[6450-01-P]

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 Clothes Washers

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

ACTION: Final rule.

SUMMARY: On April 25, 2014, the U.S. Department of Energy (DOE) issued a notice of proposed rulemaking (NOPR) to amend the test procedures for clothes washers. That proposed rulemaking serves as the basis for this final rule. DOE is issuing a final rule revising its test procedures for clothes washers established under the Energy Policy and Conservation Act. The final rule amends the current procedures, incorporating changes that will take effect 30 days after the final rule publication date. These changes will be mandatory for representations starting 180 days after publication. These amendments 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. DOE has determined that these amendments will not affect measured energy use.

DATES: The effective date of this rule is **[INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].** The final rule changes will be mandatory for representations made on or after **[INSERT DATE 180 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].**

ADDRESSES: 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. The regulations.gov web page will contain simple instructions on how to access all documents, including public comments, in the docket.

For further information on how to review the docket, contact Ms. Brenda Edwards at (202) 586-2945 or by email: Brenda.Edwards@ee.doe.gov.

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SUPPLEMENTARY INFORMATION:

Table of Contents

I. Authority and Background

A. Authority

Title III, Part B[1] of the Energy Policy and Conservation Act of 1975 (EPCA), Pub. L. 94-163 (42 U.S.C. 6291–6309, as codified), established the Energy Conservation Program for

[1] For editorial reasons, upon codification in the U.S. Code, Part B was redesignated Part A.

Consumer Products Other Than Automobiles,[2] which includes residential clothes washers (RCW). (42 U.S.C. 6292(a)(7)) Part C of title III[3] established the Energy Conservation Program for Certain Industrial Equipment, which includes commercial clothes washers (CCW). (42 U.S.C. 6311(1)(H)) Both RCWs and CCWs are the subject of this rulemaking.

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.

B. Background

DOE test procedures for clothes washers are codified at appendices J1 and J2 to 10 CFR part 430 subpart B ("appendix J1" and "appendix J2"). DOE most recently amended the test procedures for clothes washers on March 7, 2012 ("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. DOE proposed additional clarifying revisions to

[2] All references to EPCA in this document refer to the statute as amended through the Energy Efficiency Improvement Act of 2015, Pub. L. 114-11 (Apr. 30, 2015).
[3] For editorial reasons, upon codification in the U.S. Code, Part C was redesignated Part A-1.

both appendix J1 and appendix J2 in a notice of proposed rulemaking published on April 25, 2014 ("April 2014 NOPR"). 79 FR 23061.

As of March 7, 2015, manufacturers of RCWs are required to make representations of energy efficiency using appendix J2, as established by the March 2012 final rule. 77 FR 32308 (May 31, 2012) and 77 FR 59719 (October 1, 2012).

EPCA requires CCWs to be tested using the same test procedures applicable to residential clothes washers. (42 U.S.C. 6314(a)(8)) On December 3, 2014, DOE published a final rule adopting appendix J2, to be used to determine compliance with any future revised energy conservation standards for CCWs. 79 FR 71624. On December 15, 2014, DOE published a final rule amending the CCW energy conservation standards, which become effective January 1, 2018. 79 FR 74492. Manufacturers of CCWs must use appendix J1 to demonstrate compliance with the current standards established by the January 2010 final rule. (10 CFR 431.156(b)) Beginning January 1, 2018, manufacturers must use appendix J2 to demonstrate compliance with the amended energy conservation standards effective on the same date. (10 CFR 431.156(c))

C. General Test Procedure Rulemaking Process

EPCA sets forth the criteria and procedures DOE must follow when prescribing or amending test procedures for covered products. (42 U.S.C. 6293(b)) EPCA provides 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 offer 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)(1)) If DOE determines that the amended test procedure would alter the measured efficiency of a covered product, DOE must amend the applicable energy conservation standard accordingly. (42 U.S.C. 6293(e)(2))

With respect to this rulemaking, DOE has determined that the amendments it is adopting will not change the measured energy use of clothes washers compared to the current test procedure.

II. Summary of the Final Rule

This final rule codifies clarifications and technical amendments to the current DOE test procedures for clothes washers at appendix J1 and appendix J2. The final rule also amends the reporting and verification requirements for RCWs. DOE has determined that the amendments described in section III would not alter the measured efficiency of clothes washers. The 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. General Comments

As previously mentioned, DOE proposed additional clarifying revisions to both appendix J1 and appendix J2 in the April 2014 NOPR. 79 FR 23061 (Apr. 25, 2014). DOE received several general comments in response to this proposal.

The Association of Home Appliance Manufacturers (AHAM) requested that DOE publish a final rule quickly because the introduction of test procedure amendments when compliance is already underway (as required beginning March 7, 2015)[4] could cause confusion and added burden for manufacturers. (AHAM, No. 4 at p. 2)[5] AHAM also stated that DOE must present its analysis to show that the proposed changes would not alter the measured efficiency of clothes washers, per 42 U.S.C. 6293(e). Id. Furthermore, AHAM disagrees with DOE's conclusion that none of the proposed changes in the April 2014 NOPR would alter measured efficiency of clothes washers. Id.

General Electric (GE) stated that it supports all of AHAM's comments, except regarding the issue of sanitization cycles, as discussed further in section III.G.2 of this final rule. (GE, No. 6 at p. 1) Whirlpool also stated that it supports all of AHAM's comments, except AHAM's comments on the issue of test cloth loading instructions for front-loading clothes washers, as discussed further in section III.F of this final rule. (Whirlpool, No. 7 at p. 2) Throughout this

[4] March 7, 2015 is the compliance date of the amended energy conservation standards that address standby and off mode energy consumption for RCWs. 77 FR 32308 (May 31, 2012) and 77 FR 59719 (Oct. 1, 2012).

[5] A notation in this form provides a reference for information included in the docket for this rulemaking, which is maintained at www.regulations.gov. This notation indicates that the commenter's statement preceding the reference can be found in document number 4 in the docket, and appears at page 2 of that document.

final rule, reference to AHAM's written comments should be considered reflective of GE and Whirlpool's positions as well, aside from the exceptions mentioned above.

An anonymous commenter expressed support for DOE's proposal, stating that the proposal will enable testers to deliver more accurate results by streamlining the test procedure and clarifying certain confusing or unclear aspects. (Anonymous, No. 2 at p. 1)

Throughout this rule, DOE addresses concerns raised by interested parties in the specific instances where interested parties stated that the proposed changes in the April 2014 NOPR would alter the measured efficiency of clothes washers. In each case, DOE either performed additional testing and analysis to justify its conclusion that a particular amendment would not impact measured efficiency, or altered the amendment in response to the concerns raised, so that the final amendment, as codified by this final rule, will not impact the measured efficiency of clothes washers.

B. Introductory Text

In the April 2014 NOPR, DOE proposed 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. 79 FR 23061 (April 25, 2014).

DOE test procedures for clothes washers are set forth in appendices J1 and J2 in 10 CFR part 430 subpart B. In the April 2014 NOPR, DOE proposed a number of amendments to both

appendices, some of which are made final by this rule. 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 rule is prescribed or established. Therefore, beginning 180 days after this final rule is published in the Federal Register, manufacturers must make representations of energy efficiency pursuant to appendix J1 or appendix J2 as modified through such amendments.

As of March 7, 2015, manufacturers of RCWs are no longer authorized to use appendix J1. In particular, compliance with DOE's amended standards for RCWs and corresponding use of appendix J2 for all representations by RCW manufacturers, including certifications of compliance, was required as of March 7, 2015. 77 FR 32308 (May 31, 2012) and 77 FR 59719 (October 1, 2012).

AHAM stated that it does not oppose changes to appendix J1 for CCWs; however, AHAM requests that DOE expressly state that RCWs will not need to comply with the revised appendix J1. (AHAM, No. 4 at p. 2) Alliance Laundry Systems (ALS) supports DOE's proposal to amend the note at the beginning of both appendix J1 and appendix J2 test procedures. (ALS, No. 5 at p. 5)

DOE received no comments objecting to its proposal to amend the introductory text of both appendix J1 and appendix J2. Therefore, for the reasons stated above, this final rule amends the introductory text in both appendix J1 and appendix J2 to clarify their use. As described in the Background section of this notice, the current energy conservation standards for CCWs are based

on the MEF and WF metrics as measured using appendix J1. Therefore, appendix J1 will remain effective for CCWs until January 1, 2018, the effective date of the amended energy conservation standards for CCWs, which are based on appendix J2. 79 FR 74491 (Dec. 15, 2014). Since RCWs were required to use appendix J2 beginning March 7, 2015, appendix J1 will be used only for CCWs between March 7, 2015 and January 1, 2018.

C. 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."

In the April 2014 NOPR, DOE proposed codifying the clarifications and illustrations contained in the July 6, 2010 guidance document.[6] 79 FR 23061, 23063 (Apr. 25, 2014). The guidance document clarifies the definition of the uppermost edge of the clothes container for the purpose of performing capacity measurements and 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.

[6]The July 6, 2010 guidance document on residential clothes washers is located at http://www1.eere.energy.gov/buildings/appliance_standards/pdfs/clotheswashers_faq1_2010-07-06.pdf ("Guidance Document,")

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.[7] DOE proposed in the April 2014 NOPR to incorporate some of these illustrations into appendix J1 as the following: (1) Figure 3.1.4.1, displaying the maximum fill level for top-loading vertical-axis clothes washers; (2) Figure 3.1.4.2, displaying example cross-sections of tub covers showing the highest horizontal plane defining the uppermost edge of the clothes container for top-loading clothes washers; and (3) Figure 3.1.4.3, showing the maximum fill volumes for the clothes container capacity measurement of horizontal-axis clothes washers.

The April 2014 NOPR also further clarified the appropriate water fill levels for front-loading horizontal-axis clothes washers with concave door shapes and top-loading horizontal-axis clothes washers. 79 FR 23063. In the April 2014 NOPR, DOE proposed defining the capacity measurement for front-loading horizontal-axis clothes washers with concave door shapes as any space above the plane defined by the highest point of contact between the door and the door gasket, if that area could be occupied by clothing during washer operation. Id. Similarly, for top-loading horizontal-axis clothes washers, the water fill volume would include any space

[7] See April 2014 NOPR, 79 FR 23061, 23091; Guidance Document, http://www1.eere.energy.gov/buildings/appliance_standards/pdfs/clotheswashers_faq1_2010-07-06.pdf.

above the plane of the door hinge, if that area could be occupied by clothing during washer operation. Id. This additional clarification is consistent with the illustrations for these clothes washer types provided in DOE's guidance document.

AHAM supports the incorporation of DOE's existing guidance and illustrations for the capacity measurement in appendix J1. (AHAM, No. 4 at p. 4) AHAM does not oppose DOE's proposal to further clarify the water fill levels. Id.

ALS also supports DOE's proposal to incorporate the illustrations from DOE's existing guidance in appendix J1. (ALS, No. 5 at p. 3)

DOE received no comments objecting to its proposal to incorporate the capacity measurement clarifications described in its July 6, 2010 guidance document into appendix J1. Therefore, for the reasons discussed above, DOE incorporates these clarifications into section 3.1.4 of appendix J1 in this final rule.

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. In the April 2014 NOPR, DOE proposed clarifying the description of the maximum fill volume for front-loading clothes washers in appendix J2. 79 FR 23063.

For front-loading horizontal-axis clothes washers, section 3.1.4 currently 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 became 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.

In the April 2014 NOPR, DOE proposed revising the definition to provide additional clarity by referencing the "highest point of contact" rather than the "uppermost edge," in order to clearly identify the geometric boundary between the door and the door gasket for a wider range of front-loading clothes washer geometries. 79 FR 23063. DOE intended 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. Id. at 23063−64. The proposed amendments to appendix J2 also included the following illustrations: (1) Figure 3.1.4.1, showing the boundary defining the uppermost edge of the clothes container for top-loading vertical-axis clothes washers; and (2) Figure 3.1.4.2, showing the boundaries defining the maximum fill volumes for the clothes container capacity measurement of horizontal-axis clothes washers. Id.

AHAM does not oppose DOE's proposal to amend the appendix J2 description of the maximum fill volume for front-loading clothes washers using the same language as the proposed amendments to appendix J1, and as specified in existing capacity measurement guidance under

appendix J1. (AHAM, No. 4 at p. 4) AHAM also does not oppose DOE's proposal to 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. (AHAM, No. 4 at p. 4)

ALS supports DOE's proposal to add illustrations showing the maximum fill level for top-loading vertical-axis washers and the maximum fill volume for horizontal-axis washers in appendix J2. (ALS, No. 5 at p. 3)

DOE received no comments objecting to its proposal to incorporate the revised description of the maximum fill volume for front-loading clothes washers in appendix J2, as well as the illustrations of the boundaries defining the uppermost edge of the clothes container for top-loading vertical-axis clothes washers and the maximum fill volume for horizontal-axis clothes washers. Therefore, for the reasons discussed above, DOE incorporates these changes into newly renumbered section 3.1.4 of appendix J2 in this final rule.

3. Capacity Rounding Requirements

In both appendix J1 and appendix J2, the measured capacity is the basis for determining the test load sizes specified 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.

In the April 2014 NOPR, DOE proposed clarifying that manufacturers must measure capacity to the nearest 0.01 cubic foot for the purpose of determining load size and for calculating the efficiency values that manufacturers must report pursuant to 10 CFR 429.20(b). 79 FR 23061, 23064. (April 25, 2014). DOE proposed adding this clarification in both appendices, in a new section 3.1.7 following the calculation of capacity in section 3.1.5. Id.

The proposed amendments also specified in a new section at 10 CFR 429.20(c) that capacity must be reported to the nearest 0.1 cubic foot for the purpose of DOE certification reports for RCWs.

Finally, DOE proposed clarifying in a new paragraph 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. 79 FR 23064. DOE proposed this amendment for clarity, stating that it believes this is consistent with current practice because the existing test procedure and sampling plan require testing at least two units and measuring the drum capacity individually for each. Id.

AHAM and ALS support DOE's proposal to clarify measuring capacity to the nearest 0.01 cubic foot for the purposes of the test procedure measurement and the downstream calculations in the test procedure, and to report capacity to the nearest 0.1 cubic foot for certification purposes. (AHAM, No. 4 at p. 4; ALS, No. 5 at p. 3) AHAM and ALS also support DOE's proposal 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. (AHAM, No. 4 at p. 4; ALS, No. 5 at p. 1)

DOE received no comments objecting to its proposed clarifications regarding clothes container capacity rounding requirements, including the revised certification requirement. Therefore, for the reasons discussed above, DOE incorporates these clarifications in this final rule.

4. Plastic Sheet Material

Section 3.1.2 of both appendix J1 and appendix J2 specifies lining the inside of the clothes container with a 2 mil thickness (0.051mm) plastic sheet before filling the clothes container with water. 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 clothes container. DOE therefore proposed in the April 2014 NOPR 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. 79 FR 23064. DOE reasoned that 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. Id.

AHAM and ALS support the use of a plastic bag for measuring capacity, stating that they believe a plastic bag provides the most accurate measurement method. (AHAM, No. 4 at p. 4, 5; ALS, No. 5 at p. 3) AHAM added that it prefers that DOE no longer permit the use of a plastic

sheet to perform the capacity measurement, to help reduce variation in the test procedure. (AHAM, No. 4 at p 4, 5) ALS also objected to DOE's continued allowance of "plastic sheet material" for the capacity measurement, stating that it results in an inaccurate measurement due to the significant folding that occurs with the flat sheet. (ALS, No. 5 at p. 3)

DOE has conducted numerous capacity measurements of both top-loading and front-loading clothes washers using a flat plastic sheet, and has obtained the same measured capacity as each model's certified capacity value. Therefore, DOE's experience has shown that it is possible to perform the capacity measurement correctly and accurately using a flat plastic sheet. However, DOE acknowledges that the use of a flat plastic sheet can be more difficult than using a plastic bag. Using a flat plastic sheet requires careful attention to minimize the number of folds and to ensure that none of the folds encapsulate any trapped air, which could reduce the measured capacity.

Due to the challenges observed by DOE in using a flat plastic sheet, and considering the comments received in response to the April 2014 NOPR, this final rule amends section 3.1.2 of both appendix J1 and appendix J2 to require the use of only a 2 mil thickness plastic bag to line the inside of the clothes container. This final rule does not allow manufacturers to use a plastic sheet to perform measurements under appendix J1 and J2.

5. Shipping Bolts

Front-loading clothes washers are typically 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 are 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. In the April 2014 NOPR, DOE proposed to add a reference to "other forms of bracing hardware" in section 3.1.1 of both appendix J1 and appendix J2. 79 FR 23061, 23064. (Apr. 25, 2014).

In addition, DOE became 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. Therefore, in the April 2014 NOPR, DOE also proposed amendments to 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 if necessary, including temporary bracing or support beams. The amendments would require that any temporary bracing or support beams, if used, 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. DOE also proposed to require that the method used avoid any damage to the unit that would affect the results of the energy and water testing. DOE further proposed to require that test reports fully document the method used to support the wash drum, and, pursuant to 10 CFR 429.71, that the manufacturer retain such documentation as part of its test records. 79 FR 23064.

ALS supports DOE's proposed clarifications regarding shipping bolts used on front-loading washers. (ALS, No. 5 at p. 3)

AHAM supports DOE's clarification that the purpose of shipping bolts or other forms of bracing hardware remaining in place is to support the wash drum and prevent it from sagging downward as the drum is filled with water. (AHAM, No. 4 at p. 5) AHAM does not oppose DOE's proposed description of how a laboratory should proceed in cases where shipping bolts or other forms of bracing hardware are not used to support the drum during shipping. (AHAM, No. 4 at p. 5) AHAM stated that if DOE intended manufacturers to indicate whether shipping bolts or other forms of bracing hardware are used, AHAM would oppose such reporting requirement as unnecessarily adding to the certification reporting and recordkeeping burden. Instead, AHAM stated that DOE should require reporting only when something other than what is shipped with the unit is used for testing. (AHAM, No. 4 at p. 5)

DOE received no comments objecting to its proposed clarifications regarding the use of shipping bolts or other forms of bracing hardware during the clothes container capacity measurement. Therefore, for the reasons discussed above, DOE incorporates these clarifications in section 3.1.1 of both appendix J1 and appendix J2 in this final rule.

In the April 2014 NOPR, DOE intended that manufacturers would need to fully document the method used to support the wash drum, and retain such documentation as part of its test records, only in cases where temporary bracing or support beams are required to keep the

wash drum in a fixed position on front-loading clothes washer designs that do not use shipping bolts or other forms of bracing hardware to support the wash drum during shipping. The final rule provides this clarification in section 3.1.1 of both appendix J1 and appendix J2.

D. 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 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 for RCWs 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 proposed in the April 2014 NOPR 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 heating 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). In its proposal, DOE stated the amendment applied to both appendix J1 and appendix J2 (with section 2.3.1 in appendix J2 renumbered to 2.2.1). 79 FR 23064.

In the April 2014 NOPR, DOE noted 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 noted that the water supply temperature affects the outcome of the MEF or Integrated Modified Energy Factor (IMEF) results when testing clothes washers with thermostatically controlled water valves more significantly than for clothes washers without such valves. DOE requested 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.

AHAM supports DOE's proposal 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 inlet water temperature. Additionally, AHAM suggested that, with regard to water supply temperature, DOE no longer differentiate between clothes

washers with thermostatically controlled water valves and those without, and that the proposed tighter temperature tolerance should apply to all types of clothes washers. AHAM added that third-party laboratories will not likely know whether a machine is thermostatically controlled, and therefore will maintain the stricter five-degree tolerance during testing anyway. Thus, applying the same five-degree temperature tolerance to all types of clothes washers should not impact laboratories. AHAM also suggested that DOE add language to explicitly state that 135°F and 60°F are the target inlet temperatures, which would further clarify the test procedure and reduce testing variation. (AHAM, No. 4 at pp. 5−6)

ALS supports DOE's proposal regarding the hot and cold water supply conditions. ALS stated that it has equipment capable of controlling water temperature to within the proposed five-degree total tolerance for clothes washers, which are affected by supply water temperature. (ALS, No. 5 at p. 4) For added consistency, ALS proposed that the five-degree tolerance also should apply to clothes washers that are not affected by water supply temperature. (ALS, No. 5 at p. 4)

The California Investor Owned Utilities (CA IOUs) support DOE's proposal to maintain a tolerance of five degrees on both the hot and cold water supply temperatures for clothes washers in which electrical energy or water energy consumption are affected by inlet water temperature. (CA IOUs, No. 3 at p. 5)

DOE agrees with AHAM that a third-party laboratory is unlikely to know whether a clothes washer is thermostatically controlled and therefore is likely to maintain the tighter five-

degree tolerance for all clothes washer tests. DOE also agrees with AHAM and ALS that applying the tighter five-degree tolerance to all types of clothes washers would provide increased consistency of test results, with minimal or no additional test burden, since laboratories typically maintain a five-degree tolerance already. Therefore, this final rule amends both appendix J1 and appendix J2 to require maintaining a five-degree temperature range on the hot and cold water supplies (i.e., 130−135°F and 55−60 °F, respectively) for all types of clothes washers. This final rule also amends appendix J1 (section 2.3) and appendix J2 (newly renumbered section 2.2) to specify that 135°F is the target temperature for the hot water supply and 60°F is the target temperature for the cold water supply.

E. 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. In the April 2014 NOPR, DOE proposed 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 to improve the clarity and overall logical flow of the test procedure. 79 FR 23061, 23065 (Apr. 25, 2014).

AHAM does not oppose, and ALS supports, DOE's proposal to relocate the contents of sections 2.6.5 through 2.6.7 in both appendix J1 and appendix J2 to a new appendix J3 as a

standalone test method for measuring the moisture absorption and retention characteristics of the new energy test cloth lots. (AHAM, No. 4 at p. 6; ALS, No. 5 at p. 4)

DOE received no comments objecting to its proposal to create a new appendix J3 as a standalone test method for measuring the moisture absorption and retention characteristics of new energy test cloth lots. Therefore, this final rule incorporates this change and establishes a new appendix J3 test procedure. Accordingly, this final rule also removes the standard extractor RMC procedure from appendices J1 and J2 and amends section 2.6.4.6 in appendix J1 and newly renumbered section 2.7.5 in appendix J2 to reference the standard extractor RMC procedure now provided in appendix J3.

F. Test Cloth Loading Instructions

Section 2.8.3 of both appendix J1 and appendix J2 specifies loading the energy test cloths into the clothes washer by grasping them in the center, shaking them to hang loosely, and then "put[ting] them into the clothes container" prior to activating the clothes washer. These instructions apply to both top-loading and front-loading clothes washers. DOE proposed in the April 2014 NOPR to provide additional specificity for the test cloth handling and loading instructions to improve the overall clarity and consistency of test cloth loading procedures. As proposed, the 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). 79 FR 23065.

DOE proposed amending test cloth loading instructions by conforming them to a modified version of the loading instructions for towels and pillowcases provided in the AHAM

HLW-1-2010 test method, Performance Evaluation Procedures for Household Appliances.[8] 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 included similar illustrations. The proposed amendments also specified testing according to any additional loading instructions provided by the manufacturer regarding the placement of clothing within the clothes container. 79 FR 23065.

ALS supports DOE's proposal to add more specificity to the test cloth loading instructions in both appendix J1 and appendix J2. (ALS, No. 5 at p. 4)

AHAM and Whirlpool agree with DOE's proposed loading instructions for top-loading clothes washers. (AHAM, No. 4 at p. 6; Whirlpool, No. 7 at p. 2) AHAM did not comment on DOE's proposed loading instructions for front-loading clothes washers, but stated that DOE should specify a loading procedure for both top and front-loading machines. (AHAM, No. 4 at p. 6) AHAM suggested that DOE should investigate the impacts of the proposed test cloth loading instructions on measured water and energy use. AHAM further suggested that DOE strike the word "additional" from the proposed language stating, "Follow any additional manufacturer loading instructions provided to the user regarding the placement of clothing within the clothing container." AHAM stated that this would clarify that if the manufacturer's recommendations to

[8] DOE referenced AHAM HLW-1-2010 in the April 2014 NOPR. AHAM has since updated its test method as HLW-1-2013. The loading instructions for towels and pillowcases are the same in both versions. HLW-1-2013 is available at http://www.aham.org/ht/d/Store/name/MAJOR/pid/5132.

the consumer differ from the test procedure's loading instructions, the manufacturer's recommendation should be followed. (AHAM, No.4 at pp. 2-3, 6-7)

DOE agrees with AHAM's suggestion that if the manufacturer's recommendations for loading the clothes washer differ from the test procedure's loading instructions, the manufacturer's recommendation should be followed. Therefore, this final rule amends the test cloth loading instructions to require following any manufacturer loading instructions provided to the user regarding the placement of clothing within the clothes container. In the absence of any manufacturer loading instructions provided to the user, DOE's detailed loading instructions, as amended by this final rule, must be followed.

DOE received no comments objecting to its proposal to provide additional specificity for the test cloth handling and loading instructions for top-loading clothes washers. Therefore, for the reasons described above, this final rule amends the test procedures by providing greater detail regarding test cloth handling and loading instructions for top-loading clothes washers, including the accompanying illustrations as proposed in the April 2014 NOPR.

Whirlpool opposed amending the current test cloth loading procedure for front-loading clothes washers. Whirlpool stated that DOE's proposed method of stacking the cloths in a front-loader would not accomplish DOE's goal of adding more consistency to the test procedure. Whirlpool believes that whether the cloths are stacked as noted in AHAM HLW-1-2010 or loaded at random the way a consumer would load the machine at home, the cloths in both cases will ultimately be mixed together randomly within several tumbles of any front-load washer

drum, thereby producing relatively insignificant variation between the two loading methods. Whirlpool added that adopting the proposed test cloth loading instructions for front-load washers would add unnecessary test burden by extending the amount of time it takes to perform the test, in exchange for no meaningful benefits. (Whirlpool, No. 7 at p. 2)

In response to Whirlpool's comment, DOE conducted additional investigations into the proposed changes to the test cloth loading instructions for front-loading clothes washers. DOE performed comparative testing on two front-loading clothes washers: one with baseline efficiency and one with max-tech efficiency. On each clothes washer, DOE conducted 10 cycles using the procedure described in the current test procedure, and 10 cycles using the revised procedure described in the proposed amendments.

For the test runs corresponding to the current test procedure, DOE loaded each cloth individually according to instructions provided in section 2.8.3 of appendix J1 and appendix J2: "Load the energy test cloths 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." Each cloth was loaded loosely into the drum without being placed in any particular orientation, resulting in a random arrangement of cloths inside the drum.

For the test runs corresponding to the revised procedure proposed in the April 2014 NOPR, DOE loaded each cloth lengthwise, from front to back, using alternating orientations for adjacent pieces of cloth. The clothes were loaded evenly across the width of the clothes container, completing each cloth layer across its horizontal plane before adding a new layer.

During each cycle, DOE measured total water consumption, machine electrical energy consumption, remaining moisture content, cloth loading time, and total cycle time (excluding cloth loading time). Table III-1 summarizes the results by providing the range, average, and standard deviation for total water consumption (in gallons), machine electrical energy (in kilowatt-hours (kWh)), and remaining moisture content (expressed as a percentage). Table III-2 summarizes the measured loading times and cycles times associated with each method.

DOE provides the full results of these tests in a separate test report accompanying this final rule, which is available in the regulations.gov docket for this rulemaking.

Table III-1. Comparison of Total Water Consumption, Machine Electrical Energy, and Remaining Moisture Content for Front-Loading Clothes Washers

Washer Type	Loading Method	Total Water Consumption (gal)		Machine Electrical Energy Range (kWh)		Remaining Moisture Content Range (%)	
		Range	Avg; SD	Range	Avg; SD	Range	Avg; SD
Baseline	Current Method	15.4 – 17.3	16.5; 0.49	0.13 – 0.15	0.14; 0.01	44 – 48	47; 1.0
	Proposed Method	15.8 – 17.2	16.5; 0.49	0.13 – 0.15	0.14; 0.01	46 – 48	47; 0.5
Max-Tech	Current Method	11.9 – 12.9	12.3; 0.32	0.12 – 0.14	0.13; 0.00	34 – 36	35; 0.5
	Proposed Method	9.4 – 13.3	11.9; 1.10	0.12 – 0.14	0.13; 0.01	31 – 40	35; 2.5

Table III-2. Comparison of Loading Times and Cycle Times for Front-Loading Clothes Washers

Washer Type	Loading Method	Loading Time (mm:ss)		Wash Cycle Time (min)		Avg Total Time (min)
		Range	Avg	Range	Avg	
Baseline	Current Method	3:38 – 5:15	4:08	59 – 75	63	67
	Proposed Method	4:31 – 5:12	4:49	57 – 72	62	67
Max-Tech	Current Method	4:39 – 5:20	5:04	48 – 56	53	58
	Proposed Method	5:40 – 6:15	6:00	48 – 56	53	59

The results of this testing indicate that the proposed revised loading method for front-loading clothes washers improved the consistency of machine electrical energy, water consumption, and RMC for the baseline unit, as compared to the current loading method in the appendix J2 test procedure. However, the proposed revised loading method resulted in less overall consistency of these three parameters for the max-tech unit.

The proposed revised loading method required approximately one additional minute of time to load the cloths for both clothes washers. The proposed revised loading method resulted in a decrease in wash cycle time of one minute for the baseline clothes washer, but no change in wash cycle time for the max-tech clothes washer. DOE considers an overall time difference of one minute to be negligible, given the total cycle time of approximately one hour.

Based on the results of this testing, DOE concludes that the proposed revised loading method may provide more consistent test results for some front-loading clothes washer models, but less consistent results for other models. Additional tests would need to be performed on a wider range of units to further verify these conclusions. Accordingly, DOE agrees that the data collected do not support adopting a change to the instructions for loading front-loading clothes washer models. For these reasons, this final rule maintains the loading instructions provided in

the current appendix J2 test procedure for front-loading clothes washers. As stated above, this final rule amends the loading instructions in newly renumbered section 2.9.2 of appendix J2 for top-loading clothes washers by providing greater detail regarding test cloth handling and the loading procedure, including the accompanying illustrations as proposed in the April 2014 NOPR.

G. 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, to clarify 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.[9] In the April 2014 NOPR, DOE proposed codifying this 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). 79 FR 23065.

[9] See DOE's guidance document at: http://www1.eere.energy.gov/buildings/appliance_standards/pdfs/clotheswasher_faq_2010-09-21.pdf.

In the April 2014 NOPR, DOE tentatively determined that a parallel clarification regarding a warm rinse cycle is unnecessary in appendix J2. 79 FR 23065. Section 1.13(B) 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.

AHAM does not oppose DOE's inclusion of the 2010 warm rinse guidance in appendix J1. (AHAM, No. 4 at p. 7) ALS supports DOE's proposal to codify the warm rinse guidance only in appendix J1. (ALS, No. 5 at p. 6)

DOE received no comments objecting to its proposal to amend appendix J1 to codify the September 2010 guidance regarding the inclusion of warm rinse. Therefore, this final rule amends the definition of "energy test cycle" in newly renumbered section 1.8 of appendix J1 to clarify 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. DOE confirms its prior determination that a parallel clarification for appendix J2 is unnecessary.

2. Sanitization Cycles

As described in the previous section, part (A) of 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. Part (B) of the energy test cycle in appendix J1 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 for 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. In the April 2014 NOPR, DOE proposed amending the energy test cycle definition in appendix J1 to 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. 79 FR 23061, 23065 (Apr. 25, 2014). 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. Id.

As described in the April 2014 NOPR, DOE tentatively determined that a parallel clarification regarding the inclusion of sanitization cycles is unnecessary in appendix J2. The methodology for determining the extra-hot wash temperature selection in appendix J2 requires including such a setting if it is available on the clothes washer and is recommended by the manufacturer for washing clothing. Id.

GE supports DOE's proposal that the sanitization cycle be included for testing in appendix J1 if the extra-hot temperature selection is only available in a sanitization cycle. (GE, No. 6 at p. 1)

ALS has no position on DOE's proposal to include the sanitization cycle as part of the energy test cycle in appendix J1. (ALS, No. 5 at p. 4)

AHAM opposes DOE's proposal to amend appendix J1's requirements to include a sanitization cycle in the energy test cycle for clothes washers with an extra-hot temperature selection that is available only on a sanitization cycle, if the cycle is recommended by the manufacturer for washing clothes and if doing so would contribute to an accurate representation of the energy consumption as used by consumers. AHAM stated that DOE's proposal will result in decreased MEF for some basic models, and that the sanitization cycle should not be included in the energy test cycle under appendix J1. (AHAM, No. 4 at p. 3, 7−8)

In its comments, AHAM stated that cycles such as a sanitization cycle have a special use and are not likely to be used often by consumers. AHAM stated that DOE presented no consumer use data to justify its proposal that the sanitization cycle should be included. AHAM presented a summary of data from a recent study[10] conducted by Northwest Energy Efficiency Alliance (NEEA) that measured laundry energy use over a month's time across 50 residential sites. The results of the field study indicated that the consumer usage rate of the sanitization cycle fell within the range of 1.31% and 15.38%, depending on which assumptions were used to analyze the data.[11] AHAM believes that these usage levels would not justify the burden of

[10] "Dryer Field Study." Northwest Energy Efficiency Alliance. November 19, 2014. Available online at https://www.neea.org/docs/default-source/reports/neea-clothes-dryer-field-study.pdf.

[11] The calculation of 1.31% assumes that the sanitization option was available on all 50 clothes washers and could be selected for all 1,376 wash cycles conducted across the 50 sites. The calculation of 15.38% assumes that the sanitization option was available only on the units where a sanitization cycle was recorded at least once. AHAM stated that the field data do not list the available cycle options for the participating units in the study; therefore, determining an exact percentage for how often a certain cycle was selected was not possible.

adding the sanitization cycle to the energy test cycle. In addition, AHAM stated that, to its knowledge, manufacturers are not recommending consumers use sanitization cycles to wash normally soiled cotton or linen clothes. Given the impact on measured efficiency that DOE's proposal would have, AHAM commented that DOE should avoid this issue with regards to appendix J1. Finally, AHAM commented that if DOE proceeds, over its objection, then DOE must adjust the standard in accordance with the change in measured efficiency that would result from inclusion of the sanitization cycle. (AHAM, No. 4 at p. 3, 7-8)

In consideration of AHAM's comments, DOE reiterates and affirms the following test procedure principles as described in prior rulemaking documents. On November 9, 2011, DOE published a supplemental notice of proposed rulemaking ("November 2011 SNOPR") for its clothes washer test procedures. 76 FR 69869. In the November 2011 SNOPR, DOE stated that it had observed that the extra-hot wash and warm rinse temperature combinations are locked out of the "Normal" setting[12] on some clothes washer models that offer such selections. DOE understood that, in cases where certain wash/rinse combinations are locked out of the Normal setting, some manufacturers were only testing the temperature selections available on the Normal setting, despite being able to access other wash/rinse temperature selections on other settings. 76 FR 69870. DOE further stated that testing only the wash temperature selections available in the Normal setting may neglect part (B) of the energy test cycle definition, which requires manufacturers to switch out of the Normal setting to a different setting that allows the other temperature combinations to be selected and tested, if such testing "will contribute to an accurate representation of energy consumption as used by consumers." Id. at 69871. Because the

[12] Here, DOE uses the term "Normal setting" to describe the cycle recommended by the manufacturer for washing cotton or linen clothes.

temperature selections typically locked out of the Normal setting are those that use greater quantities of hot water and thus have higher water heating energy consumption, excluding them from the energy test cycle could increase (i.e., improve) a clothes washer's MEF rating. Id. at 69870−71. Wash/rinse temperature combinations that are locked out of the Normal setting should also be included in the energy test cycle, under the assumption that a consumer will switch to one of the alternate cycles to obtain that wash/rinse temperature combination. 76 FR 69875. DOE affirms these principles as applied to the issue of extra-hot wash temperature selections in this final rule.

As noted in the November 2011 SNOPR, the temperature use factors (TUFs) in Table 4.1.1 of appendix J1 were developed to represent consumer selection of different temperature options available on a clothes washer. Each TUF represents the frequency with which consumers select a particular temperature option on machines offering that temperature option. Therefore, the energy test cycle should include any temperature combination for which a TUF has been developed.

DOE interprets the results of the NEEA laundry study, as summarized by AHAM, as being consistent with the TUF for extra-hot wash, as codified in appendix J1. The extra-hot wash TUF of 5% falls within the range of 1.31% to 15.38% as indicated by the NEEA study. The results of the NEEA study suggest that although a sanitization cycle may be considered a specialty feature, consumers select this extra-hot wash feature at a frequency consistent with the extra-hot wash TUF codified in the test procedure.

With regards to AHAM's statement that manufacturers do not recommend that consumers use sanitization cycles to wash normally soiled cotton or linen clothes, DOE notes that part (B) of the energy test cycle pertains to wash/rinse temperatures not available on the cycle that is recommended for washing cotton and linen clothes. Part (B) of the definition is intended to apply to wash/rinse temperature selections on cycles other than the cycle recommended for washing cotton and linen clothes, if doing so will contribute to an accurate representation of the energy consumption of the model as used by consumers. The results of the NEEA study support DOE's conclusion that, for clothes washers offering an extra-hot temperature selection only on a separate sanitization cycle, including the sanitization as part of the energy test cycle, with a 5% TUF weighting, accurately represents the energy consumption of the model as used by consumers.

Furthermore, as discussed in DOE's warm rinse guidance document, DOE understands that some manufacturers may be relying on proprietary data about consumers' use of each wash/rinse temperature selection when applying part (B) of the energy test cycle to determine the energy consumption of such models. The Department's test procedure, however, cannot rely on proprietary data to which only the manufacturer has access. The procedure must be standardized, administrable, and enforceable. In the August 27, 1997 final rule that codified the appendix J1 test procedure, DOE explained that the clarification provided by part (B) of the energy test cycle definition was made primarily to address the issue of machines that "locked out" various wash/rinse temperatures from the Normal cycle, thereby excluding representative energy use from the test procedure measurement. 62 FR 45484, 45496. Incorporating the "locked out" temperature options in accordance with the temperature use factors allows DOE to develop a

testing standard that is clear, administrable, and standardized across all manufacturers and models.

Finally, because RCW manufacturers were required to use appendix J2 beginning March 7, 2015, the amendments to appendix J1 apply only to CCWs. DOE is not aware of any current models of CCWs listed in its compliance certification database[13] that offer extra-hot wash temperatures greater than 135°F. Therefore, DOE has determined that this amendment will not change the measured MEF or WF values of any CCW models currently on the market that are covered by DOE standards.

In summary, after consideration of all comments and data submitted on this topic, DOE concludes that on clothes washers with an extra-hot temperature selection available only on a sanitization cycle that is recommended by the manufacturer for washing clothing, inclusion of the sanitization cycle in the energy test cycle is consistent with the intent of the test procedure and the 5 percent TUF is consistent with the consumer usage data described above.. Therefore, this final rule amends the energy test cycle definition in newly renumbered section 1.8 of appendix J1 by clarifying that if an extra-hot temperature selection is available only 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. The amendment also removes the clause "and if doing so would contribute to an accurate representation of the energy consumption as used by consumers" because, as discussed above, the available data indicates that including such a cycle contributes to an accurate representation of energy consumption as used by

[13] DOE's compliance certification database for commercial clothes washers is available at http://www.regulations.doe.gov/certification-data/CCMS-79222370561.html.

consumers. The amendment further clarifies that 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 is not required for consideration as part of the energy test cycle. DOE confirms its prior determination that a parallel clarification for appendix J2 is unnecessary.

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 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.

In the April 2014 NOPR, DOE proposed amending appendix J1 by modifying 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. 79 FR 23061, 23066 (Apr. 25, 2014). Specifically, DOE proposed to require that the manufacturer default settings 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. Id. DOE also proposed to require that 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 testing be included for testing unless the manufacturer instructions recommend not selecting this option for washing normally soiled cotton or linen clothes. Id.

In addition, DOE proposed amending appendix J2 to 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. Id.

AHAM supports DOE's proposal to clarify in both appendix J1 and appendix J2 the requirement to use manufacturer default settings for cycle selections except for the temperature selection, the wash water fill levels, and, if necessary, the spin speeds on wash cycles used to determine remaining moisture content. (AHAM, No. 4 at p. 8)

AHAM also proposed that DOE further require that clothes washers with mechanical switches be tested either (1) with each switch in the position the manufacturer recommends in the use and care guide for the cottons and linens cycle or (2) if the manufacturer does not recommend a switch position, with the switch in its most energy/water intensive position. AHAM stated that this approach is consistent with current practice in manufacturer laboratories. (AHAM, No. 4 at p. 8)

ALS supports DOE's proposal to specify using the manufacturer default settings for any cycle selections in both appendix J1 and appendix J2. ALS stated that this is consistent with how ALS and the rest of the industry conduct testing. (ALS, No. 5 at p. 4)

DOE received no comments objecting to its proposal to clarify the use of 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.

As described above, DOE proposed clarifying that any optional wash cycle feature 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 (emphasis added). DOE has observed that clothes washer user manuals typically do not recommend against selecting certain options for washing normally soiled cotton clothing. Rather, descriptions in the user manual most often provide recommendations for selecting certain options for washing normally soiled cotton clothing. Therefore, this final rule modifies the wording of DOE's proposal as follows: "Any optional wash cycle feature or setting…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, or recommend selecting a different option, for washing normally soiled cotton clothing."

In response to AHAM's comments, DOE has considered AHAM's proposal to provide further clarification for clothes washers with mechanical switches. To inform its decision, DOE

investigated the control panels of 31 clothes washer models with mechanical switches, representing seven different brands on the market. DOE believes that this sample of models represents nearly the entire market for clothes washers with mechanical control switches.

Based on this market survey, DOE identified the following ten parameters that are controlled by mechanical switches or dials on one or more clothes washer models: load size, wash/rinse temperature, soil level, fabric type, rinse settings, spin settings, fabric softener, pre-soak, stain treatment, and specialty chemical dispense. Of these ten parameters, the test procedure provides specific instructions for setting load size, wash/rinse temperature, and spin settings.

Of the remaining seven parameters, DOE intends for this amendment to clarify that the soil level and fabric type settings should be those recommended for washing normally-soiled cotton[14] clothing, as described further below. This would provide clarity for any soil level or fabric type settings.

Of the remaining five parameters (rinse settings, fabric softener, pre-soak, stain treatment, and specialty chemical dispense), DOE observes that in almost all cases, the manufacturer does not provide recommendations for, or against, the use of these five parameters with respect to the level of soiling or fabric material on which they should be used; i.e., these five parameters are selected independently from other settings that are recommended for washing normally soiled cotton clothing. As summarized above, AHAM suggested that if a switch

[14] As described in the Normal Cycle Definition section of this notice, the final rule removes the reference to "linen clothing" in the Normal cycle definition in appendix J2.

position is not recommended for the cottons and linens cycle, DOE should require the most energy/water intensive position to be used for the test. DOE's product survey indicates that in almost all cases, the switches or dials for these remaining five parameters would thus be tested in their most energy intensive positions, if DOE were to adopt AHAM's suggested wording.

Although the inclusion of more energy- and water-consumptive features for testing would ultimately encourage more efficient overall performance, DOE has two major concerns with this aspect of AHAM's proposal: First, AHAM has not presented any information to indicate whether testing in the most energy intensive position would provide a more accurate representation of consumer usage than testing in the default or as-shipped position. Second, DOE's experience working with third-party laboratories conflicts with AHAM's assertion that this approach is consistent with current practice in manufacturer laboratories. In DOE's experience, third-party laboratories typically test clothes washers with the switches for these five remaining parameters (rinse settings, fabric softener, pre-soak, stain treatment, and specialty chemical dispense) in the default, or as-shipped, position. DOE has observed that these switches are mostly commonly shipped in the "off" position, or in a position other than the most energy intensive position.

DOE has also observed that mechanical switches and dials are used almost exclusively on baseline or near-baseline products.[15] DOE thus concludes that amending the test procedure to require that these parameters be tested in the most energy intensive position could negatively impact the measured efficiency of a substantial portion of baseline products. Since the intent of the amendments in this final rule is to provide clarification only, without impacting measured efficiency, DOE rejects AHAM's suggestion to require testing mechanical switches in the most

[15] DOE defines a "baseline product" as one that just meets the minimum efficiency standard.

energy intensive position if a switch position is not recommended for the cottons and linens cycle.

In addition, the notion of a "default" setting may apply more appropriately to clothes washers with electronic control panels than clothes washers with mechanical switches or dials. On most clothes washers with electronic controls, when the user selects a particular cycle (e.g., Normal, Cottons, or Whites), the control panel automatically activates the pre-programmed settings recommended for all the other optional cycle parameters. On clothes washers with mechanical switches or dials, however, selecting a particular cycle (e.g., Normal, Cottons, or Whites) does not automatically activate the other optional cycle parameters (e.g., rinse settings, fabric softener, pre-soak, stain treatment, and specialty chemical dispense), each of which, if available on the machine, would have its own mechanical switch or dial that would need to be manually set by the end user. Given that the notion of a "default" setting does not apply to mechanical switches and knobs, DOE believes that the "as-shipped" position of a mechanical switch or knob represents the equivalent of a default setting.

In some cases, however, the mechanical switch or dial position recommended to be used for normally soiled cotton clothing may not be the as-shipped position. For example, a soil level dial may offer light, normal, and heavy soil selections—in which case, the "normal" setting would be selected for testing, even if the product was shipped in the "light" position.

For these reasons, DOE has determined that the test procedure must clarify that mechanical switches or dials for any optional settings must be in the position recommended by

the manufacturer for washing normally soiled cotton clothing. DOE believes this clarification is consistent with AHAM's suggestion to further clarify for clothes washers with mechanical switches that testing take place with the switch in the position the manufacturer recommends in the use and care guide for the cottons and linens cycle. If the manufacturer instructions do not recommend a particular switch or dial position to be used for washing normally soiled cotton clothing, the switch or dial must remain in its "as-shipped" position.

In summary, based on the reasons described above, this final rule adds the following clarification to newly created section 1.8(C) in appendix J1 and newly renumbered section 3.2.7 in appendix J2:

"For clothes washers with electronic control systems, 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 or setting (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, or recommend selecting a different option, for washing normally soiled cotton clothing.

For clothes washers with control panels containing mechanical switches or dials, any optional 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, must be in the position recommended by the manufacturer for washing normally soiled cotton clothing. If the manufacturer instructions do not recommend a particular switch or dial position to be used for washing normally soiled cotton clothing, the setting switch or dial must remain in its as-shipped position."

4. Energy Test Cycle Definition

As noted in the April 2014 NOPR, 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 did not propose changing its usage of the term "energy test cycle" in appendix J1. DOE determined that in each instance where the term "energy test cycle" is used, the specific meaning of the term can be determined through context. 79 FR 23061, 23066 (Apr. 25, 2014).

In appendix J2, however, DOE proposed to simplify the definition of the term "energy test cycle" so that it refers only to the complete set of wash/rinse temperature selections required for testing. 79 FR 23066. DOE further proposed defining the individual wash/rinse temperature selections required for testing under a new definition for "Normal cycle," in conjunction with a new flow chart methodology as provided in the April 2014 NOPR and described further 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. Id.

In instances where the test procedure currently uses the term "energy test cycle" to refer to an individual wash cycle, DOE proposed to use the generic term "wash cycle" or other similar terminology as appropriate for each instance. 79 FR 23066. DOE also proposed to improve overall clarity by providing the full wash/rinse temperature designation (e.g. "Cold Wash/Cold Rinse") throughout the test procedure. Id.

ALS strongly objects to DOE's proposal to amend the energy test cycle definition in appendix J2, stating that this is not a subtle change. ALS believes it is too late for DOE to make this change, and that such a change may lead to more confusion regarding how to test clothes washers. (ALS, No. 5 at p. 6, 7)

DOE interprets the full context of ALS's comment as applying to the revised definition of the Normal cycle, as described in the next section, which serves the purpose of the current definition of the energy test cycle in appendix J2. DOE addresses all comments regarding the details of the Normal cycle definition in the next section of this notice.

DOE received no other comments objecting to its proposal 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. Therefore, this final rule implements this change as it was proposed in the April 2014 NOPR.

5. Normal Cycle Definition

DOE proposed adding a new definition in appendix J2 for "Normal cycle," defined as "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." 79 FR 23066.

DOE noted in the April 2014 NOPR that it first adopted a 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, 49808 (Sept. 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 (Sept. 21, 2010)). 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. 79 FR 23061, 23066 (Apr. 25, 2014).

In order to add clarity and ensure consistent selection of the appropriate cycle for energy testing, DOE proposed adding a ''Normal cycle'' definition in newly designated section 1.25

and, for simplicity, to reference the term in the new energy test cycle flowcharts. DOE noted that it would consider manufacturer literature and markings on the machine when determining the Normal cycle of any particular unit. DOE specifically sought comment on this definition and whether it adequately covers the cycle setting most commonly chosen by users of washing machines.

DOE received numerous comments from interested parties regarding its proposed definition for Normal cycle. DOE categorized each comment according to the specific element of the Normal cycle to which it pertains, and provides responses to all comments in the following subsections.

a. General Comments

AHAM strongly opposes DOE's proposal to add a new definition for Normal cycle in appendix J2. AHAM believes that this new definition could change the cycle selections that would be tested. (AHAM, No. 4 at p. 9)

ALS states that the new paragraph 1.25 "Normal Cycle" that has been added seems out-of-place because it is not in close proximity to the "Energy Test Cycle" definition. (ALS, No. 5 at p. 7)

DOE notes that the creation of the Normal cycle definition is a separate issue from the actual wording of the Normal cycle definition, and notes that the majority of concerns expressed by interested parties related to the wording of the definition. DOE proposed adding a new

definition for Normal cycle so that the new energy test cycle flowcharts, described later in this notice, can simply reference "the Normal cycle" rather than using the full text of the definition each time it is referenced in the flowcharts. DOE determined that because of the complex wording required in some of the flowchart diagrams, referencing the full text of the Normal cycle definition would render some of the flowchart boxes incomprehensible. Thus, a simpler phrase is required.

For these reasons, this final rule adds a definition of Normal cycle, which is referenced for simplicity in the new flowchart diagrams. The Normal cycle definition was proposed as newly created section 1.25 of appendix J2 because DOE re-sorted the list of definitions in appendix J2 in alphabetical order. 79 FR 23066. DOE maintains the alphabetical sorting of definitions in this final rule.

As explained further in the following subsections, DOE has revised the wording of the Normal cycle to address many of the concerns that were raised by interested parties.

b. Element #1: Most Common Consumer Cycle

AHAM opposes DOE's proposal to change "cottons and linens" to "most commonly used cycle."[16] AHAM believes it is impossible for manufacturers to know which cycle is the most commonly used. AHAM added that, should DOE proceed with adding the definition of Normal cycle, DOE should remove the reference to "most commonly used cycle" from the definition. (AHAM, No. 4 at p. 9)

[16] DOE notes that the proposed wording of this provision was "most common consumer cycle for washing a full load of normally to heavily soiled cotton clothing." 79 FR 23062, 23082.

ALS opposes the definition of Normal cycle because the definition of "most common consumer cycle" could also refer to "regular" or "permanent press" cycles. ALS questions whether DOE conducted a consumer survey to arrive at the conclusion that Normal cycle is the most common consumer cycle. (ALS, No. 5 at p. 7)

The CA IOUs support DOE's proposed updated definition for Normal cycle in order to adequately describe the most commonly chosen settings by users of washing machines, for testing and rating purposes. (CA IOUs, No. 3 at p. 3)

DOE's test procedures are required to produce results that are representative of an average use cycle or period of use. (42 U.S.C. 6293(b)(3)) DOE's intent in its proposal was to specify the cycle that the manufacturer recommends as the most common cycle for everyday use, as would be described in the user manual, product literature, or product labeling. DOE understands that this may be different than the cycle that would be most commonly selected during actual consumer use, and that manufacturers may not necessarily know which cycles are most commonly used by consumers. Without such consumer usage data, DOE can only assume that the cycle that the manufacturer recommends as the most common cycle for everyday use corresponds to the cycle most commonly used by consumers during actual use. The proposed phrasing was intended to prevent a manufacturer from recommending one setting to the consumer as the most common setting for everyday use, but using a different, less energy-intensive setting for DOE testing purposes. Using such a cycle for DOE testing purposes would

not provide test results that represent the average use cycle or period of use on such a clothes washer.

To clarify the intent of this element of the Normal cycle definition, this final rule refers to the cycle recommended by the manufacturer for “normal, regular, or typical use,” rather than “most common consumer cycle.” DOE believes this revised wording will eliminate the possible interpretation that determining the Normal cycle requires knowing the cycle most commonly used by consumers during actual use. This wording is consistent with the intent of the current test procedure 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, as required by EPCA. In addition, the final rule clarifies that the manufacturer recommendation is determined by considering manufacturer instructions, control panel labeling, and other markings on the clothes washer.

In summary, this final rule revises Element #1 of the Normal cycle definition as, “…the cycle recommended by the manufacturer (considering manufacturer instructions, control panel labeling, and other markings on the clothes washer) for normal, regular, or typical use…”

c. Element #2: Full Load

AHAM opposes DOE's proposal to specify that the Normal cycle is to wash a "full load," stating that the average load has the highest load usage factor in the test procedure based on consumer use data. (AHAM, No. 4 at p. 10)

ALS questions why the Normal cycle only refers to "washing a full load." ALS notes that the test procedure specifies minimum, average, and maximum load sizes, and the load usage factors favor the average load size. ALS also commented that "full load" is a new term not defined, which ALS believes adds confusion. (ALS, No. 5 at p. 8)

DOE's intent in its proposal was to specify that the cycle used for testing must not be a cycle for which the recommended maximum load size is less than a full load. DOE has observed multiple clothes washer models that provide maximum load size recommendations for each available cycle on the machine. Because the DOE test procedure approximates consumer usage habits by requiring minimum, average, and maximum load sizes, the cycle used for DOE testing purposes must not be a cycle for which the recommended load size is less than a full load, which the DOE maximum load size is designed to represent. The proposed phrasing was intended to prevent a manufacturer from certifying its product using a cycle that is only recommended for partial loads, and would thus use less water and energy than a cycle intended for washing up to a full load of clothing. Using such a cycle for DOE testing purposes would not provide test results that represent the average use cycle or period of use on such a clothes washer.

To clarify the intent of this element of the Normal cycle definition, this final rule changes the wording of this element from "…for washing a full load…" to "…for washing up to a full load…" DOE believes that this revised wording will address the concerns raised by interested parties by clarifying that the chosen cycle is intended for all load sizes, up to and including the maximum load size.

DOE considered ALS' suggestion to provide a definition for "full load." DOE believes, after due consideration, that quantifying the definition of "full load" could cause ambiguity or create an avenue for circumvention, because manufacturers' maximum design loads may not correspond exactly with the maximum load sizes defined in the DOE test procedure. DOE believes that the term "full load" is widely understood by the industry and consumers to mean a load size that takes advantage of the whole usable capacity of the clothes washer.

In summary, this final rule revises Element #2 of the Normal cycle definition as, ". . . for washing up to a full load. . . ."

d. Element #3: Normally to Heavily Soiled

AHAM opposes DOE's proposal to change "normally soiled" to "normally to heavily soiled" because this change will introduce ambiguity, and thus variation, into the test procedure. AHAM added that if DOE proceeds with adding the new definition of Normal cycle, it should strike "or heavily soiled" from the definition. (AHAM, No. 4 at p. 9)

ALS commented that the phrase "normally to heavily soiled cotton clothing" presents issues because of the many special cycles available on today's clothes washers, such as "Sturdy," "Jeans," or "Heavy Duty," which may also be cited in user instructions as cycles to be used for "normally to heavily-soiled" garments. (ALS, No. 5 at p. 8)

DOE's intent in its proposal was to specify a range of soil levels in order to distinguish which cycle should be selected in cases with overlapping ranges of recommended soil levels for

different cycles. This phrasing was also intended to provide clarity in cases where the manufacturer's recommended soil levels do not include an indication for "normally soiled" clothing. For example, a manufacturer may only provide options for "light" and "heavy" soil levels.

DOE notes that the phrase "normally soiled" is not currently referenced in either appendix J1 or appendix J2; however, based on stakeholder comments submitted for this rulemaking and throughout the historical record of clothes washer test procedure rulemakings, DOE believes there is widespread acknowledgement among the industry that the DOE test procedure is intended for measuring the cycle recommended for washing "normally soiled" clothing. By inference, the phrase "normally" is indicative of average or typical conditions. DOE believes that this is consistent with the historical intent of the DOE clothes washer test procedure.

Upon further examination of clothes washer product manuals, DOE acknowledges that the phrase "normally to heavily soiled" could, in some cases, expand the scope of wash cycles that would be considered part of the DOE test cycle. Thus, applying the criteria "normally to heavily soiled" could result in a change in cycle selections on some models, which would consequently change the measured efficiency.

In consideration of concerns expressed by interested parties, and after further additional research as described above, this final rule revises the wording of Element #3 of the Normal

cycle definition to reference “normally soiled” clothing rather than “normally to heavily soiled” clothing.

e. Element #4: Cotton Clothing

AHAM opposes DOE's proposal to change the wording from “cottons and linens” to simply “cotton.” AHAM believes that this change could impact the cycle selected because of the removal of the word “linen.” (AHAM, No. 4 at p. 9)

DOE’s intent in its proposal was to narrow the range of possible cycles that could be considered for testing by eliminating reference to “linen clothing” and instead refer only to “cotton clothing.” DOE notes that the current energy test cycle definition refers to the cycle recommended for washing cotton and linen clothing (emphasis added). DOE has observed numerous clothes washer user manuals that contain cycles recommended for washing “linens” or “household linens,” terms that refer to items such as bed sheets, pillowcases, towels, tablecloths, etc. Such items are distinctly different from linen clothing and are not intended for consideration by the DOE test procedure.

DOE is not aware of any clothes washer models for which the phrase “cotton clothing” would result in a different cycle selection for DOE testing than would be selected under the current phrase “cotton or linen clothing” (emphasis added). A different cycle selection would only occur if the cycle used for DOE testing purposes was a cycle intended for linen clothing, but not cotton clothing.

For these reasons, this final rule implements the proposed wording of Element #4 of the Normal cycle definition to refer to “cotton clothing.”

f. Element #5: If Multiple Cycles Meet This Description

ALS objects to the proposed new requirement to test other cycles that "meet this description (of Normal cycle),” stating that there are a variety of other cycle names that meet the proposed new definition. ALS also noted that the new wording of the Normal cycle differs from the existing Part B of the energy test cycle definition, which essentially includes testing the TUFs that are available on the washer, but not available on the cycle selection described in Part A of the definition (so that one might need to test an additional TUF found in another cycle, but not have to test that whole cycle and use it in place of the other). (ALS, No. 5 at p. 8)

ALS further commented that the following sentence should not be used in the definition: “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.” (ALS, No. 5 at p. 8) ALS stated that it could be irreparably harmed by the proposed definition of Normal cycle because there are other cycles that could be tested under this proposal that would have lower IMEF or MEF values, and which would not comply with the 2015 minimum standard. ALS added that its large investment in development of products for the 2015 minimum standards could be stranded, and ALS could incur significant sales and income losses due to lost sales of RCWs in the U.S. (ALS, No. 5 at p. 8)

In its proposal, DOE intended to provide a final criterion that would be used to determine the DOE test cycle in cases where multiple cycles meet all the other criteria provided in the Normal cycle definition. For example, DOE has observed that on some clothes washers, the cycle names and descriptions correspond to the color of clothing rather than to the soil level or fabric type (for example, “Colors” and “Whites”, or “Darks” and “Brights”). On such a clothes washer, both cycles could be recommended for washing normally soiled cotton clothing. Therefore, to provide clarity and certainty, a final criterion is needed to determine which of the two or more cycles must be selected as the DOE test cycle.

DOE did not intend in its proposal to include the consideration of all the cycles on a clothes washer that may be recommended for washing cotton clothing. DOE acknowledges that many clothes washers contain alternate cycles intended for washing cotton clothing that would result in a lower MEF or IMEF value compared to the cycle considered as the energy test cycle under the current test procedure. Rather, the intent of the proposal was to include for consideration only those cycles that satisfy every individual element (i.e. Elements #1 through 4 as described above) of the proposed Normal cycle definition.

In consideration of concerns expressed by interested parties, and to provide further clarity regarding the intent of this final criterion, this final rule revises the wording of Element #5 of the Normal cycle definition as follows: “For machines where multiple cycle settings are recommended by the manufacturer for normal, regular, or typical use for washing up to a full load of normally-soiled cotton clothing, then the Normal cycle is the cycle selection that results in the lowest IMEF or MEF value.” Based on its survey of clothes washers on the market, DOE

expects that for the large majority of clothes washer models, the cycle selection required under this element of the Normal cycle definition will be the same as the cycle selection used for certification under the current energy test cycle definition.

Finally, DOE notes that determination of the "Normal cycle" under this new definition corresponds to Part A of the current energy test cycle definition. Part B of the current energy test cycle definition, which involves individual wash/rinse temperatures not available in the Normal cycle, is executed through the new flowchart diagrams, which provide explicit instructions for testing additional wash/rinse temperatures available on other cycles.

g. Summary

In summary, this final rule incorporates the following revised wording for the Normal cycle in newly renumbered section 1.25 of appendix J2: "Normal cycle means the cycle recommended by the manufacturer (considering manufacturer instructions, control panel labeling, and other markings on the clothes washer) for normal, regular, or typical use for washing up to a full load of normally-soiled cotton clothing. For machines where multiple cycle settings are recommended by the manufacturer for normal, regular, or typical use for washing up to a full load of normally-soiled cotton clothing, then the Normal cycle is the cycle selection that results in the lowest IMEF or MEF value." DOE believes that this revised definition reduces any potential ambiguity associated with selecting the cycle for testing that best fulfills the intent of DOE's test procedure.

DOE also notes that this definition is similar in nature to the Normal cycle definition for dishwashers, which is defined as "the cycle type, including washing and drying temperature options, recommended in the manufacturer's instructions for daily, regular, or typical use to completely wash a full load of normally soiled dishes." (10 CFR part 430, Subpart B, Appendix C1, section 1.12).

This final definition of Normal cycle narrows the scope of potential cycles that could be considered for selection under the current definition of energy test cycle in appendix J2. By clarifying and narrowing the scope of allowable cycle selections, DOE understands that for a very small number of individual models, the revised Normal cycle definition may exclude a cycle selection that is permitted under the apparently ambiguous current definition of the energy test cycle. In these rare cases, the current regulations would permit more than one cycle to be considered the energy test cycle, rendering the test procedure unreproducible. Furthermore, the cycle selected as the energy test cycle will only change on such models if the manufacturer previously chose to test a different cycle than the one that is required as a result of the revised Normal cycle definition. Based on its survey of the market, DOE expects that for the large majority of clothes washer models, the cycle selection required under the revised Normal cycle definition will be the same as the cycle selection used for certification under the current energy test cycle definition. For the small segment of clothes washer models with more than one cycle that could be selected as the energy test cycle under the current definition, only a subset of models will be impacted by the narrowing of the definition of the Normal cycle. In addition, because any cycle that could previously be selected as the energy test cycle under the current definition would be a cycle designed for washing cotton or linen clothes, DOE expects that any

such alternate cycle previously selected would have energy and water consumption patterns very similar to the cycle required by the revised Normal cycle definition. Therefore, DOE concludes that the revised Normal cycle definition will not impact measured efficiency.

6. Determining the Energy Test Cycle with New Flowcharts

In conjunction with the simplified energy test cycle definition and new Normal cycle definition, DOE proposed in the April 2014 NOPR a new approach to determining the wash/rinse temperature selections required for testing in appendix J2. 79 FR 32061, 23066. DOE proposed to translate the current methodology for determining the energy test cycle into a set of flowcharts that would be used to determine each wash/rinse temperature selection for testing. In its proposal, DOE stated that the binary nature of each decision box within the flowcharts would provide increased clarity and ease in determining which wash/rinse temperature settings to use for testing. DOE proposed to include these flowcharts within newly renumbered section 2.12 in appendix J2. Id.

As described in its proposal, DOE intended 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 requested 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 requested that interested parties provide specific examples of cycle setting configurations that would lead to the discrepancies. DOE also requested 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. 79 FR 23066.

Because the proposed flowcharts would incorporate more precise definitions of warm and cold rinse temperatures, DOE also proposed 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. Id. The phrase, "as indicated to the user on the clothes washer control panel" 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. Id.

Finally, DOE proposed 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, renamed as Energy consumption for the purpose of determining the cycle selection(s) to be included in the energy test cycle. 79 FR 23066.

AHAM stated that it appreciates DOE's attempt to clarify the test procedure and does not oppose the proposed set of flowcharts that testers would use to determine each wash/rinse temperature selection to be used for testing. AHAM added that as manufacturers begin to use the

new flowcharts, they may discover ambiguities or discrepancies, in which case they or AHAM will seek clarification. (AHAM, No. 4 at p. 10)

However, as described in the previous section, AHAM opposes DOE's proposed definition for Normal cycle, and thus proposes that DOE revise the flowcharts to be consistent with the existing energy test cycle section and terminology, and not include a definition for, or reference to, the Normal cycle. (AHAM, No. 4 at p. 10)

ALS suggested that the reference to "Normal cycle" in the flow charts be removed and replaced with the "cycle selection recommended by the manufacturer for washing cotton or linens". (ALS, No. 5 at p. 7) ALS supports DOE's proposal to clarify the cold rinse definition by adding the text, "as indicated to the user on the clothes washer control panel." (ALS, No. 5 at p. 6)

As described in the previous section, this final rule incorporates a revised definition of "Normal cycle" that DOE believes provides improved clarity over the version presented in the April 2014 NOPR and addresses many of the concerns raised by interested parties. In addition, this final rule maintains the reference to the Normal cycle in the flowchart diagrams to reduce the complexity of wording throughout the flowchart boxes, as described earlier.

DOE received no comments objecting to its proposal to include a set of flowcharts that would be used to determine each wash/rinse temperature selection to be used for testing.

Therefore, this final rule amends appendix J2 to include these flowcharts in newly renumbered section 2.12, with additional revisions as follows.

In the April 2014 NOPR, DOE proposed Figure 2.12.2 in appendix J2 to show the flowchart for determining Hot Wash/Cold Rinse. 79 FR 23061, 23087. Since publishing the April 2014 NOPR, DOE has determined that the wording of the proposed flowchart for determining Hot Wash/Cold Rinse would result in a change in cycle selection for clothes washers offering only two wash temperature selections (e.g., Cold and Hot), where both temperature selections are available in the Normal cycle. Under the current appendix J2 test procedure, both settings would be tested using the Normal cycle, pursuant to part (A) of the energy test cycle definition in section 1.13. Since such a clothes washer only offers two wash temperature selections, only the Cold and Hot TUFs apply, and both would be fulfilled under part (A) of the energy test cycle definition. Therefore, no testing would need to be performed on any alternate cycles under part (B) of the definition. However, the proposed flowchart for Hot Wash/Cold Rinse would have required evaluating the Hot setting on all cycles available on the clothes washer and choosing the one with the highest energy consumption. The path through the April 2014 proposed flowchart would have been as follows:

1. Does the Normal cycle contain more than two available wash temperature selections with a cold rinse? Answer: No

2. Does the clothes washer offer more than one available wash temperature selection with a cold rinse, among all cycle selections available on the clothes washer, with a wash temperature less than or equal to 135°F? Answer: Yes

3. Result: Hot Wash/Cold Rinse is the temperature setting with a cold rinse that provides the hottest wash temperature less than or equal to 135°F among all cycle selections available on the clothes washer. 79 FR 23087.

This final rule revises the Hot Wash/Cold Rinse flow chart so that the evaluation of the flowchart would result in testing both the Cold and Hot temperature selections using the Normal cycle on such a clothes washer.

This final rule also revises the wording of the Cold Wash/Cold Rinse flowchart to clarify the procedure for clothes washers with multiple wash temperature selections in the Normal cycle that do not use any hot water for any of the water fill levels or test load sizes required for testing. In the April 2014 NOPR proposed flowchart, DOE used the wording "If multiple cold wash temperature selections in the Normal cycle do not use any hot water…" (emphasis added). 79 FR 23086. By using the phrase "cold wash temperature selections," DOE believes it may have unintentionally implied that the word "cold" must be included in the control panel label in order for a cold-water-only wash temperature selection to be considered for inclusion as the Cold Wash/Cold Rinse. Manufacturers may use a variety of descriptive terms to label their cold-water-only temperature selections (*e.g.*, "Ecowash", "Energy Saver", etc.), which may not include the word "cold." DOE's intent is that any cold-water-only wash temperature selection in the Normal cycle must be considered for inclusion as the Cold Wash/Cold Rinse temperature selection, regardless of its control panel label. Therefore, this final rule removes the word "cold" from this phrase in the flowchart so that its reads as follows: "If multiple wash temperature selections in the Normal cycle do not use any hot water…" (emphasis added).

Furthermore, for clothes washers with multiple cold-water-only wash temperature selections, Cold Wash/Cold Rinse is the cold wash temperature selection, paired with a cold rinse, with the highest energy consumption, as measured according to section 3.10 of appendix J2, and the other cold wash temperature selections are excluded from testing. This final rule clarifies in the Cold Wash/Cold Rinse flowchart that any such cold-water-only cycles that are excluded from testing as the Cold Wash/Cold Rinse are also excluded from consideration as the Hot Wash/Cold Rinse and Warm Wash/Cold Rinse.

DOE did not receive any comments objecting to its proposal to clarify the definition of cold rinse or 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, to rename that section "Energy consumption for the purpose of determining the cycle selection(s) to be included in the energy test cycle," and to revise the text of newly created section 3.10 to reflect the new method for determining the appropriate energy test cycle selection(s) using the flowcharts in newly renumbered section 2.12. Therefore, this final rule adopts these changes as proposed.

Finally, this final rule also modifies the wording in the flowchart boxes to make use of bullet points rather than complex sentences with multiple commas and semicolons. DOE believes that the use of bullet points provides improved clarity for interpreting each flowchart box.

H. Wash Time Setting

DOE proposed in the April 2014 NOPR to move the wash time setting provisions from section 2.10 of appendix J2 to a new section 3.2.5, which DOE believes is a more appropriate location in the amended test procedure since the wash time must be set prior to each individual wash cycle during testing. 79 FR 23067.

ALS supports DOE's proposal to relocate the provisions for wash time setting from section 2.10 to new section 3.2.5, so that the provisions are located in a more logical location corresponding to the sequence in which they would be performed during testing. (ALS, No. 5 at p. 9)

DOE received no comments objecting to its proposal to move the wash time setting provisions from section 2.10 of appendix J2 to newly revised section 3.2.5. Therefore, for the reasons described above, this final rule implements this change.

This final rule also implements a clarification to the procedure for setting the wash time on clothes washers for which the wash time is not prescribed by the wash cycle that is being tested. In such circumstances, the test procedure specifies setting the wash time at 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. DOE has become aware that in some cases, the allowable selection of wash times on such clothes washers may not be completely continuous, such that one dial position may provide a wash time just under 70 percent of the

maximum, while the next dial position may provide a wash time just over 70 percent of the maximum. This final rule clarifies that if 70 percent of the maximum wash time is not available on a dial with a discreet number of wash time settings, the next-highest setting greater than 70 percent must be chosen. This clarification applies to section 2.10 of appendix J1 and newly renumbered section 3.2.5 of appendix J2. DOE's experience with third-party laboratory testing suggests that this approach is already commonly used among the industry.

I. Standby and Off Mode Testing

In the April 2014 NOPR, DOE proposed clarifications to the standby and off-mode power testing provisions in appendix J2. 79 FR 23067. In addition to minor wording clarifications in sections 3.9 and 3.9.1 of appendix J2, the proposed clarifications were as follows:

1. Testing Sequence

DOE proposed clarifying that combined low-power mode testing in section 3.9 of appendix J2 should be performed after completing 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, because such testing may not yield a value representative of the standby or off-mode power consumption after a clothes washer's first active mode wash cycle and all subsequent wash cycles. 79 FR 23067. 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, since the period of time after the clothes washer has been installed, but before its first active mode wash cycle, is likely to be short.

AHAM and ALS support DOE's proposal to clarify how low-power mode testing in appendix J2 should be performed. (AHAM, No. 4 at p. 10; ALS, No. 5 at p. 9) AHAM agrees that this proposal would seem to be consistent with how consumers will use a clothes washer. AHAM added, however, that it could not fully evaluate DOE's proposal without reviewing test data. (AHAM, No. 4 at p. 11)

DOE received no comments objecting to its proposal that combined low-power mode testing in appendix J2 be performed after completing 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. Therefore, for the reasons stated above, this final rule incorporates this amendment in newly designated section 3.9.1 of appendix J2.

2. Door Position

In response to the April 2014 NOPR, AHAM sought clarification on whether the combined low-power mode testing is to be conducted with the clothes washer door open or closed. (AHAM, No. 4 at p. 11, 12) AHAM believes it is clear, based on the nature of the test procedure sequence, that the door would be opened and closed before the low-power mode

portion of the test is performed. AHAM requested that DOE expressly state in the test procedure, or issue guidance, that the low-power mode portion of the test is to be conducted with the door closed. AHAM believes this is consistent with current practice. (AHAM, No. 4 at p. 11, 12) AHAM added that it is not aware of any consumer use data indicating that consumers leave the door open for an extended period of time after running the active mode cycle.

DOE confirms that the intent of its test procedure is to perform the low-power mode portion with the door closed. DOE also confirms through its experience with third-party test laboratories that performing the low-power mode portion with the door closed is consistent with current practice. This final rule adds this clarification to newly designated section 3.9.1 of appendix J2.

3. Default Settings

In the April 2014 NOPR, DOE proposed clarifying that combined low-power mode testing should be performed without changing the control panel settings used for the energy test cycle completed prior to combined low-power mode testing. 79 FR 23067. In its proposal, DOE noted that the test procedure currently requires using the manufacturer default settings for any wash cycle performed within the energy test cycle. The proposed clarification would preclude parties conducting low-power mode testing from 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. DOE stated that 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. 79 FR 23067.

AHAM and ALS support DOE's proposal to require performing combined low-power mode testing without changing the control panel settings used for the energy test cycle completed prior to combined low-power mode testing. (AHAM, No. 4 at p.11; ALS, No.5 at p. 9) AHAM agreed that consumers are not likely to change their control panel settings after the active mode ends. (AHAM, No. 4 at p. 11)

DOE received no comments objecting to its proposal to require performing combined low-power mode testing without changing the control panel settings used for the energy test cycle completed prior to combined low-power mode testing. Therefore, for the reasons stated above, this final rule incorporates this amendment in newly designated section 3.9.1 of appendix J2.

4. Network Mode

EPCA, as amended by the Energy Independence and Security Act of 2007, Public Law 110–140 (Dec. 19, 2007), requires test procedures to include provisions for measuring standby and off mode energy consumption, taking into consideration the most current versions of the International Electrotechnical Commission (IEC) Standards 62301 and 62087.[17,18] The most current version of IEC Standard 62301 is Edition 2.0, issued in 2011 ("IEC 62301). In addition to defining off mode and standby mode, IEC 62301 also defines "network mode" as any product mode "where the energy-using product is connected to a mains power source and at least one

[17] IEC standards are available online at www.iec.ch.
[18] IEC Standard 62087 addresses the methods of measuring the power consumption of audio, video, and related equipment and is not relevant to clothes washers.

network function is activated (such as reactivation via network command or network integrity communication), but where the primary function is not active." (See section 3.7 of IEC 62301).

DOE considered network mode as part of the March 2012 final rule. In the final rule, DOE explained that it was unaware of any clothes washers on the market with network mode capabilities at that time. Consequently, DOE could not thoroughly evaluate any network mode provisions, as would be required to justify incorporating network mode into DOE's test procedures at that time. DOE noted that although an individual appliance may consume some small amount of power in network mode, the potential exists for energy-related benefits that more than offset this additional power consumption if the appliance can be controlled by the "smart grid" to consume power during non-peak periods (often referred to as "demand-response" capabilities). The March 2012 final rule did not incorporate network mode provisions due to the lack of available data that would be required to justify their inclusion. 77 FR 13888, 13899-900.

In response to the April 2014 NOPR, the CA IOUs recommended that DOE incorporate a definition, test procedure, and reporting requirements for network mode. (CA IOUs, No. 3 at p. 1) The CA IOUs urged DOE to adopt the technical definition of network mode, and the test procedure for measuring the energy consumption of network mode, as prescribed by the IEC Standard 62301 Final Draft International Standard (FDIS).[19] (CA IOUs, No. 3 at p. 2) The CA IOUs stated that if it is not possible for DOE to incorporate the network mode definition and associated test procedure in this rulemaking, that EPA should incorporate it into the future ENERGY STAR test method for clothes washers with connectivity. (CA IOUs, No. 3 at p. 2)

[19] IEC 62301 version FDIS was developed and issued in 2010 prior to the issuance of the Second Edition.

The CA IOUs also proposed that DOE develop definitions for connectivity in demand response transactions. (CA IOUs, No. 3 at p. 4, 5) The CA IOUs recommended that DOE develop a test method for demand response functionality to rate and measure the load reduction potential in terms of peak demand reduction, and potential energy-cost reduction for reporting purposes. (CA IOUs, No. 3 at p. 4, 5)

The CA IOUs also presented information on five clothes washer models from three manufacturers that offer various network mode features in both top-loading and front-loading products. (CA IOUs, No. 3 at p. 2) The CA IOUs referenced comments from the previous clothes washer test procedure rulemaking by the Appliance Standards Awareness Project (ASAP), Natural Resource Defense Council (NRDC), and American Council for an Energy Efficient Economy (ACEEE)[20] suggesting that Network Mode could consume power continuously in the range of 2-5 watts, translating to an additional 18 to 44 kWh annually. The CA IOUs encouraged DOE to develop a test method to rate the energy consumed by network mode, and incorporate it into the product's performance rating. (CA IOUs, No. 3 at p. 3)

DOE surveyed the market and confirms that multiple clothes washer models available on the market offer wireless network connectivity to enable features such as remote monitoring and control via smartphone, as well as limited demand response features available through partnerships with a small number of local electric utilities. As suggested by the CA IOUs, the addition of network mode into the DOE test procedure may result in additional measured energy

[20] ACEEE, NRDC, ASAP. Comment Letter for Test Procedure for Residential Clothes Washers (December 2010): http://www.appliance-standards.org/sites/default/files/Comments%20on%20the%20Clothes%20Washers%20Test%20Procedures%20NOPR-%20December%206,%202010_0.pdf

consumption that, when incorporated into the overall IMEF metric, would change the measured efficiency of the product. Because this final rule provides only clarifying edits, which would not alter the measured efficiency of a clothes washer, DOE defers further consideration of network mode and demand-response test methods for a future test procedure rulemaking.[21]

5. Clarified Procedure for Performing Inactive and Off Mode Power Measurements

Section 1.28 of appendix J2 defines ”standby mode” as any mode in which the product 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 period of time: (1) a function that facilitates the activation of other modes (including activation or deactivation of active mode) by remote switch (including remote control), internal sensor, or timer; or (2) continuous functions, including information or status displays (including clocks) or sensor-based functions. The definition also clarifies that 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.

Section 1.15 of appendix J2 defines “inactive mode” as a 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.

Section 1.24 of appendix J2 defines ”off mode” as a mode in which the clothes washer is connected to a mains power source and is not providing any active mode or standby function,

[21] Information on ENERGY STAR test methods for clothes washers is available at https://www.energystar.gov/certified-products/detail/453/partners?fuseaction=products_for_partners.showClothesWashRes.

and where the mode may persist for an indefinite period of time. The definition further states that an indicator that only shows the user that the product is in the off position is included within the classification of an off mode.

Section 3.9 of the current appendix J2 provides the instructions for measuring "combined low-power mode" power, which is defined in section 1.8 of appendix J2 as the aggregate of available modes other than active washing mode, including inactive mode, off mode, delay start mode, and cycle finished mode. Specifically, section 3.9 requires the measurement of average inactive mode and/or average off mode power, which in combination provide a representative measure of the average power consumption in all possible low-power modes on the clothes washer. Section 3.9.1 instructs the testing party to measure average inactive mode power, if the clothes washer has an inactive mode. Similarly, section 3.9.2 instructs the testing party to measure average off mode power, if the clothes washer has an off mode. These sections thus require the testing party to determine whether the clothes washer has an inactive mode, an off mode, or both.

Section 4.4 of appendix J2 provides the calculation of per-cycle low-power mode energy consumption based on the measurements performed under section 3.9. If a clothes washer has either inactive mode or off mode (but not both), the measured average power is multiplied by 8,465, representing the combined annual hours for inactive mode and off mode. If a clothes washer has both inactive mode and off mode, each of the two average power measurements are multiplied by one-half of 8,465 (i.e. 4,232.5), and the results are summed. This represents an estimate that such a clothes washer would spend half of its low-power mode hours in inactive

mode, and the other half of its low-power mode hours in off mode. The calculations performed in section 4.4, therefore, also depend on the testing party's determination in section 3.9 as to whether the clothes washer has an inactive mode, an off mode, or both.

After publishing appendix J2, DOE received questions from interested parties regarding how to distinguish between inactive mode and off mode. On October 7, 2014, and December 8, 2014, DOE issued draft guidance clarifying the difference between inactive mode and off mode for clothes washers, clothes dryers, and dishwashers with various types of on/off switches and control panels.[22,23]

For a clothes washer with a "hard" on/off switch or electromechanical dial that physically breaks the connection to the mains power supply, DOE stated in the draft guidance document that it considers the clothes washer to be in off mode when the switch or dial is in the "off" position, as long as no standby mode or active mode functions are provided. Pursuant to the definition of off mode, an indicator light that illuminates to indicate that the switch or dial is in the off position is not considered a standby mode or active mode function. DOE considers the clothes washer to be in off mode when such an indicator is active in the absence of other standby mode functions.

[22] DOE's draft guidance for clothes washers, clothes dryers, and dishwashers with a "hard" on/off switch or electromechanical dial that physically breaks the connection to the mains power supply is available at DOE's Guidance and Frequently Asked Questions website: http://www1.eere.energy.gov/buildings/appliance_standards/pdfs/homeappliancemechonoffswitch-faq-2014-10-7.pdf. Comments submitted by interested parties can be viewed in the docket located at http://www.regulations.gov/#!docketDetail;D=EERE-2014-BT-GUID-0046.

[23] DOE's draft guidance for clothes washers, clothes dryers, and dishwashers with an electronic or "soft" on/off switch that does not physically break the connection to the mains power supply is available at http://www1.eere.energy.gov/buildings/appliance_standards/pdfs/aham_offmode_faq_2014-12-2.pdf. Comments submitted by interested parties can be viewed in the docket located at http://www.regulations.gov/#!docketDetail;D=EERE-2014-BT-GUID-0056.

For a clothes washer with an electronic, or "soft," on/off button or switch that does not physically break the connection to the mains power supply, DOE stated in the draft guidance document that it considers the clothes washer to be in standby mode when the button or switch is indicated as being in the "off" position. DOE also stated in the draft guidance that it considers the internal control panel component that detects the press of the electronic power button to be an internal sensor that facilitates the activation or deactivation of other modes (including active mode); therefore, the product would be in standby mode when the electronic button or switch is indicated as being in the "off" position. Because of its capability to detect the press of the electronic power button, this internal sensor differs from a hard on/off switch, which does not provide any such sensing capabilities but may include an indicator to show that the product is in off mode. Off mode as defined in appendix J2 would not apply to a product with an electronic power button, unless the clothes washer also has a hard on/off switch or dial that physically breaks the connection to the mains power supply and the clothes washer does not activate any standby mode or active mode features when the hard on/off switch is in the "off" position.

AHAM agreed with DOE's draft guidance that clothes washers with a hard on/off switch or electromechanical dial that physically breaks the connection to the mains power supply are considered to be in off mode when the switch or dial is in the "off" position. (AHAM, No. 2 to Docket EERE-2014-BT-GUID-0046, p.1). AHAM also agreed with DOE's draft guidance that clothes washers with an electronic or soft on/off switch that does not physically break the connection to the mains power supply are considered to be in standby mode when the switch or dial is in the "off" position. (AHAM, No. 4 to Docket EERE-2014-BT-GUID-0046, p.1).

Intertek Electrical ("Intertek") commented that the "off" state on some appliances is achieved through a software/firmware action rather than a hard on/off switch, and that it is not clear whether the product is providing any active mode or standby function while in the "off" state. (Intertek, No. 3 to Docket EERE-2014-BT-GUID-0046, p.1).

UL Verification Services, Inc. ("UL") commented on the difficulty for an independent third-party laboratory to determine if the on/off button is a hard switch or a soft switch. (UL, No. 5 to Docket EERE-2014-BT-GUID-0046, p.1). UL stated that if the third-party laboratory is unable to obtain this information from the manufacturer, the next best option is to review the product's electrical schematic. According to UL, however, the schematic is located on most clothes washers somewhere inside the machine, such as behind the console. Id. UL questioned whether a third-party laboratory could remove the console during testing to determine if the switch is a hard switch or soft switch. Alternatively, if the machine must not be disassembled, UL questioned whether DOE could specify another method to determine the type of switch. Id. UL suggested, for example, that the power consumption of a hard switch should be essentially zero watts unless an "off" indicator is activated. UL questioned whether a minimum power consumption threshold could be used to determine if the machine is in standby mode or off mode. Id.

DOE's draft guidance documents clarify that it considers soft switches to be associated with standby mode and hard switches to be associated with off mode when in the "off" position. DOE agrees with UL, however, that distinguishing between a hard switch and soft switch may

not be possible without information from the manufacturer or access to the product's electrical schematic. Similarly, an independent third-party laboratory may find it difficult or impossible to determine whether a clothes washer provides any standby mode functions when the product appears, to the end user, to be in the "off" state.

To eliminate the need to distinguish between standby mode and off mode based on the position of a switch and internal functions of the clothes washer, or between hard switches and soft switches, this final rule clarifies the test provisions for measuring inactive mode[24] and off mode. Currently, section 3.9.1 and section 3.9.2 of appendix J2 provide separate symbol designations for the inactive mode and off mode power measurements: P_{ia} and P_o, respectively. If a clothes washer has either inactive mode or off mode (but not both), the average power consumption of the available mode is measured and labeled as either P_{ia} or P_o, accordingly. As described above, labeling the measurement as either P_{ia} or P_o requires a determination of the type of switch on the control panel and whether any standby functions are provided by the clothes washer when the switch is in the "off" position. Regardless of whether the average low-power measurement is designated as P_{ia} or P_o, however, section 4.4 of appendix J2 applies the total 8,465 annual hours to the measurement, as described above. If both inactive mode and off mode are available on the clothes washer, section 4.4 applies 4,232.5 hours to each of the two average power measurements.

In this final rule, DOE clarifies the testing methodology in section 3.9 of appendix J2 and the calculations in section 4.4 of appendix J2 by relabeling the symbols used for the combined low-power mode measurements. This final rule relabels these symbols P_{ia} and P_o as $P_{default}$ and

[24] Inactive mode is the only type of standby mode required to be measured in appendix J2.

P_{lowest}, respectively, and the assignment of each symbol to its respective measurement is based on observable and measureable characteristics of the clothes washer rather than the control panel switch type or internal functionality of the clothes washer. In addition, this final rule revises the wording of the testing instructions in section 3.9 of appendix J2 to clarify how the procedure corresponds to the sequence of events as they would be performed during testing. This revised procedure produces test results that yield the same measured energy as in section 3.9 of the current procedure for all clothes washer types currently on the market.

The revised wording splits the current text of section 3.9 in appendix J2 into two newly designated subsections, 3.9.1 and 3.9.2, to provide further clarity. As described previously in this notice, the newly designated section 3.9.1 includes the requirement to perform combined low-power mode testing: (1) after completion of an active mode wash cycle included as part of the energy test cycle; (2) after removing the test load; (3) without changing the control panel settings used for the active mode wash cycle; (4) with the door closed; and (5) 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.

Newly designated section 3.9.2 states that for a clothes washer that takes some time to automatically enter a stable inactive/off mode state from a higher power state, as discussed in Section 5, Paragraph 5.1, note 1 of IEC 62301, allow sufficient time for the clothes washer to automatically reach the default inactive/off mode state before proceeding with the test measurement. The revised wording replaces the term “lower power state” currently used in

section 3.9 of the test procedure with "default inactive/off mode state," which clarifies that the lower power state that the clothes washer reaches by default may be either an inactive mode or an off mode.

The amendments in this final rule move the procedural instructions for performing the power measurement, with revised labeling, into newly added section 3.9.3 of appendix J2. These instructions now state that once the stable inactive/off mode state has been reached, the default inactive/off mode power, $P_{default}$, in watts, is measured and recorded following the test procedure for the sampling method specified in Section 5, Paragraph 5.3.2 of IEC 62301.

For clothes washers with electronic controls that offer an optional switch, dial, or button that can be selected by the end user to achieve a lower-power state than the default inactive/off mode state,[25] including clothes washers with both an inactive mode and off mode as contemplated in the current test procedure, newly added section 3.9.4 of appendix J2 requires that, after performing the measurement in section 3.9.3, the switch, dial, or button be activated to the position resulting in the lowest power consumption and the measurement procedure described in section 3.9.3 be repeated. The average power consumption is measured and recorded as the lowest-power standby/off mode power, P_{lowest}, in watts.

Section 4.4 of appendix J2 applies annual hours to the average power measurement(s) performed in section 3.9 of appendix J2, consistent with the current test procedure. For those clothes washers with a single low-power mode average power consumption measurement (newly labeled as $P_{default}$), the calculation applies the total 8,465 annual hours to this measurement. For

[25] Such a feature could be labeled on the control panel as a "master power" or "vacation mode" feature, for example.

those clothes washers with two average power measurements (newly labeled as $P_{default}$ and P_{lowest}), section 4.4 applies 4,232.5 hours to each of the two measurements.

The revised section 3.9, including newly added sections 3.9.3 and 3.9.4, provides a clearer set of procedural instructions for performing the combined low-power mode measurements required in section 3.9 of the current test procedure. Under the revised section 3.9, the same sequence of measurements are performed as the current section 3.9, thus yielding the same combined low-power mode average power measurement(s) for clothes washers with standby mode, off mode, or both. Further, the same annual hours as are currently specified are applied to the average power measurement(s) in section 4.4 of appendix J2. Therefore, DOE has determined that these amendments to section 3.9 and section 4.4 of appendix J2 will not impact the measured efficiency of clothes washers.

6. Multiple Inactive Modes

In the April 2014 NOPR, DOE stated that some residential appliances, including clothes washers, could have multiple modes that meet the definition of inactive mode currently provided in section 1.15 of appendix J2 (redesignated as section 1.16). 79 FR 23067. DOE notes that it is currently unaware of any such clothes washers on the market, but believes that future clothes washers could be designed to have multiple inactive modes. DOE proposed 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. DOE stated that 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. 79 FR 23067.

AHAM stated that it does not oppose DOE's proposal to clarify the definition of inactive mode. (AHAM, No. 4 at p. 11) AHAM added, however, that it could not fully evaluate DOE's conclusion without viewing test data. Id.

ALS supports DOE's proposed clarifications to the standby and off-mode power testing regarding multiple possible inactive modes. (ALS, No. 5 at p. 9)

DOE's revisions in this final rule to the combined low-power mode measurement provisions, as described in the previous section, clarify the measurement procedure for clothes washers that have multiple inactive modes. Therefore, DOE has determined that amending the definition of inactive mode as proposed in the April 2014 NOPR is not warranted. This final rule makes no changes to the definition of inactive mode in appendix J2.

J. Fixed Water Fill Control Systems

Section 1.2 of appendix J1 defines adaptive water fill control system as "a clothes washer water fill control system which is capable of automatically adjusting the water fill level based on the size or weight of the clothes load placed in the clothes container, without allowing or requiring consumer intervention or actions."

Section 1.9 of appendix J1 defines manual water fill control system as "a clothes washer water fill control system which requires the consumer to determine or select the water fill level."

The water fill settings, load sizes, and load usage factors (LUFs) used for testing depend upon the type of water fill control system available on the clothes washer, as defined in Table 2.8 and Table 4.1.3 of both appendix J1 and appendix J2. For clothes washers with manual water fill control systems, the minimum and maximum load sizes are tested using the minimum and maximum water fill settings, respectively, and the assigned LUF weightings of 28 and 72 percent, respectively. For clothes washers with adaptive water fill control systems, the minimum, average, and maximum load sizes are tested using the water fill levels as determined by the clothes washer for each load size, and the assigned LUF weightings of 14, 74, and 12 percent, respectively.

As stated in the April 2014 NOPR, DOE is 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. 79 FR 23067. 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 proposed 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. Id.

In the April 2014 NOPR, DOE proposed amendments that 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, DOE proposed replacing instances of "adaptive water fill control system" throughout the test procedure 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. DOE proposed these amendments for both appendix J1 and appendix J2.

AHAM does not oppose DOE's proposal to add definitions for "fixed water fill control system" and "automatic water fill control system" and to amend the definition for "adaptive water fill control system." (AHAM, No. 4 at p. 12) AHAM also does not oppose DOE's proposal to clarify in both appendix J1 and appendix J2 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 system, i.e., using the minimum, average, and maximum load sizes. (AHAM, No. 4 at p. 12)

ALS supports DOE's proposed approach for addressing "fixed water fill control systems," although for appendix J2 only. ALS objects to DOE's proposed approach for addressing "fixed water fill control systems" in appendix J1, and noted that its existing CCW models containing a fixed water fill level were certified and tested based on testing only the minimum and maximum load sizes (corresponding to the procedure for manual water fill control systems), and not with minimum, average, and maximum load sizes. ALS stated that DOE's proposal would produce a minor change in MEF and WF. (ALS, No. 5 at p. 4)

DOE received no comments objecting to its proposal to add definitions for fixed water fill control system, automatic water fill control system, and to amend the definition of adaptive water fill control system in appendix J2.

To investigate the concerns raised by ALS regarding the proposed clarification to appendix J1, DOE conducted testing on two baseline top-loading CCWs featuring fixed water fill control systems. For each model, DOE used the same minimum and maximum load size data as the basis for comparison between the manual fill and adaptive fill results. The results are summarized in Table III-3. The results indicated that testing these models as adaptive fill machines (i.e., using minimum, average, and maximum load sizes) produces a slightly more favorable MEF rating, in the range of 0.01–0.02 MEF, compared to the results when tested as manual water fill machines (i.e., using only the minimum and maximum load sizes). However, testing these models as adaptive fill machines produces a less favorable WF rating, in the range of 0.2–0.3 WF, compared to the results when tested as manual water fill machines.

Table III-3.

	Tested as Manual Fill (Min, Max Load Sizes)		**Tested as Adaptive Fill (Min, Avg, Max Load Sizes)**		**Difference Between Adaptive and Manual Results**	
Unit No.	**MEF**	**WF**	**MEF**	**WF**	**MEF[a]**	**WF[b]**
Unit #1	1.65	7.7	1.66	8.0	+0.01	+0.3
Unit #2	1.67	8.1	1.69	8.3	+0.02	+0.2

a. A higher MEF rating is more favorable.
b. A higher WF rating is less favorable.

DOE first introduced water fill level distinctions in the original test procedure for clothes washers at appendix J to 10 CFR part 430 subpart B ("appendix J"), as proposed in the May 17, 1977 NOPR ("May 1977 NOPR") and codified in the September 28, 1977 final rule ("September

1977 final rule"). 42 FR 25329 and 42 FR 49802. In the May 1977 NOPR, DOE explained that field usage data provided by Procter and Gamble (P&G) indicated that maximum fill is selected 72 percent of the time and minimum fill is selected 28 percent of the time. 42 FR 25329, 25331. These data formed the basis for the "usage fill factors" codified in section 4.3 of appendix J in the September 1977 final rule. 42 FR 49802, 49809.

Appendix J included testing provisions only for manual fill control systems that required the user to determine or select the water fill level, which included all top-loading and front-loading clothes washers on the market at the time. Under section 2.8 of appendix J, top-loading clothes washers were tested without a test load. Front-loading clothes washers were tested with a 3-pound minimum load and 7-pound maximum load for the minimum and maximum water fill levels, respectively. 42 FR 49808.

During a meeting on February 16, 1995, hosted by AHAM for non-industry stakeholders, AHAM presented a test procedure proposal that provided information for the subsequent development of DOE's test procedure at appendix J1.[26] (AHAM, No. 25 to Docket EE-RM-94-230A, pp. 1–42). AHAM's proposal included provisions for testing clothes washers with adaptive water control systems, which had recently become available on the market. (Id., pp. 11–24). In its proposal, AHAM presented two sets of data from P&G: (1) data showing that consumers manually select the maximum water fill 72 percent of the time and the minimum water fill level 28 percent of the time on clothes washers with manual water fill controls, and (2) data showing the distribution of actual clothing load sizes washed by consumers, which roughly

[26] AHAM's presentation was originally submitted to Docket #EE-RM-94-230A as Comment #25. This presentation is available online at www.regulations.gov as part of Docket #EERE-2006-TP-0065, Comment #27: http://www.regulations.gov/#!documentDetail;D=EERE-2006-TP-0065-0027.

corresponded to a normal (Gaussian) distribution centered around an average load size of 5.7 to 6.7 pounds, depending on the size of the washer. Id. The results from these two data sets led AHAM to conclude that, for clothes washers with manual water fill controls, consumers overuse the maximum water fill level and that automatically controlling the water fill level based on clothing load size (i.e., by providing adaptive water fill controls) would produce energy savings. Id. at p. 20. AHAM also noted that an essential element of any adaptive control system is the removal of consumer judgment from some or all of the wash cycle selection process. Id. at p. 21.

For manual water fill clothes washers, AHAM recommended requiring the use of a fixed 3-pound minimum load size and a maximum load size that would vary with capacity, while maintaining the 28-percent and 72-percent LUFs, respectively. Id. at p. 24. For clothes washers with adaptive water fill controls, AHAM recommended requiring a third "average" load size, in addition to the minimum and maximum load sizes, and corresponding minimum, average, and maximum LUFs of 14, 74, and 12 percent, respectively.[27] These three load sizes and associated LUFs more closely approximated a normal (Gaussian) distribution of load sizes centered around the average load size, consistent with the P&G consumer usage data, and therefore, according to AHAM, provided a more accurate representation of the energy consumption of clothes washers with adaptive water fill controls. Id.

[27] AHAM also recommended including "above average" and "below average" load sizes for clothes washers that generate non-linear results between the minimum, average, and maximum load sizes. If these additional loads were required, the results of the "below average", "average", and "above average" load sizes would be averaged with equal weightings to represent a single "average" data point. (AHAM, No. 25 to Docket EE-RM-94-230A, pp. 21–23)

DOE incorporated these recommendations as part of a new DOE test procedure at appendix J1, established in a final rule on August 27, 1997.[28] 62 FR 45484, 45486–87. DOE maintained these load sizes, water fill levels, and LUFs in the new appendix J2 test procedure codified by the March 2012 final rule. 77 FR 13888, 13910–11.

As described above, the key distinction between manual water fill controls and adaptive water fill controls is whether consumer judgment is required to establish the water fill level. Any water fill control system that requires consumer judgment to manually select a water fill must be tested using the procedures in section 3.2.3.3 of appendix J2 for manual water fill control systems, in order to provide test results that are representative of consumer usage. Likewise, any water fill control system that does not require consumer judgment (i.e., does not allow or require the consumer to select the water fill level) must be tested using the procedures in section 3.2.3.2 of appendix J2 for adaptive water fill control systems, in order to provide test results that are representative of consumer usage. Clothes washers with "fixed water fill controls" do not allow or require the consumer to select a water fill level; therefore, clothes washers with "fixed water fill controls" must be tested using the procedures for adaptive water fill control systems (i.e., using the minimum, average, and maximum load sizes and the water fill levels as determined by the clothes washer), in order to provide test results that are representative of consumer usage.

For these reasons, this final rule maintains DOE's initial proposal to (1) add a definition for "fixed water fill control system," (2) add a definition for "automatic water fill control

[28] The August 27, 1997 final rule rejected the use of additional "below average" and "above average" test loads for clothes washers that generate non-linear results between the minimum, average, and maximum load sizes. DOE explained that the additional test burden associated with the extra load sizes is not warranted for the potential improvement in accuracy of the final test results. 62 FR 45483, 45487.

system," which includes both fixed water fill control systems and adaptive water fill control systems, (3) amend the definition of "adaptive water fill control system" to clarify that it is considered a type of automatic water fill control system, and (4) where appropriate, replace instances of "adaptive water fill control system" throughout the test procedure 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 apply to both appendix J1 and appendix J2.

The final rule provides a more technically precise description of "fixed water fill control system" than the definition proposed in the April 2014 NOPR. In the April 2014 NOPR, DOE proposed defining fixed water fill control system as "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." In this final rule, fixed water fill control system is defined as "a clothes washer automatic water fill control system that automatically terminates the fill when the water reaches an appropriate level in the clothes container." A fixed water fill system typically uses a single water pressure sensor, located at the bottom of the clothes container, which is calibrated to trigger at the water pressure corresponding to the manufacturer's pre-determined water fill height for the clothes washer. During the water fill portion of the wash cycle, when the height of the water in the clothes container reaches the pre-determined water fill level, the pressure sensor triggers and shuts off the incoming water supply. The revised definition more accurately reflects this mechanical design of a fixed water fill control system.

In addition, the phrase "water fill level" in the proposed April 2014 NOPR definition could create confusion depending on whether the testing party interprets this phrase to mean the physical height of the water in the clothes container, or the total volume of water in the clothes container. While the physical height of the water may be the same for all load sizes with a fixed water fill control system, the total volume of water changes slightly based on the load size because the clothing itself takes up space in the clothes container. Specifically, with a fixed water fill control system, a large clothing load will result in a slightly lower volume of water than a small clothing load, because the additional volume occupied by the larger clothing load offsets some of the total water volume. The revised definition in this final rule avoids this potential ambiguity.

Finally, DOE's proposed definition in the April 2014 NOPR described a fixed water fill control system in terms of what it does not do, (i.e., it does not adjust the water fill level based on the size or weight of the clothes load placed in the clothes container); whereas the revised definition describes what a fixed water fill system does, (i.e., it automatically terminates the fill when the water reaches an appropriate level in the clothes container).

The final rule also slightly amends the definition of "automatic water fill control system" proposed in the April 2014 NOPR to clarify more explicitly that the key criteria is the lack of user action allowed or required to determine the water fill level. In this final rule, "automatic water fill control system" is defined as "a clothes washer water fill control system that does not allow or require the user to determine or select the water fill level, and includes adaptive water fill control systems and fixed water fill control systems."

K. Maximum Water Fill Levels on Electronic Manual Water Fill Control Systems

DOE has become aware of clothes washers with electronic manual water fill control systems where the maximum water fill level setting that can be selected on some cycle settings required for testing as part of the energy test cycle is less than the maximum water fill level setting available on the clothes washer.

For clothes washers with manual water fill control systems, Section 3.2.3.3 of appendix J1 and appendix J2 (newly renumbered as section 3.2.6.1 in appendix J2) requires setting the water fill selector to the maximum water level available on the clothes washer (emphasis added) for the maximum test load size, which is based on the clothes washer capacity and defined in Table 5.1 of both appendix J1 and appendix J2. Neither test procedure addresses how to proceed with testing if the maximum water fill level setting available on the clothes washer cannot be selected for one or more of the wash cycles settings required for testing under this provision. Therefore, a manufacturer may need to submit a petition for waiver, pursuant to 10 CFR 430.27, to establish an acceptable test procedure that can accommodate testing of the maximum water fill level setting on such a clothes washer. As described in 10 CFR 430.27, the petition process includes opportunities for public comment in direct response to the waiver petition. As soon as practicable after the granting of any waiver, DOE must publish in the Federal Register a notice of proposed rulemaking to amend its regulations so as to eliminate any need for the continuation of such waiver. (10 CFR 430.27(l)) Any such NOPR would also offer an opportunity for interested parties to submit comments. This final rule does not contain any amendments regarding this potential issue.

L. 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. In the April 2014 NOPR, DOE proposed revising section 3.2.8 to include the entire active washing mode, and exclude any delay start or cycle finished modes, for each wash cycle tested. 79 FR 23061, 23067 (Apr. 25, 2014). 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. As described in the April 2014 NOPR, DOE believes that the proposed revision to 3.2.8 is clearer and more complete than the wording in the current 3.2.2 regarding the portions of the wash cycle to be included and measured for testing. Therefore, DOE proposed to delete section 3.2.2 from appendix J2 and to renumber the subsequent subsections accordingly. 79 FR 23067.

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 proposed to remove those two definitions from the section 1 of appendix J2. 79 FR 23067.

AHAM supports DOE's proposal to revise appendix J2 to include the entire active washing mode and exclude any delay start or cycle finished mode for each wash cycle tested. AHAM also supports DOE's proposal to remove the definitions for “deep rinse” and “spray rinse” from appendix J2. ALS also supports DOE’s proposal to remove the definition of “deep rinse cycle.”

DOE received no comments objecting to its proposal to revise section 3.2.8 of appendix J2 to include the entire active washing mode and exclude any delay start or cycle finished modes for each wash cycle tested, or to remove the definitions of deep rinse and spray rinse. Therefore, for the reasons stated above, this final rule incorporates these amendments in appendix J2.

M. 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. Under this definition, 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 noted in the April 2014 NOPR 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. 79 FR 23068. 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. 79 FR 23068. Since the warm wash temperature selection has the highest temperature use factor at 0.49, DOE proposed that the warm wash temperature selection(s) on such a clothes washer be tested. Therefore, DOE proposed 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. Id.

In the April 2014 NOPR, DOE requested comment on 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. 79 FR 23068. DOE estimated 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 observed constitutes the majority of the market. Id.

The CA IOUs support DOE's proposal to remove the testing provisions for clothes washers with uniformly distributed wash temperatures. (CA IOUs, No. 3 at p. 5)

DOE received no comments objecting to its proposal to remove the definition of uniformly distributed warm wash temperature selections from both appendix J1 and appendix J2,

and to remove the "shortcut" provisions within the test procedures pertaining to uniformly distributed warm wash temperature selections. Therefore, for the reasons stated above, this final rule incorporates these amendments into both appendix J1 and appendix J2.

N. 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. DOE understands that, in practice, measuring the wash water temperature can be difficult due to factors such as the geometry of front-loading clothes container design, the increasing use of door locks, and, in high-efficiency clothes washers, the lack of a standing pool of wash water in which to measure the temperature.

In the April 2014 NOPR, DOE proposed adding guidance to section 3.3 of both appendix J1 and appendix J2 on one possible method for determining whether the maximum wash water temperature exceeds 135 °F. In the proposed method, non-reversible temperature indicator labels would be adhered to the inside of the clothes container to determine the maximum water temperature during an energy test cycle. 79 FR 23068. If the temperature indicator label method was used 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. Id.

DOE acknowledges that 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 used by a third-party laboratory without requiring partial disassembly of the clothes washer or permanently altering the machine.

AHAM stated that it would need more information to evaluate DOE's proposal, including specifications for the labels that would be used to determine the maximum wash water temperature. Furthermore, AHAM suggested that DOE should not finalize its label approach until further study is done to demonstrate that the approach is repeatable and reproducible, and that the labels can be calibrated for accurate readings. Finally, AHAM stated that the temperature tolerance in the test procedure should correspond to the temperature tolerance in the measurement method. (AHAM, No. 4 at p. 12)

ALS stated that it is not aware of a source for waterproof, non-reversing temperature indicating labels that would remain adhered to the metal cylinder surface. Until more information is available regarding the source for such labels, their effectiveness, and their reliability, ALS does not support DOE’s proposed wash water temperature measurement approach. (ALS, No. 5 at p. 5)

To address concerns raised in these comments, DOE investigated a non-reversible temperature label that provides temperature indicators in 5-degree increments between 105 °F

and 120 °F and 10-degree increments between 120 °F and 160 °F. DOE is not aware of any temperature labels from any manufacturer offering a temperature indicator of 135 °F.

For this final rule, DOE tested both top-loading and front-loading clothes washers using the methodology proposed in the April 2014 NOPR. DOE provides the results of these tests in a separate test report accompanying this final rule, which is available in the regulations.gov docket for this rulemaking.[29] The test report provides specific details regarding the temperature indicator labels that DOE tested.

DOE observed the following during these additional tests:

- The labels used for testing remained waterproof in all cases.
- The labels used for testing remained intact and adhered to the wash drum throughout the entire wash cycle, in both top-loading and front-loading clothes washers.
- Multiple labels tested in a single wash cycle demonstrated consistent maximum temperature readings.
- On front-loading clothes washers, labels placed adjacent to the wash drum baffles experienced less wear compared to labels located midway between two baffles.

DOE also performed testing to confirm the accuracy of these temperature indicators. Section 2.5.3 of appendix J1 and section 2.5.4 of appendix J2 specify an allowable error no

[29] The docket for this rulemaking is available at http://www.regulations.gov/#!docketDetail;D=EERE-2013-BT-TP-0009. [30] Section 9.1 of IEC 60456 does not contain a note. DOE infers from the context of AHAM's comment that AHAM is referring to the note in section 8.2.5, which references section 9.1, and states that the reason for rejection of a test run from a test series should be explained in the test report.

greater than ±1 °F for a temperature measuring device over the range being measured. DOE's testing determined that the labels provide an average accuracy within ±1 °F for temperatures less than 120 °F, and an average accuracy within ±3 °F for temperatures 120 °F and greater. The calibrated temperatures recorded at the 140 °F indicator threshold ranged from 136.2 °F to 140.2 °F. Although the accuracy of the labels at 140 °F indicator threshold falls outside the range of ±1 °F, the pattern and range of activation temperatures observed by DOE suggests that activation of the 140 °F indicator on the label is sufficient to demonstrate that the maximum wash temperature exceeded 135 °F during the cycle under test.

DOE recognizes, however, that the 140 °F indicator may not activate at all wash temperatures greater than 135 °F and less than 140 °F. In such cases, other measurement techniques would still need to be used to identify an extra-hot wash temperature.

Based on these conclusions, this final rule amends section 3.3 of both appendix J1 and appendix J2 to allow (but not require) the use of a non-reversible temperature indicator label to confirm that an extra-hot wash temperature has been achieved during a wash cycle, provided that the label has been demonstrated to remain waterproof, intact, and adhered to the wash drum throughout an entire wash cycle; to provide consistent maximum temperature readings; and to provide repeatable temperature indications sufficient to demonstrate that a wash temperature of greater than 135 °F has been achieved. The amendments also clarify that the label must have been verified to consistently indicate temperature measurements with an accuracy of ±1 °F if the label provides a temperature indicator at 135 °F. If the label does not provide a temperature indicator at 135 °F, the label must have been verified to consistently indicate temperature

measurements with an accuracy of ±1 °F if the next highest temperature indicator is greater than 135 °F and less than 140 °F, or ±3 °F if the next highest temperature indicator is 140 °F or greater. If the label does not provide a temperature indicator at 135 °F, DOE notes that failure to activate the next-highest temperature indicator does not necessarily indicate the lack of an extra-hot wash temperature. However, such a result would not be considered a valid test due to the lack of verification of the water temperature requirement, in which case an alternative method must be used to confirm that an extra-hot wash temperature greater than 135 °F has been achieved during the wash cycle.

In addition, the amendments incorporate the proposed guidance regarding placement of a temperature label within the clothing drum, with minor wording changes for clarification, and to further clarify that the temperature labels for front-loaders should be located adjacent to one of the baffles in the clothing drum.

O. 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 DOE 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 stated in the April 2014 NOPR that it was 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 proposed 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.79 FR 23068.

AHAM supports DOE's proposal to remove the equations for calculating per-cycle hot water energy consumption using gas-heated or oil-heated water. (AHAM, No. 4 at p. 12)

ALS objects to DOE's proposal to remove the per-cycle gas hot water heating calculation from both appendix J1 and appendix J2, because this calculation is required by the Federal Trade Commission (FTC) under 16 CFR part 305, The Appliance Labeling Rule, for determining the "Estimated Yearly Cost for Gas Water Heating" on the clothes washer EnergyGuide label. (ALS, No. 5 at p. 5) ALS supports DOE's proposal to remove the calculation for per-cycle oil-heated hot water, because it is not used by either DOE or FTC. (ALS, No. 5 at p. 5)

DOE confirms that the FTC EnergyGuide label includes an estimated yearly cost for gas water heating, which is based on the calculation for determining per-cycle hot water energy consumption using gas-heated or oil-heater water in section 4.1.4 of both appendix J1 and appendix J2. Therefore, this final rule leaves intact this calculation in both appendix J1 and appendix J2, as well as the associated calculations in 10 CFR 430.23(j)(1)(i)(B) and (ii)(B). For clarification, DOE amends the title of section 4.1.4 to read, "Total per-cycle hot water energy consumption using gas-heated or oil-heated water, for product labeling requirements."

P. 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. In the April 2014 NOPR, DOE proposed amendments to provide this clarification in section 3.2 of appendix J1 and a new section 3.2.9 of appendix J2. 79 FR 23068.

AHAM supports DOE's attempt to clarify how out-of-balance loads should be addressed. (AHAM, No. 4 at p. 3) AHAM suggested that DOE add language to its proposal to indicate that if there is a visual or audio indicator that would alert the user about an out-of-balance load, the test should be stopped and the results discarded. (AHAM, No. 4 at p. 3) AHAM also suggested that to address possible circumvention concerns (e.g., that a product would be designed to terminate at any indication of out-of-balance condition), that DOE consider a similar approach used in IEC 60456, section 9.1 and the related note,[30] which limits the number of additional test runs and requires reporting the reason for the rejection of a test run. (AHAM, No. 4 at p. 3)

ALS supports AHAM's suggestion regarding visual or audio indicators that communicate to the user when an out-of-balance load has occurred. (ALS, No. 5 at p. 5) ALS also supports AHAM's suggestion that DOE require reporting the reason for any rejection of a test run. (ALS, No. 5 at p. 5) ALS supports, with qualification, DOE's proposal concerning how to proceed or to

[30] Section 9.1 of IEC 60456 does not contain a note. DOE infers from the context of AHAM's comment that AHAM is referring to the note in section 8.2.5, which references section 9.1, and states that the reason for rejection of a test run from a test series should be explained in the test report.

know when an out-of-balance condition has occurred during an RMC test. ALS suggested that DOE provide more clarification as to when a test run should be considered invalid. (ALS, No. 5 at p. 5)

DOE agrees with commenters that if a clothes washer provides a visual or audio indicator that would alert a user that an out-of-balance condition has been detected, the test should be stopped and the results discarded. Therefore, this final rule adds this additional clarification to section 3.2 of appendix J1 and a new section 3.2.9 of appendix J2. Other than a visual or audio indicator, or early termination of a cycle, DOE is unaware of any other methods that a test laboratory could use to identify when an individual test run should be invalidated.

Section 9.1 of IEC 60456 Ed. 5.0, "Clothes Washing Machines for Household Use – Methods for Measuring the Performance,"[31] states the following:

> In case of an invalid test run (in either the test washing machine or the reference machine) neither the test run result in the test washing machine nor the corresponding test run result from the reference machine shall be used for any evaluation of that test washing machine within the test series.

The related note in section 8.2.5 states the following:

NOTE Refer to 9.1 regarding evaluation of results where more than 5 test runs[32] are undertaken in a test series. The reason for rejection of a test run from a test series should be

[31] IEC 60456 Ed. 5.0 is available at http://webstore.iec.ch/webstore/webstore.nsf/artnum/043760.

explained in the test report…. If more than one test run is invalid in a test series, then the whole test series is invalid, irrespective of the reason.

Unlike IEC 60456, which requires five identical test run replications to measure each aspect of clothes washer performance, the DOE test procedure does not require the replication of any identical test runs; i.e., each DOE test run is only performed once, with each test run having a unique set of conditions including load size, wash/rinse temperature, and/or spin speed. The data from each unique test condition is required for the calculation of MEF/IMEF and WF/ integrated water factor (IWF); therefore, a valid test run must be performed at each set of required conditions. The DOE test procedure cannot limit the number of attempts needed to obtain the data for a particular test condition if multiple test runs are invalided due to out-of-balance conditions. For this reason, DOE partially rejects AHAM's suggestion to use the approach in IEC 60456, section 9.1, and the related note to limit the number of additional test runs that would be required. However, DOE agrees with AHAM's suggestion that the reason for rejecting any test run during testing should be noted in the test report for that unit.

For these reasons, this final rule implements DOE's proposal to discard any data from a wash cycle that terminates prematurely due to an out-of-balance load condition or provides a visual or audio indicator to alert the user that an out-of-balance condition has been detected. The amendments also require documenting the rejection of any test run and the reason for the rejection in the test report for that unit. These amendments apply to section 3.2 of appendix J1 and a new section 3.2.9 of appendix J2.

[32] IEC 60456 requires completing five test runs to measure each aspect of clothes washer performance, which includes the following: washing performance, rinsing performance, water extraction performance, and water and energy measurement.

Q. Reordering of Section 2, Testing Conditions

In the April 2014 NOPR, DOE proposed reordering the subsections within section 2 of appendix J2 (Testing Conditions) to improve the clarity and overall flow of the section. 79 FR 23068. 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

DOE received no comments objecting to its proposal to reorder the subsections within section 2 of appendix J2 to improve the clarity and overall flow of the section. Therefore, for the reasons stated above, this final rule incorporates these amendments into appendix J2.

R. 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. In the April 2014 NOPR, DOE proposed clarifying one of the headings in Table 3.2 of appendix J1. 79 FR 23068. DOE also proposed amending the current heading, “Number of wash temp. selections” to “Number of wash temp.

selections in the energy test cycle." In addition, DOE proposed fixing a typographical error in Table 3.2 in appendix J1 regarding the misspelling of the word "heating." Id.

DOE also proposed 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. As stated in the April 2014 NOPR, DOE does not intend for any of the required test sections to change as a result of the proposed revisions to the table. 79 FR 23068−23069.

DOE received no comments objecting to its proposal to amend Table 3.2 in both appendix J1 and appendix J2. Therefore, for the reasons stated above, this final rule incorporates these amendments.

S. Table 4.1.1 Edits

Table 4.1.1 in appendix J2 provides the temperature use factors. In the April 2014 NOPR, DOE proposed 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. 79 FR 23069. As explained in the April 2014 NOPR, DOE does not intend for any of the temperature use factors to change as a result of the proposed revisions to the table. Id.

DOE received no comments objecting to its proposal to amend Table 4.1.1 in appendix J2 to improve its clarity and overall structure. Therefore, for the reasons stated above, this final rule incorporates this amendment into appendix J2.

T. Table 2.8 Edits

Table 2.8 in appendix J2 ("Test Load Sizes and Water Fill Settings Required") contains 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. In the April 2014 NOPR, DOE proposed amending the layout of Table 2.8 in both appendix J1 and appendix J2 to improve its overall clarity. 79 FR 23069. DOE also proposed changing the heading of the relevant column to "automatic water fill control system" rather than "adaptive water fill control system." Id.

DOE received no comments objecting to its proposal to amend Table 2.8 in both appendix J1 and appendix J2 to correct a formatting error and improve its overall clarity. Therefore, for the reasons stated above, this final rule incorporates these amendment into appendix J1 and appendix J2.

U. 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 proposed in the April 2014 NOPR replacing the word "consumer" with "user" or "end user" throughout the test procedures in all instances where the word "consumer" is currently used. 79 FR 23061, 23069 (Apr. 25, 2014).

ALS supports DOE's proposal to replace the word "consumer" with the word "user" in all instances, because CCWs need to have the distinction that the test provisions are relevant to the end-user and not the purchaser of the laundry equipment. (ALS, No. 5 at p. 5)

DOE received no comments objecting to its proposal to replace the word "consumer" with "user" or "end user." Therefore, for the reasons stated above, this final rule implements these changes throughout appendix J1 and appendix J2.

V. Test Procedure Provisions in 10 CFR 430.23

In the April 2014 NOPR, DOE proposed revising section 430.23(j)(3) to contain only the provisions for calculating annual water consumption when using either appendix J1 or appendix J2. 79 FR 23069. DOE proposed adding a new section 430.23(j)(4) containing the provisions for determining water factor and integrated water factor. Id.

DOE also proposed creating a new section 430.23(j)(5) containing 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.” 79 FR 23069. 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. In its proposal, DOE noted that the measurement or reporting of any additional measures of energy or water consumption would be adopted through the rulemaking process. Id.

Finally, to eliminate any potential ambiguity, DOE proposed replacing the phrase “can be determined” with “must be determined” throughout the text of 10 CFR 430.23(j)(3) through (j)(5). 79 FR 23069.

ALS supports DOE's proposed amendments to paragraphs (j)(3) through (j)(5) under 10 CFR part 430.23. (ALS, No. 5 at pp. 2−3) ALS also supports DOE’s proposal to replace the word “shall” with “must” to avoid ambiguity. ALS added that most safety standards use the word “shall,” and then add a note clarifying that it means “mandatory.” However, ALS believes that the word “must” assures that the item needs to be done and conveys a much stronger meaning than the word “shall,” which is often considered as an optional directive.

DOE received no comments objecting to its proposal to amend 10 CFR 430.23(j)(3) through (j)(5) to improve overall clarity and consistency. Therefore, for the reasons stated above, this final rule implements these changes.

W. 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.

In the April 2014 NOPR, DOE presented example RMC test data obtained from one front-loading clothes washer model. 79 FR 23069−23070. 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[33] varied between 32.3 percent and 46.2 percent, with an average of

[33] 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.

37.0 percent. Id. DOE explained that it has observed similar variations of this magnitude on multiple front-loading clothes washer models. Id.

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 IMEF calculations. The drying energy represents between 59 and 87 percent of a clothes washer's total energy consumption;[34] hence, the RMC measurement significantly impacts the overall MEF and IMEF calculations.

In the April 2014 NOPR, DOE also proposed 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. 79 FR 23070.

DOE also proposed adding the RMC measurement to the list of public product-specific information contained in the certification reports for RCWs, as described in 10 CFR 429.20(b)(2)(i) and (ii). DOE also proposed creating a new section, 10 CFR 429.20(a)(4), which would specify 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. 79 FR 23070.

[34] 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

Finally, DOE proposed creating another new section, 10 CFR 429.134(c)(1), which would specify that during assessment or enforcement testing, the measured RMC value of a tested unit would be considered the tested unit's final RMC value if the measured RMC value was within two RMC percentage points of the certified RMC value of the basic model (expressed as a percentage), or if the measured RMC value was lower than the certified RMC value. 79 FR 23070. DOE proposed 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. Id.

For cases where 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 proposed performing 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. 79 FR 23070. Under DOE's proposal, the average of the three RMC measurements would be considered the tested unit's final RMC value and would be used as the basis for the calculation of per-cycle energy consumption for removal of moisture from the test load for that unit. Id.

AHAM agrees with DOE's proposal to add a new section to 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. (AHAM, No. 4 at p. 13) AHAM

acknowledges that these multiple measurements could increase test burden; however, AHAM believes the benefit outweighs the potential increase in test burden. (AHAM, No. 4 at p. 13)

AHAM does not oppose DOE's proposal to add the RMC measurement to the list of public product-specific information contained in certification reports for RCWs. AHAM stated that it assumes that DOE is proposing to make this information publicly available to give a reference point to third-party test laboratories who might be conducting verification testing, and that based on that reasoning, AHAM does not oppose the proposal. (AHAM, No. 4 at p. 13)

AHAM noted that DOE provided example RMC test data obtained from testing one front-loading clothes washer, but could more fully evaluate DOE’s conclusions if DOE had provided additional data on similar testing conducted on other models. (AHAM, No. 4 at p. 13)

AHAM and ALS support DOE’s proposed approach for measuring RMC during assessment or enforcement testing. (AHAM, No. 4 at p. 13; ALS, No. 5 at p. 2))

ALS supports DOE's proposed revisions to 10 CFR 429.20(b)(2)(i) and (b)(2)(ii). (ALS, No. 5 at p. 1)

DOE received no comments objecting to its proposal to allow performing up to three RMC replications, adding the RMC measurement to the list of public product-specific information contained in the certification reports for RCWs, and adding a new approach for

measuring RMC during assessment or enforcement testing. Therefore, for the reasons stated above, this final rule implements these amendments as proposed in the April 2014 NOPR.

2. Rounding Requirements for All Reported Values

In the April 2014 NOPR, DOE proposed adding a new paragraph at 10 CFR 429.20(c) to specify the rounding requirements of all reported values for RCWs 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. 79 FR 23070.

AHAM and ALS support DOE's proposed specification of rounding requirements for MEF and IMEF, WF and IWF, RMC, and clothes container capacity. (AHAM, No. 4 at pp.13-14; ALS, No. 5 at p.1)

DOE received no comments objecting to its proposal to add a new paragraph at 10 CFR 429.20(c) to specify rounding requirements for all reported values for RCWs. Therefore, for the reasons stated above, this final rule implements this amendment.

3. Energy Test Cycle Selections

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. Because the difference in wording of the energy test cycle definition in appendix J1 makes cycle selections less clear, DOE proposed in the April 2014 NOPR amending 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. 79 FR 23070.

AHAM opposes DOE's proposal to revise its regulations 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. AHAM noted that this amendment would only affect appendix J1 testing and that it is unlikely that the proposed requirement will ever be mandatory. AHAM believes it is too late to make the energy test cycle selection reporting requirement changes, and believes the changes will also increase certification reporting burden. (AHAM, No. 4 at p.14)

ALS supports DOE's proposed amendment to 10 CFR 429.20(b)(3) to require a list of all cycle selections comprising the complete energy test cycle for each basic model. (ALS, No. 5 at p. 1, 2) ALS questioned why the proposed wording in 429.20(b)(3) uses the word "shall" rather than the word "must." (ALS, No. 5 at p. 2)

The potential ambiguity regarding energy test cycle selection under appendix J1 primarily affects RCWs, more so than CCWs, due to the increasing use of electronic control panels on RCWs, which provide numerous cycle selection options. Because the use of appendix J2 became mandatory on March 7, 2015 for RCWs, and only CCWs will continue to use appendix J1, this final rule retains the current requirement in 10 CFR 429.20(b)(3) to include a list of all cycle selections comprising the complete energy test cycle for each basic model only

when using appendix J2. DOE is, however, amending this requirement in this final rule to use the word “must” rather than “shall.”

4. Product Firmware Updates

In response to the April 2014 NOPR, the CA IOUs suggested that DOE should evaluate the potential for firmware updates to materially affect the energy and water use of products. The CA IOUs proposed that if firmware updates significantly affect the energy and water use of products, DOE should assess how such changes should be managed through certified energy and water ratings. The CA IOUs recommended that DOE consider requiring manufacturers to report the magnitude of the anticipated impact on annual energy consumption associated with firmware upgrades when they are released. (CA IOUs, No. 3 at p. 4)

DOE is aware of clothes washer models on the market that offer the capability to download custom wash cycles directly from the manufacturer. DOE has observed that as currently implemented on the market, such downloadable cycles are typically niche cycles that would not be considered part of the DOE energy test cycle. However, DOE believes that this technology could be readily used to update the Normal cycle, or any alternate cycles that may be included in the energy test cycle, which could change the energy and water use of the cycle used for DOE testing.

If a manufacturer provides new or modified cycle settings for an already-certified basic model, DOE believes that the new or modified cycle settings must be included among the suite of options considered when determining the energy test cycle. Thus, if one of the new or

modified cycle settings that becomes available would meet the criteria to be selected as part of the energy test cycle, and including the new or modified cycle settings would invalidate the basic model's ratings (i.e., the rating would no longer be supported by the test data underlying the certification), then the manufacturer would be required to retest, rerate, and recertify as a new basic model.

To provide further clarification of this in the test procedure, this final rule adds the following statement to newly created section 1.8(D) in appendix J1 and newly renumbered section 2.12 in appendix J2: "The determination of the energy test cycle must take into consideration all cycle settings available to the end user for the basic model under test, including any cycle selections or cycle attributes associated with that basic model that are provided by the manufacturer via software or firmware updates."

IV. Procedural Issues and Regulatory Review

A. Review Under Executive Order 12866

The Office of Management and Budget (OMB) has determined that test procedure 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 OMB.

B. Review under the Regulatory Flexibility Act

The Regulatory Flexibility Act (5 U.S.C. 601 et seq., as amended by the Small Business Regulatory Fairness Act of 1996) requires preparation of an initial regulatory flexibility analysis (IFRA) for any rule that by law must be proposed for public comment and a final regulatory flexibility analysis (FRFA) for any such rule that an agency adopts as a final rule, unless the agency certifies that the rule, if promulgated, will not have a significant economic impact on a substantial number of small entities. A regulatory flexibility analysis examines the impact of the rule on small entities and considers alternative ways of reducing negative effects. Also, 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 website: http://energy.gov/gc/office-general-counsel.

DOE reviewed this final rule under the provisions of the Regulatory Flexibility Act and the procedures and policies published on February 19, 2003. The final rule amends 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 this final rule will 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 RCW manufacturers, is 1,000 employees. Searches of the SBA website[35] to identify clothes washer manufacturers within this NAICS code identified one small business. This small business manufactures laundry appliances, including RCWs.

The threshold number for NAICS classification code 333312—which applies to commercial laundry, dry cleaning, and pressing machine manufacturers—is 500 employees. Searches of the SBA website to identify CCW manufacturers within this NAICS classification number did not identify any small businesses that manufacture CCWs. Additionally, DOE checked its own publicly available Compliance Certification Database[36] to identify manufacturers of CCWs and also did not identify any manufacturers of CCWs that employ less than 500 people.

DOE estimates that the clarified description of the capacity measurement would take the same amount of time to conduct as the capacity measurement as described in the current DOE test procedure. DOE believes that use of an alternate bracing method for front-loading clothes

[35] A searchable database of certified small businesses is available online at: http://dsbs.sba.gov/dsbs/search/dsp_dsbs.cfm.
[36] DOE's Compliance Certification Database is available online at: http://www.regulations.doe.gov/certification-data.

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.

DOE assessed 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 final rule 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 eliminating 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 this amendment.

Finally, the changes in this final rule 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 these test procedure amendments would not have a significant impact on a substantial number of small entities. DOE has submitted 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 both residential and commercial 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 both residential and commercial clothes washers. 10 CFR part 429, Subpart B. The collection-of-information requirement for the certification and recordkeeping is subject to review and approval by OMB under the Paperwork Reduction Act (PRA).

In the April 2014 NOPR, DOE estimated the public reporting burden for certification to be 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. AHAM commented that it disagreed with DOE's estimate of an average of 20 hours per response for public reporting burden for certification. According to AHAM, no clothes washer manufacturer reported a burden of less than 50 hours, and some manufacturers reported a burden as high as 100 hours. AHAM requested that DOE revise its public reporting burden estimate. (AHAM, No. 4 at p. 14)

DOE has amended its estimate to an average of 30 hours per company, which reflects that some manufacturers (particularly small businesses) may only submit 1 or 2 certification reports per year, while other manufacturers (such as many of the large companies represented by AHAM) may submit a certification report as often as once a week. This requirement has been approved by OMB under OMB control number 1910-1400. *See* 80 FR 5099 (Jan. 30, 2015). Public reporting burden for the certification is estimated to average 30 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 final rule, DOE amends its test procedure for clothes washers. DOE has determined that this rule falls into a class of actions that are categorically excluded from review under the National Environmental Policy Act of 1969 (42 U.S.C. 4321 et seq.) and DOE's implementing regulations at 10 CFR part 1021. Specifically, this rule amends an existing rule without affecting the amount, quality or distribution of energy usage, and, therefore, will 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 final 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 this final 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 final 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. Pub. L. No. 104-4, sec. 201 (codified at 2 U.S.C. 1531). For a regulatory action resulting 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 this final rule according to UMRA and its statement of policy and determined that the rule 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. The final rule will 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 will 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 this final 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 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 significant energy action, the agency must give a detailed statement of any adverse effects on energy supply, distribution, or use if the regulation is implemented, and of reasonable alternatives to the action and their expected benefits on energy supply, distribution, and use.

This regulatory action 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 final rule, so these requirements do not apply.

M. Congressional Notification

As required by 5 U.S.C. 801, DOE will report to Congress on the promulgation of this rule before its effective date. The report will state that it has been determined that the rule is not a "major rule" as defined by 5 U.S.C. 804(2).

V. Approval of the Office of the Secretary

The Secretary of Energy has approved publication of this final 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

July 17, 2015.

Kathleen B. Hogan
Deputy Assistant Secretary for Energy Efficiency
Energy Efficiency and Renewable Energy

For the reasons stated in the preamble, DOE amends 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), the corrected remaining moisture content (RMC) expressed as a percentage, and, 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 must 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(c) is added to read as follows:

§ **429.134 Product-specific enforcement provisions.**

* * * * *

(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 revising paragraph (j)(3), and adding paragraphs (j)(4) through (j)(5) to read as follows:

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

* * * * *

(j) * * *

(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 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 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 as follows:

Old sections	New sections
1.3 to 1.7	1.4 to 1.8
1.8 to 1.16	1.10 to 1.18
1.18 to 1.23	1.19 to 1.24

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, 2.6.4.6, 2.6.5, 2.8, 2.8.3, 2.10, and Table 2.8;

g. Adding sections 2.8.3.1. and 2.8.3.2;

h. Removing sections 2.3.1, 2.3.2, 2.6.4.6.1, 2.6.4.6.2, 2.6.6, and 2.6.7;

i. Revising sections 3.1.1, 3.1.2, 3.1.4, and 3.1.5;

j. Adding section 3.1.6;

k. Revising sections 3.2, 3.2.3, 3.2.3.1, 3.2.3.2, 3.2.3.2.2, and 3.2.3.3;

l. Removing sections 3.2.1.3, 3.5.2.1, 3.5.2.2, and 3.5.2.3;

m. Revising Table 3.2, sections 3.3, 3.3.3, 3.4.3, 3.5, 3.5.1, 3.5.2, and 3.6.3;

n. Adding section 3.5.3;

o. Adding section 3.8.5; and

p. 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 a residential clothes washer must be based upon results generated using Appendix J2.

Before January 1, 2018, any representation related to the energy or water consumption of commercial clothes washers must be based on results generated using Appendix J1. Specifically, before [**INSERT DATE 180 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]**, representations must be based upon results generated either under this appendix or under Appendix J1 as it appeared in the 10 CFR parts 200-499 edition revised as of January 1, 2015. Any representations made on or after [**INSERT DATE 180 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]**, but before January 1, 2018, must be made based upon results generated using this appendix. Any representations made on or after January 1, 2018, must be based upon results generated using Appendix J2.

* * * * *

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, or 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 allow or require the user to determine or select the water fill level, 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 cotton or linen clothes, the energy test cycle shall include the warm rinse temperature selection in the cycle most comparable to the cycle recommended for washing cotton or linen clothes.

If an extra-hot temperature selection is available only 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. 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 is not required for consideration as part of the energy test cycle.

(C) For clothes washers with electronic control systems, 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 or setting (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 must be included for testing unless the manufacturer instructions recommend not selecting this option, or recommend selecting a different option, for washing normally soiled cotton clothing.

For clothes washers with control panels containing mechanical switches or dials, any optional 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, must be in the position recommended by the manufacturer for washing normally soiled cotton clothing. If the manufacturer instructions do not recommend a particular switch or dial position to be used for washing normally soiled cotton clothing, the setting switch or dial must remain in its as-shipped position.

(D) The determination of the energy test cycle must take into consideration all cycle settings available to the end user, including any cycle selections or cycle modifications provided by the manufacturer via software or firmware updates to the product, for the basic model under test.

1.9 Fixed water fill control system means a clothes washer automatic water fill control system that automatically terminates the fill when the water reaches an appropriate level 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 Supply Water. Maintain the temperature of the hot water supply at the water inlets between 130 °F (54.4 °C) and 135 °F (57.2 °C), using 135 °F as the target temperature. Maintain the temperature of the cold water supply at the water inlets between 55 °F (12.8 °C) and 60 °F (15.6 °C), using 60 °F as the target temperature. 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.

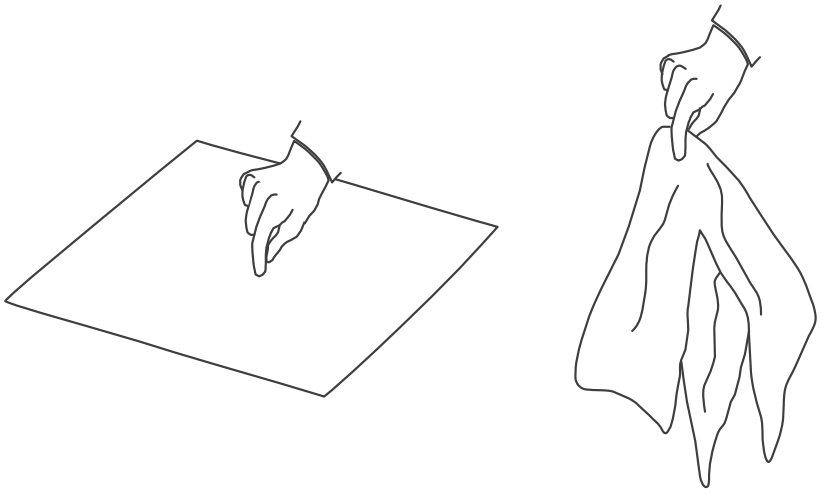
TABLE 2.8—REQUIRED TEST LOAD SIZES AND WATER FILL SETTINGS

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 of this appendix.

Figure 2.8.3—Grasping Energy Test Cloths in the Center, Lifting, and Shaking to Hang Loosely

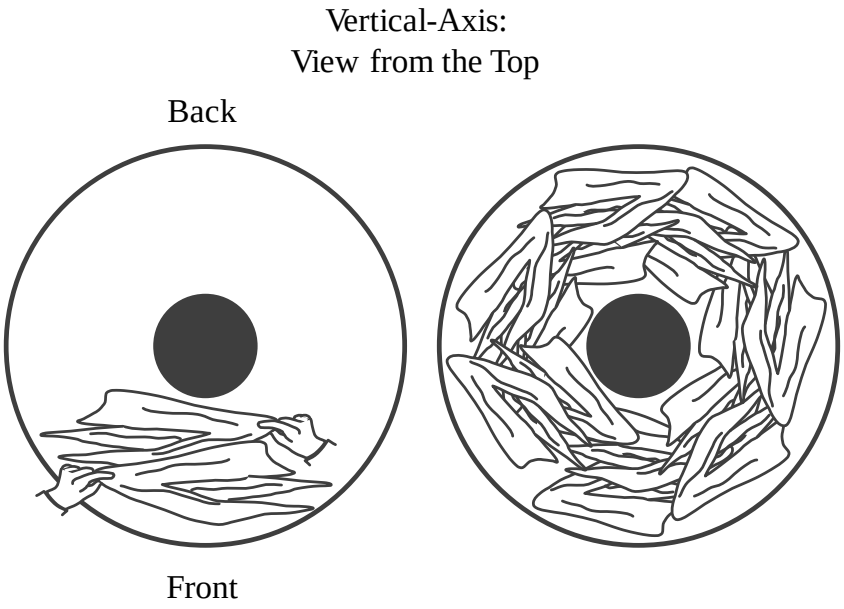


For all clothes washers, follow any manufacturer loading instructions provided to the user regarding the placement of clothing within the clothes container. In the absence of any manufacturer instructions regarding the placement of clothing within the clothes container, the following loading instructions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

2.8.3.1 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 2.8.3.1 of this appendix illustrates the correct loading technique for a vertical-axis clothes washer.

Figure 2.8.3.1—Loading Energy Test Cloths into a Top-Loading Clothes Washer



2.8.3.2 To load the energy test cloths in a front-loading clothes washer, grasp each test cloth in the center as indicated in section 2.8.3 of this appendix, and then place each cloth into the clothes container prior to activating the clothes washer.

* * * * *

2.10 Wash time setting. If one wash time is prescribed in the energy test cycle, 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 in the energy test cycle, regardless of the labeling of suggested dial locations. If 70% of the maximum wash time is not available on a dial with a discreet number of wash time settings, choose the next-highest setting greater than

70%. 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.

3.1.1 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.

For a front-loading clothes washer that does not include shipping bolts or other forms of bracing hardware to support the wash drum during shipping, the test report must document the alternative method used to support the wash drum during capacity measurement, 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 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 bag to prevent water from entering any void space.

* * * * *

3.1.4 Fill the clothes container manually with either 60 ºF ± 5 ºF (15.6 ºC ± 2.8 ºC) or 100 ºF ± 10 ºF (37.8 ºC ± 5.5 ºC) 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

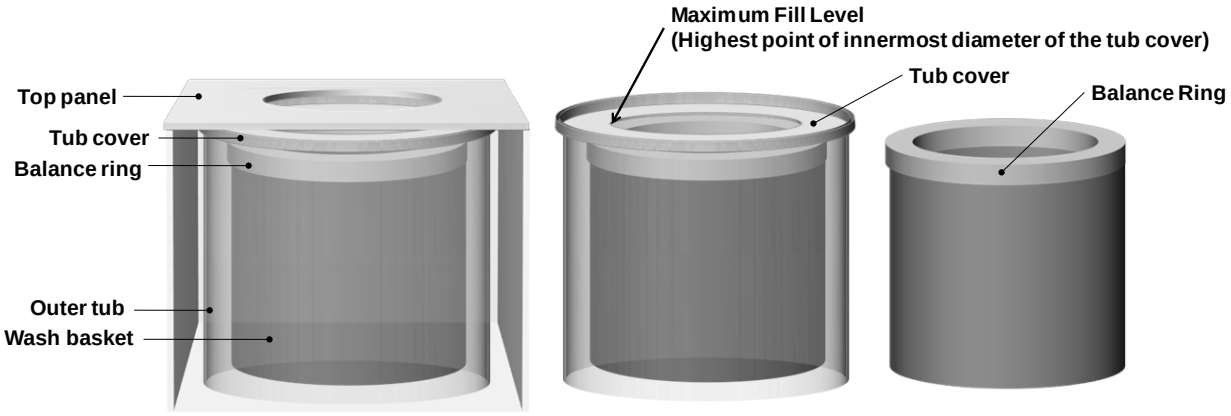
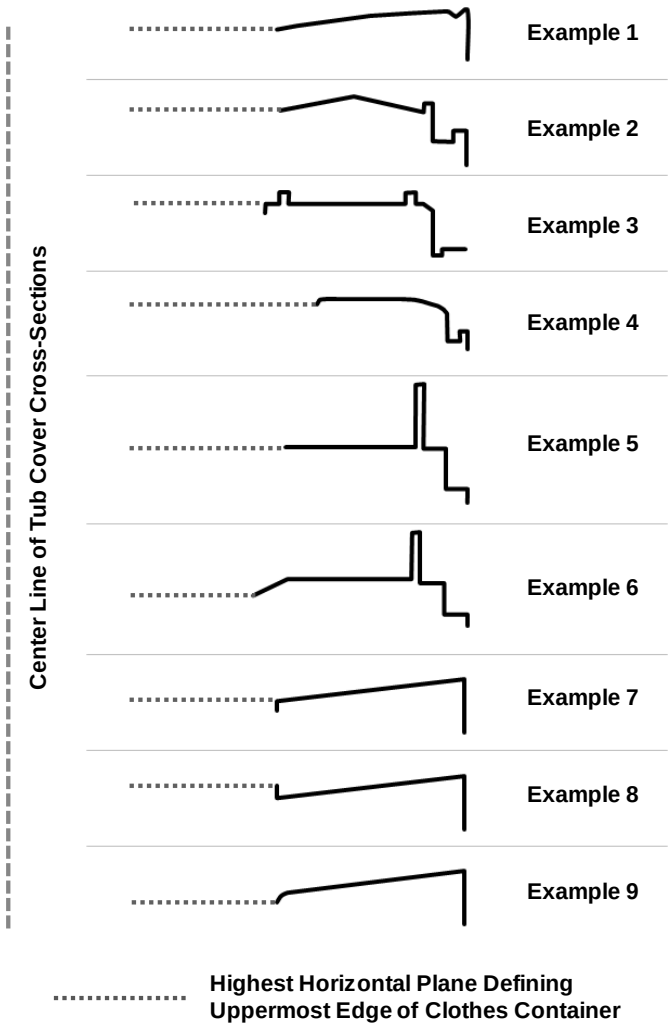


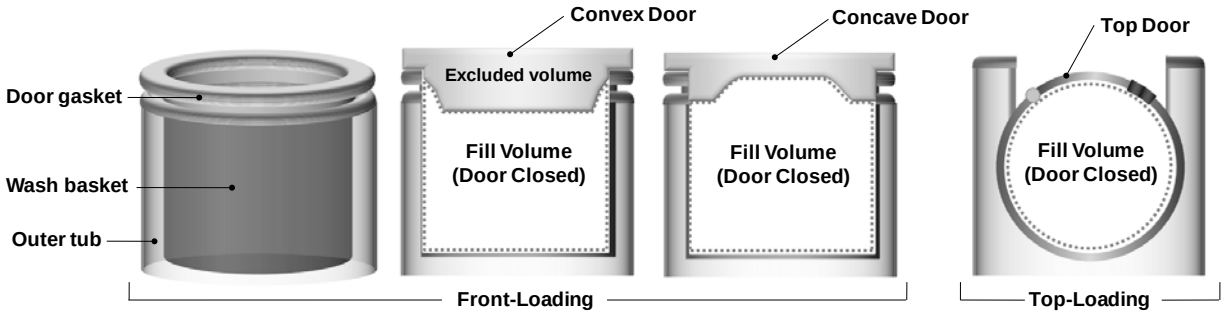
Figure 3.1.4.2— Example Cross-Sections of Tub Covers Showing the Highest Horizontal Plane Defining the Uppermost Edge of the Clothes Container



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. 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)).

3.1.6 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 provides a visual or audio indicator to alert the user that an out-of-balance condition has been detected, or 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. The test report must document the rejection of data from any wash cycle during testing and the reason for the rejection.

* * * * *

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.

3.2.3.3 Clothes washers with manual water fill control system. In accordance with Table 2.8, the water fill selector shall be set to the maximum water level available for the wash cycle under test for the maximum test load size and the minimum water level available for the wash cycle under test for the minimum test load size.

TABLE 3.2—TEST SECTION REFERENCE

Max. Wash Temp. Available	**≤ 135 ºF (57.2 ºC)**	**> 135 ºF (57.2 ºC)[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
	3.7[1]	3.7[1]	3.7[1]	3.7[1]	3.7[1]
	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 ºF (57.2 ºC).

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.

Non-reversible temperature indicator labels, adhered to the inside of the clothes container, may be used to confirm that an extra-hot wash temperature greater than 135 °F has been achieved during the wash cycle, under the following conditions. The label must remain waterproof, intact, and adhered to the wash drum throughout an entire wash cycle; provide consistent maximum temperature readings; and provide repeatable temperature indications sufficient to demonstrate that a wash temperature of greater than 135 °F has been achieved. The label must have been verified to consistently indicate temperature measurements with an accuracy of ±1 °F if the label provides a temperature indicator at 135 °F. If the label does not provide a temperature indicator at 135 °F, the label must have been verified to consistently indicate temperature measurements with an accuracy of ±1 °F if the next-highest temperature indicator is greater than 135 °F and less than 140 °F, or ±3 °F if the next-highest temperature indicator is 140 °F or greater. If the label does not provide a temperature indicator at 135 °F, failure to activate the next-highest temperature indicator does not necessarily indicate the lack of

an extra-hot wash temperature. However, such a result would not be considered a valid test due to the lack of verification of the water temperature requirement, in which case an alternative method must be used to confirm that an extra-hot wash temperature greater than 135 °F has been achieved during the wash cycle.

If using a temperature indicator label to test a front-loading clothes washer, adhere the label along the interior surface of the clothes container drum, midway between the front and the back of the drum, adjacent to one of the baffles. If using a temperature indicator label to test a top-loading clothes washer, adhere the label along the interior surface of the clothes container drum, on the vertical portion of the sidewall, 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 the 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 the results from 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} = ……...	0.72[1]	0.12[2]
F_{avg} = ……	…….	0.74[2]
F_{min} = ……...	0.28[1]	0.14[2]

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

4.1.4 Total per-cycle hot water energy consumption using gas-heated or oil-heated water, for product labeling requirements. Calculate for the energy test cycle the per-cycle hot water consumption, HE_{TG}, using gas-heated or oil-heated water, expressed in Btu per cycle (or megajoules per cycle) and defined as:

$HE_{TG} = HE_T \times 1/e \times 3412$ Btu/kWh or $HE_{TG} = HE_T \times 1/e \times 3.6$ MJ/kWh

where:

e = Nominal gas or oil water heater efficiency=0.75.

HE_T = As defined in 4.1.3.

* * * * *

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 residential clothes washers must be based upon results generated using Appendix J2. Specifically, before **[INSERT DATE 180 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]**, representations must be based upon results generated either under this appendix or under Appendix J2 as it appeared in the 10 CFR parts 200-499 edition revised as of January 1, 2015. Any representations made on or after **[INSERT DATE 180 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]** must be made based upon results generated using this appendix.

Before January 1, 2018, any representation related to the energy or water consumption of commercial clothes washers must be based on results generated using Appendix J1. Any representations made on or after January 1, 2018, must be based upon results generated using Appendix J2.

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, or 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 allow or require the user to determine or select the water fill level, 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 automatically terminates the fill when the water reaches an appropriate level 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 a 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 recommended by the manufacturer (considering manufacturer instructions, control panel labeling, and other markings on the clothes washer) for normal, regular, or typical use for washing up to a full load of normally-soiled cotton clothing. For machines where multiple cycle settings are recommended by the manufacturer for normal, regular, or typical use for washing up to a full load of normally-soiled cotton clothing, 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.

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) Facilitating 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"

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

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 (incorporated by reference, see §430.3). 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 ºF (99 ºC).

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 2.7.4 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 2.7.3 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 2.7.4 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 2.7.3 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 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/m^2).

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 both of 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 part 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

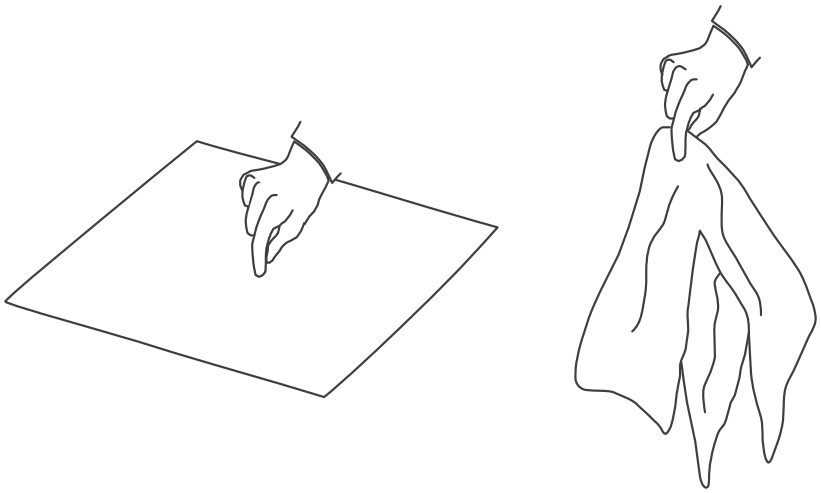
Water Fill Control System Type	Test Load Size	Water Fill Setting
Manual water fill control system	Max	Max
	Min	Min
Automatic water fill control system	Max	As determined by the clothes washer.
	Avg	
	Min	

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 of this appendix.

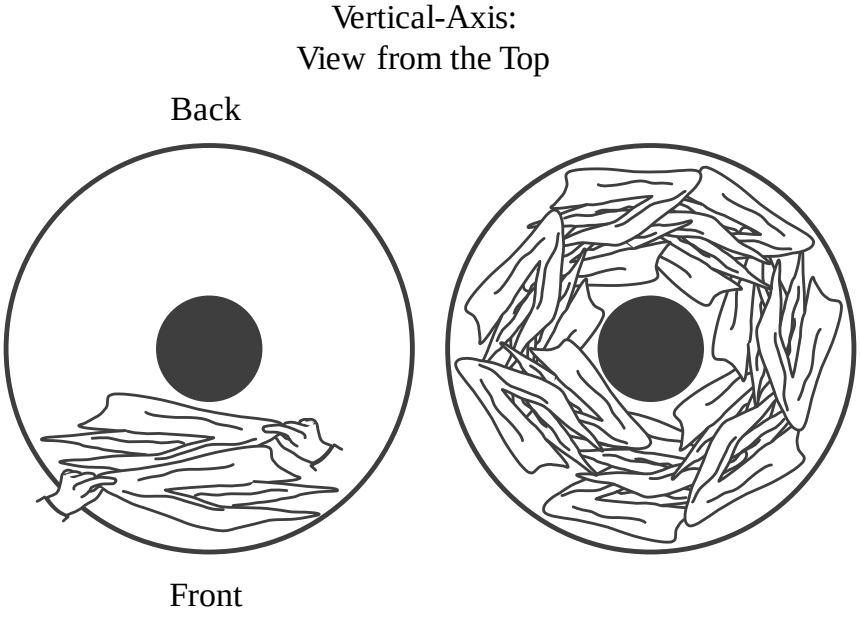
Figure 2.9.2—Grasping Energy Test Cloths in the Center, Lifting, and Shaking to Hang Loosely



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

2.9.2.1 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 2.9.2.1 of this appendix illustrates the correct loading technique for a vertical-axis clothes washer.

Figure 2.9.2.1—Loading Energy Test Cloths into a Top-Loading Clothes Washer



2.9.2.2 To load the energy test cloths in a front-loading clothes washer, grasp each test cloth in the center as indicted in section 2.9.2 of this appendix, and then place each cloth into the clothes container prior to activating the 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 determination of the energy test cycle must take into consideration all cycle settings available to the end user, including any cycle selections or cycle modifications provided by the manufacturer via software or firmware updates to the product, for the basic model under test. The energy test cycle does not include any cycle that is recommended by the manufacturer exclusively for cleaning, deodorizing, or sanitizing the clothes washer.

Figures to Section 2.12, Determining the Energy Test Cycle

Figure 2.12.1—Determination of Cold Wash/Cold Rinse

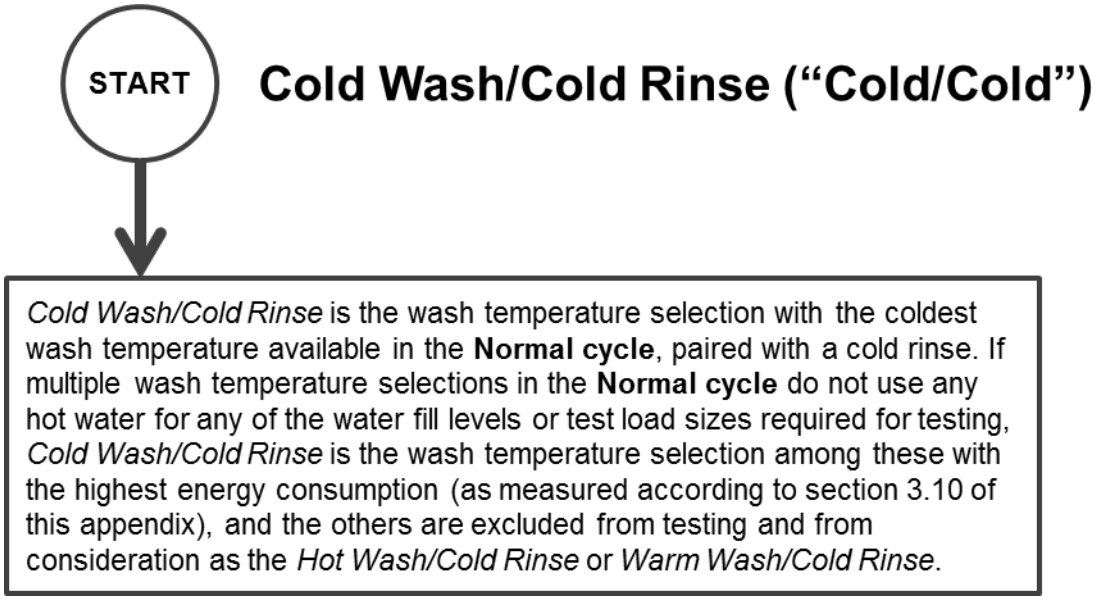


Figure 2.12.2—Determination of Hot Wash/Cold Rinse

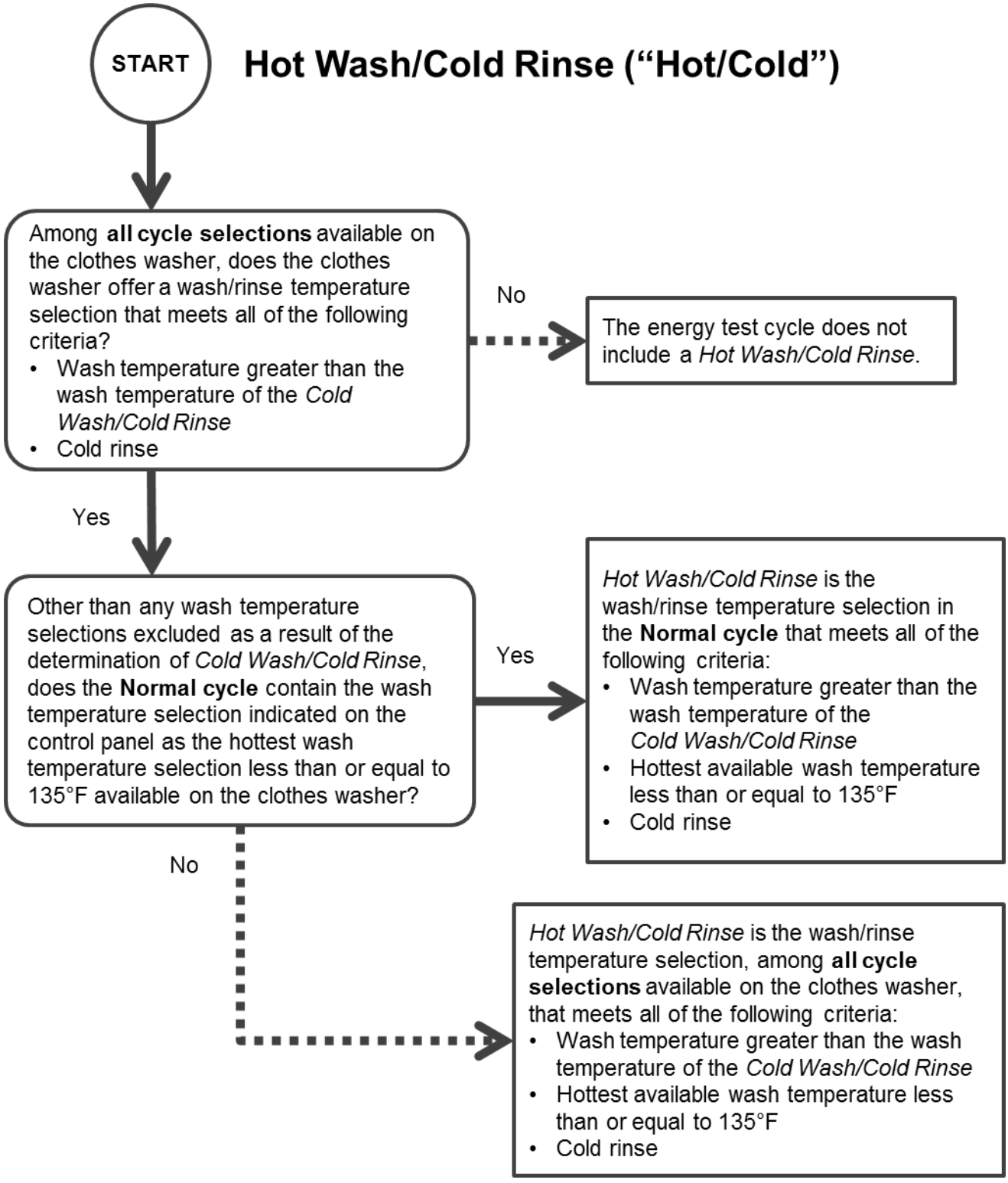


Figure 2.12.3—Determination of Warm Wash/Cold Rinse

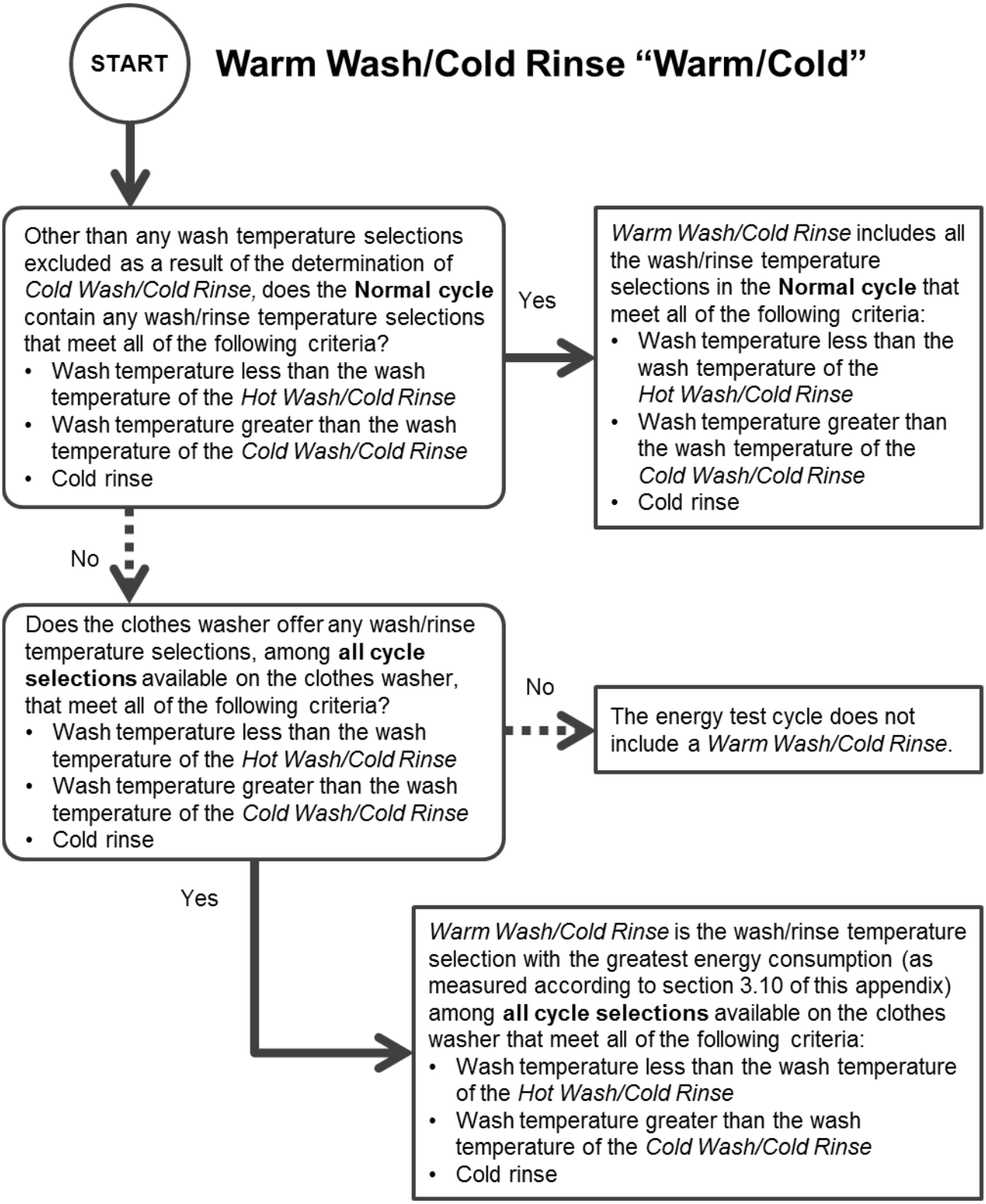


Figure 2.12.4—Determination of Warm Wash/Warm Rinse

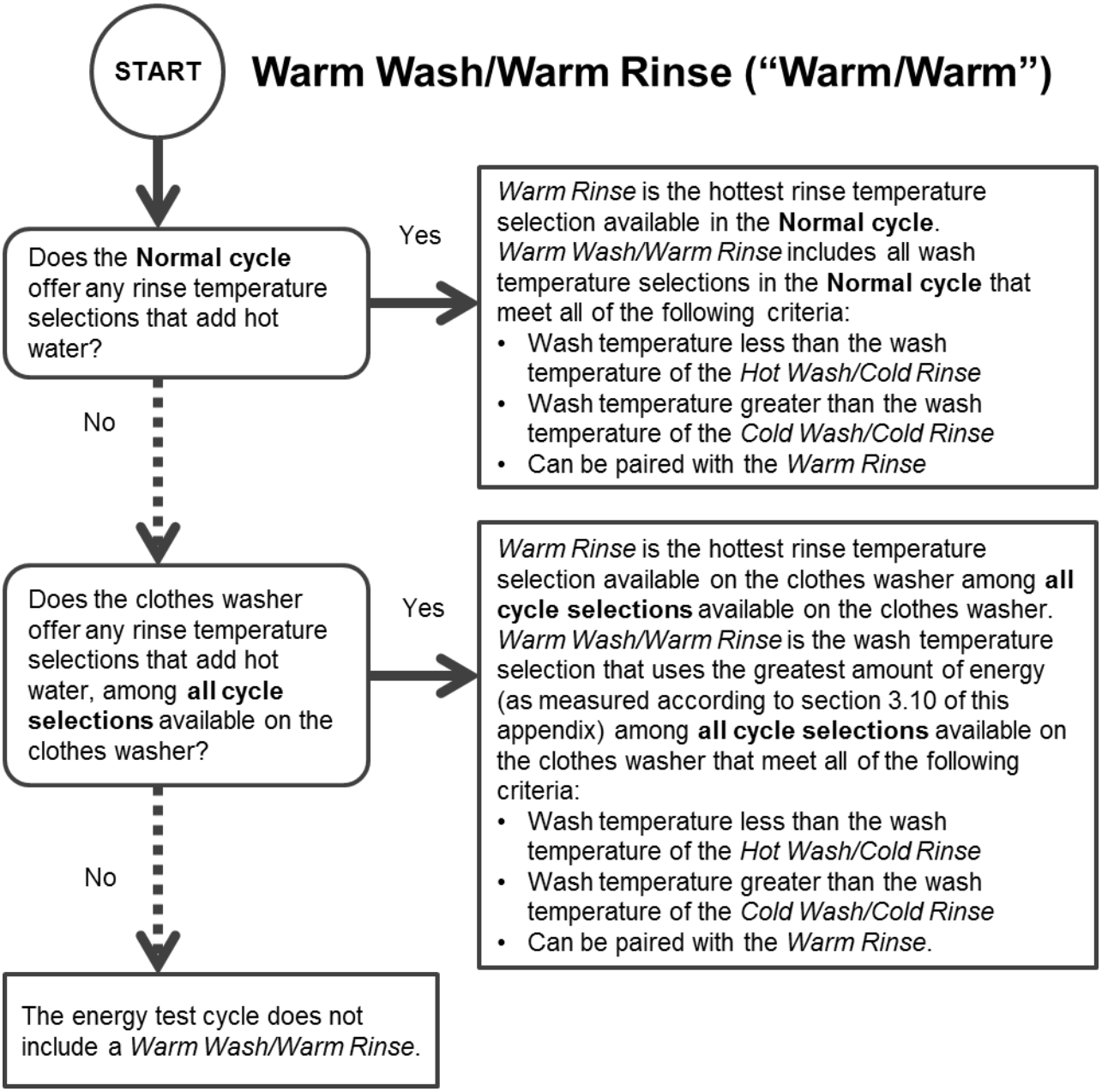
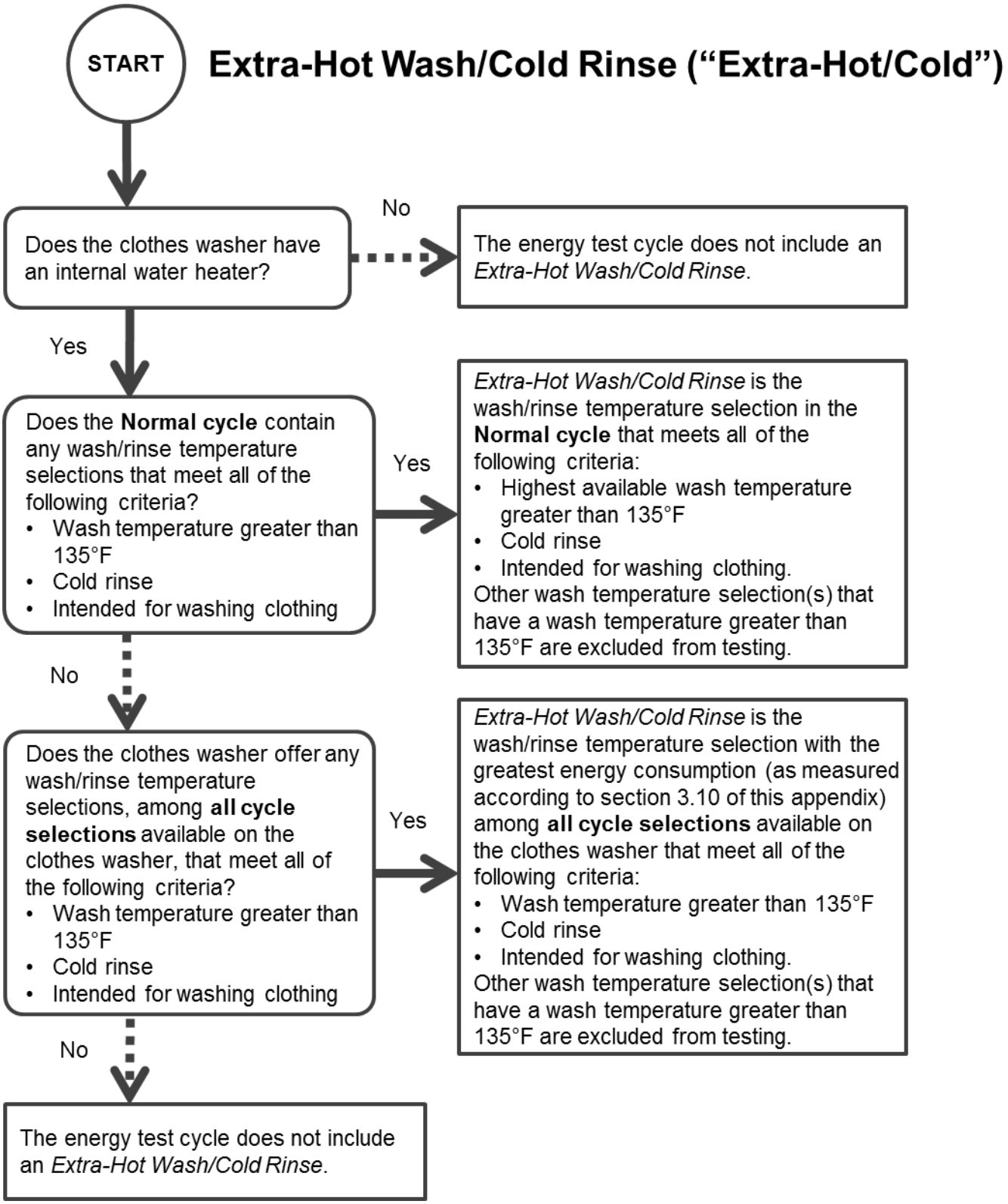


Figure 2.12.5—Determination of Extra-Hot Wash/Cold Rinse



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.

For a front-loading clothes washer that does not include shipping bolts or other forms of bracing hardware to support the wash drum during shipping, the laboratory must fully document the alternative method used to support the wash drum during capacity measurement, 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.

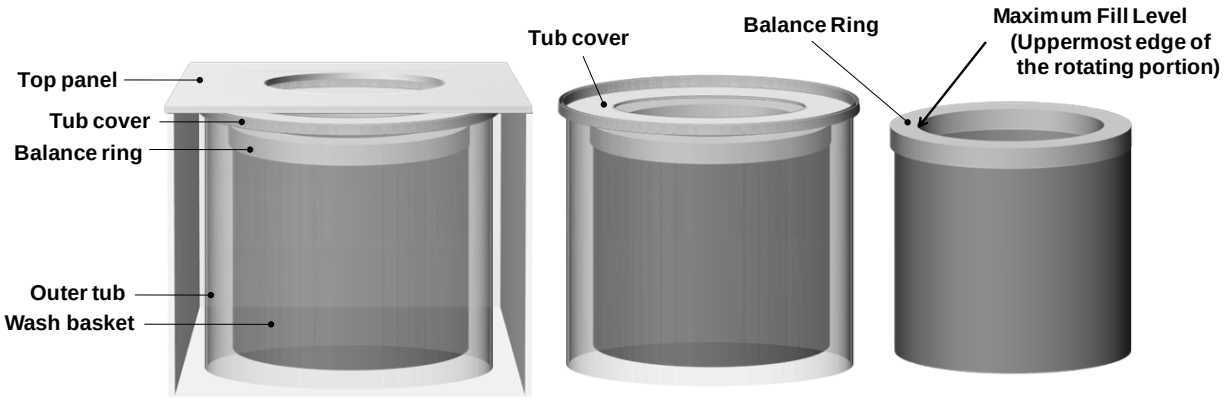
3.1.2 Line the inside of the clothes container with a 2 mil thickness (0.051 mm) plastic bag. All clothes washer components that occupy space within the clothes container and that are

recommended for use during a wash cycle must be in place and must be lined with a 2 mil thickness (0.051 mm) plastic 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 ºF ± 5 ºF (15.6 ºC ± 2.8 ºC) or 100 ºF ± 10 ºF (37.8 ºC ± 5.5 ºC) 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.

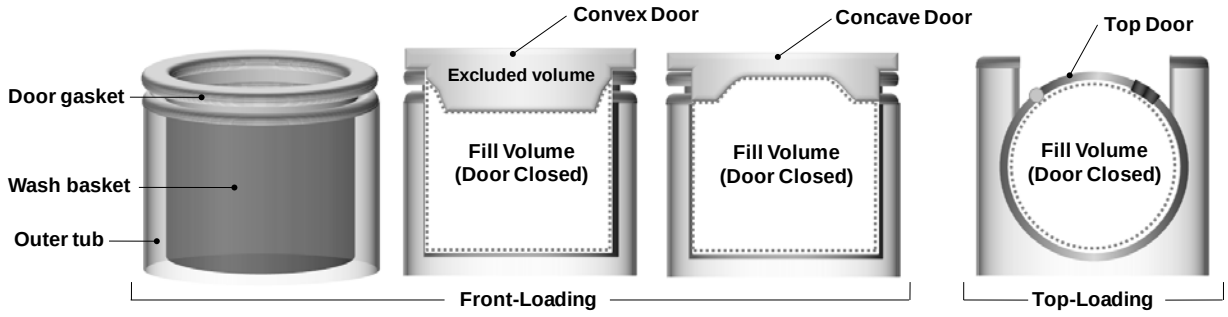
Figure 3.1.4.1—Maximum Fill Level for the Clothes Container Capacity Measurement of Top-Loading Vertical-Axis Clothes Washers



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 70% of the maximum wash time is not available on a dial with a discreet number of wash time settings, choose the next-highest setting greater than 70%. 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 wash cycle under test for the maximum test load size and the minimum water level available for the wash cycle under test 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 clothes washers with electronic control systems, 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 or setting (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 must be included for testing unless the manufacturer instructions recommend not selecting this option, or recommend selecting a different option, for washing normally soiled cotton clothing.

For clothes washers with control panels containing mechanical switches or dials, any optional 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, must be in the position recommended by the manufacturer for washing normally soiled cotton clothing. If the manufacturer instructions do not recommend a particular switch or dial position to be used for washing normally soiled cotton clothing, the setting switch or dial must remain in its as-shipped position.

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 provides a visual or audio indicator to alert the user that an out-of-balance condition has been detected, or 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. Document in the test report the rejection of data from any wash cycle during testing and the reason for the rejection.

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.

Non-reversible temperature indicator labels, adhered to the inside of the clothes container, may be used to confirm that an extra-hot wash temperature greater than 135 °F has been achieved during the wash cycle, under the following conditions. The label must remain waterproof, intact, and adhered to the wash drum throughout an entire wash cycle; provide consistent maximum temperature readings; and provide repeatable temperature indications sufficient to demonstrate that a wash temperature of greater than 135 °F has been achieved. The label must have been verified to consistently indicate temperature measurements with an accuracy of ±1 °F if the label provides a temperature indicator at 135 °F. If the label does not provide a temperature indicator at 135 °F, the label must have been verified to consistently indicate temperature measurements with an accuracy of ±1 °F if the next-highest temperature indicator is greater than 135 °F and less than 140 °F, or ±3 °F if the next-highest temperature indicator is 140 °F or greater. If the label does not provide a temperature indicator at 135 °F, failure to activate the next-highest temperature indicator does not necessarily indicate the lack of an extra-hot wash temperature. However, such a result would not be considered a valid test due

to the lack of verification of the water temperature requirement, in which case an alternative method must be used to confirm that an extra-hot wash temperature greater than 135 °F has been achieved during the wash cycle.

If using a temperature indicator label to test a front-loading clothes washer, adhere the label along the interior surface of the clothes container drum, midway between the front and the back of the drum, adjacent to one of the baffles. If using a temperature indicator label to test a top-loading clothes washer, adhere the label along the interior surface of the clothes container drum, on the vertical portion of the sidewall, 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 sections 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 the 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 sections 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 testy 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.

3.9.1 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; with the door closed; 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.

3.9.2 For a clothes washer that takes some time to automatically enter a stable inactive mode or off mode 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 automatically reach the default inactive/off mode state before proceeding with the test measurement.

3.9.3 Once the stable inactive/off mode state has been reached, measure and record the default inactive/off mode power, $P_{default}$, in watts, following the test procedure for the sampling method specified in Section 5, Paragraph 5.3.2 of IEC 62301.

3.9.4 For a clothes washer with a switch, dial, or button that can be optionally selected by the end user to achieve a lower-power inactive/off mode state than the default inactive/off mode state measured in section 3.9.3 of this appendix, after performing the measurement in section 3.9.3, activate the switch, dial, or button to the position resulting in the lowest power consumption and repeat the measurement procedure described in section 3.9.3. Measure and record the lowest-power inactive/off mode power, P_{lowest}, in Watts.

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

	Clothes Washers with Cold Rinse Only					Clothes Washers with Both Cold and Warm Rinse		
Wash/Rinse Temperature Selections Available in the Energy Test Cycle	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 Total per-cycle hot water energy consumption using gas-heated or oil-heated water, for product labeling requirements. Calculate for the energy test cycle the per-cycle hot water consumption, HE_{TG}, using gas-heated or oil-heated water, expressed in Btu per cycle (or megajoules per cycle) and defined as:

$HE_{TG} = HE_T \times 1/e \times 3412$ Btu/kWh or $HE_{TG} = HE_T \times 1/e \times 3.6$ MJ/kWh

where:

e = Nominal gas or oil water heater efficiency = 0.75.

HE_T = As defined in section 4.1.3 of this Appendix.

4.1.5 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.

4.1.6 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 4.1.5 of this appendix.

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

4.1.7 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 4.1.6 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 liters 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:

$$E_{TLP} = [(P_{default} \times S_{default}) + (P_{lowest} \times S_{lowest})] \times K_p / 295$$

where:

$P_{default}$ = Default inactive/off mode power, in watts, as measured in section 3.9.3 of this appendix.

P_{lowest} = Lowest-power inactive/off mode power, in watts, as measured in section 3.9.4 of this appendix for clothes washers with a switch, dial, or button that can be optionally selected by the end user to achieve a lower-power inactive/off mode than the default inactive/off mode; otherwise, P_{lowest}=0.

$S_{default}$= Annual hours in default inactive/off mode, defined as 8,465 if no optional lowest-power inactive/off mode is available; otherwise 4,232.5.

S_{lowest}= Annual hours in lowest-power inactive/off mode, defined as 0 if no optional lowest-power inactive/off mode is available; otherwise 4,232.5.

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

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

8,465 = Combined annual hours for inactive and off mode.

4,232.5 = One-half of the combined annual hours for inactive and off mode.

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 4.1.7 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 4.1.7 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.

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 correction curve coefficients for each approved lot of energy test cloth. These can be accessed through DOE's webpage for standards and test procedures for residential clothes washers at DOE's Building Technologies Office Appliance and Equipment Standards website.

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 part 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 ºF ± 5ºF (37.8 ºC ± 2.8 ºC) 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.