Building Massing Wind Optioneering

Building-massing wind optioneering near a runway

A **rapid comparative screening tool** for an AEC design team choosing building massing on a site near a runway. It ranks candidate massing options against the governing aviation site constraints (obstacle limitation and building-generated windshear) and reads across to ground-level pedestrian comfort, so the team can shortlist options before commissioning a full CFD or wind-tunnel study.

This is a demonstration screening tool, **not a certified engineering deliverable**. It does not replace CFD or wind-tunnel testing. Any option that fails a check, or sits close to any envelope, must be taken to a full CFD / wind-tunnel study before it is relied upon.

Regulatory and wind-climate values are grounded in the Australian instruments: **AS/NZS 1170.2:2021** (wind climate), **CASA MOS Part 139** (obstacle limitation surfaces, enacting ICAO Annex 14), and the **National Airports Safeguarding Framework (NASAG) Guideline B** (building-generated windshear and turbulence). Modelling-method guidance follows COST 732, AIJ, Blocken and ASCE 49. Several numeric values are secondary-sourced and are flagged in-page as editable assumptions to verify against the governing instrument.

Pages

All shared inputs are defined once on the design basis; every downstream page consumes them by reference, so editing an input flows through the whole pack.

1. ↗1. Scenario & Design Basis - runway geometry, the AS/NZS 1170.2 wind climate, all editable OLS / wake / comfort parameters, and the three candidate massing options.
2. ↗2. OLS Geometry Check (CASA MOS 139) - transitional obstacle-limitation-surface geometry vs each option's height and setback.
3. ↗3. Wake / Turbulence Envelope (NASAG Guideline B) - the 1:35 screening surface and the editable bluff-body wake envelope vs the runway separation, against the 7 / 6 / 4 kt windshear and turbulence criteria.
4. ↗4. Flow-Field, Comfort & Optioneering Summary - a 2D potential-flow speed-up comparison, a pedestrian wind-comfort read (NEN 8100 / Lawson), the summary table across all options, and the recommendation.

1. Scenario & Design Basis

This pack is a **rapid comparative screening tool** for choosing building massing on a site near a runway. The design team must pick a massing option that satisfies the aviation safeguarding constraints (obstacle limitation and building-generated windshear) while keeping ground-level wind amenity acceptable. This tool ranks candidate options quickly, before any full CFD or wind-tunnel study is commissioned.

It is **not** a certified engineering deliverable and does not replace CFD or wind-tunnel testing. Every option that fails a check, or sits close to any envelope, must be taken to a full CFD / wind-tunnel study before it is relied upon. Read the pass/fail flags as *screening* outcomes, not as clearance.

All inputs below are editable. Regulatory values are grounded in the Australian instruments: **AS/NZS 1170.2:2021** (wind climate), **CASA MOS Part 139** (obstacle limitation surfaces), and the **National Airports Safeguarding Framework (NASAG) Guideline B** (building-generated windshear and turbulence). Several numeric values are secondary-sourced and are flagged as assumptions to verify against the governing instrument before use.

Site wind climate (AS/NZS 1170.2:2021)

Assumed location: a regional Australian aerodrome in **Wind Region A** (non-cyclonic). The site (design) gust wind speed follows AS/NZS 1170.2:2021 Section 2,

$V_{sit,\beta} = V_R \cdot M_d \cdot (M_{z,cat} \cdot M_s \cdot M_t) \cdot M_c$. The regional gust speed V_R and the multipliers below are editable assumptions to confirm against the Standard (Tables 3.1, 3.2, 4.1 and Clause 3.4).

Untitled Statement

$v_R = 45\ \mathrm{m/s}$	$45\ \mathrm{m/s}$
$M_d = 0.95$	0.95
$M_{zcat} = 1$	1
$M_s = 1$	1
$M_t = 1$	1
$M_c = 1$	1

Untitled Statement

$v_{site} = v_R \cdot M_d \cdot (M_{zcat} \cdot M_s \cdot M_t) \cdot M_c$	$42.75\ \mathrm{m/s}$
$v_{site,\ ms} = v_{site}$	$42.75\ \mathrm{m/s}$

The site gust speed is $V_{sit,\beta} \approx$ 42.8 m/s (about 83 kt). This is the ULS peak-gust climate basis for the aviation checks; a mean-wind reference for pedestrian comfort is defined separately below.

Runway and obstacle limitation surface (CASA MOS Part 139)

Assumed Code 4 precision-approach runway. The obstacle limitation surface (OLS) used for the geometry screen is the **transitional surface**, which rises from the edge of the runway strip. Its slope and the inner-horizontal-surface height are editable; the transitional slope of 1:7 (14.3%) and the values below are the ICAO Annex 14 figures Australia adopts, to be verified by exact runway code and approach type against CASA MOS Part 139 cl 7.09 / cl 7.15.

Untitled Statement

$strip_{half,\ width} = 150\ \mathrm{m}$	$150\ \mathrm{m}$
$ols_{slope,\ n} = 7$	7
$inner_{horizontal,\ height} = 45\ \mathrm{m}$	$45\ \mathrm{m}$
$ols_{approach,\ pct} = 2$	2

Wake / turbulence screening parameters (NASAG Guideline B + wind-engineering literature)

The wake-envelope multipliers are the value proposition of this tool: swap in whatever coefficients the airport operator or NASAG assessment specifies and every downstream result recalculates. Defaults are order-of-magnitude bluff-body rules of thumb (Holmes; Cook; ESDU):

the turbulent wake extends roughly 10-20 building heights H downwind, spreads laterally over about 1.5 building widths W, and vertically over 2-3 H. Verify against the relevant wake data item before quoting a hard number.

Untitled Statement

$k_{downwind} = 15$	15
$k_{lateral} = 1.5$	1.5
$k_{vertical} = 2.5$	2.5

The NASAG 1:35 screening surface clears a building without further assessment only if its perpendicular distance from the runway centreline exceeds $35 \times H$. Buildings that penetrate it must be assessed against the windshear/turbulence criteria: an along-wind mean-deficit limit of

7 kt, an across-wind limit of 6 kt, and a horizontal-turbulence standard-deviation limit of 4 kt, all below 61 m AGL (NASAG Guideline B paras 51-57). Thresholds are stored in m/s and are editable.

Untitled Statement

$n_{trigger} = 35$	35
$shear_{along} = 3.6\ \mathrm{m/s}$	$3.6\ \mathrm{m/s}$
$shear_{across} = 3.1\ \mathrm{m/s}$	$3.1\ \mathrm{m/s}$
$turb_{sd} = 2.1\ \mathrm{m/s}$	$2.1\ \mathrm{m/s}$

Pedestrian wind-comfort basis (NEN 8100 / Lawson)

Ground-level amenity is assessed against a representative **mean** pedestrian-level wind speed (not the ULS gust above). NEN 8100 uses a comfort threshold of 5 m/s and a danger threshold of 15 m/s; the Lawson activity thresholds below (sitting / standing / walking / business) are editable and should be verified against the primary Lawson criteria.

Untitled Statement

$u_{ref,\ comfort} = 5\ \mathrm{m/s}$	$5\ \mathrm{m/s}$
$lawson_{sitting} = 1.8\ \mathrm{m/s}$	$1.8\ \mathrm{m/s}$
$lawson_{standing} = 3.6\ \mathrm{m/s}$	$3.6\ \mathrm{m/s}$
$lawson_{walking} = 5.3\ \mathrm{m/s}$	$5.3\ \mathrm{m/s}$
$lawson_{business} = 7.6\ \mathrm{m/s}$	$7.6\ \mathrm{m/s}$
$u_{danger} = 15\ \mathrm{m/s}$	$15\ \mathrm{m/s}$

Candidate massing options

Three massing options for the same gross floor area, positioned relative to the runway. For each: overall height, across-wind face width, along-wind depth, perpendicular distance from the runway centreline, and the separation from the building to the nearest runway operational point measured along the critical (building-to-runway) wind direction. All editable.

Option A is a single tall tower; Option B a pair of mid-rise blocks; Option C a distributed low-rise scheme.

Untitled Statement

$height_{A} = 60\ \mathrm{m}$	$60\ \mathrm{m}$

$width_A = 30\ \mathrm{m}$	$30\ \mathrm{m}$
$depth_A = 30\ \mathrm{m}$	$30\ \mathrm{m}$
$lateral_A = 400\ \mathrm{m}$	$400\ \mathrm{m}$
$sep_A = 250\ \mathrm{m}$	$250\ \mathrm{m}$

Untitled Statement

$height_B = 35\ \mathrm{m}$	$35\ \mathrm{m}$
$width_B = 55\ \mathrm{m}$	$55\ \mathrm{m}$
$depth_B = 25\ \mathrm{m}$	$25\ \mathrm{m}$
$lateral_B = 450\ \mathrm{m}$	$450\ \mathrm{m}$
$sep_B = 300\ \mathrm{m}$	$300\ \mathrm{m}$

Untitled Statement

$height_C = 20\ \mathrm{m}$	$20\ \mathrm{m}$
$width_C = 80\ \mathrm{m}$	$80\ \mathrm{m}$
$depth_C = 40\ \mathrm{m}$	$40\ \mathrm{m}$
$lateral_C = 520\ \mathrm{m}$	$520\ \mathrm{m}$
$sep_C = 380\ \mathrm{m}$	$380\ \mathrm{m}$

Every downstream page references this design basis, so editing any value here flows through the OLS check, the wake/turbulence screen, and the flow-field and comfort summary.

2. OLS Geometry Check (CASA MOS 139)

OLS geometry screen (CASA MOS Part 139)

This page screens each massing option against the **obstacle limitation surface (OLS)** under CASA MOS Part 139, which enacts ICAO Annex 14 in Australian regulation. The governing surface here is the **transitional surface**, a splay that rises from the edge of the runway strip toward the building at a slope of 1:7 (14.3%) for an instrument (Code 3-4) runway (cl 7.09), capped at the inner-horizontal-surface height (cl 7.15). This is a **pure-geometry** check: no fluid modelling is involved.

For an option at perpendicular distance d from the runway centreline, the maximum height permitted before it penetrates the OLS is $h_{allow} = \min\left(\frac{d - d_{strip}}{n}, h_{IHS}\right)$, where d_{strip} is the strip half-width, n the transitional slope run-per-rise, and h_{IHS} the inner-horizontal-surface height. All three quantities are the editable, verify-against-the-Standard assumptions defined on the design basis page.

An option that penetrates the OLS is not automatically prohibited, but it requires a formal aeronautical assessment and likely CASA consultation; treat NG here as "escalate", not "reject".

The strip half-width, transitional slope and inner-horizontal-surface height are consumed live from the design basis. The values below recompute if those change.

Untitled Statement

$ols_{\,allow,\,A} = \min\left(\frac{(lateral_{\,A} - strip_{\,half,\,width})}{ols_{\,slope,\,n}}, inner_{\,horizontal,\,height}\right)$	35.71 m
$ols_{\,allow,\,B} = \min\left(\frac{(lateral_{\,B} - strip_{\,half,\,width})}{ols_{\,slope,\,n}}, inner_{\,horizontal,\,height}\right)$	42.86 m
$ols_{\,allow,\,C} = \min\left(\frac{(lateral_{\,C} - strip_{\,half,\,width})}{ols_{\,slope,\,n}}, inner_{\,horizontal,\,height}\right)$	45 m
$ols_{\,allow,\,A,\,m} = ols_{\,allow,\,A}$	35.71 m
$ols_{\,allow,\,B,\,m} = ols_{\,allow,\,B}$	42.86 m
$ols_{\,allow,\,C,\,m} = ols_{\,allow,\,C}$	45 m

Untitled Statement

$height_{\,A,\,m} = height_{\,A}$	60 m

$height_{B,\ m}$ = $height_{B}$	$35\ \mathrm{m}$
$height_{C,\ m}$ = $height_{C}$	$20\ \mathrm{m}$
$pen_{A,\ m}$ = $\left(height_{A} - ols_{allow,\ A} \right)$	$24.29\ \mathrm{m}$
$pen_{B,\ m}$ = $\left(height_{B} - ols_{allow,\ B} \right)$	$-7.86\ \mathrm{m}$
$pen_{C,\ m}$ = $\left(height_{C} - ols_{allow,\ C} \right)$	$-25\ \mathrm{m}$

OLS_A = OLS_A = pen_A_m <= 0 m = false

OLS_B = OLS_B = pen_B_m <= 0 m = true

OLS_C = OLS_C = pen_C_m <= 0 m = true

Results by option

A positive penetration means the option rises above the transitional OLS at its setback and must be escalated to aeronautical assessment.

Option	Height (m)	OLS allowable height (m)	Penetration (m)	Screen
A - tall tower	$height_{A}$ = $60\ \mathrm{m}$	$ols_{allow,\ A,\ m}$ = $35.71\ \mathrm{m}$	$pen_{A,\ m}$ = $24.29\ \mathrm{m}$	OLS screen — Option A = false
B - mid-rise blocks	$height_{B}$ = $35\ \mathrm{m}$	$ols_{allow,\ B,\ m}$ = $42.86\ \mathrm{m}$	$pen_{B,\ m}$ = $-7.86\ \mathrm{m}$	OLS screen — Option B = true
C - distributed low-rise	$height_{C}$ = $20\ \mathrm{m}$	$ols_{allow,\ C,\ m}$ = $45\ \mathrm{m}$	$pen_{C,\ m}$ = $-25\ \mathrm{m}$	OLS screen — Option C = true

The tall tower (Option A) penetrates the transitional OLS at its assumed setback, while the mid-rise and distributed schemes sit below it. This is the first-pass geometry filter only; the wake / turbulence screen on the next page and the flow-field comparison after it address the fluid-dynamic effects the OLS does not capture.

3. Wake / Turbulence Envelope (NASAG Guideline B)

Building-generated windshear / turbulence screen (NASAG Guideline B)

This page screens each option for the risk of **building-generated windshear and turbulence** affecting aircraft, following the National Airports Safeguarding Framework (NASAG) Guideline B. Two screening tests are applied, plus the windshear/turbulence acceptance criteria that a triggered option must later demonstrate under CFD or wind-tunnel testing.

Test 1 - the 1:35 screening surface. Guideline B clears a building without further assessment only if its perpendicular distance from the runway centreline exceeds $35 \times H$ (paras 51-53). A building that penetrates this deliberately conservative surface must be assessed against the windshear/turbulence criteria.

Test 2 - wake-envelope reach. Using the editable bluff-body multipliers from the design basis, the turbulent wake behind an obstacle of height H and width W is taken to extend $k_{down} \cdot H$ downwind, spread $k_{lat} \cdot W$ laterally, and rise $k_{vert} \cdot H$ vertically. If the separation from the building to the nearest runway operational point (along the critical wind direction) is less than the downwind wake extent, the wake reaches the runway and the option is flagged for detailed study.

Acceptance criteria (to be demonstrated by CFD / wind-tunnel, not by this screen). Below 61 m AGL the building-induced mean-speed deficit must stay under 7 kt (3.6 m/s) along-wind and 6 kt (3.1 m/s) across-wind, and the horizontal-turbulence standard deviation under 4 kt (2.1 m/s) (paras 57-58). These thresholds are stored on the design basis in m/s and are editable. This desktop screen tests geometry and wake reach only; it cannot prove the turbulence criterion, which per Guideline B generally requires CFD or wind-tunnel modelling.

The multipliers, separations and geometry are all consumed live from the design basis.

Untitled Statement

$L_{down,\, A} = k_{downwind} \cdot height_{A}$	900 m
$L_{down,\, B} = k_{downwind} \cdot height_{B}$	525 m
$L_{down,\, C} = k_{downwind} \cdot height_{C}$	300 m
$W_{lat,\, A,\, m} = (k_{lateral} \cdot width_{A})$	45 m
$W_{lat,\, B,\, m} = (k_{lateral} \cdot width_{B})$	82.5 m
$W_{lat,\, C,\, m} = (k_{lateral} \cdot width_{C})$	120 m

$V_{ext,\ A,\ m} = (k_{vertical} \cdot height_{A})$	150 m
$V_{ext,\ B,\ m} = (k_{vertical} \cdot height_{B})$	87.5 m
$V_{ext,\ C,\ m} = (k_{vertical} \cdot height_{C})$	50 m
$L_{down,\ A,\ m} = L_{down,\ A}$	900 m
$L_{down,\ B,\ m} = L_{down,\ B}$	525 m
$L_{down,\ C,\ m} = L_{down,\ C}$	300 m

Untitled Statement

$req135_{A} = n_{trigger} \cdot height_{A}$	2100 m
$req135_{B} = n_{trigger} \cdot height_{B}$	1225 m
$req135_{C} = n_{trigger} \cdot height_{C}$	700 m
$req135_{A,\ m} = req135_{A}$	2100 m
$req135_{B,\ m} = req135_{B}$	1225 m
$req135_{C,\ m} = req135_{C}$	700 m
$sep_{A,\ m} = sep_{A}$	250 m
$sep_{B,\ m} = sep_{B}$	300 m
$sep_{C,\ m} = sep_{C}$	380 m
$lat_{A,\ m} = lateral_{A}$	400 m
$lat_{B,\ m} = lateral_{B}$	450 m
$lat_{C,\ m} = lateral_{C}$	520 m

Plain-number extracts (metres) for the comparison chart:

Untitled Statement

$Ldn_{A,\ n} = L_{down,\ A[\text{‘m’}]}$	900

$Ldn_{B,\,n} = L_{down,\,B}{}_{[\text{‘m’}]}$	525
$Ldn_{C,\,n} = L_{down,\,C}{}_{[\text{‘m’}]}$	300
$sepA_{n} = (sep_{A})_{[\text{‘m’}]}$	250
$sepB_{n} = (sep_{B})_{[\text{‘m’}]}$	300
$sepC_{n} = (sep_{C})_{[\text{‘m’}]}$	380
$reqA_{n} = req135_{A[\text{‘m’}]}$	2100
$reqB_{n} = req135_{B[\text{‘m’}]}$	1225
$reqC_{n} = req135_{C[\text{‘m’}]}$	700
$latA_{n} = (lateral_{A})_{[\text{‘m’}]}$	400
$latB_{n} = (lateral_{B})_{[\text{‘m’}]}$	450
$latC_{n} = (lateral_{C})_{[\text{‘m’}]}$	520

Trigger_A = Trigger_A = lat_A_m >= req135_A_m = false

Trigger_B = Trigger_B = lat_B_m >= req135_B_m = false

Trigger_C = Trigger_C = lat_C_m >= req135_C_m = false

WakeReach_A = WakeReach_A = sep_A_m >= L_down_A_m = false

WakeReach_B = WakeReach_B = sep_B_m >= L_down_B_m = false

WakeReach_C = WakeReach_C = sep_C_m >= L_down_C_m = true

Results by option

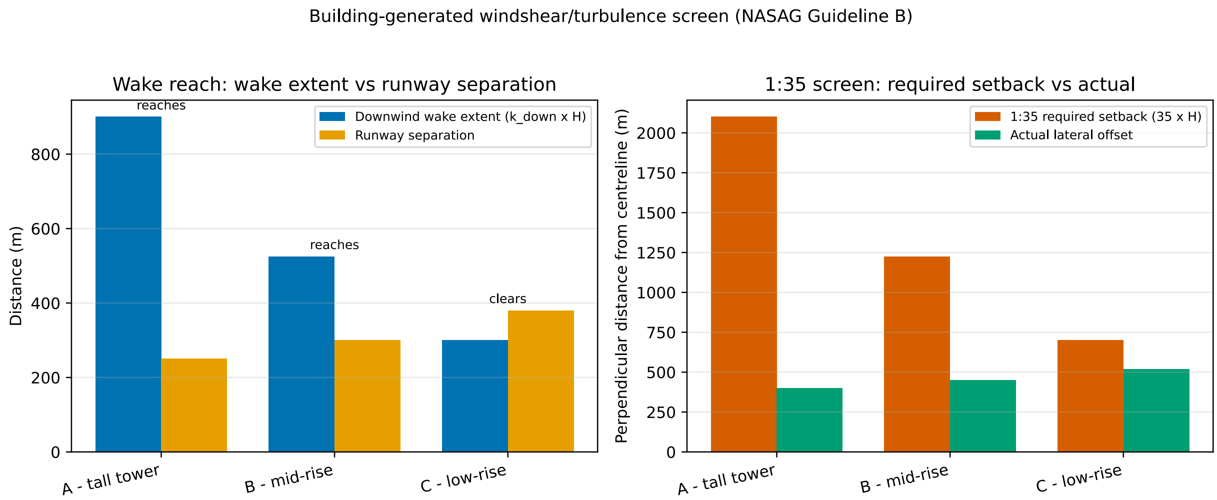
"1:35 screen" is OK only if the option is cleared without assessment; "Wake reach" is OK only if the estimated wake does not reach the runway operational area at the configured multipliers.

Option	Downwind wake extent (m)	Runway separation (m)	1:35 required setback (m)	1:35 screen	Wake reach
A - tall tower	$L_{down,\,A,\,m} =$ 900 m	$sep_{A,\,m} =$ 250 m	$req135_{A,\,m} =$ 2100 m	1:35 trigger — Option A = false	Wake reach — Option A = false

B - mid-rise blocks	$L_{down,\,B,\,m}$ = 525 m	$sep_{B,\,m}$ = 300 m	$req135_{B,\,m}$ = 1225 m	1:35 trigger — Option B = false	Wake reach — Option B = false
C - distributed low-rise	$L_{down,\,C,\,m}$ = 300 m	$sep_{C,\,m}$ = 380 m	$req135_{C,\,m}$ = 700 m	1:35 trigger — Option C = false	Wake reach — Option C = true

All three options penetrate the conservative 1:35 screening surface at their assumed setbacks, so all three formally require a windshear/turbulence assessment. The wake-reach test then ranks their relative severity: at the default multipliers the tall tower and mid-rise blocks project wakes that reach the runway operational area, while the distributed low-rise scheme does not. The chart below makes the comparison visual.

Wake extent vs runway separation and 1 in 35 setback



The wake multipliers are deliberately exposed as editable inputs on the design basis page: substitute the coefficients specified by the airport operator or the NASAG assessment and every result and the chart recalculate. Any option flagged here must proceed to full CFD or wind-tunnel testing against the 7 / 6 / 4 kt criteria before it is relied upon.

4. Flow-Field, Comfort & Optioneering Summary

Flow-field visualisation, pedestrian comfort and optioneering summary

This page adds a physics-based comparison of the ground-level flow around each massing option, reads across to pedestrian wind comfort, and closes with the optioneering summary and recommendation.

Method and limitations

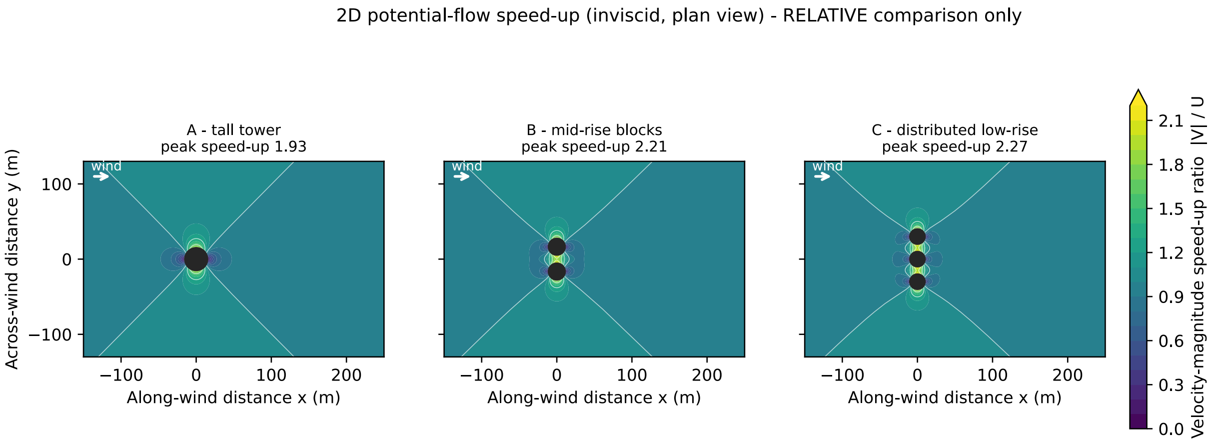
The flow field is a **2D potential-flow** (inviscid, irrotational) model: a uniform freestream with one doublet per building footprint, each footprint represented as an equivalent circular cylinder sized by its across-wind width. This is a closed-form superposition solved with plain linear algebra, not a CFD result. It captures the **speed-up and blockage** an obstacle imposes on the approach flow, and the venturi acceleration between separated blocks, but it **cannot** represent flow separation, the downwind wake, or turbulence, all of which need CFD or wind-tunnel testing. Read the contours as a **relative** comparison between massing options, not as absolute design wind speeds. Potential flow over-predicts speed-up at sharp shoulders.

Footprint widths are consumed live from the design basis.

Untitled Statement

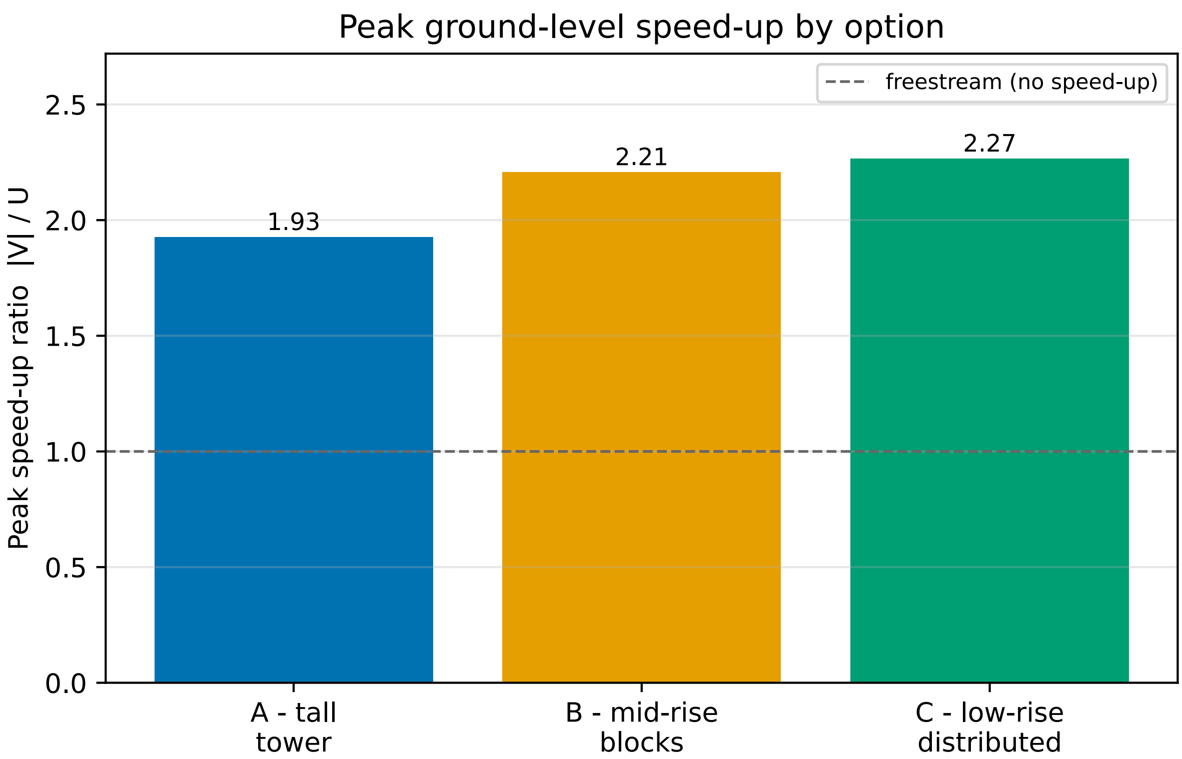
$wA_n = (width_A)_{[\text{'m'}]}$	30
$wB_n = (width_B)_{[\text{'m'}]}$	55
$wC_n = (width_C)_{[\text{'m'}]}$	80
$dA_n = (depth_A)_{[\text{'m'}]}$	30
$dB_n = (depth_B)_{[\text{'m'}]}$	25
$dC_n = (depth_C)_{[\text{'m'}]}$	40

Velocity magnitude speed up contours by option



The single tower (A) produces one localised speed-up zone; the distributed blocks (B, C) create venturi acceleration in the gaps between them, which is where ground-level amenity tends to suffer. The peak speed-up ratio per option is compared below.

Peak speed up by option



Pedestrian wind comfort (NEN 8100 / Lawson)

Ground-level comfort is estimated from the peak speed-up applied to a representative **mean** pedestrian-level wind speed U_{ref} (not the ULS gust used for the aviation checks):

$U_{local} = (\text{peak speed-up}) \times U_{ref}$. The result is mapped to a Lawson activity class using the editable thresholds on the design basis. NEN 8100 also sets a danger threshold of 15 m/s. This is an order-of-magnitude read: a defensible comfort study needs the site wind rose and annual exceedance statistics, not a single speed.

Untitled Statement

$local_{speed,\ A} = (peak_{speedup,\ A} \cdot u_{ref,\ comfort})$	$9.64\ \mathrm{m/s}$
$local_{speed,\ B} = (peak_{speedup,\ B} \cdot u_{ref,\ comfort})$	$11.04\ \mathrm{m/s}$
$local_{speed,\ C} = (peak_{speedup,\ C} \cdot u_{ref,\ comfort})$	$11.33\ \mathrm{m/s}$

$Comfort_{A} = comfort_{cat,\ A} = \text{Uncomfortable}(brief\ walking\ only)$

$Comfort_{B} = comfort_{cat,\ B} = \text{Uncomfortable}(brief\ walking\ only)$

$Comfort_{C} = comfort_{cat,\ C} = \text{Uncomfortable}(brief\ walking\ only)$

Comfort classification (computed in the Pedestrian comfort classification Python block). The local mean speed is the potential-flow peak speed-up scaled by the reference comfort wind speed, categorised against the editable Lawson / NEN 8100 thresholds on the design basis. Values update live if those inputs change.

Option	Local mean speed (m/s)	Threshold band	Lawson / NEN 8100 category
A - tall tower	$ls_{A} = 10$	$comfort_{band,\ A} = 7.6 - 15\ \mathrm{m/s}$	$comfort_{cat,\ A}$ = Uncomfortable (brief walking only)
B - mid-rise blocks	$ls_{B} = 11$	$comfort_{band,\ B} = 7.6 - 15\ \mathrm{m/s}$	$comfort_{cat,\ B}$ = Uncomfortable (brief walking only)
C - distributed low-rise	$ls_{C} = 11.332$	$comfort_{band,\ C} = 7.6 - 15\ \mathrm{m/s}$	$comfort_{cat,\ C}$ = Uncomfortable (brief walking only)

Optioneering summary

The checks from the earlier pages are recomputed here from the same design basis so the summary is self-contained and updates live. "OLS" repeats the CASA MOS 139 transitional-surface screen; "Wake reach" repeats the NASAG wake-envelope reach test.

$height_{A,\ m} = height_{A}$	$60\ \mathrm{m}$
$height_{B,\ m} = height_{B}$	$35\ \mathrm{m}$
$height_{C,\ m} = height_{C}$	$20\ \mathrm{m}$

sumOLS_A = sumOLS_A = ref_p2.ols_ok_A = false

sumOLS_B = sumOLS_B = ref_p2.ols_ok_B = true

sumOLS_C = sumOLS_C = ref_p2.ols_ok_C = true

sumWake_A = sumWake_A = ref_p3.wake_ok_A = false

sumWake_B = sumWake_B = ref_p3.wake_ok_B = false

sumWake_C = sumWake_C = ref_p3.wake_ok_C = true

Option	Height (m)	OLS screen	Wake reach	Peak speed-up	Comfort class
A - tall tower	$height_{A,\,m} = 60\ \mathrm{m}$	OLS screen — Option A = false	Wake reach — Option A = false	$peak_{speedup,\,A}$ = 1.9272036833654067	$Comfort_A$ = Uncomfortable (brief walking only)
B - mid-rise blocks	$height_{B,\,m} = 35\ \mathrm{m}$	OLS screen — Option B = true	Wake reach — Option B = false	$peak_{speedup,\,B}$ = 2.207510589824664	$Comfort_B$ = Uncomfortable (brief walking only)
C - distributed low-rise	$height_{C,\,m} = 20\ \mathrm{m}$	OLS screen — Option C = true	Wake reach — Option C = true	$peak_{speedup,\,C}$ = 2.2663389564156073	$Comfort_C$ = Uncomfortable (brief walking only)

Recommendation

On this first-pass screening, **Option C (distributed low-rise)** is the most defensible aviation choice: it clears the CASA MOS 139 transitional OLS and its estimated wake does not reach the runway operational area at the configured multipliers. **Option B (mid-rise blocks)** clears the OLS but its wake reaches the runway, so it would need a full windshear/turbulence study before it could be relied upon. **Option A (tall tower)** both penetrates the OLS and projects a wake onto the runway, and is the weakest option against the aviation constraints.

The trade-off runs the other way for ground-level amenity: the distributed and mid-rise schemes create the highest pedestrian-level speed-up in the gaps between blocks, so whichever massing is taken forward, ground-level wind mitigation (podium, landscaping, canopies) should be studied alongside it.

All three options penetrate the conservative NASAG 1:35 screening surface and therefore formally require a building-generated windshear and turbulence assessment. This pack is a rapid comparative screen to rank and shortlist massing options; any option carried forward, and in particular any option flagged NG or sitting close to an envelope, must be confirmed by full CFD or wind-tunnel testing against the CASA MOS 139 OLS and the NASAG 7 / 6 / 4 kt windshear and turbulence criteria before it is relied upon.