CLIMATIC FACTORS IN PLAY AREAS AND PUBLIC SPACE

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Résumé

L'auteur souligne l'importance d'intégrer les facteurs climatiques dans le design des espaces publiques et les places de jeux, surtout dans les régions où le climat n'est pas idéal. Une telle approche permet d'élaborer des principes d'aménagement extérieur contribuant à l'amélioration des conditions de confort existantes dans la ville, et cela pour tous ses utilisateurs, y inclus les enfants. Les éléments dont il faut tenir compte en premier lieu, sont l'humidité, le soleil, la pollution de l'air, le bruit, l'ombre, le vent, la pluie, la neige, et la glace - y compris leurs changements saisonniers - afin de rendre nos villes plus vivables tout au long de l'année.

Summary

The need to integrate climatic factors with planning and design is more urgent than it has ever been. The more stressful the climate (e.g. hot/dry, cold/dry, hot/humid, etc.), the more essential it is to incorporate climatic criteria. The typical form and structure of open spaces, for recreational purposes, in less than ideal settings, have generally not been shaped in response to climatological demands. This has often resulted in impoverished design and user-unfriendly attributes, especially in children's play areas and public open space. Achieving comfortable microclimatic conditions can undoubtedly enhance the quality of urban life. Emphasis should be placed on ensuring compatability between local climatic influences - the air quality, noise, shade, temperature, solar radiation, humidity, wind, rain and snow - and the design and location of play spaces and equipment. Performance standards and design norms should be set up where these do not exist. If climate-induced stress is alleviated, then tremendous gains will be made for all segments of society - both young and old.

Introduction

The climate in which we live has a tendency to determine our outlooks and life ways. It can sharply influence particular environments - and their effects - for every type of

civilization. Even from the slightest variations in climate, one can witness different kinds of social systems and cultural attributes which are frequently reflected in architectural styles, building traditions, and the design of open spaces.

Climate has often been called upon to explain personality, especially in extreme settings - both hot and cold. It is even believed, by many, to shape national characteristics and to define a common identity. Drastic shifts in weather systems can affect human behaviour to more than simply a limited extent where dramatic seasonal variation exists. Climate has also served as a modifying or determining force in architectural and urban design. People living in harsh regions have often ignored the need to accept climatic demands in formulating policy and design guidelines, and few designers have embodied the practice of thinking seasonally. Hence, the typical form and structure of open spaces, located in less than ideal settings, have generally not been shaped according to climatological dictates and, not infrequently, this has resulted in impoverished design and user-unfriendly attributes, particularly in children's play areas and public open space.

Microclimatology and Site Selection for Play Areas

The amount of discomfort caused to users by various climatic stressors (e.g. low temperature, lack of sunlight, high wind speeds, precipitation) can be mitigated at the outset of the planning and design process. This can be achieved by locating recreational areas on sites that maximize sunlight (in northern settings) and temperature and that minimize wind and precipitation. Microclimatologically informed site selection is important due to the fact that there are significant climatic variations between different sites which can be studied and analyzed (Pressman, 1988, 30). By understanding how different biophysical landscape features cause different microclimates, it is possible to advance site selection criteria to ensure that neighbourhoods and recreational zones are located in the most favourable areas.

Planners can make important decisions regarding the kinds of land-uses that will occur on a particular site. For example, a windswept flatland may be better used as an industrial area while a sheltered south-facing slope would be more appropriate for residential development and recreational play. Thus it is possible to allocate land-uses based on microclimatic criteria in order to improve user comfort levels. For instance, when assessing and evaluating the microclimatic characteristics of a site, the following general variables (where extending the marginal seasons is important) should be taken into account (Robinette, 1983, 38):

1. Seasonal and daily path of the sun across the site.
2. Seasonal and daily windflow patterns around and through the site.
3. Earthforms that block the sun.
4. The avoidance of low-lying areas where cold air can settle.

The site selection process should always pay close attention to the solar radiation and slope orientation (where existing), to the impact of winter winds creating uncom-

fortable wind-chill factors, and to avoiding frost pockets.

The procuring of advantageous local and microclimatic conditions necessitates that detrimental factors attendant upon human activity and climatic forces be taken into account prior to drawing up site plans or to selecting sites. The following should be considered when the area is being investigated (Pressman, 1991, 110-111):

1. air quality, noise levels caused by traffic routes and other sources, and electromagnetic fields.
2. solar radiation conditions, primarily the amount of solar radiation on slopes facing in different directions, but also the duration of daily sunlight on varying terrain at different times of the year, paying attention to seasonal variation.
3. wind conditions and classification, winds bringing rain or snow, and spots which are more or less wind-swept than average owing to the relief of vegetation characteristics on the terrain.
4. differences in air temperature and humidity caused by topographical formation, soil conditions, vegetation cover, and the influence of open water courses at different times of the day or year.

Attempts should be made to develop local climate and microclimate models. With their help, it would be possible to obtain qualitative data about the area's climatic characteristics. Attention should be paid to the development of synoptic climatic data when the models are being created. The manner in which the climatic parameters are combined is crucial in order that planners and designers have access to the data in a usable, practical form.

It is essential to analyze the air and noise quality in order to discover the most healthy and favourable sites for play, recreation, and public space activities. Analysis also aims at dividing the area, to be developed, between different forms of ground use so that, for instance, green belts may improve the air quality and so that the protective zones around noisy sectors are sufficiently encompassing.

The results of an inventory of the air and noise quality can be employed to elaborate the technological, planning, and legislative measures used for improving air quality. These measures should be incorporated when both general and detailed plans are made for recreational areas. Playgrounds, for example, should not be sited on areas where the air quality does not meet the norms in use for ensuring sufficiently good air in residential areas or where the noise level does not adhere to acceptable standards. Neither should they be sited in areas where contaminated soil exists. Qualitative and quantitative analysis of wind conditions aims at siting recreation (and housing) areas so that the impact of industrial plants releasing impurities into the air is reduced or entirely eliminated.

A further objective, in site analysis, is the resistance against uncomfortable wind conditions and velocity. This can be achieved through positioning protective structures which deflect and minimize cold winds - and snow drifts. Tree stands and shelterbelts (in northern regions) working against such forces should be planted in

appropriate locations.

Regulations and norms should be drafted (if these do not exist) for the design of environmental space, children's day care centres, playgrounds, buildings, and recreation and sports facilities locations. Furthermore, active and passive outdoor play areas should be arranged, oriented, and sheltered so that they provide warmer zones during winter and cooler ones during summer (City of Ottawa Official Plan, 1992/93, 54). Ancillary measures can include the provision of landscaping elements with plant material situated so as to modify extremes of air temperature in publicly accessible outdoor spaces. Such material can be located so as to absorb the sun's rays (when necessary), to prevent paved surfaces from acting as a heat sink, and to reduce or redirect wind flows thus creating more comfortable conditions.

In order for every outdoor living and play area within a neighbourhood to receive adequate direct solar radiation, especially during winter and the marginal seasons, consideration must be given to solar access at the neighbourhood scale. The level of ensured solar access is influenced by the type of solar access zoning that can be enacted for the neighourhood, as a whole. The layout and orientation of streets have an important influence on solar access both to dwelling units and outdoor living areas. Therefore, a comprehensive neighbourhood planning methodology can guarantee optimum solar access at this scale of concern.

A solar envelope can define a space within which a structure or open space can exist without creating shadows that will adversely affect neighbouring sites or play areas. Current zoning practices generally limit themselves to specifying setbacks and height restrictions. Such restrictions are defined with no consideration for direct solar access to open spaces or buildings and thus usually define a developable space that is shaped as a rectangular prism. A solar envelope allows development to occur within a defined space that is usually pyramidal, so when a structure is taller, it must be set back further from the lot line to prevent overshadowing. The design of acceptable solar envelopes is dependent on the latitude of the area under design, as this will affect the height of the sun in the winter sky. Finally, solar envelopes are defined by cutoff times; that is, the times during the day (or night - when the midnight sun prevails at high latitudes) when direct sunlight should be guaranteed to certain parts of buildings and open spaces.

Designing Play Areas and Public Spaces

Climatic factors should be taken into account if safe, healthy, and comfortable play areas and public spaces are to result in a given environment. Particular emphasis should be attached to ensuring compatibility between local and microclimatic factors - the air quality, noise, shade, temperature, humidity, wind, rain, and snow - and the design and location of the spaces and equipment included therein.

Recreation areas should be sufficiently well sheltered from cold winds (in northern regions). Warm spots - for winter areas - and areas which are cool (during summer) should be set aside within the same project. They should not be sited in polluted

places and should not be the recipients of pollution from traffic or industrial sources. Care should be taken so that they are not positioned on low-lying areas which collect cold air. They should be in locations which benefit from direct solar radiation for the greater part of the day and provision should be made for shady spots by employing vegetation or built forms which cast shadows during the warmer part of the year. Provision should be made for play areas to receive as much solar radiation as possible between the hours of 9 a.m. and 5 p.m. during the spring and autumn equinoxes, in northern regions. Shadows which can be cast by tall buildings - and wind turbulence around these buildings - should be considered during the initial site planning stages.

Provision should be made for surrounding sources of pollution with protective vegetation-covered area's to prevent impurities in the air from spreading to recreational zones of intensive public use. Plans being made for an area should retain enough of the area's own woods (should these exist) to ensure that the major part of any air impurities is dealt with satisfactorily. Alternatively, newly treed areas can be planted for absorption purposes, and to serve as a dust sponge. Finally, attempts to mitigate surrounding noise sources should be made by using natural or artificial noise attenuating barriers. Often, an abundance of bushes or trees will be sufficient.

The benefits of planting extensive areas go well beyond the efforts to control noise or poor air - or even to modify wind speeds. Dense planting enhances the aesthetic quality and provides a good natural habitat for flora and fauna. However, its use may be limited due to lack of available land as well as by the fact that dense and non-transparent plantings in open spaces are often undesirable due to security and safety considerations. When weather or pollution protection, by using trees or hedgerows (or even fences and walls) occurs, there should be a balance between the use of porous and non-porous material or planting (for protection) for improved visual permeability and resulting public safety (Bach & Pressman, 1992, 83).

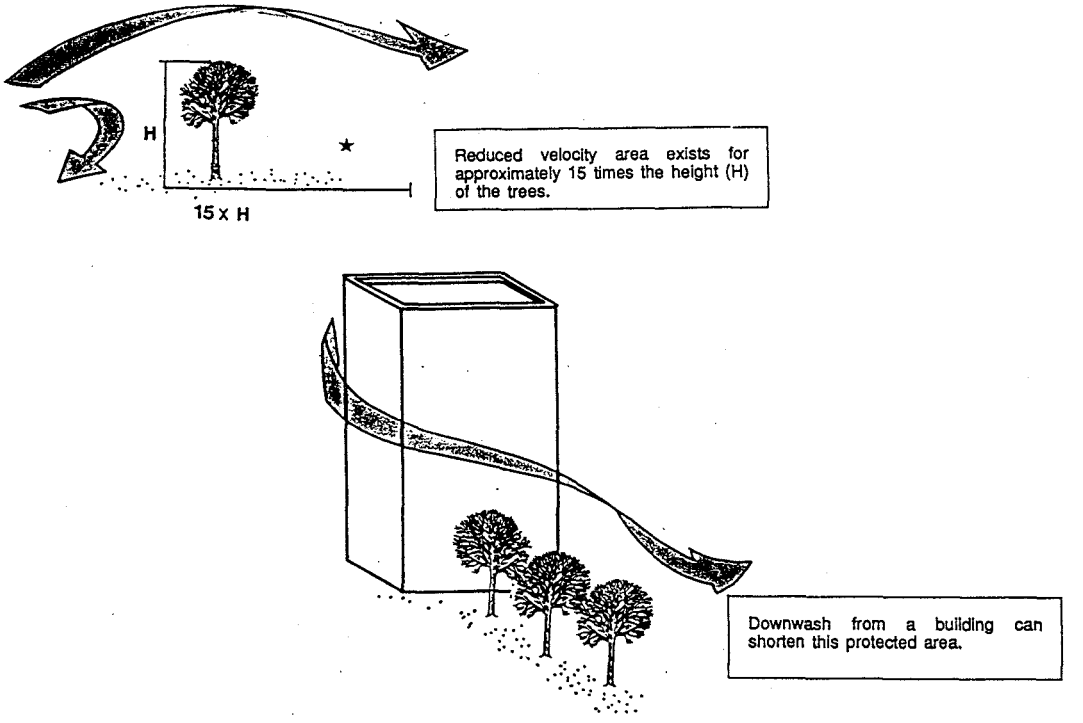
Recreational routes which provide access to play areas and public spaces - including paths for biking, walking, and tracks for jogging, skiing and hiking - should be carefully sited, safe, and preferably illuminated when dark. This is critical at high latitudes during the winter periods when daylight hours are extremely brief. They should be within easy reach, particularly for children, and should form a network throughout the municipality or the local neighbourhood (Ministry of the Interior-Finland, 1978, 24).

Playgrounds in Winter

The provision and design of children's playgrounds are important for the general well-being of the urban youth. Comfortable outdoor playgrounds are even more important, especially during winter - in northern latitudes or high altitudes - when children are confined indoors for extended periods of time. In winter, they need to come into contact with other children and with the outdoor environment as frequently as possible. In inclement weather, playgrounds can be improved and made more

thermally comfortable by employing design strategies based on the following:

1. LANDSCAPING



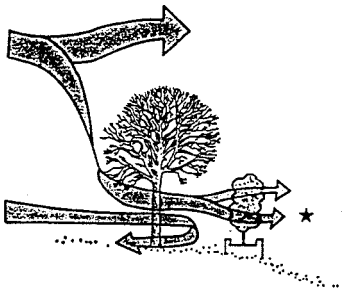
SOURCE : ROWAN WILLIAMS DAVIES IRWIN INC. GUELPH, ONTARIO : ENGINEERS AND MICROCLIMATE DESIGN

1. Areas of most concentrated winter play activities should be protected from prevailing winter winds. This can be accomplished through the use of mounds, planting (especially of coniferous trees), fences, buildings, or any combination of these elements. The wind break elements should be located on the prevailing wind side of the intended play areas.

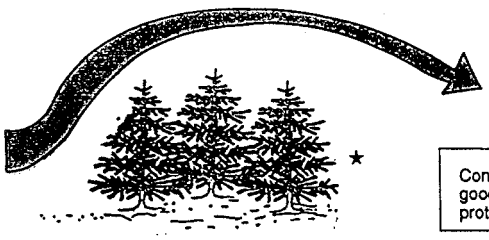
2. Heat spots or sheltered zones should be provided for every outdoor area. If the play area is too cold, light surfaces facing into the sun should be painted in dark colours to make them comfortable to the touch and to build up heat retention. Heavy wood construction should be used outdoors to maximize insulating qualities, and metal should be avoided due to its cold conducting qualities (Pihlak, 1994, 90-91).

3. A convenient water source to flood areas for skating, creating slides, or making ice sculpture, should be accommodated.

4. Provide for a variety of snow conditions to facilitate the many forms of play. Softer snow can be created by catching reflected sun; deep snow by applying wind breaks; and clear, slippery areas can be blown free of snow by channeling winds. Winds can also be directed to create interesting snow shapes and changes in existing land forms.



Underplanting will assist deciduous trees in providing ground level protection.



Coniferous trees are considered a good alternative for winter wind protection.

SOURCE : ROWAN WILLIAMS DAVIES IRWIN INC. GUELPH, ONTARIO : ENGINEERS AND MICROCLIMATE DESIGN

5. Integrate existing play structures into the winter playground by anticipating wind and snow drifting patterns, as well as reflections from the sun. The decks from play structures can be used as shelters when carefully sited.

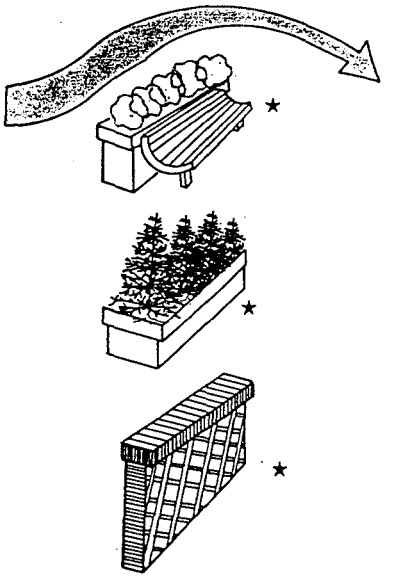
6. Innovative approaches to summer forms of play can be developed, adapting these to winter conditions. For example, snowshoe softball, snowball, snowshoe soccer and football, etc. can be promoted. Even snolf - a form of snow-golf has been witnessed.

7. Certain play areas should be placed far enough from ice-skating areas or frozen water courses (e.g. ponds), to discourage children from using play equipment which might create a safety hazard.

8. Wind can be harnessed (also in hot climates) so that banners and flags can fly amusingly. Mobiles (such as those by Alexander Calder) can be encouraged - which bring colour and movement into the cityscape. Wind indicators can serve as colourful decorative elements (de Sablet, 1991, 227).

9 Every effort should be made to extend the marginal seasons of early spring and late fall so that the outdoor environment can be maximized by all potential users - young and old alike. By minimizing winter-induced discomfort (i.e. reducing wind

chill, increasing exposure to the sun and creating sun pockets) through improved microclimatic space design, lengthier use can be anticipated of public open space and recreational facilities. For areas with climates similar to that of Oslo or Toronto, the number of outdoor days can be increased by up to 30% (Culjat & Erskine, 1988, 353).



Small scale features such as benches, planters, and lattices should be placed to shelter pedestrians from adverse wind conditions.

SOURCE : ROWAN WILLIAMS DAVIES IRWIN INC. GUELPH, ONTARIO : ENGINEERS AND MICROCLIMATE DESIGN

10. Increase the winter use of playgrounds, and design outdoor facilities and environments for winter as well as summer use - including the marginal seasons. Designs and concepts should integrate a range of microclimates which address the varying requirements of changing seasons.

Viewing ice and snow as materials to be used creatively can assist in providing environments which belong to and spring from each distinctive location, with its unique attributes. Snow can be ploughed into fascinating shapes, and flat areas can be made hilly simply by forming slopes and moving snow around a given site. There are almost no limits to the variations that can occur when snow and ice are seen as materials to be used artistically.

Adopting a Climate-Sensitive Approach

Achieving suitable microclimatic conditions will undoubtedly enhance the quality of urban life, and can simultaneously make a significant contribution toward sustainable

development practices. Therefore, performance standards which protect users in recreational areas and other public spaces should be formulated, where they do not already exist. These should be combined with measures to guarantee daylighting requirements, solar access, proper air circulation and control of uncomfortable winds. This is important in areas of intensive public use and under unfavourable conditions.

In deciding the levels of priority for weather-protection or modification, the needs of various user groups must be carefully specified. Movement networks, specific locations, site selection, and the detailing of the protective elements will have to be viewed within the overall framework of the built-up zone, the town and the district. The extent of climatic modification will have to be seen as a function of both need and cost.

Urban design concept plans or master-plans should incorporate access routes, movement networks for cyclists, hikers, pedestrians, joggers and skiers - providing the best comfort conditions available at the larger scale, in addition to that of the actual playground sites. The micro-, meso-, and macro-scales will have to be tackled simultaneously. Many passive and active forms of recreation will have to be viewed concurrently. Programmed as well as un-programmed events are all part of human nature and careful attention must be paid to them. Children will always take advantage of slides, see-saws, monkey-bars, swings, ropes, and other engaging equipment. Moreover, they may amuse themselves creatively and easily through the use of trees, bushes, open space, woodlots and paths - with tree-climbing, hide and seek, races, etc. Parents sometimes wait, watch and interact with one another, enjoying the local environs and the children. Therefore, the design of urban furniture must be attended to carefully.

Recreational areas and public spaces should be designed for users of all ages and physical needs and challenges. The public seating areas should be comfortable, visually pleasing, suitably located, and incorporate well- designed urban furniture. Easy-to-negotiate ramps, as well as stairs, should be included where changes in elevation occur. In winter climates, they should be heated both for comfort and safety. Rain-water run-off areas should be provided for as should proper drainage for rain and melting snow and ice. Last, but not least, all public spaces - especially playgrounds - should plan for the rainy occasion, which often arrives unannounced.

Some climatic modification of the outdoor environment is required if human animation is to be retained during the less than ideal periods of the year. Even if outdoor social space and the activities which it harbours, suffer a reduction during the winter, or hot summer seasons, social activity can still be supported and maintained.If improved bioclimatic conditions and a more humane urban design are to be incorporated within public space, the following issues will have to be accorded high priority:

a) Careful decisions must be taken regarding the types and location of vegetation and planting for modifying climatic conditions.

b) Multiple use of public space over varying times of the day (or night), week or even year, will ensure greater activity and animation adding to the perceived importance of the space as well as to user safety and satisfaction.

c) Alternative micro-climates should optimally be possible in the same space (some areas in shade, others exposed to sun - with varying degrees of protection from the wind).

d) Comfort criteria should be established for all seasons, where possible - especially where considerable seasonal variation occurs.

Flexible utilization of the public realm, in different seasons, will ensure improved livability for all users regardless of their inclinations or interests.

Conclusions

Public space - including play areas - especially for children, is emerging, with rapidity, as one of the most critically studied fields within urban design, for human well-being. Its configuration, its appropriation, its meaning and content, its connection to nature and the symbolic interpretations accorded to *genius loci*, have strong implications for affecting and shaping the quality of life. Human comfort conditions have a powerful bearing on the extent of its use, as do location and design. Spaces and play areas contain opportunities for attracting or repelling users. Poor design, or non-existent facilities, have the potential for causing depression and even debilitating illness. So-called healthy places must exhibit an exemplary combination of factors enhancing sociability in well-designed space so as to encourage connectedness between people when desirable, and to offer a range of choice between the extremes of solitude, on the one hand, and total togetherness, on the other.

Social enjoyment, visual delight, climatic comfort, security, strong identity, contact with nature, healthy conditions, and sensory stimulation should be viewed as goals toward which the physical organization of the city must be directed. Play areas and public spaces, for a broad range of activities and users, should also have the potential to create opportunities for sitting, chatting, meeting, staying, lingering, day-dreaming, reading, eating, drinking, demonstrating, protesting, remembering and celebrating all that is meaningful to human existence. They should speak a universal language with its signals and resonances being part of everyday learning and echoing the sensory qualities of both the city and its natural setting. Public spaces are the ultimate expression of collective territoriality. They epitomize a sense of place for the whole community and serve as a physical symbol of belonging to a larger entity - the group.

Congestion, pollution, noise and wasted time affect everyone's lives adversely. The quality of life is gradually deteriorating - although measures are being adopted to control this condition. Within the framework of decisions taken at the urban policy level, public areas and playgrounds have a role to play in improving the environment. They must be extremely well organized and skilfully woven into the urban fabric. With the year 2000 hanging over us, scenarios of unbreathable air, global warming,

depleted ozone, and unlivable cities are increasingly being developed. Cities in the future, therefore, will have to plan holistically both at the conceptual level as well as at the detailed scale. Planning in a sustainable way includes paying strong attention to climatic factors as they affect decision making, especially with respect to recreation and public activity. Climate-induced stress must be alleviated wherever possible. If the environment is adequately protected and children's needs are given greater attention than ever before, tremendous gains will result for all segments of society - both young and old.

BIBLIOGRAPHY

BACH, B. & PRESSMAN, N. (1992), "Climate-Sensitive Urban Space" (Delft, Publicatieburo, Faculteit der Bouwkunde, Technische Universiteit Delft).

CITY OF OTTAWA (1992-93), "Official Plan" , (Department of Planning and Development, Chapter 12: Urban Design).

CULJAT, B. & ERSKINE, R. (1988), Climate-Responsive Social Space: A Scandinavian Perspective, *Cities Designed for Winter*, (Mänty, J. and Pressman, N., Eds.) (Building Book Ltd., Helsinki) 347-363.

DE SABLET, M. (1991), "Des Espaces Urbains Agréables à Vivre", 2ème édition, (Editions du Moniteur, Paris).

MINISTRY OF THE INTERIOR-FINLAND (1978), "Principles of Planning the Living Environment", (Division for Planning and Building, Helsinki, Finland).

PIHLAK, M. (1994), Outdoor Comfort: Hot Desert and Cold Winter Cities, *Architecture et Comportement/Architecture and Behaviour,* **10** (1994) 1, 73-94, special issue on Climatic Factors in Urban Design (N. Pressman, guest-editor).

PRESSMAN, N. (1988), The Reduction of Winter-Induced Discomfort in Canadian Urban Residential Areas (report) (Canada Mortgage and Housing Corporation, Ottawa, Ontario).

PRESSMAN, N. (1991), Innovative Prototypes for Cold-Climate Neighbourhoods (report - unpublished) (Social Sciences and Humanities Research Council of Canada, Ottawa, Ontario).

ROBINETTE, G.O., Ed. (1983), "Energy-Efficient Site Design" (Van Nostrand Reinhold, Scarborough, Ontario, Canada).

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