



Procedures for the Determination and Expression of the Volume of Household Microwave and Conventional Ovens

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Documents

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PREFACE

The Association of Home Appliance Manufacturers develops standards in accordance with AHAM's "Policy and Procedures Governing Technical Standards", which states:

“AHAM Standards shall be in the best interest, mutually, of consumers who use appliances, and other properly interested parties.”

Use or observance of AHAM standards is voluntary.

This standard contains procedures which may be applied to any brand or model of household microwave, electric or gas oven for determining and measuring volume. Results of measurements in accordance with this standard may be publicly stated.

With regard to safety, AHAM recommends that all appliance products - both major and portable - manufactured or marketed in the United States be submitted to an appropriate independent laboratory for inspection and listing in conformance with the safety standards and procedures followed by such laboratories.

AHAM welcomes comments and suggestions regarding this standard. Any standard may be reviewed and improved as needed. All standards must be updated or reconfirmed at least every five years. Any interested party, at any time, may request a change in an AHAM standard. Such request should be addressed to AHAM's President, and should be accompanied by a statement of reason for the request and a suggested alternate proposal.

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INTRODUCTION

The project to develop a standardized method for measuring and expressing the volumes of oven cavities originated in June 2003 following an agreement by those AHAM member companies that manufacture microwave ovens to proceed with its preparation. At first, only microwave ovens were considered.

Subsequently in March 2004 the scope of the effort was broadened to encompass gas and electric fuelled conventional ovens at the direction of AHAM's Major Appliance Engineering Council, in response to requests from manufacturers of those appliances.

A task force of specialists was formed with representation from member companies and relevant outside bodies, and consensus was reached on the procedures documented herein.

The following principles were adopted:

- The use of only direct linear measurement.
- Procedures cover the determination of both overall volume and usable space.
- The limiting of claimed usable space to that contained within a hypothetical rectangular box which could be inserted through the entrance aperture.
- The coverage of as many practical situations as could reasonably be envisioned, with additional instructions on nonconforming situations.
- The extensive use of additional explanatory diagrams to aid clarity.

It is recognized that the rounded imperial and metric units specified in this standard are not direct equivalents. Survey of the consumer market has indicated that established practice is to quote cavity volume either to the first decimal of a cubic foot or to the nearest liter, and it is not proposed to change this.

It is believed that this is the first standard to address these measurements in this level of detail. AHAM welcomes comments on its usability as a working document for possible incorporation in a future edition.

1. PURPOSE

This standard establishes a uniform, repeatable procedure or standard method for determining and expressing the overall volume, and usable oven space, of the cooking cavity of individual household ovens.

The standard method is not intended to inhibit improvement and innovation in product testing, design or performance.

2. SCOPE

These procedures apply to the ovens of those household cooking appliances listed under Sections 2.1 to 2.3 below. For the purpose of these requirements, household cooking appliances are those intended for household use.

2.1 Microwave Ovens:

- 2.1.1. Household microwave ovens operated in the Industrial, Scientific and Medical (ISM) bands of 915 ± 25 and 2450 ± 50 MHz, for use in ordinary locations in accordance with the National Electrical Code, NFPA 70.
- 2.1.2. Free-standing countertop microwave ovens together with those intended for built-in installation, side-by-side mounting, stacking, wall mounting and installation over ranges.
- 2.1.3. Ovens for which microwave heating is the primary function, whether or not alternative cooking methods such as radiant or convection heating are also included, and whether manufactured as stand-alone devices or in combination with other appliances.

2.2 Electric Ovens:

- 2.2.1. In floor supported ranges equipped with surface units and one or more ovens.
- 2.2.2. In built-in combinations of surface units and one or more ovens.
- 2.2.3. Wall mounted ovens with one or more ovens.
- 2.2.4. Built-in ovens with one or more ovens.
- 2.2.5. Ovens in which radiant or convective heat produced by electricity is the primary cooking method, whether or not alternative methods are also included.
- 2.2.6. *Not covered* are portable ovens for countertop use.

2.3 Gas Ovens:

- 2.3.1. In floor supported ranges equipped with surface units and one or more ovens.
- 2.3.2. In built-in combinations of surface units and one or more ovens.
- 2.3.3. Wall mounted ovens with one or more ovens.
- 2.3.4. Built-in ovens with one or more ovens.
- 2.3.5. Ovens in which radiant or convective heat produced by the burning of any fuels within the scope of the latest edition of ANSI Z21.1, Household Cooking Gas Appliances, is the primary cooking method, whether or not alternative methods are also included.

3. DEFINITION

- 3.1. **Overall volume.** The total internal volume of the cavity in which cooking takes place.
- 3.2. **Usable oven space.** The volume inside the cooking cavity available for the placement of food.
- 3.3. **Rectangular cavity.** A cooking cavity in which all the principal internal edges are straight and meet at ninety degrees to each other in all axes. The inside door surface is flat and the top and bottom surfaces are horizontal.
 - 3.3.1. **Microwave drawer.** A microwave oven with a rectangular cavity, designed to slide horizontally out of the body of the appliance with the contents loaded and removed from above when so extended. The front surface of the movable portion is a fixed panel. The top of the cavity is a fixed part of the appliance body.
- 3.4. **Non-rectangular cavity.** A cooking cavity in which there is at least one surface that is curved or angled.
- 3.5. **Lowest food surface.** The lowest surface in the cooking cavity upon which food can be placed as recommended by the manufacturer in the user manual.
- 3.6. **Retractable radiant heating element.** In a multiple mode oven, a radiant heating element which, when radiant heating is not in use, may be relocated within the cooking cavity to increase the usable oven space.
- 3.7. **Horizontally reciprocating tray.** In a microwave oven, a food bearing tray which during the cooking process is moved horizontally and continuously across the bottom of the cooking cavity by a reciprocating mechanism.
- 3.8. **Ignored.** As in ignored feature (i.e. as if they are not present)

4. SPECIFIC PROCEDURES FOR MICROWAVE OVENS

4.1. General Principles

- 4.1.1. For the purposes of calculating both overall volume and usable oven space the volume or space occupied by removable items specified by the manufacturer to be not essential for the operation of the appliance, such as shelves or temperature probes, shall be ignored.
- 4.1.2. For the purposes of calculating overall volume where the surfaces forming the boundaries of the cavity incorporate protrusions or depressions, the planes used for measurement shall be those comprising the largest percentages of the total areas of the surfaces. Holes in surfaces shall be ignored when calculating areas for this determination.
- 4.1.3. For the purposes of calculating overall volumes only, the following volumes shall be ignored:
 - a) That occupied by radiant heating elements if provided.
 - b) That occupied by minor irregularities in the cooking compartment walls, including covers over waveguides and lamps.
 - c) That occupied by turntables or reciprocating trays, their drive mechanisms and support arrangements.
- 4.1.4. The stated usable oven space shall not be greater than the volume of the largest hypothetical rectangular box which could be inserted into the cooking cavity without the box being tilted and allow the door to close fully. Any corner radii at the intersections of the interior surfaces of the cooking cavity may be ignored for the purposes of implementing this requirement.
- 4.1.5. For the purposes of calculating usable oven space only, where a microwave oven is additionally provided with retractable radiant heating elements, and the appliance is capable of being operated in the microwave mode without those elements deployed, measurements may be taken with the elements retracted.
- 4.1.6. For the purposes of stating usable oven space, where a microwave oven with a turntable or reciprocating tray is provided with controls to allow cooking without the turntable or reciprocating tray operating if the user desires, then the manufacturer shall state the usable oven space without the turntable or reciprocating tray operating.

4.2. Rectangular Cavities.

4.2.1. Conventional Microwave Ovens - Overall Volume 4.2.1 (See FIGURE 1:).

4.2.1.1. Overall Height (H): The maximum vertical interior dimension to the nearest 1/8" (3 mm) between the plane of the cooking cavity bottom and the plane of the cavity top.

4.2.1.2. Overall Width (W): The maximum horizontal interior dimension to the nearest 1/8" (3 mm) between the planes of the cavity side walls.

4.2.1.3. Overall Depth (D): The maximum horizontal interior dimension to the nearest 1/8" (3 mm) from the plane of the inside surface of the door when closed with the interlocks engaged to the plane of the rear cavity wall.

4.2.1.4. Overall Volume In Cubic Feet (Liters): The product of H, W and D in inches (millimeters), determined as above, divided by 1728 (10^6) rounded to the nearest tenth of a cubic foot (nearest liter).

4.2.2. Conventional Microwave Ovens - Usable Oven Space.

4.2.2.1. Microwave Ovens without Turntables or Reciprocating Trays (See FIGURE 2:)

4.2.2.1.1. Usable Height (h_1). The lesser of the following: The maximum vertical dimension to the nearest 1/8" (3 mm) between the plane of the lowest food surface in the cooking cavity and the plane of the cavity top, or if barriers to food placement exist, the horizontal plane of the lowest extent of such barriers as covers, shields or heating elements, or:

The vertical height of the door aperture to the nearest 1/8" (3mm).

4.2.2.1.2. Usable Width (w_1). The lesser of the following: The maximum horizontal dimension to the nearest 1/8" (3 mm) between the planes of the cavity side walls; or if barriers to food placement exist, the vertical planes of the greatest horizontal extent to which such barriers as covers, shields, shelf supports or heating elements protrude into any part of the cavity above the plane of the lowest food surface, or:

The horizontal width of the door aperture to the nearest 1/8" (3mm).

4.2.2.1.3. Usable Depth (d_1). The maximum horizontal dimension to the nearest 1/8" (3 mm) from the plane of the inside surface of the door when closed with the interlocks engaged to the plane of the rear cavity wall; or if barriers to food placement exist, the vertical plane of the greatest horizontal extent to which such barriers as covers, shields or heating elements protrude into any part of the cavity above the plane of the lowest food surface.

4.2.2.1.4. Usable Oven Space In Cubic Feet (Liters): The product of h_1 , w_1 and d_1 in inches (millimeters), determined as above, divided by 1728 (10^6) and rounded to the nearest tenth of a cubic foot (nearest liter).