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Support of Cast Stone panels require due consideration to all applied forces. These forces include dead load (self weight) and live loads (wind and seismic). Often the most critical loading will be a combination of dead and live loads using the greater value of wind or seismic forces (if required by local building codes). Keep in mind that dead loads are often applied with a certain amount of eccentricity which must be taken into account. Under special conditions, temperature and volume changes can cause significant forces which need to be considered. The following table shows the required formula necessary to determine the design wind pressure.

Wind Loading*

Design wind pressure = Ce x Cq x qs x I

Ce, Combined Height, Exposure and Gust Factor Coefficient

Height Above Average Level of Adjoining Ground, in Feet	Exposure C(1)	Exposure B(2)
0-20	1.2	0.7
20-40	1.3	0.8
40-60	1.5	1.0
60-100	1.6	1.1
100-150	1.8	1.3
150-200	1.9	1.4
200-300	2.1	1.6
300-400	2.2	1.8

*Source: Uniform Building Code, 1988 Edition
1.= Most severe, terrain flat and generally open
2.= Terrain with surface irregularities 20 feet or more in height

Cq, Pressure Coefficients

Structure or Part Thereof	Description	Cq Factor
Elements and Components	Wall Elements:	
	All Structures	1.2 Inward
	Enclosed Structures	1.1 Outward
	Open Structures	1.6 Outward
	Parapets	1.3 Inward or Outward
Local Areas at Discontinuities	Wall Corners	2.0 Outward
	Canopies or overhangs at eaves of rakes	2.8 Upward

qs, Wind Stagnation Pressure at Standard Height of 30 Ft.

Basic Wind Speed (mph) (1)	70	80	90	100	110	120	130
Pressure, Qs (psf)	13	17	21	26	31	37	44

1: Refer UBC, Wind Speed Map

I, IMPORTANT FACTOR

I = 1.15	For essential Facilities
I = 1.00	For All other Buildings

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Working Stresses for Steel

Steel Type	Fy psi	Ft (1) psi	Fb (1) psi	Fv psi
ASTM A36	36,000	18,000	18,000	14,000
AISI 302	40,000	18,000	18,000	14,000
AISI 304	42,000	18,000	18,000	14,000

1: Stresses are less than normally allowable to reduce effects of deflection.

Typical Working Stress for Cast Stone

Compressive Strength, f'c (psi)	Modulus of Rupture, fr(psi)
5,000	$7.5(\pi)$ f'c = 530
6,000	$7.5(\pi)$ f'c = 580
7,000	$7.5(\pi)$ f'c = 625

Two types of anchors support cast stone panels. They are restraint anchors and support anchors. Support anchors generally carry the self weight of the structure although; they can also function as a combination of support and restraint anchor. Restraint anchors should be designed for live loads only (ie. wind or seismic forces). A typical restraint anchor used would be a steel strap. The following table shows allowable capacities of restraint anchors for two typical straps of various lengths

Restraint Anchors (A36 Steel)

Strap Size	Unsupported Length (in)	Allowable Tensile Cap. (k)	Allowable Compressive Cap. (k)
1/8″ x 1″	2	2.7	2.23
	3	2.7	1.87
	4	2.7	1.44
3/16" x 1"	2	4.0	3.64
	3	4.0	3.35
	4	4.0	3.00

Restraint Anchors (Stainless Steel)

Strap Size	Unsupported Length (in)	Allowable Tensile Cap. (k)	Allowable Compressive Cap. (k)
1/8″ x 1″	2	2.0	1.62
	3	2.0	1.62
	4	2.0	0.87
3/16″ x 1″	2	3.0	2.40
	3	3.0	2.40
	4	3.0	2.40

The following table shows the allowance shear capacities for stainless steel dowel pins of various diameters.

Pin Diam. (in)	Allowable Shear Cap. (#)
1/4	491
5/16	767
3/8	1104
7/16	1503
1/2	1963
9/16	2485
5/8	3068
11/16	3712
3/4	4418
13/16	5185
7/8	6013
15/16	6903