MODELING NON-BUILDING STRUCTURES IN RISA

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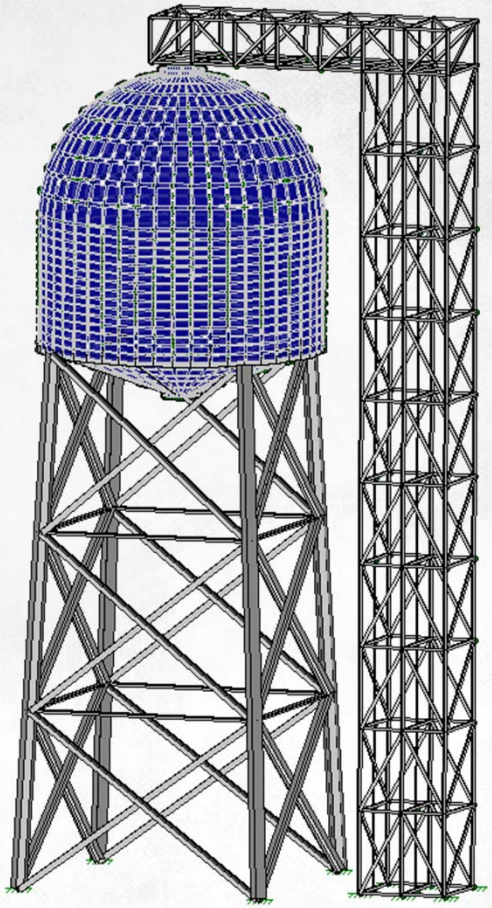
NON-BUILDING STRUCTURES IN RISA

RISA-3D

Today's Webinar Objectives

- Complex Modeling
- Static Loading
  - Area
  - Surface
- Interpreting Results



Let's Start Modeling!

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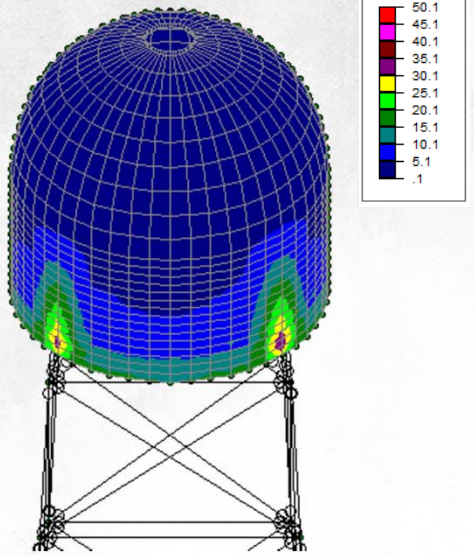
NON-BUILDING STRUCTURES IN RISA

Failure Mode: Yielding

Von Misses Stress

Plate Principal Stresses

	L...	Plate Label	Loc	Sigma1[ksi]	Sigma2[...	Tau M...	Angle[r...	Von Mises[ksi]
1	1	P1463	T	55.406	17.4	19.003	1.633	49.077
2			B	-15.657	-54.544	19.443	.065	48.643
3	1	P1442	T	55.259	17.414	18.922	1.508	48.934
4			B	-15.648	-54.384	19.368	-.065	48.492
5	1	P1462	T	53.119	18.529	17.295	1.653	46.698
6			B	-16.841	-53.52	18.34	.076	47.399
7	1	P1443	T	53.055	18.536	17.26	1.489	46.637
8			B	-16.844	-53.444	18.3	-.076	47.327
9	1	P1461	T	48.196	17.411	15.392	1.654	42.271
10			B	-15.907	-48.982	16.537	.057	43.28
11	1	P1444	T	48.195	17.416	15.389	1.49	42.269
12			B	-15.915	-48.998	16.542	-.056	43.293
13	1	P1464	T	42.989	9.296	16.847	1.573	39.177
14			B	-7.103	-44.002	18.449	-.043	40.915
15	1	P1441	T	42.841	9.273	16.784	1.568	39.04
16			B	-7.009	-43.845	18.418	.043	40.795
17	1	P1445	T	43.593	15.749	13.922	1.495	38.234
18			B	-14.748	-42.193	13.722	-.013	37.087

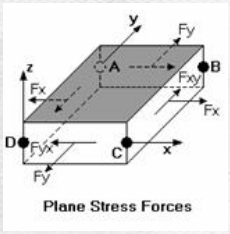


Typical 50 ksi Steel → 0.6*Fy = 30 ksi

How do we improve our model?

NON-BUILDING STRUCTURES IN RISA

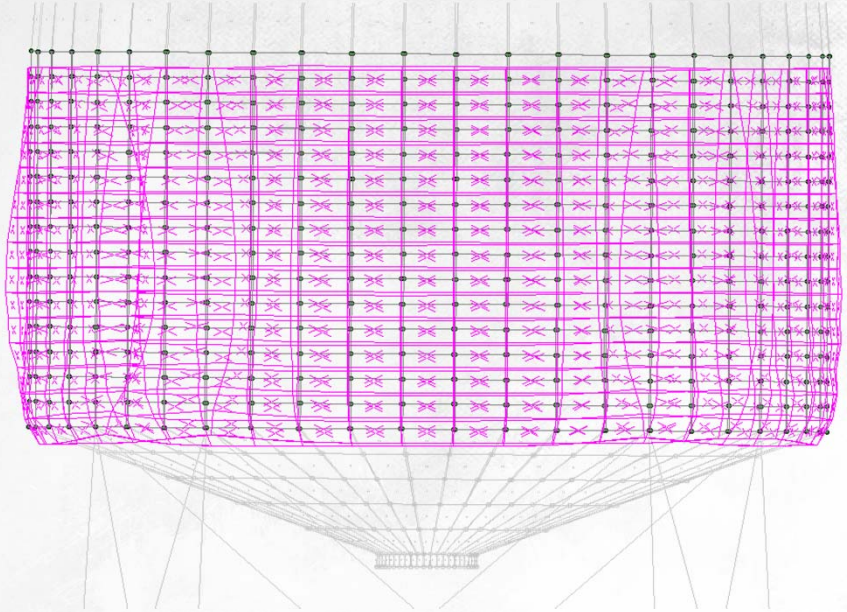
Find the Maximum Vertical Stress



Combine

Plate Forces (per ft) (By Combination)

	L...	Plate Label	Qx[k]	Qy[k]	Mx[k-ft]	My[k-ft]	Mxy[k-ft]	Fx[k]	Fy[k]	Fxy[k]
1	1	P757A	-.226	.112	-.002	-.003	-.002	-9.437	-29.03	-5.294
2	1	P756A	.632	.113	-.002	-.003	.002	-9.457	-28.957	5.313
3	1	P733A	-.43	.11	-.002	-.003	-.002	-8.83	-28.239	-5.177
4	1	P732A	.57	.11	-.002	-.003	.002	-8.848	-28.216	5.184
5	1	P805A	.125	-.094	0	.007	-.001	13.326	-26.878	-2.93
6	1	P804A	-.234	-.095	0	.007	.001	13.325	-26.813	2.939
7	1	P781A	.179	-.092	0	.007	-.001	13.324	-26.148	-2.862
8	1	P780A	-.217	-.093	0	.007	.001	13.324	-26.124	2.864
9	1	P745A	-.142	.114	-.002	-.003	-.001	-8.595	-25.096	-4.715



-29.03 +/- -5.294 = 34.324 k/ft → 2.86 k/in → 28.603 ksi

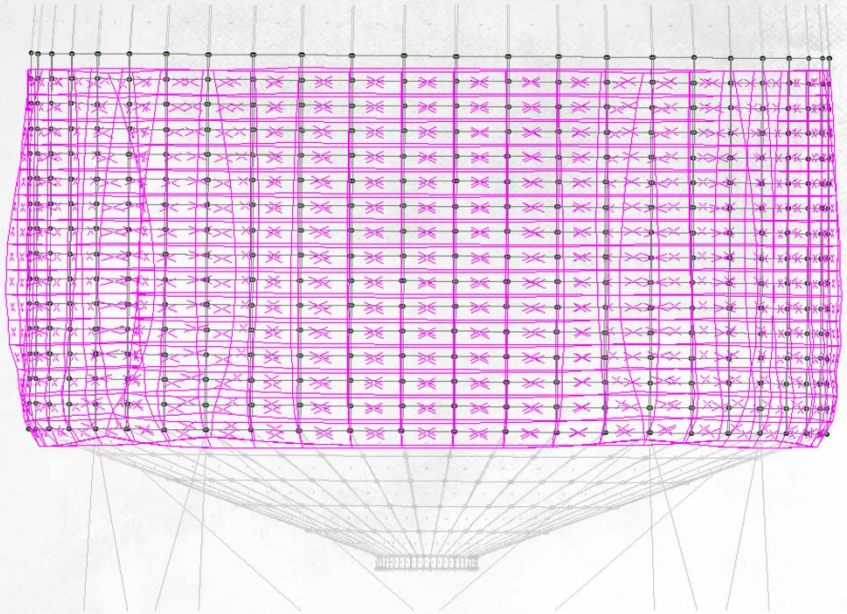
0.1in thick plate

NON-BUILDING STRUCTURES IN RISA

Failure Mode: Buckling (Approx. method)

Euler Buckling Stress

$$F_e := \frac{\pi^2 \cdot E}{\left(\frac{K \cdot L}{r}\right)^2}$$ = 0.007 ksi < 28.603 ksi FAIL



Variables:

$E := 29000 \ ksi$

$K := 1.0$

Option 1 → $L := 180 \ in$ ↔ Option 2 (Both)

$t := 0.1 \ in$

$$r := \frac{t}{\sqrt{12}} = 0.029 \ in$$

Option 1:

$$L := \sqrt{\frac{\pi^2 \cdot E}{F_e}} \cdot \left(\frac{r}{K}\right) = 2.82 \ in$$

Option 2 (Both):

$L := 12 \ in$

$t := .45 \ in$

$$r := \frac{t}{\sqrt{12}} = 0.13 \ in$$

$$F_e := \frac{\pi^2 \cdot E}{\left(\frac{K \cdot L}{r}\right)^2} = 33.541 \ ksi$$

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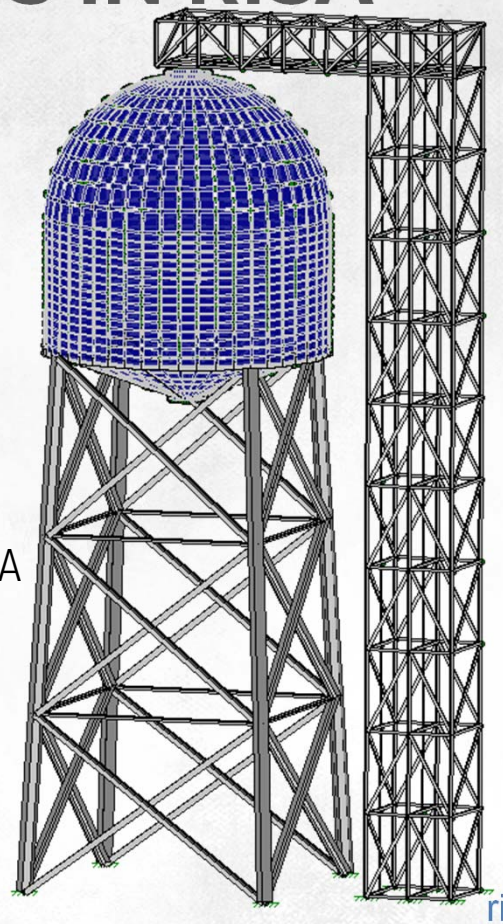
Upcoming Webinars:

Part 2 of 3: Wind Loading on Non-Building Structures in RISA
2/10/2016

Part 3 of 3: Dynamic Loading on Non-Building Structures in RISA
3/2/2016



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QUESTIONS?

Please let us know if you have questions

- We will answer questions for the next 5 minutes
- Once the webinar is closed, we will post all Q&A's at **risa.com**
- For further information, contact us at **info@risa.com**

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