

Wind and Thermal Bibliography

A Comfortable Wind Climate for Outdoor Relaxation in Urban Areas

Article by M. Tacken

Building & Environment

vol. 24, no. 4, 1989, p. 321-324

Published 1989

TH1 B933

Summary:

This study shows that in a temperate climate, extra measures are often required for making urban areas suitable for outdoor relaxation and that these measures can be used to increase the number of hours during which people perceive the climate as comfortable.

Researches into wind, temperature, solar irradiation, wind velocity and wind turbulence (variations in velocity and direction), and air humidity. Conducts tests on people using anemometer and a solarimeter – measuring perception. Compares results from 105 tests of people's perceptions with climatic data from a meteorological station in the Netherlands, to assess how often favourable combinations of wind velocity, sun and temperature occur.

Project is trying to investigate possibilities for arriving at norms for the wind climate in urban areas suited to outdoor relaxation.

Airflow Around Buildings

Article by C.B. Wilson

E.A.R. (Edinburgh Architectural Research)

vol. 11, 1982, p. 18-25

Published 1982

NAI E

Summary:

The main intention of the article is to expose the development of a research strategy aimed at providing information and techniques for use in design. Discusses different research projects: An investigation of velocity profiles in an urban area using a captive balloon as a support for anemometers

A wind tunnel study of the flow between parallel rows of "houses" of different length and separation to display the systematic relationship between changes in form and changes in flow regime.

A parametric study of wind-flow in a rectangular walled enclosure, which showed that in such a form there exist optimum dimensionless geometries, which maximise shelter in the enclosure.

A general discussion paper on the simulation of airflow around buildings.

Architecture: Comfort and Energy

Edited by C. Gallo, M. Sala, A.M.M Sayigh

Published 1988, Elsevier Science Limited, Oxford

TH6021 A673

Summary:

Chapter 1: Thermal comfort and the development of the bioclimatic concept in building design. It is an attempt to adopt the building bioclimatic chart concept as well as Mahony tables to Qatar, which is used as an example, in order to determine the most appropriate design strategies.

Chapter 3: Principles of thermal comfort. Explains that providing and maintaining a heat balance within the human body, is a fundamental condition for survival and necessary (but not sufficient) for comfort.

Investigates: heat exchanges (man-environment), comfort indices, and the adaption model.

Building Aerodynamics and Pedestrian Comfort

Research Report, ARCH 389

By Jonathan Scholes

Published 1987

H AS741 VUW A16 S368 B 1

Summary:

Investigates the causes and limits of pedestrian discomfort around the bases of tall buildings, through a study of the aerodynamic performance of building forms and aerodynamic devices used to improve their wind performance.

Covers the influence and the requirements of wind-performance on the design of tall commercial buildings (in Wellington especially) concerning the wind conditions at ground level to which pedestrians are subjected. Investigates factors relating to pedestrian comfort. Also how best to improve the pedestrian environment by either modifying the shape and proportions of buildings; or by the use of aerodynamic devices that may either deflect or dissipate problem wind flows.

Buildings, Climate and Energy

By T.A. Markus and E.N. Morris

Published 1980, Pitman Publishing Limited, London

NA2541 M346 B

Summary:

Refer to photocopy for contents.

Chapter 3: Includes information on Thermal Comfort – comfort equation, Ole Fanger and Thermal Index – operative temperature and thermal comfort. Appendix has extensive operative temperature charts and thermal comfort charts.

Discusses assessment of discomfort – measuring discomfort, the number of people affected and the duration of the discomfort. General index of the environment – index of the thermal environment, which is valid throughout the building and all the space around it.

Good book for equations.

Computer Modelling of Wind-Flow around more than one building

Article by David Summers and others

E.A.R. (Edinburgh Architectural Research)

vol. 11, 1984, p. 90-103

Published 1984

NA1 E

Summary:

Trying to analyse full flow fields using computer modelling instead of a wind tunnel. Interested in long time averages over all statistical fluctuations, assuming that the mean flow field will correspond to the solution of a time steady equation.

Includes: streaklines, speed contours.

Developed a numerical program that can treat more complex shapes. More work on the computer validation to be done.

Concepts in Thermal Comfort

By M. David Egan

Published 1975, Prentice-Hall Inc. New Jersey

TH6021 E28 C

Summary:

Refer to photocopy for contents.

This book presents the basics of thermal comfort in a graphical format. The verbal descriptions are few, emphasis being on graphical displays to illustrate the significance of climate, materials, and mechanical systems in the design of buildings.

Courtenay Place Wind Environment

By Michael Donn and Kathryn Davies

Published 1989, School of Architecture, Victoria University of Wellington

NA12 V645 P 51

Summary:

Refer to photocopy for contents.

Analyses the results of 104 wind tunnel tests of Courtenay Place and 42 types of wind gates.

Aim to assess the impact on the wind environment of the changes described in the Courtenay Place Precinct Design Guide.

The guide proposed adding entry gates at each end of the precinct to provide wind shelter. This in response to newspaper reports of the Taranaki Street Courtenay Place intersection being a "danger spot".

A simple pictorial system of analysis was used to examine the impact on the wind environment of placement of wind gates in Courtenay Place and of the increase in height of buildings allowed by the Precinct Ordinance.

Effects of Air Temperature, Humidity, and Air Movement on Thermal Comfort under Hot and Humid Conditions

By Shin-ichi Tanabe and Ken-ichi Kimura

ASHRAE Transactions

1994, Part 2, vol. 100

TH7005 A512 A5

Summary:

The purpose of this paper is to review and summarize the effects of air temperature, humidity, and air movement on thermal comfort under hot and humid conditions with a view toward energy conservation. Recently ASHRAE published a new comfort envelope in Standard 55-1992. In that standard, the upper limit of relative humidity was set at 60%. In hot and humid regions, humidity levels higher than 60% may often be observed.

This upper limit of humidity is discussed based on their subjective data. In addition, the results show that under hot and humid conditions, air movement may be one of the least expensive methods of providing thermal comfort. The effect of air movement is also described in this paper.

Energy & Form: An Ecological Approach to Urban Growth

By Ralph Knowles

Published 1981, The MIT Press, Cambridge, Massachusetts

NA2750 K73 E

Summary:

Looks at energy conservation through design. Scope is the form of our built environment. Its method is deductive and rests on the premise that human survival depends on our willingness to consciously direct urban growth.

Book advocates three new purposes for design:

An economic purpose for urban growth that stresses the long-term costs of maintaining equilibrium in the built environment over the short-term costs of development.

Large-scale view of a community as a set of associations in which the diversity of community needs is met not by supplying ever-increased mobility but by building closer contact diversity into the arrangement.

An aesthetic based on form as a natural adaptation for survival.

Energy in Architecture: The European Passive Solar Handbook

Edited by John R. Goulding, J. Owen Lewis, Theo C. Steemers

Published 1993, B.T. Batsford Limited, London

TH7413 E56

Summary:

Refer to photocopy for contents.

This book attempts to demonstrate the benefits of an approach to the design of buildings and their immediate surroundings which takes advantage of natural phenomena instead of fighting the influences of nature with expensive and often environmentally-destructive heating, cooling or lighting equipment and the energy they consume.

The overall goals to which the book is directed are improved thermal and visual comfort in more environmentally benign buildings, and the synthesis of these objectives in good architectural design.

Evaluating Thermal Environments by using a Thermal Manikin with Controlled Skin Surface Temperature

Various Contributors

ASHRAE Transactions

1994, Part 1, vol. 100

TH7005 A512 A5

Summary:

This paper describes a method for measuring non-uniform thermal environments using a new thermal manikin with controlled skin surface temperature. The manikin and its control logic are described, and an equivalent temperature based on the thermal manikin (t_{eq}) is proposed and discussed. A method to calculate the PMV index from manikin heat loss is also given.

Games That Buildings Play With Winds: wind flow patterns created by some buildings put pedestrian comfort and safety at stake

Article by Ralph W. Crummy

Journal of the American Institute of Architects

vol. 61, no. 3, p. 38-40

Published 1974

NA1 A512 A

Summary:

Short article explaining the problems that occur with buildings and their effect on the wind.

Includes:

Explanation of how the wind-flow over and around a building.

Description of the effects of winds at ground level and possible mitigation techniques.

Discussion on wind tunnels as the best tool for obtaining data on winds around buildings.

Explains solutions to dangerous levels of wind around buildings.

Generic Models for Pedestrian-Level Winds in Built-up Regions

By Theodore Stathopoulos and Hanqing Wu

Journal of Wind Engineering and Industrial Aerodynamics

1995, vol. 54/55, p. 515-525

TA654.5 J86

Summary:

Wind conditions over streets in built-up cities were examined in a boundary-layer wind tunnel model study. Presented in this paper are results of wind speeds affected by a number of

parameters such as the special density of street blocks, the building height over surroundings, the relative location of buildings, and the direction of the approaching wind.

Introduction to Building

By Derek Osbourn

Published 1985, B.T. Batsford, London

TH145 081 I 2ed

Summary:

Refer to photocopy for contents.

This volume is intended for those who are commencing a serious study of the various mental and physical processes, which are involved during the creation of a building. Divided up into the following parts:

Part A is an analysis of a building in terms of what is expected to do: its function and performance.

Part B is an analysis of a building in terms of the processes required, the Building Team which implements them, and the methods used for communicating information.

Part C is an analysis of a building in terms of construction methods.

Investigation of Measures Available for Improving Ground Level Wind Conditions around Buildings

By N. Jamieson and D. Brown

1989, Aerodynamics Section, Central Laboratories, Works & Development Services Corporation, New Zealand Limited

TA654.5 J32 1

Summary:

Refer to photocopy for contents.

Laboratory Studies of the effect of Air Movement on Thermal Comfort: a comparison and discussion of methods

By M.E. Fountain

ASHRAE Transactions

1991, Part 1, vol. 97

TH7005 A512 A5

Summary:

This paper compares and contrasts methods used in laboratory studies of thermal comfort that focus on the effect of air movement. In laboratory studies, subjects typically wear standardised or similar clothing, are pre-screened for healthy body temperature, are restricted in activity, and are exposed to a set of environmental variables that remain constant for a specific period of time. Three broad methodological categories are compared: experiments in which subjects have control of (1) air velocity or (2) air temperature or (3) neither. Specific experimental practices that may confound results are discussed.

Literature Review on Thermal Comfort in Transient Conditions

Article by J.L.M. Hensen

Building and Environment

Vol. 25, no. 4, 1990, p. 309-316

TH1 B933

Summary:

This is the background to the present literature study on thermal comfort in transient conditions. This study focused mainly on the effects of changes in temperature and mainly in homes, offices, etc.

In section 2 man's thermoregulatory system is discussed so as to show the interaction between man, building and HVAC system. Work on cyclically varying temperatures are present in Section 3.1 and on other types of changes in the following sections. Finally in Section 4 some conclusions towards practical applications are made.

Living with Wind – an introduction to the problems caused by wind, and some solutions

By P. Carpenter

1989, Aerodynamics Section, Central Laboratories, Works & Development Services Corporation, New Zealand Limited

TH891 C296 L

Summary:

Refer to photocopy for contents.

Particular interest is Chapter 11 – wind effects on people, which includes discussion on wind speed and wind chill.

Also Chapter 13 is of interest – guidelines for avoiding high wind speeds at pedestrian level in city streets.

Locally Controlled Air Movement Preferred in Warm Isothermal Environments

Various Contributors

1994, Part 2, vol. 100

TH7005 A512 A5

Summary:

While air movement can provide desirable cooling in “warm” conditions, it can also increase the risk of unacceptably cool drafts. The transition zone from desirable cooling to uncomfortable draft is a complicated function of physics, physiology, and human expectation. This work focuses on air movement for cooling in the expected temperature range, 25.5°C to 28.5°C of this transition zone.

Fifty-four human subjects were used, physical measurements of the environment and subjective votes collected. A model that predicts the percentage of satisfied people (the PS model) as a function of air temperature and air movement in warm conditions is proposed.

Multi-Source Synthesis: Shape, Texture and Flow

Article by Guy Battle and Christopher McCarthy

Architectural Design

vol. 65, no. 7/8, 1995 July/August, p. ii-iii

Published 1995

NA1 A3

Summary:

Presents some insights concerning the flow of fluids around objects streamlined and non-streamlined, rough and smooth, through a series of experiments.

Explains how order may be brought out of what seems to be chaos through the grasp of a relatively small number of fundamental concepts and governing physical principles, in order to begin a discussion of the fundamentals of shape, texture and air flow for high-rise towers.

New Metric Handbook

London: Butterworth Architecture

Published 1990

Reference

Summary:

? Planning and design data.

? Topics include:

- ? Heat Transfer Mechanisms
- ? Thermal Comfort
- ? Site and Climate
- ? Building Fabric
- ? Condensation
- ? Infiltration and Ventilation
- ? Heating and Cooling Systems
- ? Prediction and Measurement

New Solution to Tower Block Turbulence – by means of podia and perforated screens; proposals developed by: Gerry & Harvey Archtl Aerodynamics

Architects Journal

vol. 178, no.33, 1983 August 17, p. 22

Published 1983

NA1 A661

Summary:

Small article read.....

Pedestrian Level Wind Studies at the Wright Brothers Facility

By Frank H. Durgin

Journal of Wind Engineering and Industrial Aerodynamics

1992, vol. 41-44, p. 2253-2264

TA654.5 J86

Summary:

A careful re-examination of the work of Hunt is performed and the use of hot wire anemometers as well as the erosion of particles method are evaluated. A new particle is proposed and the Methods of pedestrian level wind testing at the Wright Brothers facility are reviewed.

People and the Man-made Environment

Edited by Ross Thorne & Stuart Arden

Published 1980, Department of Architecture, University of Sydney, Sydney

NA2542.4 P419

Summary:

Deals with airflow and its effect on the environment and thermal comfort. Outlines the typical environmental wind problems, these are indications of the principle areas in which problems could be expected. Also outlines examples of environmental factors, which should be taken into consideration when considering wind: downwash, vortices, channelling

Other topics include:

- ? local air pollution
- ? motion sickness in tall buildings
- ? weatherproofing
- ? windborne spray from fountains
- ? deterioration of plants in windy conditions
- ? windborne dust and debris
- ? erosion near buildings
- ? snowdrifts around buildings and cooling effects in cold and warm climates
- ? wind generated noise
- ? ventilation of indoor spaces using wind-forces
- ? design criteria for wind in pedestrian areas

Politics of Pedestrian Level Wind Control

Article by Richard M. Aynsley

Building & Environment

vol. 24, no. 4, 1989, p. 291-295

Published 1989

TH1 B933

Summary:

This paper discusses current urban policies for wind control in several US cities.

Makes short discussion on how city governments respond to undesirable pedestrian level winds, outlining the following three main ways:

1. Attempting to limit their legal liability by using existing, often inappropriate, legislation to call for specialist wind consultants reports.
2. Engage specialist wind engineering consultants to specify acceptable pedestrian level wind criteria and to create regulations or bylaws requiring wind study reports on specified projects over a certain height.
3. City governments do nothing.

Topics include:

- ? objectives for urban pedestrian level wind control
- ? liability aspects
- ? existing city government urban wind controls (in the US)
- ? reducing costs of mandatory wind tunnel studies

Proposed Guidelines for Pedestrian Level Wind Studies for Boston – Comparison of Results from 12 Studies

Article by Frank H. Durgin

Building & Environment

vol. 24, no. 4, 1989

Published 1989

TH1 B933 24

Summary:

Reviews different approaches taken by wind consultants to proposed buildings in Boston, and assess the reasons for differences in results. It shows the importance that consultants use consistent weather data for a given city.

The Boston Redevelopment Authority (BRA), the Massachusetts Environmental Protection Agency (MEPA), and other regulatory agencies now require that the developer of each new large building or project in Boston assess the effect of the proposed project on pedestrian level winds in the vicinity of the project.

However, examination of many of the resulting reports disclosed problems with the types of data presented, the criteria used to evaluate the data, and the repeatability between results from different laboratories for the same conditions. As a result, the BRA has sponsored two programs at the Wright Brothers Facility (WBA) at the Massachusetts Institute of Technology to examine some of the reasons for those differences. This paper summarises the results of the efforts to date.

Site Layout Planning for Daylight

By P.J. Littlefair

IP 5/92, March 1992

Published 1992

TH1 B828

Summary:

This paper outlines new BRE guidance on site layout planning to achieve good daylighting, both within buildings and in the open spaces between them. It deals with daylighting within

new developments, in existing buildings nearby, and on adjoining land for future development.

The guidelines developed for diffuse daylight within site layouts are intended to form part of a coherent design strategy along with new recommendations on interior daylighting.

Solar Access and Urban Form

Article by Ralph Knowles

Journal of the American Institute of Architects

vol. 69, no. 2, 1980 February, p. 42-49

Published 1980

NAI A512 A

Summary:

A discussion paper, topics include:

- ? the impact of street patterns on the solar envelope
- ? urban design impacts of the solar envelope
- ? realisations
- ? the construction of the solar envelope

Special Issue. Proceedings of the Fourth International Conference on 'Urban Climate, Planning and Building', Kyoto, Japan, November 6-11, 1989: Part ii

Article by A. B. Barlag and others

Energy & Buildings

vol. 15, no. 3/4, 1990/1991, p.i-iv, 289-514

Published 1990

NA2542.5 E56

Summary:

Very large publication, need to look at Contents page provided within photocopies.

Sun and Light for Downtown San Francisco

Environmental Simulation Laboratory

College of Environmental Design, Institute of Urban and Regional Development, University of California, Berkeley

April 1983

Summary:

This report recognises the variety of urban character and scale extent in downtown San Francisco as an important frame of reference for the way in which the city is seen and experienced both culturally and historically.

The report provides analysis of sun access criteria for down town streets and public open space and develops recommendations designed to protect and maintain the city's unique character.

Sun, Light and Wind in Central Wellington: Practical Barriers and Solutions

By Michael Donn, Werner Osterhaus and Andrew Bluck

Paper from ASCA in Paris

Summary:

Paper examines the application of wind tunnel testing and solar access assessment in the Central Business District of Wellington. It also examines the application in the Central Business District, of two architectural science techniques for the assessment of the performance of a building. It identifies the practical barriers that impede the full achievement of the potential promised by these techniques.

Includes discussion on:

- ? wind ordinances in Wellington
- ? daylight and solar access ordinances
- ? Wellington's Te Aro basin
- ? solutions for Wellington

Sun, Rhythm and Form

By Ralph Knowles

Published 1981, The MIT Press, Cambridge, Massachusetts

TJ810 K73 S

Summary:

Useful as general information.

Discusses Solar Access:

- Sun
 - significance of solar access
 - means of solar access
- Rhythm
 - rhythm and perception
 - rhythm and ritual
- Form
 - natural variation and buildings
 - the non-image of the city
 - the transformation of cities
 - street orientation
 - the influence of street orientation on the solar envelope
 - form in time

Sun, Shade and Shelter near Buildings: the forgotten art of planning with the microenvironment in mind – part IV

Article by Elisabeth Beazley

Landscape Design

no. 197, p- 46-50

Published 1991

SB469 L263

Summary:

Notes the importance of shelter and discusses the more general attitude to planning. Discussion on high-rise buildings on wind and the resulting ground level conditions, also deals with low-rise buildings. Shelter is discussed in depth, with rules of thumb, semi-permeable wind barriers – with pertinence to brick etc, but also goes into shelterbelts of trees. Looks at the habitability of spaces near buildings, some points to consider at the outset of a project:

- ? siting of the proposed building
- ? functions of the spaces near the building and their relationship with that of those spaces within it
- ? access
- ? sun and shade
- ? rain and rain shadow
- ? details to consider as the design process

Sun, Wind and Comfort: A Study of Open Spaces and Sidewalks in Four Downtown Areas

Environmental Simulation Laboratory

Institute of Urban and Regional Development, College of Environmental Design, University of California, Berkeley

Summary:

This report describes a study of development in downtown San Francisco and its consequences for street level sun, wind, and thermal comfort conditions.

This research considers the effects of buildings on both sun and wind conditions at street level and evaluating the combined effects of these conditions on pedestrian comfort.

Sun, Wind and Light: Architectural Design Strategies

By G.Z. Brown

Published 1985, John Wiley & Sons

NA2542.3 B877 S

Summary:

Deals primarily with temperate climates like those within the United States – ie: sun position to south of the building that stays low in the winter sky, therefore inappropriate for Southern Hemisphere and equatorial regions.

Organised in three parts:

1. Analysis techniques – help the designer define the context of the problem, by understanding the sun, wind, and light resources of a particular site and climate.
2. Design strategies – organised in terms of scale, building groups, buildings and building parts. This helps the designer understand a particular principle.
3. Supplements to passive systems – how passive design strategies should be integrated with more conventional electrical and mechanical systems in buildings.

Tempering Cold Winds

Article by Jeremy Dodd

Architects Journal

vol. 189, 1989 May-June, p.61-65

Published 1989

NA1 A661 189

Summary:

The main objective of this article is to outline some of the landscape planning techniques for moderating wind speeds before the wind-flow makes much impact on building surfaces, on people at ground level and on the air mass in the vicinity defined by the surrounding buildings, walls or other elements of the urban landscape.

It investigates strategies that are needed to improve indoor and outdoor comfort, to reduce loading on the structure and on relatively delicate parts of the fabric such as opening windows, and to minimise running costs of space heating, wind damage and surface erosion.

The Abatement of Wind Nuisance in the Vicinity of Tower Blocks

By U. Keith Gerry and G.P. Harvey

Published 1983, Greater London Council

TH891 G379 A

Summary:

The report begins by rating the various effects of the wind shed from tall buildings. Then, to provide a wider background, some aspects of the wind from global to local scale are reviewed. The extensive study of urban thermal effects of a single tower block is reviewed, with particular reference to Canada Estate, Rotherhithe.

The proposed means of relief are then explained and criteria for their effectiveness examined. Tests programmes are discussed and the report ends with a recommendation for wind tunnel tests to be made.

Of the two appendices, one covers tree planting and the other planning and architectural factors.

The Effect of Architectural Detailing on Pedestrian Level Wind Speeds

By N.J. Jamieson, P. Carpenter and P.D. Cenek

Journal of Wind Engineering and Industrial Aerodynamics

1992, vol. 41-44, p. 2301-2312

TA654.5 J86

Summary:

This paper presents results from a wind tunnel study on the effects of architectural detailing on pedestrian level wind speeds around city buildings. Mean and gust speeds were measured in the streets around a range of different building designs placed within a representative city model. The designs included different building shapes, towers with and without podiums, car parking buildings, and the use of fences at street level.

The Transient Nature of Thermal Loads generated by People

Various Contributors

ASHRAE Transactions

1994, Part 2, vol.100

TH7005 A512 A5

Summary:

This paper reports the results of ASHRAE research project 619-RP. The goal of the project was to provide a computer simulation model that could accurately predict the total thermal load generated by people and also predict the sensible and latent portions of this load. The predictions must also incorporate the effects of prior environmental exposure and activity levels of occupants in addition to the environmental conditions and activity levels in the vehicle.

The objectives required experimental measurements to determine the transient nature of human-generated thermal loads and to validate the model.

Thermal Comfort

By Andris Auliciems and Steven V. Szokolay

Published 1997, Department of Architecture, The University of Queensland, Brisbane

TH7222 A924 C

Summary:

Part 1: examines the physical and physiological basics

Part 2: detailed account of comfort studies and description of a range of comfort indices

Part 3: discusses recent developments: the present day broadening of views

Part 4: practical (architectural) applications

(refer to photocopy for Contents page)

Thermal Comfort

Article by Roderic Burn and N.A. Oseland

Building Services

Vol. 15, no. 6, 1993 June, p. 25-29

TH6014 C486

Summary:

Professor Ole Fanger's methods for assessing human thermal comfort are accepted by ASHRAE. Now that revised Section A1 of the CIBSE Guide will be acknowledging his work, Roderic Bunn travelled to Denmark to interview the maverick scientist.

Thermal Comfort and Moderate Heat Stress

Building Research Establishment Report 2

*Published 1973, Crown
TH7005 T411*

Summary:

Refer to photocopy for contents.

Proceedings of the CIB Commission W45 (Human Requirements) Symposium held at the Building Research Station 13-15 September 1972.

Thermal Comfort Studies Since 1958

Article by W.V. Macfarlane

Architectural Science Review

Vol. 21, no. 4, 1978 December, p. 86-92

TH1 A673

Summary:

This article reviews not only the change in definitions of comfort and newer methods of assessing comfort in buildings, but also to look again at increases in physiological understanding and at new findings on human indoor comfort. In addition some of the incursions of energy conservation into architectural design is noted.

The Solar Envelope

Ralph Knowles

UIA International Architect

vol. 5, 1984, p. 36

Published 1984

NA1 I61

Summary:

Discusses the theory that access to direct sunshine enhances the quality of life, and that guaranteeing solar access through modifying traditional zoning principles rather than through legal methods is preferable. Looks at solar zoning being formulated as a relatively simple modification of present zoning ordinances governing building height and bulk. Defines the solar envelope – being a formal expression of the sun's relative motion, defined by the passage of time as well as by the more traditional constraints of property.

Also discusses that the size, shape and orientation of the solar envelope depending on the patterns of urban settlement, with structural orientations determining solar envelope size and shape. Finally, it looks at how growth is dynamically controlled by the solar envelope. The solar envelope has impact on the size, shape and structure of buildings within it.

Urban Design in Different Climates

By Baruch Givoni

1989, World Meteorological Organisation

HT169.9 C6 G539 U

Summary:

Discusses the following topics:

- ? wind speed along streets and between buildings of about the same height
- ? mathematical representation of the effects of building height and spacing width with uniform buildings
- ? air flow patterns around high-rise buildings
- ? wind speeds around high-rise buildings located among lower buildings
- ? quantitative effects of high-rise buildings on air speeds around them
- ? effect of high-rise buildings placed upwind of the lower buildings
- ? mathematical modelling of the effect of high towers on urban ventilation
- ? pedestrian reactions to excessively windy environments

- ? width and orientation of streets and buildings
- ? impact of street layout on urban ventilation
- ? impact of street orientation, Lot's Subdivision and set-backs, on solar exposure
- ? special design details of buildings affecting the outdoor climates
- ? sun and rain protection
- ? urban glare protection
- ? façade treatments
- ? vegetation as glare control

Urban Form and Climate: Case Study, Toronto

Article by Peter Bosselmann and others

American Planning Association Journal

vol. 61, no. 2, 1995 Spring, p. 226-239

Published 1995

NA9000 A513 J

Summary:

This article describes a joint urban design study by the Berkeley Environmental Simulation Laboratory and the Centre for Landscape Research at the University of Toronto. The study analyses the effect of future development in Toronto's Central Area on street-level conditions of sun, wind and thermal comfort. The study originated in response to public concern about the quality of the downtown.

Using a Thermal Manikin

Laszlo Banhidi

Building Research and Practise

1998, vol. 16, no. 1, p. 14-17

TH1 B937

Summary:

At the time of publishing there were reputed to be only ten examples of the thermal manikin (a computerised doll) in the world at present. The author discusses their potential in microclimate research, and describes experiments with a thermal manikin at the Hungarian Institute for Building Science (ET) to identify the quality of indoor comfort conditions. One study revealed that the correct heating system would yield better results than extra thermal insulation.

Walking Around Town – Planning for Pedestrians in New Zealand

Town & Country Planning Division, Ministry of Works & Development

Published 1995

TE279.5 M153 W

Summary:

Refer to photocopy for contents.

Of particular interest is page 22-23, which discusses building forms and the airflow around buildings both in built up areas and in isolation.

Wellington City District Plan

Summary:

Refer to photocopy for contents.

Design guide for wind – outlines in non-scientific terms the basics of wind effects caused by buildings and shows how particular relationships can cause or alleviate problems.

Also contains Central Area rules.

Appendix 1: remedial treatment for existing situations including:

- ? vegetation
- ? structures
- ? verandas
- ? enclosed walkways
- ? roofing over open spaces
- ? pedestrian corridors and foyers

Appendix 7: details the form and content of reports on wind tunnel tests.

Wind: A Design Guide for the Wellington City Centre

Prepared and Published by the Town Planning Department of the Wellington City Council

Published 1984

NA9282 W4 W763

Summary:

The design guide is to help designers, developers and decision-maker to become aware of what adverse affects proposed buildings, large or small, which are likely to have an affect on wind conditions in the City Centre. It also gives a general indication of how adverse wind effects can be reduced.

The following issues are addressed:

- ? safety and comfort aspects
- ? the basics of the interaction between individual buildings and wind
- ? interaction between groups, buildings and wind
- ? architectural detailing
- ? site exposure
- ? remedial treatment for existing situations

The guide introduces in non-scientific terms the basics of wind effects caused by buildings and shows how particular relationships can cause or alleviate problems, to varying degrees.

Wind around Tall Buildings

BRE Digest

No. 390, 1994, January, p. 1-12

Published 1994

TH1 B938

Summary:

This digest describes the process of wind flow around tall buildings, it shows how to decide at an early design stage whether a building is likely to give a satisfactory environment, and suggests measures which can be taken to achieve good conditions.

It explains the three steps to assess the environmental wind effects around proposed building development:

1. determine the wind flow patterns around buildings and measure, or predict, wind speeds at vulnerable locations
2. combine these local speeds with wind statistics from a nearby meteorological station and assess how often certain wind speeds will be exceeded
3. combine this data with established criteria for acceptable wind speeds, taking into account discussing people's activities around the buildings

It then goes into discussing, in detail, these three steps.

Wind around Tall Buildings

Building Research and Information

vol. 22, no. 3, 1994 May/June, p. 134-136

Published 1994

TH1 B937

Summary:

Is a review of the previous resource.

Wind as an Influential Factor in the orientation of the Orthogonal Street Grid

Article by A.T. Kenworthy

Building & Environment

vol. 20, no. 1, 1985, p. 33-38

Published 1985

TH1 B933

Summary:

This paper deals, in the main, with model investigations into the effects of directionally variable winds on a range of orthogonally gridded block and street arrangements for which air velocity ratios have been established. These ratios have been established by comparing averaged velocities along streets in the direction of both grid axes. Block geometry is seen to have an important effect on air speeds producing large differences with the larger block ratios.

Topics include:

- ? street orientation and the sun
- ? the influence of wind on town planning
- ? model investigation
- ? wind direction and block geometry

Wind Effects on Buildings: Volume 1 Design Applications

By T.V. Lawson

Published 1980, Applied Science Publishers, England

TA654.5 L425 W 1

Summary:

Lawson deals with the mechanical effects of the wind on buildings as well as the wind and cooling effects on people that must inhabit the spaces around buildings. He discusses some of the ideas expressed by Gandemer about the effects of certain types of construction and also some of the thermal considerations raised by Penwarden.

Wind Environment around Buildings

By A.D. Penwarden and A.F.E. Wise

Published 1975, Building Research Establishment

TH891 P419 W

Summary:

Brings together, for designers, information and to make design recommendations, with particular reference to tall buildings. Some general principles of air movement around buildings are stated, indicating where windy areas are likely to occur. Includes detailed case studies. Descriptions of wind tunnel measurements around simple model buildings are followed by accounts of the use of meteorological wind data and the effects of wind on people.

Provides a method of predicting the wind conditions around a proposed development at an early design stage.

Wind Sun and Temperature – Predicting the Thermal Comfort of People in Outdoor Spaces

Article by Edward Arens and Peter Bosselmann

Building & Environment

vol. 24, no. 4, 1989, p. 315-320

Published 1989

TH1 B933

Summary:

This paper describes a procedure to predict the thermal comfort of people in outdoor spaces, and shows its application in determining the effects of urban height and bulk regulations around public open space in downtown San Francisco. The procedure is based on a computer model of the thermoregulatory system, run on a typical year's hourly climate data, to produce the number of hours, by time of day and season of year, that comfort and discomfort are to be expected. The climate data are synthesised to take into account the city's influence on wind and sunlight, and are distinct from wind tunnel tests, and the sunlight availability from one of several types of shading analysis.

Wind Tunnel Modelling of the Pedestrian Wind Environment: Modelling the Built Environment

By K.J. Davies

Published 1992, School of Architecture, Victoria University of Wellington

H AS741 VUW TBS c 1

Summary:

Examining the way the built environment is modelled in a wind tunnel.

Begins with an investigation of the context for a study into the use of models in wind tunnel testing of the pedestrian wind environment (see photocopies).

10 factors that influence wind tunnel; testing were identified. A general process for evaluating the influence of these factors was also investigated – looks more into modelling detail. Rest of the thesis looks at tests and experiments and the theories that come from them with relation to wind tunnels.

Wind Tunnel Model Study of Environmental Wind Conditions around Buildings

Article by K.C.S. Kwok and H.A. Bridgman

Architectural Science Review

vol. 23, no. 3, 1980 September, p. 57-62

Published 1980

TH1 A673

Summary:

Presentation of results and recommendations of NEWMED 1 (Royal Newcastle Hospital in Newcastle, NSW, Australia) – a major study in 1978 of the environmental wind conditions for the proposed Clinical Services Building. Article makes suggestions to minimise the effect of strong winds to maximise human comfort.

Covers:

- ? analysis of the wind in the area of NEWMED 1
- ? environmental wind speed criteria
- ? experimental procedures
- ? makes comments on the site after measurements have been taken and analysed