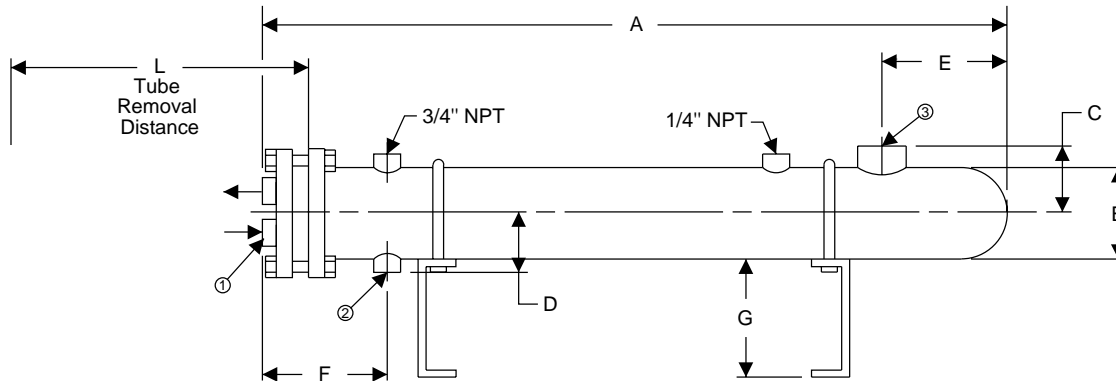




Armstrong Flo-Rite-Temp™ ST Shell and Tube Steam Instantaneous Heat Exchanger



The Flo-Rite-Temp is a compact heavy duty industrial steam shell and tube type instantaneous heat exchanger. Its heavy duty construction and easy-to-clean tube bundle make it ideal for those difficult applications where minimum downtime is a concern.

Step No. 1

From the table on page WHM-17, determine the clean tube temperature value by using inlet water temperature and outlet water temperature along with the available saturated steam pressure (psig) at the exchanger. Where necessary interpolate.

Step No. 2

The clean tube temperature values are calculated with no fouling allowance. If a fouling allowance is specified or must be considered, refer to the table on page WHM-16. Based on the fouling factor and tube velocity, obtain multiplication factor. The clean tube temperature value from Step 1 must now be corrected by multiplying its value by the fouling factor. The fouling factor will give you the value that the exchanger will be reduced to when fouling is considered.

For fully detailed certified drawing, refer to CDY #1011.

Features

- Straight tube bundle with a free floating end designed for easy bundle removal.
- A non U-bend tube bundle design with a removable end cover allows for easy and assured tube cleaning when required.
- Heavy duty 5/8" tubes of 16 gauge admiralty brass assure long life and maintainability—10 year tube bundle warranty against workmanship or material defects.
- The removable tube bundle end cover allows for 100% visual inspection of all tubes both inside and out.

To select the correct size shell and tube heat exchanger, the following data must be known:

1. Flow in gallons per minute (gpm in tubes)
2. Inlet water temperature (°F/°C in tubes)
3. Outlet water temperature (°F/°C in tubes)
4. Steam pressure available at exchanger (psig in shell)

Materials				
Head	Heat Exchanger Shell	Heat Exchanger Tubes	Tube Sheets	Tube Bundle End Cap
Cast Iron ASTM A278	Carbon Steel ASTM-SA-53B	Brass ASTM B111 Alloy C44300 5/8" - 16 BWG	Brass ASTM B16	Brass ASTM B16

NOTE: All stainless steel available upon request.

Specifications			
Tube Side Maximum Working Pressure	Shell Side Maximum Working Pressure	Shell Side Fluid	Maximum Working Temperature
150 psig (10.2 bar)		Steam	375°F (191°C)

Dimensions and Weights														
Model		Dimensions								Connections			Weight	
		A	B	C	D	E	F	G	L	1	2	3		
442ST	in	54-1/2	4-1/2	3-1/2	3-1/2	7	6-1/2	5	50	1-1/4 NPT	3/4 NPT	2 NPT	lb	94
	mm	1,384	114	89	89	178	165	127	1,270	32	20	50	kg	43
552ST	in	67-1/4	5-9/16	4-1/2	4	7-7/8	6-3/4	6	62	1-1/2 NPT	1 NPT	2-1/2 NPT	lb	169
	mm	1708	141	114	102	200	171	152	1,575	40	25	65	kg	77
662ST	in	80-1/4	6-5/8	5-1/2	4-3/4	9-1/4	6-7/8	7-1/2	74	2 NPT	1-1/4 NPT	3 NPT	lb	239
	mm	2,038	168	140	121	235	175	191	1,880	50	32	80	kg	108
862ST	in	83-1/2	8-5/8	8-7/8	6-1/8	9-1/2	7-7/8	8	74	3 NPT	2 NPT	4 150# ANSI	lb	440
	mm	2121	219	225	156	241	200	203	1,880	80	50	100	kg	200

All dimensions and weights are approximate. Use certified print for exact dimensions. Design and materials are subject to change without notice.

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Step No. 3

From the capacity table below and the known gpm, move down the appropriate gpm column and select a temperature value equal to or greater than the required value from Step 1 with no fouling allowance or from Step 2 with a fouling allowance considered.

Example:

Select a unit for 40 gpm from 40°F to 120°F with 15 psig steam pressure available. From the table on page WHM-17, the clean tube temperature value is 45. Go to capacity table below with a flow of 40 gpm. Select a temperature value of 45 or greater. A Model 552ST would be the shell and tube heat exchanger required with a temperature value of 48 and a tube velocity of 5.2.

Example:

Same as above but with a specified fouling factor of 0.0010 from the Fouling Correction Factor table below, the clean tube temperature value remains at 45. Multiply 45 by the fouling factor multiplier of 1.58 at 5 ft/sec (round velocity from the capacity table to nearest even number on the Fouling Correction Factor table) consult capacity table below. The new clean tube temperature value for this heat exchanger is now 71.1. The capacity has been reduced from 40 gpm to 25-30 gpm at this fouling factor. You also have the option to jump up to a 662ST and achieve approximately 50 gpm at this fouling factor using a 71.1 temperature value.

Ethylene glycol Correction Factor

Ethylene glycol (50% and 50% water) correction factor. Use the same steps as for water except multiply the clean tube temperature value from Step 1 or Step 2 by using the correction factors shown in the table below.

Water Heating and Mixing

Model		Gallons Per Minute Heated in Tubes															
		5	10	15	20	25	30	40	50	60	70	80	90	100	110	120	140
442ST	Clean Tube Temperature Value	105	89	60	50	45											
	Average Tube Velocity, ft/sec	1.6	2.4	3.6	4.8	6											
552ST	Clean Tube Temperature Value				85	80	59	48	38	29							
	Average Tube Velocity, ft/sec				2.9	3.7	4.4	5.2	5.9	6.6							
662ST	Clean Tube Temperature Value						112	86	70	63	50	46	39				
	Average Tube Velocity, ft/sec						2.2	2.9	3.7	4.4	5.2	5.9	6.6				
862ST	Clean Tube Temperature Value							120	118	116	104	91	85	66	62	58	46
	Average Tube Velocity, ft/sec							1.6	2	2.4	2.8	3.2	3.6	4	4.4	4.8	5.6

Fouling Correction Factor				
Tube Velocity, ft/sec	Fouling Correction Factor	0.0005	0.0010	0.0015
	1		1.12	1.26
2		1.19	1.37	1.57
3		1.25	1.37	1.57
4		1.27	1.53	1.8
5		1.30	1.58	1.9
6		1.32	1.65	1.9
6.5		1.35	1.67	2.1

50% Glycol - 50% Water Correction Factor	
Average Solution Temperature °F	Clean Tube Temperature Value Correction Factor
60	1.44
80	1.40
100	1.36
140	1.28
180	1.18
200	1.12



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Water Heating and Mixing

Clean Tube Temperature Values																														
Water Temp. °F		Saturated Steam Pressure psig (at Sea Level)												Water Temp. °F		Saturated Steam Pressure psig (at Sea Level)														
Inlet	Outlet	0	2	5	10	15	20	30	40	50	75	100	125	Inlet	Outlet	0	2	5	10	15	20	30	40	50	75	100	125			
40	60	13	13	12	12	11	10	10	10	9	8	7		130	140	11	10	9	8	7	7	5	5	4	4					
	80	27	25	24	22	21	20	18	18	16	16	15	14		150	22	21	19	17	15	14	12	11	10	9	7				
	100	42	40	38	35	33	31	28	26	24	22	21	20		160	37	34	30	28	24	22	19	17	16	14	13	12			
	120	59	54	52	49	45	43	39	37	35	31	29	28		170	54	48	42	37	32	30	26	23	22	19	17	16			
	140	78	72	69	63	59	55	50	47	44	40	38	35		180	78	68	58	52	42	40	33	30	27	25	22	20			
	160	104	96	89	80	74	70	62	58	54	48	45	42		190	106	90	76	64	55	50	42	38	34	30	26	24			
	180	143	131	118	103	94	88	76	71	67	60	54	50		200	150	136	104	80	70	60	50	46	42	37	32	29			
50	70	13	13	13	12	11	11	10	10	9	8	7		140	150	12	11	10	8	7	7	6	5	5	4	4				
	90	28	26	25	23	22	21	19	18	17	16	15	14		160	25	24	21	18	16	14	13	12	10	9	7				
	110	43	41	39	36	34	31	29	27	26	28	21	20		170	42	38	33	29	25	23	20	18	16	14	13	12			
	130	61	58	54	50	46	44	39	37	35	32	29	28		180	63	55	48	40	34	32	27	24	22	19	17	16			
	150	84	79	72	65	60	57	51	48	45	40	38	35		190	92	78	65	60	46	42	35	31	28	26	22	20			
	170	114	106	96	85	78	72	62	60	56	50	46	43		200	137	113	90	72	61	54	44	40	36	30	27	25			
	190	168	149	130	111	100	92	80	76	70	64	56	52		210		172	124	94	78	65	56	48	45	39	33	30			
200													220			191	120	105	84	66	59	53	44	39	36					
60	80	14	13	12	12	11	11	10	10	9	8	7		150	160	14	13	12	10	8	8	7	6	6	5	5	4			
	100	29	26	25	24	23	21	20	18	17	16	15	14		170	30	26	22	20	16	15	13	12	11	10	10	8			
	120	45	43	40	38	35	32	30	28	26	24	22	20		180	50	45	38	31	28	24	22	18	18	14	13	12			
	140	65	60	57	52	48	45	40	38	36	32	30	28		190	80	66	56	45	38	34	30	26	23	21	18	16			
	160	91	85	78	69	64	60	52	50	46	41	38	36		200	104	102	78	60	53	46	37	34	32	26	24	21			
	180	130	117	106	90	84	79	67	63	59	52	48	44		210			116	82	70	60	48	44	39	34	29	27			
	200	208	178	149	128	112	100	86	78	74	64	58	52		220															
80	100	15	14	13	13	12	11	10	10	9	9	7		160	170	16	14	13	12	9	8	8	6	6	5	5	4			
	120	31	30	27	25	24	22	20	19	18	16	14			180	37	32	27	22	19	17	15	13	12	10	10	8			
	140	51	47	45	40	37	34	31	29	27	25	23	21		190	65	55	45	39	31	27	23	20	19	16	14	13			
	160	78	72	66	58	53	50	43	40	38	34	31	29		200	113	88	69	52	44	39	32	28	26	22	19	17			
	180	116	105	93	80	73	68	59	54	50	44	40	38		210			146	102	75	62	53	44	38	35	29	25	23		
	200	193	163	136	112	98	90	77	70	65	56	51	46		220				168	106	84	62	56	48	44	37	31	27		
	100	120	17	16	15	14	12	12	11	10	9	9	7			170	180	20	18	16	12	11	10	8	7	6	6	6	4	
130		24	22	20	19	18	16	14	13	12	11	10	10	190	48		40	31	25	22	20	16	14	13	11	10	9			
140		37	35	32	28	26	24	21	20	18	16	16	15	200	94		73	56	42	35	30	26	22	21	17	16	14			
160		63	57	53	46	42	39	34	32	30	26	24	22	210				132	87	62	51	43	35	30	28	23	20	18		
180		101	92	80	69	62	57	49	45	42	36	33	30	220					154	93	76	62	50	43	37	32	27	24		
110		120	8	8	7	7	6	5	5	4	4	4	3		180		190	28	23	18	14	12	12	9	7	7	6	6	5	
		130	19	18	16	15	13	13	11	11	10	9	9	7			200	73	56	41	30	25	22	18	16	14	12	11	9	
	140	30	26	24	22	20	18	17	15	14	13	12	11	210		204	115	75	50	42	35	28	24	22	18	16	15			
	150	43	38	36	30	28	26	25	21	19	18	16	15	220				140	83	64	55	42	36	31	26	22	19			
	160	56	52	46	40	36	34	30	26	25	23	20	18	200		45	32	23	17	14	12	10	8	7	6	6	5			
	170	70	60	57	51	45	42	36	34	30	28	25	23	210		175	91	56	37	30	25	19	17	16	13	12	10			
	180	95	86	76	64	56	51	46	42	39	34	30	27	220				120	66	50	40	31	26	23	19	16	15			
190	124	106	90	72	66	60	52	46	44	38	34	31	230				122	68	62	46	38	33	27	23	21					
200	170	142	115	92	82	73	62	55	51	43	40	38	210	130	52	33	21	16	14	10	9	8	7	6	5					
120	130	10	9	8	8	7	7	6	5	5	4	4	4	200	220															
	140	20	18	17	16	14	13	12	11	10	9	9	7		230				98	50	36	30	22	18	16	13	12	10		
	150	31	30	27	26	22	20	17	16	15	13	12	11		240					124	84	52	46	42	31	25	22			
	160	46	42	38	32	28	27	24	22	21	18	17	15																	
	170	63	56	50	44	39	36	30	29	26	24	21	19																	
	180	83	74	65	55	49	45	38	35	32	28	26	23																	
	190	112	103	84	68	62	55	46	43	38	35	30	27																	
200	158	132	107	85	74	66	56	50	46	39	35	32																		