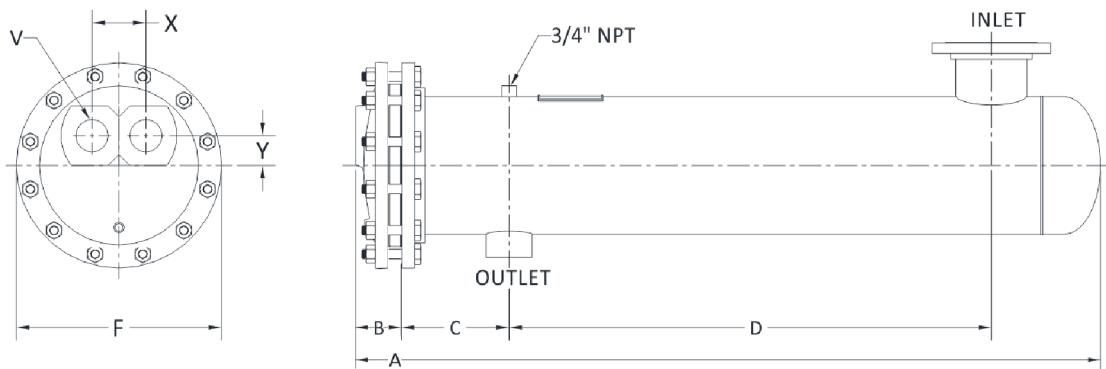


service:

	tube side	shell side
fluid:	water	saturated steam
flow rates:	400.0 gpm.us	8164.0lb/h @ 5.0 psig
temp inlets:	140.0	227.0 F
temp outlets:	180.0	227.0 F
fouling:	0.0002	0.0002(ft ² · °F)/(Btu/h)



A	B	C	D	F	inlet	outlet	V
78.02"	5.58"	8.0"	48.0"	25.0"	10" FLG"	3" NPT	5" NPT

* Designed & constructed per ASME section VIII Div 1.

materials of construction:

shell: carbon steel

head: cast : iron

tube sheet: carbon steel

tubing: copper, 3/4" 20 ga

bundle cage: carbon steel

baffles: carbon steel

maximum operating conditions:

tube-side working pressure: 125 psig

shell-side working pressure: 150 psig

hydrostatic test press' tube-side: 162 psig

hydrostatic test press' shell-side: 195 psig

maximum temp' tube-side: 375 F

maximum temp' shell-side: 375 F



Submittal Data
S18-048-422

18" dia' / 48" len' / 4 passes / 185.3 ft²
 U-tube heat exchanger (ESRN)

S18-048-422BS-ESCI-SX-CCC-11 (A)

2015 January 21

process conditions	tube-side		shell-side	
fluids:	water		saturated steam	
flow rates:	400.0	gpm.us	8164.0	lb/h @ 5.0 psig
inlet temperatures:	140.0		227.0	F
outlet temperatures:	180.0		227.0	F
operating pressure:	125		5.0	psig
density:	60.6		0.049	lb/ft ³
viscosity:	0.397		0.012	cP
heat capacity:	1.000		0.493	Btu/(lbm·°F)
thermal conductivity:	0.384		0.015	Btu/(h·ft·°F)

design criteria

max velocity	7.5	fps		
max pressure drop	15	psig		
fouling requested	0.0002		0.0002	h·ft ² ·°F/Btu

performance

velocity	6.54	fps	--	
pressure drop	4.55	psig		
heat transfer coefficient	2,291.8		1,560.0	(Btu/h)/(ft ² ·°F)
heat load	7,842,831.5	Btu/h		
corrected LMTD	65.0	x 1.0000 = 65.0 °F		
overall heat transfer coeff'	628.0	(Btu/h)/(ft ² ·°F)		
total fouling available	0.0004	(ft ² ·°F)/(Btu/h)		
required heating surface	131.8	ft ² fouled, 131.8 clean.		

construction

design rating	125		150	psig @ 375 °F
passes	4		1	
inlet nozzle	5" NPT		10" FLG	
outlet nozzle	5" NPT		3" NPT	

materials

tubes	copper, 3/4" 20 ga
tubesheet	carbon steel
head	cast : iron
shell	carbon steel
baffles	carbon steel
gasket	non-asbestos
studs & nuts	carbon steel



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U-tube heat exchanger (ESRN)

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2015 January 21

nozzle velocities	actual [fps]	(@ ft ³ /min)	limit (1)	
head inlet	6.41		15.0	fps
head outlet	6.41		15.0	fps
shell inlet (sat' steam)	84.40	2773.16096	150.0	fps
shell outlet	0.71	2.27523	15.0	fps

tube bundle impingement velocity	actual	recommended limit (2)
shell inlet	84.40	33.0 fps

notes: nozzle velocity & tube bundle impingement velocity

- (1) The above velocity limits are based on best engineering practices.
- (2) The criteria for "ESRN" units is the shell inlet fluid velocity impingement onto the tube bundle. Velocities above these engineering limit result in an "ESRN" recommendation. For "ESRN" units, the acceptable limit of vapor fluid velocity in pipe (or in a nozzle section) is not the same as that for impingement velocity of a vapor onto a tube bundle. The generally accepted limit of impingement velocity is 33 fps (or 2000 fpm). The impingement velocity is taken as the nozzle velocity, which is the volumetric flowrate of the vapor fluid (or saturated steam) divided by the cross-sectional area of the nozzle pipe.