NEW EQUIPMENT & SYSTEM APPROVAL PROFORMA

Ref: 10/37325

Note: the prompts given below are only a guide to the information required for approval. Dependent on the type of equipment or system that requires approval delete any section that is not applicable or include additional information if necessary. Mandatory fields are marked with an asterisk (*).

1 **Equipment or System to be approved** *

SpikeFast ET-75

SpikeFast ES-50-RM/RM II

2 **Originator** *

Name: Sonia Whiteman Company: Imtram Pty Ltd

3 **Introduction** *

SpikeFast is a patented dual-component, non-foam polyurethane product that is used to anchor spikes in wooden sleepers.

4 **Determination of Need** *

Within the ARTC network, it has been identified that this product has a use in the remediation of holes in timber sleepers and the remediation of seat abrasion on timber sleepers.

SpikeFast is able to repair damage to the timber sleeper so that replacement of the sleeper can be avoided and thus reduce maintenance costs substantially.

It is also a cost effective way of repairing damaged sleepers to facilitate re-gauging, in particular track can be regauged after using this product. Therefore old track can be cost effectively brought back into gauge, even when not scheduled for sleeper replacement.

5 **Significant Change or Not** *

This change in equipment or system is assessed as MINOR.

6 **Review Panel** *

- John Furness - Manager Standards
- Abbie Thomas - Track and Civil Standards Engineer
- Paul Wallace – Structures Manager CRN

7 **Safety**

SpikeFast can cause burns to the respiratory tract, eyes and skin via inhalation, eye contact and dermal contact respectively. Allergic skin reactions are also possible.

The container is to be tightly closed and sealed until ready for use. The product is not to be ingested and must be used in a ventilated area. The user must wash hands thoroughly after use.

For further details see product Material Safety Data sheets.

8 **Performance and Suitability.**

Performance tests commissioned by national railroads in America indicate that SpikeFast outperforms wood plugs and polymeric foam in lateral resistance, pull-out resistance and dynamic rail roll-over.

SpikeFast is able to be applied in extreme weather conditions including heavy rain, freezing temperatures and high humidity.

SpikeFast is easy to adz and holes are ready to re-spike within 10 minutes. SpikeFast bonds so tightly to the spike hole surface that it will not dislodge during the adzing process.

Unaffected by water, SpikeFast completely displaces standing water in spike holes without excess foaming, and it deeply penetrates cracks, voids and crevices in the sleeper to reduce moisture infiltration and sleeper rot.

The product can be applied with a manual applicator although automated equipment is available should large lengths of track require remediation

The technical and operational performance of SpikeFast is discussed further the attached documentation and in Section 8 (ii).

(i) **Use in other rail networks**

Currently SpikeFast is sold to Networks in the USA, Canada and Mexico.

Trials are also being undertaken in the United Kingdom.

(ii) **Use in the ARTC network**

SpikeFast was placed under an 18 month trial on parts of the South Corridor in the ARTC Network in July 2005.

At the time ARTC had no prior experience with this product and so the trial was based on an independent report from the Willamette Valley Company (the supplier at the time) regarding testing of this product in Canada by an internationally accredited company, Bodycote. This report established technical feasibility.

The trials occurred at Griffith and Wagga Wagga with the aim of checking the operational characteristics of SpikeFast such as general handling, application and suitability. The tests found that the product had potential for use across timber sleepers in the ARTC Network.

	For further details see the attached documentation.						
(iii)	**Issues arising from usage of the equipment/system** SpikeFast has a limited shelf-life. Product performance cannot be guaranteed if it is used past its use-by date.						
(iv)	**Changes required to infrastructure or systems for use of the equipment** No changes are required.						
9	**Approval** * The following products are approved for use on the ARTC Network: • SpikeFast® ET-75 • SpikeFast® ES-50 RM / RM II						
10	**Conditions of Approval** * • SpikeFast must be installed in accordance with manufacturer's instructions. • Ensure safe handling in accordance with the product's Material Safety Data Sheets.						
11	**Does the Originator accept the additional Conditions of Approval as set by the Review Panel:**	Yes	☒	No	☐	N/A	☐

12	**Sign off**		***ARTC office use only***
	Review Panel:		
	John Furness	Date:	12/08/2010
	Abbie Thomas	Date:	12/08/2010
	Paul Wallace	Date:	12/08/10

SpikeFast®

Willamette Valley Company's Railroad Division developed its proprietary product, SpikeFast, for wood-tie remediation in 1999.

SpikeFast is a patented dual-component, non-foam polyurethane product that is proven to anchor spikes better and longer than other traditional plugging materials. Performance tests commissioned by national railroads indicate that SpikeFast outperforms wood plugs, polymeric foam and epoxy foam in both lateral resistance and pullout resistance.

Apply SpikeFast in extreme weather conditions, including heavy rain, freezing temperatures and high humidity, and your result is solid ties that anchor as well as virgin oak. It is easy to adz, and holes are ready to re-spike within 10 minutes.

SpikeFast bonds so tightly to the spike hole surface that it will not dislodge during the adzing process. Unaffected by water, SpikeFast completely displaces standing water in spike holes without excess foaming, and it deeply penetrates cracks, voids and crevices in the tie to reduce moisture infiltration and tie rot.

SpikeFast helps maintenance crews be more efficient by allowing them to re-spike more rails in less time and providing a product that lasts longer than any alternative. SpikeFast will provide an immediate return on investment by reducing tie maintenance costs and rail down time.

Step 1

SpikeFast can be applied through the tie plate holes for re-gauging while the rail is in place. When new steel is laid the tie plates are removed.

Step 2

With the tie plates removed the spike holes are filled with SpikeFast.

WVCO

Willamette Valley Company

IMTRAM PTY. LTD.
ABN 16 006 830 119

OFFICE LOCATION:
37 Bond Street
Ringwood, Victoria
3134, Australia

MAILING ADDRESS:
P.O. Box 4460
Ringwood, Victoria
3134, Australia

Telephone: +613 9879 5200
Facsimile: +613 9879 5250
Email: imtram@imtram.com
Web: www.imtram.com

SpikeFast® Performance Specs

Performance tests commissioned by national railroads indicate that SpikeFast outperforms wood plugs, polymeric foam and epoxy foam in both lateral resistance and pullout resistance. The test results show that SpikeFast is the leading spike-hole filler in the railroad industry.

SpikeFast had high marks in tests such as spike insertion and withdrawal, where results indicated that SpikeFast's withdrawal force is equivalent to that of unspiked hardwood ties and nearly twice that of wood plugs and foam.

SpikeFast also had high results in the lateral resistance testing, where SpikeFast shows the resistance was 20% higher than that of previously unspiked hardwood ties.

See below for performance tests and their results on SpikeFast.

DESIGN CONCEPT AND CRITERIA

The design objectives are:

1. Typical spike insertion force must be less than or equal to 11,000 lbs. The basis for the maximum insertion force is the force required to spike virgin white oak.

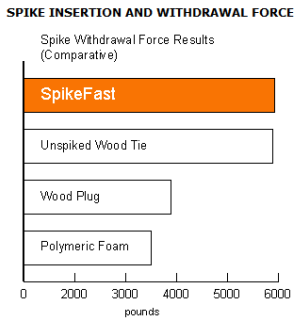
2. Typical spike withdrawal force must be greater than 6,000 lbs., which is significantly greater than wood plugs.

3. Performance must be maintained during all weather conditions including heavy rain, freezing temperatures and high humidity.

REACTION WITH WATER

SpikeFast does not react with water. Unlike the foam filler alternatives, SpikeFast retains its easy application and superior performance characteristics during all weather conditions including heavy rain, freezing temperatures and high humidity.

SPIKE INSERTION AND WITHDRAWAL FORCE



Results indicate that SpikeFast's spike withdrawal force is equivalent to that of unspiked hardwood ties and nearly twice that of wood plugs and foam – meaning you keep gauge longer. SpikeFast is as hard as red oak ties. When inserting the spike into a wood tie, SpikeFast allows the wood fibers to compress around the spike, thus providing superior holding properties.

In a separate study, spike holes filled with the SpikeFast required an average of 1000 lbs., additional force to drive the cut spike into the material.

To measure the withdrawal force, the cut spikes were pressed in and pulled out using a large tensile/compression machine.

This test indicates that SpikeFast has incredible spike holding properties – yet another reason why SpikeFast is the plugging material of choice for five of the six Class A railroads.

IMTRAM PTY. LTD.
ABN 16 006 830 119

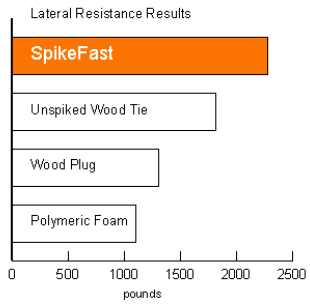
OFFICE LOCATION:
37 Bond Street
Ringwood, Victoria
3134, Australia

MAILING ADDRESS:
P.O. Box 4460
Ringwood, Victoria
3134, Australia

Telephone: +613 9879 5200
Facsimile: +613 9879 5250
Email: imtram@imtram.com
Web: www.imtram.com

LATERAL RESISTANCE TESTING

The AAR (Association of American Railroads) commissioned a comprehensive evaluation of all commercially available tie-plugging materials, including wood plugs, polymeric foams, and SpikeFast.



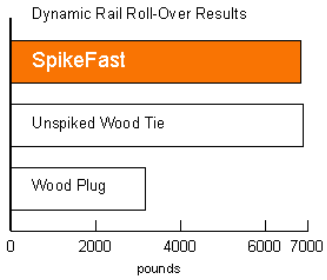
The lateral test results were obtained by measuring the force needed to laterally deflect a cut spike head 0.2 inches, which simulates rail-gauge loss (i.e., widening between the rails).

Due to using actual 20-year-old ties with wallowed-out spike holes and a wide range of tie integrity, a correspondingly wide range of analytical results were obtained. Therefore, all tests were conducted 20 to ~50 times and the results were averaged.

The data indicates that SpikeFast's lateral resistance was 20% higher than that of previously unspiked hardwood ties. These results indicate why it's beneficial to use SpikeFast over other plugging materials to minimize rail gauge loss.

DYNAMIC RAIL ROLLOVER TESTING

The results of a dynamic rail rollover study by a Class 1 railroad indicate that SpikeFast's resistance to rail rollover outperforms wood plugs two to one and can be compared to virgin oak.



Three million 32,000 lb. loading cycles at 3 Hertz were applied vertically against a railhead (two-feet long piece of rail) to simulate wear typically encountered in the field.

Simulated spike holes (3/4" with grain X 1" against grain X 5" deep) were pre-drilled into a virgin tie and filled with candidate-plugging materials. The railhead was anchored to a virgin tie with a single rail plate using four cut spikes.

After the loading cycles were completed, the lateral force needed to roll the rail over was measured. Each measurement was performed once.

IMTRAM PTY. LTD.
ABN 16 006 830 119

OFFICE LOCATION:
37 Bond Street
Ringwood, Victoria
3134, Australia

MAILING ADDRESS:
P.O. Box 4460
Ringwood, Victoria
3134, Australia

Telephone: +613 9879 5200
Facsimile: +613 9879 5250
Email: imtram@imtram.com
Web: www.imtram.com

Technical

Data Sheet

SPIKEFAST® ET-75

Wood Tie-Plugging Material

Willamette Valley Company

www.wilvaco.com

800.333.9826

Partnering through service, innovation, and integrity

WVCO Railroad Division

www.WVCORAILROAD.com

SALES DESK
1-800-333-9826
sales@wvcorailroad.com

PRODUCT SUPPORT
Michael R. Land
541.484.9621
03mikel@wilvaco.com

DESCRIPTION

SPIKEFAST® ET-75 is specifically designed to remediate wood ties. This non-foaming, 100% solid polyurethane is specifically designed to efficiently anchor spikes with comparable strength to that of un-spiked hardwood ties. SPIKEFAST® ET-75 is dispensed from equipment specifically engineered for efficient metering/mixing, presssure and temperature control, and operation under wide range of outdoor conditions.

WHERE TO USE

- **Wood crossties spike holes**–re-spike filled holes
- **Tie remediation**–bonds tightly to wood & seals out water
- **Tie defects**–penetrates cracks, voids, crevises

FEATURES AND BENEFITS

- **Quick Cure Time**–high production rates
- **Dynamic Rail Roll-Over**–equal to hardwood, 2X wood plugs
- **Lateral Resistance**–20% greater than hardwood ties
- **Easy to Apply**–minimal maintenance and clean up

PACKAGING

200 gallons (758 L), 50 gallons (190 L)
5 gallons (19 L), 15 oz. Cartridge (450 ml)

COLOR

White

YIELD

150 spike holes (0.63 in. x 0.63 in. x 4 in.) per gallon.
38 spike holes (1.6 cm x 1.6 cm x 10.2 cm) per liter.

SHELF LIFE

3 months when properly stored.

STORAGE

Store in original container and sealed until ready for use. Reseal used containers and store in an upright position.

TECHNICAL INFORMATION

Typical Properties

VOC, lbs/gal (g/L), ASTM D 2369	0
Viscosity, cps, ASTM D 4878, 77°F (25°C), Iso / Resin	200 / 5000
Hardness, Shore D, ASTM D 2240	80
Set time, sec, 77°F (25°C)	25 (Temperature dependent)
Service temperature, ° F (° C)	-40 to 212 (-40 to 100)

Process Parameters

Ratio by volume, Resin to Iso	2 to 1
Meter equipment	Plural component
Static mixer	13-32
Equipment pressure, psi (MPa)	400 - 600 (2.3 – 4.1)
Equipment temperature, ° F (° C)	70 to 125 (21 to 52)
Recommended application volume, in^3 (cm^3)	2 in^3 (32.5 cm^3)

APPLICATION

Use Willamette Valley Company's metering equipment which is specifically engineered for processing SPIKEFAST® ET-75 to generate the proper mix ratio, pressure, and temperature.

SPIKEFAST® ET-75 is supplied in a ready-to-use form that requires proper mixing and dispensing. Care should be taken that SPIKEFAST® ET-75 is stored properly, does not become contaminated with foreign matter, and is applied according to WVCO recommendations.

Proper application is the responsibility of the user. Field visits by WVCO Representatives are for the purpose of making technical recommendations and equipment service only, and not for supervising or providing quality control.

Contact a Willamette Valley Company Representative for more information on product and equipment instructions, recommendations, and full-service warranty.

HEALTH AND SAFETY

First Aid

- Refer to Material Safety Data Sheet (MSDS) for further information.
- For emergencies, call INFOTRAC 1-800-535-5053
- In case of eye or skin contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. Remove any contaminated clothing and shoes. Get medical attention immediately.
- In case material is released or spilled, stop leak or dike spilled material if without risk. Avoid contact with skin and clothing. Do not breathe vapor or mist. Use absorbent (soil may be used in the absence of other suitable materials) scoop up material and place in a sealed, liquid-proof container for disposal. Refer to MSDS for more details. Comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements for disposal of material.

WILLAMETTE VALLEY COMPANY
www.wilvaco.com
info@wilvaco.com

DIVISIONS

WESTERN DIVISION
1075 Arrowsmith Street
PO Box 2280
Eugene, OR 97402
Tel 541.484.9621
www.POLYQUIK.com
www.WVCORAILROAD.com

EASTERN DIVISION
6662 Marbut Road
Lithonia, GA 30058
Tel 888.878.9826

MIDWEST DIVISION
1549 Hwy 2
Two Harbors, MN 55616
Tel 218.834.3922

PRECISION TECHNOLOGIES DIVISION
675 McKinley Street
Eugene, OR 97402
Tel 541.484.2368
www.pre-tec.com

SOUTHERN DIVISION
100 Dixie Mae Drive
PO Box 4450
Pineville, Louisiana 71361
Tel 318.640.5077

SUBSIDIARIES

CANADIAN WILLAMETTE
20380 Langley Bypass
Langley, BC V3A 5E7
Tel 604.530.2031

ECLECTIC PRODUCTS INC.
Corporate Office
1075 Arrowsmith Street
Eugene, OR 97402
Tel 541.284.4667
www.eclecticproducts.com

IDAHO MILL & GRAIN
445 North 430 West Hwy
Po Box188
Malad City, Idaho 83252
Tel 208.766.2206

TAPEL WILLAMETTE LTD. S.A.
Av. Estero La Posada 3625 Parque Industrial Coronel Coronel, Chile
Tel 011.56.41.928.100
www.tapel.cl

REMSA AREMA

Revision Date 2-2009

Technical

Data Sheet

Willamette Valley Company

www.wilvaco.com

800.333.9826

Partnering through service, innovation, and integrity

WVCO Railroad Division

www.WVCORAILROAD.com

SALES DESK
1-800-333-9826
sales@wvcorailroad.com

PRODUCT SUPPORT
Michael R. Land
541.484.9621
03mikel@wilvaco.com

SPIKEFAST® ES-50 RM / RM II

Wood Tie-Plugging Material

DESCRIPTION

SPIKEFAST® ES-50-RM is specifically designed to remediate wood ties. This non-foaming, 100% solid polyurethane is specifically designed to efficiently anchor spikes with comparable strength to that of un-spiked hardwood ties. SPIKEFAST® ES-50-RM is dispensed from equipment specifically engineered for efficient metering/mixing, presssure and temperature control, and operation under wide range of outdoor conditions.

WHERE TO USE

- **Wood crossties spike holes**–re-spike filled holes
- **Tie remediation**–bonds tightly to wood & seals out water
- **Tie defects**–penetrates cracks, voids, crevises

FEATURES AND BENEFITS

- **Quick Cure Time**–high production rates
- **Dynamic Rail Roll-Over**–equal to hardwood, 2X wood plugs
- **Lateral Resistance**–20% greater than hardwood ties
- **Easy to Apply**–minimal maintenance and clean up

PACKAGING

200 gallons (758 L), 50 gallons (190 L)
5 gallons (19 L), 15 oz. Cartridge (450 ml)

COLOR

Yellow

YIELD

150 spike holes (0.63 in. x 0.63 in. x 4 in.) per gallon.
38 spike holes (1.6 cm x 1.6 cm x 10.2 cm) per liter.

SHELF LIFE

3 months when properly stored.

STORAGE

Store in original container and sealed until ready for use. Reseal used containers and store in an upright position.

TECHNICAL INFORMATION

Typical Properties

VOC, lbs/gal (g/L), ASTM D 2369	0
Viscosity, cps, ASTM D 4878, 77°F (25°C), Iso / Resin	200 / 4700 (RM) 200 / 2400 (RM II)
Hardness, Shore D, ASTM D 2240	80
Set time, sec, 77°F (25°C)	32 / 50—Cartridges (Temperature dependent)
Service temperature, ° F (° C)	-40 to 212 (-40 to 100)

Process Parameters

Ratio by volume, Resin to Iso	2 to 1
Meter equipment	Plural component
Static mixer	13-32
Equipment pressure, psi (MPa)	400 - 600 (2.3 – 4.1)
Equipment temperature, ° F (° C)	70 to 125 (21 to 52)
Recommended application volume, in^3 (cm^3)	2 in^3 (32.5 cm^3)

APPLICATION

Use Willamette Valley Company's metering equipment which is specifically engineered for processing SPIKEFAST® ES-50-RM to generate the proper mix ratio, pressure, and temperature.

SPIKEFAST® ES-50-RM is supplied in a ready-to-use form that requires proper mixing and dispensing. Care should be taken that SPIKEFAST® ES-50-RM is stored properly, does not become contaminated with foreign matter, and is applied according to WVCO recommendations.

Proper application is the responsibility of the user. Field visits by WVCO Representatives are for the purpose of making technical recommendations and equipment service only, and not for supervising or providing quality control.

Contact a Willamette Valley Company Representative for more information on product and equipment instructions, recommendations, and full-service warranty.

HEALTH AND SAFETY

First Aid

- Refer to Material Safety Data Sheet (MSDS) for further information.
- For emergencies, call INFOTRAC 1-800-535-5053
- In case of eye or skin contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. Remove any contaminated clothing and shoes. Get medical attention immediately.
- In case material is released or spilled, stop leak or dike spilled material if without risk. Avoid contact with skin and clothing. Do not breathe vapor or mist. Use absorbent (soil may be used in the absence of other suitable materials) scoop up material and place in a sealed, liquid-proof container for disposal. Refer to MSDS for more details. Comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements for disposal of material.

WILLAMETTE VALLEY COMPANY
www.wilvaco.com
info@wilvaco.com

DIVISIONS

WESTERN DIVISION
1075 Arrowsmith Street
PO Box 2280
Eugene, OR 97402
Tel 541.484.9621
www.POLYQUIK.com
www.WVCORAILROAD.com

EASTERN DIVISION
6662 Marbut Road
Lithonia, GA 30058
Tel 888.878.9826

MIDWEST DIVISION
1549 Hwy 2
Two Harbors, MN 55616
Tel 218.834.3922

PRECISION TECHNOLOGIES DIVISION
675 McKinley Street
Eugene, OR 97402
Tel 541.484.2368
www.pre-tec.com

SOUTHERN DIVISION
100 Dixie Mae Drive
PO Box 4450
Pineville, Louisiana 71361
Tel 318.640.5077

SUBSIDIARIES

CANADIAN WILLAMETTE
20380 Langley Bypass
Langley, BC V3A 5E7
Tel 604.530.2031

ECLECTIC PRODUCTS INC.
Corporate Office
1075 Arrowsmith Street
Eugene, OR 97402
Tel 541.284.4667
www.eclecticproducts.com

IDAHO MILL & GRAIN
445 North 430 West Hwy
Po Box188
Malad City, Idaho 83252
Tel 208.766.2206

TAPEL WILLAMETTE LTD. S.A.
Av. Estero La Posada 3625 Parque Industrial Coronel Coronel, Chile
Tel 011.56.41.928.100
www.tapel.cl

REMSA AREMA

Revision Date 8-2008

Material Safety Data Sheet

SPIKEFAST ET-75 CARTRIDGE

1 . Product and company identification

Product name : SPIKEFAST ET-75 CARTRIDGE

Supplier : Willamette Valley Company
1075 Arrowsmith
Eugene, OR 97402
541-484-9621

Material uses : Not available.

Manufacturer : Willamette Valley Company
1075 Arrowsmith
Eugene, OR 97402
541-484-9621

Code : 1710580B

Validation date : **5/15/2009.**

Print date : 5/15/2009.

Responsible name : **Regulatory Compliance**

In case of emergency : CALL INFOTRAC
800-535-5053
001-352-323-3500

2 . Hazards identification

Physical state : Liquid.

Emergency overview : DANGER !

CAUSES RESPIRATORY TRACT, EYE AND SKIN BURNS. MAY CAUSE ALLERGIC SKIN REACTION. MAY BE HARMFUL IF ABSORBED THROUGH SKIN OR IF SWALLOWED. CONTAINS MATERIAL THAT CAN CAUSE TARGET ORGAN DAMAGE.

Corrosive to the eyes, skin and respiratory system. Causes burns. Harmful in contact with skin and if swallowed. May cause sensitization by skin contact. Avoid exposure - obtain special instructions before use. Do not breathe vapor or mist. Do not ingest. Do not get in eyes or on skin or clothing. Contains material that can cause target organ damage. Use only with adequate ventilation. Keep container tightly closed and sealed until ready for use. Wash thoroughly after handling.

Routes of entry : Dermal contact. Eye contact. Inhalation.

Potential acute health effects

Inhalation : Corrosive to the respiratory system. Exposure to decomposition products may cause a health hazard. Serious effects may be delayed following exposure.

Ingestion : Harmful if swallowed. May cause burns to mouth, throat and stomach.

Skin : Corrosive to the skin. Causes burns. Harmful in contact with skin. May cause sensitization by skin contact.

Eyes : Corrosive to eyes. Causes burns.

Potential chronic health effects

Chronic effects : Contains material that can cause target organ damage.

Carcinogenicity : No known significant effects or critical hazards.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Target organs : Contains material which causes damage to the following organs: skin, eye, lens or cornea, nose/sinuses.

Over-exposure signs/symptoms

2 . Hazards identification

Inhalation : Adverse symptoms may include the following:
respiratory tract irritation
coughing

Ingestion : Adverse symptoms may include the following:
stomach pains

Skin : Adverse symptoms may include the following:
pain or irritation
redness
blistering may occur

Eyes : Adverse symptoms may include the following:
pain
watering
redness

Medical conditions aggravated by over-exposure : Pre-existing skin and digestive disorders and disorders involving any other target organs mentioned in this MSDS as being at risk may be aggravated by over-exposure to this product.

See toxicological information (section 11)

3 . Composition/information on ingredients

Name	CAS number	%
2-Ethyl-1,3-Hexanediol	94-96-2	10-30
Butyl Benzyl Phthalate	85-68-7	1-5
Amine.	Proprietary	1-5

There are no ingredients or additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

4 . First aid measures

Eye contact : Get medical attention immediately. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Chemical burns must be treated promptly by a physician.

Skin contact : Get medical attention immediately. Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Wash contaminated clothing thoroughly with water before removing or wear gloves. Continue to rinse for at least 10 minutes. Chemical burns must be treated promptly by a physician. In the event of any complaints or symptoms, avoid further exposure. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Inhalation : Get medical attention immediately. Move exposed person to fresh air. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. Keep person warm and at rest. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.

Ingestion : Get medical attention immediately. Wash out mouth with water. Remove dentures if any. Move exposed person to fresh air. Keep person warm and at rest. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Chemical burns must be treated promptly by a physician. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

4 . First aid measures

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing or wear gloves.

Notes to physician : In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.

5 . Fire-fighting measures

Flammability of the product : In a fire or if heated, a pressure increase will occur and the container may burst.

Extinguishing media

Suitable : Use an extinguishing agent suitable for the surrounding fire.

Not suitable : None known.

Special exposure hazards : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.

Hazardous combustion products : Decomposition products may include the following materials:
carbon oxides
nitrogen oxides
metal oxide/oxides

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

6 . Accidental release measures

Personal precautions : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see section 8).

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Large spill : Stop leak if without risk. Move containers from spill area. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see section 1 for emergency contact information and section 13 for waste disposal.

Small spill : Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble or absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.

7 . Handling and storage

Handling : Put on appropriate personal protective equipment (see section 8). Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Persons with a history of skin sensitization problems should not be employed in any process in which this product is used. Do not get in eyes or on skin or clothing. Do not breathe vapor or mist. Do not ingest. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Empty containers retain product residue and can be hazardous. Do not reuse container.

7 . Handling and storage

Storage : Store in accordance with local regulations. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see section 10) and food and drink. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

8 . Exposure controls/personal protection

Product name	Exposure limits
Amine.	TWA: 0.1 mg/m³ 8 hour(s).

Recommended monitoring procedures : If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment.

Engineering measures : Use only with adequate ventilation. If user operations generate dust, fumes, gas, vapor or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal protection

Respiratory : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Hands : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.

Eyes : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts.

Skin : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

9 . Physical and chemical properties

Physical state : Liquid.

Flash point : Open cup: >204.44°C (>400°F)

Color : White.

Odor : Odorless.

Boiling/condensation point : >100°C (>212°F)

Specific gravity : 1.19

Estimated Vapor Density : >1 [Air = 1]

VOC % : 15.1091%

Evaporation rate : <1 (Water = 1)

Solubility : Soluble in the following materials: water.

10 . Stability and reactivity

Stability : The product is stable. Under normal conditions of storage and use, hazardous polymerization will not occur.

Conditions to avoid : No specific data.

Materials to avoid : No specific data.

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Hazardous polymerization : Will not occur.

11 . Toxicological information

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
2-Ethyl-1,3-Hexanediol	LD50 Dermal	Rabbit	2 g/kg	-
	LD50 Dermal	Rabbit	8960 mg/kg	-
	LD50 Dermal	Rabbit	8960 mg/kg	-
	LD50 Dermal	Rabbit	8960 mg/kg	-
	LD50 Intravenous	Rat	131 mg/kg	-
	LD50 Oral	Rat	1400 mg/kg	-
	LD50 Oral	Rat	2710 mg/kg	-
	LD50 Oral	Rat	2710 mg/kg	-
Butyl Benzyl Phthalate	LD50 Dermal	Rat	6700 mg/kg	-
	LD50 Dermal	Rabbit	>10 g/kg	-
	LD50 Oral	Rat	2330 mg/kg	-

Carcinogenicity

Conclusion/Summary

IDLH : Not available.

Synergistic products : Not available.

12 . Ecological information

Environmental effects : No known significant effects or critical hazards.

Aquatic ecotoxicity

Product/ingredient name	Test	Result	Species	Exposure
Butyl Benzyl Phthalate	Intoxication	Acute EC50 1 mg/L	Daphnia	48 hours
	Intoxication	Acute EC50 >0.96 mg/L	Daphnia	48 hours
	Population	Acute EC50 0.21 mg/L	Algae	48 hours
	Mortality	Acute LC50 0.82 mg/L	Fish	96 hours
	Mortality	Acute LC50 >0.78 mg/L	Fish	96 hours
	Mortality	Acute LC50 1.5 mg/L	Fish	96 hours
Amine.	Intoxication	Acute EC50 17.4 mg/L	Daphnia	48 hours

Conclusion/Summary : Not available.

Biodegradability

Conclusion/Summary : Not available.

Other adverse effects : No known significant effects or critical hazards.

13 . Disposal considerations

Waste disposal : The generation of waste should be avoided or minimized wherever possible. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Disposal should be in accordance with applicable regional, national and local laws and regulations.

Refer to Section 7: HANDLING AND STORAGE and Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION for additional handling information and protection of employees.

14 . Transport information

Regulatory information	UN number	Proper shipping name	Classes	PG*	Label	Additional information
DOT Classification	Not regulated.	-	-	-		-
TDG Classification	Not regulated.	-	-	-		-
IMDG Class	Not regulated.	-	-	-		-
IATA-DGR Class	Not regulated.	-	-	-		-

PG* : Packing group

15 . Regulatory information

United States inventory (TSCA 8b): All components are listed or exempted.

SARA 311/312 - Acute, Chronic

California Prop. 65

WARNING: This product contains a chemical known to the State of California to cause cancer and birth defects or other reproductive harm.

Ingredient name	Cancer	Reproductive
Butyl Benzyl Phthalate	No.	Yes.
N-Methylpyrrolidone	No.	Yes.
Crystalline Silica	Yes.	No.

Canada

WHMIS (Canada) : Class D-2A: Material causing other toxic effects (Very toxic).
Class D-2B: Material causing other toxic effects (Toxic).
Class E: Corrosive material

Canadian lists : **CEPA Toxic substances**: None of the components are listed.

Canadian NPRI: The following components are listed: Butyl benzyl phthalate

Canada inventory : **Canada inventory:** Not determined.

This product has been classified according to the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.

Mexico

Classification :

EU regulations

15 . Regulatory information

Hazard symbol or symbols :

Risk phrases : R61- May cause harm to the unborn child.
R43- May cause sensitization by skin contact.
R51/53- Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Safety phrases : S53- Avoid exposure - obtain special instructions before use.
S2- Keep out of the reach of children.
S24- Avoid contact with skin.
S29- Do not empty into drains.
S37- Wear suitable gloves.
S46- If swallowed, seek medical advice immediately and show this container or label.
S61- Avoid release to the environment. Refer to special instructions/safety data sheet.

International regulations

International lists : **Australia inventory (AICS):** Not determined.
China inventory (IECSC): Not determined.
Korea inventory (KECI): Not determined.
Philippines inventory (PICCS): Not determined.
Japan inventory (ENCS): Not determined.
Europe inventory: Not determined.

16 . Other information

Hazardous Material Information System (U.S.A.) :

Health	*	2
Flammability		1
Physical hazards		0

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks Although HMIS® ratings are not required on MSDSs under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.

The customer is responsible for determining the PPE code for this material.

National Fire Protection Association (U.S.A.) :

Date of printing : **5/15/2009.**

Date of issue : **5/15/2009.**

Date of previous issue : **4/13/2009.**

Version : **0.03**

Indicates information that has changed from previously issued version.

Notice to reader

16 . Other information

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

Material Safety Data Sheet

SPIKEFAST ES ISO FOR CARTRIDGES

1 . Product and company identification

Product name : SPIKEFAST ES ISO FOR CARTRIDGES

Supplier : Willamette Valley Company
1075 Arrowsmith
Eugene, OR 97402
541-484-9621

Material uses : Not available.

Manufacturer : Willamette Valley Company
1075 Arrowsmith
Eugene, OR 97402
541-484-9621

Code : 1720010B

Validation date : **10/28/2008.**

Print date : 10/28/2008.

Responsible name : **Regulatory Compliance**

In case of emergency : CALL INFOTRAC
800-535-5053
001-352-323-3500

2 . Hazards identification

Physical state : Liquid.

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Emergency overview : WARNING !

CAUSES RESPIRATORY TRACT, EYE AND SKIN IRRITATION. MAY CAUSE ALLERGIC RESPIRATORY AND SKIN REACTION. CONTAINS MATERIAL THAT CAN CAUSE TARGET ORGAN DAMAGE.

Irritating to eyes, respiratory system and skin. May cause sensitization by inhalation and skin contact. Avoid exposure - obtain special instructions before use. Do not breathe vapor or mist. Do not get on skin or clothing. Avoid contact with eyes. Contains material that can cause target organ damage. Use only with adequate ventilation. Keep container tightly closed and sealed until ready for use. Wash thoroughly after handling.

Routes of entry : Dermal contact. Eye contact. Inhalation.

Potential acute health effects

Inhalation : Irritating to respiratory system. May cause sensitization by inhalation. Exposure to decomposition products may cause a health hazard. Serious effects may be delayed following exposure.

Ingestion : No known significant effects or critical hazards.

Skin : Irritating to skin. May cause sensitization by skin contact.

Eyes : Irritating to eyes.

Potential chronic health effects

Chronic effects : Contains material that can cause target organ damage.

Carcinogenicity : No known significant effects or critical hazards.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Target organs : Contains material which causes damage to the following organs: lungs, upper respiratory tract, eye, lens or cornea, nose/sinuses, throat.

Over-exposure signs/symptoms

2 . Hazards identification

Inhalation : Adverse symptoms may include the following:
respiratory tract irritation
coughing
wheezing and breathing difficulties
asthma

Ingestion : No specific data.

Skin : Adverse symptoms may include the following:
irritation
redness

Eyes : Adverse symptoms may include the following:
pain or irritation
watering
redness

Medical conditions aggravated by over-exposure : Pre-existing respiratory and skin disorders and disorders involving any other target organs mentioned in this MSDS as being at risk may be aggravated by over-exposure to this product.

Additional information : Sensitization may develop as a result of a single large overexposure or from repeated overexposure at lower levels. Respiratory sensitization can result in a strong asthmatic response to future airborne exposures, even at levels well below the PEL/TLV. Symptoms may include coughing, wheezing, tightness in the chest and shortness of breath. The skin sensitization reaction may include rash, itching, hives, and swelling of the arms and legs. Sensitization can be either temporary or permanent.

See toxicological information (section 11)

3 . Composition/information on ingredients

Name	CAS number	%
Polymethylenepolyphenyl Isocyanate	9016-87-9	30-60
4,4' -Diphenylmethane Diisocyanate	101-68-8	30-60
Mixed Isomers of MDI	26447-40-5	5-10

There are no ingredients or additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

4 . First aid measures

Eye contact : Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Get medical attention.

Skin contact : Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Wash contaminated clothing thoroughly with water before removing or wear gloves. Continue to rinse for at least 10 minutes. Get medical attention. In the event of any complaints or symptoms, avoid further exposure. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Inhalation : Move exposed person to fresh air. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. Keep person warm and at rest. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours. In the event of any complaints or symptoms, avoid further exposure.

4 . First aid measures

Ingestion : Wash out mouth with water. Remove dentures if any. Move exposed person to fresh air. Keep person warm and at rest. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Get medical attention. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing or wear gloves.

Notes to physician : In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.

5 . Fire-fighting measures

Flammability of the product : In a fire or if heated, a pressure increase will occur and the container may burst.

Extinguishing media

Suitable : Use an extinguishing agent suitable for the surrounding fire.

Not suitable : None known.

Special exposure hazards : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.

Hazardous combustion products : Decomposition products may include the following materials:
carbon oxides
nitrogen oxides

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

6 . Accidental release measures

Personal precautions : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see section 8).

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Large spill : Stop leak if without risk. Move containers from spill area. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see section 1 for emergency contact information and section 13 for waste disposal.

Small spill : Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble or absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.

7 . Handling and storage

Handling : Put on appropriate personal protective equipment (see section 8). Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Persons with a history of skin sensitization problems or asthma, allergies or chronic or recurrent respiratory disease should not be employed in any process in which this product is used. Do not get in eyes or on skin or clothing. Do not breathe vapor or mist. Do not ingest. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Empty containers retain product residue and can be hazardous. Do not reuse container.

Storage : Store in accordance with local regulations. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see section 10) and food and drink. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

8 . Exposure controls/personal protection

Product name	Exposure limits
4,4' -Diphenylmethane Diisocyanate	**ACGIH TLV (United States, 2/2003).** TWA: 0.05 mg/m³ 8 hour(s). Form: All forms TWA: 0.01 ppm 8 hour(s). Form: All forms **NIOSH REL (United States, 6/2001).** CEIL: 0.2 mg/m³ 10 minute(s). Form: All forms CEIL: 0.02 ppm 10 minute(s). Form: All forms TWA: 0.05 mg/m³ 10 hour(s). Form: All forms TWA: 0.01 ppm 10 hour(s). Form: All forms **OSHA PEL (United States, 6/1993).** CEIL: 0.2 mg/m³ Form: All forms CEIL: 0.02 ppm Form: All forms **OSHA PEL 1989 (United States, 3/1989).** CEIL: 0.2 mg/m³ Form: All forms CEIL: 0.02 ppm Form: All forms

Recommended monitoring procedures : If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment.

Engineering measures : Use only with adequate ventilation. If user operations generate dust, fumes, gas, vapor or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal protection

Respiratory : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Hands : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.

Eyes : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts.

Skin : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

8 . Exposure controls/personal protection

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

9 . Physical and chemical properties

Physical state : Liquid.

Flash point : Closed cup: 198.89°C (390°F) [Pensky-Martens.]
Open cup: 220°C (428°F)

Color : Brown. [Dark]

Odor : Aromatic. [Slight]

Boiling/condensation point : 200°C (392°F)

Specific gravity : 1.23

Vapor pressure : >0.0000013 kPa (>0.00001 mm Hg)

VOC % : 0%

To convert % VOC to lbs/gal use the following equation:
Specific Gravity*8.33*VOC%=VOC lbs/gal

Evaporation rate : Not available.

Solubility : Insoluble in the following materials: water.

10 . Stability and reactivity

Stability : Hazardous polymerization may occur under certain conditions of storage or use.

Conditions to avoid : No specific data.

Materials to avoid : No specific data.

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Hazardous polymerization : Yes. Water reactive.

11 . Toxicological information

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Polymethylenepolyphenyl Isocyanate	LD50 Dermal	Rabbit	>9400 mg/kg	-
	LD50 Oral	Rat	49 g/kg	-

Carcinogenicity

IDLH : Not available.

Synergistic products : Not available.

12 . Ecological information

Environmental effects : No known significant effects or critical hazards.

Aquatic ecotoxicity

Conclusion/Summary : Not available.

Biodegradability

Conclusion/Summary : Not available.

13 . Disposal considerations

Waste disposal : The generation of waste should be avoided or minimized wherever possible. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Disposal should be in accordance with applicable regional, national and local laws and regulations.

Refer to Section 7: HANDLING AND STORAGE and Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION for additional handling information and protection of employees.

14 . Transport information

Regulatory information	UN number	Proper shipping name	Classes	PG*	Label	Additional information
DOT Classification	Not regulated.	-	-	-		-
TDG Classification	Not regulated.	-	-	-		-
IMDG Class	Not regulated.	-	-	-		-
IATA-DGR Class	Not regulated.	-	-	-		-

PG* : Packing group

15 . Regulatory information

United States inventory (TSCA 8b): All components are listed or exempted.

SARA 311/312 - Acute, Chronic

SARA 313

Form R - Reporting requirements :

Product name	CAS number	Concentration
Polymethylenepolyphenyl Isocyanate	9016-87-9	30-60
4,4' -Diphenylmethane Diisocyanate	101-68-8	30-60
Mixed Isomers of MDI	26447-40-5	5-10

SARA 313 notifications must not be detached from the MSDS and any copying and redistribution of the MSDS shall include copying and redistribution of the notice attached to copies of the MSDS subsequently redistributed.

Canada

WHMIS (Canada) : Class D-1A: Material causing immediate and serious toxic effects (Very toxic).
Class D-2A: Material causing other toxic effects (Very toxic).
Class D-2B: Material causing other toxic effects (Toxic).

Canadian lists : **CEPA Toxic substances**: None of the components are listed.

Canadian NPRI: The following components are listed: Polymeric diphenylmethane diisocyanate

Canada inventory : **Canada inventory:** All components are listed or exempted.

This product has been classified according to the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.

Mexico

Classification :

15 . Regulatory information

EU regulations

Hazard symbol or symbols :

Risk phrases : R42- May cause sensitization by inhalation.

Safety phrases : S2- Keep out of the reach of children.
S23- Do not breathe vapor or spray.
S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
S63- In case of accident by inhalation: remove casualty to fresh air and keep at rest.

International regulations

International lists : **Australia inventory (AICS):** Not determined.
China inventory (IECSC): Not determined.
Korea inventory (KECI): Not determined.
Philippines inventory (PICCS): Not determined.
Japan inventory (ENCS): Not determined.

16 . Other information

Hazardous Material Information System (U.S.A.) :

Health	*	2
Flammability		1
Physical hazards		1

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks Although HMIS® ratings are not required on MSDSs under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.

The customer is responsible for determining the PPE code for this material.

National Fire Protection Association (U.S.A.) :

Date of printing : **10/28/2008.**

Date of issue : **10/28/2008.**

Date of previous issue : **No previous validation.**

Version : **1**

Indicates information that has changed from previously issued version.

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.