
THERMA FLO
"The Lost Art of Efficient Steam"
Level 1 Technical Training 2025
Presented by: Bob James
Thermaflo Inc. Newberry SC


Steam and Heat Transfer Specialist Since 1986
ASME Code Stamp U UM Holders A UL Certified Company
A Hartford Steam Boiler Certified Quality Program Company
Who is
THERMA FLO
Steam/Heat Transfer/Condensate Return
Manufacturing and Training
Located in Newberry South Carolina
And Charlotte, North Carolina
A Complete Working 5,000 lbs hr Steam and Heat Transfer Demonstration Facility
Designed to Educate Our Representatives and Demonstrate Thermaflo Products

THERMAFLO ENGINEERING CULTURE PROBLEM SOLVING

- Manufacturer Systems that Save Energy and Last 30 Years Plus
- Use Steam at the Highest Efficiency Possible in Our Designs
- Educate our Customers and Representatives on Steam and Heat Transfer
- Bring Experience to The Table
- Hands on Face to Face
- Designed for Steam

ASME Certified U and UM NB Stamp Holders

ASME Certified Welders and Hartford Boiler 3rd Party Quality Program

Innovative Long Lasting Designs

Committed to R&D
Training
Innovation

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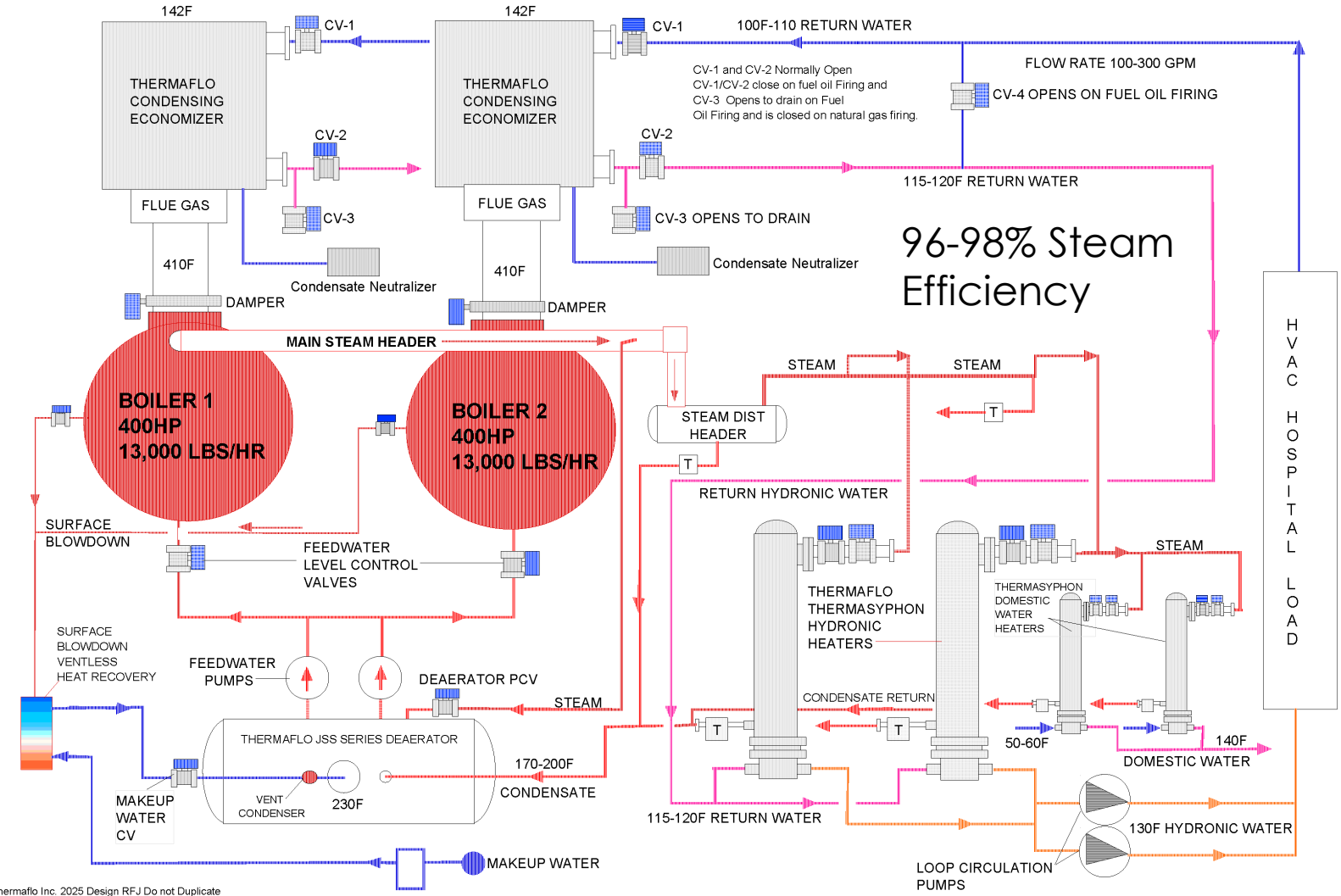

Steam Basics
"A Blind Flash of the Obvious"

STEAM / HOT WATER AND HEATER TRANSFER SYSTEMS

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FOLLOW ME

Today We Are Going to Tell You What We Learned Working In the Field for 50 Plus Years

- ✓ Steam Has A lot More BTUs to Transfer When Used at Very Low Pressures
- ✓ Steam Traps Can be Your Best Friend or Worst Enemy
- ✓ Most Steam Systems in the field are piped Wrong!!
- ✓ Condensate Pumps Fail because of Incorrectly Designed Steam Systems
- ✓ Steam Must Be Dry to Transfer Energy "I Thought all Steam was Dry"
- ✓ Wet Steam Kills Heat Transfer and Cost More to Use, Its Bad and You Have It, You're Engineering It, Designing It, and Using It!
- ✓ Any Flash Tank Vented to Atmosphere Waste Energy and Cost a Ton to Install What is a Flash Tank Anyway?
- ✓ Piping Systems are designed with Good Intentions but are not always installed that way in the field.
- ✓ Simple is Better, Less is Better, and It Starts with Design and Knowledge

Anyone Seen This Before?

ITS SO COMMON AROUND THE COUNTRY THAT ITS CONSIDERED NORMAL!

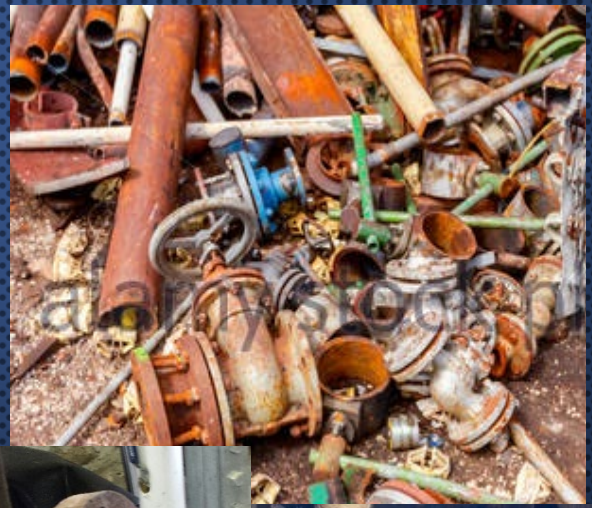
ITS NOT NORMAL AND WITH PROPER ENGINEERING THIS CAN BE TOTALLY ELIMINATED

STEAM COST $15.00 to PRODUCE PER 1000 Lbs ! Up 25% Since Jan 1 2021

A Facility Generating 5,000 lbs/hr
Avg Operating 300 Days A Year
Pays $540,000 Just in Fuel

These Are Familiar Sights in the Back of Hospital, University, College, and Industrial Maintenance Shops and Facilities

- ✓ Failed Control Valves and Isolation Valves
- ✓ Failed or Troublesome PRV Stations
- ✓ Failed Condensate Pumps / Seals and Motors
- ✓ Failed Heat Exchangers
- ✓ Failed Steam Traps
- ✓ Leaking Valves
- ✓ Wet and Damaged Insulation



THIS IS NOT NORMAL!

SIMPLE STEAM FACTS YOU SHOULD KNOW

- Steam is created by adding Heat Energy to water until the water changes state and turns into a **VAPOR.**
- Heat Energy is expressed in Btu's. More **BTUs MORE HEAT** to Transfer!
- 1 Btu is the amount of Heat Energy required to raise the temperature of 1 pound of water by **1°F.**
- The BTU Content of the **STEAM VAPOR** is called **LATENT HEAT** Latent Heat is the Workhorse and this **HEAT** You cant read on a thermometer **BUT** it Changes Water to a Vapor we call **STEAM!**
- The BTU Content of the Water (Feedwater and Condensate) is called **SENSIBLE HEAT** This is the **HEAT** you can read on a Thermometer!
- A LB of Water Contains **180 BTUS 32F** to **212F NOW A LB** of **STEAM** at **0 PSIG** Contains **970 BTUs 5 TIMES** the **BTU** Energy !
- When Water is In Your Steam the Latent Heat Is Less! That Same LB of **STEAM** with **10%** Liquid Entrained in the Vapor has **873 BTUs** of Latent Heat Per LB

BASIC STEAM PROPERTIES CHART

0 psig Steam 212F Latent Heat Btus 970 Sensible Heat Btus 180 Volume per lb 26.8 Cubic Ft per lb

Look at Vacuum Steam at 10" 982 BTUS Per Lb Latent

100 psig Steam 338F Latent Heat Btus 880 Sensible Heat Btus 309 Volume per lb 3.89 Cubic Ft per lb

STEAM AT LOWER PRESSURES CONTAINS MORE BTUS THAN HIGH PRESSURE STEAM

Properties of Saturated Steam

	Gauge Pressure PSIG	Temperature °F	Heat in Btu/lb. Sensible	Latent	Total	Specific Volume Cu. ft. per lb.	Gauge Pressure PSIG	Temperature °F	Heat in Btu/lb. Sensible	Latent	Total	Specific Volume Cu. ft. per lb.
IN VAC.	25	134	102	1017	1119	142.0	185	382	355	843	1198	2.29
	20	162	129	1001	1130	73.9	190	384	358	841	1199	2.24
	15	179	147	990	1137	51.3	195	386	360	839	1199	2.19
	10	192	160	982	1142	39.4	**200**	**388**	**362**	**837**	**1199**	**2.14**
	5	203	171	976	1147	31.8	205	390	364	836	1200	2.09
	0	**212**	**180**	**970**	**1150**	**26.8**	210	392	366	834	1200	2.05
	1	215	183	968	1151	25.2	215	394	368	832	1200	2.00
	2	219	187	966	1153	23.5	220	396	370	830	1200	1.96
	3	222	190	964	1154	22.3	**225**	**397**	**372**	**828**	**1200**	**1.92**
	4	224	192	962	1154	21.4	230	399	374	827	1201	1.89
	5	**227**	**195**	**960**	**1155**	**20.1**	235	401	376	825	1201	1.85
	6	230	198	959	1157	19.4	240	403	378	823	1201	1.81
	7	232	200	957	1157	18.7	245	404	380	822	1202	1.78
	8	233	201	956	1157	18.4	**250**	**406**	**382**	**820**	**1202**	**1.75**
	9	237	205	954	1159	17.1	255	408	383	819	1202	1.72
	10	**239**	**207**	**953**	**1160**	**16.5**	260	409	385	817	1202	1.69
	12	244	212	949	1161	15.3	265	411	387	815	1202	1.66
	14	248	216	947	1163	14.3	270	413	389	814	1203	1.63
	16	252	220	944	1164	13.4	**275**	**414**	**391**	**812**	**1203**	**1.60**
	18	256	224	941	1165	12.6	280	416	392	811	1203	1.57
	20	**259**	**227**	**939**	**1166**	**11.9**	285	417	394	809	1203	1.55
	22	262	230	937	1167	11.3	290	418	395	808	1203	1.53
	24	265	233	934	1167	10.8	295	420	397	806	1203	1.49
	26	268	236	933	1169	10.3	**300**	**421**	**398**	**805**	**1203**	**1.47**
	28	271	239	930	1169	9.85	305	423	400	803	1203	1.45
	30	**274**	**243**	**929**	**1172**	**9.46**	310	425	402	802	1204	1.43
	32	277	246	927	1173	9.10	315	426	404	800	1204	1.41
	34	279	248	925	1173	8.75	320	427	405	799	1204	1.38
	36	282	251	923	1174	8.42	**325**	**429**	**407**	**797**	**1204**	**1.36**
	38	284	253	922	1175	8.08	330	430	408	796	1204	1.34
	40	**286**	**256**	**920**	**1176**	**7.82**	335	432	410	794	1204	1.33
	42	289	258	918	1176	7.57	340	433	411	793	1204	1.31
	44	291	260	917	1177	7.31	345	434	413	791	1204	1.29
	46	293	262	915	1177	7.14	**350**	**435**	**414**	**790**	**1204**	**1.28**
	48	295	264	914	1178	6.94	355	437	416	789	1205	1.26
	50	**298**	**267**	**912**	**1179**	**6.68**	360	438	417	788	1205	1.24
	55	300	271	909	1180	6.27	365	440	419	786	1205	1.22
	60	307	277	906	1183	5.84	370	441	420	785	1205	1.20
	65	312	282	901	1183	5.49	**375**	**442**	**421**	**784**	**1205**	**1.19**
	70	316	286	898	1184	5.18	380	443	422	783	1205	1.18
	75	**320**	**290**	**895**	**1185**	**4.91**	385	445	424	781	1205	1.16
	80	324	294	891	1185	4.67	390	446	425	780	1205	1.14
	85	328	298	889	1187	4.44	395	447	427	778	1205	1.13
	90	331	302	886	1188	4.24	**400**	**448**	**428**	**777**	**1205**	**1.12**
	95	335	305	883	1188	4.05	450	460	439	766	1205	1.00
	100	**338**	**309**	**880**	**1189**	**3.89**	500	470	453	751	1204	.89
	105	341	312	878	1190	3.74	550	479	464	740	1204	.82
	110	344	316	875	1191	3.59	600	489	473	730	1203	.75
	115	347	319	873	1192	3.46	**650**	**497**	**483**	**719**	**1202**	**.69**
	120	350	322	871	1193	3.34	700	505	491	710	1201	.64
	125	**353**	**325**	**868**	**1193**	**3.23**	750	513	504	696	1200	.60
	130	356	328	866	1194	3.12	800	520	512	686	1198	.56
	135	358	330	864	1194	3.02	900	534	529	666	1195	.49
	140	361	333	861	1194	2.92	**1000**	**546**	**544**	**647**	**1191**	**.44**
	145	363	336	859	1195	2.84	1250	574	580	600	1180	.34
	150	**366**	**339**	**857**	**1196**	**2.74**	1500	597	610	557	1167	.23
	155	368	341	855	1196	2.68	1750	618	642	509	1151	.22
	160	371	344	853	1197	2.60	2000	636	672	462	1134	.19
	165	373	346	851	1197	2.54	**2250**	**654**	**701**	**413**	**1114**	**.16**
	170	375	348	849	1197	2.47	2500	669	733	358	1091	.13

Understanding Steam Demand

$$\frac{Q = L \times \text{Delta T} \times C \times 500 \times Sg = \text{BTUS Required}}{H = \text{Latent Heat of Steam}}$$

Q = Steam Load lbs/hr
L = GPM
DT = Temp Rise
C = Specific Heat
500 = 60min/hr x 8.33 lbs gallon
Sg = Specific Gravity
H = Latent Heat of the Steam Used

Short Cut Version:
GPM divided by 2 x Delta T x 1.10 = lbs/hr Steam

Example: 400 GPM Water Heated from 140F to 180F using 15 psig Steam

$$\frac{400 \times 40F \times 1 \times 500 \times 1 = 8{,}000{,}000 \text{ BTUS}}{945 \text{ BTUS per lb 15 psig}} = 8{,}465 \text{ lbs/hr}$$

Same Application using 1 psig steam
with 968 BTUs per lb = 8,264 lbs/hr
A Difference of 201 lbs/hr for the Same Work!

Realize that 15 psig Steam also generates 4% wasted Flash Steam or
330.56 lbs/hr !! Thru the Vent

1 Boiler HP = 34.5 Lbs/hr of Steam
100 Boiler HP= 3400lbs/hr of Steam x Eff Rate Generally .85 So 2,890 lbs/hr with Eff Rate Applied
Lbs/hr of Condensate x .002 = GPM Flow
10,000 x .002 = 20 GPM

WHAT IS A STEAM TRAP?

STEAM TRAP IS A DOOR!

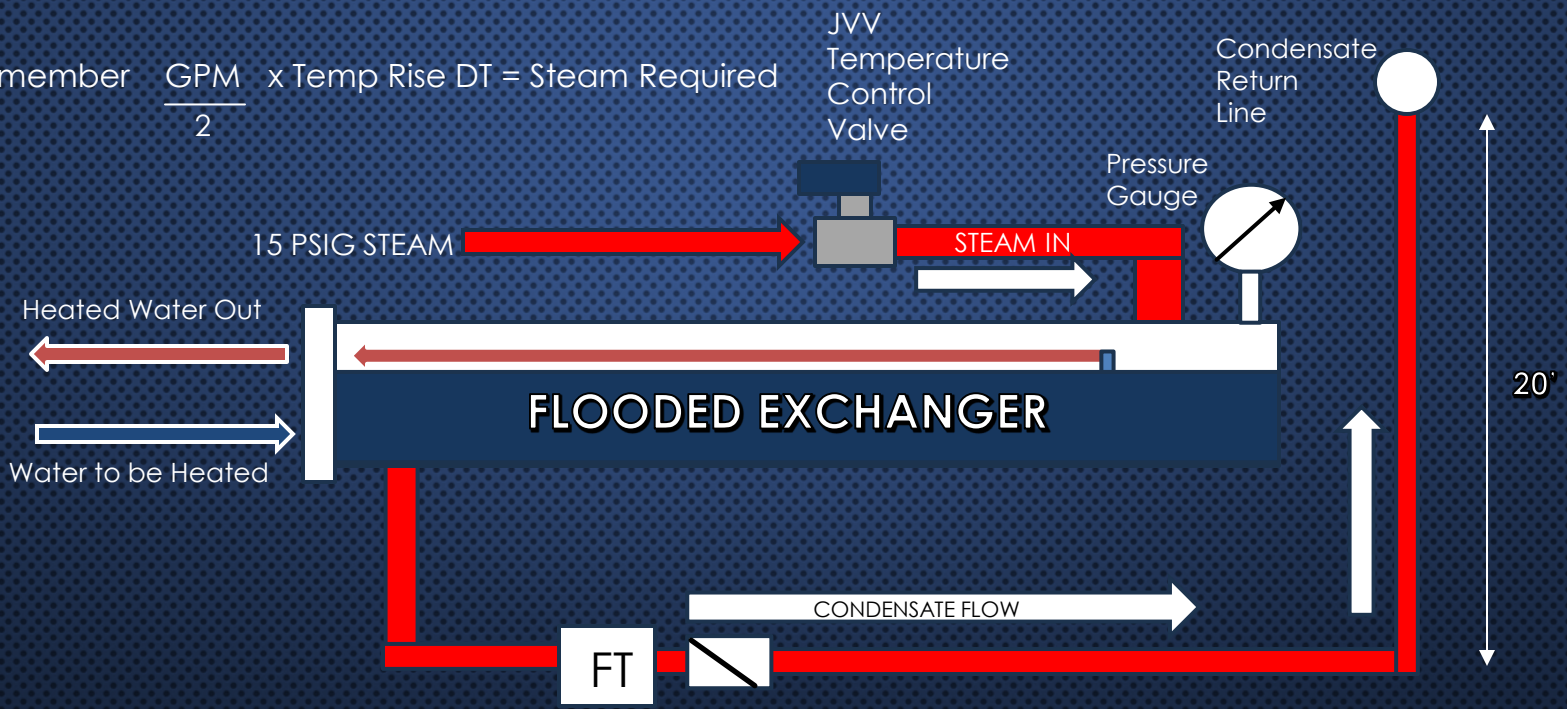
WHEN CONDENSATE COMES TO THE DOOR THE DOOR OPENS

THIS ALLOWS THE LOW BTU CONDENSATE TO LEAVE THE STEAM SPACE AND LATENT HEAT TO DO THE WORK!

WHEN STEAM COMES TO THE DOOR THE DOOR CLOSES HOLDING BACK THE STEAM AND ALLOWING THE LATENT HEAT TO HAVE TIME TO TRANSFER LATENT HEAT BTUSs AND DOING THE HEAT TRANSFER WORK

ALL STEAM TRAPs MUST HAVE MORE INLET PRESSURE THAN OUTLET PRESSURE TO OPERATE!

Remember $\frac{GPM}{2}$ x Temp Rise DT = Steam Required

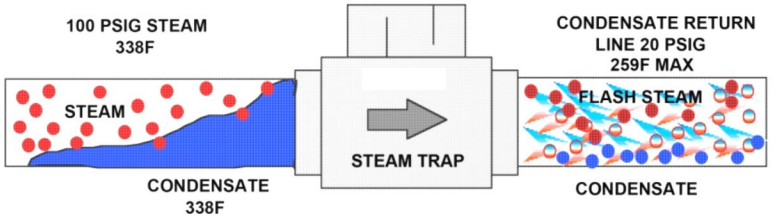


When the JVV Modulates with flow demand to hold temperature the pressure in the shell starts to drop as the steam demand decreases. When the pressure in the shell reaches 8 psig and lower the steam trap stops working and condensate backs up in the shell. This causes waterhammer on the tubes and thermal shock,

It takes 1 psig pressure to push or lift condensate 2.3' vertical. So to push the liquid condensate up the 20' you need 8.69 psig.

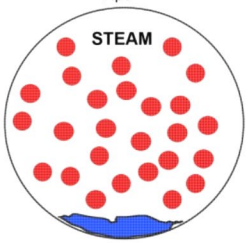
THE FLASH STEAM STORY

Flash Steam is created when Condensate under High Pressure and a High Temperature is discharged to a return line that is at a lower pressure and temperature as illustrated below.



The higher the inlet pressure and the lower the outlet pressure the higher the % of Flash Steam Produced

End View Condensate Return Pipe



Flash Steam to Condensate Ratio 250:1

100 psig to 20 psig

Flash Steam is STEAM its just created in a different way! It should not be wasted or vented to atmosphere!

FLASH STEAM TABLE

Pressure PSIG	% Flash Steam per lb 0 psig	20 psig
5	1.7	0
15	4.0	0
30	6.5	1.7
100	13.3	8.8
125	14.8	10.3

Example: 1000 lbs/hr of 100 psig discharging to 0 psig (Atmosphere) will produce 13.3% Flash or 133 lbs/hr of Flash Steam

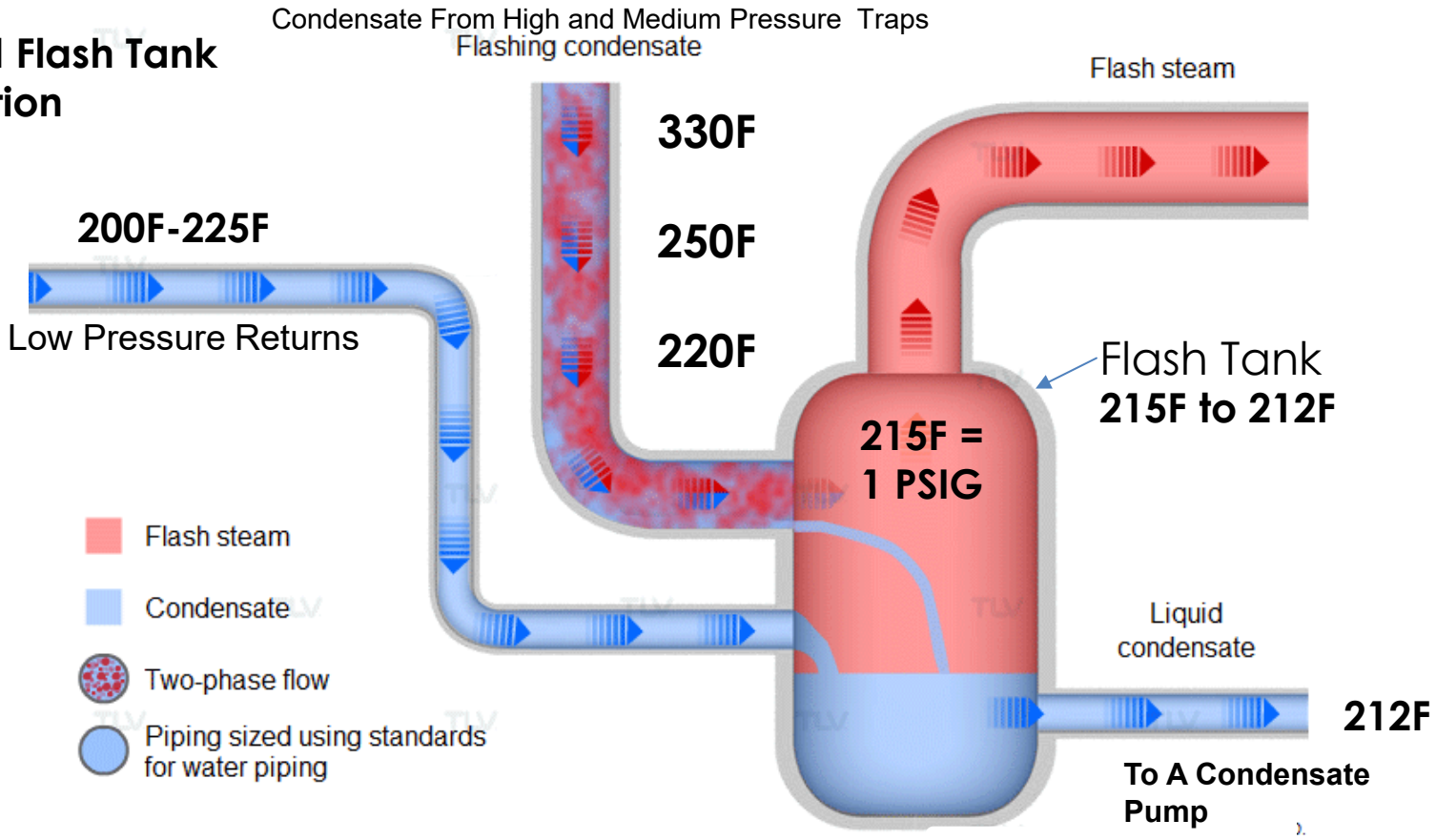
2014

Flash Steam occurs when a steam trap opens and discharges condensate from a steam line into a return line operating at a lower pressure. This occurs at all pressures even at 15 psig and lower. Higher the steam pressure the more flash steam is produced

STEAM IS STEAM

Flash Tanks are Designed to Separate Condensate from Flashing Steam Vapor and Equalize all Pressures

Typical Flash Tank Operation



Condensate Recovery Savings Analysis

A. Condensate (Lost to Drain) A= 5,000 lbs/hr

B. Annual Hrs of Operation a Year B= 7200

C. Total Water Cost (C1 + C2)

C1 Untreated Water and Sewer .005 $per Gallon

C2 Water Treatment Chemicals .010 $per Gallon

C = .015 $per Gallon

D. Makeup Water Preheating Cost of Feedwater

D1 Condensate Return Temperature: 190F

D2 Makeup Water Temperature: 60F

D= (D1-D2) x 1.0BTU/ LB/F D= 130 BTUs/Lb

E = Steam Cost E= $15.00 $1000/lb

F Savings in Water Cost

(A) 5000 x (B) 7200 x (C) .015 = $64,748.00

8.34 LB per Gallon

G Savings for Heating Makeup Water

(A) 5000 x (B) 7200 x (D) 130 x (E) $15.00 = $70,200.00

1000 x 1000

Total Annual Savings F + G

F $64,748.00 + G $70,200.00

TOTAL ANNUAL SAVINGS FOR RETURN $134,948.00

Proper Return of Condensate Is Important

This Payback Analysis Shows that 4 GPM Going to Drain and Not Being Returned Cost $134,948.00 Yearly

Condensate Return to a % Of Steam Output Should Be as High as Possible!

STEAM PROPERTIES & FLOW CHARACTERISTICS

SIZING STEAM PIPES • Steam Velocity Chart (Schedule 40 pipe)

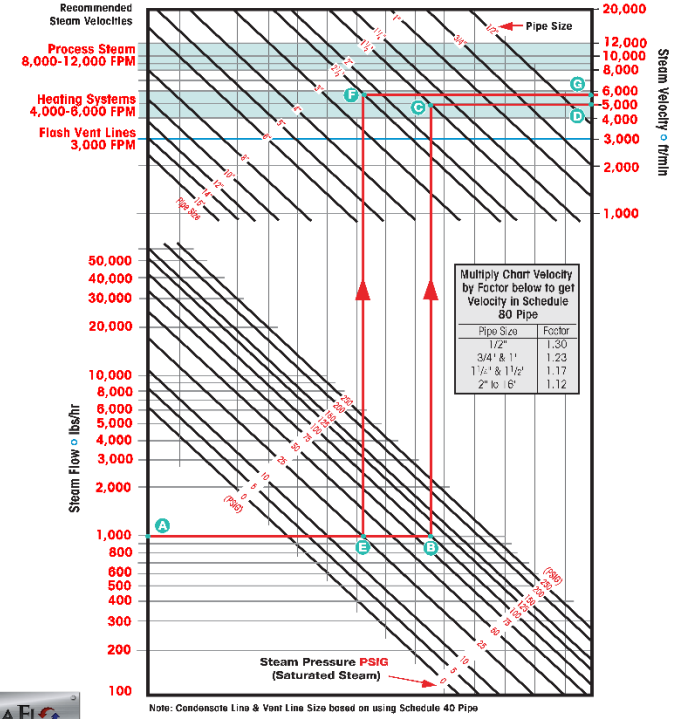
Saturated steam lines should be sized for a steam velocity of 4800 to 10000 ft/min.

Piping on pressure reducing stations should be sized for the same steam velocity on both sides of the regulator. This usually results in having a regulator smaller than the piping and having larger piping on the downstream side of the regulator.

Example using Steam Velocity Chart:
100 PSIG Inlet Pressure to control valve; 25 PSIG Outlet Pressure; 1,000 lbs/hr flow rate; Determine pipe size required.

Upstream Piping:
Enter Velocity Chart at (A) 1000 lbs/hr. Follow line to (B) 100 PSIG Inlet Pressure. Follow line vertically upwards to (C) 1½" Pipe Diameter. Steam Velocity at (D) shows 4800 ft/min.

Downstream Piping:
Enter Velocity Chart at (A) 1000 lbs/hr. Follow line to (E) 25 PSIG Outlet Pressure. Follow line vertically upwards to (F) 2½" Pipe Diameter. Steam Velocity at (G) shows 5500 ft/min.



Note: Condensate Line & Vent Line Size based on using Schedule 40 Pipe

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Is Steam Line and Water Line Sizing Important?

YOU BET!

Under Sized Steam and Water Lines Cause:

- Control Valves to be Undersized
- Poor Heat Transfer
- High Pressure Drops
- Poor Equipment Performance

REMOVING THE CONDENSATE FROM THE STEAM SYSTEM BY DESIGN

- Condensate Cuts Valve Seats
- Condensate Erodes Steam Piping
- Condensate Kills Steam Heat Transfer
- Condensate in a Steam Line causes Water Hammer and Thermal Shock
- Poor Steam Quality Drives the Cost of Steam

What is the Quality Of Your Customers Steam?

Is Your Steam Dirty?

Is Your Steam System Old?

How Far are Your Users from the Boiler?

Are Your Main Drips Located every 150 to 300'?

Are Your Steam Traps Working?

Do Your Have Steam Separators in Your Lines?

Are Your Steam Main Drips Built Correctly?

Steam Quality

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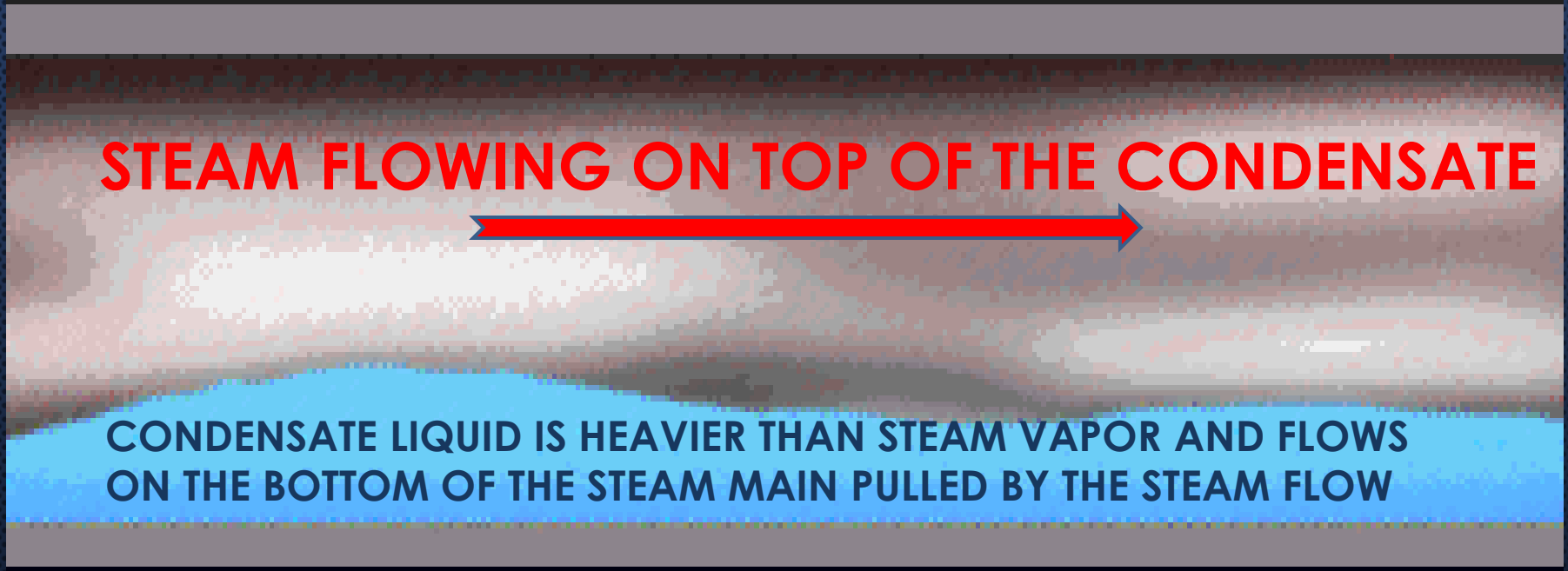
Is Steam Quality a Big Deal? Most people never talk about this or consider this!

- ➢ Most all Valve Failures are caused by Steam Quality and Incorrect Piping Install.
- ✓ Wet Steam or Condensate In Steam flowing across valve seats at High Velocities wearing away metal as if flows. This causes valves to leak and blow by steam where shutoff is required.
- ✓ Condensate Buildup causes flashing at the valve outlet when pressure drop occurs damaging seats and packing in valves.
- ➢ Wet Steam Reduces the Heating Value of a Lb of Steam
  Steam Exits the Boiler at 98-99% Dry BUT as it flows into the piping system and out to the users 200-3000' away condensate forms in the steam and reduces its Dryness Fraction or ability to transfer latent heat vapor energy. Average Steam Quality is 85-90% as it reaches users. This means 85 to 90% of the Latent Heat Value can be transferred so MORE steam in lbs/hr is required for the duty. Simply put its cost more to heat your process!

As the Steam Flows through Main Supply Piping it Latent Heat transfers to the pipe walls and through the Insulation to Atmosphere. When this happens small water droplets form and are carried with the flowing STEAM

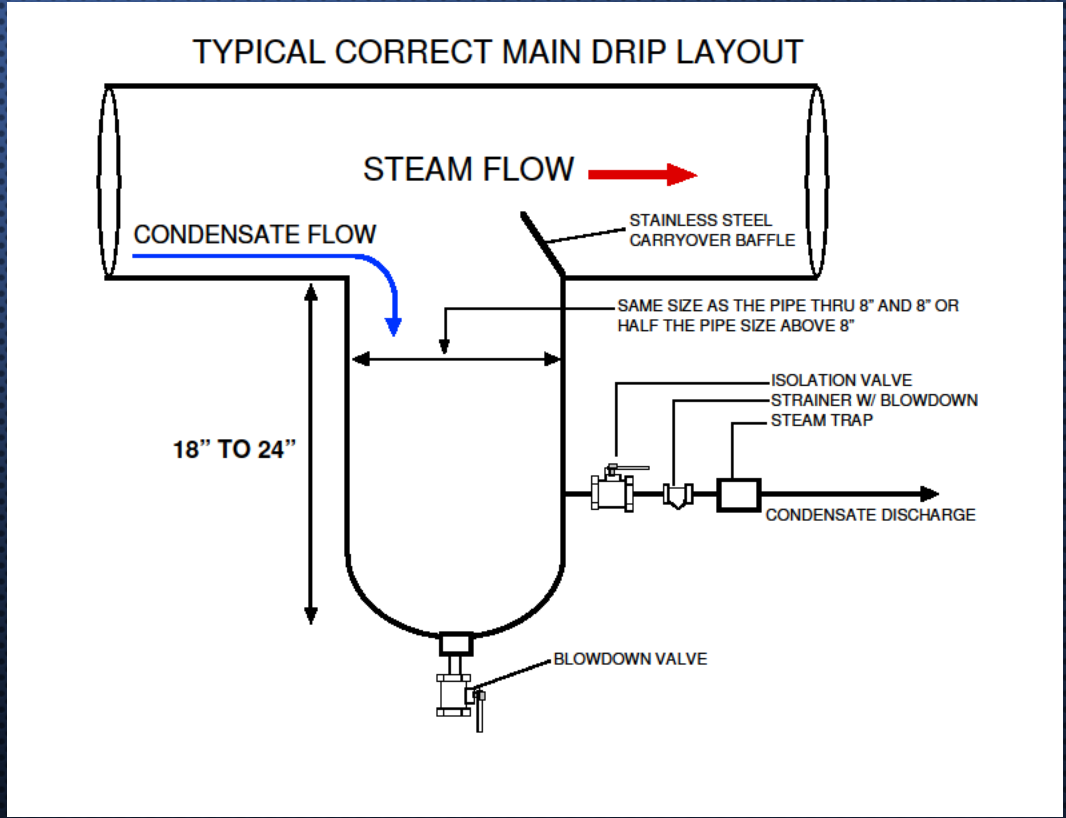


If the condensate is not properly removed from the Steam Vapor line it reduces the efficiency of the steam because (Condensate) water have far less BTU value per lb Than the STEAM 7-10 Times Less! In addition condensate buildup cause piping

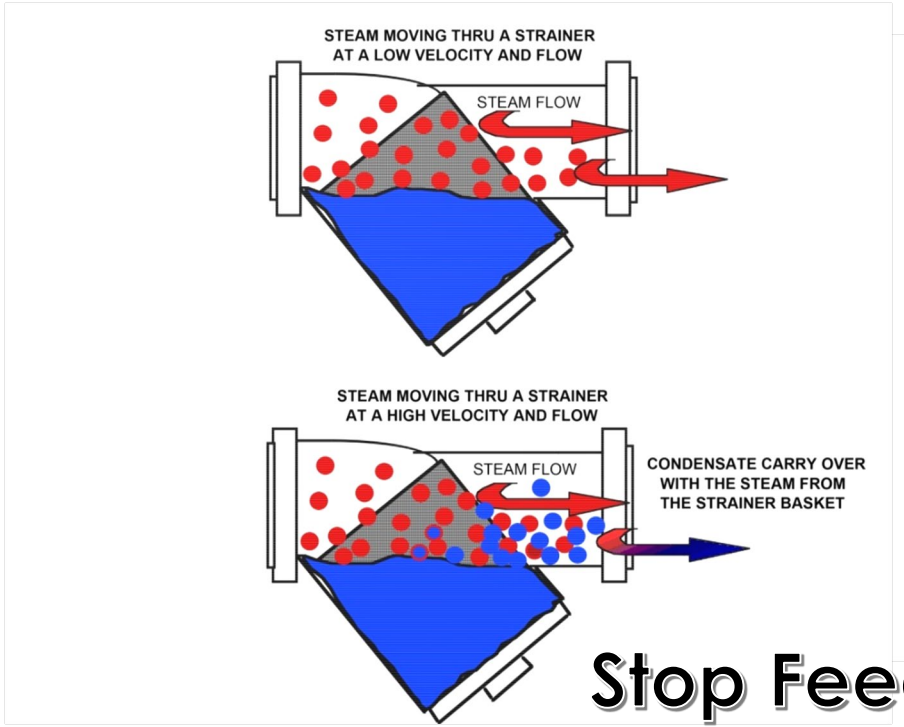
QUALITY STEAM STARTS IN THE SUPPLY

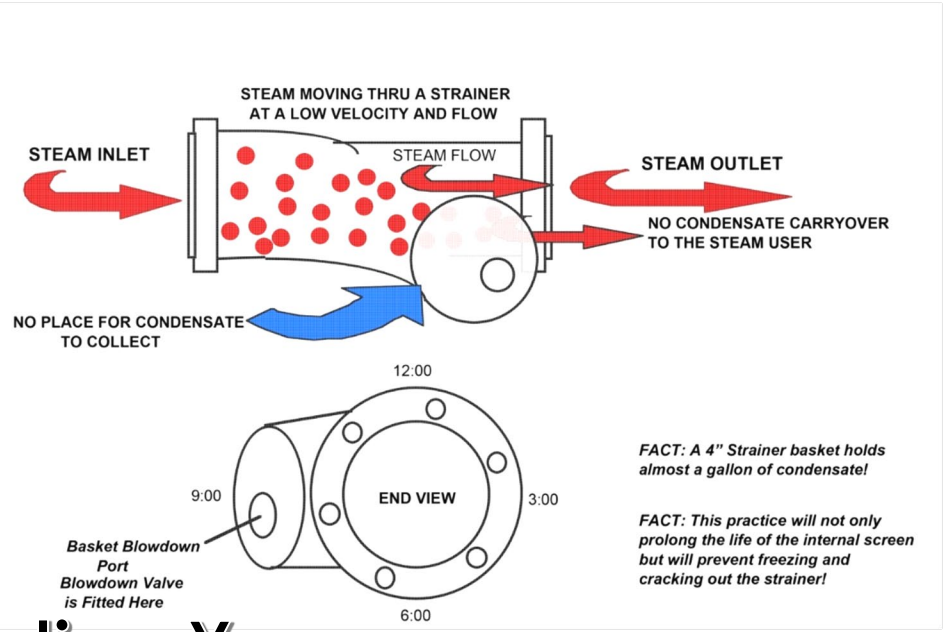
INSTALL MAIN DRIPS EVERY 150’ MIN
END OF MAINS
CONTROL VALVE INLETS
OR PIPING CHANGE IN DIRECTION

- POOR QUALITY STEAM DECREASES HEAT TRANSFER NO BTUS IN CONDENSATE!
- POOR QUALITY CUTS THE SEATS ON CONTROL VALVES
- POOR QUALITY STEAM WILL DEPOSIT SCALE ON THE TUBE SURFACES AND SEATS ON CONTROL VALVES



CORRECT STEAM STRAINER INSTALLATION IN FRONT OF CONTROL VALVES





Stop Feeding Your System Condensate

Example: Hydronic Heating Converter 200 GPM 140F to 180F REQUIRES 2,000 LBS/HR 15 PSIG Steam 2,000,000 BTUS/Hr to the Control Valve inlet and 5 psig in the Shell

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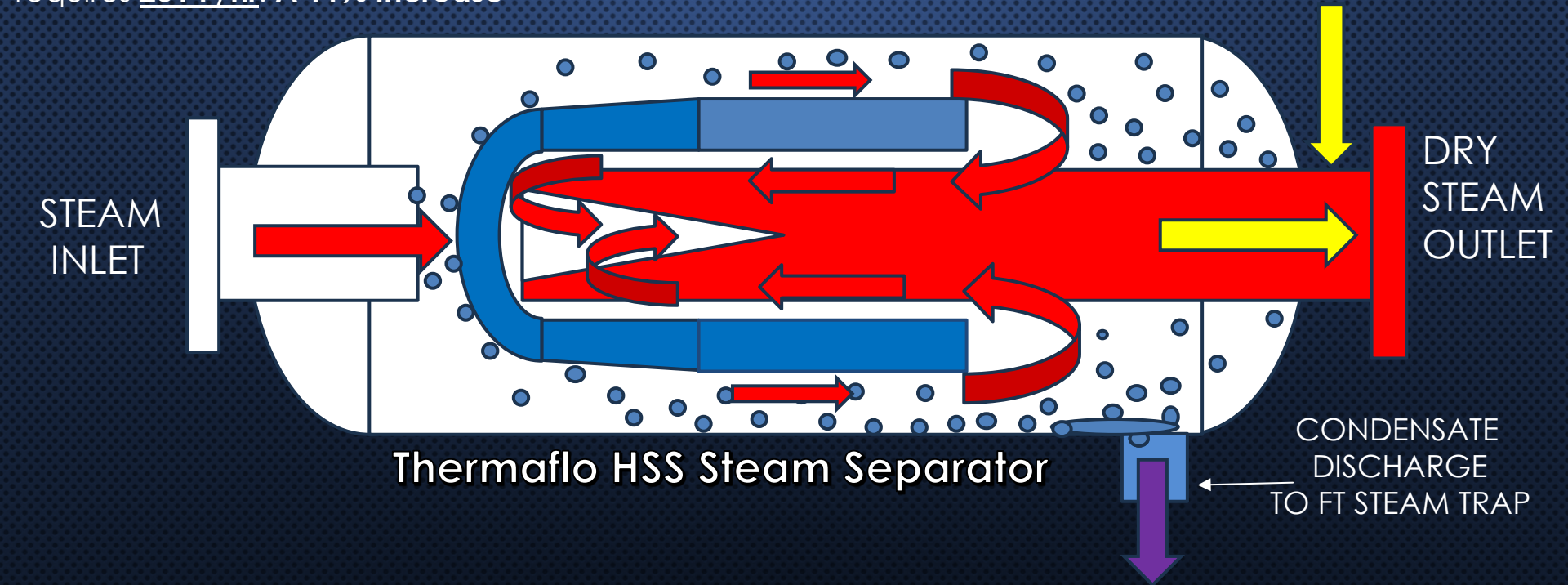
5 psig steam @ 227°F @ 100% Dry (saturated) steam supplies 961 Btu / lb. requires **2,081.16 lbS/hr**.

@ 90% Dryness Fraction, steam supplies 864 Btu/lb now requires **2314 /hr**. **A 11% Increase**

The discharge steam flow is dry and with high BTU quality with 98% of the condensate removed



Thermaflo HSS Steam Separator

Globe Control Valve

Globe Control Valves Vs V Ball Style

- Small CV Flow Factors 2" CV 42 versus a 167 CV of a V Ball
- Flow Turndown is 30: 1 versus 300: 1 plus on a V Ball
- Tight Shutoff is Only Achieved when a Soft Seat Option is Selected
  Dead Tight Shutoff is Standard on a V Ball Style
- A standard 3" Globe Valve weighs 91 lbs and has a CV of 73
  By comparison a 2" V Ball weighs in at 22 lbs and has a CV of 167
- Electronics are not slow anymore!
  8 Second Speed actuator less than 1 second between 10% movement
- V Balls have been used in Industry since the 1970s

V Ball Control Valve

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Why Condensate Return Pumps are a Major Issue

Myth 1

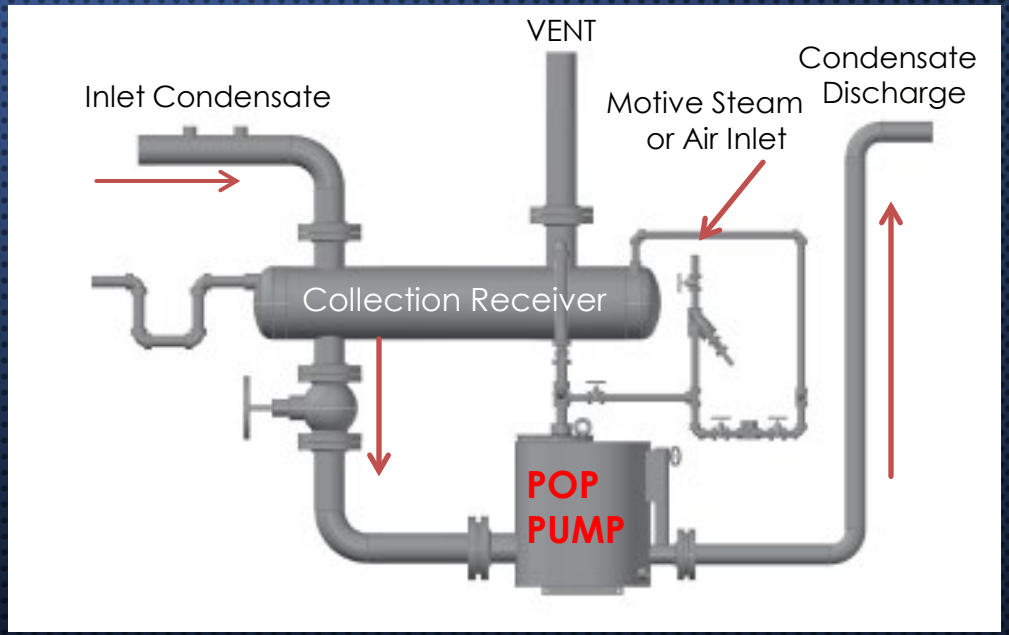
It's a Common Practice
and Belief that Steam Traps
can be piped from any
Pressure directly into
a Condensate Pump Receiver!

Myth 2

Its also a Common Belief that you can install a Flash
Tank Pipe all Condensate to the Flash Tank and the Outlet Temperature
Will Automatically Drop to 180F and Cavitation on the
Condensate Pumps will be Eliminated!
Flash Tank Vents are Expensive and Discharge Wasted BTUs

THE ANSWER TO ELECTRIC PUMPS !

POP Pressure Powered Condensate Pumps
Non Electric Condensate Return



Pumps Condensate to 400F

ASME Stainless Steel Body

No Electric Motors or Panels

No Seals or Packing

No NPSH Issues

Simple Design 5 Million Cycle Guarantee of 5 Years from Installation

Capacities to 100,000 lbs/hr


Novant Health Jan 20th 2024
20F Morning
NO FLASH STEAM VENTS
OVER 95% CONDENSATE RETURNS
(4) Thermaflo Zero Flash
Water Heating Systems

Steam Mechanical Room 2025

What if You Could:

Eliminate the Steam PRV Stations

Eliminate the Flash Tanks

75% Fewer Steam Traps

75% Less Piping

Eliminate Flash Tanks and Vents

Eliminate Condensate Pumps

Eliminate 80% of all Radiant Heat Loss

Reduce Steam Usage 20%

Understanding ThermaSyphon, Zero Flash and Vacuflo Steam Fired Water Heating Systems

Zero Flash Heat Exchangers Save Energy for the End User

- Steam Quality in a Zero Flash is 100% as Compared to 85-90% In Any Conventional Steam Heat Exchanger System Due to the Inlet Steam Conditioning Design
- Steam is Used at a Very Low Pressure Which is Safe and Has A Latent Heat/Sensible Heat Content per LB of Over 1000 BTUs Per Lb of Steam Versus 865 for a Common Exchanger System
- Zero Flash Exchangers Utilize the Sensible Heat of the Steam Reducing The Overall Amount of BTUS needed for the Same BTU Duty EFFICIENCY OF 25% ANY STANDARD STEAM EXCHANGERS

THERMA FLO

Zero Flash Steam Fluid Heater System Open Loop

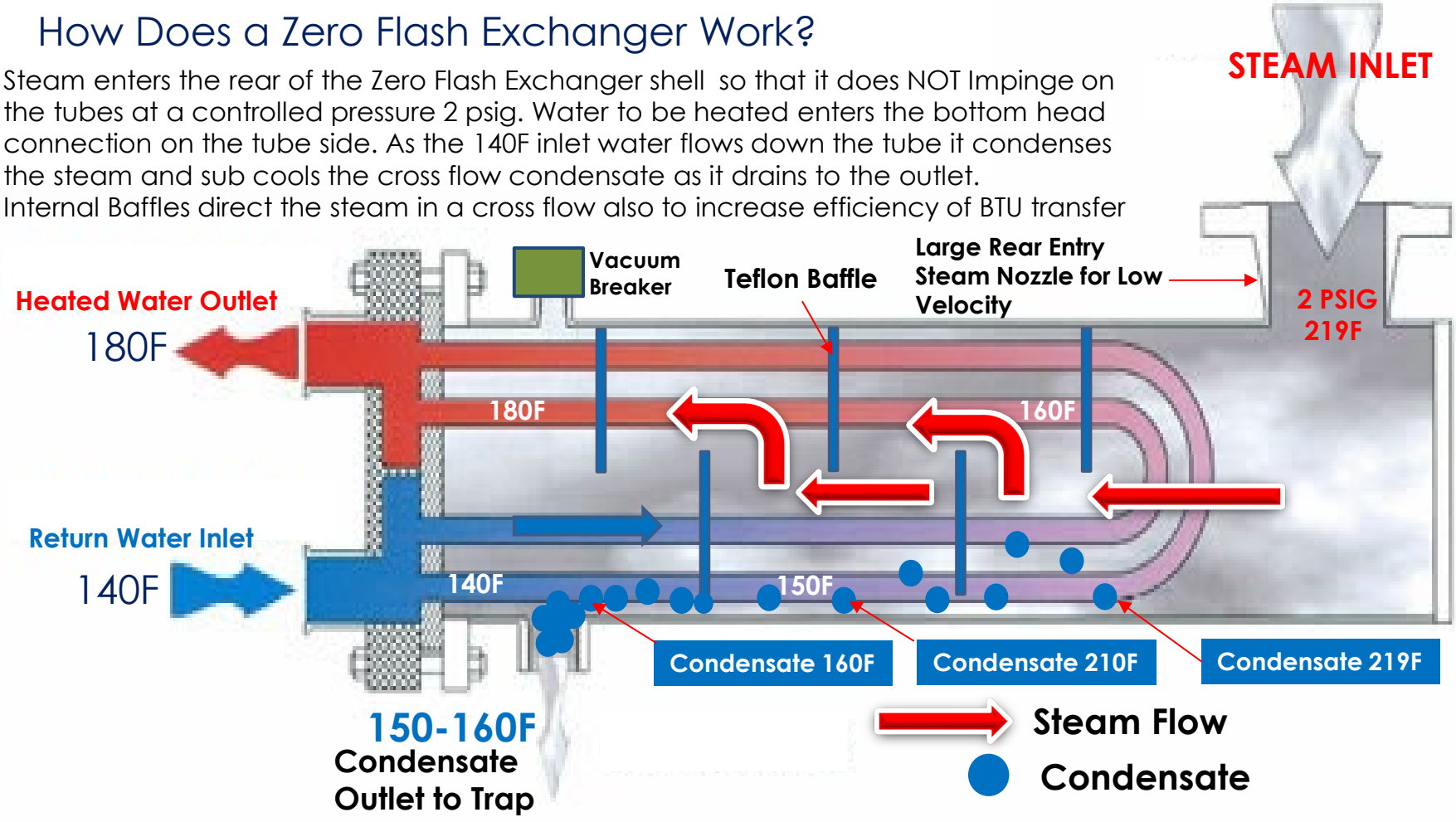
- Eliminates Wasted Flash Steam to Atmosphere and Flash Tanks
- Accepts High Pressure or Low Pressure Steam Subcools Condensate for High Efficiency
- System is Fully Pre Piped with all the Features Such as:

Inlet Isolation Valve, Strainer (installed correctly) Steam Conditioning Station to remove all condensate and enhance Steam Quality to 100%, JVV V Ball 300:1 Control Valve, FT Steam trap and the Zero Flash ASME Condensing Heat Exchanger

- Save 50% on Install Savings By Eliminating PRV Stations, Safety Valve Vents, Flash Tanks, Special Design Condensate Pumps

How Does a Zero Flash Exchanger Work?

Steam enters the rear of the Zero Flash Exchanger shell so that it does NOT Impinge on the tubes at a controlled pressure 2 psig. Water to be heated enters the bottom head connection on the tube side. As the 140F inlet water flows down the tube it condenses the steam and sub cools the cross flow condensate as it drains to the outlet.
Internal Baffles direct the steam in a cross flow also to increase efficiency of BTU transfer



TH500PH ThermaSyphon "Pumping Exchanger"

Ask Yourself:

What if we could eliminate Steam PRV Stations from my mechanical room and campus or greatly reduce the size of them?
What if we could reduce the overall steam required to heat water over 15% across the board?
What if we could eliminate condensate return pumps?
What if we could eliminate open loop flash tanks, holes cut through roofs, costly vent piping, and wasted flash steam to atmosphere?
What if we could reduce equipment space in a mechanical room 50%?
What if our exchanger equipment was designed for 30 Year service?

The Answer is Yes! ThermaSyphon

THERMA FLO

- The ThermaSyphon is a time proven shell and tube vertical space saving heat exchanger constructed of 316L High Alloy Stainless Steel to ASME Section VIII 150 psig
- High or Medium Pressure Steam Supply is reduced and controlled to low pressure in the shell at the Inlet and features a inlet Vertical Down Steam Seperator
- The ThermaSyphon features an inlet "Steam Vaporization Nozzle" to enhance the Shell "Steam Quality" to above a 98% dryness fraction saving 15 to 20% over any standard heat exchanger design
- The controlled constant shell steam pressure is used as a motive driving force to pump and return condensate to a central return line eliminating system Stall and those external condensate return pumps, and flash tanks
- The ThermaSyphon is equipped standard with a EC1000 UL Listed Touchscreen Controller that features slow ramp system startup of steam, controls shell pressure and outlet water temperature plus handles all safety alarms and controls!

THERMA FLO

DRAWING / PROJECT APPROVAL

☐ ISSUED FOR APPROVAL DATE:______________BY:________

☐ REVISE AS NOTED AND RETURN FOR APPROVAL

☐ APPROVED FOR CONSTRUCTION AS DRAWN

PLEASE INDICATE ABOVE. SIGN AND RETURN

RETURNED BY:________________

DATE:________________

It is the sole responsibility of the purchaser to assure that this drawing fully complies with any / all specifications and conditions of service when approving for construction. Approval for construction is an agreement that this system, as presented in this drawing fully complies.
Material procurement and construction will NOT begin until we receive your final drawing approved for construction without pending changes. Quoted delivery lead times are based from the end of the drawing approval process. If you require procurement to begin prior to drawing approval, make commitments and arrangements with your sales person.

MODEL SELECTION	MODEL	"AA"	"BB"	"CC"	"DD"	"EE"	"FF"	"GG"	"HH"	"JJ"	SHIPPING	DRY	FLOODED	SHIPPING
	STANDARD DIMENSIONS											STANDARD WEIGHTS (LBS)		
	636 BUNDLE	32.50	46.25	75.25	38.75	53.00	48.50	88.81	20.00	24.00	4'X8'X4'	636	861	736
	836 BUNDLE	32.50	46.25	75.25	38.75	55.00	49.50	89.25	20.00	24.00	4'X8'X4'	681	906	781
	1036 BUNDLE	28.19	47.50	75.25	39.00	58.38	51.00	90.19	20.00	24.00	4'X8'X4'	746	971	846
	1236 BUNDLE	28.19	47.50	75.25	39.13	60.38	55.50	91.19	24.00	30.00	4'X8'X4'	831	1056	931
	1436 BUNDLE	28.19	48.38	74.50	39.25	61.75	56.00	92.38	24.00	30.00	4'X8'X4'	936	1161	1036
	1636 BUNDLE	26.00	48.38	77.00	39.25	63.13	57.50	93.56	24.00	36.00	4'X8'X4'	1061	1286	1161

NOZZLES & CONNECTIONS

A	B	C	D	E	F	G
2" 150# FLG	2" 150# FLG	FILL OUT IN SELECTION BELOW	1-1/2" NPT	2" 150# FLG	1" NPT	2" 150# FLG
2" 150# FLG	2" 150# FLG		1-1/2" NPT	3" 150# FLG	1" NPT	2" 150# FLG
3" 150# FLG	3" 150# FLG		1-1/2" NPT	3" 150# FLG	1" NPT	2" 150# FLG
3" 150# FLG	3" 150# FLG		1-1/2" NPT	3" 150# FLG	1" NPT	2" 150# FLG
4" 150# FLG	4" 150# FLG		1-1/2" NPT	4" 150# FLG	1" NPT	2" 150# FLG
6" 150# FLG	6" 150# FLG		2" NPT	4" 150# FLG	1" NPT	2" 150# FLG
COLD WATER INLET	HOT WATER OUTLET	STEAM INLET	CONDENSATE OUTLET	STEAM INLET (SHELL)	GAUGE	INSPECTION PORT

DESIGN DATA

ASME CODE SECTION VIII, DIV. 1 STAMP UM	
SHELL RATED	150 PSI @ 375F
TUBE RATED	150 PSI @ 375F
CONDITION OF SERVICE AND PERFORMANCE DATA	
FLOW RATE (gpm)	GPM
INLET TEMPERATURE (Deg. F)	°F
OUTLET TEMPERATURE (Deg. F)	°F
INLET STEAM PRESSURE (PSI)	PSIG
STEAM CAPACITY REQ. (LBS/HR)	LBS/HR
SEE QUOTE	

DO NOT SUBJECT EQUIPMENT TO FREEZING TEMPERATURES OR OUTDOOR CONDITIONS

STEAM INLET CONTROL VALVE

150# FLG	STEAM SUPPLY SIZE TO CONTROL VALVE
NPT	CONTROL VALVE SIZE
NPT	SHUTDOWN VALVE SIZE

Heat Exchanger Size / BILL of MATERIALS

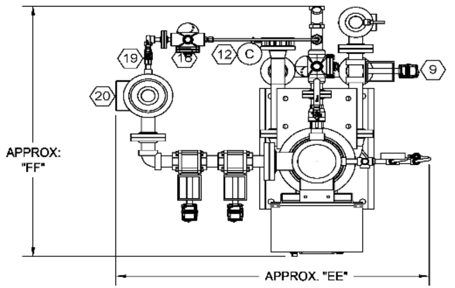
6"	8"	10"	12"	14"	16"	ITEM	DESCRIPTION
6X36	8X36	10X36	12X36	14X36	16X36	1	ASME CODE STAMPED SHELL, 1 1/2" OF GLASS INSULATION & VINYL JACKET
EC1000						2	THERMAFLO ELECTRONIC CONTROLLER, UL LISTED, PID ELEC. TEMP. CONTROL, W/ SAFETY SHUTDOWN AND OPERATION INDICATOR LIGHTS
						3	THERMAFLO JVV-VBALL STEAM CONTROL VALVE, STAINLESS, W/FAIL SAFE ACTUATOR
						3A	THERMAFLO BVV-VBALL STEAM SAFETY SHUTDOWN VALVE, STAINLESS, W/FAIL SAFE ACTUATOR
1-1/2" 46-SERIES					2" 46-SERIES	4	THERMAFLO FLOAT AND THERMOSTATIC STEAM TRAP
3" DIAL						5	TEMPERATURE GAUGE, 0-250F, SS WELL.
1/2"						6	RTD, 4-20ma OUTPUT FROM CONTROLLER
N/A - NOT USED						7	N/A - NOT USED
2"			3"	4"		8	TITAN CV-12-SS WAFER CHECK VALVE, SS
2"			3"	4"		9	THERMAFLO JVV-VBALL 3-WAY BLENDING VALVE, STAINLESS, W/FAIL SAFE ACTUATOR
1-1/2"						10	THERMAFLO 3700 BALL VALVE, FULL PORT, STAINLESS STEEL
PSIG - 4.5" DIAL						11	US GAUGE PRESSURE GAUGE W/ SYPHON
3/4"		1"				12	THERMAFLO VACUUM BREAKER
1/4"						13	THERMAFLO 3700 BALL VALVE, FULL PORT, STAINLESS STEEL
2"	3"		4"			14	PRATT LUB BODY BUTTERFLY VALVE, SS DISC & STEM
AMETEK						15	PRESSURE TRANSMITTER
1/2"						16	THERMAFLO FT42-125 THERMOSTATIC STEAM TRAP
1/2"						17	THERMAFLO ICM CONDENSATE MIXER
1-1/2"						18	KITZ 22T SWING CHECK VALVE
1/2"						19	THERMAFLO 3700 BALL VALVE, FULL PORT, STAINLESS STEEL
VDS- -150						20	THERMAFLO VDS VERTICAL DOWN STEAM SEPERATOR ASME CODE STAMPED

MATERIALS of CONSTRUCTION

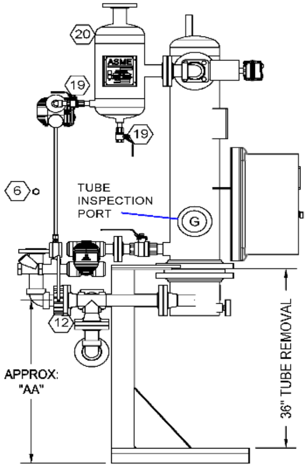
SHELL	316L STAINLESS STEEL
TUBES	
TUBESHEET	
STEAM HEAD	

ThermaSyphon Pumping Exchanger Features and Benefits

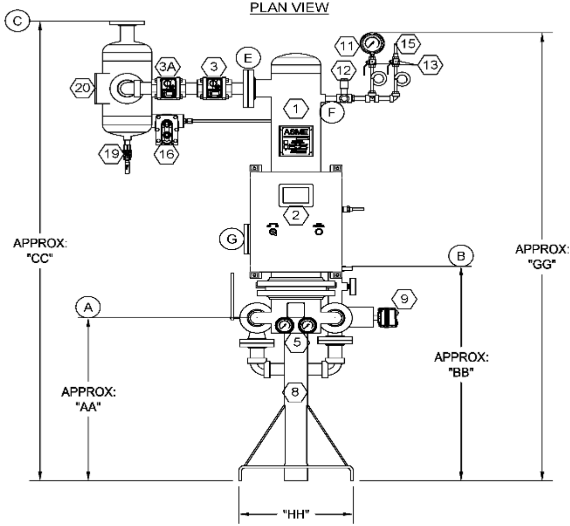
- >Vertical Constant Pressure "Pumping Exchanger Design
- >316L ASME Vertical Exchanger Shell
- >Single Wall and Double Wall Tube Bundles Available
- >99% Steam Quality Steam Vaporization Nozzle Enhances Steam BTUs Saving 10-18% Over Conventional Heat Exchangers
- >UL Listed BacNet Touchscreen Controls
- >Shell Pressure Control for Motive to Pump Condensate
- >Subcooling Design Eliminates Flash Steam
- >Accepts High Pressure Steam and Controls to Low Pressure in the Shell Eliminates Steam Pressure Reducing Stations
- >Dual Safety Shutdown Valves for High Pressure and High Temperature
- >No External Vents to Atmosphere Condensate is NOT Exposed to Air Reducing Carbonic Corrosion in Piping
- >Pumps the Condensate into Return Line Eliminates Flash Tanks and Condensate Pumps



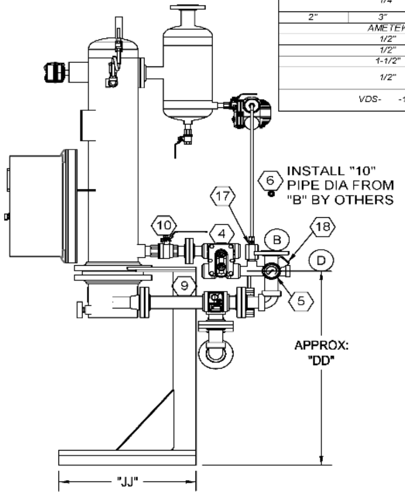
PLAN VIEW



LEFT SIDE VIEW



FRONT VIEW



RIGHT SIDE VIEW

DIM TOL= +/- 1/2"

TAG:

#	DATE	REVISION	BY

THERMAFLO INC. Since 1986
Manufacturers Of Steam Fired Specialty Equipment
2880 Fair Avenue, Newberry, SC 29108
(704) 940-1228 www.thermafloengineering.com

DESCRIPTION: TH500VPH-EC1000 STEAM FIRED PUMPING WATER HEATER

CUSTOMER:				JOB #	QTY.	DATE: 10-30-25
SCALE:	DRAWN: RSP	PO #	PLAN #	FILE: SAME	REV. # 0	PAGE: 1 OF 1

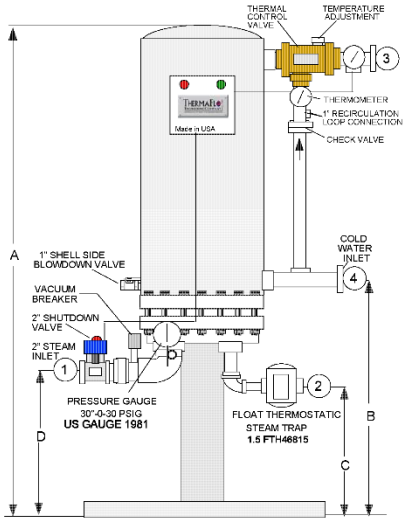
Thermaflo TH750TM
Steam Fired Water Heater

- Designed for Domestic Water Use Mainly Steam in the Tubes / Water in the 316L ASME Code Section VIII Shell
- Vertical Short Shell Spacing Design Less than 72" OAH
- Temperature is Controller to 140F or below with a Self Contained Thermostatic Mixing Valve ASSE 1017 Certified
- Inlet Steam BVV Safety Shutdown Valve
- EC100 UL Listed Safety Steam Shutdown System on High Temperature with BMS Dry Contact Alarm Notification
- Constant 15 psig Steam Pressure on the tubes eliminates condensate back, water hammer and thermal shock
- Double Wall or Single Wall Inner Tube Bundle Construction
- High Capacity Float and Thermostatic Steam Trap
- Shell Pressure Gauge and Thermometer
- Vacuum Breaker and Inlet Steam Pressure Gauge
- Vertical Base Stand and Insulation Jacket

THERMA FLO

THERMAFLO TH750TM STEAM FIRED WATER HEATER
STANDARD FEATURES AND OPERATION

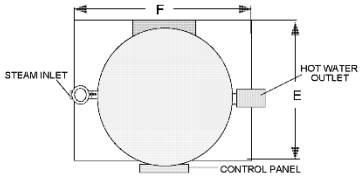
The Thermaflo TH750TM Domestic Water Heater is a completely pre-piped and tested steam water heating system. Inlet supply steam is piped to the inner tube bundle at a constant pressure heating the incoming domestic water.
Outlet domestic water demand automatically modulates the "Thermostatic Self Contained Thermal Valve" blending precise amounts of hot and cold water instantly to maintain is set point for all flow demands.
Outlet heated water temperature settings (110F to 150F) are easily made with a dial adjustment on top of the thermal control valve. Domestic loop water is recirculated to the recirculation port to maintain constant loop supply temperature
The inlet steam supply valve will shutdown in case of overheating condition with dry contact BMS system output, and red alarm light on the front of the UL Listed control panel. Bacnet output available as an option.
Constant pressure steam is used as a motive condensate removal pumping force, so the TH750TM can be used as a pumping exchanger for condensate return, eliminating a condensate return pump in some applications



FRONT ELEVATION VIEW

- ASME CODE SECTION VIII DIV1 U STAMPED CONST
- THERMOSTATIC SELF CONTAINED DOMESTIC ASSE 1017 WATER TEMPERATURE CONTROL VALVE
- VERTICAL CROSS FLOW DESIGN EXCHANGER 316L STAINLESS STEEL SHELL CONSTRUCTION
- HEAVY **WALL** COPPER TUBE BUNDLE WITH TEFLON SEGMENTED BAFFLES
- SHELL BLOWDOWN VALVE AND EXPANDABLE TUBE DESIGN TO REMOVE INTERNAL SCALE BUILDUP
- ACCURACY +/- 4F UNDER NORMAL LOADS
- STEAM SAFETY HIGH LIMIT SYSTEM
- UL LISTED CONTROL 120V/1/60 PANEL
- VACUUM BREAKER AND PRESSURE GAUGE
- OUTLET WATER BIMETAL THERMOMETER
- HIGH CAPACITY FLOAT AND THERMOSTATIC STEAM TRAP
- COMPLETE PIPED AND TESTED PACKAGED SYSTEM
- 1.5" THICK INSULATION SHELL REMOVABLE JACKET

HEAT EXCHANGER DESIGN STANDARDS			
	MAXIMUM WORKING PRESSURE PSIG	MAXIMUM TEMPERATURE	TEST PRESSURE
SHELL SIDE	150 PSIG	375F	250 PSIG
TUBE SIDE	150 PSIG	375F	250 PSIG
ASME CODE SECTION VIII, DIV 1 STAMP U/UM			



TOP VIEW

CONNECTIONS

1 2" STEAM INLET SUPPLY NPT **15 PSI**
2 1.5" CONDENSATE OUTLET
3 2" 140F HEATED WATER OUTLET 150LB FLG
4 2" COLD WATER INLET 150LB FLG

DIMENSIONS					
A	B	C	D	E	F
75	40	18	23	24	24

CONDITIONS OF SERVICE

INLET STEAM PRESSURE: 15 psig
INLET TEMPERATURE: 40F
OUTLET TEMPERATURE:140F
FLOW RATE **60**
STEAM FLOW RATE:**3000** LBS/HR

MATERIALS OF CONSTRUCTION

SHELL	316L STAINLESS STEEL
TUBESHEET	304L STAINLESS STEEL
TUBES	COPPER **DOUBLE** WALL
BAFFLES	TEFLON 25% SEGMENTED
STEAM HEAD	CLOSE GRAIN CAST IRON

NOTES:
1. UNIT HYDROTESTED BEFORE SHIPMENT.
2. UNIT SHOWN IS VERTICAL STAND MOUNTED
3. 115 VOLT/1PHASE/60HZ POWER REQUIRED FOR OPERATION.
4. MOUNTING FRAME PRIMED AND PAINTED.
5. CONTROL PANEL NEMA 4 UL LISTED.

THERMAFLO Engineering Company Inc.
Since 1986 Newberry, S.C. 29108

TH-**750TM** 8"STEAM FIRED **WATER**

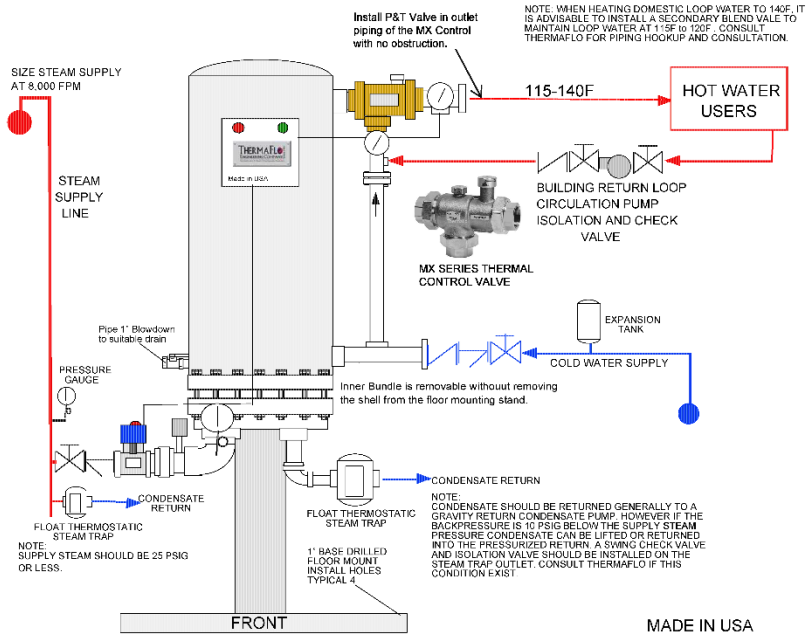
DRAWING

DWN BY: DATE:6/25
SCALE: None
CHKD: KB APPD:RFJ
DWG NO# 750V**TM**01J

DESIGN AND MATERIALS SUBJECT TO CHANGE

Manufacturing Facilities: 2880 Fair Avenue Newberry,SC 29108
www.thermafloengineering.com Phone: 704-940-1228

TYPICAL PIPING AND INSTALL ARRANGEMENT



PIPING NOTES AND MAINTENANCE FEATURES

1. The water side domestic piping standard is 316L stainless steel for long service life.
2. The Thermaflo TH750TM Shell carries a 20 Year Warranty as a standard.
3. Each Thermaflo TH750TM is factory tested on five steam and water flow conditions before shipment, with outlet water setpoint verified.
4. Piping/Valves/and Exchanger meet and exceed NSF61 material requirements for domestic water service.
5. The internal heating tube bundles are fully removable for maintenance or repairs without dismantaling domestic water piping or removing the shell from the base stand.
6. The Thermal Control Valve can be removed by means of union bronze connections, and cleaned quickly when required or replaced after years of constant service.
7. Inner tube bundle teflon baffles are arranged so that optimum heat transfer is realized and expansion and alignment assured so that wear holes are not a failure point.

Thermaflo Engineering Inc. Manufacturing Facilities: 2880 Fair Avenue Newberry, South Carolina 29108 704-940-1228