CODING FORM FOR SRC INDEXING

REVISED 10/15/86

Microfiche No.	OTS0517126	
New Doc I.D.	86-870000047	Old Doc I.D.
Date Produced	8/13/87	Date Received 9/18/87
TSCA section	8D	
Submitting Organization	PPG CANADA INC	
Contractor	CLAYTON ENVIR CONSULTANTS LTD	
Document Title	ISOCYANATE CONCENTRATIONS AT PPG CANADA INC	
Chemical Category	TOLUENE DIISOCYANATE (584-84-9)	

13.

Isocyanate Concentrations at PPG Canada Inc. - Clayton Plant, Cobourg

February 23, 1987

Toluene Diisocyanate	584-84-9
Methylene Bisphenyl Isocyanate	101-68-8
Hexamethylene Diisocyanate	822-06-0

CONTAINS NO CBI

~~Isocyanate Concentrations~~
at
PPG Canada Inc.
Duplate Division
P.O. Box 340
First Avenue
Oshawa, Ontario
L1H 7L3

Clayton Project No. 6699-53
February 23, 1987

EXECUTIVE SUMMARY

Personal and area samples collected in the Bonding Room at PPG Canada Inc., Duplate Division on February 13, 1987 indicate that:

- all measured concentrations of TDI, MDI and HDI were below the current legislated standard of 0.005 ppm set by the Ontario Ministry of Labour except for an area sample collected at the station where window glass is cleaned and primed with a MDI concentration of 0.0057 ppm.

Personal samples collected on Mr. J. Keller to determine short-term exposure levels indicate that:

- TDI concentrations ranged from <0.0019 ppm to 0.0098 ppm
- MDI concentrations ranged from <0.0013 ppm to 0.013 ppm
- HDI concentrations ranged from <0.00096 ppm to 0.081 ppm.

The measured face velocity taken at work stations in the Bonding Room revealed an average velocity of 540 fpm, ranging between 425 fpm and 642 fpm.

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Clayton Project No. 6699-53
February 23, 1987

400 Huron Church Road • Windsor, Ontario N9C 2L9 • (519) 255-9797

1.0 INTRODUCTION

This sampling program for toluene diisocyanate (TDI), methylene bisphenyl isocyanate (MDI) and hexamethylene 1,6-diisocyanate (HDI) concentrations was requested by Mr. D.C. Dale, Safety-Health-Environmental and Training Supervisor at PPG Canada Inc.

Air sampling was conducted in the Bonding Room during the V/W Body Glass Procedure by Ms. B. Malenfant, Environmental Specialist of Clayton Environmental Consultants on February 13, 1987.

2.0 BACKGROUND

The Bonding Room at PPG Canada Inc., Duplate Division uses a V/W and W Body Glass Procedure to mount clips on automobile window glass in order for a high center tail-light to be attached. The solvents and primers used in the process contain a mixture of organic solvents and isocyanate-based chemicals.

The V/W procedure used on February 6, 1987 involved the use of the following products supplied by Essex Specialty Products, Inc.:

- Essex Black Neryl Primer #435.34
- Essex Clear Primer #435.18
- Essex Black Primer #435.20
- Essex Urethane Sealant #553.02

Only Essex Black Primer #435.20 and Essex Urethane Sealant #553.02 contain isocyanates. Essex Black Primer #435.20 is a polyurethane-silane polymer containing <0.1% of total free monomer (TDI and HDI) and is used to prime automobile glass.

Essex Urethane Sealant #553.02 is also applied to the automobile window glass then the clip is mounted using an assembly fixture. This urethane sealant is an MDI based urethane polymer containing <1.0% free MDI.

3.0 OBJECTIVES

The objectives of this survey were to:

- establish the airborne concentrations of TDI, MDI and HDI for personal and area exposures in accordance with the Ontario Ministry of Labour's (MOL) Regulation respecting Isocyanates made under the Occupational Health and Safety Act
- collect samples in the Bonding Room for approximately an entire work shift in order to obtain a better estimate of the time-weighted average exposure
- collect personal samples in the Bonding Room for 15 minutes in order to determine the maximum exposure concentrations
- analyze the collected samples for TDI, MDI and HDI in accordance with approved analytical techniques
- calculate all personal and area sample concentrations of TDI, MDI and HDI in parts per million (ppm)
- determine velocity measurements in the Bonding Room
- provide a final comprehensive report to PPG Canada Inc. upon completion of sampling and analysis.

4.0 EXPERIMENTAL PROCEDURES

4.1 CALIBRATION AND QUALITY ASSURANCE

SKC model 224SD and Gilian Model HFS113A portable pumps were used for sampling. These pumps are rechargeable battery operated diaphragm models with a flow indicator which was checked hourly to ensure that the appropriate sampling rate was maintained. Calibration of all pumps before and after the sampling program provided accurate air sampling rates required to calculate the total air volume sampled.

The mini-BUCK CALIBRATOR was used as a primary gas flow standard meter. The rotameter on the pumps were set at a reading that represented the appropriate flowrate. The actual flowrate was determined from the average of three readings obtained from the mini-BUCK CALIBRATOR. All flowrates were adjusted to standard temperature and pressure.

Pumps used for the collection of area samples were placed in selected locations where they would not interfere with worker's duties and at a height which approximated workers breathing zones.

The pumps used for personal samples were attached to the worker's belt. Flexible tubing, which connected the inlet of the pump to the sampling train was clipped to the worker's lapel in order to sample as close as possible to the breathing zone. When the sampling period was completed, the air flow rate was checked and the pump switched off. Sampling was conducted only during actual work periods, hence terminated ~~during break~~ and lunch periods. Samples were removed from the worker and area locations at the completion of the work shift and placed in a cooler for transport to the laboratory for analysis.

A blank subjected to the same treatment as the samples except for no exposure to the sampling environment, was prepared and analyzed to determine the possible presence of contamination.

4.2 TDI, MDI, HDI

The equipment and procedures for collection and analysis of airborne isocyanates conforms to the "Regulation respecting Isocyanates" made under the Occupational Health and Safety Act of the Province of Ontario.

4.2.1 Sample Acquisition

The samples were collected by drawing air at 1 Lpm, by means of battery powered personal sampling pumps through two midget impingers connected in series. Each impinger contained 15ml of absorbing solution.

Each pump was calibrated with the sampling train assembled just as it was used during sampling. Flexible tubing connected the pump to a cassette packed with 0.5g glass wool, to prevent water condensation in the pump, then additional tubing connected two impingers in series to the cassette.

4.2.2 Sample Analysis

Isocyanates react with the absorbing solution, nitro reagent, to form urea derivatives which were analyzed by high pressure liquid chromatography.

5.0 RESULTS

Results of analysis for measured concentrations of TDI, MDI and HDI are presented in Table 1.

The current legislated standard for exposure to airborne isocyanates, specifically TDI, MDI and HDI is 0.005 ppm as a time-weighted average. The measured concentration of TDI ranged between <0.000066 ppm and 0.00092 ppm, and a range of <0.000034 ppm to 0.00047 ppm was found for HDI. The concentration of MDI ranged from <0.000046 ppm to 0.0057 ppm. The station at which window glass is cleaned and primed revealed a concentration of 0.0057 ppm for MDI.

Results of analysis for short-term exposures to isocyanates are presented in Table 2.

A ceiling concentration of 0.02 ppm has been set by the MOL for TDI, MDI and HDI. Short-term exposure concentrations were determined by monitoring personnel exposures at the various work stations. During window glass clean and prime, and clip clean and prime, TDI, MDI and HDI concentrations were found to be <0.0019 ppm, <0.0013 ppm and <0.00096 ppm, respectively. At the work station where clips are glued on the windows, the concentration of HDI was found to be 0.081 ppm which exceeds the ceiling limit. The concentrations of TDI and MDI were found to be 0.0098 ppm and 0.013 ppm respectively.

Table 1: Results of Analysis for Isocyanates Performed on Samples Collected on February 13, 1987 in the Bonding Room at PPG Canada Inc., Oshawa, Ontario

Clayton Project No. 6699-53

Sample Location	Total Sampling Time (minutes)	Air Volume (liters)	Measured Concentration TDI ppm	MDI ppm	HDI ppm
Clips cleaned and primed	411	428.1	<0.000066	<0.000046	<0.000034
Window glass cleaned and primed	411	408.5	0.00092	0.0057	0.00047
Clips glued on windows	410	427.0	0.00011	0.00040	<0.000034
Glen Turney Employee No. 1353 Window glass cleaned and primed	307	319.8	<0.000088	<0.000061	<0.000046
Harold Babcock Employee No. 1552 Clips glued on windows	164	166.4	<0.00017	<0.00012	<0.000087

.005

Table 2: Results of Short-Term Exposures to Isocyanate Concentrations in the Bonding Room at PPG Canada Inc., Oshawa, Ontario February 13, 1987

Clayton Project No. 6659-53

Sample Location	Total Sampling Time (minutes)	Air Volume (liters)	Measured Concentration TDI ppm	MDI ppm	HDI ppm
Jim Keller Employee No. 1241 Clips glued on windows	15	15.1	0.0098	0.013	0.081
Jim Keller Employee No. 1241 Clips cleaned and primed; window glass cleaned and primed	15	15.1	<0.0019	<0.0013	<0.00096

STEL .02ppm

Velocity measurements taken at the various work stations are presented in Table 3. Figure 1 illustrates the location of exhaust vents in the bonding room. The average velocity obtained was 540 fpm, ranging between 425 fpm and 642 fpm.

This report prepared by

Beverly Malenfant

Beverly Malenfant, B.Sc.
Environmental Specialist

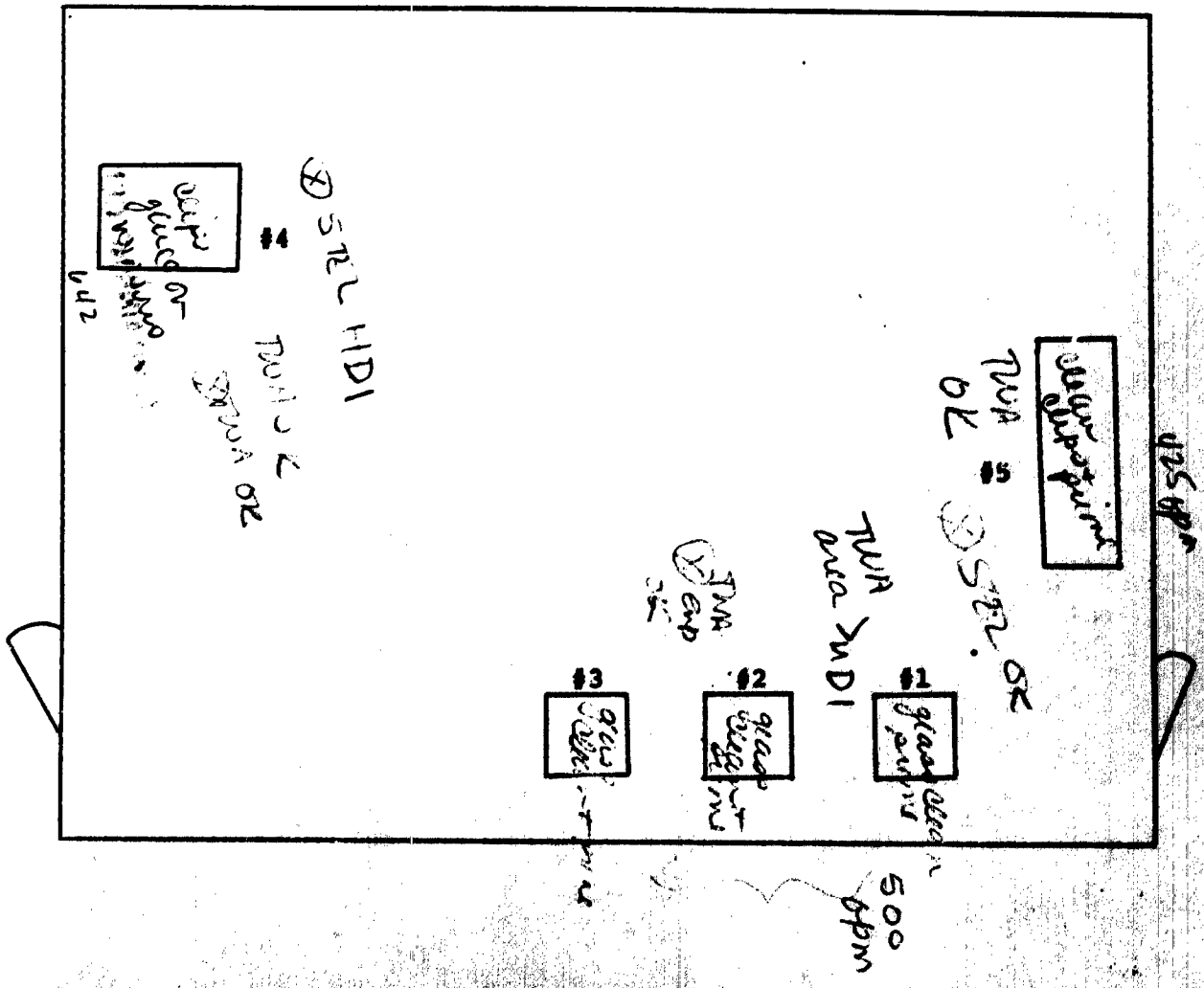
This report reviewed by

FOR Shekar Viswanathan, Ph.D., P.Eng.
Assistant Vice President
Canadian Operations

Table 3: Velocity Measurements Taken in the Bonding Room at PPG Canada Inc., Duplate Division, Oshawa, Ontario on February 13, 1987

Vent Number/Station	Velocity fpm
1. Window glass clean and prime	525
2. Window glass clean and prime	533
3. Window glass clean and prime	575
4. Clips glued on windows	642
5. Clips clean and prime	425

FIGURE 1: FIGURE 1 ILLUSTRATES LOCATION OF EXHAUST VENTS IN THE BONDING ROOM AT PPG CANADA INC., DUPLATE DIVISION



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