Evaluating Healthy Housing Parameters in Co-op Housing Examples in Canada

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Introduction: Budget, location, user groups, and program briefs all influence housing design, project quality, resident experience, and building performance. This paper presents preliminary results of a larger study that compares different housing types in terms of indoor environmental quality and certain “healthy housing” criteria. Specifically, this paper evaluates and compares daylight, ventilation and outdoor space in a number of co-op apartment housing projects in Canada to get a sense of typology-specific design challenges and benefits or healthy housing in this housing type.

Background: There are many important aspects to consider in evaluating healthy housing, and this study focused specifically on three main parameters: daylight, ventilation and outdoor space. Daylight availability was evaluated because studies show that daylight positively impacts health and wellbeing. Following COVID-19, many studies on healthy buildings have focused on ventilation. Increasingly, residents in multi-family housing are concerned about being able to ventilate their apartments. In many apartments there are windows on only one facade and it is therefore impossible to have daylight reach the back of the unit, or for it to achieve natural cross ventilation. Numerous studies have shown that access to outdoor space and proximity to outdoor space are connected to people’s health and wellbeing and so this was a parameter in this study.

Methods: The study examined three co-operative housing examples in Canada: The Neill Wycik Co-operative College (built 1969), the Woodsworth Housing Co-operative (built 1979), and the Fraserview Towers Co-operative (built 2018). To analyze these buildings, elevations, unit and building plans were redrawn in order to determine floor areas and window to wall ratios. Three aspects of healthy buildings were evaluated, for daylight, environmental simulations were carried out including their surrounding context. The building as a whole was evaluated, and typical units were evaluated to see if they would meet LEED v4.1 Option 1 Daylight Availability using Climatestudio software. Window to Wall ratio was also calculated. For ventilation, a plan-section analysis was carried out and a determination was made about how well a dwelling could be naturally ventilated. To evaluate size and location of outdoor spaces, site plans were studied in relation to the dwellings. The results of these studies were compared to standards in green building rating systems and healthy housing rating systems.

Results and Discussion: Of the three buildings studied, the Fraserview Towers Co-op scored the highest in the three areas, while the Neill Wycik and Woodsworth Co-operatives are lacking in many parameters. It was notable that each of the three buildings had a very low window-to-wall ratio (WWR) compared to typical non-co-op housing being built in Canada currently. Most bedrooms had adequate daylight although many communal areas had no direct access to windows. Conclusions: The small sample size of only three buildings made it difficult to generalize significant results about healthy housing generally. However, this study was useful in that it contributes to a growing literature about characterizing healthy housing in apartments. This work may inform future designs and renovations of this housing. Passive strategies such as natural light directed to all rooms, better natural ventilation and more focus on private and shared green spaces should be considered in the design of future housing co-operatives.

Keywords: healthy housing, daylight, ventilation, outdoor space, co-op housing

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Quantifying Healthy Housing Parameters Of Lighting, Ventilation And Outdoor Space In CANADIAN CO-OPERATIVE HOUSING

INTRODUCTION

The quality of life in urban areas is a primary concern among Canadians today as this impacts mental and physical health. There are a number of challenges associated with apartment typologies in terms of providing adequate levels of daylighting, natural ventilation and access to outdoor spaces (Kesik et al., 2019). Residents also want housing to foster a sense of community. Housing co-operatives offer a promising alternative as residents choose to live as members not tenants, and participate in a community (Roche 2025; Kohn 2022; Reyes et al., 2022; Jarvis 2015). Numerous studies show that daylight and access to nature positively impact health and wellbeing, which should lead to a greater focus on the quality of housing, and a larger emphasis on windows, views, and access to nature (Veitch and Galasiu, 2012).

BACKGROUND

There are a number of challenges associated with urban apartment typologies in terms of providing adequate levels of daylighting throughout an apartment unit. Having access to daylight affects one's health and functioning, but when used incorrectly, it can cause discomfort and require excess energy (Cole, 2003). It is common for apartments to lack outdoor access (windows or balconies) on more than one facade and fail to achieve natural cross ventilation. Urban green space has been shown to reduce the incidences of diseases that are highly prevalent in many cities and prevent the need for expensive, large-scale disease prevention programs (Maas et al., 2009) In evaluating outdoor green spaces, factors such as quality, accessibility, and community engagement should be taken into account (Amano et al., 2018).

RESEARCH METHODS

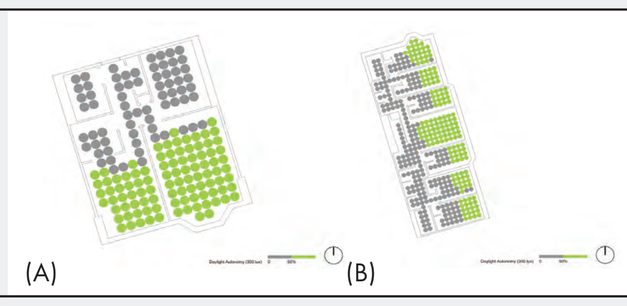
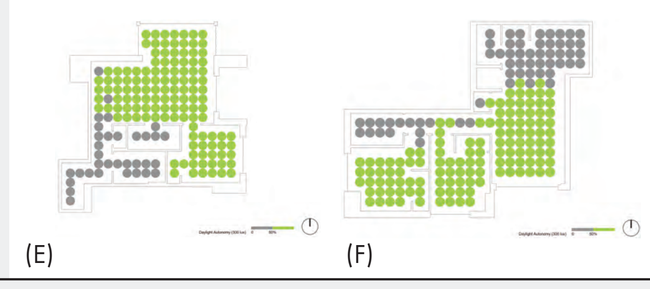
CASE STUDIES

This poster presents some initial results of a larger study. The present study examined three co-operative housing precedents in Canada, including the Neill Wycik Co-operative College (1969), the Woodsworth Housing Co-operative (1979), and the Fraserview Towers Co-operative (2018). This study built on the work of Peters and Wang (2021) which identified three main parameters of healthy housing: daylight availability, natural ventilation and outdoor space.

SIMULATION WORKFLOW

To analyze the studied buildings, elevations, unit and building plans were redrawn in order to determine floor areas and window to wall ratios. Through Climate-based Daylight Modelling (CBDM), buildings were analyzed in terms of their surrounding context and orientation. To determine whether the units met the LEED v4.1 Option 1 Daylight Availability, Solemma Climatestudio CBDM was used to simulate daylight and calculate Spatial Daylight Autonomy (sDA) and Annual Sunlight Exposure (ASE) in each of the buildings and units. Units need sDA=55% for 1 credit, sDA=75% for 2 credits and ASE may not exceed 10% although written justification may be provided for excessive ASE (USGBC 2025).

RESULTS

		UNIT TYPE	DAYLIGHT AVAILABILITY/	LEED	VENTILATION	OUTDOOR SPACES
01 NEILL WYCIK CO-OP	 (A) (B)	(A) 2 Bedroom	WWR = 37% sDA = 58.5% ASE = **21.3%**	0-1	No cross ventilation; Single-sided ventilation	Rooftop gardens and terraces, none at ground level
		(B) 1 Bedroom	WWR = 25% sDA = 41.0% ASE =7.9%	0	No cross ventilation; Single-sided ventilation	Rooftop gardens and terraces, none at ground level
02 WOODSWORTH CO-OP	 (C) (D)	(C) 1 Bedroom (Middle Unit)	WWR = 40% sDA = 35.5% ASE = 12.9%	0	No cross ventilation; Single-sided ventilation	False balcony, rooftop terrace
		(D) 1 Bedroom (End Unit)	WWR = 18% sDA = **72.3%** ASE = 15.2%	1	No cross ventilation; Single-sided ventilation	False balcony, rooftop terrace
03 FRASERVIEW TOWERS CO-OP	 (E) (F)	(E) 1 Bedroom	WWR = 26% sDA = **78.8%** ASE = 10.9%	1-2	**Cross ventilation;** Double-sided ventilation	Private balcony, outdoor community garden and playground
		(F) 2 Bedroom	WWR = 23% sDA = 67.4% ASE = **19.9%**	0-1	**Cross ventilation;** Double-sided ventilation	Private balcony, outdoor community garden and playground

DISCUSSION AND CONCLUSIONS

This study utilized the healthy housing assessment framework proposed in earlier work (Peters and Wang 2021) and identified and evaluated case studies. Each of the buildings had a low window-to-wall ratio (WWR) compared to current housing being built and most had adequate daylight. The LEED Daylight credits were low, often due to high ASE. It might be that the LEED v4 credit is not the best way to evaluate healthy lighting in housing, since unit sizes are small and it is challenging to get enough lighting without overlighting. In the Neill Wycik Co-op units performed acceptably in terms of daylighting in the bedrooms and certain communal areas with direct access to windows. However, they performed poorly in the rest of the areas due to a lack of windows and a number of internal walls which impact air circulation and the extent of natural lighting. In the Woodsworth Co-op, the end units performed very well in terms of daylighting; however, the middle units do not. It is due to the fact that the end unit has more windows on its length than its width, allowing more natural light to enter. Due to their single-sided facade designs and lack of outdoor spaces, both projects have poor natural ventilation and quality of outdoor spaces. In the Fraserview Towers Co-op, both units performed well. sDA on both buildings were good due to the presence of windows on more than one facade, which also allowed cross ventilation to occur. The high quality of outdoor space is achieved through their private balconies, as well as shared communal green areas. Of the three buildings studied, the Fraserview Towers Co-op was shown to be a good example of healthy housing practices, while the Neill Wycik and Woodsworth Co-operatives performed less well based on parameters set out in this study.

Future work should consider thermal comfort and energy use as an additional parameter. Future studies will also compare newly built co-op housing (2010-present) and compare it to older 1960s, 1970s co-op housing in terms of healthy housing parameters. Further work is required to be able to draw conclusions about co-op housing being more or less healthy than other housing types. The findings from future work could be used to inform future housing design and renovation.

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This research was supported by the Dean's Research Fund Undergraduate Research Experience (DRF-URE) Award at Toronto Metropolitan University.