RESEARCH REPORT

Advice on the Use of Chemical Strippers to Remove Leaded Paint

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ADVICE ON THE USE OF CHEMICAL STRIPPERS TO REMOVE LEADED PAINT

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Canada Mortgage and Housing Corporation, the Federal Government's housing agency, is responsible for administering the National Housing Act.

This legislation is designed to aid in the improvement of housing and living conditions in Canada. As a result, the Corporation has interests in all aspects of housing and urban growth and development.

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This publication is one of the many items of information published by CMHC with the assistance of federal funds.

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EXECUTIVE SUMMARY

Removing leaded paint can be risky business. Not only can the lead contained in the paint cause serious health hazards, but the tools for removing paint can also present potential health hazards. The tools for removing paint include chemical strippers, heat guns and abrasion. Chemical strippers have some advantages; however, protective devices including CSA approved eyewear, a cartridge-type respirator, polyvinyl alcohol gloves and protective clothing are recommended for use when working with chemical strippers.

Stripping should be done outside or under well ventilated conditions. When working indoors with methylene chloride based strippers, the recommended ventilation strategy involves slightly depressurizing the work area and exhausting the contaminated air to the outdoors. In practical terms, the following steps should be taken:

1. Turn the furnace and furnace fan off. Tape over registers located in the room.

2. If working in a containable room, place a fan in or in front of a window, and blow air out. Open door slightly for make-up air.

3. If working in a non-containable area, place a fan in a nearby window so that air can be drawn from the work area. Close as many doors as possible to the rest of the house.

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1.0 INTRODUCTION

Removing leaded paint can be a risky business. Not only can the lead contained in the paint cause serious health hazards, but also the methods for removing paint can present potential health hazards. Canada Mortgage and Housing Corporation has recognized the need for a comprehensive review of the techniques available for stripping leaded paint and an assessment of the hazards associated with the techniques. This report focuses on the use of chemical strippers to remove leaded paint and includes a brief examination of the use of heat guns and abrasion.

The emphasis on the use of chemical strippers to remove leaded paint is based on advice issued by Health and Welfare Canada.[1] Chemical strippers, as opposed to abrasion and heat guns, reduce the potential for leaded dust to spread through the house during the stripping process. Some strippers, however, release potentially harmful fumes, while all have limitations to their use. It is the intent of this report to provide precise, accurate advice on the use of chemical strippers.

In an effort to provide a comprehensive assessment of the use of chemical strippers, four objectives were addressed:

- identify and assess the hazards of using chemical strippers
- evaluate the performance of the types of strippers currently available
- examine the availability, cost, and effectiveness of protective devices for use with chemical strippers
- identify optimum ventilation arrangements for working with chemical strippers

While chemical stripping may be the suggested method for most stripping jobs, it may not be appropriate for all applications. Those who choose to use other methods to remove leaded paint should be aware of the hazards and drawbacks of their use. Heat guns and abrasives, two common techniques used to remove paint, are compared with the use of chemical strippers.

The problems of dealing with leaded paint will continue to exist until all housing stock containing leaded paint has been replaced or the paint has been effectively neutralized. In the United States, concerns about the health hazards of lead in the environment have reached "huge" proportions. In Massachusetts and a number of other American states,

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1 **"Home Renovations--Removing Leaded Paint,"** Issue Series, Health Protection Branch, Health and Welfare Canada, Ottawa, 1991.

for example, legislation exists or will soon exist requiring homes to be certified lead free before they can be sold.[2]

The Consumer Product Safety Commission in the United States issued a warning to the public in 1989 stating: "Lead based paint should be removed only by professionals trained in hazardous material removal who follow detailed procedures to control and contain lead dust. Consumers should not attempt to remove lead based paint . . . . Each of the paint removal methods–sandpaper, scrapers, chemicals, and torches or heat guns–can produce lead fumes or dust. Fumes or dust can become airborne and inhaled."[3]

2 conversation with Hy Dubin, President, Dumond Chemicals, Inc., New York, New York, May 12, 1992.

3 Gurney Williams III, **"Lead Paint Alert,"** Practical Homeowner, Vol IV, No. 5, July/August, 1989, p. 24.

2.0 BACKGROUND

Leaded Paint

The use of lead pigments in oil based paint was common until the 1960s and limited amounts may have been used until as recently as 1980. It can be assumed that the majority of older homes (built prior to 1960) contain some leaded paint. In homes, where the leaded paint is in good condition and well attached to the substrate, it is generally not considered to present a hazard unless it is disturbed for some reason. Sanding or stripping the wood trim in a room, for example, could expose the occupants to dangerous levels of lead dust. Even small amounts of lead can be harmful to infants and young children.[4] Dizziness, headache, fatigue, malaise, abdominal discomfort and weight loss are symptoms of lead poisoning.[5]

If the decision is made to remove leaded paint, care must be taken to avoid exposing the occupants of the house to lead particles. A number of techniques can be used to remove leaded paint. The most dangerous, from the perspective of adding lead to the indoor environment, is dry sanding and mechanical abrasion; the safest involves removing the item from the house and having it stripped professionally.

Regardless of the method chosen to remove leaded paint, it is important to follow good industrial hygiene. Eating, drinking, and smoking should not occur at the leaded paint removal site. Any furnishings, draperies, carpets, etc., should be removed or covered. Proper protective devices should be used (see Section 4.0), and a separate set of work clothes worn only while working. The work clothes should be washed separately from other laundry.

Chemical Strippers

The variety of chemical strippers currently available on the market can be classified into three main types: hot stripping solutions, such as lye or caustic soda; organic strippers based on organic solvents, such as methanol and acetone; and application strippers such as those used by the 'do-it-yourselfer' containing methylene chloride. Hot stripping solutions and organic solvents are primarily used for industrial applications, such as in the furniture stripping industry. Application strippers are applied either by brush or spraying and, in addition to an active ingredient such as methylene chloride, contain a wax seal to retard evaporation. In the majority of residential situations, the chemical stripper used is an application stripper.

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4 **"Home Renovations--Removing Leaded Paint,"** Issue Series, Health Protection Branch, Health and Welfare Canada, Ottawa, 1991.

5 Alf Fischbein et al, **"Lead Poisoning from 'Do-It-Yourself' Heat Guns for Removing Lead-Based Paint: Report of Two Cases,"** Environmental Research, Vol. 24, 1981, p. 429.

Methylene chloride is usually the major constituent of conventional paint strippers–often comprising 70 to 80 per cent of the mixture. A methylene chloride based stripper is generally the stripper of choice for 'do-it-yourselfers' for a number of reasons:

1. It is easy to use – the chemical does much of the work
2. It works well at lifting oil based paints
3. It works well on intricate and highly profiled woodwork
4. It does not present the fire hazards of the older, flammable, solvent based paint removers
5. It generally softens paint within 30 minutes

Also known as dichloromethane, methylene chloride is an organic solvent with a mild, sweet odour. Hazard assessments of the chemical indicate that it is the most toxic component of conventional emulsion paint removers.

Exposure to high levels of methylene chloride may cause irritation of the eye, nose, and throat. Because methylene chloride evaporates quickly, it does not generally irritate the skin; however, it can cause a burn if trapped against the skin by gloves or clothing. Methylene chloride can affect a person's central nervous system. It may cause symptoms similar to drunkenness, including: sluggishness, irritability, light-headedness, nausea, and headaches.[6] At an even more serious level, methylene chloride is considered to be a carcinogen. Methylene chloride has been designated as a "probable human carcinogen" by the International Association for Research on Cancer, the United States Environmental Protection Agency, the National Institute for Occupational Safety and Health, and others.[7]

The American Conference of Governmental Industrial Hygienists (ACGIH) sets a permissible exposure level of 175 mg methylene chloride/m^3 of air (50 ppm) (TLV-TWA) for 8 hours/day, 5 days/week. At present, Health and Welfare Canada has not established exposure guidelines for methylene chloride in residential indoor air. However, if guidelines did exist, they would probably be more strict than the present ACGIH levels. These indications are based on the observation that the occupants of the house may be living and sleeping in contaminated air and would not have the same cleansing routine as workers who would be exposed for eight hour periods only. Small children and pregnant women could be continually exposed to the vapour for days.

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6 Agency for Toxic Substances and Disease Registry, **"Toxicology Profile for Methylene Chloride,"** , ATSDR Atlanta, 1989, p.1.

7 Dr. J. Withey, Review and Comments to Draft Report of this Document, June, 1992, p. 2.

Safety guidelines for working with methylene chloride based paint removers include avoiding the inhalation (breathing in) of the vapours from the stripper and avoiding contact with the skin and eyes. The specific protective measures to be followed when working with paint removers containing methylene chloride are discussed in detail in Section 4.

A further hazard associated with the indoor use of a methylene chloride stripper relates to the premature aging of condensing furnaces (such as a high efficiency gas furnace)[8]. Chlorine compounds may be carried into the furnace burner with the combustion air and become concentrated in the condensate. The chloride ions are corrosive; and, as the corrosivity of the condensate in the furnace increases, the heat exchanger's life can be dramatically reduced. The furnace and its fan should be turned off and a negative pressure maintained in the room where the stripping is taking place in order to avoid carrying chlorine compounds to the furnace and to protect the occupants of the house.

'Safer' Strippers

Recently, a number of more 'environmentally appropriate' chemical strippers have been introduced to the market. These strippers are based on non-volatile organic esters (dibasic esters) and may contain N-methyl pyrrolidone (NMP). They do not contain methylene chloride or volatile solvents. Although they have the advantage of being safer to use, they generally take a longer time to work (24 hours or more) and tend to be fairly expensive. (Table 1 at end of this section provides a comparison of the various stripping methods.)

The safer strippers provide the user with a greater margin of safety from inhalation than more common paint strippers. They are, however, combustible with flash points in the range of 60°C to 93°C and should be used in well ventilated areas. Manufacturers recommend the use of rubber gloves to prevent severe drying and potential blistering of exposed skin and the use of goggles throughout the stripping process.[9]

The effectiveness of these environmental strippers varies widely. One of the most successful (*Peel Away 6*), utilizes a poultice concept in which the stripper is covered with a polypropylene blanket and, after the stripper has acted on the paint, the paint, stripper and blanket peel away as one piece. A major advantage of the poultice system is the complete containment of the leaded paint–greatly facilitating its safe disposal. Similar results can

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8 Razgaitis, J.H. et al, **Research on Heat Exchanger Corrosion**, Batelle Columbus Laboratories, Gas Research Institute, September 1984

9 William Walsh, **"Surface Tension Modification of MNP-based Paint Strippers,"** Reducing the Risk in Paint Stripping, U.S. EPA, Washington, D.C, 1991, p. 178.

be obtained using *3M Safest Stripper* and covering the object overnight with plastic food wrap.[10]

Heat Guns

Heat guns operate on the principle that, by applying a heat source to the paint surface, the paint will soften and can then be more readily removed. Leaded paint may pose a hazard if the air temperature from the heat gun exceeds 500°C. At that temperature, the generation of lead oxide fumes readily occurs and can result in undue lead exposure to the worker.[11] If this kind of device is to be used, the use of lower temperature heat guns (generating temperatures less than 500°C) are suggested[12] along with the use of powered, air purifying, positive pressure respirators.[13]

Some articles in American literature on leaded paint hazard abatement advocate the use of heat guns as opposed to chemical stripping for the removal of leaded paint from woodwork. When used properly, heat guns may be a very appropriate tool for certain applications. On vertical door frames, for example, heat guns can target very specific areas and be shielded from damaging adjoining surfaces. Chemicals, on the other hand, can drip or run and damage other surfaces.

Abrasion

Abrasion involves the removal of paint by sanding and scraping using either hand held tools or mechanical removal methods. Typical tools include sanding blocks, rasps, flat and hook-shaped scrapers, electric drill attachments, and electric and air sanders. Abrasion usually results in dust and debris and is generally not recommended for lead based paint. As well, unskilled operators can easily gouge and damage wood surfaces.

Wet sanding can reduce the risk of dust generation and subsequent inhalation by the operator. By using a water resistant abrasive paper and continuously watering down the work surface, the level of dust can be controlled. For the wet sanding process to be most effective, the wetted debris must be disposed of before it dries and becomes a potential generator of dust.

It should be noted that abrasion often plays a role in all types of leaded paint removal. Scraping, in particular, is an integral part of the removal

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10 Anon., **"Paint Removers: New Products Eliminate Old Hazards,"** Consumer Reports, May, 1991, p. 342.

11 Fischbein, *op. cit.* p. 428.

12 Canadian Centre for Occupational Health and Safety, **"Removal of Lead-Based Paint Using Heat Guns,"** Hamilton, 1991.

13 William Glenn, **"Workplace Lead Poisoning and Dr. Alice Hamilton: A Struggle Against Indifference,"** Occupational Health and Safety Canada, Vol. 3, No. 2, March/April, 1987, p. 19.

of paints softened by chemicals and heat. Concerns about dust and, therefore, ventilation should be considered, regardless of the removal technique chosen.

Although a considerable wealth of information has been prepared on the hazards of leaded paint, much less has been written on the safe techniques for its removal. The general consensus appears to be that no method is completely safe–all require varying degrees of caution and the use of safety equipment. Many authors recommended hiring professional help for even small jobs and moving out of the house while work is underway.

Table 1, on the following two pages, presents a comparison of the four most common methods of leaded paint removal.

Table 1

A Comparison of Four Techniques for Removing Leaded Paint

	Methylene Chloride-Based Chemical Strippers	***"Safer" Chemical Strippers*** *(Peel Away, 3M)*	***Heat Guns***	***Abrasion*** ***(Hand and Mechanical)***
Human and Environmental Concerns	methylene chloride fumes contains volatile solvents debris and residues of chemical and stripped paint	debris and residues of chemical and stripped paint	debris and residues of stripped paint possible vaporization of lead at high temperatures (+500°F)	airborne lead dust particles debris and residues of stripped paint
Health Effects	solvent vapours pose neurological and respiratory problems may cause cancer contact with chemical may cause skin irritation	vapour may cause respiratory problems contact with chemical may cause skin irritation, severe drying	high heat may vapourize lead burns	inhalation and ingestion of lead dust leading to lead poisoning
Protective Measures	use ventilation use organic vapour respirator use polyvinyl gloves use protective eye wear cover arms, legs to avoid contact with stripper cover floor with drop sheet to collect and control debris	use ventilation use rubber gloves use protective eye wear cover arms, legs to avoid contact with stripper cover floor with drop sheet to collect and control debris	special caution with heat near glass use respirators use protective gloves use protective eye wear fire safety precautions (keep water, fire extinguisher at hand) cover floor with drop sheet–collect and control debris	wet down surface use HEPAvac to keep work area clean (vacuum up dust as it is created) use protective gloves use protective eye wear
Flammability	methylene chloride is nonflammable but it is usually combined with flammable chemicals to reduce cost	generally nonflammable	heat guns can produce enough heat to ignite paint or wood	nonflammable
Time Required to Remove Paint	30 minutes to a few hours for each layer of paint	12 to 36 hours but will take off up to 8 layers of paint at one time	a few minutes for each area covered by heat gun will usually take off multiple layers at once	very dependant on thickness and number of layers of paint
Availability	at most paint and hardware stores	3M at more than half paint and hardware stores, no other safe strippers found in Ottawa Peel Away in US and through distributor	at some hardware and home improvement stores	at most hardware, home improvement, and paint stores

Table 1 (continued)

A Comparison of Four Techniques for Removing Leaded Paint

	Methylene Chloride-Based Chemical Strippers	***"Safer" Chemical Strippers*** *(Peel Away, 3M)*	***Heat Guns***	***Abrasion*** ***(Hand and Mechanical)***
Advantages	minimum amount of dust created generally work well on oil-based paints stripper evaporates therefore low waste generation	less toxic chemicals minimum amount of dust created removes multiple layers of paint debris & removed paint easily contained and disposed of	minimum amount of dust created fast removal of small areas of paint low cost after initial purchase of gun	low cost may be the only feasible method of removing paint in certain situations (access to tight corners) used as a back-up for all methods
Disadvantages	multi-layers of paint may require more than one application for complete removal time delay between application and removal cost may leave a wax residue requiring removal before repainting may attack plastics (shouldn't be a problem with lead) can be messy process use of CH_2Cl_2 can lead to premature aging of condensing furnaces (with water forms HCl)	long time delay between application and removal cost some strippers may leave residue on wood can be messy process may contain high percentage of water which can damage some woods	high heat (+500°C) may vaporize lead in paint creating a health hazard blowing heat can whip up leaded paint dust into air can burn skin can burn wood sanding usually required after cannot be used on metal care required near glass	high levels of toxic dust created fine dust particles will travel through house; may take numerous cleanings with HEPA vacuum to remove leaded dust slow process easily gouge wood
Cost	may be significant $20 to $30/4 litres estimated average coverage: 1.5 m^2 (one side of a door)	may be significant $30 to $50 /4 litres estimated average coverage: 1.5 m^2 (one side of a door)	one time expense ($30 - $80), plus electricity	tools relatively inexpensive
Observations	abrasion, scraping often integral part of using stripper CH_2Cl_2 banned in California rinse surface with cold water	mechanical abrasion may be necessary NMP formulas require rinsing with ethyl alcohol	heat guns may be the appropriate tool for certain applications lead contaminated surfaces should be washed with phosphate detergent after paint removal	

3.0 EVALUATION OF PERFORMANCE OF STRIPPERS

A 1986 article in *Canadian Consumer* provided a detailed evaluation of the chemical and electric paint removers that were on the Canadian market at that time. Unfortunately, a Canadian update is not available. Consumer Reports in the U.S., however, published a review in May, 1991. The report examined eight chemical strippers and five heat guns. All were found to do a "fine job of stripping." The focus of the review then shifted to the safety aspects of the products. Those findings have been incorporated into Table 1.

Retail Outlet Survey

A survey was made of retail stores in the Ottawa area to identify the types of strippers sold in the area and how effective they are at removing paint. Questions were asked about the most popular methods of paint removal and what advice was given to the customer on the usage of the product. A short questionnaire was developed, and eleven retail outlets were surveyed. An example of the questionnaire is included in Appendix A.

Four hardware stores and seven paint stores were visited. At six of the paint stores, the interviewer posed as a consumer wanting to remove some paint from the baseboards throughout his home. At the remainder of the stores, the employee or store owner was asked to participate in the survey.

Although questioning could not be as consistent using the first method, it provided more insight into the way in which salespeople discussed this issue with customers. (Lead paint was purposely not mentioned to see if the salesperson would bring it up.)

The main findings regarding paint removal were:

1. Salespeople generally recommended chemical strippers for paint removal. All stores contacted sold one or more brands of chemical stripper. Heat guns were available at only one hardware store.

2. All but one of the chemical strippers sold appeared to contain methylene chloride. The brand that did not, 3M, cost twice as much as the others and was not recommended by either of the two stores carrying it.

3. The store owners and salespeople were unlikely to make any recommendations on the use of chemical strippers unless asked by the customer while purchasing the product.

4. When asked what precautions should be taken when using paint stripper, the salespeople gave the following replies:

    - All recommended plastic or rubber gloves.
    - Two recommended dust masks.
    - One recommended goggles.

    Although the gloves and masks were not appropriate for the job and a dust mask does not provide protection against vapours, most stores carried these supplies.

5. When asked specifically about the need for ventilation, all but two felt the area should be ventilated. An open window or door was felt to be adequate. Only one retailer stated that a fan should be used. One said that there was no need for ventilation, while another said the area should be ventilated if work was going to be done over a period of 3 to 4 hours or more.

6. Only one retailer could produce a Material Safety Data Sheet on one of his chemical strippers. A second retailer mentioned he would fax them. Many did not know that they existed. (Although retailers are not required to provide MSD Sheets to the public, as potential retailers to persons making purchases for the work place usage of strippers, they should be aware of their existence and the information they contain.)

7. The likelihood of the salesperson being informed of the potential dangers of paint removal (particularly when lead was involved) increased dramatically if the salesperson was the store owner or management personnel.

The main findings regarding lead paint and paint removal were:

1. Most owners and salespeople were much more concerned once they realized that the paint to be removed probably contained lead.

2. Seven retailers recommended that a mask designed and tested for paint removal should be used. Only one retailer stocked them, and most retailers did not know where they could be acquired. One or two of the retailers saw no cause for concern if the consumer used a dust mask while removing lead paint, and one felt that no mask was required.

3. Two of the paint retailers were quite adamant that baseboards should be removed and stripped outside. Most recommended

that lead paint removal be done outside whenever possible. One store owner commented that problems with lead paint were the figment of the imagination of researchers with nothing else to do!

4. Most of the retailers asked did not think abrasive materials should be used to remove lead paint.

The following brands of chemical strippers were in stock at the stores surveyed:

- Mastercraft Paint and Varnish Remover
- Lepage Poly Strippa
- Circa 1850 (regular and gel)
- Beaver Paint and Varnish Remover
- Recochem Paint and Varnish Remover
- Montrex Paint Remover for Antiques
- Ultralux Paint and Varnish Remover
- M.C.S. Paint and Varnish Remover
- Colour Your World Paint and Varnish Remover
- Dad's Easy Spray - Sanshou Corp.
- Safest Stripper - 3M

All but the last two products mentioned were comparably priced. The 500 ml containers sold for $4.69 to $6.59. The 1L containers sold for $6.49 to $10.99. The 4L containers sold for $18.79 to $29.99.

3M Safest Stripper is a new, less hazardous product that does not contain methylene chloride. The 3.8L containers sold for $29.99 to $47.10. It was noted by some salespeople that the *Safest Stripper* wasn't getting much repeat business–it took a long time to work.

Dad's Easy Spray also sold at a higher price–$32.99 for a 3.8L container since it was in a spray form. The sales clerk's comment regarding this product was that it worked well on stain. It should be noted that, when using a spray, the human exposure to concentrated vapour is much greater than if a liquid was used to cover the same area.

One product that scored very well in the "American Consumer Report" as a safe and effective chemical stripper was *Peel Away 6*. Although not available on the Canadian market, a distributor in the Montreal area is working to have it in retail stores within the year.[14]

14 conversation with Robert Graul, Peel Away Canada, Montreal, Quebec, May 22, 1992.

Only one retailer sold heat guns, *Heatworks* for $44.99 and *Heat 'N Strip* for $34.99. Most retailers felt that heat guns worked fine, but the consumer must be willing to progress slowly.

The labelling on the products sold often did not communicate the care required when working with chemical strippers or what kind of chemicals were contained. There was usually some advice about using the product in a well ventilated room.

Currently, homeowners appear to be choosing chemical strippers for removing paint, including leaded paint. Methylene chloride based chemical strippers predominate the market and, it can be assumed, constitute a major portion of the strippers used by homeowners.

In general, the sales staff did not have a great depth of knowledge of the paint removal products they sold. Clearly, as much information as possible must be made available to the consumer so they can make an informed decision about leaded paint removal.

4.0 PROTECTIVE DEVICES SURVEY

Methylene chloride is a hazardous chemical. It can, however, be used with safety if the appropriate protective measures are followed. The lead in leaded paint adds a further hazard to the removal process but, it too, can be removed safely.

The hazards associated with chemical strippers and, in particular, methylene chloride based strippers relate to the potential for overexposure. It is important, therefore, to protect the worker and the other occupants of the house from overexposure to the chemical and its fumes. There is little likelihood for overexposure once the work is completed and the chemical's fumes have been diluted to a non-hazardous level.

The hazards associated with lead relate to the inhalation and ingestion of lead particles. When working with leaded paint, the recommended protection includes a dust mask, CSA (Canadian Standards Association) approved eye protection, and protective clothing.[15] Since the recommended protection while working with methylene chloride based strippers is more stringent than that for working with leaded paint, the following discussion relates to the use of chemical strippers for all types of paint.

One major concern with leaded paint, however, is to ensure the work area and surrounding environment do not become contaminated during the removal process. Leaded paint dust in the cracks of the floor and in ductwork can present a significant hazard to the occupants of the house until it is removed. The containment and cleanup of all debris must play a major role when working with leaded paint.

Material Safety Data Sheets are available from the manufacturers of potentially hazardous materials to provide workers with safety and chemical information on products they are using in the work place. MSD Sheets can provide the homeowner with valuable information and can be used as a resource for accurate information on the safe use of products.

Recommended Protective Devices

Inhalation Protection: A mask with an organic vapour cartridge is the minimum recommended protection to avoid inhaling the hazardous vapours. This is to be used in conjunction with adequate ventilation. A cartridge-type respirator with a chemical absorbant (such as charcoal) would provide better protection. When using a mask or respirator, it is important to avoid 'overloading' its capacity by using it in high

15 Buchan, Lawton, Parent Ltd, **"Renovation Hazards"**, prepared for Canada Mortgage and Housing Corporation, Ottawa, 1989.

concentrations for long periods of time. All persons occupying the work zone, whether involved in the stripping activity or not, should wear inhalation protection.

Eye Protection: When working on vertical surfaces or above the head, chemical stripper could easily splash into the eyes. CSA approved safety glasses are recommended. They should include protection to the side of the eye as well as the front.

Skin Protection: The purpose of chemical protective clothing is to provide a barrier between the chemical and the skin. When working with chemical strippers, long sleeved and full legged coveralls are recommended. Sleeves and leg ends should be tucked into the boots and gloves. It is important to ensure that the fabrics provide an appropriate barrier for the chemical stripper to be used. A heavy twill cotton or polyester and cotton coverall should be adequate. A CSA approved work boot would provide good protection for the feet. To protect the hands, a polyvinyl alcohol work glove is recommended for use with methylene chloride.

Protective devices will only provide adequate protection if used in the intended manner and not abused. Care must be taken to avoid saturating the clothing in stripper or other chemicals and to clean all protective devices as needed. As well, it is important to avoid contaminating other areas of the house by walking around in contaminated clothing. A good practice is to remove protective devices as one leaves the work area. As well, it should be remembered that, although ventilation plays a key role in maintaining a safe environment for working with chemicals, it cannot replace the protective devices listed above. A discussion of ventilation is included in the following section.

All the devices listed above can be obtained from stores selling safety equipment. The yellow pages' listings under "Safety Equipment and Clothing" should provide a variety of stores to choose from. The most expensive item to purchase will be the mask or respirator. It is worth spending money on a good one that is comfortable to wear and provides the required protection. A respirator with interchangeable cartridges can be used for many different applications.

Retail Survey of Protective Devices–What was Found

Canvassing the stores in the Ottawa area revealed that suitable masks would cost $55.00 to over $100.00. In the retail outlet survey, one retailer stocked a mask that might be satisfactory for stripping with methylene chloride. It was manufactured by Wilson and sold for $80.00. It was rated for dust, paint, pesticide, etc. and incorporated the use of a absorbent for filtering the air.

Two MSDS sheets were obtained during the Retail Outlet Survey. These have been included in Appendix B. It is interesting to note that the MSD Sheet for Mastercraft Paint and Varnish Remover does not recommend respiratory protection if the exhausting system is adequate, even though it is a methylene chloride-based paint stripper. The MSD Sheet for K-G Packaging, on the other hand, recommends a cartridge-type respirator when the stripper is used indoors with local ventilation. K-G Packaging is an N-Methyl-2-Pyrrolidone based stripper (considered safer that methylene chloride). *Note:* The Mastercraft MSDS is not current and should not be considered accurate. For accurate information, the manufacturer of the product should be contacted.

5.0 VENTILATION FIELD TEST

In addition to protective devices, ventilation is an important factor in avoiding the health hazards of chemical paint stripping. When working with toxic chemicals, exposure must be reduced to acceptable levels. This can be accomplished either through dilution of the chemical vapour or through its containment and removal (both involving ventilation) and by prevention of inhalation (through the use of filter masks).

When working with chemical strippers containing methylene chloride or other hazardous chemicals, it is preferable to move the item to be stripped outdoors. The outdoor air rapidly dilutes the chemical concentrations to safer levels. Nonetheless, workers or observers should not stand downwind of the object being stripped even out of doors. When it is not possible to move the object outside, various factors come in to play to provide adequate ventilation and protection for household occupants.

One factor which varies, depending on the type of stripper used, is the evaporation rate of the compound. This rate is dependent on the concentrations of methylene chloride and other chemicals present in the stripper and on the quantity of wax in the stripper. Wax is typically added to prevent the active chemicals from evaporating immediately. The result is a slower release rate of the chemicals from the surface being stripped. These factors can make it difficult to predict the time of greatest evaporation and the resulting highest concentration.

Many studies have been undertaken to determine such factors as methylene chloride generation rate, acceptable exposure levels, and the effect of ventilation on the methylene chloride use.

One such document prepared for Health and Welfare Canada examined the effect of ventilation on exposure rates. The following is an excerpt from that document.

> To provide information on exposures sufficient to conduct a health risk assessment, the US Department of Energy characterized methylene chloride source strengths and personal exposures in a chamber study using several paint removers (Girman & Hodgson, 1986). Experiments were conducted at two ventilation rates corresponding to approximately 0.5 and 3 AC/h, and levels were continuously monitored using IR spectroscopy. Personal exposures ranged from 1,040 - 1,200 ppm.h at the high ventilation rate and 1,970 - 2,400 ppm.h at the low ventilation rate for work periods of approximately 90 minutes. Several occupational guidelines and standards were quickly exceeded during these trials.

The exposure, while decreasing with increasing ventilation rate, did not do so in a linear fashion; and for the short exposure periods of the trials, the actual exposure could only be predicted using a mass balance model. Increasing the ventilation rate by a factor of five only reduced the air level of methylene chloride by 57%. Vertical stratification of methylene chloride was also seen at both high and low flow rates, with the concentration at 31 cm from the floor being approximately 30% and 40-60% higher at the high and low flow rate respectively. These differences disappeared by the conclusion of the work period (90 minutes).

There was good agreement between integrated chamber concentrations and measured personal exposures at low ventilation rates, but a poor correlation at high ventilation rates, with measured personal exposure being 21% higher. Exposure models were developed which were sufficiently accurate for use in an assessment of consumer health risk.

In a subsequent report, the US Department of Energy measured personal exposures to methylene chloride in a variety of residential environments (Hodgson & Girman, 1987). Personal exposures resulting from the outdoor use of a semi-paste paint remover were very low (6 - 36 ppm.h), while indoor use without mechanical exhaust ventilation resulted in exposures of between 190 - 2,090 ppm.h. Opening a door or a window halved the exposures, while placing a fan to exhaust the air through an open door or window reduced the exposure levels to the range 11-142 ppm.h. This is equivalent to a ventilation rate of 0.13 air changes per hour (ACH) in a bedroom with the internal door and window closed; and a ventilation rate of 18.7 ACH with a fan exhausting out of the open window and the internal door open.[16]

Another study yielded the following results:

An exposure assessment based on expected air concentrations of methylene chloride following application of conventional emulsion paint removers was conducted by Otson et al. (1981). Methylene chloride levels in air were measured following application of conventional emulsion paint removers to a 28 m^3 room when ventilated and when unventilated. Application of 240 g of paint remover (containing approximately 80% methylene chloride) in an unventilated room (doors closed) resulted in air levels of methylene chloride of approximately 1 g/m^3 [287 ppm] 30 minutes after application and 0.07 g/m^3 [20 ppm] 6 hours after application. Thus, it would appear that exposure to methylene chloride may exceed the permissible exposure limits established by ACGIH (1986) when person remains in the room without proper protective equipment. However, methylene chloride levels which result from use in a ventilated room

16 R.J. Hill, **"Health Hazards Associated with the Stripping of Lead-Containing Paint, A Background Document,"** Health and Welfare Canada , Ottawa, 1991.

are substantially lower and likely would not exceed the ACGIH (1986) exposure limits based on an eight-hour exposure period.

This project will not duplicate the research undertaken by others in assessing exposure to methylene chloride when working with paint strippers. The existing studies indicate that opening windows and doors and providing mechanical ventilation are adequate to reduce the methylene chloride vapour to acceptable levels. The main objective of this ventilation section was to give clear direction to a homeowner regarding how to best set up the ventilation devices in their home.

Two major determining factors in deciding the preferred venting configurations are: (1) type, location,and attributes (number of doors and windows of the room where the stripping is taking place); and (2) the venting devices available to the homeowner.

The room types were broken down into those where the contaminant can be contained, such as a bedroom or bathroom, and those where the contaminant cannot be contained, such as hallways, stairs and some kitchens and dining areas.

The availability of ventilation devices to the homeowner was based on ease of procurement and cost. This factor ruled out modified fume hood configurations even though their use will remove the contaminant at source.

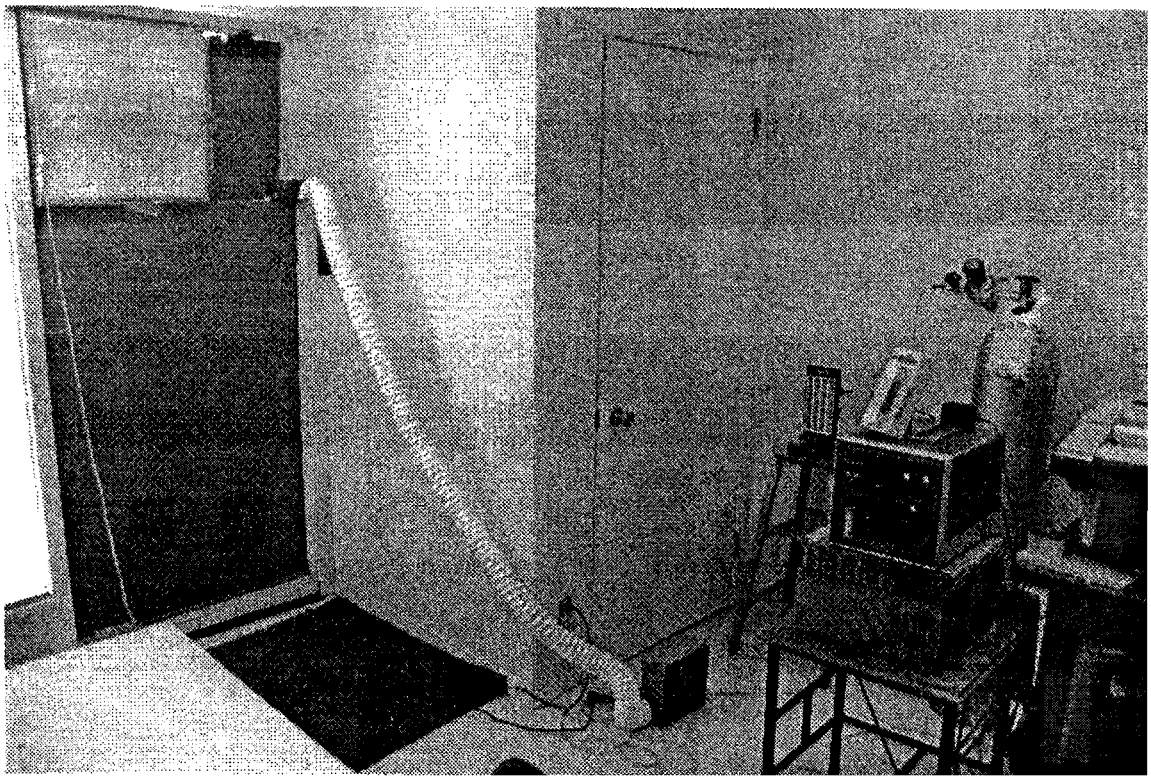
Surveys of retail stores revealed that oscillating fans and box fans are readily available. The box fan's square shape makes it ideal for placement in a window. Extra space around the fan can be filled in easily with cardboard.

A test room was configured to simulate a containable room. The test room was 28.4 m^3 excluding the closet. The room included a door to the interior and an exterior window measuring 0.5 m^2. (See Figure 1)

Because of the potential health hazards associated with methylene chloride and the difficulty in getting immediate, continuous readings of the chemical, a tracer gas was used. Carbon dioxide (CO_2) was chosen as the tracer gas. It has the advantage of being easy to produce, easy to measure, and is harmless at the concentrations deployed. It is, however, lighter than methylene chloride and may not mimic the stratification of the methylene chloride in a room. A gas mixture of 99.5% CO_2 and 0.5% Nitrogen was injected into the room at a controlled rate by means of a flow meter.

Tests were run with the fan in various locations in the room. The desire to remove the contaminant from the room, instead of blowing it throughout the house, was an important consideration. The test revealed that placing the fan in the window and exhausting air to the outside provided a significant reduction in contaminant levels. The results of the test are detailed below.

Figure 1 Test Apparatus Set Up



The test conducted on the containable room was performed in three stages:

Stage 1 window and door closed
Stage 2 window open, door closed
Stage 3 door closed, and fan placed in window to blow outdoors
Note: open areas around the fan were blocked with cardboard, but the joints were not taped.

For all concentrations of CO_2 given, the base level of CO_2 has been subtracted.

Injecting the CO_2 at a constant rate in Stage 1 yielded a steady state level of 2300 ppm (parts per million) after 15 minutes. Opening the window during

Stage 2, lead to a concentration of 550 ppm CO_2 after 20 minutes. In Stage 3, the level of CO_2 dropped still further to 400 ppm after 10 minutes.

The Stage 2 results indicated that a 76% reduction in contaminant levels was achieved when the window was opened. This method of ventilation is, of course, heavily dependent upon wind speed, wind direction, and the temperature difference between indoors and out. For this test, the wind blew parallel to the exterior wall, and the wind speed was moderate. The temperature outside was within 4°C of the indoor temperature throughout this test.

The Stage 3 results represented an 82% reduction in contaminant levels from those detected in the closed room. By using the forced ventilation method, there is no need to rely on wind speed and direction to remove the contaminant. Make-up air is required to replace the air being exhausted through the window; however, it is desirable to maintain a negative pressure in the room. Make-up air can be provided by opening an interior door to the room by a few inches or slightly opening a second window if it is located on a different wall. Supply air ducts should be covered to prevent reintrainment of the contaminated air. Figures 2 and 3 indicate suggested venting configurations for containable rooms.

Figure 2 Venting Strategy for a Typical Containable Room with Windows on One Wall

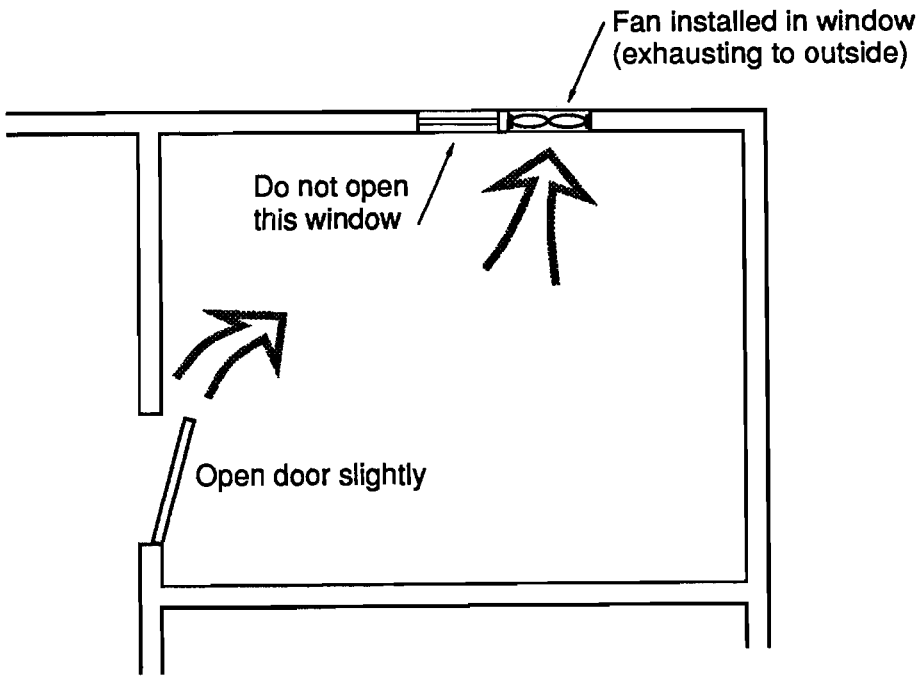
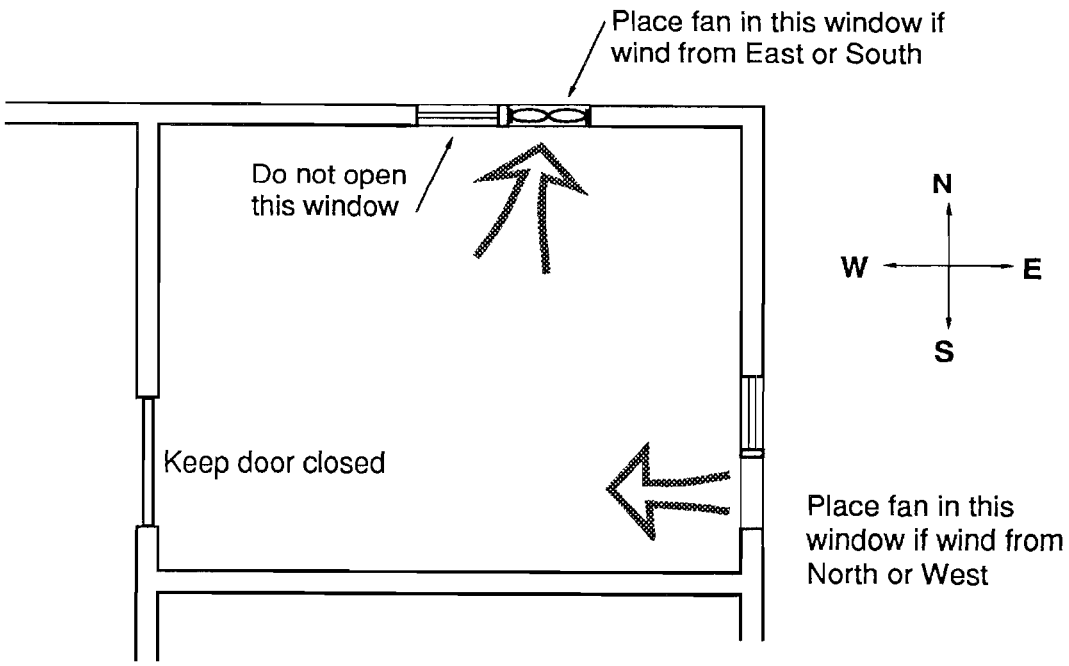


Figure 3 Venting Strategy for a Typical Containable Room with Windows on Two Walls

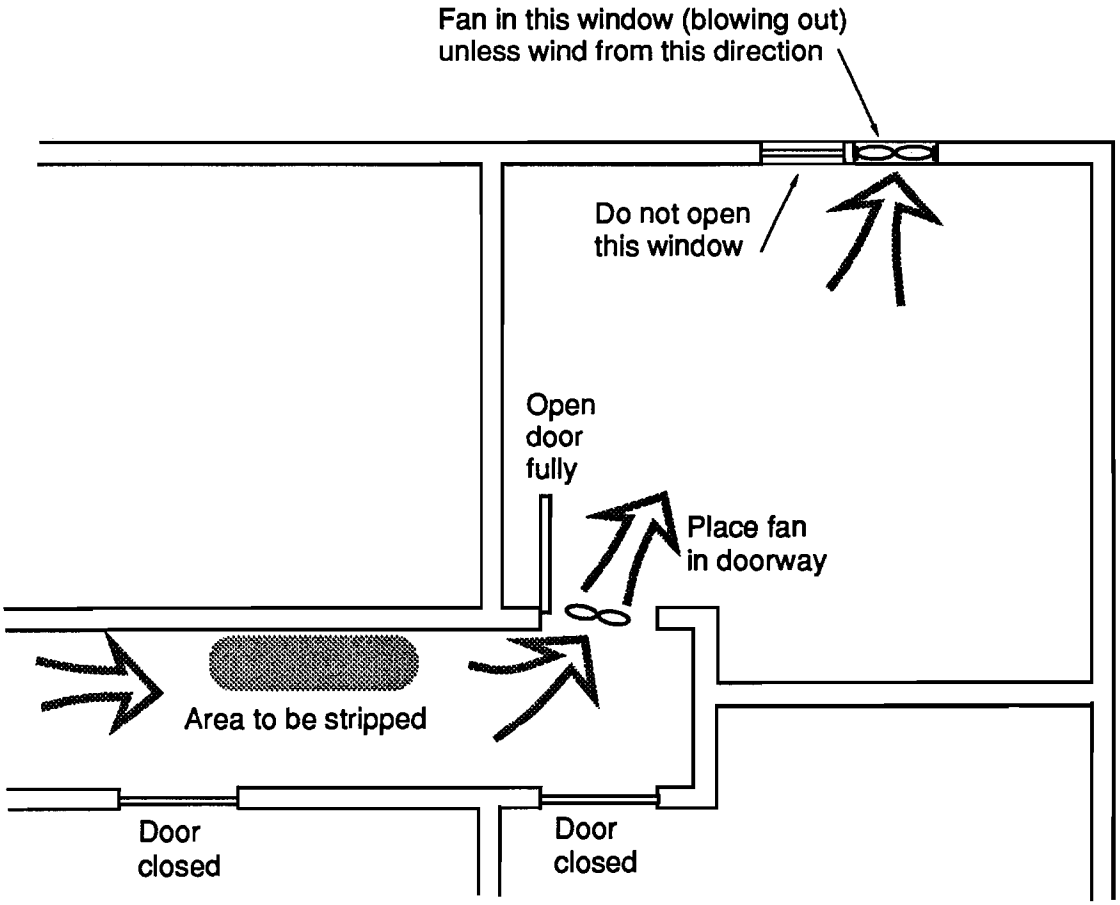


A second test room was configured to simulate a non-containable room. These types of rooms typically have a number of open doorways to the interior of the building and may not contain an exterior doorway or window to exhaust air.

For the test purposes, the doors to the room were closed, and CO_2 was injected at a rate equal to that used in Test Setup 1. When the doors were opened, and the concentration stabilized, the drop in CO_2 level went from 2300 ppm to 525 ppm. This represented a 77% reduction in contaminant levels.

From the perspective of keeping the indoor air at an acceptable level, it is desirable to move the contaminants outside the house rather than spread them inside the house at a lower concentration. For this reason, it is recommended that a fan be installed in the window of the room closest to the area where the work is being done and that the work area be contained as much as possible. An example of a ventilation strategy for a non-containable room is illustrated in Figure 4.

Figure 4 Ventilation Strategy for a Non-Containable Room



For both test room configurations, it is recommended that the work area be contained and the contaminated air be exhausted to the outdoors. If the lead content of the air was great enough, this could lead to the contamination of the soil under the window. Care should be taken to avoid tracking the soil back into the house.

6.0 CONCLUSIONS

When using methylene chloride based paint removers to strip leaded paint, ideally the item being stripped should be moved outdoors and placed on newspapers to catch all drippings. However, most stripping must take place indoors; and as such, the recommended ventilation strategy involves depressurizing the work area and exhausting the contaminated air to the outdoors. In practical terms, the following steps should be taken:

1. Turn the furnace and furnace fan off. Tape over supply and return air registers located in the room.

2. If working in a containable room, place a fan in or in front of a window, and blow air out. Seal the fan in the window if possible. If there is a window on another wall, open it; and if not, open the door slightly for make-up air.

3. If working in a non-containable area, place a fan in a nearby window so that air can be drawn from the work area. Seal the fan in the window if possible, and close the doors to the rest of the house. Place a second fan between the area being stripped and the window fan in order to draw the contaminated air away from the work site.

Regardless of the chosen method of leaded paint removal, following good industrial hygiene is very important. Eating, drinking and smoking should not occur at the leaded paint removal site. Any furnishings, draperies, carpets, etc., should be removed or covered. Proper protective devices should be used (see Section 4.0) and a separate set of work clothes worn only while working. The work clothes should be washed separately. It should be noted that vacuuming of leaded dust with typical household vacuums can spread the lead particles throughout the house. Wiping down surfaces with a damp cloth and then disposing of the cloth is a safer alternative to vacuuming.

Although it may be desirable for homeowners to avoid 'do-it-yourself' projects involving the removal of leaded paint, it may not always be feasible. Those who choose to remove leaded paint must keep in mind that they are working with a hazardous material. Proper precautions must be followed when working with any paint removal products or techniques. Debris and dust must be controlled, and care must be taken to avoid contaminating the work area.

Appendix A
Survey Questionnaire

QUESTIONNAIRE
Leaded Paint Removal

Store: _____
Address: _____
_____
Interviewee: _____

Types of Chemical Strippers Available:	Cost	Comments -effectiveness? -how do people like it? -second-time buyers?
1.		
2.		
3.		
4.		
5.		
6.		

Protective Devices:

What types of protection do you recommend for working with chemical strippers?

_____
_____

Do you sell these? (Yes / No)

If No, can you recommend where to get them?

_____
_____

If Yes, what do you sell?

Type	Cost	Effectiveness

What about ventilation? _____

What is appropriate? _____

MSDS Sheets:

Can you provide MSDS sheets on these products?

_____

If yes, can we get copies?

Types of Heat Guns Available?	Cost	Effectiveness

Do you recommend the use of protective devices?

Abrasion?

What about abrasion (sanding, scraping, etc.)?

_____
_____

Thank you for your co-operation!

Appendix B
Example MSDS Forms

K-G Packaging
DIVISION OF CCL INDUSTRIES INC.
LE DIVISION DES CCL INDUSTRIES
P.O. Box 89, 8001 Keele St., Concord, Ontario L4K 1B2
Telephone (416) 669-9855 Telex 06-964740

MATERIAL SAFETY DATA SHEET ☐ AEROSOL ☐ LIQUID

SECTION I: PRODUCT AND PREPARATION INFORMATION

MANUFACTURER'S NAME: K-G PACKAGING	EMERGENCY TELEPHONE: 416-669-9855	TRADE NAME AND SYNONYMS: PAINT & VARNISH REMOVER	CODE NUMBER: N1-140
ADDRESS: 8001 KEELE STREET, P.O. BOX 89, CONCORD, ONTARIO L4K 1B2		CHEMICAL FAMILY: ORGANIC	PREPARED BY: TECHNICAL GROUP: 669-9855
		PRODUCT USE: CLEANER	DATE OF PREPARATION: April 21, 1989

SECTION II: HAZARDOUS INGREDIENTS

INGREDIENT	CAS NUMBER	PIN (UN)	PERCENT BY WEIGHT	NATURE OF HEALTH HAZARD AND ROUTE OF ENTRY	TYPE OF HAZARD		EXPOSURE LIMITS			LD 50 (ORAL SPECIES)	LC 50 (INHALATION SPECIES)
					CHRONIC	ACUTE	PPM	mg/m³	SOURCE	mg/KG Rat	ppm Rat
Toluene	108-88-3	1294	10-30	Skin irritant.		X	100		ACGIH	5,000	8,000(4hr)
1,1,1-Trichloroethane	71-55-6	2831	3-7	Skin, eye irritant.		X	350(skin)		"	10,300	18,400(4hr)
Methyl Alcohol	67-56-1	1230	3-7	Eye damage, inhalation.		X	200(skin)		"	5,628	64,000(4hr)
Propylene Glycol Methyl Ether	107-98-2	Not Available	7-13	Inhalation		X	100		"	5,660	7,000(4hr) LCLo
Propylene Glycol Methyl Ether Acetate	108-65-6	Not Available	3-7	Inhalation		X	Not Available			8,500	4,345(6hr)
N-Methyl-2-Pyrrolidone	Not Available		15-40	Sever eye irritant.		X	Not Available		Not Available		402ml/kg Rat
PROPELLANT(S): Isobutane	75-28-5	1075	7-13	Asphyxiant		X	800		ACGIH	Not Applicable	520,000ppm (2hr)Mouse
Propane	74-98-6	1978	5-10	Asphyxiant		X	1000		OSHA	Not Available	

SECTION III: PHYSICAL DATA

PHYSICAL STATE	Liquid	SPECIFIC GRAVITY (H_2O=1)	0.9384
BOILING POINT (°C)	64.4 to 202	PERCENT VOLATILE BY VOLUME (%)	Not Available
VAPOUR PRESSURE (psig @ 20 C)	78	EVAPORATION RATE n-Butyl Acetate = 1	2.2-6
VAPOUR DENSITY (AIR = 1)	1-4.6	pH	Not Available
SOLUBILITY IN WATER (% BY WT.)	72	FREEZING POINT (°C)	< -24.4
APPEARANCE AND ODOUR	Clear, colourless Hydrocarbon	ODOUR THRESHOLD	Not Available

SECTION IV: FIRE AND EXPLOSION HAZARDS

FLASH POINT (METHOD USED) °C — CONCENTRATE · TAG-CLOSED CUP X ESTIMATED: 4-95

FLAMMABLE LIMITS IN AIR (% BY VOLUME): LOWER 1.0, UPPER 36.5

AUTOIGNITION TEMPERATURE °C — EXPERIMENTAL X ESTIMATED: 287-480

EXTINGUISHING MEDIA: ☒ Dry chemical, CO_2, Foam. ☐ Other:

HAZARDOUS COMBUSTION PRODUCTS: ☒ Possible phosgene over 500°C. ☒ Hydrocarbon fumes and smoke. CO where combustion is incomplete. ☐ Other:

SPECIAL FIRE FIGHTING PROCEDURES: ☒ Water from logging nozzles may be used to cool closed containers to prevent pressure build-up if exposed to extreme temperatures. ☐ Other:

UNUSUAL FIRE AND EXPLOSION HAZARDS: ☒ Containers may explode if exposed to temperatures greater than 50°C. ☐ Sensitive to shock ☐ Sensitive to static discharge

Print Communications Department
December 1990

SECTION IV: (CONT'D) AEROSOL FLAMMABILITY

Flammability of an aerosol is determined by flame projection. The flame projection of this product is classified as:

☐ zero cm (Non-Flammable) ☐ 0-15 cm (Caution) ☐ 15-45 cm (Warning) ☒ over 45 cm (Danger)

FLASHBACK ☐ Yes ☒ No

SECTION V: HEALTH HAZARD DATA–TOXICOLOGICAL PROPERTIES AND FIRST AID MEASURES

THRESHOLD LIMIT VALUE: See section II
(Time weighted average, unless otherwise specified)

EFFECTS OF OVEREXPOSURE
☒ ACUTE Dizziness, nausea, irritation to skin & eyes.
☒ CHRONIC Solvents may cause defatting dermatitis.

TOXICOLOGICAL SYNERGISTIC PRODUCTS: None Known

SENSITIZATION TO PRODUCT
☐ Skin ☐ Respiratory ☐ Allergen ☒ Presently Unknown

IRRITANCY OF PRODUCT
☐ Non-Irritant ☒ Irritant: ☐ Presently Unknown

☐ REPRODUCTIVE EFFECTS ☐ TERATOGENICITY ☐ MUTAGENICITY
None Known

CARCINOGENICITY OF PRODUCT
☒ Non-Carcinogenic ☐ Carcinogenic ☐ Presently Unknown

EMERGENCY AND FIRST AID PROCEDURES ☐ Other:

Remove patient to fresh air. Flush exposed skin and eyes with copious amounts of water.
If ingested do not induce vomiting. Call a physician immediately.

SECTION VI: REACTIVITY DATA

STABILITY
☒ Stable
☐ Unstable

HAZARDOUS POLYMERIZATION
☒ Will Not Occur
☐ May Occur

INCOMPATIBILITY (MATERIALS TO AVOID)
☐ Strong Acids ☐ Strong Alkalis ☒ Strong Oxidizers ☐ Organic Materials ☐ Water ☐ Other
Specifics:

CONDITIONS TO AVOID ☒ Storage in hot, unventilated areas. ☐ Other:

HAZARDOUS DECOMPOSITION PRODUCTS ☒ Possible phosgene over 500°C. ☒ Hydrocarbon fumes and smoke. CO where combustion is incomplete. ☐ Other:

SECTION VII: SPILL OR LEAK PROCEDURES

COEFFICIENT OF H_2O/OIL DISTRIBUTION Not Available

WASTE DISPOSAL METHOD
☒ Dispose of in accordance with local, provincial and federal regulations.

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
☒ Remove all sources of ignition. Use inert absorbent material, and non-sparking tools. Avoid breathing fumes. Ventilate area. Prevent from entering a watercourse.

SECTION VIII: SPECIAL PROTECTION INFORMATION

PROTECTIVE GLOVES ☐ Required ☒ Not Normally Required

EYE PROTECTION (SAFETY GLASSES) ☒ Required ☐ Not Normally Required

OTHER PROTECTIVE EQUIPMENT ☐ Required: ☒ Not Normally Required

RESPIRATION PROTECTION
☒ If used indoors on a continuous basis, use of a cartridge type respirator is recommended.

VENTILATION ☒ LOCAL ☐ MECHANICAL If used indoors on a continuous basis.

SECTION IX: SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING X
Store in a cool, well ventilated area not to exceed 50°C.

OTHER PRECAUTIONS X
Do not puncture or incinerate containers, even when empty.

Tempo Paint & Varnish Co.
Division of Tower Chemicals Ltd.
205 Fenmar Drive
Weston, Ontario
M9L 2X4

49-5511-0
49-5512-8 500ML
[redacted] 4LTR
49-5516-0 4LTR
49-5514-9 CTR
CTM 712

MATERIAL SAFETY DATA SHEET

TRADE NAME [redacted]

Section 2 INGREDIENTS	%	TLV (units)
Methylene Chloride	over 80%	
Alcohol	under 20%	
Wax	under 1%	
Cellulosic Thickner	under 1%	

Section 3 PHYSICAL DATA

BOILING POINT	40°C.	SOLUBILITY IN WATER	NIL
VAPOR PRESSURE (mmHg at 20°C)		SPECIFIC GRAVITY (H_2O = 1)	1.2
VAPOR DENSITY (air = 1)	3.2	% VOLATILE BY VOLUME	98%+

APPEARANCE: Colourless Liquid

Section 4 FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (AND METHOD USED): NIL

FLAMMABLE LIMITS (STP IN AIR): L.F.L. N/A U.F.L. N/A

EXTINGUISHING MEDIA: ☒ WATER FOG ☐ FOAM ☐ ALCOHOL FOAM ☐ CO_2 ☐ DRY CHEMICAL ☐ OTHER

SPECIAL FIRE FIGHTING PROTECTION EQUIPMENT AND HAZARDS

N/A

Section 5 REACTIVITY DATA

STABILITY (NORMAL CONDITIONS): ☐ STABLE ☐ UNSTABLE

CONDITIONS TO AVOID: Heat

INCOMPATIBILITY

MATERIALS TO AVOID: ☐ WATER ☐ ACID ☐ BASE ☐ CORROSIVE ☐ OXIDIZING MATERIAL

OTHER: ☐ Contact with Aluminum

HAZARDOUS DECOMPOSITION PRODUCTS: Solvent Fumes

HAZARDOUS POLYMERIZATION: ☐ MAY OCCUR ☐ WILL NOT OCCUR

CONDITIONS TO AVOID

Section 6 SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

Mop up with absorbent rags
Avoid skin contact and fume inhalation

DISPOSAL METHOD

Keep rags etc. in closed containers or outside.
Dispose as for Hazardous Materials.

T1-55128 500ml
T9-5514-4 1 Litre
49-5516-0 4 L

MATERIAL SAFETY DATA SHEET (cont)

Section 7 HEALTH HAZARD DATA

TION
Give Plenty of water
Do NOT induce Vomiting
Call Doctor immediately.

E CONTACT
Irrigate copiously with water.
Call Doctor immediately.

IN CONTACT
Remove contaminated clothing.
Wash thoroughly with warm soapy water.

IN ABSORPTION
N/A

HALATION
Overexposure to fumes can cause nausea, headache, 'drunkeness'.

FFECTS OF OVER EXPOSURE
Remove to fresh air at once & Call Doctor.

FIRST AID PROCEDURES

EYE

FLUSH WITH FLOWING WATER

Eyes: Flush copiously with water

Skin: Remove contaminated clothing, then wash with warm soapy water.

Ingestion: Call Doctor
Do NOT induce vomiting.

NEVER GIVE FLUIDS OR INDUCE VOMITING IF PATIENT IS UNCONSCIOUS OR HAVING CONVULSIONS

Section 8 SPECIAL PROTECTION INFORMATION

ENTILATION
Excellent exhausting in working area is required.

ESPIRATORY PROTECTION (Specify type)
None, if exhausting system is adequate.

ROTECTIVE CLOTHING
Solvent resistant apron and gloves.

YE PROTECTION
☐ NOT NORMALLY NECESSARY
☒ SAFETY GLASSES WITHOUT SIDE SHIELDS
☐ SAFETY GLASSES WITH SIDE SHIELDS
☒ CHEMICAL WORKERS GOGGLES
☐ GAS TIGHT GOGGLES OR EQUIVALENT
OTHER ☐

Section 9 SPECIAL PRECAUTIONS OR OTHER COMMENTS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING
Open carefully as some pressure may have developed in container.
Do NOT store above room temperature (77-80°F.)

Appendix C
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