



PAINT SPRAY BOOTH BACK SECTION ACCEPTANCE TEST

1. SCOPE

1.1 The purpose of this Standard is to designate the steps required to be taken by paint spray booth vendors to obtain Company approval of spray booth water wash back sections to be used in vehicle assembly plants.

Note: Company approval of spray booth water wash back sections for hi solids prime and enamels must meet this standard modified as explained in Appendix I. Those paragraphs revised in Appendix I are prefaced by an asterisk (*).

2. GENERAL

2.1 Approval shall be granted to a back section design that conforms to the provisions of Ford Manufacturing Standard BAX and meets the conditions for acceptance, in accordance with Section 8, as determined by the acceptance test outlined herein.

Note: Those vendors who have passed the test based on the November 1968 issue of this standard are deemed to have passed this revision to the standard.

2.2 The acceptance test for back section approval shall be conducted or witnessed by qualified Company personnel.

2.3 Prior to the performance of the acceptance test, the vendor shall have one or more preliminary tests performed by an accredited testing laboratory, in accordance with all provisions outlined herein, until the conditions of acceptance of Section 8 are met.

2.3.1 The vendor shall then submit the following to the applicable Ford Motor Company purchasing activity, for review by the affected Company engineering activity:

(4) copies of the report of the successful preliminary test prepared jointly by the vendor and the testing laboratory on forms as indicated in Section 9.

(4) certified copies of the design drawing of the back section.

2.3.2 Performance of the acceptance test by or in the presence of Company personnel shall be contingent upon approval of the preliminary test.

2.3.3 Throughout this Standard, a single back section is defined as a back section intended for installation on each side of a body spray booth. A double back section is defined as a back section where the paint elimination takes place in the center only of a body spray booth (i.e.: Exhaust volume is twice that of a single back section).

3. SPRAY BOOTH BACK SECTION

3.1 The spray booth water wash back section to be tested and a water retention tank shall be erected in the vendor's plant or other location mutually agreed upon. The test back section shall be sized to accommodate a 10 or 15 foot spray booth section and the portion thereof below the normal grating level, into

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which over spray will be directed, shall be the corresponding length. The test back section shall be constructed to conform to Ford Manufacturing Standard BAX—Paint Spray Booths. The back section shall include a suitable plenum to ensure uniform air distribution within the back section. The plenum shall be considered as part of the back section design and shall be so indicated on the certified drawing.

3.2 The water retention tank shall have a capacity of approximately five times +10% -0% the circulating pump capacity in gallons per minute plus adequate freeboard.

3.3 All access doors for cleaning interior surfaces, that will normally be provided, shall also be provided on the test section. Additionally, glass inspection ports and large access doors shall also be provided to permit visual inspection of water action during the test and of internal baffles and upper and lower air plenum after the test.

3.4 The exhaust air volume for a downdraft spray booth test back section shall be 1,000 CFM per foot of booth for a single back section and 2,000 CFM per foot of booth for a double back section with allowable variation of $\pm 5\%$.

3.5 A centrifugal exhaust fan, as described in Manufacturing Standard BAX, shall be connected to the top of the exhaust plenum at a minimum height of 12 ft. above the floor grating level of the booth, with an elbow and horizontal duct which shall not exceed 10 feet in length. An exhaust stack shall be connected directly to the fan outlet and shall have sufficient length to accommodate the sampling holes described below. Neither the connecting duct work nor exhaust stack shall contain any obstructions such as turning vanes, dampers, air straighteners, etc.

3.6 Two sampling ports 90° apart in the same plane shall be located in the exhaust stack at a minimum of 8 diameters from the exhaust fan outlet and 2 stack diameters upstream of any flow disturbance. The sampling ports shall consist of a standard 4" pipe coupling 3" long welded to the stack for sampling equipment use.

3.7 A suitable platform, or other means, shall be provided at the sampling port location to accommodate testing personnel and equipment.

4. EQUIPMENT AND MATERIAL

* 4.1 The following equipment, material and facilities shall be provided by the spray booth vendor:

- (1) Paint spray gun (one per every 5 ft. of booth) Binks #62 gun with #63 PB air nozzle, #63B fluid nozzle, and a 363A fluid needle.

Spray gun support

- (1) 30 gallon paint pressure tank with agitator, fluid strainer, fluid and air hoses, couplings, etc.

Air supply to provide a minimum of 14 CFM at 50 psig continuously at each spray gun.

Air filter and regulators.

- (1) Platform scale with dial indicator--500 pound capacity.



4. EQUIPMENT AND MATERIAL (continued)

4.1 (Continued)

(1) #2 and #4 Ford cup.

Paint sample heater and thermometer.

(60) gallons Ford Motor Company M50J paint - white color -

M50J - 100C

- Primary reducing solvent is AAD-696 (Gage #311175)
- Spray viscosity is 38 sec Ford #2 cup.

M50J - 107A

- Primary reducing solvent is M14J510 (Gage 4104)
- Spray viscosity is 44 sec Ford #2 cup.

Note: If paint is procured unreduced, 15 gallons of thinner will be required. Otherwise five gallons will suffice for cleanup and to adjust reduced paint.

4.1.1 Water wash compounding (M-99B151A), (M-98B31A) and defoamer.

4.1.2 M-99B151A see Approved Source List.

4.1.3 M-98B31A, a 50% caustic soda and water mixture. This material is used to maintain pH between 9-10. Source: Any reputable chemical supplier.

4.1.4 Solvent free defoamer is used as required below.

4.1.5 Chemical Usage Data:

- Precharge system with M-98B31A, the 50% caustic soda to a pH of 9-10. Precharge is approximately 0.5 gal. 50% caustic soda per 1,000 gal. of water. Make-up is generally 1:1 by volume based on the amount of M99B151A used below.
- Use M-99B151A at 6% volume of the paint sprayed in the test. Feed continuously at water recirculation pump intake for the 36 minute test duration.
- Use M-99B165A defoamer as required. A maximum of 1 pint is permitted every 5 minutes.
- Minimum paint solids to be sprayed are as follows:
 - 15 foot booth - 36 minute test - 66 lbs.
 - 10 foot booth - 36 minute test - 44 lbs.Solids content of paint to be determined at time of test.

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4. EQUIPMENT AND MATERIAL4.1.5 Chemical Usage Data: (Continued)

- . Use the following indicator paper graduated in single pH units.

EM Laboratories, Inc.
Color Phast Indicator
Strips #9590, pH range 0-14

4.2 The following equipment is required for iso-kinetic sampling:4.2.1 Field equipment

- . 1 standard pitot tube
- . 1 in-stack filter holder
- . 3 to 5 sample nozzles in assorted sizes 90° elbow type
- . 1 commercially available sampling control module or equivalent containing the following: flow control valve, leakless vacuum pump, dry gas meter, calibrated orifice, and a twin-tube (orifice/pitot tube) manometer.
- . 3 modified Greenburg-Smith impingers with fittings and clamps or equivalent
- . 1 316 stainless steel probe
- . 2 glass bulb thermometers, mercury filled, 0-200°F range
- . 1 vise-grip clamps
- . Barometer
- . Glass sample bottles
- . Tubing for sample and pitot lines

4.2.2 Laboratory equipment

- . 1 analytical balance with an accuracy of ± 0.1 mg
- . 1 beam balance with an accuracy of ± 0.1 grams
- . 1 desiccator
- . A quantity of glass fiber filters (Gelman type A or AE) prepared in accordance with section 7.3.1.
- . Aluminum foil to enclose glass fiber filters.
- . 1 wash bottle
- . Acetone, reagent grade
- . Silica gel
- . Porcelain or glass weighing dishes
- . Stopcock grease
- . Oven capable of maintaining 105°C temperatures.

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5. TESTING

- 5.1 Testing comprises spraying paint at a specific rate for a given period of time into the operating spray booth back section, observing the performance and inspecting the interior of the back section both above and below the paint elimination area, and measuring paint emission from within the exhaust stack.
- * 5.2 Three test runs of 36 minutes each (minimum) shall be made. Section 6, Test Procedure, shall be followed for each test run. A test run that does not conform to the provisions of Section 6 shall be declared invalid.
- 5.3 The performance of the back section during each test run shall be observed and recorded with special attention given to uniformity of air flow across entire width of back section.
- * 5.4 The interior of the back section, plenum, duct work and fan shall be inspected after each test run. Amount and location of paint build-up in the back section, and evidences of water in plenum, duct work and fan, shall be recorded on a form as indicated in Section 9.
- 5.5 Back section shall not be cleaned or any adjustments made between test runs.
- 5.6 Data required on test form of Section 9 shall be recorded during or after each test run.

6. TEST PROCEDURE

- 6.1 Prepare paint in accordance with 6.1.1 or 6.1.2 and determine weight of one quart of prepared paint.
 - 6.1.1 Unreduced paint shall be conditioned in the drum by agitation of prolonged stirring until all heavy material is completely distributed. The paint shall then be reduced with thinner as specified in 4.1.
 - 6.1.2 Paint that has been reduced by the supplier shall be thoroughly stirred in the drum and adjusted for viscosity, if required.
- 6.2 Install pressure tank on platform scale and transfer quantity of paint required for the test run, plus an additional amount, to the pressure tank.
- 6.3 Start back section pump and add water wash compound at the rates shown in 4.1.5. Pumps shall operate for a minimum of five minutes after compound has been added before exhaust fans are operated.
- 6.4 Start exhaust fans to permit measurement of exhaust air and preparation for iso-kinetic sampling in accordance with Section 7, before paint injection commences.
- * 6.5 Adjust each spray gun to spray at a rate of approximately 22 fluid ounces per minute. Air pressure at the heel of each gun shall be at least 50 psi. Preliminary paint flow rate shall be adjusted for each spray gun by squirting directly into a calibrated vessel at the correct fluid pressure without using atomizing air.

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6. TEST PROCEDURE (Continued)

- * 6.6 For a downdraft booth back section arrange and support the spray guns so each gun will cover 5 ft. of the spray booth length and the spray pattern shall be a horizontal fan shape directed at a downward angle of 45 degrees toward the air inlet from a diagonal distance of five feet.

6.7 Record weight of paint and pressure tank.

6.8 Determine the weight of the paint to be injected per minute in accordance with 6.1 and 6.5.

6.9 Start paint injection and iso-kinetic sampling in accordance with Section 7. Record starting time. Note: Paint flow may be stopped mid-way through the test to change sampling direction 90° at discretion of test team.

- * 6.10 Continuously monitor paint usage by reading the progressive weight loss from the scale dial, and adjust fluid pressure as required to maintain the weight loss determined in 6.8.

Note: Paint usage (based upon weight of paint solids per unit volume) for a 36 minute test run shall be not less than 59.6 quarts (134.7 lbs.) for a 15 ft. booth or 39.7 quarts (89.7 lbs.) for a 10 ft. booth.

6.11 At completion of test run, note weight of pressure tank and remaining paint and compare with value in 6.7 to determine actual paint usage.

6.12 Record test data on the forms indicated in 9.1.

7. PROCEDURE FOR DETERMINING PAINT EMISSION FROM EXHAUST STACKS7.1 Preliminary Flow Measurements

7.1.1 All exhaust fans and water recirculation pumps should be started and operating normally prior to any exhaust duct flow measurements.

7.1.2 Locate the velocity traverse points and mark the pitot tube for a six point traverse. This can be calculated using the percent diameter numbers shown below.

<u>Port/Point</u>	<u>Percent of Duct Diameter</u>
Vert. or Horz. - 1	4.4
2	14.6
3	29.6
4	70.4
5	85.4
6	95.6

7.1.3 Leak check each pitot line prior to the initial traverse by pressurizing (or evacuating) the line, pinch off the tubing and check for fluid movement. If movement is observed over a 30 second period at 3" H₂O check the line for leaks. Repeat until the system is leak free.

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7. PROCEDURE FOR DETERMINING PAINT EMISSION FROM EXHAUST STACKS (Continued)

- 7.1.4 Prior to making preliminary pitot traverses, measure the stack temperature.
- 7.1.5 Traverse the duct in both vertical and horizontal directions (both ports) and record the data obtained. Be sure all open port areas around the pitot tube and the other port are closed off to prevent any air disturbances or dilutions.
- 7.1.6 Determine the moisture (%) in the stack using the wet and dry bulb temperature and a psych chart.
- 7.1.7 Calculate the flow in the stack in SCFM.
- 7.1.8 Exhaust gas velocities measured at each sample point should be constant. Do not test if velocity pressures (at the same sample point) fluctuate by more than ± 0.02 inches H_2O .

7.2 Particulate Sampling Measurement

- * 7.2.1 After preliminary flow measurements have been made, determine the proper nozzle size which will allow for a minimum total sample volume of 30 cubic ft. Maximum sample rate should not exceed 1.5 cfm. Attach the nozzle to the filter holder, insert the filter and load the silica gel.
- 7.2.2 Leak check the meter box and orifice by closing off the low side of the orifice tap. Close the main valve on the meter box. Insert a one-holed stopper with tubing into the orifice end. Pressurize the system to 5" H_2O , pinch off the tubing and check for movement of fluid in the manometer. The system should be free of leaks for 30 second period. This check is required prior to the first test only.
- 7.2.3 Leak check the sample train by plugging the nozzle tip and slowly opening the main flow valve (with pump operating) until a vacuum of 15" registers on the vacuum gage. Partially close the main flow valve/enough to stabilize the vacuum reading and note the timer and the gas meter positions. An acceptable leak check is 0.02 cfm or less. Record the leak rate obtained. If an unacceptable leak is observed check all lines and line connections. Repeat the leak check until the system is capable of meeting the 0.02 cfm limit. Fill out the form "Particulate Test Data Sheet" with the information acquired from the preliminary traverse. Prepare to sample all 12 points using velocity head readings from preliminary traverse & calculated orifice settings. Record the initial meter reading.
- 7.2.4 After initial sampling train leak checks have been made, the velocity traverse has been performed, the proper nozzle size has been selected, the sampling rates for each of the 12 sampling points calculated, the first impinger charged with 200 ml H_2O , and the third loaded with silica gel, the particulate test can begin.

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7. PROCEDURE FOR DETERMINING PAINT EMISSION FROM EXHAUST STACKS (Continued)

7.2.5 Start the test and timer in conjunction with paint spraying in the booth. Immediately adjust the sample flow rate to the predetermined orifice pressure and check the pump vacuum to make sure it is registering a meaningful value.

- * 7.2.6 Measure and record the stack temperature at least three times during the 36 minute test. At the beginning of each 3-minute sample period record the time, velocity head, orifice reading, meter reading, pump vacuum, and meter inlet and outlet temperatures.
- * 7.2.7 Near the completion of the test correlate shut-down with paint spraying operations. Stop the test after 36 minutes. Record final meter readings and the exact test time duration. Remove the probe from the duct, plug the nozzle and perform the sample train leak check as done previously. Record the results.

7.2.8 Disassemble the filter holder and place the filter in its original container. Rinse the nozzle and front half of the filter holder with a known volume of acetone into a glass sample bottle. Disassemble the impingers and measure the volume of water condensed in the first two impingers. Place the desiccant from the third impinger into its original container. Label all sample portions and prepare them for transportation to the laboratory.

7.3 Laboratory Procedures7.3.1 Prior to sampling

- . Number a group of Gelman type A or AE glass fiber filters appropriate for sampling and place them in separate aluminum foil envelopes. Dry them in an oven at 105°C for 2 hours. Place them in a desiccator for a minimum of 24 hours. Weigh to the nearest 0.1 mg on an analytical balance. (Weights should be reproducible to ± 0.2 mg) Record the weights.
- . Pour approximately 200 grams of silica gel into a small air-tight container. Weigh on a balance to the nearest 0.1 grams. Record this initial weight.

7.3.2 After particulate sampling

- . When the used filters are returned to the laboratory, place them (in their original aluminum foil envelopes) in a drying oven set to 105°C for 2 hours. Remove to a desiccator for 24 hours and weigh to the nearest 0.1 mg.
- . Reweigh the spent silica gel to determine the net water weight gain.
- . After desiccation for 24 hours weigh a group of porcelain or glass evaporating dishes to the nearest 0.1 mg. Pour the acetone rinses from each test into separate dishes and evaporate to dryness at 120°F. Return the dishes to the desiccator for 24 hours and reweigh. Record these weights. A 100 ml acetone blank should be processed in a similar fashion. The blank should be accounted for in the final results. Record the blank values.

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