New results concerning four horn support system

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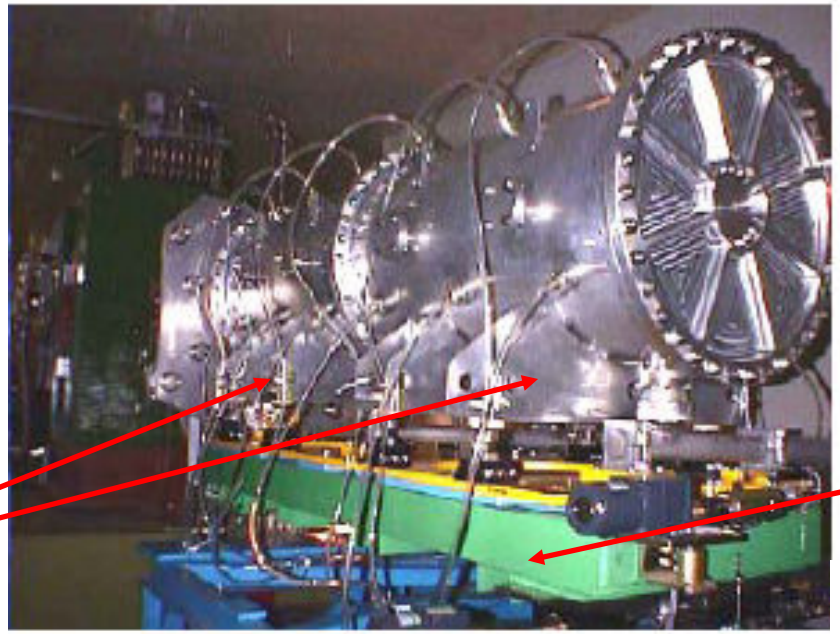
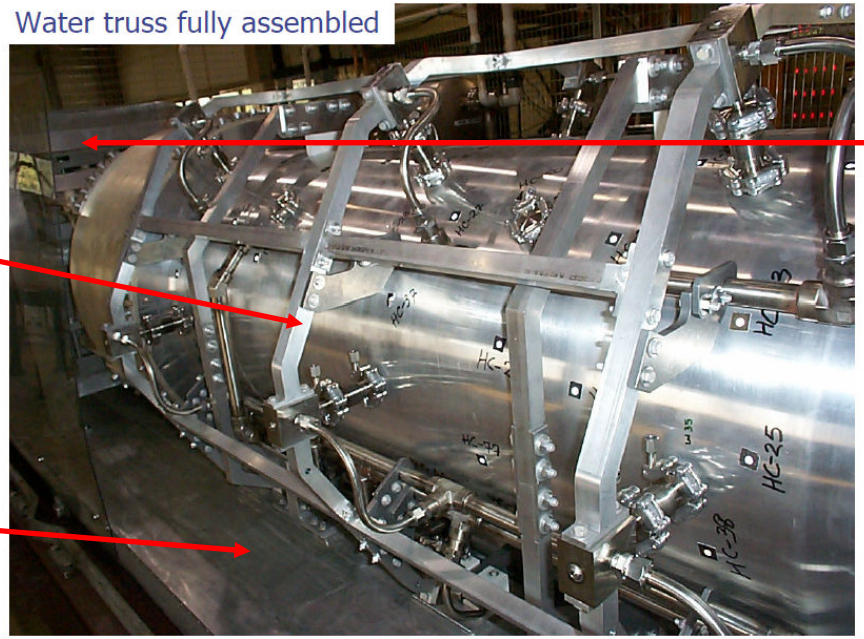


Vetical plates

Rigid horizontal frame

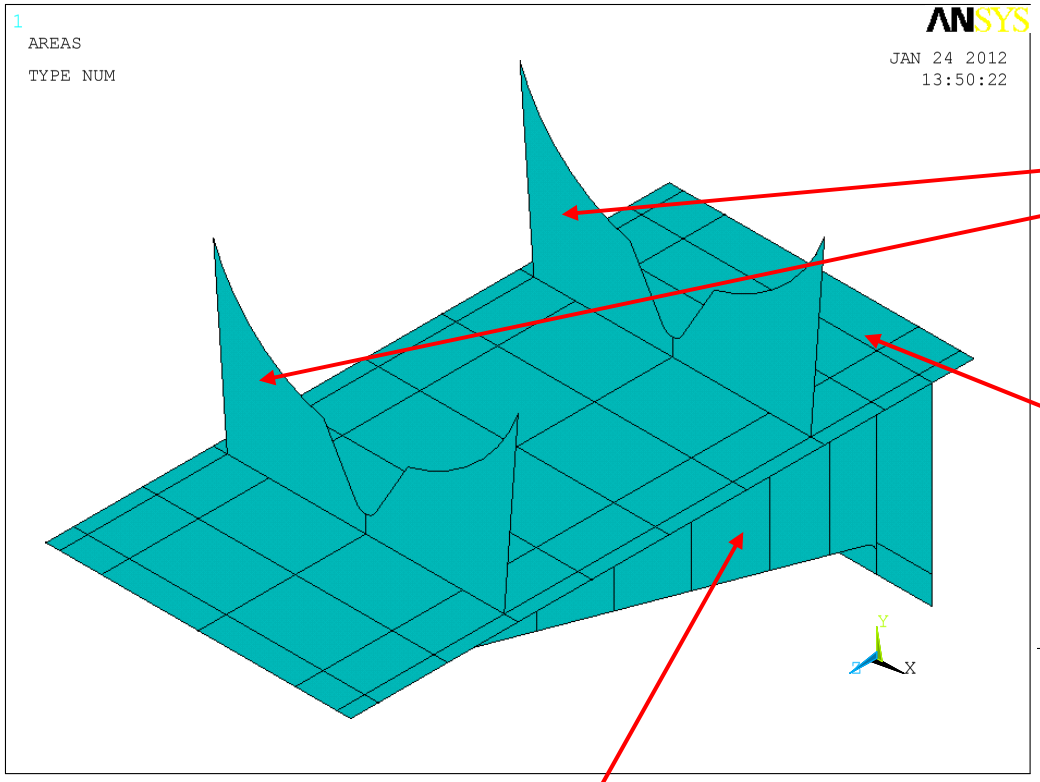
Water truss fully assembled



Water truss attached to the horn

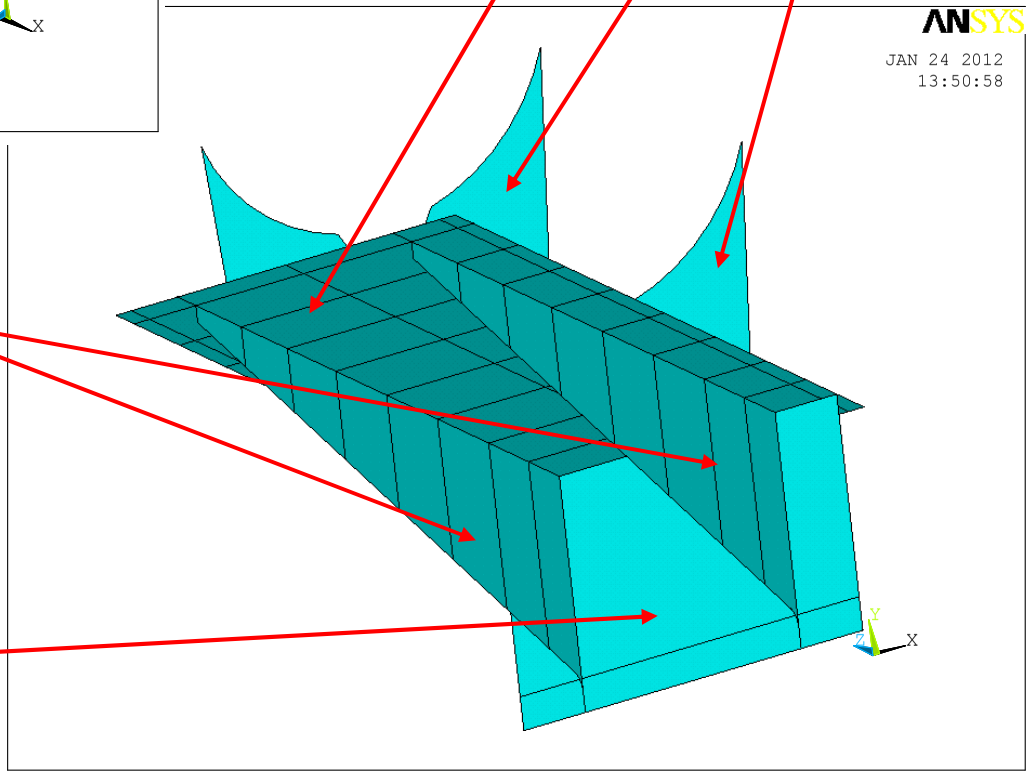
Rigid vertical frame

Stiff supporting bottom plates



Vertical plates of saddle supports

Main horizontal supporting plate



Vertical rib plates

Vertical back plate

1

L_p = 2.2 [*m*]

B_p = 1.1 [*m*]

H_p = 0.7 [*m*]

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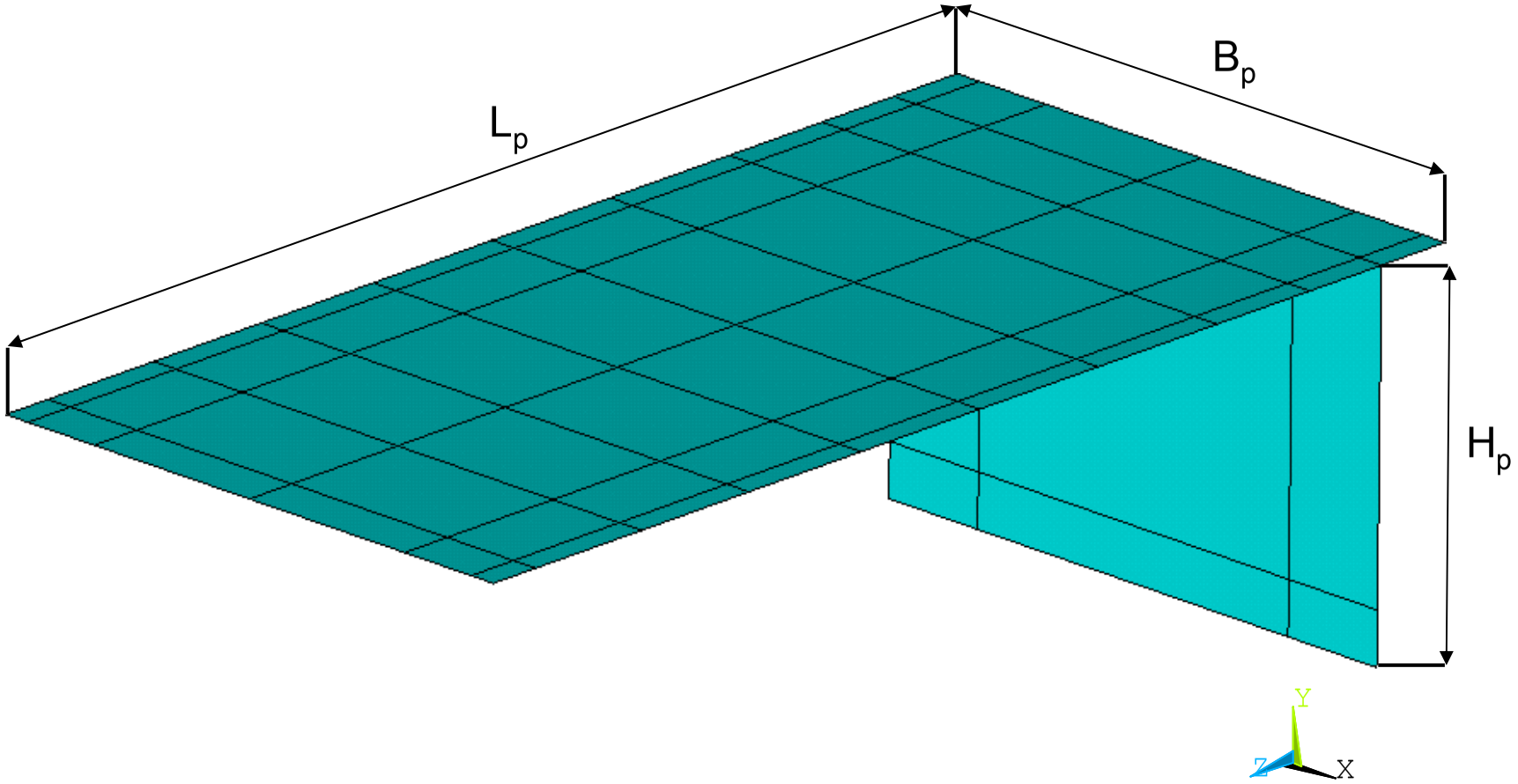
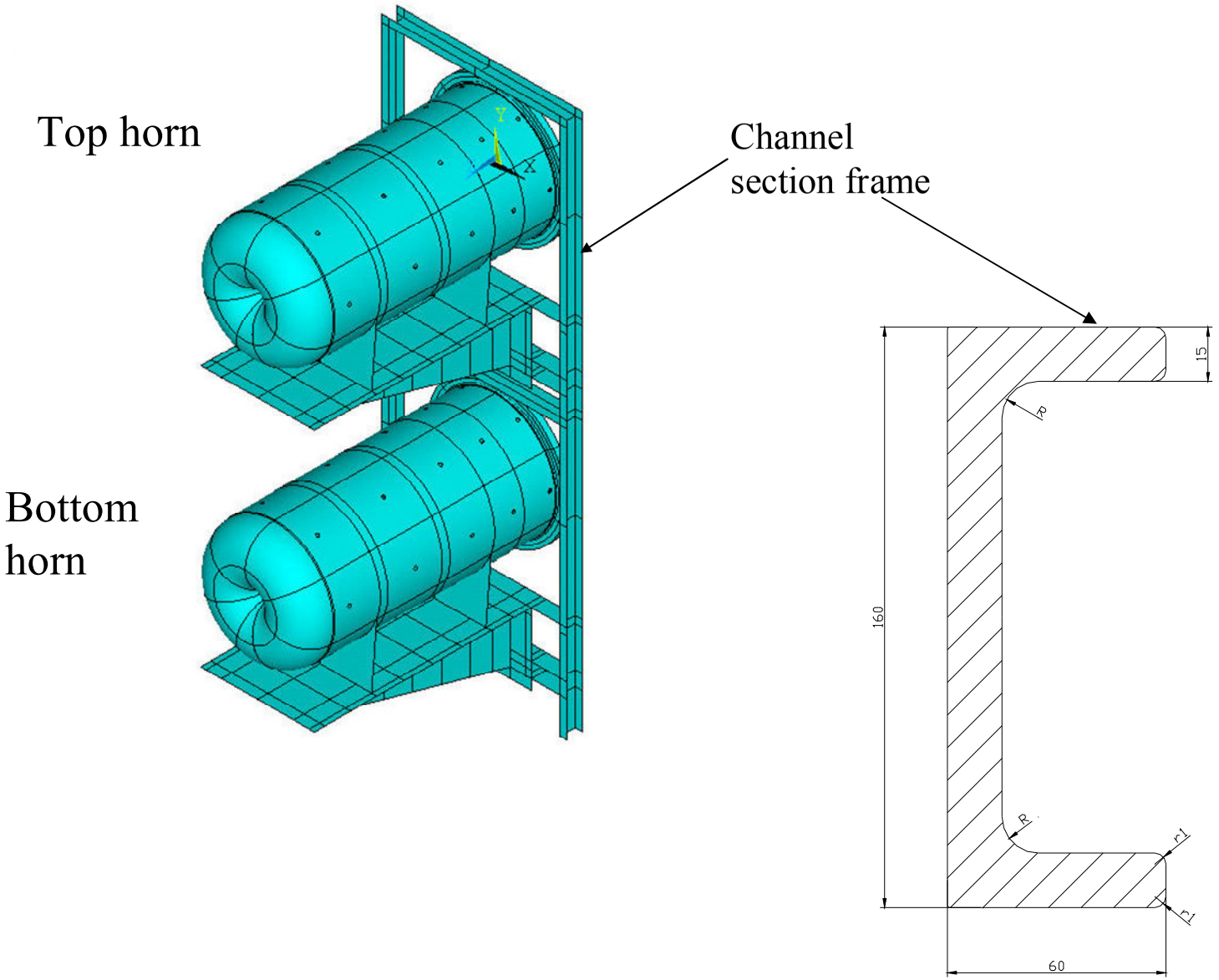
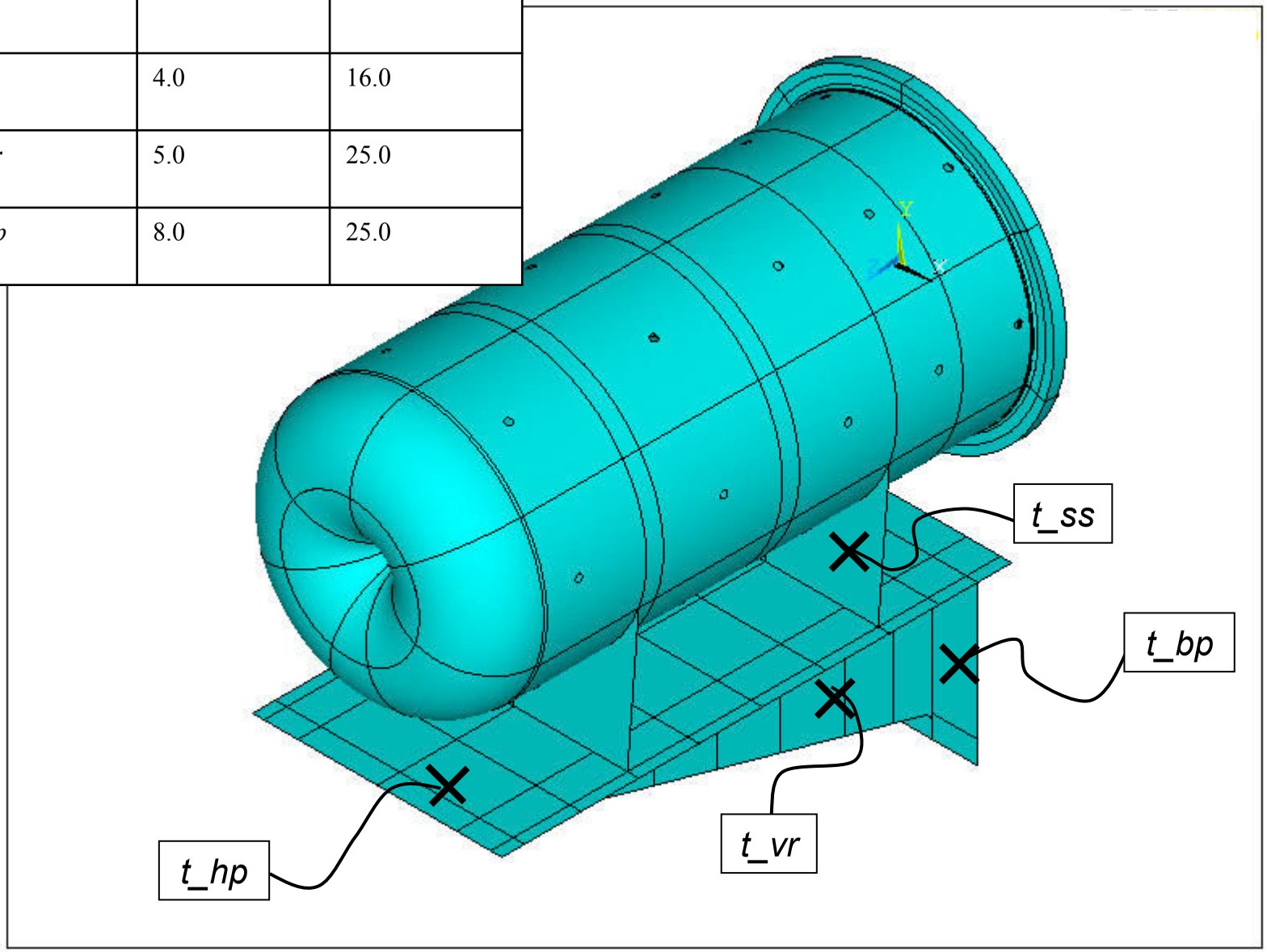



Top horn
Bottom horn
Channel section frame
15
R
160
R
r1
r1
60

Thickness parameter description	Symbol	Minimum value in *mm*	Maximum value in *mm*
Horizontal supporting plate	*t_hp*	8.0	40.0
Vertical saddle support plate	*t_ss*	4.0	16.0
Vertical rib plates	*t_vr*	5.0	25.0
Vertical back plate	*t_bp*	8.0	25.0



Optimization 1: minimum weight of the support is searched, with state conditions as follows:

absolute value for maximum vertical deflection of horn less than 0.5[*mm*]

Stress in horn less than 20 [*MPa]*

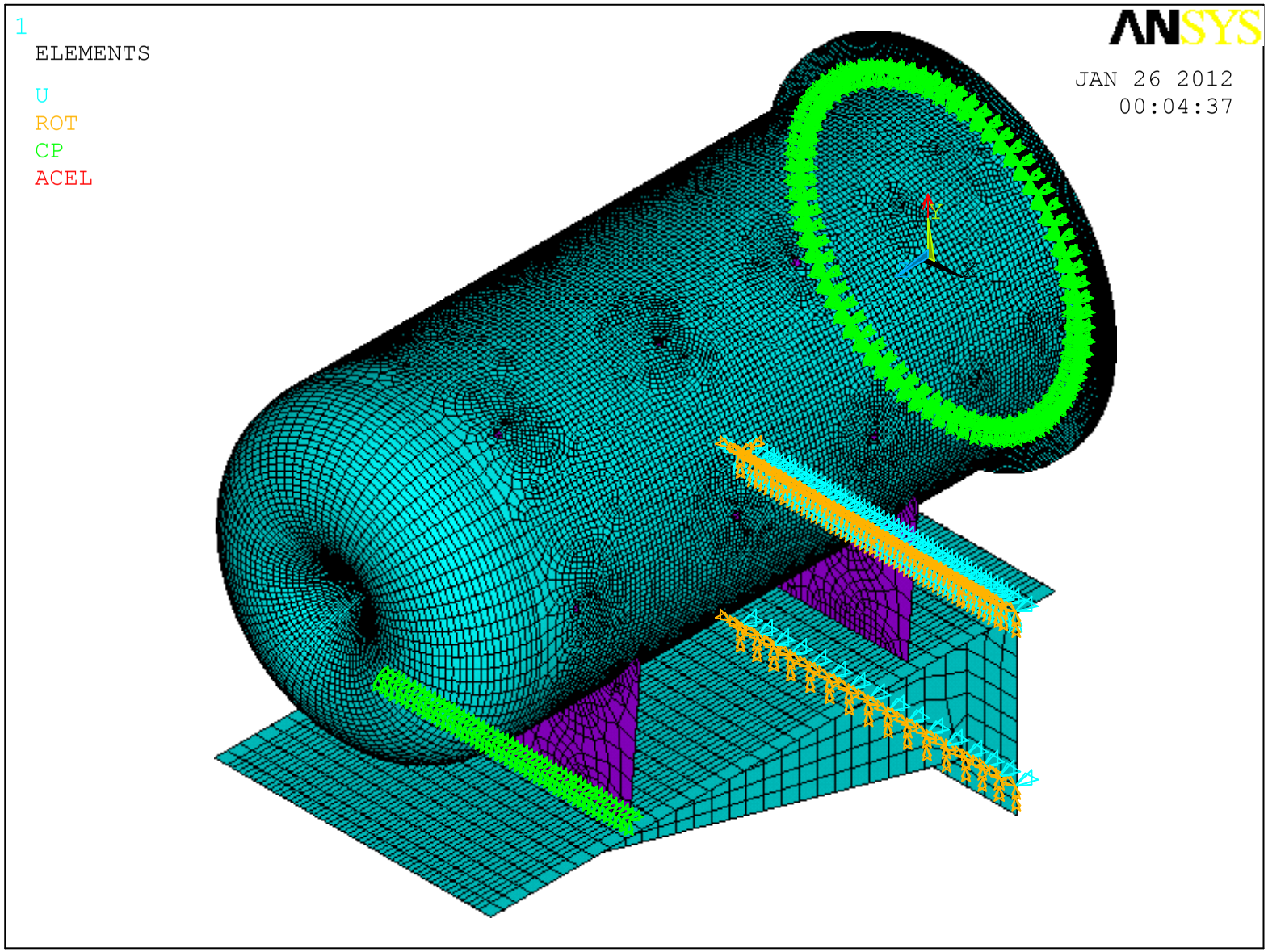
Stress in support less than 70 [*MPa]*

Optimization 2: minimum equivaent stress in horn is searched, with state conditions as follows:

absolute value for maximum vertical deflection of horn less than 0.5[*mm*]

stress in support less than 70 [*MPa]*

	Optimization 2	Optimization 1
Optimal values for design variables	*t_ss* = 14.0 [*mm*] *t_hp* = 40.0 [*mm*] *t_vr* = 8.0 [*mm*] *t_bp* = 11.0 [*mm*]	*t_ss* = 4.0 [*mm*] *t_hp* = 10.0 [*mm*] *t_vr* = 5.0 [*mm*] *t_bp* = 10.0 [*mm*]
Maximum absolute value for vertical deflection of horn $\lvert \underline{u}_y \rvert_{max}$	0.41 [*MPa*]	0.32 [*mm*]
Maximum equivalent stress in horn σ_{eqv}^{max}	3.8 [*MPa*]	5.5 [*MPa*]
Maximum equivalent stress in support σ_{eqv}^{max}	15.6 [*MPa*]	15.3 [*MPa*]
Weight of the support structure	M_{sup} = 334 [*kg*]	M_{sup} = 113 [*kg*]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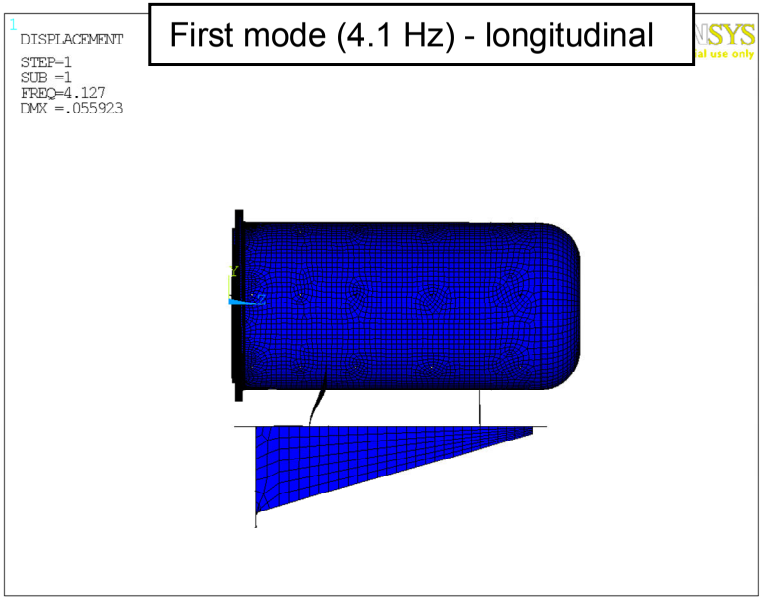
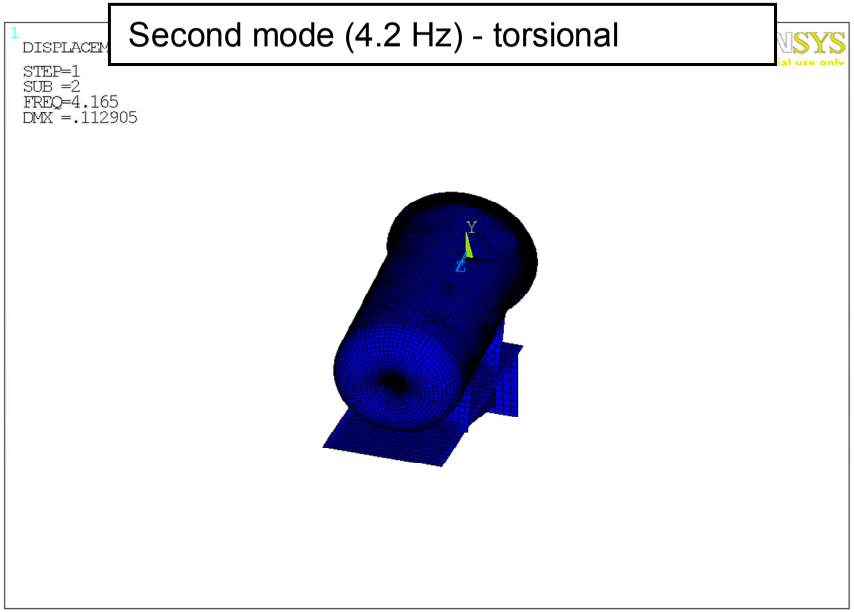
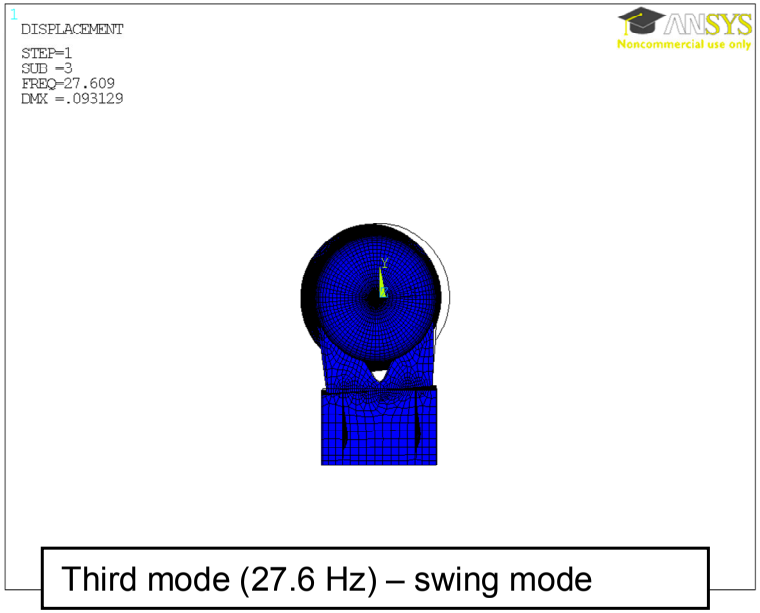
First mode (4.1 Hz) - longitudinal

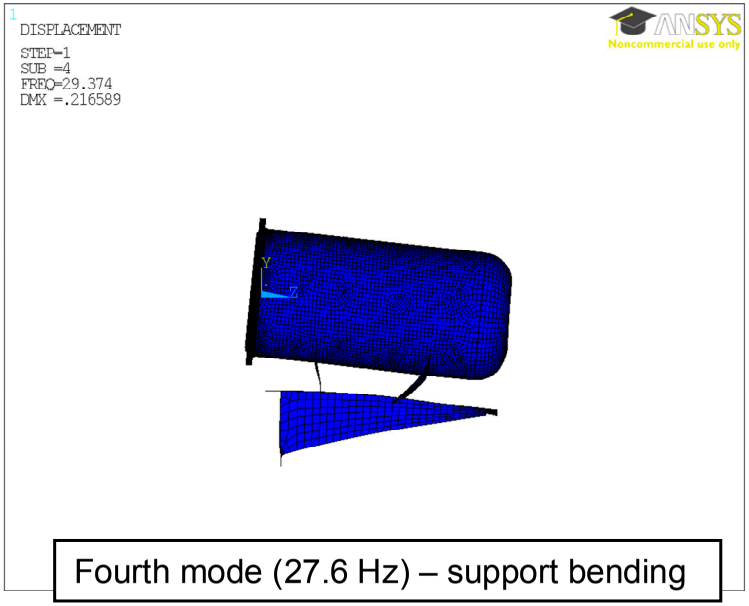


Second mode (4.2 Hz) - torsional



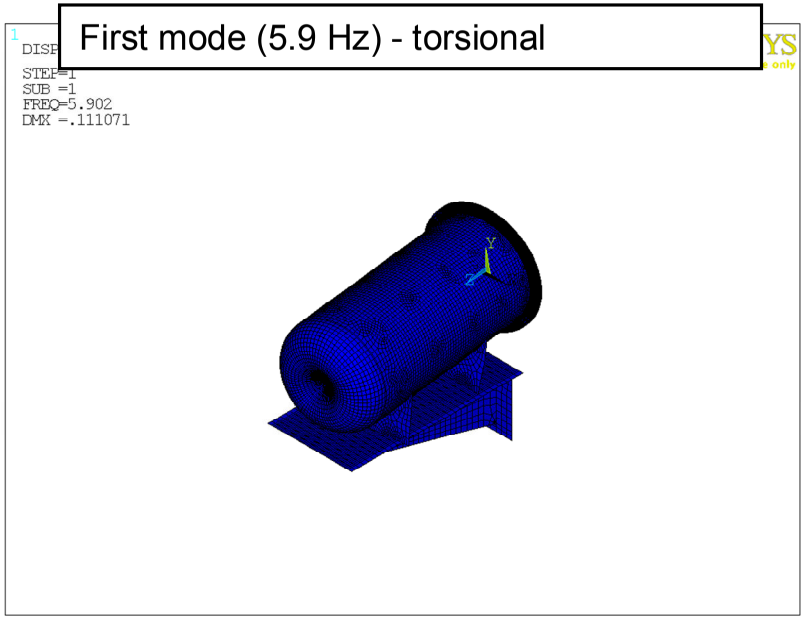


Third mode (27.6 Hz) – swing mode

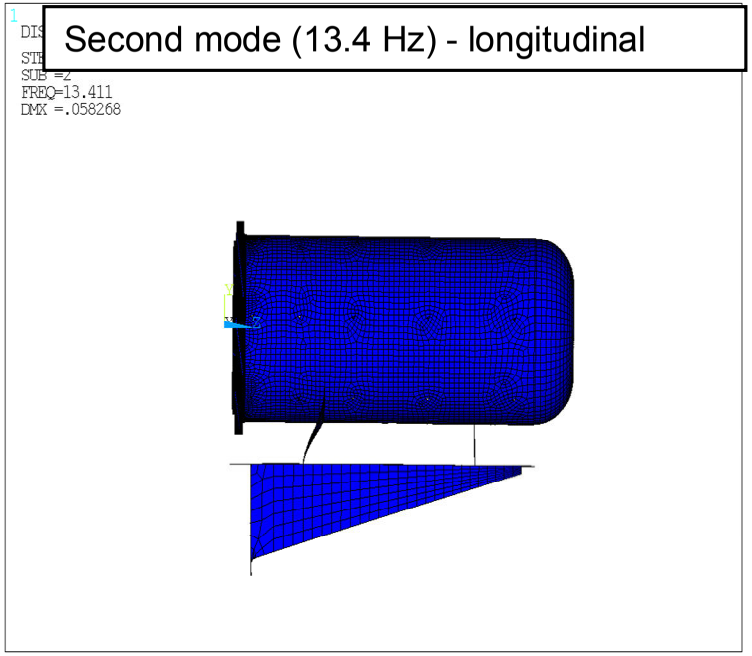


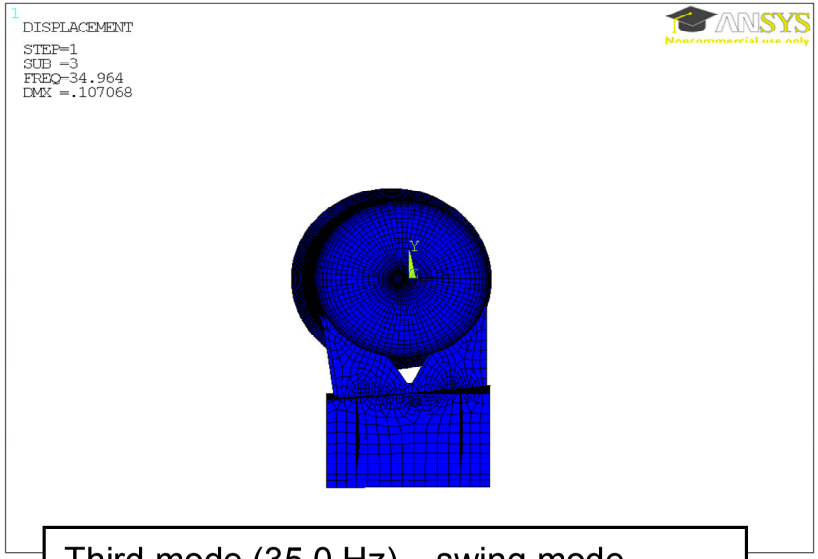
Fourth mode (27.6 Hz) – support bending

First mode (5.9 Hz) - torsional

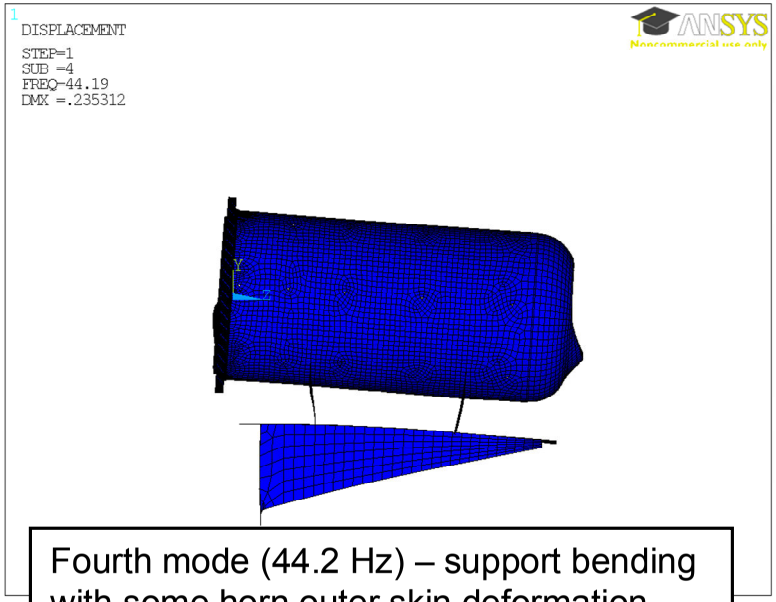


Second mode (13.4 Hz) - longitudinal

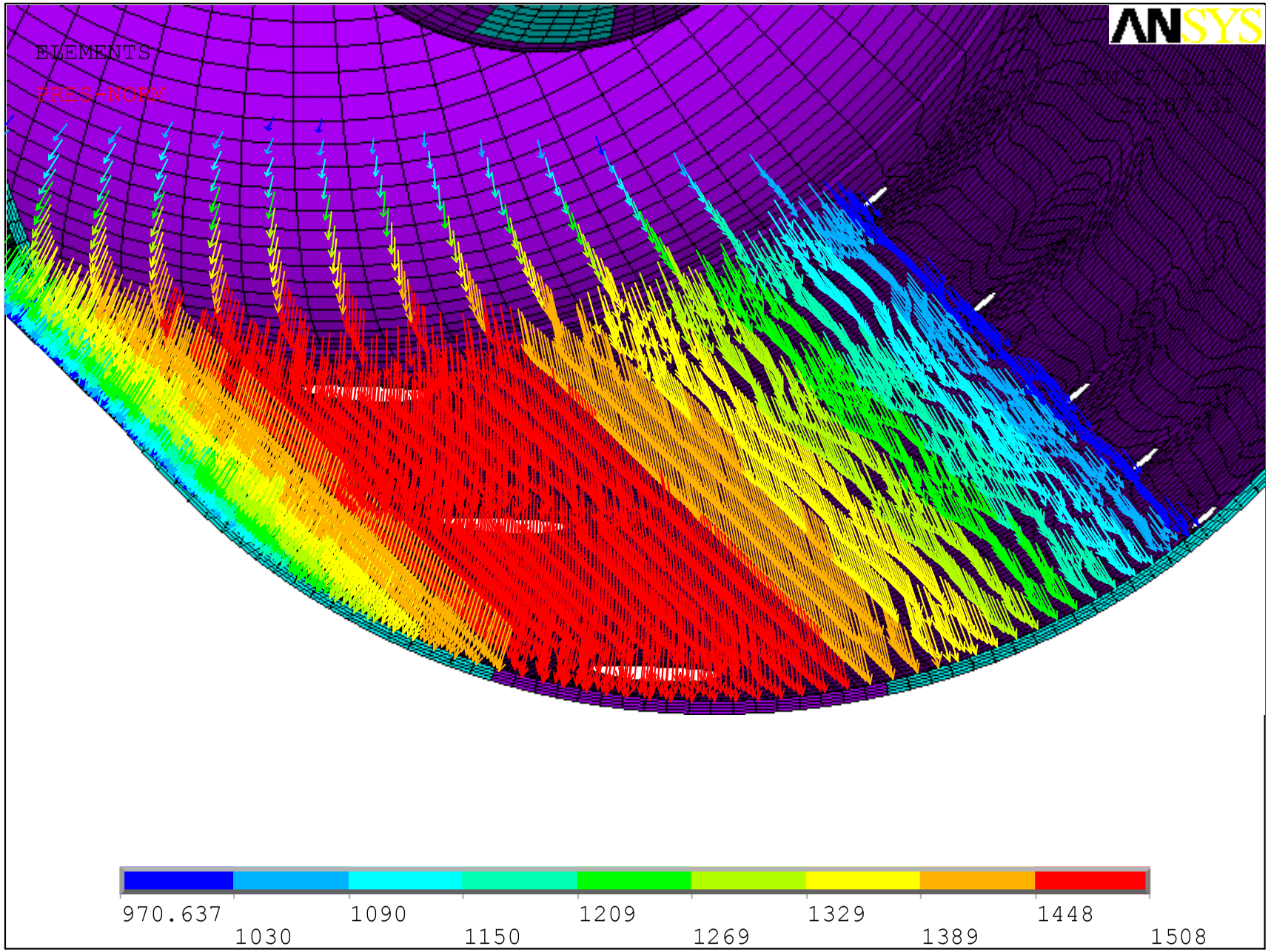




Third mode (35.0 Hz) – swing mode



Fourth mode (44.2 Hz) – support bending with some horn outer skin deformation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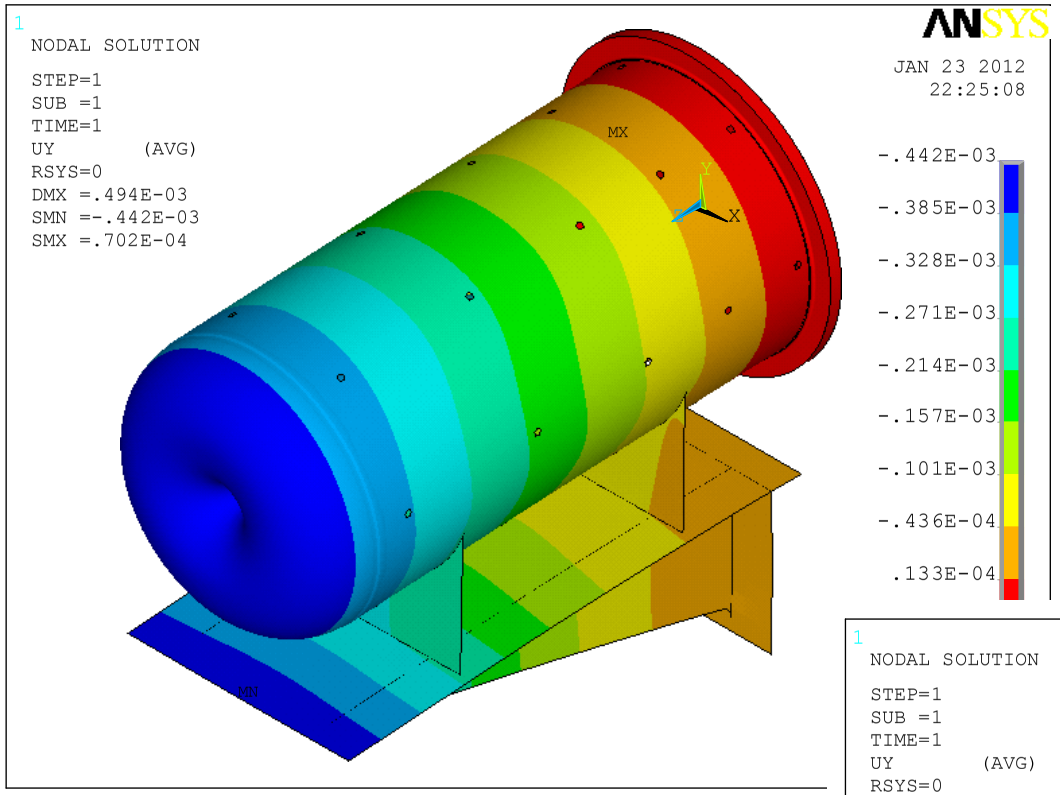
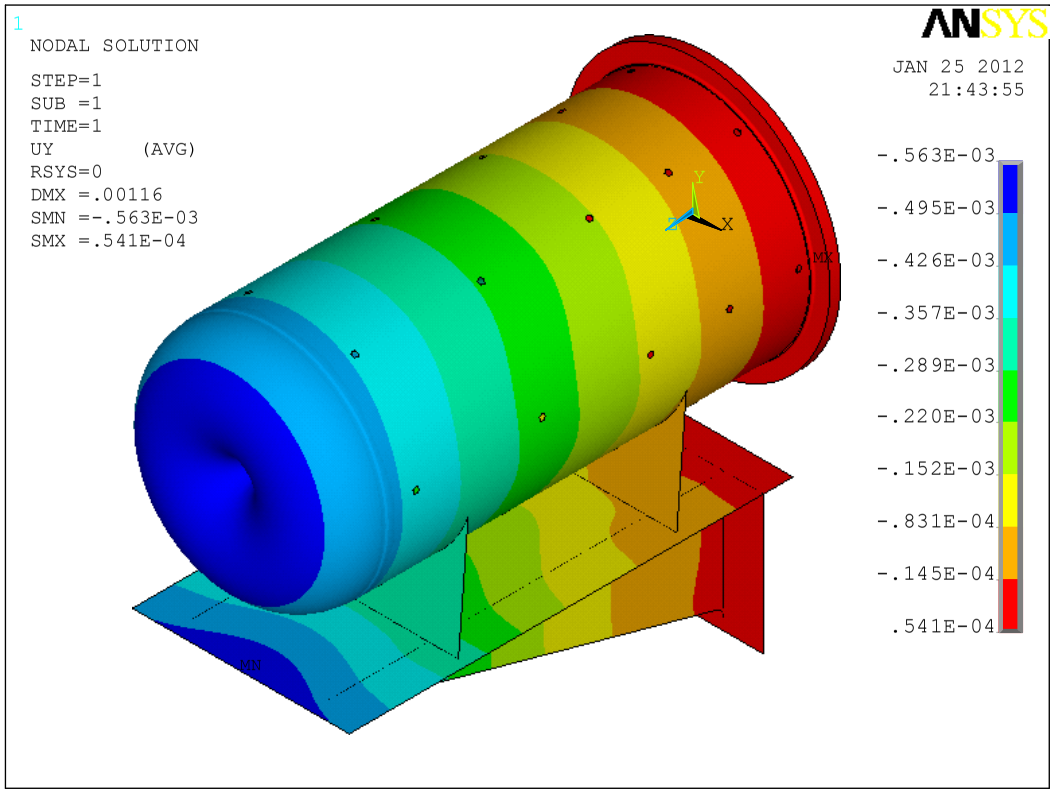
1389
1448
1508

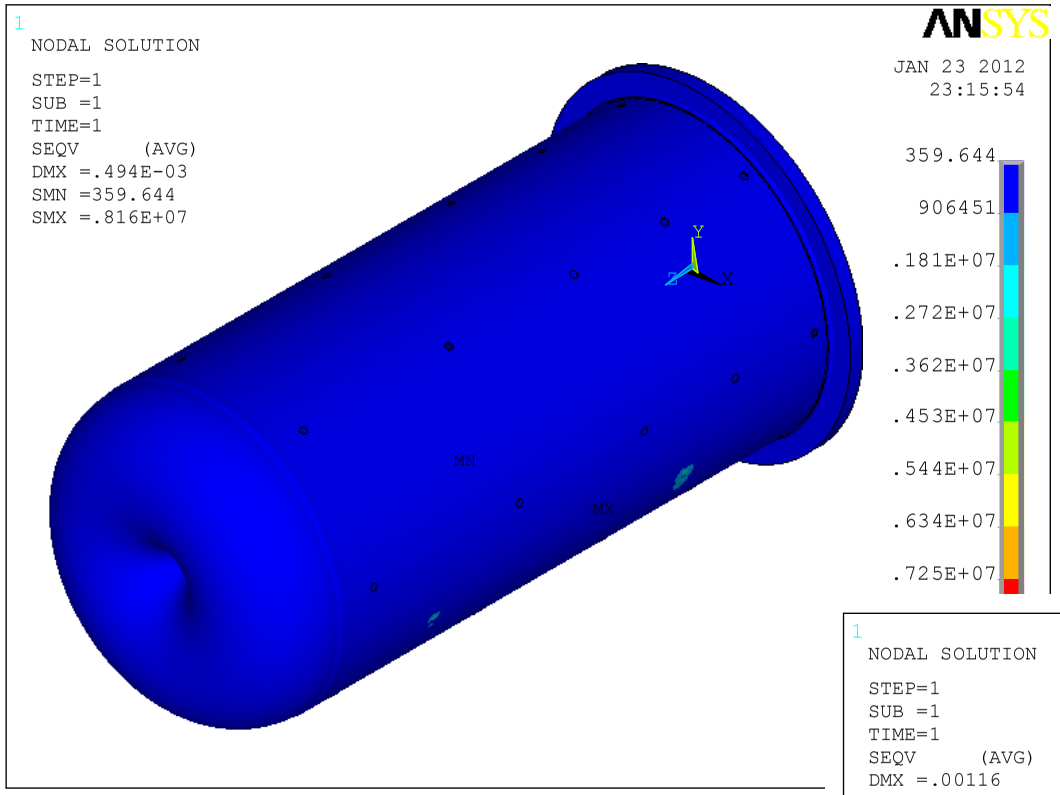
	Optimization 2	Optimization 1
Optimal values for design variables	*t_ss* = 14.0 [*mm*] *t_hp* = 40.0 [*mm*] *t_vr* = 8.0 [*mm*] *t_bp* = 11.0 [*mm*]	*t_ss* = 4.0 [*mm*] *t_hp* = 10.0 [*mm*] *t_vr* = 5.0 [*mm*] *t_bp* = 10.0 [*mm*]
Maximum absolute value for vertical deflection $\lvert \underline{u}_y \rvert_{max}$ of horn without cooling water inside	0.41 [*MPa*]	0.32 [*mm*]
Maximum absolute value for vertical deflection $\lvert \underline{u}_y \rvert_{max}$ of horn with cooling water inside	0.44 [*MPa*]	0.56 [*mm*]
Maximum value of equivalent stress in horn without cooling water inside	3.8 [*MPa*]	5.5 [*MPa*]
Maximum value of equivalent stress in horn with cooling water inside (Figure 19 and Figure 22)	8.2 [*MPa*]	11.0 [*MPa*]



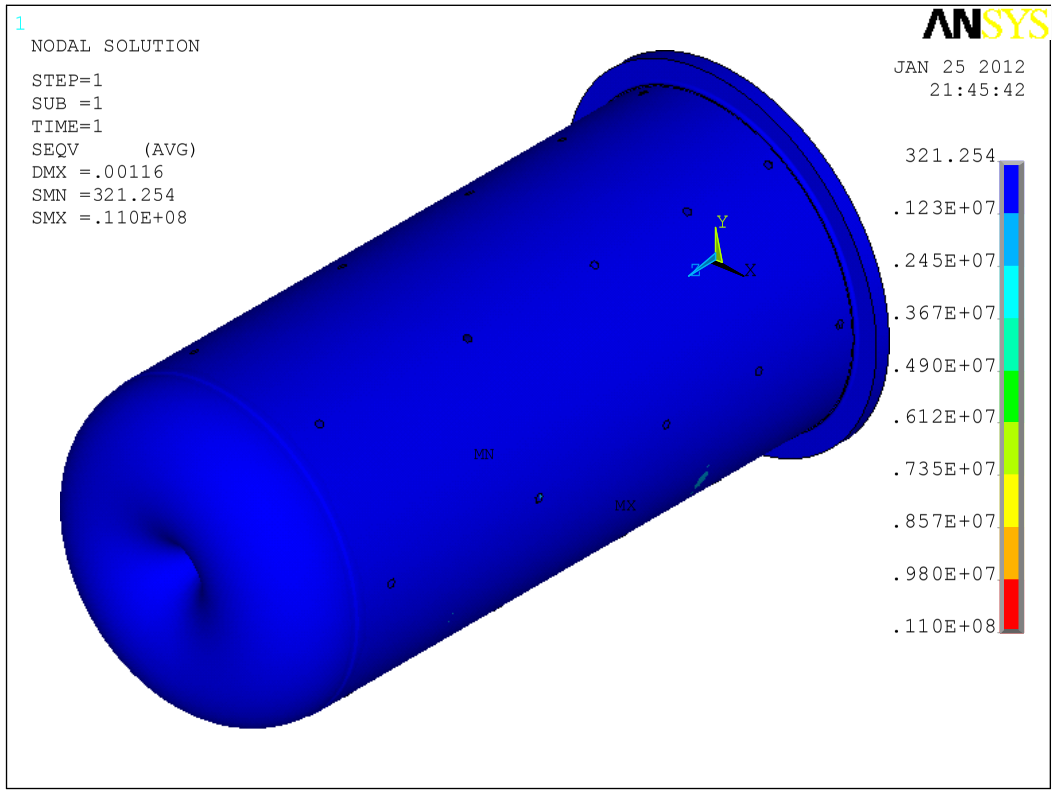
Optim.2 results



Optim.1 results



Optim.2 results



Optim.1 results

Thank you for your attention