



BAY AREA
AIR QUALITY
MANAGEMENT
DISTRICT

BAAQMD
Toxic Air Contaminant (TAC)
Emission Factor Guidelines

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**BAY AREA AIR QUALITY MANAGEMENT DISTRICT
375 BEALE STREET, SUITE 600
SAN FRANCISCO, CA 94105**

Toxic Air Contaminant (TAC) Emission Factor Guidelines

1. Introduction

On November 15, 2017, the Air District adopted Regulation 11, Rule 18, Reduction of Risk from Air Toxic Emissions at Existing Facilities. This rule requires existing facilities to reduce health risks below the risk action thresholds identified in Regulation 11-18-218. To assess the applicability of these requirements, the Air District must conduct site-wide health risk assessments (HRA) for potentially subject facilities based on all routine and predictable toxic air contaminant (TAC) emissions occurring at the site. The Air District recognizes that having a fully inclusive and consistently prepared toxic emissions inventory is crucial to ensuring that these HRAs are both comprehensive and comparable.

Some facilities, such as petroleum refineries, are subject to specific emissions inventory reporting procedures as identified in Regulation 12, Rule 15. For most other facilities, the Air District calculates the emissions inventory for each site, typically on an annual basis, using source-specific throughput rates or usage information that is reported to the Air District by the facility as part of the facility's permit renewal process and individual source-specific emission factors for each pollutant. For many facilities, the source-specific emission factors were identified when the source was first permitted or registered. Usually, default TAC emission factors are determined based on standardized procedures as identified in the Air District's Permit Handbook, California Air Toxics Emission Factors (CATEF) database, EPA's AP-42: Compilation of Air Emissions Factors, certified emission factors, vendor guarantees, or other literature. After the initial assessment, the Air District may update TAC emission factors due to site-specific source test data, facility changes in processes or materials, new standardized emission factor data, or based on other available technical information.

During the Air District's review of emission inventories for sites that are potentially subject to Rule 11-18, the Air District found that the current air toxics emission factors for different source categories have not all followed the same guidance when identifying default emission factors and that air toxic emission factor updates have been implemented inconsistently. These issues have resulted in data gaps and inconsistencies in the Air District's toxics emission inventory. To remedy this situation for individual facilities subject to Regulation 11-18 and to make overall improvements to the Air District's toxic emissions inventory, the Air District has prepared these TAC Emission Factor Guidelines.

2. Purpose

The main purpose of this document is to describe the procedures the Air District will follow when identifying representative TAC emission factors for a specific source. These TAC emission factors are intended to be used with current throughput data and appropriate abatement factors to create a toxic emissions inventory for a facility that is representative of actual, routine, and predictable emissions from a site. It is appropriate to use this toxic emissions inventory in conjunction with the preparation of a site-wide health risk assessment for a facility. It is also appropriate to use this toxic emissions inventory for assessment of Air District toxic emissions inventory fees and for purposes of meeting AB 2588 Air Toxic Hot Spots reporting and fee requirements.

These guidelines identify a hierarchy of preferred evidence for using source-specific TAC emission factors instead of default TAC emission factors. This hierarchy will assist Air District staff and industry in determining the most appropriate source-specific emission factor when multiple types of emission factor data are available for the same source and pollutant. At a minimum, each source will include TAC emission factors for all toxic compounds identified as having a default factor for that source category, unless the facility can demonstrate to the satisfaction of the Air District that it is not possible for a specific source to emit a pollutant. The information required to make such a demonstration is described later in these guidelines.

The following TAC emission factor guidelines also identify a set of procedures to be followed by Air District staff when identifying default TAC emission factors for a unique source or source category. This will ensure that the Air District's toxic emission inventory is comprehensive and that all facilities and source categories are evaluated with the same consistency and stringency.

The Air District will follow these guidelines to develop specific and default TAC emission factors for sources and many common source categories. Default TAC emission factors will be presented in a separate document: Appendix A: Default TAC Emission Factors for Specific Source Categories. The improved default TAC emission factors for specific source categories will be included in Air District Permit Handbook Chapters when these are updated.

By following these TAC Emission Factor Guidelines, the Air District's toxic emission inventories should be:

- comprehensive (include all potential TAC emissions),
- accurate (reflect the actual routine emissions),
- comparable (follow same conventions and procedures for all facility types),
- robust (ensure high data quality),
- verifiable (document evidence for all TAC factors), and

- transparent (stipulate methodologies and rationale)

3. Procedures for Identifying TAC Emission Factors

Over the last thirty years, the Air District has generally relied on the California Air Resources Board's "Emission Inventory Criteria and Guidelines" for the Air Toxics "Hot Spots" Program¹ for the selection of appropriate TAC emission factors and for the development of toxic emission inventories. However, the Air District has occasionally deviated from these guidelines for some source categories due to Air District database limitations, concerns about minimum detection limits or source test procedures, or for the purposes of streamlining HRA and permit evaluation procedures. This has led to some data gaps and inconsistencies in the Air District's toxics emissions inventory. In addition, many source categories have new TAC emission factor data available that was not known when CARB's Emission Inventory Criteria and Guidelines were developed.

Due to the adoption of Regulation 12, Rule 15 "Petroleum Refining Emissions Tracking" and Regulation 11, Rule 18 "Reduction of Risk from Air Toxic Emissions at Existing Facilities", there is renewed interest in improving the Air District's toxic emission inventory.

For petroleum refineries, the Air District has published "Petroleum Refining Emission Inventory Guidelines."²

To ensure consistency across all facility types, the Air District is incorporating the Air District's "Petroleum Refining Emission Inventory Guidelines" into these TAC Emission Factor Guidelines for non-refinery facilities. Except as explained below, the Air District will follow these Petroleum Refining Emission Inventory Guidelines when determining appropriate TAC emission factors for a source.

If a procedural issue is not covered by the Air District's "Petroleum Refining Emission Inventory Guidelines", the Air District will follow CARB's "Emission Inventory Criteria and Guidelines" for the Air Toxics "Hot Spots" Program.

3.1 Overriding Principals

The following overriding principles should be considered when doing any type of emission factor determination:

- Direct measurement is preferable to calculated emissions.

¹ The most recent version of CARB's Emission Inventory Criteria and Guidelines is located here: <https://www.arb.ca.gov/ab2588/2588guid.htm>. However, CARB is in the process of revising this document.

² The most recent version of the BAAQMD Petroleum Refining Emission Inventory Guidelines is located here: https://www.baaqmd.gov/~/_media/files/engineering/refinery-emissions-inventory-guidelines/draft-refinery-emissions-inventory-guidelines.pdf?la=en.

- Continuous measurement is preferable to periodic testing.
 - Periodic source testing should be representative of typical source operation (unless intentionally testing for atypical conditions). If multiple source tests are available for the same source, source tests covering the inventory period should be used whenever available unless the source test represents atypical operation.
 - Emission factors that are based on source testing should be updated as processes change.
 - Use default emission factors only when other data is not available. While it is desirable to avoid using default emission factors, it is impractical to directly measure or test all sources for all pollutants under all operating scenarios. However, such factors will not capture emission trends over time, due to changing operation.
 - When multiple emission factors are available for a given toxic air contaminant, use the following order of preference: *
 1. Most Recent Reliable Emission Factor Derived from an Air District Approved Source of Emission Factor Data (for example, Air District-approved source-specific or site-specific testing, other types of direct-measurement, or Air District-approved vendor guarantees)
 2. CATEF: <https://www.arb.ca.gov/ei/catef/catef.htm>
 3. U.S. EPA “Emission Estimation Protocol for Petroleum Refineries” (EEPPR): <https://www.baaqmd.gov/~media/files/engineering/refinery-emissions-inventory-guidelines/draft-refinery-emissions-inventory-guidelines.pdf?la=en>
 4. EPA AP-42, fifth edition: <https://www.epa.gov/air-emissions-factors-and-quantification/ap-42-compilation-air-emissions-factors>
 5. EPA WebFIRE: <https://cfpub.epa.gov/webfire/>
 6. Air District Permit Handbook Chapters: <http://www.baaqmd.gov/permits/permitting-manuals/permit-handbook>
 7. Studies or Reports Published by BAAQMD, CARB, or Other Air Districts
- * The information sources are listed in their general order of preference. However, there may be instances where a specific emission factor from a lower listed information source may be more appropriate. Emission factors from sources other than those listed above may also be acceptable. These will be evaluated by the Air District, on a case-by-case basis.

3.2 Pollutant Demonstration

All emission inventories shall include estimates for all toxic air contaminants (TACs) that appear in Table 2-5-1 of Air District Regulation 2, Rule 5 and that have been demonstrated, as judged by the Air District, to be emitted from a source category unless

a relevant facility can demonstrate, as approved by the Air District, that a particular TAC cannot be emitted by that facility.

The Air District will use the following evidence to demonstrate that a pollutant has been emitted from a source category:

1. Air District data (studies, sampling, or measurements);
2. Peer-reviewed published literature by scientific bodies or government agencies such as EPA and CARB;
3. Facility-specific process or equipment data; or
4. Validated measurement data of similar equipment.

For a specific facility, the Air District may exclude a TAC from the list of minimum applicable TACs for a source at that facility, if the facility can demonstrate to the satisfaction of the Air District that it is not possible for that facility's specific source or operation to emit the TAC in question. The facility will need to submit any reasonable, as judged by the Air District, data required to justify this claim.

If a facility disagrees with the Air District's determination that a TAC may be emitted from the facility, the facility may present a technical demonstration supporting its position. When evaluating such a technical demonstration for approval by the Air District, the Air District will accept the following technical demonstrations:

1. It is not possible for a pollutant to be emitted due to either process chemistry, equipment configuration, or equipment operation; or
2. A previous pollutant demonstration, used as evidence that the pollutant is emitted, is no longer valid; or
3. A previous pollutant demonstration, used as evidence that the pollutant is emitted, was invalid.

3.3 Source-Specific TAC Emission Factors

In accordance with the hierarchy listed above in Section 3.1, Air District approved source-specific emission factors are preferable to the use of a default TAC emission factor. Source-specific emission factors may be derived from:

- Air District-approved source tests for the specific source,
- Site-specific testing on similar equipment with similar fuels or processes,
- Direct-measurements of site-specific materials such as laboratory analyses of constituents in fuel gases, wastewater, or process materials,
- Vendor guaranties or certified data related to emission rates, control efficiencies, secondary emissions, or

- Material content information (such as listed in a material safety data sheet).

Facilities must provide any available information requested by the Air District to verify a source-specific emission factor. Source testing may be necessary in some cases to verify a claimed emission factor, if insufficient data is available to justify a claimed emission factor. The chosen source test data should be relevant for the use of the emission factor. For example, it would be appropriate to use the maximum concentration from three 1-hour source test runs to derive a maximum 1-hour emission factor, but the average of the three 1-hour runs may be more appropriate for deriving an emission factor that will be used to calculate annual average emissions.

3.3.1 Source Testing Procedures

Any testing conducted to establish a new or revised TAC emission factor should use Air-District approved procedures for collecting the samples and analyzing the data. The facility must contact the Air-District's Source Test Section and obtain Air-District approval for all test methods and test locations prior to conducting any source testing. Also, source testing shall be conducted under normal operating rates and conditions for the source such that the source test data collected is representative of typical operations for the source.

3.3.2 Handling Non-Detect Values from Source Tests

Toxic air contaminants are often present at much lower stack concentration levels than criteria pollutants. Source testing procedures may need to be adjusted based on the expected analytical detection limits for TACs to ensure that the source tests achieve meaningful results. Therefore, it is important to consult with the Air District's Source Test Section when developing a test plan to establish a TAC emission factor. Minimizing the limit of detection is particularly important when testing for high potency TACs such as: dioxins and furans, hexavalent chromium, cadmium, arsenic, beryllium, PAHs, and PCBs.

If the Air District has determined that a TAC is expected to be emitted from a source³ and a source test is unable to detect a TAC, the Air District will use half of the approved test's limit of detection for that TAC to calculate emissions of that TAC for the related source(s) consistent with Section 5.1.1 of the BAAQMD Petroleum Refinery Emissions Inventory Guidelines. Facilities may optimize the source test methodology, in consultation with the Air District, to achieve the lowest possible limit of detection for a TAC of concern, such as the high potency TACs above.

³ To determine if a TAC is expected to be emitted from a source, the Air District may use peer-reviewed published literature by scientific bodies or government agencies such as EPA, CARB, or other Air Districts, District-approved source test data or other measurements, peer-reviewed published studies, peer-reviewed industry literature, or site-specific data such as MSDS sheets, vendor guarantees, testing conducted for other agencies, or other relevant evidence. In addition, the Air District is developing default emission factors for many common source categories that will identify all TACs that are expected to be emitted from these source types.

Facilities desiring to demonstrate that a District-expected TAC will not be emitted by a specific source at their facility may request District-approval to use a zero emission rate for that TAC by submitting a technical demonstration to the District. This technical demonstration shall include evidence that it is not possible for the TAC to be emitted at that facility or from that source due to site-specific process chemistry, equipment configuration, or equipment operation or that the data the Air District relied on to include this TAC was invalid or is no longer valid.

3.4 Default TAC Emission Factors

For each source category, the Air District will identify a list of toxic air contaminants with default emission factors that apply to that source category. This list will be the minimum list of TACs that apply to a specific source category. This list may differ from any list of pollutants that have been demonstrated to be emitted by a source category per the evidence described in Section 3.2.

This minimum list will include any compounds for that source category identified in:

- Appendix C of CARB’s “Emission Inventory and Criteria Guidelines”,
- CATEF,
- U.S. EPA’s AP-42 (Compilation of Air Emission Factors),
- U.S. EPA’s database of emissions factors: WebFIRE,
- Air District-approved testing or analyses,
- Air District published documents (e.g. Permit Handbook chapters, reports), or
- Peer-reviewed published literature by scientific bodies or government agencies such as EPA, CARB, or other air districts;

The list will exclude any compounds that do not have a current health effects value in Table 2-5-1 of Regulation 2, Rule 5.

In the absence of source-specific emission factor data, the Air District will apply the most representative emissions factors as provided in Appendix A of these guidelines, including the mean or maximum California Air Toxics Emission Factors (“CATEF”) where appropriate, with the exception of CATEF that are based on the limit of detection of TAC emissions (identified as having a detect ratio of 0.00).

Except for emission factors for those sources and their listed pollutants identified in Appendix D of the Hot Spots Inventory Guidelines, the Air District will apply half of the lowest representative published value in cases where the most representative emission factor is CATEF based on the limit of detection of TACs. For those sources and their listed pollutants identified in Appendix D of the Hot Spots Inventory Guidelines, maximum CATEF will be applied in the absence of source-specific emission factor data.

A discussion of the derivation of the default emission factors for each source category, references to supporting documentation, and the Air District's default emission factors for each source category will be provided in a separate document, Appendix A: Default TAC Emission Factors for Specific Source Categories. Appendix A will be expanded as needed to include additional source categories.