

**Product Name:** Tandem\* A Herbicide**Issue Date:** 2012.02.27

Dow AgroSciences Canada Inc. encourages and expects you to read and understand the entire (M)SDS, as there is important information throughout the document. We expect you to follow the precautions identified in this document unless your use conditions would necessitate other appropriate methods or actions.

## 1. Product and Company Identification

**Product Name**

Tandem\* A Herbicide

**COMPANY IDENTIFICATION**

Dow AgroSciences Canada Inc.  
A Subsidiary of The Dow Chemical Company  
Suite 2100, 450 1<sup>st</sup> Street SW,  
Calgary, AB T2P 5H1  
Canada

**For MSDS updates and Product Information:** 800-667-3852**Prepared By:** Prepared for use in Canada by EH&S, Hazard Communications.  
**Revision** 2012.02.27**Customer Information Number:** 800-667-3852  
[solutions@dow.com](mailto:solutions@dow.com)**EMERGENCY TELEPHONE NUMBER****24-Hour Emergency Contact:** 613-996-6666  
**Local Emergency Contact:** 613-996-6666

## 2. Hazards Identification

**Emergency Overview****Color:** Brown**Physical State:** Liquid**Odor:** Pungent**Hazards of product:**

**WARNING!** May cause allergic skin reaction. May cause eye irritation. May cause central nervous system effects. May cause anesthetic effects. May cause respiratory tract irritation. Aspiration hazard. Can enter lungs and cause damage. Isolate area. Keep upwind of spill. Toxic fumes may be released in fire situations. Suspect cancer hazard. May cause cancer.

**Potential Health Effects**

**Eye Contact:** May cause eye irritation. Vapor may cause eye irritation experienced as mild discomfort and redness.

**Skin Contact:** Prolonged contact may cause slight skin irritation with local redness. May cause drying and flaking of the skin.

**Skin Absorption:** Prolonged skin contact is unlikely to result in absorption of harmful amounts.

**Skin Sensitization:** For the active ingredient(s): Has caused allergic skin reactions when tested in guinea pigs.

**Inhalation:** Prolonged excessive exposure to mist may cause adverse effects. Excessive exposure may cause irritation to upper respiratory tract (nose and throat) and lungs. May cause central nervous system effects. Symptoms of excessive exposure may be anesthetic or narcotic effects; dizziness and drowsiness may be observed. Signs and symptoms of excessive exposure may include: Nausea and/or vomiting.

**Ingestion:** Low toxicity if swallowed. Small amounts swallowed incidentally as a result of normal handling operations are not likely to cause injury; however, swallowing larger amounts may cause injury.

**Aspiration hazard:** Aspiration into the lungs may occur during ingestion or vomiting, causing lung damage or even death due to chemical pneumonia.

**Effects of Repeated Exposure:** For the active ingredient(s): In animals, effects have been reported on the following organs: Bone marrow. Kidney. Liver. Thymus. Thyroid. Bladder. For the solvent(s): In animals, effects have been reported on the following organs: Gastrointestinal tract. Thyroid. Urinary tract. Lung. Dose levels producing these effects were many times higher than any dose levels expected from exposure due to use. Cataracts and other eye effects have been reported in humans repeatedly exposed to naphthalene vapor or dust.

**Cancer Information:** Contains naphthalene which has caused cancer in some laboratory animals.

**3. Composition/information on ingredients**

Component	CAS #	Amount W/W
Pyroxsulam	422556-08-9	2.88 %
Cloquintocet-mexyl	99607-70-2	8.64 %
Naphthalene	91-20-3	>= 0.1 - <= 0.7 %
Balance	Not available	>= 87.76 - <= 88.36 %

Amounts are presented as percentages by weight.

**4. First-aid measures****Description of first aid measures**

**General advice:** First Aid responders should pay attention to self-protection and use the recommended protective clothing (chemical resistant gloves, splash protection). If potential for exposure exists refer to Section 8 for specific personal protective equipment.

**Inhalation:** Move person to fresh air. If person is not breathing, call an emergency responder or ambulance, then give artificial respiration; if by mouth to mouth use rescuer protection (pocket mask etc). Call a poison control center or doctor for treatment advice. If breathing is difficult, oxygen should be administered by qualified personnel.

**Skin Contact:** Take off contaminated clothing. Wash skin with soap and plenty of water for 15-20 minutes. Call a poison control center or doctor for treatment advice. Wash clothing before reuse. Shoes and other leather items which cannot be decontaminated should be disposed of properly.

**Eye Contact:** Hold eyes open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eyes. Call a poison control center or doctor for treatment advice.

**Ingestion:** Immediately call a poison control center or doctor. Do not induce vomiting unless told to do so by a poison control center or doctor. Do not give any liquid to the person. Do not give anything by mouth to an unconscious person.

**Most important symptoms and effects, both acute and delayed**

Aside from the information found under Description of first aid measures (above) and Indication of immediate medical attention and special treatment needed (below), no additional symptoms and effects are anticipated.

**Indication of immediate medical attention and special treatment needed**

Maintain adequate ventilation and oxygenation of the patient. May cause asthma-like (reactive airways) symptoms. Bronchodilators, expectorants, antitussives and corticosteroids may be of help. If lavage is performed, suggest endotracheal and/or esophageal control. Danger from lung aspiration must be weighed against toxicity when considering emptying the stomach. The decision of whether to induce vomiting or not should be made by a physician. No specific antidote. Treatment of exposure should be directed at the control of symptoms and the clinical condition of the patient. Have the Safety Data Sheet, and if available, the product container or label with you when calling a poison control center or doctor, or going for treatment.

Repeated excessive exposure may aggravate preexisting lung disease. Skin contact may aggravate preexisting dermatitis.

## 5. Fire Fighting Measures

**Suitable extinguishing media**

Water fog or fine spray. Dry chemical fire extinguishers. Carbon dioxide fire extinguishers. Foam. General purpose synthetic foams (including AFFF type) or protein foams are preferred if available. Alcohol resistant foams (ATC type) may function.

**Extinguishing Media to Avoid:** Do not use direct water stream. May spread fire.

**Special hazards arising from the substance or mixture**

**Hazardous Combustion Products:** During a fire, smoke may contain the original material in addition to combustion products of varying composition which may be toxic and/or irritating. Combustion products may include and are not limited to: Sulfur oxides. Nitrogen oxides. Hydrogen fluoride. Hydrogen chloride. Carbon monoxide. Carbon dioxide.

**Unusual Fire and Explosion Hazards:** Violent steam generation or eruption may occur upon application of direct water stream to hot liquids.

**Advice for firefighters**

**Fire Fighting Procedures:** Keep people away. Isolate fire and deny unnecessary entry. Consider feasibility of a controlled burn to minimize environment damage. Foam fire extinguishing system is preferred because uncontrolled water can spread possible contamination. Use water spray to cool fire exposed containers and fire affected zone until fire is out and danger of reignition has passed. Do not use direct water stream. May spread fire. Burning liquids may be moved by flushing with water to protect personnel and minimize property damage. Contain fire water run-off if possible. Fire water run-off, if not contained, may cause environmental damage. Review the "Accidental Release Measures" and the "Ecological Information" sections of this (M)SDS.

**Special Protective Equipment for Firefighters:** Wear positive-pressure self-contained breathing apparatus (SCBA) and protective fire fighting clothing (includes fire fighting helmet, coat, trousers, boots, and gloves). Avoid contact with this material during fire fighting operations. If contact is likely, change to full chemical resistant fire fighting clothing with self-contained breathing apparatus. If this is not available, wear full chemical resistant clothing with self-contained breathing apparatus and fight fire from a remote location. For protective equipment in post-fire or non-fire clean-up situations, refer to the relevant sections.

See Section 9 for related Physical Properties

## 6. Accidental Release Measures

**Personal precautions, protective equipment and emergency procedures:** Isolate area. Keep unnecessary and unprotected personnel from entering the area. Refer to Section 7, Handling, for additional precautionary measures. Keep upwind of spill. Ventilate area of leak or spill. Use appropriate safety equipment. For additional information, refer to Section 8, Exposure Controls and Personal Protection.

**Environmental precautions:** Prevent from entering into soil, ditches, sewers, waterways and/or groundwater. See Section 12, Ecological Information.

**Methods and materials for containment and cleaning up:** Contain spilled material if possible. Small spills: Absorb with materials such as: Clay. Dirt. Sand. Sweep up. Collect in suitable and properly labeled containers. Large spills: Contact Dow AgroSciences for clean-up assistance.

## 7. Handling and Storage

### Handling

**General Handling:** Keep out of reach of children. Do not swallow. Avoid breathing vapor or mist. Avoid contact with eyes, skin, and clothing. Use with adequate ventilation. Wash thoroughly after handling. Keep container closed.

### Storage

Store in a dry place. Store in original container. Keep container tightly closed when not in use. Do not store near food, foodstuffs, drugs or potable water supplies.

## 8. Exposure Controls / Personal Protection

### Exposure Limits

Component	List	Type	Value
Pyroxsulam	Dow IHG	TWA	5 mg/m <sup>3</sup> D-SEN
Solvent naphtha (petroleum), heavy aromatic	CAD ON OEL	TWAEV	1,600 mg/m <sup>3</sup>
Naphthalene	CAD AB OEL	TWA	52 mg/m <sup>3</sup> 10 ppm SKIN
	CAD AB OEL	STEL	79 mg/m <sup>3</sup> 15 ppm SKIN
	CAD BC OEL	TWA	10 ppm SKIN
	CAD BC OEL	STEL	15 ppm SKIN
	CAD ON OEL	TWAEV	52 mg/m <sup>3</sup> 10 ppm
	CAD ON OEL	STEV	78 mg/m <sup>3</sup> 15 ppm
	ACGIH	TWA	10 ppm SKIN
	ACGIH	STEL	15 ppm SKIN
	OEL (QUE)	TWA	52 mg/m <sup>3</sup> 10 ppm
OEL (QUE)	STEL	79 mg/m <sup>3</sup> 15 ppm	

*Consult local authorities for recommended exposure limits.*

RECOMMENDATIONS IN THIS SECTION ARE FOR MANUFACTURING, COMMERCIAL BLENDING AND PACKAGING WORKERS. APPLICATORS AND HANDLERS SHOULD SEE THE PRODUCT LABEL FOR PROPER PERSONAL PROTECTIVE EQUIPMENT AND CLOTHING.

A "skin" notation following the inhalation exposure guideline refers to the potential for dermal absorption of the material including mucous membranes and the eyes either by contact with vapors or by direct skin contact.

It is intended to alert the reader that inhalation may not be the only route of exposure and that measures to minimize dermal exposures should be considered.

A D-SEN notation following the exposure guideline refers to the potential to produce dermal sensitization, as confirmed by human or animal data.

### Personal Protection

**Eye/Face Protection:** Use safety glasses (with side shields). If exposure causes eye discomfort, use a full-face respirator.

**Skin Protection:** Use protective clothing chemically resistant to this material. Selection of specific items such as face shield, boots, apron, or full body suit will depend on the task.

**Hand protection:** Use gloves chemically resistant to this material. Examples of preferred glove barrier materials include: Chlorinated polyethylene. Neoprene. Nitrile/butadiene rubber ("nitrile" or "NBR"). Ethyl vinyl alcohol laminate ("EVAL"). Viton. Examples of acceptable glove barrier materials include: Butyl rubber. Natural rubber ("latex"). Polyvinyl chloride ("PVC" or "vinyl"). NOTICE: The selection of a specific glove for a particular application and

duration of use in a workplace should also take into account all relevant workplace factors such as, but not limited to: Other chemicals which may be handled, physical requirements (cut/puncture protection, dexterity, thermal protection), potential body reactions to glove materials, as well as the instructions/specifications provided by the glove supplier.

**Respiratory Protection:** Respiratory protection should be worn when there is a potential to exceed the exposure limit requirements or guidelines. If there are no applicable exposure limit requirements or guidelines, wear respiratory protection when adverse effects, such as respiratory irritation or discomfort have been experienced, or where indicated by your risk assessment process. In misty atmospheres, use an approved particulate respirator. The following should be effective types of air-purifying respirators: Organic vapor cartridge with a particulate pre-filter.

**Ingestion:** Avoid ingestion of even very small amounts; do not consume or store food or tobacco in the work area; wash hands and face before smoking or eating.

### Engineering Controls

**Ventilation:** Use engineering controls to maintain airborne level below exposure limit requirements or guidelines. If there are no applicable exposure limit requirements or guidelines, use only with adequate ventilation. Local exhaust ventilation may be necessary for some operations.

## 9. Physical and Chemical Properties

### Appearance

<b>Physical State</b>	Liquid
<b>Color</b>	Brown
<b>Odor</b>	Pungent
<b>Odor Threshold</b>	No test data available
<b>pH</b>	5.18 <i>pH Electrode</i>
<b>Melting Point</b>	Not applicable
<b>Freezing Point</b>	No test data available
<b>Boiling Point (760 mmHg)</b>	No test data available
<b>Flash Point - Closed Cup</b>	> 100 °C <i>Closed Cup</i>
<b>Flammable Limits In Air</b>	<b>Lower:</b> No test data available <b>Upper:</b> No test data available
<b>Vapor Pressure</b>	No test data available
<b>Vapor Density (air = 1)</b>	No test data available
<b>Specific Gravity (H<sub>2</sub>O = 1)</b>	No test data available
<b>Solubility in water (by weight)</b>	No test data available
<b>Partition coefficient, n-octanol/water (log Pow)</b>	No data available for this product. See Section 12 for individual component data.
<b>Autoignition Temperature</b>	No test data available
<b>Decomposition Temperature</b>	No test data available
<b>Liquid Density</b>	1.04 g/ml @ 20 °C <i>Digital density meter</i>

## 10. Stability and Reactivity

### Reactivity

No dangerous reaction known under conditions of normal use.

### Chemical stability

Stable under recommended storage conditions. See Storage, Section 7.

### Possibility of hazardous reactions

Polymerization will not occur.

**Conditions to Avoid:** Exposure to elevated temperatures can cause product to decompose. Generation of gas during decomposition can cause pressure in closed systems.

**Incompatible Materials:** Avoid contact with oxidizing materials.

**Hazardous decomposition products**

Decomposition products depend upon temperature, air supply and the presence of other materials. Decomposition products can include and are not limited to: Hydrocarbons. Hydrogen chloride. Hydrogen fluoride. Nitrogen oxides. Sulfur oxides. Toxic gases are released during decomposition.

**11. Toxicological Information****Acute Toxicity****Ingestion**

As product: Single dose oral LD50 has not been determined.

For the active ingredient(s): LD50, rat > 2,000 mg/kg

**Dermal**

As product: The dermal LD50 has not been determined.

For the active ingredient(s): LD50, rat > 2,000 mg/kg

**Inhalation**

As product: The LC50 has not been determined.

**Eye damage/eye irritation**

May cause eye irritation. Vapor may cause eye irritation experienced as mild discomfort and redness.

**Skin corrosion/irritation**

Prolonged contact may cause slight skin irritation with local redness. May cause drying and flaking of the skin.

**Sensitization****Skin**

For the active ingredient(s): Has caused allergic skin reactions when tested in guinea pigs.

**Respiratory**

No relevant information found.

**Repeated Dose Toxicity**

For the active ingredient(s): In animals, effects have been reported on the following organs: Bone marrow. Kidney. Liver. Thymus. Thyroid. Bladder. For the solvent(s): In animals, effects have been reported on the following organs: Gastrointestinal tract. Thyroid. Urinary tract. Lung. Dose levels producing these effects were many times higher than any dose levels expected from exposure due to use. Cataracts and other eye effects have been reported in humans repeatedly exposed to naphthalene vapor or dust.

**Chronic Toxicity and Carcinogenicity**

Contains naphthalene which has caused cancer in some laboratory animals. For the active ingredient(s): Did not cause cancer in laboratory animals.

**Carcinogenicity Classifications:**

Component	List	Classification
Naphthalene	IARC	Possibly carcinogenic to humans.; 2B

**Developmental Toxicity**

For the active ingredient(s): Did not cause birth defects or any other fetal effects in laboratory animals.

**Reproductive Toxicity**

In animal studies, active ingredient did not interfere with reproduction.

**Genetic Toxicology**

For the active ingredient(s): In vitro genetic toxicity studies were negative. Animal genetic toxicity studies were negative.

**Component Toxicology - Pyroxsulam**

Inhalation	No deaths occurred at this concentration. LC50, 4 h, Respirable dust., rat > 5.12 mg/l
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**Component Toxicology - Cloquintocet-mexyl**

Inhalation	LC50, 4 h, Aerosol, rat > 0.935 mg/l
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**Component Toxicology - Naphthalene**

Inhalation	The LC50 has not been determined. Maximum attainable concentration. , rat > 78 ppm
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Inhalation	LC50, 4 h, mouse > 100 ppm
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## 12. Ecological Information

### Toxicity

#### Data for Component: **Pyroxsulam**

Material is very highly toxic to aquatic organisms on an acute basis (LC50/EC50 <0.1 mg/L in the most sensitive species). Material is practically non-toxic to birds on an acute basis (LD50 > 2000 mg/kg). Material is practically non-toxic to birds on a dietary basis (LC50 > 5000 ppm).

#### **Fish Acute & Prolonged Toxicity**

LC50, *Oncorhynchus mykiss* (rainbow trout), static test, 96 h: > 87.0 mg/l

#### **Aquatic Invertebrate Acute Toxicity**

EC50, *Daphnia magna* (Water flea), static test, 48 h, immobilization: > 100 mg/l

#### **Aquatic Plant Toxicity**

EbC50, *Lemna minor* (duckweed), biomass growth inhibition, 7 d: 0.00257 mg/l

#### **Toxicity to Micro-organisms**

EC50; activated sludge, 3 h: > 1,000 mg/l

#### **Toxicity to Above Ground Organisms**

LC50, *Colinus virginianus* (Bobwhite quail): > 5000 mg/kg diet.

LD50, *Colinus virginianus* (Bobwhite quail): > 2000 mg/kg bodyweight.

oral LD50, *Apis mellifera* (bees): > 107.4 micrograms/bee

contact LD50, *Apis mellifera* (bees): > 100 micrograms/bee

#### **Toxicity to Soil Dwelling Organisms**

LC50, *Eisenia fetida* (earthworms), 14 d: > 10,000 mg/kg

#### Data for Component: **Cloquintocet-mexyl**

Material is highly toxic to aquatic organisms on an acute basis (LC50/EC50 between 0.1 and 1 mg/L in the most sensitive species tested). Material is practically non-toxic to birds on an acute basis (LD50 > 2000 mg/kg). Material is practically non-toxic to birds on a dietary basis (LC50 > 5000 ppm).

#### **Fish Acute & Prolonged Toxicity**

As the ester active substance. LC50, *Oncorhynchus mykiss* (rainbow trout), flow-through test, 96 h: > 0.97 mg/l

#### **Aquatic Invertebrate Acute Toxicity**

As the ester active substance. EC50, *Daphnia magna* (Water flea), flow-through test, 48 h, immobilization: > 0.82 mg/l

#### **Aquatic Plant Toxicity**

As the ester active substance. EbC50, alga *Scenedesmus* sp., biomass growth inhibition, 96 h: 0.63 mg/l

As the ester active substance. EbC50, *Lemna minor* (duckweed), biomass growth inhibition, 14 d: > 0.42 mg/l

#### **Toxicity to Above Ground Organisms**

oral LD50, *Anas platyrhynchos* (Mallard duck): > 2000 mg/kg bodyweight.

dietary LC50, *Anas platyrhynchos* (Mallard duck): > 5200 mg/kg diet.

oral LD50, *Apis mellifera* (bees): > 100 micrograms/bee

contact LD50, *Apis mellifera* (bees): > 100 micrograms/bee

#### **Toxicity to Soil Dwelling Organisms**

LC50, *Eisenia fetida* (earthworms): > 1,000 mg/kg

#### Data for Component: **Naphthalene**

Material is highly toxic to aquatic organisms on an acute basis (LC50/EC50 between 0.1 and 1 mg/L in the most sensitive species tested).

#### **Fish Acute & Prolonged Toxicity**

LC50, *Oncorhynchus mykiss* (rainbow trout), 96 h: 0.11 mg/l

#### **Aquatic Invertebrate Acute Toxicity**

EC50, *Daphnia magna* (Water flea), static test, 48 h, immobilization: 1.6 - 24.1 mg/l

## Persistence and Degradability

### Data for Component: **Pyroxsulam**

Based on stringent OECD test guidelines, this material cannot be considered as readily biodegradable; however, these results do not necessarily mean that the material is not biodegradable under environmental conditions.

#### OECD Biodegradation Tests:

Biodegradation	Exposure Time	Method	10 Day Window
20 - 30 %	28 d	OECD 301B Test	fail

### Data for Component: **Cloquintocet-mexyl**

No relevant information found.

### Data for Component: **Naphthalene**

Biodegradation under aerobic static laboratory conditions is high (BOD20 or BOD28/ThOD > 40%).

#### Indirect Photodegradation with OH Radicals

Rate Constant	Atmospheric Half-life	Method
2.16E-11 cm <sup>3</sup> /s	5.9 h	Estimated.

#### Biological oxygen demand (BOD):

BOD 5	BOD 10	BOD 20	BOD 28
57.000 %	71.000 %	71.000 %	

Theoretical Oxygen Demand: 3.00 mg/mg

## Bioaccumulative potential

### Data for Component: **Pyroxsulam**

**Bioaccumulation:** Bioconcentration potential is low (BCF < 100 or Log Pow < 3).

**Partition coefficient, n-octanol/water (log Pow):** -1.01 Measured

### Data for Component: **Cloquintocet-mexyl**

**Bioaccumulation:** Bioconcentration potential is moderate (BCF between 100 and 3000 or Log Pow between 3 and 5).

Bioconcentration potential is moderate (BCF between 100 and 3000 or Log Pow between 3 and 5).

**Partition coefficient, n-octanol/water (log Pow):** 5.3 Estimated.

**Bioconcentration Factor (BCF):** 122 - 621; Fish

### Data for Component: **Naphthalene**

**Bioaccumulation:** Bioconcentration potential is moderate (BCF between 100 and 3000 or Log Pow between 3 and 5).

**Partition coefficient, n-octanol/water (log Pow):** 3.3 Measured

**Bioconcentration Factor (BCF):** 40 - 300; Fish; Measured

## Mobility in soil

### Data for Component: **Pyroxsulam**

**Mobility in soil:** Potential for mobility in soil is very high (Koc between 0 and 50).

**Partition coefficient, soil organic carbon/water (Koc):** <= 42 Estimated.

**Henry's Law Constant (H):** 6.94E-07 Pa\*m<sup>3</sup>/mole. Calculated

### Data for Component: **Cloquintocet-mexyl**

**Mobility in soil:** Expected to be relatively immobile in soil (Koc > 5000).

**Partition coefficient, soil organic carbon/water (Koc):** 38,070 Estimated.

**Henry's Law Constant (H):** 2.98E-08 atm\*m<sup>3</sup>/mole; 25 °C Measured

### Data for Component: **Naphthalene**

**Mobility in soil:** Potential for mobility in soil is medium (Koc between 150 and 500).

**Partition coefficient, soil organic carbon/water (Koc):** 240 - 1,300 Measured

**Henry's Law Constant (H):** 2.92E-04 - 5.53E-04 atm\*m<sup>3</sup>/mole; 25 °C Measured

**Distribution in Environment: Mackay Level 1 Fugacity Model:**

Air	Water.	Biota	Soil	Sediment
74 %	8.5 %	< 0.01 %	18 %	0.39 %



### 13. Disposal Considerations

If wastes and/or containers cannot be disposed of according to the product label directions, disposal of this material must be in accordance with your local or area regulatory authorities. This information presented below only applies to the material as supplied. The identification based on characteristic(s) or listing may not apply if the material has been used or otherwise contaminated. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste identification and disposal methods in compliance with applicable regulations. If the material as supplied becomes a waste, follow all applicable regional, national and local laws.

### 14. Transport Information

**TDG Small container**  
NOT REGULATED

**TDG Large container**  
NOT REGULATED

**IMDG**

**Proper Shipping Name:** ENVIRONMENTALLY HAZARDOUS SUBSTANCES, LIQUID, N.O.S

**Technical Name:** NAPHTHALENE, Pyroxsulam.

**Hazard Class:** 9 **ID Number:** UN3082 **Packing Group:** PG III

**EMS Number:** F-A,S-F

**Marine pollutant.:** Yes

**ICAO/IATA**

**Proper Shipping Name:** ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S.

**Technical Name:** NAPHTHALENE, Pyroxsulam.

**Hazard Class:** 9 **ID Number:** UN3082 **Packing Group:** PG III

**Cargo Packing Instruction:** 964

**Passenger Packing Instruction:** 964

### 15. Regulatory Information

**CEPA - Domestic Substances List (DSL)**

All substances contained in this product are listed on the Canadian Domestic Substances List (DSL) or are not required to be listed.

**Hazardous Products Act Information: CPR Compliance**

This product has been classified in accordance with the hazard criteria of the Canadian Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

**Hazardous Products Act Information: WHMIS Classification**

This product is exempt under WHMIS.

**Pest Control Products Act Registration number:** 29985

**National Fire Code of Canada**

Not applicable

### 16. Other Information

**Hazard Rating System**

NFPA	Health	Fire	Reactivity
	2	1	1

**Recommended Uses and Restrictions****Identified uses**

Product use: End use herbicide product

**Revision**

Identification Number: 1042034 / 1023 / Issue Date 2012.02.27 / Version: 1.1

DAS Code: GF-2541

Most recent revision(s) are noted by the bold, double bars in left-hand margin throughout this document.

**Legend**

N/A	Not available
W/W	Weight/Weight
OEL	Occupational Exposure Limit
STEL	Short Term Exposure Limit
TWA	Time Weighted Average
ACGIH	American Conference of Governmental Industrial Hygienists, Inc.
DOW IHG	Dow Industrial Hygiene Guideline
WEEL	Workplace Environmental Exposure Level
HAZ_DES	Hazard Designation
VOL/VOL	Volume/Volume

*Dow AgroSciences Canada Inc. urges each customer or recipient of this (M)SDS to study it carefully and consult appropriate expertise, as necessary or appropriate, to become aware of and understand the data contained in this (M)SDS and any hazards associated with the product. The information herein is provided in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied, is given. Regulatory requirements are subject to change and may differ between various locations. It is the buyer's/user's responsibility to ensure that his activities comply with all federal, state, provincial or local laws. The information presented here pertains only to the product as shipped. Since conditions for use of the product are not under the control of the manufacturer, it is the buyer's/user's duty to determine the conditions necessary for the safe use of this product. Due to the proliferation of sources for information such as manufacturer-specific (M)SDSs, we are not and cannot be responsible for (M)SDSs obtained from any source other than ourselves. If you have obtained an (M)SDS from another source or if you are not sure that the (M)SDS you have is current, please contact us for the most current version.*

**Product Name:** Tandem\* B Herbicide**Issue Date:** 2010.12.21

Dow AgroSciences Canada Inc. encourages and expects you to read and understand the entire (M)SDS, as there is important information throughout the document. We expect you to follow the precautions identified in this document unless your use conditions would necessitate other appropriate methods or actions.

**1. Product and Company Identification****Product Name**

Tandem\* B Herbicide

**COMPANY IDENTIFICATION**

Dow AgroSciences Canada Inc.  
A Subsidiary of The Dow Chemical Company  
Suite 2100, 450 1st Street SW,  
Calgary, AB T2P 5H1  
Canada

**For MSDS updates and Product Information:** 800-667-3852**Prepared By:** Prepared for use in Canada by EH&S, Hazard Communications.  
**Revision** 2010.12.21**Customer Information Number:** 800-667-3852  
SDSQuestion@dow.com**EMERGENCY TELEPHONE NUMBER****24-Hour Emergency Contact:** 613-996-6666  
**Local Emergency Contact:** 613-996-6666**2. Hazards Identification****Emergency Overview****Color:** Yellow**Physical State:** Liquid.**Odor:** Aromatic**Hazards of product:**

**WARNING!** May cause allergic skin reaction. May cause eye irritation. Isolate area.  
Toxic fumes may be released in fire situations.

**Potential Health Effects**

**Eye Contact:** May cause moderate eye irritation. May cause slight corneal injury.

**Skin Contact:** Brief contact may cause slight skin irritation with local redness.

**Skin Absorption:** Prolonged skin contact is unlikely to result in absorption of harmful amounts.

**Skin Sensitization:** As product: Has demonstrated the potential for contact allergy in mice.

**Inhalation:** No adverse effects are anticipated from single exposure to mist.

**Ingestion:** Very low toxicity if swallowed. Harmful effects not anticipated from swallowing small amounts.

**Effects of Repeated Exposure:** Based on information for component(s): In animals, effects have been reported on the following organs: Kidney.

**Birth Defects/Developmental Effects:** For the active ingredient(s): Has been toxic to the fetus in laboratory animals at doses toxic to the mother.

### 3. Composition/information on ingredients

Component	CAS #	Amount W/W
Fluroxypyr 1-methylheptyl ester	81406-37-3	45.52 %
Solvent naphtha (petroleum), heavy aromatic	64742-94-5	>= 0.7 - <= 2.6 %
N-Methyl-2-pyrrolidone	872-50-4	0.1 %
Balance		>= 51.8 - <= 53.7 %

Amounts are presented as percentages by weight.

### 4. First-aid measures

#### Description of first aid measures

**General advice:** First Aid responders should pay attention to self-protection and use the recommended protective clothing (chemical resistant gloves, splash protection). If potential for exposure exists refer to Section 8 for specific personal protective equipment.

**Inhalation:** Move person to fresh air. If person is not breathing, call an emergency responder or ambulance, then give artificial respiration; if by mouth to mouth use rescuer protection (pocket mask etc). Call a poison control center or doctor for treatment advice.

**Skin Contact:** Take off contaminated clothing. Wash skin with soap and plenty of water for 15-20 minutes. Call a poison control center or doctor for treatment advice. Wash clothing before reuse. Shoes and other leather items which cannot be decontaminated should be disposed of properly.

**Eye Contact:** Hold eyes open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eyes. Call a poison control center or doctor for treatment advice.

**Ingestion:** No emergency medical treatment necessary.

#### Most important symptoms and effects, both acute and delayed

Aside from the information found under Description of first aid measures (above) and Indication of immediate medical attention and special treatment needed (below), no additional symptoms and effects are anticipated.

#### Indication of immediate medical attention and special treatment needed

No specific antidote. Treatment of exposure should be directed at the control of symptoms and the clinical condition of the patient. Have the Safety Data Sheet, and if available, the product container or label with you when calling a poison control center or doctor, or going for treatment.

## 5. Fire Fighting Measures

### Suitable extinguishing media

Water fog or fine spray. Dry chemical fire extinguishers. Carbon dioxide fire extinguishers. Foam. Do not use direct water stream. May spread fire. Alcohol resistant foams (ATC type) are preferred. General purpose synthetic foams (including AFFF) or protein foams may function, but will be less effective.

### Special hazards arising from the substance or mixture

**Hazardous Combustion Products:** During a fire, smoke may contain the original material in addition to combustion products of varying composition which may be toxic and/or irritating. Combustion products may include and are not limited to: Nitrogen oxides. Hydrogen fluoride. Hydrogen chloride. Carbon monoxide. Carbon dioxide.

**Unusual Fire and Explosion Hazards:** Container may rupture from gas generation in a fire situation. Violent steam generation or eruption may occur upon application of direct water stream to hot liquids. Dense smoke is produced when product burns.

### Advice for firefighters

**Fire Fighting Procedures:** Keep people away. Isolate fire and deny unnecessary entry. Consider feasibility of a controlled burn to minimize environment damage. Foam fire extinguishing system is preferred because uncontrolled water can spread possible contamination. Use water spray to cool fire exposed containers and fire affected zone until fire is out and danger of reignition has passed. Fight fire from protected location or safe distance. Consider the use of unmanned hose holders or monitor nozzles. Immediately withdraw all personnel from the area in case of rising sound from venting safety device or discoloration of the container. Burning liquids may be extinguished by dilution with water. Do not use direct water stream. May spread fire. Move container from fire area if this is possible without hazard. Burning liquids may be moved by flushing with water to protect personnel and minimize property damage. Contain fire water run-off if possible. Fire water run-off, if not contained, may cause environmental damage. Review the "Accidental Release Measures" and the "Ecological Information" sections of this (M)SDS.

**Special Protective Equipment for Firefighters:** Wear positive-pressure self-contained breathing apparatus (SCBA) and protective fire fighting clothing (includes fire fighting helmet, coat, trousers, boots, and gloves). Avoid contact with this material during fire fighting operations. If contact is likely, change to full chemical resistant fire fighting clothing with self-contained breathing apparatus. If this is not available, wear full chemical resistant clothing with self-contained breathing apparatus and fight fire from a remote location. For protective equipment in post-fire or non-fire clean-up situations, refer to the relevant sections.

See Section 9 for related Physical Properties

## 6. Accidental Release Measures

**Personal precautions, protective equipment and emergency procedures:** Isolate area. Keep unnecessary and unprotected personnel from entering the area. Refer to Section 7, Handling, for additional precautionary measures. Use appropriate safety equipment. For additional information, refer to Section 8, Exposure Controls and Personal Protection.

**Environmental precautions:** Prevent from entering into soil, ditches, sewers, waterways and/or groundwater. See Section 12, Ecological Information.

**Methods and materials for containment and cleaning up:** Contain spilled material if possible. Small spills: Absorb with materials such as: Clay. Dirt. Sand. Sweep up. Collect in suitable and properly labeled containers. Large spills: Contact Dow AgroSciences for clean-up assistance.

## 7. Handling and Storage

### Handling

**General Handling:** Keep out of reach of children. Do not swallow. Avoid breathing vapor or mist. Avoid contact with eyes, skin, and clothing. Use with adequate ventilation. Wash thoroughly after handling.

### Storage

Store in a dry place. Store in original container. Keep container tightly closed when not in use. Do not store near food, foodstuffs, drugs or potable water supplies.

## 8. Exposure Controls / Personal Protection

### Exposure Limits

Component	List	Type	Value
Fluroxypyr 1-methylheptyl ester	Dow IHG	TWA	10 mg/m <sup>3</sup>
Solvent naphtha (petroleum), heavy aromatic	CAD ON OEL	TWAEV	1,600 mg/m <sup>3</sup>
N-Methyl-2-pyrrolidone	CAD ON OEL	TWAEV	400 mg/m <sup>3</sup>
	AIHA WEEL	TWA	40 mg/m <sup>3</sup> 10 ppm SKIN

*Consult local authorities for recommended exposure limits.*

RECOMMENDATIONS IN THIS SECTION ARE FOR MANUFACTURING, COMMERCIAL BLENDING AND PACKAGING WORKERS. APPLICATORS AND HANDLERS SHOULD SEE THE PRODUCT LABEL FOR PROPER PERSONAL PROTECTIVE EQUIPMENT AND CLOTHING.

A "skin" notation following the inhalation exposure guideline refers to the potential for dermal absorption of the material including mucous membranes and the eyes either by contact with vapors or by direct skin contact.

It is intended to alert the reader that inhalation may not be the only route of exposure and that measures to minimize dermal exposures should be considered.

### Personal Protection

**Eye/Face Protection:** Use chemical goggles.

**Skin Protection:** Use protective clothing chemically resistant to this material. Selection of specific items such as face shield, boots, apron, or full body suit will depend on the task. Remove contaminated clothing immediately, wash skin area with soap and water, and launder clothing before reuse or dispose of properly. Items which cannot be decontaminated, such as shoes, belts and watchbands, should be removed and disposed of properly.

**Hand protection:** Use gloves chemically resistant to this material. Examples of preferred glove barrier materials include: Butyl rubber. Chlorinated polyethylene. Polyethylene. Ethyl vinyl alcohol laminate ("EVAL"). Examples of acceptable glove barrier materials include: Natural rubber ("latex"). Neoprene. Nitrile/butadiene rubber ("nitrile" or "NBR"). Polyvinyl chloride ("PVC" or "vinyl"). Viton. NOTICE: The selection of a specific glove for a particular application and duration of use in a workplace should also take into account all relevant workplace factors such as, but not limited to: Other chemicals which may be handled, physical requirements (cut/puncture protection, dexterity, thermal protection), potential body reactions to glove materials, as well as the instructions/specifications provided by the glove supplier.

**Respiratory Protection:** Respiratory protection should be worn when there is a potential to exceed the exposure limit requirements or guidelines. If there are no applicable exposure limit requirements or guidelines, wear respiratory protection when adverse effects, such as respiratory irritation or

discomfort have been experienced, or where indicated by your risk assessment process. For most conditions no respiratory protection should be needed; however, if discomfort is experienced, use an approved air-purifying respirator. The following should be effective types of air-purifying respirators: Organic vapor cartridge with a particulate pre-filter.

**Ingestion:** Use good personal hygiene. Do not consume or store food in the work area. Wash hands before smoking or eating.

### Engineering Controls

**Ventilation:** Use local exhaust ventilation, or other engineering controls to maintain airborne levels below exposure limit requirements or guidelines. If there are no applicable exposure limit requirements or guidelines, general ventilation should be sufficient for most operations. Local exhaust ventilation may be necessary for some operations.

## 9. Physical and Chemical Properties

<b>Appearance</b>	
<b>Physical State</b>	Liquid
<b>Color</b>	Yellow
<b>Odor</b>	Aromatic
<b>Odor Threshold</b>	No test data available
<b>pH</b>	4.1
<b>Melting Point</b>	Not applicable
<b>Freezing Point</b>	No test data available
<b>Boiling Point (760 mmHg)</b>	No test data available.
<b>Flash Point - Closed Cup</b>	> 100 °C
<b>Evaporation Rate (Butyl Acetate = 1)</b>	No test data available
<b>Flammable Limits In Air</b>	<b>Lower:</b> No test data available <b>Upper:</b> No test data available
<b>Vapor Pressure</b>	No test data available
<b>Vapor Density (air = 1)</b>	No test data available
<b>Specific Gravity (H<sub>2</sub>O = 1)</b>	
<b>Solubility in water (by weight)</b>	emulsifiable
<b>Partition coefficient, n-octanol/water (log Pow)</b>	No data available for this product. See Section 12 for individual component data.
<b>Autoignition Temperature</b>	No test data available
<b>Decomposition Temperature</b>	No test data available
<b>Dynamic Viscosity</b>	85.3 mPa.s
<b>Kinematic Viscosity</b>	No test data available
<b>Explosive properties</b>	No
<b>Liquid Density</b>	1.054 g/ml

## 10. Stability and Reactivity

### Reactivity

No dangerous reaction known under conditions of normal use.

### Chemical stability

Unstable at elevated temperatures.

### Possibility of hazardous reactions

Polymerization will not occur.

**Conditions to Avoid:** Exposure to elevated temperatures can cause product to decompose. Generation of gas during decomposition can cause pressure in closed systems.

**Incompatible Materials:** None known.

#### **Hazardous decomposition products**

Decomposition products depend upon temperature, air supply and the presence of other materials. Decomposition products can include and are not limited to: Hydrogen chloride. Hydrogen fluoride. Nitrogen oxides. Toxic gases are released during decomposition.

## 11. Toxicological Information

### **Acute Toxicity**

#### **Ingestion**

As product: LD50, Rat, female > 5,000 mg/kg  
No deaths occurred at this concentration.

#### **Dermal**

As product: LD50, Rat, male and female > 5,000 mg/kg  
No deaths occurred at this concentration.

#### **Inhalation**

LC50, 4 h, Aerosol, Rat, male and female > 5.50 mg/l

#### **Eye damage/eye irritation**

May cause moderate eye irritation. May cause slight corneal injury.

#### **Skin corrosion/irritation**

Brief contact may cause slight skin irritation with local redness.

#### **Sensitization**

##### **Skin**

As product: Has demonstrated the potential for contact allergy in mice.

#### **Repeated Dose Toxicity**

For the active ingredient(s): Based on available data, repeated exposures are not anticipated to cause significant adverse effects. Based on information for component(s): In animals, effects have been reported on the following organs: Kidney.

#### **Chronic Toxicity and Carcinogenicity**

For the active ingredient(s): No relevant information found.

#### **Developmental Toxicity**

For the active ingredient(s): Has been toxic to the fetus in laboratory animals at doses toxic to the mother. For the active ingredient(s): Did not cause birth defects in laboratory animals.

#### **Reproductive Toxicity**

For the active ingredient(s): In animal studies, did not interfere with reproduction.

#### **Genetic Toxicology**

As product: In vitro genetic toxicity studies were negative. As product: Animal genetic toxicity studies were negative.

## 12. Ecological Information

### **Toxicity**

Material is moderately toxic to aquatic organisms on an acute basis (LC50/EC50 between 1 and 10 mg/L in the most sensitive species tested). Material is practically non-toxic to birds on an acute basis (LD50 > 2000 mg/kg).

#### **Fish Acute & Prolonged Toxicity**

LC50, rainbow trout (*Oncorhynchus mykiss*), flow-through, 96 h: 14.3 mg/l

#### **Aquatic Invertebrate Acute Toxicity**

EC50, water flea *Daphnia magna*, static, 48 h, immobilization: 20 mg/l



**Aquatic Plant Toxicity**

ErC50, green alga *Pseudokirchneriella subcapitata* (formerly known as *Selenastrum capricornutum*), static, Growth rate inhibition, 72 h: 9.6 mg/l

EyC50, green alga *Pseudokirchneriella subcapitata* (formerly known as *Selenastrum capricornutum*), static, Cell yield inhibition, 72 h: 1.6 mg/l

**Toxicity to Above Ground Organisms**

oral LD50, bobwhite (*Colinus virginianus*): > 2,250 mg/kg

**Toxicity to Soil Dwelling Organisms**

LC50, Earthworm *Eisenia foetida*, adult, 14 d: > 1,000 mg/kg

EC50, Earthworm *Eisenia foetida*, adult, 28 d: > 17.2 mg/kg

**Persistence and Degradability**Data for Component: **Fluroxypyr 1-methylheptyl ester**

|| Material is not readily biodegradable according to OECD/EEC guidelines.

**Stability in Water (1/2-life):**

|| 12.8 - 16.5 h

Data for Component: **Solvent naphtha (petroleum), heavy aromatic**

|| Biodegradation may occur under aerobic conditions (in the presence of oxygen). Based on stringent OECD test guidelines, this material cannot be considered as readily biodegradable; however, these results do not necessarily mean that the material is not biodegradable under environmental conditions.

**OECD Biodegradation Tests:**

Biodegradation	Exposure Time	Method	10 Day Window
30 - 41 %	28 d	OECD 301D Test	fail

Data for Component: **N-Methyl-2-pyrrolidone**

|| Material is readily biodegradable. Passes OECD test(s) for ready biodegradability. Material is ultimately biodegradable (reaches > 70% mineralization in OECD test(s) for inherent biodegradability).

**OECD Biodegradation Tests:**

Biodegradation	Exposure Time	Method	10 Day Window
91 %	28 d	OECD 301B Test	pass
> 90 %	8 d	OECD 302B Test	Not applicable
99 %	1 d	OECD 303A Test	Not applicable

**Indirect Photodegradation with OH Radicals**

Rate Constant	Atmospheric Half-life	Method
2.199E-11 cm <sup>3</sup> /s	0.486 d	Estimated.

|| **Theoretical Oxygen Demand:** 2.58 mg/mg

**Bioaccumulative potential**Data for Component: **Fluroxypyr 1-methylheptyl ester**

|| **Bioaccumulation:** Bioconcentration potential is low (BCF < 100 or Log Pow < 3).

|| **Partition coefficient, n-octanol/water (log Pow):** 4.5 Measured

|| **Bioconcentration Factor (BCF):** 26; rainbow trout (*Oncorhynchus mykiss*); Measured

Data for Component: **Solvent naphtha (petroleum), heavy aromatic**

|| **Bioaccumulation:** Bioconcentration potential is high (BCF > 3000 or Log Pow between 5 and 7).

|| **Partition coefficient, n-octanol/water (log Pow):** 2.9 - 6.1 Measured

|| **Bioconcentration Factor (BCF):** 61 - 159; fish

Data for Component: **N-Methyl-2-pyrrolidone**

|| **Bioaccumulation:** Bioconcentration potential is low (BCF < 100 or Log Pow < 3).

|| **Partition coefficient, n-octanol/water (log Pow):** -0.38 Measured

**Mobility in soil**Data for Component: **Fluroxypyr 1-methylheptyl ester****Mobility in soil:** Expected to be relatively immobile in soil (Koc > 5000).**Partition coefficient, soil organic carbon/water (Koc):** 6,200 **Henry's Law Constant (H):** 5.42E-08 atm\*m3/mole; 25 °C MeasuredData for Component: **Solvent naphtha (petroleum), heavy aromatic****Mobility in soil:** No relevant data found.Data for Component: **N-Methyl-2-pyrrolidone****Mobility in soil:** Given its very low Henry's constant, volatilization from natural bodies of water or moist soil is not expected to be an important fate process., Potential for mobility in soil is very high (Koc between 0 and 50).**Partition coefficient, soil organic carbon/water (Koc):** 21 Estimated.**Henry's Law Constant (H):** 4.46E-08 atm\*m3/mole; 25 °C Measured**13. Disposal Considerations**

If wastes and/or containers cannot be disposed of according to the product label directions, disposal of this material must be in accordance with your local or area regulatory authorities. This information presented below only applies to the material as supplied. The identification based on characteristic(s) or listing may not apply if the material has been used or otherwise contaminated. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste identification and disposal methods in compliance with applicable regulations. If the material as supplied becomes a waste, follow all applicable regional, national and local laws.

**14. Transport Information****TDG Small container**

NOT REGULATED

**TDG Large container**

NOT REGULATED

**IMDG****Proper Shipping Name:** ENVIRONMENTALLY HAZARDOUS SUBSTANCES, LIQUID, N.O.S**Technical Name:** Fluroxypyr**Hazard Class:** 9 **ID Number:** UN3082 **Packing Group:** PG III**EMS Number:** f-a,s-f**Marine pollutant.:** Yes**ICAO/IATA****Proper Shipping Name:** ENVIRONMENTALLY HAZARDOUS SUBSTANCES, LIQUID, N.O.S**Technical Name:** Fluroxypyr**Hazard Class:** 9 **ID Number:** UN 3082 **Packing Group:** PG III**Cargo Packing Instruction:** 964**Passenger Packing Instruction:** 964

## 15. Regulatory Information

### CEPA - Domestic Substances List (DSL)

All substances contained in this product are listed on the Canadian Domestic Substances List (DSL) or are not required to be listed.

### Hazardous Products Act Information: CPR Compliance

This product has been classified in accordance with the hazard criteria of the Canadian Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

### Hazardous Products Act Information: WHMIS Classification

This product is exempt under WHMIS.

**Pest Control Products Act Registration number:** 29965

### National Fire Code of Canada

Not applicable

## 16. Other Information

### Hazard Rating System

NFPA	Health	Fire	Reactivity
	1	1	0

### Recommended Uses and Restrictions

End use herbicide product

### Revision

Identification Number: 1010010 / 1023 / Issue Date 2010.12.21 / Version: 3.0

DAS Code: GF-1784

Most recent revision(s) are noted by the bold, double bars in left-hand margin throughout this document.

### Legend

N/A	Not available
W/W	Weight/Weight
OEL	Occupational Exposure Limit
STEL	Short Term Exposure Limit
TWA	Time Weighted Average
ACGIH	American Conference of Governmental Industrial Hygienists, Inc.
DOW IHG	Dow Industrial Hygiene Guideline
WEEL	Workplace Environmental Exposure Level
HAZ_DES	Hazard Designation
VOL/VOL	Volume/Volume

*Dow AgroSciences Canada Inc. urges each customer or recipient of this (M)SDS to study it carefully and consult appropriate expertise, as necessary or appropriate, to become aware of and understand the data contained in this (M)SDS and any hazards associated with the product. The information herein is provided in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied, is given. Regulatory requirements are subject to change and may differ between various locations. It is the buyer's/user's responsibility to ensure that his activities comply with all federal, state, provincial or local laws. The information presented here pertains only to the product as shipped. Since conditions for use of the product are not under the control of the manufacturer, it is the buyer's/user's duty to determine the conditions necessary for the safe use of this product. Due to the proliferation of sources for information such as manufacturer-specific (M)SDSs, we are not and cannot be responsible for (M)SDSs obtained from any source other than ourselves. If you have obtained an (M)SDS from another source or if you are not sure that the (M)SDS you have is current, please contact us for the most current version.*