Chevron Phillips Chemical Company LP

Safe Handling & Storage of

1-Hexene and 1-Octene Alpha Olefins

April 1, 2008

Operational Excellence Policy

We will strive each day to conduct our business in a safe, secure, injury-free, and environmentally responsible manner. We are committed to comply with all laws and regulations. We will strive to make optimal use of the resources we consume and minimize emissions and waste. We will strive to limit the risks of our products throughout their lifecycle. We are committed to reducing risks in our operations to safeguard our employees and the communities where we operate. We will openly communicate our results and welcome the input of regulatory agencies, our communities, our customers, and other interested stakeholders.

We will accomplish this by integrating environmental, health, safety, security, reliability, and quality into our management processes using our Operational Excellence System (OE). OE will be used worldwide to: set goals for improvement, provide alignment of activities and resources, assess and manage risks, gain stakeholder input, and rigorously audit our performance against operational objectives and compliance requirements.

G. C. Garland
President & CEO
Chevron Phillips Chemical Company LLC

TABLE OF CONTENTS

PART 5 ***TRANSPORTATION INFORMATION AND REGULATORY PROFILES***

PART 6 ***APPENDIX***

PRODUCT STEWARDSHIP

Chevron Phillips Chemical Company LP ("Chevron Phillips Chemical Company") is committed to being a good Product Steward of the products we produce. We want anyone who comes in contact with one of our products to have access to information that will help them to understand its potential risk and how to use it safely. The thrust of our Product Stewardship program is the implementation of an Operation Excellence Management System (OEMS) initiative, which makes health, safety and environmental protection an integral part of our products. Successful implementation of this system must include a shared responsibility of all those who come in contact with a product throughout its life cycle. Chevron Phillips Chemical Company will continue to work with customers and others to help ensure that all who use and handle our products follow safe and environmentally sound practices.

The information contained in this technical bulletin is not intended to, nor does it, amend or replace the Chevron Phillips Chemical Company Material Safety Data Sheet (MSDS) for 1-Hexene (#PE0016) or 1-Octene (#PE0017). The most current MSDS can be obtained from Chevron Phillips Chemical Company by calling (800) 852-5530 and should be carefully examined prior to working with these products.

INTRODUCTION

Gulf Oil Chemicals Company first commercialized the production of normal alpha olefins, Gulftene® alpha olefins, in 1965. Today, alpha olefin products are produced and marketed by Chevron Phillips Chemical Company (CPChem). This brochure covers the safe handling and storage of 1-hexene (Alpha Olefin 6) and 1-octene (Alpha Olefin 8) alpha olefins. A brief description of typical applications of these products follows.

In the production of high-density polyethylene (HDPE) and linear low-density polyethylene (LLDPE) resins, 1-hexene and 1-octene are commonly used as comonomers. The use of either alpha olefin as a comonomer affects the density due to the amount of short-chain branching. An increase in the comonomer concentration results in a lowering of the density of the resin and affects the processing and mechanical properties of the polymer. In another application, 1-hexene and 1-octene are employed in the manufacturing of polyanhydrides (e.g., copolymers of maleic anhydride and alpha olefins).

CPChem 1-hexene and 1-octene are employed in the production of surfactants (detergent alcohols and alkyl aromatics). They can be converted to linear alkyl benzene sulfonates, which are commonly used in dishwashing liquids, laundry detergents, all-purpose cleaners and lube-oil additives. The alpha olefin fraction 1-octene can be converted to a variety of nonionic ethoxylates when the corresponding alcohols are reacted with ethylene oxide. The nonionic ethoxylates can be employed as surfactants or undergo additional derivatization.

Polyol esters are prepared from 1-hexene and 1-octene. Polyol esters are characterized by a tolerance to a wide range of temperatures and are employed as base fluids for jet engine lubricants and refrigeration compressor oils for HFC-134a chlorine-free refrigerants. They can also be used to produce plasticizer alcohols and alkenyl succinic anhydrides, which are used as additives. Finally, these products are used in specialty chemicals such as epoxides, mercaptans, alkyl silanes and metal alkyls.

PART 1

SPECIFICATIONS, PROPERTIES AND TEST METHODS

1-HEXENE (C_6H_{12}) SALES SPECIFICATION

Property	Method	Specification
1-Hexene, wt. % min.	GLC	99.0
Carbon Number, wt. % <C6 max.	GLC	0.05
Carbon Number, wt. % C6 min.	GLC	99.80
Carbon Number, wt. % >C6 max.	GLC	0.08
Vinylidene, wt. % max.	GLC	1.00
cis- and trans-2-Hexene, wt. % max.	GLC	0.34
Paraffin, wt. % max.	GLC	0.34
Benzene, ppm by wt. max.	GLC	0.2
Water, ppm by wt. max.	ASTM E1064	25
Peroxide, ppm by wt. max.	SOP PC 711.000	1.00
Carbonyls, ppm by wt. max.	ASTM E411	1.0
Color, min.	ASTM D6045	30
Appearance, min.	ASTM D4176	Clear and Bright
API Gravity @ 60 F	ASTM D4052	Note 1
Specific Gravity @ 60F/60F	ASTM D4052	Note 1

Notes: (1) Run and Record
Revision Date: February 2008

1-OCTENE (C_8H_{16}) SALES SPECIFICATION

Property	Method	Specification
Carbon Number, wt. % < C6 max.	GLC	0.05
Carbon Number, wt. % C6 max.	GLC	0.50
Carbon Number, wt. % C8 min.	GLC	99.0
Carbon Number, wt. % C10 max.	GLC	0.50
Carbon Number, wt. % >C10	GLC	0.05
n-Alpha Olefin, wt. % min.	GLC	97.0
Vinylidene, wt. % max.	GLC	2.2
cis- and trans-2-Octene, wt. % max	GLC	0.34
Paraffin, wt. % max.	GLC	0.34
Water, ppm by wt. max.	ASTM E1064	50
Peroxide, ppm by wt. max.	SOP PC 711.000	1.00
Carbonyls, ppm by wt. max.	ASTM E411	1.0
Color, min.	ASTM D6045	30
Appearance, min.	ASTM D4176	Clear and Bright
API Gravity @ 60 F	ASTM D4052	Note 1
Specific Gravity @ 60F/60F	ASTM D4052	Note 1

Notes: (1) Run and Record
Revision Date: February 2008

TYPICAL PROPERTIES

	1-Hexene	1-Octene
Aniline Point [1,2], °C (°F)	22.8 (73.0)	32.5 (90.5)
API Gravity[2] at 15.6°C (60°F)	77.4	65.2
Appearance	Clear & Bright	Clear & Bright
Autoignition Temperature[3], °C (°F)	272 (521)	221 (430)
Boiling Point[4], °C		
Vapor Pressure, mm of Hg		
760	63.478	121.286
700	60.907	118.366
600	56.209	113.029
500	50.849	106.933
400	44.559	99.776
300	36.861	91.009
200	26.728	79.454
100	11.11	61.611
80	6.48	56.321
50	-2.7	45.82
20	-18.6	27.54
Coefficient of Expansion[1] at 15.6°C (60°F), per °F, Calculated	0.00076	0.00058
Color		
Saybolt	+30	+30
Critical Density[4]		
gm/cm^3	0.238	0.238
lb/ft^3	14.86	14.86
Critical Pressure[4]		
atmosphere	30.990	25.265
lb/in^2	455.43	371.30
bar	31.401	25.600
Critical Temperature[4]		
°K	503.8	567.1
°C	230.6	293.9
°R	906.8	1020.7
°F	447.1	561.0

	1-Hexene	1-Octene
Critical Volume[4]		
cm^3/gm-mole	353.6	471.5
ft^3/lb-mole	5.664	7.553
ft^3/lb	0.0673	0.0673
Critical PV/RT(ref 4)	0.265	0.256
Density of the Liquid[4], gm/cm^3		
Temperature, °C		
10	0.6826	0.7233
20	0.67317	0.71492
25	0.66848	0.71085
Linear Least Squares Constants[5]		
(for units of gm/cm^3)		
m	-0.943714	-0.834303
b	0.692050	0.731610
Entropy of Vaporization[4] at Boiling Point, cal K^{-1} $mole^{-1}$	20.08	20.46
Flammability Limits[2], vol%		
Lower	2	0.7
Upper	7	6.8
Flash Point (TCC), °C (°F)	-26 (-15)[6]	12.8 (55.0)[2]
Free Energy of Formation[4] at 25°C, kcal/mole		
Gas, Ideal State	20.71	24.65
Freezing Point[2], °C (°F)	-139.82 (-219.67)	-101.74 (-151.12)
Heat Capacity[4] at 25°C, cal/gm-°C		
Gas	0.3723	0.3755
Liquid	0.5206	0.5133
Heat of Combustion of the Liquid[4] at 25°C and Constant Pressure, Gross, kcal/mole		
$H_2O(l) + CO_2(g)$	956.8	1269.3
$H_2O(g) + CO_2(g)$	893.7	1185.2
Heat of Formation of the Gas[4] at 25°C, kcal/mole	-10.03	-19.98
Heat of Vaporization at Boiling Point[4], kcal/mole	6.76	8.07

	1-Hexene	1-Octene
Ideal Gas Thermodynamic Properties[4]		
Temperature, °C	Heat Capacity, cal/gm-mole-°C	Heat Capacity, cal/gm-mole- °C
0	29.45	39.64
25	31.63	42.56
100	37.89	51.01
500	62.83	84.56
1000	78.93	106.04
Temperature, °C	Enthalpy, cal/gm-mole	Enthalpy, cal/gm-mole
0	5,475	7,201
25	6,229	8,214
100	8,828	11,715
500	29,464	39,509
1000	65,409	87,838
Molecular Formula	C_6H_{12}	C_8H_{16}
Molecular Weight	84.16	112.21
Odor	Olefinic	Olefinic
Odor Threshold in Air[7], (ppm)	0.02	2.0
Refractive Index[1]		
Temperature, °C	(N_D)	(N_D)
20	1.38788	1.40870
25	1.38502	1.40620
Relative Density (Specific Gravity)[8],		
10°C/15.6°C	0.6833	0.7240
20°C/15.6°C	0.6739	0.7156
25°C/15.6°C	0.6692	0.7116
Relative Vapor Density[7] (Air = 1)	3	3.9
Solubility of Water in Product, ppmw		
20°C (68°F)[9]	343	—
25°C (77°F)[3]	129 max.	100 max.
40°C (104°F)[3]	162 max.	108 max.
Solubility of Product in Water[9] at 20°C (68°F), ppmw	46.7	2.5

	1-Hexene	1-Octene
Surface tension[4], dynes/cm		
Temperature, °C		
0	20.47	23.68
20	18.42	21.76
25	17.90	21.28
40	16.36	19.85
50	15.33	18.89
60	14.31	17.93
70	--	16.97
100	--	14.10
Vapor Pressure[4] at 100 °F, mm Hg	310.7	33.97
Antoine Coefficients[10]		
A	6.85770	6.93495
B	1,148.62	1,355.46
C	225.346	213.054
Viscosity[4]		
Temperature, °C	Absolute viscosity, centipoises	Absolute viscosity, centipoises
0	0.33	0.611
15	0.27	0.497
20	0.26	0.469
25	0.25	0.446
30	0.24	0.424
40	0.22	0.382
50	0.20	0.346
60	0.19	0.316
70	--	0.291
80	--	0.270
90	--	0.250
100	--	0.234
Temperature, °C	Kinematic Viscosity, centiStokes	Kinematic Viscosity, centiStokes
0	0.47	0.835
15	0.41	0.690
20	0.39	0.654
25	0.37	0.627
30	0.36	0.597
40	0.34	0.546
50	0.32	0.501
60	0.30	0.464
70	--	0.432
80	--	0.407
90	--	0.382
100	--	0.362

REFERENCES AND NOTES:

1. "Physical Constants of Hydrocarbons C_1 to C_{10}", ASTM Data Series DS 4A, Philadelphia, PA, 1971.
2. "Physical Constants of Hydrocarbon and Non-Hydrocarbon Compounds", 2nd edition, ASTM Data Series DS 4B, Philadelphia, PA, 1988.
3. Chevron Phillips Chemical Company Test Results
4. TRC Thermodynamic Tables-Hydrocarbon; The Texas A&M University System, College Station, TX 77843-3124.
5. Density (gm/cm^3) = [(m/1000) * (Temperature (^oC))] + b; 0 $^oC \leq$ Temperature $\leq$ 60 ^oC for 1-hexene and 0$^oC \leq$ Temperature $\leq$ 120 ^oC for 1-octene. Values are good to 4 decimal places up to 100 ^oC.
6. "NFPA Haz-Mat Quick Guide", National Fire Protection Association, Inc., 1997.
7. Stahl, W. H., Ed. Compilation of Odor and Taste Threshold Values Data. American Society for Testing and Materials, Philadelphia, PA, 1973.
8. Values are calculated.
9. McAuliffe, C., J. Phys. Chem., 1966, 70, 1267.
10. $Log_{10}P = A - B/ (C+t)$ (10 mm Hg $\leq P \leq$ 1500 mm Hg, t in ^oC).

RECOMMENDED TEST METHODS

The following ASTM methods are recommended for the analysis of 1-hexene and 1-octene:

1. ASTM D 56 Standard Test Method for Flash Point by Tag Closed Cup Tester
2. ASTM D 287 Standard Test Method for API Gravity of Crude Petroleum and Petroleum Products (Hydrometer Method)
3. ASTM D 3120 Standard Test Method for Trace Quantities of Sulfur in Light Liquid Petroleum Hydrocarbons by Oxidative Microcoulometry
4. ASTM D 4176 Standard Test Method for Free Water and Particulate Contamination in Distillate Fuels (Visual Inspection Procedures)
5. ASTM D 6045 Standard Test Method for Color of Petroleum Products by the Automatic Tristimulus Method
6. ASTM D 6450 Standard Test Method for Flash Point by Continuously Closed Cup (CCCFP) Tester
7. ASTM E 411 Standard Test Method for Trace Quantities of Carbonyl Compounds with 2,4-Dinitrophenylhydrazine
8. ASTM E 659 Standard Test Method for Autoignition Temperature of Liquid Chemicals
9. ASTM E 1064 Standard Test Method for Water in Organic Liquids by Coulometric Karl Fischer Titration

PART 2

SAMPLING AND HANDLING

TRAINING

In any workplace, training should be conducted before sampling and handling operations of 1-hexene and 1-octene are undertaken. Several commercial websites provide access to the Code of Federal Regulations, NIOSH, and OSHA databases which may help in answering questions and setting up safety programs. The training program may include the following:

1. Properties and health hazards of 1-hexene or 1-octene.

2. Safe work and good housekeeping practices.

3. The importance of protection from 1-hexene or 1-octene contact; the proper clothing and cleaning requirements to ensure worker protection.

4. Signs and symptoms of 1-hexene or 1-octene exposure and action to be taken.

5. The care that must be taken whenever and wherever 1-hexene or 1-octene is used, handled, stored and transported.

6. Emergency procedures for leaks, spills and fires, including protective clothing to be worn in such instances. Check the product's MSDS for further information.

7. First aid measures to be used after exposure.

8. The availability of written 1-hexene or 1-octene usage, health hazard and training program procedures.

It is recommended that this generalized sampling and handling training program should be part of a worker's initial instruction. Refresher training should be scheduled at least annually thereafter.

A summary of accidental release, fire, and health information is presented in PART 4 of this brochure.

RECOMMENDED PRACTICE FOR SAMPLING

This information is provided for use in establishing sampling and handling procedures. This information should only be utilized in conjunction with an existing health and safety program and cannot be used as a substitute for expert safety and medical advice.

SAMPLING:

If testing for water, peroxide or carbonyl contaminants, samples must be obtained using a gas cylinder. As a best practice, Chevron Phillips Chemical Company uses cylinders specified by 49 CFR, Subpart C, Section 178.36 (3A or 3AX seamless steel cylinders). The charging of these cylinders must conform to Section 173.302. Purge the cylinder with product before collecting the final sample. Ensure the appropriate outage be left for the liquid. For all other testing procedures and before sampling 1-hexene or 1-octene, the nitrogen atmosphere within the storage container or transport vessel should be depressurized safely. Samples may be taken through the sampling port (tank) or the manway opening (vessel) by means of a clean, dry 1-qt. (1-L) bottle held in a clean, dry sheath of nickel or stainless steel attached to a long rod or lightweight chain of the same material. Fit the bottle with a glass stopper to which is attached a light metal chain. Lower the bottle to near the bottom of the tank and pull out the stopper with a sharp jerk of the chain. Raise it at such a rate that it is about three-fourths full when it emerges from the liquid. Stopper the bottle before attempting to rinse the material from the outside. Label the sample bottle according to OSHA Regulations (refer to 29 CFR 1910.1200). Also as required by DOT, an emptied 1-hexene or 1-octene cylinder or bottle must retain the same

markings and labels used during its initial transport until the container has been sufficiently purged.

NOTE: Fresh air and other personal protective gear may be required depending on exposure limits set in the individual workplace.

Emphasis should be placed on cleanliness and dryness. Both the sample bottle and its holder must be CLEAN AND DRY. Transfer the sample to another bottle for storage. A suitable bottle for storing the sample is one known as a "Boston Round." The closure should be a screw cap with a Teflon® or aluminum foil liner.

If new bottles are used, first rinse them thoroughly with carbonyl-free ethanol and then dry in a hot-air oven. Hold the bottles in a desiccator while cooling to ambient temperature. Protect them from dirt or moisture by enclosure in a polyethylene bag. Rinse used bottles very thoroughly with water, detergents and solvents. Treat the rinsed containers as new bottles.

The sampling device should be bonded to the tank manway (e.g., by resting the chain on the lip of the manway) prior to sampling.

REFERENCE DOCUMENTS:

ASTM E 300 –
Standard Practice for Sampling Industrial Chemicals

ANSI Z 288.1 –
Flammable and Combustible Liquids Code

API RP 500 –
Classification of Locations for Electrical Installation at Petroleum Facilities Classified as Class I, Division 1, and Division 2

OSHA Regulations –
29 CFR, Paragraphs 1910.1000 and 1910.2000

U.S. DOT Regulations –
49 CFR, Transportation Subchapters B and C, Parts 171-179

STATIC ELECTRICITY AND GROUNDING

Alpha olefins are characterized by high electrical resistivity (low conductivity), which can result in the buildup of excess static charge during transfer operations. Both 1-hexene and 1-octene are classified as intermediate vapor pressure products under the API RP 2003 Guidelines. At 37.8°C (100°F), 1-hexene and 1-octene have vapor pressures of 310.7 and 33.97 mm Hg, respectively. These products are likely to create a flammable mixture in the vapor space during handling. Thus, the situation can exist for extremely dangerous explosions within closed containers, storage tanks or transport vessels.

Key operations which have the potential of generating a flammable atmosphere and/or static charge include tank and container filling, splash filling, tank cleaning, sampling, gauging, switch loading, filtering, mixing/agitation and vacuum truck operations. To minimize the hazard of static electricity during these operations, bonding and grounding may be necessary but may not by themselves be sufficient. For more information, refer to OSHA Standard 29 CFR 1910.106, "Flammable and Combustible Liquids", National Fire Protection Association (NFPA) 77, "Recommended Practice on Static Electricity" and/or the American Petroleum Institute (API) Recommended Practice 2003, "Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents".

PRODUCT LOADING/UNLOADING REQUIREMENTS

Loading operations must be performed only by qualified personnel. These individuals must be properly instructed in the loading of hazardous materials and made responsible for careful compliance with 49 CFR, Parts 172 and 173. Workers should refer to their site's fire and safety guidelines for required personal protective equipment. Due to the flammable nature of these products, use caution to avoid creating any sparks that could ignite the product. As the product is being loaded/unloaded, static buildup can occur. Therefore, a ground cable must be placed on

the container to prevent the buildup of static electricity. Use only clean, oil- and dirt-free, spark-resistant tools and implements.

The importance of thorough pre-trip and post-trip safety inspections cannot be overemphasized. The process of physical inspection of the container is one of the best methods of minimizing human error, the principle cause of transportation incidents.

Take extreme care to prevent spills. In case material is spilled, wash contaminated areas thoroughly with large quantities of water and collect the liquid in the plant chemical waste system. Drums and trucks can be used for temporary storage until product can be recycled or disposed of properly. See PART 5 of this brochure for further information.

WHEN LOADING OR UNLOADING A VESSEL OR BARGE:

Requirements for shipments of flammable liquids such as 1-hexene or 1-octene over water are defined in 46 CFR. Additionally, barge shipments are regulated by the U.S. Coast Guard and the regulations are published in 46 CFR, Part 151. Refer to current International Safety Guide for Oil Tankers and Terminals (ISGOTT) and United States Coast Guard (USCG) rules (46 CFR, Part 153) for regulations governing transportation by sea-going vessels. Chevron Phillips Chemical Company and independent inspectors ensure that 1-hexene and 1-octene are loaded in uncontaminated tanks.

Plan and control the loading and unloading of 1-hexene or 1-octene to limit personnel exposure and environmental releases. OSHA and the U.S. Coast Guard have published regulations applicable to personnel involved in the handling of these products. Some of the key elements are:

1. Employee Training
2. Personal Protective Equipment
3. Warning Signs

To reduce exposure of personnel to 1-hexene or 1-octene, gauging on the barge should consist of a closed device for use during transfer of product and a restricted device to determine product quantity during transfer. Vapor return lines are also required in some states and countries to control vapor releases.

Clean stainless steel tanks, rust-free mild steel tanks or suitably washed steel tanks are acceptable for transport of 1-hexene or 1-octene. ChevronTexaco Shipping carefully selects barges to ensure that product quality is not negatively affected during transport.

Qualified contractors should be used to inspect, clean and repair barges in which 1-hexene and 1-octene are shipped. The contractor should have facilities to dispose of residual product in an acceptable manner.

WHEN LOADING OR UNLOADING TANK CARS:

DOT regulations allow both 1-hexene and 1-octene to be shipped in General Purpose (GP) tank cars. Chevron Phillips Chemical Company has chosen to use dedicated pressure (LPG) cars because of nitrogen blanketing, and the greater containment potential and strength of LPG cars in comparison to GP cars.

Pressure tank cars in the Chevron Phillips Chemical Company fleet are DOT 105A300W and DOT 112J340W rated and are stenciled accordingly. These cars are insulated and have top loading/unloading capability.

<u>Loading</u>

Erect track warning signs, set hand brakes, place wheel chocks, turn on track warning lights (if available) and connect ground cable. Rail cars with no tank pressure should be nitrogen purged to displace oxygen. Once car is oxygen free (< 1% O_2 as determined by an O_2 analyzer), check car loading and vent valves making sure they are closed. Remove plug from vent valve and attach vent line extension (nipple) with Dry Link connection. Depressurize tank car to flare header. Disconnect vent line and tighten valve plug.

Visually inspect tank car exterior for damage and inspection dates. Connect vent line to vapor recovery unit and product loading hose to car, using Dry Link connections for both.

Load product by opening product valve on tank car, starting product pump and opening product line at the rack. Fill car to the desired capacity. Shut down transfer pump and block product line valve. Nitrogen purge the loading hose and vent line for approximately 30 seconds to remove residual product. Block tank car product and vent valves and remove product vent hose. Remove extension nipples. Block and plug all fittings. Apply appropriate placards and seals. Remove ground cable, wheel chocks and warning signs. Turn off track warning lights.

Unloading

Brakes must be set, wheels chocked, ground cables connected and caution signs erected. Check unloading and vent valves making sure they are closed. Remove plugs and connect unloading hose to the liquid valve and a nitrogen hose to the vapor valve (check gaskets before connecting hoses). Open product valve and start unloading pump, bleeding any vapors prior to start. Pressurized rail cars are equipped with high-flow check valves. The product valve must be opened slowly and off-loading must be within the valve's limits or it will check. Maintain positive tank pressure with nitrogen. After offloading is completed, shut off pump, close vent valve and remove nitrogen line. Close product valve and slowly unscrew unloading hose connection relieving any pressure. Close, plug and tighten all fittings. Placard tank car with appropriate placards. Remove wheel chocks, ground cable and caution signs.

WHEN LOADING OR UNLOADING TANK TRUCKS:

Pressure tank trucks are normally MC/DOT 330 or 331 type.

Loading

Place wheel chocks in front and back of truck's rear wheels allowing ¾" clearance for ease of removal. Connect ground cable. Ensure that the trailer is oxygen-free before proceeding (< 1% O_2 as determined by an O_2 analyzer). Purge trailers with nitrogen to displace oxygen if needed. Vent trailer to flare header. Disconnect vent line.

Visually inspect trailer exterior for damage and inspection dates. Check loading and vent valves making sure they are closed. Slowly remove caps. Connect product loading hose to truck spray bar and vapor recovery vent lines. Only Dry Link connections are acceptable. Open product valve to load product, start transfer pump and vent vapors to the vapor recovery system as necessary during loading to maintain product flow into the trailer. After loading is completed, shut down transfer pump and block product line valve. Purge loading line with nitrogen for approximately 30 seconds to clear free liquid through spray fill line. Block trailer product and vent. Remove product and vent lines. Block and plug all fittings. Apply appropriate placards and seals. Remove wheel chocks and ground cable.

Unloading

Place wheel chocks in front and back of truck's rear wheels allowing ¾" clearance. Connect ground cable. Check internal and external trailer valves making sure they are closed. Remove unloading valve cap. Check gasket and connect unloading hose. Only Dry Link connections are acceptable. Check valve on trailer vent line making sure valve is closed. Remove cap and connect a nitrogen hose to vent line. Open internal and external valves and start unloading pump. Bleed vapors before starting pump, if required, otherwise valves may check. Add nitrogen to maintain positive tank pressure as required.

After product transfer is complete, shut off unloading pump, close vent line and remove nitrogen line. Close internal and external valves; slowly unscrew unloading hose connection to relieve pressure. Close, cap and tighten all fittings. Remove wheel chocks and ground cable. Placards must be retained on trailer until trailer is cleaned.

SAFETY REFERENCES

The following publications are excellent references for product handling, safety and fire control:

NFPA 10 -
Standard for Portable Fire Extinguishers

NFPA 11 -
Standard for Low-, Medium-, and High-Expansion Foam Systems

NFPA 30 -
Flammable and Combustible Liquids Code

NFPA 70 -
National Electrical Code®

NFPA 77 -
Recommended Practice on Static Electricity

Manual Sheet TC-4,
Chemical Manufacturer's Association
Recommended Practice for Unloading Flammable Liquids from Tank Cars.

PART 3

STORAGE DESIGN RECOMMENDATIONS

STORAGE TANKS

Storage tanks for 1-hexene and 1-octene should be of welded steel construction. Underground storage tanks are not recommended because of the difficulty of locating leaks. However, some states require underground storage tanks. Diking, drainage and tank supports should be designed to conform to local regulations. A rule of thumb commonly used for determining the size of customer storage facilities suggests that storage facilities be 1½ times the size of shipments received. The secondary containment requirements, as well as tank layout and spacing requirements, should be in accordance with NFPA 30. Rotating equipment such as pumps should be kept outside of the secondary containment area. Some facilities may require larger inventories, and thus storage facilities, because of seasonal transportation problems.

The storage tank inlet should be located at the bottom of the tank. Should a top inlet be desired, the fill pipe should be extended to a depth no greater than the diameter of the fill pipe from the bottom of the tank in order to minimize static charge accumulating during filling. The fill pipe should be connected electrically to both the tank flange and the transfer pipeline. The purpose of this electrical connection is to dissipate any static charge that may build up during filling.

CPChem 1-hexene and 1-octene have vapor pressures of 6.00 and 0.66 psia at 37.8°C (100°F) respectively. Local environmental regulations may require that either product be stored in a tank that is either a pressure tank, equipped with an internal floating roof or connected to a vapor recovery system. An internal floating roof along with a nitrogen blanket is one of the best methods of preventing peroxide or carbonyl buildup.

A nitrogen blanketing system is necessary for applications where the product is going to be stored for long periods of time and peroxides and/or carbonyls would present a problem in the process. A nitrogen system that maintains positive pressure and adds nitrogen as the product is withdrawn, and as the tank breathes, prevents the introduction of air that can cause peroxide buildup in the product and keeps moisture from condensing in the tank. Free water will settle out in the bottom of the tank and will normally not be seen until the tank is stripped. Dissolved water up to the saturation level may be found in products. If water is a critical contaminant, an olefin sample should be tested periodically and withdrawn though the sump. When peroxide and carbonyl development is a concern, use a closed handling system that maintains nitrogen atmosphere on the product through the loading, unloading, and other handling activities to minimize exposure to atmospheric oxygen.

All of the lines and valves, as well as the tank, can be carbon steel. However, carbon steel lines will accumulate rust if allowed to remain empty for long periods of time. In this situation the first few gallons of product moved down the line may have a yellow to orange color and may contain particulates depending on the amount of rust that has accumulated. Unlined carbon steel tanks may also accumulate rust above the liquid level. This rust, along with the condensate, will settle to the bottom of the tank and may not be seen until the tank is stripped. Rust can be avoided by having storage tanks lined with zinc, epoxy or another coating that is compatible with these products.

Exercise care in selecting the gasket and seal materials to be used. White Canadian Asbestos, Teflon®, and glass-impregnated Teflon® have proven to be compatible with these products.

Coat storage tanks with reflective paint to reduce temperature fluctuations. While there is no recommended maximum storage temperature for 1-hexene and 1-octene, both the flash point and air permitting requirements must be considered.

Specific bulk storage designs must conform to insurance underwriter's codes and local fire and building regulations. Critical design, placement, installation and maintenance requirements are usually addressed in these codes and regulations and must be followed.

Tanks should be periodically inspected for leaks and serviced in accordance with the principle of API Standard 653.

Workers should never be permitted to enter an empty tank which has been used for 1-hexene or 1-octene until the requirements of the OSHA Confined Space Standard (29 CFR 1910.146) and the Safe Entry Recommendation of API Standard 2015 have been met, including, but not limited to, required concentrations for oxygen and limitations on concentrations of 1-hexene or 1-octene.

API AND ANSI DESIGN REFERENCES

American Petroleum Institute
1220 L Street NW
Washington, DC 20005

Part I – Design:

API RP 520: *Sizing, Selection, and Installation of Pressure-relieving Devices in Refineries*

Part II – Installation:

API Standard 601: *Metallic Gaskets for Raised-Face Pipe Flanges and Flanged Connections (Double-Jacketed Corrugated and Spiral-Wound)*

API Standard 620: *Design and Construction of Large, Welded, Low-Pressure Storage Tanks*

API Standard 650: *Welded Steel Tanks for Oil Storage*

API Standard 653: *Tank Inspection, Repair, Alteration, and Reconstruction*

API Standard 2000: *Venting Atmospheric and Low-Pressure Storage Tanks; Nonrefrigerated and Refrigerated*

API Standard 2015: *Requirements for Safe Entry and Cleaning of Petroleum Storage Tanks*

API RP 2003: *Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents*

API RP 2028: *Flame Arresters in Piping Systems*

API RP 2210: *Flame Arresters for Vents of Tanks Storing Petroleum Products*

API RP 2350: *Overfill Protection for Storage Tanks in Petroleum Facilities*

American National Standards Institute
25 West 43rd Street, 4th Floor
New York, New York 10036

ANSI B16.21: *Nonmetallic Flat Gaskets for Pipe Flanges*

ANSI B31: *Interpretations of Code for Pressure Piping*

PARTICULATE MATTER

CPChem 1-hexene and 1-octene should be free of particulate matter when shipped. However, some particulate matter may originate from outside contamination via the receiving-transfer system.

Particulate matter may be avoided by:

1. Paying careful attention to cleanliness.
2. Filtering product to remove particulate matter before use.

FILTERS

Since small amounts of foreign matter may enter storage tanks and transport vessels from various sources, a filter in the transfer piping between the storage tank and processing equipment is recommended. This can be accomplished by inserting a corrugated cellulose filter paper (5 μm) inside a woven polyester fiber (10 μm mesh) cartridge-type filter. Other types of product compatible filters might also be used. Flow rates and pressures should be used to determine the proper filter

for specific situations. Contact Chevron Phillips Chemical Company's Customer Technical Service Group at 800-852-5531 for recommendations. Inspect and renew filter cartridges periodically.

IMPURITY FORMATION

Small amounts of impurities, such as peroxides, carbonyls, and water may be formed during transport or long-term storage. Alumina or Molecular Sieve are effective in removing these impurities. Contact Chevron Phillips Chemical Company's Customer Technical Service Group at 800-852-5531 if additional assistance is required.

HOSES

Hard piping is preferred to the use of hoses where possible and practical. If hoses are needed for loading or unloading operations, they should be inspected and pressure tested at the intervals required by the various regulations. A satisfactory type hose is SW-309 PETRO-VAC 150 Tank Truck Hose (seamless nitrile tube with multiple plies of polyester with helix wire and a one-piece nitrile blend cover) or SP-483 modified X-link chemical hose (seamless X-link polyethylene tube with multiple plies of polyester which is supported by a PVC rod helix and a one-piece blue synthetic cover). Teflon® is also recommended. U.S. Coast Guard regulation 33 CFR, Part 154.500 applies to hoses used for bulk transfers to and from tank vessels.

PUMPS

Liquid product can be transferred by pump or vacuum. For most product handling, centrifugal pumps with mechanical seals perform satisfactorily. The pump manufacturer can make recommendations regarding the proper type of pump if the following parameters are known: 1) flow rate, 2) size and length of suction and discharge lines, 3) suction and discharge pressures, and 4) range of product temperatures during transfer. A drain valve should be installed at the lowest point in the system so that the pump and all piping can be completely drained and washed before any maintenance work is done. Totally enclosed fan cooled (TEFC) motors are recommended. However, local fire and insurance codes should be consulted to determine if an explosion-proof motor must be used. Pump seals must be capable of meeting EPA emission standards - this requires tandem or double seals. Tandem seals enhance safety when pumping flammable materials and reduce vapor emissions of product into the atmosphere. Demisting systems should be used to keep pump bearings lubed.

The following practices are recommended to minimize the possibility of pump leakage:

1. Mechanical seals in conformance with API Standard 682.

2. Pumps in conformance with API Standard 610.

3. Pumps designed so that pump bearings will be able to carry thrust at no flow. Consider selecting non-metallic (PEEK) wear rings to minimize damage if the pump runs dry.

4. The pump shaft should be highly polished.

5. Pumps should not be subjected to forces beyond specified pump tolerances.

6. Vibration monitoring with automatic pump shutdown may be applicable in certain situations.

VALVES

Full-bore ball valves are preferred for pigged pipelines. Gate valves, butterfly valves, or ball valves may be used for pipelines that are not pigged. These valves should be made of cast iron, case steel, or other recommended materials. Valves should be packed with the following graphite materials:

Garlock® EVSP Simplified (#9000/98)(1)
Garlock® 70# / 98 (-400 to 1200 °F; 10,000 psi)(2)
Garlock® 1303 (good for steam)(2)
Slade® 3300G (-400 to 1200 °F; 10,000 psi)(2)

(1) Most efficient packing is flexible die-formed rings with flexible braided end-rings.
(2) Used for field repacking.

INCOMPATIBLE MATERIALS

Viton® is not recommended for use with 1-hexene or 1-octene. Viton® is permeable and will absorb gases or vapors. This absorption causes swelling making the material incompatible for couplings and connections.

PIPELINES

The following are recommended practices in engineering pipelines for 1-hexene or 1-octene:

1. A minimum of flanged connections should be used to avoid potential leaks.

2. Lines should not be buried because of the difficulty of checking for leakage.

3. All lines should be sloped with drain valves at appropriate locations so that they can be completely drained for maintenance.

4. All newly installed pipelines should be pressure tested by an approved method before use.

5. Bellows valves for 2-inch and smaller lines are recommended to eliminate emissions from packing glands.

TEMPERATURE CONTROL

Proper pressure relief must be provided. Storage facilities should be designed to avoid the possibility of overheating and boiling. Coating storage tanks and lines with reflective paint will help prevent temperature buildup. Insulation is not needed nor is it recommended since corrosion and deterioration of the lines can occur. Also, vapor lock may result from overheating.

VAPOR CONTROL SYSTEMS

Evaporative emissions from 1-hexene and 1-octene are not regulated by the Federal Clean Air Act. However, some states and localities may regulate evaporative emissions of these materials. Check local regulations in the facility's state. For control of these vapor emissions, the U.S. EPA has recognized two types of systems as the "Best Available Control Technology (BACT)." The two recognized technologies are Hydrocarbon Vapor Recovery using the Carbon Adsorption-Absorption process and Hydrocarbon Vapor Combustion.

Generally, storage vapor recovery systems are favored in medium-to-large terminals where a sufficient quantity of product can be recovered to justify the higher capital cost. Other factors, which favor vapor recovery, include easier permitting and inherent safety advantages. In absence of a regulatory requirement, closed loading should be carried out with vapor return to recovery systems when these facilities are available.

Note - Recommendations concerning the construction of either type of vapor recovery system are listed in the USCG Regulations in 33 CFR.

PART 4

HEALTH, ENVIRONMENT, FIRE AND ACCIDENTAL RELEASE INFORMATION

In animal studies, 1-hexene and 1-octene have shown a low level of toxicity following exposures using the oral, dermal, or inhalation routes. However, due to their flammability, these materials require special handling.

Material Safety Data Sheets (MSDS) for 1-hexene and 1-octene are available from Chevron Phillips Chemical Company to help customers further satisfy safe handling and disposal needs and OSHA Hazard Communication Standard requirements. Such information should be requested and studied prior to working with these products. Please call Chevron Phillips Chemical Company at 800-852-5530 to request the MSDS for either of these products.

NOTE:
The following information is not intended to, nor does it, amend or replace the MSDS for 1-hexene or 1-octene. The most current MSDS should be carefully examined prior to working with these products.

HEALTH HAZARDS AND FIRST AID

EYE CONTACT: Neither 1-hexene nor 1-octene is expected to cause prolonged or significant eye irritation. **First Aid:** Flush eyes with water immediately while holding the eyelids open. As a precaution remove contact lenses, if worn, and flush eyes with fresh water.

SKIN CONTACT: Contact of 1-hexene or 1-octene with skin is not expected to cause prolonged or significant irritation, or allergic skin responses; however, prolonged or frequently repeated contact may cause the skin to become cracked or dry from the defatting action of either material. If absorbed through the skin, these materials are considered practically non-toxic to internal organs. The acute dermal LD50 in rabbits for both materials is >10g/kg. **First Aid:** Remove contaminated clothing and shoes. Wash skin thoroughly with soap and water. Discard contaminated clothing and shoes or thoroughly clean before reuse.

INGESTION: If swallowed, these substances are considered practically non-toxic to internal organs. The acute oral LD50 in rats for both materials is >10g/kg. Because of the low viscosity of 1-hexene or 1-octene, either substance can directly enter the lungs if it is swallowed or vomited. Once in the lungs, the substances are very difficult to remove and can cause severe injury to the lungs and death. **First Aid:** If swallowed, do not induce vomiting. Give the person a glass of water or milk to drink and get immediate medical attention. Never give anything by mouth to an unconscious person.

INHALATION: With respect to short-term inhalation exposures, based on results of animal testing, 1-hexene and 1-octene are practically non-toxic (LC50 for 1-hexene = 32,000 ppm/4 hr [rat]); LC50 for 1-octene = 8050 ppm/4 hr [rat]. However, excessive or prolonged breathing of 1-hexene or 1-octene may cause respiratory irritation or central nervous system (CNS) effects which may include headache, dizziness, nausea, vomiting, weakness, loss of coordination, blurred vision, drowsiness, confusion, or disorientation. At extreme exposures, CNS effects may include respiratory depression, tremors or convulsions, loss of consciousness, coma, or death. **First Aid:** If symptoms occur, move the exposed person to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention if breathing difficulties continue.

ECOTOXICITY/ENVIRONMENTAL FATE

ECOTOXICITY: These materials have demonstrated toxicity to aquatic organisms in laboratory experiments; however, due to volatility and low water solubility, these materials are expected to cause harm to aquatic organisms only in the immediate area of an accidental release.

ENVIRONMENTAL FATE: These materials are expected to be readily biodegradable.

FIRE INFORMATION

FLAMMABILITY PROPERTIES:

Critical Properties	1-Hexene	1-Octene
Flash Point, (TCC), °C (°F)	-26(-15)	12.8(55.0)
Autoignition Temperature, °C (°F)	272 (521)	221 (430)
Flammable Limits in Air, vol%	2-7	0.7-6.8
Burning Rate[(1)], mm/min.	8.1	6.5
NFPA Fire Hazard Rating	3	3
Behavior in Fire	For both products vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back.	

(1) The value is the rate (in millimeters per minute) at which the depth of a pool of liquid decreases as the liquid burns. Details of measurement are given by Burgess et. al., in Fire Research Abstracts and Reviews, 3, 177 (1961).

Do not use or store 1-hexene or 1-octene near heat, sparks, or open flames. Use or store only in a well-ventilated area. Keep container closed when material is not in use. Do not use pressure to empty drum or drum may rupture with explosive force; the drum is not designed to contain pressure. Empty containers retain product residue (solid, liquid, and/or vapor) and can be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, static electricity, or other sources of ignition. They may explode and cause injury or death. Empty drums should be completely drained, properly bunged and promptly returned to a drum reconditioner or be properly disposed of. Static hazards should be eliminated to prevent ignition. Refer to Static Electricity subsection in PART 2 for further information.

FIRE HAZARDS:

CPChem 1-hexene and 1-octene are flammable liquids. Due to its low flash point, 1-hexene is considered to be extremely flammable. Liquid evaporates quickly and forms vapors that can catch fire and burn with explosive force. Invisible vapor spreads easily and can be set on fire by many sources such as pilot lights, welding equipment, and electrical motors and switches. Fire hazard is greater when handling a product at a temperature within 20 degrees below its flash point.

FIRE FIGHTING INSTRUCTIONS AND COMBUSTION PRODUCTS:

For fires involving either material, do not enter any enclosed or confined fire space without proper protective equipment. This may include self-contained breathing apparatus (SCBA) to protect against the hazardous effects of normal products of combustion or oxygen deficiency. Normal combustion forms carbon dioxide and water vapor while incomplete combustion can produce carbon monoxide.

Fires involving 1-hexene or 1-octene can be safely extinguished with foam, dry chemical, or carbon dioxide. Use water in flooding quantities as fog; solid streams of water may be ineffective. Cool exposed containers near the fire with water.

Drainage and runoff should be controlled and collected in a remote location for recovery or disposal. Minimize spread to reduce cleanup cost.

PERSONAL PROTECTIVE EQUIPMENT & OCCUPATIONAL EXPOSURE LIMITS

PERSONAL PROTECTIVE EQUIPMENT:

If user operations generate airborne material, use process enclosures, local exhaust ventilation or other engineering controls to control exposure. As a good safety practice, wear safety glasses with side shields or chemical goggles when working with these

materials. Wear impervious protective clothing to prevent skin contact. Selection of protective clothing may include gloves, apron, boots and complete facial protection and will depend on operations conducted. Users should determine acceptable performance characteristics of protective clothing. Consider physical requirements and other substances present when selecting protective clothing. Suggested materials for protective gloves include Viton®, nitrile, and polyurethane. If exposure to airborne material may occur, wear a NIOSH/MSHA approved Organic Vapor or air-supplying respirator when working with these materials.

ANSI REFERENCES:

ANSI Z41.1	Protective Footwear
ANSI Z87.1	Practice for Occupational and Educational Eye and Face Protection
ANSI Z88.2	Practices for Respiratory Protection
ANSI Z89.1	Protective Headwear for Industrial Workers
ANSI Z358.1	Emergency Eyewash and Shower Equipment

OCCUPATIONAL EXPOSURE LIMITS:

	1-Hexene	1-Octene
OSHA Permissible Exposure Limit: 8-Hour Time Weighted Average (TWA):	none established	none established
ACGIH Threshold Limit Value: 8-Hour Time Weighted Average (TWA):	50 ppm	none established

ACCIDENTAL RELEASE MEASURES

If a transportation incident involving 1-hexene or 1-octene does occur, the Chemical Transportation Emergency Center (CHEMTREC) should be contacted for immediate assistance. CHEMTREC is a public service organization established by the American Chemistry Council to provide assistance in hazardous material incidents. **FOR A CHEMICAL EMERGENCY CALL CHEMTREC AT (800) 424-9300 toll free in the United States, Canada, Puerto Rico, and the Virgin Islands. For emergency calls outside the United States call (703) 527-3887.**

CHEMTREC will provide the caller preliminary emergency assistance in the form of Material Safety Data Sheet (MSDS) information. In all cases once CHEMTREC determines the incident involves a Chevron Phillips Chemical material, CHEMTREC will immediately contact the on-call Chevron Phillips Chemical Company Crisis Management Team (CMT) member at 1-866-4HAZMAT (442-9628). The contacted Chevron Phillips Chemical CMT member will then be responsible for coordinating an appropriate response to the transportation incident. In addition, if the CMT member determines that the incident involves exposure or potential health effects, the on-call Chevron Phillips Chemical toxicologist will also be contacted.

If an accidental release of 1-hexene or 1-octene has occurred, eliminate all sources of ignition in vicinity of spill or released vapor. Stop the source of the leak or release. Clean up releases as soon as possible, observing precautions in the Personal Protective Equipment section. If the concentration of 1-hexene or 1-octene in air surrounding the spill has not been determined, assume the worst case and use the highest level of respiratory and protective clothing. All spill cleanup activities must meet the requirements of the OSHA Hazardous Waste Operations and Emergency Response (HAZWOPER) Standard 29 CFR 1910.120. Contain liquid to prevent further contamination of soil, surface water or groundwater. Clean up small spills using appropriate techniques such as sorbent materials or pumping. Effective absorbents include sand or Claymax®, a loose "vermiculite-like" material. Claymax® may be purchased from:

Road Fabric, Inc.
Environmental Division
27 West 045 St. Charles Road
Carol Stream, IL 60188
Phone: (630) 293-3111

Where feasible and appropriate, remove contaminated soil. Follow the prescribed procedure for reporting and responding to larger releases. Contact local environmental or health authorities for guidance on how to dispose of the used absorbing agent, contaminated liquid product or soil. If the spill is on a hard surface, the area should be scrubbed with soap and water after the bulk of the 1-hexene or 1-octene has been removed. There is no Reportable Quantity (RQ) for 1-hexene or 1-octene under CERCLA Section 302.4.

Release of this product should be prevented from contaminating soil and water and from entering drainage and sewer systems. U.S.A. regulations require reporting spills of either material that could reach any surface waters. The reportable quantity is an amount that causes a sheen on nearby surface water. The toll free number for the U.S. Coast Guard National Response Center is (800) 424-8802.

DISPOSAL

All disposal procedures are to be carried out in strict conformance to federal, state, and local regulations.

Recovered liquid 1-hexene or 1-octene, from a spill or contaminated product, may be reprocessed. However, if the product cannot be reprocessed, it must be disposed of in a legally acceptable manner. Recovered material may be incinerated in a properly designed furnace. Please contact Chevron Phillips Chemical Company's Customer Technical Service Group at 800-852-5531 if additional assistance is required.

PART 5

TRANSPORTATION INFORMATION AND REGULATORY PROFILES

TRANSPORTATION INFORMATION

LABELING OF 1-HEXENE AND 1-OCTENE SHIPPING CONTAINERS:

Containers should be labeled in accordance with applicable OSHA and DOT requirements.

Identification numbers are required 1) on each side and each end of bulk packaging, if the packaging capacity is 1000 gallons or more or, 2) on two opposing sides if the packaging capacity is greater than 119 gallons but less than 1000 gallons. Markings for non-bulk packaging (119 gallons or less) include the proper shipping name, identification number preceded by UN or NA, the technical name if applicable and the consignee or consignor's name and address.

Labels are required on non-bulk packages and must be located on the same surface and near the marking.

Placards are required on each side and each end of bulk packaging.

Requirements concerning marking, labeling, placarding, and the preparation of shipping papers vary somewhat depending on the transport mode, packaging configuration and quantity of hazardous material being transported.

DOT marking, labeling, and placarding requirements are explained in detail in 49 CFR, Part 172, Subparts D, E, and F respectively. Subparts E and F show sample labels and placards. Labels and placards applicable to flammable liquids are required for 1-hexene and 1-octene (See Figures 1 and 2, respectively). Bulk containers should remain placarded when emptied unless the special requirements of Subpart F are met. Requirements for OSHA labels are presented in 29 CFR 1910.1200.

Note: The preceding information is subject to frequent change. Consult DOT and OSHA regulations for current requirements.

Figure 1: Example of 1-hexene DOT placard

Figure 2: Example of 1-octene DOT placard

BILL OF LADING DESCRIPTION (DOT):

	1-Hexene	1-Octene
Bulk Truck Bill of Lading Description:	1-HEXENE, 3, UN2370, II	HYDROCARBONS, LIQUID, N.O.S. (1-OCTENE), 3, UN3295, II
Bulk Rail Bill of Lading Description:	1-HEXENE // 3 // UN2370 // II // HAZMAT	HYDROCARBONS, LIQUID, N.O.S. (1-OCTENE) // 3 // UN3295 // II // HAZMAT
	STCC=4908182	STCC=4912280
Package Bill of Lading Description:	1-HEXENE, 3, UN2370, II	HYDROCARBONS, LIQUID, N.O.S. (1-OCTENE), 3, UN3295, II

Note: The preceding descriptions are subject to frequent changes. Consult current DOT regulations to verify proper bill of lading descriptions.

CHEMICAL DESIGNATIONS:

CG Compatibility Class:	Olefin	Olefin
Formula:	C_6H_{12}	C_8H_{16}
IMO/UN Designation:	UN2370	UN3295
DOT ID No.:	UN2370	UN3295
DOT Packing Group:	II	II
CAS Registry No.:	592-41-6	111-66-0

INTERNATIONAL MARITIME ORGANIZATION (IMO):

Proper Shipping Name:	1-Hexene	Hydrocarbons, Liquid, N.O.S. (1-Octene)
Class:	3.1	3.2
UN Number:	UN 2370	UN 3295
Symbol:	Flammable Liquid	Flammable Liquid
Pollution Category:	C	B

SHIPPING INFORMATION:

Grades of Purity:	99+%	99+%
Storage Temperature:	Ambient	Ambient
Inert Atmosphere:	No requirement[(1)]	No requirement[(1)]
Venting:	Open (flame arrester) or pressure-vacuum for either product	

[(1)] As a best practice, Chevron Phillips Chemical Company recommends purging shipping and storage containers with nitrogen for extended transportation periods to prevent peroxide or carbonyl formation.

HAZARD CLASSIFICATIONS

	1-Hexene	1-Octene
OSHA (29 CFR 1910.1200):	Flammable Liquid	Flammable Liquid
American National Standards Institute Precautionary Labeling Standard (1994):	Extremely Flammable Liquid	Flammable Liquid
U.S. Dept. of Transportation (49 CFR 173.120):	Flammable Liquid	Flammable Liquid
EU Dangerous Substance Directive (93/21/EEC):	Highly Flammable Liquid	Highly Flammable Liquid
National Fire Protection Association (NFPA 30):	Class IB Flammable Liquid	Class IB Flammable Liquid

NFPA HAZARD CLASSIFICATION:

Category	Classification	
Health Hazard (Blue)	1	1
Flammability (Red)	3	3
Reactivity (Yellow)	0	0

Various restrictions apply to the preceding classifications. Please refer to the specific regulation for details concerning classification requirements. 46 CFR, Parts 150-154 should also be referenced for information about U.S. Coast Guard regulations governing the transport of 1-hexene and 1-octene.

REGULATORY PROFILES

1-HEXENE:

ODCs: Contains Class 1 or Class 2 Ozone Depleting Chemicals (ODCs)?: **NO**

TSCA: Is this product or its components subject to any of the following TSCA requirements of 40 CFR, Part:

707	Export Notification (12b)	**NO**
712	Chemical Information Reporting (8a)	**NO**
716	Health & Safety Data Reporting (8d)	**NO**
721	Significant New Use (5e)	**NO**
723.50	Low Volume Exemption	**NO**
720.36	R&D Exemption	**NO**
720.38	Test Marketing Exemption	**NO**
723.25	Polymer Exemption	**NO**
790	Health and/or Environmental Effects Testing (4e)	**NO**

Is this material distributed under limitations of a 5(e) or 5(f) Consent Order? **NO**
Have there been any Section 8(e) submissions for this material? **YES**

INTERNATIONAL REGISTRATION: Are all components of this material listed on the following international inventories?:

TSCA	(United States)	**YES**	(CAS Reg. No. 592-41-6)
DSL	(Canada)	**YES**	
EINECS	(Europe)	**YES**	(EINECS Reg. No. 209-753-1)
METI	(Japan)	**YES**	(ENCS Reg. No. 2-22)
AICS	(Australia)	**YES**	
ECL	(South Korea)	**YES**	(KMOE Reg. No. KE 19845)
PICCS	(Philippines)	**YES**	
IECSC	(China)	**YES**	

FDA: Do FDA regulations permit use of this material as a direct or indirect food additive?

DIRECT: **NO**
INDIRECT: **YES** As a comonomer of polyethylenes complying with provisions of 21 CFR 177.1520. Such polyethylene copolymers, hexene homopolymers, or copolymers of hexene and certain other monomers stipulated in 21 CFR 175.105 (c)(5) may be eligible for use as components of adhesives, in accordance with 21 CFR 177.105, provided any additional applicable constituent limitations are met.

HAZARDOUS METALS: Does the sum of the concentration levels of lead, cadmium, mercury, and hexavalent chromium present in this material exceed 100 ppm by weight? **NO**

SARA 311 CATEGORIES:

1. Immediate (Acute) Health Effects: **YES**
2. Delayed (Chronic) Health Effects: **NO**
3. Fire Hazard: **YES**
4. Sudden Release of Pressure Hazard: **NO**
5. Reactivity Hazard: **NO**

RIGHT TO KNOW STATES: 1-Hexene is found on Massachusetts, Pennsylvania, and New Jersey Right To Know Lists.

ADDITIONAL REGULATORY INFORMATION: See CPChem MSDS PE0016, Section 15 for additional regulatory information.

REGULATORY PROFILES (Cont.)

1-OCTENE:

ODCs: Contains Class 1 or Class 2 Ozone Depleting Chemicals (ODCs)?: **NO**

TSCA: Is this product or its components subject to any of the following TSCA requirements of 40 CFR, Part:

707	Export Notification (12b)	**NO**
712	Chemical Information Reporting (8a)	**NO**
716	Health & Safety Data Reporting (8d)	**NO**
721	Significant New Use (5e)	**NO**
723.50	Low Volume Exemption	**NO**
720.36	R&D Exemption	**NO**
720.38	Test Marketing Exemption	**NO**
723.25	Polymer Exemption	**NO**
790	Health and/or Environmental Effects Testing (4e)	**NO**

Is this material distributed under limitations of a 5(e) or 5(f) Consent Order? **NO**
Have there been any Section 8(e) submissions for this material? **NO**

INTERNATIONAL REGISTRATION: Are all components of this material listed on the following international inventories?:

TSCA	(United States)	**YES**	(CAS Reg. No. 111-66-0)
DSL	(Canada)	**YES**	
EINECS	(Europe)	**YES**	(EINECS Reg. No. 203-893-7)
METI	(Japan)	**YES**	(ENCS Reg. No. 2-24)
AICS	(Australia)	**YES**	
ECL	(South Korea)	**YES**	(KMOE Reg. No. KE 26673)
PICCS	(Philippines)	**YES**	
IECSC	(China)	**YES**	

FDA: Do FDA regulations permit use of this material as a direct or indirect food additive?

DIRECT:	**NO**	
INDIRECT:	**YES**	Per 21 CFR 177.1520 as comonomer in polyethylene

HAZARDOUS METALS: Does the sum of the concentration levels of lead, cadmium, mercury, and hexavalent chromium present in this material exceed 100 ppm by weight? **NO**

SARA 311 CATEGORIES:

1. Immediate (Acute) Health Effects: **YES**
2. Delayed (Chronic) Health Effects: **NO**
3. Fire Hazard: **YES**
4. Sudden Release of Pressure Hazard: **NO**
5. Reactivity Hazard: **NO**

RIGHT TO KNOW STATES: 1-Octene is found on Massachusetts, Pennsylvania, and New Jersey Right To Know Lists.

ADDITIONAL REGULATORY INFORMATION: See CPChem MSDS PE0017, Section 15 for additional regulatory information.

REVISION STATEMENTS

This revision updates the following sections and should be reviewed by the user:

Part 1	Specifications	Pages 3 and 4

Previous version: "1-Hexene 1-Octene 2005 rev0.doc"

PART 6

APPENDIX

GLOSSARY OF TERMS, ABBREVIATIONS, AND ORGANIZATIONS

ACGIH	American Conference of Governmental Industrial Hygienists
AIAG	Automotive Industry Action Group
AIHA	American Industrial Hygienists Association
AALA	American Association for Laboratory Accreditation
ANSI	American National Standards Institute
API	American Petroleum Institute
ASME	American Society of Mechanical Engineers
ASQC	American Society for Quality Control
ASTM	American Society for Testing and Materials
BABT	British Approvals Board of Communication
BACT	Best Available Control Technology
Bonding	The connection of two or more conductive objects by means of a conductor (most commonly a wire or metal plate).
BSI	British Standards Institute
CAA	Clean Air Act
CAAA	Clean Air Act Amendments
CAD	Computer-Aided Design
CANUTEC	Canadian Transport Emergency Centre
Carbonyls	Compounds containing the C=O functional group. They can occur as impurities in many organic compounds forming from peroxide contaminants.
CE-mark	Conformity European Union Mark (The CE-mark is the official marking required by the European Community)
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CG	Coast Guard

CHEMTREC	Chemical Transportation Emergency Center
CMA	Chemical Manufacturers Association
Confined Space	An area that by design has limited openings for entry and exit. A confined space has unfavorable natural ventilation and is not intended for continuous worker occupancy.
CPC	Chemical Protective Clothing
DOT	Department of Transportation
EPA	Environmental Protection Agency
ESD	Electro static discharge
EU	European Union
FDA	Food & Drug Administration
Flash Point	The minimum temperature at which a liquid gives off vapor in sufficient concentrations to form an ignitable mixture with air near the surface of a liquid.
FMEA	Failure Mode Effect Analysis
GLP	Good Laboratory Practices
Grounding	The connection of one or more conductive objects to the ground: a specific form of bonding. Grounding is also referred to as earthing.
HAP	Hazardous Air Pollutant
HAZWOPER	Hazardous Waste Operations and Emergency Response
HON	Hazardous Organic NESHAP
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
IDLH	Immediately Dangerous to Life and Health: the airborne concentration of a toxic material from which one could escape within 30 minutes without any escape-impairing symptoms or irreversible health effects.
IEEE	Institute of Electrical and Electronics Engineers
IMDG	International Maritime Dangerous Goods
IMO	International Maritime Organization
IQA	Institute of Quality Assurance
ISGOTT	International Safety Guide for Oil Tanker and Terminals
ISO	International Organization of Standardization

LFL	Lower Flammability Limit
MACT	Maximum Achievable Control Technology
MIL	Military
MSDS	Material Safety Data Sheet
MSHA	Mine Safety and Health Administration
NACCB	National Accreditation Council for Certification Board
NDE	Nondestructive Evaluation
NDT	Nondestructive Testing
NEC	National Electrical Code
NESHAP	National Emission Standard for Hazardous Air Pollutants
NFPA	National Fire Protection Association
NIST	National Institute of Standards and Technology
NIOSH	National Institute for Occupational Safety and Health
NPDES	National Pollutant Discharge Elimination System
OEM	Original Equipment Manufacture
OSHA	Occupational Safety and Health Administration
PEL	Permissible Exposure Limit. An occupational exposure limit established under OSHA's regulatory authority. It may be a time-weighted average (TWA) concentration or a maximum concentration never to be exceeded either instantaneously (CEILING) or during any 15-minute period (STEL).
Peroxides	Compounds containing the -O-O- linkage. They occur as impurities in many organic compounds, where they have been slowly formed by the action of oxygen.
PM	Preventative Maintenance
PPE	Personal Protective Equipment
ppm	parts per million.
QA	Quality Assurance
QC	Quality Control
QMI	Quality Management Institute
RAB	Registrar Accreditation Board
RCRA	Resource Conservation and Recovery Act

RQ	Reportable Quantity
SARA	Superfund Amendment and Reauthorization Act
SCC	Standards Council of Canada
SPC	Statistical Process Control
SQC	Statistical Quality Control
STEL	Short Term Exposure Limit
TLV	Threshold Limit Value; the TLV is a copyrighted exposure standard developed by the ACGIH, that refers to the airborne concentration of a substance under which it is believed that nearly all workers may be repeatedly exposed day after day without adverse health effects. TLVs are expressed in four ways: (1) TLV-C; (2) TLV-STEL; (3) TLV-Skin; (4) TLV-TWA
TLV-C	Threshold Limit Value - Ceiling Exposure Limit; the concentration that should not be exceeded during any part of the working exposure.
TLV-Skin	The “skin” notation after the TLV indicates that there is a potential for the cutaneous route (mucous membranes, eyes, skin) to significantly contribute to the overall exposure. Vehicles present in solutions or mixtures can also significantly enhance potential skin absorption. The skin designation is an alert that air sampling alone is insufficient to accurately quantify exposure and that measures to prevent significant cutaneous absorption may be required.
TLV-STEL	Threshold Limit Value - Short Term Exposure Limit; the concentration to which it is believed that workers can be exposed continuously for a short period of time without suffering from 1) irritation, 2) chronic or irreversible tissue damage, or 3) narcosis of sufficient degree to increase the likelihood of accidental injury, impair self-rescue or materially reduce work efficiency, and provided that the daily TLV-TWA is not exceeded. An STEL is a 15-minute TWA exposure, which should not be exceeded at any time during a workday even if the 8-hour TWA is within the TLV-TWA. Exposures above the TLV-TWA up to the STEL should not be longer than 15 minutes and should not occur more than four times per day. There should be at least 60 minutes between successive exposures in this range.
TLV-TWA	Threshold Limit Value - Time Weighted Average; the time-weighted average concentration for a conventional 8-hour workday and a 40-hour workweek, to which it is believed that nearly all workers may be repeatedly exposed, day after day, without adverse effect.
TOC	Total Organic Carbon
TPQ	Threshold planning quantity - under the Superfund Amendments Reauthorization Act (SARA Title III) Section 302, 304, 4311/312, a chemical specific quantity, in pounds, that triggers certain reporting requirements
TQC	Total Quality Control
TQM	Total Quality Management
TWA	Time-Weighted Average

UL	Underwriters Laboratory
Ullage	Amount by which a packaging falls short of being liquid full
UN	United Nations
USCG	United States Coast Guard
Vapor Pressure	The pressure exerted by a volatile liquid while under defined equilibrium conditions. Vapor pressure is usually reported in millimeters of mercury (mm Hg) at specified temperatures.
VOC	Volatile Organic Compound