MOCA SAFE USE GUIDANCE

FOR THE CASTABLE POLYURETHANE INDUSTRY

Prepared by the

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1.0 INTRODUCTION

This MOCA Use Guidance material has been prepared to assist members of the Polyurethane Manufacturers Association ("PMA") in developing appropriate work practices in the use of *4,4' methylene bis (2-chloroaniline*), commonly referred to as "MOCA" or "MBOCA" (CAS No. 101-14-4).[1]

This Guidance is based upon the extensive experience of the PMA in dealing with the regulatory issues concerning MOCA, participating in the evolution of recognized industry practices in the safe use of MOCA in the castable polyurethane industry, and assisting PMA members in managing consistent compliance with health and safety regulations concerning its use.[2]

This memorandum, and the attached appendices and reference materials, are intended as a supplement to and not a replacement for the product-specific information and instructions provided by MOCA manufacturers and distributors, such as Material Safety Data Sheets and product literature. This Guidance is prepared for and intended for the use solely by PMA members in conjunction with other ongoing PMA programs concerning safety and health regulatory issues applicable to the castable polyurethane industry.[3]

Typically, castable polyurethane processing facilities will have much in common with one another in the use of MOCA. However, there are also important, site-specific differences in each workplace in equipment, layout and processing methods. Therefore, in developing a MOCA use strategy, the process engineering and management staff for each polyurethane processing facility should apply and modify this Guidance to the site-specific circumstances of its particular operation. Differences from one processor to another may render a certain aspect of this Guidance more critical or require alteration in methods used to control potential employee exposure to the chemical. This guidance has been prepared in an effort to assist PMA members in developing site-specific procedures to achieve consistent compliance with applicable safety and health requirements.

Regulations administered by the Occupational Safety & Health Administration ("OSHA"), the U. S. Environmental Protection Agency ("EPA") and the U. S. Department of Transportation ("DOT") related to MOCA are intended by Congress and the respective administrative agencies to bring about a reduced potential for MOCA exposure in the workplace and to prevent releases of MOCA to the environment. The procedures presented in this Guidance can be of assistance to facility management in addressing regulatory compliance issues in the use of the chemical and in

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[1] This document supersedes the PMA "MOCA Use Guidance-Castable Urethane Industry" document dated October 23, 1997. Future changes in applicable laws or regulations following the issuance of this document could affect the appropriateness of information contained herein. Members of the PMA can check on any revisions by contacting the PMA, 6737 West Washington Street, Milwaukee, WI 53214 (414-431-3094).

[2] Environmental issues related to MOCA management, including regulatory compliance and release issues, are presented for reference in the Appendix to this guidance.

[3] PMA members are referred to the related discussions of chemical handling, hazard communication, personal protective equipment, air and surface sampling presented in the PMA Plant Operations Notebook (Revised, February 21, 1996), prepared by Theodore J. Hogan & Associates, Inc.

reducing the potential for significant liabilities. Although specific circumstances vary from processor to processor, the following discussion provides a review of considerations that are generally applicable to the use of MOCA throughout the castable polyurethane industry.[4]

2.0 SUMMARY

The common use of MOCA by polyurethane manufacturers subjects most PMA members to state and local regulatory requirements across the broad framework of safety and health regulations. The PMA has extensive experience in assisting members in managing consistent compliance under these various regulatory programs. Implementing recognized industry practices in the use of MOCA in castable polyurethane processing can assist PMA members control the potential for employee exposure, prevent or control releases and emissions, and comply with a broad range of health and safety requirements related to the use of MOCA.

Although specific circumstances vary from processor to processor, the following summarizes employee exposure considerations and environmental compliance issues generally applicable to the use of MOCA in the castable urethane industry.

A. Summary of Employee Exposure Considerations

- The use of a closed transfer system such as vacuum transfer system or contained gravity feed system, in transferring the MOCA from the MOCA shipping drum to a melter or dispenser minimizes potential for MOCA workplace contamination.

- The use of MOCA urinalysis monitoring verifies the effectiveness of the equipment and practice used to avoid employee exposure to the chemical.

- The use of impervious gloves and long-sleeved smock is generally indicated as a precaution against potential skin contact with MOCA. Cleaning solutions used periodically to decontaminate work surface subject to MOCA contamination and general area cleaning practices control workplace surface contamination. Vacuum cleaners equipped with HEPA filters are effective for removing MOCA particles in housekeeping and in the event of spill.

4 Note that this MOCA Use Guidance document addresses federal safety, health and environmental regulations applicable to MOCA, and does not evaluate the regulations of each of the states. Individual states often adopt, in large measure, the federal environmental framework as the state regulations; however, some states have promulgated regulations more strict. Therefore, compliance with a federal regulation relating to MOCA does not necessarily constitute full compliance with all relevant and applicable state and local regulations. As a result of the differences that can arise between the application of federal and state regulations concerning the use of MOCA in a specific workplace, it is absolutely essential that each processor using MOCA ascertain to what extent, if any, the state regulations relevant to the use of MOCA differ from federal regulations. For assistance in identifying the regulations applicable to the use of MOCA in your state, upon inquiry to the PMA office, assistance can be provided to PMA members through a consultation service with the PMA regulatory consultants.

- Wipe sampling provides limited information regarding status of surface contamination with MOCA in the workplace, and can be useful to augment urinalysis monitoring. However, wipe sampling results do not accurately reflect the potential for employee exposure where protective gloves and smock are used. Levels of contamination can also vary through work cycle where decontamination procedures are used.

- Documentation of employee training concerning MOCA and training in work procedures should be retained in each employees personnel file. Monitoring results should also be retained. No medical surveillance for MOCA exposure is indicated.

The following sections present discussions of such health and safety issues as air contaminant levels (Section 3.0), recommended workplace practices (Section 4.0), exposure training (Section 5.0), and medical surveillance (Section 6.0).

3.0 OSHA AIR CONTAMINANT ISSUES

A. Former OSHA Standards

At present, OSHA does not have in effect federally an air contaminant standard specifically regulating MOCA. Formerly, in January, 1989, OSHA had included MOCA in its amendment to its Air Contaminant Standard § 1900.1000, and regulated the chemical to the time weighted average limit for an 8-hour period of 0.02 ppm or 0.22 mg/m3 with a skin notation. The U.S. Court of Appeals, Eleventh Circuit vacated the air contaminant amendment in July, 1992, and OSHA formally withdrew its regulation in June, 1993. This specific OSHA regulation is therefore no longer in effect, and there is currently no federal OSHA air contaminant standard for MOCA.

Some states have adopted legislation authorizing the respective state agency responsible for occupational safety and health to adopt workplace safety standards that are more broad and more strict than the federal standards. To date, California, Kentucky and Oregon are the only states which have, independent of federal OSHA, developed and promulgated a workplace standard for MOCA that is presently in effect.

Note also that many states adopted the federal OSHA standard for MOCA promulgated in 1974, even though that federal OSHA standard was subsequently vacated by a federal court, several states retain the regulation as the workplace standard. Similarly, the amendment to the OSHA Air Contaminant Standard promulgated by OSHA in 1989 was vacated by the U.S. Court of Appeals, Eleventh Circuit. When these federal standards relating to MOCA were vacated by a federal court, some of the states which had adopted one or both of these OSHA standards withdrew their state MOCA regulation. While a few states (e.g., Oregon and Kentucky) actively enforce their state MOCA regulations, several other states have MOCA regulations but have not actively enforced them.

It is therefore important that each polyurethane processor determine the status of state regulations applicable to MOCA. Observing the recommendations contained in this Guidance will very likely result in compliance with state requirements, but some state

regulations, such as those promulgated in California, Oregon and Kentucky, may require additional actions by the processor.

OSHA has announced that one of the agency's objectives is to re-establish the vacated air contaminant amendments, and since there was no controversy regarding the MOCA regulation, it is reasonable to expect that the air contaminant regulation for MOCA will be reinstituted in the future as a federal standard. Most states will likely adopt any such standard. The PMA regards the standard that had been established by OSHA in the vacated regulation for MOCA to be a reasonable standard, and recommends that the castable polyurethane industry continue to view the standard as an industry guideline.

B. An Industry Guideline

The air exposure limits previously adopted by federal OSHA and some states are 0.02 ppm and 0.22 mg/m3. MOCA can be readily used in castable polyurethane processing without exceeding these limits. The results of air monitoring performed in castable polyurethane workplaces which utilize control procedures, equipment, and strategies described in this Guidance have routinely documented no detection of MOCA.

Detectable MOCA vapor contaminant is extremely unusual when the chemical is in either liquid or pellet form in the workplace because of the chemical's low vapor pressure of 10^{-9} mm Hg. at 70°F in the solid state and 10^{-5} mm Hg at 240°F in the liquid state.

Control of MOCA particulate contamination has been significantly enhanced with the change by MOCA manufacturers in the 1980s to a glazed pellet, which reduced the potential for MOCA dust particles as compared to the former prilled product. Also, improved methods for transfer of MOCA from the shipping container to the melter were developed in the 1970s and 1980s.

4.0 RECOMMENDED WORKPLACE PRACTICES

A. Control of MOCA contamination during the transfer of the MOCA pellets from the drum to the melting stage

Use of closed transfer procedures controls potential workplace contamination during transfer of the MOCA pellets from the drum to a MOCA melter. Where MOCA is used in the manufacture of relatively small products and parts, often utilizing a "hand-casting" procedure, a closed transfer method can be used to transfer the MOCA pellets from the drum to a dispenser for weighing and melting small quantities of the chemical.

Two principal closed transfer systems include vacuum transfer systems which are commercially available, or gravity feed systems in conjunction with MOCA shipping drums which incorporate a spout dispenser as a part of the blow mold inner liner in the drum.

Manual transfer of MOCA from the shipping drum to a melter in an enclosed MOCA transfer area, with reliance upon personal protective equipment and clothing to avoid employee exposure, or glove boxes, have also been used to control employee exposure.

B. Air monitoring to determine workplace MOCA contamination during the use of MOCA in the processing operation

Closed transfer systems readily control MOCA air contamination and achieve compliance with the previous OSHA air contaminant standard. During 1988, the PMA sponsored MOCA air contaminant testing at three typical processor operations. One processor used a vacuum system to transfer MOCA pellets from the drum to a melter in an automatic machine mixing operation. Another used a vacuum system to transfer MOCA from the drum to a gravity-feed container located in a negative pressure hood for subsequent MOCA weighing and melting for "hand-casting". A third used a gravity feed transfer system by permitting MOCA pellets to flow from the drum through the drum blow mold inner liner spout to a melter. The air monitoring results in all three operations demonstrated compliance with the OSHA MOCA standard. MOCA was undetectable in these situations, except a trace detection of MOCA air contamination in one sample. These results were consistent with previous MOCA air monitoring results observed in other workplaces.

Although MOCA air monitoring by the processor using a closed transfer system is not necessary where a program of employee urinalysis is followed, an initial air sampling provides baseline information and demonstrates that the previous OSHA levels are met.[5] If a closed transfer system is not utilized, an initial air monitoring would appear desirable to assure that the MOCA transfer procedure utilized does not result in air contaminant levels in excess of the former federal OSHA limits. In the event of significant modifications to the MOCA transfer system, it is recommended that air monitoring again be conducted, particularly where a closed system is not utilized.

C. Use of respirators by employees and provision for workplace ventilation

Employees working in MOCA areas customarily are not required to use respirators, since the recommended exposure levels are not exceeded. However, processors may, for certain operations in castable polyurethane processing, desire to instruct employees to use respirators even though the air concentrations of MOCA are not expected to exceed the recommended levels. Such use may be prescribed as an added precaution to avoid MOCA exposure, particularly in activities or operations involving a potential for exposure to accumulated MOCA particulates, such as equipment maintenance or clean-up of a MOCA spill.

5 OSHA prescribes use of OSHA 71 Sampling and Analytical Method for MOCA, which provides a detection limit of 3.6 ug/m based upon 100 liter air volumes. Information concerning consultants capable of conducting MOCA air sampling is available from the PMA.

Where respirators are used, such use must comply with provision of the respirator standard 29 CFR 1910.134. For example, the appropriate type of respirator must be used, it must be properly maintained and employees must be trained in its use. (CPA 2.45B p.IV-40).[6]

When the employee exposure to MOCA air concentrations does not exceed the recommended industry standards, then the employer is deemed by OSHA, with respect to the use of MOCA, to be in compliance with the OSHA airflow ventilation standard. (CPL 2.45B p. IV-36).

D. Potential for employee MOCA exposure by skin contact with contaminated surfaces

The former OSHA air contaminant standard identified a dermal contact factor (a "skin designation") for MOCA. This designation was based upon health concerns related to the potential for employee exposure by skin contact with MOCA. The standard required that:

> *To prevent or reduce skin absorption, an employee's skin exposure to [MOCA] ... shall be prevented or reduced to the extent necessary in the circumstances through the use of gloves, coveralls, goggles, or other appropriate personal protective equipment, engineering controls or work practices.*

Experience has demonstrated that skin contact is a potential route for employee exposure to MOCA in castable polyurethane operations. Experience has further demonstrated that MOCA particulates will inevitably be present on some workplace surfaces. However, regulators have acknowledged that surface contamination in itself does not constitute an employee exposure. Thus, surface monitoring results do not quantify the extent or the likelihood that employee exposure may occur. Engineering controls, personal protective clothing, employee work practices and housekeeping practices are routinely used by processors to successfully avoid workers' skin contact with MOCA. For this reason, surface monitoring is not generally performed by processors to evaluate the potential for employee exposure, and such monitoring is not an industry practice.

During the 1970s, OSHA compliance officers, on some occasions, observed the policy that detection of any MOCA surface contamination constituted a violation of the general duty clause. This enforcement problem subsided after the PMA successfully challenged this approach to surface contamination citations in several cases before the OSHA commission. The OSHA enforcement instruction currently observed provides as follows:

> *In general, wipe sampling (not air sampling) will be necessary to establish the presence of a toxic material posing a potential absorption or ingestion hazard.*

* * *

6 Reference is to the OSHA Field Operations Manual, Fourth Edition, May, 1999. The Manual has been updated effective November 9, 2009.

There are four primary considerations which must be met to support a citation:

(a) The potential for ingestion or absorption of the toxic material must exist.

(b) the ingestion or absorption of the material must represent a health hazard.

(c) The toxic substances must be of such a nature and exist in such quantities as to pose a serious hazard. the substance must be present on surfaces which have hand contact (such as lunch tables, cigarettes, etc.) or on other surfaces which, if contaminated, present the potential for ingestion or absorption of the toxic material (e.g., a water fountain).

(d) The protective clothing or other abatement means would be effective in eliminating or significantly reducing exposure.
(CPA 2.45B p. IV-46).

The concerns that resulted in the OSHA "skin designation" for MOCA provided in the January, 1989 air contaminant standard could reactivate the issue of whether a specific quantity of MOCA surface contamination detected in a workplace constitutes a work hazard.

This OSHA enforcement policy gives the enforcement officer discretion in determining "what quantities of [MOCA] pose a serious hazard" and what "protective clothing or other abatement means" should be used to avoid the MOCA exposure.

In light of this broad discretion, it is advisable that a processor develops and retains information which establishes that employee exposure is adequately controlled, particularly where wipe tests establish the presence and/or non-detection of MOCA surface contamination. Such information will substantially assist in avoiding an erroneous or arbitrary exercise of discretion by a compliance officer. The employer's use of urinalysis monitoring is also recommended in this regard.

E. Use of MOCA urinalysis monitoring.

A MOCA urinalysis testing program is recommended for those employees who work in areas of potential MOCA exposure, including areas where MOCA surface contamination is expected. Such a monitoring program will demonstrate that the protective equipment, protective clothing and work practices in a specific workplace provides effective control of employee exposure, including potential exposure through contact with contaminated surfaces.[7] Utilization of a MOCA urinalysis monitoring system provides an additional

[7] MOCA urinalysis monitoring has been utilized by castable urethane processors to evaluate the effectiveness of controlling employee exposure for over 20 years. EPA and NIOSH have endorsed the use of urinalysis monitoring by processors. OSHA has used MOCA urinalysis monitoring as part of enforcement inspections to evaluate employee exposure to the chemical. The State of California in 1979 adopted a MOCA health standard setting 100 ug of MOCA per liter of urine as the maximum permissible employee exposure to MOCA. In the 1970s, Health Evaluations Program, developed a MOCA urinalysis monitoring program in cooperation with the PMA. This urinalysis monitoring program is presently available from Colormetrics Laboratories Incorporated (CLI), 1261A Rand Road, Des Plaines, IL 60016 (708) 696-3036. The CLI analysis procedure was evaluated by NIOSH in 1985 and determined to provide an acceptable methodology. The castable urethane industry has

benefit in relation to establishing compliance with OSHA requirements. Urinalysis monitoring provides an effective method to establish that MOCA surface contamination in the workplace is not "of such a nature and exist in such quantities as to pose a serious hazard". It establishes that the protective clothing or other protective means used in the workplace effectively control employee exposure. Establishing that the controls used in the workplace effectively control employee exposure to MOCA should avoid an unreasonable or arbitrary exercise of discretion by a regulatory inspection officer.

Urinalysis results which are undetectable support a compliance officer's determination that the processor's controls are adequate. Urinalysis results involving detectable MOCA under 100 ug/L, based upon the industry's recognition of the California MOCA standard, would also support a determination that the exposure does not constitute a serious hazard. If a citation were issued, urinalysis results under the 100 ug/L recognized by the California standard will place the processor in a strong position to challenge the citation. In previous OSHA general duty citations against processors during the late 1970s, compliance with the California exposure standard, as expressed by the 100 ug/L MOCA urinalysis limitation, has been determined by OSHA administrative law judges not to violate the general duty clause.

Thus, urinalysis results verify whether the protective clothing, processing equipment, and procedures utilized by a processor effectively control employee exposure by absorption or ingestion. Without such factual information, an enforcement officer's discretionary judgment might lead to an erroneous or unreasonable citation.

F. Use of personal clothing

Employee protective clothing should be used as necessary to establish an effective barrier between the employee and potentially contaminated touch surfaces. The protective clothing that has been found effective and thus appropriate in most castable polyurethane operations consists of smocks with full-length sleeves and impervious gloves.

The adequacy of the protective clothing for a specific operation is effectively evaluated by urinalysis monitoring results. Any unusual processing techniques or procedures may require additional clothing and equipment on a regular or special work task basis.

G. Housekeeping, decontamination and maintenance

Surfaces that accumulate MOCA particulates should be periodically decontaminated with a cleaning solution. General cleaning procedures are used for other work areas. Some processors have successfully cleaned surfaces by vacuuming with a high-efficiency particulate air ("HEPA") filtered vacuum cleaner.

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informally applied the California standard of 100 ug/L as representing a reasonable, maximum acceptable exposure value. Processors generally experience employee urinalysis results of undetectable to less than 50 ug/L, with only occasional excursions, for any given employee over 50 ug/L. Less than 1% of the employee samples have exceeded 100 ug/L, and then only rarely has such an exceedance been repeated for any given employee. An historical analysis of the PMA's urinalysis monitoring program was published by L.K. Lowry and D.E. Clapp in Applied Occupational and Environmental Hygiene, September, 1992. Copies of the article and information regarding this program can be obtained from the PMA office.

Personal protective clothing is either discarded where disposable clothing is utilized, or frequently laundered where reusable clothing is utilized.

Infrequently, polyurethane processors encounter spills of MOCA in either the dry pellet or melted liquid state. Clean up and decontamination procedures have included the following: for the dry pellet, vacuuming with a HEPA filtered vacuum cleaner, followed by surface decontamination with a cleaning solution; and for liquid MOCA, permitting the MOCA to solidify and scraping off the MOCA under vacuum or negative pressure using a HEPA filter, followed by surface decontamination with a cleaning solution.

Occasionally, equipment which is internally contaminated with MOCA requires maintenance or repair (i.e. MOCA melter, transfer system or automatic mixing machine). Urinalysis monitoring has shown this activity can pose a risk for MOCA exposure. Where warranted, special precautions should be taken to avoid MOCA exposure. Typical precautions include the proper use of a respirator, hair covering, impervious gloves, smock, shoe covers and adequate ventilation.

5.0 WORKPLACE EXPOSURE TRAINING

Each polyurethane processor is required to provide employee training consistent with various safety, health and environmental programs. These requirements include training under OSHA's Hazard Communication Standard ("HAZCOM"), codified at 29 CFR 1910.1200; OSHA's Hazardous Waste Operations and Emergency Response Regulations, 29 CFR 190.120; the EPA Hazardous Waste Operations and Emergency Response regulations, 40 CFR 311.1; and the DOT Training for Safe Transportation of Hazardous Materials. Separate training requirements may be applicable under various environmental programs, to be discussed later in this Guidance.

As employers, polyurethane processors are required, pursuant to 29 CFR §1910.1200, the OSHA Hazard Communication regulation, to develop and maintain a written hazard communicated program. This program requirement applies to the use of MOCA, which is one of many industrial chemicals identified as a hazardous substance. The hazard communication program must include comprehensive information about MOCA, the health hazard associated with MOCA exposure, and training of the employees in the use of the chemical in the workplace. It also requires availability of material safety data sheets for all employees on all shifts (*see* 29 CFR 1910.1200(e) through (f)). The processor should also maintain written documentation that employees have been appropriately trained, such as attendance records for training sessions conducted and the subject matter presented in such training. This documentation should be maintained in the individual personnel records for each specific employee for whom such an exposure exists.

The HAZCOM standard applies to any chemical which is "known to be present in the workplace in such a manner that employees may be exposed under normal conditions or use, or in a foreseeable emergency" and which employs one or more employees and that stores or uses one of thousands of regulated substances. The employer must develop a written plan, including the collected MSDS materials, and prepare a program which details how the polyurethane processor

will comply with every part of the Standard. The deadline for compliance with this Standard was May 23, 1988. Covered employees must be made familiar with the plan and program through class room and on-the-job training.

The written Hazard Communication Plan should include an alphabetized chemical inventory of all chemicals stored, or used in the facility showing a dated, hazard determination for each inventory item (this Plan and the inventory must be updated annually). The Plan should include a toxic substances inventory, training documents and chemical response worksheets, providing information such as the following: the proper shipping name, DOT number, trade name, chemical name, vendor, hazards presented, the storage location, the MSDS file, container labels & workplace signs, chemical-specific written training program materials, applicable EPCRA state laws, annual reports, training classes and records, any emergency response incident reports, personal protection & safety equipment (i.e. eye wash, safety goggles, respirators, and protective clothing). For example, as MOCA is an aromatic amine, HAZCOM training should include information concerning target organs (i.e., the bladder) and appropriate personal protection to prevent or reduce exposure. Dermal contact issues would also need to be covered in the HAZCOM training.[8]

6.0 MEDICAL SURVEILLANCE

No specific employee medical surveillance relating to exposure to MOCA is indicated. No such surveillance has been identified by medical experts. There are no identifiable toxic effects from the potential levels of MOCA exposure which may be encountered in castable polyurethane casting operations. Massive exposure to the chemical has been shown to potentially cause cyanosis, kidney irritation, or methemoglobinemia. However, such MOCA exposure and such effects from MOCA exposure have never been reported or identified in association with the use of MOCA in castable polyurethane operations.

MOCA has been identified as causing cancer in laboratory animals. MOCA's status as a suspect human carcinogen is the principal health concern presented by the use of the chemical by processors. To date, MOCA has not been identified as a factor in causing cancer in humans.

A comprehensive study performed in 1992 of employees involved in the manufacture of MOCA prior to 1978, many of whom encountered sustained exposures to the chemical during the 1950s and 1960s found no bladder cancer attributable to MOCA exposure. Since MOCA is an aromatic amine, the bladder would constitute the organ to be affected if exposure to MOCA caused cancer.

During the period 1990 to 1992, the American Conference of Governmental Industrial Hygienists ("ACGIH") and the International Agency for the Research of Cancer ("IARC") independently reevaluated the carcinogenicity information relating to MOCA and continued the chemical's classification as a suspect human carcinogen.

8 A description of OSHA requirements under the HAZWOPER rules is provided at Appendix II to this guidance.

APPENDIX I

ENVIRONMENTAL COMPLIANCE ISSUES FOR PROCESSORS USING MOCA

1. Summary

This section provides a brief synopsis of the key federal environmental requirements that apply to a facility using MOCA, including hazardous waste management requirements that govern the generation and management of unreacted, waste MOCA, the Superfund Amendments Reauthorization Act requiring chemical inventory and release reporting, and requirements under the Clean Air Act Amendments of 1990 regarding air emissions. These regulations are intended to control workplace exposures, protect against releases to the environment and provide for community response to any release of MOCA.

EPA and the environmental regulatory agency of the particular state may need to be notified of the use of MOCA, depending upon the processor's annual usage and the maximum amount stored at any point in time during the calendar year. An EPA identification number must be assigned to a facility generating MOCA hazardous waste before offering to ship MOCA hazardous waste for treatment or disposal.

Unreacted MOCA is regulated as a listed, RCRA hazardous waste. Such wastes may not be accumulated on-site for more than 180 days if the facility is regulated as a Small Quantity Generator of hazardous waste, or 90 days if the processor is a Large Quantity Generator. Before transportation, waste MOCA must be packaged, labeled, and placarded according to DOT regulations applicable to listed hazardous wastes.

If the facility is regulated as Large Quantity Generator of hazardous waste, the facility must prepare an Emergency Preparedness and Prevention Plan ("Contingency Plan"), which must filed with the appropriate state regulatory agency. Development of an Emergency Contingency Plan is recommended although not required for Small Quantity Generators of hazardous waste.

In the event of a spill of 10 pounds or more of MOCA to the environment, (i.e., a release to soil, water, groundwater, or an emission to the air), the facility must notify the appropriate state and federal agencies. Some states have more stringent spill reporting requirements, and therefore a spill of less than 10 pounds may still need to be reported to the appropriate state agency.

Facilities that have on hand at any point in time during the calendar year 10,000 pounds or more of MOCA must submit the current Material Safety Data Sheet for MOCA to the State Emergency Response Board, Local Emergency Planning and local fire department. In addition they must submit annual Emergency Planning Fee Statements and either annual Tier I or Tier II Inventory Reports or both, depending upon state regulations, with the Local and State emergency planning agencies.

Special rules apply to laundering items that contain MOCA residues, such as aprons and gloves (see: Laundering regulatory compliance memorandum).

MOCA is listed as a hazardous air pollutant under the federal Clean Air Act. Any air emissions of MOCA must meet the emission standards achieved through the application of the Maximum Achievable Control Technology, yet to be developed by EPA. If the potential exists, for the generation of more than 10 tons of MOCA emissions annually or more than 25 tons of total hazardous air emissions annually, then the facility will be deemed a major source and an operating permit will be required under the federal/state permit program effective between years 1994 through 1998. Most states require minor source permits for emissions of less than 10 tons of hazardous air pollutants but greater than the state-specific threshold level. (See emissions factors from PMA round robin stack testing program report(s)).

The discussion below presents guidance for proper hazardous waste management of unreacted MOCA, laundering items that contain MOCA, complying with inventory and release reporting requirements, and understanding the Clean Air Act regulations applicable to MOCA use.

2. Environmental Regulation of MOCA

MOCA, like hundreds of other industrial chemicals, has been designated by the EPA as a "hazardous substance" in regulations promulgated under the Comprehensive Environmental Response, Compensation and Liability Act ("CERCLA", also known as "Superfund", *see* the table of CERCLA hazardous substances at 40 CFR 302.4).

MOCA that is disposed of, either as an off-specification, expired or spilled material, or when present in wastes, is regulated as a "listed" hazardous waste in rules promulgated under the Resource Conservation and Recovery Act ("RCRA," *see* 40 CFR 261).

Depending on the quantities of MOCA present at a processor's facility, the polyurethane processor may be subject to hazardous chemical reporting (Tier I or Tier II reporting) and Toxic Chemical Release reporting (Form R) as set forth in regulations promulgated under Title III of the Superfund Amendments Reauthorization Act ("SARA Title III, also known as the Emergency Planning and Community Right-to-Know Act or "EPCRA"). MOCA is also regulated under the Clean Air Act Amendment of 1990.

As a result, MOCA is subject to regulation under various EPA regulatory programs. A castable polyurethane processor is likely to use a number of chemicals classified as "hazardous" by EPA. This document focuses solely upon MOCA; however, a processor should have prepared an integrated environmental compliance program for all hazardous substances used and all hazardous wastes generated.

The Reportable Quantity (RQ) for spill reporting of MOCA as provided at 40 CFR 302.4 is 10 pounds. For purposes of SARA Title III reporting, the Threshold Planning Quantity for MOCA is 10,000 pounds, and the Form R or EPCRA §313 *de minimis* value as specified in 40 CFR 372.38 for MOCA is 1%. In other words, MOCA present in materials containing MOCA at less than 1% is not considered for Form R reporting or when calculating the amount of MOCA spilled for comparison to the RQ. Some states may have more stringent spill reporting requirements.

A more comprehensive discussion of the broad impact of environmental regulations on the use of MOCA in the castable polyurethane industry is dealt with in detail in the PMA's Environmental Regulatory Compliance Manual. Specific regulatory requirements are referenced in the PMA's Environmental Regulatory Compliance Manual and in the PMA's ISO 14000/14001 Environmental Management System template. Also, every MOCA user should review state environmental regulations to determine to what extent, if any, applicable state regulations differ from EPA requirements.

3. RCRA Regulation of Waste MOCA

Normal processing results in little waste MOCA. Once the MOCA is mixed with the prepolymer, an immediate chemical reaction produces polyurethane which is neither a hazardous substance nor a hazardous waste.

a. Hazardous Waste Classification of MOCA

Under the RCRA federal regulatory scheme, MOCA is listed under 40 CFR 261.33(f) as "U158", indicating that MOCA is a hazardous waste whenever it is to be managed as an off-specification commercial chemical product or manufacturing chemical intermediate. Under RCRA regulations, it is the responsibility of the polyurethane processor as the waste generator to determine when a material becomes a waste. Once a material is identified as "off-spec" and no longer suitable for the purpose for which it was intended, it becomes a waste, even where the generator stores the material with the intention of eventually identifying a useful purpose for the off-spec material, a practice referred to by USEPA as "speculative accumulation."

After declaring the material to be a waste, the generator must then determine if that waste is regulated as a "hazardous waste" (40 CFR 262.11). To make this determination, the generator should determine the following:

(a) Does the waste exhibit a hazardous characteristic as defined under the regulations (i.e., ignitability, corrosivity, reactivity, or toxicity (TCLP));

(b) Is the waste described as a waste from a non-specific or specific source (i.e., the F and K lists at 40 CFR 261.31 and 261.32);

(c) (3) Is the waste included on the lists of discarded commercial chemical products (i.e., the U and P lists at 40 CFR 261.33(e) and (f)).

This waste determination must be made individually for each waste stream on the basis of information about the chemical nature, origin and characteristics of that waste stream.

With regard to waste or off-spec MOCA, the waste does not exhibit the characteristics of ignitability, corrosivity, toxicity, or reactivity (as "reactivity" is defined at 40 CFR 261.23). Further, the manufacturing process in which this waste is used, and from which it is generated, is not described on the F and K lists. However, MOCA is listed as U158 on the "U list" which identifies "toxic hazardous wastes" under the RCRA program (whereas, the P list designates "acutely hazardous substances").

b. Waste Streams that Must Be Managed as a Hazardous Waste

Therefore, waste streams which must be managed as RCRA hazardous include the following:

(a) Any remaining MOCA (virgin or off-spec) commercial chemical product or residue to be discarded;

(b) Any mixture or rinseate waste where unreacted waste MOCA has been commingled;

(c) Any discarded items (e.g., gloves, rags and aprons) or other waste materials (e.g., floor-dry) which have adsorbed or which contain unreacted MOCA;

(d) Any manufacturing intermediate which may contain unreacted MOCA as the sole active ingredient;

(e) Any residue remaining in a container or an inner liner of a container (except an "empty" container as defined in the regulations); and

(f) Any waste residues or contaminated soil, water or other debris, such as resulting from the cleanup of a spill of MOCA.

c. Managing "Empty" Containers

Under 40 CFR 261.7, a container of hazardous waste is defined to be "empty" when "all wastes have been removed that can be removed using the practices commonly employed to remove materials from that type of container, e.g., pouring, pumping, and aspirating, and no more than 2.5 centimeters (one inch) of residues remain on the bottom of the container" (or the residue constitutes less than 3% by weight of the total capacity of the container when the container is ≤119 gallons).

Residues remaining in containers that meet the definition of "empty containers", as outlined in the paragraph above, are NOT subject to hazardous waste disposal regulations. That is, there are NO applicable hazardous waste generator standards, accumulation requirements. [40 CFR 261.7(a)(1)]. These containers including residues still need to be disposed properly and the transportation of empty containers is regulated by DOT as noted in the DOT section below. In addition, all containers with residues of hazardous materials need to retain OSHA Hazard Communication Labels.

There is also no regulatory requirement for treating (e.g., reacting), washing, rinsing, or otherwise managing these wastes as hazardous wastes. Indeed, such practices likely have the result of generating additional NON-hazardous waste streams of reactant waters, rinse waters, or wash waters. With regard to reactants or wash waters, it is important to note that the residues of the "empty" container are not regulated; and therefore, the solution (which is otherwise not regulated) does NOT become regulated as a hazardous waste when it collects or contains the residues of "empty" containers. Other residuals and materials contaminated with MOCA retain the U158 hazardous waste status.

For example, wash waters from cleaning up a spill of unreacted MOCA are hazardous wastes, whereas wash waters from reacting the residue in an "empty" drum are NOT subject to the regulations, even where these two types of wash waters would be chemically identical.

Similarly, where a drum reconditioner receives "empty" drums containing a residue of MOCA, as soon as the drum meets the definition of "empty" the residue loses the U158 hazardous waste designation, and this listing does not carry to the wash waters and rinse waters generated by the drum reconditioner's process (although, the drum reconditioner's waste waters might be hazardous for an independent reason, such as a RCRA characteristic, e.g. pH).

d. On Site Treatment of MOCA Wastes

There is no federal hazardous waste regulation addressing the treatment of hazardous wastes on-site prior to waste disposal; however, USEPA has interpreted the Hazardous Waste Generator Standards at 40 CFR 262 to mean that generators (not treatment, storage or disposal facilities) may treat hazardous wastes in the tank or drum in which the wastes are normally accumulated without the generator having to apply for a permit as a treatment facility. To qualify for this, the generator must comply with the requirements at 40 CFR 262.34 (generator standards) and 40 CFR 265 Subpart J (tank system management) and 40 CFR 265 Subpart I (container management). This treatment exemption is not extended to evaporation, incineration or thermal treatment methods.

Under this USEPA policy, the generator may treat unreacted MOCA wastes (U158) on-site while the wastes are being accumulated and prior to subsequent management or disposal, so long as the treatment takes place in the tank or container normally used for MOCA waste accumulation. This means that the tank, drum or other container in which the treatment occurs must be properly marked with the date the accumulation began, and must be emptied within the time limit imposed by 40 CFR 262.34 (90, 180, or 270 days).

For example, where TDI or other reactant may be added to a container of MOCA residue to expedite the reaction of those residues and generate an inert material which is clearly no longer MOCA, this treatment process conducted in the drum where the waste was "accumulated" is allowed without the generator possessing a RCRA treatment permit. Where the resulting wastes do not exhibit any RCRA hazardous characteristic (ignitability, corrosivity, toxicity or reactivity) and no longer contain detectable MOCA, these wastes are no longer RCRA hazardous and may be managed under various disposal options.

USEPA cautions generators from altering their waste accumulation practices to accumulate wastes in larger tanks or containers to conduct treatment under this policy, and warns that the policy may be found not to apply in such instances. Treatment in tanks or containers which have historically been used for waste accumulation is clearly allowed.

e. Feed Stocks Containing a Mixture of MOCA and At Least One Additional Active Ingredient

MOCA is a commercial chemical product or manufacturing chemical intermediate having the generic name listed in the "U" list of 40 CFR 261.33(f). Where unreacted MOCA feed stock consists of MOCA as the sole active ingredient (i.e., the MOCA feed stock can be described as a chemical substance manufactured or formulated for manufacturing or commercial use that consists of the commercially pure grade of the chemical, technical grades or formulations in which the chemical is the sole active ingredient), then any wastes consisting of unreacted feed stock should be regarded as a RCRA hazardous waste.

Note, however, that if the feed stock containing MOCA has at least one other active ingredient (i.e., the feed stock merely includes a chemical on the "U" list), the wastes of such a mixture of compounds do not meet the definition of U158 and are not to be regarded as RCRA hazardous solely due to the U158 listing (*see* "Comment" at 40 CFR 261.33 (d)).

Of course, if the waste unreacted mixed feed stock of MOCA and other active ingredients exhibits a RCRA hazardous characteristic (i.e., ignitability, corrosivity, toxicity, or reactivity, as defined at 40 CFR 261), then the waste should be managed as a RCRA hazardous waste.

Therefore, when the unreacted feed stock is a mixture of two or more active ingredients, and these ingredients are not listed on the "U" or "P" lists of 40 CFR 261.33, and where the process generating the unreacted feed stock is not listed on the "F" and "K" lists of 40 CFR 261, the feed stock is not a listed RCRA waste. Only where the unreacted feed stock consists of a single or sole active ingredient must the generator consult the Chemical Abstracts Service number ("CAS No 101-14-4.") identifying the chemical and compare this with the CAS No. of the "P" or "U" lists to be certain whether the substance is in fact the substance intended by the RCRA listing.

f. Disposal of MOCA Wastes, Waste Minimization, and Decontamination Procedures

With respect to MOCA, the principal concern under RCRA relates to disposing of waste materials contaminated with MOCA, such as protective clothing, shipping drums, and containers. Also, unreacted MOCA as a by-product of mixing machine calibration and occasionally spilled MOCA pellets or melted MOCA can give rise to the generation of hazardous waste. However, a processor normally can minimize the generation of such hazardous waste materials.

MOCA decontamination procedures vary depending on the nature of the process operation. Some of the more common methods for decontaminating drums or other waste material consist of spraying with prepolymer or applying chemical solutions that react the MOCA. Larger quantities of MOCA that become unfit for use in normal processing have been reacted with a prepolymer to make a useful polyurethane product,

such as loading dock bumper guards. This approach may minimize the generation of MOCA as a hazardous waste.

4. Hazardous Waste Generator Standards

If unreacted, waste MOCA is considered to be a RCRA hazardous waste, and as such all the state and federal generator standards are applicable. The complexity of the applicable standards depends on the volume of hazardous wastes generated and the status of the polyurethane processor as Conditionally Exempt, Small Quantity, or Large Quantity Generator. For a more comprehensive and detailed explanation of these requirements, see the "Hazardous Waste Management Plan" section of the PMA Environmental Regulatory Compliance Manual.

Depending on the generator status of the facility, the generation of waste MOCA may result in the application of the following RCRA regulations:

(a) Hazardous waste generator status determination

(b) Notification of EPA and state authority and application for an EPA facility identification number;

(c) Compliance with recordkeeping, packaging, labeling and manifesting of waste;

(d) Conduct weekly inspections of waste storage areas

(e) Emergency preparedness and prevention requirements (i.e., contingency planning);

(f) Annual or bi-annual (depending upon state regulation) hazardous waste activity report filed with state authority by March 1);

(g) Compliance with on-site storage and satellite accumulation rules. Wastes must be shipped off-site for treatment within 180 days for small quantity generators and 90 days for large quantity generators; and

(h) In preparation for shipment, compliance with DOT shipping requirements (49 CFR Part 172 and Part 172, Subpart F) and packaging in containers (49 CFR Parts 173, 178, and 179).

Since the EPA regards any waste that is mixed with or that contains a listed waste such as MOCA to be a regulated hazardous waste, precautions should be taken to minimize contamination of other materials with MOCA.

5. Special Requirements for Large Quantity Generators

A processor who has generated a total of 2,200 pounds or more of hazardous waste in any calendar month (including MOCA and all other hazardous waste) qualifies as a Large Quantity Generator. A Large Quantity Generator must comply with 40 CFR 265.30-265.37, setting forth emergency preparedness and prevention requirements. These criteria dictate

emergency communication facilities, fire control equipment, assignment of an emergency coordinator, establishment of emergency procedures and other requirements. See the "Contingency Plan" section of the PMA Environmental Compliance Manual. It is recommended that Small Quantity Generators voluntarily comply with these requirements, as feasible.

Several requirements that have been promulgated for hazardous waste treatment, storage and disposal facilities are also applicable to Large Quantity Generators. For example, polyurethane processors that are Large Quantity Generators must document personnel training for each employee whose duties may involve hazardous wastes.

6. Laundering Items that Contain MOCA

When an item to be laundered contains waste that is mixed with a commercially pure grade of MOCA, any technical grades of MOCA and all formulations in which MOCA was the *sole active ingredient*, the item to be laundered should be viewed as being contaminated with a *listed* RCRA hazardous waste.

Note that a different conclusion would be reached when making the RCRA hazardous waste determination for a waste material that had contained a mixture of MOCA and other active ingredients. In such a case, if the waste does not exhibit a RCRA hazardous waste characteristic and if the generating process is not listed on the F and K lists, it is not a RCRA hazardous waste. Similarly, where the manufacturing process generates a process residue or waste that contains several other substances, one of which is MOCA, if the waste does not exhibit a RCRA hazardous waste characteristic, the waste does not meet the definition of a RCRA hazardous waste.

Where aprons, caps, gloves, rags or other items to be laundered have adsorbed or contain commercially pure grade of MOCA, any waste manufacturing intermediate which consists of MOCA as the sole active ingredient, any residue remaining in a container or an inner liner of a container (except an "empty" container, as discussed above), any residue or contaminated soil, water or other debris resulting from the cleanup of a spill of MOCA and any other wastes derived from this listed waste, then the item contains a RCRA hazardous waste, and special laundering requirements may apply.

Where items to be laundered for reuse contain residues of one or more RCRA listed hazardous wastes (such as MOCA or TDI residues) and where such items are amenable to being cleaned at an industrial laundry (e.g., uniforms, aprons, gloves, and towels), the USEPA has refused to establish a policy at the federal level concerning how such items would be regulated, or how the wash or rinse waters from the industrial laundry would be regulated. Instead, USEPA has left the matter to be decided on a case-by-case basis by each state.

In the absence of a determination to the contrary by the state's implementing agency, the USEPA takes the position that the "contained-in" rule is to be applied, which provides that until such time as the soiled item no longer "contains" the RCRA hazardous waste residue, the item must be managed as a RCRA hazardous waste, and where laundering removes these

residues, the laundered item is no longer subject to hazardous waste regulation. Therefore, in the absence of a state policy to the contrary, there is no federal provision excluding industrial laundries or shipments of soiled linens from the full breadth of hazardous waste regulation (e.g., industrial laundries would be required to obtain hazardous waste facility permits before accepting items containing hazardous waste, laundry trucks would have to be licensed as waste transporters, and manifests would be required).

Many states and territories have taken the position that whether or not a towel or other launderable item is regulated as a hazardous waste depends upon how the residues came to be in the item. In most states, if unused product is placed on an item (such as being poured from a product container onto a towel to be used to wipe a surface), then the towel is only hazardous if it exhibits a hazardous characteristic. The basis for this view is that the product (even if listed on the U or P list) is not a waste, and therefore the definitions of the U and P lists at 40 CFR 261.33 (e) and (f) do not apply. If, on the other hand, the towel is used to clean up spilled or excess residue, then where the residue is characteristically hazardous, the towel is hazardous only if it exhibits the characteristic, and if the residue is "listed", then the towel is considered hazardous until it no longer "contains" the residue.

It has also been left to each authorized state to determine how clean the item must be before it is regarded as no longer containing the listed waste. In many states, industrial laundries are not required to obtain a special hazardous waste facility permit nor a solid waste facility permit, as the linen items are being returned to and are not regarded as a waste, however, many launderers may need to obtain or revise other permits, such as wastewater discharge permits or air pollution control permits. In addition, most states do not require a special transporter or hauling permit to transport launderable items between the generator and the laundering facility.

In virtually all states, industrial laundries may not accept linens that are saturated with a hazardous waste, or containers in which the hazardous waste is present as a free liquid. In most states, the implementing agency reserves the right to approve or disapprove the use of an industrial laundry on a case-by-case basis. In general, states have provided upon request, a letter of approval for a facility to manage industrial towels and soiled clothing containing residues of either characteristic or listed hazardous wastes have to be managed as hazardous wastes until such time as they are sent to an industrial launderer or dry cleaner to be cleaned and then returned to the owner, but exclude these wastes from hazardous waste regulation once shipped to the launderer (i.e., a laundry is not required to have a hazardous waste facility permit, they do not have to be licensed as waste transporters if they operate laundry trucks , and they are not required to use hazardous waste manifests for the shipment of soild fabrics). Note that Department of Transportation regulations continue to apply.

7. MOCA Regulation Under SARA Title III

The "Emergency Planning and Community Right-to-Know Act," commonly referred to as SARA Title III or EPCRA, mandates a nation-wide program for emergency response planning at the local community and state levels. Its intent is to provide state and local governments with the necessary information to identify chemical hazards and plan for hazardous substance emergencies. The legislation is an extension of the Hazard

Communication Standard that provides workers with the "right-to-know" potential hazards associated with chemicals.

EPCRA regulations (40 CFR Parts 350 – 372) establish four types of reporting for facilities that store, process or use specific chemicals.

a. Emergency Planning and Notification

EPCRA Section 302 requires that facilities notify the State Emergency Response Commission, fire department, and Local Emergency Planning of the presence of any "extremely hazardous substance" or EHS (see 40 CFR Part 355 Appendix A and B) if the facility stores in excess of the Threshold Planning Quantity (TPQ). MOCA is not included on the list of EHS and thus notification is not required. A comprehensive summary of the applicability of EPCRA to specific chemicals is provided in the EPA Consolidated List of Chemicals.

Facilities processing MOCA are subject to the Emergency Release Reporting Requirements of section 304 of SARA if there is a release of a reportable quantity (RQ) (10 pounds or more) of MOCA "into the environment." Some states lower the release reporting level to any amount of MOCA released into the environment. The release must be reported to the National Response Center (800/424-8802), the State Emergency Response Commission ("SERC") and the Local Emergency Planning Committees ("LEPC").

A facility may make the initial emergency notification to the LEPC, SERC and the National Response Center by telephone, radio, or in person, but this emergency notification must be followed up by written notification within 15 days, and generally as soon as possible. See "Spill Reporting," PMA Environmental Compliance Manual.

b. Hazardous Chemical Notification and Inventory Reporting Requirements of Sections 311-312

EPCRA Sections 311 and 312 apply to facilities that store OSHA hazardous chemicals in excess of the TPQ from Section 302 or any other OSHA Hazardous Chemical in excess of 10,000 pounds. Reports include:

1. An initial notification that includes an MSDS for the chemicals present
2. Subsequent annual inventory reports

Reports are made to the SERC, LEPC and the local fire department.

A polyurethane processing facility that has on hand at the facility at any point in time in the course of a calendar year 10,000 pounds or more of MOCA must comply with the reporting requirements of sections 311 and 312 of SARA.

A facility that is required to submit an MSDS sheet for MOCA must also annually file a Tier I or a Tier II form under section 312. State law governs which Tier Report is required. A Tier II form includes detailed information about MOCA, and information

about the amount and general location of where the chemical is stored and used at the facility. The completed Tier I/Tier II forms must be submitted to the SERC, LEPC, and the local fire department by March 1 of each calendar year.

c. Toxic Chemical Release Reporting Requirements Section 313

EPCRA Section 313 requires facilities that manufacture, process, or use listed chemicals (40 CFR Part 372. 65) in greater than threshold amounts submit annual toxic chemical Form R release reports. The Form R reports include releases and transfers of toxic chemical to designated facilities and to the environment.

Toxic Chemical Release Information Form ("EPA Form R") informs the government and public about off-site transfers and releases of toxic chemicals to the environment. A polyurethane processing facility is subject to a Form R reporting requirement for MOCA if it has 10 or more full-time employees; and processes 25,000 lbs or more of MOCA in any calendar year. The Form R is a chemical-specific report, and the report must be completed specifically for MOCA, as provided at 40 CFR 372.65. The Toxic Chemical Release Form is due annually on July 1. See the section pertaining to "SARA Title III," PMA Environmental Compliance Manual.

A number of MOCA processors have been required to file Form R reports annually for the chemical. None has experienced air emissions of MOCA in excess of one pound per year.

8. Clean Air Act Regulations

Title V of the Clean Air Act requires permitting of sources and emission controls for criteria pollutants and hazardous air pollutants. Criteria pollutants include VOC, particulate, NO_x, SO_x, CO, and lead. In particular emissions of particulate will need to meet Ambient Air Quality Standards (40 CFR Part 50.6). Title V of the Clean Air Act authorizes state and federal operating permit programs (40 CFR Part 70 and 71). Facilities need to estimate emissions of MOCA as well as other hazardous air pollutants and criteria pollutants to determine whether an air permit is required and what type is needed.

MOCA is classified by EPA as a Hazardous Air Pollutant (HAP) and is listed for regulation in Section 112 of the Clean Air Act. Facilities that have HAP emissions may be regulated either as major sources or area sources. Any stationary source that has the "potential to emit" 10 tons per year (TPY) of any other single HAP into the environment or 25 TPY of any combination of hazardous air pollutants listed in Section 112 will be considered a Major Source. An area source is any source of hazardous air pollutants that is not a major source. These facility emissions determinations may be calculated based upon use of emission factors from EPA or actual stack tests. The PMA conducted stack tests in 1996 for MOCA, TDI, and MDI.

Major sources of HAPs are required to obtain Title V Air Permits and apply Maximum Achievable Control Technology (MACT) to reduce emissions of hazardous air pollutants.

Since EPA has not yet published a MACT for MOCA a facility that is a major source may be required to determine an applicable control technology or Case-by-Case MACT. However, as noted in 7. a. of this appendix, no MOCA processor has experienced actual emissions of one pound of MOCA in a year. Minor or Area sources of HAP's do not need to apply a MACT unless it is published by EPA. (40 CFR Part 63 NESHAP for Hazardous Air Pollutants). As noted above, emissions of MOCA from polyurethane facilities are generally very low and most would be classified as Area Sources.

A processor should consult its PMA Environmental Compliance Manual, for current regulatory information relating to the Clean Air Act.

9. Transportation of MOCA and MOCA Wastes

Transportation of hazardous materials that are capable of posing unreasonable risk to health, safety, and property when transported in commerce are regulated by the Department of Transportation (DOT) under 49 CFR. MOCA is listed by DOT in the Tables found in 40 CFR 172.101 (also referred to as Table 172.101) and also Appendix A of this part, and thus meets the definition of a Hazardous Substance when transported in quantities of greater than the CERCLA Reportable Quantity of 10 pounds. Regulation of MOCA by DOT will include both the receipt of raw material and the shipping of MOCA Hazardous Wastes.

DOT Hazardous Materials regulations require shipping of regulated materials using appropriate shipping descriptions, markings, placarding, containers, and shipping papers described in 49 CFR 172. The backbone of the Hazardous Materials Regulations is the DOT Hazardous Materials Table 49 CFR 172.101. As a Hazardous Substance regulated by DOT, the shipping Description from Table 172.101 for MOCA is:

- Proper Shipping Name — Environmentally Hazardous Substance, Solid, N.O. S.
- Additional Description — 4,4'-methylene bis-(2-chloroaniline
- Hazard Class and Division — Class 9
- UN Identification Number — UN 3077
- Packing Group — PG III

For MOCA Hazardous Wastes, the Proper Shipping Name may include "Waste Environmentally Hazardous Substance" or the wastes may be shipped as a "Hazardous Waste, Solid".

The DOT Shipping Description tells what is in the container and is included on the markings (labels) that are applied to the outside of the shipping container. The Marking will include the 4" X 4" Hazardous Material Class Label (Hazard Class 9). The Marking may also include other descriptions or cautions and subsidiary markings such as Orientation Arrows like "This End Up". For MOCA Wastes, the appropriate Container Markings include both a Hazardous Waste Label and the Hazard Class 9 Label. The labels need to be placed near the Shipping Descriptions and if the bulk packaging is greater than 119 gallons, marking must be placed on two sides of the container.

Placards tell what the hazard is from a distance and are displayed on all four sides of the transportation vehicle. It is the shipper's responsibility to offer appropriate placards when shipping placarded amounts of hazardous materials, including wastes. In most cases a shipment that exceeds 1,000 lbs requires placarding; however, 49 CFR 172.504(f)(9) specifies that only bulk hazard class 9 packaging needs to be marked with the Class 9 Placard. It is unlikely that bulk shipments of MOCA wastes would be made from polyurethane facilities.

Shipping Papers will include a Hazardous Materials Bill of Lading for receipts of MOCA and a Hazardous Waste Manifest for offsite shipments of MOCA hazardous waste. DOT requires that each person who offers hazardous materials for transportation accurately describe the material.

The shipping paper must contain a basic description of the materials offered for transportation from Table 172.101 and will appear as one of either of the two following descriptions:

- *UN 3077, Environmentally Hazardous Substance, Solid, N.O. S. (4,4'-methylene bis-(2-chloroaniline), 9, PG III*
- *UN 3077, Hazardous Waste Solid, N.O. S. (4,4'-methylene bis-(2-chloroaniline), 9, PG III (U 158)*

In addition entries to shipping papers must be printed legibly in English and must include the following:

- The total quantity of material in Kg
- Marked with X or HM or RQ in the first column if the RQ is exceeded (RQ for MOCA is 10 pounds)
- An emergency response telephone number that is monitored at all times during the transport of the hazardous material by someone knowledgeable about the material including:
    - Hazards of the material
    - Emergency Response information
    - Accident mitigation information
- A certification by the shipper that the hazardous material has been prepared for shipment in accordance with Federal Hazardous Materials Regulations. For Hazardous Waste Manifests this requirement is met by the Generator/Offerer's Certification

The purpose of packaging requirements is to assure that hazardous materials remain in the package during transportation. DOT Hazardous Materials that are offered for transportation must comply with Performance Packaging requirements (49 CFR 173.213) or the Packaging Level for PG III (49 CFR 178).

Shippers and receivers of hazardous materials need to conduct training of HazMat Employees every three years. A HAZMAT employee may be a person that loads or unloads hazardous materials, signs shipping papers (manifests), conducts labeling or marking or container selection. Training includes:

1. General Awareness of the regulatory requirements
2. Function Specific training for the hazardous materials and activities conducted by the employee.
3. Safety and Emergency Response Training
4. Security awareness training
5. In depth security Training and for shippers who offer a placarded quantity of Hazardous Materials. In most cases MOCA processors are not expected to ship placarded quantities.

6. Function Specific to the Hazardous Material and work activity

Training and Guidance documents for DOT are posted at http://www.phmsa.dot.gov/ and training documents at http://www.fmcsa.dot.gov/safety-security/hazmat/hmawareeng.htm.

10. Toxic Substances Control Act (TSCA)

The Toxic Substances Control Act (TSCA) Section 8(b) provides EPA the authority to compile a list of chemical substances that are manufactured or processed in the United States. TSCA authorizes EPA to:

- Obtain data from industry regarding production, use and health effects of chemicals
- Regulate the manufacture, processing, and distribution of chemical in commerce
- Publish regulations specifying reporting and recordkeeping requirements for chemical imports and exports, chemical information, and chemical health and safety data, which the EPA has done at 40 CFR part 700 to 723

40 CFR 720 outlines the requirements for the premanufacture notifications (PMN) of new chemicals. The notification must identify the chemical and provide information on:

- Use
- Method of Dispersal
- Production levels
- Worker exposure
- Byproducts
- Health and environmental effects

Based on the informtion provided, EPA may approve or ban the production or manufacture of the chemical. TSCA PMN may be important for any new material, or for new uses or processes for MOCA. MOCA is included on the EPA TSCA List under:

Premanufacture Notice P05040401 Isocyanate functional polyester acrylic polyether urethane polymer (Provisional)

ID # 2252 CAS# 101-14-4 Benzenamine, 4,4'-methylenebis(2-chloro-

If a new chemical is approved for manufacture, EPA may propose a Significant New Use Rule (SNUR) under 40 CFR Part 721. A SNUR may place restrictions on the use or production of the chemical. A SNUR has not been proposed for MOCA by EPA.

APPENDIX II

HAZWOPER TRAINING REQUIREMENTS

In addition to the HAZCOM standard discussed in Section 5 of the this MOCA Use Guidance document, a higher level of hazard training may be required of employees under OSHA's Hazardous Waste Operations and Emergency Response ("HAZWOPER") standard set forth at 29 CFR 1910.120. Depending on facility-specific conditions and practices, the HAZCOM standard may **not** cover all the foreseeable exposures for employees at a particular facility where MOCA is used. There are some potential exposures, such as those that may be experienced by a "first responder," that may result in an employer being regulated under the more rigorous HAZWOPER requirements.

There has been some debate among industry representatives and regulators with respect to when the workplace conditions warrant training beyond the HAZCOM standard and when the HAZWOPER standard must be applied.

1. When HAZWOPER Applies

Effective March 6, 1990, the HAZWOPER rule regulates employers and employees engaged in cleanup or emergency operations where employees respond to a release or threatened release of a hazardous substance, regardless of the location of the hazard. For purposes of the HAZWOPER standard, OSHA uses the term "hazardous substances" to apply to a much larger range of materials than is associated with this same term under regulations promulgated pursuant to Section 101(14) of the Comprehensive Environmental Response, Compensation and Liability Act ("CERCLA, or Superfund"). In addition to the CERCLA hazardous substances listed at 40 CFR 302.4, OSHA uses the term to include all those substances listed as hazardous by the U. S. Department of Transportation at 49 CFR 172.101 (and appendices), all listed and characteristic hazardous wastes, and any "biological agent or disease-causing agent." Therefore, this standard applies to a release or a substantial threat of a release of MOCA. Examples of potential MOCA releases may include a spill during shipping or receiving, storage container failure, forklift accidents, or a major release from production process equipment.

Not every release of hazardous substances creates a safety hazard or emergency exposure condition. Responses to releases of hazardous substances where there is no potential safety or health hazard (such as no risk of a fire, chemical exposure or oxygen deficiency) are **not** considered to be emergency responses.

The HAZWOPER standard also does not apply in situations where there is an incidental release of hazardous substances, but where the released substance can be absorbed, neutralized, or otherwise controlled at the time of release by the employees in the immediate release area. This type of situation is **not** considered an "emergency response" within the meaning of the HAZWOPER regulations [29 CFR 1910.120(a)(3)].

The regulations require employers to prepare an emergency response plan addressing the release or threat of release of each hazardous substance, such as MOCA, as well as to provide

ongoing response training for their employees. The final regulations were published in 54 Fed. Reg. 9294 (March 6, 1989).

If the employer can demonstrate that the operation does not involve employee exposure or the reasonable possibility for employee exposure to safety or health hazards, then the rule does not apply. The dermal contact and inhalation concerns associated with MOCA must be evaluated when making this determination. If the polyurethane processor determines that the rule does not apply, the basis for this conclusion should be well documented and maintained on file. For those workplaces that are covered, the rule requires specific response procedures and employee training for those employees involved in the response.

Some employers have interpreted the regulations to provide that, where the efforts of ***one*** employee are adequate to respond to the emergency condition or release, the HAZWOPER requirements do not apply, but OSHA refutes this interpretation. Rather, federal OSHA regulations provide that where employees *from outside the immediate release area* conduct the response effort, the HAZWOPER requirements apply. For example, under the rule, where a maintenance department employee is assigned to go to the area of the release, either to perform defensive, spill containment tasks, or to attempt to shut down the release, the HAZWOPER standard applies.

For example, an employee designated to enter an area to shut off a leak in the event of a release would be considered under OSHA regulations as a "first responder" subject to HAZWOPER regulations. Members of hazardous materials ("HAZMAT") team assigned to respond to a release in a chemical storage area are also regulated under the HAZWOPER standard.

The HAZWOPER standard is actually a series of standards. The HAZWOPER requirements provide for several levels of employee training, depending on the activity and the potential exposure, ranging from 8-hours of training to 40-hours [29 CFR 1910.120(e)]. The levels of training are described in greater detail below.

2. Employee Teams and Outside Responders

Given the potential for emergency conditions at most polyurethane manufacturing facilities, managers have a responsibility to prepare a plan for reacting to hazardous materials emergencies. The first decision is whether the company will maintain its own response team, or rely on qualified outside responders.

The employer does not have to comply with the HAZWOPER requirements if the employer's plan includes all the following:

1. Evacuation of all employees from the area
2. Prohibits employees from assisting in the handling of the emergency
3. Provides an OSHA Emergency Action Plan under 29 CFR 1910.38(a)

Where the company elects to maintain its own team of responders, management has the responsibility to decide whether to perform in-house training, seek outside training, or

provide a combination of internal and external expertise in the training of responders. The final rule makes clear that all employers with 10 or more employees, who have at least one employee that is expected to be involved in emergency response, must prepare **emergency response plans** and provide adequate **training** for the employees responding.

Where the rule applies, the written emergency response plan should include such things as pre-emergency planning and coordination with outside parties, lines of authority, training, emergency shutdown, evacuation, procedures for controlling the emergency, employee alarm system, development of evacuation procedures and communication. In addition, it should include safe distances and places of refuge as well as emergency alerting procedures and emergency medical treatment.

Local or state emergency response plans may be substituted into the employer's plan to avoid duplication. In addition, a separate emergency response plan is not required if the employer has already prepared an emergency response plan for handling releases of hazardous substances in accordance with the Emergency Planning and Community Right-to-Know Act of 1986 and it is on file with the local emergency planning committee.

For in-house training, OSHA regulations require that management provide an effective and comprehensive training program. Equipping and training an emergency response team is costly and time consuming. The greatest benefit gained by having an in-house response team is the short time frame needed to respond.

An employee who will participate or be expected to participate in an emergency response will need training in accordance with his role at the site. Each hazardous substance present at the facility has a unique set of chemical and physical properties that may present health or safety hazards. The best response to the release of a unique chemical is a response plan in the form of a Standard Operating Procedure, and effective training will ensure that the assigned employees will implement the procedure that has been tailored to the emergency. The appropriate level of training depends on several factors. Under the HAZWOPER standard, there are five levels of training that may be required, as follows:

Level 1: First Responder Awareness

> This level of training includes individuals who "witness or discover a release of hazardous materials and are trained to notify the proper authorities." Most employees can operate at the "awareness" level because no training beyond the Hazard Communication Standard is required where the experience of the employee demonstrates competency. Of course, for an employee new to the processes, materials or hazards, some awareness training will likely be necessary, and it may be in the best interest of the facility to provide additional training for all employees who are required under OSHA regulations to have Level 1 awareness.

Level 2: First Responder Operations

> This training level applies to those employees designated to respond to the release of hazardous substances. For this level, the response is in a defensive mode (such as spill containment) and does not extend to taking steps to stop the release. Though not clearly

mandated under the regulations, a minimum of eight hours of initial training is typically warranted in such situations.

Level 3: Hazmat Technician

A hazardous materials ("hazmat") technician is an employee who is designated to respond aggressively to stop the release of hazardous substances. "A minimum of 24 hours of Level 2 training and demonstrated experience in specific competencies" are required. In practice, the hazards presented to an aggressive responder as a hazmat technician are so significant that seldom will such an employee be able to receive ample preparation in 24 hours of training. The requirement for 24-hours of training is a minimum, and an employer will be held to provide training adequate to prepare the hazmat technician to meet the threat.

Level 4: Hazmat Specialist

A hazmat specialist requires "24 hours of Level 3 and proven experience in specific competencies." Normally, this level of training is not essential to an in-house team, and hopefully facility employees have seldom had an opportunity to gain actual emergency response experience.

Level 5: On-Scene Incident Commander

The on-scene incident commander "assumes control of the incident scene beyond the first-responder awareness level." The commander trains for a minimum of 24 hours at Level 2 with *additional* competencies (e.g., selecting the proper protective equipment).

The employer must certify that the employees have the amount of training or experience required by the rule. This does not require the submission of paperwork to OSHA. However, during inspections, OSHA officials will interview employers and employees to determine if they have been adequately trained. In addition, the employees must also receive annual refresher training or demonstrate yearly their competency in the various areas.

After evaluating the costs of an in-house team and the risks to employees, many managers of polyurethane manufacturing facilities elect to make contractual arrangements in advance with qualified outside teams to respond to emergency hazardous substance releases. In addition to training, an effective team of in-plant responders will require special equipment. Typically, a minimum of two self-contained breathing apparatus ("SCBA") and two Class 1 (chemical protective) suits are required to be available to a team of two on-site responders trained to Level 3 as hazmat technicians. The use of this equipment must be part of the training. For example, Class 1 suits are air-tight and responders wearing these suits may need to cut their way out if the air supply fails.) It is generally required for each employee assigned as an emergency responder to be examined by an emergency medical technician, who must then certify that no abnormal medical conditions are evident.

3. Preparing to Respond

Other important steps to be taken in preparing to respond to an emergency release of hazardous substances include becoming familiar with the capabilities and procedures of the public responders in your area, typically the fire departments. Invite them to become familiar with the layout, material storage locations and other features of your facility. Often, the public responders may be willing to train at your site, and may allow your team of awareness-level or other responders to train on-site with them.

If facility management has decided to contract with an outside emergency response team, we recommend contracting with the private hazmat companies well in advance of any emergency. Having more than one response company to choose from minimizes the chance that your responders will be busy at another emergency and unavailable when you need them.

4. Multiple Safety Provisions

Finally, whether a situation involves HAZCOM or HAZWOPER, more than one OSHA safety standard may apply. There will typically be applicable provisions in the general standards for industry (29 CFR 1910), there may be safety requirements that are specific to a given activity or circumstance (such as torch cutting or forklift beacons), and when compared, these provisions may be found to provide different requirements for the employer and different levels of protection for the employee.

As a national policy, OSHA has announced two general rules of interpretation which the Agency will apply to determine which safety standard the employer should have applied. These two rules of interpretation are as follows:

1. Any standard is *specifically* applicable to a condition, practice, means, method, operation, or process, then that standard shall prevail over any different *general* standard which might otherwise be applicable to the same condition, practice, means, method, operation or process [29 CFR 1910.5(c)(1)].
2. In the event of a conflict or overlap of OSHA provisions, the provision that is *more protective* of the employee's safety and health shall be deemed to apply, even where another provision is more specifically applicable [29 CFR 1919.120(a)(2)(i)].

Polyurethane manufacturers should review the facility's emergency contingency plan or other employee assignments to identify any employee duties that may include exposures covered by the HAZWOPER standards, and determine the appropriate level of training and protection for each such covered employee.

5. Duplicative Training

With the promulgation of overlapping training requirements, such as the requirements by the DOT for training related to safe transportation of materials, the issue has been raised whether the DOT/OSHA/EPA rules regarding training are duplicative requirements and whether training provided for one agency's requirements may be used to satisfy another agency's training requirements.

Each agency has adopted a policy that training performed to satisfy another federal agency's requirements may be used to satisfy the requirements of all, depending upon the nature and extent of that training. Duplicative training is not necessary when the requirements of the three agencies are met by training received in a comprehensive program. Each processor should tailor its hazardous materials and substances training programs to comply with all three federal requirements using a single training session where ever practicable.

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