



Laboratory Grade Refrigerators and Freezers Test Procedure Discussion

Draft 2 ANSI/ASHRE 72-2005 Supplement

ENERGY STAR[®] Labeled Products Program

August 5, 2009

Test Procedure Supplement



ANSI/ASHRAE 72-2005

- Developed for commercial grade equipment, test conditions not applicable to lab operations
- ASHRAE development is an option but process is lengthy

Purpose of Supplement

- Provide a consistent, repeatable method to determine energy consumption
- Emulate real world operating conditions
- Supply end users with information to compare products based on energy efficiency and other performance factors

Activities To Date



- Stakeholder meeting held January 22
 - Identified areas of test method that require additional guidance specific to lab grade applications
- Draft 1 Supplement released April 10
 - Additional test conditions proposed based on January discussions
- Draft 2 Supplement released August 3
 - Stakeholder meeting August 5 to discuss proposal

Goals for Today's Discussion



- Identify elements that require additional discussion prior to finalizing supplement, testing products
- Review additional comments received on Draft 1
- Discuss options for developing a laboratory grade standard longer term
 - E.g., ASHRAE standard development process
- Review and comment on timeline for ENERGY STAR process

Loading Conditions – Section 6.2

- Test chamber empty, use un-weighted bare thermocouples
- Use representative shelving
 - Thermocouples should be placed on three planes located 1 inch above each shelf. Shelves should be placed in the: (1) top allowable position, (2) geometric center, (3) lowest allowable position.

Outstanding Issues



Representative Shelving

- Need to define what is “representative”
 - As shipped/sold?
 - Standard wire shelves? What is standard?
 - Different shelving for different product types?
- Additional comment re: thermocouple placement
 - Place 3” off wall for each shelf

Door Openings – Section 7.2

- Refrigerators: Each door opened **at an angle of 75° for fifteen seconds, three times per hour**, for eight consecutive hours
- Freezers: Each door opened **at an angle of 75° for thirty seconds, once per hour** for eight consecutive hours

Outstanding Issues



Freezer Openings

- Each door shall be opened **at an angle of 75° for thirty seconds, once per hour** for eight consecutive hours
 - Suggestion made to revise to 15 seconds
- EPA interested in choosing the time period that best emulates lab usage

Defrost – Section 7.3

- Test period must be at least 24 hours with a minimum of 2 defrost cycles
- For test periods longer than 24 hours, manufacturer should derive kWh/day by dividing total hour duration by 24

Outstanding Questions



- How do manufacturers address units with only 1 defrost cycle under typical operations?
- Manual defrost units excluded by test method
 - Any concerns with this exclusion?

Temperature Measurement

- After steady state conditions, the ambient, the test simulator temperatures, and all other data shall be recorded at **three-minute intervals** beginning at the start of the defrost period, through the defrost period, and through the running cycle until the beginning of the next successive defrost period

Outstanding Issues



- Suggestion to change to five minute intervals
 - Avoid issues with data overflow on validations

Temperature Uniformity Test

- Measurements taken during energy consumption test over a 3-hour period while door is closed at 3-minute intervals
- Test period must **not** include defrost cycle

Outstanding Issues



Temperature Uniformity – Reporting Method

- Option 1: Use standard deviation formula below and multiply the result by 3 to get 3 standard deviations of the average of all interval standard deviations, where:
 - N = number of data points
 - X = average of all data points
 - X_i = data for individual data point at any particular time

$$s_N = \sqrt{\frac{1}{N} \sum_{i=1}^N (x_i - \bar{x})^2}$$

Outstanding Issues *cont.*



Reporting Method *cont.*

- Option 2: Manufacturers report the minimum and maximum temperature during test period
- One suggestion to use Option 2 but also require the following:
 - Average Temperature – the average of all test simulator temperatures recorded shall be calculated
 - Coldest Test Simulator Average – the test simulator with the coldest recorded average temperatures
 - Warmest Test Simulator Average – the test simulator with the warmest recorded average temperatures
 - Warmest Test Simulator – the maximum temperature of the test simulator with the warmest peak temperature
 - Coldest Test Simulator – the minimum temperature of the test simulator with the coldest peak temperature

Set Point Temperatures

Product Type	Integrated Average Temperature
General Purpose Laboratory Refrigerators	5 degrees \pm 3 degrees C
Blood Bank Refrigerators	5 degrees \pm 3 degrees C
Pharmacy and Chromatography Refrigerators	5 degrees \pm 3 degrees C
General Purpose Laboratory Freezers	-20 degrees \pm 5 degrees C
-30 Freezers	-30 degrees \pm 5 degrees C
-20 Freezers	-20 degrees \pm 5 degrees C

Outstanding Issues



Integrated Average Temperature Concerns

- Requirements may be too tight for basic lab applications
- Temperatures as proposed may not support industry standards for product storage

Additional Draft 2 Elements



- Stakeholder support for:
 - All manually controlled accessories that come standard with the equipment must be installed and turned to the “ON” position during testing
 - Supplement only covers semi-automatic and automatic units

Additional Comments



- Some confusion about equipment needed to measure temperature and humidity
 - The test method only outlines the specifications required, not the approach/equipment used
 - Reference to wet/dry bulb provided for purposes of making sure testing is within chart
 - Many manufacturers are using electronic sensors
- Suggestions made to delete certain sections of the ANSI/ASHRAE
 - EPA does not have authority to revise test standard
 - Some sections (e.g., remote refrigeration) may not apply

Additional Comments *cont.*



- Suggestion made to require inner doors that come standard with unit to be tested using same criteria as outer doors
 - Does this apply to general purpose, -20, -30 units?
 - If so, would need to require sequential openings
- Question about inclusion of combination units
 - How prevalent are these products types?

Additional Comments *cont.*



- Additional reporting requirements
 - kWh/day and integrated average temperature
 - EPA should create a standard reporting template
- Also require electrical safety mark by a third party (UL, ETL, CSA, etc.) and units must meet UL 471 Standard for Commercial Refrigerators and Freezers
 - Is safety certification a concern?
 - Does UL 471 apply to lab grade applications?



Options for Standardization

- Create a new section within ANSI/ASHRAE 72 to reflect new conditions
 - This supplement could be used as a starting point
- Govt. entities can also request ASHRAE to develop a new test standard
 - Opportunity to have separate lab grade standard
- ASHRAE process is lengthy
 - Best scenario would be July/August 2010 before a test standard could be made available
 - Shorter term, use this supplement for testing

Proposed Schedule



- August 17: Comments due on Draft 2
- September 17: Final supplement released
- Sept. 17 – January 15: Testing and data collection
 - January 22: Decision made whether to move forward
- February 11: Draft 1 specification released
 - Stakeholder meeting in late February
- Early March: Draft 1 comments due to EPA
- April: Draft 2 specification released
- May/June: Potentially have final new spec

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