PD2CAEPIPE™- Plant Design-to- CAEPIPE Translator (for Aveva's PDMS)

1.0 Installing Program

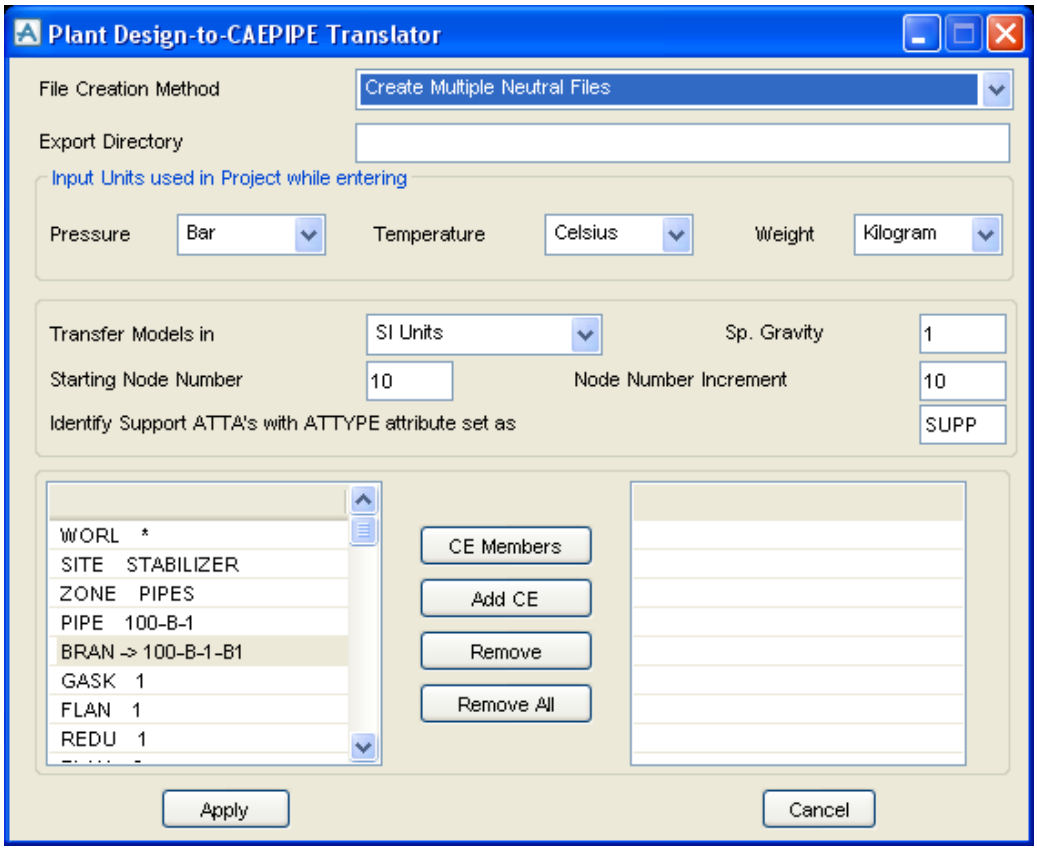
To install PD2CAEPIPE on Windows OS, load the product CD supplied by InfoPlant and execute the followings steps:

1. Browse the CD, and run the program "SETUP.EXE" and follow the instructions as they appear on the screen.
2. Add the path of the installed directory to the "pmllib" path of the PDMS as shown below.

   SET PMLLIB= D:\Iplant\PDMS2CAEPIPE %1\pmllib (assuming PDMS2CAEPIPE is installed in the directory D:\Iplant\PDMS2CAEPIPE)
3. The environment variables required by PDMS are also required for PD2CAEPIPE. The PDMS environment must exist as outlined in the appropriate PDMS Installation Guide.
4. Load PDMS and enter the Lexicon Module as a user who has Read-Write access to DICT Database and run the datal file PDMS2KP.DAT, to create the UDA: SUPCODE for ATTA elements, UDA :NX, :NY, :NZ and :NAL for Nozzle elements, UDA: :HNX, :HNY, :HNZ, :TNX, :TNY, :TNZ, :HNAL and :TNAL for Branch elements.

2.0 Neutral File Extraction

1. Add the ZONE/PIPES/BRANCHES you want to transfer to CAEPIPE in the form, using "Add CE" or "CE Members button.
2. Branches selected for transfer need to be checked for:
   - TEMP, PRES attributes of the BRAN element.
   - Each branch should have a valid PH OD.
   - It is recommended to perform "DATA CONSISTENCY CHECK" for all Pipes/Branches selected for Transfer.
   - Each branch in the network should have a valid HSTU.
   - Each branch should have a component.
3. To use PD2CAEPIPE Translator, type "show !!PD2KP" in the PDMS command line to invoke the translator. The following form appears,



4. Fill up the form and press the “Apply” button in the form.
5. Selecting the option “Create Multiple Neutral Files” creates a set of files in the specified directory. The names of the files are identical to the name of the pipe(s). If Pipes are included in the selection dialog, then the translator creates a neutral file identical to name of the each pipe and includes the details of components from all the branches (which are inter connected/not connected with welding tees, etc.) that are available in that pipe hierarchy.
6. Secondly, selecting the option “Create Single Neutral File” creates one neutral file for all the items added in the selection dialog box in the specified neutral file name.
7. Select the Input units used in Project while entering “Pressure”, “Temperatures” and “Weight” using the options as shown in the figure above. Please note, selecting wrong input units used in project will results in incorrect output.
8. Enter the Starting Node number and Node Increment value in the appropriate field. By default, the Starting Node number and Node Increment are set to 10 and 10 respectively.
9. Selecting the option “SI Units” transfers the Pipes/Branches details in SI units i.e. Length related dimensions such as OD, Nominal Size etc in mm, Temperature in Deg C, Pressure in bar, Weight in Kg, Density in Kg/m3, Translational Stiffness in N/mm, Rotational stiffness in N-m/deg to the neutral file.
10. Similarly selecting the option “ENGLISH Units” transfers Pipes/Branches details in ENGLISH units i.e. Length related dimensions such as OD, Nominal Size etc in Inch, Temperature in Deg F, Pressure in psi, Weight in lb, Density in lb/in3, Translational Stiffness in lb/in, Rotational Stiffness in lb-in/deg to the neutral file

11. The Specific Gravity of the fluid (with respect to water) is set to 0.8 by default. User can change Specific Gravity by entering the appropriate value in text box.
12. When the "Identify Support ATTA's with ATTYPE attribute set as" is entered with a Keyword, then it will transfer support locations and its information from PDMS, only when the attribute "ATTYPE" is filled with the string that matches the Keyword entered in the form. On the other hand, leaving this text box empty (unfilled) will transfer all the ATTA from the PDMS for the selected Pipes/Branches without checking its "ATTYPE" attribute. For example, if the Keyword is specified as "SUPP" then the program will include ATTA's for transfer, only when the ATTYPE attribute is filled with the same Keyword "SUPP", otherwise, it excludes them from transfer.

3.0 Limitations

1. Corrosion allowance and Mill tolerance are not transferred to CAEPIPE at this time even though the provision is available in the Neutral File.
2. Lining Density and Lining Thickness are not transferred to CAEPIPE at this time.

4.0 Reference

Loads

Temperature and Pressure values entered at Pipe/Branch level via TEMP and PRES attribute shall be transferred to CAEPIPE. Hence, user should fill these attributes with appropriate values depending upon the Units of transfer. I.e., If you wish to transfer the model in SI units, then the value enter for Temperature and Pressure should be in Deg C and kg/cm2 respectively. On the other hand, if you wish to transfer the model in English Units, then the Temperature and Pressure values shall be entered in Deg F and psi respectively.

Fluid Density

Even though the provision is available in PDMS Propcon Database to enter the Fluid density, most of the users do not use such facility. Hence, provision is given to specify the Specific Gravity of the fluid (with respect to water) during the transfer of the model.

Weight

The weights of Valves, Instruments, Flanges, etc. are extracted from the Propcon Database through the "Cweight" attribute. If defined/available in the Propcon Database, the program extracts the information and writes the same to neutral file, otherwise it shall be written as 0.0. Care should be taken while filling the "Cweight" attribute in Propcon. I.e., the values should be specified in Kg, if you to wish to transfer the same in SI units otherwise in lb for English units.

Wall Thickness

Since the Wall thickness of the Piping components is generally not available in PDMS, they are set to 0.0 by default. However, user can transfer the Wall Thickness information to CAEPIPE properly from PDMS (if they are specified) by modifying the variables defined in the program. Refer **Appendix A** for details on modifying the program to extract Wall Thickness from PDMS.

Wall thickness of piping component can also be transferred to CAEPIPE using a Mapping DB (Code.mdb) supplied along with the product. For more details, refer to Appendix C of PD2CAEPIPE User's Manual (PD2CAEPIPE.pdf).

OD and Nominal Size

OD and Nominal Size are extracted from the Paragon Database of PDMS. For reducers, the arrive OD and Thickness shall be transferred to OD1 and Thk1 of the element in CAEPIPE and the leave OD and Thickness shall be transferred as OD2 and Thk2 of the element in CAEPIPE.

Boundary Conditions

In the current version, the program will "Anchor" the Pipe Ends only when they are connected to a Nozzle otherwise it leaves them as open. On the other hand, if one end of the pipe is connected to another Branch and if that Branch is not included as the part of the Stress model, then the program will also anchor that end automatically.

For more clarity, consider the following examples. If one end of the pipe is connected to a Pump Nozzle and the other end is not connected to any equipment nozzle/object, then the program will anchor the first end and leave the other end as free (i.e., do not create any support). On the other hand, if one end of the pipe is connected to a Nozzle and the other end is connected to another Branch and that Branch is not included in the Stress model, then the program will anchor both the ends automatically.

Supports

Supports locations and its information are included for transfer from PDMS when the following conditions are met.

Step 1: Include/Exclude ATTA's for Transfer

Define ATTA and fill the attribute "ATTYPE" with an appropriate Keyword. Use the same Keyword in the text box "Identify Support ATTA's with ATTYPE attribute set as" (as shown in figure above). Mismatching of Keywords will exclude the ATTA's from transfer (or) fill the attribute "ATTYPE" with an appropriate Keyword and leave the text box "Identify Support ATTA's with ATTYPE attribute set as" empty (unfilled) to include all ATTA's for Transfer.

Step 2: Transfer Support Details

The translator performs the following for transferring the support details to CAEPIPE.

- Checks for user defined attribute (UDA) ":SUPCODE". If available, then reads the details of support from this attribute and write them to the neutral file.
- If not available, then checks for user defined attribute ":KPSUPCODE". If available, then read the details from this attribute and transfer to CAEPIPE. Please note, this feature is included for users who had used older versions of PD2CAEPIPE. i.e., User who had used the older version of PD2CAEPIPE can continue to use the same user defined attribute ":KPSUPCODE" to transfer the support details to CAEPIPE, without reentering the values to the new attribute.
- Lastly, if both the attributes are not available in PDMS, then the program will read the support details from the "STEXT" attribute of ATTA and transfer the same to CAEPIPE. This can be used in situations where, the users do not have write access to Dictionary Database of PDMS to create the User Defined attribute.

Any of the attributes defined above should be set a value as given in the field #1 i.e., "PdSupport" of the access db "SupportType.mdb", when the user selects the option "Use Mapping DB" in PD2CAEPIPE Translator for transferring the support details to CAEPIPE. Otherwise, the attribute should be filled with values as specified in **Appendix E** of PD2CAEPIPE User's Manual supplied along with the product. For more details on transferring support information to CAEPIPE with the option "Without Using Mapping DB", refer to **Appendix D** of PD2CAEPIPE User's Manual (PD2CAEPIPE.pdf).

Material

Material description entered at XTEXT attribute of SMTE is extracted from the Paragon Database and written to the neutral file. The CAEPIPE Material is then transferred to CAEPIPE by obtaining the same through Mapping DB defined by the user. Refer to **Appendix B** of PD2CAEPIPE User's Manual for more details.

Thermal Anchor Movement (TAM)

Thermal Anchor Movement (TAM) values entered at UDA :NX, :NY, and NZ in global X, Y and Z directions respectively at Equipment Nozzle where the piping layout (selected for transfer) is connecting to. These values are then transferred to CAEPIPE. TAM values should be defined in "mm" for PDMS projects in SI units and in "Inch" for PDMS project in English units.

If the Equipment Nozzle to which the Piping Layout is connecting to is not modeled in PDMS, then these TAM values can be entered at UDA :HNX, :HNY and :HNX or :TNX, :TNY and :TNZ at PDMS Branch corresponding to Head or Tail of pipe run. In other words, TAM at starting of the Pipe run should be entered at :HNX, :HNY and :HNZ of PDMS Branch. On the other hand, TAM at the end of the Pipe run should be entered at :TNX, TNY and TNZ of PDMS Branch.

User defined Equipment Nozzle Allowable Loads

Equipment Nozzle Allowable Loads (forces and moments) provided by the equipment manufacturer or calculated using Applicable codes / Finite Element Methods can be entered at UDA :NAL in global X, Y and Z directions at Equipment Nozzle in the format FX, FY, FZ, MX, MY and MZ. These values should be separated using ",". Please note, the force values should be entered in "lb" for English units and in "N" for SI units. Similarly, the moment values should be entered in "ft-lb" for English units and in "Nm" for SI units.

If the Equipment Nozzle to which the Piping Layout is "Connecting To" is not modeled in PDMS, then these Equipment Nozzle Allowable Loads can be entered at UDA :HNAL or :TNAL at PDMS Branch corresponding to Head or Tail of the Pipe run. In other words, Allowable Loads at starting of the Pipe run should be entered at :HNAL of PDMS Branch. On the other hand, Allowable Loads at the end of the Pipe run should be entered at :TNAL of PDMS Branch.

Example:

For Nozzle, enter the values of FX, FY, FZ, MX, MY and MZ as ":NAL '3000,3000,6000,500,500,2000'"

For PDMS Branch Head, enter the values of FX, FY, FZ, MX, MY and MZ as ":HNAL '3000,3000,6000,500,500,2000'" and

For PDMS Branch Tail, enter the values of FX, FY, FZ, MX, MY and MZ as ":HNAL '3000,3000,6000,500,500,2000'"

5.0 Specifying Wall Thickness

This section explains how to extract the wall thickness for PDMS piping components. To specify the wall thickness for piping components like Pipe, Olet, Tee, Elbow, Reducer and Cross, navigate to “PDMS2CAEPIPE” installed path and locate the folder “Setup”. Navigate to the folder “Objects” and then open the corresponding .pml object files in which the thickness need to be specified.

Locate the variables “!This.WallThickness[1] and “!This.WallThickness[2]” in the file and modify the values to suit the project requirement. By default these variables are assigned to ‘0.00’.

Catalogue Parameter

If wall thickness is defined using Catalogue Parameter of SCOM in PDMS, then the variable can be modified to read the value from Catalogue Parameter. For example, if the Wall Thickness is specified in Catalogue Parameter 3, modify the lines as follows.

```
!This.WallThickness[1] = !DbRef.catref.Param[3].String()

!This.WallThickness[2] = !DbRef.catref.Param[3].String()
```

Design Parameter

If Design Parameter (DESPARAM) is used to specify the Wall Thickness, then the variable can be modified to read the value from Design Parameter. For example, if the Wall Thickness is specified in Design Parameter 3, modify the lines as follows.

```
!This.WallThickness[1] = !DbRef.spref.Desparam[3].String()

!This.WallThickness[2] = !DbRef.spref.Desparam[3].String()
```

User Defined Attributes (UDA) at Specification component

If User Defined Attribute is used to specify the Wall thickness of the piping component at SPCO level, modify the variable listed below to read the value from UDA. For example, if the Wall Thickness is specified in the variable “WallThickness” of SPCO element, modify the lines as follows.

```
!This.WallThickness[1] = !DbRef.Spref.:WallThickness.string()

!This.WallThickness[2] = !DbRef.Spref.:WallThickness.string()
```

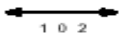
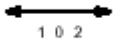
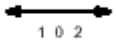
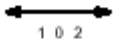
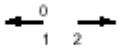
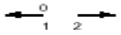
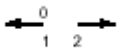
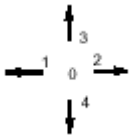
User Defined Attributes (UDA) at Piping Component

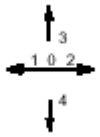
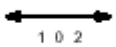
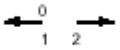
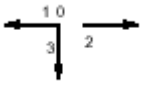
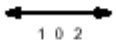
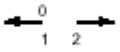
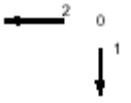
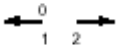
If User Defined Attribute is used to specify the Wall thickness at piping component, modify the variable listed below to read the value from UDA. For example, if the Wall Thickness is specified in the variable “WallThickness” of piping element, modify the lines as follows.

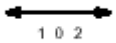
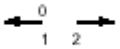
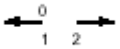
```
!This.WallThickness[1] = !DbRef.:WallThickness.string()

!This.WallThickness[2] = !DbRef.:WallThickness.string()
```

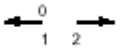
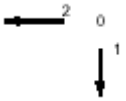
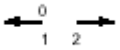
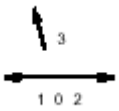
6.0 Plant Design to CAEPIPE Component Mapping

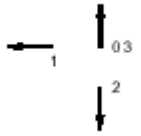
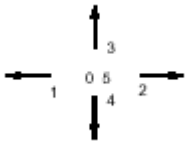
The type of component available in Plant Design is mapped with CAEPIPE component and PD2CAEPIPE transfers the component available in Plant Design to CAEPIPE as tabulated below

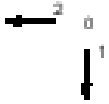
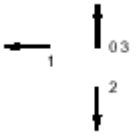
Plant Design Software Component Description	Connection Points	CAEPIPE Component	Keyword used in Neutral File
Cap			
Butt weld		Rigid Element	RB
Cap compression		Rigid Element	RB
Cap Screwed		Rigid Element	RB
Cap Socket Weld		Rigid Element	RB
Closure			
Pipe Block		Rigid Element	RB
Pipe Block Variable Length		Rigid Element	RB
Coupling			
Nipple – Screwed, Coupling Compression, Coupling Screwed, Coupling Socket weld, Butt weld Elbolet, Socket Weld Elbolet, Screwed Elbolet		Reducer Concentric	RD
Cross			
Butt Weld, Socket Weld, Compression, Flanged, Screwed		Four Pipes with Branch SIF (Welding TEE)	CR

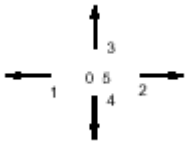
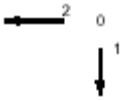
Plant Design Software Component Description	Connection Points	CAEPIPE Component	Keyword used in Neutral File
Set on, Set on Reinforced		Four Pipes with Branch SIF (Welding TEE)	CR
Blind Flange			
Flange – Blind		Rigid Element or Pipe with Flange	FL
Flange - Reducing Concentric		Rigid Element or Pipe with Flange	FL
Flange Reducing Eccentric		NA	NA
Fixed Length Tube			
Fixed length Pipe with Flanged ends and without Flanged ends.		Pipe	PI
Lap Joint and Stub End			
Lap Joint Ring Loose		Rigid Element or Pipe with Flange	FL
Lap Joint Stub End Loose		Rigid Element or Pipe with Flange	FL
PCOMponent			
Block – Angle		Pipe	PI
Expansion Bellows, Flame Trap, Flexible Hose, Hose Coupling, Non – Category item, Restrictor Plate, Tundish		Pipe	PI

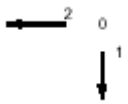
Plant Design Software Component Description	Connection Points	CAEPIPE Component	Keyword used in Neutral File
Plug		Pipe	PI
Sight Glass		Pipe	PI
Slip Plate, Slip Ring, Spectacle Blind		Pipe	PI
Reducer Concentric			
Reducer Concentric Butt Weld, Fabricated from Plate, Swaged from Pipe, Compression, Flanged, Fabricated from Plate Flanged, Swaged from Pipe Flanged, Nipple, Screwed, Socket Weld Bush, Socket Weld & Special Reducing Flange		Reducer Concentric	RD
Reducer Concentric with a Butt Weld Connection, Fabricated Plate Connection, Connection Swaged from Pipe, Connection Flanged, Connection Fabricated from Plate Flanged, Connection Swaged from Pipe Flanged, Screwed Connection and Connection Socket Weld		Reducer Concentric	RD
Reducer Eccentric			
Reducer eccentric Butt weld, Fabricated from Plate and Swaged from Pipe.		Reducer Eccentric	ER
Reducer Eccentric with a Connection Butt	NA	NA	NA

Plant Design Software Component Description	Connection Points	CAEPIPE Component	Keyword used in Neutral File
Weld, Connection Fabricated from Plate, Connection Swaged from Pipe, Connection Flanged, Connection fabricated from Plate Flanged and Connection Swaged from Pipe Flanged			
Eccentric Screwed, Flanged, Fabricated from Plate Flanged and Swaged from Pipe Flanged		Reducer Eccentric	ER
TRAP			
Trap – In Line		Pipe	PI
Trap – Angle		Pipe	PI
Trap – Offset, Trap – Return	NA	NA	NA
UNION			
Union – Screwed, Socket Weld		Pipe	PI
TEE or OLET			
Olet - Half Coupling, Nipolet (Screwed, Plain Ended), Sockolet, Thredolet, Weldolet, Tee- Set-on, Set-on Reinforced and Tee Pulled		Pipe(s) with Branch SIF (Welding TEE) or (Weldolet)	TU/TW/TF/TO
Olet – Latrolet (Butt Weld, Screwed & Socket Weld)		Pipe(s) with Branch SIF (Welding TEE) or (Weldolet)	TU/TW/TF/TO

Plant Design Software Component Description	Connection Points	CAEPIPE Component	Keyword used in Neutral File
Olet – Instrument Flanged, Tee – Butt Weld, Compression, Flanged, Screwed, Socket Weld, Swept Branch Butt Weld, Swept Branch Flanged, Swept Branch Compression and Swept Branch Socket Weld		Pipe(s) with Branch SIF (Welding TEE) or (Weldolet)	TU/TW/TF/TO
Valve			
Valve – Angle (Pressure Reducing, Relief/Vent,		Valve	VA
Valve – Ball, Basic, Butterfly, Cock, Diaphragm, Gate, Globe, Needle, Plug, Pressure Reducing, Relief/Vent and Slide		Valve	VA
Valve – Check		Valve	VA
VENT			
Rupture Disk		Rigid Element	RB
Four Way Valve			
Valve – 4 Way		Four Rigid Elements or Four Pipes with Concentrated Mass	4W
Three Way Valve			

Plant Design Software Component Description	Connection Points	CAEPIPE Component	Keyword used in Neutral File
Valve – 3 Way		Three Rigid Elements or Three Pipes with Concentrated Mass	3W
INSTRUMENT			
Instrument, Orifice Plate, Restrictor Plate and Rupture Disk		Rigid Element	RB
Instrument Angle		Rigid Element	RB
Instrument Dial and Dial Flanged		Rigid Element	RB
Valve – Angle Relief/Vent, Angle Pressure Reducing, Angle Control, Angle Control Square Indicator, Angle Control Motorised Indicator, Angle Control Hand Indicator		Rigid Element	RB
Control, Control Square Indicator, Control Motorised Indicator, Hand Indicator, Pressure Reducing and Relief/Vent		Rigid Element	RB
3 Way Control, 3 Way Control Square, 3 Way Control Motorised Indicator and 3 Way Control Hand Indicator		Three Rigid Elements or Three Pipes with Concentrated Mass	3W

Plant Design Software Component Description	Connection Points	CAEPIPE Component	Keyword used in Neutral File
4 Way Control Square Indicator, 4 Way Control, 4 Way Control Motorised Indicator, 4 Way Control Hand Indicator		Four Rigid Elements or Four Pipes with Concentrated Mass	4W
ELBOW or BEND			
Elbow – Butt Weld (90 and 45 Deg), Screwed with Female Ends, Elbow Compression, Screwed with Male Ends, Elbow Socket Weld, Elbow Reducing, Bend – Mitre, Lobster Back Butt weld and Lobster Back Bend and Pulled		Bend	EL
Butt Weld with a Connection, Compression with a Connection, Screwed Female with a Connection, Socket Weld with a Connection, Bend Flanged with a Connection, Bend – Mitre with a Connection Flanged, Butt Weld Bend – Mitre with a Connection, Lobster Back with a Connection and Pulled with a Connection		Pipes with Branch SIF (Welding TEE)	TW
Butt Weld 180 Deg Return, Flanged 180 Deg Return and Pulled 180 Deg Return		Bend	EL
FILTER			
Filter/Strainer- Straight Through		Rigid Element	RB

Plant Design Software Component Description	Connection Points	CAEPIPE Component	Keyword used in Neutral File
Filter / Strainer Angle		Rigid Element	RB
Flange			
Flange Blind, Flared/Loose Backing, Flange Backing, Flange Reducing Concentric, Screwed, Slip On, Slip On with 'J' Type Weld, Socket Weld and Weld Neck	 or 	Rigid Element or Pipe with Flange	FL