

**Occupational Exposure
Evaluation of ISOBORD and
MDF**

June 2000



FINAL REPORT

Occupational Hygiene Services

Submitted To

SHAPE
280-1385 West 8th Avenue
Vancouver, BC V6H 3V9

Submitted By

DILLON CONSULTING LIMITED
130-10691 Shellbridge Way
Richmond, B.C.
V6X 2W8

99-7047-01

EXECUTIVE SUMMARY

Dillon Consulting Limited (Dillon) was retained by Safety & Health in Arts Production & Entertainment (SHAPE) to evaluate the potential exposures to formaldehyde and isocyanates associated with Medium Density Fiberboard (MDF) products and ISOBORD™ used to construct sets and items for film and theatre production.

The results have indicated that without the use of proper engineering controls (e.g. local exhaust ventilation) or respiratory protection, there is a potential for exposure of workers to formaldehyde-containing dust. The preliminary airborne exposure monitoring of formaldehyde on wood dust resulted in a concentration of 1.5 ppm while cutting MDF, which exceeded the Ceiling Limit of 1.0 ppm. Also, the results have indicated that the potential for overexposure of workers to formaldehyde vapour from cutting and sanding MDF is unlikely.

The results from isocyanate monitoring during cutting and sanding ISOBORD indicated that the potential exposure to methylene bisphenyl isocyanate (MDI) vapour is unlikely.

It is recommended that the potential exposure to formaldehyde from formaldehyde-containing dust be minimized by engineering controls and the use of appropriate respiratory protection. Film industry personnel working frequently with MDF should be educated and informed about the potential exposure to formaldehyde during activities which generate large amounts of dust.

Although, exposure to MDI is unlikely when cutting or sanding ISOBORD, proper engineering controls and (e.g., local exhaust ventilation) or respiratory protection are required to control for dust.

The results presented in this report does not in any way endorse one product over the other for the film industry. Both products can be used in a safe manner without exposure to harmful contaminants if adequate engineering controls and personal protective equipment are used.

TABLE OF CONTENTS

1.0 INTRODUCTION2

2.0 EXPOSURE LIMITS2

3.0 POTENTIAL HEALTH EFFECTS2

 3.1 FORMALDEHYDE2

 3.2 ISOCYANATES3

4.0 METHODOLOGY3

 4.1 MEDIUM DENSITY FIBERBOARD (MDF)3

 4.2 ISOBORD™4

5.0 RESULTS4

 5.1 MDF (MEDITE)4

 5.1.1 Airborne Samples5

 5.1.2 Bulk Sample5

 5.2 ISOBORD™5

 5.2.1 Airborne Samples5

 5.2.2 Bulk Sample6

6.0 DISCUSSION6

7.0 CONCLUSIONS6

 7.1 MDF6

 7.2 ISOBORD7

8.0 RECOMMENDATIONS7

Appendices:

- Appendix A: Material Safety Data Sheet for MDF
- Appendix B: Material Safety Data Sheet for ISOBORD
- Appendix C: Field Sampling Data
- Appendix D: Original Laboratory Results

1.0 INTRODUCTION

Dillon Consulting Limited was retained by SHAPE to provide occupational hygiene services regarding potential exposures to formaldehyde and isocyanate while cutting and sanding ISOBORD™ and Medium Density Fiberboard (MDF) products.

Currently, MDF is frequently used to build sets and other items used in film and theatre production. Urea formaldehyde resin is the adhesive used in the manufacture of MDF. It is known that formaldehyde is released even after curing from certain wood products such as particleboard and fiberboard. There has been respiratory complaints from workers in the film industry of breathing difficulties and eye and nose irritation, who have extensively worked with MDF. The exact cause of the symptoms have not been investigated.

Recently, products using straw fibers and non-formaldehyde resin have been engineered due to the growing demand for environmentally responsible products. One of such product is called ISOBORD, being manufactured in Manitoba. Although ISOBORD is not manufactured using urea formaldehyde resin, an isocyanate resin (MDI) is used in the manufacturing process.

This project evaluated the two products from the perspective of potential exposure to hazardous contaminants – isocyanate and formaldehyde. This evaluation did not review the properties of these products for their practical applications in the film industry, i.e., cut or paint quality.

2.0 EXPOSURE LIMITS

In B.C., the Workers' Compensation Board (WCB) outlines occupational exposure limits for chemicals in Table 5-4 within Part 5, Chemical and Biological Substances of the *Occupational Health and Safety Regulation, 296/97, as amended by BC Reg 185/99*.

For isocyanate, in particular methylene bisphenyl isocyanate (MDI), the 8 hour Exposure Limit is 0.005 ppm with a 15-minute Exposure Limit of 0.01 ppm. MDI is designated as a sensitizer and an ALARA substance to which exposure of workers must be kept as low as reasonably achievable.

For formaldehyde, the 8 hour Exposure Limit is 0.3 ppm and has a Ceiling Exposure Limit of 1 ppm. Formaldehyde is considered a suspected human carcinogen, a sensitizer, and an ALARA substance.

3.0 POTENTIAL HEALTH EFFECTS

3.1 Formaldehyde

Formaldehyde is a colourless gas with a strong pungent odour. It is widely used in solution as a disinfectant, embalming agent and as an important industrial chemical used in glues, wood products, preservatives, paper product coatings and certain insulation materials. It is believed that products made with formaldehyde-based resin may release formaldehyde for short period of time after the product is delivered to the customer.

Formaldehyde is a strong irritant and sensitizer in humans and animals. Low level exposure to formaldehyde has been known to cause irritation of the eyes, nose and throat. Prolong exposure may

cause various symptoms, including prolonged eye, nose, and throat irritation, coughing, wheezing, diarrhea, nausea, vomiting, headaches, dizziness, lethargy, irritability, disturbed sleep, olfactory fatigue and skin irritation. Under the *B.C. Occupational Health and Safety Regulation*, formaldehyde is designated as a suspected human carcinogen.

NIOSH Manual of Analytical Methods, suggests that the results of vapour-phase and formaldehyde-containing particulates be reported separately until sufficient data has been collected to allow appropriate epidemiological interpretation of formaldehyde-containing particular exposures.

3.2 Isocyanates

Isocyanates are used in the manufacturing of plastic and polyurethane foam products, polyurethane paints, autobody products, and as an adhesive binding resin for wood products. The routes of exposure to isocyanates are mainly through inhalation and skin exposure.

Inhaling small amounts of isocyanates may sensitize a person and they can develop asthma-like reactions and symptoms. *Sensitization* may happen within days of exposure or take months or years to develop. It is well known that once sensitized, a person is likely to experience symptoms upon repeated exposure, even in very small concentrations. Direct skin contact with isocyanate-containing products may cause rashes, blistering and reddening of the skin. Repeated contact may cause dermatitis and skin sensitization. Some recent research has suggested that isocyanate exposure through the skin is very significant in the development of respiratory sensitization. Therefore, skin contact should be avoided.

After fully curing, the isocyanate based resin used in the manufacture of ISOBORD is no longer chemically active and is reported not to be a hazard to health unless heated to the point of decomposition. The cutting and sanding action of wood products with MDI resin may potentially release free isocyanates if heated enough.

Exposure limit for formaldehyde is 60 times greater than the exposure limit for isocyanate. However, the potential for exposure will depend on various factors such as the route of exposure, duration of exposure, and various work practices.

4.0 METHODOLOGY

On March 7, 2000, Madoka Okuma, of Dillon Consulting Ltd., conducted airborne sampling for formaldehyde exposure monitoring for a worker cutting and sanding MDF at Camel Productions in Vancouver. On May 9, 2000, Madoka Okuma conducted isocyanate exposure monitoring of a worker cutting and sanding ISOBORD at Camel Productions.

4.1 Medium Density Fiberboard (MDF)

The Material Safety Data Sheet (attached in Appendix A) states that the MDF contains 7-10% urea-formaldehyde resin and ammonia. Relative humidity and temperature will affect the rate of formaldehyde and ammonia emissions from products such as MDF. It states that storing MDF in warm and damp areas may promote the release of formaldehyde and ammonia.

The sampling methodology used to measure potential exposure to formaldehyde during cutting, sanding was the NIOSH method 5700, Formaldehyde on Dust. This method uses the IOM sampler 25mm PVC

filter, 5 um pore size with a flow rate of 2.0 L/minute. A Sep-Pak DNPH XpoSure Cartridge was placed behind the filter to capture any formaldehyde in the vapour phase. A bulk sample was also analyzed for formaldehyde by placing a known quantity of MDF wood dust into DNP/CAN solution prepared by the lab. This method determines both “released” formaldehyde and formaldehyde equivalents (e.g., resin components) on the wood dust for a worse case exposure scenario.

4.2 ISOBORD™

Isobord™ is an engineered “strawboard” product made from straw fibres and isocyanate-based resin. The resin, MDI (polymeric methylene bisphenyl isocyanate) is used to bind the fibres to make up the board. Although, the MDI once cured is not released into the air, there is the possibility of isocyanate exposure to person sanding or cutting products with MDI resin through thermal degradation. It has been stated that high temperatures are able to break down the resin into its constituents and therefore may release isocyanate into the air. The Material Safety Data Sheet for ISOBORD™ is attached in Appendix B.

The sampling methodology used was a version of the NIOSH 5521 method using pre-treated 13mm filters and 1-2 MP solutions. A known volume of air was pulled through the filter and any dust or vapour collected on the filter was placed in a solution of 1-2 MP in the field to form a stable derivative if any isocyanate is present. The sampler with a flow rate of 1.0 L/minute was placed on a worker that sanded and cut continuously for 15 minutes. A bulk saw dust sample was also analyzed for free isocyanate by placing a known quantity of ISOBORD wood dust into a solution of 1-2MP.

All samples were submitted to EnviroTest Laboratory in Edmonton Alberta, an American Industrial Hygiene Association (AIHA) accredited laboratory, for analysis.

See Appendix C and D for field sampling data and the original laboratory results.

5.0 RESULTS

5.1 MDF (Medite)

The results of the air sampling for formaldehyde are summarized in Table 1 below.

Table 1: Air Sampling Results for Formaldehyde

Sample ID	Location	TWA Formaldehyde Concentration (ppm)	Ceiling Limit (ppm)	8 hour Exposure Limit (ppm)
FM-1 (filter) (Mr. P. Ready)	cutting on table saw	1.5 ppm	1.0	0.3
FM-1 (cart.) (Mr. P. Ready)	cutting on table saw	0.16 ppm	1.0	0.3
FM-2 (filter) (Mr. P. Ready)	sanding	0.098 ppm	1.0	0.3
FM-2 (cart.) (Mr. P. Ready)	sanding	0.098 ppm	1.0	0.3

5.1.1 Airborne Samples

The airborne monitoring was conducted while a worker, cutting $\frac{3}{4}$ MDF on a table saw (Union Power Tools, Model # MBS250) with Makita 10” Carbide Tipped All Purpose blade. The exhaust ventilation was not operating during the air monitoring to obtain a “worst case scenario”

Another sample was collected while sanding MDF using a portable sander (Black and Decker random orbital sander, Model #4018-04 Type 2, with 180 grit). The worker was sanding on an open table with no ventilation.

The worker was wearing 3M 8210 N95 disposable dust/mist respirator at the time of monitoring. A typical cutting duration for a worker in set construction is 30 minutes in total per day. Workers tend to cut all the pieces required for the day and then start with other activities.

5.1.2 Bulk Sample

A bulk sample was taken of the dust immediately after cutting MDF with the table saw. The lab analysis concluded that the bulk dust sample had 0.37% formaldehyde by weight.

5.2 ISOBORD™

The results of the air sampling for MDI are summarized in Table 2 below.

Table 2: Air Sampling Results for MDI

Sample ID	Location	TWA MDI Concentration (ppm)	15 minute Exposure Limit (ppm)	8 hour Exposure Limit (ppm)
ISB-1 (Mr. P. Ready)	cutting on table saw	<0.0006 ppm	0.01	0.005
ISB-2 (Mr. P. Ready)	sanding	<0.0006 ppm	0.01	0.005

5.2.1 Airborne Samples

The airborne monitoring was conducted while a worker, was cutting $\frac{3}{4}$ ISOBORD on a table saw (Sharp Industries, Model # 891053) with General 10” Carbide Tipped All Purpose Blade. The exhaust ventilation was off during the air monitoring to obtain a “worst case scenario”.

Another sample was collected while sanding ISOBORD using a portable sander (Porter Cable random orbital sander, Model #7336 Type 2, with 180 grit). The worker was sanding on an open table with no ventilation.

The worker was wearing 3M 8210 N95 disposable dust/mist respirator at the time of monitoring.

5.2.2 Bulk Sample

A bulk sample was taken of the dust immediately after cutting ISOBORD with the table saw. The lab analysis concluded that the bulk dust sample had MDI concentrations below the detection limit (<5.0 µg/g) by weight.

6.0 DISCUSSION

This project evaluated MDF and ISOBORD™ for potential exposure to hazardous contaminants – isocyanate and formaldehyde. While monitoring and analysis results revealed a potential for exposure to formaldehyde while cutting and sanding of MDF, with the proper use of respiratory protection and engineering controls such as local exhaust ventilation, over-exposure of workers is unlikely. Since formaldehyde is considered an ALARA substance, good industrial hygiene practices dictate that exposure reduction measures should be taken to keep the exposure as low as reasonably achievable.

The results presented in this report does not in any way endorse one product over the other for the film industry. Both products can be used in a safe manner without exposure to harmful contaminants if adequate engineering controls and personal protective equipment are used.

7.0 CONCLUSIONS

7.1 MDF

- The 15-minute time-weighted average concentration of formaldehyde from formaldehyde-containing wood dust particle was 1.5 ppm while the worker was cutting MDF with a table saw. This exceeded the Ceiling Limit of 1.0 ppm and 8 hour exposure limit of 0.3 ppm.
- The 15-minute time-weighted average concentration of formaldehyde from formaldehyde-containing wood dust particle was 0.098 ppm while the worker was sanding MDF. The result was well below the Ceiling Limit of 1.0 ppm and 8 hour exposure limit of 0.3 ppm.
- The 15-minute time-weighted average concentrations of formaldehyde vapour (cartridge results) of 0.16 ppm and 0.098 ppm were below the Ceiling Limit and 8 hour exposure limit for both cutting and sanding MDF.
- The results of the bulk sample analysis of MDF wood dust revealed the low concentrations of formaldehyde (0.37% by weight of dry dust).
- There is a potential for exposure to formaldehyde containing dusts during table saw cutting of MDF if local exhaust ventilation and proper respiratory protection is not utilized.
- The potential for overexposure to formaldehyde vapour during cutting and sanding MDF is unlikely.

7.2 ISOBORD

- The 15-minute time-weighted average concentration of MDI when the worker was cutting ISOBORD was well below the detection limit of <0.0006 ppm and the 15-minute Exposure Limit of 0.01 ppm and 8 hour exposure limit of 0.005 ppm.
- The 15-minute time-weighted average concentration of MDI while the worker was sanding ISOBORD was well below the detection limit of <0.0006 ppm and the 15-minute Exposure Limit of 0.01 ppm and the 8 hour exposure limit of 0.005 ppm.
- The bulk sample analysis of ISOBORD dust cutting revealed that the concentration of isocyanate was below the detection limit of <0.5 µg/g.
- The potential for overexposure to MDI during cutting and sanding of ISOBORD is unlikely.

8.0 RECOMMENDATIONS

- It is recommended that local exhaust ventilation be used to minimize and control airborne concentrations of dust during activities such as cutting and sanding of wood products and other materials.
- It is recommended that NIOSH/MSHA-approved respirator equipped with N-100, R-100 or P-100 filter for dust/particulate be worn by workers cutting MDF to protect workers from exposure of formaldehyde-containing wood dust.
- It is recommended that NIOSH/MSHA-approved respirator (N-95 as a minimum) be worn by workers cutting and sanding ISOBORD to protect workers from dust.
- It is recommended that workers be educated and informed of the potential exposures to formaldehyde-containing wood dust while working with MDF.
- It is recommended that the results of the vapour-phase and formaldehyde-containing dust be kept separate due to the lack of correlation between epidemiological findings and exposure to formaldehyde-containing particles.
- A further study may be warranted if complaints of symptoms arise from workers using MDF or ISOBORD.

APPENDIX A:
MATERIAL SAFETY DATA SHEET
MDF

ATT: SAUCE

MEDIUM DENSITY FIBERBOARD (MDF)
QUICK IDENTIFIER (In Plain Common Name)

Material Safety Data Sheet

Manufacturer's Name	PLUM CREEK MANUFACTURING, L.P.	Emergency Telephone No.	(406) 892-8200
Address	500 12th Ave. West P.O. BOX 1980 Columbia Falls, MT 59912	Other Information Calls	(406) 892-8284
Signature of Person Responsible for Preparation	<i>David C. Pierce</i>	Date Prepared	APRIL 1, 1998

SECTION 1 - IDENTITY

Common Name: (used on label) (Trade Name & Synonyms)	MEDIUM DENSITY FIBERBOARD MDF	Case No.	NONE
Chemical Name	N/A	Chemical Family	N/A
Formula	N/A		

SECTION 2 - HAZARDOUS INGREDIENTS

Principal Hazardous Component(s) (chemical & common name(s))	%	Threshold Limit Value (unit)
UREA - FORMALDEHYDE RESIN	7-10%	.75 ppm
*FREE FORMALDEHYDE GAS IS LESS THAN 1% OF THE RESIN MIXTURE		
AMMONIA	<1%	25 ppm
WAX (PARAFFIN)	<1%	2.0 mg/m ³
SOFT WOOD DUST	—	8.0 mg/m ³

*0.3 ppm (1H)
1.0 ppm (C)*

LOW FORMALDEHYDE EMISSION MDF IS AVAILABLE THAT COMPLIES WITH:

- 1) H.U.D. STANDARD 24 CFR PART 3280 FOR PARTICLEBOARD
- 2) E-1

SECTION 3 - PHYSICAL & CHEMICAL CHARACTERISTICS (Fire & Explosion Data)

Boiling Point	N/A	Specific Gravity (H ₂ O = 1)	VARIABLE DEPENDENT ON WOOD SPECIES AND MOISTURE CONTENT	Vapor Pressure (mm Hg)	N/A
Percent Volatile by Volume (%)	N/A	Vapor Density (Air = 1)	N/A	Evaporation Rate (kg/m ² hr)	N/A
Solubility in Water	INSOLUBLE	Reactivity in Water	NONE		

APPEARANCE AND ODOR: LIGHT TO DARK TAN COLORED GRANULAR SOLID, COLOR AND ODOR ARE DEPENDENT ON THE WOOD SPECIES AND LENGTH OF TIME SINCE BOARD WAS MANUFACTURED. TREATED BOARD MAY SMELL LIKE AMMONIA

Flash Point	N/A	Flammable Limits in Air % by Volume	Lower: 40 g/m ³ Upper: N/A	Extinguisher Media	Water, CO ₂ , Sand	Auto-Ignition Temperature	400° - 500° F
-------------	-----	-------------------------------------	---------------------------------------	--------------------	-------------------------------	---------------------------	---------------

Special Fire Fighting Procedures: FIRE FIGHTING PROCEDURES ARE THE SAME AS OTHER WOOD PRODUCTS. SATURATE BOARD WITH WATER AND MOVE TO A SECURE OUTSIDE STORAGE LOCATION.
AVOID BREATHING SMOKE, WEAR NIOSH APPROVED RESPIRATORY PROTECTION.

Usual Fire and Explosion Hazards: FIBERBOARD DOES NOT PRESENT A FIRE OR EXPLOSION HAZARD. DUST GENERATED FROM SAWING, BANDING OR MACHINING MDF PRESENTS A SEVERE FIRE AND EXPLOSION HAZARD IF A DUST CLOUD SHOULD CONTACT AN IGNITION SOURCE.

SECTION 4 - PHYSICAL HAZARDS

Stability: Stable Unstable
 Conditions in Avoid: None 1) 2)
 RELATIVE HUMIDITY AND TEMPERATURE AFFECT THE RATE OF FORMALDEHYDE AND AMMONIA EMISSIONS FROM MDF. WOOD DUST MAY AUTO IGNITE AT TEMPERATURES IN EXCESS OF 400°F, PYROLYSIS MAY OCCUR AT LOWER TEMPERATURES.
 Incompatibility (Materials to Avoid): STRONG OXIDIZING AGENTS, STRONG ACIDS

Hazardous Decomposition Products: IRRITATING FUMES AND GASES, INCLUDING CARBON MONOXIDE, ALDEHYDES AND ORGANIC ACIDS.

Hazardous Polymerization: May Occur Will Not Occur Conditions to Avoid: NONE

SECTION 5 - HEALTH HAZARDS

Threshold Limit Value: 0.3 ppm CEILING (FORMALDEHYDE); 5.0 mg/m³ (WOOD DUST); 25 ppm 8-hr TWA (AMMONIA); 35 ppm 15 min STEL (AMMONIA)

Signs and Symptoms of Exposure: 1. Acute Overexposure: IRRITATION OF SKIN, EYES, NOSE AND RESPIRATORY SYSTEM. SENSITIZATION OF THE SKIN AND RESPIRATORY SYSTEM

2. Chronic Overexposure: THE E.P.A. HAS CLASSIFIED FORMALDEHYDE AS A PROBABLE HUMAN CARCINOGEN BASED ON LABORATORY RESEARCH.

Medical Conditions Generally Aggravated by Exposure: RESPIRATORY CONDITIONS OR ALLERGIES, SKIN CONDITIONS

Chemical Listed as Carcinogen or Potential Carcinogen: National Toxicology Program: Yes No IARC Monographs: Yes No OSHA: Yes No

OSHA Permissible Exposure Limit: 0.3 ppm 8-HR TWA (FORMALDEHYDE) ACGIH Threshold: 0.3 ppm 8-HR TWA (FORMALDEHYDE) Other Exposure Limit Used: 3 ppm 15-min STEL 6.5 ppm ACTION (FORMALDEHYDE) 50 ppm PEL; 95 ppm 15-min STEL (AMMONIA)

Emergency and First Aid Procedures:

1. Inhalation: REMOVE TO FRESH AIR

2. Eyes: FLUSH WITH WATER FOR 15 MINUTES. GET MEDICAL ATTENTION IF IRRITATION PERSISTS.

3. Skin: WASH AFFECTED AREA WITH SOAP AND WATER.

4. Ingestion: N/A

SECTION 6 - SPECIAL PROTECTION INFORMATION

Respiratory Protection (Specify Type): WEAR NIOSH / MSHA APPROVED FULL FACE DUST RESPIRATORY PROTECTION IF AIR CONTAMINANTS EXCEED TLV.

Ventilation: Local Exhaust: NECESSARY TO REMOVE DUST DURING SANDING, SAWING & MACHINING PROCESSES. Mechanical: VENTILATE TO MAINTAIN FORMALDEHYDE CONCENTRATION LESS THAN THE PEL OR TLV. Symbol: N/A Other: N/A

Protective Gloves: RECOMMENDED Eye Protection: SAFETY GLASSES, GOGGLES OR FULL FACE RESPIRATOR

Other Protective Clothing or Equipment: PROTECTIVE OUTER LAYER MAY BE DESIRABLE IN EXTREMELY DUSTY AREAS.

SECTION 7 - SPECIAL PRECAUTIONS AND SPILL/LEAK PROCEDURES

Precautions to be Taken in Handling and Storage: PROVIDE ADEQUATE VENTILATION. FORMALDEHYDE AND/OR AMMONIA VAPORS MAY BE RELEASED DURING STORAGE. STORE IN A COOL DRY PLACE AWAY FROM OPEN FLAME, SPARKS OR HOT SURFACES.

Other Precautions:

Steps to be Taken in Case Material is Released or Spilled: VACUUM, SWEEP, OR SHOVEL TO MINIMIZE DUST GENERATION. PROVIDE ADEQUATE VENTILATION

Waste Disposal Methods: DISPOSE ACCORDING TO APPLICABLE FEDERAL, STATE AND LOCAL REGULATIONS. RESINS USED IN GLUE FORMULATIONS CONTAIN FORMALDEHYDE.

IMPORTANT

Do not leave any blank spaces. If required information is unavailable, unknown, or does not apply, so indicate.

APPENDIX B:
MATERIAL SAFETY DATA SHEET
ISOBORD™

MATERIAL SAFETY DATA SHEET

SECTION I - PRODUCT IDENTIFICATION AND USE

Product Identifier: ISOBORD™
Product Use: Composite Panel
Supplier: Isobord Enterprises Inc.
Address: P.O. Box 328, Elie, Manitoba R0H 0H0
Telephone: (503) 242-7345 Fax: (503) 721-0940

SECTION II - INGREDIENTS

Ingredients	CAS Number	Exposure limits	LD 50	LC50
Wheat Straw		15 mg/m ³ total dust 5.0 mg/m ³ breathable dust	n/a	n/a
Polyurethane binder		n/a	n/a	n/a

SECTION III - PHYSICAL DATA

Physical State: Solid
Density Range: 608 – 832 kg / m³ (38 – 52 lb / cu. ft)
Odour and appearance: Pale golden colour, no distinctive odour
Odour threshold: Not applicable.
pH: Not applicable.
Vapour pressure (mm Hg): Not applicable.
Vapour density (air = 1): Not applicable.
Evaporation rate (water = 1): Not applicable.
% volatile by volume: Not applicable.
Solubility in water: Not soluble – moisture resistant
Boiling point (°C): Not applicable.
Freezing point (°C): Not applicable.
Coefficient of oil/water distribution: Not applicable.

SECTION IV - FIRE AND EXPLOSION DATA

Flammable or combustible:	Not flammable or combustible.
Flash point (°C):	Not applicable
Upper flammable limit:	Not applicable.
Lower flammable limit:	Not applicable.
Autoignition temperature:	425 °F – 475 °F
Flammability classification:	Class "C"
Conditions of flammability:	Open flame
Special fire fighting procedures:	Cool boards in vicinity of fire with water spray. Fire fighters should be equipped with full protective gear, including self-contained breathing apparatus.
Means of extinction:	Water, foam, carbon dioxide, dry chemical.
Products of combustion:	CO, CO ₂ , HCN, NO
Sensitivity to mechanical impact:	Not applicable.
Sensitivity to static discharge:	Not applicable.

Product identifier: ISOBORD™

SECTION V - REACTIVITY DATA

Is the product stable?	Stable
Conditions of reactivity	Hazardous polymerization will not occur
Incompatible substances:	None known
Products of decomposition:	Thermal decomposition may yield carbon monoxide and nitrogen

SECTION VI - TOXICOLOGICAL PROPERTIES

WHMIS CLASSIFICATION: Not a controlled product.

Primary routes of exposure: Sawing or sanding may produce sawdust particles which may irritate skin and eyes on contact and if inhaled.

Exposure limits: 15 mg/m³ total dust, 5 mg/m³ breathable dust

Acute effects of exposure: Saw dust may cause mild irritation and redness to eyes.

Inhalation: Saw dust may cause mild irritation of the respiratory tract.

Chronic effects: None anticipated

Sensitizer: None anticipated

Carcinogen Ingredients are not listed - IARC, NTP, OSHA

SECTION VII - PREVENTION MEASURES

Gloves: may be used to protect the hands in material handling situations.	Respirator: particulate mask recommended where necessary to protect against breathing sawdust.	Eye protection: safety glasses should be used when sawing or sanding.
Footwear: no special requirements.	Clothing: to prevent skin contact.	Other: emergency eye wash station.

Engineering controls: Avoid generating sawdust where possible.

Leak and spill procedures: Sawdust should be gathered up without generating dust clouds and contained for disposal.

Waste disposal: Incinerate or landfill in accordance to municipal, provincial, state, and federal regulations.

Handling and storage requirements: No special storage requirements.

Special shipping information: Not controlled under T.D.G.

SECTION VIII - FIRST AID MEASURES

Skin contact: If sawdust irritates the skin, wash thoroughly with soap and water. Remove clothing and launder before re-use.

Eye contact: Flush eyes and under eyelids with plenty of cool water until dust particles are flushed away. Consult physician if irritation persists.

Inhalation: Move to fresh air.

SECTION IX - PREPARATION DATA

THE INFORMATION HEREIN IS BASED ON THE VENDOR'S MSDS, CCOSH, AND CCINFO WITH ADDITIONS AS NECESSARY TO COMPLY WITH CURRENT REGULATIONS. THE INFORMATION IS BELIEVED TO BE ACCURATE AT THE TIME OF PREPARATION. HOWEVER, ISOBORD ENTERPRISES INC. MAKES NO WARRANTY, EITHER EXPRESSED OR IMPLIED CONCERNING THE ACCURACY OR COMPLETENESS OF THE INFORMATION.

Prepared by: Isobord Enterprises Inc.
Preparation Date: February 1, 2000

APPENDIX C:
FIELD SAMPLING DATA

DILLON CONSULTING LIMITED
 OCCUPATIONAL HYGIENE AIR SAMPLING DATA

client/project #: SHADE 99-7047-01
 date: MARCH 7/2008
 sampled by: U. OKUMA

Sample I.D.	Media	Pump I.D.	Location	Flow Rates (L/min)			Sampling Time		Duration (min)
				Pre	Post	Avg	Start	Stop	
FM-1	PC/cant.	#1	Table Saw	2.055	2.024	2.04	9:00 am	9:15 am	15 min
FM-2	PC/cant.	#2	Sander	2.039	2.013	2.05	9:37 am	9:52 am	15 min
Bulk MDF dust			Table Saw						

NOTES:

DILLON CONSULTING LIMITED
 OCCUPATIONAL HYGIENE AIR SAMPLING DATA

client/project #: SHAPE 99-7047-01
 date: MAY 9/00
 sampled by: M. OKUMA

Sample I.D.	Media	Pump I.D.	Location	Flow Rates (L/min)			Sampling Time		Duration (min)
				Pre	Post	Avg	Start	Stop	
ISB-1	MPP coated filter	2	Table Saw	1.083	1.055	1.069	2:14 pm	2:29 pm	15 min
ISB-2	MPP coated filter	2	Sawdust	1.083	1.055	1.069	2:40 pm	2:55 pm	15 min
Bulk ISD board dust			Table Saw cutting dust						

NOTES:

APPENDIX D:
ORIGINAL LABORATORY RESULTS

ETL Enviro-Test

A DIVISION OF ETL CHEMSPEC ANALYTICAL LIMITED

Edmonton (Main)
37 Avenue
Edmonton, AB
T6C 0P5
Phone: (780) 413-5227
(780) 437-2311

CHEMICAL ANALYSIS REPORT

DILLON CONSULTING

DATE: April 03, 2000

ATTN: MADOKA OKOMA
130 10691 SHELLBRIDGE WAY
RICHMOND BC V6X 2W8

Edmonton (Downtown)
10158 - 103 Street
Edmonton, AB
T6C 0X6
Phone: (780) 413-5265
(780) 424-4602

Calgary
313 - 44th Ave. N.E.
Calgary, AB
T2C 6L5
Phone: (403) 291-9897
(403) 291-0298

Lab Work Order #: L7332

Sampled By: MO

Date Received: 03/08/00

Project P.O. #: NOT SUBMITTED

Project Reference: NOT SUBMITTED

Comments:

Grande Prairie
11 Street
Grande Prairie, AB
T6S 5W1
Phone: (780) 539-5196
(780) 513-2191

Saskatoon
Primary Road
Saskatoon, SK
S7N 3C3
Phone: (306) 668-8370
(306) 668-8383
(306) 668-7645

APPROVED BY: _____



Project Manager

Winnipeg
Main Avenue
Winnipeg, MB
R3L 5L5
Phone: (204) 945-3705
(204) 945-0763

Thunder Bay
Horton Street
Thunder Bay, ON
P7B 5N3
Phone: (807) 623-6463
(807) 623-7598

Canada Wide Phone:
(800) 368-9878

Canada Fax:
(800) 286-7319

THIS REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL WITHOUT THE WRITTEN AUTHORITY OF THE LABORATORY. ALL SAMPLES WILL BE DISPOSED OF AFTER 30 DAYS FOLLOWING ANALYSIS. PLEASE CONTACT THE LAB IF YOU REQUIRE ADDITIONAL SAMPLE STORAGE TIME.

ACCREDITATIONS: STANDARDS COUNCIL OF CANADA (SCC), IN COOPERATION WITH THE CANADIAN ASSOCIATION FOR ENVIRONMENTAL ANALYTICAL LABORATORIES (CAEAL); FOR SPECIFIC TESTS AS REGISTERED BY THE COUNCIL (EDMONTON, CALGARY, SASKATOON, WINNIPEG, THUNDER BAY) AMERICAN INDUSTRIAL HYGIENE ASSOCIATION (AIHA) FOR INDUSTRIAL HYGIENE ANALYSIS (EDMONTON, WILFRED J. STANDARDS COUNCIL OF CANADA IN COOPERATION WITH THE CANADIAN FOOD INSPECTION AGENCY (CFIA) FOR FERTILIZER AND FEED TESTING (SASKATOON)

ENVIRO-TEST CHEMICAL ANALYSIS REPORT

Lab ID	Sample ID	Test Description	Result	D.L.	Units	Extracted	Analyzed	By
L7332-1	FM-1 (FILTER)							
	Sample Date	07-MAR-00						
	Matrix:							
		Formaldehyde/Air(HPLC)						
		FRONT Formaldehyde	59	0.3	ug		24-MAR-00	ALK
L7332-2	FM-2 (FILTER)							
	Sample Date	07-MAR-00						
	Matrix:							
		Formaldehyde/Air(HPLC)						
		FRONT Formaldehyde	3.6	0.3	ug		24-MAR-00	ALK
L7332-3	FM-1(CART.)							
	Sample Date	07-MAR-00						
	Matrix:							
		Formaldehyde/Air(HPLC)						
		FRONT Formaldehyde	6.8	0.03	ug		24-MAR-00	ALK
L7332-4	FM-2(CART.)							
	Sample Date	07-MAR-00						
	Matrix:							
		Formaldehyde/Air(HPLC)						
		FRONT Formaldehyde	3.7	0.03	ug		24-MAR-00	ALK
L7332-5	BULK MDF-3							
	Sample Date	07-MAR-00						
	Matrix:							
		Formaldehyde	3700	1	ug/g		24-MAR-00	ALK

Methodology Reference

<u>TL Test Code</u>	<u>Test Description</u>	<u>Methodology Reference</u>
FOR-HPLC-ED	Formaldehyde/Air(HPLC)	EPA TO-11A-HPLC UV
MISCIH-HPLC-ED	Target compounds by HPLC	HPLC UV

CHEMICAL ANALYSIS REPORT

DILLON CONSULTING
130 10691 SHELLBRIDGE WAY
RICHMOND BC V6X 2W8
ATTN: MADOKA OKUMA

DATE: June 07, 2000

Lab Work Order #: L9785
Project Reference: NOT SUBMITTED
Project P.O. #: NOT SUBMITTED

Sampled By: MO
Date Received: 05/11/00

Comments:

APPROVED BY:



LARRY SERBIN
Project Manager

THIS REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL WITHOUT THE WRITTEN AUTHORITY OF THE LABORATORY.
ALL SAMPLES WILL BE DISPOSED OF AFTER 30 DAYS FOLLOWING ANALYSIS. PLEASE CONTACT THE LAB IF YOU
REQUIRE ADDITIONAL SAMPLE STORAGE TIME.

ACCREDITATIONS: STANDARDS COUNCIL OF CANADA (SCC), IN COOPERATION WITH THE CANADIAN ASSOCIATION FOR
ENVIRONMENTAL ANALYTICAL LABORATORIES (CAEAL); FOR SPECIFIC TESTS AS REGISTERED BY THE
COUNCIL (EDMONTON, CALGARY, SASKATOON, WINNIPEG, THUNDER BAY)
AMERICAN INDUSTRIAL HYGIENE ASSOCIATION (AIHA) FOR INDUSTRIAL HYGIENE ANALYSIS (EDMONTON,
WI STANDARDS COUNCIL OF CANADA IN COOPERATION WITH THE CANADIAN FOOD INSPECTION AGENCY
(CFIA) FOR FERTILIZER AND FEED TESTING (SASKATOON)

L9785 Cont...
Page 2...**ENVIRO-TEST CHEMICAL ANALYSIS REPORT**

TEST: p,p- Diphenylmethane Diisocyanate (MDI)

METHOD: OSHA 42/47

SAMPLE DESCRIPTION	LAB-ID	RESULT (µg/sample)	D.L.	AIR VOL (L)	AIR CONCENTRATION RESULT	UNITS
1	L9785-1	<0.1	0.1	16.04	<0.0006	ppm
2	L9785-2	<0.1	0.1	16.04	<0.0006	ppm
BLANK	L9785-3	<0.1	0.1	--	--	--

D.L.: DETECTION LIMIT

TEST: p,p- Diphenylmethane Diisocyanate (MDI)

METHOD: OSHA 42/47

SAMPLE DESCRIPTION	LAB-ID	RESULT (µg/sample)	D.L.	WEIGHT (g)	BULK CONCENTRATION RESULT	UNITS
BULK	L9785-4	<0.3	0.3	0.05013	<5.0	µg/g

D.L.: DETECTION LIMIT

QUALITY CONTROL: RECOVERY OF A QUALITY CONTROL SUBSTANCE WAS 101%