

MATERIAL SAFETY DATA SHEET

Prepared to U.S. OSHA, CMA, ANSI and Canadian WHMIS Standards

PART I *What is the material and what do I need to know in an emergency?*

1. PRODUCT IDENTIFICATION

CHEMICAL NAME; CLASS: **PENTANE AND ISOMERS**
Document Number: Pentane

MIXTURE DESCRIPTION: Pentane (all isomers)
PRODUCT USE: For general analytical/synthetic chemical uses.

SUPPLIER/MANUFACTURER'S NAME: MESA Specialty Gases & Equipment
ADDRESS: 3619 Pendleton Avenue, Suite C
 Santa Ana, CA 92704

BUSINESS PHONE: 1-714-434-7102
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DATE OF PREPARATION: May 10, 1999

2. COMPOSITION and INFORMATION ON INGREDIENTS

This product can consist of any of the following pentane isomers:

CHEMICAL NAME	CAS #	mole %	EXPOSURE LIMITS IN AIR					
			ACGIH		OSHA		IDLH ppm	OTHER
			TLV ppm	STEL ppm	PEL ppm	STEL ppm		
n-Pentane	109-66-0	100	600	750	1000 600 (Vacated 1989 PEL)	750 (Vacated 1989 PEL)	1500 (Based on LEL)	NIOSH REL: 120 TWA: 610, C (15 min) DFG MAK: 1000
Neopentane	463-82-1	100	600	750	1000 600 (Vacated 1989 PEL)	750 (Vacated 1989 PEL)	1500	NIOSH REL: 350 TWA: 610, C (15 min) DFG MAK: 1000
Isopentane	78-78-4	100	600	750	1000 600 (Vacated 1989 PEL)	750 (Vacated 1989 PEL)	1500	NIOSH REL: 350 TWA: 610, C (15 min) DFG MAK: 1000

NE = Not Established

C = Ceiling Limit

See Section 16 for Definitions of Terms Used

NOTE: All WHMIS required information is included. It is located in appropriate sections based on the ANSI Z400.1-1993 format.

3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: Pentane isomers are colorless, flammable liquids with a gasoline-like odor which can rapidly turn into a gas at standard atmospheric temperatures and pressures. Inhalation of vapors of Pentane isomers can cause central nervous system depression, producing symptoms such as headaches, nausea, dizziness, drowsiness, confusion, and unconsciousness. Inhalation of high concentrations of the vapors may be fatal. Pentane isomers are not reactive. Vapors of Pentane isomers are heavier than air and may spread long distances. Distant ignition and flashback are possible. Emergency responders must wear the proper personal protective equipment (and have appropriate fire-suppression equipment) suitable for the situation to which they are responding.

SYMPTOMS OF OVEREXPOSURE BY ROUTE OF EXPOSURE: The most significant routes of occupational overexposure are by inhalation, skin and eye contact. The symptoms of overexposure to the Pentane isomers are as follows:

INHALATION: Inhalation of any of the Pentane isomers' vapors can act as an anesthetic and as an asphyxiant. Repeated or prolonged overexposures to Pentane isomers, especially at high concentrations, can cause cardiac arrest due to sensitization of the heart to adrenaline and nor-adrenaline and can cause liver damage. Inhalation of high concentrations of the vapors of Pentane isomers, as may occur if Pentane isomers are used or released in a poorly ventilated area or confined space (or during a release of large volumes of Pentane isomers), may be fatal. Effects of such exposure can be summarized as follows:

EFFECTS OF OVEREXPOSURES TO n-PENTANE and isomers:

CONCENTRATION	OBSERVED EFFECT
Brief (10 minute) up to 5,000 ppm: Higher than 5,000 ppm:	No symptoms. Exhilaration, dizziness and headache can occur.
130,000 ppm: Long term:	Collapse and death Can cause chronic neurological disorder causing damage to the nerves in the hands and feet (peripheral neuropathy).

CONTACT WITH SKIN or EYES: Contact of the liquid with the eyes may cause redness and pain. Direct contact with the skin (especially after prolonged overexposure) can cause irritation. Prolonged or repeated skin overexposures can cause dermatitis. Contact with vaporized liquid escaping from its high pressure cylinder may cause freezing of the eye. Permanent eye damage or blindness could result.

SKIN ABSORPTION: Skin absorption is not a significant route of overexposure for Pentane isomers.



INGESTION: Ingestion is not anticipated to be a significant route of overexposure for any of the Pentane isomers. Neopentane is a gas at room temperature and Isopentane cannot be swallowed because the body temperature is above its boiling point, causing the liquid to boil off when it comes in contact with body tissue. If n-Pentane is swallowed, symptoms of such exposure can include nausea and gastric distress. A significant hazard associated with ingestion of Pentane isomers is aspiration; breathing this material into the lungs can cause severe lung irritation and tissue damage, which can result in the development of chemical pneumonia or pulmonary edema (which are potentially fatal conditions).

INJECTION: Injection is not anticipated to be a significant route of overexposure for Pentane isomers. If Pentane isomers are "injected" (as may occur through punctures by contaminated, sharp objects), local swelling and irritation can occur.

OTHER POTENTIAL HEALTH EFFECTS: Contact with liquid or rapidly expanding gases (which are released under high pressure) may cause frostbite. Symptoms of frostbite include change in skin color to white or grayish-yellow. The pain after such contact can quickly subside.

HEALTH EFFECTS OR RISKS FROM EXPOSURE: An Explanation in **Lay Terms**.

ACUTE: Inhalation of high concentrations of any of the Pentane isomers' vapors can cause headaches, nausea, dizziness, drowsiness, confusion, and unconsciousness. Inhalation of high concentrations of the vapors can be fatal. Contamination of skin and eyes can be irritating. Ingestion of large volumes of n- Pentane can be harmful or fatal.

HAZARDOUS MATERIAL INFORMATION SYSTEM			
HEALTH		(BLUE)	1
FLAMMABILITY		(RED)	4
REACTIVITY		(YELLOW)	0
PROTECTIVE EQUIPMENT			C
EYES	RESPIRATORY	HANDS	BODY
	See Section 8		See Section 8

For routine industrial applications

See Section 16 for Definition of Ratings

3. HAZARD IDENTIFICATION (Continued)

CHRONIC: Pentane isomers can cause sensitization of the heart to epinephrine, adrenaline and nor-adrenaline. Chronic overexposures to Pentane isomers can cause damage to the nerves in hands and feet (peripheral neuropathy). Prolonged or repeated skin overexposures can cause dermatitis.

TARGET ORGANS: Skin, eyes, central nervous system.

PART II *What should I do if a hazardous situation occurs?*

4. FIRST-AID MEASURES

SKIN EXPOSURE: If the product contaminates the skin, immediately begin decontamination with running water. Minimum flushing is for 15 minutes. Remove exposed or contaminated clothing, taking care not to contaminate eyes. Victim must seek medical attention if any adverse reaction occurs.

EYE EXPOSURE: If the liquid or vapors of Pentane isomers enter the eyes, open victim's eyes while under gentle running water. Use sufficient force to open eyelids. Have victim "roll" eyes. Minimum flushing is for 15 minutes. Victim must seek immediate medical attention.

INHALATION: If vapors, mists, or sprays of Pentane isomers are inhaled, remove victim to fresh air. If necessary, use artificial respiration to support vital functions. Remove or cover gross contamination to avoid exposure to rescuers.

INGESTION: If Pentane isomers are swallowed, CALL PHYSICIAN OR POISON CONTROL CENTER FOR MOST CURRENT INFORMATION. If professional advice is not available, do not induce vomiting. Victim should drink milk, egg whites, or large quantities of water. If vomiting occurs naturally, have victim lean forward to reduce risk of aspiration. Never induce vomiting or give diluents (milk or water) to someone who is unconscious, having convulsions, or who cannot swallow.

Victims of chemical exposure must be taken for medical attention. Rescuers should be taken for medical attention, if necessary. Take copy of label and MSDS to health professional with victim.

5. FIRE-FIGHTING MEASURES

FLASH POINT (method): For Pentane: -49°C (-57°F)
For Isopentane: -51°C (-60°F)
For Neopentane: -28.5°C (-19.4°F)

AUTOIGNITION TEMPERATURE: For Pentane: 260°C (500°F)
For Isopentane: 420°C (788°F)
For Neopentane: 450°C (842°F)

FLAMMABLE LIMITS (in air by volume, %):

For Pentane and isomers:

Lower (LEL): 1.4 %

Upper (UEL): 7.5-7.8 %

FIRE EXTINGUISHING MATERIALS:

Water Spray: YES

Carbon Dioxide: YES

See Section 16 for Definition of Ratings

Foam: YES

Dry Chemical: YES

Halon: YES

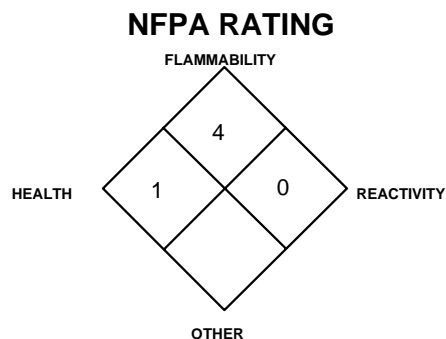
Other: Any "B" Class.

UNUSUAL FIRE AND EXPLOSION HAZARDS: This is a Class IA flammable liquid. When involved in a fire, this material may decompose and produce toxic gases (including carbon monoxide and carbon dioxide). The vapors of Pentane isomers are heavier than air and may spread long distances. Distant ignition and flashback are possible. Pentane isomers can float on water; therefore, water contaminated with Pentane isomers can spread the flammable liquid and can spread fire.

Explosion Sensitivity to Mechanical Impact: Not sensitive.

Explosion Sensitivity to Static Discharge: Static discharge may cause Pentane isomers to ignite.

SPECIAL FIRE-FIGHTING PROCEDURES: Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment. Incipient fire responders should wear eye protection. Move fire-exposed cylinders if it can be done without risk to firefighters.



5. FIRE-FIGHTING MEASURES (Continued)

SPECIAL FIRE-FIGHTING PROCEDURES (continued): Water spray can be used to cool fire-exposed containers. Water fog or spray can also be used by trained firefighters to disperse the vapors of Pentane and isomers and to protect personnel. Stop the leak or discharge, if possible. For small releases, if it is not possible to stop the leak, and it does not endanger personnel, let the fire burn itself out. If this product is involved in a fire, fire runoff water should be contained to prevent possible environmental damage.

6. ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: Uncontrolled releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of a release, clear the affected area, protect people, and respond with trained personnel.

In the event of a non-incident release, minimum Personal Protective Equipment should be **Level B: triple-gloves (rubber gloves and nitrile gloves, over latex gloves), chemical resistant suit and boots, hard-hat, and Self-Contained Breathing Apparatus**. Monitor the surrounding area for combustible vapor levels and oxygen. Combustible vapor concentration must also be below 10% of the LEL (LEL = 1.4%) prior to entry. The atmosphere must have at least 19.5 percent oxygen before personnel can be allowed in the area without Self-Contained Breathing Apparatus and other protective equipment.

Eliminate all sources of ignition before clean-up operations begin. Use non-sparking tools. Absorb spilled liquid with activated carbon, polypads or other suitable absorbent materials. Prevent material from entering sewer or confined spaces. Decontaminate the area thoroughly. Place all spill residue in an appropriate container and seal. Dispose of in accordance with Federal, State, and local hazardous waste disposal regulations (see Section 13, Disposal Considerations).

Note: There is a colorimetric tube available for Pentane and Isopentane. If a colorimetric tube is used during spill response, the reading must not be above background levels before non-emergency personnel are allowed into the release area.

PART III *How can I prevent hazardous situations from occurring?*

7. HANDLING and STORAGE

WORK PRACTICES AND HYGIENE PRACTICES: As with all chemicals, avoid getting Pentane isomers ON YOU or IN YOU. Wash hands after handling chemicals. Do not eat or drink while handling chemicals. Remove contaminated clothing immediately.

STORAGE AND HANDLING PRACTICES: All employees who handle this material should be trained to handle it safely. Avoid breathing vapors or mists generated by Pentane isomers. Use in a well-ventilated location. Cylinders of Pentane isomers must be properly labeled. If Pentane isomers are used in other types of containers, only use portable containers and dispensing equipment (faucet, pump, drip can) approved for flammable liquids. Post "NO SMOKING" signs, where appropriate in storage and use areas.

Store cylinders of Pentane isomers in a cool, dry location, away from direct sunlight, sources of intense heat, or where freezing is possible. Do not allow area where cylinders are stored to exceed 52°C (125°F). Material should be stored in secondary containers, or in a diked area, as appropriate. Store containers away from incompatible chemicals. Keep container tightly closed when not in use. Storage areas should be made of fire-resistant materials. Inspect all incoming containers before storage, to ensure containers are properly labeled and not damaged. Refer to NFPA 30, Flammable and Combustible Liquids Code for additional information on storage.

Empty containers may contain residual flammable liquid or vapors. Therefore, empty containers should be handled with care. Do not expose "empty" containers to welding touches, or any other source of ignition.

SPECIAL PRECAUTIONS FOR HANDLING CYLINDERS: Protect cylinders of Pentane isomers against physical damage. If appropriate, cylinders should be stored in an up-right position. Cylinders should be firmly secured to prevent falling or being knocked over. Cylinders can be stored in the open, but in such cases, should be protected against extremes of weather and from the dampness of the ground to prevent rusting. Never tamper with pressure relief devices in valves and cylinders. Electrical equipment should be non-sparking or explosion proof. The following rules are applicable to situations in which cylinders are being used :

7. HANDLING and STORAGE (Continued)

Before Use: If appropriate, move cylinders with a suitable hand truck. Do not drag, slide, or roll cylinders. Do not drop cylinders or permit them to strike each other. Secure cylinders firmly. Leave the valve protection cap in place until cylinder is ready for use.

During Use: Use designated CGA fittings and other support equipment. Do not use adapters. Do not heat cylinder by any means to increase the discharge rate of the product from the cylinder. Use check valve or trap in discharge line to prevent hazardous backflow into the cylinder. Do not use oils or grease on gas-handling fittings or equipment.

After Use: Close main cylinder valve. Replace valve protection cap. Mark empty cylinders "EMPTY".

NOTE: Use only DOT or ASME code containers. Earth-ground and bond all lines and equipment associated with Pentane isomers. Close valve after each use and when empty. Cylinders must not be recharged except by or with the consent of owner. For additional information refer to the Compressed Gas Association Bulletin SB-2 "Oxygen Deficient Atmospheres".

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Follow practices indicated in Section 6 (Accidental Release Measures). Make certain application equipment is locked and tagged-out safely. Always use Pentane isomers in areas where adequate ventilation is provided. Decontaminate equipment using soapy water before maintenance begins. Collect all rinsates and dispose of according to applicable Federal, State, or local procedures.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: Use with adequate ventilation. Use a mechanical fan or vent area to outside. Where appropriate, use a non-sparking, grounded ventilation system separate from other exhaust ventilation systems. Ensure eyewash/safety shower stations are available near areas where Pentane isomers are used.

RESPIRATORY PROTECTION: Maintain airborne contaminant concentrations below exposure limits listed in Section 2 (Composition and Information on Ingredients), if applicable. If respiratory protection is needed, use only protection authorized in 29 CFR 1910.134, or applicable State regulations. Use supplied air respiration protection if oxygen levels are below 19.5%. For additional information, the following recommendations for respiratory protection are from NIOSH for n-Pentane are provided.

NIOSH RECOMMENDATIONS FOR n-PENTANE CONCENTRATIONS IN AIR:

UP TO 500 ppm: SAR (Supplied Air Respirator)

UP TO 1100 ppm: SAR operated in a continuous-flow mode; or full-facepiece Self Contained Breathing Apparatus; or full-facepiece SAR.

EMERGENCY OR PLANNED ENTRY INTO UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS: Positive pressure, full-facepiece SCBA; or positive pressure, full-facepiece SAR with an auxiliary positive pressure Self Contained Breathing Apparatus.

ESCAPE Gas mask with organic vapor canister; or escape-type Self Contained Breathing Apparatus.

EYE PROTECTION: Splash goggles or safety glasses.

HAND PROTECTION: Wear Nitrile or Viton gloves for routine industrial use. (Note: Butyl Rubber, Natural Rubber, or Polyvinylchloride gloves are not recommended). Use triple gloves for spill response, as stated in Section 6 (Accidental Release Measures) of this MSDS.

BODY PROTECTION: Use body protection appropriate for task. Coveralls, chemical resistant boots, and other body protection may be appropriate, depending on the operation in which Pentane isomers are used.

9. PHYSICAL and CHEMICAL PROPERTIES

The following information is for n-Pentane:

VAPOR DENSITY (air = 1): 2.5

SPECIFIC GRAVITY (water = 1): 0.63

SOLUBILITY IN WATER: Insoluble.

EVAPORATION RATE (n-BuAc=1): 28.6

EXPANSION RATIO Not applicable.

LOG COEFFICIENT WATER/OIL DISTRIBUTION: Not available.

pH: Not applicable.

FREEZING/MELTING POINT: -129°C (-200°F)

BOILING POINT: 36°C (97°F)

ODOR THRESHOLD: 300-500 ppm.

SPECIFIC VOLUME: Not applicable.

VAPOR PRESSURE @ 25°C: 500 mm Hg

9. PHYSICAL and CHEMICAL PROPERTIES (Continued)

The following information is for Isopentane:

VAPOR DENSITY (air = 1): 2.5

SPECIFIC GRAVITY(water = 1): 0.62

SOLUBILITY IN WATER: Insoluble.

EVAPORATION RATE: Not available.

EXPANSION RATIO Not applicable.

LOG COEFFICIENT WATER/OIL DISTRIBUTION: 3.2-3.3

pH: Not applicable.

FREEZING/MELTING POINT: -160°C (-256°F)

BOILING POINT: 28°C (82°F)

ODOR THRESHOLD: Not available.

SPECIFIC VOLUME: Not applicable.

VAPOR PRESSURE @ 21°C: 595 mm Hg

The following information is for Neopentane:

VAPOR DENSITY (air = 1): 2.5

SPECIFIC GRAVITY(water = 1): 0.59

SOLUBILITY IN WATER: Insoluble.

EVAPORATION RATE: Not available.

EXPANSION RATIO Not applicable.

LOG COEFFICIENT WATER/OIL DISTRIBUTION: 3.2-3.3

pH: Not applicable.

FREEZING/MELTING POINT: -17°C (2°F)

BOILING POINT: 9°C (49°F)

ODOR THRESHOLD: Not available.

SPECIFIC VOLUME: Not applicable.

VAPOR PRESSURE @ 22°C: 1100 mm Hg

The following information is pertinent to all Pentane isomers.

APPEARANCE AND COLOR: Clear, colorless liquid with a gasoline-like odor.

HOW TO DETECT THIS SUBSTANCE (warning properties): The odor may be a distinctive characteristic of Pentane isomers.

10. STABILITY and REACTIVITY

STABILITY: Stable at standard temperatures and pressures.

DECOMPOSITION PRODUCTS: Products of thermal decomposition include carbon monoxide and carbon dioxide.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Pentane isomers are incompatible with strong oxidizing agents.

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Contact with incompatible materials and exposure to heat, sparks, and other sources of ignition.

PART III *How can I prevent hazardous situations from occurring?*

11. TOXICOLOGICAL INFORMATION

TOXICITY DATA: The following toxicology data are for the Pentane isomers.

NEOPENTANE:

LD₅₀ (intravenous, mouse) = 100 mg/kg.

N-PENTANE:

LD₅₀ (intravenous, mouse) = 446 mg/kg.

LC₅₀ (inhalation, rat) = 364 g/m³/4 hours

LCLo (inhalation, mouse) = 325 g/m³/2 hours

ISOPENTANE:

LC₅₀ (mice): 140000 ppm, 2-hour

150000-170000 ppm was lethal to dogs;

90000 ppm (mice):

EFFECT ON HEART: 100000-250000

ppm (dogs): Sensitized heart to

action of epinephrine in causing heart arrhythmia.

ISOPENTANE (Continued):

12-minute exposure caused light

anesthesia; 110000-120000 ppm

(mice): Onset of anesthesia within 4

minutes; complete loss of posture

within 10 minutes; 120000 ppm

(dogs): Light anesthesia.

SUSPECTED CANCER AGENT: None of the Pentane isomers are found on the following lists: FEDERAL OSHA Z LIST, NTP, IARC, or CAL/OSHA, and are therefore not considered to be, nor suspected to be, cancer-causing agents by these agencies.

IRRITANCY OF PRODUCT: The liquid or vapors of Pentane isomers can be irritating to contaminated tissue.

SENSITIZATION OF PRODUCT: Pentane isomers can cause sensitization of the heart to epinephrine, adrenaline and nor-adrenaline

11. TOXICOLOGICAL INFORMATION (Continued)

REPRODUCTIVE TOXICITY INFORMATION: Listed below is information concerning the effects of Pentane isomers on the human reproductive system.

Mutagenicity: Pentane isomers are not expected to cause mutagenic effects in humans.

Embryotoxicity: Pentane isomers are not expected to cause embryotoxic effects in humans.

Teratogenicity: Pentane isomers are not expected to cause teratogenic effects in humans.

Reproductive Toxicity: Pentane isomers are not expected to cause adverse reproductive effects in humans.

A mutagen is a chemical which causes permanent changes to genetic material (DNA) such that the changes will propagate through generational lines. An embryotoxin is a chemical which causes damage to a developing embryo (i.e. within the first eight weeks of pregnancy in humans), but the damage does not propagate across generational lines. A teratogen is a chemical which causes damage to a developing fetus, but the damage does not propagate across generational lines. A reproductive toxin is any substance which interferes in any way with the reproductive process.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Acute or chronic respiratory conditions, central nervous system conditions, eye disorders, or skin problems may be aggravated by overexposure to Pentane isomers.

RECOMMENDATIONS TO PHYSICIANS: Treat symptoms and eliminate exposure.

BIOLOGICAL EXPOSURE INDICES: Currently, there are no Biological Exposure Indices (BEIs) associated with any of the Pentane isomers.

12. ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.

ENVIRONMENTAL STABILITY: The components of this material will be degraded over time into other organic compounds. The following environmental data are available for the Pentane isomers:

PENTANE: Log K_{ow} = 3.39. Water Solubility = 38.5 mg/L. K_{oc} = 580-1600. LOG BCF (Bioconcentration Factor) [n-pentane] = calculated, 1.90 and 2.35, respectively. Photolysis, hydrolysis, and bioconcentration are not anticipated to be important fate processes. Biodegradation and soil adsorption are anticipated to be more important processes for this compound.

EFFECT OF MATERIAL ON PLANTS or ANIMALS: Pentane isomers may be harmful or fatal to contaminated plant and animal-life (especially if large quantities of Pentane isomers are released). Refer to Section 11 (Toxicological Information) for additional information on effects on animals. Additional plant toxicity data are available for Pentane as follows:

PENTANE:

EC₅₀ (algae) = 1 mg/L, 8 hours, photosynthesis

EFFECT OF CHEMICAL ON AQUATIC LIFE: Pentane isomers can be harmful or fatal to contaminated aquatic plant and animal life. This material floats on water, and can potentially form slicks which are capable of creating oxygen-deprived waterways and severely contaminate coastal and shore life. Additional aquatic toxicity data are available for Pentane as follows:

PENTANE:

LC₅₀ (daphnia) = 135 mmol/m³ (9.74 mg/L), 48 hours
LC₅₀ (daphnia) = 10.02 mg/L, 96 hours
LC₅₀ (catfish) = 9.92 mg/L, 96 hours
LC₅₀ (fathead minnow) = 11.59 mg/L

PENTANE (continued):

LC₅₀ (goldfish) = 13.56 mg/L, 96 hours
LC₅₀ (mosquito fish) = 12.00 mg/L, 96 hours
LC₅₀ (rainbow trout) = 9.87 mg/L, 96 hours
LC₅₀ (bluegill) = 9.99 mg/L, 96 hours

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations. Return cylinders with residual product to MESA Specialty Gas & Equipment Do not dispose of locally.

14. TRANSPORTATION INFORMATION

THIS MATERIAL IS HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.

PROPER SHIPPING NAME:

Pentanes

HAZARD CLASS NUMBER and DESCRIPTION:

3 (Flammable Liquid)

UN IDENTIFICATION NUMBER:

UN 1265

14. TRANSPORTATION INFORMATION (Continued)

PACKING GROUP: PG I or II
DOT LABEL(S) REQUIRED: Flammable Liquid

NOTE: See 49 CFR 173.120 for information on Packing Groups.

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (1996): 128

MARINE POLLUTANT: The Pentane isomers are not classified by the DOT as Marine Pollutants (as defined by 49 CFR 172.101, Appendix B).

TRANSPORT CANADA, TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: THIS MATERIAL IS CONSIDERED AS DANGEROUS GOODS. Use the above information for the preparation of Canadian Shipments.

15. REGULATORY INFORMATION

U.S. SARA REPORTING REQUIREMENTS: The Pentane isomers are not subject to the reporting requirements of Sections 302, 304, and 313 of Title III of the Superfund Amendments and Reauthorization Act.

U.S. SARA THRESHOLD PLANNING QUANTITY: Not applicable.

U.S. CERCLA REPORTABLE QUANTITY (RQ): Not applicable.

CANADIAN DSL/NDSL INVENTORY STATUS: The Pentane isomers are on the DSL Inventory.

U.S. TSCA INVENTORY STATUS: The Pentane isomers are listed on the TSCA Inventory.

OTHER U.S. FEDERAL REGULATIONS: n-Pentane, iso-Pentane, and neo-Pentane are subject to the reporting requirements of Section 112(r) of the Clean Air Act. The Threshold Quantities for these liquids are 10,000 lb. Depending on specific operations involving the use of the Pentane isomers, the regulations of the Process Safety Management of Highly Hazardous Chemicals may be applicable (29 CFR 1910.119). Under this regulation Pentanes are not listed in Appendix A; however, any process that involves a flammable liquid on-site, in one location, in quantities of 10,000 lb (4,553 kg) or greater is covered under this regulation unless it is used as a fuel.

U.S. STATE REGULATORY INFORMATION: Pentane and its isomers are covered under specific State regulations, as denoted below:

Alaska - Designated Toxic and Hazardous Substances: Pentane.

California - Permissible Exposure Limits: Pentane.

Florida - Substance List: Isopentane, Pentane.

Illinois - Toxic Substance List: Pentane.

Kansas - Section 302/313 List: No.

Minnesota - List of Hazardous Substances: Pentane.

Massachusetts - Substance List: Isopentane, Pentane.

Michigan - Critical Materials Register: No.

Missouri - Employer Information/Toxic Substance List: Pentane.

New Jersey - Right to Know Hazardous Substance List: Isopentane, Pentane.

North Dakota - List of Hazardous Chemicals, Reportable Quantities: No.

Pennsylvania - Hazardous Substance List: Pentane.

Rhode Island - Hazardous Substance List: Pentane.

Texas - Hazardous Substance List: Pentane.

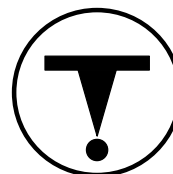
West Virginia - Hazardous Substance List: Pentane.

Wisconsin - Toxic and Hazardous Substances: Pentane.

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): Pentane and isomers are not on the California Proposition 65 Lists.

LABELING: **WARNING!** FLAMMABLE LIQUID AND VAPOR. PROLONGED OR REPEATED SKIN CONTACT MAY DRY SKIN AND CAUSE IRRITATION. CAN CAUSE CENTRAL NERVOUS SYSTEM EFFECTS. CAN CAUSE DEATH IF TOO MUCH IS BREATHED. ASPIRATION HAZARD IF SWALLOWED - CAN ENTER LUNGS AND CAUSE DAMAGE. Keep away from heat, sparks and flame. Keep container closed. Use only with adequate ventilation. Avoid contact with skin and clothing. Avoid exposure to vapor. Wash thoroughly after handling. **FIRST-AID:** In case of contact, immediately flush skin with plenty of water. Remove contaminated clothing and shoes. Get medical attention if irritation develops or persists. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. If swallowed, do not induce vomiting. Get medical attention. **IN CASE OF FIRE:** Use water fog, foam, dry chemical, or CO₂. **IN CASE OF SPILL:** Absorb spill with inert materials (e.g. activated carbon, dry sand). Flush residual spill with water. Consult Material Safety Data Sheet for additional information.

CANADIAN WHMIS SYMBOLS: **Class B2:** Flammable Liquid
Class D2B: Materials Causing Other Toxic Effects



16. OTHER INFORMATION

The information contained herein is based on data considered accurate. However, no warranty is expressed or implied regarding the accuracy of these data or the results to be obtained from the use thereof. MESA Specialty Gases & Equipment assumes no responsibility for injury to the vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, MESA Specialty Gases & Equipment assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in his use of the material.

DEFINITIONS OF TERMS

A large number of abbreviations and acronyms appear on a MSDS. Some of these which are commonly used include the following:

CAS #: This is the Chemical Abstract Service Number which uniquely identifies each constituent. It is used for computer-related searching.

EXPOSURE LIMITS IN AIR:

ACGIH - American Conference of Governmental Industrial Hygienists, a professional association which establishes exposure limits. **TLV** - Threshold Limit Value - an airborne concentration of a substance which represents conditions under which it is generally believed that nearly all workers may be repeatedly exposed without adverse effect. The duration must be considered, including the 8-hour Time Weighted Average (**TWA**), the 15-minute Short Term Exposure Limit, and the instantaneous Ceiling Level (**C**). Skin absorption effects must also be considered.

OSHA - U.S. Occupational Safety and Health Administration. **PEL** - Permissible Exposure Limit - This exposure value means exactly the same as a TLV, except that it is enforceable by OSHA. The OSHA Permissible Exposure Limits are based in the 1989 PELs and the June, 1993 Air Contaminants Rule (Federal Register: 58: 35338-35351 and 58: 40191). Both the current PELs and the vacated PELs are indicated. The phrase, "Vacated 1989 PEL," is placed next to the PEL which was vacated by Court Order.

IDLH - Immediately Dangerous to Life and Health - This level represents a concentration from which one can escape within 30-minutes without suffering escape-preventing or permanent injury. **The DFG - MAK** is the Republic of Germany's Maximum Exposure Level, similar to the U.S. PEL. **NIOSH** is the National Institute of Occupational Safety and Health, which is the research arm of the U.S. Occupational Safety and Health Administration (**OSHA**). NIOSH issues exposure guidelines called **Recommended Exposure Levels (RELs)**. When no exposure guidelines are established, an entry of **NE** is made for reference.

HAZARD RATINGS:

HAZARDOUS MATERIALS IDENTIFICATION SYSTEM: Health Hazard: **0** (minimal acute or chronic exposure hazard); **1** (slight acute or chronic exposure hazard); **2** (moderate acute or significant chronic exposure hazard); **3** (severe acute exposure hazard; onetime overexposure can result in permanent injury and may be fatal); **4** (extreme acute exposure hazard; onetime overexposure can be fatal). Flammability Hazard: **0** (minimal hazard); **1** (materials that require substantial pre-heating before burning); **2** (combustible liquid or solids; liquids with a flash point of 38-93°C [100-200°F]); **3** (Class IB and IC flammable liquids with flash points below 38°C [100°F]); **4** (Class IA flammable liquids with flash points below 23°C [73°F] and boiling points below 38°C [100°F]). Reactivity Hazard: **0** (normally stable); **1** (material that can become unstable at elevated temperatures or which can react slightly with water); **2** (materials that are unstable but do not detonate or which can react violently with water); **3** (materials that can detonate when initiated or which can react explosively with water); **4** (materials that can detonate at normal temperatures or pressures).

NATIONAL FIRE PROTECTION ASSOCIATION: Health Hazard: **0** (material that on exposure under fire conditions would offer no hazard beyond that of ordinary combustible materials); **1** (materials that on exposure under fire conditions could cause irritation or minor residual injury); **2** (materials that on intense or continued exposure under fire conditions could cause temporary incapacitation or possible residual injury); **3** (materials that can on short exposure could cause serious temporary or residual injury); **4** (materials that under very short exposure causes death or major residual injury).

NATIONAL FIRE PROTECTION ASSOCIATION (Continued): Flammability Hazard and Reactivity Hazard: Refer to definitions for "Hazardous Materials Identification System".

FLAMMABILITY LIMITS IN AIR:

Much of the information related to fire and explosion is derived from the National Fire Protection Association (**NFPA**). Flash Point - Minimum temperature at which a liquid gives off sufficient vapors to form an ignitable mixture with air. Autoignition Temperature: The minimum temperature required to initiate combustion in air with no other source of ignition. LEL - the lowest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source. UEL - the highest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source.

TOXICOLOGICAL INFORMATION:

Possible health hazards as derived from human data, animal studies, or from the results of studies with similar compounds are presented. Definitions of some terms used in this section are: **LD₅₀** - Lethal Dose (solids & liquids) which kills 50% of the exposed animals; **LC₅₀** - Lethal Concentration (gases) which kills 50% of the exposed animals; **ppm** concentration expressed in parts of material per million parts of air or water; **mg/m³** concentration expressed in weight of substance per volume of air; **mg/kg** quantity of material, by weight, administered to a test subject, based on their body weight in kg. Data from several sources are used to evaluate the cancer-causing potential of the material. The sources are: **IARC** - the International Agency for Research on Cancer; **NTP** - the National Toxicology Program, **RTECS** - the Registry of Toxic Effects of Chemical Substances, **OSHA** and **CAL/OSHA**. IARC and NTP rate chemicals on a scale of decreasing potential to cause human cancer with rankings from 1 to 4. Subrankings (2A, 2B, etc.) are also used. Other measures of toxicity include **TDLo**, the lowest dose to cause a symptom and **TCLo** the lowest concentration to cause a symptom; **TDo**, **LDLo**, and **LDo**, or **TC**, **TCo**, **LCLo**, and **LCo**, the lowest dose (or concentration) to cause lethal or toxic effects. **BEI** - Biological Exposure Indices, represent the levels of determinants which are most likely to be observed in specimens collected from a healthy worker who has been exposed to chemicals to the same extent as a worker with inhalation exposure to the TLV. Ecological Information: EC is the effect concentration in water.

REGULATORY INFORMATION:

This section explains the impact of various laws and regulations on the material. **EPA** is the U.S. Environmental Protection Agency. **WHMIS** is the Canadian Workplace Hazardous Materials Information System. **DOT** and **TC** are the U.S. Department of Transportation and the Transport Canada, respectively. Superfund Amendments and Reauthorization Act (**SARA**); the Canadian Domestic/Non-Domestic Substances List (**DSL/NDL**); the U.S. Toxic Substance Control Act (**TSCA**); Marine Pollutant status according to the **DOT**; the Comprehensive Environmental Response, Compensation, and Liability Act (**CERCLA** or **Superfund**); and various state regulations.