DEPARTMENT OF ENERGY

Office of Energy Efficiency and Renewable Energy

10 CFR Part 430

[Docket No. EE–RM–94–230]

RIN 1904–AA–52

Energy Conservation Program for Consumer Products: Test Procedure for Kitchen Ranges, Cooktops, Ovens, and Microwave Ovens

AGENCY: Office of Energy Efficiency and Renewable Energy, Department of Energy.

ACTION: Final rule.

SUMMARY: The Department of Energy (DOE or the Department) is amending its test procedure for kitchen ranges, cooktops, ovens, and microwave ovens. Generally, this rulemaking incorporates portions of the International Electrotechnical Commission Standard 705 and Amendment 2 thereto, and updates the annual useful cooking energy for kitchen ranges, cooktops, ovens, and microwave ovens.

EFFECTIVE DATES: This rule is effective November 3, 1997. The incorporation by reference of portions of International Electrotechnical Commission Standard 705 (referred to as IEC 705) and Amendment 2 thereto (referred to as Amendment 2) as referenced below is approved by the Director of the Federal Register as of November 3, 1997.

ADDRESSES: The Department of Energy (DOE or the Department) is incorporating by reference the following industry consensus test standard upon publication of this final rule.

1. IEC 705, ''Methods for Measuring the Performance of Microwave Ovens for Household and Similar Purposes,'' Section 4, Methods of Measurement, Paragraph 13 ''Electrical Power Input Measurement,'' and Paragraph 14 ''Efficiency'' (1988).

2. IEC 705, Amendment 2, ''Methods for Measuring the Performance of Microwave Ovens for Household and Similar Purposes,'' Section 4, Methods of Measurement, Paragraph 12 ''Microwave Power Output Measurement'' (1993).

Documents incorporated by reference may be viewed at the Department of Energy Freedom of Information Reading Room, U.S. Department of Energy, Forrestal Building, Room 1E–190, 1000 Independence Avenue, SW, Washington, DC 20585, (202) 586–3142, between the hours of 9:00 a.m. and 4:00 p.m., Monday through Friday, except Federal holidays. Copies of the International Electrotechnical Commission publications can be obtained from the American National Standards Institute, 11 West 42nd Street, New York, New York 10036, (212) 642–4936.

FOR FURTHER INFORMATION CONTACT: Terry Logee, U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Mail Station EE–43, Forrestal Building, 1000 Independence Avenue, S.W., Washington, D.C. 20585–0121, (202) 586–1689, FAX (202) 586–4617, terry.logee@ee.doe.gov.

Francine Pinto, Esq., U.S. Department of Energy, Office of General Counsel, Mail Station GC–72, Forrestal Building, 1000 Independence Avenue, S.W., Washington, D.C. 20585–0103, (202) 586–7432, francine.pinto@hq.doe.gov.

SUPPLEMENTARY INFORMATION:

I. Introduction

A. Background

Part B of Title III of the Energy Policy and Conservation Act, as amended (EPCA or the Act), establishes the Energy Conservation Program for Consumer Products Other Than Automobiles (Program).[1] The products currently subject to this Program (often called hereafter ''covered products'') include kitchen ranges, cooktops, ovens, and microwave ovens, which are the subject of today's notice.

Under the Act, the Program consists essentially of three parts: testing, labeling, and Federal energy conservation standards. The Department, in consultation with the National Institute of Standards and Technology (formerly the National Bureau of Standards), is required to amend or establish new test procedures as appropriate for each of the covered products. Section 323 of EPCA, 42 U.S.C. 6293. The purpose of test procedures is to produce test results which measure energy efficiency, energy use, water use (in the case of showerheads, faucets, water closets and urinals), or estimated annual operating cost of a covered product during a representative average use cycle or period of use. The test procedure must not be unduly burdensome to conduct. Section 323 (b)(3) of EPCA, 42 U.S.C. 6293 (b)(3).

DOE is required to determine to what extent, if any, an amended test procedure would alter the measured energy efficiency, measured energy use, or measured water use of any covered product as determined under the existing test procedure. Section 323(e)(1) of EPCA, 42 U.S.C. 6293(e)(1).

One hundred and eighty days after a test procedure for a product is prescribed or established, no manufacturer, distributor, retailer, or private labeler may make representations with respect to energy use, efficiency, or the cost of energy consumed by products covered by this rule, except as reflected in tests conducted according to the new or amended DOE test procedure and such representations fairly disclose the results of such tests. Section 323(c)(2) of EPCA, 42 U.S.C. 6293(c)(2). Thus, beginning on April 1, 1998, representations with respect to the products covered by this rule must be consistent with this amended test procedure.

On May 10, 1978, the Department published the current test procedure for conventional ranges, cooking tops, ovens, and microwave/conventional ranges, 43 FR 20120. These procedures are codified at 10 CFR Part 430, Subpart B, Appendix I. On March 23, 1995, (60 FR 15330), DOE published a proposed rule to amend the current test procedure.

On July 23, 1997, DOE made available to the public copies of a version of this final rule issued on July 17, 1997. That version was not published in the **Federal Register**. Today, DOE publishes this final rule as a substitute for the version issued on July 17, 1997. Today's final rule contains clarifying, non-substantive changes from the version distributed in July.

[1] Part B of Title III of EPCA, as amended, is referred to in this final rule as ''EPCA'' or the ''Act.'' Part B of Title III has been redesignated as Part A for purposes of codification. It is codified at 42 U.S.C.

II. Discussion

A. Cooking Appliances Generally

1. Combined Component Efficiency

DOE proposed to sum the efficiencies of components to calculate the efficiency of combined components (range, microwave/oven or microwave/range). Two commenters stated that the calculation of energy efficiency for all combined components was incorrect in the proposed test procedure. (AHAM, No. 3 at 3; No. 33 Attachment 2 at 2; July 12, 1995 transcript at 46; Whirlpool, No. 28 at 2.)[2]

DOE has corrected the proposed section 4.3, ''Combined Components,'' by removing the requirement to add efficiencies for combined components. The Final Rule provides no method for calculating the efficiencies for combined components because appropriate usage factors could not be determined.

2. Surface Temperature Probe Tolerance

DOE proposed that the tolerance for the surface temperature probe, Section 2.9.3.5, ''Temperature Indicator System for Measuring Surface Temperatures,'' should be changed to ±0.45°F. Several commenters, stated that the surface temperature probe tolerance of ±0.45°F for surface temperature measurement is overly strict and that the tolerance should be ±1°F as stated in the existing test procedure. (Weizeorick, No.3 at 2; July 12, 1995 Transcript at 45; Whirlpool, No. 28 at 2; and AHAM, No. 33 Attachment 2 at 2.) DOE agrees with these comments and will continue to use a tolerance of ±1°F for the surface temperature probe.

3. Comments Regarding Energy Conservation Standards for Cooking Products

Several commenters included statements on issues concerning standards for cooking products in their written comments. (Whirlpool, No. 28 at 2–3; Weizeorick, No. 3 at 6; Donovan et al., No. 47 at 1–2; AHAM, No. 33 at 2, Attachment 3A and Attachment 3C at 6 and 10; Sharp Electronics, No. 40 at 13.) However, this rulemaking is strictly limited to promulgating test procedures for cooktops, ranges, ovens and microwave ovens. Therefore, these comments are outside the scope of this proceeding and will be addressed in the rulemaking entitled; ''Final Rule Regarding Energy Conservation Standards for Kitchen Ranges, Ovens, and Microwave Ovens,'' Docket No. EE-RM–93–201.

[2] Written comments will be referenced by their assigned number.

B. Cooktops, Ranges and Ovens

1. Annual Useful Cooking Energy

In the proposed rule, DOE proposed to modify the annual useful cooking energy from the existing test procedure for each product class to reflect the change in cooking trends in the United States as follows: electric ovens from 47.09 kWh/yr (169.5 MJ/yr) to 35.5 kWh/yr (105.5 MJ/yr), gas ovens from 160.7 kBtu/yr (169.547 kJ/yr) to 124.2 kBtu/yr (131,038 kJ/yr), electric cooktops from 277.7 kWh/yr (1000 MJ/yr) to 209.4 kWh/yr (752.4 MJ/yr), gas cooktops from 947.5 kBtu/yr (999,600 kJ/yr) to 732.5 kBtu/yr (772,800 kJ/yr).

Several commenters contended that the proposed rule overstated the annual energy use of cooktops, ovens, and ranges. (AHAM, July 12, 1995 transcript at 38, 42–44, 47–48; Weizeorick, No. 3 at 1–3, 5; American Gas Association, No. 25 at 4–5; Whirlpool No. 28 at 1–2; Battelle, No. 46 at 2–6.) AHAM and Whirlpool commented that the annual energy consumption of electric cooktops should be lowered from 209.4 kWh/yr to 157.0 kWh/yr based on a Northern Illinois Gas Study. (AHAM, No. 33 at 2 and Whirlpool, No. 28 at 1.)

In response to these comments, the Lawrence Berkeley National Laboratory (LBNL) analyzed an extensive collection of studies including those identified by commenters to obtain today's revised values of annual useful cooking energy. The studies analyzed include: Gas Research Institute Report: ''Topical Report, Metered Ranges, Cooktops, and Ovens in the Northern Illinois Gas Residential Load Study Data Base,'' GRI–93/0204, July 1993; ''Electric Oven and Cooktop Data Analysis,'' prepared for the Association of Home Appliance Manufacturers by Arthur D. Little, Reference 47066, July 15, 1994; Electric Power Research Institute (CU–6952), ''Residential Energy Usage Comparison Project: An Overview,'' October 1990; Lawrence Berkeley National Laboratory (LBL–33717), ''Baseline Data for the Residential Sector and Development of a Residential Forecasting Database,'' May 1994; Electric Power Research Institute (CU–7392), ''Residential Energy Usage Comparison: Findings,'' August 1991; and Electric Power Research Institute (CU–6487), ''Residential End-Use Energy Consumption: A Survey of Conditional Demand and Estimates,'' October 1989. Copies of these studies are available for inspection in DOE's Freedom of Information Reading Room.

Based on the data from the above-referenced studies, DOE calculated a weighted average of the annual useful cooking energy for all cooking products. For estimates of annual useful cooking energy for conventional electric cooktops and ovens, and also for gas cooktops and ovens, only the latest metered data were included. Data used in the analysis shows the trend in cooking usage has been downward and shows indications that there are regional differences and year-to-year fluctuations in cooking usage. No regional effects were included in this analysis.

Accordingly, DOE has lowered the annual useful cooking energy of each product class in this final rule to make it representative of current United States cooking patterns. These quantities are being lowered to 29.3 kWh/yr for electric ovens, 88.8 kBtu/yr for gas ovens, 173.1 kWh/yr for electric cooktops and 527.6 kBtu/yr for gas cooktops.

2. Elimination of Continuous Flow Calorimeter

In the proposed rule, the Department eliminated the requirement to use a standard continuous flow calorimeter for gas cooking products because of the limited availability of this instrument. This change was favorably received by all commenters. (Weizeorick, No. 3 at 2 and Whirlpool, No. 28 at 2.)

In the final test procedure, DOE allows the manufacturer to choose the instrument to be substituted for the standard continuous flow calorimeter. Additionally, DOE requires in section 2.9.4, ''Heating Value,'' that the heating value of natural or propane gas shall be measured with an instrument and associated indicator readout device of a maximum error no greater than ±.5 percent of the measured value and a resolution of ±.2 percent or less of the full scale reading of the indicator instrument.

3. Convection Mode Testing

In the proposed test procedure, DOE added sections 3.2.1, ''Conventional oven test energy consumption'' and subsection 3.3.5 of section 3.3, ''Recorded Values,'' to include convection mode testing. AHAM, Weizeorick and Whirlpool supported these changes in the final test procedures. (Weizeorick, No. 3 at 4; Whirlpool, No. 33 Attachment 2 at 3; July 12, 1995 transcript at 47; Whirlpool, No. 28 at p.2). In the final test procedure, DOE adopted the changes as originally proposed.

4. Electric Clock

DOE proposed that during testing, the electrical clock which uses energy continuously be disconnected, except for microwave ovens. Weizeorick states that it is impossible to disconnect an

electric clock for ranges that have circuits which control the oven and cooktop unit temperatures in conjunction with a clock. (Weizeorick, No. 3 at 4, AHAM, No. 33 Attachment 2 at 2; July 12, 1995 transcript at 46–47.)

DOE agrees that several ranges employ circuits which control the oven and cooktop unit temperatures in conjunction with a clock that cannot be disconnected. Therefore, several sections of the final test procedure have been modified to address this issue. Section 3.2.1.4, ''Clock Power.'' is modified to state that the power rating or the measurement of a continuously operating clock that is an integral part of the timing or temperature control circuit which cannot be disconnected during the test may be multiplied by the applicable test period to obtain test energy consumption in watt-hours (kJ). This procedure is used to calculate annual clock energy consumption for electric clocks that cannot be disconnected. Language has also been added to the following sections to subtract the energy consumed by the clock during testing when the clock cannot be disconnected: Section 2.1, ''Installation''; section 3.2.1, ''Conventional oven test energy consumption''; section 3.2.1.1, ''Conventional oven average test energy consumption''; section 3.2.1.2, ''Energy consumption of self-cleaning operation'; section 3.2.1.4, ''Clock power''; and section 3.2.2, ''Conventional surface unit test energy consumption.''

5. Number of Self-Cleaning Oven Cycles Per Year

In the existing and proposed test procedure, section 4.1.2.3.1, ''Annual primary energy consumption'' and section 4.1.2.3.2, ''Annual secondary energy consumption for self-cleaning operation of gas ovens,'' DOE uses 11 self-cleaning cycles per year for electric ovens and 7 for gas ovens.

Two commenters stated that DOE's number of self-cleaning cycles of 11 and 7 for gas and electric ovens respectively were too high and it should be 4 for both electric and gas ovens as reflected in internal marketing data. (Weizeorick, No. 3 at 2–3; AHAM, No. 33, Attachment 2 at 2, July 12, 1995 transcript at 45–46; Whirlpool, No. 28 at 2.) In response to several comments, DOE has reduced the number of self-cleaning oven cycles per year for gas and electric ovens. DOE agrees with the figures used by the Gas Research Institute in a 1994 Gas Research Institute Topical Report (GRI–94/0195) and has changed the number of self-cleaning cycles per year to 4 for gas and electric ovens.

6. Change of Symbol Representing Number of Hours Per Year—H_K

In the existing and proposed test procedure, DOE uses the symbol ''H_K'' to represent the number of hours in a year. Weizeorick commented that the symbol ''H_K'' in section 4.1.2.4, ''Annual clock energy consumption'' should be changed to ''A'' because the symbol ''H'' is traditionally used to represent heating values. (Weizeorick, No. 3 at 4.) DOE agrees and is substituting the character ''A'' for ''H_K'' in sections 4.1.2.4, ''Annual clock energy consumption'' and 4.2.2.2, ''Annual energy consumption of any continuously burning gas pilots.''

7. Editorial Error in Section 3.1.1, ''Conventional Oven''

DOE has corrected an editorial error in section 3.1.1, paragraph 2. The following language has been changed: ''If the oven * * *, (180.6 °C) air temperature'' to ''If the oven * * *, (180.6 °C) higher than the room ambient air temperature.''

C. Microwave Ovens

1. Annual Useful Cooking Energy

In its Proposed Rule, DOE proposed to modify the annual useful cooking energy from the existing test procedure for microwave ovens to reflect the change in cooking trends in the United States. Use of microwave ovens was proposed to be increased from 34.2 kWh/yr (123 MJ/yr) to 77.3 kWh/yr (278.3 MJ/yr).

Several commenters contended that the proposal overstated the annual energy consumption of microwave ovens. (AHAM, No. 33 Attachment 2 at 3; Whirlpool, No. 28 at 2–3). Joy Weis Daniel, representing both AHAM and Sharp Electronics Company, stated that DOE should use 100 kWh/yr for annual energy consumption of microwave ovens based on an average of several metered studies. Their recommendation was based on metered studies which included: the Sierra Pacific EIP Study 1988, Southern California Edison 1990, Southern California Edison 1991, Utility Estimates Study 1991, and three studies reported in baseline data 1994. (Daniel, No. 4 at 6; AHAM, No. 33, Attachment 3B; Sharp, No. 40 at 7–9 and Exhibit C.)

In response to these comments, LBNL analyzed the microwave oven studies including those identified by commenters. The studies analyzed include: American Electric Power (AEP)/Residential Energy Consumption Survey (RECS), AEP Report ''Utility Estimates of Household Appliance Electricity Consumption,'' March 16, 1992, reported in RECS ''Household Energy Consumption and Expenditures 1990,'' DOE/EIA–0321(90), February 1993; Southern California Edison, ''Residential Appliance End-Use Survey'' for 1990 and 1991; and the 1988 Sierra Pacific EIP Study included in the Electric Power Research Institute (CU–6487), ''Residential End-Use Energy Consumption: A Survey of Conditional Demand and Estimates,'' October 1989. Copies of these studies are available for inspection in DOE's Freedom of Information Reading Room.

Based on the data from the above-referenced studies, DOE calculated a weighted average of the annual useful cooking energy for microwave ovens. For the estimate of annual useful cooking energy, both conditional demand analyses (CDA) and metered study data were included due to the limited data available. Since the metered studies are only from California, the Department believes it is necessary to include the CDA studies to get broader national representation including New York, Florida, Maryland and Texas. This analysis shows that annual useful cooking energy for microwave ovens is 79.8 kWh/yr. Today's final test procedure reflects this revised value.

2. Microwave Clock Energy

In the proposed rule, DOE included the clock energy in the calculation of annual energy consumption for microwave ovens. It accomplished this by incorporating paragraph 12 of IEC 705 Amendment 2–1993, ''Microwave Power Output Measurement.'' No comments were received. The final rule remains unchanged from the proposed rule.

3. Amend the DOE Test Procedure To Reference Portions of IEC 705 and Amendment 2

In the proposed rule, a definition of IEC 705 was added in section 1.5 and several sections of the test procedure were amended to reference portions of IEC 705 or Amendment 2 as follows: (1) Section 2.1.3, ''Microwave Ovens''; (2) section 2.5, ''Ambient Room Air Temperature''; (3) new section 2.8, ''Microwave Oven Test Load''; (4) section 2.9.3.1, ''Room Temperature Indicating System''; (5) section 2.9.3.4, ''Test Load Temperature''; (6) section 2.9.5, ''Scale''; (7) new section 3.1.3.1, ''Microwave Oven Test Energy or Power Output''; (8) section 3.2.3, ''Microwave Oven Test Energy Consumption and Power Input''; (9) section 4.4.2, ''Microwave Oven Test Power Output''; and (10) section 4.4.4, ''Microwave Oven Cooking Efficiency.'' The final rule reflects these changes. No

comments were received on these proposed changes.

4. Editorial Error in Section 4.4.1

In the proposed test procedure, the equation in section 4.4.1, ''Microwave oven test energy'', yields an answer that is incorrect by a factor of 1000. DOE corrected this problem in the final test procedure by changing the conversion factor ''H_E'' from ''H_E=(3.412 Btu/Wh) 3.6 kJ/Wh to ''H_E=(3,412 Btu/kWh) 3,600 kJ/kWh.''

5. Usage of Watt Meter and Watt-Hour Meter

DOE proposed the continued use of a watt-hour meter during microwave oven operation to measure energy consumption, also known as energy input, while performing the test procedure. DOE stated that the watt-hour meter is more accurate than a watt meter. The watt-hour meter measures all transient energy,[3] whereas the watt meter does not.

Several commenters disagreed with DOE's decision to use a watt-hour meter to determine the energy consumption of microwave ovens. AHAM took the position that a watt meter is sufficient to measure energy consumption. It contended that the power measured by the watt meter multiplied by the duration of the test, which is measured by the stop watch or timer, will yield an accurate measurement of energy consumption. (AHAM, No. 33, Attachment 3A and Attachment 3C; July 12, 1995 transcript at 62.) Sharp Electronics Corporation argued that DOE's claim that the watt-hour meter is more accurate is not supported by data. (Sharp, No. 40 at 5; July 12, 1995 transcript at 60.)

None of the commenters provided any data to demonstrate that the energy consumption calculation based on measurements from a watt meter and timer are comparable in accuracy to those derived directly from a watt-hour meter. Since a watt meter, as is used in IEC 705 to measure power, measures instantaneous power, an accurate energy calculation based on watts measured by a watt meter can only be made by summing instantaneous power measurements over small time increments, thus capturing the energy transients and mimicking a watt-hour meter. While it is possible to calculate energy consumption from measurements of power and time, the IEC test procedure itself does not contain a requirement to determine energy consumption nor does it provide a procedure for making that calculation. The Department believes the more appropriate, more accurate, and less burdensome way to measure energy consumption is by using a watt-hour meter rather than measuring power using a watt meter and a calculation procedure to determine energy consumption. Moreover, the watt-hour meter is typically used to measure electricity use in homes and commercial buildings.

6. Application of the ''Agreement on Technical Barriers to Trade'' Requiring Incorporation of IEC Standard 705

Sharp Electronics Corporation contends that DOE is legally obligated to incorporate IEC 705 and Amendment 2. Sharp relies upon Article 2.4 in the ''Agreement on Technical Barriers to Trade,'' (Agreement) a part of the ''World Trade Organization Agreement,'' to make its argument. Article 2.4 provides that where technical regulations are required and relevant international standards exist or their completion is imminent, member nations shall use such standards as a basis for their technical regulations, with certain exceptions. Sharp claims that IEC 705 constitutes an international technical standard applicable to measuring energy efficiency of microwave ovens. (Sharp, No. 40 at 4–6 and Exhibit B.)

Article 2.4 does not apply to the promulgation of a test procedure. The definition of ''technical regulation'' within the Agreement refers to mandatory product standards. Because a test procedure does not establish product standards, but rather provides the basis for evaluating whether a product meets a standard, a test procedure is not a technical regulation within the definition set forth in the Agreement. Therefore, this test procedure is not subject to the application of Article 2.4.

That DOE's rule incorporates the relevant parts of IEC 705 and Amendment 2 and uses that international test procedure as a basis for its test procedure makes it consistent with Article 5.4 of the ''Agreement on Technical Barriers to Trade,'' the controlling provision on test procedures. Article 5.4 provides that members use the ''relevant parts'' of guides or recommendations issued by international standardizing bodies ''as a basis for their conformity assessment procedures'' (defined by the agreement to include test procedures).

The U.S. World Trade Organization (WTO), Technical Barriers to Trade (TBT) enquiry point (National Institute of Standards and Technology) notified the WTO Secretariat of DOE's proposed rule pursuant to Article 2.9.2 of the TBT agreement entitled, ''Notify Members Through the Secretariat of the Products to be Covered by the Proposed Technical Regulation.'' No comments were received by the U.S. TBT enquiry point.

7. Using IEC 705 Updates To Automatically Amend DOE's Final Test Procedure

DOE proposed to incorporate paragraphs 13 and 14 of the 1988 version of IEC 705 and paragraph 12 of IEC 705, Amendment 2, 1993. Whirlpool commented that DOE should automatically accept changes to the IEC standard as they occur. Whirlpool stated that ''DOE references to the IEC 705 should be referred to as 'the latest reference' '' in order to avoid time consuming notice and comment rulemaking each time ''minor'' changes to the IEC test procedure occur. (Whirlpool, No. 28 at 3.) DOE does not accept Whirlpool's suggestion because adopting the language ''latest reference'' is overly broad and would sweep into the test procedure major as well as ''minor'' changes to the IEC test procedure. Therefore, in this final rule, DOE references the specific version and amendment of the IEC 705 as stated above.

8. Incorporation by Reference of Portions of IEC 705 and Amendment 2

DOE proposed to incorporate by reference paragraphs 13 and 14 of IEC 705 and paragraph 12 of Amendment 2. Two commenters supported DOE's proposal to incorporate by reference portions of IEC 705 and Amendment 2. (AHAM, No. 33 at 2; Whirlpool, No. 28 at 2.) Several commenters, however, took the position that DOE should incorporate IEC 705 in its entirety. (AHAM, No. 33, Attachment 3A and Attachment 3C; Sharp, No. 40 at 3.) DOE did not incorporate IEC 705 in its entirety because it contains other test methods such as heating, cooking and defrosting performance that are not relevant to energy consumption for microwave ovens.

In today's final test procedure , DOE is adopting those portions of IEC 705 and Amendment 2 that are pertinent to its test procedure for microwave ovens. This incorporation by reference is found at Section 430.22, ''Reference Sources.''

The Department is also amending section 430.22, Reference Sources, by adding paragraph (b)(5), ASHRAE standards. These standards were previously incorporated by reference in a final rule on Furnace Test procedures

[3] Transient energy is the energy consumed to warm up the magnetron and any fluctuations during microwave use.

published May 12, 1997 (62 FR 26140). In a Final Rule published May 29, 1997 (62 FR 29222), section 430.22 was amended and the furnace standards previously incorporated by reference were removed. Therefore, this rulemaking is correcting section 430.22 to include the standards previously removed.

III. Determination Concerning the Impact of the Amended Test Procedure on Standards

Section 323(e)(1) of EPCA requires that the Department determine to what extent an amended test procedure would alter the measured energy efficiency or measured energy use of kitchen ranges, ovens, cooktops or microwave ovens as compared with the existing test procedure. The Department has determined that the changes in annual useful cooking energy will decrease calculated annual energy use for electric ovens and cooktops by about 62 percent and for gas ovens and cooktops by about 55 percent. The change in annual useful cooking energy for microwave ovens will result in a 233 percent increase in their calculated annual energy use. Because there are currently no energy efficiency or energy consumption standards, no modification to standards is required under Section 323(e)(2) of EPCA.

IV. Procedural Requirements

A. Review Under the National Environmental Policy Act of 1969

In this rule, the Department will finalize amendments to test procedures that may be used to implement future energy conservation standards for kitchen ranges, cooktops, ovens, and microwave ovens. The Department has determined that this rule falls into a class of actions that are categorically excluded from review under the National Environmental Policy Act of 1969, 42 U.S.C. 4321 *et seq.* The rule is covered by Categorical Exclusion A5, for rulemakings that interpret or amend an existing rule without changing the environmental effect, as set forth in the Department's NEPA regulations at Appendix A to Subpart D, 10 CFR part 1021. This final rule will not affect the quality or distribution of energy usage and, therefore, will not result in any environmental impacts. Accordingly, neither an environmental impact statement or an environmental assessment is required.

B. Review Under Executive Order 12866, ''Regulatory Planning and Review''

Today's final rule is not a ''significant regulatory action'' under Executive Order 12866, ''Regulatory Planning and Review.'' 58 FR 51735 (October 4, 1993). Accordingly, today's action was not subject to review under the Executive Order by the Office of Information and Regulatory Affairs.

C. Review Under the Regulatory Flexibility Act of 1980

The Regulatory Flexibility Act, 5 U.S.C. 601–612, requires that an agency prepare an initial regulatory flexibility analysis for any rule, for which a general notice of proposed rulemaking is required, that would have a significant economic effect on small entities unless the agency certifies that the rule, if promulgated, will not have a significant economic impact on a substantial number of small entities. 5 U.S.C. 605. In the notice of proposed rulemaking, DOE determined that the test procedures would not have a significant economic impact, but rather would provide common testing methods. Therefore, DOE certified that the proposed rule would not if promulgated have a significant economic impact on a substantial number of small entities and that preparation of a regulatory flexibility analysis was not warranted. DOE did not receive any comments on the certification.

D. ''Takings'' Assessment Review

DOE has determined pursuant to Executive Order 12630, ''Governmental Actions and Interference with Constitutionally Protected Property Rights,'' 53 FR 8859 (March 18, 1988), that this regulation, if adopted, would not result in any takings which might require compensation under the Fifth Amendment to the United States Constitution.

E. Federalism Review

Executive Order 12612, ''Federalism,'' 52 FR 41685 (October 30, 1987), requires that regulations, rules, legislation, and any other policy actions be reviewed for any substantial direct effects on States, on the relationship between the Federal Government and the States, or in the distribution of power and responsibilities among various levels of Government. If there are substantial direct effects, then the Executive Order requires preparation of a Federalism assessment to be used in all decisions involved in promulgating and implementing a policy action.

The final rule published today would not regulate the States. Accordingly, DOE has determined that preparation of a Federalism assessment is unnecessary.

F. Review Under Section 32 of the Federal Energy Administration Authorization Act of 1974

The test procedure amended today incorporates the International Electrotechnical Commission Publication 705, ''Methods for Measuring the Performance of Microwave Ovens for Household and Similar Purposes,'' Paragraph 13 ''Electrical Power Input Measurement,'' and Paragraph 14 ''Efficiency,'' and Amendment 2–1993, Section 4, Paragraph 12 ''Microwave Power Output Measurement,'' to determine the output power and efficiency for microwave ovens.

Pursuant to Section 301 of the Department of Energy Organization Act (Pub. L. 95–91), DOE is required to comply with Section 32 of the Federal Energy Administration Act of 1974, 15 U.S.C. 788. The Department of Energy is required by Section 32 to notify the public regarding the proposed use of commercial standards in a rulemaking and allow interested persons to make known their views regarding the appropriateness of the use of any particular commercial standard in a notice of proposed rulemaking.

DOE included an invitation for public comment in the notice of proposed rulemaking. Commenters supported the inclusion of IEC 705 and Amendment 2–1993 in the test procedure and no adverse comments were received (see Section II.C.8).

In addition, section 32(c) precludes the Department from incorporating any commercial standard into a rule unless it has consulted with the Attorney General and the Chairman of the Federal Trade Commission (FTC) as to the impact of such standard on competition, and neither individual recommends against its incorporation or use. Pursuant to section 32(c), the Department advised these individuals of its intention to incorporate portions of the above-referenced standards into this final rule. Neither recommended against such incorporation.

G. Review Under the Paperwork Reduction Act of 1980

No new information or record keeping requirements are imposed by this rulemaking. Accordingly, no OMB clearance is required under the Paperwork Reduction Act, 44 U.S.C. 3501 *et seq.*

H. Review Under Executive Order 12988, ''Civil Justice Reform''

With respect to the review of existing regulations and the promulgation of new regulations, section 3(a) of

Executive Order 12988, ''Civil Justice Reform,'' 61 FR 4729 (February 7, 1996), imposes on executive agencies the following requirements: (1) Eliminate drafting errors and ambiguity; (2) write regulations to minimize litigation; and (3) provide a clear legal standard for affected conduct rather than a general standard and promote simplification and burden reduction. With regard to the review required by section 3(a), section 3(b) of the Executive Order specifically requires that Executive agencies make every reasonable effort to ensure that the regulation: (1) Clearly specifies the preemptive effect, if any; (2) clearly specifies any effect on existing Federal law or regulation; (3) provides a clear legal standard for affected conduct while promoting simplification and reducing burdens; (4) specifies the retroactive effect, if any; (5) adequately defines key terms; and (6) addresses other important issues affecting clarity and general draftsmanship under any guidelines issued by the Attorney General. Section 3(c) of the Executive Order requires Executive agencies to review regulations in light of applicable standards in sections 3(a) and 3(b) to determine whether they are met or it is unreasonable to meet one or more of them. DOE reviewed today's rule under the standards of section 3 of the Executive Order and determined that, to the extent permitted by law, it meets the requirements of those standards.

I. Review Under the Unfunded Mandates Reform Act of 1995

Title II of the Unfunded Mandates Reform Act of 1995 (the Act), 2 U.S.C. 1531 *et seq.*, requires each Federal agency, to the extent permitted by law, to prepare a written assessment of the effects of any Federal mandate in a final agency rule that may result in the expenditure by State, local, and tribal governments, in the aggregate, or by the private sector, of $100 million or more (adjusted annually for inflation) in one year.

The Department has determined that this final rule does not include any requirements that would result in the expenditure of money by State, local, and tribal governments. It also would not result in costs to the private sector of $100 million or more in any one year. Therefore, the requirements of the Unfunded Mandates Reform Act of 1995 do not apply to this rulemaking.

J. Congressional Notification

Consistent with Subtitle E of the Small Business Regulatory Enforcement Fairness Act of 1996, 5 U.S.C. 801–808, DOE will submit to Congress a report regarding the issuance of today's final rule prior to the effective date set forth at the outset of this notice. The report will note the Office of Management and Budget's determination that this rule does not constitute a ''major rule'' under that Act. 5 U.S.C. 801, 804.

List of Subjects in 10 CFR Part 430

Administrative practice and procedure, Energy conservation, Household appliances, Incorporation by reference.

Issued in Washington, DC, on September 22, 1997.

Joseph J. Romm,

Acting Assistant Secretary, Energy Efficiency and Renewable Energy.

For the reasons set forth in the preamble, Part 430 of Chapter II of Title 10, of the Code of Federal Regulations is amended as follows:

PART 430—ENERGY CONSERVATION PROGRAM FOR CONSUMER PRODUCTS

1. The authority citation for Part 430 continues to read as follows:

Authority: 42 U.S.C. 6291–6309.

2. Section 430.22 is amended by revising paragraph (a)(1) and adding paragraph (b)(4) and (b)(5) as follows:

§ 430.22 Reference Sources.

(a) *Materials incorporated by reference.*—(1) *General.* The following standards which are not otherwise set forth in Part 430 are incorporated by reference and made a part of Part 430. The standards listed in this section have been approved for incorporation by reference by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR Part 51. The specified versions of the standards are incorporated, and any subsequent amendment to a standard by the standard-setting organization will not affect the DOE test procedures unless and until those test procedures are amended by DOE.

(2) * * *

(b)(1) * * *

(2) * * *

(3) * * *

(4) International Electrotechnical Commission. Copies of the International Electrotechnical Commission Publications can be obtained from the American National Standards Institute, 11 West 42nd Street, New York, New York 10036, (212) 642–4936.

1. IEC 705, ''Methods for Measuring the Performance of Microwave Ovens for Household and Similar Purposes,'' Section 4, Methods of Measurement, Paragraph 13 ''Electrical Power Input Measurement,'' and Paragraph 14 ''Efficiency'' (1988).

2. IEC 705, Amendment 2, ''Methods for Measuring the Performance of Microwave Ovens for Household and Similar Purposes,'' Section 4, Methods of Measurement, Paragraph 12 ''Microwave Power Output Measurement'' (1993).

(5) American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., Publication Sales, 1791 Tullie Circle, NE, Atlanta, GA 30329, (1–800–5–ASHRAE).

1. American National Standards Institute/American Society of Heating, Refrigerating, and Air-Conditioning Engineers Standard 103–1993, ''Methods of Testing for Annual Fuel Utilization Efficiency of Residential Central Furnaces and Boilers,'' (with Errata of October 24, 1996) except for sections 3.0, 7.2.2.5, 8.6.1.1, 9.1.2.2, 9.5.1.1, 9.5.1.2.1, 9.5.1.2.2, 9.5.2.1, 9.7.1, 10.0, 11.2.12, 11.3.12, 11.4.12, 11.5.12 and appendices B and C.

2. American National Standards Institute Standard Z21.56–1994, ''Gas-Fired Pool Heaters,'' section 2.9.

* * * * *

§ 430.23 [Amended]

3. Section 430.23, Test procedures for measures of energy consumption, is amended as follows:

A. In § 430.23(i)(1)(iii) (second sentence) ''4.3.1, 4.2.2, 4.1.2.5, or 4.1.2.6, 4.4.3, and 4.5.1.3'' is revised to read ''4.3, 4.2.2, 4.1.2, and 4.4.3.''

B. In § 430.23(i)(2) (first sentence) ''4.2.1.3, 4.1.3 and 4.4.2'' is revised to read ''4.2.1, 4.1.3, and 4.4.4.''

C. § 430.23 (i)(3) is removed and reserved.

D. In § 430.23(i)(4) (first sentence) ''4.3.3, 4.2.3, 4.1.4, 4.4.4 and 4.5.3'' is revised to read ''4.3, 4.2.3, 4.1.4, 4.4.5.''

E. In §§ 430.23 (i)(8) and 430.23 (i)(9) remove the phrase ''and (i)(3).''

* * * * *

4. Appendix I to Subpart B of Part 430 is revised to read as follows:

Appendix I to Subpart B of Part 430—Uniform Test Method for Measuring the Energy Consumption of Conventional Ranges, Conventional Cooking Tops, Conventional Ovens, and Microwave Ovens

1. Definitions

1.1 *Built-in* means the product is supported by surrounding cabinetry, walls, or other similar structures.

1.2 *Drop-in* means the product is supported by horizontal surface cabinetry.

1.3 *Forced convection* means a mode of conventional oven operation in

which a fan is used to circulate the heated air within the oven compartment during cooking.

1.4 *Freestanding* means the product is not supported by surrounding cabinetry, walls, or other similar structures.

1.5 *IEC 705* refers to the test standard published by the International Electrotechnical Commission, entitled ''Method for Measuring the Performance of Microwave Ovens for Household and Similar Purposes,'' Publication 705–1988 and Amendment 2—1993. (See 10 CFR 430.22)

1.6 *Normal nonoperating temperature* means the temperature of all areas of an appliance to be tested are within 5°F (2.8°C) of the temperature that the identical areas of the same basic model of the appliance would attain if it remained in the test room for 24 hours while not operating with all oven doors closed and with any gas pilot lights on and adjusted in accordance with manufacturer's instructions.

1.7 *Primary energy consumption* means either the electrical energy consumption of a conventional electric oven or the gas energy consumption of a conventional gas oven.

1.8 *Secondary energy consumption* means any electrical energy consumption, other than clock energy consumption, of a conventional gas oven.

1.9 *Standard cubic foot (L) of gas* means that quantity of gas that occupies 1 cubic foot (L) when saturated with water vapor at a temperature of 60°F (15.6°C) and a pressure of 30 inches of mercury (101.6 kPa) (density of mercury equals 13.595 grams per cubic centimeter).

1.10 *Thermocouple* means a device consisting of two dissimilar metals which are joined together and, with their associated wires, are used to measure temperature by means of electromotive force.

1.11 *Symbol Usage.* The following identity relationships are provided to help clarify the symbology used throughout this procedure.

A—Number of Hours in a Year
B—Number of Hours Pilot Light Contributes to Cooking
C—Specific Heat
E—Energy Consumed
Eff—Cooking Efficiency
H—Heating Value of Gas
K—Conversion for Watt-hours to Kilowatt hours
K_e—3.412 Btu/Wh, Conversion for Watt-hours to Btu's
M—Mass
n—Number of Units
O—Annual Useful Cooking Energy Output
P—Power
Q—Gas Flow Rate
R—Energy Factor, Ratio of useful Cooking Energy Output to Total Energy Input
S—Number of Self Cleaning Operations per Year
T—Temperature
t—Time
V—Volume of Gas Consumed
W—Weight of Test Block

2. Test Conditions

2.1 *Installation.* A free standing kitchen range shall be installed with the back directly against, or as near as possible to, a vertical wall which extends at least 1 foot above and on either side of the appliance. There shall be no side walls. A drop-in, built-in or wall-mounted appliance shall be installed in an enclosure in accordance with the manufacturer's instructions. These appliances are to be completely assembled with all handles, knobs, guards and the like mounted in place. Any electric resistance heaters, gas burners, baking racks, and baffles shall be in place in accordance with the manufacturer's instructions; however, broiler pans are to be removed from the oven's baking compartment. Disconnect any electrical clock which uses energy continuously, except for those that are an integral part of the timing or temperature controlling circuit of the oven, cooktop, or microwave oven. Do not disconnect or modify the circuit to any other electrical devices or features.

2.1.1 *Conventional electric ranges, ovens, and cooking tops.* These products shall be connected to an electrical supply circuit with voltage as specified in Section 2.2.1 with a watt-hour meter installed in the circuit. The watt-hour meter shall be as described in Section 2.9.1.1.

2.1.2 *Conventional gas ranges, ovens, and cooking tops.* These products shall be connected to a gas supply line with a gas meter installed between the supply line and the appliance being tested, according to manufacturer's specifications. The gas meter shall be as described in Section 2.9.2. Conventional gas ranges, ovens and cooking tops with electrical ignition devices or other electrical components shall be connected to an electrical supply circuit of nameplate voltage with a watt-hour meter installed in the circuit. The watt-hour meter shall be as described in Section 2.9.1.1.

2.1.3 *Microwave ovens.* Install the microwave oven in accordance with the manufacturer's instructions and connect to an electrical supply circuit with voltage as specified in Section 2.2.1. A watt-hour meter and watt meter shall be installed in the circuit and shall be as described in Section 2.9.1.1 and 2.9.1.2. If trial runs are needed to set the ''on'' time for the test, the test measurements are to be separated according to Section 4, Paragraph 12.6 of IEC 705 Amendment 2. (See 10 CFR 430.22)

2.2 *Energy supply.*

2.2.1 *Electrical supply.* Maintain the electrical supply to the conventional range, conventional cooking top, and conventional oven being tested at 240/120 volts except that basic models rated only at 208/120 volts shall be tested at that rating. Maintain the voltage within 2 percent of the above specified voltages. For the microwave oven testing, however, maintain the electrical supply to a microwave oven at 120 volts ±1 volt and at 60 hertz.

2.2.2 *Gas supply.*

2.2.2.1 *Gas burner adjustments.* Conventional gas ranges, ovens, and cooking tops shall be tested with all of the gas burners adjusted in accordance with the installation or operation instructions provided by the manufacturer. In every case, the burner must be adjusted with sufficient air flow to prevent a yellow flame or a flame with yellow tips.

2.2.2.2 *Natural gas.* For testing convertible cooking appliances or appliances which are designed to operate using only natural gas, maintain the natural gas pressure immediately ahead of all controls of the unit under test at 7 to 10 inches of water column (1743.6 to 2490.8 Pa). The regulator outlet pressure shall equal the manufacturer's recommendation. The natural gas supplied should have a heating value of approximately 1,025 Btu's per standard cubic foot (38.2 kJ/L). The actual gross heating value, H_n, in Btu's per standard cubic foot (kJ/L), for the natural gas to be used in the test shall be obtained either from measurements made by the manufacturer conducting the test using equipment that meets the requirements described in Section 2.9.4 or by the use of bottled natural gas whose gross heating value is certified to be at least as accurate a value that meets the requirements in Section 2.9.4.

2.2.2.3 *Propane.* For testing convertible cooking appliances with propane or for testing appliances which are designed to operate using only LP-gas, maintain the propane pressure immediately ahead of all controls of the unit under test at 11 to 13 inches of water column (2740 to 3238 Pa). The regulator outlet pressure shall equal the manufacturer's recommendation. The propane supplied should have a heating value of approximately 2,500 Btu's per standard cubic foot (93.2 kJ/L). The

actual gross heating value, H_p, in Btu's per standard cubic foot (kJ/L), for the propane to be used in the test shall be obtained either from measurements made by the manufacturer conducting the test using equipment that meets the requirements described in Section 2.9.4 or by the use of bottled propane whose gross heating value is certified to be at least as accurate a value that meets the requirements described in Section 2.9.4.

2.2.2.4 *Test gas.* A basic model of a convertible cooking appliance shall be tested with natural gas, but may also be tested with propane. Any basic model of a conventional range, conventional cooking top, or conventional oven which is designed to operate using only natural gas as the energy source must be tested with natural gas. Any basic model of a conventional range, conventional cooking top, or conventional oven which is designed to operate using only LP gas as the gas energy source must be tested with propane gas.

2.3 *Air circulation.* Maintain air circulation in the room sufficient to secure a reasonably uniform temperature distribution, but do not cause a direct draft on the unit under test.

2.4 *Setting the conventional oven thermostat.*

2.4.1 *Conventional electric oven.* Install a thermocouple approximately in the center of the usable baking space. Provide a temperature indicator system for measuring the oven's temperature with an accuracy as indicated in Section 2.9.3.2. If the oven thermostat does not cycle on and off, adjust or determine the conventional electric oven thermostat setting to provide an average internal temperature which is 325°±5°F (180.6° ±2.8°C) higher than the room ambient air temperature. If the oven thermostat operates by cycling on and off, adjust or determine the conventional electric oven thermostat setting to provide an average internal temperature which is 325°±5°F (180.6°±2.8°C) higher than the room ambient air temperature. This shall be done by measuring the maximum and minimum temperatures in any three consecutive cut-off/cut-on actions of the electric resistance heaters, excluding the initial cut-off/cut-on action, by the thermostat after the temperature rise of 325°±5°F (180.6° ±2.8°C) has been attained by the conventional electric oven. Remove the thermocouple after the thermostat has been set.

2.4.2 *Conventional gas oven.* Install five parallel-connected weighted thermocouples, one located at the center of the conventional gas oven's usable baking space and the other four equally spaced between the center and the corners of the conventional gas oven on the diagonals of a horizontal plane through the center of the conventional gas oven. Each weighted thermocouple shall be constructed of a copper disc that is 1-inch (25.4 mm) in diameter and ⅛-inch (3.2 mm) thick. The two thermocouple wires shall be located in two holes in the disc spaced ½-inch (12.7 mm) apart, with each hole being located ¼-inch (6.4 mm) from the center of the disc. Both thermocouple wires shall be silver-soldered to the copper disc. Provide a temperature indicator system for measuring the oven's temperature with an accuracy as indicated in Section 2.9.3.2. If the oven thermostat does not cycle on or off, adjust or determine the conventional gas oven thermostat setting to provide an average internal temperature which is 325°±5°F (180.6°±2.8°C) higher than the room ambient air temperature. If the oven thermostat operates by cycling on and off, adjust or determine the conventional gas oven thermostat setting to provide an average internal temperature which is 325°±5°F (180.6±2.8°C) higher than the room ambient air temperature. This shall be done by measuring the maximum and minimum temperatures in any three consecutive cut-off/cut-on actions of the gas burners, excluding the initial cut-off/cut-on action, by the thermostat after the temperature rise of 325°±5°F (180.6°±2.8°C) has been attained by the conventional gas oven. Remove the thermocouples after the thermostat has been set.

2.5 *Ambient room air temperature.* During the test, maintain an ambient room air temperature, T_R, of 77°±9°F (25°±5°C) for conventional ovens and cooking tops, or as indicated in Section 4, Paragraph 12.4 of IEC 705 Amendment 2 for microwave ovens, as measured at least 5 feet (1.5 m) and not more than 8 feet (2.4 m) from the nearest surface of the unit under test and approximately 3 feet (0.9 m) above the floor. The temperature shall be measured with a thermometer or temperature indicating system with an accuracy as specified in Section 2.9.3.1.

2.6 *Normal nonoperating temperature.* All areas of the appliance to be tested shall attain the normal nonoperating temperature, as defined in Section 1.6, before any testing begins. The equipment for measuring the applicable normal nonoperating temperature shall be as described in Sections 2.9.3.1, 2.9.3.2, 2.9.3.3, 2.9.3.4, and 2.9.3.5, as applicable.

2.7 *Test blocks for conventional oven and cooking top.* The test blocks shall be made of aluminum alloy No. 6061, with a specific heat of 0.23 Btu/lb- °F (0.96 kJ/[kg• °C]) and with any temper that will give a czoefficient of thermal conductivity of 1073.3 to 1189.1 Btu-in/h-ft²- °F (154.8 to 171.5 W/[m• °C]). Each block shall have a hole at its top. The hole shall be 0.08 inch (2.03 mm) in diameter and 0.80 inch (20.3 mm) deep. The manufacturer conducting the test may provide other means which will ensure that the thermocouple junction is installed at this same position and depth.

The bottom of each block shall be flat to within 0.002 inch (0.051 mm) TIR (total indicator reading). Determine the actual weight of each test block with a scale with an accuracy as indicated in Section 2.9.5.

2.7.1 *Conventional oven test block.* The test block for the conventional oven, W_1, shall be 6.25±0.05 inches (158.8±1.3 mm) in diameter, approximately 2.8 inches (71 mm) high and shall weigh 8.5±0.1 lbs (3.86±0.05 kg). The block shall be finished with an anodic black coating which has a minimum thickness of 0.001 inch (0.025 mm) or with a finish having the equivalent absorptivity.

2.7.2 *Small test block for conventional cooking top.* The small test block, W_2, shall be 6.25±0.05 inches (158.8±1.3 mm) in diameter, approximately 2.8 inches (71 mm) high and shall weigh 8.5±0.1 lbs (3.86±0.05 kg).

2.7.3 *Large test block for conventional cooking top.* The large test block for the conventional cooking top, W_3, shall be 9±0.05 inches (228.6±1.3 mm) in diameter, approximately 3.0 inches (76 mm) high and shall weigh 19±0.1 lbs (8.62±0.05 kg).

2.7.4 *Thermocouple installation.* Install the thermocouple such that the thermocouple junction (where the thermocouple contacts the test block) is at the bottom of the hole provided in the test block and that the thermocouple junction makes good thermal contact with the aluminum block. If the test blocks are to be water cooled between tests the thermocouple hole should be sealed, or other steps taken, to insure that the thermocouple hole is completely dry at the start of the next test. Provide a temperature indicator system for measuring the test block temperature with an accuracy as indicated in Section 2.9.3.3.

2.7.5 *Initial test block temperature.* Maintain the initial temperature of the test blocks, T_I, within ±4°F (±2.2°C) of the ambient room air temperature as specified in Section 2.5. If the test block has been cooled (or heated) to bring it to room temperature, allow the block to stabilize for at least 2 minutes after removal from the cooling (or heating)

source, before measuring its initial temperature.

2.8 *Microwave oven test load.*

2.8.1 *Test container.* The test container shall be as specified in Section 4, Paragraph 12.2 of IEC 705 Amendment 2.

2.8.2 *Test water load.* The test water load shall be as specified in Section 4, Paragraph 12.1 of IEC 705 Amendment 2.

2.8.2.1 *Test water load and test container temperature.* Before the start of the test, the oven and the test container shall be at ambient temperature as specified in Section 4, Paragraph 12.4 of IEC 705 Amendment 2. The test water load shall be contained in a chiller (not the test container) and maintained at 18° ± 1.8°F (10° ± 1°C) below the ambient room temperature.

2.9 *Instrumentation.* Perform all test measurements using the following instruments, as appropriate:

2.9.1 *Electrical Measurements.*

2.9.1.1 *Watt-hour meter.* The watt-hour meter for measuring the electrical energy consumption of conventional ovens and cooking tops shall have a resolution of 1 watt-hour (3.6 kJ) or less and a maximum error no greater than 1.5 percent of the measured value for any demand greater than 100 watts. The watt-hour meter for measuring the energy consumption of microwave ovens shall have a resolution of 0.1 watt-hour (0.36 kJ) or less and a maximum error no greater than 1.5 percent of the measured value.

2.9.1.2 *Watt meter.* The watt meter used to measure the conventional oven, conventional range, range clock power or the power input of the microwave oven shall have a resolution of 0.2 watt (0.2 J/s) or less and a maximum error no greater than 5 percent of the measured value.

2.9.2 *Gas Measurements.*

2.9.2.1 *Positive displacement meters.* The gas meter to be used for measuring the gas consumed by the gas burners of the oven or cooking top shall have a resolution of 0.01 cubic foot (0.28 L) or less and a maximum error no greater than 1 percent of the measured value for any demand greater than 2.2 cubic feet per hour (62.3 L/h). If a positive displacement gas meter is used for measuring the gas consumed by the pilot lights, it shall have a resolution of at least 0.01 cubic foot (0.28 L) or less and have a maximum error no greater than 2 percent of the measured value.

2.9.2.2 *Flow meter.* If a gas flow meter is used for measuring the gas consumed by the pilot lights, it shall be calibrated to have a maximum error no greater than 1.5 percent of the measured value and a resolution of 1 percent or less of the measured value.

2.9.3 *Temperature measurement equipment.*

2.9.3.1 *Room temperature indicating system.* The room temperature indicating system shall be as specified in Section 4, Paragraph 12.3 of IEC 705 Amendment 2 for microwave ovens and Section 2.9.3.5 for ranges, ovens and cooktops.

2.9.3.2 *Temperature indicator system for measuring conventional oven temperature.* The equipment for measuring the conventional oven temperature shall have an error no greater than ±4°F (±2.2°C) over the range of 65° to 500°F (18°C to 260°C).

2.9.3.3 *Temperature indicator system for measuring test block temperature.* The system shall have an error no greater than ±2°F (±1.1°C) when measuring specific temperatures over the range of 65° to 330°F (18.3°C to 165.6°C). It shall also have an error no greater than ±2°F (±1.1°C) when measuring any temperature difference up to 240°F (133.3 °C) within the above range.

2.9.3.4 *Test load temperatures.* The thermometer or other temperature measuring instrument used to measure the test water load temperature shall be as specified in Section 4, Paragraph 12.3 of IEC 705 Amendment 2. Use only one thermometer or other temperature measuring device throughout the entire test procedure.

2.9.3.5 *Temperature indicator system for measuring surface temperatures.* The temperature of any surface of an appliance shall be measured by means of a thermocouple in firm contact with the surface. The temperature indicating system shall have an error no greater than ±1°F (±0.6°C) over the range 65° to 90°F (18°C to 32°C).

2.9.4 *Heating Value.* The heating value of the natural gas or propane shall be measured with an instrument and associated readout device that has a maximum error no greater than ±0.5% of the measured value and a resolution of ±0.2% or less of the full scale reading of the indicator instrument. The heating value of natural gas or propane must be corrected for local temperature and pressure conditions.

2.9.5 *Scale.* The scale used for weighing the test blocks shall have a maximum error no greater than 1 ounce (28.4 g). The scale used for weighing the microwave oven test water load shall be as specified in Section 4, paragraph 12.3 of IEC 705 Amendment 2.

3. Test Methods and Measurements

3.1 *Test methods.*

3.1.1 *Conventional oven.* Perform a test by establishing the testing conditions set forth in Section 2, ''TEST CONDITIONS,'' of this Appendix, and adjust any pilot lights of a conventional gas oven in accordance with the manufacturer's instructions and turn off the gas flow to the conventional cooking top, if so equipped. Before beginning the test, the conventional oven shall be at its normal nonoperating temperature as defined in Section 1.6 and described in Section 2.6. Set the conventional oven test block W_1 approximately in the center of the usable baking space. If there is a selector switch for selecting the mode of operation of the oven, set it for normal baking. If an oven permits baking by either forced convection by using a fan, or without forced convection, the oven is to be tested in each of those two modes. The oven shall remain on for at least one complete thermostat ''cut-off/cut-on'' of the electrical resistance heaters or gas burners after the test block temperature has increased 234°F (130°C) above its initial temperature.

3.1.1.1 *Self-cleaning operation of a conventional oven.* Establish the test conditions set forth in Section 2, ''TEST CONDITIONS,'' of this Appendix. Adjust any pilot lights of a conventional gas oven in accordance with the manufacturer's instructions and turn off the gas flow to the conventional cooking top. The temperature of the conventional oven shall be its normal nonoperating temperature as defined in Section 1.6 and described in Section 2.6. Then set the conventional oven's self-cleaning process in accordance with the manufacturer's instructions. If the self-cleaning process is adjustable, use the average time recommended by the manufacturer for a moderately soiled oven.

3.1.1.2 *Continuously burning pilot lights of a conventional gas oven.* Establish the test conditions set forth in Section 2, ''TEST CONDITIONS,'' of this Appendix. Adjust any pilot lights of a conventional gas oven in accordance with the manufacturer's instructions and turn off the gas flow to the conventional cooking top. If a positive displacement gas meter is used the, test duration shall be sufficient to measure a gas consumption which is at least 200 times the resolution of the gas meter.

3.1.2 *Conventional cooking top.* Establish the test conditions set forth in Section 2, ''TEST CONDITIONS,'' of this Appendix. Adjust any pilot lights of a conventional gas cooking top in accordance with the manufacturer's instructions and turn off the gas flow to the conventional oven(s), if so equipped. The temperature of the

conventional cooking top shall be its normal nonoperating temperature as defined in Section 1.6 and described in Section 2.6. Set the test block in the center of the surface unit under test. The small test block, W_2, shall be used on electric surface units of 7 inches (178 mm) or less in diameter. The large test block, W_3, shall be used on electric surface units over 7 inches (177.8 mm) in diameter and on all gas surface units. Turn on the surface unit under test and set its energy input rate to the maximum setting. When the test block reaches 144 °F (80 °C) above its initial test block temperature, immediately reduce the energy input rate to 25±5 percent of the maximum energy input rate. After 15±0.1 minutes at the reduced energy setting, turn off the surface unit under test.

3.1.2.1 *Continuously burning pilot lights of a conventional gas cooking top.* Establish the test conditions set forth in Section 2, ''TEST CONDITIONS,'' of this Appendix. Adjust any pilot lights of a conventional gas cooking top in accordance with the manufacturer's instructions and turn off the gas flow to the conventional oven(s). If a positive displacement gas meter is used, the test duration shall be sufficient to measure a gas consumption which is at least 200 times the resolution of the gas meter.

3.1.3 *Microwave oven.*

3.1.3.1 *Microwave oven test energy or power output.* Establish the testing conditions set forth in Section 2, ''TEST CONDITIONS,'' of this Appendix. Follow the test procedure as specified in Section 4, Paragraph 12.4 of IEC 705 Amendment 2.

3.2 *Test measurements.*

3.2.1 *Conventional oven test energy consumption.* If the oven thermostat controls the oven temperature without cycling on and off, measure the energy consumed, E_O, when the temperature of the block reaches T_O (T_O is 234 °F (130 °C) above the initial block temperature, T_I). If the oven thermostat operates by cycling on and off, make the following series of measurements: Measure the block temperature, T_A, and the energy consumed, E_A, or volume of gas consumed, V_A, at the end of the last ''ON'' period of the conventional oven before the block reaches T_O. Measure the block temperature, T_B, and the energy consumed, E_B, or volume of gas consumed, V_B, at the beginning of the next ''ON'' period. Measure the block temperature, T_C, and the energy consumed, E_C, or volume of gas consumed, V_C, at the end of that ''ON'' period. Measure the block temperature, T_D, and the energy consumed, E_D, or volume of gas consumed, V_D, at the beginning of the following ''ON'' period. Energy measurements for E_O, E_A, E_B, E_C and E_D, should be expressed in watt-hours (kJ) for conventional electric ovens and volume measurements for V_A, V_B, V_C and V_D should be expressed in standard cubic feet (L) of gas for conventional gas ovens. For a gas oven, measure in watt-hours (kJ) any electrical energy, E_{IO}, consumed by an ignition device or other electrical components required for the operation of a conventional gas oven while heating the test block to T_O. The energy consumed by a continuously operating clock that is an integral part of the timing or temperature control circuit and cannot be disconnected during the test may be subtracted from the oven test energy to obtain the test energy consumption, E_O or E_{IO}.

3.2.1.1 *Conventional oven average test energy consumption.* If the conventional oven permits baking by either forced convection or without forced convection and the oven thermostat does not cycle on and off, measure the energy consumed with the forced convection mode, $(E_O)_1$, and without the forced convection mode, $(E_O)_2$, when the temperature of the block reaches T_O (T_O is 234 °F (130 °C) above the initial block temperature, T_I). If the conventional oven permits baking by either forced convection or without forced convection and the oven thermostat operates by cycling on and off, make the following series of measurements with and without the forced convection mode: Measure the block temperature, T_A, and the energy consumed, E_A, or volume of gas consumed, V_A, at the end of the last ''ON'' period of the conventional oven before the block reaches T_O. Measure the block temperature, T_B, and the energy consumed, E_B, or volume of gas consumed, V_B, at the beginning of the next ''ON'' period. Measure the block temperature, T_C, and the energy consumed, E_C, or volume of gas consumed, V_C, at the end of that ''ON'' period. Measure the block temperature, T_D, and the energy consumed, E_D, or volume of gas consumed, V_D, at the beginning of the following ''ON'' period. Energy measurements for E_O, E_A, E_B, E_C and E_D should be expressed in watt-hours (kJ) for conventional electric ovens and volume measurements for V_A, V_B, V_C and V_D should be expressed in standard cubic feet (L) of gas for conventional gas ovens. For a gas oven that can be operated with or without forced convection, measure in watt-hours (kJ) any electrical energy consumed by an ignition device or other electrical components required for the operation of a conventional gas oven while heating the test block to T_O using the forced convection mode, $(E_{IO})_1$, and without using the forced convection mode, $(E_{IO})_2$. The energy consumed by a continuously operating clock that is an integral part of the timing or temperature control circuit and cannot be disconnected during the test may be subtracted from the oven test energy to obtain the test energy consumption, $(E_O)_1$ and $(E_O)_2$ or $(E_{IO})_1$ and $(E_{IO})_2$.

3.2.1.2 *Energy consumption of self-cleaning operation.* Measure the energy consumption, E_S, in watt-hours (kJ) of electricity or the volume of gas consumption, V_S, in standard cubic feet (L) during the self-cleaning test set forth in Section 3.1.1.1. For a gas oven, also measure in watt-hours (kJ) any electrical energy, E_{IS}, consumed by ignition devices or other electrical components required during the self-cleaning test. The energy consumed by a continuously operating clock that is an integral part of the timing or temperature control circuit and cannot be disconnected during the test may be subtracted from the self-cleaning test energy to obtain the energy consumption, E_S or E_{IS}

3.2.1.3 *Gas consumption of continuously burning pilot lights.* Measure the gas consumption of the pilot lights, V_{OP}, in standard cubic feet (L) of gas and the test duration, t_{OP}, in hours for the test set forth in Section 3.1.1.2. If a gas flow rate meter is used, measure the flow rate, Q_{OP}, in standard cubic feet per hour (L/h).

3.2.1.4 *Clock power.* If the conventional oven or conventional range includes an electric clock which is on continuously, and the power rating in watts (J/s) of this feature is not known, measure the clock power, P_{CL}, in watts (J/s.) The power rating or measurement of continuously operating clocks, that are an integral part of the timing or temperature control circuits and cannot be disconnected during testing, shall be multiplied by the applicable test period to calculate the clock energy consumption, in watt-hours (kJ), during a test. The energy consumed by the clock during the test may then be subtracted from the test energy to obtain the specified test energy consumption value.

3.2.2 *Conventional surface unit test energy consumption.* For the surface unit under test, measure the energy consumption, E_{CT}, in watt-hours (kJ) of electricity or the volume of gas consumption, V_{CT}, in standard cubic feet (L) of gas and the test block temperature, T_{CT}, at the end of the 15 minute (reduced input setting) test interval for the test specified in Section 3.1.2 and the total time, t_{CT}, in hours, that the unit is under test. Measure any

electrical energy, E_{IC}, consumed by an ignition device of a gas heating element in watt-hours (kJ). The energy consumed by a continuously operating clock that is an integral part of the timing or temperature control circuit and cannot be disconnected during the test may be subtracted from the cooktop test energy to obtain the test energy consumption, E_{CT} or E_{IC}.

3.2.2.1 *Gas consumption of continuously burning pilot lights.* If the conventional gas cooking top under test has one or more continuously burning pilot lights, measure the gas consumed during the test by the pilot lights, V_{CP}, in standard cubic feet (L) of gas, and the test duration, t_{CP}, in hours as specified in Section 3.1.2.1. If a gas flow rate meter is used, measure the flow rate, Q_{CP}, in standard cubic feet per hour (L/h).

3.2.3 *Microwave oven test energy consumption and power input.* Measurements are to be made as specified in Section 4, Paragraphs 12.4 and 13 of IEC 705 and Amendment 2. Measure the electrical input energy, E_M, in watt-hours (kJ) consumed by the microwave oven during the test. Repeat the tests three times unless the power output value resulting from the second measurement is within 1.5% of the value obtained from the first measurement as stated in Section 4, Paragraphs 12.6 of IEC 705 Amendment 2. (See 10 CFR 430.22.)

3.3 *Recorded values.*

3.3.1 Record the test room temperature, T_R, at the start and end of each range, oven or cooktop test, as determined in Section 2.5.

3.3.2 Record measured test block weights W_1, W_2, and W_3 in pounds (kg).

3.3.3 Record the initial temperature, T_1, of the test block under test.

3.3.4 For a conventional oven with a thermostat which operates by cycling on and off, record the conventional oven test measurements T_A, E_A, T_B, E_B, T_C, E_C, T_D, and E_D for conventional electric ovens or T_A, V_A, T_B, V_B, T_C, V_C, T_D, and V_D for conventional gas ovens. If the thermostat controls the oven temperature without cycling on and off, record E_O. For a gas oven which also uses electrical energy for the ignition or operation of the oven, also record E_{IO}.

3.3.5 For a conventional oven that can be operated with or without forced convection and the oven thermostat controls the oven temperature without cycling on and off, measure the energy consumed with the forced convection mode, $(E_O)_1$, and without the forced convection mode, $(E_O)_2$. If the conventional oven operates with or without forced convection and the thermostat controls the oven temperature by cycling on and off, record the conventional oven test measurements T_A, E_A, T_B, E_B, T_C, E_C, T_D, and E_D for conventional electric ovens or T_A, V_A, T_B, V_B, T_C, V_C, T_D, and V_D for conventional gas ovens. For a gas oven that can be operated with or without forced convection, measure any electrical energy consumed by an ignition device or other electrical components used during the forced convection mode, $(E_{IO})_1$, and without using the forced convection mode, $(E_{IO})_2$.

3.3.6 Record the measured energy consumption, E_S, or gas consumption, V_S, and for a gas oven, any electrical energy, E_{IS}, for the test of the self-cleaning operation of a conventional oven.

3.3.7 Record the gas flow rate, Q_{OP}; or the gas consumption, V_{OP}, and the elapsed time, t_{OP}, that any continuously burning pilot lights of a conventional oven are under test.

3.3.8 Record the clock power measurement or rating, P_{CL}, in watts (J/s), except for microwave oven tests.

3.3.9 For the surface unit under test, record the electric energy consumption, E_{CT}, or the gas volume consumption, V_{CT}, the final test block temperature, T_{CT}, the total test time, t_{CT}. For a gas cooking top which uses electrical energy for ignition of the burners, also record E_{IC}.

3.3.10 Record the gas flow rate, Q_{CP}; or the gas consumption, V_{CP}, and the elapsed time, t_{CP}, that any continuously burning pilot lights of a conventional gas cooking top are under test.

3.3.11 Record the heating value, H_n, as determined in Section 2.2.2.2 for the natural gas supply.

3.3.12 Record the heating value, H_p, as determined in Section 2.2.2.3 for the propane supply.

3.3.13 Record the electrical input energy and power input, E_M and P_M, for the microwave oven test; the initial and final temperature, T_1 and T_2, of the test water load; the mass of the test container before filling with the test water load and the mass of the test water load, M_C and M_W respectively; and the measured room temperature, T_0; as determined in Section 3.2.3.

4. Calculation of Derived Results From Test Measurements

4.1 *Conventional oven.*

4.1.1 *Test energy consumption.* For a conventional oven with a thermostat which operates by cycling on and off, calculate the test energy consumption, E_O, expressed in watt-hours (kJ) for electric ovens and in Btu's (kJ) for gas ovens, and defined as:

$$E_O = E_{AB} + \left[\left(\frac{T_O - T_{AB}}{T_{CD} - T_{AB}}\right) \times \left(E_{CD} - E_{AB}\right)\right]$$

for electric ovens, and,

$$E_O = \left(V_{AB} \times H\right) + \left[\left(\frac{T_O - T_{AB}}{T_{CD} - T_{AB}}\right) \times \left(V_{CD} - V_{AB}\right) \times H\right]$$

For gas ovens

Where:

H = either H_n or H_p, the heating value of the gas used in the test as specified in Section 2.2.2.2 and Section 2.2.2.3, expressed in Btu's per standard cubic foot (kJ/L).

T_O = 234°F (130°C) plus the initial test block temperature.

and,

$$E_{AB} = \frac{(E_A + E_B)}{2}, \quad E_{CD} = \frac{(E_C + E_D)}{2}$$

$$V_{AB} = \frac{(V_A + V_B)}{2}, \quad V_{CD} = \frac{(V_C + V_D)}{2}$$

$$T_{AB} = \frac{(T_A + T_B)}{2}, \quad T_{CD} = \frac{(T_C + T_D)}{2}$$

Where:

T_A = block temperature in °F (°C) at the end of the last ''ON'' period of the conventional oven before the test block reaches T_O.

T_B = block temperature in °F (°C) at the beginning of the ''ON'' period following the measurement of T_A.

T_C = block temperature in °F (°C) at the end of the ''ON'' period which starts with T_B.

T_D = block temperature in °F (°C) at the beginning of the ''ON'' period which follows the measurement of T_C.

E_A = electric energy consumed in Wh (kJ) at the end of the last ''ON'' period before the test block reaches T_O.

E_B = electric energy consumed in Wh (kJ) at the beginning of the ''ON'' period following the measurement of T_A.

E_C = electric energy consumed in Wh (kJ) at the end of the ''ON'' period which starts with T_B.

E_D = electric energy consumed in Wh (kJ) at the beginning of the ''ON'' period which follows the measurement of T_C.

V_A = volume of gas consumed in standard cubic feet (L) at the end of the last ''ON'' period before the test block reaches T_O.

V_B = volume of gas consumed in standard cubic feet (L) at the beginning of the ''ON'' period following the measurement of T_A.

V_C = volume of gas consumed in standard cubic feet (L) at the end of the ''ON'' period which starts with T_B.

V_D = volume of gas consumed in standard cubic feet (L) at the beginning of the ''ON'' period which follows the measurement of T_C.

The energy consumed by a continuously operating clock that cannot be disconnected during the test may be subtracted from the oven test energy to obtain the oven test energy consumption, E_O.

4.1.1.1 *Average test energy consumption.* If the conventional oven can be operated with or without forced convection, determine the average test energy consumption, E_O and E_{IO}, in watt-hours (kJ) for electric ovens and Btu's (kJ) for gas ovens using the following equations:

$$E_O = \frac{(E_O)_1 + (E_O)_2}{2}$$

$$E_{IO} = \frac{(E_{IO})_1 + (E_{IO})_2}{2}$$

Where:

$(E_O)_1$=test energy consumption using the forced convection mode in watt-hours (kJ) for electric ovens and in Btu's (kJ) for gas ovens as measured in Section 3.2.1.1.

$(E_O)_2$=test energy consumption without using the forced convection mode in watt-hours (kJ) for electric ovens and in Btu's (kJ) for gas ovens as measured in Section 3.2.1.1.

$(E_{IO})_1$=electrical energy consumption in watt-hours (kJ) of a gas oven in forced convection mode as measured in Section 3.2.1.1.

$(E_{IO})_2$=electrical energy consumption in watt-hours (kJ) of a gas oven without using the forced convection mode as measured in Section 3.2.1.1.

The energy consumed by a continuously operating clock that cannot be disconnected during the test may be subtracted from the oven test energy to obtain the average test energy consumption E_O and E_{IO}.

4.1.2 *Conventional oven annual energy consumption.*

4.1.2.1. *Annual cooking energy consumption.*

4.1.2.1.1. *Annual primary energy consumption.* Calculate the annual primary energy consumption for cooking, E_{CO}, expressed in kilowatt-hours (kJ) per year for electric ovens and in Btu's (kJ) per year for gas ovens, and defined as:

$$E_{CO} = \frac{E_O \times K_e \times O_O}{W_l \times C_p \times T_S} \text{ for electric ovens,}$$

Where:

E_O=test energy consumption as measured in Section 3.2.1 or as calculated in Section 4.1.1 or Section 4.1.1.1.

K_e=3.412 Btu/Wh (3.6 kJ/Wh,) conversion factor of watt-hours to Btu's.

O_O=29.3 kWh (105,480 kJ) per year, annual useful cooking energy output of conventional electric oven.

W_l=measured weight of test block in pounds (kg).

C_p=0.23 Btu/lb-°F (0.96 kJ/kg •°C), specific heat of test block.

T_S=234°F (130°C), temperature rise of test block.

$$E_{CO} = \frac{E_O \times O_O}{W_l \times C_p \times T_S} \text{ for gas ovens,}$$

Where:

E_O=test energy consumption as measured in Section 3.2.1. or as calculated in Section 4.1.1 or Section 4.1.1.1.

O_O=88.8 kBtu (93,684 kJ) per year, annual useful cooking energy output of conventional gas oven.

W_l, C_p and T_S are the same as defined above.

4.1.2.1.2 *Annual secondary energy consumption for cooking of gas ovens.* Calculate the annual secondary energy consumption for cooking, E_{SO}, expressed in kilowatt-hours (kJ) per year and defined as:

$$E_{SO} = \frac{E_{IO} \times K_e \times O_O}{W_l \times C_p \times T_S},$$

Where:

E_{IO}=electrical test energy consumption as measured in Section 3.2.1 or as calculated in Section 4.1.1.1.

O_O=29.3 kWh (105,480 kJ) per year, annual useful cooking energy output.

K_e, W_l, C_p, and T_S are as defined in Section 4.1.2.1.1.

4.1.2.2 *Annual energy consumption of any continuously burning pilot lights.* Calculate the annual energy consumption of any continuously burning pilot lights, E_{PO}, expressed in Btu's (kJ) per year and defined as:

$$E_{PO} = Q_{OP} \times H \times (A - B),$$

or,

$$E_{PO} = \frac{V_{OP}}{t_{OP}} \times H \times (A - B)$$

Where:

Q_{OP}=pilot gas flow rate in standard cubic feet per hour (L/h), as measured in Section 3.2.1.3.

V_{OP}=standard cubic feet (L) of gas consumed by any continuously burning pilot lights, as measured in Section 3.2.1.3.

t_{OP}=elapsed test time in hours for any continuously burning pilot lights tested, as measured in Section 3.2.1.3.

H=H_n or H_p, the heating value of the gas used in the test as specified in

Section 2.2.2.2 and Section 2.2.2.3 in Btu's per standard cubic foot (kJ/L).

A=8,760, number of hours in a year.

B=300, number of hours per year any continuously burning pilot lights contribute to the heating of an oven for cooking food.

4.1.2.3 *Annual conventional oven self-cleaning energy.*

4.1.2.3.1 *Annual primary energy consumption.* Calculate the annual primary energy consumption for conventional oven self-cleaning operations, E_{SC}, expressed in kilowatt-hours (kJ) per year for electric ovens and in Btu's (kJ) for gas ovens, and defined as:

$E_{SC}=E_S \times S_e \times K$, for electric ovens,

Where:

E_S=energy consumption in watt-hours, as measured in Section 3.2.1.2.

S_e=4, average number of times a self-cleaning operation of a conventional electric oven is used per year.

K=0.001 kWh/Wh conversion factor for watt-hours to kilowatt-hours.

or

$E_{SC}=V_S \times H \times S_g$, for gas ovens,

Where:

V_S=gas consumption in standard cubic feet (L), as measured in Section 3.2.1.2.

$H=H_n$ or H_p, the heating value of the gas used in the test as specified in Section 2.2.2.2 and Section 2.2.2.3 in Btu's per standard cubic foot (kJ/L).

S_g=4, average number of times a self-cleaning operation of a conventional gas oven is used per year.

The energy consumed by a continuously operating clock that cannot be disconnected during the self-cleaning test procedure may be subtracted from the test energy to obtain the test energy consumption, E_{SC}.

4.1.2.3.2 *Annual secondary energy consumption for self-cleaning operation of gas ovens.* Calculate the annual secondary energy consumption for self-cleaning operations of a gas oven, E_{SS}, expressed in kilowatt-hours (kJ) per year and defined as:

$E_{SS}=E_{IS} \times S_g \times K$,

Where:

E_{IS}=electrical energy consumed during the self-cleaning operation of a conventional gas oven, as measured in Section 3.2.1.2.

S_g=4, average number of times a self-cleaning operation of a conventional gas oven is used per year.

K=0.001 kWh/Wh conversion factor for watt-hours to kilowatt-hours.

4.1.2.4 *Annual clock energy consumption.* Calculate the annual energy consumption of any constantly operating electric clock, E_{CL}, expressed in kilowatt-hours (kJ) per year and defined as:

$E_{CL} = P_{CL} \times A \times K$,

Where:

P_{CL}=power rating of clock which is on continuously, in watts, as measured in Section 3.2.1.4.

A=8,760, number of hours in a year.

K=0.001 kWh/Wh conversion factor for watt-hours to kilowatt-hours.

4.1.2.5 *Total annual energy consumption of a single conventional oven.*

4.1.2.5.1 *Conventional electric oven energy consumption.* Calculate the total annual energy consumption of a conventional electric oven, E_{AO}, expressed in kilowatt-hours (kJ) per year and defined as:

$E_{AO}=E_{CO}+E_{SC}+E_{CL}$,

Where:

E_{CO}=annual primary cooking energy consumption as determined in Section 4.1.2.1.1.

E_{SC}=annual primary self-cleaning energy consumption as determined in Section 4.1.2.3.1.

E_{CL}=annual clock energy consumption as determined in Section 4.1.2.4.

4.1.2.5.2 *Conventional gas oven energy consumption.* Calculate the total annual gas energy consumption of a conventional gas oven, E_{AOG}, expressed in Btu's (kJ) per year and defined as:

$E_{AOG}=E_{CO}+E_{SC}+E_{PO}$,

Where:

E_{CO}=annual primary cooking energy consumption as determined in Section 4.1.2.1.1.

E_{PO}=annual pilot light energy consumption as determined in Section 4.1.2.2.

E_{SC}=annual primary self-cleaning energy consumption as determined in Section 4.1.2.3.1.

If the conventional gas oven uses electrical energy, calculate the total annual electrical energy consumption, E_{AOE}, expressed in kilowatt-hours (kJ) per year and defined as:

$E_{AOE}=E_{SO}+E_{SS}+E_{CL}$,

Where:

E_{SO}=annual secondary cooking energy consumption as determined in Section 4.1.2.1.2.

E_{SS}=annual secondary self-cleaning energy consumption as determined in Section 4.1.2.3.2.

E_{CL}=annual clock energy consumption as determined in Section 4.1.2.4.

4.1.2.6. *Total annual energy consumption of multiple conventional ovens.* If the cooking appliance includes more than one conventional oven, calculate the total annual energy consumption of the conventional ovens using the following equations:

4.1.2.6.1 *Conventional electric oven energy consumption.* Calculate the total annual energy consumption, ETO, in kilowatt-hours (kJ) per year and defined as:

$E_{TO} = E_{ACO} + E_{ASC} + E_{CL}$,

Where:

$$E_{ACO} = \frac{1}{n}\sum_{i=1}^{n}\left(E_{CO}\right)_i,$$

is the average annual primary energy consumption for cooking,

and where:

n = number of conventional ovens in the basic model.

E_{CO} = annual primary energy consumption for cooking as determined in Section 4.1.2.1.1.

$$E_{ASC} = \frac{1}{n}\sum_{i=1}^{n}\left(E_{SC}\right)_i,$$

average annual self-cleaning energy consumption,

Where:

n = number of self-cleaning conventional ovens in the basic model.

E_{SC} = annual primary self-cleaning energy consumption as determined according to Section 4.1.2.3.1.

E_{CL} = clock energy consumption as determined according to Section 4.1.2.4.

4.1.2.6.2 *Conventional gas oven energy consumption.* Calculate the total annual gas energy consumption, E_{TOG}, in Btu's (kJ) per year and defined as:

$E_{TOG} = E_{ACO} + E_{ASC} + E_{TPO}$,

Where:

E_{ACO} = average annual primary energy consumption for cooking in Btu's (kJ) per year and is calculated as:

$$E_{ACO} = \frac{1}{n}\sum_{i=1}^{n}\left(E_{CO}\right)_i,$$

Where:

n = number of conventional ovens in the basic model.

E_{CO} = annual primary energy consumption for cooking as determined in Section 4.1.2.1.1.

and,

E_{ASC} = average annual self-cleaning energy consumption in Btu's (kJ) per year and is calculated as:

$$E_{ASC} = \frac{1}{n}\sum_{i=1}^{n}(E_{SC})_i,$$

Where:

n = number of self-cleaning conventional ovens in the basic model.

E_{SC} = annual primary self-cleaning energy consumption as determined according to Section 4.1.2.3.1.

$$E_{TPO} = \sum_{i=1}^{n}(E_{PO})_i,$$

total energy consumption of any pilot lights,

Where:

E_{PO} = annual energy consumption of any continuously burning pilot lights determined according to Section 4.1.2.2.

n = number of pilot lights in the basic model.

If the oven also uses electrical energy, calculate the total annual electrical energy consumption, E_{TOE}, in kilowatt-hours (kJ) per year and defined as:

$E_{TOE} = E_{ASO} + E_{AAS} + E_{CL}$,

Where:

$$E_{ASO} = \frac{1}{n}\sum_{i=1}^{n}(E_{SO})_i,$$

is the average annual secondary energy consumption for cooking,

Where:

n=number of conventional ovens in the basic model.

E_{SO}=annual secondary energy consumption for cooking of gas ovens as determined in Section 4.1.2.1.2.

$$E_{AAS} = \frac{1}{n}\sum_{i=1}^{n}(E_{SS})_i,$$

is the average annual secondary self-cleaning energy consumption,

Where:

n=number of self-cleaning ovens in the basic model.

E_{SS}=annual secondary self-cleaning energy consumption of gas ovens as determined in Section 4.1.2.3.2.

E_{CL}=annual clock energy consumption as determined in Section 4.1.2.4.

4.1.3 *Conventional oven cooking efficiency.*

4.1.3.1 *Single conventional oven.* Calculate the conventional oven cooking efficiency, Eff_{AO}, using the following equations:

For electric ovens:

$$Eff_{AO} = \frac{W_l \times C_p \times T_S}{E_O \times K_e},$$

and,

For gas ovens:

$$Eff_{AO} = \frac{W_l \times C_p \times T_S}{E_O + (E_{IO} \times K_e)},$$

Where:

W_1=measured weight of test block in pounds (kg).

C_p=0.23 Btu/lb-°F (0.96 kJ/kg• °C), specific heat of test block.

T_S=234°F (130°C), temperature rise of test block.

E_O=test energy consumption as measured in Section 3.2.1 or calculated in Section 4.1.1 or Section 4.1.1.1.

K_e=3.412 Btu/Wh (3.6 kJ/Wh), conversion factor for watt-hours to Btu's.

E_{IO}=electrical test energy consumption according to Section 3.2.1 or as calculated in Section 4.1.1.1.

4.1.3.2 *Multiple conventional ovens.* If the cooking appliance includes more than one conventional oven, calculate the cooking efficiency for all of the conventional ovens in the appliance, Eff_{TO}, using the following equation:

$$Eff_{TO} = \frac{n}{\sum_{i=1}^{n}\left(\frac{1}{Eff_{AO}}\right)_i},$$

Where:

n=number of conventional ovens in the cooking appliance.

Eff_{AO}=cooking efficiency of each oven determined according to Section 4.1.3.1.

4.1.4 *Conventional oven energy factor.* Calculate the energy factor, or the ratio of useful cooking energy output to the total energy input, R_O, using the following equations:

$$R_O = \frac{O_O}{E_{AO}},$$

For electric ovens,

Where:

O_O=29.3 kWh (105,480 kJ) per year, annual useful cooking energy output.

E_{AO}=total annual energy consumption for electric ovens as determined in Section 4.1.2.5.1.

For gas ovens:

$$R_O = \frac{O_O}{E_{AOG} + (E_{AOE} \times K_e)},$$

Where:

O_O=88.8 kBtu (93,684 kJ) per year, annual useful cooking energy output.

E_{AOG}=total annual gas energy consumption for conventional gas ovens as determined in Section 4.1.2.5.2.

E_{AOE}=total annual electrical energy consumption for conventional gas ovens as determined in Section 4.1.2.5.2.

K_e=3,412 Btu/kWh (3,600 kJ/kWh), conversion factor for kilowatt-hours to Btu's.

4.2 *Conventional cooking top*

4.2.1 *Conventional cooking top cooking efficiency*

4.2.1.1 *Electric surface unit cooking efficiency.* Calculate the cooking efficiency, Eff_{SU}, of the electric surface unit under test, defined as:

$$Eff_{SU} = W \times C_p \times \left(\frac{T_{SU}}{K_e \times E_{CT}}\right),$$

Where:

W=measured weight of test block, W_2 or W_3, expressed in pounds (kg).

C_p=0.23 Btu/lb-°F (0.96 kJ/kg• °C), specific heat of test block.

T_{SU}=temperature rise of the test block: final test block temperature, T_{CT}, as determined in Section 3.2.2, minus the initial test block temperature, T_I, expressed in °F (°C) as determined in Section 2.7.5.

K_e=3.412 Btu/Wh (3.6 kJ/Wh), conversion factor of watt-hours to Btu's.

E_{CT}=measured energy consumption, as determined according to Section 3.2.2, expressed in watt-hours (kJ).

The energy consumed by a continuously operating clock that cannot be disconnected during the cooktop test may be subtracted from the energy consumption, E_{CT}, as determined in Section 3.2.2.

4.2.1.2 *Gas surface unit cooking efficiency.* Calculate the cooking efficiency, Eff_{SU}, of the gas surface unit under test, defined as:

$$Eff_{SU} = \frac{W_3 \times C_P \times T_{SU}}{E},$$

Where:

W_3=measured weight of test block as measured in Section 3.3.2, expressed in pounds (kg).

C_p and T_{SU} are the same as defined in Section 4.2.1.1.

and,

$E=[V_{CT} - V_{CP} \times H] + (E_{IC} \times K_e)$,

Where:

V_{CT}=total gas consumption in standard cubic feet (L) for the gas surface unit test as measured in Section 3.2.2.

E_{IC}=electrical energy consumed in watt-hours (kJ) by an ignition device of a gas surface unit as measured in Section 3.2.2.

K_e=3.412 Btu/Wh (3.6 kJ/Wh), conversion factor of watt-hours to Btu's.

H=either H_n or H_p, the heating value of the gas used in the test as specified in Section 2.2.2.2 and Section 2.2.2.3, expressed in Btu's per standard cubic foot (kJ/L) of gas.

$V_{CP}=Q_{CP}\times t_{CT}$, pilot consumption, in standard cubic feet (L), during unit test,

Where:

t_{CT}=the elapsed test time as defined in Section 3.2.2.

and

$$Q_{CP}=\frac{V_{CP}}{t_{CP}},$$

(pilot flow in standard cubic feet per hour)

Where:

V_{CP}=any pilot lights gas consumption defined in Section 3.2.2.1.

t_{CP}=elapsed time of the cooking top pilot lights test as defined in Section 3.2.2.1.

4.2.1.3 *Conventional cooking top cooking efficiency*. Calculate the conventional cooking top cooking efficiency, Eff_{CT}, using the following equation:

$$Eff_{CT}=\frac{1}{n}\sum_{i=1}^{n}\left(Eff_{SU}\right)_i,$$

Where:

n=number of surface units in the cooking top.

Eff_{SU}=the efficiency of each of the surface units, as determined according to Section 4.2.1.1 or Section 4.2.1.2.

4.2.2 *Conventional cooking top annual energy consumption*.

4.2.2.1 *Conventional electric cooking top energy consumption*. Calculate the annual energy consumption of an electric cooking top, E_{CA}, in kilowatt-hours (kJ) per year, defined as:

$$E_{CA}=\frac{O_{CT}}{Eff_{CT}},$$

Where:

O_{CT}=173.1 kWh (623,160 kJ) per year, annual useful cooking energy output.

Eff_{CT}=conventional cooking top cooking efficiency as defined in Section 4.2.1.3.

4.2.2.2 *Conventional gas cooking top*

4.2.2.2.1 *Annual cooking energy consumption*. Calculate the annual energy consumption for cooking, E_{CC}, in Btu's (kJ) per year for a gas cooking top, defined as:

$$E_{CC}=\frac{O_{CT}}{Eff_{CT}},$$

Where:

O_{CT}=527.6 kBtu (556,618 kJ) per year, annual useful cooking energy output.

Eff_{CT}=the gas cooking top efficiency as defined in Section 4.2.1.3.

4.2.2.2.2 *Annual energy consumption of any continuously burning gas pilots*. Calculate the annual energy consumption of any continuously burning gas pilot lights of the cooking top, E_{PC}, in Btu's (kJ) per year, defined as:

$E_{PC}=Q_{CP}\times A\times H$,

Where:

Q_{CP}=pilot light gas flow rate as measured in Section 3.2.2.1.

A=8,760 hours, the total number of hours in a year.

H=either H_n or H_p, the heating value of the gas used in the test as specified in Section 2.2.2.2. and Section 2.2.2.3, expressed in Btu's per standard cubic foot (kJ/L) of gas.

4.2.2.2.3 *Total annual energy consumption of a conventional gas cooking top*. Calculate the total annual energy consumption of a conventional gas cooking top, E_{CA}, in Btu's (kJ) per year, defined as:

$E_{CA}=E_{CC}+E_{PC}$,

Where:

E_{CC}=energy consumption for cooking as determined in Section 4.2.2.2.1.

E_{PC}=annual energy consumption of the pilot lights as determined in Section 4.2.2.2.2.

4.2.3 *Conventional cooking top energy factor*. Calculate the energy factor or ratio of useful cooking energy output for cooking to the total energy input, R_{CT}, as follows:

For an electric cooking top, the energy factor is the same as the cooking efficiency as determined according to Section 4.2.1.3.

For gas cooking tops,

$$R_{CT}=\frac{O_{CT}}{E_{CA}},$$

Where:

O_{CT}=527.6 kBtu (556,618 kJ) per year, annual useful cooking energy output of cooking top.

E_{CA}=total annual energy consumption of cooking top determined according to Section 4.2.2.2.3.

4.3 *Combined components*. The annual energy consumption of a kitchen range, e.g. a cooktop and oven combined, shall be the sum of the annual energy consumption of each of its components. The annual energy consumption for other combinations of ovens, cooktops and microwaves will also be treated as the sum of the annual energy consumption of each of its components. The energy factor of a combined component is the sum of the annual useful cooking energy output of each component divided by the sum of the total annual energy consumption of each component.

4.4 *Microwave oven*.

4.4.1 *Microwave oven test energy output*. Calculate the microwave oven test energy output, E_T, in watt-hour's (kJ). The calculation is repeated two or three times as required in section 3.2.3. The average of the E_T's is used for a calculation in section 4.4.3. For calculations specified in units of energy [watt-hours (kJ)], use the equation below:

$$E_T=\frac{C_pM_W\left(T_2-T_1\right)+C_CM_C\left(T_2-T_0\right)}{K_e}$$

Where:

M_W=the measured mass of the test water load, in pounds (g).

M_C=the measured mass of the test container before filling with test water load, in pounds (g).

T_1=the initial test water load temperature, in °F (°C).

T_2=the final test water load temperature, in °F (°C).

T_0=the measured ambient room temperature, in °F (°C).

C_C=0.210 Btu/lb − °F (0.88 kJ/kg•°C), specific heat of test container.

C_p=1.0 Btu/lb − °F (4.187 kJ/kg•°C), specific heat of water.

K_e=3,412 Btu/kWh (3,600 kJ/kWh) conversion factor of kilowatt-hours to Btu's.

4.4.2 *Microwave oven test power output*. Calculate the microwave oven test power output, P_T, in watts (J/s) as specified in Section four, paragraph 12.5 of IEC 705 Amendment 2 See Section 430.22. The calculation is repeated for each test as required in section 3.2.3. The average of the two or three P_T's is used for calculations in section 4.4.4. (See 10 CFR 430.22)

4.4.3 *Microwave oven annual energy consumption*. Calculate the microwave oven annual energy consumption, E_{mo}, in KWh's per year, defined as:

$$E_{MO}=\frac{E_M\times O_M}{E_T}$$

Where:

E_M=the energy consumption as defined in Section 3.2.3.

O_M=79.8 kWh (287,280 kJ) per year, the microwave oven annual useful cooking energy output.

E_T=the test energy as calculated in Section 4.4.1.

4.4.4 *Microwave oven cooking efficiency.* Calculate the microwave oven cooking efficiency, $Eff_{MO,}$ as specified in Section four, paragraph 14 of IEC 705.

4.4.5 *Microwave oven energy factor.* Calculate the energy factor or the ratio of the useful cooking energy output to total energy input on a yearly basis, $R_{MO,}$ defined as:

$$R_{MO} = \frac{O_M}{E_{MO}},$$

Where:

O_M=79.8 kWh (287,280 kJ) per year, annual useful cooking energy output.

E_{MO}=annual total energy consumption as determined in Section 4.4.3.

[FR Doc. 97–25745 Filed 10–2–97; 8:45 am]

BILLING CODE 6450–01–P