



Satish Lele

leeequip@gmail.com

91-9403405715 and 91-9820277283

Design and Drawings with Program for Tubular Exchanger

I offer design and detailed drawings of Heat Exchangers using my own program. This is a program for design and drawing of Tubular Exchanger, with user friendly dialog boxes, which is an add-on for any inexpensive CAD program like BricksCAD, ProgeCAD or ZWCAD program for developing GA drawing for Tubular Exchanger. The program asks for some parameters and then automatically draws the drawing of Tube Bundle. The software gives all minor details at Quotation Stage itself and this helps to quote in most competitive manner. It can draw a Tubular Exchanger with up to 1000 tubes. It will be extended to 2,000 tubes later. You can modify the drawing as per your style.

Heat Exchanger Drawing

Heat Exchanger Program by
SATISH LELE
satish.lele@gmail.com
http://www.svlpipe.com/

System of Drawing

Foot-Inch System
 Metric System

OK

Dialog Box 1 : You can select the Foot-Inch units or Metric Units for the drawing. The system variables will be set automatically to draw in either Foot-Inch or Metric Units. All inputs will also be in selected unit system.

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http://www.svlpipe.com/

Please enter Drawing data:

| | | | |
|-----------------|----------------|-------------|------------|
| Clients Name : | ABC ENGINEERS | Drawn by: | GSD |
| End User: | ABC ENGINEERS | Checked by: | AKK |
| Consultant: | ABC CONSULTANT | Appd by: | HVR |
| Company Job No: | XYZ 001 | Date: | 09-23-2011 |
| Project No: | PROJECT 123 | Drawing No: | 001 |
| Eqpt No: | EQUPT 123 | Rev No: | 0 |
| Tag No: | HE-123 | | |

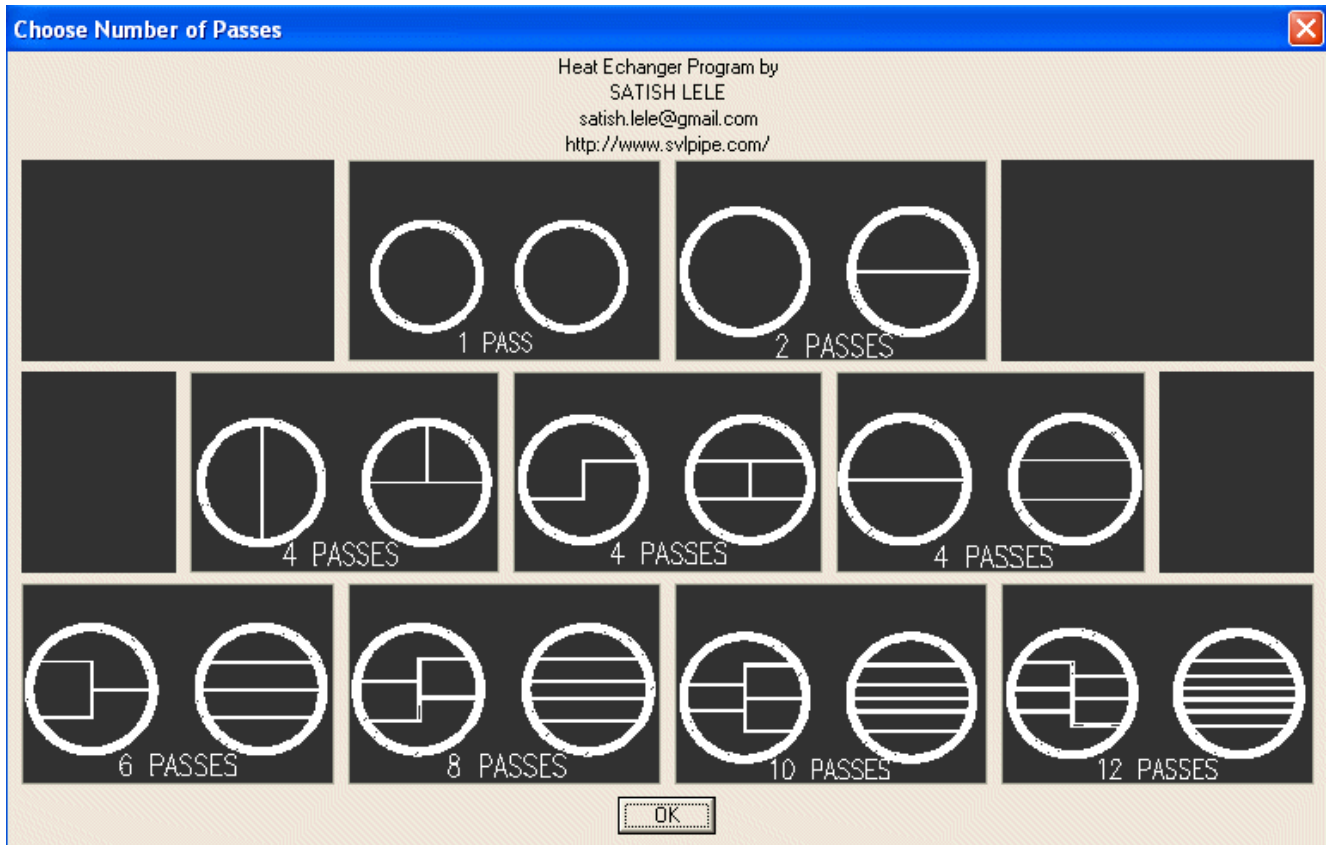
You can modify text as per your requirements in he_text.lsp file

OK

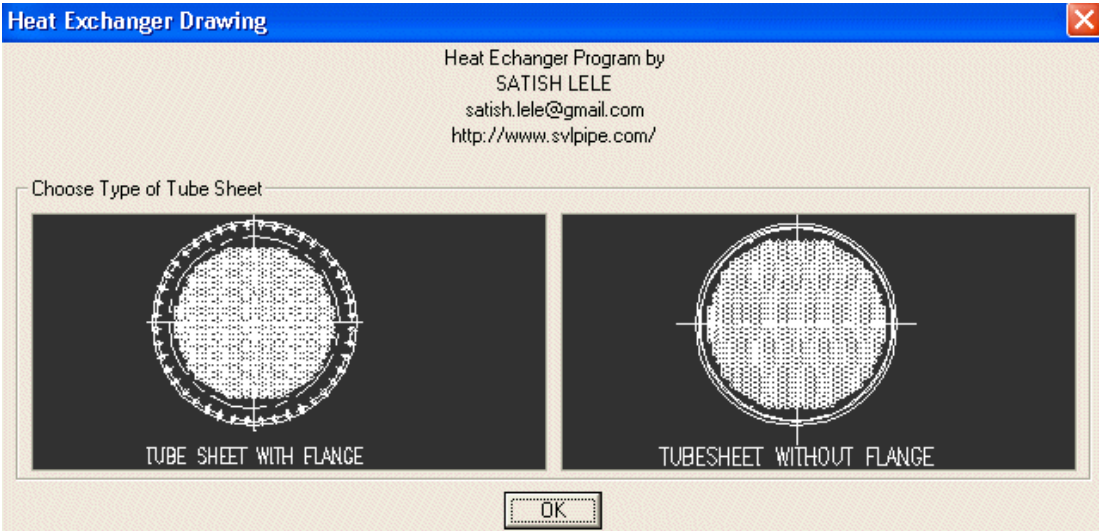
Dialog Box 2 : Enter designer data which will reflect in the title block of drawing. Program will automatically selects date.



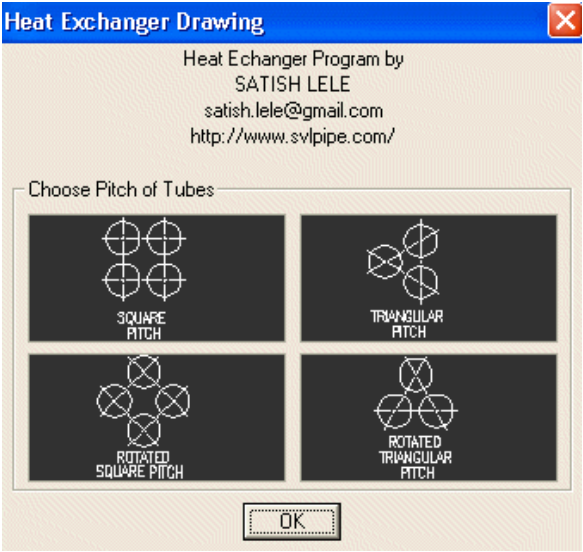
Dialog Box 3 : You can select Outer Diameter of Tube. It is generally 19 mm, 25 mm, 32 mm or higher. Correspondingly you select Tube Pitch. It is generally 25 mm (for 19 mm tube), 32 mm (for 25 mm tube), 40 mm (for 32 mm tube). Tube length is end to end length of tube. Tube Pitch is the distance between center lines of two tubes. Gasket width is for circular part as well as for dividing line for fixed tube sheet and floating tube sheet. Tube extension is projection length of tube outside the tube sheet (in head portion). You can select any number of tubes from 1 to 1,000. This will be extended to 2000 tubes. You can fix gasket thickness.



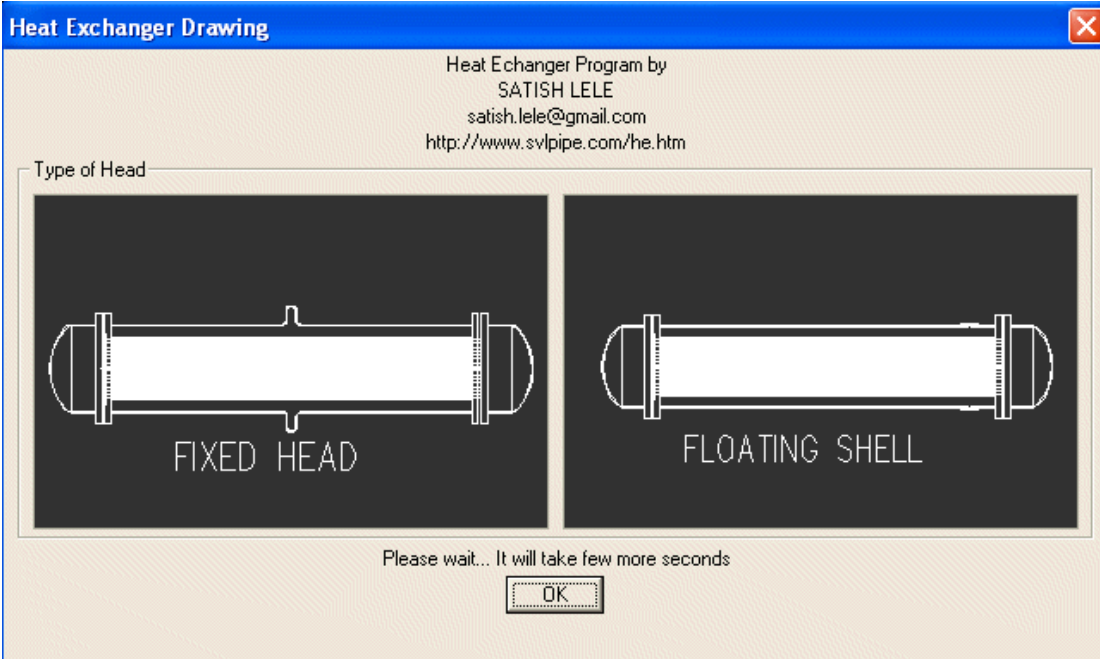
Dialog Box 4 : You can select either 1, 2, 4, 6, 8, 10 or 12 passes on tube side.



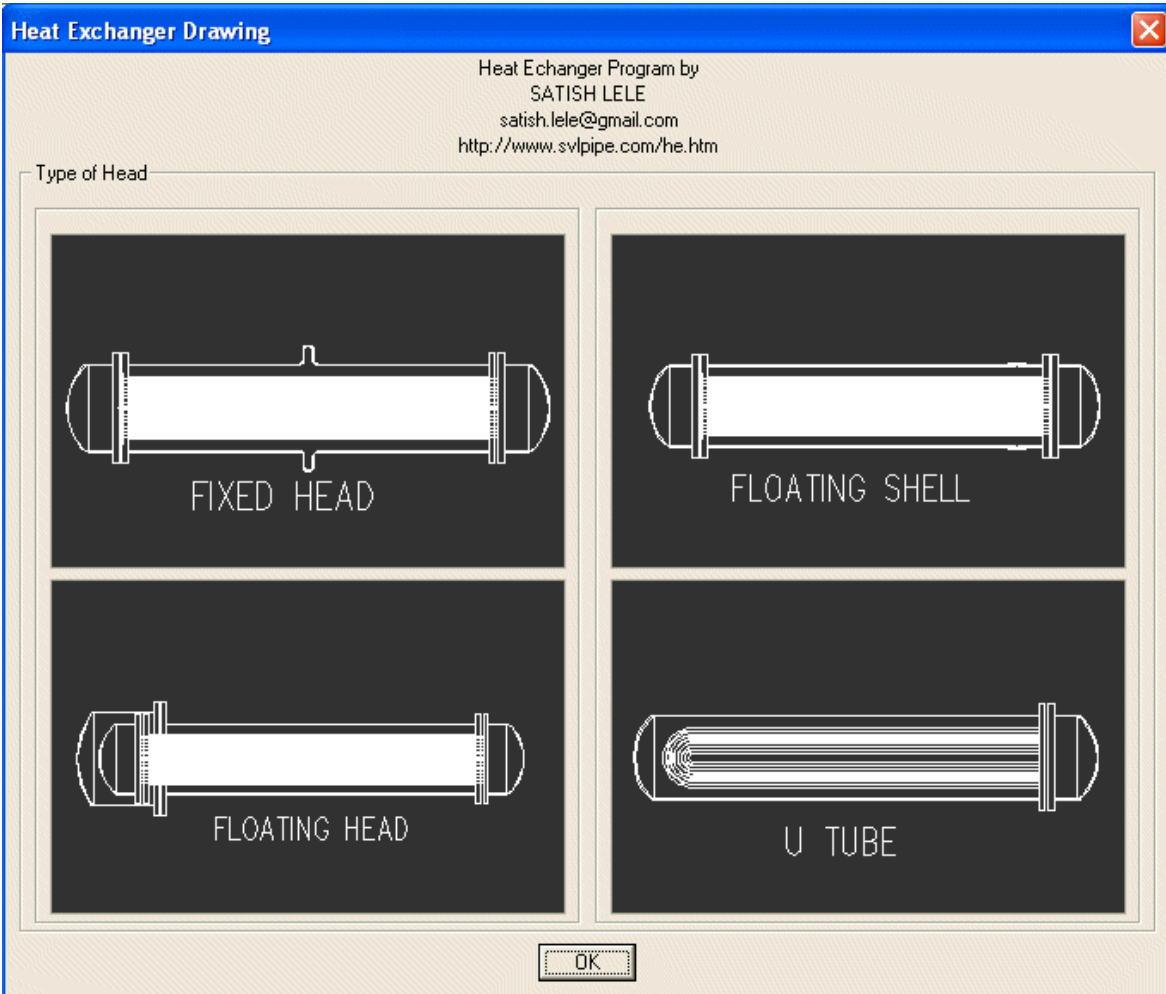
Dialog Box 5 : You can select Tube sheet with flange or without flange.



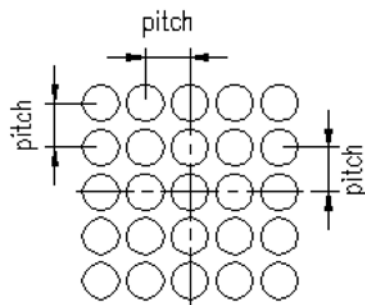
Dialog Box 6 : Once these tube parameters are fixed, you select the tube configuration. There are 4 options. You can select either Square pitch, Triangular pitch, Rotated Square pitch or Rotated Triangular pitch. Square and Triangular pitch are normally used as it facilitates cleaning of the tube externally. Configuration for different passes is shown below.



Dialog Box 7 : If it is 1 pass exchanger you can select either Fixed head or Floating Shell. In case of fixed head and floating shell, Diameter / PCD of both tube sheets will be same.

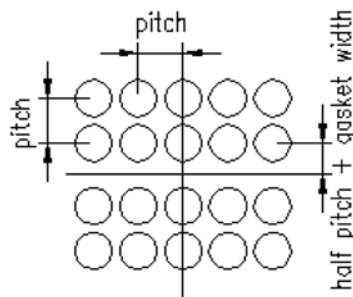


Dialog Box 7 : You can select either Fixed head, Floating head, Floating Shell or U Tube. In case of fixed head and floating shell, Diameter / PCD of both tube sheets will be same. In case of floating head Diameter / PCD of Right (Fixed Head) tube sheet will be smaller than that one on Left (Floating Head). In U Tube there is only one tube sheet.



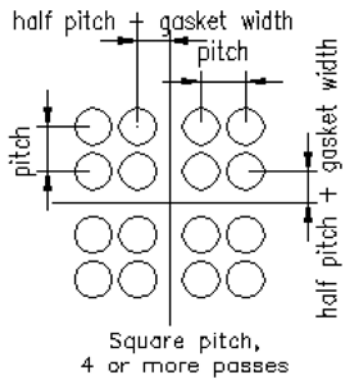
Square pitch, 1 pass

It has tubes in central line in both direction. Each tube center is one pitch distance left or right. Next tube center is one pitch distance up or down.

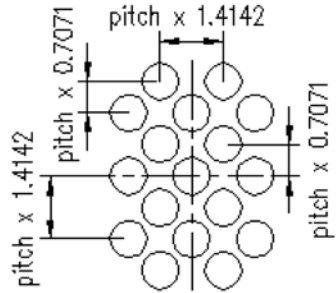


Square pitch, 2 passes

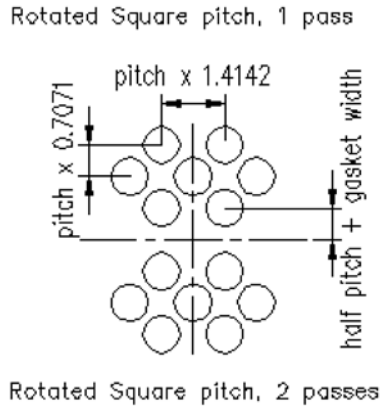
It has no tubes in horizontal central line, but tubes exists in vertical direction along central line. First vertical line is half pitch distance above or below centerline. Each tube in horizontal center is one pitch distance left or right. Next tube center is one pitch distance up or down.



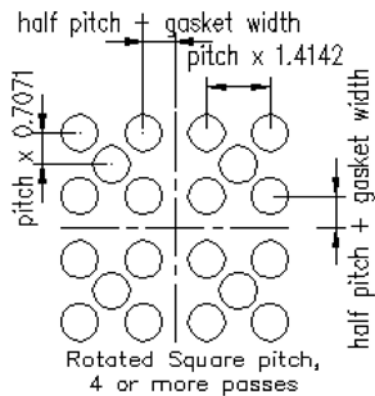
It has a no central line in horizontal and vertical direction. First line in horizontal and vertical direction is half pitch distance above or below / left or right of centerline. Next tube center is one pitch distance up or down.



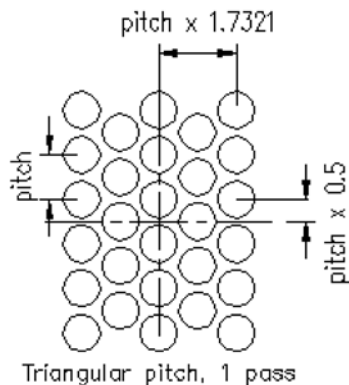
It has a central line in both direction. Each tube in centerline is one pitch distance x phfact left or right. First vertical centerline is one pitch x pvfact distance up or down. First horizontal centerline is half pitch distance x phfact left or right of centerline. Second centerline in vertical direction is one pitch distance x pvfact above or below.



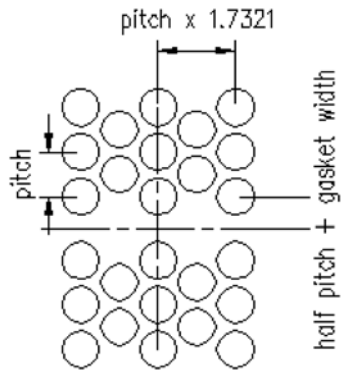
It has a no central line in horizontal direction, but exists in vertical direction. First line is half pitch distance + gasket width above or below centerline. Each tube center is one pitch x phfact distance left or right. Next tube center is one pitch distance x pvfact up or down.



It has a no central line in horizontal and vertical direction. First line in horizontal direction is half pitch distance + gasket width left or right of centerline. First line in vertical direction is half pitch distance + gasket width above or below centerline. Each tube center in horizontal direction is one pitch distance x phfact left or right. Each tube centerline in vertical direction is one pitch distance x pvfact above or below.

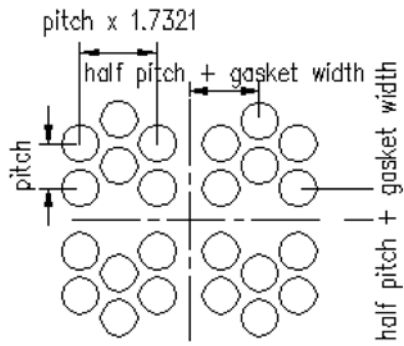


It has tubes in central line in both direction. First horizontal line is half pitch above center line. Each tube center is one pitch distance in vertical direction and pitch x 1.7321 in horizontal direction.



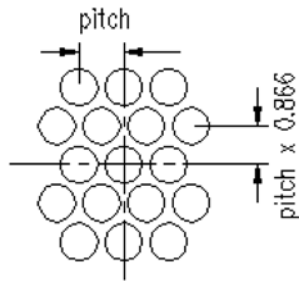
Triangular pitch, 2 passes

It has no tubes in horizontal central line but has a line of tube in vertical direction. First horizontal line is half pitch above / below center line. Each tube center is one pitch + gasket width distance in vertical direction and pitch x 1.7321 in horizontal direction.



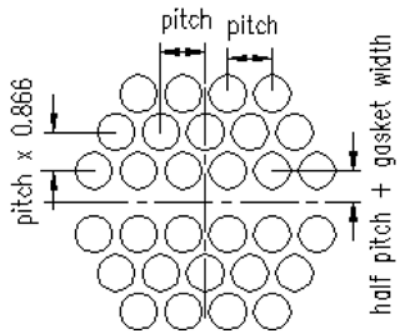
Triangular pitch, 4 or more passes

It has no tubes in horizontal and vertical central line. First horizontal and vertical line is half pitch up/ down /above / below center line. Each tube center is one pitch + gasket width distance in vertical direction and pitch x 1.7321 in horizontal direction.



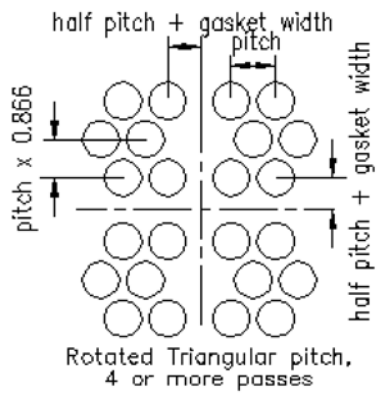
Rotated Triangular pitch, 1 pass

It has tubes in central line in both direction. First horizontal line is pitch x 0.866 above center line. Each tube center is one pitch distance in horizontal direction and pitch x 0.866 in vertical direction.

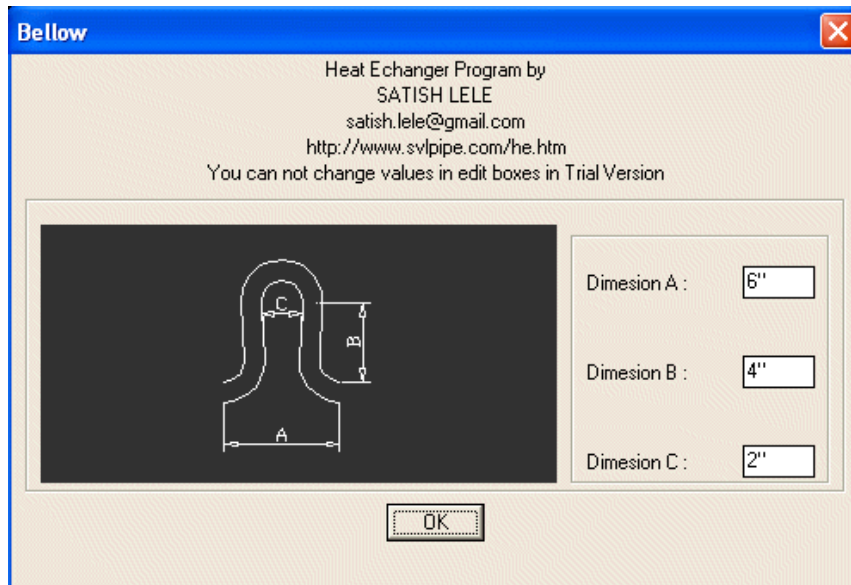


Rotated Triangular pitch, 2 passes

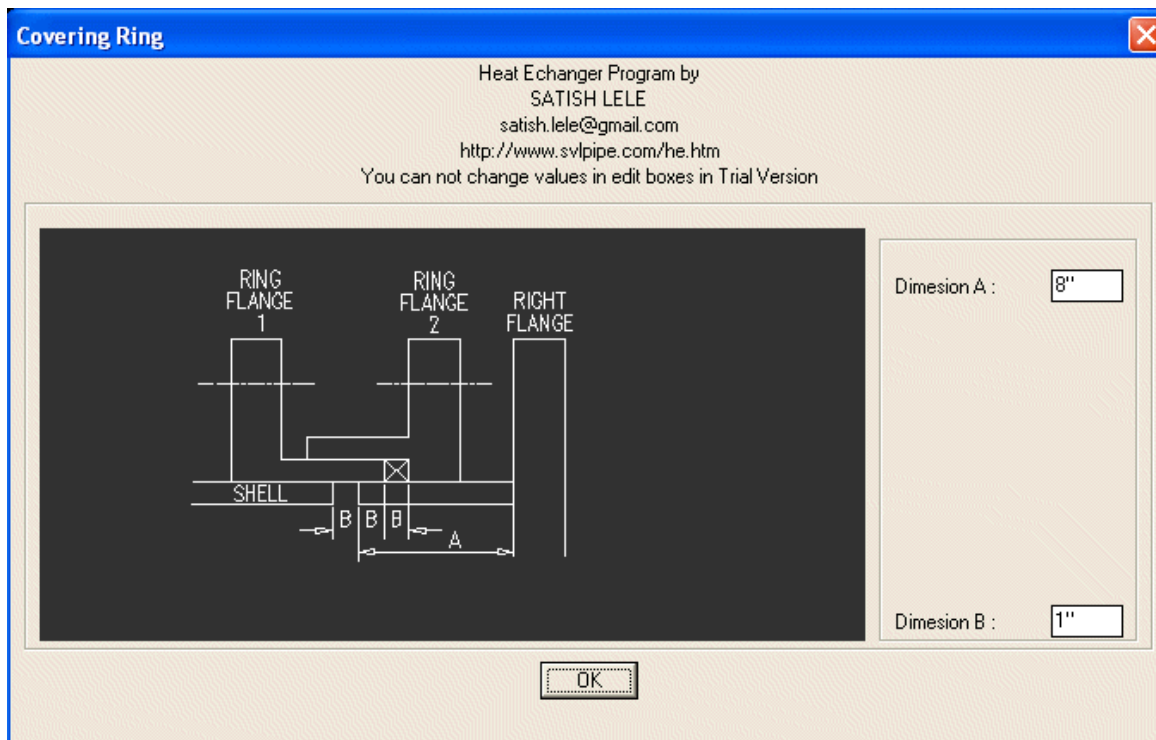
It has tubes in central line in vertical direction. First horizontal line is half pitch + gasket width above center line. Each tube center is one pitch distance in horizontal direction and pitch x 0.866 in vertical direction.



It has no tubes in central lines in both directions. First horizontal and vertical line is half pitch + gasket width above center line. Each tube center is one pitch distance in horizontal direction and pitch x 0.866 in vertical direction.



In case of Fixed Head, you can select sizes of expansion Bellow.



In case of Floating Shell, you can select sizes of Floating Ring.

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satish.lele@gmail.com
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| | | | | | |
|-------------------|-------|----------------------|------|------------------------|-----------|
| Outer Tube Limit: | 3'-3" | Shell Thickness: | 3/4" | Shell Inside Diameter: | 3'-6 1/2" |
| OD of Shell: | 3'-8" | Gap_in OTL Shell ID: | 1/4" | Baffle Diameter: | 3'-6" |




| Floating Head Cover | Floating Head | Fixed Head | | | |
|----------------------------|---------------|--------------------------|-----------|--------------------------|-----------|
| OD of Cover Flange: | 5'-11" | OD of Tube Sheet: | 4'-7 1/4" | OD of Tube Sheet: | 4'-7 1/4" |
| PCD of Flange: | 5'-7 1/4" | PCD of Flange: | 4'-3 3/4" | PCD of Flange: | 4'-3 3/4" |
| Thickness of Cover Flange: | 5" | Thickness of Tube Sheet: | 3 15/16" | Thickness of Tube Sheet: | 3 15/16" |
| Number of Bolt Holes: | 48 | Number of Bolt Holes: | 40 | Number of Bolt Holes: | 40 |
| Diameter of bolt holes: | 1 7/8" | Diameter of bolt holes: | 1 5/8" | Diameter of bolt holes: | 1 5/8" |
| Length of Stud Bolt: | 1'-8" | Length of Stud Bolt: | 1'-5" | Length of Stud Bolt: | 1'-5" |
| Diameter of stud bolt: | 1 3/4" | Diameter of stud bolt: | 1 1/2" | Diameter of stud bolt: | 1 1/2" |

Dialog Box 8 : In case of Floating Head, based on Number of tubes, program will indicate Outer Tube Limit, OD and PCD of tube sheet as well as number of bolt holes and diameter of bolt holes. It will indicate shell thickness and Gap between Outer Tube Limit and shell ID in Left Column and that for Fixed head in Right Column. In case of Fixed Head, only values in Left column will be shown.

Heat Exchanger Drawing

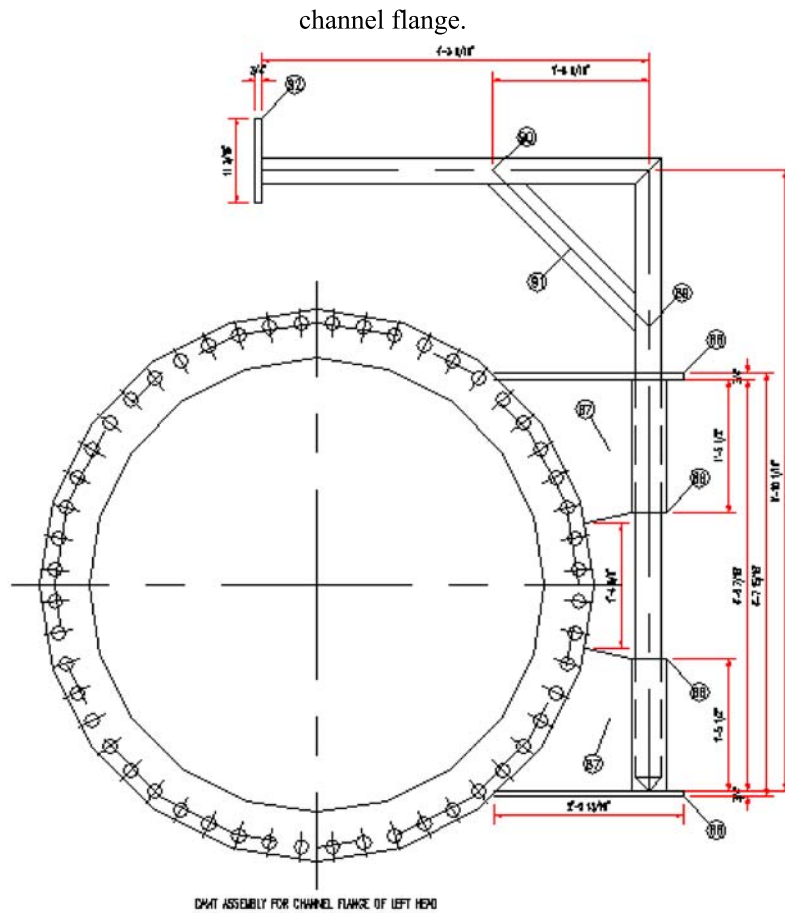
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satis.lele@gmail.com
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Choose Type of Head

| | |
|--|--|
| <input checked="" type="checkbox"/>  | <input checked="" type="checkbox"/>  |
| <input checked="" type="checkbox"/> Slip on Flange | <input checked="" type="checkbox"/> Slip on Flange |
| <input type="checkbox"/> Weld Neck Flange | <input type="checkbox"/> Weld Neck Flange |
| Channel Length: <input area"="" data-bbox="462 779 797 1100" grey="" large="" rectangular="" text"="" type="text" value="2'</input></td></tr><tr><td> | <input type="checkbox"/>  |
| <input checked="" type="checkbox"/> Davit for Flange | <input type="checkbox"/> Slip on Flange |
| | <input type="checkbox"/> Weld Neck Flange |
| | Channel Length: <input "="" type="checkbox" value="2'</input></td></tr><tr><td></td><td><input checked="/> Davit for Flange |

OK

Dialog Box 9 : You can select Heads, Type of flange and Length of channel. Also you can specify whether a davit is required for



Tubesheet Details

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satish.lele@gmail.com
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Outer Tube Limit:

OD of Tube Sheet:

Thickness of Tube Sheet:

Dialog Box 10 : This indicates values for tube sheet.

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Material of Construction

- All parts of Carbon Steel
- Tubes/baffle/tie rod/spacers/tie nut of Copper and Other parts of Carbon Steel
- All parts of Stainless Steel
- Shell/tubes/baffle/tie rod/spacers/tie nut of Stainless Steel and All parts of Carbon Steel
- Tubes/tube sheet/Heads of Stainless Steel and All parts of Carbon Steel

You can modify MDC as per your requirements in he_text.lsp file

Dialog Box 11 : You can select combinations of Material of Construction.

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Material of Construction and Specific Gravity of Parts

Left Head:

| | | |
|---------------------------|---------------|------|
| Head Flange: | SA 226 Cl. 4 | 7.85 |
| Gasket of Flange: | Br JA | 2.00 |
| Channel Shell: | SA 106 Gr. B | 7.85 |
| Tori Dish End: | SA 516 Gr. 60 | 7.85 |
| Nozzle Neck: | SA 106 Gr. B | 7.85 |
| Nozzle Flange: | SA 105 | 7.85 |
| Gasket for Nozzle Flange: | SS 304 Spiral | 2.00 |
| Reinforcing Pad: | SA 106 Gr. B | 7.85 |
| Pass Partition Plates: | SA 516 Gr. 60 | 7.85 |

Right Head:

| | | |
|---------------------------|---------------|------|
| Head Flange: | SA 226 Cl. 4 | 7.85 |
| Gasket of Flange: | Br JA | 2.00 |
| Channel Shell: | SA 106 Gr. B | 7.85 |
| Tori Dish End: | SA 516 Gr. 60 | 7.85 |
| Nozzle Neck: | SA 106 Gr. B | 7.85 |
| Nozzle Flange: | SA 105 | 7.85 |
| Gasket for Nozzle Flange: | SS 304 Spiral | 2.00 |
| Reinforcing Pad: | SA 106 Gr. B | 7.85 |
| Pass Partition Plates: | SA 516 Gr. 60 | 7.85 |

| | | |
|--------------------------|---------------|------|
| Main Shell: | SA 106 Gr. B | 7.85 |
| Nozzle Necks on Shell: | SA 106 Gr. B | 7.85 |
| Nozzle Flanges on Shell: | SA 105 | 7.85 |
| Flange Gaskets on Shell: | Br JA | 2.00 |
| Reinforcing Pad: | SA 106 Gr. B | 7.85 |
| Nozzle Stiffeners: | SA 516 Gr. 60 | 7.85 |
| Davit pipe: | SA 106 Gr. B | 7.85 |
| Davit Plates: | IS 2062 Gr.B | 7.85 |

| | | |
|------------------|---------------|------|
| Tube Sheets: | IS 2062 Gr.B | 7.85 |
| Tubes: | A179 / A179M | 7.85 |
| Baffles: | IS 2062 Gr.B | 7.85 |
| Tie Rods: | IS 2062 Gr.B | 7.85 |
| Tie Rod Nuts: | SA 194 Gr. 2H | 7.85 |
| Baffle Spacer: | A179 / A179M | 7.85 |
| Nuts: | SA 194 Gr. 2H | 7.85 |
| Studs / Bolts: | SA 193 Gr. 2H | 7.85 |
| Saddle Supports: | IS 2062 Gr.B | 7.85 |

You can modify MOC and Specific Gravities as per your requirements in he_text.lsp file



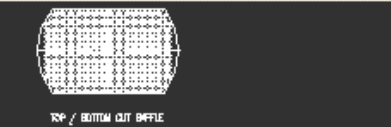



OK

Cancel

Dialog Box 12 : You can select Details of Material of Construction.

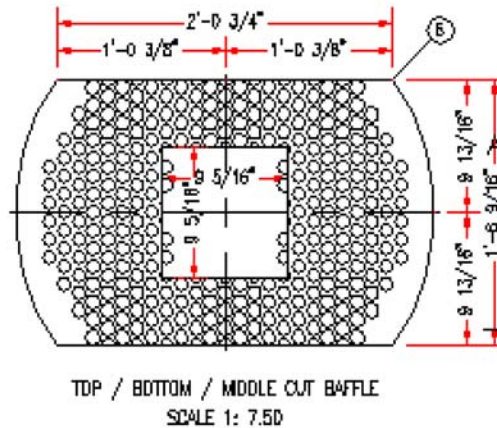
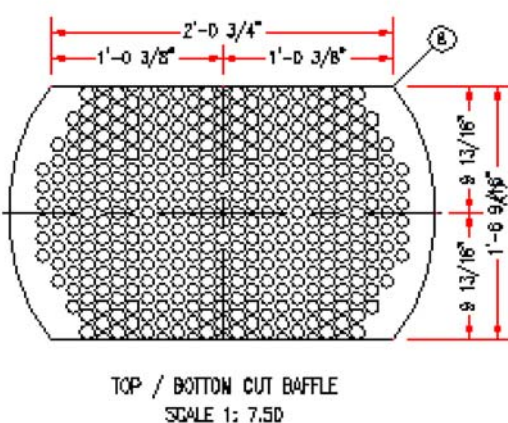
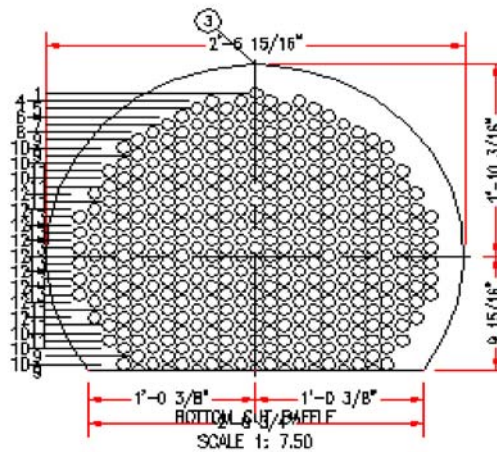
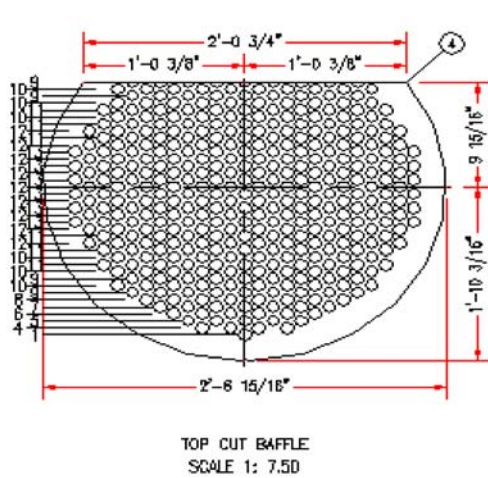


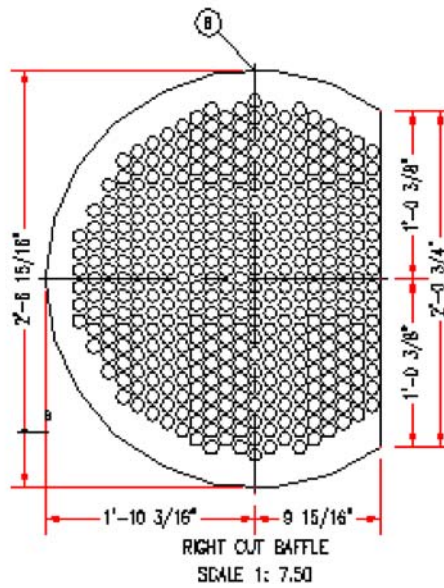
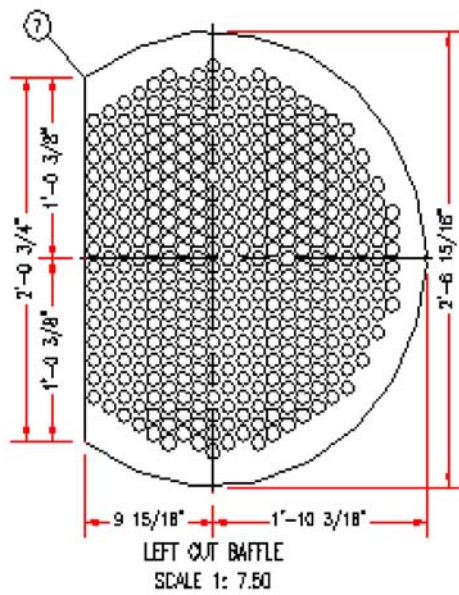
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| | | |
|---|--|---|
| <input checked="" type="checkbox"/> Left Cut Baffle  | <input checked="" type="checkbox"/> Top Cut Baffle  | <input checked="" type="checkbox"/> Top / Bottom Cut Baffle  |
| <input checked="" type="checkbox"/> Right Cut Baffle  | <input checked="" type="checkbox"/> Bottom Cut Baffle  | <input checked="" type="checkbox"/> Tie rods support plate (end baffle)  |

OK

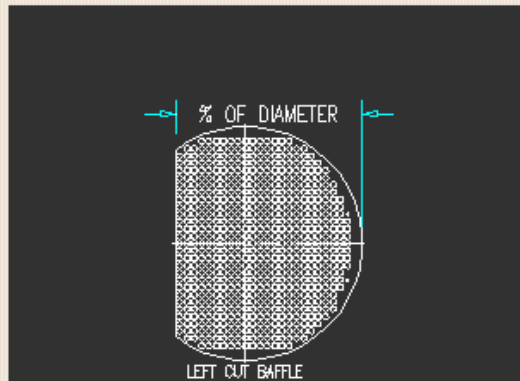
Dialog Box 13 : In this you can select 6 types of baffles.





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Number of Baffles:

Baffle size in %:

Baffle Thickness:

Position of Left Cut Baffle from left Tube Sheet

1 2 3 4 5 6 7 8 9 10

11 12 13 14 15 16 17 18 19 20

21 22 23 24 25 26 27 28 29 30

31 32 33 34 35 36 37 38 39 40

41 42 43 44 45 46 47 48 49 50

51 52 53 54 55 56 57 58 59 60

Dialog Box 14 : 6 Dialog boxes of these will be displayed if you select these in earlier box. You have to indicate the location of baffles.

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Baffle Data

Total Number of Baffles:

Gap of End Baffles:

Dialog Box 15 : In this box you can select Total Number of Baffles (these include two baffles at end, and cut baffles). End baffles are generally placed away from tube sheet for nozzle, hence you have to indicate Gap of End Baffles. Gap in Other Baffles is generally uniform. You can choose Thickness of Baffle. For Top / Bottom cut Baffles, you can indicate baffle size as % of diameter. For Top / Bottom / Center cut Baffle, you can indicate vertical and horizontal % of diameter, as vacant area.

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Tie Rods Data

Number of Tie Rods:

Diameter of Tie Rods:

Length of Tie Rods:

Dialog Box 16 : In this box you can select Number of Tie Rods, Diameter of Tie Rods, Length of Tie Rods will be indicated based on length of tube.

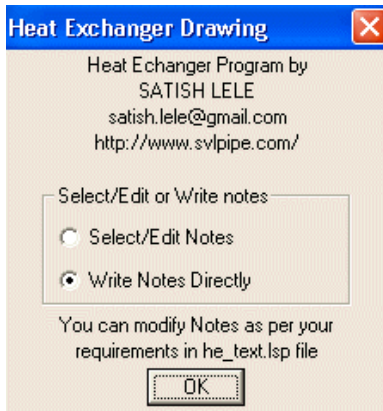
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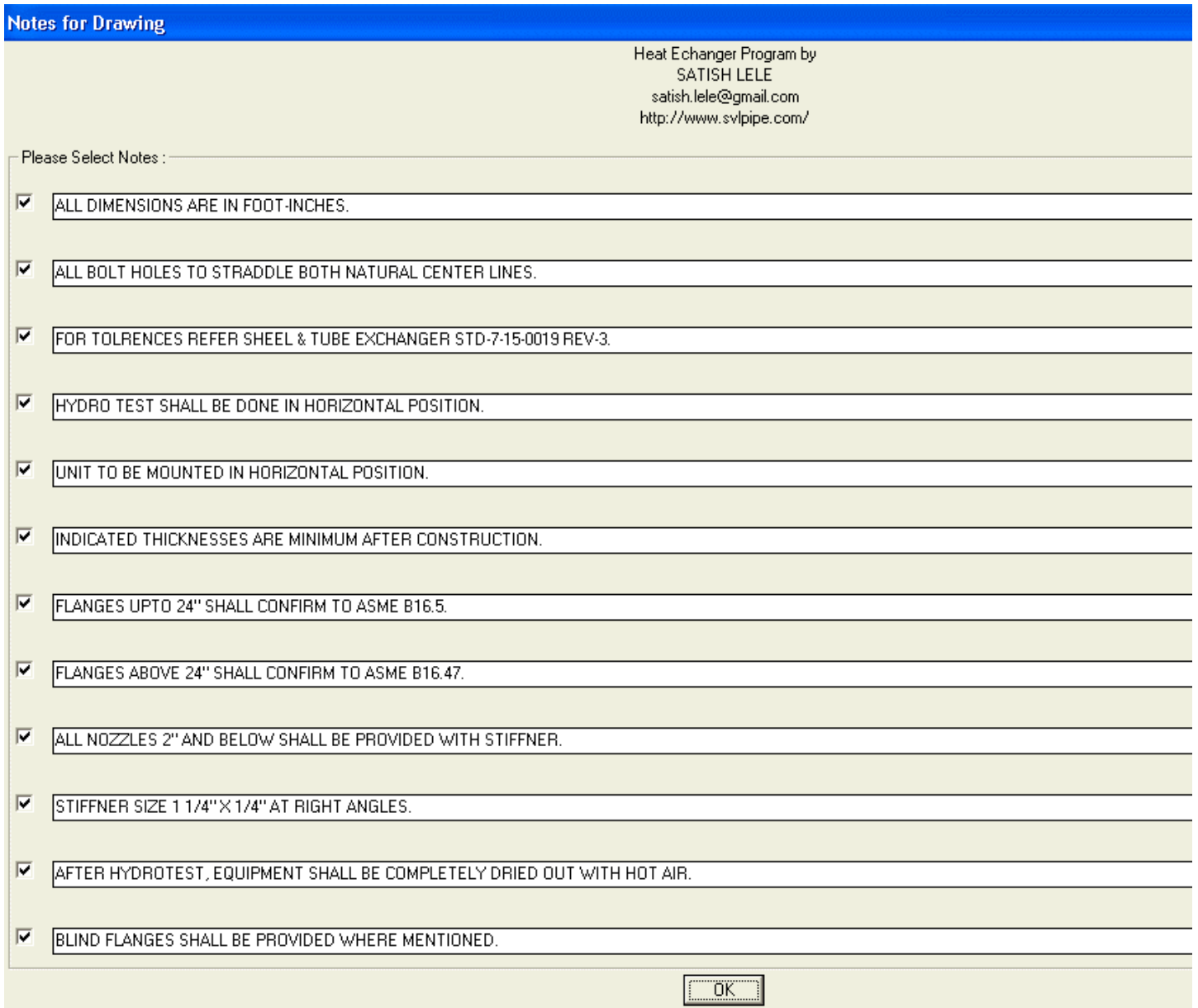
Maximum Number of Tubes should not exceed 500

| Lines above Center: | Lines below Center: |
|---|---|
| Center Line: <input type="text" value="25"/> | 1st Line below Center: <input type="text" value="25"/> |
| 1st Line above Center: <input type="text" value="25"/> | 2nd Line below Center: <input type="text" value="25"/> |
| 2nd Line above Center: <input type="text" value="25"/> | 3rd Line below Center: <input type="text" value="25"/> |
| 3rd Line above Center: <input type="text" value="25"/> | 4th Line below Center: <input type="text" value="25"/> |
| 4th Line above Center: <input type="text" value="25"/> | 5th Line below Center: <input type="text" value="23"/> |
| 5th Line above Center: <input type="text" value="23"/> | 6th Line below Center: <input type="text" value="22"/> |
| 6th Line above Center: <input type="text" value="23"/> | 7th Line below Center: <input type="text" value="21"/> |
| 7th Line above Center: <input type="text" value="21"/> | 8th Line below Center: <input type="text" value="19"/> |
| 8th Line above Center: <input type="text" value="19"/> | 9th Line below Center: <input type="text" value="17"/> |
| 9th Line above Center: <input type="text" value="17"/> | 10th Line below Center: <input type="text" value="15"/> |
| 10th Line above Center: <input type="text" value="15"/> | 11th Line below Center: <input type="text" value="13"/> |
| 11th Line above Center: <input type="text" value="13"/> | 12th Line below Center: <input type="text" value="7"/> |
| 12th Line above Center: <input type="text" value="7"/> | |

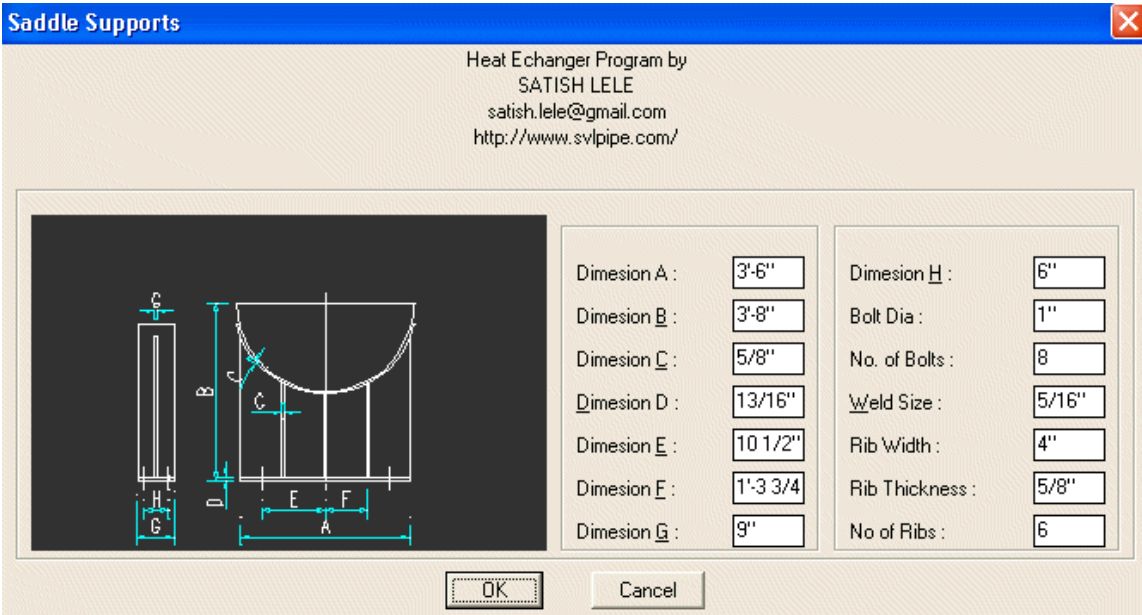
Dialog Box 17 : The Dialog Box shows number of tubes in each row above and below center line of tube sheet. You can change these, but total tubes should not exceed number of tubes selected earlier. (The box shown is for 500 tubes.)



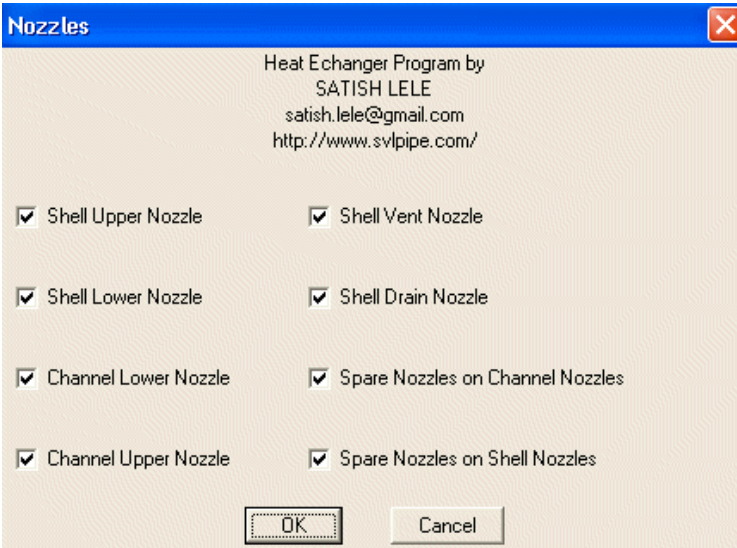
Dialog Box 18 : This offers you two options. Either you can write Notes that are generally written or you can select/edit each note.



Dialog Box 19 : If you select edit option, you can see and edit each note. If you uncheck any box, that note will be deleted. You will get 10 number of boxes with more notes.



Dialog Box 20 : You can select dimensions for Saddle Support.



Dialog Box 21 : You can select Nozzles attached to the exchanger.

Shell Upper Nozzle ✖

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Mark No. : Flange Facing :

Quantity No. :

Service : RF Pad OD :

Nozzle Size DN : RF Pad Thickness :

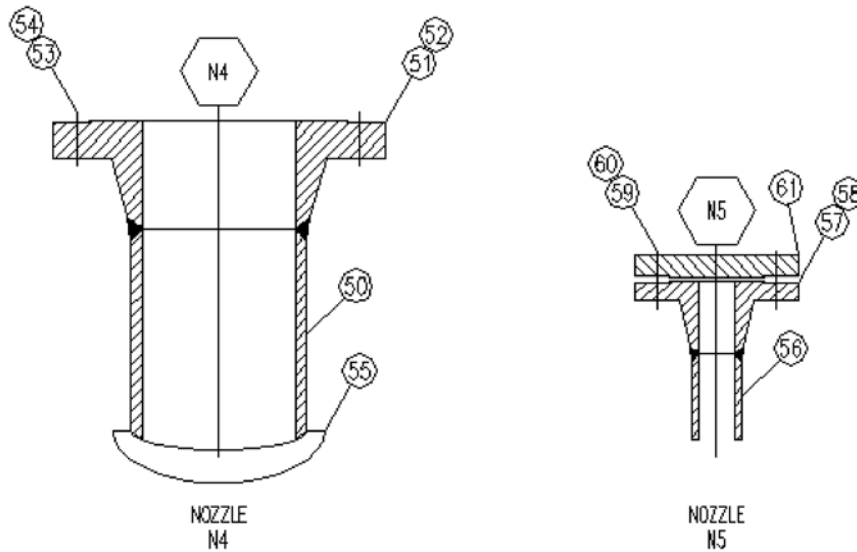
Nozzle Length : Weld Type :

Nozzle Schedule : You can select 40, 80, 120, 160

Flange Type : Weld Thickness (Nozzle) :

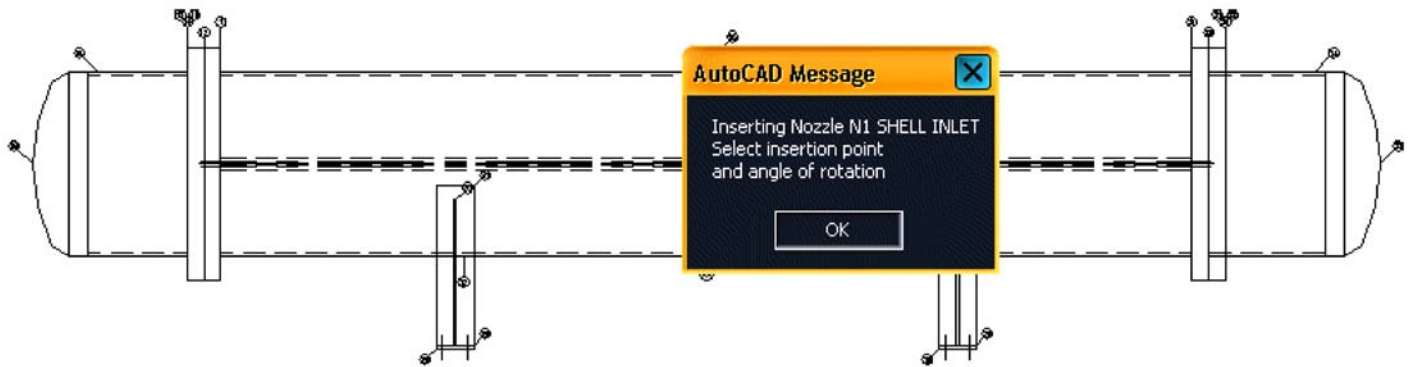
Flange Class : You can select 150, 300 or 600 Weld Thickness (RF Pad) :

Dialog Box 22 : You can select Parameters for each Nozzle attached to the exchanger. Nozzle will be drawn as detail and tags will be given to all components. Its components will be added to Bill of Material.

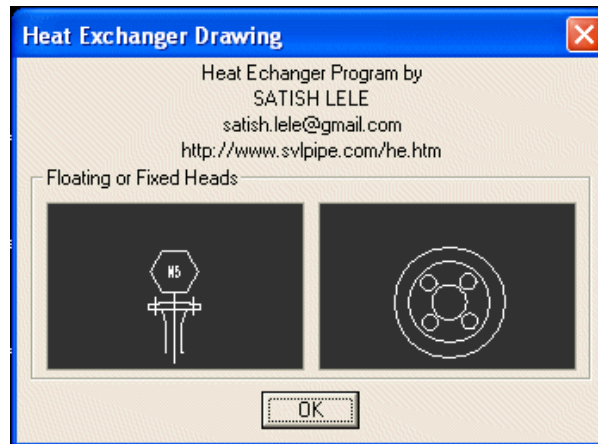


| MARK No | QTY No | NOZZLE | | | FLANGE | | | RF PAD | | NOZZLE LENGTH | WELD DET | | |
|---------|--------|---------------------------------|--------|-----|------------|-------|------|--------|------|---------------|----------|------|------|
| | | SERVICE | SIZE | SCH | TYPE | CLASS | FACE | OD | THK | | TYPE | A | B |
| N1 | 1 | SHELL INLET | 6" | 80 | ASME B16.5 | 300 | WNRF | 8" | 3/8" | 1' | W2 | 3/8" | 3/8" |
| N2 | 1 | SHELL OUTLET | 6" | 80 | ASME B16.5 | 300 | WNRF | 8" | 3/8" | 1' | W2 | 3/8" | 3/8" |
| N3 | 1 | CHANNEL INLET | 6" | 80 | ASME B16.5 | 300 | WNRF | 8" | 3/8" | 1' | W2 | 3/8" | 3/8" |
| N4 | 1 | CHANNEL OUTLET | 6" | 80 | ASME B16.5 | 300 | WNRF | 8" | 3/8" | 1' | W2 | 3/8" | 3/8" |
| N5 | 1 | SHELL VENT + BF | 1 1/2" | 160 | ASME B16.5 | 300 | WNRF | | | 6" | W2 | 3/8" | 3/8" |
| N6 | 1 | SHELL DRAIN + BF | 1 1/2" | 160 | ASME B16.5 | 300 | WNRF | | | 6" | W2 | 3/8" | 3/8" |
| N7&8 | 2 | SHELL NOZZLE CONNECTIONS + BF | 1 1/2" | 160 | ASME B16.5 | 300 | WNRF | | | 6" | W2 | 3/8" | 3/8" |
| N9&10 | 2 | CHANNEL NOZZLE CONNECTIONS + BF | 1 1/2" | 160 | ASME B16.5 | 300 | WNRF | | | 6" | W2 | 3/8" | 3/8" |

Dialog Box 23 : Nozzles drawn as detail with tags and Nozzle Table.

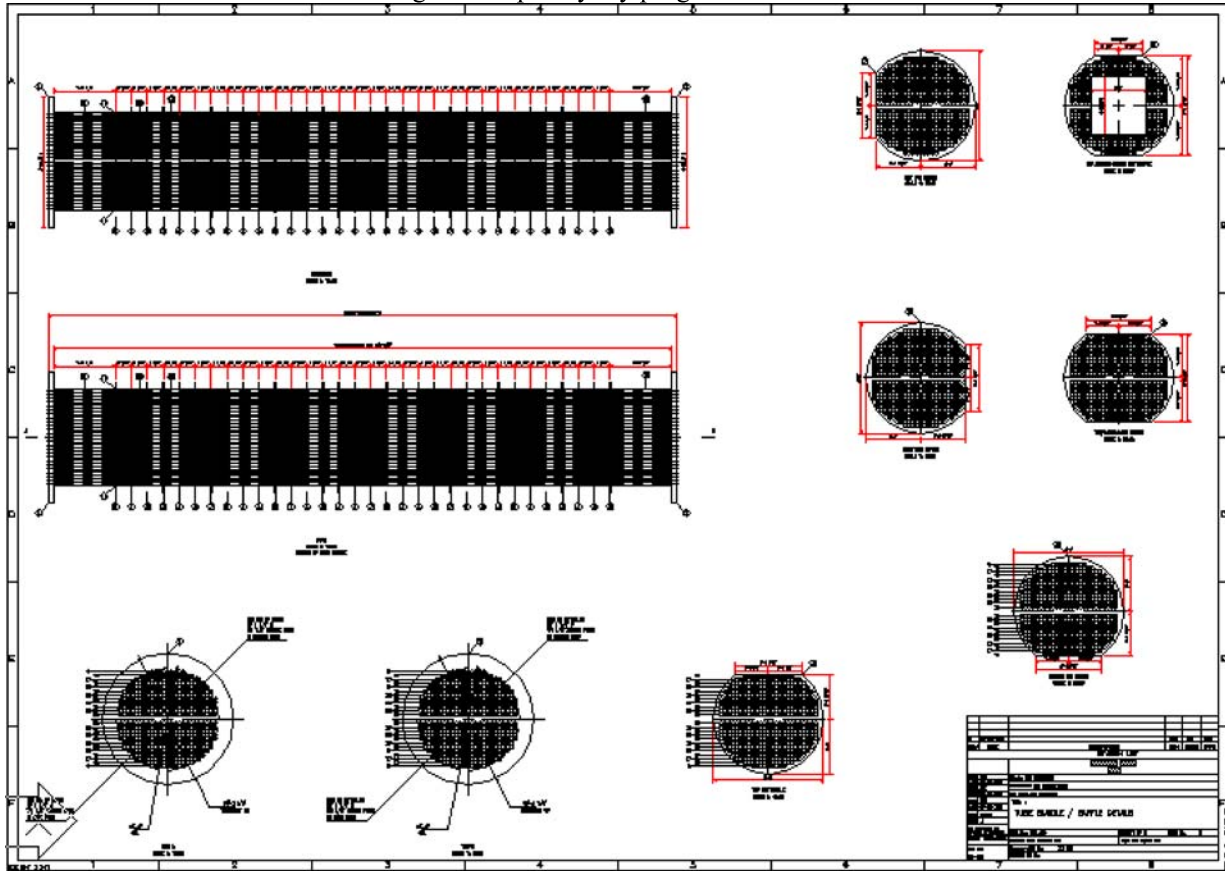


Dialog Box 24 : You will be instructed to insert each Nozzle attached to the exchanger. Select nearest or mid point to insert nozzle. Select angle of rotation. Irrespective of rotation, nozzle number will be displayed horizontally.

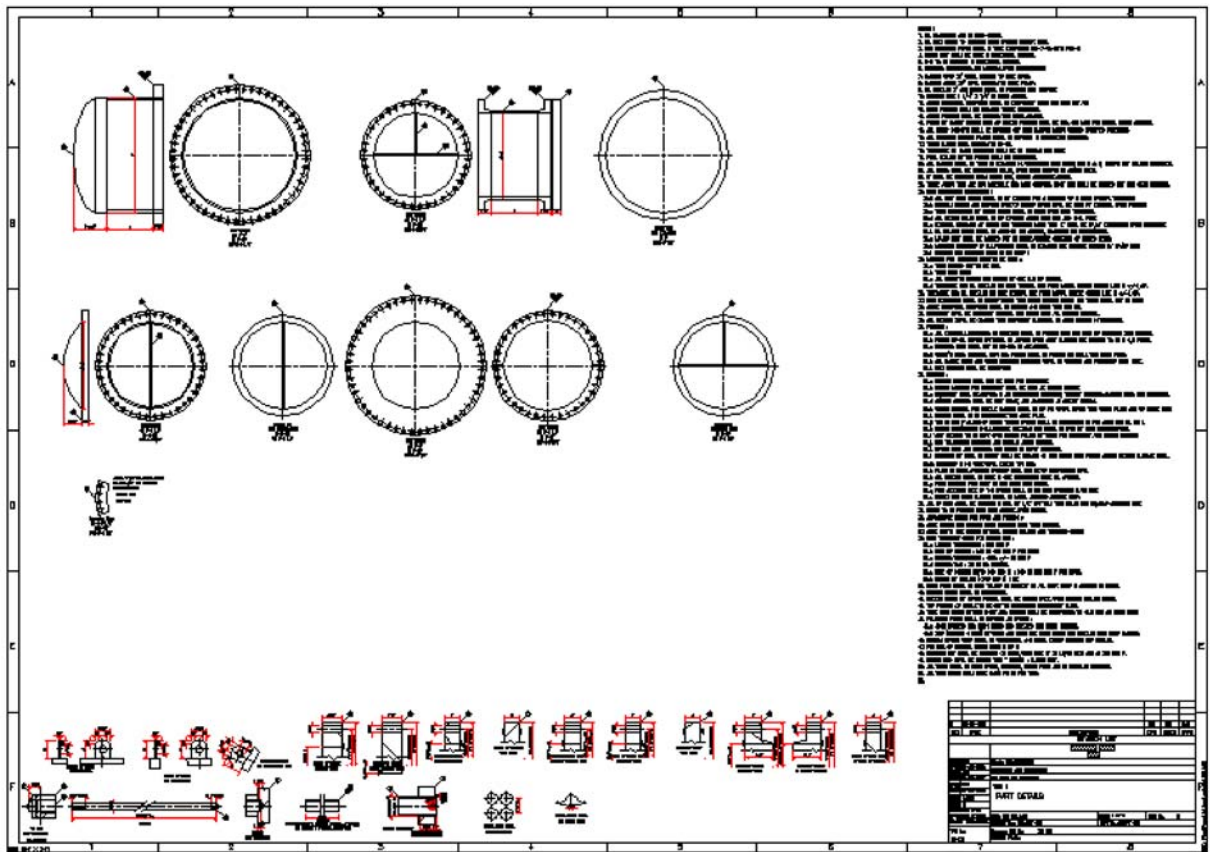


Dialog Box 25 : You will be instructed to select either side or circular Nozzle in case of smaller nozzles. Select nearest or mid point to insert nozzle.

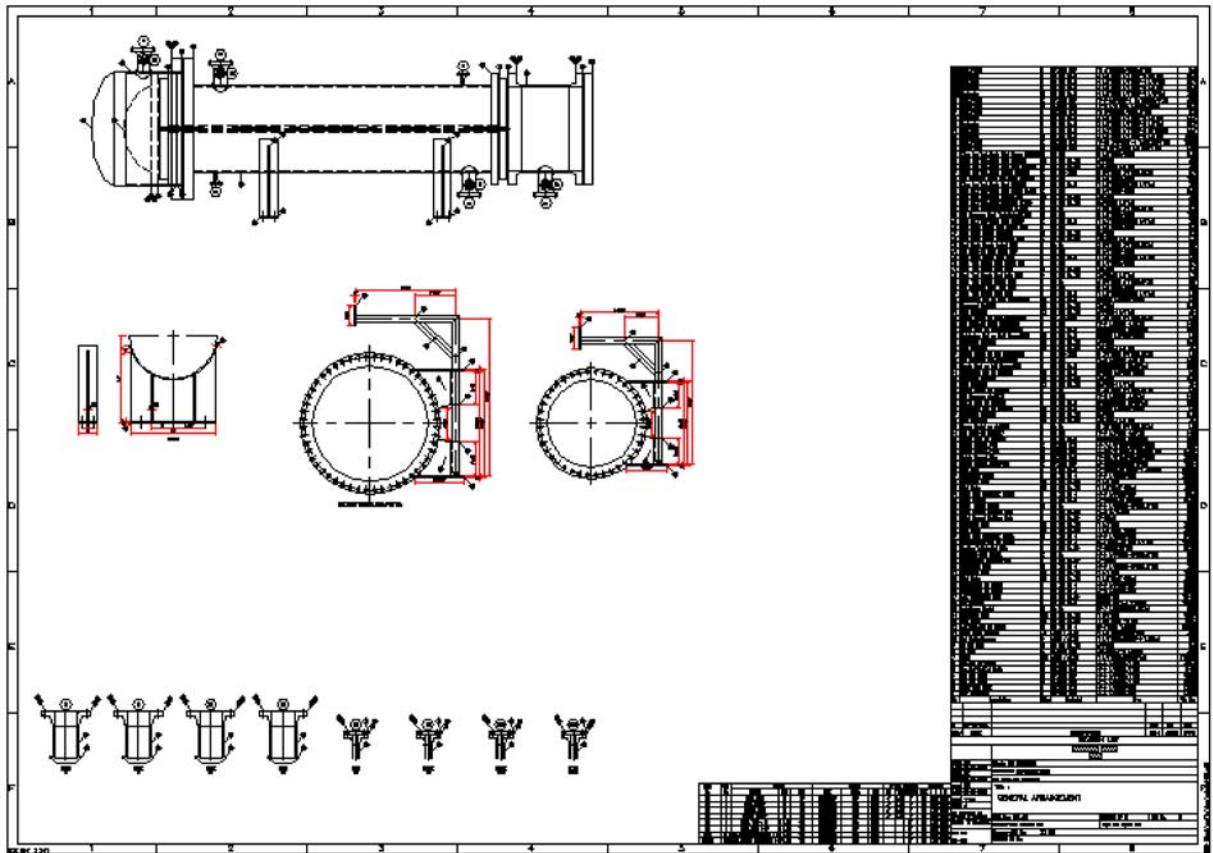
Drawings developed by my program are as follows :



A GA Drawing of Tube Bundle and baffles for double pass Tubular Exchanger with floating head. It shows tags to each component.



A Drawing of Heads and Gaskets for double pass floating head. It shows details at bottom and it writes the notes on right.



Complete GA Drawing of Exchanger, details of saddle, Nozzles and Nozzle table. It also writes Bill of Material for each component with reference to tag number. Trial program is available with 4 options of Tube Number selection. You can select only 250, 500, 750 or 1000 tubes. The Package can be customized, as per your exact specifications. This will be done with extra charges.