

Material Safety Data Sheet

Revised 11/01

Section I

Manufacturer's Name
Coatings For Industry, Inc.

Non-Emergency Telephone #
215-723-0919

Address
319 Township Line Road
Souderton, PA 18964

Emergency Telephone #
1-800-535-5053

Chemical Name & Synonyms
1,6 Hexamethylene Diisocyanate
Based Polyisocyanate

Chemical Family
Aliphatic Isocyanate

Trade Name & Synonyms
Urethabond 111 and 166 HS Part B

Section II - Hazardous Ingredients

	%	TLV	CAS #

Homopolymer of HDI			
		Essentially 85% ACGIH: Not Established	
		The manufacturer recommended guideline level for exposure to HDI based polyisocyanates is:	
		0.5 mg/m ³ TWA over 8 hours &	
		1.0 mg/m ³ stel over 15 minutes	

Hexamethylene Diisocyanate (HDI)	*	OSHA: Not Established ACGIH: .005 ppm TWA	822-06-0

*Residual monomer content less than 0.7% based on resin solids at the time of manufacture. However, after 3-6 months storage, the free monomer content may rise to a maximum of 1.6%. Manufacturer recommends a ceiling level of 0.02 ppm.

Ethyl 3-ethoxypropionate OSHA & ACGIH: Not Established 000763-69-9 Mfg.
Recommendation 50 ppm TWA, 100 ppm STEL

This document is prepared pursuant to the OSHA Hazard Communication Standard (29 CFR 1910.1200). In addition, other substances not "hazardous" per this OSHA standard may be listed.

Section III - Physical Data

Specific Gravity ~~~~~ 1.07 - 1.11 @ 68° F. (20° C.)
 % Volatile by Volume ~~~~~ 17.5
 Bulk Density ~~~~~ 8.93 – 9.26 lbs./gallon
 Vapor Pressure ~~~~~ Polyisocyanate: Approx. 7.5 x 10⁻⁵ mm hg
 @ 20° C.
 Molecular Weight ~~~~~ Approx. 500 (Polyisocyanate)
 Water Solubility ~~~~~ Resin is insoluble - reacts slowly with
 water to liberate CO₂ gas
 Appearance & Odor ~~~~~ Clear/pale yellow liquid with solvent odor

Section IV - Fire and Explosion Data

Flash point ~~~~~ 136.0° F. (58.0° C.) Setaflash
 Extinguishing Media ~~~~~ Dry chemical; carbon dioxide; foam; water
 spray for large fires.

Special Fire Fighting Procedures:

Full emergency equipment with self contained breathing apparatus and full protective clothing should be worn by fire fighters. During a fire, HDI vapors and other irritating, highly toxic gases may be generated by thermal decomposition or combustion. (see Section VIII). Isolate from heat, electrical equipment, sparks and open flame. Closed container may explode when exposed to extreme heat or burst when contaminated with water (CO₂ evolved). Solvent vapors may be heavier than air. Stagnant air may cause vapors to accumulate and travel along the ground to an ignition source which may result in a flash back to the source of the vapors.

Section V - Human Health Data

Route of entry ~~~~~ Inhalation; skin contact; eye contact.

Human Effects and Symptoms of Overexposure:

Acute Inhalation: HDI vapors or mist at concentrations above the TLV or MGL can irritate (burning sensation) the mucous membranes in the respiratory tract (nose, throat, lungs) causing runny nose, sore throat, coughing, chest discomfort, shortness of breath and reduced lung function (breathing obstruction). Persons with a preexisting, nonspecific bronchial hyperreactivity can respond to concentrations below the TLV or the manufacturer's suggested guideline with similar symptoms as well as an asthma attack. Exposure well above the TLV or manufacturer's suggested guideline may lead to bronchitis, bronchial spasm and pulmonary edema (fluid in lungs). These effects are usually reversible. Chemical or hypersensitive pneumonitis, with flu-like symptoms (e.g., fever, chills) has also been reported. High solvent vapors may cause drowsiness.

Chronic Inhalation: As a result of previous repeated overexposures or a single large dose, certain individuals will develop isocyanate sensitization (chemical asthma) which will cause them to react to a later exposure to isocyanate at levels well below the TLV or manufacturer's suggested guideline. These symptoms, which include: chest tightness, wheezing, cough, shortness of breath or asthmatic attack, could be immediate or delayed up to several hours after exposure. Similar to many non-specific asthmatic responses, there are reports that once sensitized an individual can experience these symptoms upon exposure to dust, cold air or other irritants. This increased lung sensitivity can persist for weeks and in severe cases for several years. Chronic overexposure to isocyanate has also been reported to cause lung damage, including decrease in lung function, which may be permanent. Sensitization may be either temporary or permanent.

Section V - Human Health Data (Cont'd)

Acute Skin Contact:Isocyanates react with skin protein and moisture and can cause irritation. Symptoms of skin irritation may be reddening, swelling, rash, scaling or blistering. Some persons may develop skin sensitization from skin contact. Cured material is difficult to remove. .

Chronic Skin Contact:Prolonged contact with the isocyanate can cause reddening, swelling, rash, scaling or blistering. In those who have developed a skin sensitization, these symptoms can develop as a result of contact with very small amounts of liquid material or even as a result of vapor only exposure. .

Acute Eye Contact:Liquid, aerosols and vapors of this product (isocyanate and solvents) are irritating and can cause tearing, reddening and swelling accompanied by a stinging sensation and/or feeling like that of fine dust in the eyes.

Chronic Eye Contact:May result in corneal opacity (clouding of the eye surface).

Acute Ingestion:Can result in irritation and possible corrosive action in the mouth, stomach tissue and digestive tract.

Chronic Ingestion:None found

Carcinogenicity

NTP ~~~~~ Not Listed

IARC ~~~~~ Not Listed

OSHA ~~~~~ Not Regulated

Medical Conditions Aggravated by Exposure:Asthma and other respiratory disorders (bronchitis, emphysema, hyperreactivity), skin allergies, eczema.

Exposure Limits:Not established for product as a whole. Refer to Section II for exposure limits of hazardous constituents. The manufacturer suggested guidelines of 0.5 mg/m³ TWA and 1.0 mg/m³ stel for the homopolymer of HDI and 0.02 ppm ceiling for HDI monomer are guides based on limited data; provided pending the review of future data.

Section VI - Emergency and First Aid Procedures**First Aid for Eyes:**

Flush with clean, lukewarm water (low pressure) for at least 15 minutes, while lifting eyelids. Refer individual to physician or ophthalmologist for immediate follow up.

First Aid for Skin:

Remove contaminated clothing immediately. Wash affected areas thoroughly with soap and water. Wash contaminated clothing thoroughly before reuse. For severe exposures, get under safety shower after removing clothing, then get medical attention. For lesser exposures, seek medical attention if irritation develops or persists.

First Aid for Inhalation:

Move to an area free from risk of further exposure. Administer oxygen or artificial respiration as needed. Obtain medical attention. Asthmatic type symptoms may develop and may be immediate or delayed up to several hours. Treatment is essentially symptomatic. Consult physician.

First Aid for Ingestion:

Do not induce vomiting. Give 1 to 2 cups of milk or water to drink. **Do not give anything by mouth to an unconscious or convulsing person.** Consult physician.

Note to Physician.....

Eyes: Stain for evidence of corneal injury. If cornea is burned, instill antibiotic/steroid preparation frequently. Workplace vapors could produce reversible corneal epithelial edema impairing vision.

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Section VI - Emergency and First Aid Procedures (Cont'd)

Skin: This product is a known skin sensitizer. Treat symptomatically as for contact dermatitis or thermal burn.

Ingestion: Treat symptomatically. There is no specific antidote. Inducing vomiting is contraindicated because of the irritating nature of the product.

Inhalation: This product is a known pulmonary sensitizer. Treatment is essentially symptomatic. An individual having a dermal or pulmonary sensitization reaction to this material must be removed from any further exposure to any isocyanate.

Section VII - Employee Protection Recommendations

Required work/hygiene procedures:

Precautions must be taken so that persons handling product do not breathe the vapors or have it contact the eyes or skin. In spray operations, protection must be afforded against exposure to both vapor and spray mist.

Eye protection requirements:

Safety glasses, splash goggles or face shield. Contact lenses should not be worn.

Skin protection requirements:

Permeation resistant gloves. Cover as much of the exposed skin area as possible with appropriate clothing. If skin creams are used, keep the area protected only by the cream to a minimum.

Respirator requirements:

A respirator that is recommended or approved for use in isocyanate containing environments (air purifying or fresh air supplied) may be necessary. Consider type of application and environmental concentrations. Observe OSHA regulations for respirator use (29CFR1910.134).

Note on Odor Warning Properties: Pure isocyanate materials have odor thresholds that are higher than the TLV, PEL or manufacturer's suggested guidelines. Thus, if a vapor/particulate air-purifying respirator has exceeded its service life, breakthrough of the filter can result in exposure over the allowable limit without the wearer being able to smell the isocyanate. However, when a polyurethane coating system contains organic solvents, the wearer of a vapor particulate respirator will be warned of filter breakthrough by the odor of solvents before being exposed to isocyanates because:

- 1) Organic solvents have low odor thresholds.
- 2) Testing has demonstrated that solvents break through filters before isocyanates do.

Spray Application:

Good industrial hygiene practice dictates that when isocyanate based coatings are spray applied, some form of respiratory protection should be worn. During the spray application of organic solvent containing coatings systems, the use of a positive pressure supplied air respirator is mandatory when:

- ~ the airborne isocyanate concentrations are not known, or
- ~ the airborne HDI monomer concentrations exceed 0.05 ppm (10 times the TLV) or the polyisocyanate (polymeric, oligomeric) concentrations exceed 5 mg/m³ averaged over 8 hours or 10 mg/m³ averaged over 15 minutes (10 times the manufacturer's suggested guideline) or
- ~ spraying is performed in a confined space or in an area with limited ventilation.

A properly fitted air purifying (combination organic vapor and particulate) respirator, proven

by test to be effective in isocyanate-containing spray paint environments, will provide adequate protection when:

- ~ the airborne HDI monomer concentrations is known to be below 0.05 ppm (10 times the tlv)
- ~ the polyisocyanate (polymeric, oligomeric) concentrations are known to be below 5 mg/m³ averaged over 8 hours or 10 mg/m³ averaged over 15 minutes (10 times the manufacturer's suggested guideline).

Section VII - Employee Protection Recommendations (Cont'd)

Non-spray Operations:

Even during non-spray operations such as mixing, batch making, brush or roller application, etc., depending on the conditions (for example, heating of material or application to a hot substrate), it is possible to be exposed to airborne isocyanate vapors. Therefore, when the coatings system contains solvents and will be applied in a non-spray manner, a positive pressure supplied air respirator must be worn when:

- ~ the airborne concentrations are unknown; or
- ~ the airborne HDI monomer concentrations exceed 0.05 ppm (10 times the TLV), or
- ~ the airborne concentrations of the polyisocyanate (polymeric, oligomeric) exceed 5 mg/m³ averaged over 8 hours or 10 mg/m³ averaged over 15 minutes (10 times the manufacturer's suggested guideline), or
- ~ operations are performed in a confined space or in an area with limited ventilation.

At least an air purifying (organic vapor) respirator is required when:

- ~ the airborne concentrations of the HDI monomer exceed the TLV of 0.005 ppm, but are below 0.05 ppm (10 times the TLV), or
- ~ the airborne concentrations of the polyisocyanate (polymeric, oligomeric) exceed the manufacturer's suggested guideline of 0.5 mg/m³ averaged over 8 hours, or 1.0 mg/m³ averaged over 15 minutes but are below 10 mg/m³ (10 times the manufacturer's suggested guideline).

Ventilation Requirements:

Exhaust ventilation sufficient to keep the airborne concentrations of HDI and polyisocyanate below their respective TLV and manufacturer's suggested guidelines must be utilized. Exhaust air may need to be cleaned by scrubber or filters to reduce environmental contamination.

Monitoring:

Refer to Patty's Industrial Hygiene and Toxicology- Volume 1 (3rd edition) Chapter 17 and Volume III (1st edition) Chapter 3- for guidance concerning appropriate air sampling strategy to determine airborne concentrations.

Medical Surveillance:

Medical supervision of all employees who handle or come in contact with HDI is recommended. This should include preemployment and periodic medical examinations with respiratory function tests (fev, fvc as a minimum). Persons with asthmatic-type conditions, chronic bronchitis, other chronic respiratory diseases or recurrent skin eczema or sensitization should be excluded from working with isocyanates. Once a person is diagnosed as being sensitized to isocyanates, no further exposure can be permitted.

Additional Protective Measures:

Safety showers and eyewash stations should be available. Educate and train employees in safe use of product. Follow all label information.

Section VIII - Reactivity Data

Stability ~~~~~ Stable under normal conditions.

Hazardous Polymerization:

May occur; contact with moisture or other materials which react with isocyanates or temperatures over 400° F. (204° C) may cause polymerization.

Incompatibilities ~~~~~ Water, amines, strong bases, alcohols, metal compounds and surface active materials.

Instability Conditions ~~~~~ None Known.

Decomposition Products ~~~~~ By heat and fires : carbon dioxide, oxides of nitrogen, HCN, HDI.

Section IX - Spill and Leak Procedures

Spill or leak procedures:

Evacuate nonessential personnel. Remove all sources of ignition and ventilate the area. Notify appropriate authorities if necessary. Put on personal protective equipment (see Section VII). Dike or impound spilled material and control further spillage if feasible. Cover the spill with sawdust, vermiculite, fuller's earth or other absorbent material. Pour decontamination solution over spill area and allow to react for at least 10 minutes. Collect material in open containers and add further amounts of decontamination solution. Remove containers to a safe place, cover loosely, allow to stand for 24 to 48 hours. Wash down spill area with decontamination solutions.

Decontamination Solutions:

Nonionic surfactant union carbide's tergitol TMN-10 (20%) and water (80%); concentrated ammonia (3-8%), detergent (2%) and water (90-95%).

Waste disposal method:

Waste must be disposed of in accordance with federal, state, and local environmental control regulations. Incineration is the preferred method. Empty containers must be handled with care due to product residue and flammable solvent vapor. Decontaminate containers prior to disposal. Do not heat or cut empty container with electric or gas torch. (see Sections IV and VIII).

Section X - Special Precautions and Storage Data

Storage Temperature (min/max)~~~~~ 30° F. (-34° C)/122° F. (50° C)

Shelf Life ~~~~~ One year, if unopened

Special Sensitivity:

If container is exposed to high heat, it can be pressurized and possibly rupture explosively. HDI reacts slowly with water to form CO₂ gas. This gas can cause sealed containers to expand and possibly rupture explosively.

Handling/Storage Precautions:

Store in tightly closed containers to prevent moisture contamination. Do not reseal if contamination is suspected. At maximum storage temperatures noted, material may slowly polymerize without hazard. Ideal storage temperature range for ease of handling is 50-81° F. (10-27° C.). Avoid contact with skin and eyes. Employee education and training in the safe use and handling of this product are required under the OSHA Hazard Communication Standard.

Section XI - Shipping Information

D.O.T. Shipping Name ~~~~~ Paint

D.O.T. Hazard Class ~~~~~ 3

UN/NA Number ~~~~~1263

Packaging Group~~~~~III

D.O.T. Label ~~~~~ Combustible*

D.O.T. Placard ~~~~~ Combustible*

*If quantity is in a non bulk packaging (less than 119 gallons), this material ships as non regulated unless the combustible liquid is a hazardous substance or a hazardous waste.

IMO/IMDG
ICAO/IATA
Hazard Label ~~~~~ Flammable Liquid
Hazard Placard ~~~~~ Flammable Liquid

Section XII - Animal Toxicity Data

Toxicity Data For: HDI homopolymer materials except where indicated.

Acute Toxicity

Oral LD50: Estimated to be greater than 10000 mg/kg (rats). (Based on the results of actual tests conducted using specific HDI-homopolymer products).

Inhalation LC50: Lower respiratory (pulmonary) irritant. LC50 values ranging from 137-1150 mg/m3 were obtained in rats exposed to aerosols.

Eye effects: Severe irritant capable of inducing corneal injury (rabbit); maximum primary eye irritation score: 54.6/110 for a 24 hour exposure.

Skin effects: Moderate irritant; primary dermal irritation score: 3.4/8.0 (rabbit).

Sensitization: Pulmonary and dermal sensitizer in animals and humans. Evidence exists that cross-sensitization between HDI and other isocyanates, particularly hydrogenated MDI and TDI, can occur.

Other Acute Effects: Ames Test: negative for 100% solids HDI homopolymer.

Subchronic Toxicity:

Rats exposed to an HDI homopolymer (biuret type), at 3.7, 17.5 and 76.6 mg/m3 for three weeks (6 hours/day, 5 days/week) exhibited respiratory distress and inflamed areas of tissue in the lungs and upper respiratory tract when exposed to 17.5 mg/m3 and above. The No Observable Effect Level (NOEL) was 3.7 mg/m3. Rats exposed for three months (6 hours/day, 5 days/week) to an HDI homopolymer (biuret type), at aerosol concentrations of 0.4, 3.4 and 21 mg/m3 exhibited lung weight increases at the highest dose. Histopathologic diagnosis of the test animals revealed swelling and thickening in the lower respiratory tract as well as thickening of the bronchio-alveolar areas of the lung and thickening of the septum in the 21 mg/m3 animals. There were no effects noted in the upper and central respiratory tract. The No Observable Effect Level (NOEL) in this study is considered to be 3.4 mg/m3.

Other Toxicity Data:

Mice were exposed to a liquid aerosol of an HDI homopolymer (isocyanate type), mixed with acetone for three hours. The irritation potential expressed as the RD50 (the concentration which is predicted to reduce the respiratory rate by 50%) was 20.8 mg/m3 (95% confidence interval = 18.3 to 23.9 mg/m3). Pulmonary (lung) irritation was observed first, followed by sensory (eye, nose throat) irritation.

Section XII - Federal Regulatory Information

OSHA Status ~~~~~ This product is hazardous under the criteria of the federal OSHA Hazard Communication Standard 29 CFR 1910.1200.

Tsca Status ~~~~~ On TSCA Inventory

Cercla Reportable Quantity ~~~~~ None

Sara Title III

Section 302 Extremely Hazardous Substances ~~~~~ None

Section 311/312 Hazard Categories ~~~~~ Immediate Health Hazard
~~~~~ Delayed Health Hazard

**Section XII - Federal Regulatory Information (Cont'd)**

Section 313 Toxic Chemicals ~~~~~None  
 RCRA Status ~~~~~When discarded in its purchased form, this product would not be a hazardous waste either by listing or by characteristic. However, under RCRA, it is the responsibility of the product user to determine at the time of disposal, whether a material containing the product or derived from the product should be classified as a hazardous waste. (40 CFR 261.20-24)

**Section XIV - Other Regulatory Information**

The following chemicals are specifically listed by individual states; other product specific health and safety data in other sections of the MSDS may also be applicable for state requirements. For details on your regulatory requirements, you should contact the appropriate agency in your state.

| Component Name<br>/CAS Number    | Concentration   | State Code |
|----------------------------------|-----------------|------------|
| Homopolymer of HDI<br>28182-81-2 | Essentially 85% | PA3, NJ4   |

- MA = Massachusetts Hazardous Substance List
- NJ1 = New Jersey Hazardous Substance List
- NJ4 = New Jersey Other - Included in Predominant Ingredients > 1%
- PA1 = Pennsylvania Hazardous Substance List
- PA3 = Pennsylvania Non-Hazardous Present at 3% or Greater

**California Proposition 65**

To the best of our knowledge, this product contains no levels of listed substances, which the state of California has found to cause cancer, birth defects or other reproductive effects.

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