

UBC Social Ecological Economic Development Studies (SEEDS) Sustainability Program  
Student Research Report

**The Sitting Disease – The landscape of sedentary behaviour at the University of British  
Columbia**

**Jacqueline McCarthy, Harris Sheldon, Freya Williamson**

**University of British Columbia**

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# The Sitting Disease

## The landscape of sedentary behaviour at the University of British Columbia

### Abstract

Sedentary behavior is a problem that is quickly coming into scientific light, revealing it as a nationwide health detriment and “silent killer”. In many of today’s schools and offices, individuals spent countless hours being sedentary which can lead to premature cardiovascular mortality and a higher risk for diabetes and cancer, among multiple other negative health effects. Our research set out to study how effective the University of British Columbia has been at reducing sedentary behavior on the Vancouver campus after the Okanagan Charter, and the creation of the UBC Action Framework to Increase Physical Activity and Reduce Sedentary Behavior. We did so by choosing three academic buildings on the Vancouver campus, and observing every room in them. We looked for how much space was in the room, as well as space that an individual could move in, including hallways, atriums, and common spaces. We then categorized the rooms into categories reflecting if there was a possibility to participate in non-sedentary behavior or not and mapped each floor. We found that most the rooms in all three of the buildings had the potential to room non-sedentary behavior like moving on the spot, stretching, or yoga, but there were many limitations to students’ ability to do this, such as obscuring the view of someone behind them, or disrupting students beside them. We also found that when rooms did allow for non-sedentary behavior, such as standing desks, students opted not to use the desks for standing, but instead used higher chairs to sit in. While completing our observation we saw no non-sedentary behavior from any students in class, and only saw it in the forms of using hallways and atriums as walking pathways.

## Introduction

In a society where adults typically spend more time sitting than sleeping (Carson et al., 2014), sedentary behaviour has been normalised within everyday life. As sedentary behaviour is linked with detrimental physical and mental health issues (Fox, 1999), it became pertinent to research the distribution of activity levels on the campus of the University of British Columbia (UBC henceforth) in order to target campus well-being. Coordinated through SEEDS Sustainability Programme, a partnership was established with the UBC Well-being Initiative, a project aimed at increasing physical activity and decreasing sedentary behaviour. To investigate distribution, observational analysis was chosen in order to map how selected spaces are used at UBC. This method was selected in an effort to provide an insight as to how spaces are used, which contributes to combating health risks linked to prolonged sedentary behaviour by identifying opportunities and current forms of non-sedentary behaviour (NSB henceforth).

NSB within this paper shall be defined as incorporating practices such as taking the stairs, to standing and stretching between lectures. It includes traditional forms of physical activity, but also non traditional forms, ranging from bhangra dance to skateboarding. However, it is important to note the distinction between physical activity and NSB. Undertaking NSB should increase heart rate, as does physical activity, but is achievable in ‘everyday clothes’. There are no barriers to participation; wearing jeans, skirts or otherwise should not restrict participants from engaging in NSB. Much of the literature agrees that to be in a non-sedentary state, one must surpass the metabolic equivalent unit of 1.5 MET (Pate et al. (2008) stating that “One MET is the energy cost of resting quietly”). The research conducted for this paper is relevant not only for our specific case

study, but contributes towards a greater scope of understanding how environment influences sedentary behaviour.

Our research is contributing to the dialogue surrounding the persistence of extensive non-sedentary behaviour amongst university students. The progression from high school to university life has shown to be accompanied by a decrease in physical activity and an increase in sedentary behaviour amongst students. Excessive sedentary behaviour has been found to negatively impact one's mental health and can lead to an increased risk of depression and weakened cognitive functions. Therefore it is imperative to incorporate as much NSB into everyday life as possible and as such, we will be basing our work on the research question we have formulated: Where on the UBC campus do people engage in non-sedentary behavior?

Access and provision of appropriate spaces that can be used for NSB should be widely accessible. Our project is looking into the ways in which the spaces dominated by students and their academic responsibilities are used for NSB, and sedentary behaviour. This means spaces that are not considered to be, or designated as spaces for physical activity. By looking into these types of spaces, we are hoping to discover areas where NSB unexpectedly occurs, or create opportunities within sedentary spaces for students to be non-sedentary. By providing our stakeholders with observation-based research of three specific academic buildings, our objective is to inform them where and how students are engaging in NSB within these spaces. This information can then be used to create initiatives to promote these spaces for NSB.

## Background

A good deal of research has been done on the effects of the built environment in cities, suburbs, and universities and what the built environment around people have on physical movement and non-sedentary behavior (NSB). This often aids the planning and layout of outdoor places which can facilitate more physical activity. What is not addressed as often, however, is sedentary behavior following the use of these pathways and environments. Once individuals have gotten to their destination, there is often countless hours of sedentary behavior to follow. The goal of making locations more walkable or easier to bike in is to increase activity and promote healthier lifestyles. The intended health benefits of biking or walking to locations are often negated by extended sedentary behavior and it is important to find ways to continue non-sedentary behavior within buildings. In universities and offices especially, where lectures can last hours and 8 hour work days are typically spent sitting at a desk.

There is a knowledge gap regarding non-sedentary behavior within establishments where most of the time is spent sitting. While some research has been done regarding standing desks, much of it was aimed at primary school students and does not investigate high schools, universities, or offices. There is a need for research about sedentary behavior as extended sedentary behavior has an array of negative health impacts such as a higher risk of diabetes and cancer, and premature cardiovascular mortality (Carson et al. 2014). Sedentary behavior can have negative impacts on all ages and it is important to find new ways to decrease it within day to day life.

Our work will add important information to the discussion of sedentary behavior within university, which can be applied to other levels of school, as well as offices. We will be filling the current gap regarding what happens inside of the buildings, which has not been addressed thoroughly. Sedentary behavior in buildings is often overlooked and has become largely normalized within institutions. By providing information about how much of it truly goes on, or what can help facilitate NSB, we hope to bring light to the detrimental effects of sedentary behavior and aid in reducing it.

The generally accepted definition of NSB (1.5 MET) allows for a better understanding around what level of activity individuals should aim for if they want to be non-sedentary which is valuable when creating a plan moving forward. However knowing when activity shifts from non-sedentary behavior to physical activity is not as clear. The upper limits of non-sedentary behavior may be uncomfortable for some in classrooms, and may not be able to be done by some, which may cause exclusion or feelings of discomfort. In a university setting there can be many factors that go into the willingness to participate in NSB or physical activity at all for that matter.

Research conducted by Deliens et al. (2015) provides insight on the determinants of physical activity in university students. The progression from high school to university life has shown to be accompanied by a decrease in physical activity and an increase in sedentary behavior amongst students. Excessive sedentary behavior has been found to negatively impact one's mental health and can lead to an increased risk to depression and weakened cognitive functions (Deliens et al. 2015). Deliens et al. wrote that determinants of physical activity and sedentary behavior in

university students contributes to the conflicting literature on whether there is a direct correlation between sedentary behavior and physical activity. They also provide insight on what factors motivate an individual to engage in physical activity and non-sedentary behavior. They conducted a qualitative study using focus group discussion of university students between the ages of 18 to 23. Their research involved the participation of a total of 46 students, 17 being male, and 29 being female. The study found that students were influenced by a series of factors during their initial decision making process that influenced whether they would engage in physical activity. These factors included social influences, such as encouragement from family or friends, individual factors such as self-enjoyment, convenience and self-discipline as well as available access to spaces that encourage physical activity, such as a gym.

By encouraging NSB, we will decrease some of the dependence on solely physical activity, as there a bevy of factors that go into participating in physical activity in university. Adding to knowledge about NSB can normalize a more consistent type of activity- one that does not take out 30 or more minutes of designated time in one's day, and one that does not need a change of clothes and sweating. There are countless benefits to being non-sedentary and by normalizing this there could be a decrease in pressure to engage in physical activity while still decreasing the risks involved in being sedentary. The movement away from depending on moderate to vigorous physical activity will be difficult however, as the last 60 years of research on movement has encouraged this instead of only above being sedentary (Katzmarzyk, 2010). If extended time is spent sedentary, it can mitigate the positive effects of the recommended 150 minutes a week of moderate to vigorous physical activity, further exemplifying the need for NSB (Hamilton et al. 2008). The necessary paradigm shift away from solely moderate to vigorous physical activity to

more time simply spent in a NSB state is an emerging idea that must be implemented to combat the deleterious effects of too much time spent sitting.

To lower the levels of sedentary behavior on campus, UBC created the “UBC Action Framework to Increase Physical Activity and Reduce Sedentary Behaviour.” This framework takes from the “Okanagan Charter”, which is an international meeting between 45 countries, aimed at promoting healthier lifestyles in universities and colleges (Okanagan Charter, 2015). The meeting created approaches that universities and large academic institutions should take in order to achieve a healthy campus, with personal wellbeing and health in the forefront (UBC, 2015). By exploring the buildings on campus we will be able to see the attempts by the university to reduce NSB, whether that be supplied in the buildings via standing desks or spaces, or initiatives like groups or lecture visits.

Lectures and research often require prolonged periods of sedentary behavior which has a detrimental impact upon university students (Rouse and Biddel, 2010), leading to problems such as reduced longevity and impaired health (US Surgeon General, 1996; Pate et al., 2008). In a society where adults typically spend more time sitting than sleeping (Carson et al., 2014), examining how an environment affects NSB is gaining traction as it provides an insight as to how to combat health risks linked to prolonged sedentary behavior. A popular way to reduce sedentary behavior in the traditional office environment has been the introduction of standing desks to the work-space. Many jobs and careers require you to spend many consecutive hours sitting down, similarly to student life. Although it is common practice amongst most professors, they are granted the liberty to stand during their lecture, and leisurely pace around the room. Students on the other



hand, are seated at desks, and it is considered taboo or rude for them to stand or stretch during lecture. A study conducted in a Midwestern University showed that 76.6% of students and 82.7% of professors would be in favor of introducing standing desks to the classroom (Benzo et al, 2016). Studies have shown that when introduced in children's classrooms, students respond quickly and more accurately when asked to perform tasks while standing (Britten et al., 2016).

To create behavioural change in a university setting around sedentary behaviour much work has been done in the effectiveness of certain workout regimes and NSB and the longevity of students participating in them after the research is over. Rosen (2000) discovered that to create sedentary behaviour change that is more likely to persist, giving students easy access to gyms and sources of physical activity can lead to creating healthy habits more easily. People with the intent to exercise are already more likely to change sedentary behaviour, and those with no intent to exercise will be less likely to initiate in consistently participating in NSB. By giving more people easy access to gyms or sources of physical activity, the population of individuals who will be more likely to change their sedentary behaviour on campus will increase. Once exercise becomes routine, they will more likely participate in NSB habitually. While this does conflict with some of the former ideas, those who currently exercising consistently can be targeted for campus NSB initiatives from inside of the gyms. By using this group to pioneer a movement away from sedentary lifestyles, a paradigm shift can occur that may influence others to begin physically exercising, which can lead to a better chance at consistent NSB.

## Methodology

For our observational research, we have decided to base our methodology on Danish Architect and urban design consultant Jan Gehl. In his novel, *How to Study Public Life* co-written with Birgitte Svarre, the authors outline a series of questions to reflect on when conducting observational research. These questions help guide the researcher in his or her reflection and observation of people in the public sphere.

Their first question is, who is in this space? Considering our project focuses primarily on UBC students and our observations are taking place within the campus core, we expect to primarily observe students. We hypothesis that outliers, such as UBC staff, will not dramatically effect our findings. Their following question is, where? When doing observational research of Sauder School of Business, the Geography Building, and the Integrated Science Building, we will be looking at the outdoor spaces surrounding and connecting these buildings. We also will look inside the building in spaces where students congregate; such as cafes, hallways and lounges. This leads Ghel and Svarre to their third question: what? We will be asking ourselves: what are people *doing* in these spaces? We will frame our observation around whether students are engaging in sedentary or non-sedentary behaviour in these spaces.

Although Ghel and Svarre's methodology is particularly effective in observing people in the public sphere, it does not apply as simply for the indoor built environment, transitionally spaces such as hallways, and classrooms. Because our observational research requires us to observe public space as well as indoor spaces, we are hoping to use his methods for our observations of large congregational hubs such as outdoor spaces, and distinctly large, transitional spaces. Due to our own personal knowledge of what occurs within classrooms, we

will not directly observe students within those spaces. Alternatively, using our own system of categories and we will search the classroom for indications that non-sedentary behavior does or doesn't occur, and whether it has potential for that to change. This information will be valuable for our stakeholder and the future of NSB initiatives at UBC and beyond. We hope to give recommendations around what can change within the classroom, and the general state of NSB in typical university buildings.

On UBC's point grey campus, we selected buildings that were in close proximity to one another in order to investigate the spaces between the buildings (Figure 1). We also decided to choose academic buildings that were diverse in age and character and not located near spaces designated for physical activity such as the rec centre. Using our access to the UBC building plans, we conducted our observations by surveying our buildings in order to assign categories to spaces. While going through the rooms we also kept note of any NSB that was happening, or could happen inside it. For example, space for exercise or activities that would count as non-sedentary, as well as standing desks, and moveable furniture. We also kept note of large spaces such as atriums, hallways, and lounges as these areas generally have enough open space in them to facilitate NSB. Within each of our chosen buildings, we chose an open space and allotted a one hour observation time which allowed us to see what kinds of NSB was occurring in them. This method allowed us to see if students are using these spaces for NSB without interviews or surveys. By doing this we can reveal any NSB that students may usually participate in during or between classes. The criteria for choosing this space was that it must be inclusive at all times (therefore, not a classroom), and large enough to hold more than 15 students at one time. Due to the variety in size of each of our building, we chose the largest space that fit our criteria within

each building. We have created 4 categories for mapping space. Our categories are based on how we defined non-sedentary behaviour with our Stakeholder. When speaking with our Stakeholder, she explained to us that she was looking for spaces where activities could be organized to engage multiple students in NSB. We were also asked to identify all spaces that require, or encourage students to engage in NSB.

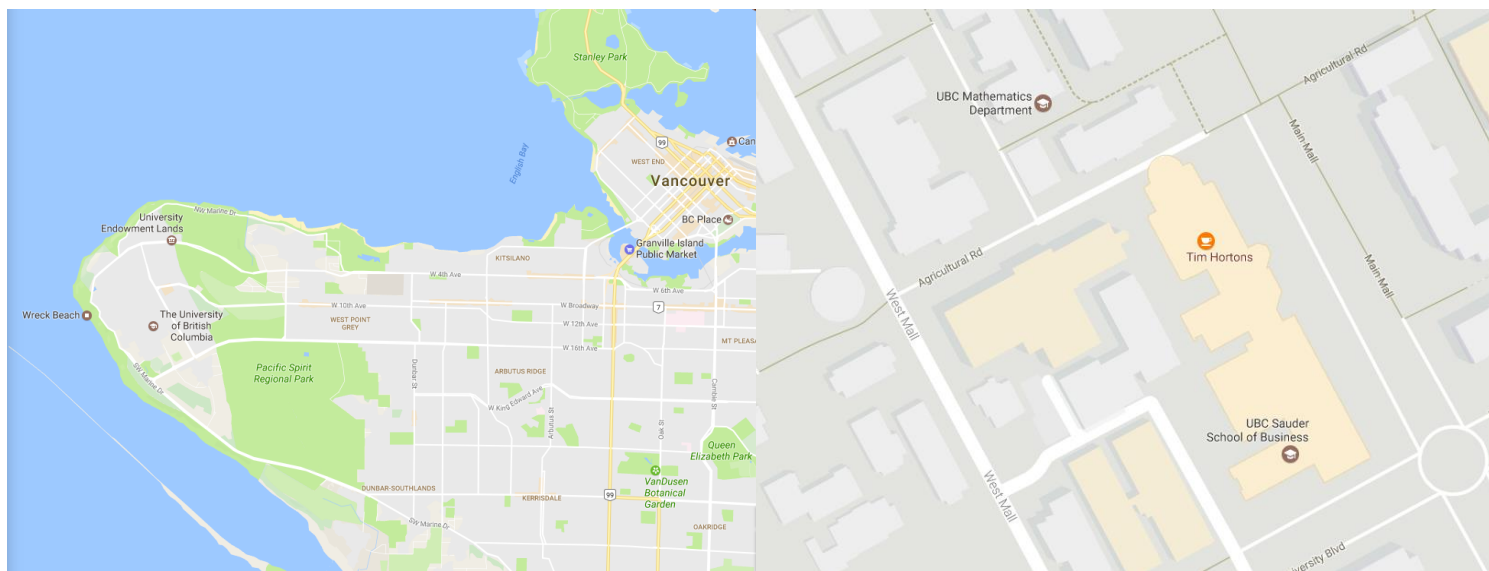


Figure 1- Location of Research Study Sites on

## UBC Campus

Spaces coloured in red do not allow, nor potentially allow, students to engage in any non-sedentary behaviour. For example, lecture halls with bolted furniture. However, It is important to note, that when we claim that the space does not allow NSB, it takes into account that the environment might not allow someone to engage in NSB. Meaning, the student could have space to stretch or stand in this classroom, but it is disruptive or not socially acceptable within the space during lecture time. Spaces that are coloured in green have potential in allowing students to engage in NSB. For example, spaces that do not have furniture bolted to the floor. That being

said, when we claim a space has POTENTIAL NSB, it means that the space may not be an environment where it is socially acceptable for someone to engage in NSB. However, we believe that there is opportunity for that to change. Spaces coloured in grey weren't applicable to our research. This was due to the fact that they were not available or open to all students, they were locked rooms, bathrooms, or offices. Finally, in Green and yellow we have spaces that do allow NSB. For example, lecture rooms with standing desks, rooms with "games" (ex: pool table), and large transitional spaces (Ex: hallways, outdoor space, stairs). Due to the challenges associated with using qualitative data, we do acknowledge that certain spaces can be more ambiguous than others.

Legend	
	Spaces that DO NOT allow NSB
	Spaces that have POTENTIAL NSB
	Spaces that DO allow NSB
	NA
	Outdoor Spaces that DO allow NSB

Our study had obvious limitations by virtue of only using qualitative data. In hindsight, we would have included a survey for the students in these buildings, in order to fill the gaps in behaviour we did not personally witness. That being said, a large component of our research was identifying spaces that could potentially be converted into areas where NSB could be facilitated. In that case, a survey would have not been entirely useful. However, it would have been a useful contribution to our overall data. It is important to note as well, that qualitative data can be affected by our own personal perception, and biases. For this reason, when conducting our

research, we tried to do our observations and categorizations in pairs. Furthermore, if we were unsure of how to categorize a specific room, we debated and discussed until we arrived at a consensus.

Analysis

**Henry Angus (Sauder) Building**

The main hall on the ground floor (Figure 2) is centrally located within the Henry Angus Building. Therefore its positioning creates a transitional space for accessing other areas of the building, and is noted in green. However, there are sofas along the edge of 106, which during our observation periods, it was discovered they are used not only for seating but for sleeping on as well. Classification of spaces, one of the largest obstacles of this research, therefore becomes problematic when such a dualism is present. To avoid confusion and maintain consistent in data collection, any spaces which provide the opportunity for NSB is either noted in blue for potential and in green if the spaces are currently used for NSB. Hence 106 is noted as a green space.

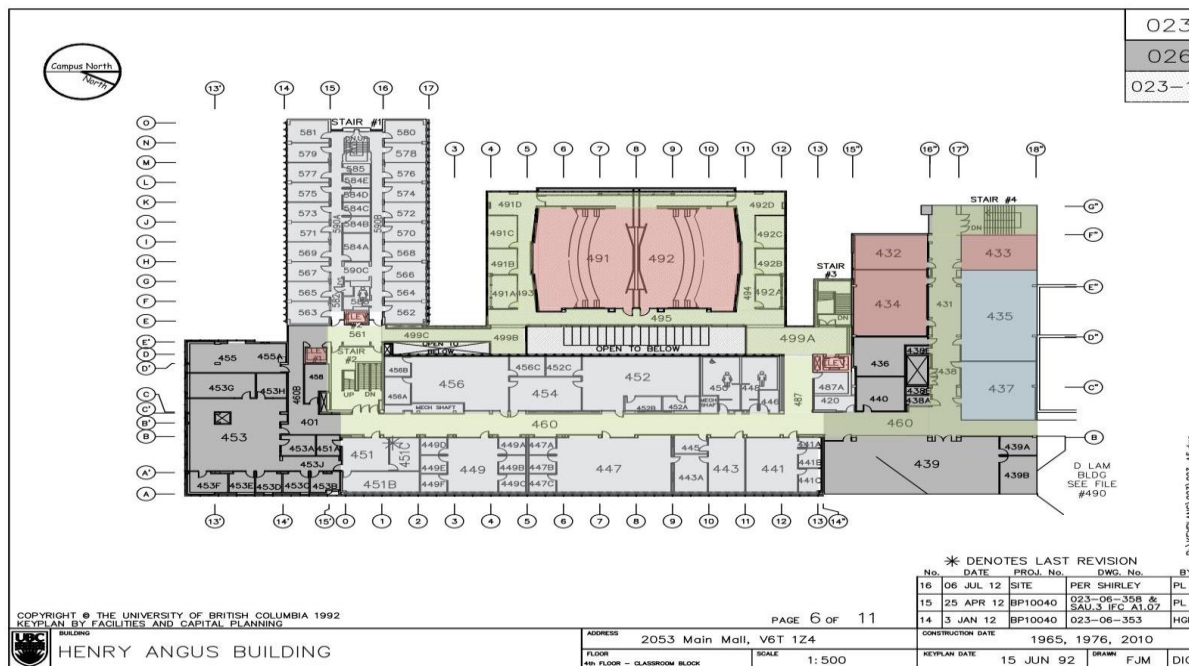


Figure 2 - Henry Angus Building Fourth Floor



Figure 3- Henry Angus Building, Room 439



Figure 4- Henry Angus Building, Room 437

Sauder Room 439 (Figure 3) has a pool table and large lounge which allows for NSB, however this space is listed as NA because it is only available to those with an access card. It is interesting to note that Sauder was the building with the most spaces deemed to fit in blue or green of the three buildings researched. There was also the most access to lounges and games despite some only being accessible with cards or codes. The greater provision of recreational space typically correlated with a greater provision of spaces with potential or current NSB use. Figure 4 shows an example of what would be deemed a ‘blue’ category as the furniture is movable and there is hard wooden flooring.

There were many classrooms with desks that can allow for standing during lecture time, however instead of standing at them, students appeared to simply use higher chairs. Possible



explanations for this could be a socially rooted obstacle, or simply that people are unsure why they are installed and what purpose they serve. It could also be as simple as a fatigue or focus related issue as students may focus on study and lectures in an environment which they feel most comfortable. However literature would promote standing whilst studying as it has been noted to increase concentration (Newport, 2007).

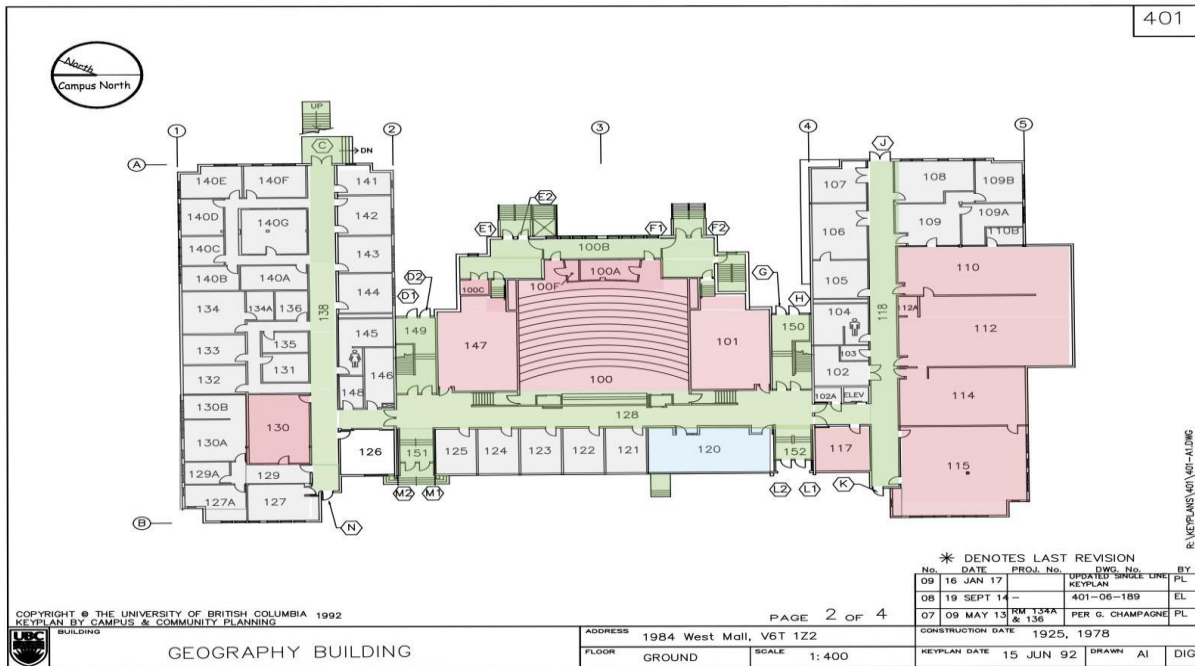


Figure 5- Geography Building First Floor



Figure 6 - Geography Room 100





Figure 7- Outdoor Space Geography Building

## Geography Building

The largest lecture hall in the Geography building is room 100 on the 1st floor. We chose to make room 100 (Figure 6) a red space because the environment does not facilitate, or allow someone to engage in NSB during class time. For example, the student would have space to stretch, but standing during lecture would block the view of the person behind you. Although you “walk up” to your seat, overall, the space is very restrictive due to the fact that all the furniture is bolted to the floor, and the room is slanted.

We decided to put the Geographic Information Center as blue because it is a space used by UBC geography staff and students. The space has potential to be interpreted by a student as large enough to stand and stretch. That being said, people around you could be uncomfortable or disturbed by your movement. Also, in the long-term, the space could not be converted or used to

facilitate NSB for more than a couple people.

When we conducted the timed observation of the Geography building, we struggled to find the “large congregational hub”, which, for example, was quite obvious in Sauder. We chose to stand directly outside the Geography lounge (room 120). Ten minutes before the next class began, the space outside room 100 was quite busy. Many students were waiting to be let into their class. The geography lounge was used for people to sit, eat and read.

On the second floor, we believe room 229 could be converted into a space used to engage in NSB. The furniture is not bolted to the floor, and could be easily pushed to the side. For this reason, we believe we could confidently report back to our Stakeholder that a small scale congregation of people could engage in NSB in this space between classes.

The outdoor space in Figure 7 is not often used for more than a transitional space, but still labelled as green. Yet the contention with this space (as with all outdoor spaces) is that its use is largely weather dependant. Rain and wet grass appear to discourage use of this space.

### **Leonard Klinck Building**

For the half hour observation periods conducted on the stairs with doors labelled F and G, it was intriguing to note the use of the space was mostly walking through this transitional space similar to Henry Angus room 106, as access to all rooms and outdoor space mandated the use of stairs due to the layout of the building. Therefore without a conscious decision to participate in NSB, those using the building are immediately immersed within an NSB environment.

Similar to the large lecture theatres in Sauder and the Geography building, the gradient and layout of the large lecture theatres in Klinck (Rooms 200 and 201) inhibit NSB. The only opportunity for NSB is either standing to give a lecture at the front of the room, or climbing the stairs to sit at the fixed desks.

With increasing elevation on the building, there appeared to be more freedom with spaces. Therefore, it was on the upper floor which had the most moving desks and also recreational spaces for students with some rooms having couches. There was also a room that included standing desks. This could perhaps be that as these rooms are more peripheral to the central lecture theatres, they are used less often so are far more flexible in their use.

## **Synthesis**

Perhaps the most sensitive of issues we wish to acknowledge would be prescribing areas to be suitable for NSB to the entire UBC community. With particular regards to members of the UBC community with special access and mobility requirements, we did not feel fully equipped in our research to justly discriminate between NSB activities and subsequent associated spaces.

The conflicting views described in our observations demonstrated that although some students are given access to standing desks, they did not appear to take the opportunity to stand during lecture. It made us wonder whether or not standing during class is still considered socially taboo or if there are other significant barriers to participation in NSB.

### Future Research Directions

We would like to recommend coupling behaviour change initiatives with programmes targeting sedentary behaviour change. If possible, furthering the SEEDS partnership would be most desirable in order to expand the study and collaborate with projects exploring behavioural change. Demonstrated by Smith et al. (2014), and by a similar study by Schwerdtfeger et al. (2012), texting prompts can be used to target behaviour change associated with sedentary behaviour. However, one has to account for the funding required in order to set this programme up. Furthering a technology/software related route, interactive mapping could also be used to compile a student led database of spaces or initiatives run on campus. With the help of students, buildings and classrooms could be explored to give a comprehensive analysis of NSB on campus and increase knowledge of available spaces on campus. Moreover, targeting unconventional spaces around campus such as alleyways could allow for creative ideas to involve people in NSB and to make the most use of the space provided.

Another recommendation we would like to propose would be increasing resource provision in order to take advantage of available spaces. For example, making spaces on campus available for drop in sessions with access to objects such as frisbees, ping pong tables or even volleyball nets. However this leads on to addressing issues with the weather. Use of outdoor spaces is inhibited by unfavourable climate conditions so we would like to acknowledge that increasing NSB is not always as simple as increasing resource provision.

By giving more people easy access to gyms or sources of physical activity, the population of individuals who will be more likely to change their sedentary behaviour on campus will

increase. Once exercise becomes routine, they will more likely participate in NSB habitually. Within these spaces of physical activity it may be helpful to make clear and informative advertisements and infographics to attract those who are more prone to habitual change. Other potential ways to increase NSB would be to engage with professors and lecturers about piloting a MoveUBC project in their course. This can change the stigma of NSB in classrooms, garnering support for the initiative, and utilizing spaces that NSB can currently occur in.

Lastly we would suggest that participating more frequently on social media to remind individuals about sedentary behaviour can help create consistency and increased awareness. There could be competitions run around campus between lecture groups or by spurring on people to upload proof of NSB activities with selected hashtags on a UBC forum. This would contribute towards generating excitement and involvement in NSB.

## Conclusion

Our research determined that there is some opportunity for students to engage in NSB within academic buildings, however, with the help of behavioral change initiatives, access to moveable furniture, standing desks and the development of more “exercise crews”, sedentary behavior could be even more significantly reduced. Our scholarly research demonstrated that there is a lack of consensus on what NSB is. Given our partnership with SEEDS, we chose to define NSB as understood through our discussions with our Stakeholder. We believe that this allowed us to conduct our research in a way that was directly in line with our Stakeholder’s expectations and understanding of our results. What we took from our observations is that students engage in NSB by virtue of living the “student life”. Meaning, walking to and from

class, talking in groups with your classmates, and going to grab coffee. That being said, “student life” means that you spend most of your time sitting in class, and sitting at your desk or the library, studying. We saw how these two parts of “student life” overlap, and how “space” can facilitate NSB, or how it can inhibit you from being non-sedentary. Our observations demonstrated that although some students are given access to standing desks, they did not appear to take the opportunity to stand during lecture. It made us wonder whether or not standing during class is still considered socially taboo.

When looking back at the scholarly literature, it is interesting to note that UBC has an incredibly small amount of student gym and recreation space. Then, during our observations, we saw no NSB within the buildings. With less people being physically active on campus due to lack of space, there is less of a chance that students are making the habitual changes that is mentioned by Rosen (2000). When UBC increases the square footage of gym space per student, allowing more students to become physically active, there is a strong possibility that the MoveUBC initiative will make a more resounding impact on student culture as more people will be more likely to be less sedentary. Knowing this, MoveUBC can more strongly target the audience that is more likely to engage in NSB in classrooms by themselves, acting as pioneers to a non-sedentary movement.

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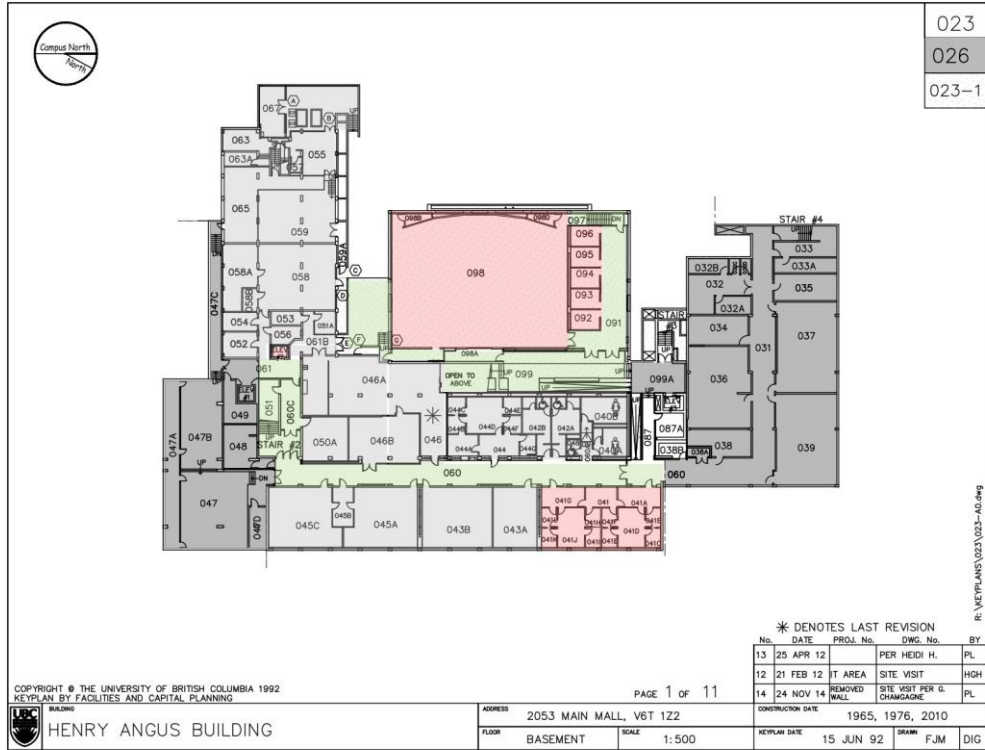
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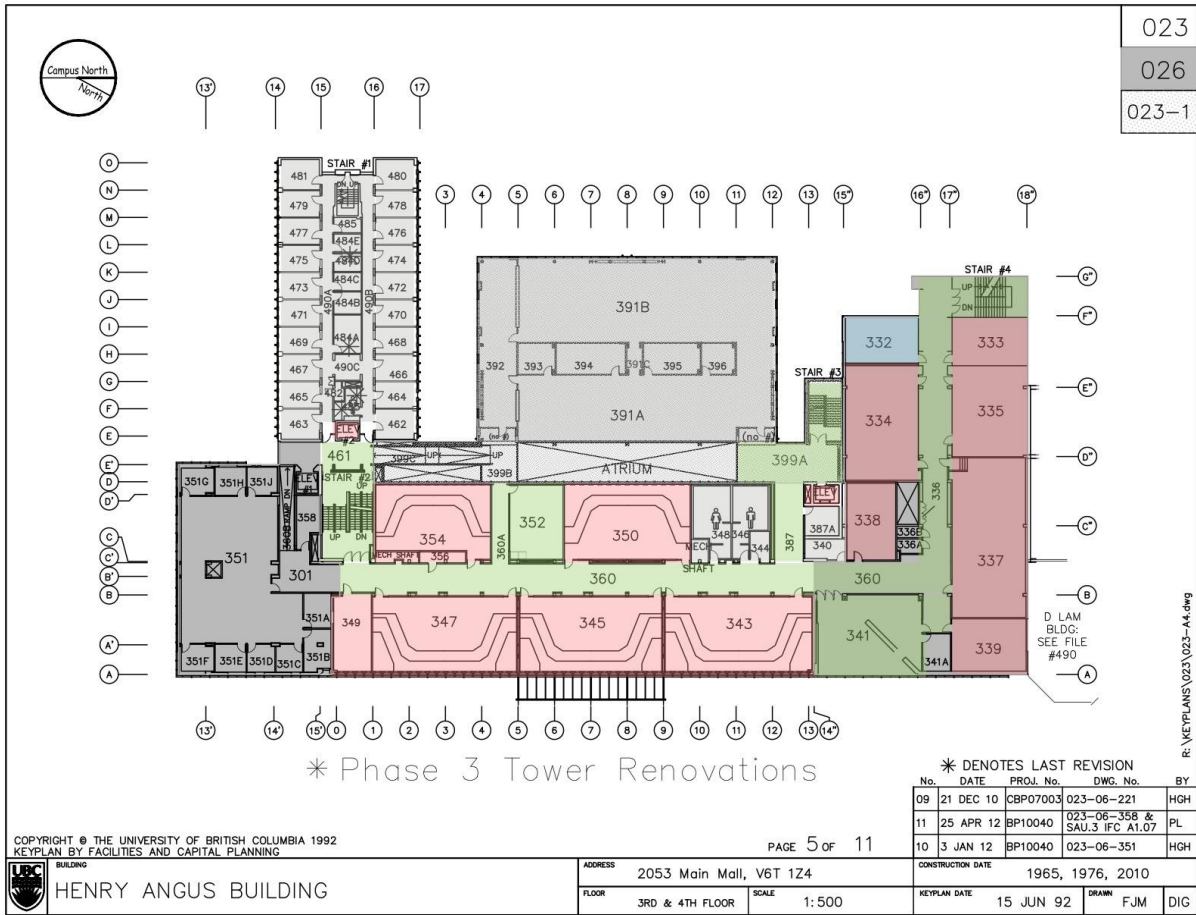


Appendices  
Henry Angus (Sauder)





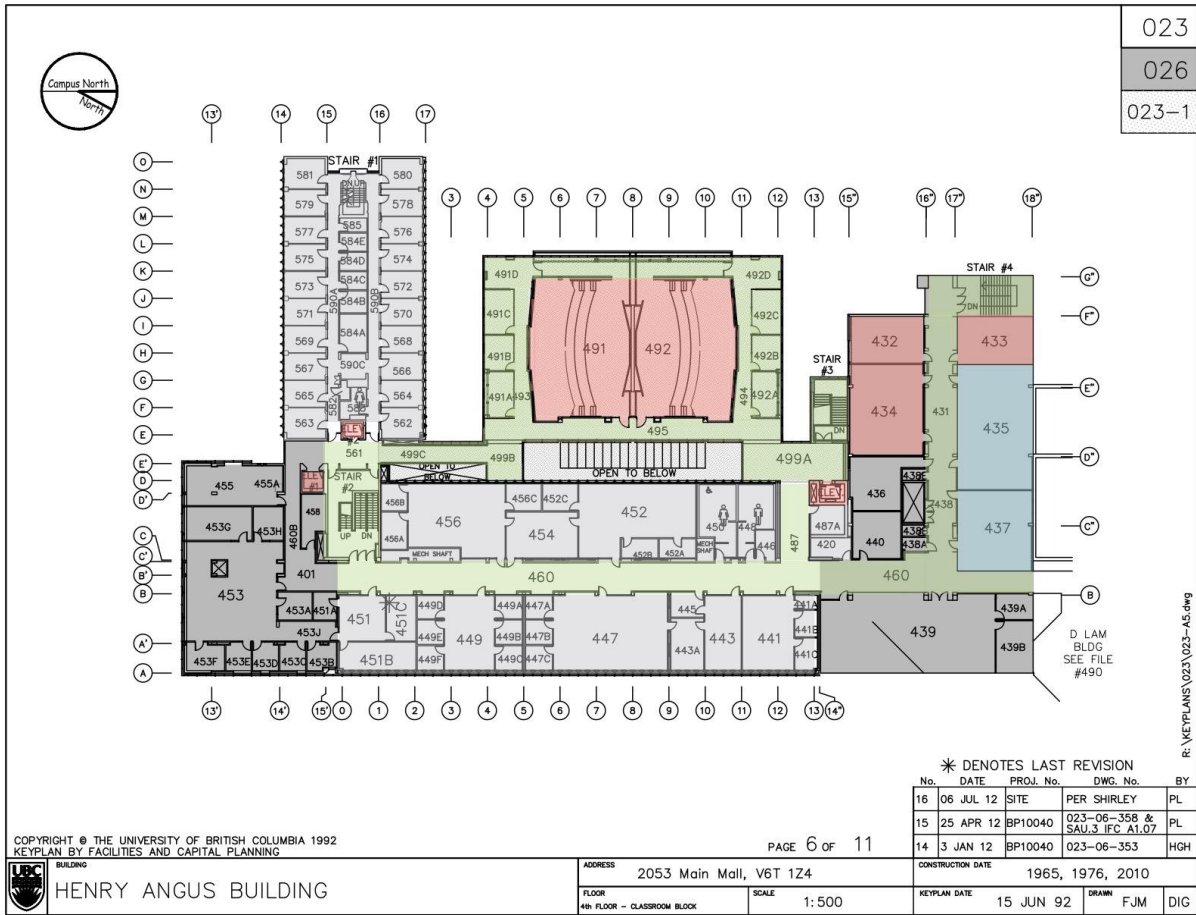
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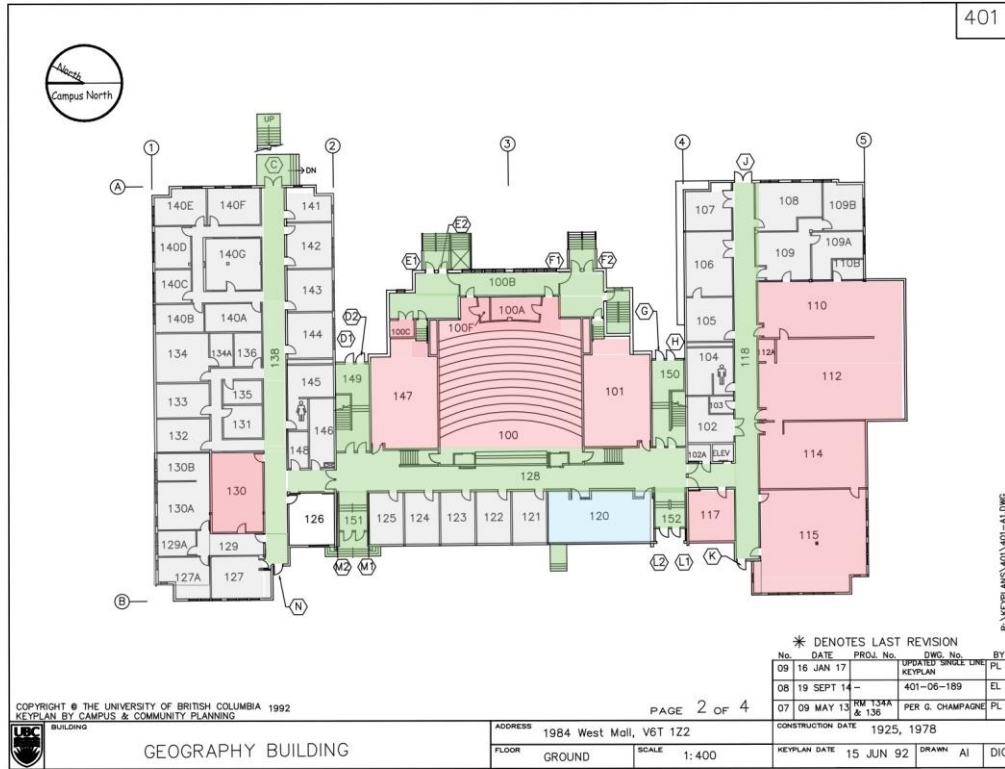
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KEYPLAN BY FACILITIES AND CAPITAL PLANNING

PAGE 5 OF 11

BUILDING	HENRY ANGUS BUILDING		ADDRESS	2053 Main Mall, V6T 1Z4		CONSTRUCTION DATE	1965, 1976, 2010	
			FLOOR	3RD & 4TH FLOOR		SCALE	1:500	
			KEYPLAN DATE	15 JUN 92		DRAWN	FJM DIG	



# Geography Building



Leonard Klink

