

TITLE 35: ENVIRONMENTAL PROTECTION  
SUBTITLE B: AIR POLLUTION  
CHAPTER II: ENVIRONMENTAL PROTECTION AGENCY

PART 278  
PROCEDURES FOR MEASURING TRANSFER EFFICIENCY FOR  
SURFACE COATING OPERATIONS IN WOOD FURNITURE COATING FACILITIES

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AUTHORITY: Implementing Sections 4(b), (e) and (g), 9(a), 30 and 5(b), and authorized by Sections 4(h) and 39 of the Environmental Protection Act (Ill. Rev. Stat. 1985 and 1986 Supp., ch. 111 1/2, par. 1004(b), (e), (g) and (h), 1005(b), 1009(a), 1030, and 1039) and authorized by 35 Ill. Adm. Code 215.108(h).

SOURCE: Adopted at 11 Ill. Reg. 19105, effective November 10, 1987.

SUBPART A: INTRODUCTION

Section 278.101 Purpose

The purpose of this Part is to establish general procedures for measuring transfer efficiency from surface coating operations to determine compliance. Sources which are subject to emission limitations pursuant to 35 Ill. Adm. Code 215.204(1) shall comply with any applicable method for measurement of transfer efficiency described herein.

Section 278.103 Definitions of Terms

"Coating Object": any object or combination of objects which is being produced at a wood coating furniture facility.

"Mileage": the amount of square feet that a gallon of paint will cover at a standard film

thickness of 1 mil.

Section 278.105 Interpretation of Symbols

"Ai": square feet per individual coating object( $Ft(2)$ ).

"F": average film thickness during test as measured in mils (mils).

"Pi": number of coating objects produced for each combination of coating objects painted.

"Vt": paint usage for the test period, as measured in gallons (gal).

Section 278.107 General Rules for Conduct of Tests

- a) A person planning to conduct a transfer efficiency test to demonstrate compliance with 35 Ill. Adm. Code 215.104(1) shall notify the Illinois Environmental Protection Agency (Agency) of that intent not less than 30 days before the planned initiation of the tests so that the Agency may observe the test.
- b) Any person conducting a transfer efficiency test to demonstrate compliance with 35 Ill. Adm. Code 215.104(1) shall record parameters measured or calculated at the site and observations on process operations either manually, by the observer and initiated, or by means of electric or mechanical recording equipment.  
Verification of a transfer efficiency test shall be demonstrated by supplying the following information:
  - 1) Additional monitored information available to the owner or operator which substantiates the recorded data;
  - 2) Evidence that the instrument has been certified by USEPA; or
  - 3) Calibration data which show that the equipment was operated within the manufacturer's specifications.
- c) Samples taken for analysis by persons other than the owner or operator or employees of the testing company shall be accompanied by a record of transfers and the identities of holders so that persons responsible for preservation of the sample and analysis can be known.
- d) Data and records submitted to the Agency may be claimed as confidential pursuant to 35 Ill. Adm. Code 161. However, emission information shall be available to the public in accordance with Section 7(c) of the Environmental Protection Act (Ill. Rev. Stat. 1985, ch. 111 1/2, par. 1001 et seq.) (the Act) and 35 Ill. Adm. Code 160.
- e) Laboratory analysis reports shall include the identity of the analyst and the procedure

used.

- f) A final report shall contain the following information:
  - 1) A summary of results;
  - 2) The company name and location, the test dates, a description of the process tested and what test was conducted;
  - 3) Description of test conditions. This description shall include control equipment and the portion of process tested including:
    - A) Parameters monitored and values for each parameter. The parameters are those listed in Sections 278.107(g)(2), (4), (6)-(9); 278.201(a), (h), (j), (k), (n), (o), (q), and (r); and 278.203(a)-(d).
    - B) Process samples taken or analyzed; and
    - C) Instruments monitored and their calibrations.
  - 4) Data and calculations including:
    - A) Copies of all raw filed data sheets;
    - B) Record of any transfers and holders as described in Subsection 278.107(c) above;
    - C) Copies of all laboratory sheets showing any analyses;
    - D) Copies of all calculations used to arrive at results;
    - E) Data on equipment calibration;
    - F) Process information including:
      - i) Raw materials
      - ii) Process rate
      - iii) Mode of operation: manual or automatic; cleaning and auxiliary systems; and process cycles.
    - G) Conclusions which shall include results of the tests in the units of the applicable standard and any additional information to assist the Agency in interpreting the results in relationship to equipment performance.

- g) Any person conducting a transfer efficiency test to demonstrate compliance with 35 Ill. Adm. Code 215.104(l) shall:
- 1) Inspect all equipment to be used. All equipment and materials must meet the requirements of the manufacturer's specifications;
  - 2) Set up paint supply and mass flow measurement equipment per manufacturer's instructions;
  - 3) According to Section 9.8 of National Fire Code, No. 33 (NFPA 33), when using fixed electrostatic apparatus, the resistance of the equipment to ground shall be measured at a resistance of less than one million Ohms;
  - 4) If electrostatic equipment is being used, the gun-to-target distance should be at least twice the sparking distance. This requirement is in accordance with Section 9-7 NFPA 33;
  - 5) Calibrate the mass flow measurement equipment once per week or each time that it is moved, whichever occurs more frequently. The mass flow measurement equipment is calibrated flow instrument or by a primary means of measurement such as a stopwatch and a container of known weight.
  - 6) Begin agitation of paint at least thirty minutes before any paint samples are taken;
  - 7) Using a small glass jar with an airtight lid, take a paint grab sample from the paint pot;
  - 8) Record test run number on label jar (each pass of ten targets is a run); and
  - 9) Paint weight percent solids shall be determined by the person conducting the test at the start of each day, at the end of each day and at any other time deemed appropriate (e.g. new batch of paint, viscosity of paint changes, and physical characteristics such as color change).

Section 278.109      Incorporation by Reference

The following materials are incorporated by reference. These standards do not include any later amendments or editions.

- a) American Society for Testing and Materials (ASTM), 1916 Race Street, Philadelphia, PA 19103. ASTM Standards.

D-1005 - 1984 Measurement of Dry Film Thickness of Organic Coatings

D-1200 - 1982 Viscosity of Paints, Varnishes, and Lacquers by Ford Viscosity Cup

D-1212 - 1985 Measurement of Wet Film Thickness of Organic Coatings

D-1475 - 1985 Density of Paint Varnish, Lacquer, and Related Products

D-2369 - 1982 Standard Test Method for Volatile Content of Coatings

D-3925 - 1981 Sampling Liquid Paints and Related Pigmented Coatings  
(reapproved 1986)

- b) National Fire Codes, by National Fire Protection Association, Batterymarch Park, Quincy, MA. NFPA No. 33 1986.

#### SUBPART B: MEASUREMENT METHODS

##### Section 278.201 Foil Strip Film Transfer Efficiency Test

This method is the preferred test method and is to be used except for the special conditions described in Sections 278.202 and 278.203. When using this test method, the following steps shall be followed in the order presented:

- a) Set up the conveyor speed measuring equipment consisting of photoelectric cells or limit switches used in conjunction with a digital timer, or timing marks on the conveyor used in conjunction with a stopwatch.
- b) Cut an appropriate number of strips of 0.0037 cm (1.5 mil) thick aluminum foil to dimensions of 38.1 cm (15 in) by approximately 127 cm (50 in) for the testing.
- c) Consecutively number each precut foil strip on the dull side using a permanent marking pen.
- d) Weigh each foil strip and record the foil number and mass.
- e) Attach preweighed labeled foil (dull side to the target) to six targets. Attach unlabeled foil on four scavenger targets. All seams must face away from the spray equipment.
- f) Mount the foil-covered targets in consecutive order from right to left (facing the booth) with the foil seam on each target facing away from the spray gun.
- g) Adjust all equipment operating parameters to the values desired for testing.
- h) Cure time and temperature of the oven should be set per manufacturer's instructions.
- i) Recheck operating parameters to ensure that they are correct.
- j) For electrostatic spray equipment, measure the operating voltage and adjust according to manufacturer's instructions and record value.

- k) Inspect conveyor clock, stopwatch, and mass flow measurement equipment to assure that all are prepared to operate.
- l) Turn on spray booth and conveyor. As the leading edge of the first scavenger target passes in front of the gun, turn on paint spray equipment and simultaneously begin mass flow measurement.
- m) As the trailing edge of the last scavenger target passes in front of the gun, stop the paint spray equipment and mass flow measurement simultaneously.
- n) Record the mass flow measurement.
- o) Measure the wet film thickness on the trailing scavenger and record.
- p) Remove the painted targets from the conveyor and ensure that no paint is lost. Securely hang the coated targets on oven racks so all painted surfaces are exposed for uniform drying. Orient all targets in the same direction in the curing oven.
- q) Insert racks in oven and bake at manufacturer's recommended schedule. Oven door shall be opened for minimum amount of time to prevent cooling.
- r) Remove targets from oven and record actual cure schedule on a separate data sheet. Cool foil to room temperature. Remove foil from each target, weigh foil and record mass on each foil and on a separate data sheet.
- s) After weighing, store foils in plastic bags, with the test run number labeled on each bag. The laboratory shall retain all samples until data analyses are complete. Check all data for correctness and completeness.

#### Section 278.202 Mileage Film on Coating Object Transfer Efficiency Test

This test may be used for very small or intricate parts which cannot be tested under the preceding Sections 278.201. When using this test method, the following techniques shall be used:

- a) Each of the steps as set forth in the preceding Section 278.201 shall be followed, except that no foil shall be used and the film shall be measured directly on the coating object.
- b) If a primer coat or coats have previously been applied, the film thickness of that coat or coats shall be measured and averaged before topcoating. The measurement method for the primer coat or coats shall be identical to that set forth in Section 278.201 herein.

#### Section 278.203 Production Record Mileage Transfer Efficiency Test

This test method utilizes the production records of a facility to determine the overall efficiency of utilization of paint, including repainting of rejects, spillage, color change waste, etc. When

using this test method, the following steps shall be followed in the order presented:

- a) The square footage per coating object shall be measured, calculated and recorded as  $A_i$  (square ft/coating object).
- b) The number of coating objects produced shall be counted and recorded for each combination of coating objects produced and recorded as  $P_i$ .
- c) The paint and solvent usage shall be recorded during the measurement period ( $V_t$  gallons).
- d) The film thickness shall be checked at least five times during the test at reasonable intervals, and shall be averaged and recorded. ( $F$  mils)
- e) Mileage shall then be calculated according to the following formula:

$$\text{mileage} = F \times \text{Summation of } (P_i)(A_i)/V_t$$

- f) The transfer efficiency shall be calculated according to the following formula:

$$\text{T.E.} = \text{mileage/theoretical mileage at 100\% application efficiency}$$