Chevron Phillips CHEMICAL

Safe Handling and Storage of

AlphaPlus® 1-Butene

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Chevron Phillips CHEMICAL

Performance by design.
Caring by choice.™

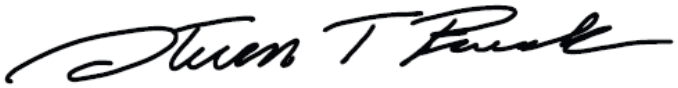
OPERATIONAL EXCELLENCE SYSTEM

March 1, 2024

Operational Excellence Policy

We will strive each day to conduct our business in a safe, secure, injury-free, environmentally responsible, and sustainable manner. We are committed to comply with all laws and regulations applicable to our facilities and business activities and to comply with all voluntary programs to which we elect to subscribe. We will strive to make optimal use of the resources we consume and minimize emissions and waste. We will strive to continually reduce the risks of our products throughout their lifecycle and will encourage their responsible use and disposal. We are committed to reducing risks in our operations to safeguard our employees, contractors, and the communities where we operate and engage in business activities. We will openly communicate our results and welcome the input of our employees and contractors, regulatory agencies, our communities, our customers, and other interested stakeholders.

We will accomplish this by integrating safety, security, health, environmental, 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.



Steven T. Prusak
President & CEO
Chevron Phillips Chemical Company LLC

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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 Safety Data Sheet (SDS) for 1-Butene (#PE0015). The most current SDS can be obtained from Chevron Phillips Chemical Company at www.cpchem.com or by calling (800) 852-5530 and should be carefully examined prior to working with this product.

INTRODUCTION

Gulf Oil Chemicals commercialized the first production of alpha olefins in 1965, under the name of Gulftene® alpha olefins. Today, alpha olefin products are produced and marketed by Chevron Phillips Chemical Company. Chevron Phillips Chemical produces 1-butene at its Cedar Bayou, TX facility.

Primarily, 1-butene is sold for use as a comonomer in the manufacture of polyethylene resins. It is also used to produce polybutenes, alcohols, aldehydes, alkylate gasoline, epoxides, mercaptans, metal alkyls and other derivatives.

NOTE:
THIS BROCHURE DOES NOT AMEND OR REPLACE OFFICIAL PUBLICATIONS, SAFETY REGULATIONS NOW IN USE, SAFETY DATA SHEETS OR COMMERCIAL TERMS OF SALE. CHEVRON PHILLIPS CHEMICAL COMPANY MAKES NO GUARANTEE OF THE ACCURACY OF THE CONTENTS OF THIS BROCHURE OR ANY WARRANTY OF ANY KIND, EITHER EXPRESSED OR IMPLIED, WITH RESPECT TO THE USE OF THIS INFORMATION OR ITS APPLICABILITY. THE USER ASSUMES ALL RISK AND LIABILITY ASSOCIATED WITH THE INFORMATION IN THIS BROCHURE.

PART 1

SPECIFICATIONS, PROPERTIES AND TEST METHODS

1-BUTENE (C_4H_8) SALES SPECIFICATION

Please reference the Chevron Phillips website for sales specifications at www.cpchem.com

TYPICAL PROPERTIES

API gravity at 15.6°C (60°F) (1)	104.14
Autoignition temperature: °C (°F)	384 (723)
Boiling Point at 1 atm. (1) : °C (°F)	-6.26 (20.73)
Coefficient of Expansion at 15.6°C (60°F), per °F (1)	0.001160
Critical Pressure (1) : psia	583.00
Critical Temperature (1) : °C (°F)	146.44 (295.59)
Critical Volume (1) : ft^3/lb	0.0685
Density of liquid at 15.6°C (60°F) (1) : lb/gal	5.006
Flammability limits (volume % in air mix) (1)	Lower= 1.60 Upper= 9.30
Flash Point, TCC: °C (°F)	-80 (-112)
Freezing point at 1 atm. (1) : °C (°F)	-185.35 (-301.63)
Heat Capacity at 15.6°C (60°F) and Constant Pressure of Gas, Ideal State (1) : BTU/lb/°F	0.3554
Heat Capacity at 15.6°C (60°F) and Constant Pressure of Liquid at 1 atm. (1) : BTU/lb/°F	0.5359
Heat of Vaporization at Normal Boiling Point, 1 atm. (1) : BTU/lb	171.98
Molecular weight (1)	56.11

Octane: Research[1] Motor[1]	97.4 80.8
Octanol/water partition coefficient (log K_{OW}) [2]	1.32 - 2.4
Odor	Slightly aromatic
Physical state at room temperature	Colorless gas or liquid
Reactivity	May react with strong oxidizing agents, such as chlorates, nitrates, peroxides, etc.
Relative Density (Specific gravity): at 15.6°C/15.6°C (60°F/60°F) [1]	0.6005
Solubility in water at 25°C (77°F) [2] : mg/l	177 - 330
Vapor Density (air=1)	1.93
Vapor Pressure: 100°F [1] : psia 20°C [3] : mm Hg	63.2775 1895
% Volatile	100

REFERENCES AND NOTES:

(1) "Physical Constants of Hydrocarbon and Non-Hydrocarbon Compounds", 2nd edition, ASTM Data Series DS 4B, Philadelphia, PA, 1988.

(2) Assessment of the environmental fate of 1-butene. Unpublished report sponsored by Novacor Chemicals Ltd. (reported in OECD SIDS dossier). Mackay, D., and S. Patterson (1993), University of Toronto.

(3) TRC Thermodynamic Tables; Thermodynamic Research Center, The Texas A&M University System.

RECOMMENDED TEST METHODS

The following ASTM methods are recommended for the analysis of 1-butene:

1.	ASTM D 1016	Standard Test Method for Purity of Hydrocarbons from Freezing Points
2.	ASTM D 1070	Standard Test Methods for Relative Density (Specific Gravity) of Gaseous Fuels
3.	ASTM D 1657	Standard Test Method for Density or Relative Density of Light Hydrocarbons by Pressure Hydrometer
4.	ASTM D 2504	Standard Test Method for Noncondensable Gases in C_2 and Lighter Hydrocarbon Products by Gas Chromatography
5.	ASTM D 2505	Standard Test Method for Ethylene, Other Hydrocarbons, and Carbon Dioxide in High-Purity Ethylene by Gas Chromatography
6.	ASTM D 3120	Standard Test Method for Trace Quantities of Sulfur in Light Liquid Petroleum Hydrocarbons by Oxidative Microcoulometry
7.	ASTM D 4051	Standard Practice for Preparation of Low-Pressure Gas Blends
8.	ASTM D 4178	Standard Practice for Calibrating Moisture Analyzers
9.	ASTM D 4929	Standard Test Methods for Determination of Organic Chloride Content in Crude Oil
10.	ASTM F 307	Standard Practice for Sampling Pressurized Gas for Gas Analysis

PART 2

SAMPLING AND HANDLING

TRAINING

In any workplace, training should be conducted before sampling and handling operations of 1-butene 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. All workers potentially exposed to 1-butene shall be provided with information and training in accordance with the requirements of OSHA Hazard Communication Standard 29 CFR 1910.1200. The training program shall include the following:

1. Properties and health hazards of 1-butene.
2. Engineering controls and work practices associated with the job assignment.
3. Emergency procedures for leaks, spills, fires, etc. that include the use of personal protective equipment.
4. Measures to be taken to protect personnel from 1-butene exposure.

Other recommended training topics include:

1. Safe work and good housekeeping practices.
2. The importance of respirators, their effectiveness, and the health hazards affected by nonuse.
3. Proper protective equipment required for safe use and handling.
4. Signs and symptoms of 1-butene exposure and action to be taken.
5. The care that must be taken when using, handling, storing, or transporting 1-butene.
6. The availability of written 1-butene usage, health hazard, and training program information.

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

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 PRECAUTIONS:

Vapor cloud formation from 1-butene liquid or vapor leaks and subsequent contact with an ignition source can cause an explosion. Petroleum gases such as 1-butene are heavier than air and can travel along the ground toward distant ignition sources, which may cause an explosive flashback. Therefore, take extreme care to prevent leakage when sampling 1-butene.

Gaseous 1-butene is extremely flammable and it is usually contained as a liquid under pressure. In liquid form, 1-butene may cause eye and skin irritations or injuries. Therefore, the proper personal protective equipment including gloves, chemical goggles and a face shield should be used when sampling and handling 1-butene.

SAMPLE CONTAINERS:

Clean sample containers by purging with nitrogen and then by flushing with product before taking samples. Cleaning with detergent/water solutions, steam or acetone is not recommended.

Samples can be collected in sample cylinders, floating piston cylinders or cylindrical containers. Sample cylinders are used for high-pressure liquid samples. Quarter-inch valves are typically used on each end of the cylinder. However, 3/8-inch needle valves have also been used. One of the ends should have an OSHA specified safety relief valve. If the samples are to be transported within the United States, the sample containers must meet the specifications of and be prepared for shipment according to the Hazardous Materials Regulations of the Department of Transportation (DOT).

Label sample containers with the sample source, sample date, container identification, sample pressure and temperature, ambient temperature, type of analysis required and the sampling method used. If the sample will be transported, it must be labeled according to DOT regulations.

Inspection, repair and testing of DOT approved cylinders must be performed by trained personnel at a DOT authorized facility. When performing maintenance on floating piston cylinders, special care should be taken when disassembling the cylinder. If either of the end caps are removed while the cylinder is under pressure, the end caps and the piston can be ejected with enough force to cause serious injury to personnel or damage to nearby equipment. When disassembling floating piston cylinders, the following steps should be followed:

1. Clamp the cylinder to a steady work surface.

2. Depressurize both ends of the cylinder to atmospheric pressure before removing the end caps. Ensure that venting is done to a proper recovery source.

3. Clear the area at either end of the cylinder before loosening the end plug.

4. Use a mechanical plunger to dislodge the piston from the cylinders. Do not use fluid pressure.

When filling sample containers with 1-butene, maintain allowances to safely handle thermal expansion. Calculate the total capacity of the sample containers in order to safely contain the product in its normal and expanded states. If provisions are not made for thermal expansion and the temperature rises, liquid leakage through the pressure relief valves will occur, resulting in a fire hazard.

SAMPLING METHODS:

ASTM D 1265, “Standard Practice for Sampling Liquefied Petroleum (LP) Gases (Manual Method)” and ASTM D 3700, “Standard Practice for Obtaining LPG Samples Using a Floating Piston Cylinder” provide recommended 1-butene sampling procedures. ASTM D 1265 describes procedures for taking liquid samples while ASTM D 3700 lists procedures for both liquid and gas phase sampling.

Emphasis should be placed on obtaining samples that are representative of the product to be tested. If the samples are not valid, analysis results will be useless regardless of the care and accuracy taken during the laboratory testing.

Once the sample has been collected, check the sample container for leaks by using Snoop® leak detector or by immersing the container in a water bath. If a leak is detected, discard the sample. See the Disposal section in PART 4 of this brochure for more information.

NOTE:
WHEN WORKING WITH 1- BUTENE, WEAR APPROVED RESPIRATORY EQUIPMENT UNLESS VENTILATION AND / OR OTHER ENGINEERING CONTROLS ARE ADEQUATE TO MAINTAIN A MINIMAL OXYGEN CONTENT OF 19.5% BY VOLUME UNDER ATMOSPHERIC PRESSURE.

REFERENCE DOCUMENTS:

ASTM D 1265 –
Standard Practice for Sampling Liquefied Petroleum (LP) Gases (Manual Method)

ASTM D 3700 –
Standard Practice for Obtaining LPG Samples Using a Floating Piston Cylinder

STATIC ELECTRICITY AND GROUNDING

Static electricity can cause serious incidents such as fires and explosions unless certain precautions are observed. Petroleum gases such as 1-butene are heavier than air and can travel along the ground toward distant ignition sources, which may cause an explosive flashback.

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 1910.110: "Storage and Handling of Liquified Petroleum Gases", 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"

Submerged filling is recommended for all flammable liquids. The inlet line should discharge at a depth no greater than the diameter of the fill pipe from the bottom of the tank in order to minimize static charge accumulation during filling. The fill pipe should be connected electrically to the tank to eliminate uncontrolled electrical discharge.

WARNING:
Personnel wearing rubber-soled shoes, particularly on certain composition floors made of good insulating materials, may pick up considerable static electricity.

AUTO-REFRIGERATION

Drains may become plugged and valves may become inoperable because of the formation of ice due to expanding vapors or vaporizing liquids (auto-refrigeration). Frozen valves may be thawed by washing with an environmentally acceptable low freezing, high-flash liquid such as propylene glycol.

PRODUCT LOADING AND UNLOADING REQUIREMENTS

Chevron Phillips Chemical Company uses vessels, rail tank cars, and tank trucks to transport 1-butene. See the Accidental Release Measures section in PART 4 of this brochure for information in the case of a transportation incident.

WHEN LOADING OR UNLOADING A MARINE VESSEL:

Vessel shipments are regulated by the U. S. Coast Guard. Requirements for vessel shipments of hazardous materials, such as 1-butene, are defined in 46 CFR, Parts 153-154 and 49 CFR, Part 176.

Inspect all equipment prior to each shipment to ensure that safety systems, tanks, piping and valves, and loading and unloading systems are in sound operating condition and free from defects. Safety features such as emergency isolation and disconnect systems on loading arm fittings lower the risk of occupational exposure on marine vessels.

Gaseous 1-butene is very flammable, forming explosive mixtures in air. When loading or unloading 1-butene, the operator must take special precautions to avoid contact with any source of ignition. Shut down any equipment that may be an ignition source. Plan and control the loading and unloading of 1-butene in order to limit personnel exposure and environmental releases.

The general procedure used for the loading and unloading process is dictated by site layout and the standards in that location. Clean carbon steel pressure tanks (bullet tanks) are acceptable for storing 1-butene when transported by vessels. The tanks should be constructed in accordance with DOT specifications and the ASME code for Unfired Pressure Vessels. ChevronTexaco Shipping carefully selects ships in order to ensure that product quality is not negatively affected during transport.

Use qualified personnel to inspect, clean and repair containers in which 1-butene is shipped, providing them with the most up-to-date MSDS. These personnel should ensure that the

necessary facilities are available to dispose of residual product in an acceptable manner.

WHEN LOADING OR UNLOADING TANK CARS OR TANK TRUCKS:

Liquefied 1-butene is shipped in pressurized rail tank cars and tank trucks. Rail tank cars are loaded and unloaded from the top and usually contain about 30,000 gallons of product. Tank trucks are ordinarily loaded and unloaded through the bottom loading/unloading valve and are often equipped with self-unloading pumps. Perform a pre-trip mechanical inspection on rail tank cars and tank trucks prior to each shipment.

Requirements for shipments of hazardous materials, such as 1-butene, by rail and by public highway are defined in 49 CFR, Parts 171, 172, 173, 174, and 177-180. Perform loading and/or unloading operations in accordance with the current regulations of the Department of Transportation (DOT). Significant operational considerations include:

1. Secure area and inform personnel in the area of the operation being performed.

2. Post caution signs during loading, unloading and disconnecting operations.

3. Prevent rail cars and trucks from moving by chocking wheels and setting brakes.

4. Bond and/or ground rail cars/trucks and all loading/unloading equipment to prevent the risk of explosion due to static electricity accumulation.

5. Remove any possible sources of ignition from the area.

6. Test all connections to ensure they are free of leaks before loading or unloading operations begin. Screw-type connections may be used between the rail car or truck and the loading/unloading arms and hoses. The use of “quick-disconnect” fittings is not recommended.

7. Maintain positive pressure to keep air out of the headspace.

8. Use an inert gas, such as nitrogen, or use the 1-butene head pressure for pressuring the product from the car/truck.

Use qualified personnel to clean, inspect, and repair rail tank cars and tank trucks. Cleaning facilities provided by the shipper or unloader should be capable of disposing of the product residue in a responsible manner. Refer to current ISGOTT and USCG rules.

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 68 –
Venting of Deflagrations

NFPA 70 –
National Electrical Code®

NFPA 77 –
Recommended Practice on Static Electricity

NFPA 325 –
Fire Hazard Properties of Flammable Liquids, Gases, and Volatile Solids

NFPA 780 –
Lightning Protection Systems

API RP 2003 –
Protection Against Ignitions Arising out of Static, Lightning, and Stray Currents

PART 3

STORAGE DESIGN RECOMMENDATIONS

Storage of 1-butene is usually in liquid form under pressure. Take special precaution when storing 1-butene because at ambient conditions it is a flammable gas that forms explosive mixtures in air. If stored in appropriate containers at ambient temperatures, 1-butene is relatively harmless.

STORAGE TANKS

Design storage tanks for 1-butene in accordance with the ASME Code for Unfired Pressure Vessels and/or API Standard 620, "Design and Construction of Large, Welded, Low-Pressure Storage Tanks" (15 psig or less, -270°F to 200°F). Storage facilities should also adhere to 29 CFR 1910.110, "Storage and Handling of Liquified Petroleum Gases." Design tanks and associated piping to prevent the possibility of brittle fracture by using welded carbon or alloy steels. Underground storage tanks are not recommended because of the difficulty of locating leaks. However, some states require underground storage tanks. The storage site is also an important consideration. When deciding where to store 1-butene, give thought to property lines, nearby buildings, adjacent operations, and possible ignition sources. Do not locate the storage site near any sources of heat or ignition, such as steam pipes. Ensure that nearby electrical equipment is explosion proof.

Construct tank supports from solid masonry, concrete or steel. If using steel, protect it from fire exposure. Electrically connect all parts of the storage system to one another and to a common ground in a way that will prevent the accumulation of static electrical charges. Enclose storage vessels within fire banks that can retain 100% of the tank's volume. Additionally, equip these vessels with pressure relief valves that are connected to a flare system and are set no higher than the design pressure of the vessel. Totally enclose all gauging devices and remove all air when placing new or existing equipment into service. This can be done by water flooding the equipment, then displacing the water with an inert gas (or 1-butene vapors) or by displacing the air by purging the equipment with an inert gas. Residual oxygen should be less than 500 ppm by volume before putting the equipment in service.

Locate the storage tank inlet at the bottom of the tank. Should a top inlet be desired, extend the fill pipe 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. Connect the fill pipe electrically to both the tank flange and the transfer pipeline. The purpose of this electrical connection is to dissipate any static charge which builds up during filling.

When filling storage vessels with 1-butene, maintain allowances to safely handle thermal expansion. Calculate the total capacity of the storage vessels in order to safely contain the product in its normal and expanded states. If provisions are not made for thermal expansion and the temperature rises, liquid leakage through the pressure relief valves will occur, resulting in a fire hazard.

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 API Standard 653, "Tank Inspection, Repair, Alteration, and Reconstruction."

Never permit workers to enter an empty tank which has been used for 1-butene 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-butene.

API AND ANSI DESIGN REFERENCES

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

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

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

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

ANSI B31: *Interpretations of Code for Pressure Piping*

PARTICULATE MATTER

Shipments of 1-butene should be free of particulate matter. However, some particulate matter may originate from outside contamination via the receiving-transfer system.

Avoid particulate matter in 1-butene by:

1. Paying careful attention to cleanliness.

2. Filtering the product to remove particulate matter before use.

FILTERS

Since small amounts of foreign matter may enter storage tanks and transport vessels from various sources, it is recommended to locate filters upstream of meters at the loading terminals. Filters will help to prevent the meters from plugging and producing inaccurate measurements. Inspect filter cartridges periodically. Clean or replace filters as needed.

HOSES

Hard piping is preferred to the use of hoses where possible and practical. Articulated arms are preferred over flexible hoses for loading and unloading operations because hoses are a potential source of leaks and/or failures. However, if flexible hoses are used, they should have a bursting pressure of at least 317 psia, which is five times the vapor pressure of 1-butene at 100°F. When not in use, do not leave flexible hoses under pressure. Articulated arms and flexible hoses must be inspected frequently, and upon any evidence of damage immediate replacement is recommended. If any problems are observed during transfer operations, shut down the operation immediately and report the problem. Replace the equipment before resuming operations. Use screw-type or flange-type connections between the transport equipment and the unloading arms and hoses. The use of "quick-disconnect" connections is not recommended.

PUMPS

For most 1-butene handling, centrifugal pumps with tandem mechanical seals perform satisfactorily. The pump manufacturer can recommend 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. Install a drain valve at the lowest point in the system so that the pump and all piping can be completely drained before any maintenance work is done. Totally enclosed fan cooled (TEFC) motors are recommended as well as the use of explosion-proof motors. The pump seals must be capable of meeting EPA emission standards, which requires tandem or double seals.

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. Selection of non-metallic (PEEK) wear rings to minimize damage if the pump runs dry should be considered.

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 shutdown devices.

VALVES

Upon purchasing valves for 1-butene service, ensure that all valve seats, packing and gaskets are rated for this type of service. Gate valves or fire-safe ball valves are recommended for use in loading and unloading operations. Soft-seated valves are useful in minimizing leakage. However, all valves must be rated fire-safe, providing a metal seat backup for the valve stem seal.

Never use cast iron or non-ferrous valves or fittings. To provide for isolation in an emergency, locate valves as close to storage facilities as possible. Refer to 29 CFR 1910.110, "Storage and Handling of Liquefied Petroleum Gases," for more detailed information.

PIPING & FITTINGS

The following are recommended practices in engineering pipelines for 1-butene:

1. Do not use screwed connections for joining pipe sections; the use of flanges and welds is recommended to join the pipe sections. To avoid the potential for leaks, keep the amount of flanged connections to a minimum.

2. Piping and fittings must meet the requirements of the National Code of Standards, such as ANSI B31, "Interpretations of Code for Pressure Piping." To provide for isolation in an emergency, locate isolation valves as close to the storage facilities as possible. Use relief valves to protect pipelines from over-pressure that can be blocked in by closing isolation valves at each end.

3. Pressure test all newly installed pipelines by an approved method (such as hydro testing) before use.

INCOMPATIBLE MATERIALS

Some materials should not be used with 1-butene. Polyvinyl chloride (PVC), neoprene, nitrile rubber, silicon rubber, butyl rubber, natural rubber, EPR (ethylene/propylene rubber), and Buna-N® are **NOT** recommended materials for use with 1-butene. Compatible materials include Viton®, Duraflow®, and Kalrez.®

Strong oxidizing agents such as chlorates, nitrates and peroxides may react with 1-butene. Therefore, avoid contact with these types of materials.

INSULATION

To provide personnel protection and/or conservation of energy, 1-butene pipelines may be insulated. The insulation will help to regulate the product's temperature, but it can make it difficult to determine if the pipeline has a leak or if corrosion is present. Insulation may consist of various materials depending on the temperature of the product. Some examples would be fiberglass or urethane foam.

Allowances for the adequate thermal pressure relief of the product must be considered with the use of insulation. If provisions for thermal expansion are not made and the temperature increases, the pressurized 1-butene liquid will leak out of the system through the pressure relief valves. This will present a fire/explosion hazard. Care should be taken in the design of the thermal control system and the type of insulation used so that the possibility of overheating will not be an issue.

VAPOR CONTROL SYSTEMS

With the implementation of the Clean Air Act by federal and local governments, 1-butene terminals must control evaporative emissions from loading, unloading and storage operations.

Vapor emissions may be controlled during loading/unloading operations by the use of a vapor recovery line. A vapor recovery line is used to connect the transport vehicle to the storage tank. The displaced vapors are then recovered into the tank through this line.

A “Refrigeration System” may also be used to control vapor emissions. The vapors are directed through a steel pipe to a refrigeration compressor where they are compressed and cooled into a liquid. The vessels used in this system must all comply with the ASME Section VIII Boiler and Pressure Vessel Code.

PART 4

HEALTH, ENVIRONMENT, FIRE AND ACCIDENTAL RELEASE INFORMATION

Safety Data Sheets (SDS) and Product Stewardship Summary for NAO products are available from Chevron Phillips Chemical Company to help customers 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. The most current SDS's and Product Stewardship Summary for NAO can be obtained from Chevron Phillips Chemical Company at www.cpchem.com or by calling (800) 852-5530. Specific questions about SDS's can be sent to sds@cpchem.com .

PART 5

TRANSPORTATION INFORMATION AND REGULATORY PROFILE

Safety Data Sheets (SDS) and Product Stewardship Summary for NAO products are available from Chevron Phillips Chemical Company to help customers 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. The most current SDS's and Product Stewardship Summary for NAO can be obtained from Chevron Phillips Chemical Company at www.cpchem.com or by calling (800) 852-5530. Specific questions about SDS's can be sent to sds@cpchem.com .

REVISION HISTORY

This revision updates the following sections:

December 2013

1. Operational Excellence statement updated
2. Part 1- Sales Specs removed and replaced with the website information
3. Part 4 – Removed and replaced with SDS reference statement
4. Part 5 – Regulatory Profile removed and replaced with SDS reference statement

December 2024

1. Parts 4 & 5 – Updated to include reference to Product Stewardship Summary

PART 6

APPENDIX

GLOSSARY OF TERMS, ABBREVIATIONS, & ORGANIZATIONS

ANSI	American National Standards Institute
API	American Petroleum Institute
ASTM	American Society for Testing and Materials
Bonding	The connection of two or more conductive objects by means of a conductor (most commonly a wire or metal plate).
CEIC	Chevron Emergency Information Center
CFR	Code of Federal Regulations
CHEMTREC	Chemical Transportation Emergency Center
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.
DOT	Department of Transportation
EPA	Environmental Protection Agency
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.
MSDS	Material Safety Data Sheet
NFPA	National Fire Protection Association
NIOSH	National Institute for Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
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.
SDS	Material Safety Data Sheet

Vapor Pressure	The pressure exerted by a volatile liquid while under defined equilibrium conditions. A common way to measure vapor pressure is in millimeters of mercury (mm Hg).