FacadeMatrix

WIND LOAD & MULLION Ixx CALCULATOR

SAMPLE CALCULATION REPORT

Bengaluru Commercial Tower · IS 875 Part 3:2015 · Free · No login required

REPORT REFERENCE

SR-IS875-001

26 May 2026

Reference Case

Bengaluru · Terrain Category 2 · h = 45 m · b = 1.5 m · L = 3.5 m

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Input Parameters

City / Location	Bengaluru, Karnataka
ECBC 2017 Climate Zone	Composite
IS 1893 Seismic Zone	Zone II
Design code	IS 875 Part 3:2015
Basic wind speed Vb	33 m/s (IS 875 Part 3 Appendix A)
Risk coefficient k1	1.00 (50-year return, Cl. 6.3.1)
Terrain Category	Category 2 — open with scattered obstructions
Building class	Class B (50 m > h > 20 m)
k2 at h = 45 m, TC2 Class B	1.005 (IS 875 Part 3 Table 2, interpolated)
Topography factor k3	1.00 (flat terrain, Cl. 6.3.3)
Importance factor k4	1.00 (general buildings, Cl. 6.3.4)
Mean roof height h	45.00 m
Mullion span L	3.50 m
Bay width b	1.50 m

Material Properties — AA 6063-T6 Aluminium

Material	AA 6063-T6 Extruded Aluminium Alloy
Modulus of elasticity E	70,000 MPa (IS 733 / IS 1285)
Yield strength Fy	214 MPa
Allowable bending stress sigma_allow	128 MPa (ADM ASD · 0.6 x Fy)
Deflection code basis	CWCT TN 32 / AAMA TIR-A11 · L/175 for spans ≤ 4.1 m

Code & Standard References

Wind load procedure	IS 875 Part 3:2015 — design wind speed and pressure
Design wind speed	IS 875 Part 3:2015 Cl. 6.3 — Vz = Vb x k1 x k2 x k3 x k4
Design wind pressure	IS 875 Part 3:2015 Cl. 7.2 — pz = 0.6 x Vz²
Pressure coefficients	IS 875 Part 3:2015 Cl. 7.3 — Cpe and Cpi
Glass design reference	IS 2553 Part 1:2018 — safety glazing
Deflection limit L/175	CWCT TN 32 / AAMA TIR-A11 — spans ≤ 4.1 m (13 ft 6 in)
Material standard	IS 733 / IS 1285 — aluminium alloy E = 70,000 MPa
Seismic reference	IS 1893 Part 1:2016 — Zone II (Bengaluru)

Calculation Steps 1–12

Design Wind Speed · Design Wind Pressure · Net Cladding Pressure · Mullion Section Properties

Step 1 — Basic Wind Speed Vb	
FORMULA	Vb from IS 875 Part 3:2015 Appendix A — Bengaluru
VALUES	Vb = 33 m/s (50-year return period, 3-sec gust equivalent)

RESULT	**Vb = 33 m/s**

Step 2 — Risk Coefficient k1	
FORMULA	k1 per IS 875 Part 3:2015 Cl. 6.3.1 and Table 1
VALUES	Design life = 50 years → k1 = 1.00
RESULT	**k1 = 1.00**

Step 3 — Terrain & Height Factor k2	
FORMULA	k2 per IS 875 Part 3:2015 Cl. 6.3.2 and Table 2 Terrain Category 2 (TC2) · Building Class B (20 m < h ≤ 50 m)
VALUES	h = 45 m — interpolating Table 2 TC2 Class B between h=40m (0.988) and h=50m (1.020) k2 = 0.988 + (1.020-0.988) x (45-40)/(50-40) = 0.988 + 0.016 = 1.004
RESULT	**k2 = 1.004 (at h = 45 m, TC2, Class B)**

Table 2 values are for mean hourly wind speed. IS 875:2015 uses these directly for Vz.

Step 4 — Topography Factor k3	
FORMULA	k3 per IS 875 Part 3:2015 Cl. 6.3.3
VALUES	Site is flat — no significant topographic feature within 3 km upwind
RESULT	**k3 = 1.00**

Step 5 — Importance Factor k4	
FORMULA	k4 per IS 875 Part 3:2015 Cl. 6.3.4
VALUES	General commercial office building — cyclone-prone region: No
RESULT	**k4 = 1.00**

Step 6 — Design Wind Speed Vz	
FORMULA	Vz = Vb x k1 x k2 x k3 x k4 (IS 875 Part 3:2015 Cl. 6.3)
VALUES	Vz = 33 x 1.00 x 1.004 x 1.00 x 1.00
RESULT	**Vz = 33.13 m/s**

Step 7 — Design Wind Pressure pz	
FORMULA	pz = 0.6 x Vz^2 (IS 875 Part 3:2015 Cl. 7.2)
VALUES	pz = 0.6 x 33.13^2 = 0.6 x 1,097.6
RESULT	**pz = 658.6 N/m² = 0.659 kN/m²**

Step 8 — Pressure Coefficients Cpe and Cpi	
FORMULA	Cpe per IS 875 Part 3:2015 Cl. 7.3 — external walls Cpi per IS 875 Part 3:2015 Cl. 7.3.2 — enclosed building
VALUES	Cpe (field zone, suction) = -0.8 | Cpe (corner zone) = -1.0 Cpi (enclosed building) = +0.2 (worst case for suction combination)
RESULT	**Cpe field = -0.8 | Cpe corner = -1.0 | Cpi = +0.2**

Step 9 — Net Design Wind Pressure p_net	
FORMULA	p_net = pz x (Cpe - Cpi) (IS 875 Part 3:2015 Cl. 7.3)
VALUES	Field zone: p_net = 0.659 x (-0.8 - (+0.2)) = 0.659 x 1.0 = 0.659 kN/m²
	Corner zone: p_net = 0.659 x (-1.0 - (+0.2)) = 0.659 x 1.2 = 0.791 kN/m²
RESULT	**p_design = 0.791 kN/m² (corner zone suction governs)**

Suction (outward pressure) governs mullion design. Corner zone taken as design case.

Step 10 — Mullion Line Load w	
FORMULA	w [N/mm] = p_design [kN/m²] x b [m] (1 kN/m = 1 N/mm exactly)
VALUES	w = 0.791 x 1.50
RESULT	**w = 1.187 kN/m = 1.187 N/mm**

Step 11 — Bending Moment and Shear Force	
FORMULA	M = w x L² / 8 (simply supported · UDL)
	V = w x L / 2
VALUES	M = 1.187 x 3,500² / 8 = 1.187 x 12,250,000 / 8 = 1,818,531 N·mm
	V = 1.187 x 3,500 / 2 = 2,077 N
RESULT	**M = 1,818,531 N·mm = 1.819 kN·m | V = 2,077 N = 2.077 kN**

Step 12 — Required Section Modulus Z_req	
FORMULA	Z_req = M / sigma_allow [sigma_allow = 128 MPa · ADM ASD · 0.6 x Fy]
VALUES	Z_req = 1,818,531 / 128
RESULT	**Z_req = 14,207 mm³ = 14.2 cm³**

Select extrusion with section modulus Z ≥ 14,207 mm³ about the strong axis.

Required Moment of Inertia Ixx — Three Deflection Limits

Common formula: Ixx_req = 5 x w x L^4 / (384 x E x delta_allow) where E = 70,000 N/mm² (IS 733 / IS 1285) · all in N and mm.

Step 13 — Ixx at L/175 — Recommended (L ≤ 4.1 m · CWCT TN 32 / AAMA TIR-A11)	
FORMULA	delta_allow = L/175 = 3,500/175 = 20.00 mm
VALUES	Ixx = 5 x 1.187 x 3,500^4 / (384 x 70,000 x 20.00)
	= 5 x 1.187 x 1.5006 x 10^13 / 537,600,000
RESULT	**Ixx = 1,660,000 mm^4 = 166.0 cm^4 ← RECOMMENDED**

Step 14 — Ixx at L/240 + 6.35 mm — Long-span limit (CWCT TN 32 / AAMA TIR-A11)	
FORMULA	delta_allow = 3,500/240 + 6.35 = 14.583 + 6.35 = 20.933 mm
VALUES	Ixx = 5 x 1.187 x 3,500^4 / (384 x 70,000 x 20.933)
RESULT	**Ixx = 1,587,000 mm^4 = 158.7 cm^4**

L/240+6.35 governs for spans 4.1 m to 12 m. At L=3.5 m, L/175 governs.

Step 15 — Ixx at L/360 — Project-specific (SSG / structurally bonded glazing)	
FORMULA	delta_allow = 3,500/360 = 9.722 mm

VALUES	Ixx = 5 x 1.187 x 3,500^4 / (384 x 70,000 x 9.722)
RESULT	**Ixx = 3,419,000 mm^4 = 341.9 cm^4**

Specify L/360 only when project specification requires it (SSG facades, brittle finishes).

Deflection Limit Summary — AA 6063-T6 Mullion

Deflection Limit	delta_allow (mm)	Ixx required (cm^4)	Note
L / 175	20.00	**166.0**	RECOMMENDED
L / 240 + 6.35 mm	20.93	**158.7**	
L / 360	9.72	**341.9**	PROJECT-SPECIFIC

Results Summary

Basic wind speed Vb	**33 m/s (Bengaluru · IS 875 Part 3 Appendix A)**
Design wind speed Vz (h = 45 m)	**33.13 m/s**
Design wind pressure pz	**0.659 kN/m²**
Governing net pressure p_design	**0.791 kN/m² — corner zone suction governs**
Mullion line load w	**1.187 kN/m = 1.187 N/mm**
Maximum bending moment M	**1.819 kN·m**
Maximum shear force V	**2.077 kN**
Required section modulus Z_req	**14,207 mm³ (14.2 cm³)**
Ixx at L/175 (RECOMMENDED)	**166.0 cm^4**
Ixx at L/240 + 6.35 mm	**158.7 cm^4**
Ixx at L/360 (project-specific)	**341.9 cm^4**

Design Recommendation

Select an AA 6063-T6 extruded aluminium mullion with Ixx ≥ 166.0 cm^4 (L/175 · CWCT TN 32 · recommended for spans ≤ 4.1 m) and section modulus Z ≥ 14,207 mm³. Apply 0.791 kN/m² for corner zones. Apply 0.659 kN/m² for field zones. This report uses IS 875 Part 3:2015 with Terrain Category 2, Class B, for a 45 m commercial tower in Bengaluru.