

WIND MICROCLIMATE

(Pearce)

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IN THE MATTER OF AN APPLICATION TO
AN BORD PLEANÁLA
FOR PERMISSION FOR
STRATEGIC INFRASTRUCTURE DEVELOPMENT
(THE CHILDREN'S HOSPITAL OF IRELAND)

ABP Reg. No. PL29N.PA0024

AND IN THE MATTER OF AN ORAL HEARING

Statement of Evidence of Dr Wayne Pearce, RWDI, on
the Wind Microclimate

1. Qualifications and Experience

My name is Wayne Pearce. I hold a degree in Aeronautical Engineering and a Ph.D. in Industrial Aerodynamics both from City University, London. Prior to working as a Consulting Engineer I was a research graduate at the University of Nottingham, studying vehicular pollutant dispersion in urban areas, the effect of cross-winds on trains and latterly ventilation of mine shafts.

My career as a Consulting Wind Engineer started in 1998 when I went to work at the University of Bristol Flowcentre with Tom Lawson where I became responsible for running investigations for clients involving desk studies and wind tunnel tests. In 2002 I was one of three founding members of Anemos Associates, a specialist Wind Engineering Consultancy registered in the UK, and in 2005 that Company was merged with RWDI¹ to form RWDI Anemos Limited, the UK office of RWDI. In 2010 I stood down from the RWDI Anemos Board of Directors. I am a Corporate member of the UK Wind Engineering Society (WES). In September 2011 I was invited to become a Principal at RWDI.

I am currently the manager of the Project Delivery team at RWDI in the UK as well as the Consultant in charge of wind microclimate studies for the UK office. In this latter role I have been responsible for most of the wind microclimate assessments conducted by RWDI (and its predecessors), in the UK office, for the past 9 years. That work includes projects in the UK, Ireland, Middle East, India, China and the Far East. . A selection of projects I've consulted on includes:

- **Bullring, Birmingham** (whilst at the Bristol Flowcentre): responsible for commissioning the wind assessments which included wind microclimate studies, ventilation studies and wind loading studies;
- **Wood Wharf, London**: wind microclimate assessment for this substantial masterplan to the east of Canary Wharf;
- **Sandiford Gateway, Dublin**: wind microclimate assessment as part of the planning submission;
- **Heuston Gate, Military Road, Kilmainham, Dublin**: wind microclimate assessment as part of the planning submission;
- **National Conference Centre, Dublin**: wind microclimate assessment as part of the planning submission, pollutant dispersion and wind loading;
- **Eastgate, Leeds**: wind microclimate assessment as part of the planning submission;
- **1 Millharbour, London**: wind microclimate assessment as part of the planning submission;
- **New Providence Wharf, London**: wind microclimate assessment as part of the planning submission;
- **Junction Lock, Cardiff**: wind microclimate assessment as part of the planning submission;
- **Royal Infirmary, Edinburgh**: wind microclimate assessment as part of the planning submission; and

¹ a Canadian Company

- **Battersea Power Station, London:** wind microclimate assessment as part of the planning submission.

2. Role in Proposed Development

I am directly responsible for the following areas of the project, and the preparation of the corresponding sections of the Environmental Impact Statement [EIS]:

- Chapter 9 – Wind Microclimate [specifically Section 9.6 of that chapter]

My role is to assess the wind microclimate in the ‘receiving environment’ defined by the EIS Consultant as areas outside the red-line boundary of the development Site, and to advise the design team of the results of the assessment, in order that informed design decisions can be made.

The initial brief was concerned with the potential provision of a Helipad on the roof of the CHoI. This was later expanded to determine the pedestrian wind microclimate in the ‘receiving environment’.

3. Assessment Methodology

The wind microclimate assessment was made by wind tunnel testing² a 1:300 scale model of the Development Site and surrounding buildings. Wind tunnel testing has been used to quantify the wind microclimate around proposed new building developments for many years^{3 4}.

The practices developed by RWDI are proprietary and there is no international standard which prescribes what to do for pedestrian level wind studies. However, the UK office of RWDI evolved from a UK company, Anemos Associates, whose founders had previously worked with Lawson at Bristol University and at the BRE. When working practices in the UK office were compared with those in Canada, where the methodology was developed independently, they were the same. RWDI operates four wind tunnel facilities in three different countries – a model can be tested in any of the facilities and results would be consistent.

The methodology is identical to that previously used to furnish equivalent results on other projects in Dublin including Heuston Gate in Kilmainham, the National Conference Centre and Sandiford Gateway.

² Section 9.6.2 of the EIS

³ Aynsley R.M., Melbourne W. & Vickery B.J., (1977), ‘Architectural Aerodynamics’, Applied Science Publishers

⁴ Lawson T.V., (2001), ‘Building Aerodynamics’, Imperial College Press

4. Key Issues in Relation to Wind Microclimate

INTRODUCTION

Chapter 9, Section 9.6, of Volume 2 of the EIS sets out the likely wind microclimate impact of the proposed development of the Children's Hospital of Ireland at the Mater Hospital Campus.

The wind microclimate assessment for the EIS is intended to quantify the wind speeds in the 'receiving environment', defined as areas outside the red-line boundary around the development, for both the existing and developed Site.

OVERVIEW OF THE ASSESSMENT

The wind conditions along Eccles Street would be compatible with those required for a street and suitable for standing or leisure walking during the windiest season.

The wind conditions in the vicinity of the Leo Street residential area would be suitable for standing during the windiest season.

The wind microclimate along the street between the CHoI and the Private Mater Hospital would be suitable for either leisure walking or roadway use during the windiest season which would be compatible with a vehicular access route or a pedestrian thoroughfare for brisk walking.

The wind microclimate to the north of the CHoI would be suitable for sitting, standing or leisure walking during the windiest season.

The wind microclimate in the receiving environment for the existing Site would be suitable for sitting, standing, leisure walking, business walking and roadway use. The wind microclimate in the receiving environment with the Proposed CHoI in situ would cover this same range of activities.

5. Submissions and Responses

I have reviewed all the submissions or responses to the Board in relation to the issues of wind microclimate and respond to those as follows:

5.1 Dublin City Council: Page 35, 'Planning Authority View on Information Provided', bullet point 9:

'...further information is requested regarding potential down draft from the ward block on the recreational terraces below. Given the proposed height of the building there is the potential for increased levels of wind in the immediate surroundings. However, the evidence presented in the EIS indicates only minimal alteration. This evidence, ..., appears only to have monitored points at or near ground level only. The potential effect of wind on proposed open spaces at higher level is not studied. These open spaces are at levels 6-9 and so much more exposed than ground level spaces. There may be a possibility of down draft from the ward block and this issue should be addressed by the applicant'.

Response: There are three types of elements incorporated in the landscape proposals in order to achieve an appropriate micro-climate at Therapy Park levels. These are tall, glazed balustrades, pergolas/screens, and tree planting in large planters. These elements have been designed-in to the landscape proposals for the Therapy Park in order to direct wind up and over the spaces and to disrupt wind blowing across the spaces. Having reviewed the landscape proposals for the Therapy Park, I am satisfied that these elements are sufficient in their own right to create the micro-climate necessary for the use and enjoyment of all the spaces in the Therapy Park, for patients, visitors and staff alike.

5.2 BLEND Residents Association: Page 37, Wind:

'It appears to us that an inevitable consequence of excessive height in developments such as the one proposed, at a latitude of 53° North, and with our prevailing climatic conditions, is the diminution of the quality of the outdoor environment. A significant feature of our climate, and one which is accentuated in Dublin due to its coastal position, is the windy conditions which prevail throughout the year with more severe winds during winter months. Average wind speeds in Dublin for the summer months are about 8 knots whereas in January average wind speed is as high as 12.2 knots.

Taller buildings create higher wind speeds at street level – studies by the Building Research Establishment found that wind speeds in areas with high buildings regularly exceeded those in areas with low buildings. The problem of wind speeds will only increase with global warming. High buildings can also create strong localised wind with consequent wind vortex effects creating a very unpleasant environment.

The EIS submitted acknowledges the changes in the wind conditions on the site resulting from the proposed development. At Table 9.6: 'Pedestrian Comfort and significant Impact Results', we note that it shows that at 13 of the 27 points of the site tested, the proposed development would have a negative impact.

We submit that any assessment of buildings greater than contextual height must consider the impact of changed wind conditions as a priority, and we would request An Bord Pleanála to pay particular attention to this aspect of the scheme'.

Response: The wind tunnel assessment takes account of the seasonal variation in wind speeds and the coastal location of Dublin. Tall buildings may create windy conditions at ground level but they can also create shelter and there are other factors such as orientation and the massing detail which influence the wind microclimate created by a building. It is not simply about the height but the wind tunnel assessment implicitly takes account of these details because it models the proposed CHol.

Table 9.6 of the EIS does summarise the changes in the wind conditions before and after development but the respondent does not mention that this Table also compares the wind conditions with the likely pedestrian activity. In my opinion, this is the more informative comparison because it takes into account any change in pedestrian activity around the development.

5.3 Paschal Donohoe TD and Councillor Ray McAdam: Page 3:

'We support the recommendation submitted by Dublin City Council with respect of a further assessment of the potential for wind tunnels to be a consequence of the height of the building and what impact that may have on the area in the immediate vicinity of the development'.

Response: The assessment presented in the EIS does quantify the wind microclimate in the areas around the Site. The submission from the City Planners focuses on the wind microclimate in the Therapy Park, above ground level. I have commented on that issue under 5.1 above.

SOLAR GLARE & SPILL LIGHT (Littlefair)

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AND IN THE MATTER OF AN ORAL HEARING

Statement of Evidence of Paul Littlefair MA PhD CEng MCIBSE MSL

1. Qualifications and Experience

My name is Paul Jeffrey Littlefair and I have been working on lighting and related issues at the Building Research Establishment, Garston, Watford WD25 9XX, since 1979. BRE is the UK's foremost construction research organisation. It was formerly part of the Department of the Environment and is now owned by the BRE Trust, a registered charity. In 1984 I was awarded a PhD for work carried out at BRE. The title of my thesis was 'Daylighting design and energy conservation'. In 1988 I became a member of the Chartered Institution of Building Services Engineers (the professional institution responsible for interior lighting) and am a Chartered Engineer. I was a founder member of the Society of Light and Lighting.

I have published over 100 papers on lighting and related issues including parts of the British Standard Code of Practice on daylight, the CIBSE Lighting Guide 'Daylighting and window design', the BRE Report 'Site layout planning for daylight and sunlight' and a guide 'Lighting and colour for hospital design' for NHS Estates.

Solar glare reflected from buildings is one of my specialised research topics. In 1987 I wrote the BRE Information Paper 'Solar dazzle reflected from sloping glazed facades' which is still used as a principal reference work. I have carried out a number of solar glare studies for developments including Lansdowne Road Stadium, and a proposed design for the Jury's Inn site in Ballsbridge. My research also includes work on spill light from buildings, and I recently co-wrote a forthcoming BRE Digest on obtrusive light in the planning process. I have carried out a number of studies of spill light including one for the proposed RTE building in Donnybrook.

2. Role in the Proposed Development

I carried out analysis of the likely impact of reflected solar glare from the proposed Children's Hospital to domestic properties and road users in areas surrounding the building. I also carried out an analysis of spill light from the building at night to nearby residential properties.

3. Key issues

3.1 Solar glare

This has been raised as an issue by Paschal Donohue TD and Councillor Ray McAdam of Fine Gael. An assessment has been carried out of solar glare reflected from the proposed building.

This includes the potential for discomfort glare, which causes visual discomfort without necessarily affecting the ability to see; and disability glare, when a bright source of light impairs the vision of other objects. A typical example of disability glare is when an oncoming vehicle at night dazzles a driver and makes it difficult to see the road.

Solar reflection from the building has been analysed in detail using computer modelling of the sun's position and its reflection from each of the panes of glass on the building. The main area of glazing on the building occurs on the upper storeys which are curved in plan, with each pane oriented at a different angle to the one next to it. This limits the impact of glare from the proposed building, particularly at long distances. Only one or at most two or three panes can reflect the sun at any one time to a distant location. Seen from a distance, the building will appear to sparkle at an isolated point or points. The proposed glazing is similar to clear glass in its light reflection properties.

Reflected discomfort glare to dwellings is not an issue here. Dwellings in Leo Street would mainly view the northern face of the building which would rarely if ever reflect sunlight. Dwellings in Berkeley Street would receive some reflected sunlight on clear mornings in the winter, but the real sun would also be shining into the windows, so blinds or curtains would be in use anyway to control glare. For dwellings further away, solar reflection would only occur at isolated times when the sun was very low in the sky.

Disability glare caused by solar reflection to motorists has been assessed for ten worst-case locations on roads approaching the building. The resulting glare has been calculated and compared with recommendations (in IS EN13201-2) for street lighting. This is a very conservative approach, because the recommendations are designed to help people to see well at night, when objects are less visible.

For motorists at points in Nelson Street, Temple Street North, Hardwicke Place, Upper Gardiner Street, the North Circular Road (two locations), Sarsfield Street, and O'Connell Avenue, calculated glare would be well within the recommended values and the impact is assessed as negligible. For motorists at one location in Mountjoy Street, glare would be just over the recommended level for an urban secondary distributor road, on the very few occasions when more than one pane of glass can reflect sunlight to this point. The impact is assessed as minor, because the calculated glare is still well under that recommended for a minor road, and it occurs when the sun is very low in the sky. Under such conditions drivers will be expecting solar glare and would have taken steps to address it. Thus for these locations no mitigating measures are required.

For a location in Eccles Place, glare could occur from small areas of low level glazing after sunrise in February and October. Special low reflectance glass will be installed on a limited number of windows to reduce levels of glare to within the recommended values. With this glass, its impact would be assessed as negligible.

3.2 Spill light at night

The Department of Arts, Heritage and the Gaeltacht and Dublin City Council have identified light spillage as one of a number of issues relevant to residential amenity in the area. Night time spill light from the proposed building has been assessed. The amount of spill light approximately decreases according to the square of the distance from an external source, so the only dwellings that could potentially be affected are those closest to the building in Leo Street.

It is envisaged that the building would not be floodlit at night. The area to the east of the building, near to Leo Street, where ambulances will drop patients for the A and E department already has planning permission. There is no intention to modify this lighting in the current application, and as a result there will be no extra light spill from this area generated by the Children's Hospital.

Some low level lighting of the roof gardens and landscaped areas at the ends of the building has been proposed, mainly in the form of recessed uplights and small spotlights. Spotlights would point inwards, and would not shine directly on neighbouring properties. Likewise the buried uplights would not be visible from

nearby properties. Spill light would therefore be negligible, and this lighting would generally be switched off in the early evening.

Spill light from internal lighting could come through windows and doorways. A calculation for a worst case window, the first floor window of the nearest dwelling, 26 Leo Street, has shown that the spill light received by this window would be within the recommended guideline (in IS EN12464-2). Other dwellings would receive less spill light. Accordingly the impact of obtrusive light is assessed as negligible.

4. Submissions and Responses

4.1 Issue – solar glare

Paschal Donohue TD and Councillor Ray McAdam of Fine Gael submitted a response that *'we would ask the Board to examine whether mitigation measures are necessary to deal with the impact of glare caused by the amount of glazing to be used in the development'*. This issue has been addressed in detail in the solar glare study. Mitigation measures will be implemented, in the form of low reflectance glass for a small number of windows. With these measures in place, there would be no significant impact of glare from sunlight reflected from the glazing.

4.2 Issue – spill light at night

The following persons made submissions or responses to the Board in relation to the issue of spill light. The Department of Arts, Heritage and the Gaeltacht quotes from the Phibsborough/Mountjoy Local Area Plan 2008, which gives a Key Site Objective to *'ensure the preservation of the amenity of adjoining residents, business and conservation buildings with regards to such issues as ... light spillage'*. Mary Gallagher of 9 Josephine Avenue, off Leo Street, stated that *'the NCH will be lit up at night like a giant Christmas tree'*. Dublin City Council state that *'Night time spill from the proposed building has been assessed within the EIS as resulting in a negligible increase in obtrusive light. It is not proposed to flood light the building and no additional external lighting is envisaged. The largely glazed ward block has glazed fins to reduce solar overheating and in*

addition to the use of blinds for privacy it is contended that these will reduce any substantial overspill of light from it. In addition the area where ambulances will drop patients already has permission.'

The only critical comment, from Ms Gallagher, about the night time lighting of the NCH, is strongly refuted. There would be no external floodlighting of the building, so light spill would be in the form of low brightness glow from windows. In many cases curtains or blinds would further limit the light spill from the building, as the submission by Dublin City Council makes clear.

5. Conclusion

The potential for solar glare reflected from the proposed building has been assessed. Reflected discomfort glare to dwellings would be negligible, because the closest dwellings would mainly view the northern face of the building which would rarely if ever reflect sunlight, and for other dwellings further away, solar reflection would only occur at isolated times when the sun was very low in the sky.

Disability glare caused by solar reflection to motorists has been assessed for locations on roads approaching the building. With the building as initially designed, solar glare was assessed as negligible or minor for all locations except in Eccles Place, where glare could occur from small areas of low level glazing after sunrise in February and October. Mitigation measures will be implemented, in the form of low reflectance glass for a small number of windows. With this glass, the impact would be assessed as negligible.

Night time spill light from the proposed building has been assessed. The only dwellings that could potentially be affected are those closest to the building in Leo Street. The building would not be floodlit at night, and the external lighting in the area close to Leo Street would not be modified as a result of the current application. This will limit obtrusive light to spill light from internal lighting coming through windows and doorways. A calculation has shown that the spill light thus received by dwellings would be within the recommended guideline. Accordingly the impact of obtrusive light is assessed as negligible.