Testing Determination System for Baghouses
Guidance Document
(Non-Combustion Emission Units)

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Disclaimer: The BAPC reserves the right to modify this guidance at any time. This document supersedes any previous documents that relate to baghouse testing requirements.

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I. Introduction

The Nevada Division of Environmental Protection – Bureau of Air Pollution Control (BAPC) has developed a standardized method to determine when a baghouse, controlling air pollution for non-combustion emission units, shall require testing for Particulate Matter with an aerodynamic diameter less than or equal to a nominal ten (10) micrometers (PM_{10}), only, and at what frequency. Presently, the BAPC does not have a sufficient quantity of data for Particulate Matter with an aerodynamic diameter less than or equal to a nominal two-point-five (2.5) micrometers ($PM_{2.5}$) to apply this system to the $PM_{2.5}$ pollutant.

In order to assure that the most accurate data is being applied to the Testing Determination System (TDS) for Baghouses, the BAPC will re-evaluate the quality of data every 5 years, or more frequently, if deemed necessary. The TDS shall be applied during all permit renewal actions, any permit revision action in which a baghouse is added, and a permit revision action that affects a system that is controlled by a baghouse. If a facility's compliance history changes, the Compliance Branch will re-evaluate the TDS to determine if a different testing frequency is required. If a change is necessary, the Compliance Branch will issue a Notice of Findings and Order requiring the facility to adhere to a new testing frequency, or lift an active Notice of Findings and Order, if applicable.

The BAPC reserves the right to consider site-specific conditions to establish testing requirements at any time.

II. System

The TDS for Baghouses employs a weighted component comprised of three (3) primary categories that relate to the BAPC's Air Quality Operating Permits. Additionally, this system is associated with a ranking component, most of which has been developed from multiple Box and Whisker Plots (BW Plots). BW Plots are statistical tools which allow the BAPC to analyze all the collected data and establish ranking thresholds. Each primary category is composed of sub-categories, which are assigned a percentage weight and a ranked numerical value. The weight component of each sub-category was determined using the BAPC's knowledge of how integral each sub-category is to a facility's Potential-to-Emit. Of the three (3) primary categories, two (2) receive ranked numerical values based on BW Plots; the Compliance History primary category and the NvAAQS Model Contribution (%) and Significant Impact Level (SIL) sub-category, under the Potential-to-Emit primary category, do not use BW Plots. An overall primary category weight is calculated, and a weighted cumulative result establishes the type and frequency of testing required.

III. List of Primary Categories

The BAPC has defined three (3) primary categories, with corresponding sub-categories, that represent the most critical factors in determining whether a baghouse requires testing, and at what frequency. A list of the categories and corresponding sub-categories is provided below:

1. <u>Potential-to-Emit</u>
   a. Uncontrolled Potential-to-Emit (tons/yr) *(Suspended for one permit renewal cycle)*
   b. Controlled Potential-to-Emit (tons/yr)
   c. Grain Loading Factor (gr/dscfm)
   d. Exhaust Flow Rate (dscfm)
   e. Nevada Ambient Air Quality Standards (NvAAQS) Model Contribution (%) and SIL
      i. Facility-Wide
      ii. Source Specific

2. <u>Operating Parameters</u>
   a. Operating Parameter (choose one (1) based on emission unit type)
      i. Throughput (tons/hr)
      ii. Fuel Flow (SCF/hr)
      iii. Heat Input (MMBtu/hr)

3. <u>Compliance History</u>
   a. Failed Source Test (System Basis)
   b. Throughput Exceedances (System Basis)
   c. Records (Facility-Wide Basis)
   d. Failed Opacity (System Basis)
   e. Failure to Test (System Basis)
   f. Control Equipment Issues (Facility-Wide Basis)

IV. Description of Primary Categories

Category #1 – Potential-to-Emit

The Uncontrolled Potential-to-Emit sub-category is essential in determining the maximum environmental impact a source can have if the baghouse is not controlling emissions. However, because the BAPC recently introduced the Guidance on Emission Factors for the Mining Industry in May 2017, it has been decided to suspend this sub-category for one permit renewal cycle (five (5) years) in order to allow all applicable facilities to correctly apply the guidance in determining their uncontrolled emissions. In the interim, the Uncontrolled Potential-to-Emit emissions weight was equally distributed into the Controlled Potential-to-Emit and NvAAQS Model Contribution (%) and SIL sub-categories. This will be re-evaluated by the BAPC and this guidance document updated approximately five (5) years from the February 1, 2021 initial date of issuance of this guidance document.

The Controlled Potential-to-Emit sub-category looks at a facility's controlled emissions to quantify the potential environmental impact when a baghouse is operating under normal conditions.

The Grain Loading Factor sub-category is used to identify the efficiency of the baghouse.

The BAPC analyzes the baghouse Exhaust Flow Rate as it functions integrally with the Grain Loading Factor to determine the mass emission rate of a system.

The NvAAQS Model Contribution (%) and SIL sub-category evaluates the potential impact a baghouse could have on the NvAAQS PM_{10} 24-hour Standard at both the Facility-Wide and Source Specific levels. If a facility conducts modeling for the entire facility (typical for any permit action), then the NvAAQS Model Contribution (%) and SIL sub-category will default to the Facility-Wide model contribution and this component will account for the entire weight of the sub-category. If a facility additionally models for each baghouse individually, then sixty percent (60%) of the weight shall be applied to the Source Specific contribution and forty percent (40%) of the weight will be applied to the Facility-Wide contribution.

Category #2 – Operating Parameters

The Operating Parameters primary category correlates to the Potential-to-Emit primary category. A facility's emission rate is dependent on the operating parameters and certain sub-categories in the Potential-to-Emit primary category. The potential magnitude at which a facility can operate is a critical parameter in determining the importance of the control equipment. The material throughput, fuel flow, or heat input limits determine how the maximum uncontrolled mass emission rate correlates to the Potential-to-Emit category. Fuel flow and heat input will be addressed in the future when the document is expanded to include combustion emission units.

IV. Description of Primary Categories (Continued)

Category #3 – Compliance History

The Compliance History primary category is included to act as an incentive for facilities to remain in good compliance, and to hold facilities accountable if they fail to adhere to permit requirements. When a facility is in good compliance standing, there is an opportunity to minimize the frequency of testing, and if a facility is not in compliance, there is the potential for an increase in testing frequency. Most of the Compliance History sub-categories are system based, with the exception of Records and Control Equipment Issues, which are facility-wide based. For example, Control Equipment Issues can include final violations related to an air pollution control device that is not installed or working properly.

The BAPC will include final Notice of Alleged Violations (NOAV) in the TDS calculation for a rolling sixty (60) month period from the date of final NOAV issuance for each individual violation. This corresponds with the Nevada Division of Environmental Protection – Bureau of Air Quality Planning (BAQP) Enforcement Branch's penalty matrix for determining penalty adjustment factors, which are based on a facility's history of non-compliance.

V. Ranking Scale

The weighted component allows the BAPC to assign a numerical ranking scale to all sub-categories. Data is analyzed with BW Plots, except for the NvAAQS Model Contribution (%) and SIL sub-category and Compliance History primary category. The threshold value ranges for each sub-category and the corresponding rank assignment are summarized in the tables below:

**Potential-to-Emit and Operating Parameters Ranking**

Potential-to-Emit					
Rank	1	2	3	4	5
***Uncontrolled PTE (tpy)**	--	--	--	--	--
Controlled PTE (tpy)	<1.1325	≥1.1325 - <3.2644	≥3.2644 - <7.18025	≥7.18025 - <15.33	≥15.33
****Grain Loading (gr/dscfm)**	>0.0218	>0.016 - ≤0.0218	>0.008 - ≤0.016	>0.005 - ≤0.008	≤0.005
Exhaust Flow (dscfm)	<4,000	≥4,000 - <7,735	≥7,735 - <17,916	≥17,916 - <36,000	≥36,000
Currently suspended, see Section IV, Category #1 – Potential-to-Emit. **Please note inverse scale ranking.**					

V. Ranking Scale (Continued)

Operating Parameters					
Rank	1	2	3	4	5
Material Throughput (tph)	<18	≥18 - <65.85	≥65.85 - <560	≥560 - <1,250	≥1,250

The BW Plot is a graphical representation that displays the distribution of a data set on a number line. It is distributed into five (5) thresholds: 1) minimum, 2) 25th percentile, 3) median, 4) 75th percentile, and 5) maximum. This method of analysis provides the BAPC an avenue to assign a numerical value to sub-categories associated with the weighted component, ranging from one (1) to five (5). Any data that falls below the 25th percentile threshold will receive the rank of one (1). As data falls below the subsequent median threshold, 75th percentile threshold, and maximum threshold, the ranks assigned will be two (2), three (3), or four (4), respectively. The highest rank, five (5), is assigned to any outlier falling above the maximum threshold. The figure below is an example of a BW Plot with the associated ranking scale:

Box and Whisker Plot with Ranking Scale
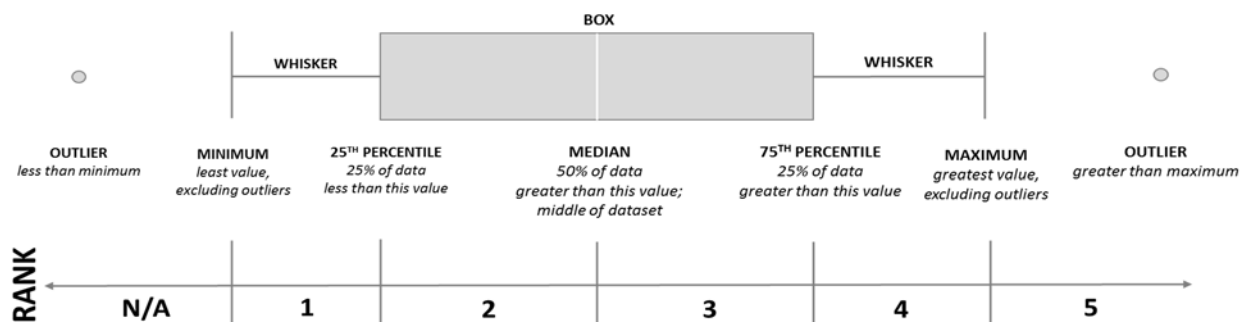
The only deviation to the ranking scale involves the Grain Loading Factor sub-category under the Potential-to-Emit primary category. The Grain Loading Factor sub-category uses the BW Plot inversely by assigning any outliers above the maximum threshold a rank of one (1). Any data that falls above the 75th percentile threshold will receive a rank of two (2). As data falls above the subsequent median threshold and 25th percentile threshold, the ranks assigned will be three (3) and four (4), respectively. A rank of five (5) will be assigned to any outlier falling below the 25th percentile threshold. The figure below is an example of a BW Plot with the associated inverse ranking scale:

V. Ranking Scale (Continued)

Box and Whisker Plot with Inverse Ranking Scale
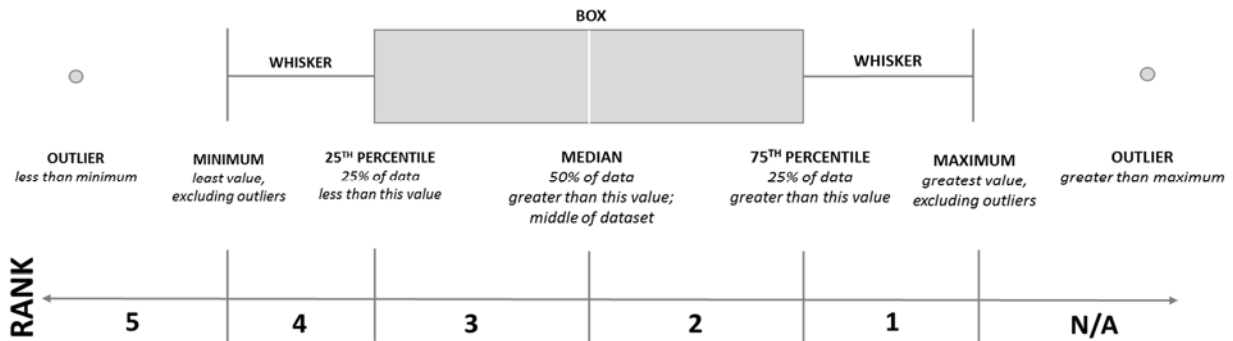
As previously mentioned, the NvAAQS Model Contribution (%) and SIL sub-category and Compliance History primary category do not utilize the BW Plots. The Facility-Wide model numerical rank is calculated based upon five (5) thresholds associated with the PM_{10} 24-hour Standard of the NvAAQS: 1) < 25% of NvAAQS, 2) ≥25% - <34% of NvAAQS, 3) ≥34% - <67% of NvAAQS, 4) ≥67% - <90% of NvAAQS, 5) ≥ 90% of NvAAQS. The Facility-Wide component will account for one-hundred percent (100%) of the sub-category, unless a facility runs a Source Specific model in conjunction with the Facility-Wide model. If a facility chooses to run both models, the Source Specific model will account for sixty percent (60%) of the total weight, while the Facility-Wide model will cover the remaining forty percent (40%) of the weight.

Facility-Wide Model					
Rank	1	2	3	4	5
Percentage Range:	<25% of NvAAQS	≥25% - <34% of NvAAQS	≥34% - <67% of NvAAQS	≥67% - <90% of NvAAQS	≥ 90% of NvAAQS

The Source Specific model numerical rank is also calculated based on the following five (5) thresholds: 1) <50% of SIL, 2) ≥50% - <100% of SIL, 3) ≥100% of SIL - <7% of NvAAQS, 4) ≥7% - <16% of NvAAQS, 5) ≥ 16% of NvAAQS. The Source Specific model will account for sixty percent (60%) of the overall contribution of NvAAQS Model Contribution (%) and SIL sub-category. Again, if a facility does not choose to run a Source Specific contribution in the model, the Facility-Wide contribution will act as the sole contributor at one-hundred percent (100%).

Source Specific Model					
Rank	1	2	3	4	5
Percentage Range:	<50% of SIL	≥50% - <100% of SIL	≥100% of SIL - <7% of NvAAQS	≥7% - <16% of NvAAQS	≥ 16% of NvAAQS

V. Ranking Scale (Continued)

The Compliance History primary category shall use the total number of final NOAVs issued to a facility for each of the applicable sub-categories. The number of final violations that each sub-category accrues, in a rolling sixty (60) month period, shall determine the count. (A facility receives a count of zero (0) if no final NOAV has been issued.) Thus, this number will be dynamic as time progresses. If a facility receives a final NOAV, with multiple violations of the same type, the TDS will only count this as one (1) NOAV and appropriately apply the numerical value as such. However, if a facility receives a final NOAV, which contains a variety of violations, the TDS will assess a numerical value of one (1) to each applicable compliance history sub-category, as necessary.

After a renewal operating permit has been issued to a facility, if a final NOAV is assessed, the BAPC will re-evaluate the TDS to incorporate that recent finalized NOAV into the Compliance History portion of the TDS. Upon re-evaluation, if a facility or system falls within a new testing frequency, the BAPC's Compliance Branch will issue a Notice of Findings and Order directing the facility to adhere to the new testing requirement for all affected systems.

For example, if a facility were issued a final NOAV in January 2019 for failure to maintain records (facility-wide basis), re-evaluation of the TDS would be triggered and the violation would be applied to all systems subject to the TDS. Results of the re-evaluation could potentially increase testing requirements for each system depending on how close the previous rankings were to crossing over a threshold. If the facility were then issued a final NOAV in March 2019 for a failed source test (system basis) on System 01, re-evaluation of the TDS would again be triggered and the violation would be applied to System 01 only. Results of the re-evaluation for the failure to maintain records violation combined with the failed source test violation could potentially cause System 01 to cross over a threshold, requiring additional testing. If so, the BAPC would issue a Notice of Findings and Order requiring the facility to adhere to the new testing requirements.

The Notice of Findings and Order would remain in effect until another re-evaluation took place due to either an addition of a future violation, or the sixty (60) month rolling period for the failure to maintain records violation expiring in January 2024.

VI. Percentages

Each of the sub-categories are assigned a weight, the sum of which determines the respective total weights for the three (3) primary categories. The ranking scale numerical values, as described in Section V, are multiplied by the assigned weights, and the values are totaled to produce a weighted cumulative result. The weighted cumulative result is then divided by the maximum rank value of (5) to calculate a final percentage. The final calculated percentage is then compared to the baghouse testing requirements table to determine the required testing frequency. A breakdown of each category, sub-category, and the corresponding percentage weights are shown in the tables below:

VI. Percentages (Continued)

Category #1 – Potential-to-Emit

Sub-Category	Sub-Category Weight	Category Weight
*Uncontrolled Potential-to-Emit(PM₁₀) (tons/yr)	0.00%	
Controlled Potential-to-Emit (PM₁₀) (tons/yr)	12.5%	
Grain Loading Factor (gr/dscfm)	10.0%	50%
Exhaust Flow Rate (dscfm)	10.0%	
NvAAQS Model Contribution	17.5%	

Currently suspended, see Section IV, Category #1 – Potential-to-Emit.

Category #2 – Operating Parameters

Sub-Category	Sub-Category Weight	Category Weight
Operating Parameter (choose one (1) based on emission unit type) i. Throughput (tons/hr) ii. *Fuel Flow (SCF/hr) iii. *Heat Input (MMBtu/hr)	8.4%	8.4%

Fuel Flow and Heat Input will be addressed in the future when the document is expanded to include combustion emission units.

Category #3 – Compliance History

Sub-Category	Sub-Category Weight	Category Weight
Failed Source Tests (System Basis)	10.15%	
Throughput Exceedances (System Basis)	6.7%	
Records (Facility-Wide Basis)	3.3%	41.6%
Failed Opacity (System Basis)	3.3%	
Failure to Test (System Basis)	10.15%	
Control Equipment Issues (Facility-Wide Basis)	8.0%	

VII. Testing

The TDS for Baghouses uses the weighted cumulative result to calculate a final rank percentage for a facility. The final rank percentage then falls into one (1) of five (5) ranges, which specifies the frequency of required testing, as shown in the table below:

Testing Frequency Ranges

Testing Frequency	Final Rank Percentage	Notes
Initial Only Testing	**0% - 15%**	Anniversary test required if initial test fails.
Initial and Anniversary Testing	**>15% - 25%**	If initial or anniversary test fails, then anniversary testing shall continue until three (3) consecutive tests pass.
Initial and Renewal Testing	**>25% - 50%**	Anniversary test required if a test fails.
Initial, Mid-Point, and Renewal Testing	**>50% - 75%**	Anniversary test required if a test fails.
Initial and Annual Testing	**>75%**	

All laboratory baghouses are exempt from testing requirements.
All existing baghouses are exempt from initial testing requirements.
These are applicable to state only requirements and do not supersede any federal requirements.

Testing Frequency Explanation

Type	Explanation
Initial Testing	Non-reoccurring initial performance test.
Anniversary Testing	Performance testing conducted one (1) year after initial performance test or test failure (conditionally reoccurring).
Renewal Testing	Performance testing required no earlier than three hundred sixty-five (365) days and no later than ninety (90) days before date of permit expiration.
Mid-Point Testing	Performance test required no earlier than two (2) years and no later than three (3) years from initial test or renewal test.
Annual Testing	Reoccurring performance testing required at anniversary of previous test.

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