GUIDA, SLAVICH & FLORES
A PROFESSIONAL CORPORATION
The Environmental Law Firm℠

May 28, 2007

By Electronic Submission

Ms. Becky Southard
Texas Commission on Environmental Quality
Office of Environmental Quality
Office of Permitting Remediation and Registration
Air Permits Division
MC 163
P.O. Box 13087
Austin, Texas 78711

Re: Public Comments Concerning
Proposed Repeal of Permit by Rule 30 TAC 106.392 and
Proposal to Adopt Standard Permit for Thermoset Resin Facilities

Dear Ms. Spencer:

This letter constitutes a Public Comment pursuant to the Texas Government Code, TEX GOV'T CODE ANN. § 2001.029 (Vernon 2000), of Guida, Slavich and Flores, P.C., on behalf of our client, the American Composites Manufacturers Association and its Texas member companies, on the referenced proposed regulatory packages.

1. TCEQ should maintain and not repeal the Permit by Rule for Thermoset Resin Facilities, 30 TAC 106.392.

The Permit by Rule for Thermoset Resin Facilities (PBR) has and remains fully protective of human health and welfare, and the environment. It should not be repealed. The TCEQ has offered no valid reason for terminating it and replacing it with a Standard Permit.

The TCEQ provides three bases for repealing the PBR and replacing it with the Standard Permit. None of these reasons is lawful.

First, TCEQ expresses concern with the fact that the PBR authorizes resin and gelcoat usage of 75 tons per year (tpy) for spraying operations and 150 tpy for non-spraying operations, 32 TexReg 2307 (April 20, 2007). The agency's role is not to regulate material usage but rather to regulate air emissions from that usage. There is no valid basis for repealing a PBR based on material usage. One must infer for the agency's position to have any validity that the TCEQ

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believes these usage rates may be unacceptable because they result in an unacceptable level of VOC emissions. The annual usage limit does not relate directly to the hourly emissions rate or to the dispersion characteristics at a particular facility.

The agency's inference is faulty because it essentially ignores the maximum facility-wide VOC emissions limitation for this, and all other facilities that qualify for a PBR, of twenty five tpy. See 30 TAC 106.4. VOC emissions from thermoset resin facilities qualifying today under this PBR are limited in the same manner as thermoset resin facilities in the past.

Second, TCEQ implies that the proposed repeal of the PBR and issuance of the proposed Standard Permit are in response to short term emissions concerns. TCEQ points to the change in styrene emission factors at thermoset resin facilities, and the TCEQ's lowering of the short term styrene Effects Screening Level (ESL) that has occurred since 1994, 32 TexReg 2307 (April 20, 2007).

TCEQ's concerns are misguided. While it is true that the composites industry has changed since 1994, the facts are (a) the production processes used by the composites industry have become much less emissive, and (b) the associated factors used for emissions estimations, expressed in pounds of VOCs emitted per ton of raw material processed, have been significantly increased to accurate levels. Accordingly, the material usage limits in the current PBR are even more protective today than they were in1994. The improvements in process and changes in emission factors provide strong support for maintaining the current PBR. As emission factors have become more stringent, the PBR has become more difficult for new facilities to satisfy. With each improvement in process and change in emissions factor, from AP-42 to the MACT standards, the protection of public health and welfare has increased. There is no logical basis for the position that the PBR has been less protective of the public as a result of changes over the last decade in the composite industry.

The agency itself has lowered the styrene ESL over time in what might be considered an arbitrary way. It has done so without any new data, studies, or scientific information to support these actions. The most recently discussed change to the styrene ESL is based on a study from 1963, over 40 years ago. This study has been in the agency's possession for quite some time, so the data in it is not new to the agency. For some unexplained and inexplicable reason, the agency is apparently viewing this data differently. That is no basis for repealing the PBR.

The agency has set the styrene ESL based on the lowest odor detection threshold that could be found among several different accepted studies and not on any human health consideration. By law, PBRs and Standard Permits are required to be based solely on protection of human health. Therefore, the increase or decrease in the styrene ESL is not a lawful basis for the proposed repeal of the PBR or the proposed Standard Permit.

Thermoset resin facilities are still, as they have been since 1994, limited to the maximum VOC limitation of twenty five tpy under the PBR. This maximum annual rate for all PBR's was, by law, set with both short and long term protectiveness considerations in mind, based in part on the ground level concentration of the air pollutant of concern as determined by air dispersion fence line-based modeling. It is unrealistic and arbitrary for the TCEQ, as its actions in this proposal suggest, to conclude that the PBR no longer satisfies these protectiveness criteria.

In fact, to the extent the agency is measuring protectiveness based on the ESL for styrene, its concerns are misplaced and arbitrary. The styrene ESL has been and is based on odor detection and not on any concept of protectiveness.

As a practical matter, repeal of the PBR and promulgation of a Standard Permit will not solve any measured or detected adverse environmental condition. According to the TCEQ website, since 2003 there have been but two odor-related notices of violation issued by the TCEQ to those in the Texas composites industry. There is no reasonable empirical basis for repealing the current PBR.

Finally, as discussed on Attachment A, we believe that the styrene ESL has been inappropriately established on the basis of odor and at an unreasonably low odor threshold, and that the styrene ESL should be based instead on health effects. Were the agency to adopt a styrene ESL based on either of these approaches, it is clear that the proposed Standard Permit would need to be repealed and reevaluated and re-promulgated. It makes little sense to us to promulgate the Standard Permit as proposed, at this time.

If the TCEQ were to repeal the PBR and promulgate the Standard Permit as proposed, that action would be arbitrary, capricious and contrary to law.

2. The Proposed Standard Permit is Unlawful

A. Unlawful Codification of the Styrene ESL

The proposed Standard Permit, if finalized, directly and indirectly codifies the ESL for styrene into strict emission rate limits for selected thermoset resin facilities. It would be unlawful, inconsistent with long-standing agency precedent, and inconsistent with the treatment of every other ESL in Texas, to give the styrene ESL the force and effect of law by directly or indirectly codifying it into state regulation.

The Texas legislature has at least twice considered codifying the TCEQ's entire ESL list. On each occasion, the legislature has rejected this approach. We do not believe the agency has the legal authority to codify an ESL, specifically the styrene ESL which is the fundamental basis for the Standard Permit proposal, in light of this legislative history.

Moreover, we are unaware of any agency proposal to codify an ESL into emission rate limits for any other chemical or compound. Doing so for styrene through this Standard Permit process would constitute selective and unlawful regulation of the composites industry.

If TCEQ intends to directly or indirectly codify the styrene ESL (assuming without accepting that doing so might be lawful), the agency is required to propose the ESL in a rulemaking and to give the public opportunity for comment. It would be an unlawful avoidance of state administrative procedural requirements and rulemaking procedures for TCEQ to directly or indirectly codify the styrene ESL in the manner presented by its Standard Permit proposal.

Directly or indirectly codifying the styrene ESL in this manner would be contrary to longstanding agency policy and procedure. The TCEQ has maintained the right over time to modify ESLs through informal practice in its Toxicology and Risk Assessment (TARA) group, and the regulatory community has come to accept this approach. If this ESL were incorporated and thereby codified into the Standard Permit, TARA's hands would be unlawfully tied.

Moreover, TARA has long maintained that the styrene ESL should only to be used by the permitting group as guidance, and that the permitting group should exercise reasonable flexibility in its use and application. Codification of the ESL might be interpreted to remove all such intended flexibility, and is therefore counter to the original purpose of the ESLs.

The TCEQ's proposed actions are arbitrary, capricious and contrary to law.

B. The Purported Technical Support for the Standard Permit is Materially Flawed.

The allowable emissions proposed in Table 1 and Table 2 of the proposed Standard Permit have no valid air dispersion modeling support. The allowable emissions proposed in Table 1 and Table 2 are based on an assumed styrene ESL of 110 ug/m^3. The modeling exercise performed by TARA, dated March 13, 2006, in purported support of the proposed Standard Permit is based on an assumed styrene ESL of 70 ug/m3. The styrene ESL in Texas has never been 70 ug/m^3. The agency's attempted extrapolation from the modeling is fatal to the agency's proposal.

The agency's air dispersion modeling contains unsubstantiated (and not necessarily accurate) assumptions concerning the input variables to the air dispersion model. Most importantly, it seems to omit consideration of the location of a facility's property boundaries and the closest relevant receptor. Air dispersion modeling has historically been used by the TCEQ to predict the maximum ground level concentration of an air pollutant at the point where a public exposure may occur, namely at or beyond the facility's property boundary. This modeling seems either to ignore past precedent or to assume an artificial property boundary line and that a relevant receptor is located at that line. This is fatal to the accuracy and predictability of the modeling purporting to sustain the proposed Standard Permit.

It is our understanding that the modeling assumed that meteorological data from the Austin area applies uniformly across the state of Texas. Meteorological data is a critical variable in air dispersion modeling, particularly in Texas where there are many varied meteorological zones. This misuse of air dispersion modeling technique would unquestionably be rejected by TARA in the air permitting of any facility in Texas not under the influence of the Austin area's meteorological conditions. We fail to see how this approach gains any validity in this regulatory context. A more accurate approach is required to satisfy the law and past agency practice.

If the TCEQ intends, despite these comments, to promulgate a Standard Permit for thermoset resin facilities and to repeal the PBR, the agency is legally required to consider and act on all of its guidance documents. The selective reliance on only air dispersion modeling, particularly flawed modeling, is legally arbitrary and capricious.

In particular, the agency has ignored its own guidance concerning the role of odor in the regulation of styrene. The TCEQ Odor Complaint Investigation Procedures Guidance, dated January 3, 2005, found in Attachment A, specifically addresses the odor of styrene, and classifies it as "Unpleasant," id. at 15. This guidance is reasonable and practical and embodies the critically important odor-related variables of Frequency, Intensity, Offensiveness, and Duration (FIDO) for determining the presence of a nuisance. This guidance is more specific in its determination concerning styrene's odor than that which the agency has taken into account in proposing the Standard Permit. It is clear that the TCEQ has failed to carefully consider (or possibly has ignored) this agency guidance because, where the FIDO procedure allows a reasonable amount of acceptable odor occurrence, the Standard Permit is essentially "zero-tolerance" for the styrene odor. Zero-tolerance is unreasonable, unprecedented, impractical, arbitrary and capricious.

Lacking any valid technical support, the TCEQ's proposed actions must be considered arbitrary, capricious and contrary to law.

C. Comparison to, and Use of, the Styrene ESL is Unlawful.

The allowable emissions proposed in Table 1 and Table 2 of the proposed Standard Permit are based on a 2006 air dispersion modeling exercise and a comparison to the current styrene ESL. The comparison to the styrene ESL for styrene is unlawful.

The styrene ESL has been and is based on odor detection and not on human health considerations. PBR's and Standard Permits are to be based by law exclusively on protection of human health. Therefore, it is unlawful to calculate or limit the allowable emissions in a Standard Permit from a comparison with an ESL.

The TCEQ's proposed actions must be considered arbitrary, capricious and contrary to law.

3. Allowable Emissions in the Standard Permit should be Based on Human Health Factors, Not Odor

A. The Styrene ESL Should Not Be based on Odor Threshold, and the Standard Permit Should Not be Based on the Current Odor-Based Styrene ESL

TCEQ has determined that styrene's odor is merely Unpleasant, its second lowest odor classification, and creates a legally recognized nuisance only in unusual, if not rare,

circumstances, see Odor Complaint Investigation Procedures Guidance. Nonetheless, TCEQ presently bases its ESL for styrene on a zero tolerance of the styrene odor. We question why. It is an approach not followed by any other state in EPA Region 6, on in any state in which major composites operations exist today, see Attachment B, or by the federal government. There is a good policy reason that Texas has discounted or ignored. Odor is a very local issue, best handled by local ordinance and state nuisance laws. Moreover, a total prohibition of any odor occurrence is an unfair and impossible barrier to industry, which is among the reasons other states do not regulate in this manner.

The fact that a small subset of the population may occasionally detect an odor does not equate necessarily to an objectionable nuisance, or anything that an environmental agency is required to recognize. Regulating based on simple odor detection is a bit like regulating based on taste or sight: each is based on the subjective, unmeasurable preference of the audience. In fact, there are many odors that are pleasing to humans and which create no adverse health impacts. Some of those pleasant odors are esters such as citrus, which are in the same chemical family as styrene. In fact, some people find the odor of dilute styrene to be pleasant.

TCEQ has claimed that it is obligated to regulate based on odor of selected compounds, including styrene, based on the reference to protection of "human health and welfare" in the Texas Clean Air Act (TCAA). In fact, this interpretation of the statute is not required: odor is not expressly mentioned.

The U.S. Environmental Protection Agency, like Texas, has ample legal authority under the federal Clean Air Act to protect public health and welfare. One could argue that the same language in the TCAA is derived from the federal statute. Yet, odor is relatively unimportant in the U.S. Environmental Protection Agency's regulation of air quality. In fact, Congress and the U.S. Environmental Protection Agency place almost no emphasis on regulation based on odor. Fragrance or odor, in general, and the fragrance or odor of styrene in particular, is essentially not regulated by the U.S. Environmental Protection Agency. For example,

National Ambient Air Quality Standards, the foundation of most air quality regulation in the United States for the last three decades are in no way based on odor.

New Source Performance Standards do not regulate odor, with the exception of Kraft Paper mills. Styrene is irrelevant to that NSPS.

The Primary Ambient Air Quality standards are primary because Congress concluded that air quality is first and foremost a health-based program. Primary standards are mandatory.

Secondary Ambient Air Quality standards, which regulate welfare effects that are defined, in part as "personal comfort and well-being," see Section 302(h) Federal Clean Air Act Amendments of 1990, do not as a practical matter consider odor. When secondary ambient air quality standards have been implemented in the past, they are phased in, not mandated as with Primary Ambient Air Quality standards. This is a very clear message that protection of human health is the higher priority and that personal comfort and well-being are well down the list.

The agency has also asserted that the establishment of the styrene ESL based on styrene's odor is mandated by agency guidance. This simply isn't so. Consistency with TARA's Guidelines to Develop Effects Screening Levels, Reference Values, and Unit Risk Factors, TCEQ Guidance RG-442, November 2006, and past internal guidance is not a basis for the TCEQ's reliance on lowest accepted odor threshold in setting the styrene ESL. The agency seems to lack internal consistency in setting odor-based ESL's.

Of the thirty eight unique odor ESL's that are listed as supported by credible evidence in the American Industrial Hygiene Association's 1989 study (AIHA) cited by the TARA group, only nine (representing twenty four percent) of these follow TARA's selection policy. These nine would be joined by five more compounds if the odor recognition threshold instead of detection threshold were used. Therefore, one can reasonably conclude that there is no consistency by the agency in its selection of odor-based thresholds as ESL's. The agency's apparent position that internal consistency forces the continued use of odor threshold as the basis for the styrene ESL lacks any strength.

The TCEQ's odor-based ESL and its reliance on that ESL in setting the allowable emissions in the proposed Standard Permit are arbitrary, capricious and contrary to law.

B. The Styrene ESL Should be based on Styrene's Heath Effects, and the Standard Permit Should be based on that Revised ESL

We propose that, if the TCEQ is intent on repealing the PBR and finalizing a Standard Permit for thermoset resin operations in Texas, allowable emissions there under should be based on a revised styrene ESL premised on human health factors.

As described in a related context above, TCEQ lacks internal consistency in setting odor-based ESL's. According to its Guidelines to Develop Effects Screening Levels, Reference Values, and Unit Risk Factors, TCEQ Guidance RG-442, November 2006, ESL's are to be set at the lowest odor threshold, vegetative impact threshold and human health impact. In fact, the agency does not follow that approach on a consistent basis, and need not do so for styrene.

For example, the five widely-used industrial solvents listed in the following table have much higher health-based ESL values than the corresponding lowest accepted AIHA odor detection values:

Solvent	CAS #	TCEQ Health ESL	Lowest accepted AIHA Odor Detection Value
MIBK	108-10-1	2,050 ug/m^3	410 ug/m^3
Toluene	108-88-3	1,880 ug/m^3	603 ug/m^3
Acetic acid	64-19-7	250 ug/m^3	91 ug/m^3
Propyl alcohol	71-23-8	4,900 ug/m^3	76 ug/m^3
Butyl alcohol	71-36-3	610 ug/m^3	364 ug/m^3

TARA's inconsistency with its guidance document extends to the setting of higher health-based ESLs for MIBK, toluene, acetic acid, propyl alcohol, and butyl alcohol. The ESL for these materials is far higher than the corresponding AIHA odor detection threshold. We believe the alternate approach taken by TCEQ for these compounds is reasonable and shows appropriate flexibility. Given this precedent, there is no reason the agency can not, or should not actively consider a health effects-based ESL for styrene, and base the Standard Permit on that revised ESL.

Our position on this issue is fully developed in Attachment C. Failure by the TCEQ to derive a health effects-based ESL would be arbitrary, capricious and contrary to law.

4. The Terms of the Standard Permit are Unworkable and Therefore Are Unlawful

If the TCEQ's goal is to create an operationally viable, reasonably accessible Standard Permit, the terms of its proposal are self-defeating. As a practical matter, no composites facility of significant size could use the Standard Permit if it is finalized as is. Consequently, if the proposed Standard Permit is finalized as is, it is likely to lie idle, unused and forgotten. Facilities will be forced to apply for a case-by-case NSR or PSD permit.

A. Control Equipment

We object to the requirement to install control equipment described in the agency's March 2007 Thermoset Resin Facilities Air Quality Standard Permit Summary Document, which is premised styrene's odor. As described above, TCEQ has determined that styrene's odor is merely Unpleasant and is capable of creating a legally recognized nuisance only in unusual, if not rare, circumstances, Odor Complaint Investigation Procedures Guidance, citation above. Moreover, the agency already recognizes that add-on controls are not cost-effective for the composites industry. See TCEQ Air Permitting Technical Guidance for Coatings Sources: Fiber Reinforced Plastics and Cultured Marble Operations, October 2000, in Attachment D . The infeasibility of add-on controls for this industry was also recognized by federal EPA during its promulgation of the Composites MACT standard.

Furthermore, control equipment is not a reasonably available (or BACT) control technology option at composites manufacturing facilities, including those that might seek to qualify for this Standard Permit. While each of the facilities in this industry has unique characteristics, the common denominator among virtually all of them, from an air pollution control equipment standpoint, is that they operate in a cavernous building and have an extremely low VOC concentration in their exhaust air. The combination of the two drives both the capital cost and the operating cost of control equipment to an extreme. In addition, almost all of them are small and medium sized companies for which cash flow is a constant challenge.

B. Startup, Shutdown and Maintenance-Related Emissions

There is no reasonable basis for proposing startup, shutdown and maintenance-related emissions prohibitions that are more stringent than requirements pertaining to the same in TCEQ regulations, see 30 TAC 101.211 (2007). We request deletion of this prohibition.

C. Regulation of Exempt Solvents Lacks Any Rational Basis

We object to proposed Section (6)(C). With a VOC emissions limitation of 50 tons per 12-month period in proposed Section (6)(B), there is no reason for this provision.

We object to the regulation of, and limitation on, the use of exempt solvents. The fact that a material has been designated as "exempt" confirms its negligible impact on the environment. There is no basis for the regulation of materials with a negligible impact on the environment.

D. Daily Recordkeeping Requirements Are Counterproductive and Self-defeating

The applicable MACT standards impose a monthly recordkeeping requirement for major sources of HAPs. There is no valid reason to require more frequent recordkeeping requirements in a Standard Permit.

These requirements are so onerous that, by themselves, they are a sufficient deterrent for most small and medium sized companies to attempt to otherwise qualify for this Standard Permit as it is proposed. If the TCEQ's goal in the development of Standard Permits, including this one, is to make them reasonably accessible, the extent and frequency (daily) of the recordkeeping proposed are counterproductive and self-defeating.

E. Request for Additional Section (4)(C)(iii)

A new section (4)(C)(iii) should be added that parallels sections (i) and (ii), "The facilities engaged in the application of paints or adhesive to molded composite

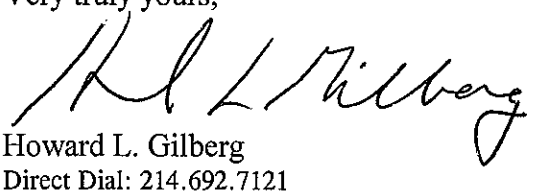
products ...in compliance with ... Subpart PPPP, Plastic Parts Surface Coating." This would serve the purpose of informing sources of these potentially applicable NESHAP, in addition to Subparts WWWW and VVVV.

E. Request for Recognition of Scrap Resin Treatment

TCEQ should expressly approve treatment of scrap resin, as provided under EPA's approval of polymerization ("POLYM") as a treatment technology scrap resin in proposed Section (5)(C). See 62 FR 26007-9; May 12, 1997.

Thank you for the opportunity to provide these public comments. We are available to discuss them at your convenience.

Very truly yours,



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Encl.

Attachment A: TCEQ Odor Complaint Investigation Procedures Guidance
Attachment B: Comparison Table of Ambient Air Toxic Values for Styrene Vapor
Attachment C: ACMA Comments Concerning Styrene ESL with Exhibits
Attachment D: Air Permitting Technical Guidance for Coatings Sources: Fiber Reinforced Plastics and Cultured Marble Operations

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ATTACHMENT A

January 3, 2005

Texas Commission on Environmental Quality
ODOR COMPLAINT INVESTIGATION PROCEDURES

The following updates and supersedes the previous version of this document dated November 13, 2002, as well as all other guidance related to odor complaint investigation.

This narrative accompanies the attached flow chart which describes the prescribed process.

DETECTION OF ODOR AND INITIAL RESPONSE

Detection

An odor may be detected by a citizen and reported to a Texas Commission on Environmental Quality (TCEQ) regional office as a citizen complaint, or detected by an investigator without a citizen complaint as the initiating factor. In either case, the regional office should promptly make a determination regarding the appropriate action based on the guidelines below. If an investigation is appropriate, the investigation should be conducted according to the procedures specified in this document and the attached flow chart.

Initial Response

If an odor is detected, and adverse health effects are alleged by a complainant, or suspected by the investigator, it should be prioritized for immediate response, and an investigation should be conducted as soon as possible, regardless of the manner of detection. The definition of "alleged" or "suspected" health effects should remain very broad in this situation, to ensure that appropriate actions are taken any time there is a potential imminent threat to public health and safety.

If an odor is detected by either a complainant or an investigator, and adverse health effects are not alleged or suspected, an investigation should be conducted to determine the cause of the odor (or alleged odor) according to the incident prioritization procedures established by the Field Operations Division.

INVESTIGATION/DATA GATHERING

Following is a brief discussion of the information which should be collected and evaluated by the regional staff in a potential nuisance odor situation. This discussion is not intended to restrict the collection of any information which the investigator considers appropriate or necessary to evaluate the citizen concerns.

It should be noted that the following protocol assumes that the investigation was initiated by receipt of an odor complaint from a citizen. In order to successfully pursue a nuisance violation, there must be an identifiable aggrieved party (complainant).

If the investigation is initiated as the result of detection of an odor by an agency investigator (no complainant), or if the complainant requests anonymity, the purpose of the investigation would be to determine the cause of the odor and require corrective actions, if appropriate, rather than to confirm nuisance conditions. If, however, during the course of an investigation that was initiated by the investigator, an aggrieved party is identified, the investigator should proceed with the following investigation protocol to document the presence or absence of nuisance odor.

Complaint Information

The following information should be gathered by the regional office at the time that a complaint is received by telephone. If the complaint is received in some other manner, this information should be collected prior to the investigation.

- Name(s) and address(es) of complainant(s).
- Location where complainant(s) experienced the odor.
- Dates, times, frequency, and duration when the complainant(s) experienced the odor.
- Nature of any allegation of adverse effects on the complainant's health, property, animals, or vegetation.
- Nature of any allegation of interference with the normal use and enjoyment of the complainant's property, animals, or vegetation.
- Alleged source of the odor.

Investigation Data/Information

All odor complaint investigation activities and results should be documented in the investigation report. The items and discussion below should be included in the investigation, but should not be construed as limiting either the collection or reporting of relevant information.

- Attempt to locate and assess the odor first-hand. It would be ideal if an investigator could be at the complainant's location at the time that the odor is occurring, in order to experience the same conditions that generated the complaint. This may not be possible, but an effort

should be made to duplicate the experience of the complainant, unless the conditions are considered potentially unsafe.

- Describe the intensity and offensiveness of any odors observed during the investigation using the terms identified for those factors on the FIDO Chart (copy attached). ("FIDO" is an acronym for Frequency, Intensity, Duration, and Offensiveness).

- Describe any physical effects experienced by the investigator which are indicative of adverse effects upon health (burning eyes, nose, throat, headache, vomiting, etc.)

- Describe the normal use of property affected by the odor, and the manner in which such odor could reasonably be expected to interfere with this use.

- Determine and document the extent of the odor plume. Document on a map of the vicinity the odor survey route, the time the investigator was at each location, and the odor observations at each location. This survey should include upwind and downwind observations at least.

- Attempt to locate the source(s) of the odor.

- If a source is identified, attempt to locate the specific cause of the odor (i.e., the specific compound, equipment, or process emitting the odor, and the reason(s), such as a plant upset).

- Gather local meteorological data for the time when the complainant(s) alleged the occurrence of the odor, as well as the time when the investigation was conducted. This should include, at a minimum, estimates of wind speed and direction, temperature, humidity, precipitation, and sky cover.

- Describe the terrain features of the area, including natural and man-made features which could influence the flow of air.

- If the investigator has detected odors at the same location at other times, document a comparison of the current observations with the prior observations.

- Collect information about the frequency and duration of any observed odors. This includes observations by the investigator during the course of the investigation, and information provided by the complainant or the source relative to these factors.

- In some cases, such as recurring short-term odor situations, the investigator may ask the complainant to maintain a log of odor observations to document conditions related to the

odors experienced. The complainant should be asked to utilize the same terminology as used on the FIDO Chart.

This log can be used to validate or invalidate complaints in conjunction with the other evidence of the case. It would not be used as the sole basis for issuance of a notice of violation. The attached "Odor Log" format should be used in all such situations.

- The investigator may conduct interviews of other citizens in the area surrounding the complainant's location with the intention of gathering information or evidence to assist in a determination of the validity of the complaint. Caution should be taken, however, to ensure that this information-gathering procedure not be construed as "soliciting" additional complaints.

INVESTIGATION FOLLOWUP

Upon completion of the investigation, the information collected should be reviewed to determine whether a nuisance condition is confirmed. Based on statutory and regulatory language, a nuisance odor exists if an odor has been emitted in such concentration and duration as to a) be injurious to or adversely affect human health, welfare, animal life, vegetation, or property, or b) interfere with normal use and enjoyment of animal life, vegetation, or property. In the first case, if any adverse effect or injury is documented, the source should be required to take measures to mitigate the odor, and the regional office should initiate appropriate enforcement action against the responsible party. If such adverse effects or injury are not confirmed, the FIDO Chart would be used to evaluate the frequency, intensity, duration, and offensiveness of the odor, and to determine whether the evidence in the case constitutes a nuisance violation.

Adverse Impacts

If the preponderance of the evidence collected during the course of the investigation (including discussions with the complainant and observations by the investigator) confirms the presence of odors in such concentration and duration as to be injurious to or adversely affect human health, welfare, animal life, vegetation, or property, remedial action should be immediately required to mitigate the odors, and appropriate enforcement action should be initiated according to agency enforcement procedures. In this situation, these actions should be taken regardless of whether the incident was complaint-generated or detected by the investigator.

Interference with Normal Use and Enjoyment of Animal Life, Vegetation, or Property

If the preponderance of the evidence does not confirm the presence of odors in such concentration and duration as to be injurious to or adversely affect human health, welfare, animal

life, vegetation, or property, the investigator should evaluate all the evidence collected during the course of the investigation using the FIDO Chart. This chart is used to determine whether a nuisance odor violation should be issued based on whether the frequency, intensity, duration, and offensiveness of observed and documented odors combine to cause interference with the normal use and enjoyment of animal life, vegetation, or property.

Each of the four tables on the FIDO Chart represents a level of offensiveness (Highly Offensive, Offensive, Unpleasant, and Not Unpleasant). The intensity of the observed odor is documented using the legend on the right side of the chart, with "VS" representing Very Strong odors, "S" for Strong, "M" for Moderate, "L" for Light, and "VL" for Very Light. The frequency and duration are then plotted on the horizontal and vertical axes of the appropriate table. If the odor situation is at least as intense as the colored block in which it is plotted, it is considered a nuisance odor. If the plot falls outside the colored area of the table (NA), the odor does not represent a nuisance.
Intensity and offensiveness are two distinct factors which should be evaluated separately. Offensiveness is the enate character of the odor which can be distinguished even in very light concentrations. Intensity is the relative measure of the perceived concentration. Investigators learn to determine relative intensity through experience and/or training. The FIDO Chart incorporates these two distinct factors along with frequency and duration into one integrated tool.

If application of the FIDO Chart confirms a nuisance odor (confirms odors in such concentration and duration as to interfere with the normal use and enjoyment of animal life, vegetation, or property), the regional office should require the responsible party to correct the problem, issue a nuisance odor violation, and initiate appropriate enforcement action based on agency enforcement procedures.

EXAMPLE APPLICATION OF THE FIDO CHART DURING ODOR COMPLAINT INVESTIGATIONS

Following are brief discussions of example nuisance odor complaint investigations, and use of the FIDO Chart to evaluate whether or not nuisance conditions should be cited.

Example 1–Rendering Plant Odor

Scenario 1
A citizen complaint is received alleging "horrible odors" from a nearby rendering plant that occur almost every morning about 10:00 a.m., and last for about an hour. The investigator discusses this with the complainant and arranges to conduct an investigation at 10:00 a.m the following morning. Upon arrival at the complainant's residence, the investigator notices the

odor which is consistent with improperly treated wastewater from a rendering plant. Further investigation confirms that the rendering plant less than 1/4 mile away is the source of the odor. By 11:00 a.m., the odor has almost completely gone away.

Using the FIDO chart, the investigator characterizes the odor as Highly Offensive, as indicated in the "Odor Characterization Examples" on the back of the chart, and determines that the intensity is Strong. Based on testimony from the complainant, and on-site observation, the investigator determines that the odor only lasts for about an hour. The FIDO chart indicates that a Highly Offensive odor lasting for about an hour in a single occurrence must be at least Very Strong to be considered a nuisance (see Figure 1). No violation is confirmed at this time.

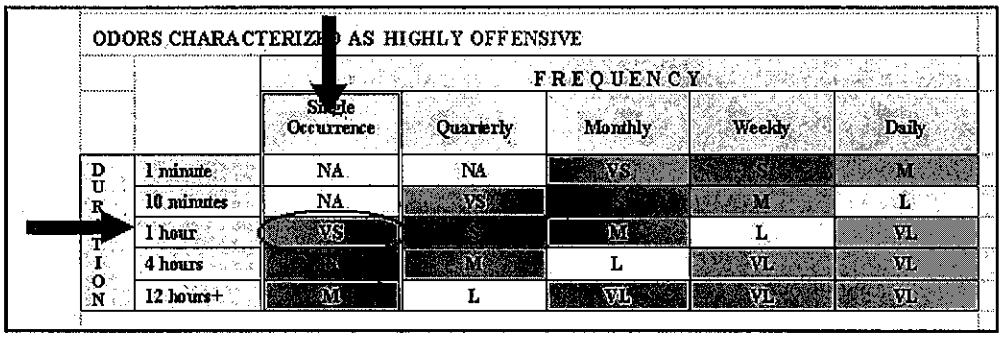


Figure 1

However, based on testimony from the complainant that this strong odor occurs almost every day, usually about the same time, the investigator goes to the rendering plant and discusses this situation with the operations manager. It is determined that a process which is conducted at about this time every day is responsible for the odor.

Given all the evidence gathered in this investigation, it is determined that a Strong, Highly Offensive odor is likely to affect the complainant on almost a daily basis under the plant's current operating conditions. Review of the FIDO Chart shows that a Strong, Highly Offensive odor which lasts for about an hour only has to occur as often as quarterly to be considered a nuisance and justify a Notice of Violation. The Chart also shows that a Highly Offensive odor only has to have a Very Light intensity to be considered a nuisance if it occurs for an hour on a daily basis (see Figure 2).

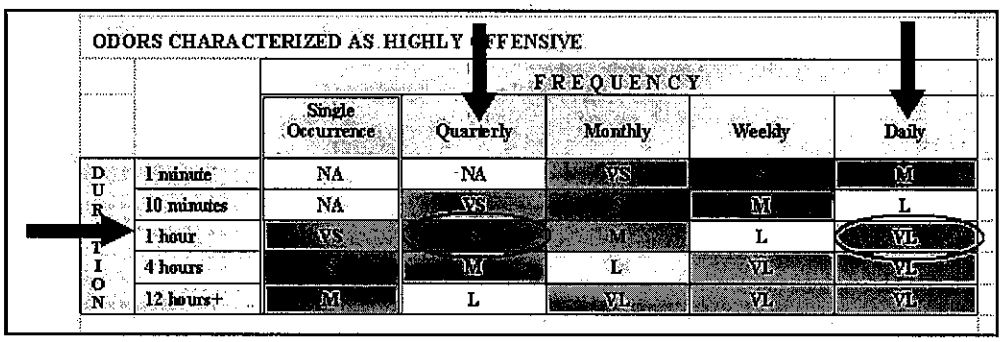


Figure 2

The investigator therefore concludes that this citizen has been subjected to a nuisance odor, and determines that a Notice of Violation is appropriate.

Scenario 2

If, during the course of the investigation, it is determined that the Strong, Highly Offensive odor occurs every two or three weeks, sometimes for only 10 or 15 minutes, sometimes for up to an hour, the investigator would need to "read between the lines" on the chart to estimate where the frequency and duration of this odor should be placed. In this case, the chart indicates that a Strong, Highly Offensive odor occurring for 10 minutes on a monthly basis would constitute a nuisance, or that it would only have to occur for one minute at a time on a weekly basis to be considered a nuisance. Since this odor has been documented to occur for between 10 minutes and an hour, and occurs more often than monthly, but less often than weekly, it would be reasonable to conclude that the odor is a nuisance.

Example 2 – Auto Body Shop Paint Odor

Scenario 1

A complainant alleges "paint odors" from a nearby auto body shop are so strong and unpleasant that he can't go in the back yard to play with his kids. He says that normally the odors from the body shop are not a problem, but that since about 8:00 a.m. on this day, they are terrible. An investigator arrives to conduct an odor complaint investigation at 11:00 a.m.

The investigator determines that organic solvent odors from the painting operation, categorized as Offensive according to the "Odor Characterization Examples" on the back of the FIDO Chart, are impacting the complainant's property with a Strong intensity. The odors continue for one

more hour, until 12:00 p.m.

During the investigation at the facility, it is determined that a fork lift operator had accidentally knocked off the paint spray booth stack the night before and when painting began that morning the solvents were being emitted at ground level without the dilution afforded by the tall stack. At 12:00 p.m., the plant manager agrees to discontinue the painting process until the stack is repaired.

Application of the FIDO Chart for this one-time odor event (Frequency = Single Occurrence) indicates that an odor characterized as Offensive, with intensity characterized as Strong, with a duration of four hours, does not represent a nuisance. The FIDO Chart indicates that a single occurrence of an Offensive odor for four hours must be at least Very Strong to constitute a nuisance violation (see Figure 3 on next page).

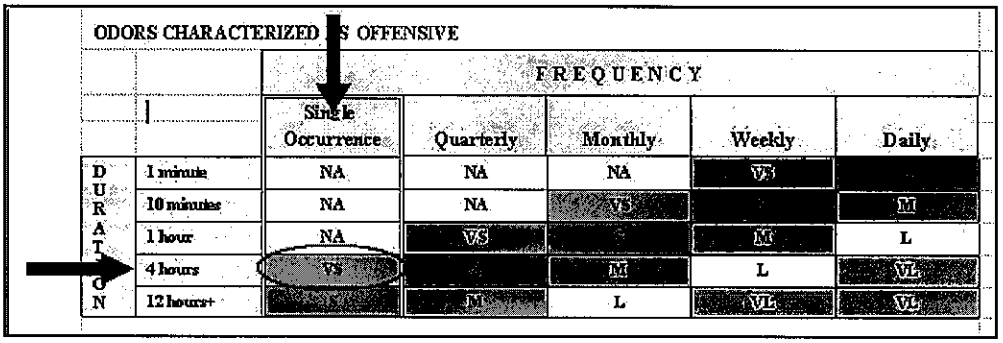


Figure 3

Scenario 2

The complainant states that the odors from the nearby auto body shop are not real strong, but that they happen just about every day, and usually last for about an hour. The odor is annoying because it is so frequent. When the investigator arrives, there are no odors present.

Investigation at the facility reveals that most of the work at the shop does not involve painting, and that they "batch" each day's painting, resulting in perhaps an hour or so of painting each day.
Several investigations are conducted over the next few weeks. During two of these investigations painting operations are being conducted, and Light to Moderate odors are confirmed at the complainant's property for an hour or a little more.

Application of the FIDO Chart indicates that odors characterized as Offensive, with Light intensity, which impact the complainant for approximately one hour (duration) on a daily basis (frequency), do represent a nuisance violation (see Figure 4).

Scenario 3

The complainant states that strong paint odors from the auto body shop aere experienced occasionally throughout the day about one day a week. They usually only last about 10 or 15

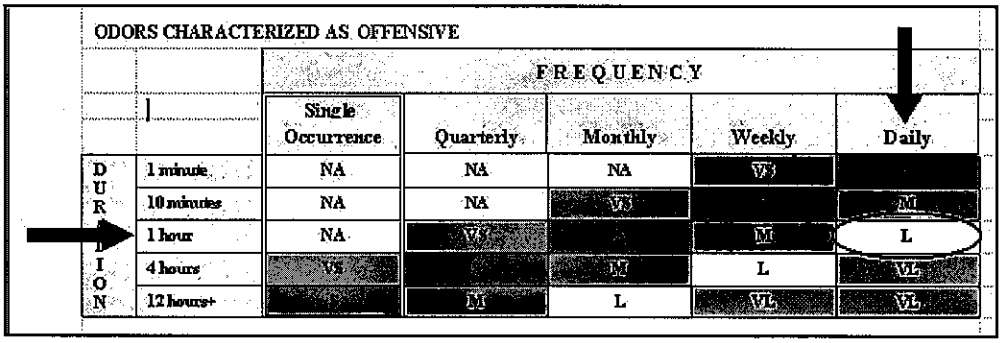


Figure 4

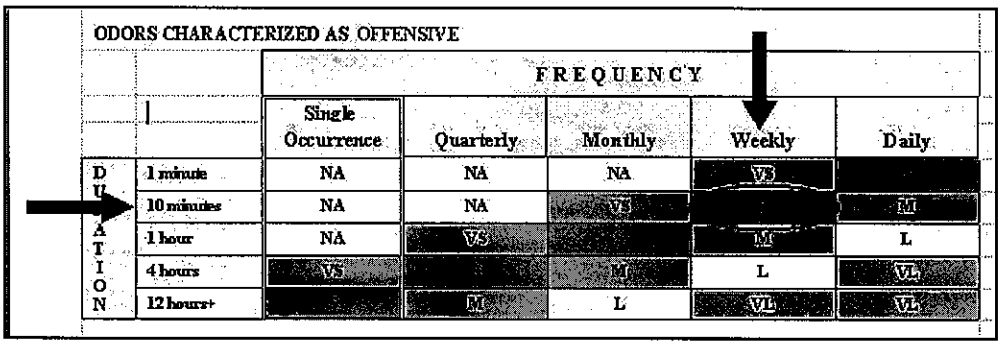
minutes at a time, but that on the days when they do occur, they become very annoying. When the investigator arrives to conduct an investigation, there are no odors observed, but the complainant indicates that the wind has shifted and the odors have disappeared. An odor survey confirms Strong, Offensive odors from the spray painting operation at a point downwind of the facility at the same distance as the complainant's house.

Investigation of meteorological conditions indicates that the complainant's residence is not downwind of the body shop according to prevailing wind direction, but that when the complaint was made, the residence was downwind of the facility. It also confirms that, typically, the complainant's house is downwind of the facility about one day each week.

Investigation at the facility reveals that painting occurs off and on during every work day and that there is only a short paint spray booth stack, thus limiting dispersion. The investigator concludes that Strong, Offensive odors are likely to impact the complainant any time painting operations are underway and the residence is downwind of the facility.

Review of the information collected during this investigation, and application of the FIDO Chart, indicates that the offensive painting odors are impacting the complainant's residence for 10 to 15 minute periods throughout any day when the orientation of the wind puts the residence downwind of the body shop. The frequency of this occurrence would be plotted as Weekly, since the wind direction causes the odors to impact the complainant's residence approximately weekly. The duration is at least 10 minutes (likely more) on these days. The FIDO Chart (See Figure 5) indicates that an Offensive odor with a Strong intensity on a weekly basis for 10

minutes or more is considered a nuisance. A notice of violation is therefore issued.



ODORS CHARACTERIZED AS OFFENSIVE						
		FREQUENCY				
		Single Occurrence	Quarterly	Monthly	Weekly	Daily
DURATION	1 minute	NA	NA	NA	V	
	10 minutes	NA	NA	V		M
	1 hour	NA	V		M	L
	4 hours	V		M	L	VL
	12 hours+		M	L	VL	VL

Figure 5

Example 3 – Landfill Odor

Scenario 1

A complainant alleges "sickeningly sweet" garbage odors from a nearby landfill that are sometimes so bad he cannot spend any time in his yard. He adds that sometimes it is so bad he cannot open the windows of his house since the smell would come inside. The odors tend to be worse when the weather is quite cool and calm, especially in the late evening and early morning hours.

Using this information, the investigator determines that an investigation should be conducted after-hours. The investigator arrives in the complainant's neighborhood at 6:00 a.m. on a cool and calm morning, when the odors should be at their worst. No odors are noted at the complainant's address but during a drive through the neighborhood, the investigator notes garbage odors of Moderate intensity in various parts of the neighborhood until about 7:00 a.m. The odors diminish rapidly after the sun has risen and the winds have picked up.

Using the FIDO Chart, the investigator characterized the odor as Offensive, as indicated in the "Odor Characterization Examples" on the back of the chart. Plotting it as a Single Occurrence for one hour, no nuisance is confirmed (See Figure 6). The chart indicates that for a Single Occurrence, an odor must be at least Very Strong for four hours to be considered a nuisance, so no violation is documented. However, the chart also indicates that a Moderate odor occurring for one hour on a weekly basis would be considered a nuisance. The investigator would need to conduct additional investigations and collect additional information regarding the frequency and duration of these odors to make a final determination.

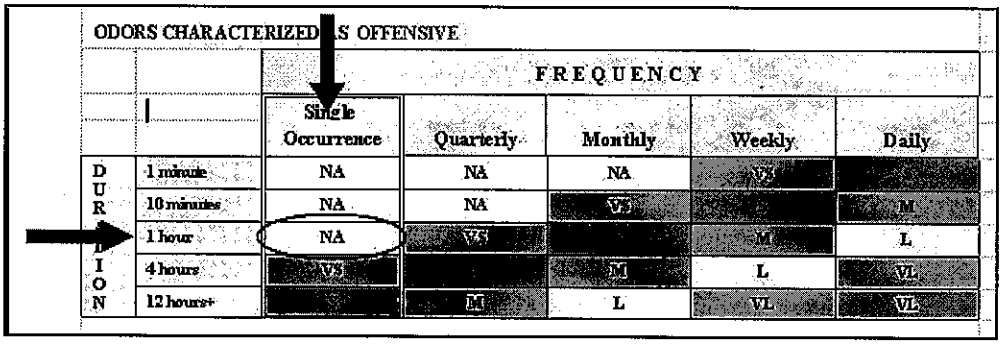


Figure 6

Scenario 2

During the course of the investigation, the investigator determines the intensity of the odor is Light and that it lasts approximately 10 minutes. Three followup investigations during the next three weeks result in:

1. No odors detected.
2. An odor of light intensity that lasts for less than 10 minutes.
3. An odor of very light intensity that lasts for about two hours.

The conclusion is that the odors occur for between 10 minutes and 2 hours at a Light to Very Light intensity on a weekly basis (approximately).

Evaluation of the FIDO Chart indicates that an offensive odor occurring weekly for one hour would have to be at least a Moderate intensity to be considered a nuisance (See Figure 7). For an offensive odor at a Light intensity, the odor must have a duration of at least four hours on a weekly basis, or one hour on a daily basis to be considered a nuisance. In this case, although some odor is frequently observed, the intensity and duration are not great enough to confirm that a nuisance condition exists.

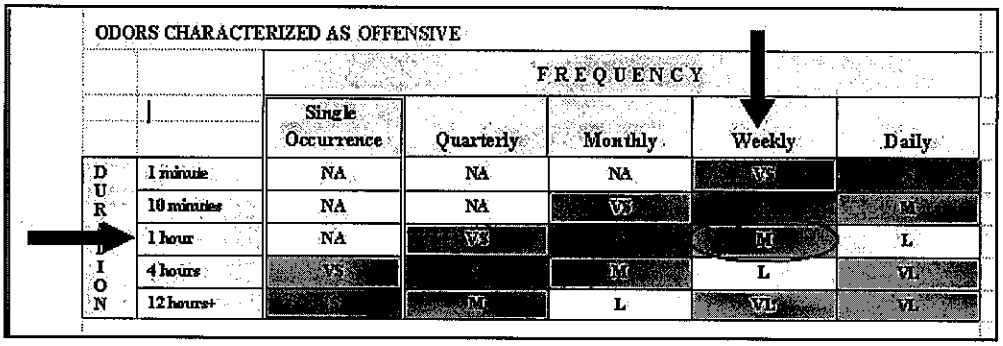


Figure 7

Scenario 3

A complaint is received alleging that landfill odor is occurring in the neighborhood again, as it does on a regular basis. Review of the file indicates that such complaints have been received and investigated 16 times in the previous 12 month period, at least once per month. Further review indicates that investigators have confirmed Moderate to Strong odors occurring for approximately one hour on four different occasions. Review of complaint records, including odor logs kept by complainants, provides documentation that Moderate to Strong landfill odors are occurring in this neighborhood on about a monthly basis for 30 minutes to an hour at a time.

Using the FIDO Chart for Offensive odors, it is determined that an odor occurring on a monthly basis for one hour at a time must have at least a Strong intensity to be considered a nuisance. The same odor with a Moderate intensity would have to occur on a weekly basis to be considered a nuisance (See Figure 8). Since the documented odors are only Moderate to Strong (not consistently Strong), and their duration is usually less than one hour, a nuisance violation is not confirmed.

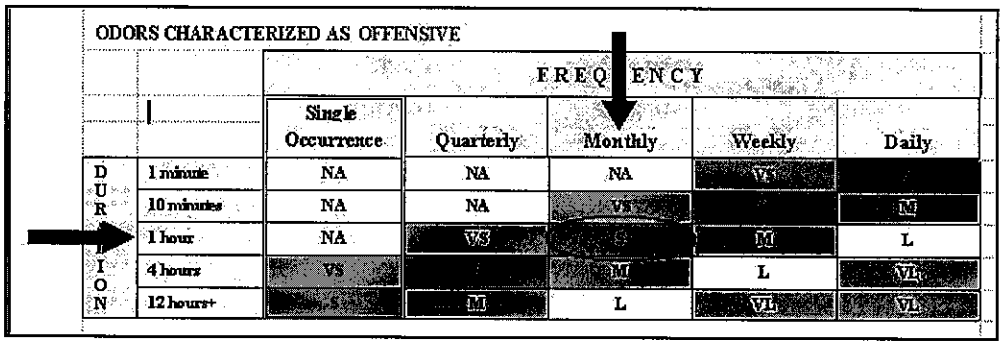

ODORS CHARACTERIZED AS OFFENSIVE
FREQUENCY
Single Occurrence
Quarterly
Monthly
Weekly
Daily
DURATION
1 minute
10 minutes
1 hour
4 hours
12 hours+
NA
NA
NA
VL
NA
NA
VL
M
NA
VS
M
M
VS
M
L
L
VL
VL

Figure 8

ODOR COMPLAINT INVESTIGATION PROCEDURES
FIDO CHART

ODORS CHARACTERIZED AS HIGHLY OFFENSIVE

DURATION	FREQUENCY				
	Single Occurrence	Quarterly	Monthly	Weekly	Daily
1 minute	NA	NA	VS		M
10 minutes	NA	VS		M	L
1 hour	VS		M	L	VL
4 hours		M	L	VL	VL
12 hours+	M	L	VL	VL	VL

ODORS CHARACTERIZED AS OFFENSIVE

DURATION	FREQUENCY				
	Single Occurrence	Quarterly	Monthly	Weekly	Daily
1 minute	NA	NA	NA	VS	
10 minutes	NA	NA	VS		M
1 hour	NA	VS		M	L
4 hours	VS		M	L	VL
12 hours+		M	L	VL	VL

ODORS CHARACTERIZED AS UNPLEASANT

DURATION	FREQUENCY				
	Single Occurrence	Quarterly	Monthly	Weekly	Daily
1 minute	NA	NA	NA	NA	VS
10 minutes	NA	NA	NA	VS	
1 hour	NA	NA	VS		M
4 hours	NA	VS		M	L
12 hours+	VS		M	L	VL

ODORS CHARACTERIZED AS NOT UNPLEASANT

DURATION	FREQUENCY				
	Single Occurrence	Quarterly	Monthly	Weekly	Daily
1 minute	NA	NA	NA	NA	NA
10 minutes	NA	NA	NA	NA	NA
1 hour	NA	NA	NA	NA	VS
4 hours	NA	NA	NA	VS	
12 hours+	NA	NA	VS		M

INTENSITY LEGEND
VS
Very Strong
Strong
M
Moderate
L
Light
VL
Very Light

TCEQ

ODOR CHARACTERIZATION EXAMPLES

Highly Offensive	Offensive	Unpleasant	Not Unpleasant
Blood Drying Operations	Paper Mill Black Liquor	Well Digested or Chemically-Treated Sludge	Ketones, Esters, Alcohols
Undigested or Untreated Sewage Treatment Primary Sludge	Landfill Garbage/waste	AFO Operation under Best Mgmt. Practices	Fresh-cut Grass or Hay
Rendering Plant Processes and Wastewater	AFO Lagoon Maintenance, Waste and Wastewater Handling	Waste-activated Sludge Processes	Normal Coffee Roasting
Decaying Animal/fish	Decaying Silage/Composting	Water-based Painting	Normal Food Preparation
Hide Processing	Typical Grease Trap Odor	Styrene	Bakery
Rancid Grease	Rubber/Plastic/Tire Burning	Gasoline, Diesel Fuel	Perfume
Acrolein	Organic Acids	Diesel Exhaust	Spice Packaging
Landfill Gas and Leachate	Aldehydes	Asphalt Odors	Winery
H_2S	Acrylates	Domestic Waste Burning	
	Septic Systems	Burned Coffee/food	
	Organic Solvents (Oil-based) Painting	Ammonia	
		Chlorine	
		Brush/wood Burning	

DETERMINING FREQUENCY/DURATION

Plant Processes
Constant, seasonal, intermittent (e.g. reactor top opened), upset condition, etc.
Process and environmental controls
Best Management Practices
Sampling/CEM data

Weather
Wind rose from source to receptor
Temperature variation affecting intensity vs climate data
Wind speed day, night, summer, winter
CAMS Station/NWS data

Terrain
Low areas/channels/valleys where odors can funnel
Changes that could affect local wind patterns

Complainant Information
Statements as to frequency, duration, intensity and character
Statements as to effects - how have odors interfered with normal use and enjoyment of property
Logs - time, effects, source operations, weather conditions
Knowledge of source operations - times, processes
Neighbor corroboration
Guest corroboration

HOW TO USE THE FIDO CHART

Each of the four tables on this FIDO Chart represents a level of offensiveness (Highly Offensive, Offensive, Unpleasant, and Not Unpleasant). The intensity of the observed odor is documented using the legend on the right side of the chart, with "VS" representing Very Strong odors, "S" for Strong, "M" for Moderate, "L" for Light, and "VL" for Very Light. The frequency and duration are then plotted on the horizontal and vertical axes of the appropriate table. If the odor situation is at least as intense as the colored block in which it is plotted for the corresponding duration and frequency, it is considered a nuisance odor. If the plot falls outside the colored area of the table (NA), the odor does not represent a nuisance.

Use checklist to document the following:

1. Characterize the odor to determine which offensiveness table to use (Not Unpleasant to Highly Offensive)
2. Assess intensity of odor (Very Light to Very Strong)
3. Determine the total duration of the odor(s) (1 minute to 24 hours)
4. Evaluate the frequency of odor occurrence (Single Occurrence to Daily)
5. Using Steps 1-4 above including previous investigation results, identify the block that corresponds with the information collected in order to determine if a nuisance condition exists.

ODOR LOG

DATE START TIME	WIND SPEED/ DIRECTION	WEATHER CONDITIONS CLOUD COVER, TEMP, ETC.	INTENSITY VS - S - M - L - VL	OFFENSIVENESS HO - O - UNP - NOT UNP	DURATION HOURS/MINUTES	SYMPTOMS/ EFFECTS	POSSIBLE SOURCE

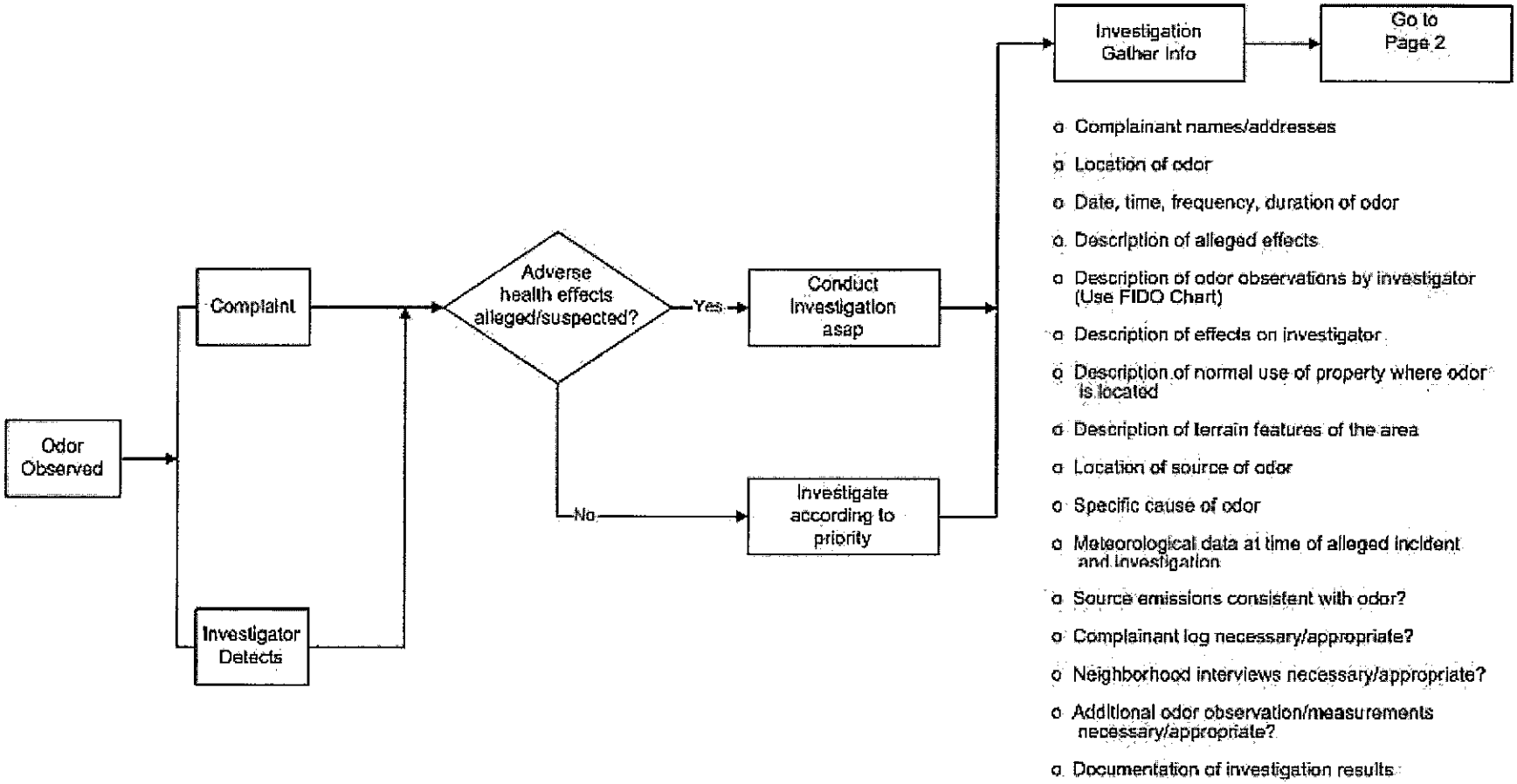
COMMENTS:

NAME: _____ ADDRESS: _____

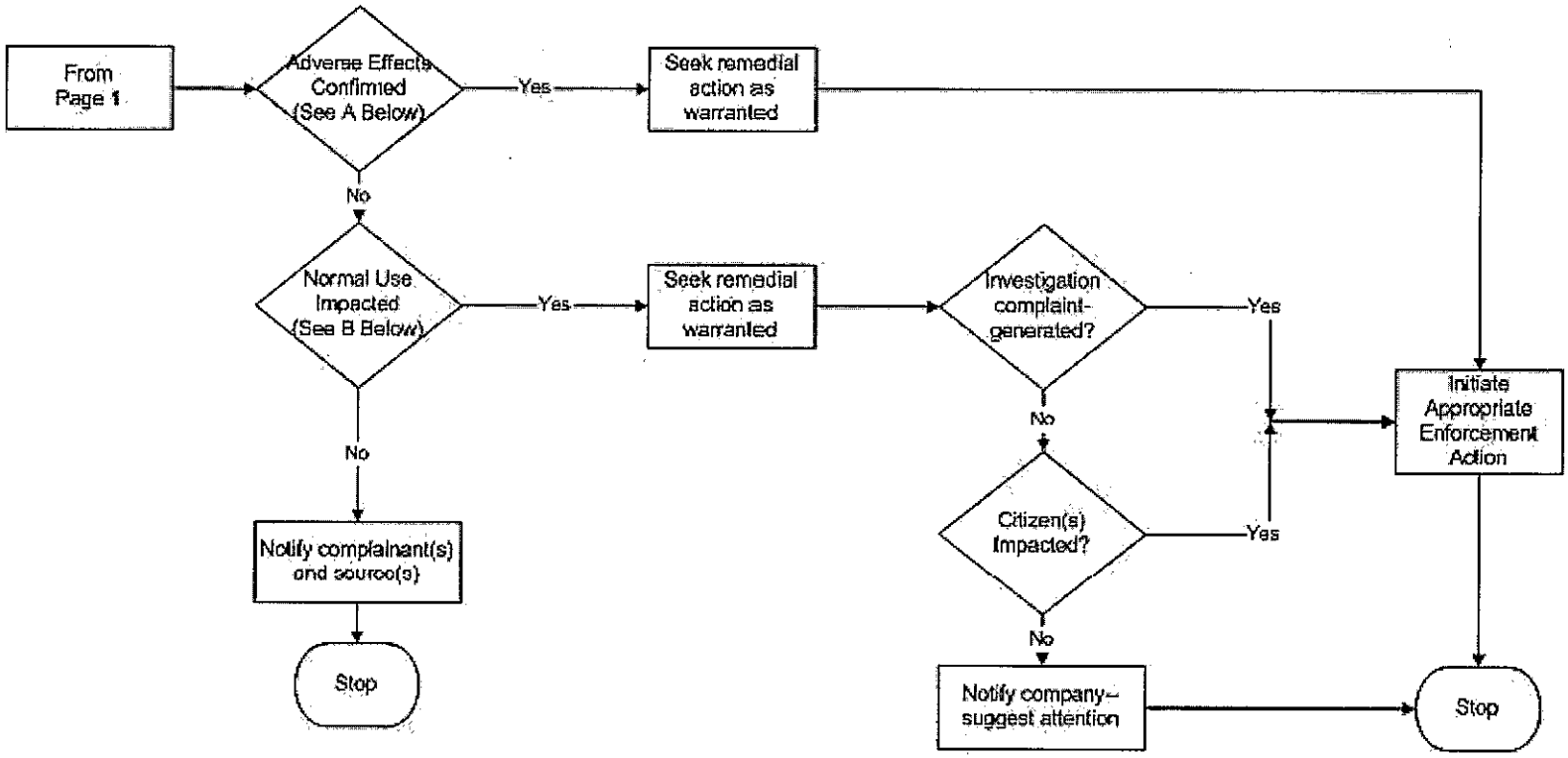
_____

PAGE _____ OF _____

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
Nuisance Odor Complaint Investigation Process



Nuisance Odor Complaint Investigation Process (cont'd)



A — Preponderance of evidence (investigation results) indicates odor in such concentration and duration as to be injurious to or adversely affect human health, welfare, animal life, vegetation, or property.

B — Preponderance of evidence (investigation results using FIDO Chart) indicates odor in such concentration and duration as to interfere with normal use and enjoyment of animal life, vegetation, or property.

ATTACHMENT B

Comparison of Ambient Air Toxic Impact Limits for Styrene Vapor

last revised on 5/29/07

State	Limit name	Value ($\mu g/m^3$)	Averaging Period	Equivalent 1-hr value ($\mu g/m^3$)	Basis	Equation or Source	Citation
AL	n/a	2,130	1-hour	2,130	Health	ACGIH '06 TLV / 40	ADEM Modeling Guidelines - April 2006
		203	annual			ACGIH '06 TLV / 420	
AR	PAIL	852	24-hour	2,130	Health	ACGIH '06 TLV / 100	Nuisance odor is treated case-by-case as a local issue Non-Criteria Pollutant Control Strategy – 1996 Screening Modeling Protocol
AZ	AAAQC	3,500	1-hour	3,500	Health	Appendix B AAAQC list	Air Modeling Guidelines for AZ Air Quality Permits July 1992
		1,700	24-hour				
CA	AIL	21,000	1-hour	21,000	Health	n/a	Consolidated Table of OEEHA/ARB Approved Risk Assessment Health Values
CT	HLV	21,500	30-min	21,500	Health	Table 29-3 April 4, 2006	RCSA 22a-174-29
		4,300	8-hr				
FL	none	n/a	n/a	n/a	NAAQS	n/a	FL DEP only requires NAAQS/PSD modeling FL repealed air toxic modeling under FAC 62-210.500
GA	AAC	1,000	annual	12,500	Health	IRIS RfC	Guideline for Ambient Impact Assessment of Toxic Air Pollutants – June 1998
IA	none	n/a	n/a	n/a	NAAQS	n/a	IA DNR only requires NAAQS/PSD modeling
IL	none	n/a	n/a	n/a	NAAQS	n/a	IL EPA only requires NAAQS/PSD modeling
IN	none	n/a	n/a	n/a	NAAQS	n/a	IN DEM only requires NAAQS/PSD modeling
KY	none	n/a	n/a	n/a	NAAQS	n/a	Odor is regulated by direct measurement Appendix A - 401 KAR 53:010
LA	AAS	5,070	8-hour	7,243	Health	ACGIH '93 TLV / 42	LAC 33.III Chapter 51 Table 51.1
MD	TAP screening limits	1,704	1-hour	1,704	Health	ACGIH '06 TLV STEL / 100	COMAR 26.11.16.07
		852	8-hour			ACGIH '06 TLV / 42	
MI	ITSL	1,000	24-hour	2,500	Health	Table 1	MAC R 336.1225
MN	acute HRV	21,000	1-hour	21,000	Health	n/a	MN DoH Health Risk Values for Air - March 2002
	chronic HRV	1,000	annual			IRIS RfC	
MO	RAL	2,240	1-hour	2,240	Health	non-public - must call DNR	List maintained by state toxicologist
		333	annual				
NC	AAL	10,600	1-hour	10,600	Health	OSHA PEL / 40	15A NCAC 2D.1104
NH	AAL	1,000	24-hour	2,500	Health	Table 1450-1	NH ARAR Env A 1400
		1,000	annual				

Comparison of Ambient Air Toxic Impact Limits for Styrene Vapor

last revised on 5/29/07

State	Limit name	Value ($\mu g/m^3$)	Averaging Period	Equivalent 1-hr value ($\mu g/m^3$)	Basis	Equation or Source	Citation
NJ	RfC_{ST}	21,000	1-hour	21,000	Health	CARB OEEHA May 00	"Technical Manual 1003" - NJAC 7:27-17
NM	none	n/a	n/a	n/a	MACT	n/a	20.2.72.502 NMAC Modeling Guidelines – Section 2.8
NV	none	n/a	n/a	n/a	NAAQS	n/a	NV DEP only requires NAAQS/PSD modeling
NY	SGC	17,000	1-hour	17,000	Health	SGC/AGC Tables	6NYCRR part 212 Air Guide 1 - November 1997
	AGC	1,000	annual			IRIS RfC	
OH	MAGLC	2,028	1-hour	2,028	Health	ACGIH '06 TLV 42	OAC 3745-114-01
OK	MAAC	4,260	24-hour	10,650	Health	ACGIH '86 TLV 50	OAC 252:100-41-40
OR	ABC	none	n/a	n/a	Health	styrene not listed or modeled as air toxic	OAR 340-246-0010
RI	AAL	20,000	1-hour	20,000	Health	Table 1	Reg 22 RI Air Toxics Guidelines - June 2005
		1,000	24-hour				
		100	annual				
SC	MAC	5,325	1-hour	5,325	Health	n/a listed in table	SC R.62.5 Standard 8 (D.) Facilities subject to MACT are exempt from modeling
TN	none	n/a	n/a	n/a	MACT	n/a	No modeling or nuisance odor citations appear in TN regulations or permitting policies
VA	SAAC	4,259	1-hour	4,259	Health	ACGIH '06 TLV STEL 40	9 VAC 5-60-230
		170	annual			ACGIH '06 TLV 500	
VT	HAAS	512	annual	1,280	Health	OSHA PEL 420	VA PER 5-261 Appendix B Cat II chronic / Appendic C acute Cat III styrene is not listed or modeled as acute air toxic
WA	ASIL	1,000	24-hour	2,500	Health	Class B Table	WAC Chapter 173-460-160
WI	SAAC	2,045	1-hour	2,045	Health	Table A	WAC NR 445.07
		1,000	annual			IRIS RfC	
WV	none	n/a	n/a	n/a	MACT	styrene is not not listed as state TAP	45 CSR 27 Toxic Air Pollutants
WY	none	n/a	n/a	n/a	NAAQS	n/a	Odor is regulated by direct measurement WAQS&R Chapter 2 Section 11(a)(i)
TX	ESL	110	1-hour	110	Odor	TARA mean of two lowest odor AIHA studies	MERA (RG-324 - Oct 2001) 2003 ESL Tables

ATTACHMENT C

(Provided as Stand Alone Document)

ATTACHMENT D

October 2000
RG-xxx (draft)

Air Permit Technical Guidance for Coatings Sources:

Fiber Reinforced Plastics and Cultured Marble Operations

printed on recycled paper

Air Permits Division

TEXAS NATURAL RESOURCE CONSERVATION COMMISSION

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Technical Disclaimer

This document is intended as a guidance to explain the requirements for new source review permitting of fiber reinforced plastics (FRP) and cultured marble (CM) facilities; it does not supersede or replace any local, state or federal law, regulation, or rule. References to abatement equipment technologies are not intended to represent minimum or maximum levels of Best Available Control Technology (BACT). Determinations of BACT are made on a case-by-case basis as part of the New Source Review of permit applications. BACT determinations are subject with consideration to specific process requirements, air quality concerns, and recent developments in abatement technology. Additionally, concerns about off-property health impacts and/or public safety may drive requirements for stricter abatement than would otherwise be acceptable as BACT.

The represented calculation methods are intended as an aid in the completion of acceptable applications; alternate calculation methods may be equally acceptable if they are based upon, and adequately demonstrate, sound engineering assumptions or data.

These guidelines are applicable as of this document's publication date but are subject to revision during the permit application preparation and review period. It is the responsibility of the applicants to remain abreast of any guideline or regulation developments that may affect their industries.

The electronic version of this document may not contain attachments or forms (such as the PI-1, Permits by Rule, or tables) that can be obtained electronically elsewhere or on the TNRCC Web site.

The special conditions included with these guidelines are for purposes of example only. Special conditions included in an actual permit are tailored to the specific facility operating conditions.

Table of Contents

Abbreviations and Acronyms

The following abbreviations are in this document

Avg	Weighted average
BACT	Best Available Control Technology
CFA	Composite Fabricators Association
CFR	Code of Federal Regulations
CM	Cultured Marble
EPA	U.S. Environmental Protection Agency
FE	Filter particulate matter removal efficiency
FRP	Fiber reinforced plastic
HAP	Hazardous Air Pollutants
MACT	Maximum Achievable Control Technology
Max	Maximum
PM	Particulate matter
TAC	Texas Administrative Code
TPY	Tons per year
TNRCC	Texas Natural Resource Conservation Commission
UEF	Unified Emission Factors
VOC	Volatile Organic Compound

Chapter 1—Overview

This document is intended to aid the permit applicant in identifying applicable federal and state regulations, and to assist in calculating the emissions from fiber reinforced plastics (FRP) and cultured marble (CM) facilities. It is important to remember that all representations made in a permit application become conditions upon which a permit is issued, amended, or renewed. This document also includes example special conditions that can be expected when a permit is issued.

The TNRCC encourages pollution prevention, specifically source reduction, as a means of eliminating or reducing air emissions from industrial processes. The applicant should consider opportunities to prevent or reduce the generation of emissions at the source whenever possible through methods such as product substitutions, process changes, or training. Considering such opportunities prior to designing or applying "end-of-pipe" controls can not only reduce the generation of emissions, but may also provide potential reductions in subsequent control design requirements (e.g., size) and costs.

This document provides guidance for FRP and CM facilities. Calculations for individual facilities, including emission calculations may vary, depending on process employed and actual operating conditions.

For additional guidance on FRP and CM facilities, contact the TNRCC Air Permits Division, Chemical & Coatings Section at (512) 239-1250 or visit *http://www.tnrcc.state.tx.us/air/nsr_permits/permit.htm*.

Chapter 2 of this document describes the applicable federal and state rules and regulations that applicable to FRP or CM facilities. These rules and regulations include the requirements for obtaining an air permit and/or claiming a permit by rule. Additional rules and regulations address volatile organic compound emissions in ozone nonattainment areas and technologies for pollution control.

Chapter 3 addresses best available control technology (BACT) for FRP and CM facilities, a requirement of 30 TAC §116.111(2)(C). BACT is defined as the best available control technology with consideration given to the technical practicability and the economic reasonableness of reducing or eliminating emissions from a facility. For FRP and CM facilities, BACT includes both source reductions and emissions controls.

Chapter 4 covers Maximum Achievable Control Technology (MACT) for constructed and reconstructed FRP and CM facilities on which construction began on or after June 29, 1998. Until MACT standards are promulgated for plastics composite fabrication facilities, 30 TAC Chapter 116 subchapter C requires that

controls proposed in affected permit applications be MACT, as determined on a case-by-case basis, and consistent with 40 Code of Federal Regulations (CFR § 63.43).

Chapter 5 provides sample calculation methods for FRP and CM facilities. These methods provide sample calculations to determine emissions from these facilities on an hourly and annual basis, as well as required formats for reporting emissions.

In addition, this packet contains several attachments including a set of sample special conditions and emission factor tables.

Chapter 2 State and Federal Permitting Requirements

Two broad groups of Fiber Reinforced Plastics (FRP) and Cultured Marble (CM) facilities are regulated by the TNRCC; existing facilities and new facilities. Facilities that were in existence before September 1, 1971, and have not undergone modification are considered grandfathered and are not subject to TNRCC permitting requirements. In accordance with Title 30 Texas Administrative Code Section 116.110 (30 TAC § 116.110), any facility built or modified after September 1, 1971 is subject to TNRCC permitting requirements, and must obtain a permit or qualify for a Permit by Rule under 30 TAC Chapter 106 (also referred to as Exemption from Permitting).

2.1 PERMITS BY RULE

Certain new and modified facilities may qualify for a Permit by Rule (PBR) because their contribution of air contaminants to the atmosphere are considered insignificant. FRP and CM facilities do not need a permit if the following two conditions are met:

> The facility meets all applicable requirements of 30 TAC § 106.392 (PBR for Thermoset Resin Facilities) and 30 TAC § 106.4 (general Permit by Rule requirements)
>
> Potential emissions from facilities constructed or reconstructed after June 29, 1998 shall not exceed 10 tons per year (TPY) for any hazardous air pollutant (HAP) or 25 TPY for any combination of HAP [30 TAC § 116.180(c)].This requirement will cease to apply upon promulgation of an applicable MACT standard for FRP and CM facilities.

Title 30 TAC § 106.392 requires that an eligible facility be registered with the TNRCC with a Form PI-7 before any construction may begin. Any claim of PBR must meet all applicable federal, state, and local rules and regulations. Until an applicable MACT standard is promulgated for such facility, the facility will need to have federally enforceable emission rates for HAP. Such certification may be made with TNRCC Form PI-8.

2.2 PERMIT OPTIONS

This guidance document focuses on requirements for a preconstruction permit as (30 TAC Chapter 116, Subchapter B). The required information is similar for authorization by flexible permit (30 TAC Chapter 116, Subchapter G) or by Standard Permit (30 TAC Chapter 116, Subchapter F). Normally, it takes six to nine months for issuance of a construction and operation permit (air quality permit), and three to six months for approval of an amendment to an existing permit.

2.2.1 Synopsis of Permit Review

The first step to obtaining a permit is sending a complete application and all subsequent correspondence to the TNRCC Central Office in Austin, the appropriate TNRCC Regional Office, and any local air pollution control program(s). Once the TNRCC receives the permit application, Permit Administrative Review Section will review for administrative completeness before transferring the application to the Air Permits Division. At that point, it will be assigned to a permit engineer for technical review.

Generally all new permit applications and major amendments require public notification. Upon determination of administrative completeness, the TNRCC Executive Director will authorize public notice-a notice of receipt of application and intent to obtain a permit. Typically, public notification involves advertisements in a local newspaper as well as sign posting at the facility location for a 30-day public comment period. [Note: Public notice requirements may be waived for certain modifications to existing permitted facilities.] Additional alternate language public notice may also be required if either the elementary school or the middle school located nearest to the facility provides a bilingual education program. During the public comment period, anyone who may be directly affected by potential emissions from the proposed facility may request a public meeting or hearing and comment about the application. In some cases, a second public notice will be required upon completion of the review process.

The first part of the technical review includes identification of all **emission sources** and calculation of **emission rates**. The permit engineer uses the following information to complete this part of the review: process description, process flow diagrams, Table 1(a) data, material usage rate table, Material Safety Data Sheets, and emission calculations.

Upon identification and evaluation of emission sources and emission rates, the permit engineer evaluates proposed control technology. 30 TAC § 116.111 requires the application of **best available control technology** (BACT) for all permitted emission sources. BACT determination is made on a case-by-case basis, with consideration given to technical practicability and economic reasonableness. Further discussion of BACT for FRP and CM facilities is provided in Chapter 3.

Title 30 TAC Chapter 116 Subchapter C requires that certain constructed and reconstructed Major Sources of hazardous air pollutants (HAP) implement **Maximum Achievable Control Technology**

(MACT) as determined on a case-by-case basis. For affected sources, the applicant is required to include a MACT proposal as part of the permit application. Details on case-by-case MACT is provided in Chapter 4.

Other requirements of 30 TAC § 116.111 include: New Source Performance Standards (NSPS), National Emission Standards for Hazardous Air Pollutants (NESHAP), Prevention of Significant Deterioration (PSD), Nonattainment review, and a review of the impacts on public health and welfare.

In order to ensure there will be no adverse impacts to public health and welfare, an off-property air quality impacts (ground level concentration analysis) is performed for all emission sources. A computer-based mathematical model is used to predict the off-property concentrations for all air contaminants. Predicted off-property concentrations for all contaminants are submitted to the TNRCC Toxicology and Risk Assessment Section for review.

Upon resolution of all technical issues, the permit engineer will draft the **permit special conditions** for review and comments by the appropriate TNRCC regional office, any applicable local program(s), and the applicant. The permit is issued upon agreement by all parties to the terms of the permit special conditions.

2.3 GENERAL REGULATION APPLICABILITY

In addition to the requirements of 30 TAC Chapter 106 and 30 TAC Chapter 116, below are additional regulations that may apply to new and existing FRP and CM facilities.

2.3.1 General Rules (30 TAC Chapter 101):

Definitions
Nuisance
Upset, maintenance, start-up, and shutdown requirements

2.3.2 Visible Emissions and Particulate Matter (30 TAC Chapter 111)

Ground level concentrations for particulate matter
Opacity

2.3.3 Control of Air Pollution from VOC (30 TAC Chapter 115)

Nonattainment areas:
DFW area- Collin, Dallas, Denton, and Tarrant Counties
El Paso area - El Paso County
Beaumont/Port Arthur area - Hardin, Jefferson, and Orange Counties
Houston/ Galveston area - Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller Counties

This chapter also applies to some attainment counties for ozone

Subchapter B: General VOC Sources

Vent Gas Control (115.121-115.123, 115.125-115.127, and 115.129). **See Section 5.3.6** on calculation of vent gas VOC concentrations for demonstration of compliance, as applicable.

Chapter 3 - Best Available Control Technology

Title 30 TAC 116.111(2)(C) requires the application of BACT for all permitted emission sources. BACT determination is made on a case-by-case basis, with consideration given to technical practicability and economic reasonableness. Current BACT practices for FRP and CM operations are discussed below.

Permit applications should include an analysis of source reduction methods. Source reduction means elimination or reduction of air pollutants before they are produced, usually by process change or material substitution. Conversely, source reduction is not destruction or capture of an air pollutant by a control device after it is produced. Some of the guidelines discussed below are considered source reduction or process controls:

1. Use of low VOC-content resins and gelcoat.

2. Use of vapor suppressed resins and gel coats.

3. Enclosed molding process, i.e. resin injection.

4. Implementation of CFA controlled spray techniques, including operator training, spray gun setting, and use of flanges to recover overspray.

5. Use of filters that are at least 95 percent efficient to capture PM.

6. Low vapor pressure cleaning solvents:

    a. Acetone usage must be less than one percent of total resin usage.
    b. Acetone replacement compounds with a vapor pressure less than 1 mm Hg.
    c. Water-based compounds with a VOC content less than five percent by weight.

7. In addition, proper ventilation design should be incorporated to minimize fugitive emissions in order to provide improved off-property impacts. This will include:

    a. An air ventilation system providing an average of at least 100 feet per minute face velocity through all building openings.

    b. Vertical airflow stacks with stack heads that conform to one of the designs found in the American Conference of Governmental and Industrial Hygienists.

8. Alternate initiator types, such as ultraviolet (UV) light activated initiators, to reduce geltime where appropriate.
9. Alternate molding processes, such as reinforced polyurethane molding instead of polyester for composite applications, to reduce or eliminate styrene.

10. If site-wide VOC (including exempt solvents) emissions exceed 80 TPY, a detailed analysis of the viability of add-on control equipment is required since add-on control may be required.

These levels are guidelines to show the applicant what the TNRCC currently considers as BACT; however, these control levels are subject to change. Each applicant is required to submit a detailed BACT analysis if proposing any controls not listed above. The BACT discussion format needs to follow the TNRCC "three tier" method or the EPA "top down" method. Regardless of the analysis used, applicants must supply control equipment cost estimates (amortized over the life of the control equipment) and annualized operating costs. The EPA document OAQPS Control Cost Manual (EPA 450/3-90-006) describes how to perform the analysis and provides the format to use for presentation of results.

Chapter 4 - Maximum Achievable Control Technology

In accordance with Sections 112(d) and (h) of the Federal Clean Air Act, the EPA is currently developing MACT standards for Reinforced Plastic Composites and Boat Manufacturing source categories. FRP and CM facilities are covered under these source categories.

Title 30 TAC Chapter 116 Subchapter C requires certain constructed and reconstructed sources to implement MACT, as determined on a case-by-case basis [§ 112(g) MACT].

For FRP and CM facilities, § 112(g) MACT is applicable to:

1. New grassroots facilities constructed on or after June 29, 1998 with potential to emit at least 10 tons per year of any hazardous air pollutant (HAP), or 25 tons per year of any combination of HAP.

2. New process or production units installed on or after June 29, 1998 at a developed site which in and of itself has potential to emit at least 10 TPY of any single HAP, or 25 TPY of any combination of HAP.

Styrene and Methyl methacrylate are common VOCs listed as HAP.

The MACT guidelines discussed below include process control, work practice standards, and control equipment to reduce HAP emissions. This list is not meant to be exhaustive and applicants are encouraged to consider control measures/combination of measures that is MACT for a particular process group.

1. Use of low HAP content resins and gelcoats.
2. Use of vapor suppressed resins and gelcoats.
3. Use of non-spray equipment (flow coaters, flow choppers,...).
4. Implementation of source reduction techniques.
5. Use of vacuum bagging equipment.
6. Changes in process chemistry to reduce HAP emissions.
7. Use of add-on control equipment.

Chapter 5- Emission Factors and Calculations

This chapter provides instructions for calculating emissions from FRP and CM facilities. Other methods of estimating emissions may be employed, and may be more appropriate for a particular process, however, sufficient documentation should be submitted to support such method.

5.1 EMISSION FACTORS

Citing the availability of more accurate emission information, the EPA withdrew the AP-42 emission factors for open molding of composites in 1998. In the absence of AP-42 data, the EPA posted some useful information regarding emission estimates. The TNRCC recommends that the factors from CFA emissions model and, by extension, the Unified Emission Factor (UEF) Table be used until revised AP-42 factors become available. The TNRCC advises that while these factors are recommended at time of this publication, it is the responsibility of the applicant to estimate emissions based on the most reliable information available.

The CFA UEF and old AP-42 factors are available in **Appendix 3**. For current information on emission factors, visit the EPA's CHIEF website at *http://www.epa.gov/ttn/chief/fyi.html* or contact the Coatings Team at (512)239-1250

5.2 POTENTIAL EMISSIONS FROM CATALYST MATERIALS

Typically, the "catalyst" used to initiate resin or gelcoat polymerization is a solution of an organic peroxide in an organic solvent. Catalyst use is rarely over two percent by weight of resin or gelcoat. The peroxide concentration in the catalyst solution is generally below 50 percent by weight. Owing to the high reactivity of the peroxide initiator, emissions are considered negligible. In many cases the catalyst solvent has relatively low vapor pressure, and considering the small quantity initially available, it's emissions are considered negligible in most cases. For permitting purposes, the applicant is advised to provide information about the catalyst composition (include material safety data sheets), usage rates, and the mixing method (internal, external). Such information will be helpful to the engineer in making a judgement on potential emissions.

5.3 SAMPLE EMISSION CALCULATIONS FOR A FRP FACILITY

5.3.1 Background

Company X operates a composites fabrication plant for the manufacture of tanks, piping and electric utility parts. The manufacturing processes employed by company X falls into two industry Subcategories: Open Molding (hand lay-up, spray lay-up, and filament winding); and Closed Molding (by resin transfer molding). Trimming and grinding of parts edges take place in the assembly area. Based on operator experience, an estimated 15 lb/hr of waste is ground off. Annual waste is estimated at 32,000 lb/yr. Filter efficiency (FE) is 98%.

5.3.2 Methodology

Before beginning the emission calculations, it is important to gather certain information. Table 5-1 identifies the potential usage rates of materials both for the short term (hourly) and on an annual basis. The short term usage rates should reflect the **maximum** hourly throughput anticipated under the worst conditions (regarding airborne emissions). Example: Company X may use several resin formulations over the year with styrene contents ranging from 39 to 50%, and methyl methacrylate (MMa) content ranging from 0 to 10 %. For hourly emission purposes, the formulation with 50% styrene content should be used to estimate maximum hourly styrene emissions and the formulation with 10% MMa content should be used for hourly MMa emissions. For annual emissions, weighted average styrene and MMa concentrations are applicable.

Step 1: Gather Data

Table 5-1 Material Usage Data

Process (Location)	Material	Volatile Ingredients, Weight Percent	Annual Usage, lb/year	Maximum Hourly Production Rate
Spray Lay-Up (Booth 1)	Resin	Styrene 43% (max), 41 % (avg)	231,380	Up to 4 spray guns max (resin) and 1 gun max (gelcoat) @ 35 lb/hr max per spray gun
	Gelcoat	Styrene 27%, MMa 10%	46,920	
Hand Lay-Up (Assembly Area)	Resin	Styrene 45% (max), 42 % (avg)	24,500	1 bucket/hr @ 6 lb/bucket
Filament Winding (Booth 3)	Resin	Styrene 48% (max), 44 % (avg)	160,560	95 lb/hour max (resin), 20 lb/hr max (gel coat)
	Gelcoat (Spray Lay-Up)	Styrene 27%, MMa 10%	25,690	
Resin Transfer Molding (Parts Room)	Resin	Styrene 50% (max), 47% (avg)	32,240	3 molds/hr max @ 3.5 lb max per mold
Clean-Up Solvent (Plantwide)	Acetone	Acetone, 100%	300	Up to 2 gallons per hour

Notes: avg-weighted average volatile composition across all formulations over the year-maximum possible content or usage rateSpray rates are derived from spray gun manufacturer's technical data.

Step 2: Determine what emission factors and/or methodology is appropriate.

Based on the discussion on emission factors in Section 5.3.1, emissions from open molding operations (spray lay-up, hand lay-up, and filament winding) will be based on the UEF factors **(Appendix 3.2)**. Closed molding (resin transfer molding) will be based on the old AP-42 factors **(Appendix 3.1)**

5.3.3 Hourly Emission Rate Calculations

1. Open Molding

(A). Spray Lay-up

RESIN, 43% Styrene

$$4\ \frac{spray}{guns} \times 35\frac{lb}{hr\ \ spray\ gun} \times \mathbf{254}^{a}\frac{\textbf{lb styrene emitted}}{\textbf{ton of resin processed}} \times \frac{1\,ton}{2000\,lb} \quad 17.78\ \frac{lb}{hr}\ styrene$$

GELCOAT, 27% Styrene and 10% MMa

$$1\ \frac{spray}{gun} \times 35\frac{lb}{hr\ \ spray\ gun} \times \mathbf{240.3}^{b}\frac{\textbf{lb styrene emitted}}{\textbf{ton of gelcoat processed}} \times \frac{1\,ton}{2000\,lb} \quad 4.21\ \frac{lb}{hr}\ styrene$$

$$1\ \frac{spray}{gun} \times 35\frac{lb}{hr\ \ spray\ gun} \times \mathbf{150}^{b}\frac{\textbf{lb MMa emitted}}{\textbf{ton of gelcoat processed}} \times \frac{1\,ton}{2000\,lb} \quad 2.63\ \frac{lb}{hr}\ MMa$$

(B). Hand Lay-up

RESIN, 45% Styrene

$$1\ \frac{bucket}{hr} \times 6\ \frac{lb}{bucket} \times \mathbf{152}^{b}\frac{\textbf{lb styrene emitted}}{\textbf{ton of resin processed}} \times \frac{1\,ton}{2000\,lb} \quad 0.46\ \frac{lb}{hr}\ styrene$$

(C). Filament Winding

RESIN, 48% *Styrene*

$$95\ \frac{lb}{hr}\ \ \frac{resin}{applied} \times \mathbf{204}^{a}\ \frac{\textbf{lb styrene emitted}}{\textbf{ton of resin processed}} \times \frac{1\,ton}{2000\,lb}\quad 9.69\ \frac{lb}{hr}\ styrene$$

GELCOAT, 27% *Styrene and* 10% *MMa*

$$20\ \frac{lb}{hr}\ \ \frac{gelcoat}{applied} \times \mathbf{240.3}^{b}\ \frac{\textbf{lb styrene emitted}}{\textbf{ton of gelcoat processed}} \times \frac{1\,ton}{2000\,lb}\quad 2.40\ \frac{lb}{hr}\ styrene$$

$$20\ \frac{lb}{hr}\ \ \frac{gelcoat}{applied} \times \mathbf{150}^{b}\ \frac{\textbf{lb MMa emitted}}{\textbf{ton of gelcoat processed}} \times \frac{1\,ton}{2000\,lb}\quad 1.50\ \frac{lb}{hr}\ MMa$$

2. Closed Molding

Resin-Transfer Molding

RESIN, 50% *Styrene*

$$3\ \frac{molds}{hr} \times 3.5\frac{lb\,resin}{mold} \times \mathbf{0.5}^{c}\ \frac{\textbf{lb Styrene}}{\textbf{lb resin}} \times \mathbf{0.03}^{d}\ \frac{\textbf{lb styrene emitted}}{\textbf{lb available styrene}}\quad 0.16\ \frac{lb}{hr}\ styrene$$

3. Trimming and grinding

Assembly Area

PM

amount of waste per hour × (1 *FE*) *PM* $\frac{lb}{hr}$

$$15\frac{lb}{hr} \times (1\ \ 0.98)\quad 0.3\frac{lb}{hr}$$

4. Clean-Up

Acetone:

$$2\ \frac{gal}{hr}\ \ \frac{usage}{rate} \times \mathbf{6.92}^{h}\ \frac{\textbf{lb}}{\textbf{gal}}\quad 13.84\frac{lb}{hr}$$

5.3.4 Annual Emission Rate Calculations

1. Open Molding

(A). Spray Lay-Up

(B). Hand Lay-Up

RESIN, 41% *Styrene*

$$231{,}380\ \frac{lb}{yr}\ \frac{resin}{applied} \times \frac{1\,ton}{2000\,lb} \times \mathbf{225}^{a}\ \frac{\textbf{lb styrene emitted}}{\textbf{ton of resin processed}} \times \frac{1\,ton}{2000\,lb}$$

$$13.02\ \frac{ton}{yr}\ styrene$$

GELCOAT, 10% *Styrene and* 10% *MMa*

$$46{,}920\ \frac{lb}{yr}\ \frac{gelcoat}{applied} \times \frac{1\,ton}{2000\,lb} \times \mathbf{240.3}^{b}\ \frac{\textbf{lb styrene emitted}}{\textbf{ton of gelcoat processed}} \times \frac{1\,ton}{2000\,lb}$$

$$2.82\ \frac{ton}{yr}\ styrene$$

$$46{,}920\ \frac{lb}{yr}\ \frac{gelcoat}{applied} \times \frac{1\,ton}{2000\,lb} \times \mathbf{150}^{c}\ \frac{\textbf{lb MMa emitted}}{\textbf{ton of gelcoat processed}} \times \frac{1\,ton}{2000\,lb}$$

$$1.76\ \frac{ton}{yr}\ MMa$$

RESIN, 42% *Styrene*

$$24{,}500\ \frac{lb}{yr}\ \frac{resin}{applied} \times \frac{1\,ton}{2000\,lb} \times \mathbf{134}^{d}\ \frac{\textbf{lb styrene emitted}}{\textbf{ton of resin processed}} \times \frac{1\,ton}{2000\,lb}$$

$$0.82\ \frac{ton}{yr}\ styrene$$

(C). Filament Winding

RESIN, 44% Styrene

$$160{,}560\ \frac{lb}{yr}\ \underset{applied}{resin} \times \frac{1\,ton}{2000\,lb} \times \mathbf{182}^{e}\frac{\textbf{lb styrene emitted}}{\textbf{ton of resin processed}} \times \frac{1\,ton}{2000\,lb}$$

$$7.31\ \frac{ton}{yr}\ styrene$$

GELCOAT, 27% Styrene and 10% Styrene

$$25{,}690\ \frac{lb}{yr}\ \underset{applied}{gelcoat} \times \frac{1\,ton}{2000\,lb} \times \mathbf{240.3}^{b}\frac{\textbf{lb styrene emitted}}{\textbf{ton of gelcoat processed}} \times \frac{1\,ton}{2000\,lb}$$

$$1.54\ \frac{ton}{yr}\ styrene$$

$$25{,}690\ \frac{lb}{yr}\ \underset{applied}{gelcoat} \times \frac{1\,ton}{2000\,lb} \times \mathbf{150}^{c}\frac{\textbf{lb MMa emitted}}{\textbf{ton of gelcoat processed}} \times \frac{1\,ton}{2000\,lb}$$

$$0.96\ \frac{ton}{yr}\ MMa$$

2. Closed Molding

Resin Transfer Molding

RESIN, 47% Styrene

$$32{,}240\ \frac{lb}{yr}\ \underset{applied}{resin} \times \mathbf{0.47}^{f}\frac{\textbf{lb Styrene}}{\textbf{lb resin}} \times \mathbf{0.03}^{g}\frac{\textbf{lb styrene emitted}}{\textbf{lb available styrene}} \times \frac{1\,ton}{2000\,lb}$$

$$0.23\ \frac{tons}{yr}\ styrene$$

3. Trimming and grinding

Assembly Area

PM

$$amount\ of\ waste\ per\ yr \times (1 \quad FE) \times \frac{1\,ton}{2000\,lb} \quad PM\ \frac{ton}{yr}$$

$$32{,}000\ \frac{lb}{yr} \times (1 \quad 0.98) \times \frac{1\,ton}{2000\,lb} \quad 0.32\ \frac{ton}{yr}$$

4. Clean-Up Solvent

$$\textit{Acetone:} \qquad 300\ \frac{gal}{yr}\ \underset{rate}{usage} \times 6.92^{h}\ \frac{lb}{gal} \times \frac{1\ ton}{2000\ lb} \quad 1.04\ \frac{tons}{yr}$$

Notes on Emission Factors:

Maximum styrene content is used for hourly emissions and average styrene content is used for annual emissions.

a. Emission factor for mechanical, atomized spray (uncontrolled) from Unified Emission Factors (UEF), Appendix 3.2
b. Emission factor from UEF, Appendix 3.2
c. Emission factor from UEF, Appendix 3.2
d. Emission factor for manual lay-up from UEF, Appendix 3.2
e. Emission factor for filament application from UEF, Appendix 3.2
f. Available styrene content of original resin
g. Styrene emission factor for closed mold operations, AP-42 Section 4.4, Appendix 3.1
h. Density of Acetone

5.3.5 Required Emission Reports and Tables

The emissions data generated from the calculations in Sections 5.3.3 and 5.3.4 are presented in Table 5-2 and should be entered into TNRCC table 1(a). In addition, it is necessary to provide information on the hourly emissions of all contaminants to be covered by the permit. In many cases a contaminant is being emitted from a facility covered by the permit as well as some other sources on the same property not included in the permit application (for example exempt, grandfathered sources), an itemized list of the **maximum hourly** emission rates of each contaminant from both groups of sources is presented in Table 5-3 and is necessary for the engineer to model off-property impacts for each contaminant.

It is necessary to calculate the potential to emit (PTE) of HAP (on an annual basis) in order to determine applicability of some federal programs. The PTE report should include an itemized list of each hazardous air pollutant (TPY) from each emission point as well as total PTE for each HAP type and a grand total PTE for all HAPs. An acceptable format for PTE report is presented in Table 5-4.

Table 5-2 Data for Table 1(a)

Emission Point		Composition of Stream	Air Contaminant Emission Rate	
Number	Name	Component	lb/hr	tons/yr
1	Spray Booth 1	VOC	24.62	17.60
2	Assembly Area	VOC	0.46	0.82
		PM	0.30	0.32
3	Filament Wind Booth	VOC	13.59	9.81
4	Resin Transfer Mold Booth	VOC	0.16	0.23
5	Building Fugitives	Acetone	13.84	1.04

*Acetone is exempt from regulations as VOC

Table 5-3 Hourly Speciated Emissions

Emission Point		Composition of Stream	Air Contaminant Emission Rate
Number	Name	Chemical Name	lb/hr
1	Spray Booth 1	Styrene	21.99
		MMa	2.63
2	Assembly Area	Styrene	0.46
		PM (Polyester resin dust)	0.30
3	Filament Wind Booth	Styrene	12.09
		MMa	1.50
4	Resin Transfer Mold Booth	Styrene	0.16
5	Building Fugitives	Acetone	13.84

Table 5-4 Potential To Emit HAP , TPY

Emission Point Number	Hazardous Air Pollutant	
	Styrene	MMa
1	15.84	1.76
2	0.82	--
3	8.85	0.96
4	0.23	--
Total (individual HAP)	25.74	2.72
Total (combined HAP)	28.46	

5.3.6 Sample Calculation of VOC concentration in Vent Gas Stream

For facilities located in affected counties, it is often necessary to demonstrate compliance with 30 TAC 115 regarding vent gas stream VOC concentrations in parts per million (ppm).

The following calculation is based on Spray Lay-Up Booth 1 emissions assumed as exhausted via a stack with total fan output of 12,500 acfm. Exit temperature is 90°F. Total styrene and methyl methacrylate (MMa) emissions are 21.99 and 2.63 lb/hr, respectively.

VOC	Emission Rate, lb/hr	Molecular Weight, lb/lb mole
Styrene	21.99	104
MMa	2.63	100

Total VOC emission rate is 21.99 lb/hr + 2.63 lb/hr = 24.62 lb/hr

Average molecular weight, $_{MW_{VOC}}$ is calculated as follows:

$$MW_{VOC} \quad \frac{21.99\frac{lb}{hr} \times 104\frac{lb}{lb\,mole} \quad 2.63\frac{lb}{hr} \times 100\frac{lb}{lb\,mole}}{21.99\frac{lb}{hr} \quad 2.63\frac{lb}{hr}} \quad 103.6\frac{lb}{lb\,mole}$$

Vent gas concentration in ppm:

$$24.62\frac{lb}{hr} \times \frac{1\,lb\,mole}{103.6\,lb} \times \frac{359 ft^3}{1\,lb\,mole} \times \frac{1\,\text{min}}{12{,}500 ft^3} \times \frac{1\,hr}{60\,\text{min}} \times \frac{(460\ \ 90)R}{(460\ \ 32)R} \times 1{,}000{,}000 \quad 127.2 ppm$$

5.4 SAMPLE EMISSION CALCULATIONS FOR A CULTURED MARBLE FACILITY

5.4.1 Background

Company Y operates a composites fabrication plant for the manufacture of simulated marble bathroom tubs and sinks. The process involves pouring a resin and filler mixture into molds where it is cured. Gelcoat and resin may either be poured on to the mold in alternate layers, or sprayed on the cast part to achieve the desired finish. An estimated 15 lb/hr of waste is ground off. Annual waste is estimated at 32,000 lb/yr. Filter efficiency (FE) is 98%.

5.4.2 Methodology

Before beginning the emission calculations, it is important to gather certain information. Table 5-5 identifies the potential usage rates of materials both for the short term (hourly) and on an annual basis. The short term usage rates should reflect the **maximum** hourly throughput anticipated under the worst conditions (regarding airborne emissions). Example: Company Y may use several resin and gelcoat formulations over the year with styrene contents ranging from 35 to 42%, and methyl methacrylate (MMa) content ranging from 0 to 12 %. For hourly emission purposes, the formulation with 42% styrene content should be used to estimate maximum hourly styrene emissions and the formulation with 10% MMa content should be used for hourly MMa emissions.

Table 5-5 Material Usage Data

Process (Location)	Material	Volatile Ingredients, weight Percent	Annual Usage lb/yr	Maximum hourly Production Rate
Marble Casting (Booths 1 & 2)	Resin	Styrene 42% (max), 40% (avg)	130,500	6 molds max @ 27 lb/mold
Spray Lay-up (Booths 1 & 2)	Gelcoat	Styrene 27% MMa 12%	24,300	1 gun max @ 35 lb/hr spray rate
Clean-Up Solvent (Plantwide)	Acetone	Acetone 100%	170 gallons	1 gallons/hr max

Based on the discussion on emission factors in this section, emissions from spray lay-up will be based on the UEF factors **(Appendix 3.2)**. Marble Casting emission calculations will be based on old AP-42 factors **(Appendix 3.1)**

5.4.3 Hourly Emission Rates

1. Marble Casting

RESIN

$$6\ \frac{molds}{hr} \times 27\frac{lb\ resin}{mold} \times \mathbf{0.42}^{a}\frac{\mathbf{lb\ Styrene}}{\mathbf{lb\ resin}} \times \mathbf{0.03}^{b}\frac{\mathbf{lb\ styrene\ emitted}}{\mathbf{lb\ available\ styrene}} \quad 2.04\ \frac{lb}{hr}styrene$$

2. Spray Lay-Up

GELCOAT

$$1\ \frac{spray}{gun} \times 35\frac{lb}{hr\ \ spray\ gun} \times \mathbf{240.3}^{c}\frac{\mathbf{lb\ styrene\ emitted}}{\mathbf{ton\ of\ gelcoat\ processed}} \times \frac{1\ ton}{2000\ lb} \quad 4.21\ \frac{lb}{hr}styrene$$

$$1\ \frac{spray}{gun} \times 35\frac{lb}{hr\ \ spray\ gun} \times \mathbf{180}^{c}\frac{\mathbf{lb\ MMa\ emitted}}{\mathbf{ton\ of\ gelcoat\ processed}} \times \frac{1\ ton}{2000\ lb} \quad 3.15\ \frac{lb}{hr}MMa$$

3. Trimming and grinding
Assembly Area

$$PM$$

$$\textit{amount of waste per hour} \times (1 \quad FE) \quad PM\frac{lb}{hr}$$

$$15\frac{lb}{hr} \times (1 \quad 0.98) \quad 0.3\frac{lb}{hr}$$

4. Clean-Up

$$\textit{ACETONE} \qquad 1\ \frac{gal}{hr}\ \ \underset{rate}{usage} \times 6.92^{d}\frac{lb}{gal} \quad 6.92\frac{lb}{hr}$$

5.4.4 Annual Emission Rates

1. Marble Casting

RESIN

$$130{,}500\frac{lb}{yr}\ \underset{applied}{resin} \times 0.40^{a}\frac{lb\ Styrene}{lb\ resin} \times 0.03^{b}\frac{lb\ styrene\ emitted}{lb\ available\ styrene} \times \frac{1\ ton}{2000\ lb} \quad 0.78\ \frac{ton}{yr}\ styrene$$

2. Spray Lay-Up

ELCOAT

$$^{2}4{,}300\frac{lb}{yr} \times \frac{1\,ton}{2000\,lb}\ \frac{gelcoat}{applied} \times \mathbf{240.3}^{c}\frac{\textbf{lb styrene emitted}}{\textbf{ton of gelcoat processed}} \times \frac{1\,ton}{2000\,lb} \quad 1.46\ \frac{ton}{yr}\ styre$$

$$24{,}300\frac{lb}{yr} \times \frac{1\,ton}{2000\,lb}\ \frac{gelcoat}{applied} \times \mathbf{180}^{c}\frac{\textbf{lb MMa emitted}}{\textbf{ton of gelcoat processed}} \times \frac{1\,ton}{2000\,lb} \quad 1.09\ \frac{ton}{yr}\ MMa$$

3. Trimming and grinding
Assembly Area

PM

$$amount\ of\ waste\ per\ yr \times (1 \quad FE) \times \frac{1\,ton}{2000\,lb} \quad PM\frac{ton}{yr}$$

$$32{,}000\frac{lb}{yr} \times (1 \quad 0.98) \times \frac{1\,ton}{2000\,lb} \quad 0.32\frac{ton}{yr}$$

4. Clean-Up

ACETONE:

$$170\ \frac{gal}{yr}\ \frac{usage}{rate} \times \mathbf{6.92}^{d}\frac{\textbf{lb}}{\textbf{gal}} \times \frac{1\,ton}{2000\,lb} \quad 0.59\ \frac{tons}{yr}$$

Notes on Emission Factors

a. Available monomer (styrene, MMa) content of original resin. Maximum monomer content is used for hourly emissions and average monomer content is used for annual emissions.
b. Monomer emission factors from AP-42 Section 4.4, Appendix 3.1
c. Emission factors from UEF, Appendix 3.2
d. Density of acetone

5.4.5 Required Emission Reports and Tables

The emissions data generated from the calculations above are collected for entry into TNRCC table 1(a). In addition, it is necessary to provide information on the hourly emissions of all contaminants to be covered by the permit. In many cases a contaminant is being emitted from a facility covered by the permit as well as some other sources on the same property not included in the permit application (for example exempt, grandfathered sources), an itemized list of the **maximum hourly** emission rates of each contaminant from both groups of sources is necessary for the engineer to model off-property impacts of each contaminant. Note that because marble casting and gelcoating emissions occur at the same point with a lag time greater than one hour, gelcoating is responsible for the maximum VOC emissions in any hour.

It is necessary to calculate the potential to emit (PTE) hazardous air pollutants (TPY) in order to determine applicability of some federal programs. The PTE report should include an itemized list of each hazardous air pollutant (TPY) from each emission point as well as total PTE for each HAP type and a grand total PTE for all HAPs.

Table 5.6 Data for Table 1(a)

Emission Point		Composition of Stream	Air Contaminant Emission Rate	
Number	**Name**	**Component**	**lb/hr**	**tons/yr**
1	Booths 1 & 2	VOC	7.36	3.54
		PM	0.30	0.32
2	Building Fugitives	Acetone	6.92	0.59

Table 5-7 Hourly Speciated Emissions

Emission Point		Composition of Stream	Air Contaminant Emission Rate
Number	**Name**	**Chemical Name**	**lb/hr**
1	Booths 1 & 2	Styrene	4.2
		MMa	3.15
		PM (Polyester resin dust)	0.30
2	Building Fugitives	Acetone	6.92

Table 5-8 Potential To Emit HAP, TPY

Emission Point Number	Hazardous Air Pollutant	
	Styrene	**MMa**
1	0.93	0.06
2	1.46	1.09
Total (individual HAP)	2.39	1.15
Total (combined HAP)	3.54	

APPENDIX

Sample Air Quality Permit

Note. The sample permit special conditions and maximum allowable emission rates table (MAERT) presented in the following pages are intended to serve as an example for FRP and CM facilities. Actual permit special conditions and MAERT are drafted to address specific regulatory, technological, and health and safety issues identified during the permitting process.

Appendix 1

SPECIAL CONDITIONS

Permit No. YYYYY

1. This permit authorizes fiber reinforced plastic parts production and assembly facilities at *Your Address* in *Your City*, *Your* County.

2. Pursuant to 30 TAC § 116.110(c), Permit by Rule (30 TAC Chapter 106) shall not be used to modify facilities to the extent that sitewide emissions exceed 10 tons per year (TPY) for any Hazardous Air pollutant or 25 TPY for any combination of Hazardous Air Pollutants.

OPERATIONAL LIMITATIONS

3. A controlled spray program shall be in place to reduce overspray and atomization during gelcoating and resin application operations. The Controlled Spray Program shall be based on the "Controlled Spraying Handbook" published by the Composite Fabricators Association. The Controlled Spray Program shall include:

   A. Spray gun calibration to determine minimum gun tip pressure at the beginning of every shift.

   B. Operator training to achieve optimum spraying techniques in order to minimize overspray and atomization.

   C. Overspray containment flanges on the edges of molds.

4. All waste resins, cleaning solutions and solvents, and cleanup rags shall be stored in closed containers until properly removed from the site. Dust collected from parts grinding and trimming shall be removed and disposed of in a manner that precludes particulate matter from becoming airborne.

5. Stack exhaust fans shall be in operation during manufacturing and cleanup operations. The ventilation system shall remain in operation for at least one-half hour after manufacturing and cleanup operations are completed.

6. Negative pressure shall be maintained across the gelcoat and lamination areas to achieve a minimum face velocity of 100 feet per minute and emissions shall be exhausted through elevated stacks with vertical discharge at least 58 feet above grade.

7. Particulate matter (PM) emissions from the production and assembly areas shall be controlled by dust collector system with a minimum of 99 percent PM arrestance efficiency. Filters shall be installed and maintained according to manufacturer's recommendations.

8. All parts produced shall be cured for at least 4 hours before being moved outside.

RECORDKEEPING

9. General Condition No. 7 regarding information and data to be maintained is supplemented as follows:

   A. Material Safety Data Sheets or Air Quality Data Sheets for all raw materials with potential to emit airborne contaminants. These sheets shall be kept for such materials currently in use and those used during the previous 24 months.

   B. Manufacturer's documentation of arrestance efficiency of filters used in the dust collection systems. Such documentation shall be kept for filters currently in use and those used during the previous 24 months.

   C. Documentation of procedures for implementation of a Controlled Spray Program as required in Special Condition No. 3. Records shall include spray gun calibrations and dates of required training for every operator on staff.

   D. Records of monthly material usage and actual hours of production. These records shall be used to produce two reports for each calendar month:

      (1) A monthly report that represents emissions in pounds per hour (monthly average) and tons per year over the previous 12 months for each contaminant and /or contaminant group listed on the maximum allowable emission rates table (MAERT). The report shall be based on the same calculation methodologies employed in the permit application.

      (2) A monthly report that represents the emissions in TPY for the previous 12 months for each contaminant and/or contaminant group listed on the MAERT.

COMPLIANCE DEMONSTRATION

10. All records prepared and reports generated in accordance with Special Condition No. 9 shall be maintained on a 24-month rolling retention basis.

Appendix 2

EMISSION SOURCES - MAXIMUM ALLOWABLE EMISSION RATES

Permit No.YYYYY

This table lists the maximum allowable emission rates and all sources of air contaminants covered by this permit. Annual emission rates (TPY) are based on any 12 consecutive months.

AIR CONTAMINANTS DATA

Emission Point No. (1)	Source Name (2)	Air Contaminant Name (3)	Emission Rates (4) lb/hr	TPY
S1	Gelcoat Area	Styrene	1.98	2.06
		Methyl Methacrylate	1.69	1.76
S2	Lamination Area	Styrene	7.54	7.84
A thru F	Parts Trimming, Parts Coating and Clean Up	PM	0.01	0.01
		VOC	0.17	0.20
		Acetone	30.00	2.00

(1) Emission point identification.

(2) Specific point or fugitive source name.

(3) VOC - volatile organic compounds as defined in 30 Texas Administrative Code (TAC) Section 101.1, excluding styrene

PM - particulate matter, suspended in the atmosphere, including PM_{10}

PM_{10} - particulate matter, equal to or less than 10 microns in diameter. Where PM is not listed, it shall be assumed that no particulate matter greater than 10 microns is emitted.

(4) The facilities are limited by the following maximum operating schedule:

_8_ Hrs/day _5_ Days/week _52_ Weeks/year

Appendix 3

3.1 Old AP-42 Emission Factors

3.2 CFA Unified Emission Factors