CONTROL PANEL	PUMP P-160
P-29	3/4" RGS	3 #12, 1 #12G	PANELBOARD "PP"	SYSTEM CONTROL PANEL
P-29A	3/4" RGS	3 #12, 1 #12G	SYSTEM CONTROL PANEL	JB
P-29B	3/4" RGS	3 #12, 1 #12G	JB	A.S. BLOWER B-300
P-30	3/4" RGS	3 #12, 1 #12G	PANELBOARD "PP"	ELECTRIC UNIT HEATER (EUH)
P-30A	3/4" RGS	3 #12, 1 #12G	PANELBOARD "PP"	ELECTRIC UNIT HEATER (EUH)
CC-1	3/4" RGS	6 #14	WELL LEVEL CONTROL PANEL	LEVEL PROBES (TYP. EACH WELL)
CC-2	3/4" RGS	12 #14	SYSTEM CONTROL PANEL	AUTODIALER
CC-3	3/4" RGS	2 #14	SYSTEM CONTROL PANEL	EQUALIZATION TANK LSLL
CC-4	3/4" RGS	2 #14	SYSTEM CONTROL PANEL	EQUALIZATION TANK LSL
CC-5	3/4" RGS	2 #14	SYSTEM CONTROL PANEL	EQUALIZATION TANK LSH
CC-6	3/4" RGS	2 #14	SYSTEM CONTROL PANEL	EQUALIZATION TANK LSHH
CC-7	3/4" RGS	TSP #16	FLOW METER PANEL	AIR STRIPPER FLOW TRANSMITTER
CC-8	3/4" RGS	2 #14	SYSTEM CONTROL PANEL	A.S. HIGH PRESSURE SWITCH (PSH-300)
CC-9	3/4" RGS	2 #14	SYSTEM CONTROL PANEL	A.S. LOW PRESSURE SWITCH (PSL-300)
CC-10	3/4" RGS	2 #14	AUTODIALER	BAG FILTER HIGH PRESS. SW. (PSH-200)
CC-11	3/4" RGS	2 #14	SYSTEM CONTROL PANEL	BAG FILTER HIGH-HIGH PRESS. SW. (PSHH-200)
CC-12	3/4" RGS	16 #14	INTRINSIC RELAY PANEL	SYSTEM CONTROL PANEL
CC-13	3/4" RGS	2 #14	INTRINSIC RELAY PANEL	LEAK/WET FLOOR SWITCH (LS-400)
CC-14	3/4" RGS	2 #14	INTRINSIC RELAY PANEL	A.S. HIGH-HIGH LEVEL (LSHH-303)
CC-15	3-1/2" PVC	3 TSP #16, 12 #14	TRAILER	PB5, 4, 3 & 2
CC-16	2-1/2" PVC	2 TSP #16, 8 #14	TRAILER	PB5 & 4
CC-17	3-1/2" PVC	3 TSP #16, 12 #14	TRAILER	PB5 & 6
CC-18	1-1/4" PVC	1 TSP #16, 4 #14	PB6	WELL 140 CONTROL PANEL
CC-19	2-1/2" PVC	2 TSP #16, 8 #14	PB6	PB7 & 8
CC-20	1-1/4" PVC	1 TSP #16, 4 #14	PB8	WELL 150 CONTROL PANEL
CC-21	1-1/4" PVC	1 TSP #16, 4 #14	PB8	WELL 160 CONTROL PANEL
CC-22	1-1/4" PVC	1 TSP #16, 4 #14	PB4	WELL 130 CONTROL PANEL
CC-23	1-1/4" PVC	1 TSP #16, 4 #14	PB4	PB3
CC-24	1-1/4" PVC	1 TSP #16, 4 #14	PB3	~~WELL 120 CONTROL PANEL~~
CC-25	1-1/4" PVC	1 TSP #16, 4 #14	PB2	WELL 110 CONTROL PANEL
CC-26	2-1/2" PVC	2 TSP #16, 8 #14	PB2	~~PB1~~
CC-27	1-1/4" PVC	1 TSP #16, 4 #14	PB1	WELL 100 CONTROL PANEL
CC-28	NONE	1 TSP #16, 4 #14	PB1	~~LEAVE COILED IN PB1 FOR FUTURE WELL CONTROL~~

△(SEE NOTE 3)

△(SEE NOTE 3)

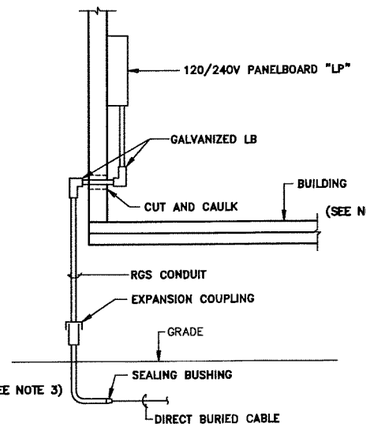


NOTE:
EXTEND SERVICE TO EXISTING BUILDING 41, WHERE SERVICE METER SHALL BE LOCATED.

△ CONDUIT REVISED FOR RELOCATED EQUIPMENT.

POWER AND INSTRUMENTATION PLAN

SCALE: 1/2"=1'-0"



(SEE NOTE 3)

NOTES:

1. THE VIEW SHOWN HAS BEEN ROTATED FOR CLARITY.
2. SIMILAR FOR CONTROL CONDUIT TO WELLS; NO DIRECT BURIED CABLE. CONDUIT SHALL USE THE WHOLE LENGTH.
3. THE OFF-SITE GROUNDWATER COLLECTION TREATMENT SYSTEM EXTRACTION WELLS EW-100 AND EW-110 ASSOCIATED UTILITIES WERE DISCONNECTED AND REMOVED IN FEBRUARY 2013, FOLLOWING NYSDEC APPROVAL ON DECEMBER 14, 2012.
4. IN JULY 2012, THE AIR STRIPPER (AS-300) WAS REPLACED WITH A NEEP 1331-P MODEL. THE TREATMENT SYSTEM CONFIGURATION WAS MODIFIED AS SHOWN TO ACCOMMODATE THE NEW AIR STRIPPER.

SECTION 1/7

NOT TO SCALE

SYMBOL LEGEND	
JB	JUNCTION BOX
S	SWITCH
	RECEPTACLE
	1'x4' FLUORESCENT LIGHT
M	MOTOR
T	THERMOSTAT

CIRCUIT BREAKER PANELBOARD – LP											
								SCHEDULE			
LOCATION:	TREATMENT BUILDING							FEED FROM		480 VOLT PANELBOARD	
MAIN BUS RATING:	100	AMPERES						120/240 VOLTS		1 PHASE, 3 WIRE	
MINIMUM SHORTCIRCUIT:	10,000	AMPERES						FEEDER CABLE		3 #4, 1 #8G	
MAIN BREAKER TRIP:	60	AMPERES						NEMA 1			
ESTIMATED CONNECTED LOAD:	41.875	AMPS						SURFACE MTD			
	C/B								C/B		
CKT	AMPS/	LOAD					LOAD		AMPS/		CKT
NO. DESCRIPTION	POLES	TYPE	AMPS	PH-A	PH-B	AMPS	TYPE		POLES	DESCRIPTION	NO.
1 BUILDING LIGHTS	20/1P	LITES	2.625	8.625		6.000	RECPT		20/1P	BUILDING RECEPTACLES	2
3 AUTODIALER	15/1P	INST	0.125		3.425	3.300	MOTOR		15	EQ. PUMP P-200 (3/4 HP)	4
5 SYSTEM CONTROL PANEL	20/1P	INST	3.000	6.300		3.300	MOTOR		2P		6
~~7 1/4 HP FAN & LOUVER~~	20/1P	MOTOR	5.800		8.800	3.000	HEAT		20/1P	HEAT TRACE	8
9 FUTURE EW-100 & EW-110 CP	30	MOTOR	7.000	14.000		7.000	MOTOR		20	EW-120 & EW-130 CONTROL PNL	10
11	2P	MOTOR	7.000		14.000	7.000	MOTOR		2P		12
13 EW-140, EW-150 & EW-160 CP	30	MOTOR	10.500	12.950		2.450	MOTOR		15	A.S. SUMP PUMP P-300 (1/2 HP)	14
15	2P	MOTOR	10.500		12.950	2.450	MOTOR		2P		16
17 SPARE	30			0.000					20	SPARE	18
19 SPARE	2P				0.000				2P		20
21 SPARE	20/1P			0.000					20	SPARE	22
23 SPARE	20/1P				0.000				2P		24
25	20/1P			0.000							26
27	20/1P				0.000						28
29	20/1P			0.000							30
LOAD SUMMARY			46.550	41.875	39.175	34.500					

△(SEE NOTE 4)

NOTE: ALL CONDUCTORS TO BE #12 IN 3/4" CONDUIT UNLESS OTHERWISE INDICATED ON ONE-LINE DIAGRAM

CIRCUIT BREAKER PANEL BOARD – PP												
LOCATION:	TREATMENT BUILDING						FEED FROM:			BUILDING 41		
MAIN BUS RATING:	225	AMPERES					480 VOLT			3 PHASE, 3 WIRE		
MINIMUM SHORT CIRCUIT:	10,000	AMPERES					FEEDER CABLE SIZE:			3 #6, 1 #8G		
MAIN BREAKER TRIP:	60	AMPERES					NEMA 1					
ESTIMATED CONNECTED LOAD:	79	KVA					SURFACE MOUNTED			SERVICE ENTRANCE RATED		
	C/B								C/B			
CKT.	AMPS/	LOAD					LOAD		AMPS/			CKT.
NO. DESCRIPTION	POLES	TYPE	AMPS	PH-A	PH-B	PH-C	AMPS	TYPE	POLES	DESCRIPTION		NO.
20	HEAT	2.000	5.670			3.670	MOTOR	20				
1 UNIT HEATER UH-1	HEAT	2.000		5.670		3.670	MOTOR		A.S. BLOWER B-300 (3 HP)		2	△(SEE NOTE 4)
3P	HEAT	2.000			5.670	3.670	MOTOR	3P				
3 15 KVA TRANSFORMER 35	SUB	28.000	30.000			2.000	HEAT	20				
2P	SUB	28.000		30.000		2.000	HEAT		UNIT HEATER (UH-2)		4	
5 BLANK					2.000	2.000	HEAT	3P				
			0.000					20				
7 BLANK				0.000					SPARE		6	
					0.000			3P				
LOAD SUMMARY		62.000	35.670	35.670	7.670	17.010						

NOTE: ALL CONDUCTORS TO BE #12 IN 3/4" CONDUIT UNLESS OTHERWISE INDICATED ON THE CONTRACT DRAWINGS

(RECORD DRAWING: MADE FROM DRAWING NO. 3, TRACER NO. 34216075/34216E03.DWG, DATED 1/24/01) DATE_____ BY_____

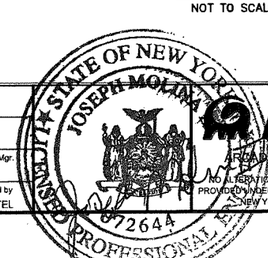
RECORD DRAWINGS
TO THE BEST OF OUR KNOWLEDGE, INFORMATION AND BELIEF, THESE RECORD DRAWINGS SUBSTANTIALLY REPRESENT THE PROJECT AS CONSTRUCTED.

1/2"=1'-0" (2' 0 2' 4')

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING: USE TO VERIFY FIGURE REPRODUCTION SCALE

No.	Date	Revisions	By	Ckd
△	7/26/13	GENERAL REVISIONS	SB	SB
△	1/24/01	GENERAL REVISIONS DURING CONSTRUCTION		

Professional Engineer's Name: JOSEPH MOLINA III
Professional Engineer's No.: 072644
State: NY | Date Signed: 7/31/13 | Project Mgr.: GMT
Designed by: AHL/MEE | Drawn by: DCC | Checked by: DRG/TEL



BAUSCH & LOMB INCORPORATED • CHILI, NEW YORK
GROUND-WATER COLLECTION AND TREATMENT SYSTEM

POWER AND INSTRUMENTATION PLAN, SCHEDULES, AND SECTION

ARCADIS Project No. 342.16.02F
Date JULY 2013

ARCADIS
6723 TOWPATH ROAD
SYRACUSE, NY 13214-0066
TEL. 315.446.9120

8

GENERAL NOTES:

1. BASE MAP DERIVED FROM EXISTING SITE PLANS PROVIDED BY BAUSCH & LOMB AND A SITE SURVEY BY BLASLAND, BOUCK, & LEE, INC. (BBL), DATED 8/17/92. REVISED 4/15/94 AND REVISED 6/17/98. ALL LOCATIONS APPROXIMATE.
2. THE LOCATION OF UNDERGROUND UTILITIES AND OTHER UNDERGROUND STRUCTURES WERE OBTAINED BY FIELD MEASUREMENTS WHERE POSSIBLE. OTHERWISE OBTAINED FROM OTHER SOURCES AND ARE APPROXIMATE ONLY. OTHER UNDERGROUND UTILITIES MAY EXIST, THE LOCATION OF WHICH AT THIS TIME ARE UNKNOWN. THE CONTRACTOR SHALL VERIFY THE LOCATION OF UTILITIES IN THE FIELD PRIOR TO INITIATING WORK UNDER THIS CONTRACT.
3. THE CONTRACTOR SHALL COORDINATE ALL CONSTRUCTION ACTIVITIES WITH REPRESENTATIVES OF BBL ENVIRONMENTAL SERVICES, INC. (BBLES) PRIOR TO COMMENCING ON-SITE ACTIVITIES.
4. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS IN THE FIELD.
5. THE CONTRACTOR SHALL OBTAIN ALL LOCAL PERMITS AND MAKE ARRANGEMENTS FOR LOCAL INSPECTIONS (AS NECESSARY).
6. THE CONTRACTOR SHALL INSTALL EQUIPMENT IN NEAT AND WORKMANLIKE MANNER; ALIGN, LEVEL, AND ADJUST FOR SATISFACTORY OPERATION; INSTALL SO THAT PARTS ARE EASILY ACCESSIBLE FOR INSPECTION, OPERATION, MAINTENANCE, AND REPAIR. DEVIATIONS FROM INDICATED ARRANGEMENTS ARE SUBJECT TO BE REVIEWED AND APPROVED BY REPRESENTATIVES OF BBLES PRIOR TO INSTALLATION AND/OR OPERATION.
7. THE CONTRACTOR SHALL FURNISH AND PLACE PROPER GUARDS FOR PREVENTION OF ACCIDENTS, PROVIDE ALL TRENCH SHORING, SCAFFOLDING, SHIELDING, DUST/FUME PROTECTION, MECHANICAL/ELECTRICAL PROTECTION, SPECIAL GROUNDING, SAFETY RAILINGS, BARRIERS, OR OTHER SAFETY FEATURES REQUIRED. THE CONTRACTOR SHALL PROVIDE AND MAINTAIN SUFFICIENT LIGHTS DURING NIGHT HOURS TO SECURE SUCH PROTECTION. THE CONTRACTOR SHALL MAINTAIN ALL SITE TRAFFIC.
8. THE CONTRACTOR SHALL PLACE ALL SPOIL MATERIAL NOT SUITABLE FOR BACKFILL AT AN ON-SITE LOCATION AS DIRECTED BY REPRESENTATIVES OF BBLES.
9. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR INITIATING, MAINTAINING, AND SUPERVISING ALL SAFETY PRECAUTIONS AND PROGRAMS IN CONNECTION WITH THE CONTRACT. THEY SHALL TAKE ALL NECESSARY PRECAUTIONS FOR THE SAFETY OF, AND SHALL PROVIDE THE NECESSARY PROTECTION TO PREVENT DAMAGE, INJURY, OR LOSS TO ALL EMPLOYEES AND ANY OTHER PERSONS WHO MAY BE AFFECTED THEREBY.
10. THE CONTRACTOR SHALL COMPLY WITH ALL APPLICABLE LAWS, ORDINANCES, RULES, REGULATIONS, AND ORDERS OF PUBLIC BODIES HAVING JURISDICTION FOR THE SAFETY OF PERSONS OR PROPERTY OR TO PROTECT THEM FROM DAMAGE, INJURY, OR LOSS, INCLUDING, WITHOUT LIMITATION, THE DEPARTMENT OF LABOR SAFETY AND HEALTH ACT OF 1970 (PL 91-596) AND UNDER SECTION 107 OF THE CONTRACT WORK HOURS AND SAFETY STANDARDS ACT (PL 91-54) AND AMENDMENTS THERETO. THEY SHALL ERECT AND MAINTAIN AS REQUIRED BY THE CONDITIONS AND THE PROGRESS OF THE WORK, ALL NECESSARY SAFEGUARDS FOR THE SAFETY AND PROTECTION OF ACCIDENT PREVENTION IN CONSTRUCTION OF THE ASSOCIATED GENERAL CONTRACTORS OF AMERICA, INC.
11. ALL SURFACES, UTILITIES, AND STRUCTURES DAMAGED DR DESTROYED AS A RESULT OF WORK PERFORMED UNDER THIS CONTRACT SHALL BE RESTORED TO THEIR PRE-CONSTRUCTION CONDITION IN A TIMELY MANNER.
12. ALL DISTURBED LAWN AREAS SHALL BE SEEDED AND MULCHED.
13. THE CONTRACTOR SHALL NOTIFY THE BBLES REPRESENTATIVE IMMEDIATELY WHEN CONFLICT BETWEEN DRAWINGS AND ACTUAL CONDITIONS ARE DISCOVERED.
14. ALL CONTRACTORS AND SUBCONTRACTORS SHALL COMPLY WITH 29 CFR 1910.120.

ABBREVIATIONS:

A	AMP	NFPA	NATIONAL FIRE PROTECTION ASSOCIATION
AWG	AMERICAN WIRE GAUGE	NO.	NUMBER
BLDG	BUILDING	NPT	NATIONAL PIPE THREAD
CFR	CODE OF FEDERAL REGULATIONS	OC	ON CENTER
CO	COMPANY	P	PHASE
CONC	CONCRETE	PB	PULL BOX
ø	DIAMETER	PSI	POUNDS PER SQUARE INCH
DISC. SW.	DISCONNECT SWITCH	PVC	POLYVINYL CHLORIDE
EUH	ELECTRIC UNIT HEATER	R	RELAY
FU	FUSE	RG&E	ROCHESTER GAS AND ELECTRIC
G.E.	GENERAL ELECTRIC	RGS	RIGID GALVANIZED STEEL
GFI	GROUND FAULT INTERRUPT	RPM	REVOLUTIONS PER MINUTE
GPM	GALLONS PER MINUTE	SDR	STANDARD DIMENSIONAL RATIO
HDPE	HIGH DENSITY POLYETHYLENE	SS	STAINLESS STEEL
HP	HORSEPOWER	T&B	THOMAS AND BETTS
HYD	HYDRANT	TDH	TOTAL DYNAMIC HEAD
IR	INTRINSIC RELAY	TEFC	TOTALLY ENCLOSED FAN COOLED
JB	JUNCTION BOX	TYP	TYPICAL
KVA	KILOVOLT AMPERE	V	VOLTS
MAX	MAXIMUM	VAC	VOLTS ALTERNATING CURRENT
MIN	MINIMUM	W	WATTS
NEC	NATIONAL ELECTRIC CODE	W/FT.	WATTS PER FOOT
NEMA	NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION		

MECHANICAL SPECIFICATIONS:

1. ALL PVC PIPES SHALL BE SCHEDULE 80 TYPE 2 UNLESS OTHERWISE SPECIFIED.
2. ALL PVC JOINTS TO BE SOLVENT WELDED.
3. ALL PVC PIPES SHALL BE SUPPORTED AT 5'-0" O.C. (MAX.) AND LOCATED 2'-0" (MAX.) FROM JOINT LOCATIONS.
4. HDPE PIPES SHALL BE A MINIMUM SDR 21.
5. ALL HDPE PIPES SHALL BE BUTT-FUSED.
6. ALL PIPE SHALL BE INSTALLED AS PER MANUFACTURER'S SPECIFICATIONS AND PRESSURE-TESTED PER MATERIALS AND PERFORMANCE SPECIFICATION. ZERO LEAKAGE IS ALLOWED FOR ALL JOINTS.
7. ALL FLOW METERS SHALL BE SIGNET 515 ROTOR-X WITH 1" DIAMETER INSERTION TEES. FLOW METERS SHALL HAVE A REMOTE MOUNTED TRANSMITTER, MODEL 3-8550-XP, AT THE WELL PUMP CONTROL PANEL AND AN INDICATOR (DISPLAYING FLOW IN ENGINEERING UNITS) AT THE TREATMENT BUILDING.
8. ALL MANUAL BALL VALVES SHALL BE PVC TRUE UNION TYPE BY TRUE BLUE, PLASTO-MATIC OR EQUAL.
9. ALL CHECK VALVES SHALL BE TRUE UNION TYPE BY TRUE BLUE, PLASTO-MATIC, OR EQUAL.
10. ALL SAMPLE TAPS AND DRAIN VALVES SHALL CONSISTS OF 1/2" PIPE EXTENSIONS AND BALL VALVE OR EQUAL. SAMPLE TAPS AND DRAIN VALVES SHALL BE LOCATED AT LOCATIONS SHOWN ON THE DRAWINGS AND AT ALL LOW ELEVATIONS IN PROCESS PIPING.
11. ALL PRESSURE GAUGES SHALL BE 0-50 PSI RANGE, 2-1/2 " DIAL SIZE, 1/4" NPT BRASS MALE CONNECTION, STAINLESS STEEL CASE, SHATTER-RESISTANT GLASS FACE, AND LIQUID FILLED.
12. THE EXTRACTION WELL PUMPS SHALL BE GRUNDFOS REDI-FLO4 ENVIRONMENTAL SUBMERSIBLE PUMP MODEL 5E3 (SINGLE PHASE, 1/2 HORSEPOWER, 230V) CAPABLE OF 5 GPM @ 50' TDH OR EQUAL. GRUNDFOS TO PROVIDE BOULAY SIMPLEX CONTROL PANELS, LEVEL ELECTRODES, AND WIRE WITH PUMPS.
13. ALL ABOVE GROUND PIPES SHALL BE HEAT TRACED AND INSULATED. INSULATION SHALL BE 1 INCH THICK FIBERGLASS WITH ALUMINUM OUTER JACKET.
14. ALL PIPES ENTERING AND EXITING THE TRAILER SHALL BE EQUIPPED WITH 12 INCH LONG FLEXIBLE COUPLINGS WITHIN 12 INCHES OF THE TRAILER EXTERIOR WALL.
15. HEATER SHALL BE CHROMALOX SERIES UB-502, RATED FOR USE AT 480V, 3 PHASE, WITH OVERHEAT PROTECTION AND INTEGRAL 120V CONTROL CIRCUIT. TOTALLY ENCLOSED FAN MOTOR. PROVIDE THERMOSTAT.
16. BAG FILTER SHALL BE AFTEK MODEL NS-122, OR EQUAL.
17. BAG FILTER PRESSURE SWITCHES SHALL BE CAPSU-PHOTOHELIC PRESSURE SWITCH/GAGE AS MANUFACTURED BY DWYER INSTRUMENTS MODEL NO. 43260S. SWITCH/GAGE SHALL HAVE DUAL ADJUSTABLE SET POINTS, 2 DPDT RELAYS RATED AT 10A AT 120 VAC, RATED FOR 0-60 PSIG IN LIQUID, 3% ACCURACY OVER FULL SCALE, 1/4 INCH NPTF GAGE CONNECTION. 120 VAC POWER INPUT THROUGH 3/4 INCH CONDUIT OPENING.
18. EQUALIZATION PUMP SHALL BE GOULDS NPE 1 X 1-1/4-6, 1ST1D4E4 WITH 4-7/16" IMPELLER AND 3/4 HP, 3450 RPM, 230 VOLT, 1 PHASE, TEFC MOTOR, OR APPROVED EQUAL, WHICH PROVIDES 20 GPM AT 65 FEET TDH.
19. SUMP PUMP SHALL BE GOULDS NPE 1 X 1-1/4-6, 1ST2C4D4 WITH 4-3/4" IMPELLER AND 1/2 HP, 1750 RPM, 230 VOLT, 1 PHASE, TEFC MOTOR, OR APPROVED EQUAL, WHICH PROVIDES 20 GPM AT 12 FEET TDH.
20. EQUALIZATION TANK SHALL BE 550-GALLON POLYETHYLENE TANK WITH THREE 2-INCH-DIAMETER INLET NOZZLES ON TOP OF TANK WITH DIP TUBES TO BOTTOM OF TANK, THREE 2-INCH-DIAMETER INLET NOZZLE ON TOP OF TANK FOR VENT AND LIQUID LEVEL FLOATS, ONE SIDE ACCESS PORT FOR TANK CLEANING, AND TWO 2-INCH-DIAMETER OUTLET NOZZLES POSITIONED AS CLOSE TO THE BOTTOM OF THE SIDE WALL AS FEASIBLE.
21. ALL EQUIPMENT SHALL BE LABELED WITH EQUIPMENT NUMBER, EQUIPMENT NAME, AND CONTENTS.
22. ALL PIPING SHALL BE LABELED WITH FLOW ARROWS AND DESCRIPTION.

STRUCTURAL SPECIFICATIONS:

1. THE AREA IMMEDIATELY ADJACENT TO THE TRAILER SHALL BE GRADED OR SLOPED TO PROMOTE RUN-OFF AND PREVENT ACCUMULATION OF WATER NEXT TO THE TRAILER.
2. THE TRAILER SHOULD HAVE "SKIRTS" INSTALLED AROUND ITS PERIMETER.
3. WALL PENETRATIONS SHALL BE REPAIRED AND SEALED TO MATCH EXISTING STRUCTURE.
4. CONCRETE SHALL HAVE 3,000 PSI STRENGTH IN 28 DAYS IN ACCORDANCE WITH LATEST ACI SPECIFICATIONS.
5. CONCRETE AIR CONTENT SHALL BE BETWEEN 3.5% AND 7.5% AS DETERMINED BY ASTM C173 OR ASTM C231, AIR CONTENT TEST. CONCRETE SLUMP SHALL BE A MINIMUM OF 4 INCHES AS DETERMINED BY ASTM C143, SLUMP TEST.
6. COARSE AGGREGATE FILL SHALL BE GRAVEL, CRUSHED GRAVEL OR CRUSHED STONE HAVING THE FOLLOWING GRADATION BY WEIGHT:

PERCENT PASSING	SQUARE OPENING (INCHES)
100%	1-1/2
95-100	1
65-80	1/2
40-60	1/4
10-20	#4 SIEVE
2-10	#4 SIEVE

7. COARSE AGGREGATE FILL SHALL BE COMPACTED TO OBTAIN 95% DENSITY EXPRESSED AS A PERCENTAGE OF MAXIMUM DRY DENSITY AS DETERMINED BT THE METHODS OF ASTM D1556 OR ASTM D2922.

ELECTRICAL SPECIFICATIONS:

GENERAL

1. ALL ELECTRICAL EQUIPMENT SHALL BE U.L. LISTED AND LABELED.
2. ALL ELECTRICAL WORK SHALL BE IN ACCORDANCE WITH THE LATEST REVISION OF NFPA-70, NATIONAL ELECTRIC CODE (NEC).
3. CONTRACTOR SHALL REUSE EXISTING EQUIPMENT WITHIN CONTROL PANEL (WITH THE EXCEPTION OF WIRING) THAT IS IN GOOD OPERATING CONDITION.
4. CONTRACTOR SHALL REUSE EXISTING EQUIPMENT AS SHOWN OR INDICATED ON CONTRACT DRAWINGS.

RIGID METAL CONDUIT (RGS)

1. GALVANIZED STEEL, HOT DIPPED ZINC, ANSI STANDARD C80.1 AND C80.4.
2. MANUFACTURERS SHALL BE ALLIED TUBE & CONDUIT CORPORATION; TRIANGLE WIRE & CABLE INC.; OR EQUAL.

NONMETALLIC (PVC) CONDUIT

1. NONMETALLIC RIGID CONDUIT AND FITTINGS SHALL BE SCHEDULE 80, POLYVINYL CHLORIDE AND SHALL BE RESISTANT TO CORROSION, SUNLIGHT AND FIRE RETARDANT.
2. CONDUIT AND FITTINGS SHALL BE IN ACCORDANCE WITH NAME STANDARD TC-2 AND TC-3, LATEST REVISION.
3. MANUFACTURERS: CARLON ELECTRIC CONDUIT CO., TRIANGLE PWC CO., OR EQUAL.

JUNCTION BOXES

1. JUNCTION BOXES AND FITTINGS SHALL BE OF GALVANIZED CAST IRON OR COPPER FREE ALUMINUM.
2. JUNCTION BOXES IN AREAS CLASSIFIED AS HAZARDOUS (IN EXTRACTION WELLS) OR WHERE INDICATED ON DRAWINGS. MANUFACTURER SHALL BE CROUSE-HINDS SERIES EJB, OR KILLARK SERIES XB.

WIRES AND CABLES

A. GENERAL

1. ALL CONDUCTORS, UNLESS OTHERWISE NOTED, SHALL BE STRANDED COPPER, CONSTRUCTED OF SOFT DRAWN OR ANNEALED COPPER.
2. CONDUCTORS INSULATION SHALL BE COLOR CODED, WITH COLOR OF INSULATION ONE COLOR THROUGHOUT THE ENTIRE RUN.
   - A. 480 VAC, 3 PHASE, 3 WIRE
     PHASE A - BROWN
     PHASE B - ORANGE
     PHASE C - YELLOW
     GROUND - GREEN
   - B. 120/240 VAC, SINGLE PHASE, 3 WIRE
     CONDUCTOR 1 - BLACK
     CONDUCTOR 2 - RED
     NEUTRAL - WHITE
     GROUND - GREEN

B. LOW VOLTAGE CONDUCTORS

1. ALL CONDUCTORS FOR POWER, LIGHTING AND 120 VAC CONTROL SHALL BE RATED A MINIMUM 600 VAC.
2. CONDUCTORS SHALL BE CONSTRUCTED OF UNCOATED CLASS C COPPER CONCENTRIC-LAY-STRANDED WIRES.
3. POWER AND LIGHTING CONDUCTORS SHALL BE TYPE THHN-90C, THWN-2-90C WITH PVC INSULATION AND NYLON JACKET.

C. INSTRUMENTATION CABLES

1. TWISTED PAIR OF NO. 16 AWG TINNED COATED CLASS C COPPER CONCENTRIC LAY STRANDED WIRES WITH AN ALUMINUM POLYESTER SHIELD AND COPPER DRAIN. RATED FOR 600V AND COLOR COATED PVC OUTER JACKET.

D. DIRECT BURIED CABLE

1. DIRECT BURIED CABLE SHALL BE BARE ANNEALED COPPER COVERED WITH PVC INSULATION WITH A NYLON OUTER JACKET, WHICH IS FLAME RESISTANT, MOISTURE AND SUNLIGHT RESISTANT. CABLE SHALL BE RATED FOR DIRECT BURIED AND SHALL MEET U.L. 1277.

E. CONNECTORS

1. PIGTAIL SPLICING #1D AND SMALLER, USE TAPERED SPRING WIRE NUTS: IDEAL WING NUT; BUCHANAN B-CAP; T&B PIGGIES, OR EQUAL.
2. FOR TERMINATION OF #14 CONTROL WIRES TO TERMINALS, USE INSULATED COMPRESSION SPADE TYPE CONNECTORS: BURNDY HYDENT; T&B STA-KON OR EQUAL.
3. SPLICES AND TERMINALS FOR #8 AND LARGER SHALL BE COPPER COMPRESSION TYPE: BURNDY HYDENT OR HYLUG; T&B, STA-CON OR EQUAL
4. FIXTURE CONNECTIONS SHALL BE: T&B STA-KON SERIES PT-66M; IDEAL CRIMP SLEEVE NO. 41D WITH LONG BARREL OR EQUAL.

HEAT TRACE

1. SELF-REGULATING HEATING CABLE FOR FREEZE PROTECTION OF PIPES. CABLE SHALL BE 3W/FT., 120 VAC, TINNED COPPER BRAID.
2. PROVIDE POWER KIT, SPLICE KIT AND ALUMINUM TAPE AS NECESSARY.
3. MANUFACTURER SHALL BE CHROMALOX SRL, OR EQUAL.

GROUNDING

1. GROUNDING OF ELECTRICAL SYSTEMS AND EQUIPMENT SHALL, AT A MINIMUM, MEET THE REQUIREMENTS OF THE NEC ARTICLE 250 OR SHALL EXCEED ARTICLE 250 AS HEREIN SPECIFIED.
2. ALL CONDUITS SHALL HAVE AN INTERNAL GROUND CONDUCTOR. THIS GROUND CONDUCTOR SHALL BE PROVIDED ALTHOUGH IT MAY NOT BE SHOWN OR SCHEDULED ON THE PLANS.
3. GROUNDING ELECTRODE CONDUCTORS SHALL BE A MINIMUM OF NO. 8 AWG BARE STRANDED COPPER.
4. GROUND RODS SHALL BE 3/4" DIAMETER, 10 FEET LONG, STEEL CORE WITH COPPER MOLTEN WELDED OR ELECTROLYTICALLY BONDED TO EXTERIOR.
5. ALL CONNECTIONS SHALL BE MADE WITH COMPRESSION OR CADWELD CONNECTORS.

ENCLOSURES

ENCLOSURES SHALL BE NEMA RATED FOR LOCATION UNLESS OTHERWISE NOTED.

1. WET LOCATIONS OR OUTDOORS, ENCLOSURES SHALL BE NEMA TYPE 4, STAINLESS STEEL.
2. ENCLOSURES SHALL HAVE NAMEPLATE ON THE EXTERIOR IDENTIFYING THE APPLICATION FUNCTION OF THE EQUIPMENT ENCLOSED.
3. HAZARDOUS AREAS SHALL BE NEMA 7.

WIRING DEVICES

PROVIDE AS INDICATED.

CIRCUIT PROTECTION DEVICES

GENERAL

1. CIRCUIT BREAKERS SHALL BE OF THE PLUG-ON TYPE. UNLESS OTHERWISE SHOWN, BREAKERS SHALL BE RATED AT 20 AMPERES.
2. CIRCUIT BREAKERS SHALL HAVE A MINIMUM INTERRUPTING RATING OF 10,000 AMPERES RMS SYMMETRICAL AT 240 VAC OR 14,000 AMPERES AT 480 VAC UNLESS OTHERWISE SHOWN.

DISCONNECT SWITCHES

1. HEAVY DUTY SAFETY SWITCH, FUSE OR NON-FUSE0 AS NOTED.
2. DISCONNECT SWITCHES SHALL BE G.E. HEAVY DUTY SAFETY SWITCH.

PULL BOXES

1. PULL BOXES SHALL BE USED IN OUTDOOR LOCATIONS FOR SPLICES. SPLICES SHALL BE WATERTIGHT.
2. PULL BOX SHALL BE CONSTRUCTED OF PRECAST CONCRETE AND SCREWED GASKETED COVER WITH STAINLESS STEEL BOLTS.
3. PULL BOX COVER TO WITHSTAND H-2D LOADING.

RELAYS

1. INTRINSIC RELAYS (IR) AND INTRINSIC BARRIERS (IB) SHALL BE SUITABLE FOR USE ON CIRCUITS THAT SERVE HAZARDOUS LOCATIONS AND SHALL BE APPROVED BY FACTORY MUTUAL (FM) FOR USE IN CLASS I, DIV, I AREAS. OUTPUT CONTACTS SHALL BE RATED 5 AMPS AT 120 VAC.
2. INTRINSIC RELAYS SHALL BE GEMS SAFE-PAK, OR EQUAL.
3. INTRINSIC BARRIERS (IB) SHALL BE PEPPER + FUCHS SAFE SNAP, OR EQUAL.

EXTERIOR LIGHTS AND ENCLOSURE

1. EXTERIOR AND ENCLOSURE, 60 WATT INCANDESCENT, ENCLOSED AND GASKETED SUITABLE FOR WET LOCATIONS. PROVIDE GUARD. MANUFACTURER SHALL BE GENERAL ELECTRIC MODEL H7-1-15F-3C-DD.
2. CONTRACTOR TO OPEN DRAIN AND VENT EXISTING VAPORTIGHT LIGHT FIXTURES. REPLACE ANY DAMAGED PARTS IF NECESSARY.

FLOATS

1. EQUALIZATION TANK LEVEL FLOATS SHALL BE MECHANICAL TILTING SWITCH ENCAPSULATED IN PVC. CABLE LENGTH TO BE DETERMINED IN FIELD. MANUFACTURER: FLYGT ENM-10.
2. WET FLOOR/LEAK ALARM FLOAT SWITCH LS-400 SHALL BE BUNA-N FLOAT WITH EPOXY COATED WETTED MATERIALS. FLOAT SHALL BE ABLE TO DETECT LIQUID LEVEL AS LOW AS 5/8 INCH. GEMS MODEL LS3 PART NO. 76707. OR EQUAL.
3. AIR STRIPPER LEVEL FLOAT SHALL BE HORIZONTAL MOUNT WITH POLY FLOAT AND STEM, JACKET WIRE, MINIMUM SPECIFIC GRAVITY OF 0.55, ACTUATION LEVEL OF 0.90 INCHES. GEMS SERIES LS-7 PART NO. 131100.

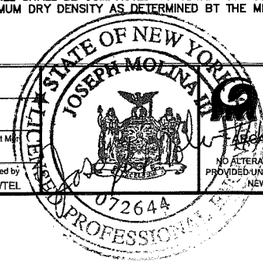
RECORD DRAWINGS
TO THE BEST OF OUR KNOWLEDGE, INFORMATION AND BELIEF, THESE RECORD DRAWINGS SUBSTANTIALLY REPRESENT THE PROJECT AS CONSTRUCTED.

(RECORD DRAWING: MADE FROM DRAWING NO. 9, TRACER NO. 34216075/34216G02.DWG, DATED 1/30/01) DATE_____BY_____

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING: USE TO VERIFY FIGURE REPRODUCTION SCALE

No.	Date	Revisions	By	Ckd

Professional Engineer's Name: JOSEPH MOLINA III
Professional Engineer's No.: 072644
State: NY | Date Signed: 7/31/13 | Project Mgr: GMT
Designed by: AHL/MEE | Drawn by: DCC | Checked by: DRG/TEL



ARCADIS
ARCADIS OF NEW YORK, INC.

BAUSCH & LOMB INCORPORATED • CHILI, NEW YORK
GROUND-WATER COLLECTION AND TREATMENT SYSTEM

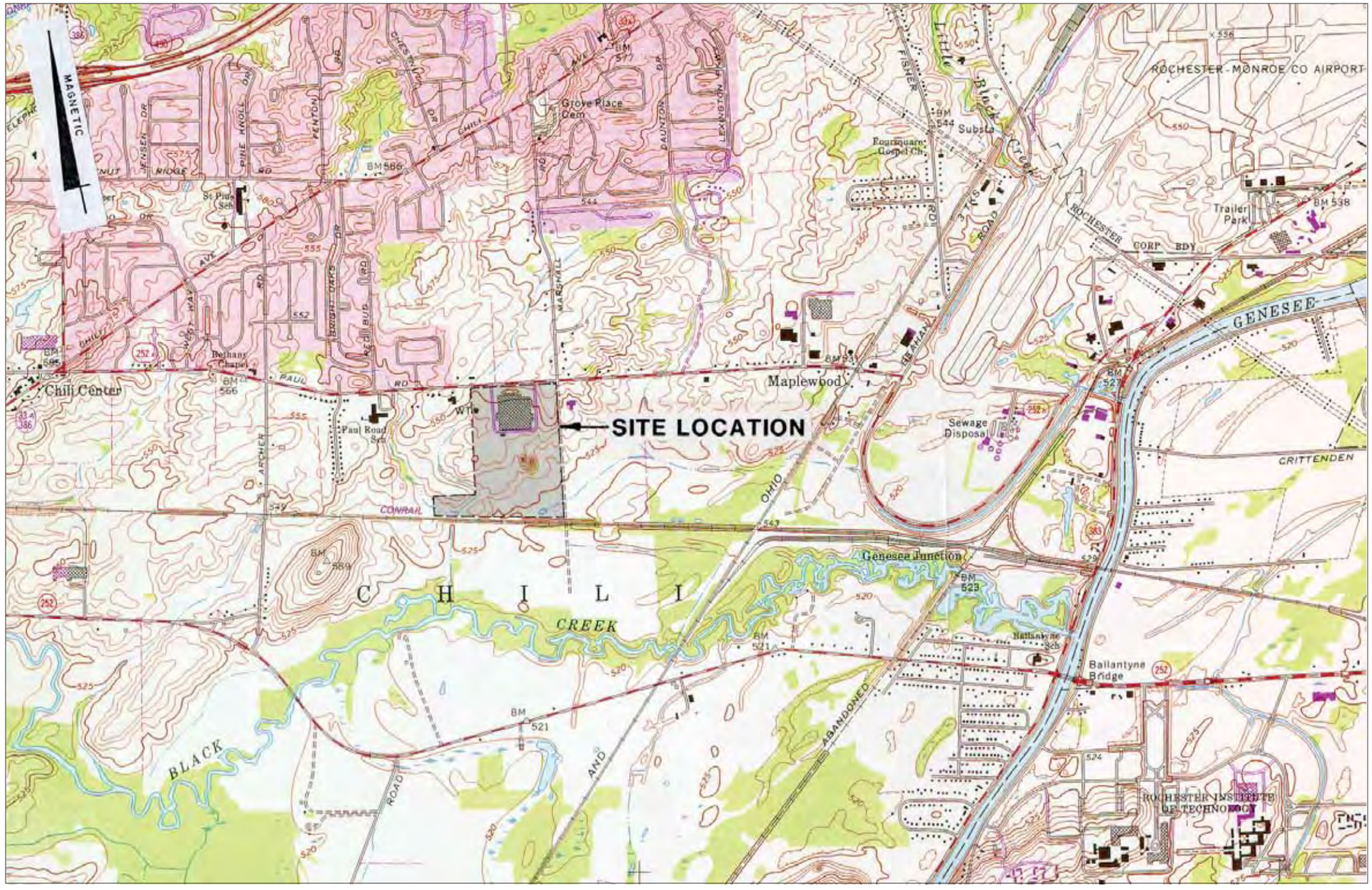
GENERAL NOTES, ABBREVIATIONS, AND SPECIFICATIONS

ARCADIS Project No.: 342.16.02F
Date: JULY 2013
ARCADIS
6723 TOWPATH ROAD
SYRACUSE, NY 13214-0066
TEL. 315.446.9120

9

ARCADIS

Figures



2000' 0 2000'

APPROXIMATE SCALE: 1" = 2000'

REFERENCE: Base Map Source, USGS 7.5 Min. Topo. Quad., West Henrietta, New York. 1978.

BAUSCH & LOMB INCORPORATED
FORMER FRAME CENTER
CHILI, NEW YORK

SITE MANAGEMENT PLAN

SITE LOCATION MAP

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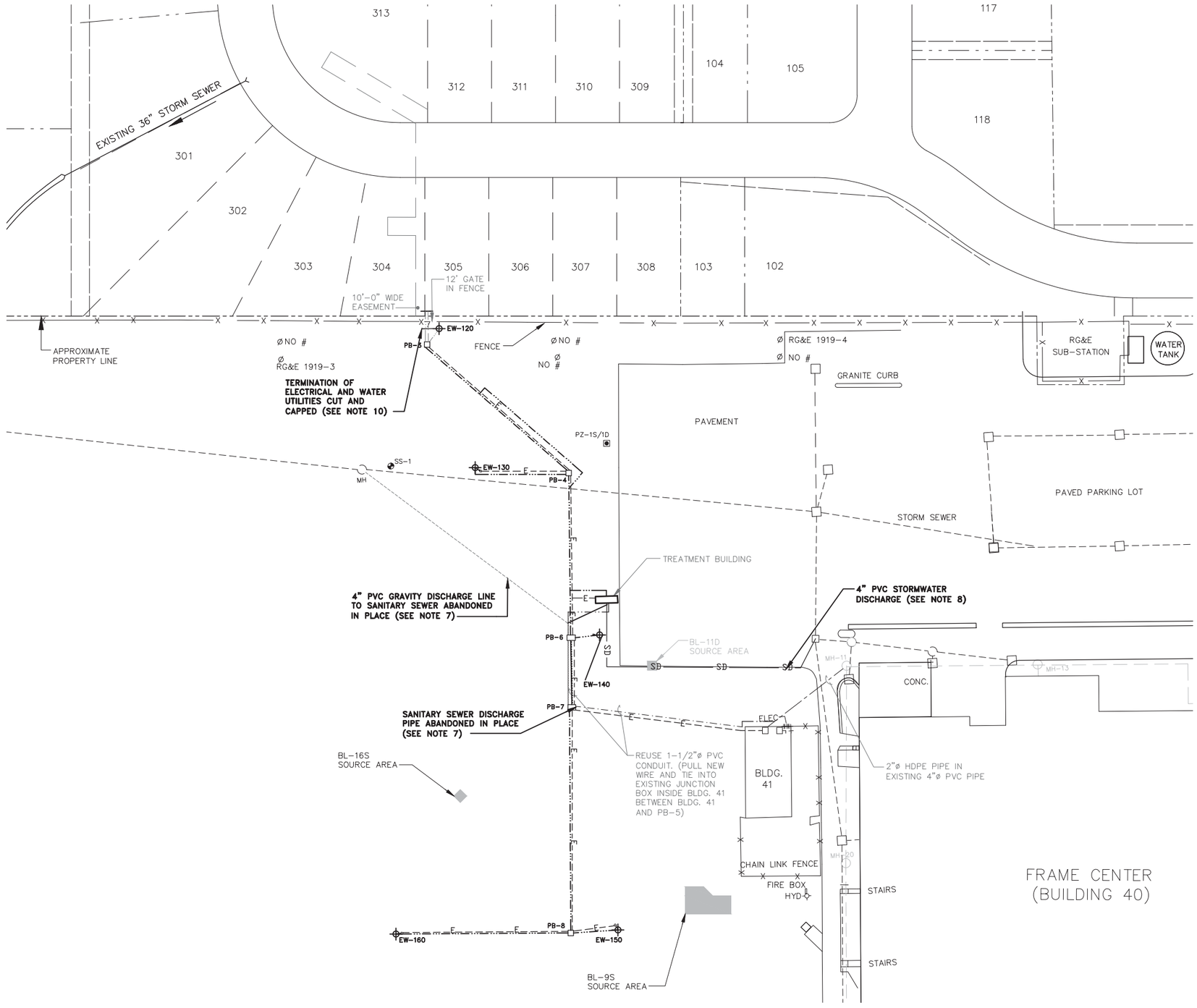
FIGURE
1

07/29/2013 SYRACUSE, NY-ENV/CAD-DJHOWES, K.SARTORI
B003422\2013\300001/CDR/SMP/34221N01.CDR



LEGEND:

- MONITORING WELL INSTALLED IN SHALLOW OVERBURDEN
- MONITORING WELL INSTALLED AT BASE OF OVERBURDEN/TOP OF ROCK
- SS — STAINLESS STEEL WELL POINT
- CATCH BASIN
- MANHOLE
- 1"ø NESTED PIEZOMETER
- ø — TELEPHONE POLE
- 6" EXTRACTION WELL AND CONTROL PANEL
- PB-1 — PULL BOX
- DISCHARGE TO SANITARY SEWER
- EXISTING PIPE TRENCH
- GROUNDWATER COLLECTION PIPE
- E — ELECTRIC SUPPLY
- CULVERT PIPE
- APPROXIMATE ADJACENT TRACT BOUNDARY
- APPROXIMATE PROPOSED LOT BOUNDARY
- APPROXIMATE EXISTING LOT BOUNDARY
- APPROXIMATE EASEMENT BOUNDARY
- SD — STORMWATER COLLECTION PIPE
- EXISTING DISCHARGE TO SANITARY SEWER
- x — x — FENCE
- SOURCE AREA
- GRAVITY LINE TO SURFACE WATER

NOTES:

1. SITE PLAN FOR THE ON-SITE AREAS COMPILED FROM EXISTING SITE PLANS PROVIDED BY BAUSCH & LOMB AND SITE SURVEYS TO LOCATE ALL MONITORING WELLS BY BBL DATED 6/17/92, REVISED 4/13/94, 8/13/98, AND 10/28-29/98.
2. LOCATIONS OF PROPERTY LINES, SUBSURFACE UTILITIES AND LIMITS OF BUILDINGS AND PARKING AREAS ARE APPROXIMATE.
3. ADJACENT PROPERTY INFORMATION FROM TRACT MAPS PREPARED BY LADIEU ASSOCIATES P.C.; LOT NUMBERS 101 TO 118 AND 201 TO 208 WERE DESIGNATED BY LADIEU ASSOCIATES P.C.; LOTS IDENTIFIED AS 301 TO 313 ARE IDENTIFIED HERE FOR CONVENIENCE ONLY. INVERT ELEVATION DATUM IS UNKNOWN.
4. LOCATIONS OF EXTRACTION WELLS AND CONTROL PANELS, PULL BOXES, TREATMENT BUILDING, GROUNDWATER COLLECTION PIPE, CULVERT PIPE, ELECTRICAL SUPPLY CONDUIT, AND FUTURE GRAVITY LINE PER BBLES SURVEY CONDUCTED AFTER CONSTRUCTION OF GROUNDWATER COLLECTION AND TREATMENT SYSTEM.
5. BOLD TEXT INDICATES NEW, NON-BOLD TEXT INDICATES EXISTING (REFERS TO ALL DRAWINGS IN THIS CONTRACT).
6. NEW DISCHARGE PIPE TO SURFACE WATER BEGINNING INVERT TO BE AT ELEVATION 543.64 FEET ASL. CONNECTION TO MANHOLE TO BE COMPLETED AT 537.31 ASL.
7. DISCHARGE PIPING TO SANITARY SEWER WAS ABANDONED IN PLACE IN AUGUST 2011. 4" PVC DISCHARGE LINE WAS CUT AND CAPPED WITH A GLUED ON PVC PIPE CAP BELOW GRADE. 2" HDPE DISCHARGE LINE WAS CUT AND CAPPED WITH A STAINLESS STEEL CLAMP BELOW GRADE.
8. NEW 4" PVC STORMWATER DISCHARGE PIPE INSTALLED AUGUST 2011.
9. THE OFF-SITE GROUNDWATER COLLECTION TREATMENT SYSTEM EXTRACTION WELLS EW-100 AND EW-110 ASSOCIATED UTILITIES WERE DISCONNECTED AND REMOVED IN FEBRUARY 2013, FOLLOWING NYSDEC APPROVAL ON DECEMBER 14, 2012.
10. OFF-SITE GWCTS ELECTRICAL TERMINATED BELOWGRADE AND CAPPED WITH WIRE NUTS. GROUNDWATER PIPING TERMINATED BELOW GRADE AND CAPPED WITH CLAMP ON METAL AND PVC PIPE CAPS.

BAUSCH & LOMB INCORPORATED
FORMER FRAME CENTER
CHILI, NEW YORK
SITE MANAGEMENT PLAN

SITE PLAN

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FIGURE
2

CITY: SYRACUSE,NY DIV/GROUP: ENV/CAD DB: DCC SD, K.SARTORI PIC: PM:/TM: L.PRESTON LYR:ON=*;OFF=*REF*
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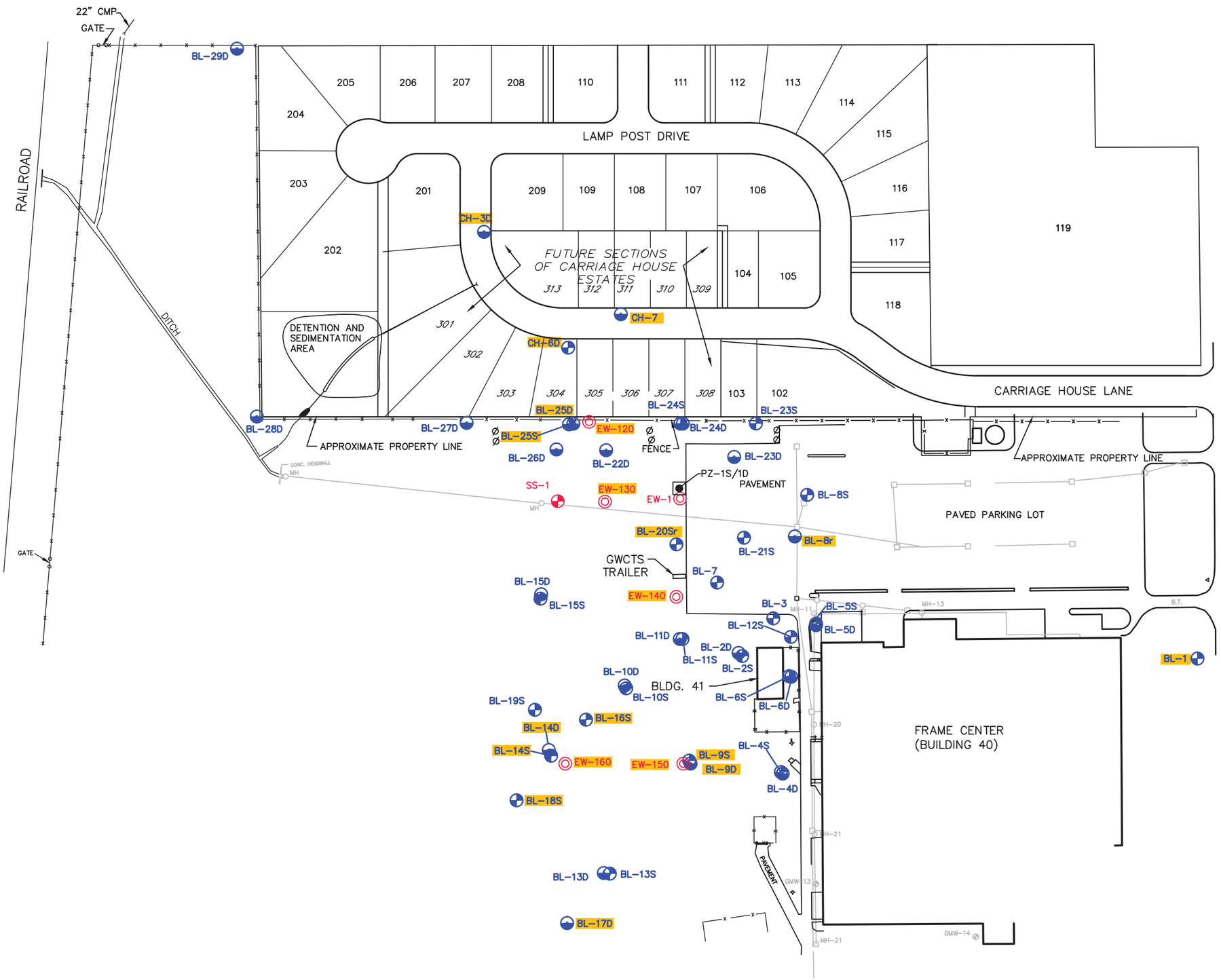

LEGEND:

- MONITORING LOCATION TO BE SAMPLED SEMI-ANNUALLY
- MONITORING WELL INSTALLED IN SHALLOW OVERBURDEN
- MONITORING WELL INSTALLED AT BASE OF OVERBURDEN/TOP OF ROCK
- STAINLESS STEEL WELL POINT
- CATCH BASIN
- MANHOLE
- 6"ø EXTRACTION WELL
- 1"ø NESTED PIEZOMETER
- APPROXIMATE ADJACENT TRACT BOUNDARY
- APPROXIMATE PROPOSED LOT BOUNDARY
- APPROXIMATE EXISTING LOT BOUNDARY
- APPROXIMATE EASEMENT BOUNDARY
- FENCE
- RG&E POWER POLE

NOTES:

1. SITE PLAN FOR THE ON-SITE AREAS COMPILED FROM EXISTING SITE PLANS PROVIDED BY BAUSCH & LOMB AND SITE SURVEYS TO LOCATE ALL MONITORING WELLS BY BB&L DATED 6/17/92, REVISED 4/13/94, 8/13/98, 10/28-29/98, AND 10/11/00.
2. LOCATIONS OF PROPERTY LINES, SUBSURFACE UTILITIES AND LIMITS OF BUILDINGS AND PARKING AREAS ARE APPROXIMATE.
3. ADJACENT PROPERTY INFORMATION FROM TRACT MAPS PREPARED BY LADIEU ASSOCIATES P.C.; LOT NUMBERS 101 TO 118 AND 201 TO 208 WERE DESIGNATED BY LADIEU ASSOCIATES P.C.; LOTS IDENTIFIED AS 301 TO 313 ARE IDENTIFIED HERE FOR CONVENIENCE ONLY. INVERT ELEVATION DATUM IS UNKNOWN.
4. EXTRACTION WELLS EW-100 AND EW-110 AND MONITORING WELLS CH-1, CH-3S, CH-4, CH-5S, CH-5D, CH-6S, CH-8S AND CH-8D WERE DECOMMISSIONED IN FEBRUARY 2013 BY OVERDRILLING AND TREMIE GROUTING.

0 200' 400'

GRAPHIC SCALE

BAUSCH & LOMB INCORPORATED
FORMER FRAME CENTER
CHILI, NEW YORK

SITE MANAGEMENT PLAN

SEMI-ANNUAL MONITORING LOCATIONS

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FIGURE 3

CITY: SYRACUSE,NY DIV/GROUP: 141/ENVCAD DB: LJPOSENAUER L. FORAKER LD:(Opt) PIC:(Opt) PM:(Reqd) TM:(Opt) LYR:(Opt)ON=*;OFF=*REF*
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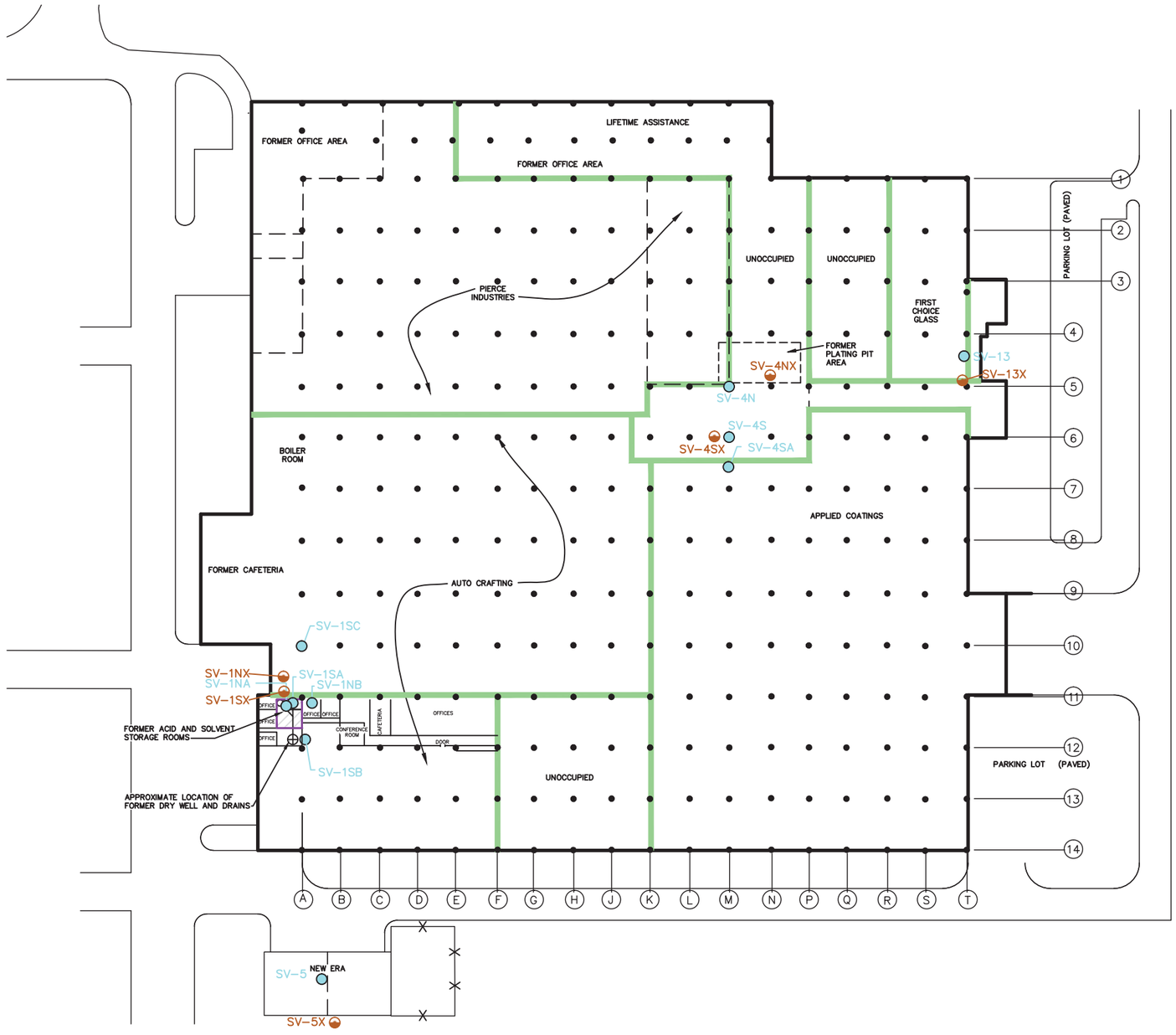

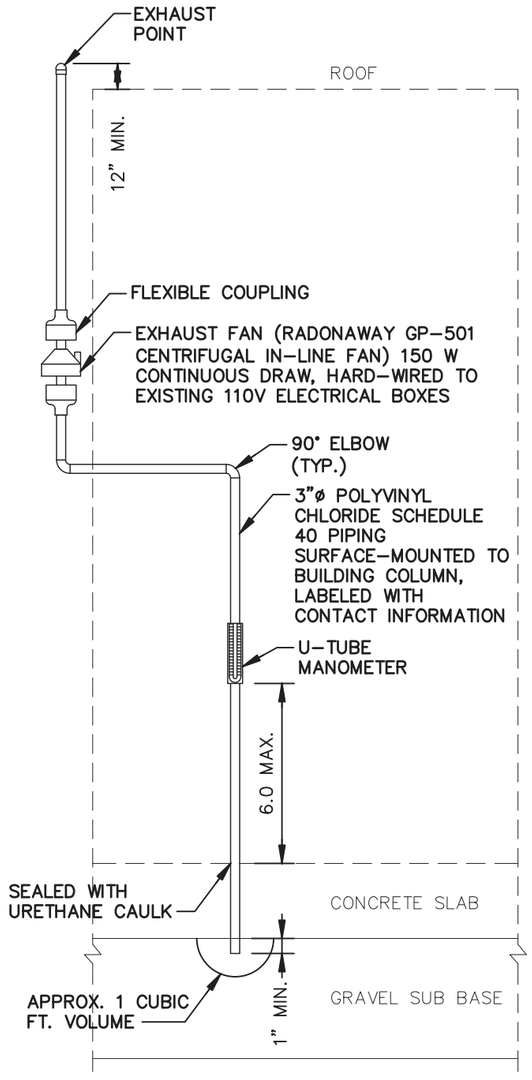

GENERAL SYSTEM PROFILE

NOT TO SCALE

NOTES:

1. ALL LOCATIONS APPROXIMATE.
2. BASE MAP PREPARED FROM FIGURE 3 OF THE REMEDIAL INVESTIGATION REPORT (REVISED OCTOBER 1993) PREPARED BY BLASLAND, BOUCK & LEE, INC. MODIFIED BY SITE OBSERVATIONS ON DECEMBER 13, 2005.

LEGEND:

- INTERIOR WALL
- LIMIT OF OCCUPANCY
- (10) BUILDING COLUMN AND IDENTIFIER
- SV-5 APPROXIMATE SYSTEM SUCTION LOCATION
- SV-5X APPROXIMATE SYSTEM EXHAUST LOCATION

0 100' 200'
GRAPHIC SCALE

BAUSCH & LOMB INCORPORATED
FORMER FRAME CENTER
CHILI, NEW YORK
SITE MANAGEMENT PLAN

SUB-SLAB DEPRESSURIZATION SYSTEMS DETAIL

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FIGURE 4

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Forms

Form 1. Monitoring Log for _____ 20__, Site Management Plan, Groundwater Collection and Treatment System, Former Bausch Lomb Frame Center, Chili, NY

Weekly														
		Flow Rate (gpm)								Effluent Meter Reading (gal)	Bag Filter Pressure (psi)	Bag Filter Changed? Y or N	System Check Y or N	Name and Company Performing the System Monitoring
Date	Time	EW-100	EW-110	EW-120	EW-130	EW-140	EW-150	EW-160	Effluent Pump					

Quarterly			
Date	Time	Obtained system effluent sample in accordance with discharge permit? Yes or No	Name and Company Performing the System Monitoring
Weekly pH Monitoring for Discharge			

Annual							
Date	Time	Well Head Piping Leak Check	Operate Well Head and GWCTS Valves	Verify System Interlock Operation	Inspect Flow Meters, Pressure/Level Gauges & Switches	Comments	Name and Company Performing the System Monitoring

Note:
System check includes: checking the equalization tank, bag filter, air stripper, and all related indoor piping for leaks (and repair if necessary), checking the equalization tank for excessive sludge, and visually checking the air stripper.

Form 2. Monthly Maintenance Log for _____ 20__, Site Management Plan, Groundwater Collection and Treatment System, Former Bausch Lomb Frame Center, Chili, NY

Date	Time of Alarm Notification	Time Arrived on Site	Time Departed from Site	Description of Maintenance Performed	Reason for Maintenance	Name and Company Performing Maintenance

Form 3. Monthly Measurements, Site Management Plan, Sub-Slab Depressurization System, Former Bausch Lomb Frame Center, Chili, NY

Location	Date	Time	System Manometer Reading (negative inches of water)	Comments
Dry Well (SV-1N)				
Dry Well (SV-1S)				
Plating North (SV-4N)				
Plating South (SV-4S)				
Bldg 41 (SV-5)				
WWT Area (SV-13)				
Dry Well (SV-1N)				
Dry Well (SV-1S)				
Plating North (SV-4N)				
Plating South (SV-4S)				
Bldg 41 (SV-5)				
WWT Area (SV-13)				

Notes:
? = Meter issue (photoionization detector [PID] clogged with dust)
NA = Not Available
ppb = parts per billion
ppm = parts per million

Form 4. Sub-Slab Depressurization System Monitoring and Maintenance Form, Site Management Plan, Former Bausch Lomb Framer Center, Chili, NY

Sub-Slab Depressurization System ID:_____ **Inspected By:**_____

Location (Building, Area):_____ **Date:**_____

Structure Review	**Yes**	**No**	**Comments**
Have the owner(s) / occupant(s) changed?			
Have any changes been made to the structure?			
Are there any new/additional gas combustion appliances? If yes, evaluate the potential for backdrafting.			
Are there any new/additional air intakes? If yes, describe, including distance to closest system exhaust.			
Have there been any repairs made or recent damage to the floor or walls near the systems? If yes, check for leaks.			
Are there any leaks or cracks that need to be addressed? (Check for leaks at piping joints or in floor or wall penetrations using a smoke puffer and listening for any whistling or other air movement-related noises).			
Are revisions needed to the site map? If yes, describe and provide markup (use space below, attach figure with markup if needed).			
Mitigation System Review	**Yes**	**No**	**Comments**
Is the fan operating normally (e.g., there are no unusual sounds or vibrations; describe if present)? (Do not attempt to open fan case.)			
Is the fan and associated piping mounted securely, vibration free, and intact?			
Is the u-tube manometer operating normally and securely mounted?			
Is the pressure differential in the system piping on the suction side of the fan consistent with the prior reading(s)? (Record the reading, and if pressure differential is less than prior reading(s), then sub-slab communication testing should be performed. Verify less than maximum operating pressure; e.g., 3.8" for GP-501 fan at sea level.)			
Does the fan shut off and on as expected when the switch is turned off and on? (make sure fan is locked in on position before leaving)			
Does the electrical system conduit and/or wiring appear secure and intact (e.g., is the insulation free of cracks)?			
Is the system labeling intact, visible and accurate?			
Overall System Performance			
Is the system not operating? (fan may need to be replace and/or an electrical issue may require an electrical contractor or licensed electrician).			
Is sub-slab communication testing required? (This is indicated if the pressure differential in the system piping on the suction side of the fan differs significantly from the previous reading.)			
If leaks or cracks were identified, have they been addressed?			
If backdrafting conditions were identified, have they been addressed?			
Does any additional maintenance need to be scheduled?			

Appendix A

Health and Safety Plan

ARCADIS
Infrastructure, environment, buildings

Imagine the result

Bausch & Lomb

Health and Safety Plan

Former Bausch & Lomb Frame Center
Chili, New York

August 2010

ARCADIS

Health and Safety Plan

Former Bausch & Lomb
Frame Center
Chili, New York

Prepared for:
Bausch & Lomb

Prepared by:
ARCADIS
6723 Towpath Road
P.O. Box 66
Syracuse
New York 13214-0066
Tel 315.446.9120
Fax 315.446.8053

Our Ref.:
B0034221.0001.00001

Date:
August 2010

Approvals and Acknowledgments

Approvals

I have read and approved this *Health and Safety Plan* (HASP) with respect to project hazards, regulatory requirements and procedures.

Project Name: Former Bausch & Lomb Frame Center Site, Chili, NY

Project Manager/Date

Health and Safety Officer/Date

Health and Safety Supervisor/Date

Acknowledgments

The final approved version of this HASP has been provided to the site supervisor. I acknowledge my responsibility to provide the site supervisor with the equipment, materials and qualified personnel to implement fully all safety requirements in this HASP. I will formally review this plan with the Health and Safety Staff every 6 months until project completion.

Project Manager/Date

I acknowledge receipt of this HASP from the project manager, and that it is my responsibility to explain its contents to all site personnel and cause these requirements to be fully implemented. Any change in conditions, scope of work, or other change that might affect worker safety requires me to notify the project manager and/or the health and safety officer.

Site Supervisor/Date

Health and Safety Plan Acknowledgement

I have read this Site-Specific Health and Safety Plan, or its contents have been presented to me, and I understand the contents and I agree to abide by its requirements.

Name (Print)	Signature	Representing	Date

1. Introduction

1.1 Objective

The objective of site activities is to perform site monitoring, necessary maintenance and sampling associated with the Groundwater Collection Treatment System (GWCTS) and Sub-Slab Depressurization System (SSDS) installed at the former Bausch & Lomb Frame Center facility located at 465 Paul Road in Chili, New York. The activities anticipated will include the following:

- Mobilization
- Maintenance and Sampling of the GWCTS
- Maintenance of the SSDS
- Groundwater Sampling and Water Level Measurements
- Soil Vapor Sampling
- Decontamination
- Demobilization

The objective of this Health and Safety Plan (HASP) is to provide a mechanism for establishing safe working conditions at the site. The safety organization, procedures, and protective equipment have been established based on an analysis of potential physical, chemical, and biological hazards. Specific hazard control methodologies have been evaluated and selected to minimize the potential of accident or injury.

1.2 Site and Facility Description

The former Frame Center property (the site) is located on the south side of Paul Road, approximately 1.5 miles east of the intersection of State Route 33A and Paul Road in Chili, New York (Figure 1). The Frame Center property is approximately 89 acres in size and is bordered to the north by Paul Road, and an 8-foot-high chain-link fence along the southern and most of the eastern and western site boundaries (Figure 2).

The site was comprised of one main building (Building 40) located in the northern portion of the property and a smaller building (Building 41) located adjacent to and south of Building 40. Building 40 is approximately 354,000 square feet in size and housed the production area, as well as offices, cafeteria, and other associated facilities when owned by Bausch & Lomb. Building 41 is approximately 5,000 square feet in size and was used by Bausch & Lomb for vehicle maintenance and general storage.

Paved parking areas abut the western sides of both buildings, and a paved driveway runs along the eastern side of Building 40 and between Buildings 40 and 41. A small gravel-covered general parking area adjoins the southern side of the main asphalt parking area southwest of Building 41. South of the buildings and parking areas the property is covered with open-field-type vegetation, including grasses, shrubs, and herbaceous plants.

The former Frame Center was constructed in 1961 and was enlarged in 1966. Based on site history and a review of the building construction, it was determined that the southern portion of Building 40 (i.e., the area south of column line 11) is located on a separate foundation system from the balance of the building; this area represents the 1966 addition to the original building. Historic operations at the facility included the production of plastic and metal eyeglass frames. A variety of materials, including solvents and plating metals, were used at the facility throughout its operational history for the production of eyeglass frames. The exact location of particular processes changed throughout the operational history of the facility in response to changing production and marketing needs (BBL, 1999a).

Since Bausch & Lomb sold the property, the space within Building 40 has gradually shifted from an unoccupied large open space, to subdivided areas occupied by various tenants for use as warehousing, manufacturing and office space.

1.3 Policy Statement

The objective is to provide a safe and healthful work environment. No aspect of operations is of greater importance than injury and illness prevention. A fundamental principle of safety management is that all injuries, illnesses, and incidents are preventable. All site personnel should take every reasonable step to eliminate or control hazards to minimize the possibility of injury, illness, or incident.

This HASP prescribes the procedures that must be followed while performing site activities. Operational changes that could affect the health and safety of personnel, the community, or the environment will not be made without prior approval of the project manager (PM) and the health and safety officer (HSO). This document will be reviewed periodically to confirm that it is current and technically correct. Any changes in site conditions and/or the scope of work will require a review of and modification to this HASP. Such changes will be completed in the form of an addendum or a revision to the HASP.

The provisions of this HASP are mandatory for all personnel and subcontractors assigned to the project. All visitors to work areas at the site must abide by the requirements of this HASP.

This HASP complies with applicable Occupational Safety and Health Administration (OSHA) regulations, United States Environmental Protection Agency (USEPA) *Standard Operating Safety Guidelines* (USEPA, 1992) and follows the guidelines established in the references listed in Section 11.

1.4 Definitions

The following definitions (listed alphabetically) are applicable to this HASP:

- *Contamination-Reduction Zone (CRZ)*—Area between the exclusion zone and support zone that provides a transition between contaminated and clean areas. Decontamination stations are located in this zone.

- *Emergency*—Any occurrence (including any failure of hazard control or monitoring equipment) or event (internal or external) to the permit space that could endanger confined space entrants.

- *Exclusion Zone (EZ)*—Any portions of the site where hazardous substances are present, or are reasonably suspected to be present, and pose an exposure hazard to onsite personnel.

- *Incident*—All losses, including first-aid cases, injuries, illnesses, near misses, spills/leaks, equipment and property damage, motor vehicle accidents, regulatory violations, fires, and business interruptions.

- *Near Miss*—An incident in which no injury, illness, motor vehicle accident, equipment or property damage, etc., occurred, but under slightly different circumstances could have occurred.

- *Project*—All onsite work performed under the scope of work.

- *Site*—The area described in Section 1.2, Site and Facility Description, where the work is to be performed by site personnel and subcontractors.

- *Subcontractor*—Includes contractor personnel hired by Bausch & Lomb.

- *Support Zone (SZ)*—All areas of the site, except the EZ and CRZ. The SZ surrounds the CRZ and EZ. Support equipment and break areas are located in this zone.

- *Visitor*—All other personnel, except the onsite personnel.

- *Work Area*—The portion of the site where work activities are actively being performed. This area may change daily as work progresses and includes the SZ, CRZ, and EZ. If the work area is located in an area onsite that is not contaminated, or suspected of being contaminated, the entire work area may be an SZ.

2. Roles and Responsibilities

2.1 All Personnel

All personnel and subcontractors must adhere to the procedures outlined in this HASP during the performance of their work. Each person is responsible for completing tasks safely and reporting any unsafe acts or conditions to their supervisor. No person may work in a manner conflicting with these procedures. After due warnings, the PM will dismiss from the site any person who violates safety procedures.

All personnel will receive training in accordance with applicable regulations, and be familiar with the requirements and procedures contained in this HASP prior to initiating site activities. In addition, all personnel will attend an initial hazard briefing prior to beginning work at the site.

The roles of personnel are outlined in the following subsections. A summary table for key project personnel and contacts is provided below.

Table 2-1. Key Personnel

Bausch & Lomb Key Personnel		
Title/Role	**Name**	**Address/Telephone No.**
Client/Onsite Rep. Project Manager	Frank Chiappone, Manager, Global Environmental Affairs	Bausch & Lomb One Bausch & Lomb Place Rochester, New York 14604-2701 585.338.5087 (work) 585.764.7556 (cell)
Project Manager	Various	Various
Health & Safety Supervisor	Various	Various
Site Supervisor	Various	Various
Health and Safety Officer	Various	Various
Subcontractor Personnel		
Company/Role	**Name**	**Address/Telephone No.**
ARCADIS (Consultant)	Scott Powlin	6723 Towpath Road PO Box 66 Syracuse, NY 13214-0066 315.446.9120
Paradigm Environmental Services, Inc. (Laboratory)	Marshall Shannon/ Bruce Hoogestegger	179 Lake Avenue Rochester, New York 14608 585.647.2530

2.2 Site Personnel

2.2.1 Health and Safety Officer

The HSO or his/her designee (the Health and Safety Manager) has overall responsibility for the technical health and safety aspects of the project, including review and approval of this HASP. Inquiries regarding health and safety procedures, project procedures, and other technical or regulatory issues should be addressed to this individual. The HSO or his/her designee must approve changes or addenda to this HASP.

2.2.2 Project Manager

The PM is responsible for verifying that project activities are completed in accordance with the requirements of this HASP. The PM is responsible for confirming that the site supervisor (SS) has the equipment, materials, and qualified personnel to fully implement the safety requirements of this HASP. It is also the responsibility of the PM to perform the following duties:

- Consult with the HSO onsite health and safety issues
- Verify that all incidents are thoroughly investigated and reported to the Bausch & Lomb Project Manager within 24 hours of notification
- Approve, in writing, addenda or modifications to this HASP
- Suspend work or modify work practices, as necessary, for personal safety, protection of property, and regulatory compliance

2.2.3 Health and Safety Supervisor

The health and safety supervisor (HSS) is responsible for field health and safety issues, including the execution of this HASP. Questions in the field regarding health and safety procedures, project procedures, and other technical or regulatory issues should be addressed to this individual. The HSS will advise the PM on health and safety issues, and will establish and coordinate the project air monitoring program if one is deemed necessary (see Section 6.1, Air Monitoring). The HSS is the primary site contact on health and safety matters. It is the responsibility of the HSS to perform the following duties:

- Provide onsite technical assistance, if necessary
- Participate in all incident investigations (IIs), and confirm that they are reported to the HSM/HSO, PM, and Bausch & Lomb before end of shift
- Coordinate site and personal air monitoring, as required, including equipment maintenance and calibration
- Conduct site safety orientation training and safety meetings
- Verify that site personnel have received the required physical examinations and medical certifications
- Review site activities with respect to compliance with this HASP
- Maintain required health and safety documents and records
- Assist the SS in instructing field personnel on project hazards and protective procedures

2.2.4 Site Supervisor

The SS is responsible for implementing this HASP, including communicating requirements to onsite personnel. The SS will be responsible for informing the PM of changes in the work plan, procedures, or site conditions so that those changes may be addressed in this HASP. Other responsibilities are to perform the following duties:

- Consult with the HSS onsite health and safety issues
- Stop work, as necessary, for personal safety, protection of property, and regulatory compliance
- Obtain a site map, determine and post routes to medical facilities, and post emergency telephone numbers
- Notify local public emergency representatives (as appropriate) of the nature of the site operations and post their telephone numbers (e.g., local fire department personnel who would respond for a confined-space rescue)

- Observe onsite project personnel for signs of ill-health effects
- Investigate and report any incidents to the HSS
- Verify that all onsite personnel have completed applicable training
- Verify that onsite personnel are informed of the physical, chemical, and biological hazards associated with the site activities and the procedures and protective equipment necessary to control the hazards
- Issue/obtain any required work permits (hot work, confined space, etc.)

2.3 All Onsite Personnel

All onsite personnel must read and acknowledge their understanding of this HASP before commencing work, and abide by the requirements of the HASP. All onsite personnel must sign the HASP Acknowledgement Form after reviewing this HASP.

All onsite personnel will receive training in accordance with applicable regulations, and be familiar with the requirements and procedures contained in this HASP prior to initiating site activities. In addition, all onsite personnel will attend an initial hazard briefing (prior to beginning work at the site) and the daily safety meetings.

Safety issues should be either eliminated or mitigated prior to starting work. Risk assessment must also be performed after any near-miss or other incident to determine if it is safe to proceed. Onsite personnel will immediately report the following to the SS or HSS:

- Personal injuries and illnesses, no matter how minor
- Unexpected or uncontrolled release of chemical substances
- Symptoms of chemical exposure
- Unsafe or hazardous situations
- Unsafe or malfunctioning equipment
- Changes in site conditions that may affect the health and safety of project personnel
- Damage to equipment or property
- Situations or activities for which they are not properly trained
- Near misses

2.4 Stop Work Authority

Every employee or subcontractor at the site has the responsibility to stop the work of a coworker or if the working conditions or behaviors are considered unsafe.

2.5 Visitors

All visitors to within designated work areas must check in with the SS. Visitors will be cautioned to avoid skin contact with surfaces, soils, or other materials that may impacted or be suspected to be impacted by constituents of concern (COC).

Visitors requesting to observe work at the site must don appropriate personal protective equipment (PPE) prior to entry to the work area and must have the appropriate training and medical clearances to do so. If respiratory protective devices are necessary, visitors who wish to enter the work area must have been respirator-trained and fit tested for a respirator within the past 12 months.

3. Project Hazards and Control Measures

3.1 Introduction

Field activities will include the following tasks:

- Mobilization
- Maintenance and Sampling of the GWCTS
- Maintenance of the SSDS
- Groundwater Sampling and Water Level Measurement
- Soil Vapor Sampling
- Decontamination
- Demobilization

The following activity analyses identify potential health, safety, and environmental hazards associated with each type of field activity listed above. Because of the complex and changing nature of field projects, supervisors must continually inspect the site to identify hazards that may affect onsite personnel, the community, or the environment. The SS must be aware of these changing conditions and discuss them with the PM whenever these changes impact employee health, safety, the environment, or performance of the project. The SS will keep onsite personnel informed of the changing conditions and the PM will write and/or approve addenda or revisions to this HASP as necessary.

Each field activity is described below, and potential hazards and control measures for each activity are discussed.

3.2 Mobilization

Site mobilization and site surveying will include the following activities:

- Identify sampling locations
- Recognize potential tasks associated with the maintenance of the SSDS and GWCTS
- Determine the location of utilities and other installations
- Establish work areas

A break area will be set up outside of regulated work areas. Mobilization may involve identifying areas for the SZ and CRZ. During this initial phase, project personnel will

walk the site to confirm the existence of anticipated hazards and identify safety and health issues that may have arisen since the writing of this HASP.

Hazards –hazards associated with mobilization activities consist of the following:

- Heavy equipment operation into, out of and around the site
- Manual materials handling
- Installing temporary onsite facilities
- Manual site preparation
- Plants, such as poison ivy and poison oak
- Aggressive fauna, such as ticks, fleas, mosquitoes, wasps, spiders, and snakes
- Weather, such as sunburn, lightning, rain, and heat- or cold-related illnesses
- Pathogens, such as rabies, Lyme disease, and blood-borne pathogens

Heavy equipment operation, manual materials handling, and manual site preparation may cause blisters, sore muscles, and joint and skeletal injuries; manual materials handling may also present eye, contusion, and laceration hazards. Installing temporary field office and support facilities may expose personnel to electrical hazards, underground and overhead utilities, and physical injury due to manually lifting and moving materials. The work area presents slip, trip, and fall hazards from scattered debris and irregular walking surfaces. The flora and fauna of the site may present hazards of poison ivy, poison oak, ticks, fleas, mosquitoes, wasps, spiders, and snakes. Blood-borne pathogens such as rabies and Lyme disease may also present hazards at the site. The work area presents slip, trip, and fall hazards from scattered debris and irregular walking surfaces. Rainy weather may cause wet, muddy, slick walking surfaces and unstable soil. Freezing weather hazards include frozen, slick, and irregular walking surfaces.

Controls – Procedures for the above listed hazards are discussed in Section 4, General Safety Practices.

3.3 Maintenance and Sampling of the Groundwater Collection and Treatment System

Maintenance and of the GWCTS equipment consists of conducting equipment inspections and maintenance, and waste disposal inspections activities of the system which involve a potential for exposure to physical and health hazards. GWCTS sampling consists of obtaining water samples from the GWCTS to evaluate the effectiveness of the system, potential migration of constituents, and determine if there are exceedances of the State Pollution Discharge Elimination System (SPDES)

standards. Inhalation and absorption (contact) of constituents are the primary routes of entry associated with sampling activities due to the manipulation of sample media and equipment, manual transfer of media into sample containers, and proximity of operations to the breathing zone. To control dermal exposure during sampling activities, a minimum of modified Level D protection will be worn.

Hazards – The hazards involved with GWCTS equipment inspections and maintenance, and waste disposal inspections relate to work done with heavy equipment, hand tools and the site environment itself. There exists a potential for incidents involving personnel struck by or struck against equipment or materials, resulting in fractures, cuts, punctures, or abrasions. Walking and working surfaces during activities may involve slip, trip, and fall hazards. Electrical hazards associated with operating equipment exist during inspection and maintenance activities. Inhalation, ingestion, or transdermal exposure to potentially toxic constituents may be encountered during sampling activities.

Slippery work surfaces can increase the likelihood of back injuries, overexertion injuries, slips and falls. All personnel should frequently inspect working surfaces and keep working surface clear of debris. All personnel must pay close attention to weather conditions and their impact on working and walking surfaces.

The most common type of accident that occurs in material handling operations is the "caught between" situation when a load is being handled and an appendage gets caught between two objects. Extreme care must be taken when loading and unloading material. Proper lifting technique must be employed, and mechanical means must be used to lift objects whenever possible.

Due to the type of work involved, the primary health hazards involve repetitive motion disorders, lifting and other ergonomic stressors. Noise may also present a hazard. Operation of heavy equipment, power tools and pneumatic hand tools frequently results in high noise levels. Personnel involved in site activities associated with these tasks may be exposed to skin contact with groundwater containing site constituents of concern (COCs).

Controls – Prior to initiating work, the operation will be explained to all employees. Hazards will be identified and protective measures will be explained. Appropriate PPE, as specified in Section 5 of this HASP, must be worn at all times. Equipment will be inspected and in proper working condition. Employees should receive training to address the equipment, its operations and care. Personnel should be scheduled in a

manner to reduce the likelihood of performing repetitive tasks for prolonged periods. Mechanical assistance should be provided for large lifting tasks. Hearing protection is required for use when exposed to noise levels exceeding 85 decibels (dBA), or a level which commonly results in difficult conversation. Control procedures for environmental and general hazards are discussed in Section 4, General Safety Practices.

3.4 Maintenance of Sub-Slab Depressurization System Equipment

Maintenance of the SSDS equipment consists of conducting equipment inspections and maintenance which involve a potential for exposure to physical and health hazards. Hazards may be associated with the materials used in the above-mentioned site activities themselves.

Hazards – The hazards involved with SSDS equipment inspections and maintenance relate to work done with heavy equipment, hand tools and the site environment itself. There exists a potential for incidents involving personnel struck by or struck against equipment or materials, resulting in fractures, cuts, punctures, or abrasions. Walking and working surfaces during activities may involve slip, trip, and fall hazards. Electrical hazards associated with operating equipment exist during inspection and maintenance activities.

Slippery work surfaces can increase the likelihood of back injuries, overexertion injuries, slips and falls. All personnel should frequently inspect working surfaces and keep working surface clear of debris. All personnel must pay close attention to weather conditions and their impact on working and walking surfaces.

The most common type of accident that occurs in material handling operations is the “caught between” situation when a load is being handled and an appendage gets caught between two objects. Extreme care must be taken when loading and unloading material. Proper lifting technique must be employed, and mechanical means must be used to lift objects whenever possible.

Due to the type of work involved, the primary health hazards involve repetitive motion disorders, lifting and other ergonomic stressors. Noise may also present a hazard. Operation of heavy equipment, power tools and pneumatic hand tools frequently results in high noise levels. Personnel involved in site activities associated with these tasks may be exposed to skin contact with soil and/or groundwater containing site constituents of concern (COCs).

Controls: Prior to initiating work, the operation will be explained to all employees. Hazards will be identified and protective measures will be explained. Equipment will be inspected and in proper working condition. Employees should receive training to address the equipment, its operations and care. Personnel should be scheduled in a manner to reduce the likelihood of performing repetitive tasks for prolonged periods. Mechanical assistance should be provided for large lifting tasks. Hearing protection is required for use when exposed to noise levels exceeding 85 decibels (dBA), or a level which commonly results in difficult conversation. Control procedures for environmental and general hazards are discussed in Section 4, General Safety Practices.

3.5 Groundwater Sampling and Water Level Measurement

Groundwater sampling and water level measurement consists of the collection of water samples for subsequent laboratory analysis and evaluation of potential impacts and obtaining water level measurements. The physical hazards of this operation are primarily associated with the sample collection and water level measuring methods, procedures utilized, and the site environment.

Hazards - Ingestion and absorption (contact) of COCs are the primary routes of entry associated with groundwater sampling due to the manipulation of sample media and equipment, manual transfer of media into sample containers, and proximity of operations to the breathing zone. During the course of this project, several different groundwater sampling methodologies may be utilized based on equipment accessibility and the types of materials to be sampled. These sampling methods may include hand or mechanical bailing. The primary hazards associated with these specific sampling procedures are not potentially serious; however, other operations in the area, or the conditions under which samples must be collected, may present chemical and physical hazards. The hazards directly associated with groundwater sampling procedures are generally limited to strains/sprains from hand bailing and potential eye hazards. Exposure to soil and water containing COCs is also possible.

The flora and fauna of the site may present hazards of poison ivy, poison oak, ticks, fleas, mosquitoes, wasps, spiders, and snakes. The work area presents slip, trip, and fall hazards from scattered debris and irregular walking surfaces. Rainy weather may cause wet, muddy, slick walking surfaces and unstable soil. Freezing weather hazards include frozen, slick, and irregular walking surfaces.

Control - To control dermal exposure during water level measurement and groundwater sampling activities, a minimum of Modified Level D protection will be

worn. If necessary, based on field observations and site conditions, air monitoring may be conducted during groundwater sampling activities to assess the potential for exposure to airborne COCs. If the results of air monitoring indicate the presence of organic vapors in a concentration causing concern, personnel will upgrade to Level C protection. Refer to Section 6.1, Air Monitoring, for a description of air monitoring requirements and action levels. A description of each level of personal protection is included in Section 5, Personal Protective Equipment. Control procedures for environmental and general hazards are discussed in Section 4, General Safety Practices.

3.6 Soil Vapor Sampling

Soil vapor sampling involves the use of a flow controller with an in-line particulate filter and vacuum gauge to purge soil gas vapor into a laboratory certified clean, passivated, stainless steel canister (e.g., Entech, SUMMA®).

Hazards – Care must be taken to minimize the potential for introducing interferences during the sampling event. As such, care must be taken to keep the canister away from heavy pedestrian traffic areas (e.g., main entranceways, walkways). If the canister is not to be overseen for the entire sample duration, precautions should be taken to maintain the security of the sample. Sampling personnel should not handle hazardous substances (such as gasoline), permanent marking pens, wear/apply fragrances, or smoke cigarettes before and/or during the sampling event.

The flora and fauna of the site may present hazards of poison ivy, poison oak, ticks, fleas, mosquitoes, wasps, spiders, and snakes. The work area presents slip, trip, and fall hazards from scattered debris and irregular walking surfaces. Rainy weather may cause wet, muddy, slick walking surfaces and unstable soil. Freezing weather hazards include frozen, slick, and irregular walking surfaces.

Control – Care should be taken to avoid placing the sample canister within an area of heavy pedestrian traffic. If the canister is not overseen during the entire sample duration, the sample canister should be placed in a location that is not regularly accessed by the public. If this is not possible, the sample canister should be secured using a lock and chain and labeled to indicate that the sample is part of a scientific project. Control procedures for environmental and general hazards are discussed in Section 4, General Safety Practices.

3.7 Decontamination

All equipment will be decontaminated before leaving the site using visual inspection to verify that COCs have been removed. Personnel involved in decontamination activities may be exposed to skin contact with contaminated materials and chemicals brought to the site as part of the project work. In addition all operations that have the potential to generate or release hazardous material will be conducted in a controlled area using the appropriate engineering controls. Specific decontamination techniques will be established based onsite conditions.

Decontamination procedures will be reviewed with all personnel onsite. Anticipated decontamination activities include use of 5-gallon buckets with a soap and water wash. Pressure washing with manual scrub brushing as needed will be used to decontaminate equipment. COC impacted equipment will be determined “clean” by using visual inspection of all equipment.

Personnel involved in decontamination activities must wear PPE that is one level below the level worn by personnel working in the EZ.

3.8 Demobilization

Demobilization involves the removal of all tools, equipment, supplies, and vehicles brought to the site. The hazards of this phase of activity are associated with heavy equipment operation and manual materials handling.

Manual materials handling may cause blisters, sore muscles, and joint and skeletal injuries; and may present eye, contusion, and laceration hazards. Heavy equipment operation presents noise and vibration hazards, and hot surfaces, to operators. Personnel in the vicinity of heavy equipment operation may be exposed to physical hazards resulting in fractures, contusions, and lacerations and may be exposed to high noise levels. The work area presents slip, trip, and fall hazards from scattered debris and irregular walking surfaces. Rainy weather may cause wet, muddy, slick walking surfaces, and unstable soil.

Environmental hazards include plants, such as poison ivy and poison oak; aggressive fauna, such as ticks, fleas, mosquitoes, wasps, spiders, and snakes; weather, such as sunburn, lightning, rain, and heat- or cold-related illnesses; and pathogens, such as rabies, Lyme disease, and blood-borne pathogens.

Control procedures for these hazards are discussed in Section 4, General Safety Practices.

3.9 Chemical Hazards

The chemical hazards associated with site operations are related to inhalation, ingestion, and skin exposure to site COCs. Concentrations of airborne COCs during site tasks may be measurable, and will require air monitoring during intrusive operations. Air monitoring requirements for site tasks are outlined in Section 6.1.

Site COCs may potentially include the following:

Contaminant	CAS Number
Acetone	67-64-1
Benzene	71-43-2
2-Butanone (MEK)	78-93-3
Carbon Disulfide	75-15-0
Chloroethane	75-00-3
Chloroform	67-66-3
1,1-Dichloroethane	75-34-3
1,1-Dichloroethene	75-35-4
cis-1,2-Dichloroethene	156-59-2
trans-1,2-Dichloroethene	10061-01-5
Freon 113	76-13-1
2-Hexanone	591-78-6
Methyl tertiary-butyl ether (MTBE)	1634-04-4
Tetrachloroethene	127-18-4
Toluene	108-88-3
Trichloroethane	25323-89-1
Trichloroethene	79-01-6
1,2,4-Trimethylbenzene	95-63-6
Vinyl chloride	75-01-4
Chromium	7440-47-3
Cyanide	57-12-5
Lead	7439-92-1
Nickel	7440-02-0
Zinc	1314-13-2

Airborne concentrations of constituents of concern during certain site tasks may be significant, and will require air monitoring of potentially toxic and flammable atmospheres during such operations. Air monitoring requirements for site tasks are outlined in Section 6.1.

The potential for inhalation of constituents during drilling and sampling is moderate. The potential for dermal contact with contaminated soils and water during drilling is moderate.

Material Safety Data Sheets (MSDS) for the COCs are included in Attachment A.

4. General Safety Practices

4.1 General Safety Rules

General safety rules for site activities include, but are not limited to, the following:

- At least one copy of this HASP must be in a location at the site that is readily available to personnel, and all project personnel shall review the plan prior to starting work.
- Consume or use food, beverages, chewing gum, and tobacco products only in the SZ or other designated area outside the EZ and CRZ. Cosmetics shall not be applied in the EZ or CRZ.
- Wash hands before eating, drinking, smoking, or using toilet facilities.
- Wear all PPE as required, and stop work and replace damaged PPE immediately.
- Secure disposable coveralls, boots, and gloves at the wrists and legs and ensure closure of the suit around the neck.
- Upon skin contact with materials that may be impacted by COC, remove contaminated clothing and wash the affected area immediately. Contaminated clothing must be changed. Any skin contact with materials potentially impacted by COC must be reported to the SS or HSS immediately. If needed, medical attention should be sought.
- Practice contamination avoidance. Avoid contact with surfaces either suspected or known to be impacted by COC, such as standing water, mud, or discolored soil. Equipment must be stored on elevated or protected surfaces to reduce the potential for incidental contamination.
- Remove PPE as required in the CRZ to limit the spread of COC-containing materials.
- At the end of each shift or as required, dispose of all single-use coveralls, soiled gloves, and respirator cartridges in designated receptacles designated for this purpose.

- Removing soil containing site COC from protective clothing or equipment with compressed air, shaking, or any other means that disperses contaminants into the air is prohibited.

- Inspect all non-disposable PPE for contamination in the CRZ. Any PPE found to be contaminated must be decontaminated or disposed of appropriately.

- Recognize emergency signals used for evacuation, injury, fire, etc.

- Report all injuries, illnesses, near misses, and unsafe conditions or work practices to the SS or HSS.

- Use the "buddy system" during all operations requiring Level C PPE, and when appropriate, during Modified Level D operations.

- Obey all warning signs, tags, and barriers. Do not remove any warnings unless authorized to do so.

- Use, adjust, alter, and repair equipment only if trained and authorized to do so, and in accordance with the manufacturer's directions.

- Personnel are to perform only tasks for which they have been properly trained and will advise their supervisor if they have been assigned a task for which they are not trained.

- The presence or consumption of alcoholic beverages or illicit drugs during the workday is strictly prohibited. Notify your supervisor if you must take prescription or over-the-counter drugs that could cause drowsiness or other side effects that could impair judgment.

- Remain upwind during site activities whenever possible.

4.2 Buddy System

Onsite personnel must use the buddy system as required by operations. Use of the "buddy system" is required during all operations requiring Level C to Level A PPE, and when appropriate, during Level D/Modified D operations. Crewmembers must observe each other for signs of chemical exposure, and heat or cold stress. Indications of adverse effects include, but are not limited to:

- Changes in complexion and skin coloration
- Changes in coordination
- Changes in demeanor
- Excessive salivation and pupillary response
- Changes in speech pattern

Crewmembers must also be aware of the potential exposure to possible safety hazards, unsafe acts, or non-compliance with safety procedures.

Field personnel must inform their partners or fellow crewmembers of non-visible effects of exposure to toxic materials that they may be experiencing. The symptoms of such exposure may include, but are not limited to:

- Headaches
- Dizziness
- Nausea
- Blurred vision
- Cramps
- Irritation of eyes, skin, or respiratory tract

If protective equipment or noise levels impair communications, prearranged hand signals must be used for communication. Personnel must stay within line of sight of another team member.

4.3 Heat Stress

Heat stress is caused by a number of interacting factors, including environmental conditions, clothing, workload, etc., as well as the physical and conditioning characteristics of the individual. Since heat stress is one of the most common illnesses associated with heavy outdoor work conducted with direct solar load and, in particular, because wearing PPE can increase the risk of developing heat stress, workers must be capable of recognizing the signs and symptoms of heat-related illnesses. Personnel must be aware of the types and causes of heat-related illnesses and be able to recognize the signs and symptoms of these illnesses in both themselves and their co-workers.

Heat rashes are one of the most common problems in hot work environments. Commonly known as prickly heat, a heat rash is manifested as red papules and usually appears in areas where the clothing is restrictive. As sweating increases, these papules give rise to a prickling sensation. Prickly heat occurs in skin that is persistently wetted by

unevaporated sweat, and heat rash papules may become infected if they are not treated. In most cases, heat rashes will disappear when the affected individual returns to a cool environment.

Heat cramps are usually caused by performing hard physical labor in a hot environment. These cramps have been attributed to an electrolyte imbalance caused by sweating. It is important to understand that cramps can be caused both by too much or too little salt.

Cramps appear to be caused by the lack of water replenishment. Because sweat is a hypotonic solution (plus or minus 0.3% NaCl), excess salt can build up in the body if the water lost through sweating is not replaced. Thirst cannot be relied on as a guide to the need for water; instead, water must be taken every 15 to 20 minutes in hot environments.

Under extreme conditions, such as working for 6 to 8 hours in heavy protective gear, a loss of sodium may occur. Drinking commercially available carbohydrate electrolyte replacement liquids is effective in minimizing physiological disturbances during recovery.

Heat exhaustion occurs from increased stress on various body organs due to inadequate blood circulation, cardiovascular insufficiency, or dehydration. Signs and symptoms include pale, cool, moist skin; heavy sweating; dizziness; nausea; headache, vertigo, weakness, thirst, and giddiness. Fortunately, this condition responds readily to prompt treatment.

Heat exhaustion should not be dismissed lightly, however, for several reasons. One is that the fainting associated with heat exhaustion can be dangerous because the victim may be operating machinery or controlling an operation that should not be left unattended; moreover, the victim may be injured when he or she faints. Also, the signs and symptoms seen in heat exhaustion are similar to those of heat stroke, which is a medical emergency.

Workers suffering from heat exhaustion should be removed from the hot environment, be given fluid replacement, and be encouraged to get adequate rest.

Heat stroke is the most serious form of heat stress. Heat stroke occurs when the body's system of temperature regulation fails and the body's temperature rises to critical levels. This condition is caused by a combination of highly variable factors, and its occurrence is difficult to predict.

Heat stroke is a medical emergency. The primary signs and symptoms of heat stroke are confusion; irrational behavior; loss of consciousness; convulsions; a lack of sweating (usually); hot, dry skin; and an abnormally high body temperature, e.g., a rectal temperature of 41°C (105.8°F). If body temperature is too high, it causes death. The elevated metabolic temperatures caused by a combination of workload and environmental heat load, both of which contribute to heat stroke, are also highly variable and difficult to predict.

If a worker shows signs of possible heat stroke, professional medical treatment should be obtained immediately. The worker should be placed in a shady area and the outer clothing should be removed. The worker's skin should be wetted and air movement around the worker should be increased to improve evaporative cooling until professional methods of cooling are initiated and the seriousness of the condition can be assessed. Fluids should be replaced as soon as possible. The medical outcome of an episode of heat stroke depends on the victim's physical fitness and the timing and effectiveness of first aid treatment.

Regardless of the worker's protestations, no employee suspected of being ill from heat stroke should be sent home or left unattended unless a physician has specifically approved such an order.

Proper training and preventive measures will help avert serious illness and loss of work productivity. Preventing heat stress is particularly important because once someone suffers from heat stroke or exhaustion, that person may be predisposed to additional heat injuries.

Heat Stress Safety Precautions

Heat stress monitoring and work rest cycle implementation should commence when the ambient adjusted temperature exceeds 72°F. A minimum work rest regimen and procedures for calculating ambient adjusted temperature are described in Table 4-1.

Table 4-1. Work/Rest Schedule

Adjusted Temperature[b]	Work/Rest Regimen Normal Work Ensemble[c]	Work/Rest Regimen Impermeable Ensemble
90ºF (32.2ºC) or above	After each 45 minutes of work	After each 15 minutes of work
87.5º - 90ºF (30.8º-32.2ºC)	After each 60 minutes of work	After each 30 minutes of work
82.5º - 87.5ºF (28.1º - 30.8ºC)	After each 90 minutes of work	After each 60 minutes of work

Adjusted Temperature[b]	Work/Rest Regimen Normal Work Ensemble[c]	Work/Rest Regimen Impermeable Ensemble
77.5º - 82.5ºF (25.3º - 28.1ºC)	After each 120 minutes of work	After each 90 minutes of work
72.5º - 77.5ºF (30.8º - 32.2ºC)	After each 150 minutes of work	After each 120 minutes of work

a. For work levels of 250 kilocalories/hour (Light-Moderate Type of Work).
b. Calculate the adjusted air temperature (ta adj) by using this equation: ta adj ^{o}F = ta ^{o}F + (13 x % sunshine). Measure air temperature (ta) with a standard mercury-in-glass thermometer, with the bulb shielded from radiant heat. Estimate percent sunshine by judging what percent time the sun is not covered by clouds that are thick enough to produce a shadow. (100% sunshine = no cloud cover and a sharp, distinct shadow; 0% sunshine = no shadows.)
c. A normal work ensemble consists of cotton coveralls or other cotton clothing with long sleeves and pants.
d. The information presented above was generated using the information provided in the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLV) Handbook.

In order to determine if the work rest cycles are adequate for the personnel and specific site conditions, additional monitoring of individual heart rates will be conducted during the rest cycle. To check the heart rate, count the radial pulse for 30 seconds at the beginning of the rest period. If the heart rate exceeds 110 beats per minute, shorten the next work period by one third and maintain the same rest period.

Additionally, one or more of the following control measures can be used to help control heat stress and are mandatory if any site worker has a heart rate (measure immediately prior to rest period) exceeding 115 beats per minute:

- Site workers will be encouraged to drink plenty of water and electrolyte replacement fluids throughout the day.
- Onsite drinking water will be kept cool (50 to 60°F).
- A work regimen that will provide adequate rest periods for cooling down will be established, as required.
- All personnel will be advised of the dangers and symptoms of heat stroke, heat exhaustion, and heat cramps.
- Cooling devices, such as vortex tubes or cooling vests, should be used when personnel must wear impermeable clothing in conditions of extreme heat.
- Employees should be instructed to monitor themselves and co-workers for signs of heat stress and to take additional breaks as necessary.

- A shaded rest area must be provided. All breaks should take place in the shaded rest area.

- Employees must not be assigned to other tasks during breaks.

- Employees must remove impermeable garments during rest periods. This includes white Tyvek™-type garments.

All employees must be informed of the importance of adequate rest, acclimation, and proper diet in the prevention of heat stress disorders.

4.4 Cold Stress

Cold stress normally occurs in temperatures at or below freezing, or under certain circumstances in temperatures of 40°F. Extreme cold for a short time may cause severe injury to exposed body surfaces or result in profound generalized cooling, causing death. Body areas that have high surface area-to-volume ratio, such as fingers, toes, and ears, are the most susceptible. Two factors influence the development of a cold-weather injury: ambient temperature and wind velocity. For instance, a temperature of 10°F with a wind of 15 miles per hour (mph) is equivalent in chilling effect to still air at 18°F. An equivalent chill temperature chart relating the actual dry-bulb temperature and wind velocity is presented in Table 4-3, below.

Table 4-3. Wind Chill Temperature Chart

Estimated Wind Speed (in mph)	Actual Temperature Reading (ºF)											
	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
	Equivalent Chill Temperature (ºF)											
Calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-121
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148
(Wind speeds greater than 40 mph have little additional effect.)	Little Danger Maximum danger of false sense of security.				Increasing Danger Danger from freezing of exposed flesh within one minute.			Great Danger Flesh may freeze within 30 seconds.				
	Trench foot and immersion foot may occur at any point on this chart.											

(This chart was developed by the U.S. Army Research Institute of Environmental Medicine, Natick, MA [Source: ACGIH TLV Handbook, ACGIH, 2002a]).

Local injury resulting from cold is included in the generic term “frostbite.” There are several degrees of tissue damage associated with frostbite. Frostbite of the extremities falls into the following categories:

- *Frost Nip or Incipient Frostbite* – Characterized by sudden blanching or whitening of skin.
- *Superficial Frostbite* – Skin has a waxy or white appearance and is firm to the touch, but tissue beneath is resilient.
- *Deep Frostbite* – Tissues are cold, pale, and solid; extremely serious injury.

Systemic hypothermia is caused by exposure to freezing or rapidly dropping temperature. It can be fatal. Its symptoms are usually exhibited in five stages:

- shivering
- apathy, listlessness, sleepiness, and (sometimes) rapid cooling of the body to less than 95°F
- unconsciousness, glassy stare, slow pulse, and slow respiratory rate
- freezing of the extremities
- death

Trauma sustained in freezing or sub-zero conditions requires special attention because an injured worker is predisposed to secondary cold injury. Special provisions must be made to prevent hypothermia and secondary freezing of damaged tissues in addition to providing for first-aid treatment. To avoid cold stress, site personnel must wear protective clothing appropriate for the level of cold and physical activity. In addition to protective clothing, preventive safe work practices, additional training, and warming regimens may be used to prevent cold stress.

4.4.1 Cold Stress Safety Precautions

The following safety precautions should be followed to prevent cold stress:

- For air temperature of 0°F or less, mittens should be used to protect the hands. For exposed skin, continuous exposure should not be permitted when air speed and temperature results in a wind chill temperature of -25°F.

- At air temperatures of 36°F or less, field personnel who become immersed in water or whose clothing becomes wet must be immediately provided with a change of clothing and be treated for hypothermia.

- If work is done at a normal temperature or in a hot environment before entering the cold, the field personnel must confirm that their clothing is not wet as a consequence of sweating. If wet, field personnel must change into dry clothes prior to entering the cold area.

- If the available clothing does not give adequate protection to prevent hypothermia or frostbite, work must be modified or suspended until adequate clothing is made available or until weather conditions improve.

Field personnel handling evaporative liquid (e.g., gasoline, alcohol, and cleaning fluids) at air temperatures below 40°F must take special precaution to avoid soaking of clothing or gloves with the liquids because of the added danger of cold injury due to evaporative cooling.

4.4.2 Safe Work Practices

The following safe work practices must be employed to prevent cold stress:

- Direct contact between bare skin and cold surfaces (less than 20°F) should be avoided. Metal tool handles and/or equipment controls should be covered by thermal insulating material.

- For work performed in a wind chill temperature at or below 10°F, workers should be under constant protective observation (buddy system). The work rate should be established to prevent heavy sweating that will result in wet clothing. For heavy work, rest periods must be taken in heated shelters and workers should be provided with an opportunity to change into dry clothing if needed.

- Field personnel should be provided the opportunity to become accustomed to cold-weather working conditions and required protective clothing.

- Work should be arranged in such a way that sitting or standing still for long periods is minimized.

During the warming regimen (rest period), field personnel should be encouraged to remove outer clothing to permit sweat evaporation or to change into dry work clothing. Dehydration, or loss of body fluids, occurs insidiously in the cold environment and may increase susceptibility to cold injury due to a significant change in blood flow to the extremities. Fluid replacement with warm, sweet drinks and soups is recommended. The intake of coffee should be limited because of diuretic and circulatory effects.

4.5 Biological Hazards

Biological hazards may include poison ivy, snakes, thorny bushes and trees, ticks, mosquitoes, scorpions, and other pests.

4.5.1 Tick Borne Diseases

Lyme Disease: The disease commonly occurs in summer and is transmitted by the bite of infected ticks. “Hot spots” in the United States include New York, New Jersey, Pennsylvania, Massachusetts, Connecticut, Rhode Island, Minnesota, and Wisconsin.

Erlichiosis: The disease also commonly occurs in summer and is transmitted by the bite of infected ticks. “Hot spots” in the United States include New York, Massachusetts, Connecticut, Rhode Island, Minnesota, and Wisconsin.

These diseases are transmitted primarily by the deer tick, which is smaller and redder than the common wood tick. The disease may be transmitted by immature ticks, which are small and hard to see. The tick may be as small as a period on this page.

Symptoms of Lyme disease include a rash or a peculiar red spot, like a bull’s eye, which expands outward in a circular manner. The victim may have headache, weakness, fever, a stiff neck, and swelling and pain in the joints, and eventually, arthritis. Symptoms of erlichiosis include muscle and joint aches, flu-like symptoms, but there is typically no skin rash.

Rocky Mountain Spotted Fever (RMSF): This disease is transmitted via the bite of an infected tick. The tick must be attached 4 to 6 hours before the disease-causing organism (Rickettsia rickettsii) becomes reactivated and can infect humans. The primary symptom of RMSF is the sudden appearance of a moderate-to-high fever. The fever may persist for two to three weeks. The victim may also have a headache, deep muscle pain, and chills. A rash appears on the hands and feet on about the third day and eventually spreads to all parts of the body. For this reason, RMSF may be confused with measles or meningitis. The disease may cause death, if untreated, but if identified and treated promptly, death is uncommon.

Control: Tick repellant containing diethyltoluamide (DEET) should be used when working in tick-infested areas, and pant legs should be tucked into boots. In addition, workers should search the entire body every three or four hours for attached ticks. Ticks should be removed promptly and carefully without crushing, since crushing can squeeze the disease-causing organism into the skin. A gentle and steady pulling action should be used to avoid leaving the head or mouth parts in the skin. Hands should be protected with surgical gloves when removing ticks.

4.5.2 Poisonous Plants

Poisonous plants may be present in the work area. Personnel should be alerted to their presence and instructed on methods to prevent exposure. Poison sumac grows as a shrub or small tree with large alternate, compound leaves having 7-13 leaflets without teeth. All plant parts are poisonous. The lack of 1) leaflet glands, 2) "wings" between the leaflets, and 3) teeth on the leaves, in addition to this species' red stems supporting the leaflets and leaves, help to distinguish this plant from similar-looking nonpoisonous species such as other sumacs and tree-of-heaven. Flowers are shades of green, white and yellow and appear in late spring. Fruits are small white berries that mature in late summer and may last through winter. Occasional in moist or wet soils.

Poison ivy is a woody shrub or vine with hairy looking aerial roots. It grows to 10 feet or more, climbing high on trees, walls and fences or trails along the ground. All parts of poison ivy, including the roots, are poisonous at all times of the year.

Poison Sumac

Poison Ivy

Control - The main control for both poison ivy and poison sumac is to avoid contact with the plant, cover arms and hands, and frequently wash potentially exposed skin. Particular attention must be given to avoiding skin contact with objects or protective clothing that have touched the plants. Treat every surface that may have touched the plant as contaminated, and practice contamination avoidance.

Poison ivy and sumac are very easy to treat ***if*** you identified your contact with the irritating plant within a few hours of the incident. The urushiol oil present in both plants chemically bonds with the proteins in your skin about 30 minutes after contact. 75% of the population is affected by contact with urushiol, although immunity to urushiol today does not assure immunity tomorrow, and vice versa. Rash symptoms can appear within a few hours but can take two to five days to appear. The rash starts as a red, annoyingly itchy area that starts to swell. The area then gets inflamed and will get covered in clusters of tiny pimples, the pimple eventually merge and turn into blisters. The fluid in the blisters turns yellow, dries up, and becomes crusty. Left completely

untreated, this cycle can last as short as five days and in severe cases as long as five to six weeks.

If you come in contact with poison ivy, oak or sumac, or a animal exposed to any of these, or tools, gear, or clothing exposed to any of these, you should wash off with hot water (not so hot that it burns) and strong soap as soon as possible. If you can get washed up in the first six hours, before the first symptoms appear, you have a good chance of avoiding an out break, and an even better chance of minimizing the effects if you do have one.

4.5.3 Snakes

The possibility of encountering snakes exists, specifically for personnel working in wooded/vegetated areas. Snake venoms are complex and include proteins, some of which have enzymatic activity. The effects produced by venoms include neurotoxic effects with sensory, motor, cardiac, and respiratory difficulties; cytotoxic effects on red blood cells, blood vessels, heart muscle, kidneys, and lungs; defects in coagulation; and effects from local release of substances by enzymatic actions. Other noticeable effects of venomous snakebites include swelling, edema, and pain around the bite, and the development of ecchymosis (the escape of blood into tissues from ruptured blood vessels).

Control: To minimize the threat of snakebites, all personnel walking through vegetated areas must be aware of the potential for encountering snakes, and the need to avoid actions potentiating encounters, such as turning over logs, etc. If a snakebite occurs, an attempt should be made to obtain snake markings, size and color for identification. The victim must be transported to the nearest hospital within 30 minutes; first aid consists of applying a constriction band, and washing the area around the wound to remove any unabsorbed venom.

4.5.4 Spiders

Personnel may encounter spiders during work activities.

Two spiders are of concern, the black widow and the brown recluse. Both prefer dark sheltered areas such as basements, equipment sheds and enclosures, and around woodpiles or other scattered debris. The black widow is shiny black, approximately one inch long, and found throughout the United States. There is a distinctive red hourglass marking on the underside of the black widows body. The bite of a black widow is

seldom fatal to healthy adults, but effects include respiratory distress, nausea, vomiting, and muscle spasms. The brown recluse is smaller than the black widow and gets its name from its brown coloring and behavior. The brown recluse is more prevalent in the southern United States. The brown recluse has a distinctive violin shape on the top of its body. The bite of the brown recluse is painful and the bite site ulcerates and takes many weeks to heal completely.

Control: To minimize the threat of spider bites, all personnel walking through vegetated areas must be aware of the potential for encountering these arachnids. Personnel need to avoid actions that may result in encounters, such as turning over logs, and placing hands in dark places such as behind equipment or in corners of equipment sheds or enclosures. If a spider bite occurs, the victim must be transported to the nearest hospital as soon as possible; first aid consists of applying ice packs and washing the area around the wound to remove any unabsorbed venom.

4.5.5 Mosquitoes

Personnel may be exposed to mosquitoes during work activities.

Typical exposure to mosquitoes does not present a significant hazard. However, if West Nile virus is prevalent in the area exposure to this virus is increased. West Nile virus results in flu-like symptoms and can be serious if not treated or in immune compromised individuals.

Control: To minimize the threat of mosquito bites all personnel working outside must be aware of the potential for encountering mosquitoes and implement the basic precautions listed below:

- Avoid working at dawn or dusk when mosquitoes are most active
- Prevent accumulation of standing water at the work-site
- Apply an insect repellent that contains DEET to exposed skin
- Wear light colored clothes, preferably with long-sleeves and full-length pants
- Do not touch any dead birds or animals that you encounter

If dead birds are detected near the site, report to the local County Health Department. If flu-like symptoms are present, contact your Doctor or the Health and Safety Officer for more information.

4.6 Noise

Exposure to noise over the OSHA action level can cause temporary impairment of hearing; prolonged and repeated exposure can cause permanent damage to hearing. The risk and severity of hearing loss increase with the intensity and duration of exposure to noise. In addition to damaging hearing, noise can impair voice communication, thereby increasing the risk of accidents onsite.

Control: All personnel must wear hearing protection, with a Noise Reduction Rating (NRR) of at least 20, when noise levels exceed 85 dBA. When it is difficult to hear a co-worker at normal conversation distance, the noise level is approaching or exceeding 85 dBA, and hearing protection is necessary. All site personnel who may be exposed to noise must also receive baseline and annual audiograms and training as to the causes and prevention of hearing loss.

Noise monitoring is discussed in Section 6.2, Noise Monitoring.

Whenever possible, equipment that does not generate excessive noise levels will be selected for this project. If the use of noisy equipment is unavoidable, barriers or increased distance will be used to minimize worker exposure to noise, if feasible.

4.7 Spill Control

All personnel must take every precaution to minimize the potential for spills during site operations. All onsite personnel shall immediately report any discharge, no matter how small, to the SS.

Spill control equipment and materials will be located on the site at locations that present the potential for discharge. All sorbent materials used for the cleanup of spills will be containerized and labeled appropriately. In the event of a spill, the SS will follow the provisions in Section 9, Emergency Procedures, to contain and control released materials and to prevent their spread to offsite areas.

4.8 Sanitation

Site sanitation will be maintained according to appropriate federal, state, and local requirements and the guidance provided below.

4.8.1 Break Area

Breaks must be taken in the SZ, away from the active work area after site personnel go through decontamination procedures. There will be no smoking, eating, drinking, or chewing gum or tobacco in any area other than the SZ.

4.8.2 Potable Water

The following rules apply to all field operations:

- An adequate supply of potable water will be provided at each project site. Potable water must be kept away from hazardous materials or media, and contaminated clothing or equipment.

- Portable containers used to dispense drinking water must be capable of being tightly closed, and must be equipped with a tap dispenser. Water must not be consumed directly from the container (drinking from the tap is prohibited) nor may it be removed from the container by dipping.

- Containers used for drinking water must be clearly marked and shall not be used for any other purpose.

- Disposable drinking cups must be provided. A sanitary container for dispensing cups and a receptacle for disposing of used cups is required.

4.8.3 Sanitary Facilities

Access to facilities for washing before eating, drinking, or smoking, or alternate methods such as waterless hand-cleaner and paper towels will be provided.

4.8.4 Lavatory

If permanent toilet facilities are not available, an appropriate number of portable chemical toilets will be provided.

This requirement does not apply to mobile crews or to normally unattended site locations so long as employees at these locations have transportation immediately available to nearby toilet facilities.

4.9 Emergency Equipment

Adequate emergency equipment for the activities being conducted onsite and as required by applicable sections of 29 CFR 1910 and 29 CFR 1926 will be onsite prior to the commencement of project activities. Personnel will be provided with access to emergency equipment, including, but not limited to, the following:

- Fire extinguishers of adequate size, class, number, and location as required by applicable sections of 29 CFR 1910 and 1926
- Industrial first aid kits of adequate size for the number of personnel onsite
- Emergency eyewash and/or shower if required by operations being conducted onsite

4.10 Lockout/Tagout Procedures

Only fully qualified and trained personnel will perform maintenance procedures. Before maintenance begins, lockout/tagout procedures per OSHA 29 CFR 1910.147 will be followed.

Lockout is the placement of a device that uses a positive means, such as lock, to hold an energy or material-isolating device such that the equipment cannot be operated until the lockout device is removed. If a device cannot be locked out, a tagout system shall be used. Tagout is the placement of a warning tag on an energy or material isolating device indicating that the equipment controls may not be operated until the tag is removed by the personnel who attached the tag.

4.11 Electrical Safety

Electricity may pose a particular hazard to site workers due to the use of portable electrical equipment. If wiring or other electrical work is needed, a qualified electrician must perform it.

General electrical safety requirements include:

- All electrical wiring and equipment must be a type listed by Underwriters Laboratories (UL), Factory Mutual Engineering Corporation (FM), or other recognized testing or listing agency.

- All installations must comply with the National Electrical Safety Code (NESC), the National Electrical Code (NEC), or USCG regulations.

- Portable and semi-portable tools and equipment must be grounded by a multi-conductor cord having an identified grounding conductor and a multi-contact polarized plug-in receptacle.

- Tools protected by an approved system of double insulation, or its equivalent, need not be grounded. Double insulated tools must be distinctly marked and listed by UL or FM.

- Live parts of wiring or equipment must be guarded to prevent persons or objects from touching them.

- Electric wire or flexible cord passing through work areas must be covered or elevated to protect it from damage by foot traffic, vehicles, sharp corners, projections, or pinching.

- All circuits must be protected from overload.

- Temporary power lines, switchboxes, receptacle boxes, metal cabinets, and enclosures around equipment must be marked to indicate the maximum operating voltage.

- Plugs and receptacles must be kept out of water unless of an approved submersible construction.

- All extension cord outlets must be equipped with ground fault circuit interrupters (GFCI).

- Attachment plugs or other connectors must be equipped with a cord grip and be constructed to endure rough treatment.

- Extension cords or cables must be inspected prior to each use, and replaced if worn or damaged. Cords and cables must not be fastened with staples, hung from nails, or suspended by bare wire.

- Flexible cords must be used only in continuous lengths without splice, with the exception of molded or vulcanized splices made by a qualified electrician.

4.12 Lifting Safety

Using proper lifting techniques may prevent back strain or injury. The fundamentals of proper lifting include:

- Consider the size, shape, and weight of the object to be lifted. A mechanical lifting device or additional persons must be used to lift an object if it cannot be lifted safely alone.
- The hands and the object should be free of dirt or grease that could prevent a firm grip.
- Gloves must be used, and the object inspected for metal slivers, jagged edges, burrs, or rough or slippery surfaces.
- Fingers must be kept away from points that could crush or pinch them, especially when putting an object down.
- Feet must be placed far enough apart for balance. The footing should be solid and the intended pathway should be clear.
- The load should be kept as low as possible, close to the body with the knees bent.
- To lift the load, grip firmly and lift with the legs, keeping the back as straight as possible.
- A worker should not carry a load that he or she cannot see around or over.
- When putting an object down, the stance and position are identical to that for lifting; the legs are bent at the knees, and the back is straight as the object is lowered.

5. Personal Protective Equipment

5.1 Levels of Protection

PPE is required to safeguard site personnel from various hazards. Varying levels of protection may be required depending on the levels of COC and the degree of physical hazard. This section presents the various levels of protection and defines the conditions of use for each level. A summary of the levels is presented in Table 5-1 in this section.

5.1.1 Level D Protection

The minimum level of protection that will be required of site personnel and subcontractors at the site will be Level D, which will be worn when no dermal hazard exists and air monitoring indicates no inhalation hazard exists. The following equipment will be used:

- Work clothing as prescribed by weather
- Steel toe work boots, meeting ANSI Z41
- Safety glasses or goggles, meeting ANSI Z87
- Hard hat, meeting ANSI Z89, when falling object hazards are present
- Hearing protection (if noise levels exceed 85 dBA, then hearing protection with a USEPA NRR of at least 20 dBA must be used)
- PFD if working on or near the water

5.1.2 Modified Level D Protection

Modified Level D will be used when airborne contaminants are not present at levels of concern, but site activities present a potential for skin contact with contaminated materials. Modified Level D consists of:

- Nitrile gloves worn over nitrile surgical gloves
- Latex/PVC overboots when contact with COC-impacted media is anticipated

- Steel toe work boots, meeting ANSI Z41
- Safety glasses or goggles, meeting ANSI Z87
- Face shield in addition to safety glasses or goggles when projectiles or splash hazards exist
- Hard hat, meeting ANSI Z89 when falling object hazards are present
- Hearing protection (if noise levels exceed 85 dBA, then hearing protection with a USEPA NRR of at least 20 dBA must be used)
- Tyvek® suit (polyethylene coated Tyvek® suits for handling liquids) when body contact with COC-impacted media is anticipated
- PFD if working on or near the water

5.1.3 Level C Protection

Level C protection will be required when the airborne concentration of COC reaches one-half of the OSHA Permissible Exposure Limit (PEL) or American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV). The following equipment will be used for Level C protection:

- Full-face, air-purifying respirator with combination organic vapor and HEPA cartridges
- Polyethylene-coated Tyvek® suit, with ankles and cuffs taped to boots and gloves
- Nitrile gloves worn over nitrile surgical gloves
- Steel toe work boots, meeting ANSI Z41
- Chemical resistant boots with steel toes or latex/PVC overboots over steel toe boots
- Hard hat, meeting ANSI Z89

- Hearing protection (if noise levels exceed 85 dBA, then hearing protection with a USEPA NRR of at least 20 dBA must be used)

- PFD if working on or near the water

5.2 Selection of PPE

Equipment for personal protection will be selected based on the potential for contact, site conditions, ambient air quality, and the judgment of supervising site personnel and health and safety professionals. The PPE used will be chosen to be effective against the COC present on the site.

5.3 Site Respiratory Protection Program

Respiratory protection is an integral part of employee health and safety at the site due to potentially hazardous concentrations of airborne COC. The site respiratory protection program will consist of the following (as a minimum):

- All onsite personnel who may use respiratory protection will have an assigned respirator.

- All onsite personnel who may use respiratory protection will have been fit tested and trained in the use of a full-face air-purifying respirator within the past 12 months.

- All onsite personnel who may use respiratory protection must within the past year have been medically certified as being capable of wearing a respirator. Documentation of the medical certification must be provided to the HSS, prior to commencement of site work.

- Only cleaned, maintained, NIOSH-approved respirators will be used.

- If respirators are used, the respirator cartridge is to be properly disposed of at the end of each work shift, or when load-up or breakthrough occurs.

- Contact lenses are not to be worn when a respirator is worn.

- All onsite personnel who may use respiratory protection must be clean-shaven. Mustaches and sideburns are permitted, but they must not touch the sealing surface of the respirator.

- Respirators will be inspected, and a negative pressure test performed prior to each use.

- After each use, the respirator will be wiped with a disinfectant, cleansing wipe. When used, the respirator will be thoroughly cleaned at the end of the work shift. The respirator will be stored in a clean plastic bag, away from direct sunlight in a clean, dry location, in a manner that will not distort the face piece.

5.4 Using PPE

Depending upon the level of protection selected, specific donning and doffing procedures may be required. The procedures presented in this section are mandatory if Modified Level D or Level C PPE is used. All personnel entering the EZ must put on the required PPE in accordance with the requirements of this HASP. When leaving the EZ, PPE will be removed in accordance with the procedures listed, to minimize the spread of COC.

5.4.1 Donning Procedures

These procedures are mandatory only if Modified Level D or Level C PPE is used on the site:

- Remove bulky outerwear; remove street clothes and store in clean location

- Put on work clothes or coveralls

- Put on the required chemical protective coveralls

- Put on the required chemical protective boots or boot covers

- Tape the legs of the coveralls to the boots with duct tape

- Put on the required chemical protective gloves

- Tape the wrists of the protective coveralls to the gloves

- Don the required respirator and perform appropriate fit check (Level C)
- Put hood or head covering over head and respirator straps and tape hood to facepiece (Level C)
- Don remaining PPE, such as safety glasses or goggles and hard hat

When these procedures are instituted, one person must remain outside the work area to ensure that each person entering has the proper protective equipment.

5.4.2 Doffing Procedures

The following procedures are only mandatory if Modified Level D or Level C PPE is required for the site. Whenever a person leaves the work area, the following decontamination sequence will be followed:

- Upon entering the CRZ, rinse contaminated materials from the boots or remove contaminated boot covers
- Clean reusable protective equipment
- Remove protective garments, equipment, and respirator (Level C). All disposable clothing should be placed in plastic bags, which are labeled with contaminated waste labels
- Wash hands, face, and neck (or shower if necessary)
- Proceed to clean area and dress in clean clothing
- Clean and disinfect respirator for next use

All disposable equipment, garments, and PPE must be bagged in plastic bags and labeled for disposal. See Section 7, Decontamination, for detailed information on decontamination stations.

5.5 Selection Matrix

The level of personal protection selected will be based on air monitoring of the work environment and an assessment by the SS and HSS of the potential for skin contact

with COC. The PPE selection matrix is presented in Table 5-1. This matrix is based on information available at the time this plan was written. The Airborne Contaminant Action Levels in Table 6 should be used to verify that the PPE prescribed in these matrices is appropriate.

Table 5-1. PPE Selection Matrix

Task	Level of Protection
Site Set-Up, Mobilization	Level D
Maintenance and sampling of GWCTS	Modified Level D
Maintenance of SSDS	Modified Level D
Groundwater sampling and water level measurements	Modified Level D
Soil vapor sampling	Modified Level D/Level C
Decontamination	Modified Level D
Demobilization	Level D

6. Monitoring

6.1 Air Monitoring

Air monitoring should be conducted to evaluate airborne levels of COCs, as necessary. Air monitoring should take place during non-routine activities (i.e., excavation). The monitoring results will dictate work procedures and the selection of PPE during these activities. Should air monitoring need to be implemented, a brief air monitoring plan shall be prepared and followed to supplement this HASP.

6.2 Noise Monitoring

Hearing protection is mandatory for all employees in noise hazardous areas. As a general rule, sound levels that cause speech interference at normal conversation distance should require the use of hearing protection. Work in noisy areas will require ear plugs and ear muffs. The combined NRR shall be at least 55db.

7. Work Zones and Decontamination

7.1 Work Zones

7.1.1 Authorization to Enter

Only personnel with the appropriate training and medical certifications (if respirators are required) will be allowed to work at the project site. The SS will maintain a list of authorized persons; only personnel on the authorized persons list will be allowed to enter the site work areas.

7.1.2 Site Orientation and Hazard Briefing

No person will be allowed in the work area during site operations without first being given a site orientation and hazard briefing. This orientation will be presented by the SS or HSS, and will consist of a review of this HASP. This review must cover the chemical, physical, and biological hazards, protective equipment, safe work procedures, and emergency procedures for the project. Following this initial meeting, daily safety meetings will be held each day before work begins.

All people entering the site work areas, including visitors, must document their attendance at this briefing, as well as the daily safety meetings on the forms included with this plan.

7.1.3 Certification Documents

A training and medical file may be established for the project and kept onsite during all site operations. Specialty training, such as first aid/cardiopulmonary resuscitation (CPR) certificates, as well as current medical clearances for all project field personnel required to wear respirators, will be maintained within that file. All site personnel must provide their training and medical documentation to the HSS prior to starting work.

7.1.4 Entry Log

A log-in/log-out sheet will be maintained at the site by the SS. Personnel must sign in and out on a log sheet as they enter and leave the work area, and the SS may document entry and exit in the field notebook.

7.1.5 Entry Requirements

In addition to the authorization, hazard briefing, and certification requirements listed above, no person will be allowed in any work area unless they are wearing the minimum PPE as described in Section 5, Personal Protective Equipment.

7.1.6 Emergency Entry and Exit

People who must enter the work area on an emergency basis will be briefed of the hazards by the SS. All activities will cease in the event of an emergency. People exiting the work area because of an emergency will gather in a safe area for a head count. The SS is responsible for ensuring that all people who entered the work area have exited in the event of an emergency.

7.1.7 Contamination Control Zones

Contamination control zones are maintained to prevent the spread of contamination and to prevent unauthorized people from entering hazardous areas.

7.1.7.1 Exclusion Zone

An EZ may consist of a specific work area, or may be the entire area of potential contamination. All employees entering an EZ must use the required PPE, and must have the appropriate training and medical clearance for hazardous waste work. The EZ is the defined area where there is a possible respiratory and/or contact health hazard. Cones, caution tape, or a site diagram will identify the location of each EZ.

7.1.7.2 Contamination Reduction Zone

The CRZ or transition area will be established, if necessary, to perform decontamination of personnel and equipment. All personnel entering or leaving the EZ will pass through this area to prevent any cross-contamination. Tools, equipment, and machinery will be decontaminated in a specific location. The decontamination of all personnel will be performed onsite adjacent to the EZ. Personal protective outer garments and respiratory protection will be removed in the CRZ and prepared for cleaning or disposal. This zone is the only appropriate corridor between the EZ and the SZ.

7.1.7.3 Support Zone

The SZ is a clean area outside the CRZ located to prevent employee exposure to hazardous substances. Eating and drinking will be permitted in the support area only after proper decontamination. Smoking may be permitted in the SZ, subject to site requirements.

7.1.8 Posting

Work areas will be prominently marked and delineated using cones, caution tape, or a site diagram.

7.1.9 Site Inspections

The SS will conduct a daily inspection of site activities, equipment, and procedures to verify that the required elements are in place.

7.2 Decontamination

7.2.1 Personnel Decontamination

All personnel wearing Modified Level D or Level C protective equipment in the EZ must undergo personal decontamination prior to entering the SZ. The personnel decontamination area will consist of the following stations at a minimum:

- *Station 1*: Personnel leaving the contaminated zone will remove the gross contamination from their outer clothing and boots.

- *Station 2*: Personnel will remove their outer garment and gloves and dispose of it in properly labeled containers. Personnel will then decontaminate their hard hats, and boots with an aqueous solution of detergent or other appropriate cleaning solution. These items are then hand carried to the next station.

- *Station 3*: Personnel will thoroughly wash their hands and face before leaving the CRZ. Respirators will be sanitized and then placed in a clean plastic bag.

7.2.2 Equipment Decontamination

All vehicles that have entered the EZ will be decontaminated at the decontamination pad prior to leaving the zone. If the level of vehicle contamination is low, decontamination may be limited to rinsing of tires and wheel wells with water. If the vehicle is significantly contaminated, steam cleaning or pressure washing of vehicles and equipment may be required.

7.2.3 Personal Protective Equipment Decontamination

Where and whenever possible, single-use, external protective clothing must be used for work within the EZ or CRZ. This protective clothing must be disposed of in properly labeled containers. Reusable protective clothing will be rinsed at the site with detergent and water. The rinsate will be collected for disposal.

When removed from the CRZ, the respirator will be thoroughly cleaned with soap and water. The respirator face piece, straps, valves, and covers must be thoroughly cleaned at the end of each work shift and ready for use prior to the next shift. Respirator parts may be disinfected with a solution of bleach and water, or by using a spray disinfectant.

8. Training and Medical Surveillance

8.1 Training

8.1.1 General

All onsite project personnel who work in areas where they may be exposed to site contaminants must be trained as required by OSHA Regulation 29 CFR 1910.120 (HAZWOPER) as appropriately identified below. Personnel who completed their initial training more than 12 months prior to the start of the project must have completed an eight-hour refresher course within the past 12 months. The SS must have completed an additional eight hours of supervisory training, and must have a current first-aid/CPR certificate.

8.1.2 Basic 40-Hour Course

General site workers (such as equipment operators, general laborers and supervisory personnel) engaged in hazardous substance removal or other activities which expose or potentially expose workers to hazardous substances and health hazards shall receive a minimum of 40 hours of instruction off the site, and a minimum of three days actual field experience under the direct supervision of a trained experienced supervisor.

The following is a list of the topics typically covered in a 40-hour HAZWOPER training course:

- General safety procedures
- Physical hazards (fall protection, noise, heat stress, cold stress)
- Names and job descriptions of key personnel responsible for site health and safety
- Safety, health, and other hazards typically present at hazardous waste sites
- Use, application, and limitations of PPE
- Work practices by which employees can minimize risks from hazards
- Safe use of engineering controls and equipment onsite
- Medical surveillance requirements
- Recognition of symptoms and signs which might indicate overexposure to hazards
- Worker right-to-know (Hazard Communication OSHA 1910.1200)
- Routes of exposure to contaminants
- Engineering controls and safe work practices
- Components of a health and safety program and a site-specific HASP

- Decontamination practices for personnel and equipment
- Confined-space entry procedures
- General emergency response procedures

8.1.3 Supervisor Course

Management and supervisors must receive an additional 8 hours of training, which typically includes:

- General site safety and health procedures
- PPE programs
- Air monitoring techniques

8.1.4 24-hour Training

Workers on site only occasionally for a specific limited task (such as, but not limited to, ground water monitoring, land surveying, or geophysical surveying) and who are unlikely to be exposed over permissible exposure limits and published exposure limits shall receive a minimum of 24 hours of instruction off the site, and the minimum of one day actual field experience under the direct supervision of a trained, experienced supervisor.

8.1.5 Site-Specific Training

Site-specific training will be accomplished by onsite personnel reading this HASP or through a thorough site briefing by the PM, SS, or HSS on the contents of this HASP before work begins. The review must include a discussion of the chemical, physical, and biological hazards; the protective equipment and safety procedures; and emergency procedures.

8.1.6 Daily Safety Meetings

Twice daily safety meetings will be held to cover the work to be accomplished, the hazards anticipated, the PPE and procedures required to minimize site hazards, and emergency procedures. The SS or HSS should present these meetings prior to beginning the day's fieldwork and again after lunch. No work will be performed in an EZ before a safety meeting has been held. A safety meeting must also be held prior to new tasks, and repeated if new hazards are encountered.

8.1.7 First Aid and CPR

At least one employee current in first aid/CPR will be assigned to the work crew and will be on the site during operations. Refresher training in first aid (triennially) and CPR (annually) are required to keep the certificate current. These individuals must also receive training regarding the precautions and protective equipment necessary to protect against exposure to blood-borne pathogens.

8.2 Medical Surveillance

8.2.1 Medical Examination

All personnel who are potentially exposed to site contaminants must participate in a medical surveillance program as defined by OSHA at 29 CFR 1910.120 (f).

8.2.2 Pre-placement Medical Examination

All potentially exposed personnel must have completed a comprehensive medical examination prior to assignment, and periodically thereafter as defined by applicable regulations. The pre-placement and periodic medical examinations typically include the following elements:

- Medical and occupational history questionnaire
- Physical examination
- Complete blood count, with differential
- Liver enzyme profile
- Chest X-ray, at a frequency determined by the physician
- Pulmonary function test
- Audiogram
- Electrocardiogram for persons older than 45 years of age, or if indicated during the physical examination

- Drug and alcohol screening, as required by job assignment
- Visual acuity
- Follow-up examinations, at the discretion of the examining physician or the corporate medical director

The examining physician provides the employee with a letter summarizing his findings and recommendations, confirming the worker's fitness for work and ability to wear a respirator. Documentation of medical clearance will be available for each employee during all project site work.

Subcontractors will certify that all their employees have successfully completed a physical examination by a qualified physician. The physical examinations must meet the requirements of 29 CFR 1910.120 and 29 CFR 1910.134. Subcontractors will supply copies of the medical examination certificate for each onsite employee.

8.2.3 Other Medical Examinations

In addition to pre-employment, annual, and exit physicals, personnel may be examined:

- At employee request after known or suspected exposure to toxic or hazardous materials
- At the discretion of the HSS, HSO, or occupational physician in anticipation of, or after known or suspected exposure to toxic or hazardous materials

8.2.4 Periodic Exam

Following the placement examination, all employees must undergo a periodic examination, similar in scope to the placement examination. For employees potentially exposed over 30 days per year, the frequency of periodic examinations will be annual. For employees potentially exposed less than 30 days per year, the frequency for periodic examinations will be 24 months.

8.2.5 Medical Restriction

When the examining physician identifies a need to restrict work activity, the employee's supervisor must communicate the restriction to the employee and the HSS. The terms of the restriction will be discussed with the employee and the supervisor.

9. Emergency Procedures

9.1 General

Prior to the start of operations, the work area will be evaluated for the potential for fire, contaminant release, or other catastrophic event. Unusual conditions or events, activities, chemicals, and conditions will be reported to the SS/HSS immediately.

The SS/HSS will establish evacuation routes and assembly areas for the site. All personnel entering the site will be informed of this route and the assembly area.

9.2 Emergency Response

If an incident occurs, the SS or HS should take the following steps:

- Evaluate the incident and assess the need for assistance and/or evacuation
- Call for outside assistance as needed
- Confirm that the PM is notified promptly of the incident
- Take appropriate measures to stabilize the incident scene

9.3 Fire

In the case of a fire onsite, the SS/HSS will assess the situation and direct firefighting activities. The SS/HSS will confirm that the PM is immediately notified of any fires. Site personnel will attempt to extinguish the fire with available extinguishers, if safe to do so. In the event of a fire that site personnel are unable to safely extinguish with one fire extinguisher, the local fire department will be summoned.

9.4 Contaminant Release

In the event of a contaminant release, the following steps will be taken:

- Notify SS/HSS immediately
- Evacuate immediate area of release
- Conduct air monitoring to determine needed level of PPE
- Don required level of PPE and prepare to implement control procedures

The SS/HSS has the authority to commit resources as needed to contain and control released material, and to prevent its spread to offsite areas.

9.5 Medical Emergency

All employee injuries must be promptly reported to the HSS/SS, who will:

- Confirm that the injured employee receives prompt first aid and medical attention.
- In emergency situations, the worker is to be transported by appropriate means to the nearest urgent care facility (normally a hospital emergency room).

9.6 Emergency Care Steps

Upon entering an accident area, site personnel must follow these emergency care steps:

- Survey the scene. Determine if it is safe to proceed. Try to determine if the conditions that caused the incident are still a threat. Protect yourself from exposure before attempting to rescue the victim.
- Do a primary survey of the victim. Check for airway obstruction, breathing, and pulse. Assess likely routes of chemical exposure by examining the eyes, mouth, nose, and skin of the victim for symptoms.
- Phone emergency medical services (EMS). Give the location, telephone number used, caller's name, what happened, number of victims, victim's condition, and help being given.
- Maintain airway and perform rescue breathing as necessary.
- Perform CPR as necessary.
- Do a secondary survey of the victim. Check vital signs and do a head-to-toe exam.
- Treat other conditions as necessary. If the victim can be moved, take him or her to a location away from the work area where EMS can gain access.

9.7 First Aid—General

All persons must report any injury or illness to their immediate supervisor or the SS. Trained personnel will provide first aid. Injuries and illnesses requiring medical

treatment must be documented. The SS and HSS must conduct an II as soon as emergency conditions no longer exist, and first aid and/or medical treatment has been confirmed. IIs must be completed and submitted to the PM within 24 hours after the incident.

If first-aid treatment is required, first-aid kits are kept at the CRZ. If treatment beyond first aid is required, the injured person(s) should be transported to the medical facility. If the injured person is not ambulatory or shows any sign of not being in a comfortable and stable condition for transport, then an ambulance and/or paramedics should be summoned. If there is any doubt as to the injured worker's condition, it is best to let the local paramedic or ambulance service examine and transport the worker.

9.7.1 First Aid—Inhalation

Any employee complaining of symptoms of chemical overexposure as described in Section 4, General Safety Practices, will be removed from the work area and transported to the designated medical facility for examination and treatment.

9.7.2 First Aid—Ingestion

Call EMS and consult a poison control center for advice. If available, refer to the MSDS for treatment information. If the victim is unconscious, keep them on their side and clear the airway if vomiting occurs.

9.7.3 First Aid—Skin Contact

Project personnel who have had skin contact with contaminants will, unless the contact is severe, proceed through the CRZ to the wash area. Personnel will remove any contaminated clothing and then flush the affected area with water for at least 15 minutes. The worker should be transported to the medical facility if he or she shows any sign of skin reddening, irritation, or if he or she requests a medical examination.

9.7.4 First Aid—Eye Contact

Project personnel who have had contaminants splashed in their eyes, or who have experienced eye irritation while in the EZ, must immediately proceed to the eyewash station in the CRZ. Do not decontaminate prior to using the eyewash. Remove whatever protective clothing is necessary to use the eyewash. Flush the eye with clean

running water for at least 15 minutes. Arrange prompt transport to the designated medical facility.

9.7.5 Reporting Injuries, Illnesses, and Near-Miss Incidents

Injuries and illnesses, however minor, will be reported to the SS immediately. The SS will notify the HSM/HSO, and the PM immediately upon learning of a near-miss, injury or illness. The SS will complete an injury report and submit it to the HSM/HSO, and the PM within 24 hours.

Near-miss incidents are situations in which no injury or property damage occurred, but under slightly different circumstances an injury or property damage could have occurred. Near misses are caused by the same factors as injuries; therefore, they must be reported and investigated in the same manner. An investigation must be done immediately after an injury, illness, near miss, or other incident to determine if it is safe to proceed with the work.

9.8 Emergency Information

The means to summon local public response agencies such as police, fire, and ambulance will be reviewed in the daily safety meeting. These agencies are identified in Table 9-1.

Table 9-1. Emergency Contacts

Local Emergency Contacts	Phone Number
FIRE DEPARTMENT: Chili Fire Department	3231 Chili Avenue Rochester, NY 14624 **911**
LOCAL POLICE: Rochester Police Dept	630 Clinton Ave N, Rochester, NY 14605 **911**
SHERIFF: Monroe County Sheriff's Office	4201 Buffalo Road North Chili, NY 14624 **911**
STATE POLICE: New York State Police	1155 Scottsville Rd Rochester, NY 14624 **911**
AMBULANCE: Gates Ambulance Service Or Fire Department	1600 Buffalo Rd Rochester, NY or dial **911**
HOSPITAL: Strong Memorial Hospital	601 Elmwood Ave, Rochester, NY 14642 585.275.2100

Local Emergency Contacts	Phone Number
LOCAL HEALTH DEPARTMENT: Monroe County Department of Public Health	111 Westfall Rd. Rochester NY 14692 585.753.5470
STATE HEALTH DEPARTMENT: New York State Department of Health	547 River Street Albany NY 12180 518.402.7860
PROJECT EMERGENCY CONTACTS	
National Spill Response Center	800.424.8802
Emergency Client Contact: Frank Chiappone	One Bausch & Lomb Place Rochester, New York 14604-2701 585.338.5087
Other Emergency Contacts	**Phone Number**
Local NYSDEC Office (Region 8)	585.226.2426

Directions to Strong Memorial Hospital

Starting from: A 465 Paul Rd, Rochester, NY 14624-4722

Arriving at: B Strong Memorial Hospital 601 Elmwood Ave, Rochester, NY

Distance: 5.9 miles **Approximate Travel Time:** 12 mins

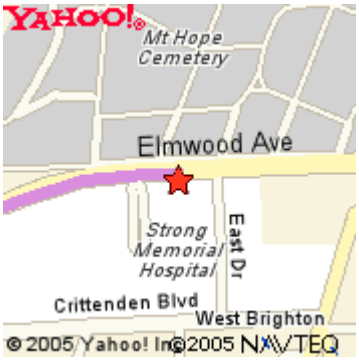
Your Directions

1. Start at **465 PAUL RD[RT-252A], ROCHESTER** going toward **MARSHALL RD** - go **2.9** mi
2. Turn L on **SCOTTSVILLE RD[RT-383]** - go **2.1** mi
3. Bear R on **ELMWOOD AVE** - go **0.9** mi
4. Arrive at **STRONG MEMORIAL HOSPITAL**

When using any driving directions or map, it's a good idea to do a reality check and make sure the road still exists, watch out for construction, and follow all traffic safety precautions. This is only to be used as an aid in planning.

Maps to Strong Memorial Hospital

601 Elmwood Avenue
Rochester, New York



10. Acronyms and Abbreviations

The following acronyms and abbreviations (listed alphabetically) are applicable to this HASP:

ACGIH	American Conference of Governmental Industrial Hygienists
CFR	Code of Federal Regulations
COC(s)	Constituent(s) of Concern
CPR	Cardiopulmonary Resuscitation
CRZ	Contamination-Reduction Zone
DEET	diethyltoluamide
DOT	Department of Transportation
EMS	Emergency Medical Services
EZ	Exclusion Zone
FM	Factory Mutual Engineering Corporation
GFCI	Ground-Fault-Circuit Interrupter
GWCTS	Groundwater Collection and Treatment System
HASP	Health and Safety Plan
HSO	Health and Safety Officer
HSS	Health and Safety Supervisor
II	Incident Investigation
kV	Kilovolts

LEL	Lower Explosive Limit
LFL	Lower Flammable Limit
mph	Miles Per Hour
MSDS	Material Safety Data Sheet
NEC	National Electrical Code
NESC	National Electrical Safety Code
NIOSH	National Institute for Occupational Safety and Health
NRR	Noise Reduction Rating
OSHA	Occupational Safety and Health Administration
PEL	Permissible Exposure Limit
PFD	Personal Flotation Device
PID	Photoionization Detector
PM	Project Manager
PO	Project Officer
PPE	Personal Protective Equipment
RMSF	Rocky Mountain Spotted Fever
SPDES	State Pollution Discharge Elimination System
SS	Site Supervisor
SSDS	Sub-Slab Depressurization System
SZ	Support Zone

Ta adj	Adjusted Air Temperature
TLV	Threshold Limit Value
UFPO	Underground Facility Protection Organization
UL	Underwriters Laboratory
USEPA	United States Environmental Protection Agency

11. References

This HASP follows the guidelines established in the references listed below.

ACGIH. 2005a. *Threshold Limit Values Handbook*.

ACGIH. 2005b. *Guide to Occupational Exposure Values*.

Forsberg, K. and S.Z. Mansdorf. 1993. *Quick Selection Guide to Chemical Protective Clothing*, 2nd Edition.

NIOSH. 2003. Pocket Guide to Chemical Hazards.

NIOSH, OSHA, USCG, and USEPA. 1985. *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*. 86116.

Title 29 of the Code of Federal Regulations (CFR), Parts 1910 and 1926.

USEPA. 1992. *Standard Operating Safety Guides*. Publication 9285.1-03.

ARCADIS

Attachment A

Material Safety Data Sheets

Material Safety Data Sheet Collection
Genium Publishing Corp.
1171 RiverFront Center
Amsterdam, NY 12010
(518) 842-4111

Issue Date: 2000-07

Acetone
MSDS 300
ACE4750

Section 1 - Chemical Product and Company Identification 54.1

Material Name: Acetone **CAS Number:** 67-64-1
Chemical Formula: C_3H_6O
Structural Chemical Formula: CH_3COCH_3
Synonyms: ACETON; ACETONE; CHEVRON ACETONE; DIMETHYL KETONE; DIMETHYLFORMALDEHYDE; DIMETHYLKETAL; EPA PESTICIDE CHEMICAL CODE 004101; KETONE PROPANE; KETONE,DIMETHYL; BETA-KETOPROPANE; METHYL KETONE; 2-PROPANONE; PROPANONE; PYROACETIC ACID; PYROACETIC ETHER
General Use: Solvent for fats, oils, waxes, resins, rubber, plastics, lacquers.
Used in manufacture of methyl isobutyl ketone, mesityl oxide, acetic acid, diacetone alcohol, isoprene. Used in solvent extraction processes.
Solvent in the manufacture of explosives and rayon. Component of adhesives, glues, cleaning solvents, lacquer thinners, nail polish, paint removers.
Storing acetylene gas (takes up about 24 times its volume of the gas).
Purifying paraffin and biomedical hardening and dehydrating tissues.
Minor food additive, permitted in USA.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
acetone	67-64-1	95-99.5

OSHA PEL
TWA: 1000 ppm; 2400 mg/m^3.

NIOSH REL
TWA: 250 ppm; 590 mg/m^3.

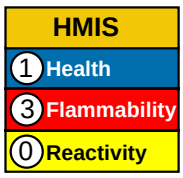
DFG (Germany) MAK
TWA: 500 ppm; 1200 mg/m^3.

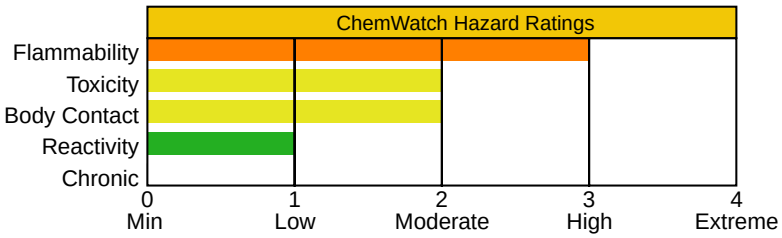
OSHA PEL Vacated 1989 Limits
TWA: 750 ppm; 1800 mg/m^3;
STEL: 1000 ppm; 2400 mg/m^3.

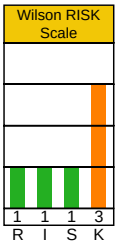
IDLH Level
2500 ppm; LEL.

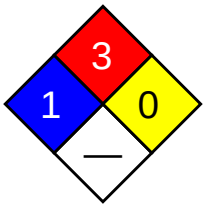
ACGIH TLV
TWA: 750 ppm; 1780 mg/m^3;
STEL: 1000 ppm; 2380 mg/m^3.

Section 3 - Hazards Identification









Fire Diamond

ANSI Signal Word
Danger!


Flammable

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Colorless, highly volatile liquid; sweet odor. Irritating. Also causes: muscle weakness, mentaI confusion, coma (high concentrations). Ingestion: GI irritation, kidney and liver damage, metabolic changes, coma. Chronic: dermatitis. Highly flammable.

Potential Health Effects

Primary Entry Routes: inhalation, skin contact, eye contact, ingestion

Target Organs: respiratory system, central nervous system (CNS), skin

Acute Effects

Inhalation: The vapor is discomforting to the upper respiratory tract.
Inhalation hazard is increased at higher temperatures.
Exposure to ketone vapors may produce nose, throat and mucous membrane irritation. High concentrations of vapor may produce central nervous system depression characterized by headache, vertigo, loss of coordination, narcosis and cardiorespiratory failure. Some ketones produce neurological disorders (polyneuropathy) characterized by bilateral symmetrical paresthesia and muscle weakness primarily in the legs and arms.
Symptoms of exposure may include restlessness, headache, vomiting, stupor, low blood pressure and rapid and irregular pulse, eye and throat irritation, weakness of the legs, dizziness and lightheadedness.
Inhalation of high concentrations produces dryness of the mouth and throat, dizziness, nausea, incoordinated movements, loss of coordinated speech, drowsiness, and in extreme cases, coma.
Inhalation of acetone vapors over long periods causes irritation of the respiratory tract, coughing, headache. Acetone concentrations of 52200 ppm for 1 hour produced narcosis in rats and fatalities at 126600 ppm.

Eye: The liquid may produce eye discomfort and is capable of causing temporary impairment of vision and/or transient eye inflammation, ulceration.
The vapor is discomforting to the eyes.
The material may produce severe irritation to the eye causing pronounced inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

Skin: The liquid is discomforting to the skin if exposure is prolonged and may cause drying of the skin, which may lead to dermatitis.
Toxic effects may result from skin absorption.
Open cuts, abraded or irritated skin should not be exposed to this material.
The material may accentuate any pre-existing skin condition.
The material may cause skin irritation after prolonged or repeated exposure and may produce a contact dermatitis (nonallergic). This form of dermatitis is often characterized by skin redness (erythema) and swelling (edema) which may progress to vesiculation, scaling and thickening of the epidermis. Histologically there may be intercellular edema of the spongy layer (spongiosis) and intracellular edema of the epidermis.

Ingestion: Considered an unlikely route of entry in commercial/industrial environments.
The liquid is highly discomforting and mildly toxic if swallowed but may be harmful if swallowed in quantity.
Small amounts or low dose rates are regarded as practically non-harmful.

Carcinogenicity: NTP - Not listed; IARC - Not listed; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Class D, Not classifiable as to human carcinogenicity; MAK - Not listed.

Chronic Effects: Prolonged or continuous skin contact with the liquid may cause defatting with drying, cracking, irritation and dermatitis following.
Workers exposed to 700 ppm acetone for 3 hours/day for 7-15 years showed inflammation of the respiratory tract, stomach and duodenum, attacks of giddiness and loss of strength. Exposure to acetone may enhance liver toxicity of chlorinated solvents.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.
Lay patient down. Keep warm and rested.
If available, administer medical oxygen by trained personnel.
If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor, without delay.

Eye Contact: Immediately hold the eyes open and flush with fresh running water.
Ensure irrigation under the eyelids by occasionally lifting upper and lower lids. If pain persists or recurs seek medical attention.
Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

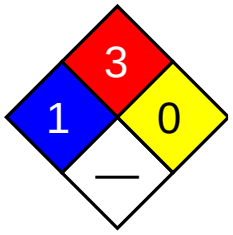
Skin Contact: Immediately remove all contaminated clothing, including footwear (after rinsing with water).
Wash affected areas thoroughly with water (and soap if available).
Seek medical attention in event of irritation.

Ingestion: Rinse mouth out with plenty of water.
Contact a Poison Control Center.
Do NOT induce vomiting. Give a glass of water.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: For acute or short-term repeated exposures to acetone:
1.Symptoms of acetone exposure approximate ethanol intoxication.
2.About 20% is expired by the lungs and the rest is metabolized.
Alveolar air half-life is about 4 hours following two hour inhalation at levels near the Exposure Standard; in overdose, saturable metabolism and limited clearance, prolong the elimination half-life to 25-30 hours.
3.There are no know antidotes and treatment should involve the usual methods of decontamination followed by supportive care.

Section 5 - Fire-Fighting Measures



Fire Diamond

Flash Point: -20 °C
Autoignition Temperature: 465 °C
LEL: 2.15% v/v
UEL: 13% v/v
Extinguishing Media: Water spray or fog; alcohol stable foam.
Dry chemical powder.
Bromochlorodifluoromethane (BCF) (where regulations permit).
Carbon dioxide.
General Fire Hazards/Hazardous Combustion Products: Liquid and vapor are highly flammable.
Severe fire hazard when exposed to heat, flame and/or oxidizers.
Vapor forms an explosive mixture with air.
Severe explosion hazard, in the form of vapor, when exposed to flame or spark. Vapor may travel a considerable distance to source of ignition.
Heating may cause expansion/decomposition with violent rupture of containers.
On combustion, may emit toxic fumes of carbon monoxide (CO). Other combustion products include carbon dioxide (CO_2).
Fire Incompatibility: Avoid contamination with oxidizing agents i.e. nitrates, oxidizing acids, chlorine bleaches, pool chlorine etc. as ignition may result.
PLEASE NOTE: 10% of acetone in water has a flash point below 20 deg. C.
Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.
May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.
Fight fire from a safe distance, with adequate cover.
If safe, switch off electrical equipment until vapor fire hazard removed.
Use water delivered as a fine spray to control the fire and cool adjacent area. Avoid spraying water onto liquid pools.
Do not approach containers suspected to be hot.
Cool fire-exposed containers with water spray from a protective location.
If safe to do so, remove containers from path of fire.

Section 6 - Accidental Release Measures

Small Spills: Remove all ignition sources. Clean up all spills immediately.
Avoid breathing vapors and contact with skin and eyes.
Control personal contact by using protective equipment.
Contain and absorb small quantities with vermiculite or other absorbent material. Wipe up. Collect residues in a flammable waste container.
Large Spills: Clear area of personnel and move upwind.
Contact fire department and tell them location and nature of hazard.
Avoid breathing vapors and contact with skin and eyes.
May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.
Shut off all possible sources of ignition and increase ventilation.
Water spray or fog may be used to disperse vapor.
Stop leak if safe to do so. Contain spill with sand, earth or vermiculite.
Collect residues and place in flammable waste container.
Any electric cleaning equipment must be explosion proof.
Wash spill area with large quantities of water.
If contamination of drains or waterways occurs, advise emergency services.
After clean-up operations, decontaminate and launder all protective clothing and equipment before storing and reusing.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid all personal contact, including inhalation.
Wear protective clothing when risk of exposure occurs.
Use in a well-ventilated area. Prevent concentration in hollows and sumps.
DO NOT enter confined spaces until atmosphere has been checked.
Avoid smoking, bare lights, heat or ignition sources.
When handling, DO NOT eat, drink or smoke.
Vapor may ignite on pumping or pouring due to static electricity.

DO NOT use plastic buckets. Ground and secure metal containers when dispensing or pouring product. Use spark-free tools when handling.
Avoid contact with incompatible materials.
Keep containers securely sealed. Avoid physical damage to containers.
Always wash hands with soap and water after handling.
Work clothes should be laundered separately.
Use good occupational work practices. Observe manufacturer's storing and handling recommendations. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions.

Recommended Storage Methods: Metal can; metal drum. Packing as recommended by manufacturer.
Check all containers are clearly labeled and free from leaks.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: CARE: Use of a quantity of this material in confined space or poorly ventilated area, where rapid build-up of concentrated atmosphere may occur, could require increased ventilation and/or protective gear. Use in a well-ventilated area. Local exhaust ventilation may be required for safe working, i.e., to keep exposures below required standards; otherwise, PPE is required.
None required when handling small quantities. OTHERWISE: If inhalation risk of overexposure exists, wear NIOSH-approved organic-vapor respirator.

Personal Protective Clothing/Equipment

Eyes: Safety glasses with side shields; or as required, chemical goggles.
Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: Barrier cream with polyethylene gloves or Butyl rubber gloves or Neoprene rubber gloves.
Safety footwear.

Respiratory Protection:
Exposure Range >1000 to <2500 ppm: Supplied Air, Constant Flow/Pressure Demand, Full Face
Exposure Range 2500 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face
Note: use ov (black) cartridge for nuisance(<1000)

Other: Overalls. Ensure that there is ready access to eye wash unit and Ensure there is ready access to an emergency shower.

Glove Selection Index:

BUTYL/NEOPRENE	A
PE/EVAL/PE	A
PVDC/PE/PVDC	A
BUTYL	A
SARANEX-23 2-PLY	B
TEFLON	B
SARANEX-23	C
CPE	C
HYPALON	C
NITRILE+PVC	C
PVA	C
VITON/NEOPRENE	C
NEOPRENE	C
PVC	C
NATURAL+NEOPRENE	C
NATURAL RUBBER	C
NITRILE	C

A: Best selection
B: Satisfactory; may degrade after 4 hours continuous immersion
C: Poor to dangerous choice for other than short-term immersion

Section 9 - Physical and Chemical Properties

Appearance/General Info: Clear, colorless, highly volatile, highly flammable liquid with characteristic sweet odor. Mixes in alcohol, ether, most hydrocarbons and oils.

Physical State: Liquid
Vapor Pressure (kPa): 24 at 20 °C
Vapor Density (Air=1): 2.0
Formula Weight: 58.08
Specific Gravity (H_2O=1, at 4 °C): 0.79 at 20 °C
Water Solubility: Miscible
Evaporation Rate: 11 (BuAc=1) VFast

pH: Not applicable
pH (1% Solution): Not applicable.
Boiling Point Range: 56.2 °C (133 °F) at 760 mm Hg
Freezing/Melting Point Range: -95.35 °C (-139.63 °F)
Volatile Component (% Vol): 100

Section 10 - Stability and Reactivity

Stability/Polymerization: Product is considered stable. Hazardous polymerization will not occur.
Storage Incompatibilities: Avoid storage with oxidizers, strong acids and strong alkalis.
Reacts violently with bromoform and chloroform in the presence of alkalies or in contact with alkaline surfaces.

Section 11 - Toxicological Information

Unless otherwise specified data extracted from RTECS - Registry of Toxic Effects of Chemical Substances

TOXICITY
Oral (man) TD_{Lo}: 2857 mg/kg
Oral (rat) LD_{50}: 5800 mg/kg
Inhalation (human) TC_{Lo}: 500 ppm
Inhalation (man) TC_{Lo}: 12000 ppm/4 hr
Inhalation (man) TC_{Lo}: 10 mg/m^3/6 hr
Inhalation (rat) LC_{50}: 50100 mg/m^3/8 hr
Dermal (rabbit) LD_{50}: 20000 mg/kg

IRRITATION
Eye (human): 500 ppm - irritant
Eye (rabbit): 3.95 mg - SEVERE
Eye (rabbit): 20 mg/24 hr -moderate
Skin (rabbit): 395 mg (open) - mild
Skin (rabbit): 500 mg/24 hr - mild

See NIOSH, *RTECS* AL 3150000, for additional data.

Section 12 - Ecological Information

Environmental Fate: If released on soil, it will both volatilize and leach into the ground and probably biodegrade. If released into water, it will probably biodegrade. It will also be lost due to volatilization (estimated half-life 20 hr from a model river). Bioconcentration in aquatic organisms and adsorption to sediment should not be significant. In the atmosphere, it will be lost by photolysis and reaction with photochemically produced hydroxyl radicals. Half-life estimates from these combined processes average 22 days and are shorter in summer and longer in winter. It will also be washed out by rain.
Ecotoxicity: LD_{100} Asellus aquaticus 3 ml/l (within 3 days of exposure) /Conditions of bioassay not specified; LC_{50} Mexican axolotl 20.0 mg/l/48 hr (3-4 weeks after hatching) /Conditions of bioassay not specified; TLm Mosquito fish 13,000 mg/l/24, 48, 96 hr /Conditions of bioassay not specified; LD_{100} Gammarus fossarum 10 ml/l (within 48 hr) /Conditions of bioassay not specified; LC_{50} Poecilia reticulata (guppy) 7,032 ppm/14 days /Conditions of bioassay not specified; LC_{50} Ring-necked pheasant oral greater than 40,000 ppm, in diet, age 10 days, (no mortality to 40,000 ppm); LC_{50} Salmo gairdneri (Rainbow trout) 5,540 mg/l/96 hr at 12 °C (95% confidence limit 4,740-6,330 mg/l), wt 1.0 g /static bioassay; LC_{50} Clawed toad 24.0 mg/l/48 hr (3-4 weeks after hatching) /Conditions of bioassay not specified; TLm Daphnia magna 10 mg/l/24, 48 hr /Conditions of bioassay not specified
Henry's Law Constant: 3.97 x10^{-5}
BCF: negligible
Biochemical Oxygen Demand (BOD): theoretical 122%, 5 days
Octanol/Water Partition Coefficient: log K_{ow} = -0.24

Section 13 - Disposal Considerations

Disposal: Consult manufacturer for recycling options and recycle where possible.
Follow applicable federal, state, and local regulations.
Incinerate residue at an approved site.
Recycle containers where possible, or dispose of in an authorized landfill.

Section 14 - Transport Information

DOT Transportation Data (49 CFR 172.101):

Shipping Name: ACETONE
Hazard Class: 3.1
ID No.: 1090
Packing Group: II
Label: Flammable Liquid[3]

Additional Shipping Information:

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Listed U002 Ignitable Waste
CERCLA 40 CFR 302.4: Listed per RCRA Section 3001 5000 lb (2268 kg)
SARA 40 CFR 372.65: Not listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

Research Date: .....1999-11 **Review Date:** 2000-07

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Material Safety Data Sheet Collection
Genium group inc.
1171 RiverFront Center, Amsterdam, NY 12010
(518) 842-4111

Issue Date: 2005-05

Section 1 - Chemical Product and Company Identification 55/60

Material Name: cis-Acetylene Dichloride **CAS Number:** 156-59-2
Chemical Formula: $C_2H_2Cl_2$
Structural Chemical Formula: CHCl=CHCl
EINECS Number: 205-859-7
ACX Number: X1007815-0
Synonyms: ACETALYNE DICHLORIDE; CIS-ACETYLENE DICHLORIDE; CIS-1,2-DICHLORETHYLENE; CIS-1,2-DICHLOROETHENE; (Z)-1,2-DICHLOROETHYLENE; 1,2-CIS-DICHLOROETHYLENE; CIS-1,2-DICHLOROETHYLENE; CIS-DICHLOROETHYLENE; ETHENE,1,2-DICHLORO-,(Z)-; ETHYLENE,1,2-DICHLORO-,(Z)-
General Use: solvent for waxes, resins, fats, phenol, camphor, acetyl cellulose, organic materials and heat-sensitive substances such as caffeine; in rubber manufacture, as a refrigerant, as an additive to dye and lacquer solutions, in retarding fermentation, in organic synthesis, in medicines, in dye extraction, in chlorination reactions and in the manufacture of artificial pearls; a constituent of perfumes and thermoplastics

Section 2 - Composition / Information on Ingredients

Name	CAS	%
cis-acetylene dichloride	156-59-2	>98

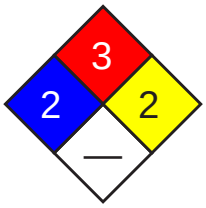
OSHA PEL
TWA: 200 ppm; 790 mg/m^3.

NIOSH REL

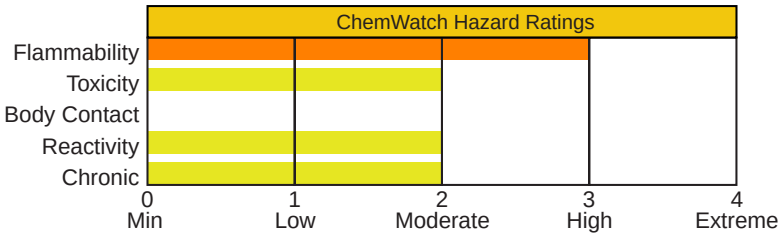
DFG (Germany) MAK
TWA: 200 ppm; PEAK: 400 ppm.

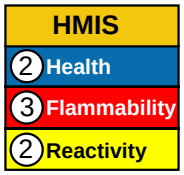
ACGIH TLV
TWA: 200 ppm.

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word
Warning!


Flammable

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Colorless liquid; sweetish odor. Irritating to eyes/skin/respiratory tract. Harmful. Other Acute Effects: narcotic effect. Flammable.

Potential Health Effects

Target Organs: eyes, skin, respiratory system, nervous system, liver, kidneys
Primary Entry Routes: inhalation of vapor, skin/eye contact

Acute Effects

Inhalation: There is a single report of an industrial poisoning, a fatality caused by the inhalation of a vapor in a small enclosure. Acute intoxication by halogenated aliphatic hydrocarbons appears to take place over two stages. Signs of a reversible narcosis are evident in the first stage and in the second stage signs of injury to organs may become evident, a single organ alone is (almost) never involved. Depression of the central nervous system is the most outstanding effect of most halogenated aliphatic hydrocarbons. Inebriation and excitation, passing into narcosis, is a typical reaction. In severe acute exposures there is always a danger of death from respiratory failure or cardiac arrest due to a tendency to make the heart more susceptible to catecholamines (adrenalin). The most important effects of exposure are narcosis and irritation of the central nervous system. Liver responses may occur after repeated narcotic doses and involves fatty liver degeneration. Vapor exposure may produce central nervous system depression or in milder exposures, nausea, vomiting, weakness, tremor and epigastric cramps. Recovery is usually rapid.

Eye: The vapor when concentrated has pronounced eye irritation effect; this gives some warning of high vapor concentrations. If eye irritation occurs seek to reduce exposure with available control measures, or evacuate area. Exposure to the trans isomer at 2200 ppm caused burning of the eyes, vertigo, nausea. Reversible corneal clouding has been described in exposures to acetylene dichloride.

Skin: The liquid may produce skin discomfort following prolonged contact. Defatting and/ or drying of the skin may lead to dermatitis.

Ingestion: The liquid is discomforting to the gastrointestinal tract and toxic if swallowed. Considered an unlikely route of entry in commercial/industrial environments.

Carcinogenicity: NTP - Not listed; IARC - Not listed; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Class D, Not classifiable as to human carcinogenicity; MAK - Not listed.

Chronic Effects: The material may accumulate in the human body and progressively cause tissue damage.

Section 4 - First Aid Measures

See DOT ERG

Inhalation: • If fumes or combustion products are inhaled, remove to fresh air.
• Lay patient down. Keep warm and rested.
• If breathing is shallow or has stopped, ensure clear airway and apply resuscitation, preferably with a demand valve resuscitator, bag-valve mask device, or pocket mask as trained. Perform CPR if necessary.
• Transport to hospital or doctor.

Eye Contact: • Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water.
• Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids.
• Transport to hospital or doctor without delay.
• Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: • Immediately remove all contaminated clothing, including footwear (after rinsing with water).
• Wash affected areas thoroughly with water (and soap if available).
• Seek medical attention in event of irritation.

Ingestion: Contact a Poison Control Center. Do NOT induce vomiting. Give a glass of water.

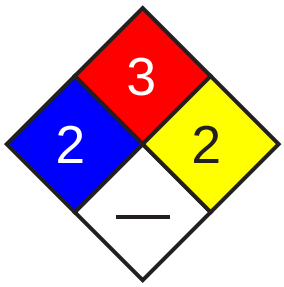
After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Treatment should follow that practiced in carbon tetrachloride exposures:
• Acute exposures to carbon tetrachloride present, initially, with CNS depression followed by hepatic and renal dysfunction.
• Respiratory depression and cardiac dysrhythmias are an immediate threat to life.
• Since a major fraction of absorbed carbon tetrachloride is exhaled in first hour, good tidal volumes should be maintained in severely poisoned patients; hyperventilation may be an additional therapeutic modality.
• Ipecac syrup, lavage, activated charcoal or catharsis may all be used in the first 4 hours.
• Since reactive metabolites may cause hepatorenal toxicity, administration of N-acetyl-L-cysteine may reduce complications. Experience with this therapy is limited.

Section 5 - Fire-Fighting Measures

Flash Point: 2.2 to 3.9 °C Closed Cup
Autoignition Temperature: 460 °C
LEL: 9.7% v/v
UEL: 12.8% v/v
Extinguishing Media: Foam. Dry chemical powder. BCF (where regulations permit). Carbon dioxide. Water spray or fog - Large fires only.

See DOT ERG



Fire Diamond

General Fire Hazards/Hazardous Combustion Products: • Liquid and vapor are highly flammable.
• Severe fire hazard when exposed to heat, flame and/or oxidizers.
• Vapor forms an explosive mixture with air.
• Severe explosion hazard, in the form of vapor, when exposed to flame or spark.
• Vapor may travel a considerable distance to source of ignition.
• Heating may cause expansion/decomposition with violent rupture of containers.
• On combustion, may emit toxic fumes of carbon monoxide (CO). Other combustion products include hydrogen chloride and phosgene.
Fire Incompatibility: Avoid contamination with oxidizing agents i.e., nitrates, oxidizing acids, chlorine bleaches, pool chlorine etc. as ignition may result.
Fire-Fighting Instructions: • Contact fire department and tell them location and nature of hazard.
• May be violently or explosively reactive.
• Wear breathing apparatus plus protective gloves.
• Prevent, by any means available, spillage from entering drains or waterways.
• Consider evacuation (or protect in place).
• Fight fire from a safe distance, with adequate cover.
• If safe, switch off electrical equipment until vapor fire hazard removed.
• Use water delivered as a fine spray to control the fire and cool adjacent area.
• Avoid spraying water onto liquid pools.
• Do not approach containers suspected to be hot.
• Cool fire-exposed containers with water spray from a protected location.
• If safe to do so, remove containers from path of fire.

Section 6 - Accidental Release Measures

See DOT ERG

Small Spills: • Remove all ignition sources.
• Clean up all spills immediately.
• Avoid breathing vapors and contact with skin and eyes.
• Control personal contact by using protective equipment.
• Contain and absorb small quantities with vermiculite or other absorbent material.
• Wipe up.
• Collect residues in a flammable waste container.
Large Spills: • Clear area of personnel and move upwind.
• Contact fire department and tell them location and nature of hazard.
• May be violently or explosively reactive.
• Wear breathing apparatus plus protective gloves.
• Prevent, by any means available, spillage from entering drains or waterways.
• No smoking, bare lights or ignition sources.
• Increase ventilation.
• Stop leak if safe to do so.
• Water spray or fog may be used to disperse/absorb vapor.
• Contain spill with sand, earth or vermiculite.
• Use only spark-free shovels and explosion proof equipment.
• Collect recoverable product into labeled containers for recycling.
• Absorb remaining product with sand, earth or vermiculite.
• Collect solid residues and seal in labeled drums for disposal.
• Wash area and prevent runoff into drains.
• If contamination of drains or waterways occurs, advise emergency services.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: • Avoid all personal contact, including inhalation.
• Wear protective clothing when risk of exposure occurs.
• Use in a well-ventilated area.
• Prevent concentration in hollows and sumps.

• DO NOT enter confined spaces until atmosphere has been checked.
• Avoid smoking, bare lights or ignition sources.
• Avoid contact with incompatible materials.
• When handling, DO NOT eat, drink or smoke.
• Keep containers securely sealed when not in use.
• Avoid physical damage to containers.
• Always wash hands with soap and water after handling.
• Work clothes should be laundered separately.
• Follow good occupational work practices.
• Observe manufacturer's storage and handling recommendations.
• Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions.

Recommended Storage Methods: Check that containers are clearly labeled. Packaging as recommended by manufacturer. DO NOT use aluminum or galvanized containers.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Local exhaust ventilation usually required. If risk of overexposure exists, wear NIOSH-approved respirator. Provide adequate ventilation in warehouse or closed storage area.

Personal Protective Clothing/Equipment:

Eyes: Safety glasses with side shields or, as required, chemical goggles. Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: Butyl rubber gloves. Neoprene gloves.

Respiratory Protection: Respirator protection may be required. Consult your supervisor.

Other: • Overalls.
• Barrier cream.
• Eyewash unit.

Glove Selection Index:

VITON ..... Poor to dangerous choice for other than short-term immersion

Section 9 - Physical and Chemical Properties

Appearance/General Info: Colorless liquid with pleasant chloroform-like odor.

Physical State: colorless liquid

Vapor Pressure (kPa): 200 mm Hg at 25 °C

Vapor Density (Air=1): 3.34

Formula Weight: 96.94

Specific Gravity (H_2O=1, at 4 °C): 1.2837 at 20 °C/4 °C

Boiling Point: 60.3 °C (141 °F) at 760 mm Hg

Freezing/Melting Point: -80.5 °C (-112.9 °F)

Water Solubility: 1 to 5 mg/mL at 16 °C

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Product is considered stable. Hazardous polymerization will not occur.

Storage Incompatibilities: Avoid reaction with oxidizing agents. Acetylene dichloride in contact with solid caustic alkalies or their concentrated solutions will form chloracetylene which ignites in air. Haloalkenes are highly reactive.

Section 11 - Toxicological Information

Toxicity

Inhalation (mouse) LC_{Lo}: 65000 mg/m^3/2 hr

Rat liver cell mutagen in vitro

Irritation

Nil reported

See *RTECS* KV9420000, for additional data.

Section 12 - Ecological Information

Environmental Fate: If released on soil, it should evaporate and/or leach into the groundwater where very slow biodegradation should occur. If released into water, it will be lost mainly through volatilization (half life 3 hr in a model river). Biodegradation, adsorption to sediment, and bioconcentration in aquatic organisms should not be significant. In the atmosphere it will be lost by reaction with photochemically produced hydroxyl radicals (half life 8 days) and scavenged by rain. Because it is relatively long lived in the atmosphere, considerable dispersal from source areas should occur.

Ecotoxicity: LC_{50} Lepomis machrochirus (bluegill) 135,000 ug/l/96 hr in a static unmeasured bioassay

Henry's Law Constant: estimated at 0.00337

BCF: calculated at 15
Octanol/Water Partition Coefficient: log K_{ow} = 1.86
Soil Sorption Partition Coefficient: K_{oc} = 49

Section 13 - Disposal Considerations

Disposal: • Consult manufacturer for recycling options and recycle where possible.
• Follow applicable local, state, and federal regulations.
• Incinerate residue at an approved site.
• Recycle containers if possible, or dispose of in an authorized landfill.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Shipping Name and Description: 1,2-Dichloroethylene
ID: UN1150
Hazard Class: 3 - Flammable and combustible liquid
Packing Group: II - Medium Danger
Symbols:
Label Codes: 3 - Flammable Liquid
Special Provisions: IB2, T7, TP2
Packaging: **Exceptions:** 150 **Non-bulk:** 202 **Bulk:** 242
Quantity Limitations: **Passenger aircraft/rail:** 5 L **Cargo aircraft only:** 60 L
Vessel Stowage: **Location:** B **Other:**

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Not listed
CERCLA 40 CFR 302.4: Not listed
SARA 40 CFR 372.65: Not listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

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1171 RiverFront Center
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(518) 842-4111

Issue Date: 2000-07

Benzene
MSDS 316
BEN2200

Section 1 - Chemical Product and Company Identification 54.1

Material Name: Benzene **CAS Number:** 71-43-2
Chemical Formula: C_6H_6
Structural Chemical Formula: C_6H_6
Synonyms: (6)ANNULENE; BENZEEN; BENZEN; BENZENE; BENZIN; BENZINE; BENZOL; BENZOL 90; BENZOLE; BENZOLENE; BENZOLO; BICARBURET OF HYDROGEN; CARBON OIL; COAL NAPHTHA; CYCLOHEXATRIENE; EPA PESTICIDE CHEMICAL CODE 008801; FENZEN; MINERAL NAPHTHA; MOTOR BENZOL; NITRATION BENZENE; PHENE; PHENYL HYDRIDE; POLYSTREAM; PYROBENZOL; PYROBENZOLE
General Use: Manufacture of chemicals including styrene, dyes, and many other organic chemicals. Has been used in artificial leather, linoleum, oil cloth, airplane dopes, lacquers; as solvent for waxes, resins, oils etc.
May also be a minor component of gasoline, petrol.
Exposure should be minimized by use in closed systems.
Handling procedures and control measures should be evaluated for exposure before commencement of use in plant operations.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
benzene	71-43-2	99.9

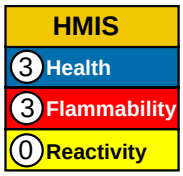
OSHA PEL
TWA: 1 ppm; 3 mg/m^3; STEL: 5 ppm; 15 mg/m^3; from Table Z-2.

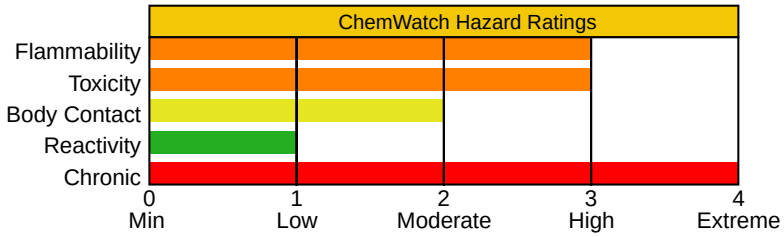
ACGIH TLV
TWA: 10 ppm; 32 mg/m^3.

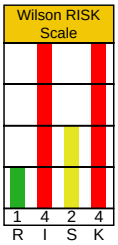
NIOSH REL
TWA: 0.1 ppm. STEL: 1 ppm.

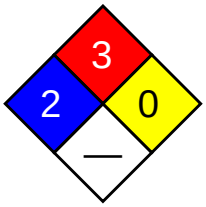
IDLH Level
500 ppm.

Section 3 - Hazards Identification









Fire Diamond

ANSI Signal Word
Danger!


Flammable

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Colorless liquid; sweet odor. Irritating to eyes/skin/respiratory tract. Toxic. Also causes: headache, dizziness, drowsiness. Absorbed through the skin. Chronic: dermatitis, leukemia, bone marrow damage. Carcinogen. Reproductive effects. Flammable.

Potential Health Effects

Primary Entry Routes: inhalation, skin contact
Target Organs: blood, central nervous system (CNS), bone marrow, eyes, upper respiratory system, skin
Acute Effects
Inhalation: The vapor is discomforting to the upper respiratory tract and lungs and may be harmful if inhaled.
If exposure to highly concentrated solvent atmosphere is prolonged this may lead to narcosis, unconsciousness, even coma and possible death.

Acute effects from inhalation of high concentrations of vapor are pulmonary irritation, including coughing, with nausea; central nervous system depression - characterized by headache and dizziness, increased reaction time, fatigue and loss of coordination.

Inhalation hazard is increased at higher temperatures.

The symptoms of acute exposure to high vapor concentrations include confusion, dizziness, tightening of the leg muscles and pressure over the forehead followed by a period of excitement. If exposure continues the casualty quickly becomes stupefied and lapses into a coma with narcosis.

Effects of inhalation may include nausea, vomiting headache, dizziness, drowsiness, weakness, sometimes preceded by brief periods of exhilaration, or euphoria, irritability, malaise, confusion, ataxia, staggering, weak and rapid pulse, chest pain and tightness with breathlessness, pallor, cyanosis of the lips and fingertips and tinnitus. Severe exposures may produce blurred vision, shallow, rapid breathing, delirium, cardiac arrhythmias, unconsciousness, deep anesthesia, paralysis and coma characterized by motor restlessness, tremors and hyperreflexia (occasionally preceded by convulsions). Polyneuritis and persistent nausea, anorexia, muscular weakness, headache, drowsiness, insomnia and agitation may also occur. Two-three weeks after the exposure, nervous irritability, breathlessness and unsteady gait may still persist; cardiac distress and an unusual dicoloration of the skin may be evident for up to four weeks.

Hemotoxicity is not normally a feature of acute exposures although anemia, thrombocytopenia, petechial hemorrhage, and spontaneous internal bleeding have been reported. Fatal exposures may result from asphyxia, central nervous system depression, cardiac and respiratory failure and circulatory collapse; sudden ventricular fibrillation may also be fatal.

Death may be sudden or may be delayed for 24 hours. Central nervous system, respiratory or hemorrhagic complications may occur up to five days after the exposure and may be lethal; pathological findings include respiratory inflammation with edema, and lung hemorrhage, renal congestion, cerebral edema and extensive petechial hemorrhage in the brain, pleurae, pericardium, urinary tract, mucous membrane and skin.

Exposure to toxic levels has also produced chromosome damage.

Eye: The liquid is highly discomforting to the eyes, may be harmful following absorption and is capable of causing a mild, temporary redness of the conjunctiva (similar to wind-burn), temporary impairment of vision and/or other transient eye damage/ulceration.

The vapor is moderately discomforting to the eyes.

The material may produce severe irritation to the eye causing pronounced inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

Skin: The liquid may produce skin discomfort following prolonged contact.

Defatting and/or drying of the skin may lead to dermatitis. Open cuts, abraded or irritated skin should not be exposed to this material.

Toxic effects may result from skin absorption.

The material may cause skin irritation after prolonged or repeated exposure and may produce a contact dermatitis (nonallergic). This form of dermatitis is often characterized by skin redness (erythema) and swelling (edema) which may progress to vesiculation, scaling and thickening of the epidermis. Histologically there may be intercellular edema of the spongy layer (spongiosis) and intracellular edema of the epidermis.

Ingestion: The liquid is discomforting to the gastrointestinal tract and may be harmful if swallowed.

Ingestion may result in nausea, pain, vomiting. Vomit entering the lungs by aspiration may cause potentially lethal chemical pneumonitis.

Carcinogenicity: NTP - Class 1, Known to be a carcinogen; IARC - Group 1, Carcinogenic to humans; OSHA - Listed as a carcinogen; NIOSH - Listed as carcinogen; ACGIH - Class A2, Suspected human carcinogen; EPA - Class A, Human carcinogen; MAK - Class A1, Capable of inducing malignant tumors as shown by experience with humans.

Chronic Effects: Liquid is an irritant and may cause burning and blistering of skin on prolonged exposure.

Chronic exposure may cause headache, fatigue, loss of appetite and lassitude with incipient blood effects including anemia and blood changes.

Benzene is a myelotoxicant known to suppress bone-marrow cell proliferation and to induce hematologic disorders in humans and animals.

Signs of benzene-induced aplastic anemia include suppression off leukocytes (leukopenia), red cells (anemia), platelets (thromocytopenia) or all three cell types (pancytopenia). Classic symptoms include weakness, purpura, and hemorrhage. The most significant toxic effect is insidious and often irreversible injury to the blood forming tissue. Leukemia may develop.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.

Lay patient down. Keep warm and rested.

If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor.

Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water.

Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.

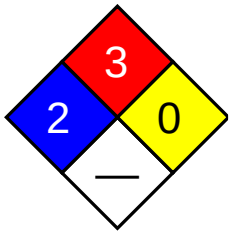
Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Immediately remove all contaminated clothing, including footwear (after rinsing with water).

Wash affected areas thoroughly with water (and soap if available).
Seek medical attention in event of irritation.
Ingestion: Contact a Poison Control Center.
Do NOT induce vomiting. Give a glass of water.
After first aid, get appropriate in-plant, paramedic, or community medical support.
Note to Physicians: For acute or short-term repeated exposures to petroleum distillates or related hydrocarbons:
1.Primary threat to life from pure petroleum distillate ingestion and/or inhalation is respiratory failure.
2.Patients should be quickly evaluated for signs of respiratory distress (e.g. cyanosis, tachypnea, intercostal retraction, obtundation) and given oxygen. Patients with inadequate tidal volumes or poor arterial blood gases (pO_2 <50 mm Hg or pCO_2 >50 mm Hg) should be intubated.
3.Arrhythmias complicate some hydrocarbon ingestion and/or inhalation and electrocardiographic evidence of myocardial injury has been reported; intravenous lines and cardiac monitors should be established in obviously symptomatic patients. The lungs excrete inhaled solvents, so that hyperventilation improves clearance.
4.A chest x-ray should be taken immediately after stabilization of breathing and circulation to document aspiration and detect the presence of pneumothorax.
5.Epinephrine (adrenalin) is not recommended for treatment of bronchospasm because of potential myocardial sensitization to catecholamines.
Inhaled cardioselective bronchodilators (e.g. Alupent, Salbutamol) are the preferred agents, with aminophylline a second choice.
6.Lavage is indicated in patients who require decontamination; ensure use of cuffed endotracheal tube in adult patients.
Consider complete blood count. Evaluate history of exposure.

Section 5 - Fire-Fighting Measures

Flash Point: -11 °C Closed Cup
Autoignition Temperature: 562 °C
LEL: 1.3% v/v
UEL: 7.1% v/v
Extinguishing Media: Foam, dry chemical powder, BCF (where regulations permit), carbon dioxide.
Water spray or fog - Large fires only.
General Fire Hazards/Hazardous Combustion Products: Liquid and vapor are highly flammable.
Severe fire hazard when exposed to heat, flame and/or oxidizers.
Vapor forms an explosive mixture with air.
Severe explosion hazard, in the form of vapor, when exposed to flame or spark. Vapor may travel a considerable distance to source of ignition.
Heating may cause expansion/decomposition with violent rupture of containers.
On combustion, may emit toxic fumes of carbon monoxide (CO).



Fire Diamond

Fire Incompatibility: Avoid contamination with oxidizing agents i.e. nitrates, oxidizing acids, chlorine bleaches, pool chlorine etc. as ignition may result.
Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.
May be violently or explosively reactive. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.
Fight fire from a safe distance, with adequate cover.
If safe, switch off electrical equipment until vapor fire hazard removed.
Use water delivered as a fine spray to control fire and cool adjacent area.
Avoid spraying water onto liquid pools.
Do not approach containers suspected to be hot.
Cool fire-exposed containers with water spray from a protected location.
If safe to do so, remove containers from path of fire.
Equipment should be thoroughly decontaminated after use.

Section 6 - Accidental Release Measures

Small Spills: Remove all ignition sources. Clean up all spills immediately.
Avoid breathing vapors and contact with skin and eyes.
Control personal contact by using protective equipment.
Contain and absorb small quantities with vermiculite or other absorbent material. Wipe up. Collect residues in a flammable waste container.
Large Spills: Pollutant - contain spillage. Clear area of personnel and move upwind.
Contact fire department and tell them location and nature of hazard.
May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.
No smoking, bare lights or ignition sources. Increase ventilation.

Stop leak if safe to do so. Water spray or fog may be used to disperse/absorb vapor. Contain spill with sand, earth or vermiculite.
Use only spark-free shovels and explosion proof equipment.
Collect recoverable product into labeled containers for recycling.
Absorb remaining product with sand, earth or vermiculite.
Collect solid residues and seal in labeled drums for disposal.
Wash area and prevent runoff into drains.
If contamination of drains or waterways occurs, advise emergency services.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid all personal contact, including inhalation.
Wear protective clothing when risk of exposure occurs.
Use in a well-ventilated area. Prevent concentration in hollows and sumps.
DO NOT enter confined spaces until atmosphere has been checked.
Avoid smoking, bare lights, heat or ignition sources.
When handling, DO NOT eat, drink or smoke.
Vapor may ignite on pumping or pouring due to static electricity.
DO NOT use plastic buckets. Ground and secure metal containers when dispensing or pouring product. Use spark-free tools when handling.
Avoid contact with incompatible materials.
Keep containers securely sealed. Avoid physical damage to containers.
Always wash hands with soap and water after handling.
Work clothes should be laundered separately.
Use good occupational work practices. Observe manufacturer's storing and handling recommendations. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions.
Recommended Storage Methods: Metal can; metal drum. Packing as recommended by manufacturer.
Check all containers are clearly labeled and free from leaks.
Storage Requirements: Store in original containers in approved flame-proof area.
No smoking, bare lights, heat or ignition sources.
DO NOT store in pits, depressions, basements or areas where vapors may be trapped. Keep containers securely sealed.
Store away from incompatible materials in a cool, dry well ventilated area.
Protect containers against physical damage and check regularly for leaks.
Observe manufacturer's storing and handling recommendations.
Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Use in a well-ventilated area. Local exhaust ventilation usually required.
If risk of overexposure exists, wear NIOSH-approved respirator.
Correct fit is essential to obtain adequate protection. NIOSH-approved self contained breathing apparatus (SCBA) may be required in some situations.
Provide adequate ventilation in warehouse or closed storage area.
Personal Protective Clothing/Equipment
Eyes: Chemical goggles. Full face shield.
Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.
Hands/Feet: Nitrile gloves; Neoprene gloves.
Safety footwear.
Do NOT use this product to clean the skin.
Respiratory Protection:
Exposure Range >1 to 10 ppm: Air Purifying, Negative Pressure, Half Mask
Exposure Range >10 to 100 ppm: Air Purifying, Negative Pressure, Full Face
Exposure Range >100 to 1000 ppm: Supplied Air, Constant Flow/Pressure Demand, Full Face
Exposure Range >1000 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face
Cartridge Color: black
Note: must change cartridge at beginning of each shift
Other: Overalls. Eyewash unit. Barrier cream. Skin cleansing cream.
Glove Selection Index:

PE/EVAL/PE	A
PVA	A
TEFLON	A
VITON	A
VITON/NEOPRENE	A
NITRILE+PVC	C

A: Best selection
B: Satisfactory; may degrade after 4 hours continuous immersion
C: Poor to dangerous choice for other than short-term immersion

BUTYL C
NITRILE.....C
NEOPRENE.....C
PVC.....C
NATURAL RUBBER C
BUTYL/NEOPRENE C

Section 9 - Physical and Chemical Properties

Appearance/General Info: Clear, highly flammable liquid; floats on water. Characteristic aromatic odor. Highly volatile. Mixes with alcohol, chloroform, ether, carbon disulfide, carbon tetrachloride, glacial acetic acid, acetone and oils.

Physical State: Liquid
Vapor Pressure (kPa): 9.95 at 20 °C
Vapor Density (Air=1): 2.77
Formula Weight: 78.12
Specific Gravity (H_2O=1, at 4 °C): 0.879 at 20 °C
Water Solubility: 0.18 g/100 g of water at 25 °C
Evaporation Rate: Fast

pH: Not applicable
pH (1% Solution): Not applicable.
Boiling Point Range: 80.1 °C (176 °F)
Freezing/Melting Point Range: 5.5 °C (41.9 °F)
Volatile Component (% Vol): 100

Section 10 - Stability and Reactivity

Stability/Polymerization: Product is considered stable. Hazardous polymerization will not occur.
Storage Incompatibilities: Avoid reaction with oxidizing agents.

Section 11 - Toxicological Information

Unless otherwise specified data extracted from RTECS - Registry of Toxic Effects of Chemical Substances

TOXICITY
Oral (man) LD_{Lo}: 50 mg/kg
Oral (rat) LD_{50}: 930 mg/kg
Inhalation (rat) LC_{50}: 10000 ppm/7h
Inhalation (human) LC_{Lo}: 2000 ppm/5m
Inhalation (man) TC_{Lo}: 150 ppm/1y - I
Inhalation (human) TC_{Lo}: 100 ppm
Reproductive effector in rats

IRRITATION
Skin (rabbit): 20 mg/24 hr - mod
Eye (rabbit): 2 mg/24 hr - SEVERE

See NIOSH, *RTECS* CY 1400000, for additional data.

Section 12 - Ecological Information

Environmental Fate: If released to soil, it will be subject to rapid volatilization near the surface and that which does not evaporate will be highly to very highly mobile in the soil and may leach to groundwater. It may be subject to biodegradation based on reported biodegradation of 24% and 47% of the initial 20 ppm in a base-rich para-brownish soil in 1 and 10 weeks, respectively. It may be subject to biodegradation in shallow, aerobic groundwaters, but probably not under anaerobic conditions. If released to water, it will be subject to rapid volatilization; the half-life for evaporation in a wind-wave tank with a moderate wind speed of 7.09 m/sec was 5.23 hours; the estimated half-life for volatilization from a model river one meter deep flowing 1 m/sec with a wind velocity of 3 m/sec is estimated to be 2.7 hours at 20 °C. It will not be expected to significantly adsorb to sediment, bioconcentrate in aquatic organisms or hydrolyze. It may be subject to biodegradation based on a reported biodegradation half-life of 16 days in an aerobic river die-away test. In a marine ecosystem biodegradation occurred in 2 days after an acclimation period of 2 days and 2 weeks in the summer and spring, respectively, whereas no degradation occurred in winter. According to one experiment, it has a half-life of 17 days due to photodegradation which could contribute to removal in situations of cold water, poor nutrients, or other conditions less conductive to microbial degradation. If released to the atmosphere, it will exist predominantly in the vapor phase. Gas-phase will not be subject to direct photolysis but it will react with photochemically produced hydroxyl radicals with a half-life of 13.4 days calculated using an experimental rate constant for the reaction. The reaction time in polluted atmospheres which contain nitrogen oxides or sulfur dioxide is accelerated with the half-life being reported as 4-6 hours. Products of photooxidation include phenol, nitrophenols, nitrobenzene, formic acid, and peroxyacetyl nitrate. It is fairly soluble in water and is removed from the atmosphere in rain.

Ecotoxicity: LC_{50} Clawed toad (3-4 wk after hatching) 190 mg/l/48 hr /Conditions of bioassay not specified; LC_{50} Morone saxatilis (bass) 5.8 to 10.9 ppm/96 hr /Conditions of bioassay not specified; LC_{50} Poecilia reticulata (guppy) 63 ppm/14 days /Conditions of bioassay not specified; LC_{50} Salmo trutta (brown trout yearlings) 12 mg/l/1 hr (static bioassay); LD_{50} Lepomis macrochirus (bluegill sunfish) 20 mg/l/24 to 48 hr /Conditions of bioassay not specified; LC_{100} Tetrahymena pyriformis (ciliate) 12.8 mmole/l/24 hr /Conditions of bioassay not specified; LC_{50} Cancer magister (crab larvae) stage 1, 108 ppm/96 hr /Conditions of bioassay not specified; LC_{50} Crangon franciscorum (shrimp) 20 ppm/96 hr /Conditions of bioassay not specified

Henry's Law Constant: 5.3×10^{-3}

BCF: eels 3.5

Biochemical Oxygen Demand (BOD): 1.2 lb/lb, 10 days

Octanol/Water Partition Coefficient: log K_{ow} = 2.13

Soil Sorption Partition Coefficient: K_{oc} = woodburn silt loam 31 to 143

Section 13 - Disposal Considerations

Disposal: Consult manufacturer for recycling options and recycle where possible.
Follow applicable federal, state, and local regulations.
Incinerate residue at an approved site.
Recycle containers where possible, or dispose of in an authorized landfill.

Section 14 - Transport Information

DOT Transportation Data (49 CFR 172.101):

Shipping Name: BENZENE
Hazard Class: 3.1
ID No.: 1114
Packing Group: II
Label: Flammable Liquid[3]

Additional Shipping Information:

Section 15 - Regulatory Information

EPA Regulations:

RCRA 40 CFR: Listed U019 Toxic Waste; Ignitable Waste
CERCLA 40 CFR 302.4: Listed per CWA Section 311(b)(4); per RCRA Section 3001; per CWA Section 307(a); per CAA Section 112 10 lb (4.535 kg)
SARA 40 CFR 372.65: Listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

Research Date: .....1999-11 **Review Date:** 2000-07

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Genium Publishing Corp.
1171 RiverFront Center
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(518) 842-4111

Issue Date: 2002-02

Carbon Disulfide
CAR4990

Section 1 - Chemical Product and Company Identification 54

Material Name: Carbon Disulfide **CAS Number:** 75-15-0
Chemical Formula: CS_2
Structural Chemical Formula: S=C=S
Synonyms: CARBON BISULFIDE; CARBON BISULPHIDE; CARBON DISULFIDE; CARBON DISULPHIDE; CARBON SULFIDE; CARBON SULPHIDE; CARBONE (SUFURE DE); CARBONE (SULFURE DE); CARBONIO (SOLFURO DI); DITHIOCARBONIC ANHYDRIDE; EPA PESTICIDE CHEMICAL CODE 016401; KOHLENDISULFID (SCHWEFELKOHLENSTOFF); KOOLSTOFDISULFIDE; SCHWEFELKOHLENSTOFF; SOLFURO DI CARBONIO; SULPHOCARBONIC ANHYDRIDE; SULPHURET OF CARBON; WEEVILTOX; WEGLA DWUSIARCZEK
General Use: Used in manufacture of rayon, carbon tetrachloride, xanthogenates, soil disinfectants, electronic vacuum tubes; solvent for phosphorus, sulfur, selenium, bromine, iodine, fats, resins, rubbers.
Also used as solvent in gas chromatography.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
carbon disulfide	75-15-0	>99

OSHA PEL
TWA: 20 ppm; Ceiling: 30 ppm, 100 ppm, 30-minute maximum peak.

OSHA PEL Vacated 1989 Limits
TWA: 4 ppm; 12 mg/m^3; STEL: 12 ppm; 36 mg/m^3.

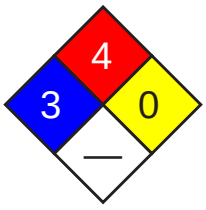
ACGIH TLV
TWA: 10 ppm, 31 mg/m^3; skin.

NIOSH REL
TWA: 1 ppm, 3 mg/m^3; STEL: 10 ppm, 30 mg/m^3; skin.

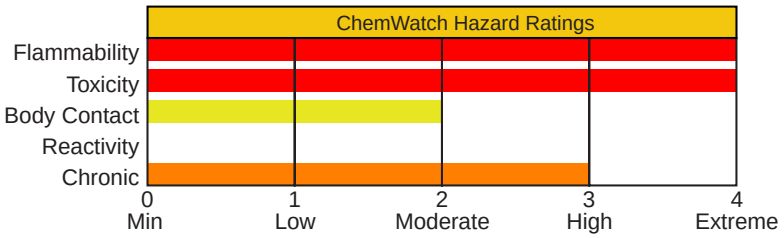
IDLH Level
500 ppm.

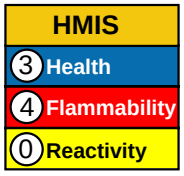
DFG (Germany) MAK
TWA: 5 ppm, 16 mg/m^3; PEAK: 10 ppm, 32 mg/m^3; skin, substances with systemic effects, onset of effect within 2 hours.

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word

Danger!


Corrosive Flammable

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Colorless liquid; chloroform-like odor. Corrosive. Also causes: cardiac/CNS damage, headache, dizziness, convulsions. Chronic: pyschosis, liver damage, eye effects, peripheral neuropathies, gastric disturbances, reproductive effects. Highly flammable!

Potential Health Effects

Target Organs: skin, central nervous system (CNS), peripheral nervous system, cardiovascular system, eyes, liver, kidneys
Primary Entry Routes: inhalation, skin contact/absorption
Acute Effects
Inhalation: The vapor is highly discomforting to the upper respiratory tract and lungs and may be harmful if inhaled. The material may accentuate any pre-existing skin condition.

Acute inhalation produces rapid onset of both local irritation and central nervous system symptoms ranging from pharyngitis, nausea, vomiting, dizziness, fatigue, headache, mood changes, lethargy and blurred vision, to agitation, uncontrollable anger, suicidal tendencies, delirium, hallucinations, convulsions, coma and death.

Eye: The liquid is extremely discomforting to the eyes and is capable of causing pain and severe conjunctivitis. Corneal injury may develop, with possible permanent impairment of vision, if not promptly and adequately treated.

Skin: The liquid is extremely discomforting to the skin and is capable of causing allergic skin reactions.
Toxic effects may result from skin absorption.
Concentrated solutions of carbon disulfide may cause skin pain, erythema, and exfoliation. Several minutes of contact may cause blistering with second and third degree burns. May be directly toxic to the cutaneous nerves. Skin sensitization may occur.

Ingestion: The liquid is highly discomforting to the gastrointestinal tract and may be fatal if swallowed in large quantity.
Ingestion of small amounts may result in numbness of the lips, nausea, vomiting, dyspnea, dizziness, spasmodic tremor, hyperactive tendon reflexes, hyperesthesia, cardiac arrhythmias, hallucinations, prostration, peripheral vascular collapse, hypothermia, cyanosis, mydriasis, convulsions, coma, and death within a few hours from respiratory paralysis. Non-fatal exposures may produce delayed effects including motor agitation, disorientation, pyschic disturbances, narcosis, delirium, areflexia, mydriasis, and permanent damage to the central and peripheral nervous systems.

Carcinogenicity: NTP - Not listed; IARC - Not listed; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Not listed; MAK - Not listed.

Chronic Effects: Long-term exposure has caused serious damage to the central nervous system (degeneration of the peripheral nerves).
Concentrations as low as 20 ppm may produce neurological damage - women are apparently more susceptible to the neurological effects of carbon disulfide. Neurological effects may include headache, apprehension, lethargy, sleepiness, hearing and position sense loss, paresthesias, muscle pain, tremors, ataxia, staggering gait, weakness, loss of lower extremity reflexes, and paralysis. Visual disturbances include decreased visual acuity, impaired recognition of red and green, nystagmus, diplopia, disturbed pupillary reaction to light - optic nerve atrophy may also occur.
A decrease in corneal reflex may be an early indication of chronic intoxication.
Psychiatric symptoms may include loss of memory, nightmares leading to loss of sleep, mental deterioration, acoustic and visual hallucinations, rapid mood changes ranging from irritability to manic-depressive pyschoses, suicidal tendencies. Disturbances to the libido and impotence (with effects on sperm) have also been recorded. Menstrual and ovarian function disorders and an increased risk of spontaneous abortion may also occur.
Liver damage may be indicated by palpable, tender liver and minor derangement of liver function. Chronic renal dysfunction may occur at concentrations not sufficiently great to produce neurological damage.
Gastric or duodenal ulcers may also be produced as a result of chronic exposure.
Coronary heart disease has been significantly linked to exposure to carbon disulfide. A series of studies performed in Finland showed a significant excess mortality from cardiovascular heart disease in workers exposed to carbon disulfide for at least 5 years to concentrations estimate to range from 20-40 ppm in the 1950s and 10-30 ppm in the 1960s. Most workers however had been exposed repeatedly to far higher concentrations at various times.
Nutritional factors may account for variations in response shown amongst workers. Experimental rabbit diets reinforced with a high mineral mixture, especially copper and zinc, permitted daily exposures at 1100 ppm CS_2 without the observed effects seen in controls (body weight loss, serum lipoprotein and total cholesterol increase, adrenal hypertrophy and pathological changes in the brain and spinal cord).
A daily 4-hour exposure at concentrations exceeding 150 ppm produces chronic intoxication after a few months; 100-150 ppm is thought to produce chronic poisoning after a year or more whilst 50-100 ppm produce sporadic cases of mild intoxication.
Personnel with pre-existing central nervous system, gastrointestinal tract, liver, kidneys, skin and blood diseases may be potentially more susceptible to symptom of exposure and should be excluded from exposure.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.
Lay patient down. Keep warm and rested.
If available, administer medical oxygen by trained personnel.
If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor, without delay.

Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water.
Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.
Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Immediately remove all contaminated clothing, including footwear (after rinsing with water).
Wash affected areas thoroughly with water (and soap if available).
Seek medical attention in event of irritation.

Ingestion: Contact a Poison Control Center.

If more than 15 minutes from a hospital, induce vomiting, preferably using Ipecac Syrup APF.
Note: DO NOT INDUCE VOMITING in an unconscious person.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians:

1. Carbon disulfide intoxication results in severe debilitating CNS symptoms (irritability, mania, hallucinations, tremors, memory loss).
2. Chronic industrial exposures may cause neuropsychiatric changes, peripheral neuropathies and accelerated atherogenic changes.
3. Peak blood concentrations appear 2 hours after inhalation. Plasma elimination half-life is about 1 hour. Metabolic products seen in urine include thiourea, 2-mercapto-2-thiazolin-5-one and 2-thiazolidine-4- carboxylic acid (TTCA). The iodine-azide test identifies these.
4. Initial management of severe inhalation poisoning requires careful attention to airway, breathing and circulation. Treatment involves symptomatic care.

BIOLOGICAL EXPOSURE INDEX - BEI

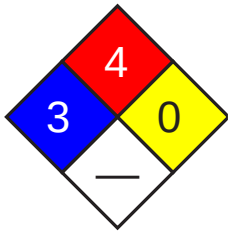
These represent the determinants observed in specimens collected from a healthy worker exposed at the Exposure Standard (ES or TLV):

Determinant	Index	Sampling Time	Comments
2-thiothiazolidine 4-carboxylic acid	5 mg/gm creatinine.	End of shift	

NOTE: Preplacement and periodic medical examinations should be concerned especially with skin, eyes, central and peripheral nervous system, cardio-vascular disease, as well as liver and kidney function. Electrocardiograms should be taken.

Section 5 - Fire-Fighting Measures

Flash Point: 30 °C Closed Cup
Autoignition Temperature: 90 °C
LEL: 1.3% v/v
UEL: 50% v/v
Extinguishing Media: Water spray or fog; foam, dry chemical powder, or BCF (where regulations permit).
Carbon dioxide.
Note: Water may be ineffective except as a blanket. Foam is ineffective.



Fire Diamond

General Fire Hazards/Hazardous Combustion Products: Liquid and vapor are highly flammable.
Severe fire hazard when exposed to heat, flame and/or oxidizers.
Vapor forms an explosive mixture with air.
Severe explosion hazard, in the form of vapor, when exposed to flame or spark. Vapor may travel a considerable distance to source of ignition.
Heating may cause expansion/decomposition with violent rupture of containers.
On combustion, may emit toxic fumes of carbon monoxide (CO). Other combustion products include sulfur oxides (SO_x).
WARNING: Vapors may be ignited by contact with an ordinary light bulb, a warm steam pipe or a hot exhaust pipe.
Fire Incompatibility: WARNING: May decompose violently or explosively on contact with other substances.
This substance is one of the relatively few compounds which are described as "endothermic" i.e. heat is absorbed into the compound, rather than released from it, during its formation.
The majority of endothermic compounds are thermodynamically unstable and may decompose explosively under various circumstances of initiation.
Many but not all endothermic compounds have been involved in decompositions, reactions and explosions and, in general, compounds with significantly positive values of standard heats of formation, may be considered suspect on stability grounds.
Explosively reactive with azides or organic amines.
Reacts with zinc with incandescence.
Avoid contact with chemically active metals (sodium, potassium, aluminum, magnesium) and strong oxidizers.
Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.
May be violently or explosively reactive. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.
If safe to do so, switch off electrical equipment until vapor fire hazard is removed.
Cool fire-exposed containers with water spray from a protected location.
Do not approach containers suspected to be hot.
Avoid spraying water onto liquid pools.
If safe to do so, remove containers from path of fire.

Section 6 - Accidental Release Measures

Small Spills: Environmental hazard - contain spillage. Clean up all spills immediately.
Avoid breathing vapors and contact with skin and eyes.
Control personal contact by using protective equipment.
Shut off all possible sources of ignition and increase ventilation.
Wipe up and absorb small quantities with vermiculite or other absorbent material.
Allow absorbed spillage to evaporate in an open top container, away from habitation.
Large Spills: Clear area of personnel and move upwind.
Contact fire department and tell them location and nature of hazard.
May be violently or explosively reactive. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.
Shut off all possible sources of ignition and increase ventilation.
No smoking or bare lights within area.
Stop leak if safe to do so.
Use extreme caution to avoid a violent reaction.
Any electric cleaning equipment must be explosion proof.
Absorb or cover spill with sand, earth, inert material or vermiculite.
Water spray or fog may be used to disperse vapor.
Collect recoverable product into labeled containers for recycling.
Collect, using a spark-free shovel, and seal in labeled drums for disposal.
If contamination of drains or waterways occurs, advise emergency services.
After clean-up operations, decontaminate and launder all protective clothing and equipment before storing and reusing.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Atmosphere should be regularly checked to ensure safe working conditions are maintained.
Use good occupational work practices.
Avoid breathing vapors and contact with skin and eyes. Wear protective clothing when risk of exposure occurs. Avoid smoking, bare lights or ignition sources. Avoid generation of static electricity.
Avoid thermal shock (wait for surfaces to cool).
Use in a well-ventilated area. Local exhaust ventilation usually required.
Vapor may travel a considerable distance to source of ignition.
Use spark-free tools when handling. Ground all lines and equipment.
Prevent concentration in hollows and sumps. DO NOT enter confined spaces where vapor may have collected.
Avoid contact with incompatible materials. Avoid physical damage to containers. Keep containers securely sealed.
Always wash hands with soap and water after handling. Work clothes should laundered separately.
Recommended Storage Methods: Check that containers are clearly labeled.
Packaging as recommended by manufacturer.
Glass container.
Steel drum.
Metal can.
Store in metal drums or safety cans.
Plastic containers may only be used if approved for flammable liquids.
Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Local exhaust ventilation usually required.
If risk of overexposure exists, wear NIOSH-approved respirator.
Correct fit is essential to obtain adequate protection. NIOSH-approved self contained breathing apparatus (SCBA) may be required in some situations.
Provide adequate ventilation in warehouse or closed storage area.
Personal Protective Clothing/Equipment
Eyes: Chemical goggles. Full face shield.
DO NOT wear contact lenses.
Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.
Hands/Feet: Impervious, gauntlet length gloves; Viton gloves.
PVA gloves.
PVC boots.
Safety footwear.
Respiratory Protection:
Exposure Range >20 to 200 ppm: Air Purifying, Negative Pressure, Half Mask
Exposure Range >200 to <500 ppm: Air Purifying, Negative Pressure, Full Face

Exposure Range 500 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face
Cartridge Color: black
Other: Overalls. PVC apron. PVC protective suit may be required if exposure severe.
Eyewash unit. Ensure there is ready access to a safety shower.

Glove Selection Index:

PE/EVAL/PE.....Best selection
PVA.....Best selection
VITON/CHLOROBUTYL.....Best selection
VITON.....Best selection
TEFLON-FEP.....Best selection
NITRILE.....Poor to dangerous choice for other than short-term immersion
CPE.....Poor to dangerous choice for other than short-term immersion
NEOPRENE.....Poor to dangerous choice for other than short-term immersion
BUTYL.....Poor to dangerous choice for other than short-term immersion

Section 9 - Physical and Chemical Properties

Appearance/General Info: Clear, colorless to yellow, mobile liquid with a strong disagreeable odor; nearly odorless when pure. Miscible with anhydrous methanol, ethanol, ether, benzene, chloroform, carbon tetrachloride, oils.

Physical State: Liquid
Vapor Pressure (kPa): 40 at 20 °C
Vapor Density (Air=1): 2.67
Formula Weight: 76.14
Specific Gravity (H_2O=1, at 4 °C): 1.26 at 20 °C
Water Solubility: 0.3% by weight
pH: Not applicable
pH (1% Solution): Not applicable.
Boiling Point Range: 46.5 °C (116 °F) at 760 mm Hg
Freezing/Melting Point Range: -111.5 °C (-168.7 °F)
Volatile Component (% Vol): 100

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Long term storage.
Presence of heat source and ignition source.
Stable under normal storage conditions. Hazardous polymerization will not occur.

Storage Incompatibilities: WARNING: May decompose violently or explosively on contact with other substances.
This substance is one of the relatively few compounds which are described as "endothermic" i.e. heat is absorbed into the compound, rather than released from it, during its formation.
The majority of endothermic compounds are thermodynamically unstable and may decompose explosively under various circumstances of initiation.
Many but not all endothermic compounds have been involved in decompositions, reactions and explosions and, in general, compounds with significantly positive values of standard heats of formation, may be considered suspect on stability grounds.
Avoid reaction with oxidizing agents.
Segregate from, azides, organic amines and chemically active metals.

Section 11 - Toxicological Information

TOXICITY
Oral (human) LD_{Lo}: 14 mg/kg
Oral (human) TC_{Lo}: 40 mg/m^3
Oral (rat) LD_{50}: 3188 mg/kg
Inhalation (human) LC_{Lo}: 4000 ppm/30 min
Inhalation (human) LC_{Lo}: 2000 ppm/5 min
Inhalation (rat) LC_{50}: 25000 mg/m^3/2 h
Fatty liver degeneration, paternal effects, effects on fertility, fetotoxicity, effects on newborn recorded.
NOTE: Substance has been shown to be mutagenic in various assays, or belongs to a family of chemicals producing damage or change to cellular DNA. Exposure to the material for prolonged periods may cause physical defects in the developing embryo (teratogenesis).

IRRITATION
Nil reported

See NIOSH, *RTECS* FF 6650000, for additional data.

Section 12 - Ecological Information

Environmental Fate: If released on land, it will be primarily lost by volatilization. It may also readily leach into the ground where it may biodegrade. If released into water, it will be primarily lost due to volatilization (half-life 2.6 hr in a model river). Adsorption to sediment and bioconcentration in fish should not be significant. In the atmosphere it degrades by reacting with atomic oxygen and photochemically produced hydroxyl radicals (half-life 6-9 days). The soil may be a natural sink for the chemical by adsorbing and subsequently biodegrading it.

Ecotoxicity: TLm Mosquitofish 162-135 mg/l/24-96 hr /Conditions of bioassay not specified

Henry's Law Constant: 1.44 x10^{-2}
BCF: estimated at 7.9
Octanol/Water Partition Coefficient: log K_{ow} = 0.852
Soil Sorption Partition Coefficient: K_{oc} = estimated at 63

Section 13 - Disposal Considerations

Disposal: Recycle wherever possible. Consult manufacturer for recycling options.
Follow applicable federal, state, and local regulations.
Evaporate or incinerate residue at an approved site.
Recycle containers if possible, or dispose of in an authorized landfill.
Ensure damaged or non-returnable drums are gas-free before disposal.

Section 14 - Transport Information

DOT Transportation Data (49 CFR 172.101):

Shipping Name: CARBON DISULFIDE **Additional Shipping Information:** CARBON SULPHIDE
Hazard Class: 3.1
ID No.: 1131
Packing Group: I
Label: Flammable Liquid[3],Poison

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Listed P022
CERCLA 40 CFR 302.4: Listed per CWA Section 311(b)(4), per RCRA Section 3001 100 lb (45.35 kg)
SARA 40 CFR 372.65: Listed
SARA EHS 40 CFR 355: Listed
RQ: 100 lb
TPQ: 10000 lb
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Publishing Corporation extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

Material Safety Data Sheet Collection
Genium group inc.
1171 RiverFront Center, Amsterdam, NY 12010
(518) 842-4111

Issue Date: 2005-05

Section 1 - Chemical Product and Company Identification 54/60

Material Name: Chloroform
CAS Number: 67-66-3
Chemical Formula: $CHCl_3$
Structural Chemical Formula: $CHCl_3$
EINECS Number: 200-663-8
ACX Number: X1000035-4
Synonyms: Chloroform; CHLOROFORM; CHLOROFORME; CLOROFORMIO; FORMYL TRICHLORIDE; FREON 20; METHANE TRICHLORIDE; METHANE,TRICHLORO-; METHENYL CHLORIDE; METHENYL TRICHLORIDE; METHYL TRICHLORIDE; R 20; R 20 (REFRIGERANT); TCM; TRICHLOORMETHAAN; TRICHLORMETHAN; TRICHLOROFORM; TRICHLOROMETHANE; TRICLOROMETANO
General Use: As a solvent for fats, oils, rubber, alkaloids, waxes, gutta-percha and resins; as a cleaning agent; in fire extinguishers to lower the freezing temperature of carbon tetrachloride; in the rubber industry; as a solvent in organic chemistry.
Medical use as anesthetic discontinued because ot toxicity.
Major use in modern industry is in the production of fluorocarbon-22, a refrigerant.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
chloroform	67-66-3	>98

OSHA PEL
Ceiling: 50 ppm, 240 mg/m^3.

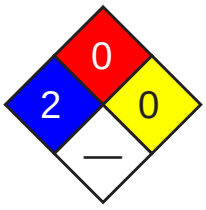
NIOSH REL
STEL: 2 ppm, 9.78 mg/m^3; 60-minute.

DFG (Germany) MAK
TWA: 0.5 ppm; PEAK: 1 ppm; skin.

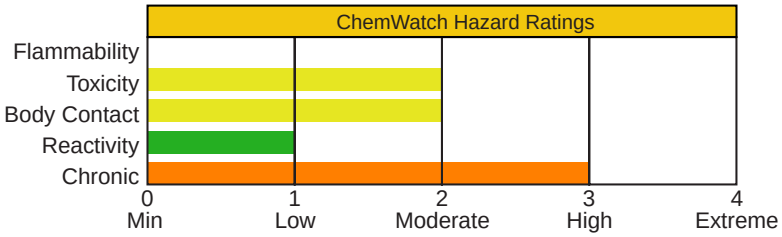
ACGIH TLV
TWA: 10 ppm.

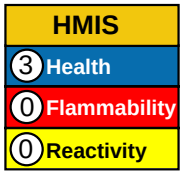
IDLH Level
500 ppm.

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word

Warning!

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Colorless, volatile liquid; ethereal odor. Irritating to eyes/skin/respiratory tract. Toxic. Other Acute Effects: dizziness, liver/kidney damage. Chronic Effects: CNS effects, possible cancer hazard, possible birth defects based on animal data.

Potential Health Effects

Target Organs: liver, kidneys, heart, eyes, skin
Primary Entry Routes: inhalation, ingestion, skin contact/absorption
Acute Effects
Inhalation: Acute intoxication by halogenated aliphatic hydrocarbons appears to take place over two stages. Signs of a reversible narcosis are evident in the first stage and in the second stage signs of injury to organs may become evident. A single organ alone is (almost) never involved.
Depression of the central nervous system is the most outstanding effect of most halogenated aliphatic hydrocarbons. Inebriation and excitation, passing into narcosis, is a typical reaction. In severe acute exposures there is always a danger of death from respiratory failure or cardiac arrest due to a tendency to make the heart more susceptible to catecholamines (adrenalin).

1000-2000 ppm may cause dizziness, headache, fatigue, salivation and nausea. 4000 ppm may cause vomiting, serious disorientation and a fainting feeling. 14000-16000 ppm may cause anesthesia and rapid loss of consciousness. More than 20000 ppm may cause respiratory failure, cardiac arrhythmias and death. Fatty changes and centrilobular necrosis of the liver and fatty degenerative changes of the kidney and heart may occur.
If death does not occur immediately from respiratory arrest or ventricular fibrillation, it may occur later from liver and kidney damage.
Toxic effects are increased by consumption of alcohol.

Eye: The liquid is highly discomforting to the eyes and is capable of causing a mild, temporary redness of the conjunctiva (similar to wind-burn), temporary impairment of vision and/or other transient eye damage/ulceration. The material may produce moderate eye irritation leading to inflammation.
Repeated or prolonged exposure to irritants may produce conjunctivitis.

Skin: The liquid may produce skin discomfort following prolonged contact.
Defatting and/or drying of the skin may lead to dermatitis The material may cause skin irritation after prolonged or repeated exposure and may produce a contact dermatitis (nonallergic). This form of dermatitis is often characterized by skin redness (erythema) and swelling (edema) which may progress to vesiculation, scaling and thickening of the epidermis. Histologically there may be intercellular edema of the spongy layer (spongiosis) and intracellular edema of the epidermis.

Ingestion: The material is highly discomforting to the gastrointestinal tract and may be harmful if swallowed. Ingestion may result in nausea, pain, vomiting. Vomit entering the lungs by aspiration may cause potentially lethal chemical pneumonitis.
Other symptoms include burning of the mouth, throat, esophagus and stomach, diarrhea, abdominal and substernal pain, cold, clammy skin, cyanosis of the extremities and face, muscle cramps, mydriasis, hypotension, peripheral vasodilation, irregular respiration, respiratory failure, unconsciousness and liver damage.

Carcinogenicity: NTP - Class 2B, Reasonably anticipated to be a carcinogen, sufficient evidence of carcinogenicity from studies in experimental animals; IARC - Group 2B, Possibly carcinogenic to humans; OSHA - Not listed; NIOSH - Listed as carcinogen; ACGIH - Class A3, Animal carcinogen; EPA - Class B2, Probable human carcinogen based on animal studies; MAK - Class B, Justifiably suspected of having carcinogenic potential.

Chronic Effects: Repeated exposure to 77-237 ppm has caused lassitude, dullness, urinary frequency, and gastrointestinal disturbances. Other symptoms include dry mouth, thirst, malaise, anorexia, headache, depression, confusion, weakness, blurred vision, paresthesias, loss of sense of balance, memory loss, tremors, anemia, kidney damage, and fatty degeneration of the liver.
Repeated ingestion may cause liver and kidney damage.
Chloroform is not strongly teratogenic but is embryotoxic. Several epidemiological and ecological studies indicate that there is an association between cancer of the large intestine, rectum, and/or urinary bladder and the constituents of chlorinated water.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.
Lay patient down. Keep warm and rested.
If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor.

See DOT ERG

Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids. Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Wash affected areas thoroughly with water (and soap if available).
Seek medical attention in event of irritation.

Ingestion: Contact a Poison Control Center.
If more than 15 minutes from a hospital, induce vomiting, preferably using Ipecac Syrup APF.
Note: DO NOT INDUCE VOMITING in an unconscious person.
Avoid giving milk or oils.
Avoid giving alcohol.

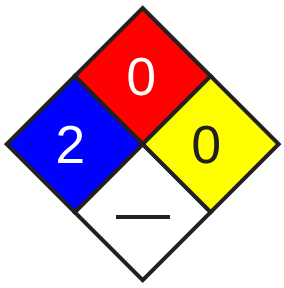
After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Treat symptomatically. Do not administer sympathomimetic drugs as they may cause ventricular arrhythmias.

Section 5 - Fire-Fighting Measures

Flash Point: Nonflammable
LEL: Not applicable
UEL: Not applicable
Extinguishing Media: There is no restriction on the type of extinguisher which may be used. Use fire fighting procedures suitable for surrounding area.
General Fire Hazards/Hazardous Combustion Products: Nonflammable liquid
Decomposes on heating and produces acrid and toxic fumes of phosgene, carbon dioxide (CO_2), carbon monoxide (CO), chlorine and hydrogen chloride.
Heating may cause expansion or decomposition leading to violent rupture of containers.
Fire Incompatibility: Avoid contamination with oxidizing agents i.e. nitrates, oxidizing acids, chlorine bleaches, pool chlorine etc. as ignition may result.

See DOT ERG



Fire Diamond

Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.
Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways.
Product is not combustible. No special firefighting procedures required.
Use fire fighting procedures suitable for surrounding area.
If safe to do so, remove containers from path of fire.
Cool fire-exposed containers with water spray from a protected location.

Section 6 - Accidental Release Measures

Small Spills: Clean up all spills immediately.
Avoid breathing vapors and contact with skin and eyes.
Increase ventilation.
Wipe up and absorb small quantities with vermiculite or other absorbent material.
Place in suitable containers for disposal.
Allow small quantities to evaporate.

See DOT ERG

Large Spills: Contact fire department and tell them location and nature of hazard.
Clear area of personnel and move upwind.
Wear breathing apparatus plus protective gloves. Stop leak if safe to do so.
Absorb or cover spill with sand, earth, inert material or vermiculite.
Collect and seal in labeled drums for disposal.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid breathing vapors and contact with skin and eyes. Avoid contact with strong alkalis.
Avoid sources of heat.
When handling, DO NOT eat, drink or smoke.
Use in a well-ventilated area.
Keep containers securely sealed when not in use.
Prevent concentration in hollows and sumps. DO NOT enter confined spaces until atmosphere has been checked.
Always wash hands with soap and water after handling. Work clothes should be laundered separately.
Recommended Storage Methods: Check that containers are clearly labeled.
Store in metal drums or safety cans.
Glass container.
Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: General exhaust is adequate under normal operating conditions.
Local exhaust ventilation may be required in specific circumstances.
If risk of overexposure exists, wear NIOSH-approved respirator.
Correct fit is essential to obtain adequate protection.
Provide adequate ventilation in warehouse or closed storage areas.
Personal Protective Clothing/Equipment:
Eyes: Safety glasses; safety glasses with side shields; chemical goggles.
Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.
Hands/Feet: Wear chemical protective gloves, eg. PVC. Wear safety footwear.
Respiratory Protection:
Exposure Range >50 to <500 ppm: Supplied Air, Constant Flow/Pressure Demand, Full Face
Exposure Range 500 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face

Note: poor warning properties

Other: Impervious protective clothingRubber apron.
Ensure there is ready access to a safety shower.

Glove Selection Index:

PE/EVAL/PE ..... Best selection
PVA ..... Best selection
TEFLON ..... Best selection
VITON ..... Satisfactory; may degrade after 4 hours continuous immersion

Section 9 - Physical and Chemical Properties

Appearance/General Info: Clear, colorless, very volatile liquid with characteristic heavy, "sweetish" ethereal odor and sweet taste. Viscosity is 0.56 mPa sec at 20 °C. Mixes with alcohol, benzene, ether, petroleum ether, carbon tetrachloride, carbon disulfide, and oils.

Physical State: Liquid
Vapor Pressure (kPa): 21.2 at 20 °C
Vapor Density (Air=1): 4.13
Formula Weight: 119.37
Specific Gravity (H_2O=1, at 4 °C): 1.489 at 20 °C
pH: Not applicable
pH (1% Solution): Not applicable
Boiling Point: 61.67 °C (143 °F)
Freezing/Melting Point: -63.33 °C (-81.994 °F)
Volatile Component (% Vol): 100
Water Solubility: < 1 mg/mL at 19 °C

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Product is considered stable under normal handling conditions. Hazardous polymerization will not occur.

Storage Incompatibilities: Segregate from acetone, strong alkali, nitrogen tetroxide, fluorine, metals (Al, K, Li, Mg, Na, NaK alloy), potassium tert-butoxide, methanol, sodium methoxide, disilane, amd triisopropylphosphine.
Also reacts violently with (acetone + a base), (perchloric acid + phosphorous pentoxide), (KOH + methanol) and (NaOH + methanol).
Attacks, softens and may dissolve rubber, many plastics, paints and coatings.

Section 11 - Toxicological Information

Toxicity

Oral (rat) LD_{50}: 800 mg/kg
Oral (human) LD_{Lo}: 140 mg/kg
Unknown route (human) LD_{Lo}: 546 mg/kg
Inhalation (human) LC_{Lo}: 25000 ppm/5 m
Inhalation (rat) LC_{Lo}: 8000 ppm/4 h
Inhalation (human) TC_{Lo}: 10 mg/m^3/1 y
Inhalation (human) TC_{Lo}: 5000 mg/m^3/7 m

Irritation

Skin (rabbit): 10 mg/24 hr (open) - mild
Skin (rabbit): 500 mg/24 hr - mild
Eye (rabbit): 148 mg
Eye (rabbit): 20 mg/24 hr - moderate

See *RTECS* FS 9100000, for additional data.

Section 12 - Ecological Information

Environmental Fate: Releases to water and land will be primarily lost by evaporation and will end up in the atmosphere. Release to the atmosphere may be transported long distances and will photodegrade with a half-life of a few months. Spills and other releases on land will also leach into the groundwater where it will reside for long periods of time. Will not be expected to bioconcentrate into the food chain but contamination of food is likely due to its use as an extractant and its presence in drinking water.

Ecotoxicity: LC_{50} Micropterus salmoides (largemouth bass) 51 ppm/96 hr /Conditions of bioassay not specified; LC_{50} Daphnia magna (cladoceran) 28,900 ug/l/48 hr in a static bioassay; LC_{50} Salmo gairdneri (rainbow trout) 2030 ug/l soft water, 1240 ug/l hard water (40% teratogenesis), 27 day flow-through tests (20 min after fertilization to 8 days after hatching)

Henry's Law Constant: 3.67 x10^{-3}
BCF: fish < 1
Biochemical Oxygen Demand (BOD): none
Octanol/Water Partition Coefficient: log K_{ow} = 1.97
Soil Sorption Partition Coefficient: K_{oc} = soils 34

Section 13 - Disposal Considerations

Disposal: Recycle wherever possible.
Allow absorbed spillage to evaporate in an open top container, away from habitation.
Bury residue in an authorized landfill.
Return containers to drum reconditioner or recycler.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Shipping Name and Description: Chloroform
ID: UN1888
Hazard Class: 6.1 - Poisonous materials
Packing Group: III - Minor Danger
Symbols:
Label Codes: 6.1 - Poison *or* Poison Inhalation Hazard *if inhalation hazard, Zone A or B*
Special Provisions: IB3, N36, T7, TP2
Packaging: **Exceptions:** 153 **Non-bulk:** 203 **Bulk:** 241
Quantity Limitations: **Passenger aircraft/rail:** 60 L **Cargo aircraft only:** 220 L
Vessel Stowage: **Location:** A **Other:** 40

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Listed U044 Toxic Waste
CERCLA 40 CFR 302.4: Listed per CWA Section 311(b)(4), per RCRA Section 3001, per CWA Section 307(a) 10 lb (4.535 kg)
SARA 40 CFR 372.65: Listed
SARA EHS 40 CFR 355: Listed
RQ: 10 lb
TPQ: 10000 lb
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

Material Safety Data Sheet Collection
Genium group inc.
1171 RiverFront Center, Amsterdam, NY 12010
(518) 842-4111

Issue Date: 2005-05

Chromium
CHR4520

Section 1 - Chemical Product and Company Identification 54/60

Material Name: Chromium
CAS Number: 7440-47-3
Chemical Formula: Cr
Structural Chemical Formula: Cr
EINECS Number: 231-157-5
ACX Number: X1002501-1
Synonyms: CHROM; CHROME; CHROMIUM; CHROMIUM METAL
General Use: Used in the manufacture of chrome-steel or chrome-nickel-steel alloys (stainless steel); for greatly increasing resistance and durability of metals; for chrome-plating of other metals.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
chromium	7440-47-3	> 99.5

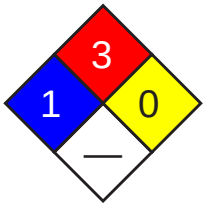
OSHA PEL
TWA: 1 mg/m^3.

NIOSH REL
TWA: 0.5 mg/m^3.

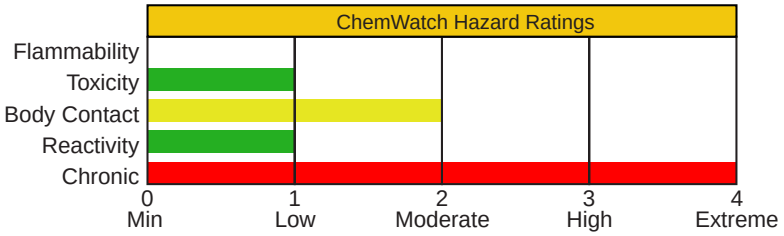
ACGIH TLV
TWA: 0.5 mg/m^3.

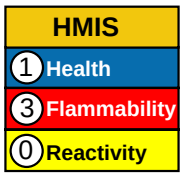
IDLH Level
250 mg/m^3 (as Cr).

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word

Warning!

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Steel-gray, lustrous metal powder; odorless. Irritating to eyes/skin/respiratory tract. Chronic Effects: lung fibrosis. Flammable. Explosive in air.

Potential Health Effects

Target Organs: respiratory system
Primary Entry Routes: inhalation, skin absorption, ingestion
Acute Effects

Inhalation: The dust may be discomforting to the upper respiratory tract and may be harmful if inhaled.
Chrome fume is irritating to the respiratory tract and lungs.
Toxic effects result from over-exposure.
Asthmatic conditions may result as a consequence of the sensitizing action of chrome VI compounds.

Eye: The dust may produce eye discomfort and abrasive eye inflammation.

Skin: The material may be mildly discomforting to the skin and is capable of causing skin reactions which may lead to dermatitis.
Chrome fume, as the chrome VI oxide, is corrosive to the skin and may aggravate pre-existing skin conditions such as dermatitis and eczema.
As a potential skin sensitizer, the fume may cause dermatoses to appear suddenly and without warning. Absorption of chrome VI compounds through the skin can cause systemic poisoning effecting the kidneys and liver.

Ingestion: The material is moderately discomforting to the gastrointestinal tract and may be harmful if swallowed in large quantity.

Carcinogenicity: NTP - Listed; IARC - Group 3, Not classifiable as to carcinogenicity to humans; OSHA - Not listed; NIOSH - Not listed; ACGIH - Class A4, Not classifiable as a human carcinogen; EPA - Not listed; MAK - Not listed.

Chronic Effects: Metallic dusts generated by the industrial process give rise to a number of potential health problems. The larger particles, above 5 micron, are nose and throat irritants. Smaller particles however, may cause lung deterioration. Particles of less than 1.5 micron can be trapped in the lungs and, dependent on the nature of the particle, may give rise to further serious health consequences.

Chromium(III) is considered an essential trace nutrient serving as a component of the "glucose tolerance factor" and a cofactor for insulin action. High concentrations of chromium are also found in RNA. Trivalent chromium is the most common form found in nature.

Chronic inhalation of trivalent chromium compounds produces irritation of the bronchus and lungs, dystrophic changes to the liver and kidney, pulmonary edema, and adverse effects on macrophages. Intratracheal administration of chromium(III) oxide, in rats, increased the incidence of sarcomas, and tumors and reticulum cell sarcomas of the lung. There is inadequate evidence of carcinogenicity of chromium(III) compounds in experimental animals and humans (IARC).

Chronic exposure to hexavalent chromium compounds reportedly produces skin, eye and respiratory tract irritation, yellowing of the eyes and skin, allergic skin and respiratory reactions, diminished sense of smell and taste, blood disorders, liver and kidney damage, digestive disorders and lung damage. There is sufficient evidence of carcinogenicity of chromium(VI) compounds in experimental animals and humans to confirm these as Class 1 carcinogens (IARC).

Exposure to chromium during chrome production and in the chrome pigment industry is associated with cancer of the respiratory tract. A slight increase in gastrointestinal cancer following exposure to chromium compounds has also been reported. The greatest risk is attributed to exposure to acid- soluble, water-insoluble hexavalent chromium which occurs in roasting and refining processes. Animal studies support the idea that the most potent carcinogenic compounds are the slightly soluble hexavalent compounds.

The cells are more active in the uptake of the hexavalent forms compared to trivalent forms and this may explain the difference in occupational effect. It is the trivalent form, however, which is metabolically active and binds with nucleic acid within the cell suggesting that chromium mutagenesis first requires biotransformation of the hexavalent form by reduction.

Hexavalent chromes produce chronic ulceration of skin surfaces (quite independent of other hypersensitivity reactions exhibited by the skin).

Water-soluble chromium(VI) compounds come close to the top of any published "hit list" of contact allergens (eczematogens) producing positive results in 4 to 10% of tested individuals. On the other hand only chromium(III) compounds can bind to high molecular weight carriers such as proteins to form a complete allergen (such as a hapten). Chromium(VI) compounds cannot.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.

Encourage patient to blow nose to ensure clear breathing passages. Rinse mouth with water. Consider drinking water to remove dust from throat.

Seek medical attention if irritation or discomfort persist.

Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.

Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Immediately remove all contaminated clothing, including footwear (after rinsing with water).

Wash affected areas thoroughly with water (and soap if available).

Seek medical attention in event of irritation.

Ingestion: Contact a Poison Control Center.

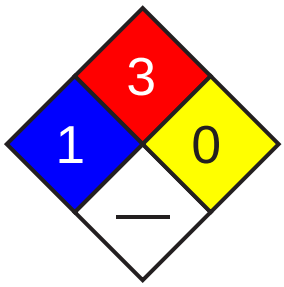
Do NOT induce vomiting. Give a glass of water.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Long term exposure to high dust concentrations may cause changes in lung function i.e. pneumoconiosis; caused by particles less than 0.5 micron penetrating and remaining in the lung. Prime symptom is breathlessness; lung shadows show on X-ray.

Section 5 - Fire-Fighting Measures

Flash Point: Noncombustible Solid
Autoignition Temperature: 580 °C (cloud)
LEL: Not applicable
UEL: Not applicable
Extinguishing Media: Sand, dry powder extinguishers or other inerts should be used to smother dust fires.
These are the only suitable means for extinguishing metal dust fires.
Do NOT use water.
General Fire Hazards/Hazardous Combustion Products: Sand, dry powder extinguishers or other inerts should be used to smother dust fires.
These are the only suitable means for extinguishing metal dust fires.
Do NOT use water.



Fire Diamond

Fire Incompatibility: Avoid contamination with oxidizing agents i.e. nitrates, oxidizing acids, chlorine bleaches, pool chlorine etc. as ignition may result.
Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.
Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways.
Cool fire-exposed containers with water spray from a protected location.
If safe to do so, remove containers from path of fire.

Section 6 - Accidental Release Measures

Small Spills: Clean up all spills immediately. Avoid contact with skin and eyes.
Wear impervious gloves and safety glasses.
Remove all ignition sources.
Use dry clean-up procedures and avoid generating dust.
Vacuum up or sweep up.
Place spilled material in clean, dry, sealable, labeled container.
Large Spills: Clear area of personnel.
Contact fire department and tell them location and nature of hazard.
Control personal contact by using protective equipment.
Prevent, by any means available, spillage from entering drains or water ways.
Moderate hazard.
No smoking, bare lights or ignition sources. Increase ventilation.
Stop leak if safe to do so.
Avoid generating dust.
Collect recoverable product into labeled containers for recycling.
Collect residues and seal in labeled drums for disposal.
Wash area down with large quantity of water and prevent runoff into drains.
After clean-up operations, decontaminate and launder all protective clothing and equipment before storing and reusing.
If contamination of drains or waterways occurs, advise emergency services.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Limit all unnecessary personal contact.
Wear protective clothing when risk of exposure occurs.
Use in a well-ventilated area. When handling DO NOT eat, drink or smoke.
Always wash hands with soap and water after handling.
Avoid physical damage to containers. Use good occupational work practices.
Observe manufacturer's storing and handling recommendations.
Recommended Storage Methods: Packaging as recommended by manufacturer.
Check that containers are clearly labeled.
Store in metal drums or safety cans.
Plastic container.
Metal can.
Metal drum.
Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Metal dusts must be collected at the source of generation as they are potentially explosive.

1. Vacuum cleaners, of flame-proof design, should be used to minimize dust accumulation.
2. Metal spraying and blasting should, where possible, be conducted in separate rooms. This minimizes the risk of supplying oxygen, in the form of metal oxides, to potentially reactive finely divided metals such as aluminum, zinc, magnesium or titanium.
3. Work-shops designed for metal spraying should possess smooth walls and a minimum of obstructions, such as ledges, on which dust accumulation is possible.
4. Wet scrubbers are preferable to dry dust collectors.
5. Bag or filter-type collectors should be sited outside the workrooms and be fitted with explosion relief doors.
6. Cyclones should be protected against entry of moisture as reactive metal dusts are capable of spontaneous combustion in humid or partially wetted state.
7. Local exhaust systems must be designed to provide a minimum capture velocity at the fume source, away from the worker, of 0. 5 meter/sec.

Special ventilation requirements apply for processes which result in the generation of barium, chromium, lead, or nickel fume and in those processes which generate ozone.

The use of mechanical ventilation by local exhaust systems is required as a minimum in all circumstances (including outdoor work).

(In confined spaces always check that oxygen has not been depleted by excessive rusting of steel or snowflake corrosion of aluminum). Local exhaust systems must be designed to provide a minimum capture velocity at the fume source, away from the worker, of 0. 5 meter/sec.

Personal Protective Clothing/Equipment:

Eyes: Safety glasses with side shields; or as required, chemical goggles.
Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: PVC gloves; Safety footwear.
Rubber gloves.

Respiratory Protection:

Exposure Range >1 to 10 mg/m^3: Air Purifying, Negative Pressure, Half Mask
Exposure Range >10 to 100 mg/m^3: Air Purifying, Negative Pressure, Full Face
Exposure Range >100 to <250 mg/m^3: Supplied Air, Constant Flow/Pressure Demand, Half Mask
Exposure Range 250 to unlimited mg/m^3: Self-contained Breathing Apparatus, Pressure Demand, Full Face
Cartridge Color: dust/mist filter (use P100 or consult supervisor for appropriate dust/mist filter)

Other: Overalls. Eyewash unit.

Section 9 - Physical and Chemical Properties

Appearance/General Info: A hard, brittle, lustrous, steel-grey metal which is very resistant to corrosion. Soluble in dilute sulphuric and hydrochloric acids. Welding flux grades typical sieve analysis (cumulative retention %):- 200 um 0, 150 um 10-40, 100 50-80, 75 um 80-95, 63 um 90-96, 43 um 97-100.

Physical State: Divided solid
Vapor Pressure (kPa): 0.13 at 1616 °C
Vapor Density (Air=1): 1.79
Formula Weight: 52.00
Specific Gravity (H_2O=1, at 4 °C): 7.2
Evaporation Rate: Not applicable
pH: Not applicable

pH (1% Solution): Not applicable.
Boiling Point: 2642 °C (4788 °F)
Freezing/Melting Point: 1900 °C (3452 °F)
Volatile Component (% Vol): Nil
Decomposition Temperature (°C): Not applicable
Water Solubility: Insoluble in water

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Product is considered stable. Hazardous polymerization will not occur.
Storage Incompatibilities: Segregate from strong oxidizers, nitric oxide, potassium chlorate, sulfur dioxide, acids and strong alkalis.

Section 11 - Toxicological Information

No relevant toxicological data found at time of research.

See *RTECS* GB 4200000, for additional data.

Section 12 - Ecological Information

Environmental Fate: No data found.
Ecotoxicity: No data found.
BCF: snails 1 $x10^6$
Biochemical Oxygen Demand (BOD): 62.5 lb/lb, 5 days

Section 13 - Disposal Considerations

Disposal: Recycle wherever possible. Consult manufacturer for recycling options. Follow applicable federal, state, and local regulations.
Bury residue in an authorized landfill.
Recycle containers if possible, or dispose of in an authorized landfill.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Shipping Name and Description: None

Section 15 - Regulatory Information

EPA Regulations:

RCRA 40 CFR: Listed
CERCLA 40 CFR 302.4: Listed per CWA Section 307(a) 5000 lb (2268 kg)
SARA 40 CFR 372.65: Listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

Material Safety Data Sheet Collection
Genium Publishing Corp.
1171 RiverFront Center
Amsterdam, NY 12010
(518) 842-4111

Issue Date: 2000-07

Cyanide Ion
MSDS 789
CYA1720

Section 1 - Chemical Product and Company Identification 54.1

Material Name: Cyanide Ion **CAS Number:** 57-12-5
Chemical Formula: CN
Structural Chemical Formula: CN
Synonyms: CARBON NITRIDE ION; CYANIDE; CYANIDE(1-); CYANIDE ANION; CYANIDE ION; CYANIDE(1-) ION; CYANIDE SOLUTIONS; CYANIDE,DRY; CYANURE; HYDROCYANIC ACID,ION(1-); ISOCYANIDE
General Use: Available ONLY for industrial and manufacturing purposes.

Section 2 - Composition / Information on Ingredients

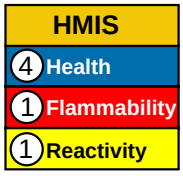
Name	CAS	%
cyanide ion	57-12-5	100

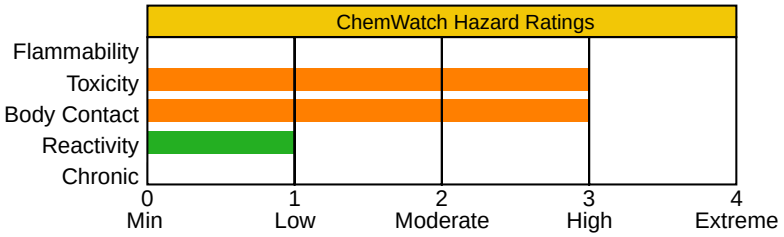
OSHA PEL
TWA: 5 mg/m^3; as CN.

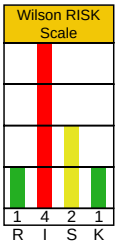
NIOSH REL
No data found.

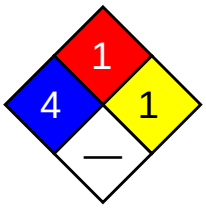
ACGIH TLV
No data found.

Section 3 - Hazards Identification









Fire Diamond

ANSI Signal Word
Danger!


Poison

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Almond odor. Poison. Irritating to the eyes/respiratory tract. Fast acting chemical asphyxiant that prevents tissue utilization of oxygen. Chronic: skin rash, appetite loss, weakness, dizziness, chest discomfort, nose bleed, hearing changes.

Potential Health Effects

Primary Entry Routes: inhalation, ingestion, skin absorption
Target Organs: brain, heart, lungs, skin, blood
Acute Effects

Inhalation: The dust is highly discomforting to the upper respiratory tract and extremely toxic and may be fatal. As little as a few breaths of higher concentrations of hydrogen cyanide vapor, given off from moist material, may cause instant collapse and stop breathing.

Eye: The solid/dust is corrosive to the eyes and is capable of causing severe damage with loss of sight. The material may be absorbed in toxic amounts through the eyes.

Skin: The solid/dust is highly discomforting to the skin and it is absorbed by the skin and may be fatal. The material is capable of causing chemical burns, ulceration and skin reactions which may lead to dermatitis. Exposure limits with "skin" notation indicate that vapor and liquid may be absorbed through intact skin. Absorption by skin may readily exceed vapor inhalation exposure. Symptoms for skin absorption are the same as for inhalation. Contact with eyes and mucous membranes may also contribute to overall exposure and may also invalidate the exposure standard.

The material may cause second degree burns and deep ulcers. Prolonged or repeated skin contact with low concentrations of the dust may result in `cyanide rash' characterized by itching and skin eruptions.

Ingestion: Considered an unlikely route of entry in commercial/industrial environments.
The solid/dust is extremely toxic and may be fatal if swallowed unless immediate treatment is applied.
The adult lethal dose is less than 250 mg.

Carcinogenicity: NTP - Not listed; IARC - Not listed; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Class D, Not classifiable as to human carcinogenicity; MAK - Not listed.

Chronic Effects: Cyanide prevents body cells from using oxygen.
Overexposure causes headache, dizziness, sweating, ineffective breathing and nausea which can be followed by a weak and irregular heartbeat, unconsciousness, convulsions, coma and death. Chronic exposure may interfere with iodine uptake by the thyroid and lead to its enlargement and related thyroid disorders. Loss of weight and appetite, mental deterioration, weakness and nervous system abnormalities may result.
Sodium cyanide is alkaline and is irritating and corrosive to body tissue.
Repeated minor contact causes cyanide rash, also itching, papules (small, superficial raised spots on the skin).
Inhalation may result in obstruction, bleeding, sloughs and in some cases perforations of the septum.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air, lay down and rest.
If not breathing, ensure clear airway, apply resuscitation.
Keep patient warm.
Use approved cyanide antidote kit.
Transport to hospital.

Eye Contact: Immediately hold eyes open and flush continuously with running water for at least 15 minutes. Ensure irrigation under eyelids.
Seek medical attention without delay.

Skin Contact: Quickly but gently, wipe material off skin with a dry, clean cloth.
Immediately remove all contaminated clothing, including footwear.
Wash affected areas with water (and soap if available) for at least 15 minutes. Transport to hospital or doctor.

Ingestion: IMPORTANT: ESTABLISH A FIRST AID PLAN BEFORE WORKING WITH CYANIDES. ANTIDOTES SHOULD BE AVAILABLE ON SITE.
In all cases of cyanide exposure get medical help urgently after administering first aid.
NOTE: Amyl nitrite is no longer considered to have an antidotal role in the treatment of real or suspected cyanide poisoning. As a first aid measure its disadvantages include: (i) Vasodilatory effects may promote fatal cardiac arrhythmias (particularly if the patient is not really poisoned by cyanide), (ii) Disguise of any arrhythmias or respiratory stimuli used as an indication of true cyanide poisoning, (iii) Its role as a competitive inducer of methemoglobin in the blood-stream is highly variable and, alone, may produce levels of methemoglobin as low as 5% only.(iv) An increase in use of nitrite "poppers" as aphrodisiacs introduces substance-abuse problems.
For cyanide poisonings by any route:
1. Contact Poison Control Center.
2. Seek immediate medical attention.
3. Place casualty in coma position.
4. Give oxygen when available.
5. Consider external cardiac compression, mechanical resuscitation and use of antidote kit.
6. If breathing stops mouth-to-mouth resuscitation may be given only as a last resort. Should such resort prove necessary, first wash the casualty's mouth and lips. A first aid attendant must not inhale the expired air of the casualty.

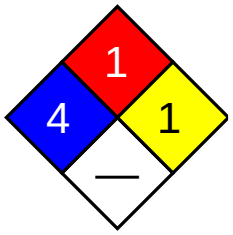
After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians:
1.Signs & symptoms of acute & cyanide poisoning reflect cellular hypoxia and are often non-specific.
2.Cyanosis may be a late finding.
3.A bradycardia, hypertensive and tachypneic patient suggests poisoning especially if CNS and cardiovascular depression subsequently occurs.
4.Immediate attention should be directed towards assisted ventilation, administration of 100% oxygen, insertion of intravenous lines and institution of cardiac monitoring.
5.Obtain an arterial blood gas immediately and correct any severe metabolic acidosis (pH below 7.15).
6.Mildly symptomatic patients generally require supportive care alone.
Nitrites should not be given indiscriminately - in all cases of moderate to severe poisoning, they should be given in conjunction with thiosulfate.
As a temporizing measure supply amyl nitrite perles (0.2 mL inhaled 30 seconds every minute) until intravenous lines for sodium nitrite are established. 10 mL of a 3% solution is administered over 4 minutes to produce 20% methemoglobin in adults. Follow directly with 50 mL of 25% sodium thiosulfate, at the same rate, IV. If symptoms reappear or persist within 1/2-1 hour, repeat nitrite and thiosulfate at 50% of initial dose.
As the mode of action involves the metabolic conversion of the thiosulfate to thiocyanate, renal failure may enhance thiocyanate toxicity.

7.Methylene blue is not an antidote.

Section 5 - Fire-Fighting Measures

Flash Point: -17.8 °C Closed Cup
Extinguishing Media: Dry chemical powder.
Vaporizing liquid.
Do NOT use carbon dioxide (CO_2) or acidic chemical extinguishers.
General Fire Hazards/Hazardous Combustion Products: Pollutant. Noncombustible.
Dangerous hazard when exposed to heat or flame.
Contact with acids produces toxic fumes.
Decomposes on heating and produces toxic fumes of hydrogen cyanide, nitrogen oxides (NO_x).



Fire Diamond

Fire Incompatibility: Avoid contamination with oxidizing agents i.e. nitrates, oxidizing acids, chlorine bleaches, pool chlorine etc. as ignition may result.
Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.
Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways.
Cool fire-exposed containers with water spray from a protected location.
Fight fire from a safe distance, with adequate cover.

Section 6 - Accidental Release Measures

Small Spills: Environmental hazard - contain spillage. Clean up all spills immediately.
Wear protective clothing, gloves, safety glasses and dust respirator.
Use dry clean-up procedures and avoid generating dust.
Sweep up.
Vacuum up or sweep up.
Place in suitable containers for disposal.
Large Spills: Pollutant - contain spillage. Clear area of personnel and move upwind.
Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways.
If contamination of drains or waterways occurs, advise emergency services.
Stop leak if safe to do so.
Increase ventilation.
Avoid generating dust.
Recover uncontaminated product in clean, dry, labeled containers.
Collect residues and seal in labeled drums for disposal.
Wash spill area with large quantities of water.
After clean-up operations, decontaminate and launder all protective clothing and equipment before storing and reusing.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.
Use good occupational work practices.
Avoid generating and breathing dust.
Avoid contact with skin and eyes.
Wear personal protective equipment when handling.
When handling, DO NOT eat, drink or smoke.
Avoid contact with incompatible materials.
Avoid sources of heat.
Avoid physical damage to containers.
Use in a well-ventilated area.
Keep containers securely sealed when not in use.
Wash hands with soap and water after handling.
Launder contaminated clothing before reuse.
Recommended Storage Methods: Glass container; plastic container.
Plastic drum.
Polylined drum.
Packaging as recommended by manufacturer.
Check that containers are clearly labeled.
Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: If inhalation risk exists, wear NIOSH-approved respirator.
Local exhaust ventilation usually required.

Personal Protective Clothing/Equipment

Eyes: Chemical goggles. Full face shield.
Safety glasses with side shields.
Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: Impervious gloves; rubber gloves.
Rubber boots.

Respiratory Protection:
Exposure Range >5 to <25 mg/m^3: Supplied Air, Constant Flow/Pressure Demand, Half Mask
Exposure Range 25 to unlimited mg/m^3: Self-contained Breathing Apparatus, Pressure Demand, Full Face
Note: poor warning properties

Other: Eyewash unit. Overalls. Laboratory coat. Rubber apron.

Section 9 - Physical and Chemical Properties

Appearance/General Info: Information applies to the cynaide ion which is a constituent of a number of cyanide compounds.

Physical State: Divided solid
Vapor Pressure (kPa): Negligible
Formula Weight: 26.02
Water Solubility: Soluble in water
pH: Not applicable

Boiling Point Range: Varies
Freezing/Melting Point Range: Varies
Volatile Component (% Vol): Negligible

Section 10 - Stability and Reactivity

Stability/Polymerization: Contact with acids produces toxic fumes.
Sodium cyanide is deliquescent and is gradually decomposed on exposure to air by reaction with carbon dioxide and moisture forming hydrogen cyanide gas.

Storage Incompatibilities: Avoid reaction with oxidizing agents. Avoid strong acids, bases.
Avoid contamination of water, foodstuffs, feed or seed.

Section 11 - Toxicological Information

Unless otherwise specified data extracted from RTECS - Registry of Toxic Effects of Chemical Substances

TOXICITY
Intraperitoneal (mouse) LD_{50}: 3 mg/kg

IRRITATION
Nil reported

See NIOSH, *RTECS* GS 7175000, for additional data.

Section 12 - Ecological Information

Environmental Fate: No data found.
Ecotoxicity: No data found.

Section 13 - Disposal Considerations

Disposal: Recycle wherever possible. Consult manufacturer for recycling options.
Follow applicable federal, state, and local regulations.
Waste solutions can be reacted with ferrous sulfate to form relatively non-toxic ferrocyanide, or reacted with sodium hypochlorite or calcium hypochlorite to form less toxic cyanate.
Caution: Concentrated hypochlorite should not be mixed with concentrated cyanide solutions or solid cyanide because highly toxic cyanogen chloride gas will be released.
Decontaminate empty containers. Puncture containers to prevent reuse.
Bury empty containers at an authorized landfill.

Section 14 - Transport Information

DOT Transportation Data (49 CFR 172.101):

Shipping Name: CYANIDES, INORGANIC, SOLID, N.O.S.
Additional Shipping Information:
Hazard Class: 6.1(a)
ID No.: 1588
Packing Group: II
Label: Poison[6]

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Listed P030 Toxic Waste
CERCLA 40 CFR 302.4: Listed per RCRA Section 3001 10 lb (4.535 kg)
SARA 40 CFR 372.65: Not listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

Research Date: .....1999-11 **Review Date:** 2000-07

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1171 RiverFront Center, Amsterdam, NY 12010
(518) 842-4111

Issue Date: 2005-05

1,1-Dichloroethane
ETH8150

Section 1 - Chemical Product and Company Identification 54/60

Material Name: 1,1-Dichloroethane **CAS Number:** 75-34-3
Chemical Formula: $C_2H_4Cl_2$
Structural Chemical Formula: Cl_2CHCH_3
EINECS Number: 200-863-5
ACX Number: X1002609-2
Synonyms: AETHYLIDENCHLORID; ASYMMETRICAL DICHLOROETHANE; CHLORINATED HYDROCHLORIC ETHER; CHLORURE D'ETHYLIDENE; CLORURO DI ETILIDENE; 1,1-DICHLOORETHAAN; 1,1-DICHLORAETHAN; 1,1-DICHLORETHANE; 1,1-DICHLOROETHANE; ALPHA ALPHA DICHLOROETHANE; DICHLOROETHANE,1,1-; 1,1-DICLOROETANO; ETHANE,1,1-DICHLORO-; ETHYLIDENE CHLORIDE; 1,1-ETHYLIDENE DICHLORIDE; ETHYLIDENE DICHLORIDE
General Use: Extraction solvent, fumigant.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
1,1-dichloroethane	75-34-3	>99

OSHA PEL
TWA: 100 ppm; 400 mg/m^3.

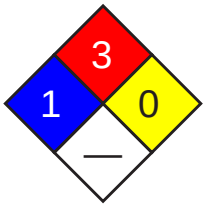
NIOSH REL
TWA: 100 ppm, 400 mg/m^3.

DFG (Germany) MAK
TWA: 100 ppm; PEAK: 200 ppm.

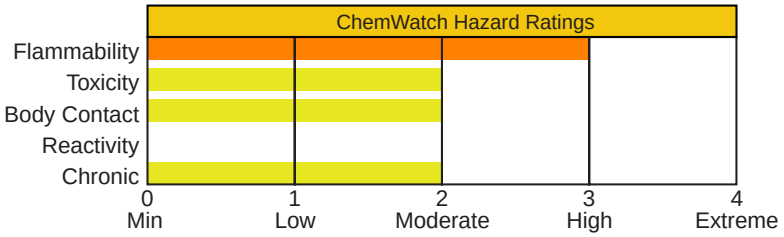
ACGIH TLV
TWA: 100 ppm.

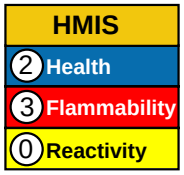
IDLH Level
3000 ppm.

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word

Danger!


Flammable

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Colorless liquid; chloroform odor. Irritating to eyes/skin/respiratory tract. Other Acute Effects: dizziness, coughing, staggering, disturbed vision, irregular heartbeat, unconsciousness, coma, pulmonary edema. Chronic Effects: rash, neurological effects. Flammable.

Potential Health Effects

Target Organs: skin, central nervous system (CNS), liver, kidneys
Primary Entry Routes: inhalation, skin contact
Acute Effects
Inhalation: The vapor is discomforting to the upper respiratory tract and lungs.
1,1-dichloroethane is reported to produce salivation, sneezing and coughing in exposed workers. In the few cases of reported intoxication the anticipated anesthetic effects have been observed with associated dizziness, nausea and vomiting. In severe or fatal cases hepatic and renal injury has been described.
Acute intoxication by halogenated aliphatic hydrocarbons appears to take place over two stages. Signs of a reversible narcosis are evident in the first stage and in the second stage signs of injury to organs may become evident. A single organ alone is (almost) never involved.

Depression of the central nervous system is the most outstanding effect of most halogenated aliphatic hydrocarbons. Inebriation and excitation, passing into narcosis, is a typical reaction. In severe acute exposures there is always a danger of death from respiratory failure or cardiac arrest due to a tendency to make the heart more susceptible to catecholamines (adrenalin).

Eye: The liquid is moderately discomforting to the eyes and is capable of causing a mild, temporary redness of the conjunctiva (similar to wind-burn), temporary impairment of vision and/or other transient eye damage/ulceration.

Skin: The liquid is discomforting to the skin and is capable of causing skin reactions which may lead to dermatitis from repeated exposures over long periods or if exposure is prolonged.
The liquid may cause more severe response, even a burn, if exposure is prolonged.

Ingestion: Considered an unlikely route of entry in commercial/industrial environments.
The liquid is discomforting to the gastrointestinal tract and harmful if swallowed. Ingestion may result in nausea, pain, vomiting. Vomit entering the lungs by aspiration may cause potentially lethal chemical pneumonitis.

Carcinogenicity: NTP - Not listed; IARC - Not listed; OSHA - Not listed; NIOSH - Not listed; ACGIH - Class A4, Not classifiable as a human carcinogen; EPA - Class C, Possible human carcinogen; MAK - Not listed.

Chronic Effects: Prolonged or continuous skin contact with the liquid may cause defatting with drying, cracking, irritation and dermatitis following.
Excessive exposure may cause kidney injury; liver injury is not likely.
Birth defects are unlikely. Even exposures having an adverse effect on the mother should have no effects on the fetus.

Section 4 - First Aid Measures

See DOT ERG

Inhalation: Remove to fresh air.
Lay patient down. Keep warm and rested.
If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor.

Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.
Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Immediately remove all contaminated clothing, including footwear (after rinsing with water).
Wash affected areas thoroughly with water (and soap if available).
Seek medical attention in event of irritation.

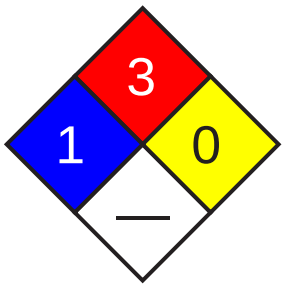
Ingestion: Contact a Poison Control Center.
Do NOT induce vomiting. Give a glass of water.
Avoid giving milk or oils.
Avoid giving alcohol.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Treat symptomatically. For ingestion, consider gastric lavage.
Do not administer sympathomimetic drugs as they may cause ventricular arrhythmias.

Section 5 - Fire-Fighting Measures

See DOT ERG



Fire Diamond

Flash Point: 13.889 °C Open Cup
Autoignition Temperature: 458 °C
LEL: 5.6% v/v
UEL: 11.4% v/v

Extinguishing Media: Foam, dry chemical powder, BCF (where regulations permit), carbon dioxide.
Water spray or fog - Large fires only.

General Fire Hazards/Hazardous Combustion Products: Liquid and vapor are highly flammable.
Severe fire hazard when exposed to heat, flame and/or oxidizers.
Vapor forms an explosive mixture with air.
Severe explosion hazard, in the form of vapor, when exposed to flame or spark. Vapor may travel a considerable distance to source of ignition.
Heating may cause expansion/decomposition with violent rupture of containers.
On combustion, may emit toxic fumes of carbon monoxide (CO). Other combustion products include hydrogen chloride, phosgene and carbon dioxide (CO_2).

Fire Incompatibility: Avoid reaction with strong oxidizing agents, alkalis, amines, aluminum and its alloys.

Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.
May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.
Fight fire from a safe distance, with adequate cover.
If safe, switch off electrical equipment until vapor fire hazard removed.

Use water delivered as a fine spray to control the fire and cool adjacent area. Avoid spraying water onto liquid pools.
Do not approach containers suspected to be hot.
Cool fire-exposed containers with water spray from a protective location.
If safe to do so, remove containers from path of fire.

Section 6 - Accidental Release Measures

Small Spills: Remove all ignition sources. Clean up all spills immediately.
Avoid breathing vapors and contact with skin and eyes.
Control personal contact by using protective equipment.
Contain and absorb small quantities with vermiculite or other absorbent material. Wipe up. Collect residues in a flammable waste container.

Large Spills: Clear area of personnel and move upwind.
Contact fire department and tell them location and nature of hazard.
May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.
No smoking, bare lights or ignition sources. Increase ventilation.
Stop leak if safe to do so. Water spray or fog may be used to disperse/absorb vapor. Contain spill with sand, earth or vermiculite.
Use only spark-free shovels and explosion proof equipment.
Collect recoverable product into labeled containers for recycling.
Absorb remaining product with sand, earth or vermiculite.
Collect solid residues and seal in labeled drums for disposal.
Wash area and prevent runoff into drains.
If contamination of drains or waterways occurs, advise emergency services.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid all personal contact, including inhalation.
Wear protective clothing when risk of exposure occurs.
Use in a well-ventilated area. Prevent concentration in hollows and sumps.
DO NOT enter confined spaces until atmosphere has been checked.
Avoid smoking, bare lights, heat or ignition sources.
When handling, DO NOT eat, drink or smoke.
Vapor may ignite on pumping or pouring due to static electricity.
DO NOT use plastic buckets. Ground and secure metal containers when dispensing or pouring product. Use spark-free tools when handling.
Avoid contact with incompatible materials.
Keep containers securely sealed. Avoid physical damage to containers.
Always wash hands with soap and water after handling.
Work clothes should be laundered separately.
Use good occupational work practices. Observe manufacturer's storing and handling recommendations. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions.

Recommended Storage Methods: Metal can; metal drum. Metal safety cans.
Packing as supplied by manufacturer.
Plastic containers may only be used if approved for flammable liquid.
Check that containers are clearly labeled and free from leaks.
DO NOT use aluminum containers.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Local exhaust ventilation usually required.
If risk of overexposure exists, wear NIOSH-approved respirator.
Correct fit is essential to obtain adequate protection. NIOSH-approved self contained breathing apparatus (SCBA) may be required in some situations.
Provide adequate ventilation in warehouse or closed storage area.

Personal Protective Clothing/Equipment:

Eyes: Safety glasses with side shields; or as required, chemical goggles.
Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: Wear chemical protective gloves, eg. PVC. Wear safety footwear.

Respiratory Protection:
Exposure Range >100 to <3000 ppm: Supplied Air, Constant Flow/Pressure Demand, Half Mask

Exposure Range 3000 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face
Note: poor warning properties

Other: Overalls. PVC apron. PVC protective suit may be required if exposure severe.
Eyewash unit. Ensure there is ready access to a safety shower.

Glove Selection Index:
VITON ..... Poor to dangerous choice for other than short-term immersion

Section 9 - Physical and Chemical Properties

Appearance/General Info: Colorless, neutral, volatile mobile liquid with a chloroform odor and a sweet taste similar to saccharin. Mixes with alcohol, ether, acetone and benzene.

Physical State: Liquid
Vapor Pressure (kPa): 24.34 at 20 °C
Vapor Density (Air=1): 3.42
Formula Weight: 98.96
Specific Gravity (H_2O=1, at 4 °C): 1.174
Evaporation Rate: 11.6 (BuAc=1)
pH: Not applicable
pH (1% Solution): Not applicable.
Boiling Point: 57.3 °C (135 °F)
Freezing/Melting Point: -96.9 °C (-142.42 °F)
Volatile Component (% Vol): 100
Water Solubility: 0.5 g/100 ml water at 20 °C

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Product is considered stable. Hazardous polymerization will not occur.
Storage Incompatibilities: Avoid storage with strong oxidizing agents, alkalis, amines, aluminum and its alloys.

Section 11 - Toxicological Information

Toxicity
Oral (rat) LD_{50}: 725 mg/kg
Inhalation (rat) LC_{Lo}: 16000 ppm/4 hr
Equivocal tumorigenic agent by RTECS criteria.

Irritation
Nil reported

See *RTECS* KI 0175000, for additional data.

Section 12 - Ecological Information

Environmental Fate: If released on land, it will rapidly volatilize, although it may also leach into groundwater where its fate is unknown. Bioconcentration in aquatic organisms will not be important. If released in water it will be removed by volatilization with a half-life of 6-9 days, 5-8 days, and 24-32 hr, respectively in a typical pond, lake, or river. In the atmosphere, it will degrade (half-life 62 days) by reaction with photochemically produced hydroxyl radicals, and it will be scavenged by rain.

Ecotoxicity: LC_{50} Lepomis macrochirus (bluegill) 550 ppm/96 hr, static bioassay in fresh water at 23 °C; mild aeration applied after 24 hr (no specific isomer; LC_{50} Poecilia reticulata (guppies) 202 ppm/7 days. /Conditions of bioassay not specified; TL_m Lagodon rhomboides (pinperch) 160 mg/l/24 hr. /Conditions of bioassay not specified; TL_m Artemia salina (brine shrimp) 320 mg/l/24 hr. /Conditions of bioassay not specified

BCF: estimated at 1.3

Biochemical Oxygen Demand (BOD): 0.05 g/g, 10 days

Octanol/Water Partition Coefficient: log K_{ow} = 1.9

Soil Sorption Partition Coefficient: K_{oc} = estimated at 43

Section 13 - Disposal Considerations

Disposal: Consult manufacturer for recycling options and recycle where possible.
Follow applicable federal, state, and local regulations.
Incinerate residue at an approved site.
Recycle containers where possible, or dispose of in an authorized landfill.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Shipping Name and Description: 1,1-Dichloroethane
ID: UN2362
Hazard Class: 3 - Flammable and combustible liquid
Packing Group: II - Medium Danger
Symbols:
Label Codes: 3 - Flammable Liquid
Special Provisions: IB2, T4, TP1
Packaging: **Exceptions:** 150 **Non-bulk:** 202 **Bulk:** 242
Quantity Limitations: **Passenger aircraft/rail:** 5 L **Cargo aircraft only:** 60 L
Vessel Stowage: **Location:** B **Other:** 40

Section 15 - Regulatory Information

EPA Regulations:

RCRA 40 CFR: Listed U076 Toxic Waste
CERCLA 40 CFR 302.4: Listed per RCRA Section 3001, per CWA Section 307(a) 1000 lb (453.5 kg)
SARA 40 CFR 372.65: Listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

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(518) 842-4111

Issue Date: 2005-05

Ethyl Chloride
ETH3350

Section 1 - Chemical Product and Company Identification 54/60

Material Name: Ethyl Chloride
CAS Number: 75-00-3
Chemical Formula: C_2H_5Cl
Structural Chemical Formula: H_3CCH_2Cl
EINECS Number: 200-830-5
ACX Number: X1003019-2
Synonyms: Ethyl Chloride; ETHYL CHLORIDE; AETHYLCHLORID; AETHYLCHLORIDE; AETHYLIS; AETHYLIS CHLORIDUM; ANODYNON; CHELEN; CHLOORETHAAN; CHLORENE; CHLORETHYL; CHLORIDUM; CHLOROAETHAN; CHLOROETHANE; CHLORURE D'ETHYLE; CHLORYL; CHLORYL ANESTHETIC; CLORENE; CLORETILO; CLOROETANO; CLORURO DI ETILE; DUBLOFIX; ETHANE,CHLORO-; ETHER CHLORATUS; ETHER CHLORIDUM; ETHER HYDROCHLORIC; ETHER MURIATIC; ETYLU CHLOREK; HYDROCHLORIC ETHER; KELENE; MONOCHLORETHANE; MONOCHLOROETHANE; MURIATIC ETHER; NARCOTILE
General Use: Used in manufacture of tetraethyl lead, ethylcellulose, dyes, drugs and perfumes. Used as a refrigerant, alkylating agent, anesthetic, analytical reagent, solvent for phosphorus,sulfur, fats, oils, resins and waxes; insecticides.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
ethyl chloride	75-00-3	>98

OSHA PEL
TWA: 1000 ppm; 2600 mg/m^3.

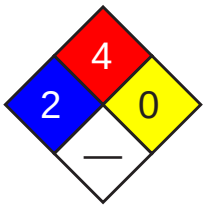
ACGIH TLV
TWA: 100 ppm; skin.

NIOSH REL
Handle with caution in the workplace.

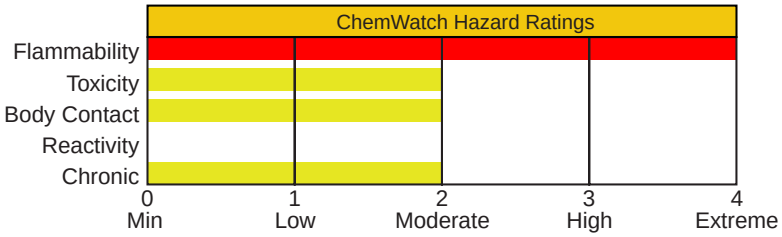
IDLH Level
3800 ppm (10% LEL).

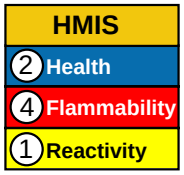
DFG (Germany) MAK
Skin.

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word

Danger!


Flammable Compressed Gas

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Colorless gas; ethereal, slightly pungent. Irritating to eyes/skin/respiratory tract. Compressed gas which can cause frostbite. Other Acute Effects: upon exposure to high concentrations: CNS depression, cardiac arrythmias, abdominal cramps. Flammable.

Potential Health Effects

Target Organs: respiratory system, cardiovascular system
Primary Entry Routes: inhalation, skin absorption
Acute Effects
Inhalation: The vapor is highly discomforting to the upper respiratory tract and lungs and may be harmful if inhaled. Acute intoxication by halogenated aliphatic hydrocarbons appears to take place over two stages. Signs of a reversible narcosis are evident in the first stage and in the second stage signs of injury to organs may become evident. A single organ alone is (almost) never involved.

Depression of the central nervous system is the most outstanding effect of most halogenated aliphatic hydrocarbons. Inebriation and excitation, passing into narcosis, is a typical reaction. In severe acute exposures there is always a danger of death from respiratory failure or cardiac arrest due to a tendency to make the heart more susceptible to catecholamines (adrenalin).
Ethyl chloride administered to humans at 1.3%, 1.9%, 2.5% and 3.36% produced intoxication which increased with dose. Incoordination began at 2.5%.
At 3.36%, noisy talkativeness and incoordination was followed by cyanosis, nausea and vomiting during recovery. Memory loss began at 1.9% and increased at increasing doses.
Death occurred in guinea pigs exposed to 4%.
12% for 1 minute produced complete loss of equilibrium, a running movement, and scratching. Abdominal walls appeared to distend and a convulsive action of the intestines was observed. After 15-20 minutes struggling became less violent and respiration became shallow, rapid and of a convulsive type.
Death occurred in 30-40 minutes. At 2% and above ethyl chloride produced congestion, edema and hemorrhage of the lungs, congestion of the intestines with blood-filled contents, dilated hearts with degenerated musculature, congested brains, pancreas and suprarenals (often with hemorrhage), liver congestion with degeneration and slight edema and slight degeneration of the spleen and kidneys. Dogs anesthetised with ethyl chloride showed increased sensitivity to administered adrenalin

Eye: The vapor is highly discomforting to the eyes, may be to the upper respiratory tract following absorption, may cause chemical burns and is capable of causing pain and severe conjunctivitis.
Corneal injury may develop, with possible permanent impairment of vision, if not promptly and adequately treated.
Vaporizing liquid causes rapid cooling and contact may cause cold burns, frostbite.

Skin: The liquid is discomforting to the skin.
Toxic effects may result from skin absorption.
Exposure limits with "skin" notation indicate that vapor and liquid may be absorbed through intact skin. Absorption by skin may readily exceed vapor inhalation exposure. Symptoms for skin absorption are the same as for inhalation. Contact with eyes and mucous membranes may also contribute to overall exposure and may also invalidate the exposure standard.
Vaporizing liquid causes rapid cooling and contact may cause cold burns, frostbite.

Ingestion: Considered an unlikely route of entry in commercial/industrial environments.
The liquid is discomforting to the gastrointestinal tract and may be harmful if swallowed.
Ingestion may result in nausea, abdominal irritation, pain and vomiting.

Carcinogenicity: NTP - Not listed; IARC - Group 3, Not classifiable as to carcinogenicity to humans; OSHA - Not listed; NIOSH - Not listed; ACGIH - Class A3, Animal carcinogen; EPA - Not listed; MAK - Class B, Justifiably suspected of having carcinogenic potential.

Chronic Effects: Male rats exposed via inhalation at 15000 ppm for 6 hours/day for 102 weeks, showed a significant increase in the numbers of benign and malignant epithelial tumors of the skin. Malignant astrocytomas of the brain were observed in exposed female animals.
Mice exposed at 15000 ppm for 6 hours/day, 5 days per week for 100 weeks showed an increase in alveolar and bronchiolar neoplasms of the lung in males and carcinomas of the uterus for the females. Hepatocellular neoplasms were present in both sexes. Nephropathy (characterized by scattered foci of tubular regeneration and minimal glomerulosclerosis) occurred in female mice and keryomegaly of the renal tubular cells increased in both sexes.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.
Lay patient down. Keep warm and rested.
If available, administer medical oxygen by trained personnel.
If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor, without delay.

Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.
Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: In case of cold burns (frost-bite): Bathe the affected area immediately in cold water for 10 to 15 minutes, immersing if possible and without rubbing.
Do not apply hot water or radiant heat. Apply a clean, dry dressing.
Transport to hospital or doctor.

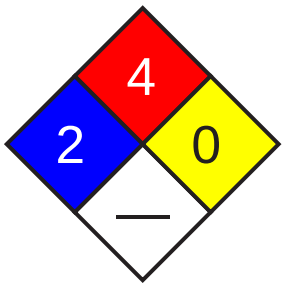
Ingestion: Contact a Poison Control Center.
Do NOT induce vomiting. Give a glass of water.
Avoid giving milk or oils.
Avoid giving alcohol.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Treat symptomatically.
Do not administer sympathomimetic drugs as they may cause ventricular arrhythmias.

Section 5 - Fire-Fighting Measures

See DOT ERG



Fire Diamond

Flash Point: -50 °C Closed Cup
Autoignition Temperature: 519 °C
LEL: 3.8% v/v
UEL: 15.4% v/v
Extinguishing Media: Alcohol stable foam.
Bromochlorodifluoromethane (BCF) (where regulations permit).
Dry chemical powder.
Carbon dioxide.
Water spray or fog.
General Fire Hazards/Hazardous Combustion Products: Liquid and vapor are highly flammable.
Severe fire hazard when exposed to heat, flame and/or oxidizers.
Vapor forms an explosive mixture with air.
Severe explosion hazard, in the form of vapor, when exposed to flame or spark. Vapor may travel a considerable distance to source of ignition.
Heating may cause expansion/decomposition with violent rupture of containers.
On combustion, may emit toxic fumes of carbon monoxide (CO).
Other combustion products include phosgene and hydrogen chloride.
Fire Incompatibility: Reacts explosively with magnesium, zinc or potassium, sodium or their alloys.
Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.
May be violently or explosively reactive. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.
Fight fire from a safe distance, with adequate cover.
If safe to do so, switch off electrical equipment until vapor fire hazard is removed.
Do not extinguish burning gas.
If safe to do so, stop flow of gas.
If flow of gas cannot be stopped, leave gas to burn.
Use water delivered as a fine spray to control the fire and cool adjacent area.
Do not approach cylinders suspected to be hot.
Cool fire-exposed containers with water spray from a protected location.
If safe to do so, remove containers from path of fire.

Section 6 - Accidental Release Measures

See DOT ERG

Small Spills: Avoid breathing vapor and any contact with liquid or gas. Protective equipment including respirator should be used. Do NOT enter confined spaces where gas may have accumulated. Shut of all sources of possible ignition and increase ventilation. Clear area of personnel. Stop leak only if safe to so do. Remove leaking cylinders to safe place. Release pressure under safe controlled conditions by opening valve. Keep area clear of personnel until gas has dispersed.
Large Spills: .....Clear area of all unprotected personnel and move upwind.
Contact fire department and advise them of the location and nature of hazard.
May be violently or explosively reactive.
Wear full body clothing with breathing apparatus.
Prevent by any means available, spillage from entering drains and waterways.
Consider evacuation.
Shut off all possible sources of ignition and increase ventilation.
No smoking or bare lights within area.
Use extreme caution to prevent violent reaction.
Stop leak only if safe to so do.
Water spray or fog may be used to disperse vapor.
Do NOT enter confined space where gas may have collected.
Keep area clear until gas has dispersed.
Keep area clear of personnel until gas has dispersed.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Use good occupational work practices.
Avoid breathing vapors and contact with skin and eyes.
Avoid contact with incompatible materials.
Avoid smoking, bare lights or ignition sources.
Avoid sources of heat.

Avoid physical damage to containers.
Wear protective clothing and gloves when handling containers.
Use in a well-ventilated area.
Keep containers securely sealed when not in use.
Prevent concentration in hollows and sumps. DO NOT enter confined spaces until atmosphere has been checked.
Vapor may travel a considerable distance to source of ignition.
DO NOT transfer gas from one cylinder to another.
Ground all lines and equipment.
Vapor may ignite on pumping or pouring due to static electricity.

Recommended Storage Methods: Check that containers are clearly labeled.
Packaging as recommended by manufacturer.
Cylinder fitted with valve protector cap.
Ensure the use of equipment rated for cylinder pressure.
Ensure the use of compatible materials of construction.
Cylinder valve must be closed when not in use or when empty.
Cylinder must be properly secured either in use or in storage.
WARNING: Suckback into cylinder may result in rupture.
Use back-flow preventive device in piping.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Local exhaust ventilation usually required.
If risk of overexposure exists, wear NIOSH-approved respirator.
Correct fit is essential to obtain adequate protection. NIOSH-approved self contained breathing apparatus (SCBA) may be required in some situations.
Provide adequate ventilation in warehouse or closed storage area.

Personal Protective Clothing/Equipment:

Eyes: Close fitting gas tight goggles. Full face shield.
Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: PVA gloves.

Respiratory Protection:
Exposure Range >1000 to <3800 ppm: Supplied Air, Constant Flow/Pressure Demand, Half Mask
Exposure Range 3800 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face
Note: odor threshold unknown

Other: Overalls. Eyewash unit.
Ensure there is ready access to a safety shower.

Section 9 - Physical and Chemical Properties

Appearance/General Info: Colorless gas at room temperature. Colorless, volatile liquid when compressed or at low temperatures. Ether-like odor. Burning taste. Soluble in alcohol and ether.

Physical State: Compressed gas
Vapor Pressure (kPa): 133.32 at 20 °C
Vapor Density (Air=1): 2.23
Formula Weight: 64.51
Specific Gravity (H_2O=1, at 4 °C): 0.92 at 0 °C(liq)
Evaporation Rate: Not applicable
pH: Not applicable
pH (1% Solution): Not applicable.
Boiling Point: 12.3 °C (54 °F) at 760 mm Hg
Freezing/Melting Point: -138.7 °C (-217.66 °F)
Volatile Component (% Vol): 100
Water Solubility: 0.574 g/100 ml in water at 20 °C

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Product is considered stable under normal storage and handling conditions. Hydrolyzes with water to produce toxic and corrosive oxidizing materials. Hazardous polymerization will not occur.

Storage Incompatibilities: Avoid reaction with oxidizing agents.

Section 11 - Toxicological Information

Toxicity
Inhalation (rat) LC_{50}: 160,000mg/m^3/2h
Inhalation (mouse) LC_{50}: 146,000 mg/m^3/2h

Irritation
Nil reported

See *RTECS* KH 7525000, for additional data.

Section 12 - Ecological Information

Environmental Fate: If released to the atmosphere, the dominant environmental fate process will be reaction with photochemically generated hydroxyl radicals, estimated half-life of about 40 days. If released to surface water, volatilization will be the dominant process as half-lives ranging from 1.1-5.6 days have been predicted for representative bodies of water. In groundwater, where volatilization may not be able to occur, hydrolysis may be the most important removal mechanism. The hydrolysis half-life has been estimated to be 38 days at 25 °C. Very limited biodegradation data suggest that it may be biodegradable, but insufficient data are available to estimate the relative importance of biodegradation in the environment. Aquatic bioconcentration, adsorption, direct photolysis, and oxidation are not important. If released to soil, it will evaporate rapidly where release to air is possible. It is susceptible to significant leaching.
Ecotoxicity: No data found.
Henry's Law Constant: estimated at 0.00848
BCF: none
Octanol/Water Partition Coefficient: log K_{ow} = 1.43
Soil Sorption Partition Coefficient: K_{oc} = estimated at 143

Section 13 - Disposal Considerations

Disposal: Follow applicable federal, state, and local regulations.
Evaporate or incinerate residue at an approved site.
Return empty containers to supplier.
Ensure damaged or non-returnable cylinders are gas-free before disposal.
Recycle containers if possible, or dispose of in an authorized landfill.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Shipping Name and Description: Ethyl chloride
ID: UN1037
Hazard Class: 2.1 - Flammable gas
Packing Group:
Symbols:
Label Codes: 2.1 - Flammable Gas
Special Provisions: B77, T50
Packaging: **Exceptions:** None **Non-bulk:** 322 **Bulk:** 314, 315
Quantity Limitations: **Passenger aircraft/rail:** Forbidden **Cargo aircraft only:** 150 kg
Vessel Stowage: **Location:** B **Other:** 40

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Not listed
CERCLA 40 CFR 302.4: Listed per CWA Section 307(a) 100 lb (45.35 kg)
SARA 40 CFR 372.65: Listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

Material Safety Data Sheet Collection
Genium Publishing Corp.
1171 RiverFront Center
Amsterdam, NY 12010
(518) 842-4111

Issue Date: 2000-07

Lead
MSDS 713
LEA1000

Section 1 - Chemical Product and Company Identification 54.1

Material Name: Lead **CAS Number:** 7439-92-1
Chemical Formula: Pb
Structural Chemical Formula: Pb
Synonyms: C.I. 77575; C.I. PIGMENT METAL 4; GLOVER; KS-4; LEAD; LEAD FLAKE; LEAD INORGANIC; LEAD METAL; LEAD S2; LEAD SZ; OLOW; OMAHA & GRANT; PB-S 100; PLUMBUM
General Use: Used as a construction material in chemical reaction equipment (tank piping,etc.); manufacture of tetraethyl lead; pigments for paints.
Used in pottery glazes, glass, ceramics, bearing metal and alloys, solder and other lead alloys.
Also used in metallurgy of steel and other metals, cable sheathing, storage batteries, radiation shielding and ammunition.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
lead	7439-92-1	>99

OSHA PEL
STEL: 0.05 mg/m^3; as Pb inorganic.

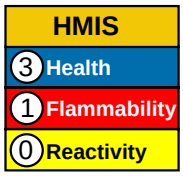
ACGIH TLV
TWA: 0.05 mg/m^3.

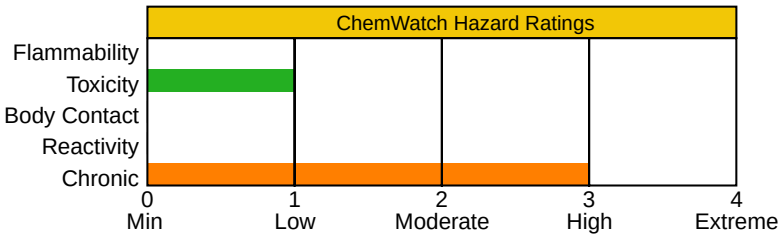
NIOSH REL
TWA: 0.1 mg/m^3.

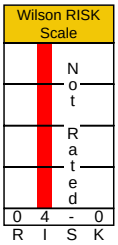
IDLH Level
100 mg/m^3; as Pb.

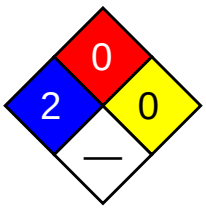
DFG (Germany) MAK
TWA: 0.1 mg/m^3.

Section 3 - Hazards Identification









Fire Diamond

ANSI Signal Word
Danger!


Poison

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Bluish-white, silvery, or gray metal. Cumulative poison. Repeated low exposures causes: severe neurological effects, blood/kidney damage. Possible cancer hazard. Reproductive damage (sterility, decreased fertility) and developmental damage to fetus.

Potential Health Effects

Primary Entry Routes: inhalation, ingestion
Target Organs: blood, central nervous system (CNS), peripheral nervous system, kidneys, gastrointestinal (GI) tract
Acute Effects
Inhalation: The dust may be discomforting to the upper respiratory tract and may be harmful if inhaled.
Eye: The dust may be discomforting to the eyes.
Skin: The material may be mildly discomforting to the skin.
Prolonged exposure may cause skin reactions.
Skin absorption is not considered a significant route of exposure.
Ingestion: The material is moderately discomforting to the gastrointestinal tract and may be harmful if swallowed.
In rats intestinal lead absorption is bidirectional and does not follow a linear relationship with oral dose.

Acute effects of exposure are generally minor because of its relative insolubility and physical form. Unusual instances of exposure have been reported in inadequately ventilated indoor firing ranges (as fume), in the application of surma, a mascara-like cosmetic agent, to the conjunctival surfaces in Asian countries and in lead-smelting and associated occupations.

In humans lead metabolism fits into a three compartment model. The first compartment in which lead has a half-life of about 35 days includes the blood; it receives blood from the gut and delivers some of it to the urine and communicates with the other two pools. The second compartment in which lead has a similar half-life includes the soft tissues which contain about half the blood level; they share lead with hair, nails, sweat, saliva, bile and other digestive secretions. The skeleton is the third compartment and contains the vast bulk of the total body burden, possesses a very long half-life and demonstrates a difference between the dense and less dense components to bind lead.

Carcinogenicity: NTP - Not listed; IARC - Group 2B, Possibly carcinogenic to humans; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Class B2, Probable human carcinogen based on animal studies; MAK - Not listed.

Chronic Effects: Symptoms of exposure include headache, fatigue, sleep disturbances, abdominal pains and decreased appetite. Overexposure to lead in the form of dust has toxic effects on the lungs and kidneys and on the nervous system resulting in mental disturbances and anemia.

Skin absorption is not considered to be a significant route of exposure.

Worker exposure to lead must be kept to a minimum, especially in cases where lead is worked at temperatures whereby lead vapors are evolved e.g. metal refining.

Lead is an accumulative poison and exposure even to small amounts can raise the body's content to toxic levels.

Potential adverse effects on the offspring of pregnant workers have been cited in the literature.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.

Lay patient down. Keep warm and rested.

If available, administer medical oxygen by trained personnel.

If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor, without delay.

Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water.

Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.

Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Wash affected areas thoroughly with water (and soap if available).

Seek medical attention in event of irritation.

Ingestion: Rinse mouth out with plenty of water.

Seek medical attention if irritation or discomfort persist.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: 1.Gastric acids solubilize lead and its salts and lead absorption occurs in the small bowel.

2.Particles of less than 1um diameter are substantially absorbed by the alveoli following inhalation.

3.Lead is distributed to the red blood cells and has a half-life of 35 days.

It is subsequently redistributed to soft tissue & bone-stores or eliminated.The kidney accounts for 75% of daily lead loss; integumentary and alimentary losses account for the remainder.

4.Neurasthenic symptoms are the most common symptoms of intoxication.

Lead toxicity produces a classic motor neuropathy.

Acute encephalopathy appears infrequently in adults.

Diazepam is the best drug for seizures.

5.Whole-blood lead is the best measure of recent exposure; free erythrocyte protoporphyrin (FEP) provides the best screening for chronic exposure. Obvious clinical symptoms occur in adults when whole-blood lead exceeds 80 ug/dL.

6.British Anti-Lewisite is an effective antidote and enhances fecal and urinary excretion of lead. The onset of action of BAL is about 30 minutes and most of the chelated metal complex is excreted in 4-6 hours, primarily in the bile.

Adverse reaction appears in up to 50% of patients given BAL in doses exceeding 5 mg/kg. CaNa2EDTA has also been used alone or in concert with BAL as an antidote.

D-penacillamine is the usual oral agent for mobilization of bone lead; its use in the treatment of lead poisoning remains investigational.

2-3-dimercapto-1-propanesulfonic acid (DMPS) and dimercaptosuccinic acid (DMSA) are water soluble analogues of BAL and their effectiveness is undergoing review.

As a rule, stop BAL if lead decreases below 50 ug/dL; stop CaNa2EDTA if blood lead decreases below 40 ug/dL or urinary lead drops below 2 mg/24 hrs.

BIOLOGICAL EXPOSURE INDEX - BEI

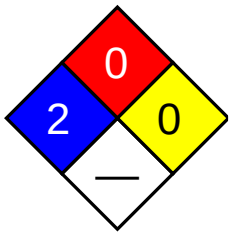
These represent the determinants observed in specimens collected from a healthy worker who has been exposed at the Exposure Standard (ES or TLV):

Determinant	Index	Sampling Time	Comments
Lead in blood	50 ug/100 mL	Not Critical	B
Lead in urine	150 ug/gm creatinine	Not critical	B
Zinc Protoporphyrin in blood	250 ug/100 mL erythrocytes OR 100 ug/100 mL blood	After 1 month exposure	B

B: Background levels occur in specimens collected from subjects NOT exposed.

Section 5 - Fire-Fighting Measures

Flash Point: Not available; probably noncombustible
Autoignition Temperature: Not applicable
LEL: Not applicable
UEL: Not applicable
Extinguishing Media: There is no restriction on the type of extinguisher which may be used.
General Fire Hazards/Hazardous Combustion Products: Noncombustible.
Not considered to be a significant fire risk; however, containers may burn.
Moderate fire hazard, in the form of dust, when exposed to heat or flames.
Decomposition products may include toxic lead dust and lead oxide fumes.



Fire Diamond

Fire Incompatibility: Incompatible with strong acids, oxidants, ammonium nitrate, chlorine trifluoride and sodium azide.
Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.
Use fire fighting procedures suitable for surrounding area.
Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways.
If safe to do so, remove containers from path of fire.
Cool fire-exposed containers with water spray from a protected location.
Equipment should be thoroughly decontaminated after use.

Section 6 - Accidental Release Measures

Small Spills: Clean up all spills immediately. Avoid contact with skin and eyes.
Wear protective clothing, gloves, safety glasses and dust respirator.
Use dry clean-up procedures and avoid generating dust.
Vacuum up.
Place spilled material in clean, dry, sealable, labeled container.
Large Spills: Clear area of personnel and move upwind.
Contact fire department and tell them location and nature of hazard.
Control personal contact by using protective equipment and dust respirator.
Prevent spillage from entering drains, sewers or waterways.
Recover product wherever possible. Avoid generating dust. Sweep / shovel up.
If required, wet with water to prevent dusting.
Put residues in labeled plastic bags or other containers for disposal.
Wash area down with large quantity of water and prevent runoff into drains.
If contamination of drains or waterways occurs, advise emergency services.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Limit all unnecessary personal contact.
Wear protective clothing when risk of exposure occurs.
Use in a well-ventilated area.
Avoid contact with incompatible materials.
When handling, DO NOT eat, drink or smoke.
Keep containers securely sealed when not in use. Avoid physical damage to containers. Always wash hands with soap and water after handling.
Work clothes should be laundered separately.

Use good occupational work practices. Observe manufacturer's storing and handling recommendations. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.

Recommended Storage Methods: Check that containers are clearly labeled.
Packaging as recommended by manufacturer.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: General exhaust is adequate under normal operating conditions.
If risk of overexposure exists, wear NIOSH-approved dust respirator.
Correct fit is essential to obtain adequate protection.

Personal Protective Clothing/Equipment

Eyes: Safety glasses with side shields; or as required, chemical goggles.
Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: Impervious gloves; rubber gloves.
Rubber boots.
Protective footwear.

Respiratory Protection:
Exposure Range >0.05 to 0.5 mg/m^3: Air Purifying, Negative Pressure, Half Mask
Exposure Range >0.5 to 2.5 mg/m^3: Air Purifying, Negative Pressure, Full Face
Exposure Range >2.5 to 50 mg/m^3: Powered Air Purifying Respirator, Half or Full Facepiece or Hood
Exposure Range >50 to 100 mg/m^3: Supplied Air Respirator with Full Facepiece, Hood, Helmet, or Suit, operated in a Positive Pressure Mode
Exposure Range >100 to unlimited mg/m^3: Self-contained Breathing Apparatus, Pressure Demand, Full Face
Cartridge Color: magenta (P100)
Note: (29CFR 1910.1025) for general industry

Other: Overalls. Eyewash unit. Skin cleansing cream.
Provide adequate ventilation in warehouse or closed storage areas.
General and local exhaust ventilation usually required to maintain airborne dust levels to safety levels.

Section 9 - Physical and Chemical Properties

Appearance/General Info: Bluish-white, silvery-gray metal. Malleable, lustrous when freshly cut and tarnishes when exposed to air. Reacts with strong acids like nitric acid, sulphuric or hydrochloric acid. Attacked by water in presence of oxygen. Poor electrical conductor. Lead fumes are formed at temperatures above 500-700 °C.

Physical State: Divided solid
Vapor Pressure (kPa): 0.24 at 1000 °C
Vapor Density (Air=1): Not applicable
Formula Weight: 207.19
Specific Gravity (H_2O=1, at 4 °C): 11.34
Water Solubility: Insoluble in water
Evaporation Rate: Not applicable

pH: Not applicable
pH (1% Solution): Not applicable.
Boiling Point Range: 1740 °C (3164 °F)
Freezing/Melting Point Range: 327.4 °C (621.32 °F)
Volatile Component (% Vol): Not applicable

Section 10 - Stability and Reactivity

Stability/Polymerization: Hazardous polymerization will not occur. Stable under normal storage conditions.
Storage Incompatibilities: Avoid storage with strong acids, oxidants, ammonium nitrate, chlorine trifluoride and sodium azide.

Section 11 - Toxicological Information

TOXICITY
Oral (woman) TD_{Lo}: 450 mg/kg/6 years
Inhalation (human) TC_{Lo}: 0.01 mg/m^3

IRRITATION
Nil Reported

WARNING: Lead is a cumulative poison and has the potential to cause abortion and intellectual impairment to unborn children of pregnant workers.

See NIOSH, *RTECS* OF 7525000, for additional data.

Section 12 - Ecological Information

Environmental Fate: If released or deposited on soil, it will be retained in the upper 2-5 cm of soil, especially soils with at least 5% organic matter or a pH 5 or above. Leaching is not important under normal conditions although there is some evidence to suggest that it is taken up by some plants. Generally, the uptake from soil into plants is not significant. It is expected to slowly undergo speciation to the more insoluble sulfate, sulfide, oxide, and phosphate salts. It enters water from atmospheric fallout, runoff or wastewater; little is transferred from natural ores. It is a stable metal and adherent films of protective insoluble salts form that protect the metal from further corrosion. That which dissolves tends to form ligands. It is effectively removed from the water column to the sediment by adsorption to organic matter and clay minerals, precipitation as insoluble salt (the carbonate or sulfate, sulfide), and reaction with hydrous iron and manganese oxide. Under most circumstances, adsorption predominates. It does not appear to bioconcentrate significantly in fish but does in some shellfish such as mussels. When released to the atmosphere, it will generally be in dust or adsorbed to particulate matter and subject to gravitational settling and be transformed to the oxide and carbonate.

Ecotoxicity: LC_{50} Japanese quail (Coturnix japonica), males or females, 14 days old, oral (5-day ad libitum in diet) >5,000 ppm; at 1000, 2236 & 5000 onset of toxic signs began at 7, 7 & 7 days and remissed at 11, 11 & 12 days, respectively, no mortality was observed; control references were dieldrin & dicrotophos; corn oil diluent was added to diet at ratio of 2:98 by wt; (extreme concentrations: 1,000-5,000 ppm)

BCF: freshwater fish 1.38 to 1.65

Section 13 - Disposal Considerations

Disposal: Recycle wherever possible. Consult manufacturer for recycling options.
Follow applicable federal, state, and local regulations.

Section 14 - Transport Information

DOT Transportation Data (49 CFR 172.101):

Shipping Name: NONE
Hazard Class: None
ID No.: None
Packing Group: None
Label: No class label assigned

Additional Shipping Information:

Section 15 - Regulatory Information

EPA Regulations:

RCRA 40 CFR: Not listed
CERCLA 40 CFR 302.4: Listed per CWA Section 307(a) 10 lb (4.535 kg)
SARA 40 CFR 372.65: Listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

Research Date: .....1999-11 **Review Date:** 2000-07

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Material Safety Data Sheet Collection
Genium group inc.
1171 RiverFront Center, Amsterdam, NY 12010
(518) 842-4111

Issue Date: 2005-05

Methyl Ethyl Ketone
BUT2330

Section 1 - Chemical Product and Company Identification 54/60

Material Name: Methyl Ethyl Ketone **CAS Number:** 78-93-3
Chemical Formula: C_4H_8O
Structural Chemical Formula: $CH_3COCH_2CH_3$
EINECS Number: 201-159-0
ACX Number: X1001472-1
Synonyms: ACETONE,METHYL-; AETHYLMETHYLKETON; 2-BUTANONE; 3-BUTANONE; BUTANONE; BUTANONE 2; EPA PESTICIDE CHEMICAL CODE 044103; ETHYL METHYL CETONE; ETHYL METHYL KETONE; ETHYLMETHYLCETONE; ETHYLMETHYLKETON; KETONE,ETHYL METHYL; MEETCO; MEK; METHYL ACETONE; METHYL ETHYL KETONE; METILETILCETONA; METILETILCHETONE; METYLOETYLOKETON
General Use: As a solvent in lacquers, thinners, solvent cements, adhesives, glues, in paint removers, nail polish removers, nail polish and cleaning solvents.
In the manufacture of smokeless gunpowder and colorless synthetic resins.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
methyl ethyl ketone	78-93-3	>99

OSHA PEL
TWA: 200 ppm; 590 mg/m^3.

OSHA PEL Vacated 1989 Limits
TWA: 200 ppm; 590 mg/m^3;
STEL: 300 ppm; 885 mg/m^3.

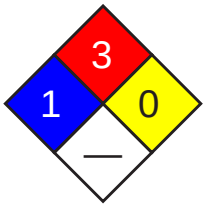
ACGIH TLV
TWA: 200 ppm; STEL: 300 ppm.

NIOSH REL
TWA: 200 ppm, 590 mg/m^3;
STEL: 300 ppm, 885 mg/m^3.

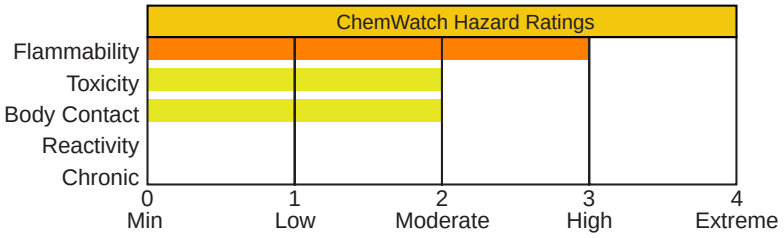
IDLH Level
3000 ppm.

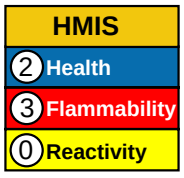
DFG (Germany) MAK
TWA: 200 ppm; PEAK: 200 ppm; skin.

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word

Danger!


Flammable

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Colorless, volatile liquid; sweet mint odor. Irritating to eyes/respiratory tract. Other Acute Effects: corneal injury; inhalation may cause dizziness or vomiting. Chronic Effects: dry skin, dermatitis. Flammable. Can form explosive mixtures in air.

Potential Health Effects

Target Organs: respiratory system, central nervous system (CNS), skin, eyes
Primary Entry Routes: inhalation, eyes, skin contact/absorption
Acute Effects
Inhalation: The vapor is highly discomforting to the upper respiratory tract. Inhalation hazard is increased at higher temperatures.

Acute effects from inhalation of high concentrations of vapor are pulmonary irritation, including coughing, with nausea; central nervous system depression - characterized by headache and dizziness, increased reaction time, fatigue and loss of coordination.
If exposure to highly concentrated solvent atmosphere is prolonged this may lead to narcosis, unconsciousness, even coma and possible death.
Inhalation of vapor may aggravate a pre-existing respiratory condition.
Easy odor recognition and irritant properties means that high vapor levels are readily detected and should be avoided by application of control measures; however odor fatigue may occur with loss of warning of exposure.
Exposure to ketone vapors may produce nose, throat and mucous membrane irritation. High concentrations of vapor may produce central nervous system depression characterized by headache, vertigo, loss of coordination, narcosis and cardiorespiratory failure. Some ketones produce neurological disorders (polyneuropathy) characterized by bilateral symmetrical paresthesia and muscle weakness primarily in the legs and arms.

Eye: The liquid is highly discomforting to the eyes if exposure is prolonged and is capable of causing pain and severe conjunctivitis.
Corneal injury may develop, with possible permanent impairment of vision, if not promptly and adequately treated.
The vapor is highly discomforting to the eyes if exposure is prolonged.
The vapor when concentrated has pronounced eye irritation; this gives some warning of high vapor concentrations. If eye irritation occurs seek to reduce exposure with available control measures, or evacuate area.

Skin: The liquid is highly discomforting to the skin, it is absorbed by the skin and may cause drying of the skin, which may lead to dermatitis.
Toxic effects may result from skin absorption.
The material may accentuate any pre-existing skin condition.
Material on the skin evaporates rapidly and may cause tingling, chilling and even temporary numbness.
The material may cause skin irritation after prolonged or repeated exposure and may produce a contact dermatitis (nonallergic). This form of dermatitis is often characterized by skin redness (erythema) and swelling (edema) which may progress to vesiculation, scaling and thickening of the epidermis. Histologically there may be intercellular edema of the spongy layer (spongiosis) and intracellular edema of the epidermis.

Ingestion: Considered an unlikely route of entry in commercial/industrial environments.
The liquid is highly discomforting if swallowed and toxic if swallowed in large quantity.
Ingestion may result in nausea, abdominal irritation, pain and vomiting.

Carcinogenicity: NTP - Not listed; IARC - Not listed; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Class D, Not classifiable as to human carcinogenicity; MAK - Not listed.

Chronic Effects: Prolonged or continuous skin contact with the liquid may cause defatting with drying, cracking, irritation and dermatitis following.
The material is considered to have a low order of toxicity; however Methyl ethyl ketone is often used in combination with other solvents and the toxic effects of mix may be greater than either solvent alone.
Combinations of n-hexane with methyl ethyl ketone and also methyl n-butyl ketone with methyl ethyl ketone show increase in peripheral neuropathy, a progressive disorder of nerves of extremities.
Combinations with chloroform show increase in toxicity.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.
Lay patient down. Keep warm and rested.
If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor.

Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.
Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Immediately remove all contaminated clothing, including footwear (after rinsing with water).
Wash affected areas thoroughly with water (and soap if available).
Seek medical attention in event of irritation.

Ingestion: Contact a Poison Control Center.
Do NOT induce vomiting. Give a glass of water.

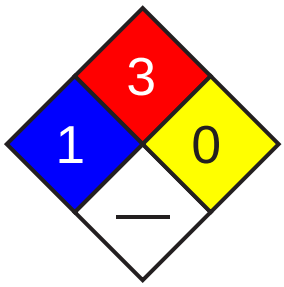
After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Treat symptomatically.

Section 5 - Fire-Fighting Measures

Flash Point: -9 °C Closed Cup
Autoignition Temperature: 404 °C
LEL: 1.4% v/v
UEL: 11.4% v/v
Extinguishing Media: Foam, dry chemical powder, BCF (where regulations permit), carbon dioxide.
Water spray or fog - Large fires only.
General Fire Hazards/Hazardous Combustion Products: Liquid and vapor are highly flammable.
Severe fire hazard when exposed to heat, flame and/or oxidizers.
Vapor forms an explosive mixture with air.
Severe explosion hazard, in the form of vapor, when exposed to flame or spark. Vapor may travel a considerable distance to source of ignition.
Heating may cause expansion/decomposition with violent rupture of containers.
On combustion, may emit toxic fumes of carbon monoxide (CO). Other combustion products include carbon dioxide (CO_2).
Fire Incompatibility: Avoid contamination with strong oxidizing agents as ignition may result. Attacks, softens and may dissolve rubber, many plastics, paints and coatings.
Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.
May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.
Fight fire from a safe distance, with adequate cover.
If safe, switch off electrical equipment until vapor fire hazard removed.
Use water delivered as a fine spray to control the fire and cool adjacent area. Avoid spraying water onto liquid pools.
Do not approach containers suspected to be hot.
Cool fire-exposed containers with water spray from a protective location.
If safe to do so, remove containers from path of fire.

See DOT ERG



Fire Diamond

Section 6 - Accidental Release Measures

Small Spills: Remove all ignition sources. Clean up all spills immediately.
Avoid breathing vapors and contact with skin and eyes.
Control personal contact by using protective equipment.
Contain and absorb small quantities with vermiculite or other absorbent material. Wipe up. Collect residues in a flammable waste container.
Large Spills: Clear area of personnel and move upwind.
Contact fire department and tell them location and nature of hazard.
May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.
No smoking, bare lights or ignition sources. Increase ventilation.
Stop leak if safe to do so. Water spray or fog may be used to disperse/absorb vapor. Contain spill with sand, earth or vermiculite.
Use only spark-free shovels and explosion proof equipment.
Collect recoverable product into labeled containers for recycling.
Absorb remaining product with sand, earth or vermiculite.
Collect solid residues and seal in labeled drums for disposal.
Wash area and prevent runoff into drains.
If contamination of drains or waterways occurs, advise emergency services.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

See DOT ERG

Section 7 - Handling and Storage

Handling Precautions: Avoid generating and breathing mist. Avoid all personal contact, including inhalation.
Wear protective clothing when risk of exposure occurs.
Use in a well-ventilated area. Prevent concentration in hollows and sumps.
DO NOT enter confined spaces until atmosphere has been checked.
Avoid smoking, bare lights, heat or ignition sources.
When handling, DO NOT eat, drink or smoke.
Vapor may ignite on pumping or pouring due to static electricity.
DO NOT use plastic buckets. Ground and secure metal containers when dispensing or pouring product. Use spark-free tools when handling.
Avoid contact with incompatible materials.

Keep containers securely sealed. Avoid physical damage to containers.
Always wash hands with soap and water after handling.
Work clothes should be laundered separately.
Use good occupational work practices. Observe manufacturer's storing and handling recommendations. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions.

Recommended Storage Methods: Metal can; metal drum. Packing as recommended by manufacturer.
Check all containers are clearly labeled and free from leaks.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Use in a well-ventilated area. Local exhaust ventilation may be required for safe working, i. e. , to keep exposures below required standards; otherwise, PPE is required.
CARE: Use of a quantity of this material in confined space or poorly ventilated area, where rapid build-up of concentrated atmosphere may occur, could require increased ventilation and/or protective gear.
General exhaust is adequate under normal operating conditions.
Local exhaust ventilation may be required in special circumstances.
If risk of overexposure exists, wear NIOSH-approved respirator. NIOSH-approved respirator (supplied air type) may be required in special circumstances. Correct fit is essential to ensure adequate protection.
Provide adequate ventilation in warehouses and enclosed storage areas.
In confined spaces where there is inadequate ventilation, wear full-face air supplied breathing apparatus.

Personal Protective Clothing/Equipment:

Eyes: Safety glasses with side shields; or as required, chemical goggles.
Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: Barrier cream with polyethylene gloves or Butyl rubber gloves.
Safety footwear.
Do NOT use this product to clean the skin.

Respiratory Protection:

Exposure Range >200 to 1000 ppm: Air Purifying, Negative Pressure, Half Mask
Exposure Range >1000 to <3000 ppm: Air Purifying, Negative Pressure, Full Face
Exposure Range 3000 to unlimited ppm: Supplied Air, Constant Flow/Pressure Demand, Full Face; Self-contained Breathing Apparatus, Pressure Demand, Full Face
Cartridge Color: black

Other: Overalls or Impervious protective clothing.
Eyewash unit.
Ensure there is ready access to an emergency shower.

Glove Selection Index:

BUTYL ..... Best selection
PE/EVAL/PE ..... Best selection
TEFLON ..... Best selection
PVA ..... Satisfactory; may degrade after 4 hours continuous immersion
BUTYL/NEOPRENE ..... Satisfactory; may degrade after 4 hours continuous immersion
SARANEX-23 ..... Poor to dangerous choice for other than short-term immersion
NEOPRENE/NATURAL..... Poor to dangerous choice for other than short-term immersion
HYPALON ..... Poor to dangerous choice for other than short-term immersion
NITRILE+PVC ..... Poor to dangerous choice for other than short-term immersion
NATURAL+NEOPRENE..... Poor to dangerous choice for other than short-term immersion
VITON/NEOPRENE ..... Poor to dangerous choice for other than short-term immersion
NATURAL RUBBER..... Poor to dangerous choice for other than short-term immersion
PVC..... Poor to dangerous choice for other than short-term immersion
NEOPRENE..... Poor to dangerous choice for other than short-term immersion
NITRILE ..... Poor to dangerous choice for other than short-term immersion

Section 9 - Physical and Chemical Properties

Appearance/General Info: Thin colorless highly flammable liquid. Penetrating, sharp smell. Very volatile and vapor is heavier than air. Mixes with alcohol, ether and hydrocarbon solvents, petrol, turps etc. Attacks, softens and may dissolve rubber, many plastics, paints and coatings.

Physical State: Liquid
Vapor Pressure (kPa): 9.5 at 20 °C
Vapor Density (Air=1): 2.4 at 20 °C
Formula Weight: 72.12
Specific Gravity (H_2O=1, at 4 °C): 0.81 at 20 °C
Evaporation Rate: 5.7 Fast (BuAc=1)

pH: Not applicable
pH (1% Solution): Not applicable.
Boiling Point: 79.6 °C (175 °F)
Freezing/Melting Point: -86.3 °C (-123.34 °F)
Volatile Component (% Vol): 100
Water Solubility: 353 g/L water at 10 °C

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Product is considered stable. Hazardous polymerization will not occur.
Storage Incompatibilities: Avoid storage with oxidizers hypochlorites, e.g. pool chlorine, bleaches and. strong bases and chloroform.

Section 11 - Toxicological Information

Toxicity
Oral (rat) LD_{50}: 2737 mg/kg
Inhalation (human) TC_{Lo}: 100 ppm/5 m
Inhalation (rat) LD_{50}: 23500 mg/m^3/8 hr
Dermal (rabbit) LD_{50}: 6480 mg/kg

Irritation
Eye (human): 350 ppm -irritant
Eye (rabbit): 80 mg - irritant
Skin (rabbit): 402 mg/24 hr - mild
Skin (rabbit): 13.78mg/24 hr open - mild

See *RTECS* EL 6475000, for additional data.

Section 12 - Ecological Information

Environmental Fate: When discharged into water, it will be lost by evaporation (half-life 3-12 days) or be slowly biodegraded. When released to the atmosphere, it will photodegrade at a moderate rate (half-life 2.3 days or less). It would not be expected to bioconcentrate into aquatic organisms.
Ecotoxicity: LC_{50} Pimephales promelas (fathead minnow) 3220 mg/l/96 hr (confidence limit 3130-3320 mg/l) /Conditions of bioassay not specified; Toxicity Threshold (Cell Multiplication Inhibition Test) Scenedesmus quadricauda (green algae) 4300 mg/l /Conditions of bioassay not specified; Toxicity Threshold (Cell Multiplication Inhibition Test) Entosiphon sulcatum (protoza) 190 mg/l /Conditions of bioassay not specified
Henry's Law Constant: 2.4 $x10^{-5}$
BCF: not significant
Biochemical Oxygen Demand (BOD): 214%, 5 days
Octanol/Water Partition Coefficient: log K_{ow} = 0.26 to 0.29

Section 13 - Disposal Considerations

Disposal: Consult manufacturer for recycling options and recycle where possible.
Follow applicable federal, state, and local regulations.
Incinerate residue at an approved site.
Recycle containers where possible, or dispose of in an authorized landfill.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Shipping Name and Description: Ethyl methyl ketone *or* Methyl ethyl ketone
ID: UN1193
Hazard Class: 3 - Flammable and combustible liquid
Packing Group: II - Medium Danger
Symbols:
Label Codes: 3 - Flammable Liquid
Special Provisions: IB2, T4, TP1
Packaging: **Exceptions:** 150 **Non-bulk:** 202 **Bulk:** 242
Quantity Limitations: **Passenger aircraft/rail:** 5 L **Cargo aircraft only:** 60 L
Vessel Stowage: **Location:** B **Other:**

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Listed U159 Toxic Waste, Ignitable Waste
CERCLA 40 CFR 302.4: Listed per RCRA Section 3001 5000 lb (2268 kg)
SARA 40 CFR 372.65: Listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

Material Safety Data Sheet Collection
Genium group inc.
1171 RiverFront Center, Amsterdam, NY 12010
(518) 842-4111

Methyl n-Butyl Ketone
HEX7500

Issue Date: 2005-05

Section 1 - Chemical Product and Company Identification 45/60

Material Name: Methyl n-Butyl Ketone **CAS Number:** 591-78-6
Chemical Formula: $C_6H_{12}O$
Structural Chemical Formula: $CH_3COC_4H_9$
EINECS Number: 209-731-1
ACX Number: X1001528-8
Synonyms: BUTYL METHYL KETONE; N-BUTYL METHYL KETONE; 2-HEXANONE; HEXAN-2-ONE; HEXANONE-2; KETONE,BUTYL METHYL; MBK; METHYL BUTYL KETONE; METHYL N-BUTYL KETONE; MNBK; 2-OXOHEXANE; PROPYLACETONE
Derivation: Produced by reaction of acetyl chloride with butyl magnesium chloride or by catalyzed reaction of acetic acid and ethylene under pressure, followed by distillation.
General Use: Formerly used as a solvent for lacquers, thinners, nitrocellulose, resins, oils, fats, and waxes. Not currently produced in the United States, but potential exposure can occur through its presence as a byproduct in wood pulping, coal gassification, and oil-shale processing.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
Methyl *n*-Butyl Ketone	591-78-6	ca% vol

OSHA PEL
TWA: 100 ppm; 410 mg/m^3.

NIOSH REL
TWA: 1 ppm, 4 mg/m^3.

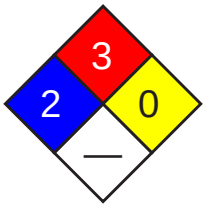
DFG (Germany) MAK
TWA: 5 ppm; PEAK: 40 ppm; skin.

OSHA PEL Vacated 1989 Limits
TWA: 5 ppm; 20 mg/m^3.

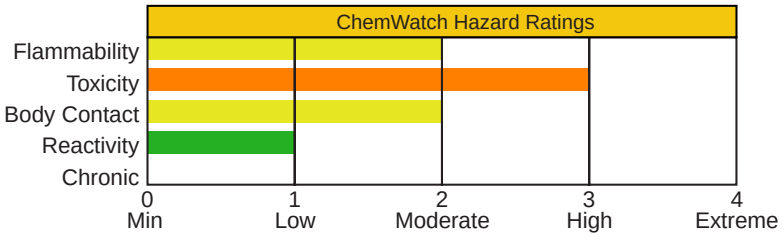
IDLH Level
1600 ppm.

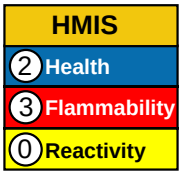
ACGIH TLV
TWA: 5 ppm; STEL: 10 ppm; skin.

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word
Warning!


Flammable

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Colorless liquid; pungent, acetone-like odor. Irritating to eyes/skin. Other Acute Effects: varying degrees of CNS depression, nausea, headache, unconsciousness. Chronic Effects: nerve damage. Flammable. Capable of forming explosive mixtures with air.

Potential Health Effects

Target Organs: Eyes, skin, respiratory system, central and peripheral nervous systems.
Primary Entry Routes: Inhalation, eye and skin contact/absorption.
Acute Effects
Inhalation: Vapor inhalation can cause respiratory tract irritation and varying degrees of central nervous system depression. Symptoms include headache, nausea and vomiting, incoordination, and dizziness, with progression to narcosis (unconsciousness) and cardiorespiratory failure.
Eye: Irritation can occur from exposures to as low as 1000 ppm for 15 sec. to 1 min.
Skin: Methyl n-butyl ketone is easily absorbed through the skin (222 mg/hr through hands).

Ingestion: Central nervous system depression is likely.

Carcinogenicity: NTP - Not listed; IARC - Not listed; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Not listed; MAK - Not listed.

Medical Conditions Aggravated by Long-Term Exposure: Skin conditions such as dermatitis or any disorder that affects the peripheral nervous system.

Chronic Effects: Repeated skin contact can cause dermatitis. Repeated inhalation or skin absorption can lead to significant peripheral nerve damage due to metabolism to 2,5-hexanedione. Symptoms include muscle weakness, tingling, sensation loss, and incoordination. The degree of these effects vary depending on exposure duration and concentration and may progress slowly for several months after cessation of exposure. In general, chronic exposure appears to affect only the peripheral nervous system; however, some animal studies have demonstrated chronic damage to the central nervous system, including the optic nerves. Whereas peripheral nerves may regenerate after damage, nerves of the central nervous system do not.

Section 4 - First Aid Measures

Inhalation: Remove exposed person to fresh air and support breathing as needed.

Eye Contact: *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water for at least 15 min. Consult a physician or ophthalmologist if pain or irritation persist.

See DOT ERG

Skin Contact: *Quickly* remove contaminated clothing (*be aware*, clothing is now flammable - dispose of or clean with care). Rinse with flooding amounts of water for at least 15 min. Wash exposed area with soap and water. For reddened or blistered skin, consult a physician.

Ingestion: Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center. Unless the poison control center advises otherwise, have the *conscious and alert* person drink 1 to 2 glasses of water. *Do not* induce vomiting if small amounts have been ingested because of the danger of aspiration into the lungs. However, if large amounts are ingested, vomiting may be indicated as potential systemic effects may outweigh danger of aspiration. Consult a physician.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: In chronic exposures, clinical biopsies and electromyographic studies may show axonal degeneration with enlarged axons containing masses of neurofilaments and thinning of the myelin sheath. MBK toxicity is potentiated by exposure to other solvents, especially those that increase liver microsomal activities.

Section 5 - Fire-Fighting Measures

Flash Point: 77 °F (25 °C) CC; 83 °F (28.3 °C) OC

Burning Rate: 4.8 mm/min.

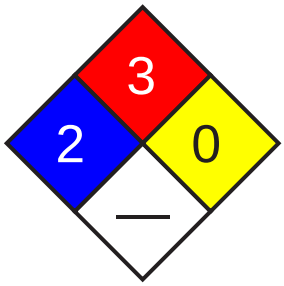
Autoignition Temperature: 795 °F (423 °C)

LEL: 1.22% v/v

UEL: 8% v/v

See DOT ERG

Flammability Classification: Class 1C Flammable Liquid



Fire Diamond

Extinguishing Media: For small fires, use dry chemical, carbon dioxide, or alcohol-resistant foam. For large fires, use fog or alcohol-resistant foam. Water spray may be ineffective for fires as methyl *n*-butyl ketone may float on top of water and spread fire.

General Fire Hazards/Hazardous Combustion Products: Acrid smoke and carbon dioxide gas. Vapors may travel to an ignition source and flash back. Container may explode in heat of fire. Methyl *n*-butyl ketone presents a vapor explosion hazard indoors, outdoors, and in sewers.

Fire-Fighting Instructions: Apply cooling water to sides of fire-exposed containers until well after fire is out. Stay away from ends of tanks. For massive fire in cargo area, use unmanned monitor nozzles or unmanned hose holders. If impossible, withdraw from area and let fire burn. Withdraw from area immediately if you hear any rising sound from venting safety device or notice any tank discoloration as a BLEVE (boiling liquid expanding vapor explosion) may be imminent. Do not release runoff from fire control methods to sewers or waterways. Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Structural firefighters' protective clothing provides only limited protection.

Section 6 - Accidental Release Measures

Spill/Leak Procedures: Notify safety personnel, isolate and ventilate area, deny entry, and stay upwind. Shut off all ignition sources. Use water spray to "knock-down" vapor. Cleanup personnel should protect against inhalation and skin/eye contact.

See DOT ERG

Small Spills: Take up with earth, sand, vermiculite, or other absorbent, noncombustible material and place in suitable containers.

Large Spills: Dike far ahead of liquid spill for later disposal or reclamation. Do not release into sewers or waterways. Damp mop any residue.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Do not use near heat or ignition sources. Use non-sparking tools to open containers. Never eat, drink, or smoke in work areas. Practice good personal hygiene after using methyl *n*-butyl ketone, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Recommended Storage Methods: Store in a cool, dry, well-ventilated area away from heat, ignition sources, and incompatibles (sec. 10).

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: To prevent static sparks, electrically ground and bond all equipment used with and around methyl *n*- butyl ketone. Inert atmospheres may be useful for process equipment. Provide general or local exhaust ventilation systems to maintain airborne concentrations below OSHA PELs (Sec. 2). Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.

Administrative Controls: Consider preplacement and periodic medical exams of exposed workers with emphasis on the peripheral nervous system and skin. Advise employees of the health and fire hazards associated with handling methyl *n*-butyl ketone.

Personal Protective Clothing/Equipment: Wear chemically protective gloves, boots, aprons, and gauntlets to prevent prolonged or repeated skin contact. Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Contact lenses are not eye protective devices. Appropriate eye protection must be worn instead of, or in conjunction with contact lenses.

Respiratory Protection: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. For <= 10 ppm, use any supplied-air respirator. For <= 25 ppm, use any supplied-air respirator operated in continuous-flow mode. For <= 50 ppm, use any SAR with a tight-fitting facepiece operated in continuous-flow mode or any SCBA or supplied-air respirator with a full facepiece. For <= 1600 ppm, use any supplied-air respirator with a full facepiece operated in pressure-demand or other positive-pressure mode. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air- purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas.

Other: Separate contaminated work clothes from street clothes. Launder before reuse. Remove methyl *n*- butyl ketone from your shoes and clean personal protective equipment. Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work area.

Section 9 - Physical and Chemical Properties

Appearance/General Info: Colorless with a pungent odor.

Physical State: Liquid

Odor Threshold: 0.076 ppm

Vapor Pressure (kPa): 11 mm Hg at 77 °F (25 °C)

Bulk Density: 6.75 lb/gal

Formula Weight: 100.16

Specific Gravity (H_2O=1, at 4 °C): 0.8113 at 68 °F (20 °C)

Evaporation Rate: Relative Evaporation Rate (BuAc = 1): 1

Refractive Index: 1.4024 at 68 °F (20 °C)

Boiling Point: 268 °F (128 °C)

Freezing/Melting Point: -70.6 °F (-57 °C)

Viscosity: 0.62 cP at 68 °F (20 °C)

Surface Tension: 25.49 dyne/cm at 68 °F (20 °C)

Ionization Potential (eV): 9.34 eV

Water Solubility: 1.4 wt% at 68 °F (20 °C)

Other Solubilities: Soluble in alcohol, acetone, and ether.

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Methyl *n*-butyl ketone is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization does not occur. Exposure to heat, ignition sources, and incompatibles.

Storage Incompatibilities: Strong oxidizers.

Hazardous Decomposition Products: Thermal oxidative decomposition of methyl *n*-butyl ketone can produce carbon dioxide.

Section 11 - Toxicological Information

Acute Oral Effects:
Rat, oral, LD_{50}: 2590 mg/kg.
Guinea pig, oral, LD_{50}: 914 mg/kg.
Acute Inhalation Effects:
Rat, inhalation, LC_{50}: 8000 ppm.
Human, inhalation, TC_{Lo}: 1000 ppm caused headache and nausea or vomiting.
Acute Skin Effects:
Rabbit, skin, LD_{50}: 4800 mg/kg.
Irritation Effects:
Rabbit, skin: 500 mg/24 hr caused mild irritation.
Other Effects:
Rat, inhalation: 1000 ppm/6 hr administered from 1 to 21 days of pregnancy caused specific developmental abnormalities of the gastrointestinal and urogenital system.
Chicken, inhalation: 200 ppm/90 days, continuously caused peripheral nerve sensation changes (spastic paralysis with or without sensory change) and weight loss or decreased weight gain.

See *RTECS* MP1400000, for additional data.

Section 12 - Ecological Information

Environmental Fate: If released to soil, methyl *n*-butyl ketone is highly mobile and can leach to groundwater. Some may volatilize as well as undergo rapid biodegradation. In water, volatilization is expected to be rapid. Bioconcentration is not expected (BCF = 6). In the air, methyl *n*-butyl ketone reacts with photochemically-produced hydroxyl radicals with an estimated half-life of 2 days. Because it is soluble, washout via rain is expected. Highly mobile.
Ecotoxicity: Fathead minnow (*Pimephales promelas*), LC_{50} = 428 mg/L/96 hr at 77 °F (25 °C)
Octanol/Water Partition Coefficient: log K_{ow} = 1.38

Section 13 - Disposal Considerations

Disposal: Methyl *n*-butyl ketone can be subjected to incineration; addition of a more flammable solvent may facilitate easier burning. Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Note: This material has multiple possible HMT entries. Choose the appropriate one based on state and condition of specific material when shipped.

Shipping Name and Description: Ketones, liquid, n.o.s.
ID: UN1224
Hazard Class: 3 - Flammable and combustible liquid
Packing Group: I - Great Danger
Symbols: G - Technical Name Required
Label Codes: 3 - Flammable Liquid
Special Provisions: T11, TP1, TP8, TP27
Packaging: **Exceptions:** None **Non-bulk:** 201 **Bulk:** 243
Quantity Limitations: **Passenger aircraft/rail:** 1 L **Cargo aircraft only:** 30 L
Vessel Stowage: **Location:** E **Other:**

Shipping Name and Description: Ketones, liquid, n.o.s.
ID: UN1224
Hazard Class: 3 - Flammable and combustible liquid
Packing Group: II - Medium Danger
Symbols: G - Technical Name Required
Label Codes: 3 - Flammable Liquid
Special Provisions: IB2, T7, TP1, TP8, TP28
Packaging: **Exceptions:** 150 **Non-bulk:** 202 **Bulk:** 242
Quantity Limitations: **Passenger aircraft/rail:** 5 L **Cargo aircraft only:** 60 L
Vessel Stowage: **Location:** B **Other:**

Shipping Name and Description: Ketones, liquid, n.o.s.
ID: UN1224
Hazard Class: 3 - Flammable and combustible liquid
Packing Group: III - Minor Danger
Symbols: G - Technical Name Required
Label Codes: 3 - Flammable Liquid
Special Provisions: B1, IB3, T4, TP1, TP29
Packaging: **Exceptions:** 150 **Non-bulk:** 203 **Bulk:** 242
Quantity Limitations: **Passenger aircraft/rail:** 60 L **Cargo aircraft only:** 220 L
Vessel Stowage: **Location:** A **Other:**

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Not listed
CERCLA 40 CFR 302.4: Not listed
SARA 40 CFR 372.65: Not listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

Material Safety Data Sheet Collection
Genium group inc.
1171 RiverFront Center, Amsterdam, NY 12010
(518) 842-4111

Issue Date: 2005-05

Methyl tert-Butyl Ether
BUT5410

Section 1 - Chemical Product and Company Identification 54/60

Material Name: Methyl tert-Butyl Ether **CAS Number:** 1634-04-4
Chemical Formula: $C_5H_{12}O$
Structural Chemical Formula: $(CH_3)_3COCH_3(CH_3)_3COCH_3$
EINECS Number: 216-653-1
ACX Number: X1001502-4
Synonyms: T-BUTYL METHYL ETHER; TERT-BUTYL METHYL ETHER; ETHER,TERT-BUTYL METHYL; 2-METHOXY-2-METHYL PROPANE; 2-METHOXY-2-METHYLPROPANE; METHYL TERT-BUTYL ETHER; METHYL 1,1-DIMETHYLETHYL ETHER; METHYL-TERT-BUTYL ETHER; 2-METHYL-2-METHOXYPROPANE; MTBE; PROPANE,2-METHOXY-2-METHYL-; PROPANE,2-METHOXY-2-METHYL-(9CI)
General Use: Octane booster for unleaded petrol (up to 7% by volume), manufacture of isobutene; solvent for a number of applications, including pesticide analysis.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
methyl tert-butyl ether	1634-04-4	>95
commercial material may contain C_5 hydrocarbons <5%		

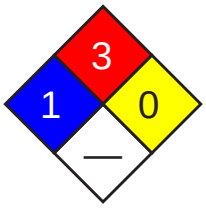
OSHA PEL

NIOSH REL

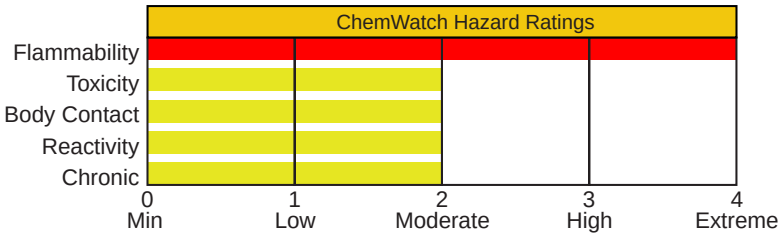
DFG (Germany) MAK
TWA: 50 ppm; PEAK: 75 ppm.

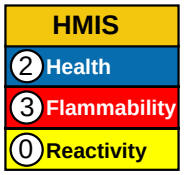
ACGIH TLV
TWA: 50 ppm.

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word
Danger!


Flammable

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Clear, colorless liquid; slight hydrocarbon/mint or terpene-like odor. Irritating to eyes/skin/respiratory tract. Other Acute Effects: CNS and respiratory depression, aspiration pneumonitis. Chronic Effects: nasal/tracheal inflammation. Flammable.

Potential Health Effects

Target Organs: upper respiratory system, central nervous system (CNS)
Primary Entry Routes: inhalation, ingestion
Acute Effects
Inhalation: The vapor is harmful and discomforting to the upper respiratory tract. Acute effects from inhalation of high vapor concentrations may be chest and nasal irritation with coughing, sneezing, headache and even nausea. If exposure to highly concentrated vapor atmosphere is prolonged this may lead to narcosis, unconsciousness, even coma, and unless resuscitated, death. Inhalation of the lower alkyl ethers may produce intoxication, blurred vision, headache, dizziness, excitation, pharyngitis, and irritation of the nose and throat. Convulsions, respiratory distress or paralysis, asphyxia, pneumonitis, and unconsciousness are all serious manifestations of poisoning; liver and kidney damage may occur. Fatalities have been reported. Ethers produce narcosis following inhalation.

Rats exposed to 8000 ppm for 6 hours showed changes in motor activity with the pattern and time course of effects being indicative of transient central nervous system depression. Transient increases in motor activity, on the other hand, were observed in male rats exposed at 800 and 4000 ppm. This finding may reflect an exposure-related stimulant effect or an exaggerated response following recovery from an anesthetic effect. Rats exposed to 1000 ppm, 6 hours/day, 5 days/week for 9 exposures showed lachrymation, conjunctival swelling and corneal changes. A reduced reaction to auditory stimuli was noted at 3000 ppm. There were no other macroscopic pathology findings other than chronic inflammatory changes in the nasal mucosa and trachea.

Eye: The liquid is extremely discomforting to the eyes.
Eye contact with alkyl ethers (vapors or liquid) may produce irritation, redness and lachrymation.

Skin: The liquid is discomforting to the skin and is capable of causing skin reactions which may lead to dermatitis. Bare unprotected skin should not be exposed to this material. Considered to be harmful if it is absorbed by the skin. Alkyl ethers may defat and dehydrate the skin producing dermatoses.
Absorption may produce headache, dizziness, and central nervous system depression.

Ingestion: Considered an unlikely route of entry in commercial/industrial environments. The liquid is extremely discomforting and may be fatal if swallowed. Ingestion may result in nausea, pain, vomiting. Vomit entering the lungs by aspiration may cause potentially lethal chemical pneumonitis. Ingestion of alkyl ethers may produce symptoms to those produced following inhalation.

Carcinogenicity: NTP - Not listed; IARC - Group 2B, Possibly carcinogenic to humans; OSHA - Not listed; NIOSH - Not listed; ACGIH - Class A3, Animal carcinogen; EPA - Not listed; MAK - Not listed.

Chronic Effects: Prolonged or repeated exposure may cause kidney damage.
Rats exposed to 800, 4000 or 8000 ppm, 6 hours/day, 5 days/week, for 13 weeks showed statistically significant increases in the mean absolute and relative weights of liver, kidneys, and adrenal gland in the two higher exposure groups, while mild hematological changes were seen in all animals.
Chronic exposure to alkyl ethers may result in loss of appetite, excessive thirst, fatigue, and weight loss.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air. Lay patient down. Keep warm and rested. If available, administer medical oxygen by trained personnel. If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor without delay.

See DOT ERG

Eye Contact: Immediately hold the eyes open and wash continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids. Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Immediately flush body and clothes with large amounts of water, using safety shower if available. Quickly remove all contaminated clothing, including footwear. Wash affected areas with water (and soap if available) for at least 15 minutes. Transport to hospital or doctor.

Ingestion: DO NOT induce vomiting.
Observe the patient carefully. Never give liquid to a person showing signs of being sleepy or with reduced awareness; i.e. becoming unconscious. Give water (or milk) to rinse out mouth. Then provide liquid slowly and as much as casualty can comfortably drink. Transport to hospital or doctor without delay.

After first aid, get appropriate in-plant, paramedic, or community medical support.

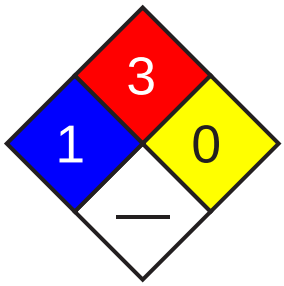
Note to Physicians: Treat symptomatically.

Section 5 - Fire-Fighting Measures

Flash Point: -26 °C Closed Cup
Autoignition Temperature: 435 °C
LEL: 1.5% v/v

See DOT ERG

Extinguishing Media: Foam. Dry chemical powder. BCF (where regulations permit). Carbon dioxide.
Water spray or fog - Large fires only.



Fire Diamond

General Fire Hazards/Hazardous Combustion Products: Liquid and vapor are highly flammable. Severe fire hazard when exposed to heat, flame and/or oxidizers. Vapor forms an explosive mixture with air.
Severe explosion hazard, in the form of vapor, when exposed to flame or spark. Vapor may travel a considerable distance to source of ignition.
Heating may cause expansion/decomposition with violent rupture of containers.
On combustion, may emit toxic fumes of carbon monoxide (CO). May emit poisonous fumes.

Fire Incompatibility: Avoid contact with oxidizing agents and strong acids.

Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.
May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.
Fight fire from a safe distance, with adequate cover.

If safe, switch off electrical equipment until vapor fire hazard removed.
Use water delivered as a fine spray to control the fire and cool adjacent area. Avoid spraying water onto liquid pools.
Do not approach containers suspected to be hot. Cool fire exposed containers with water spray from a protective location. If safe to do so, remove containers from path of fire.

Section 6 - Accidental Release Measures

Small Spills: Remove all ignition sources. Clean up all spills immediately.
Avoid breathing vapors and contact with skin and eyes.
Control personal contact by using protective equipment.
Contain and absorb small quantities with vermiculite or other absorbent material. Wipe up. Collect residues in a flammable waste container.
Large Spills: Clear area of personnel and move upwind.
Contact fire department and tell them location and nature of hazard.
May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.
No smoking, bare lights or ignition sources. Increase ventilation.
Stop leak if safe to do so. Water spray or fog may be used to disperse/absorb vapor. Contain spill with sand, earth or vermiculite.
Use only spark-free shovels and explosion proof equipment.
Collect recoverable product into labeled containers for recycling.
Absorb remaining product with sand, earth or vermiculite.
Collect solid residues and seal in labeled drums for disposal.
Wash area and prevent runoff into drains.
If contamination of drains or waterways occurs, advise emergency services.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Do not allow clothing wet with material to stay in contact with skin.
Avoid all personal contact, including inhalation. Wear protective clothing when risk of exposure occurs. Use in a well-ventilated area. Prevent concentration in hollows and sumps.
DO NOT enter confined spaces until atmosphere has been checked.
Avoid smoking, bare lights, heat or ignition sources. When handling, DO NOT eat, drink or smoke.
Vapor may ignite on pumping or pouring due to static electricity.
Ground and secure containers when dispensing or pouring product. Use spark-free tools when handling.
Avoid contact with incompatible materials.
Keep containers securely sealed. Avoid physical damage to containers.
Always wash hands with soap and water after handling. Work clothes should be laundered separately.
Use good occupational work practice. Observe manufacturer's storing and handling recommendations. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions.
Recommended Storage Methods: Metal can; Metal drum; Metal safety cans. Packing as supplied by manufacturer.
Plastic containers may only be used if approved for flammable liquid.
Check that containers are clearly labeled and free from leaks.
Storage Requirements: Store below 38 deg. C.
Rotate all stock to prevent aging. Use on FIFO (First In-First Out) basis.
Store in original containers in approved flame-proof area.
No smoking, bare lights, heat or ignition sources.
DO NOT store in pits, depressions, basements or areas where vapors may be trapped. Keep containers securely sealed.
Store away from incompatible materials in a cool, dry well ventilated area.
Protect containers against physical damage and check regularly for leaks.
Observe manufacturer's storing and handling recommendations.
Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Use in a well-ventilated area.
General exhaust is adequate under normal operating conditions.
Local exhaust ventilation may be required in specific circumstances.
If risk of overexposure exists, wear NIOSH approved respirator.
Correct fit is essential to obtain adequate protection.
Provide adequate ventilation in warehouse or closed storage areas.
Ground and secure containers when dispensing or pouring.
Avoid generation of static electricity. Ground all lines and equipment.

Vapor may ignite on pumping or pouring due to static electricity. Ground and secure containers when dispensing or pouring product.

Personal Protective Clothing/Equipment:

Eyes: Safety glasses. Safety glasses with side shields. Chemical goggles.
Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: Nitrile gloves Safety footwear.

Respiratory Protection:

Exposure Range >40 to 2000 ppm: Supplied Air, Constant Flow/Pressure Demand, Half Mask
Exposure Range >2000 to 40,000 ppm: Supplied Air, Constant Flow/Pressure Demand, Full Face
Exposure Range >40,000 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face
Note: odor threshold unknown

Other: Eyewash unit. Ensure there is ready access to a safety shower.
Impervious apron.

Section 9 - Physical and Chemical Properties

Appearance/General Info: Colorless, highly volatile, highly flammable liquid; ethereal odor.

Physical State: Liquid
Vapor Pressure (kPa): 27.5 at 20 °C
Vapor Density (Air=1): 3.1
Formula Weight: 88.15
Specific Gravity (H_2O=1, at 4 °C): 0.74
Evaporation Rate: Fast
pH: Not applicable

pH (1% Solution): Not applicable
Boiling Point: 55.2 °C (131 °F)
Freezing/Melting Point: -109 °C (-164.2 °F)
Volatile Component (% Vol): 100
Water Solubility: Solubility of water in methyl-tbutyl ether 2 g/100 g

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: WARNING: Long standing in contact with air and light may result in the formation of potentially explosive peroxides.
Product is considered stable. Hazardous polymerization will not occur.

Storage Incompatibilities: May form explosive peroxides on standing or following concentration by distillation. Review of stocks and testing for peroxide content by given tested procedures at 3-monthly intervals is recommended, together with safe disposal of peroxidic samples.
[Peroxide containing residues can often be rendered innocuous by pouring into an excess of sodium carbonate solution] Avoid storage with oxidizers and strong acids.

Section 11 - Toxicological Information

Toxicity

Oral (rat) LD_{50}: 4000 mg/kg
Inhalation (rat) LC_{50}: 23576 ppm/4 H

Irritation

Nil reported

See *RTECS* KN5250000, for additional data.

Section 12 - Ecological Information

Environmental Fate: If released to soil, it will be subject to volatilization. It will be expected to exhibit very high mobility in soil and, therefore, it may leach to groundwater. It will not be expected to hydrolyze in soil. If released to water, it will not be expected to significantly adsorb to sediment or suspended particulate matter, bioconcentrate in aquatic organisms, hydrolyze, directly photolyze, or photooxidize via reaction with photochemically produced hydroxyl radicals in the water, based upon estimated physical-chemical properties or analogies to other structurally related aliphatic ethers. In surface water it will be subject to rapid volatilization with estimated half-lives of 4.1 hr and 2.0 days for volatilization from a river one meter deep flowing 1 m/sec with a wind velocity of 3 m/sec and a model pond, respectively. It may be resistant to biodegradation in environmental media based upon screening test data from a study using activated sludge inocula. Many ethers are known to be resistant to biodegradation. If released to the atmosphere, it will be expected to exist almost entirely in the vapor phase based on its vapor pressure. It will be susceptible to photooxidation via vapor phase reaction with photochemically produced hydroxyl radicals with an estimated half-life of 5.6 days for this process. Direct photolysis will not be an important removal process since aliphatic ethers do not adsorb light at wavelengths >290 nm.

Ecotoxicity: No data found.
Henry's Law Constant: 5.87×10^{-4}
BCF: carp 1.5
Soil Sorption Partition Coefficient: K_{OC} = estimated at 11.2

Section 13 - Disposal Considerations

Disposal: Consult manufacturer for recycling options and recycle where possible. Follow applicable federal, state, and local regulations. Incinerate residue at an approved site. Recycle containers where possible, or dispose of in an authorized landfill.
BEWARE: Empty solvent, paint, lacquer and flammable liquid drums present a severe explosion hazard if cut by flame torch or welded. Even when thoroughly cleaned or reconditioned the drum seams may retain sufficient solvent to generate an explosive atmosphere in the drum.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Shipping Name and Description: Methyl tert-butyl ether
ID: UN2398
Hazard Class: 3 - Flammable and combustible liquid
Packing Group: II - Medium Danger
Symbols:
Label Codes: 3 - Flammable Liquid
Special Provisions: IB2, T7, TP1
Packaging: **Exceptions:** 150 **Non-bulk:** 202 **Bulk:** 242
Quantity Limitations: **Passenger aircraft/rail:** 5 L **Cargo aircraft only:** 60 L
Vessel Stowage: **Location:** E **Other:**

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Not listed
CERCLA 40 CFR 302.4: Listed per CAA Section 112 1000 lb (453.5 kg)
SARA 40 CFR 372.65: Listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

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Material Safety Data Sheet Collection
Genium group inc.
1171 RiverFront Center, Amsterdam, NY 12010
(518) 842-4111

Issue Date: 2005-05

Nickel
NIC1000

Section 1 - Chemical Product and Company Identification 54/60

Material Name: Nickel
CAS Number: 7440-02-0
Chemical Formula: Ni
Structural Chemical Formula: Ni
EINECS Number: 231-111-4
ACX Number: X1002560-0
Synonyms: ALCAN 756; C.I. 77775; CARBONYL NICKEL POWDER; EL12; FIBREX; FIBREX P; NI 0901-S; NI 4303-S; NI 4303T; NI-4303T; NI 270; NI 0901-S (HARSHAW); NICHEL; NICKEL; NICKEL 200; NICKEL 201; NICKEL 205; NICKEL 207; NICKEL 270; NICKEL CATALYST SYNONYMS OF OTHER NICKEL COMPOUNDS VARY DEPENDING UPON THE SPECIFIC COMPOUND; NICKEL (DUST); NICKEL METAL: ELEMENTAL NICKEL; NICKEL PARTICLES; NICKEL SPONGE; NICKEL,METAL; NICKLE CATALYST,WET; NP-2; NP 2; PULVERIZED NICKEL; RANEY ALLOY; RANEY NICKEL; RCH 55/5
General Use: Used in the manufacture of Monel metal, stainless steels, and nickel -chrome resistance wire; nickel-plating; various alloys such as new silver, Chinese silver, German silver; for coins, electrotypes, storage batteries. Used for magnets, lightning-rod tips, electrical contacts and electrodes, spark plugs, machinery parts; catalyst for hydrogenation of oils and other organic substances; in alloys for electronic and space applications.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
nickel	7440-02-0	> 99

OSHA PEL
TWA: 1 mg/m^3.

NIOSH REL
TWA: 0.015 mg/m^3.

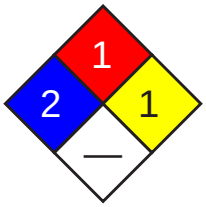
DFG (Germany) MAK
Danger of sensitization of the airways and the skin.

OSHA PEL Vacated 1989 Limits
TWA: 1 mg/m^3; Insoluble as Ni. Other Values: soluble as Ni mg/m^3; 0.1.

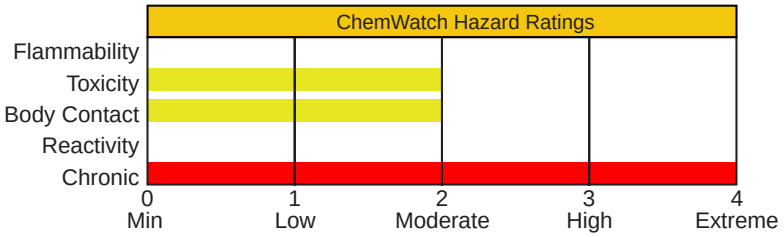
IDLH Level
10 mg/m^3 (as Ni).

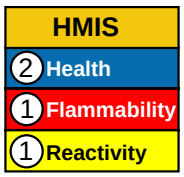
ACGIH TLV
TWA: 1.5 mg/m^3; measured as inhalable fraction of the aerosol.

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word

Warning!

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Silvery-white metal powder. Irritating. Other Acute Effects: metal fume fever, asthma, noninfectious pneumonia, vomiting, abdominal pain, nickel itch. Possible cancer hazard. Chronic Effects: sensitization, perforation of nasal septum.

Potential Health Effects

Target Organs: nasal cavities, lungs, skin
Primary Entry Routes: inhalation, skin contact, ingestion
Acute Effects
Inhalation: The dust may be discomforting to the upper respiratory tract and may be harmful if inhaled.

Persons with impaired respiratory function, airway diseases, and conditions such as emphysema or chronic bronchitis may incur further disability if excessive concentrations of particulate are inhaled.
Regular exposure to nickel fume, as the oxide, may result in "metal fume fever" a sometimes debilitating upper respiratory tract condition resembling influenza.
Symptoms include malaise, fever, weakness, nausea and may appear quickly if operations occur in closed or poorly ventilated areas.
Pulmonary edema, pulmonary fibrosis and asthma has been reported in welders using nickel alloys; levels of exposure are generally not available and case reports are often confounded by mixed exposures to other agents.
Inhalation of freshly formed metal oxide particles sized below 1.5 microns and generally between 0.02 to 0.05 microns may result in "metal fume fever". Symptoms may be delayed for up to 12 hours and begin with the sudden onset of thirst, and a sweet, metallic or foul taste in the mouth.
Other symptoms include upper respiratory tract irritation accompanied by coughing and a dryness of the mucous membranes, lassitude and a generalized feeling of malaise. Mild to severe headache, nausea, occasional vomiting, fever or chills, exaggerated mental activity, profuse sweating, diarrhea, excessive urination and prostration may also occur. Tolerance to the fumes develops rapidly, but is quickly lost. All symptoms usually subside within 24-36 hours following removal from exposure.

Eye: The dust may produce eye discomfort and abrasive eye inflammation.

Skin: The material may be mildly discomforting to the skin.
Nickel dusts, fumes and salts are potent contact allergens and sensitizers producing a dermatitis known as "nickel" rash.
In the absence of properly designed ventilation systems or where respiratory protective devises are inadequate, up to 10% of exposed workers are expected to be symptomatic.

Ingestion: The material may be mildly discomforting to the gastrointestinal tract if swallowed in large quantity.
The potential to generate small quantities of nickel chloride in the stomach may produce a low order toxic effect.
Nickel salts cause vomiting, following ingestion, as a result of astringent and irritant effects. In common with other irritant-emetics the lethal dose varies widely. Absorption is generally poor and systemic poisoning is rare.
Systemic effects include increased blood sugar levels (hyperglycemia), capillary damage (especially in the brain and adrenals), kidney damage, heart damage (myocardial weakness) and central nervous system depression.

Carcinogenicity: NTP - Class 2A, Reasonably anticipated to be a carcinogen, limited evidence of carcinogenicity from studies in humans; IARC - Group 1, Carcinogenic to humans; OSHA - Not listed; NIOSH - Listed as carcinogen; ACGIH - Not listed; EPA - Class A, Human carcinogen; MAK - Class A1, Capable of inducing malignant tumors as shown by experience with humans.

Chronic Effects: Metallic dusts generated by the industrial process give rise to a number of potential health problems. The larger particles, above 5 micron, are nose and throat irritants. Smaller particles however, may cause lung deterioration. Particles of less than 1.5 micron can be trapped in the lungs and, dependent on the nature of the particle, may give rise to further serious health consequences.
The most common toxic reaction to nickel is skin sensitization which may produce a chronic eczema called "nickel itch". The first symptom is itching which occurs up to 7 days prior to the appearance of skin eruption.
The primary skin eruption is erythematous or follicular and may be followed by superficial discrete ulcers (which discharge and become crusted), or eczema. In the chronic stages, pigmented or depigmented plaques may be formed.
Recovery from the dermatitis usually occurs within 7 days but may take several weeks.
Nickel dusts and several specific compounds are carcinogenic in animals following inhalation or parenteral administration (but not by ingestion or skin contact). Increases in lung and nasal cavity cancers have been observed amongst nickel workers in smelters and refineries.
Respiratory cancer risks primarily relate to chronic exposure to soluble nickels at concentrations in excess of 1 mg Ni/m^3 and exposure to the less soluble forms at concentrations greater than 10 mg Ni/m^3. Metallic nickel does not appear to pose such a threat.
When injected intramuscularly, nickel induced incidences of fibrosarcomas in rats and hamsters of both sexes, local sarcomas in rats of both sexes and local tumors with some metastases to pre-vertebral lymph nodes in female rats.
When injected intrapleurally, nickel powder induced round cell and spindle cell tumors at the site of injection in female rats.
Inhalation of nickel dusts induced lymphosarcomas in female mice and anaplastic intraalveolar carcinomas in male and female guinea pigs.
Subdermal implantation of nickel pellets induced sarcomas surrounding the pellet in rats of both sexes whilst intramedullar injection into the femur of rats produced neoplasms at or near the site of injection, including fibrosarcomas (neurogenic in origin).

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.
Encourage patient to blow nose to ensure clear breathing passages. Rinse mouth with water. Consider drinking water to remove dust from throat.
Seek medical attention if irritation or discomfort persist.

Eye Contact: Immediately hold the eyes open and flush with fresh running water.

Ensure irrigation under the eyelids by occasionally lifting upper and lower lids. If pain persists or recurs seek medical attention.
Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Immediately remove all contaminated clothing, including footwear (after rinsing with water).
Wash affected areas thoroughly with water (and soap if available).
Seek medical attention in event of irritation.

Ingestion: Rinse mouth out with plenty of water. Seek medical attention if irritation or discomfort persist.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Long term exposure to high dust concentrations may cause changes in lung function i.e. pneumoconiosis; caused by particles less than 0.5 micron penetrating and remaining in the lung. Prime symptom is breathlessness; lung shadows show on X-ray.

* Preplacement and periodic medical examinations of workers exposed to nickel are recommended. Preplacement examination should evaluate any history of skin allergies or asthma, other exposures to nickel, smoking history, condition of nasal cavity and lungs. Periodic examinations should include chest X-rays.

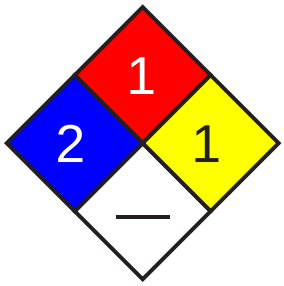
Section 5 - Fire-Fighting Measures

Flash Point: Not available; probably combustible

LEL: Not applicable

UEL: Not applicable

Extinguishing Media: Sand, dry powder extinguishers or other inerts should be used to smother dust fires.
These are the only suitable means for extinguishing metal dust fires.
Do NOT use water.



Fire Diamond

General Fire Hazards/Hazardous Combustion Products: Metal powders, while generally regarded as noncombustible, may burn when metal is finely divided and energy input is high. Metal dust fires are slow moving but intense and difficult to extinguish. DO NOT disturb burning dust. Explosion may result if dust is stirred into a cloud, by providing oxygen to a large surface of hot metal. DO NOT use water or foam as generation of explosive hydrogen may result.
When heated with sulfur reacts with incandescence.
If involved in fire, may produce toxic fumes of nickel carbonyl and nickel.

Fire Incompatibility: Avoid reaction with nitric acid and other strong acids, oxidizing agents and sulfur compounds.
Nickel dust reacts violently with titanium, ammonium nitrate, potassium perchlorate and hydrazoic acid.

Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.
Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways.
Use fire fighting procedures suitable for surrounding area.
Do not approach containers suspected to be hot.
If safe to do so, remove containers from path of fire.
Equipment should be thoroughly decontaminated after use.

Section 6 - Accidental Release Measures

Small Spills: Clean up all spills immediately. Avoid contact with skin and eyes.
Wear protective clothing, impervious gloves and safety glasses.
Use dry clean-up procedures and avoid generating dust.
Vacuum up or sweep up.
Place in suitable containers for disposal.

Large Spills: Clear area of personnel and move upwind.
Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways.
Stop leak if safe to do so.
Use dry clean-up procedures and avoid generating dust.
Collect recoverable product into labeled containers for recycling.
Collect residues and seal in labeled drums for disposal.
Wash spill area with large quantities of water.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Limit all unnecessary personal contact.
Wear protective clothing when risk of exposure occurs.
Use in a well-ventilated area. When handling DO NOT eat, drink or smoke.
Always wash hands with soap and water after handling.

Avoid physical damage to containers. Use good occupational work practices.
Observe manufacturer's storing and handling recommendations.

Recommended Storage Methods: Packaging as recommended by manufacturer.
Check that containers are clearly labeled.
Glass container.
Plastic drum.
Plastic bag.
Polyethylene or polypropylene container.
Metal drum.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Metal dusts must be collected at the source of generation as they are potentially explosive.
1. Vacuum cleaners, of flame-proof design, should be used to minimize dust accumulation.
2. Metal spraying and blasting should, where possible, be conducted in separate rooms. This minimizes the risk of supplying oxygen, in the form of metal oxides, to potentially reactive finely divided metals such as aluminum, zinc, magnesium or titanium.
3. Work-shops designed for metal spraying should possess smooth walls and a minimum of obstructions, such as ledges, on which dust accumulation is possible.
4. Wet scrubbers are preferable to dry dust collectors.
5. Bag or filter-type collectors should be sited outside the workrooms and be fitted with explosion relief doors.
6. Cyclones should be protected against entry of moisture as reactive metal dusts are capable of spontaneous combustion in humid or partially wetted state.
7. Local exhaust systems must be designed to provide a minimum capture velocity at the fume source, away from the worker, of 0. 5 meter/sec.

Special ventilation requirements apply for processes which result in the generation of barium, chromium, lead, or nickel fume and in those processes which generate ozone.
The use of mechanical ventilation by local exhaust systems is required as a minimum in all circumstances (including outdoor work).
In confined spaces always check that oxygen has not been depleted by excessive rusting of steel or snowflake corrosion of aluminum. Local exhaust systems must be designed to provide a minimum capture velocity at the fume source, away from the worker, of 0. 5 meter/sec.

Personal Protective Clothing/Equipment:

Eyes: Safety glasses. Chemical goggles.
Full face shield.
Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: Impervious gloves; rubber gloves.
Neoprene gloves.
Safety footwear.
Rubber boots.

Respiratory Protection:
Exposure Range >1 to <10 mg/m^3: Supplied Air, Constant Flow/Pressure Demand, Half Mask
Exposure Range 10 to unlimited mg/m^3: Self-contained Breathing Apparatus, Pressure Demand, Full Face
Note: odor threshold unknown

Other: Overalls. Barrier cream. Eyewash unit.

Section 9 - Physical and Chemical Properties

Appearance/General Info: Lustrous silver-white, hard, ferromagnetic metal. Soluble in dilute nitric acid; slightly soluble in hydrochloric acid and sulfuric acid. Insoluble in ammonia. Mohs' hardness:3.8

Welding flux grades typical sieve analysis (cumulative retention %):- 200 um 0, 150 um 2, 100 um 12, 75 um 60, 63 um 80, 43 um 98.

Physical State: Solid
Vapor Pressure (kPa): 0.13 at 1810 °C
Formula Weight: 58.71
Specific Gravity (H_2O=1, at 4 °C): 8.9
Evaporation Rate: Non-volatile
pH: Not applicable
pH (1% Solution): Not applicable
Boiling Point: 2730 °C (4946 °F)
Freezing/Melting Point: 1455 °C (2651 °F)
Volatile Component (% Vol): Nil at 38 °C
Water Solubility: Insoluble in water

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Product is considered stable. Hazardous polymerization will not occur.
Storage Incompatibilities: Avoid reaction with oxidizing agents. Reacts with acids producing flammable/explosive hydrogen (H_2) gas.

Section 11 - Toxicological Information

Toxicity
Oral (rat) LD_{50}: 5000 mg/kg

See *RTECS* QR 5950000, for additional data.

Section 12 - Ecological Information

Environmental Fate: No data found.
Ecotoxicity: No data found.

Section 13 - Disposal Considerations

Disposal: Recycle wherever possible. Consult manufacturer for recycling options.
Follow applicable federal, state, and local regulations.
Bury residue in an authorized landfill.
Recycle containers if possible, or dispose of in an authorized landfill.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Shipping Name and Description: None

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Listed
CERCLA 40 CFR 302.4: Listed per CWA Section 307(a) 100 lb (45.35 kg)
SARA 40 CFR 372.65: Listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

Material Safety Data Sheet Collection
Genium group inc.
1171 RiverFront Center, Amsterdam, NY 12010
(518) 842-4111

Issue Date: 2005-05

Perchloroethylene
TET2750

Section 1 - Chemical Product and Company Identification 54/60

Material Name: Perchloroethylene
CAS Number: 127-18-4
Chemical Formula: C_2Cl_4
Structural Chemical Formula: $Cl_2C=CCl_2$
EINECS Number: 204-825-9
ACX Number: X1000034-7
Synonyms: ANKILOSTIN; ANTISAL 1; ANTISOL 1; CARBON BICHLORIDE; CARBON DICHLORIDE; CZTEROCHLOROETYLEN; DIDAKENE; DILATIN PT; DOW-PER; ENT 1,860; EPA PESTICIDE CHEMICAL CODE 078501; ETHENE,TETRACHLORO-; ETHYLENE TETRACHLORIDE; ETHYLENE,TETRACHLORO-; FEDAL-UN; NEMA; PCE; PER; PERAWIN; PERC; PERCHLOORETHYLEEN,PER; PERCHLOR; PERCHLORAETHYLEN,PER; PERCHLORETHYLENE; PERCHLORETHYLENE,PER; PERCHLOROETHYLENE; PERCLENE; PERCLENE D; PERCLOROETILENE; PERCOSOLV; PERCOSOLVE; PERK; PERKLONE; PERSEC; TETLEN; TETRACAP; TETRACHLOORETHEEN; TETRACHLORAETHEN; TETRACHLORETHYLENE; TETRACHLOROETHENE; 1,1,2,2-TETRACHLOROETHYLENE; TETRACHLOROETHYLENE; TETRACLOROETENE; TETRAGUER; TETRALENO; TETRALEX; TETRAVEC; TETROGUER; TETROPIL
General Use: Used as a drycleaning solvent, a vapor-degreasing solvent; a drying agent for metals and certain other solids. Used also as a heat transfer medium and in the manufacture of fluorocarbons.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
perchloroethylene	127-18-4	100

OSHA PEL
TWA: 100 ppm; Ceiling 200 ppm; 300 ppm, 5-minute maximum peak in any 3 hours.

OSHA PEL Vacated 1989 Limits
TWA: 25 ppm; 170 mg/m^3.

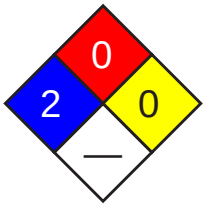
ACGIH TLV
TWA: 25 ppm; STEL: 100 ppm.

NIOSH REL
Minimize workplace exposure concentrations.

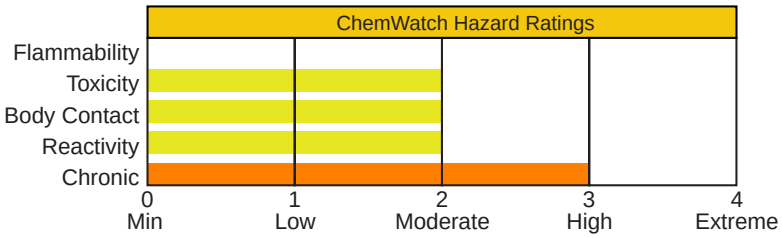
IDLH Level
150 ppm.

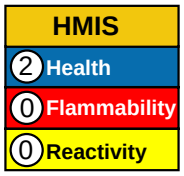
DFG (Germany) MAK
Skin.

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word

Caution

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Colorless liquid; ether-like odor. Irritating to eyes/skin/respiratory tract. Other Acute Effects: headache, dizziness, CNS depression, incoordination, slurred speech. Chronic Effects: liver/kidney damage; possible cancer hazard (animal studies).

Potential Health Effects

Target Organs: liver, kidneys, eyes, upper respiratory system, skin, central nervous system (CNS)
Primary Entry Routes: inhalation, skin contact, eye contact

Acute Effects

Inhalation: Acute intoxication by halogenated aliphatic hydrocarbons appears to take place over two stages. Signs of a reversible narcosis are evident in the first stage and in the second stage signs of injury to organs may become evident. A single organ alone is (almost) never involved.
The vapor is highly discomforting to the upper respiratory tract and lungs.
Inhalation hazard is increased at higher temperatures.
Anesthetic and narcotic effects (with dulling of senses and odor fatigue) are a consequence of exposure to chlorinated solvents.
Individual response varies widely; odor may not be considered objectionable at levels which quickly induce central nervous system effects.
High vapor concentrations may give a feeling of euphoria. This may result in reduced responses, followed by rapid onset of unconsciousness, possible respiratory arrest and death.
Accidental high level exposure has produced lightheadedness, unconsciousness and liver and kidney damage in workers. In at least two cases such exposures were fatal. Subjects exposed to 106 ppm in laboratory studies experienced slight eye irritation; dizziness and sleepiness were reported at 216 ppm; at exposures of 280 ppm or 600 ppm for 10 minutes there was a loss of motor coordination. In another study subjects exposed for 7 hours at 101 ppm complained of eye irritation and subjective symptoms such headache, drowsiness and sleepiness.

Eye: The liquid may produce eye discomfort and is capable of causing temporary impairment of vision and/or transient eye inflammation, ulceration Eye contact may cause lachrymation (tears) and burning sensation.
The vapor is highly discomforting to the eyes.
The material may be irritating to the eye, with prolonged contact causing inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

Skin: The liquid is highly discomforting to the skin if exposure is prolonged and may cause drying of the skin, which may lead to dermatitis.
Toxic effects may result from skin absorption.
Absorption by skin may readily exceed vapor inhalation exposure.
Symptoms for skin absorption are the same as for inhalation.
Bare unprotected skin should not be exposed to this material.
The material may accentuate any pre-existing skin condition.
The material may produce severe skin irritation after prolonged or repeated exposure, and may produce a contact dermatitis (nonallergic).
This form of dermatitis is often characterized by skin redness (erythema) and swelling (edema) which may progress to vesiculation, scaling and thickening of the epidermis.
Histologically there may be intercellular edema of the spongy layer (spongiosis) and intracellular edema of the epidermis.
Prolonged contact is unlikely, given the severity of response, but repeated exposures may produce severe ulceration.
Industrial experience shows localized skin irritation. Prolonged dermal contact can cause chemical burns and blistering.

Ingestion: Considered an unlikely route of entry in commercial/industrial environments.
The liquid is highly discomforting and toxic if swallowed and may be fatal if swallowed in large quantity.
Ingestion may result in nausea, abdominal irritation, pain and vomiting.
When used in the treatment of hookworm (4.5 to 6.5 gm orally) the only adverse effect is inebriation. Transient hepatotoxicity in patients given single oral doses of up to 5 mL have been recorded.

Carcinogenicity: NTP - Class 2B, Reasonably anticipated to be a carcinogen, sufficient evidence of carcinogenicity from studies in experimental animals; IARC - Group 2B, Possibly carcinogenic to humans; OSHA - Not listed; NIOSH - Listed as carcinogen; ACGIH - Class A3, Animal carcinogen; EPA - Not listed; MAK - Class B, Justifiably suspected of having carcinogenic potential.

Chronic Effects: Prolonged or continuous skin contact with the liquid may cause defatting with drying, cracking, irritation and dermatitis following.
Workers inhaling 232 to 385 ppm for 8 hours/day, 5 days/week for 2 to 6 years have shown abnormal hepatic function, including cirrhosis, with lightheadedness, headache, malaise and dizziness.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.
Lay patient down. Keep warm and rested.
If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor.

Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.
Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Immediately remove all contaminated clothing, including footwear (after rinsing with water).
Wash affected areas thoroughly with water (and soap if available).

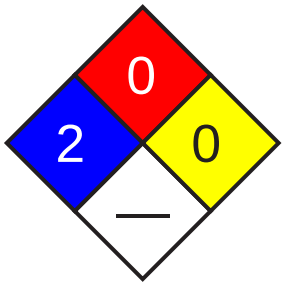
Seek medical attention in event of irritation.
Ingestion: Contact a Poison Control Center.
Do NOT induce vomiting. Give a glass of water.
Avoid giving milk or oils.
Avoid giving alcohol.
After first aid, get appropriate in-plant, paramedic, or community medical support.
Note to Physicians: Treat symptomatically.
Do not administer sympathomimetic drugs as they may cause ventricular arrhythmias.
For acute or short-term repeated exposures to perchloroethylene:
Tetrachloroethylene/perchlorethylene is well absorbed through the lungs with peak levels more important than duration in determining blood concentration.
Lungs excrete most of the absorbed tetrachloroethylene in an unchanged state; about 3% is converted by the liver to form trichloracetic acid and subsequently excreted by the kidney. Exhaled material has a biological half-life of 65 hours.
INHALATION:
The treatment of acute inhalation exposures is supportive with initial attention directed to evaluation/support of ventilation and circulation.
As with all hydrocarbons care must be taken to reduce the risk of aspiration by proper positioning and medical observation.
INGESTION:
1.The ingestion level at which emesis should be induced is difficult to predict in the absence of extensive human studies.
2.The role of charcoal and cathartics remains uncertain.
BIOLOGICAL EXPOSURE INDEX - BEI
These represent the determinants observed in specimens collected from a healthy worker exposed at the Exposure Standard (ES or TLV):

Determinant	Index	Sampling Time	Comments
Perchloroethylene in end-exhaled air	10 ppm	Prior to last shift of work-week	
Perchloroethylene in Blood	1 mg/L	Prior to last shift of work-week	
Trichloroacetic acid in urine	7 mg/L	End of work-week	NS,SQ

NS: Non-specific determinant; also seen after exposure to other materials
SQ: Semi-quantitative determinant - Interpretation may be ambiguous; should be used as a screening test or confirmatory test.

Section 5 - Fire-Fighting Measures

Flash Point: Nonflammable
Autoignition Temperature: 490 °C
LEL: 1.8% v/v
UEL: 11.5% v/v at 740 mm Hg 160 °C
Extinguishing Media: Use extinguishing media suitable for surrounding area.



Fire Diamond

General Fire Hazards/Hazardous Combustion Products: Nonflammable liquid.
However vapor will burn when in contact with high temperature flame. Ignition ceases on removal of flame.
May form a flammable/explosive mixture in an oxygen enriched atmosphere. Heating may cause expansion/vaporization with violent rupture of containers. Decomposes on heating and produces corrosive fumes of hydrochloric acid, carbon monoxide and small amounts of toxic phosgene.
Fire Incompatibility: Avoid mixing with strong alkalis or powdered metals, particularly zinc as ignition may result.
Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.
Wear breathing apparatus plus protective gloves for fire only. Prevent, by any means available, spillage from entering drains or waterways.

Use fire fighting procedures suitable for surrounding area.
Do not approach containers suspected to be hot.
Cool fire-exposed containers with water spray from a protected location.
If safe to do so, remove containers from path of fire.
Equipment should be thoroughly decontaminated after use.

Section 6 - Accidental Release Measures

Small Spills: Clean up all spills immediately.
Wear protective neoprene gloves and chemical goggles.
If risk of overexposure exists, wear NIOSH-approved respirator.
Wipe up and absorb small quantities with vermiculite or other absorbent material.
DO NOT discharge into sewer or waterways.
Place spilled material in clean, dry, sealable, labeled container.

Large Spills: Minor hazard. Clear area of personnel and move upwind.
Contact fire department and tell them location and nature of hazard.
Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways.
No smoking, bare lights or ignition sources. Increase ventilation.
Stop leak if safe to do so. Contain spill with sand, earth or vermiculite.
Collect recoverable product into labeled containers for recycling.
Absorb remaining product with sand, earth or vermiculite.
Collect solid residues and seal in labeled drums for disposal.
Wash area and prevent runoff into drains.
If contamination of drains or waterways occurs, advise emergency services.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid generating and breathing mist. Avoid all personal contact, including inhalation.
Wear protective clothing when risk of exposure occurs.
Use in a well-ventilated area. Prevent concentration in hollows and sumps.
DO NOT enter confined spaces until atmosphere has been checked.
DO NOT allow material to contact humans, exposed food or food utensils.
Avoid contact with incompatible materials.
When handling, DO NOT eat, drink or smoke.
Keep containers securely sealed when not in use. Avoid physical damage to containers. Always wash hands with soap and water after handling. Work clothes should be laundered separately.
Launder contaminated clothing before reuse.
Use good occupational work practices. Observe manufacturer's storing and handling recommendations. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.
Recommended Storage Methods: Check that containers are clearly labeled. Glass container.
Heavy gauge metal packages/heavy gauge metal drums.
Avoid storage with zinc, galvanized or diecast metal (including bungs).
DO NOT use aluminum or galvanized containers.
Packaging as recommended by manufacturer.
Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: CARE: Use of a quantity of this material in confined space or poorly ventilated area, where rapid build-up of concentrated atmosphere may occur, could require increased ventilation and/or protective gear. Use in a well-ventilated area.
Local exhaust ventilation may be required for safe working, i. e. , to keep exposures below required standards; otherwise, PPE is required.
If inhalation risk exists, wear NIOSH-approved organic-vapor respirator or air supplied breathing apparatus.
Personal Protective Clothing/Equipment:
Eyes: Chemical goggles. Full face shield.
Hands/Feet: Neoprene gloves; Viton gloves.
PVA gloves.
PVC gloves.
Protective footwear.
Respiratory Protection:
Exposure Range >100 to <150 ppm: Supplied Air, Constant Flow/Pressure Demand, Half Mask
Exposure Range 150 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face

Note: poor warning properties

Other: Overalls. Eyewash unit. Ensure there is ready access to an emergency shower.

Glove Selection Index:

PE/EVAL/PE ..... Best selection
VITON/CHLOROBUTYL ..... Best selection
VITON/NITRILE..... Best selection
VITON ..... Best selection
PVA ..... Best selection
CPE ..... Best selection
NITRILE ..... Satisfactory; may degrade after 4 hours continuous immersion
TEFLON ..... Satisfactory; may degrade after 4 hours continuous immersion
NITRILE+PVC ..... Poor to dangerous choice for other than short-term immersion
SARANEX-23 2-PLY..... Poor to dangerous choice for other than short-term immersion
SARANEX-23 ..... Poor to dangerous choice for other than short-term immersion
PVC..... Poor to dangerous choice for other than short-term immersion
BUTYL ..... Poor to dangerous choice for other than short-term immersion
NEOPRENE..... Poor to dangerous choice for other than short-term immersion

Section 9 - Physical and Chemical Properties

Appearance/General Info: Colorless liquid, with a chloroform-like odor. Extremely stable, resists hydrolysis. Miscible with alcohol, ether and oils.

Physical State: Liquid
Vapor Pressure (kPa): 2.11 at 22 °C
Vapor Density (Air=1): 5.83
Formula Weight: 165.82
Specific Gravity (H_2O=1, at 4 °C): 1.63 at 15 °C
Evaporation Rate: 0.09 Ether=1
pH: Not applicable
pH (1% Solution): Not applicable.
Boiling Point: 121 °C (250 °F) at 760 mm Hg
Freezing/Melting Point: -19 °C (-2.2 °F)
Volatile Component (% Vol): 100
Water Solubility: 0.02% by weight

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Product is considered stable and hazardous polymerization will not occur.

Storage Incompatibilities: Avoid reaction with oxidizing agents. Segregate from strong alkalis.

Haloalkenes are highly reactive. Some of the more lightly substituted lower members are highly flammable; many members of the group are peroxidizable and polymerizable.

The presenceof 0.5% trichloroethylene as an impurity caused generation of dichloroacetylene during unheated drying over solid sodium hydroxide.

Subsequent fractional distillation produced an explosion.

Section 11 - Toxicological Information

Toxicity

Oral (rat) LD_{50}: 2629 mg/kg
Inhalation (man) LD_{Lo}: 2857 mg/kg
Inhalation (human) TC_{Lo}: 96 ppm/7 hrs
Inhalation (man) TC_{Lo}: 280 ppm/2 hrs
Inhalation (man) TC_{Lo}: 600 ppm/10 min
Inhalation (rat) LC_{Lo}: 34200 mg/m^3/8 hr

Irritation

Skin (rabbit): 810 mg/24h -SEVERE
Eye (rabbit): 162 mg -mild

See *RTECS* KX 3850000, for additional data.

Section 12 - Ecological Information

Environmental Fate: If it is released to soil, it will be subject to evaporation into the atmosphere and to leaching to the groundwater. Biodegradation may be an important process in anaerobic soils based on laboratory tests with methanogenic columns. Slow biodegradation may occur in groundwater where acclimated populations of microorganisms exist. If released to water, it will be subject to rapid volatilization with estimated half-lives ranging from <1 day to several weeks. It will not be expected to significantly biodegrade, bioconcentrate in aquatic organisms or significantly adsorb to sediment. It will not be expected to significantly hydrolyze in soil or water under normal environmental conditions. If released to the atmosphere, it will exist mainly in the gas-phase and it will be subject to photooxidation with estimates of degradation time scales ranging from an approximate half-life of 2 months to complete degradation in an hour. Some in the atmosphere may be subject to washout in rain based on the solubility in water.

Ecotoxicity: LC_{50} Tanytarsus dissimilis (midge) 30, 840 ug/l/48 hr, static bioassay; LC_{50} Poecilia reticulata (guppy) 18 ppm/7 days /Conditions of bioassay not specified; LC_{50} Daphnia magna (water flea) 18 mg/l/48 hr, static bioassay, at 22 °C; LC_{50} Salmo gairdneri (rainbow trout) 5 mg/l/96 hr, static bioassay at 12 °C

Henry's Law Constant: 2.87×10^{-2}

BCF: fathead minnow 38.9

Biochemical Oxygen Demand (BOD): none

Octanol/Water Partition Coefficient: $\log K_{ow} = 3.40$

Soil Sorption Partition Coefficient: $K_{oc} = 209$

Section 13 - Disposal Considerations

Disposal: Reclaim solvent at an approved site.
Allow absorbed spillage to evaporate in an open top container, away from habitation.
Incinerate residue at an approved site.
Used containers should be left upside down with bungs out.
Return containers to drum reconditioner or recycler.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Shipping Name and Description: Tetrachloroethylene
ID: UN1897
Hazard Class: 6.1 - Poisonous materials
Packing Group: III - Minor Danger
Symbols:
Label Codes: 6.1 - Poison *or* Poison Inhalation Hazard *if inhalation hazard, Zone A or B*
Special Provisions: IB3, N36, T4, TP1
Packaging: **Exceptions:** 153 **Non-bulk:** 203 **Bulk:** 241
Quantity Limitations: **Passenger aircraft/rail:** 60 L **Cargo aircraft only:** 220 L
Vessel Stowage: **Location:** A **Other:** 40

Section 15 - Regulatory Information

EPA Regulations:

RCRA 40 CFR: Listed U210 Toxic Waste
CERCLA 40 CFR 302.4: Listed per RCRA Section 3001, per CWA Section 307(a) 100 lb (45.35 kg)
SARA 40 CFR 372.65: Listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

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Genium Publishing Corp.
1171 RiverFront Center
Amsterdam, NY 12010
(518) 842-4111

Issue Date: 2002-02

Toluene
TOL2320

Section 1 - Chemical Product and Company Identification 54

Material Name: Toluene **CAS Number:** 108-88-3
Chemical Formula: C_7H_8
Structural Chemical Formula: $C_6H_5CH_3$
Synonyms: ANTISAL 1A; BENZENE,METHYL-; CP 25; METHACIDE; METHANE,PHENYL-; METHYL BENZENE; METHYL BENZOL; METHYLBENZENE; METHYLBENZOL; PHENYL METHANE; PHENYLMETHANE; TOLUEEN; TOLUEN; TOLUENE; TOLUENO; TOLUOL; TOLUOLO; TOLU-SOL
General Use: Used as a solvent for paint, resins, lacquers inks & adhesives. Component of solvent blends and thinners; in gasoline and aviation fuel. Used in the manufacture of chemicals, dyes, explosives, benzoic acid.
Some grades of toluene may contain traces of xylene and benzene.
Odor threshold: 2 ppm approx. Odor is not a reliable warning property due to olfactory fatigue.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
toluene	108-88-3	> 99.5

OSHA PEL
TWA: 200 ppm; Ceiling: 300 ppm, 500 ppm, 10-minute maximum peak.

OSHA PEL Vacated 1989 Limits
TWA: 100 ppm; 375 mg/m^3; STEL: 150 ppm; 560 mg/m^3.

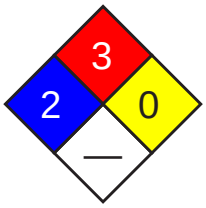
ACGIH TLV
TWA: 50 ppm, 188 mg/m^3; skin.

NIOSH REL
TWA: 100 ppm, 375 mg/m^3; STEL: 150 ppm, 560 mg/m^3.

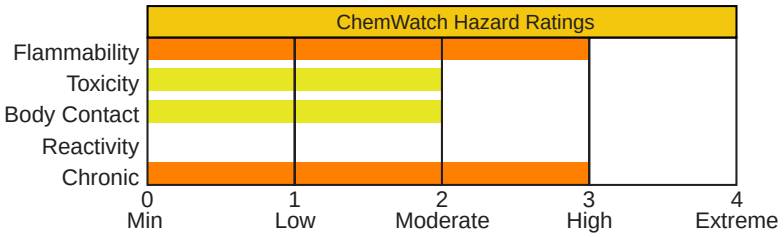
IDLH Level
500 ppm.

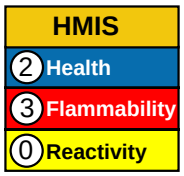
DFG (Germany) MAK
TWA: 50 ppm, 190 mg/m^3; skin, ceiling, substances with systemic effects, onset of effects within 2 hours, half-life two hours to shift length.

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word
Danger!


Flammable

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Colorless liquid; sickly, sweet odor. Irritating to the eyes/skin/respiratory tract. Also causes: weakness, headache, dizziness, confusion, and insomnia. Chronic: liver and kidney damage. May cause birth defects. Flammable.

Potential Health Effects

Target Organs: Skin, liver, kidneys, central nervous system.
Primary Entry Routes: Inhalation, skin contact/absorbtion.
Acute Effects
Inhalation: The vapor is highly discomforting to the upper respiratory tract.
Inhalation hazard is increased at higher temperatures.
Acute effects from inhalation of high concentrations of vapor are pulmonary irritation, including coughing, with nausea; central nervous system depression - characterized by headache and dizziness, increased reaction time, fatigue and loss of coordination.

If exposure to highly concentrated solvent atmosphere is prolonged this may lead to narcosis, unconsciousness, even coma and possible death.
Central nervous system (CNS) depression may include nonspecific discomfort, symptoms of giddiness, headache, dizziness, nausea, anesthetic effects, slowed reaction time, slurred speech and may progress to unconsciousness.
Serious poisonings may result in respiratory depression and may be fatal.

Eye: The liquid produces a high level of eye discomfort and is capable of causing pain and severe conjunctivitis.
Corneal injury may develop, with possible permanent impairment of vision, if not promptly and adequately treated.
The vapor is discomforting to the eyes if exposure is prolonged.
The material may produce severe irritation to the eye causing pronounced inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

Skin: The liquid may produce skin discomfort following prolonged contact.
Defatting and/or drying of the skin may lead to dermatitis and it is absorbed by skin.
Toxic effects may result from skin absorption.
Open cuts, abraded or irritated skin should not be exposed to this material.
The material may accentuate any pre-existing skin condition.
The material may cause skin irritation after prolonged or repeated exposure and may produce a contact dermatitis (nonallergic). This form of dermatitis is often characterized by skin redness (erythema) and swelling (edema) which may progress to vesiculation, scaling and thickening of the epidermis. Histologically there may be intercellular edema of the spongy layer (spongiosis) and intracellular edema of the epidermis.

Ingestion: Considered an unlikely route of entry in commercial/industrial environments.
The liquid may produce gastrointestinal discomfort and may be harmful if swallowed. Ingestion may result in nausea, pain and vomiting. Vomit entering the lungs by aspiration may cause potentially lethal chemical pneumonitis.

Carcinogenicity: NTP - Not listed; IARC - Group 3, Not classifiable as to carcinogenicity to humans; OSHA - Not listed; NIOSH - Not listed; ACGIH - Class A4, Not classifiable as a human carcinogen; EPA - Class D, Not classifiable as to human carcinogenicity; MAK - Not listed.

Chronic Effects: Chronic solvent inhalation exposures may result in nervous system impairment and liver and blood changes.
Chronic toluene habituation occurs following intentional abuse (glue-sniffing) or from occupational exposure. Ataxia, incoordination and tremors of the hands and feet (as a consequence of diffuse cerebral atrophy), headache, abnormal speech, transient memory loss, convulsions, coma, drowsiness, reduced color perception, frank blindness, nystagmus (rapid, involuntary eye-movements), decreased hearing leading to deafness and mild dementia have all been associated with chronic abuse.
Peripheral nerve damage, encephalopathy, giant axonopathy, electrolyte disturbances in the cerebrospinal fluid and abnormal computer tomographic (CT) scans are common amongst toluene addicts. Although toluene abuse has been linked with kidney disease, this does not commonly appear in cases of occupational toluene exposures. Cardiac and hematological toxicity are however associated with chronic toluene exposure. Cardiac arrhythmia, multifocal and premature ventricular contractions and supraventricular tachycardia are present in 20% of patients who abused toluene-containing paints.
Previous suggestions that chronic toluene inhalation produced human peripheral neuropathy have largely been discounted. However central nervous system (CNS) depression is well documented where blood toluene levels exceed 2.2 mg%. Toluene abusers can achieve transient circulating concentrations of 6.5 mg%. Amongst workers exposed for a median time of 29 years to toluene no subacute effects on neurasthenic complaints and pyschometric test results could be established.
The prenatal toxicity of very high toluene concentrations has been documented for several animal species and man. Malformations indicative of specific teratogenicity have not generally been found. The toxicity described in the literature takes the form of embryo death or delayed fetal growth and delayed skeletal system development. Permanent damage of children has been seen only when mothers had suffered from chronic intoxication as a result of "sniffing".

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.
Lay patient down. Keep warm and rested.
If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor.

Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water.
Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.
Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Immediately remove all contaminated clothing, including footwear (after rinsing with water).
Wash affected areas thoroughly with water (and soap if available).
Seek medical attention in event of irritation.

Ingestion: Contact a Poison Control Center.
Do NOT induce vomiting. Give a glass of water.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Following acute or short-term repeated exposures to toluene:

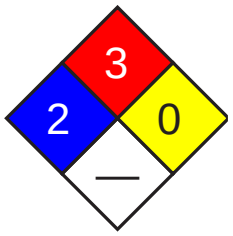
1. Toluene is absorbed across to alveolar barrier, the blood/air mixture being 11.2/15.6 (at 37 °C) The order of toluene, in expired breath, is of the order of 18 ppm following sustained exposure to 100 ppm.
The tissue/blood proportion is 1/3 except in adipose where the proportion is 8/10.
2.Metabolism by microsomal mono-oxygenation, results in the production of hippuric acid. This may be detected in the urine in amounts between 0.5 and 2.5 g/24hr which represents, on average 0.8 gm/gm of creatinine.
The biological half life of hippuric acid is in the order of 1-2 hours.
3.Primary threat to life from ingestion and/or inhalation is respiratory failure.
4.Patients should be quickly evaluated for signs of respiratory distress (e.g. cyanosis, tachypnea, intercostal retraction, obtundation) and given oxygen. Patients with inadequate tidal volumes or poor arterial blood gases (pO_2 <50 mm Hg or pCO_2 >50 mm Hg) should be intubated.
5.Arrhythmias complicate some hydrocarbon ingestion and/or inhalation and electrocardiographic evidence of myocardial injury has been reported; intravenous lines and cardiac monitors should be established in obviously symptomatic patients. The lungs excrete inhaled solvents, so that hyperventilation improves clearance.
6.A chest x-ray should be taken immediately after stabilization of breathing and circulation to document aspiration and detect the presence of pneumothorax.
7.Epinephrine (adrenalin) is not recommended for treatment of bronchospasm because of potential myocardial sensitization to catecholamines.
Inhaled cardioselective bronchodilators (e.g. Alupent, Salbutamol) are the preferred agents, with aminophylline a second choice.
8.Lavage is indicated in patients who require decontamination; ensure use of cuffed endotracheal tube in adult patients.
BIOLOGICAL EXPOSURE INDEX - BEI
These represent the determinants observed in specimens collected from a healthy worker exposed at the Exposure Standard (ES or TLV):

Determinant	Index	Sampling Time	Comments
Hippuric acid in urine	2.5 gm/gm creatinine	End of shift Last 4 hrs of shift	B,NS
Toluene in venous blood	1 mg/L	End of shift	SQ
Toluene in end-exhaled air		End of shift	SQ

NS: Non-specific determinant; also observed after exposure to other material
SQ: Semi-quantitative determinant - Interpretation may be ambiguous; should be used as a screening test or confirmatory test.
B: Background levels occur in specimens collected from subjects NOT exposed.

Section 5 - Fire-Fighting Measures

Flash Point: 4 °C Closed Cup
Autoignition Temperature: 480 °C
LEL: 1.2% v/v
UEL: 7.1% v/v
Extinguishing Media: Foam, dry chemical powder, BCF (where regulations permit), carbon dioxide.
Water spray or fog - Large fires only.
General Fire Hazards/Hazardous Combustion Products: Liquid and vapor are highly flammable.
Severe fire hazard when exposed to heat, flame and/or oxidizers.
Vapor forms an explosive mixture with air.
Severe explosion hazard, in the form of vapor, when exposed to flame or spark. Vapor may travel a considerable distance to source of ignition.
Heating may cause expansion/decomposition with violent rupture of containers.
On combustion, may emit toxic fumes of carbon monoxide (CO) and carbon dioxide (CO_2).
Fire Incompatibility: Avoid contamination with strong oxidizing agents as ignition may result.
Nitric acid with toluene, produces nitrated compounds which are explosive.
Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.
May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.
Fight fire from a safe distance, with adequate cover.



Fire Diamond

If safe, switch off electrical equipment until vapor fire hazard removed.
Use water delivered as a fine spray to control the fire and cool adjacent area. Avoid spraying water onto liquid pools.
Do not approach containers suspected to be hot.
Cool fire-exposed containers with water spray from a protective location.
If safe to do so, remove containers from path of fire.

Section 6 - Accidental Release Measures

Small Spills: Remove all ignition sources. Clean up all spills immediately.
Avoid breathing vapors and contact with skin and eyes.
Control personal contact by using protective equipment.
Contain and absorb small quantities with vermiculite or other absorbent material. Wipe up. Collect residues in a flammable waste container.
Large Spills: Clear area of personnel and move upwind.
Contact fire department and tell them location and nature of hazard.
May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.
No smoking, bare lights or ignition sources. Increase ventilation.
Stop leak if safe to do so. Water spray or fog may be used to disperse/absorb vapor. Contain spill with sand, earth or vermiculite.
Use only spark-free shovels and explosion proof equipment.
Collect recoverable product into labeled containers for recycling.
Absorb remaining product with sand, earth or vermiculite.
Collect solid residues and seal in labeled drums for disposal.
Wash area and prevent runoff into drains.
If contamination of drains or waterways occurs, advise emergency services.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid all personal contact, including inhalation.
Wear protective clothing when risk of exposure occurs.
Use in a well-ventilated area. Prevent concentration in hollows and sumps.
DO NOT enter confined spaces until atmosphere has been checked.
Avoid smoking, bare lights, heat or ignition sources.
When handling, DO NOT eat, drink or smoke.
Vapor may ignite on pumping or pouring due to static electricity.
DO NOT use plastic buckets. Ground and secure metal containers when dispensing or pouring product. Use spark-free tools when handling.
Avoid contact with incompatible materials.
Keep containers securely sealed. Avoid physical damage to containers.
Always wash hands with soap and water after handling.
Work clothes should be laundered separately.
Use good occupational work practices. Observe manufacturer's storing and handling recommendations. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions.
Recommended Storage Methods: Metal can; Metal drum; Metal safety cans. Packing as supplied by manufacturer.
Plastic containers may only be used if approved for flammable liquid.
Check that containers are clearly labeled and free from leaks.
Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Use in a well-ventilated area; local exhaust ventilation may be required for safe working, i.e., to keep exposures below required standards; otherwise, PPE is required.
General exhaust is adequate under normal operating conditions.
Local exhaust ventilation may be required in special circumstances.
If risk of overexposure exists, wear NIOSH-approved respirator. Correct fit is essential to ensure adequate protection.
Provide adequate ventilation in warehouses and enclosed storage areas.
In confined spaces where there is inadequate ventilation, wear full-face air supplied breathing apparatus.
Personal Protective Clothing/Equipment
Eyes: Safety glasses with side shields; chemical goggles. Full face shield.
DO NOT wear contact lenses. Contact lenses pose a special hazard; soft contact lenses may absorb irritants and all lenses concentrate them.
Hands/Feet: Wear chemical protective gloves, eg. PVC. Wear safety footwear.

Respiratory Protection:
Exposure Range >200 to <500 ppm: Air Purifying, Negative Pressure, Half Mask
Exposure Range 500 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face Cartridge Color: black
Other: Overalls. Barrier cream. Eyewash unit.

Glove Selection Index:

PE/EVAL/PE	Best selection
VITON/CHLOROBUTYL	Best selection
VITON	Best selection
PVA	Best selection
TEFLON	Satisfactory; may degrade after 4 hours continuous immersion
SARANEX-23 2-PLY	Poor to dangerous choice for other than short-term immersion
CPE	Poor to dangerous choice for other than short-term immersion
VITON/NEOPRENE	Poor to dangerous choice for other than short-term immersion
SARANEX-23	Poor to dangerous choice for other than short-term immersion
NEOPRENE/NATURAL	Poor to dangerous choice for other than short-term immersion
NITRILE+PVC	Poor to dangerous choice for other than short-term immersion
NITRILE	Poor to dangerous choice for other than short-term immersion
BUTYL	Poor to dangerous choice for other than short-term immersion
PVC	Poor to dangerous choice for other than short-term immersion
NEOPRENE	Poor to dangerous choice for other than short-term immersion

Section 9 - Physical and Chemical Properties

Appearance/General Info: Clear highly flammable liquid with a strong aromatic odor; floats on water. Mixes with most organic solvents.
Physical State: Liquid
Vapor Pressure (kPa): 2.93 at 20 °C
Vapor Density (Air=1): 3.2
Formula Weight: 92.14
Specific Gravity (H_2O=1, at 4 °C): 0.87 at 20 °C
Water Solubility: < 1 mg/mL at 18 °C
Evaporation Rate: 2.4 (BuAc=1)
pH: Not applicable
pH (1% Solution): Not applicable.
Boiling Point Range: 111 °C (232 °F) at 760 mm Hg
Freezing/Melting Point Range: -95 °C (-139 °F)
Volatile Component (% Vol): 100

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Product is considered stable. Hazardous polymerization will not occur.
Storage Incompatibilities: Segregate from strong oxidizers.

Section 11 - Toxicological Information

TOXICITY
Oral (human) LD_{Lo}: 50 mg/kg
Oral (rat) LD_{50}: 636 mg/kg
Inhalation (human) TC_{Lo}: 100 ppm
Inhalation (man) TC_{Lo}: 200 ppm
Inhalation (rat) LC_{50}: > 26700 ppm/1h
Dermal (rabbit) LD_{50}: 12124 mg/kg
Reproductive effector in rats

IRRITATION
Skin (rabbit): 20 mg/24h-moderate
Skin (rabbit): 500 mg - moderate
Eye (rabbit): 0.87 mg - mild
Eye (rabbit): 2 mg/24h - SEVERE
Eye (rabbit): 100 mg/30sec - mild

See NIOSH, *RTECS* XS 5250000, for additional data.

Section 12 - Ecological Information

Environmental Fate: If released to soil, it will be lost by evaporation from near-surface soil and by leaching to the groundwater. Biodegradation occurs both in soil and groundwater, but it is apt to be slow especially at high concentrations, which may be toxic to microorganisms. The presence of acclimated microbial populations may allow rapid biodegradation. It will not significantly hydrolyze in soil or water under normal environmental conditions. If released into water, its concentration will decrease due to evaporation and biodegradation. This removal can be rapid or take several weeks, depending on temperature, mixing conditions, and acclimation of microorganisms. It will not significantly adsorb to sediment or bioconcentrate in aquatic organisms. If released to the atmosphere, it will degrade by reaction with photochemically produced hydroxyl radicals (half-life 3 hr to slightly over 1 day) or be washed out in rain. It will not be subject to direct photolysis.

Ecotoxicity: LC_{50} Aedes aegypti-4th instar (mosquito larvae) 22 mg/l /Conditions of bioassay not specified; LC_{50} Cyprinodon variegatus (sheepshead minnow) 277-485 mg/l 96 hr /Conditions of bioassay not specified; LC_{50} Calandra granaria (grain weevil) 210 mg/l /in air; LC_{50} Cancer magister (crab larvae stage I) 28 ppm/96 hr /Conditions of bioassay not specified; LC_{50} Crangon franciscorum (shrimp) 4.3 ppm 96 hr /Conditions of bioassay not specified; LC_{50} Artemia salina (brine shrimp) 33 mg/l 24 hr /Conditions of bioassay not specified; LC_{50} Morone saxatilis (striped bass) 7.3 mg/l 96 hr /Conditions of bioassay not specified; LC_{50} Pimephales promelas (fathead minnows) 55-72 mg/l (embryos), 25-36 mg/l (1-day posthatch protolarvae), and 26-31 mg/l (30-day-old minnows)/ 96 hour /Conditions of bioassay not specified

Henry's Law Constant: 0.0067

BCF: eels 13.2

Biochemical Oxygen Demand (BOD): 0%, 5 days

Octanol/Water Partition Coefficient: log K_{ow} = 2.69

Soil Sorption Partition Coefficient: K_{oc} = silty loam 37

Section 13 - Disposal Considerations

Disposal: Consult manufacturer for recycling options and recycle where possible.
Follow applicable federal, state, and local regulations.
Incinerate residue at an approved site.
Recycle containers where possible, or dispose of in an authorized landfill.

Section 14 - Transport Information

DOT Transportation Data (49 CFR 172.101):

Shipping Name: TOLUENE

Additional Shipping Information: TOLUOL

Hazard Class: 3.1

ID No.: 1294

Packing Group: II

Label: Flammable Liquid[3]

Section 15 - Regulatory Information

EPA Regulations:

RCRA 40 CFR: Listed U220 Toxic Waste

CERCLA 40 CFR 302.4: Listed per CWA Section 311(b)(4), per RCRA Section 3001, per CWA Section 307(a) 1000 lb (453.5 kg)

SARA 40 CFR 372.65: Listed

SARA EHS 40 CFR 355: Not listed

TSCA: Listed

Section 16 - Other Information

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Material Safety Data Sheet Collection
Genium group inc.
1171 RiverFront Center, Amsterdam, NY 12010
(518) 842-4111

trans-Acetylene Dichloride
DIC4650

Issue Date: 2005-05

Section 1 - Chemical Product and Company Identification 55/60

Material Name: trans-Acetylene Dichloride **CAS Number:** 156-60-5
Chemical Formula: $C_2H_2Cl_2$
Structural Chemical Formula: ClCH=CHCl
EINECS Number: 205-860-2
ACX Number: X1003965-9
Synonyms: TRANS-ACETYLENE DICHLORIDE; 1,2-DICHLORO-,(E)-ETHENE; TRANS-1,2-DICHLOROETHENE; 1,2-DICHLORO-,(E)-ETHYLENE; 1,2-TRANS-DICHLOROETHYLENE; SYM-DICHLOROETHYLENE; TRANS-1,2-DICHLOROETHYLENE; TRANS-DICHLOROETHYLENE; ETHYLENE,1,2-DICHLORO-,
General Use: solvent for fats, phenols, camphor, etc.; retards fermentation; rubber manufacturing; refrigerants; additive to dye and lacquer solutions; low temperature solvent for heat sensitive substances; constituent of perfumes, thermoplastics; used in organic synthesis and medicine

Section 2 - Composition / Information on Ingredients

Name	CAS	%
trans-acetylene dichloride	156-60-5	>98

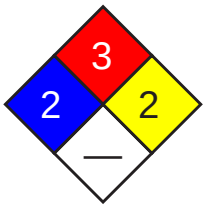
OSHA PEL
TWA: 200 ppm; 790 mg/m^3.

NIOSH REL

DFG (Germany) MAK
TWA: 200 ppm; PEAK: 400 ppm.

ACGIH TLV
TWA: 200 ppm.

Section 3 - Hazards Identification



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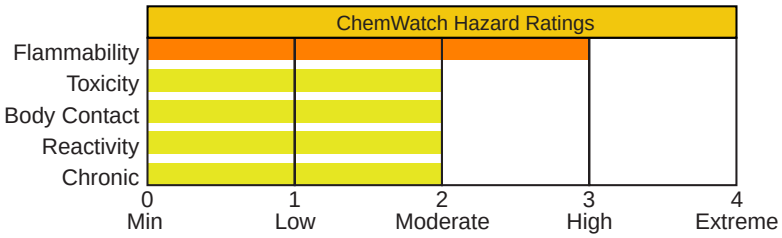
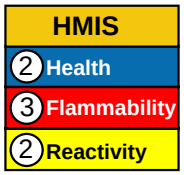




ANSI Signal Word
Warning!


Flammable

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Colorless, light liquid; sweetish odor. Irritating to eyes/skin/respiratory tract. Harmful. Other Acute Effects: narcotic effect. Flammable.

Potential Health Effects

Target Organs: eyes, skin, respiratory system, nervous system, liver, kidneys
Primary Entry Routes: inhalation of vapor, skin/eye contact

Acute Effects

Inhalation: There is a single report of an industrial poisoning, a fatality caused by the inhalation of a vapor in a small enclosure. Acute intoxication by halogenated aliphatic hydrocarbons appears to take place over two stages. Signs of a reversible narcosis are evident in the first stage and in the second stage signs of injury to organs may become evident, a single organ alone is (almost) never involved. Depression of the central nervous system is most outstanding effect of most halogenated aliphatic hydrocarbons. Inebriation and excitation, passing into narcosis, is a typical reaction. In severe acute exposures there is always a danger of death from respiratory failure or cardiac arrest due to a tendency to make the heart more susceptible to catecholamines (adrenalin). The most important effects of exposure are narcosis and irritation of the central nervous system. Liver responses may occur after repeated narcotic doses and involves fatty liver degeneration. Vapor exposure may produce central nervous system depression or in milder exposures, nausea, vomiting, weakness, tremor and epigastric cramps. Recovery is usually rapid. At high concentrations the trans-isomer is twice as strong a CNS depressant as the cis isomer.

Eye: The vapor when concentrated has pronounced eye irritation effect; this gives some warning of high vapor concentrations. If eye irritation occurs seek to reduce exposure with available control measures, or evacuate area. The material may produce moderate eye irritation leading to inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis. Exposure to the trans isomer at 2200 ppm caused burning of the eyes, vertigo, nausea. Reversible corneal clouding has been described in exposures to acetylene dichloride.

Skin: The liquid may produce skin discomfort following prolonged contact. Defatting and/ or drying of the skin may lead to dermatitis. The material may cause skin irritation after prolonged or repeated exposure and may produce a contact dermatitis (nonallergic). This form of dermatitis is often characterized by skin redness (erythema) and swelling (edema) which may progress to vesiculation, scaling and thickening of the epidermis. Histologically there may be intercellular edema of the spongy layer (spongiosis) and intracellular edema of the epidermis.

Ingestion: The liquid is discomforting to the gastrointestinal tract and toxic if swallowed. Considered an unlikely route of entry in commercial/industrial environments.

Carcinogenicity: NTP - Not listed; IARC - Not listed; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Not listed; MAK - Not listed.

Chronic Effects: The material may accumulate in the human body and progressively cause tissue damage.

Section 4 - First Aid Measures

Inhalation: • If fumes or combustion products are inhaled, remove to fresh air.
• Lay patient down. Keep warm and rested.
• If breathing is shallow or has stopped, ensure clear airway and apply resuscitation, preferably with a demand valve resuscitator, bag-valve mask device, or pocket mask as trained. Perform CPR if necessary.
• Transport to hospital or doctor.

See DOT ERG

Eye Contact: • Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water.
• Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids.
• Transport to hospital or doctor without delay.
• Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: • Immediately remove all contaminated clothing, including footwear (after rinsing with water).
• Wash affected areas thoroughly with water (and soap if available).
• Seek medical attention in event of irritation.

Ingestion: Contact a Poison Control Center. Do NOT induce vomiting. Give a glass of water.

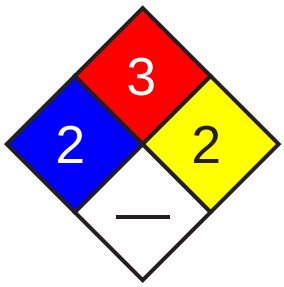
After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Treatment should follow that practiced in carbon tetrachloride exposures:
• Acute exposures to carbon tetrachloride present, initially, with CNS depression followed by hepatic and renal dysfunction.
• Respiratory depression and cardiac dysrhythmias are an immediate threat to life.
• Since a major fraction of absorbed carbon tetrachloride is exhaled in first hour, good tidal volumes should be maintained in severely poisoned patients; hyperventilation may be an additional therapeutic modality.
• Ipecac syrup, lavage, activated charcoal or catharsis may all be used in the first 4 hours.
• Since reactive metabolites may cause hepatorenal toxicity, administration of N-acetyl-L-cysteine may reduce complications. Experience with this therapy is limited.

Section 5 - Fire-Fighting Measures

Flash Point: 6 °C
Autoignition Temperature: 1,2-dichloroethylene 460 °C
LEL: 9.7% v/v
UEL: 12.8% v/v
Extinguishing Media: Foam. Dry chemical powder. BCF (where regulations permit). Carbon dioxide. Water spray or fog - Large fires only.

See DOT ERG



Fire Diamond

General Fire Hazards/Hazardous Combustion Products: • Liquid and vapor are highly flammable.
• Severe fire hazard when exposed to heat, flame and/or oxidizers.
• Vapor forms an explosive mixture with air.
• Severe explosion hazard, in the form of vapor, when exposed to flame or spark.
• Vapor may travel a considerable distance to source of ignition.
• Heating may cause expansion/decomposition with violent rupture of containers.
• On combustion, may emit toxic fumes of carbon monoxide (CO). Other combustion products include hydrogen chloride and phosgene.
Fire Incompatibility: Avoid contamination with oxidizing agents i.e., nitrates, oxidizing acids, chlorine bleaches, pool chlorine etc. as ignition may result.
Fire-Fighting Instructions: • Contact fire department and tell them location and nature of hazard.
• May be violently or explosively reactive.
• Wear breathing apparatus plus protective gloves.
• Prevent, by any means available, spillage from entering drains or waterways.
• Consider evacuation (or protect in place).
• Fight fire from a safe distance, with adequate cover.
• If safe, switch off electrical equipment until vapor fire hazard removed.
• Use water delivered as a fine spray to control the fire and cool adjacent area.
• Avoid spraying water onto liquid pools.
• Do not approach containers suspected to be hot.
• Cool fire-exposed containers with water spray from a protected location.
• If safe to do so, remove containers from path of fire.

Section 6 - Accidental Release Measures

See DOT ERG

Small Spills: • Remove all ignition sources.
• Clean up all spills immediately.
• Avoid breathing vapors and contact with skin and eyes.
• Control personal contact by using protective equipment.
• Contain and absorb small quantities with vermiculite or other absorbent material.
• Wipe up.
• Collect residues in a flammable waste container.
Large Spills: • Clear area of personnel and move upwind.
• Contact fire department and tell them location and nature of hazard.
• May be violently or explosively reactive.
• Wear breathing apparatus plus protective gloves.
• Prevent, by any means available, spillage from entering drains or waterways.
• No smoking, bare lights or ignition sources.
• Increase ventilation.
• Stop leak if safe to do so.
• Water spray or fog may be used to disperse/absorb vapor.
• Contain spill with sand, earth or vermiculite.
• Use only spark-free shovels and explosion proof equipment.
• Collect recoverable product into labeled containers for recycling.
• Absorb remaining product with sand, earth or vermiculite.
• Collect solid residues and seal in labeled drums for disposal.
• Wash area and prevent runoff into drains.
• If contamination of drains or waterways occurs, advise emergency services.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: • Avoid all personal contact, including inhalation.
• Wear protective clothing when risk of exposure occurs.
• Use in a well-ventilated area.
• Prevent concentration in hollows and sumps.

• DO NOT enter confined spaces until atmosphere has been checked.
• Avoid smoking, bare lights or ignition sources.
• Avoid contact with incompatible materials.
• When handling, DO NOT eat, drink or smoke.
• Keep containers securely sealed when not in use.
• Avoid physical damage to containers.
• Always wash hands with soap and water after handling.
• Work clothes should be laundered separately.
• Follow good occupational work practices.
• Observe manufacturer's storage and handling recommendations.
• Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions.

Recommended Storage Methods: Check that containers are clearly labeled. Packaging as recommended by manufacturer. DO NOT use aluminum or galvanized containers.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Local exhaust ventilation usually required. If risk of overexposure exists, wear NIOSH-approved respirator. Provide adequate ventilation in warehouse or closed storage area.

Personal Protective Clothing/Equipment:

Eyes: Safety glasses with side shields or, as required, chemical goggles. Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: Butyl rubber gloves. Neoprene gloves.

Respiratory Protection: Respirator protection may be required. Consult your supervisor.

Other: • Overalls.
• Barrier cream.
• Eyewash unit.

Glove Selection Index:

VITON ..... Poor to dangerous choice for other than short-term immersion

Section 9 - Physical and Chemical Properties

Appearance/General Info: Colorless liquid with pleasant chloroform-like odor.

Physical State: colorless, light liquid

Vapor Pressure (kPa): 200 mm Hg at 14 °C

Vapor Density (Air=1): 3.34

Formula Weight: 96.95

Specific Gravity (H_2O=1, at 4 °C): 1.2565 at 20 °C/4 °C

Boiling Point: 48 °C (118 °F) to 48.5 °C (119 °F) at 760 mm Hg

Freezing/Melting Point: -50 °C (-58 °F)

Water Solubility: < 1 mg/mL at 18 °C

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Product is considered stable. Hazardous polymerization will not occur.

Storage Incompatibilities: Avoid reaction with oxidizing agents. Acetylene dichloride in contact with solid caustic alkalies or their concentrated solutions will form chloracetylene which ignites in air. Haloalkenes are highly reactive.

Section 11 - Toxicological Information

Toxicity

Oral (rat) LD_{50}: 1235 mg/kg
Intraperitoneal (rat) LD_{50}: 7411 mg/kg
Oral (mouse) LD_{50}: 2122 mg/kg
Inhalation (mouse) LC_{Lo}: 75000 mg/m^3/2 hr
Intraperitoneal (mouse) LD_{50}: 3952 mg/kg
Dermal Rabbit) LD_{50}: >5000 mg/kg
Inhalation (human) TC_{Lo}: 4800 mg/m^3/10m

Hamster lung cell mutagen in vitro.

Irritation

Skin (rabbit): 500 mg/24 hr - mod
Eye (rabbit): 10 mg - moderate

See *RTECS* KV9400000, for additional data.

Section 12 - Ecological Information

Environmental Fate: If released on soil, it should evaporate and leach into the groundwater where very slow biodegradation should occur. If released into water, it will be lost mainly through volatilization (half-life 3 hr in a model river). Biodegradation, adsorption to sediment, and bioconcentration in aquatic organisms should not be significant. In the atmosphere, it will be lost by reaction with photochemically produced hydroxyl radicals (half-life 3.6 days) and scavenged by rain. Because it is relatively long-lived in the atmosphere, considerable dispersal from source areas should occur.
Ecotoxicity: LC_{50} Lepomis machrochirus (bluegill) 135,000 ug/l/96 hr in a static unmeasured bioassay
Henry's Law Constant: estimated at 0.00672
BCF: calculated at 22
Octanol/Water Partition Coefficient: log K_{ow} = 2.06
Soil Sorption Partition Coefficient: K_{oc} = 36

Section 13 - Disposal Considerations

Disposal: • Consult manufacturer for recycling options and recycle where possible.
• Follow applicable local, state, and federal regulations.
• Incinerate residue at an approved site.
• Recycle containers if possible, or dispose of in an authorized landfill.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Shipping Name and Description: 1,2-Dichloroethylene
ID: UN1150
Hazard Class: 3 - Flammable and combustible liquid
Packing Group: II - Medium Danger
Symbols:
Label Codes: 3 - Flammable Liquid
Special Provisions: IB2, T7, TP2
Packaging: **Exceptions:** 150 **Non-bulk:** 202 **Bulk:** 242
Quantity Limitations: **Passenger aircraft/rail:** 5 L **Cargo aircraft only:** 60 L
Vessel Stowage: **Location:** B **Other:**

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Listed U079 Toxic Waste
CERCLA 40 CFR 302.4: Listed per RCRA Section 3001, per CWA Section 307(a) 1000 lb (453.5 kg)
SARA 40 CFR 372.65: Not listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

Material Safety Data Sheet Collection
Genium group inc.
1171 RiverFront Center, Amsterdam, NY 12010
(518) 842-4111

Issue Date: 2005-05

Section 1 - Chemical Product and Company Identification 53/60

Material Name: Trichloroethane **CAS Number:** 25323-89-1
Chemical Formula: $C_2H_3Cl_3$
ACX Number: X1007877-0
Synonyms: TRICHLOROETHANE
Derivation: By the catalytic chlorination of ethane or ethylene or by action of chlorine on 1,1-dichlorethane; by catalytic addition of hydrogen chloride to 1,1-dichloroethylene.
General Use: In vapor degreasing; cleaning of electrical equipment, motors, electronic compounds and instruments; missile hardware; paint masks; photographic films; printed circuit boards and various metal and certain plastics components during manufacture; intermediate in the production of vinylidine chloride; solvent and cleaning agent in fabric cleaners, in the thermal oxidation of silicon, and furnace tube cleaning.

Section 2 - Composition / Information on Ingredients

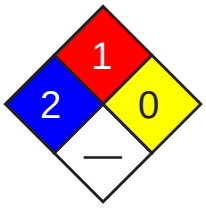
Name	CAS	%
1,1,2-Trichloroethane	79-00-5	
1,1,1-trichloroethane	71-55-6	

Trace Impurities: May include 1,2-dichloroethane; 1,1-dichloroethane; chloroform; carbon tetrachloride; trichloroethylene; 1,1,2-trichloroethane; sec-butanol; 1,2-butylene oxide; and vinylidene chloride.

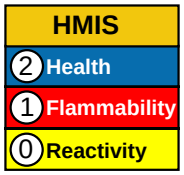
OSHA PEL **NIOSH REL**

ACGIH TLV

Section 3 - Hazards Identification



Fire Diamond



ANSI Signal Word

Caution

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Colorless liquid; chloroform-like, sweetish odor. Irritating to eyes/skin/respiratory tract. Also causes: CNS depression that can lead to respiratory depression and death.

Potential Health Effects

Target Organs: Skin, eyes, respiratory system, central nervous system (CNS)
Primary Entry Routes: Inhalation, skin/eye contact
Acute Effects
Inhalation: Inhalation of vapors causes respiratory tract irritation. As a central nervous system depressant, trichlorethane produces headache, lightheadedness, impaired coordination, dysequilibrium, drowsiness, convulsion, gait disturbances, stupor, coma, and, in severe exposures, death, likely due to respiratory depression. Deaths have occurred in both industrial use (small, poorly ventilated spaces) and recreational abuse (solvent sniffing or "huffing").
Eye: Contact causes irritation.
Skin: Contact causes defatting of the skin and irritation. Cutaneous absorption happens slowly and may not produce significant toxicity unless trapped against the skin by an impermeable barrier.
Ingestion: Causes CNS depression (see Inhalation)
Carcinogenicity: NTP - Not listed; IARC - Not listed; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Not listed; MAK - Not listed.

Medical Conditions Aggravated by Long-Term Exposure: Neuropathies.
Chronic Effects: Chronic accumulation probably does not occur; however, repeated exposure may cause liver and kidney damage and may lead to nervous system damage (neuropathies).

Section 4 - First Aid Measures

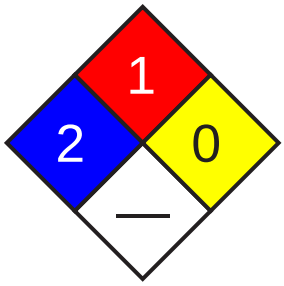
Inhalation: Remove exposed person to fresh air and support breathing as needed.
Eye Contact: *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately with copious amounts of water. Consult a physician or ophthalmologist if pain or irritation persist.
Skin Contact: Remove contaminated clothing. Rinse with flooding amounts of water. Wash exposed area with soap and water. For reddened or blistered skin, consult a physician.
Ingestion: Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center. Unless the poison control center advises otherwise, have the *conscious and alert* person drink 1 to 2 glasses of water, then induce vomiting.
After first aid, get appropriate in-plant, paramedic, or community medical support.

See DOT ERG

Section 5 - Fire-Fighting Measures

Flash Point: Combustible.
Autoignition Temperature: 932 °F (500 °C)
LEL: 7% v/v
UEL: 16% v/v
Extinguishing Media: Extinguish with dry chemical, carbon dioxide, or foam.
General Fire Hazards/Hazardous Combustion Products: Poisonous gases (HCl and phosgene) are produced in fire situations.
Fire-Fighting Instructions: *Do not* release runoff from fire control methods to sewers or waterways. Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode.

See DOT ERG



Fire Diamond

Section 6 - Accidental Release Measures

Spill/Leak Procedures: Notify safety personnel, evacuate all unnecessary personnel, remove heat and ignition sources. Isolate and ventilate area, deny entry, stay upwind. Cleanup personnel should protect against exposure (Sec. 8).
Small Spills: Absorb liquid spill with an inert, noncombustible absorbent such as sand or vermiculite.
Large Spills: For large spills, dike far ahead of liquid spill for later disposal. *Do not* release into sewers or waterways.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

See DOT ERG

Section 7 - Handling and Storage

Handling Precautions: Wear personal protective clothing/equipment to prevent inhalation and contact with skin or eyes.
Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.
Recommended Storage Methods: Store in tightly closed containers in a cool, well-ventilated area away from heat and ignition sources.
Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Where feasible, enclose and ventilate operations to avoid vapor dispersion into the work area. Provide general or local exhaust ventilation systems to maintain airborne concentrations as low as possible. Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.
Administrative Controls: Educate workers about the health and safety hazards associated with this material. Train in work practices which minimize exposure. Consider preplacement and periodic medical exams with emphasis on liver function and the central and peripheral nervous systems.
Personal Protective Clothing/Equipment: Wear trichloroethane-resistant, protective gloves, boots, aprons, and gauntlets to prevent prolonged or repeated skin contact. Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Contact lenses are not protective eye devices. Appropriate eye protection must be worn instead of, or in conjunction with, contact lenses.

Respiratory Protection: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a NIOSH-approved respirator. Select respirator based on its suitability to provide adequate worker protection for given working conditions, level of airborne contamination, and presence of sufficient oxygen. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas.

Other: Separate contaminated work clothes from street clothes. Launder before reuse. Remove this material from your shoes and clean personal protective equipment. Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work area.

Section 9 - Physical and Chemical Properties

Appearance/General Info: Colorless. Chloroform-like sweetish odor.
Physical State: Liquid
Odor Threshold: 100 ppm
Vapor Pressure (kPa): 1,1,1-trichloroethane: 16.5 kPa at 77 °F
Formula Weight: 133.41
Specific Gravity (H_2O=1, at 4 °C): 1,1,1-trichloroethane: 1.3376 at 20 °C/4 °C; 1,1,2-trichloroethane: 1.4416 at 20 °C/4 °C
Refractive Index: 1.43838 at 20 °C
Boiling Point: 1,1,1-trichloroethane: 165 °F (74 °C) at 760 mm
Freezing/Melting Point: 1,1,1-trichloroethane: -22.74 °F (-30.4 °C); 1,1,2- trichloroethane: -33.9 °F (-36.6 °C)
Viscosity: 1,1,1-trichloroethane: 0.858 cP at 68 °F (20 °C); 1,1,2- trichloroethane: 1.69 cP at 77 °F (25 °C)
Surface Tension: 25.4 dynes/cm = 0.0254 N/m at 20 °C
Water Solubility: Will sink.

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Trichloroethane is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur. Avoid contact with heat and sources of ignition.

Storage Incompatibilities: Although there were no listings given for trichloroethane, consider those of its components: 1,1,1- trichloroethane incompatibilites include strong caustics; strong oxidizers; chemically-active metals such as zinc, aluminum, magnesium powders, sodium and potassium; reacts slowly with water to form hydrochloric acid. 1,1,2-trichlorethane is highly corrosive to aluminum, iron and zinc. The rate of corrsion increases with the addition of water.

Hazardous Decomposition Products: Thermal oxidative decomposition of trichloroethane can produce toxic HCl and phosgene.

Section 11 - Toxicological Information

No data found.

Section 12 - Ecological Information

Environmental Fate: No data found.
Ecotoxicity: Data not found.

Section 13 - Disposal Considerations

Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable federal, state, and local regulations. Handle empty containers carefully as hazardous residues may still remain.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Shipping Name and Description: 1,1,1-Trichloroethane
ID: UN2831
Hazard Class: 6.1 - Poisonous materials
Packing Group: III - Minor Danger
Symbols:
Label Codes: 6.1 - Poison *or* Poison Inhalation Hazard *if inhalation hazard, Zone A or B*
Special Provisions: IB3, N36, T4, TP1
Packaging: **Exceptions:** 153 **Non-bulk:** 203 **Bulk:** 241
Quantity Limitations: **Passenger aircraft/rail:** 60 L **Cargo aircraft only:** 220 L
Vessel Stowage: **Location:** A **Other:** 40

Section 15 - Regulatory Information

EPA Regulations:

RCRA 40 CFR: Not listed
CERCLA 40 CFR 302.4: Listed as Compound per CWA Section 307(a)
SARA 40 CFR 372.65: Not listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

Material Safety Data Sheet Collection
Genium group inc.
1171 RiverFront Center, Amsterdam, NY 12010
(518) 842-4111

Issue Date: 2005-05

Section 1 - Chemical Product and Company Identification 54/60

Material Name: Trichloroethylene **CAS Number:** 79-01-6
Chemical Formula: C_2HCl_3
Structural Chemical Formula: $ClCH=CCl_2$
EINECS Number: 201-167-4
ACX Number: X1000039-2
Synonyms: ACETYLENE TRICHLORIDE; ALGYLEN; ANAMENTH; BENZINOL; BLACOSOLV; BLANCOSOLV; CECOLENE; CHLORILEN; 1-CHLORO-2,2-DICHLOROETHYLENE; CHLORYLEA; CHLORYLEA,CHORYLEN,CIRCOSOLV,CRAWHASPOL,DOW-TRI,DUKERON,PER-A-CLOR,TRIAD,TRIAL,TRI-PLUS M,VITRAN; CHLORYLEN; CHORYLEN; CIRCOSOLV; CRAWHASPOL; DENSINFLUAT; 1,1-DICHLORO-2-CHLOROETHYLENE; DOW-TRI; DUKERON; EPA PESTICIDE CHEMICAL CODE 081202; ETHENE,TRICHLORO-; ETHINYL TRICHLORIDE; ETHYLENE TRICHLORIDE; ETHYLENE,TRICHLORO-; FLECK-FLIP; FLOCK FLIP; FLUATE; GEMALGENE; GERMALGENE; LANADIN; LETHURIN; NARCOGEN; NARKOGEN; NARKOSOID; NIALK; NSC 389; PERM-A-CHLOR; PERM-A-CLOR; PETZINOL; PHILEX; TCE; THRETHYLEN; THRETHYLENE; TRETHYLENE; TRI; TRIAD; TRIAL; TRIASOL; TRICHLOORETHEEN; TRICHLOORETHYLEEN,TRI; TRICHLORAETHEN; TRICHLORAETHYLEN,TRI; TRICHLORAN; TRICHLOREN; TRICHLORETHENE; TRICHLORETHYLENE; TRICHLORETHYLENE,TRI; TRICHLOROETHENE; 1,1,2-TRICHLOROETHYLENE; TRICHLOROETHYLENE; TRICHLOROETHYLENE; 1,2,2-TRICHLOROETHYLENE; TRI-CLENE; TRICLENE; TRICLORETENE; TRICLOROETILENE; TRIELENE; TRIELIN; TRIELINA; TRIELINE; TRIKLONE; TRILEN; TRILENE; TRILINE; TRIMAR; TRIOL; TRI-PLUS; TRI-PLUS M; VESTROL; VITRAN; WESTROSOL
General Use: Mainly used for vapor degreasing; solvent in textile and electronics industries; for adhesives, lubricants and consumer products (such as spot removers and rug cleaners).
Until recently, it was used to make hop extracts for beer, decaffeinated coffee and spice extracts.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
trichloroethylene	79-01-6	> 99

OSHA PEL
TWA: 100 ppm; Ceiling: 200 ppm; 300 ppm, 5-minute maximum peak in any 2 hours.

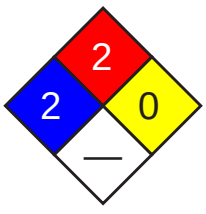
OSHA PEL Vacated 1989 Limits
TWA: 50 ppm; 270 mg/m^3; STEL: 200 ppm; 1080 mg/m^3.

ACGIH TLV
TWA: 50 ppm; STEL: 100 ppm.

NIOSH REL

IDLH Level
1000 ppm.

Section 3 - Hazards Identification



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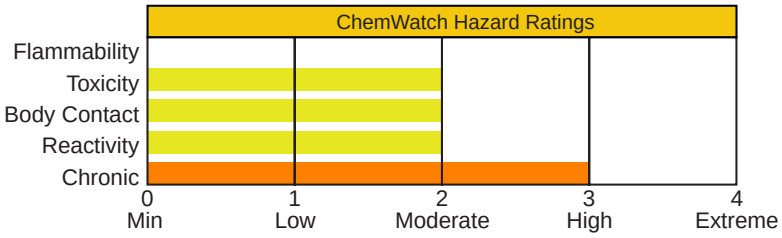
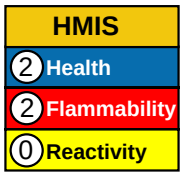




ANSI Signal Word
Warning!


Flammable

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Clear, colorless liquid; sweet odor. Irritating to eyes/skin/respiratory tract. Other Acute Effects: irregular heart beat, drunkenness. Chronic Effects: heart/liver/kidney damage, dermatitis, birth defects, cancer (animal studies). Flammable.

Potential Health Effects

Target Organs: respiratory system, central nervous system (CNS), peripheral nervous system, cardiovascular system, liver, kidneys, skin

Primary Entry Routes: inhalation, skin contact, eye contact, ingestion (rarely)

Acute Effects

Inhalation: The vapor is mildly discomforting to the upper respiratory tract.
Inhalation hazard is increased at higher temperatures.
Anesthetics and narcotic effects (with dulling of senses and odor fatigue) are a consequence of exposure to chlorinated solvents.
Individual response varies widely; odor may not be considered objectionable at levels which quickly induce central nervous system effects.
High vapor concentrations may give a feeling of euphoria. This may result in reduced responses, followed by rapid onset of unconsciousness, possible respiratory arrest and death.
Acute effects from inhalation of high concentrations of vapor are pulmonary irritation, including coughing, with nausea; central nervous system depression - characterized by headache and dizziness, increased reaction time, fatigue and loss of coordination.
If exposure to highly concentrated solvent atmosphere is prolonged this may lead to narcosis, unconsciousness, even coma and possible death.
Evidence of acute human toxicity comes mainly from the use of TCE as an anesthetic, Tachypnea and ventricular arrhythmias are experienced at inhaled concentrations exceeding 15000 ppm. Systemic toxicity is low following anesthesia. Occasional hepatotoxicity (liver dysfunction) has been reported; this is probably due to the breakdown of TCE to dichloroacetylene and phosgene by soda-lime present in some anesthetic devices. The effects of TCE appear to be enhanced in some individuals by simultaneous exposure to caffeine, ethanol and other drugs. "Degreasers Flush" describes a reddening of facial, neck, and back skin and is seen after intake of substantial quantities of ethanol by certain individuals after exposures to TCE.

Eye: The liquid is highly discomforting to the eyes and is capable of causing pain and severe conjunctivitis.
Corneal injury may develop, with possible permanent impairment of vision, if not promptly and adequately treated.
The vapor is discomforting to the eyes.
The material may produce moderate eye irritation leading to inflammation.
Repeated or prolonged exposure to irritants may produce conjunctivitis.

Skin: The liquid is discomforting to the skin and may cause drying of the skin, which may lead to dermatitis.
Toxic effects may result from skin absorption.
Bare unprotected skin should not be exposed to this material. The material may accentuate any pre-existing skin condition.
The material may produce severe skin irritation after prolonged or repeated exposure, and may produce a contact dermatitis (nonallergic).
This form of dermatitis is often characterized by skin redness (erythema) and swelling (edema) which may progress to vesiculation, scaling and thickening of the epidermis.
Histologically there may be intercellular edema of the spongy layer (spongiosis) and intracellular edema of the epidermis.
Repeated exposures may produce severe ulceration.
Localized application may produce pustular eruptions, pruritus and erythema. A permeability coefficient of 1.6×10^{-2} cm/hr has been calculated by the US EPA. Percutaneous absorption is unlikely to contribute significantly to total body burdens unless dermatitis is present.

Ingestion: The liquid is highly discomforting and toxic if swallowed.
Ingestion may result in nausea, abdominal irritation, pain and vomiting.
Considered an unlikely route of entry in commercial/industrial environments.

Carcinogenicity: NTP - Not listed; IARC - Group 3, Not classifiable as to carcinogenicity to humans; OSHA - Not listed; NIOSH - Listed as carcinogen; ACGIH - Class A5, Not suspected as a human carcinogen; EPA - Not listed; MAK - Class B, Justifiably suspected of having carcinogenic potential.

Chronic Effects: Sensitive humans may experience anesthetic effects from short exposures.
Chronic effects of exposure include fatigue, headache, irritability, vomiting, skin flush and intolerance to alcohol.
Liver, kidney, heart and neurological damage may also result from chronic overexposure.
Alcohol intake may increase the toxic effects of the material.
A variety of disturbances have been seen among workers exposed at concentrations ranging from 1 to 335 ppm. These disturbances increased with the length of exposure (to 5 years or more) and where more prominent when exposures exceeded 40 ppm. Increased complaints of alcohol intolerance, tremors, giddiness and anxiety were amongst symptoms recorded. Variation in effects in different occupational settings may be due to different physical workloads.

There appeared to be no increase in the expected rates of congenital defects in children born to women exposed to TCE over a 13 year period.
Epidemiological studies consistently fail to show a link between cancers and TCE exposure. This is significant because of the tens of thousands of exposed workers monitored.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.
Lay patient down. Keep warm and rested.
If available, administer medical oxygen by trained personnel.
If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor, without delay.

Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.
Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Immediately remove all contaminated clothing, including footwear (after rinsing with water).
Wash affected areas thoroughly with water (and soap if available).
Seek medical attention in event of irritation.

Ingestion: Contact a Poison Control Center.
Do NOT induce vomiting. Give a glass of water.
Avoid giving milk or oils.
Avoid giving alcohol.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Treat symptomatically.
Do not administer sympathomimetic drugs as they may cause ventricular arrhythmias.
Following acute or short-term continued exposures to trichloroethylene:
1.Trichloroethylene concentration in expired air correlates with exposure. 8 hours exposure to 100 ppm produces levels of 25 ppm immediately and 1 ppm 16 hours after exposures.
2.Most mild exposure respond to removal from the source and supportive care.
Serious toxicity most often results from hypoxemia or cardiac dysrhythmias so that oxygen, intubation, intravenous lines and cardiac monitoring should be started initially as the clinical situation dictates.
3.Ipecac syrup should be give to alert patients who ingest more than a minor amount and present within 2 hours.
4.The efficacy of activated charcoal and cathartics is unclear.
5.The metabolites, trichloracetic acid, trichlorethanol and to a lesser degree, chloral hydrate, may be detected in the urine up to 16 days postexposure.
BIOLOGICAL EXPOSURE INDEX - BEI
These represent the determinants observed in specimens collected from a healthy worker exposed at the Exposure Standard (ES or TLV):

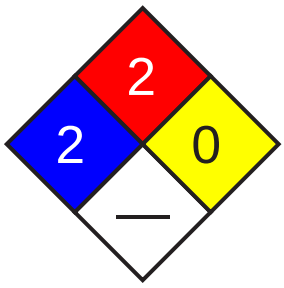
Determinant	Index	Sampling Time	Comments
Trichloroacetic acid in urine	10 mg/gm creatinine	End of work-week	NS
Trichloroacetic acid AND Trichloroethanol in urine	300 mg/mg creatinine	End of shift at end of work-week	NS
Free Trichloroethanol in blood	4 mg/L	End of shift at end of work-week	NS
Trichloroethylene in end-exhaled air			SQ
Trichloroethylene in blood			SQ

NS: Non-specific determinant; also seen after exposure to other materials
SQ: Semi-quantitative determinant - Interpretation may be ambiguous; should be used as a screening test or confirmatory test.

Section 5 - Fire-Fighting Measures

Flash Point: 32.222 °C Closed Cup
Autoignition Temperature: 420 °C
LEL: 8% v/v
UEL: 10.5% v/v
Extinguishing Media: Water spray or fog; foam, dry chemical powder, or BCF (where regulations permit).
Carbon dioxide.
General Fire Hazards/Hazardous Combustion Products: Vapor will burn when in contact with high temperature flame.
May form a flammable/explosive mixture in an oxygen enriched atmosphere. Heating may cause expansion/vaporization with violent rupture of containers. Decomposes on heating and produces corrosive fumes of hydrochloric acid, carbon monoxide and small amounts of toxic phosgene.

See DOT ERG



Fire Diamond

Fire Incompatibility: Avoid reaction with strong oxidizing agents (particularly oxygen in gas or liquid form and nitrogen dioxide), strong bases, sodium and sodium-potassium alloys. Powdered metals; magnesium, zinc and aluminum.
Contact with water may result in the slow formation of hydrochloric acid.
Attacks natural rubber.
Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.
Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways.
Use water delivered as a fine spray to control fire and cool adjacent area.
Avoid spraying water onto liquid pools.
Do not approach containers suspected to be hot.
Cool fire-exposed containers with water spray from a protected location.
If safe to do so, remove containers from path of fire.

Section 6 - Accidental Release Measures

Small Spills: Remove all ignition sources. Clean up all spills immediately.
Avoid breathing vapors and contact with skin and eyes.
Control personal contact by using protective equipment.
Contain and absorb spill with sand, earth, inert material or vermiculite.
Wipe up. Place in a suitable labeled container for waste disposal.

See DOT ERG

Large Spills: Clear area of personnel and move upwind.
Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways.
Increase ventilation.
No smoking or bare lights within area.
Stop leak if safe to do so.
Contain and absorb spill with sand, earth, inert material or vermiculite.
Collect and seal in labeled drums for disposal.
If contamination of drains or waterways occurs, advise emergency services.
After clean-up operations, decontaminate and launder all protective clothing and equipment before storing and reusing.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid all personal contact, including inhalation.
Wear protective clothing when risk of overexposure occurs.
Use in a well-ventilated area. Prevent concentration in hollows and sumps.
DO NOT enter confined spaces until atmosphere has been checked.
DO NOT allow material to contact humans, exposed food or food utensils.
Avoid smoking, bare lights or ignition sources. When handling, DO NOT eat, drink or smoke. Avoid contact with incompatible materials.
Keep containers securely sealed when not in used. Avoid physical damage to containers. Always wash hands with soap and water after handling. Working clothes should be laundered separately.
Launder contaminated clothing before reuse.
Observe manufacturer's storing/handling recommendations. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.
Recommended Storage Methods: Inhibited grades may be stored in metal drums.
DO NOT use aluminum or galvanized containers. Check that containers are clearly labeled and free from leaks.

Packaging as recommended by manufacturer.
Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Local exhaust ventilation usually required.
If risk of overexposure exists, wear NIOSH-approved respirator.
Correct fit is essential to obtain adequate protection. NIOSH-approved self contained breathing apparatus (SCBA) may be required in some situations.
Provide adequate ventilation in warehouse or closed storage area.
Personal Protective Clothing/Equipment:
Eyes: Safety glasses with side shields; chemical goggles. Full face shield.
Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.
Hands/Feet: PVA gloves. Polyethylene gloves.
Viton gloves.
PVC boots.
Respiratory Protection:
Exposure Range >100 to <1000 ppm: Supplied Air, Constant Flow/Pressure Demand, Half Mask
Exposure Range 1000 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face
Note: odor threshold unknown
Other: Overalls. Eyewash unit. Barrier cream. Skin cleansing cream.
Glove Selection Index:

PE/EVAL/PE	Best selection
PVA	Best selection
TEFLON	Best selection
VITON	Satisfactory; may degrade after 4 hours continuous immersion
VITON/NEOPRENE	Poor to dangerous choice for other than short-term immersion
VITON/NITRILE	Poor to dangerous choice for other than short-term immersion
HYPALON	Poor to dangerous choice for other than short-term immersion
NEOPRENE	Poor to dangerous choice for other than short-term immersion
PVC	Poor to dangerous choice for other than short-term immersion
NITRILE	Poor to dangerous choice for other than short-term immersion

Section 9 - Physical and Chemical Properties

Appearance/General Info: Colorless liquid with a sweetish, chloroform-like odor, miscible with most organic solvents.
Physical State: Liquid
Vapor Pressure (kPa): 7.87 at 20 °C
Vapor Density (Air=1): 4.54
Formula Weight: 131.38
Specific Gravity (H_2O=1, at 4 °C): 1.47 at 15 °C
pH: Not applicable
pH (1% Solution): Not applicable.
Boiling Point: 87 °C (189 °F)
Freezing/Melting Point: -73 °C (-99.4 °F)
Volatile Component (% Vol): 100
Water Solubility: < 1 mg/mL at 21 °C

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Decomposes in the presence of moisture to produce corrosive acid.
Product is considered stable under normal handling conditions. Hazardous polymerization will not occur.
Storage Incompatibilities: Avoid storage with strong oxidizers (particularly oxygen in gas or liquid form and nitrogen dioxide), strong bases, acetone, sodium/sodium-potassium alloys, magnesium, zinc and aluminum.
Avoid contact with water as the slow formation of hydrochloric acid results.
Attacks natural rubber.
Haloalkenes are highly reactive. Some of the more lightly substituted lower members are highly flammable; many members of the group are peroxidizable and polymerizable.

Section 11 - Toxicological Information

Toxicity

Oral (human) LD_{Lo}: 7000 mg/kg
Oral (man) TD_{Lo}: 2143 mg/kg
Oral (rat) LD_{50}: 5650 mg/kg
Inhalation (man) LC_{Lo}: 2900 ppm
Inhalation (human) TD_{Lo}: 812 mg/kg
Inhalation (human) TC_{Lo}: 6900 mg/m^3/10 m
Inhalation (man) TC_{Lo}: 2900 ppm
Inhalation (man) TC_{Lo}: 110 ppm/8h
Inhalation (man) TC_{Lo}: 160 ppm/83 m

Irritation

Skin (rabbit): 500 mg/24h - SEVERE
Eye (rabbit): 20 mg/24h - SEVERE

See *RTECS* KX 4550000, for additional data.

Section 12 - Ecological Information

Environmental Fate: No data found.

Ecotoxicity: LC_{50} Sheepshead minnow 20 mg/l/96 hr. /Conditions of bioassay not specified; LC_{50} Mexican axolotl (3-4 wk after hatching) 48 mg/l/48 hr /Conditions of bioassay not specified; LC_{50} Clawed toad (3-4 wk after hatching) 45 mg/l/48 hr /Conditions of bioassay not specified; LC_{50} Pimephales promelas (fathead minnow) 40.7 mg/l/96 hr (95% confidence limits 31.4-71.8 mg/l) /Flow-through test; EC_{10} Pimephales promelas (fathead minnow) 15.2 mg/l/24 hr; 16.9 mg/l/48 hr; 15.5 mg/l/72 hr; 13.7 mg/l/96 hr; Toxic effect for all concentrations specified: loss of equilibrium. /Flow-through bioassay; Toxicity Threshold (Cell Multiplication Inhibition Test) Scenedesmus quadricauda(green algae) >1000 mg/l /Time not specified, conditions of bioassay not specified; Toxicity Threshold (Cell Multiplication Inhibition Test) Pseudomonas putida (bacteria) 65 mg/l ; LC_{50} Grass shrimp 2 mg/l/96 hr. /Conditions of bioassay not specified

Henry's Law Constant: 1×10^{-2}

BCF: bluegill 17 to 39

Biochemical Oxygen Demand (BOD): 0%, 20 days

Octanol/Water Partition Coefficient: log K_{ow} = 2.29

Soil Sorption Partition Coefficient: K_{oc} = 2.0

Section 13 - Disposal Considerations

Disposal: Recycle wherever possible. Consult manufacturer for recycling options.
Follow applicable federal, state, and local regulations.
Reclaim solvent at an approved site.
Evaporate or incinerate residue at an approved site.
Recycle containers if possible, or dispose of in an authorized landfill.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Shipping Name and Description: Trichloroethylene
ID: UN1710
Hazard Class: 6.1 - Poisonous materials
Packing Group: III - Minor Danger
Symbols:
Label Codes: 6.1 - Poison *or* Poison Inhalation Hazard *if inhalation hazard, Zone A or B*
Special Provisions: IB3, N36, T4, TP1
Packaging: **Exceptions:** 153 **Non-bulk:** 203 **Bulk:** 241
Quantity Limitations: **Passenger aircraft/rail:** 60 L **Cargo aircraft only:** 220 L
Vessel Stowage: **Location:** A **Other:** 40

Section 15 - Regulatory Information

EPA Regulations:

RCRA 40 CFR: Listed U228 Toxic Waste

CERCLA 40 CFR 302.4: Listed per CWA Section 311(b)(4), per RCRA Section 3001, per CWA Section 307(a) 100 lb (45.35 kg)

SARA 40 CFR 372.65: Listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

Material Safety Data Sheet Collection
Genium group inc.
1171 RiverFront Center, Amsterdam, NY 12010
(518) 842-4111

Issue Date: 2005-05

Section 1 - Chemical Product and Company Identification 44/60

Material Name: Trichlorotrifluoroethane **CAS Number:** 76-13-1
Chemical Formula: $C_2Cl_3F_3$
Structural Chemical Formula: CCl_2FCClF_2
EINECS Number: 200-936-1
ACX Number: X1000036-1
Synonyms: ARCTON 63; ARKLONE P; ASAHIFRON 113; CFC-113; CHLOROFLUOROCARBON-113; CHLOROFLUOROCARBON 113; DAIFLON S 3; ETHANE,1,1,2-TRICHLORO-1,2,2-TRIFLUORO-; F 113; FC 113; FC-133,FREON 113,TRICHLOROTRIFLUOROETHANE; FLUGENE 113; FLUOROCARBON 113; FORANE 113; FREON 113TR-T; FREON 113; FREON 113 TR-T; FREON F113; FREON R 113; FREON TF; FRIGEN 113TR-N; FRIGEN 113TR-T; FRIGEN 113; FRIGEN 113 TR-T; FRIGEN 113A; FRIGEN 113TR; GENESOLV D; GENETRON 113; HALOCARBON 113; ISCEON 113; KAISER CHEMICALS 11; KALTRON 113MDR; KHLADON 113; LEDON 113; R 113; R 113 (HALOCARBON); REFRIGERANT 113; REFRIGERANT R 113; TCTFE; 1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE; 1,1,2-TRICHLOROTRIFLUOROETHANE; 1,2,2-TRICHLOROTRIFLUOROETHANE; TRICHLOROTRIFLUOROETHANE; 1,1,2-TRIFLUORO-1,2,2-TRICHLOROETHANE; 1,1,2-TRIFLUOROTRICHLOROETHANE; TRIFLUOROTRICHLOROETHANE; TTE; UCON 113; UCON FLUORCARBON 113; UCON FLUOROCARBON 113
Derivation: From perchloroethylene and hydrofluoric acid; by the reaction of perchloroethylene with a mixture of hydrogen fluoride and chlorine in the presence of a zirconium fluoride catalyst; or by catalytic fluorination of perhalo-olefins or alkanes with hydrogen fluoride.
General Use: Used as a dry-cleaning solvent and a solvent for cleaning electronic equipment and degreasing of machinery, a refrigerant, in fire extinguishers, to make chlorotrifluoroethylene, as a blowing agent and polymer intermediate, in solvent drying and drying electronic parts and precision equipment. Note: Trichlorotrifluoroethane is a Class 1 Ozone Depleting Substance and its production and use is being phased out in accordance with The Montreal Protocol on Substances that Deplete the Ozone Layer.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
Trichlorotrifluoroethane	76-13-1	ca 100% vol

Trace Impurities: 0.0005% water

OSHA PEL
TWA: 1000 ppm; 7600 mg/m^3.

OSHA PEL Vacated 1989 Limits
TWA: 1000 ppm; 7600 mg/m^3;
STEL: 1250 ppm; 9500 mg/m^3.

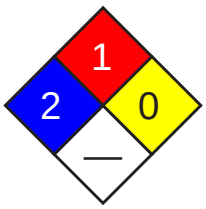
ACGIH TLV
TWA: 1000 ppm; STEL: 1250 ppm.

NIOSH REL
TWA: 1000 ppm, 7600 mg/m^3;
STEL: 1250 ppm, 9500 mg/m^3.

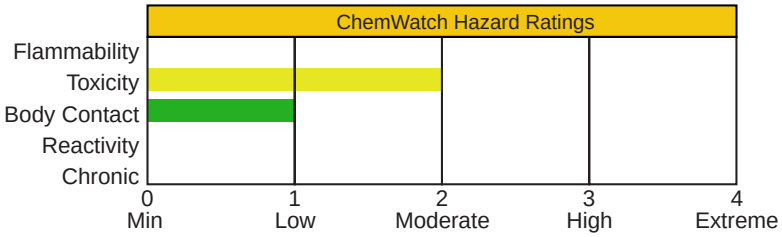
IDLH Level
2000 ppm.

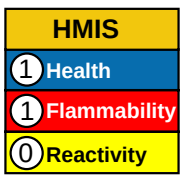
DFG (Germany) MAK
TWA: 500 ppm; PEAK: 1000 ppm.

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word

Caution

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Colorless liquid and gas above 117.9 °F (47.7 °C); ether-like odor at high concentrations. Irritating to respiratory tract. Also causes: defatting to skin, CNS depressant, cardiac (heart) sensitizer, high concentrations can cause asphyxiation.

Potential Health Effects

Target Organs: Skin, central nervous and cardiovascular (heart) systems.

Primary Entry Routes: Inhalation, skin or eye contact, and ingestion.

Acute Effects Many workers may find the PEL and TLV concentrations sufficient to cause central nervous system effects and irritation. Keep exposures to all volatile organic compounds as low as possible.

Inhalation: Eye, nose, and throat irritation, headache, dizziness, drowsiness, and inability to concentrate. The threshold concentration for impairment of psychomotor (performance is about 2500 ppm as determined by the exposure of human volunteers. High concentrations can cause shortness of breath, bronchial constriction, lung irritation, pulmonary edema (fluid in lungs), irregular heart beat, unconsciousness, and death. High concentrations can cause asphyxiation due to dilution of available oxygen in air below levels necessary to sustain life.

Eye: Irritation.

Skin: Prolonged or repeated skin contact can cause defatting, drying, irritation, and redness.

Ingestion: Transient cyanosis (dark blue or purplish coloration of the skin and mucous membrane caused by lack of oxygen in the blood), rectal irritation, and diarrhea.

Carcinogenicity: NTP - Not listed; IARC - Not listed; OSHA - Not listed; NIOSH - Not listed; ACGIH - Class A4, Not classifiable as a human carcinogen; EPA - Not listed; MAK - Not listed.

Medical Conditions Aggravated by Long-Term Exposure: Skin, respiratory (bronchopulmonary), or cardiovascular disease.

Chronic Effects: Palpitations (abnormally rapid heart beat), light headedness, defatting of the skin and dermatitis. One case of sensorimotor neuropathy (an abnormal and usually degenerative state of the nervous system involving sensory and motor skills) was reported in a laundress who worked with trichlorotrifluoroethane for several years. Weakness, pain, and paresthesias ("pins and needles" sensation) were most severe distally in the legs.

Section 4 - First Aid Measures

See DOT ERG

Inhalation: Remove exposed person to fresh air, monitor for respiratory distress, and support breathing as needed.

Eye Contact: *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of tepid water for at least 15 min. Consult an ophthalmologist immediately if pain or irritation persist.

Skin Contact: *Quickly* remove contaminated clothing. Wash exposed area with soap and water. For reddened or blistered skin, consult a physician.

Ingestion: Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center. Unless the poison control center advises otherwise, have the *conscious and alert* person drink 1 to 2 glasses of water, then induce vomiting. Because trichlorotrifluoroethane has a low potential for oral toxicity, inducing vomiting is recommended only in cases of large oral ingestion.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Dilantin improves atrio-ventricular conduction and may be useful in management of ventricular arrhythmias. Beta-blocking agents may also be useful.

Special Precautions/Procedures: *Do not* administer epinephrine or other sympathomimetic amines and adrenergic activators because they will further sensitize the heart to development of arrhythmias. Cardiopulmonary resuscitation may be necessary. Carefully monitor EKG, vital signs, and arterial blood gases. Minimize physical exertion and provide a quiet, calm atmosphere.

Section 5 - Fire-Fighting Measures

See DOT ERG

Flash Point: None reported.

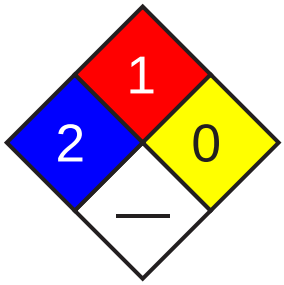
LEL: None reported.

UEL: None reported.

Extinguishing Media: Use agents suitable for type of surrounding fire since trichlorotrifluoroethane burns with difficulty.

General Fire Hazards/Hazardous Combustion Products: Hydrogen fluoride, hydrogen chloride, phosgene, carbonyl fluoride, and chloride and fluoride gases. High concentrations may tend to accumulate in low-lying areas. Very high concentrations can dilute available oxygen in the air below levels necessary to sustain life.

Fire-Fighting Instructions: Use water spray to cool fire-exposed containers. Apply water from as far a distance as possible. Do not release runoff from fire control methods to sewers or waterways. Because fire may produce toxic thermal decomposition products,



Fire Diamond

wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode.

Section 6 - Accidental Release Measures

Spill/Leak Procedures: Notify safety personnel, evacuate all unnecessary personnel, remove all heat and ignition sources, and ventilate area. Cleanup personnel should protect against vapor inhalation and skin or eye contact.

See DOT ERG

Small Spills: Collect for reclamation or absorb in vermiculite, dry sand, earth, or similar noncombustible absorbent material.

Large Spills: For large spills, dike far ahead of liquid spill for later disposal. Do not release into sewers or waterways.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid vapor inhalation. Products of thermal decomposition can form halogen acids that have very sharp, irritating effects and can be detected by odor. Such odor is a hazard warning; when detected, immediately evacuate and ventilate area.

Never eat, drink, or smoke in work areas. Practice good personal hygiene after using trichlorotrifluoroethane, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Recommended Storage Methods: Store in a cool, well-ventilated area away from heat and ignition sources and incompatibles (Sec. 10). Protect containers against physical damage.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Where feasible, enclose all processes to keep airborne concentrations at a minimum. Isolate reaction vessels and properly design and operate filling heads for packaging and shipping. Provide general or local exhaust ventilation systems to maintain airborne concentrations as low as practically achievable (Sec. 2). Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.

Administrative Controls: Consider preplacement and periodic medical examinations with emphasis on the skin and cardiovascular system. Monitor work areas for oxygen levels and halocarbons.

Personal Protective Clothing/Equipment: Wear chemically protective gloves, boots, aprons, and gauntlets to prevent prolonged or repeated skin contact. Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Contact lenses are not eye protective devices. Appropriate eye protection must be worn instead of, or in conjunction with contact lenses.

Respiratory Protection: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. Select respirator based on its suitability to provide adequate worker protection for given working conditions, level of airborne contamination, and presence of sufficient oxygen. For concentrations <= 2000 ppm, use a supplied-air respirator or a SCBA. For emergency or planned entry into unknown concentrations or IDLH conditions, wear any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode; or any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary SCBA operated in pressure- demand or other positive-pressure mode. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas.

Other: Separate contaminated work clothes from street clothes. Launder before reuse. Remove trichlorotrifluoroethane from your shoes and clean personal protective equipment. Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work area.

Section 9 - Physical and Chemical Properties

Appearance/General Info: Colorless; little odor in low concentrations; at high concentrations, the odor is ether-like and similar to carbon tetrachloride.

Physical State: Liquid; a gas above 117.9 °F (47.7 °C)

Odor Threshold: Detection: 45 ppm; recognition: 68 ppm

Vapor Pressure (kPa): 284 mm Hg at 68 °F (20 °C); 363.6 mm Hg at 77 °F (25 °C)

Formula Weight: 187.38

Specific Gravity (H_2O=1, at 4 °C): 1.5635 at 77 °F (25 °C)

Refractive Index: 1.3557 at 25 °C

Boiling Point: 117.9 °F (47.7 °C) at 760 mm Hg

Freezing/Melting Point: -33.5 °F (-36.4 °C)

Viscosity: 0.68 cP at 77 °F (25 °C) (liquid); 0.010 cP at 10 kPa (vapor)

Surface Tension: 17.3 dyne/cm

Ionization Potential (eV): 11.99 eV

Critical Temperature: 417.4 °F (214.1 °C)

Critical Pressure: 33.7 atm **Other Solubilities:** Alcohol, ether, benzene
Water Solubility: 0.017 g/100 g water at 68 °F (20 °C)

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Trichlorotrifluoroethane is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur. Avoid incompatibles and heat and ignition sources.

Storage Incompatibilities: Calcium, powdered aluminum, zinc, magnesium, beryllium, magnesium alloys >2% of magnesium, granular barium, lithium shavings, powdered titanium, samarium, sodium-potassium alloy, and acids (evolve highly toxic chloride fumes). Trichlorotrifluoroethane also attacks some forms of plastics, rubber, and coatings.

Hazardous Decomposition Products: Thermal oxidative decomposition of trichlorotrifluoroethane can produce hydrogen fluoride, hydrogen chloride, phosgene, carbonyl fluoride, and chloride and fluoride gases.

Section 11 - Toxicological Information

Acute Oral Effects:

Rat, oral, LD_{50}: 43 g/kg caused general depressed activity, gastrointestinal changes, and changes involving skin and appendages-hair.

Acute Inhalation Effects:

Rat, inhalation, LC_{Lo}: 87000 ppm/6 hr caused general depressed activity, convulsions or effect on seizure threshold, and acute pulmonary edema.

Irritation Effects:

Rabbit: 500 mg/24 hr caused mild irritation.

Other Effects:

Rat, inhalation: 20 pph/6 hr/2 yr (intermittent) caused kidney, ureter, and bladder changes (changes in urine composition) and decreased weight gain.

See *RTECS* KJ4000000, for additional data.

Section 12 - Ecological Information

Environmental Fate: If released on soil, trichlorotrifluoroethane rapidly volatilizes from soil surfaces or leaches through soil, possibly into groundwater. If released in water, essentially all of trichlorotrifluoroethane is expected to be lost by volatilization (half-life 4 hr from a model river). Chemical hydrolysis and bioaccumulation are not expected to be significant fate processes in water. If released to the atmosphere, it will not degrade in the troposphere and diffuses to the stratosphere (lifetime ranges between 63 and 122 yr). In the stratosphere, trichlorotrifluoroethane slowly photolyzes to release chlorine atoms which in turn participates in the catalytic removal of stratospheric ozone. K_{oc} values of 191 and 259 (estimated) suggest moderate mobility in soil and moderate adsorption to suspended solids and sediment in water.

Ecotoxicity: Aquatic Toxicity: Flat head minnow, LC_{50}: 1250 ppm/96 hr. Trichlorotrifluoroethane will not bioaccumulate significantly in aquatic organisms.

Henry's Law Constant: 0.53 atm-cu m/mole

Octanol/Water Partition Coefficient: log K_{ow} = 1.66

Section 13 - Disposal Considerations

Disposal: Trichlorotrifluoroethane is a potential candidate for liquid injection, rotary kiln, or fluidized bed incineration. Exercise care to assure complete combustion to prevent the formation of phosgene. An acid scrubber is necessary to remove the haloacids produced. Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Shipping Name and Description: Environmentally hazardous substances, liquid, n.o.s.
ID: UN3082
Hazard Class: 9 - Miscellaneous hazardous material
Packing Group: III - Minor Danger
Symbols: G - Technical Name Required
Label Codes: 9 - Class 9
Special Provisions: 8, 146, IB3, T4, TP1, TP29
Packaging: **Exceptions:** 155 **Non-bulk:** 203 **Bulk:** 241
Quantity Limitations: **Passenger aircraft/rail:** No limit **Cargo aircraft only:** No limit
Vessel Stowage: **Location:** A **Other:**

Section 15 - Regulatory Information

EPA Regulations:

RCRA 40 CFR: Not listed
CERCLA 40 CFR 302.4: Listed 5000 lb (2268 kg)
SARA 40 CFR 372.65: Listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

Material Safety Data Sheet Collection
Genium group inc.
1171 RiverFront Center, Amsterdam, NY 12010
(518) 842-4111

Issue Date: 2005-05

1,2,4-Trimethyl Benzene
TRI6340

Section 1 - Chemical Product and Company Identification 55/60

Material Name: 1,2,4-Trimethyl Benzene **CAS Number:** 95-63-6
Chemical Formula: C_9H_{12}
Structural Chemical Formula: $C_6H_3(CH_3)_3$
EINECS Number: 202-436-9
ACX Number: X1004033-6
Synonyms: ASSYMETRICAL TRIMETHYLBENZENE; ASYMMETRICAL TRIMETHYLBENZENE; BENZENE,1,2,4-TRIMETHYL-; BENZENE,1,2,5-TRIMETHYL-; PSEUDOCUMENE; PSEUDOCUMOL; PSI-CUMENE; 1,2,4-TRIMETHYL BENZENE; 1,2,4-TRIMETHYLBENZENE; 1,2,5-TRIMETHYLBENZENE; 1,3,4-TRIMETHYLBENZENE; AS-TRIMETHYLBENZENE; UNS-TRIMETHYLBENZENE
General Use: mfr of dyes, perfumes & resins; mfr of trimellitic anhydride, dyes, pharmaceuticals & pseudocumidine; chem int for pyromellitic dianhydride; comonomer for pseudocumene-formaldehyde resins; solvent & paint thinner

Section 2 - Composition / Information on Ingredients

Name	CAS	%
1,2,4-trimethyl benzene	95-63-6	>99

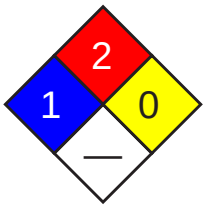
OSHA PEL

NIOSH REL
TWA: 25 ppm, 125 mg/m^3.

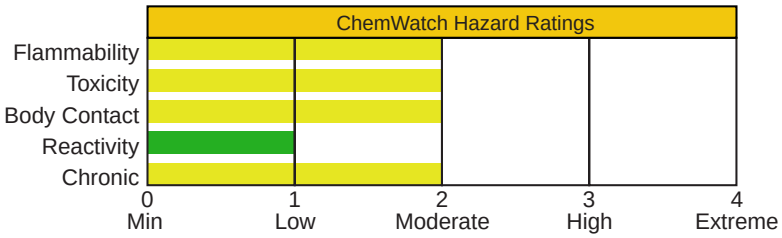
OSHA PEL Vacated 1989 Limits
TWA: 25 ppm; 125 mg/m^3

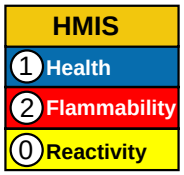
ACGIH TLV

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word
Warning!


Flammable

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Clear, colorless liquid; distinctive, aromatic odor. Irritating. Harmful. Other Acute Effects: dermatitis, nausea, dizziness, headache, narcotic effects. Flammable.

Potential Health Effects

Target Organs: eyes, skin, respiratory system, nervous system
Primary Entry Routes: accidental skin and eye contact, inhalation of vapors especially at higher temperatures

Acute Effects

Inhalation: The vapor is discomforting to the upper respiratory tract and may be regarded as harmful. Inhalation hazard is increased at higher temperatures. Acute effects from inhalation of high concentrations of vapor are pulmonary irritation, including coughing, with nausea; central nervous system depression - characterized by headache and dizziness, increased reaction time, fatigue and loss of coordination. A significant number of individuals exposed to mixed trimethylbenzenes complained of nervousness, tension, anxiety and asthmatic bronchitis. Peripheral blood showed a tendency to hypochromic anemia and a deviation from normal in coagulability of the blood. Hydrocarbon concentrations ranged from 10 to 60 ppm. Contamination of the mixture with benzene may have been responsible for the blood dyscrasias. Central nervous system (CNS) depression may include nonspecific discomfort, symptoms of giddiness, headache, dizziness, nausea, anesthetic effects, slowed reaction time, slurred speech and may progress to unconsciousness. Serious poisonings may result in respiratory depression and may be fatal.

Eye: The liquid is discomforting to the eyes. The liquid is mildly discomforting to the eyes.

Skin: The liquid is mildly discomforting and it is absorbed to the skin. Toxic effects may result from skin absorption. The liquid is capable of causing skin reactions that may lead to dermatitis from repeated exposures over long periods. The vapor and liquid may be absorbed by intact skin.

Ingestion: The liquid is discomforting and is harmful if swallowed. Ingestion may result in nausea, pain, vomiting. Vomit entering the lungs by aspiration may cause potentially lethal chemical pneumonitis. Considered an unlikely route of entry in commercial/industrial environments.

Carcinogenicity: NTP - Not listed; IARC - Not listed; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Not listed; MAK - Not listed.

Chronic Effects: Prolonged or continuous skin contact with the liquid may cause defatting with drying, cracking, irritation and dermatitis following. Chronic solvent inhalation exposures may result in nervous system impairment and liver and blood changes.

Section 4 - First Aid Measures

Inhalation: • If fumes or combustion products are inhaled, remove to fresh air.
• Lay patient down. Keep warm and rested.
• If breathing is shallow or has stopped, ensure clear airway and apply resuscitation, preferably with a demand valve resuscitator, bag-valve mask device, or pocket mask as trained. Perform CPR if necessary.
• Transport to hospital or doctor.

Eye Contact: • Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water.
• Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids.
• Transport to hospital or doctor without delay.
• Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: • Immediately remove all contaminated clothing, including footwear (after rinsing with water).
• Wash affected areas thoroughly with water (and soap if available).
• Seek medical attention in event of irritation.

Ingestion: Contact a Poison Control Center. Do NOT induce vomiting. Give a glass of water.

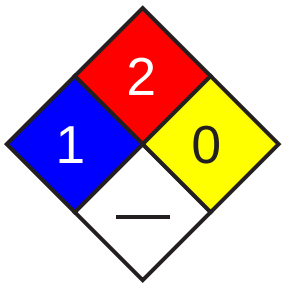
After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: For acute or short-term repeated exposures to petroleum distillates or related hydrocarbons:
• Primary threat to life, from pure petroleum distillate ingestion and/or inhalation, is respiratory failure.
• Patients should be quickly evaluated for signs of respiratory distress (e.g. cyanosis, tachypnea, intercostal retraction, obtundation) and given oxygen. Patients with inadequate tidal volumes or poor arterial blood gases (pO_2 <50 mm Hg or pCO_2 >50 mm Hg) should be intubated.
• Arrhythmias complicate some hydrocarbon ingestion and/or inhalation and electrocardiographic evidence of myocardial injury has been reported; intravenous lines and cardiac monitors should be established in obviously symptomatic patients. The lungs excrete inhaled solvents, so that hyperventilation improves clearance
• A chest x-ray should be taken immediately after stabilization of breathing and circulation to document aspiration and detect the presence of pneumothorax.
• Epinephrine (adrenalin) is not recommended for treatment of bronchospasm because of potential myocardial sensitization to catecholamines. Inhaled cardioselective bronchodilators (e.g. Alupent, Salbutamol) are the preferred agents, with aminophylline a second choice.
• Lavage is indicated in patients who require decontamination; ensure use of cuffed endotracheal tube in adult patients. In acute poisonings by essential oils the stomach should be emptied by aspiration and lavage. Give a saline purgative such as sodium sulfate (30 g in 250 mL water) unless catharsis is already present. Demulcent drinks may also be given. Large volumes of fluid should be given provided renal function is adequate.

Section 5 - Fire-Fighting Measures

Flash Point: 44 °C Closed Cup
Autoignition Temperature: 500 °C
LEL: 0.9% v/v
UEL: 6.4% v/v
Extinguishing Media: Foam. Dry chemical powder. BCF (where regulations permit). Carbon dioxide. Water spray or fog - Large fires only.
General Fire Hazards/Hazardous Combustion Products: • Liquid and vapor are flammable.
• Moderate fire hazard when exposed to heat or flame.
• Vapor forms an explosive mixture with air.
• Moderate explosion hazard when exposed to heat or flame.
• Vapor may travel a considerable distance to source of ignition.
• Heating may cause expansion or decomposition leading to violent rupture of containers.
• On combustion, may emit toxic fumes of carbon monoxide (CO). May emit clouds of acrid smoke.
Fire Incompatibility: Avoid contamination with oxidizing agents i.e., nitrates, oxidizing acids, chlorine bleaches, pool chlorine etc. as ignition may result.
Fire-Fighting Instructions: • Contact fire department and tell them location and nature of hazard.
• May be violently or explosively reactive.
• Wear breathing apparatus plus protective gloves.
• Prevent, by any means available, spillage from entering drains or waterways.
• If safe, switch off electrical equipment until vapor fire hazard removed.
• Use water delivered as a fine spray to control fire and cool adjacent area.
• Avoid spraying water onto liquid pools.
• Do not approach containers suspected to be hot.
• Cool fire-exposed containers with water spray from a protected location.
• If safe to do so, remove containers from path of fire.

See DOT ERG



Fire Diamond

Section 6 - Accidental Release Measures

Small Spills: • Remove all ignition sources.
• Clean up all spills immediately.
• Avoid breathing vapors and contact with skin and eyes.
• Control personal contact by using protective equipment.
• Contain and absorb small quantities with vermiculite or other absorbent material.
• Wipe up.
• Collect residues in a flammable waste container.
Large Spills: • Clear area of personnel and move upwind.
• Contact fire department and tell them location and nature of hazard.
• May be violently or explosively reactive.
• Wear breathing apparatus plus protective gloves.
• Prevent, by any means available, spillage from entering drains or waterways.
• No smoking, bare lights or ignition sources.
• Increase ventilation.
• Stop leak if safe to do so.
• Water spray or fog may be used to disperse/absorb vapor.
• Contain spill with sand, earth or vermiculite.
• Use only spark-free shovels and explosion proof equipment.
• Collect recoverable product into labeled containers for recycling.
• Absorb remaining product with sand, earth or vermiculite.
• Collect solid residues and seal in labeled drums for disposal.
• Wash area and prevent runoff into drains.
• If contamination of drains or waterways occurs, advise emergency services.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

See DOT ERG

Section 7 - Handling and Storage

Handling Precautions: • Avoid all personal contact, including inhalation.
• Wear protective clothing when risk of overexposure occurs.
• Use in a well-ventilated area.
• Prevent concentration in hollows and sumps.
• DO NOT enter confined spaces until atmosphere has been checked.
• Avoid smoking, bare lights or ignition sources.
• Avoid generation of static electricity.

- Do not use plastic buckets.
- Ground all lines and equipment.
- Use spark-free tools when handling.
- Avoid contact with incompatible materials.
- When handling, DO NOT eat, drink or smoke.
- Keep containers securely sealed when not in use.
- Avoid physical damage to containers.
- Always wash hands with soap and water after handling.
- Work clothes should be laundered separately.
- Follow good occupational work practices.
- Observe manufacturer's storage and handling recommendations.
- Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions.

Recommended Storage Methods: Metal can. Metal drum. Metal safety cans. Plastic containers may only be used if approved for flammable liquid. Check that containers are clearly labeled and free from leaks.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: General exhaust is adequate under normal operating conditions. Local exhaust ventilation may be required in special circumstances. If risk of overexposure exists, wear NIOSH-approved respirator. Provide adequate ventilation in warehouses and enclosed storage areas.

Personal Protective Clothing/Equipment:

Eyes: Safety glasses with side shields or, as required, chemical goggles. Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: Wear chemical protective gloves, e.g. PVC. Wear safety footwear.

Respiratory Protection: Respirator protection may be required. Consult your supervisor.

Other:
- Overalls.
- P.V.C. apron.
- Barrier cream.
- Skin cleansing cream.
- Eye wash unit.

Section 9 - Physical and Chemical Properties

Appearance/General Info: Colorless flammable liquid with an aromatic odor. Soluble in alcohol, ether, acetone, benzene.

Physical State: clear, colorless liquid

Vapor Pressure (kPa): 2.1 mm Hg at 25 °C

Vapor Density (Air=1): 4.15

Formula Weight: 120.2

Specific Gravity (H_2O=1, at 4 °C): 0.8761 at 20 °C/4 °C

Boiling Point: 168.89 °C (336 °F)

Freezing/Melting Point: -43.8 °C (-46.84 °F)

Volatile Component (% Vol): 100

Water Solubility: Practically Insoluble in Water

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Product is considered stable. Hazardous polymerization will not occur.

Storage Incompatibilities: Avoid storage with oxidizers.

Section 11 - Toxicological Information

Toxicity

Inhalation (rat) LC_{50}: 18000 mg/m^3/4 hr

Irritation

Nil reported

See *RTECS* DC3325000, for additional data.

Section 12 - Ecological Information

Environmental Fate: If released to the atmosphere, it will exist solely in the vapor phase in the ambient atmosphere, based on a measured vapor pressure of 2.1 mm Hg at 25 °C. Vapor-phase is degraded in the atmosphere by reaction with photochemically-produced hydroxyl radicals and nitrate radicals with half-lives of about 12 hours and 6-30 days, respectively. An estimated K_{oc} value of 720 suggests it will have low mobility in soil. Volatilization from moist and dry soil surfaces should occur based on a measured Henry's Law constant of 6.16 $x10^{-3}$ atm-cu m/mole and the vapor pressure of this compound, respectively. It is expected to aerobically biodegrade in both soil and water, although it may be toxic to microbial populations at high concentrations. In aerobic aquifer microcosms, 1.2 mg/l was completely biodegraded within 8 days. Anaerobic aquifer microcosms did not show significant biodegradation in comparison to poisoned controls. In water, it may adsorb to sediment or particulate matter based on its K_{oc} value. This compound should volatilize from water surfaces given its Henry's Law constant. Estimated half-lives for a model river and model lake are 3 hours and 4 days, respectively. Adsorption to sediment and particulate matter may attenuate this process. Bioconcentration in aquatic organisms should be moderate not high to high based on BCF values of 31-275, measured in carp. It should photodegrade in natural waters with 81 and 100% degradation reported for pond water and artificial seawater, respectively, following exposure to sunlight for 21 days.

Ecotoxicity: LC_{50} Pimephales promelas (fathead minnow) 7.72 mg/l/96 hr (confidence limit 7.19 - 8.28 mg/l), flow-through bioassay with measured concentrations, 25.0 °C, dissolved oxygen 7.3 mg/l, hardness 44.9 mg/l calcium carbonate, alkalinity 41.6 mg/l calcium carbonate, and pH 7.24

Henry's Law Constant: 6.16 $x10^{-3}$

BCF: carp 33 to 275

Octanol/Water Partition Coefficient: log K_{ow} = 3.78

Soil Sorption Partition Coefficient: K_{oc} = 720

Section 13 - Disposal Considerations

Disposal: • Consult manufacturer for recycling options and recycle where possible.
• Follow applicable local, state, and federal regulations.
• Incinerate residue at an approved site.
• Recycle containers if possible, or dispose of in an authorized landfill.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Shipping Name and Description: 1,3,5-Trimethylbenzene
ID: UN2325
Hazard Class: 3 - Flammable and combustible liquid
Packing Group: III - Minor Danger
Symbols:
Label Codes: 3 - Flammable Liquid
Special Provisions: B1, IB3, T2, TP1
Packaging: **Exceptions:** None **Non-bulk:** 203 **Bulk:** 242
Quantity Limitations: **Passenger aircraft/rail:** 60 L **Cargo aircraft only:** 220 L
Vessel Stowage: **Location:** A **Other:**

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Not listed
CERCLA 40 CFR 302.4: Not listed
SARA 40 CFR 372.65: Listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

MATERIAL SAFETY DATA SHEET

MSDS Number
APP-9-212
Effective Date: 4/12/2005

AccuStandard®
125 Market Street • New Haven, CT USA 06513
Phone: (203) 786-5290 • Fax: (203) 786-5287

Emergency Phone Number
203-786-5290
Mon. to Fri. 8am-5pm EDT

Product Number : APP-9-212

Product Name : Vinyl chloride

Synonyms : N/A

Formula : N/A **Molecular Weight :** N/A

Section 2 - Composition / Information on Ingredients

Component(s) (2)	CAS #	Appr. %	ACGIH TLV TWA mg/m3	ACGIH TLV SKIN	OSHA PEL TWA mg/m3	OSHA PEL SKIN
Vinyl chloride	75-01-4	0.01%	2.5			
Methanol	67-56-1	99.99%	262	x	260	

Section 3 - Hazards Identification

Symptoms of Exposure:

Over exposure may cause dizziness, nausea, muscle weakness, narcosis and respiratory failure.

Irritating to eyes, skin, mucous membranes and upper respiratory system.

After ingestion or inhalation, initial symptoms may be only that of mild intoxication, but may become severe after 12 or 18 hours.

Potential Health Effects:

Toxic if inhaled, absorbed through skin, or swallowed.

May cause eye, kidney, liver, and skin damage.

May cause central nervous system, kidney, and liver damage.

Poison, May be fatal or cause blindness if swallowed.

Fetal development abnormalities and effects on embryo or fetus have been reported from prolonged exposure to methanol in laboratory tests involving pregnant rats.

Routes of Entry:

Inhalation, ingestion or skin contact.

Carcinogenicity:

Notification of carcinogenic ingredients in quantity less than 0.1% is not required under Federal Hazard Communication Law.

Contains component(s) which are cancer hazard(s) in quantities less than 0.1%.

Section 4 - First Aid Measures

First Aid Procedures:

Get medical assistance for all cases of overexposure.

Skin contact: Immediately flush thoroughly with large amounts of water.

Eye contact: Immediately flush thoroughly with water for at least 15 minutes. Assure adequate flushing by separating the eyelids with fingers.

Inhalation: Remove to fresh air; give artificial respiration if breathing has stopped. Contact a physician

Ingestion: If conscious, drink water and induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person.

Remove contaminated clothing and wash before reuse.

Section 5 - Fire Fighting Measures

Fire fighting measures for the Solvent

Flammable Properties:

Flash Point (°F):	52 °F (11 °C) (tcc)
Flammable Limits LEL (%):	6.7
Flammable Limits UEL (%):	36.5
Autoignition Temperature:	385 °C

Dangerous fire and explosive hazard.

Closed containers may explode upon heating.

Vapors can travel to a source of ignition and flash back.

Thermal decomposition produces toxic fumes.

Extinguishing Media:

Use water spray, dry chemical, CO2, or "alcohol" foam.

Protection of Firefighters:

Wear self-contained breathing apparatus and protective clothing.

Section 6 - Accidental Release Measures

Spill Response:

Wear suitable protective equipment listed under Exposure Controls / Personal Protection. Eliminate any ignition sources until the area is determined to be free from explosion or fire hazards. Contain the release and eliminate its source, if this can be done without risk. Dispose as hazardous waste. Comply with Federal, State and local regulations.

Section 7 - Handling and Storage

Keep container closed.

Store in a cool area away from ignition sources and oxidizers.

Do not breath vapor or mist.

Do not get in eyes, on skin, or on clothing.

This product should only by used by persons trained in the safe handling of hazardous chemicals.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls and Personal Protection Equipment (PPE):

Respiratory Protection: If workplace exposure limit(s) of product or any component is exceeded (see TLV/PEL), a NIOSH/MSHA approved air supplied respirator is advised in absence of proper environmental control. OSHA regulations also permit other NIOSH/MSHA respirators (negative pressure type) under specified conditions (see your safety equipment supplier). Engineering and/or administrative controls should be implemented to reduce exposure.

Material should be handled or transferred in an approved fume hood or with adequate ventilation.

Protective gloves must be worn to prevent skin contact.

(Butyl Rubber, Viton or equivalent)

Safety glasses with side shields must be worn at all times.

General Hygiene Considerations:

Wash thoroughly after handling. Do not take internally. Eye wash and safety equipment should be readily available.

Section 9 - Physical and Chemical Properties

Physical and chemical properties for the Solvent

Appearance: Clear liquid

Odor: N/A

Boiling Point: 65 °C

Melting Point: -93.9 °C

pH: N/A

Specific Gravity (Water = 1): 0.791 g/cm3

Vapor Pressure: 97 mmHg (20 °C)

Vapor Density (Air = 1): 1.1 g/L

Percent Volatile (by volume): 99.9+

Evaporation Rate (Butyl acetate = 1): 5.9

Flash Point: 52 °F (11 °C) (tcc)

Explosion Limits (%): 6.7 to 36.5

Solubility in water (%):

Section 10 - Stability and Reactivity

Stability and reactivity for the Solvent

Stability: Stable

Materials to Avoid: Acids
Oxidizers

Alkali metals; Reducing agents

Hazardous Decomposition: Carbon oxides; Formaldehyde

Hazardous Polymerization: Does not occur

Conditions to Avoid: Heat; Contact with ignition sources

Section 11 - Toxicological Information

See section 3 for specific toxicological information for the ingredients of this product.

Section 12 - Ecological Information

By complying with sections 6 and 7 there will be no release to the environment.

Section 13 - Disposal Considerations

Recycle or incinerate at any EPA approved facility or dispose in compliance with Federal, State and local regulations. Empty containers must be triple-rinsed prior to disposal.

Section 14 - Transport Information

DOT UN Number: UN1230 Shipping Class: 3 Packing Group: II FLAMMABLE

Section 15 - Regulatory Information

In addition to Federal and state regulations, local regulations may apply. Check with your local regulatory authorities.

The following regulations apply:

WARNING: This product contains chemicals known to the state of California to cause cancer, birth defects or other reproductive harm.

Section 16 - Other Information

This document has been designed to meet the requirements of OSHA, ANSI and CHIPs regulations.

The statements contained herein are offered for informational purposes only and are based on technical data that we believe to be accurate. It is intended for use only by persons having the necessary technical skill and at their own discretion and risk. Since conditions and manner of use are outside our control, we make NO WARRANTY, EXPRESS OR IMPLIED, OF MERCHANTABILITY, FITNESS OR OTHERWISE.

Legend : N/A = Not Available ND = Not Determined NR = Not regulated

Material Safety Data Sheet Collection
Genium group inc.
1171 RiverFront Center, Amsterdam, NY 12010
(518) 842-4111

Issue Date: 2005-05

Vinylidene Chloride
DIC4450

Section 1 - Chemical Product and Company Identification 54/60

Material Name: Vinylidene Chloride **CAS Number:** 75-35-4
Chemical Formula: $C_2H_2Cl_2$
Structural Chemical Formula: $H_2C=CCl_2$
EINECS Number: 200-864-0
ACX Number: X1003497-6
Synonyms: 1,1-DICHLOROETHYLENE; ASYM-DICHLOROETHYLENE; CHLORURE DE VINYLIDENE; 1,1-DCE; 1,1-DICHLOROETHENE; 1,1-DICHLOROETHENE (9CI); AS-DICHLOROETHYLENE; ETHENE,1,1-DICHLORO-; ETHYLENE,1,1-DICHLORO-; SCONATEX; VDC; VINYLIDENE CHLORIDE; VINYLIDENE CHLORIDE (II); VINYLIDENE CHLORIDE (INHIBITED); VINYLIDENE CHLORIDE MONOMER; VINYLIDENE CHLORIDE(II); VINYLIDENE CHLORIDE,INHIBITED; VINYLIDENE CHLORIDE,MONOMER; VINYLIDENE DICHLORIDE; VINYLIDINE CHLORIDE
General Use: Reactive monomer in manufacture of vinylidene polymer plastics and copolymers.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
vinylidene chloride	75-35-4	>98

OSHA PEL

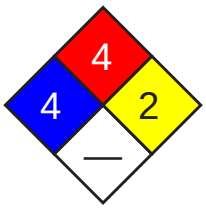
NIOSH REL

DFG (Germany) MAK
TWA: 2 ppm; PEAK: 4 ppm.

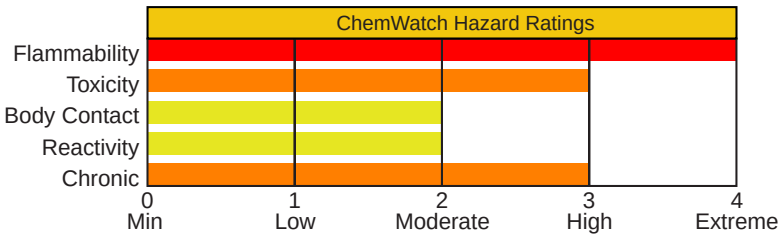
OSHA PEL Vacated 1989 Limits
TWA: 1 ppm; 4 mg/m^3.

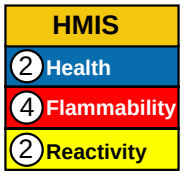
ACGIH TLV
TWA: 5 ppm.

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word

Danger!


Flammable

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Colorless liquid; sweet odor. Irritating. Other Acute Effects: narcosis, drunkenness, unconsciousness, conjunctivitis, transient corneal injury, iritis. Chronic Effects: hepatic/renal dysfunction. Flammable.

Potential Health Effects

Target Organs: skin, eyes, central nervous system (CNS), liver, kidneys
Primary Entry Routes: inhalation
Acute Effects

Inhalation: Depression of the central nervous system is the most outstanding effect of most halogenated aliphatic hydrocarbons. Inebriation and excitation, passing into narcosis, is a typical reaction. In severe acute exposures there is always a danger of death from respiratory failure or cardiac arrest due to a tendency to make the heart more susceptible to catecholamines (adrenalin).
Vapor concentrations of 400 ppm are said to induce symptoms of drunkenness leading to unconsciousness.
Extensive hemorrhagic centrolobular liver necrosis was seen in rats 6 hours after a 4-hour exposure to 200 ppm.

Eye: The liquid is highly discomforting to the eyes and is capable of causing pain and severe conjunctivitis.

Corneal injury may develop, with possible permanent impairment of vision, if not promptly and adequately treated.
The vapor when concentrated has pronounced eye irritation; this gives some warning of high vapor concentrations. If eye irritation occurs seek to reduce exposure with available control measures, or evacuate area.

Skin: The liquid may produce skin discomfort following prolonged contact.
Defatting and/or drying of the skin may lead to dermatitis.

Ingestion: Considered an unlikely route of entry in commercial/industrial environments.
The liquid is highly discomforting to the gastrointestinal tract and toxic if swallowed.
Ingestion may result in nausea, pain, vomiting. Vomit entering the lungs by aspiration may cause potentially lethal chemical pneumonitis.
A single oral dose of 500 mg/kg elicited extensive liver enzyme changes.
Acute intoxication by halogenated aliphatic hydrocarbons appears to take place over two stages. Signs of a reversible narcosis are evident in the first stage and in the second stage signs of injury to organs may become evident, a single organ alone is (almost) never involved.

Carcinogenicity: NTP - Not listed; IARC - Group 3, Not classifiable as to carcinogenicity to humans; OSHA - Not listed; NIOSH - Listed as carcinogen; ACGIH - Class A3, Animal carcinogen; EPA - Class C, Possible human carcinogen; MAK - Class B, Justifiably suspected of having carcinogenic potential.

Chronic Effects: The material may accumulate in the human body and progressively cause tissue damage.
Chronic solvent inhalation exposures may result in nervous system impairment and liver and blood changes.
Vinylidene chloride is toxic to the liver and kidneys. After exposure to 48 ppm continuously for 90 days, liver damage was evident in rats and deaths occurred among monkeys and guinea pigs. In this study only rats showed evidence of renal (kidney) tubular injury.
It is proposed that vinylidene chloride may undergo microsomal oxidation to produce oxiranes. These are highly reactive and covalently bind to nucleic acids producing mutations and possibly cancers. The monohalogenated alkenes are thought be more carcinogenic than their dihalogenated counterparts.

Section 4 - First Aid Measures

See DOT ERG

Inhalation: Remove to fresh air.
Lay patient down. Keep warm and rested.
If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor.

Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.
Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Immediately remove all contaminated clothing, including footwear (after rinsing with water).
Wash affected areas thoroughly with water (and soap if available).
Seek medical attention in event of irritation.

Ingestion: Contact a Poison Control Center.
Do NOT induce vomiting. Give a glass of water.
Avoid giving milk or oils.
Avoid giving alcohol.

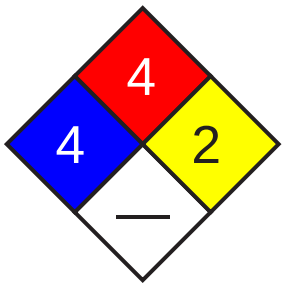
After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Treatment that is employed in carbon tetrachloride exposures follows:
1.Acute exposures to carbon tetrachloride present, initially, with CNS depression followed by hepatic and renal disfunction.
2.Respiratory depression and cardiac dysrhythmias are an immediate threat to life.
3.Since a major fraction of absorbed carbon tetrachloride is exhaled in first hour, good tidal volumes should be maintained in severely poisoned patients; hyperventilation may be an additional therapeutic modality.
4.Ipecac syrup, lavage, activated charcoal or catharsis may all be used in the first 4 hours.
5.Since reactive metabolites may cause hepatorenal toxicity, administration of N-acetyl-L-cysteine may reduce complications.
Experience with this therapy is limited.

Section 5 - Fire-Fighting Measures

Flash Point: -16.111 °C Open Cup
Autoignition Temperature: 570 °C
LEL: 7.3% v/v
UEL: 16% v/v
Extinguishing Media: Foam, dry chemical powder, BCF (where regulations permit), carbon dioxide.
Water spray or fog - Large fires only.
General Fire Hazards/Hazardous Combustion Products: Liquid and vapor are highly flammable.
Severe fire hazard when exposed to heat, flame and/or oxidizers.
Vapor forms an explosive mixture with air.
Severe explosion hazard, in the form of vapor, when exposed to flame or spark. Vapor may travel a considerable distance to source of ignition.
Heating may cause expansion/decomposition with violent rupture of containers.
On combustion, may emit toxic fumes of carbon monoxide (CO). Other combustion products include hydrogen chloride and phosgene.
Fire Incompatibility: Avoid any contamination of this material as it is very reactive and any contamination is potentially hazardous. Avoid contamination with oxidizing agents i.e. nitrates, oxidizing acids, chlorine bleaches, pool chlorine etc. as ignition may result.
Polymerization may occur at elevated temperatures.
Polymerization may be accompanied by generation of heat as exotherm.
Process is self accelerating as heating causes more rapid polymerization.
Exotherm may cause boiling with generation of acrid, toxic and flammable vapor.
Polymerization and exotherm may be violent if contamination with strong acids, amines or catalysts occurs.
Polymerization and exotherm of material in bulk may be uncontrollable and result in rupture of storage tanks.
Polymerization may occur if stabilizing inhibitor becomes depleted by aging.
Stabilizing inhibitor requires dissolved oxygen to be present in liquid for effective action.
Specific storage requirements must be met for stability on ageing and transport.
Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.
May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.
Fight fire from a safe distance, with adequate cover.
If safe, switch off electrical equipment until vapor fire hazard removed.
Use water delivered as a fine spray to control the fire and cool adjacent area. Avoid spraying water onto liquid pools.
Do not approach containers suspected to be hot.
Cool fire-exposed containers with water spray from a protective location.
If safe to do so, remove containers from path of fire.

See DOT ERG



Fire Diamond

Section 6 - Accidental Release Measures

Small Spills: Remove all ignition sources. Clean up all spills immediately.
Avoid breathing vapors and contact with skin and eyes.
Control personal contact by using protective equipment.
Contain and absorb small quantities with vermiculite or other absorbent material. Wipe up. Collect residues in a flammable waste container.
Large Spills: Clear area of personnel and move upwind.
Contact fire department and tell them location and nature of hazard.
May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways.
No smoking, bare lights or ignition sources. Increase ventilation.
Stop leak if safe to do so. Water spray or fog may be used to disperse/absorb vapor. Contain spill with sand, earth or vermiculite.
Use only spark-free shovels and explosion proof equipment.
Collect recoverable product into labeled containers for recycling.
Absorb remaining product with sand, earth or vermiculite.
Collect solid residues and seal in labeled drums for disposal.
Wash area and prevent runoff into drains.
If contamination of drains or waterways occurs, advise emergency services.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

See DOT ERG

Section 7 - Handling and Storage

Handling Precautions: Material contains a stabilizer / polymerization inhibitor system that provides workable but not indefinite shelf life.
Storage at higher temperatures and long term storage may result in polymerization with solidification. In larger quantities e.g. 200 l drums this may result in generation of heat (exotherm); which may release highly irritating hot vapor. Do not open hot exotherming drums - cool externally with water to avoid vapor release.
Avoid all personal contact, including inhalation.
Wear protective clothing when risk of exposure occurs.
Use in a well-ventilated area. Prevent concentration in hollows and sumps.
DO NOT enter confined spaces until atmosphere has been checked.
Avoid smoking, bare lights, heat or ignition sources.
When handling, DO NOT eat, drink or smoke.
Vapor may ignite on pumping or pouring due to static electricity.
DO NOT use plastic buckets. Ground and secure metal containers when dispensing or pouring product. Use spark-free tools when handling.
Avoid contact with incompatible materials.
Keep containers securely sealed. Avoid physical damage to containers.
Always wash hands with soap and water after handling.
Work clothes should be laundered separately.
Use good occupational work practices. Observe manufacturer's storing and handling recommendations. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions.
Recommended Storage Methods: Metal can; metal drum. Packing as recommended by manufacturer.
Check all containers are clearly labeled and free from leaks.
DO NOT use aluminum or galvanized containers.
Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Use in a well-ventilated area. Local exhaust ventilation usually required.
If risk of overexposure exists, wear NIOSH-approved respirator.
Correct fit is essential to obtain adequate protection. NIOSH-approved self contained breathing apparatus (SCBA) may be required in some situations.
Provide adequate ventilation in warehouse or closed storage area.
Personal Protective Clothing/Equipment:
Eyes: Safety glasses with side shields; or as required, chemical goggles.
Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.
Hands/Feet: Barrier cream and Butyl rubber gloves or Nitrile rubber gloves.
Safety footwear.
Respiratory Protection:
Exposure Range >5 to 250 ppm: Supplied Air, Constant Flow/Pressure Demand, Half Mask
Exposure Range >250 to 5000 ppm: Supplied Air, Constant Flow/Pressure Demand, Full Face
Exposure Range >5000 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face
Note: poor warning properties
Other: Overalls. Eyewash unit.
Glove Selection Index:
PVA ..... Best selection
VITON ..... Poor to dangerous choice for other than short-term immersion

Section 9 - Physical and Chemical Properties

Appearance/General Info: Colorless highly flammable liquid with pleasant chloroform-like odor. Soluble in organic solvents. Presence of a stabilizing inhibitor prevents / retards peroxide formation.

Physical State: Liquid
Vapor Density (Air=1): >1
Formula Weight: 96.94
Specific Gravity (H_2O=1, at 4 °C): 1.2129
Evaporation Rate: Fast
pH: Not applicable
pH (1% Solution): Not applicable
Boiling Point: 31.7 °C (89 °F) at 760 mm Hg
Freezing/Melting Point: -122.5 °C (-188.5 °F)
Water Solubility: 0.04% by weight

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: May form explosive peroxides on standing or following concentration by distillation.
Review of stocks and testing for peroxide content by given tested procedures at 3-monthly intervals is recommended, together with safe disposal of peroxidic samples.

Peroxide containing residues can often be rendered innocuous by pouring into an excess of sodium carbonate solution.
Presence of a stabilizing inhibitor prevents/retards peroxide formation.
Stable under controlled storage conditions provided material contains adequate stabilizer/polymerization inhibitor.
Bulk storages may have special storage requirements.
In absence of inhibitor and in the presence of air, vinylidene chloride rapidly absorbs oxygen with formation of a violently explosive peroxide.
Peroxides initiate vinylidene chloride polymerization, producing insoluble polymer which absorbs peroxide. This results in separated polymer with concentrate of peroxide. In the dry state and 15% or more peroxide present this is readily detonated by heat or shock.
Hindered phenols are suitable inhibitors to prevent peroxidation.

Storage Incompatibilities: WARNING: Long standing in contact with air and light may result in the formation of potentially explosive peroxides.
Avoid any contamination of this material as it is very reactive and any contamination is potentially hazardous.
Explosion hazard may follow contact with incompatible materials.
Contamination with polymerization catalysts - peroxides, persulfates, oxidizing agents - also strong acids, strong alkalies, will cause polymerization with exotherm - generation of heat. Polymerization of large quantities may be violent - even explosive.
Light or water tend to promote self-polymerization.
Haloalkenes are highly reactive. Some of the more lightly substituted lower members are highly flammable; many members of the group are peroxidizable and polymerizable.
When stored at between -40 and 25 C in the absence of an inhibitor and in the presence of air, vinylidene chloride rapidly absorbs oxygen with the formation of a violently explosive peroxide. This peroxide initiates polymerization to produce an insoluble polymer which adsorbs the peroxide. Separation of the polymer in the dry state must be avoided since if more than 15% of the peroxide is present, the polymer may be detonatable by slight shock or friction.
Hindered phenols have been used to prevent peroxidation. Reaction products with ozone are particularly dangerous.

Section 11 - Toxicological Information

Toxicity
Oral (rat) LD_{50}: 200 mg/kg
Inhalation (human) TC_{Lo}: 25 ppm
Inhalation (rat) LC_{50}: 6350 ppm/4 hr

Irritation
Nil reported

See *RTECS* KV 9275000, for additional data.

Section 12 - Ecological Information

Environmental Fate: Once in the atmosphere it will degrade rapidly by photooxidation with a half-life of 11 hours in relatively clean air or under 2 hours in polluted air. If spilled on land, part will evaporate and part will leach into the groundwater where its fate is unknown, but degradation is expected to be slow based upon microcosm studies. It would not be expected to bioconcentrate into fish.

Ecotoxicity: LC_{50} Cyprinodon variegatus (sheepshead minnow) 249 mg/l/24 hr, 48 hr, 72 hr, 96 hr in a static bioassay using sea water; EC_{50} Skeletonema costatum (alga) > 712,000 ug/l/96 hr, Toxic effects: Inhibition chlorophyll synthesis; reduced cell counts. /Conditions of bioassay not specified; LC_{50} Lepomis macrochirus (bluegill) 74 mg/l at 24 hr & 96 hr, temp at 21-23 °C, water hardness 32-48 mg/l (calcium carbonate), pH 6.7-7.8, dissolved oxygen concentration 7.0-8.8 mg/l (static bioassay); LC_{50} Mysidopsis bahia (mysid shrimp) > 798 mg/l/24 hr, 48 hr, 72 hr; 224 mg/l/96 hr in a static bioassay using seawater; LC_{50} Menidia beryllina (inland silverside) 250 ppm/96 hr in a static bioassay in synthetic seawater at 23 °C with mild aeration

Henry's Law Constant: 2.61×10^{-2}

BCF: not significant

Octanol/Water Partition Coefficient: log K_{ow} = 1.48

Soil Sorption Partition Coefficient: K_{oc} = estimated at 150

Section 13 - Disposal Considerations

Disposal: Consult manufacturer for recycling options and recycle where possible.
Follow applicable federal, state, and local regulations.
Incinerate residue at an approved site.
Recycle containers where possible, or dispose of in an authorized landfill.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Shipping Name and Description: Vinylidene chloride, stabilized
ID: UN1303
Hazard Class: 3 - Flammable and combustible liquid
Packing Group: I - Great Danger
Symbols:
Label Codes: 3 - Flammable Liquid
Special Provisions: T12, TP2, TP7
Packaging: **Exceptions:** 150 **Non-bulk:** 201 **Bulk:** 243
Quantity Limitations: **Passenger aircraft/rail:** 1 L **Cargo aircraft only:** 30 L
Vessel Stowage: **Location:** E **Other:** 40

Section 15 - Regulatory Information

EPA Regulations:

RCRA 40 CFR: Listed U078 Toxic Waste
CERCLA 40 CFR 302.4: Listed per CWA Section 311(b)(4), per RCRA Section 3001, per CWA Section 307(a) 100 lb (45.35 kg)
SARA 40 CFR 372.65: Listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

Genium Publishing Corp.
One Genium Plaza
Schenectady, NY 12304-4690
(518) 377-8854

Material Safety Data Sheet Collection

Zinc **MSDS No. 73**

Date of Preparation: 7/80 Revision: B, 3/98

Section 1 - Chemical Product and Company Identification 51

Product/Chemical Name: Zinc **Chemical Formula:** Zn **CAS Number:** 7440-66-6

Synonyms: asarco L15; blue powder; C.I. 77945; C.I. pigment black 16; C.I. pigment metal 6; emenay zinc dust; granular zinc; jasad; merrillite; pasco; rheinzink; zinc ashes; zinc dust; zinc powder

Derivation: Manufactured by concentrating zinc ore, roasting the concentrate, followed with thermal smelting (reduction with carbon); by reducing the zinc oxide with carbon in retorts from which the resultant zinc is distilled and condensed; or by the hydrometallurgical or electrolytical process where the zinc oxide is leached from the roasted or calcined material with sulfuric acid to form zinc sulfate solution which is then leached from electrolyzed cells to deposit zinc on the cathodes.

General Use: Used in alloys (dental amalgams, brass), metallic driers, mixed-metal stabilizers, automotive parts, electrical fuses, storage and dry-cell batteries, in vacuum fluorescence displays, in electrical contact grease, in bearings, in paper defoxing, galvanizing iron and other metals, protective coating, desilverizing agent for lead, deoxidizing bronze, reducing agent in organic chemistry, reagent in analytical chemistry, extracting gold, electroplating, metal spraying, anodic inhibitors, fungicides, nutrition, roofing, gutters, engravers' plates, cable wrappings, railroad car linings, purifying fats, bleaching glue, canteens, and organ pipes.

Vendors: Consult the latest *Chemical Week Buyers' Guide.* (73)

Section 2 - Composition / Information on Ingredients

Zinc, special high-grade (99.990%), high-grade (99.95%), intermediate (99.5%), brass special (99%), prime western (98%).
Trace Impurities: Tin, lead, iron, cadmium, arsenic, cesium, antimony, and zinc chloride (increases corrosion resistance).

OSHA PEL*	ACGIH TLV*	NIOSH REL*	DFG (Germany) MAK*
None established	None established	None established	None established

*When working with heated or powdered zinc, consider exposure limits for zinc oxide: OSHA TWA: 15 mg/m^3 (total dust), 5 mg/m^3 (respirable dust, fume); ACGIH TLV: 5 mg/m^3 (fume), 10 mg/m^3 (dust - containing no asbestos and <1% crystalline silica); ACGIH STEL: 10 mg/m^3 (fume); NIOSH TWA 5 mg/m^3 (dust, fume); STEL: 10 mg/m^3 (fume), 15 minute ceiling, 15 mg/m^3 (dust); DFG MAK: TWA 5 mg/m^3 (fume/respirable dust).

Section 3 - Hazards Identification

ANSI Signal Word: Warning!

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Zinc is a bluish-white lustrous metal that becomes covered with a white oxide coating of basic carbonate on exposure to moist air. Zinc itself is relatively non-toxic, but the presence of impurities such as cesium, antimony, arsenic, and lead, or the production of airborne zinc oxide fumes may cause toxic effects. It is incompatible with many materials and the dust produces explosive hydrogen gas when mixed with water. Zinc dust is flammable and may ignite spontaneously in air when dry.

Wilson Risk Scale	
R	1
I	2
S	1
K	1

HMIS	
H	1*
F	1
R	1
PPE†	

*Chronic effects
†Sec. 8

Potential Health Effects

Primary Entry Routes: Inhalation and eye and skin contact

Target Organs: Respiratory system, eyes, and skin

Acute Effects

Inhalation: Exposure to dust may result in cough. Heated zinc may give off zinc oxide (ZnO) fumes. Characteristics of exposure include sweet taste, dry throat, injury to mucous membrane, cough, weakness, aches, chills, fever, nausea, and vomiting. Concentrations of ZnO particulates at 45 to 870 mg/m^3 cause "metal fume fever," a transient condition characterized by fever, chills, muscle pain, and vomiting. Recovery normally occurs within 24 to 48 hours. Tolerance may develop but is generally lost over a weekend.

Eye: Zinc dust particles can irritate the eyes. Zinc salts will precipitate eye protein and cause corneal and lens changes.

Skin: A human skin irritant.

Ingestion: Relatively non-toxic, though significant ingestion (12 g) of metallic zinc was reported to cause lethargy, light headedness, staggering gait, and difficulty writing, suggesting cerebellar dysfunction. Ingestion of acidic food or beverages stored in zinc or galvanized containers can lead to nausea, vomiting, diarrhea, and abdominal pain.

Carcinogenicity: IARC, NTP, and OSHA do not list zinc as a carcinogen.

Medical Conditions Aggravated by Long-Term Exposure: None reported.

Chronic Effects: Abnormally large amounts of zinc may enter and leave the body for years without resulting in symptoms or clinical evidence. Zinc poisoning has been associated with prolonged consumption of water from galvanized pipes. Symptoms

include irritability, muscular stiffness and pain, loss of appetite and nausea. Ingestion of excessive doses for prolonged periods alters the immune response and causes copper and iron deficiency, anemia, headache, vomiting, chills, fever, malaise, and abdominal pain.

Section 4 - First Aid Measures

Inhalation: Remove exposed person to fresh air and support breathing as needed. Apply artificial respiration if victim is not breathing. Administer oxygen if breathing is difficult.

Eye Contact: *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water for at least 15 minutes. Consult a physician or ophthalmologist if pain or irritation develop.

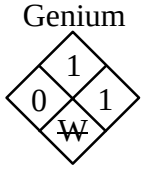
Skin Contact: Remove contaminated clothing and rinse with flooding amounts of water. Wash exposed area with soap and water. For reddened or blistered skin, consult a physician.

Ingestion: Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center. Unless the poison control center advises otherwise, have the *conscious and alert* person drink 1 to 2 glasses of water, then induce vomiting.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Maintain hydration and observe for metabolic acidosis, hypocalcemic tetany, anuria, liver damage, gastric perforation, and pyloric stenosis. For pulmonary edema (noncardiogenic), maintain ventilation and oxygenation with close arterial blood gas monitoring. Early use of PEEP and mechanical ventilation may be needed to maintain pO_2 greater than 50 mm Hg with FI O_2 less than 60%. For eye exposure, rinse with 0.05 M neutral sodium edetate to help prevent or reverse a portion of the protein precipitation.

Section 5 - Fire-Fighting Measures



Flash Point: Not applicable, combustible solid

Autoignition Temperature: Cloud, 1256 °F (680 °C); dust layer, 860 °F (460 °C); powder 650 mJ spark.

LEL: Dust cloud explosion, 0.5 oz/ft^3

UEL: None reported.

Flammability Classification: Combustible solid

Extinguishing Media: *Do not* use water or foam. Use a Class D fire extinguisher, dry chemical, dry ground limestone, dry clay, soda ash, lime, or sand, or withdraw from area and let fire burn.

Unusual Fire or Explosion Hazards: Zinc dust reacts vigorously or explosively on contact with water. It produces flammable gases on contact with water or moist air. It may be ignited by heat, sparks or flames and may re-ignite after fire is extinguished. Dust forms explosive mixtures with air.

Hazardous Combustion Products: Fire will produce irritating, corrosive and/or toxic gases. Inhalation or contact with vapors, substance, or decomposition products may cause severe injury or death.

Fire-Fighting Instructions: *Do not* get water inside containers. Cool containers with flooding quantities of water until well after fire is out. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank as rupture or explosion may be imminent. *Do not* release runoff from fire control methods to sewers or waterways as runoff may create fire or explosion hazard. Corrosive solutions may be produced on contact with water. Move containers from fire area if it can be done without undue risk.

Fire-Fighting Equipment: Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Structural firefighters' protective clothing will only provide limited protection.

Section 6 - Accidental Release Measures

Spill /Leak Procedures: Eliminate all ignition sources (no smoking, flares, sparks or flames). Isolate spill or leak area immediately for at least 160 to 330 feet (50 to 100 meters) in all directions. *Do not* walk through or touch spilled material. For large spills consider downwind evacuation for at least 800 feet (250 meters). Keep unauthorized personnel away, stay upwind, keep out of low areas, and ventilate area before entry.

Small Spills: Cover with dry earth, dry sand, or other non-combustible material followed with plastic sheet to minimize spreading or contact with rain. With a clean shovel, carefully scoop material into a dry, sealed container and move container from spill area. Cleanup personnel should protect against dust inhalation and skin and eye contact.

Large Spills

Containment: For large spills, dike far ahead of liquid spill for later disposal. *Do not* release into sewers or waterways.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Bulk dust in damp state may heat spontaneously and ignite on exposure to air.

Storage Requirements: Protect against physical damage. Store in a cool, dry ventilated place away from heat and ignition sources and incompatibles.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Routinely evaluate exposure to zinc by collecting personal and area air samples. Prevention of metal fume fever is a matter of keeping exposure of workers below the level of zinc oxide concentration currently accepted as satisfactory for working with metal in the industry (15 mg/m^3) by employment of proper local exhaust ventilation to collect fumes at their source.

Ventilation: Enclose operations and/or provide general or local exhaust ventilation systems to maintain airborne concentrations below OSHA PELs (Sec. 2). Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.

Administrative Controls: Post hazard and warning information in the work area. In addition, educate, train, and communicate all information on the health and safety hazards of zinc to potentially exposed workers.

Respiratory Protection: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator equipped with particulate (dust/fume/mist) filters. Particulate filters must be checked daily before work for physical damage and replaced as needed. If, while wearing a filter cartridge or canister respirator, you can smell, taste, or otherwise detect zinc, or in the case of a full facepiece respirator you experience eye irritation, leave the area immediately. Select respirator based on its suitability to provide adequate worker protection for given working conditions, level of airborne contamination, and presence of sufficient oxygen. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas.

Protective Clothing/Equipment: Wear chemically protective gloves, boots, aprons, and gauntlets to prevent prolonged or repeated skin contact. Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Contact lenses are not eye protective devices. Appropriate eye protection must be worn instead of, or in conjunction with contact lenses.

Safety Stations: Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work area.

Contaminated Equipment: Separate contaminated work clothes from street clothes. *Do not* take contaminated work clothes home. Launder before reuse. Contaminated work clothes should be laundered by individuals who have been informed of the hazards of exposure to zinc dust. Remove this material from your shoes and clean personal protective equipment.

Comments: Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9 - Physical and Chemical Properties

Physical State: Solid

Appearance and Odor: Bluish-white lustrous metal or dark powder

Vapor Pressure: 1 mm Hg at 908.6 °F (487 °C); 60 mm Hg at 1292 °F (700 °C)

Formula Weight: 65.38

Specific Gravity (H_2O=1, at 4 °C): 7.14 at 77 °F (25°C)

Water Solubility: Insoluble

Other Solubilities: Soluble in acid, alkalies, acetic acid

Boiling Point: 1666.4 °F (908 °C)

Melting Point: 787.1 °F (419.5 °C)

Heat Capacity at Constant Pressure (25 °C): 6.07 cal/mole deg

Mohs' Hardness: 2.5

Standard Electrode Potential: +0.761

Ionizing Potential (eV): 9.39405

Section 10 - Stability and Reactivity

Stability: Zinc powder is stable at room temperature in closed containers under normal storage and handling conditions. However, moist zinc can react exothermically and ignite spontaneously in air.

Polymerization: Hazardous polymerization cannot occur.

Chemical Incompatibilities: Avoid contact with acids, alkali hydroxides (e.g., sodium hydroxide), ammonium nitrate, ammonium sulfide, arsenic oxide, barium dioxide, barium oxide, barium nitrate, cadmium, carbon disulfide, catalytic metals, chlorates, chlorides, chlorine, chlorinated rubber, chromium (VI) oxide, ethyl acetoacetate + tribromoneopentyl alcohol, fluorine, halogenated hydrocarbons, hydrazine mononitrate, hydroxylamine, lead azide, lead nitride, magnesium nitrate, manganese chloride, nitric acid, *o*-nitroanisole, nitrobenzene, nonmetals, oxidizing agents (sulfur, oxygen), paint primer base, pentacarbonyliron, performic acid, potassium chlorate, potassium nitrate, potassium peroxide, seleninyl bromide, selenium, sodium chlorate, sodium peroxide, tellurium, transition metal halides, and water.

Conditions to Avoid: Avoid exposure to moisture, heat, and ignition sources (flares, sparks, cigarettes, and open flames).

Hazardous Decomposition Products: Thermal oxidative decomposition of zinc metal/powder can produce hydrogen gas and zinc oxide fumes (of particle diameter ≤1 μm).

Section 11- Toxicological Information

Toxicity Data:*

Skin Effects:
Human, skin, standard Draize test, 300 µg over 3 days intermittently caused mild irritation.

Acute Inhalation Effects:
Human, inhalation, 124 mg/m^3/50 minutes, resulted in toxic effects on lung, thorax, or respiration - cough and dyspnea, and skin and appendages - sweating.

*See NIOSH, *RTECS* (ZG8600000), for additional toxicity data. Refer to Genium MSDS #45 for toxicity data relevant to exposure to zinc oxide fumes generated from heated zinc metal.

Section 12 - Ecological Information

Ecotoxicity: Chronic aquatic toxicity limits: 0.04 ppm; toxicity to aquatic plants: 25 ppm. Rainbow trout, LC_{50} = 4 ppm/48 hrs; zebrafish (embryo), LC_{50} = 19 ppm/72 hrs. Zinc accumulates in gill tissue and bone. Zinc is thought to exert its toxic action by forming insoluble compounds with the mucous that covers the gills, by damage to the gill epithelium, or by an internal poison.
Environmental Fate: Bioaccumulation may be significant (Biological Concentration Factor (BCF) ranges from 85 to 100,000).
Environmental Degradation: Zinc can persist in water indefinitely.

Section 13 - Disposal Considerations

Disposal: Reclaim for salvage or reuse. Unsalvageable waste may be buried in an approved landfill. Maximum concentration in effluent to sewer or stream is 1 ppm. Criteria for land treatment or burial disposal practices are under significant review. Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

Section 14 - Transport Information

DOT Transportation Data (49 CFR 172.101):

Shipping Name: Zinc powder
Shipping Symbols: –
Hazard Class: 4.3
ID No.: UN 1436
Packing Group: II
Label: Dangerous When Wet, Spontaneously Combustible
Special Provisions (172.102): A19, B109, N40

Packaging Authorizations
a) Exceptions: None
b) Non-bulk Packaging: 173.211
c) Bulk Packaging: 173.242

Quantity Limitations
a) Passenger, Aircraft, or Railcar: Forbidden
b) Cargo Aircraft Only: 15 kg

Vessel Stowage Requirements
a) Vessel Stowage: A
b) Other: –

Section 15 - Regulatory Information

EPA Regulations:
Classified as a RCRA Hazardous Waste (40 CFR 261.21, 23), Characteristics of Ignitability and Reactivity
RCRA Hazardous Waste Number: D001, D003
Listed as a CERCLA Hazardous Substance (40 CFR 302.4) specific per CWA, Sec. 307(a)
CERCLA Final Reportable Quantity (RQ), 1000 lb (454 kg)
Listed as a SARA Toxic Chemical (40 CFR 372.65) as zinc (fume or dust)
SARA EHS (Extremely Hazardous Substance) (40 CFR 355): Not listed

OSHA Regulations:
Air Contaminant (29 CFR 1910.1000, Table Z-1, Z-1-A): Not listed

Section 16 - Other Information

References: 1, 73, 103, 124, 136, 149, 190, 209, 216, 222, 224, 230

Prepared By..... R Reals, MS/HM Spliethoff, MS
Industrial Hygiene Review..... PA Roy, MPH, CIH
Medical Review..... T Thoburn, MD, MPH

Appendix B

Deed Restrictions

Exhibit "I"

DECLARATION OF COVENANTS AND RESTRICTIONS

This Declaration of Covenants and Restrictions shall serve as notice to any party who may acquire an interest in the real property situated in the Town of Chili, County of Monroe, State of New York, which property is commonly known as 465 Paul Road and is Tax Parcel No. 146.02-1-5, that a portion of the property has been listed by the New York State Department of Environmental Conservation on the NYS Registry of Inactive Hazardous Waste Sites as Site # 8-28-061.

Further notice is hereby served that this listed portion of the property is restricted. This restricted portion is depicted and more fully described in Exhibit A, which is attached hereto and made a part hereof ("Restricted Property"). The Restricted Property must be held, sold and conveyed in accordance with the following conditions:

1. The installation of drinking water wells is prohibited unless the extracted water is treated to meet drinking water standards before use;

2. Use is restricted to commercial or industrial applications, and the construction of residences or day care facilities is prohibited;

3. Construction activities must be conducted in a manner so as not to leave subsurface materials at the surface, unless such materials have been previously tested and found to contain less than 10 parts per million (ppm) of total volatile organic compounds, per the New York State Department of Environmental Conservation Technical and Administrative Guidance Memorandum (TAGM) 4046.

4. Prior to any proposed substantial change in use, the property owner must evaluate whether the proposed change might expose humans to contaminated subsurface soil or groundwater and take appropriate action to prevent such exposure. Additionally, prior written notice of a proposed substantial change in use must be provided to the New York State Department of Environmental Conservation, with copies of such notice sent to the Bureau of Environmental Exposure Investigation, New York State Department of Health, and to the Director, Environment, Health & Safety of Bausch & Lomb Incorporated. "Substantial change in use" is defined in 6 NYCRR 375-1.3(v). Notification requirements are described in 6 NYCRR 375-1.6.

Conditions 2 through 4 above shall terminate upon delisting of the Restricted Property from the NYS Registry of Inactive Hazardous Waste Sites. Condition 1 above may be revised or terminated upon demonstration by Bausch & Lomb Incorporated or by the Owner to the New York State Department of Environmental Conservation and the New York State Department of Health that groundwater meets drinking water standards, but in no event shall this condition be terminated prior to delisting from the NYS Registry of Inactive Hazardous Waste Sites.

OWNER: BAUSCH & LOMB INCORPORATED

By: Alan H. Resnick

STATE OF NEW YORK)
COUNTY OF MONROE) ss.:

On this 12th day of May, 1998, before me personally came ALAN H. RESNICK, to me know, who being duly sworn, did depose and say that s/he resides in ROCHESTER, NEW YORK; that s/he is the VICE PRESIDENT AND TREASURER of Bausch & Lomb Incorporated, the corporation described in and which executed the foregoing instrument; and that s/he is duly authorized to execute the foregoing instrument on behalf of the said corporation.

Jean M. Schreiner
Notary Public

JEAN M. SCHREINER
NOTARY PUBLIC, State of N.Y., Monroe Co.
My Commission Expires May 12, 2000.

Exhibit A: Map and Legal Description of Restricted Property

A.J. BAREA - PLS

Professional Land Surveyor

138 South Union St. Spencerport, NY 14559
P.O. Box 224 (716) 352-6070

INSTRUMENT SURVEY

SHOWING
"RESTRICTED PROPERTY"

Parcel at TOWN OF CHILI - COUNTY OF MONROE - STATE OF NEW YORK

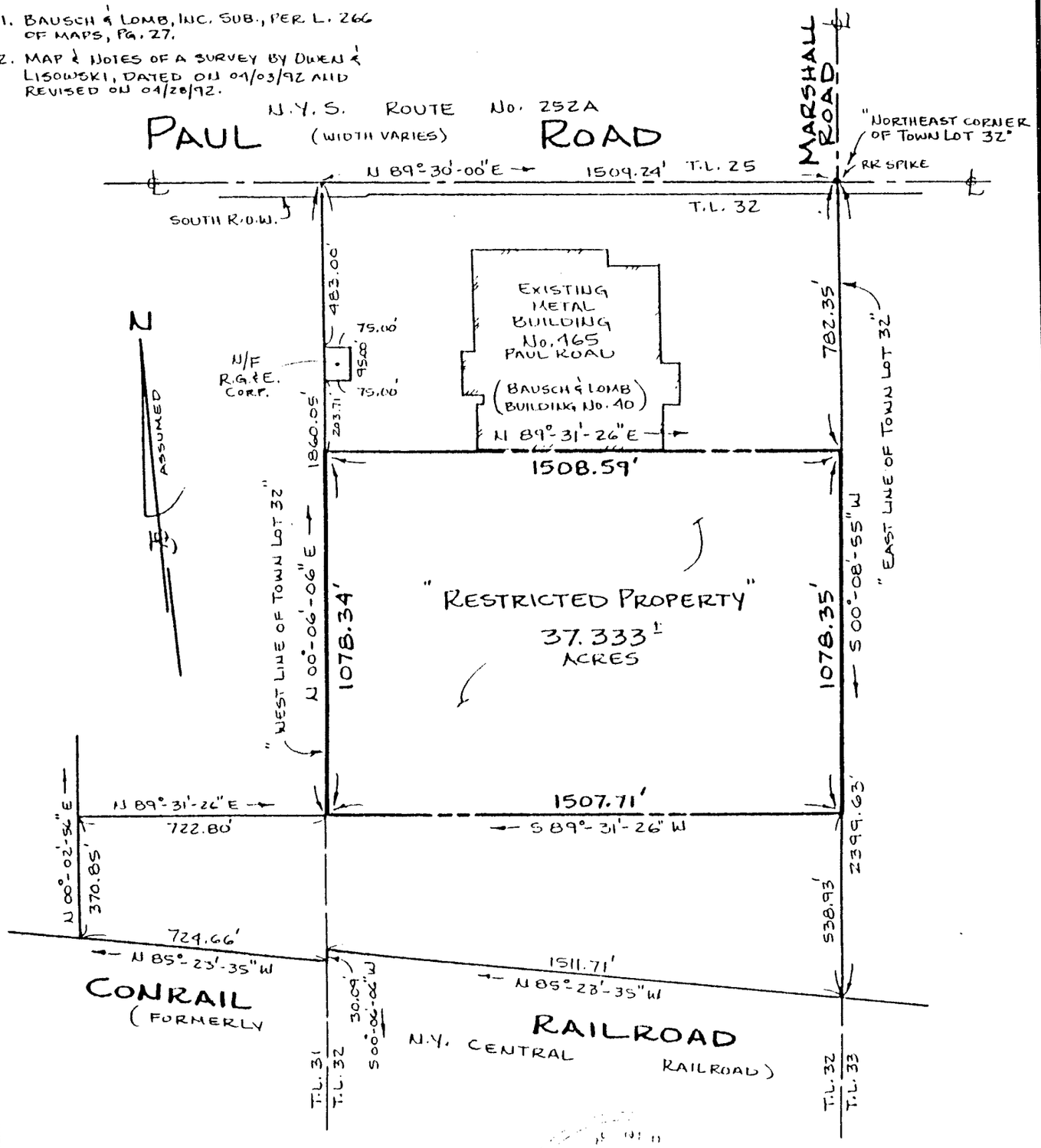
3,000 ACRE TRACT No. 465 PART OF TOWN

Subdivision TOWNSHIP 2 - RANGE 1 Street PAUL ROAD Lot No. 32

NO ASPHALT PROVIDED
S.B.L. No. 146.02-1-5

REFERENCES:

1. BAUSCH & LOMB, INC. SUB., PER L. 266 OF MAPS, PG. 27.
2. MAP & NOTES OF A SURVEY BY DUNN & LISOWSKI, DATED ON 04/03/92 AND REVISED ON 04/28/92.



SCALE 1" = 400 FEET

"Unauthorized alteration or addition to a survey map bearing a licensed land surveyor's seal is a violation of section 7209, sub-division 2, of the New York State Education Law" This map was made from notes of an Instrument Survey

"Only copies from the original of this survey map bearing the signature and an original stamp in blue ink of the Land Surveyor's seal shall be considered to be valid true copies."

Dated MAY 04, 1998

Signed

A.J. BAREA, NYSPLS No. 050229

B&L, Inc.

A1257-1

A.J. BAREA - PLS
138 SOUTH UNION STREET - P.O. BOX 224
SPENCERPORT - NEW YORK - 14559
(716) 352-6070 OFFICE
(716) 352-1520 FAX

* RESTRICTED PROPERTY DESCRIPTION *

Property: 465 Paul Road - T/O Chili - S.B.L. No. 146.02-1-5
(Bausch & Lomb, Inc. Property)

All That Tract or Parcel of Land, situate in the Town of Chili, County of Monroe, State of New York being part of Town Lot No. 32, Township 2, Range 1, of the 3,000 Acre Tract, bounded and described as follows:

Commencing at a Rail Road Spike at the intersection of the centerline of Paul Road with the centerline of Marshall Road, said point also being the northeast corner of Town Lot 32; Thence S 00°08'55" W, along the east line of said Town Lot 32, a distance of 782.35 feet to the true point and place of beginning;

Thence 1) S 00°08'55" W, continuing along said east line of Town Lot 32, a distance of 1078.35 feet to a point;

Thence 2) S 89°31'26" W a distance of 1507.71 feet to a point on the west line of Town Lot 32;

Thence 3) N 00°06'06" E, along the said west line of Town Lot 32, a distance of 1078.34 feet to a point;

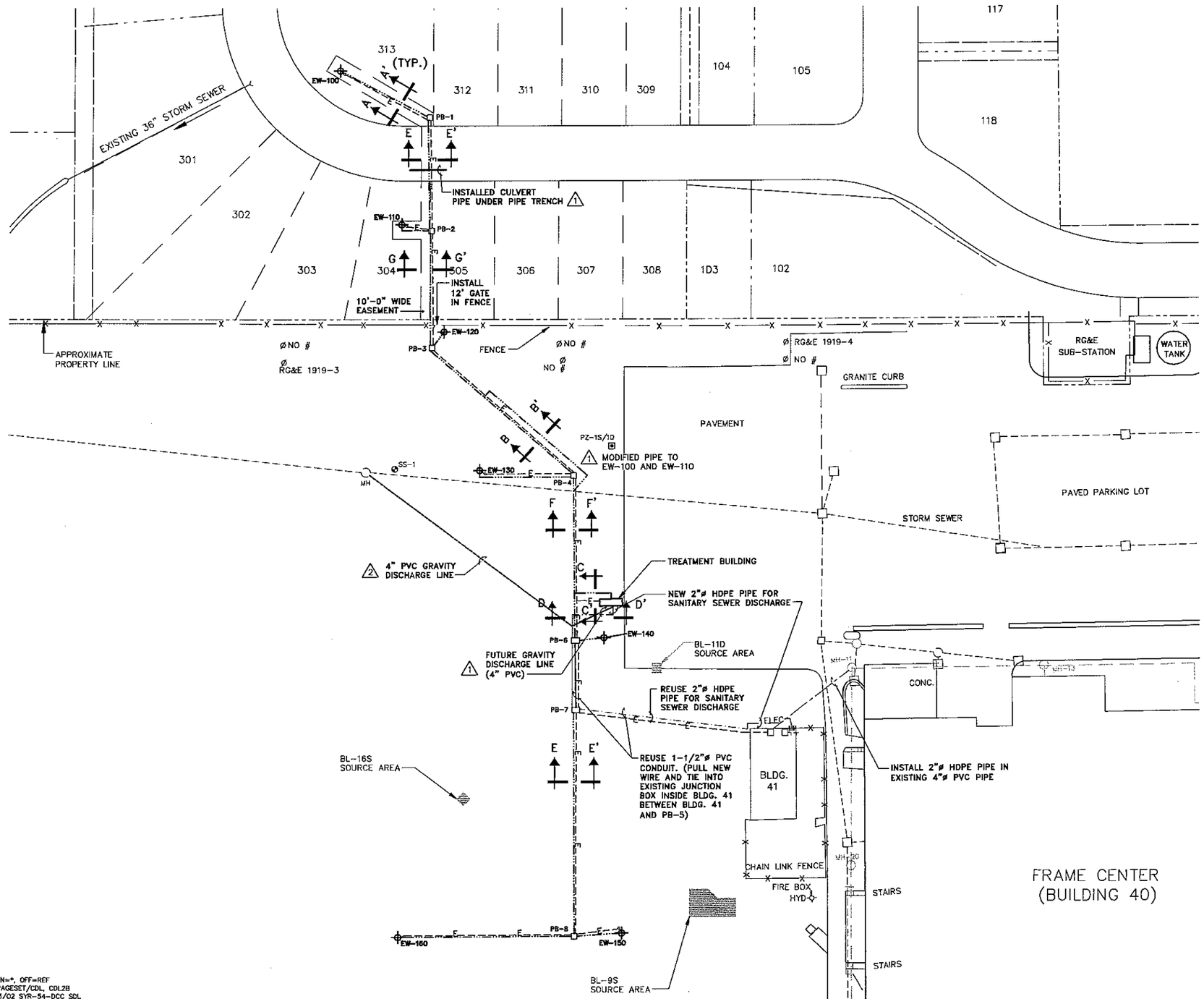
Thence 4) N 89°31'26" E a distance of 1508.59 feet to the point and place of beginning.

Hereby intending to describe a portion of land containing 37.333± Acres, all as shown and labeled as "Restricted Property" on a survey map prepared by A.J. BAREA-PLS, dated on May 04, 1998. (Said map should be attached)

A.J. Barea
05/04/98

Appendix C

GWCTS Record Drawings



LEGEND:

- MONITORING WELL INSTALLED IN SHALLOW OVERBURDEN
- MONITORING WELL INSTALLED AT BASE OF OVERBURDEN/TOP OF ROCK
- SS STAINLESS STEEL WELL POINT
- CATCH BASIN
- MANHOLE
- 1"ø NESTED PIEZOMETER
- TELEPHONE POLE
- **6" EXTRACTION WELL AND CONTROL PANEL**
- PB-1 **PULL BOX**
- **DISCHARGE TO SANITARY SEWER**
- EXISTING PIPE TRENCH
- **GROUNDWATER COLLECTION PIPE**
- **ELECTRIC SUPPLY**
- **CULVERT PIPE**
- APPROXIMATE ADJACENT TRACT BOUNDARY
- APPROXIMATE PROPOSED LOT BOUNDARY
- APPROXIMATE EXISTING LOT BOUNDARY
- APPROXIMATE EASEMENT BOUNDARY
- STORMWATER COLLECTION PIPE
- EXISTING DISCHARGE TO SANITARY SEWER
- FENCE
- SOURCE AREA
- GRAVITY LINE TO SURFACE WATER

NOTES:

1. SITE PLAN FOR THE ON-SITE AREAS COMPILED FROM EXISTING SITE PLANS PROVIDED BY BAUSCH & LOMB AND SITE SURVEYS TO LOCATE ALL MONITORING WELLS BY BBL DATED 6/17/92, REVISED 4/13/94, 8/13/98, AND 10/28-29/98.
2. LOCATIONS OF PROPERTY LINES, SUBSURFACE UTILITIES AND LIMITS OF BUILDINGS AND PARKING AREAS ARE APPROXIMATE.
3. ADJACENT PROPERTY INFORMATION FROM TRACT MAPS PREPARED BY LADIEU ASSOCIATES P.C.; LOT NUMBERS 101 TO 118 AND 201 TO 208 WERE DESIGNATED BY LADIEU ASSOCIATES P.C.; LOTS IDENTIFIED AS 301 TO 313 ARE IDENTIFIED HERE FOR CONVENIENCE ONLY. INVERT ELEVATION DATUM IS UNKNOWN.
4. 1 LOCATIONS OF EXTRACTION WELLS AND CONTROL PANELS, PULL BOXES, TREATMENT BUILDING, GROUNDWATER COLLECTION PIPE, CULVERT PIPE, ELECTRICAL SUPPLY CONDUIT, AND FUTURE GRAVITY LINE PER BBLES SURVEY CONDUCTED AFTER CONSTRUCTION OF GROUNDWATER COLLECTION AND TREATMENT SYSTEM.
5. BOLD TEXT INDICATES NEW, NON-BOLD TEXT INDICATES EXISTING (REFERS TO ALL DRAWINGS IN THIS CONTRACT).
6. 2 NEW DISCHARGE PIPE TO SURFACE WATER BEGINNING INVERT TO BE AT ELEVATION 543.64 FEET ASL. CONNECTION TO MANHOLE TO BE COMPLETED AT 537.31 ASL.

L: ON=*, OFF=REF
P: PAGESET/CDL, CDL2B
4/23/02 SYR-54-DCC SDL
34216070/34216B01.DWG

Graphic Scale
60' 0 60' 120'
1"=60'

No.	Date	Revisions	Init
1	1/24/01	GENERAL REVISIONS DURING CONSTRUCTION	
2	4/17/02	DISCHARGE MODIFICATION	

Project Mgr. GMT

BLASLAND, BOUCK & LEE, INC.
engineers & scientists

BAUSCH & LOMB INCORPORATED • CHILI, NEW YORK
FORMER FRAME CENTER
GROUND-WATER COLLECTION AND TREATMENT SYSTEM

SITE PLAN

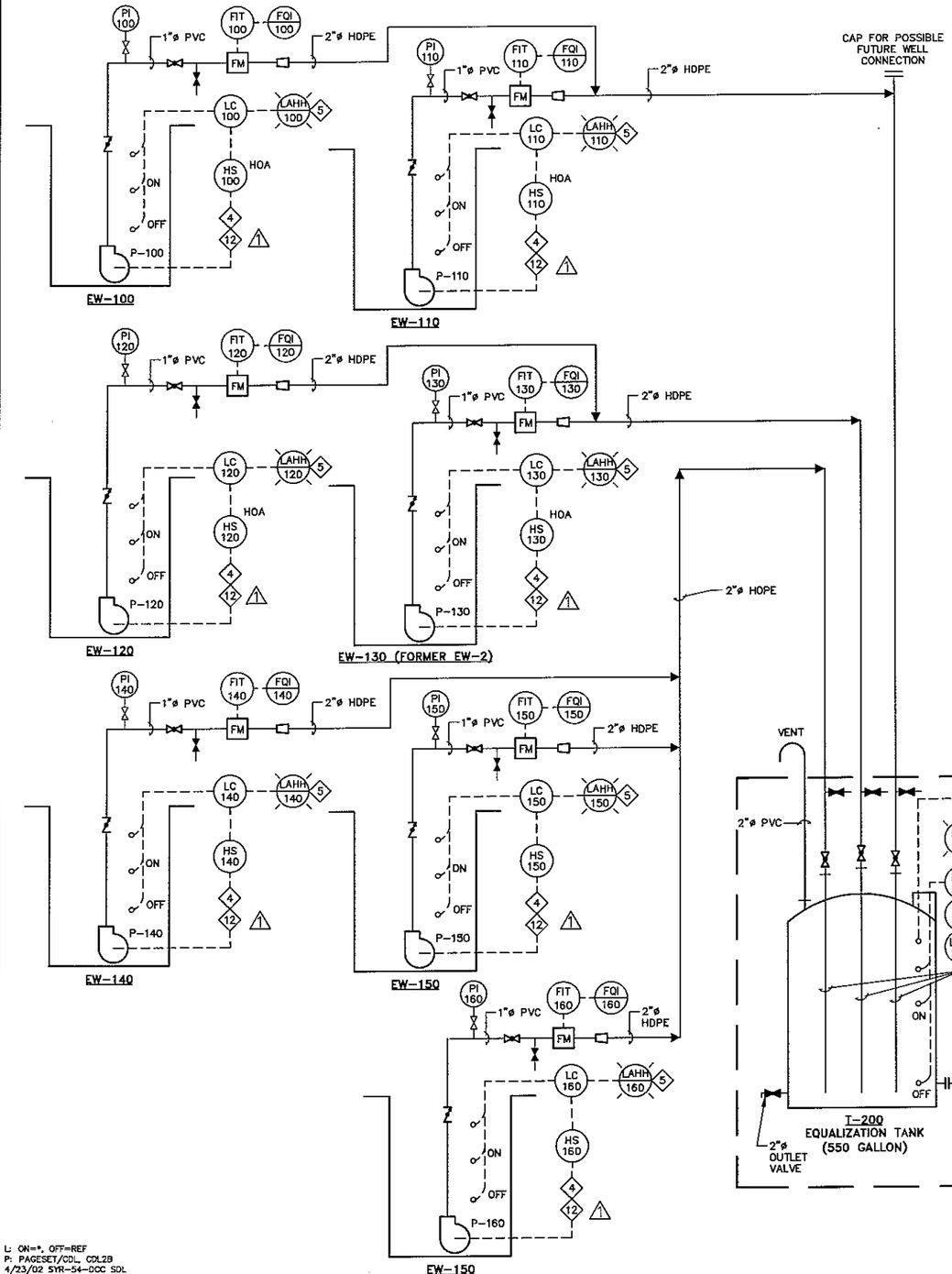
GENERAL

File Number 342.16.01F

Date SEPTEMBER 2000

Blasland, Bouck & Lee, Inc.
Corporate Headquarters
6723 Towpath Road
Syracuse, NY 13214
315-446-9120

1A



INSTRUMENTATION LEGEND	INDICATOR	(L) LOW (H) HIGH (HH) HIGH-HIGH SWITCH	CONTROL	INDICATING CONTROLER	(L) LOW (H) HIGH (HH) HIGH-HIGH ALARM	INTEGRATING INDICATOR	INDICATOR/TRANSMITTER
LEVEL		LS	LC	LIC	LA		
PRESSURE	PI	PS					
FLOW	FI					FQI	FIT
HAND		HS					

XX / XXX — INSTRUMENT FUNCTION (SEE CHART FOR FUNCTION) / INSTRUMENT TAG NUMBER

INTERLOCK SCHEDULE:

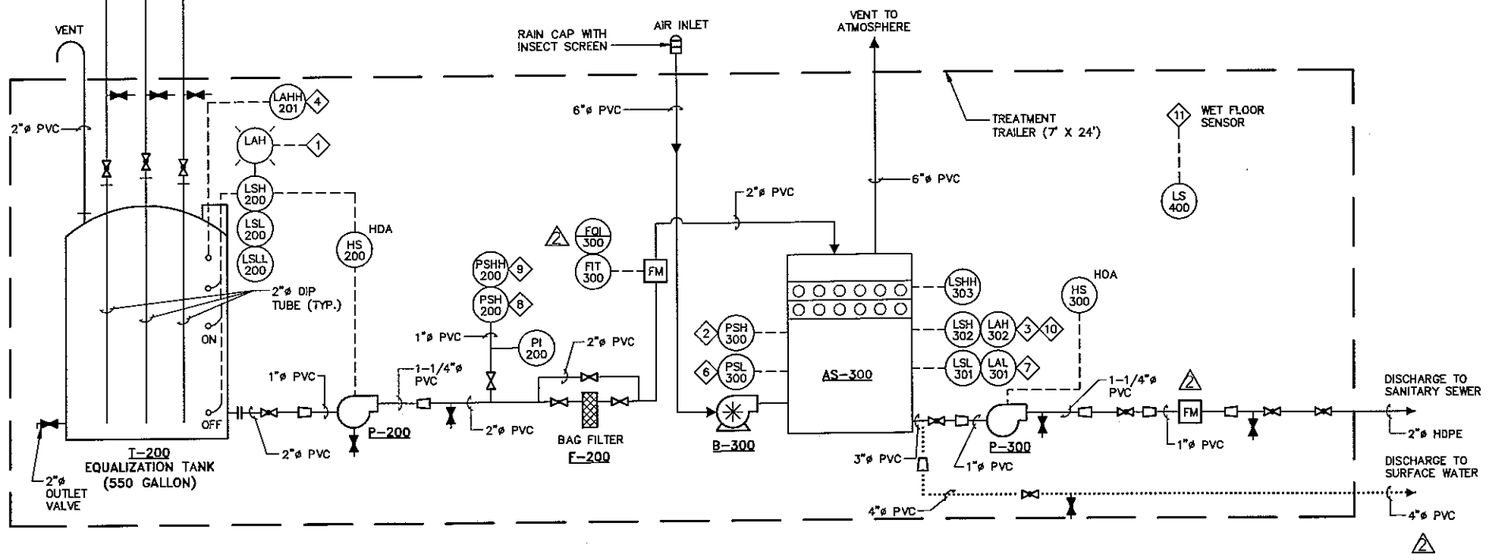
1. HIGH LEVEL ON EQUALIZATION TANK, AUTODIALER NOTIFICATION
2. BLOWER HIGH PRESSURE, SHUT DOWN P-200, P-300, AND B-300, AND AUTODIALER NOTIFICATION
3. HIGH LEVEL IN SUMP, START P-300.
4. HIGH-HIGH LEVEL ON EQUALIZATION TANK, SHUT DOWN ALL WELL PUMPS
5. HIGH-HIGH LEVEL ON EXTRACTION WELL, AUTODIALER NOTIFICATION
6. BLOWER LOW PRESSURE, SHUTDOWN P-200, P-300, AND B-300, AND AUTODIALER NOTIFICATION
7. LOW LEVEL IN SUMP, SHUTDOWN P-300.
8. HIGH INLET PRESSURE, AUTODIALER NOTIFICATION
9. HIGH-HIGH INLET PRESSURE, SHUTDOWN P-200, P-300, AND B-300, AND AUTODIALER NOTIFICATION.
10. HIGH LEVEL IN SUMP CONTINUOUS, SHUTDOWN P-200, P-300, AND B-300, AND AUTODIALER NOTIFICATION
11. WET FLOOR DETECTED, SHUTDOWN ALL WELL PUMPS, AND AUTODIALER NOTIFICATION.

LEGEND:

- PRIMARY PROCESS PIPING
- INSTRUMENTATION SIGNAL
- GRAVITY LINE TO SURFACE WATER
- REDUCER
- CHECK VALVE
- BALL VALVE
- SAMPLE DRAIN/VALVE
- PRESSURE GAUGE (PI XXX)
- FLOW METER (FM)
- PUMP
- BLOWER
- LOCAL INDICATOR (AT EQUIPMENT) (XX / XXX)
- REMOTE INDICATOR (AT CONTROL PANEL) (XX / XXX)

1

2 **NOTE:** INSTALLATION OF DISCHARGE LINE TO SURFACE WATER, FIT-300 RELOCATED TO INLET OF AS-300. INSTALLATION OF MECHANICAL FLOW METER ON DISCHARGE TO SANITARY SEWER.



L: ON=*, OFF=REF
P: PAGESET/CDL, CDL2B
4/23/02 SIR-54-OCC SDL
34218070/34216D01.DWG

No.	Date	Revisions	Init
1	1/24/01	GENERAL REVISIONS DURING CONSTRUCTION	
2	4/18/02	DISCHARGE MODIFICATION	

Graphic Scale

Project Mgr. _____ GMT _____

BLASLAND, BOUCK & LEE, INC. engineers & scientists

BAUSCH & LOMB INCORPORATED • CHILI, NEW YORK
FORMER FRAME CENTER
GROUND-WATER COLLECTION AND TREATMENT SYSTEM

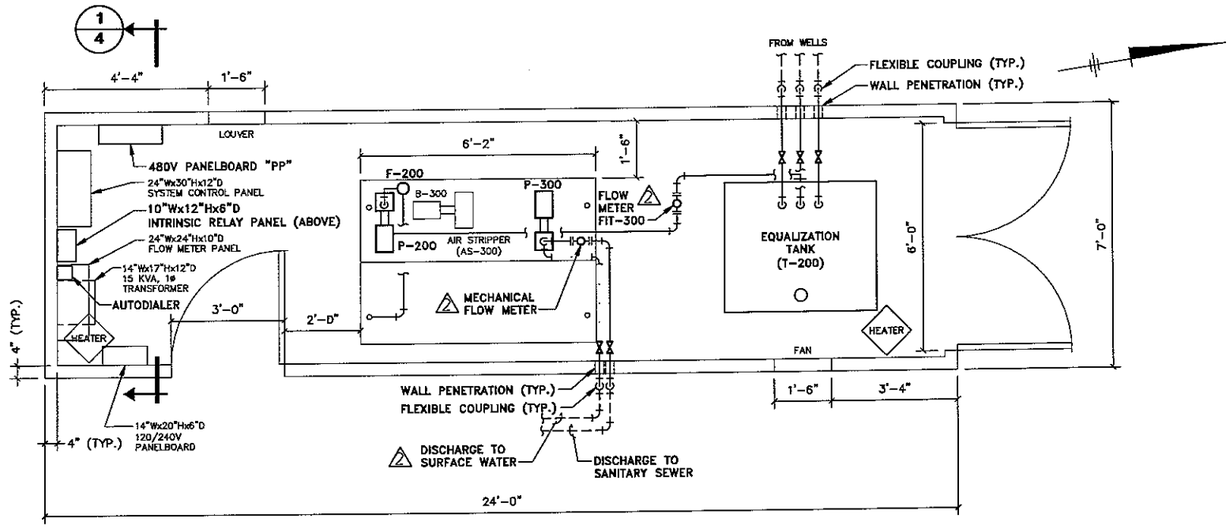
PROCESS AND INSTRUMENTATION DIAGRAM

MECHANICAL/ELECTRICAL

File Number 342.16.02F
Date APRIL 2002

Blasland, Bouck & Lee, Inc.
Corporate Headquarters
6723 Towpath Road
Syracuse, NY 13214
315-446-9120

2A

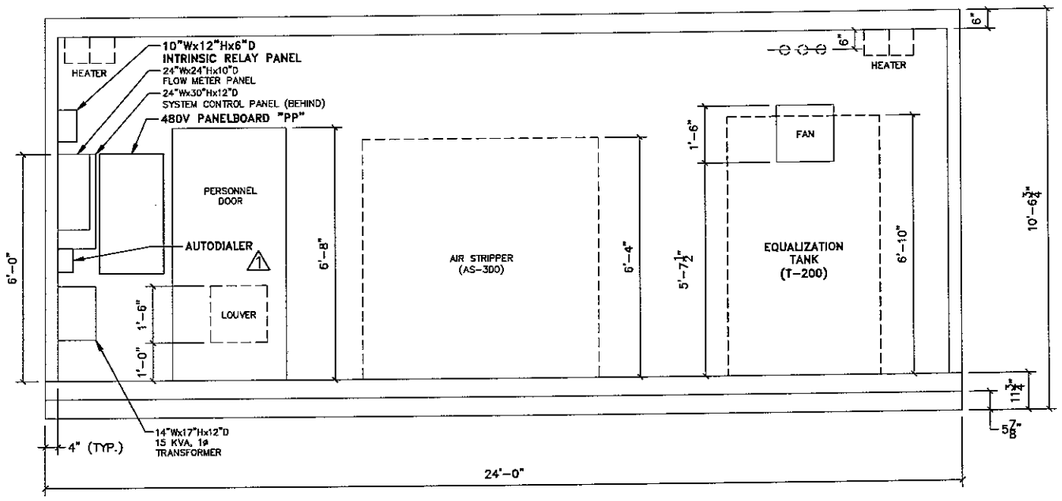


EQUIPMENT PLAN

SCALE: 1/2"=1'-0"

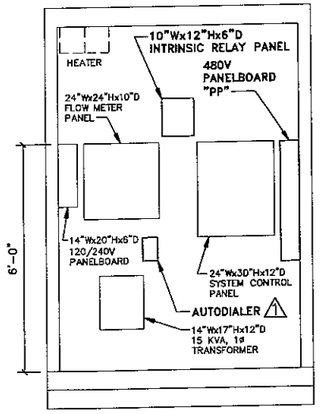
1 REVISED DIMENSIONS ON EQUALIZATION TANK; RELOCATED P-200 AND F-200; AND RELOCATED AUTODIALER.

2 INSTALL NEW DISCHARGE LINE TO SURFACE WATER.



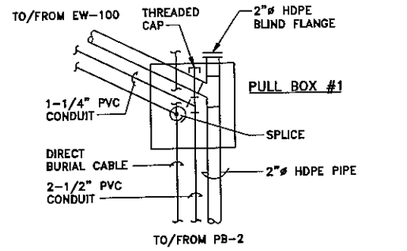
EQUIPMENT ELEVATION

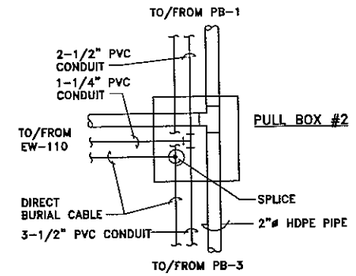
SCALE: 1/2"=1'-0"

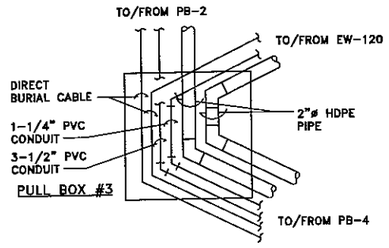


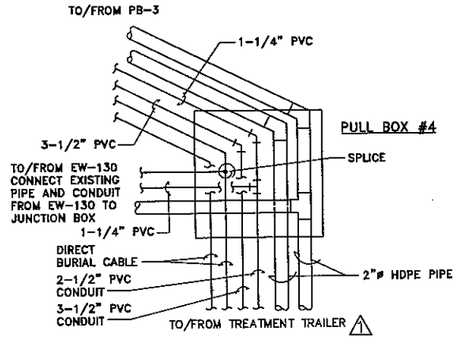
SECTION 1/4

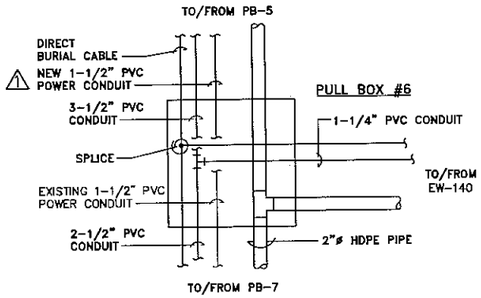
SCALE: 1/2"=1'-0"



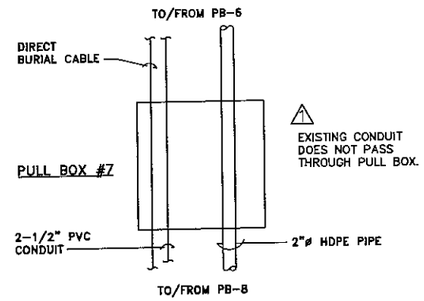


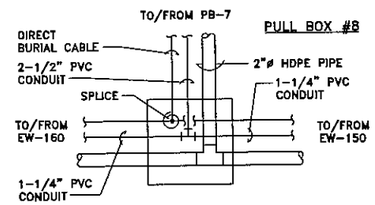






1 REMOVED PULL BOX #5





NOTE:

DIRECT BURIAL CABLE CAN BE PULLED AROUND OR UNDER PULL BOX WHERE IT IS NOT BEING SPLICED.

PULL BOX DETAIL

NOT TO SCALE

L: ON=*,OFF=REF
P: PAGESET/CDL, CDL2B
4/23/02 SYR-54-DCC SDL
34216070/34216M01.DWG

Graphic Scale 1/2"=1'-0" (2' 0 2' 4')

NO ALTERATIONS PERMITTED HEREON EXCEPT AS PROVIDED UNDER SECTION 7209 SUBDIVISION 2 OF THE NEW YORK STATE EDUCATION LAW

No.	Date	Revisions	Init
1	1/24/01	GENERAL REVISIONS DURING CONSTRUCTION	
2	4/17/02	DISCHARGE MODIFICATION	

Project Mgr. GMT

BLASLAND, BOUCK & LEE, INC. engineers & scientists

BAUSCH & LOMB INCORPORATED • CHILI, NEW YORK
FORMER FRAME CENTER
GROUND-WATER COLLECTION AND TREATMENT SYSTEM

EQUIPMENT LAYOUT AND DETAIL

MECHANICAL

File Number 34216070/34216M01

Date APRIL 2002

Blasland, Bouck & Lee, Inc.
Corporate Headquarters
6723 Towpath Road
Syracuse, NY 13214
315-446-9120

5A

ARCADIS

Appendix D

Storm Sewer Discharge
Correspondence

New York State Department of Environmental Conservation
Division of Environmental Remediation, Region 8
6274 East Avon-Lima Road, Avon, New York 14414-9519
Phone: (585) 226-5353 • **FAX:** (585) 226-8139
Website: www.dec.ny.gov

Alexander B. Grannis
Commissioner

July 12, 2010

Mr. Frank Chiappone
Manager, Global Environmental Affairs
Bausch & Lomb
Rochester, New York 14604-2701

Dear Mr. Chiappone:

Subject: Former Bausch & Lomb Frame Center, Site #828061
Site Management Plan, February 2010
Town of Chili, Monroe County

The New York State Department of Environmental Conservation (NYSDEC) has completed its review of the February 2010 Site Management Plan (SMP) for the Former Bausch & Lomb Frame Center site and offers the following comments:

1. Please include the attached revised effluent criteria for the groundwater treatment system which will apply to the site effective August 1, 2010. The updated effluent criteria have been based on treated effluent from the air stripper being discharged to the storm sewer, also known as an unnamed tributary to Black Creek. The requested modifications in the facility's January 20, 2010 letter have been taken into consideration whilst revising the current effluent limits. The facility requested semiannual monitoring for these parameters; however, monitoring frequencies of less than quarterly do not provide sufficient data to judge a treatment system's efficiency or allow for adequate monitoring of the effluent. The facility also requested the removal of Oil and Grease, pH and iron from its monitoring requirements. The monitoring of pH has been maintained; the effluent limit for Iron has been increased to 1.0 mg/L to bring the value in line with current NYSDEC guidance; and monitoring for Oil and Grease has been removed. A monitoring requirement and effluent limit for cis-1,2-dichloroethene has also been included. The Region 8 Regional Water Engineer should be kept appraised of the status of this discharge and sent a copy of the effluent results for informational purposes.

2. Review and revise the SMP to make it consistent with the attached effluent criteria. For example, in Sections 2.3.3 and 2.4.1 the discharge monitoring frequency needs to be changed from semi-annually to quarterly.

3. Please include the NYSDEC site identification number, 828061, on the cover.

4. Please include the contingency plan from the Final Engineering Report.

5. In section 2.4.1, add MW-17D to the list of wells to be sampled semi-annually.

6. Include a figure showing the groundwater monitoring wells that will be sampled as part of the semi-annual monitoring.

7. References to the Draft version DER-10 should be changed to the final version of DER-10 dated May 2010.

By **August 31, 2010,** please submit a revised SMP that addresses these comments; however, compliance with the attached effluent criteria is required starting **August 1, 2010**.

Thank you for your cooperation and please contact me at (585) 226-5357 if you have any questions.

Sincerely,

Frank Sowers, P.E.
Environmental Engineer 2

Attach

ec: w/attach
B. Putzig
J. Kenney
J. Kosmala
S. Powlin

FINAL EFFLUENT LIMITS, LEVELS AND MONITORING

L:\DOW\PERMITS\!permitequivalents\828061e.705.wpd

OUTFALL No.	WASTEWATER TYPE	RECEIVING WATER	EFFECTIVE	EXPIRING
001	Treated Air Stripper Discharge	Unnamed Tributary to Black Creek	August 1, 2010	August 1, 2015

PARAMETER	MINIMUM	MAXIMUM	UNITS	SAMPLE FREQUENCY	SAMPLE TYPE	FOOTNOTES
pH	6.5	8.5	SU	Weekly	Grab	1

PARAMETER	COMPLIANCE LIMIT		UNITS	SAMPLE FREQUENCY	SAMPLE TYPE	FOOTNOTES
	Daily Avg.	Daily Max.				
Flow	Monitor	Monitor	GPM	Weekly	Instantaneous	1,4,6
Iron, Total	NA	1.0	mg/l	Quarterly	Grab	4,6
1,1-Dichloroethane	NA	0.01	mg/l	Quarterly	Grab	4,6
1,1-Dichloroethene	NA	0.01	mg/l	Quarterly	Grab	4,6
cis-1,2-Dichloroethene	NA	0.01	mg/l	Quarterly	Grab	4,6
Freon 113	NA	0.01	mg/l	Quarterly	Grab	4,6
1,1,1-Trichloroethane	NA	0.01	mg/l	Quarterly	Grab	4,6
Trichloroethene	NA	0.01	mg/l	Quarterly	Grab	4,6
Vinyl Chloride	NA	0.01	mg/l	Quarterly	Grab	4,6

Footnotes:

(1) The discharge rate may not exceed the effective treatment system capacity. All monitoring data, engineering submissions and modification requests must be submitted to the following DER contact person: Frank Sowers, P.E., NYSDEC – Region 8.

(2) Only site generated wastewater is authorized for treatment and discharge.

(3) Authorization to discharge is valid only for the period noted above but may be renewed if appropriate. A request for renewal must be received 6 months prior to the expiration date to allow for a review of monitoring data and reassessment of monitoring requirements.

(4) Both concentration (mg/l) and mass loadings (lbs/day) must be reported to the Department for all parameters except Flow and pH.

(5) Samples and measurements, to comply with the monitoring requirements specified above, shall be taken from the effluent side of the air stripper prior to discharge to the unnamed tributary (swale) of Black Creek, Class C.

(6) The minimum measurement frequency for all the parameters (except flow) shall be QUARTERLY. If a discharge limitation for any parameter is exceeded the measurement frequency for that parameter shall be WEEKLY, until a period of four (4) consecutive sampling events shows no exceedances at which point QUARTERLY monitoring may resume.

New York State Department of Environmental Conservation
Division of Environmental Remediation, Region 8
6274 East Avon-Lima Road, Avon, New York 14414-9519
Phone: (585) 226-5353 • **FAX:** (585) 226-8696
Website: www.dec.state.ny.us

Erin M. Crotty
Commissioner

April 26, 2002

Mr. Frank Chiappone
Manager, Global Environmental Affairs
Bausch & Lomb
One Bausch & Lomb Place
Rochester, New York 14604-2701

Dear Mr. Chiappone:

RE: Former Bausch & Lomb Frame Center Site #828061
Request to Modify Groundwater Monitoring Program

The Department has reviewed Bausch & Lomb's request to modify the groundwater monitoring program at the above-referenced site. A summary of your proposals and the Department's responses are provided in the attached Table 1. Please include the approved changes in the next revision of the Operation and Maintenance Manual and please contact me at (585) 226-5357 if you have any questions.

Sincerely,

Frank Sowers, P.E.
Environmental Engineer 1

cc:
B. Putzig- DEC
T. Reamon- DEC Albany
F. Navratil- DOH Troy
J. Albert - MCHD

Table 1. Summary of Proposed Changes to Monitoring Schedule

Parameter	Current Requirements	Bausch & Lomb's Proposed Change	Department Response	Comments
Well BL 18S	Monitor quarterly	Monitor annually	The proposed change is acceptable	See notes 1, 2, and 3
Well BL 17D	Monitor quarterly	Monitor annually	The proposed change is acceptable	See notes 1, 2, and 3
Well CH 3S	Monitor quarterly	Monitor annually	The proposed change is not-acceptable	Monitoring this well twice per year (April and October) is acceptable. See notes 2 and 3
Well CH 5S	Monitor quarterly	Monitor annually	The proposed change is acceptable	See notes 1, 2, and 3
Well CH 7	Monitor quarterly	Monitor annually	The proposed change is acceptable	See notes 1, 2, and 3
Well CH 8S	Monitor quarterly	Monitor annually	The proposed change is not-acceptable	Monitoring this well twice per year (April and October) is acceptable. See notes 2 and 3
Well CH 6S	Monitor quarterly	Monitor annually	The proposed change is acceptable	See notes 1, 2, and 3
Well BL 14D	Monitor quarterly	Monitor annually	The proposed change is acceptable	See notes 1, 2, and 3
Well BL 25S	Monitor quarterly	Monitor annually	The proposed change is acceptable	See notes 1, 2, and 3
Well CH 5D	Monitor quarterly	Monitor annually	The proposed change is not-acceptable	See note 4.
Well CH 8D	Monitor quarterly	Monitor annually	The proposed change is not-acceptable	VOCs have not been detected in this well for several sampling events the, but the well is located adjacent to an existing residential area and the well is screened in the deep zone where VOC contamination is present. Quarterly monitoring must continue. See note 4.
Field Parameters	Monitor quarterly	Monitor annually	The proposed change is acceptable	See notes 1 and 2
Groundwater Elevation Measurements	Measure quarterly	Measure twice a year (April and July)	The proposed change is acceptable, except as noted.	The measurements should be obtained in April and October, rather than April and July.

Notes:

1. To monitor possible seasonal effects, the quarter during which the annual monitoring is performed should be changed on a rotating schedule. That is, in year 1 the annual monitoring would take place in quarter 1, in year 2 the annual monitoring would take place in quarter 2, and so on.

2 If a well is dry during the quarter in which annual monitoring is performed, the dry well must be sampled during the next quarterly monitoring event.

3. If Freon 113 is detected at any concentration or VOCs are detected at concentrations above NYS groundwater standards or guidance values in a well, then quarterly monitoring must resume for that well for at least the next four quarters.

4. For the off-site wells, including CH-3S, CH-8S, CH-5D, and CH-8D, further reductions in the monitoring frequency may be proposed when either the contaminant levels in the off-site groundwater plume are consistently at or below the ambient groundwater standard, or appropriate institutional controls are in place preventing the installation of private wells at off-site properties.

December 11, 2001

BAUSCH & LOMB

Mr. Frank Sowers
NYSDEC Region 8
6274 East Avon Lima Road
Avon, New York 14414

RE: Bausch & Lomb Frame Center (Former), Site No. 8-28-0618

Dear Mr. Sowers,

As we discussed during the annual site inspection on October 11-12, 2001, I would like to formally propose changes to the Paul Road Site ground water treatment system (GWTS) and the site-monitoring program. It is my understanding understand that the site reclassification is very near completion. In order to expedite the proposed changes I decided to send this letter to the regional office in advance of the reclassification.

The GWTS currently discharges to the Monroe County Sewer System under a permit from the county. The flow is approximately 30,000 GPD and the county has indicated that if the discharge is showing non-detectable contaminant levels, the preference would be to not have the discharge use capacity in POTWs system. The discharge data for the GWTS has been provided to NYSDEC, the most recent data is included in the first annual report (Groundwater Collection and Treatment System Annual Report November 2001). The discharge data suggests that for most of the year and consecutively for the past few months, the system has removed the contaminants monitored to non-detectable levels.

Given the demonstrated performance of GWTS, Bausch & Lomb would like to pursue installation of a surface water discharge for the GWTS. As you may recall, I had initiated the surface water discharge proposal in a letter dated May 24, 2000 to Dylan Keenan who was the DEC Project Manager at the time (see attached letter dated May 24, 2001). That letter was prepared after conversations with Angus Eaton of NYSDEC in Albany regarding the GWTS discharge and the consent order, whereby B&L would not require SPDES permitting but would be required to meet the substantial requirements of a SPDES permit. On November 2, 2000 I received a letter back from Dylan Keenan with the effluent criteria for the treated air stripper discharge to the swale a.k.a. unknown tributary to Black Creek (see attached letter dated November 2, 2000). We subsequently discussed a modification to the special condition No. 6 in the November 2, 2000 letter. Mr. Eaton was in agreement with our proposal that the last condition could be modified to indicate an exceedance for oil and grease, TSS or iron did not require the re-sampling of VOC's.

When constructing the GWTS in the fall of 2000 we anticipated that a surface water discharge would someday be a practical alternative to the POTW discharge. We took the opportunity to install approximately 40 feet of 4" schedule 80 PVC pipe under the trench that was excavated for the GWTS pipe and electrical conduits. This piping is in place and with risers extending above the ground surface on both ends. To complete the installation of a surface water discharge we would need to reconfigure the air stripper discharge piping to accommodate both discharges and extend the 4" in ground PVC pipe with the appropriate pitch for approximately 120' to the nearest storm sewer manhole.

In addition to incorporating the surface water discharge, we are proposing a modification to the monitoring program. With over one year of monitoring completed, it has become apparent that a number of monitoring wells we monitor on a quarterly basis are consistently showing non-detectable concentrations for the parameters. Accordingly, we propose the following wells would be monitored annually as opposed to quarterly; BL18S, BL17D, CH3S, CH5S, CH5D, CH7, CH8S, CH8D, CH6S, BL14D and BL25S.

Additionally we are proposing that the field analytical parameters (pH, temperature, conductivity, dissolved oxygen and oxidation/reduction potential) be taken annually and the well elevation

measurements be taken on a semi- annual basis (April and July) to provide the most meaningful high and low water table data.

I am hopeful you will give consideration to these suggestions in light of the recently submitted Annual Report, as the intent is to be both efficient and effective with the resources we are committing to this project.

Sincerely;

Frank Chiappone
Manager of Environmental Affairs

Xc: J. Grathwol (NYSDEC)
G. Thomas (BBL)

One Bausch & Lomb Place
Rochester NY 14604-2701
716 338 6000

Transmitted US Mail

BAUSCH & LOMB

May 24, 2000

Mr. Dylan Keenan, P.E.
New York State Department of Environmental Conservation
Division of Environmental Remediation
50 Wolf Road
Albany, New York 12233-7010

Re: Application for Remedial Project Discharge to Surface Water
Former Bausch & Lomb Frame Center, Site #8-28-061
Chili, New York
Project #: 34216

Dear Mr. Keenan:

As you are aware, Angus Eaton of NYSDEC provided me an application to request effluent criteria for the direct discharge of remediation wastewater. Below you will find the responses to the eleven listed items in the application for discharge of remedial water to surface water:

1. *Discharge rate (i.e. treatment system design capacity).* The treatment system is expected to have an average flow rate of 9.5 gpm and a maximum flow rate of 19.5 gpm.

2. *A brief description/flow diagram for the proposed treatment system.* Groundwater will be pumped from seven groundwater extraction wells to an equalization tank within the treatment building. After some settling and equalization occurs, the groundwater will be pump through a 25 micron bag filter and into the NEEP Model 2621 low profile air stripper. The water will pass across two trays of the air stripper as air from the blower is bubbled though the water. The subsequent frothing action will transfer air- strippable VOCs from the groundwater to the air. The vapor will be discharged to the atmosphere and the treated groundwater will be pumped to the sanitary sewer. When NYSDEC authorization is obtained, the discharge will be directed to a gravity drain connected to the site storm sewer system.

3. *A description of the receiving stream, including an accurate map showing the stream and discharge location. When available, provide latitude and longitude of discharge point.* The treated water will be discharged via an approximately 300-foot long gravity drainage line to a storm sewer manhole. This storm sewer system receives storm-water runoff from the former Frame Center roof drains and parking lots and possibly other discharges from the current occupants of the former Frame Center (the site was sold by Bausch & Lomb in 1998). Once the treatment system discharge water is in the storm sewer, the water will travel approximately 500 feet to a storm sewer outfall. Bausch & Lomb previously had a SPDES permit for this outfall, DEC 8-2622-00003/00047-0, SPDES NY 0001317. That outfall is located at a latitude of approximately 43 06' 04" and a longitude of approximately 77 43' 08". This previous SPDES permit was for discharge of non-contact cooling water and storm-water from the former Frame Center. The outfall discharges into a drainage swale which was reconstructed in 1995. The drainage swale is approximately 700 feet long and is lined with a medium-sized rip rap underlain by a geotextile. Two minor, intermittent tributaries enter the rip rap-lined drainage swale. The reconstructed drainage swale terminates at a railroad culvert. The intermittent drainage swale flow will travel under the tracks via the culvert, and then south approximately 1,500 feet via an open drainage swale through agricultural fields to the confluence with Black Creek.

Because the storm water sewers at the site receives water from other sources besides the treatment system, the outfall location for this currently proposed system should not be the same as the previous

SPDES outfall. Bausch & Lomb suggests that the outfall should be considered to be the manhole where the treatment system drainage line discharges to the storm sewer. Due to the difficulty of monitoring at this location, Bausch & Lomb proposes to monitor the discharge from a sample tap inside the treatment system building but after the air stripper.

4. Provide available wastewater monitoring data in a tabular format (NYSDEC Form NY-2C, section II, outfall information should be used). Data must be provided for all substances detected in the wastewater source, not just those substances identified as parameters of concern. Concentration data should represent worst case discharge (i.e. "hottest well", etc.). The attached table has both the concentration data and the per day total mass data for the groundwater sampled at the seven groundwater extraction wells.

5. The proposed first day of discharge (for pump test discharges please do not encourage pump tests during summer low flow periods). The discharge will be routed to the sanitary sewer until surface water discharge is authorized by NYSDEC and effluent data is obtained.

6. Proposed duration of discharge. Discharge is planned for thirty years.

7. State whether it is a potentially responsible party, federal superfund or state superfund site. The site is listed in the Registry of Inactive Hazardous Waste Sites in New York State as Classification 2 pursuant to ECL 27-1305.4b..

8. Please note that it is not unusual for a DOW review to take 8 weeks. Please inform responsible parties to plan on submitting requests for effluent criteria at least 8 weeks in advance of the proposed first day of discharge. See response to no. 5 above.

9. Include the name and telephone number of the responsible DHWR project engineer to contact if we have questions or want to borrow a copy of the RI report. Dylan T. Keenan, P.E. (518) 457-5636.

10. The Site number. Site Code # 8-28-061.

11. The DHWR contact/address where compliance monitoring data is to be sent. Same as no. 9 above.

Please feel free to contact me at (716)338-5087 if you have any questions.

Sincerely,

BAUSCH & LOMB

Frank Chiappone
Manager, Global Environmental Affairs

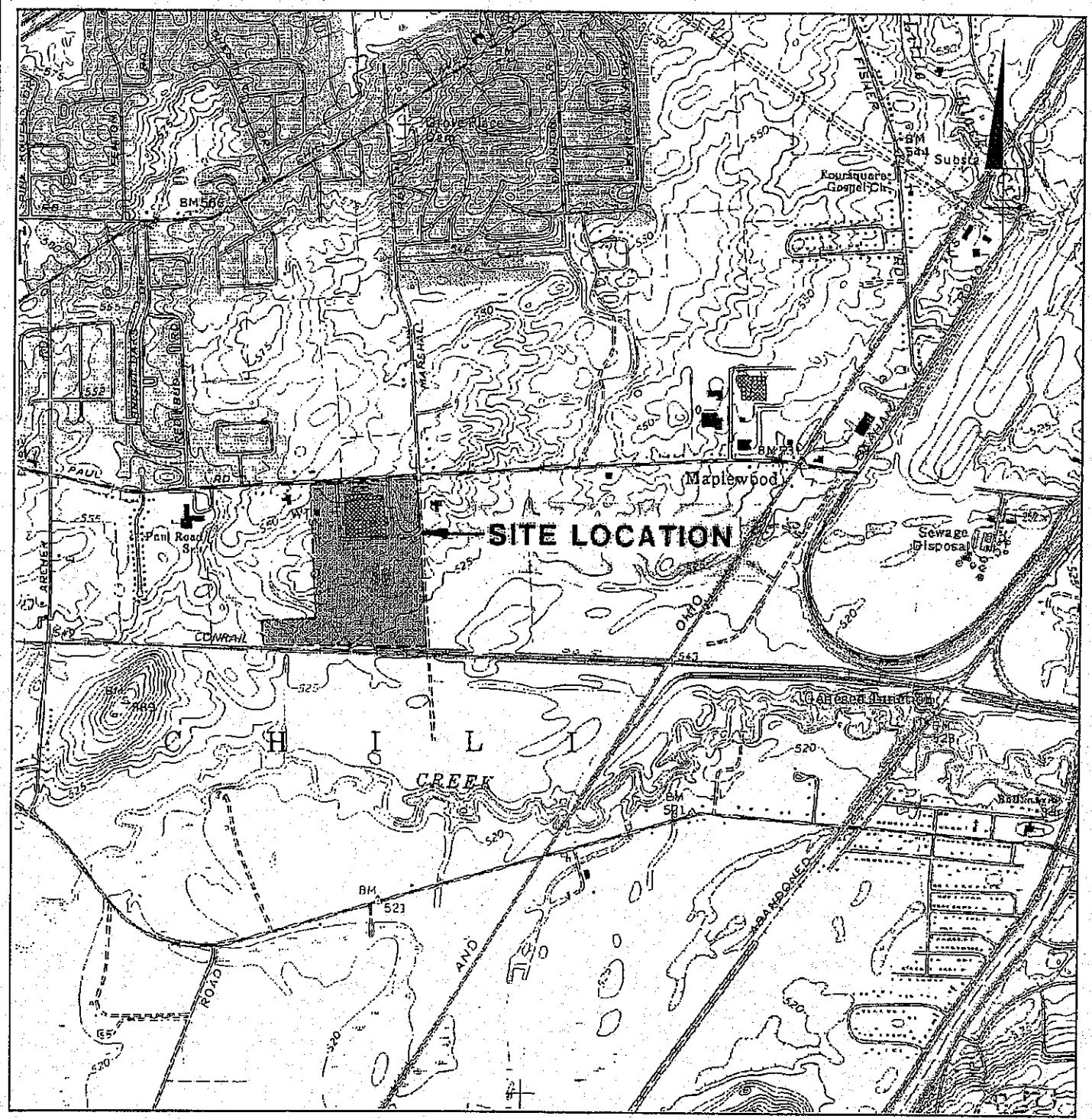
Xc: G. Thomas (BBL)

Bausch and Lomb, Chili, New York
Basis of Design for Air Stripper

Bausch & Lomb, Chili, New York
February 2000 New well samples

	EW-100	EW-110	EW-120	EW-130	EW-140	EW-150	EW-160	Total
Flow rate	1.5	1.5	1.5	1.5	1.5	1	1	9.5 gpm
Vinyl Chloride	33	33	20	34	48	2600		300 µg/L
Methylene Chloride		12					120	14 µg/L
Acetone		18		20				6.0 µg/L
Freon 113	13	85	72	240	500			144 µg/L
1,1-Dichloroethene	16	41	33	17.5	69	22	480	81 µg/L
1,1-Dichloroethane	50	103	77	32	160		280	96 µg/L
cis-1,2-Dichloroethene	210	370	240	330	580	3200	11	611 µg/L
trans-1,2-Dichloroethene		3						0.47 µg/L
1,1,1-Trichloroethane		2		63	140		990	137 µg/L
Trichloroethene	110	800	680	1300	2600	360	10000	1957 µg/L
1,1,2-Trichloroethane							10	1.1 µg/L
Tetrachloroethene		610					66	103 µg/L
Hardness	610	690	510		660	460	680	510 mg/L
Iron	3.4	12	0.15		2.2	0.6	13	4.23 mg/L
Manganese	0.085	0.4	0.024		0.061	0.075	0.28	0.13 mg/L
pH	7.02	7.02	7.11		7.08	7.21	7.27	7.12
Oil & grease	<5	<5	<5		<5	<5	<5	<5 mg/L
Surfactants	<0.02	<0.02	<0.02		0.027	0.024	<0.02	<0.02 mg/L
TSS	103	487	13.0		102	6.0	670	182 mg/L
TDS	923	777	710		940	683	607	665 mg/L

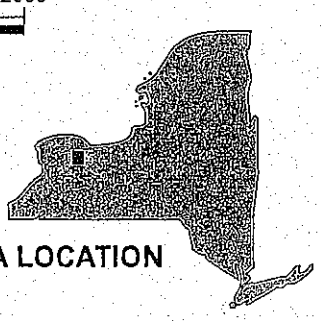
Vinyl Chloride (lbs/day)	0.0006	0.0006	0.0004	0.0006	0.0009	0.0312		0.0343
Methylene Chloride		0.0002					0.0014	0.0016
Acetone		0.0003		0.0004				0.0007
Freon 113	0.0002	0.0015	0.0013	0.0043	0.0090			0.0164
1,1-Dichloroethene	0.0003	0.0007	0.0006	0.0003	0.0012	0.0003	0.0058	0.0092
1,1-Dichloroethane	0.0009	0.0018	0.0014	0.0006	0.0029		0.0034	0.0110
cis-1,2-Dichloroethene	0.0038	0.0067	0.0043	0.0059	0.0104	0.0384	0.0001	0.0697
trans-1,2-Dichloroethene		0.0001						0.0001
1,1,1-Trichloroethane		0.0000		0.0011	0.0025		0.0119	0.0156
Trichloroethene	0.0020	0.0144	0.0122	0.0234	0.0468	0.0043	0.1201	0.2233
1,1,2-Trichloroethane							0.0001	0.0001
Tetrachloroethene		0.0110					0.0008	0.0118
Hardness	11.0	12.4	9.2		11.9	5.5	8.2	58.2
Iron	0.061	0.22	0.0027		0.040	0.007	0.16	0.4831
Manganese	0.0015	0.0072	0.0004		0.0011	0.0009	0.00	0.0145
Surfactants	0.0004	0.0004	0.0004		0.0005	0.0003	0.0002	0.0021
TSS	1.8555	8.7730	0.2342		1.8375	0.0721	8.05	20.8
TDS	16.6273	13.9972	12.7902		16.9335	8.2026	7.29	75.8



REFERENCE: BASE MAP SOURCE, USGS QUAD., CAMILLUS, NY, 1973.

2000' 0 2000'

Approximate Scale: 1" = 2000'



AREA LOCATION

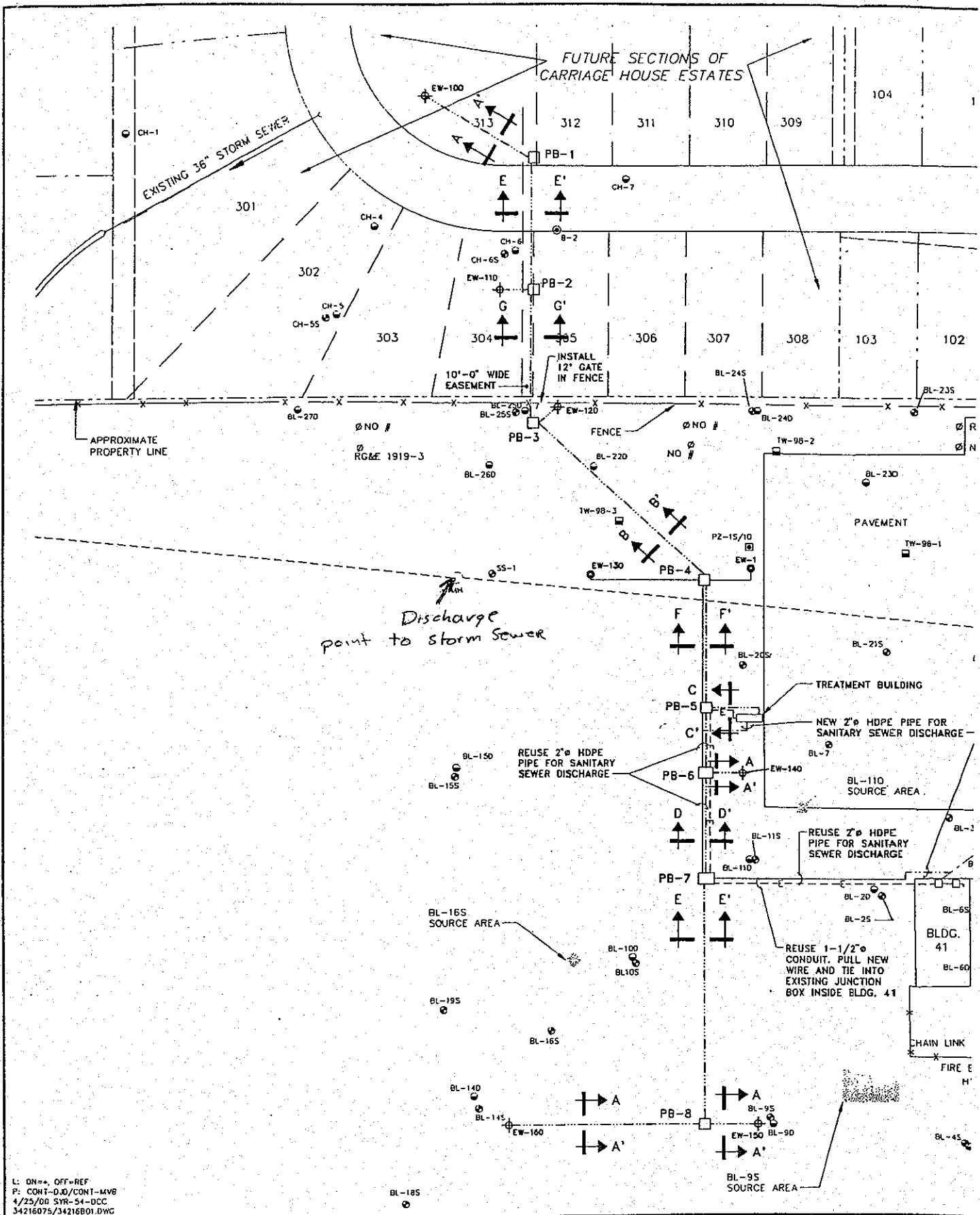
BAUSCH & LOMB INCORPORATED
FRAME CENTER
CHILI, NEW YORK

SITE LOCATION MAP

BBL BLASLAND, BOUCK & LEE, INC. *engineers & scientists*

FIGURE 1

04/98 SYR-D54-LBR
34217010/34217n02.cdr

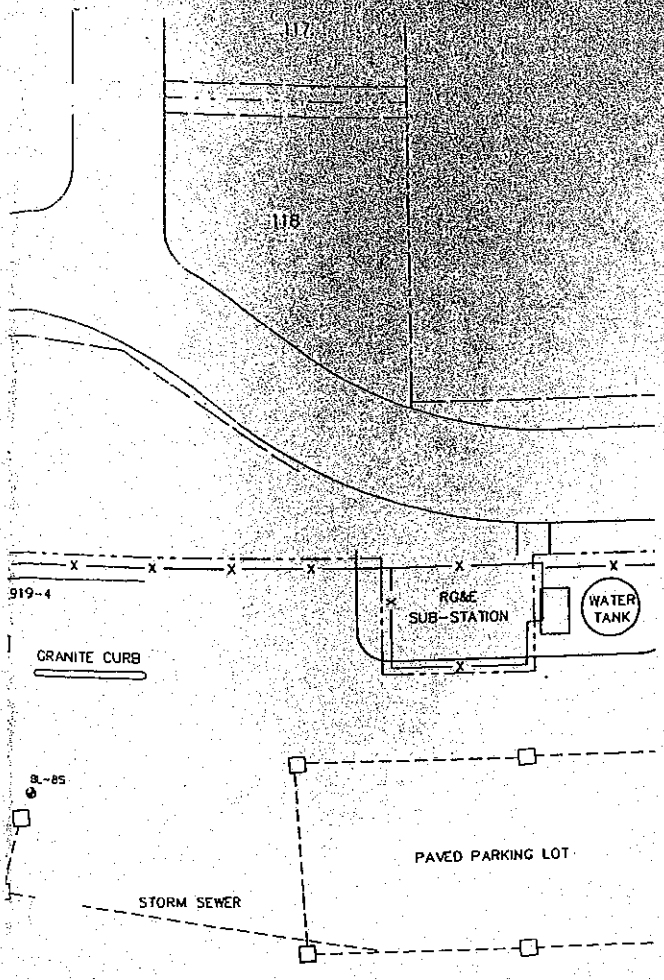


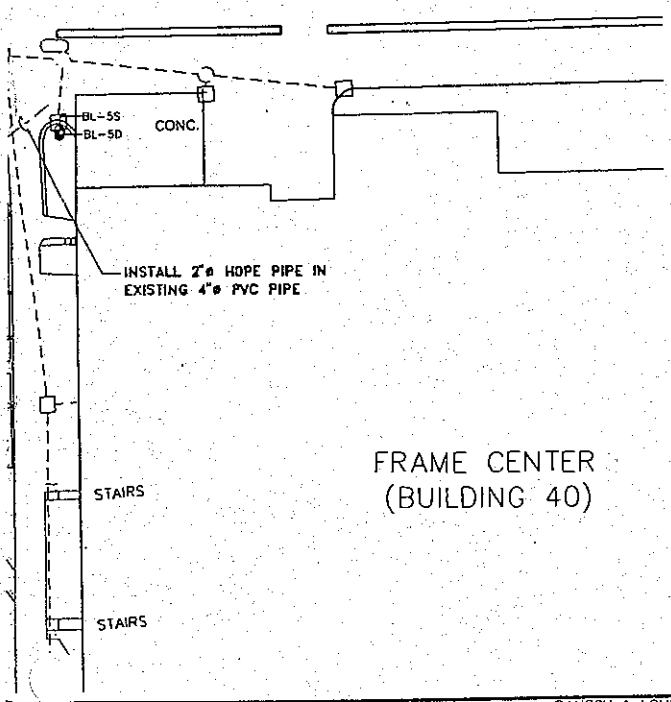
L: ON=*, OFF=REF
P: CONT-DJD/CONT-MV8
4/25/00 SYR-54-DCC
34216075/34216B01.DWG

Graphic Scale
1"=60' 60' 0 60' 120'

No.	Date	Revisions	Init

Project Mgr.	GMT
Designed by	AHL
Drawn by	DCC
Checked by	DRG
Prof. Eng.	XXX
PE License	XXX





FRAME CENTER
(BUILDING 40)

LEGEND:

- MONITORING WELL INSTALLED IN SHALLOW OVERBURDEN
- MONITORING WELL INSTALLED AT BASE OF OVERBURDEN/TOP OF ROCK
- SS — STAINLESS STEEL WELL POINT
- CATCH BASIN
- MANHOLE
- 6"ø EXTRACTION WELL
- 1"ø NESTED PIEZOMETER
- TEMPORARY WELL
- TELEPHONE POLE
- **NEW 6" EXTRACTION WELL**
- PB-1 — PULL BOX
- **NEW DISCHARGE TO SANITARY SEWER**
- EXISTING PIPE TRENCH
- **NEW PIPE/ELECTRICAL TRENCH**
- **NEW ELECTRIC SUPPLY TRENCH**
- EXISTING ELECTRIC SUPPLY TRENCH
- APPROXIMATE ADJACENT TRACT BOUNDARY
- APPROXIMATE PROPOSED LOT BOUNDARY
- APPROXIMATE EXISTING LOT BOUNDARY
- APPROXIMATE EASEMENT BOUNDARY
- STORMWATER COLLECTION PIPE
- EXISTING DISCHARGE TO SANITARY SEWER
- FENCE
- SOURCE AREA

NOTES:

1. SITE PLAN FOR THE ON-SITE AREAS COMPILED FROM EXISTING SITE PLANS PROVIDED BY BAUSCH & LOMB AND SITE SURVEYS TO LOCATE ALL MONITORING WELLS BY BBL DATED 6/17/92, REVISED 4/13/94, 8/13/98, AND 10/28-29/98.
2. LOCATIONS OF PROPERTY LINES, SUBSURFACE UTILITIES AND LIMITS OF BUILDINGS AND PARKING AREAS ARE APPROXIMATE.
3. ADJACENT PROPERTY INFORMATION FROM TRACT MAPS PREPARED BY LADIEU ASSOCIATES P.C.; LOT NUMBERS 101 TO 118 AND 201 TO 208 WERE DESIGNATED BY LADIEU ASSOCIATES P.C.; LOTS IDENTIFIED AS 301 TO 313 ARE IDENTIFIED HERE FOR CONVENIENCE ONLY. INVERT ELEVATION DATUM IS UNKNOWN.
4. LOCATIONS OF THE FOLLOWING WELLS ARE APPROXIMATE: CH-5S, CH-6S, EW-10D, EW-11D, EW-12D, EW-14D, EW-15D, AND EW-16D. EXACT LOCATIONS WILL BE SURVEYED DURING CONSTRUCTION OF THE GROUND-WATER TREATMENT SYSTEM.

DRAFT

BBL
BLASLAND, BOUCK & LEE, INC.
engineers & scientists

BAUSCH & LOMB INCORPORATED • CHILI, NEW YORK
FORMER FRAME CENTER
GROUND-WATER TREATMENT SYSTEM

SITE PLAN

GENERAL

File Number
342.16.01F

Date
APRIL 2000

Blasland, Bouck & Lee, Inc.
Corporate Headquarters
6723 Towpath Road
Syracuse, NY 13214
315-446-9120

New York State Department of Environmental Conservation
Division of Environmental Remediation
Bureau of Western Remedial Action, Room 348
50 Wolf Road, Albany, New York 12233-7010
Phone: (518) 457-5636 • **FAX:** (518) 457-3972
Website: www.dec.state.ny.us

John P. Cahill
Commissioner

November 2, 2000

Mr. Frank Chiappone
Bausch & Lomb
1 Bausch & Lomb Place
Rochester, New York 14604-2701

Re: **Bausch & Lomb Frame Center (Former), Site No. 8-28-061**
Chili (T), Monroe County, New York
Effluent Discharge Criteria

Dear Mr. Chiappone:

The enclosed table outlines the effluent criteria for the treated effluent from the air stripper being discharged to the swale a.k.a. an unknown tributary to Black Creek for the above referenced site. These criteria were developed from the submission of the information to the Department of Water as referenced in the letter from Frank Chiappone, Bausch & Lomb, to Dylan Keenan, DEC, dated May 24, 2000.

Compliance monitoring data, engineering submissions, and modification requests must be submitted to Ms. Mary Jane Peachey, P.E., the Region 8 Regional Hazardous Waste Engineer. Prior to implementing surface water discharge, Bausch & Lomb must update the Operation and Maintenance Plan to include surface water discharge reporting requirements and reports. These reports shall include quarterly status reports and a yearly report that evaluates the effectiveness and performance of the remediation system in a format acceptable to the State.

Also, Mr. Tom Pearson, P.E., the Region 8 Regional Water Engineer, should be kept appraised of the status of this discharge and sent a copy of the effluent results and reports for informational purposes.

If you have any questions, please contact Ms. Peachey at (716) 226-2466.

Sincerely,

Dylan T. Keenan

Dylan T. Keenan, P.E.
Environmental Engineer 2

Enclosure:

cc: J. Grathwol, NYSDEC, BCS
M. J. Peachey/F. Sowers, NYSDEC, Avon
T. Pearson, NYSDEC, Avon
B. Baker, NYSDEC, DOW
F. Navratil, NYSDOH, Troy
J. Albert, MCHD

8-28-061.014

FINAL EFFLUENT LIMITS, LEVELS AND MONITORING

D:\BFR BAKER\DHWR\82

OUTFALL No.	WASTEWATER TYPE	RECEIVING WATER	EFFECTIVE	EXPIRING
001	Treated Air Stripper Discharge	Unnamed Tributary to Black Creek	August 1, 2000	August 1, 2005

PARAMETER	MINIMUM	MAXIMUM	UNITS	SAMPLE FREQUENCY	SAMPLE TYPE	FOOTNOTES
pH	6.5	8.5	SU	Weekly	Grab	1

PARAMETER	COMPLIANCE LIMIT		UNITS	SAMPLE FREQUENCY	SAMPLE TYPE	FOOTNOTES
	Daily Avg.	Daily Max.				
Flow	Monitor	Monitor	GPM	Weekly	Instantaneous	1,4,6
Oil and Grease	NA	15	mg/l	Weekly	Grab	4,6
Solids, Total Suspended	NA	50	mg/l	Weekly	Grab	4,6
Iron, Total	NA	0.3	mg/l	Weekly	Grab	4,6
Acetone	NA	0.01	mg/l	Weekly	Grab	4,6
1,1-Dichloroethane	NA	0.01	mg/l	Weekly	Grab	4,6
1,1-Dichloroethene	NA	0.01	mg/l	Weekly	Grab	4,6
cis-1,2-Dichloroethene	NA	0.01	mg/l	Weekly	Grab	4,6
trans-1,2-Dichloroethene	NA	0.01	mg/l	Weekly	Grab	4,6
Freon 113	NA	0.01	mg/l	Weekly	Grab	4,6
Methylene Chloride	NA	0.01	mg/l	Weekly	Grab	4,6
Tetrachloroethene	NA	0.01	mg/l	Weekly	Grab	4,6
1,1,1-Trichloroethane	NA	0.01	mg/l	Weekly	Grab	4,6
1,1,2-Trichloroethane	NA	0.01	mg/l	Weekly	Grab	4,6
Trichloroethene	NA	0.01	mg/l	Weekly	Grab	4,6
Vinyl Chloride	NA	0.01	mg/l	Weekly	Grab	4,6

Footnotes: See Page 2 of 2

Special Conditions:

(1) The discharge rate may not exceed the effective treatment system capacity. All monitoring data, engineering submissions and modification requests must be submitted to the following DER contact person: _____.

(2) Only site generated wastewater is authorized for treatment and discharge.

(3) Authorization to discharge is valid only for the period noted above but may be renewed if appropriate. A request for renewal must be received 6 months prior to the expiration date to allow for a review of monitoring data and reassessment of monitoring requirements.

(4) Both concentration (mg/l) and mass loadings (lbs/day) must be reported to the Department for all parameters except Flow and pH.

(5) Samples and measurements, to comply with the monitoring requirements specified above, shall be taken from the effluent side of the air stripper prior to discharge to the unnamed tributary (swale) of Black Creek, Class C.

(6) The minimum measurement frequency for all the parameters (except flow) shall be MONTHLY following a period of 12 consecutive WEEKLY sampling events showing no exceedances of the stated discharge limitations. If a discharge limitation for any parameter is exceeded the measurement frequency for all parameters shall again be WEEKLY, until a period of 8 consecutive sampling events shows no exceedances at which point MONTHLY monitoring may resume.

Appendix E

NYSDEC Well Decommissioning Forms

FIGURE 1

SITE NAME: Bausch & Lomb

SITE ID.:
INSPECTOR: RDC
DATE/TIME: 2-19-13
WEll ID.: EW-100

MONITORING WELL FIELD INSPECTION LOG
NYSDEC WELL DECOMMISSIONING PROGRAM

	YES	NO
WELL VISIBLE? (If not, provide directions below)	X	
WELL I.D. VISIBLE?		X
WELL LOCATION MATCH SITE MAP? (if not, sketch actual location on back)	X	

WELL I.D. AS IT APPEARS ON PROTECTIVE CASING OR WELL: NA

	YES	NO
SURFACE SEAL PRESENT?		X
SURFACE SEAL COMPETENT? (If cracked, heaved etc., describe below) NA		
PROTECTIVE CASING IN GOOD CONDITION? (If damaged, describe below)	X	

HEADSPACE READING (ppm) AND INSTRUMENT USED: NA
TYPE OF PROTECTIVE CASING AND HEIGHT OF STICKUP IN FEET (If applicable): stick up ≈ 2'
PROTECTIVE CASING MATERIAL TYPE: PVC
MEASURE PROTECTIVE CASING INSIDE DIAMETER (Inches): 8"

	YES	NO
LOCK PRESENT?		X
LOCK FUNCTIONAL? NA		
DID YOU REPLACE THE LOCK?		X
IS THERE EVIDENCE THAT THE WELL IS DOUBLE CASED? (If yes,describe below)		X
WELL MEASURING POINT VISIBLE?	X	

MEASURE WELL DEPTH FROM MEASURING POINT (Feet): Measured from Top of casing: 32.60'
MEASURE DEPTH TO WATER FROM MEASURING POINT (Feet): 6.45'
MEASURE WELL DIAMETER (Inches): 6"
WELL CASING MATERIAL: slotted PVC
PHYSICAL CONDITION OF VISIBLE WELL CASING: Good
ATTACH ID MARKER (if well ID is confirmed) and IDENTIFY MARKER TYPE: NA
PROXIMITY TO UNDERGROUND OR OVERHEAD UTILITIES: NA

DESCRIBE ACCESS TO WELL: (Include accessibility to truck mounted rig, natural obstructions, overhead power lines, proximity to permanent structures, etc.); ADD SKETCH OF LOCATION ON BACK, IF NECESSARY.
Accessible to drill rig, Bobcat, 4x4 vehicles.

DESCRIBE WELL SETTING (For example, located in a field, in a playground, on pavement, in a garden, etc.) AND ASSESS THE TYPE OF RESTORATION REQUIRED.
located in grassy field (unused fill material present)

IDENTIFY ANY NEARBY POTENTIAL SOURCES OF CONTAMINATION, IF PRESENT (e.g. Gas station, salt pile, etc.):
None

REMARKS:
Extraction well was made visable by setting 8" PVC over the 6" PVC casing. 8" PVC protective casing stuck up about 2' (AGS) and had no cover. Top of 8" protective casing is where measurements were taken from.

FIGURE 3

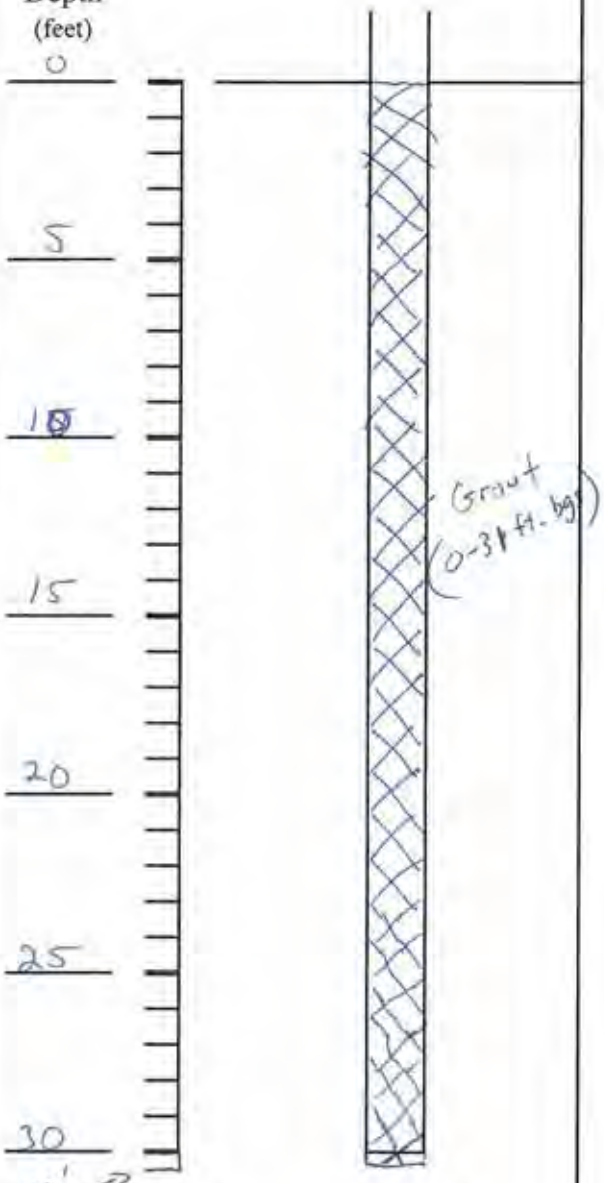
WELL DECOMMISSIONING RECORD

Site Name: Bausch & Lomb	Well I.D.: EW-100
Site Location: Future location of Carriage House Estates, Chili, New York	Driller: Neil Short
Drilling Co.: Nothnagle Drilling Inc.	Inspector: Ryan Clare
	Date: 2-19-13

DECOMMISSIONING DATA
(Fill in all that apply)

OVERDRILLING	
Interval Drilled	0'-31'
Drilling Method(s)	HSA
Borehole Dia. (in.)	14"
Temporary Casing Installed? (y/n)	NA
Depth temporary casing installed	NA
Casing type/dia. (in.)	NA
Method of installing	NA
CASING PULLING	
Method employed	Cable
Casing retrieved (feet)	31'
Casing type/dia. (in)	PVC/6"
CASING PERFORATING	
Equipment used	NA
Number of perforations/foot	NA
Size of perforations	NA
Interval perforated	NA
GROUTING	
Interval grouted (FBLS)	0-31'
# of batches prepared	3
For each batch record:	
Quantity of water used (gal.)	≈30
Quantity of cement used (lbs.)	282
Cement type	Type 1
Quantity of bentonite used (lbs.)	12
Quantity of calcium chloride used (lbs.)	NA
Volume of grout prepared (gal.)	40
Volume of grout used (gal.)	40

WELL SCHEMATIC*



* Sketch in all relevant decommissioning data, including: interval overdrilled, interval grouted, casing left in hole, well stickup, etc.

COMMENTS: Well overdrilled 0-30 ft. bgs
30' of PVC well recovered

Drilling Contractor

Department Representative

FIGURE 1

SITE NAME: Bausch + Lomb

SITE ID.:
INSPECTOR: RDC
DATE/TIME: 2-20-13
WELL ID.: EW-110

MONITORING WELL FIELD INSPECTION LOG
NYSDEC WELL DECOMMISSIONING PROGRAM

	YES	NO
WELL VISIBLE? (If not, provide directions below)	X	
WELL I.D. VISIBLE?		X
WELL LOCATION MATCH SITE MAP? (if not, sketch actual location on back)	X	

WELL I.D. AS IT APPEARS ON PROTECTIVE CASING OR WELL: NA

	YES	NO
SURFACE SEAL PRESENT?		X
SURFACE SEAL COMPETENT? (If cracked, heaved etc., describe below) NA		
PROTECTIVE CASING IN GOOD CONDITION? (If damaged, describe below)	X	

HEADSPACE READING (ppm) AND INSTRUMENT USED: NA
TYPE OF PROTECTIVE CASING AND HEIGHT OF STICKUP IN FEET (If applicable): Stick up
PROTECTIVE CASING MATERIAL TYPE: PVC
MEASURE PROTECTIVE CASING INSIDE DIAMETER (Inches): 6"

	YES	NO
LOCK PRESENT?		X
LOCK FUNCTIONAL? NA		
DID YOU REPLACE THE LOCK?		X
IS THERE EVIDENCE THAT THE WELL IS DOUBLE CASED? (If yes,describe below)		X
WELL MEASURING POINT VISIBLE?	X	

X MEASURE WELL DEPTH FROM MEASURING POINT (Feet): measured from top of 8" casing — 28.55
MEASURE DEPTH TO WATER FROM MEASURING POINT (Feet): 6.28
MEASURE WELL DIAMETER (Inches): 6"
WELL CASING MATERIAL: PVC
PHYSICAL CONDITION OF VISIBLE WELL CASING: Good
ATTACH ID MARKER (if well ID is confirmed) and IDENTIFY MARKER TYPE: NA
PROXIMITY TO UNDERGROUND OR OVERHEAD UTILITIES: NA

DESCRIBE ACCESS TO WELL: (Include accessibility to truck mounted rig, natural obstructions, overhead power lines, proximity to permanent structures, etc.); ADD SKETCH OF LOCATION ON BACK, IF NECESSARY.

Accessible to drill rig, Bobcat, 4x4 vehicles

DESCRIBE WELL SETTING (For example, located in a field, in a playground, on pavement, in a garden, etc.) AND ASSESS THE TYPE OF RESTORATION REQUIRED.

located in grassy field (unused fill material present)

IDENTIFY ANY NEARBY POTENTIAL SOURCES OF CONTAMINATION, IF PRESENT (e.g. Gas station, salt pile, etc.):

None

REMARKS:

extraction well was modified last week. Man hole structure around well was removed and the 8" PVC tubing was placed over well casing to make accessible and mark out location. The PVC protective casing was about 2' above ground surface. Well depth and ground water measurements were taken from top of that casing.

FIGURE 3

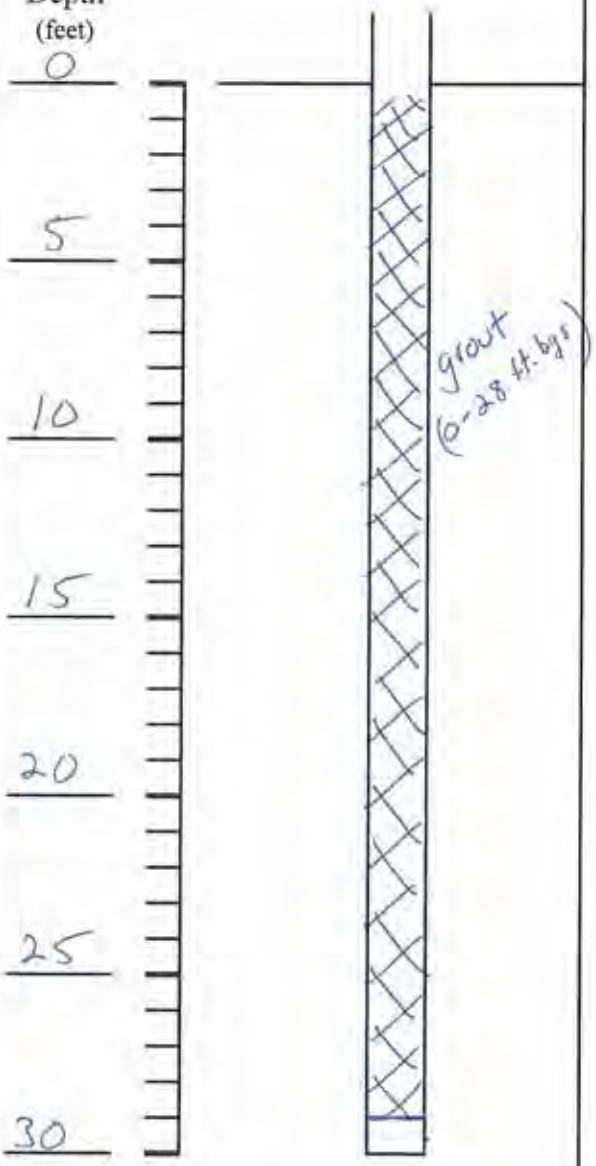
WELL DECOMMISSIONING RECORD

Site Name: Bausch & Lomb	Well I.D.: EW-110
Site Location: Carriage House Estates Chili, New York	Driller: Neil Short
Drilling Co.: Nothnagle Drilling	Inspector: Ryan Clare
	Date: 2-20-13

DECOMMISSIONING DATA
(Fill in all that apply)

OVERDRILLING	
Interval Drilled	0-28'
Drilling Method(s)	HSA
Borehole Dia. (in.)	14"
Temporary Casing Installed? (y/n)	N
Depth temporary casing installed	NA
Casing type/dia. (in.)	NA
Method of installing	NA
CASING PULLING	
Method employed	Cable
Casing retrieved (feet)	28'
Casing type/dia. (in)	PVC/6"
CASING PERFORATING	
Equipment used	NA
Number of perforations/foot	NA
Size of perforations	NA
Interval perforated	NA
GROUTING	
Interval grouted (FBLS)	0-28'
# of batches prepared	3
For each batch record:	
Quantity of water used (gal.)	30
Quantity of cement used (lbs.)	282
Cement type	Type 1
Quantity of bentonite used (lbs.)	12
Quantity of calcium chloride used (lbs.)	NA
Volume of grout prepared (gal.)	40
Volume of grout used (gal.)	40

WELL SCHEMATIC*



COMMENTS: Well overdrilled 0'-28' bgs.
28' of PVC well casing recovered.

* Sketch in all relevant decommissioning data, including: interval overdrilled, interval grouted, casing left in hole, well stickup, etc.

Drilling Contractor

Department Representative

FIGURE 1

SITE NAME: Bausch & Lomb

SITE ID.:
INSPECTOR: RDC
DATE/TIME: 2/20/13
WELL ID.: CH-65

MONITORING WELL FIELD INSPECTION LOG
NYSDEC WELL DECOMMISSIONING PROGRAM

	YES	NO
WELL VISIBLE? (If not, provide directions below)	X	
WELL I.D. VISIBLE?		X
WELL LOCATION MATCH SITE MAP? (if not, sketch actual location on back)	X	

WELL I.D. AS IT APPEARS ON PROTECTIVE CASING OR WELL: NA

	YES	NO
SURFACE SEAL PRESENT?	X	
SURFACE SEAL COMPETENT? (If cracked, heaved etc., describe below)	X	
PROTECTIVE CASING IN GOOD CONDITION? (If damaged, describe below)	X	

HEADSPACE READING (ppm) AND INSTRUMENT USED	NA
TYPE OF PROTECTIVE CASING AND HEIGHT OF STICKUP IN FEET (If applicable)	Flushmount
PROTECTIVE CASING MATERIAL TYPE:	steel / concrete
MEASURE PROTECTIVE CASING INSIDE DIAMETER (Inches):	8"

	YES	NO
LOCK PRESENT?	X	
LOCK FUNCTIONAL?		X
DID YOU REPLACE THE LOCK?		X
IS THERE EVIDENCE THAT THE WELL IS DOUBLE CASED? (If yes,describe below)		X
WELL MEASURING POINT VISIBLE?	X	

MEASURE WELL DEPTH FROM MEASURING POINT (Feet):	14.49
MEASURE DEPTH TO WATER FROM MEASURING POINT (Feet):	5.58
MEASURE WELL DIAMETER (Inches):	2"
WELL CASING MATERIAL:	PVC
PHYSICAL CONDITION OF VISIBLE WELL CASING:	Good
ATTACH ID MARKER (if well ID is confirmed) and IDENTIFY MARKER TYPE	NA
PROXIMITY TO UNDERGROUND OR OVERHEAD UTILITIES	NA

DESCRIBE ACCESS TO WELL: (Include accessibility to truck mounted rig, natural obstructions, overhead power lines, proximity to permanent structures, etc.); ADD SKETCH OF LOCATION ON BACK, IF NECESSARY.

Accessible to drill rig, bobcat, any 4X4 vehicle

DESCRIBE WELL SETTING (For example, located in a field, in a playground, on pavement, in a garden, etc.) AND ASSESS THE TYPE OF RESTORATION REQUIRED.

located in a grassy field (unused fill material present)

IDENTIFY ANY NEARBY POTENTIAL SOURCES OF CONTAMINATION, IF PRESENT (e.g. Gas station, salt pile, etc.):

None

REMARKS:

Flushmount well in 8" steel protective casing (~3" ags.) and concrete
All depth measurements taken from top of PVC casing.

FIGURE 3

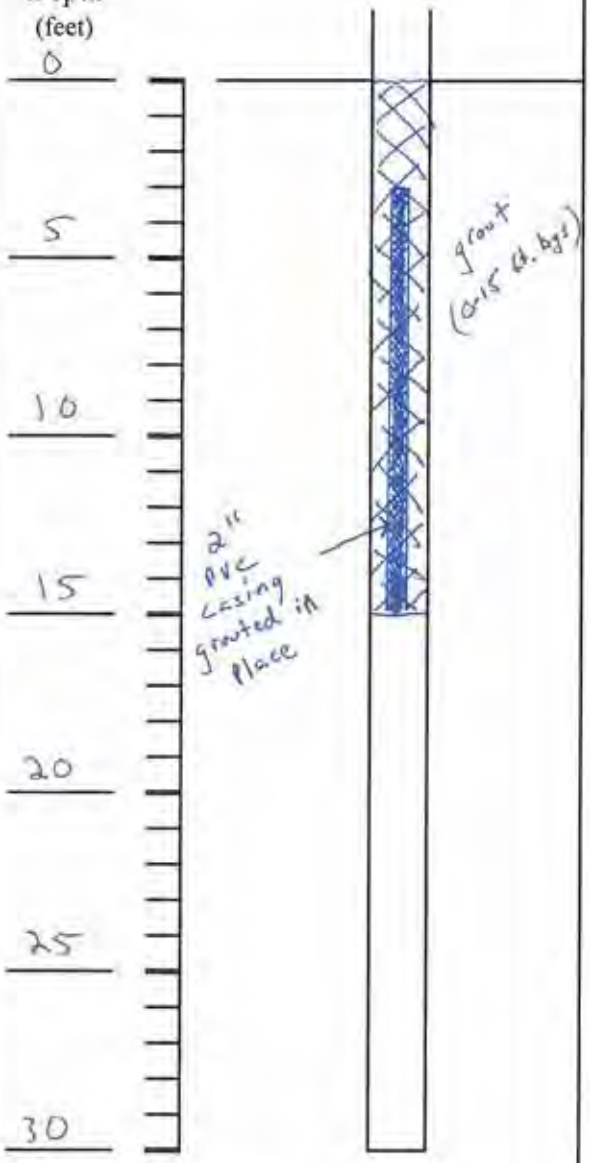
WELL DECOMMISSIONING RECORD

Site Name: Bausch + Lomb	Well I.D.: CH-6S
Site Location: Carriage House lane, Chili, New York	Driller: Neil Short
Drilling Co.: Nothnagle Drilling Inc.	Inspector: Ryan Clare
	Date: 2-20-13

DECOMMISSIONING DATA
(Fill in all that apply)

OVERDRILLING	
Interval Drilled	0-15'
Drilling Method(s)	HSA
Borehole Dia. (in.)	8"
Temporary Casing Installed? (y/n)	N
Depth temporary casing installed	NA
Casing type/dia. (in.)	NA
Method of installing	NA
CASING PULLING	
Method employed	NA
Casing retrieved (feet)	NA
Casing type/dia. (in)	NA
CASING PERFORATING	
Equipment used	NA
Number of perforations/foot	NA
Size of perforations	NA
Interval perforated	NA
GROUTING	
Interval grouted (FBLS)	0-15'
# of batches prepared	1
For each batch record:	
Quantity of water used (gal.)	30
Quantity of cement used (lbs.)	282
Cement type	Type 1
Quantity of bentonite used (lbs.)	12
Quantity of calcium chloride used (lbs.)	NA
Volume of grout prepared (gal.)	40
Volume of grout used (gal.)	40

WELL SCHEMATIC*



COMMENTS: PVC well casing grouted in place at 3' bgs. Upper 3' of casing recovered.

* Sketch in all relevant decommissioning data, including: interval overdrilled, interval grouted, casing left in hole, well stickup, etc.

Drilling Contractor

Department Representative

FIGURE 1

SITE NAME: Bausch & Lomb

SITE ID.:
INSPECTOR: RDC
DATE/TIME: 2-20-13
WELL ID.: CH-4

MONITORING WELL FIELD INSPECTION LOG
NYSDEC WELL DECOMMISSIONING PROGRAM

	YES	NO
WELL VISIBLE? (If not, provide directions below)	X	
WELL I.D. VISIBLE?		X
WELL LOCATION MATCH SITE MAP? (if not, sketch actual location on back)	X	

WELL I.D. AS IT APPEARS ON PROTECTIVE CASING OR WELL: N/A

	YES	NO
SURFACE SEAL PRESENT?	X	
SURFACE SEAL COMPETENT? (If cracked, heaved etc., describe below)	X	
PROTECTIVE CASING IN GOOD CONDITION? (If damaged, describe below)	X	

HEADSPACE READING (ppm) AND INSTRUMENT USED: NA
TYPE OF PROTECTIVE CASING AND HEIGHT OF STICKUP IN FEET (If applicable): Flushmount
PROTECTIVE CASING MATERIAL TYPE: concrete / steel
MEASURE PROTECTIVE CASING INSIDE DIAMETER (Inches):

	YES	NO
LOCK PRESENT?	X	
LOCK FUNCTIONAL?		X
DID YOU REPLACE THE LOCK?		X
IS THERE EVIDENCE THAT THE WELL IS DOUBLE CASED? (If yes,describe below)		X
WELL MEASURING POINT VISIBLE?	X	

MEASURE WELL DEPTH FROM MEASURING POINT (Feet): 31.61
MEASURE DEPTH TO WATER FROM MEASURING POINT (Feet): 5.15
MEASURE WELL DIAMETER (Inches): 2"
WELL CASING MATERIAL: PVC
PHYSICAL CONDITION OF VISIBLE WELL CASING: Good
ATTACH ID MARKER (if well ID is confirmed) and IDENTIFY MARKER TYPE: NA
PROXIMITY TO UNDERGROUND OR OVERHEAD UTILITIES: NA

DESCRIBE ACCESS TO WELL: (Include accessibility to truck mounted rig, natural obstructions, overhead power lines, proximity to permanent structures, etc.); ADD SKETCH OF LOCATION ON BACK, IF NECESSARY.
Accessible to drill rig, Bobcat, 4x4 vehicles

DESCRIBE WELL SETTING (For example, located in a field, in a playground, on pavement, in a garden, etc.) AND ASSESS THE TYPE OF RESTORATION REQUIRED.
located in grassy field (unused fill material present)

IDENTIFY ANY NEARBY POTENTIAL SOURCES OF CONTAMINATION, IF PRESENT (e.g. Gas station, salt pile, etc.):
None

REMARKS:
Flushmount in 8" steel protective casing and concrete.
All depth measurements taken from top of PVC well casing.

FIGURE 3

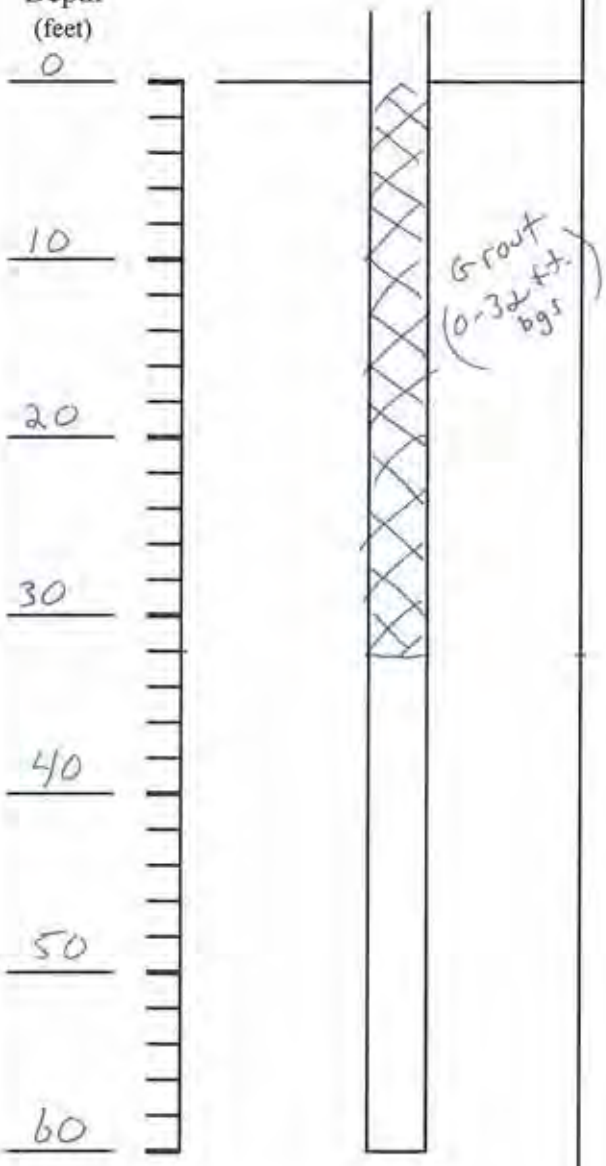
WELL DECOMMISSIONING RECORD

Site Name: Bausch & Lomb	Well I.D.: CH-4
Site Location: Carriage Lane Estates - Chili, New York	Driller: Neil Short
Drilling Co.: Nothnagle Drilling Inc.	Inspector: Ryan Clare
	Date: 2-20-13

DECOMMISSIONING DATA
(Fill in all that apply)

OVERDRILLING	
Interval Drilled	0'-32'
Drilling Method(s)	HSA
Borehole Dia. (in.)	8"
Temporary Casing Installed? (y/n)	N
Depth temporary casing installed	NA
Casing type/dia. (in.)	NA
Method of installing	NA
CASING PULLING	
Method employed	Cable
Casing retrieved (feet)	31.6'
Casing type/dia. (in)	PVC/ 2"
CASING PERFORATING	
Equipment used	NA
Number of perforations/foot	NA
Size of perforations	NA
Interval perforated	NA
GROUTING	
Interval grouted (FBLS)	0-32
# of batches prepared	2
For each batch record:	
Quantity of water used (gal.)	30
Quantity of cement used (lbs.)	282
Cement type	Type 1
Quantity of bentonite used (lbs.)	12
Quantity of calcium chloride used (lbs.)	NA
Volume of grout prepared (gal.)	40
Volume of grout used (gal.)	35

WELL SCHEMATIC*



COMMENTS: Well overdrilled 0-32 ft. bgs
31.6' of PVC well recovered

* Sketch in all relevant decommissioning data, including: interval overdrilled, interval grouted, casing left in hole, well stickup, etc.

Drilling Contractor

Department Representative

FIGURE 1

SITE NAME: Bausch + Lomb

SITE ID.:
INSPECTOR: RDC
DATE/TIME: 2-21-13
WELL ID.: CH-5S

MONITORING WELL FIELD INSPECTION LOG
NYSDEC WELL DECOMMISSIONING PROGRAM

	YES	NO
WELL VISIBLE? (If not, provide directions below)	X	
WELL I.D. VISIBLE?		X
WELL LOCATION MATCH SITE MAP? (if not, sketch actual location on back)	X	

WELL I.D. AS IT APPEARS ON PROTECTIVE CASING OR WELL: NA

	YES	NO
SURFACE SEAL PRESENT?	X	
SURFACE SEAL COMPETENT? (If cracked, heaved etc., describe below)	X	
PROTECTIVE CASING IN GOOD CONDITION? (If damaged, describe below)	X	

HEADSPACE READING (ppm) AND INSTRUMENT USED: NA
TYPE OF PROTECTIVE CASING AND HEIGHT OF STICKUP IN FEET (If applicable): Flushmount
PROTECTIVE CASING MATERIAL TYPE: steel / concrete
MEASURE PROTECTIVE CASING INSIDE DIAMETER (Inches): 8"

	YES	NO
LOCK PRESENT?		X
LOCK FUNCTIONAL?		X
DID YOU REPLACE THE LOCK?		X
IS THERE EVIDENCE THAT THE WELL IS DOUBLE CASED? (If yes,describe below)		X
WELL MEASURING POINT VISIBLE?	X	

MEASURE WELL DEPTH FROM MEASURING POINT (Feet): 19.23
MEASURE DEPTH TO WATER FROM MEASURING POINT (Feet): 6.25
MEASURE WELL DIAMETER (Inches): 2"
WELL CASING MATERIAL: PVC
PHYSICAL CONDITION OF VISIBLE WELL CASING: Good
ATTACH ID MARKER (if well ID is confirmed) and IDENTIFY MARKER TYPE: NA
PROXIMITY TO UNDERGROUND OR OVERHEAD UTILITIES: NA

DESCRIBE ACCESS TO WELL: (Include accessibility to truck mounted rig, natural obstructions, overhead power lines, proximity to permanent structures, etc.); ADD SKETCH OF LOCATION ON BACK, IF NECESSARY.

Accessible to drill rig.

DESCRIBE WELL SETTING (For example, located in a field, in a playground, on pavement, in a garden, etc.) AND ASSESS THE TYPE OF RESTORATION REQUIRED.

Well located in grassy field and up on a mound of fill material. (elevated about 4' from surrounding areas)

IDENTIFY ANY NEARBY POTENTIAL SOURCES OF CONTAMINATION, IF PRESENT (e.g. Gas station, salt pile, etc.):

None

REMARKS:

Flushmount well in 8" steel casing and concrete
All depth measurements taken from the top of PVC well casing.

FIGURE 3

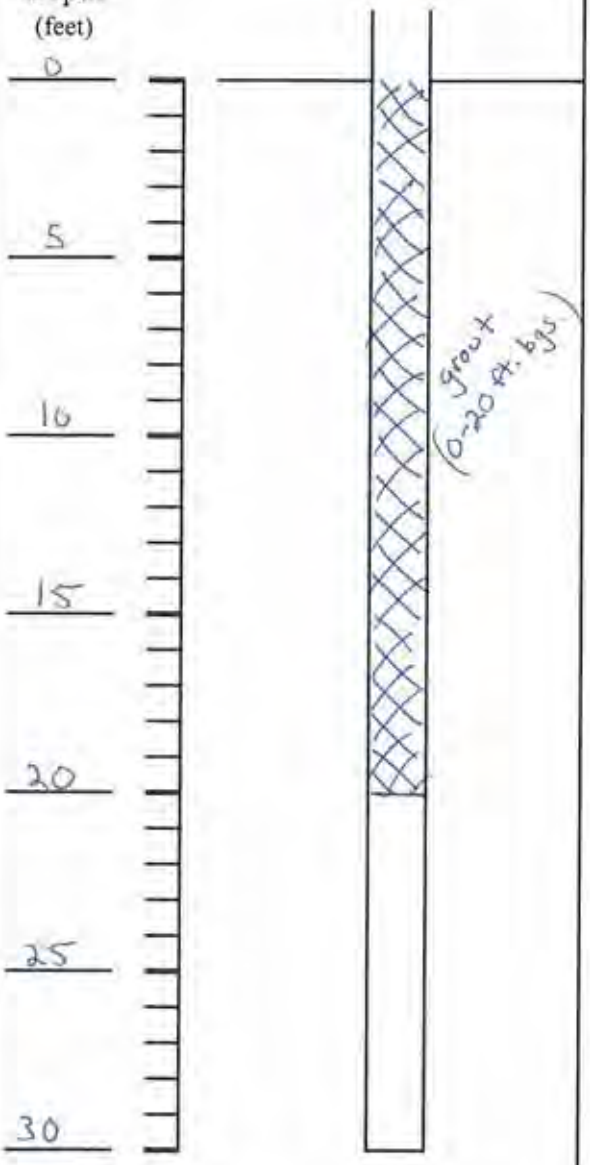
WELL DECOMMISSIONING RECORD

Site Name: Bausch + Lomb	Well I.D.: CH-SS
Site Location: Carriage House lane, Chili, New York	Driller: Neil Short
Drilling Co.: Nothnagle Drilling Inc.	Inspector: Ryan Clare
	Date: 2-21-13

DECOMMISSIONING DATA
(Fill in all that apply)

OVERDRILLING	
Interval Drilled	0'-20'
Drilling Method(s)	HSA
Borehole Dia. (in.)	8"
Temporary Casing Installed? (y/n)	N
Depth temporary casing installed	NA
Casing type/dia. (in.)	NA
Method of installing	NA
CASING PULLING	
Method employed	Cable
Casing retrieved (feet)	19.2'
Casing type/dia. (in)	PVC/2"
CASING PERFORATING	
Equipment used	NA
Number of perforations/foot	NA
Size of perforations	NA
Interval perforated	NA
GROUTING	
Interval grouted (FBLS)	0'-20'
# of batches prepared	2
For each batch record:	
Quantity of water used (gal.)	30
Quantity of cement used (lbs.)	282
Cement type	Type 1
Quantity of bentonite used (lbs.)	12
Quantity of calcium chloride used (lbs.)	NA
Volume of grout prepared (gal.)	40
Volume of grout used (gal.)	30

WELL SCHEMATIC*



COMMENTS: Well overdrilled 0'-20' bgs.
19.2' of PVC casing recovered.

* Sketch in all relevant decommissioning data, including: interval overdrilled, interval grouted, casing left in hole, well stickup, etc.

Drilling Contractor

Department Representative

FIGURE 1

SITE NAME: Bausch & Lomb

SITE ID.:
INSPECTOR: RDC
DATE/TIME: 2-21-13
WELL ID.: CH-5D

MONITORING WELL FIELD INSPECTION LOG
NYSDEC WELL DECOMMISSIONING PROGRAM

	YES	NO
WELL VISIBLE? (If not, provide directions below)	X	
WELL I.D. VISIBLE?		X
WELL LOCATION MATCH SITE MAP? (if not, sketch actual location on back)	X	

WELL I.D. AS IT APPEARS ON PROTECTIVE CASING OR WELL: NA

	YES	NO
SURFACE SEAL PRESENT?	X	
SURFACE SEAL COMPETENT? (If cracked, heaved etc., describe below)		
PROTECTIVE CASING IN GOOD CONDITION? (If damaged, describe below)	X	

HEADSPACE READING (ppm) AND INSTRUMENT USED: NA
TYPE OF PROTECTIVE CASING AND HEIGHT OF STICKUP IN FEET (If applicable): Flushmount
PROTECTIVE CASING MATERIAL TYPE: steel / concrete
MEASURE PROTECTIVE CASING INSIDE DIAMETER (Inches): 8"

	YES	NO
LOCK PRESENT?	X	
LOCK FUNCTIONAL?		X
DID YOU REPLACE THE LOCK?		X
IS THERE EVIDENCE THAT THE WELL IS DOUBLE CASED? (If yes,describe below)		X
WELL MEASURING POINT VISIBLE?	X	

MEASURE WELL DEPTH FROM MEASURING POINT (Feet): 35.95
MEASURE DEPTH TO WATER FROM MEASURING POINT (Feet): 9.33
MEASURE WELL DIAMETER (Inches): 2"
WELL CASING MATERIAL: PVC
PHYSICAL CONDITION OF VISIBLE WELL CASING: Good
ATTACH ID MARKER (if well ID is confirmed) and IDENTIFY MARKER TYPE: NA
PROXIMITY TO UNDERGROUND OR OVERHEAD UTILITIES: NA

DESCRIBE ACCESS TO WELL: (Include accessibility to truck mounted rig, natural obstructions, overhead power lines, proximity to permanent structures, etc.); ADD SKETCH OF LOCATION ON BACK, IF NECESSARY.

Accessible to drill rig.

DESCRIBE WELL SETTING (For example, located in a field, in a playground, on pavement, in a garden, etc.) AND ASSESS THE TYPE OF RESTORATION REQUIRED.

Well located in grassy field and up on a mound of fill material (elevated about 4' from surrounding areas)

IDENTIFY ANY NEARBY POTENTIAL SOURCES OF CONTAMINATION, IF PRESENT (e.g. Gas station, salt pile, etc.):

None

REMARKS:

Flushmount well in 8" steel protective casing and concrete
All depth measurements taken from the top of pvc well casing.

FIGURE 3

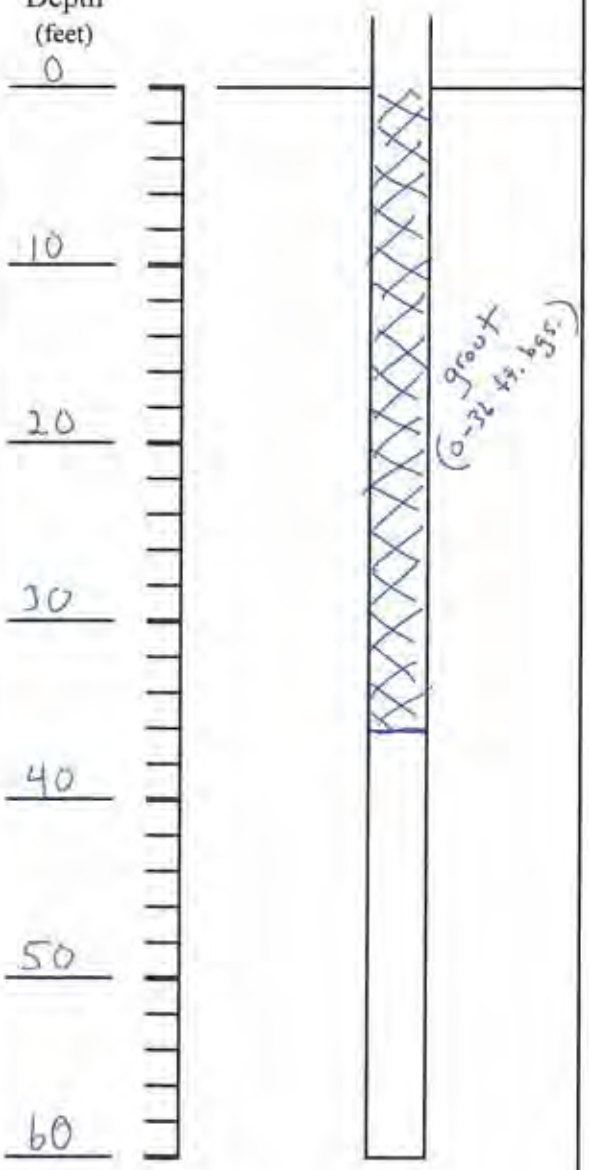
WELL DECOMMISSIONING RECORD

Site Name: Bausch + lomb	Well I.D.: CH-5D
Site Location: Carriage House lane, Chili, New York	Driller: Neil Short
Drilling Co.: Nothnagle Drilling Inc.	Inspector: Ryan Clare
	Date: 2-21-13

DECOMMISSIONING DATA
(Fill in all that apply)

OVERDRILLING	
Interval Drilled	0'-36'
Drilling Method(s)	HSA
Borehole Dia. (in.)	8"
Temporary Casing Installed? (y/n)	N
Depth temporary casing installed	NA
Casing type/dia. (in.)	NA
Method of installing	NA
CASING PULLING	
Method employed	Cable
Casing retrieved (feet)	35.95
Casing type/dia. (in)	PVC/2"
CASING PERFORATING	
Equipment used	NA
Number of perforations/foot	NA
Size of perforations	NA
Interval perforated	NA
GROUTING	
Interval grouted (FBLS)	0'-36'
# of batches prepared	2
For each batch record:	
Quantity of water used (gal.)	35
Quantity of cement used (lbs.)	376
Cement type	Type 1
Quantity of bentonite used (lbs.)	16
Quantity of calcium chloride used (lbs.)	NA
Volume of grout prepared (gal.)	50
Volume of grout used (gal.)	50

WELL SCHEMATIC*



COMMENTS: well overdrilled 0'-36' bgs.
35.95' of PVC well casing recovered

* Sketch in all relevant decommissioning data, including: interval overdrilled, interval grouted, casing left in hole, well stickup, etc.

Drilling Contractor

Department Representative

FIGURE 1

SITE NAME: Bausch & Lomb

SITE ID.:
INSPECTOR: RDC
DATE/TIME: 2-21-13
WELL ID.: CH-1

MONITORING WELL FIELD INSPECTION LOG
NYSDEC WELL DECOMMISSIONING PROGRAM

	YES	NO
WELL VISIBLE? (If not, provide directions below)	X	
WELL I.D. VISIBLE?		X
WELL LOCATION MATCH SITE MAP? (if not, sketch actual location on back)	X	

WELL I.D. AS IT APPEARS ON PROTECTIVE CASING OR WELL: NA

	YES	NO
SURFACE SEAL PRESENT?	X	
SURFACE SEAL COMPETENT? (If cracked, heaved etc., describe below)	X	
PROTECTIVE CASING IN GOOD CONDITION? (If damaged, describe below)	X	

HEADSPACE READING (ppm) AND INSTRUMENT USED	NA
TYPE OF PROTECTIVE CASING AND HEIGHT OF STICKUP IN FEET (If applicable)	Flushmount
PROTECTIVE CASING MATERIAL TYPE:	steel/concrete
MEASURE PROTECTIVE CASING INSIDE DIAMETER (Inches):	8" steel

	YES	NO
LOCK PRESENT?		X
LOCK FUNCTIONAL? NA		X
DID YOU REPLACE THE LOCK?		X
IS THERE EVIDENCE THAT THE WELL IS DOUBLE CASED? (If yes,describe below)		X
WELL MEASURING POINT VISIBLE?	X	

MEASURE WELL DEPTH FROM MEASURING POINT (Feet):	33.79'
MEASURE DEPTH TO WATER FROM MEASURING POINT (Feet):	0.70'
MEASURE WELL DIAMETER (Inches):	2"
WELL CASING MATERIAL:	PVC
PHYSICAL CONDITION OF VISIBLE WELL CASING:	Good
ATTACH ID MARKER (if well ID is confirmed) and IDENTIFY MARKER TYPE	NA
PROXIMITY TO UNDERGROUND OR OVERHEAD UTILITIES	NA

DESCRIBE ACCESS TO WELL: (Include accessibility to truck mounted rig, natural obstructions, overhead power lines, proximity to permanent structures, etc.); ADD SKETCH OF LOCATION ON BACK, IF NECESSARY.

Accessible to any vehicle, but is close to a tree on private property (lot 202)

DESCRIBE WELL SETTING (For example, located in a field, in a playground, on pavement, in a garden, etc.) AND ASSESS THE TYPE OF RESTORATION REQUIRED.

located at edge of private property (lot 202) and in overgrown area.

~~If private yard area it~~

IDENTIFY ANY NEARBY POTENTIAL SOURCES OF CONTAMINATION, IF PRESENT (e.g. Gas station, salt pile, etc.):

None

REMARKS:

Flushmount well in 8" steel protective casing and concrete.

All depth measurements taken from top of ~~casing~~ PVC well casing.

FIGURE 3

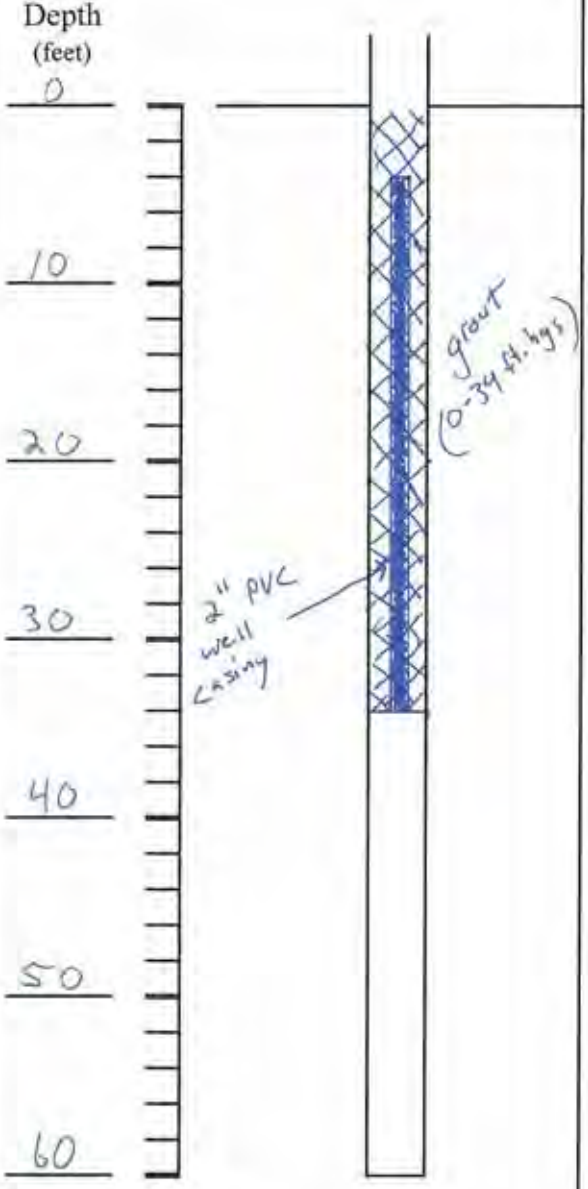
WELL DECOMMISSIONING RECORD

Site Name: Bausch & Lomb	Well I.D.: CH-1
Site Location: Carriage House lane, Chili, New York	Driller: Neil Short
Drilling Co.: Nothnagle Drilling Inc	Inspector: Ryan Clare
	Date: 2-21-13

DECOMMISSIONING DATA
(Fill in all that apply)

OVERDRILLING	
Interval Drilled	0'-34'
Drilling Method(s)	HSA
Borehole Dia. (in.)	8"
Temporary Casing Installed? (y/n)	N
Depth temporary casing installed	NA
Casing type/dia. (in.)	NA
Method of installing	NA
CASING PULLING	
Method employed	Cable
Casing retrieved (feet)	4'
Casing type/dia. (in)	2" / PVC
CASING PERFORATING	
Equipment used	NA
Number of perforations/foot	NA
Size of perforations	NA
Interval perforated	NA
GROUTING	
Interval grouted (FBLS)	0'-34'
# of batches prepared	2
For each batch record:	
Quantity of water used (gal.)	35
Quantity of cement used (lbs.)	376
Cement type	Type 1
Quantity of bentonite used (lbs.)	16
Quantity of calcium chloride used (lbs.)	NA
Volume of grout prepared (gal.)	50
Volume of grout used (gal.)	50

WELL SCHEMATIC*



COMMENTS: Well overdrilled 0'-34' bgs. only top 4' of PVC well casing was recovered. Rest of casing was grouted in place and concrete pad was still present.

* Sketch in all relevant decommissioning data, including: interval overdrilled, interval grouted, casing left in hole, well stickup, etc.

Drilling Contractor

Department Representative

FIGURE 1

SITE NAME: Bausch & Lomb

SITE ID.:
INSPECTOR: RDC
DATE/TIME: 2-21-13
WELL ID.: CH-3S

MONITORING WELL FIELD INSPECTION LOG
NYSDEC WELL DECOMMISSIONING PROGRAM

	YES	NO
WELL VISIBLE? (If not, provide directions below)	X	
WELL I.D. VISIBLE?		X
WELL LOCATION MATCH SITE MAP? (if not, sketch actual location on back)	X	

WELL I.D. AS IT APPEARS ON PROTECTIVE CASING OR WELL: NP

	YES	NO
SURFACE SEAL PRESENT?	X	
SURFACE SEAL COMPETENT? (If cracked, heaved etc., describe below)	X	
PROTECTIVE CASING IN GOOD CONDITION? (If damaged, describe below)	X	

HEADSPACE READING (ppm) AND INSTRUMENT USED	NA
TYPE OF PROTECTIVE CASING AND HEIGHT OF STICKUP IN FEET (If applicable)	Flushmount
PROTECTIVE CASING MATERIAL TYPE:	Steel / Concrete
MEASURE PROTECTIVE CASING INSIDE DIAMETER (Inches):	8"

	YES	NO
LOCK PRESENT?	X	
LOCK FUNCTIONAL?		X
DID YOU REPLACE THE LOCK?		X
IS THERE EVIDENCE THAT THE WELL IS DOUBLE CASED? (If yes,describe below)		X
WELL MEASURING POINT VISIBLE?	X	

MEASURE WELL DEPTH FROM MEASURING POINT (Feet):	11.30
MEASURE DEPTH TO WATER FROM MEASURING POINT (Feet):	1.79
MEASURE WELL DIAMETER (Inches):	2"
WELL CASING MATERIAL:	PVC
PHYSICAL CONDITION OF VISIBLE WELL CASING:	Good
ATTACH ID MARKER (if well ID is confirmed) and IDENTIFY MARKER TYPE	NA
PROXIMITY TO UNDERGROUND OR OVERHEAD UTILITIES:	NA

DESCRIBE ACCESS TO WELL: (Include accessibility to truck mounted rig, natural obstructions, overhead power lines, proximity to permanent structures, etc.); ADD SKETCH OF LOCATION ON BACK, IF NECESSARY.

Accessible to any vehicle through dead end of a Carriage House Estates roadway

DESCRIBE WELL SETTING (For example, located in a field, in a playground, on pavement, in a garden, etc.) AND ASSESS THE TYPE OF RESTORATION REQUIRED.

located in a grassy field near private property (yards) and a dead end road in the housing track.

IDENTIFY ANY NEARBY POTENTIAL SOURCES OF CONTAMINATION, IF PRESENT (e.g. Gas station, salt pile, etc.):

Potential spill of lawn mower fluids.

REMARKS:

Flushmount well in 8" protective steel casing & concrete.
All depth measurements taken from top of PVC well casing

FIGURE 3

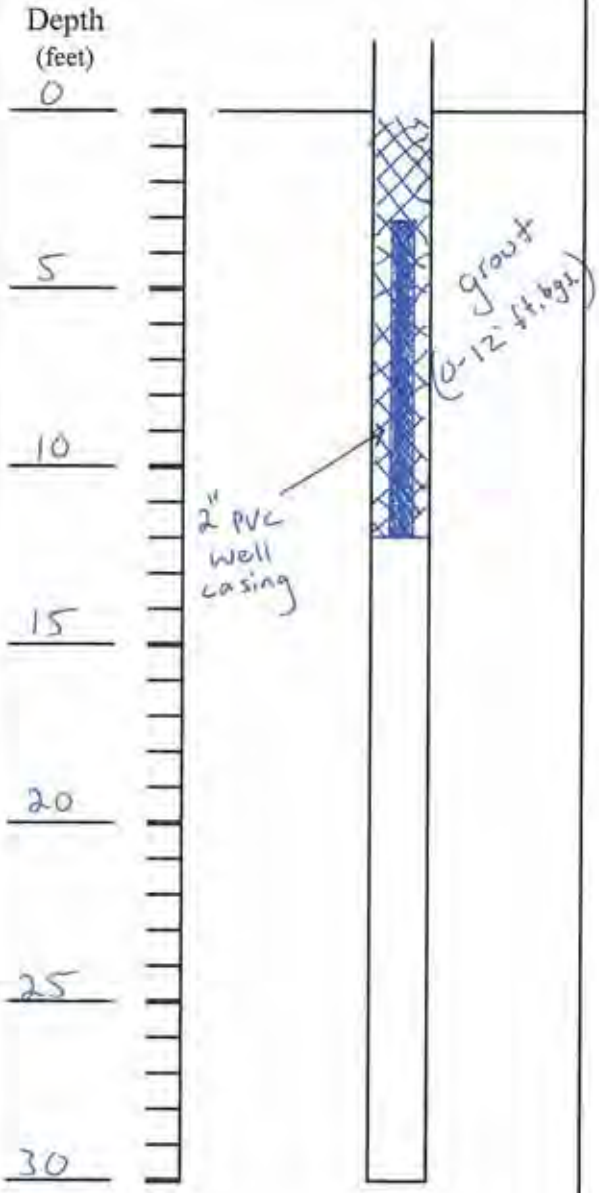
WELL DECOMMISSIONING RECORD

Site Name: Bausch + Lomb	Well I.D.: CH-33
Site Location: Cartlage House Lane Chili, New York	Driller: Neil Short
Drilling Co.: Nathaniels Drilling Company	Inspector: Ryan Clare
	Date: 2-21-13

DECOMMISSIONING DATA
(Fill in all that apply)

OVERDRILLING	
Interval Drilled	0'-12'
Drilling Method(s)	HSA
Borehole Dia. (in.)	8"
Temporary Casing Installed? (y/n)	N
Depth temporary casing installed	NA
Casing type/dia. (in.)	NA
Method of installing	NA
CASING PULLING	
Method employed	NA
Casing retrieved (feet)	NA
Casing type/dia. (in)	NA
CASING PERFORATING	
Equipment used	NA
Number of perforations/foot	NA
Size of perforations	NA
Interval perforated	NA
GROUTING	
Interval grouted (FBLS)	0'-12'
# of batches prepared	1
For each batch record:	
Quantity of water used (gal.)	30
Quantity of cement used (lbs.)	282
Cement type	Type I
Quantity of bentonite used (lbs.)	12
Quantity of calcium chloride used (lbs.)	NA
Volume of grout prepared (gal.)	40
Volume of grout used (gal.)	40

WELL SCHEMATIC*



COMMENTS: Well overdrilled 0'-12' bgs.
~3' of pvc well casing recovered. The rest was grouted in place.

* Sketch in all relevant decommissioning data, including: interval overdrilled, interval grouted, casing left in hole, well stickup, etc.

Drilling Contractor

Department Representative

FIGURE 1

SITE NAME: Bausch & Lomb

SITE ID.:
INSPECTOR: RDC
DATE/TIME: 2-22-13
WELL ID.: CH-8D

MONITORING WELL FIELD INSPECTION LOG
NYSDEC WELL DECOMMISSIONING PROGRAM

	YES	NO
WELL VISIBLE? (If not, provide directions below)	X	
WELL I.D. VISIBLE?		X
WELL LOCATION MATCH SITE MAP? (if not, sketch actual location on back)	X	

WELL I.D. AS IT APPEARS ON PROTECTIVE CASING OR WELL: NA

	YES	NO
SURFACE SEAL PRESENT?	X	
SURFACE SEAL COMPETENT? (If cracked, heaved etc., describe below)	X	
PROTECTIVE CASING IN GOOD CONDITION? (If damaged, describe below)	X	

HEADSPACE READING (ppm) AND INSTRUMENT USED: NA
TYPE OF PROTECTIVE CASING AND HEIGHT OF STICKUP IN FEET (If applicable): Flushmount
PROTECTIVE CASING MATERIAL TYPE: steel / concrete
MEASURE PROTECTIVE CASING INSIDE DIAMETER (Inches): 8" steel

	YES	NO
LOCK PRESENT?	X	
LOCK FUNCTIONAL?		X
DID YOU REPLACE THE LOCK?		X
IS THERE EVIDENCE THAT THE WELL IS DOUBLE CASED? (If yes,describe below)		X
WELL MEASURING POINT VISIBLE?	X	

MEASURE WELL DEPTH FROM MEASURING POINT (Feet): 23.34
MEASURE DEPTH TO WATER FROM MEASURING POINT (Feet): 2.44
MEASURE WELL DIAMETER (Inches): 2"
WELL CASING MATERIAL: PVC
PHYSICAL CONDITION OF VISIBLE WELL CASING: Good
ATTACH ID MARKER (if well ID is confirmed) and IDENTIFY MARKER TYPE: N/A
PROXIMITY TO UNDERGROUND OR OVERHEAD UTILITIES: N/A

DESCRIBE ACCESS TO WELL: (Include accessibility to truck mounted rig, natural obstructions, overhead power lines, proximity to permanent structures, etc.); ADD SKETCH OF LOCATION ON BACK, IF NECESSARY.

Accessible by drill rig, Bobcat, truck

DESCRIBE WELL SETTING (For example, located in a field, in a playground, on pavement, in a garden, etc.) AND ASSESS THE TYPE OF RESTORATION REQUIRED.

located in grassy field near shrubs and small trees and adjacent to private property line (mowed lawn)

IDENTIFY ANY NEARBY POTENTIAL SOURCES OF CONTAMINATION, IF PRESENT (e.g. Gas station, salt pile, etc.):

None Potential lawn tractor oil spill and swimming pool near by.

REMARKS:

well cased with 2" PVC 0'-23.34' bgs. Some of PVC casing grouted in place. Other half of casing recovered.

FIGURE 3

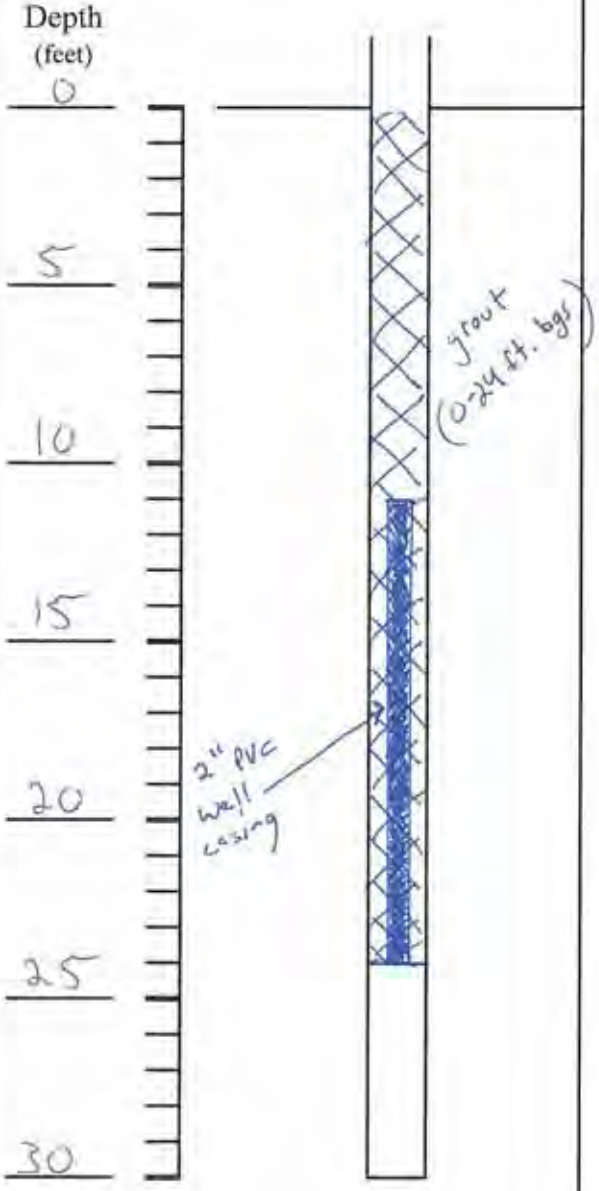
WELL DECOMMISSIONING RECORD

Site Name: Bausch + Lomb	Well I.D.: CH-8D
Site Location: Carriage House Estates Chili, New York	Driller: Neil Short
Drilling Co.: Nothnagle Drilling Inc.	Inspector: Ryan Clare
	Date: 2-22-13

DECOMMISSIONING DATA
(Fill in all that apply)

OVERDRILLING	
Interval Drilled	0'-24'
Drilling Method(s)	HSA
Borehole Dia. (in.)	8"
Temporary Casing Installed? (y/n)	N
Depth temporary casing installed	NA
Casing type/dia. (in.)	NA
Method of installing	NA
CASING PULLING	
Method employed	Cable
Casing retrieved (feet)	≈ 11'
Casing type/dia. (in)	PVC / 2"
CASING PERFORATING	
Equipment used	NA
Number of perforations/foot	NA
Size of perforations	NA
Interval perforated	NA
GROUTING	
Interval grouted (FBLS)	0'-24'
# of batches prepared	2
For each batch record:	
Quantity of water used (gal.)	20
Quantity of cement used (lbs.)	235
Cement type	Type 1
Quantity of bentonite used (lbs.)	10
Quantity of calcium chloride used (lbs.)	NA
Volume of grout prepared (gal.)	30
Volume of grout used (gal.)	30

WELL SCHEMATIC*



COMMENTS: Well overdrilled 0'-24' bgs.
≈ 11' of PVC well casing was recovered.
The remaining PVC casing was grouted in place.

* Sketch in all relevant decommissioning data, including: interval overdrilled, interval grouted, casing left in hole, well stickup, etc.

Drilling Contractor

Department Representative

FIGURE 1

SITE NAME: Bausch & Lomb

SITE ID.:
INSPECTOR: EDC
DATE/TIME: 2-22-13
WELL ID.: CH-8S

MONITORING WELL FIELD INSPECTION LOG
NYSDEC WELL DECOMMISSIONING PROGRAM

	YES	NO
WELL VISIBLE? (If not, provide directions below)	X	
WELL I.D. VISIBLE?		X
WELL LOCATION MATCH SITE MAP? (if not, sketch actual location on back)	X	

WELL I.D. AS IT APPEARS ON PROTECTIVE CASING OR WELL: NA

	YES	NO
SURFACE SEAL PRESENT?	X	
SURFACE SEAL COMPETENT? (If cracked, heaved etc., describe below)	X	
PROTECTIVE CASING IN GOOD CONDITION? (If damaged, describe below)	X	

HEADSPACE READING (ppm) AND INSTRUMENT USED: NA
TYPE OF PROTECTIVE CASING AND HEIGHT OF STICKUP IN FEET (If applicable): Flushmount
PROTECTIVE CASING MATERIAL TYPE: steel / concrete
MEASURE PROTECTIVE CASING INSIDE DIAMETER (Inches): 8" steel

	YES	NO
LOCK PRESENT?	X	
LOCK FUNCTIONAL?		X
DID YOU REPLACE THE LOCK?		X
IS THERE EVIDENCE THAT THE WELL IS DOUBLE CASED? (If yes,describe below)		X
WELL MEASURING POINT VISIBLE?	X	

MEASURE WELL DEPTH FROM MEASURING POINT (Feet): 9.57
MEASURE DEPTH TO WATER FROM MEASURING POINT (Feet): 0.75
MEASURE WELL DIAMETER (Inches): 2"
WELL CASING MATERIAL: PVC
PHYSICAL CONDITION OF VISIBLE WELL CASING: Good
ATTACH ID MARKER (if well ID is confirmed) and IDENTIFY MARKER TYPE: NA
PROXIMITY TO UNDERGROUND OR OVERHEAD UTILITIES: NA

DESCRIBE ACCESS TO WELL: (Include accessibility to truck mounted rig, natural obstructions, overhead power lines, proximity to permanent structures, etc.); ADD SKETCH OF LOCATION ON BACK, IF NECESSARY.
Accessible by drill rig, Bobcat, a truck

DESCRIBE WELL SETTING (For example, located in a field, in a playground, on pavement, in a garden, etc.) AND ASSESS THE TYPE OF RESTORATION REQUIRED.
located in grassy field near shrubs and small trees, adjacent to private property line (mowed lawn)

IDENTIFY ANY NEARBY POTENTIAL SOURCES OF CONTAMINATION, IF PRESENT (e.g. Gas station, salt pile, etc.):
potential lawn tractor oil spill and swimming pool near by

REMARKS:
well cased with 2" PVC 0'-9.57' bgs. Most to all of PVC casing recovered.

FIGURE 3

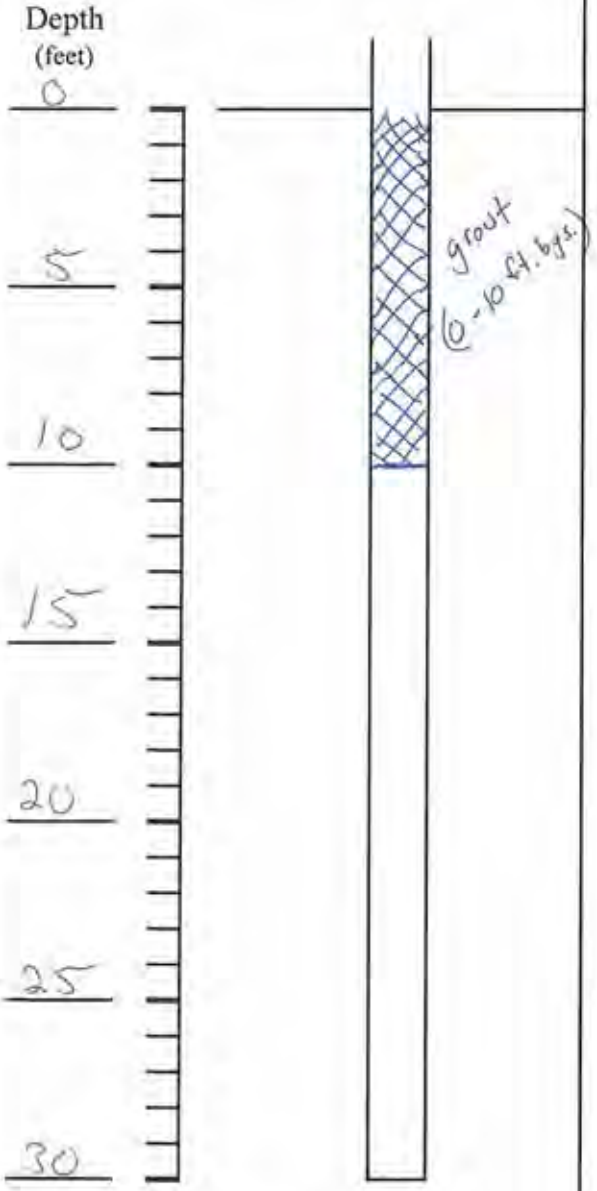
WELL DECOMMISSIONING RECORD

Site Name: Bausch + Lomb	Well I.D.: CH-8S
Site Location: Cardinal Hill Lane - Chili, New York	Driller: Neil Shoit
Drilling Co.: Nothnagle Drilling Inc.	Inspector: RDC
	Date: 2-22-13

DECOMMISSIONING DATA
(Fill in all that apply)

OVERDRILLING	
Interval Drilled	0-10'
Drilling Method(s)	HSA
Borehole Dia. (in.)	8"
Temporary Casing Installed? (y/n)	N
Depth temporary casing installed	NA
Casing type/dia. (in.)	NA
Method of installing	NA
CASING PULLING	
Method employed	Cable
Casing retrieved (feet)	9.57
Casing type/dia. (in)	PVC/2"
CASING PERFORATING	
Equipment used	NA
Number of perforations/foot	NA
Size of perforations	NA
Interval perforated	NA
GROUTING	
Interval grouted (FBLS)	0-10
# of batches prepared	1
For each batch record:	
Quantity of water used (gal.)	20
Quantity of cement used (lbs.)	235
Cement type	Type 1
Quantity of bentonite used (lbs.)	10
Quantity of calcium chloride used (lbs.)	NA
Volume of grout prepared (gal.)	30
Volume of grout used (gal.)	30

WELL SCHEMATIC*



COMMENTS: Well overdrilled 0'-10' ft. bgs.

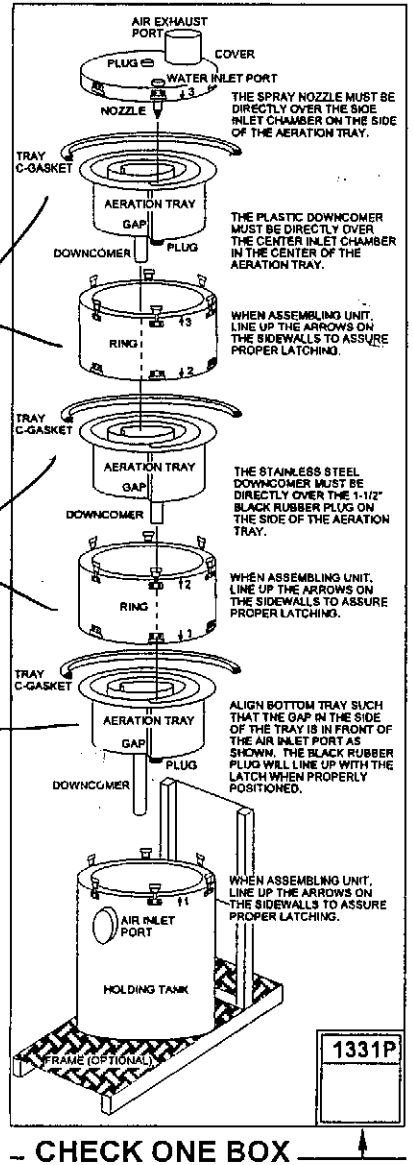
* Sketch in all relevant decommissioning data, including: interval overdrilled, interval grouted, casing left in hole, well stickup, etc.

Drilling Contractor

Department Representative

Appendix F

GWCTS Air Stripper O&M Manual



Tray #1

Tray #2

Tray #3

– CHECK ONE BOX

Tray # 1 has short round pvc down comer

Tray # 2 has short s/s square down comer

Tray # 3 has long round pvc down comer. It does nd have a ring because it sits in the sump.

Environmental Remediation Equipment

General Operation and Maintenance Guidelines

BISCO Environmental

135 Robert Treat Paine Drive | Taunton, Massachusetts 02780 | Phone: (508) 738-5100 | Fax: (508) 738-5022

Table of Contents

Chapter 1.0 Introduction

1.1 Scope

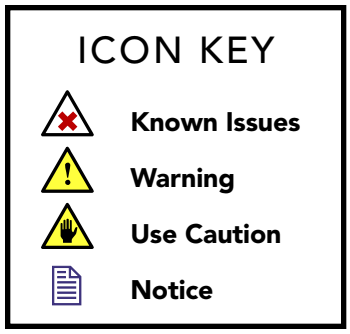
This Operations and Maintenance Manual was written as a generic guide for maintenance on a range of equipment used in remediation applications.

1.2 Related Drawings

As with all equipment supplied by most environmental equipment manufactures, drawings exist that can aid the user with the operation and maintenance process. Examples include stated performance of pumps on Process & Instrumentations Diagrams, motor amperage statements on the Control Panel drawings or equipment location in the System Layout Drawing. The drawings that are provided will be dependent upon the equipment supplied, for example, if a control panel only was supplied, only Control Panel drawings will be provided.

1.3 Icons & Icon Key

ICONS are utilized throughout this manual to aid the user in locating information (See below). Periodically throughout this manual, you will notice the ICON KEY. This is to assist in identifying the different icons.



Chapter 2.0 Operation & Maintenance

2.1 Air Stripper System Operation and Maintenance

ICON KEY


Known Issues


Warning


Use Caution


Notice

NOTICES

If maintenance procedures need to be performed, ensure that power is disconnected and locked out prior to starting the maintenance.

It is recommended the user follow the maintenance procedures outlined in the manufacturers supplied literature.

Maintenance schedules outlined below or by the manufacturer may need to be performed more often depending upon site-specific conditions.

2.1.1 Air Stripper System & Blower Operation

BASIC SYSTEM DESCRIPTION

Low profile air stripping systems are usually supplied with their outer shell materials in stainless steel or plastic. Regardless of the shell material of construction, operation of these types of systems is the same. Maintenance procedures may differ slightly for access to the bubble plates. Typically, low profile air strippers are built to meet site and project specifications, which can include a number of standard or optional pieces of equipment. Depending upon the specifics of your order, the equipment described in this manual may or may not be included with your system configuration. Please refer to your sales order for the equipment that should be included with your system. Equipment information should be found in the O&M manual provided with the system.

Air Pressure Gauge
The pressure gauge reads the differential pressure between the sump pressure and atmospheric pressure, in inches of water column. The gauge is connected to the system via tubing that is attached to a pressure port on the air stripper sump. The air hose connected to the sump leads to the "high" pressure port on the gauge. The "low" pressure port is left open to the atmosphere.

Demister
A demister pad is installed beneath the air discharge stack located on the top cover of the unit. The purpose of the demisting pad is to remove entrained water droplets that would have blown through the discharge stack. It is possible, though unlikely, that the demisting pad may become plugged or fouled. If this occurs the demisting pad is easily removed. Disconnect the vent line, take off the demister cap, and remove the demister. The demisting pad can be cleaned with a pressure washer or replaced with a new one.

Gaskets
Gaskets seal various parts of the low profile air strippers. Through the course of regular maintenance, these gaskets will eventually wear and will not seal effectively. When the gaskets are ripped, worn, or do not seal properly, these gaskets should be replaced. Contact the manufacturer for replacement gaskets and adhesive.

Sight Tube
The sight tube provides a means of easily viewing the water level in the sump tank. Sight tubes can be a simple, clear flexible hose or a clear section of PVC. Some manufacturers incorporate the level sensor in the sight tube assembly.

Blower
Blowers on low profile are selected to meet the proper airflow requirements (cfm) at the anticipated working pressures (inches of water column) of each system.

It is critical that the blower damper be opened wide enough to provide the unit with the designated minimum flow. If the damper is opened too wide, however, high airflow can cause water entrainment, with water droplets caught up in the air stream, to be sent out of the air stripper discharge stack. This can have a detrimental effect on downstream vapor treatment equipment.

It is also critical that water does not enter the blower housing while the blower is in operation; this will damage your blower and usually voids the manufacturer's warranty. The high water level alarm switch should prevent this from happening. Make sure it is installed correctly. If not installed by the manufacturer, it is recommended that the blower piping be of an inverted-U design, capable of collecting water within the blower piping and minimizing the potential for blower flooding.

If water does accumulate in the blower, it must be removed from the blower housing before continuing operation. Usually a drain port is supplied in the blower housing for removal of accumulated water. If one is not available, a small drain hole may be drilled and plugged on the bottom side of the blower housing to provide a means of discharging any water that may accumulate. Remove the plug temporarily to drain any water. Else, take off the front panel of the fan housing and remove the water. Dispose of any collected water accordingly.

When staffing the unit for the first time, check that the blower wheel is rotating in the direction of the arrow on the blower housing. If you hear the blower wheel rubbing or any odd sounds shut down the system immediately and call the manufacturer.

Damper

Air stripper blowers normally have a damper on the discharge side of the blower. The damper is used to make adjustments to the air flow rate (cubic feet per minute) of your system. The airflow rate is increased (higher cfm's) by opening the damper, and decreased by closing the damper. Dampers can be a integral part of the blower or a valve installed in the piping between the blower and the air stripper.

Use the damper to adjust the sump pressure to its proper operating value. By adjusting the sump pressure, the proper operating airflow through the air stripper will be achieved. Follow the instructions given in the earlier "Air Pressure Gauge" section to obtain the correct sump operating pressure. Using an air flow meter and an air pressure gauge together is desirable for confirming airflow and sump pressure, especially when attempting to troubleshoot any problems encountered with the air stripper operation. It is also recommended that you keep a logbook of pressure readings so you can determine when and the frequency of system fouling.

Air Blower Silencer

The air blower silencer reduces the dynamic noise level of the blower. The size of the silencer and the type of connection used to mount it is dictated by the size of the blower and the choice of options. The silencer can be mounted either horizontally or vertically (through the use of an elbow) but should be properly supported to avoid over-stressing the blower housing. Silencers exposed to high wind velocities should also be properly secured.

Air Flow Meter

The air flow meter measures the amount of air flowing through the system. If it is a pitot tube-type, two air tubes lead from the air piping to a meter/gauge. To operate effectively, the pitot tube must be located a minimum required distance upstream and downstream from elbows, valves, etc. Refer to manufacturer's installation instructions for proper installation procedures.

The air flow meter typically gives readings in feet per minute, which is then multiplied by the cross sectional area, square feet, of the vent line to give cubic feet per minute (CFM). As stated in the damper section, the air flow meter is needed to make damper adjustments, especially after initial start-up.

Control

The necessary controls for the air stripper system serves two basic functions required for safe operation. The first is to provide the required electrical safety for each motor (blowers and pumps) per NEC standards. These components may consist of fuses, motor starters, and overload relays.

The second function is to provide the required process safety alarm components. The alarm circuit monitors the low air pressure switch and the high water level alarm switch. If either of these alarms occur then the alarm contacts must shut off the incoming water source (feed or well pumps) if the appropriate connections have been made. A qualified, licensed electrician should perform any and all electrical connections.

Low profile air stripper systems that process potentially explosive concentrations of vapors require intrinsically safe (IS) signals to all electrical components housed in non-explosion proof enclosures. The IS signal does not

have enough energy to ignite the concentration of any NEC classified explosive vapor. Typical components that need IS signals are the float switches and well probes. Determination of when IS signals are required is generally the responsibility of the groundwater remediation engineer who has placed the order for a system. A qualified, licensed electrician should perform any and all electrical connections.

Feed and Discharge Pumps
Any transfer pumps should meet all known flow and pressure requirements. The pumps are usually not self-priming; they must be primed before starting by filling either the discharge port or the priming port with clean water until the entire pump chamber is full. The pipe leading into the pump should also be full of water, too. Install throttle valves on the discharge lines for adjusting water flow rate. The valve should be throttled back until the motor draws the nameplate current rating or is producing the required flow rate. Warning: If the pump is running wide open and it is not pumping against the required head, the pump will cavitate and adversely affect pump performance and pump life.

Centrifugal transfer pumps typically must be throttled back if they are not pumping against the required head. Before initial system start-up, double-check the pump rotation. A pump shaft rotating in the wrong direction could spin off the pump impeller and cause serious damage to the pump. Pumps operating in the wrong rotation will show poor performance. Systems using pumps should have the flow rates tuned so that the discharge is keeping up and slightly exceeds the feed pump's performance.

High Water Level Alarm Switch
The high water level alarm switch is one of the two, minimum alarm interlocks that must be properly connected by a licensed electrician prior to the system's initial start-up. Please see the Special Cautions at the beginning of the operating Instructions section for more information. The purpose of the high water level alarm switch is to prevent water from flooding the blower by shutting off the incoming contaminated water once it has reached a designated level. The high water level switch can be an integral part of a stem type, level sensor assembly and is typically the top float on the stem. Another type of high water level alarm switch used can be a pendant type installed through the sump wall of the air stripper.

HIGH AND LOW LEVEL SWITCHES

High and low level switches are typically employed only when a transfer pump is installed to evacuate water from the sump of the air stripper. As explained above, two types of level switches can be installed. A common stem type switch assembly is one type that is usually installed inside a clear, PVC sight tube unit. This type usually can easily be removed for inspection and cleaning. Another common type of sensor is the pendant type sensor and is usually installed through the air stripper sump wall. Both types of sensors are intended to operate the discharge transfer pump in the same manner.

Water enters the top of the air stripper system, passes down through each successive tray and accumulates in the sump of the air stripper. The stem type sensor has a low level (transfer pump OFF) and high level (transfer pump ON). Once enough liquid has accumulated in the air stripper sump to reach the high level, the transfer pump starts and water is transferred out of the air stripper to the appropriate discharge point. Once the liquid level in the air stripper sump reaches the low-level power to the transfer pump is interrupted.

The high and low switches are typically both incorporated into the pendant style switch. As above, the water in the sump rises and raises the float to a point that the transfer pump activates and starts evacuating the liquid to an appropriate discharge point. The float will continue to fall with the decreasing water level and when the float reaches its low level, power to the transfer pump is interrupted.

In either case, if for any reason the transfer pump were unable to keep up to the influent flow into the air stripper sump, the liquid level would rise to the high-high level sensor. Power to the devices supplying water to the stripper should be interrupted and an alarm should be generated.

Line Sampling Ports
The line sampling ports provide a quick and easy means to take a water sample of both incoming contaminated water and outgoing clean water. The sampling ports are the ball valves located on both of the inlet and outlet piping. When starting the unit for the first time double check that the valves on the sample ports are closed.

Low Air Pressure Alarm Switch
The low air pressure alarm switch is one of the two alarm interlocks that must be properly connected by a licensed electrician prior to the system's initial start-up. Please see the Special Cautions at the beginning of Operating Instructions section for more information. The low air pressure alarm switch monitors the blower for continuous water treatment.

Should the blower fail, the low air pressure switch should be wired to shut off all incoming water. It, like the air pressure gauge, is connected to the system via tubing that is attached to a pressure port on the sump tank. The tubing is connected to the "high" pressure port on the switch. The "low" pressure port is open to the atmosphere. Periodically inspect and remove any water that may have accumulated in the tubing. The presence of water can affect proper switch operation.

Test the switch, at initial start up, by removing the air hose from the pressure port on the sump tank once the system is in full operation. This should set the system into an alarm condition and shut off the incoming contaminated water.

Main Disconnect Switch
The main disconnect switch should be provided that removes power from the low profile air stripper system. A disconnect is required by the National Electric Code (NEC) and must be installed. Some control panels contain an internal disconnect or circuit breaker to remove power. A qualified, licensed electrician should perform any and all electrical connections.

Intermittent Operation
Some systems are ordered with an intermittent operation option. Some low profile air stripper systems can be designed to run intermittently when continuous blower operation is a concern. When the feed water is flowing into the system, the blower will be in operation and the outlet pump (if provided) will maintain proper sump tank levels. When the feed water is shut down, the blower will run for an additional period of time to treat the water that had previously entered the air stripper before shutting down. When the feed water is restored, the blower will start up to treat the new incoming water. The benefits of intermittent operation are lower operating costs, better control of noise, and longer motor life.

Water Pressure Gauge
Water pressure gauges can be installed on both the inlet and outlet water lines. The gauges can be used to determine the water pressures entering and exiting the system. Excessively high readings could signal that something in your system is plugged. Large fluctuations in the pressure readings could be a sign that the water flow rate is varying.

2.1.2 Equipment Maintenance Instructions

Stacked tray and slide out tray air strippers require slightly different procedures for cleaning but basically the same components are targeted. This information describes how to clean the stacked tray and slide out tray type air stripper units. Please refer to the specific manufacturer's instructions for maintenance on the non-air stripper equipment.

Tray Fouling
With normal operation of the air stripper, the sump pressure will typically increase over time. This typically indicates that the air stripper trays are becoming fouled. If this occurs, shut down the system.

On slide out tray type air strippers, remove the door and visually inspect for signs of fouling and clean the air stripper as outlined previously. On stacked tray air strippers the trays are secured either by full length connecting rods or individual tray clips. On all systems, order of the trays and bubble plates inside are important to note. Tray orientation is specific to each model air stripper and re-assembling the trays or bubble plates incorrectly will interfere with proper operation of the system. Also please note that seal pots are present at each tray. The seal pots when filled with water and during operation, creates the "seal" so that air is directed up through the bubble plates and not through the downcomers. While cleaning or inspecting, these seal pots may have contaminated water present. Steps should be taken to avoid personal contact with or spillage of the water. Dispose of this water appropriately.

Occasionally inspect the pressure gauge tubing for water build up. Water trapped in the air tubing could produce an erroneous reading. A pinch clamp can be used on the tubing and should be closed when no one is at the site in order to prevent potential condensate accumulation. Condensation buildup will ruin the pressure gauge.

DEALING WITH HIGH MINERAL CONCENTRATIONS

Minerals, dissolved in high concentrations, tend to precipitate out of groundwater during the aeration processes. These minerals form insoluble deposits commonly referred to as "fouling". Pre-treating the water with sequestering agents or possibly other types of technologies can reduce deposits from iron-rich or mineral-rich feed water. There are a number of sequestering suppliers that should be able to offer recommendations or suggestions. The recommended cleaning procedure is pressure washing. Follow the instructions detailed below.

Cleaning the Air Stripper

Recommended cleaning equipment: Pressure Washer with Washer Wand
2 GPM minimum flow at 900 PSI maximum. Equipment rental companies can usually supply such a unit on a daily rental basis.

Clean Water Supply
Clean water supply with a capacity of at least 2 GPM at 20 PSI, connected to the pressure washer by means of an ordinary garden hose.

Cleaning the Unit.
The low profile air strippers are designed for easy cleaning. Trays can either be removed for cleaning or left in the unit and cleaned. Another option would be for the customer to purchase a spare set of trays that would allow maintenance personnel to replace the fouled trays with clean trays and reduce air stripper downtime and allow the maintenance personnel to clean the trays at a more convenient time.

Cleaning Step 1. Turn Off Equipment, Perform Electrical "Lockout" Procedure
Turn off the feed water supply and all associated electrical equipment.

Cleaning Step 2. Provide for Waste Disposal
Make provisions for disposing of the sludge and waste generated during cleaning.

Cleaning Step 3. Remove Front Cover(s).
Either remove the trays from the air stripper unit or leave them in for cleaning.

Cleaning Step 4. Turn On Water and Pressure Washer
Turn on the water supply to the pressure washer first then activate the pressure washer. Using the pressure washer and medium bristle brush clean any residue from the trays surfaces, concentrating on the sieve holes. DO NOT USE SOAP or cleaning agents unless they will be thoroughly rinsed from the trays; soap residue can affect stripper performance. When finished, turn off the pressure washer itself. Wear protective goggles and other personal protective equipment while spraying.

For hard to remove scales and precipitates a dilute (5%-10%) muriatic acid and water solution can be used to rinse or soak the trays. Be certain to completely rinse the solution off the trays before reassembling the unit.

Cleaning Step 5. Insert Wand into Air Stripper
(This step is for cleaning trays while they remain in the air stripper unit. If trays have been removed for cleaning, skip step 5 and proceed to step 6.) Insert the wand all the way into the door opening. Point the spray nozzle up towards the bottom of the lowest tray.

Cleaning Step 6. Clean Bottom Side of Tray
Holding the wand tightly, pull the trigger to start the pressurized water flow. Expect the wand to kick back as flow starts. Move the wand side to side at a rate of about 1" per second. Be sure to cover the entire tray bottom area. The tray holes must be cleaned of all deposits. Periodically stop the cleaning operation and inspect the cleaned area. The area is clean when there are no deposits around the aeration holes.

Cleaning Step 7. Clean Top Side of Tray
Move the wand to the topside of the tray. Continue spraying with the nozzle pointed down onto the top surface of the tray. Also clean the downcomer and sealpot areas. Remove all visible deposits from the tray baffles and the walls of the unit. Inspect the cleaned area for deposits.

Cleaning Step 8. Repeat for all Trays
Repeat the procedure for all trays, working up to the top-most tray.

Cleaning Step 9. Spray the Ceiling and Walls of the Air Stripper.
If the air stripper is a mild-steel unit with coal tar epoxy coating, extra care must be taken not to remove the epoxy with the high pressure water. Cleaning the walls and ceiling are not necessarily required for proper air stripper operation.

Cleaning Step 10. Rinse
After the cleaning operation is finished, rinse the ceiling, trays, baffles, and walls with the pressure sprayer. Work from the top down to the sump tank. Make sure the surfaces are clean and the holes are not blocked by loosened debris.

Cleaning Step 11. Check the Demister Pad and Replace as Necessary
Inspect the demister pad and clean as needed. Use the pressure sprayer to remove debris, deposits and gummy residues sometimes found on the demister pad. Demister pads that are excessively plugged should be replaced.

Cleaning Step 12. Inspect the Air Stripper
Visually inspect the air stripper box for the following:

1. Gasket integrity
2. If this is a mild steel unit, the internal and external epoxy-coatings must be inspected for exposed areas. Scratches, chips, burns, etc. will expose the mild steel to water, contaminants, and the elements, creating potential for corrosion. These exposed areas must be cleaned, dried, and re-epoxyed before commencing air stripper operation. Contact the manufacturer for touchup epoxy.
3. Aeration tray integrity. Inspect trays for structural damage, sealing gasket integrity, and acceptable silicone sealant in the sealpot area. Check the downcomer of each tray for holes, rips, etc. Replace as necessary. Contact the manufacturer for replacement items.
4. Inspect the internal piping if present (typically PVC piping) and replace as necessary.

Cleaning Step 13. Air Stripper Re-Assembly
Reassemble the trays - note – on stacked tray systems, some trays are numbered and that a mark is used to assist in proper alignment of the trays during reassembly. Check to make sure the gasket is still seated correctly and undamaged.

On stacked tray systems, reinstall the gasket hold-down ring and retension the hold-down rod nuts (cranks.) The hold-down tensioning springs should be compressed to a length of 3-1/2 inches for proper gasket sealing.Reattach any pipe and exhaust stack connections.

Follow Start-Up instructions per the manufacturer's recommendations.

Cleaning Step 14. Follow Manufacturer's Instructions for Maintenance on Non-Air Stripper Equipment

Other stripper maintenance items include:

1. Periodically check blower for vibration. Bearings may require eventual service or conditions of excessive motor start / stop cycles may lead to premature motor or blower failure.

2. Check gasket condition during disassembly for cleaning. The gasket is designed to allow numerous assembly and disassemblies before requiring replacement.

3. The stripper demister element is essentially maintenance free, although dried inorganic residue can build up within the demister and affect demister operation. This condition is evidenced in water droplets not being removed by the demister and blowing out of the stripper exhaust stack--occasionally on start-up water is discharged from the stripper stack, which is normal. The demister may be cleaned with a dilute muriatic and water solution (5%-10%) as instructed for tray cleaning.

4. Solids may build up in the sump. These solids can be suctioned out during tray cleaning operations.

5. Periodically check the structural integrity of the stripper sump, trays and top. Check bulkhead nuts for snugness. Cracks or loose fittings will normally be evidenced by water leakage.

Monthly: Check the air pressure readings at the air stripper. Reduced readings could indicate fouling bubble plates.

Monthly: Check the y strainer prior to the transfer pump. Clean as necessary.

Monthly: Check the Critical Safety Device (CE) overrides, alarm sensor integrity including:
Air stripper blower low-pressure sensor
Air stripper sump "HIGH-HIGH" level sensor

NOTE

After testing the above overrides and after the sensor is returned to normal operating position the ***"RESET"*** button at the controller may need to be pressed.

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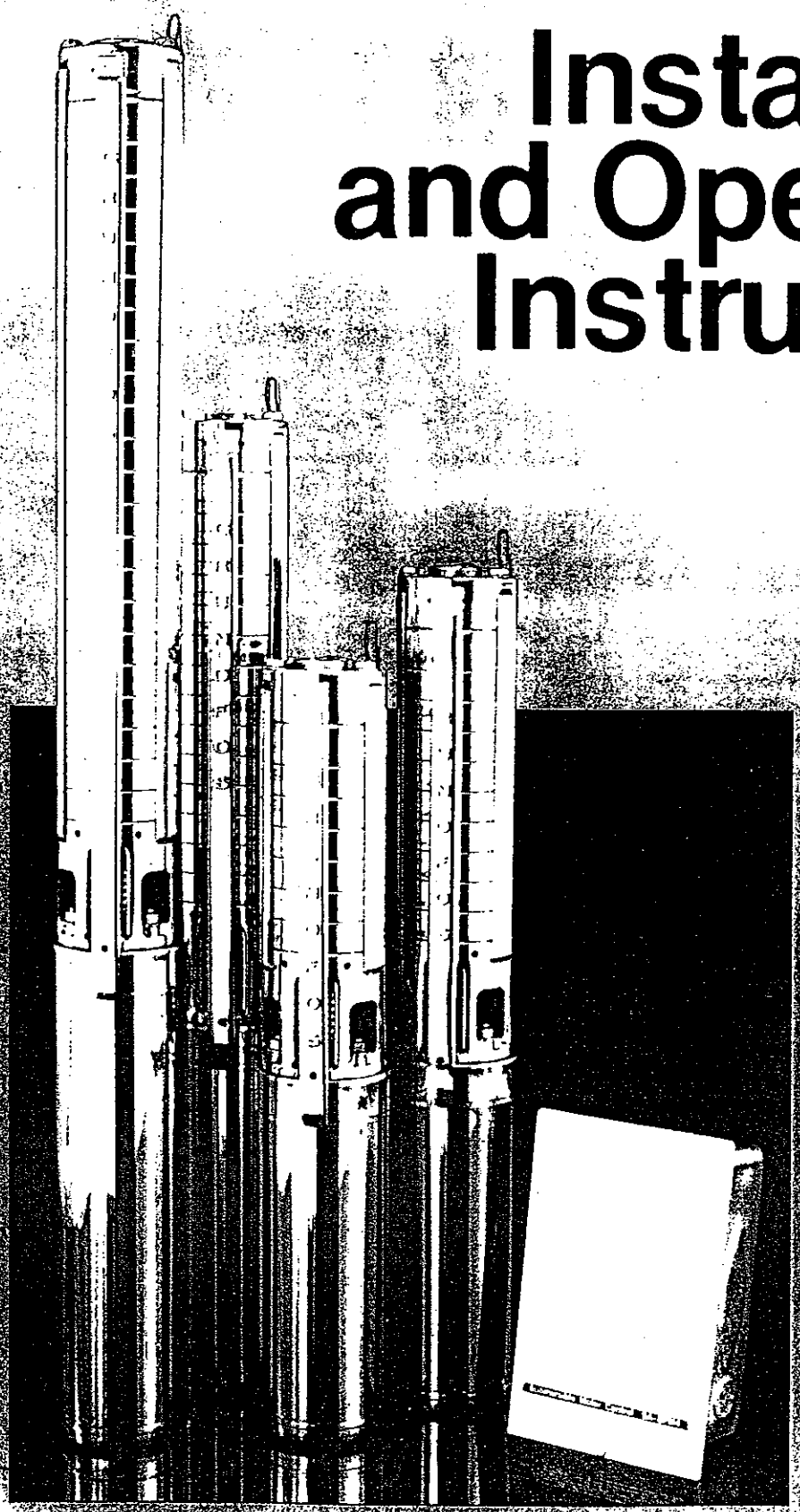
Appendix G

GWCTS Submersible Pump
O&M Manual

Installation and Operating Instructions



Please leave these instructions with the pump

Installation and Operating Instructions

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Installation and Operating Instructions

GRUNDFOS

Redi-Flo4

Your Grundfos Redi-Flo4 Environmental Pump is of the utmost quality. Combined with proper installation, your Grundfos pump will give you many years of reliable service.

To ensure the proper installation of the pump, carefully read the complete manual before attempting to install the pump.

SECTION **1.**

Shipment Inspection

Examine the components carefully to make sure no damage has occurred to the pump-end, motor, cable or control box during shipment.

This Grundfos Redi-Flo4 Environmental Pump should remain in its shipping carton until it is ready to be installed. The carton is specially designed to protect it from damage. During unpacking and prior to installation, **make sure that the pump is not contaminated, dropped or mishandled.**

The motor is equipped with an electrical cable. **Under no circumstance should the cable be used to support the weight of the pump.**

You will find a loose data plate wired to the pump. It should be securely mounted at the well or attached to the control box.

SECTION **2.**

Pre-Installation Checklist

Before beginning installation, the following checks should be made. They are all critical for the proper installation of this submersible pump.

☑ **A. CONDITION OF THE WELL**

If the pump is to be installed in a new well, the well should be fully developed and bailed or blown free of cuttings and sand. Dispose of discharged materials in accordance with the specific job site requirements. The stainless steel construction of the Redi-Flo4 Environmental Pump makes it resistant to abrasion; however, no pump, made of any material, can forever withstand the destructive wear that occurs when constantly pumping sandy groundwater.

Determine the maximum depth of the well, and the drawdown level at the pump's maximum capacity. Pump selection and setting depth should be based on this data.

The inside diameter of the well casing should be checked to ensure that it is not smaller than the size of the pump and motor.

☑ **B. CONDITION OF THE WATER**

Redi-Flo4 pumps are designed for pumping cold groundwater that is free of air or gases. Decreased pump performance and life expectancy can occur if the groundwater is not cold or contains air or gases.

☑ **C. INSTALLATION DEPTH**

Pumping sand or well sediment can occur when the pump motor is installed lower than the top of the well screen or within five feet of the well bottom. This can reduce the performance and life expectancy of the pump and should be avoided.

If the pump is to be installed in a lake, containment pond, tank or larger diameter well, the water velocity passing over the motor must be sufficient to ensure proper motor cooling. The minimum recommended water flow rates which ensure proper cooling are listed in Table A.

☑ **D. ELECTRICAL SUPPLY**

The motor voltage, phase and frequency indicated on the motor nameplate should be checked against the actual electrical supply.

SECTION 3.

Wire Cable Type

The type of wire used between the pump and control box should be approved for submersible pump applications. The conductor insulation should have a continuous Teflon® jacket with no splices and must be suitable for use with submersible pumps.

SECTION 4.

Installation

The riser pipe or hose should be properly sized and selected based on estimated flow rates and friction-loss factors.

A back-up wrench should be used when attaching a riser pipe or metallic nipple to the pump. The pump should only be gripped by the flats on the top of the discharge chamber. **The body of the pump, cable guard or motor should not be gripped under any circumstance.**

If steel riser pipe is used:

An approved pipe thread compound should be used on all joints. Make sure the joints are adequately tightened in order to resist the tendency of the motor to loosen the joints when stopping and starting.

When tightened, the first section of the riser pipe must not come in contact with the check valve retainer in the discharge chamber of the pump.

After the first section of the riser pipe has been attached to the pump, the lifting cable or elevator should be clamped to the pipe. **Do not clamp the pump.** When raising the pump and riser section, be careful not to place bending stress on the pump by picking it up by the pump-end only.

Make sure that the electrical cables are not cut or damaged in any way when the pump is being lowered in the well.

The drop cable should be secured to the riser pipe at frequent intervals using an approved clip or tape to prevent sagging, looping and possible cable damage.

If plastic or flexible riser pipe is used:

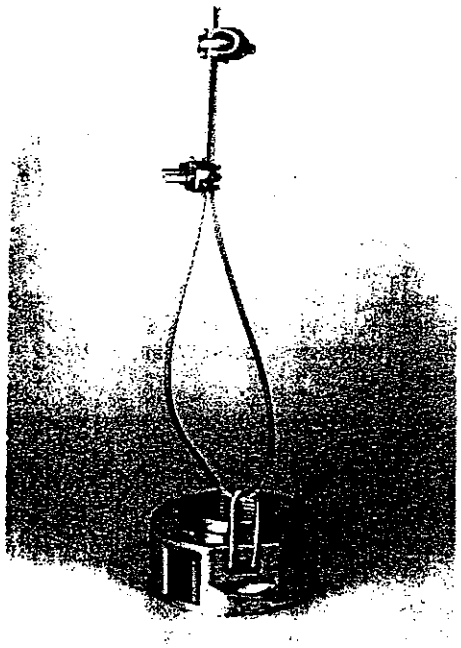
Use the correct compound recommended by the pipe manufacturer or specific job specifications. Besides making sure that joints are securely fastened, the use of a torque arrester is recommended when using these types of pipe.

Do not connect the first plastic or flexible riser section directly to the pump. Always attach a metallic nipple or adapter into the discharge chamber of the pump. When tightened, the threaded end of the nipple or adapter must not come in contact with the check valve retainer in the discharge chamber of the pump.

The drop cable should be secured to the riser pipe at frequent intervals using an approved clip or tape to prevent sagging, looping and possible cable damage.

IMPORTANT- Plastic and flexible pipe tend to stretch under load. This stretching must be taken into account when securing the cable to the riser pipe. Leave enough slack between clips or taped points to allow for this stretching. This tendency for plastic and flexible pipe to stretch will also affect the calculation of the pump setting depth. If the depth setting is critical, check with the manufacturer of the pipe to determine how to compensate for pipe stretch.

When these types of pipe are used, it is recommended that a safety cable be attached to the pump to lower and raise it. The discharge piece of Redi-Flo4 submersibles is designed to accommodate this cable. (Figure 4)



Protect the well from contamination:

While installing the pump, proper care should be used not to introduce foreign objects or contaminants into the well. The well should be finished off above grade to protect against surface water from entering the well, causing contamination.

NOTE: Teflon® is a registered trademark of DuPont.

SECTION 5.

Electrical

WARNING: To reduce the risk of electric shock during operation of this pump requires the provision of acceptable grounding. If the means of connection to the supply connected box is other than grounded metal conduit, ground the pump back to the service by connecting a copper conductor, at least the size of the circuit supplying the pump, to the grounding screw provided within the wiring compartment.

All electrical work should be performed by a qualified electrician in accordance with the latest edition of the National Electrical Code, local codes and regulations.

Verification of the electrical supply should be made to ensure the voltage, phase and frequency match that of the motor. Motor voltage, phase, frequency and full-load current information can be found on the nameplate attached to the motor. Motor electrical data can be found in Table C.
If voltage variations are larger than ± 10%, do not operate the pump.
Direct on-line starting is used due to the extremely fast run-up time of the motor (0.1 second maximum), and the low moment of inertia of the pump and motor. Direct on-line starting current (locked rotor amp) is between 4 and 6.5 times the full-load current.

Engine-Driven Generators

If the Redi-Flo4 pump is going to be operated using an engine driven generator, we suggest the manufacturer of the generator be contacted to ensure the proper generator is selected and used. See Table B for generator sizing guide.

Control Box, Single-Phase Motors

Single-phase motors must be connected as indicated in the motor control box. A typical single-phase wiring diagram using a Grundfos control box is shown. (Figure 5-A)

High Voltage Surge Arresters

A high voltage surge arrester should be used to protect the motor against lightning and switching surges. The correct voltage-rated surge arrester should be installed on the supply(line) side of the control box.(Figure 5-B) The arrester must be grounded in accordance with the National Electric Code, local codes and regulations.

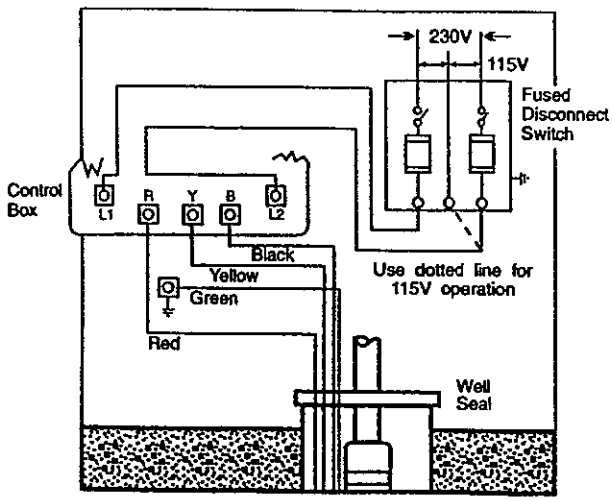
Control Box and Surge Arrester Grounding

The control box shall be permanently grounded in accordance with the National Electrical Code and local codes or regulations. The ground wire should be a bare copper conductor at least the same size as the drop cable wire size. The ground wire should be run as short a distance as possible and be securely fastened to a true grounding point.

True grounding points are considered to be: a grounding rod driven into the water strata, steel well casing submerged into the water lower than the pump setting level, and steel discharge pipes without insulating couplings. If plastic discharge pipe and well casing are used, a properly sized bare copper wire should be connected to a stud on the motor and run to the control panel. Do not ground to a gas supply line. Connect the grounding wire to the ground point first and then to the terminal in the control box.

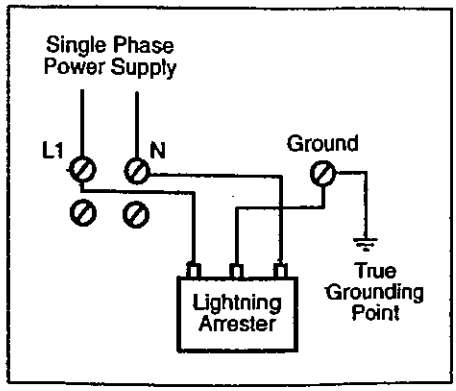
Wiring Checks

Before making the final wiring connections of the drop cable to the control box terminal, it is a good practice to check the insulation resistance to ensure that the cable is good. Measurements for a new installation must be at least 1,000,000 ohm. Do not start the pump if the measurement is less than this. If it is higher, finish wiring and verify that all electrical connections are made in accordance with the wiring diagram. Check to ensure the control box and high voltage surge arrester have been grounded.



Single Phase Wiring Diagram for Grundfos Control Boxes

(Figure 5-A)



Single Phase Hookup

(Figure 5-B)

SECTION 6.

Start-Up

After the pump has been set into the well and the wiring connections have been made, the following procedures should be performed.

A. Attach a temporary horizontal length of pipe with installed gate valve to the riser pipe.

B. If required, make provisions to capture discharged fluids for disposal.

C. Adjust the gate valve one-third open.

D. Start the pump and let it operate until the water runs clear of sand and silt.

E. As the water clears, slowly open the gate valve in small increments until the desired flow rate of clear water is reached. The pump should not be operated beyond its maximum flow rating and should not be stopped until the groundwater runs clear.

F. If the groundwater is clean and clear when the pump is first started, the valve should still be opened until the desired flow rate is reached.

G. Disconnect the temporary piping arrangements and complete the final piping connections.

H. **Under no circumstances should the pump be operated for any prolonged period of time with the discharge valve closed.** This can result in motor damage due to overheating. A properly sized relief valve should be installed at the well head to prevent the pump from running against a closed valve.

I. Start the pump and test the system. Check and record the voltage and current draw on each motor lead.

Operation

A. The pump and system should be periodically checked for water quantity, pressure, drawdown, periods of cycling, and operation of controls. **Under no circumstances should the pump be operated for any prolonged periods of time with the discharge valve closed.** This can result in motor and pump damage due to overheating.

A properly sized relief valve should be installed at the well head to prevent the pump from running against a closed valve.

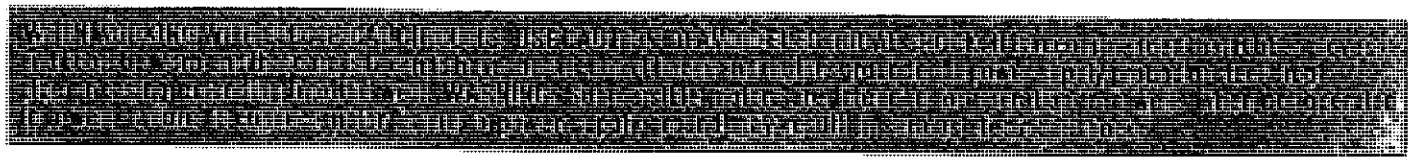
B. If the pump fails to operate, or there is a loss of performance, refer to Troubleshooting, Section 7.

SECTION 7.

Troubleshooting

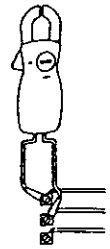
The majority of problems that develop with submersible pumps are electrical, and most of these problems can be corrected without pulling the pump from the well. The following charts cover most of the submersible service work. As with any troubleshooting procedure, start with the simplest solution first; always make all the above-ground checks before pulling the pump from the well.

Usually only two instruments are needed – a combination voltmeter/ammeter, and an ohmmeter. These are relatively inexpensive and can be obtained from most water systems suppliers.



Preliminary Tests

SUPPLY VOLTAGE



How to Measure

By means of a voltmeter, which has been set to the proper scale, measure the voltage at the control box. On single-phase units, measure between line and neutral.

What it Means

When the motor is under load, the voltage should be within ± 10% of the nameplate voltage. Larger voltage variation may cause winding damage.

Large variations in the voltage indicate a poor electrical supply and the pump should not be operated until these variations have been corrected.

If the voltage constantly remains high or low, the motor should be changed to the correct supply voltage.

CURRENT MEASUREMENT

How to Measure

By use of an ammeter, set on the proper scale, measure the current on each power lead at the control box. See the Electrical Data, Table C, for motor amp draw information.

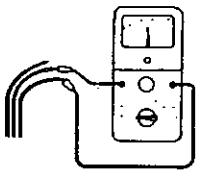
Current should be measured when the pump is operating at a constant discharge pressure with the motor fully loaded.

What it Means

If the amp draw exceeds the listed service factor amps (SFA), check for the following:

1. Loose terminals in control box or possible cable defect. Check winding and insulation resistances.
2. Too high or low supply voltage.
3. Motor windings are shorted.
4. Pump is damaged causing a motor overload.

WINDING RESISTANCE



How to Measure

Turn off power and disconnect the drop cable leads in the control box. Using an ohmmeter, set the scale selectors to Rx1 for values under 10 ohms and and Rx10 for values over 10 ohms.

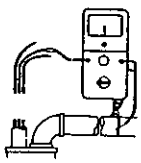
Zero-adjust the meter and measure the resistance between leads. Record the values.

Motor resistance values can be found in the Electrical Data, Table C. Cable resistance values are in Table D.

What it Means

If all the ohm values are normal, and the cable colors correct, the windings are not damaged. If any one ohm value is less than normal, the motor may be shorted. If any one ohm value is greater than normal, there is a poor cable connection or joint. The windings or cable may also be open. If some of the ohm values are greater than normal and some less, the drop cable leads are mixed. To verify lead colors, see resistance values in Electrical Data, Table C.

INSULATION RESISTANCE



How to Measure

Turn off power and disconnect the drop cable leads in the control box. Using an ohm or mega ohmmeter, set the scale selector to Rx100K and zero-adjust the meter.

Measure the resistance between the lead and ground (discharge pipe or well casing, if steel).

What it Means

For ohm values, refer to table below. Motors of all Hp, voltage, phase and cycle duties have the same value of insulation resistance.

OHM VALUE	MEGAOHM VALUE	CONDITION OF MOTOR AND LEADS
2,000,000 (or more)	2.0	**Motor not yet installed:** New Motor
1,000,000 (or more)	1.0	Used motor which can be reinstalled in the well
500,000 - 1,000,000	0.5 - 1.0	**Motor in well** (Ohm readings are for drop cable plus motor): A motor in reasonably good condition.
20,000 - 50,000	0.02 - 0.5	A motor which may have been damaged by lightning or with damaged leads. Do not pull the pump for this reason.
10,000 - 20,000	0.01 - 0.02	A motor which definitely has been damaged or with damaged cable. The pump should be pulled and repairs made to the cable or the motor replaced. The motor will still operate, but probably not for long.
less than 10,000	0 - 0.01	A motor which has failed or with completely destroyed cable insulation. The pump must be pulled and the cable repaired or the motor replaced. The motor will not run in this condition.

Troubleshooting Chart

FAULT	POSSIBLE CAUSES	HOW TO CHECK	HOW TO CORRECT
A. Pump Does Not Run	1. No power at pump panel.	Check for voltage at panel.	If no voltage at panel, check feeder panel for tripped circuits.
	2. Fuses are blown or circuit breakers are tripped.	Remove fuses and check for continuity with ohmmeter.	Replace blown fuses or reset circuit breaker. If new fuses blow or circuit breaker trips, the electrical installation and motor must be checked.
	3. Defective controls.	Check all safety and pressure switches for operation. Inspect contact in control devices.	Replace worn or defective parts.
	4. Motor and/or cable are defective.	Turn off power. Disconnect motor leads from control box. Measure the lead to lead resistances with the ohmmeter (Rx1). Measure lead to ground values with ohmmeter (Rx100K). Record measured values.	If open motor winding or ground is found, remove pump and recheck values at the surface. Repair or replace motor or cable.
	5. Defective capacitor.	Turn off the power, then discharge capacitor. Disconnect leads and check with an ohm-meter (Rx100K). When meter is connected, the needle should jump forward and slowly drift back.	If there is no needle movement, replace the capacitor.
B. Pump Runs But Does Not Deliver Water	1. Groundwater level in well is too low or well is collapsed.	Check well drawdown.	Lower pump if possible. If not, throttle discharge valve and install water level control.
	2. Integral pump check valve is blocked.	Install pressure gauge, start pump, gradually close the discharge valve and read pressure at shut-off. After taking reading, open valve to its previous position. Convert PSI to feet (For water: PSI x 2.31 ft/PSI = _____ ft.), and add to this the total vertical distance from the pressure gauge to the water level in the well while the pump is running. Refer to the specific pump curve for the shut-off head for that pump model. If the measured head is close to the curve, pump is probably OK.	If not close to the pump curve, remove pump and inspect discharge section. Remove blockage, repair valve and valve seat if necessary. Check for other damage. Rinse out pump and reinstall.
	3. Inlet strainer is clogged.	Same as B.2 above.	If not close to the pump curve, remove pump and inspect. Clean strainer, inspect integral check valve for blockage, rinse out pump and reinstall.
	4. Pump is damaged.	Same as B.2 above.	If damaged, repair as necessary. Rinse out pump and reinstall.
C. Pump Runs But at Reduced Capacity	1. Drawdown is larger than anticipated.	Check drawdown during pump operation.	Lower pump if possible. If not, throttle discharge valve and install water level control.
	2. Discharge piping or valve leaking.	Examine system for leaks.	Repair leaks.
	3. Pump strainer or check valve are clogged.	Remove pump and inspect.	Clean, repair, rinse out pump and reinstall.
	4. Pump worn.	Same as B.2 above.	If not close to pump curve, remove pump and inspect.

Troubleshooting (continued)

FAULT	POSSIBLE CAUSES	HOW TO CHECK	HOW TO CORRECT
D. Pump Cycles Too Much	1. Pressure switch is not properly adjusted or is defective.	Check pressure setting on switch and operation. Check voltage across closed contacts.	Re-adjust switch or replace if defective.
	2. Level control is not properly set or is defective.	Check setting and operation.	Re-adjust setting (refer to manufacturer data). Replace if defective.
	3. Plugged snifter valve or bleed orifice.	Examine valve and orifice for dirt or corrosion.	Clean and/or replace if defective.
E. Fuses Blow or Circuit Breakers Trip	1. High or low voltage.	Check voltage at pump panel. If not within ± 10%, check wire size and length of run to pump panel.	If wire size is correct, contact power company. If not, correct and/or replace as necessary.
	2. Control box wiring and components.	Check that control box parts match the parts list. Check to see that wiring matches wiring diagram. Check for loose or broken wires or terminals.	Correct as required.
	3. Defective capacitor.	Turn off power and discharge capacitor. Check using an ohmmeter (Rx100K). When the meter is connected, the needle should jump forward and slowly drift back.	If no meter movement, replace the capacitor.
	4. Starting relay (Franklin single phase motors only).	Check resistance of relay coil with an ohmmeter (Rx1000). Check contacts for wear.	Replace defective relay.

Table A

Minimum Water Flow Requirements for Submersible Pump Motors

MOTOR DIAMETER	CASING OR SLEEVE I.D. IN INCHES	MIN. FLOW PAST THE MOTOR (GPM)
4"	4	1.2
	5	7
	6	13
	7	21
	8	30

NOTES: 1. A flow inducer or sleeve must be used if the water enters the well above the motor or if there is insufficient water flow past the motor.

2. The minimum recommended water velocity over 4" motors is 0.25 feet per second.

Table B

Guide for Engine-Driven Generators in Submersible Pump Applications

	MINIMUM KILOWATT RATING OF GENERATOR FOR THREE-WIRE SUBMERSIBLE PUMP MOTORS	
MOTOR HP	EXTERNALLY REGULATED GENERATOR	INTERNALLY REGULATED GENERATOR
0.33 HP	1.5 KW	1.2 KW
0.50	2.0	1.5
0.75	3.0	2.0
1.0	4.0	2.5
1.5	5.0	3.0

NOTES:

1. Table is based on typical 80°C rise continuous duty generators with 35% maximum voltage dip during start-up of single phase motors.
2. Contact the manufacturer of the generator to assure the unit has adequate capacity to run the submersible motor.
3. If the generator rating is in KVA instead of kilowatts, multiply the above ratings by 1.25 to obtain KVA.

Table C

Electrical Data - 60 Hz Submersible Pump Motors

GRUNDFOS MOTORS

4 Inch (Two Wire) Motors - Control Box Not Required

60 Hz

HP	Ph	VOLT	Ser. Fact.	Circ. Brk. or Stnd. Fuse	Dual Element Fuse	AMPERAGE Full Load	AMPERAGE Lock Rotor	AMPERAGE S.F. Amps	FULL LOAD Eff.	FULL LOAD Power Factor	Line-to-Line Resistance(Ohms) Blk-Yel Delta	Line-to-Line Resistance(Ohms) Red-Yel Delta	KVA Code **	Maximum Thrust (lbs)	GRUNDFOS PART NO.
SINGLE PHASE															
1/3	1	230	1.75	15	5	3.0	25.5	4.4	47.3	63.0	6.8-8.2		S	750	79.952301
1/2	1	230	1.60	15	7	4.3	34.5	5.9	50.6	64.7	5.2-6.3		R	750	79.952302
3/4	1	230	1.50	20	9	6.6	40.5	8.0	57.0	70.0	3.2-3.8		N	750	79.952303
1	1	230	1.40	25	12	8.0	47.4	9.6	59.8	74.3	2.5-3.1		M	750	79.952304
1 1/2	1	230	1.30	35	15	10.6	60.8	13.1	64.3	77.2	1.9-2.3		L	750	79.952305

4 Inch (Three Wire) Motors

SINGLE PHASE

1/3	1	230	1.75	15	5	3.0	14.0	4.4	47.0	63.0	6.8-8.3	17.3-21.1	L	750	79.453301
1/2	1	230	1.60	15	7	4.3	20.0	5.9	50.7	64.6	4.7-5.7	15.8-19.6	L	750	79.453302
3/4	1	230	1.50	20	9	6.6	30.8	8.0	57.3	70.0	3.2-3.9	14-17.2	L	750	79.453303
1	1	230	1.40	25	12	8.0	36.3	9.6	59.8	74.5	2.6-3.1	10.3-12.5	K	750	79.453304
1 1/2	1	230	1.30	30	15	9.7	44.0	11.5	67.5	84.1	1.9-2.3	7.8-9.6	H	750	79.453305

Franklin Motors

(refer to the Franklin Submersible Motors Application Maintenance Manual)

Table D
Total Resistance of Drop Cable (OHMS)

The values shown in this table are for copper conductors. Values are for the total resistance of drop cable from the **Control box to the motor and back.**

To determine the resistance:

1. Disconnect the drop cable leads from the control box.
2. Record the size and length of drop cable.
3. Determine the cable resistance from the table.
4. Add drop cable resistance to motor resistance. Motor resistances can be found in the Electrical Data Chart, Table C.
5. Measure the resistance between each drop cable lead using an ohmmeter. Meter should be set on Rx1 and zero-balanced for this measurement.
6. The measured values should be approximately equal to the calculated values.

Wire Resistances

Distance From Control Box to Pump Motor (FT.)	12 AWG Wire Resistance (OHMS)	14 AWG Wire Resistance (OHMS)
10	0.03	0.05
20	0.06	0.10
30	0.10	0.15
40	0.13	0.21
50	0.16	0.26
60	0.19	0.31
70	0.23	0.36
80	0.26	0.41
90	0.29	0.46
100	0.32	0.51
110	0.36	0.57
120	0.39	0.62
130	0.42	0.67
140	0.45	0.72
150	0.49	0.77
160	0.52	0.82
170	0.55	0.87
180	0.58	0.93
190	0.62	0.98
200	0.65	1.03

Redi-Flo4

LIMITED WARRANTY

Redi-Flo4 Environmental Pumps manufactured by GRUNDFOS Pumps Corporation (GRUNDFOS) are warranted to the original user only to be free of defects in material and workmanship for a period of 18 months from date of installation, but not more than 24 months from date of manufacture. GRUNDFOS' liability under this warranty shall be limited to repairing or replacing at GRUNDFOS' option, without charge, F.O.B. GRUNDFOS' factory or authorized service station, any product of GRUNDFOS manufacture. GRUNDFOS will not be liable for any costs of removal, installation, transportation, or any other charges which may arise in connection with a warranty claim. Products which are sold but not manufactured by GRUNDFOS are subject to the warranty provided by the manufacturer of said products and not by GRUNDFOS' warranty. GRUNDFOS will not be liable for damage or wear to products caused by abnormal operating conditions, accident, abuse, misuse, unauthorized alteration or repair, or if the product was not installed in accordance with GRUNDFOS' printed installation and operating instructions.

To obtain service under this warranty, the defective product must be returned to the distributor or dealer of GRUNDFOS products from which it was purchased together with proof of purchase and installation date, failure date, and supporting installation data. Unless otherwise provided, the distributor or dealer will contact GRUNDFOS or an authorized service station for instructions. Any defective product to be returned to GRUNDFOS or a service station must be sent freight prepaid; documentation supporting the warranty claim and/or a Return Material Authorization must be included if so instructed.

GRUNDFOS WILL NOT BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES, LOSSES, OR EXPENSES ARISING FROM INSTALLATION, USE OR ANY OTHER CAUSES. THERE ARE NO EXPRESS OR IMPLIED WARRANTIES, INCLUDING MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, WHICH EXTEND BEYOND THOSE WARRANTIES DESCRIBED OR REFERRED TO ABOVE.

Some jurisdictions do not allow the exclusion or limitation of incidental or consequential damages and some jurisdictions do not allow limitations on how long implied warranties may last. Therefore, the above limitations or exclusions may not apply to you. This warranty gives you specific legal rights and you may also have other rights which vary from jurisdiction to jurisdiction.

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Appendix H

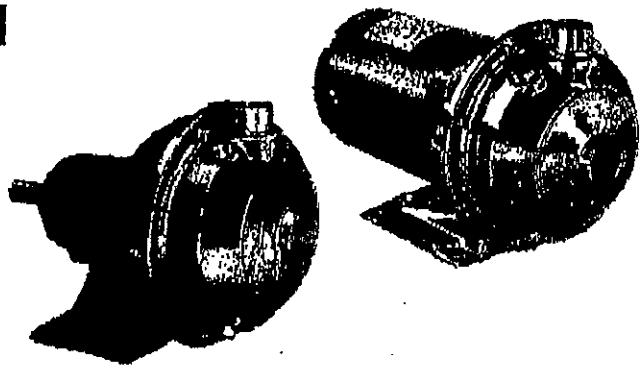
GWCTS Equalization Tank Pump and Sump Pump O&M Manual

GOULDS PUMPS, INC.
SENECA FALLS, NEW YORK 13148

G&L
A GOULDS PUMPS COMPANY

Installation, Operation and Maintenance Instructions

Model NPE/ NPE-F



DESCRIPTION & SPECIFICATIONS:

The Models NPE (close-coupled) and NPE-F (frame-mounted) are end suction, single stage centrifugal pumps for general liquid transfer service, booster applications, etc. Liquid-end construction is all AISI Type 304 stainless steel, stamped and welded. Impellers are fully enclosed, non-trimable to inter-mediate diameters. Casings are fitted with a diffuser for efficiency and for negligible radial shaft loading.

Close-coupled units have NEMA 48J or 56J motors with C-face mounting and threaded shaft extension. Frame-mounted units can be coupled to motors through a spacer coupling, or belt driven.

1. Important:

1.1. Inspect unit for damage. Report any damage to carrier/dealer immediately.

1.2. Electrical supply must be a separate branch circuit with fuses or circuit breakers, wire sizes, etc., per National and Local electrical codes. Install an all-log disconnect switch near pump.

CAUTION

Always disconnect electrical power when handling pump or controls.

1.3. Motors must be wired for proper voltage. Motor wiring diagram is on motor nameplate. Wire size must limit maximum voltage drop to 10% of nameplate voltage at motor terminals, or motor life and pump performance will be lowered.

1.4. Always use horsepower-rated switches, contactors and starters.

1.5. Motor Protection

1.5.1. Single-phase: Thermal protection for single-phase units is sometimes built in (check nameplate). If no built-in protection is provided, use a contactor with a proper overload. Fusing is permissible.

1.5.2. Three-phase: Provide three-leg protection with properly sized magnetic starter and thermal overloads.

1.6. Maximum Operating Limits:

Liquid Temperature:	212F (100C) with standard seal.
	250F (120C) with optional high temp seal.
Pressure:	75 PSI.
Starts Per Hour:	20, evenly distributed.

1.7. Regular inspection and maintenance will increase service life. Base schedule on operating time. Refer to Section 8.

2. Installation:

2.1. General

2.1.1. Locate pump as near liquid source as possible (below level of liquid for automatic operation).

2.1.2. Protect from freezing or flooding.

2.1.3. Allow adequate space for servicing and ventilation.

2.1.4. All piping must be supported independently of the pump, and must "line-up" naturally.

CAUTION

Never draw piping into place by forcing the pump suction and discharge connections.

2.1.5. Avoid unnecessary fittings. Select sizes to keep friction losses to a minimum.

2.2. Close-Coupled Units:

2.2.1. Units may be installed horizontally, inclined or vertically.

CAUTION

Do not install with motor below pump. Any leakage or condensation will affect the motor.

2.2.2. Foundation must be flat and substantial to eliminate strain when tightening bolts. Use rubber mounts to minimize noise and vibration.

2.2.3. Tighten motor hold-down bolts before connecting piping to pump.

2.3. Frame-Mounted Units:

2.3.1. Bedplate must be grouted to a foundation with solid footing. Refer to Fig.1.

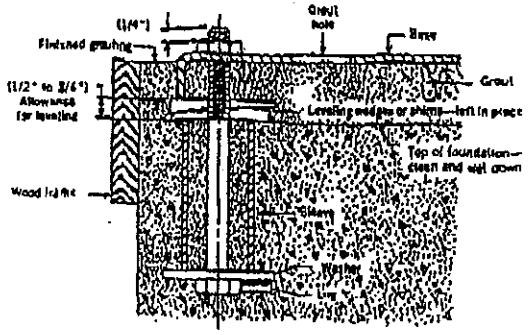


Figure 1

2.3.2. Place unit in position on wedges locating at four points (two below approximate center of driver and two below approximate center of pump). Adjust wedges to level unit. Level or plumb suction and discharge flanges.

2.3.3. Make sure bedplate is not distorted and final coupling alignment can be made within the limits of movement of motor and by shimming, if necessary.

2.3.4. Tighten foundation bolts finger tight and build dam around foundation. Pour grout under bedplate making sure the areas under pump and motor feet are filled solid. Allow grout to harden 48 hours before fully tightening foundation bolts.

2.3.5. Tighten pump and motor hold-down bolts before connecting the piping to pump.

3. Suction Piping:

3.1. Low static suction lift and short, direct, suction piping is caired. For suction lift over 10 feet and liquid temperatures over 20 F, consult pump performance curve for Net Positive Suction Head Required.

3.2. Suction pipe must be at least as large as the suction connection of the pump. Smaller size will degrade performance.

3.3. If larger pipe is required, an eccentric pipe reducer (with straight side up) must be installed at the pump.

3.4. Installation with pump below source of supply:

3.4.1. Install full flow isolation valve in piping for inspection and maintenance.

CAUTION

Do not use suction isolation valve to throttle pump.

3.5. Installation with pump above source of supply:

3.5.1. Avoid air pockets. No part of piping should be higher than pump suction connection. Slope piping upward from liquid source.

3.5.2. All joints must be airtight.

3.5.3. Foot valve to be used only if necessary for priming, or to hold prime on intermittent service.

3.5.4. Suction strainer open area must be at least triple the pipe area.

3.6. Size of inlet from liquid source, and minimum submergence over inlet, must be sufficient to prevent air entering pump through vortexing. See Figs. 2-5

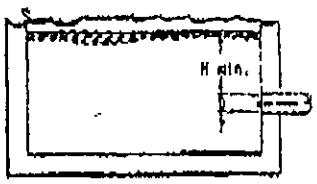


Figure 2

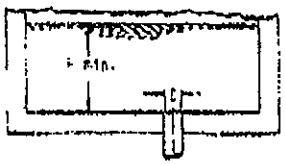


Figure 3

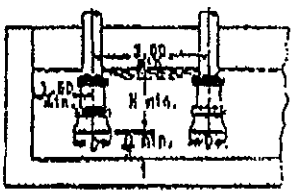


Figure 4

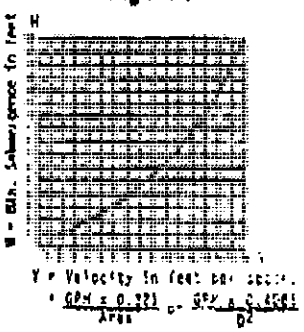


Figure 5

4. Discharge Piping:

4.1. Arrangement must include a check valve located between a gate valve and the pump. The gate valve is for regulation of capacity, or for inspection of the pump or check valve.

4.2. If an increaser is required, place between check valve and pump.

5. Motor-To-Pump Shaft Alignment:

5.1. Close-Coupled Units:

5.1.1. No field alignment necessary.

5.2. Frame-Mounted Units:

5.2.1. Even though the pump-motor unit may have a factory alignment, this could be disturbed in transit and must be checked prior to running. See Fig. 6.

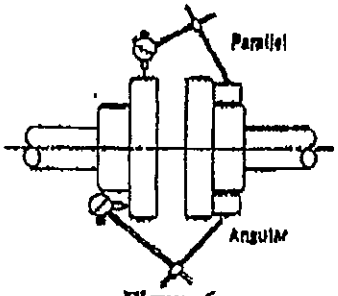


Figure 6

5.2.2. Tighten all hold-down bolts before checking the alignment.

5.2.3. If re-alignment is necessary, always move the motor. Shim as required.

5.2.4. Parallel misalignment - shafts with axis parallel but not concentric. Place dial indicator on one hub and rotate this hub 360 degrees while taking readings on the outside diameter of the other hub. Parallel alignment occurs when Total Indicator Reading is .005", or less.

5.2.5. Angular misalignment - shafts with axis concentric but not parallel. Place dial indicator on one hub and rotate this hub 360 degrees while taking readings on the face of the other hub. Angular alignment is achieved when Total Indicator Reading is .005", or less.

5.2.6. Final alignment is achieved when parallel and angular requirements are satisfied with motor hold-down bolts tight.

CAUTION

Always recheck both alignments after making any adjustment.

6. Rotation:

6.1. Correct rotation is right-hand (clockwise when viewed from the motor end). Switch power on and off quickly. Observe shaft rotation. To change rotation:

6.1.1. Single-phase motor: Non-reversible.

6.1.2. Three-phase motor: Interchange any two power supply leads.

7. Operation:

7.1. Before starting, pump must be primed (free of air and suction pipe full of liquid) and discharge valve partially open.

CAUTION

Pumped liquid provides lubrication. If pump is run dry, rotating parts will seize and mechanical seal will be damaged. Do not operate at or near zero flow. Energy imparted to the liquid is converted into heat. Liquid may flash to vapor. Rotating parts require liquid to prevent seizing or seizing.

7.2. Make complete check after unit is run under operating conditions and temperature has stabilized. Check for expansion of piping. On frame-mounted units coupling alignment may have changed due to the temperature differential between pump and motor. Recheck alignment.

8. Maintenance

8.1. Close-Coupled Unit. Ball bearings are located in and are part of the motor. They are permanently lubricated. No greasing required.

8.2. Frame-Mounted Units:

8.2.1. Bearing frame should be regreased every 2,000 hours or 3 month interval, whichever occurs first. Use a #2 sodium or lithium based grease. Fill until grease comes out of relief fittings, or lip seals, then wipe off excess.

8.2.2. Follow motor and coupling manufacturers' lubrication instructions.

8.2.3. Alignment must be rechecked after any maintenance work involving any disturbance of the unit.

9. Disassembly

Complete disassembly of the unit will be described. Proceed only as far as required to perform the maintenance work needed.

9.1. Turn off power.

9.2. Drain system. Flush if necessary.

9.3. Close-Coupled Units: Remove motor hold-down bolts.

Frame-Mounted Units: Remove coupling, spacer, coupling guard and frame hold-down bolts.

9.4. Disassembly of Liquid End:

9.4.1. Remove casing bolts (370).

9.4.2. Remove back pull-out assembly from casing (100).

9.4.3. Remove impeller locknut (304).

CAUTION

Do not insert screwdriver between impeller vanes to prevent rotation of close-coupled units. Remove cap at opposite end of motor. A screwdriver slot or a pair of flats will be exposed. Using them will prevent impeller damage.

9.4.4. Remove impeller (101) by turning clockwise. Protect hand with rag or glove.

9.4.5. With two pry bars 180 degrees apart and inserted between the seal housing (184) and the motor adapter (108), carefully separate the two parts. The mechanical seal rotary unit (383) should come off the shaft with the seal housing.

9.4.6. Push out the mechanical seal stationary seat from the motor side of the seal housing.

9.5. Disassembly of Bearing Frame:

9.5.1. Remove bearing cover (109).

9.5.2. Remove shaft assembly from frame (228).

9.5.3. Remove lip seals (138 & 139) from bearing frame and bearing cover if worn and are being replaced.

9.5.5. Use bearing puller or arbor press to remove ball bearings (112 & 168).

10. Reassembly

10.1. All parts should be cleaned before assembly.

10.2. Refer to parts list to identify required replacement items. Specify pump index or catalog number when ordering parts.

10.3. Reassembly is the reverse of disassembly.

10.4. Observe the following when reassembling the bearing frame:

10.4.1. Replace lip seals if worn or damaged.

10.4.2. Replace ball bearings if loose, rough or noisy when rotated.

10.4.3. Check shaft for runout. Maximum permissible is .002" T.I.R.

10.5. Observe the following when reassembling the liquid-end:

10.5.1. All mechanical seal components must be in good condition or leakage may result. Replacement of complete seal assembly, whenever seal has been removed, is good standard practice.

It is permissible to use a light lubricant, such as glycerin, to facilitate assembly. Do not contaminate the mechanical seal faces with lubricant.

10.5.2. Inspect casing O-ring (513) and replace if damaged. This O-ring may be lubricated with petroleum jelly to ease assembly.

10.5.3. Inspect guidevane O-ring (349) and replace if worn.

CAUTION

Do not lubricate guidevane O-ring (349). Insure it is not pinched by the impeller on reassembly.

10.6. Check reassembled unit for binding. Correct as required.

11. Trouble Shooting Chart:

MOTOR NOT RUNNING
(See causes 1 thru 6)

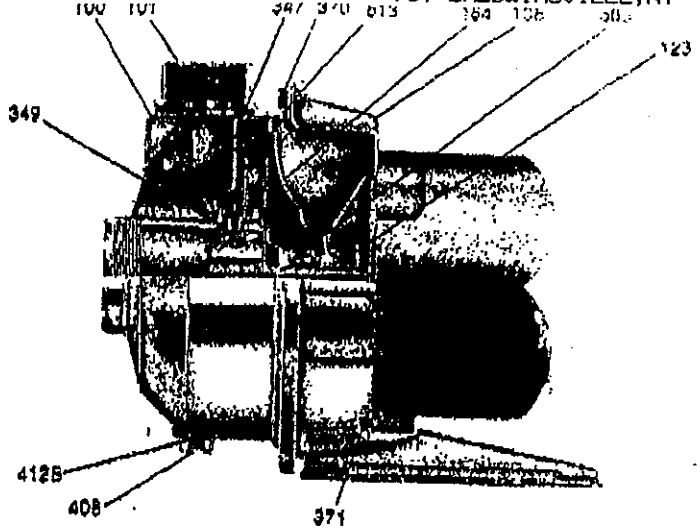
LITTLE OR NO LIQUID DELIVERED:
(See causes 7 thru 17)

POWER CONSUMPTION TOO HIGH:
(See causes 4, 17, 18, 19, 22)

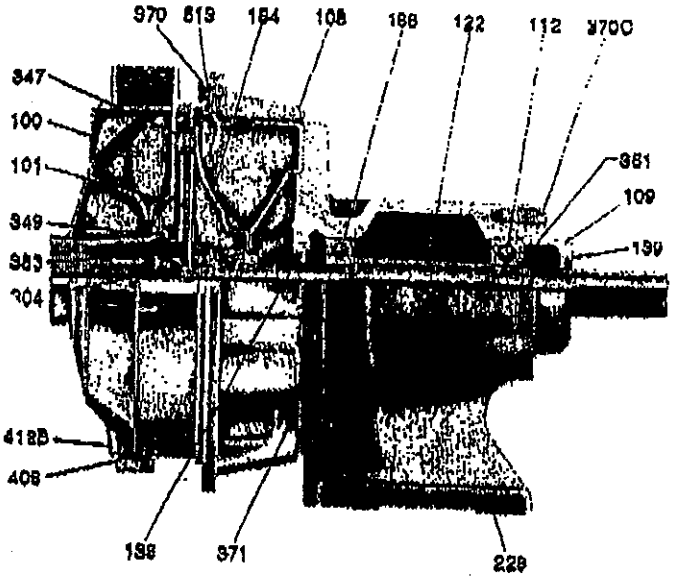
EXCESSIVE NOISE AND VIBRATION:
(See causes 4, 6, 9, 13, 15, 16, 18, 20, 21, 22)

PROBABLE CAUSE:

1. Tripped thermal protector
2. Open circuit breaker
3. Blown fuse
4. Rotating parts binding
5. Motor wired improperly
6. Defective motor
7. Not primed
8. Discharge plugged or valve closed
9. Incorrect rotation
10. Foot valve too small, suction not submerged, inlet screen plugged.
11. Low voltage
12. Phase loss (3-phase only)
13. Air or gasses in liquid
14. System head too high
15. NPSHA too low:
    Suction lift too high or suction losses excessive. Check with vacuum gauge.
16. Impeller worn or plugged
17. Incorrect impeller diameter
18. Head too low causing excessive flow rate
19. Viscosity or specific gravity too high
20. Worn bearings
21. Pump or piping loose
22. Pump and motor misaligned



NPE



NPE-F

Liquid End Components

Item No.	Description	Materials
100	Casing	AISI 304 Stainless Steel
101	Impeller	
184	Seal Housing	
804	Impeller Locknut	
347	Guidevane	
349	O-Ring, Guidevane	Buna-N
370	Socket Hd. Screws, Casing	AISI 304 S.S.
383	Mechanical Seal	** see Chart
408	Drain & Vent Plug, Casing	AISI 304 S.S.
412B	O-Ring, Drain & Vent Plug	Buna-N
613	O-Ring, Casing	Buna-N
	Power End Components	
108	Adapter	AISI 304 S.S.
109	Bearing Cover	Cast Iron
112	Ball Bearing (Outboard)	Steel
122	Shaft	AISI 303 S.S.
138	Lip Seal (Inboard)	Buna/Steel
139	Lip Seal (Outboard)	Buna/Steel
168	Ball Bearing (Inboard)	Steel
228	Bearing Frame	Cast Iron
361	Snap Ring	Steel
370C	Hex. Hd. Cap Screw, Brg. Cvr	Plated Steel
371	Hex. Hd. Cap Screw, Adapter	Plated Steel

**Mechanical Seals–Item 383

Part No.	Service	Rotary	Stationary	Elastomer	Metal Parts	Crane Type
10K16	Standard	Carbon	Ceramic	Buna	18-8 S.S.	8
10K8	Option-Severe Duty		Ni-Resist			
10K18	Option-High Temp.			EPR		21
10K24	Option-Chemical Duty		Ceramic	Viton		

LIMITED WARRANTY

This warranty applies to all pumps and related accessories manufactured and/or supplied by Goulds Pumps, Inc. - Water Systems Division.

Any part or parts found to be defective within the warranty period shall be replaced at no charge to the buyer or any subsequent owner during the warranty period. The warranty period shall exist for twelve (12) months from date of installation, or eighteen (18) months from date of manufacture, whichever expires first.

A consumer who believes that a warranty claim exists must contact the authorized dealer from whom the equipment was originally purchased and furnish complete details regarding the claim. The dealer is authorized to adjust any warranty claim utilizing Goulds Customer Relations Department and its distributor organization.

This warranty excludes: (a) Labor, transportation and related costs incurred by the consumer to make the allegedly defective equipment available to the dealer for inspection. (b) Re-installation costs of repaired equipment. (c) Re-installation costs of replacement equipment. (d) Consequential damages of any kind. (e) Reimbursement for loss caused by interruption of service.

GOULDS PUMPS, INC.
SENECA FALLS NEW YORK 13148

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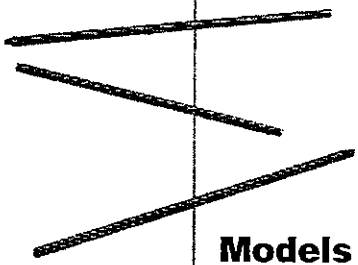
Appendix I

GWCTS Vendor Information

PROBES

SERIES 3R/3T General Purpose Probes

For general purpose use, Series 3R probes are metallic rods with threaded ends that screw into a fitting that extends vertically down into the liquid. Available in a variety of materials for different applications. 3T tapered rods are also available.



Ordering Information Series 3R & 3T

ORDER BY COMPONENT NUMBER *3R & 3T XXX*

3RD PLACE SYMBOL	
	Length (Feet)
1	One
2	Two
3	Three
4	Four
5	Five
6	Six
7	Seven
8	Eight
9	Nine
10	Ten

4TH PLACE SYMBOL	
	Probe Material
A	Brass
C	316 SS
D	Carp. 20
E	Hast. B
F	Hast. C
G	Monel
H	Titanium

5TH PLACE SYMBOL	
	Sheathing Heat Shrink
1	None
2	PVC
3	Teflon

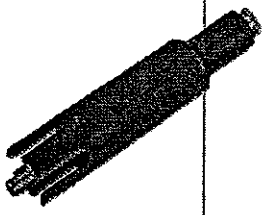
Standard part numbers in bold

Specifications Series 3R, 3T & Series 3W

Series	Style	Material	Sheathing
3R 3T	1/4" (.64cm) rod (threaded) 1/4" (.64cm) rod (tapered)	Brass 316 SS Carp. 20 Hast. B Hast. C Monel Titanium	PVC Heat Shrink (200° F) Teflon Heat Shrink (350° F)
3W	Wire suspended	Brass 316 SS	Polyethylene shield PVC-coated wire (150° F)

SERIES 3W Wire Suspended Probes

Series 3W probes, consisting of metallic bars within a protective plastic shield, are designed to be suspended above liquid with PVC-insulated wires. 7/8" (2.22cm) diameter x 3 3/4" (9.52) length. 3Z1A wire and 3Z1B adaptor kit required for use with 3E, 3F and 3N fittings.



Ordering Information Series 3W

ORDER BY COMPONENT NUMBER 3WX

3RD PLACE SYMBOL	
	Probe Material:
1	Brass
2	316 SS

Standard part numbers in bold

Models

- Series 3R
- Series 3T
- Series 3W

Applications

- General Purpose Immersion (3R)
- Deep Applications (3W)

Features

- Metallic Rods (3R & 3T)
- Metallic Bars (3W)
- Available in Many Materials for Various Requirements
- Adaptable for Various Fittings

FloSite™ HAYWARD®

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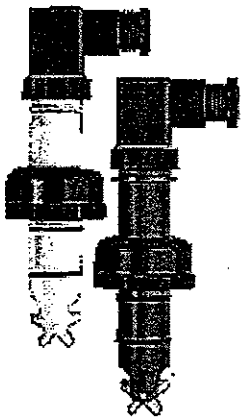
Hayward Industrial Products, Inc
One Hayward Industrial Dr., Clemmons, NC 27012
Tel: (888) 429-4635 • Fax: (336) 712-9935

Model 2000 Flow Sensor

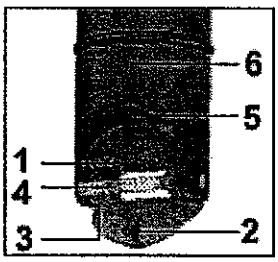
Flow Meters & Instrumentation

Select topic / product and click go... go



Features

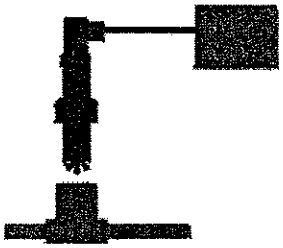
Reliable Hall-Effect Sensor – Offers a wide flow velocity range from 0.5 ft/sec to 33 ft/sec. Flow can be measured in either direction.
No Signal Conditioning Required – Output signal can be sent direct to PLC or computer without the need for additional electronics.
Rugged Construction – A choice of PVC, PPL or PVDF sensor materials provides high chemical resistance. A sturdy 3-pole DIN-style electrical connector is provided on the sensor as standard.
Versatile Mounting – One sensor for all pipe sizes up to 8".
High Accuracy – Unique 5-bladed Hall-effect sensor offers an accuracy of ± 1% over the full measuring range (see diagram on pg. 23).
LDM (Low Drag Magnetic) Sensor – The LDM sensor utilizes smaller magnets than other designs for minimal drag and less fouling.
Long Life – Ceramic shaft and bearings for reduced wear, long life.
Easy Installation – A matched Tee or Pipe saddle fitting makes installation quick.



Principle of Operation

FloSite flow sensors are equipped with a Halar 5-bladed rotor **(1)** with a permanent magnet **(2)** integrated into each blade. Ceramic bearings **(3)** are embedded on each side. Together with a ceramic shaft **(4)**, these bearings provide extremely long life at high flow velocities and high chemical resistance.

As the magnet **(2)** in each blade passes by the Hall-effect transducer pickup **(5)** an output pulse is generated. This output signal is processed by the sensor's electronics **(6)** to a square wave output with a frequency that is proportional to the rate of rotor rotation and thus flow velocity. Unlike other sensors with sine wave outputs, the FloSite sensor's square wave output signal is not reduced at low flow rates and can be connected directly to a PLC without signal conditioning.



Description

As the heart of the flow monitoring system, the FloSite Model 2000 sensor offers high accuracy and excellent low flow performance, as well as long life. It produces a square-wave output signal with a frequency proportional to the flow, which can be transmitted up to 325 ft to a display unit without signal conditioning. A specially designed pipe fitting makes installation easy.

Unlike other sensor designs that utilize a four-blade rotor, the Hayward FloSite rotor has five blades for 20% more contact with the process fluid and thus higher accuracy at lower velocities. It also employs an LDM (low drag magnetic) design using smaller magnets for less chance of fouling from accumulation of any metallic particles in the process.

Hayward FloSite sensors are available in a choice of three corrosion-resistant materials: PVC, PPL, or PVDF. The Model 2000 sensor output can be sent directly to a PLC or to a versatile range of Hayward remote-mounted flow monitors. The same flow sensor technology is also used in the Hayward Point-of-Use transmitters (see pg. 14) where the display indication is integrally mounted to the sensor.

Technical Data

Type: Insertion paddle flow sensor, Hall-effect method of flow measurement
Flow Velocity Range: 0.5 to 33 ft/sec (0.15 to 10 m/sec), flow measured in either direction
Measuring Range
Pipe Size Range: 1/2" to 8"
Output Signal: Square wave, 5 to 24 V dc P-P (depending on input voltage)
Output Frequency: Approximately 12.8 Hz/ft/sec (42 Hz/m/sec)
Output Signal Transmission: 325 ft (100 m) without conditioning
Accuracy: ±1% of indicated flow over the full calibrated range
Repeatability: ±0.5% over calibrated range
Linearity: ±1% over calibrated range
Viscosity Range: 0.5 to 20 centistokes
Maximum Percent Solids: 10% (with particulate size not to exceed 0.5 mm length or cross-section
Power Requirement: Any supply voltage between 5 and 24 V DC. Note: If used with digital panel indicators or batch controller (pgs. 12 or 16), sensor is powered from indicator/controller Electrical Connection: NEMA 4X (IP65), 3-pole DIN43650 connection with ground pin, cable gland for 4-conductor shielded cable. Also accepts 1/2" NPT conduit fitting

Pressure and Temperature Ratings

Sensor Materials:

- **Flow Sensor Body:** Choice of PVC, PPL, or PVDF
- **Rotor:** 5-bladed E-CTFE (Halar) with magnet inserts
- **Rotor Shaft:** Ceramic
- **Rotor Bearings:** Ceramic
- **O-Rings:** EPDM standard with PVC or PPL bodies (Viton® optional). Viton® standard with PVDF sensor

Required Installation Fittings:

T-fittings in PVC (1/2" to 1-1/4"), Pipe saddles in PVC (1-1/2" to 8")

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Technical Data

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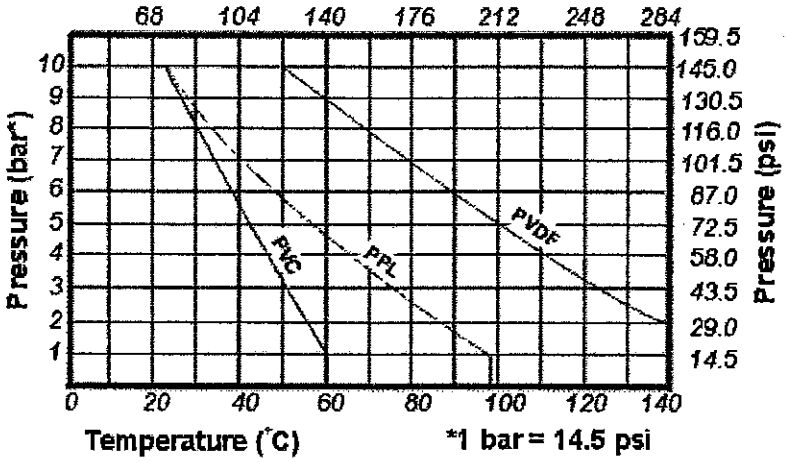
Pressure Temperature Diagram

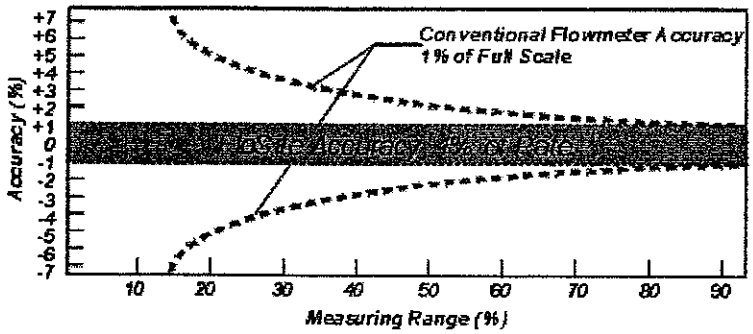


Typical Flow Rate Measuring Range for FloSite Sensors

Pipe Size Sched. 80 PVC	Fluid Velocity (ft/sec)		Flow (gpm)	
	Min	Max	Min	Max
1/2"	0.529	7.827	0.4	8.0
3/4"	0.574	7.185	0.8	10.0
1"	0.871	6.531	2.0	15.0
1-1/4"	0.525	7.884	2.0	30.0
1-1/2"	0.538	7.171	3.0	40.0
2"	0.65	7.55	6.0	70.0
2-1/2"	0.752	7.523	10.0	100.0
3"	0.986	7.395	20.0	150.0
4"	0.973	7.645	35.0	275.0
6"	1.225	7.971	100.0	650.0
8"	1.577	7.719	225.0	1100.0

Based on water at 60F, max 8 ft/sec velocity to minimize water hammer

Flow Sensor Accuracy Comparison



Flo-Site Flow Sensors have an accuracy of ± 1% of indicated flow over the full measuring range, unlike other flow sensors with accuracy stated as a percentage of full scale (maximum flow).

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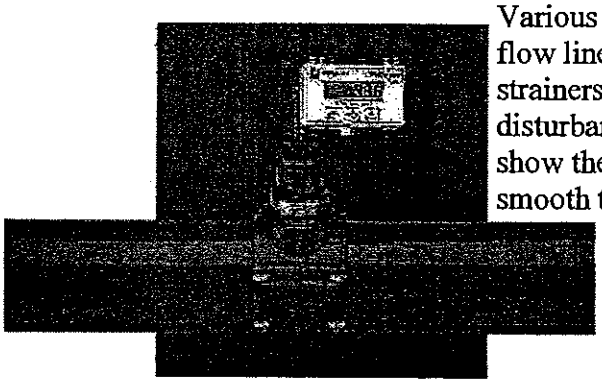
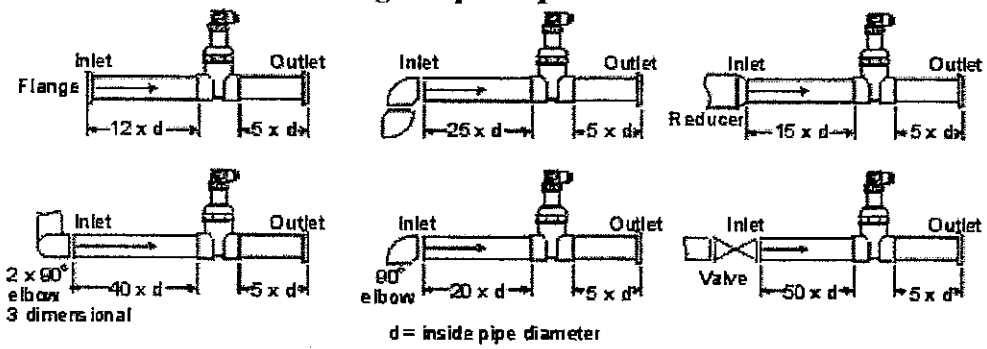
Installation Information

Select topic / product and click go... GO



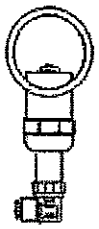
Various piping configurations and obstacles in the flow line such as valves, elbows, pipe bends and strainers create varying amounts and profiles of disturbance. Therefore, the following guidelines show the required lengths of straight pipe to smooth the flow.

Straight Pipe Requirements

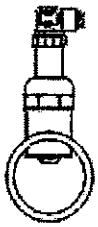


d = inside pipe diameter

Recommended Mounting Positions



Installation with no sediment present



Installation with no air pockets present

Installation if sediment or air pockets are present

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Dimensions

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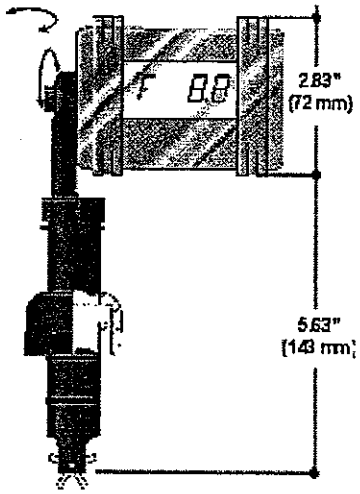
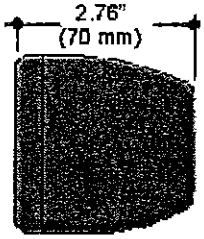
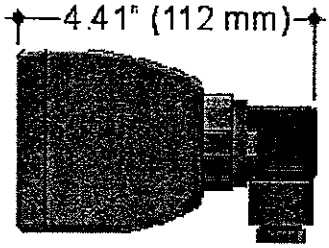
Models 2100 and 2500



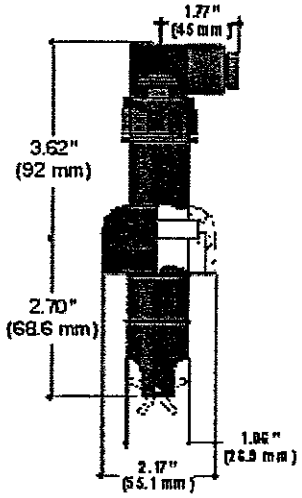
Model 2100



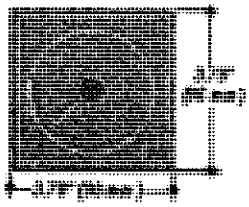
Model 2500



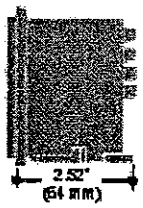
Models 2000 and 2600



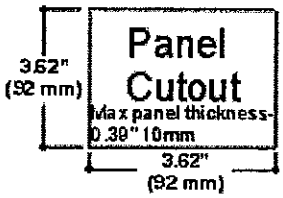
Models 2200



Front
3.78"(96 mm) 3.78" (96 mm)

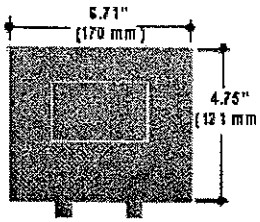


Side
2.52" (64 mm)



Panel Cutout
3.62" (92 mm) x 3.62" (92 mm)
Max Panel thickness 0.39" (10mm)

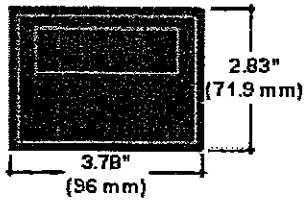
Wall Enclosures*



Front
6.71" (170 mm) x 4.75" (121mm)

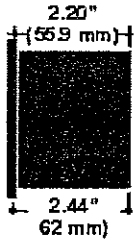
Side
3.16" (80 mm)

Models 2300, 2350, 2400



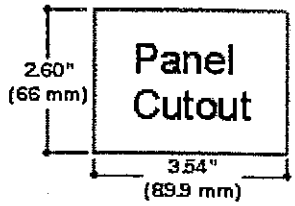
Front - Typical

3.78" (96 mm) x 2.83" (71.9 mm)



Side

2.20" (55.9 mm) & 2.44" (62 mm)



Panel Cutout

3.54" (89.9 mm) x 2.60" (66mm)

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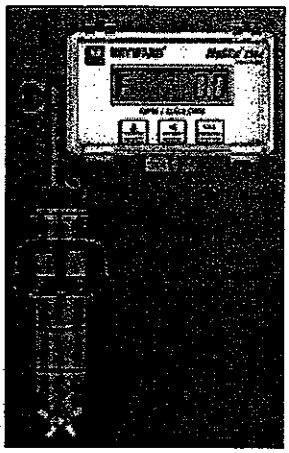
Model 2500
Digital Flow Transmitters

Flow Meters & Instrumentation

Select topic / product and click go...



Features

4-20 mA Output Signal – Can be transmitted over 300 ft without conditioning.
Point-of-Use Display – Display of flow rate and totalized flow is standard.
Wide Rangeability – Flow velocity range of 0.5 to 33 ft/sec, measures flow in either direction.
High Reliability – Utilizing an integral Hall-effect flow sensor with unique 5-bladed rotor.
Adjustable Display – The viewing angle for display can be adjusted to the ideal viewing angle.

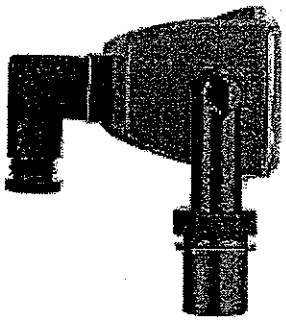
Description

The FloSite Model 2500 Flow Transmitter provides a 4-20 milliamp output signal proportional to measured flow. The flow transmitter is typically used in water treatment applications for flow-pacing control of a chemical dosing pump or to control an actuated valve.

The Model 2500 Transmitter consists of an integral flow sensor and local display of flow rate and accumulated flow. The flow sensor is a Hall-effect type, available in a choice of PVC, polypropylene, or PVDF. The sensor utilizes a unique
5-bladed low-drag rotor which minimizes the chance of fouling.

The digital display of flow or total flow is selectable through a 3-pushbutton keypad. Calibration of the display to the application requirements (as well as the 4-20 mA output signal) is easily done through this front keypad.

Sensor electronics are epoxy-encapsulated and the view-adjustable display is housed in a corrosion resistant NEMA 4X enclosure. Output signal can be transmitted up to 3300 ft. without conditioning.



Technical Data

Type: Insertion paddlewheel flow sensor (Hall-effect type) with integral display
Flow Velocity Range: 0.5 to 33 ft/sec (0.15 to 10 m/sec), flow measured in either direction
Measuring Range
Pipe Size Range: 1/2" to 8"
Output: 4-20 mA signal proportional to flow, maximum loop resistance <700 ohms

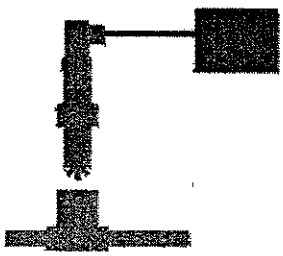
Output Signal Transmission: Up to 3300 ft (1000 m)
Accuracy: ±1 % of indicated flow over the full calibrated range
Repeatability: ±0.5 % over calibrated range
Linearity: ±1 % over calibrated range
Viscosity Range: 0.5 to 20 centistokes
Maximum Percent Solids: 10 % (with particulate size not to exceed 0.5 mm length of cross-section)
Power Requirement: Any power supply from 12 to 24 V DC
Display Type: 6-digit LCD for flow rate or totalized flow (user-selectable)
Volumetric Units: Flow rate in GPM, total flow in gallons
Enclosure Rating: NEMA 4X (IP65) with cover closed
Operating Temperature of Electronics: 32 to 140F (0 to 60C)
Sensor Pressure and Temperature Rating: See chart on pg. 23

Materials:

- **Enclosure:** ABS
- **Flow Sensor Body:** PVC, PPL, or PVDF
- **Rotor:** 5-bladed E-CTFE (Halar) with magnet inserts
- **Rotor Shaft:** Ceramic
- **Rotor Bearings:** Ceramic
- **O-Rings:** EPDM standard with PVC or PPL sensors (Viton® optional), Viton® standard with PVDF sensor

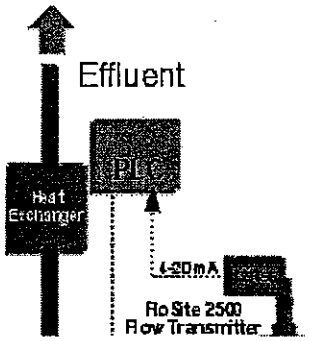
Required Installation Fittings:
T-fittings in PVC (1/2" to 1-1/4"), Pipe saddles in PVC (1-1/2" to 8")

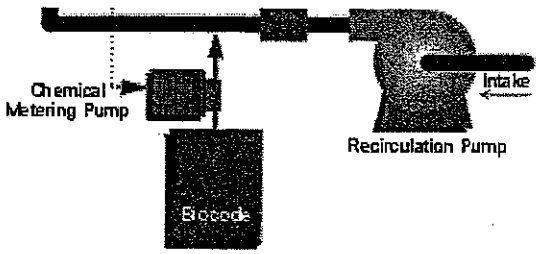
Dimensions



Flow-Paced Liquid Chemical Addition in a Cooling Water Recirculation System

For de-sliming and preventing fouling of cooling water makeup lines, a chemical dosing pump is typically used to dispense a biocide. A FloSite 2500 Flow Transmitter is installed in the makeup waterline and provides a 4-20 mA output to the dosing pump's external stroke frequency control in proportion to flow.





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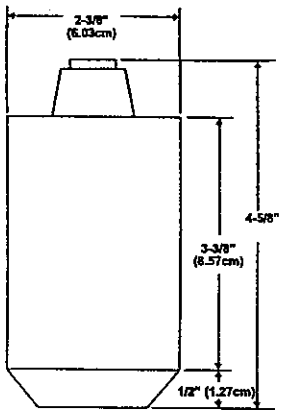
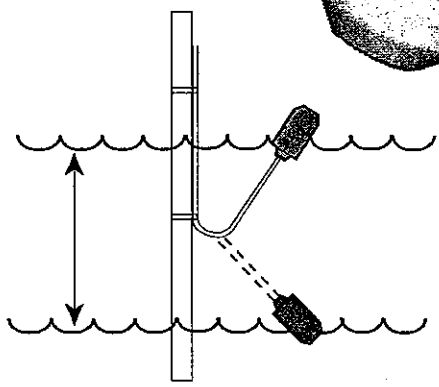
FLOAT SYSTEMS

SERIES M Mechanical Tilt Float Level Switch

Designed for level control and alarm applications in difficult liquids such as sewage and waste water. Series M mechanical tilt floats are ideal for applications where the presence of mercury is a concern. Series M Switches have impact resistant ABS shell and neoprene jacketed cable.

Dimensions Series M





Specifications Series M

Cord	Contact Rating	Contact Design	Temperature Rating	Overall Weight	Tether Method	Listings
16 gauge 2 or 3 conductor SJOW Oil resistant CPE	13 amp @ 120/240 VAC 1/2 h.p.	SPST, Normally Open or Normally Closed Common with N.O. & N.C. (form C)	32° to 221° F	1.0 lbs. (not including weight)	Tie-wrap nylon, Weight: 2.5 lbs	U.L. Rec. CSA Cert.

Ordering Information Series M

Standard part numbers in bold

ORDER BY COMPONENT NUMBER M XXX XX X

BLU	13 Amp, SPST - Normally Open, narrow angle
YEL	13 Amp, SPST - Normally Closed, narrow angle
RED	*13 Amp, SPST - Normally Open, wide angle*
WHI	*13 Amp, SPST - Normally Closed, wide angle*
GRE	13 Amp, SPDT - Form C, wide angle

Length	
20	20 Feet (6.09 m)
40	40 Feet (12.19 m)

Tether Method	
T	Tie
W	Weight

Tie wrap part number 7762360
Weight part number 7762381

Model

- Series M

Applications

- Level Control
- Alarms
- Sewage Lift Systems
- Slurries
- Drainage Sumps
- Wastewater Treatment
- Holding Tanks

Features

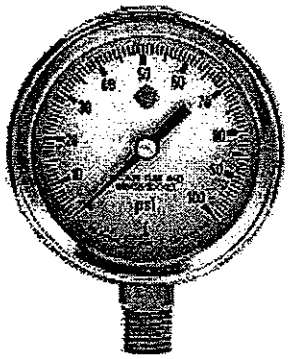
- Non-Mercury Switch
- Oil Resistant Cable
- Sealed Cable
- Impact & Corrosion Resistant ABS Shell
- N.O., N.C., SPDT Contacts
- Various Cable Lengths
- Color Coded Body

WARRICK CONTROLS One Cowles Rd., Plainville, CT 06062-1198 • Phone: 860-793-4579 • Fax: 860-793-4580

Model J

2 1/2" (63 mm) Dial Size - Fillable 1/4" NPT

Description: General Service Gauge, Cost advantage of brass internals - proven ruggedness and accuracy of McDaniel engineering. Stainless Steel Case, Blowout relief, Laminated safety glass Lens



Standard and optional features

Dial size: 2 1/2 inch (63mm)

Fillable: Yes

Connection: 1/4" NPT (1/8" NPT Special Order)

Case: 304 Stain.Steel

Internals: Brass

Wetted parts: Brass/bronze wetted parts

Accuracy: 1% full scale ASME B40.1-Grade 1A

Ranges: Vacuum, Rec., Compound, 0-6000 psi
(Selected range: 0-30 psi)

Mount. Standard Bottom Connection , L-Lower back connection (without panel mount flange) , P-Panel mount/lower back connection , R-Rear Flange-(For Wall Mounting) , U-Panel Mount/lower back u-clamp

Scale: B=psi/Bar(dual scale), K=psi/kPa(dual scale),psi/kg/cm2(dual scale)

Options: O2(cleaned for oxygen service)

Choice(s) of filling: GF=Glycerin,SF=Silicone, or FF=Fluorolube

Standard: 304 Stainless Steel Case and bayonet ring, Blow-out relief, Fillable case, Laminated safety glass lens, pulsation dampened with restrictor screw, field repairable.

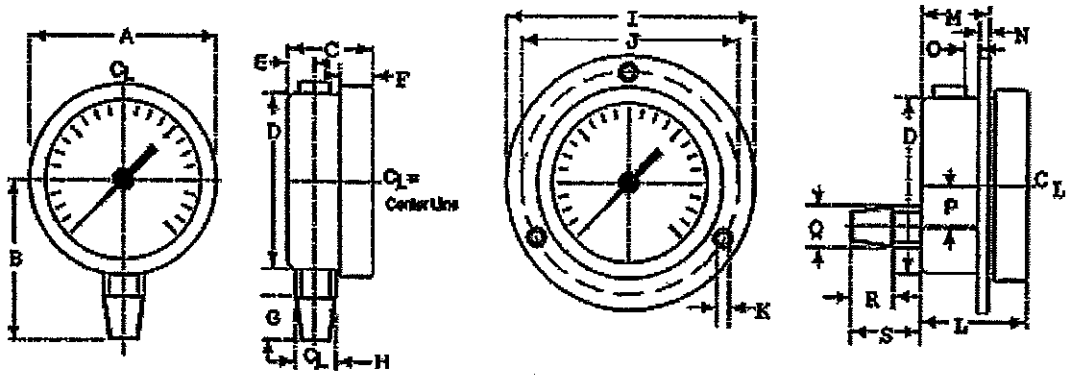
Engineering Drawings

Click here to further select optional features or for catalog price and order information for Model J Gauge.

McDaniel Controls, Inc., P.O. Box 187 Luling, LA 70070
Street address: 14148 Highway 90 West, Paradis, LA 70080 U.S.A.
Tel: 504-758-2782 New Orleans: 504-467-1333 Fax: 504-758-1688
E-mail: info@mcdanielcontrols.com Web address: http://www.mcdanielcontrols.com

Engineering Specifications for - Model J *Input for Quality Decisions*

Dimensional Data - Model J



Nominal Size	Case Diameter	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	
-	MM	68.5	57	31	62	10	12	15	14	85(7)	75	3.8	37	24	3	4	18	
2 1/2"	In.	2.70	2.24	1.22	2.44	0.39	0.47	0.59	0.55	3.35	2.95	0.15	1.46	0.94	0.12	0.16	0.71	0.
2 1/2"	In.	2 45/64	2 1/4	1 7/32	2 7/16	25/64	15/32	19/32	35/64	3 11/32	2 61/64	5/32	1 29/64	15/16	1/8	5/32	45/64	35

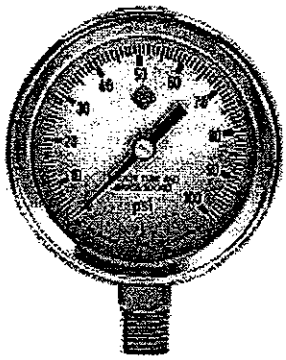
(7) "U" Clamp model reduced to 68.5 mm (2.70)

McDaniel Controls, Inc., P.O. Box 187 Luling, LA 70070
Street address: 14148 Highway 90 West, Paradis, LA 70080 U.S.A.
Tel: 504-758-2782 New Orleans: 504-467-1333 Fax: 504-758-1688
E-mail: info@mcdanielcontrols.com Web address: http://www.mcdanielcontrols.com

Model J

2 1/2" (63 mm) Dial Size - Fillable 1/4" NPT

Description: General Service Gauge, Cost advantage of brass internals - proven ruggedness and accuracy of McDaniel engineering. Stainless Steel Case, Blowout relief, Laminated safety glass Lens



Standard and optional features

Dial size: 2 1/2 inch (63mm)

Fillable: Yes

Connection: 1/4" NPT (1/8" NPT Special Order)

Case: 304 Stain.Steel

Internals: Brass

Wetted parts: Brass/bronze wetted parts

Accuracy: 1% full scale ASME B40.1-Grade 1A

Ranges: Vacuum, Rec., Compound, 0-6000 psi
(Selected range: 0-60 psi)

Mount: Standard Bottom Connection , L-Lower back connection (without panel mount flange) , P-Panel mount/lower back connection , R-Rear Flange-(For Wall Mounting) , U-Panel Mount/lower back u-clamp

Scale: B=psi/Bar(dual scale), K=psi/kPa(dual scale),psi/kg/cm2(dual scale)

Options: O2(cleaned for oxygen service)

Choice(s) of filling: GF=Glycerin,SF=Silicone, or FF=Fluorolube

Standard: 304 Stainless Steel Case and bayonet ring, Blow-out relief, Fillable case, Laminated safety glass lens, pulsation dampened with restrictor screw, field repairable.

Engineering Drawings

Click here to further select optional features or for catalog price and order information for Model J Gauge.

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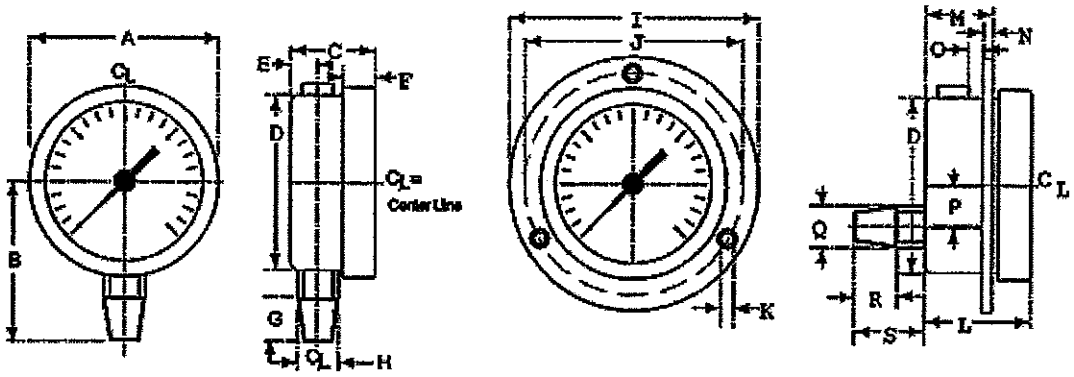
E-mail: info@mcdanielcontrols.com Web address: http://www.mcdanielcontrols.com

Engineering Specifications for - Model J *Input for Quality Decisions*

Dimensional Data - Model J



Nominal Size	Case Diameter	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
-	MM	68.5	57	31	62	10	12	15	14	85(7)	75	3.8	37	24	3	4	18
2 1/2"	In.	2.70	2.24	1.22	2.44	0.39	0.47	0.59	0.55	3.35	2.95	0.15	1.46	0.94	0.12	0.16	0.71
2 1/2"	In.	2 45/64	2 1/4	1 7/32	2 7/16	25/64	15/32	19/32	35/64	3 11/32	2 61/64	5/32	1 29/64	15/16	1/8	5/32	45/64

(7) "U" Clamp model reduced to 68.5 mm (2.70)

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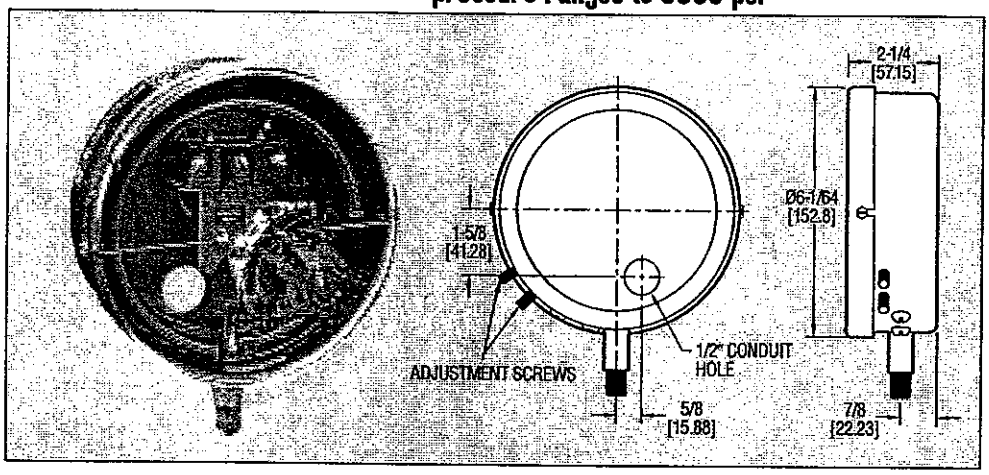
Mercoid®

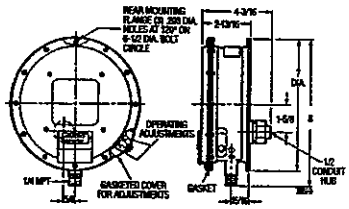
Series DA/DS

Bourdon Tube Pressure Switches

Visible setpoint, adjustable deadband, snap action switch pressure ranges to 5000 psi



Weather-Proof
Types DAW, DSW, DRW



Customers tell us that this is the best pressure switch made. Our most popular, Model DA combines extremely high sensitivity and repeatability with easily adjustable set and reset points through non-interactive external adjustments. Visible calibrated dial for setpoints and on/off indicator to indicate switch actuation are included. Choose either high current snap-switch or hermetically sealed contact mercury switch. The DS Model has a fixed deadband.

FEATURES

- DA Series is equipped with two external adjustments. One sets high pressure operating point, the other sets reset point. Deadband, or the difference between set and reset points is adjustable over the full scale. DS Series has a single external adjustment and fixed deadband.
- Visible calibrated dial, on/off indication.
- SPDT snap-action or sealed mercury switches.
- Minimum deadband obtainable at any point in range.
- Pressure Ranges vacuum to 5000 psig.
- U.L. and C.S.A. listed. Many models FM listed.

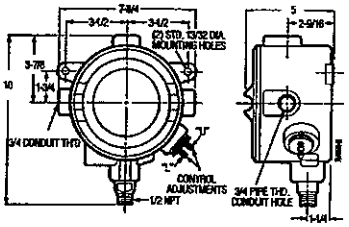
PHYSICAL DATA

Max. Temperature: 180°F. For higher temperature media applications, a remote connection or siphon (pigtail) should be used.
Pressure Connection: 1/4" NPT. (1/2" on range 15S).
Housing: pressed steel with transparent cover.
Wiring Connections: 3 screw type.
Wetted Parts: same as Bourdon tube material.
Weight: 4 lb. (std); 6 lb. (wea-proof); 8 lb. (exp-proof).
Max. Press.: Max. adjustment operating range.

Suggested Specification

Pressure switch shall be Mercoid Series DA operated by a (brass) (type 316 stainless steel) (type 403 stainless steel) Bourdon tube actuating a (mercury switch) (snap-switch). Switch shall have deadband fixed or adjustable up to a maximum of 100% of switch range. Switch shall have calibrated dial and one or two pointers indicating set and reset points. Switch shall have visible on/off indication. Setpoints shall be adjustable without removing switch cover or shutting down process.

Explosion-Proof
Types DAH, DRH, DSH



STOCKED MODELS in bold

BOURDON TUBE MATERIAL	ADJUSTABLE OPERATING RANGE (PSIG)	SNAP ACTION SWITCH – SPDT 15A @ 120/240 VAC		SNAP ACTION SWITCH – SPDT 15A @ 120/240 VAC		MERCURY SWITCH – SPDT 4A @ 120V., 2A @ 240V. AC/DC	
		FIXED DEADBAND PSIG	MODEL NUMBER	MINIMUM DEADBAND PSIG	MODEL NUMBER	MINIMUM DEADBAND PSIG	MODEL NUMBER
BRASS	0-30" Hg. Vac.	3" Hg. Vac.	**DS-7231-153-2***	9" Hg. Vac.	**DA-7031-153-2***	2" Hg. Vac.	**DA-31-153-2***
	1/8-15	1.5	**DS-7231-153-1**	4	**DA-7031-153-1**	1	**DA-31-153-1**
	1/8-20	1.5	**DS-7231-153-3A**	4	**DA-7031-153-3A**	1	**DA-31-153-3A**
	1-35	1.5	**DS-7231-153-4**	5	**DA-7031-153-4**	1.75	**DA-31-153-4**
	2-60	2	**DS-7231-153-5**	6	**DA-7031-153-5**	3	**DA-31-153-5**
	5-100	2.5	**DS-7231-153-6**	9	**DA-7031-153-6**	3.75	**DA-31-153-6**
	5-150	3	**DS-7231-153-7**	16	**DA-7031-153-7**	6	**DA-31-153-7**
	10-200	4	**DS-7231-153-8**	16	**DA-7031-153-8**	8	**DA-31-153-8**
	10-300	5	**DS-7231-153-9**	25	**DA-7031-153-9**	12	**DA-31-153-9**
403SS	2-60	3	**DS-7221-153-5S**	9	**DA-7021-153-5S**	4	**DA-21-153-5S**
	5-100	3.5	**DS-7221-153-6S**	13	**DA-7021-153-6S**	6	**DA-21-153-6S**
	10-200	4	**DS-7221-153-8S**	15	**DA-7021-153-8S**	8	**DA-21-153-8S**
	10-300	6	**DS-7221-153-9S**	19	**DA-7021-153-9S**	14	**DA-21-153-9S**
	25-600	10	**DS-7221-153-10S**	45	**DA-7021-153-10S**	25	**DA-21-153-10S**
	100-1500	30	**DS-7221-153-12S**	130	**DA-7021-153-12S**	90	**DA-21-153-12S**
	500-5000	200	**DS-7221-153-15S***	900	**DA-7021-153-15S***	450	**DA-21-153-15S***
316SS	10-150	4	**DS-7241-153-24E**	11	**DA-7041-153-24E**	6	**DA-41-153-24E**
	10-300	8	**DS-7241-153-9E**	28	**DA-7041-153-9E**	18	**DA-41-153-9E**

Additional features available on special order, include other electrical ratings and circuits, lower minimum differentials, special housings, diaphragm seals and manual reset. For severe vibration, a special Delrin Bushed Movement is available.
*Range 2 and 15S not FM approved. Other ranges FM approved. For FM approved models specify DAF or DSF. Example DAF-31-153-1.

STOCKED MODELS in bold High Current Capacity† or Extra Low Deadband Mercury Switches (SPST)†

BOURDON TUBE MATERIAL	ADJUSTABLE OPERATING RANGE (PSIG)	MERCURY SWITCH – SPST – HIGH CURRENT 10A @ 120V., 5A @ 240V. AC/DC			MERCURY SWITCH – SPST – LOW DEADBAND 5A @ 120VAC., 2A @ 240VAC., 2.5A @ 120VDC		
		MINIMUM DEADBAND PSIG	OPEN ON INC. MODEL NUMBER	CLOSE ON INC. MODEL NUMBER	MINIMUM DEADBAND PSIG	OPEN ON INC. MODEL NUMBER	CLOSE ON INC. MODEL NUMBER
BRASS	0-30" Hg. Vac.	2" Hg. Vac.	**DA-31-2-2***	**DA-31-3-2***	1" Hg. Vac.	**DA-531-2-2***	DA-531-3-2*
	1/8-15	1	**DA-31-2-1**	**DA-31-3-1**	0.5	**DA-531-2-1**	DA-531-3-1
	1/8-20	1	**DA-31-2-3A**	**DA-31-3-3A**	0.5	**DA-531-2-3A**	DA-531-3-3A
	1-35	1.75	**DA-31-2-4**	**DA-31-3-4**	0.75	DA-531-2-4	DA-531-3-4
	2-60	3	**DA-31-2-5**	**DA-31-3-5**	1.0	**DA-531-2-5**	DA-531-3-5
	5-100	3.75	**DA-31-2-6**	**DA-31-3-6**	2.0	**DA-531-2-6**	DA-531-3-6
	5-150	6	**DA-31-2-7**	**DA-31-3-7**	3.0	**DA-531-2-7**	DA-531-3-7
	10-200	8	**DA-31-2-8**	**DA-31-3-8**	3.5	**DA-531-2-8**	DA-531-3-8
	10-300	14	**DA-31-2-9**	**DA-31-3-9**	6.0	DA-531-2-9	DA-531-3-9
403SS	2-60	4	DA-21-2-5S	DA-21-3-5S	2.5	DA-521-2-5S	DA-521-3-5S
	5-100	6	DA-21-2-6S	DA-21-3-6S	3.0	DA-521-2-6S	DA-521-3-6S
	10-200	8	**DA-21-2-8S**	DA-21-3-8S	4.0	DA-521-2-8S	DA-521-3-8S
	10-300	14	**DA-21-2-9S**	**DA-21-3-9S**	7	DA-521-2-9S	DA-521-3-9S
	25-600	25	**DA-21-2-10S**	DA-21-3-10S	15	**DA-521-2-10S**	DA-521-3-10S
	100-1500	90	DA-21-2-12S	DA-21-3-12S	50	DA-521-2-12S	DA-521-3-12S
	500-5000	450	DA-21-2-15S*	DA-21-3-15S*	200	DA-521-2-15S*	DA-521-3-15S*
316SS	10-150	6	DA-41-2-24E	DA-41-3-24E	3.0	DA-541-2-24E	DA-541-3-24E
	10-300	18	DA-41-2-9E	DA-41-3-9E	5.0	DA-541-2-9E	DA-541-3-9E

†Also available in Weather-proof (DAW-33) or Explosion-proof (DAH-31) Housings.
*Range 2 and 15S not FM approved. Other ranges FM approved. For FM approved models specify DAF or DSF. Example DAF-31-2-1.

STOCKED MODELS in bold Weather-proof Models

Bourdon Tube Material	Adjustable Operating Range (PSIG)	SNAP ACTION SWITCH – SPDT 15A @ 120/240 VAC		SNAP ACTION SWITCH – SPDT 15A @ 120/240 VAC		MERCURY SWITCH – SPDT 4A @ 120V., 2A @ 240V. AC/DC	
		Fixed Deadband PSIG	Model Number	Minimum Deadband PSIG	Model Number	Minimum Deadband PSIG	Model Number
BRASS	0-30" Hg. Vac.	3" Hg. Vac.	DSW-7233-153-2*	9" Hg. Vac.	**DAW-7033-153-2***	2" Hg. Vac.	**DAW-33-153-2***
	1/8-15	1.5	DSW-7233-153-1	4	**DAW-7033-153-1**	1	**DAW-33-153-1**
	1/8-20	1.5	DSW-7233-153-3A	4	**DAW-7033-153-3A**	1	**DAW-33-153-3A**
	1-35	1.5	DSW-7233-153-4	5	DAW-7033-153-4	1.75	**DAW-33-153-4**
	2-60	2	DSW-7233-153-5	6	**DAW-7033-153-5**	3	**DAW-33-153-5**
	5-100	2.5	DSW-7233-153-6	9	**DAW-7033-153-6**	3.75	**DAW-33-153-6**
	5-150	3	DSW-7233-153-7	16	**DAW-7033-153-7**	6	**DAW-33-153-7**
	10-200	4	DSW-7233-153-8	16	DAW-7033-153-8	8	**DAW-33-153-8**
	10-300	5	DSW-7233-153-9	25	DAW-7033-153-9	14	**DAW-33-153-9**
403SS	2-60	3	DSW-7223-153-5S	9	DAW-7023-153-5S	4	DAW-23-153-5S
	5-100	3.5	DSW-7223-153-6S	13	DAW-7023-153-6S	6	**DAW-23-153-6S**
	10-200	4	DSW-7223-153-8S	15	DAW-7023-153-8S	8	DAW-23-153-8S
	10-300	6	DSW-7223-153-9S	19	DAW-7023-153-9S	14	**DAW-23-153-9S**
	25-600	10	DSW-7223-153-10S	45	DAW-7023-153-10S	25	**DAW-23-153-10S**
	100-1500	30	DSW-7223-153-12S	130	DAW-7023-153-12S	90	DAW-23-153-12S
	500-5000	200	DSW-7223-153-15S*	900	DAW-7023-153-15S*	450	DAW-23-153-15S*
316SS	10-150	4	DSW-7243-153-24E	11	**DAW-7043-153-24E**	6	**DAW-43-153-24E**
	10-300	8	DSW-7243-153-9E	28	**DAW-7043-153-9E**	18	**DAW-43-153-9E**

*Range 2 and 15S not FM approved. All other DAW ranges are FM approved.

POPULAR MODELS Explosion-proof Models

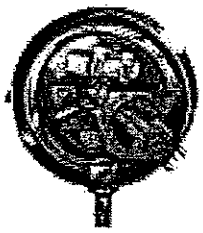
BOURDON TUBE MATERIAL	ADJUSTABLE OPERATING RANGE (PSIG)	SNAP ACTION SWITCH – SPDT 15A @ 120/240 VAC		SNAP ACTION SWITCH – SPDT 15A @ 120/240 VAC		MERCURY SWITCH – SPDT 4A @ 120V., 2A @ 240V. AC/DC	
		FIXED DEADBAND PSIG	MODEL NUMBER	MINIMUM DEADBAND PSIG	MODEL NUMBER	MINIMUM DEADBAND PSIG	MODEL NUMBER
BRASS	0-30" Hg. Vac.	3" Hg. Vac.	DSH-7231-153-2*	9" Hg. Vac.	DAH-7031-153-2*	2" Hg. Vac.	DAH-31-153-2*
	1/8-15	1.5	DSH-7231-153-1	4	DAH-7031-153-1	1	DAH-31-153-1
	1/8-20	1.5	DSH-7231-153-3A	4	DAH-7031-153-3A	1	DAH-31-153-3A
	1-35	1.5	DSH-7231-153-4	5	DAH-7031-153-4	1.75	DAH-31-153-4
	2-60	2	DSH-7231-153-5	6	DAH-7031-153-5	3	DAH-31-153-5
	5-100	2.5	DSH-7231-153-6	9	DAH-7031-153-6	3.75	DAH-31-153-6
	5-150	3	DSH-7231-153-7	16	DAH-7031-153-7	6	DAH-31-153-7
	10-200	4	DSH-7231-153-8	16	DAH-7031-153-8	8	DAH-31-153-8
	10-300	5	DSH-7231-153-9	25	DAH-7031-153-9	14	DAH-31-153-9
403SS	2-60	3	DSH-7221-153-5S	9	DAH-7021-153-5S	4	DAH-21-153-5S
	5-100	3.5	DSH-7221-153-6S	13	DAH-7021-153-6S	6	DAH-21-153-6S
	10-200	4	DSH-7221-153-8S	15	DAH-7021-153-8S	8	DAH-21-153-8S
	10-300	6	DSH-7221-153-9S	19	DAH-7021-153-9S	14	DAH-21-153-9S
	25-600	10	DSH-7221-153-10S	45	DAH-7021-153-10S	25	DAH-21-153-10S
	100-1500	30	DSH-7221-153-12S	130	DAH-7021-153-12S	90	DAH-21-153-12S
	500-5000	200	DSH-7221-153-15S*	900	DAH-7021-153-15S*	450	DAH-21-153-15S*
316SS	10-150	4	DSH-7241-153-24E	11	DAH-7041-153-24E	6	DAH-41-153-24E
	10-300	8	DSH-7241-153-9E	28	DAH-7041-153-9E	18	DAH-41-153-9E

*Range 2 and 15S not FM approved. Other ranges FM approved. For FM approved models specify DAHF or DSHF. Example DAHF-31-153-1.

Mercoid® Series DA/DS Bourdon Tube Pressure Switches

Type DA

Adjustable Deadband, Fully Automatic, Double Adjustments



VISIBLE CALIBRATED DIAL

DOUBLE EXTERNAL ADJUSTMENTS

Snap Action Switch

SWITCH INDICATOR

VISIBLE CALIBRATED DIAL

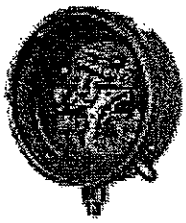
DOUBLE EXTERNAL ADJUSTMENTS

Mercury Switch Contact

Equipped with two external adjustments, one for setting *high* pressure operating point, the other for setting *low* pressure operating point. Deadband, or the difference between high and low setpoints, is adjustable over full scale. Mercoid's most popular operating mode, available on most Series D pressure and temperature controls.

Type DS

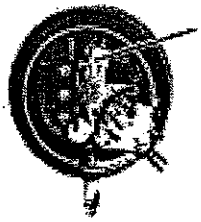
Fixed Deadband, Fully Automatic, Single Adjustment



VISIBLE CALIBRATED DIAL

SINGLE EXTERNAL ADJUSTMENT

Snap Action Switch



SWITCH INDICATOR

VISIBLE CALIBRATED DIAL

SINGLE EXTERNAL ADJUSTMENT

Mercury Switch Contact

Equipped with single adjustment for setting operating point only. A single pointer on scale sets pressure point at which switch action occurs. Fixed deadband is factory set and cannot be altered in the field. Available on series D-200, D-7200 and D-9200 only.

Type DR

Semi-Automatic, Manual Reset, Single Adjustment

VISIBLE CALIBRATED DIAL

RESET

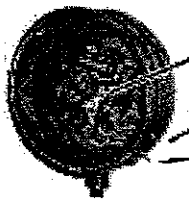
SINGLE ADJUSTMENT

Manual Reset (–2 or –3 circuits only)

Equipped with a single adjustment for setting operating point to operate the circuit automatically upon a pressure increase or decrease. Pushbutton reset must be operated manually to restore the circuit to original position after automatic operation. Suffix "L," i.e. DR-31-153L denotes control will operate automatically on *increase*; suffix "U" denotes control will operate automatically on *decrease*.

Type DL

Semi-Automatic, Manual Lock Reset, Single Adjustment



VISIBLE CALIBRATED DIAL

RESET

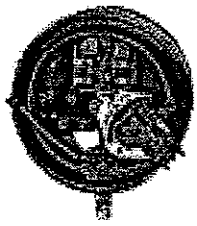
SINGLE EXTERNAL ADJUSTMENT

Manual Lock Reset (–2 or –3 circuits only)

Equipped with a single adjustment for setting operating point. Control will operate at setpoint only upon a *decrease* in pressure. Manual lock feature permits circuit to be reset and locked in position. Lock remains in effect until pressure rises above control setting. Lock then releases and circuit is held in reset position until further automatic operation upon pressure decrease.

Type D-400, DA-7400

Two-Stage, Fully Automatic, 2 Set Pts.



Provides two stage control by actuating one circuit upon a rise or fall in pressure and a second circuit on a further rise or fall. Each setpoint has a fixed deadband.

Mercoid®

Series DA

Bourdon Tube Pressure Switches — General Data and Accessories

FEATURES

External Setpoints
Deadband Adjustable (over 100% of scale) or Fixed
Visible Calibrated Dial, PSI/kg
Visible Operation
On/Off Indication
Repeatability ±1% of full scale
Minimum Deadband Obtainable at any Point in Range
Welded Stainless Steel Bourdon Tubes Provide Reduced Chance of Leakage in Case of Fire
Pressure Ranges to 8000 psig
UL, CSA Listed (most models, features)

PHYSICAL DATA

Max. Temp.: 180°F. For higher media applications, a remote connection or siphon (pigtail) should be used.

Pressure Connection: 1/4" NPT std. 1/2" NPT on range 15S, 16S

Wetted Parts: Same as bourdon tube material except range 23K, 24K, 9K.

Weight: 4 lb. std., 6 lb. weatherproof 8 lb. exp. proof

Max. Press.: Max. adjustment operating range. Use of a surge tank, snubber of capillary tubing connection is recommended where pulsation, pressure surge or water hammer may occur.

Suggested Specification

Pressure switch shall be Mercoid Series DA operated by a (brass) (type 316 stainless steel) (type 403 stainless steel) Bourdon tube actuating a (mercury switch) (snap-switch). Switch shall have deadband adjustable up to a maximum of 100% of switch range. Switch shall have calibrated dial and two pointers indicating set and reset points. Switch shall have visible on/off indication. Setpoints shall be adjustable without removing switch cover or shutting down process.

Mounting Flange

For Surface Mounting (Field Installation)

For DA, DAF, DS, DSF, DR, DRF and DL controls only. May be ordered separately for field installation.

Part No. 17-26
(except on 15S, 16S)
Part No. 17-31
(for range 15S, 16S only)

Mounting Bracket

For use with standard NEMA 1 enclosure general purpose controls only: Series DA, DAF, DS, DSF, DR, DRF, DL. Note: *not* adaptable for Range 15S and 16S.

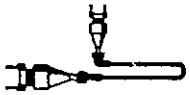
Part No. 33-25

Conduit Hub

For 1/2" rigid conduit. Mercury switch type controls with standard general purpose NEMA-1 or optional weather-resistant NEMA-3 or NEMA-4 enclosures are suitable for Class 1, Div. 2 applications when ordered with this hub. Available for DA Series.

Part No. 42-413

Remote Connections



Part No. 49-62HP – 6 ft. copper remote connection, 2500 psig max.

Part No. 49-210 – 12 ft. 316 s.s. connection with 303 s.s. fittings, 3000 psig max.

Breathers & Drains

For Class I, Groups C, D and Class II, Groups E, F, G (water only). Mercoid s.s. drains are flame-tight, but not watertight which permits water to escape continuously.

Mercoid s.s. breathers include a water shedding cap and provide effective case ventilation.

For Series DAH, DAHF, DRH, DRHF, DSH, DSHF.
Part No. 42-274 – Standard drain.

Part No. 42-276 – Standard breather.

For Series DAE, DRE.
Part No. 42-275 – Drain with 1/4" connection.
***Part No. 42-276** – Standard breather with 1/2" connection.
***Part No. 42-279** – Reducer (3/4" to 1/2") for breather.

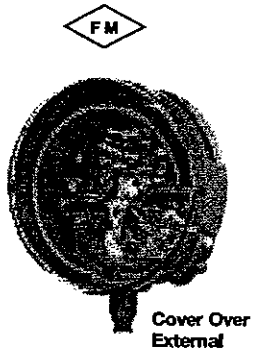
*Breather and reducer must be ordered together.

Pigtail Siphon

Recommended for steam applications 35 psig or higher. For Series D-30, D-530, D-230, D-7030, D-7230 pressure controls. Please specify.

Part No. 42-58 2000 psig max.

Factory Mutual Approved Series D Pressure Switches



Cover Over External Adjustments

Miscellaneous

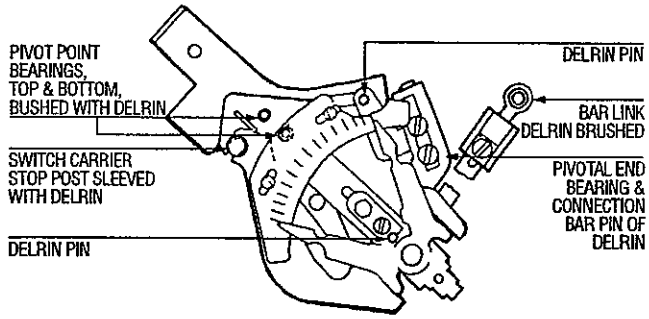
Oxygen & Acetylene Service
Spec. 23444

Fungus Proof
Spec. 23720

FM Approval –
DAF, DRF, DSF

DELRIN* Bushed Movement "B"

*Registered Trademark of E.I. DuPont de Nemours & Co.



Provides longer service life for Series D pressure and temperature controls. Vibration and pulsation are the prime causes of control wear. Almost all types of vibration will have some effect on the life and continued accuracy of controls.

To offset the wearing of metal surfaces found in bearings and pivot points, the control mechanism is designed to incorporate Delrin bushed movements at each possible wear point. Also for environments where corrosion may be a factor.

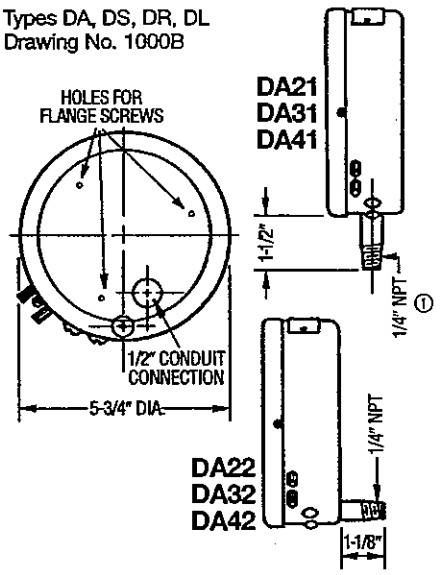
Add Letter B After Type and Suffix Nos. Example: DS-221-2B, DA-31-3B, DAH-41-3B.

Mercoid® Series DA

Bourdon Tube Pressure Switches — Control Dimensions

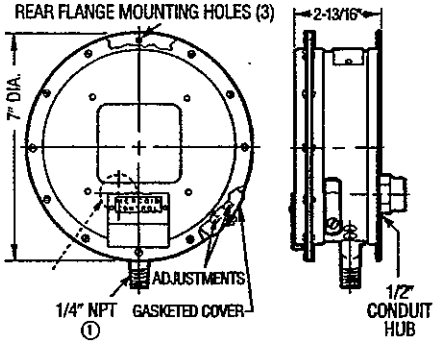
General Purpose

Types DA, DS, DR, DL
Drawing No. 1000B



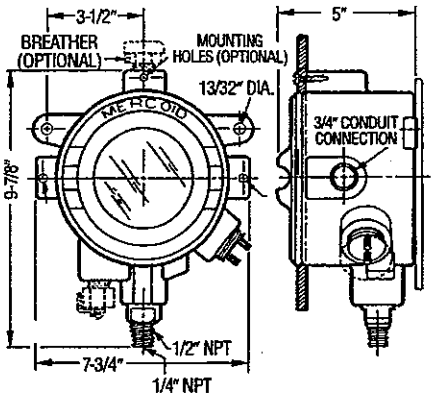
Weather-Proof

Types DAW, DSW, DRW
Drawing No. 1062



Explosion-Proof

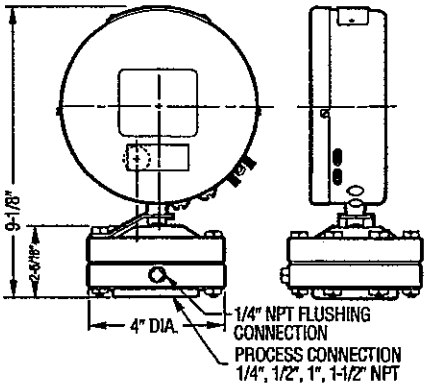
Types DAH, DRH, DSH
Drawing No. 1350



***Consult factory for Cenelec approved DAH models.**

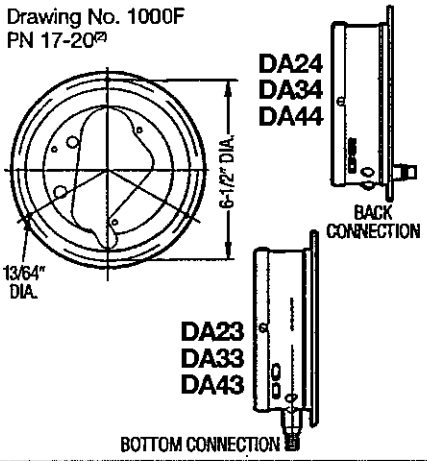
Diaphragm Seal

Types MSAG
Drawing No. 2305



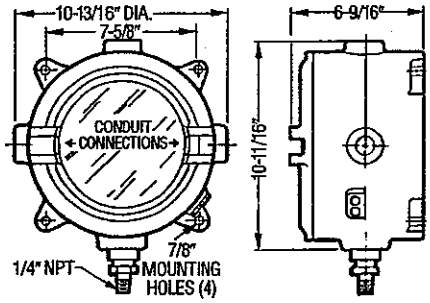
Flange for Surface Mounting

Drawing No. 1000F
PN 17-20(2)



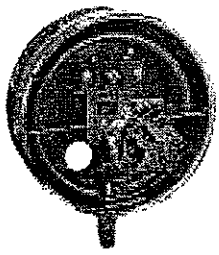
Explosion-Proof

Types DAE, DRE, DSE
Drawing No. 98D



(1.) 1/2" NPT Connection for ranges 15S, 16S

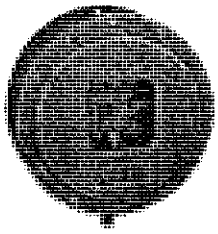
(2.) Use PN 17-31 for ranges 15S, 16S



General Purpose

NEMA 1 Enclosure

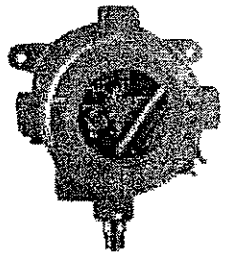
For indoor use and other general purpose applications under normal atmospheric conditions. Provides protection against dust and light splashing. Heavy gauge plain steel case. Flanged case available. Transparent cover for visible on-off operation. Locking device prevents tampering. Pressure connection, 1/4" NPT. Electrical connection back of case for 1/2" conduit or BX. Shipping wt. 4 lbs. See above for dimensions. *Furnished as standard unless otherwise specified.*



Watertight, Dust-tight/ Type W

NEMA 3S, 4, & 4X Enclosure

For outdoor or indoor applications. Complies with hose test and requirements for watertight, dust-tight, drip-tight weatherproof, weather-resistant, splash-proof, sleet-proof, and moisture-resistant. Flanged, heavy gauge steel case with transparent cover for visible on-off operation. External adjustments protected by cover. Bottom pressure connection. 1/4" NPT. Electrical connection back of case for 1/2" conduit, removable 1/2" hub. Shipping wt. 6 lbs. See above for dimensions. *Optional, add "W" to prefix, i.e. DAW, DRW, DSW, when ordering.*



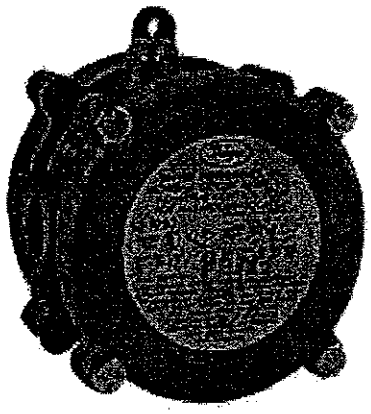
Explosion-Proof Type H

Hazardous Area Enclosure suitable for Class I, Groups C & D, Class II, Groups E, F & G; NEMA 7 & 9 applications. Control mechanism is an integral part of enclosure and cannot be replaced in the field. For surface, panel or pipe mounting. Aluminum case with glass window in cover for visible on-off operation. Bottom pressure connection, 1/2" NPT male × 1/4" NPT female. External adjustments. Available with breather and drain. Shipping wt. 8 lbs. (3.6 kg.). See above for dimensions. Optional housing, to order add "H" to prefix. Example: DAH, DRH, or DSH. Not available on D80 Series.

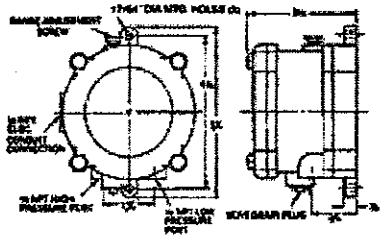
NOTE: Standard general purpose NEMA 1 and NEMA 4 enclosures are suitable for Class I, Division 2 applications with addition of conduit hub (mercury switch models only).

Series 1950 Explosion-Proof Differential Pressure Switches

Compact, low cost, explosion-proof and weatherproof.



Service Manual



Dimensional Enlargement

Model 1950 Explosion-Proof Differential Pressure Switch combines the best features of the popular Dwyer series 1900 with an integral explosion-proof and weather-proof housing, making it an exceptional value for either application. It is U.L. and C.S.A. listed, F.M. approved for use in Class I Groups C and D, Class II Groups E, F, and G and Class III hazardous atmospheres (NEMA 7 & 9). Weather-proof features include a drain plug and O-ring seal in cover. Electrical connections are easily made by removing front cover. For convenience the set point adjustment screw is located on the outside of the housing. Twelve models offer set points from .03 to 20 inches W.C. and from .5 to 50 PSI. The unit is very light and compact - about half the weight and bulk of other explosion-proof or weather-proof switches with separate enclosures.

TO ORDER

PHYSICAL DATA

Temperature Limits: -40°F to 140°F. 0°F to 140°F for 1950P-8, 15, 25, and 50 -30°F to 130°F for 1950-02
Maximum Surge Pressure: 1950-10 PSI, 1950P-50 PSI 1950P-50 only - 90 PSI
Rated Pressure: 1950 - 45 IN. W.C., 1950P - 35 PSI 1950P-50 only - 70 PSI
Pressure Connections: 1/8" NPT.
Electrical Rating: 15 amps, 125, 250, 480 volts, 60 Hz. A.C. Resistive 1/8 H.P. @ 125 volts, 1/4 H.P. @ 250 volts, 60 Hz. A.C.
Wiring Connections: 3 screw type; common, norm. open and norm. closed.
Conduit Connection: 1/2" NPT.
Set Point Adjustment: Screw type on top of housing. Field adjustable.
Housing: Anodized cast aluminum.
Diaphragm: Molded fluorosilicone rubber. 02 model, silicone on nylon.
Calibration Spring: Stainless steel.
Installation: Mount with diaphragm in vertical position.
Weight: 3 1/4 lbs. 02 model, 4 lbs., 7 oz.

TO ORDER

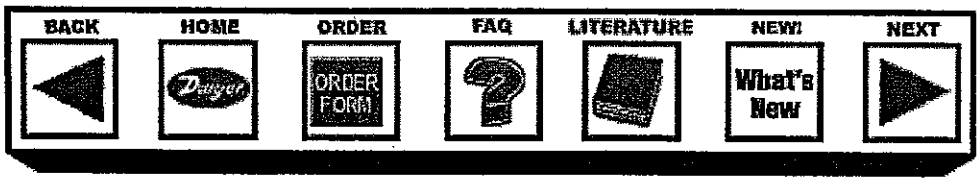
STOCKED MODELS

Model Number	Operating Range Inches W.C.	Approximate Dead Band	
		At Min. Set Point	At Max. Set Point
1950-02	0.03 to 0.10	0.025	0.05
1950-00	0.07 to 0.15	0.04	0.05
1950-0	0.15 to 0.5	0.10	0.15
1950-1	0.4 to 1.6	0.15	0.20
1950-5	1.4 to 5.5	0.3	0.4
1950-10	3.0 to ll.0	0.4	0.5
1950-20	4.0 to 20.0	0.4	0.6

Model Number	Operating Range PSI	Approximate Dead Band	
		At Min. Set Point	At Max. Set Point
1950P-2	.5 to 2.0	0.3 PSI	0.3 PSI
1950P-8	1.5 to 8.0	1.0 PSI	1.0 PSI
1950P-15	3.0 to 15.0	0.9 PSI	0.9 PSI
1950P-25	4.0 to 25.0	0.7 PSI	0.7 PSI
1950P-50	15.0 to 50.0	1.0 PSI	1.5 PSI

E-Mail:

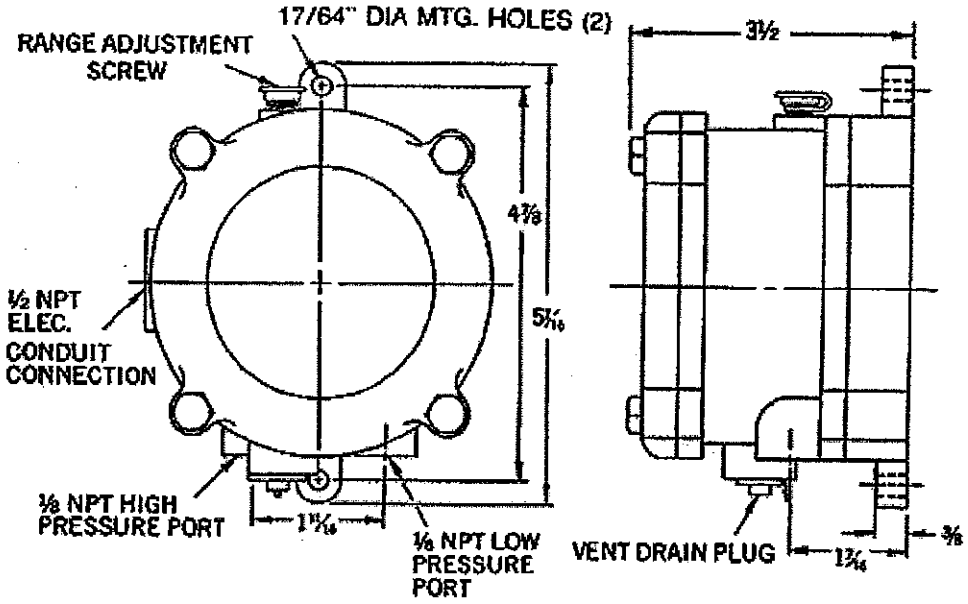
General Information: info@dwyer-inst.com
Technical Inquiries: tech@dwyer-inst.com
Literature Request: lit@dwyer-inst.com
Quotes Request: quotes@dwyer-inst.com



New Products ¤ Pressure ¤ Flow ¤ Temperature ¤ Level ¤ Valves ¤ Site Map

Back to Series 1950

TO ORDER



1950 SWITCH OUTLINE DIMENSIONS

Back to Series 1950

P/N 100274-1
Form 270

Installation and Operation Bulletin
Series 27 Controls

This bulletin should be used by experienced personnel as a guide to the installation of Series 27. Selection or installation of equipment should always be accompanied by competent technical assistance. We encourage you to contact Warrick Controls, or its local representative if further information is required.

Important!
Before proceeding to install and wire the control, read and thoroughly understand these instructions.

When installing according to these instructions, the sensing circuit is intrinsically safe for Class I and II, Division 1, Groups A, B, C, D, E, F and G.

Electrical equipment connected to associated apparatus should not exceed maximum voltage marked on product.

Location: The control must be situated in a non-hazardous area where an explosive atmosphere will not exist at any time.

Wiring:

1. Intrinsically safe wiring must be kept separate from non-intrinsically safe wiring.
2. Intrinsically safe and non-intrinsically safe wiring may occupy the same enclosure or raceway if they are at least 2 inches (50mm) apart and separately tied down. Inside panels, field wiring terminals for intrinsically safe circuits must be separated by at least 2 inches (50 mm) from non-intrinsically safe terminals.
3. Wire the control device(s) to the Series 27 relay as shown in the specific application wiring diagram in this bulletin. A separate rigid metallic conduit should be used to enclose the conductors of the intrinsically safe control circuit.
4. An approved seal should be used at the point where the intrinsically safe control circuit wiring enters the hazardous area.

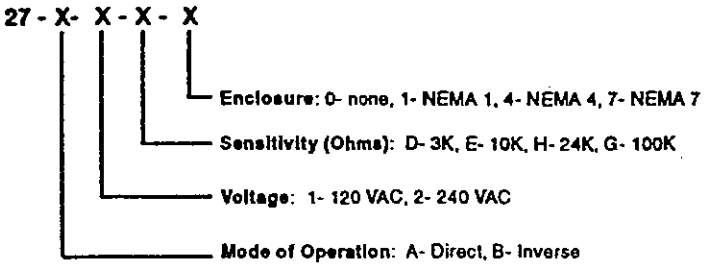
For intrinsically safe output wiring, use #14 or #16 AWG type MTW or THHN wire. By using these wire types in conjunction with the following distance recommendations, you will not exceed the maximum capacitance for field wiring. Use the following chart as a guide for maximum wire runs for differential level service (3wire) field wiring.

Model	Max. Sensitivity (K Ohms)	Distance (FT.)
27XXD0	3	4,000
27XXE0	10	900
27XXH0	24	800
27XXG0	100	75

One of the two grounding terminals provided on the intrinsically safe output terminal strip must be connected as reference to the same conductive media presented to terminals "H" and "L" ***(See applicable wiring diagram in this bulletin)*** Terminal G1 on the supply line/load side terminal strip is a redundant system ground terminal and should be connected to the earth ground buss of the control's AC supply line feeder.

Note:

1. Intrinsically safe terminals can be connected to any non-energy generating or storing switch device such as a pushbutton, limit or float type switch or any Warrick electrode and fitting assembly.
2. To prevent electrical shock from supply line/load side powered connections, Series 27 should be mounted in a tool accessible enclosure of proper NEMA rated integrity.
3. For additional guidance on "Hazardous Location Installation" and "Intrinsically Safe Devices", consult ANSI/ISA standard RP 12-6 or NEC articles 500-516.

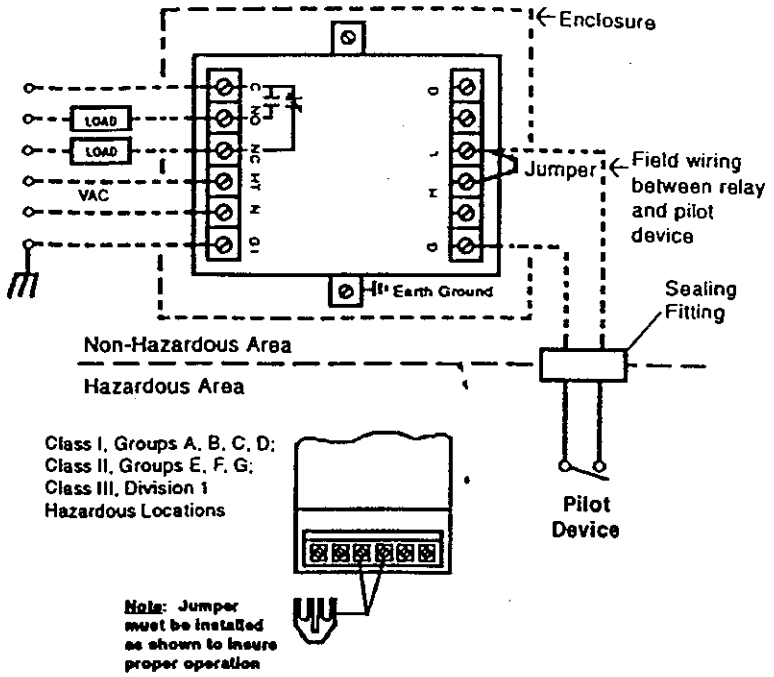


Grounding: Both mounting tabs of the Series 27 provide an electrical connection for earth grounding between the control's internal solid state circuitry and the enclosure chassis. To insure proper grounding, use only metal screws and lock washers when mounting this control.

Wiring Diagram
Single Input (Non Latching)
- Pilot Contact Actuated

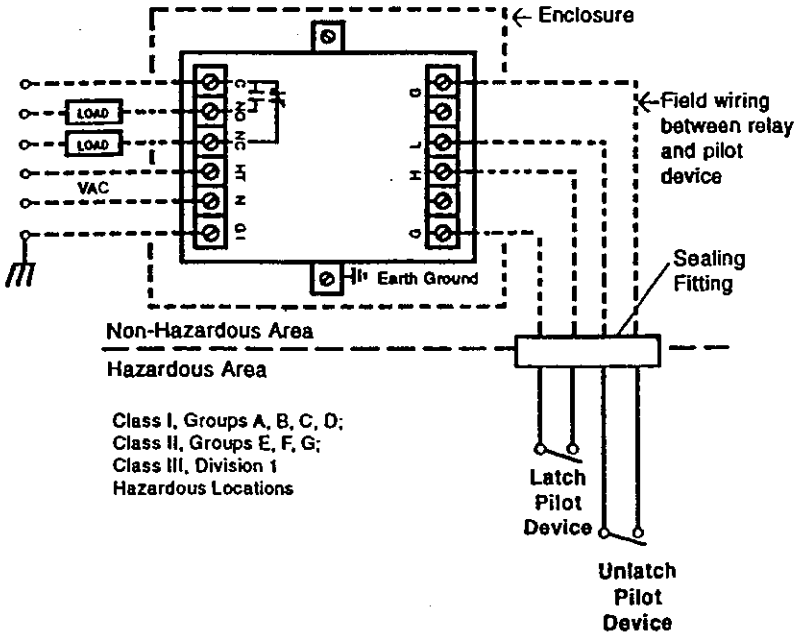
1. Connect terminals AC & G1 to appropriate VAC supply line.
2. Install metallic jumper between terminals H and L.
3. Wire contacts (C-NO) normally open and (C-NC) normally closed into load circuit as required.
4. Connect the pilot contact to terminals G and L.

Note: **Jumper must be installed as shown to insure proper operation.**



Wiring Diagram
Dual Input Latching
- Pilot Contact Actuated

1. Connect terminals AC & G1 to appropriate VAC supply line.
2. Wire contacts (C-NO) normally open and (C-NC) normally closed into load circuit as required.
3. Connect the latch pilot contact to terminals G and H and the unlatch pilot contact to terminals G and L



Contact Design
SPDT (1 form C): One normally open (N.O.) and one normally closed (N.C.), non-powered contacts
Contact Ratings: 8A @ 240 VAC resistive, 8Amps @ 30 VDC resistive

Contact Life
Mechanical: 10 million operations.
Electrical: 100,000 operations minimum at rated load

Electronics Module
Solid state components epoxy encapsulated in a black nylon shell

Supply Voltage
120 or 240 VAC models ±10%, 50/60 Hz.

Supply Current
Relays energized - 1.7 VA.

Secondary Circuit
11 VAC RMS voltage on probes, 2.3 milli-amp current

Sensitivity
Models operate from 0-100,000 ohms maximum specific resistance (factory set)

Temperature
-40° to 150° F ambient

Terminals
Size 6 pan head screws with captivated wire clamping plate

Time Delays
Standard: 0.5 seconds rising level
LLCO probe: 3 seconds lowering level

Listings
U.L. Intrinsically Safe (UL 913)

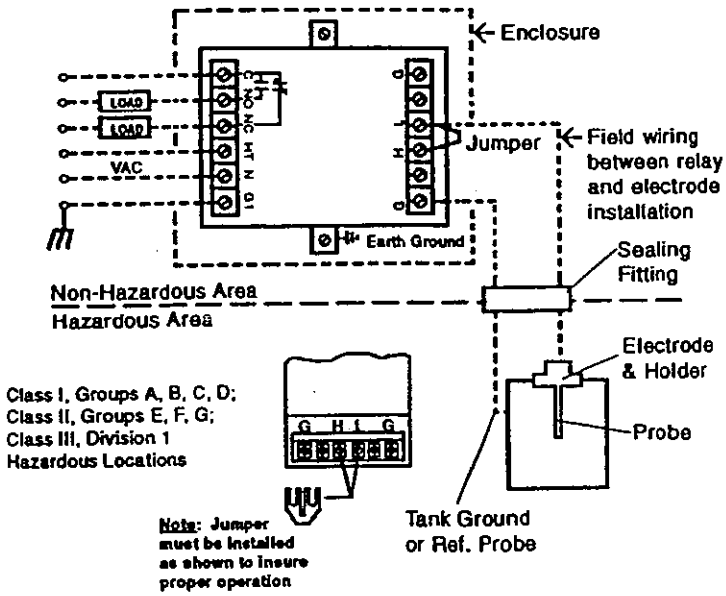
Wiring Diagram
Single Level Service
- Conductance Actuated

1. Connect terminals AC and G1 to appropriate VAC supply line.
2. Install metallic jumper between terminals H and L.
3. Connect terminal L to the electrode.

Terminal G must be grounded to the tank if metallic. When the tank is non-metallic, terminal G must be connected to an additional electrode of length equal to the longest electrode.

4. Wire contacts (C-NO) normally open and (C-NC) normally closed into load circuit as required.

Note: Jumper must be installed as shown to insure proper operation.

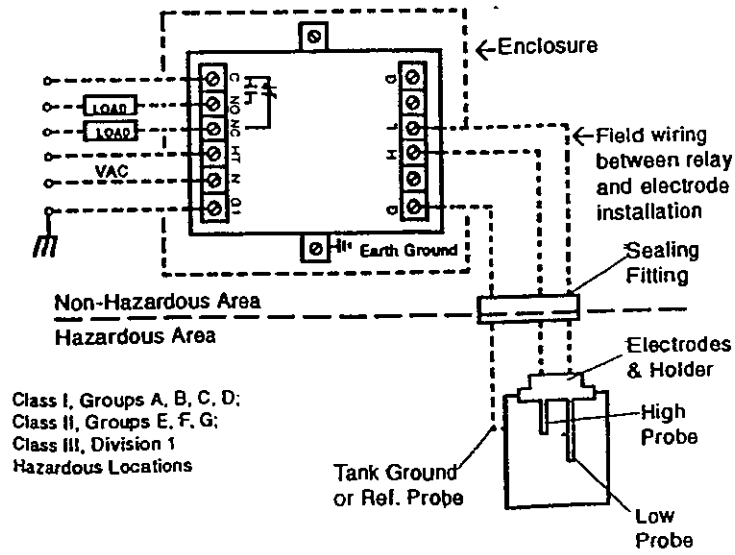


Wiring Diagram
Differential Level Service
- Conductance Actuated

1. Connect terminals AC and G1 to appropriate VAC supply line.
2. Connect terminal H to high electrode and terminal L to low electrode.

Terminal G must be grounded to the tank if metallic. When the tank is non-metallic, terminal G must be connected to an additional electrode of length equal to the longest electrode.

3. Wire contacts (C-NO) normally open and (C-NC) normally closed into load circuit as required.



Series 67
Intrinsically Safe Multi-Function Contrc
Installation & Operation Instructions

Table of Contents

Installation: Intrinsically Safe Sensing Circuits

This bulletin should be used by experienced personnel as a guide to the installation of the series 67. Selection or installation of equipment should always be accompanied by competent technical assistance. We encourage you to contact Warrick Controls, Inc., or its local representative if further information is required.

IMPORTANT: BEFORE PROCEEDING TO INSTALL AND WIRE THE SERIES 67 CONTROL, READ AND THROUGHLY UNDERSTAND THESE INSTRUCTIONS.

When installing according to these instructions, this device provides intrinsically safe sensing circuits for interface into Class I; Groups C & D, Class II; Groups E, F, & G and Class III; Hazardous Areas. Electrical equipment connected to associated apparatus should not exceed maximum ratings marked on product.

MOUNTING LOCATION

The control must be situated in a non-hazardous area where an explosive atmosphere will not exist at any time; otherwise, it must be mounted in a suitable U.L. approved explosion-proof enclosure with suitable U.L. approved explosion-proof seals.

WIRING: GENERAL INFORMATION

1. Intrinsically safe wiring must be kept separate from non-intrinsically safe wiring.
2. Intrinsically safe and non-intrinsically safe wiring may occupy the same enclosure or raceway if they are at least 2 inches (50mm) apart and separately tied down. Inside panels, field wiring terminals for intrinsically safe circuits must be separated by at least 2 inches (50 mm) from non-intrinsically safe wiring.
3. Wire the control device(s) to the Series 67 relay as shown in figure 1. A separate rigid metallic conduit should be used to enclose the conductors of the intrinsically safe control circuit.
4. An approved seal should be used at the point where the intrinsically safe control circuit wiring enters the hazardous area.

For intrinsically safe output wiring use #14 or #16 AWG type MTW or THHN wire. By using these wire types in conjunction with the following distance recommendations, you will not exceed the maximum capacitance for field wiring. Use Table 1 as a guide for maximum wire runs.

Table 1

MODEL NUMBER	SENSITIVITY	DISTANCE
67AXXXA	4.7 K Ohms	4000 Feet
67BXXXA	10 K Ohms	2400 Feet
67CXXXA	26 K Ohms	1200 Feet
67DXXXA	50 K Ohms	600 Feet
67EXXXA	100 K Ohms	300 Feet

Installation: Intrinsically Safe Sensing Circuits

GROUNDING:

The four mounting holes on the Series 67 provide an electrical connection for earth grounding between the control's internal solid state circuitry and the enclosure chassis. To insure proper grounding, use only metal screws and lock washers when mounting this control. Terminal G on the supply line/load side terminal strip is a redundant system ground terminal and must be connected to earth ground buss of the control's AC supply line feeder.

Note:

1. Intrinsically safe terminals can be connected to any non-energy generating or storing switch device such as a pushbutton, limit or float type switch or any Warrick electrode and fitting assembly.
2. To prevent electrical shock from supply line/load side powered connections, the Series 67 should be mounted in a tool accessible enclosure of proper NEMA rated integrity.
3. For U.L. 913 Listed panels, a metallic partition may be necessary to provide adequate spacing between non-intrinsically safe and intrinsically safe wiring and /or terminals.
4. For additional guidance on "Hazardous Location Installation" and "Intrinsically Safe Devices", consult ANSI/ISA standard RP 12-6 or NEC articles 500-516 and local codes.

SENSOR WIRING

The Series 67 control has four independent intrinsically safe channels, which can be connected to different types of sensors including floats, conductance probes, pressure switches and other non-powered contacts or sensors. The connections of the sensors to the terminals will not vary with normally open or closed sensors. However, the Inverse/Direct DIP switches must be set to the proper mode for each channel to achieve the correct operation. Consult tables 2 and 3 for the proper DIP switch setting for various sensors and functions.

The following sections cover the intrinsically safe sensor connections for single and differential level service.

SINGLE LEVEL SERVICE:

All four channels can be used for single level service. Each channel is independent and can be used for its own single point function. However, only channels 3 and 4 have the alarm bell and silence capabilities. Consult the alarm sections for more information regarding the installation and operation of the alarm circuitry. Table 2 covers the sensor style to terminal connections for all four channels.

Table 2

SENSOR STYLE	TERMINAL CONNECTIONS	DIP SWITCH SETTINGS
Normally Open- Closes on alarm condition	Channel 1- HS1 & G* Channel 2- HS2 & G* Channel 3- S3 & G Channel 4- S4 & G	Inverse Mode- Up Position
Normally Open- Opens on alarm condition	Channel 1- HS1 & G* Channel 2- HS2 & G* Channel 3- S3 & G Channel 4- S4 & G	Direct Mode- Down Position
Normally Closed- Closes on alarm condition	Channel 1- HS1 & G* Channel 2- HS2 & G* Channel 3- S3 & G Channel 4- S4 & G	Inverse Mode- Up Position
Normally Closed- Opens on alarm condition	Channel 1- HS1 & G* Channel 2- HS2 & G* Channel 3- S3 & G Channel 4- S4 & G	Direct Mode- Down Position

*** Note: Channels 1 & 2 can not activate the alarm bell contacts and do not have the silence/acknowledge capabilities**

Installation: Intrinsically Safe Sensing Circuits

DIFFERENTIAL LEVEL SERVICE:
Channels 1 and 2 are designed to provide differential on/off points to control pumps, solenoid valves or other equipment. These channels can also be used in single level service for alarms and cutoffs, however the control's built in silence circuitry and bell contacts can not be used. Consult the Alarm section for more information.

When channels 1 and 2 are used for differential level service the associated sensors must be normally open. The Inverse/Direct DIP switches must also be set to the proper mode for each channel to achieve the correct operation. Table 3 gives the correct sensor to terminal connections an DIP switch settings for various applications.

FOR APPLICATIONS THAT DO NOT REQUIRE DUPLEX ALTERNATION, A JUMPER WIRE MUST BE PLACED FROM THE "G" TO "1-2" TERMINAL.

Table 3

APPLICATION	SENSOR CONTACT STYLE	SENSOR TERMINAL CONNECTIONS	DIP SWITCH SETTING
Simplex Pump Down or Solenoid Valve Drain**	Normally Open- Closes on Rising Level	Start Pump/ Open Valve - HS1 & G* Stop Pump/ Close Valve- LS1 & G*	Direct- Down Channels 1 or 2
Simplex Pump Up or Solenoid Valve Fill**	Normally Open- Closes on Rising Level	Start Pump/ Open Valve- LS1 & G* Stop Pump/ Close Valve- HS1 & G*	Inverse- Up Channles 1 or 2
Duplex Pump Down- Common Pump Stop	Normally Open- Closes on Rising Level	Duty Pump Start- HS1 & G* Standby Pump Start- HS2 & G* Duty and Standby Pump Stop LS1 & G* Jumper LS1 and LS2	Direct- Down Channels 1 or 2
Duplex Pump Up- Common Pump Stop	Normally Open- Closes on Rising Level	Duty Pump Start- LS1 & G* Standby Pump Start- LS2 & G* Duty and Standby Pump Stop HS1 & G* Jumper HS1 and HS2	Inverse- Up Channles 1 or 2
Duplex Pump Down- Seperate Pump Stops	Normally Open- Closes on Rising Level	Duty Pump Start- HS1 & G* Standby Pump Start HS2 & G* Duty Pump Stop LS1 & G* Standby Pump Stop- LS2 & G*	Direct- Down Channels 1 or 2
Duplex Pump Up- Seperate Pump Stops	Normally Open- Closes on Rising Level	Duty Pump Start- LS1 & G* Standby Pump Start LS2 & G* Duty Pump Stop HS1 & G* Standby Pump Stop- HS2 & G*	Inverse- Up Channles 1 or 2

* Note 1: If conductance probes are being used, only one "G" connection is required. Terminal "G" must be grounded to the vessel if metallic. If the electrode fitting being used has a metallic body and is supported directly upon a metallic vessel, the ground connection is facilitated by securing that end of the ground connector beneath the head of one of the screws which fasten the terminal housing to the body of the fitting. When the vessel is non-metallic, terminal "G" must be connected to an additional electrode of length equal to or longer than, the longest electrode. If wire suspension electrodes are being used, more than one Ground/Reference probe may be required.

** Note 2: This setup is based on the use of a Normally Closed (N.C.) solenoid valve that energizes to open when power is applied to the coil circuit.

Installation: Intrinsically Safe Sensing Circuits

ALARM CHANNEL WIRING:

SILENCE CIRCUITRY:
A normally open pushbutton is required for the Series 67's alarm silence circuitry. The N.O. pushbutton must be connected to the "SIL" and "G" terminals. For more information about the operation of the silence circuitry consult the Alarm Operation section on page 11. **NOTE: THE SILENCE PUSHBUTTON IS CONNECTED TO THE INTRINSICALLY SAFE CIRCUITRY. THEREFORE THE PUSHBUTTON AND ITS ASSOCIATED WIRING SHOULD BE SEPARATED FROM THE NON-INTRINSICALLY SAFE WIRING AND DEVICES. CONSULT GENERAL WIRING INFORMATION FOR MORE INFORMATION.**

ALARM DIP SWITCHES:
The alarm DIP switches for channels 3 and 4 can be set to enable the bell contacts for one or both alarm channels. However, this does not disable the alarm contact for that channel. Table 4 covers the DIP switch settings for various alarm conditions.

Table 4

DIP SWITCH SETTINGS	BELL CONTACT STATUS
3 Off-Down 4 Off- Down	Channel 3- Off- Disabled Channel 4- Off- Disabled
3 On- Up 4 Off- Down	Channel 3- On- Enabled Channel 4- Off- Disabled
3 On- Up 4 On- Up	Channel 3- On- Enabled Channel 4- On- Enabled
3 Off-Down 4 On- Up	Channel 3- Off- Disabled Channel 4- On- Enabled

ALTERNATION CIRCUITRY

AUTO OR MANUAL:
The Series 67 control's built in alternator can be used to automatically alternate between two loads controlled by channels 1 and 2. However, the automatic alternation may be by-passed to become a manual operation. This can be accomplished with the use of jumper wires or a three position switch connected to the 2-1, 1-2 and "G" terminals. Table 5 covers the jumper connections for manual alternation. Refer to figure 1 for more wiring information on the wiring of the three position selector switch. **NOTE: THE MANUAL ALTERNATION CIRCUITRY IS CONSIDERED INTRINSICALLY SAFE. THEREFORE THE SELECTOR SWTICH, JUMPERWIRES AND THEIR ASSOCIATED WIRING SHOULD BE SEPARATED FROM NON-INTRINSICALLY SAFE WIRING DEVICES. CONSULT GENERAL WIRING INFORMATION FOR MORE INFORMATION ON INTRINSIC SAFETY.**

Table 5

ALTERNATION STATUS	JUMPER REQUIRED	LED STATUS PUMP DOWN*	LED STATUS PUMP UP*
Automatic *	None	Either	Either
Manual 2-1	Terminals 1-2 to "G"	No. 1**	No. 1**
Manual 2-1*	Terminals 2-1 to "G"	No. 2**	No. 2**

* Note: For non-alternation applications jumper 1-2 to "G"
** Note: The position of the 1-2 and 2-1 indicating LED's is dependent on the application. The position changes for pump up or down. Consult control diagram figure 6-1 for more information.

Installation: High Voltage Circuits

A.C. SUPPLY:

Connect the incoming supply HOT lead to the L1 terminal, NEUTRAL lead to the L2 terminal and EARTH GROUND lead to the "G" Terminal. Note: the incoming power supply should have the same electrical characteristics as indicated on the control's label.

GROUNDING

Terminal "G" on the supply line/load side terminal strip is a redundant system ground terminal and must be connected to the earth ground buss of the panel's AC supply line feeder.

OUTPUT CONTACTS

Channels 1-4: Each channel has a dedicated non-powered contacts. These can be either Form C or Form A & B depending on the model. These contacts will change state when their respective channel activates. In DIRECT mode the relay will energize and the contacts will change state when the probe circuit sensor closes. In INVERSE mode the relay will energize and contacts will change state upon power up. The channel will then de-energize and return the contacts to their shelf state when the probe circuit sensor closes.

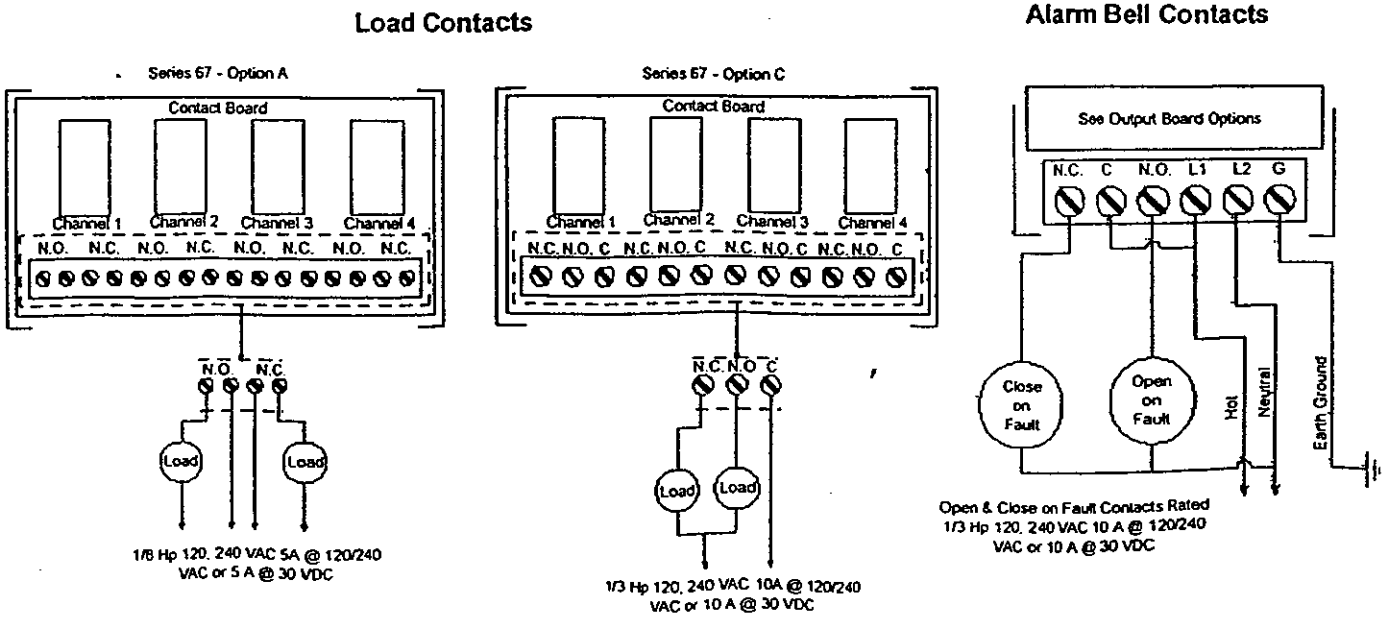
Form C- This contact configuration consists of one (1) Normally Open contact and one (1) Normally Closed contact. There are three terminals for electrical connections, N.O., N.C. and Common. Each terminal will accept up to two (2) #14 AWG wires

Form A & B: This contact configuration consists of one (1) Normally Open contact and one (1) Normally Closed contact which are electrically isolated from each other. There are two terminals for each contact. Each will accept one (1) # 14 AWG wire.

Alarm Bell: The alarm bell contacts are non-powered Form C construction. This contact configuration consist of consists of one (1) Normally Open contact and one (1) Normally Closed contact. There are three terminals for electrical connections, N.O., N.C. and Common. Each terminal will accept up to two (2) #14 AWG wires

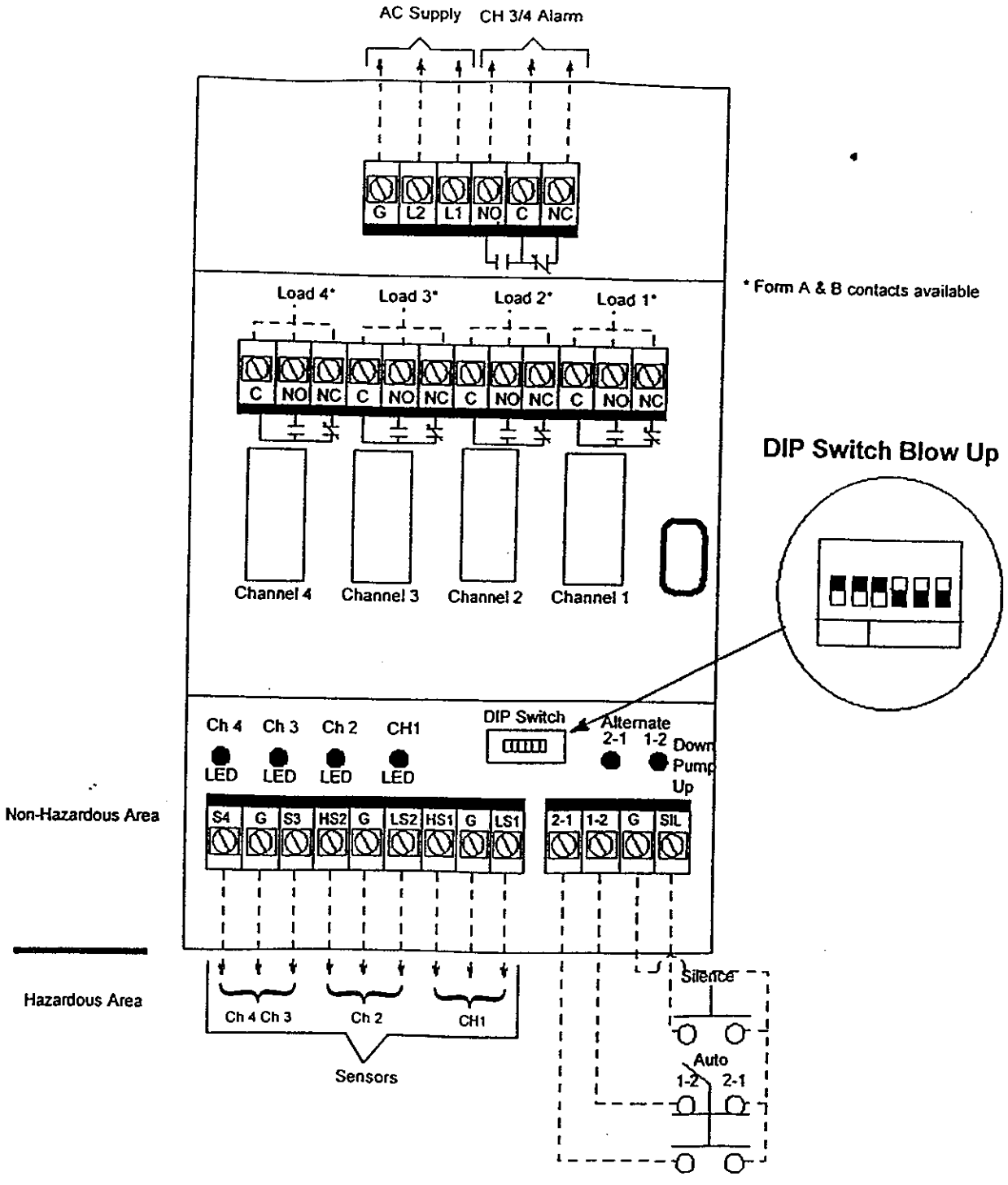
When the output contacts are used to drive loads they should be wired in series with the load. This series branch circuit should then be connected across a power source compatible with the load. See figure 1.

Figure 1



Control Diagram

Figure 2



Note: For applications that do nto require duplex alternation, a jumper wire must be placed from the "G" to "1-2" terminal

Technical Information

SPECIFICATIONS

Contact Design: Standard SPDT (1 form C): one normally open (N.O.) and one normally closed (N.C.), non powered contacts Contact Ratings for each channel. Optional 1 Form A (N.O.) and 1 Form B (N.C.) isolated
Load Contact Ratings: Standard Form C- 10A @ 120/240 VAC resistive and 30 VDC resistive, 1/3 Hp @ 120/240 VAC. Optional Form A & B - 5A @120/240 VAC and 30 VDC resistive, 1/8 Hp @ 120/240 VAC.
Bell Contacts: 1 Form C (N.O., N.C., C)
Bell Contact Ratings: 10A @ 120/240 VAC and 30 VDC resistive, 1/3 Hp @ 120/240 VAC
Contact Life: Mechanical - 10 million operations. Electrical - 1,000,000 operations minimum at rated load.
Primary Voltage: 120 or 240 VAC models + 10% - 15%, 50/60 Hz.
Supply Current: Relays energized - 60ma @ 120 VAC, 30ma @ 240 VAC
Secondary Circuit: 12 VAC RMS voltage on probes, 6ma current RMS.
Sensitivity: Models operate from 4700-100,000 ohms maximum specific resistance
Temperature: -40° to 150° F Ambient
Electronics Module: Solid state components enclosed in a black nylon housing
Terminals: Standard Form C removable terminal strip containing a size 4 pan head screw with a clamping plate. Will accept up to two (2) #14 AWG wires per terminal. Optional Form A & B relay board will accept up to one (1) #14 AWG wire per terminal. Use copper (60-75° C) wire only. Torque to 20 inch pounds.
Listings: U.L. Intrinsically Safe (UL 913) File Number: E87112

ORDERING INFORMATION

67 X X X X X

A	4.7K
B	10 K
C	26 K
D	50 K
E	100K

1	120 VAC
2	240 VAC

A	1 Form A & B (N.O. & N.C. Isolated) for each channel
C	1 Form C (N.O., N.C. C) for each channel

0	None
1	NEMA 1
4	NEMA 4

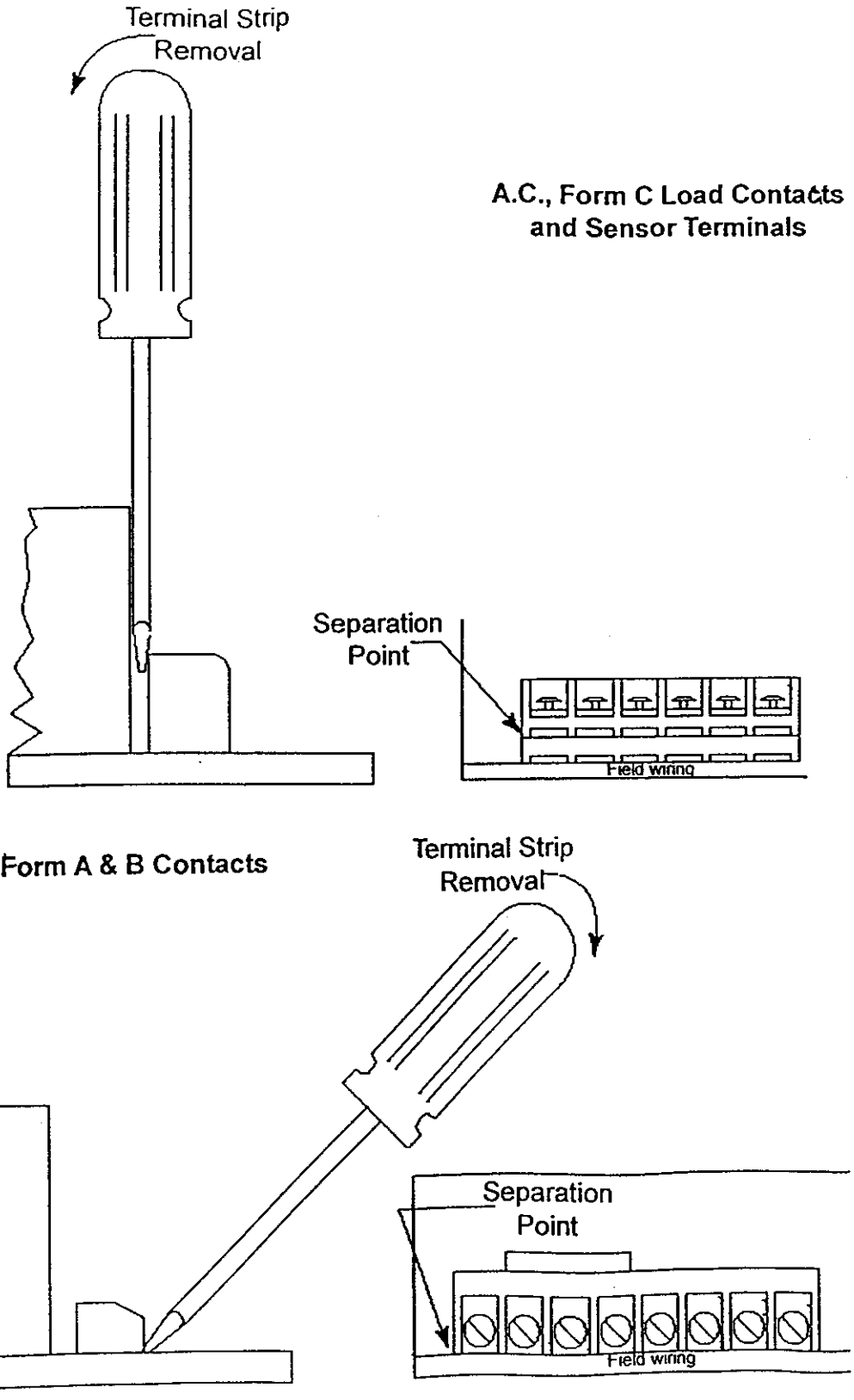
A	AC on probe circuit
D	DC on probe circuit

MODULE REPLACEMENT

If the electronic module needs to be replaced:

1. Turn off power to the control and load devices
2. Remove the metal partition located across the center of the module (when required).
3. Remove all field wiring terminal blocks from the electronic module. **The field wires do not need to be removed from the terminal blocks.** The terminal blocks separate from the board as show in figure 8-1.
4. Remove the four (4) retaining screws from the base of the electronic module. The module can now be removed from the control panel.
5. Install a new module and reinstall all of the terminal blocks.
6. Reinstall the metal partition (when required).
7. Set all DIP switches according to previous instructions.

Diagram 3


Terminal Strip
Removal
A.C., Form C Load Contacts
and Sensor Terminals
Separation
Point
Field wiring
Form A & B Contacts
Terminal Strip
Removal
Separation
Point
Field wiring

Operation Instructions

The Series 67 Multi-function control can be used for many different applications including: Pump control, solenoid valve control and alarm activation. The following instructions cover the most common applications. If your application is not included, contact Warrick Controls or our authorized Representative in your area for assistance.

The operating instructions are broken up into two general categories: SINGLE and DIFFERENTIAL LEVEL SERVICE. The alarm functions are covered under the SINGLE LEVEL SERVICE heading while the pumping and solenoid valve functions are covered under the DIFFERENTIAL LEVEL SERVICE heading.

SINGLE LEVEL SERVICE: CONTACT OPERATION

LOAD CONTACTS: CHANNELS 1-4

The activation of these contacts is dependent upon the type of sensor (normally open or closed) and the mode of operation (direct or inverse). The table 6 gives the sensor activation condition, DIP switch settings, contact status and LED status for various applications and sensors.

Table 6

APPLICATION	WARRICK SENSOR	SENSOR'S ALARM ACTIVATIONCONDITION	DIP SWITCH SETTING	RELAY STATUS UPON ALARM	LED STATUS UPON ALARM
High Level Alarm Normally Open Float	FE- Reed Switch Float For M Tilt Float	Closes on rising level	Inverse UP "I"	De-energized	ON
High Level Alarm Normally Closed Float	FE- Reed Switch Float For M Tilt Float	Opens on rising level	Direct Down "D"	De-energized	OFF
Low Level Alarm Normally Open Float	FE- Reed Switch Float For M Tilt Float	Opens on falling level	Direct Down "D"	De-energized	OFF
Low Level Alarm Normally Closed Float	FE- Reed Switch Float For M Tilt Float	Closes on falling level	Inverse UP "I"	De-energized	ON
High Level Alarm Conductance Probes	3R, 3T, 3W, 3Y, 3H or 3S	Probes in contact with conductive liquid	Inverse UP "I"	De-energized	ON
Low Level Alarm Conductance Probes	3R, 3T, 3W, 3Y, 3H or 3S	Probes not in contact with conductive liquid	Direct Down "D"	De-energized	OFF
UNKNOWN SENSOR Normally Open		Closes on fault	Inverse UP "I"	De-energized	ON
UNKNOWN SENSOR Normally Closed		Opens on fault	Direct Down "D"	De-energized	OFF

SINGLE LEVEL SERVICE: ALARM FUNCTIONS

BELL CONTACTS:

Under NORMAL operating conditions the alarm bell relay is held energized. The relay will de-energize to activate an alarm device when an abnormal condition exists on either channels 3 and/or 4. Either one or both alarm bell circuits can be disabled by adjusting the alarm DIP switches. Consult table 4 for more information on the bell DIP switch settings.

SILENCE CIRCUITRY:

Should an abnormal condition exist on either channels 3 and/or 4 the normally closed (N.C.) alarm bell relay contacts will close, activating an alarm device. The N.C. alarm bell contacts can be returned to their normal state (open) silencing the alarm, by depressing a normally open pushbutton connected to the "SIL" and "G" terminals. This will NOT affect the load contacts for channels 3 or 4 as they act independent from the alarm bell contacts.

Operation Instructions

DIFFERENTIAL LEVEL SERVICE:

The following operating instructions are based on correct DIP switch settings and sensor types. Any deviation from these requirements may result in incorrect system operations. Consult table 7 for further instructions.

Table 7

APPLICATION	WARRICK SENSOR	DIP SWITCH SETTING	ACTIVATION CONDITION	CONTACT STATUS	LED STATUS SENSOR CLOSED
Simplex Pump Down or Solenoid Valve Drain	Normally open- F, M, FE, FOE, 3R, 3T, 3W, 3Y, 3H or 3S	Direct "Down"	Sensor Closes on Rising Level	N.O.- Closes N.C.- Opens	ON
Simplex Pump Up or Solenoid Valve Fill	Normally open- F, M, FE, FOE, 3R, 3T, 3W, 3Y, 3H or 3S	Inverse "UP"	Sensor Closes on Rising Level	N.O.- Opens N.C.- Closes	OFF
Duplex Pump Down - Common Pump Stop	Normally open- F, M, FE, FOE, 3R, 3T, 3W, 3Y, 3H or 3S	Direct "Down"	Sensor Closes on Rising Level	N.O.- Closes N.C.- Opens	ON
Duplex Pump Up- Common Pump Stop	Normally open- F, M, FE, FOE, 3R, 3T, 3W, 3Y, 3H or 3S	Inverse "UP"	Sensor Closes on Rising Level	N.D.- Opens N.C.- Closes	OFF
Duplex Pump Down- Seperate Pump Stop	Normally open- F, M, FE, FOE, 3R, 3T, 3W, 3Y, 3H or 3S	Direct "Down"	Sensor Closes on Rising Level	N.O.- Closes N.C.- Opens	ON
Duplex Pump Up- Seperate Pump Stop	Normally open- F, M, FE, FOE, 3R, 3T, 3W, 3Y, 3H or 3S	Inverse "UP"	Sensor Closes on Rising Level	N.O.- Opens N.C.- Closes	OFF

DIFFERENTIAL LEVEL SERVICE: SIMPLEX

Simplex Pump Down- Should the level rise to the PUMP START sensor the N.O. load contacts will close starting the pump. The pump will remain running until the level recedes below the PUMP STOP sensor and the load contacts open.

Simples Pump UP- Should the level recede below the PUMP START sensor the N.O. load contacts will close starting the pump. The pump will remain running until the level rises to the PUMP STOP sensor and the load contacts open.

Solenoid Valve Drain- Should the level rise to the VALVE OPEN sensor the N.O. load contacts will close energizing the normally closed valve to open. The valve will remain open until the level recedes below the VALVE CLOSE sensor and the load contacts open

Solenoid Valve Fill- Should the level recede below the VALVE OPEN sensor, the N.O. load contacts will close energizing the normally closed valve to open. The valve will remain open until the level rises to the VALVE CLOSE sensor and load contacts open.

Operation Instructions

DIFFERENTIAL LEVEL SERVICE: DUPLEX PUMP DOWN WITH ALTERNATION

Common Pump Stop- The pumps will alternate each cycle with the duty pump starting when the level rises to the DUTY PUMP START sensor and stops when the level recedes below the PUMP(S) STOP sensor.

If the duty pump fails or cannot meet the demand of the system and the level rises to the STANDBY PUMP START sensor, the standby pump will be started and will continue in operation until the level recedes below the PUMP(S) STOP sensor.

Separate Pump Stops- The pumps will alternate each cycle with the duty pump starting when the level rises to the DUTY PUMP START sensor and stops when the level recedes below the DUTY PUMP STOP sensor.

If the duty pump fails or cannot meet the demand on the system and the level rises to the STANDBY PUMP START sensor, the standby pump will be started and will continue in operation until the level recedes below the STANDBY PUMP STOP sensor.

DIFFERENTIAL LEVEL SERVICE: DUPLEX PUMP UP WITH ALTERNATION

Common Pump Stop- The pumps will alternate each cycle with the duty pump starting when the level recedes below the DUTY PUMP START sensor and stops when the level rises to the PUMP(S) STOP sensor.

If the duty pump fails or cannot meet the demand of the system and the level recedes to the STANDBY PUMP START sensor, the standby pump will be started and will continue in operation until the level rises to the PUMP(S) STOP sensor.

Separate Pump Stops- The pumps will alternate each cycle with the duty pump starting when the level recedes to the DUTY PUMP START sensor and stops when the level rises to the DUTY PUMP STOP sensor.

If the duty pump fails or cannot meet the demand on the system and the level recedes to the STANDBY PUMP START sensor, the standby pump will be started and will continue in operation until the level rises to the STANDBY PUMP STOP sensor.

DIFFERENTIAL LEVEL SERVICE: DUPLEX PUMP DOWN WITHOUT ALTERNATION

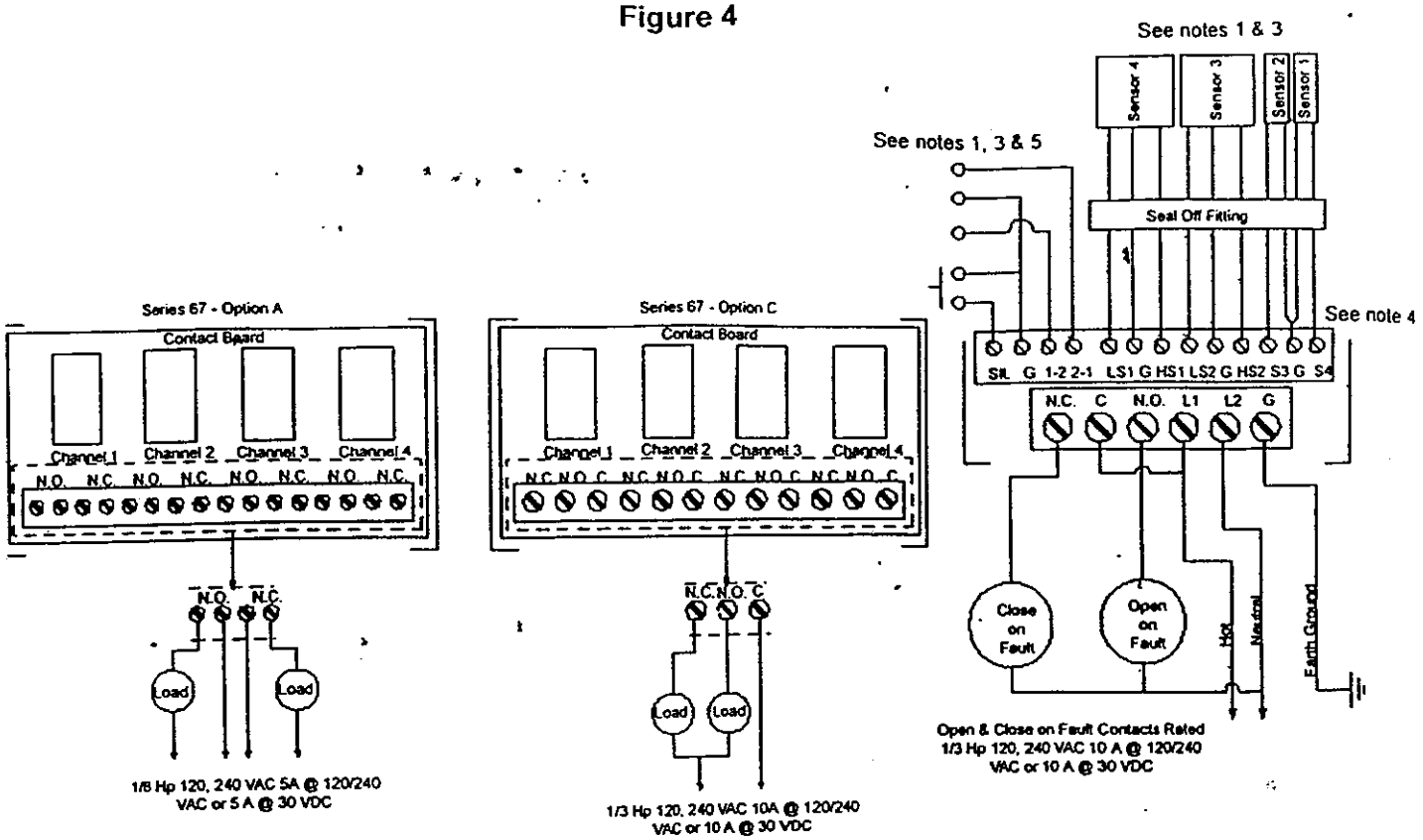
Same operation as above disregarding the alternation sequence. Use appropriate jumper to determine manual pump start sequence. Refer to table 5 for the manual alternation jumper information.

DIFFERENTIAL LEVEL SERVICE: DUPLEX PUMP UP WITHOUT ALTERNATION

Same operation as above disregarding the alternation sequence. Use appropriate jumper to determine manual pump start sequence. Refer to table 5 for the manual alternation jumper information.

General Control Information

Figure 4



Notes:

1. All intrinsically safe wiring must be installed in accordance with article 504 of the National Electric Code, publication ANSI/NFPA 70 or CEC, Part 1 as applicable.

2. Grounding- The four mounting holes on the Series 67 provide an electrical connection for earth grounding between the controls internal solid state circuitry and the enclosure chassis. To insure proper grounding, use only metal screws and lock washers when mounting the control.

   Terminal "G" on the supply line/load side terminal strip is a redundant system ground terminal and must be connected to the earth ground buss of the controls A.C. supply line feeder. The resistance between the system ground terminals and the earth ground buss must be less than 1 ohm.

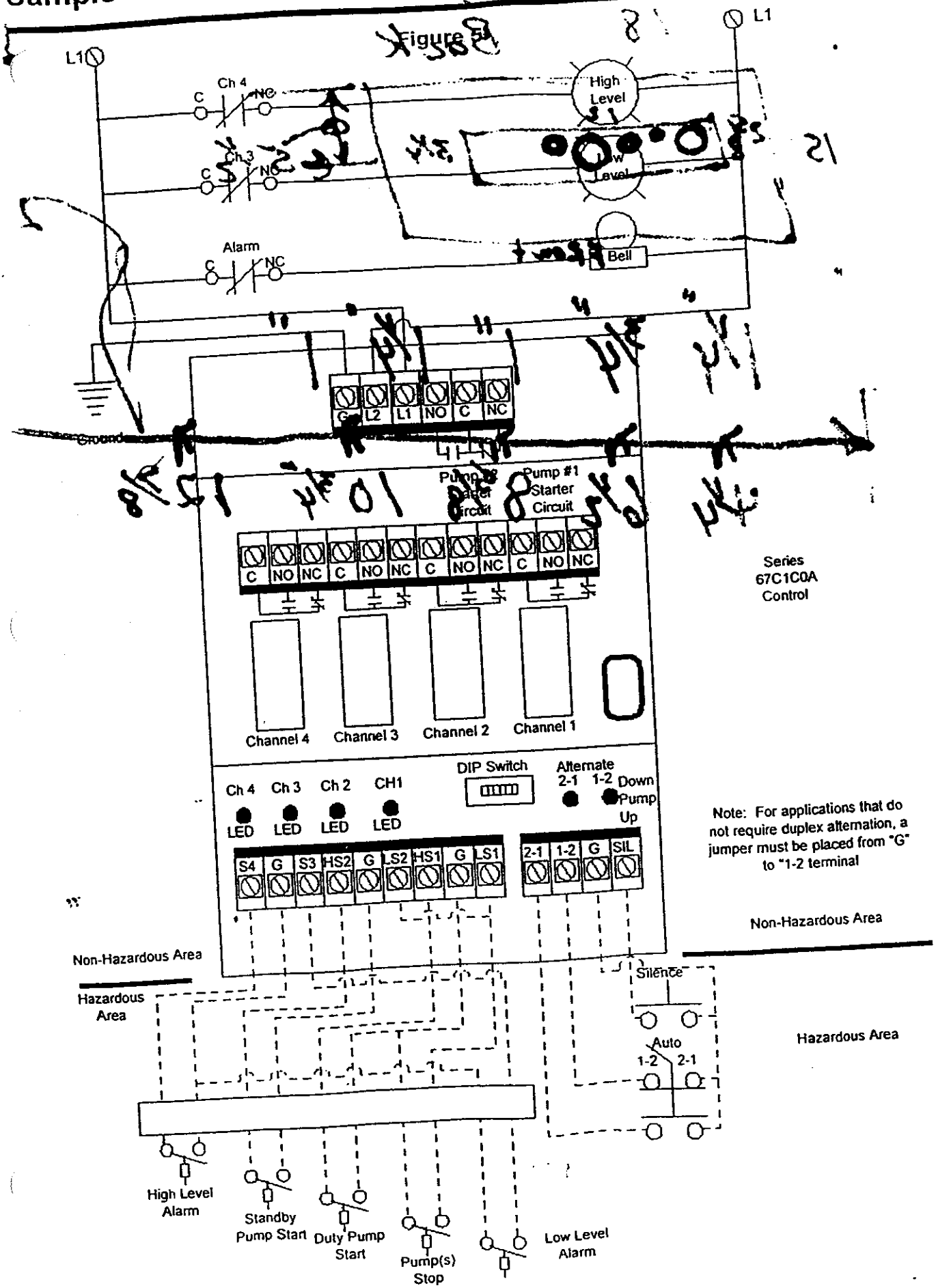
   To prevent electrical shock from supply line/load side powered connections, the Series 67 should be mounted in a metal enclosure of proper NEMA integrity.

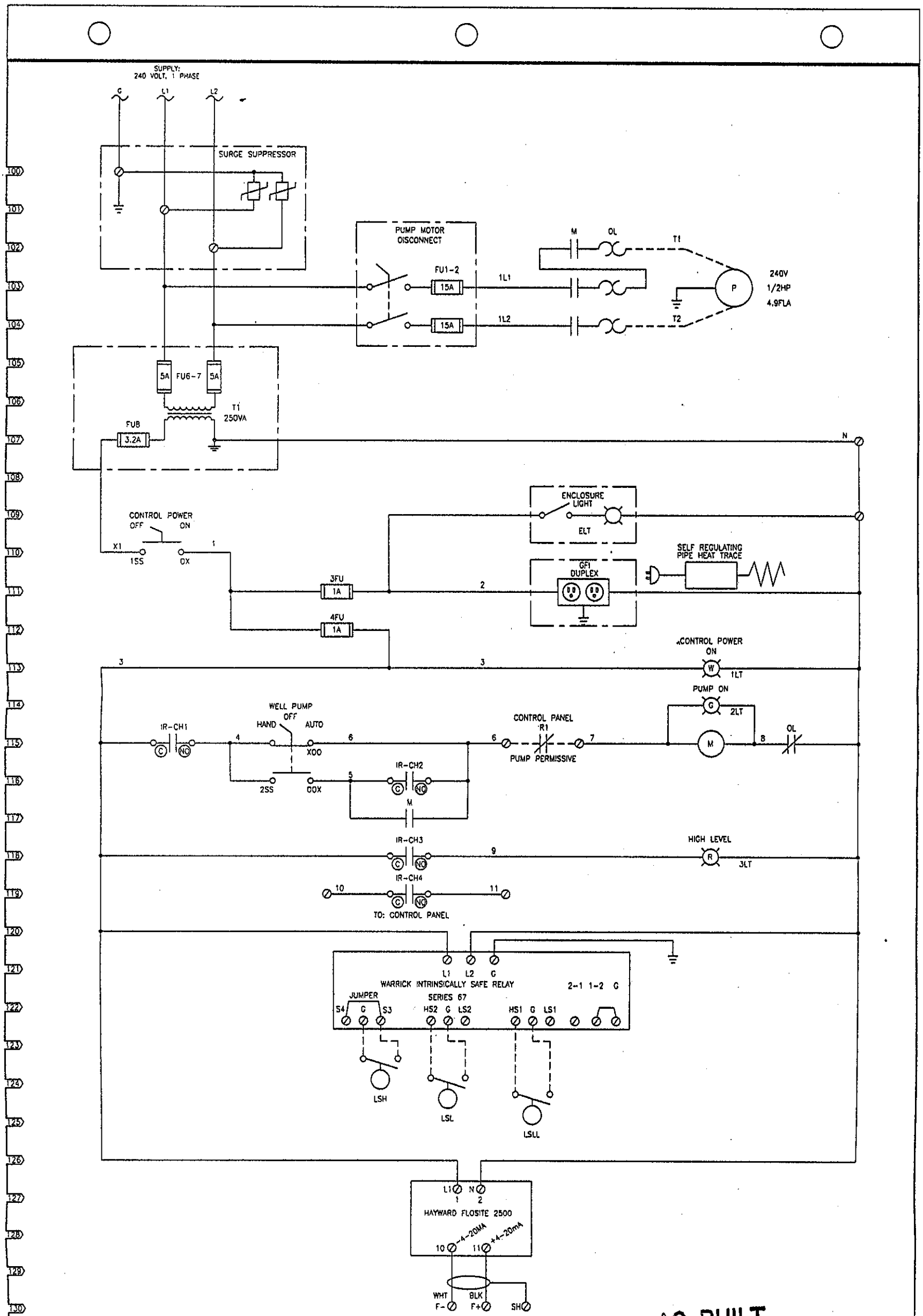
3. The maximum total length of all of the intrinsically safe wiring (of each conductor) shall not exceed an accumulative value of 16,000 feet, excluding any ground wiring.

4. The intrinsically safe terminals of the Series 67 can be connected to any non-energy generating or storing switch device such as a push button, a limit or float type switch or any of Warrick's electrode fitting assemblies.

5. When wiring alternation and bell silence switches, the switches and wiring must be separated from non-intrinsically safe circuits and wired in accordance with article 504 of the National Electric Code, publication ANSI/NFPA 70 or CEC, Part 1 as applicable.

Sample Wiring Diagram



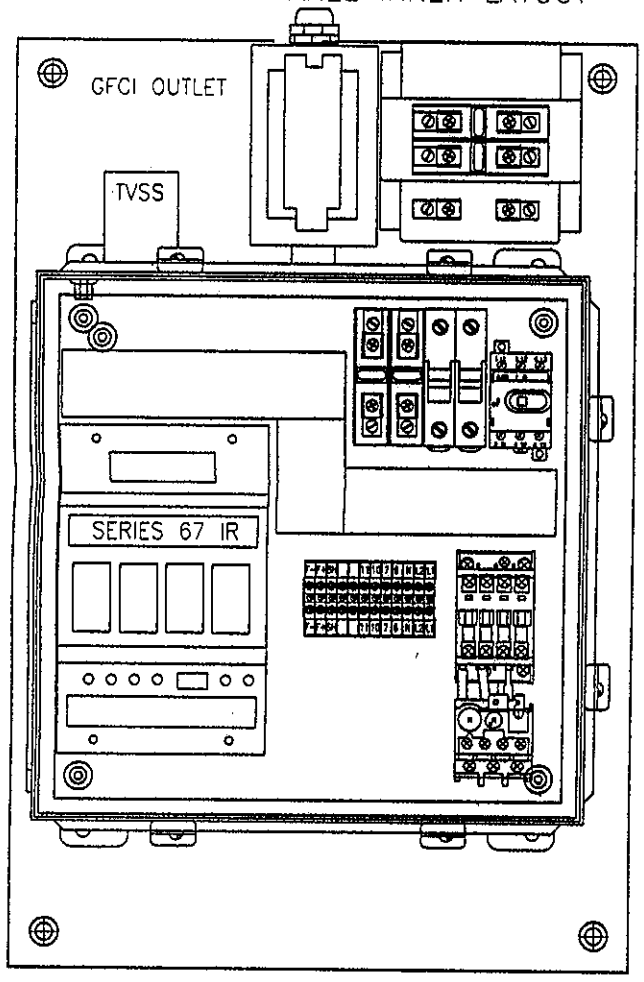


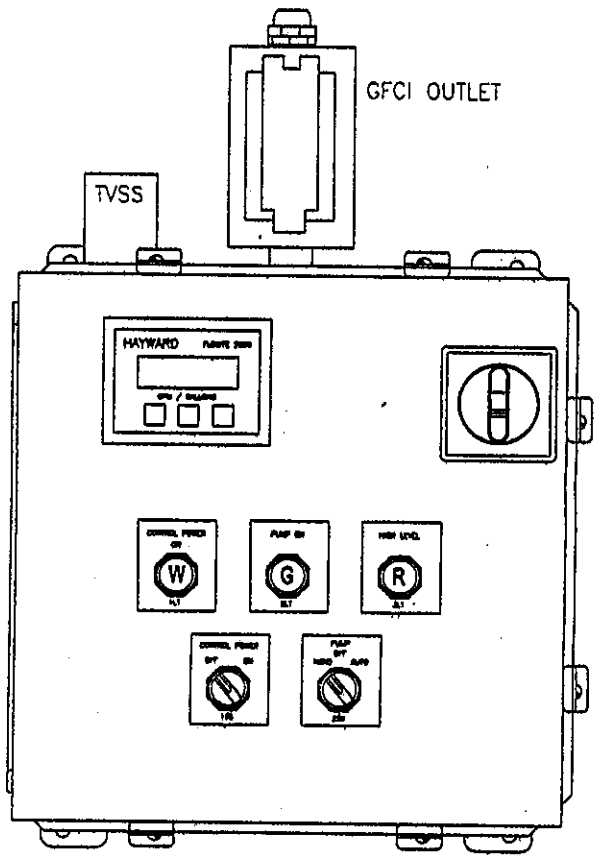
AS BUILT

RL Stone company inc
630 CLEVELAND DRIVE • BUFFALO, NY 14225
716-834-2525

SCALE: DIM	PO# 20000895
TYPE: POWER SCHEMATIC	
DRAFTED: JPR	
BCS JOB: 001421	
DATE: 7/10/00	
TITLE: BAUSH & LOMB INCORPERATED CHILI, NEW YORK WELL PUMP CONTROL PANEL	
DWG No: 20000895-1	SHT: 1 OF 3
	REV: A

WELL PUMP PANEL INNER LAYOUT





AS BUILT

RL Stone company inc
630 CLEVELAND DRIVE • BUFFALO, NY 14225
716-834-2525

SCALE: DIM	PO# 20000895
TYPE: ENCLOSURE LAYOUT	
DRAFTED: JPR	
BCS JOB: 001421	
DATE: 7/10/00	
TITLE: BAUSH & LOMB INCORPERATED CHILI, NEW YORK WELL PUMP CONTROL PANEL	
DWG No: 20000895-1	SHT: 2 OF 3
	REV: A

WELL PUMP CONTROL PANEL BILL OF MATERIAL

LINE #	ITEM	DESCRIPTION	MANUFACTURE	PART NUMBER	QTY
1	EXTERIOR ENCLOSURE	NEMA 4X S.S. FREESTANDING ENCLOSURE 30 X 18 X 15	PARK METAL FAB	Q4850	1
2	ENCLOSURE	NEMA 4X S.S. WALLMOUNT ENCLOSURE 12 X 12 X 6	HAMMOND MFG	1414N4PHSSL6	1
3	SURGE ARRESTOR	SINGLE PHASE SURGE ARRESTOR	CUTLER HAMMER	CHSA01	1
4	DISCONNECT	30 AMP NON FUSED ROTARY DISCONNECT	ABB	OT32E3	1
5	DISCONNECT	DISCONNECT HANDLE	ABB	OX180	1
6	DISCONNECT	ROTARY DISCONNECT HANDLE	ABB	OHB2AJ	1
7	FU1-2	2 POLE CLASS CC FUSE SWITCH	GOULD	USCC2	1
8	FU1-2	15 AMP CLASS CC FUSE	GOULD	ATDR15	2
9	M	9 AMP IEC CONTACTOR	ABB	A9-30-10-84	1
10	OL	OVERLOAD RELAY	ABB	TA25DU6.5	1
11	ENCLOSURE LIGHT	60 WATT INCANDECENT LIGHT W/ SWITCH	HOFFMAN	A-LTMB1	1
13	ENCLOSURE LIGHT	LIGHT POWER CABLE CORD GRIP	HEYCO	3231	1
14	FU6-7	5 AMP CLASS CC FUSE	GOULD	ATDR5	2
15	T1	250VA CPT	HAMMOND	PT250MQMJ-3	1
16	FU8	3 2/1- AMP TIME DELAY FUSE	GOULD	TRM3 2/10	1
17	T1	TRANSFORMER PRIMARY SAFETY COVER	HAMMOND	SG4	1
18	T1	TRANSFORMER PRIMARY FUSE SAFETY COVER	GOULD	DFC-7	2
19	T1	TRANSFORMER SECONDARY FUSE COVER	HAMMOND	SG3	1
20	3-4FU	1 POLE MIDGET FUSE BLOCK	GOULD	30311	2
21	3-4FU	1 AMP TIME DELAY FUSE	GOULD	TRM1	2
22	GFCI OUTLET	GROUND FAULT DUPLEX RECPETACLE	LEVITRON	16352-ESP	1
23	GFCI OUTLET	RECEPTACLE BOX	REDDOT	R1H31LM	1
24	GFCI OUTLET	BOX WEATHER COVER	REDDOT	RCCGV-S306E	1
25	1SS	2 POSITION SELECTOR (W/1NO)	ABB	CBK-C2AMK-10	1
26	2SS	3 POSITION SELECTOR SWITCH (W/2NO)	ABB	CBK-C3MK-20	1
27	1LT	WHITE PILOT LIGHT 120V LAMP	ABB	CBK-KLF1W	1
28	2LT	GREEN PILOT LIGHT 120V LAMP	ABB	CBK-KLF1G	1
29	3LT	RED PILOT LIGHT 120V LAMP	ABB	CBK-KLF1R	1
30	TERMINALS	IEC 30 AMP TERMINAL BLOCK	PHOENIX	3004362	12
31	TERMINALS	TERMINAL BLOCK END PLATE	PHOENIX	3003020	1
32	TERMINALS	TERMINAL BLOCK DIN RAIL CLAMPS	PHOENIX	3022218	2
33	GROUND LUG	PANEL GROUND LUG	ILSCO	TA-2	1
34	INTRINSIC RELAY	4 CHANNEL INTRINSIC RELAY	WARRICK	SERIES 67	1
35	FLOW METER	FLOW METER	HAYWARD	FS2500MTT110	1

AS BUILT

RL Stone company inc
630 CLEVELAND DRIVE • BUFFALO, NY 14225
716-834-2525

SCALE: DIM | PO# 20000895

TYPE: BILL OF MATERIAL
DRAFTED: JPR
BCS JOB: 001421
DATE: 7/10/00

TITLE: BAUSH & LOMB INCORPERATED CHILI, NEW YORK
WELL PUMP CONTROL PANEL

DWG No: 20000895-1

SHT: 3 OF 3

REV: A

SUPPLY: #1
240 VOLT, 1 PHASE

N L1 L2

SUPPLY: #2
460V, 3 PHASE

L1 L2 L3

MS2 M2 — 240V 3/4HP 6.9FLA — P-200 EQUALIZATION PUMP

MS3 M3 — 240V 1/2HP 4.9FLA — P-300 AIR STRIPPER PUMP

MS1 M1 — 460V 7.5HP 11FLA — B-300 AIR STRIPPER BLOWER

1FU 5A

CONTROL POWER ON — W — 1LT

EMERGENCY STOP — 1ES

AIR STRIPPER BLOWER — HAND OFF AUTO — XOO — 1SS — OOX

TR2 — NCTO

BLOWER B-300 ON — G — 2LT

MS1-AUX

EQUALIZATION PUMP — HAND OFF AUTO — XOO — 2SS — OOX

R8-1 R9-1

M2-1 R4-1 (REMOVED) R5-1 R3-1

PUMP P-200 ON — G — 3LT

MS2-AUX

AIR STRIPPER PUMP — HAND OFF AUTO — XOO — 3SS — OOX

M3-1 R6-1 (REMOVED) R5A-1

PUMP P-300 ON — G — 4LT

MS3-AUX

IR1 — 1 2 3 4 5 6 — G RH H L RL G — R7-2 — N.O. — LSHH-201

IR2 — 1 2 3 4 5 6 — G RH H L RL G — N.O. — LSH-200

R1 R1A R1B — EQUALIZATION TANK HIGH-HIGH LEVEL — R — 5LT

R2 — EQUALIZATION TANK HIGH LEVEL — R — 6LT

1 SHEET 2

1 SHEET 2 (REMOTE)

N SHEET 2 (REMOTE)

N SHEET 2

AS BUILT

RL Stone company inc 630 CLEVELAND DRIVE • BUFFALO, NY 14225 716-834-2525	*PROPRIATARY DRAWING* This document is the property of RL Stone Co., Incorporated. No part shall be copied by any means without the express written permission of RL Stone Co., Inc. personnel and then only for reference purposes.	TYPE: POWER SCHEMATIC DRAFTED: JPR BCS JOB: 001421 DATE: 7/10/00	TITLE: BAUSH & LOMB INCORPERATED CHILI, NEW YORK SYSTEM CONTROL PANEL DWG No: 20000895-2
	SCALE: DIM — PO# 20000895		SHT: 1 OF 5 — REV: B

SHEET 1
1

SHEET 1
(REMOTE)
1

SHEET 1
(REMOTE)
N

SHEET 1
N

200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230

IR3
1 2 3 4 5 6
G RH H L RL G
N.O.
LSL-200

N.O.
LSLL-200

19
RJ
EQUALIZATION PUMP ON
G 7LT

(REMOVED)
20
R4
EQUALIZATION TANK LOW-LOW LEVEL EQUALIZATION PUMP OFF
R 8LT

IR4
1 2 3 4 5 6
G RH H L RL G
N.O.

21
R5
AIR STRIPPER TANK HIGH-HIGH LEVEL
R 9LT

IR5
1 2 3 4 5 6
G RH H L RL G
N.O.
LS302

22
R5A
AIR STRIPPER HIGH SUMP LEVEL
R 10LT

N.O.
LS-301

(REMOVED)
23
R6
AIR STRIPPER LOW SUMP LEVEL
R 11LT

LS-301

IR6
1 2 3 4 5 6
G RH H L RL G
N.O.
LS-300

24
R7
WET FLOOR/LEAK
R 12LT

1
SHEET 3

N
SHEET 3

AS BUILT

RL Stone company inc
630 CLEVELAND DRIVE • BUFFALO, NY 14225
716-834-2525

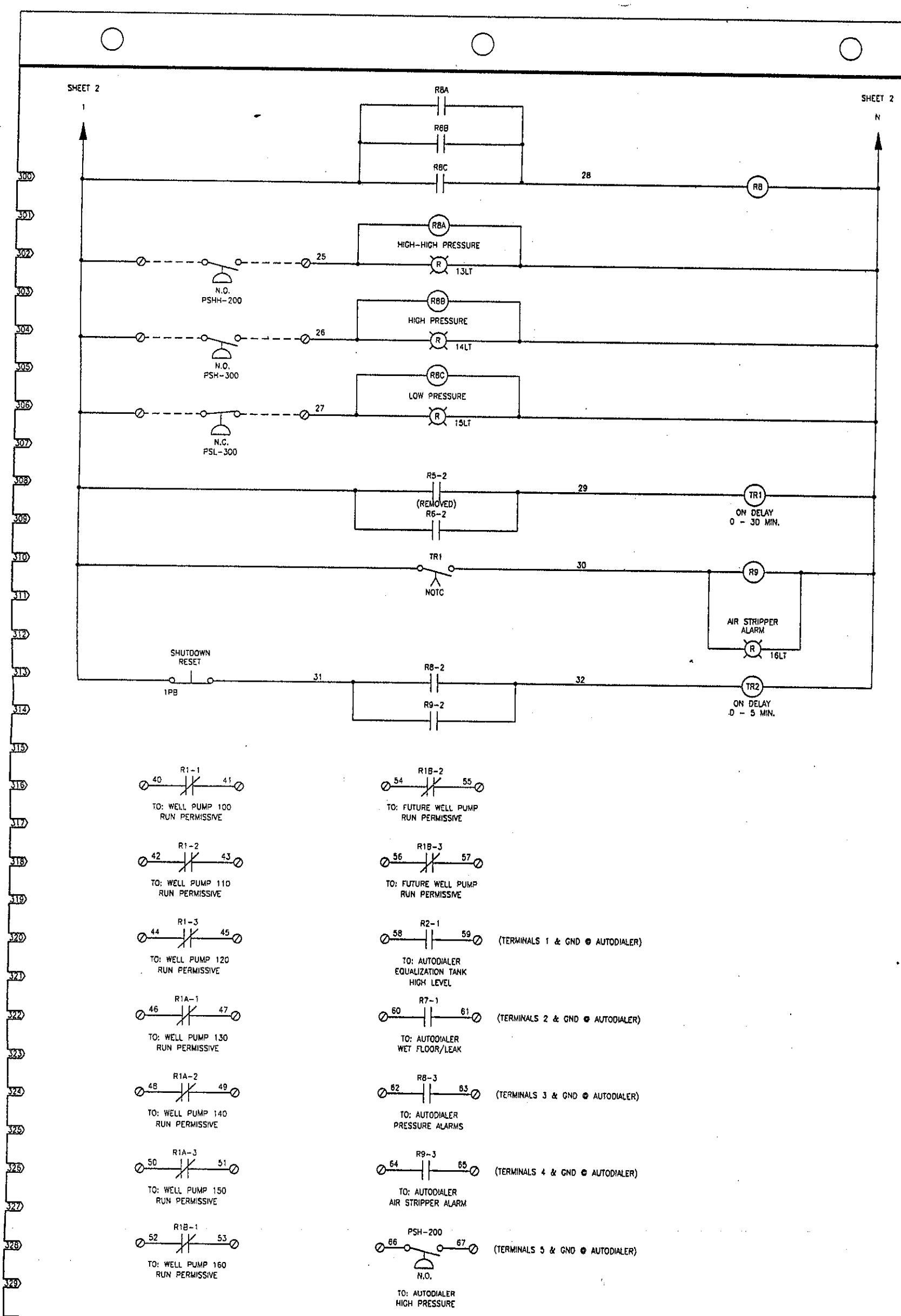
SCALE: DIM	PO# 20000895
TYPE: POWER SCHEMATIC	
DRAFTED: JPR	
BCS JOB: 001421	
DATE: 7/10/00	

TITLE: BAUSH & LOMB INCORPERATED CHILI, NEW YORK
SYSTEM CONTROL PANEL

DWG No: 20000895-2

SHT: 2 OF 5

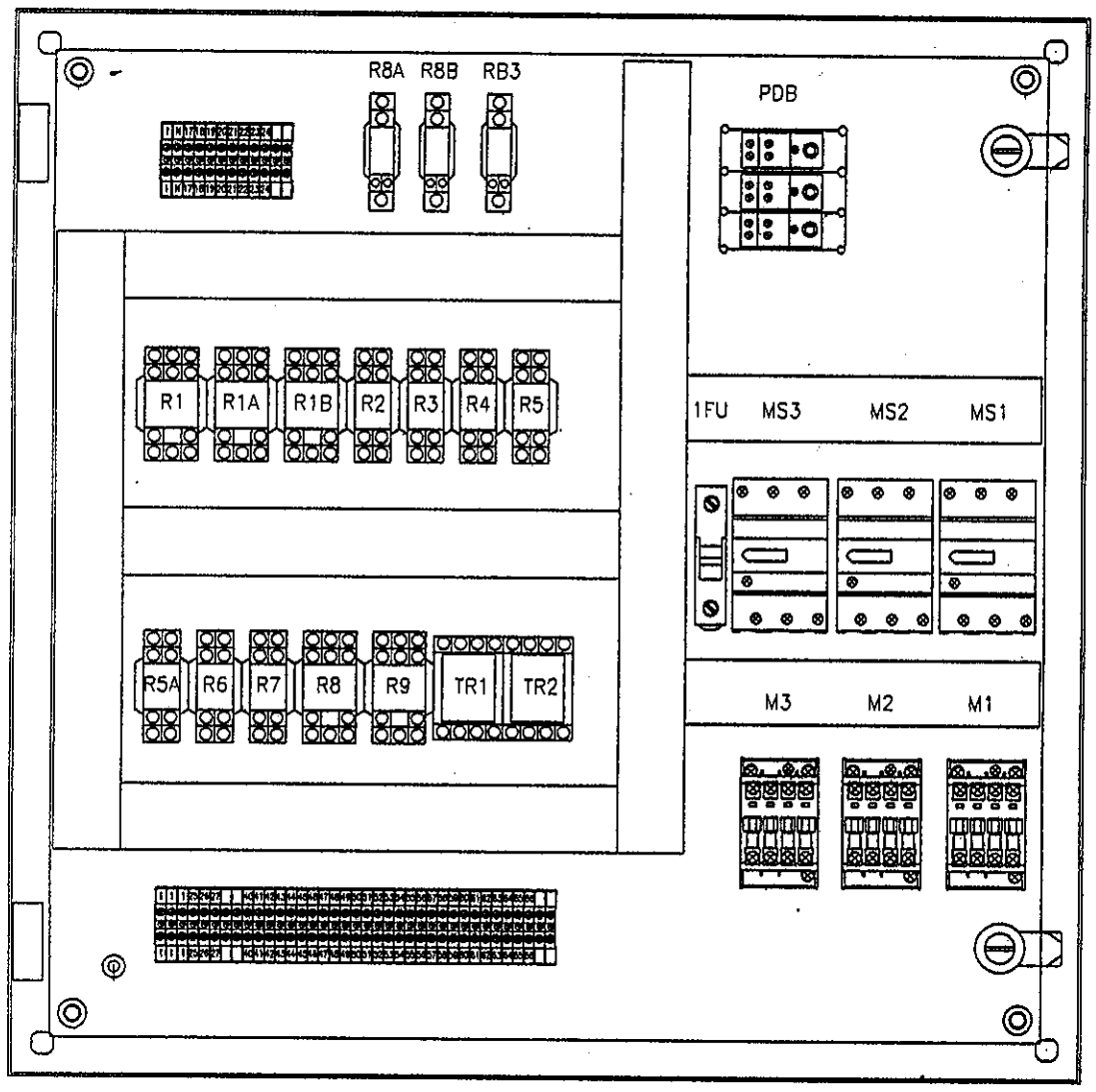
REV: B

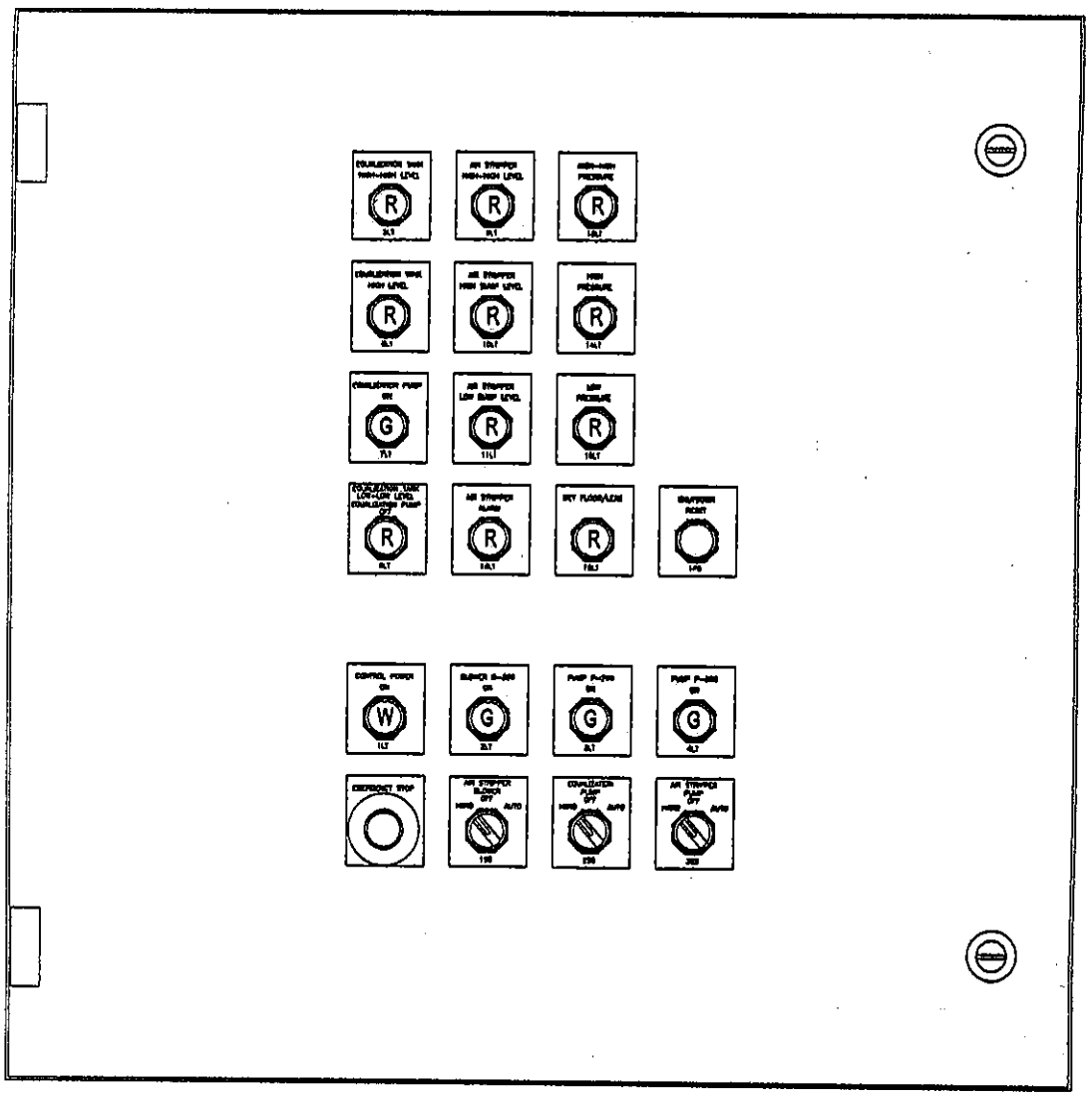


AS BUILT

RL Stone company inc
630 CLEVELAND DRIVE • BUFFALO, NY 14225
716-834-2525

SCALE: DIM	PO# 20000895
TYPE: POWER SCHEMATIC	
DRAFTED: JPR	
BCS JOB: 001421	
DATE: 7/10/00	
TITLE: BAUSH & LOMB INCORPERATED CHILI, NEW YORK SYSTEM CONTROL PANEL	
DWG No: 20000895-2	SHT: 3 OF 5
	REV: B





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	SCALE: DIM / PO# 20000895	DATE: 7/10/00	DWG No: 20000895-2 / SHT: 4 OF 5 / REV: B

SYSTEM CONTROL PANEL BILL OF MATERIAL

LINE #	ITEM	DESCRIPTION	MANUFACTURE	PART NUMBER	QTY
1	ENCLOSURE	NEMA 12 24 X 24 X 8 WALLMOUNT ENNCLOSURE	HAMMOND MFD	ESD24248CG	1
2	ENCLOSURE	22 X 22 STEEL BACKPANEL	HAMMOND MFG	EP2424	1
3	PDB	POWER DISTRIBUTION BLOCK	GOULD	63133	1
4	1FU	1 POLE MIDGET FUSE SWITCH	GOULD	USM1	1
5	1FU	5 AMP TIME DELAY FUSE	GOULD	TRM5	1
6	MS1	MANUAL MOTOR STARTER	ABB	MS325-12.5	1
7	MS2	MANUAL MOTOR STARTER	ABB	MS325-9.0	1
8	MS3	MANUAL MOTOR STARTER	ABB	MS325-6.3	1
9	MS1-3	MANUAL MOTOR STARTER AUXILIARY CONTACT	ABB	MS325-SK01	3
10	M1	12 AMP IEC CONTACTOR	ABB	A12-30-10-84	1
11	M2-3	9 AMP IEC CONTACTOR	ABB	A9-30-10-85	2
12	R1,R1A,R1B,R8,R9	3PDT RELAY, 120VAC COIL	IDEC	RH3B-UAC12DV	5
13	R1,R1A,R1B,R8,R9	3PDT RELAY SOCKET	IDEC	SH3B-05	5
14	R2,R3,R4,R5,R5A,R6,R7	DPDT RELAY, 120VAC COIL	IDEC	RH2B-UAC120V	7
15	R2,R3,R4,R5,R5A,R6,R7	DPDT RELAY SOCKET	IDEC	SH2B-05	7
16	R8A,R8B,R8C	1PDT RELAY, 120VAC COIL	IDEC	RH1B-UAC120V	3
17	R8A,R8B,R8C	1PDT RELAY SOCKET	IDEC	SH1B-05	3
18	TR1	MULTI FUNCTION TIMER, 120VAC COIL	IDEC	RTE-P12-AC120V	1
19	TR2	MULTI FUNCTION TIMER, 120VAC COIL	IDEC	RTE-P11-AC120V	1
20	TR1,TR2	TIMER SOCKET	IDEC	SR2P-06	2
21	1ES	RED MUSHROOM PUSH-PULL OPERATOR (W/1NC)	ABB	CBK-PMP40R-01	1
22	1SS,2SS,3SS	3 POSITION SELECTOR (W/1NO)	ABB	CBK-C3MK-20	3
23	1PB	BLACK MOMENTARY PUSHBUTTON (W/1NC)	ABB	CBK-CPB-01	1
24	1LT	WHITE PILOT LIGHT 120V LAMP	ABB	CBK-KLF1W	1
25	2LT,3LT,4LT,7LT	GREEN PILOT LIGHT 120V LAMP	ABB	CBK-KLF1G	4
26	5LT-6LT,8LT-16LT	RED PILOT LIGHT 120V LAMP	ABB	CBK-KLF1R	11
27	TERMINALS	IEC 30 AMP TERMINAL BLOCK	PHOENIX	3004362	49
28	TERMINALS	TERMINAL BLOCK END PLATE	PHOENIX	3003020	2
29	TERMINALS	TERMINAL BLOCK DIN RAIL CLAMPS	PHOENIX	3022218	4
30	GROUND LUG	PANEL GROUND LUG	ILSCO	TA-2	4
31	INTRINSIC RELAY ENCLOSURE	12 X 12 X 6 NEMA 12 ENCLOSURE	RITTAL/ELECTROMATE	E1212CH	1
32	INTRINSIC RELAY	1 CHANNEL INTRINSIC RELAY	WARRICK	SERIES 17A1	8

AS BUILT

Appendix J

Well Redevelopment Procedure

1. Introduction

This appendix describes methods of well redevelopment based on the type of plugging that has occurred.

2. Well Failure Caused by Physical Plugging of Screen and Surrounding Formation

Over time, almost all screened wells will undergo some loss in specific capacity. Some of this loss is attributable to the slow movement of fine formation particles into the area around the screen. Depending on the type of screen-slot opening, many of these particles may partially plug the screen itself, or even erode the slot openings under certain conditions. Thus, invasion of small particles reduces the yield, increases the drawdown in the well itself, and may damage the screen.

2.1 Polyphosphates and Surfactants

Silt and clay particles tend to adhere strongly to one another in a viscous state, which makes their removal from sand and gravel aquifers quite difficult. Wells that are plugged with silt and clay particles are most effectively restored to efficient conditions by treatment with dispersing and sequestering (chelating) compounds that belong to the polyphosphate family of chemicals. They have the power to separate clay particles. Dispersing agents cause the particles to repel one another, increasing their mobility sufficiently to allow them to move when water is pumped into and out of the well during the development process. Furthermore, the calcium, magnesium, and iron ions adhering to the fine particles can be requested (caused to remain in a soluble state) by the use of polyphosphates. Therefore, particles bonded together by these ions can be removed more easily from the aquifer.

Sodium polyphosphates, a family of white, free-flowing dry material, have been used widely with great success in treating clay-plugging problems. There are two types of sodium polyphosphates, crystalline and glassy. Crystalline polyphosphates that help remove clays from the aquifer are sodium acid pyrophosphate (SAPP), tetrasodium pyrophosphate (TSPP), and sodium tripolyphosphate (STP). Sodium hexametaphosphate (SHMP) is a glassy phosphate that is readily available and therefore often used in rehabilitating wells. Commercial trade names for sodium hexametaphosphate include Calgon™, Quadrafos™, and Polyphos™. Weltone™ is sodium hexametaphosphate mixed with a chlorinating chemical and wetting agent.

2.2 Physical Agitation

Agitation of the phosphate or surfactant solution is important in removing the maximum amount of fine material from the formation. Agitation of the chemical solution during rehabilitation can be done using a surge plunger, compressed air, well pump, or high-velocity jet. One of the most efficient methods of redeveloping wells with polyphosphates is high-velocity jetting, where the appropriate polyphosphate solution is used as the jetting fluid. If high-velocity jetting is not used, the polyphosphate solution should be placed in the well, forced into the formation adjacent to the screen, and agitated by jetting or surging the well.

When agitating with a high-velocity jet, it may be desirable to pump the well periodically at a low rate. In operation, jetting adds water to the well at the rate of 25 to 200 gallons per minute (gpm), depending on the size of the jetting nozzles and the pump pressure. The water pumped from the well can be recirculated to continue the jetting operation. Movement of water through the screen openings into well carries with it some of the sediment loosened by the jetting process. Material should be settled out in a tank or pit before being recirculated to avoid damaging the screen, pump, or jetting nozzle. Continuous removal of loosened material from the formation will

greatly improve the effectiveness of the polyphosphate treatment by allowing the phosphate to reach untreated parts of the formation more quickly.

3. Well Failure Caused by Incrustation

Chemical and biological incrustations are major causes of well failure. Water quality chiefly determines the occurrence of incrustation. The surface characteristics of the screen itself may also play a part in regulating the rate at which incrustation occurs. If the screen is constructed of rough surface metal, for example, incrustation may build up at a faster rate.

The incrustation often forms a hard, brittle, cement-like deposit similar to the scale found in water pipes. Under different conditions, however, it may be a soft, paste-like sludge or a gelatinous material. The major forms of incrustation include: (1) incrustation from precipitation of calcium and magnesium carbonates or their sulfates; (2) incrustation from precipitation of iron and manganese compounds, primarily their hydroxides or hydrated oxides; and (3) plugging caused by slime-producing iron bacteria or other slime-forming organisms (biofouling).

3.1 Sulfamic Acid

Sulfamic acid is a dry, white, granular material that produces a strong acid when mixed with water. Its solubility in water increases with temperature, ranging from 15 to 20 percent by weight at most prevailing groundwater temperatures. In its dry form, it is relatively safe to handle; the dry material does not give off fumes and will not irritate dry skin. If spillage occurs, it may be cleaned up easily and safely, providing for safer shipping and handling. If mixed at the surface, however, sulfamic acid should be handled as if it were hydrochloric acid. During treatment, this slowly dissolving acid releases dangerous fumes at a relatively slow rate; nevertheless, proper ventilation should always be provided. Less corrosion of pumps, screens, and casings will occur when an inhibitor is added to the acid. For example, little corrosion results when stainless steel well screens are treated repeatedly with an inhibited sulfamic acid. The pelletized form is used in wells completed with relatively short screens where the screens are located at the bottom of the well. Because the pellets are heavier than water, they sink through the column of water standing in the casing and then dissolve inside the screen. The pellets should dissolve in approximately four hours if oversaturation does not occur. Agitation of the water in the screen increases the solution rate of the chemical. The proper quantity of pelletized sulfamic acid required to treat the well is generally determined by the length and diameter of the well screen or by the length of water standing in the screen.

3.2 General Procedure for Acid Treatment

Great care should be taken in placing liquid acid into a well. Only experienced personnel with specialized equipment should attempt to use liquid acid in rehabilitation of a well. When using any liquid acid, personnel should wear protective rubber clothing and goggles. A breathing respirator should also be used by all personnel handling the acid and by other persons near the well. All mixing tanks, chemical pumps, and piping (tremie pipe) should be constructed of plastic or black iron to minimize reaction to the acid. A large quantity of water, or a water tank with a mixture of sodium bicarbonate, should be available in the event of an accidental release. Proper ventilation must be maintained because the fumes released from the well during treatment are lethal.

Liquid acid should be introduced into the well through a small-diameter pipe. Enough acid should be added to fill the lower 5 feet of screen. Then the pipe should be raised and the next 5 feet of screen filled with acid, continuing in this way until the entire screen is filled. Pelletized forms of sulfamic acid dropped into the casing will

accumulate in the screen where the pellets dissolve. When the granular forms are poured into the casing, they will go into solution throughout the entire column of water in the well.

After the acid is placed in the well (or the pellets have dissolved), a volume of water equal to that standing in the well screen is poured into the well to force the acid solution through the screen slot openings into the formation. Some form of mechanical agitation, such as surging, should be employed while the acid is in the well to help break up the incrustation and improve the overall efficiency of the process. This step is particularly important because it exposes the incrustant to the acid, thereby assuring maximum removal.

The use of surge blocks or jetting tools is an effective method of agitation in the well. The agitation time will depend on the amount of incrustation in the well. If a surge block is used, the surging effect drives the acid into the formation and brings loosened material into the screen. In the jetting operation, the acid is first poured into the well. The screen of the face of the well bore can then be jetted with clean water from the surface or acidified water from the well. A pump pressure of 100 to 250 pounds per square inch (psi) is sufficient for this type of operation. Circulation of the acid solution may be corrosive to the jetting pump and other equipment, but the wide use of plastic impellers has eliminated most of this type of corrosion damage. If the job requires recirculating the jetting acid at the surface, it is best to call on a well servicing company that has specialized equipment for this work. Great care should always be exercised whenever acid is being pumped in any well rehabilitation operation.

An extended zone of the formation around the well screen may be wholly or partially clogged. Thus, it must never be assumed that the chemical solution moves uniformly outward into the voids of the water-bearing materials in all directions throughout the full thickness of the formation. The chemical solutions will flow most readily into those areas where the formation or screen is the most open, that is, where the resistance to flow is the least. Therefore, it may be extremely difficult and even impossible to diffuse the chemical solution to all points where it can dissolve or to otherwise remove the unwanted deposits.

After mechanical agitation, the solution is left in the well to react with the incrusting material until the pH is between 6.5 and 7.0, then agitated again and pumped out of the well and containerized for disposal/treatment. The time for the reaction to the completed will vary from a few hours to more than 15 hours, depending on the type of acid used and the amount of incrustation. To minimize disposal problems, the water in the well should be neutralized, if necessary, before it is removed from the well.

3.3 Mechanical Methods to Remove Incrustation

Although removal of most incrustants by acid treatment is extremely effective, several mechanical methods are useful either in preparing for acid treatment or as a primary method of removing incrustants that have been deposited on the inside of the well screen. The loosened material is then removed from the well by bailing, air-lift pumping, or other means. Removal of these incrustants minimizes the quantity of acid that must be used in any subsequent acid treatment, enhances the effectiveness of this treatment, and reduces the time required for the acidification process.

Appendix K

Compendium of Historic Data

Table 1A. Quarterly Groundwater Sampling Results, Rounds 1 through 40, Summary of Detected Volatile Organic Compounds, Background Area, Former Bausch & Lomb Frame Center, Chili, NY

Site Area		Background																	
Location	NYSDEC	BL-01	BL-01	BL-01	BL-01	BL-01	BL-01	BL-01	BL-01	BL-01	BL-8R	BL-8R	BL-8R	BL-8R	BL-8R	BL-8R	BL-8R	BL-8R	BL-8R
Sample Date	GA	7/26/99	8/21/01	7/7/03	10/8/04	1/10/05	4/26/06	7/9/07	10/20/08	2/9/09	7/28/99	8/21/01	7/7/03	10/6/04	1/10/05	4/26/06	7/9/07	10/20/08	2/10/09
Sample Type	Criteria	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS
1,1,1-Trichloroethane	5	5 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	5 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
cis-1,2-Dichloroethene	5*	5 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	5 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Freon 113	NA	5 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	5 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Trichloroethene	5	5 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	5 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Vinyl chloride	2	5 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	5 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Total VOCs		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

See Notes on Page 15.

Table 1B. Quarterly Groundwater Sampling Results, Rounds 1 through 40, Summary of Detected Volatile Organic Compounds, BL-9S Area, Former Bausch & Lomb Frame Center, Chili, NY

Site Area		BL-9S														
Location	NYSDEC	BL-9D	BL-9D	BL-9D	BL-9D	BL-9D	BL-9D	BL-9D	BL-9D	BL-9D	BL-9D	BL-9D	BL-9D	BL-9D	BL-9D	BL-9D
Sample Date	GA	7/26/99	1/12/00	1/12/00	4/12/00	7/25/00	10/25/00	1/10/01	4/11/01	8/21/01	10/8/01	1/15/02	4/19/02	4/19/02	7/11/02	10/15/02
Sample Type	Criteria	FS	FS	DUP	FS	FS	FS	FS	FS	FS	FS	FS	FS	DUP	FS	FS
1,1,1-Trichloroethane	5	5 U	5 U	5 U	100 U	5 UJ	40 U	40 U	40 U	40 U	2 U	4 U	20 U	20 U	4 U	4 U
cis-1,2-Dichloroethene	5*	**870 D**	**54**	**48**	**3,300**	**1,200 DJ**	**155**	**601**	**620**	**133**	**85.3**	**364**	**1,550**	**1,590**	**199**	**42.5**
Freon 113	NA	5 U	5 U	5 U	100 U	5 UJ	40 U	40 U	40 U	40 U	**17.1**	**14.5**	20 U	20 U	**14.4**	**12.3**
Trichloroethene	5	**110**	5 U	5 U	**1,100**	**290 DJ**	40 U	**48.8**	40 U	**105**	**92.2**	**123**	**320**	**327**	**128**	**153**
Vinyl chloride	2	**160**	**110**	**100**	**740**	**520 DJ**	**67.5**	**224**	**257**	40 U	**15.1**	**74.3**	**317**	**307**	**88.9**	4 U
Total VOCs		**1,147**	**164**	**148**	**5,183**	**2,021**	**222.5**	**873.8**	**877**	**238**	**209.7**	**575.8**	**2,187**	**2,224**	**430.3**	**208**

Site Area		BL-9S														
Location	NYSDEC	BL-9D	BL-9D	BL-9D	BL-9D	BL-9D	BL-9D	BL-9D	BL-9D	BL-9D	BL-9D	BL-9D	BL-9D	BL-9D	BL-9D	BL-9D
Sample Date	GA	1/6/03	4/9/03	7/9/03	10/8/03	1/21/04	4/26/04	7/8/04	10/7/04	1/11/05	4/12/05	7/11/05	10/4/05	1/4/06	4/27/06	7/5/06
Sample Type	Criteria	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS
1,1,1-Trichloroethane	5	4 U	40 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
cis-1,2-Dichloroethene	5*	**432**	**2,360**	**146**	**38**	**197**	**440**	**353**	**479**	**366**	**428**	**140**	**40.3**	**223**	**105**	**117**
Freon 113	NA	**10.9**	40 U	**12.9**	**9.6**	**10**	**7.14**	4 U	**5.82**	**5.83**	**6.21**	**22.1**	**5.71**	**7.16**	**6**	4 U
Trichloroethene	5	**184**	**564**	**160**	**166**	**178**	**233**	**246**	**304**	**253**	**291**	**151**	**177**	**268**	**252**	**253**
Vinyl chloride	2	**182**	**510**	**15.4**	4 U	**59.5**	**68.4**	**49.8**	**95.9**	**78.4**	**58.9**	**26.9**	**6.04**	**44.8**	**26.8**	**23.7**
Total VOCs		**813.4**	**3,434**	**334.3**	**213.7**	**444.5**	**752.6**	**648.8**	**890.0**	**707.5**	**784.1**	**340.0**	**229.1**	**543.0**	**389.8**	**393.7**

Site Area		BL-9S														
Location	NYSDEC	BL-9D	BL-9D	BL-9D	BL-9D	BL-9D	BL-9D	BL-9D	BL-9D	BL-9D	BL-9D	BL-9D	BL-9D	BL-9S	BL-9S	BL-9S
Sample Date	GA	10/16/06	1/8/07	4/26/07	7/9/07	10/15/07	1/7/08	4/21/08	7/14/08	10/20/08	1/26/09	4/20/09	7/31/09	7/26/99	1/12/00	4/12/00
Sample Type	Criteria	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS
1,1,1-Trichloroethane	5	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	5 U	250 U	100 U
cis-1,2-Dichloroethene	5*	**78.6**	**63**	**35.9**	**36.3**	**35.8**	**119**	**82.9**	**42.1**	**48.8**	**39.1**	**41.1**	**75.7**	**5,300 D**	**19,000 D**	**2,300**
Freon 113	NA	**6.6**	**16.3**	**7.54**	**9.97**	**16.7**	**4.51**	4 U	4 U	**7.66**	4 U	4 U	4 U	5 U	250 U	100 U
Trichloroethene	5	**213**	**180**	**200**	**205**	**155**	**177**	**176**	**177**	**197**	**177**	**156**	**167**	**1,200 D**	**11,000 D**	**2,200**
Vinyl chloride	2	**20**	**37.4**	**8.32**	**8.86**	**6.04**	**33.5**	**18.5**	4 U	**9.2**	**12.4**	**15.5**	**38.8**	**1,000 D**	**670**	**94 J**
Total VOCs		**318.2**	**296.7**	**251.8**	**260.1**	**213.5**	**334.0**	**277.4**	**219.1**	**262.7**	**228.5**	**212.6**	**281.5**	**7,544**	**30,670**	**4,632**

Site Area		BL-9S														
Location	NYSDEC	BL-9S	BL-9S	BL-9S	BL-9S	BL-9S	BL-9S	BL-9S	BL-9S	BL-9S	BL-9S	BL-9S	BL-9S	BL-9S	BL-9S	BL-9S
Sample Date	GA	7/25/00	10/25/00	1/10/01	4/11/01	8/21/01	10/8/01	1/15/02	4/19/02	7/11/02	10/15/02	1/6/03	4/9/03	7/9/03	10/8/03	1/21/04
Sample Type	Criteria	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS
1,1,1-Trichloroethane	5	250 UJ	200 U	200 U	200 U	200 U	200 U	20 U	20 U	40 U	40 U	20 U	20 U	20 U	20 U	20 U
cis-1,2-Dichloroethene	5*	**13,000 DJ**	**14,900**	**13,300**	**5,970**	**2,200**	**2,650**	**1,480**	**2,510**	**2,620**	**3,810**	**604**	**1,540**	**1,840**	**776**	**656**
Freon 113	NA	250 UJ	200 U	200 U	200 U	200 U	200 U	20 U	20 U	40 U	40 U	20 U	20 U	20 U	20 U	20 U
Trichloroethene	5	**8,800 J**	**7,760**	**8,750**	**5,540**	**219**	200 U	**168**	**1,050**	**954**	**410**	**155**	**551**	**701**	**268**	**176**
Vinyl chloride	2	**2,800 J**	**1,980**	**759**	200 U	**330**	**520**	**214**	**136**	**76.8**	**845**	**139**	**108**	**90.4**	20 U	**29.5**
Total VOCs		**24,691**	**24,640**	**22,809**	**11,510**	**2,749**	**3,170**	**1,862**	**3,733.1**	**3,650.8**	**5,115**	**898**	**2,199**	**2,656.5**	**1,212.2**	**861.5**

See Notes on Page 15.

Table 1B. Quarterly Groundwater Sampling Results, Rounds 1 through 40, Summary of Detected Volatile Organic Compounds, BL-9S Area, Former Bausch & Lomb Frame Center, Chili, NY

Site Area		BL-9S														
Location	NYSDEC	BL-9S	BL-9S	BL-9S	BL-9S	BL-9S	BL-9S	BL-9S	BL-9S	BL-9S	BL-9S	BL-9S	BL-9S	BL-9S	BL-9S	BL-9S
Sample Date	GA	4/26/04	7/8/04	10/7/04	1/11/05	4/12/05	7/11/05	10/4/05	1/4/06	4/27/06	7/5/06	10/16/06	1/8/07	4/26/07	7/9/07	10/15/07
Sample Type	Criteria	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS
1,1,1-Trichloroethane	5	20 U	20 U	20 U	20 U	20 U	20 U	40 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	2 U
cis-1,2-Dichloroethene	5*	**831**	**939**	**636**	**774**	**911**	**1,180**	**2,090**	**298**	**158**	**533**	**482**	**303**	**237**	**252**	**587**
Freon 113	NA	20 U	20 U	20 U	20 U	20 U	20 U	40 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Trichloroethene	5	**363**	**468**	**285**	**239**	**514**	**385**	**383**	**113**	**69.9**	**154**	**231**	**137**	**122**	**137**	**133**
Vinyl chloride	2	**47.4**	**77.3**	**81.1**	**212**	**92.3**	**189**	**358**	**99.4**	**33.7**	**131**	**273**	**252**	**91.4**	**98.7**	**405**
Total VOCs		**1,214.4**	**1,484.3**	**1,002.1**	**1,246.1**	**1,517.3**	**1,778.4**	**2,871.3**	**510.4**	**261.6**	**818**	**1,009**	**692**	**450**	**488**	**1,147**

Site Area		BL-9S														
Location	NYSDEC	BL-9S	BL-9S	BL-9S	BL-9S	BL-9S	BL-9S	BL-9S	BL-17D	BL-17D	BL-17D	BL-17D	BL-17D	BL-17D	BL-17D	BL-17D
Sample Date	GA	1/7/08	4/21/08	7/14/08	10/20/08	1/26/09	4/20/09	7/13/09	1/12/00	4/11/00	7/26/00	10/26/00	1/10/01	4/12/01	8/21/01	10/8/01
Sample Type	Criteria	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS
1,1,1-Trichloroethane	5	2 U	2 U	5 U	20 U	2 U	20 U	2 U	5 U	5 U	5 UJ	2 U	2 U	2 U	2 U	2 U
cis-1,2-Dichloroethene	5*	**36**	**128**	**304**	**1,130**	**82.8**	**50.9**	**67.0**	5 U	5 U	5 UJ	2 U	2 U	2 U	2 U	2 U
Freon 113	NA	2 U	2 U	5 U	20 U	2 U	20 U	2 U	5 U	5 U	5 UJ	2 U	2 U	2 U	2 U	2 U
Trichloroethene	5	**31.3**	**82.4**	**63.2**	**160**	**39.1**	**30.7**	**33.9**	5 U	5 U	5 UJ	2 U	2 U	2 U	2 U	2 U
Vinyl chloride	2	**4.93**	**61.1**	**162**	**449**	**60.7**	**41.1**	**78.4**	5 U	5 U	5 UJ	2 U	2 U	2 U	2 U	2 U
Total VOCs		**74.9**	**280.9**	**537.3**	**1,769.3**	**182.6**	**122.7**	**179.3**	--	--	--	--	--	--	--	--

Site Area		BL-9S								
Location	NYSDEC	BL-17D	BL-17D	BL-17D	BL-17D	BL-17D	BL-17D	BL-17D	BL-17D	BL-17D
Sample Date	GA	1/15/02	4/19/02	7/7/03	10/5/04	1/10/05	4/25/06	7/12/07	10/20/08	2/10/09
Sample Type	Criteria	FS	FS	FS	FS	FS	FS	FS	FS	FS
1,1,1-Trichloroethane	5	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
cis-1,2-Dichloroethene	5*	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Freon 113	NA	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Trichloroethene	5	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Vinyl chloride	2	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Total VOCs		--	--	--	--	--	--	--	--	--

See Notes on Page 15.

Table 1C. Quarterly Groundwater Sampling Results, Rounds 1 through 40, Summary of Detected Volatile Organic Compounds, BL-16S Area, Former Bausch & Lomb Frame Center, Chili, NY

Site Area		BL-16S															
Location	NYSDEC	BL-14D	BL-14D	BL-14D	BL-14D	BL-14D	BL-14D	BL-14D	BL-14D	BL-14D	BL-14D	BL-14D	BL-14D	BL-14S	BL-14S	BL-14S	BL-14S
Sample Date	GA	1/13/00	7/26/00	1/12/01	8/21/01	1/15/02	7/9/03	10/6/04	1/11/05	4/27/06	7/9/07	10/20/08	2/11/09	7/27/99	1/13/00	4/12/00	7/26/00
Sample Type	Criteria	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS
1,1,1-Trichloroethane	5	5 U	5 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	**18**	**140**	**20**	**5**
cis-1,2-Dichloroethene	5*	5 U	5 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	5 U	**3 J**	10 U	5 U
Freon 113	NA	5 U	5 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	5 U	10 U	10 U	5 U
Trichloroethene	5	5 U	5 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	**280 DJ**	**1,700 D**	**310**	**120**
Vinyl chloride	2	5 U	5 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	5 U	10 U	10 U	5 U
Total VOCs		**6**	--	--	--	--	--	--	--	--	--	--	--	**328**	**2,037**	**369**	**137**

Site Area		BL-16S															
Location	NYSDEC	BL-14S	BL-14S	BL-14S	BL-14S	BL-14S	BL-14S	BL-14S	BL-14S	BL-14S	BL-14S	BL-14S	BL-14S	BL-14S	BL-14S	BL-14S	BL-14S
Sample Date	GA	10/25/00	1/10/01	4/11/01	8/21/01	10/8/01	1/15/02	4/19/02	7/11/02	10/16/02	1/6/03	4/9/03	7/9/03	10/8/03	1/21/04	4/26/04	7/8/04
Sample Type	Criteria	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS
1,1,1-Trichloroethane	5	20 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
cis-1,2-Dichloroethene	5*	20 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Freon 113	NA	20 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Trichloroethene	5	**75**	**12.7**	2 U	**7.75**	**11.1**	**2.74**	2 U	**3.45**	**2.9**	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Vinyl chloride	2	20 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Total VOCs		**75**	**12.7**	--	**7.75**	**11.1**	**2.74**	--	**3.45**	**2.92**	--	--	--	--	--	--	--

Site Area		BL-16S															
Location	NYSDEC	BL-14S	BL-14S	BL-14S	BL-14S	BL-14S	BL-14S	BL-14S	BL-14S	BL-14S	BL-14S	BL-14S	BL-14S	BL-14S	BL-14S	BL-14S	BL-14S
Sample Date	GA	10/6/04	1/11/05	4/12/05	7/11/05	10/4/05	1/5/06	4/27/06	10/16/06	1/9/07	4/26/07	7/9/07	10/15/07	1/7/08	4/21/08	7/14/08	10/20/08
Sample Type	Criteria	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS
1,1,1-Trichloroethane	5	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
cis-1,2-Dichloroethene	5*	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Freon 113	NA	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Trichloroethene	5	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Vinyl chloride	2	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Total VOCs		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Site Area		BL-16S															
Location	NYSDEC	BL-14S	BL-14S	BL-14S	BL-16S	BL-16S	BL-16S	BL-16S	BL-16S	BL-16S	BL-16S	BL-16S	BL-16S	BL-16S	BL-16S	BL-16S	BL-16S
Sample Date	GA	1/27/09	4/20/09	7/13/09	7/27/99	1/13/00	4/12/00	7/25/00	10/25/00	1/10/01	4/11/01	8/21/01	10/21/01	1/15/02	4/19/02	7/11/02	1/6/03
Sample Type	Criteria	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	Dry	Dry	FS	FS	FS	FS
1,1,1-Trichloroethane	5	2 U	2 U	2 U	**1,500 D**	**250**	**220**	**1,600 J**	**1,620**	**1,640**	**19.7**	NS	NS	**647**	**271**	**386**	**78**
cis-1,2-Dichloroethene	5*	2 U	2 U	2 U	**18**	100 U	50 U	50 UJ	200 U	200 U	2 U	NS	NS	200 U	100 U	100 U	20 U
Freon 113	NA	2 U	2 U	2 U	5 U	100 U	50 U	50 UJ	200 U	200 U	2 U	NS	NS	200 U	100 U	100 U	20 U
Trichloroethene	5	2 U	2 U	2 U	**19,000 D**	**2,300**	**2,000**	**14,000 DJ**	**14,400**	**11,700**	**253**	NS	NS	**6,880**	**3,320**	**4,210**	**953**
Vinyl chloride	2	2 U	2 U	2 U	5 U	100 U	50 U	50 UJ	200 U	200 U	2 U	NS	NS	200 U	100 U	100 U	20 U
Total VOCs		--	--	**23.5**	**21,071**	**2,550**	**2,278**	**16,340**	**16,314**	**13,594**	**276.25**	NS	NS	**7,527**	**3,591**	**4,596.0**	**1,031**

See Notes on Page 15.

Table 1C. Quarterly Groundwater Sampling Results, Rounds 1 through 40, Summary of Detected Volatile Organic Compounds, BL-16S Area, Former Bausch & Lomb Frame Center, Chili, NY

Site Area		BL-16S															
Location	NYSDEC	BL-16S	BL-16S	BL-16S	BL-16S	BL-16S	BL-16S	BL-16S	BL-16S	BL-16S	BL-16S	BL-16S	BL-16S	BL-16S	BL-16S	BL-16S	BL-16S
Sample Date	GA	4/9/03	7/9/03	1/21/04	4/26/04	7/8/04	10/6/04	1/11/05	4/12/05	7/11/05	10/4/05	1/5/06	4/27/06	7/5/06	10/16/06	1/9/07	4/26/07
Sample Type	Criteria	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS
1,1,1-Trichloroethane	5	100 U	**260**	**32.3**	100 U	**142**	**196**	**19.1**	**126**	**502**	**261**	100 U	100 U	**221**	100 U	100 U	**151**
cis-1,2-Dichloroethene	5*	100 U	100 U	10 U	100 U	100 U	100 U	10 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
Freon 113	NA	100 U	100 U	10 U	100 U	100 U	100 U	10 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
Trichloroethene	5	**1,140**	**2,920**	**436**	**914**	**2,060**	**3,230**	**326**	**1,970**	**7,000**	**4,000**	**783**	**1,790**	**4,670**	**1,430**	**801**	**2,750**
Vinyl chloride	2	100 U	100 U	10 U	100 U	100 U	100 U	10 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
Total VOCs		**1,140**	**3,180**	**468.3**	**914.0**	**2,202**	**3,426**	**345.1**	**2,096**	**7,502**	**4,261**	**783**	**1,790**	**4,891**	**1,430**	**801**	**2,901**

Site Area		BL-16S									BL-18S	BL-18S	BL-18S	BL-18S	BL-18S	BL-18S	BL-18S
Location	NYSDEC	BL-16S	BL-16S	BL-16S	BL-16S	BL-16S	BL-16S	BL-16S	BL-16S	BL-16S	BL-18S	BL-18S	BL-18S	BL-18S	BL-18S	BL-18S	BL-18S
Sample Date	GA	7/9/07	10/15/07	1/7/08	4/21/08	7/14/08	10/20/08	1/27/09	4/20/09	7/31/09	7/27/99	1/17/00	4/12/00	7/26/00	10/26/00	1/10/01	4/11/01
Sample Type	Criteria	FS	Dry	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS
1,1,1-Trichloroethane	5	**326**	NS	100 U	**32.1**	50 U	50 U	**22.7**	**105**	**96.2**	5 U	5 U	5 U	5 UJ	2 U	2 U	2 U
cis-1,2-Dichloroethene	5*	100 U	NS	100 U	10 U	50 U	50 U	5 U	50 U	50 U	5 U	5 U	5 U	5 UJ	2 U	2 U	2 U
Freon 113	NA	100 U	NS	100 U	10 U	50 U	50 U	5 U	50 U	50 U	5 U	5 U	5 U	5 UJ	2 U	2 U	2 U
Trichloroethene	5	**6,740**	NS	**210**	**511**	**3,820**	**4,600**	**446**	**2,080**	**1,920**	5 U	5 U	5 U	5 UJ	2 U	2 U	2 U
Vinyl chloride	2	100 U	NS	100 U	10 U	50 U	50 U	5 U	50 U	50 U	5 U	5 U	5 U	5 UJ	2 U	2 U	2 U
Total VOCs		**7,066**	NS	**210**	**543.1**	**3,820**	**4,652**	**469**	**2,185**	**2,016**	--	--	--	--	--	--	--

Site Area		BL-16S										
Location	NYSDEC	BL-18S	BL-18S	BL-18S	BL-18S	BL-18S	BL-18S	BL-18S	BL-18S	BL-18S	BL-18S	BL-18S
Sample Date	GA	8/21/01	10/8/01	1/15/02	4/19/02	7/9/03	10/5/04	1/11/05	4/25/06	7/9/07	10/20/08	2/11/09
Sample Type	Criteria	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS
1,1,1-Trichloroethane	5	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
cis-1,2-Dichloroethene	5*	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Freon 113	NA	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Trichloroethene	5	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Vinyl chloride	2	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Total VOCs		--	--	--	--	--	--	--	--	--	--	--

See Notes on Page 15.

Table 1D. Quarterly Groundwater Sampling Results, Rounds 1 through 40, Summary of Detected Volatile Organic Compounds, BL-11D Area, Former Bausch & Lomb Frame Center, Chili, NY

Site Area		BL-11D														
Location	NYSDEC	BL-20Sr	BL-20Sr	BL-20Sr	BL-20Sr	BL-20Sr	BL-20Sr	BL-20Sr	BL-20Sr	BL-20Sr	BL-20Sr	BL-20Sr	BL-20Sr	BL-20Sr	BL-20Sr	BL-20Sr
Sample Date	GA	7/28/99	1/13/00	4/12/00	7/25/00	10/26/00	1/10/01	4/12/01	8/21/01	10/9/01	1/14/02	4/19/02	7/9/02	10/16/02	1/8/03	4/10/03
Sample Type	Criteria	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS
1,1,1-Trichloroethane	5	**890 D**	**880**	**720**	**790 J**	**577**	**500**	**268**	**191**	**247**	**327**	**404**	**218**	**171**	**187**	**105**
cis-1,2-Dichloroethene	5*	**1,800 D**	**1,400**	**1,400**	**1,500 J**	**1,240**	**1,120**	**522**	**307**	**163**	**248**	**685**	**423**	**208**	**285**	**199**
Freon 113	NA	**800 D**	**930**	**680**	**700 J**	**93.8**	**662**	**352**	**268**	**448**	**653**	**670**	**250**	**275**	**305**	**140**
Trichloroethene	5	**3,000 D**	**3,000**	**2,300**	**2,600 DJ**	**2,200**	**1,670**	**1,060**	**610**	**579**	**1,330**	**1,740**	**963**	**655**	**827**	**530**
Vinyl chloride	2	**290 D**	**420**	**400**	**400 J**	**323**	**225**	**76.3**	40 U	40 U	40 U	**136**	**20.8**	20 U	**41.4**	**29.2**
Total VOCs		**6,947**	**7,017**	**5,649**	**6,343**	**4,487.8**	**4,234.8**	**2,333.5**	**1,376.0**	**1,437**	**2,600**	**3,678**	**1,897.2**	**1,330**	**1,683.6**	**1,003.2**

Site Area		BL-11D														
Location	NYSDEC	BL-20Sr	BL-20Sr	BL-20Sr	BL-20Sr	BL-20Sr	BL-20Sr	BL-20Sr	BL-20Sr	BL-20Sr	BL-20Sr	BL-20Sr	BL-20Sr	BL-20Sr	BL-20Sr	BL-20Sr
Sample Date	GA	7/7/03	10/8/03	4/26/04	7/8/04	10/8/04	1/10/05	4/11/05	7/13/05	10/6/05	1/3/06	4/26/06	7/5/06	10/16/06	1/8/07	4/26/07
Sample Type	Criteria	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS
1,1,1-Trichloroethane	5	**91.2**	**92.4**	**3.05**	**5.46**	**12.5**	2 U	**3.83**	**21.6**	**19**	**6.11**	**5.07**	**13.5**	2 U	2 U	2 U
cis-1,2-Dichloroethene	5*	**182**	**112**	**3.85**	**7.23**	**17.6**	**4.81**	**5.47**	**44.2**	**36.7**	**10.2**	**5.6**	**29.5**	2 U	2 U	2 U
Freon 113	NA	**116**	**148**	**4.53**	**4.53**	**15.9**	2 U	**3.15**	**13.9**	**17.5**	**8.3**	**2.97**	**12.5**	2 U	2 U	2 U
Trichloroethene	5	**446**	**408**	**16**	**33.7**	**72.2**	**15.1**	**22.8**	**137**	**119**	**37**	**30.1**	**113**	2 U	2 U	**10.5**
Vinyl chloride	2	20 U	20 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Total VOCs		**835.2**	**984.4**	**27.43**	**50.92**	**102.30**	**19.91**	**35.25**	**217.17**	**194.75**	**61.61**	**43.74**	**176.75**	--	--	**10.5**

Site Area		BL-11D								
Location	NYSDEC	BL-20Sr	BL-20Sr	BL-20Sr	BL-20Sr	BL-20Sr	BL-20Sr	BL-20Sr	BL-20Sr	BL-20Sr
Sample Date	GA	7/10/07	10/15/07	1/7/08	4/21/08	7/14/08	10/20/08	1/28/09	4/17/09	7/14/09
Sample Type	Criteria	FS	FS	FS	FS	FS	FS	FS	FS	FS
1,1,1-Trichloroethane	5	**9.46**	**5.29**	2 U	2 U	2 U	2 U	2 U	2 U	2 U
cis-1,2-Dichloroethene	5*	**18.7**	**15.8**	2 U	2 U	**4.51**	2 U	**2.03**	2 U	2 U
Freon 113	NA	**13.2**	**14.1**	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Trichloroethene	5	**77.2**	**50.9**	**9.12**	**7.08**	**23.0**	**10.8**	**9.5**	2 U	**2.2**
Vinyl chloride	2	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Total VOCs		**118.56**	**86.09**	**9.12**	**7.08**	**27.51**	**10.80**	**11.54**	--	**42.80**

* Note that analytical report states ID as BL-20SR.

See Notes on Page 15.

Table 1E. Quarterly Groundwater Sampling Results, Rounds 1 through 40, Summary of Detected Volatile Organic Compounds, Western Boundary Area (Onsite), Former Bausch & Lomb Frame Center, Chili, NY

Site Area		Western (onsite)															
Location	NYSDEC	BL-25D	BL-25D	BL-25D	BL-25D	BL-25D	BL-25D	BL-25D	BL-25D	BL-25D	BL-25D	BL-25D	BL-25D	BL-25D	BL-25D	BL-25D	BL-25D
Sample Date	GA	7/28/99	8/12/99	8/12/99	1/14/00	4/11/00	7/26/00	10/26/00	1/11/01	4/12/01	8/20/01	8/20/01	10/9/01	1/15/02	4/18/02	7/11/02	10/15/02
Sample Type	Criteria	FS	FS	DUP	FS	FS	FS	FS	FS	FS	FS	DUP	FS	FS	FS	FS	FS
1,1,1-Trichloroethane	5	5 U	5	5	5 U	5 U	18 J	6.7	5 U	5 U	5 U	5 U	5 U	2 U	2 U	2 U	2 U
cis-1,2-Dichloroethene	5*	5 U	370 D	370 D	61	8	270 DJ	88.9	42	14.8	16.8	19.8	29.8	17.6	16.5	2 U	16.2
Freon 113	NA	5 U	150	140	16	3 J	180 J	8.3	18.2	5 U	5.55	7.23	13.4	5.21	3.49	2 U	9.2
Trichloroethene	5	4 J	1,100 D	1,100 D	130	34	1,200 DJ	337	145	53.7	69.2	83.6	119	67.1	61	2 U	51.1
Vinyl chloride	2	5 U	36	32	8	5 U	32 J	10.4	5 U	5 U	5 U	5 U	5 U	2 U	2 U	2 U	2 U
Total VOCs		45	1,792	1,775	237	45	1,780	491.12	211.91	68.5	91.55	110.63	162.2	92.45	83.2	--	79.8

Site Area		Western (onsite)															
Location	NYSDEC	BL-25D	BL-25D	BL-25D	BL-25D	BL-25D	BL-25D	BL-25D	BL-25D	BL-25D	BL-25D	BL-25D	BL-25D	BL-25D	BL-25D	BL-25D	BL-25D
Sample Date	GA	1/7/03	4/11/03	7/8/03	10/8/03	1/21/04	4/28/04	7/8/04	10/7/04	1/10/05	4/12/05	7/12/05	10/6/05	1/3/06	4/27/06	7/5/06	10/16/06
Sample Type	Criteria	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS
1,1,1-Trichloroethane	5	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
cis-1,2-Dichloroethene	5*	30.2	9.26	2 U	7.35	2 U	4.41	2 U	2 U	4.56	2 U	2 U	2 U	10.4	5.15	7.81	4.17
Freon 113	NA	6.02	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2.91	2.41	2 U
Trichloroethene	5	81.6	34.9	6.06	35.4	10.6	16.7	4.78	11.3	16.3	7.89	3.59	8.45	32.5	24	36.2	22.3
Vinyl chloride	2	3.42	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Total VOCs		129.2	44.16	6.06	42.75	10.6	21.11	4.78	11.3	20.86	7.89	3.59	8.45	42.9	32.06	46.42	26.47

Site Area		Western (onsite)															
Location	NYSDEC	BL-25D	BL-25D	BL-25D	BL-25D	BL-25D	BL-25D	BL-25D	BL-25D	BL-25D	BL-25D	BL-25D	BL-25S	BL-25S	BL-25S	BL-25S	BL-25S
Sample Date	GA	1/8/07	4/24/07	7/10/07	10/16/07	1/7/08	4/22/08	7/15/08	10/22/08	1/28/09	4/20/09	7/14/09	7/29/99	1/14/00	4/11/00	7/26/00	10/26/00
Sample Type	Criteria	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS
1,1,1-Trichloroethane	5	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	5 UJ	5 U	5 U	5 UJ	2 U
cis-1,2-Dichloroethene	5*	2 U	3.38	2.4	4.88	10.1	2.61	2.89	6.23	4.89	2.4	3.3	5 UJ	5 U	5 U	5 UJ	2 U
Freon 113	NA	2 U	2 U	2 U	3.82	2 U	2 U	2 U	2 U	2 U	2 U	2 U	5 UJ	5 U	5 U	5 UJ	3.75
Trichloroethene	5	2 U	13.4	15.4	16.6	25.6	10.2	14	21.2	15.9	9.43	12	5 UJ	5 U	5 U	5 UJ	2 U
Vinyl chloride	2	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	5 UJ	5 U	5 U	5 UJ	2 U
Total VOCs		--	16.78	17.8	25.3	35.7	12.81	16.89	27.43	20.79	11.83	38.5	--	--	--	--	3.75

Site Area		Western (onsite)															
Location	NYSDEC	BL-25S	BL-25S	BL-25S	BL-25S	BL-25S	BL-25S	BL-25S	BL-25S	BL-25S	BL-25S	BL-25S	BL-25S	BL-25S	EW-100	EW-100	EW-100
Sample Date	GA	1/11/01	4/12/01	8/21/01	10/8/01	1/14/02	4/18/02	7/8/03	10/7/04	1/10/05	4/27/06	7/12/07	10/22/08	2/9/09	10/25/00	11/8/00	12/6/00
Sample Type	Criteria	FS	FS	Dry	Dry	Dry	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS
1,1,1-Trichloroethane	5	2 U	2 U	NS	NS	NS	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
cis-1,2-Dichloroethene	5*	2 U	2 U	NS	NS	NS	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	115	98.6	89.7
Freon 113	NA	2 U	2 U	NS	NS	NS	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	4.65	9.3
Trichloroethene	5	2 U	2 U	NS	NS	NS	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	111	94.5	90.5
Vinyl chloride	2	2 U	2 U	NS	NS	NS	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	19.4	17.9	20.3
Total VOCs		--	--	NS	NS	NS	--	--	--	--	--	--	--	--	286.6	252.45	251.7

See Notes on Page 15.

Table 1E. Quarterly Groundwater Sampling Results, Rounds 1 through 40, Summary of Detected Volatile Organic Compounds, Western Boundary Area (Onsite), Former Bausch & Lomb Frame Center, Chili, NY

Site Area		Western (onsite)															
Location	NYSDEC	EW-100	EW-100	EW-100	EW-100	EW-100	EW-100	EW-100	EW-100	EW-100	EW-100	EW-100	EW-100	EW-100	EW-100	EW-100	EW-100
Sample Date	GA	1/11/01	8/20/01	10/9/01	1/14/02	4/18/02	7/11/02	7/11/02	10/14/02	10/12/06	1/7/03	4/11/03	7/8/03	10/7/03	1/21/04	4/29/04	7/6/04
Sample Type	Criteria	FS	FS	FS	FS	FS	FS	Dup	FS	FS	FS	FS	FS	FS	FS	FS	FS
1,1,1-Trichloroethane	5	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
cis-1,2-Dichloroethene	5*	**77.2**	**40.2**	**36.4**	**26.3**	**27.4**	**27.4**	**28.2**	**23.4**	**9.33**	**17.3**	**18.9**	**22.4**	**16.3**	**13.2**	**13**	**11.2**
Freon 113	NA	**5.93**	**2.83**	**2.83**	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Trichloroethene	5	**50.2**	**28.2**	**24.8**	**18.5**	**18.3**	**18.9**	**20.1**	**18**	**11**	**12.4**	**13.2**	**15.5**	**14.7**	**10.5**	**10.1**	**11.4**
Vinyl chloride	2	**12.2**	**3.61**	**3.23**	**2.3**	2 U	**7.93**	**8.22**	2 U	2 U	**2.27**	2 U	2 U	2 U	2 U	2 U	2 U
Total VOCs		**172.16**	**85.87**	**76.94**	**51.76**	**50.24**	**61.6**	**64.02**	**46.1**	**20.33**	**35.3**	**36.26**	**41.7**	**33.85**	**26.57**	**25.67**	**24.96**

Site Area		Western (onsite)															
Location	NYSDEC	EW-100	EW-100	EW-100	EW-100	EW-100	EW-100	EW-100	EW-100	EW-100	EW-100	EW-100	EW-100	EW-100	EW-100	EW-100	EW-100
Sample Date	GA	10/4/04	1/13/05	4/15/05	7/13/05	10/4/05	1/6/06	4/19/06	7/7/06	1/9/07	4/13/07	7/12/07	10/11/07	1/8/08	4/23/08	7/16/08	10/2/08
Sample Type	Criteria	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS
1,1,1-Trichloroethane	5	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
cis-1,2-Dichloroethene	5*	**13.9**	**9.35**	**7.04**	**8.31**	**8.4**	**8.89**	**12.6**	**8.9**	**10.4**	**7.99**	**8.1**	**8.79**	**7.48**	**8.3**	**6.99**	**8.61**
Freon 113	NA	2 U	2 U	2 U	5 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Trichloroethene	5	**12.6**	**8.19**	**18.7**	**9.5**	**8.1**	**8.55**	**13.5**	**8.95**	**11.1**	**7.38**	**9.93**	**8.9**	**7.66**	**9.43**	**7.47**	**9.39**
Vinyl chloride	2	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Total VOCs		**28.83**	**17.54**	**25.74**	**20.08**	**19.25**	**17.44**	**29.16**	**17.85**	**24.88**	**15.37**	**20.07**	**17.69**	**15.14**	**17.73**	**14.46**	**18**

Site Area		Western (onsite)															
Location	NYSDEC	EW-100	EW-100	EW-100	EW-110	EW-110	EW-110	EW-110	EW-110	EW-110	EW-110	EW-110	EW-110	EW-110	EW-110	EW-110	EW-110
Sample Date	GA	1/23/09	4/17/09	7/15/09	10/25/00	11/8/00	12/15/00	1/11/01	8/21/01	10/9/01	1/14/02	4/18/02	7/11/02	10/14/02	1/7/03	1/7/03	4/11/03
Sample Type	Criteria	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	DUP	FS
1,1,1-Trichloroethane	5	2 U	2 U	2 U	5 U	5 U	5 U	5 U	5 U	2 U	5 U	2 U	2 U	2 U	2 U	2 U	2 U
cis-1,2-Dichloroethene	5*	**7.77**	**6.38**	**5.64**	**179**	**173**	**168**	**157**	**51.4**	**57.9**	**61.6**	**59.3**	**42.7**	**30.5**	**32.6**	**22.9**	**27.5**
Freon 113	NA	2 U	2 U	2 U	**8.33**	**23.8**	**43.4**	**28.9**	**8.38**	**9.25**	**7.73**	**7.24**	**5.79**	**5.9**	**4.05**	**2.9**	**3.16**
Trichloroethene	5	**8.28**	**7.33**	**6.18**	**425**	**418**	**388**	**263**	**84.4**	**89.5**	**93.6**	**91.4**	**71.8**	**62.2**	**54.8**	**42.3**	**49.3**
Vinyl chloride	2	2 U	2 U	2 U	**18.9**	**19**	**23.1**	**13.2**	5 U	**3.74**	5 U	**4.44**	**8.08**	2 U	**3.69**	2 U	2 U
Total VOCs		**16.05**	**13.71**	**11.82**	**702.43**	**701.2**	**709.6**	**521.2**	**162.11**	**180.45**	**180.98**	**179.49**	**142.37**	**108**	**106.1**	**73.4**	**88.34**

Site Area		Western (onsite)															
Location	NYSDEC	EW-110	EW-110	EW-110	EW-110	EW-110	EW-110	EW-110	EW-110	EW-110	EW-110	EW-110	EW-110	EW-110	EW-110	EW-110	EW-110
Sample Date	GA	7/8/03	10/7/03	1/21/04	4/29/04	7/6/04	10/4/04	1/13/05	4/15/05	7/12/05	10/4/05	1/5/06	4/19/06	7/706	10/12/06	1/9/07	4/13/07
Sample Type	Criteria	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS
1,1,1-Trichloroethane	5	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
cis-1,2-Dichloroethene	5*	**18.9**	**20.6**	**21.9**	**18**	**12.1**	**9.69**	**4.22**	**13.5**	**5.99**	**6.8**	**6.9**	**7.46**	**4.54**	**5.28**	**5.58**	**8.76**
Freon 113	NA	**2.7**	**3.1**	**3.22**	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	**4.29**	**2.28**
Trichloroethene	5	**29.7**	**42.5**	**39**	**33.4**	**30.4**	**23.3**	**11.4**	**13.6**	**18.8**	**19**	**17.7**	**22.3**	**13.1**	**17.2**	**14.8**	**18.8**
Vinyl chloride	2	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Total VOCs		**55.3**	**73.27**	**69.53**	**55.64**	**12.1**	**35.08**	**15.62**	**29.77**	**26.95**	**25.8**	**24.6**	**32.17**	**17.64**	**22.48**	**27.45**	**32.3**

See Notes on Page 15.

Table 1E. Quarterly Groundwater Sampling Results, Rounds 1 through 40, Summary of Detected Volatile Organic Compounds, Western Boundary Area (Onsite), Former Bausch & Lomb Frame Center, Chili, NY

Site Area		Western (onsite)															
Location	NYSDEC	EW-110	EW-110	EW-110	EW-110	EW-110	EW-110	EW-110	EW-110	EW-110	EW-120	EW-120	EW-120	EW-120	EW-120	EW-120	EW-120
Sample Date	GA	7/12/07	10/11/07	1/8/08	4/23/08	7/15/08	10/2/08	1/23/09	4/17/09	7/15/09	10/26/00	11/8/00	12/6/00	10/9/01	10/14/02	10/7/03	10/4/04
Sample Type	Criteria	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS
1,1,1-Trichloroethane	5	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	5 U	5 U	5.08	5 U	5 U	5 U	2 U
cis-1,2-Dichloroethene	5*	6.68	8.16	5.49	3.61	3.77	3.47	2 U	3.46	2 U	151	153	127	55.1	41	15.7	12.4
Freon 113	NA	2.26	3.94	2 U	2 U	2 U	2 U	2 U	2 U	2 U	9.38	30.2	55	29.9	23.1	5.68	2.95
Trichloroethene	5	13.5	17.7	13.5	10	11	10.7	4.94	8.52	5.91	497	504	440	150	112	52.2	47.5
Vinyl chloride	2	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	16.5	18.3	18.7	5 U	5 U	5 U	2 U
Total VOCs		25.04	31.88	18.99	13.61	14.77	14.17	4.94	11.98	5.91	742.28	771.7	710.98	255.19	186	73.58	66.32

Site Area		Western (onsite)															
Location	NYSDEC	EW-120	EW-120	EW-120	EW-120	EW-130	EW-130	EW-130	EW-130	EW-130	EW-130	EW-130	EW-130	EW-130	EW-130	EW-130	EW-140
Sample Date	GA	10/4/05	10/12/06	10/11/07	10/2/08	10/26/00	11/8/00	12/6/00	10/9/01	10/14/02	10/7/03	10/4/04	10/4/05	10/12/06	10/11/07	10/3/08	10/26/00
Sample Type	Criteria	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS
1,1,1-Trichloroethane	5	5 U	5 U	2 U	2 U	42.7	54.7	67.3	40.2	25.2	14.5	4.76	10 U	10 U	2 U	2 U	105
cis-1,2-Dichloroethene	5*	5.15	18.7	12.6	11.2	222	244	245	209	180	16.3	66.1	11.7	45.8	38.6	2 U	314
Freon 113	NA	5 U	8.98	15.2	3.46	27.4	83.5	169	140	109	76.5	29.7	11.4	22.7	63.3	17.7	67.4
Trichloroethene	5	26.6	80.9	41.8	39.6	826	880	847	554	534	430	237	79.5	223	136	164	2,280
Vinyl chloride	2	5 U	5 U	2 U	2 U	38	45	57.6	23.8	23	17.8	6.49	10 U	10 U	2.99	5.29	32.9
Total VOCs		31.75	108.58	72.41	56.93	1,213	1,376	1,445.8	1,010.9	907	684.7	362.0	102.6	291.5	249.6	198.02	2,918.4

Site Area		Western (onsite)															
Location	NYSDEC	EW-140	EW-140	EW-140	EW-140	EW-140	EW-140	EW-140	EW-140	EW-140	EW-140	EW-150	EW-150	EW-150	EW-150	EW-150	EW-150
Sample Date	GA	11/8/00	12/6/00	10/9/01	10/15/02	10/7/03	10/4/04	10/4/05	10/12/06	10/11/07	10/3/08	10/25/00	11/8/00	12/6/00	10/9/01	10/14/02	10/7/03
Sample Type	Criteria	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS
1,1,1-Trichloroethane	5	219	134	88.8	40 U	42.1	58.5	42.3	40 U	13.4	5 U	10 U	10 U	10 U	10 U	10 U	2 U
cis-1,2-Dichloroethene	5*	977	397	153	60.7	180	213	142	156	141	115	1,020	711	756	118	71.9	19.1
Freon 113	NA	209	616	361	40 U	161	129	132	104	266	66.6	10 U	10 U	10 U	10.9	10 U	2 U
Trichloroethene	5	3,520	3,150	1,160	275	1,160	1,060	921	894	549	430	635	472	603	130	123	28
Vinyl chloride	2	180	68.3	40 U	40 U	40 U	20 U	40 U	40 U	10 U	5 U	272	213	223	13.9	10 U	3.1
Total VOCs		5,379.7	4,513.7	1,805	336	1,557.1	1,460.5	1,237.3	1,154	982.3	667.07	1,938.7	1,396	1,582	272.8	195	50.2

Site Area		Western (onsite)															
Location	NYSDEC	EW-150	EW-150	EW-150	EW-150	EW-150	EW-160	EW-160	EW-160	EW-160	EW-160	EW-160	EW-160	EW-160	EW-160	EW-160	EW-160
Sample Date	GA	10/4/04	10/4/05	10/12/06	10/11/07	10/3/08	10/25/00	11/8/00	12/6/00	10/9/01	10/14/02	10/7/03	10/4/04	10/4/05	10/12/06	10/11/07	10/2/08
Sample Type	Criteria	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS
1,1,1-Trichloroethane	5	2 U	10 U	10 U	2 U	2 U	14.3	64.9	45.3	20 U	20 U	92.4	2 U	20 U	20 U	2 U	2 U
cis-1,2-Dichloroethene	5*	155	43.8	149	54.9	55	5 U	20 U	20 U	20 U	20 U	20 U	2 U	20 U	20 U	2 U	2 U
Freon 113	NA	5.46	10 U	10 U	26.2	5.58	5 U	20 U	--	20 U	20 U	20 U	2 U	20 U	20 U	2 U	2 U
Trichloroethene	5	154	105	136	118	110	441	1,700	1,180	188	114	116	2 U	127	402	103	196
Vinyl chloride	2	27.4	10 U	36.8	6.68	8.26	5 U	20 U	20 U	20 U	20 U	20 U	2 U	20 U	20 U	2 U	2 U
Total VOCs		343.94	148.8	321.8	205.78	178.8	493.6	1,903.8	1,312.6	188	114	208.4	94.11	127	402	112.51	211.19

See Notes on Page 15.

Table 1F. Quarterly Groundwater Sampling Results, Rounds 1 through 40, Summary of Detected Volatile Organic Compounds, Western Boundary Area (Carriage House Estate Properties), Former Bausch & Lomb Frame Center, Chili, NY

Site Area		Western (Carriage House)															
Location	NYSDEC	CH-3D	CH-3D	CH-3D	CH-3D	CH-3D	CH-3D	CH-3D	CH-3D	CH-3D	CH-3D	CH-3D	CH-3D	CH-3D	CH-3D	CH-3D	CH-3D
Sample Date	GA	7/28/99	1/17/00	4/11/00	7/25/00	10/25/00	1/11/01	4/12/01	8/20/01	10/9/01	1/14/02	4/18/02	7/10/02	10/15/02	10/15/02	1/8/03	4/11/03
Sample Type	Criteria	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	DUP	FS	FS
1,1,1-Trichloroethane	5	5 U	5 U	5 U	5 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
cis-1,2-Dichloroethene	5*	5 U	**24**	**96**	**110**	**98.4**	**48.1**	**50.5**	**20.2**	**18.3**	**13**	**11**	**9.23**	**7.3**	**7.2**	**5.72**	**7.41**
Freon 113	NA	5 U	5 U	**5**	**7**	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Trichloroethene	5	5 U	5 U	**18**	**36**	**33.6**	**7.07**	**9.74**	**3.16**	**2.58**	**2**	2 U	2 U	2 U	2 U	2 U	2 U
Vinyl chloride	2	5 U	**14**	**25**	**17**	**17.8**	**8.45**	**9.8**	**3.87**	**3.12**	**2.58**	**2.53**	**4.86**	2 U	2 U	2 U	2 U
Total VOCs		--	**42**	**176**	**202**	**180.88**	**76.99**	**85.81**	**31.39**	**27.39**	**19.72**	**13.53**	**14.09**	**7.27**	**7.21**	**5.72**	**7.41**

Site Area		Western (Carriage House)															
Location	NYSDEC	CH-3D	CH-3D	CH-3D	CH-3D	CH-3D	CH-3D	CH-3D	CH-3D	CH-3D	CH-3D	CH-3D	CH-3D	CH-3D	CH-3D	CH-3D	CH-3D
Sample Date	GA	7/7/03	10/8/03	1/21/04	4/26/04	7/8/04	10/8/04	1/13/05	4/13/05	7/13/05	10/6/05	1/6/06	4/27/06	7/7/06	10/17/06	1/8/07	4/23/07
Sample Type	Criteria	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS
1,1,1-Trichloroethane	5	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
cis-1,2-Dichloroethene	5*	**8.22**	**4.99**	2 U	**3.01**	2 U	2 U	**3.31**	**4.29**	2 U	2 U	**3.55**	2 U	**2.92**	**2.74**	**4.53**	**4.22**
Freon 113	NA	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Trichloroethene	5	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Vinyl chloride	2	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Total VOCs		**8.22**	**4.99**	--	**3.01**	--	--	**3.31**	**4.29**	**--**	**--**	**3.55**	--	**2.92**	**2.74**	**7.18**	**4.22**

Site Area		Western (Carriage House)															
Location	NYSDEC	CH-3D	CH-3D	CH-3D	CH-3D	CH-3D	CH-3D	CH-3D	CH-3D	CH-3D	CH-3S	CH-3S	CH-3S	CH-3S	CH-3S	CH-3S	CH-3S
Sample Date	GA	7/12/07	10/17/07	1/8/08	4/23/08	7/16/08	10/24/08	1/29/09	4/21/09	7/15/09	7/25/00	10/25/00	1/11/01	4/12/01	8/20/01	10/9/01	1/14/02
Sample Type	Criteria	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS
1,1,1-Trichloroethane	5	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	5 U	2 U	2 U	2 U	2 U	2 U	2 U
cis-1,2-Dichloroethene	5*	**3.59**	**2.68**	**3.02**	**2.95**	**3.35**	**2.55**	**2.98**	**3.27**	**2.01**	5 U	2 U	2 U	2 U	2 U	2 U	2 U
Freon 113	NA	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	5 U	2 U	2 U	2 U	2 U	2 U	2 U
Trichloroethene	5	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	5 U	2 U	2 U	2 U	2 U	2 U	2 U
Vinyl chloride	2	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	5 U	2 U	2 U	2 U	2 U	2 U	2 U
Total VOCs		**3.59**	**2.68**	**3.02**	**2.95**	**3.35**	**2.55**	**2.98**	**3.27**	**2.01**	--	--	--	--	--	--	--

Site Area		Western (Carriage House)															
Location	NYSDEC	CH-3S	CH-3S	CH-3S	CH-3S	CH-3S	CH-3S	CH-3S	CH-3S	CH-3S	CH-3S	CH-3S	CH-3S	CH-3S	CH-3S	CH-5	CH-5D
Sample Date	GA	4/18/02	4/11/03	10/8/03	4/26/04	10/8/04	4/13/05	10/6/05	4/27/06	10/17/06	4/23/07	10/17/07	4/23/08	10/24/08	4/21/09	7/29/99	1/12/00
Sample Type	Criteria	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS
1,1,1-Trichloroethane	5	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	5 UJ	5 U
cis-1,2-Dichloroethene	5*	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	5 UJ	**6**
Freon 113	NA	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	5 UJ	**2 J**
Trichloroethene	5	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	5 UJ	**4 J**
Vinyl chloride	2	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	5 UJ	**1 J**
Total VOCs		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	**25**

See Notes on Page 15.

Table 1F. Quarterly Groundwater Sampling Results, Rounds 1 through 40, Summary of Detected Volatile Organic Compounds, Western Boundary Area (Carriage House Estate Properties), Former Bausch & Lomb Frame Center, Chili, NY

Site Area		Western (Carriage House)															
Location	NYSDEC	CH-5D	CH-5D	CH-5D	CH-5D	CH-5D	CH-5D	CH-5D	CH-5D	CH-5D	CH-5D	CH-5D	CH-5D	CH-5D	CH-5D	CH-5D	CH-5D
Sample Date	GA	4/11/00	7/25/00	10/25/00	1/12/01	4/11/01	8/20/01	10/9/01	1/14/02	1/14/02	4/18/02	7/10/02	10/15/02	1/7/03	4/10/03	7/8/03	10/7/03
Sample Type	Criteria	FS	FS	FS	FS	FS	FS	FS	FS	DUP	FS	FS	FS	FS	FS	FS	FS
1,1,1-Trichloroethane	5	5 U	5 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
cis-1,2-Dichloroethene	5*	**2 J**	**6**	**2.22**	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Freon 113	NA	5 U	5 U	2 U	2 U	2 U	**12.1**	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Trichloroethene	5	**2 J**	**3 J**	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Vinyl chloride	2	5 U	**1 J**	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Total VOCs		**4**	**10**	**2.22**	--	--	**12.1**	--	--	--	--	--	--	--	--	--	--

Site Area		Western (Carriage House)															
Location	NYSDEC	CH-5D	CH-5D	CH-5D	CH-5D	CH-5D	CH-5D	CH-5D	CH-5D	CH-5D	CH-5D	CH-5D	CH-5D	CH-5D	CH-5D	CH-5D	CH-5D
Sample Date	GA	1/21/04	4/28/04	4/15/05	7/12/05	10/6/05	1/5/06	4/25/06	7/706	10/17/06	1/9/07	4/24/07	7/10/07	10/16/07	1/8/08	4/22/08	7/15/08
Sample Type	Criteria	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS
1,1,1-Trichloroethane	5	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
cis-1,2-Dichloroethene	5*	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Freon 113	NA	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Trichloroethene	5	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Vinyl chloride	2	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Total VOCs		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Site Area		Western (Carriage House)															
Location	NYSDEC	CH-5D	CH-5D	CH-5D	CH-5D	CH-5S	CH-5S	CH-5S	CH-5S	CH-5S	CH-5S	CH-5S	CH-5S	CH-5S	CH-5S	CH-5S	CH-5S
Sample Date	GA	10/23/08	1/29/09	4/21/09	7/15/09	4/11/00	7/25/00	10/25/00	1/12/01	4/11/01	8/20/01	10/9/01	1/14/02	4/18/02	7/8/03	10/5/04	1/13/05
Sample Type	Criteria	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS
1,1,1-Trichloroethane	5	2 U	2 U	2 U	2 U	5 U	5 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
cis-1,2-Dichloroethene	5*	2 U	2 U	2 U	2 U	5 U	5 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Freon 113	NA	2 U	2 U	2 U	2 U	5 U	5 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Trichloroethene	5	2 U	2 U	2 U	2 U	5 U	5 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Vinyl chloride	2	2 U	2 U	2 U	2 U	5 U	5 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Total VOCs		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Site Area		Western (Carriage House)															
Location	NYSDEC	CH-5S	CH-5S	CH-5S	CH-5S	CH-6	CH-6D	CH-6D	CH-6D	CH-6D	CH-6D	CH-6D	CH-6D	CH-6D	CH-6D	CH-6D	CH-6D
Sample Date	GA	4/25/06	7/10/07	10/23/08	2/11/09	8/12/99	1/12/00	4/11/00	4/11/00	7/25/00	7/25/00	10/25/00	1/11/01	4/11/01	8/20/01	10/9/01	1/14/02
Sample Type	Criteria	FS	FS	FS	FS	FS	FS	FS	DUP	FS	DUP	FS	FS	FS	FS	FS	FS
1,1,1-Trichloroethane	5	2 U	2 U	2 U	2 U	25 U	5 U	25 U	25 U	**2 J**	**2 J**	10 U	10 U	10 U	2 U	5 U	10 U
cis-1,2-Dichloroethene	5*	2 U	2 U	2 U	2 U	**320 D**	**300 D**	**240**	**240**	**180**	**180 J**	**213**	**141**	**72.4**	**48.4**	**36.8**	**35.7**
Freon 113	NA	2 U	2 U	2 U	2 U	**73**	**42**	**73**	**63**	**51**	**52 J**	10 U	**37.7**	**16.1**	**12.3**	**11.1**	10 U
Trichloroethene	5	2 U	2 U	2 U	2 U	**450 D**	**330 D**	**570**	**540**	**380**	**400 DJ**	**425**	**194**	**74.8**	**56.4**	**48.3**	**42.5**
Vinyl chloride	2	2 U	2 U	2 U	2 U	**34**	**30**	**23 J**	**20 J**	**14**	**18 J**	10 U	10 U	10 U	2 U	5 U	10 U
Total VOCs		--	--	--	--	**1,014**	**831**	**1,055**	**1,004**	**700**	**724**	**764.6**	**427.8**	**192.4**	**129.1**	**105.96**	**78.2**

See Notes on Page 15.

Table 1F. Quarterly Groundwater Sampling Results, Rounds 1 through 40, Summary of Detected Volatile Organic Compounds, Western Boundary Area (Carriage House Estate Properties), Former Bausch & Lomb Frame Center, Chili, NY

Site Area		Western (Carriage House)															
Location	NYSDEC	CH-6D	CH-6D	CH-6D	CH-6D	CH-6D	CH-6D	CH-6D	CH-6D	CH-6D	CH-6D	CH-6D	CH-6D	CH-6D	CH-6D	CH-6D	CH-6D
Sample Date	GA	4/18/02	7/10/02	10/15/02	1/7/03	4/10/03	4/10/03	7/8/03	10/7/03	1/21/04	4/29/04	7/8/04	10/7/04	1/12/05	4/13/05	7/12/05	10/6/05
Sample Type	Criteria	FS	FS	FS	FS	FS	DUP	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS
1,1,1-Trichloroethane	5	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
cis-1,2-Dichloroethene	5*	**17.5**	**15.8**	**12.1**	**13.5**	**9.3**	**9.48**	**9.25**	**7.71**	**15.2**	**3.38**	2 U	**3.12**	**3.23**	**3.30**	**2.22**	2 U
Freon 113	NA	**3.27**	**3.85**	**3.0**	**3.03**	2 U	2 U	**2.35**	**2.26**	**2.24**	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Trichloroethene	5	**21.5**	**19.4**	**16.8**	**17.2**	**12.2**	**12.7**	**10.8**	**10**	**11.5**	**5.16**	2 U	**6.39**	**6.11**	**5.74**	**4.2**	2 U
Vinyl chloride	2	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Total VOCs		**46.05**	**42.54**	**34.9**	**37.1**	**24.16**	**25.04**	**22.4**	**19.97**	**32.97**	**8.54**	--	**9.51**	**9.34**	**9.04**	**6.42**	--

Site Area		Western (Carriage House)															
Location	NYSDEC	CH-6D	CH-6D	CH-6D	CH-6D	CH-6D	CH-6D	CH-6D	CH-6D	CH-6D	CH-6D	CH-6D	CH-6D	CH-6D	CH-6D	CH-6D	CH-6S
Sample Date	GA	1/5/06	4/27/06	7/6/06	10/17/06	1/9/07	4/24/07	7/10/07	10/16/07	1/8/08	4/22/08	7/15/08	10/22/08	1/29/09	4/21/09	7/16/09	4/11/00
Sample Type	Criteria	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS
1,1,1-Trichloroethane	5	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2U	2 U	2 U	2 U	5 U
cis-1,2-Dichloroethene	5*	**3.48**	2 U	2 U	2 U	**2.47**	2 U	**2.2**	**2.15**	**2.78**	**2.17**	2 U	**2.26**	2 U	2 U	2 U	**3 J**
Freon 113	NA	2 U	2 U	2 U	2 U	**4.19**	2 U	2 U	**2.02**	2 U	2 U	2 U	2 U	2 U	2 U	2 U	5 U
Trichloroethene	5	**5.42**	**4**	**3.53**	**4.15**	**4.5**	**3.23**	**3.65**	**3.25**	**4.64**	**3.45**	**2.31**	**3.39**	**3.38**	**3.31**	**2.04**	5 U
Vinyl chloride	2	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	5 U
Total VOCs		**8.9**	**4**	**3.53**	**4.15**	**11.16**	**3.23**	**5.85**	**7.42**	**7.42**	**5.62**	**2.31**	**5.65**	**3.38**	**3.31**	**2.04**	**3**

Site Area		Western (Carriage House)															
Location	NYSDEC	CH-6S	CH-6S	CH-6S	CH-6S	CH-6S	CH-6S	CH-6S	CH-6S	CH-6S	CH-6S	CH-6S	CH-6S	CH-6S	CH-6S	CH-6S	CH-6S
Sample Date	GA	7/25/00	10/25/00	1/11/01	4/11/01	8/20/01	1/14/02	4/18/02	7/8/03	4/29/04	7/8/04	10/6/04	1/12/05	4/13/05	7/12/05	4/27/06	7/10/07
Sample Type	Criteria	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS
1,1,1-Trichloroethane	5	5 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
cis-1,2-Dichloroethene	5*	**4 J**	**2.01**	**3.91**	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Freon 113	NA	5 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Trichloroethene	5	5 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Vinyl chloride	2	5 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Total VOCs		**5**	**2.01**	**3.91**	--	--	--	--	--	--	--	--	--	--	--	--	--

Site Area		Western (Carriage House)															
Location	NYSDEC	CH-6S	CH-6S	CH-7	CH-7	CH-7	CH-7	CH-7	CH-7	CH-7	CH-7	CH-7	CH-7	CH-7	CH-7	CH-7	CH-7
Sample Date	GA	10/22/08	2/11/09	7/29/99	8/12/99	1/17/00	4/12/00	7/25/00	10/26/00	1/12/01	4/11/01	8/20/01	10/9/01	10/9/01	1/14/02	4/18/02	7/8/03
Sample Type	Criteria	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	DUP	FS	FS	FS
1,1,1-Trichloroethane	5	2 U	2 U	5 UJ	25 U	5 U	5 U	5 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
cis-1,2-Dichloroethene	5*	2 U	2 U	5 UJ	25 U	5 U	5 U	**8**	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Freon 113	NA	2 U	2 U	5 UJ	25 U	5 U	5 U	5 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Trichloroethene	5	2 U	2 U	5 UJ	25 U	5 U	5 U	5 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Vinyl chloride	2	2 U	2 U	5 UJ	**1 J**	5 U	**4 J**	**6**	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Total VOCs		--	--	--	**1**	--	**4**	**17**	--	--	--	--	--	--	--	--	--

See Notes on Page 15.

Table 1F. Quarterly Groundwater Sampling Results, Rounds 1 through 40, Summary of Detected Volatile Organic Compounds, Western Boundary Area (Carriage House Estate Properties), Former Bausch & Lomb Frame Center, Chili, NY

Site Area		Western (Carriage House)															
Location	NYSDEC	CH-7	CH-7	CH-7	CH-7	CH-7	CH-7	CH-8D	CH-8D	CH-8D	CH-8D	CH-8D	CH-8D	CH-8D	CH-8D	CH-8D	CH-8D
Sample Date	GA	10/5/04	1/12/05	4/25/06	7/12/07	10/23/08	2/10/09	7/29/99	1/12/00	4/11/00	7/25/00	10/25/00	1/11/01	4/11/01	8/20/01	10/9/01	1/14/02
Sample Type	Criteria	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS
1,1,1-Trichloroethane	5	2 U	2 U	2 U	2 U	2 U	2 U	5 UJ	5 U	5 U	5 U	2 U	2 U	2 U	2 U	2 U	2 U
cis-1,2-Dichloroethene	5*	2 U	2 U	2 U	2 U	2 U	2 U	5 UJ	5 U	5 U	5 U	2 U	2 U	2 U	2 U	2 U	2 U
Freon 113	NA	2 U	2 U	2 U	2 U	2 U	2 U	5 UJ	5 U	5 U	5 U	2 U	2 U	2 U	2 U	2 U	2 U
Trichloroethene	5	2 U	2 U	2 U	2 U	2 U	2 U	5 UJ	5 U	5 U	5 U	2 U	2 U	2 U	2 U	2 U	2 U
Vinyl chloride	2	2 U	2 U	2 U	2 U	2 U	2 U	**2 J**	**5**	**4 J**	**6**	2 U	2 U	2 U	2 U	2 U	2 U
Total VOCs		--	--	--	--	--	--	**2**	**13**	**4**	**6**	--	--	--	--	--	--

Site Area		Western (Carriage House)															
Location	NYSDEC	CH-8D	CH-8D	CH-8D	CH-8D	CH-8D	CH-8D	CH-8D	CH-8D	CH-8D	CH-8D	CH-8D	CH-8D	CH-8D	CH-8D	CH-8D	CH-8D
Sample Date	GA	4/18/02	7/10/02	10/15/02	1/7/03	4/10/03	7/8/03	10/7/03	1/21/04	4/29/04	7/8/04	10/5/04	1/12/05	4/15/05	7/13/05	10/6/05	1/6/06
Sample Type	Criteria	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS
1,1,1-Trichloroethane	5	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
cis-1,2-Dichloroethene	5*	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Freon 113	NA	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Trichloroethene	5	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Vinyl chloride	2	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Total VOCs		--	--	**2.74**	**2.52**	--	--	--	--	--	--	--	--	--	--	--	--

Site Area		Western (Carriage House)															
Location	NYSDEC	CH-8D	CH-8D	CH-8D	CH-8D	CH-8D	CH-8D	CH-8D	CH-8D	CH-8D	CH-8D	CH-8D	CH-8D	CH-8D	CH-8D	CH-8S	CH-8S
Sample Date	GA	4/25/06	7/7/06	10/17/06	1/9/07	4/23/07	7/12/07	10/17/07	1/8/08	4/23/08	7/16/08	10/23/08	1/29/09	4/21/09	7/16/09	7/29/99	1/11/00
Sample Type	Criteria	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS
1,1,1-Trichloroethane	5	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	5 UJ	5 U
cis-1,2-Dichloroethene	5*	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	5 UJ	5 U
Freon 113	NA	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	5 UJ	5 U
Trichloroethene	5	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	5 UJ	5 U
Vinyl chloride	2	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	5 UJ	5 U
Total VOCs		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	**14**

Site Area		Western (Carriage House)															
Location	NYSDEC	CH-8S	CH-8S	CH-8S	CH-8S	CH-8S	CH-8S	CH-8S	CH-8S	CH-8S	CH-8S	CH-8S	CH-8S	CH-8S	CH-8S	CH-8S	CH-8S
Sample Date	GA	4/11/00	7/25/00	10/25/00	1/11/01	4/11/01	8/19/01	4/18/02	4/10/03	4/29/04	10/5/04	4/15/05	10/18/05	4/25/06	10/17/06	4/23/07	10/17/07
Sample Type	Criteria	FS	FS	FS	FS	FS	Dry	FS	FS	FS	FS	FS	FS	FS	FS	FS	Dry
1,1,1-Trichloroethane	5	5 U	5 U	2 U	2 U	2 U	NS	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	NS
cis-1,2-Dichloroethene	5*	5 U	5 U	2 U	2 U	2 U	NS	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	NS
Freon 113	NA	5 U	5 U	2 U	2 U	2 U	NS	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	NS
Trichloroethene	5	5 U	5 U	2 U	2 U	2 U	NS	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	NS
Vinyl chloride	2	5 U	5 U	2 U	2 U	2 U	NS	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	NS
Total VOCs		--	--	--	--	--	NS	--	--	--	--	--	--	--	--	--	NS

See Notes on Page 15.

Table 1F. Quarterly Groundwater Sampling Results, Rounds 1 through 40, Summary of Detected Volatile Organic Compounds, Western Boundary Area (Carriage House Estate Properties), Former Bausch & Lomb Frame Center, Chili, NY

Site Area		Western (Carriage House)		
Location	NYSDEC	CH-8S	CH-8S	CH-8S
Sample Date	GA	4/23/08	10/23/08	4/21/09
Sample Type	Criteria	FS	FS	FS
1,1,1-Trichloroethane	5	2 U	2 U	2 U
cis-1,2-Dichloroethene	5*	2 U	2 U	2 U
Freon 113	NA	2 U	2 U	2 U
Trichloroethene	5	2 U	2 U	2 U
Vinyl chloride	2	2 U	2 U	2 U
Total VOCs		--	**3.56**	--

See Notes on Page 15.

Table 1. Quarterly Groundwater Sampling Results, Rounds 1 through 40, Summary of Detected Volatile Organic Compounds, Former Bausch & Lomb Frame Center, Chili, NY

Notes:
All results in micrograms per liter (ug/L) equivalent to parts per billion (ppb).
-- = Not Detected.
NS = Not sampled because well was dry.
B = Analyte was detected in the method blank, as well as the sample.
D = Concentrations based on diluted sample analysis.
J = Estimated concentration, compound was detected but results are below the quantitation limit.
U = The compound was analyzed for but not detected. The associated number is the quantitation limit.
UJ = Estimated detection limit.
Shade = Indicates concentrations at or above the associated criteria value.
NYSDEC GA criteria values as reported in NYSDEC Division of Water Technical and Operational Guidance Series (1.1.1) Memorandum, Ambient Water Quality Standards, June 1998.
* Criteria value listed for 1,2-Dichloroethene (total) applies to the cis- and trans- isomers individually.
** Monitoring wells BL-25D and CH-6D, sampled on July 28 and July 29, 1999, respectively, were resampled on August 12, 1999 due to potential field and/or laboratory error.
Background monitoring wells BL-8r and BL-20Sr are sampled on an annual basis during the second quarter of each year.
Monitoring well BL-14D is sampled on a twice-per-year basis during the second and fourth quarter of each year.
CH-3, CH-5, and CH-6 renamed CH-3D, CH-5D, and CH-6D, respectively, following installation of CH-3S, CH-5S, and CH-6S.
July 2001 samples exceeded hold times due to analytical equipment difficulties. Resampled in August 2001.

Table 2. Summary of Groundwater Elevations, Former Bausch & Lomb Frame Center, Chili, NY

Location	MP elev. (ft.)	Water Level Elevation												
		7/30/99	1/10/00	4/10/00	7/24/00	10/24-26/00	1/9-10/01	4/10/01	7/8/01	8/19/01	10/7/01	1/14-15/02	4/17/02	10/14/02
Monitoring Wells														
BL-1	552.52	544.8	550.1	550.5	547.2	547.9	548.8	550.7	545.9	545.4	547.6	NM	550.2	545.8
BL-2S	548.65	537.0	540.7	545.1	539.3	537.5	536.2	543.0	534.7	533.6	533.4	NM	540.5	533.7
BL-2D	548.11	536.2	539.3	541.9	538.6	535.1	533.0	538.3	531.9	530.5	529.9	NM	535.4	531.8
BL-3	549.73	537.7	540.1	542.4	539.7	537.7	536.0	540.8	534.6	533.3	532.9	NM	538.6	533.5
BL-4S	546.77	537.8	540.5	543.6	539.8	538.4	537.2	540.1	536.0	535.5	535.5	NM	540.2	534.2
BL-4D	546.93	536.9	539.4	NM	539.1	536.0	534.0	539.0	532.3	531.5	531.6	NM	536.6	532.4
BL-5S	546.12	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
BL-5D	546.10	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
BL-6S	548.62	538.1	NM	NM	540.1	538.6	537.4	544.2	532.3	531.7	531.2	NM	539.8	532.3
BL-6D	548.77	536.9	NM	NM	538.8	533.5	534.0	539.3	537.9	537.1	536.2	NM	536.8	535.3
BL-7	548.52	536.7	539.3	542.7	539.2	536.3	534.5	539.5	533.6	533.2	531.4	NM	535.5	532.8
BL-8r	543.82	536.6	539.6	541.7	539.3	536.0	535.3	541.6	533.0	531.7	NM	NM	NM	534.1
BL-8S	543.72	537.5	540.2	540.8	539.4	538.6	535.0	540.2	534.7	534.6	533.1	NM	533.9	NM
BL-9S	545.18	534.4	541.4	543.0	538.3	536.9	536.4	541.6	533.9	531.0	531.2	534.4	541.1	531.7
BL-9D	545.39	536.2	539.1	541.8	538.6	534.9	531.8	538.2	531.2	530.3	529.7	531.5	535.6	531.6
BL-10S	547.16	534.5	541.2	543.7	538.4	536.9	536.6	542.9	533.5	534.7	532.0	NM	NM	NM
BL-10D	547.21	535.8	538.9	541.7	538.4	534.7	532.6	537.9	531.0	530.4	529.5	NM	NM	NM
BL-11S	548.74	536.3	540.9	545.4	538.9	537.4	536.6	544.1	534.6	532.6	**<533.84(dry)**	NM	539.3	532.8
BL-11D	548.90	536.2	539.2	542.3	538.6	535.2	533.3	538.8	531.7	530.5	534.8	NM	536.1	532.1
BL-12S	549.11	537.9	540.8	543.9	540.1	538.4	536.5	543.0	535.2	533.8	533.2	NM	540.8	NM
BL-13S	541.20	524.9	532.9	536.3	531.0	529.9	533.1	535.8	527.9	**<524.3(dry)**	526.5	NM	535.8	**<524.3(dry)**
BL-13D	541.05	526.4	531.9	535.4	530.4	525.2	527.7	531.4	523.9	522.4	522.5	NM	531.2	522.0
BL-14S	542.12	529.8	537.2	539.2	533.5	530.1	531.2	535.7	527.3	524.1	522.6	527.6	534.8	523.0
BL-14D	542.44	529.7	534.9	536.7	532.1	523.7	525.7	529.1	521.9	520.4	519.5	522.2	526.8	519.9
BL-15S	545.90	532.1	537.2	543.0	535.9	534.6	538.2	543.1	530.7	529.5	**<525.9(dry)**	NM	542.6	528.6
BL-15D	546.12	534.9	538.3	540.9	537.4	533.9	531.9	537.9	530.0	529.1	528.1	NM	534.9	529.9
BL-16S	544.53	530.6	541.4	542.2	535.7	535.7	537.3	542.2	531.4	**<528.4(dry)**	**<528.4(dry)**	536.4	541.7	**<528.4(dry)**
BL-17D	536.45	523.9	529.7	533.2	528.2	523.8	526.0	528.8	522.4	520.1	519.5	523.6	528.6	519.7
BL-18S	538.23	526.4	528.2	535.7	529.9	526.0	529.5	534.1	526.4	523.7	525.1	523.8	533.7	521.9
BL-19S	545.04	530.4	536.3	541.7	534.5	532.0	526.7	541.4	529.0	527.0	**<526.94(dry)**	NM	540.4	525.5
BL-20Sr	548.58	536.1	NM	541.9	538.9	535.4	533.5	539.4	532.0	530.2	530.4	531.5	535.0	531.7
BL-21S	547.13	538.9	539.3	541.4	541.2	540.1	537.2	539.1	538.5	537.2	536.6	NM	539.0	537.4
BL-22D	549.60	535.1	538.6	541.2	537.7	534.2	532.1	538.1	530.4	529.1	528.5	NM	534.9	530.2
BL-23S	549.06	537.5	540.6	543.4	539.6	538.0	536.6	542.3	536.1	NM	533.0	NM	540.3	533.8
BL-23D	546.91	535.8	539.1	541.5	538.5	535.2	537.3	538.3	530.2	530.2	529.5	NM	539.8	531.5
BL-24S	549.55	535.2	538.9	542.6	NM	535.4	533.8	540.0	533.7	**<532.6(dry)**	**<532.6(dry)**	NM	536.9	**<532.6(dry)**
BL-24D	549.46	535.3	538.6	541.1	537.9	534.3	532.4	538.1	531.1	529.9	529.0	NM	535.3	530.7
BL-25S	549.15	534.9	538.2	544.6	537.8	535.6	533.5	542.4	**<532.2(dry)**	**<532.2(dry)**	**<532.2(dry)**	**<532.2(dry)**	536.6	**<532.2(dry)**
BL-25D	549.28	534.8	538.3	540.7	537.4	533.7	531.6	537.6	529.3	529.1	528.8	530.4	534.5	529.6
BL-26D	549.03	534.8	538.4	540.7	537.4	533.7	531.7	538.1	532.1	530.3	528.9	NM	534.9	529.7
BL-27D	546.99	534.0	537.6	539.6	536.6	533.4	531.7	537.6	NM	NM	527.8	NM	534.6	528.9
BL-28D	534.42	536.6	538.7	542.8	539.1	536.8	535.8	539.5	533.9	535.4	536.2	NM	538.9	NM
BL-29D	531.46	529.1	532.1	533.1	532.1	530.9	531.5	532.6	530.4	533.4	534.5	NM	532.7	NM

See Notes on Page 5.

Table 2. Summary of Groundwater Elevations, Former Bausch & Lomb Frame Center, Chili, NY

Location	MP elev. (ft.)	Water Level Elevation												
		7/30/99	1/10/00	4/10/00	7/24/00	10/24-26/00	1/9-10/01	4/10/01	7/8/01	8/19/01	10/7/01	1/14-15/02	4/17/02	10/14/02
SSA Monitoring Wells														
SS-1	545.90	534.8	NM	544.3	538.6	536.6	536.0	545.2	536.5	531.2	**<531.9(dry)**	NM	542.9	**<531.9(dry)**
Carriage House Property Monitoring Wells														
CH-1	538.70	532.5	536.3	NM	535.2	533.5	533.3	538.1	531.2	529.8	530.5	NM	536.6	529.4
CH-3S	539.36	NI	NI	NI	535.3	533.4	532.4	537.1	530.2	529.3	528.9	531.7	535.4	529.1
CH-3D	539.50	532.6	536.1	537.9	535.2	533.3	532.2	537.0	530.0	529.2	528.8	531.6	535.2	529.0
CH-4	543.02	534.0	537.6	539.5	536.6	533.2	531.7	537.6	531.5	531.0	528.0	NM	534.6	528.8
CH-5S	547.53	NI	NI	543.0	537.5	534.6	533.3	542.3	533.3	533.6	529.8	531.8	541.0	530.8
CH-5D	547.27	534.0	537.6	539.6	536.6	533.3	531.7	537.7	529.5	529.0	528.0	530.7	534.9	529.1
CH-6S	544.21	NI	NI	539.0	536.8	534.7	533.6	538.3	531.2	530.0	**<528.85(dry)**	532.4	536.4	529.8
CH-6D	543.82	534.4	537.9	540.1	537.1	533.5	531.8	537.8	529.8	528.3	527.5	531.0	534.8	529.5
CH-7	541.30	534.4	537.9	NM	537.0	533.6	533.0	535.7	532.0	529.7	528.3	531.0	534.9	529.6
CH-8S	540.46	533.5	537.7	539.9	536.0	534.5	533.3	539.0	530.9	**<530.6(dry)**	**<530.6(dry)**	**<530.6(dry)**	537.2	**<530.6(dry)**
CH-8D	540.83	533.4	537.0	538.9	536.7	533.7	532.5	537.9	530.4	529.5	519.9	531.8	537.8	529.5
Extraction Wells														
EW-1	547.98	534.8	NM	541.2	538.2	534.7	NM	NM	NM	537.9	528.2	NM	NM	NM
EW-100	539.85	NI	NI	NS	NS	532.0	NM	NM	NM	524.6	521.4	NM	529.4	522.5
EW-110	541.79	NI	NI	NS	NS	529.4	NM	NM	NM	529.0	523.3	NM	522.0	521.8
EW-120	544.73	NI	NI	NS	NS	535.9	NM	NM	NM	527.8	525.8	NM	533.3	528.3
EW-130	544.45	532.7	536.1	538.5	536.2	531.2	NM	NM	NM	522.3	524.8	NM	521.8	522.0
EW-140	546.41	NI	NI	NS	NS	531.7	NM	NM	NM	526.4	528.4	NM	530.8	526.1
EW-150	540.67	NI	NI	NS	NS	534.3	NM	NM	NM	528.3	528.0	NM	536.2	529.5
EW-160	537.56	NI	NI	NS	NS	514.2	NM	NM	NM	512.7	513.2	NM	514.4	512.1
Piezometers														
PZ-1S	550.43	535.9	538.9	542.0	538.3	535.7	533.7	539.1	532.2	531.5	**<532.43(dry)**	NM	534.9	531.2
PZ-1D	550.43	535.4	538.8	541.4	538.2	534.6	532.4	538.1	530.8	530.5	528.7	NM	535.2	531.1

See Notes on Page 5.

Table 2. Summary of Groundwater Elevations, Former Bausch & Lomb Frame Center, Chili, NY

Location	MP elev. (ft.)	Water Level Elevation										
		4/15/03	7/7-9/03	10/7/03	4/12/04	10/4/04	4/5-6/05	10/3/05	4/18/06	4/12/07	10/2-3/08	4/15-17/09
Monitoring Wells												
BL-1	552.52	550.1	546.5	547.2	549.9	547.9	550.9	548.9	549.7	550.9	547.1	549.3
BL-2S	548.65	542.7	NM	534.0	541.3	538.0	545.0	NM	539.6	540.9	536.4	540.4
BL-2D	548.11	537.7	NM	531.2	536.4	536.0	539.3	533.8	537.1	535.2	534.2	536.6
BL-3	549.73	540.2	NM	534.3	539.1	537.8	542.1	536.2	538.9	538.7	536.8	538.7
BL-4S	546.77	541.4	NM	534.6	540.2	538.3	NM	536.6	539.4	NM	540.9	540.0
BL-4D	546.93	538.3	NM	532.1	536.8	536.4	NM	534.8	537.6	NM	535.3	537.4
BL-5S	546.12	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
BL-5D	546.10	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
BL-6S	548.62	543.1	NM	NM	542.0	538.8	544.2	537.4	NM	NM	NM	NM
BL-6D	548.77	538.0	NM	NM	537.5	536.5	539.4	534.9	NM	NM	NM	NM
BL-7	548.52	538.3	NM	532.7	537.6	536.9	540.5	534.5	538.4	535.7	534.9	538.2
BL-8r	543.82	539.9	NM	535.5	539.1	537.8	540.6	537.8	539.6	NM	538.8	537.2
BL-8S	543.72	NM	NM	NM	NM	NM	NM	535.4	537.9	NM	NM	NM
BL-9S	545.18	541.5	536.2	532.4	540.9	537.8	542.4	534.4	540.3	540.9	535.3	540.7
BL-9D	545.39	537.4	533.4	531.1	536.2	535.9	539.2	533.7	537.0	534.9	534.2	536.4
BL-10S	547.16	542.3	NM	531.9	541.9	538.1	543.5	534.2	541.0	541.7	534.8	541.5
BL-10D	547.21	537.0	NM	530.9	536.1	535.5	539.0	533.5	536.8	535.2	533.9	536.3
BL-11S	548.74	543.3	NM	532.7	542.4	538.3	545.2	534.6	540.6	540.9	535.3	541.5
BL-11D	548.90	537.7	NM	531.3	536.7	536.0	539.7	533.8	537.2	535.6	534.2	536.7
BL-12S	549.11	542.3	NM	534.6	541.2	538.4	544.5	537.5	539.8	540.2	NM	540.1
BL-13S	541.20	535.5	NM	**<524.3(dry)**	535.3	533.3	536.4	**<524.3(dry)**	535.2	535.7	529.8	535.2
BL-13D	541.05	531.2	NM	523.5	529.9	529.0	532.4	525.6	531.5	531.9	528.4	532.8
BL-14S	542.12	535.8	533.1	525.0	535.9	532.3	536.5	528.5	536.0	536.1	528.2	535.3
BL-14D	542.44	528.6	527.4	519.6	526.0	526.0	530.9	524.2	533.1	534.3	528.9	535.5
BL-15S	545.90	542.4	NM	529.5	542.0	538.1	543.0	530.9	541.5	542.9	532.1	541.5
BL-15D	546.12	536.6	NM	530.1	535.7	535.3	538.4	533.7	536.4	535.5	533.0	536.4
BL-16S	544.53	541.7	536.5	**<528.4(dry)**	541.5	536.7	542.1	535.0	541.1	542.4	531.1	540.8
BL-17D	536.45	528.7	527.5	521.2	527.5	526.6	529.7	523.1	528.9	529.6	526.2	530.1
BL-18S	538.23	533.0	529.2	523.1	532.1	529.6	534.8	523.2	532.3	532.9	527.2	533.5
BL-19S	545.04	540.6	NM	526.6	540.0	535.8	540.8	529.1	539.8	540.3	530.9	540.0
BL-20Sr	548.58	537.8	536.6	531.2	536.9	536.2	539.9	534.0	537.6	536.9	534.1	537.2
BL-21S	547.13	538.8	NM	538.4	538.6	539.3	NM	NM	NM	NM	NM	NM
BL-22D	549.60	537.1	NM	530.4	536.1	535.5	539.1	533.7	536.6	535.8	533.3	536.5
BL-23S	549.06	542.0	NM	534.8	541.7	538.9	543.9	537.0	540.5	541.1	536.8	541.1
BL-23D	546.91	537.6	NM	531.2	536.4	536.0	539.3	534.3	537.3	535.8	534.0	536.8
BL-24S	549.55	539.5	NM	**<532.6(dry)**	538.4	536.4	542.1	534.2	537.7	537.8	533.6	538.1
BL-24D	549.46	537.2	NM	532.7	536.2	535.6	538.9	534.1	536.7	535.7	533.6	536.5
BL-25S	549.15	542.3	536.2	**<532.2(dry)**	541.2	537.4	537.6	533.7	539.1	540.2	533.0	540.6
BL-25D	549.28	536.5	537.3	530.0	535.9	535.3	538.3	533.8	536.3	535.2	532.9	536.2
BL-26D	549.03	536.8	NM	530.0	536.0	535.4	538.7	533.7	536.6	536.0	532.9	536.8
BL-27D	546.99	536.6	NM	**<541.4(dry)**	**<541.4(dry)**	**<541.4(dry)**	537.3	533.7	535.9	535.7	532.7	536.2
BL-28D	534.42	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
BL-29D	531.46	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM

See Notes on Page 5.

Table 2. Summary of Groundwater Elevations, Former Bausch & Lomb Frame Center, Chili, NY

Location	MP elev. (ft.)	Water Level Elevation										
		4/15/03	7/7-9/03	10/7/03	4/12/04	10/4/04	4/5-6/05	10/3/05	4/18/06	4/12/07	10/2-3/08	4/15-17/09
SSA Monitoring Wells												
SS-1	545.90	543.5	NM	531.5	543.0	538.7	544.3	533.8	541.4	541.0	531.7	540.4
Carriage House Property I												
CH-1	538.70	537.6	NM	530.5	536.4	535.3	538.5	526.6	536.2	536.9	NM	536.8
CH-3S	539.36	536.7	530.4	530.3	535.1	534.6	537.3	534.0	535.1	536.3	533.0	535.7
CH-3D	539.50	536.6	530.5	530.1	535.1	534.6	537.2	534.0	535.0	536.0	532.6	535.7
CH-4	543.02	536.7	NM	529.8	534.8	534.8	537.2	533.7	535.1	535.7	532.5	535.7
CH-5S	547.53	542.1	537.5	531.6	541.1	537.6	543.2	533.9	539.8	541.4	532.8	540.8
CH-5D	547.27	536.7	537.3	529.9	535.0	535.0	537.6	533.9	535.5	535.9	532.7	536.0
CH-6S	544.21	537.6	537.2	531.6	536.6	535.9	538.7	535.0	536.4	536.9	533.7	536.8
CH-6D	543.82	537.1	533.8	530.6	535.5	535.3	538.0	534.1	536.0	535.7	533.1	536.3
CH-7	541.30	537.0	532.3	530.3	535.5	535.3	538.1	534.1	536.0	536.0	533.2	536.3
CH-8S	540.46	538.6	**<530.6(dry)**	**<530.6(dry)**	537.2	535.6	540.1	534.9	536.5	538.1	532.9	538.2
CH-8D	540.83	537.5	530.8	530.6	535.9	535.5	538.6	534.4	535.7	536.7	533.0	536.6
Extraction Wells												
EW-1	547.98	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
EW-100	539.85	536.1	NM	524.6	530.0	532.4	531.0	530.7	529.5	535.5	521.6	526.1
EW-110	541.79	536.9	NM	522.9	524.5	522.3	523.7	522.8	522.7	522.6	522.4	522.5
EW-120	544.73	536.9	NM	527.4	533.0	533.9	536.0	533.0	535.0	531.1	530.3	532.8
EW-130	544.45	524.1	NM	522.6	524.9	524.8	525.1	525.0	533.1	525.6	525.7	525.9
EW-140	546.41	532.0	NM	529.6	531.3	531.2	534.9	530.4	534.3	530.8	532.0	529.5
EW-150	540.67	538.9	NM	529.4	539.7	535.4	540.7	532.1	NM	538.9	533.7	533.0
EW-160	537.56	519.4	NM	514.7	516.4	518.4	529.1	512.4	522.9	515.0	513.2	516.3
Piezometers												
PZ-1S	550.43	538.3	NM	531.3	537.5	536.3	540.5	534.1	537.6	537.2	533.9	537.6
PZ-1D	550.43	537.3	NM	530.8	536.2	535.6	539.1	533.9	537.0	535.6	533.7	536.5

See Notes on Page 5.

Table 2. Summary of Groundwater Elevations, Former Bausch & Lomb Frame Center, Chili, NY

Notes:
All elevations are referenced to National Geodetic Vertical Datum of 1929 (NGVD).
NM = Not Measured.
MP = top of inner casing, where applicable.
NI = Not installed.
NS = Not surveyed.
dry = Well dry during round of water level measurements.

Table 3. Summary of Treatment System Influent and Effluent, Former Bausch & Lomb Frame Center, Chili, NY

Constituent	Discharge Limit	GWTS Influent 4/19/02	GWTS Influent 7/11/02	GWTS Influent 10/16/02	GWTS Influent 1/7/03	GWTS Influent 4/11/03	GWTS Influent 7/8/03	GWTS Influent 10/8/03	GWTS Influent 1/20/04	GWTS Influent 4/26/04	GWTS Influent 7/6/04	GWTS Influent 10/8/04	GWTS Influent 1/12/05	GWTS Influent 4/11/05	GWTS Influent 7/12/05
Volatile Organics															
1,1,1-Trichloroethane	10 [b]	**10.7**	**14.5**	10 U	**11.6**	20 U	20 U	10 U	**9.9**	**10.3**	**11.8**	**17.9**	10 U	**11**	10 U
1,1,2,2-Tetrachloroethane		10 U	4 U	10 U	10 U	20 U	20 U	10 U	4.0 U	10 U	10 U	10 U	10 U	10 U	10 U
1,1,2-Trichloroethane	10 [b]	10 U	4 U	10 U	10 U	20 U	20 U	10 U	4.0 U	10 U	10 U	10 U	10 U	10 U	10 U
1,1-Dichloroethane	10 [b]	**10.9**	**9.83**	10 U	**10.2**	20 U	20 U	10 U	**8.26**	10 U	10 U	**10.9**	10 U	10 U	10 U
1,1-Dichloroethene	10 [b]	10 U	**6.28**	10 U	10 U	20 U	20 U	10 U	4.0 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dichlorobenzene		10 U	4 U	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloroethane		10 U	4 U	10 U	10 U	20 U	20 U	10 U	4.0 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dichloropropane		10 U	4 U	10 U	10 U	20 U	20 U	10 U	4.0 U	10 U	10 U	10 U	10 U	10 U	10 U
1,3-Dichlorobenzene		10 U	4 U	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene		10 U	4 U	--	--	--	--	--	--	--	--	--	--	--	--
2-Butanone		--	--	25 U	25 U	50 U	50 U	25 U	10 U	25 U	25 U	25 U	25 U	25 U	25 U
2-Chloroethyl vinyl ether		10 U	4 U	10 U	10 U	20 U	20 U	10 U	4.0 U	10 U	10 U	10 U	10 U	10 U	10 U
2-Hexanone		--	--	25 U	25 U	50 U	50 U	25 U	10 U	25 U	25 U	25 U	25 U	25 U	25 U
4-Methyl-2-pentanone		--	--	25 U	25 U	50 U	50 U	25 U	10 U	25 U	25 U	25 U	25 U	25 U	25 U
Acetone	10 [b]	--	--	50 U	50 U	50 U	50 U	50 U	20 U	50 U	50 U	50 U	50 U	50 U	50 U
Benzene		3.5 U	1.4 U	3.5 U	3.5 U	20 U	20 U	10 U	1.4 U	3.5 U	3.5 U	3.5 U	3.5 U	3.5 U	3.5 U
Bromodichloromethane		10 U	4 U	10 U	10 U	20 U	20 U	10 U	4.0 U	10 U	10 U	10 U	10 U	10 U	10 U
Bromoform		10 U	4 U	10 U	10 U	20 U	20 U	10 U	4.0 U	10 U	10 U	10 U	10 U	10 U	10 U
Bromomethane		10 U	4 U	10 U	10 U	20 U	20 U	10 U	4.0 U	10 U	10 U	10 U	10 U	10 U	10 U
Carbon disulfide		--	--	25 U	25 U	50 U	50 U	25 U	10 U	25 U	25 U	25 U	25 U	25 U	25 U
Carbon tetrachloride		10 U	4 U	10 U	10 U	20 U	20 U	10 U	4.0 U	10 U	10 U	10 U	10 U	10 U	10 U
Chlorobenzene		10 U	4 U	10 U	10 U	20 U	20 U	10 U	4.0 U	10 U	10 U	10 U	10 U	10 U	10 U
Chlorodibromomethane		10 U	4 U	10 U	10 U	20 U	20 U	10 U	4.0 U	10 U	10 U	10 U	10 U	10 U	10 U
Chloroethane		10 U	4 U	10 U	10 U	20 U	20 U	10 U	4.0 U	10 U	10 U	10 U	10 U	10 U	10 U
Chloroform		10 U	4 U	10 U	10 U	20 U	20 U	10 U	4.0 U	10 U	10 U	10 U	10 U	10 U	10 U
Chloromethane		10 U	4 U	10 U	10 U	20 U	20 U	10 U	4.0 U	10 U	10 U	10 U	10 U	10 U	10 U
cis-1,2-Dichloroethene	10 [b]	--	--	**55.5**	**75.6**	**97.3**	**106**	**63.2**	**72.4**	**81.1**	**63.7**	**101**	**73.8**	**69.2**	**57.4**
cis-1,3-Dichloropropene		10 U	4 U	10 U	10 U	20 U	20 U	10 U	4.0 U	10 U	10 U	10 U	10 U	10 U	10 U
Ethylbenzene		10 U	4 U	10 U	10 U	20 U	20 U	10 U	4.0 U	10 U	10 U	10 U	10 U	10 U	10 U
Freon-113		--	--	**18.1**	**30.7**	**52.3**	**51.2**	**42.9**	**48.5**	**41.9**	**38.3**	**43.4**	**33.6**	**31.9**	**107**
m,p-Xylene		--	--	10 U	10 U	20 U	20 U	10 U	4.0 U	10 U	10 U	10 U	10 U	10 U	10 U
Methylene chloride	10 [b]	25 U	10 U	25 U	25 U	50 U	50 U	25 U	10 U	25 U	25 U	25 U	25 U	25 U	25 U
o-Xylene		--	--	10 U	10 U	20 U	20 U	10 U	4.0 U	10 U	10 U	10 U	10 U	10 U	10 U
Styrene		--	--	10 U	10 U	20 U	20 U	10 U	4.0 U	10 U	10 U	10 U	10 U	10 U	10 U
Tetrachloroethene	10 [b]	10 U	4 U	10 U	10 U	20 U	20 U	10 U	4.0 U	10 U	10 U	10 U	10 U	10 U	10 U
Toluene		10 U	4 U	10 U	10 U	20 U	20 U	10 U	4.0 U	10 U	10 U	10 U	10 U	10 U	10 U
trans-1,2-Dichloroethene	10 [b]	10 U	4 U	10 U	10 U	20 U	20 U	10 U	4.0 U	10 U	10 U	10 U	10 U	10 U	10 U
trans-1,3-Dichloropropene		10 U	4 U	10 U	10 U	20 U	20 U	10 U	4.0 U	10 U	10 U	10 U	10 U	10 U	10 U
Trichloroethene	10 [b]	**487**	**335**	**149**	**328**	**487**	**331**	**229**	**280**	**266**	10 U	**451**	**283**	**258**	**235**
Trichlorofluoromethane		10 U	4 U	--	--	--	--	--	--	--	--	10 U	10 U	10 U	10 U
Vinyl acetate		--	--	25 U	25 U	50 U	50 U	25 U	10 U	25 U	25 U	25 U	25 U	25 U	25 U
Vinyl chloride	10 [b]	10 U	**24.4**	10 U	10 U	20 U	20 U	10 U	4.0 U	10 U	10 U	10 U	10 U	10 U	10 U
Total VOCs	2,130 [a]	**508.6**	**390.01**	**222.6**	**456.1**	**636.6**	**488.2**	**335.1**	**419.1**	**399.3**	**113.8**	**624.2**	**390.4**	**370.1**	**399.4**
Miscellaneous Parameters															
Iron	300	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Solids, Total Suspended	50,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Oil and Grease	15,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--

See Notes on Page 9.

Table 3. Summary of Treatment System Influent and Effluent, Former Bausch & Lomb Frame Center, Chili, NY

Constituent	Discharge Limit	GWTS Influent 10/6/05	GWTS Influent 1/4/06	GWTS Influent 4/20/06	GWTS Influent 7/7/06	GWTS Influent 10/12/06	GWTS Influent 1/9/07	GWTS Influent 4/13/07	GWTS Influent 7/10/07	GWTS Influent 10/11/07	GWTS Influent 1/8/08	GWTS Influent 4/22/08	GWTS Influent 7/16/08	GWTS Influent 10/2/08
Volatile Organics														
1,1,1-Trichloroethane	10 (b)	20 U	10 U	10 U	10 U	10 U	20 U	10 U	**47.5**	10 U	10 U	10 U	10 U	10 U
1,1,2,2-Tetrachloroethane		20 U	10 U	10 U	10 U	10 U	20 U	10 U	20 U	10 U	10 U	10 U	10 U	10 U
1,1,2-Trichloroethane	10 (b)	20 U	10 U	10 U	10 U	10 U	20 U	10 U	20 U	10 U	10 U	10 U	10 U	10 U
1,1-Dichloroethane	10 (b)	20 U	10 U	10 U	10 U	10 U	20 U	10 U	**62.1**	10 U	10 U	10 U	10 U	10 U
1,1-Dichloroethene	10 (b)	20 U	10 U	10 U	10 U	10 U	20 U	10 U	**35.8**	10 U	10 U	10 U	10 U	10 U
1,2-Dichlorobenzene		--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloroethane		20 U	10 U	10 U	10 U	10 U	20 U	10 U	20 U	10 U	10 U	10 U	10 U	10 U
1,2-Dichloropropane		20 U	10 U	10 U	10 U	10 U	20 U	10 U	20 U	10 U	10 U	10 U	10 U	10 U
1,3-Dichlorobenzene		--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene		--	--	--	--	--	--	--	--	--	--	--	--	--
2-Butanone		50 U	25 U	25 U	25 U	25 U	50 U	25 U	50 U	25 U	25 U	50 U	50 U	50 U
2-Chloroethyl vinyl ether		20 U	10 U	10 U	10 U	10 U	20 U	10 U	20 U	10 U	10 U	50 U	50 U	50 U
2-Hexanone		50 U	25 U	25 U	25 U	25 U	50 U	25 U	50 U	25 U	25 U	25 U	25 U	25 U
4-Methyl-2-pentanone		50 U	25 U	25 U	25 U	25 U	50 U	25 U	50 U	25 U	25 U	25 U	25 U	25 U
Acetone	10 (b)	100 U	50 U	50 U	50 U	50 U	100 U	50 U	100 U	50 U	50 U	50 U	50 U	50 U
Benzene		0.7 U	3.5 U	3.5 U	3.5 U	3.5 U	0.7 U	3.5 U	0.7 U	3.5 U	3.5 U	3.5 U	3.5 U	3.5 U
Bromodichloromethane		20 U	10 U	10 U	10 U	10 U	20 U	10 U	20 U	10 U	10 U	10 U	10 U	10 U
Bromoform		20 U	10 U	10 U	10 U	10 U	20 U	10 U	20 U	10 U	10 U	25 U	25 U	25 U
Bromomethane		20 U	10 U	10 U	10 U	10 U	20 U	10 U	20 U	10 U	10 U	10 U	10 U	10 U
Carbon disulfide		50 U	25 U	25 U	25 U	25 U	50 U	25 U	50 U	25 U	25 U	25 U	25 U	25 U
Carbon tetrachloride		20 U	10 U	10 U	10 U	10 U	20 U	10 U	20 U	10 U	10 U	10 U	10 U	10 U
Chlorobenzene		20 U	10 U	10 U	10 U	10 U	20 U	10 U	20 U	10 U	10 U	10 U	10 U	10 U
Chlorodibromomethane		20 U	10 U	10 U	10 U	10 U	20 U	10 U	20 U	10 U	10 U	10 U	10 U	10 U
Chloroethane		20 U	10 U	10 U	10 U	10 U	20 U	10 U	20 U	10 U	10 U	10 U	10 U	10 U
Chloroform		20 U	10 U	10 U	10 U	10 U	20 U	10 U	20 U	10 U	10 U	10 U	10 U	10 U
Chloromethane		20 U	10 U	10 U	10 U	10 U	20 U	10 U	20 U	10 U	10 U	10 U	10 U	10 U
cis-1,2-Dichloroethene	10 (b)	**64.3**	**55.9**	**67.4**	**41.6**	**57.4**	**54.8**	**46**	**557**	**42**	10 U	**33.6**	**50.3**	**42.4**
cis-1,3-Dichloropropene		20 U	10 U	10 U	10 U	10 U	20 U	10 U	20 U	10 U	10 U	10 U	10 U	10 U
Ethylbenzene		20 U	10 U	10 U	10 U	10 U	20 U	10 U	20 U	10 U	10 U	10 U	10 U	10 U
Freon-113		**39.2**	**24.7**	**30.1**	**20.9**	10 U	**58.4**	**19.8**	**369**	**59.9**	**18.2**	**135.5**	**16.2**	**14.4**
m,p-Xylene		20 U	10 U	10 U	10 U	10 U	20 U	10 U	20 U	10 U	10 U	10 U	10 U	10 U
Methylene chloride	10 (b)	20 U	25 U	25 U	25 U	25 U	20 U	25 U	20 U	25 U	25 U	25 U	25 U	25 U
o-Xylene		20 U	10 U	10 U	10 U	10 U	20 U	10 U	20 U	10 U	10 U	10 U	10 U	10 U
Styrene		20 U	10 U	10 U	10 U	10 U	20 U	10 U	20 U	10 U	10 U	25 U	25 U	25 U
Tetrachloroethene	10 (b)	20 U	10 U	10 U	10 U	10 U	20 U	10 U	20 U	10 U	10 U	10 U	10 U	10 U
Toluene		20 U	10 U	10 U	10 U	10 U	20 U	10 U	20 U	10 U	10 U	10 U	10 U	10 U
trans-1,2-Dichloroethene	10 (b)	20 U	10 U	10 U	10 U	10 U	20 U	10 U	20 U	10 U	10 U	10 U	10 U	10 U
trans-1,3-Dichloropropene		20 U	10 U	10 U	10 U	10 U	20 U	10 U	20 U	10 U	10 U	10 U	10 U	10 U
Trichloroethene	10 (b)	**312**	**246**	**253**	**204**	**187**	**185**	**137**	**2430**	**142**	**136**	**131**	**181**	**156**
Trichlorofluoromethane		20 U	10 U	10 U	10 U	10 U	20 U	10 U	20 U	10 U	10 U	10 U	10 U	10 U
Vinyl acetate		50 U	25 U	25 U	25 U	25 U	50 U	25 U	50 U	25 U	25 U	25 U	25 U	25 U
Vinyl chloride	10 (b)	20 U	10 U	10 U	10 U	10 U	20 U	10 U	**37.1**	10 U	10 U	10 U	10 U	10 U
Total VOCs	2,130 (a)	**415.5**	**326.6**	**350.5**	**266.5**	**244.4**	**298.2**	**202.8**	**3538.5**	**243.9**	**154.2**	**178.1**	**247.5**	**212.8**
Miscellaneous Parameters														
Iron	300	--	--	--	--	--	--	--	--	--	--	--	--	--
Solids, Total Suspended	50,000	--	--	--	--	--	--	--	--	--	--	--	--	--
Oil and Grease	15,000	--	--	--	--	--	--	--	--	--	--	--	--	--

See Notes on Page 9.

Table 3. Summary of Treatment System Influent and Effluent, Former Bausch & Lomb Frame Center, Chili, NY

Constituent	Discharge Limit	GWTS Influent 1/26/09	GWTS Influent 4/20/09	GWTS Effluent 4/19/02	GWTS Effluent 6/19/02	GWTS Effluent 6/26/02	GWTS Effluent 7/2/02	GWTS Effluent 7/11/02	GWTS Effluent 7/17/02	GWTS Effluent 7/24/02	GWTS Effluent 7/31/02	GWTS Effluent 8/6/02	GWTS Effluent 8/14/02	GWTS Effluent 10/16/02
Volatile Organics														
1,1,1-Trichloroethane	10 [b]	10 U	10 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--	2 U	2 U	2 U
1,1,2,2-Tetrachloroethane		10 U	10 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--	2 U	2 U	2 U
1,1,2-Trichloroethane	10 [b]	10 U	10 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--	2 U	2 U	2 U
1,1-Dichloroethane	10 [b]	10 U	10 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--	2 U	2 U	2 U
1,1-Dichloroethene	10 [b]	10 U	10 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--	2 U	2 U	2 U
1,2-Dichlorobenzene		--	--	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--	2 U	2 U	--
1,2-Dichloroethane		10 U	10 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--	2 U	2 U	2 U
1,2-Dichloropropane		10 U	10 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--	2 U	2 U	2 U
1,3-Dichlorobenzene		--	--	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--	2 U	2 U	--
1,4-Dichlorobenzene		--	--	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--	2 U	2 U	--
2-Butanone		50 U	50 U	--	--	--	--	--	--	--	--	--	--	5 U
2-Chloroethyl vinyl ether		50 U	50 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--	2 U	2 U	2 U
2-Hexanone		25 U	25 U	--	--	--	--	--	--	--	--	--	--	5 U
4-Methyl-2-pentanone		25 U	25 U	--	--	--	--	--	--	--	--	--	--	5 U
Acetone	10 [b]	50 U	50 U	--	--	--	--	--	--	--	--	--	--	10 U
Benzene		3.5 U	3.5 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	--	0.7 U	0.7 U	0.7 U
Bromodichloromethane		10 U	10 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--	2 U	2 U	2 U
Bromoform		25 U	25 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--	2 U	2 U	2 U
Bromomethane		10 U	10 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--	2 U	2 U	2 U
Carbon disulfide		25 U	25 U	--	--	--	--	--	--	--	--	--	--	5 U
Carbon tetrachloride		10 U	10 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--	2 U	2 U	2 U
Chlorobenzene		10 U	10 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--	2 U	2 U	2 U
Chlorodibromomethane		10 U	10 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--	2 U	2 U	2 U
Chloroethane		10 U	10 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--	2 U	2 U	2 U
Chloroform		10 U	10 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--	2 U	2 U	2 U
Chloromethane		10 U	10 U	2 U	**4.17**	2 U	2 U	2 U	2 U	2 U	--	2 U	2 U	2 U
cis-1,2-Dichloroethene	10 [b]	**38.9**	**42.2**	--	--	--	--	--	--	--	--	--	--	2 U
cis-1,3-Dichloropropene		10 U	10 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--	2 U	2 U	2 U
Ethylbenzene		10 U	10 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--	2 U	2 U	2 U
Freon-113		**12.7**	**14.6**	--	--	--	--	--	--	--	--	--	--	2 U
m,p-Xylene		10 U	10 U	--	--	--	--	--	--	--	--	--	--	2 U
Methylene chloride	10 [b]	25 U	25 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	--	5 U	5 U	5 U
o-Xylene		10 U	10 U	--	--	--	--	--	--	--	--	--	--	2 U
Styrene		25 U	25 U	--	--	--	--	--	--	--	--	--	--	2 U
Tetrachloroethene	10 [b]	10 U	10 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--	2 U	2 U	2 U
Toluene		10 U	10 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--	2 U	2 U	2 U
trans-1,2-Dichloroethene	10 [b]	10 U	10 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--	2 U	2 U	2 U
trans-1,3-Dichloropropene		10 U	10 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--	2 U	2 U	2 U
Trichloroethene	10 [b]	**156**	10 U	2 U	**5.89**	2 U	2 U	2 U	2 U	2 U	--	2 U	2 U	2 U
Trichlorofluoromethane		10 U	10 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--	2 U	2 U	--
Vinyl acetate		25 U	25 U	--	--	--	--	--	--	--	--	--	--	5 U
Vinyl chloride	10 [b]	10 U	10 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--	2 U	2 U	2 U
Total VOCs	2,130 [a]	**207.6**	**218.8**	ND	**10.06**	ND	ND	ND	ND	ND	--	--	--	ND
Miscellaneous Parameters														
Iron	300	--	--	--	100 U	--	--	--	--	--	--	100 U	100 U	100 U
Solids, Total Suspended	50,000	--	--	--	4,000 U	2,000 U	2,000 U	2,000 U	2,000 U	2,000 U	2,000 U	2,000 U	2,000 U	4,000 U
Oil and Grease	15,000	--	--	--	5,000 U	5,000 U	5,000 U	5,000 U	5,000 U	5,000 U	5,000 U	6,000 U	5,000 U	6,000 U

See Notes on Page 9.

Table 3. Summary of Treatment System Influent and Effluent, Former Bausch & Lomb Frame Center, Chili, NY

Constituent	Discharge Limit	GWTS Effluent 11/21/02	GWTS Effluent 12/6/02	GWTS Effluent 1/7/03	GWTS Effluent 2/3/03	GWTS Effluent 3/3/03	GWTS Effluent 4/11/03	GWTS Effluent 6/3/03	GWTS Effluent 7/8/03	GWTS Effluent 7/22/03	GWTS Effluent 7/30/03	GWTS Effluent 8/6/03	GWTS Effluent 8/13/03	GWTS Effluent 8/19/03
Volatile Organics														
1,1,1-Trichloroethane	10 (b)	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--	--	2 U	--	--
1,1,2,2-Tetrachloroethane		2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--	--	2 U	--	--
1,1,2-Trichloroethane	10 (b)	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--	--	2 U	--	--
1,1-Dichloroethane	10 (b)	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--	--	2 U	--	--
1,1-Dichloroethene	10 (b)	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--	--	2 U	--	--
1,2-Dichlorobenzene		--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloroethane		2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--	--	2 U	--	--
1,2-Dichloropropane		2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--	--	2 U	--	--
1,3-Dichlorobenzene		--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene		--	--	--	--	--	--	--	--	--	--	--	--	--
2-Butanone		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	--	--	5 U	--	--
2-Chloroethyl vinyl ether		2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--	--	2 U	--	--
2-Hexanone		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	--	--	5 U	--	--
4-Methyl-2-pentanone		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	--	--	5 U	--	--
Acetone	10 (b)	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	--	--	10 U	--	--
Benzene		0.7 U	0.7 U	0.7 U	2 U	0.7 U	2 U	2 U	2 U	--	--	2 U	--	--
Bromodichloromethane		2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--	--	2 U	--	--
Bromoform		2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--	--	2 U	--	--
Bromomethane		2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--	--	2 U	--	--
Carbon disulfide		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	--	--	5 U	--	--
Carbon tetrachloride		2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--	--	2 U	--	--
Chlorobenzene		2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--	--	2 U	--	--
Chlorodibromomethane		2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--	--	2 U	--	--
Chloroethane		2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--	--	2 U	--	--
Chloroform		2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--	--	2 U	--	--
Chloromethane		2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--	--	2 U	--	--
cis-1,2-Dichloroethene	10 (b)	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--	--	2 U	--	--
cis-1,3-Dichloropropene		2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--	--	2 U	--	--
Ethylbenzene		2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--	--	2 U	--	--
Freon-113		--	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--	--	2 U	--	--
m,p-Xylene		2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--	--	2 U	--	--
Methylene chloride	10 (b)	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	--	--	5 U	--	--
o-Xylene		2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--	--	2 U	--	--
Styrene		2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--	--	2 U	--	--
Tetrachloroethene	10 (b)	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--	--	2 U	--	--
Toluene		2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--	--	2 U	--	--
trans-1,2-Dichloroethene	10 (b)	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--	--	2 U	--	--
trans-1,3-Dichloropropene		2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--	--	2 U	--	--
Trichloroethene	10 (b)	2 U	2 U	**2.03**	2 U	**2.43**	**3.43**	2 U	2 U	--	--	2 U	--	--
Trichlorofluoromethane		--	--	--	--	--	--	--	--	--	--	--	--	--
Vinyl acetate		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	--	--	5 U	--	--
Vinyl chloride	10 (b)	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--	--	2 U	--	--
Total VOCs	2,130 (a)	ND	ND	**2.03**	ND	**2.43**	**3.43**	ND	ND	--	--	ND	--	--
Miscellaneous Parameters														
Iron	300	100 U	**124**	**167**	100 U	100 U	100 U	100 U	**730**	100 U	100 U	100 U	100 U	100 U
Solids, Total Suspended	50,000	5,000 U	5000 U	2,000 U	5,000 U	5,000 U	5,000 U	5,000 U	**16,000**	--	--	2,000 U	--	--
Oil and Grease	15,000	5,000 U	5,000 U	5,000 U	5,000 U	6,000 U	6,000 U	6,000 U	6,000 U	--	--	6,000 U	--	--

See Notes on Page 9.

Table 3. Summary of Treatment System Influent and Effluent, Former Bausch & Lomb Frame Center, Chili, NY

Constituent	Discharge Limit	GWTS Effluent 8/27/03	GWTS Effluent 9/4/03	GWTS Effluent 9/8/03	GWTS Effluent 10/8/2003	GWTS Effluent 11/14/2003	GWTS Effluent 12/9/2003	GWTS Effluent 1/20/2004	GWTS Effluent 2/5/2004	GWTS Effluent 3/9/2004	GWTS Effluent 4/26/2004	GWTS Effluent 5/12/2004	GWTS Effluent 6/7/2004	GWTS Effluent 6/22/04
Volatile Organics														
1,1,1-Trichloroethane	10 [b]	--	2 U	--	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--
1,1,2,2-Tetrachloroethane		--	2 U	--	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--
1,1,2-Trichloroethane	10 [b]	--	2 U	--	2 U	2 U	2 U	2 U	2 U	6.25 U	2 U	2 U	2 U	--
1,1-Dichloroethane	10 [b]	--	2 U	--	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--
1,1-Dichloroethene	10 [b]	--	2 U	--	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--
1,2-Dichlorobenzene		--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloroethane		--	2 U	--	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--
1,2-Dichloropropane		--	2 U	--	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--
1,3-Dichlorobenzene		--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene		--	--	--	--	--	--	--	--	--	--	--	--	--
2-Butanone		--	5 U	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	--
2-Chloroethyl vinyl ether		--	2 U	--	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--
2-Hexanone		--	5 U	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	--
4-Methyl-2-pentanone		--	5 U	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	--
Acetone	10 [b]	--	10 U	--	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	--
Benzene		--	0.7 U	--	2 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	--
Bromodichloromethane		--	2 U	--	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--
Bromoform		--	2 U	--	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--
Bromomethane		--	2 U	--	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--
Carbon disulfide		--	5 U	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	--
Carbon tetrachloride		--	2 U	--	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--
Chlorobenzene		--	2 U	--	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--
Chlorodibromomethane		--	2 U	--	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--
Chloroethane		--	2 U	--	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--
Chloroform		--	2 U	--	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--
Chloromethane		--	2 U	--	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--
cis-1,2-Dichloroethene	10 [b]	--	2 U	--	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--
cis-1,3-Dichloropropene		--	2 U	--	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--
Ethylbenzene		--	2 U	--	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--
Freon-113		--	2 U	--	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--
m,p-Xylene		--	2 U	--	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--
Methylene chloride	10 [b]	--	5 U	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	--
o-Xylene		--	2 U	--	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--
Styrene		--	2 U	--	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--
Tetrachloroethene	10 [b]	--	2 U	--	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--
Toluene		--	2 U	--	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--
trans-1,2-Dichloroethene	10 [b]	--	2 U	--	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--
trans-1,3-Dichloropropene		--	2 U	--	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--
Trichloroethene	10 [b]	--	2 U	--	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--
Trichlorofluoromethane		--	--	--	--	--	--	--	--	--	--	--	--	--
Vinyl acetate		--	5 U	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	--
Vinyl chloride	10 [b]	--	2 U	--	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--
Total VOCs	2,130 [a]	--	ND	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	--
Miscellaneous Parameters														
Iron	300	100 U	**116**	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	**1,670**	100 U
Solids, Total Suspended	50,000	--	4,000 U	--	2,000 U	4,000 U	4,000 U	3,000 U	4,000 U	5,000 U	5,000 U	1,000 U	**21,000**	--
Oil and Grease	15,000	--	6,000 U	--	6,000 U	6,000 U	6,000 U	6,000 U	**10,000**	6,000 U	6,000 U	1,000 U	6,000 U	--

See Notes on Page 9.

Table 3. Summary of Treatment System Influent and Effluent, Former Bausch & Lomb Frame Center, Chili, NY

Constituent	Discharge Limit	GWTS Effluent 6/28/04	GWTS Effluent 7/6/2004	GWTS Effluent 7/13/04	GWTS Effluent 7/19/04	GWTS Effluent 7/28/04	GWTS Effluent 8/2/04	GWTS Effluent 8/9/04	GWTS Effluent 9/13/04	GWTS Effluent 10/8/2004	GWTS Effluent 11/15/2004	GWTS Effluent 12/2/2004	GWTS Effluent 1/12/2005	GWTS Effluent 2/3/2005
Volatile Organics														
1,1,1-Trichloroethane	10 (b)	--	2 U	--	--	--	--	--	2 U	2 U	2 U	2 U	2 U	2 U
1,1,2,2-Tetrachloroethane		--	2 U	--	--	--	--	--	2 U	2 U	2 U	2 U	2 U	2 U
1,1,2-Trichloroethane	10 (b)	--	2 U	--	--	--	--	--	2 U	2 U	2 U	2 U	2 U	2 U
1,1-Dichloroethane	10 (b)	--	2 U	--	--	--	--	--	2 U	2 U	2 U	2 U	2 U	2 U
1,1-Dichloroethene	10 (b)	--	2 U	--	--	--	--	--	2 U	2 U	2 U	2 U	2 U	2 U
1,2-Dichlorobenzene		--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloroethane		--	2 U	--	--	--	--	--	2 U	2 U	2 U	2 U	2 U	2 U
1,2-Dichloropropane		--	2 U	--	--	--	--	--	2 U	2 U	2 U	2 U	2 U	2 U
1,3-Dichlorobenzene		--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene		--	--	--	--	--	--	--	--	--	--	--	--	--
2-Butanone		--	5 U	--	--	--	--	--	5 U	5 U	5 U	5 U	5 U	5 U
2-Chloroethyl vinyl ether		--	2 U	--	--	--	--	--	2 U	2 U	2 U	2 U	2 U	2 U
2-Hexanone		--	5 U	--	--	--	--	--	5 U	5 U	5 U	5 U	5 U	5 U
4-Methyl-2-pentanone		--	5 U	--	--	--	--	--	5 U	5 U	5 U	5 U	5 U	5 U
Acetone	10 (b)	--	10 U	--	--	--	--	--	10 U	10 U	10 U	10 U	10 U	10 U
Benzene		--	0.7 U	--	--	--	--	--	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
Bromodichloromethane		--	2 U	--	--	--	--	--	2 U	2 U	2 U	2 U	2 U	2 U
Bromoform		--	2 U	--	--	--	--	--	2 U	2 U	2 U	2 U	2 U	2 U
Bromomethane		--	2 U	--	--	--	--	--	2 U	2 U	2 U	2 U	2 U	2 U
Carbon disulfide		--	5 U	--	--	--	--	--	5 U	5 U	5 U	5 U	5 U	5 U
Carbon tetrachloride		--	2 U	--	--	--	--	--	2 U	2 U	2 U	2 U	2 U	2 U
Chlorobenzene		--	2 U	--	--	--	--	--	2 U	2 U	2 U	2 U	2 U	2 U
Chlorodibromomethane		--	2 U	--	--	--	--	--	2 U	2 U	2 U	2 U	2 U	2 U
Chloroethane		--	2 U	--	--	--	--	--	2 U	2 U	2 U	2 U	2 U	2 U
Chloroform		--	2 U	--	--	--	--	--	2 U	2 U	2 U	2 U	2 U	2 U
Chloromethane		--	2 U	--	--	--	--	--	2 U	2 U	2 U	2 U	2 U	2 U
cis-1,2-Dichloroethene	10 (b)	--	2 U	--	--	--	--	--	2 U	2 U	2 U	2 U	2 U	2 U
cis-1,3-Dichloropropene		--	2 U	--	--	--	--	--	2 U	2 U	2 U	2 U	2 U	2 U
Ethylbenzene		--	2 U	--	--	--	--	--	2 U	2 U	2 U	2 U	2 U	2 U
Freon-113		--	2 U	--	--	--	--	--	2 U	2 U	2 U	2 U	2 U	2 U
m,p-Xylene		--	2 U	--	--	--	--	--	2 U	2 U	2 U	2 U	2 U	2 U
Methylene chloride	10 (b)	--	5 U	--	--	--	--	--	5 U	5 U	5 U	5 U	5 U	5 U
o-Xylene		--	2 U	--	--	--	--	--	2 U	2 U	2 U	2 U	2 U	2 U
Styrene		--	2 U	--	--	--	--	--	2 U	2 U	2 U	2 U	2 U	2 U
Tetrachloroethene	10 (b)	--	2 U	--	--	--	--	--	2 U	2 U	2 U	2 U	2 U	2 U
Toluene		--	2 U	--	--	--	--	--	2 U	2 U	2 U	2 U	2 U	2 U
trans-1,2-Dichloroethene	10 (b)	--	2 U	--	--	--	--	--	2 U	2 U	2 U	2 U	2 U	2 U
trans-1,3-Dichloropropene		--	2 U	--	--	--	--	--	2 U	2 U	2 U	2 U	2 U	2 U
Trichloroethene	10 (b)	--	2 U	--	--	--	--	--	2 U	2 U	2 U	2 U	2 U	2 U
Trichlorofluoromethane		--	--	--	--	--	--	--	--	--	--	--	--	--
Vinyl acetate		--	5 U	--	--	--	--	--	5 U	5 U	5 U	5 U	5 U	5 U
Vinyl chloride	10 (b)	--	2 U	--	--	--	--	--	2 U	2 U	2 U	2 U	2 U	2 U
Total VOCs	2,130 (a)	--	ND	--	--	--	--	--	ND	ND	ND	ND	ND	ND
Miscellaneous Parameters														
Iron	300	100 U	**100**	100 U	100 U	100 U	100 U	100 U	100 U	100 U	**108**	100 U	100 U	100 U
Solids, Total Suspended	50,000	--	1,000 U	--	--	--	--	--	5,000 U	5,000 U	4,000 U	4,000 U	4,000 U	4,000 U
Oil and Grease	15,000	--	6,000 U	--	--	--	--	--	6,000 U	6,000 U	6,000 U	6,000 U	6,000 U	6,000 U

See Notes on Page 9.

Table 3. Summary of Treatment System Influent and Effluent, Former Bausch & Lomb Frame Center, Chili, NY

Constituent	Discharge Limit	GWTS Effluent 3/2/2005	GWTS Effluent 4/11/2005	GWTS Effluent 5/20/2005	GWTS Effluent 6/8/2005	GWTS Effluent 7/12/2005	GWTS Effluent 10/6/2005	GWTS Effluent 1/4/2006	GWTS Effluent 4/20/2006	GWTS Effluent 7/7/2006	GWTS Effluent 10/12/2006	GWTS Effluent 1/9/2007	GWTS Effluent 4/13/2007	GWTS Effluent 7/10/2007
Volatile Organics														
1,1,1-Trichloroethane	10 [b]	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
1,1,2,2-Tetrachloroethane		2 U	2 U	2 U	2 U	2 U	--	--	--	--	--	--	--	--
1,1,2-Trichloroethane	10 [b]	2 U	2 U	2 U	2 U	2 U	--	--	--	--	--	--	--	--
1,1-Dichloroethane	10 [b]	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
1,1-Dichloroethene	10 [b]	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
1,2-Dichlorobenzene		--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloroethane		2 U	2 U	2 U	2 U	2 U	--	--	--	--	--	--	--	--
1,2-Dichloropropane		2 U	2 U	2 U	2 U	2 U	--	--	--	--	--	--	--	--
1,3-Dichlorobenzene		--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene		--	--	--	--	--	--	--	--	--	--	--	--	--
2-Butanone		5 U	5 U	5 U	5 U	5 U	--	--	--	--	--	--	--	--
2-Chloroethyl vinyl ether		2 U	2 U	2 U	2 U	2 U	--	--	--	--	--	--	--	--
2-Hexanone		5 U	5 U	5 U	5 U	5 U	--	--	--	--	--	--	--	--
4-Methyl-2-pentanone		5 U	5 U	5 U	5 U	5 U	--	--	--	--	--	--	--	--
Acetone	10 [b]	10 U	10 U	10 U	10 U	10 U	--	--	--	--	--	--	--	--
Benzene		0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	--	--	--	--	--	--	--	--
Bromodichloromethane		2 U	2 U	2 U	2 U	2 U	--	--	--	--	--	--	--	--
Bromoform		2 U	2 U	2 U	2 U	2 U	--	--	--	--	--	--	--	--
Bromomethane		2 U	2 U	2 U	2 U	2 U	--	--	--	--	--	--	--	--
Carbon disulfide		5 U	5 U	5 U	5 U	5 U	--	--	--	--	--	--	--	--
Carbon tetrachloride		2 U	2 U	2 U	2 U	2 U	--	--	--	--	--	--	--	--
Chlorobenzene		2 U	2 U	2 U	2 U	2 U	--	--	--	--	--	--	--	--
Chlorodibromomethane		2 U	2 U	2 U	2 U	2 U	--	--	--	--	--	--	--	--
Chloroethane		2 U	2 U	2 U	2 U	2 U	--	--	--	--	--	--	--	--
Chloroform		2 U	2 U	2 U	2 U	2 U	--	--	--	--	--	--	--	--
Chloromethane		2 U	2 U	2 U	2 U	2 U	--	--	--	--	--	--	--	--
cis-1,2-Dichloroethene	10 [b]	2 U	2 U	2 U	2 U	2 U	--	--	--	--	--	--	--	--
cis-1,3-Dichloropropene		2 U	2 U	2 U	2 U	2 U	--	--	--	--	--	--	--	--
Ethylbenzene		2 U	2 U	2 U	2 U	2 U	--	--	--	--	--	--	--	--
Freon-113		2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
m,p-Xylene		2 U	2 U	2 U	2 U	2 U	--	--	--	--	--	--	--	--
Methylene chloride	10 [b]	5 U	5 U	5 U	5 U	5 U	--	--	--	--	--	--	--	--
o-Xylene		2 U	2 U	2 U	2 U	2 U	--	--	--	--	--	--	--	--
Styrene		2 U	2 U	2 U	2 U	2 U	--	--	--	--	--	--	--	--
Tetrachloroethene	10 [b]	2 U	2 U	2 U	2 U	2 U	--	--	--	--	--	--	--	--
Toluene		2 U	2 U	2 U	2 U	2 U	--	--	--	--	--	--	--	--
trans-1,2-Dichloroethene	10 [b]	2 U	2 U	2 U	2 U	2 U	--	--	--	--	--	--	--	--
trans-1,3-Dichloropropene		2 U	2 U	2 U	2 U	2 U	--	--	--	--	--	--	--	--
Trichloroethene	10 [b]	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Trichlorofluoromethane		--	--	--	--	--	--	--	--	--	--	--	--	--
Vinyl acetate		5 U	5 U	5 U	5 U	5 U	--	--	--	--	--	--	--	--
Vinyl chloride	10 [b]	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Total VOCs	2,130 [a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Miscellaneous Parameters														
Iron	300	100 U	100 U	100 U	100 U	100 U	**199**	100 U	100 U	100 U	**321**	100 U	100 U	100 U
Solids, Total Suspended	50,000	4,000 U	4,000 U	5,000 U	10,000 U	5,000 U	--	--	--	--	--	--	--	--
Oil and Grease	15,000	6,000 U	6,000 U	6,000 U	6,000 U	6,000 U	1,000 U	1,000 U	7,000 U	6,000 U	6,000 U	6,000 U	6,000 U	6,000 U

See Notes on Page 9.

Table 3. Summary of Treatment System Influent and Effluent, Former Bausch & Lomb Frame Center, Chili, NY

Constituent	Discharge Limit	GWTS Effluent 10/11/2007	GWTS Effluent 1/8/2008	GWTS Effluent 4/22/2008	GWTS Effluent 7/16/2008	GWTS Effluent 10/21/2008	GWTS Effluent 1/26/2009	GWTS Effluent 4/20/2009
Volatile Organics								
1,1,1-Trichloroethane	10 (b)	2 U	2 U	2 U	2 U	2 U	2 U	2 U
1,1,2,2-Tetrachloroethane		--	--	--	--	--	--	--
1,1,2-Trichloroethane	10 (b)	--	--	--	--	--	--	--
1,1-Dichloroethane	10 (b)	2 U	2 U	2 U	2 U	2 U	2 U	2 U
1,1-Dichloroethene	10 (b)	2 U	2 U	2 U	2 U	2 U	2 U	2 U
1,2-Dichlorobenzene		--	--	--	--	--	--	--
1,2-Dichloroethane		--	--	--	--	--	--	--
1,2-Dichloropropane		--	--	--	--	--	--	--
1,3-Dichlorobenzene		--	--	--	--	--	--	--
1,4-Dichlorobenzene		--	--	--	--	--	--	--
2-Butanone		--	--	--	--	--	--	--
2-Chloroethyl vinyl ether		--	--	--	--	--	--	--
2-Hexanone		--	--	--	--	--	--	--
4-Methyl-2-pentanone		--	--	--	--	--	--	--
Acetone	10 (b)	--	--	--	--	--	--	--
Benzene		--	--	--	--	--	--	--
Bromodichloromethane		--	--	--	--	--	--	--
Bromoform		--	--	--	--	--	--	--
Bromomethane		--	--	--	--	--	--	--
Carbon disulfide		--	--	--	--	--	--	--
Carbon tetrachloride		--	--	--	--	--	--	--
Chlorobenzene		--	--	--	--	--	--	--
Chlorodibromomethane		--	--	--	--	--	--	--
Chloroethane		--	--	--	--	--	--	--
Chloroform		--	--	--	--	--	--	--
Chloromethane		--	--	--	--	--	--	--
cis-1,2-Dichloroethene	10 (b)	--	--	--	--	--	--	--
cis-1,3-Dichloropropene		--	--	--	--	--	--	--
Ethylbenzene		--	--	--	--	--	--	--
Freon-113		2 U	2 U	2 U	2 U	2 U	2 U	2 U
m,p-Xylene		--	--	--	--	--	--	--
Methylene chloride	10 (b)	--	--	--	--	--	--	--
o-Xylene		--	--	--	--	--	--	--
Styrene		--	--	--	--	--	--	--
Tetrachloroethene	10 (b)	--	--	--	--	--	--	--
Toluene		--	--	--	--	--	--	--
trans-1,2-Dichloroethene	10 (b)	--	--	--	--	--	--	--
trans-1,3-Dichloropropene		--	--	--	--	--	--	--
Trichloroethene	10 (b)	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Trichlorofluoromethane		--	--	--	--	--	--	--
Vinyl acetate		--	--	--	--	--	--	--
Vinyl chloride	10 (b)	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Total VOCs	2,130 (a)	ND	ND	ND	ND	ND	ND	ND
Miscellaneous Parameters								
Iron	300	**1,320**	**101**	100 U	100 U	100 U	100 U	100 U
Solids, Total Suspended	50,000	--	--	--	--	--	--	--
Oil and Grease	15,000	6,000 U	6,000 U	6,000 U	6,000 U	6,000 U	6,000 U	6,000 U

See Notes on Page 9.

Table 3. Summary of Treatment System Influent and Effluent, Former Bausch & Lomb Frame Center, Chili, NY

Notes:
All results in micrograms per liter (ug/L) equivalent to parts per billion (ppb).
All results are preliminary.
U = The compound was analyzed for but not detected. The associated number is the quantitation limit.
Detections are bolded.
Shaded values exceed the discharge limit.
-- = Compound not analyzed.

(a) - For discharge to sanitary sewer.
(b) - For discharge to storm sewer.

Effluent discharge to sanitary sewer until 6/24/02.
From 6/25/02 on the effluent has been discharged to the storm sewer.

Table 4. Treatment System Effluent Discharge Rate Summary, Former Bausch & Lomb Frame Center, Chili, NY

Date	Effluent Meter Totalizer Reading (Gallons)	Days Since Previous Reading	Total Flow During This Period (Gallons)	Average Flow Rate (Gallons/Minute)
8/1/01	8,891,942	27	916,382	23.6
9/4/01	9,884,568	34	992,626	20.3
10/9/2001	10,928,004	35	1,043,436	20.7
11/8/2001	11,724,464	30	796,460	18.4
12/6/2001	12,518,760	28	794,296	19.7
1/14/2002	13,759,373	39	1,240,613	22.1
2/4/2002	14,585,233	21	825,860	27.3
3/7/2002	15,832,853	31	1,247,620	27.9
4/19/2002	17,517,428	43	1,684,575	27.2
5/16/2002	18,348,758	27	831,330	21.4
6/26/2002	19,061,860	41	713,102	12.1
7/31/2002	19,874,688	35	812,828	16.1
8/29/2002	20,560,582	29	685,894	16.4
9/29/2002	21,187,833	31	627,251	14.1
10/31/2002	21,691,826	32	503,993	10.9
11/27/2002	22,092,324	27	400,498	10.3
12/31/2002	22,696,051	34	603,727	12.3
1/31/2003	23,435,442	31	739,391	16.6
2/28/2003	24,056,616	28	621,174	15.4
4/2/2003	24,782,322	33	725,706	15.3
4/30/2003	25,327,938	28	545,616	13.5
6/2/2003	26,118,097	33	790,159	16.6
7/1/2003	26,952,960	29	834,863	20.0
7/31/2003	27,628,382	30	675,422	15.6
8/28/2003	28,149,201	28	520,819	12.9
9/29/2003	28,900,392	32	751,191	16.3
10/30/2003	29,402,003	31	501,611	11.2
11/27/2003	29,874,675	28	472,672	11.7
12/31/2003	30,541,818	34	667,143	13.6
1/30/2004	31,313,979	30	772,161	17.9
2/29/2004	31,951,473	30	637,494	14.8
3/31/2004	32,759,767	31	808,294	18.1
4/29/2004	33,511,431	29	751,664	18.0
5/27/2004	34,105,802	28	594,371	14.7
6/28/2004	34,691,110	32	585,308	12.7
7/29/2004	35,260,941	31	569,831	12.8
8/30/2004	35,788,348	32	527,407	11.4
9/28/2004	36,233,389	29	445,041	10.7
10/31/2004	36,726,274	33	492,885	10.4
11/30/2004	37,293,650	30	567,376	13.1
12/29/2004	37,895,926	29	602,276	14.4
1/31/2005	38,459,540	33	563,614	11.9
2/28/2005	38,969,410	28	509,870	12.6
3/29/2005	39,553,747	29	584,337	14.0
4/29/2005	40,216,722	31	662,975	14.9
5/31/2005	40,796,268	32	579,546	12.6
6/30/2005	41,232,324	30	436,056	10.1
7/29/2005	41,682,112	29	449,788	10.8
8/30/2005	42,189,935	32	507,823	11.0
9/30/2005	42,642,085	31	452,150	10.1
10/31/2005	43,161,193	31	519,108	11.6
11/30/2005	43,691,865	30	530,672	12.3
12/30/2005	44,116,924	30	425,059	9.8
1/30/2006	44,544,108	31	427,184	9.6
2/28/2006	44,904,395	29	360,287	8.6
3/31/2006	45,369,571	31	465,176	10.4
4/28/2006	45,793,701	28	424,130	10.5
5/31/2006	46,221,727	33	428,026	9.0
6/30/2006	46,635,718	30	413,991	9.6
7/31/2006	47,093,269	31	457,551	10.2
8/31/2006	47,458,234	31	364,965	8.2
9/27/2006	47,795,840	27	337,606	8.7
10/31/2006	48,440,555	34	644,715	13.2
11/28/2006	49,126,212	28	685,657	17.0
12/27/2006	49,745,056	29	618,844	14.8

Table 4. Treatment System Effluent Discharge Rate Summary, Former Bausch & Lomb Frame Center, Chili, NY

Date	Effluent Meter Totalizer Reading (Gallons)	Days Since Previous Reading	Total Flow During This Period (Gallons)	Average Flow Rate (Gallons/Minute)
1/28/2007	50,405,233	32	660,177	14.3
2/27/2007	50,921,993	30	516,760	12.0
3/30/2007	51,473,976	31	551,983	12.4
4/30/2007	52,193,991	31	720,015	16.1
5/29/2007	52,760,230	29	566,239	13.6
6/25/2007	53,295,681	27	535,451	13.8
7/31/2007	53,883,624	36	587,943	11.3
8/31/2007	54,350,527	31	466,903	10.5
9/27/2007	54,704,280	27	353,753	9.1
10/31/2007	55,215,747	34	511,467	10.4
11/28/2007	55,675,428	28	459,681	11.4
12/21/2007	56,161,646	23	486,218	14.7
1/31/2008	57,008,776	41	847,130	14.3
2/29/2008	57,539,571	29	530,795	12.7
3/28/2008	58,075,486	28	535,915	13.3
4/29/2008	58,562,682	32	487,196	10.6
5/29/2008	59,054,733	30	492,051	11.4
6/30/2008	59,545,040	32	490,307	10.6
7/30/2008	59,963,401	30	418,361	9.7
8/24/2008	60,412,156	25	448,755	12.5
9/29/2008	60,824,211	36	412,055	7.9
10/30/2008	61,237,530	31	413,319	9.3
11/25/2008	61,651,058	26	413,528	11.0
12/23/2008	62,174,109	28	523,051	13.0
1/30/2009	62,904,246	38	730,137	13.3
2/26/2009	63,491,861	27	587,615	15.1
3/31/2009	64,151,148	33	659,287	13.9
4/30/2009	64,760,172	30	609,024	14.1
5/28/2009	65,265,499	28	505,327	12.5
6/30/2009	65,789,571	33	524,072	11.0
7/31/2009	66,335,014	31	545,443	12.2
8/29/2009	66,806,139	29	471,125	11.3

Table 5. Sub-Slab Depressurization System Monitoring Data Summary, Bausch & Lomb, Former Frame Center, Chili, NY

Location	Date	Time	PID Background Reading (ppb)	System Discharge PID Reading (ppb)	System Pressure (negative inches of water)	Comments
Dry Well (SV-1N)	11/2/06	11:04	120	> 199,000	NA	
Dry Well (SV-1N)	11/2/06	15:20	NA	3,500	NA	
Dry Well (SV-1N)	11/3/06	11:16	44	45	2.4	
Dry Well (SV-1N)	11/6/06	10:09	240	6,836	2.3	
Dry Well (SV-1N)	11/7/06	8:23	200	1,339	2.3	
Dry Well (SV-1N)	11/21/06	10:25	130	7,182	2.0	Second suction drop to sub-slab in Eagle Freight Company area added to dry well area SV-1 fan.
Dry Well (SV-1N)	12/27/06	15:07	121	536	2.7	New suction drop installed on December 27, 2006.
Dry Well (SV-1N)	1/5/07	14:13	122	2,251	1.7	
Dry Well (SV-1N)	1/12/07	9:23	120	1,025	1.7	
Dry Well (SV-1N)	1/19/07	9:12	108	859	1.7	
Dry Well (SV-1N)	1/28/07	3:40	NA	NA	1.6	Pilot study ended, record system checks by logging manometer readings only.
Dry Well (SV-1N)	2/6/07	10:50	NA	NA	1.5	
Dry Well (SV-1N)	2/15/07	2:40	NA	NA	1.6	
Dry Well (SV-1N)	2/23/07	2:23	NA	NA	1.6	
Dry Well (SV-1N)	3/2/07	3:15	NA	NA	1.6	
Dry Well (SV-1N)	3/8/07	3:30	NA	NA	1.5	
Dry Well (SV-1N)	3/13/07	1:30	NA	NA	1.6	
Dry Well (SV-1N)	3/23/07	1:38	NA	NA	1.6	
Dry Well (SV-1N)	3/27/07	3:40	NA	NA	1.6	
Dry Well (SV-1N)	4/3/07	2:53	NA	NA	1.6	
Dry Well (SV-1N)	4/12/07	4:00	NA	NA	1.5	
Dry Well (SV-1N)	4/20/07	1:45	NA	NA	1.6	
Dry Well (SV-1N)	4/26/07	3:10	NA	NA	1.6	
Dry Well (SV-1N)	5/4/07	2:37	NA	NA	1.6	
Dry Well (SV-1N)	5/10/07	3:03	NA	NA	1.6	
Dry Well (SV-1N)	5/18/07	1:10	NA	NA	1.6	
Dry Well (SV-1N)	5/24/07	3:30	NA	NA	1.5	
Dry Well (SV-1N)	5/29/07	3:10	NA	NA	1.5	
Dry Well (SV-1N)	6/8/07	3:00	NA	NA	1.6	
Dry Well (SV-1N)	6/13/07	10:05	NA	NA	1.6	
Dry Well (SV-1N)	6/20/07	8:40	NA	NA	1.6	
Dry Well (SV-1N)	6/27/07	3:10	NA	NA	1.6	
Dry Well (SV-1N)	7/5/07	2:00	NA	NA	1.6	
Dry Well (SV-1N)	7/12/07	12:30	NA	NA	1.6	
Dry Well (SV-1N)	7/18/07	3:17	NA	NA	1.5	
Dry Well (SV-1N)	7/27/07	2:50	NA	NA	1.6	
Dry Well (SV-1N)	7/31/07	3:25	NA	NA	1.6	
Dry Well (SV-1N)	8/8/07	3:28	NA	NA	1.6	
Dry Well (SV-1N)	8/20/07	2:40	NA	NA	1.6	
Dry Well (SV-1N)	8/24/07	8:36	NA	NA	1.6	
Dry Well (SV-1N)	8/28/07	3:01	NA	NA	1.6	
Dry Well (SV-1N)	9/7/07	9:40	NA	NA	1.6	
Dry Well (SV-1N)	9/12/07	11:59	NA	NA	1.5	
Dry Well (SV-1N)	9/17/07	10:51	NA	NA	1.5	
Dry Well (SV-1N)	9/24/07	2:32	NA	NA	1.5	
Dry Well (SV-1N)	10/1/07	2:37	NA	NA	1.5	

See Notes on Page 14.

Table 5. Sub-Slab Depressurization System Monitoring Data Summary, Bausch & Lomb, Former Frame Center, Chili, NY

Location	Date	Time	PID Background Reading (ppb)	System Discharge PID Reading (ppb)	System Pressure (negative inches of water)	Comments
Dry Well (SV-1N)	10/9/07	2:00	NA	NA	1.5	
Dry Well (SV-1N)	10/17/07	8:00	NA	NA	1.5	
Dry Well (SV-1N)	10/26/07	1:45	NA	NA	1.5	
Dry Well (SV-1N)	10/30/07	3:50	NA	NA	1.5	
Dry Well (SV-1N)	11/7/07	2:20	NA	NA	1.5	
Dry Well (SV-1N)	11/15/07	2:03	NA	NA	1.5	
Dry Well (SV-1N)	11/19/07	8:29	NA	NA	1.5	
Dry Well (SV-1N)	11/26/07	3:21	NA	NA	1.5	
Dry Well (SV-1N)	12/5/07	2:52	NA	NA	1.4	
Dry Well (SV-1N)	12/12/07	1:00	NA	NA	1.4	
Dry Well (SV-1N)	12/19/07	3:05	NA	NA	1.4	
Dry Well (SV-1N)	1/4/08	2:40	NA	NA	1.4	
Dry Well (SV-1N)	1/8/08	10:30	NA	NA	1.4	
Dry Well (SV-1N)	1/17/08	2:27	NA	NA	1.4	
Dry Well (SV-1N)	1/24/08	3:35	NA	NA	1.3	
Dry Well (SV-1N)	1/31/08	4:05	NA	NA	1.4	
Dry Well (SV-1N)	2/6/08	1:36	NA	NA	1.4	
Dry Well (SV-1N)	2/14/08	8:10	NA	NA	1.4	
Dry Well (SV-1N)	2/18/08	3:16	NA	NA	1.4	
Dry Well (SV-1N)	2/27/08	3:21	NA	NA	1.4	
Dry Well (SV-1N)	3/7/08	3:20	NA	NA	1.4	
Dry Well (SV-1N)	3/12/08	3:28	NA	NA	1.4	
Dry Well (SV-1N)	3/19/08	2:45	NA	NA	1.3	
Dry Well (SV-1N)	3/28/08	1:45	NA	NA	1.4	
Dry Well (SV-1N)	4/4/08	9:15	NA	NA	1.4	
Dry Well (SV-1N)	4/10/08	1:35	NA	NA	1.4	
Dry Well (SV-1N)	4/18/08	2:41	NA	NA	1.4	
Dry Well (SV-1N)	4/22/08	11:30	NA	NA	1.4	
Dry Well (SV-1N)	4/29/08	9:15	NA	NA	1.4	
Dry Well (SV-1N)	5/5/08	3:15	NA	NA	1.4	
Dry Well (SV-1N)	5/13/08	10:17	NA	NA	1.4	
Dry Well (SV-1N)	5/23/08	10:15	NA	NA	1.4	
Dry Well (SV-1N)	5/27/08	3:05	NA	NA	1.4	
Dry Well (SV-1N)	6/4/08	2:50	NA	NA	1.4	
Dry Well (SV-1N)	6/12/08	3:01	NA	NA	1.5	
Dry Well (SV-1N)	6/17/08	3:10	NA	NA	1.5	
Dry Well (SV-1N)	6/30/08	2:58	NA	NA	1.4	
Dry Well (SV-1N)	7/11/08	11:49	NA	NA	1.5	
Dry Well (SV-1N)	7/16/08	1:00	NA	NA	1.5	
Dry Well (SV-1N)	7/21/08	2:28	NA	NA	1.4	
Dry Well (SV-1N)	8/31/08	2:40	NA	NA	1.5	
Dry Well (SV-1N)	8/22/08	9:53	NA	NA	1.5	
Dry Well (SV-1N)	8/29/08	8:38	NA	NA	1.5	
Dry Well (SV-1N)	9/12/08	1:42	NA	NA	1.5	
Dry Well (SV-1N)	9/26/08	2:20	NA	NA	1.5	
Dry Well (SV-1N)	10/15/08	1:45	NA	NA	1.5	

See Notes on Page 14.

Table 5. Sub-Slab Depressurization System Monitoring Data Summary, Bausch & Lomb, Former Frame Center, Chili, NY

Location	Date	Time	PID Background Reading (ppb)	System Discharge PID Reading (ppb)	System Pressure (negative inches of water)	Comments
Dry Well (SV-1N)	11/6/08	9:00	NA	NA	1.4	
Dry Well (SV-1N)	12/17/08	2:59	NA	NA	1.4	
Dry Well (SV-1N)	2/2/09	3:21	NA	NA	1.4	
Dry Well (SV-1N)	3/10/09	11:35	NA	NA	1.5	
Dry Well (SV-1N)	4/8/09	3:18	NA	NA	1.4	
Dry Well (SV-1N)	5/5/09	2:27	NA	NA	1.4	
Dry Well (SV-1N)	6/3/09	1:36	NA	NA	1.4	
Dry Well (SV-1N)	7/14/09	8:40	NA	NA	1.5	
Dry Well (SV-1N)	8/15/09	9:01	NA	NA	1.5	
Dry Well (SV-1S)	11/17/06	10:25	176	134	2.4	
Dry Well (SV-1S)	11/20/06	11:58	226	182	2.4	
Dry Well (SV-1S)	11/28/06	15:02	234	>199,000	2.0	PID Reading at manometer tube port; PID reading at sampling port was only 600 ppb.
Dry Well (SV-1S)	12/6/06	12:55	155	50,400	3.6	
Dry Well (SV-1S)	12/13/06	15:20	169	8,178	3.7	
Dry Well (SV-1S)	12/21/06	14:00	170	6,200	3.7	Original system.
Dry Well (SV-1S)	12/27/06	12:52	121	191	3.7	
Dry Well (SV-1S)	1/5/07	14:07	122	34,200	3.7	
Dry Well (SV-1S)	1/12/07	9:26	120	120,000	3.7	Initial PID reading from line to dry well via drain pipe; re-read at 43,000 ppb.
Dry Well (SV-1S)	1/19/07	9:15	108	138,000	3.7	
Dry Well (SV-1S)	1/28/07	3:40	NA	NA	3.7	Pilot study ended, record system checks by logging manometer readings only.
Dry Well (SV-1S)	2/6/07	10:50	NA	NA	3.8	
Dry Well (SV-1S)	2/15/07	2:40	NA	NA	3.8	
Dry Well (SV-1S)	2/23/07	2:23	NA	NA	3.8	
Dry Well (SV-1S)	3/2/07	3:15	NA	NA	3.8	
Dry Well (SV-1S)	3/8/07	3:30	NA	NA	3.7	
Dry Well (SV-1S)	3/13/07	1:30	NA	NA	3.6	
Dry Well (SV-1S)	3/23/07	1:38	NA	NA	3.6	
Dry Well (SV-1S)	3/27/07	3:40	NA	NA	3.7	
Dry Well (SV-1S)	4/3/07	2:53	NA	NA	3.7	
Dry Well (SV-1S)	4/12/07	4:00	NA	NA	3.6	
Dry Well (SV-1S)	4/20/07	1:45	NA	NA	3.6	
Dry Well (SV-1S)	4/26/07	3:10	NA	NA	3.6	
Dry Well (SV-1S)	5/4/07	2:37	NA	NA	3.6	
Dry Well (SV-1S)	5/10/07	3:03	NA	NA	3.6	
Dry Well (SV-1S)	5/18/07	1:10	NA	NA	3.6	
Dry Well (SV-1S)	5/24/07	3:30	NA	NA	3.6	
Dry Well (SV-1S)	5/29/07	3:10	NA	NA	3.6	
Dry Well (SV-1S)	6/8/07	3:00	NA	NA	3.5	
Dry Well (SV-1S)	6/13/07	10:05	NA	NA	3.6	
Dry Well (SV-1S)	6/20/07	8:40	NA	NA	3.6	
Dry Well (SV-1S)	6/27/07	3:10	NA	NA	3.6	
Dry Well (SV-1S)	7/5/07	2:00	NA	NA	3.5	
Dry Well (SV-1S)	7/12/07	12:30	NA	NA	3.6	
Dry Well (SV-1S)	7/18/07	3:17	NA	NA	3.5	
Dry Well (SV-1S)	7/27/07	2:50	NA	NA	3.5	
Dry Well (SV-1S)	7/31/07	3:25	NA	NA	3.5	

See Notes on Page 14.

Table 5. Sub-Slab Depressurization System Monitoring Data Summary, Bausch & Lomb, Former Frame Center, Chili, NY

Location	Date	Time	PID Background Reading (ppb)	System Discharge PID Reading (ppb)	System Pressure (negative inches of water)	Comments
Dry Well (SV-1S)	8/8/07	3:28	NA	NA	3.5	
Dry Well (SV-1S)	8/20/07	2:40	NA	NA	3.5	
Dry Well (SV-1S)	8/24/07	8:36	NA	NA	3.2	New suction cavity added.
Dry Well (SV-1S)	8/28/07	3:01	NA	NA	3.2	New suction cavity added and operating.
Dry Well (SV-1S)	9/7/07	9:40	NA	NA	3.1	
Dry Well (SV-1S)	9/12/07	11:59	NA	NA	3.2	
Dry Well (SV-1S)	9/17/07	10:51	NA	NA	3.2	
Dry Well (SV-1S)	9/24/07	2:32	NA	NA	3.2	
Dry Well (SV-1S)	10/1/07	2:37	NA	NA	3.2	
Dry Well (SV-1S)	10/9/07	2:00	NA	NA	3.1	
Dry Well (SV-1S)	10/17/07	8:00	NA	NA	3.1	
Dry Well (SV-1S)	10/26/07	1:45	NA	NA	3.1	
Dry Well (SV-1S)	10/30/07	3:50	NA	NA	3.1	
Dry Well (SV-1S)	11/7/07	2:20	NA	NA	3.0	
Dry Well (SV-1S)	11/15/07	2:03	NA	NA	3.0	
Dry Well (SV-1S)	11/19/07	8:29	NA	NA	3.0	
Dry Well (SV-1S)	11/26/07	3:21	NA	NA	3.0	
Dry Well (SV-1S)	12/5/07	2:52	NA	NA	2.9	
Dry Well (SV-1S)	12/12/07	1:00	NA	NA	3.0	
Dry Well (SV-1S)	12/19/07	3:05	NA	NA	2.9	
Dry Well (SV-1S)	1/4/08	2:40	NA	NA	2.8	
Dry Well (SV-1S)	1/8/08	10:30	NA	NA	3.0	
Dry Well (SV-1S)	1/17/08	2:27	NA	NA	3.4	
Dry Well (SV-1S)	1/24/08	3:35	NA	NA	2.8	
Dry Well (SV-1S)	1/31/08	4:05	NA	NA	2.8	
Dry Well (SV-1S)	2/6/08	1:36	NA	NA	2.9	
Dry Well (SV-1S)	2/14/08	8:10	NA	NA	2.8	
Dry Well (SV-1S)	2/18/08	3:16	NA	NA	2.9	
Dry Well (SV-1S)	2/27/08	3:21	NA	NA	2.8	
Dry Well (SV-1S)	3/7/08	3:20	NA	NA	2.9	
Dry Well (SV-1S)	3/12/08	3:28	NA	NA	2.9	
Dry Well (SV-1S)	3/19/08	2:45	NA	NA	2.9	
Dry Well (SV-1S)	3/28/08	1:45	NA	NA	3.0	
Dry Well (SV-1S)	4/4/08	9:15	NA	NA	3.0	
Dry Well (SV-1S)	4/10/08	1:35	NA	NA	3.0	
Dry Well (SV-1S)	4/18/08	2:41	NA	NA	3.0	
Dry Well (SV-1S)	4/22/08	11:30	NA	NA	3.1	
Dry Well (SV-1S)	4/29/08	9:15	NA	NA	3.0	
Dry Well (SV-1S)	5/5/08	3:15	NA	NA	3.0	
Dry Well (SV-1S)	5/13/08	10:17	NA	NA	3.1	
Dry Well (SV-1S)	5/23/08	10:15	NA	NA	3.1	
Dry Well (SV-1S)	5/27/08	3:05	NA	NA	3.2	
Dry Well (SV-1S)	6/4/08	2:50	NA	NA	3.1	
Dry Well (SV-1S)	6/12/08	3:01	NA	NA	3.1	
Dry Well (SV-1S)	6/17/08	3:10	NA	NA	3.1	
Dry Well (SV-1S)	6/30/08	2:58	NA	NA	3.1	

See Notes on Page 14.

Table 5. Sub-Slab Depressurization System Monitoring Data Summary, Bausch & Lomb, Former Frame Center, Chili, NY

Location	Date	Time	PID Background Reading (ppb)	System Discharge PID Reading (ppb)	System Pressure (negative inches of water)	Comments
Dry Well (SV-1S)	7/11/08	11:49	NA	NA	3.1	
Dry Well (SV-1S)	7/16/08	1:00	NA	NA	3.1	
Dry Well (SV-1S)	7/21/08	2:28	NA	NA	3.1	
Dry Well (SV-1S)	8/13/08	2:45	NA	NA	3.1	
Dry Well (SV-1S)	8/22/08	9:53	NA	NA	3.2	
Dry Well (SV-1S)	8/29/08	8:38	NA	NA	3.2	
Dry Well (SV-1S)	9/12/08	1:42	NA	NA	3.2	
Dry Well (SV-1S)	9/26/08	2:20	NA	NA	3.2	
Dry Well (SV-1S)	10/15/08	1:45	NA	NA	3.2	
Dry Well (SV-1S)	11/6/08	9:00	NA	NA	3.2	
Dry Well (SV-1S)	12/17/08	2:59	NA	NA	3.3	
Dry Well (SV-1S)	2/2/09	3:21	NA	NA	3.2	
Dry Well (SV-1S)	3/10/09	11:35	NA	NA	3.3	
Dry Well (SV-1S)	4/8/09	3:18	NA	NA	3.3	
Dry Well (SV-1S)	5/5/09	2:27	NA	NA	3.3	
Dry Well (SV-1S)	6/3/09	1:36	NA	NA	0.3	45º elbow on suction side broken; schedule repair.
Dry Well (SV-1S)	7/14/09	8:40	NA	NA	3.3	
Dry Well (SV-1S)	8/5/09	9:01	NA	NA	3.3	
Plating North (SV-4N)	11/2/06	11:30	155	> 199,000	NA	
Plating North (SV-4N)	11/2/06	15:36	NA	3,750	NA	
Plating North (SV-4N)	11/3/06	11:30	142	> 199,000	NA	
Plating North (SV-4N)	11/6/06	15:51	247	2,103	NA	
Plating North (SV-4N)	11/7/06	9:50	227	258	2.0	
Plating North (SV-4N)	11/17/06	10:13	171	200	2.5	
Plating North (SV-4N)	11/20/06	11:28	210	205	3.4	
Plating North (SV-4N)	11/28/06	14:51	212	856	2.4	PID reading at manometer tube port; PID reading was only 239 ppb at sampling port.
Plating North (SV-4N)	12/6/06	12:50	182	154	2.2	
Plating North (SV-4N)	12/13/06	15:10	157	179	3.2	
Plating North (SV-4N)	12/21/06	14:34	168	10,500	2.3	
Plating North (SV-4N)	12/27/06	12:59	135	172	2.2	
Plating North (SV-4N)	1/5/07	14:17	148	201	2.3	
Plating North (SV-4N)	1/12/07	9:40	173	427	3.2	
Plating North (SV-4N)	1/19/07	9:35	118	5,478	2.1	
Plating North (SV-4N)	1/28/07	3:40	NA	NA	2.0	Pilot study ended, record system checks by logging manometer readings only.
Plating North (SV-4N)	2/6/07	10:50	NA	NA	2.8	
Plating North (SV-4N)	2/15/07	2:40	NA	NA	1.8	
Plating North (SV-4N)	2/23/07	2:23	NA	NA	1.9	
Plating North (SV-4N)	3/2/07	3:15	NA	NA	1.8	
Plating North (SV-4N)	3/8/07	3:30	NA	NA	1.8	
Plating North (SV-4N)	3/13/07	1:30	NA	NA	2.0	
Plating North (SV-4N)	3/23/07	1:38	NA	NA	1.9	
Plating North (SV-4N)	3/27/07	3:40	NA	NA	2.3	
Plating North (SV-4N)	4/3/07	2:53	NA	NA	2.3	
Plating North (SV-4N)	4/12/07	4:00	NA	NA	2.2	
Plating North (SV-4N)	4/20/07	1:45	NA	NA	2.3	
Plating North (SV-4N)	4/26/07	3:10	NA	NA	2.3	

See Notes on Page 14.

Table 5. Sub-Slab Depressurization System Monitoring Data Summary, Bausch & Lomb, Former Frame Center, Chili, NY

Location	Date	Time	PID Background Reading (ppb)	System Discharge PID Reading (ppb)	System Pressure (negative inches of water)	Comments
Plating North (SV-4N)	5/4/07	2:37	NA	NA	2.3	
Plating North (SV-4N)	5/10/07	3:03	NA	NA	2.4	
Plating North (SV-4N)	5/18/07	1:10	NA	NA	2.3	
Plating North (SV-4N)	5/24/07	3:30	NA	NA	2.4	
Plating North (SV-4N)	5/29/07	3:10	NA	NA	2.4	
Plating North (SV-4N)	6/8/07	3:00	NA	NA	2.4	
Plating North (SV-4N)	6/13/07	10:05	NA	NA	2.5	
Plating North (SV-4N)	6/20/07	8:40	NA	NA	2.5	
Plating North (SV-4N)	6/27/07	3:10	NA	NA	2.5	
Plating North (SV-4N)	7/5/07	2:00	NA	NA	2.5	
Plating North (SV-4N)	7/12/07	12:30	NA	NA	2.5	
Plating North (SV-4N)	7/18/07	3:17	NA	NA	2.5	
Plating North (SV-4N)	7/27/07	2:50	NA	NA	2.5	
Plating North (SV-4N)	7/31/07	3:25	NA	NA	2.5	
Plating North (SV-4N)	8/8/07	3:28	NA	NA	2.5	
Plating North (SV-4N)	8/20/07	2:40	NA	NA	2.5	
Plating North (SV-4N)	8/24/07	8:36	NA	NA	2.5	
Plating North (SV-4N)	8/28/07	3:01	NA	NA	1.6	
Plating North (SV-4N)	9/7/07	9:40	NA	NA	2.5	
Plating North (SV-4N)	9/12/07	11:59	NA	NA	2.5	
Plating North (SV-4N)	9/17/07	10:51	NA	NA	2.4	
Plating North (SV-4N)	9/24/07	2:32	NA	NA	2.5	
Plating North (SV-4N)	10/1/07	2:37	NA	NA	2.5	
Plating North (SV-4N)	10/9/07	2:00	NA	NA	2.5	
Plating North (SV-4N)	10/17/07	8:00	NA	NA	2.3	
Plating North (SV-4N)	10/24/07	1:45	NA	NA	2.3	
Plating North (SV-4N)	10/30/07	3:50	NA	NA	2.2	
Plating North (SV-4N)	11/7/07	2:20	NA	NA	2.2	
Plating North (SV-4N)	11/15/07	2:03	NA	NA	off	New construction Plating Pit area, electrician cut power to re-wire. Get note for Buckingham to have units reconnected. Exterior meter shows vacuum.
Plating North (SV-4N)	11/19/07	8:29	NA	NA	off	Electrical contractor for new construction instructed by Buckingham to power-up vapor systems ASAP during remedial/construction of new area.
Plating North (SV-4N)	11/26/07	3:21	NA	NA	2.4	
Plating North (SV-4N)	12/5/07	2:52	NA	NA	2.5	
Plating North (SV-4N)	12/12/07	1:00	NA	NA	2.5	
Plating North (SV-4N)	12/19/07	3:05	NA	NA	NA	Contractor drywalled over meter. Left note for contractor to box out manometer, told Buckingham.
Plating North (SV-4N)	1/4/08	2:40	NA	NA	2.4	
Plating North (SV-4N)	1/8/08	10:30	NA	NA	2.5	
Plating North (SV-4N)	1/17/08	2:27	NA	NA	2.5	
Plating North (SV-4N)	1/24/08	3:35	NA	NA	2.3	
Plating North (SV-4N)	1/31/08	4:05	NA	NA	2.4	
Plating North (SV-4N)	2/6/08	1:36	NA	NA	2.4	
Plating North (SV-4N)	2/14/08	8:10	NA	NA	2.4	
Plating North (SV-4N)	2/18/08	3:16	NA	NA	2.5	
Plating North (SV-4N)	2/27/08	3:21	NA	NA	2.5	
Plating North (SV-4N)	3/7/08	3:20	NA	NA	2.5	

See Notes on Page 14.

Table 5. Sub-Slab Depressurization System Monitoring Data Summary, Bausch & Lomb, Former Frame Center, Chili, NY

Location	Date	Time	PID Background Reading (ppb)	System Discharge PID Reading (ppb)	System Pressure (negative inches of water)	Comments
Plating North (SV-4N)	3/12/08	3:28	NA	NA	2.5	
Plating North (SV-4N)	3/19/08	2:45	NA	NA	2.6	
Plating North (SV-4N)	3/28/08	1:45	NA	NA	2.6	
Plating North (SV-4N)	4/4/08	9:15	NA	NA	2.6	
Plating North (SV-4N)	4/10/08	1:35	NA	NA	2.7	
Plating North (SV-4N)	4/18/08	2:41	NA	NA	2.8	
Plating North (SV-4N)	4/22/08	11:30	NA	NA	2.8	
Plating North (SV-4N)	4/29/08	9:15	NA	NA	2.7	
Plating North (SV-4N)	5/5/08	3:15	NA	NA	2.8	
Plating North (SV-4N)	5/13/08	10:17	NA	NA	2.8	
Plating North (SV-4N)	5/23/08	10:15	NA	NA	2.8	
Plating North (SV-4N)	5/27/08	3:05	NA	NA	2.9	
Plating North (SV-4N)	6/4/08	2:50	NA	NA	2.8	
Plating North (SV-4N)	6/12/08	3:01	NA	NA	3.0	
Plating North (SV-4N)	6/17/08	3:10	NA	NA	3.0	
Plating North (SV-4N)	6/30/08	2:58	NA	NA	3.0	
Plating North (SV-4N)	7/11/08	11:49	NA	NA	3.2	
Plating North (SV-4N)	7/16/08	1:00	NA	NA	3.2	
Plating North (SV-4N)	7/21/08	2:28	NA	NA	3.2	
Plating North (SV-4N)	8/13/08	2:45	NA	NA	*	No access, area locked. Schedule with Buckingham.
Plating North (SV-4N)	8/22/08	9:53	NA	NA	3.2	
Plating North (SV-4N)	8/29/08	8:38	NA	NA	3.2	
Plating North (SV-4N)	9/12/08	1:42	NA	NA	3.1	
Plating North (SV-4N)	9/26/08	2:20	NA	NA	3.0	
Plating North (SV-4N)	10/15/08	1:45	NA	NA	2.8	
Plating North (SV-4N)	11/6/08	9:00	NA	NA	2.8	
Plating North (SV-4N)	12/17/08	2:59	NA	NA	2.5	
Plating North (SV-4N)	2/2/09	3:21	NA	NA	2.5	
Plating North (SV-4N)	3/10/09	11:35	NA	NA	2.7	
Plating North (SV-4N)	4/8/09	3:18	NA	NA	2.7	
Plating North (SV-4N)	5/5/09	2:27	NA	NA	2.8	
Plating North (SV-4N)	6/3/09	1:43	NA	NA	2.8	
Plating North (SV-4N)	7/14/09	8:40	NA	NA	3.0	
Plating North (SV-4N)	8/5/09	9:01	NA	NA	3.0	Found off. Breaker #7 off by plating bathroom. Turned on; working o.k.
Plating South (SV-4S)	11/2/06	11:20	155	1,380	NA	
Plating South (SV-4S)	11/2/06	15:36	NA	655	NA	
Plating South (SV-4S)	11/3/06	11:30	142	8,500	NA	
Plating South (SV-4S)	11/6/06	15:47	247	1,704	NA	
Plating South (SV-4S)	11/7/06	9:56	227	320	3.9	
Plating South (SV-4S)	11/17/06	10:18	171	227	4.0	
Plating South (SV-4S)	11/20/06	11:25	210	212	4.0	
Plating South (SV-4S)	11/28/06	14:58	212	630	3.8	PID reading at manometer tube port; PID reading was only 250 ppb at sampling port.
Plating South (SV-4S)	12/6/06	12:48	182	370	3.9	
Plating South (SV-4S)	12/13/06	15:05	157	274	3.9	
Plating South (SV-4S)	12/21/06	14:44	168	471	3.9	
Plating South (SV-4S)	12/27/06	13:05	135	135	3.9	

See Notes on Page 14.

Table 5. Sub-Slab Depressurization System Monitoring Data Summary, Bausch & Lomb, Former Frame Center, Chili, NY

Location	Date	Time	PID Background Reading (ppb)	System Discharge PID Reading (ppb)	System Pressure (negative inches of water)	Comments
Plating South (SV-4S)	1/5/07	14:16	148	408	3.8	
Plating South (SV-4S)	1/12/07	9:44	173	417	3.9	
Plating South (SV-4S)	1/19/07	9:32	118	419	4.0	
Plating South (SV-4S)	1/28/07	3:40	NA	NA	4.0	Pilot study ended, record system checks by logging manometer readings only.
Plating South (SV-4S)	2/6/07	10:50	NA	NA	>4.0	
Plating South (SV-4S)	2/15/07	2:40	NA	NA	4.0	
Plating South (SV-4S)	2/23/07	2:23	NA	NA	4.0	
Plating South (SV-4S)	3/2/07	3:15	NA	NA	4.0	
Plating South (SV-4S)	3/8/07	3:30	NA	NA	4.0	
Plating South (SV-4S)	3/13/07	1:30	NA	NA	3.8	
Plating South (SV-4S)	3/23/07	1:38	NA	NA	3.7	
Plating South (SV-4S)	3/27/07	3:40	NA	NA	3.7	
Plating South (SV-4S)	4/3/07	2:53	NA	NA	3.8	
Plating South (SV-4S)	4/12/07	4:00	NA	NA	3.8	
Plating South (SV-4S)	4/20/07	1:45	NA	NA	3.7	
Plating South (SV-4S)	4/26/07	3:10	NA	NA	3.8	
Plating South (SV-4S)	5/4/07	2:37	NA	NA	3.8	
Plating South (SV-4S)	5/10/07	3:03	NA	NA	3.7	
Plating South (SV-4S)	5/18/07	1:10	NA	NA	3.8	
Plating South (SV-4S)	5/24/07	3:30	NA	NA	3.6	
Plating South (SV-4S)	5/29/07	3:10	NA	NA	3.7	
Plating South (SV-4S)	6/8/07	3:00	NA	NA	3.6	
Plating South (SV-4S)	6/13/07	10:05	NA	NA	3.7	
Plating South (SV-4S)	6/20/07	8:40	NA	NA	3.8	
Plating South (SV-4S)	6/27/07	3:10	NA	NA	3.8	
Plating South (SV-4S)	7/5/07	2:00	NA	NA	3.7	
Plating South (SV-4S)	7/12/07	12:30	NA	NA	3.7	
Plating South (SV-4S)	7/18/07	3:17	NA	NA	3.6	
Plating South (SV-4S)	7/27/07	2:50	NA	NA	3.7	
Plating South (SV-4S)	7/31/07	3:25	NA	NA	3.6	
Plating South (SV-4S)	8/8/07	3:28	NA	NA	3.6	
Plating South (SV-4S)	8/20/07	2:40	NA	NA	3.6	
Plating South (SV-4S)	8/24/07	8:36	NA	NA	3.6	Suction cavity to be added this morning.
Plating South (SV-4S)	8/28/07	3:01	NA	NA	3.6	New suction cavity added and operating.
Plating South (SV-4S)	9/7/07	9:40	NA	NA	3.7	
Plating South (SV-4S)	9/12/07	11:59	NA	NA	3.8	
Plating South (SV-4S)	9/17/07	10:51	NA	NA	3.8	
Plating South (SV-4S)	9/24/07	2:32	NA	NA	3.6	
Plating South (SV-4S)	10/1/07	2:37	NA	NA	3.7	
Plating South (SV-4S)	10/9/07	2:00	NA	NA	3.6	
Plating South (SV-4S)	10/17/07	8:00	NA	NA	3.8	
Plating South (SV-4S)	10/26/07	1:45	NA	NA	3.8	
Plating South (SV-4S)	10/30/07	3:50	NA	NA	3.8	
Plating South (SV-4S)	11/7/07	2:20	NA	NA	3.9	
Plating South (SV-4S)	11/15/07	2:03	NA	NA	off	New construction Plating Pit area, electrician cut power to re-wire. Get note for Buckingham to have units reconnected. Exterior meter shows vacuum.

See Notes on Page 14.

Table 5. Sub-Slab Depressurization System Monitoring Data Summary, Bausch & Lomb, Former Frame Center, Chili, NY

Location	Date	Time	PID Background Reading (ppb)	System Discharge PID Reading (ppb)	System Pressure (negative inches of water)	Comments
Plating South (SV-4S)	11/19/07	8:29	NA	NA	off	Electrical contractor for new construction instructed by Buckingham to power-up vapor systems ASAP during remedial/construction of new area.
Plating South (SV-4S)	11/26/07	3:21	NA	NA	3.8	Plating N&S fans operating, electrician powered them as promised.
Plating South (SV-4S)	12/5/07	2:52	NA	NA	3.9	
Plating South (SV-4S)	12/12/07	1:00	NA	NA	3.9	
Plating South (SV-4S)	12/19/07	3:05	NA	NA	3.9	
Plating South (SV-4S)	1/4/08	2:40	NA	NA	4.0	
Plating South (SV-4S)	1/8/08	10:30	NA	NA	3.8	
Plating South (SV-4S)	1/17/08	2:27	NA	NA	3.9	
Plating South (SV-4S)	1/24/08	3:35	NA	NA	3.9	
Plating South (SV-4S)	1/31/08	4:05	NA	NA	3.9	
Plating South (SV-4S)	2/6/08	1:36	NA	NA	3.9	
Plating South (SV-4S)	2/14/08	8:10	NA	NA	3.9	
Plating South (SV-4S)	2/18/08	3:16	NA	NA	3.9	
Plating South (SV-4S)	2/27/08	3:21	NA	NA	3.9	
Plating South (SV-4S)	3/7/08	3:20	NA	NA	3.9	
Plating South (SV-4S)	3/12/08	3:28	NA	NA	4.0	
Plating South (SV-4S)	3/19/08	2:45	NA	NA	3.8	
Plating South (SV-4S)	3/28/08	1:45	NA	NA	3.9	
Plating South (SV-4S)	4/4/08	9:15	NA	NA	3.9	
Plating South (SV-4S)	4/10/08	1:35	NA	NA	3.8	
Plating South (SV-4S)	4/18/08	2:41	NA	NA	3.7	
Plating South (SV-4S)	4/22/08	11:30	NA	NA	3.8	
Plating South (SV-4S)	4/29/08	9:15	NA	NA	4.0	
Plating South (SV-4S)	5/5/08	3:15	NA	NA	3.8	
Plating South (SV-4S)	5/13/08	10:17	NA	NA	3.8	
Plating South (SV-4S)	5/23/08	10:15	NA	NA	3.9	
Plating South (SV-4S)	5/27/08	3:05	NA	NA	3.9	
Plating South (SV-4S)	6/4/08	2:50	NA	NA	3.8	
Plating South (SV-4S)	6/12/08	3:01	NA	NA	3.8	
Plating South (SV-4S)	6/17/08	3:10	NA	NA	3.9	
Plating South (SV-4S)	6/30/08	2:58	NA	NA	3.8	
Plating South (SV-4S)	7/11/08	11:49	NA	NA	3.8	
Plating South (SV-4S)	7/16/08	1:00	NA	NA	3.8	
Plating South (SV-4S)	7/21/08	2:28	NA	NA	3.8	
Plating South (SV-4S)	8/13/08	2:45	NA	NA	*	No access, area locked. Schedule with Buckingham.
Plating South (SV-4S)	8/22/08	9:53	NA	NA	3.8	
Plating South (SV-4S)	8/29/08	8:38	NA	NA	3.8	
Plating South (SV-4S)	9/12/08	1:42	NA	NA	3.8	
Plating South (SV-4S)	9/26/08	2:20	NA	NA	3.8	
Plating South (SV-4S)	10/15/08	1:45	NA	NA	3.8	
Plating South (SV-4S)	11/6/08	9:00	NA	NA	3.8	
Plating South (SV-4S)	12/17/08	2:59	NA	NA	4.0	
Plating South (SV-4S)	2/2/09	3:21	NA	NA	3.9	
Plating South (SV-4S)	3/10/09	11:35	NA	NA	3.9	
Plating South (SV-4S)	4/18/09	3:18	NA	NA	4.0	

See Notes on Page 14.

Table 5. Sub-Slab Depressurization System Monitoring Data Summary, Bausch & Lomb, Former Frame Center, Chili, NY

Location	Date	Time	PID Background Reading (ppb)	System Discharge PID Reading (ppb)	System Pressure (negative inches of water)	Comments
Plating South (SV-4S)	5/5/09	2:27	NA	NA	3.8	
Plating South (SV-4S)	6/3/09	1:40	NA	NA	3.8	
Plating South (SV-4S)	7/14/09	8:40	NA	NA	3.8	
Plating South (SV-4S)	8/5/09	9:01	NA	NA	3.8	Found off. Breaker #7 off by plating bathroom. Turned on; o.k.
Bldg 41 (SV-5)	11/3/06	11:42	2,463	9,410	3.3	
Bldg 41 (SV-5)	11/6/06	13:55	496	6,708	3.3	
Bldg 41 (SV-5)	11/7/06	15:30	14,000 ?	95,100 ?	3.2	
Bldg 41 (SV-5)	11/17/06	12:46	270	275	3.4	
Bldg 41 (SV-5)	11/20/06	14:00	242	5,250	3.4	
Bldg 41 (SV-5)	11/28/06	15:10	296	3,700	3.4	
Bldg 41 (SV-5)	12/6/06	13:10	111	2,917	3.4	
Bldg 41 (SV-5)	12/13/06	14:55	149	680	3.2	
Bldg 41 (SV-5)	12/22/06	8:55	115	NA	0.0	System not working, fan off. Notified Mitigation Tech.
Bldg 41 (SV-5)	12/27/06	16:05	199	1,164	3.4	System restarted, GFI breaker had tripped.
Bldg 41 (SV-5)	1/5/07	14:34	220	1,252	3.3	
Bldg 41 (SV-5)	1/12/07	10:02	112	2,107	3.4	
Bldg 41 (SV-5)	1/19/07	11:44	121	1,854	3.3	
Bldg 41 (SV-5)	1/28/07	3:40	NA	NA	3.3	Pilot study ended, record system checks by logging manometer readings only.
Bldg 41 (SV-5)	2/6/07	10:50	NA	NA	3.2	
Bldg 41 (SV-5)	2/15/07	2:40	NA	NA	NA	Need snow removal to access.
Bldg 41 (SV-5)	2/23/07	2:23	NA	NA	3.7	
Bldg 41 (SV-5)	3/2/07	3:15	NA	NA	3.7	
Bldg 41 (SV-5)	3/8/07	3:30	NA	NA	3.7	
Bldg 41 (SV-5)	3/13/07	1:30	NA	NA	3.6	
Bldg 41 (SV-5)	3/23/07	1:38	NA	NA	3.6	
Bldg 41 (SV-5)	3/27/07	3:40	NA	NA	3.6	
Bldg 41 (SV-5)	4/3/07	2:53	NA	NA	3.8	
Bldg 41 (SV-5)	4/12/07	4:00	NA	NA	3.7	
Bldg 41 (SV-5)	4/19/07	2:48	NA	NA	3.4	Power out from 4/16 - not sure if unit was down, operating ok on 4/19 at 4:28 pm.
Bldg 41 (SV-5)	4/26/07	3:10	NA	NA	3.5	
Bldg 41 (SV-5)	5/4/07	2:37	NA	NA	3.6	
Bldg 41 (SV-5)	5/10/07	3:03	NA	NA	3.5	GFI breaker tripped, unit off. Reset ok.
Bldg 41 (SV-5)	5/18/07	1:10	NA	NA	3.5	
Bldg 41 (SV-5)	5/24/07	3:30	NA	NA	3.5	
Bldg 41 (SV-5)	5/29/07	3:10	NA	NA	3.5	
Bldg 41 (SV-5)	6/8/07	3:00	NA	NA	3.4	
Bldg 41 (SV-5)	6/13/07	10:05	NA	NA	3.5	
Bldg 41 (SV-5)	6/20/07	8:40	NA	NA	3.5	
Bldg 41 (SV-5)	6/27/07	3:10	NA	NA	3.5	
Bldg 41 (SV-5)	7/5/07	2:00	NA	NA	3.5	
Bldg 41 (SV-5)	7/12/07	12:30	NA	NA	3.4	
Bldg 41 (SV-5)	7/18/07	3:17	NA	NA	3.5	
Bldg 41 (SV-5)	7/27/07	2:50	NA	NA	*	New tenant in storage bldg. No access to area to take reading. Heard motor from bldg exterior.
Bldg 41 (SV-5)	7/31/07	3:25	NA	NA	*	No access, new tenant. Ron from Buckingham to get reading when tenant is there.
Bldg 41 (SV-5)	8/9/07	2:24	NA	NA	3.4	New tenant onsite, had access for reading.
Bldg 41 (SV-5)	8/20/07	2:40	NA	NA	*	No access on 8/20. Fan operating from exterior check.

See Notes on Page 14.

Table 5. Sub-Slab Depressurization System Monitoring Data Summary, Bausch & Lomb, Former Frame Center, Chili, NY

Location	Date	Time	PID Background Reading (ppb)	System Discharge PID Reading (ppb)	System Pressure (negative inches of water)	Comments
Bldg 41 (SV-5)	8/24/07	8:36	NA	NA	*	No access. Mit Tech to install remote manometer next week. Fan working ok.
Bldg 41 (SV-5)	8/28/07	3:01	NA	NA	*	No access, fan motor operating exterior check.
Bldg 41 (SV-5)	9/7/07	9:40	NA	NA	3.4	Access provided.
Bldg 41 (SV-5)	9/12/08	11:59	NA	NA	*	Exterior check for fan. Mit Tech to install exterior manometer. Fan running.
Bldg 41 (SV-5)	9/17/07	10:51	NA	NA	*	Exterior check. Fan Operating. No access to building.
Bldg 41 (SV-5)	9/24/07	2:32	NA	NA	NA	No access.
Bldg 41 (SV-5)	10/2/07	2:37	NA	NA	3.4	
Bldg 41 (SV-5)	10/17/07	3:00	NA	NA	*	Mit Tech installed remote manometer, doesn't read as inside one does, bubbles with vacuum-indicator. Mit Tech to repair.
Bldg 41 (SV-5)	10/26/07	1:45	NA	NA	*	Exterior manometer oil bubbles with fan on, indications running. Mit Tech to try to calibrate outdoor reading to indoor.
Bldg 41 (SV-5)	10/30/07	3:50	NA	NA	*	Running.
Bldg 41 (SV-5)	11/7/07	2:20	NA	NA	*	Running.
Bldg 41 (SV-5)	11/15/07	2:03	NA	NA	*	Operating - exterior meter shows vacuum.
Bldg 41 (SV-5)	11/19/07	8:29	NA	NA	*	Operating.
Bldg 41 (SV-5)	11/26/07	3:21	NA	NA	*	Operating - exterior manometer crack and broke. System vacuum is present in can - see bubbling of trapped water.
Bldg 41 (SV-5)	12/5/07	2:52	NA	NA	*	Operating - Waiting for repair by Mit Tech.
Bldg 41 (SV-5)	12/12/07	1:00	NA	NA	*	Operating - water used to check for vacuum.
Bldg 41 (SV-5)	12/19/07	3:05	NA	NA	*	Operating - test exterior manometer, vacuum pull water - ok. Mit Tech failed to make repair.
Bldg 41 (SV-5)	1/4/08	2:40	NA	NA	*	Operating - vacuum pulls water.
Bldg 41 (SV-5)	1/8/08	10:30	NA	NA	*	Operating - vacuum pulls water.
Bldg 41 (SV-5)	1/17/08	2:27	NA	NA	3.4	Repaired external manometer with in-house fabricated unit & calibrated to indoor unit.
Bldg 41 (SV-5)	1/24/08	3:35	NA	NA	3.4	
Bldg 41 (SV-5)	1/31/08	4:05	NA	NA	3.4	
Bldg 41 (SV-5)	2/6/08	1:36	NA	NA	3.4	Water in manometer tube, but still reading.
Bldg 41 (SV-5)	2/14/08	8:10	NA	NA	3.8	New manometer installed outside by Mit Tech.
Bldg 41 (SV-5)	2/18/08	3:16	NA	NA	*	Operating - new amnometer failed at Bldg. 41, all oil gone.
Bldg 41 (SV-5)	2/27/08	3:21	NA	NA	*	Manometer oil gone, water frozen in gauge. Contact Mitigation Tech.
Bldg 41 (SV-5)	3/7/08	3:20	NA	NA	3.8	
Bldg 41 (SV-5)	3/12/08	3:28	NA	NA	3.8	
Bldg 41 (SV-5)	3/19/08	2:45	NA	NA	3.8	
Bldg 41 (SV-5)	3/28/08	1:45	NA	NA	3.8	
Bldg 41 (SV-5)	4/4/08	9:15	NA	NA	3.6	
Bldg 41 (SV-5)	4/10/08	1:35	NA	NA	3.9	
Bldg 41 (SV-5)	4/18/08	2:41	NA	NA	3.9	
Bldg 41 (SV-5)	4/22/08	11:30	NA	NA	3.9	
Bldg 41 (SV-5)	4/29/08	9:15	NA	NA	4.0	
Bldg 41 (SV-5)	5/5/08	3:15	NA	NA	4.0	
Bldg 41 (SV-5)	5/13/08	10:17	NA	NA	4.0	
Bldg 41 (SV-5)	5/23/08	10:15	NA	NA	3.8	Estimated - water in manometer.
Bldg 41 (SV-5)	5/27/08	3:05	NA	NA	3.2	Estimated - water in manometer.
Bldg 41 (SV-5)	6/4/08	2:50	NA	NA	3.6	
Bldg 41 (SV-5)	6/12/08	3:01	NA	NA	3.7	
Bldg 41 (SV-5)	6/17/08	3:10	NA	NA	3.8	
Bldg 41 (SV-5)	6/30/08	2:58	NA	NA	2.9	

See Notes on Page 14.

Table 5. Sub-Slab Depressurization System Monitoring Data Summary, Bausch & Lomb, Former Frame Center, Chili, NY

Location	Date	Time	PID Background Reading (ppb)	System Discharge PID Reading (ppb)	System Pressure (negative inches of water)	Comments
Bldg 41 (SV-5)	7/11/08	11:49	NA	NA	3.0	
Bldg 41 (SV-5)	7/16/08	1:00	NA	NA	2.6	
Bldg 41 (SV-5)	7/21/08	2:28	NA	NA	2.6	
Bldg 41 (SV-5)	8/13/08	2:32	NA	NA	3.8	Water in manometer, need replacement.
Bldg 41 (SV-5)	8/22/08	9:53	NA	NA	3.5	
Bldg 41 (SV-5)	8/29/08	8:38	NA	NA	3.5	New manometer is in, will install next week.
Bldg 41 (SV-5)	9/12/08	1:42	NA	NA	3.5	New manometer and enclosure installed outside Building 41.
Bldg 41 (SV-5)	9/26/08	2:20	NA	NA	3.5	
Bldg 41 (SV-5)	10/15/08	1:45	NA	NA	3.5	
Bldg 41 (SV-5)	11/6/08	9:00	NA	NA	3.6	
Bldg 41 (SV-5)	12/17/08	2:59	NA	NA	3.6	
Bldg 41 (SV-5)	2/2/09	3:21	NA	NA	3.9	
Bldg 41 (SV-5)	3/10/09	11:35	NA	NA	3.7	
Bldg 41 (SV-5)	4/8/09	3:18	NA	NA	3.7	
Bldg 41 (SV-5)	5/5/09	2:27	NA	NA	3.8	
Bldg 41 (SV-5)	6/3/09	1:50	NA	NA	3.8	
Bldg 41 (SV-5)	7/14/09	8:40	NA	NA	3.8	
Bldg 41 (SV-5)	8/5/09	9:01	NA	NA	3.7	
WWT Area (SV-13)	2/18/08	3:16	NA	NA	3.5	
WWT Area (SV-13)	2/27/08	3:21	NA	NA	3.1	
WWT Area (SV-13)	3/7/08	3:20	NA	NA	3.3	
WWT Area (SV-13)	3/12/08	3:28	NA	NA	2.4	
WWT Area (SV-13)	3/19/08	2:45	NA	NA	0.8	System manometer at unit dropped, power is on. Contact Mit. Tech to inquire about drop in vacuum.
WWT Area (SV-13)	3/28/08	1:45	NA	NA	1.7	
WWT Area (SV-13)	4/4/08	9:15	NA	NA	0.6	
WWT Area (SV-13)	4/10/08	1:35	NA	NA	3.8	Mitigation Tech found twist in manometer tube - repaired and reading ok.
WWT Area (SV-13)	4/18/08	2:41	NA	NA	3.8	
WWT Area (SV-13)	4/22/08	11:30	NA	NA	3.7	
WWT Area (SV-13)	4/29/08	9:15	NA	NA	3.7	
WWT Area (SV-13)	5/5/08	3:15	NA	NA	3.7	
WWT Area (SV-13)	5/13/08	10:17	NA	NA	3.7	
WWT Area (SV-13)	5/23/08	10:15	NA	NA	3.7	
WWT Area (SV-13)	5/27/08	3:05	NA	NA	3.7	
WWT Area (SV-13)	6/4/08	2:50	NA	NA	3.7	
WWT Area (SV-13)	6/12/08	3:01	NA	NA	3.1	
WWT Area (SV-13)	6/17/08	3:10	NA	NA	3.7	
WWT Area (SV-13)	6/30/08	2:58	NA	NA	3.6	
WWT Area (SV-13)	7/11/08	11:49	NA	NA	3.7	
WWT Area (SV-13)	7/16/08	1:00	NA	NA	3.6	
WWT Area (SV-13)	7/21/08	2:28	NA	NA	3.7	Mit Tech added roof extension to exhaust point.
WWT Area (SV-13)	8/13/08	2:32	NA	NA	*	No access, area locked. Schedule with Buckingham.
WWT Area (SV-13)	8/22/08	9:53	NA	NA	3.6	
WWT Area (SV-13)	8/29/08	8:38	NA	NA	3.7	
WWT Area (SV-13)	9/12/08	1:42	NA	NA	3.6	
WWT Area (SV-13)	9/26/08	2:20	NA	NA	3.7	

See Notes on Page 14.

Table 5. Sub-Slab Depressurization System Monitoring Data Summary, Bausch & Lomb, Former Frame Center, Chili, NY

Location	Date	Time	PID Background Reading (ppb)	System Discharge PID Reading (ppb)	System Pressure (negative inches of water)	Comments
WWT Area (SV-13)	10/15/08	1:45	NA	NA	3.6	
WWT Area (SV-13)	11/6/08	9:00	NA	NA	3.5	
WWT Area (SV-13)	12/17/08	2:59	NA	NA	3.6	
WWT Area (SV-13)	2/2/09	3:21	NA	NA	3.5	
WWT Area (SV-13)	3/10/09	11:35	NA	NA	3.6	
WWT Area (SV-13)	4/8/09	3:18	NA	NA	3.5	
WWT Area (SV-13)	5/5/09	2:27	NA	NA	3.6	
WWT Area (SV-13)	6/3/09	1:45	NA	NA	3.5	
WWT Area (SV-13)	7/14/09	8:40	NA	NA	3.5	
WWT Area (SV-13)	8/5/09	9:01	NA	NA	3.7	Found off. Breaker #7 off by plating bathroom. Turned on; o.k.

See Notes on Page 14.

Table 5. Sub-Slab Depressurization System Monitoring Data Summary, Bausch & Lomb, Former Frame Center, Chili, NY

Notes:

* System motor running.

? = Meter issue (photoionization detector [PID] clogged with dust).

NA = Not Available.

ppb = parts per billion.

1. On November 21, 2006, and December 27, 2006, additional suction drops in Eagle Freight Company area were added to the former dry well area SV-1 fan.
2. On November 28, 2006, noted that PID measurements made from manometer tube port were significantly higher than from sampling port. Initial PID readings were collected through sampling port. After November 28, 2006, PID readings are from the manometer tube port.

Appendix L

RadonAway™ Installation and Warranty Information

RadonAway Ward Hill, MA IN014 Rev F

XP/GP/XR Series Fan Installation Instructions

Please Read And Save These Instructions.

DO NOT CONNECT POWER SUPPLY UNTIL FAN IS COMPLETELY INSTALLED. MAKE SURE ELECTRICAL SERVICE TO FAN IS LOCKED IN "OFF" POSITION. DISCONNECT POWER BEFORE SERVICING FAN.

1. **WARNING!** Do not use fan in hazardous environments where fan electrical system could provide ignition to combustible of flammable materials.

2. **WARNING!** Do not use fan to pump explosive or corrosive gases.

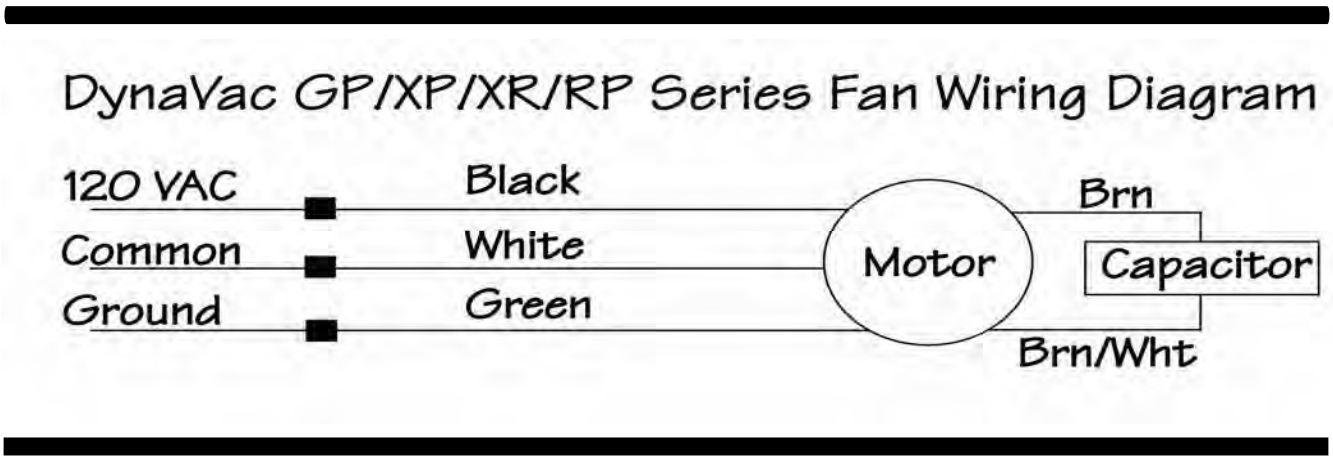
3. **WARNING!** Check voltage at the fan to insure it corresponds with nameplate.

4. **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.

5. **NOTICE!** There are no user serviceable parts located inside the fan unit. **Do NOT attempt to open.** Return unit to the factory for service.

6. 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.

7. **WARNING!** Do not leave fan unit installed on system piping without electrical power for more than 48 hours. Fan failure could result from this non-operational storage.



DynaVac - XP/XR Series		DynaVac - GP Series	
XP101	p/n 23008-1,-2	GP201	p/n 23007-1
XP151	p/n 23010-1,-2	GP301	p/n 23006-1,-2
XP201	p/n 23011-1,-2	GP401	p/n 23009-1
XR161	p/n 23018-1,-2	GP501	p/n 23005-1,-2
XR261	p/n 23019-1,-2		

1.0 SYSTEM DESIGN CONSIDERATIONS

1.1 INTRODUCTION

The DynaVac GP/XP/XR Series Radon Fans are intended for use by trained, professional Radon mitigators. The purpose of this instruction is to provide additional guidance for the most effective use of a DynaVac Fan. This instruction should be considered as a supplement to EPA standard practices, state and local building codes and state regulations. In the event of a conflict, those codes, practices and regulations take precedence over this instruction.

1.2 ENVIRONMENTALS

The GP/XP/XR Series Fans 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, the fan should be stored in an area where the temperature is never less than 32 degrees F. or more than 100 degrees F.

1.3 ACOUSTICS

The GP/XP/XR Series Fan, when installed properly, operates with little or no noticeable noise to the building occupants. The velocity of the outgoing air should be considered in the overall system design. In some cases the "rushing" sound of the outlet air may be disturbing. In these instances, the use of a RadonAway Exhaust Muffler is recommended.

1.4 GROUND WATER

In the event that a temporary high water table results in water at or above slab level, water may be drawn into the riser pipes thus blocking air flow to the GP/XP/XR Series Fan. The lack of cooling air may result in the fan cycling on and off as the internal temperature rises above the thermal cutoff and falls upon shutoff. Should this condition arise, it is recommended that the fan be turned off until the water recedes allowing for return to normal operation.

1.5 SLAB COVERAGE

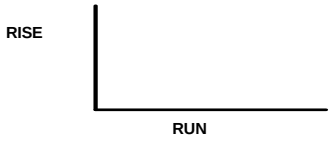
The GP/XP/XR Series Fan can provide coverage up to 2000+ sq. ft. per slab penetration. This will primarily depend on the sub-slab material in any particular installation. In general, the tighter the material, the smaller the area covered per penetration. Appropriate selection of the GP/XP/XR Series Fan best suited for the sub-slab material can improve the slab coverage. The GP & XP series have a wide range of models to choose from to cover a wide range of subslab material. The higher static suction fans are generally used for tighter subslab materials. The XR Series is specifically designed for high flow applications such as stone/gravel and drain tile. Additional suction points can be added as required. It is recommended that a small pit (5 to 10 gallons in size) be created below the slab at each suction hole.

1.6 CONDENSATION & DRAINAGE

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 GP/XP/XR Series Fan **MUST** be mounted vertically plumb and level, with the outlet pointing up for proper drainage through the fan. Avoid mounting the fan in any orientation that will allow water to accumulate inside the fan housing. The GP/XP/XR Series Fans are **NOT** suitable for underground burial.

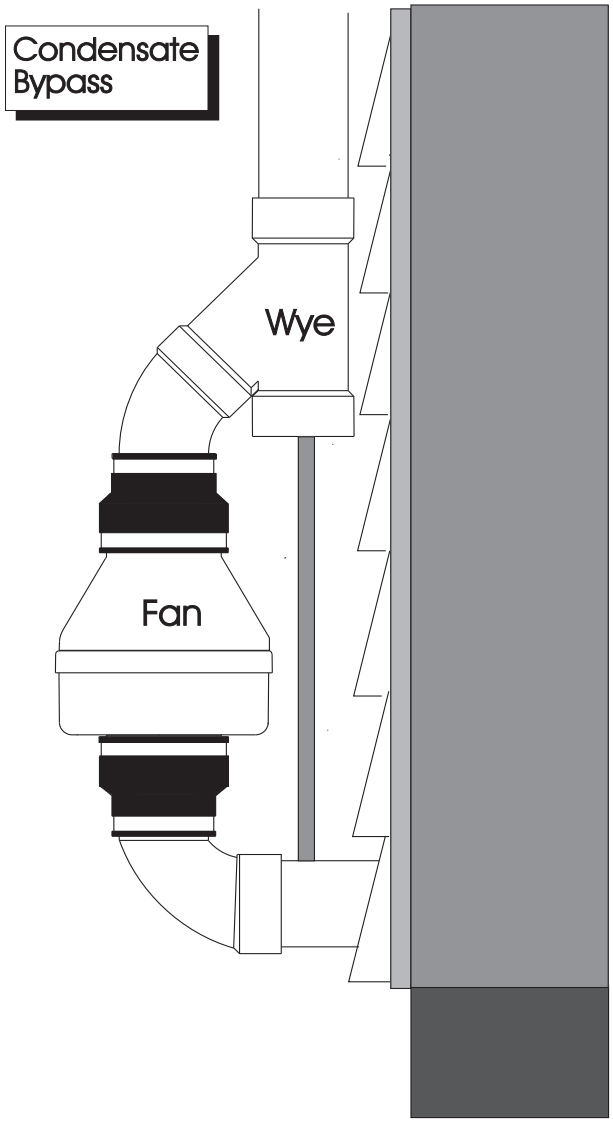
For GP/XP/XR Series Fan piping, the following table provides the minimum recommended pipe diameter and pitch under several system conditions.

Pipe Dia.	Minimum Rise per Foot of Run* @25 CFM	@50 CFM	@100 CFM
4″	1/8″	1/4″	3/8″
3"	1/4"	3/8"	1 1/2"



*Typical GP/XP/XR Series Fan operational flow rate is 25 - 90 CFM. (For more precision, determine flow rate by using the chart in the addendum.)

Under some circumstances in an outdoor installation a condensate bypass should be installed in the outlet ducting as shown. This may be particularly true in cold climate installations which require long lengths of outlet ducting or where the outlet ducting is likely to produce large amounts of condensation because of high soil moisture or outlet duct material. Schedule 20 piping and other thin-walled plastic ducting and Aluminum downspout will normally produce much more condensation than Schedule 40 piping.



The bypass is constructed with a 45 degree Wye fitting at the bottom of the outlet stack. The bottom of the Wye is capped and fitted with a tube that connects to the inlet piping or other drain. The condensation produced in the outlet stack is collected in the Wye fitting and drained through the bypass tube. The bypass tubing may be insulated to prevent freezing.

1.7 "SYSTEM ON" INDICATOR

A properly designed system should incorporate a "System On" Indicator for affirmation of system operation. A manometer, such as a U-Tube, or a vacuum alarm is recommended for this purpose.

1.8 ELECTRICAL WIRING

The GP/XP/XR Series Fans operate on standard 120V 60 Hz. AC. All wiring must be performed in accordance with the National Fire Protection

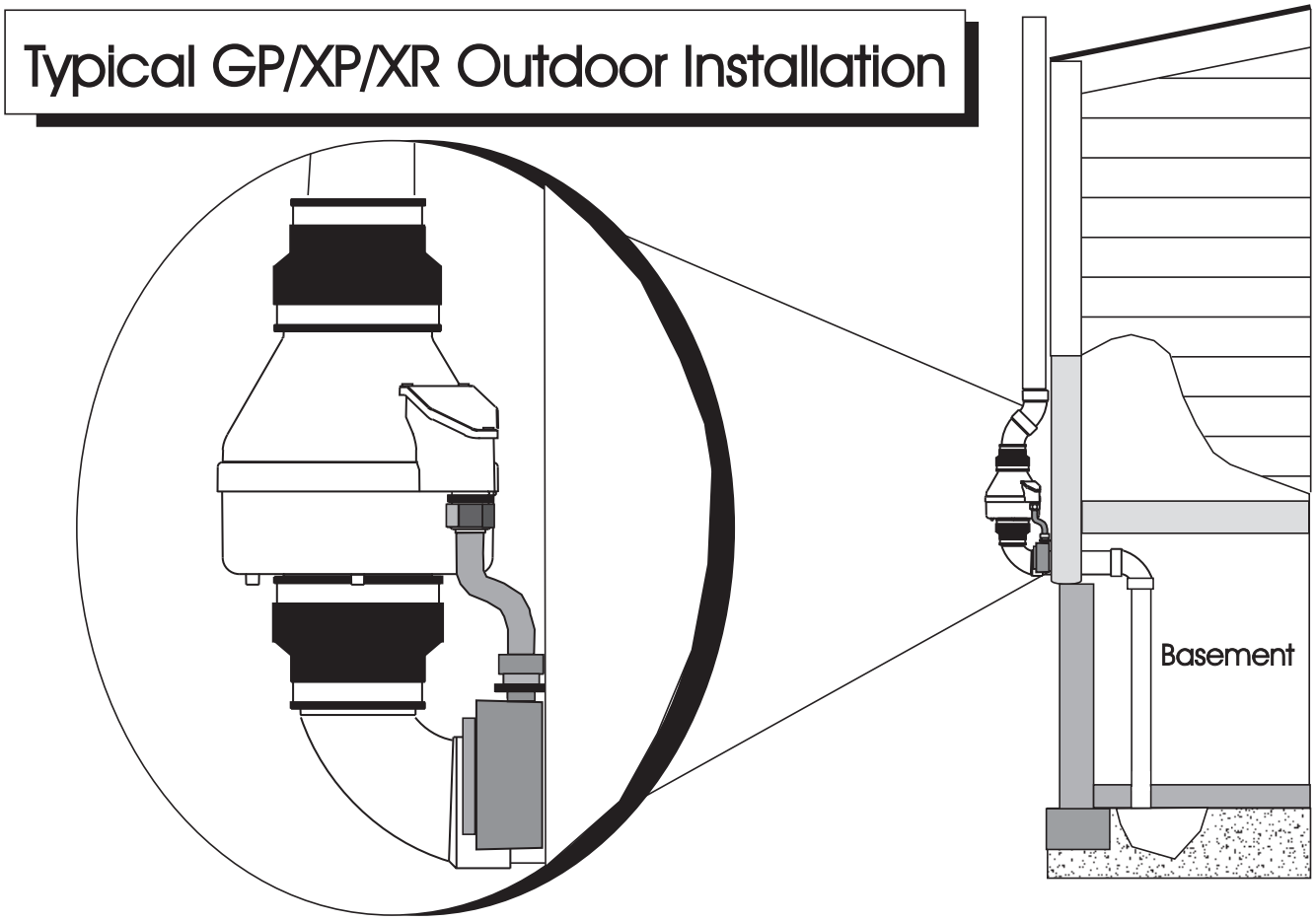
Association's (NFPA)"National Electrical Code, Standard #70"-current edition for all commercial and industrial work, and state and local building codes. All wiring must be performed by a qualified and licensed electrician. Outdoor installations require the use of a U.L. listed watertight conduit.

1.9 SPEED CONTROLS

The GP/XP/XR Series Fans are rated for use with electronic speed controls ,however, they are generally not recommended.

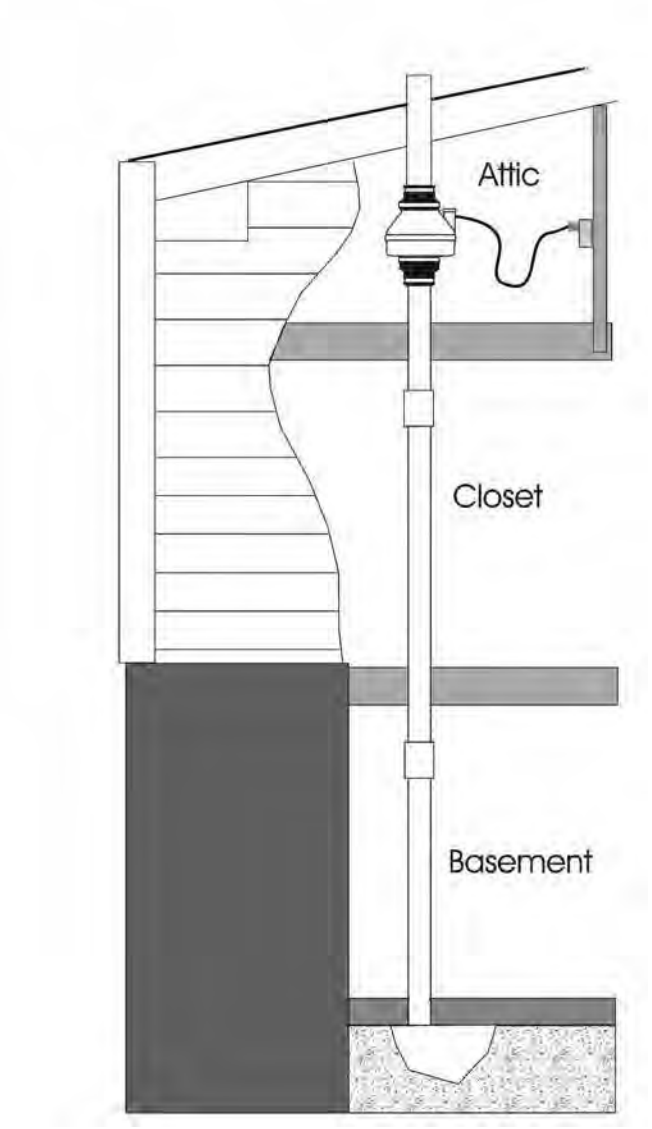
2.0 INSTALLATION

The GP/XP/XR Series Fan can be mounted indoors or outdoors. (It is suggested that EPA recommendations be followed in choosing the fan location.) The GP/XP/XR Series Fan may be mounted directly on the system piping or fastened to a supporting structure by means of optional mounting bracket.



2.1 MOUNTING

Mount the GP/XP/XR Series Fan vertically with outlet up. Insure the unit is plumb and level. When mounting directly on the system piping assure that the fan does not contact any building surface to avoid vibration noise.



2.2 MOUNTING BRACKET (optional)

The GP/XP/XR Series fan may be optionally secured with the integral mounting bracket on the GP Series fan or with RadonAway P/N 25007-2 mounting bracket for an XP/XR Series fan. Foam or rubber grommets may also be used between the bracket and mounting surface for vibration isolation.

2.3 SYSTEM PIPING

Complete piping run, using flexible couplings as means of disconnect for servicing the unit and vibration isolation.

2.4 ELECTRICAL CONNECTION

Connect wiring with wire nuts provided, observing proper connections:

Fan Wire	Connection
Green	Ground
Black	AC Hot
White	AC Common

2.5 VENT MUFFLER (optional)

Install the muffler assembly in the selected location in the outlet ducting. Solvent weld all connections. The muffler is normally installed at the end of the vent pipe.

2.6 OPERATION CHECKS

_____ **Verify** all connections are tight and **leak-free**.

_____ **Insure** the GP/XP/XR Series Fan and all ducting is secure and vibration-free.

_____ **Verify** system vacuum pressure with manometer. **Insure** vacuum pressure is **less than** maximum recommended operating pressure

(Based on sea-level operation, at higher altitudes reduce by about 4% per 1000 Feet.)
(Further reduce Maximum Operating Pressure by 10% for High Temperature environments)
See Product Specifications. If this is exceeded, increase the number of suction points.

_____ **Verify Radon levels by testing to EPA protocol.**

XP/XR SERIES PRODUCT SPECIFICATIONS

The following chart shows fan performance for the XP & XR Series Fan:

Typical CFM Vs Static Suction "WC									
	0"	.25"	.5"	.75"	1.0"	1.25"	1.5"	1.75"	2.0"
XP101	125	118	90	56	5	-	-	-	-
XP151	180	162	140	117	78	46	10	-	-
XP201	150	130	110	93	74	57	38	20	-
XR161	215	175	145	105	75	45	15	-	-
XR261	250	215	185	150	115	80	50	20	-

Maximum Recommended Operating Pressure*		
XP101	0.9" W.C.	(Sea Level Operation)**
XP151	1.3" W.C.	(Sea Level Operation)**
XP201	1.7" W.C.	(Sea Level Operation)**
XR161	1.3" W.C.	(Sea Level Operation)**
XR261	1.6" W.C.	(Sea Level Operation)**

**Reduce by 10% for High Temperature Operation*
***Reduce by 4% per 1000 feet of altitude*

Power Consumption @ 120 VAC	
XP101	40 - 49 watts
XP151	45 - 60 watts
XP201	45 - 66 watts
XR161	48 - 75 watts
XR261	65 - 105 watts

XP Series Inlet/Outlet: 4.5" OD (4.0" PVC Sched 40 size compatible)

XR Series Inlet/Outlet: 5.875" OD

Mounting: Mount on the duct pipe or with optional mounting bracket.

Recommended ducting: 3" or 4" Schedule 20/40 PVC Pipe

Storage temperature range: 32 - 100 degrees F.

Normal operating temperature range: -20 - 120 degrees F.

Maximum inlet air temperature: 80 degrees F.

Size: 9.5H" x 8.5" Dia.

Weight: 6 lbs. (XR261 - 7 lbs)

Continuous Duty

Thermally protected

Class B Insulation

3000 RPM

Residential Use Only

Rated for Indoor or Outdoor use

LISTED Electric Fan ETL® Tested to UL Std. 507

77728

GP SERIES PRODUCT SPECIFICATIONS

The following chart shows fan performance for the GPx01 Series Fan:

Typical CFM Vs Static Suction "WC	1.0"	1.5"	2.0"	2.5"	3.0"	3.5"	4.0"
GP501	95	87	80	70	57	30	5
GP401	93	82	60	38	12	-	-
GP301	92	77	45	10	-	-	-
GP201	82	58	5	-	-	-	-

Maximum Recommended Operating Pressure*		
GP501	3.8" W.C.	(Sea Level Operation)**
GP401	3.0" W.C.	(Sea Level Operation)**
GP301	2.4" W.C.	(Sea Level Operation)**
GP201	1.8" W.C.	(Sea Level Operation)**

**Reduce by 10% for High Temperature Operation*

***Reduce by 4% per 1000 feet of altitude*

Power Consumption @ 120 VAC	
GP501	70 - 140 watts
GP401	60 - 110 watts
GP301	55 - 90 watts
GP201	40 - 60 watts

Inlet/Outlet: 3.5" OD (3.0" PVC Sched 40 size compatible)

Mounting: Fan may be mounted on the duct pipe or with integral flanges.

Weight: 12 lbs.

Size: 13H" x 12.5" x 12.5"

Recommended ducting: 3″ or 4" Schedule 20/40 PVC Pipe

Storage temperature range: 32 - 100 degrees F.

Normal operating temperature range: -20 - 120 degrees F.

Maximum inlet air temperature: 80 degrees F.

Continuous Duty

Class B Insulation

3000 RPM

Thermally protected

Rated for Indoor or Outdoor Use

GP301C / GP501C Rated for Commercial Use

LISTED Electric Fan ETL® Tested to UL Std. 507

77728

IMPORTANT INSTRUCTIONS TO INSTALLER

Inspect the GPx01/XP/XR Series Fan for shipping damage within 15 days of receipt. Notify RadonAway of any damages immediately. Radonaway is not responsible for damages incurred during shipping. However, for your benefit, Radonaway does insure shipments.

There are no user serviceable parts inside the fan. **Do not attempt to open.** Return unit to factory for service.

Install the GPx01/XP/XR Series Fan in accordance with all EPA standard practices, and state and local building codes and state regulations.

WARRANTY

Subject to any applicable consumer protection legislation, RadonAway warrants that the GPX01/XP/XR/RP Series Fan (the "Fan") will be free from defects in materials and workmanship for a period of 90 days from the date of purchase (the "Warranty Term").

RadonAway will replace any Fan which fails due to defects in materials or workmanship. The Fan must be returned (at Owner's cost) to the RadonAway factory. Any Fan returned to the factory will be discarded unless the Owner provides specific instructions along with the Fan when it is returned regardless of whether or not the Fan is actually replaced under this warranty. Proof of purchase must be supplied upon request for service under this Warranty.

This Warranty is contingent on installation of the Fan 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.

5 YEAR EXTENDED WARRANTY WITH PROFESSIONAL INSTALLATION.

RadonAway will extend the Warranty Term of the fan to 5 years from date of manufacture if the Fan is installed in a professionally designed and professionally installed radon system or installed as a replacement fan in a professionally designed and professionally installed radon system. Proof of purchase and/or proof of professional installation may be required for service under this warranty. Outside the Continental United States and Canada the extended Warranty Term is limited to one (1) year from the date of manufacture.

RadonAway is not responsible for installation, removal or delivery costs associated with this Warranty.

EXCEPT AS STATED ABOVE, THE GPx01/XP/XR/RP SERIES FANS 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 FAN 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 cost to and from factory.

RadonAway
3 Saber Way
Ward Hill, MA 01835
TEL. (978) 521-3703
FAX (978) 521-3964

Record the following information for your records:

Serial No._____
Purchase Date_____

Appendix M

RadonAway™ GP Series Fan Information Sheet

RadonAway™
The World's Leading Radon Fan Manufacturer

GP Series

Radon Mitigation Fans

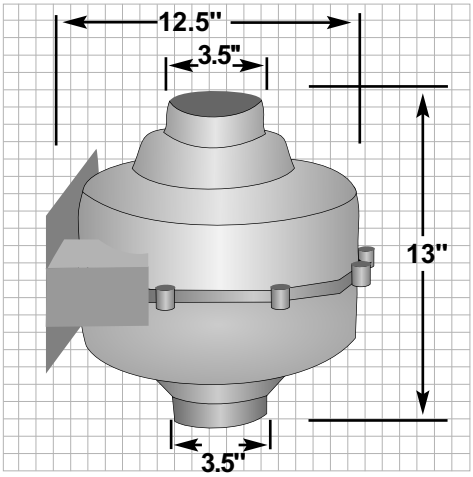
All RadonAway fans are specifically designed for radon mitigation. GP Series Fans provide a wide range of performance that makes them ideal for most sub-slab radon mitigation systems.

Features:

- Five-year hassle-free warranty
- Mounts on duct pipe or with integral flange
- 3.5" diameter ducts for use with 3" or 4" pipe
- Electrical box for hard wire or plug in
- ETL Listed - for indoor or outdoor use
- Meets all electrical code requirements
- Thermally protected
- Rated for commercial and residential use.

Model	Watts	Max. Pressure "WC	Typical CFM vs. Static Pressure WC						
			1.0"	1.5"	2.0"	2.5"	3.0"	3.5"	4.0"
GP201	40-60	2.0	82	58	5	-	-	-	-
GP301	55-90	2.6	92	77	45	10	-	-	-
GP401	60-110	3.4	93	82	60	40	15	-	-
GP501	70-140	4.2	95	87	80	70	57	30	10

Choice of model is dependent on building characteristics including sub-slab materials and should be made by a radon professional.



For Further Information Contact:

03/08
P/N 02002