Sample No. 6

Sample FEA Analysis for Reinforced Branch Connection

DN1800 WT=7mm Header with DN1400 WT=7mm Branch
Pipe Material A106-B

Geometry:

Header Pipe OD =	1828.8	mm	D/t=	261.257143
Header Pipe WT=	7	mm		
Branch Pipe OD =	1422.4	mm	D/t=	203.2
Branch Pipe WT=	7	mm		
Re-pad Width=	711.2	mm	Note: D/t is greater than 20 therefore can be considered as thin shell.	
Re-pad WT=	7	mm		
Header Length (10D)=	18000	mm	Note: Length of Header is the total length. Branch is modelled at the center of header.	
Nozzle Lenghth (4D)=	6300	mm	The given length of Branch is from face of header to end of branch.	

Load Applied at Branch End:

In-plane Bending Moment=	20000	N-m
Out-Plane Bending Moment=	20000	N-m
Axial Force=	20000	N
Torsional Moment=	20000	N-m
Internal Pressure=	0.25	Mpa

Boundary Condition:
Fixed at the One End of the Header Pipe

Inplane Von-Mises Equivalent Stress Output:

One FEA Software=	21	Mpa	(Inplane)	
Another FEA Software (Plate Element)=	31	Mpa	(Inplane)	(Linear Plate Element Formulation)
Another FEA Software (Shell Element)=	38	Mpa	(Inplane)	(Thin Shell Element)
Another FEA Software (Shell Element)=	24	Mpa	(Inplane)	(General Shell Element with Mid Node)

Outplane Von-Mises Equivalent Stress Output:

One FEA Software=	117	Mpa	(Outplane)	
Another FEA Software (Plate Element)=	134	Mpa	(Outplane)	(Linear Plate Element Formulation)
Another FEA Software (Shell Element)=	26	Mpa	(Outplane)	(Thin Shell Element)
Another FEA Software (Shell Element)=	134	Mpa	(Outplane)	(General Shell Element with Mid Node)

Torsion Von-Mises Equivalent Stress Output:

One FEA Software=	8	Mpa	(Torsion)	
Another FEA Software (Plate Element)=	18	Mpa	(Torsion)	(Linear Plate Element Formulation)
Another FEA Software (Shell Element)=	8	Mpa	(Torsion)	(Thin Shell Element)
Another FEA Software (Shell Element)=	15	Mpa	(Torsion)	(General Shell Element with Mid Node)

Axial Von-Mises Equivalent Stress Output:

One FEA Software=	55	Mpa	(Axial)	
Another FEA Software (Plate Element)=	48	Mpa	(Axial)	(Linear Plate Element Formulation)
Another FEA Software (Shell Element)=	1	Mpa	(Axial)	(Thin Shell Element)
Another FEA Software (Shell Element)=	49	Mpa	(Axial)	(General Shell Element with Mid Node)

Pressure Von-Mises Equivalent Stress Output:

One FEA Software=	228	Mpa	(Pressure)	
Another FEA Software (Plate Element)=	1138	Mpa	(Pressure)	(Linear Plate Element Formulation)
Another FEA Software (Shell Element)=	209	Mpa	(Pressure)	(Thin Shell Element)
Another FEA Software (Shell Element)=	1068	Mpa	(Pressure)	(General Shell Element with Mid Node)