

MINNESOTA



**POST-OCCUPANCY
EVALUATION**

Indoor Environment Quality + Residence Hall Heritage Hall, University of Minnesota, Crookston, MN Report 1

April 2015, Minneapolis, MN

Sustainable Post-Occupancy Evaluation Survey (SPOES)

B3 Guidelines

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1.0 Overview

The purpose of this report is to examine the connection between sustainable design criteria used in the design of Heritage Hall, a residence hall on the University of Minnesota, Crookston (UMC) Campus, and residents' satisfaction with their living environment. The Heritage Hall facility was designed using the B3 Guidelines (formerly known as the Minnesota Sustainability Guidelines or MSBG) and completed for occupancy in January 2013. The B3 Guidelines track specific state-funded, B3 buildings as a means of demonstrating real outcomes aimed at the conservation of energy resources, creation and maintenance of healthy environments, and occupants' satisfaction with their building environments. The Sustainable Post-Occupancy Evaluation Survey (SPOES) was developed to assess human outcomes in workplace, classroom, and residence hall settings in compliance with the B3 Guidelines project tracking requirements. This is a report of residents' responses at about 24 months post-occupancy. The survey was conducted in April 2015 and is the first of two required survey events for this building.

This SPOES report focuses on residents' satisfaction with the physical environment as related to 23 indoor environment quality (IEQ) criteria such as lighting, thermal, and acoustic conditions in their primary living units. Residents' satisfaction with the facility (site, building, and interior) and the effect of the facility's physical environment on their perceptions of their academic performance and health also are included. Finally, a brief look at residents' commuting practices and physical activities within the building are reported. The report provides descriptive information about residents' perceptions of the IEQ of their resident hall environment (overall facility and primary living unit). In addition, this information serves the broader development of knowledge regarding the influence of IEQ on individuals living in residence hall environments.

2.0 Method

SPOES consists of a self-administered, Internet-based, questionnaire submitted to and completed by residents. The SPOES questionnaire has been tested for **validity** (measures what it is intended to measure) and **reliability** (repeatability or replicability of findings). Residents rate their level of satisfaction on a **Likert-type scale** (measurement scale) from 1 (very dissatisfied) to 7 (very satisfied) with IEQ of the facility and their primary living spaces. They also rate the influence of their physical environment on their perception of their academic performance and health on a scale from 1 (hinders) to 7 (enhances). There were no physical measurements taken of environmental conditions such as temperature or acoustic level. This study is limited to residents' perceptions.

The report provides a descriptive summary of the results stated as a **mean** (average of all responses), **standard deviations** (SD) (how different scores are from each other and the mean), and **number of responses** (N) for each question analyzed. The mean for a 7-point scale is 4.00. Lower or higher means reflect stronger tendencies towards dissatisfaction/satisfaction and hinders/enhances. Means that are close to the center of the scale (4) are considered to be neither dissatisfied/hinders or satisfied/enhances.

When interpreting **mean** responses, the following labels were used:

- 1.00 - 3.50 dissatisfied (hinders)
- 3.51 - 4.50 neither satisfied (enhances) nor dissatisfied (hinders)
- 4.51 - 7.00 satisfied (enhances)

An IEQ Score is also calculated for residents' satisfaction with IEQ in their primary living spaces. This is a statistical combination of IEQ scores, which results in a single IEQ score for all residents on IEQ category-level criteria and is reported in an IEQ Scorecard.

2.1 Description of the Questionnaire

Residents first rate their level of satisfaction with the facility (site, building, and interior) and the influence of their physical environment on their perception of their academic performance and health. Then they respond to questions about their satisfaction with their primary living spaces in relation to IEQ criteria from the B3 Guidelines. Additionally, residents' physical activities and commuting practices are investigated.

In the SPOES questionnaire, the 23 IEQ criteria listed below are evaluated. There are two levels of criteria, categories and attributes. As shown in the list, the 'overall' criteria are boldfaced and called 'categories' or 'category level' criteria. A category is broader or more general such as Overall View Conditions or Overall Indoor Air Quality. Some categories have 'attributes' or 'attribute level' criteria and provide greater detail about the category. For example, Overall Thermal Conditions is a category level question, and there are four attribute level questions related to thermal conditions such as adjustability, air velocity (draft), humidity, and temperature. Overall Acoustic Conditions is a category with attributes of residents' ability to hear desired sounds and their ability to limit undesired sounds. There are 12 category-level and 11 attribute level questions. Means are calculated and reported for all category and attribute-level criteria.

An IEQ Satisfaction Score is also calculated for residents' satisfaction with IEQ in their primary living spaces. This is a statistical combination of the 12 category-level criteria only and results in a single, mean IEQ Satisfaction Score for all residents' satisfaction with the physical conditions of their primary living spaces. Attribute-level criteria are not included in the IEQ Score because unequal weight would be given to criteria that have both category and attribute-level questions.

In the following list, **category (boldface)** criteria are listed in alphabetical order. If a category has attributes, they are listed with the category.

Overall Acoustic Quality

- Ability to hear desired sounds
- Ability to limit undesired sounds

Overall Appearance (aesthetics)

Overall Cleaning and Maintenance

Overall Daylighting Conditions

- Adjustability of daylighting
- Amount of daylighting

Overall Electric Lighting Conditions

- Adjustability of electric lighting
- Amount of electric lighting

Overall Furnishings

- Function of furnishings

Overall Indoor Air Quality

Overall Privacy

Overall Technology

Overall Thermal Conditions

- Adjustability of thermal conditions
- Air velocity (drafty/stagnant))
- Humidity (dry or moist)
- Temperature (hot or cold)

Overall Vibration and Movement

Overall View Conditions

2.2 Limitations

Residents' participation is voluntary, and responses are self-reported. As is true with all survey research, the responses indicate residents' perceptions. There were no physical measurements, e.g., temperature, humidity, or lighting levels, of the environment taken.

3.0 Sample Description

3.1 Description of Building

The Heritage Hall Residence Hall facility was designed as a co-educational living community serving students at the University of Minnesota on the Crookston (UMC) campus in Crookston, Minnesota. Heritage Hall was completed for occupancy in January of 2013. The facility was designed to accommodate students in the freshman and sophomore years of study. The two-story facility includes five one-bedroom suites and 35 two-bedroom units equipped with a shared bathroom (shower, vanity, and toilet accommodations), living / study room, and mini-refrigerator. The building was intentionally designed to serve students' academic and community needs by including exercise rooms, four kitchen commons, laundry facilities, recreation rooms, and a large 'state-of-the art classroom/multi-purpose room'.



Figure 1. Heritage Hall Residence Hall, University of Minnesota, Crookston, Minnesota (Photo credit: <http://www1.crk.umn.edu/reslife/buildings/heritage/index.html>)

3.2 Description of Respondents

This survey was administered to approximately 145 students at the Heritage Hall facility. The response rate to the questionnaire was approximately 30%. Of those responding, 59% were female, 38% were male, and 3% were other. The mean age of respondents was slightly over 19 years, with a range of 18 to 26 years. The respondent's student status or level at UMC varied. Of those responding, 69% indicated that they were at the freshman level, 26% were at the sophomore level, 3% were at the junior level, and 3% were considered professional/graduate level students.

Heritage Hall opened for occupancy in January 2013. Of those residents responding, 3% reported that they have lived in the residence hall more than three semesters, 3% have lived there for two-three

semesters, 90% have lived there for one-two semesters, and 5% have lived in the residence hall only during the current semester. Relating to the percentage of time (including sleep) residents spend in their primary living unit, 23% of the respondents reported they spend more than 75% of their time during the week in their primary living unit; 38% spend 51-75% of their time in their primary living unit; 26% spend 25-50% of their time in their primary living unit, and 14% spend less than 25% of their time in their primary living unit. (Some percentages do not add up to 100% due to rounding).

Heritage Hall has two types of primary living units that include sleeping space with shared living / study space and bath. Results indicated that 67% of the respondents live in a double-room (4 occupants) with shared living / study space and a bath, and 33% of the respondents live in a double room or more (5 occupants) with shared common living / study space and a bath.

4.0 Findings and Discussion

4.1 Heritage Hall Facility (Site, Building, and Interior): Overall Satisfaction, Academic Performance, and Health

Residents responded to questions concerning the Heritage Hall facility (site, building, and interior) and their overall satisfaction with the facility, overall perceptions of their academic performance in relation to the facility, and their overall perception of their health in relation to the facility. Table 1 shows the means and standard deviations of their responses as well as how the responses are interpreted. Figure 2 is a graph that shows the mean for each question as a blue, horizontal bar. The standard deviation is shown by the vertical bar that runs from green, representing satisfied (or enhanced) and red representing dissatisfaction (or hindered). Gray represents the 'neither/nor' range of responses. In cases where there were no dissatisfied responses, the bar will be all grey and green. This graph is simply a visual image of the findings from Table 1.

Table 1. Heritage Hall Facility - overall satisfaction, academic performance, and health

Facility (site, building, and interior)	Mean (1-7)	SD	N	Interpretation
Overall satisfaction	5.56	1.37	39	Satisfied
Overall academic performance	5.21	1.38	39	Enhanced
Overall health	4.89	1.43	38	Enhanced

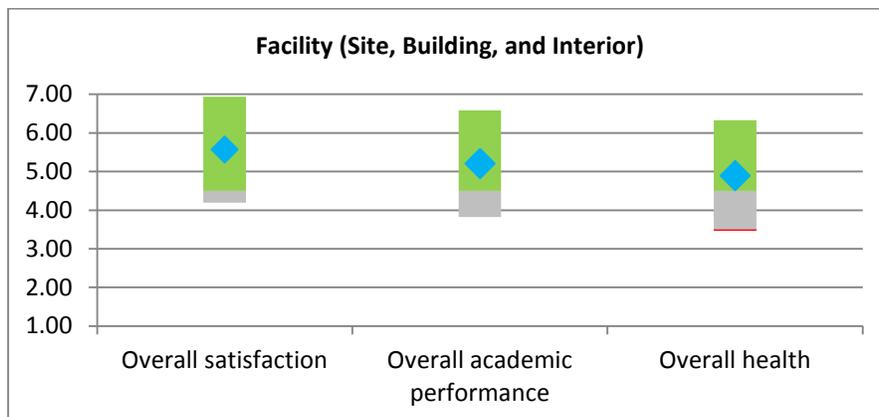


Figure 2. Heritage Hall facility - overall satisfaction, academic performance, and health

Results indicated that respondents were **satisfied** ($M = 5.56$) with the Heritage Hall facility (building, site, and interior). Further, they reported that their overall academic performance was **enhanced** ($M = 5.21$), and their overall health was **enhanced** ($M = 4.89$) by the facility.

4.2 Heritage Hall Facility Common Spaces (shared with all residents): Overall Satisfaction

Residents responded to questions concerning the Heritage Hall facility (site, building, and interior) and their overall satisfaction with the shared common spaces located on the main floor and the lower level. Table 2 shows the means and standard deviations of their responses as well as how the responses are interpreted. Figure 3 is a visual image of the findings from Table 2.

Table 2. Heritage Hall common spaces - overall resident satisfaction

Common spaces	Mean (1-7)	SD	N	Interpretation
Lobby	5.79	1.42	39	Satisfied
Peterson Classroom	5.79	1.40	39	Satisfied
Study Areas	5.44	1.48	39	Satisfied
Recreation Area	5.23	1.74	39	Satisfied
Workout / Fitness Area	4.97	1.78	39	Satisfied

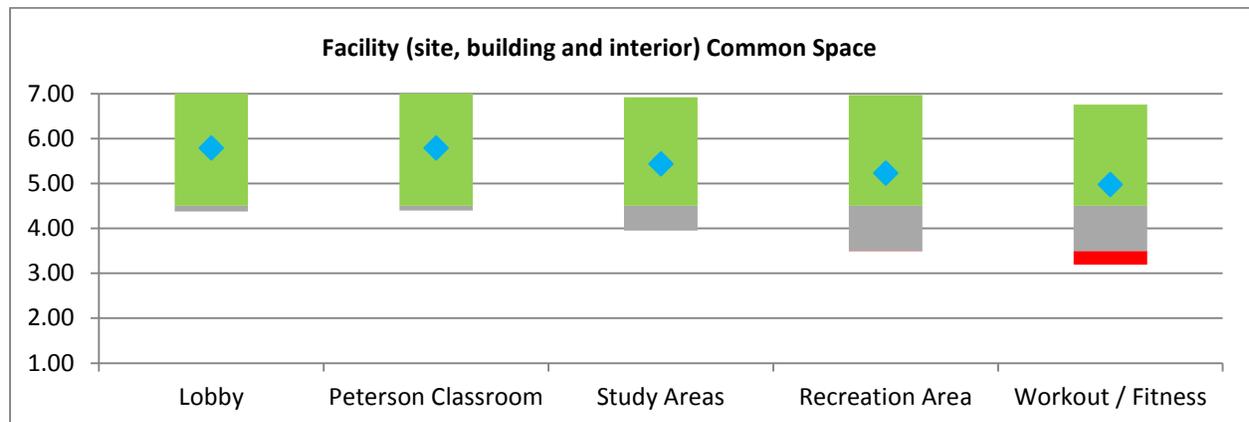


Figure 3. Heritage Hall common spaces (main floor and lower level) - overall satisfaction

Results indicated that residents were **satisfied** with the lobby ($M = 5.79$), Peterson Classroom ($M = 5.79$), study areas ($M = 5.44$), recreation areas ($M = 5.23$), and workout / fitness center ($M = 4.97$) at the Heritage Hall Residence facility.

4.3 Primary Living Unit: Overall Satisfaction, Academic Performance, and Health

Residents responded to questions concerning their overall satisfaction and overall perceptions of their academic performance and health as related to their primary living unit (e.g., single and double rooms with and without a bath). Table 3 shows the means and standard deviations of their responses as well as how the responses are interpreted. Figure 4 is a visual image of the findings from Table 3.

Table 3. Primary living unit - overall satisfaction, academic performance, and health

Primary Living Space	Mean (1-7)	SD	N	Interpretation
Overall satisfaction	5.13	1.63	39	Satisfied
Overall academic performance	5.08	1.40	39	Enhanced
Overall health	4.85	1.41	39	Enhanced

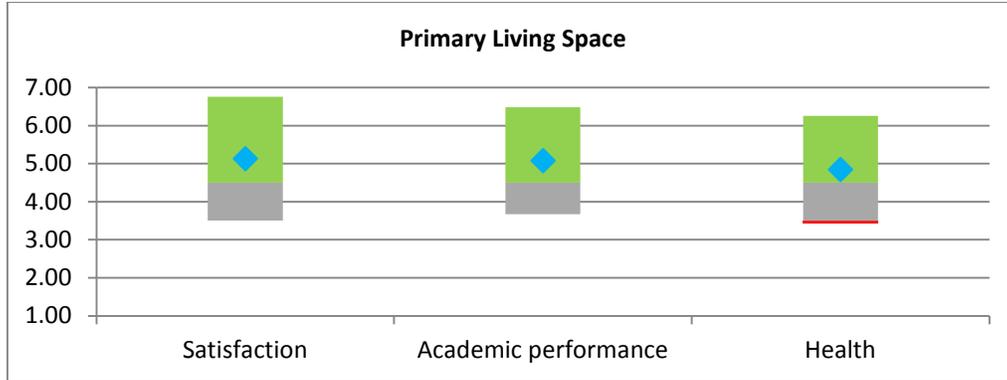


Figure 4. Primary living unit - overall satisfaction, academic performance, and health

Results indicated that residents were **satisfied (M = 5.13)** with their primary living unit and reported that their overall **academic performance (M = 5.08)** and overall **health (M = 4.85)** were **enhanced** by their primary living unit.

4.4 Primary Living Unit and Common (shared) Spaces: Overall Satisfaction

The Heritage Hall facility provides several common or shared spaces (living room / lounge, bathrooms, on each floor for use by the student residents. The common (shared) spaces selected for this study included the living room / lounge and the bathroom spaces. Residents responded to questions concerning the common or shared spaces associated with their primary living unit. Table 4 shows the means and standard deviations of their responses as well as how the responses are interpreted. Figure 5 is a visual image of the findings from Table 4.

Table 4. Primary living unit and common (shared) spaces - overall satisfaction

Primary Living Unit / Shared common spaces	Mean (1-7)	SD	N	Interpretation
Study Area	5.28	1.62	39	Satisfied
Kitchenette	5.10	1.57	39	Satisfied
Laundry Area	4.54	1.88	39	Satisfied

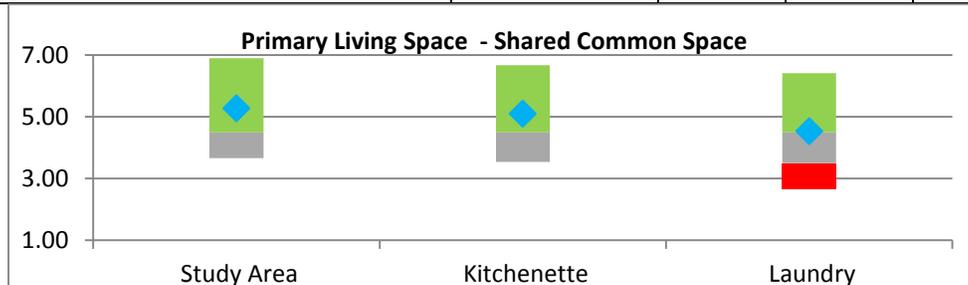


Figure 5. Primary living unit and common (shared) spaces - overall satisfaction

Results indicated that respondents were **satisfied (M = 5.28)** with the study space, **satisfied (M = 5.10)**

with the kitchenette, and **satisfied (M = 4.54)** with the laundry area with their primary living unit.

4.5 Primary Living space: Satisfaction with Indoor Environment Quality (IEQ)

Residents responded to questions concerning their satisfaction with IEQ criteria (thermal conditions, indoor air quality, acoustic conditions, etc.) related to their primary living unit (e.g., single and double occupancy spaces with or without bathrooms). Table 5 shows the means and standard deviations of their responses as well as how the responses are interpreted. Figure 6 is a visual image of the findings from Table 5.

Table 5. Primary living unit - satisfaction with IEQ conditions

#	IEQ Criteria (1-23) (Category level criteria are bold face)	Mean	SD	N	Interpretation (D = Dissatisfied) (S = Satisfied)
1	Overall cleaning and maintenance	5.82	1.68	39	Satisfied
2	Adjustability of thermal conditions	5.72	1.59	39	Satisfied
3	Temperature (hot or cold)	5.49	1.52	39	Satisfied
4	Overall daylighting conditions	5.36	1.68	39	Satisfied
5	Overall appearance (aesthetics)	5.36	1.72	39	Satisfied
6	Amount of electric light	5.31	1.89	39	Satisfied
7	Overall electric lighting conditions	5.28	1.85	39	Satisfied
8	Amount of daylighting	5.26	1.67	39	Satisfied
9	Overall view conditions	5.23	1.77	39	Satisfied
10	Overall technology	5.23	1.60	39	Satisfied
11	Overall thermal conditions	5.15	1.65	39	Satisfied
12	Overall indoor air quality	5.15	1.81	39	Satisfied
13	Adjustability of daylighting	5.11	1.71	38	Satisfied
14	Air velocity (drafty or stagnant)	5.11	1.77	38	Satisfied
15	Adjustability of electric lighting	5.10	1.97	39	Satisfied
16	Function of furnishings	5.05	1.77	38	Satisfied
17	Ability to hear desired sounds	4.95	1.75	39	Satisfied
18	Overall vibration and movement	4.85	1.83	39	Satisfied
19	Overall furnishings	4.64	1.72	39	Satisfied
20	Humidity (dry or moist)	4.38	2.14	39	Neither S or D
21	Overall privacy (sound and visual privacy)	4.13	1.92	39	Neither S or D
22	Overall acoustic quality	3.56	1.97	39	Neither S or D
23	Ability to limit undesired sounds	2.97	1.86	39	Dissatisfied

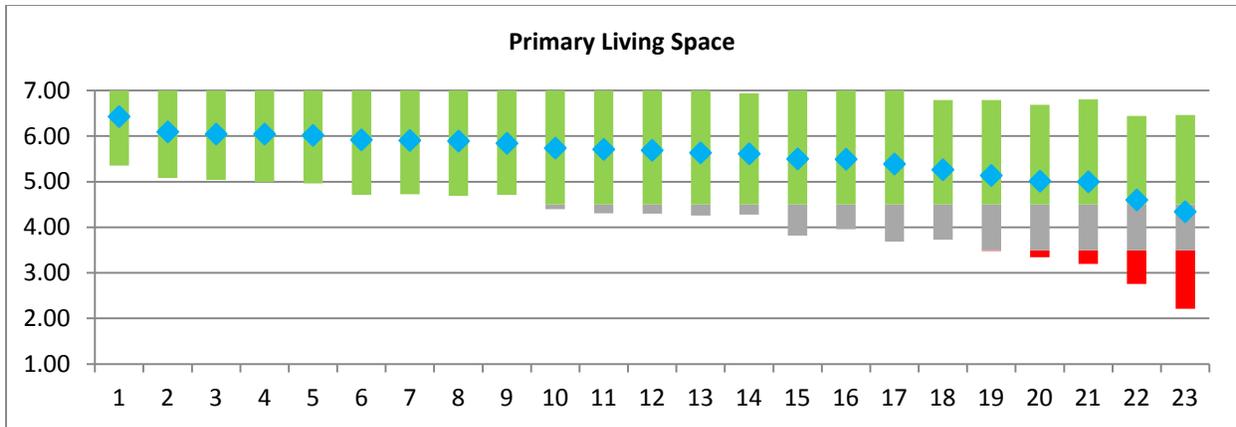


Figure 6. Primary living unit - satisfaction with IEQ conditions (IEQ 1-23 are listed in Table 5 above)

Results indicate that residents were satisfied with 19 of the IEQ criteria in their primary living spaces, i.e., means at or above 4.50. They were neither dissatisfied nor satisfied with three of the IEQ criteria, the humidity (dry or moist) (**M = 4.38**), the overall privacy (sound and visual privacy) (**M = 4.13**), and the overall acoustic quality (**M = 3.56**). They were dissatisfied with one of the IEQ criteria, their ability to limit undesired sounds (**M = 2.97**). The mean satisfaction scores are at the moderate to moderately high levels, meaning there is still room for improvement of residents’ satisfaction with their primary living spaces and will be addressed in Section 6.2 Recommendations. Further explanation of these scores also can be found in Appendix A. Open-Ended Responses.

4.4 IEQ Satisfaction Scorecard

The IEQ Satisfaction Score is determined by calculating a mean of all overall category level IEQ criteria. At this time, all variables are weighted equally in this calculation as little evidence exists that provides rationale for weighting some variables heavier than others. The IEQ mean is representative of a fair overall IEQ score and can serve as a benchmark of residents’ satisfaction with the physical environment of their primary living space. As shown in Figure 7, the **IEQ Satisfaction Score** for primary living spaces at the Heritage Hall facility is **4.98**.

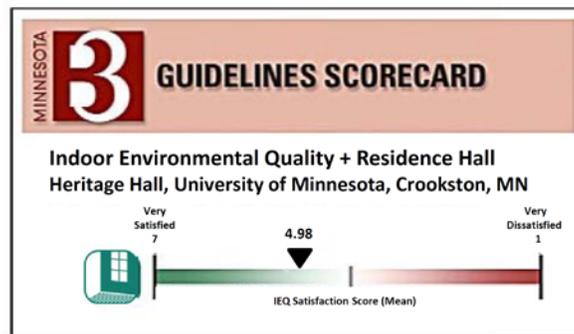


Figure 7. Primary living unit - IEQ Satisfaction Score

Overall, the residents were satisfied with IEQ conditions as indicated by the mean score of **4.98**. As shown in Table 5, satisfaction with the **Overall cleaning and maintenance (M = 5.82)**, **Overall daylighting conditions (M = 5.36)**, and **Overall appearance (aesthetics) (M = 5.36)** were the criteria with the highest

satisfaction and pulled the IEQ Satisfaction Score in a slightly more positive direction. The lowest rated categories **Overall privacy (sound and visual privacy) (M = 4.13)** and **Overall acoustic quality (M = 3.56)**, although still in the neutral satisfaction / dissatisfaction range, pulled the IEQ Score down. Any of the IEQ criteria can be addressed by building management to increase residents' satisfaction. Recommendations to assist with this process are noted in Section 6.2 Recommendations. Please note that the IEQ Satisfaction Score only uses the category level criteria (those labeled 'Overall'; see section 2.1, paragraph 3 for explanation).

5.0 Physical Activity Engagement and Commuting Practices

In the final section of the survey, residents responded to questions regarding their overall physical activity while at Heritage Hall facility (site, building, and interior) and their commuting practices.

5.1 Physical Activity Engagement

Providing residents with opportunities for alternative paths of travel around the residence hall facility, e.g., taking stairs as opposed to using the elevator, provides opportunities to engage in additional types of physical activities. Engaging in physical travel throughout the residence hall can be associated with healthier lifestyles.

Table 6. Overall physical activity (walking, stair use, etc.) affected by the Heritage Hall

Heritage Hall	Mean	SD	N	Interpretation
Physical Activity	4.95	1.59	39	Enhances

Results indicated that residents felt that Heritage Hall facility **enhanced (M = 4.95)** their physical activities (walking, stair use, etc.). Further, of the 39 residents responding to this question, 64% said that facility's enhanced their overall physical activity; 23% said they were **neither dissatisfied nor satisfied**; and 13% were **dissatisfied**.

5.2 Commuting Practices

The Heritage Hall facility is located in on the edge of the University of Minnesota – Crookston campus. UMN-Crookston is generally a residential campus with many on-campus activities. The University provides parking facilities, bike paths, and sidewalks throughout the campus and adjacent to the Heritage Residence Hall.

Table 7 provides results on residents' primary mode of transportation. These results, although not related to IEQ, do offer the University insight into residents' commuting behaviors and opinions. These data can provide important information about commuting practices that can reduce transportation energy consumption.

Table 7. Commuting Practices – Primary mode of transportation

Heritage Hall Facility	Walk	Car / Truck (Vehicle)	Carpool / Vanpool
Primary mode of transportation on campus	79%	18%	3%

Related to primary modes of transportation to class and other campus activities, 79% of the student residents walk, and 18% use a vehicle (car or truck), and 3% use a carpool or vanpool service.

6.0 Conclusions

6.1 Summary

A post-occupancy evaluation was conducted of residents of Heritage Hall facility at approximately two years after it was first occupied. About 30% of the residents responded to the survey.

The survey included questions related to residents' overall satisfaction with the facility (site, building, and interior) and influence of the facility on their overall academic performance and health. Residents were **satisfied** with the facility (**M = 5.56**); they found the facility **enhances** their overall academic performance (**M = 5.21**) and **enhances** their overall health (**M = 4.89**). In addition, similar results were reported when residents were asked these same questions about their primary living spaces. They reported overall **satisfaction** (**M = 5.13**) with their primary living spaces and that their overall academic performance was **enhanced** (**M = 5.08**) by their primary living spaces. Additionally, their overall health was **enhanced** (**M = 4.85**) by their primary living space. As the range of scores was from 1-7, scores that showed satisfaction are in the low to moderate range of satisfaction.

Most of the survey questions related to residents' satisfaction with the IEQ criteria in their primary living spaces). Residents' responses showed they were **satisfied** with 19 of the 23 IEQ criteria. The mean satisfaction scores ranged from 4.64 (Overall furnishings) to **5.82** (Overall cleaning and maintenance). This shows a low to moderately high range of **satisfaction**. Residents responded **neither dissatisfied nor satisfied** to two IEQ criteria (Overall privacy and Overall acoustic quality). They were dissatisfied with their Ability to limit undesired sounds (2.97).

From the responses, an IEQ Score was developed and shows respondents' satisfaction with the IEQ of all category level criteria. For Heritage Hall, the IEQ Satisfaction Score was **5.57**. This score reflects an overall moderately high satisfaction level with IEQ categories. Finally, residents reported that Heritage Hall facility **enhances** their physical activity, which is one of the sustainable design criteria that influence occupant behavior.

6.2 Recommendations

The satisfaction scores are certainly in the positive direction, however, improvement may be possible. For IEQ categories that can be physically measured (e.g., thermal, acoustic, and lighting), it is recommended that these measurements be taken in the primary living units. Specific recommendations for the most common areas of occupants' concern follow:

Acoustic Conditions

- Identify acoustic criteria for overall requirements.
- Determine if any task areas differ now from their original spatial layout/use (i.e., study rooms adjacent to noisy area).

- Develop specialized acoustical performance requirements to support functional programming residents' tasks (e.g., sources of recurrent noise that need to be controlled, special user populations that may have distinct auditory performance limitations, or multiple uses of building spaces that may have different acoustic criteria). Identify and apply appropriate acoustics modeling software for the project.
- Measure acoustic performance onsite with full building systems (heating, ventilation, air conditioning; HVAC) running.
- Identify residents' privacy concerns via focus groups and/or log complaints relative to acoustical conditions for further evaluation.
- Consider residents' tasks within shared spaces to determine if spatial layout changes can be made for increased acoustic control.

Lighting Conditions

- Identify residents' lighting performance criteria that are to be met to achieve goals by conducting onsite measurements of existing illumination and compare them to standards for residents' tasks as identified by the Illuminating Engineering Society (IES).
- Determine if any task areas differ now from original intent to be sure illumination quantity and quality are not impeded by physical changes to the space (i.e., walls, ceilings, furnishings, fixtures, or equipment).
- Develop additional quality lighting criteria as needed for special facility (e.g., influence of daylight quality or quantity) or employee (e.g., age, task duration) issues.
- Log complaints related to lighting conditions for further evaluation.
- Identify poor lighting conditions in the workspace caused by a lack of control over daylighting, which can cause glare and eyestrain.

Personal Adjustability

- Determine if adjustability issues arise with temperature, lighting, or furnishings via a focus group.
- Identify personal, individual problem areas and relate them to other IEQ issues via log of complaints relative to adjustability.
- Provide education to residents about any existing/achievable adjustment options, e.g., furnishings, air diffusers, lighting, temperature control, etc.

Privacy Conditions

- Identify residents' privacy concerns via focus groups or log complaints relative to privacy to determine if visual or audio privacy is most affected.
- Determine if any task areas or responsibilities differ from original intent and develop alternatives or modifications.
- Consider adding noise masking equipment and/or visual screening depending on the nature of the complaints.
- Document and compare acoustic privacy problem areas with acoustic measurements to pinpoint specific problem areas.

Thermal Conditions

- Measure thermal performance conditions on site.
- Log complaints related to thermal conditions for further evaluation.
- Determine special thermal comfort requirements or problems that may be encountered in the building due to physicality of work activities, duration of sitting, or design/layout considerations. Focus groups

can be useful in identifying problem locations.

- Determine if any residents' task areas differ now from original layout to determine if air flow is meeting systems design intent.
- Review conditions that affect thermal comfort using ASHRAE Standard 55-2004 or *Human Factors Design Handbook* (see B3 Guidelines).

It seems obvious that satisfaction can be improved by addressing the categories that had 'neither dissatisfied nor satisfied' and 'dissatisfied' scores. However, addressing some of the other criteria before they become an issue is recommended and can further improve satisfaction. Exploring these areas in more detail and making adjustments may increase overall satisfaction at the primary living space. It is a good investment to improve satisfaction, which, in turn affects their academic performance and their health.

This study investigated satisfaction with the facility and primary living spaces of the Heritage Residence Hall, a residence hall on the UMN-Crookston campus. IEQ satisfaction is individual, but the results of the survey show a central tendency of moderate satisfaction with the facility and most of the IEQ criteria. The results can be used as a diagnostic tool to aid in improving IEQ conditions for residents and to set the benchmarks from which improvement can be measured in the future.

Appendix A. Open-Ended Responses

Residents had the opportunity to raise specific concerns on the overall facility and their primary living spaces. Important information can be gleaned from the open-ended responses. Heritage Hall residents raised specific concerns about the following themes: acoustics, the construction, furnishings, and administration. There were positive comments as well. Though these qualitative responses overall appear as the residents are dissatisfied; it does not mean they represent the overall sentiment from residents. Following are qualitative responses to the criteria. Generally, the comments are shown as written.

Open Ended Comments

Acoustics

- The walls are way too thin and the doors are too high off the ground. Sound carries way too easily. Whispering in one room can be heard clearly halfway down the hall.
- The wall are too thin, any amount of noise can be heard half way down the hall.
- Walls almost seem like cardboard. Could hear the snow brush at 5 am almost every day in the winter.
- Could hear my roommates TV through the wall dividing our room.
- Walls are made out of textured cardboard, could hear my neighbors from 3 doors down take a shower every morning.
- The walls and ceiling are very thin, so you can always here your neighbors, which is really frustrating. Also when you are standing in the hallway regardless to how loudly the people in the room are speaking you can hear everything they say.
- Noise carries way too easily. Whispering in a room can be heard down the hall.
- Very loud especially living on first floor next to stairs- a lot of noise from above and from people taking the stairs.
- Paper thin walls have no noise cancellation.
- The air is like a desert, motor oil is the only solution to prevent chapped lips. I can hear the person above me breathing and snoring at night due to the cardboard walls and ceilings.
- I can hear my neighbors when they are whispering to each other. The walls and doors are way too thin.
- The walls are too thin, any amount of noise can be heard half way down the hall.

Administration

- I can't count on one hand how security would be walking through the hall and stop and listen for the smallest noise in our room to try to get us in trouble. I can't believe they can do this. Its college not naptime at daycare.
- It is horrible living on campus. They treat you like children and there is nothing worse than going to school for 6 hrs, working an hour shift, and then coming back to the dorm to be harassed by security for playing some video games.
- The 'security' took my refreshments. . This is college not kindergarten.
- Security guards give residents tickets for minuscule things

Cleaning and Maintenance

- The hall is always kept very clean.
- The cleaning staff does a WONDERFUL job of keeping the building clean!! I really enjoyed the building and think it is a very nice option for underclassmen!

Construction

- It's nice, but it seems like everything in the rooms was made as cheap as possible.
- None of the outlets would work.
- Everything in here is cheap and breaks easily. Wasted too much money on class room, could have something that did the same job for half the price.
- Sinks could be bigger to do some small quantities of dishes.
- Seemed like the lights were also purchased as cheap as possible. Half of ours burnt out throughout the school year. When we contacted maintenance, it took pert near a month to come fix it. You tell me how you like pooping in the dark.
- Half of the lights in our room burned out including our bathroom lights and it took over a month for them to replace them. We had no light in the bathroom for over a month! How would you like to do that?
- I was scared the place would burn down due to flickering lights every day.

Furniture / Equipment

- Nice furniture and relaxing atmosphere especially in the lobby and lounges make it easier to study and feel at home.
- The furniture that was in the rooms and lobby was very low quality. Fell apart very easily didn't last very long. Couldn't stand up to much.
- The chairs and tables in public areas are flimsy and not built well, some are visibly broken. The decorations and furniture makes this hall feels as if it is your home.
- Treadmills in workout area don't work sometimes and it's inconvenient. Many times when I went to run on the treadmills, they would not work.
- Our provided chairs had ripped seams at the beginning of the year.
- It would be nicer to have more than two chairs; it complicates thing when there are four people. Maybe couches?
- Horrible, chairs are ripped and the outlets are falling out of the wall.
- The printers are always out of ink and paper. Also the furniture in the entire building is falling apart.
- The dryers rarely dry your clothes the first time

IAQ

- We've had problems with our water from the sink smelling like rotten eggs all semester and it was never fixed.
- Our room was drier than the Sahara desert. I bought a humidifier that pumped a gallon and a half per 8 hours. It still couldn't keep up.
- Air movement in the living room areas is lacking, not enough vents

Spatial Layout

- It kind a confused me how each room was slightly different sizes.

Thermal Conditions

- Our heater wouldn't work one of the coldest nights of the year.
- Paper thin walls loses heat easier.

Overall Negative

- UMC residential life is horrible. It is just a bit better than living in a prison.

- I could not even begin to express the lack of available parking. Look at the football field? What a waste of space that I could park on. How about the new wellness center is cancelled and we spend 11 million on thicker insulated walls for privacy and better learning environment. I've been horribly disappointed with the atmosphere, building, staff, and decision making of the UMC campus. For the amount of money I paid to attend this last year I got chapped lips, headaches, no sleep, and diarrhea, and a big old \$20,000 bill to pay. I don't see why everyone would want that right?
- They seem nice, but are just so cheaply made, but it costs so much to live on campus. Because of the price I'm not living on campus next year.

Overall Positive

- Overall nice place to live.

Appendix B. Glossary

Descriptive statistics

Statistics used to summarize large sets of data (i.e., means, frequencies, medians). Descriptive statistics describe only the sample under consideration and are not intended to infer results to the larger population.

Frequency

A descriptive statistic that provides information about how many of a particular response or measurement are observed.

Likert-type scale

A measurement technique, employed in questionnaires and interviews, that utilizes a range of standardized response categories such as strongly agree, agree, etc.

Mean

The average score of a set of data calculated by adding all scores together, then dividing by the number of scores.

N

The number of subjects or participants responding to the questions, or a single question, in the study.

Reliability

The repeatability or replicability of findings; the same results are produced each time. Instruments and procedures should produce the same results when applied to similar people in similar situations, or on a second occasion.

Standard deviation

A statistic used to measure the variability of a group of scores (how different scores are from each other and the mean). For example, if the range of scores is 1-7 and the mean (average) is 5.0 with a standard deviation of 1.0, then the scores are closely clustered around the mean, i.e., there is one unit of variation among all scores. If the mean was 5.0 and the SD was 3.0, there is a broader range of variation among the scores...a smaller SD means the scores are similar and the mean score is likely to be more accurate and more useful (this is better!).

Validity

The extent to which an instrument or procedure measures what it is intended to measure (internal validity). The generalizability of results to another population (external validity).