



Designation: D7868 – 21

Standard Practice for Determining the Dry Fall (Fog) Properties of Protective Coatings¹

This standard is issued under the fixed designation D7868; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This practice covers a procedure for qualitatively evaluating the dry fall properties of coatings. The establishment of the test environment and the evaluation procedures are described.

1.2 This practice uses panels containing an automotive finish since these types of surfaces are often the primary concern relating to overspray damage. Panels coated with other systems may be used as collection surfaces when they are deemed to be more representative.

1.3 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*²

D610 Practice for Evaluating Degree of Rusting on Painted Steel Surfaces

D5402 Practice for Assessing the Solvent Resistance of Organic Coatings Using Solvent Rubs

¹ This practice is under the jurisdiction of ASTM Committee D01 on Paint and Related Coatings, Materials, and Applications and is the direct responsibility of Subcommittee D01.46 on Industrial Protective Coatings.

Current edition approved Nov. 1, 2021. Published November 2021. Originally approved in 2013. Last previous edition approved in 2017 as D7868 – 13 (2017). DOI: 10.1520/D7868-21.

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

3. Terminology

3.1 *Definitions:*

3.1.1 *dry fall/fog coating, n*—an interior or exterior coating specially formulated so that the fine particles of overspray dry to a dust or powder during a free fall of a certain distance at specific temperature and humidity ranges, and will not adhere to surfaces on which the overspray is subsequently deposited.

4. Summary of Practice

4.1 A structural frame is erected and enclosed unless a dry fall/fog test chamber or laboratory space is pre-designated. Spray targets are placed at the top, inside the enclosure. Four steel panels coated with an automotive basecoat/clear coat system are placed on the enclosure floor to collect the dry fall. (Panels coated with other systems or uncoated panels, or both, can be used when they are deemed to be more representative.) A duplicate panel set is maintained at the prevailing air temperature, while the other duplicate panel set is heated in oven and placed inside the enclosure immediately prior to atomizing the coating. The coating is atomized against the targets at each of two distances and the panels are removed for evaluation. Two of the coated steel panels remain at laboratory ambient conditions, while the “pre-heated” panels are returned to a laboratory oven. The heated and ambient coated panels are cleaned and evaluated after 24-h for dry fall attachment.

5. Significance and Use

5.1 Attachment of overspray particles to vehicles and other surfaces not intended to be coated can result in property damage and insurance claims. Dry fall coatings are formulated such that overspray particles dry as they move through the air, and before they land on horizontal surfaces. These particles can then be brushed off, vacuumed or washed from the surfaces with no damage. This practice can be used to evaluate the dry fall properties of coatings prior to large scale use. The practice can also be used to evaluate whether the coating(s) possess the same dry fall properties when the fallout collects on surfaces with an elevated temperature.

6. Reagents

6.1 *Commercially available Car Washing Concentrate.*

6.2 *Mineral Spirits.*



FIG. 1 Dry Fall Evaluation Enclosure with Plastic Sheeting
(Note—Base is heightened using 1.5 in. wooden blocks.)

7. Procedure

7.1 Construct a frame (enclosure) using steel conduit and couplings or other materials of construction. The interior of the enclosure measures approximately 3 ft wide by 4 ft deep and is approximately 20 ft high in order to permit a dry fall test distance of 18 ft.³ Enclose the frame with plastic sheeting or tarpaulins and secure, making sure there is access at the base of the enclosure to add and remove the collection surfaces (coated panels). A base constructed of plywood and protected with paper or plastic sheeting (that can be pushed in/pulled out to load/unload the panels) may be used. This requires the frame to be heightened approximately 2 in. from the floor surface using wooden blocks or other methods (see Fig. 1).⁴

³ Other dry fall distances can be selected as agreed upon between purchaser and seller. The enclosure height may be adjusted to accommodate other dry fall distances.

⁴ A dry fall/fog paint properties evaluation laboratory may be used in lieu of an enclosure.

7.2 Fabricate and suspend (vertically) a spray target constructed of 1/8 in. by 3 by 3 ft wood or other rigid material onto two hanging rods inside the enclosure. Mount troughs along the bottom edge of the target (optional) or position the collection surfaces to prevent dripping coating on the dry fall collection surfaces at the base of the enclosure. The spray targets are positioned at the top of the enclosure to allow a dry fall distance of 18 ft, and are positioned 48 in. and 24 in. from the spray gun tip (see 7.7 and 7.9). The spray targets shall be replaced for each test to prevent build-up of wet coating on the targets and potential dripping onto the dry fall collection surfaces at the base of the enclosure (see Fig. 2).

7.3 Mix and reduce (thin) the coating material according to the manufacturer's instructions, by the maximum amount permitted. Record the material temperature. Atomize the coating by airless spray (unless another spray method is mutually selected), using the pump pressure, hose diameter and tip size recommended by the manufacturer. If the coating manufacturer recommends a range of pump pressures and tip sizes, use the lowest pump pressure and the largest tip size (of the ranges recommended) to create a worse case scenario. Record the actual pressure and tip size used, and the type, batch number and amount of reducer used.

7.4 Record the date and time of day. Measure and record the air temperature, relative humidity and dew point temperature inside the enclosure. Testing should be performed when the air temperature is between 60 and 80°F (16 and 27°C) and the relative humidity is between 40 and 85 %. The enclosure should not be mechanically ventilated.

7.5 Place duplicate 4 by 6 in. steel panels coated with an automotive system (basecoat/clear coat) near the center of the enclosure base. The color of the coating on the panels shall be black unless another panel color is mutually selected or required for contrast to the color of the dry fall product being evaluated. Record the coating system on the panels as well as the color of the finish coat on the panels. The surface temperature of the panels shall be measured and recorded. Place a second set of duplicate steel panels near the center of the enclosure base (that have been pre-heated in an oven maintained at 50°C until a surface temperature of 122°F (50°C) is attained).⁵ Record the oven temperature. This set of pre-heated panels (designed to replicate a hot surface) shall be placed inside the enclosure within 10 s of coating atomization to minimize heat loss. Identify the back sides of the panels with the replicate number; (for example, 1, 2) and the condition (for example, normal and hot).

7.6 Position the spray target (described in 7.2) at the top of the enclosure against the back wall. Orient the target vertically (the middle of the target should be approximately 18 ft from the dry fall collection platform at the base of the enclosure). Record the start time, then atomize the coating against the spray target (48 in. from the spray tip) for 45 ± 3 s.⁶ Monitor

⁵ The use of thicker steel panels (for example, 0.25 in.) will retain heat longer than thinner steel panels.

⁶ Shorter atomization time (for example, 15 s.) may be invoked when shorter dry fall distances (for example, 10 ft) are employed.

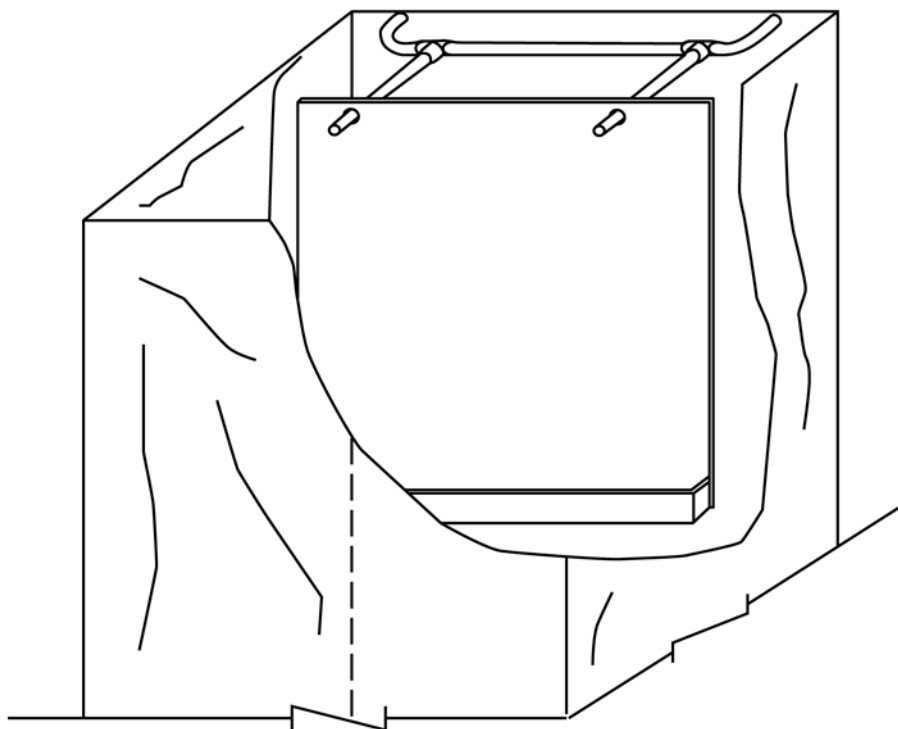


FIG. 2 Illustration of Target Suspension Inside Upper Area of Enclosure
(Note—Top is enclosed with plastic or tarpaulins.)

the atomization time using a stopwatch. After the elapsed spray time, immediately remove the panels from the base of the enclosure. Allow two of the steel panels to remain at laboratory ambient conditions (nominal 77°F (25°C) and 50 % relative humidity) for approximately 24 h. Immediately place the pre-heated panels back into laboratory oven (maintained at 122°F (50°C) for 24 h. After the 24 h period, proceed to 7.8.

7.7 Repeat steps 7.2 – 7.6 with a new target positioned midway in the enclosure so that it is 24 in. from the spray tip. To reduce any influence of residual solvent vapors inside the enclosure, allow a minimum of 30 min between spray trials with the same product (for example, between 48 and 24 in. spray distances) and a minimum of 1 h between products.⁷

7.8 Allow the panels removed from the oven to equilibrate to room temperature, then evaluate the surface of the ambient and oven panels by attempting to remove the dry fall by dry brushing (using a clean, soft bristle dust pan brush). Rate and record the degree of attachment after dry brushing (DB) using Fig. 3 (4–DB to 1–DB).

7.9 If dry brushing will not remove the overspray, use moderate pressure⁸ with a cellulose sponge and standard car wash concentrate, diluted per the manufacturer's instructions in warm (70 to 90°F (21 to 32°C) water to scrub the surface.

Rate and record the degree of attachment after scrubbing the surface with the car wash (CW) solution using Fig. 3 (4–CW to 1–CW).

7.10 If moderate scrubbing with a cellulose sponge and standard car wash concentrate in warm water will not remove the overspray, use moderate pressure with cotton cloths and mineral spirits to scrub the surface. Rate and record the degree of attachment after scrubbing the surface with mineral spirits (MS) using Fig. 3 (4–MS to 1–MS).

7.11 Other methods of removal such as pressure washing may be used.

8. Report

8.1 The following information shall be documented and reported.

- 8.1.1 Product manufacturer and product number.
- 8.1.2 Batch number of product and reducer.
- 8.1.3 Date and time of testing.
- 8.1.4 Coating system used on dry fall collection panels.
- 8.1.5 Prevailing temperature and relative humidity conditions.
- 8.1.6 Type and amount of reducer added.
- 8.1.7 Application method.
- 8.1.8 Application equipment (pressure, tip size, hose diameter).
- 8.1.9 Pre-test oven temperature.
- 8.1.10 Post-test oven temperature.
- 8.1.11 Dry fall distance (if greater or less than 18 ft).
- 8.1.12 Elapsed time of atomization.

⁷ Alternatively, one side of the enclosure may be opened for ventilation between spray trials or product trials, or both.

⁸ As defined by subsection 6.1 of Practice D5402, the pressure exerted onto a cellulose sponge or cotton cloth on a laboratory balance required to generate 1000 to 2000 g of force shall be considered by this practice to be moderate pressure.