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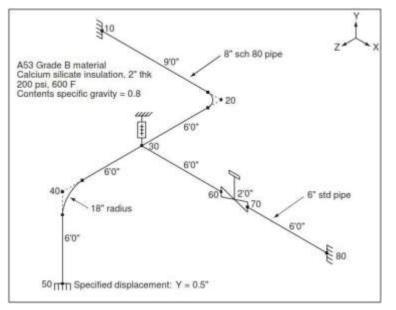
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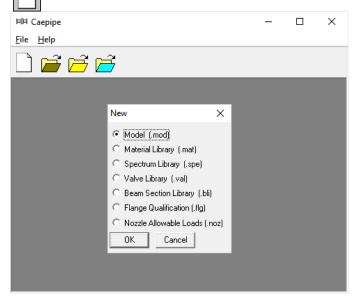
The best way to learn CAEPIPE is to try it yourself. In this tutorial we will create a simple model to help you understand the use of CAEPIPE. The details of the model are shown below:



You will learn how to:

- 1. Enter Title
- 2. Select Analysis options (piping code etc.)
- 3. Define Material, Section and Loads for the model
- 4. Input Model Layout
- 5. Select Load Cases for Analysis
- 6. Analyze
- 7. View Results

Start CAEPIPE. Then click on the New file button. The New file dialog opens.

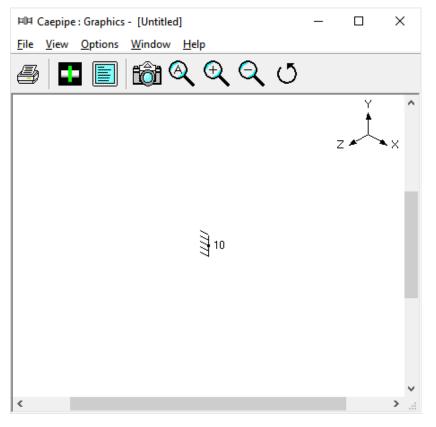


From the New file dialog, select the type of the new file as Model (.mod) file. This opens two independent windows: Layout and Graphics.

Layout window

旽	Caepipe	e : Layou	t (2) - [Uni	titled]				-	- 🗆	×
<u>F</u> ile	<u>E</u> dit	<u>V</u> iew	<u>O</u> ptions <u>L</u>	oads <u>M</u> isc	<u>W</u> indow	<u>H</u> elp				
				+		-	A,			
#	Node	Туре	DX (ft'in")	DY (ft'in")	DZ (ft'in")	Matl	Sect	Load	Data	
1	Title =									
2	10	From							Anchor	
3										

Graphics window



Adjust the size of the windows to fit your desktop such that you can view both comfortably at the same time.

1. Enter Title

Type "Sample problem" as the title in the first row that contains "Title = ". Press Enter.

2. Select Analysis options (piping code etc.)

Click on the Options menu and then select Analysis (Options > Analysis) to specify options for analysis.

旽	Caepip	e : Layo	ut (2) - [l	Untitled]					-	_		\times
<u>F</u> ile	<u>E</u> dit	<u>V</u> iew	<u>O</u> ptions	<u>L</u> oads	<u>M</u> isc	<u>W</u> indow	<u>H</u> elp					
) 🖻		<u>A</u> na	lysis				A				
			<u>U</u> nit	s		Ctrl+U		~				
#	Node	Турє	<u>F</u> on	t			.tl	Sect	Load	Data	ι	
1	Title =	Samp	Nod	le incren	nent							
2	10	From								Anch	ior 👘	
3												

This opens the Analysis Options dialog.

Analysis Options	?	×
Code Temperature Pressure Dynamics Mis	c	
Piping code B31.3 (2014)		
 Include axial force in stress calculations 		
Use liberal allowable stresses		
ОК	Ca	ncel

On the Code property page, select B31.3 for Piping code. Then click on OK to close Analysis Options dialog.

3. Define Material, Sections and Load Material

Click on "Matl" in the header in the Layout window (or press Ctrl+Shift+M)

旽	Caepipe	e : Layou	it (2) - [Unt	titled]				-	- 🗆	×
<u>F</u> ile	<u>E</u> dit	<u>V</u> iew	Options <u>L</u>	oads <u>M</u> isc	<u>W</u> indow	<u>H</u> elp				
) 🖻	;	3			ô1 (A,			
#	Node	Туре	DX (ft'in")	DY (ft'in")	DZ (ft'in")		Sect	Load	Data	
1	Title =	Sample	e Problem			2				
2	10	From							Anchor	
3										

This opens up the Materials list in a separate List window. Position and resize the list window as you desire. Click on Library button on the Toolbar (or choose File > Library).

印	Caepipe : M	laterials (0) - [U	ntitle	ed]							_		×
<u>F</u> ile	<u>E</u> dit <u>V</u> ie	w <u>O</u> ptions <u>N</u>	lisc	<u>W</u> indow	<u>H</u> elp								
-#	Image: Second state sta												
#	Name	Description	Ty pe	Density (lb/in3)	Mater	ial libran factor		#	Temp (F)	E (psi)	Alpha (in/in/F)	Allowable (psi)	
1								1					

The Open Material Library dialog is shown.

비비 Open Mat	terial Library			\times
Look in:	Material_Library	- +	1 📸 📰	
Name	×	Date	Туре	^
B 314-20	09	7/24/2014	Microsoft	
📕 B314-20	06	7/24/2014	Microsoft	
B 314-20	02	7/24/2014	Microsoft	
B 313-20	14	9/3/2015 2	Microsoft	
B 313-20	12	8/25/2014	Microsoft	Υ.
<			>	
File <u>n</u> ame:	B313-2014.mat		<u>O</u> pen	
Files of type:	Material Library files (*.mat)	•	Cancel	

Select B313.mat as the library file to open by double clicking on it. The available materials in the library are shown.

Material Library - [B313-2014.mat (🗙										
Piping code : B31.3										
#	Material Description	^								
1	A53 Grade A									
2	A53 Grade B									
3	A106 Grade A									
4	A106 Grade B									
5	A106 Grade C									
6	A135 Grade A									
7	A135 Grade B									
8	API 5L×46									
9	API 5L X42									
10	API 5L-X52									
11	API5L-X56									
12	A381-Y35	~								
	OK Cancel Library									

Double click on A53 Grade B material to select it. The properties for this material are transferred to the material in the List window. Type "A53" for material name and then press Enter.

			R	н	6	•	╞╡						
4	Name	Description	Ty pe	Density (Ib/in3)	Nu	Joint fector	Yield (psi)	#	Temp (F)	E (psi)	Alpha (in/in/F)	Alloweb (psi)	ſ
1	A53	A53 Grade B	CS	0.283	0.3	1.00	35000	1	-20	29.9E+6	6.25E-6	20000	1
				1				2	100	29.3E+6	6.47E-6	20000	1
								3	200	28.8E+6	6.70E-6	28080	
								4	300	28.3E+6	6.90E-6	20000	
	1							5	400	27.7E+6	7.10E-6	19900	
								6	500	27.3E+6	7.30E-6	19000	
								7	600	26.7E+6	7.40E-6	17900	
								8	650	26.1E+6	7.50E-6	17300	1
-								<				>	

Sections

Select Sections from the Misc menu of the List window (or press Ctrl+Shift+S).

며	Caepipe : N	laterials (1) -	[Untitled]					_		×	<
<u>F</u> ile	<u>E</u> dit <u>V</u> ie	w <u>O</u> ptions	<u>Misc</u> <u>Window</u> <u>H</u> elp								
_11			<u>C</u> oordinates	Ctrl+Shift+C	I						
			Materials	Ctrl+Shift+M	Ļ						
#	Name	Descriptior	Sections	Ctrl+Shift+S		Temp (F)	E (psi)	Alpha (in/in/F)	Allowa (psi)	ωle	Ê
1	A53	A53 Grade	<u>L</u> oads	Ctrl+Shift+L	t	-20	29.9E+6	6.25E-6	20000		
2	· ·		Beam <u>M</u> aterials		t	100	29.3E+6	6.47E-6	20000		
			Beam Sections		Γ	200	28.8E+6	6.70E-6	20000		
			Beam <u>L</u> oads			300	28.3E+6	6.90E-6	20000		
			Pumps			400	27.7E+6	7.10E-6	19900		
			C <u>o</u> mpressors		L	500	27.3E+6	7.30E-6	19000		
			T <u>u</u> rbines			600	26.7E+6	7.40E-6	17900		
			Spectrums			650	26.1E+6	7.50E-6	17300		~
<			Eorce coestrums							>	

The Sections list is shown. To enter the first section, Type '8' for Section name and press Enter. The Section Properties dialog is shown with the section name 8.

	HDH Caepipe : Pipe Sections (0) - [Untitled] - - × <u>File Edit View Options Misc Window H</u> elp												×	
-														
#	Name	Nom Dia				Cor.Al (inch)	M.Tol (%)	Ins.Dens (Ib/ft3)	Ins.Thk (inch)	Lin.Dens (lb/ft3)	Lin.Thk (inch)	Soil		
1	8													
\vdash														

The Section Properties dialog is shown with the section name 8.

Section # 1					\times
Section name	8	œ۵	NSI O DIN (O JIS O IS	0
Nominal diameter	Non Std 💌	[Schedule	~	
Outside diameter	4" ^ 5" ^	(inch)	Thickness		(inch)
Corrosion allowance	8" 10" 12"	(inch)	Mill tolerance		(%)
Insulation : Density	14'' 16''	(Ib/ft3)	Thickness		(inch)
Lining : Density	18" 20" 22"	(Ib/ft3)	Thickness		(inch)
OK Ca	24" 26" 28" ¥	ulation	Soil 🛛	Ŧ	

Click on the down arrow of the DropDown combo box for Nominal diameter and select 8" for Nominal diameter. The Outside diameter (8.625") is automatically entered.

To select the schedule for the 8" pipe, click on the down arrow of the DropDown combo box for Schedule and select 80 for Schedule.

Section # 1					×
Section name 8	۰,	ansi O din	O JIS (D IS	50
Nominal diameter 8''		Schedule	5S	•	
Outside diameter 8.625	(inch)	Thickness	5S 10S LW	^	(inch)
Corrosion allowance	(inch)	Mill tolerance	20 30 STD		(%)
Insulation : Density	(Ib/ft3)	Thickness	40S 40		(inch)
Lining : Density	(Ib/ft3)	Thickness	60 XS 80S		(inch)
OK Cancel Ins	ulation	Soil	80 100 120	~	

The Thickness (0.5") is automatically entered.

For Insulation density, click on the Insulation button or Press Alt+I.

A table of Insulation materials and their densities is shown.

Insulation Densities X						
Insulation Material	Density (Ib/ft3)					
Amosite Asbestos	16					
Calcium Silicate	15					
Careytemp	10					
Cellular Glass	9					
Fiberglass	7					
High Temperature	24					
Kaylo 10	12.5					
Mineral Wool	8.5					
Perlite	13					
Poly Urethane	2.2					
Styro Foam	1.8					
Super-X	25					
OK Ca	incel					

Double click on Calcium Silicate. The Insulation density (15.0 lb/ft3) is entered on the Section dialog. Type 2 (inches) for Insulation Thickness then press Enter or click OK to enter the first section.

印	III Caepipe : Pipe Sections (1) - [Untitled]										\times	
<u>F</u> ile	ile <u>E</u> dit <u>V</u> iew <u>O</u> ptions <u>M</u> isc <u>W</u> indow <u>H</u> elp											
#												
#	Name	Nom Dia	Sch	OD (inch)	Thk (inch)	Cor.Al (inch)	M.Tol (%)	Ins.Dens (lb/ft3)	Ins.Thk (inch)	Lin.Dens (lb/ft3)	Lin.Thk (inch)	Soil
1	8	8"	80	8.625	0.5			15	2			
2												

Now repeat the process for the second section.

In row # 2, Type 6 for Section name and press Enter. The Section Properties dialog is shown with the section name 6. Select 6" for Nominal diameter, STD for Schedule and 2" Calcium Silicate for Insulation. Press Enter or click on OK to enter the second section.

印	¤ Caepipe : Pipe Sections (2) - [Untitled] − □ ×											
<u>F</u> ile	Eile <u>E</u> dit <u>V</u> iew <u>O</u> ptions <u>M</u> isc <u>W</u> indow <u>H</u> elp											
#												
#	Name	Nom Dia	Sch	OD (inch)	Thk (inch)	Cor.Al (inch)	M.Tol (%)	Ins.Dens (Ib/ft3)	Ins.Thk (inch)	Lin.Dens (lb/ft3)	Lin.Thk (inch)	Soil
1	8	8"	80	8.625	0.5			15	2			
2	6	6"	STD	6.625	0.28			15	2			
3												
<			1									>

Load

Select Loads from the Misc menu (or press Ctrl+Shift+L).

旽	I¤ Caepipe : Pipe Sections (2) - [Untitled] - □ ×												
<u>F</u> ile	<u>E</u> dit	<u>V</u> iew	Option	IS	<u>M</u> isc	Window	<u>H</u> elp						
-#			f ĉ	1		<u>C</u> oordinates	s	Ctrl+Shift+C					
				<u>/</u> 20		<u>Materials</u>		Ctrl+Shift+M					
#	Name	Nom Dia	Sch			Sections		Ctrl+Shift+S	.Th ch)	ik	Lin.Dens (lb/ft3)	Lin.Thk (inch)	Soil
				(i		Loads		Ctrl+Shift+L			(ionio)	(inch)	
1	8	8"	80	8									
2	6	6"	STD	6		Beam <u>M</u> ater	rials						
3						Beam <u>S</u> ection	ons						
						Beam <u>L</u> oads	s						
<	1	1	1	1		<u>P</u> umps							>

The Loads list is shown. To enter the first load, Type '1' for Name, Tab to T1 and type 600, Tab to P1 and type 200, Tab to Specific gravity and type 0.8. Then press Enter. That is it! The load is entered. (Alternately, you could have pressed Ctrl+E on the first row and typed in the same information in a dialog box).

盹	Caepipe	: Load	s (1) -	[Untitled]	_		ı ×
<u>F</u> ile	<u>E</u> dit	<u>V</u> iew	<u>Optior</u>	ns <u>M</u> isc	<u>W</u> indow	<u>H</u> elp	
-#			E)] Q	H		
#	Name	T1 (F)	P1 (psi)	Specific gravity	Add.Wgt. (lb/ft)	Wind Load	
1	1	600	200	0.8			
2							

Click in the Layout window or press F3 to move the focus to the Layout window.

4. Input Model Layout

We are going to model the 8" header line first, followed by the 6" branch line.

NOTE

- In the following text, the word 'type' should be distinguished from the words 'Type column' or simply 'Type' (upper case 'T'). The former ('type') would mean press the keys for the text you want to type. The latter word 'Type' would refer to the Type column in the Layout spreadsheet.
- Also, the instruction "type B for Bend" does not necessarily mean the upper case 'B'. The lower case 'b' could also be typed.
- For items input in the Data column (such as Anchor or Hanger), the cursor needs to be in the Data column. This can be quickly done by pressing Ctrl+D from any column or clicking in the Data column. Another way is to Tab repeatedly to reach the Data column.
- As the graphics window is simultaneously updated, you should position the graphics window in such a way that you can see it along with the input window.

First the 8" header

Following the Title at row #1, row #2 is already generated with Node 10 of Type "From" with an Anchor in the Data column.

Press Enter to move the highlight to the next row(#3). Tab to the Type column. The next Node 20 is automatically assigned. In the Type column, type 'b' (for Bend), Tab to DX, type 9. Tab over to Material, type A53, Tab to Section, type 8, Tab to Load, type 1. Press Enter and the cursor moves to the next row(#4).

In row #4, Tab to the Type column. The next Node 30, is automatically assigned.

旽	Caepipe	e : Layou	t (3) - [Uni	titled]				-	- 🗆	×	
<u>F</u> ile	<u>E</u> dit	<u>V</u> iew	<u>Options</u>	oads <u>M</u> isc	<u>W</u> indow	<u>H</u> elp					
	🗋 🚔 🖨 🔳 🗐 🔟 🚳 🔍										
#	Node	Туре	DX (ft'in")	DY (ft'in")	DZ (ft'in")	Matl	Sect	Load	Data		
1	Title =	Sample	e Problem			_	_	_			
2	10	From							Anchor		
3	20	Bend	9'0"			A53	8	1			
4	30										

You will see the model in the graphics window as it is entered. You can press F2 to switch between text and graphics windows.

비며 Caepipe : Graphics - [Untitled]	—		×
<u>File View Options Window H</u> elp			
<i>ම</i> 🖬 🗐 📷 🍳 ද ද ර	5		
10	¹	z - 20	××
<			>

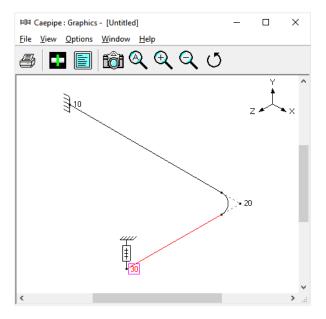
In row #4 with Node 30, Tab to DZ, type 6, Tab to Data (or press Ctrl+D), type 'h' (for a to be designed Hanger) and press Enter, the Hanger dialog is opened.

Hanger	at node 30	?	\times
Tag			
Туре	Grinnell		-
Numb	er of Hangers	1	
L	.oad Variation	25 (%)	
E F	langer below	🔲 Short	Range
	Connected to		
OK	Cancel		

Press Enter or click on OK to input the hanger. The material, section and load are automatically inserted (based on the previous row's material, section and load), and the cursor moves to the next row.

印	Caepipe	: Layou	t (4) - [Uni	titled]				-	- 🗆	×
<u>F</u> ile	<u>E</u> dit	<u>V</u> iew	<u>Options</u>	oads <u>M</u> isc	<u>W</u> indow	<u>H</u> elp				
	🗋 🚔 🖶 😹 🗐 🗊 📸 🔍									
#	Node	Туре	DX (ft'in")	DY (ft'in")	DZ (ft'in")	Matl	Sect	Load	Data	
1	Title =	Sample	e Problem				_			
2	10	From							Anchor	
3	20	Bend	9'0"			A53	8	1		
4	30				6'0"	A53	8	1	Hanger	
5										

The Graphics window will look like this.



In row #5, Tab to the Type column. The next Node 40, is automatically assigned. In the Type column, type 'b' (for Bend). This bend has a non standard (user defined) bend radius. Therefore the bend radius needs to be modified from the default long radius. Double click on the bend in the Type column or press Ctrl+T to bring up the bend dialog box. Click on User Bend Radius radio button and enter 18 for bend radius. Press Enter or click on OK to modify the bend.

Bend at node 40	?	×
Bend Radius © Long C Short C User	(inch)	
Bend <u>T</u> hickness	(inch)
Bend <u>M</u> aterial]	
Elexibility Factor		
<u>S</u> IFs: In Plane	ut Plane	
Intermediate Nodes		
Node at Angle	(deg)
Node at Angle		deg)
OK Cancel		

While still in row #5, Tab to DZ, type 6 then press Enter. The material, section and load are automatically inserted like before, and the cursor moves to the next row.

In row #6, Tab to the DY column. The next Node 50, is automatically assigned. In the DY column, type -6, Tab to the Data column or press Ctrl+D to move to the data column, then type 'a' (for Anchor). An anchor, material, section and load are automatically inserted, and the cursor moves to the next row.

Let us specify a thermal anchor movement for the Anchor we just put in at node 50. Double click on the Anchor at node 50 in row #6. The Anchor dialog comes up.

Anchor at node 50	?	\times
Tag		
┌─ Translational stiffness (Ib/inch) ──── ┌─ Rotational stiffness (in	·lb/deg)—	
KX KY KZ KXX KYY	KZZ	
Rigid Rigid Rigid Rigid Rigid	Rigid	_
	r	
Releases for hanger selection $\square X \square Y \square Z \square X \square$	IYY 🗆	ZZ
Cancel Displacements Rigid A	nchor in Pip	e LCS

Note:

Option "Anchor in Pipe LCS" allows the user to input Anchor stiffnesses in the LCS of the adjoining pipe. On the other hand, if "Anchor in Pipe LCS" is not turned ON, then the user to input Anchor stiffnesses in the Global Coordinate System (GCS).

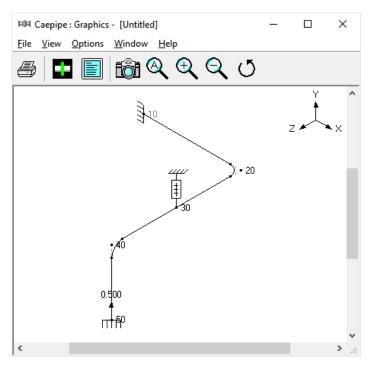
Click on Displacements button. The Specified Displacements dialog for the anchor comes up. Tab to Y displacement field and type 0.5.

Specified Displac	?	×			
Load X (inch)	Y (inch)	Z (inch)	XX (deg)	YY (deg)	ZZ (deg)
T1	0.5				
OK Ca	ncel 🗆	Displacem	ents in Pipe	LCS	

Press Enter to exit the Specified Displacements dialog. Press Enter again to exit the Anchor dialog. In the Layout window, press Enter to move to the next row.

비며 Caepipe : Layout (6) - [Untitled] — 🗆											
<u>F</u> ile	<u>E</u> dit	<u>V</u> iew	<u>Options</u> <u>L</u>	oads <u>M</u> isc	<u>W</u> indow	<u>H</u> elp					
) 🖻		4	╟		â (A,				
#	Node	Туре	DX (ft'in")	DY (ft'in")	DZ (ft'in")	Matl	Sect	Load	Data		
1	Title = Sample Problem										
2	10	From							Anchor		
3	20	Bend	9'0"			A53	8	1			
4	30				6'0"	A53	8	1	Hanger		
5	40	Bend			6'0"	A53	8	1			
6	50			-6'0"		A53	8	1	Anchor		
7											

Click on the Zoom All button (or press Ctrl+A) to view the 8" header line fully in the graphics window.



Now the 6" branch

Let us input a comment saying that this is a 6" std pipe. On an empty row, if the first character in the Node field is input as 'c', that row becomes a comment row. On row #7, type 'c' to create the comment and then type: 6" std pipe and then press Enter to go to the next row.

⊨□¤ Caepipe : Layout (7) - [Untitled] — □										
<u>F</u> ile	<u>E</u> dit	<u>V</u> iew	Options L	oads <u>M</u> isc	<u>W</u> indow	<u>H</u> elp				
#	Node	Туре	DX (ft'in")	DY (ft'in")	DZ (ft'in")	Matl	Sect	Load	Data	
1	Title =	Sample	e Problem		_				_	
2	10	From							Anchor	
3	20	Bend	9'0"			A53	8	1		
4	30				6'0"	A53	8	1	Hanger	
5	40	Bend			6'0"	A53	8	1		
6	50			-6'0"		A53	8	1	Anchor	
7	6" std p	oipe								
8										

On the next row (#8), type 30 for Node, Tab to the Type column, type 'f' (for "From", since we are beginning a new branch), press Enter. In the next row (#9), Tab to the DX column. The next Node 60, is automatically assigned. In the DX column, type 6 and press Enter.

CAEPIPE inserts the previous material, and automatically detects the new branch and asks if you want to change section.

티며 Caepipe:Layout (8) - [Untitled] - 다											
<u>F</u> ile	<u>E</u> dit	<u>V</u> iew	Options L	oads <u>M</u> isc	<u>W</u> indow	<u>H</u> elp					
📄 🚔 🖨 📕 🗐 🔟 📸 🔍											
#	Node	Туре	DX (ft'in")	DY (ft'in")	DZ (ft'in")	Matl	Sect	Load	Data	^	
2	10	From	Comin						Anchor		
3	20	Bend	9'0 Caepip	e			×	1			
4	30			Do you war	it to change s	ection 1	2	1	Hanger	_	
5	40	Bend		, 20,000,110	in to onlange t			1			
6	50		(Ye	s <u>N</u> o				1	Anchor		
7	6" std p	oipe									
8	30	From									
9	60		6'0"			A53					
										~	

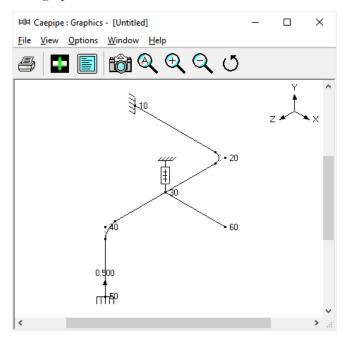
Since we want to change the section to 6, click on Yes. This opens the Section selection dialog.

Select Section X										
Name	Nominal Diameter	Sch	OD (inch)	Thk (inch)						
8	8''	80	8.625	0.5						
6	6"	STD	6.625	0.28						
OK Cancel										

Select the 6" section by double clicking on it. The section (6) is entered in the Section column in the Layout window. Press Enter to go to the next row. The load is again automatically inserted from the previous load.

HUH Caepipe : Layout (9) - [Untitled] —											\times
<u>F</u> ile	<u>E</u> dit	<u>V</u> iew	Options L	oads <u>M</u> isc	<u>W</u> indow	<u>H</u> elp					
#	Node	Туре	DX (ft'in")	DY (ft'in")	DZ (ft'in")	Matl	Sect	Load	Data	^	
2	10	From							Anchor		
3	20	Bend	9'0"			A53	8	1			
4	30				6'0"	A53	8	1	Hanger		
5	40	Bend			6'0"	A53	8	1			
6	50			-6'0"		A53	8	1	Anchor		
7	6" std p	oipe									
8	30	From									
9	60		6'0"			A53	6	1			
10										~	

The graphics window will look like this.



In the next row (#10), Tab to the Type column. The next Node 70, is automatically assigned. In the Type column, type 'v' (for Valve). This brings up the Valve dialog box.

Valve from 60 to 70		?	\times
Weight	200		(lb)
Length			(inch)
Thickness X			
Insulation weight $ imes$			
Additional weight	50		(lb)
Valve Type			•
Offsets of additional DX (inch) DY (inch			
OK Cance	! <u>L</u> i	brar	у

In the Valve dialog box, type 200 for Weight, 50 for Additional Weight and 18 for DY offset. Then press Enter or click on OK to input the valve.

In the Layout window, type 2 for DX offset and press Enter. The material, section and load are automatically inserted as before, and the cursor moves to the next row.

In the next row (#11), Tab to DX. The next Node 80, is automatically assigned. In the DX column, type 6. Tab to Data or press Ctrl D to move to the data column, then type 'a'(for Anchor). Material, section and load are automatically inserted like before, and the cursor moves to the next row.

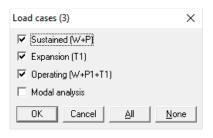
비내 Caepipe: Layout (11) - [Untitled] - 다										
<u>F</u> ile	<u>E</u> dit	<u>V</u> iew (Options Lo	oads <u>M</u> isc	<u>W</u> indow	<u>H</u> elp				
#	Node	Туре	DX (ft'in")	DY (ft'in")	DZ (ft'in")	Matl	Sect	Load	Data	
1	Title =	Sample	Problem							
2	10	From							Anchor	
3	20	Bend	9'0"			A53	8	1		
4	30				6'0"	A53	8	1	Hanger	
5	40	Bend			6'0"	A53	8	1		
6	50			-6'0"		A53	8	1	Anchor	
7	6" std p	oipe								
8	30	From								
9	60		6'0"			A53	6	1		
10	70	Valve	2'0"			A53	6	1		
11	80		6'0"			A53	6	1	Anchor	
12										

5. Select Load Cases for Analysis

Select Loads cases from the Loads menu.

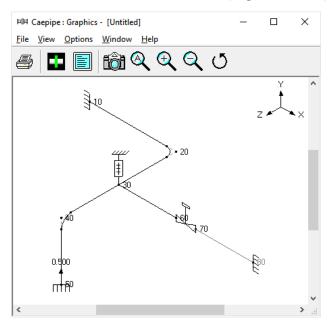
1	1 12	:	The	Load cases (3)		Ð		
+	-	1000	DX (#ir	Static seismic Wind 1			Loed	Data
1	_		Proble	Wind 2		-		
2	10	From		Wind 3				Anchor
3	20	Bend	9'0"	Wind 4		8	1	
4	30			Spectrum		8	1	Hanger
5	40	Bend		Time history		8	1	
6	50			Harmonic		8	1	Anchor
7	6" std	pipe		Hermonie	_			
8	30	From						
9	60		6'0"		A53	6	1	
10	70	Valve	2'0"		A53	б	1	
11	80		6.0.		A53	6	1	Anchor
12								

The Load cases dialog is shown.



By default, Sustained(W+P), Expansion(T1) and Operating(W+P1+T1) load cases are already selected. Press OK to return to the Layout window. The model input is now complete.

Click on the Zoom All button (or press Ctrl+A) to show the whole model in the graphics window.



To see a 3D rendered view of the model, click on the Render button (or press Ctrl+R) in the graphics window.

비며 Caepipe : Graphics - [Untitled]	-		×
<u>File View Options Window H</u> elp			
ا الله الله الله الله الله الله الله ال	5		
		z	× ×
<			>

To return to the non rendered view, click on the Do not render button (or press Ctrl+R).

List

One of the useful features of CAEPIPE is the ability to show a list of all like items such as anchors, bends etc. in a separate List window. Click on the List button (or press Ctrl+L) to show the list dialog.

List	×
Anchors	O Loads
C Bends	C <u>M</u> aterials
C Branch points	© <u>S</u> ections
C <u>C</u> oordinates	C Specified displ
C Hangers	⊂ <u>V</u> alves
OK Cance	el

Click on an item of interest to show the list for that item.

A list of all the anchors in the sample model is shown below:

印	■ Caepipe : Anchors (3) - [Untitled] - □ ×														
<u>F</u> ile	<u>File E</u> dit <u>V</u> iew <u>O</u> ptions <u>M</u> isc <u>W</u> indow <u>H</u> elp														
-#															
#	Node Tag KX/kx KY/ky KZ/kz KXX/kxx KYY/kyy KZZ/kzz Releases														
			(lb/inch)	(lb/inch)	(lb/inch)	(in-lb/deg)	(in-lb/deg)	(in-lb/deg)	X	Υ	Ζ	×	ΥY	ZZ	Anchor in Pipe
1	10		Rigid	Rigid	Rigid	Rigid	Rigid	Rigid							GCS
2	50		Rigid	Rigid	Rigid	Rigid	Rigid	Rigid							GCS
3	80		Rigid	Rigid	Rigid	Rigid	Rigid	Rigid							GCS

The highlighted item can be edited directly in the List window (in most cases) or in a dialog by pressing Ctrl+E. The items can be deleted by pressing Ctrl+X. The item is also highlighted in the graphics window by flashing and with a box around the node number.

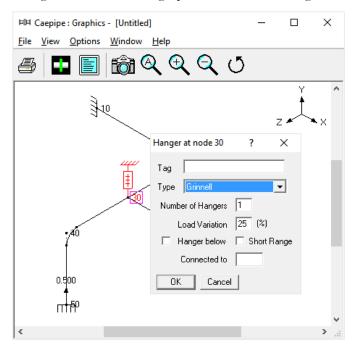
A list of all the bends in the sample model is shown below:

The	Ean	view O	puons	IVIISC	window	<u>nei</u> t	, 					
-#												
#	Bend Node	Radius (inch)	Rad. Type			Flex. Fact.	In PIn SIF		lnt. Node	Angle (deg)	lnt. Node	Angle (deg)
1	20	12	Long									
2	40	18	User									

<u>File Edit View Options Misc Window Help</u>

Editing in the Graphics Window

Another useful feature is the ability to edit an item in the graphics window. When an item such as a Hanger is clicked in the graphics window, a dialog box for that item is opened, where it can be modified.



Save the model by clicking on the Save button.										
印	Caepipe	: Layout	t (11) - [Un	titled]				_	- 🗆	×
<u>F</u> ile	<u>E</u> dit	<u>V</u> iew <u>(</u>	Options Lo	oads <u>M</u> isc	<u>W</u> indow	<u>H</u> elp				
) 🖻		4	╞		<u>_</u>	2			
#	Node	Type <mark>S</mark>	<mark>ave</mark> K (ft'in")	DY (ft'in")	DZ (ft'in")	Matl	Sect	Load	Data	
1	Title =	Sample	Problem							
2	10	From							Anchor	
3	20	Bend	9'0"			A53	8	1		
4	<u>30</u>				6'0"	A53	8	1	Hanger	
5	40	Bend			6'0"	A53	8	1		
6	50			-6'0"		A53	8	1	Anchor	
7	6" std p	oipe								
8	30	From								
9	60		6'0"			A53	6	1		
10	70	Valve	2'0"			A53	6	1		
11	80		6'0"			A53	6	1	Anchor	
12										

The "Save Model As" dialog is shown.

비며 Save Mod	el As			\times
Save in:	Caepipe	•	🗢 🗈 🔿	T T
Name	^		Date modifie	d Ty
	No items m	atch your search	ı .	
<				>
File <u>n</u> ame:	Sample			<u>S</u> ave
Save as type:	Model files (*.mod)		•	Cancel

Type the File name as "Sample" and press Enter to save the model. We are done with modelling. Let us analyze now.

6. Analyze

Click on Analyze under the File menu.

볘	Caepipe : Layout (11) - [Sam	ple.mod (E	:\C	aepipe)]			_	- 🗆	×
<u>F</u> ile	<u>E</u> dit <u>V</u> iew <u>O</u> ptions <u>L</u> oa	ds <u>M</u> isc	M	/indow	<u>H</u> elp				
	<u>N</u> ew	Ctrl+N			âu (A)			
	<u>O</u> pen	Ctrl+0			ЭП `	1			
	Recent Models		>	? (ft'in")	Matl	Sect	Load	Data	
	Open <u>R</u> esults								
	Merge	Ctrl+M						Anchor	
	<u>C</u> lose				A53	8	1		
	Save	Ctrl+S)"	A53	8	1	Hanger	
	Save As)"	A53	8	1		
	Export to MBF				A53	8	1	Anchor	
	Export to 3 <u>D</u> Plant Design								
	Export to PCE								
		CH D			A53	6	1		
	Print Model	Ctrl+P			A53	6	1		
	Analyze				A53	6	1	Anchor	
	QA Block								
	Revision Record								_
	Exit	Alt+F4							
_				· · · · ·					_

After the analysis, you are asked if you want to see the results. Select Yes.

비며 Caepipe			_	×
<u>F</u> ile <u>H</u> elp				
🗋 🖻	é			
Ana	alyze			
	riginal bandwidth = 30 New bandwidth = 18 erage bandwidth = 12	Number of equations = 60 Stiffness matrix size = 714 = 6 K		
	Do you want	to see the results ?		
Ti	ime = 0			

7. View Results

After finishing the analysis and choosing to see the results or by opening the results file (.res), the results window is displayed. The Results dialog is opened automatically.

Results × © Gorted attesses C Support loads © Lode compliance Dement torces C Lupport load summary OK OK Cancel		Results - [Sample.res (E:\Caepipe)] View Options Window Help	5	×
Gorted attesses C Support loads Dode compliance Displacements Support load summary	s •		⇒	
Gorfed attesses C Support loads Dode compliance Displacements Support load summary				
C Gode compliance C Element toroes C Hanger report C Displacements C Support load summary		Results	×	
C Hanger report C Displacements C Support load summary		Softed attesses C Support loads		
C Support load summary				
		and the second se		

Select an item of interest by clicking on it. When you are viewing the results, use Tab (or Next Result button) to view the next result and Shift+Tab (or Previous Result button) to view the previous result. The Results dialog can be brought up by clicking on the Results button (or press Ctrl+R).

While viewing the results, the model data can also be simultaneously viewed in separate Layout and List windows. These are now "read only" windows, i.e. the model data can not be modified while viewing the results. Some of the results from the sample problem are shown below:

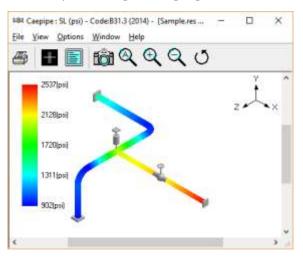
Sorted Stresses

The computed stresses (sustained, expansion and occasional) are sorted in descending order by stress ratios.

旽	비내 Caepipe : B31.3 (2014) Code compliance (Sorted stresses) ロ ×												
<u>F</u> ile	<u>File R</u> esults <u>V</u> iew <u>O</u> ptions <u>W</u> indow <u>H</u> elp												
	Sustained Expansion												
#	Node	SL (psi)	SH (psi)	<u>SL</u> SH	Node	SE (psi)	SA (psi)	<u>SE</u> SA					
1	80	2537	17900	0.14	30	53892	29475	1.83					
2	60	2204	17900	0.12	50	51451	29475	1.75					
3	70	2133	17900	0.12	20A	48350	29475	1.64					
4	30	2035	17900	0.11	20B	34221	29475	1.16					
5	10	1446	17900	0.08	10	32730	29475	1.11					
6	40B	1054	17900	0.06	80	27595	29475	0.94					
7	20B	980	17900	0.05	40A	19059	29475	0.65					
8	20A	938	17900	0.05	60	17805	29475	0.60					
9	50	924	17900	0.05	70	12046	29475	0.41					
10	40A	902	17900	0.05	40B	10375	29475	0.35					

When the stress ratio exceeds 1.00, the stress and the stress ratio are shown in red. In this particular case, the high thermal stresses may be reduced by replacing the anchor at Node 80 by a guide. This allows the 6" pipe to expand more freely and reduce the thermal stresses. The maximum thermal stress is reduced to 22195 psi and the stress ratio is reduced to 0.76.

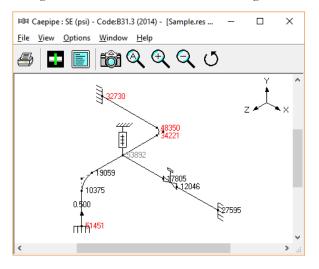
Color coded stresses may be rendered in the graphics window by pressing the Show stresses button (or choose View > Show Stresses). The stresses in the highlighted columns (the bar highlights three columns simultaneously) are displayed in the graphics window. Use the left and right arrow keys to change the highlighted column or click in a particular column.



^S∕₄

The stress ratios may similarly be rendered by using the Show stress rations button (or choose View > Show Stress Rations).

Instead of rendering color coded stresses/ratios, the values of stresses/stress ratios may be plotted by using the menu: View > No color coding.



While plotting stresses or stress ratios, thresholds may be specified (choose View > Thresholds). Only the stresses or stress ratios exceeding the thresholds are plotted.

Thresholds	×
Stress threshold	(psi)
Ratio threshold	
OK Cancel	

Code compliance

The element stresses calculated according to the piping code are shown under code compliance.

¤04 File					nplian indow	ce - [Sar Help	nple.res.	–	-		×
4	Eile Results View Options Window Help Image: Second Secon										
#	Node	Press. Allow. (psi)	SL (psi)	ustaine SH (psi)	d SL SH	E× SE (psi)	pansior SA (psi)	1 SE SA			
1	10 20A	200 2075	1446 932	17900 17900	0.08 0.05	32730 28711	29475 29475	1.11 0.97			
2	20A 20B	200 2075	938 980	17900 17900	0.05 0.05	48350 34221	29475 29475	1.64 1.16			
3	20B 30	200 2075	968 1769	17900 17900	0.05 0.10	20053 53892	29475 29475	0.68 1.83			
4	30 40A	200 2075	1760 902	17900 17900	0.10 0.05	<mark>48427</mark> 16060	29475 29475	1.64 0.54			
5	40A 40B	200 2075	902 1054	17900 17900	0.05 0.06	19059 10375	29475 29475	0.65 0.35			
6	40B 50	200 2075	1054 924	17900 17900	0.06 0.05	9362 51451	29475 29475	0.32 1.75			
7	30 60	200 1513	2035 2204	17900 17900	0.11 0.12	<mark>38098</mark> 17805	29475 29475	1.29 0.60			
8	70 80	200 1513	2133 2537	17900 17900	0.12 0.14	12046 27595	29475 29475	0.41 0.94			

Hanger report

The hanger report is shown below.

<u>F</u> ile	<u>R</u> esult	s <u>V</u>	iew <u>O</u> pti	ons <u>W</u> ii	ndow	<u>H</u> elp					
4											
#	Node	No of	Туре	Figure No.	Size	Spring rate (lb/inch)	Vert travel (inch)	Horz tra∨el (inch)	Hot Ioad (Ib)	Cold Ioad (lb)	Var (%)
1	30	1	Grinnell	B-268	10	260	0.608	0.620	1287	1445	12

The "No of" field shows the number of hangers required at the indicated location. The Figure No. and Size refer to the manufacturer's catalog. The vertical travel is the vertical deflection at the hanger location for the first operating load case. Similarly, the horizontal travel is the resultant horizontal deflection at the hanger location for the first operating case. The hot load is the hanger load for the operating condition and the cold load is the hanger load at zero deflection.

 $Variability(\%) = (Spring rate \times Hanger travel / Hot load) \times 100$

Support load summary

Support load summary for each support is created by considering all the load cases and appropriate combinations and then showing the maximum and minimum loads.

비며 Caepipe : Suppor	t load sumn	nary for anc	hor at node	10 - [Samp	I —		×			
<u>F</u> ile <u>R</u> esults <u>V</u> iew	<u>O</u> ptions	<u>W</u> indow	<u>H</u> elp							
							^			
Load combination	FX (lb)	FY (lb)	FZ (lb)	MX (ft-lb)	MY (ft-lb)	MZ (ft-lb)	2			
Operating1	-29243	1485	-14077	-6953	59111	16505	(
Maximum	-14	1485	26	-375	59111	16505	<u>-</u> -			
Minimum	-29243	-397	-14077	-6953	-174	-1156	(,			
<	1		1	1		3	>			

Use the Other supports button (F6), Next support button (Ctrl+Right arrow) or Previous support button (Ctrl+Left arrow) to see loads on other supports (e.g. other anchors, hangers etc.).

Suppor	Support load summary X									
Node	Туре									
10	Anchor									
50	Anchor									
80	Anchor									
30	Hanger									
0	K Cancel									

Support loads

Ī

Support loads are the loads acting on the supports imposed by the piping system. The loads on anchors for the Sustained case are shown below.

ᄢ	FIM Caepipe : Loads on Anchors: Sustained (W+P) - [Sample.res ($ \Box$ \times										
<u>F</u> ile	<u>File R</u> esults <u>V</u> iew <u>Options Window H</u> elp										
4											
#	Node	Tag	FX (lb)	FY (lb)	FZ (lb)	MX (ft-lb)	MY (ft-lb)	MZ (ft-lb)			
1	10		-14	-397	26	-375	-174	-1156			
2	50		-42	-201	-27	126	107	-90			
3	80		55	-378	1	-23	17	965			



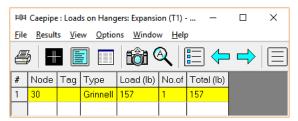
Ī

Use the Load cases button, Next load case button(Right arrow) or Previous load case button (Left arrow) to see loads for different load cases(e.g. Sustained, Expansion etc.).

Use the Other supports button (F6), Next support button(Ctrl+Right arrow) or Previous support button (Ctrl+Left arrow) to see loads on other supports (e.g. other anchors, hangers etc.).

Other Supports	×
 Anchors Hangers 	
OK	Cancel

The loads on hangers (i.e. the loads acting at the hanger locations imposed by the piping system) for the Operating case are shown below.



Element Forces

The element forces in local and global coordinates are shown. For pipe (also bend and reducer) element forces in local coordinates, the stress intensification factors (SIFs) and stresses are also shown.

印	Caepipe	e : Pipe for	ces in local	coordinate	es: Expansio	on (T1) - [S	ample	.r —		×
<u>F</u> ile	<u>R</u> esult	ts <u>V</u> iew	<u>O</u> ptions	<u>W</u> indow	<u>H</u> elp					
4	8 -			<u>ê</u> (Q		-	⇒			
#	Node	Axial (lb)	y Shear (lb)	z Shear (lb)	Torque (ft-lb)	Inplane(Moment	ft-lb) SIF	Outplane Moment	(ft-lb) SIF	SE (psi)
1	10 20A	-29229 -29229	1882 1882	-14103 -14103	-6578 -6578	17661 2608		59285 -53541		32730 28711
2	20A 20B	-29229 -14103	-14103 29229	-1882 -1882	-6578 727	53541 38415	1.75 1.75	2608 4696	1.46 1.46	48350 34221
3	20B 30	-14103 -14103	1882 1882	29229 29229	727 727	4696 -4712		-38415 107729		20053 53892
4	30 40A	-12841 -12841	4126 4126	-18116 -18116	17523 17523	-3134 -21700		95257 13733		48427 16060
5	40A 40B	-12841 -4126	-4126 12841	18116 18116	17523 13441	21700 8627	1.33 1.33	-13733 9652	1.11 1.11	19059 10375
6	40B 50	-4126 -4126	-18116 -18116	12841 12841	13441 13441	9652 91175		-8627 49157		9362 51451
7	30 60	-47345 -47345	-2087 -2087	-1262 -1262	1578 1578	-16796 -4274		12472 4898		38098 17805
8	70 80	-47345 -47345	-2087 -2087	-1262 -1262	1578 1578	-100 12423		2373 -5201		12046 27595

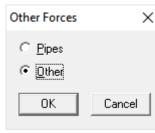
† G	U	se the (Global	forces	button	(F7) to	see th	e elei	nent	force	s in g	obal co	ordir	iate
ÞЭA	Caepipe	: Pipe for	rces in glo	bal coordi	nates: Exp	ansion (T	I) - [Samp	ole	_		Х			
<u>F</u> ile	<u>R</u> esult	ts <u>V</u> iew	<u>O</u> ptions	<u>W</u> indov	v <u>H</u> elp									
Æ	3 -			i 👸 🤇	2	= 🗲		\equiv	+	⇒	Ì			
#	Node	FX (lb)	FY (lb)	FZ (lb)	MX (ft-lb)	MY (ft-lb)	MZ (ft-lb)							
1	10 20A	29229 -29229	-1882 1882	14103 -14103	6578 -6578	-59285 -53541	-17661 2608							
2	20A 20B	29229 -29229	-1882 1882	14103 -14103	6578 -4696	53541 -38415	-2608 727							
3	20B 30	29229 -29229	-1882 1882	14103 -14103	4696 4712	38415 107729	-727 727							
4	30 40A	-18116 18116	-4126 4126	12841 -12841	-3134 21700	-95257 13733	-17523 17523							
5	40A 40B	-18116 18116	-4126 4126	12841 -12841	-21700 8627	-13733 -13441	-17523 -9652							
6	40B 50	-18116 18116	-4126 4126	12841 -12841	-8627 -49157	13441 -13441	9652 -91175							
7	30 60	47345 -47345	2087 -2087	1262 -1262	-1578 1578	-12472 4898	16796 -4274							
8	70 80	47345 -47345	2087 -2087	1262 -1262	-1578 1578	-2373 -5201	100 12423							
	1													



Use the Local forces button (F7) to see the element forces in local coordinates.



Use the Other forces button (F6), Next force button(Ctrl+Right arrow) or Previous force button (Ctrl+Left arrow) to see other element forces(e.g. valves, bellows etc.).



ÞЮH	Caepipe	: Other	forces in	global co	ordinates	Expansio	n (T1) -	Sampl	_		×
<u>F</u> ile	<u>R</u> esult	s <u>V</u> iew	<u>O</u> ption	ıs <u>W</u> ind	ow <u>H</u> el	р					
ł	3 +			tô	Q		╞╺╡	$ \equiv$] 🔶	⇒	
#	Node	Туре	FX (lb)	FY (lb)	FZ (lb)	MX (ft-lb)	MY (ft-lb)	MZ (ft-lb)			
1	60 70	Valve	47345 -47345	2087 -2087	1262 -1262	-1578 1578	-4898 2373	4274 -100			

Displacements

The nodal displacements are shown.

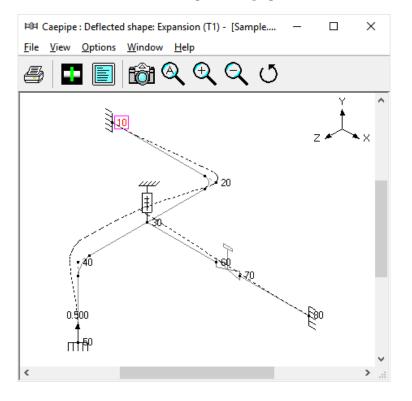
印	⊫⊫ Caepipe : Displacements: Expansion (T1) - [Sample.res – □ ×							
<u>F</u> ile	<u>R</u> esult	s <u>V</u> iew <u>(</u>	Options <u>W</u>	indow <u>H</u> e	lp			
4	3 -			ð 🔍	E 🔶	■ 🚽		
#	Displacements (global)							
	Node	X (inch)	Y (inch)	Z (inch)	XX (deg)	YY (deg)	ZZ (deg)	
1	10	0.000	0.000	0.000	0.0000	0.0000	0.0000	
2	20A	0.370	0.227	-0.404	-0.1813	0.0609	0.2149	
3	20B	0.291	0.324	-0.291	-0.2556	-0.9122	0.2599	
4	30	-0.618	0.604	-0.057	-0.2555	-0.4529	0.2724	
5	40A	-0.648	0.795	0.153	-0.1074	0.1971	0.5441	
6	40B	-0.373	0.712	0.178	0.2418	0.2084	0.6014	
7	50	0.000	0.500	0.000	0.0000	0.0000	0.0001	
8	60	-0.355	0.467	0.136	-0.1330	0.0660	-0.3570	
9	70	-0.263	0.314	0.103	-0.1225	0.0845	-0.3681	
10	80	0.000	0.000	0.000	0.0000	0.0000	0.0000	
	1							

A

Use the Load cases button, Next load case button (Right arrow) or Previous load case button (Left arrow) to see loads for different load cases(e.g. Sustained, Expansion etc.).

Use the Deflected shape button (or View > Show deflected shape) to plot the deflected shape in the graphics window.

Use the Animated deflected shape button (or View > Show animated deflected shape) to plot the animated deflected shape in the graphics window.



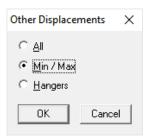
Choose View > Magnification to change the magnification of the deflected shape.

Magnification	ı		×
Deflection ma	agnification 🔢		
ОК	Cancel	Apply	<u>R</u> eset

The reset button is used to calculate a default magnification factor which scales the maximum deflection to about 5% of the width of the graphics window.

Ī

Use the Other displacements button (F6), Next displacement button (Ctrl+Right arrow) or Previous displacement button (Ctrl+Left arrow) to see other displacements (e.g. Min/Max, displacements at hangers, flex joints, limit stops etc.).



The minimum and maximum displacements for each of the directions and the corresponding nodes are shown below.

			- A (- A
TO SALE			∎≪ [
Direction	Type	Value	Node	2
X	Minimum	-0.648	404	
(inch)	Moximum	8.370	20A	
Y	Minimum	0.000	10	
(inch)	Meximum	0.795	40A	
z	Minimum	-0.404	20A	
(inch)	Maximum	0.178	408	
**	Minimum	-0.2556	208	
(deg)	Meximum	0.2418	408	
YY	Minimum	-0.9122	208	
(deg)	Maximum	0.2064	408	
22	Minimum	-0.3691	70	
(deg)	Moximum	0.6014	408	

The displacements at hanger nodes are shown below.

Ħ0Ħ	Caepipe	: Displacemen	ts at Hangers:	Expansion (T1)	- [Sample.res	(—	
<u>F</u> ile	<u>R</u> esults	s <u>V</u> iew <u>O</u> pt	ions <u>W</u> indov	v <u>H</u> elp			
4	3 +		1 6)			
#	Node	X (inch)	Y (inch)	Z (inch)	XX (deg)	YY (deg)	ZZ (deg)
1	30	-0.618	0.604	-0.057	-0.2555	-0.4529	0.2724

Print



To print results and model data, click on the Print button (or press Ctrl+P). In the Print Results dialog, the item to print can be selected in the property pages.

Print Results	?	×
Model Load cases Results Misc Printer		
Sorted stresses Support loads		
Code compliance 🔽 Element forces	(local)	
Hanger report I Element forces	(global)
Support load summary 🔽 Displacements		
Print Cancel Preview To File A		<u>N</u> one

You can also be print to a text file by using the To File button.

A preview of the printed output can be seen by using the Preview button.

The printing options such as choice of printer, margins, portrait or landscape and font can be set on the Printer tab.

Print Results	?	×
Model Load cases Results Misc Printer		
Text Printer		
Printer setup doPDF v7		
Page setup Orientation : Portrait		
Font Arial Narrow, 10 point		
Print Cancel Preview To File All		None

The sample problem report is shown next. Observe that for sorted stresses and code compliance, when the stress ratio exceeds 1.00, the stress and the stress ratio are shown in white letters on black background.

This is the end of the tutorial. If you have questions or comments, please email them to:

support@sstusa.com.

aepipe		Sample Problem		
		Quality Assurance Block		
		Caepipe		
		Version 7.60		
	Client	5		
	Project	21		
	File Number	12		
	Report Numbe	κ :		
	Model Name	Sample		
	Title	Sample Problem		
	Analyzed	: Wed Jan 18 13:48:25 2017		
	Prepared by	8	Date:	
	Checked by		Date:	
ersion 7.60		Sample		Jan 18,2

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20	90°	0	0									
20B	90"	0	1'0	r								
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40A	90"	0	10	6"								
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40B	90"	-16	12	η.								
50	90'	-60	12	0*								
60	15'0"	0	6'0	۳. T								
70	17'0"	0	6'0	*								
80	23'0"	0	6'0	*								
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850	and straight a loss	Name and Address	5E-6 8	ini ni m	1							
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Caepi	μö					Bot 2	/2014/		ample Pro		A stresse	eì		Page
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70	2133	1790	0.12	20A	48350	29475	1.64							
30	2035	1790	0.11	208	3422	29475	1.16							
10	1446	1790	0.08	10	3273	29475	1.11							
40B	1054	1790	0.06	80		5 29475								
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Susta	CONTRACTOR OF THE OWNER OWNE	nauon	FX (b) -14	-39	(lb)	FZ (lb) 26	-375	distant states	MY (R-ID) -174	MZ (ft-lb) -1156	0.000	Y (inch) 0.000	2 (inch) 0.000	
Susta Opera			-14	_	Contraction of the	-14077	-575	_	-1/4 59111	16505	0.000	0.000	0.000	
Upera Maxin			-28243	14		26	-6953		59111	16505		0.000	0.000	
Minim		_	-14			-14077	-575	2	-174	-1156	0.000	0.000	0.000	
Allowa			-25243 0	0		0	0000		0	0	0.000	0.000	0.000	
-910,996	aurea		0	10		110	port las	der	5	r anchor at	100000	0.000	0.000	
				3122		Juc	Т	20 20	minary 10	Fanicitui at	1995 1996	oomonic	(alabel)	
nad	combi	nation	FX (lb)	EV	(lb)	FZ (lb)	MX (F	HIN	MY (ft-b)	MZ (ft-lb)	Property and the second	cements (IY (inch)	THE CONTRACTOR OF A	
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~uau3	100	-		1.000	-		1.44	_	100.5		0.000	0.000	3.000	

Version 7.60

Sample

Jan 18,2017

						Sup	port load	summary fe	r anchor at	node 50			
			í –	1	- T		<u> </u>	T	1	10 m	ements	global)	
oad c	combi	ination	FX (b) FY	(lb) F	Z (lb)	MX (ft-l	b) MY (ft-lb	MZ (ft-lb)	X (inch)	Y (inch)	Z (inch)	
perat	ting1		-1815	8 -43	27 1	2813	49283	13548	91086	0.000	0.500	0.000	
Aaxim	um		-42	-20	1 1	2813	49283	13548	91086	0.000	0.500	0.000	
dinim.	um		-1815	8 -43	27 -	27	126	107	-90	0.000	0.000	0.000	
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						Sup	port load	summary fi	r anchor al	node 80			
1.10	50)		foreste	al Ros		1000		A Constant	Laure and		ements i		
		ination			5. C	Z (lb)	MX (ft-)		MZ (R-lb)			Z (inch)	
Sustair	ned		55	-37			-23	17	965	0.000	0.000	0.000	
perat			47401	_		264	-1601	5218	-11457	0.000	0.000	0.000	
Aaxim			47401			264	-23	5218	965	0.000	0.000	0.000	
Ainimu			55	-37		<u>a</u>	-1601	17	-11457	0.000	0.000	0.000	
llowa	bles		0	0	0		0	0	0	0.000	0.000	0.000	
						Sup	port load	summary fe	r hanger at	node 30			
					splacem								
ALC: NOT THE OWNER		nation		(analysis and some	nch) Y (NAME AND ADDRESS OF TAXABLE PARTY.	NAMES OF TAXABLE PARTY.						
Sustair	12.7		-1444	0.00	which the party of	the second second	002						
)perat			-1287	-			055						
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_	_									_			_
							1.5.5.1.0.0	n Anchors: S		N+P)			
	Tag	FX (Ib)			FZ (lb)	-		(ft-lb) MZ (
0		-14	-35		26	-375	-174						
0		-42	-20	11	-27	126	107	-90					
		Carl March	- 0.1	10		0.0	1.4.10	0.05	- i -				
0		55	-33	/8	1	-23	17	965					
					1	1		965 Hangers: S	Justained (V	N+P)			
lode	Tag	Туре	Loa	d (lb) N	1 0.of Tot	al (lb)			Sustained (V	N+P)			
	Tag		Loa	d (lb) N	1	al (lb) 44	Loads or	Hangers: \$					
lode	Tag	Type Grinne	Loa II -144	đ (ib) N 14 1	1 o.of Tot -14	al (lb) 44 Pipe fo	Loads or				P)		
lode 0 lode	Axial	Type Grinne y S	Loa II -14 Shear	d (lb) N 14 1 z Shear	1 o.of Tol -14 Torque	al (lb) 44 Pipe fo Inplar	Loads or rces in k ne(ft-lb)	Hangers: 5 ocal coordin Outplane(fi	ates: Susta 4b) SL		P)		
lode 0 lode	Axial (lb)	Type Grinne y S (lb	Loa III - 144 Shear)	d (ib) N 14 1 z Shear (ib)	1 o.of Tot -14 Torque (ft-lb)	al (lb) 44 Pipe fo Inplar Mome	Loads or inces in k ne(ft-lb) int SIF	Hangers: S ocal coordin Outplane(fl Moment S	ates: Susta (b) SL (psi)		P)		
lode 0 lode 0	Axial (lb) -14	Type Grinne y S (lb -3)	Loa III -144 Shear)	f (lb) N 14 1 z Shear (lb) 26	1 -14 Torque (11-lb) -375	al (lb) 44 Pipe fo Inplar Mome -1156	Loads or inces in k ne(ft-lb) int SIF	Hangers: S ocal coordin Outplane(f Moment S -174	ates: Susta (b) SL (F (psi) 1446		P)		
lode lode lode	Axial (lb) -14 -14	Type Grinne (b -3! 13	Loa III -144 Shear) 97 2	d (ib) N 14 1 z Shear (ib) 26 26	1 -14 Torque (ft-lb) -375 -375	al (lb) 44 Pipe fo Inpla Mome -1156 -100	Loads or rces in k ne(ft-lb) int SIF	Hangers: S ocal coordin Outplane(fl Moment S -174 35	ates: Susta (b) SL (F (psi) 1446 932		P)		
lode 0 lode 0 0A	Axial (lb) -14 -14 -14	Type Grinne (ib -3! 13 26	Loa III -144 Shear) 97 2	d (lb) N 4 1 z Shear (lb) 26 26 132	1 -14 Torque (11-lb) -375 -375 -375	al (lb) 44 Pipe fo Inplar Mome -1156 -100 -35	Loads or rces in k ne(ft-lb) int SIF	Hangers: S ocal coordin Outplane(fi Moment S -174 35 -100 1	ates: Susta (b) SL (F (psi) 1446 932 46 938		P)		
lode 0 lode 0 0A 0A 0B	Axial (lb) -14 -14 -14 26	Type Grinne (lb -3) 13 26 14	Loa III -144 Shear) 97 2	f (lb) N 4 1 z Shear (lb) 26 26 26 132 -236	1 -14 Torque (fl-lb) -375 -375 -375 -270	Al (lb) 44 Pipe fo Inplay Mome -1156 -100 -35 -75	Loads or rces in k ne(ft-lb) int SIF	Hangers: S ocal coordin Outplane(fi Moment S -174 35 -100 1 177 1	ates: Susta (b) SL (psi) 1446 932 46 938 46 980		9		
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Version 7.60

Sample

Jan 18,2017

	ipe				_	2060			ple Problem		to factor of	1700A	Ph.		Pag
-	1	fx	f.	fz n	ux In		mz	#190Call (coordinates:	ous	uarned	1144+	e)_		
Node	Type	(b)	fy (b)				(ft-lb)								
60	and the second s		-94	the second s	3 -7		755								
70	268843	-55	145	-1 2	3 -	10	704								
					Î	Pipe	forces in	n global i	coordinates:	Sus	tained	d (W+	P)		
Node	FX	FY	FZ	MX	MY	MZ									
	(b)	(lb)	(lb)	(ft-lb)	100 L 100 L	(ft-li	1000								
10	14	397	-26	375	174	115									
20A	-14	132	26	-375	35	-10									
20A 20B	14	-132 236	-26 26	375	-35 75	-27									
20B	14	-236	-26	177	-75	270									
30	-14	567	26	1831	144	-27	0								
30	-42	550	-27	-1808	-143	-34									
40A	42	-252	27	3	-44	340	tion of the local division of the local divi								
40A 40B	42	252	-27	-3	44	-34									
40B	42	-97	27	-250	-107	277									
40B 50	42	201	27	-126	-107	90									
30	55	327	1	-23	-1	610	1								
60	-55	-119	-1	23	-7	730	É.,								
70	55	-170	1	-23	10	-67	3 Y								
80	-55	378	-1	23	-17	-96				0.9400	Cords and More				
	_							n global	coordinates	: Sus	staine	d (W-	+P)		
	T		FY				MZ								
Node 60	Type Valve	Constanting of the local division of the loc	(b) 94		t-lb) (f 23 7		(ft-lb) -755								
70	Valve	-55	145		C		704								
-	-	-		-		-		lacemer	ts: Sustaine	2.00	(+D)		_		
										ea (v	YTC 1 -				
	<u> </u>		ſ	Displace	nents	aloha	aD -		1	sa (x	are j.				
Node	X (inc	h) Y()isplacer Z (inch		_		a) ZZ (d		so (x	ver.				
	X (inc		inch)	Displacer Z (inch 0.000		(deg)		a) ZZ (d	eg)	eo (w	irej.				
10		0.0	inch)	Z (inch	0.00	(deg)	YY (de	0.000	eg) O	eo (x	wej.				
10 20A	0.000	0.0	inch) 00	Z (inch 0.000	XX 0.00 -0.0	(deg) 000	YY (de 0.0000	0.000	eg) 0 58	eù (x					
10 20A 20B	0.000	0.0 -0.0 0 -0.0	inch) 00 008 007	Z (inch 0.000 0.002) XX 0.00 -0.0 -0.0	(deg) 000 103	YY (de 0.0000 -0.001!	0.000	eg) 0 58 67	eù (x	urry.				
10 20A 20B 30	0.000 0.000 -0.000	0.0 -0.0 0 -0.0 0.0	00 008 007 04	Z (inch 0.000 0.002 0.002) XX 0.00 -0.0 -0.0	(deg) 100 103 129 038	YY (de 0.0000 -0.0019 -0.0004	0.000	eg) 0 58 67 14	90 (V	urry.				
10 20A 20B 30 40A 40B	0.000 0.000 -0.000 0.000	0.0 -0.0 0 -0.0 0.0 0.0	inch) 00 008 007 04 02	Z (inch 0.000 0.002 0.002 0.002	0.00 -0.0 -0.0 -0.0	(deg) 100 103 129 038 157	YY (de 0.0000 -0.0019 -0.0004 0.0010	0.000 -0.00 -0.00 -0.01	eg) 0 58 67 14 81	eo (v					
10 20A 20B 30 40A 40B 50	0.000 0.000 -0.000 0.000 0.002 0.001 0.001	0.0 -0.0 0 -0.0 0.0 0.0 0.0 0.0	inch) 008 007 04 02 00 00	Z (inch 0.000 0.002 0.002 0.002 0.002 0.001 0.000	XX 0.00 -0.0 -0.0 -0.0 0.00 0.00	(deg) 100 103 129 038 057 022 100	YY (de 0.0000 -0.0015 -0.0004 0.0010 0.0016 0.0017 0.0000	0.000 -0.00 -0.01 -0.01 -0.00 -0.00 0.000	eg) 0 58 67 14 81 22 0	ed (w					
10 20A 20B 30 40A 40B 50 60	0.000 0.000 -0.000 0.000 0.002 0.001 0.000 0.000	0.0 -0.1 0.0 0.0 0.0 0.0 0.0 0.0	inch) 00 008 007 04 02 00 00 00 013	Z (inch 0.000 0.002 0.002 0.002 0.002 0.002 0.001 0.000 0.001	XX 0.00 -0.0 -0.0 -0.0 0.00 0.00 0.00	(deg) 100 103 129 038 057 022 000 020	YY (de) 0.0000 -0.0019 -0.0004 0.0010 0.0016 0.0017 0.0000 0.0000 0.0008	0.000 -0.00 -0.01 -0.00 -0.00 -0.00 0.000 -0.00	eg) 0 58 67 14 22 0 16	50 (v					
10 20A 20B 30 40A 40B 50 60 70	0.000 0.000 -0.000 0.002 0.001 0.000 0.000 0.000 0.000	0.0 -0.1 0.0 0.0 0.0 0.0 0.0 -0.1 -0.1	inch) 00 008 007 04 02 00 00 00 013 012	Z (inch 0.000 0.002 0.002 0.002 0.002 0.001 0.001 0.001 0.001	XX 0.00 -0.0 -0.0 -0.0 0.00 0.00 -0.0 -0.	(deg) 100 103 129 038 057 022 000 020 018	YY (de) 0.0000 -0.0019 -0.0004 0.0010 0.0010 0.0017 0.0000 0.0008 0.0008	0.000 -0.00 -0.01 -0.01 -0.00 -0.00 -0.00 -0.00 -0.00 -0.00	eg) 0 58 67 14 61 22 0 16 3	50 (m					
10 20A 20B 30 40A 40B 50 60 70	0.000 0.000 -0.000 0.000 0.002 0.001 0.000 0.000	0.0 -0.1 0.0 0.0 0.0 0.0 0.0 -0.1 -0.1	inch) 00 008 007 04 02 00 00 00 013 012	Z (inch 0.000 0.002 0.002 0.002 0.002 0.002 0.001 0.000 0.001	XX 0.00 -0.0 -0.0 -0.0 0.00 0.00 0.00	(deg) 100 103 129 038 057 022 000 020 018	YY (de) 0.0000 -0.0011 -0.0004 0.0010 0.0016 0.0017 0.0000 0.0008 0.0008 0.0008	0.000 -0.00 -0.01 -0.00 -0.00 -0.00 -0.00 0.000 0.002 0.000	eg) 0 58 67 14 81 22 0 16 3 0						
10 20A 20B 30 40A 40B 50 60 70 80	0.000 0.000 -0.000 0.002 0.001 0.000 0.000 0.000 0.000	0.0 -0.1 0.0 0.0 0.0 0.0 0.0 -0.1 -0.1 0.0	nch) 00 008 007 04 02 00 00 013 012 00	Z (inch 0.000 0.002 0.002 0.002 0.002 0.001 0.000 0.001 0.001 0.001	XX 0.00 -0.0 -0.0 0.00 0.00 -0.0 -0.0 0.00 -0.0	(deg) 100 103 129 038 057 022 000 018 000	YY (de 0.0000 -0.0015 -0.0004 0.0010 0.0016 0.0017 0.0000 0.0008 0.0008 0.0008 0.0008 0.0000 Load	0.000 -0.00 -0.00 -0.00 -0.00 -0.00 0.000 0.000 0.000 0.000 0.000 0.000 0.000	eg) 0 58 67 14 61 22 0 16 3 0 0 16 3 0 0 thors: Expan						
10 20A 20B 30 40A 40B 50 60 70 80 Node	0.000 0.000 -0.000 0.002 0.001 0.000 0.000 0.000 0.000 Tag I	0.0 -0.1 0.0 0.0 0.0 0.0 0.0 -0.1 -0.1 0.0 FX (b)	nch) 00 008 007 04 02 00 00 013 012 00 FY	Z (inch 0.000 0.002 0.002 0.002 0.002 0.001 0.000 0.001 0.001 0.001 0.001 0.000 F	XX 0.00 -0.0 -0.0 0.00 0.00 -0.0 -0.0 0.00 -0.0 2 (lb)	(deg) 100 103 129 038 057 020 020 018 000 MD	YY (de 0.0000 -0.0011 -0.0004 0.0010 0.0010 0.0017 0.0000 0.0008 0.008 0	0.000 -0.00 -0.01 -0.00 -0.00 -0.00 -0.00 0.0000 0.00000 0.0000 0.0000 0.0000 0.00000 0.00000 0.0000 0.000	eg) 0 58 67 14 81 22 0 16 3 0 thors: Exper MZ (ft-lb)						
10 20A 20B 30 40A 40B 50 60 60 70 80 Node 10	0.000 0.000 -0.000 0.002 0.001 0.000 0.000 0.000 0.000 0.000	0.0 -0.1 0.0 0.0 0.0 0.0 0.0 -0.1 -0.1 0.0 FX (lb) -29229	inch) 00 008 007 00 00 00 00 00 013 012 00 00 013 012 00 00 188	Z (inch 0.000 0.002 0.002 0.002 0.002 0.002 0.001 0.000 0.001 0.001 0.001 0.001 0.000 10.0000 10.000 10.0000 10.0000 10.000 10.000 10.0000 10.0000 10.0000 10.0	XX 0.00 -0.0 -0.0 0.00 0.00 -0.0 0.00 -0.0 0.00 2 (lb) 4103	(deg) 100 103 129 038 129 038 057 022 000 018 000 018 000 018 000 018 000 018 000 018 000 000	YY (de 0.0000 -0.0011 -0.0004 0.0010 0.0016 0.0017 0.0000 0.0008 0.0008 0.0008 0.0008 0.0008 0.0008 0.0008 0.0008 0.0008 0.0008 0.0008 0.0008 0.0000 0.0017 0.0004 0.0017 0.0004 0.0008 0.008 0	0.000 -0.00 -0.00 -0.00 -0.00 -0.00 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.00000 0.0000 0.0000 0.0000 0.00000 0.00000 0.0000 0.000	eg) 0 58 67 14 81 22 0 16 3 0 thors: Expar MZ (ft-lb) 17661						
10 20A 20B 30 40A 40B 50 60 70 80 Node 10 50	0.000 0.000 -0.000 0.002 0.001 0.000 0.000 0.000 0.000 Tag I	0.0 -0.1 0.0 0.0 0.0 0.0 -0.1 -0.1 -0.1	inch) 00 008 007 04 002 00 00 013 012 00 00 013 012 00 00 013 012 00 00 013 012 00 00 013 012 00 00 00 00 00 00 00 00 00 00 00 00 00	Z (inch 0.000 0.002 0.002 0.002 0.002 0.001 0.000 0.001 0.001 0.001 0.001 0.000 (b) F 12 - 26 1	XX 0.00 -0.0 -0.0 -0.0 -0.0 -0.0 -0.0 -0.0	(deg) 100 103 129 038 057 022 000 020 018 000 49 49	YY (de 0.0000 -0.0011 -0.0004 0.0010 0.0016 0.0017 0.0000 0.0008 0.0008 0.0008 0.0008 0.0008 0.0008 1.0000 Load (ft-lb) 1 78 5 157 1	0.000 -0.00 -0.00 -0.00 -0.00 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.00000 0.0000 0.0000 0.0000 0.00000 0.00000 0.0000 0.0000	eg) 0 58 67 14 61 22 0 16 3 0 17661 91175				_	_	
10 20A 20B 30 40A 40B 50 60 70 80 Node 10 50	0.000 0.000 -0.000 0.002 0.001 0.000 0.000 0.000 0.000 Tag I	0.0 -0.1 0.0 0.0 0.0 0.0 0.0 -0.1 -0.1 0.0 FX (lb) -29229	inch) 00 008 007 00 00 00 00 00 013 012 00 00 013 012 00 00 188	Z (inch 0.000 0.002 0.002 0.002 0.002 0.001 0.000 0.001 0.001 0.001 0.001 0.000 (b) F 12 - 26 1	XX 0.00 -0.0 -0.0 0.00 0.00 -0.0 0.00 -0.0 0.00 2 (lb) 4103	(deg) 100 103 129 038 057 022 000 020 018 000 49 49	YY (de 0.0000 -0.0011 0.0010 0.0010 0.0016 0.0017 0.0000 0.0008 0.0008 0.0008 0.0008 0.0008 0.0008 0.0008 0.0008 0.0008 0.0008 0.0008 0.0000 0.0008 0.0000 0.0008 0.0000 0.00017 0.0000 0.0011 0.0000 0.0010 0.0010 0.00000 0.00000 0.000000	0.000 -0.00 -0.00 -0.00 -0.00 -0.00 0.000 0.000 0.000 0.000 0.000 0.000 3441 201	eg) 0 58 67 14 81 22 0 16 3 0 17661 91175 -12423	nsion	1(11)				
10 20A 20B 30 40A 40B 50 60 70 80 Node 10 50 80	0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 Tag I	0.0 -0.1 0.0 0.0 0.0 0.0 -0.1 -0.1 0.0 -0.1 -0.1	inch) 00 008 007 04 02 00 00 013 012 00 118 411 208	Z (inch 0.000 0.002 0.002 0.002 0.001 0.001 0.001 0.001 0.001 0.001 0.001 0.001 0.001 1.000 0.001 0.001 0.000 1.000 1.000 0.001 0.000 1.000 0.002 0.002 0.002 0.002 0.002 0.002 0.002 0.002 0.002 0.002 0.002 0.002 0.002 0.002 0.002 0.002 0.002 0.000 0.002 0.002 0.002 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.00000 0.00000 0.0000 0.0000 0.0	XX 0.00 -0.0 -0.0 0.00 0.00 0.00 -0.0 0.00 -0.0 0.00 -0.0 0.00 -0.0 2 (b) 4103 2841 262	(deg) 000 103 129 038 057 022 000 018 000 018 000 018 000 018 000 018 000 018 000 018 000 010 01	YY (de 0.0000 -0.0011 -0.000 0.0010 0.0016 0.0017 0.0000 0.0008 0.008	0.000 -0.00 -0.00 -0.00 -0.00 -0.00 0.000 0.000 0.000 0.000 0.000 0.000 3441 201	eg) 0 58 67 14 61 22 0 16 3 0 17661 91175	nsion	1(11)				
10 20A 20B 30 40A 40B 50 60 60 60 70 80 Node 10 50 80	0.000 0.0000 0.0000 0.0000 0.0000 0.000000	0.0 -0.1 0.0 0.0 0.0 0.0 -0.1 -0.1 0.0 -0.1 -0.1	inch) 00 008 007 04 00 00 00 013 012 00 013 012 00 00 013 012 00 00 013 012 00 00 012 00 00 013 012 00 00 00 00 00 00 00 00 00 00 00 00 00	Z (inch 0.000 0.002 0.002 0.002 0.002 0.001 0.000 0.001 0.001 0.001 0.001 0.000 (b) F 12 - 26 1	XX 0.00 -0.0 -0.0 0.00 0.00 0.00 -0.0 0.00 -0.0 0.00 -0.0 0.00 -0.0 2 (b) 4103 2841 262	(deg) 000 103 129 038 057 022 000 020 018 000 018 000 018 100 00 00 00 00 00 00 00 00 0	YY (de 0.0000 -0.0011 -0.000 0.0010 0.0016 0.0017 0.0000 0.0008 0.008	0.000 -0.00 -0.00 -0.00 -0.00 -0.00 0.000 0.000 0.000 0.000 0.000 0.000 3441 201	eg) 0 58 67 14 81 22 0 16 3 0 17661 91175 -12423	nsion	1(11)				

								Dine Ter	ees le	Sample			Page (
		1.00	10			-	_		_				ansion (T1)
Node	Axial	y Sh	ear	z Sh	ear	10010215	- H	Inplane	Contraction of the local division of the loc	Outplane Moment		0.7532	
10	(b)	(lb)	_	(b)	66	(ft-lb	-	Momen	SIF		SIF	(psi)	-
10 20A	-2922		2.2	-141 -141	2010	-657 -657	- E	17661 2608		59285 -53541		32730 28711	
20A	-2922	and the second division of the second divisio	in the second	-188	-	-657	-	53541	1.75	2608	1.46	48350	
20B	-1410			-188		727	-	38415	1.75	4696	1.46	34221	
20B	-1410	100000	51011	2922		727	- 6	4696		-38415		20053	
30 30	-1410		-	2922		727	_	4712 -3134	-	107729 95257	-	53892 48427	
40A	-1284		21.1	-181	10.00	175	- -	21700		13733		16060	
40A	-1284	_	6	1811	6	1752		21700	1.33	-13733	1.11	19059	
40B	4126	128		1811		1344	-	8627	1.33	9652	1.11	10375	4
40B 50	-4126	-181	1.000	1284	21	1344	10 I I I	9652 91175		-8627 49157		9362 51451	
30	-4734	-	-	-126		1578	-	-16796	-	12472	-	38098	4
60	-4734	0.00	5811	-126	10	1578	2 D	4274		4898		17805	2
70	-4734	11.8000.50	7.7	-126	22	1578	с II	-100		2373		12046	
80	-4734	5 -208	7	-126	2	1578	<u> </u>	12423	1	-5201		27595	a national and a second s
			1.0		_	_		Other fo	rces in	local coo	rdinat	es: Exp	pansion (T1)
Node	Time	fx (fb)	fy (R)		fz (lb)		mx 信-Ib	my	and the second	iz Hib)			
80	Type Valve	-4734	-	087		262	1578	11-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1		274			
70	10110	-4734		087	1.1.1.1	262	1578	C 100 Get	- Sec. 11-12	00			
							F	Pipe for	es in g	global coo	rdinat	les: Exp	vansion (T1)
Node	FX	FY		FZ		MX	. 0	ΛY	MZ				
	(lb)	(lb)		(lb)		(ft-lb)	10000	ft-lb)	(曲-lb)				
10	29229		- C - C - C - C - C - C - C - C - C - C	1410	S	6578		59285	-1766	1			
20A 20A	-2922	and the second se	-	-1410	_	-657 6578	_	53541 i3541	2608				
208	-2922	1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1	225	-1410	2 A . I	-469	S 10	38415	727				
20B	29229	-188	2	1410	3	4696	1	8415	-727	Ť.			
30	-2922	-		-141(-	4712	-	07729		_			
30	-1811 18116	************************************	08.1	1284		-313 2170	- P	95257 3733	-1752 17523	10 mil			
40A 40A	-1811			1284	-	-2170	_	13733	-1752				
40B	18116	The Color of	CC -	-128		8627	2014	13441	-9652				
40B	-1811	1 100 000	22.	1284	- C - L	-862	- X-1	3441	9652				
50	18116		-	-128	-	-491		13441	-9117	and and a second se			
30 60	47345	1.100.00	1.1	1262		-157 1578	2 P.	12472 898	16796				
70	and similar in the	208		1262	_	-1576		and the second second	100	-			
80	-4734	5 -208	7	-1262		1578			12423	3			
							C	ther for	ces in	global cod	ordina	tes: Exp	pansion (T1)
		FX	E		FZ		MX	MY		Z			50. 66
		(lb)	(1)		(Ib)	_	(ft-lb			Hb)			
60 70	Valve	47345	1.0	087	12	62 262	-157	8 0.000	82. KS	274			
.9		er ratis	4.4	507	- 14	.02	1010	231		cements:	Eyna	nsion /T	[1]
			_	Disp	lace	ment	s (al	oball	Subje	- unite net	Linpa	Constit (1	
Node	X (incl	1) Y (nch)			the state of the	100		(deg)	ZZ (deg)			
10	0.000	0.0	C	-	000	1000	0000	100 Mar 100	0.000	0.0000			
	xn 7.60			-		-							

								Die	nia	cemente	Expe	nsion (T	40 V
-	-			Disc	acer	ents (g	loheli	UIS	hid	oomenta	- Expa	naion (1	1/
Node	X (in	chì	Y (in		nch)			Y (der	al.	ZZ (deg)	5		
20A	0.37	-	0.227		404	-0.18	and the second second	.0609	-	0.2149	2		
20B	0.29	<u>. </u>	0.324		291	-0.25	-	0.9122	-	0.2599	1		
30	-0.61		0.604		057	-0.25	_	0.4529	-+	0.2724	1		
40A	-0.64	_	0.795			-0.10		1971	-	0.5441	1		
40B	-0.37	<u> </u>	0.712			0.24	_	2084	-	0.6014	1		
50	0.00	-	0.500		-	0.000		.0000	-	0.0001	1		
60	-0.35	55	0.467	7 0.1	36	-0.13	30 0.	.0660	1	-0.3570	3		
70	-0.26	3	0.314	1 0.1	03	-0.12	25 0	0845	-	0.3681	2		
80	0.00	0	0.000	0.0	00	0.000	0 00	0000	1	0.0000			
							Lo	ads o	n A	nchors:	Operat	ing (W+i	P1+T1)
Node	Tag	FX	(lb)	FY (lb)	FZ	(lb)	And in case of the local division of the loc		1000	(h-lb) M	-	Contraction of the	
10			243	1485	-	4077	-6953		91	Contract of the	8505	1	
50		-18	158	-4327	12	813	49283	3 1	35	48 9	1086		
80		474	101	1709	12	64	-1601	5	21	8 -1	1457		
		57	10		297		Lo	ads or	n H	angers:	Operat	ing (W+	P1+T1)
Node	Tag	Typ	e L	oad (lb)	No.	of Tota	(lb)						
30		and the state of the	nnell -	1287	1	-128	7						
	_					Pi	pe force	es in l	oca	il coordi	nates: (Operatin	ig (W+P1+T1)
Node	Axial		y She	ar z Sh	ar T	orque	Inplar	ne(ft-l	b)	Outplan	e(ft-lb)	Sopr	
	(lb)		(ib)	(lb)	100	ft-lb)	Mome	ent SI	F	Momen	t SIF	(psi)	
10	-292	0000	1485	-140	17 -	6953	16505	5	1	59111		28806	
20A	-292	-	2014	-140	the second second	6953	2508			-53506	-	25012	
20A	-292	67 M	-1407	0.533	3 I S	6953	53506			2508	100 (1973)	44617	
20B	-140		29243	-	-	56	38340	1 1.	15	4873		32823	0
20B 30	-140	N	2118 2449	2924	C 102	56 56	4873 -6543			-38340 107873		18680 52663	[]
30	-128		3576	-181	_	7863	-4942	_		95400	1	47432	
40A	-128	5 G. J.	3873	-181	100	7863	-2170			13689		15163	
40A	-128	_	-3873		_	7863	21703	_	33	-13689	1.11	18095	
40B	-402	9	12813	1815	_	3548	8377	1.	33	9374	1.11	10541	
40B	-402	Sec. 1	-1815	Value Value Value		3548	9374	8.0		-8377		9594	
50	-432		-1815	-	-	3548	91086			49283	1	51652	
30 60	-474	500 I	-2414	-126	< 1.0	601 601	-1740 -3544	5.7		12473 4891		23021 1516	
70	-474		-1917	-126	-	601	579		-	2364	-	3195	
80	-474	2004	-1709	-126	G 107	601	11457			-5218		10616	
							ner forc	es in	loca		nates:		ng (W+P1+T1)
		fx		fy	fz	mx			m			-	
Node	Type		(0	(10)	(lb)	(肉-)	CONTRACTOR OF A	1-lb)	1000	-lb)			
60	Valv			-2182	-126	0.010000	- C - 100	891	10.0	519			
70	2000	-4	7401	-1942	-126	S. 1005	12 100	364	60	111 A. J. H.			
								_	-	al coord	inates:	Operatir	ng (W+P1+T1)
Node	10 C 1 A 1		FY	FZ	1.10	X	MY	MZ					
	(b)		(lb)	(b)		t-lb)	(ft-lb)	(1)-1	-	1			
10	2924	- I	-1485	1407	1 C C C C C C C C C C C C C C C C C C C	953	-59111	ALC: NOT		5			
20A	-292	43	2014	-1407	1 -6	953	-53506	6 250	18	S			

Caep	ere:	_					line fr	1000	in al	San	
Mode	Icv		FY	157	1					obal co	
Node	(lb)		⊢Υ (Ib)	FZ (lb)	- 12	viX ft-lb)	MY (ft-lt	2010.04	MZ (用-It	1	
20A	2924		-2014	1407		6953	535		-250	-	
20B	-292	- C - I	2118	-140		4873	-383	S.C. 1	456	6.96	
20B	2924	200 m. I.	-2118	1407		4873	383	2.2	-456		
30	-292		2449	-140		5543	-	873			
30 40A	-181 1815	- CC	-3576 3873	1281		4942 21703	-954	1.2.6	-178	222	
40A	-181		-3873	1281		2170	-		-178	daily and a	
40B	1815		4029	-128	2.11	8377	-13	100 C I	-937	1000	
40B	-181	2020	-4029	1281		8377	135		937	10.0	
50	1815		4327	-128		4928	-		-910	-	
30 60	4740	CO.U.I.	2414	1264	23 I.I.	1601 1601	-124	53.01	174 -354	2026	
70	4740	-	1917	1264	-	1601	-236		-579		
80	-474	1011	-1709	-126	- E	1601	-52	222	114	1226	
						C	ther fo	rces	in gl	iobal co	
seu ²	14			FY	FZ		(X	MY		MZ	
Node			and the second	(lb)	(lb)	-	t-lb)	(#-#		(ft-lb)	
60 70	Valv		1000 C.C.U.	2182 -1942	126	C	1601 601	236	CAS	3519 604	
10	_	14	11401	1342	- 12	- T	out		-	ements	
-	-	_		Disn	lane	ments	(globs		pilar	en ret ne	
Node	X (in	ch)	Y (inc	No. of Concession, Name	(inch	And in case of the local division of the loc	1.0		(dea) ZZ (d	
10	0.00		0.000		000		000	0.00	evenesis	0.000	
20A	0.37	0	0.219	-0.	402	-0.	1917	0.05	595	0.209	
20B	0.29	0	0.317	-0.	289	-0.	2686	-0.9	127	0.253	
30	-0.61	_	0.608		055	-	2593		519	0.261	
40A	-0.64	- iii	0.797	-	155	-	1017	0.19		0.538	
40B	-0.37	-	0.712	_	179		440	0.2	interimpted	0.599	
50	0.00	÷	0.500	-	000	-	000	0.00	-	0.000	
60 70	-0.35	_	0.455		136		1350 1244	0.08		-0.35	
80	0.00	- 14	0.002		000	-	000	0.00		0.000	
	10.00	1	10.000	100		19.9		0.00	11.10	/eight 8	
Insula Conte Lining Total Cente	ation w ant we weigh weigh ar of G	veigl ight ht = it = 3	2419.3 ty for T	7.8 (lb) 32 (lb)		705	(ftin")				
									B	ill of ma	
# N	ame	Des	cription	18	-	-	-	-	-		
			Grade								
				- 20						Bill of r	
# M	latería	0	D TI	nk To	tal le	ngth	Total	veigt	t		
		(ir	nch) (ir	ich) (ft	'n")		(b)				
1 A	53	6.	625 0.	28 12	'0"		227,4	5			

F								Bill of m	aterials: P	ipes		
	Material	00	Thk	Total le	ngth	Total	weight			÷		
	100			(ft'in")		(lb)						
	A53	8.625	0.5	22'0*		953.5	3	Diff of an	and the R			
2	hand	0.0	170-10	Deather		10.			aterials: B	ends		
	Material	(inch)	Thk (inch)	(inch)	(deg	e coi	(b)	al weight				
	A53	8.625		12	90.0	01		082				
j	A53	8.625		18	90.0			2.12				
Ì					÷	÷.,		Bill of ma	iterials: Va	alves		
	OD T	hk V	Veight	Add.We	ight (Count	Total v	veight				
	(inch) (i			(lb)			(lb)	100				
8	6.625 0	28 2	00	50	1		250	_				