

TRANSMITTAL OF RULES ADOPTED

FROM: WASHINGTON STATE AIR POLLUTION CONTROL BOARD
(Name of Agency)

TO: CODE REVISER
LEGISLATIVE BLDG (Southwest Corner, Ground Floor)
Olympia 98501

The enclosed Permanent rules , being order No. 10
Emergency rules
relating to (Name of rules or description of subject matter)

Suspended particulate. These rules and regulations create chapter 18-40 WAC and establish the air quality standard for suspended particulate, the air quality objective, and the method of measuring and reporting.

(ALTERNATIVE A. Use only for adoption of permanent rules)

pursuant to Notice No. 2604 ^① filed with the code reviser on 3-26-70 ^② were regularly adopted as permanent rules of this agency at Spokane, Washington on 4-17-70 and are herewith filed in the office of the code reviser pursuant to chapter 34.04 RCW. The effective date of such rules shall be ^③

(ALTERNATIVE B. Use only for adoption of emergency rules)

pursuant to its finding that the immediate adoption of these rules is necessary for the preservation of the public health, safety, or general welfare and that observance of the requirements of notice and opportunity to present views on the proposed action would be contrary to the public interest, were regularly adopted as emergency rules of this agency at _____ on _____ and are herewith filed in the office of the code reviser pursuant to chapter 34.04 RCW.

Dated this 17th day of April 1970.

STATE OF WASHINGTON
FILED
MAY 18 1970
CODE REVISER'S OFFICE
KET # 66 FILE # 1
2876

WASHINGTON STATE AIR POLLUTION CONTROL BOARD
(AGENCY)
Wallace Lane MD
By Wallace Lane, M. D.
Chairman
Title

- ① NOTICE NUMBER AS APPEARS ON THE COPY OF NOTICE RETURNED TO YOU BY REVISER'S OFFICE (IF PROCEEDINGS WERE CONTINUED, USE NO. OF LAST NOTICE)
- ② STAMPED DATE AS APPEARS ON THE COPY OF NOTICE RETURNED TO YOU BY REVISER'S OFFICE (IF PROCEEDINGS WERE CONTINUED, USE DATE OF LAST NOTICE)
- ③ UNLESS A LATER DATE IS SPECIFIED IN THIS ORDER OR IS PRESCRIBED IN ANOTHER STATUTE, RULES ARE EFFECTIVE 30 DAYS AFTER FILING: RCW 34.04.040. LEAVE THIS SPACE BLANK EXCEPT IN SUCH SPECIAL CASES.

STATE OF WASHINGTON
STATE AIR POLLUTION CONTROL BOARD


PURSUANT to the authority vested in it by the laws of the state of Washington, particularly chapter 70.94 RCW, and pursuant to chapter 34.04 RCW:

THE STATE AIR POLLUTION CONTROL BOARD DOES HEREBY ADOPT as permanent rules and regulations chapter 18-40 WAC pertaining to suspended particulate. These rules and regulations, as attached hereto, establish the air quality standard for suspended particulate, the air quality objective, and the method of measuring and reporting.


THIS order, after being first recorded in the order register of this agency, shall be forwarded to the Code Reviser for filing pursuant to chapter 34.04 RCW and chapter 1-12 WAC.

DONE in the City of Spokane, County of Spokane, State of Washington, this 17th day of April, 1970.

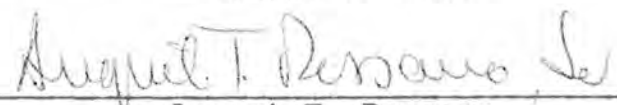
WASHINGTON STATE AIR POLLUTION CONTROL BOARD



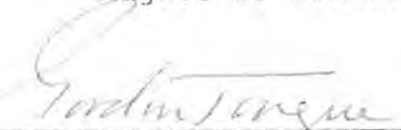
Wallace Lane, M.D., Chairman



Donald W. Moos




August T. Rossano

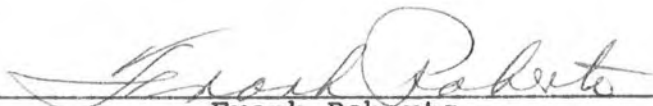


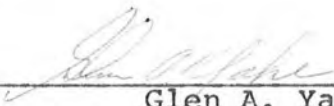
Gordon Tongue

John C. Ranger



Harvey S. Poll


Frank Roberts


Glen A. Yake

John W. Judy

Chapter 18-40

SUSPENDED PARTICULATE

WAC 18-40-010 PREAMBLE. In the interest of the people of the state of Washington, it is the objective of the state air pollution control board to obtain and maintain the cleanest air possible, consistent with the highest and best practicable control technology.

In areas where existing concentrations are lower than concentrations allowed by the standards enumerated below, degradation of the atmosphere should be minimized. The highest and best practicable control technology should be applied to all sources emitting particulate matter to the atmosphere unless it is determined by the responsible air pollution control agency that application of lesser technology is justified. Air quality standards should not be construed to encourage degradation of existing air quality.

WAC 18-40-020 DEFINITIONS. (1) Ambient Air - The surrounding outside air.

(2) Air Quality Objective - The concentration and exposure time of a contaminant or multiple contaminants in the ambient air below which, according to available knowledge, undesirable effects will not occur.

(3) Air Quality Standard - An established concentration, exposure time and frequency of occurrence of a contaminant or multiple contaminants in the ambient air which shall not be exceeded.

(4) Primary Air Mass Station Suspended Particulate (PAMS-SP) - A type of station designed to measure contamination in an air mass, and representing a relatively broad area. The sampling site shall be representative of the general area concerned and not be contaminated by any special source. The sampler shall be a minimum of twenty feet and a maximum of one hundred fifty feet above ground level. Actual elevation will vary depending upon surrounding buildings and terrain. The filter shall be placed a minimum of three feet above the rooftop.

(5) Particle - A small discrete mass of solid or liquid matter. (For air pollution usage, sizes generally range from submicron to over two thousand microns.)

(6) Suspended Particulates - Those airborne particulates collected on eight inch by ten inch sheets of flash-fired glass fiber filter web of specified collection efficiency using a high-volume air sampler or other particulate collection equipment equivalent to the high volume sampler and glass fiber filter.

WAC 18-40-030 AIR QUALITY STANDARD. Suspended particulate in the ambient air shall not exceed the standards enumerated below at the conditions stated.

(1) The suspended particulate concentration measured at any primary air mass station shall not exceed:

(a) Sixty micrograms per cubic meter of air for more than fifty per cent of the samples collected in any calendar year.

(b) One hundred micrograms per cubic meter of air for more than fifteen per cent of the samples collected in any calendar month.

(2) In recognition of natural dust loading in some areas of the state, the following exceptions shall apply to areas east of the Cascade Mountain crest.

(a) If concentrations, measured at approved background locations, exceed thirty micrograms per cubic meter of air on individual sample days, the concentration of suspended particulate matter measured at any primary air mass station shall not exceed seventy micrograms per cubic meter of air plus background,

for more than fifteen per cent of the samples collected in any calendar month. Samples exceeding one hundred micrograms per cubic meter of air on days when background levels are less than thirty micrograms per cubic meter of air will be added to the seventy micrograms per cubic meter of air plus background samples in determining compliance with the fifteen per cent limitation.

(b) If concentrations, measured at approved background locations, exceed twenty micrograms per cubic meter of air as an annual median, the concentration of suspended particulate matter at any primary air mass station shall not exceed forty micrograms per cubic meter of air plus background, for more than fifty per cent of the samples collected in any calendar year.

(3) A minimum of eighty-five samples shall be collected in a calendar year and a minimum of seven samples shall be collected each calendar month.

(4) Sampling shall be conducted on a schedule approved by, and on file with, the state air pollution control board. Only those samples taken in compliance with an approved schedule may be used to determine compliance with the air quality standards. A maximum of two makeup samples may be taken each month to meet the required sample frequency. (A typical sample schedule is attached as Appendix I.)

NEW WAC 18-40-040 AIR QUALITY OBJECTIVE. In recognition of the need for continuing improvement of the quality of the air resource, it is the intent of the state air pollution control board to work toward achievement of the following objective for suspended particulate: Concentrations measured at primary air mass stations shall not exceed thirty micrograms per cubic meter of air for more than fifty per cent of the samples collected in any calendar year.

NEW WAC 18-40-050 METHOD OF MEASUREMENT. Sampling and analysis for suspended particulates shall be conducted according to methods approved by, and on file with, the state air pollution control board (Appendix II). Methods equivalent in sensitivity, accuracy, reproducibility and selectivity to the approved standard method may be used after approval by the state air pollution control board.

NEW WAC 18-40-060 REPORTING OF DATA. (1) Local and regional agencies. Local and regional air pollution control agencies sampling for suspended particulates shall notify the state office of air quality control of all results exceeding the adopted standards. Notification shall be made monthly by the twenty-fifth of each month, covering the previous calendar month's results. An annual summary of all samples exceeding the standards shall be submitted by April 1st of the following year. Monthly data shall be reported on forms provided by the state and shall include:

- (a) Location of sampler.
- (b) Time span involved (month or year).
- (c) Standard exceeded (monthly, annual).
- (d) Concentrations recorded.
- (i) Result of all samples and the percent of samples exceeding one hundred micrograms per cubic meter of air for each month that exceeds the monthly standards.
- (ii) Per cent of samples greater than sixty micrograms

per cubic meter of air if the annual standard is exceeded.

(e) Action taken or planned to prevent recurrence.

(2) If a violation of the standards is detected by the state office of air quality control, the appropriate local agency shall be notified after validation of the results. This notification shall include:

(a) Standard exceeded.

(b) Location.

(c) Time or time span involved.

(d) Concentrations recorded.

(e) Request for reply indicating action planned or taken to prevent recurrence.

Control action shall be implemented by the state agency, if appropriate.

APPENDIX I High Volume Sampling Schedule.

January, 1970

Saturday	3
Wednesday	7
Sunday	11
Thursday	15
Monday	19
Friday	23
Tuesday	27
Saturday	31

February, 1970

Wednesday	4
Sunday	8
Thursday	12
Monday	16
Friday	20
Tuesday	24
Saturday	28

March, 1970

Wednesday	4
Sunday	8
Thursday	12
Monday	16
Friday	20
Tuesday	24
Saturday	28

April, 1970

Wednesday	1
Sunday	5
Thursday	9
Monday	13
Friday	17
Tuesday	21
Saturday	25
Wednesday	29

May, 1970

Sunday	3
Thursday	7
Monday	11
Friday	15
Tuesday	19
Saturday	23
Wednesday	27
Sunday	31

June, 1970

Thursday	4
Monday	8
Friday	12
Tuesday	16
Saturday	20
Wednesday	24
Sunday	28

July, 1970

Thursday	2
Monday	6
Friday	10
Tuesday	14
Saturday	18
Wednesday	22
Sunday	26
Thursday	30

August, 1970

Monday	3
Friday	7
Tuesday	11
Saturday	15
Wednesday	19
Sunday	23
Thursday	27
Monday	31

September, 1970

Friday	4
Tuesday	8
Saturday	12
Wednesday	16
Sunday	20
Thursday	24
Monday	28

October, 1970

Friday	2
Tuesday	6
Saturday	10
Wednesday	14
Sunday	18
Thursday	22
Monday	26
Friday	30

November, 1970

Tuesday	3
Saturday	7
Wednesday	11
Sunday	15
Thursday	19
Monday	23
Friday	27

December, 1970

Tuesday	1
Saturday	5
Wednesday	9
Sunday	13
Thursday	17
Monday	21
Friday	25
Tuesday	29

Samples are to be run from midnight to midnight on the dates indicated.

APPENDIX II Method of Determination and Reporting.

GENERAL:

Samples of air-borne particulates are collected on 8" x 10" tared sheets of flash-fired glass fiber filter web for 24 ± 2 hours, using a high volume air sampler, and weighed to determine total air particulate collected on the filter.

APPARATUS:

1. High Volume air sampler, with frame adapter for 8" x 10" sheets of filter web. (2, 3, 4)
2. Housing which allows for vertical positioning of the air sampler and provides a minimum of 65 square inches and a maximum of 100 square inches in area to permit a uniform flow of ambient air into space above the filter. (2, 3, 4)
3. Flowmeter calibrated in cubic feet per minute. A constant flow regulator or continuous flow recorder is recommended if flow rate during sampling period decreases more than 10% due to particulate loading. (2, 4, 5)
4. Timer switch, 7 day.
5. Elapsed time indicators (recommended).
6. Analytical balance, capable of weighing to 1.0 mg, and a weighing chamber large enough to accommodate an open full-sized 8" x 10" filter web. If the balance is to be used as a multipurpose balance, it is recommended it be capable of weighing to 0.1 mg and have a capacity of 160 to 200 grams. (1, 4, 7)
7. Large desiccating and/or humidifying chamber, such as a converted oven, refrigerator or incubator with trays for holding dessicant and racks for holding filters. (1, 4, 7)
8. A constant temperature (20-24°C) and humidity (less than 50% r.h.) balance room for equilibrating and weighing samples. If a balance room is not available, it is recommended that a humidity chamber be placed immediately adjacent to the balance in a room held at constant temperature (20-24°C). Saturated solutions of sodium nitrite (NaNO_2) (50% r.h. at 21°C) or calcium nitrate ($\text{Ca}(\text{NO}_3)_2$) (46% r.h. at 23°C) may be used to provide constant relative humidity in the chamber. (2, 4, 6, 7)
9. Flash-fired glass fiber filter web, 8" x 10". (2, 4, 6)
10. A 6-wheel numbering device.
11. Paper supplies:
 - (a) Manila tag cards, 9-1/2" x 11".
 - (b) Envelopes, 5" x 11-1/2".
 - (c) File folder, 9" x 12".

PRELIMINARY FILTER PREPARATION:

1. Each filter will be screened over a light table for "pin holes" and other visible defects. The filter will be discarded if defects are found.
2. The last two filter sheets from each group of 25 of a specific manufacturer's lot will be analyzed as blanks. (2, 4)
3. Number the filter web on two diagonally opposite corners, one on front and one on reverse, and outside the area to be exposed, using the numbering device with gentle pressure. A series of filters assigned at one time to one location should be numbered consecutively, weighed and placed on top of one another in a folder with manila tag cards separating them. (1, 4)
4. Weigh the 8" x 10" filter, full size, to the nearest milligram after a minimum 16 hour equilibration in an air conditioned room or chamber at a temperature of 20-24°C and a relative humidity below 50%. (2, 4, 6, 7)

SAMPLING PROCEDURE: For General Metals Sampler; procedure with minor modifications is applicable to other acceptable sampling devices. Care should be taken while handling filter to prevent damage or contamination.

1. Secure the high volume air sampler in a vertical position in a shelter at the sampling site. The sampler should be allowed to run to seat the brushes and insure a representative flow rate. It is helpful to position the shelter so that the lid provides a windbreak during installation of the filter.
2. Set the time switch for the desired sampling period.
3. Remove the frame from the filter holder and position the prenumbered and weighed filter with rough side out, making certain the filter is centered on its holder. (1, 2, 4)
4. Turn the sampler on and then replace the filter holder. Secure the wing nuts diagonally and finger tight so the frame holder is not put in a bind which may cause air leaks. Close the roof of the shelter. (2, 4)
5. Allow the sampler to run for several minutes, then connect the calibrated flowmeter to the sampler and take a flow reading with the flowmeter in a vertical position. Read the top of the flowmeter ball estimating to the nearest whole number. Make a record of the time the time switch will start and the flowmeter reading. (2, 4)
6. Turn the sampler off, remove the flowmeter and make sure the clock and time switch are operational.
7. After a 24-hour sample has been obtained, measure the air flow as in Step 5 above. Turn the sampler on for several minutes before taking the reading. Record the stop time and the final flowmeter reading.
8. Stop the motor, remove the filter, fold once lengthwise with the dirty side in, place in a folded manila tag card and finally into an envelope. Return the packaged filter to the laboratory.

ANALYSIS:

1. Equilibrate the sample at 20-24°C and 50%, or less, relative humidity in an air conditioned room or humidity chamber for a minimum of 16 hours. If it is necessary to remove excess moisture from the filter, dry it in a desiccating chamber at room temperature for 24 hours prior to equilibration. Weigh the filter sample to the nearest milligram. (1, 2, 4, 6, 7)
2. For further analysis, aliquot the filter sample across the 8" dimension using a plastic template designed for the purpose. (2, 3)
 - a. Organic materials; half the sample is used for extraction.
 - b. Non-metals; a 3/4" wide strip representing 8% of the sample is used for water extraction, nitrate, and sulfate determinations.
 - c. Metals; a 2" wide strip representing 22% of the sample is used.
3. Water soluble constituents are extracted by placing the 8% aliquot filter strip in a 125 ml boiling flash containing 50 ml of distilled water. The filter is refluxed for a minimum of 90 minutes, cooled and filtered through Whatman #1, or equivalent, paper. Repeat the extraction with 10-15 ml of water for a few minutes without a condensor. Pass the additional extract through the same Whatman filter. Wash the boiling flask and sample filter to insure good quantitative transfer. (2, 3, 4, 10)

a. Sulfates are determined by the Sulfa Ver Turbidimetric or Turbidimetric Barium Sulfate Method.

b. Nitrates are determined by the 2, 4 Xylenol Method. (2, 3, 4, 10)

4. Organic constituents are extracted with benzene. (2, 3, 4, 10)

a. Fold the sample into a small bundle such that the particulate matter is entirely enclosed within the filter. Tie the bundle with copper wire and place in a 125 ml soxhlet extraction apparatus.

b. Add about 80 ml of redistilled reagent grade benzene and extract for a minimum of 6 hours. Concentrate the extract to approximately 5 ml and quantitatively transfer through a medium porosity fritted disc funnel into a pre-weighed vial. Rinse the extraction flask three times, using about 5 ml of benzene in each rinse. Transfer the wash through the funnel and into the vial.

c. Evaporate the benzene in an explosion proof, ventilated oven at 62°C.

d. Transfer the vial to a constant humidity chamber, equilibrate overnight and weigh to the nearest milligram.

CALCULATIONS - TOTAL WEIGHT:

1. Correct field Flowmeter readings to true air flow from calibration curve.

2. Calculate the average air flow (cfm):

$$\frac{\text{start flow} + \text{stop flow}}{2}$$

3. Calculate the total hours of sampling time: stop time - start time.

4. Calculate the total air flow: Average air flow (cfm) x total hours sample time (to nearest tenth of one hour) x 1.7 + total air volume (to the nearest whole number in cubic meters (m³)).

5. Report as micrograms per cubic meter (µg/M³) to the nearest microgram.

$$\frac{\text{grams of collected material (nearest 1.0 mg)} \times 10^6 = \mu\text{g}}{\text{air volume (M}^3\text{)}} \quad (1,4)$$

SAMPLER LOCATION:

1. The sampler may be located at a Primary Air Mass Station or at a Primary Ground Level Monitoring Station adhering to the requirements of these locations.

2. Other stations, designated as Special Stations, shall be evaluated to be representative of the pollution information desired. The placement of the sampling unit shall minimize biased results from eddy currents, etc., to the fullest extent possible. The filter should be approximately 3 to 4 feet above mounting level. (2, 9)

3. A sampling site report form shall be completed for each site.

SAMPLING SCHEDULE:

1. All samples shall be taken on a midnight to midnight schedule. (4)

2. The number of samples to be taken shall be within consideration of limits of:

a. Approximately 250 to 300 days on a random schedule per year could be required to produce accurate estimates of monthly means (i.e. ± 20%).

b. Twenty-six bi-weekly random samples are sufficient to determine a site's annual mean (± 20% of the true mean). (11, 12, 13)

3. Determination of seasonal and monthly estimates of means is best accomplished by sampling on a systematic basis; example, every fourth day. Any bias introduced into the selection of the starting date may be removed by selecting the starting date for the first week of sampling from a table of random numbers. (11)

4. Sampling schedules on file with the Washington State Air Pollution Control Board and Oregon State Sanitary Authority require a minimum number of samples and allow make-up sampling as follows: A minimum of 35 samples shall be collected in a calendar year and a minimum of seven samples shall be taken each calendar month. A maximum of two make-up samples may be taken each month. It is desirable, but not mandatory, that make-up samples be taken the same day of the week as the missed samples.

5. For a community sampling program all high-volume samplers should operate during the same time period to provide for comparison of the suspended particulate pollution within the area. (11)

DATA RECORDING:

The type of data form utilized shall be compatible with the type of data processing used.

Weather observations shall be recorded with each sample if not available elsewhere. Record any unusual happenings which may affect sampling results.

DATA REPORTING:

1. All suspended particulate data obtained with the high-volume air sampler shall be reported in a micrograms per cubic meter.

2. Data reporting should relate to the effects that are caused by the contaminant and should reflect how the data relates to standards.

3. Total suspended particulate data shall be reported to the nearest whole number and shall include:

a. All sample results including dates of sampling and type of stations.

b. Minimum, maximum and median values.

c. Number of samples $> 100 \mu\text{g}/\text{M}^3$ (PAMS, PGLMS ONLY).

CALIBRATION PROCEDURE:

GENERAL:

High volume samplers operated with regular use should be calibrated every six months and after each motor change. Calibration can be performed either in the field or laboratory using a National Air Sampling Network (NASN) type orifice calibration assembly.

EQUIPMENT:

1. National Air Sampling Network (NASN) type calibration orifice and calibration curve.

2. Manometer, fillings and tubing.

3. Flowmeter and small wrenches for adjustment.

4. Variable voltage transformer.

5. Graph paper.

PRE-CALIBRATION CHECKS:

1. Replace flowmeter tubing if dirty.

2. Clean or replace flowmeter. A soft pipe cleaner and Stoddard solvent is good for cleaning.

3. Check the system for leaks. (See leak test procedure under post calibration checks).

4. If new brushes have been installed, run the sampler for 30 minutes to seat the brushes. (Leak check can be done at this time).

CALIBRATION:

1. Remove filter head from sampler and install the calibration orifice. Make sure the joint is air tight.
2. Set up the manometer and attach the tubing from manometer to the pressure tap on the side of the calibration orifice.
3. Plug sampler into output plug of the variable voltage transformer.
4. Adjust the scaler on the manometer to zero.
5. Check all connections (electrical and tubing) and plug the variac into 120 VAC power line.
6. Adjust variable voltage transformer such that the manometer read the inches of water equivalent to 50 cfm as shown on the orifice calibration curve. Adjust the flowmeter to read 50 cfm by turning the orifice screw at the top of the flowmeter. If a constant flow regulator is to be used in the sampler, the manometer and flow meter should be set at 35 cfm.
7. Tighten the lock nut and put a drop of sealant, i.e., Duco cement, to assure the setting is not changed. Recheck to assure a 50 cfm flow at the proper manometer setting. (35 cfm for constant flow regulator use)
8. Run a standard calibration from 15 to 65 cfm in intervals of 5 cfm, recording the inches of water at each interval.
9. Using the orifice calibration data draw a flow curve so that a best fit line is drawn through the points. On the ordinate of the graph, plot the true air flow as taken from the orifice data and on the abscissa, plot the flowmeter readings. The curve should approximate a 45° angle from 40 to 60 cfm (30 to 40 cfm for constant flow regulator). If not, all connections should be checked and another calibration run.

POST-CALIBRATION CHECKS:

1. Remove calibration orifice and return equipment to operational configuration.
2. Place an 8" x 10" piece of tag board into the filter holder and tighten the wing nuts.
3. Start the motor to check for leaks. If the flowmeter does not stay on zero a leak exists. Tighten the holder adaptor connection and retest. CAUTION! Do not leave the motor running with the tag board on the filter holder as they will damage the motor.
4. Remove tag board and replace with a clean filter.
5. Start the sampler, record the air flow through the clean filter (should not be greater than 65 cfm).
6. Information should be recorded on the calibration curve to include the following:
 - a. Sampler Number
 - b. Date
 - c. Date of Previous Calibration
 - d. Clean Air Filter Flow
 - e. Flowmeter Set -- cfm
 - f. Calibrated by _____
 - g. Remarks
 - h. Pressure Regulator Number (if used).