22 February 2019 CPP Project 9973

Macquarie Corporate Holdings Pty. Ltd
Level 6, 50 Martin Place
Sydney NSW 2000

Attn: Holly Rhoades
Project: Martin Place Over Station Development

Dear Ms. Rhoades

This letter will address environmental wind conditions on the external terraces of the Martin Place OSD. CPP has conducted wind tunnel tests for the North and South sites including measurement of wind velocities on the terraces, the results are reported in [1-3].

The environmental wind conditions discussed herein are assessed in accordance with the criteria of Lawson [4], Table 1. These classify locations according to an associated activity, ranging from Outdoor Dining to Business Walking. Classification into a particular category does not preclude activities associated with calmer conditions for that space, it simply indicates those activities are expected to be available for a smaller proportion of the time. Descriptions of the threshold wind speeds as experienced by people are given in Table 2.

External terraces on large developments are often windy, though they may be subject to different expectations from patrons than public areas. A typical terrace in Sydney would be expected to fall into the Pedestrian Walking or Pedestrian Standing categories under Lawson. A Pedestrian Standing rating would be considered adequate for most uses of an external balcony or terrace, while more extensive mitigation measures are generally required to achieve a Pedestrian Sitting or Outdoor Dining rating.

Table 1: The Lawson comfort criteria

Comfort (maximum of mean or gust equivalent mean (GEM†) wind speed exceeded 5% of the time from all wind direction sectors combined)	
< 2 m/s	Outdoor Dining
2-4 m/s	Pedestrian Sitting (considered to be of long duration)
4 - 6 m/s	Pedestrian Standing (or sitting for a short time or exposure)
6 - 8 m/s	Pedestrian Walking
8 - 10 m/s	Business Walking (objective walking from A to B or for cycling)
> 10 m/s	Uncomfortable[1]

Note: † The gust equivalent mean (GEM) is the peak 3 s gust wind speed divided by 1.85.

Table 2: Summary of wind effects on people, [5]

Description	Beaufort Number	Speed (m/s)	Effects
Calm, light air	0, 1	0–2	Calm, no noticeable wind.
Light breeze	2	2–3	Wind felt on face.
Gentle breeze	3	3–5	Wind extends light flag. Hair is disturbed. Clothing flaps
Moderate breeze	4	5–8	Raises dust, dry soil, and loose paper. Hair disarranged.
Fresh breeze	5	8–11	Force of wind felt on body. Drifting snow becomes airborne. Limit of agreeable wind on land.
Strong breeze	6	11–14	Umbrellas used with difficulty. Hair blown straight. Difficult to walk steadily. Wind noise on ears unpleasant. Windborne snow above head height (blizzard).
Near gale	7	14–17	Inconvenience felt when walking.
Gale	8	17–21	Generally impedes progress. Great difficulty with balance in gusts.
Strong gale	9	21–24	People blown over by gusts.

North Tower

An excerpt from [2] showing the test locations on the North Tower terraces and associated comfort ratings is provided in Figure 1. The north-facing and east-facing terraces meet the criteria for classification into the Outdoor Dining and Pedestrian Sitting categories respectively. These areas experience calm conditions for most of the time. The north-facing terrace would be suitable for use as a dining space, while the east-facing terrace would be suitable for more casual café-style dining and long-term seating or stationary activity.

The south-facing terrace areas meet the criteria for Pedestrian Standing classification. This category is associated with short or medium-term occupation. These areas would experience wind speeds less than 4 m/s for approximately 90% of the time. With reference to Table 2, this means that there is only 10% of the time when winds here are stronger than a light breeze. Due to the interaction of the building with prevailing winds, a calm area of this terrace would be available most of the time – the south-east side is mainly affected by winds from the south-west and north-east, while the other side is mainly affected by winds from the north-west and south-east. When considered as a whole, the terrace would therefore be suitable for medium and long-term occupation, with some portions available for informal dining.

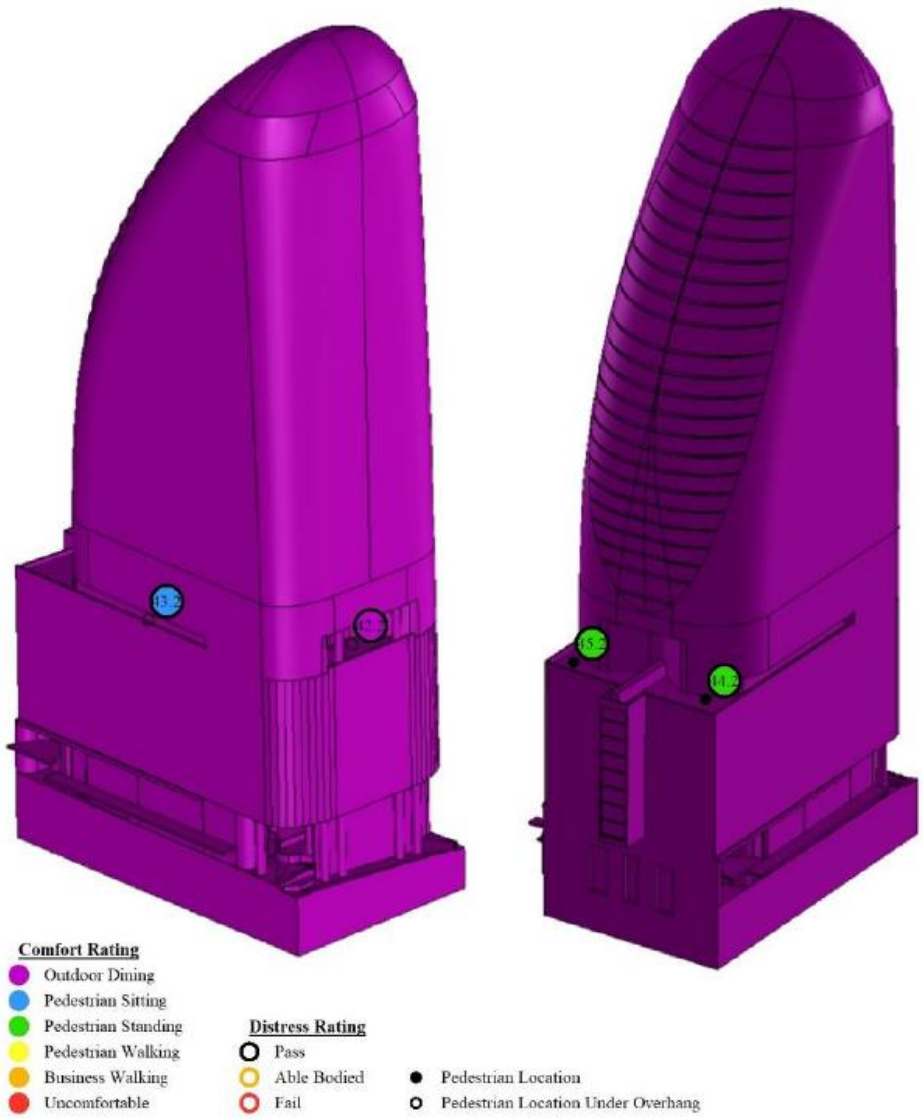

Figure 1: Test locations and Lawson comfort ratings – North Site terraces

South Tower

Tests locations and associated Lawson ratings for the South Tower terrace are shown in Figure 2. The terrace achieves a Pedestrian Standing rating, and conditions are similar to the surrounding ground level areas. The terrace would experience wind speeds less than 4 m/s for approximately 85-90% of the time. With reference to Table 2, this means that there is only 10-15% of the time when this area experiences winds stronger than a light breeze.

Figure 2: Test locations and Lawson comfort ratings – South Site terraces

Overall, measured conditions for the current designs are similar to or better than comparable terraces in the Sydney CBD.

I trust this information is of assistance. Please do not hesitate to contact me if you have any questions regarding any aspect of this letter.

Yours sincerely,

Thomas Evans
Project Engineer
Cermak Peterka Petersen Pty. Ltd.

cc: Joe Paetzold, CPP

REFERENCES

[1] Cermak Peterka Petersen (2018) Wind Tunnel Test for: Martin Place Overstation, *CPP9973_Martin Place Overstation_REP_PW_11R02*, dated 20/07/2018.

[2] Cermak Peterka Petersen (2018) Wind Tunnel Test For: Sydney Metro Martin Place Integrated Station Development North Site, *CPP9973_Martin Place Overstation_North Site_REP_PW_14R01*, dated 20/07/2018.

[3] Cermak Peterka Petersen (2018) Wind Tunnel Test For: Sydney Metro Martin Place Integrated Station Development South Site, *CPP9973_Martin Place Overstation_South Site_REP_PW_15R02*, dated 23/08/2018.

[4] Lawson, T.V. (1990), "The Determination of the Wind Environment of a Building Complex before Construction" Department of Aerospace Engineering, University of Bristol, *Report Number TVL 9025*.

[5] Penwarden, A.D. (1973), "Acceptable wind speeds in towns", Building Science, Vol.8, pp. 259-267.