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Let us model a slightly more advanced piping system now that you have familiarized yourself with the basic use of CAEPIPE via Tutorial 1. The details of the model (in SI units) 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 (different loads for different segments)
- 5. Select Load Cases for Analysis
- 6. Analyze
- 7. View Results

Model Description

Details of the Layout, Material, Sections, Loads and Connection details are summarized for reference:

- 1. Axes Chosen: Global X = East, Global Y = Up and Global Z = South
- 2. Piping Code: ASME B31.1 (2020)
- 3. Section Properties:
 - a. Main Line: 10" Schedule STD
 - b. Branch Line: 6" Schedule STD

- 4. Insulation throughout the Piping system:
 - a. **Density**: 176.2 kg/m3
 - b. Thickness: 65 mm
- 5. Material: A 312 TP 316

6. Temperature:

- a. For Main Line and Branch Line up to Valve End Node 105:
 Operating Temperature = 185 Deg. C and Design Temperature = 230 Deg. C
- b. For Branch Line after Valve Node 105:Operating Temperature = 260 Deg. C and Design Temperature = 300 Deg. C

7. Pressure:

a. For Main Line and Branch Line up to Valve End Node 105:

Operating Pressure = 10 bar and Design Pressure = 15 bar

b. For Branch Line after Valve Node 105:

Operating Pressure = 32 bar and Design Pressure = 48 bar

8. Operating Fluid and Specific Gravity: Steam, 0.1

9. Connection Details:

- a. Node 5 connecting to Nozzle of a Cylindrical Vessel
- b. Node 50 connecting to Nozzle of a API 610 Horizontal Pump
- 10. Wind Velocity: 100 km/hr
- 11. Static Seismic g's: X=0.3, Y=0.2 and Z=0.3

Start CAEPIPE. From the "File" pull down menu select "Preferences".

-0-1	Caepipe			\times
<u>F</u> ile	<u>H</u> elp			
	<u>N</u> ew	Ctrl+N		
	<u>O</u> pen	Ctrl+O		
	Recent <u>m</u> odels	>		
	Open <u>l</u> ast model	Enter		
	Open <u>r</u> esults			
	<u>I</u> mport			
	<u>P</u> references			
	E <u>x</u> it	Alt+F4		

Make sure that the "Automatic save feature" is enabled and the "Automatic Renumbering of nodes" feature is disabled.

Preferences	?	×
General Fonts Toolbar		
🗖 Make backup copy 🛛 🗖 Disable graphics e	diting	
Automatic save every 10 minutes		
Folder < Default >		
Automatic Renumbering of nodes		
Starting node number		
Continous Rendering while modeling		
Specify RGB Codes for Highlight		
RGB 112 0 32		
Suppress refine branch message		
Split factors for Refinement of Branches for B31J		
Run split factor 1.00 Branch split factor 0	.50	
Close		

Start CAEPIPE. Then click on the "New" file button. New Model (.mod) Material Library (.mat) Spectrum Library (.mat) Spectrum Library (.spe) Valve Library (.val) Beam Section Library (.bli) Flange Qualification (.flg) Nozzle Evaluation (.noz) Lug Evaluation (.lug)

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

H	*I* Caepipe : Layout (2) - [Untitled]												
File	Edit	View	Options L	oads Misc	Window	Help							
	🗋 📂 🖨 📕 🗐 🔲 🎼 🍳												
#	Node	Туре	DX (ft"in")	DY (ft'in")	DZ (ft'in")	Matl	Sect	Load	Data				
1	Title =												
2	10	From							Anchor				
3													

Graphics window

HIN (Caepipe	e : Graphi	cs - [Untitl	led]					_		×
File	View	Options	Windov	v He	lp						
4			tôt	Q	Ð	Q	Q	цТц	щ	*	
										z	××
					1111	10					
	_			_							

Tutorial for Modeling and Results Review – Problem 2

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

Change Units

As this is a SI/Metric model, change the units appropriately. From the layout window, click on "Options menu > Units" (alternately, press the hotkey "Ctrl+U"). Click on "All SI" button followed by "OK". The layout window will show the offsets (DX/DY/DZ) in mm units.

Units				×
Length	(mm) 💌	Temperature	(C) •	OK
Dimension	(mm) 💌	Thermal expansion	(mm/mm/C) 💌	Cancel
Displacement	(mm) 💌	Pressure	(bar) 💌	All English
Angle	(deg) 💌	Stress	(MPa) 💌	AirEnglish
Force	(N) •	Modulus	(MPa) 💌	All SI
Moment	(Nm) 💌	Stiffness	(N/mm) 💌	All Metric
Additional weight	(kg/m) 💌	Rot stiffness	(Nm/deg) 💌	
Weight	(kg) 💌	Area	(mm2) 💌	
Density	(kg/m3) 🔹	Moment of Inertia	(mm4) 💌	
Insulation density	(kg/m3) 🔹	Velocity	(m/s) 💌	

1. Enter Title

Type "Sample Problem 2" 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.

1-0-1	Caepip	e : Layo	ut (2) - [Untitled]	l						×
<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	_			
			Analysis								
			<u>U</u> ni	ts		0	Ctrl+U	•			
#	Node	Турє	<u>F</u> or	it				C	t Load	Data	
1	Title =	Samp	lnc	rease For	nt	Ct	rl+Up				
2	10	From	Dec	rease Fo	nt	Ctrl+	Down			Anchor	
3			No	de increr	ment						

This opens the "Analysis Options" dialog.

Analysis	Options	?	×
Code	Temperature Pressure Dynamics Misc		
Pi	ping code		
В	31.1 (2022) 🔹		
V	Use B31J for SIFs and Flexibility Factors		
	Include axial force in stress calculations		
V	Use liberal allowable stresses		
	ОК	Can	cel

On the Code property page, select "B31.1 (2022)" for "Piping code". Turn ON the option "Use liberal allowable stresses". Then click on OK to close "Analysis Options" dialog.

3. Define Material, Sections and Loads

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

H	📲 Caepipe : Layout (2) - [Untitled] — 🗆 🗙												
File	Edit	View	Options L	oads Misc	Window	Help							
#	Node	Туре	DX (ft'in")	DY (ft'in")	DZ (ft'in")	Matl	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").

-0-1	Caepipe : N	1aterials (0) - (L	Intitle	ed]								—	o x
File	Edit Vie	w Options M	lisc	Window	Help								
-#													
#	Name	Description	Ty pe	Density (kq/m3)	Nu Mate	factor	y Yield (MPa)	Tensile (MPa)	#	Temp (C)	E (MPa)	Alpha (mm/mm/C)	Allowable (MPa)
1									1				

The Open Material Library dialog is shown. If you don't see the folder shown below, then navigate to the Material Library folder under the CAEPIPE installed folder (usually C:\CAEPIPIE\xxxx, xxxx = version number).

🗝 Open Material Library		×		
Look in: Daterial_Library	+ 🗈 💣 📰 ◄			
Name	Date modified			
B311-2022.mat	26-07-2023 02:27			
B311-2 Type: MAT File B313-1 Size: 114 KB B313-2 Date modified: 26-07-2023 02:27	02-08-2023 22:59 23-07-2014 22:50 23-07-2014 22:50			
File name: B311-2022	Open			
Files of type: Material Library files (*.mat)	Cancel			

Select "B311-2022.mat" as the library file by double clicking on it. The available materials in the library are shown. Scroll down to "A312 TP 316". Double click on it or click on "OK" to select it.

Mate	erial Library - [B311-2022.mat	×
Pipin	ig code : B31.1	
#	Material Description	
44	A285 GRADE B	
45	A285 GRADE C	
46	A312 TP304	
47	A312 TP304H	
48	A312 TP304L	-
49	A312 TP304N	
50	A312 TP309H	
51	A312 TP310H	
52	A312 TP316	
53	A312 TP316H	
54	A312 TP316L	-
55	A312 TP316N	
	OK Cancel Library	

The properties for this selected material are transferred to the material in the List window. Type "312" for material name and then **press "Enter"**.

-0-	*I* Caepipe : Materials (0) - [Untitled] - □ ×													
File	Edit Vie	w Options N	lisc	Window	Help									
-#														
#	Name	Description	Ty pe	Density (kg/m3)	Nu	Joint factor	Yield (MPa)	Tensile (MPa)	#	Temp (C)	E (MPa)	Alpha (mm/mm/C)	Allowable (MPa)	
1	312	A312 TP316	AS	8027	0.3	1.00	206.8	517.1	1	-198.3	201327	13.50E-6	137.9	
									2	-101.1	201327	14.40E-6	137.9	
									3	-45.56	199259	14.76E-6	137.9	
									4	21.11	195122	15.30E-6	137.9	
									5	37.78	193743	15.46E-6	137.9	
									6	93.33	189606	16.02E-6	119.3	
									7	148.9	186159	16.56E-6	107.6	
									8	204.4	182022	17.10E-6	98.60	
									9	260	178574	17.46E-6	91.70	
									10	315.6	174437	17.82E-6	86.87	
									11	343.3	173058	17.91E-6	84.81	
									12	371.1	170990	18.00E-6	83.43	
									13	398.9	168922	18.18E-6	82.05	
									14	426.7	166164	18.18E-6	81.36	

Sections

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

H	Caepipe :	Materials (0) -	[Untitled]								×
<u>F</u> ile	<u>E</u> dit <u>V</u>	iew <u>O</u> ptions	<u>Misc Window H</u> elp								
		1 1 1	<u>C</u> oordinates	Ctrl+Shift+C							
			<u>M</u> aterials	Ctrl+Shift+M			-				_
#	Name	Descriptior	<u>S</u> ections	Ctrl+Shift+S] nsile Pa)	#	lemp (C)	E (MPa)	Alpha (mm/mm/C)	Allowable (MPa)	
1	312	A312 TP31	<u>L</u> oads	Ctrl+Shift+L	21	1	-198.3	201327	13.50E-6	137.9	
			Beam <u>M</u> aterials			2	-101.1	201327	14.40E-6	137.9	
			Beam Sections			3	-45.56	199259	14.76E-6	137.9	
			Beam <u>L</u> oads			4	21.11	195122	15.30E-6	137.9	
			Dumper			5	37.78	193743	15.46E-6	137.9	
			Comproserr			6	93.33	189606	16.02E-6	119.3	
			Turbinos			7	148.9	186159	16.56E-6	107.6	
			Turbines		-	8	204.4	182022	17.10E-6	98.60	
			Spectrums			9	260	178574	17.46E-6	91.70	
			Force spectrums			10	315.6	174437	17.82E-6	86.87	
			Time Functions			11	343.3	173058	17.91E-6	84.81	
			Soils			12	371.1	170990	18.00E-6	83.43	
						13	398.9	168922	18.18E-6	82.05	
						14	426.7	166164	18.18E-6	81.36	

A list of Sections is shown. This system has three sections: 6", 8" and 10". To enter the first section, type '6' for "Section name" and press "Enter". The "Section #1" properties dialog is shown with the section name 6.

Section # 1	×
Section name 6	● ANSI O DIN O JIS O ISO
Nominal diameter Non Std	Schedule 🗾
Outside diameter 2" 2-1/2" 3"	(mm) Thickness (mm)
Corrosion allowance 4'' 5''	(mm) Mill tolerance (%)
Insulation : Density	(kg/m3) Thickness (mm)
Lining: Density 12"	(kg/m3) Thickness (mm)
OK Ca 16" 20"	ulation Soil 🗾

Click on the down arrow of the dropdown combo box for "Nominal diameter" and select 6" for "Nominal diameter". Select/Enter other properties (STD thickness, Insulation density [Alt+I may be used for a list of insulation materials or you may enter your own density, in this case, 176.2 kg/cu.m] and thickness).

Section # 1				\times
Section name 6	• 4	ANSI O DIN	O JISI O IS	30
Nominal diameter 6''		Schedule	STD 💌	
Outside diameter 168.27	(mm)	Thickness	7.112	(mm)
Corrosion allowance	(mm)	Mill tolerance		(%)
Insulation : Density 176.2	(kg/m3)	Thickness	65	(mm)
Lining : Density	(kg/m3)	Thickness		(mm)
OK Cancel Ins	sulation	Soil		

After entering all properties, press "Enter" or click on "OK" to enter the first section.

Now repeat the process for the 8" pipe section.

In row # 2, Type 8 for "Section name" and press "Enter". The "Section Properties" dialog is shown with the section name 8. Select 8" for "Nominal diameter", STD for "Schedule", and same insulation

properties as before for "Insulation". Press "Enter" or click on "OK' to enter the second section. Do similarly for the 10" pipe section.

H 04	Caepipe	: Pipe S	Section	s (3) - [l	Jntitled]									×
File	Edit	View	Option	s Misc	Window	v Help								
-#														
#	Name	Nom Dia	Sch	OD (mm)	Thk (mm)	Cor.Al (mm)	M.Tol (%)	Ins.Dens (kg/m3)	Ins.Thk (mm)	Lin.Dens (kg/m3)	Lin.Thk (mm)	Soil		
1	6	6"	STD	168.27	7.112			176.2	65					
2	8	8"	STD	219.07	8.1788			176.2	65					
3	10	10"	STD	273.05	9.271			176.2	65					
4														

Load

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

H0H	Caepipe	: Pipe S	Sections	(3)	- [Untitled]						—		×
File	Edit	View	Option	s N	Aisc Window Help								
-#	-		6	h	<u>C</u> oordinates	Ctrl+Shift+C							
					Materials	Ctrl+Shift+M							
#	Name	Nom Dia	Sch	С () _	<u>S</u> ections	Ctrl+Shift+S	₃.Thk _ im)	Lin.Dens (kg/m3)	Lin.Thk (mm)	Soil			
1	6	6"	STD	î (<u>L</u> oads	Ctrl+Shift+L]	, ,	. ,				
2	8	8"	STD	2	Beam <u>M</u> aterials								
3	10	10"	STD	2	Beam Sections								
4					Beam <u>L</u> oads								
				_	Pumps								

The Loads list is shown. To enter the first load, Type 'L1' for "Name", Tab to "T1" and type 185, Tab to "P1" and type 10 bar, tab to "Desg.T" and type 230, Tab to "Desg.Pr." and type 15 and Tab to "Specific gravity" and type 0.1. 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). Similarly, enter the second load set "L2" { $260^{\circ}C$, 32 bar, $300^{\circ}C$, 48 bar and Sp. Gravity = 0.1}.

101	I* Caepipe : Loads (2) - [Untitled]											×	
File	Edit	View	Option	s Misc	Window	Help							
-#													
#	Name	T1 (C)	P1 (bar)	Desg.T (C)	Desg.Pr. (bar)	Specific gravity	Add.Wgt. (kg/m)	Wind Load 1	Wind Load 2	Wind Load 3	Wind Load 4		
1	L1	185	10.0	230	15.0	0.1							
2	L2	260	32.0	300	48.0	0.1							
3													

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 10" main line first, followed by the 8" segment.

CONVENTIONS

- In the following text, the word 'type' should be distinguished from the words 'Type column' or simply 'Type' (upper case 'T'). The former ('type') will mean press the keys on the keyboard. The latter word 'Type' will refer to the ''Type column'' in the Layout spreadsheet. Of course, occurrence of Type at the beginning of a sentence will mean type the keys.
- Also, the instruction "type B for Bend" does not necessarily mean the upper case B. The lower case 'b' can also be typed.
- For items in the "Data" column (such as "Anchor" or "Hanger"), the cursor needs to be in the "Data" column. To move the cursor quickly to that column, press "Ctrl+Shift+D" from any column or click in the "Data" column. Or press the Tab key 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. Simultaneous feedback is one of the chief design intents in CAEPIPE.
- For mouse clicks, when you read the word "click on xxx," this means left-click on your mouse. For the context menu, if referred to, right-click.

Change Node Increment

You might have noticed in the model drawing that the node numbering scheme has an increment of 5. CAEPIPE has a feature that allows you to specify a node increment. Select "Options menu > Node increment"...type 5 for value. Click on "OK".

r®* Caepipe : Layout (2) - [Untitled] - □ ×												
<u>File Edit View Opti</u>	ions <u>L</u> oads <u>M</u> isc	<u>W</u> indow <u>H</u> el										
Analysis												
	Units Ctrl+U >											
# Node Type	<u>F</u> ont		:t	Load	Data							
1 Title = Samp	Increase Font	Ctrl+Up	•									
2 10 From	Decrease Font	Ctrl+Dowr	<u> </u>		Anchor							
3	Node increment											
Node Increment	\times											
Increment 5												
OK Cancel												

After defining the above parameters, Save the model by clicking on the Save button.

HUH	™ Caepipe : Layout (2) - [Untitled] ×												
File	File Edit View Options Loads Misc Window Help												
	🗋 📂 🖃 📰 🛅 🚳 🍳												
#	Node	Typ <mark>Sa</mark>	ve×(mm)	DY (mm)	DZ (mm)	Matl	Sect	Load	Data				
1	Title =	Sample	e Problem	2									
2	10	From							Anchor				
3													

The "Save Model As" dialog is shown.

	×
Save in: CAEPIPE 💌 🗲 🛍	➡ 🎫
Sample	
File name: Sample2	Save
Save as type: Model files (*.mod)	Cancel

Type the File name as "Sample2" and press "Enter" to save the model.

First model the 10" Main line

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

Model information shows that the piping is connecting to a Nozzle of a Cylindrical Vessel with node number as 5. So, to account for the stiffness of the Nozzle protruding out of the Cylindrical Vessel, the nozzle portion is modeled as a pipe in this model. The junction of this Pipe (Nozzle) and the Shell is modeled as "Nozzle".

To change the Node number and to replace "Anchor" with "Nozzle", click on 10, press Backspace to erase 10, type 5. Press Tab to advance. Confirm the node number change when asked (by clicking on Yes, or simply pressing the Spacebar key on the keyboard).

Caepipe X
Do you want to change Node from "10" to "5" ?
<u>Yes</u> <u>N</u> o

To replace the "Anchor" with "Nozzle", highlight the data type "Anchor" at row #2 using mouse left button and then click on "Data" in the header in the Layout window. From the "Data types" dialog box shown, select the new data type as "Nozzle".



CAEPIPE will prompt as shown below. Press "Yes" to proceed.

Enter the Nozzle and Vessel parameters as shown below and press "OK".

Nozzle at node 5	×
Nozzle Tag) tank
Spherical Vessel Nozzle OD 273.05 (mm) Thk 9.271 (mm)	
Vessel OD 1800 (mm) Thk 9.271 (mm) L1 1500 (mm) L2 2100 (mm) Elastic modulus of vessel material 193950 (MPa)	Nozale Thickness L1 Nozale Nozale
Vessel axis direction X comp Y comp Z comp 1.0	Cylindrical Vess
Level Tag OK Cancel Displacements	Vessel OD

From the snap shots shown above, Lengths L1 and L2 on either side of the nozzle are the distances from the nozzle center line to the nearest location on vessel where the "ovalization deformation" of the vessel is stopped such as at a stiffener on the inner or outer surface of the vessel, or at the center of a

saddle support to the vessel or at the junction to the torispherical enclosure (also called the head) or at a tube sheet inside the vessel etc. Nozzle stiffness computed by CAEPIPE can be seen through Layout window > View > List > Nozzle Stiffnesses.

100		×						
File	Edit	View 0	Options Mise	c Window Help				
#			i i i i i i i i i i i i i i i i i i i 					
#	Node	Vess. Type	Radial (kp) (N/mm)	Circumferential (kmc) (Nm/deg)	Longitudinal (kml) (Nm/deg)			
1	5	СуГ	40981	4352.04	27373.07			

Now, press Enter to move the highlight to the next row (#3). Tab to the Type column. The next Node 10 is automatically assigned. Tab over to DX, type 200 (mm), Tab over to Material, press Enter to open the list of materials and select 312. Next Tab over to Section and press Enter. Select section 10 and press OK. Tab over to Load and press Enter, select L1 and click OK. Tab again to Data to input the flanges mating with the pipe and the equipment nozzle. Type "fl" to model flange and enter the data as shown below and press OK. CAEPIPE moves the highlight automatically to the next (new) row (#4).

Flange at node 10	?	×
Type Weld neck		•
Weight 6	9.799	(kg)
Gasket Diameter 2	97	(mm)
Bolt Circle Dia		(mm)
Allowable Pressure 4	D.O	(bar)
ANSI <u>L</u> ibrary	<u>E</u> urope	an Library
ОК	Ca	ncel

Tab to the type column. The next node 15 is automatically assigned. Node 15 has a LR (long radius) bend (in CAEPIPE, a bend node is defined always at the tangent intersection point, being such, this node does not exist on the physical bend). Tab to the Type column; type "ben" to insert a default LR bend. Tab to DX, type in 8080 (mm), press Enter. CAEPIPE automatically enters the material, section and load from the previous row and moves the highlight to the next new row.

1404	Caepipe	e : Layou	ıt (4) - [Sa	mple2.mod	(C:\Users\ve	enum\(OneDriv	ve\Des		×
File	Edit	View	Options L	oads Mise	: Window	Helj	p			
) 🖻	;	4	+		ô	Q			
#	Node	Туре	DX (mm)	DY (mm)	DZ (mm)	Matl	Sect	Load	Data	
1	Title =	Sample	e Problem	2			_	_		
2	5	From							Nozzle	
3	10		200			312	10	L1	Flange	
4	15	Bend	8080			312	10	L1		
5										

The following vertical bend (at node 20) can be modeled as before. Tab to Type (node 20 is automatically inserted), and type "ben" to insert a default LR bend, Tab again to DY, type 6550 (mm) and press Enter.

1-0-1	Caepipe	e : Layout	(5) - [Sam	ple2.mod ((:\Users\ver	um\O	neDrive	\Des	—	×
File	Edit	View C	ptions Lo	ads Misc	Window	Help				
) 🖻	;	4			<u>i</u>	A			
#	Node	Туре	DX (mm)	DY (mm)	DZ (mm)	Matl	Sect	Load	Data	
1	Title =	Sample	Problem 2			_				
2	5	From							Nozzle	
3	10		200			312	10	L1	Flange	
4	15	Bend	8080			312	10	L1		
5	20	Bend		6550		312	10	L1		
6										

This bend has an already existing hanger (called "User Hanger" in CAEPIPE) at the far end, referred to as node 20B, an internally generated bend node.

So, on the next row, type 20B for Node, Tab to Type, press "L" for Location, which spawns the available data types you can insert at this node. Pick "User Hanger" from the dialog.

Data Types		?	\times	User Hanger at node 20B	×
C Anchor	C <u>Hanger</u>	O <u>S</u> nubber		Tag	
C Branch SIF	C <u>H</u> armonic Load	◯ <u>S</u> pider		Spring rate 105	(N/mm)
O <u>C</u> onc. Mass	O Jacket End Cap	○ <u>T</u> hreaded J	oint	Number of hangers 1	
© Constant Support	C Limit Stop	C _ime Varyin	ig Load	Hanger load 13200	(N)
C <u>F</u> lange	C <u>N</u> ozzle	User Hange	en l	Load type : 💿 Hot 📿	Cold
○ <u>F</u> orce	C <u>R</u> estraint	◯ <u>U</u> ser SIF		Connected to	
C Eorce Sp. Load	C <u>R</u> od Hanger	\bigcirc <u>W</u> eld		🗌 Hange	r below
⊖ <u>G</u> uide	O Skewed Restrain	t 🔘 <u>G</u> eneric Su	pport	Level Tag	-
OK Cance	1			OK Cancel	

Enter its properties as shown. Click on OK.

Next, the line moves in the Z direction to the flange node 25. Pressing Tab on the new row generates node 25 for you. Tab to DZ, type 4240, (click in Data column) or press Ctrl+Shift+D to move cursor to Data column. Type "fl" to open the Flange Data type dialog. Enter the details shown below and press OK.

Tutorial for	r Modelina	and	Results	Review	– Problem	2
i utoriar ioi	mouching	and	Results			-

Flange at node 25	?	×
Type Weld neck		•
Weight 6	9.977	(kg)
Gasket Diameter 2	97	(mm)
Bolt Circle Dia		(mm)
Allowable Pressure 4	D	(bar)
ANSI <u>L</u> ibrary	<u>E</u> uropea	an Library
ОК	Ca	ncel

A valve is placed next from Node 25 to Node 30, where another mating flange is located. Pressing Tab on the new row generates node 30. Tab to the Type column; type "v" to insert a "Valve" and enter the data as shown below and press OK.

Valve from 25 to 30	?	×
Weight 459.23	(kg)	
Length 622.3	(mm)	
Thickness X 3.00		
Insulation weight X 1.75		
Additional weight	(kg)	
Valve Type	•	
Offsets of additional weight from	i valve	center
DX (mm) DY (mm) DZ (m	nm)	
OK Cancel Libra	ary	

Tab to Data and type "fl" to enter a "flange". Type "fl" to open the Flange Data type dialog. Enter the details shown below and press OK.

Flange at node 30	?	×
Type Weld neck		•
Weight 6	9.799	(kg)
Gasket Diameter 2	97	(mm)
Bolt Circle Dia		(mm)
Allowable Pressure 4	0.0	(bar)
ANSI Library	Europe	an Library
ОК	Ca	ncel

H	Caepipe	e:Layout (8	3) - [Sampl	le2.mod (C:\	Users\venu	m\One	Drive\[)es	-		×
File	Edit	View Opt	ions Load	ls Misc	Window H	lelp					
#	Node	Туре	DX (mm)	DY (mm)	DZ (mm)	Matl	Sect	Load	Data		
1	Title =	Sample Pi	roblem 2	_	_	_	_	_			
2	5	From							Nozzle	;	
3	10		200			312	10	L1	Flange	;	
4	15	Bend	8080			312	10	L1			
5	20	Bend		6550		312	10	L1			
6	20B	Location							Userh	anger	
7	25				4240	312	10	L1	Flange	,	
8	30	Valve			622.3	312	10	L1	Flange	;	
9											

Next model a pipe element till node 35 (welding tee). Press Tab for node 35, Tab to DZ, type 300, (click in Data column) or press Ctrl+Shift+D to move cursor to Data column. Type "br" (or right-click in Data, select Branch SIF) to open the Tee types Data type dialog. Select Welding Tee from the dropdown box. Click on OK (or press Enter).



Branch SIF at node 35						
Туре	Welding tee	•				
No. of f ends lo	Welding tee Reinforced fabricated tee Unreinforced fabricated tee Extruded welding tee Sweepolet (Welded-in contour insert)					

H	Caepipe	e:Layout (9) - (Sampl	e2.mod (C:\	Users\venu	m\One	Drive\[)es	- 0	×
File	Edit	View Opt	tions Load	ls Misc	Window H	Help				
#	Node	Туре	DX (mm)	DY (mm)	DZ (mm)	Matl	Sect	Load	Data	
2	5	From							Nozzle	
3	10		200			312	10	L1	Flange	
4	15	Bend	8080			312	10	L1		
5	20	Bend		6550		312	10	L1		
6	20B	Location							User hanger	
7	25				4240	312	10	L1	Flange	
8	30	Valve			622.3	312	10	L1	Flange	
9	35				300	312	10	L1	Welding tee	
10										

Next model a pipe element till node 40. Press Tab for node 40, Tab to DZ, type 300 and press Enter.

The next element is a 10x8 concentric reducer. Here is how to model it. Tab for the next node # (45), type "red" for Reducer in the Type column. CAEPIPE displays the Reducer dialog with the current section properties.

Reducer from 40 to 45 X								
OD1 273.05	Thk1 9.271	(mm)	Section <u>1</u>					
0D2	Thk2	(mm)	Section 2					
Con	e <u>a</u> ngle	(deg)						
ОК	Cancel							

Click on "Section 2" button to select the following section, in this case, the 8" section. After placing the highlight on the 8" section, press Enter (or click on OK).

Select Section 2 ×									
Name	Nominal Diameter	Nominal Sch OI Diameter (m		Thk (mm)					
6	6''	STD	168.27	7.112					
8	8''	STD	219.07	8.1788					
10	10''	STD	273.05	9.271					
OK	OK Cancel								

You are back at the Reducer dialog.



Click on OK to finish inserting the reducer. On the layout screen, type 530 for DZ and press Enter, at which point CAEPIPE wants you to confirm the section change. Click on Yes.

Caepipe X										
Do you want to change section ? Yes										
Select Section X										
Name	Nominal Diameter	Sch	OD (mm)	Thk (mm)						
6	6''	STD	168.27	7.112						
8	8''	STD	219.07	8.1788						
10	10 10" STD 273.05 9.271									
OK Cancel										

Then select 8 as the new section from here on. Press Enter to move to next row.

1-0-1	*I* Caepipe : Layout (11) - [Sample2.mod (C:\Users\venum\OneDrive\De $ \Box$ $ imes$											
File	Edit	View Opt	ions Load	ls Misc \	Window H	lelp						
#	Node	Туре	DX (mm)	DY (mm)	DZ (mm)	Matl	Sect	Load	Data			
4	15	Bend	8080			312	10	L1				
5	20	Bend		6550		312	10	L1				
6	20B	Location							Userh	anger		
7	25				4240	312	10	L1	Flange	9		
8	30	Valve			622.3	312	10	L1	Flange	9		
9	35				300	312	10	L1	Weldir	ng tee		
10	40				300	312	10	L1				
11	45	Reducer			530	312	8	L1				
12											1	

The last element here is an 8" pipe that ends at node 50. As before, press Tab for Node 50, type 2100 for length in the same direction. Press Ctrl+Shift+D to go to Data and press A to insert a rigid anchor (note that CAEPIPE inserts the correct old material, new section and old load for this row).

*** Caepipe : Layout (12) - [Sample2.mod (C:\Users\venum\OneDrive\De 🛛 🗙												
File	Edit	View Opt	ions Load	ls Misc \	Window H	lelp						
#	Node	Туре	DX (mm)	DY (mm)	DZ (mm)	Matl	Sect	Load	Data			
5	20	Bend		6550		312	10	L1				
6	20B	Location							User hanger			
7	25				4240	312	10	L1	Flange			
8	30	Valve			622.3	312	10	L1	Flange			
9	35				300	312	10	L1	Welding tee			
10	40				300	312	10	L1				
11	45	Reducer			530	312	8	L1				
12	50				2100	312	8	L1	Anchor			
13												

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



Node 50 is connecting to a Side Suction Nozzle of an API 610 Horizontal Pump. To model this, select the option "Pumps" through Layout Window > Misc. Double click on an empty row and enter the

values as shown below. Once modeled, CAEPIPE will automatically perform the Pump Qualification and shows the report in Results.

HIR	Caepipe	e:Layout (1	12) - [Sam	ple2.m	od (C:\Users\venur	n\OneDrive\De	sktop\CAEPIPI	E —		×
<u>F</u> ile	<u>E</u> dit	<u>V</u> iew <u>O</u> pt	ions <u>L</u> oa	ds <u>M</u>	isc <u>W</u> indow <u>H</u> e	lp				
	1 🚅		z 1		<u>C</u> oordinates			Ctrl+Shift+C		
					Element <u>t</u> ypes			Ctrl+Shift+T		
#	Node	Туре	DX (mm)	С	<u>D</u> ata types			Ctrl+Shift+D		
6	20B	Location			Check <u>B</u> ends					
7	25				Check Connect	tions				
8	30	Valve			Check Branch S	SIF				
9	35				<u>M</u> aterials		(Ctrl+Shift+M		
10	40			-	Sections			Ctrl+Shift+S		
11	45	Reducer			<u>L</u> oads			Ctrl+Shift+L		
12	50			-	Beam Materials	;				
13					Beam Sections					
<u> </u>				-	Beam Loads					
				+					n 📃	
-				+ L	Pumps				J	
-				-	Compressors					
-				-	Turbines					
					Spectrums					
				+	Force spectrum	15				
Purr	ıp#1									\times
_				~ .		~				
De	escription	Pump		•	Horizontal (API 610)	Vertical	inline (API 610	IJ O ANSI/H	19.6.2	
	Dura				_	Pump size				
	Fump	type				Fump size	1			
M	laterial g	roup			-	Mounting type				-
	т									
	i empera	iture		,cj						
					-					
	Suction	Node 50		Locatio	on C Top		Side	○ End		
Di	scharge	Node		Locatio	on 🔍 Top	- C	Side	C End		
		,								
S	haft axis	direction -								
r	X comp		omp		mp					
	1.000			I						
	oostien -	of the center	of pump							
	V X	i the center Y	or pump-	Z						
	8280	655	50	8520) (mm)					
		,								
	UK	Cano	el							
	UN.									

Now the 6" branch

On the next row (#13), type 35 for Node, Tab to the Type column, type 'f' (for "From", since we are beginning a new branch from an existing Node 35), press Enter. In the next row (#14), type "100" in the Node column to clearly identify the new branch. Tab to DX and enter -1400. CAEPIPE inserts the previous material, and automatically detects the new branch and asks if you want to change section.

Саеріре	×
Do you want to change section	1?
Yes <u>N</u> o	

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

Select Section ×									
Name	Nominal Diameter	Sch	OD (mm)	Thk (mm)					
6	6''	STD	168.27	7.112					
8	8''	STD	219.07	8.1788					
10	10''	STD	273.05	9.271					
OK Cancel									

Select the 6" section by double clicking on it. The section (6) is entered in the Section column in the Layout window. The load is again automatically inserted from the previous load. Lastly, type "fl" in the Data column and hit enter to create a mating Flange. This will bring up the Flange type dialog box.

Flange at node 100	?	×
Type Weld neck		-
Weight 23	.596	(kg)
Gasket Diameter 19	2.02	(mm)
Bolt Circle Dia		(mm)
Allowable Pressure 40		(bar)
ANSI Library	<u>E</u> uropea	n Library
ОК	Car	ncel

Type in 23.596 for Weight, 192.02 for Gasket Diameter, 40 for Allowable Pressure and click Ok.

The graphics window will look like this. For better view, rotate the model by clicking the icon of and scrolling the horizontal scroll bar towards left using the mouse left button or through keyboard left arrow

key. Alternatively, you can specify the viewpoint as shown below by selecting the icon from the graphics frame.



In the next row (#15), Tab to the Type column. The next Node 105 is automatically assigned. In the Type column, type 'v' (for Valve). This brings up the Valve dialog box. In the Valve dialog box, type 151.56 for Weight, 403.23 for Length, 3.00 for Thickness, and 1.75 for Insulation weight. Then press Enter or click on OK to input the valve. Press Enter again.

Valve from 100 to 105 \qquad ? \qquad \qquad								
Weight 151.56 (kg)								
Length 403.23 (mm)								
Thickness X 3.00								
Insulation weight X 1.75								
Additional weight (kg)								
Valve Type								
Offsets of additional weight from valve center								
DX (mm) DY (mm) DZ (mm)								
OK Cancel Library								

You will see that the DX, Material, Section and Load information is automatically input in the Layout window.

You can now copy the flange along with data from Node 100 and paste it at Node 105. To perform this, highlight row # 14 and press Ctrl+C. Then move the cursor to Data column of row #15 and press Ctrl+V to paste the flange. Press Enter to move to the next row.

-0-1	Caepipe	e:Layout (1	15) - [Samp	ole2.mod (C	\Users\venı	um∖On	eDrive\	Desktor	>\CAEPIPE	—		×
File	Edit	View Opt	ions Load	ls Misc \	Window H	lelp						
#	Node	Туре	DX (mm)	DY (mm)	DZ (mm)	Matl	Sect	Load	Data			
4	15	Bend	8080			312	10	L1				
5	20	Bend		6550		312	10	L1				
6	20B	Location							User hanger			
7	25				4240	312	10	L1	Flange			
8	30	Valve			622.3	312	10	L1	Flange			
9	35				300	312	10	L1	Welding tee			
10	40				300	312	10	L1				
11	45	Reducer			530	312	8	L1				
12	50				2100	312	8	L1	Anchor			
13	35	From										
14	100		-1400			312	6	L1	Flange			
15	105	Valve	-403.23			312	6	L1	Flange			
16										'		

In the next row (#16), Tab to the Type column, type "ben" to create a Long Radius Bend and then Tab to the DX column. The default LR Bend is automatically input when you Tab over. In the DX column type –255 and hit Enter. The Material, Section and Load information and is automatically input. As the Temperature and Pressure is changing from this element, change the Load from L1 to L2 by right clicking on the "L1" in the Load field.

-0-1	Caepipe	e:Layout (1	16) - [Samp	ple2.mod (C:	\Users\venı	um\On	eDrive\	Desktop	o\CAEPIPE	—		×
<u>F</u> ile	<u>E</u> dit	<u>V</u> iew <u>O</u> pt	ions <u>L</u> oad	ls <u>M</u> isc <u>\</u>	<u>W</u> indow <u>H</u>	<u>l</u> elp						
#	Node	Туре	DX (mm)	DY (mm)	DZ (mm)	Matl	Sect	Load	Data			
13	35	From										
14	100		-1400			312	6	L1	Flange			
15	105	Valve	-403.23			312	6	L1	Flange			
16	110	Bend	-255			312	6	L1				
17									Select Load			
									Edit Load			
									List Loads			

This will bring up a small Context menu from which you will choose Select Load. This will bring up the Select Load window. Highlight L2 and click Ok. Press Enter to complete inputting Node 110 at row (#16).

Select Load										
Name	T1 (C)	P1 (bar)	Specific gravity	Addialog.Wgt. (kg/m)	Wind Load					
L1	185	10.0	0.1							
L2	260	32.0	0.1							
OK Cancel										

In the next row (#17), create another Long Radius Bend just like the one in row (#17), except change the DX -255 to DY 2950 and press Enter. Your layout window should look like this.

HIH	Caepipe	e:Layout (1	17) - [Samp	ole2.mod (C:	\Users\venu	um\On	eDrive\	Desktor	>\CAEPIPE	—		×	
<u>F</u> ile	<u>E</u> dit	<u>V</u> iew <u>O</u> pt	ions <u>L</u> oad	ls <u>M</u> isc <u>\</u>	<u>W</u> indow <u>H</u>	<u>l</u> elp							
#	Node	Туре	DX (mm)	DY (mm)	DZ (mm)	Matl	Sect	Load	Data				
8	30	Valve			622.3	312	10	L1	Flange				
9	35				300	312	10	L1	Welding tee				
10	40				300	312	10	L1					
11	45	Reducer			530	312	8	L1					
12	50				2100	312	8	L1	Anchor				
13	35	From											
14	100		-1400			312	6	L1	Flange	П			
15	105	Valve	-403.23			312	6	L1	Flange				
16	110	Bend	-255			312	6	L2					
17	115	Bend		2950		312	6	L2					
18										'			

Start the next row (#18) by typing 115B in the Node column. Tab to the Type column and type "L" to specify a Location type. This will automatically open the Data Types dialog box. Select Hanger.

Data Types		? >	<	Hanger at node 11 ? $ imes$
C <u>A</u> nchor C <u>B</u> ranch SIF C <u>C</u> onc. Mass	 Hanger Harmonic Load Jacket End Cap 	 <u>S</u>nubber <u>S</u>pider <u>I</u>hreaded Joint 	:	Tag Type Grinnell 💌
C <u>C</u> onstant Support C <u>F</u> lange C <u>F</u> orce	C Limit Stop C <u>N</u> ozzle C <u>R</u> estraint	C Time Varying L C User Hanger C User SIF	oad	Load Variation 25 (%)
C Eorce Sp. Load C <u>G</u> uide	C <u>R</u> od Hanger C <u>S</u> kewed Restrain	○ <u>W</u> eld t ○ <u>G</u> eneric Suppo	rt	Connected to
OK Cance	1			OK Cancel

Another dialog box will appear with specific Hanger type input options. Keep the default settings and click OK.

At Node 120 on the next row (#19), Tab to the Type column and input a default LR Bend by typing "ben". Tab to the DX column and input -4290 and press Enter.

-0-1	Caepipe	e:Layout (1	19) - [Samp	ole2.mod (C	\Users\venu	um\On	eDrive\	Deskto	o\CAEPIPE	—		×	
File	Edit	View Opt	ions Load	ls Misc \	Window H	lelp							
#	Node	Туре	DX (mm)	DY (mm)	DZ (mm)	Matl	Sect	Load	Data				
10	40				300	312	10	L1					
11	45	Reducer			530	312	8	L1					
12	50				2100	312	8	L1	Anchor				
13	35	From											
14	100		-1400			312	6	L1	Flange				
15	105	Valve	-403.23			312	6	L1	Flange				
16	110	Bend	-255			312	6	L2					
17	115	Bend		2950		312	6	L2					
18	115B	Location							Hanger				
19	120	Bend	-4290			312	6	L2					
20													

On the next row (#20), Tab over to the DX column and input -910, then in DY input -3660. Create an Anchor in the Data column by either pressing Ctrl+Shift+D or Tabbing to the Data column and typing "a". Press Enter and you are done with Layout window input.

1=0=1	•III Caepipe : Layout (20) - [Sample2.mod (C:\Users\venum\OneDrive\Desktop\CAEPIPE												
File	Edit	View Opt	ions Load	ls Misc \	Window H	lelp							
#	Node	Туре	DX (mm)	DY (mm)	DZ (mm)	Matl	Sect	Load	Data				
11	45	Reducer			530	312	8	L1					
12	50				2100	312	8	L1	Anchor				
13	35	From											
14	100		-1400			312	6	L1	Flange				
15	105	Valve	-403.23			312	6	L1	Flange				
16	110	Bend	-255			312	6	L2					
17	115	Bend		2950		312	6	L2					
18	115B	Location							Hanger				
19	120	Bend	-4290			312	6	L2					
20	125		-910	-3600		312	6	L2	Anchor				
21										1			

Define "Static seismic" through Layout Window > Loads > Static Seismic. Enter the value as shown below.

Static Seismic Load (g's)	×
ASCE/SEI 7-16 Seismic	
🔲 🔲 Use ASCE for Static Seismic g's	
Structure occupancy category	III -
Site Class	D 👻
Mapped MCE Spectral Acceleration at short period S(S)	0.000
Component Height in Structure (z)	0 (mm)
Structure Height (h)	0 (mm)
Component Amplication Factor, a(p)	2.500
Component Response Modification Factor, R(p)	12.000
Importance Factor, I(p)	1.000
All. Stress Design Factor, ASD(a)	0.700
X Y 0.3 0.2	Z 0.3
Load Combination SRSS Absolute sum	
OK Cancel	Reset

Let us define "Wind Load" profile in +X direction through Layout Window > Loads > Wind 1 and enter the data as shown below and press OK. The maximum elevation of 20m is chosen so that the entire piping system experiences wind load.

Wind Load 1	1	×
Shape factor	0.60	Select Wind Code
	10.00	
X comp	Ycomp	Z comp
1		
	1	
	0.1.5	— C Pressure vs Elevation
Elevation	(kmh)	 Velocity vs Elevation
0	100	
20	100	Units
		Elevation (m)
		Pressure (kg/cm2)
		Velocity (kmh) 🔻
Get Directio	on from LCS of	
Axial	Shear y	Shear z
I OK I	Cancel	Delete
	Cancer	
Wind Load 2		×
Wind Load 2		×
Wind Load 2 Shape factor	0.60	Select Wind Code
Wind Load 2 Shape factor	0.60	X Select Wind Code
Wind Load 2 Shape factor Direction X comp	0.60	Select Wind Code
Wind Load 2 Shape factor Direction X comp	0.60	X Select Wind Code Z comp 1.000
Wind Load 2 Shape factor Direction X comp	0.60	X Select Wind Code
Wind Load 2 Shape factor Direction X comp	0.60	X Select Wind Code Z comp 1.000 C Pressure vs Elevation
Wind Load 2 Shape factor Direction X comp Elevation (m)	0.60 Y comp Velocity (kmh)	Select Wind Code Z comp 1.000 Pressure vs Elevation Velocity vs Elevation
Wind Load 2 Shape factor Direction X comp Elevation (m) 0	0.60 Y comp Velocity (kmh) 100	X Select Wind Code Z comp 1.000 C Pressure vs Elevation Velocity vs Elevation
Wind Load 2 Shape factor Direction × comp Elevation (m) 0 20	Velocity (kmh) 100	Select Wind Code Z comp 1.000 Pressure vs Elevation Velocity vs Elevation Units
Wind Load 2 Shape factor Direction X comp Elevation (m) 0 20	0.60 Y comp Velocity (kmh) 100	Select Wind Code Z comp 1.000 C Pressure vs Elevation Velocity vs Elevation Units Elevation [m]
Wind Load 2 Shape factor Direction X comp Elevation (m) 0 20	0.60 Y comp Velocity (kmh) 100 100	Select Wind Code Z comp 1.000 Pressure vs Elevation Velocity vs Elevation Units Elevation (m) Pressure (ka/cm2)
Wind Load 2 Shape factor Direction X comp Elevation (m) 0 20	Velocity (kmh) 100	Select Wind Code Z comp 1.000 O Pressure vs Elevation O Velocity vs Elevation Units Elevation (m) Pressure (kg/cm2)
Wind Load 2 Shape factor Direction X comp Elevation (m) 0 20	Velocity (kmh) 100	Select Wind Code Z comp 1.000 Pressure vs Elevation Velocity vs Elevation Units Elevation (m) Pressure (kg/cm2) Velocity (kmh)
Wind Load 2 Shape factor Direction X comp Elevation (m) 0 20	0.60 Y comp Velocity (kmh) 100	Select Wind Code Z comp 1.000 C Pressure vs Elevation Velocity vs Elevation Units Elevation (m) Pressure (kg/cm2) Velocity (kmh)
Wind Load 2 Shape factor Direction X comp Elevation (m) 0 20	0.60 Y comp Velocity (kmh) 100 100	Select Wind Code Z comp 1.000 Pressure vs Elevation Velocity vs Elevation Units Elevation (m) Pressure (kg/cm2) Velocity (kmh)
Wind Load 2 Shape factor Direction X comp Elevation (m) 0 20 Get Direction	Velocity (kmh) 100 100	Select Wind Code Z comp 1.000 Pressure vs Elevation Velocity vs Elevation Units Elevation (m) Pressure (kg/cm2) Velocity (kmh) CE
Wind Load 2 Shape factor Direction X comp Elevation (m) 0 20 Get Direction Axial	Velocity (kmh) 100 100 from LCS of (Shear y	Select Wind Code Z comp 1.000 Pressure vs Elevation Velocity vs Elevation Units Elevation (kg/cm2) Velocity (kmh) CE Shear z
Wind Load 2 Shape factor Direction X comp Elevation (m) 0 20 Comp Get Direction Axial	Velocity (kmh) 100 100 from LCS of (Shear y	Select Wind Code Z comp 1.000 C Pressure vs Elevation Velocity vs Elevation Units Elevation (m) Pressure (kg/cm2) Velocity (kmh) CE Shear z Deleta

Similarly, define "Wind Load" profile in +Z direction through Layout Window > Loads > Wind 2 and enter the data as shown below and press OK.

Assign the Wind Load defined above to the stress layout through Layout window > Misc > Loads and then double click on the Loads "L1" and select the check box "Wind load 1" and "Wind load 2" as shown below.

Load # 1		× Load # 2	<
Load name		Load name L2	
Temperature 1 185 (i	C) Pressure 1 10.0 (bar)	Temperature 1 260 (C) Pressure 1 32.0 (bar)	
Temperature 2	C) Pressure 2 (bar)	Temperature 2 (C) Pressure 2 (bar)	
Temperature 3	c) Pressure 3 (bar)	Temperature 3 (C) Pressure 3 (bar)	
Temperature 4 (1) Pressure 4 (bar)	Temperature 4 (C) Pressure 4 (bar)	
Temperature 5 (0	.) Pressure 5 (bar)	Temperature 5 (C) Pressure 5 (bar)	
Temperature 6 (C	;) Pressure 6 (bar)	Temperature 6 (C) Pressure 6 (bar)	
Temperature 7 (C	;) Pressure 7 (bar)	Temperature 7 (C) Pressure 7 (bar)	
Temperature 8 (C	.) Pressure 8 (bar)	Temperature 8 (C) Pressure 8 (bar)	
Temperature 9 (C	;) Pressure 9 (bar)	Temperature 9 (C) Pressure 9 (bar)	
Temperature 10 (C) Pressure 10 (bar)	Temperature 10 (C) Pressure 10 (bar)	
- Design		Design	
Temperature 230 (0	i) Pressure 15.0 (bar)	Temperature 300 (C) Pressure 48.0 (bar)	
Spec. gravity 0.1	Add. weight (kg/m)	Spec. gravity 0.1 Add. weight (kg/m)	
☑ Wind load 1 ☑ Wind load	12 🔲 Wind load 3 🔲 Wind load 4	4 🔽 Wind load 1 🔽 Wind load 2 🗔 Wind load 3 🗔 Wind load 4	
OK Cancel	Specific gravity is with respect to water	h OK Cancel Specific gravity is with respect to water	

Similarly, select the check boxes "Wind load 1" and "Wind load 2" for "L2".

5. Select Load Cases for Analysis

Select Loads cases from the Loads menu.

1-0-1	Caepipe	e : Layou	t (20) -	[Sample	≘2.mod ((C:\Users\ve	enum\Or	neDrive\	Desktor	o\CAEPIPE	_	×
<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		oad cas	ies (4)		ک ر				
#	Node	Туре	DX (Ť,	Static sei	ismic 2		Sect	Load	Data		
18	115B	Locatio	on		Static sei	ismic 3				Hanger	-	
19	120	Bend	-429	~ 1	Nind 1			6	L2			
20	125		-910	~ 1	Nind 2			6	L2	Anchor		
21				1	Wind 3							

The Load cases dialog is shown.

Load cases (8)	×						
☑ Sustained (W+P)	▼ Static seismic 1 (g's)						
🔽 Empty Weight (W)	✓ Wind						
🔽 Expansion (T1)	🔽 Wind 2						
Operating (W+P1+T1)	🔽 Modal analysis						
🔲 Design (W+PD+TD)							
OK Cancel	All None						

By default, Sustained (W+P), Empty Weight (W), Expansion (T1) and Operating (W+P1+T1) load cases are already selected. Add Static Seismic (g's), Wind, Wind 2, and the Modal analysis Load cases by clicking on the checkbox next to it. Design (W+PD+TD) load cases when selected for the Analysis, CAEPIPE will compute and show results for Displacements, Element Forces & Moments, Support Loads and Support Load Summary. Design load cases does not include Stress Calculations, Rotating Equipment Qualifications and Flange Equivalent Pressure Calculations. 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.





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.



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

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

-0-1	Caepipe	: Ancl	hors (2) -	[Sample2	.mod (C:\l	Jsers\venum [\]	OneDrive\D	esktop\CAEP	PE_	Tuto	rials\T	utoria	s\00.	–		×
File	Edit	View	Options	Misc V	Vindow	Help										
-#																
#	Node	Tag	KX/kx	KY/ky	KZ/kz	KXX/kxx	KYY/kyy	KZZ/kzz		F	telea:	ses			Level	Tag
			(N/mm)	(N/mm)	(N/mm)	(Nm/deg)	(Nm/deg)	(Nm/deg)	×	Y ;	z ××	YY	ZZ	Anchor in		
1	50		Rigid	Rigid	Rigid	Rigid	Rigid	Rigid						GCS		
2	125		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:

H	Caepipe	e : Bends	(5) - [S	ample2.	mod (C:	\Users\ve	enum\One	Drive\Des	sktop\CAE	PIPE_Tu	itorials\Tut	orials\00	1			\times
File	Edit	View (Options	Misc	Windov	v Help										
-#																
#	Bend Node	Radius (mm)	s Rad. Type	Thk (mm)	Bend Matl	Flex.F In Pln	Flex.F Out Pln	In Pin SIF	Out Pln SIF	Axial SIF	Torsion SIF	lnt. Node	Angle (deg)	lnt. Node	Angle (deg)	
1	15	381	Long													
2	20	381	Long													
3	110	228.6	Long													
4	115	228.6	Long													
5	120	228.6	Long													

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.													
101	■■ Caepipe : Layout (20) - [Sample2.mod (C:\Users\venum\OneDrive\Desktop\CAEPIPE — 🛛 🗙													
File	File Edit View Options Loads Misc Window Help													
#	Node	Typ Save	DX (mm)	DY (mm)	DZ (mm)	Matl	Sect	Load	Data					
11	45	Reducer			530	312	8	L1		-				
12	50				2100	312	8	L1	Anchor					
13	35	From												
14	100		-1400			312	6	L1	Flange					
15	105	Valve	-403.23			312	6	L1	Flange					
16	110	Bend	-255			312	6	L2						
17	115	Bend		2950		312	6	L2						
18	115B	Location							Hanger					
19	120	Bend	-4290			312	6	L2						
20	125		-910	-3600		312	6	L2	Anchor					
21										1				

6. Analyze

Click on Analyze under the File menu.

I Caepipe : Layout (23) - [Sample2.mod (C:\Users\venum\OneDrive\Desktop\CAEPIPE								\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>	<u>(indow</u> <u>H</u>	<u>l</u> elp						
	<u>N</u> ew	Ctrl+N	1 📾	a 🔿)					
	<u>O</u> pen	Ctrl+0								
	Recent <u>M</u> odels	>	Z (mm)	Matl	Sect	Load	Data			
	Open <u>R</u> esults		73.05	312	10	L1				
	Merge	Ctrl+M	5.9499	312	10	L1				
	<u>C</u> lose		30	312	8	L1				
	Save	Ctrl+S	100	312	8	L1	Anchor			
	- Save As									
	Export to MBF			312	6	L1				
	Export to 3D Plant Design			312	6	L1	Flange			
_	Export to PCF			312	6	L1	Flange	П		
	Print Model	Ctrl+P		312	6	L2				
				312	6	L2				
	Analyze	F12	J				Hanger			
	<u>Q</u> A Block			312	6	L2				
	Revision Record			312	6	L2	Anchor			
	E <u>x</u> it	Alt+F4								
. I	- I I I									

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

Analyze							
Original bandwidth = 36 New bandwidth = 18 Average bandwidth =	Number of equations = 144 Stiffness matrix size = 3312 = 26 K						
Do you want to see the results ?							
Time = 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.



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 icon (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 cannot 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.

Caepipe : B31.1 (2022) Code compliance (Sorted stresses) - [Sample2.res (C:\Us 🛛 🗙													×	
File	Result	s View	Option	ns W	indow	Help								
4	3 -			1	<u>ð</u> Q] 🔶		S	^{\$} ∕₄				
		Susta	ined			Expan	sion			Occa	sional			
#	Node	SL (MPa)	SH (MPa)	SL SH	Node	SE (MPa)	SA (MPa)	<u>SE</u> SA	Node	SO (MPa)	1.2SH (MPa)	<u>SO</u> 1.2SH		
1	115B	35.40	91.70	0.39	110A	52.93	270.8	0.20	50	78.98	122.1	0.65		
2	110B	31.36	91.70	0.34	110B	46.93	261.1	0.18	125	50.75	110.0	0.46		
3	50	31.82	101.7	0.31	115B	41.80	256.9	0.16	110B	41.77	110.0	0.38		
4	125	26.94	91.70	0.29	125	38.98	265.6	0.15	115B	41.23	110.0	0.37		
5	120A	26.51	91.70	0.29	115A	36.24	267.9	0.14	35	45.45	122.1	0.37		
6	35	28.55	101.7	0.28	120A	33.61	266.0	0.13	120A	39.11	110.0	0.36		
7	120B	25.12	91.70	0.27	50	34.29	273.4	0.13	20B	41.69	122.1	0.34		
8	115A	24.64	91.70	0.27	35	29.54	276.7	0.11	120B	36.83	110.0	0.33		
9	25	25.82	101.7	0.25	120B	27.11	267.4	0.10	45	40.32	122.1	0.33	1	
10	110A	21.86	91.70	0.24	15A	29.96	296.2	0.10	110A	34.34	110.0	0.31		
11	30	24.25	101.7	0.24	15B	26.86	290.7	0.09	65	35.03	122.1	0.29		
12	55	24.02	101.7	0.24	105	24.17	272.5	0.09	115A	29.92	110.0	0.27		
13	105	20.19	91.70	0.22	100	22.41	293.9	0.08	25	33.10	122.1	0.27		
14	45	21.99	101.7	0.22	20B	20.32	283.5	0.07	105	29.12	110.0	0.26		
15	20B	21.97	101.7	0.22	65	18.19	284.1	0.06	15B	32.20	122.1	0.26		
16	65	21.37	101.7	0.21	45	16.86	283.4	0.06	30	31.59	122.1	0.26		
17	40	20.90	101.7	0.21	20A	17.41	292.9	0.06	55	31.39	122.1	0.26		
18	60	19.46	101.7	0.19	5	6.254	297.5	0.02	20A	30.61	122.1	0.25		
19	15B	14.86	101.7	0.15	55	5.669	281.4	0.02	15A	28.51	122.1	0.23		
20	20A	12.70	101.7	0.12	10	5.974	297.2	0.02	40	27.15	122.1	0.22		
0.1	1.00	44 70	101 7	0.40	20	E 000	001.1	0.00	00	0400	1001	0.00		

S

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 columns or click in a particular column.



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

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



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

Thresholds	×
Stress threshold	(MPa)
Ratio threshold 0.5	
OK Cancel	

Code compliance

Element stresses and stress ratios calculated according to the selected piping code are shown under Code compliance. Design pressure and CAEPIPE computed Allowable pressure are shown in 2nd column.

Caepipe : B31.1 (2022) Code Compliance - [Sample2.res (C:\Users\venu — 🗆													×
File	Result	s View	Optio	ns Win	dow	Help							Clos
4	3 🖿			tôt] 🔶		`				
		Press.	Su	ustained		Ex	pansior	1	0	ccasion	al		
#	Node	Allow. (bar)	SL (MPa)	SH (MPa)	SL SH	SE (MPa)	SA (MPa)	SE SA	SO (MPa)	1.2SH (MPa)	<u>SO</u> 1.2SH		
1	5 10	15.0 66.6	8.182 8.529	101.7 101.7	0.08 0.08	6.254 5.974	297.5 297.2	0.02 0.02	17.36 16.74	122.1 122.1	0.14 0.14		
2	10 15A	15.0 66.6	8.529 8.493	101.7 101.7	0.08 0.08	5.974 12.66	297.2 297.2	0.02 0.04	16.71 19.28	122.1 122.1	0.14 0.16		
3	15A 15B	15.0 66.6	9.538 14.86	101.7 101.7	0.09 0.15	29.96 26.86	296.2 290.7	0.10 0.09	28.51 32.20	122.1 122.1	0.23 0.26		
4	15B 20A	15.0 66.6	11.44 10.98	101.7 101.7	0.11 0.11	12.51 9.751	294.2 294.7	0.04 0.03	21.06 20.84	122.1 122.1	0.17 0.17		
5	20A 20B	15.0 66.6	12.70 21.97	101.7 101.7	0.12 0.22	17.41 20.32	292.9 283.5	0.06 0.07	30.61 41.69	122.1 122.1	0.25 0.34		
6	20B 25	15.0 66.6	14.96 25.82	101.7 101.7	0.15 0.25	9.512 4.866	290.6 279.5	0.03 0.02	25.96 33.10	122.1 122.1	0.21 0.27		
7	30 55	15.0 66.6	24.25 24.02	101.7 101.7	0.24 0.24	5.628 5.669	281.1 281.4	0.02 0.02	31.59 31.39	122.1 122.1	0.26 0.26		
8	55 35	15.0 66.6	24.02 21.65	101.7 101.7	0.24 0.21	5.669 10.42	281.4 283.8	0.02 0.04	31.39 30.52	122.1 122.1	0.26 0.25		
9	35 co	15.0 cc.c	21.59 10.40	101.7	0.21	2.724	283.8	0.01	26.33	122.1	0.22		

Hanger report

The hanger report is shown below.

*** Caepipe : Hanger Report - [Sample2.res (C:\Users\venum\OneDrive\Deskt D X														
File	File Results View Options Window Help													
Ē														
#	# Node No Type Figure Size rate travel travel load load Var of No. (N/mm) (mm) (N) (N) (%)													
1	20B	1	User hanger			105	2.153	25.006	13200	13426	1			
2 115B 1 Grinnell B-268 10 45.533 16.882 15.847 5115 5884 15														

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 (also referred to as "Hanger 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 × Hanger travel / Hot load) × 100

Flange report

The Flange report in the CAEPIPE results window shows the loads at each flange location for the operating case (W+P1+T1).

The Flange Pressure is an "equivalent pressure" calculated from the actual pressure in the piping element, the bending moment and the axial force on the flange for the first operating case (W+P1+T1).

™ Caepipe : Flange Report - [Sample2.res (C:\Users\venum\OneDrive\Deskto – □ ×													
File	Result	s View	Options	Window H	Help								
4													
#	Node	Pipe NS/OD (mm)	Pressure (bar)	Bending Torsion (Nm)	Gasket diameter (mm)	Flange Pressure (bar)	Allowable <u>Pressure</u> (bar)	Flange Pressure Allowable					
1	105	6"	32.0	3090	192.02	54.2	40.0	1.356					
2	100	6"	10.0	3708	192.02	36.7	40.0	0.917					
3	25	10"	10.0	8768	297	27.0	40.0	0.676					
4	30	10"	10.0	8450	297	26.4	40.0	0.661					
5	10	10"	10.0	2464	297	14.8	40.0	0.370					

The last column shows a ratio of this "equivalent" Flange Pressure to a user-input Allowable Pressure. This ratio is flagged in red when it exceeds 1.0.

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.

Note: Allowable loads at an equipment nozzle can be calculated using the module "Nozzle Evaluation" available in CAEPIPE through Main Frame > New > Nozzle Evaluation.

The allowable loads thus calculated can then be entered as "User Allowables" in CAEPIPE Stress Model through Layout window > Misc. See the CAEPIPE tutorial titled "*Tutorial on Qualification of Nozzles to Equipment using CAEPIPE*" for more details.

Here Caepipe : Support load summary for anchor at node 50 - [Sample2.res ($ \Box$ $ imes$														
File Results View Options Window Help														
<i>⊕</i> ⊨ ≡ ∎														
Load combination	FX (N)	FY (N)	FZ (N)	MX (Nm)	MY (Nm)	MZ (Nm)								
Empty Weight -360 -4992 25 -4871 1556 -1057														
Sustained -330 -5482 7 -6729 1287 -1106														
Operating1 2754 -5675 1078 -6457 -8087 -615														
Sustained+Wind 878 -5602 151 -7396 -2594 -1786														
Operating1+Wind	3962	-5795	1222	-7124	-11969	-1295								
Sustained+Wind 2	-314	-5252	1816	-6761	1271	-1222								
Operating1+Wind 2	2770	-5445	2887	-6489	-8104	-731								
Sustained+Seismic1	3544	-2665	6506	1726	12102	456								
Sustained-Seismic1	-4203	-8298	-6492	-15184	-9527	-2669								
Operating1+Seismic1	6628	-2858	7577	1998	2727	947								
Operating1-Seismic1	-1119	-8491	-5421	-14912	-18902	-2177								
Maximum	6628	-2665	7577	1998	12102	947								
Minimum -4203 -8491 -6492 -15184 -18902 -2669														
Allowables 0 0 0 0 0 0 0														



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.).

Support load summary $ imes$									
Node	Туре								
50	Anchor								
125	Anchor								
20B	User hanger								
115B	Hanger								
5	Nozzle								
0	K Cancel								

Support loads

Support loads are the loads acting on all the supports of each support type for a specific loading case. The loads on anchors for the Operating load case are shown below.

HOH	Caepipe	e : Load	ds on Ancho	rs: Operatin	g (W+P1+T	1) - [Sampl	e2.res (C:\Us	ers\venum\	–				
File	File Results View Options Window Help												
4	$\textcircled{\begin{tabular}{ c c c c } \hline @ & @ & @ & @ & @ & @ & @ & & & & & &$												
#	Node	Tag	FX (N)	FY (N)	FZ (N)	MX (Nm)	MY (Nm)	MZ (Nm)	Next load case				
1	50		2754	-5675	1078	-6457	-8087	-615					
2	125		-1755	-1605	-332	-727	832	4113					



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.).

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



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

1-0-0	*I* Caepipe : Loads on Hangers: Operating (W+P1+T1) - [Sample2.res (C:\Users\venum\													
File	Result	ts Vie	w Option	ns Winde	ow Help									
4	3 -			ĨĴ	0		• ➡			$\langle \neg$	\Rightarrow			
#	Node	Tag	Туре	Loa	.d (N) No	o.of Tota	I (N)							
1	20B Userhanger -13200 1 -13200													
2	115B Grinnell -5115 1 -5115													
-0-1	Caepipe	e : Load	ls on Nozzl	les: Operat	ing (W+P1	+T1) - [Sa	mple2.res (C:\Users\venum\	–		×			
File	Result	s Vie	w Option	ns Windo	w Help									
4	3 -			Î	2		• ->	≡ 🖛 •	▶ 1	$\langle \neg$	\Rightarrow			
#	# Node Tag Axial y Shear z Shear Torque Circ.Mom Long.Mom (N) (N) (Nm) (Nm) (Nm)													
1	5 -999 -745 4378 -1561 -884 -2613													

Element forces

For pipe (also bend and reducer), element forces in local coordinates, Stress Intensification Factors (SIF) and stresses are shown by default for the selected load case.

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

H	*II* Caepipe : Pipe forces in local coordinates: Operating (W+P1+T1) - [Sample2.res (C:\Users\venum\OneDrive\Deskt — 🛛 🛛 🗙														
File	Result	s View	Options	Window	Help										
Æ	3 🛛			<u>ê</u> (Q		⇐ =	╞║═] (-)	\rightarrow	ļ (~	\Rightarrow	t	Globa	I Forces	
#	Node	Axial (N)	y Shear (N)	z Shear (N)	Torsic Moment	n(Nm) SIF	Inplan Moment	e(Nm) SIF	Outplaı Moment	ne(Nm) SIF	Fle: FFi	x. Fac FFo	tors FFt	Sopr (MPa)	
1	5 10	-999 -999	-4378 -4224	-745 -745	-1561 -1561	1.00	-884 -24	1.00	2613 2464	1.00				13.70 13.19	
2	10 15A	-999 -999	-3539 2419	-745 -745	-1561 -1561	1.00	-24 4288	1.00	2464 -3276	1.00				13.19 18.70	
3	15A 15B	-999 2882	2419 999	-745 -745	-1561 -3560	1.00 1.00	4288 2922	2.61 2.61	-3276 1277	2.17 2.17	8.13 8.13	8.13 8.13		34.44 25.79	
4	15B 20A	2882 7362	999 999	-745 -745	-3560 -3560		2922 -2861		1277 -3038					17.49 19.51	
5	20A 20B	7362 -745	-745 -7825	-999 -999	-3560 -3241	1.00 1.00	3038 6239	2.61 2.61	-2861 3179	2.17 2.17	8.13 8.13	8.13 8.13		30.10 43.90	
6	20B 25	-745 -745	-5375 -2389	999 999	-3241 -3241	1.00	-6239 8741	1.00	-3179 676	1.00				23.01 26.34	
7	30 55	-745 -745	3646 3667	999 999	-3241 -3241	1.00	8350 8251	1.00	1298 1325	1.00				25.74 25.56	
8	55 35	-745 -745	3667 3879	999 999	-3241 -3241	1.39	8251 -1598	2.00	1325 7221	1.00				25.56 25.82	
9	35 60	-1078 -1078	3919 4130	2754 2754	615 615	1.39	-18 6633	2.00	7732 770	1.00				23.10 20.91	
10	60 40	-1078 -1078	4130 4151	2754 2754	615 615		6633 6522		770 844					20.91 20.70	
11	40 45	-1078 -1078	4151 4502	2754 2754	615 615	1.00 1.00	6522 4228	1.52 1.52	844 2304	1.52 1.52				27.70 33.21	
12	45 50	-1078 -1078	4502 5675	2754 2754	615 615		4228 -6457		2304 8087					24.12 44.14	
13	35 65	-1755 -1755	-40 12	-332 -332	-511 -511	1.07	1580 3858	1.47	-3856 1535	1.86		2.44 2.44		59.82 35.48	
14	65 100	-1755 -1755	12 497	-332 -332	-511 -511	1.00	3858 3537	1.00	1535 1115	1.00				35.48 32.32	
15	105 110A	-1755 -1755	2512 2522	-332 -332	-511 -511	1.00	2930 2864	1.00	981 972	1.00				40.94 40.47	



Use the Global forces button (F7) to see the element forces in global coordinates.

H	Caepipe	e : Pipe f	orces in	global	coordina	ites: Ope	erating (N+	V+P1+T1) - [Sample2.res (C:\Users\venum\OneDri — 🛛 🗙
File	Result	s Viev	v Opti	ons W	indow	Help			
Ē	8 🗄								
#	Node	FX (N)	FY	FZ	MX (Nm)	MY (Nm)	MZ (Nm)	1	Local Forces
1	5	999 999	4378 4224	745	1561	-2613	884		
2	10 10 15A	-333 999 -999	3539 2419	745	1561 -1561	-2464	24 4288		
3	15A 15B	999 -999	-2419 2882	745 -745	1561 -1277	3276 -3560	-4288 2922		
4	15B 20A	999 -999	-2882 7362	745 -745	1277 3038	3560 -3560	-2922 -2861		
5	20A 20B	999 -999	-7362 7825	745 -745	-3038 6239	3560 -3179	2861 -3241		
6	20B 25	999 -999	5375 -2389	745 -745	-6239 -8741	3179 676	3241 -3241		
7	30 55	999 -999	-3646 3667	745 -745	8350 -8251	-1298 1325	3241 -3241		
8	55 35	999 -999	-3667 3879	745 -745	8251 -7221	-1325 1598	3241 -3241		
9	35 60	2754 -2754	-3919 4130	1078 -1078	7732 -6633	-18 770	-615 615		
10	60 40	2754 -2754	-4130 4151	1078 -1078	6633 -6522	-770 844	-615 615		
11	40 45	2754 -2754	-4151 4502	1078 -1078	6522 -4228	-844 2304	-615 615		
12	45 50	2754 -2754	-4502 5675	1078 -1078	4228 6457	-2304 8087	-615 615		
13	35 65	-1755 1755	40 12	-332 332	-511 511	-1580 1535	3856 -3858		
14	65 100	-1755 1755	-12 497	-332 332	-511 511	-1535 1115	3858 -3537		
15	105 110A	-1755 1755	-2512 2522	-332 332	-511 511	-981 972	2930 -2864		



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.).



Displacements

The nodal displacements are shown.

1-0-0	📲 Caepipe : Displacements: Operating (W+P1+T1) - [Sample2.res (C:\Users\venum\OneDrive\Desk — 🛛 🛛 🗡											
File	Result	s View (Options W	/indow He	lp							
4	3			ð 🔍	E 🕻	■ 🚽		• →			⇒∣	
#				Displaceme	ents (globa	l)						
	Node	X(mm)	Y (mm)	Z (mm)	XX (deg)	YY (deg)	ZZ (deg)					
1	5	-0.024	0.000	0.000	0.0000	0.0955	-0.2031					
2	10	0.530	-0.713	-0.338	-0.0018	0.0977	-0.2035					
3	15A	21.863	-16.180	-14.734	-0.0704	0.0840	-0.0022					
4	15B	22.594	-14.935	-15.609	-0.0681	0.0501	0.0732					
5	20A	13.909	1.126	-22.295	-0.0457	-0.0675	0.0739					
6	20B	12.991	2.153	-21.367	0.0454	-0.0913	0.0558					
7	25	5.747	-1.120	-10.674	0.0079	-0.1125	-0.0155					
8	30	4.527	-1.170	-8.949	0.0015	-0.1118	-0.0186					
9	55	4.475	-1.170	-8.874	0.0005	-0.1116	-0.0191					
10	35	3.941	-1.167	-8.118	0.0005	-0.1116	-0.0191	'				
11	60	3.405	-1.163	-7.361	0.0005	-0.1116	-0.0191					
12	40	3.353	-1.163	-7.287	-0.0003	-0.1115	-0.0191					
13	45	2.336	-1.060	-5.818	-0.0186	-0.1062	-0.0163					
14	50	0.000	0.000	0.000	0.0000	0.0000	0.0000					
15	65	3.563	-1.121	-8.383	0.0005	-0.1116	-0.0565					
16	100	0.065	1.456	-10.355	0.0215	-0.0697	-0.1753					
17	105	-1.053	2.721	-10.835	0.0233	-0.0670	-0.1838					
18	110A	-1.163	2.807	-10.866	0.0237	-0.0663	-0.1857					
19	110B	-0.996	4.730	-10.886	0.0544	-0.0258	-0.3248					
20	115A	13.733	15.138	-8.294	0.0558	0.0470	-0.3052					
21	115B	13.765	16.882	-7.852	0.0537	0.0708	-0.1236					
20	1204	0.400	17.000	1 701	0.0057	0 0070	0 0702					



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 3	8	
ОК	Cancel	Apply	Reset

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.



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.

📲 Caepip	e : Minimum	& Maximum	Displacemen	its: Operatin	g (W+P1+T	1) - [Samp	ole2.res (×
File Resu	lts View (Options Wir	ndow Help						
			ع 🛛	= 누	\Rightarrow	≣ ←	• →		\Rightarrow
Direction	Туре	Value	Node						
×	Minimum	-2.981	120B						
(mm)	Maximum	22.594	15B						
Y	Minimum	-16.180	15A						
(mm)	Maximum	17.086	120A						
Z	Minimum	-22.295	20A						
(mm)	Maximum	0.000	5						
\times	Minimum	-0.0704	15A						
(deg)	Maximum	0.0558	115A						
YY	Minimum	-0.1125	25						
(deg)	Maximum	0.0977	10						
ZZ	Minimum	-0.3248	110B						
(deg)	Maximum	0.1422	120B						

The Pump qualification report (Rotating Equipment report) is shown below.

📲 Caepi	pe : Rotating Equ	iipment Repor	t - [Sam			×
File Resu	Its View Opt	ions Windo	w Help			
B		1 📸 (ð 🗄		\Rightarrow	
API 610 (1	l1thied.), Sep 2	010/ISO 13	709 report fo	<mark>r pump</mark> :	: Pump	
Load cas	e: Operating (V	V+P1+T1)				
Shaft axis	: Xcomp = 1.00	0, Ycomp = ().000, Zcomp	o = 0.000)	
Center lo	cation: X = 8280), Y = 6550, Z	= 8520 (mr	n)		
Suction n	ode: 50, Locat	tion: (Side), 3	Size: 8.000 (i	nch)		
Offsets fro	om center: dx =	0, dy = 427.7	, dz = 0 (mm)		
Check of	condition F.1.1	for suction n	ode 50:			
	Calculated	Allowed	Ratio	Statu	IS	
FX (N)	2754	3781	0.728	OK		
FY (N)	-1078	4893	0.220	OK		
FZ (N)	-5675	3114	1.822	—		
FR (N)	6399	6939	0.922	OK		
MX (Nm)	-6457	3525	1.832	—		
MY (Nm)	615	1763	0.349	OK		
MZ (Nm)	-8087	2576	3.139	Faile	d	
MR (Nm)	10367	4745	2.185	Faile	d	
Condition	F.1.2.a for suc	tion node 50	failed 🚧			
🚧 Disch	arge node is no	ot defined 🚧				

Frequencies and Mode shapes

A list of natural frequencies, periods, modal participation factors and modal mass fractions is shown next. You can show each frequency's mode shape graphically or animate it by clicking on Show mode shape or Show animated mode shape button in the toolbar.

🗝 Caepipe : Frequencies - [Sample2.res (C:\Users\venum\OneDrive\Des — 🛛 🛛 🛛												
File	Results Vi	ew Option	ns Wind	ow Help)							
#	# Frequency Period Participation factors Modal mass / Total mass											
	(Hz)	(second)	×	Y	Z	×	Y	Z				
1	1.703	0.5872	0.7395	-1.9310	1.2246	0.0314	0.2138	0.0860				
2	2.458	0.4069	0.8526	-2.2220	-1.5016	0.0417	0.2831	0.1293				
3	2.675	0.3739	-2.4950	-1.3661	0.2625	0.3570	0.1070	0.0040				
4	4.158	0.2405	-0.3444	0.3579	-1.2489	0.0068	0.0073	0.0894				
5	6.661	0.1501	0.8111	-1.2509	0.1106	0.0377	0.0897	0.0007				
6	6.761	0.1479	0.9343	0.6600	-0.0140	0.0501	0.0250	0.0000				
7	7.456	0.1341	0.0803	-0.1084	-0.1687	0.0004	0.0007	0.0016				
8	9.959	0.1004	1.2280	0.1913	-0.1710	0.0865	0.0021	0.0017				
9	11.629	0.0860	0.0727	-0.9579	0.0383	0.0003	0.0526	0.0001				
10	13.281	0.0753	-0.6669	-0.0590	-1.1835	0.0255	0.0002	0.0803				
11	30.952	0.0323	-2.2993	-0.0525	0.0055	0.3032	0.0002	0.0000				
12	53.862	0.0186	-0.1820	0.1712	-0.5697	0.0019	0.0017	0.0186				
13					Total	0.9423	0.7834	0.4117				

Each frequency's mode shape detail is shown in the next window. As in the earlier window, you can show graphically the mode shape or animate it by clicking on the appropriate button.

HUH	Caepipe	e:Mode 1:	1.70 Hz - [Sample2.res	(C:\Users\ve	enum\OneD	riv —	(×	
File	Result	s View (Options W	indow He	lp						
#	Node	X (mm)	Y (mm)	Z (mm)	XX (deg)	YY (deg)	ZZ (deg)				
1	5	0.000	0.000	0.000	0.0000	-0.0583	-0.0444				
2	10	0.000	-0.155	0.206	-0.0017	-0.0597	-0.0446				
3	15A	0.000	-6.256	10.160	-0.0657	-0.0766	-0.0440				
4	15B	0.278	-6.539	10.121	-0.0864	-0.0619	-0.0402				
5	20A	3.941	-6.537	0.568	-0.0928	-0.0455	-0.0306				
6	20B	3.830	-6.013	0.000	-0.0695	-0.0424	-0.0265				
7	25	1.357	-2.102	0.000	-0.0461	-0.0297	-0.0142				
8	30	1.039	-1.607	0.000	-0.0450	-0.0289	-0.0137				
9	55	1.025	-1.586	0.000	-0.0448	-0.0288	-0.0136				
10	35	0.887	-1.372	0.000	-0.0448	-0.0288	-0.0136				
11	60	0.750	-1.158	0.000	-0.0448	-0.0288	-0.0136				
12	40	0.736	-1.137	0.000	-0.0446	-0.0287	-0.0135				

The graphic window will show the mode shape as below.



Use the black arrow buttons to cycle through the different Modes.

Dynamic Susceptibility

Note: Dynamic Susceptibility is NOT available for Evaluation Version of CAEPIPE. For Full Version of CAEPIPE, this feature can be turned ON by setting an environment variable "HARTLEN" that needs to be declared under My Computer or This PC Icon > Mouse Right Click > Properties > Advanced System Settings > Environmental Variable with its Value set to (YES). Refer to CAEPIPE User's Manual for more details.

The stress / velocity method, implemented in CAEPIPE as the "Dynamic Susceptibility" feature, provides quantified insights into the stress versus vibration characteristics of the system layout per se.

-0-1	- Caepipe : Dynamic Susceptibility - [Sample2.res (C:\Users\venum\OneDrive D X												
File	Result	s View Op	tions Wir	ndow H	lelp								
4	3 🖿		1) 🔍									
#	Mode	Frequency	Maxima	Nodes	Susceptibility								
		(Hz)	Velocity	Stress	(psi/ips)								
1	10	13.281	110B	35	1352								
2	8	9.959	20A	35	1128								
3	5	6.661	110A	35	892								
4	9	11.629	25	35	821								
5	12	53.862	45	45	601								
6	6	6.761	120B	120A	570								
7	2	2.458	15A	20B	452								
8	3	2.675	20B	50	421								
9	4	4.158	115B	110B	421								
10	7	7.456	120B	125	366								
11	1	1.703	15A	45	316								
12	11	30.952	15B	15B	255								

A Pressing the Animated mode shape button (or View > Show animated mode shape) for Mode 10, for example, shows the maximum dynamic bending stress at the Bend Node 35 (RED dot) and the maximum velocity at the Bend Node 110B (PINK dot).



In case the maximum dynamic bending stress and the maximum velocity occur at the same node for a specific mode, then the RED and PINK dots overlap with each other and only the RED dot is seen for that mode. See the Animated mode shape shown below for mode 11 as an example.



The dynamic susceptibility module *does not apply directly to meeting code or other formal stress analysis requirements.* However, it is an incisive analytical tool to help the designer understand the stress / vibration relationship, assess the situation and to decide how to modify the design if necessary to possibly reduce the susceptibility to vibration. It can be used for design, planning acceptance tests, troubleshooting and correction.

Print



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



You can also 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 Microsoft Print to PDF		
Page setup Orientation : Landscape		
Font Arial, 10 point		
Print Cancel Preview To File All		None

The sample problem report is shown next. Note that for sorted stresses and code compliance, wherever the stress ratio exceeds 1.00, the corresponding stress and stress ratio are shown in white letters on black background. Similarly, wherever the Flange Pressure exceeds the Allowable Pressure, the corresponding Flange Pressure and the 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.co

Caepipe		Sample Problem 2		
		Quality Assurance Block		
		Caepipe		
		Version 12.10		
	Client	:		
	Project	:		
	File Number	:		
	Report Numbe	er :		
	Model Name	: Sample2		
	Title	: Sample Problem 2		
	Analyzed	· Thu Jan 04 16:34:29 2024		
	/ mary200	. The ball of 10.04.20 2024		
	Prepared by	:	Date:	
	Checked by	:	Date:	
Version 12.10		Sample2		Jan 4,2024

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Version 12.10

Sample2

Jan 4,2024

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С	ode		: Pip Inc Us Us	ing code lude axi e liberal e B31J f	e = B al for allow or SI	31.1 (2 ce in st /able st Fs and	022) ress calc resses Flexibilit	ulation y Facto	s ors													
Т	empe	erature	e:Re Nu Nu Th Us	ference mber of mber of ermal = e modul	temp thern thern Oper us at	erature nal cyc nal load ating - referer	e = 21.11 les = 700 ds = 1 Sustaine nce temp	(C) 0 d erature	•													
P	essu	ire	: Pre Pe Do Do	essure s ak press not incli not use	tress are f ude E pres	= PD / actor = Sourdor sure co	4t 1.00 n effect prrection	for ber	ds													
D	ynam	lics	: Cu Nu Inc Do	t off freq mber of lude mis not use	uenc mode sing frictio	y = 33 es = 20 mass o on in dy	Hz correctior /namic a	n nalysis														
M	ISC.		: Inc Ve	lude har rtical dire	nger s ectior	stiffnes 1 = Y	S															
											L	.ay	yout	(23	3)							
#	Nod	е Тур	e	DX (mm) DY	′ (mm)	DZ (mm) Matl	Sec	t Load	Data	a										
1	Title	= Sar	nple F	Problem	2						Nor	-										
2	5	Fro	m	200				312	10	1.1	Flan	ZIE	9									
4	15	Ber	h	8080				312	10	11	riar	iye	5	_								
5	20	Ber	id id	0000	65	50		312	10	L1				_								
6	20B	Loc	ation								Use	r h	nang	jer								
7	25					Ĩ	4240	312	10	L1	Flan	ge	Э									
8	30	Valv	ve 🛛				622.3	312	10	L1	Flan	ge	Э									
9	55						26.9499	312	10	L1												
10	35						273.05	312	10	L1	Wel	dir	ng te	ee								
11	60						273.05	312	10	L1				_								
12	40				_		26.9499	312	10	L1	_			_								
13	45	Rec	lucer		_		530	312	8	L1												
14	50	- Free			-		2100	312	8	L1	Anc	ho	or	_								
15	35	Fro	m	126 50	-			210	6	1.4	-			_								
17	100			-1263.4	7			312	6	11	Flan		2	_								
18	105	Valv	/e	-403.23				312	6	L1	Flan	ae	- -	-								
19	110	Ben	id	-255				312	6	L2		.9.	-	_								
20	115	Ben	d		29	50		312	6	L2												
21	115	3 Loc	ation								Han	ge	er									
22	120	Ber	ıd	-4290				312	6	L2												
23	125			-910	-36	600		312	6	L2	Anc	ho	or									
											Α	n	chor	's (2	2)							
No	de T	ag K)	(/kx	KY/ky	KZ/	kz K	XX/kxx	KYY/k	уу	<zz kz<="" td=""><td>z</td><td></td><td>Rel</td><td>eas</td><td>ses</td><td></td><td></td><td></td><td>Level</td><td>Tag</td><td></td><td></td></zz>	z		Rel	eas	ses				Level	Tag		
	-	(N	/mm)	(N/mm)	(N/r	nm) (N	Im/deg)	(Nm/d	eg)	Nm/de	eg) X	Y	Z	XX	YY Z	ZA	nch	nor in				
50		Ri	gid	Rigid	Rigi	d R	igid	Rigid	_	Rigid	_	_				G	SCS					
12:)	Ri	gid	Rigid	Rigi	d R	igid	Rigid		Rigid		_		(5)		G	scs					
_						-						ыe	ends	s (5))							
Be	nd R	adius	Rad.	Thk I	Bend	Flex.F	Flex.F	In Plr		out Pln	Axial		Fors	ion	Int.	Ang	gle	Int.	Angl	e		
15	30 (1	81	Long	(1111)	viati	11 F 11	OutFIL	OIF	e		OIF	-	JII-		Noue	lae	·9)	Noue	laed	/		
20	3	81	Long					-				+		_						-		
110) 2	28.6	Long			1		-				+		_		-				-		
11	5 2	28.6	Long																			
						1			-					_				1				
Ve	sion	12.10										Sa	amp	le2								Jan 4,2024

Caepi	ре									Samp	ole Probl	em 2						Page 2
										E	Bends (5)						
Bend	Radiu	s Rad	I. Thk	Bend	Flex.F	Flex.F	In Pl	n Oi	ut Pln	Axial	Torsion	Int.	Angle	Int.	Angle			
Node	(mm)	Тур	e (mm) Matl	In PIn	Out P	'In SIF	SI	F	SIF	SIF	Node	(deg)	Node	(deg)			
120	228.6	Lor	g															
										Brar	nch SIFs	; (1)						
Node	Туре																	
35	Weldi	ng tee	,No. o	f flange	s = 0													
		-	200							FI	anges (5)						
Node	Pipe	Typ	e	Weigh	t Gaske	t Dia	Allow F	res										
10	10"	We	ld neck	(NG)	297		(Dar)											
25	10"	We	ld neck	69.97	297		40.0											
30	10"	We	ld neck	69.79	297		40.0											
100	6"	We	ld neck	23.596	5 192.02	2	40.0											
105	6"	We	ld neck	23.596	6 192.02	2	40.0											
										Ha	angers (2)						
Node	Tag T	ype		No Loa	d Short	Sprin	ng rate	Load	Load	I CNo	de Leve	l Tag						
20B	1	lsor h	anger	1	// range	105	iiii)	(IN) 13200	Hot	,								
115B	C	Grinne	ll	1 25		105		15200										
1100				1 20					-	N	ozzles (*	1)						
Node	Tag \	less.	Rnf	Nozzl	e i	Vesse	al L1	12		lodulus	s Ves	sel axi	s direct	tion	Level	Гад		
····	T	ype	Pad O	D/R T	hk OE	R T	hk (m	m) (m	nm) (M	ИРа)	X com	p Y cc	mp Z	comp		. ag		
5	C	Syl	2	73.05 9	.271 18	00 9.	271 15	00 21	100 1	93950			1.	000				
Nozzle stiffnesses (1)																		
Node	Vess.	Radi	al (kp)	Circum	ferential	(kmc)	Longit	udinal	(kml)									
	Туре	(N/m	m)	(Nm/de	g)		(Nm/d	eg)										
5	5 Cyl 40981 4352.04 27373.07																	
										Pu	mp: Pur	np						
Туре	= Horiz	ontal	Suct. N	lode: 50	Suct. Lo	oc: Si	de Shaf	t axis o	directi	on:1.0	00, 0.00	0, 0.00	0,					
Locat	on of c	enter	8280,	6550, 8	520 (mn	ו)												
										Re	ducers ((1)						
From	То	OD1	Thk	1 OD2	Thk2	Co	ne angle	э										
		(mm)	(mm	i) (mm)	(mm)	(de	eg)	-										
40	45	273.0	9.27	1 219.0	07 8.178	8					(-h (0							
-	-							~	<i></i>	V	aives (2)						
From	10	Weig	ht Len	gth The		Add	1.VVgt	UI V (mn	msets	of Add	DZ (mr	2)						
25	30	(NY)	13 622	3 3 0	1 75	(kg) L	v (mm		(11111)		11)						
100	105	151 5	6 403	23 3.0	1.75							-						
			5 100							Cool	rdinates	(29)						
Node	X (mn		(mm)	7 (mm)						2.00		()						
5	0	0		0														
10	200	0		0	-													
15A	7899	0		0														
15	8280	0		0														
15B	8280	38	1	0														
20A	8280	61	69	0														
20	8280	65	50	0	_													
20B	8280	65	50	381														
25	8280	65	50	4240	-													
30	8280	65	50	4862.3														
55	8280	65	50	4889.25)													
35	8280	65	50	5162.3														
00	0280	65	50	0435.35	2												 	
Versio	n 12.1	0								5	Sample2							Jan 4.2024

Caepi	ре							Sample F	roblem 2		Page 3
								Coordina	ates (29)		
Node	X (mm)	Y (mm)	Z (m	n)							
40	8280	6550	5462	.3							
45	8280	6550	5992	.3							
50	8280	6550	8092	.3							
65	8143.48	6550	5162	.3							
100	6880	6550	5162	.3							
105	6476.77	6550	5162	.3							
110A	6450.37	6550	5162	.3							
110	6221.77	6550	5162	.3							
110B	6221.77	6778.6	5162	.3							
115A	6221.77	9271.4	5162	.3							
115	6221.77	9500	5162	.3							
115B	5993.17	9500	5162	.3							
120A	2109.78	9500	5162	3							
120	1931.77	9500	5162	.3							
120B	1888 15	9327 42	5162	3							
125	1021 77	5900	5162	3							
0		5000	5.02	-			Pine	material 3	12° a312	tp316	
Densi	000	(1	N.L	0.000 1-		- 1 00 7			12. 00 12	(poro	
Vield 9	trenath	(Kg/M3), = 206.8 (M	NU = /Pa)	0.300, 30	Int facto	br = 1.00,	Type = A	5			
Tensil	e streng	h = 517.1	(MPa)							
Temp	F	Alpha		llowable							
(C)	(MPa)	(mm/mn	n/C) (MPa)							
-198.3	201327	13.50E-6	6 1	37.9							
-101.1	201327	14.40E-6	6 1	37.9							
-45.56	199259	14.76E-6	3 1	37.9							
21.11	195122	15.30E-6	6 1	37.9							
37 78	193743	15 46E-6	6 1	37.9							
93.33	189606	16.02E-6	6 1	19.3							
148.9	186159	16.56E-6	6 1	07.6							
204.4	182023	17 10E-	3 0	8 60							
260	17857/	17.46E-6		1 70							
315.6	17443	17.900-0		6.87							
242.2	172059	17.020-0		10.07							
271 1	173030	19 00E		2 42							
3/1.1	16900	10.00E-0		03.43							
390.9	100924	10.10E-0		2.05							
420.7	100104	10.18E-0		0.00							
404.4	16000	10.30E-0	o /	9.90							
482.2	16202	18.36E-6		9.29							
507.0	159958	10.54E-0		0.00							
537.8	15/20	18.54E-6		7.91							
0.600	15444	18.72E-0		1.22							
593.3	15168	18.72E-0		0.53							
021.1	14892	18.90E-0		1.57							
648.9	146169	19.08E-6	o [5	1.02				D' 0			
						1		Pipe Sec	tions (3)		
Name	Nom S	ch OD	The	Cor.A		Ins.Dens	Ins.Thk	Lin.Dens	Lin.Thk	Soil	
0	Dia C	(mm)	(mr	(mm)	(%)	(kg/m3)	(mm)	(kg/m3)	(mm)		
0	6" S	1D 168.2	1 1.1	12	-	176.2	60				
8	8" S	TD 219.0	/ 8.1	/88	-	1/6.2	65				
10	10" S	ID 273.0	5 9.2	/1		176.2	65				
								Loa	ads		
							Static S	Seismic Lo	bad Case	1: (g's)	
Static	seismic	load 1: X	= 0.30), Y = 0.20	, Z = 0.3	30 (g's)					
Veri	- 10 10							0-			10004-0004
versic	n 12.10							Sam	DIEZ		Jan 4.2024

Caepi	ре									Samp	ole Prol	olem 2					Page 4
Seism	nic load	combi	nation	= Squ	are Roo	ot of Su	m of S	Square	s			N: 1/2					
										W	ind loa	d 1					
Shape Wind	e factor directio	= 0.60 on: X co) mp =	1.000,	Y com	p = 0.0	00, Z d	comp =	0.000								
Elevat (m)	tion	velocity (kmh)	'														
0		100															
20	1	100								w	ind loa	12					
Shape Wind	e factor directic	= 0.60 on: X co) mp = 1	0.000,	Y com	p = 0.0	00, Z d	comp =	: 1.000								
Elevat (m)	tion	velocity (kmh)	'														
0		100															
20		100								Din	aload	s (2)					
Name	T1	P1 F)esa T	Deso	Pr. Sr	pecific	Add W	/at. W	ind V	Vind	Wind	Wind					
. tamb	(C)	(bar) (C)	(bar)	gr:	avity	(kg/m) Lo	ad 1 L	oad 2	Load 3	Load 4	1				
L1	185	10.0 2	230	15.0	0.1	1		Y)	(-				
LZ	200	32.0 3	000	40.0	0.	1		331.1 (2022)	Code c	omplia	nce (Sor	ted stres	ses)			
	Susta	ained			Expar	nsion			Occa	asional				,			
Nede	SL	SH	SL	Niede	SE	SA	SE	Nede	SO	1.2SH	I SO	-					
115B	(MPa) 35.40	(MPa) 91.70	5H 0.39	110A	(MPa)	(MPa)	0.20	Node 50	(MPa)	(MPa)	0.65	1					
110B	31.36	91.70	0.34	110B	46.93	261.1	0.18	125	50.75	110.0	0.46						
50	31.82	101.7	0.31	115B	41.80	256.9	0.16	110B	41.77	110.0	0.38						
125 1204	26.94	91.70	0.29	125 1154	38.98	265.6	0.15	115B	41.23	110.0	0.37	_					
35	28.55	101.7	0.28	120A	33.61	266.0	0.13	120A	39.11	110.0	0.36	-					
120B	25.12	91.70	0.27	50	34.29	273.4	0.13	20B	41.69	122.1	0.34						
115A	24.64	91.70	0.27	35 120P	29.54	276.7	0.11	120B	36.83	110.0	0.33	_					
25 110A	25.82	91.70	0.25	120B	29.96	296.2	0.10	45 110A	34.34	110.0	0.33						
30	24.25	101.7	0.24	15B	26.86	290.7	0.09	65	35.03	122.1	0.29						
55	24.02	101.7	0.24	105	24.17	272.5	0.09	115A	29.92	110.0	0.27						
105	20.19	91.70	0.22	100 20B	22.41	293.9	0.08	25 105	33.10	122.1	0.27	-					
20B	21.97	101.7	0.22	65	18.19	284.1	0.06	15B	32.20	122.1	0.26						
65	21.37	101.7	0.21	45	16.86	283.4	0.06	30	31.59	122.1	0.26						
40	20.90	101.7	0.21	20A	17.41	292.9	0.06	55 20A	31.39	122.1	0.26						
15B	14.86	101.7	0.15	55	5.669	281.4	0.02	15A	28.51	122.1	0.23	_					
20A	12.70	101.7	0.12	10	5.974	297.2	0.02	40	27.15	122.1	0.22						
100	11.78	101.7	0.12	30	5.628	281.1	0.02	60	24.98	122.1	0.20	_					
15A 10	9.538	101.7	0.09	25 40	4.866	279.5	0.02	5	20.96	122.1	0.17						
5	8.182	101.7	0.08	60	3.196	286.0	0.01	10	16.74	122.1	0.14						
									B31.	1 (2022	2) Code	Complia	ance		_		
Ned	Press.	SI	ustaine	ed	E	xpansio	on	(Occasi	onal							
NODE	(bar)	(MPa)	SH (MPa) SH	(MPa)) (MPa) SA	(MPa	1.2S) (MPa	a) 1.25	н						
5	15.0	8.182	101.7	0.08	6.254	297.5	0.02	17.36	122.	1 0.14							
10	69.90	8.529	101.7	0.08	5.974	297.2	0.02	16.74	122.1	1 0.14							
		0								ç	Sample	2					lan 4 2024

Caepi	ре									Sample	Probl	oler	m 2								F	age 5
									B31.1	(2022) C	ode (С	ompli	oliance	e							
Nada	Press.	SL	ustaine	d	Ex	pansi	on	0	ccasio	nal												
Node	(bar)	SL (MPa)	(MPa)	SH	SE (MPa)	(MPa) SA	(MPa)	(MPa)	1.2SH												
10	15.0	8.529	101.7	0.08	5.974	297.2	0.02	16.71	122.1	0.14												
15A 15A	66.6 15.0	8.493 9.538	101.7	0.08	12.66	297.2	0.04	19.28	122.1	0.16												
15B	66.6	14.86	101.7	0.15	26.86	290.7	0.09	32.20	122.1	0.26												
15B	15.0	11.44	101.7	0.11	12.51	294.2	0.04	21.06	122.1	0.17												
20A	15.0	12.70	101.7	0.12	17.41	292.9	0.05	30.61	122.1	0.17												
20B	66.6	21.97	101.7	0.22	20.32	283.5	0.07	41.69	122.1	0.34												
20B 25	15.0 66.6	14.96 25.82	101.7	0.15	9.512	290.6	0.03	25.96 33.10	122.1	0.21												
30	15.0	24.25	101.7	0.24	5.628	281.1	0.02	31.59	122.1	0.26												
55	66.6	24.02	101.7	0.24	5.669	281.4	0.02	31.39	122.1	0.26												
35	66.6	24.02	101.7	0.24	10.42	283.8	0.02	30.52	122.1	0.25												
35	15.0	21.59	101.7	0.21	2.724	283.8	0.01	26.33	122.1	0.22												
60 60	15.0	19.46	101.7	0.19	3.196	286.0	0.01	24.98	122.1	0.20												
40	66.6	19.24	101.7	0.19	3.326	286.2	0.01	24.90	122.1	0.20												
40 45	15.0	20.90	101.7	0.21	4.933	284.6	0.02	27.15	122.1	0.22												
45	15.0	20.17	101.7	0.20	11.15	285.3	0.00	36.54	122.1	0.30												
50	73.4	31.82	101.7	0.31	34.29	273.4	0.13	78.98	122.1	0.65												
35 65	15.0 83.5	28.55 21.37	101.7	0.28	29.54 18.19	276.7	0.11	45.45 35.03	122.1 122.1	0.37 0.29												
65	15.0	21.37	101.7	0.21	18.19	284.1	0.06	35.03	122.1	0.29												
100	83.5	11.78	101.7	0.12	22.41	293.9	0.08	20.96	122.1	0.17												
1103 110A	77.2	20.19	91.70	0.22	24.17	271.9	0.09	29.46	110.0	0.20												
110A	48.0	21.86	91.70	0.24	52.93	270.8	0.20	34.34	110.0	0.31												
110B	48.0	26.64	91.70	0.34	46.93 21.87	261.1	0.18	33.79	110.0	0.38												
115A	77.2	22.81	91.70	0.25	17.44	269.8	0.06	26.52	110.0	0.24												
115A	48.0	24.64 35.40	91.70 91.70	0.27	36.24	267.9	0.14	29.92	110.0	0.27												
115B	48.0	28.66	91.70	0.31	19.42	263.8	0.07	32.67	110.0	0.30												
120A	77.2	23.42	91.70	0.26	15.64	269.2	0.06	31.03	110.0	0.28												
120A 120B	48.0 77.2	26.51 25.12	91.70 91.70	0.29	33.61 27.11	266.0	0.13	39.11 36.83	110.0	0.36												
120B	48.0	22.55	91.70	0.25	12.80	270.1	0.05	29.63	110.0	0.27												
125	77.2	26.94	91.70	0.29	38.98	265.6	0.15	50.75	110.0	0.46	r Ror	me	ort									
					Spr	rina	/ert	Horz	Hot	Cold	ιτeμ	-p0										
Node	No Ty	pe	Fig	ure S	ize rat	e	ravel	travel	load	load	Var	r										
20B	or 1 Us	er hand		•	(N/ 105	mm) (5	(nm) 2.153	(mm) 25.006	(N) 13200	(N) 13426	(%) 1	,										
115B	1 Gr	innell	B-2	268 1	0 45.	533	16.882	15.847	5115	5884	15											
							lange	report -	NC.36	58.1 of A	SME	E	Secti	tion II	II Cla	ass 2	(2017)					
Node	Pipe	Press	Be Be	ending	Gaske	et Fl	ange	Allowa	ible Fla	ange												
Noue	(mm)	(bar)	(N	m)	(mm)	(b	ar)	(bar)	AI	lowable												
105	6"	32.0	30	90	192.0	2 54	.2	40.0	1.	356												
25	10"	10.0	87	08 68	297	2 30	 .0	40.0	0.	676												
30	10"	10.0	84	50	297	26	6.4	40.0	0.	661												
10	10"	10.0	24	64	297	14	.8	40.0	0.	370										 		

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Sample2

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Caepipe					Sample Problem 2 Page 6
			API 61	0 (11th ed.),	, Sep 2010 / ISO 13709 report for pump : Pump
Load case: C Shaft axis: X Center locati	Operating (W- comp = 1.000 on: X = 8280	+P1+T1)), Ycomp = (, Y = 6550, 2	0.000, Zcomj Z = 8520 (n	o = 0.000 nm)	
Suction node Offsets from	e: 50, Locatio center: dx =	on: (Side), 3 0, dy = 427.	Size: 8.000 (i 7, dz = 0 (mi	nch) n)	
Check of cor	ndition F.1.1 f	or suction n	ode 50:		
	Calculated	Allowed	Ratio	Status	
FX (N) FY (N)	-1078	4893	0.728	OK	
FZ (N)	-5675	3114	1.822		
MX (Nm)	-6457	3525	1.832		
MY (Nm) MZ (Nm)	615 -8087	1763	0.349	OK Failed	
MR (Nm)	10367	4745	2.185	Failed	
Condition F.	1.2.a for sucti	on node 50	failed ***		
*** Discharge	e node is not	defined ***			

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Sample2

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Lead cambination PK (N) <	Caepipe					Sampl	e Problem	2 Page 7
Lad combination FX (N) FY (N) FZ (N) MX (Nm) MY (Nm) MZ (Nm) Empty Weight -300 -482 7 -472 1287 -1106 Operating1 27.44 -67.5 1078 -64.67 -60.67 -70.76 Sustanced -Wind 348 42.67 61.77 -70.76 -22.64 -10.76 Sustanced -Wind 344 62.55 60.67 12.71 -72.22 -72.64 -73.1 Sustanced -Wind 3444 62.55 60.66 12.72 -72.66 -73.1 -73.1 Sustanced -Wind 16.823 25.88 74.77 19.02 -24.77 Minimum 62.02 0 0 0 0 0 0 - Sustancel -Seismic 1 11.99 44.92 15.184 -11902 -21.77 - - - - - - - - - - - - - - - - -					Support lo	oad summ	ary for and	hor at node 50
Ladi combination P, K (N) PT (N) PZ (N) MK (
Emply Weight -360 -492 25 -471 156 -1057 Sustained -330 -642 7 -672 1287 -106 Operating1 27.4 -6675 1078 -6607 -1076 Sustained/Wind 362 -5755 1222 -7726 -1272 Operating1 364 2565 6506 177 12102 466 Sustained/Second 1642 2567 1202 474 -6697 Operating1 - Segmit 1 1402 4285 5777 1980 1202 477 Maximum 6628 2650 777 1980 12012 474 Maximum 6628 2650 777 1980 12012 477 Maximum 6628 2650 777 1980 12012 477 Maximum 420 1584 1690 1502 -204 -0697 Sustained/Wind 220 1715 420 20	Load combination	FX (N)	FY (N)	FZ (N)	MX (Nm)	MY (Nm)	MZ (Nm)	u de la companya de la
Sustained -330 -642 7 -6729 1287 -106 Operating 1- Vind 874 -687 -788 -697 -788	Empty Weight	-360	-4992	25	-4871	1556	-1057	
Operating 1 27/4 -667 1078 -6457 1078 -6457 1078 -615 Operating 1+Wind 367 5765 122 -7124 -1786 -2285 Operating 1+Wind 362 2578 1222 -7124 -1295 -1295 Sustained-Vision 1 3544 2686 6660 1751 -1222 -2669 Querating 1+Sistion 1 3544 2686 7577 1986 2727 9464 Operating 1+Sistion 1 6628 -6656 1777 1996 1209 2477 Maximum 6628 -666 1567 1996 1209 2669 Allowables 0 0 0 0 0 0 0 Sustained-Vision 1 6288 -6497 1514 18902 -2669 Allowables 0 0 0 0 0 0 Sustained-Vision 1 213 1522 1718 -1717 1650 1752 1	Sustained	-330	-5482	7	-6729	1287	-1106	
Sustained-Wind 8/8 -66/2 11 -7386 -7286 Sustained-Wind 3662 -757 1222 -1216 -7286 Sustained-Seimic1 3644 -6525 1816 -6711 -12202 -12086 Sustained-Seimic1 4403 -6525 1518 -6727 -1988 -7680 Operating1-Wind 4203 -6980 -6402 -1718 -6600 -7731 Minimum 4203 -6869 -777 1988 12102 -4669 Minimum 4203 -6491 -4492 -15184 -16922 -2669 Minimum 4203 -6491 -4492 -15184 -1692 -2677 Minimum 4203 -6491 -16902 -2689 -777 1988 12102 947 Minimum 4203 -6491 -1718 42 22 -288 -1177 Sustained-Seimic1 1116 -1203 -7277 832 -1178 -1178	Operating1	2754	-5675	1078	-6457	-8087	-615	
Operating 1-Wind 3822 -F/124 -F/124 <th< td=""><td>Sustained+Wind</td><td>878</td><td>-5602</td><td>151</td><td>-7396</td><td>-2594</td><td>-1786</td><td></td></th<>	Sustained+Wind	878	-5602	151	-7396	-2594	-1786	
Sustained-Wind 2 3:14 -52/2 18:16 -6761 12/1 -721 Sustained-Seismic 1 2770 -546 2807 -6489 -6104 -721 Sustained-Seismic 1 4203 2828 -6489 15164 -527 -2669 Operating 1-Wing 1 1118 -6828 -777 1978 2727 947 Minimum 4203 5491 -5512 -15184 5927 -2669 Norwaltes 0 0 0 0 0 0 0 Alwabies 0 0 0 0 0 0 0 Alwabies 0 0 0 0 0 0 0 Alwabies 0 0 0 0 0 0 0 Operating 1-Wind 2 201 1534 527 727 824 1113 52 1113 52 1113 52 1113 52 1113 52 1111	Operating1+Wind	3962	-5795	1222	-7124	-11969	-1295	
Operating 1-Wing 2 2/70 -6445 2807 -6489 8104 -731 Sustained-Seismi 1 1364 -2665 6666 1726 1720 2102 486 Operating 1-Seismi 1 1119 -8482 -11518 4962 2467 Maximum 6628 -5667 1790 1272 2102 947 Maximum 6628 -5667 1797 1996 1272 2669 Alowabes 0 0 0 0 0 0 0 Sustained-Seismin 1 1716 24 22 2669 1717 140 997 Lad combination FX (N) FY (N) FZ (N) MX (Nn MX (Nn MZ (Nn) MZ (Nn) Sustained-Seismin 4 231 1715 24 22 24113 2289 1714 990 152 2289 Sustained-Seismin 1 1612 -1601 344 1003 387 2479 3807 2498 3807 </td <td>Sustained+Wind 2</td> <td>-314</td> <td>-5252</td> <td>1816</td> <td>-6761</td> <td>1271</td> <td>-1222</td> <td></td>	Sustained+Wind 2	-314	-5252	1816	-6761	1271	-1222	
Sustained-Seismi Same i <	Operating1+Wind 2	2770	-5445	2887	-6489	-8104	-731	8
Sustained-Seemine 1 42/20 439/2 -1164 490/2 -200-7 Operating 1-Seismic 1 1110 -849/2 -1169 27.2 -200-9 Minimum -6628 -5665 75.7 1499 27.27 -200-9 Minimum -6628 -5665 75.7 1499 27.27 -200-9 Allowables 0 0 0 0 0 0 0 Allowables 0 0 0 0 0 0 0 Sustained 123 -1574 X 22 28 -1177 Operating 1 1755 -1605 -332 -727 832 -1177 Operating 1+Wind 1742 -164 -228 -1177 240 -228 Operating 1+Wind 1747 -600 152 -114 -920 -114 Sustained-Siemin 1 1602 -100 811 208 -6813 Operating 1-Siemin 1 -1100 111	Sustained+Seismic 1	3544	-2665	6506	1726	12102	456	
Operating 1: books 1	Sustained-Seismic 1	-4203	-8298	-6492	-15184	-9527	-2669	
Operating 1-Sensem 1 1119 2449 -1492 12902 2177 Mainmum 4623 -8491 -6492 -161802 -2669 Allowables 0 0 0 0 0 0 Allowables 0 0 0 0 0 0 Lad combination FX (N) FY (N) FZ (N) MX (Nm) MY (Nm) MZ (Nm) Sustained 231 -1715 24 22 -104 -997 Sustained 231 -1715 24 22 24 -1137 Operating 1+Wind -1634 -627 -960 1004 3001 Sustained-Seismic 1 1602 -1104 1813 2289 -0248 -0208 Operating 1+Wind 152 -1104 811 2033 765 6813 Operating 1+Wind 1027 -220 -1119 2787 763 -3877 Operating 1+Wind -1280 -1119 2787	Operating1+Seismic 1	6628	-2858	/5//	1998	2/2/	947	
Maxmum B628 Zeb69 T/7 / 1998 T/2102 94 / 1 Minimum 4203 4491 -6492 -16184 -1060 -0 0	Operating1-Seismic 1	-1119	-8491	-5421	-14912	-18902	-2177	
Minimum -1423 -1491 -0492 -1514 -14802 -2669 Support Load summary for anchor at node 125 Load combination FX (N) FY (N) FZ (N) MX (Nm) MY (Nm) MZ (Nm) Empty Weight 220 -1564 50 152 -104 -997 Sustained 231 -1715 24 22 -28 -1117 Operating 1 -1715 -1605 -332 -727 832 +1117 Operating 1+Wind 1152 -1604 34 1000 446 -1203 Operating 1+Wind -1714 690 1750 463 1203 Operating 1+Wind -1714 690 112 2033 763 -3377 Operating 1+Wind -1700 811 2033 763 -3377 Operating 1+Wind -3027 -2330 -1119 2787 -6613 Minimum -3027 -2330 -1119 2787 -6613 <	Maximum	6628	-2665	/5//	1998	12102	947	
Allowables 0	Minimum	-4203	-8491	-6492	-15184	-18902	-2669	R. C.
Load combination FX (N) FY (N) FZ (N) MX (Nm) MY (Nm) MZ (Nm) Load combination FX (N) FY (N) FZ (N) MX (Nm) MY (Nm) MZ (Nm) Sustained* 231 -1715 24 22 28 -1177 Sustained* 1716 24 22 28 -1177 Operating1 -1715 140 -997 303 3061 Sustained*Wind 2 1192 -1631 -427 4960 1004 3001 Sustained*Mind1 1502 -1704 690 1760 496 -1203 Sustained*Selsmic1 1502 -1700 811 2033 768 1523 Sustained*Selsmic1 3027 -220 -1119 2787 763 -3877 Alowable 0 0 0 0 0 0 0 Iawables 0 0 0 0 0 0 0 Sustained*Mind1 1320 <td>Allowables</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>1 1 105</td>	Allowables	0	0	0	0	0	0	1 1 105
Lead combination FX (N) FY (N) FZ (N) MX (Nm) MY (Nm) MZ (Nm) Empty Weight 220 -1584 50 152 -104 -997 Sustained 231 -1715 24 22 -28 -117 Operating 1-Wind 1152 -1634 -227 -802 4113 Sustained+Wind 1152 -1644 334 1004 304 Operating 1-Wind 2 239 -1714 690 1750 4966 -1203 Operating 1-Wind 2 239 -1710 611 2083 766 6813 Operating 1-Seismic 1 1409 490 1557 6813 Operating 1-Seismic 1 -3027 220 1119 -2787 96 1413 Maximum 1502 900 0 0 0 0 0 Displacements (gbbal) Laad combination Load (N) 119 -2787 -681 -3877 Sustained - 1520 Sustained - 1620 <td></td> <td></td> <td></td> <td></td> <td>Support lo</td> <td>ad summa</td> <td>ary for ancl</td> <td>hor at node 125</td>					Support lo	ad summa	ary for ancl	hor at node 125
Lead combinations. 1, 2 (17) 1, 12 (17) 12 (17) 12 (17) 10 (17	Load combination				MY (Nm)	MV (Nm)	MZ (Nm)	
Entry Weight 220 -154 30 102 -104 -997 Sustained 211 -1715 248 -1177 248 -1177 Operating 1 -1755 1605 332 -727 832 4113 Sustained+Wind 1152 -1631 427 -600 1004 3001 Sustained+Wind 2 239 -1714 600 1750 4966 -1203 Operating 1+Wind 2 21747 632 708 1623 -3877 Operating 1-Seismic 1 1041 -2303 -763 -3877 Operating 1-Seismic 1 -604 90 0 0 0 Operating 1-Seismic 1 -604 0 0 0 0 Operating 1-Seismic 1 -602 -763 -3877 Allowables 0 0 0 0 0 Displacements (global) 2280 -763 -3877 Allowables -102 0 0 0	Load combination	FX (N)	FY (N)	FZ (N)	MA (INIT)	104 (INITI)		
Sustained 231 1/13 24 22 260 1/17 Operating1 1.765 332 727 832 4113 Sustained+Wind 834 1741 671 -211 145 -2289 Operating1+Wind 1152 -1631 427 -960 1004 3001 Sustained+Wind 239 1.774 660 1550 496 -1203 Operating1+Wind 21747 -1604 334 1000 364 4087 Sustained+Nind 239 -1774 1604 334 1000 364 4087 Sustained+Seismic1 1041 -2330 -763 -2038 7763 -3877 Operating1+Seismic1 -3027 -2220 1119 -2787 763 -3877 Allowables 0 0 0 0 0 0 0 0 Load combination Load (N) Export load summary for hanger at node 20B 1111 2083 1119 2787 Operating1+Weight -12300 Operating1 13200 111	Empty weight	220	-1004	24	152	-104	-997	9
Operating 1 -1750 -1005 -3.32 -127 6.32 4113 Sustained+Wind 834 -1741 -711 211 145 -2289 Operating 1+Wind -1152 -1631 427 -960 1004 3001 Sustained+Wind 21747 -1604 334 1000 364 4967 Sustained+Seismic 1 1021 -1100 811 2083 763 -3877 Operating 1+Seismic 1 1041 -2330 -763 -3877 6613 Operating 1-Seismic 1 1052 -990 811 2083 1567 6813 Maximum -3027 -2230 -1119 -2787 763 -3877 Allovables 0 0 0 0 0 0 0 Sustained+Wind 13200 -1139 -2787 763 -3877 Sustained+Wind 13200 -2300 1119 -2787 763 -3817 Sustained+Wind	Sustained	231	-1715	24	22	-28	-11//	2
Sustained+Wind 634 -1/4 -7/1 -211 143 -2209 Operating1+Wind -152 -1631 -427 -960 1004 3001 Sustained+Seismic1 1502 -1100 314 1000 364 4087 Sustained+Seismic1 1021 -1404 334 1000 364 4087 Sustained+Seismic1 1021 -1100 811 2033 763 -3877 Operating1+Seismic1 484 -990 455 1333 1567 6813 Minimum -3027 -2230 -1119 -2787 763 -3877 Operating1-Seismic1 -3027 -2230 -1119 -2787 -763 -3877 Minimum -3027 -2330 -1119 -2787 -763 -3877 Ioad combination Load (N) Empty Weight -12895 Sustained+Seismic1 -1164 Sustained+Wind -13320 Operating1-Seismic1 -1174 Sustained-Seismic1 -11744 Sustained+Seismic1 -11744 Sustained-Seiseismic1 -11644 <	Operating I	-1755	-1605	-332	-121	832	4113	
Operating 1-Wrind -1162 -1631 -427 -900 10/04 3001 Sustained+Wrind 2 -1714 600 1750 -496 -1203 Operating 1-Wrind 2 1152 -1100 811 2083 768 -3877 Operating 1-Seismic 1 1011 -2203 -1119 -2767 966 1413 Maximum 1502 -990 811 2083 1567 6813 Minimum 3002 -2203 -1119 -2767 -66 -8877 Allowables 0 0 0 0 0 -0 Ustained-Seismic 1 -1604 -3877 -303 -3877 -308 Allowables 0 0 0 0 0 -0 Ustained-Seismic 1 -1630 -1333 1567 6813 Sustained-Wrind -13421 -2300 -1119 -2787 -763 -3877 Sustained-Wrind -13421 -1203 -1164	Sustained+wind	834	-1741	-/1	-211	145	-2289	s
Sustained+Wind 2 239 174 600 344 400 Sustained+Seismic 1 1502 -1100 811 2083 708 1523 Sustained-Seismic 1 -1041 -2330 -763 -3877 Operating1+Seismic 1 -3027 -2220 -1119 -2787 96 1413 Maximum 1502 -990 811 2083 1567 6813 Minimum 1502 -990 811 2083 1567 6813 Maximum 1502 -990 811 2083 1567 6813 Maximum 1502 -990 811 2083 1567 6813 Minimum -3027 -2230 -1119 -2787 96 1413 Allowables 0 0 0 0 0 0 0 Displacements (gibbal) Cad combination Load (N) Exampted -1180 208 Sustained-Wind 2 -13200 Sustained-Seismic 1 -11744 209 209 219 Sustained-Seismic 1 -11745	Operating 1+vvind	-1152	-1631	-427	-960	1004	3001	
Operating 1+Wind 2 -11/4 -10/4 3-4 10/0 40/8 Sustained-Seismic 1 -100/4 23-4 10/0 40/8 -10/8 Sustained-Seismic 1 -104/1 -2330 -763 -2038 -763 -3877 Operating 1-Seismic 1 -3027 -2220 -1119 2787 -763 -3877 Minimum -3027 -2330 -1119 2787 -763 -3877 Allowables 0 0 0 0 0 0 0 Displacements (gibal) Load combination Load (N) Empty Weight -13280 -1174 Operating 1+Wind 2 -13371 Sustained-Seismic 1 -11744 -14815 Sustained-Seismic 1 -11744 -14815 -11744 -14815 Operating 1+Wind 2 -13201 -11744 -14815 Sustained-Seismic 1 -11644 -14815 -11744 Sustained-Seismic 1 -116464 -14815 -14815 Operating 1+Wind 2 -14815 <td>Sustained+Wind 2</td> <td>239</td> <td>-1/14</td> <td>690</td> <td>1750</td> <td>-496</td> <td>-1203</td> <td></td>	Sustained+Wind 2	239	-1/14	690	1750	-496	-1203	
Sustained-Seismic 1 1002 1100 811 2083 708 1523 Operating1+Seismic 1 484 -990 455 1333 1567 6813 Operating1+Seismic 1 -002 -773 -2083 7663 -3877 Maximum 1502 -990 811 2083 1567 6813 Maximum -3027 -2220 -1119 -2787 96 1413 Maximum -3027 -2330 -1119 -2787 -763 -3877 Allowables 0 0 0 0 0 0 0 Usplacements (globa) Load combination Load (N) Empty Weight -12320 -1119 -7763 -3877 Sustained-Wind -13200 Sustained-Wind -13280 Sustained-Wind -13371 Sustained-Wind -13421 -14415 -11744 Sustained-Seismic 1 -11744 Sustained-Seismic 1 -14766 Maximum -11664 Minimum -14815	Operating 1+wind 2	-1/4/	-1604	334	1000	364	4087	z
Sustained-Seismic 1 -1041 -2330 -763 -2038 -763 -3877 Operating1+Seismic 1 3027 -2220 -1119 -2787 96 1413 Maximum 1502 -990 811 2083 1567 6813 Minimum -3027 -2230 -1119 -2787 -763 -3877 Allowables 0 0 0 0 0 0 0 Displacements (global) Load (N) Emply Weight -12895 Sustained -13280 Operating1+Wind -13371 Sustained+Wind 2 -1174 Sustained+Wind 2 -13301 Operating1+Wind 2 -13201 Operating1+Seismic 1 -14736 Operating1+Seismic 1 -14815 -14736 Maximum -14815 -14815 Displacements (global) Load combination Load summary for hanger at node 1158 Displacements (global) Load combination -14815 Operating1+Seismic 1 -14815 -14815 Displacements (global) Load combination Load (N) Empty Weight -57	Sustained+Seismic 1	1502	-1100	811	2083	708	1523	
Operating 1+Seismic 1 484 -990 455 1333 1567 6813 Operating 1-Seismic 1 3027 -2220 1119 -2787 96 1413 Minimum 3027 -2230 1119 -2787 96 1413 Minimum 3027 -2330 1119 -2787 763 -3877 Allowables 0 0 0 0 0 0 0 Displacements (global) Load combination Load (N) Empty Weight -12895 Sustained-Wind -1331 Sustained-Wind -13200 Operating 1 -13200 Sustained-Wind -13421 Operating 1+Seismic 1 -11744 -23501 Operating 1+Seismic 1 -11664 Operating 1+Seismic 1 -11664	Sustained-Seismic 1	-1041	-2330	-763	-2038	-763	-3877	
Operating 1-Seismic 1 -3027 -2220 -1119 -2787 96 1413 Maximum -3027 -2330 -1119 2787 -763 -3877 Allowables 0 0 0 0 0 0 0 Displacements (g/bal) Load (N) Empty Weight -12885 Sustained -13200 Sustained +Wind -13451 Operating 1+Wind -13421 Operating 1+Wind 2 -13421 Sustained+Seismic 1 -11744 Sustained+Seismic 1 -14736 Maximum -11664 Operating 1-Seismic 1 -14736 Maximum -11664 Maximum -11664 Minimum -14815 Operating 1-Seismic 1 -14736 Maximum -11664 Minimum -14815 Operating 1-Seismic 1 -14736 Maximum -11664 Minimum -14815 Displacements (g/bal) Empty Weight Load combination <	Operating1+Seismic 1	-484	-990	455	1333	1567	6813	
Maximum 1502 -990 811 2033 1567 6813 Minimum -3027 -2330 -1119 -2767 -763 -3877 Allowables 0 0 0 0 0 0 0 Displacements (gibbal) Load ombination Load (N) Empty Weight -12895 Sustained -13280 Operating 1 -13280 Operating 1 -13280 Sustained+Wind -13371 Sustained+Wind 2 -13501 Operating 1+Wind 2 -13501 Operating 1+Wind 13421 Sustained-Seismic 1 -11644 Operating 1-Seismic 1 -11644 Operating 1-14815 - Operating 1-Seismic 1 -14815 - - - Displacements (gibbal) Load combination Load (N) - - Empty Weight -5767 Sustained -5767 - - Sustained -5767 - - - - Variance - - - - - Variane - - -<	Operating1-Seismic 1	-3027	-2220	-1119	-2/8/	96	1413	
Minimum -3027 -2330 -1119 -2787 -763 -3877 Allowables 0 0 0 0 0 0 0 Allowables 0 0 0 0 0 0 0 Displacements (global) Load combination Load (N) Support load summary for hanger at node 20B Bisplatements -13280 -13280 Sustained -13280 Operating 1 -13451 -13451 Sustained+Wind 2 -13421 Sustained+Wind 2 -13421 -13501 Operating 1+Wind 2 -13421 Operating 1+Wind 2 -1341 -11664 Operating 1+Seismic 1 -11664 Operating 1+Seismic 1 -11664	Maximum	1502	-990	811	2083	1567	6813	
Allowables 0 0 0 0 0 Support load summary for hanger at node 20B Displacements (global) Load combination Load (N) Empty Weight -12895 Sustained -13200 Operating1 -13200 Sustained+Wind -13371 Operating1+Wind -13371 Sustained+Wind -13421 Sustained+Seismic1 -11744 Sustained+Seismic1 -11744 Sustained+Seismic1 -11664 Operating1-Seismic1 -14815 Minimum -14815 Displacements (global) - Load (N) - Empty Weight -5767 Sustained -5810	Minimum	-3027	-2330	-1119	-2787	-763	-3877	8
Displacements (g obal) Load combination Load (N) Empty Weight -12895 Sustained -13280 Operating1 -13280 Operating1+Wind -13451 Operating1+Wind 2 -13501 Operating1+Wind 2 -13501 Operating1+Wind 2 -13501 Operating1+Seismic 1 -11744 Sustained+Seismic 1 -14815 Operating1-Seismic 1 -14815 Operating1-Seismic 1 -14815 Maximum -11664 Minimum -14815 Displacements (g bal) Support load summary for hanger at node 1158 Displacements (g bal) Load combination Load combination Load (N) Empty Weight -5767 Sustained -5810	Allowables	0	0	0	0	0	0	
Displacements (global) Load combination Load (N) Empty Weight -12895 Sustained -13280 Operating1 -13200 Sustained+Wind -13451 Operating1+Wind -13501 Operating1+Wind -13501 Operating1+Wind -13501 Operating1+Wind -13501 Operating1+Wind -13501 Operating1-Seismic1 -11744 Sustained-Seismic1 -11864 Operating1-Seismic1 -14815 Operating1-Seismic1 -1464 Maximum -11664 Minimum -14815 Displacements (global)		1			Support lo	ad summa	ary for hang	ger at node 20B
Load combination Load (N) Empty Weight -12895 Sustained -13280 Operating1 -13200 Sustained+Wind -13371 Sustained+Wind 2 -13501 Operating1+Wind 2 -13501 Operating1+Wind 2 -13601 Operating1+Wind 2 -134815 Sustained-Seismic 1 -11744 Sustained-Seismic 1 -11664 Operating1+Seismic 1 -11664 Maximum -11664 Minimum -14815 Displacements (global) - Load combination Load (N) Empty Weight -5767 Sustained -5810	Displacements (gl	obal)						
Empty Weight -12895 Sustained -13280 Operating1 -13200 Sustained+Wind -13451 Operating1+Wind -13371 Sustained+Wind 2 -13501 Operating1+Wind 2 -13421 Sustained+Seismic 1 -11744 Sustained-Seismic 1 -11644 Operating1-Seismic 1 -11664 Maximum -11664 Minimum -14815 Displacements (global)	Load combination	Load (N)						
Sustained -13280 Operating1 -13280 Sustained+Wind -13451 Operating1+Wind -13371 Sustained+Wind 2 -13501 Operating1+Wind 2 -13421 Sustained+Seismic 1 -11744 Sustained-Seismic 1 -11664 Operating1+Seismic 1 -11664 Maximum -11664 Minimum -14815 Displacements (gbal) - Load combination Load (N) Empty Weight -5767 Sustained -5810	Empty Weight	-12895	_					
Operating1 -13200 Sustained+Wind -13451 Operating1+Wind -13371 Sustained+Wind -13371 Sustained+Wind -13501 Operating1+Wind -13501 Operating1+Wind -13415 Sustained+Seismic1 -11744 Sustained-Seismic1 -14815 Operating1+Seismic1 -11664 Operating1-Seismic1 -14815 Operating1-Seismic1 -14815 Operating1-Seismic1 -14815 Displacements (gibal) - Load combination Load (N) Empty Weight -5767 Sustained -5810	Sustained	-13280	_					
Sustained+Wind -13451 Operating1+Wind -13371 Sustained+Wind -13371 Sustained+Wind -13361 Operating1+Wind -13501 Operating1+Wind -13421 Sustained+Seismic 1 -11744 Sustained-Seismic 1 -14815 Operating1-Seismic 1 -11664 Operating1-Seismic 1 -1464 Minimum -11664 Minimum -14815 Displacements (gl>bal) - Load combination Load (N) Empty Weight -5767 Sustained -5810	Operating1	-13200	-					
Uperating1+Wind -133/1 Sustained+Wind 2 -13501 Operating1+Wind 2 -13421 Sustained+Seismic 1 -11744 Sustained-Seismic 1 -11815 Operating1+Seismic 1 -11664 Operating1-Seismic 1 -11664 Operating1-Seismic 1 -11664 Maximum -11864 Minimum -14815 Displacements (g) bal - Load combination Load (N) Empty Weight -5767 Sustained -5810	Sustained+Wind	-13451	-					
Sustained+twind 2 -13501 Operating1+Wind 2 -13421 Sustained+Seismic 1 -11744 Sustained-Seismic 1 -14815 Operating1+Seismic 1 -11664 Operating1-Seismic 1 -14736 Maximum -11664 Minimum -14815 Deperating1-Seismic 1 -14736 Maximum -11664 Minimum -14815 Displacements (g/bal) - Load combination Load (N) Empty Weight -5767 Sustained -5810	Operating1+Wind	-133/1						
Operating Frvming 2 -13421 Sustained+Seismic 1 -11744 Sustained-Seismic 1 -14815 Operating1+Seismic 1 -11664 Operating1-Seismic 1 -14736 Maximum -11664 Minimum -14815 Deperating1-Seismic 1 -1464 Minimum -14815 Displacements (gbal) - Load combination Load (N) Empty Weight -5767 Sustained -5810	Sustained+Wind 2	-13501	-					
Sustained+Seismic 1 -11/44 Sustained-Seismic 1 -14815 Operating1+Seismic 1 -11664 Operating1-Seismic 1 -14736 Maximum -11664 Minimum -14815 	Operating1+Wind 2	-13421	-					
Sustained-Seismic 1 -14815 Operating1+Seismic 1 -11664 Operating1-Seismic 1 -14736 Maximum -11664 Minimum -14815 	Sustained+Seismic 1	-11/44	-					
Operating 1+Seismic 1 -11664 Maximum -11664 Minimum -14815 Support load summary for hanger at node 115B Displacements (global) Load combination Load (N) Empty Weight -5767 Support load summary for hanger at node 115B	Sustained-Seismic 1	-14815	-					
Operating1-Seismic 1 -14736 Maximum -11664 Minimum -14815 Support load summary for hanger at node 115B Displacements (global) Load combination Load (N) Empty Weight -5767 Sustained -5810 Version 12.10	Operating1+Seismic 1	-11664						
Maximum -11664 Minimum -14815 Minimum -14815 Support load summary for hanger at node 115B Displacements (global) Load combination Load (N) Empty Weight -5767 Sustained -5810	Operating1-Seismic 1	-14736	_					
Minimum -14815 Immum -14815 Support load summary for hanger at node 115B Displacements (global) Load combination Load combination Load (N) Empty Weight -5767 Sustained -5810	Maximum	-11664	-					
Support load summary for hanger at node 115B Displacements (global) Load combination Load (N) Empty Weight -5767 Sustained -5810	winimum	-14815	-					
Displacements (global) Load combination Load (N) Empty Weight -5767 Sustained -5810					• ••			
Displacements (global) Load combination Load (N) Empty Weight -5767 Sustained -5810			1		Support loa	ad summa	ry for hang	er at node 115B
Load combination Load (N) Empty Weight -5767 Sustained -5810	Displacements (gl	obal)	-					
Empty Weight -5/6/ Sustained -5810	Load combination	Load (N)						
Sustained -5810 Version 12.10 Sample?	Empty Weight	-5767	_					
Version 12.10 Sample? Ion 4.2024	Sustained	-5810						
	Varsion 12 10					0	ample?	I 4 0004

Caepi	ре							Sample Pro	blem 2				Page 8
						Support	load	summary for	hanger a	at node	115	В	
C	isplace	ements (g	lobal)	_									
Load	combir	ation	Load (N)	1									
Susta	ined+V	Vind	-5115	-									
Opera	atina1+	Wind	-5116	-									
Susta	ined+V	Vind 2	-5812	1									
Opera	ating1+	Wind 2	-5118										
Susta	ined+S	eismic 1	-5613	1									
Susta	ined-S	eismic 1	-6006										
Opera	ating1+	Seismic 1	-4919	1									
Opera	ating1-8	Seismic 1	-5311										
Maxin	num		-4919										
Minim	um		-6006	_									
-													
			1			Suppo	ort loa	d summary	for nozzle	e at noo	le 5		
Load	combir	nation	Radial (F (N)	P) y Sł (N)	hear (VL)	z Shear ((N)	VC)	Forque (MT) [Nm)	Circ.Mo (Nm)	m (MC) Lo (N	mg.Mom (ML) m)	
Empty	Weig	ht	140	-75		3419	4	162	-106		-58	81	
Susta	ined		99	-31		3687	2	252	-247		-29	98	
Opera	ating1		-999	-74	5	4378	-	1561	-884		-26	613	
Susta	ined+V	Vind	972	-80		3476	-	-58	-251		-1(05	
Opera	ating1+	Wind	-126	-79	5	4167	-	1871	-888		-24	419	
Susta	ined+V	Vind 2	75	923		3732		·1413	-328		18	49	
Opera	ating1+	Wind 2	-1023	208		4424		3226	-965		-40	66	
Susta	ined+S		3952	1/3	4	4817		3142	290		33	73	
Susta	inea-5	eismic 1 Seiemie 1	-3755	-1/3	96	2557	- 5	2638	-783		-3	969	
Opera	ating 1+	Seismic 1	2004	-25	9 10	3248		1329	-347		10	284	
Maxin	aung I-s	Seisinic I	3952	-23	4	5509		2142	290		-0.	73	
Minim	um		-4852	-25	10	2557		4451	-1420		-6	284	
Allowa	ables		0	0		0	()	0		0		
						Loa	ads or	Anchors: E	mpty We	ight (W)	1	
Node	Tag F	X (N)	FY (N)	FZ (N)	MX (Nm)	MY (Nm) MZ	(Nm)			<u>.</u>		
50	-	360 -	4992	25	-4871	1556	-10	57					
125	2	220 .	-1584	50	152	-104	-99	7					
						Loa	ids or	Hangers: E	mpty We	ight (W	')		
Node	Tag T	уре	Load (I	N) No.of	Total (N)								
20B	ι	Jser hang	er -12895	1	-12895								
115B	C	Grinnell	-5767	1	-5767								
						Loa	ads or	n Nozzles: E	mpty We	ight (W)		
Node	Tag A	xial y	Shear z S	Shear To	rque Circ	.Mom Lo	ng.M	om					
-	(N) (N	N) (N) (Nr	n) (Nm		lm)						
5		40 -7	5 34	19 464	2 -106	Dine ferre	81	a a la a a a dina	teer Eng	at Mai	abt /	(A/)	
	A	0	0	-	()	Pipe force	s in io	ocal coordina	ates: Emp	oty vvei	gnt (vv)	
Node	Axial	y Shea	r z Shear	Iorsic	on(Nm)	Inplane	e(Nm)) Outpla	ne(Nm)	Flex	. Fac	tors	
5	(IN) 140	(IN) 2410	(IN) 75	Moment		106	SIF	Moment 501	SIF	FFI	FFO	FFL	
5 10	140	-3419	-75	462	1.00	-106 564	1.00	566	1.00				
10	140	-2590	-75	462	1.00	564	1.00	566	1.00				
15A	140	2985	-75	462		-955		-9					
15A	140	2985	-75	462	1.00	-955	2.61	-9	2.17	8.13	8.13		
15B	3418	-140	-75	-38	1.00	-2099	2.61	-490	2.17	8.13	8.13		
15B 20A	3418 7609	-140	-75 -75	-38 -38		-2099 -1291		-490 -923					
20A	7609	-75	140	-38	1.00	923	2.61	-1291	2.17	8.13	8.13		
20B	-75	-8042	140	-1238	1.00	3955	2.61	91	2.17	8.13	8.13		
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							F	Pipe force	es in loc	al coordin	ates: Emp	oty We	ight (W)		
Node	Axial	y Shea	ar z	Shear	Tors	ion(Nn	n)	Inplar	ne(Nm)	Outpla	ane(Nm)	Flex	. Fac	tors		
	(N)	(N)	1)	۷)	Momer	nt SIF		Moment	SIF	Momen	t SIF	FFi	FFo	FFt		
20B 25	-75 -75	-4853 -2059	-1	140 140	-1238 -1238	1.00		-3955 9381	1.00	-91 -630	1.00					
30 55	-75 -75	3945 3965	-1	140 140	-1238 -1238	1.00		8794 8687	1.00	-717 -721	1.00					
55	-75	3965	-1	140	-1238	1 20		8687	2.00	-721	1.00					
35	-25	3339	-3	360	1057	1.39		503	2.00	7457	1.00					
60 60	-25 -25	3537	-3	360 360	1057		_	6519 6519		-601						
40	-25	3556	-3	360 360	1057	1.00		6423 6423	1 52	-610	1.52					
45	-25	3886		360	1057	1.00		4451	1.52	-801	1.52					
45 50	-25 -25	3886 4992	14	360 360	1057 1057			4451 -4871		-801 -1556						
35 65	220 220	823 873	5	0	120 120	1.07		-256 2179	1.47	-2295 -250	1.86		2.44 2.44			
65 100	220 220	873 1335	5 5	0 0	120 120	1.00		2179 784	1.00	-250 -187	1.00					
105	220	3343	5	0	120	1.00)	-160	1.00	-167	1.00					
110A	220	3352	5	0	120	1.00		-248	2.27	-166	1.89	6.59	6.59			
110B	3484	-220	5	0	-154	1.00)	-975	2.27	-109	1.89	6.59	6.59			
110B 115A	3484 4395	220 220	-5	50 50	-154 -154			975 426		-15						
115A 115B	4395 220	220 -4527	-5	50 50	-154 -26	1.00		426 1400	2.27 2.27	-15 143	1.89 1.89	6.59 6.59	6.59 6.59			
115B	220	-1240	5	0	-26			-1400		-143						
120A	220	-180	5	0 50	-26 -26	1.00	1	658 -658	2.27	-50	1.89	6.59	6.59			
120B	-228	-285	-5	50	-63	1.00)	-569	2.27	2	1.89	6.59	6.59			
1206	-228	601	5	0	-63 -63			-997		-2 173						
				1		1	C	ther for	ces in loc	al coordi	nates: Em	pty We	eight ((W)		
Node	Туре	fx fy (N) (I	/ N)	fz (N)	mx (Nm)	my (Nm)	mz (Nm	1)								
25 30	Valve	-75 - ⁴ -75 3	1373 261	-140	-1238	-630 -717	938 879	1 4								
100	Valve	220 1	567	50	120	-187	784	,								
100		220 0		00	120	-107	P	ipe forc	es in glob	al coordi	nates: Em	pty W	eight	(W)		
Node	FX (NI)	FY F	Z	MX (Nm)	MY (Nm)	MZ (Nm)										
5	-140	3419 7	v) 5	-462	-581	106										
10	140	-3274 -	75 5	462	566	564										
15A	140	2985 -	5 75	462	-9	-955										
15A 15B	-140 140	-2985 7 3418 -	5 75	-462 490	9 -38	955 -2099										
15B	-140	-3418 7	5	-490	38	2099										
20A 20A	-140	-7609 -	5 5	-923	-38 38	1291										
20B 20B	140 -140	8042 - 4853 7	75 5	3955 -3955	-91 5 91	-1238 1238										
25	140	-2059 -	75	-9381	-630	-1238										
30 55	-140 140	-3945 7 3965 -	5 75	8794 -8687	717 7-721	1238 -1238										

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							Pipe f	orces in gl	lobal coordinates: Empty Weight (W)	
Node	FX	FY	FZ	MX	MY	MZ				
	(N)	(N)	(N)	(Nm)	(Nm)	(Nm)				
55	-140	-3965	75	8687	721	1238				
35	-360	-3339	25	7457	503	-1057	<u>.</u>			
60	360	3537	-25	-6519	-601	1057				
60	-360	-3537	25	6519	601	-1057				
40	360	3556	-25	-6423	-610	1057	-			
40	-360	-3556	25	6423 -4451	610 -801	-1057				
45	-360	-3886	25	4451	801	-1057				
50	360	4992	-25	4871	-1556	1057				
35	220	-823	50	120	256	2295				
65	-220	873	-50	-120	-250	-2179				
100	-220	1335	-50	-120	-187	-784				
105	220	-3343	50	120	167	-160				
110A	-220	3352	-50	-120	-166	248				
110A	220	-3352	50	120	166	-248				
110B	-220	3484	-50	-109	-154	975	<u></u>			
115A	-220	4395	-50	15	-154	426				
115A	220	-4395	50	-15	154	-426				
115B	-220	4527	-50	26	-143	1400	<u>_</u>			
115B	220	1240	50	-26	143	-1400	1			
120A	220	-180	-50	-26	-50	-000				
120A	-220	291	-50	18	61	-569				
120B	220	-291	50	-18	-61	569				
125	-220	1584	-50	-152	104	997	~			
		EV	EV	F 7	MAX	BAX/	Other	forces in g	giobal coordinates: Empty Weight (W)	
Node	Type	(N)	(N)	IFZ (N)	(Nm)	(Nm)	(Nm)			
25	Valve	-140	1373	75	9381	630	1238			
30		140	3261	-75	-8794	-717	-1238			
100	Valve	220	-1567	50	120	187	784			
105		-220	3111	-50	-120	-107	160	Displac	cements: Empty Weight (W)	
			Г)isplace	ments	(aloba	D)	Displac		
Node	X (mn	n) Y (mm)	Z (mm) XX	(deg)	YY (deg)	ZZ (deg)		
5	0.003	0.0	000	0.000	0.0	000	0.0212	-0.0243		
10	0.003	-0.	087	-0.075	0.0	005	0.0217	-0.0241		
15A	0.004	4.9	933	-3.845	0.0	208	0.0311	0.0902		
15B	-0.459	5.4	65	-3.888	0.0	269	0.0281	0.0541	-	
20A	-3.5/5	5.4	86	-0.361	0.0	448	0.0269	0.0111	-	
20B	1 200	5 5.U	125	0.000	0.0	268	0.0333	-0.0043		
30	-1.007	, -0. , -0.	378	0.000	0.0	200	0.0271	-0.0313		
55	-0.994	↓ -0.	387	0.000	0.0	189	0.0266	-0.0329	-	
35	-0.867	′ -0.	471	0.000	0.0	189	0.0266	-0.0329		
60	-0.740	-0.	557	0.000	0.0	189	0.0266	-0.0329		
40	-0.728	·-0.	565	0.000	0.0	182	0.0265	-0.0328	-	
45	-0.492	-0.	634	0.000	-0.0	0003	0.0241	-0.0281	-	
50	0.000	0.0	200	0.000	0.0	190	0.0000	0.0000	-	
100	-0.867	-0.	392 125	0.063	0.0	140	0.0266	-0.0540	-	
105	-0.868	3 2.1	54	0.705	0.0	136	0.0192	-0.1023		
110A	-0.868	3 2.2	202	0.714	0.0	135	0.0191	-0.1033		
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							D	isplacem	ents: Em	pty Weig	ht (W)	Ę.				
			Displa	cements	(globa	ıl)										
Node	X (mm)	Y (mm	1) Z (m	nm) XX	(deg)	YY (deg) ZZ	(deg)								
110B	-0.548	2.573	0.81	5 0.0	070	0.01	16 -0.0	604								
115A	1.000	2.587	1.02	0.0	025	-0.00	0.0 -0.0	166								
115B	1.023	2.567	1.02	.0 0.0	025	-0.00	104 0.02	201								
120A	1.022	-0.230	0.30	5 0.0	056	-0.01	104 0.02	107								
1200	0.000	0.000	0.00	0 0.0	000	0.00		000								
120	0.000	0.000	0.00	0.0	000	0.00	Lo	ads on A	nchors: S	Sustained	(W+F))				
Node	Tag FX	(N) F	Y (N)	FZ (N)	MX	(Nm)	MY (Nm) MZ (Nr	n)							
50	-33	30 -	5482	7	-672	29	1287	-1106								
125	23	1 -	1715	24	22		-28	-1177								
							Lo	ads on H	angers: S	Sustained	l (W+F	?)				
Node	Tag Ty	ре	Load	(N) No.o	f Tota	I (N)										
20B	Us	er hange	er -1328	0 1	-132	80										
115B	Gr	innell	-5810	1	-581	0										
							Lo	ads on N	lozzles: S	Sustained	(W+F	')				
Node	Tag Ax	ial y S	Shear z	Shear T	orque	Circ.	Mom Lo	ong.Mom								
-	(N)) (N) ()	 (N) (N) 	lm)	(Nm) (N	lm)								
5	99	-3	1 30	687 2	52	-247	-2	98				1.0.01				
			-				Pipe forc	es in loca	al coordin	ates: Sus	stained	4 (W+	P)			
Node	Axial	y Shear	z Shea	ar Tors	ion(Nr	n)	Inplan	e(Nm)	Outpla	ne(Nm)	Flex	K. Fac	tors	SL (MDa)		
5	(IN)	(IN)	(IN)	Nome			Moment	SIF	Moment	SIF	FFI	FFO	FFL			
5 10	99	-3687	-31	252	1.00	۰ L	-247 475	1.00	298	1.00				8.182		
10	99	-2848	-31	252	1.00)	475	1.00	292	1.00	-			8.529		
15A	99	3111	-31	252			-537		55					8.493		
15A	99	3111	-31	252	1.00)	-537	2.61	55	2.17	8.13	8.13		9.538		
15B	3574	-99	-31	44	1.00)	-1749	2.61	-264	2.17	8.13	8.13		14.86		
15B	3574	-99	-31	44			-1749		-264					11.44		
20A	8053	-31	99	44	1.00)	442	2.61	-1177	2.17	8,13	8.13		12.70		
20B	-31	-8516	99	-1139	1.00)	3634	2.61	-6	2.17	8.13	8.13		21.97		
20B	-31	-4763	-99	-1139			-3634		6					14.96		
25	-31	-1777	-99	-1139	1.00	0	8986	1.00	-375	1.00		-		25.82		
30	-31	4258	-99	-1139	1.00	נ	8213	1.00	-437	1.00				24.25		
55	-31	4279	-99	-1139	-		8098		-439					24.02		
35	-31	4490	-99	-1139	1.39	9	466	2.00	6901	1.00				21.65		
35	-7	3726	-330	1106	1.39	9	322	2.00	6894	1.00				21.59		
60	-7	3937	-330	1106			5848		-412					19.46		
60	-7	3937	-330	1106			5848		-412					19.46		
40	-7	3958	-330	1106	1.00)	5741	1 52	-420	1.52				20.00		
45	-7	4309	-330	1106	1.00	5	3551	1.52	-595	1.52				21.99		
45	-7	4309	-330	1106			3551		-595					20.17		
50	-7	5482	-330	1106			-6729		-1287					31.82		
35	231	764	24	7	1.07	7	-145	1.47	-2246	1.86		2.44		28.55		
65	231	817	24	7	_		2138		-141	-		2.44		21.37		
65 100	231	81/	24	7	1.00	<u>ا</u> ۲	2138 799	1.00	-141	1.00				21.37		
105	231	3317	24	7	1.00	,)	-132	1.00	-102	1.00	-			20.19		
110A	231	3327	24	7	1.00	-	-220	1.00	-101	1.00				20.73		
110A	231	3327	24	7	1.00)	-220	2.27	-101	1.89	6.59	6.59		21.86		
110B	3465	-231	24	-96	1.00)	-939	2.27	-2	1.89	6.59	6.59		31.36		
110B	3465	231	-24	-96			939		2					26.64		
115A	4422	231	-24	-96			364		-58					22.81		

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							Pipe	forces in lo	cal coord	dinates: Sus	stained	4 (W+	P)		
Node	Axial	y Sh	ear z	Shear	Tors	ion(Nm	n) Ing	lane(Nm)	Outp	plane(Nm)	Fle	x. Fac	tors	SL	
	(N)	(N)	(N	4)	Momer	nt SIF	Mom	ent SIF	Mome	ent SIF	FFi	FFo	FFt	(MPa)	
115A	4422	231	-2	4	-96	1.00	364	2.27	-58	1.89	6.59	6.59		24.64	
115B	231	-456	i0 -2	.4 1	-63	1.00	1342	2.27	90	1.89	6.59	6.59		35.40	
120A	231	241	24	+ 1	-63		616	<u>-</u>	2					23.42	
120A	231	-241	-2	4	-63	1.00	-616	2.27	-2	1.89	6.59	6.59		26.51	
120B	-290	-311	-2	4	-21	1.00	-512	2.27	55	1.89	6.59	6.59		25.12	
120B	-290	311	24	1	-21		512	,	-55					22.55	
125	-1000	044	24	•	-21		Other	forces in l		dinates: Su	staine	d (\\/+	-P)	20.94	
		fv	fv	f-	my	my	mz				otanio	u (11 -	• ,		
Node	Туре	(N)	(N)	(N)	(Nm)	(Nm)	(Nm)								
25	Valve	-31	-1091	-99	-1139	-375	8986								
30		-31	3574	-99	-1139	-437	8213								
100	Valve	231	1534 3085	24	7	-111	-132								
100		201	0000	<u></u> .	1.	102	Pipe f	orces in al	obal coor	dinates: Su	Istaine	d (W+	P)		
Node	FX	FY	FZ	МХ	MY	MZ		J. J. J.					,		
	(N)	(N)	(N)	(Nm)	(Nm)	(Nm)									
5	-99	3687	31	-252	-298	247	-								
10	99	-3532	-31	252	292	475	-								
10 154	-99	2848	31	-252	-292	-475									
15A	-99	-3111	31	-252	-55	537	-								
15B	99	3574	-31	264	44	-1749									
15B	-99	-3574	31	-264	-44	1749									
20A	99	8053	-31	442	44	-1177	_								
20A 20B	-99	-8053	-31	-442 3634	-44	-1139									
20B	-99	4763	31	-3634	1 -6	1139	-								
25	99	-1777	-31	-8986	6 -375	-1139									
30	-99	-4258	31	8213	437	1139									
55	-00	4279	-31	-8098	439	-1139	-								
35	99	4490	-31	-6901	-466	-1139									
35	-330	-3726	7	6894	322	-1106									
60	330	3937	-7	-5848	3 -412	1106	-								
60 40	-330	-3937	7	5848	412	-1106									
40	-330	-3958	7	5741	420	-1106									
45	330	4309	-7	-3551	-595	1106									
45	-330	-4309	7	3551	595	-1106									
50	330	5482	-7	6729	-1287	1106	-								
65	-231	817	-24	-7	-145	-2138									
65	231	-817	24	7	141	2138	-								
100	-231	1302	-24	-7	-111	-799									
105	231	-3317	24	7	102	-132									
110A	231	-3327	-24 24	-/	101	-220									
110B	-231	3465	-24	-2	-96	939									
110B	231	-3465	24	2	96	-939									
115A	-231	4422	-24	58	-96	364									
115A	231	-4422	24	-58	96 _90	-364 1342									
115B	231	1250	24	-63	90	-1342	-								
120A	-231	241	-24	63	2	-616									
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							F	Pipe for	ces in gl	bal coordinates: Sustained (W+P)	
Node	FX	FY	FZ	MX	MY	MZ					
	(N)	(N)	(N)	(Nm)	(Nm)	(Nm)					
120A	231	-241	24	-63	-2	616					
120B	-231	358	-24	59	7	-512	-				
120B	231	-358	24	-59	-7	512					
125	-231	1715	-24	-22	20	1177	С	ther for	ces in g	bal coordinates: Sustained (W+P)	
		FX	FY	FZ	MX	MY	MZ				
Node	Туре	(N)	(N)	(N)	(Nm)	(Nm)	(Nm)			
25	Valve	e -99	1091	31	8986	375	1139	9			
30	N/-1-	99	35/4	-31	-8213	-437	-113	9			
100	vaive	-231	-1534	-24	-7	-102	132				
100		201	0000	2.		102	102		Displac	ments: Sustained (W+P)	
			D	isplace	ements	(globa	I)				
Node	X (m	m) Y	(mm)	Z (mm	n) XX	(deg)	YY (c	leg) ZZ	Z (deg)		
5	0.000	0.	000	0.000	0.0	000	0.010	9 -0	.0567		
10	0.000	-C	.200	-0.039	0.0	003	0.011	2 -0	.0566		
15A	0.003	3 1.	188	-2.022	0.0	114	0.017	0 0.0	0715		
15B	-0.37	1 1.	617	-2.050	0.0	143	0.016	52 0.0	0436		
20A	-2.11	4 1.	639 204	-0.193	0.0	232	0.017	6 0.0	0084		
206	-2.01	9 1.	634 634	0.000	0.0	0/3	0.024	-0	0001		
30	-0.80	17 -1	550	0.000	-0.0	1043	0.02	1 -0	0343		
55	-0.79	07 -1	.545	0.000	-0.0	0118	0.021	0 -0	.0344		
35	-0.69	7 -1	.482	0.000	-0.0	0118	0.021	0 -0	.0344		
60	-0.59	6 -1	.420	0.000	-0.0	0118	0.021	0 -0	.0344		
40	-0.58	6 -1	.414	0.000	-0.0	125	0.021	0 -0	.0343		
45	-0.39	9 -1	.211	0.000	-0.0	283	0.019	92 -0	.0294		
50	0.000	0.	000	0.000	0.0	000	0.000	0.0	0000		
65	-0.69	97 -1	.399	0.050	-0.0	0118	0.021	0 -0	.0552		
100	-0.69	07 0.	436	0.467	-0.0	0121	0.017	0 -0	.1033		
105	-0.69	97 1.	170	0.586	-0.0)121	0.016	67 -0	.1043		
110A	-0.69	07 1.	219	0.594	-0.0	0121	0.016	67 -0	.1042		
110B	-0.36	i9 1.	597	0.600	-0.0	0137	0.013	31 -0.	.0632		
115A	1.362	2 1.	610	0.027	-0.0	0120	0.005	-0.	.0225		
1158	1.414	+ 1. > 0	023 272	0.000	-0.0	022	0.002	14 0.0	0192		
120A	1.41		353	0.000	-0.0	033	-0.00	14 0.0	0208		
125	0.000	0	000	0.000	0.0	000	0.00	0 0 0	0000		
120	0.00			0.000	0.0		0.000	0	Loads o	Anchors: Expansion (T1)	
Node	Tag	FX (N)	FY (N) F	Z (N)	MX	(Nm)	MY (N	m) MZ (lm)	
50		3084	-193	1	071	272	. ,	-9375	491		
125		-1986	110	-	356	-750)	860	5290		
									Loads o	Hangers: Expansion (T1)	
Node	Tag	Туре	L	.oad (N) No.ot	Tota	(N)				
20B		User h	anger 8	80	1	80					
115B		Grinne	II 6	95	1	695			Loade o	Nozzlec: Expansion (T1)	_
Node	Таа	Axial	v She	ar z Sł	near To	orque	Circ	Mom I	Lona.Mc		
		(N)	(N)	(N)	(N	lm)	(Nm)	((Nm)		
5		-1098	-715	691	-1	813	-637		-2315		
Versic	n 12.	10								Sample2 Jan 4.20)24

Caepi	ipe								S	Sample Pro	blem 2							Pa	ge 14
		~			,			Pipe fo	orces in lo	ocal coordii	nates: Ex	pansio	on (T1)					
Node	Axial	y Shea	ar z S	Shear	Tors	ion(Nn	n)	Inpla	ne(Nm)	Outpla	ne(Nm)	Flex	k. Fac	tors	SE	SA	SE	_	
F	(N)	(N)	(N	15	Momer	nt SIF		Momen	it SIF	Moment	SIF	FFi	FFo	FFt	(MPa)	(MPa)	SA		
5 10	-1098	-691	-7	15	-1813	1.00)	-637	1.00	2315	1.00				5.974	306.8	0.02		
10	-1098	-691	-7	15	-1813	1.00)	-499	1.00	2172	1.00				5.974	306.4	0.02		
15A	-1098	-691	-7	15	-1813		_	4825	2010-011-0020-0	-3331	Companying and	Carro Member			12.66	306.5	0.04		
15A 15B	-1098	-691	-7	15 15	-1813	1.00)	4825	2.61	-3331 1541	2.17	8.13	8.13		29.96	305.4	0.10		
15B	-691	1098	-7	15	-3603	1.00		4670	2.01	1541	2.17	0.10	0.10		12.51	303.5	0.04		
20A	-691	1098	-7	15	-3603			-1684		-2596					9.751	303.9	0.03		
20A 20B	-691	-715	-1	098	-3603	1.00)	2596	2.61	-1684	2.17	8.13	8.13		17.41	302.2	0.06		
20B	-715	-612	10	98	-2102	1.00		-2605	2.01	-3185	2.17	0.10	0.10		9.512	299.9	0.03	-	
25	-715	-612	10	98	-2102	1.00)	-244	1.00	1051	1.00	_			4.866	288.8	0.02		
30 55	-715	-612	10	98 98	-2102	1.00)	136 153	1.00	1735 1764	1.00				5.628	290.4 290.6	0.02		
55	-715	-612	10	98	-2102			153		1764		1			5.669	290.6	0.02		
35	-715	-612	10	98	-2102	1.39)	-2064	2.00	320	1.00				10.42	293.0	0.04		
35	-1071	193	30	084	-491	1.39)	-339	2.00	838	1.00				2.724	293.1	0.01		
60	-1071	193	30)84)84	-491	-	-	785		1181		-			3 196	295.3	0.01	-	
40	-1071	193	30	084	-491			780		1264					3.326	295.5	0.01		
40	-1071	193	30)84	-491	1.00)	780	1.52	1264	1.52				4.933	293.8	0.02		
45	-1071	193	30	084	-491	1.00)	678	1.52	2899	1.52				16.86	292.7	0.06		
45 50	-1071	193	30)84)84	-491			272		2899 9375					34.29	294.5 282.6	0.04		
35	-1986	-805	-3	56	-518	1.07		1724	1.47	-1611	1.86		2.44		29.54	286.0	0.10		
65	-1986	-805	-3	56	-518	_		1721		1676		_	2.44		18.19	293.3	0.06	-	
100	-1986	-805	-3	56	-518	1.00)	2737	1.00	1226	1.00				22.41	293.3	0.06		
105	-1986	-805	-3	56	-518	1.00)	3062	1.00	1082	1.00				24.17	284.3	0.09		
110A	-1986	-805	-3	56	-518			3083		1073		0.50			24.29	283.7	0.09	-	
110A	-1986	-805 1986	-3	56 56	-518 992	1.00)	3083 2813	2.27	1073	1.89	6.59	6.59		52.93	282.6	0.19		
110B	-805	-1986	35	56	992			-2813		-437					21.87	277.7	0.08		
115A	-805	-1986	35	56	992			2137		451					17.44	281.6	0.06		
115A	-805	-1986	35	56	992 532	1.00)	2137	2.27	451 -910	1.89	6.59	6.59		36.24	279.7	0.13		
115B	-1986	-110	-3	56	532	1.00		-2407	2.21	910	1.00	0.00	0.00		19.42	275.6	0.07		
120A	-1986	-110	-3	56	532			-1980		-472					15.64	281.0	0.06		
120A	-1986	110	35	66	532	1.00)	1980	2.27	472	1.89	6.59	6.59		33.61	277.8	0.12		
120B	-380	-1952	-3	56	650	1.00	,	-1612	2.21	321	1.09	0.59	0.59		12 80	281.9	0.10		
125	-380	-1952	-3	56	650			5290		-937					38.98	277.4	0.14		
								Other f	orces in I	ocal coordi	inates: E	xpansi	on (T	1)					
Nada	T	fx fy		fz	mx	my	mz	~											
Node 25	Valve	-715 -6	N) 12	(IN) 1098	(INIT) -2102	(INIT) 1051	-24	n) 4											
30	valve	-715 -6	512	1098	-2102	1735	136	5											
100	Valve	-1986 -8	805	-356	-518	1226	273	37											
105		-1986 -8	305	-356	-518	1082	306	Dino fo	roog in al	chal coord	inotoo: E	vnonci	on /T	1)					
Node	FX	FYF	7	MX	MY	MZ		r-ipe io	rees in gi	obai coord	mates: E	vpansi	011 (1	1)					
Noue	(N)	(N) (1	N)	(Nm)	(Nm)	(Nm)													
5	1098	691 7	15	1813	-2315	637													
10	-1098	-691 -7	15	-1813	3 2172	-499	_												
10 154	1098	691 7	15	1813	-2172	499 4825													
IUA	1000	001 -1	10	-1013	-0001	4020													
Vorsia	n 10 4	n								Comel	02							loc 4	2024
v croit	// / / /	-								Jampi	~~							Jall 4,	,_024

Caepi	ре								Sample Problem 2 Pag	je 15			
				0			Pipe	e forces in	global coordinates: Expansion (T1)				
Node	FX	FY	FZ	MX	MY	MZ							
	(N)	(N)	(N)	(Nm)	(Nm)	(Nm)							
15A	1098	691	715	1813	3331	-4825							
15B	-1098	-691	-/15	-1541	-3603	4670	-						
20A	-1098	-691	-715	2596	-3603	-4670							
20A	1098	691	715	-2596	3603	1684	-						
20B	-1098	-691	-715	2605	-3185	-2102							
20B	1098	612	715	-2605	3185	2102							
25	-1098	-612	-715	244	1051	-2102	_						
30	1098	612	715	136	-1735	2102							
55	1098	612	715	153	-1764	2102							
35	-1098	-612	-715	-320	2064	-2102							
35	3084	-193	1071	838	-339	491							
60	-3084	193	-1071	-785	1181	-491	_						
60	3084	-193	1071	785	-1181	491							
40	-3084	193	-1071	-780	1264	-491	-						
40	-3084	-193	-1071	-678	-1264	-491							
45	3084	-193	1071	678	-2899	491	-						
50	-3084	193	-1071	-272	9375	-491							
35	-1986	805	-356	-518	-1724	1611							
65	1986	-805	356	518	1676	-1721	_						
65	-1986	805	-356	-518	-1676	1721							
100	1986	-805	356	518	1226	-2737	-						
105 110A	-1986	805	-356	-518 518	-1082	-3083							
110A	-1986	805	-356	-518	-1073	3083	-						
110B	1986	-805	356	437	992	-2813							
110B	-1986	805	-356	-437	-992	2813							
115A	1986	-805	356	-451	992	2137							
115A	-1986	805	-356	451	-992	-2137							
115B	-1986	110	-356	532	-910	-2407	-						
120A	1986	-110	356	-532	-472	1980							
120A	-1986	110	-356	532	472	-1980							
120B	1986	-110	356	-471	-551	1612	_						
120B	-1986	110	-356	471	551	-1612							
125	1986	-110	356	750	-860	-5290	011	<i>.</i>	adalah shara Turan ing (T4)				
				1			Othe	er torces in	I GIODAI COORDINATES: EXPANSION (11)				
Node	Type	FX (N)	FY (N)	FZ (N)	MX (Nm)	MY (Nm)	MZ (Nm)						
25	Valve	1098	612	715	-244	-1051	2102						
30		-1098	-612	-715	-136	1735	-2102						
100	Valve	-1986	805	-356	-518	-1226	2737						
105		1986	-805	356	518	1082	-3062						
	Displacements: Expansion (T1)												
			D	isplace	ments	(globa)						
Node	X (mm	1) Y (mm)	Z (mm) XX	(deg)	YY (deg)	ZZ (deg)					
5	-0.027	0.0	512	0.000	0.0	000	0.0846	-0.1464	-				
154	21.860	-U.	-17.368 -12		-0.299 -0.002 -12 713 -0.08		0.0670	-0.1409	-				
15B	22.96	5 -16	16.552 -13.560) -0.0824		0.0339	0.0296					
20A	16.683	16.683 -0.513		-22.102 -0.		0690	-0.0851	0.0675	-				
20B	15.610	0.7	'59	-21.36	7 -0.0	0119	-0.1158	0.0639					
25	6.784	0.5	514	-10.67	4 0.0	123	-0.1339	0.0176					
30	5.334	0.3	880	-8.949	0.0	123	-0.1328	0.0156					
Versio	on 12.1	0							Sample2 Jan 4,	2024			

Node X (mm) Y (mm) Z (mm) XX (dg) YY (dg) ZZ (dg) So S.272 0.374 - 6.874 0.0123 0.1260 0.0153 So S.272 0.374 - 6.874 0.0123 0.1260 0.0153 So S.272 0.374 - 6.874 0.0123 0.1260 0.0153 So 0.000 0.0000 0.0000 0.0000 0.0000 0.0000 G 2.335 0.151 -5.816 0.0027 0.0123 0.153 O 0.762 0.733 0.0133 0.0130 0.0000 0.0000 G 0.835 1.551 1.1421 0.0387 0.0390 0.2876 1106 0.637 1.328 1.4320 0.0389 0.2876 0.427 1200 0.000 0.000 0.0000 0.0000 0.0000 0.0007 0.0277 0.2827 1201 1.328 1.477 1.781 0.0017 0.427 0.328 1.13200 125 0.000	Caepi	ре									Sam	ple Pro	oblem 2						Page 16
Image: Normal of the second of the	Displac											ents: E	xpansion	(T1)					
Node X X </td <td></td> <td></td> <td></td> <td></td> <td>Displac</td> <td>emen</td> <td>ts (glo</td> <td>obal)</td> <td></td>					Displac	emen	ts (glo	obal)											
58 5.27 0.374 4.874 0.0123 0.0125 0.0133 60 4.001 0.257 -7.361 0.012 0.0125 0.013 60 4.001 0.257 -7.361 0.0122 0.0125 0.013 60 4.000 0.257 -8.874 0.0122 0.0132 0.0134 60 4.000 0.257 -8.433 0.0123 0.0132 0.0134 60 4.200 0.278 -8.433 0.0123 0.0136 0.0014 100 0.762 1.19 0.0354 0.0354 0.0357 0.0151 1106 0.455 1.58 -11.450 0.0354 0.0267 0.076 1106 0.627 1.77 0.417 0.2827 0.000 0.000 0.000 1156 1.232 1.425 0.000 0.000 0.000 0.000 0.000 1206 1.425 0.027 1.425 0.000 0.000 0.0000 0.0000	Node	X (m	m)	Y (mm)) Z (mr	n) X	(X (de	eg) YY	(deg)	ZZ (deg)								
38 4.838 0.315 6.118 0.0123 0.0125 0.013 40 3.939 0.257 -7.287 0.0122 0.0125 0.0153 50 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 56 4.200 0.277 -4.433 0.012 0.0360 0.0000 0.0000	55	5.27	2	0.374	-8.87	4 0	.0123	-0.1	326	0.01	53								
60 60 7.361 0.012 0.123 0.013 45 0.257 7.267 0.020 0.022 0.013 0.0013 65 4.20 0.275 6.581 0.000 0.000 0.0001 0.0001 0.0001 66 4.20 0.276 6.433 0.0122 0.0126 0.0174 100 0.425 1.58 1.14.52 0.0354 0.0087 0.0076 1104 0.455 1.58 1.14.52 0.0364 0.0887 0.0176 1106 0.627 1.752 0.064 0.0687 0.0497 0.058 1200 3.38 1.7457 1.76 0.0049 0.069 0.000 1200 3.38 1.457 0.000 0.000 0.000 0.000 0.000 1201 3.32 1.420 0.327 22 217 21.5 3.52 7.55 1201 27.54 57.5 1.78 4.57 3.52 2.22	35	4.63	638 0.315 -8.118		8 0	.0123 -0.1		326	0.01	53									
40 3 399 0.251 -7.267 0.1325 0.0192 50 0.000<	60	4.00	4.001 0.257 -		-7.36	51 0.0123		-0.1	326	0.01	53								
4 4 2 2 5 8 0 0.000 1006 13.30 11.42 10.33 0.123 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0	40	3.93	.939 0.251 -7.287		7 0	0.0122		325	0.01	52									
adia bodie bodie <thb< td=""><td>45</td><td>2.73</td><td colspan="2">2.735 0.151 -5</td><td>-5.81</td><td colspan="2">8 0.0097</td><td>-0.1</td><td colspan="2">-0.1254</td><td>31</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></thb<>	45	2.73	2.735 0.151 -5		-5.81	8 0.0097		-0.1	-0.1254		31								
bit zeb 0.276 -0.433 0.122 0.012 0.	50	0.000 0.000		0.000	0.000 0.0			200	0.00	00									
International internatintered international international international inter	100	4.260 0.278		1.010	-0.43	5.433 0.			320	-0.00	720								
100 0.067 3.138 1.1459 0.0350 0.0315 1106 0.067 3.133 -11.456 0.0212 0.0370 0.2216 1156 12.371 15.28 -3.221 0.0070 0.0074 0.2227 1158 12.351 15.29 -1.455 0.0070 0.0070 0.0070 120 -3.360 17.457 -1.761 -0.0070 0.0070 0.0070 125 0.007 0.000 0.000 0.000 0.000 0.000 125 -17.55 -1605 1078 -4457 4087 -615 125 -17.55 -1605 1078 -4457 4087 -615 126 0.007 1 -1320 -775 182 +113 Load (N) No.of Total (N) 115 0.017 1 -1320 -775 1681 -897 1150 0.017 1 -1320 -775 1691 -691	105	0.762 1		1.551	-10.822		1 0.0336		-0.0837		795								
1108 0.627 3.133 -11.486 0.0622 -0.0389 -0.2616 1156 12.371 13.528 -8.321 0.0677 0.0477 -0.2827 1208 -3.386 17.457 -1.761 -0.0024 0.0780 0.1678 0.1427 1208 -3.386 17.457 -1.761 -0.0024 0.0881 0.078 0.1427 1208 -3.386 17.457 -1.761 -0.0024 0.0881 0.078 0.1427 1208 -1.300 -1.300 0.000 0.0000 0.0000 0.0000 0.0000 0.0000 125 -1.05 -3.32 -7.27 3.02 -7.45 -615 125 -1.15 1 -1.3200 1 -1.3200 1 -1.3200 1168 Grinnet -5.115 1 -5.115 1 -5.115 1 -5.115 1 -5.115 -5.115 -5.115 -5.115 1 -0.02 2.61 2.71 3.13 3.13 3.13 3.13 3.13 3.13 3.13 3.13 3.13	110A	-0.46	55	1.588	-11.4	59 0.035		-0.0	830	-0.08	315								
1158 12.371 13.528 -8.321 0.0677 0.0417 -0.2827 1158 12.351 15.250 -7.850 0.0649 0.0678 0.1427 1208 -3.360 16.309 -1.425 -0.0081 0.0793 0.1630 1208 -0.300 0.000 0.000 0.000 0.000 0.000 0.000 1208 0.300 1.000 1.000 0.000 0.0000 0.0000 0.0000 1208 0.300 0.000 0.000 0.0000 0.0000 0.0000 0.0000 1208 2754 -6575 1078 -8457 -8057 -1017 -4457 -8057 -1017 -1017 -0117	110B	-0.62	27	3.133	-11.4	86 0	6 0.0682		389	-0.26	516								
1158 12.351 17.457 -7.850 0.0649 0.0678 -0.1427 1200 -3.360 17.457 -1.761 -0.0024 0.081 0.0733 0.1427 125 0.000 0.000 0.000 0.0000 0.00733 0.1427 125 0.000 0.000 0.0000 0.0000 0.0000 0.0000 Use set set set set set set set set set s	115A	12.3	71	13.528	8 -8.321		0.0677		0.0417		327								
1200 -3.836 17.457 -1.761 -0.0024 0.0891 0.0708 1208 -3.800 60.000 -0.000 0.0000 0.0000 0.0000 Value 1.25 0.000 0.000 0.0000 0.0000 0.0000 Value 1.25 0.000 0.0000 0.0000 0.0000 0.0000 Value 1.25 -1000 7.675 -0615 0.000 0.0000 <td>115B</td> <td colspan="2">12.351 15.259</td> <td>15.259</td> <td>-7.85</td> <td>0 0</td> <td colspan="2">0.0649</td> <td colspan="2">0.0678</td> <td>127</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	115B	12.351 15.259		15.259	-7.85	0 0	0.0649		0.0678		127								
1208 4.3 00 0.000 0.000 0.0000	120A	-3.83	86	17.457	-1.76	1 -0.00		4 0.0	391	91 0.0708									
125 0.00 0.000 0.000 0.000 0.000 V </td <td>120B</td> <td>-4.36</td> <td>60</td> <td>16.309</td> <td colspan="2">16.309 -1.42</td> <td>0.008</td> <td colspan="2">1 0.0793</td> <td colspan="2">93 0.1630</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	120B	-4.36	60	16.309	16.309 -1.42		0.008	1 0.0793		93 0.1630									
Variable in the second secon	125	0.00	0	0.000	0.000) ()	0.000 0.00		000 0.0000		00								
Node Tag FX (N) FY (N) FZ (N) MX (Nm)										Loads	on Ancho	rs: Op	erating (V	V+P1+	T1)				
50 2754 6667 1078 6457 807 615 125 -1055 -1050 -323 727 832 4113 Node Tag Type Load (N) No.of Total (N) No.of Total (N) 208 User Lange -13200 1 -13200 1 -13200 1158 Grunet -5175 1 -5115 1 -5115 Node Tag N/N Y here Z here Total (N) No.of Circ.Mon No.of	Node	Tag	FX (N) F	Y (N)	FZ (N) N	/IX (Nm) MY	(Nm)	MZ (Nm)								
125 - - 1600 -332 -727 832 4113 Image: Solution of the s	50		2754	4 -5	675	1078	-	6457	-80	87	-615								
Node Tag Type Load (N) No.of Total (N) Value hanger -13200 1 -13200 Value hanger -13200 1 -13200 Value hanger -13200 Value hanger -13200 Value hanger -13200 Value hanger Value hanger	125	-1755 -1605 -332 -727 832 4						4113											
Node Type Load (N) No.e Total (N) 208 User Janger -13200 1 -13200 1158 Grim-II 5115 1 -5115 1 -5115 Node Tag Axial Y Shear Z Shear Torque Circ.Mom Long.Mom 5 -999 Axial Y Shear Z Shear Torque Circ.Mom Long.Mom (N) (N) Y Shear Z Shear Torque Circ.Mom Long.Mom (N) (N) Y Shear Z Shear Torque Circ.Mom Long.Mom (N) (N) Y Shear Z Shear Torque Circ.Mom Long.Mom Shear Sop (N) (N) Y Shear Z Shear Torque No.ex Sit Cong.Mom Sit Kom Sop 10 -999 4324 745 1561 1.0 -24 1.00 2464 1.00 I 13.19 13.19 <										Loads	on Hange	ers: Op	erating (V	V+P1+	·T1)				
208 is User word 1 -13200 1 -13200 1158 0 File -5115 1 -5115 2 2 2 1 2 2 2 2 1 2 2 2 2 1<100 2 2 1<100 2 2 2 1<100 2 2 2 2 2	Node	Tag	Туре	Э	Load (I	N) No	.of T	otal (N)											
11580Grimell-51151-51151-51150-51150Node7215111111111101011011111150999-7454378-15611100100utplane(Nm)FileFaceFaceSop10-9994327-745-15611.00-241.0024641.0024641.005File13.1910-9992419-745-15611.00-241.0024641.002461.0013.1910-9992419-745-15611.00-2441.0024641.002.178.138.133.44156-9992419-745-15611.002922.6113.0103.133.44156-999-745-15611.002922.6113.108.138.133.43156-999-745-15611.002922.6113.108.138.133.4315611.00-929-9324-935-15611.002922.6113.108.138.133.4315611.00-929-9324-935-935-93241.002922.6113.108.138.133.133.44 <tr< td=""><td>20B</td><td></td><td>User</td><td>r hangei</td><td>r -13200</td><td>1</td><td>-1</td><td>3200</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr<>	20B		User	r hangei	r -13200	1	-1	3200											
Vertice ver	115B		Grin	nell	-5115	1	-5	115											
Node Tag Axia Y Y Norme Norme Circ. Mon Mon Mon 5 999 -745 4378 4156 -884 -2613 Norme X Y <th< td=""><td></td><td colspan="15">Loads on Nozzles: Operating (W+P1+T1)</td></th<>		Loads on Nozzles: Operating (W+P1+T1)																	
111 <th< td=""><td>Node</td><td>Tag</td><td>Axia</td><td>I y S</td><td>hear z S</td><td>Shear</td><td>Torq</td><td>Le Ciro</td><td>.Mon</td><td>n Lo</td><td>ng.Mom</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></th<>	Node	Tag	Axia	I y S	hear z S	Shear	Torq	Le Ciro	.Mon	n Lo	ng.Mom								
Node Axial (N) y Shear (N) Z Shear (N) Torsion(Nm) Inplame(Nm) Outplame(Nm) Flex. Factors Sopr (MPa) 5 -999 -4378 -745 -1561 .00 -24 1.00 2464 1.00 13.70 10 -999 -4224 -745 -1561 1.00 -24 1.00 2464 1.00 13.19 10 -999 -4224 -745 -1561 1.00 -24 1.00 2464 1.00 13.19 15A -999 2419 -745 -1561 1.00 -24 1.00 2464 1.00 13.19 15A -999 2419 -745 -1561 1.00 228 2.61 -3276 18.70 18.70 15B 2882 999 -745 -3560 1.00 2922 2.61 2177 8.13 8.13 25.79 15B 2882 999 -745 -3560 1.00 2392 -2177 <td>5</td> <td></td> <td>-999</td> <td>-74</td> <td>5 43</td> <td>, 78</td> <td>-156</td> <td>1 -88</td> <td>4</td> <td>-26</td> <td>313</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	5		-999	-74	5 43	, 78	-156	1 -88	4	-26	313								
Node Axial (N) y Shear (N) Z Shear (N) Z Shear (N) Inplame(Nm) Outplame(Nm) Flax. Factors Sopr (MPa) 5 -999 -4378 -745 -1561 1.00 -24 1.00 2464 1.00 - 13.19 10 -999 -4224 -745 -1561 1.00 -24 1.00 2464 1.00 - 13.19 10 -999 -3339 -745 -1561 1.00 -24 1.00 2464 1.00 - 13.19 15A -999 -32419 -745 -1561 1.00 -24 1.00 2464 1.00 - 13.19 15A -999 -2419 -745 -1561 1.00 4288 -3276 2.17 8.13 8.13 25.79 15B 2882 999 -745 -3560 2.022 2.61 -3276 17.48 8.13 3.0.10 20A 7362 -999 -3560		Pipe forces in local coordinates: Operating (W+P1+T1)																	
Note (N)Note 	Node	Axial y Shear z Shear Torsion(Nm) Inplane(Nm)										Outola	ne(Nm)	Flex	(Fac	tors	Sopr		
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		(N)		N)	(N)	Mom	Noment SI		- Mor		SIF M	loment	SIF	FFi FFo FFt		(MPa)			
10 -999 -4224 -745 -1561 1.00 -24 1.00 2464 1.00 - - 13.19 10 -999 -3539 -745 -1561 1.00 -24 1.00 2464 1.00 - - 13.19 15A -999 2419 -745 -1561 1.00 4288 2.61 -3276 2.17 8.13 8.13 34.44 15B 2882 999 -745 -3560 1.00 2922 2.61 1277 2.17 8.13 8.13 25.79 15B 2882 999 -745 -3560 1.00 2922 2.61 1277 8.13 8.13 34.44 20A 7362 -745 -3560 1.00 2038 2.61 -2861 2.17 8.13 8.13 30.10 20B -745 -7825 -999 -3241 1.00 6239 2.61 3179 2.17 8.13 8.13 30.10 20B -745 -5375 999 -3241 1.00 <td>5</td> <td>-999</td> <td>-</td> <td>4378</td> <td>-745</td> <td>-156</td> <td>1</td> <td></td> <td>-884</td> <td>L</td> <td>2</td> <td>613</td> <td></td> <td></td> <td></td> <td></td> <td>13.70</td> <td></td> <td></td>	5	-999	-	4378	-745	-156	1		-884	L	2	613					13.70		
10 -999 -3539 -745 -1561 1.00 -24 1.00 -3276 1.00 13.19 15A -999 2419 -745 -1561 1.00 4288 2.61 -3276 2.17 8.13 8.13 34.44 15B 2882 999 -745 -3560 1.00 2922 2.61 1277 2.17 8.13 8.13 25.79 15B 2882 999 -745 -3560 1.00 2922 2.61 1277 2.17 8.13 8.13 25.79 15B 2882 999 -745 -3560 1.00 2922 2.61 1277 8.13 8.13 30.10 20A 7362 -745 -3560 1.00 3038 2.61 -2861 2.17 8.13 8.13 30.10 20B -745 -5375 999 -3241 1.00 6239 2.61 3179 2.17 8.13 8.13 43.90 25 -745 -5375 999 -3241 1.00 <t< td=""><td>10</td><td>-999</td><td>-</td><td>4224</td><td>-745</td><td>-156</td><td>1 1</td><td>.00</td><td>-24</td><td></td><td>1.00 2</td><td>464</td><td>1.00</td><td></td><td></td><td></td><td>13.19</td><td></td><td></td></t<>	10	-999	-	4224	-745	-156	1 1	.00	-24		1.00 2	464	1.00				13.19		
15A -999 2419 -745 -1561 4288 -3276 C C 18.70 15A -999 2419 -745 -1561 1.00 4288 2.61 -3276 2.17 8.13 8.13 34.44 15B 2882 999 -745 -3560 1.00 2922 2.61 1277 2.17 8.13 8.13 25.79 15B 2882 999 -745 -3560 2922 2.61 1277 2.17 8.13 8.13 25.79 15B 2882 999 -745 -3560 2922 2.61 1277 2.17 8.13 8.13 30.10 20A 7362 -745 -999 -3560 1.00 3038 2.61 2.17 8.13 8.13 30.10 20B -745 -5375 999 -3241 1.00 6239 2.61 3179 2.17 8.13 8.13 43.90 25 -745 -6389 999 -3241 1.00 8741 1.00 2676 1.0	10	-999	-	3539	-745	-156	1 1	.00	-24		1.00 2	464	1.00				13.19		
15A -999 2419 -745 -1561 1.00 4288 2.61 -3276 2.17 8.13 8.13 34.44 15B 2882 999 -745 -3560 1.00 2922 2.61 1277 2.17 8.13 8.13 25.79 15B 2882 999 -745 -3560 2922 2.61 1277 2.17 8.13 8.13 25.79 20A 7362 999 -745 -3560 2922 1277 -3038 17.49 19.51 20A 7362 9745 -3560 1.00 3038 2.61 2.17 8.13 8.13 30.10 20B -745 -7825 -999 -3241 1.00 6239 2.61 3179 2.17 8.13 8.13 43.90 20B -745 -5375 999 -3241 1.00 676 1.00 26.34 26.34 30 -745 3667 999 -3241 1.00 8251 1.00 25.74 25.56 25.56 25.56	15A	-999	2	2419	-745	-156	1		428	8	-<	3276					18.70		
15B 2862 999 -745 -3560 1.00 2922 2.61 1277 2.17 8.13 8.13 25.79 15B 2882 999 -745 -3560 2922 1277 -3038 17.49 17.49 20A 7362 999 -745 -3560 2922 -3038 1277 8.13 8.13 17.49 20A 7362 999 -745 -3560 2922 -2861 -3038 10 19.51 20A 7362 -745 -999 -3560 1.00 3038 2.61 2.17 8.13 8.13 30.10 20B -745 -5375 999 -3241 1.00 6239 2.61 3179 2.17 8.13 8.13 43.90 20B -745 -5375 999 -3241 1.00 8741 1.00 676 1.00 26.34 30 -745 3667 999 -3241 8251 1.00 1325 25.74 25.56 55 -745 3667	15A	-999	2	2419	-745	-156	1 1	.00	428	8 3	2.61 -3	3276	2.17	8.13	8.13		34.44		
13B2602999-743-356029221277-303817.4920A7362999-745-3560-2861-303819.5120A7362-745-999-35601.0030382.61-28612.178.138.1330.1020B-745-5875999-32411.0062392.6131792.178.138.1343.9020B-745-5375999-32411.0062392.6131792.178.138.1343.9020B-745-5389999-32411.0087411.006761.0026.3430-7453666999-32411.0087411.006761.0025.7455-7453667999-32418251132525.5625.5655-7453667999-32411.39-15982.0072211.0025.7455-7453879999-32411.39-15982.0072211.0025.5655-7453879999-32411.39-15982.0072211.0025.8235-1078391927546151.39663377077020.9123.10	158	2882 0		999 -745 200 745		-3560		.00	2922		2.01 1	277	2.17	8.13	8.13		25.79		
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	20A	7362		999	-745	-356	-3560		-292		-	3038					19.51		
20B -745 -7825 -999 -3241 1.00 6239 2.61 3179 2.17 8.13 8.13 43.90 20B -745 -5375 999 -3241 1.00 -6239 -3179 1.00 2.6 23.01 25 -745 -2389 999 -3241 1.00 8741 1.00 676 1.00 26.34 30 -745 3646 999 -3241 1.00 8350 1.00 1298 1.00 2.574 25.56 55 -745 3667 999 -3241 1.39 2.198 1.00 2.574 25.56 55 -745 3667 999 -3241 1.39 -1598 2.00 7221 1.00 2 25.56 55 -745 3879 999 -3241 1.39 -1598 2.00 7221 1.00 2 25.56 355 -1078 3919 2754 615 1.39 6633 200 7732 1.00 2 23.10 603	20A	7362		745	-999	-356	-3560 1.0		00 303		2.61 -2	2861	2.17	8.13	8.13		30.10		
20B -745 -5375 999 -3241 1.00 -6239 -3179 1.00 23.01 25 -745 -2389 999 -3241 1.00 8741 1.00 676 1.00 26.34 30 -745 3646 999 -3241 1.00 8350 1.00 1298 1.00 25.74 55 -745 3667 999 -3241 1.00 8251 1.00 1298 1.00 25.74 55 -745 3667 999 -3241 1.39 8251 1.00 1298 1.00 25.56 55 -745 3867 999 -3241 1.39 -1598 2.00 7221 1.00 25.56 35 -1078 3919 2754 615 1.39 -18 2.00 7732 1.00 23.10 20.91 60 -1078 4130 2754 615 1.39 6633 200 772 1.00 23.10 20.91	20B	-745		7825 -999		-3241		.00	6239		2.61 3	179	2.17	8.13	8.13		43.90		
25 -745 -2389 999 -3241 1.00 8741 1.00 676 1.00 26.34 30 -745 3646 999 -3241 1.00 8350 1.00 1298 1.00 25.74 55 -745 3667 999 -3241 8251 1325 25.56 55 -745 3667 999 -3241 8251 1325 25.56 35 -745 3879 999 -3241 1.39 -1598 2.00 7221 1.00 25.82 35 -1078 3919 2754 615 1.39 -18 2.00 7732 1.00 23.10 60 -1078 4130 2754 615 633 200 7732 1.00 23.10	20B	-745	-	5375	999	-324	1		-623	39	-<	3179					23.01		
30 -745 3646 999 -3241 1.00 8350 1.00 1298 1.00 25.74 55 -745 3667 999 -3241 8251 1325 25.56 55 -745 3667 999 -3241 8251 1325 25.56 35 -745 3879 999 -3241 1.39 -1598 2.00 7221 1.00 25.82 35 -1078 3919 2754 615 1.39 -18 2.00 7732 1.00 23.10 60 -1078 4130 2754 615 6633 770 20.91 20.91	25	-745	-	2389	999	-324	1 1	.00	874	1	1.00 6	76	1.00				26.34		
55 -745 3667 999 -3241 8251 1325 25.56 55 -745 3667 999 -3241 8251 1325 25.56 35 -745 3879 999 -3241 1.39 -1598 2.00 7221 1.00 25.56 35 -1078 3919 2754 615 1.39 -18 2.00 7732 1.00 23.10 60 -1078 4130 2754 615 633 770 20.91 20.91	30	-745		3646	999 -		-3241 1.0		0 8350		1.00 1	298	1.00				25.74		
35 -745 3807 999 -3241 1.39 -1598 2.00 7221 1.00 25.82 35 -1078 3919 2754 615 1.39 -18 2.00 7732 1.00 23.10 60 -1078 4130 2754 615 6633 770 20.91	55	-745		0007	999 -3		3241		8251		1	323					25.50		
35 -1078 3919 2754 615 1.39 -18 2.00 7732 1.00 23.10 60 -1078 4130 2754 615 1.39 6633 770 1.00 23.10	35	-745		3879	999	-324	1 1	.39	-159	8	2.00 7	221	1.00				25.82		
60 -1078 4130 2754 615 6633 770 20.91	35	-107	8 3	3919	2754	615	1	.39	-18		2.00 7	732	1.00				23.10		
	60	-1078 413		1130	2754	615			6633		7	70					20.91		
60 -1078 4130 2754 615 6633 770 20.91	60	-1078 4		1130	2754 61		615		6633		7	70					20.91		
40 -1078 4151 2754 615 6522 844 20.70	40	-107	8 4	1151	2754	615			652	2	8	44	1, 1210				20.70		
40 -1078 4151 2754 615 1.00 6522 1.52 844 1.52 27.70 45 4078 4502 2754 645 1.00 4238 4.52 27.70	40	-107	8 4	1502	2754	615	1	.00	652	2	1.52 8	44	1.52				27.70		
+0 -1070 4502 2754 015 1.00 4220 1.32 2304 1.32 33.21 45 -1078 4502 2754 615 4228 2304 2304 24.12	45	-107	0 4 8 7	1502	2754	615		.00	422	8	1.52 2	304	1.52				24 12		
50 -1078 5675 2754 615 -6457 8087 44.14	50	-107	8 5	5675	2754 61		15		4228		2 8	087					44.12		
Version 12.10 Sample2 Jan 4.202	Versio	on 12.	10			1					0	Samp	le2						Jan 4,2024
Caepi	ре								S	Sample Pro	blem 2					Page 17			
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					2		Pipe	e forces	s in local	coordinate	es: Opera	ating (V	V+P1	+T1)	 				
Node	Axial	y Sh	ear z	Shear	Tors	ion(Nm	ı)	Inplan	ne(Nm)	Outpla	ne(Nm)	Flex	k. Fac	tors	Sopr				
	(N)	(N)	1)	۷)	Momer	nt SIF	N	loment	SIF	Moment	SIF	FFi	FFo	FFt	(MPa)				
35	-1755	-40		332	-511	1.07	1:	580 858	1.47	-3856	1.86		2.44		59.82				
65	-1755	12	-3	332	-511	-	3	858		1535		+	2.44		35.48				
100	-1755	497	-3	332	-511	1.00	3	537	1.00	1115	1.00				32.32				
105	-1755	2512	2 -3	332	-511	1.00	2	930	1.00	981	1.00				40.94				
110A	-1755	2522	2 -3	332	-511	1.00	2	864	0.07	972	1.00	0.50	0.50		40.47				
110A	-1/55	175	2 -3	332	-511 896	1.00	2	864 874	2.27	972 435	1.89	6.59	6.59		67.01 51.39				
110B	2660	-175	5 3	32	896		-1	1874		-435		0.00	0.00		34.91				
115A	3617	-175	5 3	32	896		2	501		393					39.22				
115A	3617	-175	5 3	32	896	1.00	2	501	2.27	393	1.89	6.59	6.59		61.48				
115B	-1755	-375	10 3 10 5	32	469	1.00	3	749	2.21	-820	1.89	6.59	6.59		46.21				
120A	-1755	131	-3	332	469		-1	1364		-470					29.34				
120A	-1755	-131	3	32	469	1.00	1	364	2.27	470	1.89	6.59	6.59		41.77				
120B	-670	1641	1 3	32	628	1.00	1	100	2.27	-266	1.89	6.59	6.59		37.56				
120B	-670	-164	1 -3	332	628		-1	1100		266					28.04				
125	-1300	-150	-0	JJZ	020		Othe	r force	s in loca	-909	es: Oner	ating (W+P1	(+T1)	40.97				
		fv	fv	fz	my	my	mz	10100	5 11 1000	recordinat		ating (,					
Node	Туре	(N)	(N)	(N)	(Nm)	(Nm)	(Nm)												
25	Valve	-745	-1703	999	-3241	676	8741												
30		-745	2962	999	-3241	1298	8350	-											
100	valve	-1755	2280	-332	-511	1115 981	3537 2930												
			2200	002			Pipe	forces	in globa	l coordinat	es: Oper	ating (W+P	1+T1	1				
Node	FX	FY	FZ	MX	MY	MZ			J		•	0.							
	(N)	(N)	(N)	(Nm)	(Nm)	(Nm)													
5	999	4378	745	1561	-2613	884													
10	-999	-4224	-745	-1561	1 2464	-24	_												
10 15A	-999	2419	-745	-1561	-2464	4288													
15A	999	-2419	745	1561	3276	-4288													
15B	-999	2882	-745	-1277	7 -3560	2922	_												
15B	999	-2882	745	1277	3560	-2922													
20A	-999	7362	-745	-3038	-3560	2861	-												
20A	-999	7825	-745	6239	-3179	-3241													
20B	999	5375	745	-6239	3179	3241													
25	-999	-2389	-745	-8741	676	-3241													
30 55	999 _900	-3646	745	8350	-1298	3241													
55	999	-3667	745	8251	-1325	3241													
35	-999	3879	-745	-7221	1 1598	-3241													
35	2754	-3919	1078	7732	-18	-615													
60	-2754	4130	-1078	-6633	3 770	615													
40	-2754	4151	-1078	6633	-770	615													
40	2754	-4151	1078	6522	-844	-615													
45	-2754	4502	-1078	3 -4228	3 2304	615													
45	2754	-4502	1078	4228	-2304	-615													
35	-2754	40	-10/8	-511	-1580	3856													
65	1755	12	332	511	1535	-3858													
65	-1755	-12	-332	-511	-1535	3858	1												
100	1755	497	332	511	1115	-3537													
Versio	on 12.1	0								Sampl	e2					Jan 4,2024			

Caep	ipe								S	Sample Problem 2 Pag
							Pipe	forces ir	n globa	I coordinates: Operating (W+P1+T1)
Node	FX	FY	FZ	MX	MY	MZ				
	(N)	(N)	(N)	(Nm)	(Nm)	(Nm)				
105	-1755	-2512	-332	-511	-981	2930				
110A	1755	2522	332	511	972	-2864	- -			
110A	-1755	-2522	-332	-511	-972	2864				
110B	-1755	-2660	-332	-435	-896	1874	-			
115A	1755	3617	332	-393	896	2501				
115A	-1755	-3617	-332	393	-896	-2501				
115B	1755	3755	332	-469	820	3749	_			
115B	-1755	1360	-332	469	-820	-3749				
120A	1755	131	332	-469	-470	1364				
120A	1755	248	332	-412	-544	1100				
120B	-1755	-248	-332	412	544	-1100	1			
125	1755	1605	332	727	-832	-4113				
							Other	forces i	n globa	al coordinates: Operating (W+P1+T1)
		FX	FY	FZ	MX	MY	MZ			
Node	Туре	(N)	(N)	(N)	(Nm)	(Nm)	(Nm)	4		
25	Valve	999	1703	745	8741	-676	3241	8		
100	Valvo	-999	-720	-745	-511	-1115	3537			
105	valve	1755	2280	332	511	981	-2930	1		
			1	1				Disp	lacem	ents: Operating (W+P1+T1)
			C	isplace	ments	(globa	I)			
Node	X (mm	n) Y ((mm)	Z (mm) XX	(deg)	ÝY (de	eg) ZZ (d	deg)	
5	-0.024	0.0	000	0.000	0.0	000	0.0955	5 -0.20	031	
10	0.530	-0.	713	-0.338	-0.0	018	0.0977	-0.20	035	
15A	21.863	3 -16	5.180	-14.73	4 -0.0	704	0.0840	-0.00)22	
15B	22.594	4 -14	1.935	-15.60	9 -0.0	681	0.0501	0.07	32	
20A	13.909	9 1.1	26	-22.29	5 -0.0	457	-0.067	5 0.07	39	
20B	12.991	1 2.1	153	-21.36	7 0.0	454	-0.091	3 0.05	58	
25	5.747	-1.	120	-10.67	4 0.0	079	-0.112	5 -0.01	55	
30	4.527	-1.	170	-8.949	0.0	015	-0.111	8 -0.01	86	
55	4.475	-1.	1/0	-8.8/4	0.0	005	-0.111	6 -0.01	91	
35	3.941	-1.	167	-8.118	0.0	005	-0.111	6 -0.01	91	
40	3.405	-1.	162	-7.301	0.0	002	-0.111	5 0.01	01	
45	2 336	-1.	060	-5.818	-0.0	186	-0.111	2 -0.01	63	
50	0.000	-1.	000	0.000	0.0	000	0.000		00	
65	3,563	-1	121	-8,383	0.0	005	-0.111	6 -0.05	565	
100	0.065	1.4	156	-10.35	5 0.0	215	-0.069	7 -0.17	753	
105	-1.053	2.7	721	-10.83	5 0.0	233	-0.067	0 -0.18	338	
110A	-1.163	2.8	307	-10.86	6 0.0	237	-0.066	3 -0.18	857	
110B	-0.996	4.7	730	-10.88	6 0.0	544	-0.025	8 -0.32	248	
115A	13.733	3 15	.138	-8.294	0.0	558	0.0470	-0.30)52	
115B	13.765	5 16	.882	-7.852	0.0	537	0.0708	-0.12	236	
120A	-2.423	17	.086	-1.761	-0.0	057	0.0878	8 0.07	83	
120B	-2.981	15	.956	-1.423	-0.0	099	0.0772	2 0.14	22	
125	0.000	0.0	000	0.000	0.0	000	0.0000	0.00	00	
	-							L	oads o	n Anchors: Seismic 1 (g)
Node	Tag F	X (N)	FY (N) F	Z (N)	MX	(Nm)	۷Y (Nm)	MZ (M	Nm)
50	3	873	281	6	499	845		10815	1562	
125	1	272	615	7	87	206	זן נ	36	2700	
Versi	on 12.1	0								Sample2 .lan 4 2

	Caepi	ре							Sa	ample Pro	oblem 2							Page 19
Node TarpType TotalNode TarpTotal								w	Loads on	Hangers	: Seismic	: 1 (g)						
OB User larger 13 1 158 0 138 0 138 0 138 0 138 0 138 0 138 0 138 0 138 0 138 0 138 0 138 0 138 0 138 0 138 0 138	Node	Tag 1	Гуре	Load	(N) N	lo.of	Total (N))										
1158 Cirkmen 19 1 196 1 196 1 196 Node Tag Axial Y Nise 2 Shear Torque CircxMon Long Mon Not Not <td< td=""><td>20B</td><td>ι</td><td>Jser hang</td><td>er 1536</td><td>1</td><td></td><td>1536</td><td>_</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></td<>	20B	ι	Jser hang	er 1536	1		1536	_										
Uncast on Nozzles: Selemin 1 (g) Nod Tag / Xul Not Torpie Circ/Nom (Nm) Not Torpie Circ/Nom (Nm) Not Nom (Nm) Not Nom (Nm) Nom (Nm) Nom (Nm) Nom (Nm) Nom (Nm Nom (Nm Nom (Nm) Nom (Nm) Nom (Nm) Nom (Nm Nom (Nm) Nom (Nm) Nom (Nm) Nom (Nm) Nom (Nm) Nom (Nm) Nom (Nm Nom (Nm)	115B	(Grinnell	196	1		196											
Node Tage Vision									Loads or	Nozzles	: Seismic	1 (g)						
S0883178611302806080080080080080080080NodeNo081808008180800813080081308017180801808018 <th< td=""><td>Node</td><td>Tag /</td><td>Axial y N) (</td><td>Shear z N) (</td><td>z Shea N)</td><td>r Toro (Nm</td><td>que Cir n) (Nr</td><td>c.Mom n)</td><td>Long.Mom (Nm)</td><td>1</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></th<>	Node	Tag /	Axial y N) (Shear z N) (z Shea N)	r Toro (Nm	que Cir n) (Nr	c.Mom n)	Long.Mom (Nm)	1								
Pipe forces in local coordinates: Selemic 1 (2) Visite 1	5	3	3853 1	765 1	130	289	0 536	6	3671									
Node Node Stear Torsion(Nm) Implane(Nm) Outplane(Nm) Fer Fer <th< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>Pipe</td><td>forces in lo</td><td>cal coord</td><td>dinates: S</td><td>eismic</td><td>c 1 (g)</td><td>1</td><td></td><td></td><td>1</td><td></td></th<>								Pipe	forces in lo	cal coord	dinates: S	eismic	c 1 (g)	1			1	
(v) (v) <td>Node</td> <td>Axial</td> <td>y Shea</td> <td>ar z She</td> <td>ar 7</td> <td>Forsio</td> <td>n(Nm)</td> <td>Inpl</td> <td>ane(Nm)</td> <td>Outpla</td> <td>ane(Nm)</td> <td>Flex</td> <td>x. Factors</td> <td>SL+SO</td> <td>SA</td> <td>SL+SO</td> <td></td> <td></td>	Node	Axial	y Shea	ar z She	ar 7	Forsio	n(Nm)	Inpl	ane(Nm)	Outpla	ane(Nm)	Flex	x. Factors	SL+SO	SA	SL+SO		
5 3830 1130 1738 2830 1.00 384 1.00 17.38 17.33 17.33 17.33	-	(N)	(N)	(IN)	INIO 200	ment	SIF	Nome	nt SIF	Momen	(SIF	FFI	FFO FFT	(MPa)	(IMPa)	SA		
10 6002 602 615 2890 1.00 354 1.00 334 1.00 1.01 1	10	3807	1102	1705	289	90	1.00	354	1.00	3334	1.00			16.74	122.1	0.14		
15A 16A 16B 606 338 2800 1.02 1.03 1.01 1.01 1.00 <th< td=""><td>10</td><td>3602</td><td>982</td><td>1515</td><td>289</td><td>90</td><td>1.00</td><td>354</td><td>1.00</td><td>3334</td><td>1.00</td><td></td><td></td><td>16.71</td><td>122.1</td><td>0.14</td><td>-</td><td></td></th<>	10	3602	982	1515	289	90	1.00	354	1.00	3334	1.00			16.71	122.1	0.14	-	
15A 1818 606 338 2890 1.00 421 2.61 1973 2.17 8.13 8.13 2.25 1221 0.26 15B 663 1679 461 1911 .00 3727 2.61 1776 8.13 8.13 32.20 1221 0.26 20A 1424 9464 1776 364 1911 1.00 4576 2.61 1996 2.17 8.13 8.13 30.64 1221 0.26 20B 1914 466 246 2540 1.00 2616 1996 2.17 8.13 8.13 30.61 1221 0.26 20B 1914 466 246 2540 1.00 2616 1996 1.00 2 2.33 1021 0.26 25 462 1844 262 2440 2057 . 1 2.33 1221 0.26 26 4262 2582 2440 1.00 2528 2274 1.00 2.33 1221 0.26 26 4426	15A	1818	606	338	289	90		4231		1973				19.28	122.1	0.16	_	
108 0.073 0.073 0.073 0.073 0.073 0.073 0.073 0.173 0.120 1221 0.17 20A 1424 364 1776 1911 1.00 3727 2763 4100 2.06 1221 0.17 20A 1424 364 1776 1911 1.00 4766 121 2.17 8.13 8.13 30.61 1221 0.21 20B 1914 1511 2.46 2.46 1.00 256 6221 0.21 0.25 20B 1914 466 246 2.46 1.00 281 1.00 1.01 1.01 1.01 0.121 0.21 0.21 0.21 0.21 0.21 0.21 0.21 0.26 0.21 0.21 0.21 0.21 0.21 0.21 0.21 0.21 0.21 0.21 0.23 1.01 0.21 1.22 0.26 0.21 0.26 0.23 1.21 0.26 0.23 1.21 0.26 0.21 0.21 0.21 0.21 0.22 1.21 <td< td=""><td>15A</td><td>1818</td><td>606</td><td>338</td><td>289</td><td>90</td><td>1.00</td><td>4231</td><td>2.61</td><td>1973</td><td>2.17</td><td>8.13</td><td>8.13</td><td>28.51</td><td>122.1</td><td>0.23</td><td></td><td></td></td<>	15A	1818	606	338	289	90	1.00	4231	2.61	1973	2.17	8.13	8.13	28.51	122.1	0.23		
20A 124 384 1776 1911 2451 4100 0 20.8 1221 0.17 20A 1424 1776 384 1911 1.00 400 2.61 2410 1.07 8.13 8.13 30.61 1221 0.25 20B 1914 466 2440 1.00 4576 2.61 1996 7 8.13 8.13 30.61 1221 0.24 20B 1914 466 2440 1.00 2811 1.00 1891 1.00 31.19 1221 0.26 30 4616 1841 2522 2400 1.00 2848 2057 1.00 31.39 1221 0.26 55 4622 1845 2582 2440 1.00 1500 1000 2.438 1221 0.26 60 6036 2514 3410 1662 1.992 1267 0 2.498 1221 0.20 616 2587 3522 1562 1.00 1351 10192 1267 2.48 <	15B	663	1679	461	19	11	1.00	3727	2.01	2763	2.17	0.13	0.13	21.06	122.1	0.20	-	
20A 1242 1776 364 1911 100 4576 2.61 1996 2.17 8.13 8.13 1.61 12.1 0.24 20B 1914 466 2.46 1.00 4576 2.61 1996 2.17 8.13 8.13 1.61 12.1 0.21 20B 1914 466 2.46 1.00 2.81 1.00 1.81 1.00 1.81 1.00 2.96 12.1 0.21 0.21 20B 1814 2522 2.640 1.00 2.848 2.057	20A	1424	364	1776	191	11		2451		4100				20.84	122.1	0.17		
208 9194 1511 246 246 1.00 4576 2.61 1996 2.17 8.13 8.13 4.169 122.1 0.24 25 2808 79 724 2540 1.00 2814 1.00 1891 1.00 1891 1.00 256 122.1 0.24 26 4616 1844 2522 2540 1.00 2848 2057 3.1.39 122.1 0.26 25 4622 1845 2528 2540 1.39 4241 2.00 170 2.633 122.1 0.26 35 6973 2473 3347 1562 1.39 -2414 2.00 1277 2.438 12.21 0.20 60 6036 2514 3410 1562 1.92 1.267 1.348 1.52 2.77.6 12.21 0.20 60 6433 2519 3417 1562 1.00 192 1.14 2.00 2.7.6 12.21 0.20 65 6418 2587 3522 1562 1.00 <td>20A</td> <td>1424</td> <td>1776</td> <td>364</td> <td>191</td> <td>11</td> <td>1.00</td> <td>4100</td> <td>2.61</td> <td>2451</td> <td>2.17</td> <td>8.13</td> <td>8.13</td> <td>30.61</td> <td>122.1</td> <td>0.25</td> <td></td> <td></td>	20A	1424	1776	364	191	11	1.00	4100	2.61	2451	2.17	8.13	8.13	30.61	122.1	0.25		
20B 9194 466 246 246 240 0.0 281 1.00 28.96 1.221 0.21 30 616 1841 2522 2540 1.00 281 0.202 1.00 31.09 1221 0.21 35 6622 1845 2528 2540 2648 2057 31.39 1221 0.26 55 4622 1845 2528 2540 1.39 -649 2.00 1750 1.00 24.38 1221 0.20 66 6036 2514 3410 1562 1.99 -2648 2.00 1500 1.00 24.98 1221 0.20 60 6036 2514 3410 1562 1929 1267 2.49.8 1221 0.20 60 6036 2514 3417 1562 1929 1267 2.49.8 1221 0.20 61 6148 2587 3522 1562 100 3034 152 306 152 40.32 1221 0.20 65 <t< td=""><td>20B</td><td>1914</td><td>1511</td><td>246</td><td>254</td><td>40</td><td>1.00</td><td>4576</td><td>2.61</td><td>1996</td><td>2.17</td><td>8.13</td><td>8.13</td><td>41.69</td><td>122.1</td><td>0.34</td><td></td><td></td></t<>	20B	1914	1511	246	254	40	1.00	4576	2.61	1996	2.17	8.13	8.13	41.69	122.1	0.34		
20 200 7.99 7.24 7.24 7.00 1.00 <t< td=""><td>20B</td><td>1914</td><td>466</td><td>246</td><td>254</td><td>10</td><td>1 00</td><td>4576</td><td>1.00</td><td>1996</td><td>1.00</td><td></td><td></td><td>25.96</td><td>122.1</td><td>0.21</td><td></td><td></td></t<>	20B	1914	466	246	254	10	1 00	4576	1.00	1996	1.00			25.96	122.1	0.21		
55 4622 1845 2528 2540 2648 2067 100 100 122.1 0.26 56 4622 1846 2528 2540 2648 2057 100 31.39 122.1 0.26 56 4622 1848 2528 2540 1.39 -2414 2.00 1500 1.00 26.33 122.1 0.26 56 6036 2514 3410 1562 1929 1267 24.98 122.1 0.20 60 6036 2514 3410 1562 1929 1267 24.98 122.1 0.20 618 2587 3522 1562 100 3034 1.52 3096 1.52 24.98 122.1 0.20 6489 2519 3417 1562 3034 1.52 3096 1.52 24.98 122.1 0.20 65 741 606 1290 1135 1.07 27.41 1.47 -1082 1.86 2.44 45.45 122.1 0.26 710 57<	30	2000	1841	2522	254	10 10	1.00	2646	1.00	2032	1.00			31 59	122.1	0.27		
66 4622 1846 2528 2540 1.39 22414 2.00 2722 1.00 30.52 1221 0.26 00 0036 2514 3417 1562 1.39 649 2.00 1267 1.00 24.88 1221 0.20 00 0036 2514 3417 1562 1.39 649 2.00 1267 2 24.88 1221 0.20 00 6033 2514 3417 1562 1.00 107 1348 1.52 2.48 1221 0.20 00 6043 2519 3417 1562 1.00 107 135 1348 1.52 4.03 24.98 1221 0.20 40 6043 2519 3417 1562 1.00 1037 135 108 1.52 4.03 2.21 0.33 649 2.107 1.15 1.00 630 1.35 1.07 274 1.47 -0.082 1.86 2.44 35.03 1221 0.31 100 516 <th< td=""><td>55</td><td>4622</td><td>1845</td><td>2528</td><td>254</td><td>10</td><td>1.00</td><td>2648</td><td>1.00</td><td>2057</td><td>1.00</td><td></td><td></td><td>31.39</td><td>122.1</td><td>0.26</td><td></td><td></td></th<>	55	4622	1845	2528	254	10	1.00	2648	1.00	2057	1.00			31.39	122.1	0.26		
36 6865 1886 2892 2540 1.39 -2414 2.00 2722 1.00	55	4622	1845	2528	254	10		2648		2057				31.39	122.1	0.26		
35 5973 2473 3347 1562 1.39 -649 2.00 1590 1.00 26.33 122.1 0.20 60 6036 2514 3410 1562 1972 1267 2 24.98 122.1 0.20 60 6036 2519 3417 1562 1972 1.52 1348 1.52 24.90 122.1 0.20 40 6043 2519 3417 1562 1.00 1972 1.52 1348 1.52 40.32 122.1 0.30 45 6148 2587 3522 1562 1.00 3034 1.52 3096 1.52 40.32 122.1 0.30 56 741 606 1290 1135 1.07 2274 1.47 -1082 1.86 2.44 45.45 122.1 0.30 56 741 606 1290 1135 1.00 666 1.00 984 1.00 2.21 0.29 12.1 0.30 100 55 516 1148 1135	35	4685	1886	2592	254	10	1.39	-2414	2.00	2722	1.00			30.52	122.1	0.25	-	
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40 6043 2519 3417 1562 1972 1348 I I I 24.9 12.1 0.20 40 6043 2517 3522 1562 1.00 1972 1.52 1348 1.52 I I 27.15 122.1 0.20 45 6148 2587 3522 1562 3034 1.52 1348 1.52 I I 0.36,4 122.1 0.30 50 6499 2816 8373 1562 3034 3096 1.52 I I 0.36,4 122.1 0.30 65 741 616 1306 1135 1.07 2274 1.47 -1082 1.86 2.44 45.45 122.1 0.30 65 741 606 1290 1135 1.00 666 1.00 883 1.00 2.44 35.03 122.1 0.77 105 12 570 1135 1.00 626 2.77 879 1.89 6.59 6.59 34.34 110.0 0.31 </td <td>60</td> <td>6036</td> <td>2514</td> <td>3410</td> <td>156</td> <td>62</td> <td></td> <td>1929</td> <td></td> <td>1267</td> <td></td> <td></td> <td></td> <td>24.98</td> <td>122.1</td> <td>0.20</td> <td></td> <td></td>	60	6036	2514	3410	156	62		1929		1267				24.98	122.1	0.20		
40 6043 2519 3417 1562 1.00 1972 1.52 1348 1.52 0 40.32 122.1 0.22 45 6148 2587 3522 1562 1.00 3034 1.52 3096 1.52 40.32 122.1 0.33 45 6148 2587 3522 1562 1.00 3034 1.52 3096 1.52 40.32 122.1 0.33 455 616 1305 107 2774 147 -1082 1.86 2.44 4.545 122.1 0.37 65 741 616 1290 1135 1.01 2.17 2.114 2.44 3.503 122.1 0.20 105 12 199 570 1135 1.00 630 1.00 883 1.00 2.99 2.912 110.0 0.22 100 12 19 570 1135 1.00 630 1.00 883 1.00 2.912 11.00 0.22 110A 12 13 100 2.	40	6043	2519	3417	156	62		1972		1348				24.90	122.1	0.20	-	
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05 1/41 000 1/25 1/18 1/135 1/10 2/14 1/14 1/12 0.29 1/22.1 0.17 105 12 219 570 1135 1.00 666 0.09 883 1.00 20.66 100.0 0.27 105 12 219 570 1135 1.00 626 879 20.66 100.0 0.27 1104 15 219 570 1135 1.00 626 2.27 879 1.89 6.59 34.34 10.0 0.31 1108 15 54 533 855 1.00 584 2.77 1013 1.89 6.59 34.37 110.0 0.31 1108 212 54 533 855 1.00 584 1013 2.77 1.89 6.59 29.92 110.0 0.31 1158 382 275 287 306 1.00 299 2.77 15 1.89 6.59 39.11 110.0 0.33 1204 829 354	65	741	606	1290	113	35		1019		2114			2.44	35.03	122.1	0.29	-	
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	100	595	516	1290	113	35	1.00	666	1.00	2114 984	1.00			20.96	122.1	0.29		
110A 15 219 570 1135 ∞ 626 879 ∞ ∞ ∞ ∞ 29.46 1100 0.27 110A 15 519 570 1135 1.00 626 2.27 879 1.89 6.59 6.59 41.77 110.0 0.31 110B 212 54 533 855 1.00 626 2.27 1013 1.89 6.59 6.59 41.77 110.0 0.31 110B 212 54 533 855 1.00 310 2.27 277 1.89 6.59 6.59 41.77 110.0 0.31 110A 257 341 310 855 1.00 310 2.27 277 1.89 6.59 6.59 41.23 110.0 0.31 115B 382 275 287 306 1.00 299 2.27 815 1.89 6.59 6.59 41.23 110.0 0.31 110A 822 354 393 306 1.00 993 2.27 247 1.89 6.59 6.59 39.11 110.0 0.36 120A 829 354 893 306	105	12	219	573	113	35	1.00	630	1.00	883	1.00			29.12	110.0	0.26	-	
110A 15 219 570 1135 1.00 626 2.27 879 1.89 6.59 6.59 34.34 110.0 0.31 110B 212 54 533 855 1.00 584 2.27 1013 1.89 6.59 6.59 41.77 110.0 0.31 110B 212 54 533 855 584 1013 277 0 2 33.79 110.0 0.31 115A 257 341 310 855 1.00 217 277 1.89 6.59 6.59 41.23 110.0 0.27 115B 382 275 287 306 1.00 299 2.27 815 1.89 6.59 6.59 41.23 110.0 0.30 120A 829 354 393 306 1.00 993 2.27 247 1.89 6.59 6.59 39.11 110.0 0.30 120B 514 789 421 313 1.00 916 2.27 280 1.89 <	110A	15	219	570	113	35		626		879				29.46	110.0	0.27		
11 UB 212 94 533 855 1.00 584 2.27 1013 1.89 6.59 6.59 41.77 110.0 0.38 110B 212 54 533 855 584 1013 277 2652 110.0 0.31 115A 257 341 310 855 1.00 310 2.27 277 1.89 6.59 6.59 29.92 110.0 0.27 115B 382 275 287 306 1.00 310 2.27 815 1.89 6.59 6.59 41.23 110.0 0.37 115B 382 216 287 306 299 815 1.89 6.59 6.59 39.11 110.0 0.30 120A 829 354 393 306 1.00 916 2.27 247 1.89 6.59 6.59 39.11 110.0 0.33 120B 514 789 421 313 1.00 916 2.27 240 1.89 6.59 6.59 36.83	110A	15	219	570	113	35	1.00	626	2.27	879	1.89	6.59	6.59	34.34	110.0	0.31		
1106 212 341 310 853 633 634 1013 277 0 33.79 110.0 0.31 115A 257 341 310 855 310 277 0 26.52 110.0 0.24 115A 257 341 310 855 1.00 299 2.77 1.89 6.59 6.59 29.92 110.0 0.27 115B 382 275 287 306 1.00 299 2.27 815 1.89 6.59 6.59 41.23 110.0 0.37 115B 382 216 287 306 1.00 993 2.47 815 31.03 110.0 0.30 120A 829 354 393 306 1.00 993 2.27 247 1.89 6.59 6.59 36.83 110.0 0.33 120B 514 789 421 313 1.00 916 2.27 280 1.89 6.59 6.59 36.83 110.0 0.27 120B	110B	212	54	533	855	2	1.00	584	2.27	1013	1.89	6.59	6.59	41.77	110.0	0.38		
115A 257 341 310 855 1.00 310 2.27 277 1.89 6.59 6.59 41.23 110.0 0.27 115B 382 275 287 306 1.00 299 2.27 815 1.89 6.59 6.59 41.23 110.0 0.27 115B 382 216 287 306 299 2.27 815 1.89 6.59 6.59 41.23 110.0 0.37 115B 382 216 287 306 299 247 1.89 6.59 6.59 31.03 110.0 0.30 120A 829 354 393 306 1.00 993 2.27 247 1.89 6.59 6.59 39.11 110.0 0.30 120B 514 789 421 313 1.00 916 2.27 280 1.89 6.59 6.59 36.83 110.0 0.27 120 514 787 313 200 2165 1.89 6.59 50.5 310.0 <td>115A</td> <td>257</td> <td>341</td> <td>310</td> <td>855</td> <td>5</td> <td></td> <td>310</td> <td></td> <td>277</td> <td></td> <td></td> <td></td> <td>26.52</td> <td>110.0</td> <td>0.24</td> <td></td> <td></td>	115A	257	341	310	855	5		310		277				26.52	110.0	0.24		
115B 382 275 287 306 1.00 299 2.27 815 1.89 6.59 6.59 41.23 110.0 0.37 115B 382 216 287 306 299 2.27 815 1.89 6.59 6.59 41.23 110.0 0.37 120A 829 354 393 306 299 247 1.89 6.59 6.59 31.03 110.0 0.30 120A 829 354 393 306 1.00 993 2.27 247 1.89 6.59 6.59 39.11 110.0 0.30 120A 829 354 393 306 1.00 993 2.27 247 1.89 6.59 6.59 38.11 110.0 0.36 120B 514 789 421 313 1.00 916 2.27 280 1.89 6.59 6.59 36.83 110.0 0.27 125 763 1188 787 313 2000 2165 8 29.63 110.0 0.48 25 Valve 3013 850 926 1891 2816 189 659 100 0.48 </td <td>115A</td> <td>257</td> <td>341</td> <td>310</td> <td>855</td> <td>5</td> <td>1.00</td> <td>310</td> <td>2.27</td> <td>277</td> <td>1.89</td> <td>6.59</td> <td>6.59</td> <td>29.92</td> <td>110.0</td> <td>0.27</td> <td>1</td> <td></td>	115A	257	341	310	855	5	1.00	310	2.27	277	1.89	6.59	6.59	29.92	110.0	0.27	1	
115B 382 216 287 306 299 815 310 31.03 110.0 0.30 120A 829 354 393 306 1.00 993 247 1.89 6.59 6.59 31.03 110.0 0.28 120A 829 354 393 306 1.00 993 2.27 247 1.89 6.59 6.59 39.11 110.0 0.36 120B 514 789 421 313 1.00 916 2.27 280 1.89 6.59 6.59 36.83 110.0 0.33 120B 514 789 421 313 916 2.80 29.63 110.0 0.27 125 763 1188 787 313 2700 2165 280 29.63 110.0 0.46 Node Type fX fX fX mx my mz mz 125 Valve 3013 850 926 2540 1891 2811 284 411 1709 23	115B	382	275	287	306	6	1.00	299	2.27	815	1.89	6.59	6.59	41.23	110.0	0.37	-	
1207 025 034 393 300 993 227 247 1.89 6.59 6.59 39.11 110.0 0.28 1208 514 789 421 313 1.00 993 2.27 247 1.89 6.59 6.59 39.11 110.0 0.36 1208 514 789 421 313 1.00 916 2.27 280 1.89 6.59 6.59 36.83 110.0 0.33 1208 514 789 421 313 916 2.80 280 29.63 110.0 0.27 125 763 1188 787 313 2700 2165 0 0 50.75 110.0 0.46 Node Type fX fV fX mx my mz mz 125 Valve 3013 850 926 2540 1891 2810 50.75 110.0 0.46 50.75 100 Valve 3013 850 926 2540 1891 2811 29	115B	382	216	287	306	6		299		815				32.67	110.0	0.30		
1208 514 789 421 313 1.00 916 2.27 280 1.89 6.59 36.83 110.0 0.33 1208 514 789 421 313 1.00 916 2.27 280 1.89 6.59 36.83 110.0 0.33 1208 514 789 421 313 916 2.27 280 29.63 110.0 0.27 125 763 1188 787 313 2700 2165 50.75 110.0 0.46 Other forces in local coordinates: Seismic 1 (g) Vertice 1013 850 926 2540 1891 2811 30 113 850 926 2540 1891 2811 25 Valve 3013 850 926 2540 1891 2811 30 2013 850 926 2540 1891 2811 2912 2466 100 Valve 526 474 1080 1135 883 630 Version 1	120A	829	354	303	300	, ;	1.00	993	2 27	247	1.89	6 50	6.59	39 11	110.0	0.26		
120B 514 789 421 313 916 280 2165 10.0 0.27 120B 763 1188 787 313 916 280 2165 10.0 0.27 120B 763 1188 787 313 916 2165 10.0 0.46 Other forces in local coordinates: Seismic 1 (g) Valve 3013 850 926 2540 1891 2811 30 213 850 926 2540 1891 2811 30 4411 1709 2317 2540 2032 2646 100 Valve 526 474 1080 1135 984 666 100 Valve 526 474 1080 1135 883 630 Version 12.10 Sample2	120R	514	789	421	313	3	1.00	916	2.27	280	1.89	6.59	6.59	36.83	110.0	0.33		
Image: Node Type fs fy fz mx my mz Node Type (N)	120B	514	789	421	313	3		916		280				29.63	110.0	0.27		
Node Type fx fy fz mx my mz 25 Valve 3013 850 926 2540 1891 2811 100 Valve 526 474 1080 1135 984 666 100 Valve 526 474 1080 1135 883 630	120	103	1100	101	313	,		Othe	r forces in l		dinates: 9	Seismi	c 1 (a)	30.75	110.0	0.40		
Node Type (N) (N) (N) (Nm) (Nm) 25 Valve 3013 850 926 2540 1891 2811 30 4411 1709 2317 2540 2032 2646 100 Valve 526 474 1080 1135 984 666 100 Version 12.10 Sample2 Sample2 Jan 4.2024			fy fy	f7	my	my	mz	Oure	101003 111	0001	unitites. c	2013111	0 1 (9)					
25 Valve 3013 850 926 2540 1891 2811 30 4411 1709 2317 2540 2032 2646 100 Valve 526 474 1080 1135 984 666 100 Version 12.10 Sample2 Sample2 Jan 4.2024	Node	Туре	(N) (N) (N)	(Nm) (Nm	n) (Nm)											
100 Valve 526 474 1080 1135 984 666 105 Version 12.10 Sample2 Jan 4.2024	25 30	Valve	3013 85 4411 17	0 926 09 2317	2540 7 2540) 189) 203	1 2811 2 2646											
Version 12.10 Sample2 Jan 4.2024	100	Valve	526 47	4 1080	1135	5 984	666											
	Versio	on 12.1	0	000	1130	003	030			Samp	le2						2	Jan 4,2024

Caep	ipe									Sample Problem 2	Page 20
								Pip	e forces in	n global coordinates: Seismic 1 (g)	
Node	FX	FY	FZ	MX	M	Y I	ΜZ				
-	(N)	(N)	(N)	(Nm)) (N	m) ((Nm)				
5 10	3853	1130	1765	2890) 36	34	354				
10	3602	982	1515	2890) 33	34 3	354				
15A	1818	606	338	2890) 19	73	4231				
15A	1818	606	338	2890) 19	73	4231				
15B	1679	663	461	2763	3 19	11 3	3727				
20A	364	1424	1776	4100) 19	11	2451				
20A	364	1424	1776	4100) 19	11	2451				
20B	240	466	1914	4576	5 19 5 19	96	2540				
25	724	739	2808	2811	18	91	2540				
30	2522	1841	4616	2646	6 20	32	2540	1			
55	2528	1845	4622	2648	3 20	57	2540				
35	2526	1886	4622	2040	2 24	14	2540				
35	3347	2473	5973	1590) 64	9	1562				
60	3410	2514	6036	1929) 12	67	1562				
60 40	3410	2514	6036 6043	1929) 12	48	1562				
40	3417	2519	6043	1972	2 13	48	1562				
45	3522	2587	6148	3034	30	96	1562				
45	3522	2587	6148	3034	30	96	1562				
50 35	3873	2816	1306	1135	5 10 5 22	74	1082				
65	741	606	1290	1135	5 21	14	1019				
65	741	606	1290	1135	5 21	14	1019	1			
100	595	516	1148	1135	5 98	4 (566				
105 110A	12	219	573	1135	5 88 5 87	9	530 526				
110A	15	219	570	1135	5 87	9 (626				
110B	54	212	533	1013	8 85	5	584				
110B	54 341	212	533	1013	85	5	584 310				
115A	341	257	310	277	85	5 :	310				
115B	382	275	287	306	81	5	299				
115B	382	216	287	306	81	5	299				
120A	829	354	393	306	24	7	993	-			
120A	639	692	421	195	37	2	993				
120B	891	305	421	348	23	5 9	916				
125	1339	449	787	2176	5 22	8	2700				
								Oth	er forces i	n global coordinates: Seismic 1 (g)	
Node	Type	FX (N)	FY F (N) (·Z IV N) (1	Nm)	MY (Nm)	MZ (Nm)				
25	Valve	926	850 3	013 2	811	1891	2540				
30		2317	1709 4	411 2	646	2032	2540				
100	Valve	526 61	474 1 238 6	080 1	135 135	984 883	666 630				
100		01	200 0		100	000	000		Disp	placements: Seismic 1 (g)	
			Di	splace	ment	s (glo	bal)				
Node	X (mm	n) Y (mm)	Z (mm) X	X (de	g) YY	(deg)	ZZ (deg)		
5	0.094	0.0	00	0.000	0.	.0000	0.1	341	0.1233	-	
10	0.095	0.4	32	0.475	0.	.0033	0.1	372	0.1237	-	
15A 15B	0.108	14.	916 466	20.497 20.200	0.	1303	0.1	368 108	0.1010		
20A	17.085	5 15.	462	1.112	0.	1850	0.1	100	0.1442		
Versie	on 12.1	0		Antonia - 200299	1940					Sample2 Ja	an 4,2024

Caep	ipe										Sampl	le Prol	blem 2							Page 21
										Disp	laceme	ents: S	eismic 1	(g)						
				Displa	cem	ents (g	globa	l)												
Node	X (m	m) Y	′ (mm) Z (m	m)	XX (deg)	YY (deg)	ZZ (deg)										
20B	17.13	29 1	4.624	0.02	4	0.13	51	0.13	34 (0.1067										
25	7.61	86	.236	0.01	8	0.12	40	0.14	83 (0.0514										
30	6.00	6 4	.893	0.01	7	0.12	35	0.14	82 (0.0490										
55	5.93	6 4	.834	0.01	7	0.12	34	0.14	81 (0.0486										
35	5.22	6 4	.244	0.01	6	0.12	33	0.14	81 (0.0486										
60	4.51	63	.654	0.01	5	0.12	33	0.14	81 (0.0486										
40	4.44	63	.596	0.01	5	0.12	32	0.14	80 (0.0484										
45	3.09	92	.485	0.01	3	0.11	53	0.14	07 (0.0415										
50	0.00		.000	0.00	0	0.00	00	0.00	00 00	0.0000										
65	5.22	7 4 0 4	.227	0.35	3	0.12	33	0.14	81 (0.0404										
100	5.22	84 84	.383	3.25	4	0.10	00 40	0.11	75 0	0172										
1100	5.22	0 4 0 1	.401	4.00	4 0	0.10	40	0.11	52 (47 (0.0169										
110A	5 20	0 4 2 1	455	4.11	2	0.10	40 18	0.11	47 0	0.0100										
1154	4 13	2 4 1 4	466	6.69	7	0.10	63	0.00	10 0	0.0137										
115R	4.13	8 4	311	6.96	3	0.10	88	0.03	59 (0.0402										
120A	4 04	5 1	195	4 15	7	0.08	65	0.05	75 (0.0599										
120B	3.84	8 0	.971	3.73	5	0.08	31	0.05	02 (0794										
125	0.00	0 0	.000	0.00	0	0.00	00	0.00	00 0	0.0000										
					-					Lc	ads on	Anch	ors: Win	d						
Node	Tag	FX (N) F	Y (N)	F7	(N)	мх	(Nm)	MY (Nm) MZ	(Nm)									
50	rug	1208	, . _1	21	144	1	-666	5	-388	1 -68	0									
125		603	-2	26	-95		-233	3	172	-11	12									
						2		2		Lo	ads on	Hang	ers: Win	d						
Node	Tag	Type		Load (N) I	No.of	Tota	I (N)												
20B		User h	nange	r -171		1	-171													
115B		Grinne	ell 🛛	-1		1	-1													
										Lo	oads on	Nozz	les: Wind	d						
Node	Тад	Axial	v S	hear z	Shea	ar Tor	aue	Circ	.Mom	Long.M	om									
	Ŭ	(N)	(N)	(N	I)	(Nr	n)	(Nm)	(Nm)										
5		873	-50	-2	11	-31	0	-4		194										
										Pipe force	es in lo	ocal co	ordinate	s: Wir	nd					
Node	Axia	y s	Shear	z Shea	r	Torsic	on(Nr	n)	Inp	lane(Nm)) 0	outplar	ne(Nm)	Flex	k. Fac	tors	SL+SO	SA	SL+SO	
	(N)	(N)	(N)	Mo	oment	SIF		Mome	ent SIF	Мо	ment	SIF	FFi	FFo	FFt	(MPa)	(MPa)	SA	
5	873	21	1	-50	-3	10			-4		-19	94					8.045	122.1	0.07	
10	873	21	1	-50	-3	10	1.00)	-46	1.00	-20)4	1.00	-			8.384	122.1	0.07	
10	873	21	1	-50	-3	10	1.00)	-46	1.00	-20	94	1.00				8.384	122.1	0.07	
154	854	21	0	-50	-3	10	1.00)	-1673	2.61	-58	5	2 17	8 13	8 13		16.47	122.1	0.10	
15B	230	-8	54	-50	-60	04	1.00)	-1435	2.61	291	1	2.17	8.13	8.13		20.58	122.1	0.17	
15B	250	-4	21	-50	-60	04			-1037	8	291	1					13.59	122.1	0.11	
20A	250	-42	21	-50	-60	04			1399		5						9.513	122.1	0.08	
20A	250	-5	0	-32	-60	04	1.00)	-5	2.61	100	01	2.17	8.13	8.13		10.35	122.1	0.08	
20B	-50	-2:	50	-32	98	89	1.00)	109	2.61	592	2	2.17	8.13	8.13		22.41	122.1	0.18	
20B	-50	78		346	98	89	1.00		-109	1.00	-76	8	1.00				15.15	122.1	0.12	
20	-50	78		340	98	99	1.00	, 	-412	1.00	568	20	1.00	-			24.85	122.1	0.20	
55	-50	78		735	98	9	1.00	,	-463	1.00	118	36	1.00				23.01	122.1	0.19	
55	-50	78		756	98	9	-		-463		118	35		-			23.01	122.1	0.19	
35	-50	78		756	98	9	1.39	9	-1391	2.00	-48	5	1.00				20.75	122.1	0.17	
35	-144	12	1	853	68	80	1.39	9	-878	2.00	-31	3	1.00				21.22	122.1	0.17	
60	-144	12	1	853	68	80			-346		111	11					19.01	122.1	0.16	
60	-144	12	1	875	68	80			-346		111	11					19.01	122.1	0.16	
40	-144	12	1	010	08	NU			-349		113	50		1			10.00	122.1	0.15	l.

Version 12.10

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Caepi	ре								5	Sample Pr	oblem 2							Page 22
								P	ipe force	s in local o	coordinate	es: Wir	nd					
Node	Axial	y Sł	near	z Shear	То	rsion	n(Nm)	Inpla	ne(Nm)	Outpla	ane(Nm)	Flex	x. Fact	ors	SL+SO	SA	SL+SO	
40	(N) -144	(N) 121		(N) 912	Mom 680	ent	SIF 1.00	Momen	1 52	Momen 1132	1 51F	FFI	FFO	FFt	(MPa)	(MPa)	SA 0.17	
45	-144	121		912	680	-	1.00	-413	1.52	1615	1.52				21.36	122.1	0.17	
45	-144	121		1078	680			-413		1573					19.70	122.1	0.16	
50 35	-144	-42		-95	-172	-	1 07	-000	1 47	3836	1.86		2 44		25.60	122.1	0.29	
65	-58	-42		-95	-172		1.07	-304	1.47	501	1.00		2.44		19.43	122.1	0.16	
65	-58	-42		-95	-172		1 00	-304	1 00	501	1.00				19.43	122.1	0.16	
100	-58	-42		-95	-172	-	1.00	-233	1.00	343	1.00				22.15	122.1	0.09	
110A	-58	-42		-95	-172	_		-232		341					22.68	110.0	0.21	
110A 110B	-49 -51	-51 49		-95 -95	-172		1.00 1.00	-232	2.27	341 150	1.89	6.59 6.59	6.59 6.59		25.04 34.28	110.0	0.23	
110B	-59	91		95	319			287		-150					28.79	110.0	0.26	
115A	-59	91		95	319	_		60	0.07	86		0.50	0.50		23.24	110.0	0.21	
115A 115B	-68 232	68		95 95	319		1.00 1.00	5 -63	2.27	-298	1.89	6.59	6.59 6.59		34.80	110.0	0.22	
115B	240	-77		-95	107			63		298					28.36	110.0	0.26	
120A	240	-77		-95	107		1 00	363	0.07	-70	1.00	0.50	0.50		26.11	110.0	0.24	
120A	128	-22	1	95 95	107		1.00	-363	2.27	-66	1.89	6.59	6.59		29.24	110.0	0.28	
120B	122	410		-95	110			443		66					25.75	110.0	0.23	
125	122	410		-95	110			-1005	lla a u fa ua a	-268	e e e e el in et				34.29	110.0	0.31	
		fv	fv	f7	my	mv	mz	0		s in local	coordinati	es. vvi	nu					
Node	Туре	(N)	(N)	(N)	(Nm)	(Nm)) (Nm)											
25	Valve	-50	78	678	989	738	-412											
100	Valve	-50	-42	-95	-172	381	-250											
105		-58	-42	-95	-172	343	-233											
						1	_	Pi	pe forces	in global	coordinat	es: Wi	nd					
Node	FX (N)	FY (NI)	FZ (N)	MX (Nm	MY) (Nm		Z Jm)											
5	-873	-211	50	310	194	4	,											
10	873	211	-50	-310	-204	-4	6											
10 15A	-873 873	-211 211	50 -50	310 -310	204	46	673											
15A	-854	-230	50	310	585	16	573											
15B	854	230	-50	-291	-604	-1	435											
15B 20A	-421 421	-250	-50	-5	-604	10	399											
20A	32	-250	50	5	604	-1	001											
20B	-32	250	-50	109	-592	98	39											
20B 25	-346	78	-50	412	568	-9	39 39											
30	735	-78	50	-461	-116	6 -9	89											
55 55	-735	78	-50	463	118	5 98	39											
35	-756	78	-50	485	139	1 98	39											
35	853	-121	144	-313	-878	-6	80											
60	-853 875	121	-14	4 346	111	1 -6	50 580											
40	-875	121	-14	4 349	113	5 68	30											
40	912	-121	144	-349	-113	2 -6	80											
45 45	-912	121	-14	4 413	-157	5 68 3 -6	50 580											
50	-1078	121	-14	4 666	383	6 68	30											
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Caepi	ре										Sar	mpl	ole Pr	oblen	n 2						Ρ	age 23
		7								Pipe	forces in	glo	lobal	coord	dinate	es: W	'ind					
Node	FX	FY	FZ	MX	MY	′ I	ΜZ														 	
	(N)	(N)	(N)	(Nm) (Nr	m) ((Nm))														
35	-58 58	42	-95 95	-172	2 -51	4 -	-309															
65	-58	42	-95	-172	2 -50)1 -	-304															
100	58	-42	95	172	38	1	250															
105	-58	42	-95	-172	2 -34	3 -	-233															
110A	-49	-42	-95	-172	2 -34	1 4	-232															
110B	49	-51	95	150	319	9	232															
110B	91	59	-95	-150) -31	9 -	-287															
115A	-91	-59	95	-86	-31	9 (50 -5	_														
115B	-232	-68	95	-107	298	8 -	-63															
115B	240	77	-95	107	-29	98 (63															
120A	-240	-77	95	-107	-70) -	-363															
120A	-246	-70	-95 95	-91	-91		-336															
120B	427	18	-95	91	91	4	443															
125	-427	-18	95	233	-17	2	1005											 	 		 	
									(Other	forces ir	n gl	global	coor	dinat	tes: V	Vind					
Node	Type	FX (N)	FY (N)	FZ (N)	MX (Nm)	MY (Nr	n) (n	l∠ Nm)														
25	Valve	678	-78	50	-412	-73	8 -9	989														
30		-678	78	-50	461	116	50 9	89														
100	Valve	-58 58	42	-95 95	-172	-38	1 - 2	250														
100		00	12	00	172	010	. 2				Displ	lace	ceme	nts: V	Vind							
				Displa	cemer	nts (g	globa	al)										 	 	 	 	
Node	X (mn	ו) Y	(mm)	Z (m	m) 2	XX (deg)	YY (deg)	ZZ (d	leg)											
5	0.021	0.	000	0.00	0	0.00	00	-0.00	071	-0.00	10											
10	0.021	-0	.003	0.02	5 ·	-0.00	04	-0.00	072	-0.00	10											
15A	0.020	-1	.465	1.74	9. 7.	-0.01	40	-0.02	206	-0.03	44											
20A	7.177	-1	.749	0.12	0.	-0.01	181	-0.04	461	-0.05	98											
20B	7.169	-1	.631	0.00	0 ·	-0.01	72	-0.05	592	-0.04	40											
25	2.992	-0	.594	0.00	0.	-0.01	127	-0.06	609	-0.02	23											
30	2.333	-0	.458	0.00	0 ·	-0.01	124	-0.06	502	-0.02	13											
35	2.305	-0	303	0.00	0.	-0.01	124	-0.06	S01	-0.02	12											
60	1.730	-0	.334	0.00	0.	-0.01	124	-0.00	501 501	-0.02	12											
40	1.702	-0	.328	0.00	0.	-0.01	123	-0.05	599	-0.02	11											
45	1.165	-0	.219	0.00	0 ·	-0.01	110	-0.05	553	-0.01	81											
50	0.000	0.	000	0.00	0 (0.00	00	0.00	00	0.000	00											
65 100	2.017	-0	.342	-0.14	13 .	-0.01	124	-0.06	161	-0.01	82											
105	2.018	-0	024	-1.62	27 .	-0.00)47	-0.04	452	-0.00	88											
110A	2.018	0.	028	-1.64	17	-0.00)46	-0.04	149	-0.00	87											
110B	2.018	0.	042	-1.79	93 (0.00	61	-0.03	307	0.004	19											
115A	1.516	0.	042	-1.42	29	0.00	81	-0.00	048	0.015	57											
115B	1.454	-0	.017	-1.39	98 (0.00	94	0.00	46	0.013	37											
120A	1.455	-0	352	-0.50	14 ·	-0.00)42)56	0.01	57 45	-0.00	49											
125	0.000	0.	000	0.00	0 0	0.00	00	0.00	00	0.000	00											
		1.000									Loads o	on /	Anch	nors: \	Wind	12						
Node	Tag F	X (N)	FY	(N)	FZ (N	V)	MX	(Nm)	MY	(Nm)	MZ (Nm	1)										
50	1	6	23	0	1809		-32		-16		-116										 	
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											Loads	on Anch	nors: Wind	12						
Node	Tag	FX (N)	FY (I	N)	FZ ((N)	MX	(Nm)	MY (Nm) MZ (Nr	n)								
125		9		1		666		172	7	-468	-26			10						
Nodo	Tag	Turn	_	1	and /I		lo of	Total	(NI)		Loads	on Hanç	gers: wind	32						
20B	Tag	Use	e r han	aer -2	0au (1 221	N) N 1	10.01	-221	(IN)											
115B		Grin	nell	-3	3	1		-3												
							,				Loads	on Nozz	zles: Wind	12						
Node	Тад	Axia	il	y Shea	ar z S	Shea	r Tor	que	Circ.	Mom Lo	ong.Mom									
5		-24		954	45	,	-16	65	-81	2	147									
										Pipe	e forces ir	n local co	oordinates	s: Wind	12					
Node	Axia	1	y She	ear z S	Shear	· 1	Torsic	on(Nn	n)	Inplan	e(Nm)	Outpla	ane(Nm)	Flex	k. Fac	tors	SL+SO	SA	SL+SO	-
E	(N)	1	(N)	(N)	Mo	ment	SIF		Moment	SIF	Momen	t SIF	FFi	FFo	FFt	(MPa)	(MPa)	SA	
5 10	-24		-45	94	0	-16	65 65	1.00		-72	1.00	-1959	1.00				11.25	122.1	0.09	
10	-24		45	37	5	-16	65	1.00	1	-72	1.00	-1253	1.00				9.927	122.1	0.08	
15A 15A	-24		-45 -45	37	ວ 15	-16	65	1.00	1	277	2.61	1632 925	2.17	8 13	8.13		11.23	122.1	0.09	
15B	-45		24	-2	15	843	3	1.00		285	2.61	1584	2.17	8.13	8.13		15.23	122.1	0.12	
15B	-45		24	-6	67 67	843	3			285		1981					12.56	122.1	0.10	
20A	-26		-1100) -2	4	843	3	1.00	1	2278	2.61	145	2.17	8.13	8.13		19.86	122.1	0.16	
20B	-110	0	26	-2-	4	136	6	1.00		2688	2.61	-853	2.17	8.13	8.13		32.65	122.1	0.27	-
20B 25	-112	0	-228	24		136	6	1 00		-2688	1 00	853 946	1.00				20.34	122.1	0.17	
30	-112	0.	-228	24		136	6 6	1.00		-1666	1.00	961	1.00				20.72	122.1	0.17	
55	-112	0.	-228	24		136	6	_		-1660		962					20.50	122.1	0.17	-
55 35	-112	0 .	-228	24		136	о 6	1.39		-1660 -968	2.00	-1597	1.00				18.27	122.1	0.17	
35	-180	9.	-230	16		116	6	1.39	•	30	2.00	-705	1.00				19.97	122.1	0.16	
60 60	-180	9. 0.	-230	16		116	6 8		_	-643		-26					17.96	122.1	0.15	-
40	-180	9	-230	16		116	6			-636		-25					17.76	122.1	0.15	
40	-180	9.	-230	16		116	6	1.00		-636	1.52	-25	1.52				19.23	122.1	0.16	
45	-180	9.	-230	16		116	5 6	1.00		-515	1.02	-17	1.52				18.16	122.1	0.16	
50	-180	9	-230	16		116	6			-32	10 100000	16					31.65	122.1	0.26	-
35 65	9		2	-6	82 82	-89)2)2	1.07		998 -20	1.47	20 905	1.86		2.44		30.01	122.1	0.25	
65	9		2	-6	08	-89	2			-20		891		1			23.01	122.1	0.19	
100	9	-	2	-6	08	-89	2	1.00		-23	1.00	123	1.00	-			13.19	122.1	0.11	
105 110A	9		2	-4	83 83	-89	2 92	1.00		-23 -23	1.00	-70 -83	1.00				21.61	110.0	0.20	
110A	9	:	2	-4	64	-89	2	1.00	1	-23	2.27	-83	1.89	6.59	6.59		23.38	110.0	0.21	
110B	2		-9 9	-4	64 5	-18	9 19	1.00		-22	2.27	786	1.89	6.59	6.59		34.14	110.0	0.31	
115A	2		9	31	5	-18	9			1		55					22.87	110.0	0.20	
115A	2	1	9	16	6	-18	9	1.00		1	2.27	1	1.89	6.59	6.59		24.73	110.0	0.22	
115B	9		- <u>-</u> -1	56		39		1.00		1	2.21	-359	1.09	0.59	0.59		29.15	110.0	0.32	
120A	9		-1	56		39				4		-140					23.56	110.0	0.21	
120A	9		1 -8	-2	77 77	39		1.00		-4 -3	2.27	8 -97	1.89	6.59	6.59		26.56	110.0	0.24	
120B	3	1	B	47	9	-31				3		-13					22.58	110.0	0.21	
125	3	1	8	47	9	-31	l .			-26		1679					33.49	110.0	0.30	

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						,		Other forces in local coordinates: Wind 2
Node	Type	fx (NI)	fy (NI)	fz (N)	mx (Nm)	my (Nm)	mz (Nm)	
25	Valve	-1120	-228	24	136	946	-1808	
30		-1120	-228	24	136	961	-1666	
100	valve	9	2	-513	-892 -892	-72	-23 -23	
								Pipe forces in global coordinates: Wind 2
Node	FX	FY	FZ	MX	MY	MZ		
5	(N) 24	(N) 45	(N) -940	(INM)	(INM) 2147	(INM) 81	-	
10	-24	-45	940	-1665	-1959	-72		
10 15A	24	45	-375	1665	1253	72		
15A	24	45	215	1665	-925	-277		
15B	-24	-45	-215	-1584	843	285		
15B 20A	24 -24	45 -45	667 -667	1981 1880	-843 843	-285 145		
20A	24	26	1100	-2278	-843	-145		
20B	-24	-26	-1100	2688	853	136	7	
20B 25	-24	-228	-1120	1808	946	136		
30	24	228	1120	-1666	-961	-136		
55 55	-24 24	-228 228	-1120	-1660	962 -962	-136	-	
35	-24	-228	-1120	1597	968	136		
35	16	230	1809	-705	30	-116		
60	16	230	1809	-643	26	-116	-	
40	-16	-230	-1809	636	-25	116	_	
40 45	16 -16	230 -230	1809 -1809	-636 515	25 -17	-116 116		
45	16	230	1809	-515	17	-116		
50 35	-16 9	-230	-1809	32	16	116	-	
65	-9	2	682	892	905	20		
65	9	-2	-608	-892	-891	-20		
100	-9 9	-2	-483	-892	70	-23	_	
110A	-9	2	483	892	-83	23	_	
110A 110B	9 -9	-2 2	-464 464	-892 786	83 -189	-23 22		
110B	9	-2	-315	-731	189	-22		
115A	-9	2	315	-55	-189	1		
115A	-9	2	166	-39	-227	-1		
115B	9	1	56	39	359	1		
120A	-9	-1	-56 277	-39	-140	-4 4	-	
120B	-9	-1	-277	-86	53	-3		
120B	9	1 -1	479 -479	-20	-26 441	3 26		
120	0		415	1021	1	20		Other forces in global coordinates: Wind 2
	_	FX	FY	FZ	MX	MY	MZ	
Node	Type	(N) 24	(N) 228	(N) 1120	(Nm)	(Nm)	(Nm) -136	
30	valve	-24	-228	-1120	1666	961	136	
100	Valve	9	-2	-513	-892	-135	-23 23	
100		5	-	510	502	14	20	

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Cae	oipe						Sample Problem 2	Paç
						Di	splacements: Wind 2	
			Displace	ments (globa	al)			
Node	e X (mm)	Y (mm)	Z (mm)) XX (deg)	YY (deg)	ZZ (deg)		
5	0.000	0.000	0.000	0.0000	-0.0784	-0.0186		
10	0.000	-0.065	0.278	-0.0019	-0.0802	-0.0186		
15A	0.000	-2.471	11.731	-0.0751	-0.0738	-0.0152		
15B	0.075	-2.557	11.576	-0.1001	-0.0535	-0.0091		
20A	0.689	-2.558	0.558	-0.1014	-0.0257	-0.0036		
20B	0.577	-2.107	0.008	-0.0472	-0.0160	-0.0067		
25	0.005	-0.300	0.005	-0.0091	-0.0007	-0.0038		
30	0.000	-0.209	0.005	-0.0078	0.0000	-0.0036		
55	0.000	-0.205	0.005	-0.0076	0.0001	-0.0036		
35	0.000	-0.169	0.005	-0.0076	0.0001	-0.0036		
60	0.000	-0.133	0.004	-0.0076	0.0001	-0.0036		
40	0.000	-0.130	0.004	-0.0075	0.0001	-0.0036		
45	0.000	-0.070	0.004	-0.0056	0.0000	-0.0031		
50	0.000	0.000	0.000	0.0000	0.0000	0.0000		
65	0.000	-0.160	0.006	-0.0076	0.0001	-0.0034		
100	0.000	-0.093	0.235	0.0291	0.0161	-0.0027		
105	0.000	-0.074	0.350	0.0321	0.0162	-0.0027		
1104	0.000	-0.072	0.357	0.0329	0.0162	-0.0027		
110E	3 0.008	-0.064	0.618	0.0603	0.0244	-0.0013		
1154	0.044	-0.064	3.885	0.0814	0.0090	-0.0006		
115E	3 0.046	-0.061	4.227	0.0777	0.0012	-0.0006		
1204	0.046	-0.014	3.366	0.0728	-0.0231	-0.0008		
120F	3 0.043	-0.011	3 061	0.0707	-0.0215	-0.0010		
125	0.000	0.000	0.000	0.0000	0.0000	0.0000		
							Frequencies	
# F	requency	Period	Partic	ination facto	rs Mod	lal mass / T	otal mass	
" ·	Hz)	(second)	X	Y Z	X	Y	Z	
1 1	703	0.5872	0 7395	-1 9310 1 2	246 0.03	14 0 2138		
$\frac{1}{2}$	458	0.4069	0.8526	-2 2220 -1	5016 0.04	17 0 2831	0 1293	
3 2	675	0.3739	-2 4950	-1.3661 0.2	625 0.35	70 0 1070	0.0040	
4 4	158	0 2405	-0.3444	0.3579 -1	2489 0.00	68 0.0073	0.0894	
5 6	661	0.1501	0.8111	-1 2509 0 1	106 0.03	377 0.0897	0.0007	
6 6	761	0 1479	0.9343	0.6600 -0.0	0140 0.05	01 0.0250	0.0000	
7 7	456	0 1341	0.0803	-0 1084 -0	1687 0.00	04 0.0007	0.0016	
R C	959	0.1004	1 2280	0.1913 _0	1710 0.08	865 0.0021	0.0017	
a 1	1 629	0.0860	0.0727	-0.9579 0.0	383 0.00	03 0.0526	0.0001	
10 1	3 281	0.0753	-0.6669	-0.0590 -1	1835 0.00	255 0.0020	0.0803	
11 3	0.952	0.0323	-2 2003	-0.0525.0.0	055 0.02		0.0000	
12 5	3 862	0.0186	-0 1820	0 1712 -0	5697 0.00	19 0 0017	0.0186	
13	0.002	0.0100	-0.1020	0.1712 -0.	al 0.94	23 0 7834	0.0100	
							Mode 1: 1.70 Hz	
Node	X (mm)	Y (mm)	Z (mm)) XX (dea)	YY (dea)	ZZ (deg)		
5	0.000	0.000	0.000	0.0000	-0.0583	-0.0444		
10	0.000	-0.155	0.206	-0.0017	-0.0597	-0.0446		
15A	0.000	-6.256	10 160	-0.0657	-0.0766	-0.0440		
15B	0.278	-6 539	10.100	-0.0864	-0.0619	-0.0402		
204	3 941	-6.537	0.568	-0.0928	-0.0455	-0.0306		
20B	3.830	-6.013	0.000	-0.0695	-0.0424	-0.0265		
25	1.357	-2 102	0.000	-0.0461	-0.0297	-0.0142		
30	1.030	-1.607	0.000	-0.0401	-0 0280	-0.0137		
55	1.035	-1.586	0.000	-0.0430	-0.0203	-0.0136		
35	0.887	-1.300	0.000	-0.0448	-0.0200	-0.0136		
60	0.750	-1.572	0.000	-0.0448	-0.0288	-0.0136		
	0.100	1.100	0.000	0.0440	0.0200	0.0100		
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							Mode 1: 1.70 Hz
Node	X (mm)	Y (mm)	Z (mm)	XX (deg)	YY (deg)	ZZ (deg)	
40	0.736	-1.137	0.000	-0.0446	-0.0287	-0.0135	
45	0.487	-0.749	0.000	-0.0391	-0.0252	-0.0116	
50	0.000	0.000	0.000	0.0000	0.0000	0.0000	
65	0.887	-1.339	-0.067	-0.0448	-0.0288	-0.0124	
100	0.887	-1.109	-0.616	-0.0389	-0.0211	-0.0083	
105	0.887	-1.052	-0.763	-0.0384	-0.0205	-0.0080	
110A	0.887	-1.048	-0.772	-0.0383	-0.0204	-0.0079	
110B	0.896	-1.030	-0.969	-0.0301	-0.0105	0.0009	
115A	0.782	-1.029	-2.142	-0.0249	0.0068	0.0015	
1158	0.787	-1.016	-2.192	-0.0208	0.0145	-0.0061	
120A	0.786	-0.249	-0.870	-0.0183	0.0197	-0.0153	
1200	0.735	-0.100	-0.749	-0.0101	0.0159	-0.0176	
125	0.000	0.000	0.000	0.0000	0.0000	0.0000	Mode 2: 2 46 Hz
Node	X (mm)	Y (mm)	Z (mm)	XX (deg)	YY (deg)	ZZ (deg)	
5	0.000	0.000	0.000	0.0000	0.0593	-0.0435	
10	0.000	-0.152	-0.210	0.0018	0.0607	-0.0436	
15A	0.000	-6.078	-9.610	0.0695	0.0623	-0.0421	
15B	0.264	-6.346	-9.388	0.0954	0.0367	-0.0383	
20A	3.806	-6.343	-0.217	0.0631	-0.0064	-0.0304	
20B	3.866	-6.397	-0.005	-0.0227	-0.0247	-0.0174	
25	1.736	-3.225	-0.003	-0.0628	-0.0349	-0.0082	
30	1.357	-2.540	-0.003	-0.0631	-0.0347	-0.0078	
55	1.341	-2.511	-0.003	-0.0632	-0.0347	-0.0078	
35	1.175	-2.208	-0.003	-0.0632	-0.0347	-0.0078	
60	1.009	-1.905	0.000	-0.0632	-0.0347	-0.0078	
40	0.992	-1.875	0.000	-0.0631	-0.0346	-0.0077	
45	0.681	-1.302	0.000	-0.0597	-0.0322	-0.0066	
50	0.000	0.000	0.000	0.0000	0.0000	0.0000	
65	1.175	-2.189	-0.085	-0.0632	-0.0347	-0.0063	
100	1.175	-2.095	-0.773	-0.0615	-0.0271	-0.0029	
105	1.175	-2.075	-0.961	-0.0613	-0.0264	-0.0028	
110A	1.175	-2.073	-0.974	-0.0613	-0.0262	-0.0028	
110B	1.178	-2.067	-1.284	-0.0550	-0.0145	0.0000	
115A	1.227	-2.066	-3.603	-0.0514	0.0109	-0.0048	
115B	1.263	-2.017	-3.729	-0.0444	0.0228	-0.0167	
120A	1.263	-0.409	-1.659	-0.0368	0.0310	-0.0282	
120B	1.175	-0.297	-1.446	-0.0326	0.0250	-0.0293	
125	0.000	0.000	0.000	0.0000	0.0000	0.0000	
N. d.	X (mana)	V (mark)	7 (XXX (dea)	$\lambda \alpha (d - z)$	77 (1	Mode 3: 2.67 Hz
Node	X (mm)	Y (mm)	Z (mm)	XX (deg)	11 (deg)	ZZ (deg)	
10	-0.024	-0 177	0.000	0.0000	-0.0057	-0.0505	
154	-0.020	-4.171	0.020	0.0003	0.0140	0.0143	
15B	-0 478	-3.873	-0.096	0.0045	0.0293	0.0965	
20A	-12 517	-3.873	0.086	-0.0056	0.0744	0 1179	
20B	-12.602	-3.749	0.000	-0.0256	0.1026	0.0858	
25	-5.294	-1.680	0.000	-0.0336	0.1081	0.0424	
30	-4.123	-1.315	0.000	-0.0336	0.1073	0.0406	
55	-4.072	-1.299	0.000	-0.0335	0.1071	0.0403	
35	-3.559	-1.138	0.000	-0.0335	0.1071	0.0403	
60	-3.047	-0.977	0.000	-0.0335	0.1071	0.0403	
40	-2.996	-0.961	0.000	-0.0335	0.1069	0.0401	
45	-2.042	-0.660	0.000	-0.0311	0.0982	0.0344	
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							Mode 3: 2.67 Hz
Node	X (mm)	Y (mm)	Z (mm)	XX (deg)	YY (deg)	ZZ (deg)	
50	0.000	0.000	0.000	0.0000	0.0000	0.0000	
65	-3.559	-1.234	0.255	-0.0335	0.1071	0.0336	
100	-3.559	-1.727	2.460	-0.0339	0.0918	0.0107	
105	-3.559	-1.796	3.101	-0.0340	0.0903	0.0088	
110A	-3.559	-1.800	3.142	-0.0340	0.0899	0.0083	
110B	-3.481	-1.769	3.299	-0.0430	0.0690	-0.0347	
115A	-1.396	-1.768	1.541	-0.0352	0.0219	-0.0527	
115B	-1.196	-1.580	1.464	-0.0347	0.0058	-0.0431	
120A	-1.194	0.307	0.702	0.0000	-0.0183	-0.0073	
120B	-1.165	0.294	0.622	0.0057	-0.0195	0.0184	
125	0.000	0.000	0.000	0.0000	0.0000	0.0000	
							Mode 4: 4.16 Hz
Node	X (mm)	Y (mm)	Z (mm)	XX (deg)	YY (deg)	ZZ (deg)	
5	-0.003	0.000	0.000	0.0000	-0.0046	0.0072	
10	-0.003	0.025	0.016	-0.0001	-0.0048	0.0072	
15A	-0.004	1.189	0.568	-0.0051	-0.0008	0.0110	
15B	-0.097	1.273	0.511	-0.0082	0.0039	0.0161	
20A	-1.793	1.271	-0.052	0.0009	0.0145	0.0150	
20B	-1.760	1.194	-0.004	0.0168	0.0196	0.0097	
25	-0.604	0.262	-0.005	0.0025	0.0100	0.0040	
30	-0.501	0.244	-0.005	0.0007	0.0089	0.0038	
55	-0 497	0.243	-0.005	0.0003	0.0087	0.0037	
35	-0 454	0.240	-0.005	0.0003	0.0087	0.0037	
60	-0.412	0.237	-0.004	0.0003	0.0087	0.0037	
40	-0.408	0.237	-0.004	0.0005	0.0088	0.0037	
45	-0.315	0.212	-0.004	0.0041	0.0107	0.0032	
50	0.000	0.000	0.000	0.0000	0.0000	0.0000	
65	-0 454	0.232	0.013	0.0003	0.0087	0.0025	
100	-0.454	0.210	-0.478	-0.1911	-0.0384	-0.0001	
105	-0 455	0.211	-0.750	-0 2067	-0.0380	-0.0002	
110A	-0.455	0.212	-0.767	-0.2107	-0.0376	-0.0002	
110B	-0.451	0.214	-2.085	-0.3547	-0.0773	-0.0012	
115A	-0.389	0.214	-21 257	-0 4784	0.0057	-0.0013	
115B	-0.384	0.217	-23.008	-0.4486	0.0522	-0.0003	
120A	-0.384	0.114	-16 693	-0.3870	0 1140	0.0042	
120B	-0.364	0.092	-15 123	-0.3690	0 1022	0.0077	
125	0.000	0.000	0.000	0.0000	0.0000	0.0000	
120	0.000	0.000	0.000	0.0000	0.0000	0.0000	Mode 5: 6.66 Hz
Node	X (mm)	Y (mm)	7 (mm)	XX (deg)	YY (dea)	77 (deg)	
5	0.017	0.000	0.000	0.0000	-0.0105	0.0239	
10	0.017	0.084	0.000	-0.0004	-0.0109	0.0239	
154	0.020	2 675	0.972	-0.0155	0.0049	0.0087	
15B	0.022	2 693	0.743	-0.0251	0.0204	-0.0027	
204	-1 088	2.683	-0 333	0.0212	0.0204	0.0411	
20R	-1 207	2.000	0.003	0.0212	0.0422	0.0835	
25	0.800	-2 651	0.000	0.0016	0.0030	0 1730	
30	0.902	-2 614	0.000	-0.0089	-0.0010	0 1769	
55	0.902	-2.600	0.000	-0.0107	-0.0017	0.1775	
35	0.802	-2.550	0.000	-0.0107	-0.0017	0.1775	
60	0.881	-2.005	0.000	-0.0107	-0.0017	0.1775	
40	0.001	-2.490	0.000	-0.0107	-0.0017	0.1766	
45	0.000	-2.409	0.000	-0.0122	-0.0022	0.1515	
50	0.000	-2.100	0.000	-0.0404	0.0104	0.1010	
65	0.000	-2 005	-0.003	-0.0000	-0.0017	0.0000	
00	0.095	-2.990	-0.003	-0.0107	-0.0017	0.2595	
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							Mode 5: 6.66 Hz	
Node	X (mm)	Y (mm)	Z (mm)	XX (deg)	YY (deg)	ZZ (deg)		_
100	0.901	-10.380	-0.028	-0.0081	-0.0005	0.3398		
105	0.902	-12.739	-0.030	-0.0079	-0.0003	0.3274		
110A	0.902	-12.890	-0.031	-0.0078	-0.0003	0.3233		
110B	0.628	-13.611	-0.051	-0.0047	0.0026	-0.0778		
115A	9.561	-13.623	-0.168	-0.0007	0.0069	-0.2478		
115B	10.434	-12.845	-0.131	0.0024	0.0097	-0.1650		
120A	10.438	-3.203	0.543	0.0101	0.0079	-0.1609		
120B	9.836	-2.484	0.532	0.0127	0.0043	-0.2204		
125	0.000	0.000	0.000	0.0000	0.0000	0.0000		
							Mode 6: 6.76 Hz	
Node	X (mm)	Y (mm)	7 (mm)	XX (dea)	YY (dea)	77 (dea)		
5	-0.018	0.000	0.000	0.0000	-0.0002	-0.0135		
10	-0.018	-0.047	0.000	0.0000	-0.0002	-0.0135		
154	-0.022	-1.001	-0 197	0.0002	0.0047	0.0062		
15R	-0 159	-0.903	-0 191	0.0070	0.0077	0.0271	-	
204	-2 240	-0.900	0.131	-0.0074	0.0190	-0.0021	-	
20R	-1.881	-0.300	0.000	-0.0310	0.0302	-0.0406	-	
200	0.183	0.888	0.000	-0.0019	0.0112	-0.1044	-	
30	0.103	0.876	0.000	0.0000	0.0085	-0 1072	-	
55	0.205	0.070	0.000	0.0036	0.0000	0.1072		
35	0.295	0.857	0.000	0.0036	0.0080	0 1077		
60	0.334	0.007	0.000	0.0036	0.0080	-0.1077		
40	0.309	0.030	0.000	0.0030	0.0080	-0.1077		
40	0.372	0.732	0.000	0.0041	0.0070	-0.1071		
40	0.000	0.732	0.000	0.0155	-0.0020	-0.0919		
50	0.000	1 1 1 9	0.000	0.0000	0.0000	0.0000		
100	0.335	6.404	0.019	0.0030	0.0087	0.2010		
100	0.340	0.404	0.214	0.0016	0.0007	-0.2910		
1100	0.340	8.606	0.274	0.0016	0.0084	0.2954		
110A	1 714	0.000	0.278	0.0016	0.0004	-0.2903		
1154	1.7 14	9.902	0.303	-0.0010	0.0044	0.3040		
115A	10.099	9.090	0.175	-0.0042	-0.0035	-0.2003	-	
1204	16.032	9.007	0.133	-0.0067	-0.0073	0.1317		
120A	16.025	-4.130	-0.476	-0.0102	-0.0076	0.0635		
1208	15.630	-3.934	-0.467	-0.0119	-0.0049	-0.2464	-	
125	0.000	0.000	0.000	0.0000	0.0000	-0.0000	Mada 7: 7.40 Hz	
							Mode 7: 7.46 Hz	
Node	X (mm)	Y (mm)	Z (mm)	XX (deg)	YY (deg)	ZZ (deg)		
5	0.003	0.000	0.000	0.0000	0.0014	-0.0013	-	
10	0.003	-0.004	-0.005	0.0000	0.0014	-0.0013		
15A	0.004	-0.276	-0.097	0.0014	-0.0013	-0.0034		
15B	0.040	-0.305	-0.065	0.0028	-0.0038	-0.0066		
20A	0.666	-0.304	0.047	-0.0025	-0.0097	-0.0033		
20B	0.590	-0.252	0.009	-0.0102	-0.0132	0.0020	-	
25	0.016	0.122	0.009	0.0061	0.0018	0.0088	-	
30	0.043	0.048	0.009	0.0078	0.0033	0.0091	-	
55	0.045	0.044	0.009	0.0081	0.0035	0.0091	-	
35	0.061	0.006	0.009	0.0081	0.0035	0.0091	-	
60	0.076	-0.031	0.009	0.0081	0.0035	0.0091	-	
40	0.078	-0.034	0.009	0.0079	0.0034	0.0091	-	
45	0.093	-0.081	0.007	0.0030	0.0003	0.0078	-	
50	0.000	0.000	0.000	0.0000	0.0000	0.0000	-	
65	0.061	-0.016	0.023	0.0081	0.0035	0.0143	-	
100	0.061	-0.450	0.696	0.1959	0.0303	0.0214	-	
105	0.061	-0.599	0.895	0.2112	0.0248	0.0210		
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							Mode 7: 7.46 Hz
Node	X (mm)	Y (mm)	Z (mm)	XX (deg)	YY (deg)	ZZ (deg)	
110A	0.061	-0.609	0.907	0.2152	0.0230	0.0208	
110B	0.017	-0.670	1.898	0.3126	-0.0276	0.0052	
115A	0.064	-0.671	17.400	0.3203	-0.3231	-0.0051	
115B	0.089	-0.642	16.648	0.1336	-0.5120	-0.0083	
120A	0.090	-0.042	-21.395	-0.3442	-0.4708	-0.0074	
120B	0.075	-0.019	-21,538	-0.5029	-0.2678	-0.0036	
125	0.000	0.000	0.000	-0.0000	0.0000	0.0000	
	1						Mode 8: 9.96 Hz
Node	X (mm)	Y (mm)	Z (mm)	XX (deg)	YY (deg)	ZZ (deg)	
5	-0.034	0.000	0.000	0.0000	-0.0247	-0.0227	
10	-0.034	-0.080	0.088	0.0007	-0.0252	-0.0228	
15A	-0.041	-0.999	0.338	0.0296	0.0537	0.0253	
15B	-0.443	-0.693	-0 143	0.0070	0 1148	0.0775	
204	-8 739	-0.686	0.171	-0.0119	0.2892	0.0654	
20R	-6.887	-0.434	-0.010	-0.0499	0.3414	0.0219	
200	8 420	1 821	-0.000	0.0499	-0.0277	0.0219	-
20	7 045	1.031	-0.009	0.0172	-0.0211	0.0217	
50	7.014	1.0//	-0.009	0.0172	-0.0008	0.0217	-
25	7.914	1.009	-0.009	0.0181	-0.0001	0.0217	-
35	7.581	1.5/8	-0.009	0.0181	-0.0661	0.0217	
60	7.235	1.486	-0.009	0.0181	-0.0661	0.0217	-
40	7.201	1.477	-0.009	0.0187	-0.0696	0.0216	
45	6.110	1.225	-0.007	0.0327	-0.1495	0.0186	-
50	0.000	0.000	0.000	0.0000	-0.0000	0.0000	
65	7.582	1.528	-0.171	0.0181	-0.0661	0.0296	
100	7.595	0.499	-2.685	0.0497	-0.1375	0.0689	
105	7.595	0.000	-3.654	0.0523	-0.1370	0.0734	
110A	7.595	-0.036	-3.717	0.0530	-0.1366	0.0747	
110B	7.011	-0.496	-3.912	0.0912	-0.1026	0.1881	
115A	-1.936	-0.494	0.616	0.1028	-0.0491	0.1784	
115B	-2.450	-0.852	0.832	0.0941	-0.0353	0.0382	
120A	-2.452	0.602	-0.204	0.0231	-0.0030	-0.0242	
120B	-2.414	0.606	-0.246	0.0078	0.0073	0.0337	
125	0.000	0.000	0.000	0.0000	0.0000	0.0000	
							Mode 9: 11.63 Hz
Node	X (mm)	Y (mm)	Z (mm)	XX (deg)	YY (deg)	ZZ (deg)	
5	-0.039	0.000	0.000	0.0000	-0.0079	0.0217	
10	-0.039	0.076	0.028	-0.0011	-0.0080	0.0217	
15A	-0.047	2.806	0.842	-0.0451	0.0010	0.0166	
15B	-0.197	2.925	0.454	-0.0564	0.0116	0.0298	
20A	-1.544	2.891	-1.040	0.0757	0.0183	-0.0323	
20B	-0.813	1.473	0.004	0.2734	0.0506	-0.1030	
25	1.314	-10.510	0.000	-0.0744	-0.0063	-0.2239	
30	1.220	-9.514	0.000	-0.1066	-0.0107	-0.2292	
55	1.215	-9.460	0.000	-0.1113	-0.0114	-0.2300	
35	1.155	-8.889	0.000	-0.1113	-0.0114	-0.2300	
60	1.097	-8.330	0.000	-0.1113	-0.0114	-0.2300	
40	1 091	-8 275	0.000	-0 1145	-0 0110	-0 2289	
45	0.918	-6.804	0.000	-0 1873	-0.0232	-0 1963	
50	0.000	0.004	0.000	-0.0000	0.0202	0.1000	
50	1 165	0.000	0.000	-0.0000	0.0000	0.0000	-
100	1.100	-0.327	-0.024	-0.1113	-0.0114	-0.3420	-
100	1.153	1.756	-0.149	-0.0528	-0.0022	-0.4907	-
105	1.153	5.186	-0.163	-0.0480	-0.0021	-0.4801	-
110A	1.153	5.408	-0.164	-0.0468	-0.0021	-0.4760	
110B	2.015	6.735	-0.247	-0.0007	0.0141	-0.0604	
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							Mode 9: 11.63 Hz
Node	X (mm)	Y (mm)	Z (mm)	XX (deg)	YY (deg)	ZZ (deg)	
115A	-1.678	6.752	0.857	0.0361	-0.0014	0.1468	
115B	-2.205	6.279	0.960	0.0271	-0.0121	0.1036	
120A	-2.214	0.752	-0.278	0.0019	-0.0176	0.0652	
120B	-2.040	0.518	-0.327	-0.0054	-0.0098	0.0545	
125	0.000	0.000	0.000	0.0000	0.0000	0.0000	
	•						Mode 10: 13.28 Hz
Node	X (mm)	Y (mm)	Z (mm)	XX (deg)	YY (deg)	ZZ (deg)	
5	-0.006	0.000	0.000	0.0000	-0.0013	-0.0020	
10	-0.006	-0.007	0.005	0.0000	-0.0013	-0.0020	
15A	-0.007	-0.048	0.026	0.0002	0.0027	0.0031	
15B	-0.053	-0.013	-0.008	-0.0012	0.0058	0.0086	
20A	-0.857	-0.012	-0.094	-0.0003	0.0143	0.0042	
20B	-0.760	-0.014	-0.093	0.0005	0.0151	0.0002	
25	-1.557	-0.172	-0.093	0.0056	-0.0648	-0.0000	
30	-2.299	-0.235	-0.092	0.0062	-0.0732	-0.0000	
55	-2.332	-0.238	-0.092	0.0063	-0.0749	-0.0000	
35	-2.671	-0.266	-0.092	0.0063	-0.0749	-0.0000	
60	-3.001	-0.294	-0.086	0.0063	-0.0749	-0.0000	
40	-3.034	-0.296	-0.085	0.0060	-0.0712	-0.0000	
45	-3.220	-0.308	-0.070	-0.0021	0.0165	-0.0000	
50	0.000	0.000	0.000	0.0000	0.0000	0.0000	
65	-2.672	-0.267	-0.319	0.0063	-0.0749	-0.0007	
100	-2.681	-0.174	-14.334	0.1986	-0.9363	-0.0105	
105	-2.681	-0.095	-20.965	0.2143	-0.9388	-0.0121	
110A	-2.681	-0.089	-21.399	0.2183	-0.9365	-0.0125	
110B	-2.529	0.018	-23.356	0.4757	-0.7072	-0.0541	
115A	0.241	0.017	1.676	0.5838	-0.3063	-0.0580	
115B	0.414	0.144	2.909	0.5554	-0.1868	-0.0163	
120A	0.415	-0.092	-0.071	0.1586	0.0307	0.0078	
120B	0.416	-0.104	-0.243	0.0786	0.0757	-0.0045	
125	0.000	0.000	0.000	0.0000	0.0000	0.0000	
					1		Mode 11: 30.95 Hz
Node	X (mm)	Y (mm)	Z (mm)	XX (deg)	YY (deg)	ZZ (deg)	
5	-9.395	0.000	0.000	0.0000	-0.0026	-0.1125	
10	-9.446	-0.398	0.009	0.0001	-0.0027	-0.1122	
15A	-10.710	-1.279	0.023	0.0021	0.0056	0.1880	
15B	-12.541	0.532	-0.030	0.0005	0.0111	0.1378	
20A	-0.167	0.566	0.017	-0.0013	0.0255	-0.2356	
20B	1.318	0.576	0.000	0.0034	-0.0120	-0.1857	
25	0.034	0.055	0.000	0.0072	-0.0120	-0.0697	
30	-0.086	-0.021	0.000	0.0065	-0.0098	-0.0646	
55	-0.091	-0.024	0.000	0.0063	-0.0094	-0.0638	
35	-0.137	-0.056	0.000	0.0063	-0.0094	-0.0638	
60	-0.180	-0.085	0.000	0.0063	-0.0094	-0.0638	
40	-0.184	-0.088	0.000	0.0061	-0.0090	-0.0635	
45	-0.229	-0.121	0.000	0.0015	-0.0014	-0.0544	
50	0.000	0.000	0.000	0.0000	0.0000	0.0000	
65	-0.137	0.094	-0.020	0.0063	-0.0094	-0.0348	
100	-0.140	0.059	0.013	0.0035	0.0081	0.0247	
105	-0.140	-0.121	0.072	0.0033	0.0084	0.0256	
110A	-0.140	-0.133	0.076	0.0032	0.0084	0.0255	
110B	-0.199	-0.216	0.113	-0.0005	0.0063	0.0050	
115A	0.000	-0.220	-0.004	-0.0036	0.0025	-0.0078	
115B	0.024	-0.203	-0.010	-0.0037	0.0013	-0.0033	
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Mode 11: 30.95 Hz Node X (mm) Y (mm) Z (mm) XX (deg) YY (deg) ZZ (deg) 120A 0.025 -0.012 0.000 -0.0011 -0.0004 -0.0020 120B 0.022 -0.006 0.0000 -0.0000 -0.0020 120B 0.022 -0.006 0.0000 -0.0020 -0.0020
Node X (mm) Y (mm) Z (mm) XX (deg) YY (deg) ZZ (deg) 120A 0.025 -0.012 0.000 -0.0011 -0.0004 -0.0020 120B 0.022 -0.006 0.000 -0.0010 -0.0009 120B 0.020 -0.0000 -0.0009 -0.0009
120A 0.025 -0.012 0.000 -0.0011 -0.0004 -0.0020 120B 0.022 -0.006 0.000 -0.0010 -0.0009 120B 0.022 -0.006 0.000 -0.0009 -0.0009
120B 0.022 -0.006 0.000 -0.0006 -0.0007 -0.0009
125 0.000 0.000 0.000 0.0000 0.0000
Mode 12: 53.86 Hz
Node X (mm) Y (mm) Z (mm) XX (deg) YY (deg) ZZ (deg)
5 -0.218 0.000 0.000 -0.0000 -0.5900 0.1098
10 -0.219 0.395 2.146 -0.0297 -0.5950 0.1086
15A -0.215 1.753 7.777 -1.1724 0.9900 -0.1339
15B 0.552 0.701 -9.871 -0.9121 1.3985 -0.0115
20A -2.625 0.373 -8.608 0.8323 0.8100 -0.1007
20B 3.104 -5.466 -1.895 0.4485 0.4586 -0.0882
25 4.437 -2.218 -1.147 -0.3887 -0.4890 -0.0376
30 -1.109 2.073 -1.102 -0.3755 -0.4869 -0.0354
55 -1.354 2.253 -1.095 -0.3685 -0.4779 -0.0350
35 -3.904 4.089 -1.023 -0.3684 -0.4778 -0.0350
60 -6.212 5.879 -0.953 -0.3684 -0.4778 -0.0350
40 -6.435 6.052 -0.946 -0.3593 -0.4665 -0.0348
45 -9.246 8.165 -0.784 -0.0957 -0.1426 -0.0299
50 0.000 0.000 0.000 0.0000 0.0000 0.0000
65 -3.935 4.199 -2.149 -0.3684 -0.4778 0.0021
100 -4.191 1.944 -1.546 -0.1722 0.4097 0.2497
105 -4.205 0.087 1.486 -0.1562 0.4352 0.2687
110A -4.206 -0.042 1.691 -0.1521 0.4363 0.2704
110B -5.087 -1.135 3.138 -0.0882 0.4577 0.0695
115A -0.298 -1.192 -0.182 -0.0593 0.2074 -0.1702
115B 0.211 -0.828 0.196 -0.0861 0.1024 -0.0539
120A 0.235 -0.036 0.014 -0.0254 -0.0509 0.0090
120B 0.256 -0.068 -0.111 -0.0195 -0.0479 0.0020
125 0.000 0.000 0.000 0.0000 0.0000 0.0000
Dynamic susceptibility
Mode Frequency Maxima Nodes Susceptibility
(Hz) Velocity Stress (psi / ips)
10 13,281 110B 35 1352
8 9.959 20A 35 1128
5 6.661 110A 35 892
9 11.629 25 35 821
12 53.862 45 45 601
6 6.761 120B 120A 570
2 2,458 15A 20B 452
3 2 675 208 50 421
4 4.158 115B 110B 421
7 7 456 120B 125 366
1 1 703 154 45 316
11 30 952 15B 15B 255
Dynamic stresses for mode 10: 13.28 Hz, susceptibility = 1352
Node Displacement Nominal Stress SIF Intensified Stress
5 0 0000F+00 1 0974F+01 1 00 1 0974F+01
10 3 3603E-04 7 7408E+00 1 00 7 7415E+00
15A 2 1654E-03 1 1873E+02 2 61 3 0931E+02
15B 2 1001E-03 5 6006E+01 2 61 1 /8/8E+02
2.1031E-03 3.0330E-01 2.01 1.4040E-02 20A 3.3023E-02 1.5063E+02 2.61 4.1585E+02
20R 2 0036E-02 8 0856E+01 2 61 2 106/E+02
25 6 1668E-02 2 7189E+03 1 00 2 7192E+03
30 9.0975E-02 4.0671E+03 1.00 4.0675E+03
Version 12.10 Sample?

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				Dynamic stresse	es for mode 10: 13.28 Hz, susceptibility = 1352	
Node	Displacement	Nominal Stress	SIF	Intensified Stress		
55	9.2305E-02	4.1650E+03	1.00	4.1650E+03		
35	1.0568E-01	5.6011E+04	2.00	1.0435E+05		
60	1.1872E-01	9.3189E+03	1.00	9.3189E+03		
40	1.2001E-01	9.1709E+03	1.52	1.3966E+04		
45	1.2734E-01	1.1023E+04	1.52	1.6788E+04		
50	0.0000E+00	1.1880E+04	1.00	1.1880E+04		
65	1.6356E-02	5.1086E+04	1.00	5.1086E+04		
100	5.6437E-01	5.6100E+03	1.00	5.6105E+03		
105	8.2542E-01	3.6630E+03	1.00	3.6634E+03		
110A	8.4248E-01	3.8478E+03	2.27	8.7171E+03		
110B	9.2489E-01	6.2693E+03	2.27	1.4203E+04		
115A	6.6656E-02	2.6975E+03	2.27	6.1110E+03		
115B	1.1465E-01	4.5477E+03	2.27	1.0303E+04		
120A	4.5947E-03	2.8515E+02	2.27	6.4601E+02		
120B	1.9388E-02	2.9647E+03	2.27	6.7165E+03		
125	0.0000E+00	1.6407E+03	1.00	1.6407E+03		
				Dynamic stress	ses for mode 8: 9.96 Hz, susceptibility = 1128	
Node	Displacement	Nominal Stress	SIF	Intensified Stress		
5	0.0000E+00	2.0187E+02	1.00	2.0187E+02		
10	4.6663E-03	1.4841E+02	1.00	1.4843E+02		
15A	4.1541E-02	1.7460E+03	2.61	4.5484E+03		
15B	1.8342E-02	6.1493E+02	2.61	1.6020E+03		
20A	3.4414E-01	1.0622E+03	2.61	2.7672E+03		
20B	2.7169E-01	7.8423E+02	2.61	2.0430E+03		
25	3.3958E-01	1.3815E+04	1.00	1.3816E+04		
30	3.1970E-01	1.3305E+04	1.00	1.3306E+04		
55	3.1843E-01	1.3204E+04	1.00	1.3204E+04		
35	3.0486E-01	1.2158E+04	2.00	2.4292E+04		
60	2.9079E-01	8.9986E+03	1.00	8.9986E+03		
40	2.8941E-01	8.8247E+03	1.52	1.3439E+04		
45	2.4533E-01	9.4639E+03	1.52	1.4413E+04		
50	0.0000E+00	1.7342E+04	1.00	1.7342E+04		
65	6.0516E-02	4.5669E+03	1.00	4.5669E+03		
100	1.0752E-01	1.7551E+03	1.00	1.7553E+03		
105	1.4385E-01	2.0157E+03	1.00	2.0159E+03		
110A	1.4635E-01	2.0308E+03	2.27	4.6006E+03		
110B	3.1607E-01	2.1922E+03	2.27	4.9664E+03		
115A	8.0003E-02	2.3807E+03	2.27	5.3935E+03		
115B	4.6877E-02	2.5413E+03	2.27	5.7572E+03		
120A	2.5034E-02	1.1383E+03	2.27	2.5789E+03		
120B	9.8468E-02	1.3507E+03	2.27	3.0599E+03		
125	0.0000E+00	2.0679E+03	1.00	2.0679E+03		
				Dynamic stres	ses for mode 5: 6.66 Hz, susceptibility = 892	
Node	Displacement	Nominal Stress	SIF	Intensified Stress		
5	0.0000E+00	9.0716E+01	1.00	9.0716E+01		
10	3.6076E-03	7.5490E+01	1.00	7.5497E+01		
15A	1.1207E-01	4.5087E+02	2.61	1.1746E+03		
15B	2.9275E-02	8.0454E+01	2.61	2.0959E+02		
20A	4.4775E-02	1.5654E+03	2.61	4.0780E+03		
20B	9.9096E-02	7.9618E+02	2.61	2.0741E+03		
25	1.1009E-01	4.3271E+03	1.00	4.3275E+03		
30	1.0886E-01	4.7377E+03	1.00	4.7381E+03		
55	1.0868E-01	4.7435E+03	1.00	4.7435E+03		
35	1.0672E-01	1.0171E+04	2.00	1.8948E+04		
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			Dynamic stres	ses for mode 5: 6.66 Hz, susceptibility = 892
Node	Displacement	Nominal Stress	SIF Intensified Stress	
60	1.0417E-01	4.0401E+03	1.00 4.0401E+03	
40	1.0392E-01	3.9628E+03	1.52 6.0350E+03	
45	9.1433E-02	4.3221E+03	1.52 6.5822E+03	
50	0.0000E+00	6.8378E+03	1.00 6.8378E+03	
65	1.1792E-01	8.8168E+03	1.00 8.8168E+03	
100	4.0867E-01	3.5292E+03	1.00 3.5295E+03	
105	5.0154E-01	6.4964E+03	1.00 6.4970E+03	
110A	5.0747E-01	6.6274E+03	2.27 1.5014E+04	
110B	2.4808E-02	6.9514E+03	2.27 1.5748E+04	
115A	3.7647E-01	1.2840E+03	2.27 2.9089E+03	
115B	5.0575E-01	1.3561E+03	2.27 3.0721E+03	
120A	1.2791E-01	1.2694E+03	2.27 2.8757E+03	
120B	3.9994E-01	1.1720E+03	2.27 2.6551E+03	
125	0.0000E+00	6.3614E+03	1.00 6.3614E+03	
			Dynamic stress	ses for mode 9: 11.63 Hz, susceptibility = 821
Node	Displacement	Nominal Stress	SIF Intensified Stress	
5	0.0000E+00	6.9629E+01	1.00 6.9629E+01	
10	3.1829E-03	5.5744E+01	1.00 5.5749E+01	
15A	1.1534E-01	2.3759E+02	2.61 6.1894E+02	
15B	1.9477E-02	3.1387E+02	2.61 8.1/66E+02	
20A	7.3272E-02	3.6543E+03	2.61 9.5197E+03	
208	6.6255E-02	1.8563E+03	2.01 4.8358E+03	
25	4.1701E-01	1.4148E+04	1.00 1.4149E+04	
50	3.7763E-01	1.1937 E+04	1.00 1.1936E+04	
35	3.7552E-01	1.1713E+04	2.00 2.5018E+04	
60	3.3078E-01	8 2527E+03	1.00 8.2527E+03	
40	3.2860E-01	8 0899E+03	1.52 1.2320E+04	
45	2 7031E-01	8 4626E+03	1.52 1.2888E+04	
50	0.0000E+00	1.8183E+04	1.00 1.8183E+04	
65	3.2786E-01	1.2056E+04	1.00 1.2056E+04	
100	6.9362E-02	2.2657E+03	1.00 2.2659E+03	
105	2.0429E-01	6.3288E+03	1.00 6.3294E+03	
110A	2.1301E-01	6.5165E+03	2.27 1.4763E+04	
110B	7.9922E-02	7.6134E+03	2.27 1.7248E+04	
115A	7.4197E-02	6.0022E+02	2.27 1.3598E+03	
115B	2.5008E-01	6.5207E+02	2.27 1.4772E+03	
120A	3.1562E-02	2.7920E+02	2.27 6.3253E+02	
120B	8.3844E-02	2.8900E+02	2.27 6.5473E+02	
125	0.0000E+00	1.1557E+03	1.00 1.1557E+03	
			Dynamic stress	es for mode 12: 53.86 Hz, susceptibility = 601
Node	Displacement	Nominal Stress	SIF Intensified Stress	
5	0.0000E+00	4.7818E+03	1.00 4.7818E+03	
10	8.5905E-02	1.6979E+03	1.00 1.6980E+03	
15A	3.1388E-01	2.6558E+04	2.61 6.9186E+04	
15B	3.8923E-01	2.4440E+04	2.61 6.3668E+04	
20A	3.5430E-01	1.8149E+04	2.61 4.7279E+04	
20B	2.4747E-01	2.6021E+04	2.61 6.7786E+04	
25	1.9529E-01	2.1194E+04	1.00 2.1196E+04	
30	9.2561E-02	2.7837E+04	1.00 2.7840E+04	
55	1.0349E-01	2.9302E+04	1.00 2.9302E+04	
35	2.2258E-01	4.4299E+04	2.00 8.8511E+04	
60	3.3673E-01	3.6251E+04	1.00 3.6251E+04	
40	3.4//8E-01	3.04U0E+U4	1.32 3.3443E+04	
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				Dynamic stress	es for mode 12: 53.86 Hz, susceptibility = 601
Node	Displacement	Nominal Stress	SIF	Intensified Stress	
45	4.8563E-01	6.4842E+04	1.52	9.8750E+04	
50	0.0000E+00	5.6042E+04	1.00	5.6042E+04	
65	1.8571E-01	4.0141E+04	1.00	4.0141E+04	
100	9.7797E-02	2.2162E+04	1.00	2.2165E+04	
105	5.8607E-02	3.6880E+03	1.00	3.6884E+03	
110A	6.6597E-02	2.8344E+03	2.27	6.4213E+03	
110B	2.3533E-01	9.7806E+03	2.27	2.2158E+04	
115A	1.3746E-02	1.9305E+03	2.27	4.3735E+03	
115B	3.3516E-02	3.6982E+03	2.27	8.3781E+03	
120A	1.5356E-03	1.6203E+02	2.27	3.6708E+02	
120B	1.1313E-02	4.4538E+02	2.27	1.0090E+03	
125	0.0000E+00	3.4754E+02	1.00	3.4754E+02	
				Dynamic stres	sses for mode 6: 6.76 Hz, susceptibility = 570
Node	Displacement	Nominal Stress	SIF	Intensified Stress	
5	0.0000E+00	1.7400E+01	1.00	1.7400E+01	
10	1.8595E-03	6.2283E+00	1.00	6.2289E+00	
15A	4.0177E-02	3.6060E+02	2.61	9.3939E+02	
15B	9.7625E-03	2.2224E+02	2.61	5.7895E+02	
20A	8.8306E-02	9.7549E+02	2.61	2.5412E+03	
20B	7.9573E-02	2.6455E+02	2.61	6.8917E+02	
25	3.5705E-02	1.7054E+03	1.00	1.7056E+03	
30	3.6327E-02	1.8951E+03	1.00	1.8952E+03	
55	3.6319E-02	1.8995E+03	1.00	1.8995E+03	
35	3.6221E-02	6.6249E+03	2.00	1.2342E+04	
60	3.5963E-02	1.6688E+03	1.00	1.6688E+03	
40	3.5943E-02	1.6383E+03	1.52	2.4950E+03	
45	3.2594E-02	1.8428E+03	1.52	2.8065E+03	
50	0.0000E+00	2.5600E+03	1.00	2.5600E+03	
65	4.4027E-02	6.1773E+03	1.00	6.1773E+03	
100	2.5225E-01	2.1099E+03	1.00	2.1101E+03	
105	3.3363E-01	1.4323E+03	1.00	1.4324E+03	
110A	3.3900E-01	1.4312E+03	2.27	3.2423E+03	
110B	6.8544E-02	7.8496E+02	2.27	1.7783E+03	
115A	6.1809E-01	5.9943E+03	2.27	1.3580E+04	
115B	3.8811E-01	5.7475E+03	2.27	1.3021E+04	
120A	1.6390E-01	6.7794E+03	2.27	1.5359E+04	
120B	6.3480E-01	6.6803E+03	2.27	1.5134E+04	
125	0.0000E+00	1.2477E+04	1.00	1.2477E+04	
				Dynamic stres	sses for mode 2: 2.46 Hz, susceptibility = 452
Node	Displacement	Nominal Stress	SIF	Intensified Stress	
5	0.0000E+00	4.8339E+02	1.00	4.8339E+02	
10	1.0195E-02	4.5899E+02	1.00	4.5903E+02	
15A	4.4765E-01	4.3452E+02	2.61	1.1320E+03	
15B	3.6977E-01	4.1770E+02	2.61	1.0882E+03	
20A	1.5008E-01	1.1/86E+03	2.61	3.0703E+03	
20B	2.9427E-01	1.2005E+03	2.61	3.12/3E+03	
25	1.4420E-01	2.5830E+02	1.00	2.5832E+02	
30	1.1340E-01	1.1/8/E+02	1.00	1.1788E+02	
55	1.1206E-01	1.1844E+02	1.00	1.1844E+02	
35	9.8455E-02	2.5804E+02	2.00	4.8070E+02	
60	8.4848E-02	2.3327E+02	1.00	2.3327E+02	
40	0.3509E-02	2.4511E+02	1.52	3./329E+02	
45	5.7840E-02	0.0019E+02	1.52	1.31/0E+U3	
50	0.0000E+00	2.0323E+03	1.00	2.0323E+03	
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				Dynamic stres	ses for mode 2: 2.46 Hz, susceptibility = 452	
Node	Displacement	Nominal Stress	SIF	Intensified Stress		
65	8.6259E-02	2.5718E+02	1.00	2.5718E+02		
100	8.7911E-02	3.0277E+02	1.00	3.0280E+02		
105	9.0027E-02	3.2276E+02	1.00	3.2279E+02		
110A	9.0183E-02	3.2365E+02	2.27	7.3323E+02		
110B	6.8610E-02	6.3716E+01	2.27	1.4435E+02		
115A	1.4985E-01	2.1331E+02	2.27	4.8326E+02		
115B	1.6691E-01	3.7707E+02	2.27	8.5424E+02		
120A	6.7274E-02	1.4621E+02	2.27	3.3124E+02		
120B	7.4268E-02	1.2866E+02	2.27	2.9149E+02		
125	0.0000E+00	1.0262E+03	1.00	1.0262E+03		
				Dynamic stres	sses for mode 3: 2.67 Hz, susceptibility = 421	
Node	Displacement	Nominal Stress	SIF	Intensified Stress		
5	0.0000E+00	7 9832E+01	1.00	7 9832E+01		
10	7.0117E-03	4 8088E+01	1.00	4 8093E+01		
154	1 6422E-01	1 2314E+03	2.61	3 2078E+03		
15P	1 92095.02	1.0740E±02	2.01	2 8001E±02		
204	1.9209E-02	6 30795+03	2.01	1 6667=+02		
20A	4.9200E-01	1 94265 102	2.01	1.0007 E+03		
208	5.1763E-01	4.8436E+02	2.01	1.2018E+03		
25	2.1867E-01	2.2141E+02	1.00	2.2144E+02		
30	1.7037E-01	4.5137E+02	1.00	4.5142E+02		
55	1.6828E-01	4.6454E+02	1.00	4.6454E+02		
35	1.4/13E-01	8.0762E+02	2.00	1.5045E+03		
60	1.2597E-01	6.3163E+02	1.00	6.3163E+02		
40	1.2388E-01	6.4562E+02	1.52	9.8323E+02		
45	8.4488E-02	1.6439E+03	1.52	2.5035E+03		
50	0.0000E+00	3.6640E+03	1.00	3.6640E+03		
65	4.9614E-02	8.2568E+02	1.00	8.2568E+02		
100	1.1834E-01	9.8913E+02	1.00	9.8923E+02		
105	1.4108E-01	1.0003E+03	1.00	1.0004E+03		
110A	1.4257E-01	9.9833E+02	2.27	2.2617E+03		
110B	1.8883E-01	7.0948E+02	2.27	1.6073E+03		
115A	8.1844E-02	2.7807E+02	2.27	6.2997E+02		
115B	8.4801E-02	6.1447E+02	2.27	1.3921E+03		
120A	3.0155E-02	5.5352E+02	2.27	1.2540E+03		
120B	5.3266E-02	5.4465E+02	2.27	1.2339E+03		
125	0.0000E+00	1.0388E+03	1.00	1.0388E+03		
				Dynamic stres	ses for mode 4: 4.16 Hz, susceptibility = 421	
Node	Displacement	Nominal Stress	SIF	Intensified Stress		
5	0.0000E+00	3.8777E+01	1.00	3.8777E+01		
10	1.1845E-03	3.5317E+01	1.00	3.5320E+01		
15A	5.1875E-02	1.1648E+02	2.61	3.0343E+02		
15B	2.0470E-02	7.8477E+01	2.61	2.0444E+02		
20A	7.0632E-02	2.5861E+02	2.61	6.7370E+02		
20B	8.3737E-02	1.8810E+02	2.61	4.9003E+02		
25	2.5923E-02	7.8486E+02	1.00	7.8494E+02		
30	2.1928E-02	9.7258E+02	1.00	9.7268E+02		
55	2 1774F-02	9.8151E+02	1.00	9.8151E+02		
35	2 02375-02	3 1306E+03	2 00	5.8321E+03		
60	1 87155-02	4 6540E+02	1.00	4 6540E+02		
40	1 85675 02	4.5553E±02	1.00	6 037/E±02		
40	1.0007E-02	4.000000000	1.52	7 12105+02		
40	1.4947E-02	4.0/09E+U2	1.52	0.7021E+02		
50	0.0000E+00	9.763 IE+U2	1.00	9.7031E+U2		
100	9.1300E-03	2.0490E+03	1.00	2.0493E+03		
100	2.0004E-02	2.0002E+02	1.00	2.3064E+02		
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				Dynamic stres	ses for mode 4: 4.16 Hz, susceptibility = 421
Node	Displacement	Nominal Stress	SIF	Intensified Stress	
105	3.0666E-02	5.6585E+02	1.00	5.6591E+02	
110A	3.1341E-02	6.1750E+02	2.27	1.3989E+03	
110B	8.3967E-02	4.3960E+03	2.27	9.9591E+03	
115A	8.3704E-01	2.7204E+02	2.27	6.1631E+02	
115B	9.0588E-01	1.2995E+03	2.27	2.9440E+03	
120A	6.5720E-01	7.9281E+01	2.27	1.7961E+02	
120B	5.9558E-01	7.7686E+02	2.27	1.7600E+03	
125	0.0000E+00	8.2297E+03	1.00	8.2297E+03	
				Dynamic stres	ses for mode 7: 7.46 Hz, susceptibility = 366
Node	Displacement	Nominal Stress	SIF	Intensified Stress	
5	0.0000E+00	1.1389E+01	1.00	1.1389E+01	
10	2.6127E-04	9.5623E+00	1.00	9.5633E+00	
15A	1.1512E-02	6.7125E+01	2.61	1.7487E+02	
15B	2.9890E-03	4.5384E+01	2.61	1.1823E+02	
20A	2.6272E-02	1.7531E+02	2.61	4.5670E+02	
20B	2.5256E-02	7.3374E+01	2.61	1.9114E+02	
25	4.8609E-03	8.3983E+02	1.00	8.3991E+02	
30	2.5322E-03	9.7093E+02	1.00	9.7103E+02	
55	2.4693E-03	9.7657E+02	1.00	9.7657E+02	
35	2.3979E-03	3.8297E+03	2.00	7.1344E+03	
60	3.2401E-03	6.0139E+02	1.00	6.0139E+02	
40	3.3527E-03	5.9209E+02	1.52	9.0170E+02	
45	4.8503E-03	7.2721E+02	1.52	1.1075E+03	
50	0.0000E+00	5.9135E+02	1.00	5.9135E+02	
65	1.0945E-03	3.3104E+03	1.00	3.3104E+03	
100	3.2624E-02	1.5017E+03	1.00	1.5018E+03	
105	4.2418E-02	2.9472E+03	1.00	2.9475E+03	
110A	4.3011E-02	3.0360E+03	2.27	6.8779E+03	
110B	7.4739E-02	3.9993E+03	2.27	9.0603E+03	
115A	6.8504E-01	3.7327E+03	2.27	8.4563E+03	
115B	6.5591E-01	3.9903E+03	2.27	9.0399E+03	
120A	8.4233E-01	4.8723E+03	2.27	1.1038E+04	
120B	8.4796E-01	4.6252E+03	2.27	1.0478E+04	
125	0.0000E+00	1.4544E+04	1.00	1.4544E+04	
			1	Dynamic stres	ses for mode 1: 1.70 Hz, susceptibility = 316
Node	Displacement	Nominal Stress	SIF	Intensified Stress	
5	0.0000E+00	4.7604E+02	1.00	4.7604E+02	
10	1.0163E-02	4.5921E+02	1.00	4.5925E+02	
15A	4.6974E-01	1.7214E+02	2.61	4.4843E+02	
15B	3.9862E-01	4.2194E+02	2.61	1.0992E+03	
20A	1.5676E-01	3.1888E+02	2.61	8.3072E+02	
20B	2.8069E-01	4.0958E+02	2.61	1.0670E+03	
25	9.8487E-02	5.2491E+02	1.00	5.2496E+02	
30	7.5318E-02	5.6931E+02	1.00	5.6937E+02	
55	7.4329E-02	5.7178E+02	1.00	5.7178E+02	
35	6.4319E-02	5.9701E+02	2.00	1.1929E+03	
60	5.4313E-02	5.4173E+02	1.00	5.4173E+02	
40	5.3328E-02	5.4388E+02	1.52	8.2829E+02	
45	3.5156E-02	1.0438E+03	1.52	1.5897E+03	
50	0.0000E+00	1.3549E+03	1.00	1.3549E+03	
65	5.2792E-02	2.9205E+02	1.00	2.9205E+02	
100	4.9950E-02	2.8110E+02	1.00	2.8113E+02	
105	5.1143E-02	2.7863E+02	1.00	2.7866E+02	
110A	5.1245E-02	2.7848E+02	2.27	6.3090E+02	
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	Dynamic stresses for mode 1: 1.70 Hz, susceptibility = 316									
Node	Displacement	Nominal Stress	SIF	Intensified Stress						
110B	5.1958E-02	2.0076E+02	2.27	4.5483E+02						
115A	8.9787E-02	1.2786E+02	2.27	2.8967E+02						
115B	9.5139E-02	2.4922E+02	2.27	5.6460E+02						
120A	3.5636E-02	1.1395E+02	2.27	2.5815E+02						
120B	4.1969E-02	7.1201E+01	2.27	1.6130E+02						
125	0.0000E+00	5.9742E+02	1.00	5.9742E+02						
	1			Dynamic stresse	es for mode 11: 30.95 Hz, susceptibility = 255					
Node	Displacement	Nominal Stress	SIF	Intensified Stress						
5	0.0000E+00	1.4646E+02	1.00	1.4646E+02						
10	1.5675E-02	3.1518E+02	1.00	3.1521E+02						
15A	5.0371E-02	4.9476E+03	2.61	1.2889E+04						
15B	4.9376E-01	9.4124E+03	2.61	2.4520E+04						
20A	6.6195E-03	7.1781E+02	2.61	1.8699E+03						
208	5.6615E-02	7.8056E+02	2.01	2.0334E+03						
20	2.5409E-03	1.3779E+02	1.00	7.3787E+02						
50	3.5020E-03	1.1400E+03	1.00	1.1401E+03						
35	5.8150E 02	3 50625-02	2.00	6.5318=+02						
60	7 8377= 03	8 9247E±02	2.00	8 9247E+02						
40	8.0367E-03	8.8308E+02	1.00	1 3449E+03						
40	1.0177E-02	1.2017E+03	1.52	1.8301E+03						
50	0.0000E+00	1.1001E+03	1.02	1.0001E+03						
65	3 7752E-03	3 2570E+03	1.00	3 2570E+03						
100	2 3907E-03	8 2121E+02	1.00	8 2129E+02						
105	5.5300E-03	6 7829E+01	1.00	6 7835E+01						
110A	6.0183E-03	1.1129E+02	2.27	2.5212E+02						
110B	9.0113E-03	5.3472E+02	2.27	1.2114E+03						
115A	1.5636E-04	9.7670E+01	2.27	2.2127E+02						
115B	8.0027E-03	3.8549E+01	2.27	8.7331E+01						
120A	4.6548E-04	2.2762E+01	2.27	5.1567E+01						
120B	8.7610E-04	2.6008E+01	2.27	5.8921E+01						
125	0.0000E+00	1.0013E+01	1.00	1.0013E+01						
					Weight & Center of gravity					
Empt Insula Conte Lining Addit Total Cente X = 6	y weight = 2536 ation weight = 3 ent weight = 134 g weight = 0 (kg ional weight = 0 weight = 3056. er of Gravity for 460.7, $Y = 474$	5.7 (kg) 85.57 (kg) 4.17 (kg)) (kg) 4 (kg) Total weight 40.72, Z = 2735	.61 (mm)						
					Bill of materials: Materials					
# N	ame Descriptio	n								
1 3	12 a312 tp31	6								
					Bill of materials: Pipes					
# M	aterial OD (mm)	Thk Total len (mm) (mm)	gth 1	otal weight						
1 3	12 168.27	7.112 11337.8	3	27.71						
2 3	12 219.07	8.1788 2100	g	1.344						
3 3	12 273.05	9.271 18146	1	119.1	Dill of montaviales. Devide					
ш .		The Devision	mai	Count Tatal	Bill of materials: Bends					
# N	(mm)	(mm) (mm) (c	ngle	(kg)						
1 3	12 168.27	7.112 228.6 7	5.81	1 8.743						
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Bill of materials: Bends																	
#	Mater	ial OI (m) Thk m) (mm	Radius	s Angle (dea)	Count	Total wei (kg)	ght									
2	312	16	8.27 7.112	2 228.6	90.00	2	20.758										
3	312	27	3.05 9.27	1 381	90.00	2	73.817										
								Bill of r	naterials	Reduce	ers						
#	Mater	ial OD	D1 Thk1	OD2	Thk2	Leng	th Count	Total weigh	t								
1	212	27	11) (11111 2.05 0.27) (mm) 1 210 07	(mm)	(mm)	1	(KY) 27.676									
-	312	21	3.05 9.27	1 219.07	0.170	6 550	1	Bill of	materia	s: Valve	S						
#	OD	Thk	Weight	Add.W	eight C	ount To	otal weight										
4	(mm)	(mn	1) (Kg)	(kg)	1	(K	g) 1 50										
2	272.0	/ /.I	12 101.00	0	1	10	01.00	-									
2	273.0	5 9.21	1 459.25	0	1	45	9.23	of motorials	Itomizo	d Elama	at Maiabi						
	# From To Type Length OD Thk Mat Den Fluid Den Ins Den Ins Thk Lin Den Lin Thk Empty Wt Fluid Wt Ins Wt Add Wt																
#	From	10	Туре	Length (mm)	(mm)	Ihk (mm)	Mat.Den	Fluid.Den	Ins.Den	Ins. I hk	Lin.Den	Lin. Thk	Empty.Wt	Fluid.Wt	Ins.Wt	Lin.Wt	Add.Wt
1	5	10		200	273.05	9 271	(kg/m3) 8027		176.2	65	(kg/iii3)	(((((((((((((((((((((((((((((((((((((((12 33/	1.0164	2 /327	(kg)	0
2	10	154		7600	273.05	9.271	8027	99.9	176.2	65			12.004	39 127	03 645	0	0
2	15 4	15A	Rond	509 47	272.05	0.271	9027	99.9	176.2	65			26 009	30.127	7 2704	0	0
3	ACD	158	Bena	598.47	273.05	9.271	8027	99.9	170.2	00			30.908	3.0415	7.2794	0	0
4	158	20A	Dand	5/88	273.05	9.271	8027	99.9	176.2	05			356.95	29.415	70.401	0	0
5	20A	208	Bend	598.47	273.05	9.271	8027	99.9	176.2	65			36.908	3.0415	1.2794	0	0
6	208	25		3859	273.05	9.271	8027	99.9	176.2	65			237.99	19.612	46.938	0	0
7	25	30	Valve	622.3	273.05	27.813	8027	99.9	176.2	65		1	459.23	3.1626	13.246	0	0
8	30	55		26.95	273.05	9.271	8027	99.9	176.2	65			1.662	0.13696	0.3278	0	0
9	55	35		273.05	273.05	9.271	8027	99.9	176.2	65			16.839	1.3877	3.3212	0	0
10	35	60		273.05	273.05	9.271	8027	99.9	176.2	65			16.839	1.3877	3.3212	0	0
11	60	40		26.95	273.05	9.271	8027	99.9	176.2	65			1.662	0.13696	0.3278	0	0
12	40	45	Reducer	530	246.06	8.7249	8027	99.9	176.2	65			27.676	2.1732	5.9318	0	0
13	45	50		2100	219.07	8.1788	8027	99.9	176.2	65			91.344	6.7705	21.464	0	0
14	35	65		136.52	168.27	7.112	8027	99.9	176.2	65			3.9461	0.25419	1.1459	0	0
15	65	100		1263.5	168.27	7.112	8027	99.9	176.2	65			36.519	2.3524	10.605	0	0
16	100	105	Valve	403.23	168.27	21.336	8027	99.9	176.2	65			151.56	0.75075	5.9227	0	0
17	105	110A		26.4	168.27	7.112	8027	99.9	176.2	65			0.76306	0.049152	0.22158	0	0
18	110A	110B	Bend	359.08	168.27	7.112	8027	99.9	176.2	65			10.379	0.66856	3.0139	0	0
19	110B	115A		2492.8	168.27	7.112	8027	99.9	176.2	65			72.052	4.6412	20.923	0	0
20	115A	115B	Bend	359.08	168.27	7.112	8027	99.9	176.2	65			10.379	0.66856	3.0139	0	0
21	115B	120A		3883.4	168.27	7.112	8027	99.9	176.2	65			112.25	7.2303	32.594	0	0
22	120A	120B	Bend	302.48	168.27	7.112	8027	99.9	176.2	65			8.743	0.56318	2.5388	0	0
23	120B	125		3535.2	168.27	7.112	8027	99.9	176.2	65			102.18	6.582	29.672	0	0
20 21 22 23	115A 115B 120A 120B	1158 120A 120B 125	Bend	359.08 3883.4 302.48 3535.2	168.27 168.27 168.27 168.27	7.112 7.112 7.112 7.112 7.112	8027 8027 8027 8027	99.9 99.9 99.9 99.9	176.2 176.2 176.2 176.2	65 65 65 65			10.379 112.25 8.743 102.18	0.66856 7.2303 0.56318 6.582	3.0139 32.594 2.5388 29.672	000000000000000000000000000000000000000	

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