IN2
ENGINEERING DESIGN PARTNERSHIP
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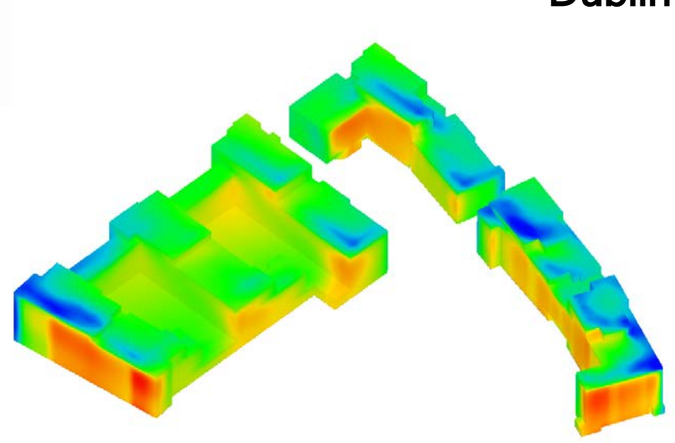
Greenleaf Homes Limited

Greenleaf GROUP

Proposed Residential Development

The Former Gallagher Site,
Airton Road,
Tallaght,
Dublin 24



Microclimatic Wind Analysis and Pedestrian Comfort Report
Planning Stage

IN2 Project No. D1919
Rev.01
13th January 2020

CONTENTS

1.0 EXECUTIVE SUMMARY

This report summarises the results of wind analysis and associated pedestrian comfort carried out for the proposed Airton Residential development located at The Former Gallagher site, Airton Road, Tallaght, Dublin 24, based on 3D model information as received from Ferreira Architects, as well as neighbouring buildings and terrain.

Wind Analysis

Wind analysis around the building was completed utilising Computational Fluid Dynamics (CFD) for the proposed building, as detailed in Section 2.0. This determined regions of positive and negative pressures, with associated microclimatic air velocities, for the proposed development for varying wind speeds and directions. The results of this initial CFD analysis found that generally predicted pressure differentials and associated air velocities were not excessive around the development.

Pedestrian Comfort

Predicted pedestrian comfort due to wind was assessed utilising the “Lawson Criteria”, an index of how usable an external space may be for comfortable sitting/walking etc. which accounts for the annual probability of wind direction and speed as applied to microclimatic conditions. Section 3.0 outlines the methodology utilised for pedestrian comfort; as well as analysing predicted conditions at ground level, rooftop amenity spaces and balconies.

The proposed development was predicted to not negatively impact on the micro-climate at ground level with respect to surrounding buildings, with no areas determined as being “Not Suitable for Pedestrian Comfort” in accordance with the Lawson Criteria utilised within the analysis.

All amenity spaces and balconies in the proposed development had were determined to be suitable for either “Long” or “Short Term Sitting”, in accordance with the methodology.

The analysis identified relatively sheltered conditions for Block D roof terrace, as the building mass of Blocks A, B and C in the proposed development provides sheltering from prevailing W / SW wind direction.

The analysis also demonstrated that localised landscaping effects as proposed for the development were found to mitigate against pedestrian discomfort, in particular to the walkway adjacent to basement car park ramp located at the under-croft below Block F.

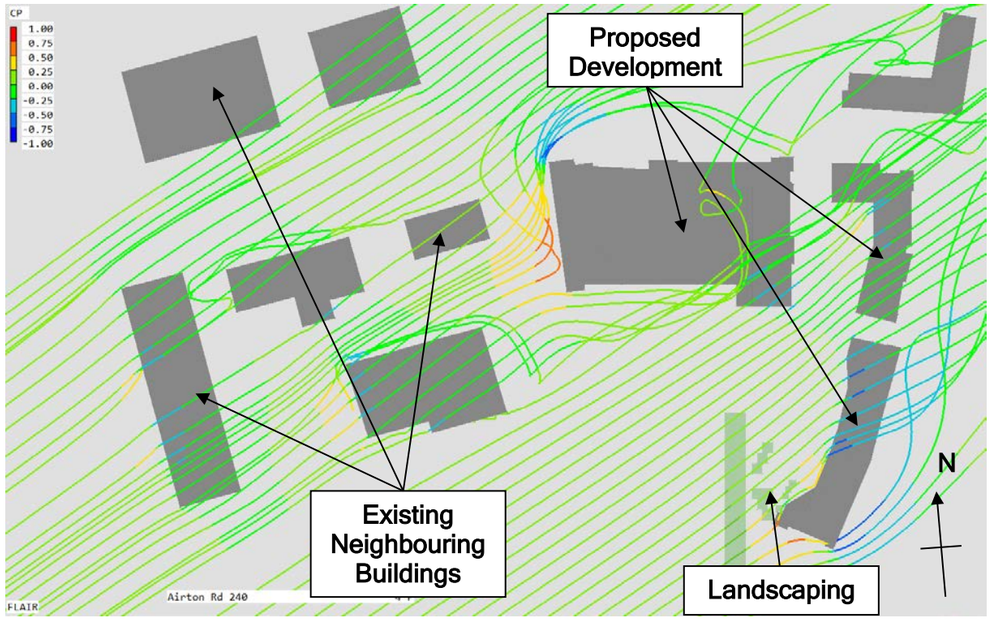


Fig 1 – CFD Model of proposed Airton Road Residential development with Blocks A – F identified

2.0 WIND ANALYSIS

2.1 Methodology

In order to determine the predicted wind patterns around the proposed development, airflow simulations were undertaken using Computational Fluid Dynamics (CFD) software (Phoenics / Flair).

This enabled an assessment of the site wind conditions, calculating zones of high pressure, negative pressure, and predicted air velocities/directions for varying wind conditions.

An initial 3D representational model of the proposed buildings and their immediate surroundings was created (Figure 2.1.1), representing the proposed development (Residential Blocks A – F) and existing neighbouring buildings.

The CFD simulations utilised wind profiles accounting for terrain effects. Allowing for the relatively exposed nature of the site, a boundary layer profile representative of the terrain was utilised, with assumed average obstruction height of 0.25m – i.e. “High Crops, Scattered Obstacles”.

Figure 2.2 (over) indicates predicted pressure co-efficient contours for each wind direction. Red contours indicate regions of positive pressure, green as neutral and blue negative. The images indicate wind pressures on the proposed buildings are not excessive.

Figure 2.3 indicates predicted velocity contours for each wind direction. Red contours indicate regions of higher velocities, green as moderate, and blue as low velocities. The results illustrate low air velocities within the communal courtyard amenity areas for all wind directions.

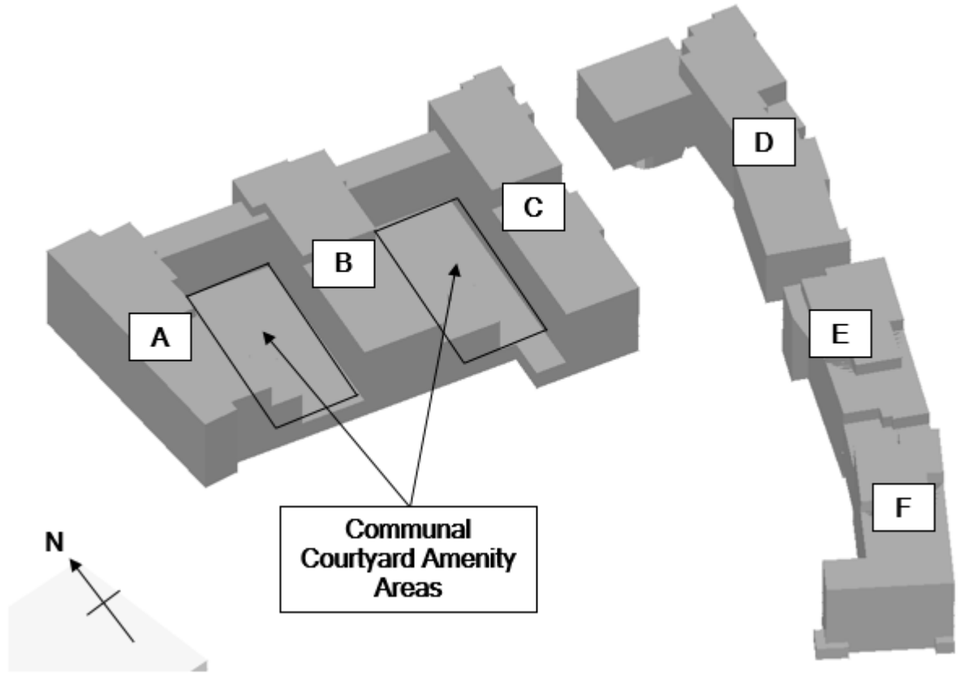


Fig 2.1.1 – 3D Model of proposed Airton Road Residential development with Blocks A – F identified

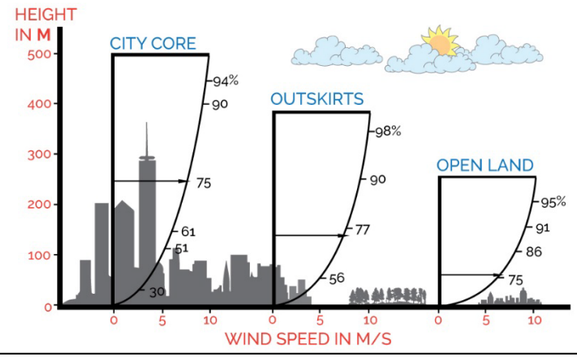
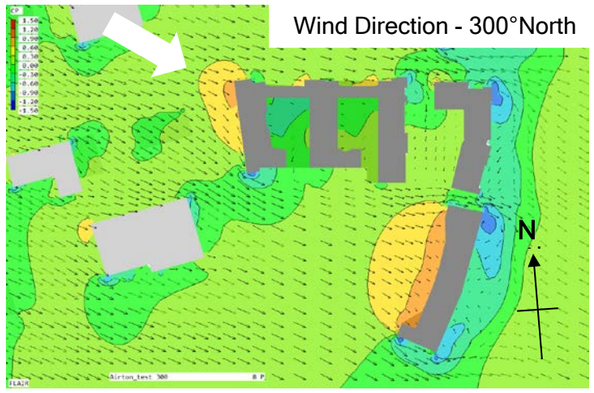
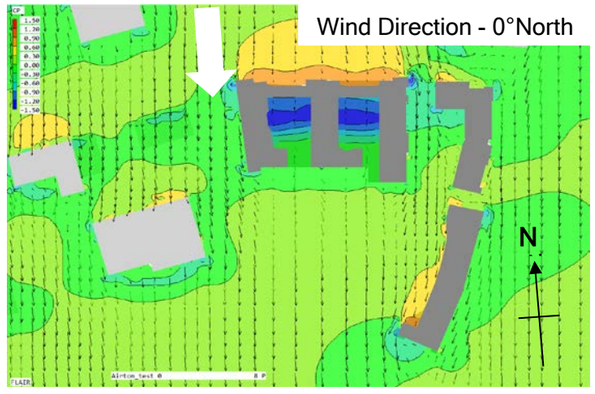


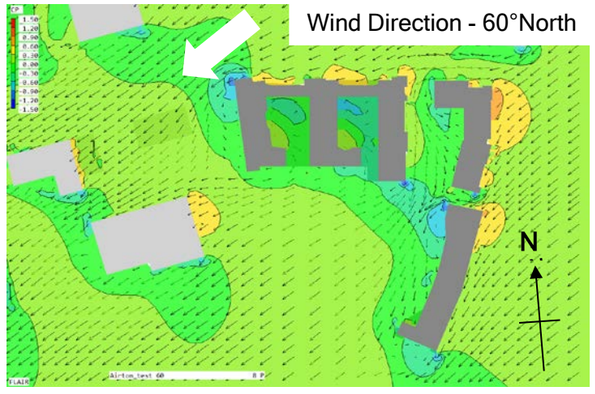
Fig 2.1.2 – Wind Profiles Accounting for Terrain Effects

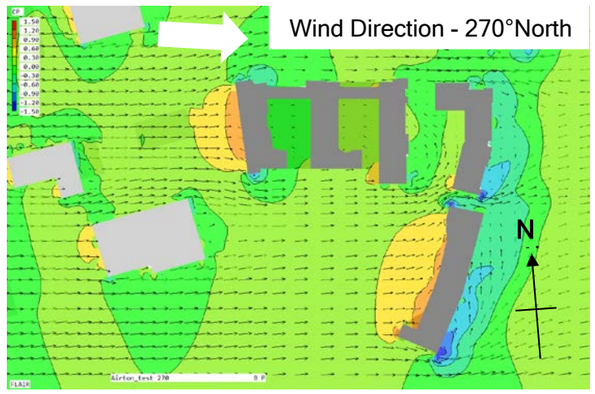
2.0 WIND ANALYSIS

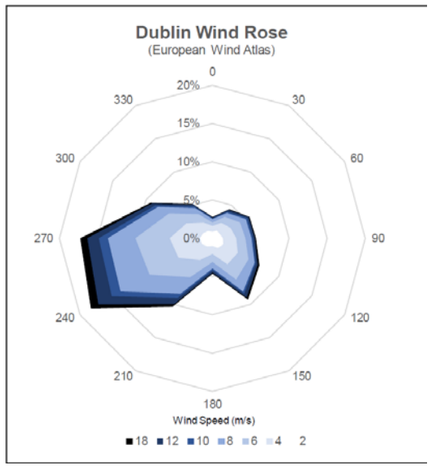
2.2 Results (Wind Pressure Coefficients)

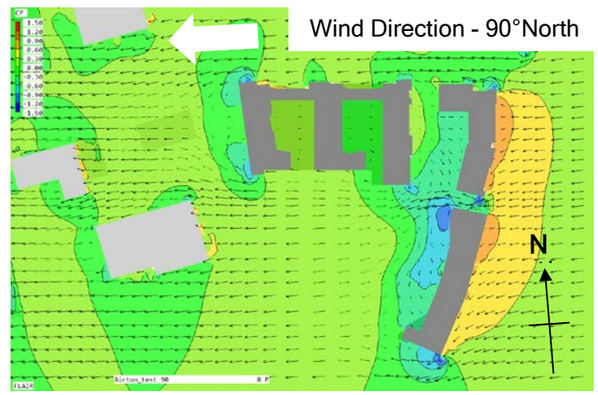


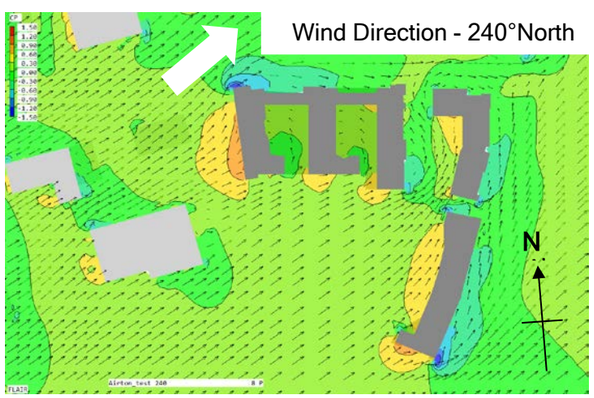


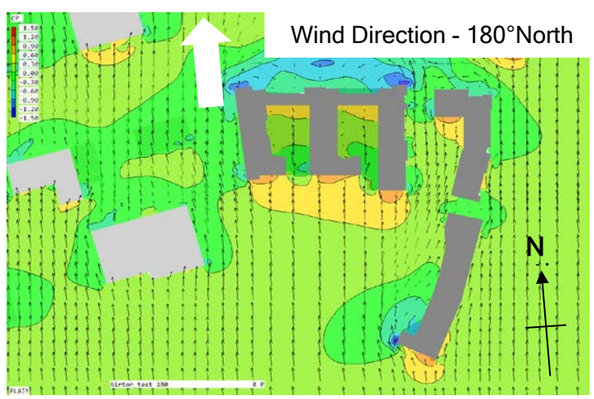


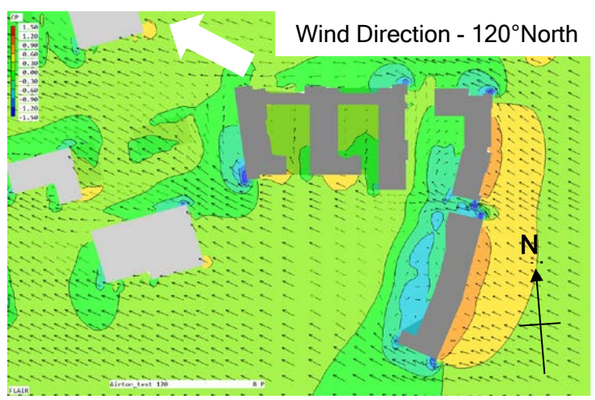








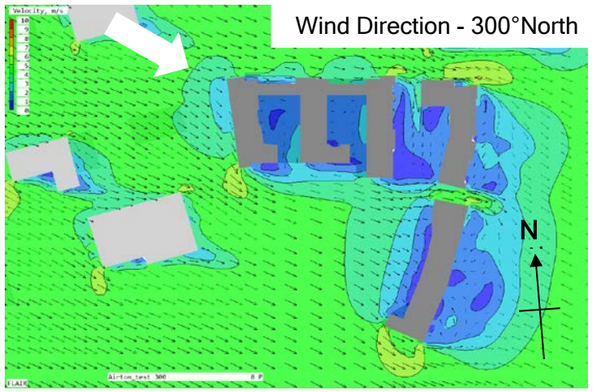




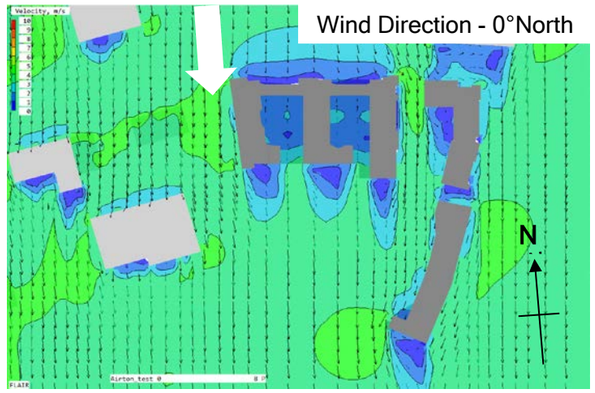
2.0 WIND ANALYSIS

2.3 Results (Wind Velocities)

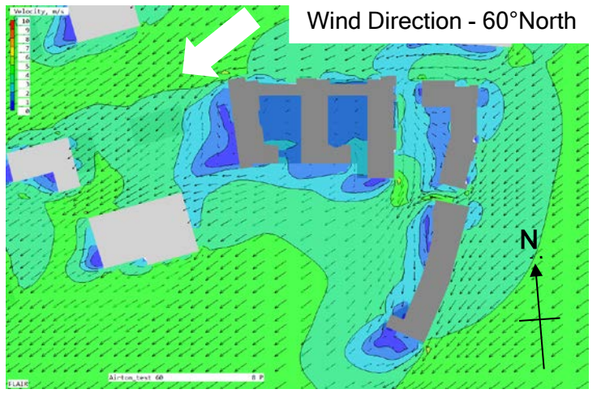
Wind Direction - 300°North



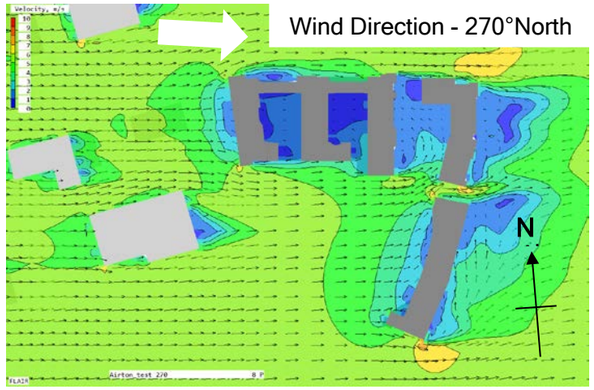
Wind Direction - 0°North

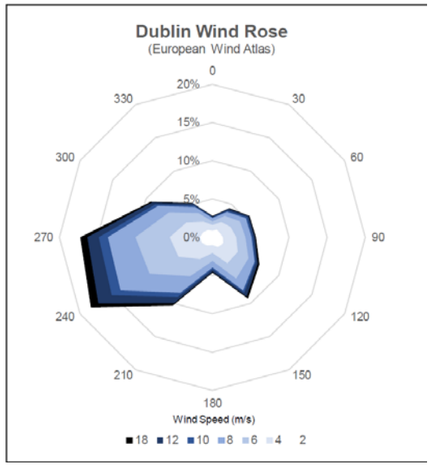


Wind Direction - 60°North

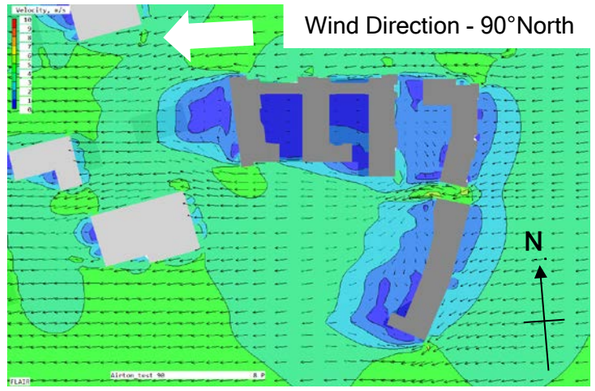


Wind Direction - 270°North

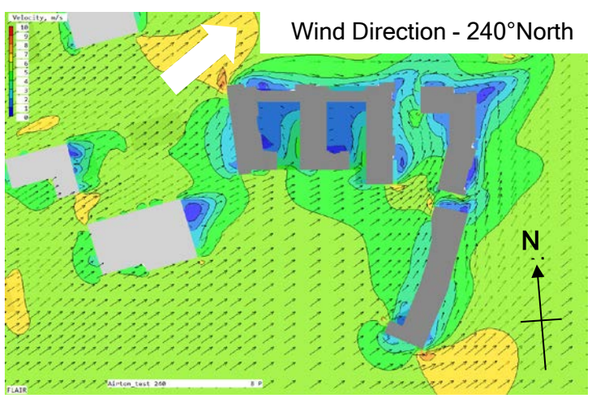




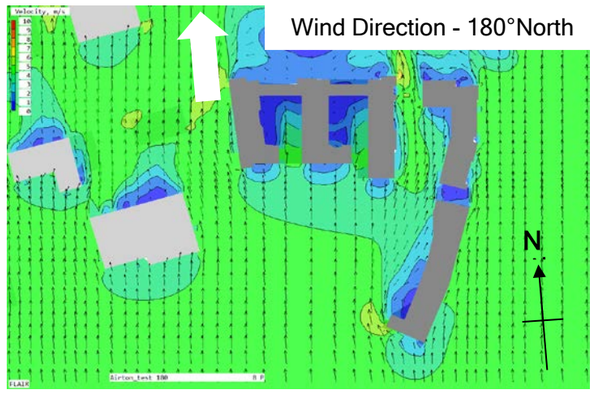
Wind Direction - 90°North



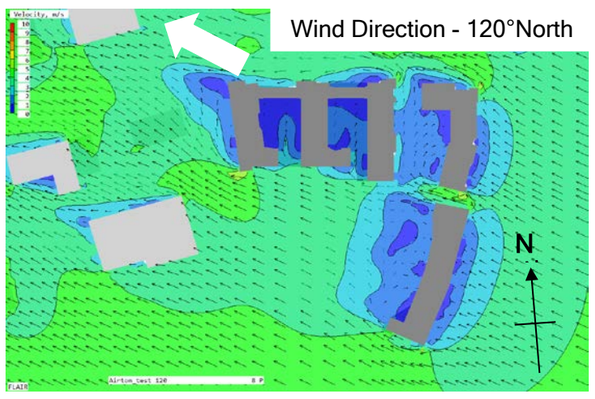
Wind Direction - 240°North



Wind Direction - 180°North



Wind Direction - 120°North



2.0 WIND ANALYSIS

2.2 Results (Cont'd)

In addition to pressures and airflow patterns around the buildings, results for the predicted surface contours of pressure coefficients on the building for the prevailing SW wind direction were also compiled as indicated in Figures 2.2.3. Positive pressures are indicated as red contours, negative pressures are blue, with neutral green.

These images indicate predicted pressures on the proposed buildings are generally neutral, with some higher pressure differentials to the western face of Block A, and the SW corner of Block F.

The generally curved design of Blocks E and F aid the dampening of prevailing W/SW winds.

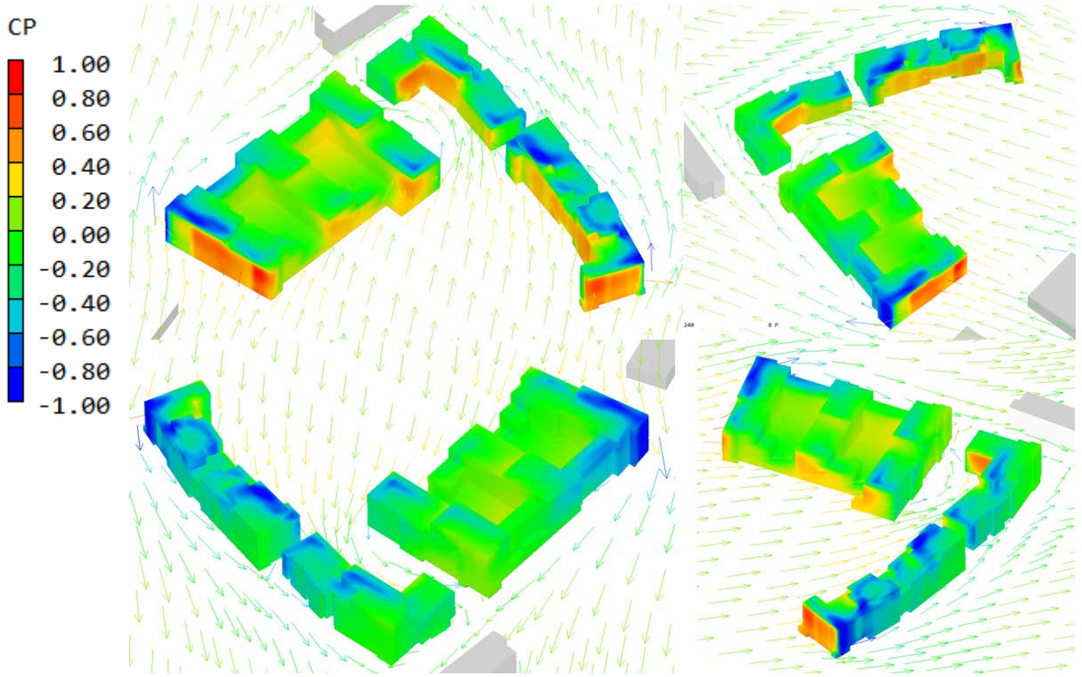


Fig 2.2.3 - Surface Wind Pressure Coefficients around the Building for Prevailing Wind (240°) Direction

3.0 PEDESTRIAN COMFORT

3.1 Methodology

Pedestrian Wind Comfort was assessed utilising the "Lawson Criteria" scale, which has been developed as a means of assessing the long term suitability of urban areas for walking or sitting, accounting for both microclimatic wind effects (i.e. site location and prevailing winds) and microclimatic air movement associated with wind forces influenced by the localised built environment form. Figure 3.1.1 illustrates the Lawson Criteria scale; which ranges from areas deemed suitable for long term sitting through to regions not suitable for pedestrian comfort, as wind effects and associated air velocities would be too excessive for significant periods of the year.

The methodology calculates predicted airflow patterns around buildings for all wind orientations and calculates average velocity applying weighting based on probability of occurrence throughout the year. Therefore, wind effects around buildings for prevailing wind conditions are deemed to have more of a potential impact to pedestrian discomfort, as these will occur on a more regular occurrence.

However, it may be noted that in terms of pedestrian comfort, the Lawson Criteria assesses solely for wind/associated air velocity effects. Therefore, other environmental aspects that may influence a space's microclimate, such as exposure to sunlight and envisaged temperature variation throughout the year are not accounted for within this methodology.

In terms of microclimate assessment, wind data for the nearest available meteorological station at Dublin Airport was utilised. Analysis is based on frequency of hourly wind speeds and direction data included in European Wind Atlas for Dublin Airport. It may be noted that wind data and subsequent analysis is therefore based on hourly averages and does not include for example, intermittent gusting effects.

Figure 3.1.2 indicates the long-term annual "Wind Rose" for Dublin Airport. The rose diagram illustrates the frequency that wind will be from a certain direction and at what speed. It can be seen how the prevailing South Westerly winds entirely predominate for Dublin due to Atlantic gulf stream, with only lower occurrence from other directions- notably South East, which tend to occur during warm summer weather due to offshore breeze effects.

Furthermore, higher wind speeds (which accentuate pedestrian discomfort) occur almost entirely for prevailing South Westerly conditions and therefore will predominate in terms of the potential impact on pedestrian comfort as analysed below.

Lawson Criteria	Colour
Suitable for long term Sitting	
Suitable for Standing or short term Sitting	
Suitable for Walking and Strolling	
Suitable for Business Walking	
Not Suitable for Pedestrian Comfort	

Figure 3.1.1 – Lawson Criteria Scale

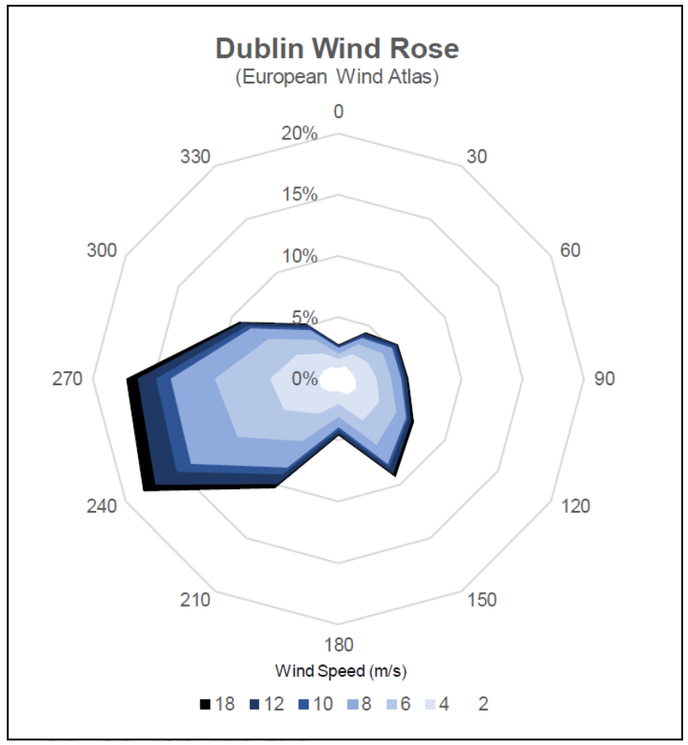


Figure 3.1.2 – Windrose Dublin

3.0 PEDESTRIAN COMFORT

3.2 Ground Level

CFD simulations were undertaken for the proposed building configurations as illustrated in Fig's. 3.2.1 & 3.2.2.

Pedestrian comfort at ground level was assessed by predicting Lawson Criteria values at 1.5m above ground level (indicative of average height sitting/ standing).

Grey/ cyan contours illustrate areas deemed suitable for either "Long" or "Short Term Sitting" (grey/ cyan contours) respectively as well as standing. Green contours indicate areas "Suitable for Walking and Strolling", with yellow illustrative of being "Suitable for Business Walking". There were no red areas determined within the analysis, hence no zones predicted as not suitable for pedestrians, except localised conditions to under croft below Block F.

Whilst this area is to predominantly comprise of a car park ramp to basement level, there are intended to be some pedestrian walkways and entrance doorways to this area also.

This area was therefore assessed in higher detail, including representation of the proposed landscaping arrangement, comprising of trees (existing mature poplar trees) and vegetation, as proposed by Mitchell + Associates.

Fig 3.2.3 illustrates how the landscaping effects were determined to significantly mitigate wind conditions within the under-croft area, (compared to Fig 3.2.2 which shows conditions for theoretical no landscaping condition), ensuring pedestrian walkways and entrance doorways were deemed suitable for their intended use.

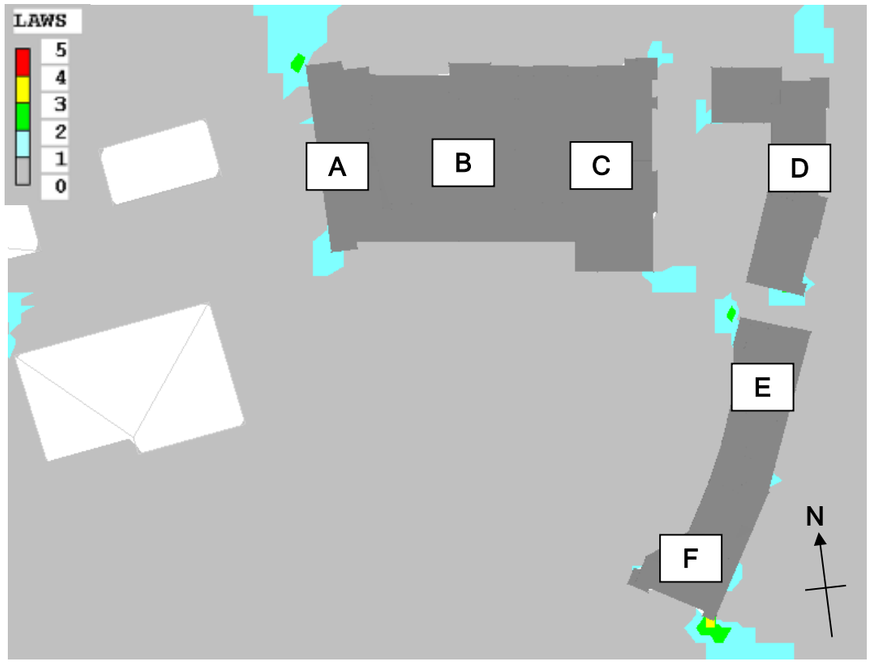


Figure 3.2.1 - Lawson Criteria 1.5m above Ground - Plan View

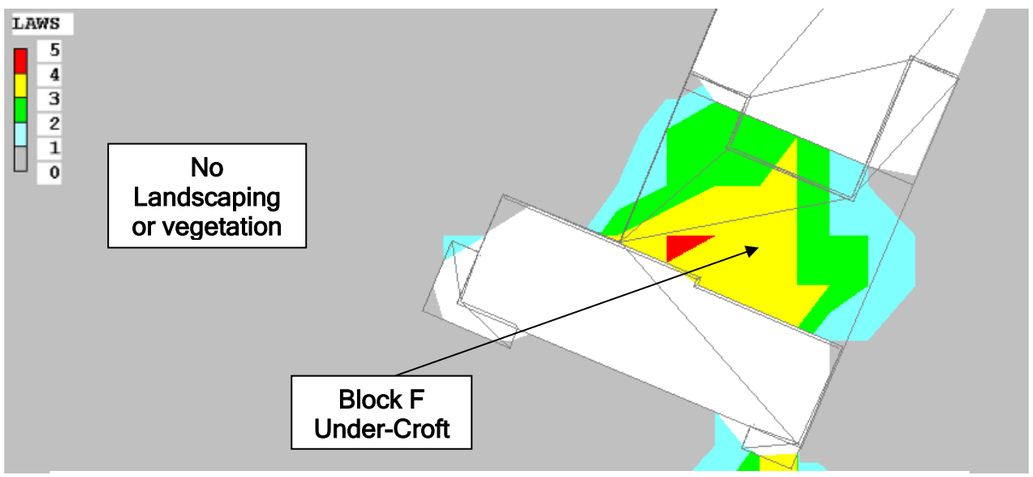


Figure 3.2.2 - Block F Under-Croft

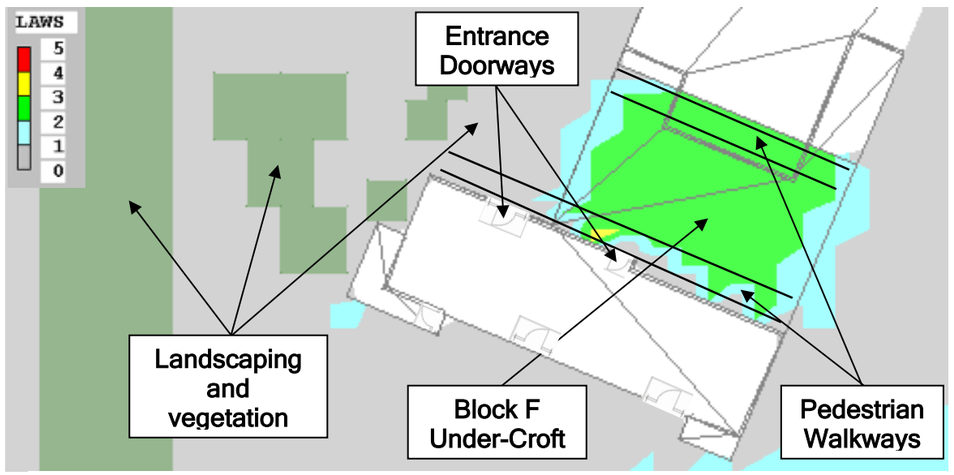


Figure 3.2.3 - Block F Under-Croft

3.0 PEDESTRIAN COMFORT

3.3 Podium Level

Communal amenity spaces are to be provided as part of the proposed development, between Blocks A, B and C. These are at a raised podium level.

Pedestrian comfort at podium level was assessed by predicting Lawson Criteria values at 1.5m above podium level (indicative of average height sitting/ standing).

As illustrated in Fig 3.3.1, all of the area within these courtyards are Grey/ cyan contours, illustrative of areas deemed suitable for either “Long” or “Short Term Sitting” respectively as well as standing.

Therefore, they are predicted to be well suited to their intended use as amenity spaces, their generally enclosed nature enabling good sheltering from wind.

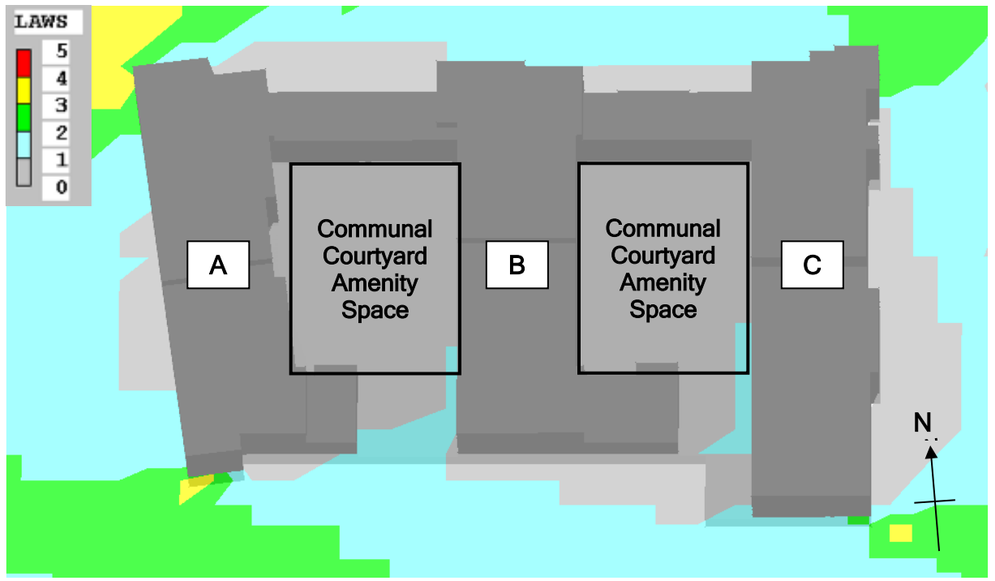


Figure 3.3.1 - Podium Level Communal Courtyard Amenity Space

3.0 PEDESTRIAN COMFORT

3.4 Rooftop Amenity (Block D)

The proposed Rooftop Amenity spaces to Block D roof level were found to be generally well sheltered, with conditions deemed suitable for sitting (grey contours) throughout.

These rooftop areas were determined to be well sheltered by the mass of Blocks A, B and C, which extend to taller heights than these rooftop amenity spaces during prevailing wind conditions.

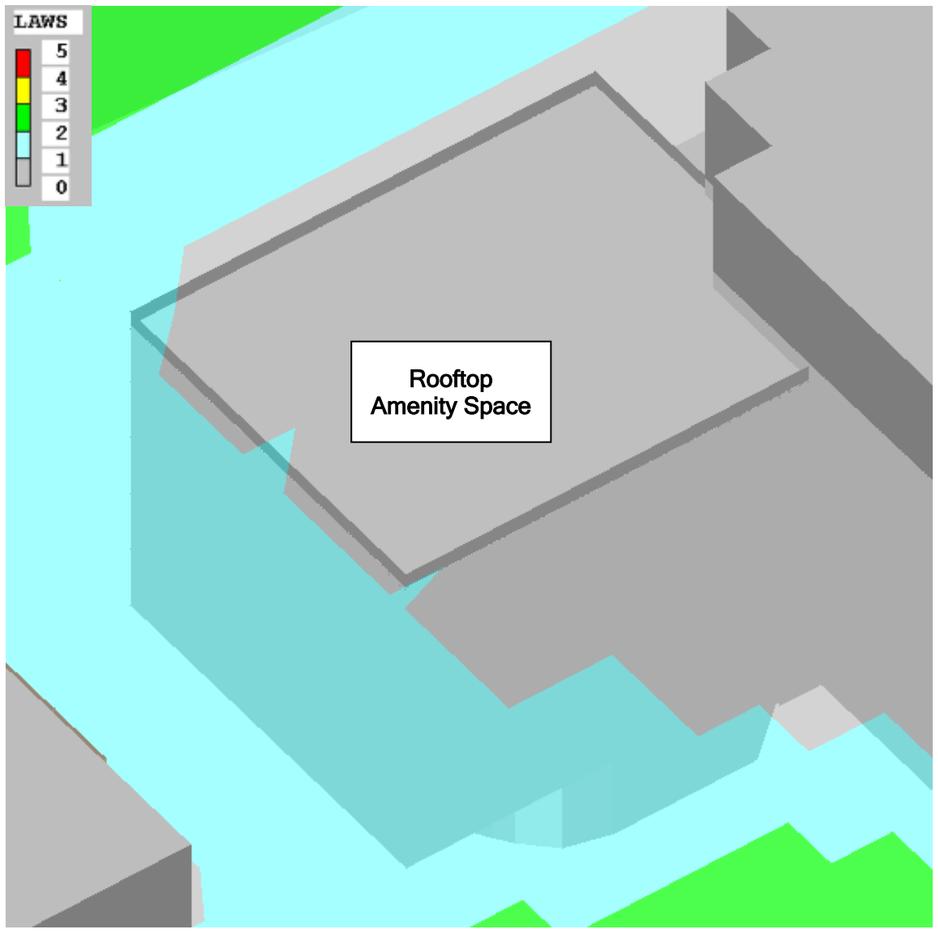


Figure 3.4.1 - Bock D Roof Amenity Space (North)

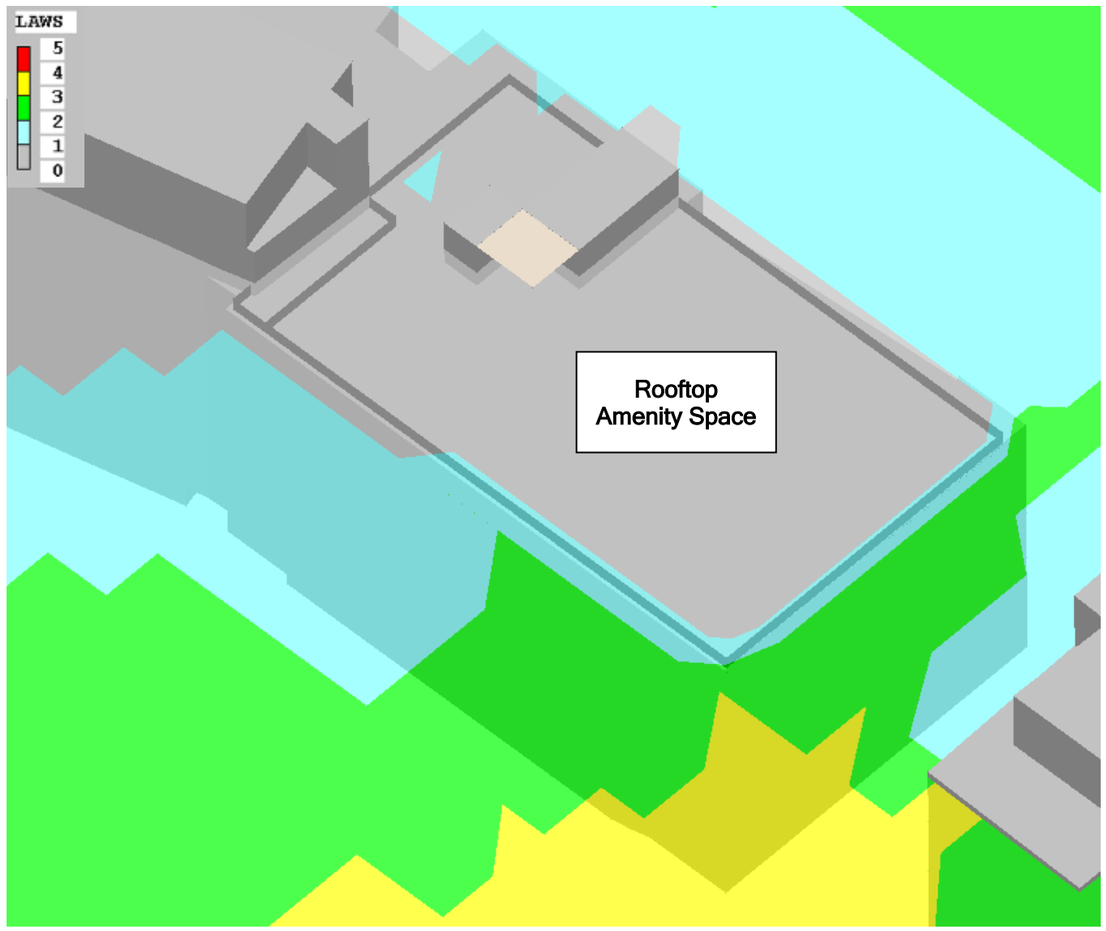


Figure 3.4.2 - Bock D Roof Amenity Space (South)

3.0 PEDESTRIAN COMFORT

3.5 Balconies

The pedestrian wind comfort conditions for balconies in the proposed development were determined to be favourable for their intended use as private amenity spaces.

Through detailed simulation and analysis, it was found that all balconies were deemed fully sheltered (grey/cyan contours), hence based on the Lawson Criteria they are determined to be suited to either “Long” or “Short Term Sitting”, and can therefore be utilised as Amenity spaces.

The “worst-case scenario” for the development are the balconies located at the highest level, being the 8th Floor of Block C, for which the results for pedestrian comfort at this level is illustrated in Fig 3.5.1. Balconies were predicted to have all their areas determined to be suitable for sitting, as indicated by grey/cyan contours. Other balconies across the development were determined to achieve similar or better levels of pedestrian comfort.

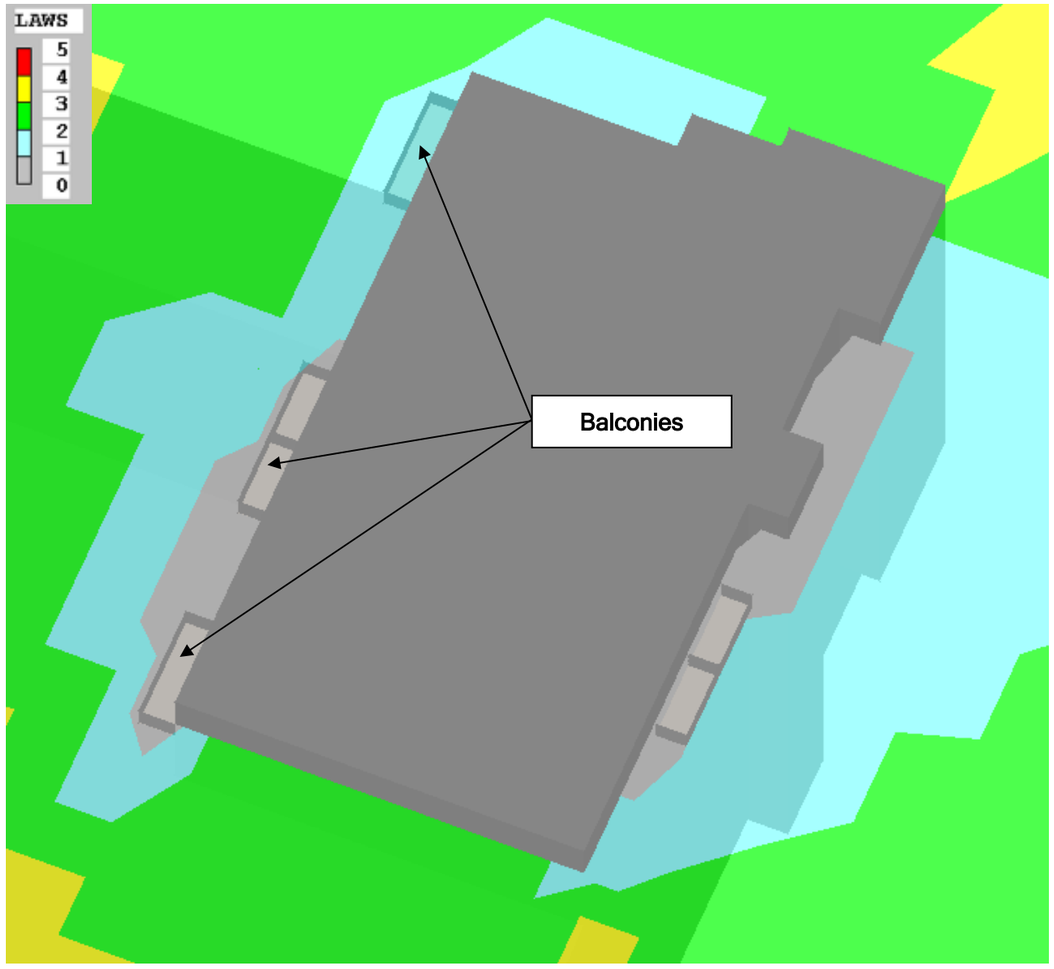


Figure 3.5.1 - Lawson Criteria for Balconies, Block C 8th Floor

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