



IOWA DEPARTMENT OF NATURAL RESOURCES

LEADING IOWANS IN CARING FOR OUR NATURAL RESOURCES

PM2.5 Permitting & Compliance

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What is PM?

PM stands for particulate matter (also called particle pollution): the term for a mixture of solid particles and liquid droplets found in the air. Some particles, such as dust, dirt, soot, or smoke, are large or dark enough to be seen with the naked eye. Others are so small they can only be detected using an electron microscope.

What is PM_{2.5}?

Particle pollution includes:

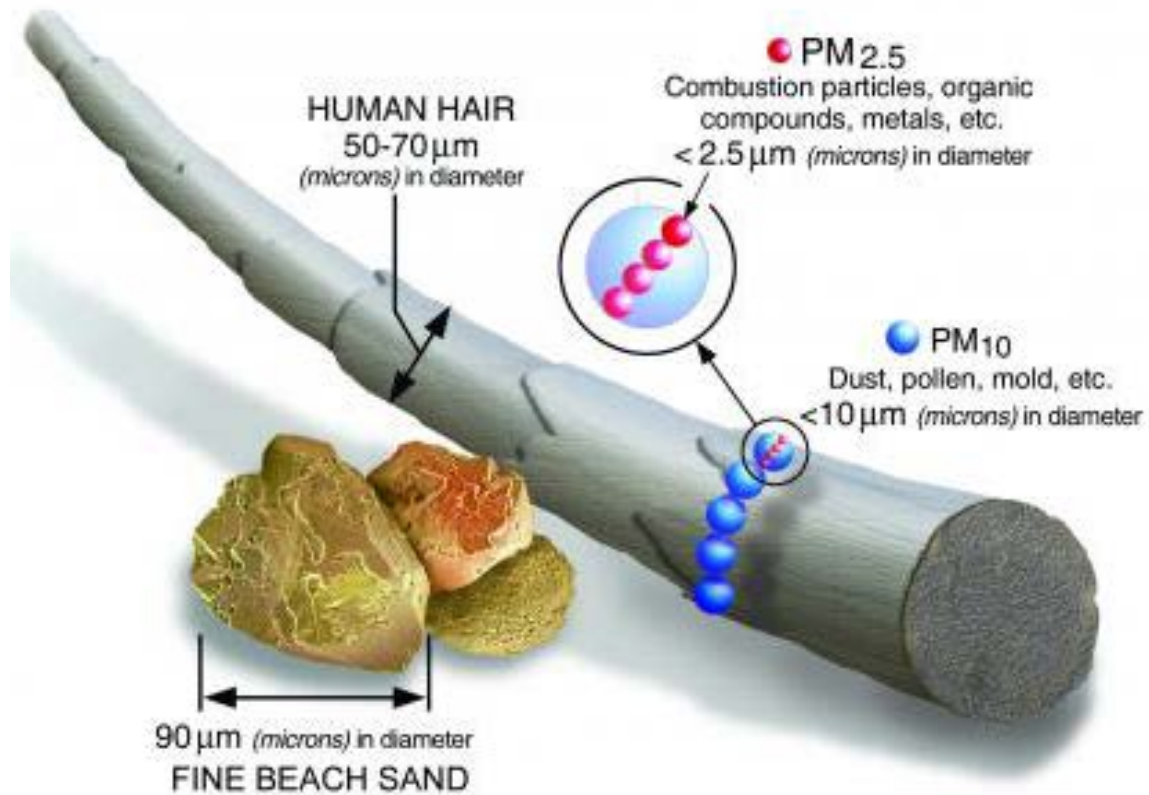
PM₁₀ : inhalable particles, with diameters that are generally 10 micrometers and smaller; and

PM_{2.5} : fine inhalable particles, with diameters that are generally 2.5 micrometers and smaller.

What is PM_{2.5} (continued)

How small is 2.5 micrometers?

Think about a single hair from your head. The average human hair is about 70 micrometers in diameter – making it 30 times larger than the largest fine particle.



Size comparisons for PM particles

PM_{2.5} Permitting

- Stationary sources do emit direct PM_{2.5} emissions
- Quantity is dependent on operation type, temperature, control equipment and the number of sources at the stationary source.
- Feed Dryer versus Grain Handling
- Baghouse versus Cyclone
- During application review, process type and temperature are considered in establishing the PM_{2.5} appropriate emission limit (if necessary)

PM_{2.5} Permitting

When is a limit for PM_{2.5} necessary?

- Prevention of Significant Deterioration (PSD)
 - Avoidance limit (major sources only)
 - BACT limit (major sources only)

- National Ambient Air Quality Standards (NAAQs)
 - Ambient Air Analysis (dispersion modeling)

How do I estimate PM_{2.5} Emissions?

- Relevant sections of AP-42, Compilation of Air Pollutant Emission Factors, may contain particle size distributions for processes characterized in those sections, and appendix B2 of AP-42 contains generalized particle size distributions for nine industrial process categories (e.g., stationary internal combustion engines firing gasoline or diesel fuel, calcining of aggregate or unprocessed ores). The generalized particle size distributions can be used if source-specific particle size distributions are unavailable. Appendix B2 of AP-42 also contains typical collection efficiencies of various particulate control devices and example calculations showing how to estimate uncontrolled total particulate emissions, uncontrolled size-specific emissions, and controlled size-specific particulate emissions. (<http://www.epa.gov/ttnchie1/ap42>.)

How do I estimate PM_{2.5} Emissions?

- AP-42 (<http://www.epa.gov/ttnchie1/ap42>)
 - Particle size distribution (Appendix B2)
- Site specific data
 - PM_{2.5} stack tests conducted on similar operations
 - Previous PM /PM₁₀ stack tests
- Data from Other Sources
 - PM_{2.5} stack tests of similar source types

PM_{2.5} Compliance Demonstration

“PM_{2.5} is defined by the method”

PM_{2.5} Compliance Demonstration

METHOD 201A—DETERMINATION OF PM₁₀ AND PM_{2.5} EMISSIONS FROM STATIONARY SOURCES (CONSTANT SAMPLING RATE PROCEDURE)

- Represents only the filterable portion of PM_{2.5}

PM_{2.5} Compliance Demonstration

METHOD 202—DRY IMPINGER METHOD FOR DETERMINING CONDENSABLE PARTICULATE EMISSIONS FROM STATIONARY SOURCES

- Represents only the condensable fraction of PM_{2.5} (back half)

PM_{2.5} Compliance Demonstration

Method 202 measures concentrations of Condensable Particulate Matter (CPM) in stationary source sample gas after the filterable PM has been removed using another test method such as Method 5, 17, or 201A. The CPM sampling train begins at the back half of the filterable PM filter holder and consists of a condenser, two dry impingers (temperatures maintained to less than 30°C (85°F)), and a CPM filter (temperature maintained between 20°C (65°F) and 30°C (85°F)). During the test, sample gases are cooled and CPM is collected in the dry impingers and on the CPM filter.

PM_{2.5} Compliance Demonstration

What is back half/condensable?

- It is everything that is collected after the filter.
- Condenses out in the impingers.
- Impingers are in a Water bath.
- Can be an issue in the winter.

PM_{2.5} Compliance Demonstration

- These methods can be done at the same time
 - PM is conducted using Method 5/202
 - Heated probe and filter box (240 degrees)
 - PM₁₀/PM_{2.5} is conducted using 201A/202
 - Method 201A adds a PM_{2.5} measurement device (PM_{2.5} cyclone) that allows the method to measure filterable PM_{2.5}, filterable PM₁₀, or both filterable PM_{2.5} and filterable PM₁₀.

PM_{2.5} Compliance Demonstration

- *Approximate PM concentration in the gas stream.* Determine the approximate PM concentration for the PM_{2.5} and the PM_{2.5} to PM₁₀ components of the gas stream through qualitative measurements or estimates from previous stack particulate emissions tests. Having an idea of the particulate concentration in the gas stream is not essential but will help you determine the appropriate sampling time to acquire sufficient PM weight for better accuracy at the source emission level. The collectible PM weight requirements depend primarily on the types of filter media and weighing capabilities that are available and needed to characterize the emissions. Estimate the collectible PM concentrations in the greater than 10 micrometer, less than or equal to 10 micrometers and greater than 2.5 micrometers, and less than or equal to 2.5 micrometer size ranges. Typical PM concentrations are listed in Table 1 of Section 17.

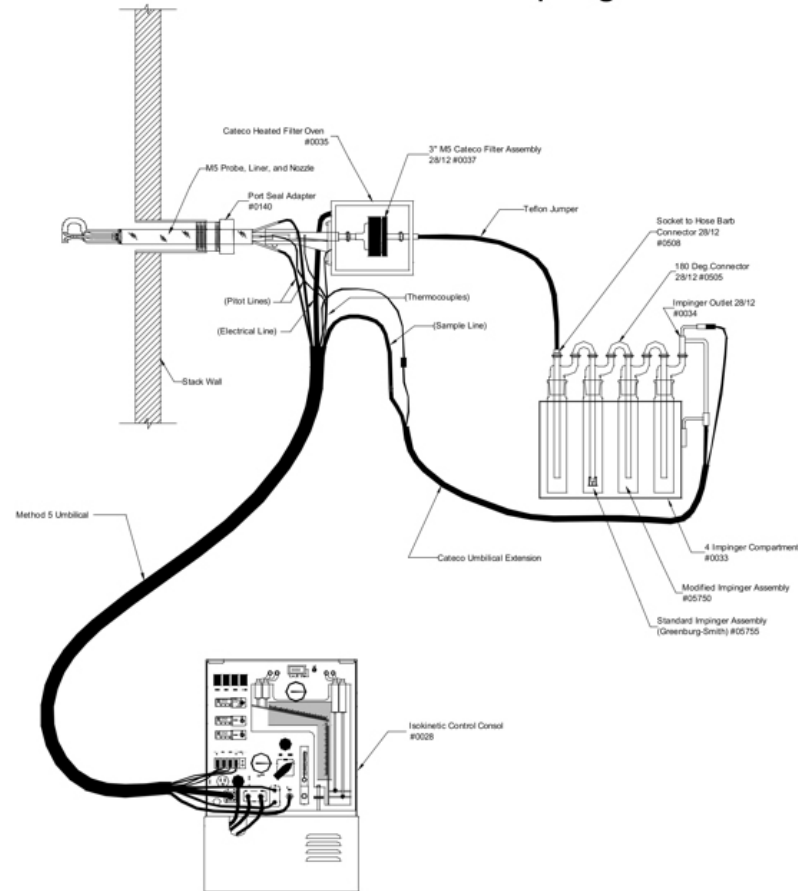
PM_{2.5} Compliance Demonstration

- Minimum particulate matter catches were changed to align with amended Method 201A detection limits
- Design test to capture a minimum of 3 times the detection limits
- Minimum catches

	Design	LDL
• PM	7.62 mg	2.54 mg
• PM ₁₀	4.32 mg	1.44 mg
• PM _{2.5}	4.05 mg	1.35 mg

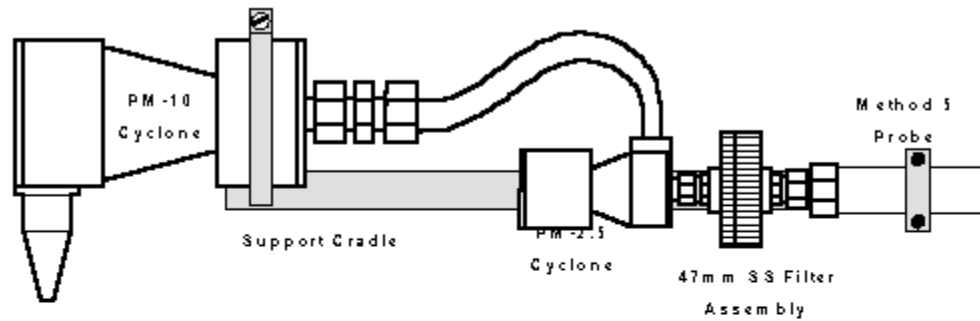
PM_{2.5} Compliance Demonstration

Cateco Method 5 Sampling Train

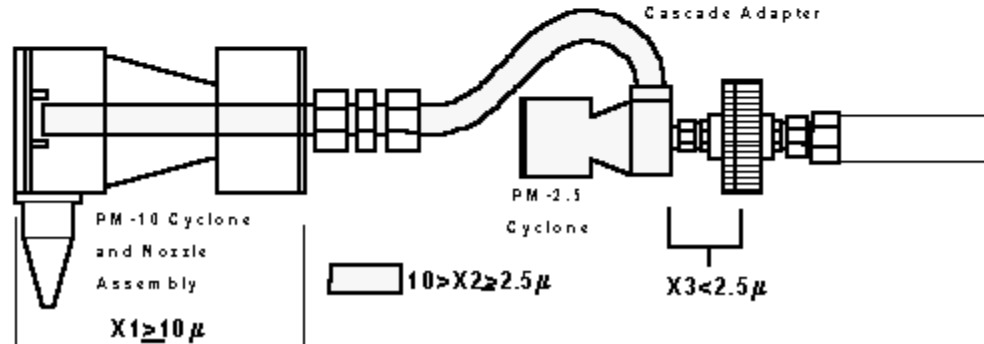


PM_{2.5} Compliance Demonstration

PM-10 & PM-2.5 COMBINATION ASSEMBLY WITH SUPPORT CRADLE



PARTICULATE FRACTION RECOVERY



PM_{2.5} Compliance Demonstration

Method 201A Limitations

“You cannot use this method to measure emissions in which water droplets are present because the size separation of the water droplets may not be representative of the dry particle size released into the air. To measure filterable PM₁₀ and PM_{2.5} in emissions where water droplets are known to exist, we recommend that you use Method 5 of appendix A-3 to part 60. Because of the temperature limit of the O-rings used in this sampling train, you must follow the procedures in Section 8.6.1 to test emissions from stack gas temperatures exceeding 205 °C (400 °F). “

- The method cannot be used to measure emissions from stacks that have entrained moisture droplets (e.g., from a wet scrubber stack).

PM_{2.5} Compliance Demonstration

What effect does moisture have on the test?

- Cannot perform Method 201A
 - Method 5 may be conducted and assumed it is all PM₁₀/PM_{2.5}.

What effect does ambient temperature have on the test?

- Cannot perform Method 202 in cold weather
 - Contact the DNR

PM_{2.5} Compliance Demonstration

“You must use Equation 26 to calculate an average probe blockage correction factor (bf) if the diameter of your stack or duct is between 25.7 and 36.4 inches for the combined PM_{2.5}/PM₁₀ sampling head and pitot and between 18.8 and 26.5 inches for the PM_{2.5} cyclone and pitot. “

- The method is not applicable for stacks with diameters less than 25.7 inches when the combined PM₁₀/PM_{2.5} cyclone is used and 18.8 inches when PM_{2.5} cyclone used only.

PM_{2.5} Compliance Demonstration

What effect does stack diameter have on the test?

- Cannot perform Method 201A
 - Add temporary stack extension
 - Method 5 may be conducted and assumed it is all PM₁₀/PM_{2.5}

PM_{2.5} Stack Testing Contact

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Questions?