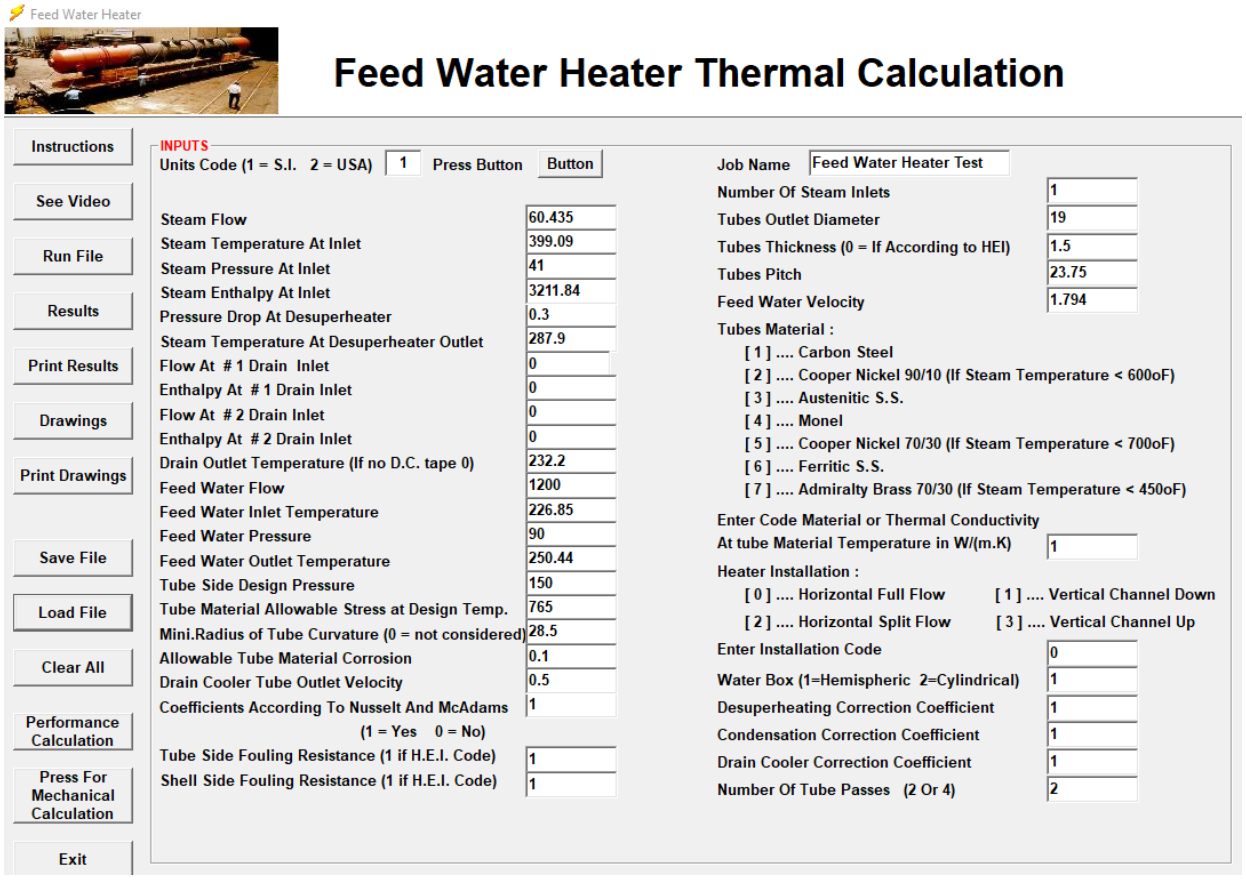
Feedwater Heater

Thermal and mechanical design of feedwater heaters based on HEI standards and heat transfer coefficients for each zone based on classic correlations (Nusslet, McAdams,…) or proprietary methods. Full or split flow heaters are accommodated, as are horizontal and vertical units with up and down channel. In addition to the performance results required to complete heater specification datasheet, the program generates a heater drawing showing the principal dimensions of the unit and of the tube support system, tube layout and results sheet for thickness and weights. The program also generates the heater's performance for other thermal load conditions.

DATA ENTRY WINDOW



FEED WATER HEATER - Data Results

Job Name : **Feed Water Heater Test**

■ Data Input

Steam Flow (Including 0.3% Lost)	60,355	tn/h
Steam Temperature At Inlet	399,09	oC
Steam Enthalpy At Inlet	3211,84	kj/kg
Steam Pressure At Inlet	41	bara
Specific Volume Of Steam Inlet	0,07135	m3/Kg
Steam Saturation Temp. At Inlet Pressure	251,797	oC
Steam Temp. At Condensation Pressure	251,357	oC
Condensed Water Enthalpy	1092,39	kj/kg
Steam Temp. At Desuperheater Outlet	287,9	oC
Steam Enthalpy At Desuperheater Outlet	2923,62	kj/kg
Flow At # 1 Drain Inlet	0	tn/h
Enthalpy At # 1 Drain Inlet	0	kj/kg
Flow At # 2 Drain Inlet	0	tn/h
Enthalpy At # 2 Drain Inlet	0	kj/kg
Drain Outlet Temperature	232,2	oC
Drain Outlet Enthalpy	1000,8	kj/kg
Feed Water Flow	1200	tn/h
Feed Water Inlet Temperature	226,85	oC
Feed Water Inlet Enthalpy	977,02	kj/kg
Feed Water Outlet Temperature	250,44	oC
Feed Water Outlet Enthalpy	1087,9	kj/kg
Average Feed Water Specific Volume	0,001218	m3/Kg
Tubes Outlet Diameter	19	mm
Tubes Thickness	1,5	mm
Tubes Pitch	23,75	mm
Feed Water Velocity	1,794	m/s
Tubes Material	Carbon Steel	
Heater Installation	Horizontal Full Flow	
Desuperheating Correction Coefficient	1	
Condensation Correction Coefficient	1	
Drain Cooler Correction Coefficient	1	

■ Results

Desuperheating Duty	17342,9	Mj/h
Condensation Duty	110194	Mj/h
Drain Cooler Duty	5511	Mj/h
Desuperheating L.M.T.D.	83,15	oC
Condensation L.M.T.D.	10,95	oC
Drain Cooler L.M.T.D.	12,26	oC
Desup.Heat Transfer Coefficient	2386	kj/hoCm2
Conden.Heat Transfer Coefficient	14997	kj/hoCm2
D.C. Heat Transfer Coefficient	9905	kj/hoCm2
Desuperheater Effective Surface	87,4	m2
Condensation Effective Surface	670,9	m2
D.C. Effective Surface	45,4	m2
Total Surface	808,6	m2
Inactive Surface	5	m2
Number Of U Tubes	1125	
Tube Side Pressure Drop	0,26	bar
Feed Water Temp. At Conden. Inlet	227,84	oC
Feed Water Temp. At Conden. Outlet	247,41	oC
Terminal Temperature Difference	1,35	oC
Drain Cooler Aproach	5,34	oC
Approx. Inlet Channel Diameter	1350	mm
Approx. Inlet Shell Diameter	1410	mm
Approx. Heater Total Length	7,89	m
Approx. Straight Tube Length	5490	mm
Approx. Desuper. Casing Length	1300	mm
Approx. Drain Cooler Casing Length	670	mm
Tube Number In Drain Cooler	1125	
Feed Water Nozzles Diameters	420	mm
Number Of Steam Nozzles	1	
Diameter Of Steam Nozzles	180	mm
Diameter Of Drain Nozzle	140	mm

Dew Point Verification 272,21 oC

(It Must Be Less Than Temperature At Desuperheater Outlet)

For Desuperheater :

Support Plates Number 3
Pressure Drop 0,22 bar

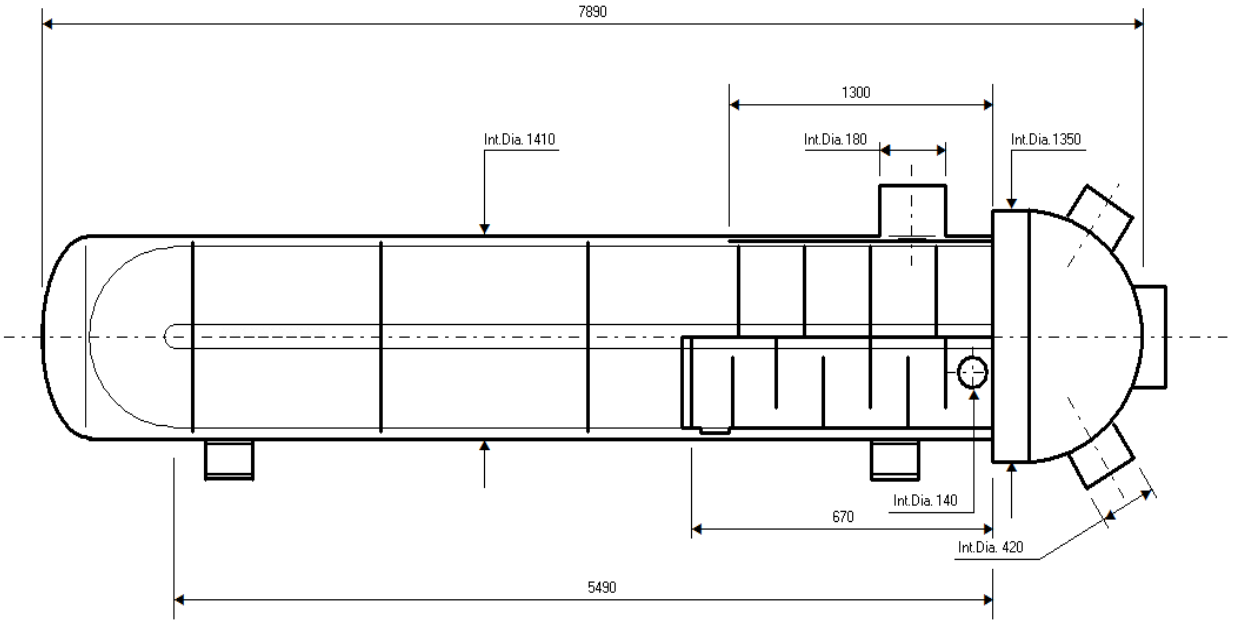
For Drain Cooler :

Support Plates Number 3
Pressure Drop 0,11 bar

For Condensing :

Support Plates Number 6
Pressure Drop NEGLIGIBLE

RESULTS SHEET



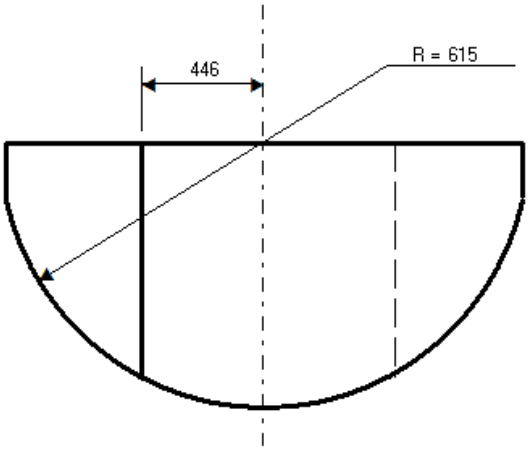
HORIZONTAL TYPE - Three Zones

Dimensions in mm

DIMENSIONAL DRAWING

DRAIN COOLER TUBES SUPPORT PLATE ARRANGEMENT

RIGHT-LEFT FULL FLOW WINDOW TYPE

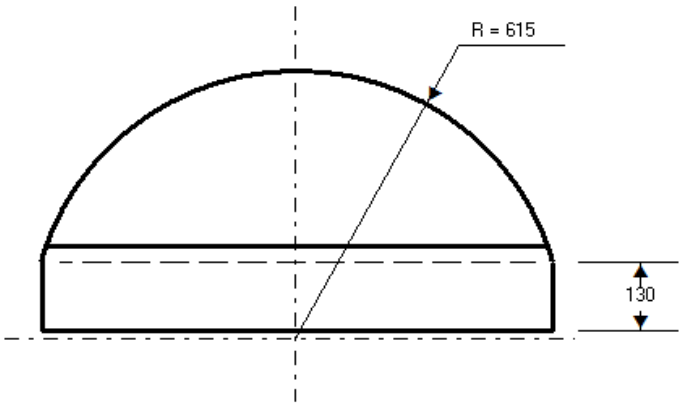


Type and dimensions are for information only and
must be fixed during the final conception after order

Dimensions in mm

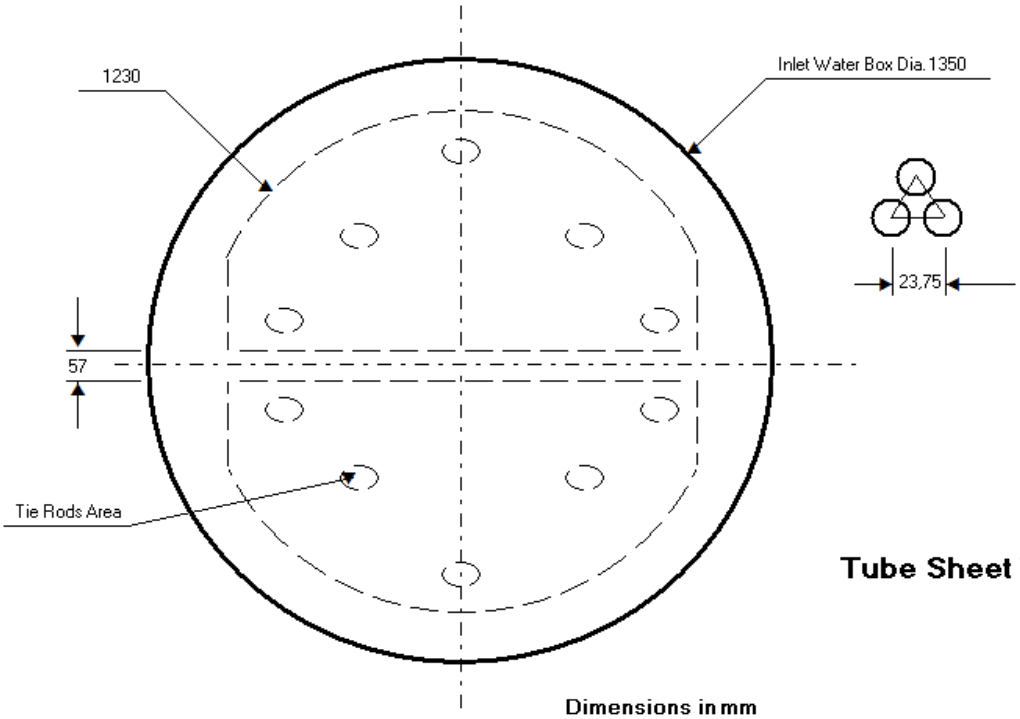
DESUPERHEATER TUBES SUPPORT PLATE ARRANGEMENT

UP-DOWN FULL FLOW WINDOW TYPE



Type and dimensions are for information only and
must be fixed during the final conception after order

Dimensions in mm



Tube Sheet Tube Layout

Dimensions in mm

F W H Performance

FWH Performance

Coefficients from Nusselt and McAdams

Run File

Results

Print Results

Drawing

Print Drawing

Save File

Load File

Exit

INPUTS

Units Code (1 = S.I. 2 = USA) 1 Press Button Button

Steam Temperature At Inlet	399.09	oC
Steam Enthalpy At Inlet	3211.84	kj/kg
Steam Pressure At Inlet	41	bara
Flow At # 1 Drain Inlet	0	tn/h
Enthalpy At # 1 Drain Inlet	0	kj/kg
Flow At # 2 Drain Inlet	0	tn/h
Enthalpy At # 2 Drain Inlet	0	kj/kg
Feed Water Flow	1200	tn/h
Feed Water Inlet Temperature	226.85	oC
Number Of Tubes In D. C. If Code = 2 Or 3	0	
~ Ext.Surf. Of D. C. Casing If Code 3	0	m2

End Of Calculation. Press Results

60,736

PERFORMANCE CALCULATION DATA

F W H Performance - Data Results

Job Name : **Feed Water Heater Test**

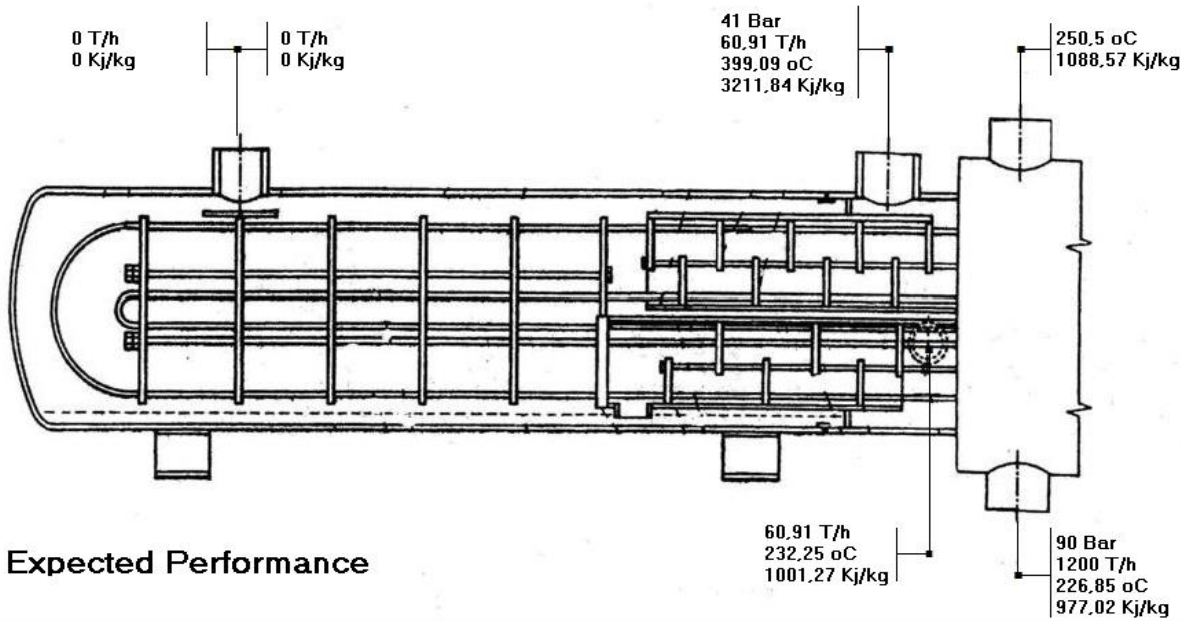
■ Data

Steam Pressure At Inlet	41	Bara
Steam Saturation Temp.At Inlet Pressure	251,797	oC
Steam Temperature At Inlet	399,09	oC
Steam Enthalpy At Inlet	3211,84	kj/Kg
Temperature At Condensation Zone	251,474	oC
Enthalpy At Condensation Zone	1092,96	Kj/Kg
Flow At # 1 Drain Inlet	0	Tn/h
Enthalpy At # 1 Drain Inlet	0	Kj/Kg
Flow At # 2 Drain Inlet	0	Tn/h
Enthalpy At # 2 Drain Inlet	0	Kj/Kg
Feed Water Pump Pressure	90	Bara
Feed Water Flow	1200	T/h
Feed Water Inlet Temperature	226,85	oC
Feed Water Inlet Enthalpy	977,02	Kj/Kg
Number Of Non Pugged Tubes	1125	
Tubes Outlet Diameter	19	mm
Tubes Thickness	1,5	mm
Tubes Material	Carbon Steel	
Active Desuperheating Surface	87,7	m2
Active Condensing Surface	672,3	m2
Active Drain Cooler Surface	45,5	m2
Heater Installation	Horizontal Full Flow	
Desuperheating Correction Coefficient	1	
Condensation Correction Coefficient	1	
Drain Cooler Correction Coefficient	1	

■ Results

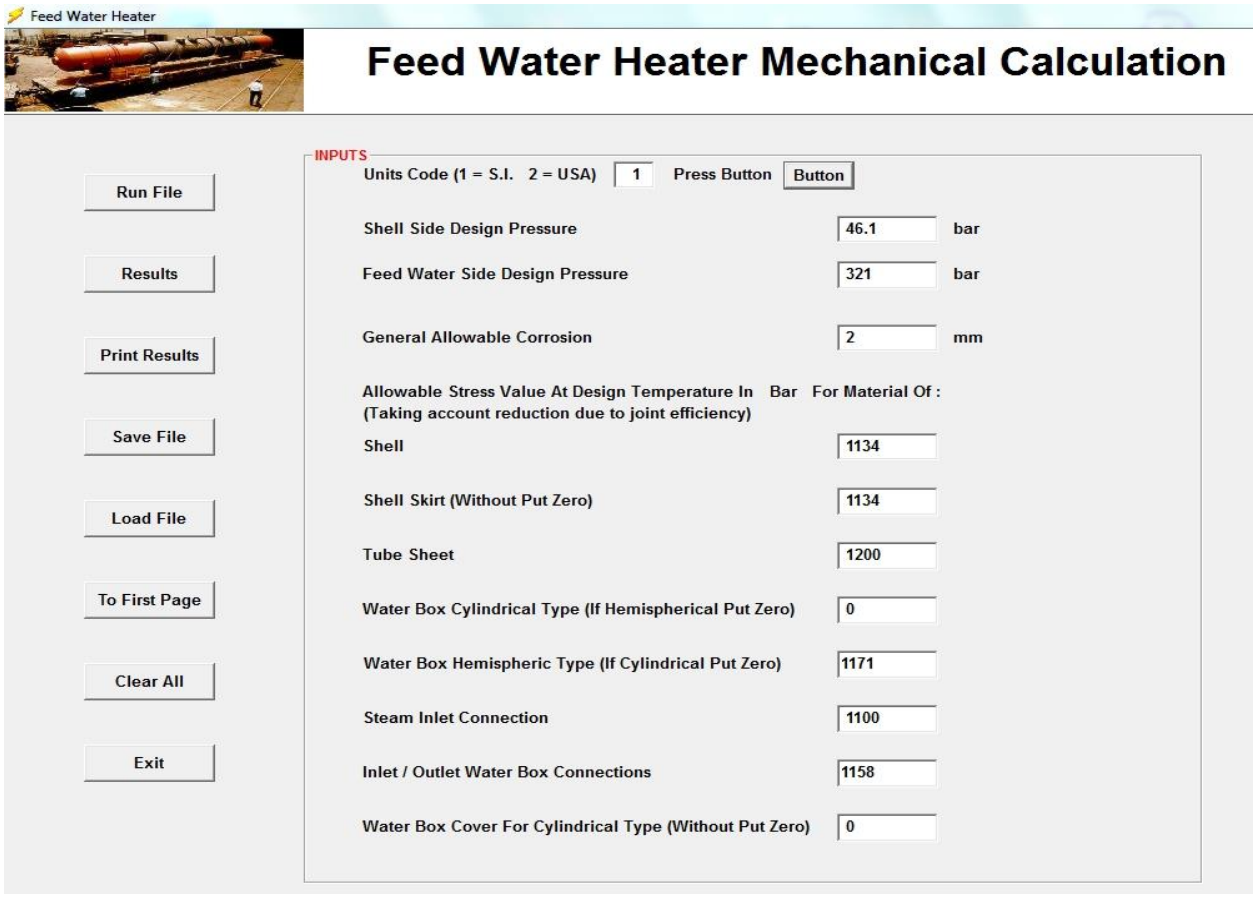
Steam Flow (Including 0.3 % Lost)	60,91	T/h
Desuperheating Duty	17143	Mj/h
Condensation Duty	111145	Mj/h
Drain Cooler Duty	5568	Mj/h
Desuperheating L.M.T.D.	83,52	oC
Condensation L.M.T.D.	10,95	oC
Drain Cooler L.M.T.D.	12,37	oC
Desup.Heat Transfer Coefficient	2386	Kj/hoCm2
Conden.Heat Transfer Coefficient	14976	Kj/hoCm2
D.C. Heat Transfer Coefficient	9876	Kj/hoCm2
F W Heater Shell Outlet Temperature	232,25	oC
Feed Water Outlet Temperature	250,5	oC
Feed Water Temp.At In Conden.Zone	227,76	oC
Feed Water Temp.At Out Conden.Zone	247,58	oC
F W Heater Shell Outlet Enthalpy	1001,27	Kj/Kg
Feed Water Outlet Enthalpy	1088,57	Kj/Kg
Feed Water Enthal.At In Conden.Zone	981,66	Kj/Kg
Feed Water Enthal.At Out Conden.Zone	1074,29	Kj/Kg
Steam Temp.At Desuperheater End	288,47	oC
Steam Enthal.At Desuperheater End	2922,95	Kj/Kg
Terminal Temperature Difference	1,29	oC
Drain Cooler Approach	5,4	oC
Tube Number In Drain Cooler	1125	
Number Of Plugged Tubes	0	
Dew Point Verification	272,02	oC
(It Must Be Less Than Temperature At Desuperheater Outlet)		

PERFORMANCE RESULTS



PERFORMANCE DATA DRAWING

MECHANICAL CALCULATION



MECHANICAL CALCULATION DATA WINDOW

FW HEATER RESULTS - Thickness (mm) and Weights (Kg)

Job Name : HP7

■ THICKNESSES

Shell	36
Shell Skirt	36
Elliptical Shell Cover End	36
Tube Sheet	425
Water Box (Hemispherical Type)	117
Water Box (Cylindrical Type)	0
Water Box Cover (Plate Type)	0
Water Box Cover (Elliptical Type)	0
Tubes Support Plate	10
Water Box Pass Partition Sheet	16
Steam Inlet Pipe	7
Feedwater Inlet/Outlet Pipe	61
Drains Outlet Pipe	7

■ WEIGHTS

Exchange Tubes	21470
Tube Sheet Gross Weight	7280
Tube Sheet Net Weight	5340
Shell With Cover End, Pipes And Internals	13750
Shell Skirt	1400
Hemispherical Water Box, Pipes And Manhole	3360
Cylindrical Water Box , Pipes And Plate Cover	0
Cylindrical Water Box, Pipes And Elliptical Cover	0
Complete Desuperheating Crate	560
Complete Drain Cooler Crate	860
Condensing Zone Tubes Support Plates	870
Heater Supports	400
Heater Empty	48010
Heater In Operation	52500
Heater Full Of Water	64400

RESULTS SHEET