



South Coast Air Quality Management District

Guidelines for Demonstrating Equivalency with District Approved Transfer Efficient Spray Guns

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Guidelines for Demonstrating Equivalency with District Approved Transfer Efficient Spray Guns

Many District regulations require the use of High-Volume, Low-Pressure (HVLP) spray guns, or a demonstrated equivalent to the HVLP guns, in order to achieve a transfer efficient spray application. Historically, equivalency demonstrations were performed and approved on a facility specific basis. A number of conditions accompanied these approvals, which restricted the operation of the candidate spray gun to settings which reflected the parameters of the equivalency test. However, an equivalency demonstration of a non-HVLP spray gun under District Rule 1151 (Motor Vehicle and Mobile Equipment Non-Assembly Line Coating Operations) was recently approved for multiple facilities, which generated a high level of interest for equivalency testing by other gun manufacturers. In response to the requests from spray gun manufacturers for guidelines to assist in the planning and development of an equivalency test program, this document was prepared as a companion document to the District's "Spray Equipment Transfer Efficiency Test Procedure For Equipment User" dated May 24, 1989 (hereafter referred to as the Transfer Efficiency Procedure). These guidelines can only be used for source specific rules that require alternative application methods to have a transfer efficiency that is equivalent to or better than HVLP spray technology. They are not applicable to source specific rules that require alternative application methods to have a transfer efficiency of at least sixty-five (65) percent.

Industry Survey

The manufacturer of the candidate spray gun shall perform a survey of the applicable industry to determine:

- a) The make, model, and manufacturer of the HVLP guns used by the industry. The two most popular, commercially available HVLP guns shall be selected to test for equivalency.
- b) The types of coatings that are applied by the HVLP guns. For example, the automotive refinishing industry generally applies three types of coatings: primer, basecoat, and clearcoat.
- c) The major manufacturers that supply the majority of the types of coatings identified in item (b). If, for example, a manufacturer provides only two out of three types of coatings, the survey shall identify which coatings the manufacturer provides.
- d) The mixing ratios and reducers typically used to dilute the coatings. Solvent manufacturers shall also be identified.
- e) A range of part sizes for the particular industry. Of special interest are the commonly sprayed items that would result in the lowest transfer efficiency (often the smallest or thinnest part).

At the District's option, the facilities surveyed by the gun manufacturer may be contacted by the District for further questioning. As a result, upon request, the raw survey data as well as each facility name and contact shall be submitted for review. It is important to note that this survey

shall be conducted for industries located and operating in the South Coast Air Basin under valid permits issued by the District.

Manufacturer's Test Protocol

A testing protocol, which describes the testing procedures, shall be submitted to the District for written approval prior to conducting the transfer equivalency testing. As a supplement to the requirements in the District's Transfer Efficiency Procedure, the following items must be addressed.

Gun Operation, Coating Information, and Spray Methodology

- a) Information regarding the candidate gun shall be submitted with the test protocol. A manufacturer's specification sheet is often acceptable.
- b) The make, model, and manufacturer of the two HVLP guns which are proposed to be tested.
- c) A minimum of two target sizes that are proposed to be sprayed. Generally, a "large" and a "small" target will be identified. The size of the targets shall be selected based on the survey. It should be noted that any District approval of the candidate spray gun may be conditioned based on the smallest target size tested during the equivalency testing.
- d) The type of substrate (wood, metal, etc.) proposed for the target, and whether aluminum foil will be used to cover the substrate during spraying. If a foil covering is proposed, the protocol shall specify the foil thickness and the method of attachment to the substrate.
- e) The types of coatings which are proposed to be sprayed by each gun. These coatings, as well as the mixing ratios and reducers, will also be selected based on the industry survey.
- f) The method for triggering and spraying the guns. The spraying shall be automated, and the protocol shall contain information on the spraying machine.
- g) The spray pattern proposed for each type of target. The protocol shall detail how many passes will be performed to paint the target, what percent of each pass will overlap the previous pass, the amount of planned overspray above and below the spray target, the distance prior to the leading edge of the target where the gun will be triggered, and the distance following the trailing edge where the trigger will be released. A schematic of the spray pattern will greatly assist in the evaluation.
- h) The proposed gun-target distance, gun speed, spraying time, and anticipated film thickness. These parameters may be based on usage information obtained from the survey. The protocol shall also state how these parameters will be measured during the test.
- i) The proposed gun parameters to be used during testing, such as the fluid flow rate, air pressure, and airflow, and the method for measuring these parameters. Air pressure and flow shall be determined at the spray gun's Inlet, Center, and Horn. The manufacturer's test protocol should justify these parameters to assure that the gun is not operated outside the manufacturer's recommended settings. Additionally, the manufacturer of the

candidate gun is cautioned that any District approval may be conditioned on the parameters used during the test.

- j) Estimates of the fan width and pattern thickness based on the Spreader Position, and justify the selected position. This information might also be obtained from the industry survey.
- k) The protocol should state the maximum time a coating mixture will be allowed to sit before mixing. Note this time interval will be coating dependent.
- l) A testing sequence shall be developed which tests for each combination of factors. The testing combinations must be randomized, and the proposed testing sequence shall be submitted for the District's approval prior to testing. As an example, one test combination may consist of the following factors:

Factor	Combination
Spray Gun	HVLP Gun #1
Coating	Basecoat
Coating Supplier	Supplier #1
Target Size	Large

A minimum of three replicates shall be performed for each test combination; these replicates may be performed sequentially.

Laboratory Information and Procedures

- a) The test protocol shall describe the testing laboratory, its staff, and experience in performing transfer efficiency tests.
- b) The ambient conditions that will be monitored (such as barometric pressure, temperature and humidity), the frequency of measurement, and the location of the monitoring instruments in relation to the spray booth.
- c) A description of the spray booth shall be submitted, which includes information on the booth manufacturer, dimensions, and airflow rate. A schematic showing the booth dimensions and the spray target location within the booth shall also be included.
- d) The spraying direction relative to the booth airflow rate shall be indicated.
- e) The type of drying oven to be used, and the oven temperature setting for each of the proposed coatings to be used.
- f) Procedures for determining as-applied coating temperature, viscosity, specific gravity, and percent solids shall be submitted. Additionally, the protocol shall state how often these variables will be measured per day, given the "shelf life" of the mixed coating.
- g) Procedures for determining the baking time of the target panels shall be described.
- h) Submit a list of equipment and instruments that will be used for the test. For weight measurements, indicate the range, accuracy, and precision of the scale.

Calculation Procedures

- a) The procedure for establishing equivalency shall be described. In general, a statistical calculation such as the Analysis of Variance (ANOVA) procedure is usually appropriate.

Quality Assurance

- a) The protocol shall describe how the quality of the panel finish will be evaluated. The finish quality shall be evaluated using (but not be limited to) wet and dry film thickness, gloss measurements, DOI, and orange peel.
- b) The quantity and locations of film thickness, gloss, and DOI measurements for each test panel shall be proposed. At least three film thickness measurements shall be made along an axis which is perpendicular to the spray direction. The measurement locations are best shown using a diagram. Following testing, panel samples shall be submitted at the District's request for evaluation of spray finish.
- c) The procedure for tagging panels to identify each spray combination shall be described. Additionally, procedures for insuring the integrity of the coating analyses when performing measurements of specific gravity, weight percent solids, etc. shall also be described.
- d) Sample data and calculation sheets shall be included with the test protocol.
- e) Preventative steps to assure quality data of critical measurements should be included with the protocol. For example, the laboratory may wish to prevent air currents or dampen fan vibrations during panel weight measurements.
- f) The protocol shall include calibration procedures, and the maintenance schedule of all instruments used in determining transfer efficiency.
- f) Other miscellaneous procedures, such as assuring that the target panels are sufficiently cleaned or prepared.

Protocol Format

- a) The protocol must be signed and dated. The contacts for both the candidate gun manufacturer and the testing laboratory should be identified along with the postal address, phone number, and e-mail address of both contacts.
- b) To facilitate review, the protocol should also be logically organized, with each page individually numbered.
- c) A statement shall be provided that the independent testing laboratory meets the requirements of District Rule 304, Subdivision (k).

It should be noted that these guidelines are generic, and were not meant to address all possible testing situations. Hence, the District reserves the right to add, delete, and amend the above guidelines depending on the application. It is expected that the testing laboratory will share the responsibility in developing equivalency testing procedures by submitting a test protocol for

District approval prior to testing. The submission of a test protocol should follow the procedures below in order to expedite the protocol's receipt and evaluation by the District.

Protocol Submittal

The test protocol shall be submitted as a Plan Application to the attention of Manager, Coating, Printing and Aerospace Operations, Engineering and Compliance, South Coast Air Quality Management District, P.O. Box 4944, Diamond Bar, CA 91765. Form 400-P, which may be downloaded via the AQMD Website at www.aqmd.gov/permit/int-400e.html, must be completed and submitted with the test protocol, along with the required fees specified in Rule 306(c) and Rule 306(h). A Plan Evaluation Fee will be determined in accordance with Rule 306(d) after the evaluation of the test protocol is completed and the applicant will be notified of any additional amount due.

The following is a step by step instruction for completing Form 400-P.

Section I – Company Information

Legal Name of Applicant – This is the name of the manufacturer of the spray gun to be tested.

IRS or S.S. Number – This is the Internal Revenue Service number or social security number of the manufacturer of the spray gun to be tested.

Permit to Be Issued to – This is typically the name of the manufacturer of the spray gun to be tested.

Business Mailing Address – This is the mailing address of the manufacturer of the spray gun to be tested.

Section II – Facility Information

Equipment Address/Location – This is the address where the transfer efficiency testing will occur.

Facility Name – This is the name of the facility where the transfer efficiency testing will occur.

Facility ID Number – This is the AQMD ID number of the facility where the transfer efficiency testing will occur, leave blank if unknown.

Name of Contact Person – This is the name of the contact person at the manufacturer of the spray gun.

Title – This is the title of the contact person.

Contact Telephone Number – This is the telephone number of the contact person.

Type of Business at this Facility – Describe the type of business at the facility where the transfer efficiency testing will occur.

Business Type Code – This is the four digit Standard Industrial Classification (SIC) business code for the business where the transfer efficiency testing will occur.

Section III – Equipment Information

Application hereby submitted for: This is the make and model of the spray gun to be tested.

Rule Number which this Application Applies to: This is the rule number for which the transfer efficiency equivalency is being requested.

Type of Plan Application: Check the “Other” box and write in “spray gun transfer efficiency test.”

If this Application is Associated with Certain District Application(s)/permit(s), enter application/permit number: Enter not applicable.

Operating Schedule – Leave blank.

For AECP Please Fill in the Table Below: Leave blank.

Section IV – Signature

Signature of Responsible Official of Firm: This is the responsible official from the manufacturer of the spray gun to be tested.

Signature of Preparer: This is the individual who was responsible for preparing the application package.