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10 CFR Parts 429 and 430
Energy Conservation Program: Test Procedures for Residential Clothes Washers; Proposed Rule

DEPARTMENT OF ENERGY

10 CFR Parts 429 and 430

[Docket No. EERE–2013–BT–TP–0009]

RIN 1904–AC97

Energy Conservation Program: Test Procedures for Residential Clothes Washers

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

ACTION: Notice of proposed rulemaking.

SUMMARY: The U.S. Department of Energy (DOE) proposes to revise its test procedures for residential clothes washers established under the Energy Policy and Conservation Act. The proposed amendments would codify test procedure guidance that DOE has issued in response to frequently asked questions, clarify additional provisions within the test procedures, provide improved organization of each section, and correct formatting errors in DOE's clothes washer test procedures.

DATES: DOE will accept comments, data, and information regarding this notice of proposed rulemaking (NOPR) no later than July 9, 2014. See section V, ''Public Participation,'' for details. DOE will hold a public meeting on this proposed test procedure if one is requested by May 12, 2014.

ADDRESSES: Any comments submitted must identify the NOPR for Test Procedures for Residential Clothes Washers and provide docket number EERE–2013–BT–TP–0009 and/or regulatory information number (RIN) number 1904–AC97. Comments may be submitted using any of the following methods:

1. *Federal eRulemaking Portal: www.regulations.gov.* Follow the instructions for submitting comments.
2. *Email: RCWTPAmendments 2013TP0009@ee.doe.gov.* Include the docket number and/or RIN in the subject line of the message.
3. *Mail:* Ms. Brenda Edwards, U.S. Department of Energy, Building Technologies Program, Mailstop EE–2J, 1000 Independence Avenue SW., Washington, DC 20585–0121. If possible, please submit all items on a CD. It is not necessary to include printed copies.
4. *Hand Delivery/ Courier:* Ms. Brenda Edwards, U.S. Department of Energy, Building Technologies Program, 950 L'Enfant Plaza SW., Suite 600, Washington, DC 20024. Telephone: (202) 586–2945. If possible, please submit all items on a CD. It is not necessary to include printed copies.

For detailed instructions on submitting comments and additional information on the rulemaking process, see section V of this document (Public Participation).

Docket: The docket, which includes **Federal Register** notices, public meeting attendee lists and transcripts, comments, and other supporting documents/ materials, is available for review at *http://www.regulations.gov/#!docketDetail;D=EERE-2013-BT-TP-0009.* All documents in the docket are listed in the regulations.gov index. However, some documents listed in the index, such as those containing information that is exempt from public disclosure, may not be publicly available.

For further information on how to submit a comment or review other public comments and the docket, or to request a public meeting, contact Ms. Brenda Edwards at (202) 586–2945 or by email: *Brenda.Edwards@ee.doe.gov.*

FOR FURTHER INFORMATION CONTACT:
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I. Background

Title III of the Energy Policy and Conservation Act of 1975 (42 U.S.C. 6291, et seq.; ''EPCA'') sets forth a variety of provisions designed to improve energy efficiency. (All references to EPCA refer to the statute as amended through the American Energy Manufacturing Technical Corrections Act (AEMTCA), Public Law 112–210 (Dec. 18, 2012)). Part B of title III, which for editorial reasons was redesignated as Part A upon incorporation into the U.S. Code (42 U.S.C. 6291–6309, as codified), establishes the ''Energy Conservation Program for Consumer Products Other Than Automobiles.'' These include residential clothes washers, the subject of today's notice. (42 U.S.C. 6292(a)(7))

Under EPCA, the energy conservation program consists essentially of four parts: (1) Testing, (2) labeling, (3) Federal energy conservation standards,

and (4) certification and enforcement procedures. The testing requirements consist of test procedures that manufacturers of covered products must use as the basis for (1) certifying to DOE that their products comply with the applicable energy conservation standards adopted under EPCA, and (2) making representations about the efficiency of those products. Similarly, DOE must use these test procedures to determine whether the products comply with any relevant standards promulgated under EPCA.

General Test Procedure Rulemaking Process

Under 42 U.S.C. 6293, EPCA sets forth the criteria and procedures DOE must follow when prescribing or amending test procedures for covered products. EPCA provides in relevant part that any test procedures prescribed or amended under this section shall be reasonably designed to produce test results that measure energy efficiency, energy use, or estimated annual operating cost of a covered product during a representative average use cycle or period of use and shall not be unduly burdensome to conduct. (42 U.S.C. 6293(b)(3))

In addition, if DOE determines that a test procedure amendment is warranted, it must publish proposed test procedures and afford the public an opportunity to present oral and written comments on them. (42 U.S.C. 6293(b)(2)) Finally, in any rulemaking to amend a test procedure, DOE must determine to what extent, if any, the proposed test procedure would alter the measured energy efficiency of any covered product as determined under the existing test procedure. (42 U.S.C. 6293(e))

DOE test procedures for clothes washers are codified at appendices J1 and J2 to 10 CFR part 430 subpart B (hereafter, ''appendix J1'' and ''appendix J2''). DOE most recently amended the test procedures for clothes washers on March 7, 2012 (hereafter, the ''March 2012 final rule''). 77 FR 13888. The March 2012 final rule amended certain provisions in appendix J1 and also established the clothes washer test procedure codified in appendix J2.

Manufacturers of residential clothes washers are required to make representations of energy efficiency using either appendix J1 or appendix J2, as revised by the March 2012 final rule. Manufacturers must use a single test procedure for all representations for a basic model and may not use appendix J1 for certain representations and appendix J2 for other representations. Compliance with DOE's amended standards for residential clothes washers, and the corresponding mandatory use of the test procedure at appendix J2 for all representations, is required as of March 7, 2015. 77 FR 32308 (May 31, 2012) and 77 FR 59719 (October 1, 2012).

II. Summary of the Notice of Proposed Rulemaking

In this NOPR, DOE proposes clarifications and technical amendments to its test procedures for clothes washers at appendix J1 and appendix J2. In addition, DOE proposes amendments to the reporting and verification requirements for residential clothes washers. DOE has determined that today's proposed amendments, as described in section III, would not alter the measured efficiency of clothes washers. The proposed amendments either codify guidance interpreting DOE's existing regulations, provide further clarification of the relevant test procedure provisions, provide improved organization of each section, or correct formatting errors in DOE's clothes washer test procedures.

III. Discussion

A. Clothes Container Capacity Measurement

1. Capacity Measurement in Appendix J1

Section 3.1 of appendix J1 contains procedures for measuring the clothes container capacity. The capacity measurement procedure involves filling the clothes container with water and determining the volume based on the weight of the added water divided by the water density. Section 3.1.4 specifies that the clothes container be filled manually with water to its ''uppermost edge.''

DOE published guidance on July 6, 2010, clarifying the definition of the uppermost edge of the clothes container for the purpose of performing the capacity measurement. See DOE's guidance document at: *http://www1.eere.energy.gov/buildings/appliance_standards/pdfs/clotheswashers_faq1_2010-07-06.pdf.*

The guidance document provides detailed descriptions and illustrations of the boundary defining the uppermost edge of the clothes container for both top-loading and front-loading clothes washers. For top-loading vertical-axis clothes washers, DOE's guidance document defines the uppermost edge of the clothes container as the highest point of the innermost diameter of the tub cover. For front-loading horizontal-axis clothes washers, the guidance document specifies filling the clothes container with water to the highest point of contact between the door and the door gasket. If any portion of the door or the door gasket would occupy the measured volume when the door is closed, that volume must be excluded from the measurement. DOE's guidance document also provides illustrations of the boundary defining the uppermost edge of the clothes container for both top-loading and front-loading clothes washers. The proposed amendments incorporate these clarifications into section 3.1.4 of appendix J1, including the illustrations.

The proposal also further clarifies the appropriate water fill levels for front-loading horizontal-axis clothes washers with concave door shapes and top-loading horizontal-axis clothes washers. For front-loading horizontal-axis clothes washers with concave door shapes, the capacity measurement would include any space above the plane defined by the highest point of contact between the door and the door gasket, if that area can be occupied by clothing during washer operation. Similarly, for top-loading hojjhrizontal-axis clothes washers, the water fill volume would include any space above the plane of the door hinge, if that area can be occupied by clothing during washer operation. This additional clarification is consistent with the illustrations for these clothes washer types provided in DOE's guidance document.

2. Capacity Measurement in Appendix J2

Section 3.1.4 of appendix J2 specifies the maximum allowable water fill levels for determining the capacity of top-loading and front-loading clothes washers. For front-loading horizontal-axis clothes washers, section 3.1.4 specifies filling the clothes container to the ''uppermost edge that is in contact with the door seal.'' DOE intended this language to clarify the text in DOE's July 6, 2010 guidance document interpreting appendix J1, but did not intend for the measured capacity values to differ. Since publishing the March 2012 final rule, DOE has become aware of front-loading clothes washer door geometries with complex curvatures that may not have an easily discernible ''uppermost edge'' in contact with the door seal. Therefore, DOE proposes to amend the description of the maximum fill volume for front-loading clothes washers using the same language as the proposed amendments in appendix J1 and specified in the July 6, 2010 guidance, as described in the previous section. The proposed revision would provide additional clarity by referencing the ''highest point of contact'' rather than the ''uppermost edge,'' and will more

clearly identify the geometric boundary between the door and the door gasket. The proposal would more clearly define the uppermost fill level for a wider range of front-loading clothes washer geometries. As noted above, DOE intends for the measured capacity of a front-loading clothes washer using the proposed revised language to be equivalent to the measured capacity using the current front-loading capacity language in section 3.1.4 of appendix J2.

The proposed amendments to appendix J2 also incorporate illustrations of the boundary defining the uppermost edge of the clothes container for top-loading vertical-axis clothes washers and the boundaries defining the fill volumes for horizontal-axis clothes washers.

3. Capacity Rounding Requirements

In both appendix J1 and appendix J2, the capacity measurement is used to determine the test load sizes as defined in Table 5.1. The table provides test load sizes for capacity ranges in increments of 0.10 cubic feet. The precision of the capacity ranges in Table 5.1 implies that the capacity of the clothes container must be measured to the nearest 0.01 cubic foot for the purpose of determining load size. However, manufacturers typically report capacity to the nearest 0.1 cubic foot in DOE certification reports and in retail advertisements.

The proposed amendments clarify that, under appendix J1 and appendix J2, capacity must be measured to the nearest 0.01 cubic foot not only for the purpose of determining load size, but also for the purpose of calculating the values that manufacturers must report pursuant to 10 CFR 429.20(b). In both appendices, DOE proposes specifying this requirement in a new section 3.1.7 following the calculation of capacity in newly renumbered section 3.1.6.

The proposed amendments would also specify in a new section at 10 CFR 429.20(c) that capacity must be reported to the nearest 0.1 cubic foot (cu. ft.) for the purpose of DOE certification reports for residential clothes washers.

Finally, DOE proposes to clarify in a new section at 10 CFR 429.20(a)(3) that the certified capacity of any clothes washer basic model shall be the mean of the capacities of the units in the sample for the basic model. While DOE believes this is current practice because the existing test procedure and sampling plan require testing at least two units and measuring the drum capacity individually for each, DOE is proposing this amendment for clarity.

4. Plastic Sheet Material

Section 3.1.2 of both appendix J1 and appendix J2 instructs the testing party to line the inside of the clothes container with a 2 mil thickness (0.051mm) plastic sheet in preparation for performing the capacity measurement. DOE is aware that common industry practice is to use a large 2 mil plastic bag, rather than a plastic sheet, for lining the clothes container because the shape of the plastic bag more easily conforms to the geometry of the clothing container. DOE believes the measured capacity of the clothes washer would be the same regardless of whether a plastic sheet or plastic bag is used, provided that the thickness of either the plastic sheet or plastic bag is 2 mil. DOE therefore proposes to amend section 3.1.2 of both appendix J1 and appendix J2 to allow the use of either a 2 mil thickness plastic sheet or plastic bag to line the inside of the clothes container.

5. Shipping Bolts

Typically, front-loading clothes washers are designed with large bolts, inserted through the back of the clothes washer, that secure the wash drum to prevent movement of the drum during shipping. These ''shipping bolts'' must be removed prior to operating the clothes washer. Alternatively, on some front-loading clothes washers, the drum is secured using other forms of bracing hardware that is intended to be removed prior to operating the clothes washer.

Section 3.1.1 of appendix J2 currently specifies that the shipping bolts must remain in place during the capacity measurement procedure to support the wash drum and prevent it from sagging downward as the drum is filled with water. The proposed amendments would add a reference to ''other forms of bracing hardware'' in section 3.1.1 of both appendix J1 and appendix J2.

In addition, DOE has become aware of front-loading clothes washer designs that do not use shipping bolts or other forms of bracing hardware to support the wash drum during shipping. DOE proposes further amending section 3.1.1 of both appendix J1 and J2 to describe how a laboratory should measure the capacity of this type of clothes washer. The proposed amendments would allow a laboratory to support the wash drum by other means, including temporary bracing or support beams. Any temporary bracing or support beams would be required to keep the wash drum in a fixed position, relative to the geometry of the door and door seal components, that is representative of the position of the wash drum during normal operation. The proposal would also require that the method used avoid damage to the unit that would affect the results of the energy and water testing. The proposed amendments further specify that the test report must fully document the method used to support the wash drum, and pursuant to 10 CFR 429.71, the manufacturer must retain such documentation as part of its test records.

B. Hot and Cold Water Supply Test Conditions

Section 2.3.1 of both appendix J1 and appendix J2 specifies that the temperature of the hot water supply must not exceed 135 °F and the cold water supply must not exceed 60 °F for clothes washers in which electrical energy or water energy consumption are affected by the inlet water temperature (for example, water heating clothes washers or clothes washers with thermostatically controlled water valves). This specification does not provide a lower bound for the hot and cold water supply temperatures. In contrast, section 2.3.2 of both test procedures specifies a hot water supply temperature of 135 °F ± 5 °F and a cold water supply temperature of 60 °F ± 5 °F for clothes washers in which electrical energy and water energy consumption are not affected by the inlet water temperature.

On clothes washers with thermostatically controlled mixing valves, the supply water temperatures directly affect the relative quantities of hot and cold water consumption during a wash cycle. DOE has observed that the large majority of residential clothes washers on the market now use thermostatically controlled mixing valves or other similar technologies for precisely controlling the wash water temperatures. DOE's engineering analysis during the most recent energy conservation standards rulemaking indicated that precise temperature control will be required to achieve the higher efficiency levels established by the May 31, 2012 direct final rule. (77 FR 32308)

To improve consistency and repeatability of test results, DOE proposes to establish a lower bound of 130 °F for the hot water supply and 55 °F for the cold water supply for clothes washers in which electrical energy or water energy consumption are affected by the inlet water temperature. This would provide an allowable range of five degrees on the hot and cold water supplies (i.e., 130–135 °F and 55–60 °F, respectively). This amendment would apply to both appendix J1 and appendix J2 (with section 2.3.1 in appendix J2 renumbered to 2.2.1).

DOE notes that the proposed five-degree temperature tolerance is a tighter tolerance than is required for clothes washers in which electrical energy and water energy consumption are not affected by the inlet water temperature; however, DOE notes that the water supply temperature affects the outcome of the MEF results when testing clothes washers with thermostatically controlled water valves more significantly than for clothes washers without such valves. DOE requests comment on the potential test burden associated with maintaining a tolerance of five degrees on the hot and cold water supply temperature for clothes washers in which electrical energy and water energy consumption are affected by the inlet water temperature.

C. Test Cloth Standard Extractor RMC Test Procedure

Sections 2.6.5 through 2.6.7 of both appendix J1 and appendix J2 contain the procedures for performing the standard extractor remaining moisture content (RMC) test to evaluate the moisture absorption and retention characteristics and to develop a unique correction curve for each new lot of test cloth. To improve the clarity and overall logical flow of the test procedure, DOE proposes moving the contents of sections 2.6.5 through 2.6.7 in both appendices to a new appendix J3 as a standalone test method for measuring the moisture absorption and retention characteristics of new energy test cloth lots.

D. Test Cloth Loading Instructions

Section 2.8.3 of both appendix J1 and appendix J2 instruct the testing party to load the energy test cloths into the clothes washer by grasping them in the center, shaking them to hang loosely, and then ''put them into the clothes container'' prior to activating the clothes washer. DOE proposes to provide additional specificity for the test cloth handling and loading instructions, which DOE believes will improve the overall clarity and consistency of test cloth loading procedures. The proposed amendments would apply to both appendix J1 and appendix J2 (section 2.8.3 would be renumbered to 2.9.2 in appendix J2 per the proposed amendments).

DOE proposes using a modified version of the loading instructions for towels and pillowcases provided in the Association of Home Appliance Manufacturers (AHAM) HLW–1–2010 test method, *Performance Evaluation Procedures for Household Appliances.*[1] Like DOE's current test cloth loading instructions, the AHAM procedure involves grasping the towel/pillowcase in the center and shaking it so that it hangs loosely. The AHAM procedure further describes placing the towels/pillowcases into the drum with alternating orientations. It also provides sketches illustrating each step in the loading process. DOE's proposed amendments would adopt similar illustrations. The amendments would also specify following any additional manufacturing loading instructions provided to the user regarding the placement of clothing within the clothing container.

E. Energy Test Cycle

1. Warm Rinse Cycles

Section 1.7 of appendix J1 defines the energy test cycle as (A) the cycle recommended by the manufacturer for washing cotton or linen clothes, including all wash/rinse temperature selections and water levels offered in that cycle, and (B) for each other wash/rinse temperature selection or water level available on that basic model, the portion(s) of other cycle(s) with that temperature selection or water level that, when tested pursuant to these test procedures, will contribute to an accurate representation of the energy consumption of the basic model as used by consumers.

DOE published guidance on September 21, 2010, clarifying that the energy test cycle should include the warm rinse of the cycle most comparable to the cottons and linens cycle if warm rinse is not available on the cottons and linens cycle. See DOE's guidance document at: *http://www1.eere.energy.gov/buildings/appliance_standards/pdfs/clotheswasher_faq_2010-09-21.pdf.* The proposed amendments codify DOE's guidance by incorporating this clarification into section 1.7(B) of appendix J1 (redesignated as section 1.8(B) due to the proposed addition of a new entry in the list of definitions before the energy test cycle definition).

As described in section III.E.4 of this NOPR, DOE is proposing a new methodology for determining the energy test cycle in appendix J2. Based on the proposed methodology, which is intended to improve clarity without altering the cycle selections that will be part of the energy test cycle, DOE has tentatively determined that a parallel clarification regarding a warm rinse cycle is unnecessary in appendix J2. The methodology for determining the warm wash/warm rinse temperature selection in appendix J2 requires including the warm rinse cycle if it is not available on the cycle recommended for washing cotton or linen clothes but is available on an alternative cycle selection.

2. Sanitization Cycles

As described in the previous section, the energy test cycle in appendix J1 includes all temperature selections available on the cycle recommended by the manufacturer for washing cotton or linen clothing. The energy test cycle also includes other temperature selections available on other cycles that ''will contribute to an accurate representation of the energy consumption of the basic model as used by consumers.''

Section 3.3 of appendix J1 defines the ''Extra Hot Wash'' as a cycle with a maximum wash temperature of greater than 135 °F on water heating clothes washers. DOE is aware that on some clothes washers, an extra hot temperature selection is available only on a separate sanitization cycle. The proposed amendments to the energy test cycle definition in appendix J1 would clarify that for such clothes washers, the sanitization cycle should be included in the energy test cycle if the cycle is recommended by the manufacturer for washing clothing and if doing so would contribute to an accurate representation of the energy consumption as used by consumers. If the extra hot temperature selection is available only on a sanitization cycle not recommended by the manufacturer for washing clothing (*e.g.,* a cycle intended only for sanitizing the wash drum), such a cycle would not be required for consideration as part of the energy test cycle.

Based on DOE's proposed new methodology for determining the energy test cycle in appendix J2, DOE has tentatively determined that a specific clarification regarding a sanitization cycle is unnecessary in appendix J2 because the methodology for determining the extra hot wash temperature selection requires including the extra hot wash temperature setting if such a setting is available on the clothes washer and is recommended by the manufacturer for washing clothing.

3. Default Cycle Settings

Testing a clothes washer according to appendix J1 or appendix J2 requires selecting specific wash/rinse temperatures and wash water fill levels for the wash cycles used to determine energy and water consumption. In addition, specific spin speeds must be

[1] AHAM HLW–1–2010 is available at *http://www.aham.org/ht/d/Store/name/MAJOR/pid/5132.*

selected for the wash cycle(s) used to determine the remaining moisture content. Other than these settings, the test procedure does not instruct the user to change any other optional settings during testing.

The proposed amendments to appendix J1 would modify section 1.7(B) (redesignated as 1.8(B)) to clarify the requirement to use the manufacturer default settings for any cycle selections, except for (1) the temperature selection, (2) the wash water fill levels, or (3) if necessary, the spin speeds on wash cycles used to determine remaining moisture content. Specifically, the manufacturer default settings must be used for wash conditions such as agitation/tumble operation, soil level, spin speed on wash cycles used to determine energy and water consumption, wash times, rinse times, optional rinse settings, water heating time for water-heating clothes washers, and all other wash parameters or optional features applicable to that wash cycle. Any optional wash cycle feature (other than wash/rinse temperature, water fill level selection, or spin speed on cycle selections used to determine remaining moisture content) that is activated by default on the wash cycle under test must be included for testing unless the manufacturer instructions recommend not selecting this option for washing normally soiled cotton or linen clothes.

The proposed amendments to appendix J2 would add a new section 3.2.7 to address the use of default cycle settings in the same manner as the modification proposed for appendix J1. DOE believes the new section 3.2.7 is the most appropriate location for this amendment in appendix J2 in conjunction with the revised structure of the energy test cycle definition and flowcharts in appendix J2.

4. Energy Test Cycle Definition and Flowcharts

DOE notes that appendix J1 uses the term ''energy test cycle'' in two different ways. In some instances, ''energy test cycle'' refers to the complete set of wash/rinse temperature selections required for testing. In other instances, ''energy test cycle'' refers to the single wash cycle under test. DOE does not propose changing its usage of the term ''energy test cycle'' in appendix J1. In each instance where the term ''energy test cycle'' is used, the specific meaning of the term can be determined through context.

In appendix J2, however, DOE proposes to simplify the definition of the energy test cycle so that it means the complete set of wash/rinse temperature selections required for testing. The individual wash/rinse temperature selections required for testing would be determined using a new methodology as described below. The provisions within parts (D) and (E) of the current energy test cycle definition would be moved to sections 3.2.7 and 3.2.8, respectively, which is a more appropriate location within the test procedure. Additionally, throughout appendix J2, DOE proposes to provide greater consistency in its usage of the term ''energy test cycle,'' such that when used, it refers only to the entire set of wash/rinse temperature selections required for testing. In instances where the test procedure currently uses the term ''energy test cycle'' to refer to an individual wash cycle, DOE proposes to use the generic term ''wash cycle'' or other similar terminology as appropriate for each instance. DOE also proposes to improve overall clarity by providing the full wash/rinse temperature designation (e.g. ''Cold wash/Cold rinse'') throughout the test procedure.

In conjunction with the simplified energy test cycle definition, DOE proposes a new approach to determining the wash/rinse temperature selections required for testing in appendix J2. DOE proposes to translate the current methodology for determining the energy test cycle into a set of flowcharts that testing parties would use to determine each wash/rinse temperature selection to be used for testing. DOE believes that the binary nature of each decision box within the flowcharts would provide increased clarity and ease of use in determining which wash/rinse temperature settings to use for testing. DOE proposes to include these flowcharts within newly renumbered section 2.12 in appendix J2.

Because the proposed flowcharts would incorporate more precise definitions of warm and cold rinse temperatures, DOE also proposes to clarify the definition of ''cold rinse'' in appendix J2 so that it means the coldest rinse temperature available on the machine, as indicated to the user on the clothes washer control panel. This would prevent the unintended consequence of a wash/rinse temperature designation being excluded from the energy test cycle if the rinse portion of the cycle included a small amount of hot water (thus raising the rinse temperature slightly higher than the coldest rinse available on the machine), but was indicated on the control panel as being a cold rinse paired with the selected wash temperature.

In addition, DOE proposes adding a new definition in appendix J2 for ''Normal cycle,'' which would be defined as: ''Normal cycle means the cycle selection recommended by the manufacturer as the most common consumer cycle for washing a full load of normally to heavily soiled cotton clothing. For machines where multiple cycle settings meet this description, then the Normal cycle is the cycle selection that results in the lowest IMEF or MEF value.'' ''. DOE first adopted a similar definition of ''Normal cycle'' for clothes washer testing in appendix J, which incorporated the general approach to calculating the energy consumption of automatic clothes washers contained in AHAM's standard HLW–2EC for clothes washers at the time. (42 FR 25329, 25330 (May 17, 1977); 42 FR 49802 (September 28, 1977)) Over time, machine labeling and literature evolved to the point that the term ''normal'' as previously defined no longer captured all of the control settings most consumers would typically choose in operating the machine to wash their laundry. (See, e.g., 75 FR 57556, 57575) Further, the range of cycle options and terminology on the control panels have changed such that many machines no longer refer to a ''Normal'' cycle, instead relying upon other terms. This evolution may have resulted in inaccurate representations of the energy usage of these machines due to differing interpretations regarding the appropriate test cycle. In order to add clarity and ensure consistent selection of the appropriate cycle for energy testing, DOE is proposing to add the ''Normal cycle'' definition in newly designated section 1.25 and to reference the term in the new energy test cycle flowcharts, and DOE will consider manufacturer literature and markings on the machine when determining the normal cycle of any particular unit. DOE specifically seeks comment on this definition and whether it adequately covers the cycle setting most commonly chosen by users of washing machines.

DOE also proposes to remove the definitions for ''warm rinse'' and ''warm wash'' from section 1 of appendix J2 (Definitions and Symbols), since those terms would be defined in the proposed flowcharts instead.

Finally, DOE proposes to move the current section 2.13 of appendix J2, *Energy consumption for the purpose of certifying the cycle selection(s) to be included in Part (B) of the energy test cycle definition,* to newly created section 3.10. Section 3 of appendix J2 (Test Measurements*),* is a more appropriate location in the test procedure for these provisions.

DOE intends for the cycle selections as determined using the new energy test cycle flowcharts to be the same as the cycle selections as determined using the current energy test cycle definition in appendix J2. DOE requests comment on whether discrepancies exist when determining the wash/rinse temperature selections using the proposed flowcharts compared to using the current energy test cycle definition. If discrepancies exist, DOE requests that interested parties provide specific examples of cycle setting configurations that would lead to the discrepancies. DOE also requests comment on whether the methodology presented in the flowcharts could result in an efficiency rating that is unrepresentative of how a particular clothes washer would be used by consumers.

F. Wash Time Setting

DOE proposes moving the wash time setting provisions from section 2.10 of appendix J2 to a subsection of newly revised section 3.2.5. The procedure for setting the wash time must be performed prior to each individual wash cycle during testing; therefore, the most appropriate location for this instruction is within the specific testing procedures provided in section 3.2.

G. Standby and Off Mode Testing

DOE proposes clarifications to the standby and off mode power testing provisions in appendix J2. In addition to minor wording clarifications in sections 3.9 and 3.9.1 of appendix J2, the proposed clarifications are as follows:

1. Testing Sequence

DOE proposes clarifying that combined low-power mode testing in section 3.9 of appendix J2 be performed after completion of an energy test cycle, after removing the test load, and without disconnecting the electrical energy supply to the clothes washer between completion of the energy test cycle and the start of combined low-power mode testing. This clarification would preclude performing combined low-power mode testing directly after connecting the clothes washer to the electrical energy supply. DOE testing suggests that testing a clothes washer's standby or off-mode power consumption directly after connecting the clothes washer to the electrical energy supply may not be representative of the standby or off-mode power consumption after its first use. DOE believes this clarification would ensure that the results of the combined low-power mode testing accurately represent the conditions most likely to be experienced in a residential setting.

2. Default Settings

DOE proposes clarifying that combined low-power mode testing be performed without changing the control panel settings used for the energy test cycle completed prior to combined low-power mode testing. The test procedure requires using the manufacturer default settings for any wash cycle performed within the energy test cycle. The proposed clarification would preclude activating or deactivating any optional control panel displays or other features not activated by default on the clothes washer when it is not being used to perform an active mode wash cycle, during combined low-power mode testing. DOE believes this clarification would ensure that the results of the combined low-power mode testing accurately represent the conditions most likely to be experienced in a residential setting.

3. Multiple Possible Inactive Modes

DOE testing indicates that some residential appliances, including clothes washers, may have multiple modes that meet the definition of inactive mode currently provided in section 1.15 of appendix J2 (redesignated section 1.16). DOE proposes clarifying that inactive mode is the lowest-power standby mode that facilitates the activation of active mode by remote switch (including remote control), internal sensor, or timer, or that provides continuous status display. Specifying use of the lowest-power mode would clarify potential ambiguity regarding which inactive mode to use for testing if multiple inactive modes exist on a clothes washer.

H. Fixed Water Fill Control Systems

The load sizes used for testing depend upon the type of water fill control system available on the clothes washer, as defined in section 2.8 of both appendix J1 and appendix J2. For clothes washers with manual water fill control systems, the minimum and maximum load sizes are tested. For clothes washers with adaptive water fill control systems, the minimum, average, and maximum load sizes are tested.

DOE has become aware of clothes washers that have fixed water levels for all load sizes and no water fill selector or water fill control settings available to the user. DOE notes that, as with adaptive water fill control systems, fixed water fill control systems do not require user action to determine the water fill level. Therefore, DOE proposes that a clothes washer with a fixed water fill control system be tested in the same manner as a clothes washer with an adaptive water fill control system; i.e., using the minimum, average, and maximum load sizes.

The proposed amendments would (1) add a definition for ''fixed water fill control system,'' (2) add a definition for ''automatic water fill control system,'' which would include both fixed water fill control systems and adaptive water fill control systems, and (3) amend the definition of ''adaptive water fill control system'' to clarify that it is considered a type of automatic water fill control system. Additionally, where appropriate, instances of ''adaptive water fill control system'' throughout the test procedure would be replaced with ''automatic water fill control system,'' to indicate that such testing provisions apply to both adaptive water fill control systems and fixed water fill control systems. These amendments would apply to both appendix J1 and appendix J2.

I. Deep Rinse and Spray Rinse Definitions

Section 3.2.2 of appendix J2 states that total water consumption during the energy test cycle shall be measured, including hot and cold water consumption, during wash, deep rinse, and spray rinse. As proposed, the revised section 3.2.8 would specify including the entire active washing mode, and excluding any delay start or cycle finished modes, for each wash cycle tested. Active washing mode is defined in section 1.2 as including the main functions of washing, soaking, tumbling, agitating, rinsing, and/or removing water from the clothing. DOE believes that the proposed revision to 3.2.8 provides better clarity and completeness, compared to the wording in 3.2.2, regarding the portions of the wash cycle to be included and measured for testing. Therefore, DOE proposes to delete section 3.2.2 from appendix J2 and to renumber the subsequent subsections accordingly.

Furthermore, since section 3.2.2 is the only location within the test procedure where the terms ''deep rinse'' and ''spray rinse'' occur, DOE also proposes to remove those two definitions from the section 1 of appendix J2.

J. Uniformly Distributed Warm Wash Temperatures

Section 1.17 of appendix J1 and section 1.32 of appendix J2 provide the definition of uniformly distributed warm wash temperature selections. A clothes washer has uniformly distributed warm wash temperature selections if (A) the warm wash temperatures have a linear relationship with all discrete warm wash selections

when the water temperatures are plotted against equally spaced consecutive warm wash selections between the hottest warm wash and the coldest warm wash, and the mean water temperature of the warmest and the coldest warm selections coincide with the mean of the hot wash and cold wash water temperatures within ±3.8 °F; or (B) on a clothes washer with only one warm wash temperature selection, the warm wash temperature selection has a water temperature that coincides with the mean of the hot wash and cold wash water temperatures within ±3.8 °F. For clothes washers with uniformly distributed warm wash temperature selections, the reported values to be used for the warm wash setting are the arithmetic average of the measurements for the hot and cold wash selections. This is a ''shortcut'' calculation only; no testing is required.

DOE notes that the criteria for determining whether the warm wash temperatures are uniformly distributed are based on water temperature only; total water consumption is not considered. On a clothes washer with electronic control systems, a clothes washer's warm wash cycles could be programmed to use larger quantities of water than the cold wash and hot wash cycles, yet the data to be used to represent the warm wash cycle would be the average of the cold and hot wash cycles, rather than actual data from testing. Since the warm wash temperature selection has the highest temperature use factor at 0.49, DOE proposes that the warm wash temperature selection(s) on such a clothes washer be tested. Therefore, DOE proposes to remove the definition of uniformly distributed warm wash temperature selections from both appendix J1 and appendix J2, and to remove any provisions within the test procedures pertaining to uniformly distributed warm wash temperature selections.

DOE requests comment on any potential increase in test burden as result of its proposal to eliminate the separate testing provisions for clothes washers with uniformly distributed warm wash temperatures. DOE estimates that the resulting total testing time would be no greater than for clothes washers with the same number of warm wash temperature options, but with non-uniformly distributed temperatures, which DOE observes constitutes the majority of the market.

K. Determining Extra Hot Wash Temperature

Section 3.3 of both appendix J1 and appendix J2 defines Extra Hot Wash as having a maximum wash temperature greater than 135 °F. Determining the maximum wash temperature requires measuring the water temperature during the wash cycle to determine the maximum wash temperature achieved. DOE understands that, in practice, measuring the wash water temperature can be difficult due to factors such as the geometry of front-loading tub design; the increasing use of door locks; and, in high-efficiency clothes washers, the lack of a standing pool of wash water from which to measure the temperature.

DOE proposes adding a statement to section 3.3 of both appendix J1 and appendix J2 to provide guidance on one possible method that testing parties could use to determine the maximum wash water temperature. In the proposed method, testing parties would adhere non-reversible temperature indicator labels to the inside of the clothing container to determine the maximum water temperature during an energy test cycle. If a testing party used the temperature indicator label method when testing a front-loading clothes washer, the label would be adhered along the inner circumference of the clothes container drum, midway between the front and the back of the clothes container. For a top-loading clothes washer, the label would be adhered along the inner circumference of the clothes container drum, as close to the bottom of the container as possible.

Manufacturers may be able to use alternate methods for determining the maximum wash temperature during an energy test cycle; however, DOE is unaware of any other direct measurement methods that could be safely used by a third-party laboratory without requiring partial disassembly of the clothes washer or without permanently altering the machine.

L. Gas-Heated and Oil-Heated Hot Water Energy

Section 4.1.4 of both appendix J1 and appendix J2 provides equations for calculating per-cycle hot water energy consumption using gas-heated or oil-heated water. The result of this calculation is not used in any downstream calculations within the test procedure. The calculated result is referenced within 10 CFR 430.23(j)(1)(i)(B) and (ii)(B); however, these values are not included as part of DOE's certification requirements for clothes washers in 10 CFR 429.20 and 429.46, nor are they required for other DOE regulatory purposes. DOE is unaware of any other regulatory programs that require the calculation of per-cycle hot water energy using gas- or oil-heated water for clothes washers. Therefore, DOE proposes to remove section 4.1.4 from both appendix J1 and appendix J2, and to remove the related sections of 10 CFR 430.23(j)(1)(i)(B) and (ii)(B), adjusting the subsequent section numberings accordingly.

M. Out-of-Balance Loads

DOE has observed that some clothes washers may terminate the wash cycle prematurely if an out-of-balance condition is detected. Because the test procedure defines an energy test cycle as including the agitation/tumble operation, spin speed(s), wash times, and rinse times applicable to each cycle, the data from a wash cycle that terminates prematurely if an out-of-balance condition is detected, and thus does not include these required elements, should be discarded. The proposed amendments provide this clarification to section 3.2 of appendix J1 and a new section 3.2.9 of appendix J2.

N. Reordering of Section 2, Testing Conditions

DOE proposes to reorder the subsections within section 2 of appendix J2 (Testing Conditions) to improve the clarity and overall flow of the section. After reordering, the general progression of section 2 would be as follows:

- Laboratory infrastructure requirements
- Instrumentation requirements
- Test cloth requirements
- Test load composition and handling
- Clothes washer installation and preconditioning procedures
- Energy test cycle determination

O. Table 3.2 Edits

Table 3.2 in both appendix J1 and appendix J2 defines the sections within the test procedure that govern the tests of particular clothes washers, based on the number of wash/rinse temperature selections available on the model. DOE proposes to clarify one of the headings in Table 3.2 of appendix J1. The proposal would amend the current heading, ''Number of wash temp. selections'' to ''Number of wash temp. selections in the energy test cycle.'' In addition, Table 3.2 in appendix J1 contains a typographical error in the second footnote: the word ''heating'' is misspelled. Today's proposal corrects this error.

DOE proposes simplifying the overall structure of Table 3.2 in appendix J2 (renumbered 3.2.2) by using the clarified wash/rinse temperature nomenclature within the revised energy

test cycle definition and flowcharts. DOE does not intend for any of the required test sections to change as a result of the proposed revisions to the table.

P. Table 4.1.1 Edits

Table 4.1.1 in appendix J2 provides the temperature use factors. DOE proposes improving the clarity of the overall structure of Table 4.1.1 in appendix J2 by reorganizing the columns in the table to more closely match the wash/rinse temperature nomenclature within the revised energy test cycle definition and flowcharts. DOE does not intend for any of the temperature use factors to change as a result of the proposed revisions to the table.

Q. Table 2.8 Edits

In the March 2012 final rule, Table 2.8 in appendix J2 (''Test Load Sizes and Water Fill Settings Required'') contained a formatting error that combined the average and minimum test load sizes into a single row for clothes washers with an adaptive water fill control system. DOE did not intend to amend the test load sizes required for clothes washers with an adaptive water fill control system. Today's proposal amends the layout of Table 2.8 in both appendix J1 and appendix J2 to improve its overall clarity. As described above, DOE has also proposed changing the heading of the relevant column to ''automatic water fill control system'' rather than ''adaptive water fill control system''.

R. Replacing ''Consumer'' With ''User''

Both appendix J1 and appendix J2 refer to the ''consumer'' in various parts of the test procedures. In each instance, the word ''consumer'' refers to the individual using the clothes washer. DOE notes that the word ''consumer'' may be misconstrued as the original purchaser or owner of the clothes washer. In some cases, particularly coin-operated laundries and multi-family housing common laundry rooms, the purchaser or owner of the clothes washer is not the end user of the clothes washer.

The distinction between the owner and the end user may be relevant to the test procedure if certain settings, such as water fill levels, may be customized by the owner of the clothes washer but are not adjustable by the end user. To prevent any possible ambiguity implied by the word ''consumer,'' DOE proposes to replace the word ''consumer'' with ''user'' or ''end user'' throughout the test procedure in all instances where the word ''consumer'' is currently used.

S. Introductory Text

DOE proposes revising the introductory text after the appendix headings in both appendix J1 and appendix J2 to clarify the proper use of appendices J1 and J2 for making representations of energy efficiency, including certifying compliance with DOE energy conservation standards.

DOE test procedures for clothes washers are set forth in appendices J1 and J2 in 10 CFR Part 430 subpart B. This proposal describes amendments to both appendices. Pursuant to 42 U.S.C. 6293(c), manufacturers must make representations of energy efficiency using any amendments DOE adopts in a final test procedure rule beginning 180 days after the effective date of such rule. Therefore, beginning 180 days after the effective date of any final amendments based on today's proposals, manufacturers must make representations of energy efficiency pursuant to appendix J1 or appendix J2 as modified through such amendments.

In addition, as of March 7, 2015, manufacturers of residential clothes washers will no longer be authorized to use appendix J1. Residential clothes washer manufacturers must use appendix J2, as modified though any amendments that DOE may adopt based on today's proposal, to demonstrate compliance with the standards and make any representations of energy efficiency as of March 7, 2015. March 7, 2015 is the compliance date of the amended energy conservation standards that address standby and off mode energy consumption for residential clothes washers. 77 FR 32308 (May 31, 2012) and 77 FR 59719 (October 1, 2012).

T. Test Procedure Provisions in 10 CFR 430.23

DOE proposes revising section 430.23(j)(3) to contain only the provisions for calculating annual water consumption when using either appendix J1 or appendix J2. The proposed amendments would add a new section 430.23(j)(4), which would contain the provisions for determining water factor and integrated water factor.

The proposed amendments would also create a new section 430.23(j)(5) that would contain the following statement: ''Other useful measures of energy consumption for automatic or semi-automatic clothes washers shall be those measures of energy consumption that the Secretary determines are likely to assist consumers in making purchasing decisions and that are derived from the application of appendix J1 or appendix J2, as appropriate.'' This statement is currently contained in section 430.23(j)(3). Moving the statement to a dedicated subsection would maintain consistency with DOE's test procedure provisions for other products within 10 CFR Part 430. DOE notes that the measurement or reporting of any additional measures of energy or water consumption would be adopted through the rulemaking process.

Finally, to eliminate any potential ambiguity, the proposed amendments would replace the phrase ''can be determined'' with ''must be determined'' throughout the text of 10 CFR 430.23(j)(3) through (j)(5).

U. Reporting and Verification Requirements

1. Remaining Moisture Content

DOE has observed the potential for significant variation in the RMC measurement at the maximum spin speed setting on some clothes washer models. During testing of front-loading clothes washer models, DOE observed that the maximum target spin speed may not be achieved during the final spin portion of the cycle if the load size is not evenly distributed around the circumference of the wash drum. DOE believes that in such cases, the spin speed may be automatically reduced as a safety precaution and to prevent damage to the clothes washer caused by the asymmetric rotation of the unbalanced load within the wash basket.

Figure III.1 shows an example of RMC test data obtained from one front-loading residential clothes washer model. DOE performed the RMC measurement using the cold wash cycle at the maximum available spin speed setting. The RMC measurement was performed a total of twelve times using three different test cloth lots. The corrected RMC measurement [2] varied between 32.3 percent and 46.2 percent, with an average of 37.0 percent. DOE has observed similar variations of this magnitude on multiple front-loading clothes washer models.

[2] Corrected RMC measurements are obtained using the test cloth correction factors developed for each test cloth lot, as applied in section 2.6.7 of appendix J1 and appendix J2. DOE publishes a list of the test cloth correction factors developed for test cloth Lots 5 through 20 at *http://www2.eere.energy.gov/buildings/appliance_standards/residential/clothes_washer_test_cloth_correction.html.*

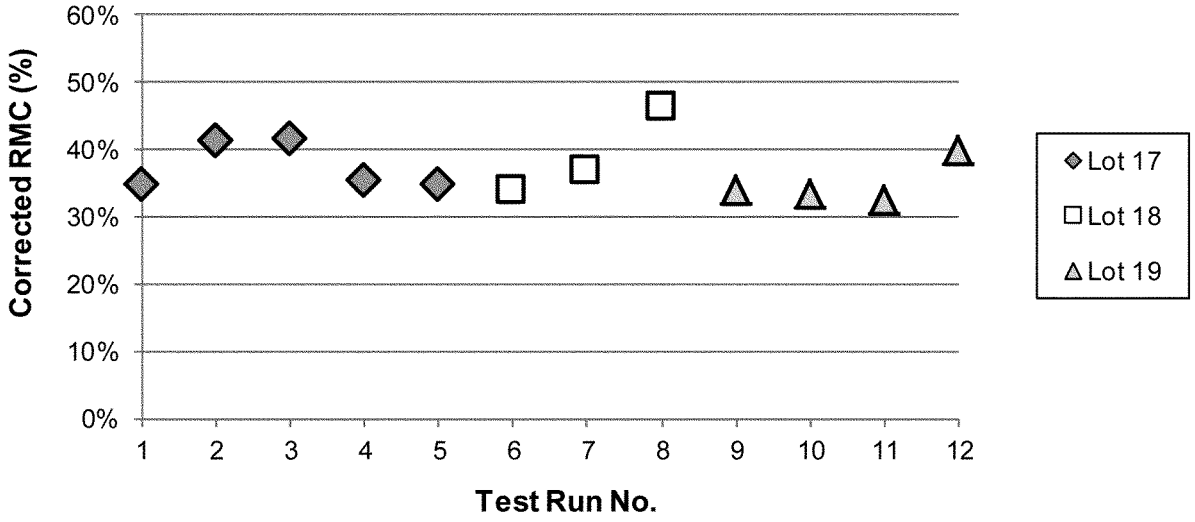


Figure III.1 Remaining Moisture Content Measurements for a Front-Loading Residential Clothes Washer at Maximum Spin Speed

The RMC measurement is used to determine the per-cycle energy consumption for removal of moisture from the test load; i.e., the ''drying energy'' portion of the MEF and Integrated Modified Energy Factor (IMEF) calculations. The drying energy represents between 59 and 87 percent of a clothes washer's total energy consumption; [3] hence, the RMC measurement significantly impacts the overall MEF and IMEF calculations. For example, the level of RMC variation shown in Figure III.1 would lead to a 25 percent variation in the overall MEF calculation.

In today's rule, DOE proposes adding a new section 3.8.5 in both appendix J1 and appendix J2 to specify that manufacturers may perform up to two additional replications of the RMC measurement, for a total of three independent RMC measurements for the tested unit, and use the average of the three measurements as the basis for the calculation of per-cycle energy consumption for removal of moisture from the test load.

DOE also proposes to add the RMC measurement to the list of public product-specific information contained in the certification reports for residential clothes washers, as described in 10 CFR 429.20(b)(2)(i) and (ii). DOE also proposes in newly created 10 CFR 429.20(a)(4) that the certified RMC value of any clothes washer basic model shall be the mean of the final RMC value measured for all tested units of the basic model.

Finally, DOE proposes to add provisions in newly created section 10 CFR 429.134(c)(1) specifying that during assessment or enforcement testing, the measured RMC value of a tested unit will be considered the tested unit's final RMC value if the measured RMC value is within two RMC percentage points of the certified RMC value of the basic model (expressed as a percentage), or if the measured RMC value is lower than the certified RMC value. DOE proposes a threshold of two RMC percentage points because such a variation would limit the variation in the overall MEF or IMEF calculation to roughly five percent.

If the measured RMC value of a tested unit is more than two RMC percentage points higher than the certified RMC value of the basic model, DOE will perform two additional replications of the RMC measurement, each pursuant to the provisions of newly added section 3.8.5 of appendix J1 and appendix J2, for a total of three independent RMC measurements of the tested unit. The average of the three RMC measurements will be considered the tested unit's final RMC value and will be used as the basis for the calculation of per-cycle energy consumption for removal of moisture from the test load for that unit.

2. Rounding Requirements for All Reported Values

DOE proposes adding a new section at 10 CFR 429.20(c) to specify the rounding requirements of all reported values for residential clothes washers as follows: MEF and IMEF to the nearest 0.01 cu ft/kWh/cycle, WF and IWF to the nearest 0.1 gal/cycle/cu ft, RMC to the nearest 0.1 percentage point, and clothes container capacity to the nearest 0.1 cu ft.

3. Energy Test Cycle Selections

As amended by the March 2012 final rule, 10 CFR 429.20(b)(3) requires certification reports based on testing conducted in accordance with appendix J2 to include a list of all cycle selections comprising the complete energy test cycle for each basic model. DOE believes that this reporting requirement should also pertain when appendix J1 is used, particularly due to the difference in wording of the energy test cycle definition in appendix J1. Therefore, DOE proposes to amend 10 CFR 429.20(b)(3) to require a list of all cycle selections comprising the complete energy test cycle for each basic model, regardless of whether the certification is based on testing conducted in accordance with appendix J1 or appendix J2.

IV. Procedural Issues and Regulatory Review

A. Review Under Executive Order 12866

The Office of Management and Budget has determined that test procedure

[3] Percentages derived from Table 7.2.1 and 7.2.2 in the May 31, 2012 direct final rule technical support document for the residential clothes washer energy conservations standards rulemaking, available at *http://www.regulations.gov/#!documentDetail;D=EERE-2008-BT-STD-0019-0047.*

rulemakings do not constitute ''significant regulatory actions'' under section 3(f) of Executive Order 12866, Regulatory Planning and Review, 58 FR 51735 (Oct. 4, 1993). Accordingly, this action was not subject to review under the Executive Order by the Office of Information and Regulatory Affairs (OIRA) in the Office of Management and Budget (OMB).

B. Review Under the Regulatory Flexibility Act

The Regulatory Flexibility Act (5 U.S.C. 601 *et seq.*) requires preparation of a regulatory flexibility analysis (IFRA) for any rule that by law must be proposed for public comment, unless the agency certifies that the rule, if promulgated, will not have a significant economic impact on a substantial number of small entities. As required by Executive Order 13272, ''Proper Consideration of Small Entities in Agency Rulemaking,'' 67 FR 53461 (August 16, 2002), DOE published procedures and policies on February 19, 2003, to ensure that the potential impacts of its rules on small entities are properly considered during the DOE rulemaking process. 68 FR 7990. DOE has made its procedures and policies available on the Office of the General Counsel's Web site: *http://energy.gov/gc/office-general-counsel*.

DOE reviewed today's proposed rule under the provisions of the Regulatory Flexibility Act and the procedures and policies published on February 19, 2003. Today's NOPR would amend DOE's test procedure by codifying guidance interpreting DOE's existing regulations, providing further clarifying interpretation of the relevant test procedure provisions, correcting formatting errors, providing improved overall organization, and removing certain testing provisions within the current test procedures. DOE has concluded that the rule would not have a significant impact on a substantial number of small entities. The factual basis for this certification is as follows:

The Small Business Administration (SBA) considers a business entity to be a small business, if, together with its affiliates, it employs less than a threshold number of workers specified in 13 CFR Part 121. These size standards and codes are established by the 2007 North American Industry Classification System (NAICS). The threshold number for NAICS classification code 335224, which applies to household laundry equipment manufacturers and includes residential clothes washer manufacturers, is 1,000 employees. Searches of the SBA Web site [4] to identify clothes washer manufacturers within this NAICS code identified one small business. This small business manufactures laundry appliances, including residential clothes washers.

DOE estimates that the clarified description of the capacity measurement would take the same amount of time to conduct as the capacity measurement analyzed in the March 2012 final rule. DOE believes that use of an alternate bracing method for front-loading clothes washers that do not contain shipping bolts or other bracing hardware is already current practice among manufacturers of such clothes washers. Additionally, DOE notes that the identified small business produces only a single platform of top-loading clothes washers, for which the proposed alternate bracing method would not be applicable.

Regarding the potential increased testing burden associated with maintaining a five degree tolerance on supply water temperatures for clothes washers in which electrical energy consumption or water energy consumption are affected by the inlet water temperature. One method for achieving this temperature tolerance would be to use electronically controlled water mixing valves on both the cold and hot water supply lines. DOE estimates a capital cost of approximately $2,500 for installing electronically controlled water mixing valves on a single test stand. DOE notes that the identified small business currently does not manufacturer this type of clothes washer; therefore, DOE does not expect this proposed amendment to require any changes to the testing hardware currently used by the small business.

DOE does not expect any of the clarifications to the energy test cycle definition or the standby and off mode measurements to affect the total length of testing time. Regarding any potential increase in test burden as a result of its proposal to eliminate the separate testing provisions for clothes washers with uniformly distributed warm wash temperatures. DOE notes that the total testing time would be no greater than for clothes washers with the same number of warm wash temperature options, but with non-uniformly distributed temperatures, which DOE observes constitutes the majority of the market. DOE also notes that the clothes washers manufactured by the identified small business do not contain uniformly distributed warm wash temperatures, and thus the small business will not be affected by the proposed amendment.

Finally, the remaining proposed changes in today's NOPR are intended to clarify the existing test methods without adding any additional requirements and therefore would not result in additional burden.

For the reasons stated above, DOE certifies that the proposed test procedure amendments would not have a significant impact on a substantial number of small entities. DOE will submit a certification and supporting statement of factual basis to the Chief Counsel for Advocacy of the SBA for review under 5 U.S.C. 605(b).

C. Review Under the Paperwork Reduction Act of 1995

Manufacturers of residential clothes washers must certify to DOE that their products comply with any applicable energy conservation standards. In certifying compliance, manufacturers must test their products according to the DOE test procedures for clothes washers, including any amendments adopted for those test procedures. DOE has established regulations for the certification and recordkeeping requirements for all covered consumer products and commercial equipment, including residential clothes washers. (76 FR 12422 (March 7, 2011). The collection-of-information requirement for the certification and recordkeeping is subject to review and approval by OMB under the Paperwork Reduction Act (PRA). This requirement has been approved by OMB under OMB control number 1910–1400. Public reporting burden for the certification is estimated to average 20 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

Notwithstanding any other provision of the law, no person is required to respond to, nor shall any person be subject to a penalty for failure to comply with, a collection of information subject to the requirements of the PRA, unless that collection of information displays a currently valid OMB Control Number.

D. Review Under the National Environmental Policy Act of 1969

In this proposed rule, DOE proposes test procedure amendments that it expects will be used to develop and implement future energy conservation standards for residential clothes washers. DOE has determined that this rule falls into a class of actions that are categorically excluded from review

[4] A searchable database of certified small businesses is available online at: *http://dsbs.sba.gov/dsbs/search/dsp_dsbs.cfm*.

under the National Environmental Policy Act of 1969 (42 U.S.C. 4321 *et seq.*) and DOE's implementing regulations at 10 CFR Part 1021. Specifically, this proposed rule would amend the existing test procedures without affecting the amount, quality or distribution of energy usage, and, therefore, would not result in any environmental impacts. Thus, this rulemaking is covered by Categorical Exclusion A5 under 10 CFR Part 1021, subpart D, which applies to any rulemaking that interprets or amends an existing rule without changing the environmental effect of that rule. Accordingly, neither an environmental assessment nor an environmental impact statement is required.

E. Review Under Executive Order 13132

Executive Order 13132, ''Federalism,'' 64 FR 43255 (August 4, 1999) imposes certain requirements on agencies formulating and implementing policies or regulations that preempt State law or that have Federalism implications. The Executive Order requires agencies to examine the constitutional and statutory authority supporting any action that would limit the policymaking discretion of the States and to carefully assess the necessity for such actions. The Executive Order also requires agencies to have an accountable process to ensure meaningful and timely input by State and local officials in the development of regulatory policies that have Federalism implications. On March 14, 2000, DOE published a statement of policy describing the intergovernmental consultation process it will follow in the development of such regulations. 65 FR 13735. DOE examined this proposed rule and determined that it will not have a substantial direct effect on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government. EPCA governs and prescribes Federal preemption of State regulations as to energy conservation for the products that are the subject of today's proposed rule. States can petition DOE for exemption from such preemption to the extent, and based on criteria, set forth in EPCA. (42 U.S.C. 6297(d)) No further action is required by Executive Order 13132.

F. Review Under Executive Order 12988

Regarding the review of existing regulations and the promulgation of new regulations, section 3(a) of Executive Order 12988, ''Civil Justice Reform,'' 61 FR 4729 (Feb. 7, 1996), imposes on Federal agencies the general duty to adhere to the following requirements: (1) Eliminate drafting errors and ambiguity; (2) write regulations to minimize litigation; (3) provide a clear legal standard for affected conduct rather than a general standard; and (4) promote simplification and burden reduction. Section 3(b) of Executive Order 12988 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 burden reduction; (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 Executive Order 12988 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 has completed the required review and determined that, to the extent permitted by law, this proposed rule meets the relevant standards of Executive Order 12988.

G. Review Under the Unfunded Mandates Reform Act of 1995

Title II of the Unfunded Mandates Reform Act of 1995 (UMRA) requires each Federal agency to assess the effects of Federal regulatory actions on State, local, and Tribal governments and the private sector. Public Law 104–4, sec. 201 (codified at 2 U.S.C. 1531). For a proposed regulatory action likely to result in a rule that may cause the expenditure by State, local, and Tribal governments, in the aggregate, or by the private sector of $100 million or more in any one year (adjusted annually for inflation), section 202 of UMRA requires a Federal agency to publish a written statement that estimates the resulting costs, benefits, and other effects on the national economy. (2 U.S.C. 1532(a), (b)) The UMRA also requires a Federal agency to develop an effective process to permit timely input by elected officers of State, local, and Tribal governments on a proposed ''significant intergovernmental mandate,'' and requires an agency plan for giving notice and opportunity for timely input to potentially affected small governments before establishing any requirements that might significantly or uniquely affect small governments. On March 18, 1997, DOE published a statement of policy on its process for intergovernmental consultation under UMRA. 62 FR 12820; also available at *http://energy.gov/gc/office-general-counsel.* DOE examined today's proposed rule according to UMRA and its statement of policy and determined that the proposal contains neither an intergovernmental mandate, nor a mandate that may result in the expenditure of $100 million or more in any year, so these requirements do not apply.

H. Review Under the Treasury and General Government Appropriations Act, 1999

Section 654 of the Treasury and General Government Appropriations Act, 1999 (Pub. L. 105–277) requires Federal agencies to issue a Family Policymaking Assessment for any rule that may affect family well-being. This rule would not have any impact on the autonomy or integrity of the family as an institution. Accordingly, DOE has concluded that it is not necessary to prepare a Family Policymaking Assessment.

I. Review Under Executive Order 12630

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

J. Review Under Treasury and General Government Appropriations Act, 2001

Section 515 of the Treasury and General Government Appropriations Act, 2001 (44 U.S.C. 3516 note) provides for agencies to review most disseminations of information to the public under guidelines established by each agency pursuant to general guidelines issued by OMB. OMB's guidelines were published at 67 FR 8452 (Feb. 22, 2002), and DOE's guidelines were published at 67 FR 62446 (Oct. 7, 2002). DOE has reviewed today's proposed rule under the OMB and DOE guidelines and has concluded that it is consistent with applicable policies in those guidelines.

K. Review Under Executive Order 13211

Executive Order 13211, ''Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use,'' 66 FR 28355 (May 22, 2001), requires Federal agencies to prepare and submit to OMB, a Statement of Energy Effects for any proposed significant energy action. A ''significant energy action'' is defined as

any action by an agency that promulgated or is expected to lead to promulgation of a final rule, and that: (1) Is a significant regulatory action under Executive Order 12866, or any successor order; and (2) is likely to have a significant adverse effect on the supply, distribution, or use of energy; or (3) is designated by the Administrator of OIRA as a significant energy action. For any proposed significant energy action, the agency must give a detailed statement of any adverse effects on energy supply, distribution, or use should the proposal be implemented, and of reasonable alternatives to the action and their expected benefits on energy supply, distribution, and use.

Today's regulatory action to amend the test procedure for measuring the energy efficiency of residential clothes washers is not a significant regulatory action under Executive Order 12866. Moreover, it would not have a significant adverse effect on the supply, distribution, or use of energy, nor has it been designated as a significant energy action by the Administrator of OIRA. Therefore, it is not a significant energy action, and, accordingly, DOE has not prepared a Statement of Energy Effects.

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

Under section 301 of the Department of Energy Organization Act (Pub. L. 95–91; 42 U.S.C. 7101), DOE must comply with section 32 of the Federal Energy Administration Act of 1974, as amended by the Federal Energy Administration Authorization Act of 1977. (15 U.S.C. 788; FEAA) Section 32 essentially provides in relevant part that, where a proposed rule authorizes or requires use of commercial standards, the notice of proposed rulemaking must inform the public of the use and background of such standards. In addition, section 32(c) requires DOE to consult with the Attorney General and the Chairman of the Federal Trade Commission (FTC) concerning the impact of the commercial or industry standards on competition. DOE is not requiring the use of any new commercial standards in this rulemaking, so these requirements do not apply.

V. Public Participation

A. Submission of Comments

DOE will accept comments, data, and information regarding this proposed rule no later than the date provided in the **DATES** section at the beginning of this proposed rule. Interested parties may submit comments using any of the methods described in the **ADDRESSES** section at the beginning of this NOPR.

Submitting comments via regulations.gov. The regulations.gov Web page will require you to provide your name and contact information. Your contact information will be viewable to DOE Building Technologies staff only. Your contact information will not be publicly viewable except for your first and last names, organization name (if any), and submitter representative name (if any). If your comment is not processed properly because of technical difficulties, DOE will use this information to contact you. If DOE cannot read your comment due to technical difficulties and cannot contact you for clarification, DOE may not be able to consider your comment.

However, your contact information will be publicly viewable if you include it in the comment or in any documents attached to your comment. Any information that you do not want to be publicly viewable should not be included in your comment, nor in any document attached to your comment. Persons viewing comments will see only first and last names, organization names, correspondence containing comments, and any documents submitted with the comments.

Do not submit to regulations.gov information for which disclosure is restricted by statute, such as trade secrets and commercial or financial information (hereinafter referred to as Confidential Business Information (CBI)). Comments submitted through regulations.gov cannot be claimed as CBI. Parties who submit comments through the Web site will waive any CBI claims for the information submitted. For information on submitting CBI, see the Confidential Business Information section.

DOE processes submissions made through regulations.gov before posting. Normally, comments will be posted within a few days of being submitted. However, if large volumes of comments are being processed simultaneously, your comment may not be viewable for up to several weeks. Please keep the comment tracking number that regulations.gov provides after you have successfully uploaded your comment.

Submitting comments via email, hand delivery, or mail. Comments and documents submitted via email, hand delivery, or mail also will be posted to regulations.gov. If you do not want your personal contact information to be publicly viewable, do not include it in your comment or any accompanying documents. Instead, provide your contact information on a cover letter. Include your first and last names, email address, telephone number, and optional mailing address. The cover letter will not be publicly viewable as long as it does not include any comments.

Include contact information each time you submit comments, data, documents, and other information to DOE. If you submit via mail or hand delivery, please provide all items on a CD, if feasible. It is not necessary to submit printed copies. No facsimiles (faxes) will be accepted.

Comments, data, and other information submitted to DOE electronically should be provided in PDF (preferred), Microsoft Word or Excel, WordPerfect, or text (ASCII) file format. Provide documents that are not secured, written in English and free of any defects or viruses. Documents should not contain special characters or any form of encryption and, if possible, they should carry the electronic signature of the author.

Campaign form letters. Please submit campaign form letters by the originating organization in batches of between 50 to 500 form letters per PDF or as one form letter with a list of supporters' names compiled into one or more PDFs. This reduces comment processing and posting time.

Confidential Business Information. According to 10 CFR 1004.11, any person submitting information that he or she believes to be confidential and exempt by law from public disclosure should submit via email, postal mail, or hand delivery two well-marked copies: one copy of the document marked confidential including all the information believed to be confidential, and one copy of the document marked non-confidential with the information believed to be confidential deleted. Submit these documents via email or on a CD, if feasible. DOE will make its own determination about the confidential status of the information and treat it according to its determination.

Factors of interest to DOE when evaluating requests to treat submitted information as confidential include: (1) A description of the items; (2) whether and why such items are customarily treated as confidential within the industry; (3) whether the information is generally known by or available from other sources; (4) whether the information has previously been made available to others without obligation concerning its confidentiality; (5) an explanation of the competitive injury to the submitting person that would result from public disclosure; (6) when such information might lose its confidential character due to the passage of time; and

(7) why disclosure of the information would be contrary to the public interest.

It is DOE's policy that all comments may be included in the public docket, without change and as received, including any personal information provided in the comments (except information deemed to be exempt from public disclosure).

B. Issues on Which DOE Seeks Comment

Although DOE welcomes comments on any aspect of this proposal, DOE is particularly interested in receiving comments and views of interested parties concerning the following issues:

(1) The normal cycle definition and whether it adequately covers the cycle setting most commonly chosen by users of washing machines;

(2) The potential test burden associated with maintaining a tolerance of five degrees on the hot and cold water supply temperature ranges for clothes washers in which electrical energy and water energy consumption are affected by the inlet water temperature;

(3) The potential increase in test burden associated with removing the separate testing provisions for clothes washers with uniformly distributed warm wash temperatures.

(4) Whether any discrepancies exist when determining the wash/rinse temperature selections comprising the energy test cycle in appendix J2 using the proposed flowcharts compared to using the current energy test cycle definition (and, if so, specific examples of cycle setting configurations that would lead to the discrepancies); and

(5) Whether the methodology presented in the energy test cycle flowcharts in appendix J2 could result in an efficiency rating unrepresentative of how a particular clothes washer would be used by consumers.

VI. Approval of the Office of the Secretary

The Secretary of Energy has approved publication of this proposed rule.

List of Subjects

10 CFR Part 429

Administrative practice and procedure, Energy conservation, Household appliances, Reporting and recordkeeping requirements.

10 CFR Part 430

Administrative practice and procedure, Energy conservation, Household appliances.

Issued in Washington, DC, on April 11, 2014.

Kathleen B. Hogan,

Deputy Assistant Secretary for Energy Efficiency, Energy Efficiency and Renewable Energy.

For the reasons stated in the preamble, DOE is proposing to amend parts 429 and 430 of Chapter II of Title 10, Code of Federal Regulations as set forth below:

PART 429—CERTIFICATION, COMPLIANCE, AND ENFORCEMENT FOR CONSUMER PRODUCTS AND COMMERCIAL AND INDUSTRIAL EQUIPMENT

■ 1. The authority citation for part 429 continues to read as follows:

Authority: 42 U.S.C. 6291–6317.

■ 2. Section 429.20 is amended by:
■ a. Adding paragraphs (a)(3), (a)(4), and (c); and
■ b. Revising paragraphs (b)(2)(i), (b)(2)(ii), and (b)(3).

The revisions and additions read as follows:

§ 429.20 Residential clothes washers.

(a) * * *

(3) The capacity of a basic model reported in accordance with paragraph (b)(2) of this section shall be the mean of the measured clothes container capacity, C, of all tested units of the basic model.

(4) The remaining moisture content (RMC) of a basic model reported in accordance with paragraph (b)(2) of this section shall be the mean of the final RMC value measured for all tested units of the basic model.

(b) * * *

(2) * * *

(i) For residential clothes washers tested in accordance with Appendix J1: The modified energy factor (MEF) in cubic feet per kilowatt hour per cycle (cu ft/kWh/cycle), the capacity in cubic feet (cu ft), and the corrected remaining moisture content (RMC) expressed as a percentage. For standard-size residential clothes washers, a water factor (WF) in gallons per cycle per cubic foot (gal/cycle/cu ft).

(ii) For residential clothes washers tested in accordance with Appendix J2: The integrated modified energy factor (IMEF) in cu ft/kWh/cycle, the integrated water factor (IWF) in gal/cycle/cu ft, the capacity in cu ft, the corrected remaining moisture content (RMC) expressed as a percentage, and the type of loading (top-loading or front-loading).

(3) Pursuant to § 429.12(b)(13), a certification report shall include the following additional product-specific information: a list of all cycle selections comprising the complete energy test cycle for each basic model.

(c) *Reported values.* Values reported pursuant to this subsection must be rounded as follows: MEF and IMEF to the nearest 0.01 cu ft/kWh/cycle, WF and IWF to the nearest 0.1 gal/cycle/cu ft, RMC to the nearest 0.1 percentage point, and clothes container capacity to the nearest 0.1 cu ft.

■ 3. Section 429.134 is added to read as follows:

§ 429.134 Product-specific enforcement provisions.

(a) *General.* The following provisions apply to assessment and enforcement testing of the relevant products.

(b) Reserved.

(c) *Clothes washers.* (1) *Determination of Remaining Moisture Content.* The procedure for determining remaining moisture content (RMC) will be performed once in its entirety, pursuant to the test requirements of section 3.8 of appendix J1 and appendix J2 to subpart B of part 430, for each unit tested.

(i) The measured RMC value of a tested unit will be considered the tested unit's final RMC value if the measured RMC value is within two RMC percentage points of the certified RMC value of the basic model (expressed as a percentage), or is lower than the certified RMC value.

(ii) If the measured RMC value of a tested unit is more than two RMC percentage points higher than the certified RMC value of the basic model, DOE will perform two additional replications of the RMC measurement procedure, each pursuant to the provisions of section 3.8.5 of appendix J1 and appendix J2 to subpart B of part 430, for a total of three independent RMC measurements of the tested unit. The average of the three RMC measurements will be the tested unit's final RMC value and will be used as the basis for the calculation of per-cycle energy consumption for removal of moisture from the test load for that unit.

(2) Reserved.

PART 430—ENERGY CONSERVATION PROGRAM FOR CONSUMER PRODUCTS

■ 4. The authority citation for part 430 continues to read as follows:

Authority: 42 U.S.C. 6291–6309; 28 U.S.C. 2461 note.

■ 5. Section 430.23 is amended by:
■ a. Revising paragraphs (j)(1)(i) and (ii);
■ b. Revising paragraph (j)(3); and
■ c. Adding paragraphs (j)(4) through (j)(5).

The revisions and additions read as follows:

§ 430.23 Test procedures for the measurement of energy and water consumption.

* * * * *

(j) * * *

(1) * * *

(i) When using appendix J1 (see the note at the beginning of appendix J1),

$(N_1 \times E_{TE1} \times C_{KWH})$

Where,

N_1 = the representative average residential clothes washer use of 392 cycles per year according to appendix J1,

E_{TE1} = the total per-cycle energy consumption when electrically heated water is used, in kilowatt-hours per cycle, determined according to section 4.1.7 of appendix J1, and

C_{KWH} = the representative average unit cost, in dollars per kilowatt-hour, as provided by the Secretary.

(ii) When using appendix J2,

$(N_2 \times (E_{TE2} + E_{TSO}) \times C_{KWH})$

Where,

N_2 = the representative average residential clothes washer use of 295 cycles per year according to appendix J2,

E_{TE2} = the total per-cycle energy consumption when electrically heated water is used, in kilowatt-hours per cycle, determined according to section 4.1.6 of appendix J2,

E_{TSO} = the per-cycle combined low-power mode energy consumption, in kilowatt-hours per cycle, determined according to section 4.4 of appendix J2, and

C_{KWH} = the representative average unit cost, in dollars per kilowatt-hour, as provided by the Secretary.

* * * * *

(3) The annual water consumption of a clothes washer must be determined as:

(i) When using appendix J1, the product of the representative average-use of 392 cycles per year and the total weighted per-cycle water consumption in gallons per cycle determined according to section 4.2.2 of appendix J1.

(ii) When using appendix J2, the product of the representative average-use of 295 cycles per year and the total weighted per-cycle water consumption for all wash cycles, in gallons per cycle, determined according to section 4.2.11 of appendix J2.

(4)(i) The water factor must be determined according to section 4.2.3 of appendix J1 (when using appendix J1) or section 4.2.12 of appendix J2 (when using appendix J2), with the result rounded off to the nearest 0.1 gallons per cycle per cubic foot.

(ii) The integrated water factor must be determined according to section 4.2.13 of appendix J2, with the result rounded off to the nearest 0.1 gallons per cycle per cubic foot.

(5) Other useful measures of energy consumption for automatic or semi-automatic clothes washers shall be those measures of energy consumption that the Secretary determines are likely to assist consumers in making purchasing decisions and that are derived from the application of appendix J1 or appendix J2, as appropriate.

* * * * *

Appendix J1—[Amended]

■ 6. Appendix J1 to subpart B of part 430 is amended by:

■ a. Revising the introductory text after the heading, and sections 1.1 and 1.2;

■ b. Removing section 1.17;

■ c. Redesignating sections 1.3 to 1.7, 1.8 to 1.16, and 1.18 to 1.23 as sections 1.4 to 1.8, 1.10 to 1.18, and 1.19 to 1.24, respectively.d. Revising newly redesignated sections 1.8, 1.11, and 1.12;

■ e. Adding sections 1.3, and 1.9;

■ f. Revising sections 2.3.1, 2.6.4.6, 2.6.5, 2.6.5.1, 2.6.5.2, 2.8, Table 2.8, and 2.8.3;

■ g. Removing sections 2.6.4.6.1, 2.6.4.6.2, 2.6.6, and 2.6.7;

■ h. Revising sections 3.1.1, 3.1.2, 3.1.4, and 3.1.5;

■ i. Adding sections 3.1.6 and 3.1.7;

■ j. Revising sections 3.2, 3.2.3, 3.2.3.1, 3.2.3.2, and 3.2.3.2.2;

■ k. Removing section 3.2.1.3;

■ l. Revising Table 3.2, sections 3.3, 3.3.3, 3.4.3, 3.5, 3.5.1, 3.5.2, 3.5.3, and 3.6.3;

■ m. Adding section 3.5.3;

■ n. Adding section 3.8.5; and

■ o. Revising Table 4.1.3 and section 4.1.4.

The revisions and additions read as follows:

Appendix J1 to Subpart B of Part 430—Uniform Test Method for Measuring the Energy Consumption of Automatic and Semi-automatic Clothes Washers

Note: Any representation related to the energy or water consumption of clothes washers made after [insert date 180 days after date of publication of any test procedure final rule in the **Federal Register**] must be made based upon results generated using this appendix or Appendix J2. Any representation related to the energy or water consumption of clothes washers made between [insert date 30 days after date of publication of any test procedure final rule in the **Federal Register**] and [insert date 180 days after date of publication of any test procedure final rule in the **Federal Register**] must be based upon results generated either under this Appendix J1 or Appendix J2, or upon the test procedures in Appendix J1 or Appendix J2 as they appeared at 10 CFR part 430, subpart B, Appendix J1 or J2, in the 10 CFR parts 200 to 499 edition revised as of January 1, 2013. Manufacturers must use a single appendix for all representations, including certifications of compliance. Compliance with DOE's amended standards for residential clothes washers, and corresponding use of the test procedures at Appendix J2 for all representations by residential clothes washer manufacturers, including certifications of compliance, is required as of March 7, 2015.

* * * * *

1.1. *Adaptive control system* means a clothes washer control system, other than an adaptive water fill control system, that is capable of automatically adjusting washer operation or washing conditions based on characteristics of the clothes load placed in the clothes container, without allowing or requiring user intervention or actions. The automatic adjustments may, for example, include automatic selection, modification, or control of any of the following: wash water temperature, agitation or tumble cycle time, number of rinse cycles, and spin speed. The characteristics of the clothes load, which could trigger such adjustments, could, for example, consist of or be indicated by the presence of either soil, soap, suds, or any other additive laundering substitute or complementary product.

1.2 *Adaptive water fill control system* means a clothes washer automatic water fill control system that is capable of automatically adjusting the water fill level based on the size or weight of the clothes load placed in the clothes container.

1.3 *Automatic water fill control system* means a clothes washer water fill control system that does not require user intervention or action, and includes adaptive water fill control systems and fixed water fill control systems.

* * * * *

1.8 *Energy test cycle* for a basic model includes:

(A) All wash/rinse temperature selections and water levels offered in the cycle recommended by the manufacturer for washing cotton or linen clothes, and

(B) For each other wash/rinse temperature selection or water level available on that basic model, the portion(s) of other cycle(s) with that temperature selection or water level that, when tested pursuant to these test procedures, will contribute to an accurate representation of the energy consumption of the basic model as used by end users.

If a warm rinse temperature selection is available on the clothes washer but is not available in the cycle recommended for washing cottons or linens, the energy test cycle shall include the warm rinse temperature selection in the cycle most comparable to the cycle recommended for washing cottons or linens.

If an extra hot temperature selection is only available on a sanitization cycle, the sanitization cycle should be included in the energy test cycle if the cycle is recommended by the manufacturer for washing clothing, and if doing so would contribute to an accurate representation of the energy consumption as used by consumers.

For any cycle under (A) or (B) of this section, use the manufacturer default settings, except for (1) the temperature selection, (2) the wash water fill levels, or (3) if necessary, the spin speeds on wash cycles used to determine remaining moisture content. This includes wash conditions such as agitation/tumble operation, soil level, spin

speed on wash cycles used to determine energy and water consumption, wash times, rinse times, optional rinse settings, water heating time for water-heating clothes washers, and all other wash parameters or optional features applicable to that wash cycle. Include any optional wash cycle feature for testing (other than wash/rinse temperature, water fill level selection, or spin speed on wash cycles used to determine remaining moisture content) that is activated by default on the wash cycle under test unless the manufacturer instructions recommend not selecting this option for washing normally soiled cotton or linen clothes.

1.9 *Fixed water fill control system* means a clothes washer automatic water fill control system that does not adjust the water fill level based on the size or weight of the clothes load placed in the clothes container.

* * * * *

1.11 *Manual control system* means a clothes washer control system that requires that the user make the choices that determine washer operation or washing conditions, such as, for example, wash/rinse temperature selections, and wash time before starting the cycle.

1.12 *Manual water fill control system* means a clothes washer water fill control system that requires the user to determine or select the water fill level.

* * * * *

2.3.1 *Clothes washers in which electrical energy consumption or water energy consumption are affected by the inlet water temperature (including water heating clothes washers or clothes washers with thermostatically controlled water valves).* The temperature of the hot water supply at the water inlets shall be maintained between 130 °F (54.4 °C) and 135 °F (57.2 °C) and the cold water supply at the water inlets shall be maintained between 55 °F (12.8 °C) and 60 °F (15.6 °C). A water meter shall be installed in both the hot and cold water lines to measure water consumption.

* * * * *

2.6.4.6 The moisture absorption and retention shall be evaluated for each new lot of test cloth by the standard extractor Remaining Moisture Content (RMC) test specified in appendix J3 to 10 CFR part 430 subpart B.

2.6.5. *Application of RMC correction curve.*

2.6.5.1 Using the coefficients A and B calculated in appendix J3 to 10 CFR part 430 subpart B:

$RMC_{corr} = A \times RMC + B$

2.6.5.2 Substitute RMC_{corr} values in calculations in section 3.8 of this appendix.

* * * * *

2.8 *Use of Test Loads.* Use the test load sizes and corresponding water fill settings defined in Table 2.8 when measuring water and energy consumptions. Automatic water fill control system and manual water fill control system are defined in section 1 of this appendix:

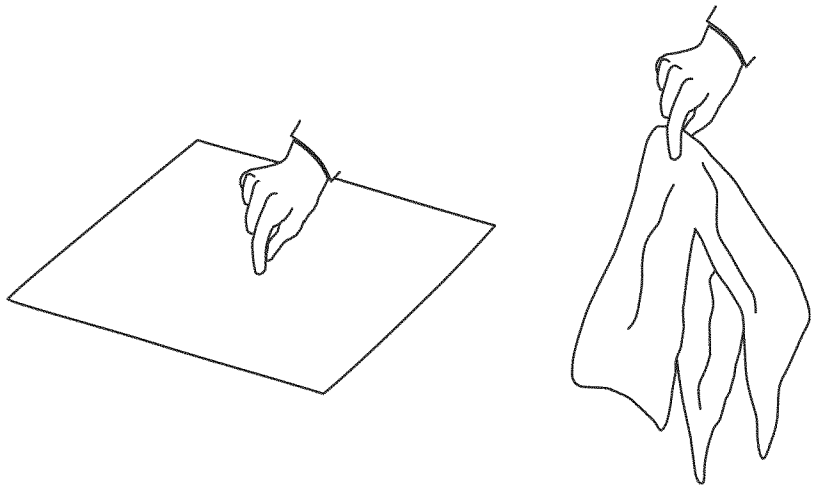
TABLE 2.8—REQUIRED TEST LOAD SIZES AND WATER FILL SETTINGS

Water fill control system type	Test load size	Water fill setting
Manual water fill control system	Max	Max.
	Min	Min.
Automatic water fill control system	Max	As determined by the clothes washer.
	Avg	
	Min	

* * * * *

2.8.3 Prepare the energy test cloths for loading by grasping them in the center, lifting, and shaking them to hang loosely, as illustrated in Figure 2.8.3.1 of this appendix.

Figure 2.8.3.1—Grasping Energy Test Cloths in the Center, Lifting, and Shaking to Hang Loosely



To load the energy test cloths in a top-loading clothes washer, arrange the cloths circumferentially around the axis of rotation of the clothes container, using alternating lengthwise orientations for adjacent pieces of cloth. Complete each cloth layer across its horizontal plane within the clothes container before adding a new layer. Figure 2.8.3.2 of this appendix illustrates the correct loading technique for a vertical-axis clothes washer.

To load the energy test cloths in a front-loading clothes washer, arrange the cloths lengthwise, from front to back, using alternating orientations for adjacent pieces of cloth. Load the cloths evenly across the width of the clothes container. Complete each cloth layer across its horizontal plane within the clothes container before adding a

new layer. Figure 2.8.3.3 of this appendix illustrates the correct loading technique for a horizontal-axis clothes washer.

For all clothes washers, follow any additional manufacturer loading instructions provided to the user regarding the placement of clothing within the clothing container.

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Figure 2.8.3.2—Loading Energy Test Cloths into a Top-Loading Clothes Washer

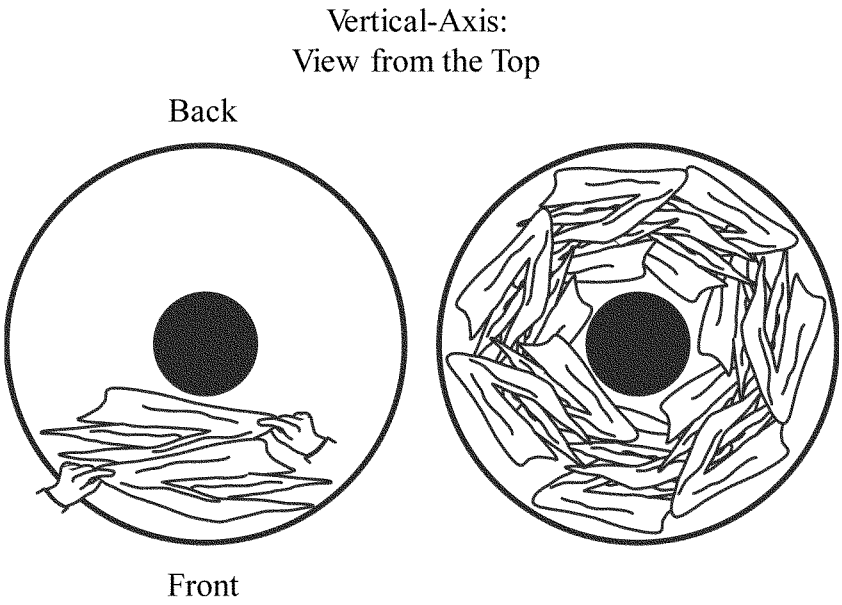
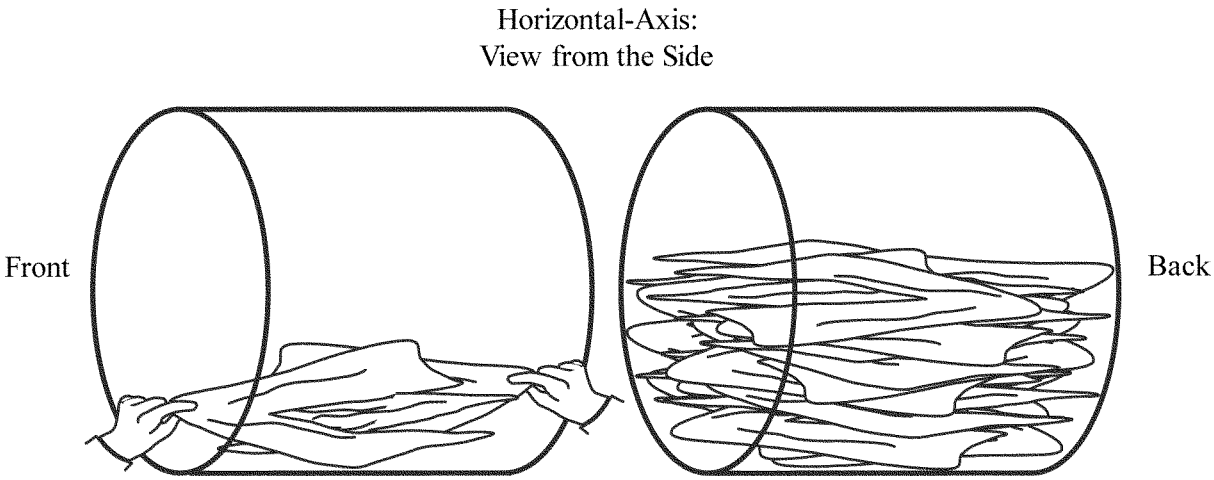


Figure 2.8.3.3—Loading Energy Test Cloths into a Front-Loading Clothes Washer



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* * * * *

3.1.1 Place the clothes washer in such a position that the uppermost edge of the clothes container opening is leveled horizontally, so that the container will hold the maximum amount of water. For front-loading clothes washers, the door seal and shipping bolts or other forms of bracing hardware to support the wash drum during shipping must remain in place during the capacity measurement.

If the design of a front-loading clothes washer does not include shipping bolts or other forms of bracing hardware to support the wash drum during shipping, a laboratory may support the wash drum by other means, including temporary bracing or support beams. Any temporary bracing or support beams must keep the wash drum in a fixed position, relative to the geometry of the door and door seal components, that is representative of the position of the wash drum during normal operation. The method used must avoid damage to the unit that would affect the results of the energy and water testing. The test report must document the method used to support the wash drum, and pursuant to § 429.71 of this chapter, the manufacturer must retain such documentation as part of its test records.

3.1.2 Line the inside of the clothes container with a 2 mil thickness (0.051 mm) plastic sheet or plastic bag. All clothes washer components that occupy space within the clothes container and that are recommended for use during a wash cycle must be in place and must be lined with a 2 mil thickness (0.051 mm) plastic sheet or plastic bag to prevent water from entering any void space.

* * * * *

3.1.4 Fill the clothes container manually with either 60 °F ± 5 °F (15.6 °C ± 2.8 °C) or 100 °F ± 10 °F (37.8 °C ± 5.5 °C) water to its uppermost edge. For a top-loading, vertical-axis clothes washer, the uppermost edge of the clothes container is defined as the highest point of the innermost diameter of the tub cover. Figure 3.1.4.1 illustrates the maximum fill level for top-loading vertical-axis clothes washers. Figure 3.1.4.2 shows the location of the maximum fill level for a variety of example tub cover designs.

Figure 3.1.4.1—Maximum Fill Level for the Clothes Container Capacity Measurement of Top-Loading Vertical-Axis Clothes Washers

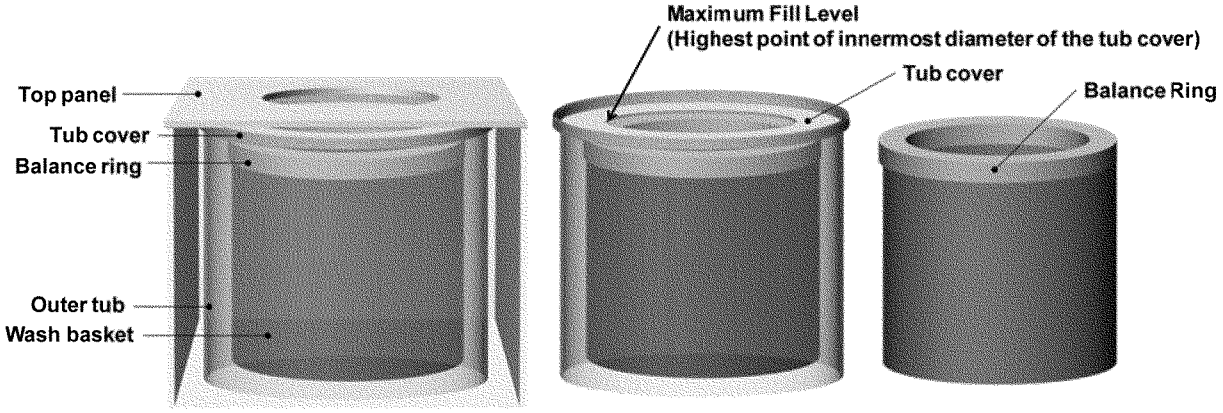
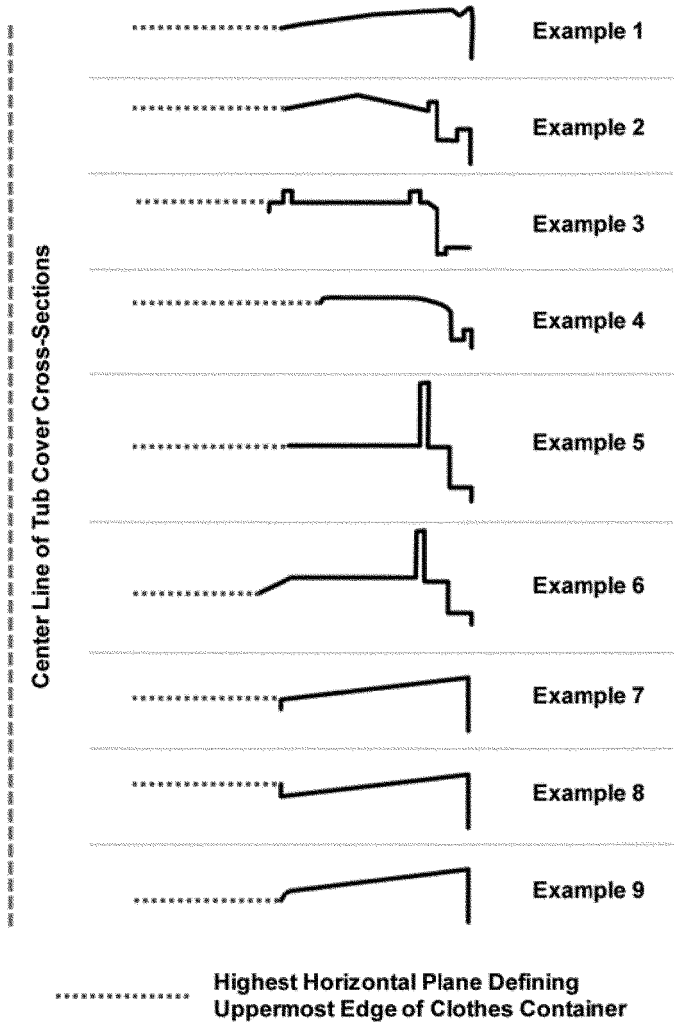


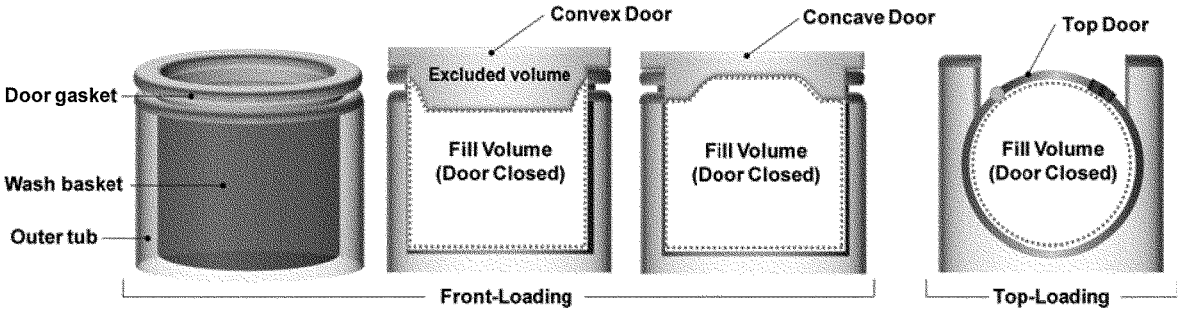
Figure 3.1.4.2— Example Cross-Sections of Tub Covers Showing the Highest Horizontal Plane Defining the Uppermost Edge of the Clothes Container



For a front-loading horizontal-axis clothes washer, fill the clothes container to the highest point of contact between the door and the door gasket. If any portion of the door or gasket would occupy the measured volume space when the door is closed, exclude the volume that the door or gasket portion would occupy from the measurement. For a front-loading horizontal-axis clothes washer with a concave door shape, include any additional volume above the plane defined by the highest point of contact between the door and the door gasket, if that area can be occupied by clothing during washer operation. For a top-loading horizontal-axis clothes washer, include any additional volume above the plane of the door hinge that clothing could occupy during washer operation. Figure 3.1.4.3 illustrates the maximum fill volumes for all horizontal-axis clothes washer types.

Figure 3.1.4.3—Maximum Fill Volumes for the Clothes Container Capacity

Measurement of Horizontal-Axis Clothes Washers



For all clothes washers, exclude any volume that cannot be occupied by the clothing load during operation.

3.1.5 Measure and record the weight of water, W, in pounds.

3.1.6 Calculate the clothes container capacity as follows:

C = W/d

Where:

C = Capacity in cubic feet (liters).
W = Mass of water in pounds (kilograms).
d = Density of water (62.0 lbs/ft^3 for 100 °F (993 kg/m^3 for 37.8 °C) or 62.3 lbs/ft^3 for 60 °F (998 kg/m^3 for 15.6 °C)).

3.1.7 Calculate the clothes container capacity, C, to the nearest 0.01 cubic foot for the purpose of determining test load sizes per Table 5.1 of this appendix and for all subsequent calculations in this appendix that include the clothes container capacity.

* * * * *

3.2 *Procedure for measuring water and energy consumption values on all automatic and semi-automatic washers.* All energy consumption tests shall be performed under the energy test cycle(s), unless otherwise specified. Table 3.2 indicates the sections below that govern tests of particular clothes washers, based on the number of wash/rinse temperature selections available on the model and also, in some instances, method of water heating. The procedures prescribed are applicable regardless of a clothes washer's washing capacity, loading port location, primary axis of rotation of the clothes container, and type of control system. Data from a wash cycle that terminates prematurely if an out-of-balance condition is detected, and thus does not include the agitation/tumble operation, spin speed(s), wash times, and rinse times applicable to the wash cycle under test, shall be discarded.

* * * * *

3.2.3. *Clothes washers with automatic water fill/manual water fill control systems.*

3.2.3.1 *Clothes washers with automatic water fill control system and alternate manual water fill control system.* If a clothes washer with an automatic water fill control system allows user selection of manual controls as an alternative, then both manual and automatic modes shall be tested and, for each mode, the energy consumption (HE_T, ME_T, and D_E) and water consumption (Q_T) values shall be calculated as set forth in section 4. Then the average of the two values (one from each mode, automatic and manual) for each variable shall be used in section 4 for the clothes washer.

3.2.3.2 *Clothes washers with automatic water fill control system.*

* * * * *

3.2.3.2.2 User-adjustable. Four tests shall be conducted on clothes washers with user-adjustable automatic water fill controls that affect the relative wash water levels. The first test shall be conducted using the maximum test load and with the automatic water fill control system set in the setting that will give the most energy intensive result. The second test shall be conducted with the minimum test load and with the automatic water fill control system set in the setting that will give the least energy intensive result. The third test shall be conducted with the average test load and with the automatic water fill control system set in the setting that will give the most energy intensive result for the given test load. The fourth test shall be conducted with the average test load and with the automatic water fill control system set in the setting that will give the least energy intensive result for the given test load. The energy and water consumption for the average test load and water level shall be the average of the third and fourth tests.

* * * * *

TABLE 3.2—TEST SECTION REFERENCE

Max. wash temp. available	≤ 135 °F (57.2 °C)			> 135 °F (57.2 °C) [2]	
Number of wash temp. selections in the energy test cycle	1	2	> 2	3	> 3
Test Sections Required to be Followed				3.3	3.3
		3.4	3.4		3.4
			3.5	3.5	3.5
	3.6	3.6	3.6	3.6	3.6
	[1] 3.7	[1] 3.7	[1] 3.7	[1] 3.7	[1] 3.7
	3.8	3.8	3.8	3.8	3.8

[1] Only applicable to machines with warm rinse in any cycle.
[2] This only applies to water heating clothes washers on which the maximum wash temperature available exceeds 135 °F (57.2 °C).

3.3 *"Extra Hot Wash" (Max Wash Temp > 135 °F (57.2 °C)) for water heating clothes washers only.* Water and electrical energy consumption shall be measured for each water fill level and/or test load size as specified in 3.3.1 through 3.3.3 for the hottest wash setting available. Testing parties may use non-reversible temperature indicator labels, adhered to the inside of the clothes container, to determine the maximum water temperature during the wash cycle. If using a temperature indicator label to test a front-loading clothes washer, adhere the label along the inner circumference of the clothes container drum, midway between the front and the back of the clothes container. If using a temperature indicator label to test a top-loading clothes washer, adhere the label along the inner circumference of the clothes

container drum, as close to the bottom of the container as possible.

* * * * *

3.3.3 *Average test load and water fill.* For clothes washers with an automatic water fill control system, measure the values for hot water consumption (Hm_a), cold water consumption (Cm_a), and electrical energy consumption (Em_a) for an extra-hot wash/cold rinse energy test cycle, with an average test load size as determined per Table 5.1.

* * * * *

3.4.3 *Average test load and water fill.* For clothes washers with an automatic water fill control system, measure the values for hot water consumption (Hh_a), cold water consumption (Ch_a), and electrical energy consumption (Eh_a) for a hot wash/cold rinse energy test cycle, with an average test load size as determined per Table 5.1.

* * * * *

3.5 *''Warm Wash.''* Water and electrical energy consumption shall be determined for each water fill level and/or test load size as specified in 3.5.1 through 3.5.3 for the applicable warm water wash temperature(s). For a clothes washer with fewer than four discrete warm wash selections, test all warm wash temperature selections. For a clothes washer that offers four or more warm wash selections, test at all discrete selections, or test at 25 percent, 50 percent, and 75 percent positions of the temperature selection device between the hottest hot (≤135 °F (57.2 °C)) wash and the coldest cold wash. If a selection is not available at the 25, 50 or 75 percent position, in place of each such unavailable selection use the next warmer setting. Each reportable value to be used for the warm water wash setting shall be the arithmetic average of all tests conducted pursuant to this section.

3.5.1 *Maximum test load and water fill.* Hot water consumption (Hwx), cold water consumption (Cwx), and electrical energy consumption (Ewx) shall be measured with the controls set for the maximum water fill level. The maximum test load size is to be used and shall be determined per Table 5.1.

3.5.2 *Minimum test load and water fill.* Hot water consumption (Hwn), cold water consumption (Cwn), and electrical energy consumption (Ewn) shall be measured with the controls set for the minimum water fill level. The minimum test load size is to be used and shall be determined per Table 5.1.

3.5.3 *Average test load and water fill.* For clothes washers with an automatic water fill control system, measure the values for hot water consumption (Hwa), cold water consumption (Cwa), and electrical energy consumption (Ewa) with an average test load size as determined per Table 5.1.

* * * * *

3.6.3 *Average test load and water fill.* For clothes washers with an automatic water fill control system, measure the values for hot water consumption (Hc_a), cold water consumption (Cc_a), and electrical energy consumption (Ec_a) for a cold wash/cold rinse energy test cycle, with an average test load size as determined per Table 5.1.

* * * * *

3.8.5 The procedure for calculating RMC as defined in section 3.8.2.5, 3.8.3.3., or 3.8.4 of this appendix may be replicated twice in its entirety, for a total of three independent RMC measurements. If three replications of the RMC measurement are performed, use the average of the three RMC measurements as the final RMC in section 4.3 of this appendix.

* * * * *

TABLE 4.1.3—LOAD USAGE FACTORS

Load usage factor	Water fill control system	
	Manual	Automatic
F_{max} = ...	[1] 0.72	[2] 0.12
F_{avg} = ...	.....	[2] 0.74
F_{min} = ...	[1] 0.28	[2] 0.14

[1] Reference 3.2.3.3.
[2] Reference 3.2.3.2.

4.1.4 Removed.

* * * * *

■ 7. Appendix J2 to subpart B of part 430 is revised to read as follows:

Appendix J2 to Subpart B of Part 430–Uniform Test Method for Measuring the Energy Consumption of Automatic and Semi-automatic Clothes Washers

Note: Any representation related to the energy or water consumption of clothes washers made after [Date 180 days after date of publication of any test procedure final rule in the **Federal Register**] must be made based upon results generated using this appendix or appendix J1. Any representation related to the energy or water consumption of clothes washers made between [Date 30 days after date of publication of any test procedure final rule in the **Federal Register**] and [Date 180 days after date of publication of any test procedure final rule in the **Federal Register**] must be based upon results generated either under this Appendix J2 or Appendix J1, or upon the test procedures in Appendix J2 or Appendix J1 as they appeared at 10 CFR part 430, subpart B, Appendix J2 or Appendix J1, in the 10 CFR parts 200 to 499 edition revised as of January 1, 2013. Manufacturers must use a single appendix for all representations, including certifications of compliance. Compliance with DOE's amended standards for residential clothes washers, and corresponding use of the test procedures at this appendix for all representations by residential clothes washer manufacturers, including certifications of compliance, is required as of March 7, 2015.

1. Definitions and Symbols

1.1 *Active mode* means a mode in which the clothes washer is connected to a mains power source, has been activated, and is performing one or more of the main functions of washing, soaking, tumbling, agitating, rinsing, and/or removing water from the clothing, or is involved in functions necessary for these main functions, such as admitting water into the washer or pumping water out of the washer. Active mode also includes delay start and cycle finished modes.

1.2 *Active washing mode* means a mode in which the clothes washer is performing any of the operations included in a complete cycle intended for washing a clothing load, including the main functions of washing, soaking, tumbling, agitating, rinsing, and/or removing water from the clothing.

1.3 *Adaptive control system* means a clothes washer control system, other than an adaptive water fill control system, that is capable of automatically adjusting washer operation or washing conditions based on characteristics of the clothes load placed in the clothes container, without allowing or requiring user intervention or actions. The automatic adjustments may, for example, include automatic selection, modification, or control of any of the following: wash water temperature, agitation or tumble cycle time, number of rinse cycles, and spin speed. The characteristics of the clothes load, which could trigger such adjustments, could, for example, consist of or be indicated by the presence of either soil, soap, suds, or any other additive laundering substitute or complementary product.

1.4 *Adaptive water fill control system* means a clothes washer automatic water fill control system that is capable of automatically adjusting the water fill level based on the size or weight of the clothes load placed in the clothes container.

1.5 *Automatic water fill control system* means a clothes washer water fill control system that does not require user intervention or action, and includes adaptive water fill control systems and fixed water fill control systems.

1.6 *Bone-dry* means a condition of a load of test cloth that has been dried in a dryer at maximum temperature for a minimum of 10 minutes, removed and weighed before cool down, and then dried again for 10 minute periods until the final weight change of the load is 1 percent or less.

1.7 *Clothes container* means the compartment within the clothes washer that holds the clothes during the operation of the machine.

1.8 *Cold rinse* means the coldest rinse temperature available on the machine, as indicated to the user on the clothes washer control panel.

1.9 *Combined low-power mode* means the aggregate of available modes other than active washing mode, including inactive mode, off mode, delay start mode, and cycle finished mode.

1.10 *Compact* means a clothes washer that has a clothes container capacity of less than 1.6 ft^3 (45 L).

1.11 *Cycle finished mode* means an active mode that provides continuous status display, intermittent tumbling, or air circulation following operation in active washing mode.

1.12 *Delay start mode* means an active mode in which activation of active washing mode is facilitated by a timer.

1.13 *Energy test cycle* means the complete set of wash/rinse temperature selections required for testing, as determined according to section 2.12. Within the energy test cycle, the following definitions apply:

(A) *Cold wash/Cold rinse* is the wash/rinse temperature selection determined by evaluating the flowchart in Figure 2.12.1 of this appendix.

(B) *Hot wash/Cold rinse* is the wash/rinse temperature selection determined by

evaluating the flowchart in Figure 2.12.2 of this appendix.

(C) *Warm wash/Cold rinse* is the wash/rinse temperature selection determined by evaluating the flowchart in Figure 2.12.3 of this appendix.

(D) *Warm wash/Warm rinse* is the wash/rinse temperature selection determined by evaluating the flowchart in Figure 2.12.4 of this appendix.

(E) *Extra Hot wash/Cold rinse* is the wash/rinse temperature selection determined by evaluating the flowchart in Figure 2.12.5 of this appendix.

1.14 *Fixed water fill control system* means a clothes washer automatic water fill control system that does not adjust the water fill level based on the size or weight of the clothes load placed in the clothes container.

1.15 *IEC 62301* means the test standard published by the International Electrotechnical Commission, entitled ''Household electrical appliances–Measurement of standby power,'' Publication 62301, Edition 2.0 2011–01 (incorporated by reference; see § 430.3).

1.16 *Inactive mode* means the lowest-power standby mode that facilitates the activation of active mode by remote switch (including remote control), internal sensor, or timer, or that provides continuous status display.

1.17 *Integrated modified energy factor* means the quotient of the cubic foot (or liter) capacity of the clothes container divided by the total clothes washer energy consumption per cycle, with such energy consumption expressed as the sum of:

(a) The machine electrical energy consumption;

(b) The hot water energy consumption;

(c) The energy required for removal of the remaining moisture in the wash load; and

(d) The combined low-power mode energy consumption.

1.18 *Integrated water factor* means the quotient of the total weighted per-cycle water consumption for all wash cycles in gallons divided by the cubic foot (or liter) capacity of the clothes washer.

1.19 *Load usage factor* means the percentage of the total number of wash loads that a user would wash a particular size (weight) load.

1.20 *Lot* means a quantity of cloth that has been manufactured with the same batches of cotton and polyester during one continuous process.

1.21 *Manual control system* means a clothes washer control system that requires that the user make the choices that determine washer operation or washing conditions, such as, for example, wash/rinse temperature selections and wash time, before starting the cycle.

1.22 *Manual water fill control system* means a clothes washer water fill control system that requires the user to determine or select the water fill level.

1.23 *Modified energy factor* means the quotient of the cubic foot (or liter) capacity of the clothes container divided by the total clothes washer energy consumption per cycle, with such energy consumption expressed as the sum of the machine electrical energy consumption, the hot water energy consumption, and the energy required for removal of the remaining moisture in the wash load.

1.24 *Non-water-heating clothes washer* means a clothes washer that does not have an internal water heating device to generate hot water.

1.25 *Normal cycle* means the cycle selection recommended by the manufacturer as the most common consumer cycle for washing a full load of normally to heavily soiled cotton clothing. For machines where multiple cycle settings meet this description, then the Normal cycle is the cycle selection that results in the lowest IMEF or MEF value.

1.26 *Off mode* means a mode in which the clothes washer is connected to a mains power source and is not providing any active or standby mode function, and where the mode may persist for an indefinite time. An indicator that only shows the user that the product is in the off position is included within the classification of an off mode.

1.27 *Roll* means a subset of a lot.

1.28 *Standard* means a clothes washer that has a clothes container capacity of 1.6 ft^3 (45 L) or greater.

1.29 *Standby mode* means any mode in which the clothes washer is connected to a mains power source and offers one or more of the following user oriented or protective functions that may persist for an indefinite time:

(a) To facilitate the activation of other modes (including activation or deactivation of active mode) by remote switch (including remote control), internal sensor, or timer;

(b) Continuous functions, including information or status displays (including clocks) or sensor-based functions.

A timer is a continuous clock function (which may or may not be associated with a display) that provides regular scheduled tasks (*e.g.,* switching) and that operates on a continuous basis.

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

C—Capacity
C (with subscripts)—Cold Water Consumption
D—Energy Consumption for Removal of Moisture from Test Load
E—Electrical Energy Consumption
F—Load Usage Factor
H—Hot Water Consumption
HE—Hot Water Energy Consumption
ME—Machine Electrical Energy Consumption
P—Power
Q—Water Consumption
RMC—Remaining Moisture Content
S—Annual Hours
TUF—Temperature Use Factor
V—Temperature-Weighted Hot Water Consumption
W—Mass of Water
WC—Weight of Test Load After Extraction
WI—Initial Weight of Dry Test Load

Subscripts:

a or avg—Average Test Load
c—Cold Wash (minimum wash temp.)
corr—Corrected (RMC values)
h—Hot Wash (maximum wash temp. ≤135 °F (57.2 °C))
ia—Inactive Mode
LP—Combined Low-Power Mode
m—Extra Hot Wash (maximum wash temp. >135 °F (57.2 °C))
n—Minimum Test Load
o—Off Mode
oi—Combined Off and Inactive Modes
T—Total
w—Warm Wash
ww—Warm Wash/Warm Rinse
x—Maximum Test Load

The following examples are provided to show how the above symbols can be used to define variables:

Em_x = ''Electrical Energy Consumption'' for an ''Extra Hot Wash'' and ''Maximum Test Load''
HE_{min} = ''Hot Water Energy Consumption'' for the ''Minimum Test Load''
P_{ia} = ''Power'' in ''Inactive Mode''
Qh_{min} = ''Water Consumption'' for a ''Hot Wash'' and ''Minimum Test Load''
TUF_m = ''Temperature Use Factor'' for an ''Extra Hot Wash''

1.31 *Temperature use factor* means, for a particular wash/rinse temperature setting, the percentage of the total number of wash loads that an average user would wash with that setting.

1.32 *Thermostatically controlled water valves* means clothes washer controls that have the ability to sense and adjust the hot and cold supply water.

1.33 *Water factor* means the quotient of the total weighted per-cycle water consumption for cold wash divided by the cubic foot (or liter) capacity of the clothes washer.

1.34 *Water-heating clothes washer* means a clothes washer where some or all of the hot water for clothes washing is generated by a water heating device internal to the clothes washer.

2. Testing Conditions

2.1 *Electrical energy supply.*

2.1.1 *Supply voltage and frequency.* Maintain the electrical supply at the clothes washer terminal block within 2 percent of 120, 120/240, or 120/208Y volts as applicable to the particular terminal block wiring system and within 2 percent of the nameplate frequency as specified by the manufacturer. If the clothes washer has a dual voltage conversion capability, conduct test at the highest voltage specified by the manufacturer.

2.1.2 *Supply voltage waveform.* For the combined low-power mode testing, maintain the electrical supply voltage waveform indicated in Section 4, Paragraph 4.3.2 of IEC 62301. If the power measuring instrument used for testing is unable to measure and record the total harmonic content during the test measurement period, total harmonic content may be measured and recorded immediately before and after the test measurement period.

2.2 *Supply water.*

2.2.1 *Clothes washers in which electrical energy consumption or water energy consumption are affected by the inlet water temperature. (For example, water heating clothes washers or clothes washers with thermostatically controlled water valves).* Maintain the temperature of the hot water

supply at the water inlets between 130 °F (54.4 °C) and 135 °F (57.2 °C). Maintain the temperature of the cold water supply at the water inlets between 55 °F (12.8 °C) and 60 °F (15.6 °C).

2.2.2 *Clothes washers in which electrical energy consumption and water energy consumption are not affected by the inlet water temperature.* Maintain the temperature of the hot water supply at the water inlets at 135 °F ± 5 °F (57.2 °C ± 2.8 °C). Maintain the temperature of the cold water supply at the water inlets at 60 °F ± 5 °F (15.6 °C ± 2.8 °C).

2.3 *Water pressure.* Maintain the static water pressure at the hot and cold water inlet connection of the clothes washer at 35 pounds per square inch gauge (psig) ± 2.5 psig (241.3 kPa ± 17.2 kPa) when the water is flowing.

2.4 *Test room temperature.* For all clothes washers, maintain the test room ambient air temperature at 75 ± 5 °F (23.9 ± 2.8°C) for active mode testing and combined low-power mode testing. Do not use the test room ambient air temperature conditions specified in Section 4, Paragraph 4.2 of IEC 62301 for combined low-power mode testing.

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

2.5.1 *Weighing scales.*

2.5.1.1 *Weighing scale for test cloth.* The scale used for weighing test cloth must have a resolution of no larger than 0.2 oz (5.7 g) and a maximum error no greater than 0.3 percent of the measured value.

2.5.1.2 *Weighing scale for clothes container capacity measurement.* The scale used for performing the clothes container capacity measurement must have a resolution no larger than 0.50 lbs (0.23 kg) and a maximum error no greater than 0.5 percent of the measured value.

2.5.2 *Watt-hour meter.* The watt-hour meter used to measure electrical energy consumption must have a resolution no larger than 1 Wh (3.6 kJ) and a maximum error no greater than 2 percent of the measured value for any demand greater than 50 Wh (180.0 kJ).

2.5.3 *Watt meter.* The watt meter used to measure combined low-power mode power consumption must comply with the requirements specified in Section 4, Paragraph 4.4 of IEC 62301. If the power measuring instrument used for testing is unable to measure and record the crest factor, power factor, or maximum current ratio during the test measurement period, the crest factor, power factor, and maximum current ratio may be measured and recorded immediately before and after the test measurement period.

2.5.4 *Water and air temperature measuring devices.* The temperature devices used to measure water and air temperature must have an error no greater than ±1 °F (±0.6 °C) over the range being measured.

2.5.5 *Water meter.* A water meter must be installed in both the hot and cold water lines to measure water flow and/or water consumption. The water meters must have a resolution no larger than 0.1 gallons (0.4 liters) and a maximum error no greater than 2 percent for the water flow rates being measured.

2.5.6 *Water pressure gauge.* A water pressure gauge must be installed in both the hot and cold water lines to measure water pressure. The water pressure gauges must have a resolution of 1 pound per square inch gauge (psig) (6.9 kPa) and a maximum error no greater than 5 percent of any measured value.

2.6 *Bone dryer temperature.* The dryer used for bone drying must heat the test cloth load above 210 °F (99 °C).

2.7 *Test cloths.*

2.7.1 *Energy test cloth.* The energy test cloth must be made from energy test cloth material, as specified in section 2.6.4 of this Appendix, that is 24 ± 1/2 inches by 36 ± 1/2 inches (61.0 ± 1.3 cm by 91.4 ± 1.3 cm) and has been hemmed to 22 ± 1/2 inches by 34 ± 1/2 inches (55.9 ± 1.3 cm by 86.4 ± 1.3 cm) before washing. The energy test cloth must be clean and must not be used for more than 60 test runs (after preconditioning as specified in 2.6.3 of this appendix). All energy test cloth must be permanently marked identifying the lot number of the material. Mixed lots of material must not be used for testing a clothes washer.

2.7.2 *Energy stuffer cloth.* The energy stuffer cloth must be made from energy test cloth material, as specified in section 2.6.4 of this Appendix, that is 12 ± 1/4 inches by 12 ± 1/4 inches (30.5 ± 0.6 cm by 30.5 ± 0.6 cm) and has been hemmed to 10 ± 1/4 inches by 10 ± 1/4 inches (25.4 ± 0.6 cm by 25.4 ± 0.6 cm) before washing. The energy stuffer cloth must be clean and must not be used for more than 60 test runs (after preconditioning as specified in section 2.6.3 of this Appendix). All energy stuffer cloth must be permanently marked identifying the lot number of the material. Mixed lots of material must not be used for testing a clothes washer.

2.7.3 *Preconditioning of test cloths.* The new test cloths, including energy test cloths and energy stuffer cloths, must be pre-conditioned in a clothes washer in the following manner:

Perform five complete wash-rinse-spin cycles, the first two with current AHAM Standard detergent Formula 3 and the last three without detergent. Place the test cloth in a clothes washer set at the maximum water level. Wash the load for ten minutes in soft water (17 ppm hardness or less) using 27.0 grams + 4.0 grams per pound of cloth load of AHAM Standard detergent Formula 3. The wash temperature is to be controlled to 135 °F ± 5 °F (57.2 °C ± 2.8 °C) and the rinse temperature is to be controlled to 60 °F ± 5 °F (15.6 °C ± 2.8 °C). Repeat the cycle with detergent and then repeat the cycle three additional times without detergent, bone drying the load between cycles (for a total of five complete wash-rinse-spin cycles).

2.7.4 *Energy test cloth material.* The energy test cloths and energy stuffer cloths must be made from fabric meeting the following specifications:

2.7.4.1 The test cloth material should come from a roll of material with a width of approximately 63 inches and approximately 500 yards per roll. However, other sizes may be used if the test cloth material meets the specifications listed in sections 2.7.4.2 through 2.7.4.7.

2.7.4.2 *Nominal fabric type.* Pure finished bleached cloth made with a momie or granite weave, which is nominally 50 percent cotton and 50 percent polyester.

2.7.4.3 *Fabric weight.* 5.60 ± 0.25 ounces per square yard (190.0 ± 8.4 g/m²).

2.7.4.4 *Thread count.* 65 x 57 per inch (warp × fill), ± 2 percent.

2.7.4.5 *Fiber content of warp and filling yarn.* 50 percent ± 4 percent cotton, with the balance being polyester, open end spun, 15/1 ± 5 percent cotton count blended yarn.

2.7.4.6 Water repellent finishes, such as fluoropolymer stain resistant finishes, must not be applied to the test cloth. Verify the absence of such finishes using the following:

2.7.4.6.1 AATCC Test Method 118–2007, (incorporated by reference; see § 430.3), for each new lot of test cloth (when purchased from the mill) to confirm the absence of Scotchguard™ or other water repellent finish (required scores of ''D'' across the board).

2.7.4.6.2 AATCC Test Method 79–2010, (incorporated by reference; see § 430.3), for each new lot of test cloth (when purchased from the mill) to confirm the absence of Scotchguard™ or other water repellent finish (time to absorb one drop should be on the order of 1 second).

2.7.4.7 The maximum shrinkage after preconditioning must not be more than 5 percent of the length and width. Measure per AATCC Test Method 135–2010, (incorporated by reference; see § 430.3).

2.7.5 The moisture absorption and retention must be evaluated for each new lot of test cloth using the standard extractor Remaining Moisture Content (RMC) procedure specified in appendix J3 to 10 CFR 430 subpart B.

2.8 *Test load sizes.* Use Table 5.1 of this appendix to determine the maximum, minimum, and, when required, average test load sizes based on the clothes container capacity as measured in section 3.1 of this appendix. Test loads must consist of energy test cloths and no more than five energy stuffer clothes per load to achieve the proper weight.

Use the test load sizes and corresponding water fill settings defined in Table 2.8 of this appendix when measuring water and energy consumption. Use only the maximum test load size when measuring RMC.

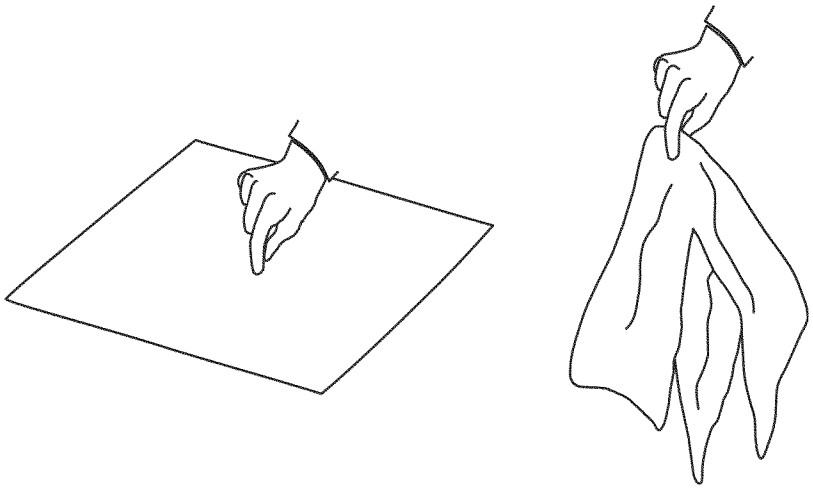
TABLE 2.8—REQUIRED TEST LOAD SIZES AND WATER FILL SETTINGS

Water fill control system type	Test load size	Water fill setting
Manual water fill control system	Max	Max.
	Min	Min.
Automatic water fill control system	Max	As determined by the clothes washer.
	Avg	
	Min	

2.9 *Use of test loads.* 2.9.1 Test loads for energy and water consumption measurements must be bone dry prior to the first cycle of the test, and dried to a maximum of 104 percent of bone dry weight for subsequent testing.

2.9.2 Prepare the energy test cloths for loading by grasping them in the center, lifting, and shaking them to hang loosely, as illustrated in Figure 2.9.2.1 of this appendix.

Figure 2.9.2.1—Grasping Energy Test Cloths in the Center, Lifting, and Shaking to Hang Loosely



To load the energy test cloths in a top-loading clothes washer, arrange the cloths circumferentially around the axis of rotation of the clothes container, using alternating lengthwise orientations for adjacent pieces of cloth. Complete each cloth layer across its horizontal plane within the clothes container before adding a new layer. Figure 2.9.2.2 of this appendix illustrates the correct loading technique for a vertical-axis clothes washer.

To load the energy test cloths in a front-loading clothes washer, arrange the cloths lengthwise, from front to back, using alternating orientations for adjacent pieces of cloth. Load the cloths evenly across the width of the clothes container. Complete each cloth layer across its horizontal plane within the clothes container before adding a new layer. Figure 2.9.2.3 of this appendix illustrates the correct loading technique for a horizontal-axis clothes washer.

For all clothes washers, follow any additional manufacturer loading instructions provided to the user regarding the placement of clothing within the clothing container.

Figure 2.9.2.2—Loading Energy Test Cloths into a Top-Loading Clothes Washer

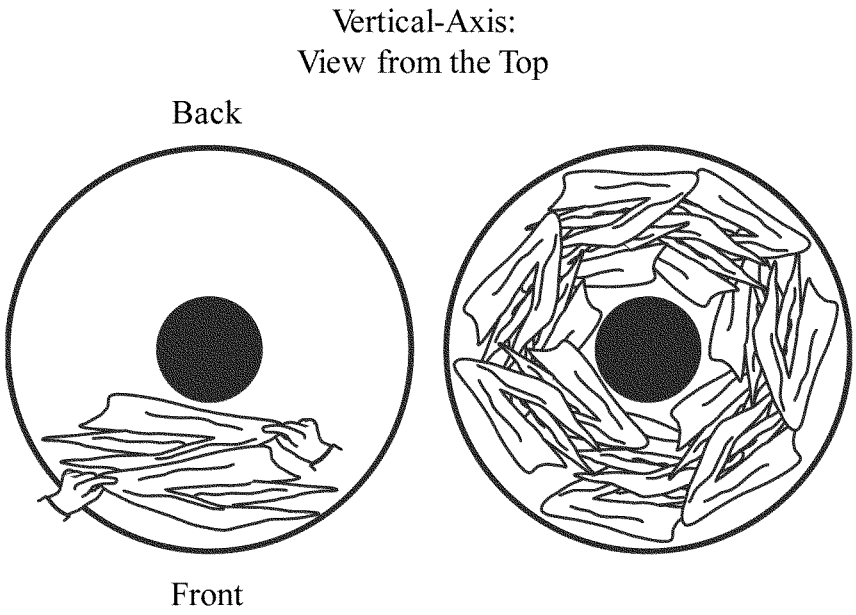
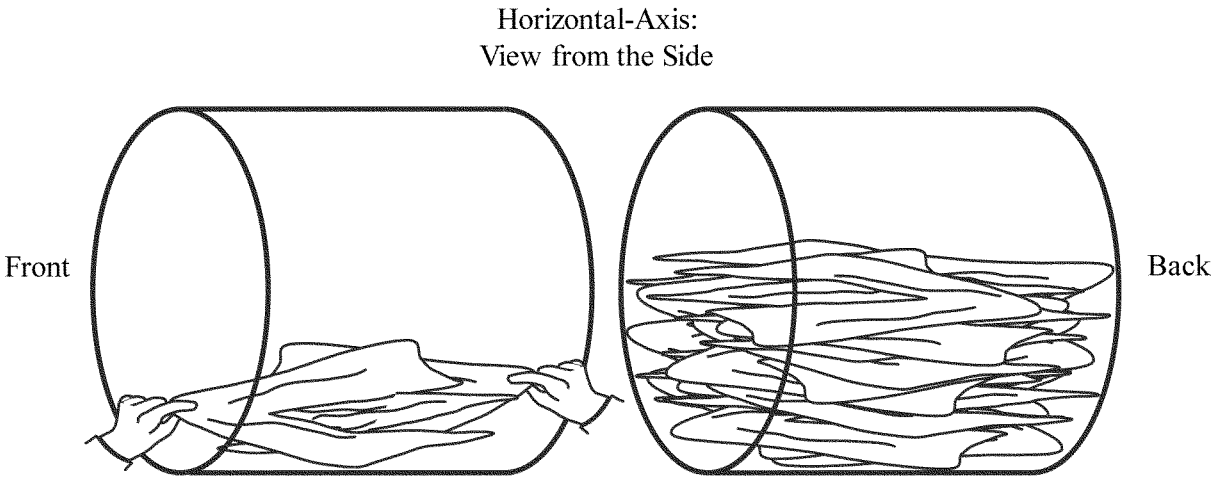


Figure 2.9.2.3—Loading Energy Test Cloths into a Front-Loading Clothes Washer



2.10 *Clothes washer installation.* Install the clothes washer in accordance with manufacturer's instructions. For combined low-power mode testing, install the clothes washer in accordance with Section 5, Paragraph 5.2 of IEC 62301 (incorporated by reference; see § 430.3), disregarding the provisions regarding batteries and the determination, classification, and testing of relevant modes.

2.11 *Clothes washer pre-conditioning.*

2.11.1 *Non-water-heating clothes washer.* If the clothes washer has not been filled with water in the preceding 96 hours, pre-condition it by running it through a cold rinse cycle and then draining it to ensure that the hose, pump, and sump are filled with water.

2.11.2 *Water-heating clothes washer.* If the clothes washer has not been filled with water in the preceding 96 hours, or if it has not been in the test room at the specified ambient conditions for 8 hours, pre-condition it by running it through a cold rinse cycle and then draining it to ensure that the hose, pump, and sump are filled with water.

2.12 *Determining the energy test cycle.* To determine the energy test cycle, evaluate the wash/rinse temperature selection flowcharts in the order in which they are presented in this section. The energy test cycle does not include any cycle, if available, that is recommended by the manufacturer exclusively for cleaning, deodorizing, or sanitizing the clothes washer.

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Figures to Section 2.12, Determining the Energy Test Cycle

Figure 2.12.1—Determination of Cold Wash/Cold Rinse

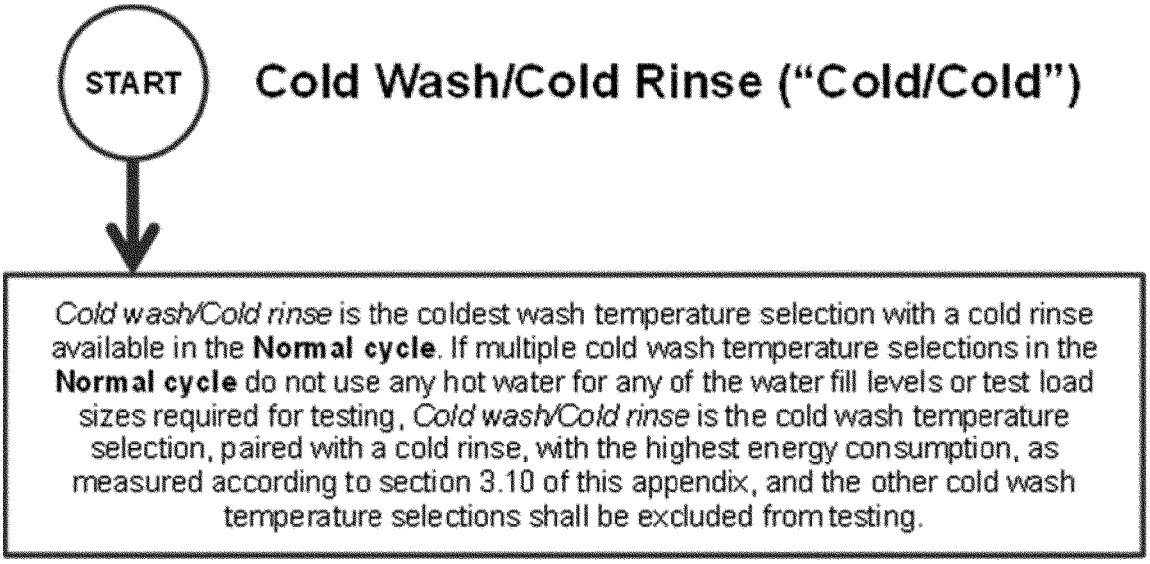


Figure 2.12.2—Determination of Hot Wash/Cold Rinse

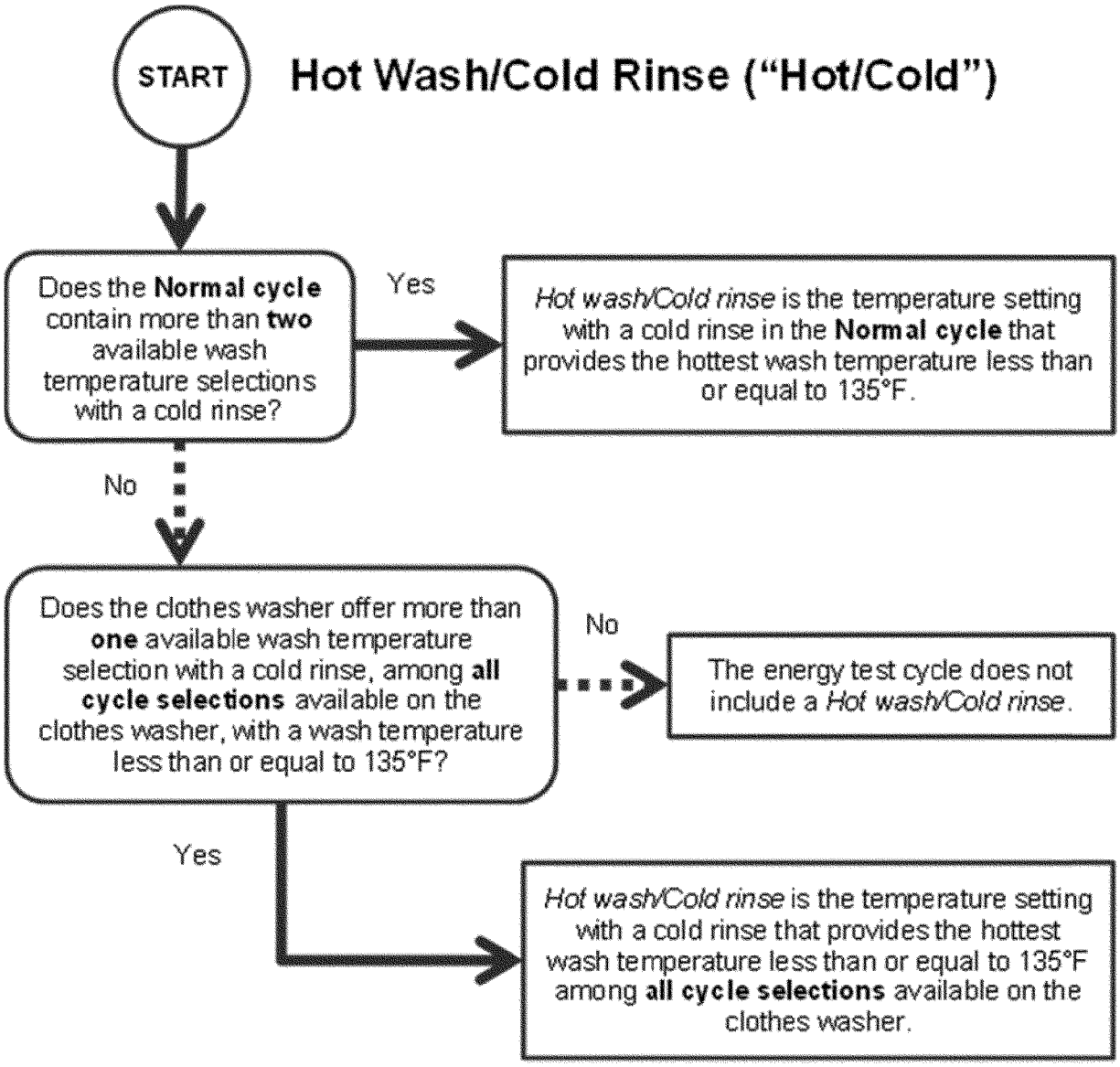


Figure 2.12.3—Determination of Warm Wash/Cold Rinse

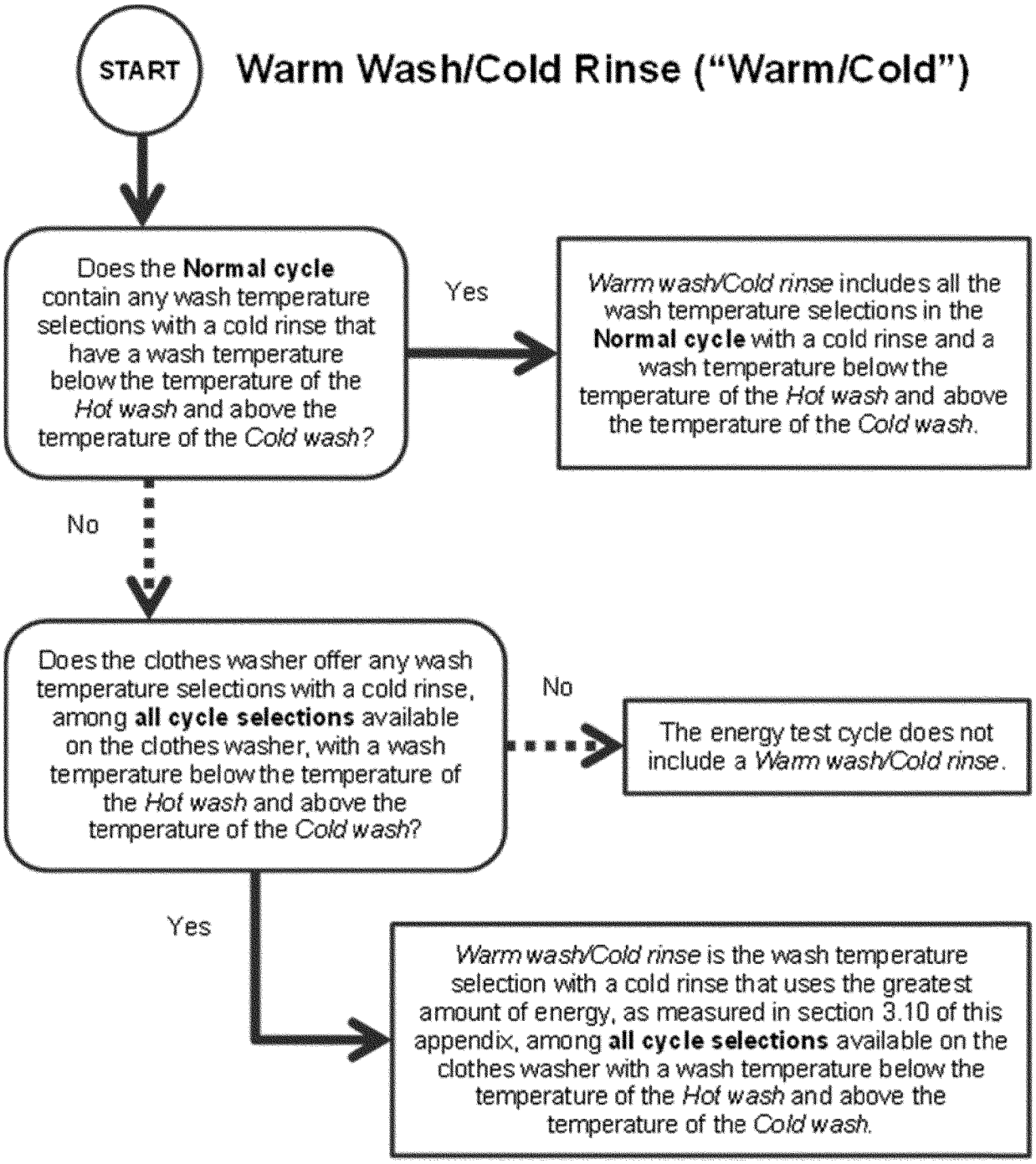


Figure 2.12.4—Determination of Warm Wash/Warm Rinse

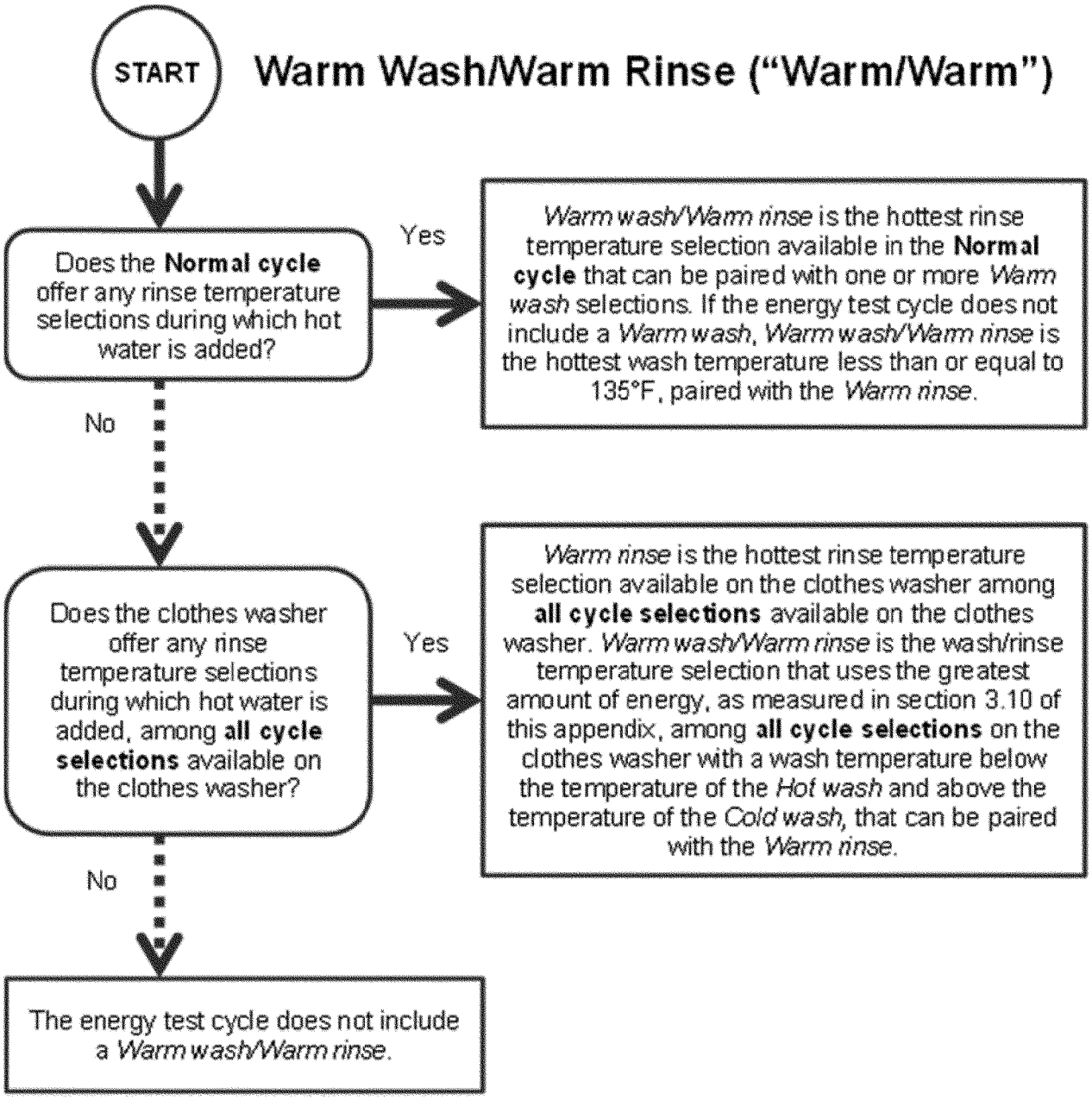
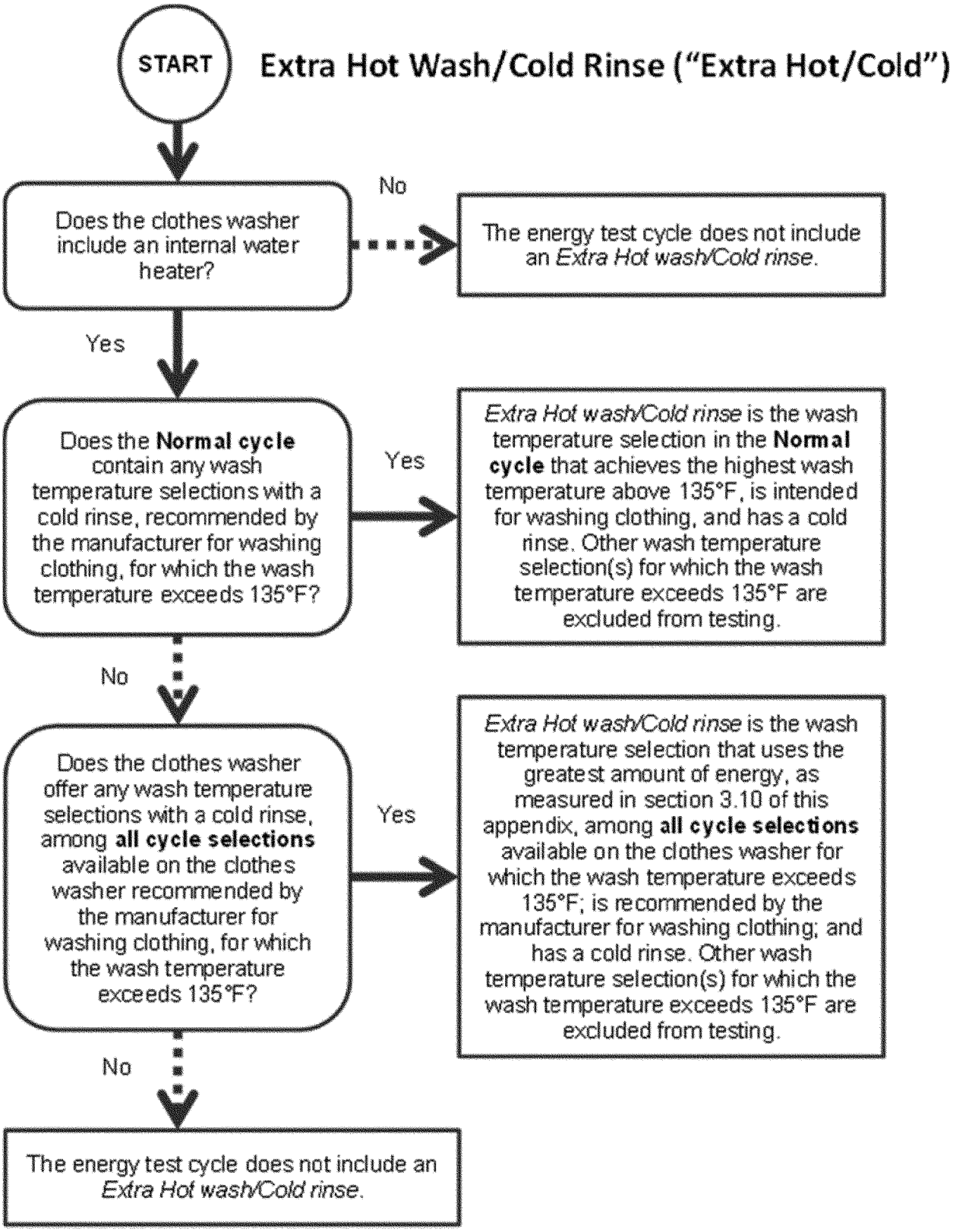


Figure 2.12.5—Determination of Extra Hot Wash/Cold Rinse



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3. Test Measurements

3.1 *Clothes container capacity.* Measure the entire volume that a clothes load could occupy within the clothes container during active mode washer operation according to the following procedures:

3.1.1 Place the clothes washer in such a position that the uppermost edge of the clothes container opening is leveled horizontally, so that the container will hold the maximum amount of water. For front-loading clothes washers, the door seal and shipping bolts or other forms of bracing hardware to support the wash drum during shipping must remain in place during the capacity measurement.

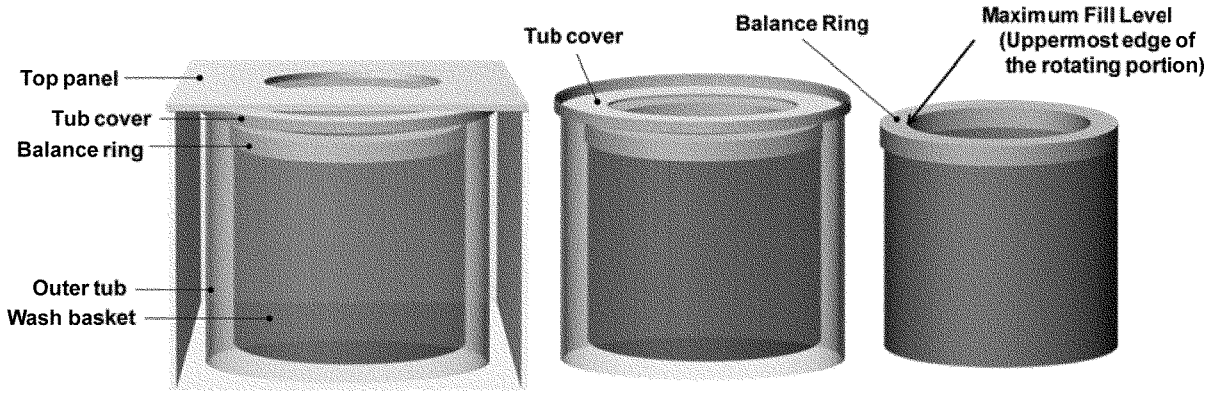
If the design of a front-loading clothes washer does not include shipping bolts or other forms of bracing hardware to support the wash drum during shipping, a laboratory may support the wash drum by other means, including temporary bracing or support beams. Any temporary bracing or support beams must keep the wash drum in a fixed position, relative to the geometry of the door and door seal components, that is representative of the position of the wash drum during normal operation. The method used must avoid damage to the unit that would affect the results of the energy and water testing. The laboratory must fully document the method used to support the wash drum, include such documentation in the final test report, and pursuant to § 429.71 of this chapter, the manufacturer must retain such documentation as part its test records.

3.1.2 Line the inside of the clothes container with a 2 mil thickness (0.051 mm) plastic sheet or plastic bag. All clothes washer components that occupy space within the clothes container and that are recommended for use during a wash cycle must be in place and must be lined with a 2 mil thickness (0.051 mm) plastic sheet or plastic bag to prevent water from entering any void space.

3.1.3 Record the total weight of the machine before adding water.

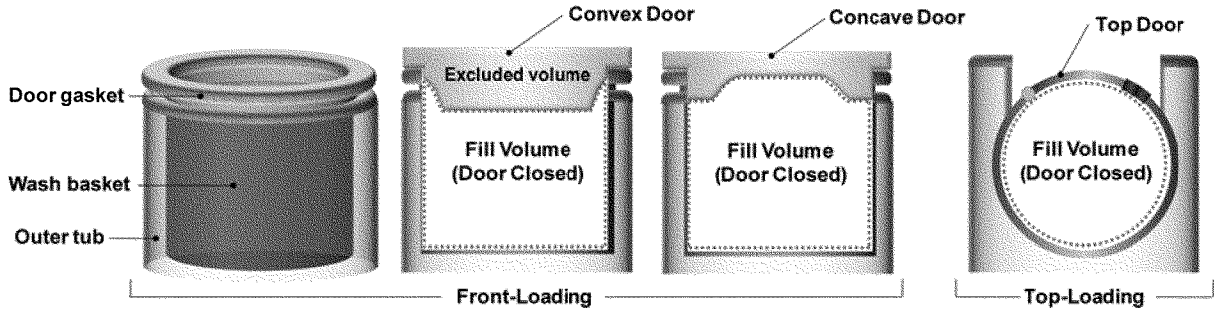
3.1.4 Fill the clothes container manually with either 60 °F ± 5 °F (15.6 °C ± 2.8 °C) or 100 °F ± 10 °F (37.8 °C ± 5.5 °C) water, with the door open. For a top-loading vertical-axis clothes washer, fill the clothes container to the uppermost edge of the rotating portion, including any balance ring. Figure 3.1.4.1 of this appendix illustrates the maximum fill level for top-loading clothes washers.

Figure 3.1.4.1—Maximum Fill Level for the Clothes Container Capacity Measurement of Top-Loading Vertical-Axis Clothes Washers



For a front-loading horizontal-axis clothes washer, fill the clothes container to the highest point of contact between the door and the door gasket. If any portion of the door or gasket would occupy the measured volume space when the door is closed, exclude from the measurement the volume that the door or gasket portion would occupy. For a front-loading horizontal-axis clothes washer with a concave door shape, include any additional volume above the plane defined by the highest point of contact between the door and the door gasket, if that area can be occupied by clothing during washer operation. For a top-loading horizontal-axis clothes washer, include any additional volume above the plane of the door hinge that clothing could occupy during washer operation. Figure 3.1.4.2 of this appendix illustrates the maximum fill volumes for all horizontal-axis clothes washer types.

Figure 3.1.4.2—Maximum Fill Volumes for the Clothes Container Capacity Measurement of Horizontal-Axis Clothes Washers



For all clothes washers, exclude any volume that cannot be occupied by the clothing load during operation.

3.1.5 Measure and record the weight of water, W, in pounds.

3.1.6 Calculate the clothes container capacity as follows:

$C = W/d$

Where:

C = Capacity in cubic feet (liters).
W = Mass of water in pounds (kilograms).
d = Density of water (62.0 lbs/ft^3 for 100 °F (993 kg/m^3 for 37.8 °C) or 62.3 lbs/ft^3 for 60 °F (998 kg/m^3 for 15.6 °C)).

3.1.7 Calculate the clothes container capacity, C, to the nearest 0.01 cubic foot for the purpose of determining test load sizes per Table 5.1 of this appendix and for all subsequent calculations that include the clothes container capacity.

3.2 *Procedure for measuring water and energy consumption values on all automatic and semi-automatic washers.*

3.2.1 Perform all energy consumption tests under the energy test cycle.

3.2.2 Perform the test sections listed in Table 3.2.2 in accordance with the wash/rinse temperature selections available in the energy test cycle.

TABLE 3.2.2—TEST SECTION REFERENCE

Wash/rinse temperature selections available in the energy test cycle	Corresponding test section reference
Extra Hot/Cold	3.3
Hot/Cold	3.4
Warm/Cold	3.5
Warm/Warm	3.6
Cold/Cold	3.7
Test Sections Applicable to all Clothes Washers	
Remaining Moisture Content	3.8
Combined Low-Power Mode Power	3.9

3.2.3 *Hot and cold water faucets.*

3.2.3.1 For automatic clothes washers, open both the hot and cold water faucets.

3.2.3.2 For semi-automatic washers:

(1) For hot inlet water temperature, open the hot water faucet completely and close the cold water faucet;

(2) For warm inlet water temperature, open both hot and cold water faucets completely;

(3) For cold inlet water temperature, close the hot water faucet and open the cold water faucet completely.

3.2.4 *Wash/rinse temperature selection.* Set the wash/rinse temperature selection control to obtain the desired wash/rinse temperature selection within the energy test cycle.

3.2.5 *Wash time setting.* If one wash time is prescribed for the wash cycle under test, that shall be the wash time setting; otherwise, the wash time setting shall be the higher of either the minimum or 70 percent of the maximum wash time available for the wash cycle under test, regardless of the labeling of suggested dial locations. If the clothes washer is equipped with an electromechanical dial controlling wash time, reset the dial to the minimum wash time and then turn it in the direction of increasing wash time to reach the appropriate setting. If the appropriate setting is passed, return the dial to the minimum wash time and then turn in the direction of increasing wash time until the appropriate setting is reached.

3.2.6 *Water fill levels.*

3.2.6.1 *Clothes washers with manual water fill control system.* Set the water fill selector to the maximum water level available for the maximum test load size and the minimum water level available for the minimum test load size.

3.2.6.2 *Clothes washers with automatic water fill control system.*

3.2.6.2.1 *Not user adjustable.* The maximum, minimum, and average water levels as described in the following sections refer to the amount of water fill that is automatically selected by the control system when the respective test loads are used.

3.2.6.2.2 *User adjustable.* Conduct four tests on clothes washers with user adjustable automatic water fill controls that affect the relative wash water levels. Conduct the first test using the maximum test load and with the automatic water fill control system set in the setting that will give the most energy intensive result. Conduct the second test using the minimum test load and with the automatic water fill control system set in the setting that will give the least energy intensive result. Conduct the third test using the average test load and with the automatic water fill control system set in the setting that will give the most energy intensive result for the given test load. Conduct the fourth test using the average test load and with the automatic water fill control system set in the setting that will give the least energy intensive result for the given test load. Average the results of the third and fourth tests to obtain the energy and water consumption values for the average test load size.

3.2.6.3 *Clothes washers with automatic water fill control system and alternate manual water fill control system.* If a clothes washer with an automatic water fill control system allows user selection of manual controls as an alternative, test both manual and automatic modes and, for each mode, calculate the energy consumption (HE_T, ME_T, and D_E) and water consumption (Q_T) values as set forth in section 4 of this appendix. Then, calculate the average of the two values (one from each mode, automatic and manual) for each variable (HE_T, ME_T, D_E, and Q_T) and use the average value for each variable in the final calculations in section 4 of this appendix.

3.2.7 *Manufacturer default settings.* For all wash cycles tested, use the manufacturer default settings, except for (1) the temperature selection, (2) the wash water fill levels, or (3) if necessary, the spin speeds on wash cycles used to determine remaining moisture content. This includes wash conditions such as agitation/tumble operation, soil level, spin speed on wash cycles used to determine energy and water consumption, wash times, rinse times, optional rinse settings, water heating time for water heating clothes washers, and all other wash parameters or optional features applicable to that wash cycle. Include any optional wash cycle feature for testing (other than wash/rinse temperature, water fill level selection, or spin speed on wash cycles used to determine remaining moisture content) that is activated by default on the wash cycle under test unless the manufacturer instructions recommend not selecting this option for washing normally soiled cotton or linen clothes.

3.2.8 For each wash cycle tested, include the entire active washing mode and exclude any delay start or cycle finished modes.

3.2.9 Discard the data from a wash cycle that terminates prematurely if an out-of-balance condition is detected, and thus does not include the agitation/tumble operation, spin speed(s), wash times, and rinse times applicable to the wash cycle under test.

3.3 *Extra Hot wash/Cold rinse.* Measure the water and electrical energy consumption for each water fill level and test load size as specified in sections 3.3.1 through 3.3.3 of this appendix for the Extra Hot wash/Cold rinse as defined within the energy test cycle.

Testing parties may use non-reversible temperature indicator labels, adhered to the inside of the clothes container, to determine the maximum water temperature during the wash cycle. If using a temperature indicator label to test a front-loading clothes washer, adhere the label along the inner circumference of the clothes container drum, midway between the front and the back of the clothes container. If using a temperature indicator label to test a top-loading clothes washer, adhere the label along the inner circumference of the clothes container drum, as close to the bottom of the container as possible.

3.3.1 *Maximum test load and water fill.* Measure the values for hot water consumption (Hm_x), cold water consumption (Cm_x), and electrical energy consumption (Em_x) for an Extra Hot wash/Cold rinse cycle, with the controls set for the maximum water fill level. Use the maximum test load size as specified in Table 5.1 of this appendix.

3.3.2 *Minimum test load and water fill.* Measure the values for hot water consumption (Hm_n), cold water consumption (Cm_n), and electrical energy consumption (Em_n) for an Extra Hot wash/Cold rinse cycle, with the controls set for the minimum water fill level. Use the minimum test load size as specified in Table 5.1 of this appendix.

3.3.3 *Average test load and water fill.* For a clothes washer with an automatic water fill control system, measure the values for hot water consumption (Hm_a), cold water consumption (Cm_a), and electrical energy consumption (Em_a) for an Extra Hot wash/Cold rinse cycle. Use the average test load size as specified in Table 5.1 of this appendix.

3.4 *Hot wash/Cold rinse.* Measure the water and electrical energy consumption for each water fill level and test load size as specified in sections 3.4.1 through 3.4.3 of this appendix for the Hot wash/Cold rinse temperature selection, as defined within the energy test cycle.

3.4.1 *Maximum test load and water fill.* Measure the values for hot water

consumption (Hh_x), cold water consumption (Ch_x), and electrical energy consumption (Eh_x) for a Hot wash/Cold rinse cycle, with the controls set for the maximum water fill level. Use the maximum test load size as specified in Table 5.1 of this appendix.

3.4.2 *Minimum test load and water fill.* Measure the values for hot water consumption (Hh_n), cold water consumption (Ch_n), and electrical energy consumption (Eh_n) for a Hot wash/Cold rinse cycle, with the controls set for the minimum water fill level. Use the minimum test load size as specified in Table 5.1 of this appendix.

3.4.3 *Average test load and water fill.* For a clothes washer with an automatic water fill control system, measure the values for hot water consumption (Hh_a), cold water consumption (Ch_a), and electrical energy consumption (Eh_a) for a Hot wash/Cold rinse cycle. Use the average test load size as specified in Table 5.1 of this appendix.

3.5 *Warm wash/Cold rinse.* Measure the water and electrical energy consumption for each water fill level and test load size as specified in 3.5.1 through 3.5.3 of this appendix for the applicable Warm wash/Cold rinse temperature selection(s), as defined within the energy test cycle.

For a clothes washer with fewer than four discrete Warm wash/Cold rinse temperature selections, test all Warm wash/Cold rinse selections. For a clothes washer that offers four or more Warm wash/Cold rinse selections, test at all discrete selections, or test at 25 percent, 50 percent, and 75 percent positions of the temperature selection device between the hottest hot (≤ 135 °F (57.2 °C)) wash and the coldest cold wash. If a selection is not available at the 25, 50 or 75 percent position, in place of each such unavailable selection, use the next warmer setting. For each reportable value to be used for the Warm wash/Cold rinse temperature selection, calculate the average of all Warm wash/Cold rinse temperature selections tested pursuant to this section.

3.5.1 *Maximum test load and water fill.* Measure the values for hot water consumption (Hw_x), cold water consumption (Cw_x), and electrical energy consumption (Ew_x) for the Warm wash/Cold rinse cycle, with the controls set for the maximum water fill level. Use the maximum test load size as specified in Table 5.1 of this appendix.

3.5.2 *Minimum test load and water fill.* Measure the values for hot water consumption (Hw_n), cold water consumption (Cw_n), and electrical energy consumption (Ew_n) for the Warm wash/Cold rinse cycle, with the controls set for the minimum water fill level. Use the minimum test load size as specified in Table 5.1 of this appendix.

3.5.3 *Average test load and water fill.* For a clothes washer with an automatic water fill control system, measure the values for hot water consumption (Hw_a), cold water consumption (Cw_a), and electrical energy consumption (Ew_a) for a Warm wash/Cold rinse cycle. Use the average test load size as specified in Table 5.1 of this appendix.

3.6 *Warm wash/Warm rinse.* Measure the water and electrical energy consumption for each water fill level and/or test load size as specified in 3.6.1 through 3.6.3 of this appendix for the applicable Warm wash/Warm rinse temperature selection(s), as defined within the energy test cycle.

For a clothes washer with fewer than four discrete Warm wash/Warm rinse temperature selections, test all Warm wash/Warm rinse selections. For a clothes washer that offers four or more Warm wash/Warm rinse selections, test at all discrete selections, or test at 25 percent, 50 percent, and 75 percent positions of the temperature selection device between the hottest hot (≤135 °F (57.2 °C)) wash and the coldest cold wash. If a selection is not available at the 25, 50 or 75 percent position, in place of each such unavailable selection use the next warmer setting. For each reportable value to be used for the Warm wash/Warm rinse temperature selection, calculate the arithmetic average of all Warm wash/Warm rinse temperature selections tested pursuant to this section.

3.6.1 *Maximum test load and water fill.* Measure the values for hot water consumption (Hww_x), cold water consumption (Cww_x), and electrical energy consumption (Eww_x) for the Warm wash/Warm rinse cycle, with the controls set for the maximum water fill level. Use the maximum test load size as specified in Table 5.1 of this appendix.

3.6.2 *Minimum test load and water fill.* Measure the values for hot water consumption (Hww_n), cold water consumption (Cww_n), and electrical energy consumption (Eww_n) for the Warm wash/Warm rinse cycle, with the controls set for the minimum water fill level. Use the minimum test load size as specified in Table 5.1 of this appendix.

3.6.3 *Average test load and water fill.* For a clothes washer with an automatic water fill control system, measure the values for hot water consumption (Hww_a), cold water consumption (Cww_a), and electrical energy consumption (Eww_a) for the Warm wash/Warm rinse cycle. Use the average test load size as specified in Table 5.1 of this appendix.

3.7 *Cold wash/Cold rinse.* Measure the water and electrical energy consumption for each water fill level and test load size as specified in sections 3.7.1 through 3.7.3 of this appendix for the applicable Cold wash/Cold rinse temperature selection, as defined within the energy test cycle.

3.7.1 *Maximum test load and water fill.* Measure the values for hot water consumption (Hc_x), cold water consumption (Cc_x), and electrical energy consumption (Ec_x) for a cold wash/cold rinse cycle, with the controls set for the maximum water fill level. Use the maximum test load size as specified in Table 5.1 of this appendix.

3.7.2 *Minimum test load and water fill.* Measure the values for hot water consumption (Hc_n), cold water consumption (Cc_n), and electrical energy consumption (Ec_n) for a cold wash/cold rinse cycle, with the controls set for the minimum water fill level. Use the minimum test load size as specified in Table 5.1 of this appendix.

3.7.3 *Average test load and water fill.* For a clothes washer with an automatic water fill control system, measure the values for hot water consumption (Hc_a), cold water consumption (Cc_a), and electrical energy consumption (Ec_a) for a cold wash/cold rinse cycle. Use the average test load size as specified in Table 5.1 of this appendix.

3.8 *Remaining moisture content (RMC).*

3.8.1 The wash temperature must be the same as the rinse temperature for all testing. Use the maximum test load as defined in Table 5.1 of this appendix for testing.

3.8.2 *Clothes washers with cold rinse only.*

3.8.2.1 Record the actual ''bone dry'' weight of the test load (WI_x), then place the test load in the clothes washer.

3.8.2.2 Set the water level controls to maximum fill.

3.8.2.3 Run the Cold wash/Cold rinse cycle.

3.8.2.4 Record the weight of the test load immediately after completion of the wash cycle (WC_x).

3.8.2.5 Calculate the remaining moisture content of the maximum test load, RMC_x, defined as:

$$RMC_x = (WC_x - WI_x)/WI_x$$

3.8.2.6 Apply the RMC correction curve described in section 6.3 of this appendix to calculate the corrected remaining moisture content, RMC_{corr}, expressed as a percentage as follows:

$$RMC_{corr} = (A \times RMC_x + B) \times 100\%$$

Where:

A and B are the coefficients of the RMC correction curve as defined in section 6.2.1 of this appendix.

RMC_x = As defined in section 3.8.2.5 of this appendix.

3.8.2.7 Use RMC_{corr} as the final corrected RMC in section 4.3 of this appendix.

3.8.3 *Clothes washers with both cold and warm rinse options.*

3.8.3.1 Complete sections 3.8.2.1 through 3.8.2.4 of this appendix for a Cold wash/Cold rinse cycle. Calculate the remaining moisture content of the maximum test load for Cold wash/Cold rinse, RMC_{COLD}, defined as:

$$RMC_{COLD} = (WC_x - WI_x)/WI_x$$

3.8.3.2 Apply the RMC correction curve described in section 6.3 of this appendix to calculate the corrected remaining moisture content for Cold wash/Cold rinse, $RMC_{COLD,corr}$, expressed as a percentage, as follows:

$$RMC_{COLD,corr} = (A \times RMC_{COLD} + B) \times 100\%$$

Where:

A and B are the coefficients of the RMC correction curve as defined in section 6.2.1 of this appendix.

RMC_{COLD} = As defined in section 3.8.3.1 of this appendix.

3.8.3.3 Complete sections 3.8.2.1 through 3.8.2.4 of this appendix using a Warm wash/Warm rinse cycle instead. Calculate the remaining moisture content of the maximum test load for Warm wash/Warm rinse, RMC_{WARM}, defined as:

$$RMC_{WARM} = (WC_x - WI_x)/WI_x$$

3.8.3.4 Apply the RMC correction curve described in section 6.3 of this appendix to calculate the corrected remaining moisture content for Warm wash/Warm rinse, $RMC_{WARM,corr}$, expressed as a percentage, as follows:

$$RMC_{WARM,corr} = (A \times RMC_{WARM} + B) \times 100\%$$

Where:

A and B are the coefficients of the RMC correction curve as defined in section 6.2.1 of this appendix.

RMC_{WARM} = As defined in section 3.8.3.3 of this appendix.

3.8.3.5 Calculate the corrected remaining moisture content of the maximum test load, RMC_{corr}, expressed as a percentage as follows:

$$RMC_{corr} = RMC_{COLD,corr} \times (1 - TUF_{ww}) + RMC_{WARM,corr} \times (TUF_{ww})$$

Where:

$RMC_{COLD,corr}$ = As defined in section 3.8.3.2 of this Appendix.

$RMC_{WARM,corr}$ = As defined in section 3.8.3.4 of this Appendix.

TUF_{ww} is the temperature use factor for Warm wash/Warm rinse as defined in Table 4.1.1 of this appendix.

3.8.3.6 Use RMC_{corr} as calculated in section 3.8.3.5 as the final corrected RMC used in section 4.3 of this appendix.

3.8.4 *Clothes washers that have options such as multiple selections of spin speeds or spin times that result in different RMC values, and that are available within the energy test cycle.*

3.8.4.1 Complete sections 3.8.2 or 3.8.3 of this appendix, as applicable, using the maximum and minimum extremes of the available spin options, excluding any ''no spin'' (zero spin speed) settings. Combine the calculated values $RMC_{corr,max\ extraction}$ and $RMC_{corr,min\ extraction}$ at the maximum and minimum settings, respectively, as follows:

$$RMC_{corr} = 0.75 \times RMC_{corr,max\ extraction} + 0.25 \times RMC_{corr,min\ extraction}$$

Where:

$RMC_{corr,max\ extraction}$ is the corrected remaining moisture content using the maximum spin setting, calculated according to section 3.8.2 or 3.8.3 of this appendix, as applicable.

$RMC_{corr,min\ extraction}$ is the corrected remaining moisture content using the minimum spin setting, calculated according to section 3.8.2 or 3.8.3 of this appendix, as applicable.

3.8.4.2 Use RMC_{corr} as calculated in section 3.8.4.1 as the final corrected RMC used in section 4.3 of this appendix.

3.8.5 The procedure for calculating the corrected RMC as described in section 3.8.2, 3.8.3, or 3.8.4 of this appendix may be replicated twice in its entirety, for a total of three independent corrected RMC measurements. If three replications of the RMC measurement are performed, use the average of the three corrected RMC measurements as the final corrected RMC in section 4.3 of this appendix.

3.9 *Combined low-power mode power.* Connect the clothes washer to a watt meter as specified in section 2.5.3 of this appendix. Establish the testing conditions set forth in sections 2.1, 2.4, and 2.10 of this appendix. Perform combined low-power mode testing after completion of an active mode wash cycle included as part of the energy test cycle; after removing the test load; without changing the control panel settings used for the active mode wash cycle; and without disconnecting the electrical energy supply to the clothes washer between completion of the active mode wash cycle and the start of combined low-power mode testing. For a clothes washer that takes some time to enter a stable state from a higher power state as discussed in Section 5, Paragraph 5.1, note 1 of IEC 62301 (incorporated by reference; see § 430.3), allow sufficient time for the clothes washer to reach the lower power state before proceeding with the test measurement. Follow the test procedure for the sampling method specified in Section 5, Paragraph 5.3.2 of IEC 62301 for testing in either inactive mode, off mode, or both, as described in sections 3.9.1 and 3.9.2 of this appendix.

3.9.1. If a clothes washer has an inactive mode as defined in section 1.16 of this appendix, measure and record the average inactive mode power of the clothes washer, P_{ia}, in Watts, for that mode.

3.9.2. If a clothes washer has an off mode as defined in section 1.26 of this appendix, measure and record its average off mode power, P_o, in watts, for that mode.

3.10 *Energy consumption for the purpose of determining the cycle selection(s) to be included in the energy test cycle.* This section is implemented only in cases where the energy test cycle flowcharts in section 2.12 require the determination of the wash/rinse temperature selection with the highest energy consumption.

3.10.1 For the wash/rinse temperature selection being considered under this section, establish the testing conditions set forth in section 2 of this appendix. Select the applicable cycle selection and wash/rinse temperature selection. For all wash/rinse temperature selections, the manufacturer default settings shall be used as described in section 3.2.7 of this appendix.

3.10.2 Use the clothes washer's maximum test load size, determined from Table 5.1 of this appendix, for testing under this section.

3.10.3 For clothes washers with a manual fill control system, user-adjustable automatic water fill control system, or automatic water fill control system with alternate manual water fill control system, use the water fill selector setting resulting in the maximum water level available for each cycle selection for testing under this section.

3.10.3 Each wash cycle tested under this section shall include the entire active washing mode and exclude any delay start or cycle finished modes.

3.10.4 Measure each wash cycle's electrical energy consumption (E_X) and hot water consumption (H_X). Calculate the total energy consumption for each cycle selection (E_{TX}), as follows:

$$E_{TX} = E_X + (H_X \times T \times K)$$

Where:

E_X is the electrical energy consumption, expressed in kilowatt-hours per cycle.

H_X is the hot water consumption, expressed in gallons per cycle.

T = nominal temperature rise = 75 °F (41.7 °C)

K = Water specific heat in kilowatt-hours per gallon per degree F = 0.00240 kWh/gal-°F (0.00114 kWh/L-°C)

4. Calculation of Derived Results From Test Measurements

4.1 *Hot water and machine electrical energy consumption of clothes washers.*

4.1.1 *Per-cycle temperature-weighted hot water consumption for all maximum, average, and minimum water fill levels tested.* Calculate the per-cycle temperature-weighted hot water consumption for the maximum water fill level, Vh_x, the average water fill level, Vh_a, and the minimum water fill level, Vh_n, expressed in gallons per cycle (or liters per cycle) and defined as:

(a) $Vh_x = [Hm_x \times TUF_m] + [Hh_x \times TUF_h] + [Hw_x \times TUF_w] + [Hww_x \times TUF_{ww}] + [Hc_x \times TUF_c]$

(b) $Vh_a = [Hm_a \times TUF_m] + [Hh_a \times TUF_h] + [Hw_a \times TUF_w] + [Hww_a \times TUF_{ww}] + [Hc_a \times TUF_c]$

(c) $Vh_n = [Hm_n \times TUF_m] + [Hh_n \times TUF_h] + [Hw_n \times TUF_w] + [Hww_n \times TUF_{ww}] + [Hc_n \times TUF_c]$

Where:

Hm_x, Hm_a, and Hm_n, are reported hot water consumption values, in gallons per-cycle (or liters per cycle), at maximum, average, and minimum water fill levels, respectively, for the Extra Hot wash/Cold rinse cycle, as measured in sections 3.3.1 through 3.3.3 of this appendix.

Hh_x, Hh_a, and Hh_n, are reported hot water consumption values, in gallons per-cycle (or liters per cycle), at maximum, average, and minimum water fill levels, respectively, for the Hot wash/Cold rinse cycle, as measured in sections 3.4.1 through 3.4.3 of this appendix.

Hw_x, Hw_a, and Hw_n, are reported hot water consumption values, in gallons per-cycle (or liters per cycle), at maximum, average, and minimum water fill levels, respectively, for the Warm wash/Cold rinse cycle, as measured in sections 3.5.1 through 3.5.3 of this appendix.

Hww_x, Hww_a, and Hww_n, are reported hot water consumption values, in gallons per-cycle (or liters per cycle), at maximum, average, and minimum water fill levels, respectively, for the Warm wash/Warm rinse cycle, as measured in sections 3.6.1 through 3.6.3 of this appendix.

Hc_x, Hc_a, and Hc_n, are reported hot water consumption values, in gallons per-cycle (or liters per cycle), at maximum, average, and minimum water fill levels, respectively, for the Cold wash/Cold rinse cycle, as measured in sections 3.7.1 through 3.7.3 of this appendix.

TUF_m, TUF_h, TUF_w, TUF_{ww}, and TUF_c are temperature use factors for Extra Hot wash/Cold rinse, Hot wash/Cold rinse, Warm wash/Cold rinse, Warm wash/Warm rinse, and Cold wash/Cold rinse temperature selections, respectively, as defined in Table 4.1.1 of this appendix.

TABLE 4.1.1—TEMPERATURE USE FACTORS

Wash/Rinse temperature selections available in the energy test cycle	Clothes washers with cold rinse only					Clothes washers with both cold and warm rinse		
	C/C	H/C C/C	H/C W/C C/C	XH/C H/C C/C	XH/C H/C W/C C/C	H/C W/C W/W C/C	XH/C H/C W/W C/C	XH/C H/C W/C W/W C/C
TUF_m (Extra Hot/Cold)	.....	.....	.....	0.14	0.05	.....	0.14	0.05
TUF_h (Hot/Cold)	.....	0.63	0.14	* 0.49	0.09	0.14	* 0.22	0.09
TUF_w (Warm/Cold)	.....	.....	0.49	.....	0.49	0.22	.....	0.22
TUF_{ww} (Warm/Warm)	.....	.....	.....	.....	.....	0.27	0.27	0.27
TUF_c (Cold/Cold)	1.00	0.37	0.37	0.37	0.37	0.37	0.37	0.37

* On clothes washers with only two wash temperature selections ≤135 °F, the higher of the two wash temperatures is classified as a Hot wash/Cold rinse, in accordance with the wash/rinse temperature definitions within the energy test cycle.

4.1.2 *Total per-cycle hot water energy consumption for all maximum, average, and minimum water fill levels tested.* Calculate the total per-cycle hot water energy consumption for the maximum water fill level, HE_{max}, the average water fill level, HE_{avg}, and the minimum water fill level, HE_{min}, expressed in kilowatt-hours per cycle and defined as:

(a) $HE_{max} = [Vh_x \times T \times K]$ = Total energy when a maximum load is tested.

(b) $HE_{avg} = [Vh_a \times T \times K]$ = Total energy when an average load is tested.

(c) $HE_{min} = [Vh_n \times T \times K]$ = Total energy when a minimum load is tested.

Where:

Vh_x, Vh_a, and Vh_n are defined in section 4.1.1 of this appendix.

T = Temperature rise = 75 °F (41.7 °C).

K = Water specific heat in kilowatt-hours per gallon per degree F = 0.00240 kWh/gal-°F (0.00114 kWh/L-°C).

4.1.3 *Total weighted per-cycle hot water energy consumption.* Calculate the total weighted per-cycle hot water energy consumption, HE_T, expressed in kilowatt-hours per cycle and defined as:

$HE_T = [HE_{max} \times F_{max}] + [HE_{avg} \times F_{avg}] + HE_{min} \times F_{min}]$

Where:

HE_{max}, HE_{avg}, and HE_{min} are defined in section 4.1.2 of this appendix.

F_{max}, F_{avg}, and F_{min} are the load usage factors for the maximum, average, and minimum test loads based on the size and type of the control system on the washer being tested, as defined in Table 4.1.3 of this appendix.

TABLE 4.1.3—LOAD USAGE FACTORS

Load usage factor	Water fill control system	
	Manual	Automatic
F_{max} = ...	0.72	0.12
F_{avg} = ...	.....	0.74
F_{min} = ...	0.28	0.14

4.1.4 *Per-cycle machine electrical energy consumption for all maximum, average, and minimum test load sizes.* Calculate the total per-cycle machine electrical energy consumption for the maximum water fill level, ME_{max}, the average water fill level, ME_{avg}, and the minimum water fill level, ME_{min}, expressed in kilowatt-hours per cycle and defined as:

(a) $ME_{max} = [Em_x \times TUF_m] + [Eh_x \times TUF_h] + [Ew_x \times TUF_w] + [Eww_x \times TUF_{ww}] + [Ec_x \times TUF_c]$

(b) $ME_{avg} = [Em_a \times TUF_m] + [Eh_a \times TUF_h] + [Ew_a \times TUF_w] + [Eww_a \times TUF_{ww}] + [Ec_a \times TUF_c]$

(c) $ME_{min} = [Em_n \times TUF_m] + [Eh_n \times TUF_h] + [Ew_n \times TUF_w] + [Eww_n \times TUF_{ww}] + [Ec_n \times TUF_c]$

Where:

Em_x, Em_a, and Em_n, are reported electrical energy consumption values, in kilowatt-hours per cycle, at maximum, average, and minimum test loads, respectively, for the Extra Hot wash/Cold rinse cycle, as measured in sections 3.3.1 through 3.3.3 of this appendix.

Eh_x, Eh_a, and Eh_n, are reported electrical energy consumption values, in kilowatt-hours per cycle, at maximum, average, and minimum test loads, respectively, for the Hot wash/Cold rinse cycle, as measured in sections 3.4.1 through 3.4.3 of this appendix.

Ew_x, Ew_a, and Ew_n, are reported electrical energy consumption values, in kilowatt-hours per cycle, at maximum, average, and minimum test loads, respectively, for the Warm wash/Cold rinse cycle, as measured in sections 3.5.1 through 3.5.3 of this appendix.

Eww_x, Eww_a, and Eww_n, are reported electrical energy consumption values, in kilowatt-hours per cycle, at maximum, average, and minimum test loads, respectively, for the Warm wash/Warm rinse cycle, as measured in sections 3.6.1 through 3.6.3 of this appendix.

Ec_x, Ec_a, and Ec_n, are reported electrical energy consumption values, in kilowatt-hours per cycle, at maximum, average, and minimum test loads, respectively, for the Cold wash/Cold rinse cycle, as measured in sections 3.7.1 through 3.7.3 of this appendix.

TUF_m, TUF_h, TUF_w, TUF_{ww}, and TUF_c are defined in Table 4.1.1 of this appendix.

4.1.5 *Total weighted per-cycle machine electrical energy consumption.* Calculate the total weighted per-cycle machine electrical energy consumption, ME_T, expressed in kilowatt-hours per cycle and defined as:

$ME_T = [ME_{max} \times F_{max}] + [ME_{avg} \times F_{avg}] + [ME_{min} \times F_{min}]$

Where:

ME_{max}, ME_{avg}, and ME_{min} are defined in section 4.1.4 of this appendix.

F_{max}, F_{avg}, and F_{min} are defined in Table 4.1.3 of this appendix.

4.1.6 *Total per-cycle energy consumption when electrically heated water is used.* Calculate the total per-cycle energy consumption, E_{TE}, using electrically heated water, expressed in kilowatt-hours per cycle and defined as:

$E_{TE} = H_{ET} + M_{ET}$

Where:

M_{ET} = As defined in section 4.1.5 of this appendix.

H_{ET} = As defined in section 4.1.3 of this appendix.

4.2 Water consumption of clothes washers.

4.2.1 *Per-cycle water consumption for Extra Hot wash/Cold rinse.* Calculate the maximum, average, and minimum total water consumption, expressed in gallons per cycle (or liters per cycle), for the Extra Hot wash/Cold rinse cycle and defined as:

$Qm_{max} = [Hm_x + Cm_x]$

$Qm_{avg} = [Hm_a + Cm_a]$

$Qm_{min} = [Hm_n + Cm_n]$

Where:

Hm_x, Cm_x, Hm_a, Cm_a, Hm_n, and Cm_n are defined in section 3.3 of this appendix.

4.2.2 *Per-cycle water consumption for Hot wash/Cold rinse.* Calculate the maximum, average, and minimum total water consumption, expressed in gallons per cycle (or liters per cycle), for the Hot wash/Cold rinse cycle and defined as:

$Qh_{max} = [Hh_x + Ch_x]$

$Qh_{avg} = [Hh_a + Ch_a]$

$Qh_{min} = [Hh_n + Ch_n]$

Where:

Hh_x, Ch_x, Hh_a, Ch_a, Hh_n, and Ch_n are defined in section 3.4 of this appendix.

4.2.3 *Per-cycle water consumption for Warm wash/Cold rinse.* Calculate the maximum, average, and minimum total water consumption, expressed in gallons per cycle (or liters per cycle), for the Warm wash/Cold rinse cycle and defined as:

$Qw_{max} = [Hw_x + Cw_x]$

$Qw_{avg} = [Hw_a + Cw_a]$

$Qw_{min} = [Hw_n + Cw_n]$

Where:

Hw_x, Cw_x, Hw_a, Cw_a, Hw_n, and Cw_n are defined in section 3.5 of this appendix.

4.2.4 *Per-cycle water consumption for Warm wash/Warm rinse.* Calculate the maximum, average, and minimum total water consumption, expressed in gallons per cycle (or liters per cycle), for the Warm wash/Warm rinse cycle and defined as:

$Qww_{max} = [Hww_x + Cww_x]$
$Qww_{avg} = [Hww_a + Cww_a]$
$Qww_{min} = [Hww_n + Cww_n]$

Where:

Hww_x, Cww_x, Hww_a, Cww_a, Hww_n, and Cww_n are defined in section 3.7 of this appendix.

4.2.5 *Per-cycle water consumption for Cold wash/Cold rinse.* Calculate the maximum, average, and minimum total water consumption, expressed in gallons per cycle (or liters per cycle), for the Cold wash/Cold rinse cycle and defined as:

$Qc_{max} = [Hc_x + Cc_x]$
$Qc_{avg} = [Hc_a + Cc_a]$
$Qc_{min} = [Hc_n + Cc_n]$

Where:

Hc_x, Cc_x, Hc_a, Cc_a, Hc_n, and Cc_n are defined in section 3.6 of this appendix.

4.2.6 *Total weighted per-cycle water consumption for Extra Hot wash/Cold rinse.* Calculate the total weighted per-cycle water consumption for the Extra Hot wash/Cold rinse cycle, Qm_T, expressed in gallons per cycle (or liters per cycle) and defined as:

$Qm_T = [Qm_{max} \times F_{max}] + [Qm_{avg} \times F_{avg}] + [Qm_{min} \times F_{min}]$

Where:

Qm_{max}, Qm_{avg}, Qm_{min} are defined in section 4.2.1 of this appendix.

F_{max}, F_{avg}, F_{min} are defined in Table 4.1.3 of this appendix.

4.2.7 *Total weighted per-cycle water consumption for Hot wash/Cold rinse.* Calculate the total weighted per-cycle water consumption for the Hot wash/Cold rinse cycle, Qh_T, expressed in gallons per cycle (or liters per cycle) and defined as:

$Qh_T = [Qh_{max} \times F_{max}] + [Qh_{avg} \times F_{avg}] + [Qh_{min} \times F_{min}]$

Where:

Qh_{max}, Qh_{avg}, Qh_{min} are defined in section 4.2.2 of this appendix.

F_{max}, F_{avg}, F_{min} are defined in Table 4.1.3 of this appendix.

4.2.8 *Total weighted per-cycle water consumption for Warm wash/Cold rinse.* Calculate the total weighted per-cycle water consumption for the Warm wash/Cold rinse cycle, Qw_T, expressed in gallons per cycle (or liters per cycle) and defined as:

$Qw_T = [Qw_{max} \times F_{max}] + [Qw_{avg} \times F_{avg}] + [Qw_{min} \times F_{min}]$

Where:

Qw_{max}, Qw_{avg}, Qw_{min} are defined in section 4.2.3 of this appendix.

F_{max}, F_{avg}, F_{min} are defined in Table 4.1.3 of this appendix.

4.2.9 *Total weighted per-cycle water consumption for Warm wash/Warm rinse.* Calculate the total weighted per-cycle water consumption for the Warm wash/Warm rinse cycle, Qww_T, expressed in gallons per cycle (or liters per cycle) and defined as:

$Qww_T = [Qww_{max} \times F_{max}] + [Qww_{avg} \times F_{avg}] + [Qww_{min} \times F_{min}]$

Where:

Qww_{max}, Qww_{avg}, Qww_{min} are defined in section 4.2.4 of this appendix.

F_{max}, F_{avg}, F_{min} are defined in Table 4.1.3 of this appendix.

4.2.10 *Total weighted per-cycle water consumption for Cold wash/Cold rinse.* Calculate the total weighted per-cycle water consumption for the Cold wash/Cold rinse cycle, Qc_T, expressed in gallons per cycle (or liters per cycle) and defined as:

$Qc_T = [Qc_{max} \times F_{max}] + [Qc_{avg} \times F_{avg}] + [Qc_{min} \times F_{min}]$

Where:

Qc_{max}, Qc_{avg}, Qc_{min} are defined in section 4.2.5 of this appendix.

F_{max}, F_{avg}, F_{min} are defined in Table 4.1.3 of this appendix.

4.2.11 *Total weighted per-cycle water consumption for all wash cycles.* Calculate the total weighted per-cycle water consumption for all wash cycles, Q_T, expressed in gallons per cycle (or liters per cycle) and defined as:

$Q_T = [Qm_T \times TUF_m] + [Qh_T \times TUF_h] + [Qw_T \times TUF_w] + [Qww_T \times TUF_{ww}] + [Qc_T \times TUF_c]$

Where:

Qm_T, Qh_T, Qw_T, Qww_T, and Qc_T are defined in sections 4.2.6 through 4.2.10 of this appendix.

TUF_m, TUF_h, TUF_w, TUF_{ww}, and TUF_c are defined in Table 4.1.1 of this appendix.

4.2.12 *Water factor.* Calculate the water factor, WF, expressed in gallons per cycle per cubic foot (or liters per cycle per liter), as:

$WF = Qc_T/C$

Where:

Qc_T = As defined in section 4.2.10 of this appendix.

C = As defined in section 3.1.6 of this appendix.

4.2.13 *Integrated water factor.* Calculate the integrated water factor, IWF, expressed in gallons per cycle per cubic foot (or liter per cycle per liter), as:

$IWF = Q_T/C$

Where:

Q_T = As defined in section 4.2.11 of this Appendix.

C = As defined in section 3.1.6 of this appendix.

4.3 *Per-cycle energy consumption for removal of moisture from test load.* Calculate the per-cycle energy required to remove the remaining moisture of the test load, D_E, expressed in kilowatt-hours per cycle and defined as:

$D_E = [(F_{max} \times \text{Maximum test load weight}) + (F_{avg} \times \text{Average test load weight}) + (F_{min} \times \text{Minimum test load weight})] \times (RMC_{corr} - 4\%) \times (DEF) \times (DUF)$

Where:

F_{max}, F_{avg}, and F_{min} are defined in Table 4.1.3 of this appendix

Maximum, average, and minimum test load weights are defined in Table 5.1 of this appendix.

RMC_{corr} = As defined in section 3.8.2.6, 3.8.3.5, or 3.8.4.1 of this Appendix.

DEF = Nominal energy required for a clothes dryer to remove moisture from clothes = 0.5 kWh/lb (1.1 kWh/kg).

DUF = Dryer usage factor, percentage of washer loads dried in a clothes dryer = 0.91.

4.4 *Per-cycle combined low-power mode energy consumption.* Calculate the per-cycle combined low-power mode energy consumption, E_{TLP}, expressed in kilowatt-hours per cycle and defined as:

$E_{TLP} = [(P_{ia} \times S_{ia}) + (P_o \times S_o)] \times K_p/295$

Where:

P_{ia} = Washer inactive mode power, in watts, as defined in section 3.9.1 of this appendix for clothes washers capable of operating in inactive mode; otherwise, $P_{ia} = 0$.

P_o = Washer off mode power, in watts, as defined in section 3.9.2 of this appendix for clothes washers capable of operating in off mode; otherwise, $P_o = 0$.

S_{ia} = Annual hours in inactive mode, defined as S_{oi} if no off mode is possible; $[S_{oi}/2]$ if both inactive mode and off mode are possible; and 0 if no inactive mode is possible.

S_o = Annual hours in off mode, defined as S_{oi} if no inactive mode is possible; $[S_{oi}/2]$ if both inactive mode and off mode are possible; and 0 if no off mode is possible.

S_{oi} = Combined annual hours for off and inactive mode = 8,465.

K_p = Conversion factor of watt-hours to kilowatt-hours = 0.001.

295 = Representative average number of clothes washer cycles in a year.

4.5 *Modified energy factor.* Calculate the modified energy factor, MEF, expressed in cubic feet per kilowatt-hour per cycle (or liters per kilowatt-hour per cycle) and defined as:

$MEF = C/(E_{TE} + D_E)$

Where:

C = As defined in section 3.1.6 of this appendix.

E_{TE} = As defined in section 4.1.6 of this appendix.

D_E = As defined in section 4.3 of this appendix.

4.6 *Integrated modified energy factor.* Calculate the integrated modified energy factor, IMEF, expressed in cubic feet per kilowatt-hour per cycle (or liters per kilowatt-hour per cycle) and defined as:

$IMEF = C/(E_{TE} + D_E + E_{TLP})$

Where:

C = As defined in section 3.1.6 of this appendix.

E_{TE} = As defined in section 4.1.6 of this appendix.

D_E = As defined in section 4.3 of this appendix.

E_{TLP} = As defined in section 4.4 of this appendix.

5. Test Loads

TABLE 5.1—TEST LOAD SIZES

Container volume		Minimum load		Maximum load		Average load	
cu. ft.	liter	lb	kg	lb	kg	lb	kg
≥ <	≥ <						
0.00–0.80	0.00–22.7	3.00	1.36	3.00	1.36	3.00	1.36
0.80–0.90	22.7–25.5	3.00	1.36	3.50	1.59	3.25	1.47
0.90–1.00	25.5–28.3	3.00	1.36	3.90	1.77	3.45	1.56
1.00–1.10	28.3–31.1	3.00	1.36	4.30	1.95	3.65	1.66
1.10–1.20	31.1–34.0	3.00	1.36	4.70	2.13	3.85	1.75
1.20–1.30	34.0–36.8	3.00	1.36	5.10	2.31	4.05	1.84
1.30–1.40	36.8–39.6	3.00	1.36	5.50	2.49	4.25	1.93
1.40–1.50	39.6–42.5	3.00	1.36	5.90	2.68	4.45	2.02
1.50–1.60	42.5–45.3	3.00	1.36	6.40	2.90	4.70	2.13
1.60–1.70	45.3–48.1	3.00	1.36	6.80	3.08	4.90	2.22
1.70–1.80	48.1–51.0	3.00	1.36	7.20	3.27	5.10	2.31
1.80–1.90	51.0–53.8	3.00	1.36	7.60	3.45	5.30	2.40
1.90–2.00	53.8–56.6	3.00	1.36	8.00	3.63	5.50	2.49
2.00–2.10	56.6–59.5	3.00	1.36	8.40	3.81	5.70	2.59
2.10–2.20	59.5–62.3	3.00	1.36	8.80	3.99	5.90	2.68
2.20–2.30	62.3–65.1	3.00	1.36	9.20	4.17	6.10	2.77
2.30–2.40	65.1–68.0	3.00	1.36	9.60	4.35	6.30	2.86
2.40–2.50	68.0–70.8	3.00	1.36	10.00	4.54	6.50	2.95
2.50–2.60	70.8–73.6	3.00	1.36	10.50	4.76	6.75	3.06
2.60–2.70	73.6–76.5	3.00	1.36	10.90	4.94	6.95	3.15
2.70–2.80	76.5–79.3	3.00	1.36	11.30	5.13	7.15	3.24
2.80–2.90	79.3–82.1	3.00	1.36	11.70	5.31	7.35	3.33
2.90–3.00	82.1–85.0	3.00	1.36	12.10	5.49	7.55	3.42
3.00–3.10	85.0–87.8	3.00	1.36	12.50	5.67	7.75	3.52
3.10–3.20	87.8–90.6	3.00	1.36	12.90	5.85	7.95	3.61
3.20–3.30	90.6–93.4	3.00	1.36	13.30	6.03	8.15	3.70
3.30–3.40	93.4–96.3	3.00	1.36	13.70	6.21	8.35	3.79
3.40–3.50	96.3–99.1	3.00	1.36	14.10	6.40	8.55	3.88
3.50–3.60	99.1–101.9	3.00	1.36	14.60	6.62	8.80	3.99
3.60–3.70	101.9–104.8	3.00	1.36	15.00	6.80	9.00	4.08
3.70–3.80	104.8–107.6	3.00	1.36	15.40	6.99	9.20	4.17
3.80–3.90	107.6–110.4	3.00	1.36	15.80	7.16	9.40	4.26
3.90–4.00	110.4–113.3	3.00	1.36	16.20	7.34	9.60	4.35
4.00–4.10	113.3–116.1	3.00	1.36	16.60	7.53	9.80	4.45
4.10–4.20	116.1–118.9	3.00	1.36	17.00	7.72	10.00	4.54
4.20–4.30	118.9–121.8	3.00	1.36	17.40	7.90	10.20	4.63
4.30–4.40	121.8–124.6	3.00	1.36	17.80	8.09	10.40	4.72
4.40–4.50	124.6–127.4	3.00	1.36	18.20	8.27	10.60	4.82
4.50–4.60	127.4–130.3	3.00	1.36	18.70	8.46	10.85	4.91
4.60–4.70	130.3–133.1	3.00	1.36	19.10	8.65	11.05	5.00
4.70–4.80	133.1–135.9	3.00	1.36	19.50	8.83	11.25	5.10
4.80–4.90	135.9–138.8	3.00	1.36	19.90	9.02	11.45	5.19
4.90–5.00	138.8–141.6	3.00	1.36	20.30	9.20	11.65	5.28
5.00–5.10	141.6–144.4	3.00	1.36	20.70	9.39	11.85	5.38
5.10–5.20	144.4–147.2	3.00	1.36	21.10	9.58	12.05	5.47
5.20–5.30	147.2–150.1	3.00	1.36	21.50	9.76	12.25	5.56
5.30–5.40	150.1–152.9	3.00	1.36	21.90	9.95	12.45	5.65
5.40–5.50	152.9–155.7	3.00	1.36	22.30	10.13	12.65	5.75
5.50–5.60	155.7–158.6	3.00	1.36	22.80	10.32	12.90	5.84
5.60–5.70	158.6–161.4	3.00	1.36	23.20	10.51	13.10	5.93
5.70–5.80	161.4–164.2	3.00	1.36	23.60	10.69	13.30	6.03
5.80–5.90	164.2–167.1	3.00	1.36	24.00	10.88	13.50	6.12
5.90–6.00	167.1–169.9	3.00	1.36	24.40	11.06	13.70	6.21

Notes: (1) All test load weights are bone dry weights.
(2) Allowable tolerance on the test load weights is ±0.10 lbs (0.05 kg).

6. Waivers and Field Testing

6.1 *Waivers and Field Testing for Nonconventional Clothes Washers.* Manufacturers of nonconventional clothes washers, such as clothes washers with adaptive control systems, must submit a petition for waiver pursuant to 10 CFR 430.27 to establish an acceptable test procedure for that clothes washer if the washer cannot be tested pursuant to the DOE test procedure or the DOE test procedure yields results that are so unrepresentative of the clothes washer's true energy consumption characteristics as to provide materially inaccurate comparative data. In such cases, field testing may be appropriate for establishing an acceptable test procedure. The following are guidelines for field testing that may be used by manufacturers in support of petitions for waiver. These guidelines are not mandatory and the Department may determine that they do not apply to a particular model. Depending upon a manufacturer's approach for conducting field testing, additional data may be required. Manufacturers are encouraged to communicate with the Department prior to the commencement of field tests that may be used to support a petition for waiver. Section 6.3 of this appendix provides an example of

field testing for a clothes washer with an adaptive water fill control system. Other features, such as the use of various spin speed selections, could be the subject of field tests.

6.2 *Nonconventional Wash System Energy Consumption Test.* The field test may consist of a minimum of 10 of the nonconventional clothes washers (''test clothes washers'') and 10 clothes washers already being distributed in commerce (''base clothes washers''). The tests should include a minimum of 50 wash cycles per clothes washer. The test clothes washers and base clothes washers should be identical in construction except for the controls or systems being tested. Equal numbers of both the test clothes washer and the base clothes washer should be tested simultaneously in comparable settings to minimize seasonal or end-user laundering conditions or variations. The clothes washers should be monitored in such a way as to accurately record the average total energy and water consumption per cycle, including water heating energy when electrically heated water is used, and the energy required to remove the remaining moisture of the test load. Standby and off mode energy consumption should be measured according to section 4.4 of this test procedure. The field test results should be used to determine the best method to correlate the rating of the test clothes washer to the rating of the base clothes washer.

6.3 *Adaptive water fill control system field test.* (1) Section 3.2.6.3 of this appendix defines the test method for measuring energy consumption for clothes washers that incorporate both adaptive (automatic) and alternate manual water fill control systems. Energy consumption calculated by the method defined in section 3.2.6.3 of this appendix assumes the adaptive cycle will be used 50 percent of the time. This section can be used to develop field test data in support of a petition for waiver when it is believed that the adaptive cycle will be used more than 50 percent of the time. The field test sample size should be a minimum of 10 test clothes washers. The test clothes washers should be representative of the design, construction, and control system that will be placed in commerce. The duration of field testing in the user's house should be a minimum of 50 wash cycles, for each unit. No special instructions as to cycle selection or product usage should be given to the field test participants, other than inclusion of the product literature pack that would be shipped with all units, and instructions regarding filling out data collection forms, use of data collection equipment, or basic procedural methods. Prior to the test clothes washers being installed in the field test locations, baseline data should be developed for all field test units by conducting laboratory tests as defined by section 1 through section 5 of this appendix to determine the energy consumption, water consumption, and remaining moisture content values. The following data should be measured and recorded for each wash load during the test period: wash cycle selected, the mode of the clothes washer (adaptive or manual), clothes load dry weight (measured after the clothes washer and clothes dryer cycles are completed) in pounds, and type of articles in the clothes load (*e.g.,* cottons, linens, permanent press). The wash cycles used in calculating the in-home percentage split between adaptive and manual cycle usage should be only those wash cycles that conform to the definition of the energy test cycle.

Calculate:

T = The total number of wash cycles run during the field test.

T_a = The total number of adaptive control wash cycles.

T_m = The total number of manual control wash cycles.

The percentage weighting factors:

$P_a = (T_a/T) \times 100\%$ (the percentage weighting for adaptive control selection)

$P_m = (T_m/T) \times 100\%$ (the percentage weighting for manual control selection)

(2) Energy consumption (HE_T, ME_T, and D_E) and water consumption (Q_T) values calculated in section 4 of this appendix for the manual and adaptive modes should be combined using P_a and P_m as the weighting factors.

■ 8. Add a new Appendix J3 to subpart B of part 430 to read as follows:

Appendix J3 to Subpart B of Part 430–Uniform Test Method for Measuring the Moisture Absorption and Retention Characteristics of New Energy Test Cloth Lots

Note: DOE maintains an historical record of the standard extractor test data and final correctio5tn curve coefficients for each approved lot of energy test cloth. These can be accessed through DOE's Web page for standards and test procedures for residential clothes washers at DOE's Building Technologies Office Appliance and Equipment Standards Web site.

1. Objective

The following procedure is used to evaluate the moisture absorption and retention characteristics of a new lot of test cloth by measuring the remaining moisture content (RMC) in a standard extractor at a specified set of conditions. The results are used to develop a set of coefficients that correlate the measured RMC values of the new test cloth lot with a set of standard RMC values established as an historical reference point. These correction coefficients are applied to the RMC measurements performed during testing according to appendix J1 or appendix J2 to 10 CFR 430 subpart B, ensuring that the final corrected RMC measurement for a clothes washer remains independent of the test cloth lot used for testing.

2. Definitions

2.1 *AHAM* means the Association of Home Appliance Manufacturers.

2.2 *Bone-dry* means a condition of a load of test cloth that has been dried in a dryer at maximum temperature for a minimum of 10 minutes, removed and weighed before cool down, and then dried again for 10 minute periods until the final weight change of the load is 1 percent or less.

2.3 *Lot* means a quantity of cloth that has been manufactured with the same batches of cotton and polyester during one continuous process.

3. Testing Conditions

3.1 Table 3.1 of this appendix provides the matrix of test conditions. In the table, ''g Force'' represents units of gravitational acceleration. When this matrix is repeated 3 times, a total of 60 extractor RMC test runs are required. For the purpose of the extractor RMC test, the test cloths may be used for up to 60 test runs (after preconditioning as specified in appendix J1 or appendix J2).

TABLE 3.1—MATRIX OF EXTRACTOR RMC TEST CONDITIONS

''g Force''	Warm soak		Cold soak	
	15 min. spin	4 min. spin	15 min. spin	4 min. spin
100				
200				
350				
500				
650				

3.2 Perform the standard extractor RMC tests using a North Star Engineered Products Inc. (formerly Bock) Model 215 extractor (having a basket diameter of 20 inches, height of 11.5 inches, and volume of 2.09 ft^3), with a variable speed drive (North Star Engineered Products, P.O. Box 5127, Toledo, OH 43611) or an equivalent extractor with same basket design (*i.e.* diameter, height, volume, and hole configuration) and variable speed drive. Table 3.2 shows the extractor spin speed, in revolutions per minute (RPM), that must be used to attain each required g-force level.

TABLE 3.2—EXTRACTOR SPIN SPEEDS FOR EACH TEST CONDITION

"g Force"	RPM
100	594 ± 1
200	840 ± 1
350	1111 ± 1
500	1328 ± 1
650	1514 ± 1

3.3 *Bone dryer temperature.* The dryer used for bone drying must heat the test cloth and energy stuffer cloths above 210 °F (99 °C).

4. Test Loads

4.1 *Preconditioning.* New test cloths, including energy test cloths and energy stuffer cloths, must be pre-conditioned in a clothes washer in the following manner:

Perform five complete wash-rinse-spin cycles, the first two with current AHAM Standard detergent Formula 3 and the last three without detergent. Place the test cloth in a clothes washer set at the maximum water level. Wash the load for ten minutes in soft water (17 ppm hardness or less) using 27.0 grams + 4.0 grams per pound of cloth load of AHAM Standard detergent Formula 3. The wash temperature is to be controlled to 135 °F ±5 °F (57.2 °C ±2.8 °C) and the rinse temperature is to be controlled to 60 °F ±5 °F (15.6 °C ±2.8 °C). Repeat the cycle with detergent and then repeat the cycle three additional times without detergent, bone drying the load between cycles (for a total of five complete wash-rinse-spin cycles).

4.2 *Test load composition.* Test loads must be comprised of randomly selected cloth at the beginning, middle and end of a lot.

4.3 *Test load size.* Use a test load size of 8.4 lbs. Two test loads may be used for standard extractor RMC tests, with each load used for half of the total number of required tests.

5. Test Measurements

5.1 Dry the test cloth until it is ''bone-dry'' according to the definition in section 2.2 of this appendix. Record the bone-dry weight of the test load (WI).

5.2 Prepare the test load for soak by grouping four test cloths into loose bundles. Create the bundles by hanging four cloths vertically from one corner and loosely wrapping the test cloth onto itself to form the bundle. Bundles should be wrapped loosely to ensure consistency of water extraction. Then place the bundles into the water to soak. Eight to nine bundles will be formed depending on the test load. The ninth bundle may not equal four cloths but can incorporate energy stuffer cloths to help offset the size difference.

5.3 Soak the test load for 20 minutes in 10 gallons of soft (<17 ppm) water. The entire test load must be submerged. Maintain a water temperature of 100 °F ± 5 °F (37.8 °C ± 2.8 °C) at all times between the start and end of the soak.

5.4 Remove the test load and allow each of the test cloth bundles to drain over the water bath for a maximum of 5 seconds.

5.5 Manually place the test cloth bundles in the basket of the extractor, distributing them evenly by eye. The draining and loading process must take no longer than 1 minute. Spin the load at a fixed speed corresponding to the intended centripetal acceleration level (measured in units of the acceleration of gravity, g) ± 1g for the intended time period ± 5 seconds. Begin the timer when the extractor meets the required spin speed for each test.

5.6 Record the weight of the test load immediately after the completion of the extractor spin cycle (WC).

5.7 Calculate the remaining moisture content of the test load as (WC–WI)/WI.

5.8 Draining the soak tub is not necessary if the water bath is corrected for water level and temperature before the next extraction.

5.9 Drying the test load in between extraction runs is not necessary. However, the bone dry weight must be checked after every 12 extraction runs to make sure the bone dry weight is within tolerance (8.4 ± 0.1 lb).

5.10 The test load must be soaked and extracted once following bone drying, before continuing with the remaining extraction runs. Perform this extraction at the same spin speed used for the extraction run prior to bone drying, for a time period of 4 minutes. Either warm or cold soak temperature may be used.

5.11 Measure the remaining moisture content of the test load at five g levels: 100 g, 200 g, 350 g, 500 g, and 650 g, using two different spin times at each g level: 4 minutes and 15 minutes.

5.12 Repeat sections 5.1 through 5.11 of this appendix using soft (<17 ppm) water at 60 °F ± 5 °F (15.6 °C ± 2.8 °C).

6. Calculation of RMC Correction Curve

6.1 Average the values of 3 test runs, and fill in Table 3.1 of this appendix. Perform a linear least-squares fit to determine coefficients A and B such that the standard RMC values shown in Table 6.1 of this appendix ($RMC_{standard}$) are linearly related to the RMC values measured in section 5 of this appendix (RMC_{cloth}):

$RMC_{standard} \sim A * RMC_{cloth} + B$

Where A and B are coefficients of the linear least-squares fit.

TABLE 6.1—STANDARD RMC VALUES ($RMC_{standard}$)

"g Force"	RMC percentage			
	Warm soak		Cold soak	
	15 min. spin (percent)	4 min. spin (percent)	15 min. spin (percent)	4 min. spin (percent)
100	45.9	49.9	49.7	52.8
200	35.7	40.4	37.9	43.1
350	29.6	33.1	30.7	35.8
500	24.2	28.7	25.5	30.0
650	23.0	26.4	24.1	28.0

6.2 Perform an analysis of variance with replication test using two factors, spin speed and lot, to check the interaction of speed and lot. Use the values from Table 3.1 and Table 6.1 of this appendix in the calculation. The ''P'' value of the F-statistic for interaction between spin speed and lot in the variance analysis must be greater than or equal to 0.1. If the ''P'' value is less than 0.1, the test cloth is unacceptable. ''P'' is a theoretically based measure of interaction based on an analysis of variance.

7. Application of the RMC Correction Curve

7.1 Using the coefficients A and B calculated in section 6.1 of this appendix:

$RMC_{corr} = A \times RMC + B$

7.2 Apply this RMC correction curve to measured RMC values in appendix J1 and appendix J2.

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