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This is a program for Skill Development and Bridging the Gap between Manual and Computer work. I offer Training of Basic Fundamentals and How to Use my Software to a batch of 5 to 10 people in your office. This can speed up Drawing work using my own Software, compared to conventional methods. This is a package, which can run on any CAD program and is very simple and easy to use. The package is given FREE of CHARGE to the company during Training.

**Why Isometric Drawings are required?:** Generally in the development of a project, a conceptual 2D drawing is first created. In this all pipelines are drawn at zero z co-ordinate. This is then converted into a 3D scale model, to check interference of pipe lines. 2D General Arrangement (GA) drawings are used for fabrication on site. A GA drawing is generally on A0 or A1 size paper and contains a lot of lines, and may not be easy to understand pipe routine. A0 or A1 size drawing is too big to handle. A pipe fabricator can understand GA drawing better only with the help of 3D scale model. But 3D scale model can not be put on a paper, and 3D scale model does not indicate dimensions. To aid pipe fabricator on site, isometric drawings are prepared. An isometric drawing is generally on a A3 size paper. A pipe fabricator can read the drawing and understand pipe routine easily. Also pipe fabricator can pick up material required for fabrication of pipe line from stores, with the help of Bill of Material given in isometric drawing.

#### ISO vs ORTHOGRAPHIC

- Simplicity (Only one pipe line is drawn in one A3 size paper).
- In an orthographic view it is not a problem if the pipe runs in one plane, but when a pipe runs in two or three planes (north to south, then down and then to the west, etc.) an orthographic view can be unclear.
- More number of drawings needed in orthographic views than ISO to represent the same piping system.
- Sectional views are required for clarity of pipe routing

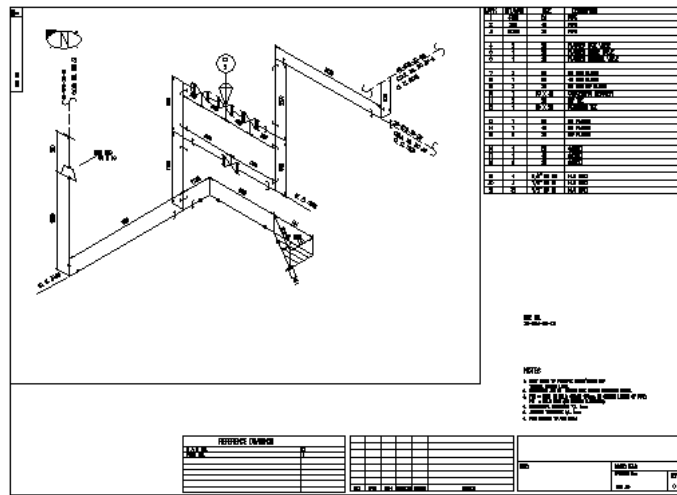
Unlike orthographic drawings, piping isometric drawings allow the pipe line to be drawn in a manner by which the length, width and depth are shown in a single view. Isometrics are usually drawn from information found on a plan and sectional elevation views. The symbols that represent fittings, Valves and flanges are modified to adapt to the isometric grid.

The Iso, as isometric is commonly referred, is oriented on the grid relative to the north arrow found on plan drawings. Because isos are not drawn to scale, accurate dimensions are required to specify exact lengths of piping runs.

Pipe lengths are determined through calculations using coordinates and elevations. Vertical lengths of pipe are calculated using center line elevations of pipe lines, while horizontal lengths are calculated using north-south and east-west coordinates.

Piping isometrics are generally produced from orthographic drawings and are important pieces of information to engineers. In very complex or large piping systems, piping isometrics are essential to the design and manufacturing phases of a project.

Piping isometrics are often used by designers prior to a stress analysis and are also used by draftsmen to produce shop fabrication spool drawings. Isometrics are the most important drawings for installation contractors during the field portion of the project.



### What is an Isometric Drawing?

- A piping isometric drawing is a 2D drawing in which piping is represented like a 3D drawing. In CAD drawing, only x and y co-ordinates are used to draw entire drawing.
- **Isometric Layout:** Isometric lines can be in vertical direction and two other directions at 30° from horizontal. All directions of the pipe may match the three isometric axis lines.
- Isometric is popular within the process piping industry because Isometric can be drawn and read with ease and shows the piping in a realistic view.
- Isometric is used along with plans and sectional elevations but typically Isometric is used to supplement the plan drawings.
- Isometrics are used as fabrication & shop drawings for fabrication of run of a pipe.
- Isometrics also provide a drafter with the ability to calculate angular offsets in the pipe run.



Isometrics are drawn on b-size paper (11" x 17") in imperial units and on A3 size paper (297 mm x 210 mm) in metric units. Drawing number and revision number is indicated in box on top left corner. Drawing number and revision number is also shown in title box. The table at bottom indicates the numbers of relevant P&ID drawing and General Arrangement (GA) drawing. The bill of material appears in top right corner. A table is also provided for indicating revisions made. The rectangular area on left is reserved for Isometric drawing.

LINE NO.  
25-STM-35-CS-H

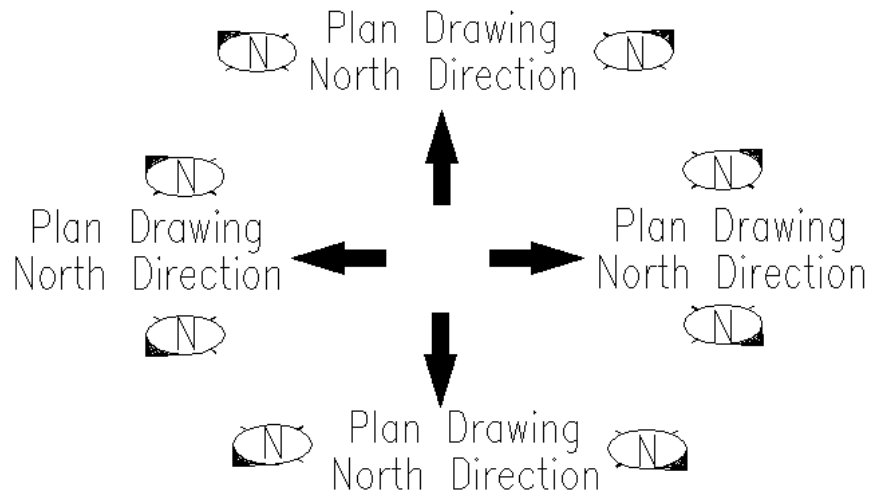
### NOTES

1. BOLT HOLES TO STRADDLE NORTH/SOUTH AND VERTICAL CENTRE LINES.
2. ELEVATIONS ARE TO CENTRE LINE UNLESS OTHERWISE NOTED.
3. FFW = FIELD FIT WELD. (ALLOW 150mm ON CUTTING LENGTH OF PIPE).  
FW = FIELD WELD (NO CUTTING ALLOWANCE).
4. DIMENSIONAL TOLERANCE  $\pm/ - 1\text{mm}$
5. ANGULAR TOLERANCE  $\pm/ - 1\text{mm}$
6. PIPE WELDING TO ANSI B31.3

The line number is shown in space in right column. General notes appear below line number.

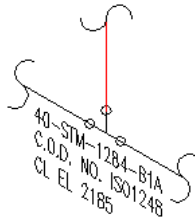
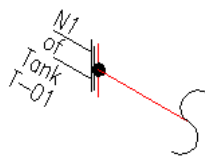
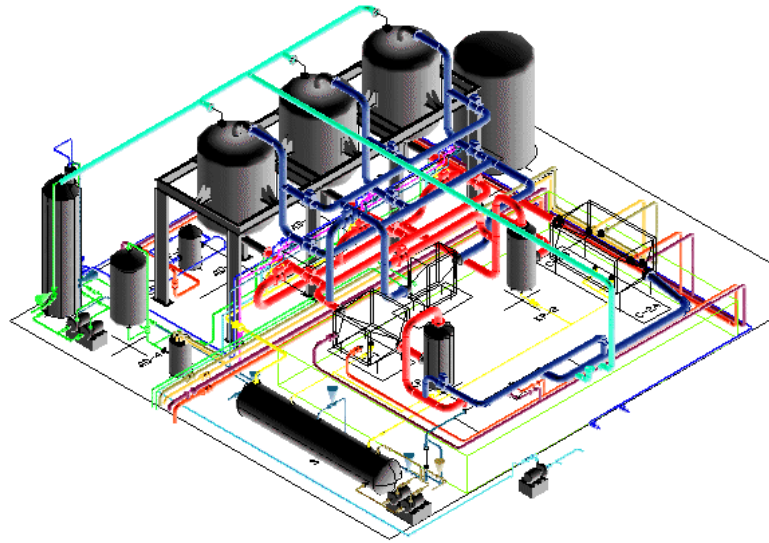
Company Logo	Isometrics Created by : ABC Company, Mumbai Client : Multination Company, Mumbai	
	TITLE: Isometric drawing for line number 25-STM-35-CS-H	SCALE: N.T.S.
	DRAWING No: ISO 35	REV 0

Every company has its own template, showing company's name, address, logo etc.,

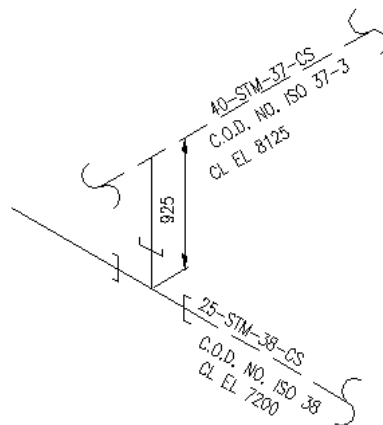


Arrow showing north direction is shown in top left corner. A north arrow shows North direction with respect to North direction in GA drawing. The direction orientation depends on North Direction of Plan drawing. This helps in reading the Plan and Isometric drawings together.

**Preparing a sketch to draft isometric drawing:** View the model in the direction of north of model and start sketching pipe lines.

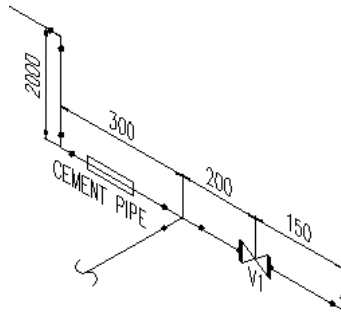


The line may start from nozzle of an equipment, such as a vessel or a pump. Indicate nozzle number and equipment tag near nozzle. In some cases, pipe line may originate from some other line. Indicate line number of that pipe line, its center line elevation, and isometric drawing number of that pipe line.

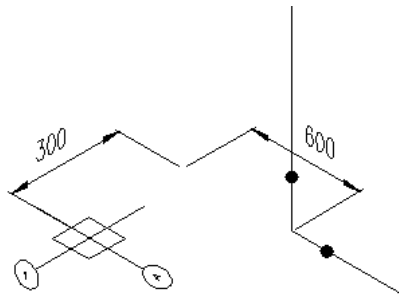


Branches of the pipe run or continuations are placed on other drawings, typically shown as short portion of dashed line on main pipe run. Dashed lines show pipe continuation. Reference drawing information is given for continuation.

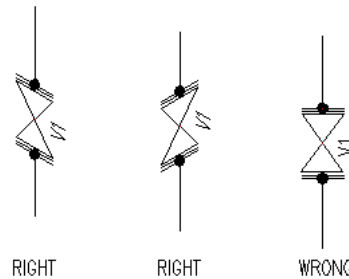
One run of pipe is drawn in one isometric drawing. If one pipe run can not be accommodated in one drawing, pipe run is continued in next drawing. Two identical pipe lines (Two similar suction lines of two pumps) are generally drawn in one isometric drawing.



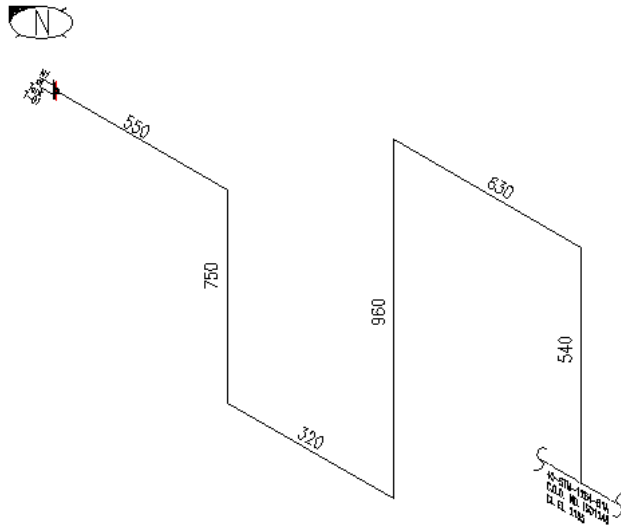
Isometrics are rarely drawn to scale. A longer pipe, (on left), may be shown shorter, if pipe line does not have any fittings in it. However, a small length pipe may be shown with longer length, to show all the fittings in that portion of line. However, pipe lengths should be shown accurately. In this case, Isometric is limited by space, so sometimes proportion may be sacrificed but it is important that the written dimensions are accurate. If the pipe is vertical, the lettering should be written vertically and at 30° obliquing angle. Text in dimension in vertical lines, should always be parallel with dimension line.



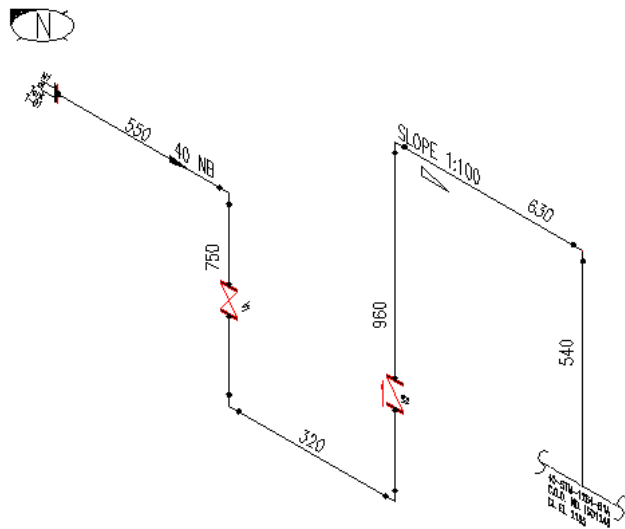
**Direction & Location:** Location and direction helps to orient the isometric drawing properly. Structural reference points that provide location of column along the grid can be shown on isometric. Dimensions must always be given to points of reference, such as structures, center line of existing equipment etc. Co-ordinates should also be shown on the isometric drawing.



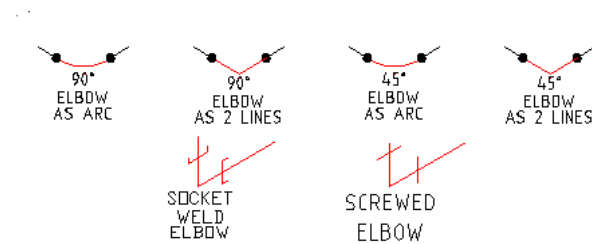
When orienting fittings or valves, it is important to draw the fittings or valves, so that they are inclined to the last direction change or branch in the pipe. Fittings or valves are drawn the same shape as they appear on the plan & elevation drawings but they are drawn at an isometric angle.



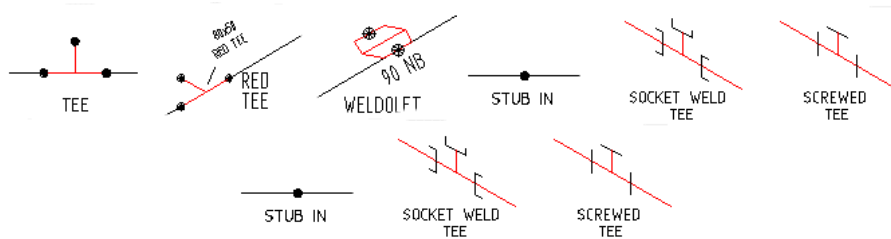
Looking at the orientation of model, go on sketching the line from one end to other. To get the length of each cut pipe, get distance between two ends of 3D pipe. To get the length of pipe from center line of fitting to center line of another fitting get distance between insertion points of two fittings. If you are sketching with the help of plan drawings, use the difference in elevations of two adjacent lines as length of the vertical line. For horizontal lines, use the distance between two pipes, to get length of the pipe. Mark length of each pipeline on each line in the sketch of isometric drawing.



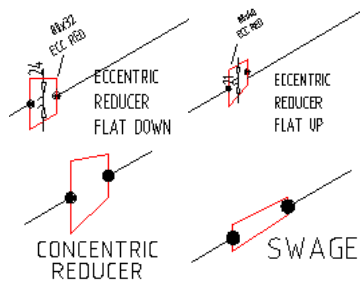
Mark elbows on the drawing. Show location of valves, with type of flange. The location of the valve is shown by dimension of the center of valve. Show direction of flow, with pipe NB. If a horizontal pipe line has a slope, indicate slope on that pipe line.



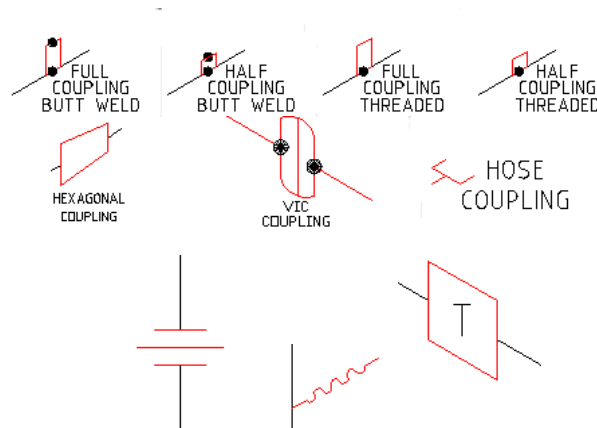
Use branching table to select end connection of Elbows. Normally, Elbows with NB less than 50 are socket weld or screwed and Elbows with NB greater than 40 have butt weld ends. Elbows can be drawn in a couple of ways.



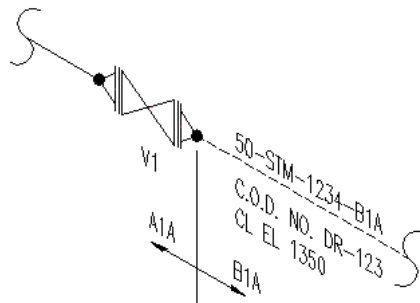
Add any branch to the drawing, like, Tee, Reducing Tee, Weldolet, Socolet, elbolet etc.



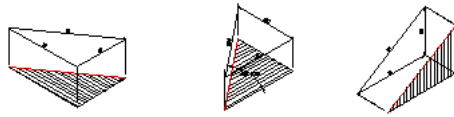
If the line is reduced in its path, add a reducer. Reducer can be concentric, eccentric with flat top or eccentric with flat bottom. Concentric reducer is generally used in a vertical line or line where flow pattern should not get disturbed, as in case of line of Control Valve. Eccentric reducer with flat top is generally used in suction line of a pump. Eccentric reducer with flat bottom is generally used in horizontal lines. Eccentric reducer maintains the bottom level of pipe line after reduction in size. Swage is used to connect a pipe with butt weld end to a pipe with a socket weld end.



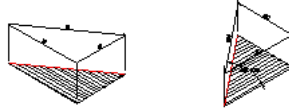
If there is any Coupling, Union, Hose or trap in a pipe line, draw it on line.



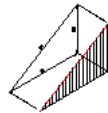
Spec change is generally implemented at isolating valve or at flange of different pressure rating. The spec of valve depends on Fluid in this and next pipe line or pressure ratings of this and next pipe line. Demarcation is shown between new and existing pipe spec and reference line number, drawing number and center line elevation is indicated for new drawing. Usually a note indicates the name or specification of the branch line.



Offsets: To indicate an offset, hatches on isometric drawings are applied, to indicate that a pipe runs at a certain angle and in which direction the pipe runs. Offset is shown with a fitting (typically a 45° elbow).



Horizontal Offset: If a line turns at 30° to 45° in horizontal plane, you draw a pipe with a 45° elbow. But pipe line would look like a vertical line. To avoid confusion, the offset is drawn 22½° horizontal offset to give the illusion of the angle.



Vertical Offset: If a line turns at 30° to 45° in vertical plane, you draw a pipe with a 45° elbow. In this case, too, to avoid confusion, the offset is drawn 22½° vertical offset to give the illusion of the angle.

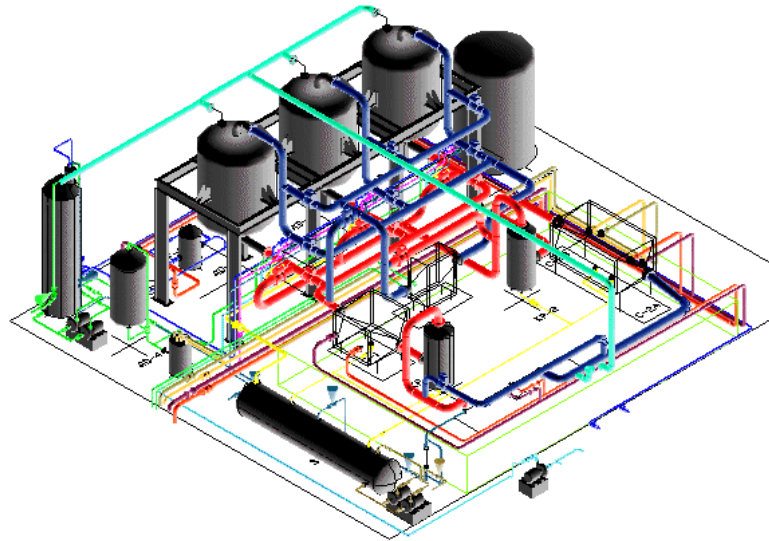
Dimensioning: Dimensions should preferably appear above if the pipe line is horizontal and on left hand side, if the pipe line is vertical. Best way to dimension a pipe line is between its center line at the intersection points. Try to keep all dimensions outside the piping view when possible. Dimensions should always be shown between points in the same plane. One of the extension lines of the dimension should be a center line of the run of pipe.

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When you create an isometric sketch from a model, use of the following features will make the best use of the system:

1. **Single source for all piping documents:** The piping model provides a single central source from which all project personnel can extract and manipulate data. In effect, this is an official master document that is always up to current revision level. Drawings for any purpose are based upon the model's geometry.
2. **Three-dimensional geometry:** The piping model is a true three-dimensional representation of the piping system. The actual coordinates of every point on the design are available for use in dimensioning individual drawings, checking clearance between modeled objects, making special reports, extracting geometry for pipe stress analysis, and removing hidden lines.
3. **Standard design technique:** The model is conducive to proper drafting and design techniques because it promotes a specific method of model creation. In the case of a 3D piping model, certain steps must be followed, thereby promoting a standard technique of model design.
4. **Reduced drafting repetition:** Some of the commands used for plant design eliminate many time-consuming steps that arise in drafting an isometric. These include creating fitting symbols, calculating dimensions, dimensioning skew pipes, and extracting a bill of materials.
5. **External software interface:** The database of a piping model can be output in a neutral format that is used to interface to external programs. An example of an external program is one for stress analysis.
6. **Project linkage:** Data from a piping model can be linked with data from related models in a common project. This allows reporting across adjacent models and data consistency checks between pipelines in different types of drawings such as arrangements and P&IDs.





To create an isometric drawing, first create a true three-dimensional piping model. Although you can use explicit modeling as a conventional drafting system, it is recommended that you use it as an intelligent 3D modeling aid.

Making an isometric involves the following steps:

1. Establishing model defaults: The first step is to establish default parameters for the model. The values set here have a great effect on the appearance of both the model and the isometric and the ease with which they are made. The following is a list of some of the more important items and the commands used to set their values:

- Modeling units.
- Drawing appearance.
- View orientation.
- Construction plane origin.
- Text width and font.
- Component insertion parameters.
- Dimensioning parameters.

2. Inserting non-piping items: As a part of your piping model, you may want to insert items at the origin and destinations of pipe lines such as nozzles on vessels or heat exchangers, and other pieces of major equipment. Before inserting the piping, fit the model in the active view window. End points of the piping main line are the likely locations. Then position these points using the ZOOM VIEW or DYNAMIC VIEW commands. Maintain the final orientation with SET VIEW.

3. Inserting piping items: Menu options provide the required data for automatic component selection. Begin routing at the upstream terminus of the main line and route from vertex to vertex in the flow direction until the line is terminated. Going from beginning to end, insert all fittings by inserting these through menu. After completing the main line, route branches off the main line in the same way.

4. Freezing model geometry: After checking the piping layout and the fitting locations, freeze the model geometry.

5. Setting up the isometric: Create a sketch on paper, looking at the model. Measure dimensions on model and note down in sketch. Using the isometric program, create isometric.

6. Dimensioning the isometric: Using different dimension options, write all dimensions.

7. Editing the isometric: Changing the layer scheme, rotating item number labels, translating weld numbers, unblanking pipe segments, and editing dimensions.

8. Inserting a bill of materials: Using automatic bill of material option you can create a table. The values in the table need to be adopted as per sketch. Lengths of pipe, size of reducers and number and lengths of bolts need to be changed using options in BOM menu.

9. Plotting the drawing: You can plot the isometric using standard plot command.

Most CAD packages are prepared in such a manner that these can be easily customized. 4 Programs of **OpenPipe** are such customized programs. The Iso program is totally based on LISP programs and there are only 4 small symbols or blocks to be inserted as in other programs, due to which there is a lot of saving of Disk space as well as the drawing also has very small size. Since the program is written in LISP, you can even modify PROGRAM for PIPING ISOMETRIC DRAWINGS further as per your choice. The different piping entities are arranged on layers 1 to 6 (which is compatible with Microstation). Special Dialogue Boxes are created to make the program more user friendly. The drawing can be converted to Microstation DGN format.

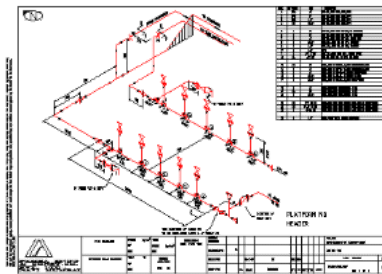
**PIPING ISOMETRICS PROGRAM** can run on Personal Computers, on a Pentium system with 32 MB RAM. PROGRAM for PIPING ISOMETRIC DRAWINGS supports screen, buttons and icon menus, as well as, dialogue boxes. The program is specifically written for any CAD program. PROGRAM for PIPING ISOMETRIC DRAWINGS can not run on Autocad LT.

To try the program, send a request for trial package. The package is a zip file, openpipe.zip. There is no setup.exe file as in other packages. Download and unzip openpipe.zip and copy files in a folder, say openpipe. While running AutoCAD program, click on tools ->Options (or Preferences) -> Files -> + of Support File Search Path -> Add -> Browse -> Select the folder, select apply and close. The openpipe.zip file contains iso\*.lsp, iso.dcl and iso.slb, iso.dwg (Border drawing) and trial.dwg.

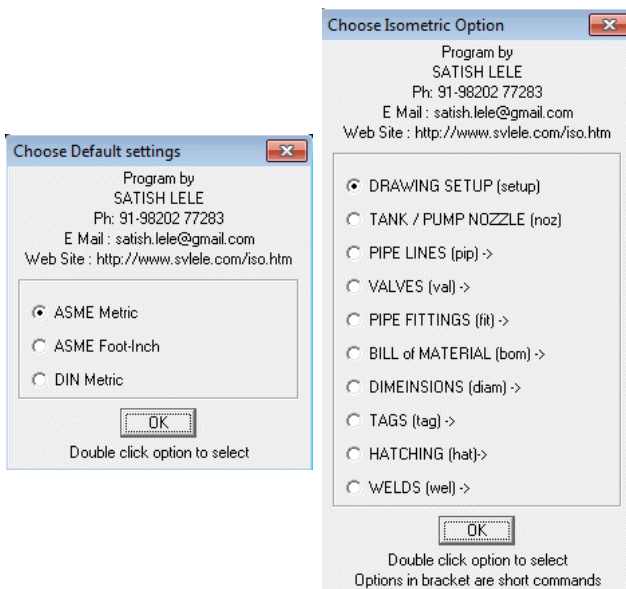
ASME package Bought so far by 74 parties  
 ASME, Triclover and Victaulic package Bought so far by 41 parties  
 Professional Charges for CAD Ad-on Software for  
 Piping Isometrics for ASME Fittings US\$ 50 or Rs. 3,500

Piping Isometrics for ASME + Tri-Clover + Victaulic Fittings US\$ 70 or Rs. 4,900

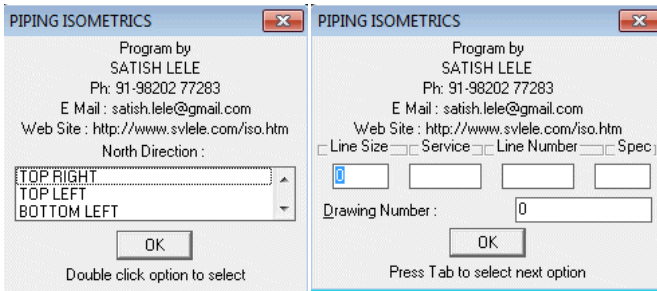
Source programs for all the above are also available for sale. Price will be double the indicated price.



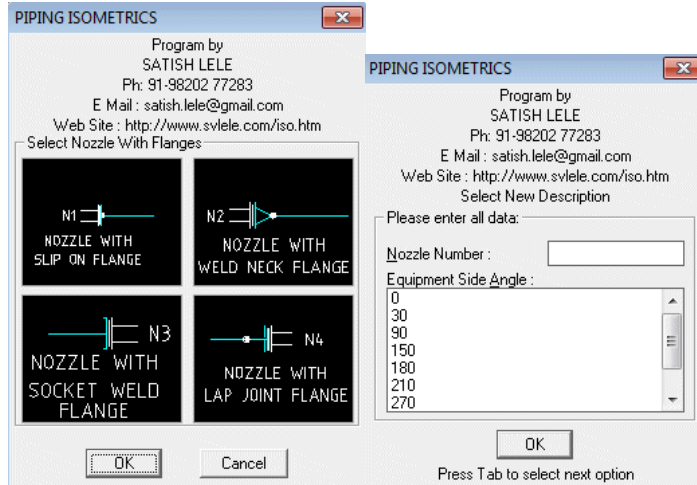
While running CAD program (it can not run in AutoCAD LT), open trial.dwg and at command prompt type (load "iso") and press <enter>. Iso package will be loaded, and start using iso program, by typing iso and press <enter>.



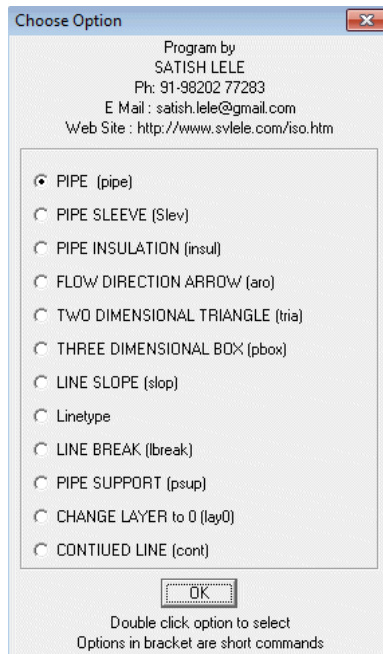
You can select the type of Standard and system you want to use. Once you select it, you can get all the options available.



**SETUP:** To draw an Isometric Drawing, first run this option from ISO button menu and select North Direction. A drawing with all default values properly set, is set-up automatically. The size of the drawing is 420 mm wide and 297 mm high for Metric Units and 17" wide and 11" high for Foot-Inch Units. In the dialog box that appears, enter drawing number, and line number. Then change P&I D Number as well as GAD Number using ddedit. Whenever program ask for angle of a pipe line, angle is selected in degrees, as per CAD Standard angles.(0 degree for East, 90 degree for North, 180 degrees for West, 270 or -90 for South and any other angle in between).

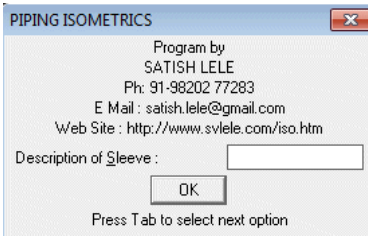
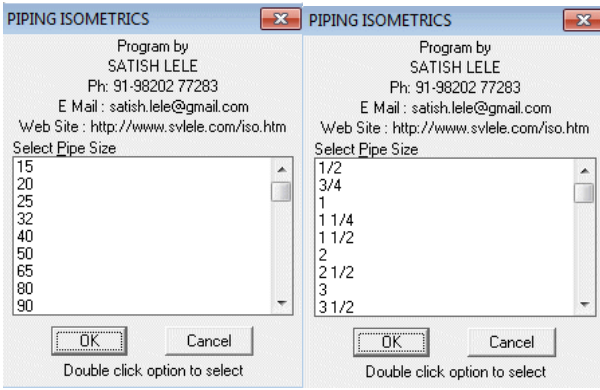


**NOZZLE:** Draw a vessel nozzle with four types of flanges attached to nozzle, at any angle, using this option. When you click on this a dialogue box will open, showing the type of flange attached to nozzle. You can have Slip On, Weld Neck, Socket Weld or Lap Joint Flange. Select the proper flange connection. Dialogue Box will close and you are asked to select point location of nozzle on the pipeline and then through a Dialog Box, you can define nozzle side direction angle in degrees. Assign nozzle number or pump number to the nozzle. PROGRAM for PIPING ISOMETRIC DRAWINGS will automatically draw a nozzle with flange and gasket and write nozzle or pump number.

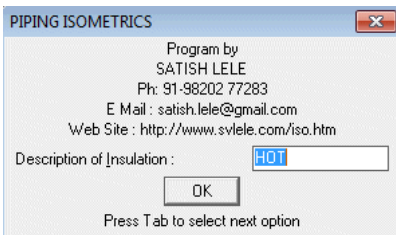


**PIPELINES:** When you click on this, this offers twelve options.

**Pipe :** You can draw all pipelines with diameter from 15 mm NB to 3600 mm NB, or from 1/2" to 144", using this option. PROGRAM for PIPING ISOMETRIC DRAWINGS will set layer to linesize\_1 and colour of layer to cyan. If pipe size in not defined, a dialog box will open and ask you to select size.



**Sleeve** : You can draw a sleeve through a pipe passes. Program asks to select the pipe line, and then you can enter the description of the sleeve in dialog box. PROGRAM for PIPING ISOMETRIC DRAWINGS draws the sleeve, and writes description on top of pipe line.

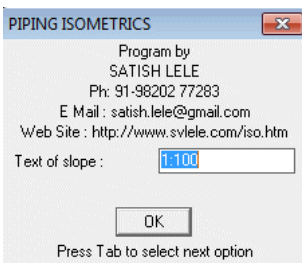


**Insulation** : You can draw insulation symbol on a pipe line. Program asks to select the pipe line, and then you can enter the description of Insulation in the dialog box. Insulation symbol will be put on the line, and description is written on top of pipe line.

**Arrow** : To show direction of flow of a pipe line, you can use this option. Pick start point of arrow head on the pipe line and point on the line towards tail of arrow. PROGRAM for PIPING ISOMETRIC DRAWINGS automatically draws the arrow, and writes pipe NB above pipe line.

**Triangle** : If a line is running at an angle other than North / South or East / West, or at an angle in horizontal or vertical plane, you can use this option to draw the other two sides of triangle (These lines are drawn un layer 0). Program draws pipeline joining two end points of triangle and you can continue pipe option and draw the pipe line further. These lines can be used for hatching the triangle.

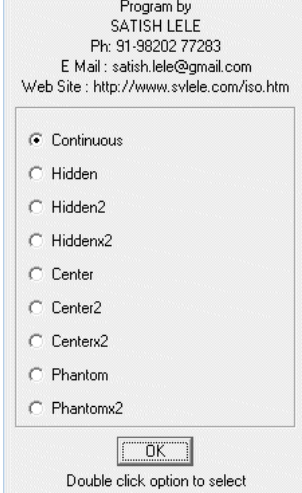
**Box** : If a line is running at an angle other than North / South or East / West, as well as at an angle in horizontal or vertical plane, you can use this option to draw the lower two sides as triangle option and the program then asks to select vertical distance and draws a box (The box is drawn un layer 0). A pipeline joining two end points of box is drawn and you can continue pipe option and draw the pipe line further. These lines can be used for dimensioning the box.



**Slope** : To write slope of a line on a pipeline, you can use this option. Program asks us to select a line, then a point in the direction of the slope, text to be written on line (eg. 1:100) and after you select the location of the text, program writes slope automatically at that location, while drawing a triangle showing slope.

**Linetype** : You can change linetype of a line to continuous, hidden, hidden2, hiddenx2,

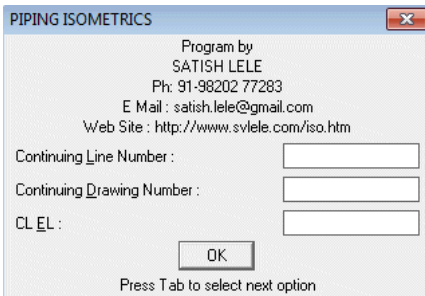
Choose LineType center, center2, centerx2, phantom and phantom2.



**Line Break** : You can put a line break at the end or anywhere in the pipe line. you can pick up insertion point and line break is inserted.

**Pipe Support** : Program asks to select pipe line. If line is inclined, PROGRAM for PIPING ISOMETRIC DRAWINGS marks a support at the point selected, an arrow pointing upwards, and writes C1 of support. If line is vertical, PROGRAM for PIPING ISOMETRIC DRAWINGS draws a horizontal line from that point and writes PS.

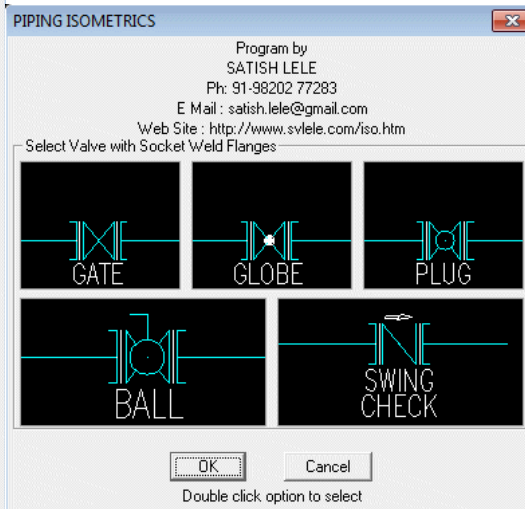
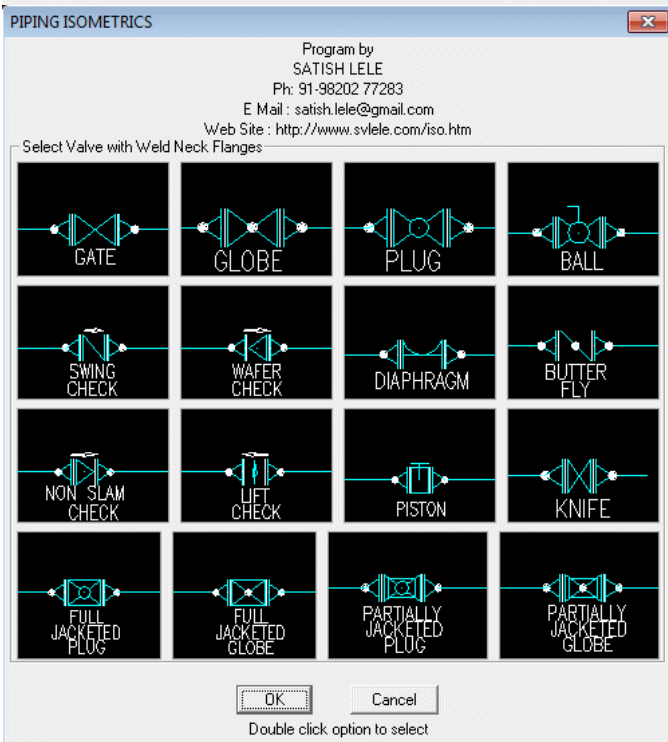
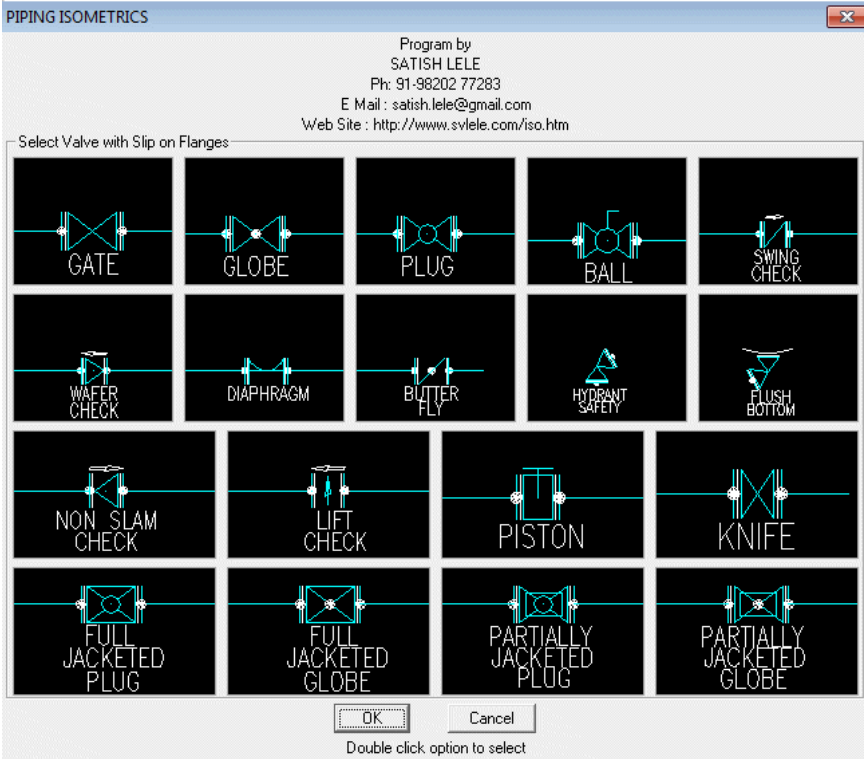
**Change Layer to 0** : If the particular entity is not part of the the line, you can put that entity to layer zero and change its linetype to hidden, using this option. Program asks to select a number of entities, and then changes the same.

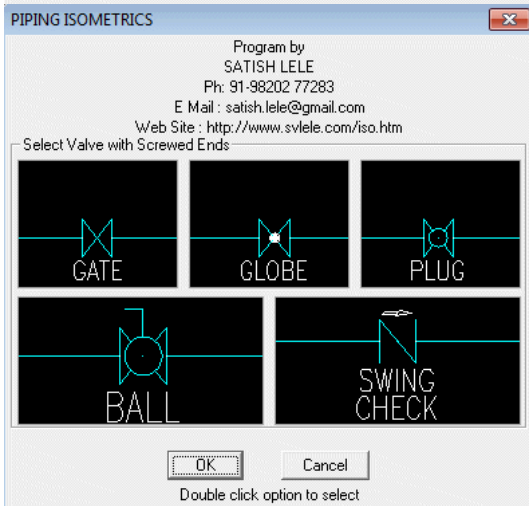
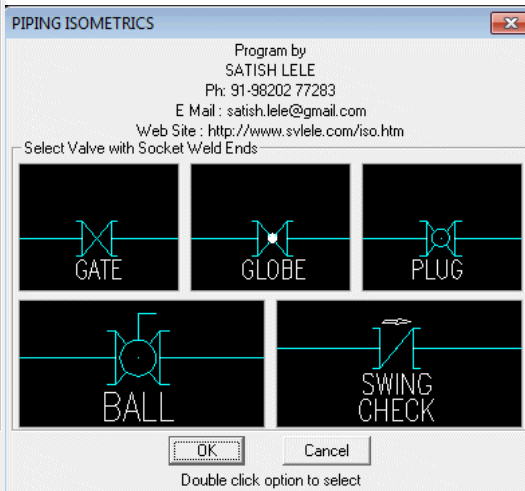
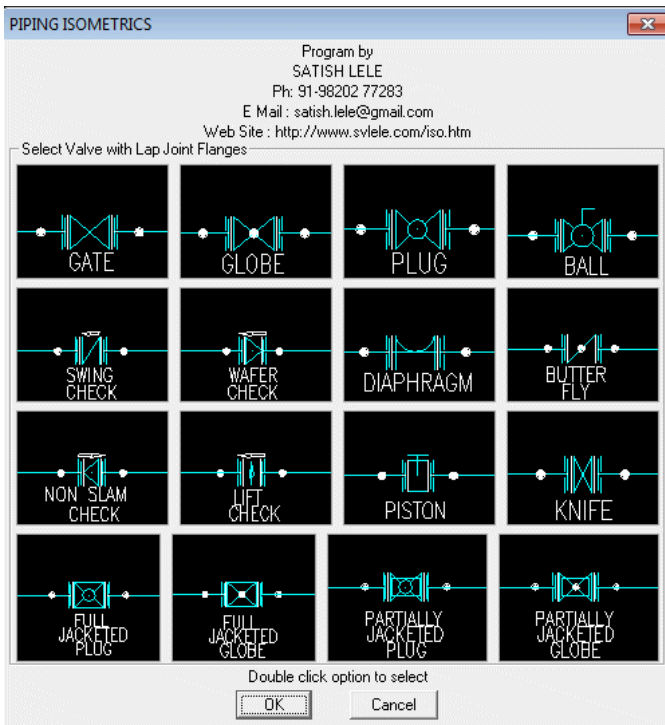


**Continue** : If a pipe line is not included in this drawing, that pipe line can be drawn with this. Line is drawn dotted. The program asks you to select first point, then second point. Through a dialog box, you can enter line number which appears above the line. You can also enter Drawing number in which that line is drawn. Detail is written below the line as C.O.D. and line number. PROGRAM for PIPING ISOMETRIC DRAWINGS writes Centerline Elevation, below it.



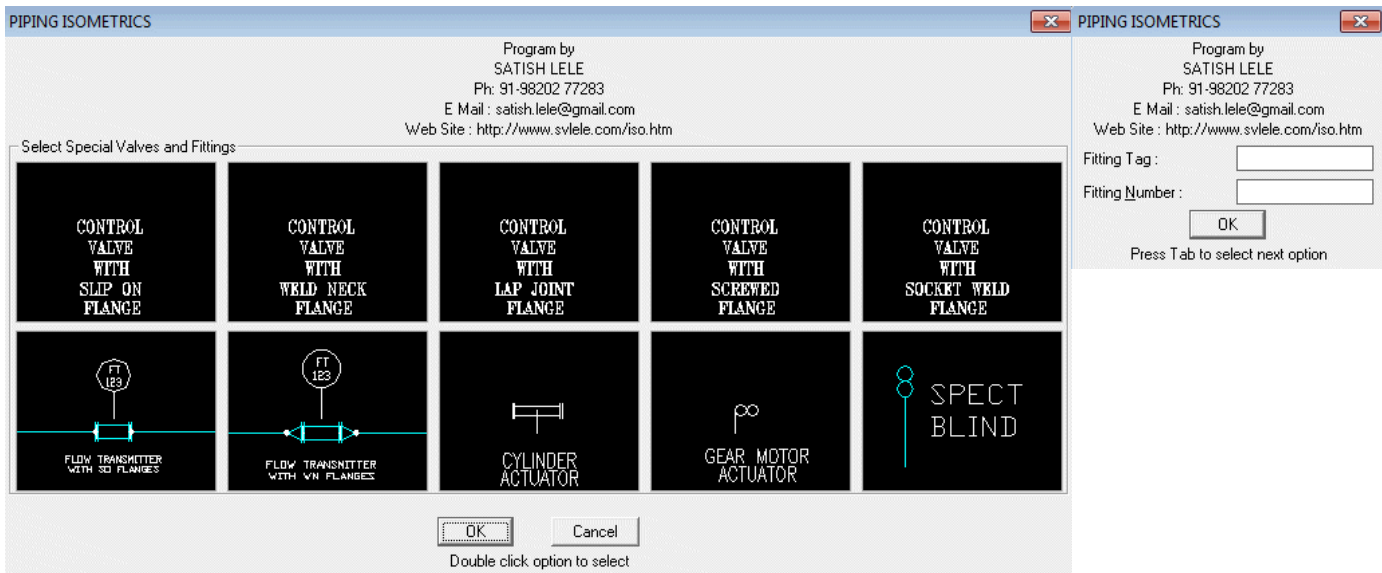
**VALVES**: When you click on this option, this offers six options, which in-turn offers a number of options with the help of Dialogue Boxes.





Once you insert a valve a dialog box will appear. You can fill in valve number as per (P & ID). If you do not want to assign any number, select cancel. It will still ask for number in command line. Press <Escape> to exit.

**SPECIAL FITTINGS:** When we click on this, this offers ten options through icon menu. If you select control valves or flow transmitters, a tag will be drawn. For that select point where tag will be drawn. It will show a dialog box. Fill in details. It will be written in circle.



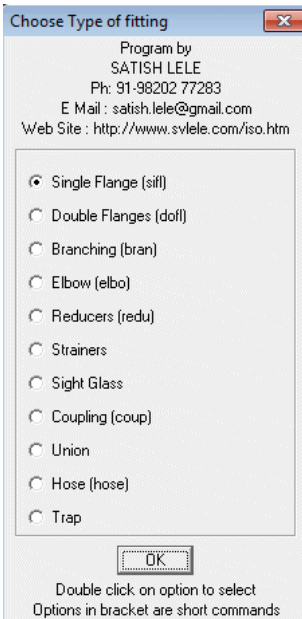
1. Control Valve with Slip-on Flanges
2. Control Valve with Weld Neck Flanges
3. Control Valve with Lap Joint Flanges
4. Control Valve with Screwed Flanges
5. Control Valve with Socket weld Flanges
6. Flow Transmitter with Slip-on Flanges
7. Flow Transmitter with Weld Neck Flanges
8. Cylinder Actuator
9. Geared Motor Actuator
10. Spectacle Blind

**Method to Insert a Valve:** First you select the option by clicking the option. Dialogue Box appears on screen showing the type of drawing PROGRAM for PIPING ISOMETRIC DRAWINGS will draw. Select the one required, by double-clicking. Click on the pipeline and in case of Gate, Globe, Plug, Ball, Diaphragm and Butterfly Valves, valve will be inserted in the line. For Check and Wafer Check valve, you pick up from dialog box the angle of pipeline in the direction of flow. The valve is drawn in the line in proper direction. You can enter valve number through a dialog box, which will be written near valve. For Hydrant valve (or PSV), double click on the end point of pipeline (osnap end is already set), pick-up from dialog box the angle of pipeline, and again pick-up from dialog box, angle of outlet of valve in the direction of flow. The Hydrant valve (or PSV) is drawn in the line. Program automatically puts these valves on layer 2, assign color of layer as cyan and also draws flanges and gaskets in the drawing.

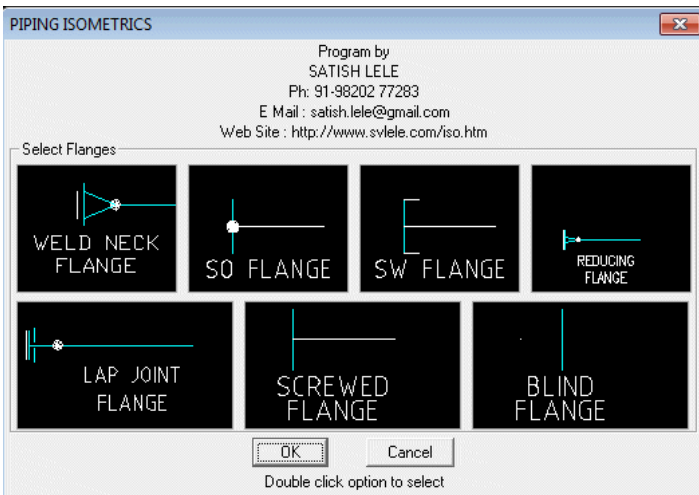
**FITTINGS:** When we click on this, this offers eleven options.

1. Single Flange
2. Double Flanges
3. Branch Connection
4. Elbows
5. Reducers
6. Strainers

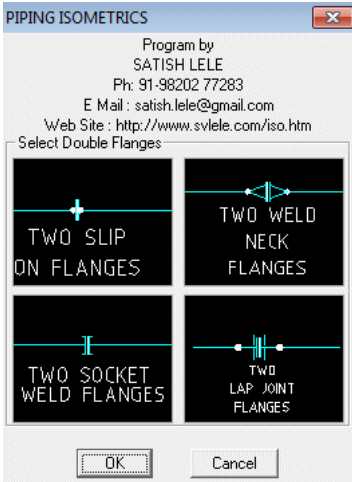




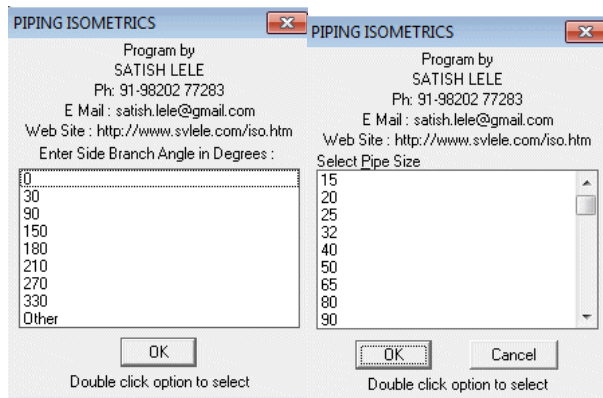
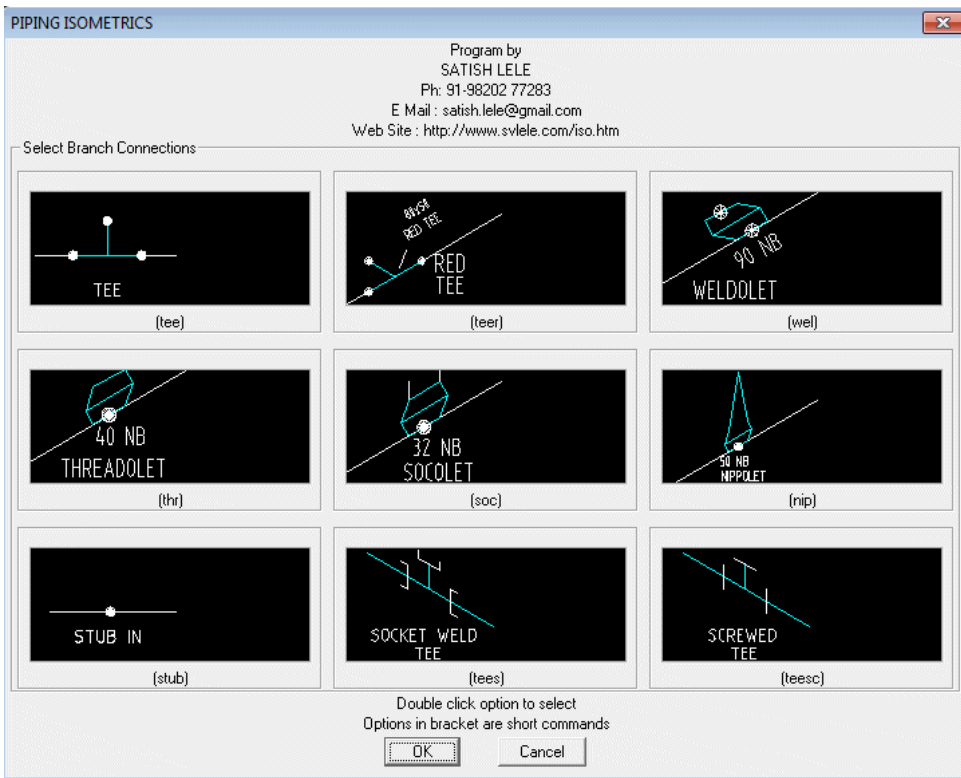
- 7. Sight glass
- 8. Couplings
- 9. Union
- 10. Hose
- 11. Trap



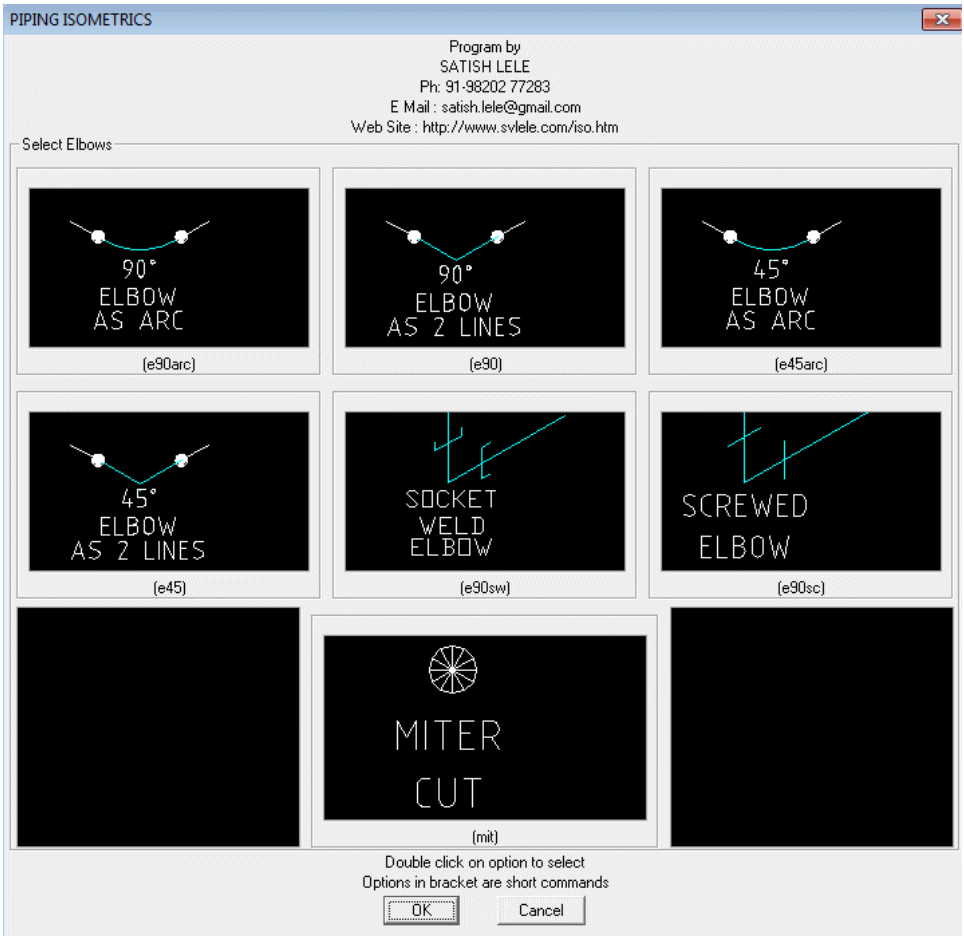
**Single Flange** : This has seven options. Weld-neck, slip-on, socket-weld, lap-joint, screwed blind and reducing flanges. You can select the option by clicking in menu. A Dialogue box appears on screen showing the type of drawing, PROGRAM for PIPING ISOMETRIC DRAWINGS will draw. Select the one required, by double-clicking, and select the pipe line (osnap nearest is already set), and from dialog box we pick the gasket side angle of pipe line. The flange is inserted in the pipe line. PROGRAM for PIPING ISOMETRIC DRAWINGS asks whether gasket is required. If you say yes, gasket is put in line near the flange, in the direction of flow.



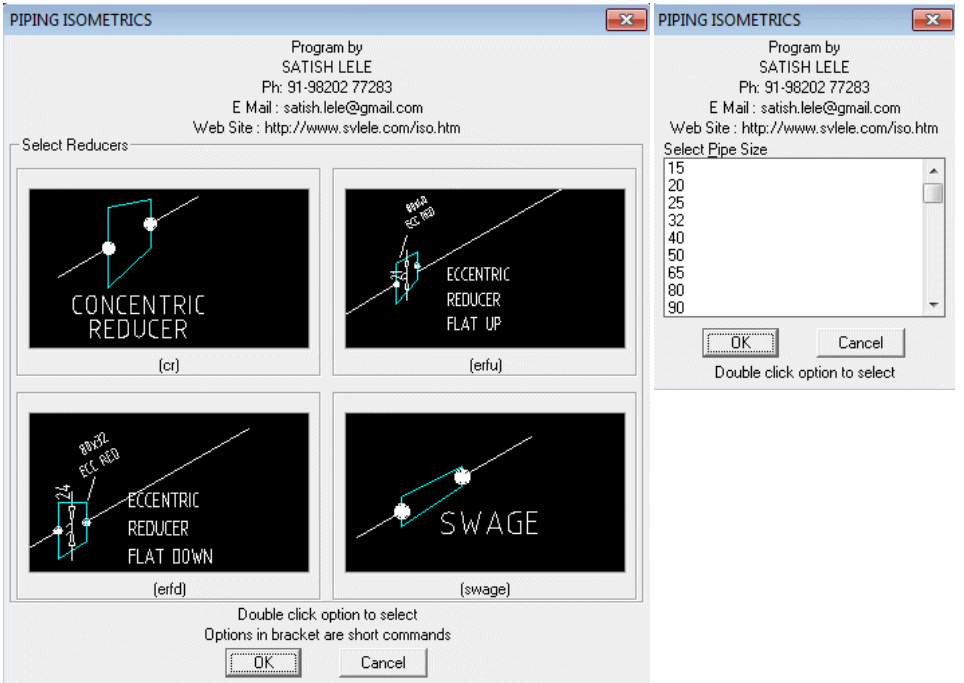
**Double Flanges** : This has four options, weld-neck, slip-on, socket-weld, and lap-joint. Select the option by clicking flanges. A dialogue box appears on screen showing the type of drawing PROGRAM for PIPING ISOMETRIC DRAWINGS will draw. Select the one required, by double-clicking and select the pipe line (osnap nearest is already set), and the double flanges are inserted in the pipe line. PROGRAM for PIPING ISOMETRIC DRAWINGS puts gasket in line between two flange.

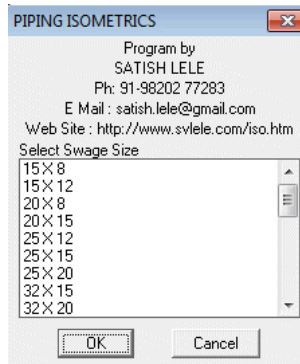


**Branch Connection :** This has nine options, equal tee, reducing tee, weldolet, threadolet, socollet, nippolet, stub-in, socket weld tee and screwed tee. Select the option by clicking branch connection. A Dialogue box appears on screen showing the type of drawing PROGRAM for PIPING ISOMETRIC DRAWINGS will draw. Select the one required, by double-clicking and select the pipe line. You have to then indicate the angle of side branch, through dialog box. The branch connection is inserted in the line. You can then continue drawing a pipeline. In case of reducing tee, weldolet, socollet, nipolet, threadolet and stub-in you are asked to select the size of branch pipe through dialogue box. Only valid sizes are offered for selection of reducing tees and you have to pick a point where the size is written. For stub-in, select the pipe line (osnap nearest already set). A weld is put on pipe, and you can draw the branching line.

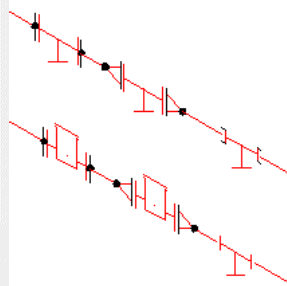
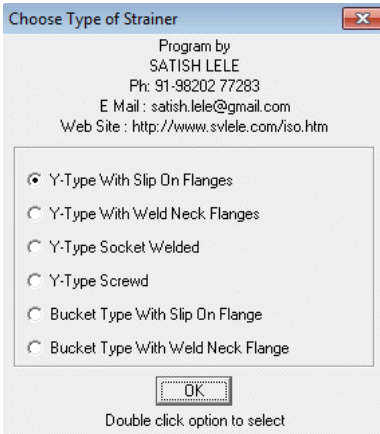


**Elbows :** You can draw 90 degree or 45 degree Butt Weld elbows, as arcs or as two lines. you can also draw socket weld or screwed elbows. Also, you can put a donut to indicate miter-cut. Select the option by clicking elbow. Icons appear on screen showing the type of drawing PROGRAM for PIPING ISOMETRIC DRAWINGS will draw. Select the one required, by double-clicking. For inserting an elbow, select the two pipe lines near the end (osnap end is already set). The elbow is inserted in the junction of two lines. If you are using arc option, a point will be put at the intersection of the two pipe lines, which can be picked as node during dimensioning. In case of miter cut, PROGRAM for PIPING ISOMETRIC DRAWINGS asks to select the pipe line and PROGRAM for PIPING ISOMETRIC DRAWINGS puts a weld at the end of the line.

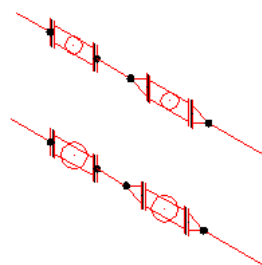
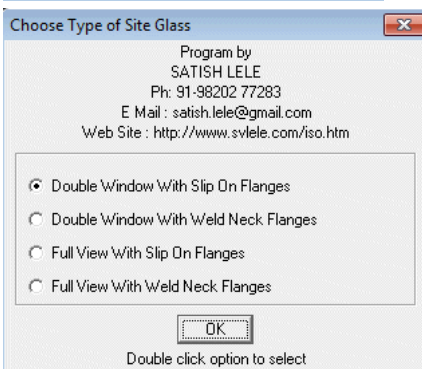




**Reducer** : You can draw a concentric reducer, eccentric reducer flat side up, eccentric reducer flat side down or swage. Select the option by clicking reducer. Dialogue Box appears on screen showing the type of drawing PROGRAM for PIPING ISOMETRIC DRAWINGS will draw. Select the one required, by double-clicking, and select the point on the pipe line where larger end of reducer will be inserted (osnap nearest is already set), and then a point on pipe towards the side of smaller end of reducer. You are prompted for size of pipe on other side of reducer through a dialogue box. Only valid sizes are available for swage. You are then asked to select a point where text will be written. Program calculates offset distance and writes offset distance on reducer in case of eccentric reducers only. In all cases, PROGRAM for PIPING ISOMETRIC DRAWINGS writes size and type of reducer at the text insertion point. The reducer is inserted in the line. An alert message tells you to erase lines on other side and draw a new pipe lines with proper size. In case you select line angle as 90 degree or 270 degree for eccentric reducer, program ends action alerting that eccentric reducer is not used in vertical lines.

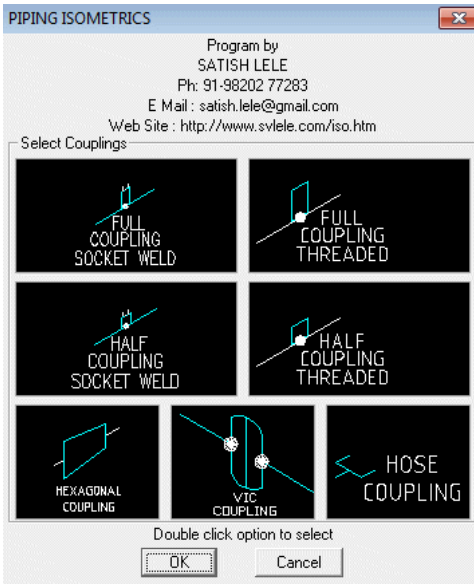


**Strainers** : This offers 4 options. Y type Strainer with Slip-on Flanges or Y-Strainer with Weld Neck Flanges, Bucket type Strainer with Slip-on Flanges, or Bucket-Strainer with Weld Neck Flanges. Select the pipe line, and the strainer with flanges and gasket is drawn in the line.

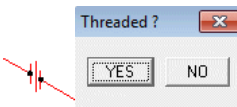


**Sight glass** : This offers 4 options. Double Window with Slip-on Flanges or Double Window with Weld Neck Flanges, Full View with Slip-on Flanges, or Full View with Weld Neck Flanges. Select the pipe line, and the sight glass with flanges and gasket is drawn in the line.

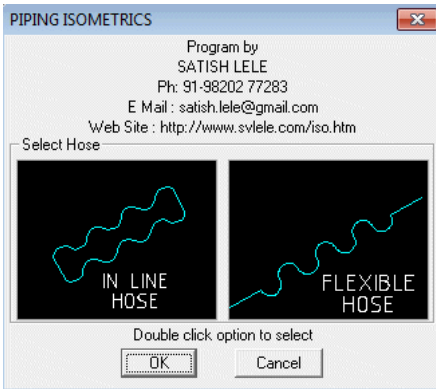
**Couplings** : You can draw full and half coupling, with butt-weld or



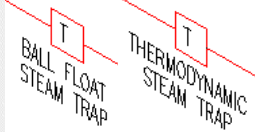
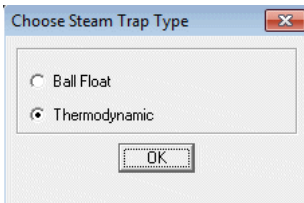
threaded end, hexagonal coupling, victolic coupling and hose coupling. Select the option by clicking coupling. Dialogue Box appears on screen showing the type of drawing PROGRAM for PIPING ISOMETRIC DRAWINGS will draw. Select the one required, by double-clicking and then the pipe line. In first four cases, you are prompted for size of coupling through a dialogue box. You have to then select, through dialog box, the angle of side branch. PROGRAM for PIPING ISOMETRIC DRAWINGS draws coupling and you can continue drawing pipe line. PROGRAM for PIPING ISOMETRIC DRAWINGS writes size near the fitting. In case of hexagonal coupling, select the pipe line, and then size of coupling from the dialog box. The hexagonal coupling is put in the pipe line. PROGRAM for PIPING ISOMETRIC DRAWINGS writes size near the fitting. In case of victolic coupling, select the pipe line and the coupling is put in the pipe line. In case of hose coupling, you are asked for location of insertion and then angle of hose coupling, and PROGRAM for PIPING ISOMETRIC DRAWINGS draws a hose coupling.



**Union** : With this you can draw a union. Select the option by clicking union, and then the pipe line. The union is inserted in the line. You are asked whether union is butt-welded or threaded, to draw the appropriate one.



**Hose** : With this you can draw in-line hose which is like a bellow in a line, or flexible hose. Select the option by clicking hose. Dialogue box appears on screen showing the type of drawing PROGRAM for PIPING ISOMETRIC DRAWINGS will draw. Select the one required, by double-clicking, and then the pipe line for hose and from dialog box, pick-up the angle of in-line hose, or flexible hose. The in-line hose is inserted in the pipe line and flexible hose is inserted at the point selected.



**Trap** : With this we can draw a trap. We select the option by clicking trap and the pipeline. The trap is inserted in the line.

**BILL OF MATERIAL (BOM)**: With this we can write BOM and edit Bill of Material. There are thirteen options:

**Choose Bill of Materials Option**

Program by  
SATISH LELE  
Ph: 91-98202 77283  
E Mail : satish.lele@gmail.com  
Web Site : http://www.svlele.com/iso.htm

Table with Dummy Entries  
 Automatic BOM  
 Only Table  
 Edit Description ->  
 Edit by Class ->  
 Studbolt Size ->  
 Bolt Size ->  
 Change No by ->  
 Oblique Text to ->  
 Change Text Height ->  
 Erase BOM/Tags

Double click option to select

MARK	QTY/LENH	SIZE	DESCRIPTION
1	?	5/8	Desc
2	?	5/8	Desc
3	?	5/8	Desc
4	?	5/8	Desc
5	?	5/8	Desc
6	?	5/8	Desc
7	?	5/8	Desc
8	?	5/8	Desc
9	?	5/8	Desc
10	?	5/8	Desc

**Table with Dummy Entries** : Program asks for number of entries. Type in the last number of BOM list. PROGRAM for PIPING ISOMETRIC DRAWINGS then asks for pipeline size. Program draws a table with 5 more empty lines. PROGRAM for PIPING ISOMETRIC DRAWINGS writes serial numbers, line size in all rows and ? entry in quantity column. PROGRAM for PIPING ISOMETRIC DRAWINGS writes desc in Description column. These are edited later, using ddedit command.

MARK	QTY/LENH	SIZE	DESCRIPTION
1	1	05	WPC
2	1	05	WPC
3	1	05	WPC
4	1	05	WPC
5	1	05	WPC
6	1	05	WPC
7	1	05	WPC
8	1	05	WPC
9	1	05	WPC
10	1	05	WPC
11	1	05	WPC
12	1	05	WPC
13	1	05	WPC
14	1	05	WPC
15	1	05	WPC
16	1	05	WPC
17	1	05	WPC
18	1	05	WPC
19	1	05	WPC
20	1	05	WPC
21	1	05	WPC
22	1	05	WPC
23	1	05	WPC
24	1	05	WPC
25	1	05	WPC

**Automatic Bill of Materials** : PROGRAM for PIPING ISOMETRIC DRAWINGS searches for number of entities and writes in a table.

MARK	QTY/LENH	SIZE	DESCRIPTION

**Only table**: You can draw a blank table. A dialog box appears, and asks for number of entries. PROGRAM for PIPING ISOMETRIC DRAWINGS draws a blank table with those many entries.

**Choose Option to Edit Description**

Program by  
SATISH LELE  
Ph: 91-98202 77283  
E Mail : satish.lele@gmail.com  
Web Site : http://www.svlele.com/iso.htm

Valve ->  
 Pipe  
 Fittings ->  
 Flange ->  
 Gasket  
 Nut / Bolts

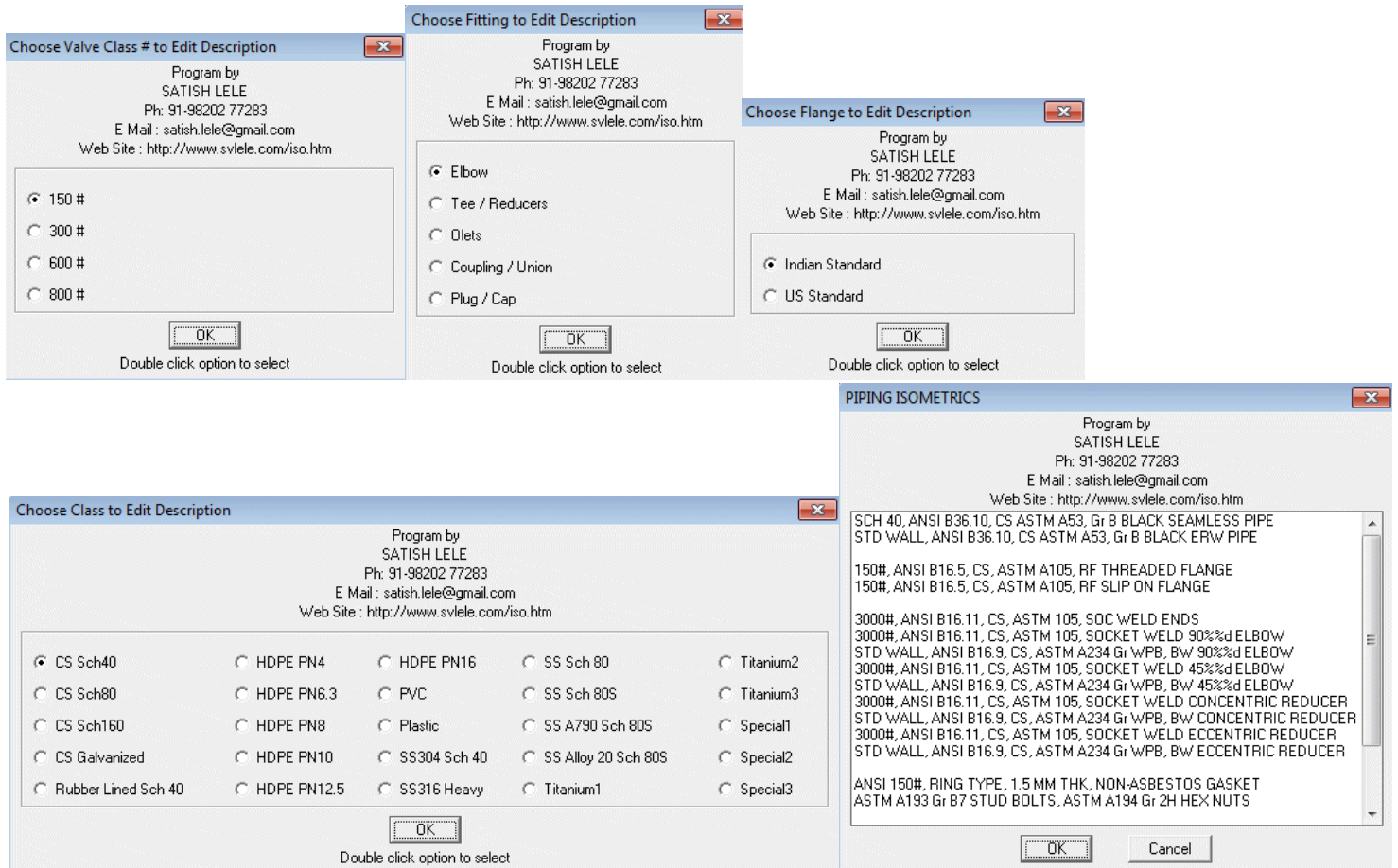
Double click option to select

**Edit Description** : With this option you can change text in description column by selection of piping item. Program asks to select text to modify and then you can choose text from dialogue boxes. Text is written in place of desc. *You can change or add description by editing iso10.lsp in notepad.*

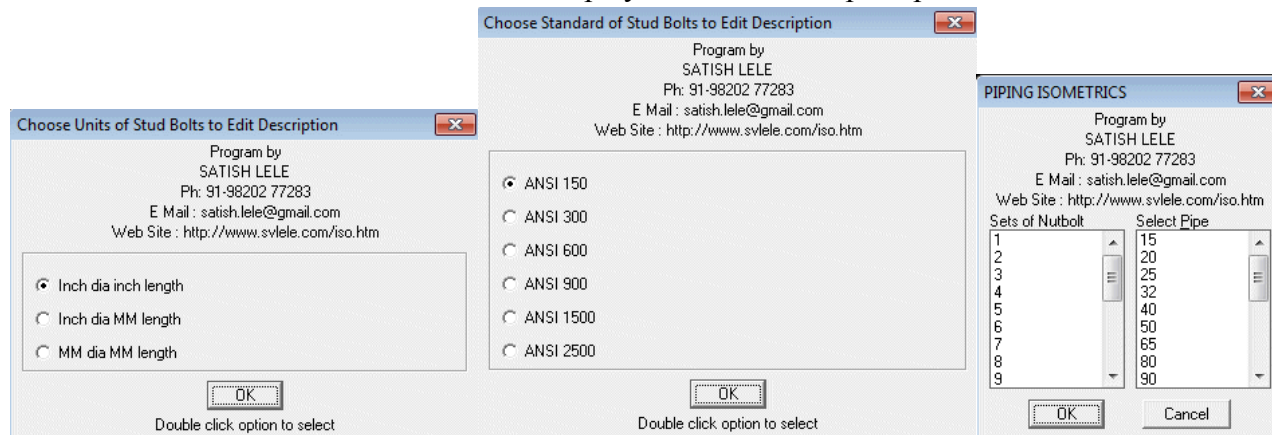
- You can edit description of
- Valves as per class 150# / 300# / 600# / 800#
  - Pipes
  - Fittings: Elbows, tee, reducer, Olets, coupling, union, plug or cap
  - Flanges as per IS or ASME
  - Gasket
  - Nut Bolts

When you click on the option program will ask you to select text. You can select multiple texts. A dialog box will open and allow you to select from multiple

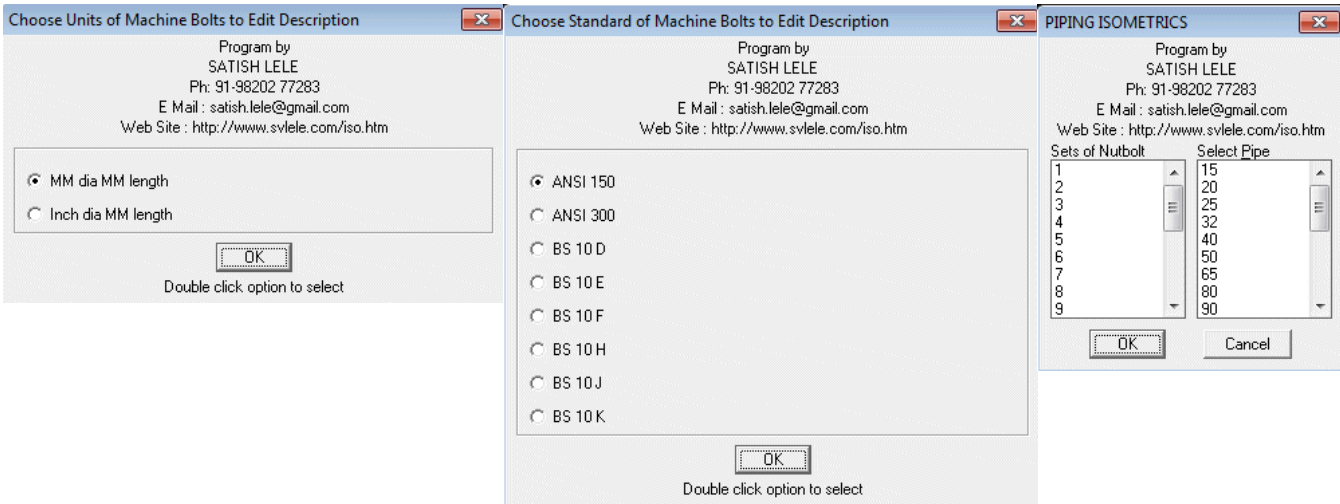
options. The selected text will be inserted in the place of text from the drawing that was selected.



**Edit text by Class (spec) :** Select proper spec, and then program asks to select text to modify from the BOM table. Pick up text to modify and you can replace text by typing a text or by picking corresponding one in dialog box. You can also use short commands as displayed in command prompt.



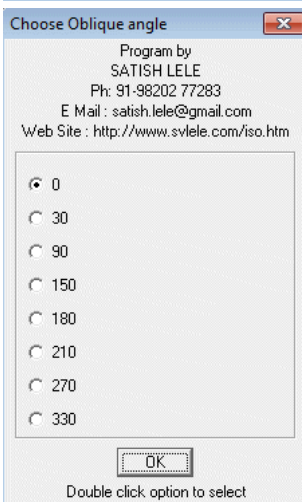
**Stud bolt Size :** You can change the size of stud bolt in BOM table in two ways, Diameter in inches and length in mm or diameter in mm and length in mm. Select the standard and class of flanges (ANSI or BS) and proper option. Then select the diameter of flange from dialog box and give number of sets of stud bolts. Program calculates number of bolts required for those many sets and ask to select text to replace the size and then quantity of stud bolts.



**Nut bolt Size :** You can change the size of Machine bolt in BOM table in two ways, Diameter in inches and length in mm or diameter in mm and length in mm. Further select the standard and class of flanges (ANSI or BS) and proper option. Then select the diameter of flange from dialog box and give number of sets of nut bolts. Program calculates number of bolts required for those many sets and ask to select text to replace the size and then quantity of nut bolts.



**Change Number By :** In case there is any change in tag numbers, we can change the numbers from -5 to 5.



**Oblique Text to :** With this we can oblique the text so as to fit its rotation angle.

**Text Height :** We can change text height of the text you select to 2, 2.5 and 3 mm.





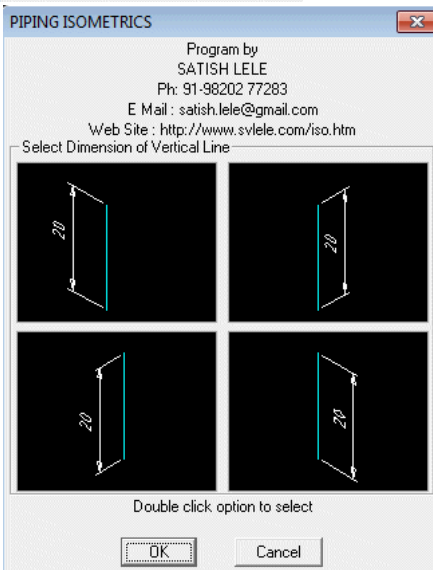
**Move Bill Of Material** : We leave a gap of one row after valves, pipes, fittings, flanges, gaskets and stud bolts. It can be done by this option. We select text to move and PROGRAM for PIPING ISOMETRIC DRAWINGS will move it by one column down.

**Find and Replace** : If there is any addition in tags, the number may go up. To change these numbers in tags and Bill of Material Table, we use this option. The text that will be changed is shown on screen. We change the numbers in reverse order.

**Erase BOM / Tags** : If we use this option, all the tags and BOM Table with all entries will be erased.

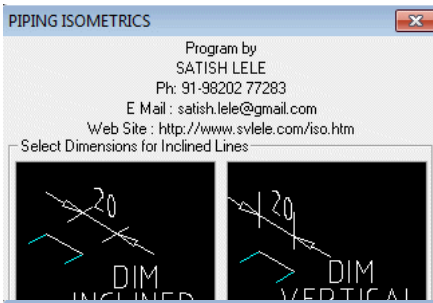


**DIMENSIONS:** Dimensions have got five options.

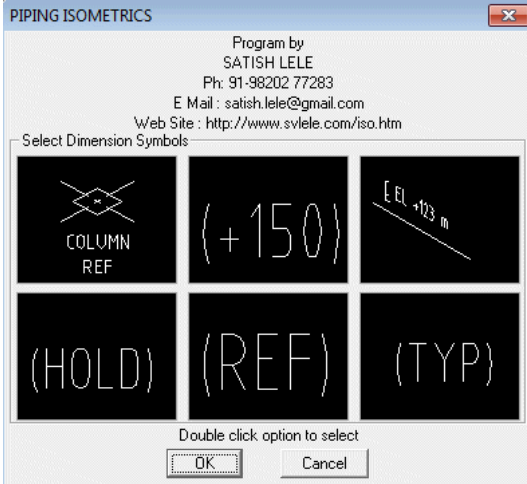


**Dimensions for Vertical Lines** : With this you can write dimensions, in four inclined directions, for a vertical line. Select the option by clicking menu. Dialogue box appears on screen showing the type of dimension PROGRAM for PIPING ISOMETRIC DRAWINGS will draw. Select the one required, by double-clicking, and the two end-points, or press enter to select the line, and indicate location of dimension text, and enter dimension text. The dimension is written on the line. In case of continued dimension, select last point option at location of dimension. (Just press enter when asked to indicate location of dimension text).

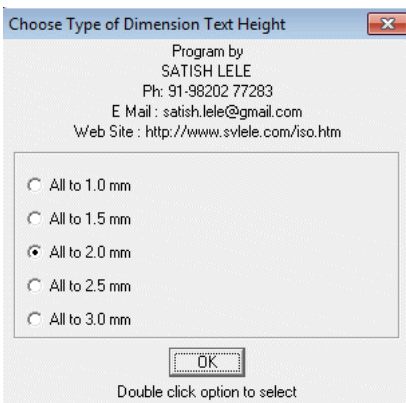
**Dimensions for Inclined Lines** : With this you can write dimensions, for inclined lines. Select the option by clicking menu. Dialogue box appears on screen showing the type of dimension PROGRAM for PIPING ISOMETRIC DRAWINGS will draw. Select the one required, by double-clicking, and the two end-points, or press enter to select the line, and indicate location of dimension text, and enter dimension text. The dimension is written on the line. In case of continued dimension, select last point option at location of



dimension. (Just press enter when asked to indicate location of dimension text).



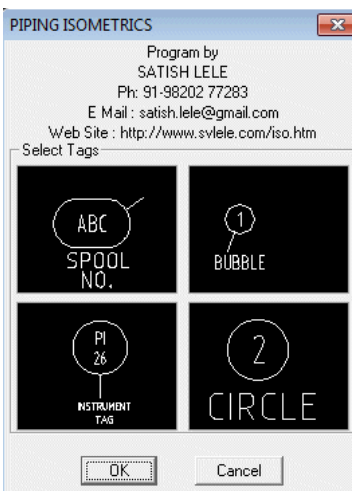
**Isodim Symbols** : With this option you can draw a column reference as well as write texts as (+150), (HOLD), (REF), (TYP) below an existing dimension text. For this we pick-up option from dialogue box and then a dimension text. Text is written below the dimension text. you can also write CI EI with a line from end point of an elbow.



**Dim Text Height** : You can change text height of all the dimensions to 1, 1.5, 2, 2.5 and 3 mm.



**Gasket Sign** : You can put the gasket sign in dimension, using this. Pick-up end point of valve (osnap end already set), and pick-up inclination angle from dialog box.



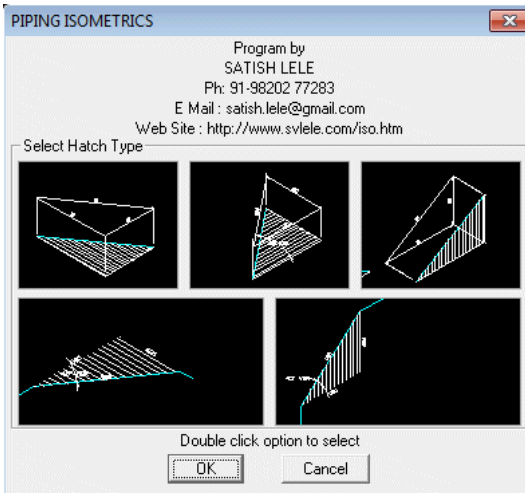
**TAGS** : With this you can draw spool nos., bubble, instrument tag and tag for gaskets / nut-bolts. Select the option by clicking menu. Dialogue box appears on screen showing the type of drawing PROGRAM for PIPING ISOMETRIC DRAWINGS will draw. Select the one required, by double-clicking. In case of spool no, enter the spool no as text and then pick a point where text should appear. Then select pipeline or fitting (osnap nearest is already set), and then select second point on spool tag to draw a line indicating the spool.

In case of bubble, select pipeline or fitting (osnap nearest is already set), and then select second point where the tag no will be written. A tag no is displayed. You can accept the same number by pressing enter or type a new number and press enter.

In case of instrument no., select instrument valve, or fitting (osnap nearest is already set), and then select second point where the tag no will be written. Fill in dialog box text for fitting type and number. Fitting tag appears.

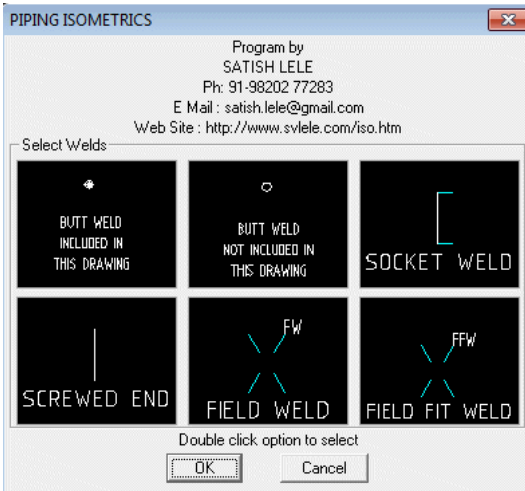
In case of circle, select the earlier circle at the top point (osnap nearest is already set), A tag no will be displayed. You can accept same number by pressing enter or type a new number.

**HATCH**: With this you can draw vertical or horizontal hatch patterns in 5 different ways by selecting three pipe lines. In first 2 cases you



can do horizontal hatching in 2 different ways. With third you can do vertical hatching. When you select a pipe line, program asks for dimension of this pipe line. Hatch repeats for other two pipe lines. hatch then runs zoom window command and ask you to select window to zoom the area where to write angle. After you write angle, drawing will zoom to previous view.

With fourth and fifth option, you can draw vertical or horizontal hatch patterns by selecting three pipe lines. After you select each pipe line, program asks for the length to be written as text. After hatch is drawn, program writes length of the three lines. Program then runs zoom window command and ask to select window to zoom the area where to write angle. After you write angle, program will zoom to previous view.



**WELD:** With this you can draw welds or ends. Six options are available. Butt-weld included in this drawing option will draw filled donut, Butt-weld not included in this drawing option will draw hollow circle. Other options will draw socket-weld end, screwed end, field weld, field fit weld. Select the option by clicking weld option. Dialogue Box appears on screen showing the type of welds / ends program will draw. Select the one required, by double-clicking. Then select pipeline (osnap nearest is already set), where a weld or end is drawn instantly.

### Check List for Isometric Drawings

1. Check whether P&ID number and GA drawing number is correct.
2. Check Line Number in Title Block.
3. Check whether direction of flow and other details are as per P&ID.
4. Check details of vents and drains, dimensions of vent from high point / drain from BOP or low point.
5. Field weld should be provided for every 12 meters of pipe line.
6. If some exact dimension is not known, like FOF of pump or length of valve, provide a field fit weld. Add 150 mm to the length of pipe line in BOM table and indicate (+150) below tag of dimension.
7. If straight length of pipe exceeds 4 meters, provide a field fit weld and indicate (+150) below tag of dimension.
8. Check sizes of all fittings as per standard. Check proper symbols for gate, globe and check valves.
9. Provide tag numbers to every cut pipe and all fittings. Different types of fittings should have different numbers. These tag numbers should match with those in BOM table. Lengths of pipes should be exact cut lengths.
10. Spool numbers to be given to all spools. The number is same as drawing number with A,B,C,D etc. added to spool.

11. For instruments, show piping scope and instrument scope. For FE, show tappings in proper directions, size, length and detail. Show spec change, if any. Size for TG should be 200 mm and for PI should be 40 mm.
12. If line is continuing in other drawing, (C.O.D.), indicate iso number of that pipe line, or write field run for small pipe lines.
13. Reference elevation should be indicated at least at one point.
14. Proper symbol for butt weld, socket weld and screwed connection.
15. If an iso has more than one line, the number of main line should be written in title block, and numbers of other lines under This Drawing Includes:
16. Match line for split drawings and dotted lines for pipe lines from other drawings.
17. Hatching for angular details, horizontal hatch for horizontal turn and vertical hatch for vertical turn. Indicate angle of turn. Dimensions should be provided for three sides. CL EL for three lines.
18. Special fittings should be marked properly with a tag number and tag should reflect in BOM table.
19. Tag number of valve should be written below the valve and should reflect in BOM table.
20. Check fittings as per spec and branching table.
21. Indicate sign of gasket for valves in dimension.
22. Indicate nozzle number for equipments.
23. If mating flange of a pump is supplied by pump vendor, indicate it on drawing.
24. If an end of pipe line is open, indicate open end on drawing.
25. Show spec break, if any.
26. Show cloud for hold.
27. Show insulation for insulated pipe lines.
28. Show special specs like rubber lined or SS, 3D bends or part insulation.
29. For reducing tee and reducers, indicate size and type as per spec and branching table.
30. For olets, indicate NB of branch.
31. Check obliquing angle for all texts and dimensions.
32. Provide weld numbers in direction of flow.
33. In BOM table, entities should be in order. Pipes, Valves, Fittings, Gaskets and Stud bolts. A line should be left blank between these groups.
34. Check cross-referenced drawings and check details in title block.

Some samples of drawings



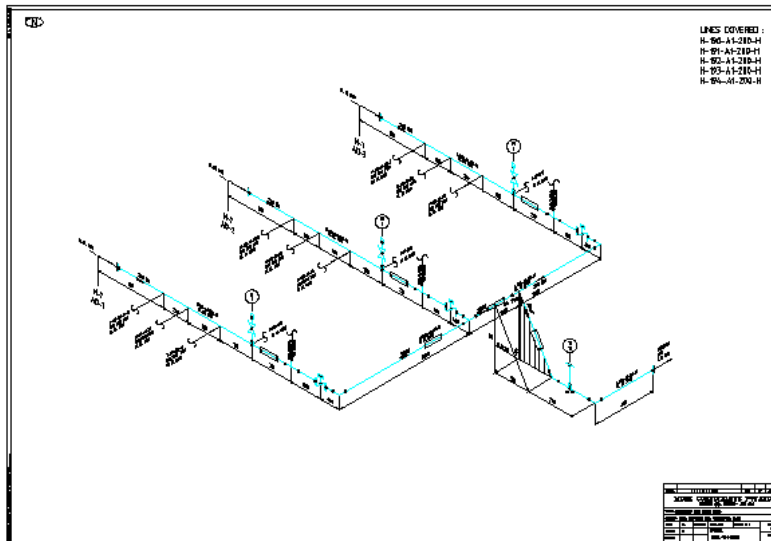
● Isometric Drawing drawn by our AutoLISP Program.

MARK	QTY/LGTH	SIZE	DESCRIPTION
1	117	40	SCH 80, P.E., SEAMLESS, ASTM A106 GR B, ANSI B36.10, CS PIPE
2	50	40	SCH 80, P.E., SEAMLESS, ASTM A106 GR B, ANSI B36.10, CS PIPE
3	110	40	SCH 80, P.E., SEAMLESS, ASTM A106 GR B, ANSI B36.10, CS PIPE
4	110	40	SCH 80, P.E., SEAMLESS, ASTM A106 GR B, ANSI B36.10, CS PIPE
5	55	40	SCH 80, P.E., SEAMLESS, ASTM A106 GR B, ANSI B36.10, CS PIPE
6	100 X 2	40	SCH 80, P.E., SEAMLESS, ASTM A106 GR B, ANSI B36.10, CS PIPE
7	550	40	SCH 80, P.E., SEAMLESS, ASTM A106 GR B, ANSI B36.10, CS PIPE
8	651	40	SCH 80, P.E., SEAMLESS, ASTM A106 GR B, ANSI B36.10, CS PIPE
9	100 X 2	15	SCH 80, P.E., SEAMLESS, ASTM A106 GR B, ANSI B36.10, CS PIPE
10	3	40	SEAMLESS, ASTM A105, ANSI 3001, SW ENDS, ELBOW
11	2	40	SEAMLESS, ASTM A105, ANSI 3001, SW ENDS, TEE
12	2	40 X 15	SEAMLESS, ASTM A105, ANSI 3001, SW ENDS, REDUCING TEE
13	5	40	ANSI B16.5 150#, ASTM A105, SLIP ON FLANGE
14	8	40	CAF-9HFLLI OR STYLE 39 (CHAMPIONI), 2 MM THK, GASKET
15	32	1/2" 70 LG	ASTM A193 GR B7 ALLOY STUD, ASTM A194 GR 2H HEX NUTS
16	1	40	151#, NON RETURN VALVE, ENDS FLANGED, V-06
17	3	40	151#, BALL VALVE, ENDS FLANGED, V-01, V-05, V-07
18	1	15	800#, GATE VALVE, SOCKET WELD ENDS, V-W7
19	1	40	151#, STRAINER, ENDS SOCKET WELD, SR-2

● Part of Isometric Drawing showing Bill of Material for Socket Weld Fittings Drawn by our AutoLISP Program.

MARK	QTY/LGTH	SIZE	DESCRIPTION
1	239	200	SCH 20, B.E., SEAMLESS, ASTM A106, GR B, ANSI B36.10, CS, PIPE
2	470	200	SCH 20, B.E., SEAMLESS, ASTM A106, GR B, ANSI B36.10, CS, PIPE
3	100	200	SCH 20, B.E., SEAMLESS, ASTM A106, GR B, ANSI B36.10, CS, PIPE
4	100	40	SCH 20, B.E., SEAMLESS, ASTM A106, GR B, ANSI B36.10, CS, PIPE
5	1	200	SEAMLESS, ASTM A234, WPB, BW ENDS, 90 DEG ELBOW
6	1	200	SEAMLESS, ASTM A234, WPB, BW ENDS, 45 DEG ELBOW
7	1	40	SEAMLESS, ASTM A105, ANSI 3000, SW END, HALF COUPLING
8	1	200	ANSI B16.5 150#, ASTM A105, SLIP ON FLANGE
9	1	40	ANSI B16.5 150#, ASTM A105, SLIP ON FLANGE
10	1	200	CAF-9HFLLI OR STYLE 39 (CHAMPIONI), 2 MM THK, GASKET
11	1	40	CAF-9HFLLI OR STYLE 39 (CHAMPIONI), 2 MM THK, GASKET
12	8	3/4" 105 LG	ASTM A193 GR B7 ALLOY STUD, ASTM A194 GR 2H HEX NUTS
13	4	1/2" 70 LG	ASTM A193 GR B7 ALLOY STUD, ASTM A194 GR 2H HEX NUTS

● Part of Isometric Drawing showing Bill of Material for Butt Weld Fittings Drawn by our AutoLISP Program.



● Isometric Drawing showing a Detail

drawn by our AutoLISP Program.