Organization	Commenter	Topic	Subtopic	Stakeholder Comments	DOE/EPA Response
Summary		**Definitions**	**General**	**A stakeholder noted that the definitions for lab grade refrigerators, lab grade freezers, and ultra-low temperature lab freezers reference different requirements for storage of volatile or non-volatile reagents and requested clarification and consistency with this.**	**The difference in language was intentional. Based on DOE's understanding, Laboratory Grade Freezers (LGF) are used to store volatile reagents and Lab Grade Refrigerators (LGR) are used for storing non-volatile reagents. However, DOE's primary intention is to define products based on the operating temperatures and not the types of items stored. As such, DOE and EPA haves updated the definitions to remove the terms "volatile" and "non-volatile" to reduce confusion.**
Summary		**Definitions**	**Lab Grade Refrigerators and Freezers**	**One stakeholder recommended the definition of lab grade refrigerators and freezers include those in a single unit, noting that some combination units do exist that provide lab and pharmaceutical grade storage utilizing separate refrigeration systems and controls.**	**Considering that most combination units are not suitable for laboratory applications, DOE and EPA have decided to exclude units that combine both a refrigerator and freezer into one unit from the scope of this version of the Laboratory Grade Program.**
Summary		**Definitions**	**Ultra-Low-Temperature Laboratory Freezer (ULT)**	**A stakeholder suggested expanding the temperature range in the definition for ultra-low temperature lab freezers to include other applications like cryogenic mechanical ultra-low freezers which perform at -160 to -40 degrees Celsius. Another stakeholder appreciated the use of the ULT abbreviation and strongly supported measuring the freezers at both -70 and -80 degrees Celsius.**	**DOE appreciates the stakeholder's support for its proposal to test at both -70° and -80° C. In regards to including other temperature applications, -40° C freezers are included under the definition of LGF and are tested at -40° C. In regards to the -150° C application, DOE and EPA believe that Cryogenic freezers represent a relatively small portion of the overall ULT market and have excluded them from this version of the Laboratory Grade Program.**
Summary		**Definitions**	**Automatic Defrost**	**A stakeholder suggested that the definition of automatic defrost be changed to 'A system in which the defrost system is automatically initiated and terminated based on a time method or other methodology which does not rely on ref. system temperature feedback to determine defrost initial conditions'. They cited that the definition and the use of the word automatically could cause confusion due to some units using natural evaporation as a disposal method.**	**Based on the stakeholder's comment, DOE reevaluated the defrost-related terms and determined that including a definition for both "Automatic Defrost" and "Variable Defrost" was unnecessary and create confusion since both defrost types are tested in the same way. As such, DOE has combined the two definitions to define a single defrost type that is initiated and terminated automatically based on one (or more) of a number of variables. DOE has also clarified that automatic defrost water disposal means no user action is required for the removal of defrost water.**
Summary		**Test Conditions**	**Power Supply**	**A stakeholder noted that for products with a rated voltage, a voltage should be selected within the range. Also, they suggested using sections of the Commercial Refrigerators and Freezers Version 3.0 specification, such as adopting ANSI/AHRI Standard 1200 (I-P) 2013 Standard for Performance Rating of Commercial Refrigerated Display Merchandisers and Storage Cabinets, specifically Section 4 Test Requirements since it addressed test voltage. Another stakeholder requested that dual rated voltages be specified and mentioned that 208V +/- 4% was discussed to standardize.**	**DOE and EPA agrees with the stakeholders and has updated the input power requirements section to account for units with multiple rated voltages.**
Summary		**Test Conditions**		**A stakeholder requested that all the test conditions should be in line with the ANSI/ASHRAE Standard 72 for dry-bulb temperature, wet-bulb temperature, and the AHRI 110 standard for electrical conditions. Another stakeholder requested clarification if it would be acceptable to measure dry bulb and relative humidity (RH) and then calculate the wet bulb temperature in order to offer more transducer flexibility. A commenter also requested that the dry-bulb temperature be changed to 23.0 degrees Celsius, +/- 1 degree because more manufacturers present their energy consumption data with ambient temperatures lower than 24 degrees Celsius. This stakeholder also requested clarification on test invalidation occurring if a single or a few temperature readings are outside of the dry or wet bulb temperatures were outside the acceptable range over the 24 hour test period.**	**Responded to individual comments**
		Test Conditions	Test Requirements	4.1 Test Requirements. The tests required for this standard shall be conducted in accordance with ANSI/ASHRAE Standard 72. 4.1.1 Dry-Bulb Temperature. The average test-room dry-bulb temperature shall be 75.2ºF ± 1.8ºF, when measured in accordance with ANSI/ASHRAE Standard 72. 4.1.2 Wet-Bulb Temperature. The average test-room wet-bulb temperature shall be 64.4ºF ± 1.8ºF, when measured in accordance with ANSI/ASHRAE Standard 72. 4.1.3 Electrical Conditions. Nameplate voltages for 60 Hertz systems are shown in Table 1 of AHRI Standard 110. Nameplate voltages for 50 Hertz systems shall include one or more of the utilization voltages shown in Table 1 of IEC Standard 60038. Tests shall be performed at the nameplate rated voltage and frequency unless otherwise specified in this standard. For all dual nameplate voltage equipment covered by this standard, tests shall be performed at both voltages or at the lower voltage if only a single rating is to be published. Overall, the stakeholder felt that the initial December 2009 supplement to ASHRAE 72 was the best approach. It used ASHRAE 72-2005 verbatim with only a few supplemental changes for testing the lab grade products. Since that supplement you have issued 3 drafts, all of which have not progressively reduced conflicting details or lack of clarity, but instead have introduced new problems and poor definitions. This is supposed to be a specification, so re-ground yourselves with ASHRAE 72-2005 and then make certain every important test condition variation which you introduce has a nominal requirement with a tolerance specified for it. Adapt parts that apply to Laboratory Grade Storage Refrigerator and Freezers from ANSI/AHRI Standard 1200 (I-P) 2013 Standard for Performance Rating of Commercial Refrigerated Display Merchandisers and Storage Cabinets which references ASHRAE 72 for testing. Add a subsection to the standard for the ULTs with their special requirements as to storage temperature bands and Test Simulator(s). At Draft 1 in Nov2012, the stakeholder commented that ULTs (then ULFs) should be a separate standard from the more common lab grade refrigerators and freezers.	DOE and EPA agrees with the Stakeholder and has updated the Ambient Test Conditions to mirror ASHRAE 72-2005 more closely to reduce any possible confusion. DOE understands and agrees that mirroring ASHRAE 72-2005 is preferable and has attempted to reference it directly whenever possible, but in many cases additional language is required to account for products unique to the Laboratory Grade market. DOE has attempted to make these additions to ASHRAE 72 as simple and concise as possible.

		Test Conditions	Dry-bulb and Wet-bulb Temperature	The stakeholder still feels that the average test-room dry-bulb temperature should be changed to 23.0 +/-1oC. Most manufactures present their energy consumption data with ambient temperatures lower than 24oC. Line 76-79 Question: For Dry-bulb and Wet-bulb temperature, if a single or a few temperature readings drift outside this range over a 24 hour period, is this going to invalidate the test? The stakeholder, as well as other manufacturers, feel that we should not have to change the way we test their freezers.	In all ENERGY STAR Test Methods, DOE attempts to align with current industry test methods for the covered equipment. As such, DOE has specified that ambient conditions meet the requirements in ASHRAE 72-2005. Individual temperatures are allowed to move outside of the specified range as long as the average ambient temperature over the course of the test remains within the range.
		Test Conditions	Dry-bulb and Wet-bulb Temperature	Is it permissible to measure dry bulb and RH and derive wet bulb? Offers transducer options/flexibility.	Yes, as long as measurements are still meet the accuracy requirements specified in Section 4 of the Final Test Method.
Summary		**Test Setup**	**Temperature Measurement Devices**	**Two stakeholders noted that the Temperature Measurement Devices (TMD) section allows too large a range for the TMD container volume and the UUT fill, one recommended a maximum volume of 473 mL be applied since smaller containers have less thermal diffusivity and experience more temperature variation. They also suggested that the statement "The UUT shall be filled with TMDs.." be changed to "The UUT shall have TMDs placed according to subsections 1, 2, or 3" or it appears confusing as to what the term filled means. This commenter stated that the ASHRAE 72-2005 Section 6.2 specifies this test condition and could be duplicated for this test method. They also requested clarity for the test simulators containers, content, the number of simulators and the locations, citing that they never witnessed a unit that was completely stocked with product.** **Another stakeholder requested that weighted TMDs with brass weights be used instead of containers filled with glycol and water since it leads to a more repeatable test with minimal instrumentation effort. They also stated that the text referring to TMD locations and Figure 1 are not aligned and to offer clarification. Another commenter suggested that the diagonal distance be changed from 3" to 5" to give a better representation of the chest freezer's uniformity. This stakeholder also requested clarification on the overall TMD placement procedure as units have different configurations.** **A stakeholder strongly supported that weighted TMDs are used in the test method as it is a realistic representation. This commenter suggested using a 1.5 mL tube with 0.25 to 0.5 mL of water and a small sponge, however it would be necessary to specify the exact tube to use, the exact volume of water, sponge type and size, and the purity of the water. They mentioned that water seems like a sufficient fluid for this test and that the smaller sample will be more susceptible to temperature fluctuations in the unit and testing would be useful in determining what the fluctuation is. Also, they stated that a weighted TMD will be small and light so it can be easily suspended without touching the sides of the unit. To limit the burden of weighting the TMDs, this commenter suggested reducing the number of the TMDs required, perhaps in half. They also recommended that upright freezers be tested with shelving as they are not functional without shelving.**	**DOE has updated the TMD Placement section to provide additional clarification regarding the size of the weighting container, the solution inside the container, and the number and placement of TMDs in the test unit.**
Summary		**Test Methodology**	**Cabinet Temperature Requirements**	**A stakeholder did not agree with the ULT temperature specification presented in Table 1 and recommended it be changed to +/- 2.5. They also noted that placement of probes can vary due to a large variation in freezer design and this can make a big difference in the average temperature.** **Another stakeholder requested clarification on the 2 hour running average cabinet temperature. They also suggested a defined specific average cabinet temperature range that need to be achieved throughout the door opening portion of the test to allow for fair comparison.** **Another commenter supported the replacement of the steady state requirements with the pull down requirements.**	**DOE and EPA believe that, with the addition of weights to the TMDs, units should be able to maintain an average temperature over the course of the test within the specified ranges. Furthermore, we have updated the TMD placement requirements to provide additional clarity. DOE has not increased the tolerance for internal temperature because of the potentially significant effect of internal temperature differences on rated energy use.** **The 2-hour temperature average applies only to the Pull Down period, in which the average temperature over each of two 2-hour periods must be within the specified range prior to the beginning of testing. Once testing has started, the average temperature must be within the specified range over the course of the entire test, not any individual part of it.**
Summary		**Test Methodology**	**Door Opening Requirements**	**A stakeholder noted that the changes made to testing methodology appear to be sufficient given explanations in the notes. Another stakeholder suggested adding an inner door section for the refrigerator scenario.** **A commenter also strongly suggested that repeatability could be improved by testing products without door openings as the efficiency of vapor compression systems would be reflected as well as the thermal insulation efficiency. However, if the door opening procedure is required, they requested clarification on the inner door procedure - How many inner doors will be opened? If not all, which ones?** **An additional stakeholder strongly supported the inclusion of the door openings in the test method as it will highlight the difference in energy consumption between chest and upright units. This commenter mentioned that the doors may not be open long enough in the text and to consider 30 seconds to be more representative of real world use.**	**For any given door opening, only one inner door shall be opened at a time. DOE has clarified the Door Opening requirements to reduce confusion.**
Summary		**Test Methodology**	**Energy Consumption Test**	**One stakeholder stated that the defrost adequacy test should be removed since some units will not have a defrost cycle occur at all during testing. They noted that to force a defrost to occur, the doors would have to be left open in a humid room or some humidity source would have to be introduced.**	**DOE and EPA agrees with the stakeholder and removed the Defrost Adequacy Test in the Final Draft Test Method.**

Summary		Reporting		Two commenters suggested an inclusion of test uniformity since performance characteristics can vary if uniformity is not established. A stakeholder requested reporting of temperature peak variation and stability also as these are also critical attributes for customers. A stakeholder stated that the test cabinet temperature will be higher that the specification allows since 6 doors will be open. Another stakeholder noted that Equation 1 should be clarified by adding parenthesis around the terms to show order of operation. An additional commenter strongly supported the reporting of the energy consumption numbers for freezer units for the door opening test and when the door is closed. These units are used in two extreme situations, either where daily where door openings are common or for long-term storage where door openings are uncommon, thus allowing users to compare the performance for their applications. They suggested reporting consumption in terms of kWh/day and W/cu.ft. as both are helpful values for decision making for a specific environment.	The Test Method includes reporting requirements for both Stability and Uniformity during several sections of the test, including the portion with door openings and the portion without door openings. DOE and EPA agrees with the stakeholder and has updated Equation 1 to clarify. DOE and EPA has also included reporting requirements for energy consumption during each section of the test, the portion with door openings and the portion without.
Summary		Future Considerations		A stakeholder recommended that the following be considered in this specification and in future revisions: • Impacts of variation in ambient temperature on energy consumption • ULT freezer measurements at -60°C as universities would be willing to raise the temperature ten degrees if savings are significant • Impacts of ULT freezer racks and standardization of the freezer racks for efficient use of space in freezers	DOE and EPA thank the stakeholder for their input but comment that these items are outside of the scope of the ENERGY STAR Program and are unlikely to be included in subsequent versions of the Laboratory Grade Program.