



Designation: E2543 – 08 (Reapproved 2022)

# Standard Specification for Portable Air Heaters Used at Personnel Decontamination Stations and Shelters<sup>1</sup>

This standard is issued under the fixed designation E2543; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

## 1. Scope

1.1 This specification is used to standardize the portable air heaters used on personnel decontamination lines to insure the heaters provide sufficient heated air for personnel comfort before, during, and after the decontamination for as long as they are needed during the emergency.

NOTE 1—These heaters are not intended to be used for the decontamination for any other surface or material. Also, these heaters are intended to be portable and easy to use by first responders during a chemical, biological, radiological, nuclear, and explosive (CBRNE) event.

1.2 This specification contains a specification section and a test methods section so users need to refer to the section applicable to their needs when using this standard specification.

1.3 The values stated in SI units are to be regarded as standard. The values given in parentheses are for information only.

NOTE 2—The U.S. first responder personnel using the equipment manufactured under this standard are not likely to be familiar with SI units so English units need to be included as part of the system documentation and shown on control panels for any equipment sold to U.S. organizations.

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.*

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee E54 on Homeland Security Applications and is the direct responsibility of Subcommittee E54.01 on CBRNE Detection and CBRN Protection.

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## 2. Referenced Documents

2.1 *ASTM Standards:*<sup>2</sup>

D3195 Practice for Rotameter Calibration

E11 Specification for Woven Wire Test Sieve Cloth and Test Sieves

2.2 *NFPA Standard:*<sup>3</sup>

NFPA 70 National Electrical Code

2.3 *NIST Standard:*<sup>4</sup>

Recommended Practice Guide Special Publication 960-12 Stopwatch and Timer Calibrations

## 3. Terminology

3.1 *Definitions:*

3.1.1 *decontamination, n*—process of reducing or eliminating the hazards associated with chemical, biological, or radiological contamination.

3.1.1.1 *Discussion*—The means of decontaminating personnel, equipment, or areas include absorption, neutralization, weathering, and physical removal of the contaminant and hazards associated with nuclear, biological, or chemical (NBC) agents.

## 4. Classification

4.1 There will be no attempt to classify into categories the different types of portable air heaters that can fall under this specification since this specification will only address the minimum requirements these heaters shall satisfy.

## 5. Ordering Information

5.1 Personnel ordering portable air heaters using this specification as a basis for their order should be aware that this specification is the minimum requirement for these types of devices and any needs beyond these minimum requirements shall be stated in the request for quote.

<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

<sup>3</sup> Available from National Fire Protection Association (NFPA), 1 Batterymarch Park, Quincy, MA 02169-7471, <http://www.nfpa.org>.

<sup>4</sup> Available from National Institute of Standards and Technology (NIST), 100 Bureau Dr., Stop 1070, Gaithersburg, MD 20899-1070, <http://www.nist.gov>.

## 6. Mechanical Properties

6.1 The heater materials of construction shall be easily cleaned of surface mud and grime with no degradation of the unit's ability to perform its function.

6.2 The preferred fuels for the heater section of the portable air heater are diesel fuel, gasoline, or bottled propane gas. If electricity is used, the circuit shall be no more than 120 V, 30 A, single phase, and shall conform to NFPA 70 for outdoor usage.

## 7. Performance Requirements

7.1 Be able to provide a continuous flow of warm air between 27 °C and 35 °C (80 and 95 °F) at a flow rate of not less than 0.24 m<sup>3</sup>/s (500 ft<sup>3</sup>/min).

7.2 The input line shall be filtered using an ASTM Number 7 filter (manufactured according to Specification E11) to remove solid contaminants that might damage the equipment or injure the personnel in the shelter.

NOTE 3—The air inlet will provide suction to the area around the inlet. The user may wish to provide a design to prevent covering or clogging the inlet with debris and suitable marking devices to warn users of the inlet's suction. Additionally, as specified, the inlet filter is not intended to protect against chemical and biological warfare agents. The sole intended purpose of the inlet filter is to protect the air heater device from debris that may be attracted to it as a result of the suction of the inlet.

7.3 Be capable of providing warm air flow within the temperature range specified in 7.1 within 2 min of being supplied –20 °C to +35 °C (–4 to +95 °F) feed air.

## 8. Other Requirements

8.1 Contain sufficient hoses as part of the unit packaging to allow for an air intake up to 15.24 m (50 ft) distant and provide warm air to a shelter up to 7.62 m (25 ft) from the unit. The warm air outlet duct from the unit shall be able to connect to a 15 cm (6-in.) duct.

## 9. Dimensions, Mass, and Permissible Variations

9.1 The unit shall be man-transportable by not more than four first responders carrying the assembled unit and not weigh more than 91 kg (200 lb) not including the fuel and hoses.

## TEST METHODS

### 10. Scope

10.1 These test methods shall be used to insure portable air heaters comply with the requirements of this specification.

### 11. Significance and Use

11.1 The use of these acceptance tests will insure that organizations buying portable heaters will be assured the heaters meet certain performance requirements.

### 12. Hazards

12.1 Personnel using this portable air heater should take precautions against normal industrial hazards, such as fire and temperature hazards or accumulation of exhaust. They shall also comply with all other manufacturer's warnings when using the equipment.

## 13. Procedure

### 13.1 *Measurement of the Air Heater Unit's Air Flow:*

13.1.1 The testing facility shall obtain an air flow meter (certified to Practice D3195) with a current calibration in the 0.0833 m<sup>3</sup>/s to 0.333 m<sup>3</sup>/s flow regime for the unit's hot air side.

13.1.2 Install the flow meter as specified by the manufacturer's instructions on the warm air outlet of the heater unit.

13.1.3 Begin operation of the air heater unit, in accordance with the manufacturer's instructions.

13.1.4 Allow 2 min to pass, as measured by a calibrated stopwatch certified by NIST Recommended Practice Guide Special Publication 960-12.

13.1.5 Record the flow rate of the warm air as detected by the flow meter, perform follow-on recordings either using an automated continuous recording device (with physical checks of the device being performed hourly to insure continued operation of the air heater unit), or manually recording the flow rate on an hourly basis. The warm air measurement shall take place at the warm air outlet, at least 7.62 m (25 ft) from the unit. The warm air outlet hose shall be exposed to the same ambient air temperatures as used for the air introduced into the heater system.

13.1.6 Maintain operation of the air heater unit for a minimum of 12 h to insure the air heater unit can continuously supply warm air at this rate.

### 13.2 *Measurement of the Air Heater Unit's Air Input and Output Temperatures:*

13.2.1 The testing facility shall obtain an air temperature meter (certified to ASTM Manual MNL 12<sup>5</sup>) with a current calibration in the –25 °C to +35 °C range for the cold air inlet and the unit's warm air outlet.

13.2.2 Install the temperature meters as specified by the manufacturer's instructions on the inlet and outlet of the air heater unit.

13.2.3 Begin operation of the unit, in accordance with the manufacturer's instructions.

13.2.4 Allow 2 min to pass, as measured by a calibrated stopwatch certified by NIST Recommended Practice Guide Special Publication 960-12.

13.2.5 Record the temperature of the inlet and outlet air as detected by the temperature meters, perform follow-on recordings either using an automated continuous recording device (with physical checks of the device being performed hourly to insure continued operation of the unit), or manually recording the temperatures on an hourly basis. The warm air measurement shall take place at the warm air outlet, at least 7.62 m (25 ft) from the unit and with the temperature of the ambient air surrounding the outlet duct being the same as the temperature of the air entering the unit.

13.2.6 Maintain operation of the unit for a minimum of 12 h to insure the air heater unit can continuously supply warm air at this temperature.

<sup>5</sup> Manual on the Use of Thermocouples in Temperature Measurement, Fourth Edition, MNL 12, ASTM International, West Conshohocken, PA, 1993.