Designation: D 3438 – 99

Standard Practice for Sampling and Handling Naphthalene, Maleic Anhydride, and Phthalic Anhydride[1]

This standard is issued under the fixed designation D 3438; 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 procedures for sampling and handling naphthalene, maleic anhydride, and phthalic anhydride in various solid forms, and as liquids at elevated temperatures in a safe manner that represents and preserves quality.

1.2 Any person sampling or handling these products should have specific first aid instructions and equipment available for use in the event of personal contact or exposure.

1.3 *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 and health practices and determine the applicability of regulatory limitations prior to use.* For specific hazard statements, see Sections 3, 4, 5, 6, and 7.

2. Referenced Documents

2.1 *ASTM Standards:*

E 300 Practice for Sampling Industrial Chemicals[2]

2.2 *Other Documents:*

OSHA Regulations, 29 CFR, Paragraph 1910.1000 and 1910.1200[3]

U.S. DOT Regulations, 49CFR Transportation, Subchapter C, Parts 171-180[3]

3. Significance and Use

3.1 This practice is issued to provide information useful in establishing sampling and handling procedures. It is expected that this information will only be utilized in conjunction with an existing health and safety program. The information provided cannot be used as a substitute for expert safety and medical advice, but rather as a supplement to such advice.

4. Description of Products (See Tables 1 and 2)

4.1 Phthalic anhydride is classified as hazardous by the Department of Transportation as a corrosive material and is therefore subject to DOT regulations governing the transportation of hazardous materials. Maleic anhydride and napthalene are classified as hazardous by the Department of Transportation and are subject to DOT regulations. Maleic anhydride has the classification corrosive material, and naphthalene has the classification flammable solid.

4.1.1 These products are normally transported in several types of containers, including cartons, barrels, bags, cans, metal and fiber drums, tank trucks, tank cars, and barges.

4.1.2 Products shipped by air must be packaged to meet IATA and (ICAO) requirements.

4.2 While these products are dangerous when handled improperly, particularly at elevated temperatures, their unloading need not be hazardous provided the hazards are recognized and handling instructions are rigidly observed.

5. Hazards

5.1 *Health*—Consult current OSHA regulations and supplier's Material Safety Data Sheets, and local regulations for all materials used in this practice.

5.1.1 Aside from the risk of burns in handling these products when molten, and a possibility of dermatitis from impurities, particularly in crude grades, industrial use does not present a significant health hazard. However, ordinary handling precautions must be observed to protect personnel from contact with molten material or excessive exposure to dusts or high concentrations of vapor.

5.1.2 Precautions must be observed to protect personnel from excessive inhalation of vapors and dust.

NOTE 1—For permissible exposure limits see OSHA Regulations, paragraph 1910.1000.

5.2 *Fire*:

5.2.1 These products in both the solid and liquid forms are combustible, and introduce a potential fire hazard where they are stored, handled, or used.

5.2.2 Naphthalene, maleic and phthalic anhydride vapors or dust can form explosive mixtures with air.

5.2.3 When molten naphthalene, at temperatures above 110°C, comes into contact with water, foaming or possible explosion may result.

5.2.4 Dry chemicals, carbon dioxide, and foam can all be used in fighting fires involving these materials.

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[1] This practice is under the jurisdiction of ASTM Committee D16 on Aromatic Hydrocarbons and Related Chemicals and is the direct responsibility of Subcommittee D16.08 on Handling and Sampling Aromatic and Cyclic Hydrocarbons.

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[2] *Annual Book of ASTM Standards*, Vol 15.05.

[3] Available from Superintendent of Documents, Government Printing Office, Washington, DC 20402.

TABLE 1 Typical Physical Properties

Product	Melting Point, °C	Boiling Point, °C	Forms	Flash Point, °C	Explosive Limit, %		Ignition Temperature, °F	Specific Gravity, 20°C
					Lower	Higher		
Naphthalene	80	218 (sublimes)	flakes, balls, liquid, rods, tablets	78	0.9	5.9	979	1.15
Maleic anhydride	53	200 (sublimes)	rods, briquettes, liquid	101	1.4	7.1	878	1.43
Phthalic anhydride	130	284 (sublimes)	flakes, liquid	165	1.7	10.5	1058	1.53

TABLE 2 Bulk Packaging Regulatory Information

NOTE 1—Single packagings are not permitted on passenger aircraft in accordance with the International Civil Aviation Organization Technical Instructions for the Safe Transport of Dangerous Goods By Air and the International Air Transport Association Dangerous Goods Regulations.

DOT Basic Description	RQ, lb	Listed Marine Pollutant	Packaging Authorization 49 CFR, 173.*			Label(s)	Placards	Remarks
			Exception	Non-bulk	Bulk			
Naphthalene, crude, 4.1, UN1334, III	100	yes	151	213	240	Flammable Solid	Flammable Solid	See Note 1.
Naphthalene, refined, 4.1, UN1334, III	100	yes	151	213	240	Flammable Solid	Flammable Solid	See Note 1.
Naphthalene, molten, 4.1, UN2304, III	100	yes	151	213	241	Flammable Solid	Flammable Solid	Forbidden for air transport.
Maleic anhydride, 8, UN2215, III	5000	no	154	213	240	Corrosive	Corrosive	Molten maleic anhydride is forbidden for air shipment. For non-molten, see Note 1.
Phthalic anhydride, 8, UN2214, III	5000	no	154	213	240	Corrosive	Corrosive	Basic description applies for phthalic anhydride with more than 0.05 % maleic anhydride. Note, molten phthallic anhydride is forbidden for air shipment. For non-molten, see Note 1.

5.2.5 Maleic anhydride decomposes violently in the presence of amines or alkali metals, especially at elevated temperatures.

5.3 For chemical emergency (spill, leak, fire, exposure, or accident) call CHEMTREC, day or night, at 1-800-424-9300. For emergency calls outside the United States, call 703-527-3887. (Collect calls are accepted and all calls are recorded.)

6. Protective Equipment

6.1 Persons handling molten naphthalene, maleic, and phthalic anhydrides require eye, face, respiratory, body, skin, and hand protection. Coveralls or rubber apron, or both; rubber shoes or boots; chemical goggles or face shield, or both; Bureau of Mines organic respirator (Type AB); and gauntlet-type leather or rubber gloves are recommended.

6.2 Personal protective equipment is not an adequate substitute for good safe working conditions, proper ventilation, and intelligent conduct. Correct usage of protective equipment requires education in its proper use.

7. Safety Precautions

7.1 Unloading, loading, and sampling operations of molten liquids should be performed only by carefully instructed personnel and only when adequate light is available.

7.2 Exercise care to prevent spills and leaks. If they do occur, only properly protected personnel should remain in the contaminated area.

7.3 Allow spilled material to cool and solidify. If the spill is large, rope the area off. All spill-related activities should comply with applicable EPA, OSHA, and local regulations and laws.

7.4 Because of fire and explosion hazards, do not permit open flames in the vicinity of tank carriers, other shipping containers, or storage tanks. Provide all electrical fixtures with vapor-proof globes and explosion-proof safety devices. Ground tank carriers and metal drums by an approved method. Prohibit smoking.

7.5 Employees shall:

7.5.1 Know the hazards connected with the handling of naphthalene, maleic anhydride, and phthalic anhydride;

7.5.2 Be completely acquainted with the purpose, use, and maintenance of personal protective equipment;

7.5.3 Be trained to report promptly to supervision all suspected leaks or equipment failures;

7.5.4 Be trained to recognize and report any symptoms of systemic poisoning or skin contact; be thoroughly trained in the proper procedures for administering first aid and for obtaining professional medical help;

7.5.5 Know and routinely practice the accepted methods of sampling and handling these materials in order to avoid spilling or splashing, leaks, skin contact, vapor or mist inhalation, or ingestion;

7.5.6 Be completely familiar with the location and operation of safety showers, eye baths, hose lines, and all other first aid equipment; and

7.5.7 Know the importance of personal cleanliness and the necessity for immediate removal of clothing contaminated with these materials.

8. Unloading Tank Cars or Tank Trucks

8.1 Before unloading the tank car, observe all safety precautions. Always follow DOT Regulations shipper's instructions for unloading, and read and observe all caution markings on both sides of the tank or dome. In general, the safety precautions and procedures recommended are also applicable to tank trucks and barges.

8.2 Always keep in mind that these materials are hot enough when molten to cause severe burns.

8.3 Because these materials are solids at temperatures below 50°C, it is necessary to apply steam to the heater coils of the car to melt the material and get it hot enough for unloading.

8.4 Opening of the tank car dome cover, connection of steam or heater coils, attachment of delivery lines and pumps should all be done by accepted safety procedures.

8.5 Avoid steam pressures and temperatures that will raise the temperature to a point where expansion will cause an overflow at the top of the dome. It is recommended that the contents be heated with steam coils and held at the temperatures listed below until completely molten. Heating the contents more than 5°C above these temperatures is dangerous, because of the likelihood of boil-over.

Product	Recommended Maximum Temperature,° C (°F)
Naphthalene	90 (194)
Maleic anhydride	70 (158)
Phthalic anhydride	140 (284)

8.6 With the tank car dome cover still open and the contents of the car completely liquefied, the product is ready to be sampled and unloaded.

9. Sampling Tank Cars

9.1 Use brown 1-qt (1-L) bottles made of heat-resistant glass with screw caps to collect samples of molten maleic anhydride and phthalic anhydride. Use metal 1-qt cans with screw caps for sampling molten naphthalene.

NOTE 2—Caps must have aluminum foil liners.

9.2 Install the can or glass bottle in a suitable weighted sampling harness, constructed in such a way that the top of the container is held in an upright position, when the apparatus is lowered into the car.

9.3 Obtain the sample through the open dome. Lower the can or bottle in the weighted harness quickly to the bottom of the compartment, and raise it slowly at such a rate so that it is about three fourths full as it emerges from the liquid.

9.3.1 Remove the sample apparatus carefully, taking care not to strike it sharply against the tank car. As soon as the sampling container is removed from the harness, cap and wipe it off with a rag before the material solidifies on the threads.

9.3.2 Label the sample container in accordance with OSHA Regulations to indicate, as a minimum, the source of the sample, type of material, quantity, hazards, and the purpose of the sample.

9.3.3 It should be emphasized that cleanliness and the absence of moisture are absolutely essential to ensure that a truly representative sample is obtained from the tank car. The practices recommended for Practice E 300 should be observed.

10. Sampling Metal Drums and Cans of Naphthalene

10.1 Before heating the container of naphthalene, provide a vent and protect the material from contamination. Melt the naphthalene under dry heat. If it is necessary to use a water bath for melting, protect the naphthalene from any moisture contamination.

10.2 To ensure a representative sample, mix the contents of the container thoroughly by a suitable means.

10.3 Sample the naphthalene as soon as possible after it is melted and mixed. Collect the sample in tinned cans. Sampling may be done either by dipping out portions or by means of a heated pipet.

10.4 Label the sample container in accordance with 9.3.2.

11. Sampling Solid Naphthalene (Chips, Flakes, Balls)

11.1 *Bulk Quantities*:

11.1.1 Take a representative sample, preferably from a falling naphthalene stream, using a straight-path sampler. Adjust sampler feed rate, slot width, cutter speed, and frequency to collect ½ lb of sample per 10 000 lb (4540 kg) of naphthalene.

11.1.2 Melt the entire naphthalene sample and mix thoroughly before analyzing.

11.2 *Bags*:

11.2.1 Using a small thief 8 to 12 in. (203 to 305 mm) remove about ½ lb of sample from 1 bag out of every 40 bags (4000 lb) (1814 kg) of naphthalene. Take the sample from the filling ear or, if necessary, by opening one corner of the bag. Place each sample in a plastic bag or brown glass jar labeled with proper identification.

11.2.2 Make a composite blend from the individual samples. Melt the blend and mix thoroughly before analyzing.

11.3 *Drums (200 to 240 lb (91 to 109 kg))*:

11.3.1 Insert a thief into the center of the drum to the halfway point and remove about 200 g of naphthalene. Sample 1 drum out of every 20 drums (4000 to 5000 lb (1814 to 2268 kg)). Place each sample in a plastic bag or glass jar labeled with proper identification. Label the sample container in accordance with 9.3.2.

11.3.2 Make a composite blend from the individual samples. Melt the blend and mix thoroughly before analyzing.

11.3.3 Label the sample container in accordance with 9.3.2.

12. Sampling Solid Phthalic Anhydride and Maleic Anhydride

12.1 For the purpose of this sampling procedure, a sample unit is defined as 2000 lb (907 kg) consisting of forty 50-lb (22.7-kg) bags, for phthalic anhydride and maleic anhydride. These are usually shipped on a pallet.

12.2 It is recommended that 10 % of the shipment be sampled, with a maximum of five sample units comprising a composite sample.

12.3 A maximum of five sample units may be composited for analysis with a minimum of 200 g taken from each sample unit.

12.4 Sample containers shall be brown glass bottles, fitted with aluminum foil-lined caps. Before use, clean and dry the bottles in a clean air convection-type oven.

12.5 Nickel, high-density polyethylene, polypropylene, or

stainless steel-type scoops are recommended for taking samples of product from the bags selected for sampling.

12.6 Place samples taken for interlaboratory testing or shipment in a polyethylene bag that is subsequently sealed and placed in a brown bottle containing a desiccant. If a sample exchange between purchaser and seller is indicated, duplicate samples must be taken and packaged as recommended.

12.7 Extreme care and good judgment are necessary to ensure that the samples truly represent the product. Since the maleic and phthalic anhydride is packaged in multiwall moisture-resistant paper bags, take care in obtaining the sample.

12.8 Remove approximately 75-g portions from each of the bags selected from a sample unit and place in a wide-mouth brown bottle with a polyethylene-lined cap. Seal the opened bags with a suitable tape.

12.9 Label the bottle and bags in accordance with 9.3.2. for future identification in the testing laboratory.

13. Keywords

13.1 handling; maleic anhydride; naphthalene; phthalic andhydride; sampling