PEDESTRIAN WIND ENVIRONMENT STATEMENT

75-81 RAILWAY STREET, ROCKDALE

PLANNING PROPOSAL - 28M BUILDING HEIGHT SCHEME

WC327-02F01(REV0)- WS REPORT

20 MARCH 2015

Prepared for:

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DOCUMENT CONTROL

Date	Revision History	Non-Issued Revision	Issued Revision	Prepared By (initials)	Instructed By (initials)	Reviewed & Authorised by (initials)
20/03/2015	Initial	-	0	HK	TR	TR

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EXECUTIVE SUMMARY

This report is in relation to the proposed development located at 75-81 Railway Street, Rockdale, and presents an opinion on the likely impact of the proposed design on the wind environment in the critical outdoor areas within and around the subject development. The effect of wind activity is examined for the three predominant wind directions for the Sydney region; north-easterly, southerly and westerly winds. The analysis of the wind effects relating to the proposal was carried out in the context of the local wind climate, building morphology and land topography.

The conclusions of this report are drawn from our extensive experience in this field and are based on an examination of the architectural drawings which have been prepared by the project architect Candalepas Associates, received March 6, 2015. No wind tunnel tests have been undertaken for the subject development. As such, this report addresses only the general wind effects and any localised effects that are identifiable by visual inspection. Any recommendations in this report are made only in-principle and are based on our extensive experience in the study of wind environment effects around buildings.

The results of this study indicate that the subject development will benefit from shielding provided by the existing surrounding buildings. Several features are proposed for the subject development, which will aid in achieving suitable wind conditions. These features, which should be retained for the final design scheme, are summarised as follows:

- Tree planting in the ground level central courtyard, northern entryway, and southern planting area.
- The ground façade elements on the eastern side of the development.
- Most of the balconies benefit from effective design features such as their recessed design into the overall building footprint, end screens, privacy screens, and impermeable balustrades and/or parapets.
- The setback of the upper level balconies from the extent of the lower level balconies on the eastern and western aspects.
- Proposed rooftop planting, especially on northern and eastern sides and around the central courtyard void, as well as around any potential seating areas.
- Proposed parapet/ impermeable balustrade around the perimeter of the rooftop area of the development.

However, the analysis indicates that some trafficable outdoor areas of the development may be exposed to strong winds, and hence the following treatments are suggested in addition to the abovementioned features:

- An awning over the southern planting area on the southern edge of the development.

- Full-height impermeable end screens on the south-eastern corner balcony on Level 5, and south-western corner balcony on Level 6.
- Full-height impermeable privacy screens for the north-eastern apartment on Level 5 and north-western corner apartment on Level 6.
- Full-height impermeable screens on the eastern edges of the north-western corner apartment on Level 6.
- Extended 2 densely foliating trees planted on either side of the eastern edge tree planting on the roof.
- Hedge planting and/or other forms of dense planting around potential seating areas on the roof.

With the inclusion of the abovementioned treatments, it is expected that adequate wind conditions will be achieved for all outdoor trafficable areas within and around the site. Furthermore, the development is not expected to have any adverse impact onto the wind conditions for the local surrounding area.

1 DESCRIPTION OF THE PROPOSED DEVELOPMENT AND SURROUNDS

The proposed development site is situated at the corner of Railway Street and Parker Street in Rockdale. Immediately surrounding the site are 2 to 4 storey residential buildings to the north, south and west, while the railway line lies to the east Further from the site are mostly 1 to 2 storey residential buildings in to the north, south and west, while to the east lies 2-3 storey commercial buildings. Rockdale Station situated to the south-east of the site. The land topography around the site generally flat in all directions, with a slight upwards slope to the east of the development site. An aerial image of the subject site location is shown in Figure 1 below.

The subject development consists of 121 residential apartments on Levels 1 to 8, commercial spaces located on the ground floor, as well as an open courtyard. Car parking is also proposed over 2-3 basement levels. Each of the apartments have a private balcony area. A communal landscaped area is proposed on Level 8 (rooftop).

Figure 1: Aerial Image of the Proposed Development Site

2 WIND CLIMATE OF THE SYDNEY REGION

The Sydney region is governed by three principal wind directions, and these can potentially affect the subject development. These winds prevail from the north-east, south and west. A summary of the principal time of occurrence of these winds throughout the year is presented in Table 1 below. This summary is based on a detailed analysis undertaken by Windtech Consultants of recorded directional wind speeds obtained at the meteorological station located at Kingsford Smith Airport by the Bureau of Meteorology (recorded from 1939 to 2008). From this analysis, a directional plot of the annual and weekly recurrence winds for the Sydney region is also determined, as shown in Figure 2. The frequency of occurrence of these winds is also shown in Figure 2.

As shown in Figure 2, the southerly winds are by far the most frequent wind for the Sydney region, and are also the strongest. The westerly winds occur most frequently during the winter season for the Sydney region, and although they are typically not as strong as the southerly winds, they are usually a cold wind since they occur during the winter and hence can be a cause for discomfort for outdoor areas. North-easterly winds occur most frequently during the warmer months of the year for the Sydney region, and hence are usually welcomed within outdoor areas since they are typically not as strong as the southerly or westerly winds.

Table 1: Principal Time of Occurrence of Winds for Sydney

Month	Wind Direction		
	North-Easterly	Southerly	Westerly
January	X	X	
February	X	X	
March	X	X	
April		X	X
May			X
June			X
July			X
August			X
September		X	X
October	X	X	
November	X	X	
December	X	X	

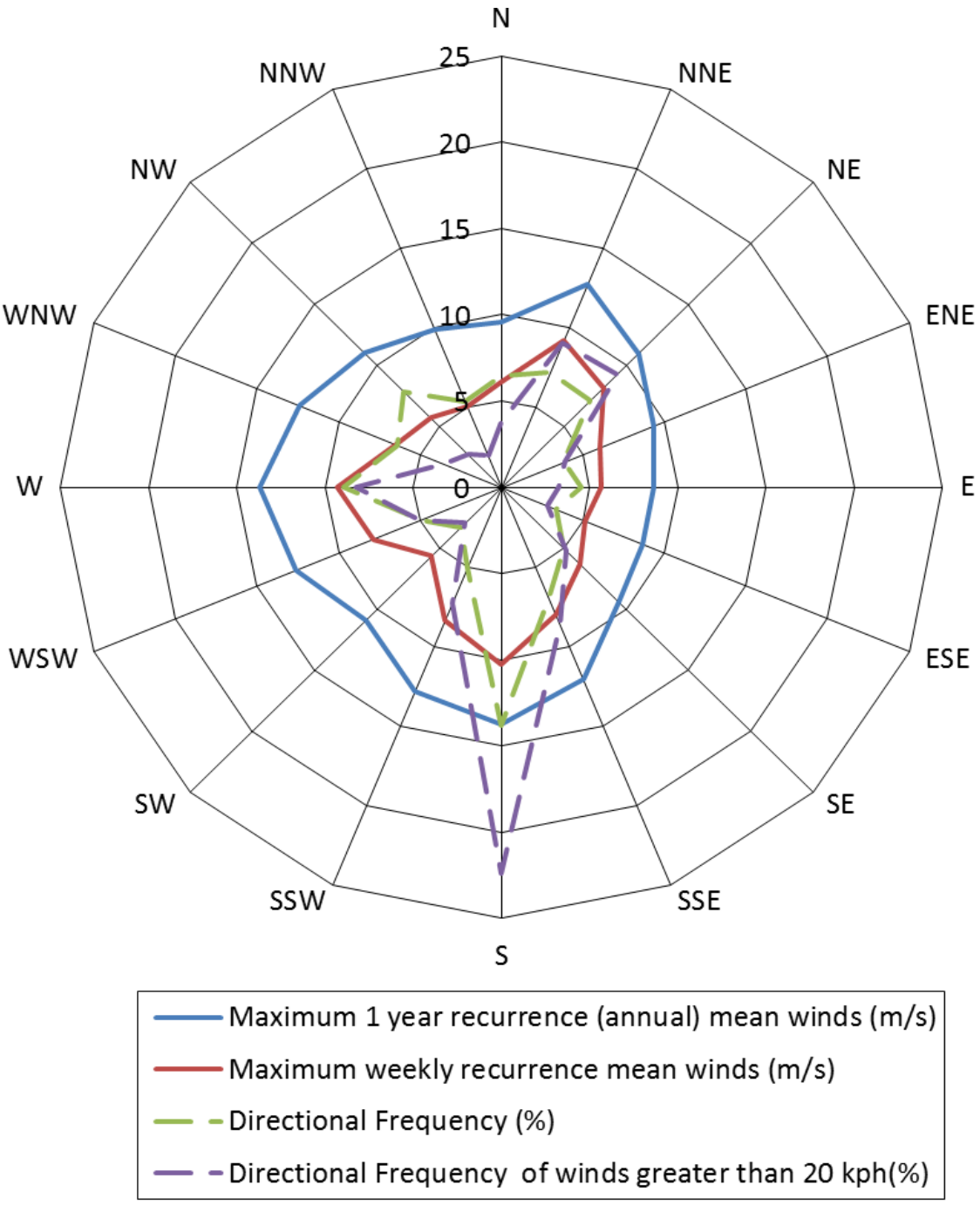

Figure 2: Annual and Weekly Recurrence Mean Wind Speeds, and Frequencies of Occurrence, for the Sydney Region (based on 10-minute mean observations from Kingsford Smith Airport from 1939 to 2008, corrected to open terrain at 10m)

3 WIND EFFECTS ON PEOPLE

The acceptability of wind in any area is dependent upon its use. For example, people walking or window-shopping will tolerate higher wind speeds than those seated at an outdoor restaurant. Various other researchers, such as Davenport, Lawson, Melbourne, Penwarden, etc, have published criteria for pedestrian comfort for pedestrians in outdoor spaces for various types of activities. Some Councils and Local Government Authorities have also adopted elements of some of these into their planning control requirements in Australia. The following table is an example, which was developed by Penwarden in 1975, and describes the effects of various wind intensities on people. Note that the applicability column relates to the indicated wind conditions occurring frequently (exceeded approximately once per week on average). Higher ranges of wind speeds can be tolerated for rarer events.

Table 2: Summary of Wind Effects on People (Penwarden, 1975)

Type of Winds	Gust Speed (m/s)	Effects	Applicability
Calm, light air	0 - 1.5	Calm, no noticeable wind.	Generally acceptable for Stationary, long exposure activities such as in outdoor restaurants, landscaped gardens and open air theatres.
Light breeze	1.6 - 3.3	Wind felt on face.	
Gentle breeze	3.4 - 5.4	Hair is disturbed, Clothing flaps.	
Moderate breeze	5.5 - 7.9	Raises dust, dry soil and loose paper. Hair disarranged.	Generally acceptable for walking & stationary, short exposure activities such as window shopping, standing or sitting in plazas.
Fresh breeze	8.0 - 10.7	Force of wind felt on body.	Acceptable as a main pedestrian thoroughfare
Strong breeze	10.8 - 13.8	Umbrellas used with difficulty, Hair blown straight, Difficult to walk steadily, Wind noise on ears unpleasant.	Acceptable for areas where there is little pedestrian activity or for fast walking.
Near gale	13.9 - 17.1	Inconvenience felt when walking.	
Gale	17.2 -20.7	Generally impedes progress, Great difficulty with balance.	Unacceptable as a public accessway.
Strong gale	20.8 - 24.4	People blown over by gusts.	Completely unacceptable.

It should be noted that wind speeds can only be accurately quantified with a wind tunnel study. This assessment addresses only the general wind effects and any localised effects that are identifiable by visual inspection, and the acceptability of the conditions for outdoor areas are determined based on their intended use (rather than referencing specific wind speeds). Any recommendations in this report are made only in-principle and are based on our extensive experience in the study of wind environment effects.

4 RESULTS AND DISCUSSION

The expected wind conditions are discussed in this section for the various outdoor areas within and around the subject development for each of the three predominant wind directions for the Sydney region. The interaction between the wind and the building morphology in the area was considered, and important features taken into account include the distances between the proposed building form, their overall heights and bulk, as well as the landform. Note that only the potentially critical wind effects are discussed in this report.

4.1 Pedestrian Footpaths and Ground Level Courtyard

With the inclusion of the proposed development, the wind conditions for the pedestrian footpaths along Railway Street, Parker Street and Heston Lane are expected to be similar to, or better than, the existing wind conditions. The existing buildings located to the south and west of the development site assist in providing shielding from direct southerly and westerly wind for the lower levels wind effects. The proposed setback of the upper level balconies on the eastern and western aspects will mitigate any potential downwash effects from the development.

The proposed courtyard has the potential to experience some adverse winds caused by a pressure differential between the northern and southern aspects of the development. However, the proposed trees to the north, south, and central courtyard are expected to be effective in providing suitable wind conditions for this area. Note that, to be effective in wind mitigation, the proposed vegetation to be retained should be densely foliating. In addition north-easterly winds are less of a concern due to the prevalence during the warmer months.

The residential entry on the eastern aspect is exposed to southerly and north-easterly winds. It is recommended to retain the façade elements on either side of the entryway to mitigate these effects. An awning over the southern courtyard planting area is recommended to mitigate direct southerly winds.

It is not expected that the proposed development will cause any adverse wind effects to the ground level areas of neighbouring sites. With the inclusion of the proposed development, wind conditions for those areas are expected to either remain as they are now, or even be improved, due to the shielding that the proposed development provides.

Hence, with the retention of the proposed planting, and the addition of the recommended treatments, the wind conditions for the various trafficable ground level areas within and around the subject site are expected to be suitable for their intended uses.

4.2 Private Balconies

Wind conditions for the majority of private balconies of the proposed development are expected to be suitable for their intended use by the occupants. This is due to the effective proposed design, including recessing the balcony areas into the buildings form, privacy screens between adjacent balconies, and impermeable balustrades. However, the corner balcony areas (specifically the north-eastern and south eastern balconies on Level 5 and north-western and south-western balconies on Level 6) are expected to be exposed to the prevailing winds. To mitigate these effects, the elements to be retained and further treatments are suggested are as follows:

- Impermeable balustrades on the upper level balconies.
- Full-height impermeable end screens on the south-eastern corner balcony on Level 5, and south-western corner balcony on Level 6.
- Full-height impermeable privacy screens for the north-eastern apartment on Level 5 and north-western corner apartment on Level 6.
- Full-height impermeable screens on the eastern edges of the north-western balcony on Level 6.

4.3 Level 8 Rooftop

The Level 8 rooftop area is subject to winds from the north-easterly and southerly critical wind directions for the region as the westerlies are shielded by the Level 8 apartments. The proposed landscaping and tree planting on this level will greatly assist in mitigating adverse winds, and is hence recommended to be retained for the final landscaping design of the development, especially around any potential seating areas, and around the central courtyard void. However, further tree planting is recommended on this floor. 2 additional trees on each side of the proposed line of trees on the eastern edge of the rooftop is recommended.

Furthermore, the proposed parapets around the perimeter of the rooftop area will also be effective in mitigating adverse winds, and is also recommended to be retained for the final design. Hedge planting or other forms of dense planting around potential rooftop seating areas is also recommended. Note that, to be effective in wind mitigation, the proposed vegetation should be densely foliating.

5 CONCLUSION

An analysis of the wind environment impact with respect to the three principal wind directions for the Sydney region has been undertaken for the proposed development located at 75-81 Railway Street, Rockdale. The conclusions of this report are drawn from our extensive experience in this field and are based on an examination of the architectural drawings prepared by project architect Candalepas Associates, received March 6, 2015. No wind tunnel tests have been undertaken for the subject development. As such, this report addresses only the general wind effects and any localised effects that are identifiable by visual inspection. Any recommendations in this report are made only in-principle and are based on our extensive experience in the study of wind environment effects around buildings.

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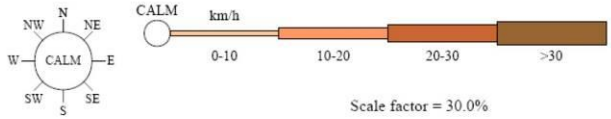
With the inclusion of the abovementioned treatments, it is expected that adequate wind conditions will be achieved for all outdoor trafficable areas within and around the site. Furthermore, the development is not expected to have any adverse impact onto the wind conditions for the local surrounding area.

6 APPENDIX – SYDNEY WIND ROSES

WIND FREQUENCY ANALYSIS (in km/h)

SYDNEY AIRPORT AMO STATION NUMBER 066037

Latitude: -33.94 ° Longitude: 151.17 °



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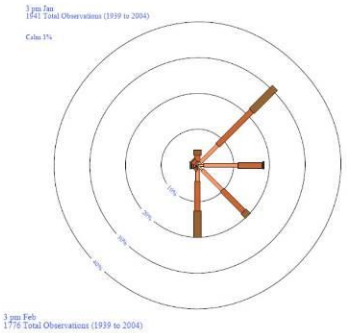

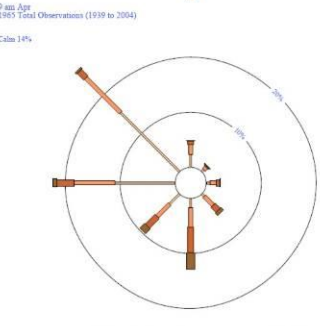

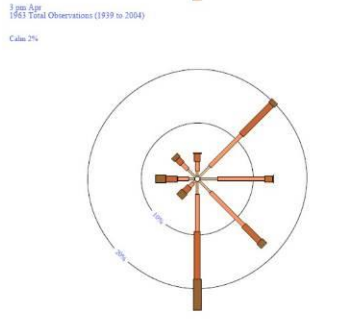

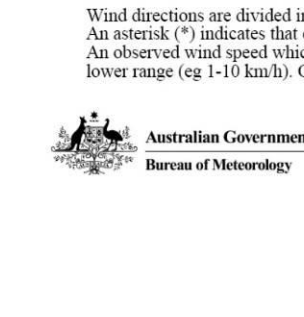

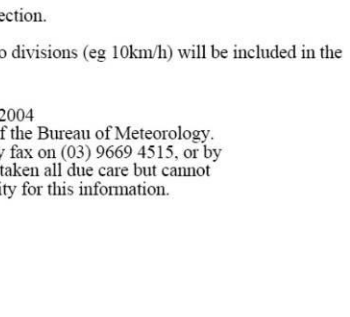

Wind directions are divided into eight compass directions. Calm has no direction.
An asterisk (*) indicates that calm is less than 1% .
An observed wind speed which falls precisely on the boundary between two divisions (eg 10km/h) will be included in the lower range (eg 1-10 km/h). Only quality controlled data have been used.

Australian Government
Bureau of Meteorology

WIND FREQUENCY ANALYSIS (in km/h)

SYDNEY AIRPORT AMO STATION NUMBER 066037

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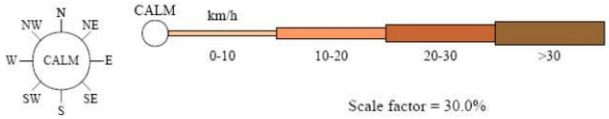

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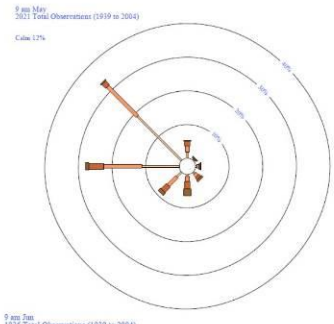

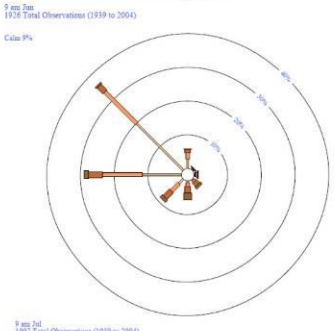

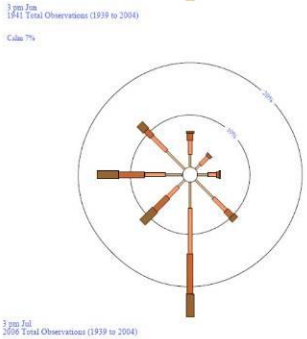

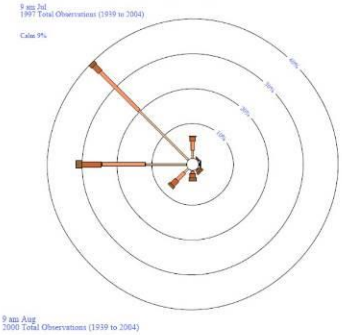

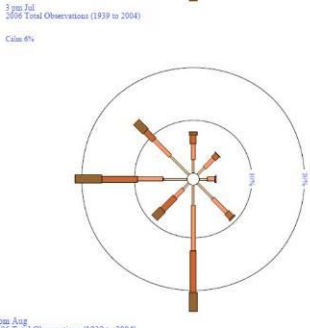

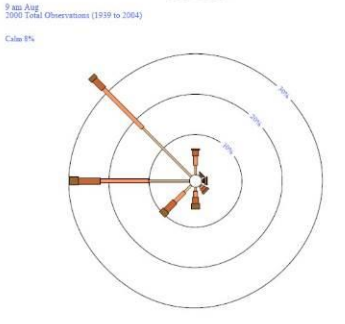

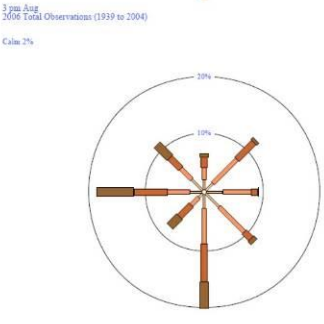

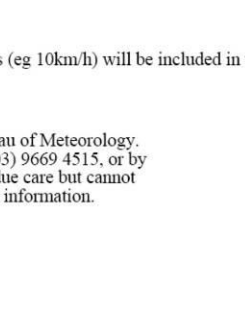

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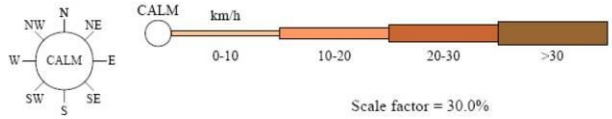

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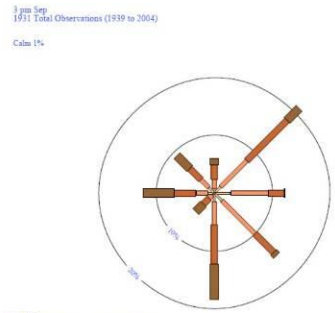

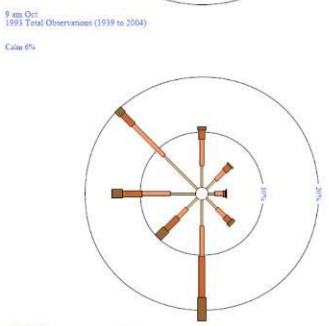

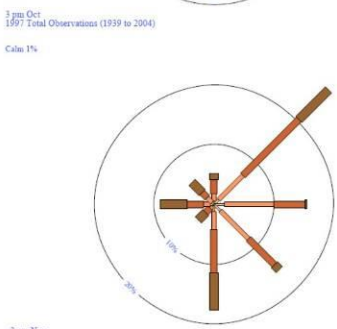

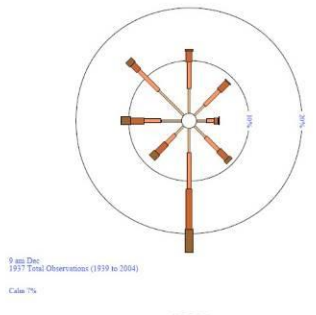

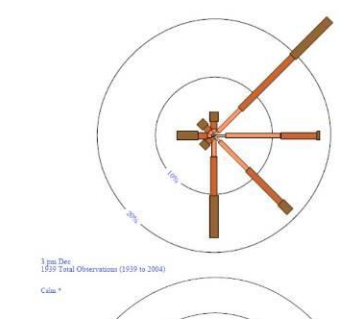

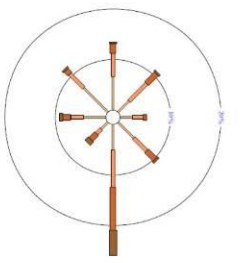

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