Advanced Testing for Innovative Design

Norman Asbjornson Innovation Center

AAON®

Norman Asbjornson Innovation Center

The Norman Asbjornson Innovation Center (NAIC) solidifies AAON as the technological leader in high performance HVAC equipment. Since the groundbreaking of the research and development lab in February 2016, construction crews have been working round-the clock on bringing this vision to life – with an expected completion and official opening in Fall 2018.

The NAIC is a 65 foot tall 134,000 square foot laboratory marvel able to measure both acoustics and thermal performance. A few features of the lab include supply, return, and outside sound testing at actual load conditions, testing of up to a 300 ton air conditioning system, testing of up to a 540 ton chiller system, and 80 million Btu of gas heating test capacity. Environmental application testing capabilities include -20°F to 140°F testing conditions, up to 8 inches per hour rain testing, up to 2 inches per hour snow testing, and up to 50 mph wind testing.

Water-Source Heat Pump Test Chamber Interior

Test Chambers

The Norman Asbjornson Innovation Center consists of ten testing chambers allowing AAON to meet and maintain AHRI (Air-Conditioning Heating and Refrigeration Institute) and DOE (Department of Energy) certification, and solidifying the company's industry position as a technological leader in the manufacturing of HVAC equipment. This is the only lab in the world able to measure the supply, return, and outside sound under actual load conditions. The 540 ton sound and psychrometric test chamber is isolated into three different sections for supply, return, and outside sound measurement. Furthermore, the testing chamber is able to measure the efficiency by which energy is converted into heating, cooling, or air movement.

NAIC Facility Construction Facts

Basic Information	
Building Info:	Location - AAON Headquaters, Tulsa, OK
	Three Stories – 65 ft Tall
	75,000 ft² Footprint – 327 ft (North & South) by 230 ft (East & West)
	Facility Chilled Water Capacity = 960 tons
	Facility Electrical Capacity = 13.2 kVA

Number of Man Hours for Construction
277,000+

Number of Workers involved in the Construction
200+ workers

Expected number of AAON lab employees who will work in the Norman Asbjornson Innovation Center	
48 by the end of 2018	80 by the end of 2022

Estimated Materials	
Reinforcing Steel	**278 tons** (556,000 lbs)
Structural Steel	1,224 tons
Concrete	6,520 cubic yards
Imported Select Fill for Building Pad	8,000 cubic yards
Imported Rock Base Under 1st Floor	5,600 tons

Factory Witness Testing

Factory witness testing is now available to order for all test chambers. Watch your units tested at the real world conditions of your application or at AHRI/ASHRAE/ISO test standard conditions. See firsthand the capabilities of AAON equipment in the beautifully designed lab facilities of the Norman Asbjornson Innovation Center.

Witness Testing Conference Room

Benefits of NAIC Testing

- Verify Capacity and Efficiency before Equipment Installation
- Verify Acoustical Performance at Actual Application Conditions
- Eliminate Risk and Costly Job Site Modifications
- Save Time at Startup

NAIC Testing Scheduling

Scheduling of witness testing is subject to the NAIC test chamber availability and is independent of the AAON production schedule. AAON unit testing dates can be scheduled after an order is entered. For witness testing, any punch list items or other work required by witnesses will require the unit to go back to AAON production for rework.

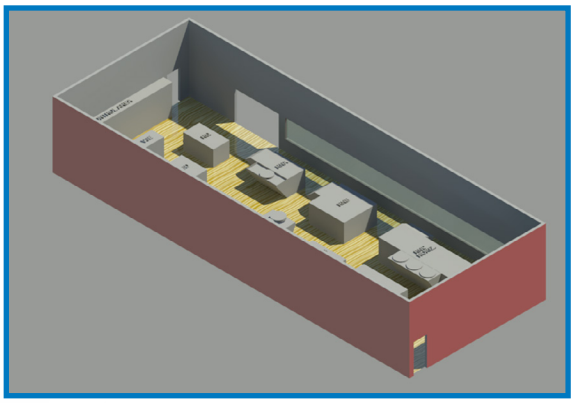
540 ton Test Chamber Interior

Sound and Airflow Testing + Optional Performance Testing

Sound and airflow testing, with optional performance testing is available and will consist of installing the unit into the three-room sound and performance chamber, ducting and sealing as required through the floor of the outdoor room into the discharge room and into the inlet room. Airflow will be measured between the discharge room and inlet room and inlet, outlet and radiated sound will be measured simultaneously. Sound power measurements will be presented in 1/3 octaves and full octaves.

Product Showcase Room

AAON products are beautifully displayed in a dedicated Product Showcase Room within the NAIC. You can tour the latest AAON equipment and HVAC designs to see what makes AAON stand out from the competition. Nearby, a conference room is available for meetings and use during witness testing.



Product Showcase Room

Psychrometric Test Chambers

10 ton Cooling Capacity Over/Under Psychrometric Chambers - Two North or Two South Chambers		
Indoor Room	Cooling Cap. (tons)	20
	Test Airflow (cfm)	5,000
	DB Range (°F)	40-130
	DB Stability (°F)	± 0.2 °F DB
	RH Range (%)	10-80
	RH Stability	± 0.9 °F WB
	Height	18 feet
Outdoor Room	Cooling Cap. (tons)	13
	Test Airflow (cfm)	10,000
	Code Tester Stability (%)	± 1
	DB Range (°F)	-20-130
	DB Stability (°F)	±0.2
	RH Range (%)	10-90
	RH Stability	± 0.9 °F WB
	Height	24 feet
Power	230V 3Ph Max Amps	235
	460V 3Ph Max Amps	117
Indoor/Outdoor chambers may be used as two separate 10 ton testing chambers		

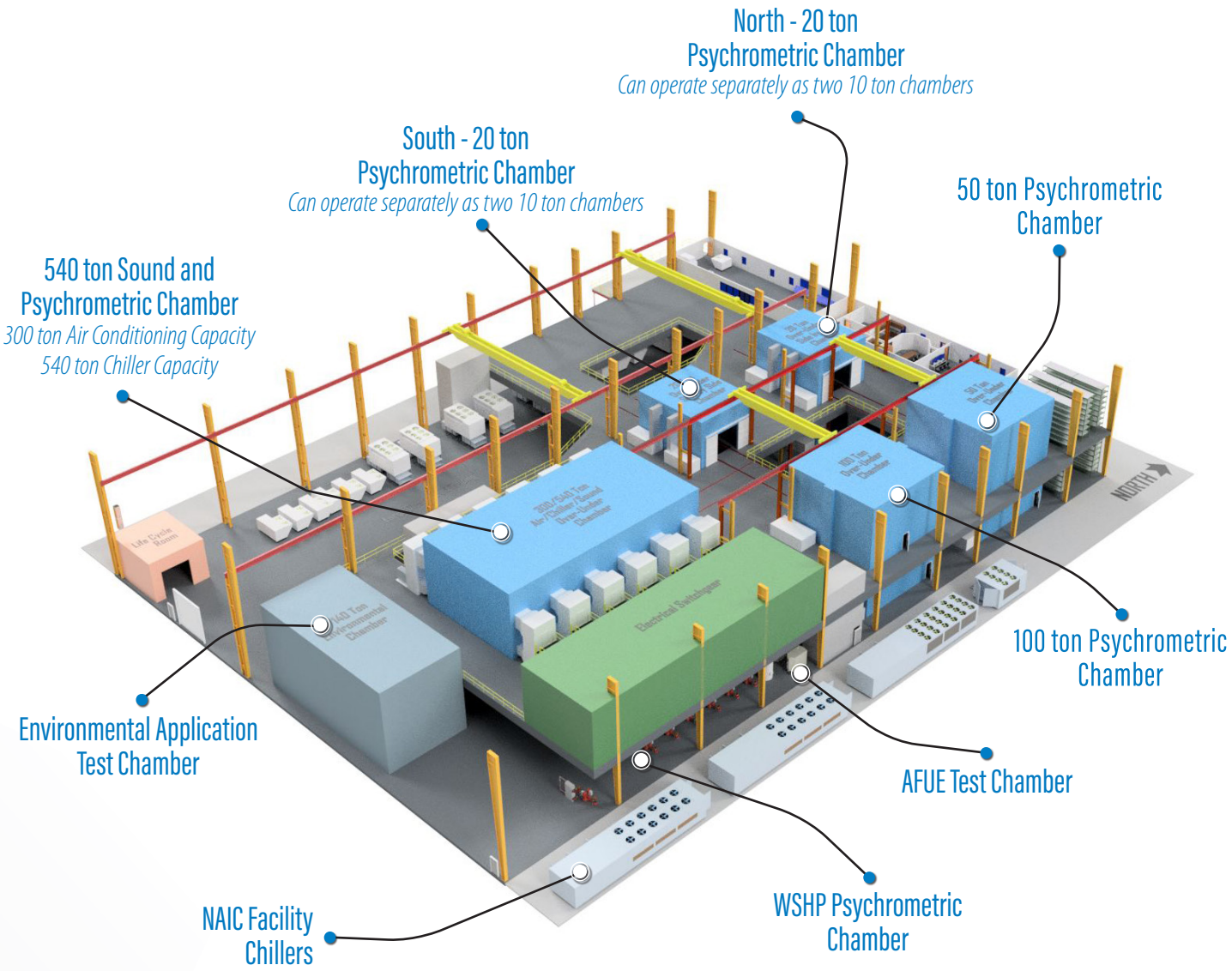
20 ton Cooling Capacity Over/Under Psychrometric Chambers - North or South		
Indoor Room	Cooling Cap. (tons)	20
	Test Airflow (cfm)	10,000
	DB Range (°F)	40-130
	DB Stability (°F)	± 0.2 °F DB
	RH Range (%)	10-80
	RH Stability	± 0.9 °F WB
	Height	18 feet
Outdoor Room	Cooling Cap. (tons)	26
	Test Airflow (cfm)	20,000
	Code Tester Stability (%)	± 1
	DB Range (°F)	-20-130
	DB Stability (°F)	±0.2
	RH Range (%)	10-90
	RH Stability	± 0.9 °F WB
	Height	24 feet
Power	230V 3Ph Max Amps	470
	460V 3Ph Max Amps	235
Indoor/Outdoor chambers may be used as two separate 10 ton testing chambers		

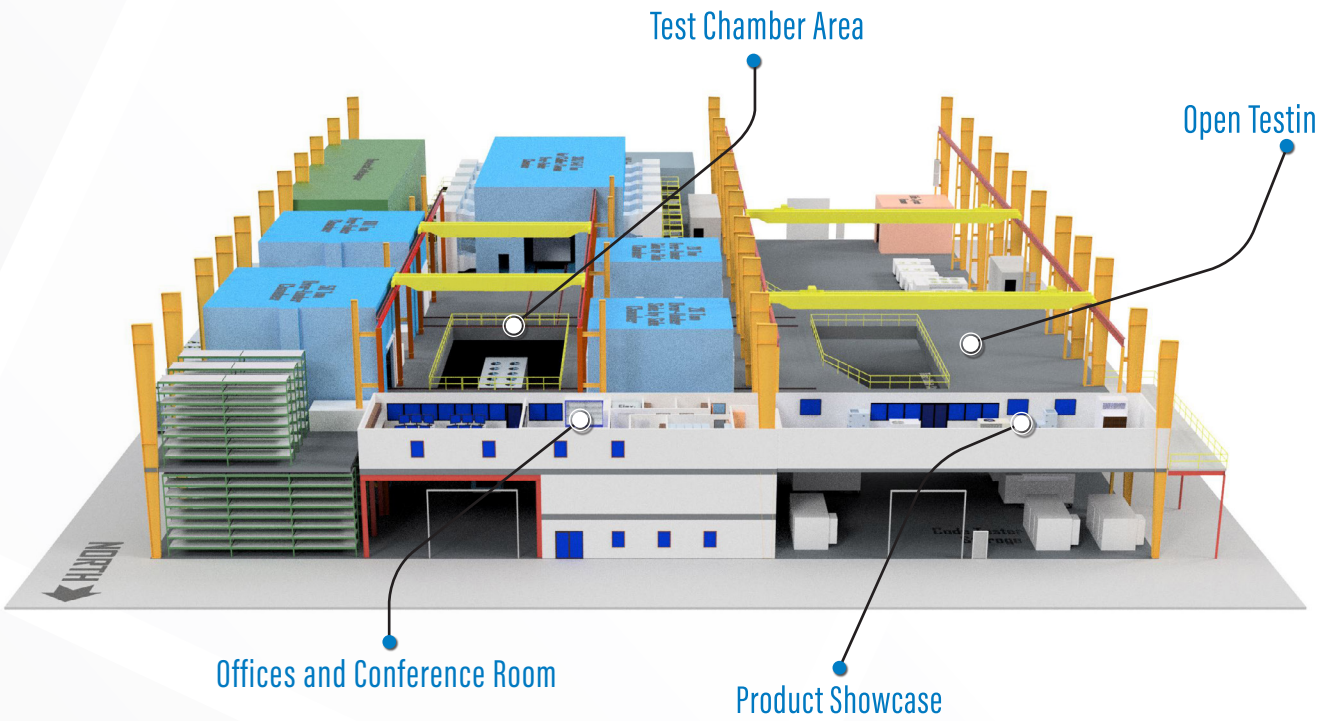
100 ton Cooling Capacity Over /Under Psychrometric Chamber		
Indoor Room	Cooling Cap. (tons)	100
	Test Airflow (cfm)	50,000
	DB Range (°F)	40-130
	DB Stability (°F)	± 0.2 °F DB
	RH Range (%)	10-80
	RH Stability	± 0.9 °F WB
	Height	18 feet
Outdoor Room	Cooling Cap. (tons)	130
	Test Airflow (cfm)	100,000
	Code Tester Stability (%)	± 1
	DB Range (°F)	-20-130
	DB Stability (°F)	± 0.2
	RH Range (%)	10-90
	RH Stability	± 0.9 °F WB
	Height	24 feet
Power	230V 3Ph Max Amps	783
	460V 3Ph Max Amps	391

50 ton Cooling Capacity Over/Under Psychrometric Chamber		
Indoor Room	Cooling Cap. (tons)	50
	Test Airflow (cfm)	25,000
	DB Range (°F)	40-130
	DB Stability (°F)	± 0.2 °F DB
	RH Range (%)	10-80
	RH Stability	± 0.9 °F WB
	Height	18 feet
Outdoor Room	Cooling Cap. (tons)	65
	Test Airflow (cfm)	50,000
	Code Tester Stability (%)	± 1
	DB Range (°F)	-20-130
	DB Stability (°F)	±0.2
	RH Range (%)	10-90
	RH Stability	± 0.9 °F WB
	Height	24 feet
Power	230V 3Ph Max Amps	627
	460V 3Ph Max Amps	300

Water-Source Heat Pump Psychrometric Chamber		
Indoor Room	Capacity (tons)	12
	Test Airflow (cfm)	6,000
	DB Range (°F)	20-120
	DB Stability (°F)	± 0.2 °F DB
	RH Range (%)	30-80
	RH Stability	± 0.9 °F WB
Power	230V 3Ph Max Amps	200
	460V 3Ph Max Amps	200
Chilled Water	GPM	50
	Capacity (tons)	12
	Temp. Range (°F)	20-120
Larger Psychrometric Chambers will be used to test water-source heat pump units larger than 12 tons.		

540 ton Chiller Capacity/300 ton Cooling Capacity Over/Under Sound and Psychrometric Chamber		
Indoor Room	Cooling Cap. (tons)	300
	Test Airflow (cfm)	100,000
	DB Range (°F)	50-100
	DB Stability (°F)	± 0.2 °F DB
	RH Range (%)	10-80
	RH Stability	± 1 %
	Height	33 feet
Outdoor Room	Cooling Cap. (tons)	600
	Test Airflow (cfm)	480,000
	Code Tester Stability (%)	± 1
	DB Range (°F)	50-130
	DB Stability (°F)	± 1
	RH Range (%)	10-90
	RH Stability	± 1%
	Height	24 feet
Power	230V 3Ph Max Amps	1,200
	460V 3Ph Max Amps	800
Chilled Water	GPM	1,300
	Capacity (tons)	540
	Temp. Range (°F)	45-65
Gas Heating Capacity	Max Capacity (Btu)	8 million


North - 20 ton
Psychrometric Chamber
Can operate separately as two 10 ton chambers
South - 20 ton
Psychrometric Chamber
Can operate separately as two 10 ton chambers
50 ton Psychrometric
Chamber
540 ton Sound and
Psychrometric Chamber
300 ton Air Conditioning Capacity
540 ton Chiller Capacity
100 ton Psychrometric
Chamber
Environmental Application
Test Chamber
AFUE Test Chamber
WSHP Psychrometric
Chamber
NAIC Facility
Chillers
NORTH


Test Chamber Area
Open Testing Area
Offices and Conference Room
Product Showcase
NORTH

Chamber Instrumentation

The instrumentation in the psychrometric chambers is capable of reading temperature, humidity, pressures, airflow, water flow, rpm, air velocity, voltage, current, frequency, power factor, power, etc. From these values, unit performance and other valuable information is collected. The integrated data acquisition system in the chambers is capable of reading, processing, and saving over 93,000 points of data per minute.The chamber data combined with the data gathered from floor testing creates over 120,000 different data points in one minute of testing.

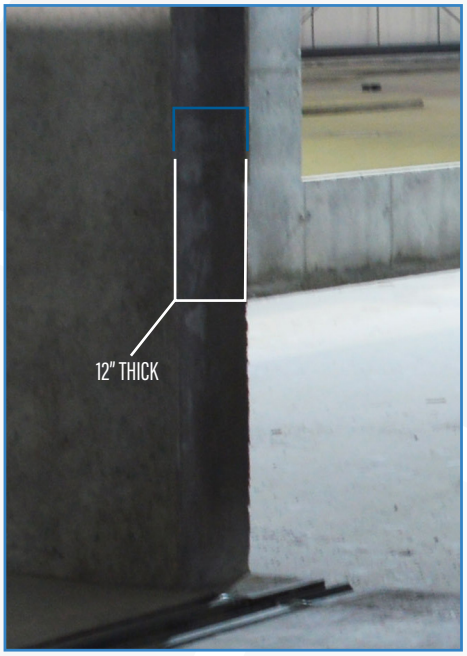
Environmental Test Chambers

AFUE and Low Temperature Test Chamber		
Chamber Size	18 ft x 18 ft x 14 ft high	
Outside Temperature Test Range	-20 °F to 140 °F (+/-1 °F)	
Humidity Range	30 to 80% (+/- 1%)	
Max NG or LPG Capacity	300,000 Btu	
AFUE Test Standard	ANSI 103 - 2007 Capable	
Power	230V 3Ph Max Amps	200
	460V 3Ph Max Amps	200

Environmental Application Test Chamber		
Chamber Size	40 ft x 60 ft x 35 ft high	
Outside Temperature Test Range	-0 °F to 140 °F (+/-1 °F)	
Humidity Range	30 to 80% (+/-1%)	
Max NG or LPG Capacity	4 million Btu	
AFUE Test Standard	ANSI 103 – 2007 Capable	
Rain Testing Capability	8"/ per Hour Max	
Snow Testing Capability	2"/ per Hour Max	
Wind Testing Capability	50 mph Max	
Power	230V 3Ph Max Amps	783
	460V 3Ph Max Amps	391

Sound Test Chamber

Sound Testing	
Chamber Description	3 Chamber Configuration - Outside, Return and Supply
Equipment	• Brüel & Kjær Pulse LAN-XI Type I Sound Measurement System • Capable of Measuring 10 Channels of Sound or Vibration Simultaneously • Real Time measurement of 1/24 through 1/1 octave bands • Narrow Band FFT Measurements • Simultaneous testing for inlet, outlet and radiated sound with equipment under cooling or heating load
Cooling Load	Up to 100,000 cfm and/or 300 tons
Chiller Sound Power Testing	Up to 540 tons
Pure Tone Qualified	45 Hz through 2,760 Hz
Test Standards	• Reference Sound Sources Comply with the requirements of ANSI S12.5 • Satisfy the Acoustical Requirements Specified in AMCA 300, ANSI S12.51 (ISO 3741), AHRI 260, and AHRI 220
Outdoor Room Volume	106,326 cubic feet
Supply and Return Room Volume	51,765 cubic feet each



Twelve inch concrete walls isolate the 540 ton psychrometric test chamber for sound testing of equipment.

Open Testing Area (25,000 ft²)					
Description	Size	Description	Max Ceiling Height	Maximum Single Unit Test Width	Maximum Single Unit Test Length
Over/Under Rooftop Unit Testing Area	150 ft x 50 ft with 12 ft x 30 ft Floor Openings	• Up to 150 ton Capacity • Ducts Through Floor – Bottom Discharge and Return • Outside air duct connection available for exhaust and makeup air • Four Testing Areas	55 feet	18 feet	100 feet
Open Testing Area (Ground Floor)	320 ft x 80 ft	• Flexible Connections • 24 Gas Testing Stations • 36 million Btu of natural gas service • 1,200 Amps of electrical service			

Direct Fired Testing Capabilities	
Natural Gas	20 million Btu Max
Liquid Propane Gas	10 million Btu Max
Non-Recirculating And Recirculating	ANSI Z83.4-2015 and Z83.18-2015
Combustion Instrumentation per ANSI Standards	300,000 Btu
Maximum Test Length	300 ft straight (longer with offset)

Test Gases and Capacities	
Natural Gas	Maximum Test Area Total Capacity – 60 million Btu
	5 – 10,000 ft³ connections
	11 – 4,000 ft³ connections
LP Gas	Maximum Test Area Total Capacity – 10 million Btu
	1 – 10,000 ft³ connection
	7 – 4,000 ft³ connections
Butane / Air Mixed Gas	600 ft³

Electrical Capabilities		
0-480V/3Ø Variable Phase Balance Voltage	900 amps Max	Multiple Power Connections
480V/3Ø Non-Variable Phase Balance Voltage	1200 amps Max	Multiple Power Connections

Airflow Testing	
4 Roll Around Airflow Test Tunnels	Up to 15,000 cfm

Heating Testing Specialized Instrumentation	
Gas Calorimeter	NG or LPG
Gas Combustion Meters	
Thermal Camera	
Data Recording	Portable Multi Channels DAQ's

Heating Test Standards Capabilities	
ANSI 103-2007	Method of Testing Annual Fuel Utilization Efficiency
ANSI Z21.47-2016	Gas Fired Central Furnaces
ANSI Z83.8 – 2016	Gas Unit Heaters, Gas Packaged Heaters, etc.
ANSI Z83.4-2015	Non-Recirculating Direct Fired Gas Heaters
ANSI Z83.18-2015	ANSI Z83.18-2015 – Recirculating Direct Fired Gas Heaters
UL 1995 , UL 60335-1, UL- 60335-2-40	Standard for Safety – Heating and Cooling Equipment

Cooling Test Standards Capabilities	
AHRI 210/240	Performance Rating of Unitary Air-Conditioning & Air-Source Heat Pump Equipment
AHRI 340/360	Performance Rating of Commercial and Industrial Unitary Air-Conditioning and Heat Pump Equipment
ASHRAE 37	Methods of Testing for Rating Electrically Driven Unitary Air-Conditioning and Heat Pump Equipment
ISO 13256	Water-Source Heat Pumps Testing and Rating for Performance: Water-to-Water and Brine-to-Water Heat Pumps
ASHRAE 198	Method of Test for Rating DX-Dedicated Outdoor Air Systems for Moisture Removal Capacity and Moisture Removal Efficiency
AHRI 410	Forced-Circulation Air-Cooling and Air-Heating Coils
AHRI 870	Performance Rating of Direct Geoexchange Heat Pumps
AHRI 390	Performance Rating of Single Package Vertical Air-Conditioners and Heat Pumps
AHRI 365	Commercial and Industrial Unitary Air-Conditioning Condensing Units
AHRI 550/590	Performance Rating of Water-chilling and Heat Pump Water-heating Packages Using the Vapor Compression Cycle
AHRI 920	DX Dedicated Outdoor Air System Units
UL 1995 , UL 60335-1, UL- 60335-2-40	Standard for Safety – Heating and Cooling Equipment

Open Testing Area and Psychrometric Chambers

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For more information about scheduling testing contact your local AAON Representative

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