HEX HANDLING/STORAGE PROCEDURE

I. HEX PHYSICAL PROPERTIES

Hexachlorocyclopentadiene (Hex) is a chlorinated hydrocarbon of the cyclic olefin chemical family with a molecular weight of 273 and the chemical formula C_5Cl_6. The finished product is a light amber colored liquid with an irritating pungent odor. Important physical properties are listed below.

Specific gravity	1.712
Melting point	10°C
Boiling Point	238°C

Additional physical information can be found in the accompanying Material Safety Data Sheets.

Hex is listed under the DOT Hazard Class as a Poison B. Hex also meets the definition of a corrosive material. It is non-flammable but, when decomposed by combustion, can form hydrogen chloride, phosgene and chlorine.

II. SAFE HANDLING PROCEDURES

Personal Protective Equipment - All personnel involved in the manufacture, transfer, loading and unloading of Hex are required to wear specific protective clothing and safety equipment. Standard gear consists of hard hat, splash goggles, safety shoes/boots and long sleeve coveralls. It is recommended that all safety gear be removed at the end of the work day, and left within the plant or work site. Hex handling functions require splash goggles as minimum eye protection.

When any piece of Hex handling equipment (piping, pumps, vessels, etc.) is initially disconnected or opened, the personnel implementing the work are required to wear full face, acid gas cartridge respirators.

Hex drumming operators are required to wear a face shield attached to their hard hats for splash protection in addition to standard safety equipment.

For special cases where spill areas or contaminated vessels have to be entered, full coverage acid suits and self-contained breathing equipment are required.

The American Council of Government and Industrial Hygienists and the National Institute for Occupational Safety and Health have recommended an 8-hour time-weighted average maximum exposure limit of 0.01 ppm. Facilities handling Hex may wish to consider periodic air monitoring to confirm that air levels do not exceed the recommended level.

Safety Equipment - Eye wash and shower stations must be located at strategic work stations and passage way points of any operating process or material handling/storage area. It is important to wash off all Hex material with mild soap and water should it come in contact with any part of the body.

First-Aid Procedures - Hex is listed as a Poison B corrosive. Hex can cause eye damage and irritation of the lungs and skin upon contact. First-aid for Hex contact should incorporate the procedures as listed below and on the Material Safety Data Sheet. A properly equipped first-aid room or facility should be on site, and the operating personnel be fully trained in the first-aid procedures.

•EYE	Flush eyes with tap water for at least 15 minutes. **Get medical attention.**
•SKIN	Remove contaminated clothing. Wash skin with mild soap and water. **Get medical attention.**
•INGESTION	Do not induce vomiting. Drink several glasses of water and milk. **Call a physician.**
•INHALATION	Move the affected person to fresh air. If breathing has stopped, apply artificial respiration. Have a qualified person administer oxygen. **Get medical attention.**

IN ALL CASES OF EMERGENCY, CONTACT A PHYSICIAN.

III. HEX TRANSFER AND STORAGE

The handling and storage of Hex requires special consideration in the selection of equipment materials of construction and compliance with U.S. Department of Transportation hazardous material transportation regulations (for transport). Between the temperatures of 10°C and 50°C Hex can be satisfactorily handled in 316 $^{s}/_{s}$ and several types of plastic resin coated carbon steel. Specific considerations and applications are listed below.

Piping and Valves - 316 stainless steel pipe with welded and flanged joints is the material of choice. 316 $^{s}/_{s}$ ball or plug valves with Teflon seat and seals are recommended. Teflon lined piping and valves are usable, but a failure in the lining exposes the product to the backup carbon steel. Any iron pickup can be detrimental to Hex quality for some end uses.

The preferred gasket for Hex piping is either Gray Durable asbestos or Garlock 7705.

Pumps and Seals - 316 $^{s}/_{s}$ centrifugal pumps are utilized exclusively with Hex. The current seal of preference is the Chesterton 123 made of 316 $^{s}/_{s}$ with sealing faces of carbon against ceramic.

Because of periodic seal leakage, conversion to seal-less magnetic drive pumps should be the ultimate goal.

Storage/Controls/Containment - Hex is stored in lined steel storage tanks which allows for economical construction and still provides barrier protection from carbon steel contact and subsequent contamination.

The recommended lining for large storage tanks is COROLINE 505 series multi-layered, modified epoxy lining with glass cloth reinforcing. This is a Ceilcote lining, and should be installed by a skilled contractor. A satisfactory spark test of the applied lining is necessary before use.

Temperature controls are necessary on Hex storage to maintain the Hex temperature above its freezing point of 10°C. This can be accomplished by external electrical heat tape or steam heating panels with jacket temperature control and insulation. All transfer system lines and equipment also require heat tracing and insulation to prevent freezing.

Nitrogen padding is required on Hex storage tanks to prevent the gradual air oxidation of the Hex and resulting loss of assay. Fume scrubbing can be done by venting through activated carbon. Adequate pressure/vacuum relief protection should always be provided for the tank.

All Hex storage should be located within secure, diked, spill containment pads. The containment areas should be equipped with a drainage sump and sump pump. Any contaminated rain water or spilled Hex must be collected for proper disposal. Multiple storage tanks are preferred to allow flexibility in isolating tanks requiring maintenance. Hex should not be stored in close proximity to incompatible materials.

IV. HEX CONTAINERS - UNLOADING

Hex is currently packaged and shipped to customers in three containers. These are 55 gallon lined steel drums, Isotainers holding 3100 gallons, and railroad tank cars holding approximately 12,000 gallons. The piping, pumping and valves for unloading these containers should be of 316 $^{s}/_{s}$ construction. They require the same freeze protection considerations as Hex handling and storage systems. The shipping containers themselves, however, are of different construction specifications.

<u>55 Gallon Drums</u> - These drums should be of tight head, 16 gauge steel construction. The Velsicol specification on internal surface coating is a 2 coat (1.25-1.5 mils thick) Bradley-Vrooman 36405 lining applied by the drum manufacturer.

Drum pumps should be used for unloading. Since these drums are not pressure rated, air or inert gas padding should not be used for unloading.

<u>Isotainers</u> - These tanks are of 316 $^{s}/_{s}$ construction with a heavy carbon steel external support frame. Isotainers can be lined with Plasite 4310, a vinyl ester based resin coating.

Isotainers can be unloaded by either nitrogen padding or pumping. As with the storage tanks, air is not recommended as a pad gas. the isotainers should be equipped with both a relief valve and a rupture disk. Currently, most are set to relieve around either 65 or 120 psig. If padding is used for unloading, the pad pressure setting should be maintained well below the relief valve setting.

Railroad Tankcars - Tankcars are loaded with approximately 12,000 gallons of Hex for shipment by rail. These cars are carbon steel cylindrical tankers with external heating coils and 4" of external fiberglass insulation. Internally they are lined with Plasite 3066 which is a high bake phenolic coating. The cars are equipped with a dip pipe for loading and unloading. They can be unloaded by pump or nitrogen pad. The relief valve setting on the tankcar is 75 psig.

Note: For temperatures below about 27°C, Hex will need to be heated for unloading. For isotainers and tankcars, install a regulator to regulate steam pressure to about 15 psig (about 1 Bar) and install a trap on the discharge of the steam coil. Hex drums must be vented using appropriate fume collection if heating is required.

V. SPILLS/CLEANUP/DISPOSAL

Procedures for response to a Hex spill should be specified in facility emergency response plans, and operating personnel should be trained to respond properly to such a spill. Hex is classified as an extremely hazardous substance under U.S. Environmental Protection Agency regulations. In the event of a release of Hex to the environment in excess of the reportable quantity, currently ten pounds, appropriate notifications should be made to the Federal National Response Center and state and local emergency planning commissions.

Personal Protective Equipment (PPE) - The handling of a Hex spill requires the basic PPE as noted in the safe handling procedures with exceptions as required by the severity of the spill and the difficulty of the clean up. Full coverage acid suits, acid gas cartridge respirators or self contained breathing equipment may be required.

Clean Up/Disposal - Small spills or leaks which are not possible or practical to collect and return to the processing system or a liquid waste handling system should be absorbed with a dry absorbent. This material can be swept or shoveled up and placed in an environmentally secure waste drum. When all possible spilled material has been absorbed and removed, the spill area can be washed down using a liquid detergent (preferably lemon scented) and water. This resulting washdown must be in a contained area where the wash can be collected and routed for proper disposal according to the permit conditions of your facility.

High contamination wash waters or spills should be collected and incinerated by a properly permitted facility.

Hex cleaned up by absorbent should be collected in a secured solid waste drum and stored in a permitted Part B RCRA storage area, until it can be incinerated in a properly permitted solid waste incinerator.