

Michigan Air Toxics Regulations

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Michigan Air Toxics Regulations

Introduction

Air toxics collectively refers to any chemical or compound emitted to the air other than criteria pollutants--CO, VOC, No_x, PM₁₀, SO_x, and Pb. In response to increased concern over adverse health effects related to air toxics, new federal regulations and permit requirements are being promulgated in an attempt to reduce air toxics emissions. Toxic air pollution in Michigan is controlled under two sets of regulations: (1) state administrative rules and (2) the federal Clean Air Act, as amended.

States may implement a plan specific to the needs of their communities with regard to air emission regulations. According to Michigan's rules all known substances can be regulated as toxic contaminants (except for 41 substances which have been specifically excluded because they are regulated elsewhere in the law or are considered relatively non-toxic). Appendix A lists these exempt substances. These rules apply to all new or modified sources of air pollution that are required under Michigan regulations to obtain an air permit.

Michigan's air toxics rules take precedence over the federal Clean Air Act regulations where the rules provide for stricter control of toxic air pollution. Michigan's rules are now in effect, whereas many of the toxic air pollution provisions of the federal Clean Air Act will take effect over a period of years into the future.

The state of Michigan addresses air toxics in Part 2, Rules 224-232 of the *Administrative Rules for Air Pollution Control*. The primary requirements are found in Rules 224(1) and 225(1), which state that a source that emits a toxic air contaminant (TAC):

shall not cause or allow the emission of the toxic air contaminant from the proposed new or modified emission unit or units in excess of each of the following:

(Rule 224 (1)): The maximum allowable emission rate based on the application of best available control technology for toxics (T-BACT)...

(Rule 225 (1)): The maximum allowable emission rate which results in a predicted maximum ambient impact that is more than the initial threshold screening level or the initial risk screening level, or both.

As stated in Rule 226(b), subrule 225(1) does not apply to air contaminants and emission units that are regulated by certain national emission standards for hazardous air pollutants (NESHAPs) that have been promulgated on or before November 14, 1990, or that are regulated under Section 112(f) of the Clean Air Act. Also, subrule 225(1) does not apply to certain noncarcinogenic substances emitted in very small quantities (Rule 226(a)).

The Michigan air toxics regulations apply only to new and modified sources. Subrule (1) of Rule 224, which requires T-BACT, does not apply if an emission unit or units are in compliance with all of the following as referenced in subrule 224(b):

- ⑤ Maximum allowable emissions of each toxic air contaminant from the new or modified emission unit or units is 0.1 pound per hour or less for a carcinogen or 1.0 pound per hour or less for non-carcinogenic contaminants
- ⑤ Applicable initial threshold based screening level is more than 200 micrograms per cubic meter
- ⑤ Initial risk screening level is more than 0.1 micrograms per cubic meter

Subrule 224(2) also states that the T-BACT requirement of subrule 224(1) does not apply if the emission unit or units emit only toxic air contaminants (TACs) that are particulates or VOCs, and are in compliance with best available control technology (BACT) or lowest achievable emission rate (LAER) requirements for particulates and VOCs.

Also, subrule 224(2) states that the T-BACT requirement of subrule 224(1) does not apply to an emission unit or units for which standards have been promulgated under section 112(d) of the Clean Air Act, or for which a control technology determination has been made under section 112(g) or 112(j) of the Clean Air Act with certain conditions (see subrule 224(2) (a)).

Michigan's air toxics rules require two-fold analysis. First, the rules require new or modified sources of air pollution to undergo an evaluation for toxic air pollution. The owners or operators of sources of toxic air pollution are required to evaluate and use the best economically feasible, technologically advanced air pollution controls. This means that, as new technology progresses and better air pollution controls continue to be developed, each new or modified source will be required to consider the newest and best technology. Second, MDEQ engineers review the permit application to determine the amount of toxic air pollution the facility could possibly emit after the best controls are installed. The facility is required to limit its toxic air emissions to amounts at or below those deemed safe for each toxic air pollutant based on protection of public health. Again, as knowledge progresses, these limits can be continuously reviewed and changed, if necessary, for each toxic air pollutant.

Michigan T-BACT

Toxic air contaminant emission limits for both permit special conditions and standards are based on control technology analysis (T-BACT), followed by impact analysis. Emission limits are expressed in pounds/hour based on maximum capacity, and in terms of process variables such as material processed, fuel consumed or pollutant concentrations (e.g. lbs/10⁶ Btu, lbs/gal of solids applied, g/dscm). The special conditions of an air use permit set emission limits and work practice standards that are enforceable.

Best available control technology for toxics (T-BACT) is similar to BACT but pertains specifically to toxic air contaminants. T-BACT is the most efficient alternative which is reasonably achievable as stated in Rule 102(a):

T-BACT is the maximum degree of emission reduction which the [Department] determines is reasonably achievable for each process emitting toxic air contaminants, taking into account energy, environmental, and economic impacts and other costs.

Examples of types of situations when energy, economics, or environmental impacts and other costs can affect the alternatives are as follows:

- ⑤ **Energy** - The most efficient fuel is not available.
- ⑤ **Economic** - Increased cost of process or project unreasonable, increased cost out of proportion with environmental benefit.
- ⑤ **Environmental** - control method may create a by-product which may have a greater negative impact.
- ⑤ **Other costs** - The control method may produce unwarranted operator safety concerns.

A T-BACT review must be submitted as part of the air permit application when the potential to emit toxics is apparent and Rule 224(1) applies. The analysis must be process specific with respect to the toxic air contaminants subjected to a T-BACT review. The permitting agency, in this case the MDEQ, will not develop the T-BACT analysis for the applicant. The entire range of demonstrated options should be included in the evaluation, with special attention to alternatives that may be transferable or innovative. The level of detail in the control options analysis should vary with the relative magnitude of the emissions reduction achievable.

T-BACT Guidelines

The MDEQ AQD has developed guidelines for T-BACT review which are as follows:

1. Pollutant Applicability

The first step is to determine which "toxic air contaminants" are to be evaluated in the T-BACT analysis. Carcinogens with an IRSL greater than 0.1 microgram per cubic meter and non-carcinogens with an ITSL greater than 200 $\mu\text{g}/\text{m}^3$ are exempt from T-BACT, if their maximum allowable emission rates are less than 0.1 pph (pounds per hour) and 1.0 pph respectively.

2. Emission Unit Applicability

Next, identify all process emissions and determine all potential emission concentrations including fugitive emissions (e.g. each stack, relief valves, pumps, storage piles or tanks, conveyors, valves, etc.). Refer to the separate section on emissions estimations in this manual.

3. Potential Sensitive Concerns

Identify any potentially sensitive concerns involving energy, economic, and environmental issues.

4. Selection of Alternative Control Strategies

Selection of alternative control strategies is a two part process. First, determine the base case--the control strategy, that in the absence of T-BACT decision making, would normally have been applied (e.g. NSPS, NESHAP, emission limits in state or local regulations, or the level of control that is generally used in practice).

Secondly, identify alternative control strategies which are available at the time of the submission of a complete permit application, affording greater control including:

- 1) transferable and innovative control technologies,
- 2) processes that inherently produce less pollution, and
- 3) various configurations of the same technology which achieve different control efficiencies.

The MDEQ AQD provides a guideline of information sources to be investigated which include technical literature, industrial publications, BACT/LAER/NATICH Clearinghouses, and EPA, state, and local air pollution control agency surveys.

5. Evaluation of Alternative Control Strategies

This is the heart of T-BACT. Determine if the alternative(s) with the greatest emission reduction is reasonable or not because of energy, economic or environmental impacts or other costs. "Reasonable" is defined on a case-by-case basis. If necessary, continue evaluating the less efficient technologies. T-BACT is the most efficient alternative which is demonstrated to be feasible. The following are examples when energy, economic, or environmental impacts may make an alternative not feasible.

- A. Energy -- Natural gas for operating an afterburner is not available based on local regulations.
- B. Economic
 - i) The increased cost of the final product (e.g. automobile, cement, coke, etc.) would increase to a level that the project would no longer be feasible.
 - ii) The increased cost is out of proportion to the environmental benefit. (e.g., the increased cost of going from 93% control to 94% control increases the capital cost from \$2,000,000 to \$4,000,000 and the operating costs from \$500,000/year to \$1,000,000/year but only reduces xylene by 10 tons per year).
- C. Environmental -- A wet scrubber may create a by-product which cannot be disposed of without creating a more detrimental impact.
- D. Other costs -- Cleaning or bag changes on a dry particulate collector would expose operators to an excessive level of toxic material.

6. Establish Emission Limits

Finally, the special conditions of the permit are proposed. The emission limits are set within a safety margin to minimize the risk of harm to the environment (e.g., 95% confidence level of available test data). Additional special conditions with respect to averaging times, stack testing, continuous emission monitoring (CEM), recordkeeping and reporting may also be included in the permit.

Demonstration of Compliance with Screening Levels

Compliance with the screening levels (SLs) can be determined by any of the following ways:

1. Subrule 227(1)(a) provides a simple method to determine an allowable emission rate based only on the screening level, without the need to estimate impacts.
2. Subrule 227(1)(b) refers to Subrule 227(3), which provides the Ambient Impact Ratio (AIR) matrix. This can be used to determine the maximum allowable emission rate based on the SL and facility characteristics.
3. Dispersion of the maximum hourly emission rate can determine the maximum ambient impact for comparison to SLs ((Subrule 227(1)c)).
4. A screening method approved by MDEQ may be used (Subrule 227(1)(b)).

Instructions on how to use the AIR matrix and a discussion of air quality dispersion modeling are found in the monograph on modeling in this series.

Screening Levels

Screening levels based on toxicity research are divided into two major groups: carcinogenic and non-carcinogenic substances. The list of screening levels is updated periodically as more compounds are evaluated. This list of screening levels is available from the MDEQ AQD Toxics Unit and is found in Appendix D.

These screening levels are based on industrial, governmental and academic toxicological research. For example, the available data may include studies of laboratory animals exposed to a range of doses of a compound. The data generated from these tests are evaluated statistically to determine significant differences in health among the test groups. Human data are also evaluated. The U.S. EPA, National Institute for Occupational Safety and Health (NIOSH) and the American Conference of Governmental Industrial Hygienists (ACGIH) are key groups that are involved in interpretation of studies. NIOSH is responsible for undertaking research and developing recommended health and safety standards for substances and develops recommended exposure limits for chemicals. ACGIH develops threshold limit values (TLVs) as guidelines to assist in the control of health hazards. These values are used when evaluating the screening level for air toxics, and will be described in detail later in this section.

Initial Threshold Screening Level

The Initial Threshold Screening Level (ITSL) for a toxic non-carcinogenic compound is the ambient air concentration of a contaminant that is not expected to result in adverse noncancer effects in humans. ITSLs are regulatory levels that are used to evaluate the acceptability of emissions from new and modified sources, and are not intended to be an exact line above which toxic effects would occur and below which no effects would occur.

Generally, the principle for deriving an ITSL is that there exists a dose level for a toxic chemical below which no adverse effect will occur. This threshold dose level must be exceeded before an adverse effect would be expected to occur. The ITSL is set at some fraction of the no-effect or lowest-effect determined in studies using laboratory animals or from human data. The fraction applied depends primarily on the quality of the toxicological database for a specific chemical, and is intended to account for uncertainties in the risk assessment.

Initial and Secondary Risk Screening Levels

Screening levels for cancer-causing compounds, also called carcinogens, are risk based. A carcinogen is defined in Rule 103 of the *Administrative Rules*.

Group A: Carcinogen means any substance for which there is sufficient evidence from human epidemiological studies to support a causal association between exposure to the agent and cancer,

Group B: any substance for which the weight of evidence of human carcinogenicity based on epidemiological studies is limited evidence or for which the weight of evidence of carcinogenicity based on animal studies is sufficient evidence, or

Group C: any substance for which there is limited evidence of carcinogenicity in animals in the absence of human data and which causes a significant increased incidence of benign or malignant tumors in a single, well-conducted animal bioassay.

The Initial Risk Screening Level (IRSL) is based on an increased cancer risk of one in a million (1×10^{-6}), while the SRSL, or Secondary Risk Screening Level is based on increased cancer risk of one in one hundred thousand (1×10^{-5}). The IRSL and SRSL are calculated from the unit risk factor. Unit risk is defined as the additional lifetime cancer risk occurring in a population in which all individuals are exposed continuously for a lifetime to a concentration of 1 microgram of the chemical per one cubic meter of the air they breathe. Multistage modeling is used to derive the unit risk. The explanation of the methodology used goes beyond the scope of this document. In certain circumstances, a facility may only have to meet the Secondary Risk Screening Level, (SRSL) which is based on a one in a hundred thousand risk. Rule 225(2) states that a carcinogen does not have to meet the IRSL, if the total allowable emissions of the carcinogen from all new and existing processes result in a predicted ambient impact less than or equal to the SRSL. Also, subrule 225(3) allows for

ten-fold higher allowable impacts of emissions of carcinogens to industrial areas and public roadways. Both IRSL and SRSL are developed according to Rule 231 which presents the risks as:

$$IRSL = \frac{1 \times 10^{-6}}{\text{unit risk}} \quad SRSL = \frac{1 \times 10^{-5}}{\text{unit risk}}$$

Developing Screening Levels (ITSLs)

Rule 232 specifies the methodology for determining Initial Threshold Screening Levels (ITSLs) by using a hierarchical framework. Screening levels are based on the best data available to evaluate the effects of the toxic air contaminants. Methods using better data appear at the top of the hierarchy. The top of the hierarchy provides the best value for each chemical because the research provides the best quality data for estimating inhalation effects. As one descends the hierarchy, the values are typically lower due to uncertainty factors included in the development of the screening level. As the quality of the toxicological data base decreases, larger uncertainty factors must be employed in calculating the ITSL to accommodate uncertainties that arise from the less desirable database. The "uncertainty factor" approach to adjustment of no-observable-effect-levels (NOELS) of chemicals has been well documented in the scientific literature. In some cases, the studies were based on oral exposure, and then screening levels were derived using an algorithm found in the Rules.

Definition of some terms is necessary to understand the hierarchy. RfC is the reference concentration determined by inhalation exposure in the toxicological study, while RfD is the reference dosage determined by oral exposure. Occupational exposure levels (OELs) can be those standards set by ACGIH and NIOSH. Threshold Limit Values (TLVs), published by ACGIH, are the concentrations to which nearly all workers may be repeatedly exposed without adverse effect. Recommended Exposure Limits (RELs) are published by NIOSH.

The Toxics Unit develops screening levels for toxic air contaminants after receiving a request from the Permit Section. Requests to develop screening levels are processed based upon the date they are received from the Permit Section, unless a priority is requested by one of the supervisors in the Permit Section.

After a request for a screening level is received from the Permit Section it is logged in and assigned to one of the toxicologists. The toxicologist initiates a search of relevant databases, references, and the scientific literature. The extent of this search depends upon the information obtained from key references, or databases, the toxicity of the compound, and the predicted ambient impact. For example, if the U.S. Environmental Protection Agency (EPA) has established a reference concentration for a chemical that is published in EPA's Integrated Risk Information System (IRIS), and there is no indication that the chemical is carcinogenic, then the ITSL is determined from the RfC, and no further evaluation is done. The process for conducting

searches of the literature is discussed further in the section on Guidelines for Conducting a Search of the Literature.

Chemicals with a Predicted Ambient Impact (PAI) Less Than 0.1 $\mu\text{g}/\text{m}^3$

If the chemical has a PAI less than 0.1 $\mu\text{g}/\text{m}^3$ (annual averaging time), a quick screen of select databases or references is done to determine if data are available to indicate the chemical should be considered a carcinogen according to Rule 103(c), or if it is highly toxic. Generally, the databases or references checked include IRIS, RTECS, IARC Monographs and the NTP Management Status Reports. If no data are available to indicate that the chemical is a carcinogen, or that the ITSL would likely be less than 0.1 $\mu\text{g}/\text{m}^3$ (annual averaging time), the predicted ambient impact is generally approved, however, no screening level is established for this chemical. If data are available to indicate the chemical may be a carcinogen, or have an ITSL less than 0.1 $\mu\text{g}/\text{m}^3$ (annual averaging time), then further review is done to either establish a screening level or verify that the PAI is acceptable.

Chemicals with PAI Greater Than 0.1 $\mu\text{g}/\text{m}^3$

If the PAI is greater than 0.1 $\mu\text{g}/\text{m}^3$ (annual averaging time), the toxicologist establishes a screening level for the chemical following the methodologies and hierarchy established in Rules 229, 231, and 232. Occasionally, the toxicologist may approve a PAI greater than 0.1 $\mu\text{g}/\text{m}^3$ (annual averaging time) for some compounds considered to have relatively low toxicity, without determining a screening level. This is only done in those cases where, in the toxicologist's professional judgment, the PAI is significantly lower than the expected screening level.

Procedures for determining screening levels are outlined below. These procedures outline the routine process that is followed in determining the screening levels. However, as the scientific data dictates, and per Rule 229(1)(c) and 229(2)(b), an alternative methodology may be used if it can be demonstrated to be more appropriate based on biological grounds, and is supported by the scientific data.

Initial Risk Screening Level (IRSL) and Secondary Risk Screening Level (SRSL)

If the chemical is considered a "carcinogen" based upon the definition in Rule 103(c), then the toxicologist determines the initial risk screening level (IRSL) and the secondary risk screening level (SRSL), following the methodology specified in Rule 229(1). Figure 1 outlines this procedure.

In establishing IRSLs and SRSLs, priority is first given to using EPA established inhalation cancer potency values. If EPA has established an inhalation cancer potency value for a chemical that is published in IRIS, that value is used to establish the IRSL and SRSL. If there is no inhalation cancer potency value in IRIS, but there is one listed in EPA's Health Effects Assessment Summary Tables (HEAST), then that value may be used to establish the screening level. If EPA has not established an inhalation cancer potency value, and there is adequate inhalation toxicity data

available, the toxicologist establishes the IRSL and SRSL using this data and the procedures identified in Rule 229(1) and Rule 231.

If no inhalation cancer potency value is available from EPA or can be determined from data, the toxicologist evaluates the existing information available from the oral route of exposure. If EPA has established an oral potency value in IRIS (first choice) or HEAST, and data are not available to indicate that oral route to inhalation route extrapolation is inappropriate, this value is used to establish the IRSL and SRSL. If EPA has not established an oral potency value, the toxicologist establishes the IRSL and SRSL following the procedures identified in Rule 229(1) and Rule 231.

Initial Threshold Screening Level

The hierarchy of methods for establishing the ITSL for a chemical is specified in Rule 232. The process used to implement this rule as illustrated in Figure 2 is as follows:

1. If EPA has established a reference concentration (RfC) for a chemical, the RfC is used to determine the ITSL. RfCs from IRIS are used as the first choice for establishing an ITSL. If no RfC is available from IRIS, a RfC from HEAST is next used to establish the ITSL. If no EPA established RfC is available, but toxicity data are available to determine the RfC, the toxicologist determines the RfC, and uses this value to establish the ITSL.
2. If a RfC is not available, or cannot be determined from the data, and EPA has established an oral reference dose (RfD), and data are not available to indicate it is inappropriate to extrapolate from the oral route of exposure to exposure via inhalation, then the RfD is used to establish the ITSL. RfDs from IRIS are used as the first choice for establishing the ITSL. If no RfD is available from IRIS, a RfD from HEAST may be used to establish the ITSL. If no EPA established RfD is available, but toxicity data are available to determine the RfD, the toxicologist determines the RfD, and uses this value to establish the ITSL.
3. If a RfC or RfD is not available, or cannot be determined from the available data, the occupational exposure level (OEL) is then used to establish the ITSL.
4. If a RfC or RfD is not available, or cannot be determined from the available data, and an OEL is not available, the toxicological data are evaluated, and the methodology in Rules 232(d) - 232(h) is used to establish the ITSL.
5. If no data are available to determine the ITSL, the ITSL is set at the default value of $0.1 \mu\text{g}/\text{m}^3$. Prior to setting the ITSL at the default value, the toxicologist will pursue all potential leads for data that could be useful for setting a screening level.

Figure 1

Flowchart for determining Initial Risk Screening Level (IRSL) and Secondary Risk Screening Level (SRSL)

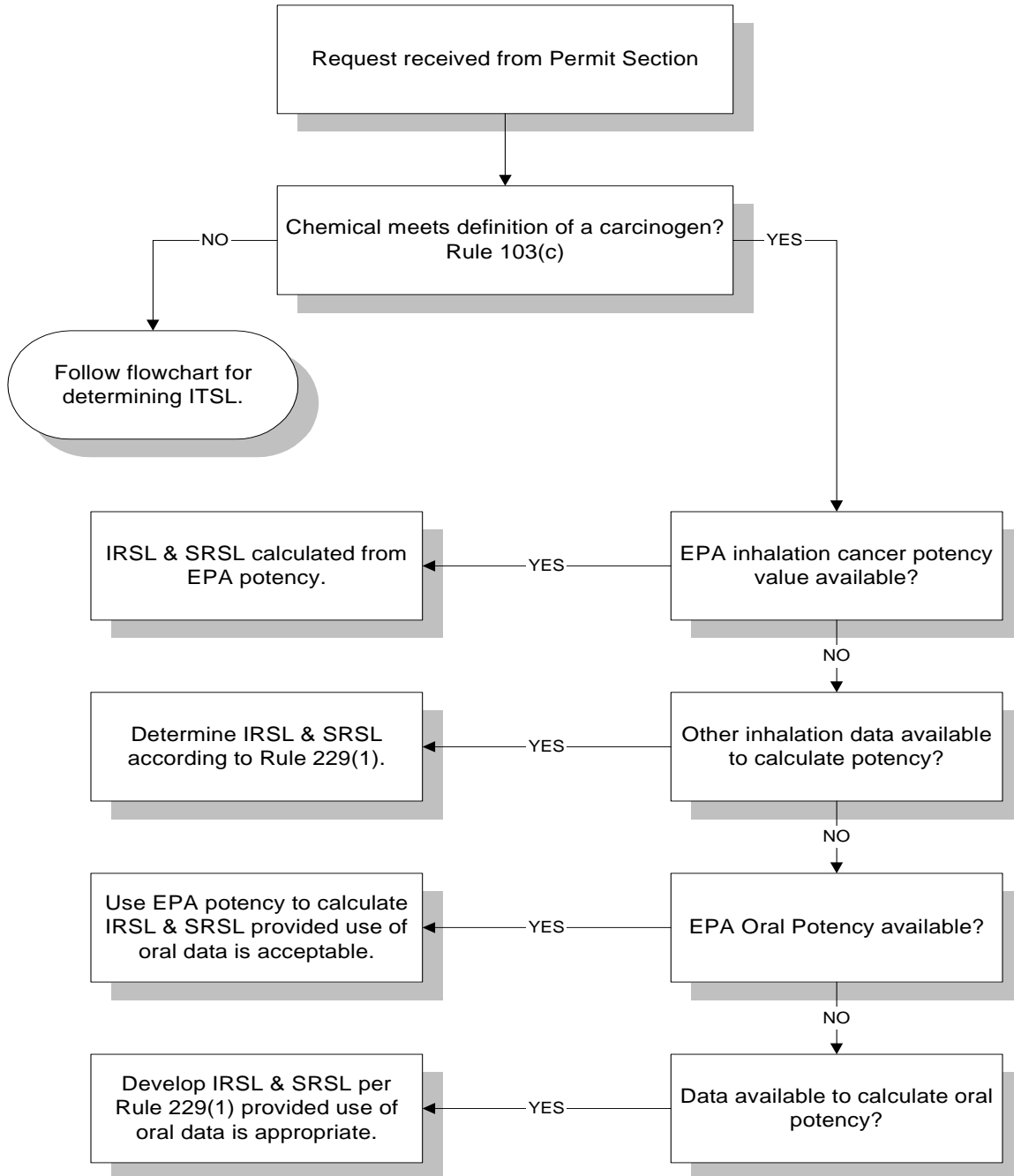
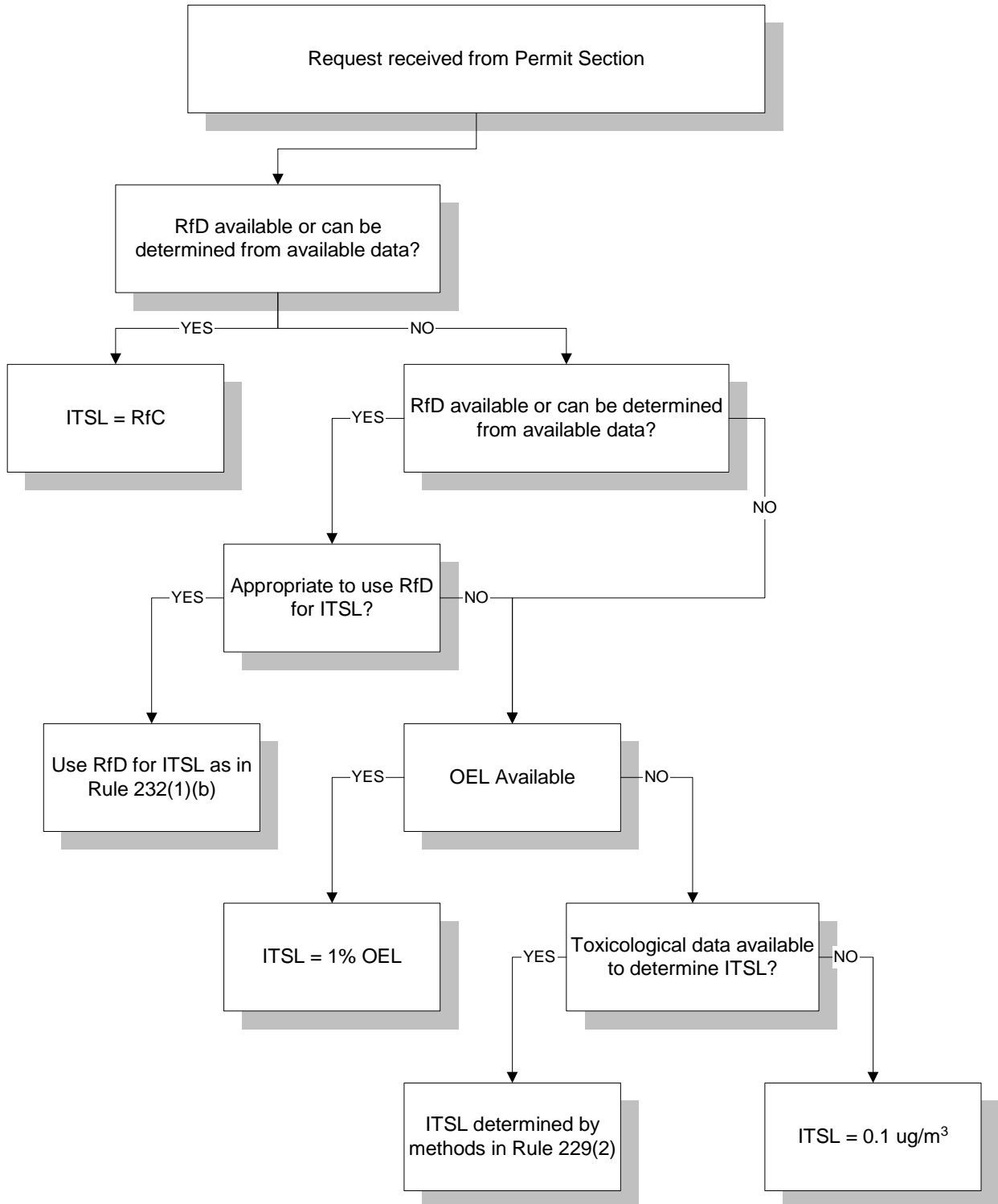


Figure 2

Flowchart for determining Initial Threshold Screening Levels (ITSL)



List of Screening Levels

The Toxics Unit maintains a list of all screening levels that have been established to date. A hard copy or paper copy list is updated every two months, and is available to anyone upon request. The Toxics Unit also maintains a mailing list for people wishing to receive this hard copy updated list as it becomes available. The screening level list is also available electronically via the Internet at www.michigan.gov/deq. Click on "AIR" and then select "Air Toxics." The electronic version on the Internet is updated weekly. Also available via the Internet at the same location is a list of chemicals which are currently under review for development of screening levels.

In general, no updates of screening levels are being done at this time, unless significant new data are brought to the attention of the Toxics Unit, or the EPA updates a RfC, RfD, or cancer potency value.

Interim List of Screening Levels

When the air toxic rules were first promulgated, an initial backlog of requests for screening levels developed, so interim procedures were implemented to reduce this backlog. These interim procedures are outlined in the staff activity report, "Air Toxic Rules - Implementation Procedures", dated January 20, 1993. Part of the interim procedures included doing a shortened review of the data for a chemical and establishing an "interim" screening level. Interim screening levels were maintained on a separate list from the screening levels undergoing a more complete review.

Under the interim procedures a chemical was placed on the interim list when there was both an EPA RfD and an OEL. In this case, no determination was made regarding the appropriateness of using the RfD to establish the ITSL, and ITSLs determined from both the RfD and OEL were added to the list. If an applicant met the most restrictive value, then they had demonstrated compliance with Rule 225(1). If an applicant could not meet the most restrictive value, the Permit Section submitted a request to the Toxics Unit to determine a final screening level. Chemicals were also placed on the interim list if there were no EPA established RfCs or RfDs, and the OEL was not health based or based only on acute data.

The backlog of requests for screening levels has been eliminated and the interim procedures are no longer being implemented. As a result, no new chemicals are being added to the interim screening level list. As time permits, the Toxics Unit intends to review those chemicals on the interim screening level list and make a final determination regarding the screening level. Eventually, the interim list will be eliminated. Until that time, the interim list of screening levels is also available to anyone upon request.

The most current List of Screening Levels and the List of Interim Screening Levels are found in Appendix D. Contact the Toxics Unit at MDEQ AQD to be added to the mailing list to receive updates.

Guidelines for Conducting a Search of the Literature

When a request is received by the Toxics Unit for the development of a screening level, a search of the literature is initiated by the toxicologist. This search includes the review and evaluation of various databases, books, documents, and the scientific literature. The standard references checked for the search of the literature are listed on the Reference Check List (appendix B). A reference check list is initiated for each chemical to track which references have been checked and the date the check was completed. A short description of each reference found on the Reference Check List is given in appendix C.

The purpose of the literature search is to identify the available toxicological data for the chemical, and then to use this data in determining the appropriate screening level. As outlined below, the extent of this search depends upon the information obtained from key references, the toxicity of the compound, and the predicted ambient impact.

Literature Search for Chemicals with PAI Less than $0.10 \mu\text{g}/\text{m}^3$

If the chemical has a PAI less than $0.1 \mu\text{g}/\text{m}^3$ (annual averaging time), a quick screen of select databases or references is done to determine if data are available to indicate the chemical should be considered a carcinogen according to Rule 103(c), or if it is highly toxic. Generally, the databases or references checked include IRIS, RTECS, IARC Monographs and the NTP Management Status Reports. If no data are available to indicate the chemical is a carcinogen, or the ITSL would be less than $0.1 \mu\text{g}/\text{m}^3$ (annual averaging time), the predicted ambient impact is approved, however, no screening level is established for this chemical. If data are available to indicate the chemical may be a carcinogen, or have an ITSL less than $0.1 \mu\text{g}/\text{m}^3$ (annual averaging time), then further review is done to either establish a screening level or verify that the PAI is acceptable.

Literature Search for Chemicals with a PAI Greater Than $0.1 \mu\text{g}/\text{m}^3$

If the chemical has a PAI greater than $0.1 \mu\text{g}/\text{m}^3$ (annual averaging time), and a screening level will be established, a full search of the literature is initiated, which generally includes reviewing all references found on the Reference Check List. Exceptions to this include the following:

1. If an EPA derived RfC is available, no other references are checked, except the quick screen for carcinogenicity data summarized above in the section on literature searches for chemicals with PAI less than $0.1 \mu\text{g}/\text{m}^3$.
2. If an EPA derived inhalation cancer potency value is available, no other references are checked.

When doing a full search of the literature, the toxicologist utilizes summaries or evaluation of the scientific literature done by other groups to help expedite the review process. The following guidelines are used in these cases:

1. Check the EPB Chemical Criteria Database to determine if the chemical has already been evaluated by another Division. Review any existing evaluations to determine if further evaluation is necessary.

2. Comprehensive review documents published by the EPA, Agency for Toxic Substance and Disease Registry (ATSDR), NIOSH, or other group may be used to limit the extent of the CAS On-line or NLM/TOXLINE searches, or to limit the review of original articles. Examples of documents that may be useful in this regard are EPA's *Health Assessment Documents*, ATSDR's *Toxicological Profiles*, and NIOSH's *Criteria for a Recommended Standard* documents. If a review document is used to limit the on-line database searches, the CAS on-line and NLM searches should cover the period of time from at least one year before the most recent comprehensive review document was published, to the present.

Comparison of Federal and Michigan Air Toxics Rules

The preceding discussion has centered around the Michigan air toxics rules. However, the federal Clean Air Act (CAA) Amendments of 1990 contain major new provisions for the control of toxic air contaminants. The revised CAA requires regulation of 188 toxic chemicals, which are referred to as hazardous air pollutants (HAPs). The U.S. Environmental Protection Agency may add chemicals to or delete chemicals from this list in the future.

Other provisions of the revised CAA require major sources of toxic air pollution to use "maximum achievable control technology" (MACT). This will ensure that both new and existing major sources of toxic air pollution will use the kind of technology which provides maximum control of hazardous air pollutants on an ongoing basis. The specific regulations for the various industrial sectors will be phased in over a period of 10 years.

As with Michigan's rules, the federal regulations also require the assessment of residual risks of emissions after MACT standards are in place. If stricter emission limits are needed for public health protection, then standards must be established within 8 years after the establishment of the MACT standards. The residual risk standards will set limits on the amount of toxic air pollution a source can emit after MACT is installed. The federal government may require sources of toxic air pollution to use additional controls if necessary to protect public health and the environment.

The following table outlines the provisions of both Michigan's toxic air pollutant regulations and the federal Clean Air Act Amendment's air toxic regulations:

Table 1.

Comparison of federal and Michigan programs

	Federal Clean Air Act Amendments	Michigan Air Toxics Rules
Applies to new or modified sources of toxic air contaminants (TACs)	Yes	Yes
Applies to existing sources of TACs	Yes	No
Which air toxics are regulated?	At present, 188 chemicals known as hazardous air pollutants or HAPs (the list is subject to change)	All known substances (toxic air contaminants or TACs) except the 41 specifically exempted
Effective date of regulations	Phased in between 1990 and 2000 (and beyond)	In effect now
Types of controls required	Maximum achievable controls, followed by residual risk standards within 8 years	Best Available Controls, and health-based screening levels

Appendix A.
Categories and Chemicals not Covered by Rule 225(1)

An air contaminant and process regulated by the following national emission standards for hazardous air pollutants as listed in Rule 226(c) is exempt from the health based screening level requirement.

- Radon-222 emissions from underground uranium mines
- Beryllium from extraction propellant and ceramic plants, foundries, incinerators, machine shops, and rocket motor test sites
- Mercury from facilities that process mercury ore, use mercury chlor-alkali cells, and sludge incinerators
- Vinyl chloride from facilities that produce ethylene dichloride, vinyl chloride, and polymers containing vinyl chloride
- Radionuclide emissions from Department of Energy facilities
- Radionuclide emissions from facilities licensed by the Nuclear Regulatory Commission and other federal facilities
- Equipment leaks (fugitive emission sources) of benzene
- Radionuclide emissions from elemental phosphorous plants
- Benzene emissions from coke by-product recovery plants
- Asbestos from manufacturing, asbestos mills, roadways, demolition and renovation, spraying, fabricating, insulating, landfills, and conversion of asbestos containing waste into non-asbestos material
- Inorganic arsenic emissions from glass manufacturing plants
- Inorganic arsenic emissions from primary copper smelters
- Inorganic arsenic emissions from arsenic trioxide and metallic arsenic production facilities
- Equipment leaks (fugitive emission sources)
- Radon-222 emissions from licensed uranium tailings
- Benzene emissions from benzene storage vessels, transfer operations, and waste operations

The following chemicals listed in Rule 120(f) are not considered toxic air contaminants:

- | | |
|-------------------------------------------------------------------|---------------------------------|
| • Acetylene | • Lead |
| • Aluminum metal dust | • Liquefied petroleum gas (LPG) |
| • Aluminum oxide (nonfibrous forms) | • Methane |
| • Ammonium sulfate | • Neon |
| • Argon | • Nitrogen |
| • Calcium carbonate | • Nitrogen oxide |
| • Calcium hydroxide | • Nuisance particulates |
| • Calcium oxide | • Oxygen |
| • Calcium silicate | • Ozone |
| • Calcium sulfate | • Perlite |
| • Carbon dioxide | • Portland cement |
| • Carbon monoxide | • Propane |
| • Cellulose | • Silicon |
| • Coal dust | • Starch |
| • Crystalline silica emissions from specifically listed processes | • Sucrose |
| • Emery | • Sulfur dioxide |
| • Ethane | • Vegetable oil mist |
| • Graphite (synthetic) | • Water vapor |
| • Grain dust | • Zinc metal dust |
| • Helium | |
| • Hydrogen | |
| • Iron oxide | |

Appendix B.

Reference Check List

Chemical Name
CAS No.

<u>REFERENCE</u>	<u>NAME</u>	<u>DATE</u>
ACGIH TLV*	_____	_____
AQD Chemical Files	_____	_____
CAS ONLINE	_____	_____
Chem Finder	_____	_____
EPB Chemical Criteria Database	_____	_____
EPB Library	_____	_____
Hazardous Substances Data Bank (HSDB)	_____	_____
HEAST (if nothing in IRIS)	_____	_____
IARC Monographs	_____	_____
Interim Database	_____	_____
IRIS	_____	_____
NIOSH REL	_____	_____
NLM/TOXLINE	_____	_____
NTP Study Database	_____	_____
RTECs*	_____	_____

If other secondary references and/or reviews necessary, check:

Handbook of Environmental Data on Organic Chemicals	_____	_____
Patty's Industrial Hygiene and Toxicology	_____	_____
Merck Index	_____	_____
Condensed Chemical Dictionary	_____	_____

Comments/Other References:

* If an ITSL can be determined from an RfC, RfD, or OEL; and data indicates potential carcinogenic effects, do a full review of the literature.

Appendix C.

Description of References

American Conference of Governmental Hygienists (ACGIH) Threshold Limit Values (TLV) - The ACGIH is a non-governmental organization that develops TLVs as guidelines to assist in the control of health hazards in an occupational setting. These values are listed in a booklet published by the ACGIH each year. The basis for the TLVs are found in ACGIH's *Documentation for Threshold Limit Values and Biological Exposure Indices*.

AQD Chemical File - A file is maintained by the Toxics Unit for each chemical for which a screening level is established, or literature reviewed to evaluate a predicted ambient impact (PAI). It may include information such as the following: memos and correspondence dealing with the basis of the screening level, reference check lists, printouts from IRIS, CAS On-line and NLM/Toxline searches and other relevant information.

ChemFinder - This database provides the chemical formula, structure, and chemistry, and many useful internet links. It is available at <http://chemfinder.cambridgesoft.com>.

Chemical Abstract Services (CAS Online) - The CAS file is a bibliographic database covering worldwide literature from all areas of chemistry, biochemistry, and chemical engineering from 1967 to present. The records contain bibliographic information and abstracts which are concise summaries of the major findings reported in the scientific literature. As of July 1994, over 9000 journals were monitored; conference proceedings, reviews, technical reports, books and dissertations are also included. The database is updated every 2 weeks. There are over 13 million chemicals in the CAS Registry.

EPB Chemical Criteria Database - This database is maintained and used by toxicologists in the Air Quality Division (AQD), Environmental Response Division (ERD), Surface Water Quality Division (SWQD), and Waste Management Division (WMD). The database contains human health, wildlife, and aesthetic criteria established by the toxicologists in these divisions for use in the various environmental regulatory programs. Included in this database are the screening levels established by staff of the Air Quality Division.

Hazardous Substances Data Bank (HSDB) - This database provides information on the toxicity, properties, environmental fate, etc. for over 4,500 substances. It is available at <http://toxnet.nlm.nih.gov>.

Health Effects Assessment Summary Tables (HEAST) - This reference is prepared by EPA's Office of Health and Environmental Assessment. HEAST contains primarily provisional risk assessment information relative to oral and inhalation routes of exposure of chemicals of interest to Superfund, the Resource Conservation and Recovery Act (RCRA), and the EPA in general. The entries in HEAST are limited to chemicals that have undergone review and have the concurrence of individual EPA program Offices, although the risk assessment information has not had enough review to be recognized as high quality EPA-wide consensus information.

Integrated Risk Information System (IRIS) - This electronic database is maintained by the U.S. Environmental Protection Agency, and contains health risk information that has received EPA-wide consensus. IRIS contains summary information on several hundred chemicals, including such things as RfCs, RfDs, carcinogen risk assessments, and other regulatory information. EPA has made IRIS available to the public.

Interim Database - This database contains the interim screening levels established by toxicologists in the Air Quality Division.

International Agency for Research on Cancer (IARC) Monographs - This series of monographs entitled, *IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Humans* provides critical reviews and evaluations of the data regarding the carcinogenicity of a large number of chemical, physical, and biological agents. Reviews and evaluations are done by a working group of experts selected by IARC staff in consultation with other experts. This is an ongoing project, and new monographs are published every year.

MDEQ Library - The AQD, SWQD, WMD, and ERD maintain a joint on-line catalogue of reference materials maintained in each Division's library. Materials included in the on-line catalogue are primarily those dealing with the toxicological effects of chemicals, and include books, journal articles obtained from scientific literature, documents from various international, federal and state agencies, and other relevant information. The catalogue may be searched by many different parameters, including chemical name, CAS number, author, and key words.

National Institute of Occupational Safety and Health (NIOSH) Recommended Exposure Levels (REL) - NIOSH is a federal agency responsible for recommending criteria for preventing disease and hazardous conditions in the workplace. RELs are examples of such criteria. RELs are occupational exposure limits recommended by NIOSH as being protective of worker health and safety over a working lifetime. RELs are listed in the *NIOSH Pocket Guide to Chemical Hazards*.

National Library of Medicine - Primarily the TOXLINE file is searched. The TOXLINE file contains toxicological, pharmacological, biochemical and physiological effects of drugs and other chemicals. Journals, monographs, technical reports, theses, letters and meeting abstracts are monitored as well as papers and reports. The TOXLINE file is updated monthly. Occasionally other databases are searched, e.g. MEDLINE (covers the fields of medicine, nursing, dentistry, veterinary medicine and the pre-clinical sciences from over 3600 international biomedical journals from 1966 to present); TOXLINE65 and TOXLIT65 (for older citations).

National Toxicology Program (NTP) Study Database - This database provides status information for all toxicological studies conducted by NTP, including carcinogenicity bioassays. The database is available at <http://ntp-server.niehs.nih.gov>.

Registry of Toxic Effects of Chemical Substances (RTECS) - This database is prepared and maintained by NIOSH, and contains summary toxicological information on a large number of chemicals. The data is extracted from the scientific literature, however, no evaluation of the data is done by the Registry. All data listed in the Registry are referenced to the sources in which the data appeared. As of June, 2002, there was data on more 153,000 chemicals in the Registry. RTECS is updated regularly, and is available on microfiche form NIOSH, on-line via NLM, and on CD-ROM from various sources.

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Appendix D.

Lists of Screening Levels for Michigan's Air Toxic Rules

The following pages will be updated periodically as new screening levels become available.

If you need to receive the latest list and you do not want to wait for the update to be mailed, you can either contact Sheila Blais at 517-335-6989, or you can access the Air Quality Division information via the MDEQ homepage at www.michigan.gov/deq. Files of screening levels by CAS# and alphabetical listings can be downloaded from the FTP server. An ITSL/IRSL database query to find the screening level of a particular chemical is also available.

LIST OF SCREENING LEVELS
(In CAS Number Order)

LIST OF SCREENING LEVELS
(In Alphabetical Order)

INTERIM LIST OF SCREENING LEVELS
(In CAS Number Order)

INTERIM LIST OF SCREENING LEVELS
(In Alphabetical Order)