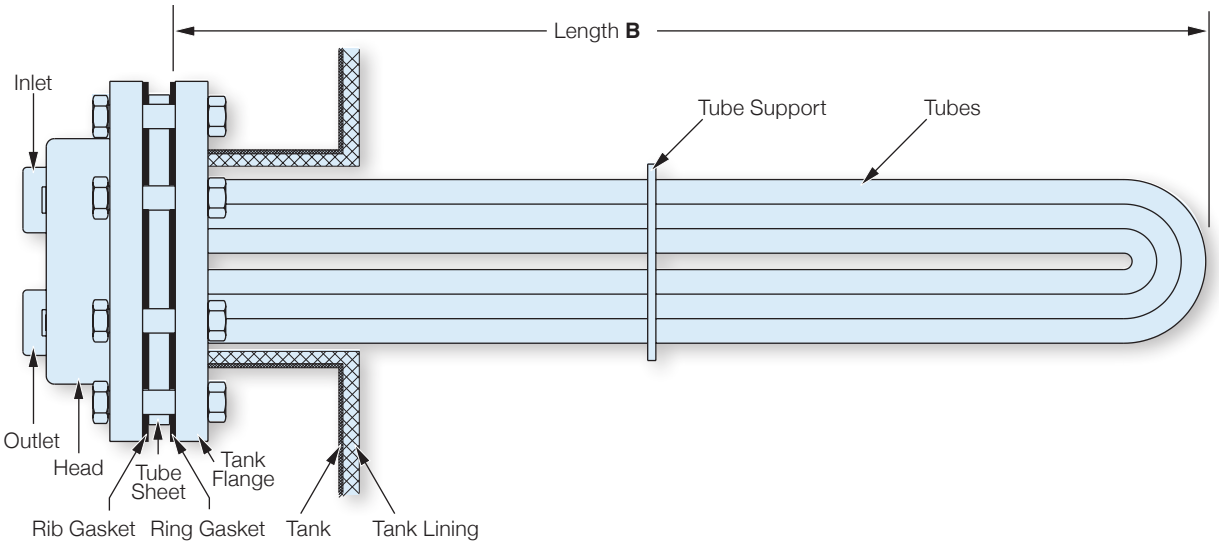
Tube Bundle General Configuration



Please Complete The Following Information:

1 **Tube Sheet Data**

Outside Diameter _____

Thickness _____

Material _____

Number of Tube holes in the tube sheet _____

Does the tube sheet have Bolt Holes in it?

☐ Yes ☐ No

If Yes:

- # of bolt holes _____
- Dia. of bolt holes _____
- Bolt circle _____

Do the bolt holes straddle the centerline?

☐ Yes ☐ No

2 **Diameter of the neck nozzle on the tank.**

Outside Diameter _____

Inside Diameter _____

(Include thickness of neck lining, if any)

Circumference Of Neck _____

3 Immersion length of tubes "B" _____

Heating surface area in Sq. Ft. (if known) _____

Tank Type: ☐ Vertical ☐ Horizontal

Tank dimensions: Diameter _____

Height _____

Pull space maximum length _____

4 Tube Outside Diameter _____

Material _____

Gauge _____ BWG

Type ☐ Single Wall ☐ Double Wall

Design Pressure _____

Design Temperature _____

5 Number of passes _____

6 Number of tube supports _____

☐ Full ☐ Half type

Distance to each tube support _____

Material _____

O.D. of supports _____

Thickness _____

7 Recovery rated to heat _____ GPH

from _____ °F to _____ °F

When supplied with the following heat source:

☐ Steam at _____ psig

_____ Lbs./Hour Steam Consumption

☐ Boiler Water at _____ GPM

from _____ °F to _____ °F

☐ HTHW at _____ GPM

from _____ °F to _____ °F

8 **Pressure Drop**

Steam _____ psi

Boiler or HTHW _____ psi

Recovery Ratings - Selecting A Properly Sized Steam Heating Coil

Note: If the heating coil is a wrapped, baffled, and force-circulated type please consult factory for sizing.

Determining The Total Square Feet of Heating Surface

Step 1
Determine The Following Variables:

Steam Supply Pressure: _____ psi
Recovery Rating: _____ GPH
Incoming Cold Water: _____ °F
Desired Hot Water: _____ °F
Steam Consumption: _____ Lbs./Hr.

Step 2
Determine if the storage tank is to include a built-in Intra-Tank circulator, or if it is to rely on natural convection for circulation within the tank.

Note: If the Recovery Rating is greater than three times the storage capacity of the vessel, then the heating coil may be wrapped and baffled to allow for an integral pump to force circulate water over the heating coil. The pump must be sized for the maximum GPM recovery rating.

Step 3
Use Chart #1 to determine the conversion factor of GPH heated per square foot of heating coil at the given steam supply pressure, temperature rise, and method of tank circulation.

Step 4
Solve for the required square footage of heating surface by dividing the total GPH recovery by the conversion factor solved for in Chart #1 on the following page.

$$\frac{\text{GPH}}{\text{Conversion Factor}} = \square \text{ Total Square Ft. of Heating Surface}$$

Selecting The Steam Coil

Step 5
Determine the length of the heating coil.

Note: A coil in a vertical tank should be as close as possible to but not exceed the diameter of the vessel.

A coil in a horizontal tank is typically approximately $^2/_3$ the length of the vessel

_____ " Approximate Coil Length desired

Step 6
From Chart #2 (see following page) starting with the smallest diameter coil, continue down the Coil Total Sq. Ft. column until the desired Sq. Ft. as determined in **Step 4** is within the range. Then multiply the desired Sq. Ft. of heating surface by the length multiplier. This will yield the total length of the coil. If the resulting length is longer than the required length as determined in **Step 5**, then continue to the next coil range until a suitable length can be selected.

Step 7
Formulate the coil model number by using the model number configurator on page 8.

Example:

A 1000 gallon 48" diameter vertical storage tank requires a coil rated to heat 1200 GPH 40-140 °F when supplied with 35psi steam

A. Because 1200 recovery is less than 3x the 1000 gallon storage capacity, no intra-tank circulator is required.

B. From Chart #1, we see that 35 psig steam supply equates to 20 psig steam in the tubes. Moving down to the 40-140°F row for uncirculated tanks, we see that the conversion factor is 35.0. This tells us that 35 GPH will be heated from 40-140°F for each square foot of coil heating surface.

C. Solve For The Total Sq. Ft. Heating Surface

$$\frac{1200}{35} = 34.2 \text{ Total Sq. Ft.}$$

D. Using Chart #2 the "F" Model coil is selected because its length is suitable for a 48" diameter vertical tank.

Model	Sq.Ft.		Length Multiplier		Length (Inches)	
D	34.2	x	4.4	=	150.4	Too long
E	34.2	x	2.4	=	82.0	Too Long
F	34.2	x	1.3	=	44.5	Acceptable

Steam Coil Sizing - Chart 1: GPH Heated per Sq. Ft. of Heating Coil

Blue (top number**)** indicates capacity based on tanks with a built-in intra-tank circulator for forced circulation.

Gray (bottom number**)** indicates capacity based on tanks relying on convection for internal circulation.

Water Temperature	Steam Pressure (psi) In line/In Coil											
	2/0	5/2	10/5	15/10	25/15	35/20	50/30	65/40	75/50	125/75	150/100	175/125
40-120°F	52.9	57.3	58.9	62.7	67.9	70.8	77.5	81.4	85.7	94.8	102.1	105.6
	30.7	33.2	35.7	39.4	43.2	47	51.9	57	60.8	69.6	75.8	82.1
40-140°F	40	43.8	46.3	50	53.1	57.5	63.1	66.9	71.3	79.4	83.8	90
	22	24	26	29	32	35	39	43	46	53	58	63
40-160°F	31.2	33.5	36	39.7	42.7	45	50.4	53.6	56.9	63.9	67.3	72.4
	15.9	17.6	19.3	21.9	24.4	26.8	30.2	33.5	36	41.8	46	50.2
40-180°F	21.9	23.8	26.9	31.9	33.1	35	41.3	43.1	46.9	51.9	55	61.3
	11.2	12.7	14.3	16.6	18.7	20.8	23.7	26.6	28.8	33.7	37.3	40.8
50-120°F	59	62.4	66.7	73.5	77.4	81.9	89.9	98.1	103	112	121.1	127.9
	33.9	36.8	39.6	43.7	48	52.4	58	63.7	67.9	78.1	85.2	92.2
50-140°F	43.6	46	49.4	54.1	58.2	61.2	67.4	71.4	75.4	83.7	89	94
	23.6	25.8	28	31.3	34.6	37.9	42.3	46.7	50	57.7	63.2	68.8
50-160°F	32.6	34.8	37.9	42.3	45.7	48.6	53.8	57.3	60.9	67.7	72.4	77.3
	16.7	18.5	20.4	23.1	25.8	28.5	32.1	35.7	38.4	44.7	49.2	53.8
50-180°F	23.1	26.3	28.1	33.1	36.3	38.1	43.1	46.9	50	55	58.8	66.9
	11.6	13.2	14.8	17.3	19.5	21.8	24.9	27.9	30.2	35.6	39.4	43.2
60-120°F	67.6	70.8	75.7	79.4	85.7	93.2	98.9	104.8	112.2	119.9	130.9	139.1
	38.1	41.5	44.7	49.6	54.5	69.5	66.1	72.8	77.7	89.2	97.5	105.9
60-140°F	48.3	51.9	54.8	59.3	63.9	67.9	75.7	80.2	83.5	94.3	98.9	104.1
	25.5	27.9	30.4	34.4	37.8	41.4	46.4	51.3	55	63.6	69.8	76
60-160°F	35.3	37.6	40.9	45.6	48.9	51.9	59.1	61.5	66.2	74	79.4	84.4
	17.6	19.6	21.6	24.6	27.5	30.4	34.4	38.3	41.3	48.1	53.1	58
60-180°F	23.8	28.1	30	35	36.9	41.3	46.3	48.1	53.1	58.1	65	68.8
	12	13.7	15.4	18	20.5	22.9	26.2	29.5	32	37.7	41.8	45.8

Note: The drop in steam pressure is to account for the pressure drop across the steam control valve.

Steam Coil Sizing - Chart 2: Heating Coil Selections

Base Model	Head Flange Size (150# ANSI)	Steam Inlet And Condensate Outlet Port Sizing Male NPT (Inches)	Number of Tubes	Coil Total Sq. Ft. Range	Length Multiplier
C	4	1 1/4	5	1-24	6.3
D	5	1 1/2	7	2-31	4.4
E	6	2	13	4-55	2.4
F	8	3	24	11-105	1.3
G	10	4	41	17-186	0.76
H	12	4	59	34-266	0.53
J	14	4	92	42-364	0.39
K	16	To Spec	112	54-625	0.28
L	18	To Spec	143	76-803	0.22

Notes:

1. The inlet and outlet port sizes on the steam coil can be bushed to the actual line size.

2. All steam coils are a 2 Pass design.

3. All steam coils include two (2) 1/4" FNPT auxiliary tappings in the head.

Recovery Ratings - Selecting A Properly Sized Boiler Water Heating Coil

Note: If the heating coil is a wrapped, baffled, and force-circulated type please consult factory for sizing.

Determining The Total Square Feet of Heating Surface

Step 1
Determine The Following Variables:

Boiler Water Entering: _____ °F
Boiler Water Leaving: _____ °F
Boiler Water Flow Rate: _____ GPM
Recovery Rating: _____ GPH
Incoming Cold Water: _____ °F
Desired Hot Water: _____ °F
Max. Pressure Drop: _____ psi

Step 2
Determine if the storage tank is to include a built-in Intra-Tank circulator, or if it is to rely on natural convection for circulation within the tank.

Note: If the Recovery Rating is greater than three times the storage capacity of the vessel, then the heating coil may be wrapped and baffled to allow for an integral pump to force circulate water over the heating coil. The pump must be sized for the maximum GPM recovery rating.

Step 3
Use Chart #3 to determine the conversion factor of GPH heated per square foot of heating coil at the given boiler water entering and leaving temperatures, temperature rise, and method of tank circulation.

Step 4
Solve for the required square footage of heating surface by dividing the total GPH recovery by the conversion factor solved for in Chart #3.

$$\frac{\text{GPH}}{\text{Conversion Factor}} = \boxed{} \text{ Total Square Ft. of Heating Surface}$$

Selecting The Steam Coil

Step 5
Determine the length of the heating coil.

Note: A coil in a vertical tank should be as close as possible to but not exceed the diameter of the vessel.

A coil in a horizontal tank is typically approximately $^2/_3$ the length of the vessel

_____ " Approximate Coil Length desired

Step 6
From Chart #4 starting with the smallest diameter coil, continue down the Coil Total Sq. Ft. column until the desired Sq. Ft. as determined in **Step 4** is within the range. Then multiply the desired Sq. Ft. of heating surface by the length multiplier. This will yield the total length of the coil. If the resulting length is longer than the required length as determined in **Step 5**, then continue to the next coil range until a suitable length can be selected.

Step 7
Formulate the coil model number by using the model number configurator on page 8.

Example:

A 400 gallon 42" diameter vertical storage tank requires a coil rated to heat 950 GPH 40-140°F when supplied with 200-180°F Boiler Water

A. Because 950 recovery is less than 3x the 400 gallon storage capacity, no intra-tank circulator is required.

B. From Chart #3, go to the 200-180°F boiler water column and move down to the 40-140°F row for uncirculated tanks. We see that the conversion factor is 19.5. This tells us that 19.5 GPH will be heated from 40-140°F for each square foot of heating surface.

C. Solve For The Total Sq. Ft. Heating Surface

$$\frac{950 \text{ GPH}}{19.5} = 48.7 \text{ Total Sq. Ft.}$$

D. Using Chart #4 the "G" Model is selected because its length is suitable for a 42" diameter vertical tank.

Model	Sq.Ft.		Length Multiplier		Length (Inches)	
E	48.7	x	2.4	=	116.8	Too long
F	48.7	x	1.3	=	63.3	Too long
G	48.7	x	.76	=	37	Acceptable

Boiler Water Coil Sizing - Chart 3: GPH Heated per Sq. Ft. of Heating Coil

Blue (top number**)** indicates capacity based on a tank with a built-in intra-tank circulator for forced circulation.

Gray (bottom number**)** indicates capacity based on a tank relying on convection for internal circulation.

Water Temperature	Boiler Water Temperature			
	180°-160°F	190°-170°F	200°-180°F	212°-192°F
40-120°F	27	30.4	34.0	38.9
	20.3	24.0	27.7	32.3
40-140°F	18.0	21.0	24	28
	13.7	16.5	19.5	23.2
40-160°F	10.0	13.1	15.4	19.9
	8.7	10.7	13.7	16.8
40-180°F	—	—	10.1	12.9
	—	—	9.1	11.9
50-120°F	28.9	33.2	37.5	43.1
	22.1	26.3	30.5	35.6
50-140°F	19.0	22.2	25.5	29.9
	14.4	17.6	20.8	24.7
50-160°F	11.0	13.5	16.4	21.0
	9.0	11.5	14.3	17.6
50-180°F	—	—	10.3	14.0
	—	—	9.3	12.3
60-120°F	32.1	36.9	41.8	47.9
	24.4	29.1	34.3	39.8
60-140°F	19.9	23.5	27.2	31.9
	15.0	18.5	22.3	26.5
60-160°F	11.1	13.7	16.6	22.2
	9.1	11.6	14.4	18.5
60-180°F	—	—	10.3	14.1
	—	—	9.3	12.3

For other temperature rises or boiler water temperatures (including HTHW), please consult factory.

Boiler Water & HTHW Coil Sizing - Chart 4: Heating Coil Selections

Base Model	Head Flange Size (150# ANSI)	4 Pass	6 Pass	Number of Tubes	Coil Total Sq. Ft. Range	Length Multiplier
		Inlet and Outlet Port Sizing Male NPT (Inches)	Inlet and Outlet Port Size Male NPT (Inches)			
C	4	1	1	5	1-24	6.3
D	5	1 1/4	1	7	2-31	4.4
E	6	1 1/2	1 1/4	13	4-55	2.4
F	8	2	1 1/2	24	11-105	1.3
G	10	3	2	41	17-186	0.76
H	12	3	2 1/2	59	34-266	0.53
J	14	4	3	92	42-364	0.39
K	16	To Spec	To Spec	112	54-625	0.28
L	18	To Spec	To Spec	143	76-803	0.22

Notes:

1. The inlet and outlet port sizes on the coil can be bushed to the actual line size.

2. The number of passes on a water to water heating coil is determined by the factory.

3. Boiler water velocity is typically greater than 1 and less than 7 ft./sec.

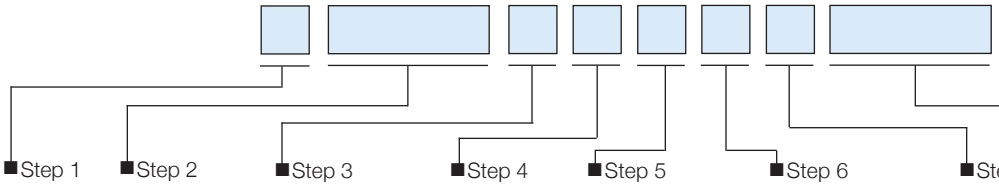
4. Pressure drop across the coil is typically 5 ft. (11 psi).

5. Typically no auxiliary ports are supplied in a water to water heating coil head.

Metric Conversions

Liters x 0.2641 = Gallons	°F = (°C x 1.8) + 32	kPa x 0.1456 = psi
Gallons x 3.79 = Liters	°C = (°F - 32) x 0.556	Lbs x 0.4536 = Kg
Gallons x 0.003785 = m^3	psi x 0.06896 = Bar	Kg x 2.2 = Lbs
m^3 x 264.2 = Gallons	Bar x 14.5 = psi	ft^2 x 0.0929 = m^2
1°C ΔT = 1.8°F ΔT	psi x 6.86 = kPa	m^2 x 10.765 = ft^2

Model Number Configuration



Step 1
Base Model:
C = 4"
D = 5"
E = 6"
F = 8"
G = 10"
H = 12"
J = 14"
K = 16"
L = 18"
X = Other

Step 2
Surface Area In Sq. Feet:
5-800 Sq. Ft.

Step 3
Tubing Style:
S = Single Wall
D = Double Wall

Step 4
 # Passes:
2, 4, 6

Step 5
Tube Material:
C = Copper
N = 90/10 Copper-Nickel
F = 304 Stainless Steel
S = 316L SS

Step 6
Tube Sheet Material:
B = Carbon Steel with Copper facing
N = 90/10 Copper-Nickel
F = 304 Stainless Steel
S = 316L SS

Step 7
Head Construction:
N = Not Supplied
F = Fabricated Carbon Steel
B = Fabricated Carbon Steel with Copper Lining
S = Fabricated Stainless Steel

Step 8
Immersion Length (Inches):
12-240

Example: F61S2CBF80

Is an 8" Class 150 ANSI flanged heating coil with 61 square feet of heating surface in a single wall 2 pass copper tube coil and carbon steel copper faced tube sheet design with a fabricated steel head and an immersion length of 80 inches.

Note: All coil sizing is subject to change pending formal factory calculations.

Option Note

Many optional features in a Hubbell heating coil are not indicated within a model number and therefore must be called out in the written specification.

Hubbell™

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