Advanced Testing for Innovative Design

AAON®

Research & Development Lab

Opening 2018

The new AAON Research & Development Lab solidifies AAON as the technological leader in high performance HVAC equipment. Since the groundbreaking of the lab in February of 2016, construction crews have been working round-the-clock on bringing this vision to life – with an expected completion in Summer 2018.

The AAON lab is a 63 foot tall 162,000 square foot laboratory marvel able to measure both acoustics and thermal performance. A few features of the lab include supply, return, and ambient 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 60 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.

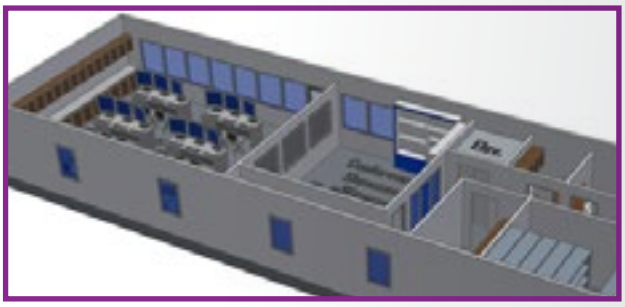
Test Chamber Interior Under Construction

Test Chambers

The AAON Research & Development Lab 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 ambient sound under actual load conditions. The 300 ton sound and psychrometric test chamber is isolated into three different sections for supply, return, and ambient sound measurement. Furthermore, the performance laboratory is able to measure the efficiency by which energy is converted into heating, cooling, or air movement.

Witness Testing

All testing chambers tie into a centralized control room. The control room allows customers to be able to witness product testing of their units. AAON products are also beautifully displayed in a nearby dedicated Product Showcase Room.

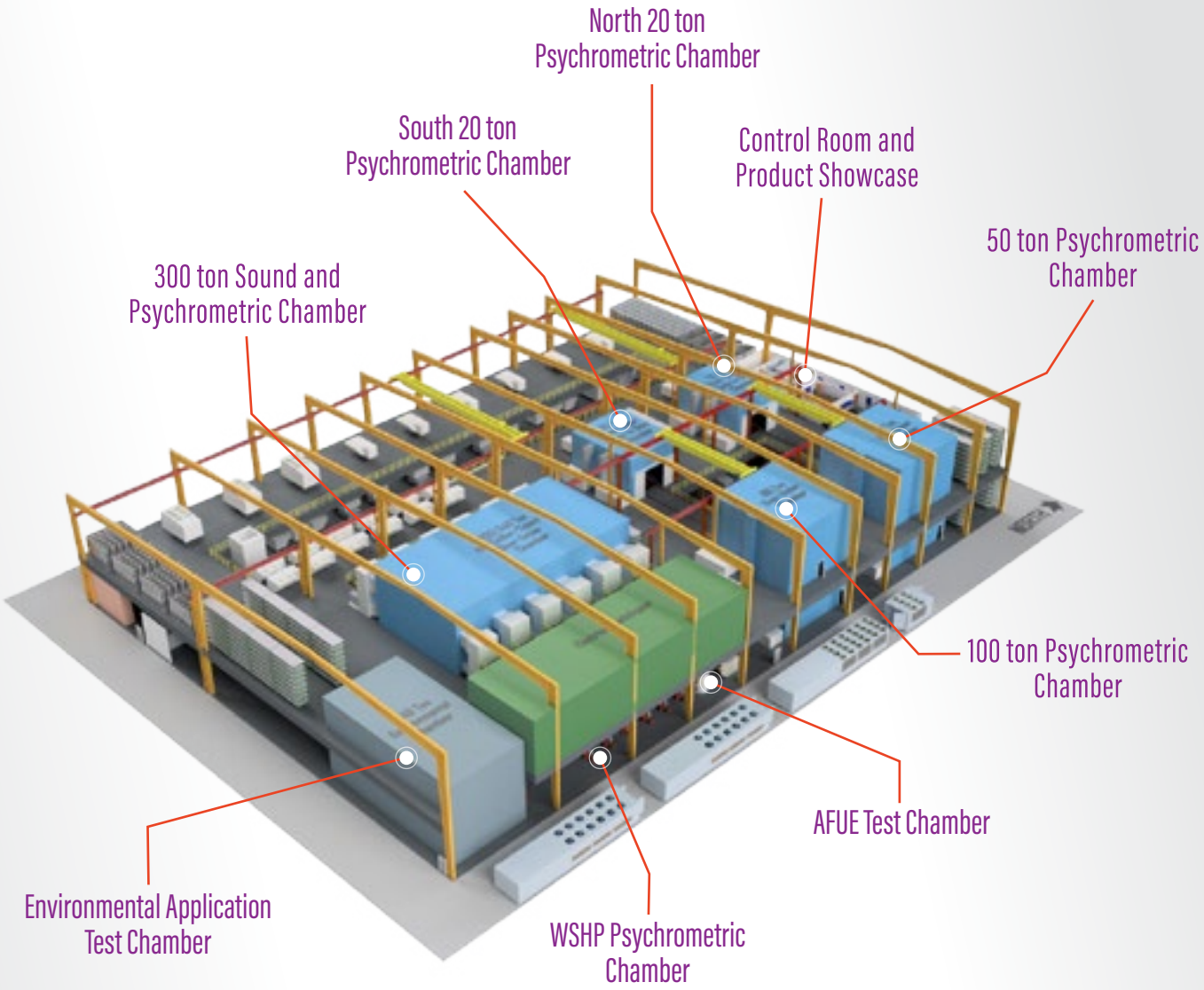


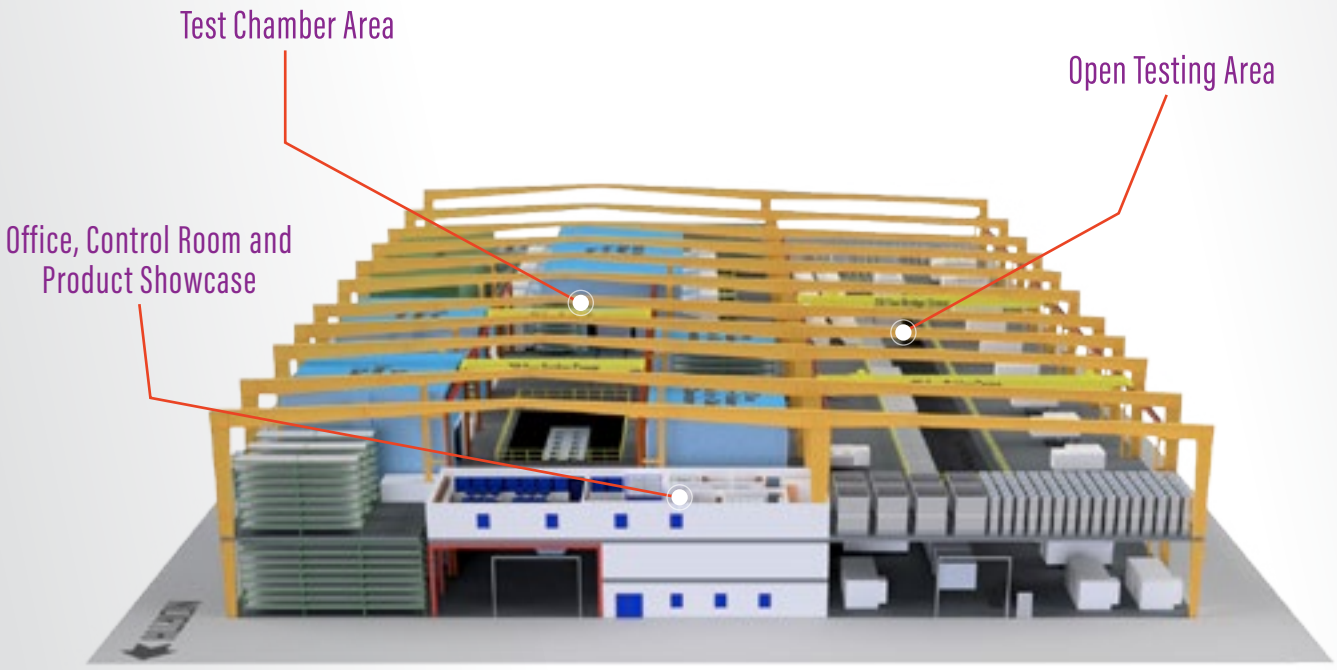
Control Room for Customer Witness Testing

Open Testing Area Under Construction

Open Testing Area

The open testing area consists of over 25,000 square feet of testing space with 60 million Btu of natural gas service and 1700 Amps of electrical service. Four test areas include ducts through the floor for over/under rooftop unit testing.


North 20 ton
Psychrometric Chamber
South 20 ton
Psychrometric Chamber
Control Room and
Product Showcase
50 ton Psychrometric
Chamber
300 ton Sound and
Psychrometric Chamber
100 ton Psychrometric
Chamber
AFUE Test Chamber
Environmental Application
Test Chamber
WSHP Psychrometric
Chamber


Test Chamber Area
Open Testing Area
Office, Control Room and
Product Showcase

Psychrometric Test Chambers

20 ton Cooling Capacity Over/Under Psychrometric Chamber 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	33 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

20 ton Cooling Capacity Over/Under Psychrometric Chamber North		
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	33 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	33 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	33 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

300 ton Cooling Capacity/540 ton Chiller 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

• Chamber Instrumentation

The instrumentation in the psychrometric chambers is capable of reading temperature, humidity, pressures, airflow, mass, rpm, air velocity, voltage, current, frequency, power factor, power, etc. From these values unit performance and other valuable information is gathered. 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	
Ambient 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	
Ambient 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 - Ambient, 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/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

Sound Chamber Walls are 12 Inches Thick Concrete

Open Testing

Open Testing Area					
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			

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 ft^3 connections
	11 – 4,000 ft^3 connections
LP Gas	Maximum Test Area Total Capacity – 10 million Btu
	1 – 10,000 ft^3 connection
	7 – 4,000 ft^3 connections
Butane / Air Mixed Gas	600 ft^3

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 Z23.47 – 2012	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 - 5th edition	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
UL 1995	Standard of Safety for Heating and Cooling Equipment

Open Testing Area and Psychrometric Chambers

Conference Rooms, Witness Viewing Room, and Product Showcase Room

Research & Development Lab Construction Timeline

2015
- Lab Design Work Begins

2016
- **February** - AAON Breaks Ground on New R&D Lab
- **Spring** - Concrete and Foundation Work
- **Summer** - Psychrometric and Sound Chamber Walls
- **Fall/Winter** - Structural Steel Work

2017
- **Spring** - Exterior Walls and Roofing
- **Summer** - Interior Construction - Electrical and Plumbing
- **Fall/Winter** - Mechanical and Chamber Construction

2018
- **Winter** - Functionality Testing
- **Spring** - Finishing Work
- Grand Opening (Late Summer)

Norm Asbjornson, CEO, at the Lab Ground Breaking

Structural Steel Work

Exterior Wall and Roof Completed

Interior Construction Underway

Contact your local AAON Representative for information about utilizing the AAON Research & Development Lab

AAON Environmentally Friendly HVAC Product Family

ROOFTOP UNITS (2-240 tons)


RN SERIES


RQ SERIES


RZ/RL SERIES

WATER-SOURCE HEAT PUMPS (½ - 230 tons)


VERTICAL & HORIZONTAL WSHP


RQ SERIES


RZ/RL SERIES


RN SERIES


M2 SERIES


SA SERIES


SB SERIES

PACKAGED OUTDOOR MECHANICAL ROOMS (4-540 tons)


BOILER MECHANICAL ROOM


LF SERIES


LN SERIES


FLUID COOLER


LZ SERIES

INDOOR AIR HANDLING UNITS (800 - 100,000 + cfm)


F1 SERIES


H3 SERIES


V3 SERIES


SA SERIES


M2 SERIES


M3 SERIES

SELF-CONTAINED UNITS (3-70 tons)


SB SERIES


SA SERIES


M2 SERIES

CONDENSING UNITS (2-230 tons)


CB SERIES


CF SERIES


CN SERIES


CL SERIES

OUTDOOR AIR HANDLING UNITS (800 - 100,000 + cfm)


RZ/RL SERIES


RN SERIES


RQ SERIES

COILS BOOSTER, HYDRONIC, & DX

CONTROLS (WSHP, RTU, SELF-CONTAINED, & SPLIT SYSTEM)


Touchscreen Contoller


Pioneer Gold


Pioneer Silver

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