

Steel Chimney or Steel Stack Design

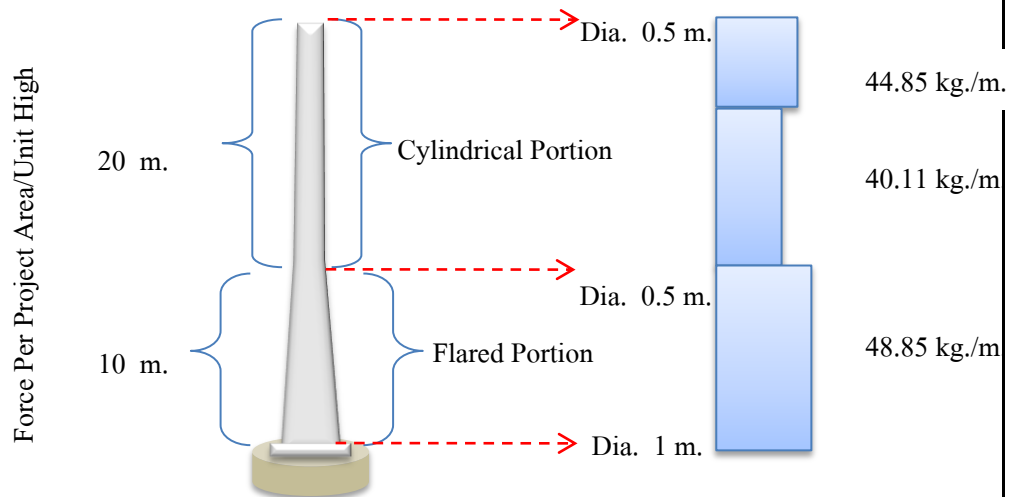
For Self-Supporting Chimneys

3. Allowable Stress For Design (Cont.)

3.4 Bending Stress Of Stainless & Tensile	=	1,230.00	kg./cm. ²
3.5 Compressive Stress Of Stainless	=	1,025.00	kg./cm. ²
3.6 Shearing Stress Of Stainless	=	820.00	kg./cm. ²
3.7 Shearing Stress Of Bolt	=	960.00	kg./cm. ²
3.8 Shearing Stress Of Welding	=	1,260.00	kg./cm. ²

4. Select Dimensions Of Steel Chimney

4.1 Total High Of Steel Chimney	=	30.00	m.
4.2 High Of Conical (Flared) Portion	=	10.00	m. [30]/3
4.3 High Of Cylindrical Portion	=	20.00	m.
4.4 Outside Diameter At Top Of Flared Portion	=	0.50	m.
4.5 Outside Diameter At Base Of Flared Portion	=	1.00	m. [1.60xD]
4.6 Outside Diameter At Top&Bott. Of Cylindrical Portion	=	0.50	m. [20]/20
4.7 Thickness Of Steel Chimney (Account For Corr. = 1/16")	=	12.00	mm. [D/t]<130



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6. Analysis (Modal Analysis) And Result

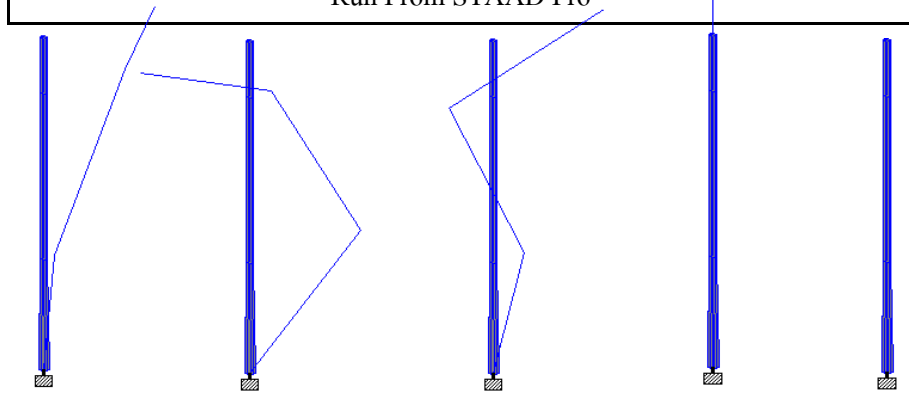
[A Steel Chimney Is Modeled As A Cantilevered, Thin Wall Steel Cylinder, Fixed Base With Free End]

6.1 Natural Frequency Of Steel Chimney (Dead Load Only)

Mode	Freq, Hz	Period, sec	Parti, X %	Parti, Y %	Parti, Z %
<u>1</u>	<u>41.07</u>	0.02	0.00	79.29	0.00
<u>2</u>	<u>85.06</u>	0.01	0.00	20.71	0.00
3	250.68	0.00	0.00	0.00	0.00
Run From STAAD Pro					

6.2 Frequency Of Steel Chimney (When Wind Load Action+Dead Load)

Mode	Freq, Hz	Period, sec	Parti, X %	Parti, Y %	Parti, Z %
1	1.60	0.63	55.54	0.00	0.00
2	14.18	0.07	23.94	0.00	0.00
3	21.47	0.05	20.51	0.00	0.00
<u>4</u>	<u>41.07</u>	0.02	0.00	79.29	0.00
<u>5</u>	<u>85.06</u>	0.01	0.00	20.71	0.00
Run From STAAD Pro					



Mode 1

Mode 2

Mode 3

Mode 4

Mode 5

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At Level 10 m.

Axial Force	Fy	=	3,475.00	kg.
Shear Force	Fx	=	826.00	kg.
Bending Force	Mz	=	8,437.00	kg.-m.

At Level 25 m.

Axial Force	Fy	=	722.00	kg.
Shear Force	Fx	=	224.00	kg.
Bending Force	Mz	=	561.00	kg.-m.

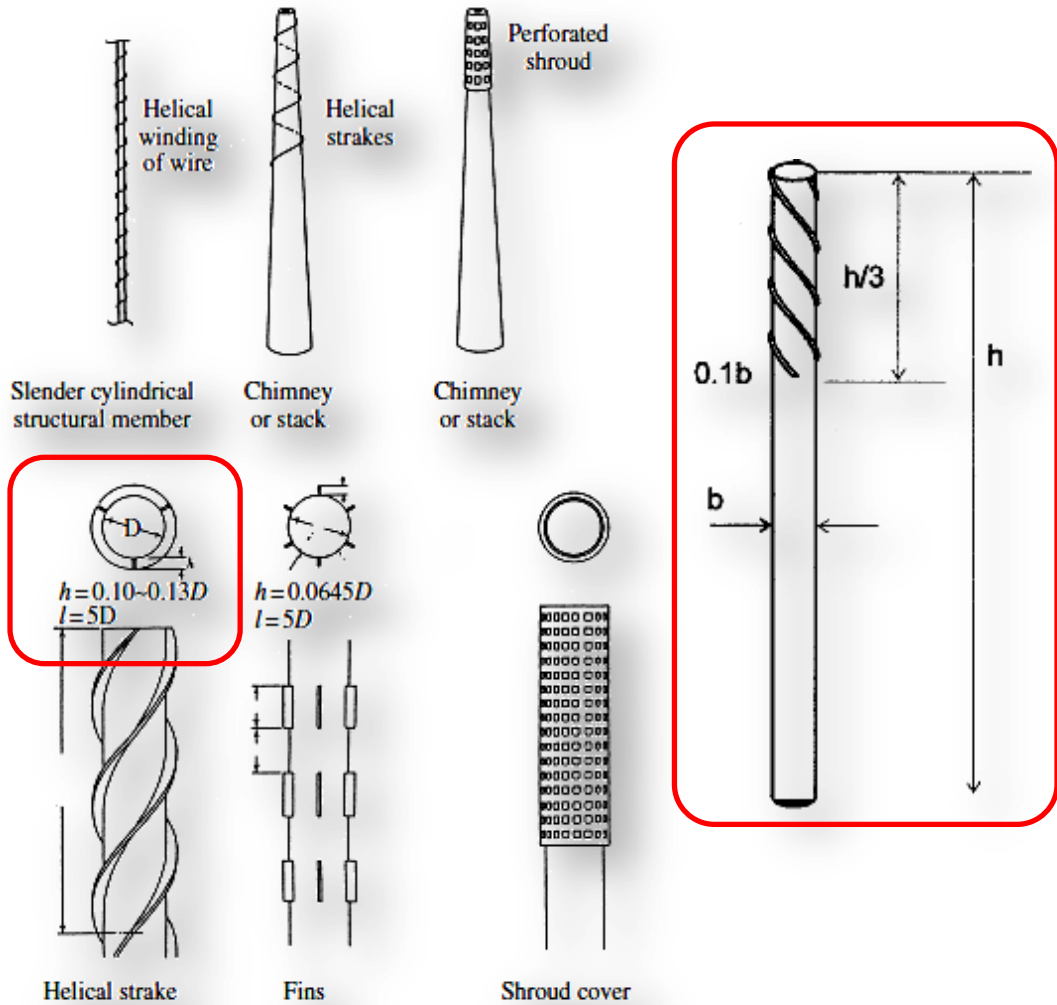
6.6 Check Design Of Chimney Shell Thickness

At Level	=	25.00	m.	Diameter	=	0.50	m.
Stress Due To Chimney Weight	=	3.93			=	3.93	kg./cm. ²
Stress Due To Weight Of Lining	=	3.95			=	3.95	kg./cm. ²
Stress Due To Wind	=	23.80			=	23.80	kg./cm. ²
Max. Compressive Stress	=	31.68			=	31.68	kg./cm. ² < 1,150.00
Max. Tension Stress	=	27.75			=	27.75	kg./cm. ² < 1,440.00
Allowable Bending Moment	=	12,721.24			=	12,721.24	kg.-m. > 561.00
At Level	=	10.00	m.	Diameter	=	0.50	m.
Stress Due To Chimney Weight	=	15.70			=	15.70	kg./cm. ²
Stress Due To Weight Of Lining	=	15.80			=	15.80	kg./cm. ²
Stress Due To Wind	=	357.93			=	357.93	kg./cm. ²
Max. Compressive Stress	=	389.43			=	389.43	kg./cm. ² < 1,150.00
Max. Tension Stress	=	373.73			=	373.73	kg./cm. ² < 1,440.00
Allowable Bending Moment	=	12,721.24			=	12,721.24	kg.-m. > 8,437.00

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Vortex Shedding Control Method



Examples of countermeasure for vortex-excited vibration of a circular cylinder