

Quick Reference Guide

Booster Coils • Fluid Coils Steam Coils • Evaporator Coils Condenser Coils • Industrial Coils

The Guide to All Things RAE Coils

RAE Coils Model Nomenclature

	58	W	30	Х	60	6	8	W	F	L
Tube Size* 38 = 3/8" O.D. 12 = 1/2" O.D. 58 = 5/8" O.D. 11 = 1" O.D.										
Coil Type — B = Booster (F BS = Booster (C = Condense D = Direct Exp S = Steam SD = Steam D W = Water	langed) (Slip & Driv r ansion istributing	e)								
Fin Height** —										
Fin Length Tube Length										
Fin Spacing — Fins Per Inch										
Rows Deep —										
Fin Type F = Flat W = Waffle C = Sine										
Circuiting Frac Q = Quarter H = Half T = Three-quarter $F = FullN = One & oneD = DoubleE = One tube for J = Two tube for Z = Special$	tion —— rter e-half fed (header ed (header	rless) less)								
Hand (air hittin	g in back	of head)								

R = Right

L = Left

*Notes:

3/8" tube fin heights are in increments of 1"1/2" tube fin heights are in increments of 1-1/4"5/8" tube fin heights are in increments of 1-1/2"1" tube fin heights are in increments of 3"

RAE Coils Terminology

Blow Through	The supply fan is upstream of the cooling coil.
BTU	British thermal unit
Cleanable Tubes	Threaded plugs are provided for each tube or a removable plate is provided usually at the return bend end of the coil.
Coil Circuitry	The ratio of the number of water inlet tubes to the number of tubes in the first row fed directly from the entering water header. Example: A single circuit coil has all tubes fed in the first row as compared to a half circuit coil where only 1/2 of the tubes are fed in the first row. Examples of typical coil circuiting can be found on page 10.
Condensate Burst	A phenomena where condensate fills the space between fins and the air traveling across the coil pushes or bursts the water into the airstream. Commonly referred to as water carryover.
CW	Chilled water
De-Saturation Coil	A coil design that provides integral 1-2 degrees re-heat to avoid wet final filters that are immediately downstream of a cooling coil and supply fan is in a blow-thru position.
Draw Through	The supply fan is downstream of the cooling coil.
DX Distributor	Refrigerant distributors improve system performance by mixing the refrigerant liquid and vapor as it leaves the thermal expansion valve (TEV). This ensures that all circuits of the evaporator are evenly fed, which means the evaporator is fully utilized and operating efficiently
EAT	Entering air temperature into coil
EWT	Entering water temperature into coil
FPS	Feet per second
GPM	Gallons per minute
HW	Hot water
Intermediate Drain Pan	Drain pan installed between two coils (or installed in the finpack on coils taller that 48")to reduce condensate build-up between fins. Condensate accumulates in a sloped drain pan and is carried to the lower pan via a down-spout.
LAT	Leaving air temperature after coil
LWT	Leaving water temperature after coil
Phenolic or E-Coat	A dipped coating that is applied to coils to provide enhanced corrosion protection.
Sensible BTU (SBTU)	Sensible heat only, not latent. Heating coils will only show Sensible heat gain. Note: Some cooling coils may only perform sensibly.
Spray Coating	A sprayed coating that is applied to coils to provide enhanced corrosion protection. Spray coatings are generally less expensive than dipped coatings.
Turbulators	A spiral wound wire placed inside each tube to help prevent laminar flow of water to promote more efficient energy transfer from the water to the tube/fin assy. Turbulators are used frequently with high percentages of glycol. Some engineers/owners do not allow Turbs.
Total BTU (TBTUH)	Includes Latent and Sensible heat. Cooling coil performance data sheets will show Total and Sensible BTU per- formance.
Ultra Casing	Copper tube sheets attached to desired standard casing material to provide copper tube to copper tube sheet connection. Ultra casing can be used for extreme, abrupt changes in operating temperatures or for applications that involve excessive vibration.

RAE Coils General Guidelines

COIL SIZING GUIDELINES

CFM (Cooling Coils)	350-400 CFM/Ton with return air 200-250 CFM/Ton with outside air	
Face Velocities	Cooling Coils: typically 500 (+/-50) FPM, can be lower for 100% outside air conditions Heating Coils: typically 700 (+/-100) FPM, can be much higher based on application	
Fin Height (FH)	Typically 42"-48" max depending on fin spacing, FPM, and application. FH can be as high as 96" if the customer will install a intermediate drain pan in the fin pack, try to stay under 12 FPI or if conditions do not present sufficient condensate to create water carry over.	
Fin Length (FL)	Maximum of 288" (Indoor access pull may limit and/or scheduled max WPD)	
Fin Spacing/Fins per Inch (FPI)	Generally 8-10 FPI for cooling/heating applications. Low temp applications or applications that will require defrost may have a low fin spacing of 4-6 FPI. Any application that needs to be frequently washed or cleaned in place (CIP) would also use a lower FPI	
Mixed Air Cooling Conditions	Typically 80°F/67°F	
Outside Air Conditions	Typically 95°F/75°F	
Tubes High (in coil face)	3/8" Tubes: FH/1 = number of tubes high per row 1/2" Tubes: FH/1.25 = number of tubes high per row 5/8" Tubes: FH/1.5 = number of tubes high per row 1" Tubes: FH/3 = number of tubes high per row	

COIL MATERIALS OF CONSTRUCTION

AcryCoat	Fin coated with Epoxy coating from the mill (80% less cost than dipped)	
Casing Options	asing Options Cooling Coils: galvanized, stainless, aluminum (Stainless preferred for rust prevention) Heating Coils: galvanized, stainless, aluminum (Galvanized preferred due to lack of condensate)	
Coating Options	Electrofin, Heresite P-413, E-Coat and Phenolic Coatings	
Connection Options	Water/Steam Coils: steel, brass, copper DX Coils: Copper	
Fin Thicknesses	Aluminum: .006", .008", .010" Copper: .006", .008", .010"	
Fin Types	Sine, Waffle and Flat. Sine offers the highest performanc but at the expense of APD. Waffle is moderate fin patters with increased performance over flat with reasonable APD. Flat offers the least APD with decreased performance. Note at higher fin spacing applications the flat fin performance de-rate is less prominent.	
Tube Diameters	DX, Condensing, Chilled Water, and Hot Water Coils: 3/8", 1/2", 5/8" Standard Steam Coils: 5/8" Steam Distributing Coil: 1"	
Tube Thicknesses	3/8" Tubes: .014", .016", .020" 1/2" Tubes: .017", .025", .032" 5/8" Tubes: .020", .025", .035", .049" 1" Tubes: .035", .049"	

NOTE: All RAE Coils are tested to 400 PSIG, with the exception of 1" steam coils (tested at 200 PSIG) and 410A refrigerant heat pump DX or condensing coils (tested at 650 PSIG.)

COIL SELECTION GUIDELINES

Air Pressure Drop	Chilled Water Coils: 0.75°F to 1°F Hot Water Coils: 0.25°F to 5°F
Altitude	Most coils are selected at SCFM. If your elevation exceeds 1,000-2,000 feet consider ACFM and entering the actual altitude. Your selection will need to be more robust due to the decrease in air density.
Entering Water Temperature (EWT)	Chilled Water Coils: 43°F to 45°F with a 10°F to 15°F TD Hot Water Coils: 180°F with a 20°F TD
Gallons per Minute (GPM)	2.4 GPM/Ton of cooling
Maximum Rows (Chilled Water Coils)	Typically 12, though some engineers limit to 6-8 rows per coil and require two coils in series separated by an access section.
Refrigerant Pressure Drop	R-410a: 6 PSI is the target, with a minimum of 2 PSI and a maximum of 12 PSI R-22: 2-4PSI is the target, with a minimum of 2 PSI and a maximum of 6 PSI
Water Pressure Drop (WPD)*	Chilled Water Coils: 10 to 25 feet Hot Water Coils: 5 to 15 feet
Water Velocity*	3 to 4 FPS with a minimum of 2 FPS and a maximum of 6 FPS
Weight	To determine water weight in coil, add 1 lb./square foot of coil face area/row

*Always adjust coil circuiting to maximize allowable water velocity and water pressure drop (WPD.)

FREQUENTLY ASKED QUESTIONS

What criteria most affects coil selection?

- 1. Coil circuiting (tube velocity and water pressure drop)
- 2. Fin spacing, then feet per minute and rows
- 3. Fin height is more expensive than fin length when adjusting coil face area

One issue confronting salespeople, contractors, and engineers as they attempt to discuss an existing coil is how to describe it. What one person describes as "rows," another will call "passes," and yet a third will identify as "tubes high."

The diagram below is what we believe most accurately describes the components of a coil. It shows the rows deep, tubes in the face (or tubes high), number of passes, etc.

However, when an old coil is observed in the field, you can usually only see the header end and/or the end opposite the header (also known as the return bend end.) Luckily, taking good pictures or notes of both of those ends will identify many of the critical details on a coil.

The following section shows several diagrams of various circuiting views.



Typical Coil Circuiting

Circuitry is the ratio of water inlet tubes to total number of tubes in the first row. **Note: 1 row, full-circuit coils have opposite end connections!**

SINGLE SERPENTINE





DOUBLE SERPENTINE



4 rows16 circuits8 tubes per row2 passes

HALF SERPENTINE









opposite end connections shown

8 rows 8 tubes per row	16 circuits 4 passes
1	1

Typical Coil Circuiting

HEADER END SHOWN - HEADERS REMOVED



4 row, quarter circuit



4 row, half circuit



4 row, full circuit



6 row, half circuit



6 row, full circuit



6 row, one and a half circuit



8 row, half circuit



8 row, full circuit



8 row, double circuit

RAE Coils Installation Guidelines

WATER & STEAM COILS

Coil connections are extended through the duct or AHU casing walls (unless an internal pipe chase is required in the AHU). Coils are certified/rated in accordance with AHRI 410.

DX COILS

Same as Chilled Water Coils except that coil construction may be single circuit or dual circuit interlaced, dual circuit face split, or dual circuit split by rows. Coils are certified/rated in accordance with AHRI 410.

CHILLED WATER DESIGN RULES FOR AHU INSTALLATION

- Minimum unit width based on coils: *FL* + 10" + (2 x wall thickness) *Add an additional 9" for internal pipe case and an additional 12" for 2W coils. *DX Coils: Add 4-6" in width to accomodate Distributor and Tubing
- Minimum unit height based on coils:
 FH + 7" + base height + roof thickness + roof slope
 *Add an additional (2" + FH) for each additional coil. Add an additional 2" for each additional coil that has slide racks.
- 3. Try not to exceed 42"-48" fin height per coil unless the coil is entirely sensible cooling. Try not to exceed 240" fin length. Most indoor units will require much shorter coil lengths to allow for replacement.
- 4. Target minimum 2 FPS on CV systems and 3-5 FPS on VAV systems to help address turn down (6 FPS maximum). Recommend verifying with engineer minimum conditions to assure operation above Laminar flow conditions. Balance FPS with scheduled maximum WPD (CW WPD is typically 15-20')

Note: Where to put cooling coils is usually a question of where they are in relation to the supply fan. If unit conditions are given vs. coil conditions, then motor heat must be taken into consideration. If blow through cooling is used, then fan heat must be added to the mixed air conditions entering the cooling coil. If blow through is preferred, a desaturation coil design can add 1-2° of reheat to help avoid the wet final filter concern. This arrangement has the least impact on the amount of cooling coil surface required to provide a given discharge temperature. In a draw through, the leaving conditions for the coil must be lower than the desired discharge temperature as the fan/motor heat must be added to the air leaving the coil. This does provide an advantage in applications that include final filters as the fan/motor heat lowers the relative humidity slightly. Under certain conditions, cold saturated air will "wet" the final filter.

HEATING COIL DESIGN RULES FOR AHU INSTALLATION

- Minimum unit width based on coils: *FL* + 10" + (2 x wall thickness) *Add an additional 9" for internal pipe case and an additional 12" for 2W coils.
- Minimum unit height based on coils:
 FH + 6" + base height + roof thickness + roof slope
 *Add an additional (3.5" + FH) for each additional coil. No additional space required for slide racks.
- 3. Try not to exceed 60" fin height per coil. Try not to exceed 240" fin length. Most indoor units will require much shorter coil lengths to allow for replacement.
- 4. Size at 550 to 700 FPM. Maximum of 1,000 FPM if unit layout allows.
- 5. Maintain a 1 to 6 FPS on fluid flow (2 to 4 FPS is preferred) and a maximum WPD of 10 to 15 feet.

Note: Where to put heating coils depends on the application. If freezing of a cooling coil during the winter is a concern, a heating coil could be placed upstream of the cooling coil to provide freeze protection. If reheating of conditioned air to lower the relative humidity is more of a concern, the heating coil would be placed downstream of the cooling coil. Some systems may have both preheat and reheat coil, if both concerns are valid.

Coil Field Measurement Sheets

Note: Field measurment sheets are available electronically. Contact your RAE Coils Account Manager.

STANDARD STEAM COILS



STEAM DISTRIBUTING COILS



Coil Field Measurement Sheets

Note: Field measurment sheets are available electronically. Contact your RAE Coils Account Manager.

WATER COILS



DIRECT EXPANSION COILS, SINGLE CIRCUIT



Coil Field Measurement Sheets

Note: Field measurment sheets are available electronically. Contact your RAE Coils Account Manager.

DIRECT EXPANSION COILS, DUAL CIRCUIT INTERLACED











4492 Hunt St • Pryor, OK 74361 Phone: 918-825-7222 Fax: 1-800-264-5329

www.RAE-Coils.com

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