3. PROJECT 3: DEHUMIDIFICATION PERFORMANCE ADVANCED SYSTEM RESEARCH

3.1 Executive Summary

Overview

Energy-efficient houses in warm, humid climates have low sensible heat gain. Low sensible heat gain is good for reducing cooling costs, but contributes to part load moisture control challenges. Especially during Spring and Fall seasons, as well as rainy periods and summer nights, there are a significant number of hours where little or no sensible cooling is needed but moisture removal is still needed due to internal moisture generation and outside air exchange. Conventional cooling equipment is equipped mostly for reducing air temperature (sensible cooling), with only about 20 to 30 percent of its capacity typically designed for removing moisture (latent cooling). This results in periods of high indoor relative humidity.

Enhanced space conditioning equipment can slow the indoor fan and stage the compressor to remove more moisture while the system is cooling for longer periods, but, regardless, it continues to cool in order to dehumidify. In efficient, low heat gain houses in warm-humid climates, when no cooling is needed but moisture removal alone is needed, the solution has been to employ systems that can remove moisture while supplying room neutral temperature or warmer air. That has been in the form of stand-alone dehumidifiers, or dehumidifiers integrated with the central space conditioning system, or central cooling systems with condenser reheat capability.

There is a significant lack of performance information to characterize these equipment options in residential buildings. The Building America Program has been obtaining some performance data through field and laboratory testing. Current standards for performance ratings, and methods of test, do not account for a wide enough range of test conditions to allow a designer or analyst to know what to expect for moisture removal capacity and moisture removal efficiency over a range of operating conditions and operating states. The goal of this project is achieve an industry-based standard for rating residential dehumidifier performance with a large enough set of test conditions to allow designers to understand the expected performance and correctly apply the right equipment in the field. It is also anticipated that more test conditions will enable better performance mapping of the equipment for better energy and humidity control modeling of high-performance buildings.

Key Results

Currently, we have drafted both a performance rating standard and a method of test standard. These documents need to be refined under the guidance of an AHRI committee for the performance rating, and under the guidance of an ASHRAE committee for the method of test. Contacts have been made in both organizations and efforts will continue to see the committees formed and progressing with these documents. There is support for this from industry and manufacturing partners.

Gate Status

The following sections evaluate the research project results based on performance benefits and the ability to develop performance specifications for advanced systems.

1. *Source Energy Savings and Whole Building Benefits (“must meet”)*

This project meets the Gate 1B "must meet" requirement for source energy savings. The performance rating standard will assist HVAC system designers to properly apply dehumidification systems in the most efficient ways.

2. Performance-Based Code Approval ("must meet")

This project meets the Gate1B "must meet" requirement for performance-based safety, health and building code requirements for new homes. The system is fully compliant with all relevant performance-based codes.

3. Prescriptive-Based Code Approval ("should meet")

This project meets the Gate1B "should meet" requirement for prescriptive-based safety, health and building code requirements for new homes. The system is fully compliant with all relevant prescriptive-based codes.

4. Cost Advantage ("should meet")

This project meets the Gate 1B "should meet" requirement for strong potential to provide cost benefits relative to current systems. A dehumidification system tested to a new expanded performance rating standard may have a slightly higher first cost, but should provide operating cost benefits through more appropriate application of the system and knowledge of its dehumidification efficiency under multiple operating conditions.

5. Reliability Advantage ("should meet")

Compared to products not tested to an expanded set of test conditions, products tested to and expanded performance rating standard should more likely meet the Gate 1B "should meet" requirement to meet reliability, durability, ease of operation, and net added value requirements for use in new homes.

6. Manufacturer/Supplier/Builder Commitment ("should meet")

This project meets the Gate 1B "should meet" requirement of manufacturer commitment since manufacturing partners are helping to push the new performance rating standard forward through AHRI.

7. Gaps Analysis ("should meet")

Current gaps for this project include:

a) getting the right mix of people together between AHRI and ASHRAE to benefit from the proponents of related existing performance rating standards and methods of test so as to gain from their experience;

b) achieving consensus among participants concerning the appropriate information to include in either a performance rating or a method of test; and

c) achieving consensus on how many and what standard test conditions should be included.

We see no major market barriers to this project, but minor market barriers could include trying to broaden the standard to include desiccant dehumidifiers and standard cooling systems that are not dedicated dehumidifiers but cool to dehumidify.

Conclusions

The goal of this project is to reach publication of a new performance rating standard and method of test standard to facilitate appropriate application of residential dehumidifiers in high-performance homes. This will provide accurate means to compare multiple efficient and cost effective paths to control indoor humidity in homes, year round, yielding confidence to continue pushing ahead with efficiency improvements that reduce sensible cooling load. The efforts made toward establishing a coherent industry based performance rating and method of test standard will continue and will yield long-term benefits due to quantifiable and appropriate application of whole-building dehumidification systems for high-performance homes. Realistic performance maps can also be developed from more detailed test data to support accurate modeling efforts.

Research Approach and Results to Date

3.1.1. New Standard Test Conditions

BSC has been leading the effort on behalf of the Building America Program to achieve an industry-based standard for rating residential dehumidifier performance. The process started by developing a rationale and specification for more test conditions than what current standards call for. These recommended new test conditions are listed in Tables 3.1 thru 3.3.

Referring to Table 3.1, the Test 1a to 1c outdoor and indoor conditions are intended to represent summer peak cooling conditions in warm- humid climates. The Test 2a to 2c outdoor and indoor conditions are intended to represent summer off-peak cooling conditions, such as during summer nights and overcast or rainy periods. The Test 3a to 3c outdoor and indoor conditions are intended to represent spring/fall off-peak cooling conditions when the outside temperature is close to room temperature but the outdoor still humidity remains high. The Test 4a to 4c outdoor and indoor conditions are intended to represent winter periods in warm-humid climates when the outside air temperature is lower than room temperature but the outdoor humidity remains above indoors.

	Outdoor T/RH/Tdp (F/%/F)	Inlet T/RH/Tdp (F/%/F)	Outlet T/RH/Tdp (F/%/F)	Indoor Wet-coil Airflow (cfm)	Sensible Cooling Capacity[1] (Btu/h)	Latent Cooling Capacity (Btu/h)	Moisture Removal Capacity (L/h)	Total Power (kW)	Moisture Removal Efficiency[2] (L/kW-h)
Test 1a	95/58/78	80/60/65							
Test 1b	""	78/55/61							
Test 1c	""	75/50/55							
Test 2a	80/85/75	80/60/65							
Test 2b	""	78/55/61							
Test 2c	""	75/50/55							
Test 3a	75/85/70	78/60/63							
Test 3b	""	78/55/61							
Test 3c	""	75/50/55							
Test 4a	65/90/62	72/60/57							
Test 4b	""	70/52/52							
Test 4c	""	68/45/46							

[1] Negative cooling capacity denotes net heat added from inlet to outlet

[2] Same units as the USDOE and USEPA Energy Factor for dehumidifiers

[3] All tests with steady wet coil

Table 3.1: Recommended new standard test conditions and reporting results, for rating residential dehumidifier performance, for units with both indoor and outdoor heat transfer components

Referring to Table 3.2, the Test 1 to 7 indoor conditions are intended to represent a range of indoor temperature and humidity combinations commonly found in warm-humid climates. The range extends from the AHAM test conditions of 80 F and 60% RH for dehumidifiers to conditions representing wintertime in warm-humid climates where dehumidification may be used to address interior window condensation.

	Inlet T/RH/Tdp (F/%/F)	Outlet T/RH/Tdp (F/%/F)	Indoor Wet-coil Airflow (cfm)	Sensible Cooling Capacity (Btu/h)	Latent Cooling Capacity[1] (Btu/h)	Moisture Removal Capacity (L/h)	Total Power (kW)	Moisture Removal Efficiency[2] (L/kW-h)
Test 1	80/60/65							
Test 2	78/60/63							
Test 3	78/55/61							
Test 4	75/50/55							
Test 5	72/60/57							
Test 6	70/52/52							
Test 7	68/45/46							

[1] Negative cooling capacity denotes net heat added from inlet to outlet

[2] Same units as the USDOE and USEPA Energy Factor for dehumidifiers

[3] All tests with steady wet coil

Table 3.2. Recommended new standard test conditions and reporting results, for rating residential dehumidifier performance, for units with only indoor heat transfer components

Referring to Table 3.3, the Test 1 to 4 indoor conditions are intended to represent a range of temperature and humidity combinations commonly found when controlling basement moisture.

	Inlet T/RH/Tdp (F/%/F)	Outlet T/RH/Tdp (F/%/F)	Indoor Wet-coil Airflow (cfm)	Sensible Cooling Capacity[1] (Btu/h)	Latent Cooling Capacity (Btu/h)	Moisture Removal Capacity (L/h)	Total Power (kW)	Moisture Removal Efficiency[2] (L/kW-h)
Test 1	65/50/46							
Test 2	65/60/51							
Test 3	70/50/51							
Test 4	70/60/56							
[1] Negative cooling capacity denotes net heat added from inlet to outlet								
[2] Same units as the USDOE and USEPA Energy Factor for dehumidifiers								
[3] All tests with steady wet coil								

Table 3.3. Recommended new standard test conditions and reporting results, for rating residential dehumidifier performance, for basement units

3.1.2. Modifying AHRI Standard 210/240

Initially, the intention was to restrict the scope of the new rating performance standard to electrically operated refrigerant vapor compression systems, either dehumidifier systems that were independent of a central cooling system or part of a central cooling system. In other words, it would be for any equipment that dehumidifies (AC systems) or dedicated dehumidification equipment (dehumidifiers).

AC systems may have enhanced dehumidification capability through the common method of lowering evaporator fan speed, to the newer methods of condenser reheat (subcooling only, or with partial or full condensing). AC systems that just lower evaporator fan speed would still provide more than 60% of the total cooling capacity as sensible cooling, having outlet air colder than inlet air. AC systems with process air condenser reheat could adjust the outlet air temperature to be colder, equal to, or warmer than inlet air. In the case where outlet air was warmer than inlet air, a negative sensible cooling capacity would be recorded, meaning that heat was added to the process air.

Because conventional AC systems would be included in the new residential dehumidifier performance rating standard, the AHRI Standard 210/240 "Performance Rating Of Unitary Airconditioning and Airsource Heat Pump Equipment" was first considered to be the base standard to work from. The AHRI Standard 210/240 was then modified to redact unnecessary portions and to add new portions, including the new standard test conditions given in Tables 3.1 to 3.3. A draft of that document is provided in Section 0.

3.1.3. Modifying ASHRAE Standard 37

Upon presenting a draft of the approach to modify AHRI Standard 210/240 to the Building America Working Group, there was a strong suggestion that the new standard should be a method of test (MOT) standard rather than a rating standard. There was also a strong suggestion that the new dehumidifier standard should be inclusive of desiccant dehumidifiers. ASHRAE Standard 37 is the primary MOT relied upon by AHRI 210/240. It

already covered much of what we wanted to describe for unitary AC equipment. So, that led to another draft dehumidifier performance standard derived from modifying ASHRAE Standard 37 "Methods of Testing for Rating Electrically Driven Unitary Air-Conditioning and Heat Pump Equipment." A draft of that document is provided in Section 3.4.2.

At that point, the developing standard was a method of test (not a rating) to cover all residential equipment that removes moisture from process air. Basically, using the air-enthalpy method, keeping track of moisture removal, sensible cooling, net sensible heat added if applicable, and energy consumption, all at multiple specified environmental operating conditions.

In terms of a rating, based on overall annual energy use prediction, the thinking was that the method of test could provide data to complete equipment performance maps that could be input into annual simulations for rating purposes.

3.1.4. Building America Expert Meeting on "Residential Dehumidifier Performance: Modeling, Lab Testing, And Method Of Test Development"

BSC held a Building America Expert Meeting on the topic, "Residential Dehumidifier Performance: Modeling, Lab Testing, And Method Of Test Development." The meeting was held on Friday morning, 6/19/2009 in Louisville in advance of the ASHRAE Summer Annual Meeting technical program.

The objective of the session was to present and discuss recent developments in modeling and lab testing of residential dehumidification equipment, as well as ongoing efforts to develop a standard method of test. TRNSYS was the primary modeling platform presented. The goal was to provide Building America teams with necessary tools and performance information to make informed choices in the design and application of dehumidification in net-zero energy homes.

The following are key points addressed at this meeting:

1. In order to develop a building simulation model for any HVAC system, a performance map must created from either measured data or a more detailed equipment model. Regression analysis or lookup tables are generally the most common approach to accomplish this task. In addition, many HVAC systems inherently include control algorithms that describe how the system responds to the building loads and operating conditions.

2. There are different data needs for simulating various systems: 1) stand alone dehumidifiers, 2) spilt system dehumidifiers, 3) air conditioners with enhanced dehumidification features, and 4) dedicated outdoor air systems that pre-treat ventilation air. Each control state must be characterized. The specific needs for laboratory measured data will be discussed including the range of data needed and how these needs could fit into a method of test (MOT).

3. Current HVAC equipment EER & SEER test methods do not include accurate evaluations of dehumidification performance. This motivates laboratory evaluation at a wider range of test conditions to develop performance maps. NREL has begun a program of laboratory performance testing the dehumidification performance of residential HVAC equipment. The data will illuminate energy simulations and allow better comparisons between divergent technologies for Net-Zero Energy Homes. Recent experimental results will be presented to show laboratory capabilities and difficulties in obtaining test data at the proposed matrix of test conditions.

4. A standard method of test (MOT) is needed to better evaluate and compare the performance of residential dehumidification equipment, and to eventually allow more detailed modeling toward a standard rating. Testing dehumidification equipment at a number of environmental conditions is critical. Ongoing work has produced a preliminary draft MOT. ASHRAE TC 8.10 may be willing to sponsor a new SPC to pursue this formally. With an industry consensus MOT in place, resultant test data would feed into detailed modeling to allow development of a new rating standard.

A full summary report on the meeting is provided in Section 3.4.3. An important outcome of that meeting towards achieving an industry based standard on residential dehumidifier performance was guidance on how to improve the draft MOT derived from ASHRAE Standard 37.

3.1.5. Meetings with ASHRAE Technical Committees

Both ASHRAE Technical Committee (TC) 8.12 Desiccant Dehumidification Equipment & Components and TC 8.10 Mechanical Dehumidification Equipment and Heat Pipes provided time for BSC to discuss the intentions and progress of the new draft dehumidification performance standard. After meeting with both committees, a number of things became clear:

1. The focus of those committees was primarily for commercial equipment. Residential equipment was a low priority.

2. There was a lot of new work going on with dehumidification standards (both MOT and Ratings). A number of draft standards were in progress for pool dehumidifiers, dedicated outdoor air systems, and desiccant dehumidifiers. What we were doing was probably overlapping in a number of ways with what was currently in progress in ASHRAE committees.

3. TC 8.10 minimized the need for a new MOT standard for dehumidifiers. There was a strong suggestion, amidst some opposition, that an MOT should not cover test conditions but just the methods of performing the tests. A new Rating standard would be needed to expand standard test conditions, and the Air-conditioning, Heating, and Refrigeration Institute (AHRI) would be the entity responsible for that. Since the primary reason for developing the new dehumidifier standard was to expand the number or test conditions (state points) it was agreed that BSC would focus on working with AHRI on this project rather than ASHRAE. A few of the TC membership from the dehumidifier industry offered to help with coordinating an AHRI committee on the subject.

3.1.6. Summary of Rating and MOT Standards Related to Dehumidification

After the Building America Expert Meeting and the meetings with the ASHRAE technical committees, it became clear that there was a need to organize all the dehumidification related standards, whether existing or in progress, or whether a rating or a method of test. Tables 4 through 8 provide that information, grouped by major topic area. There are still some gaps in information regarding some of the AHRAE and AHRI works-in-progress that need to be understood.

3.2 Next Steps

The next steps in this process include working closely with AHRI to come to a conclusion concerning whether the new dehumidifier performance standard should be a AHRI rating or

an ASHRAE MOT. If AHRI agrees to develop a new rating standard, it would need to form a committee which would be responsible for developing the new standard. The experience we have gained and the contacts we have made should make that process move more quickly and smoothly next year.

Standard	Title	Purpose/Scope Other/Comments
ANSI/AHAM DH-1-1992/1986 Rating	Dehumidifiers	Purpose: This standard establishes a uniform, repeatable procedure for measuring the capacity and energy input of dehumidifiers under specified test conditions. Scope: This standard applies to dehumidifiers as defined in 3.1 and includes definitions, performance test procedures, and safety. 3.1 Se1f-Contained, Electrically-operated, Mechanically-Refrigerated Dehumidifier. Other: Single test condition: Dry-bulb temperature 80F (26.7C), Wet-bulb temperature 69.6F (20.9C), Relative humidity 60% 6 hour steady state test
CAN/CSA-C749-1994 Rating (Based on ANSI/AHAM DH-1)	Performance of Dehumidifiers	This Standard specifies performance requirements for factory made dehumidifiers having a rated daily water-removal capacity of up to 30 L (63.4 US pints). Included are uniform procedures for measuring the (a) capacity; and (b) minimum energy factor (EF).

Table 3.4. Standards on Dehumidifiers

Standard	Title	Purpose/Scope Other/Comments
ASHRAE 190 MOT (draft)	Method of Testing for Rating Indoor Pool Dehumidifiers for Moisture Removal Capacity and Moisture Removal Efficiency	Purpose: The purpose of this standard is to prescribe test methods for determining the moisture removal and efficiency for indoor pool dehumidifiers. Scope: This Standard (a) established uniform methods of testing to obtain rating data; (b) specifies test equipment for performing such tests; (c) specifies data required and calculation to be used; and (d) list and defines the terms used in testing. For purposes of this standard, indoor pool dehumidifiers are defined as equipment to provide the function of dehumidifying , air circulation, air reheating and may include the function of air cooling, air filtration, pool water heating and air-to-air heat recovery.

ARI 910-2006	Performance of Indoor Pool Dehumidifiers	Purpose: The purpose of this standard is to establish for Indoor Pool Dehumidifiers: definitions; classifications; test requirements; rating requirements; minimum data requirements for Published Ratings; operating requirements; marking and nameplate data; and conformance conditions. Scope: This standard applies to factory-made residential, commercial and industrial Indoor Pool Dehumidifiers, as defined in Section 3. This standard applies to **electrically operated, vapor-compression refrigeration systems**. 3.2 Indoor Pool Dehumidifier. A type of air-cooled or water-cooled electrically operated, vapor compression refrigeration system; factory assembled as a single package or split system, which includes an indoor cooling/dehumidifying coil, an air reheat coil, compressor(s) and an air moving device. It may also include a Refrigerant Heat Recovery Unit, an auxiliary refrigerant condenser, Economizer, and an air-to-air heat recovery device. It shall provide the function of dehumidifying, air circulation, air reheating and may include the function of air-cooling, air-cleaning, pool water heating and air-to-air heat recovery.

Table 3.5. Standards on Pool Dehumidifiers

Standard	Title	Purpose/Scope Other/Comments
ASHRAE 174 MOT (Draft)	Method of Test for Rating Desiccant Based Dehumidification Equipment	Purpose: This standard provides test methods for rating the performance of desiccant based dehumidification equipment. Scope: This method of test applies to dehumidification equipment operating at atmospheric pressure using desiccants combined with other components to produce dehumidified air that is to be provided to a conditioned space.
ARI 940-1998 Rating	Dehumidification Components (Relies on 174 MOT)	Includes multiple test conditions. According to Harry Milliken presentation, when combining Std 940 test conditions with Std 340/360 (commercial unitary equip.), up to 25% outside air can be accommodated before needing dedicated outside air unit. Purpose. The purpose of this standard is to establish for thermally regenerated dynamic desiccant dehumidification components: definitions; classification requirements for testing and rating; minimum data requirements for published ratings; marking and nameplate data; and conformance conditions. Scope. This standard applies to factory manufactured, thermally regenerated, dynamic desiccant components operating at atmospheric pressure as defined in Section 3. Only the desiccant containing component is subject to this standard. Blowers, heat exchangers, evaporative coolers, drive motors, etc. are not rated within this standard, but may be subject to other ARI standards.

Table 3.6. Standards on Desiccant Dehumidification Equipment

Standard	Title	Purpose/Scope Other/Comments
AHRI 220P (or 920P, the document uses both, 920 also	DX Dedicated Outside Air Systems – Testing and	Purpose. The purpose of this standard is to establish for Dedicated Outside Air Systems: definitions; symbols and constants; classifications; test requirements; rating requirements; minimum data requirements for Published Ratings; operating

shows up as a standard on solar hot water)	Rating for Performance	requirements; marking and nameplate data; and conformance conditions. Scope. This standard applies to factory-assembled commercial or industrial Dedicated Outside Air Systems as defined in Section 3. Applicability. ARI Standard 210/240, ARI Standard 340/360, and ANSI/ARI/ASHRAE ISO Standard 13256-1 shall not apply to commercial or industrial equipment covered by this Standard. Energy Source. This standard applies to equipment that includes **electrically operated, vapor-compression refrigeration systems**. Installation. Dedicated Outside Air Systems are intended for ducted or non-ducted installation with field or factory supplied grilles.
ASHRAE 198 or 190??? MOT (used by ARI 910)	DX DOAS Equipment	Need to get copy of this. Check with Harry/Craig/Keith at Desert Aire

Table 3.7: Standards on Dedicated Outdoor Air Systems (DOAS)

Standard	**Title**	**Purpose/Scope Other/Comments**
ARI 210/240-2006 Rating	Performance Rating Of Unitary Airconditioning and Airsource Heat Pump Equipment	Purpose: The purpose of this standard is to establish, for Unitary Air-Conditioners and Air-Source Unitary Heat Pumps: definitions; classifications; test requirements; rating requirements; minimum data requirements for Published Ratings; operating requirements; marking and nameplate data; and conformance conditions. Scope: This standard applies to factory-made Unitary Air-Conditioners and Air-Source Unitary Heat Pumps as defined in Section 3. 3.1 Air-Source Unitary Heat Pump. One or more factory-made assemblies which normally include an indoor conditioning coil(s), compressor(s), and outdoor coil(s), including means to provide a heating function. They shall provide the function of air heating with controlled temperature, and may include the functions of air-cooling, air-circulating, air-cleaning, dehumidifying or humidifying. 3.16 Unitary Air-Conditioner. One or more factory-made assemblies which normally include an evaporator or cooling coil(s), compressor(s), and condenser(s). Either alone or in combination with a heating plant, the functions are to provide air-circulation, air cleaning, cooling with controlled temperature and dehumidification, and may optionally include the function of heating and/or humidifying.
ASHRAE 37-2005 MOT	Methods of Testing for Rating Electrically Driven Unitary Air-Conditioning and Heat Pump Equipment	Purpose: The purpose of this standard is to provide test methods for determining the cooling capacity of unitary air-conditioning equipment and the cooling or heating capacities, or both, of unitary heat pump equipment. Scope: This standard applies to **electrically driven mechanical-compression** unitary air conditioners and heat pumps consisting of one or more assemblies that include an indoor air coil(s), a compressor(s), and an outdoor coil(s).
ARI 310/380-2004 Rating	Standard For Packaged Terminal Air-	Purpose. The purpose of this Standard is to establish the following for packaged terminal air-conditioner and heat pump equipment: test requirements, rating requirements, minimum

	Conditioners And Heat Pumps	data requirements for published ratings, operating requirements, marking and nameplate data, and conformance conditions. Scope. This Standard applies to factory-manufactured residential, commercial, and industrial packaged terminal air-conditioners and heat pumps as defined in Clause 3.
AHRI 340/360-2007	Performance Rating of Commercial and Industrial Unitary Air-Conditioning and Heat Pump Equipment	

3.8. Standards on Unitary Cooling and Heat Pump Equipment

3.3 Conclusions/Remarks

The goal of this project is to reach publication of a new performance rating standard and method of test standard to facilitate appropriate application of residential dehumidifiers in high-performance homes. This will provide accurate means to compare multiple efficient and cost effective paths to control indoor humidity in homes, year round, yielding confidence to continue pushing ahead with efficiency improvements that reduce sensible cooling load. The efforts made toward establishing a coherent industry based performance rating and method of test standard will continue and will yield long-term benefits due to quantifiable and appropriate application of whole-building dehumidification systems for high-performance homes. Realistic performance maps can also be developed from more detailed test data to support accurate modeling efforts.

Currently, we have drafted both a performance rating standard and a method of test standard. These documents need to be refined under the guidance of an AHRI committee for the performance rating, and under the guidance of an ASHRAE committee for the method of test. Contacts have been made in both organizations and efforts will continue to see the committees formed and progressing with these documents. There is support for this from industry and manufacturing partners.

3.4 Appendices

3.4.1. Standard for Performance Rating Of Electrically Operated Dehumidifying Equipment (DRAFT); adapted from AHRI Standard 210/240

3.4.2. Method of Testing for Residential Dehumidifiers for Moisture Removal (DRAFT); adapted from ASHRAE Standard 37

3.4.3. Final Report on the Expert Meeting for “Residential Dehumidifier Performance: Modeling, Lab Testing, And Method Of Test Development”