



# **Indoor Environment Quality + Workplace Environment Science Teaching Student Services Building (STSS) Report 2**

**March 2014, 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 the Science Teaching Student Services Building (STSS) and employees' satisfaction with their work environments. The STSS facility was designed using the B3 Guidelines (formerly known as the Minnesota Sustainability Guidelines or MSBG) and completed for occupancy in Fall 2010. The B3 Guidelines track specific state-funded 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 work environments. The Sustainable Post-Occupancy Evaluation Survey (SPOES) was developed to assess human outcomes in classroom and workplace settings in compliance with the project tracking requirements for the B3 Guidelines goals. The survey was conducted in March 2014 and serves as the second of two required POE events.

This SPOES report focuses on employees' satisfaction with the physical environment as related to 15 overall indoor environment quality (IEQ) criteria such as lighting, thermal, and acoustic conditions in their primary workspaces, i.e., offices. Employees' satisfaction with the facility (site, building, and interior) and the effect of the facility's physical environment on their perceptions of their work performance and health are included. Finally, a brief look at employees' commuting and physical activities within the building are also reported. The report provides descriptive information about employees' perceptions of the IEQ of their work environments. In addition, this information serves the broader development of knowledge regarding the influence of IEQ on employees.

## 2.0 Method

SPOES consists of a self-administered, Internet-based, questionnaire submitted to and completed by employees. The SPOES questionnaire has been tested for **validity** (measures what it is intended to measure) and **reliability** (repeatability or replicability of findings) in studies involving similar facilities and employees. Employees 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 workspaces. They also rate the influence of their physical environment on their perception of their work 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 employees' perceptions.

The report provides a descriptive summary of the results stated as a **mean** (M = average of all responses), **standard deviations** (SD) (how different scores are from each other and the mean), and **number of responses** (N) for questions 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:

- 1-3.99 dissatisfied (hinders)
- 4-4.49 neither satisfied (enhances) or dissatisfied (hinders)
- 4.5-7 satisfied (enhances)

An IEQ Score is also calculated for employees' satisfaction with IEQ in their primary workspaces. This is a statistical combination of all IEQ scores, which results in a single IEQ score for all employees on all IEQ variables and is reported in an IEQ Scorecard.

## 2.1 Description of the Questionnaire

Employees first rate their level of satisfaction with the facility and the influence of their physical environment on their perception of their work performance and health. Then they respond to questions about their satisfaction with their primary workspaces in relation to the IEQ criteria. The questionnaire uses the IEQ criteria from the B3 Guidelines and relates each of them to employees' satisfaction with their physical environment. Additional questions are also asked to delve deeper into IEQ conditions at the primary workspace.

Categories include (in alphabetical order)

- |                                 |                                       |
|---------------------------------|---------------------------------------|
| 1. Acoustic Conditions          | 9. Lighting Conditions                |
| 2. Appearance                   | 10. Personal Adjustability Conditions |
| 3. Cleaning and Maintenance     | 11. Privacy                           |
| 4. Daylighting Conditions       | 12. Technology                        |
| 5. Electric Lighting Conditions | 13. Thermal Conditions                |
| 6. Function                     | 14. Vibration and Movement            |
| 7. Furnishings                  | 15. View Conditions                   |
| 8. Indoor Air Quality           |                                       |

## 2.2 Limitations

Employees' participation is voluntary, and responses are self-reported. As is true with all survey research, the responses indicate employees' 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

Built in 2010, the five-story, 118,000 square-foot STSS building houses instructional classrooms and administrative offices that service University of Minnesota (UMN) students (see Figure 1). The STSS building is located along the East Bank of the Mississippi River in the heart of the UMN Minneapolis campus. It was designed according to the B3-MSBG guidelines and also received LEED New Construction Version 2.2 Gold Certification. The building is occupied throughout the year by employees, students, and other transient individuals; however, the building has its highest occupancy loads during the fall and spring semesters (September through May).



Figure 1. The STSS building (Photo credit:[http:// www1.umn.edu/twincities/maps/STSS/](http://www1.umn.edu/twincities/maps/STSS/))

### 3.2 Description of Respondents

The STSS has 98 workspaces, for a potential total sample size  $n=98$ . The response rate was 53%. Of those responding (26.5% were male and 73.5% were female). Approximately 43% of the respondents have worked in the STSS building for three years or more, followed by 24.5% who had worked in the STSS building for 1 to 2 years. A majority of respondents (64%) spent more than 75% of their time in their primary workplace, followed by 30% who spent between 51-75% of their time at their primary workplace. The mean for years of employment in the STSS building is 2.9 years. The mean age was 23.9 years with a range from 19 to 75.

Overall, 51% (26) of the respondents' workspaces were open. Open workspaces were classified as a cubical with 5+ feet high partitions or a desk in an open office with no partitions which were only located in the reception areas.

## 4.0 Findings and Discussion

### 4.1 STSS Facility (Site, Building, and Interior): Overall Satisfaction, Work Performance, and Health

Employees responded to questions concerning the STSS building (site, facility, and interior) and their overall satisfaction with the facility, overall perceptions of their work performance in relation to the facility, and their overall perception of their health in relation to the facility. Table 1 and Figure 2 show a summary and interpretation of their responses.

Table 1. Overall satisfaction, work performance, and health related to the STSS facility

STSS Facility (site, building, and interior)	Mean(1-7)	SD	N	Interpretation
Overall satisfaction	5.06	1.58	51	Satisfied
Overall work performance	4.96	1.66	51	Enhances
Overall health	5.03	1.21	51	Enhances



Figure 1. Overall satisfaction, work performance, and health related to the STSS facility

Results indicated that employees were **satisfied** with the (**M = 5.06**) STSS facility (site, building, and interior) and reported that their overall work performance was **enhanced** (**M = 4.96**) by the facility. Employees reported that their overall health and well-being was **enhanced** (**M = 5.03**) by the facility.

#### 4.2 Primary Workspace: Overall Satisfaction, Work Performance, and Health

Employees responded to questions concerning their overall satisfaction and overall perceptions of their work performance and health as related to their primary workspace (e.g., private office, workstation, or other primary workspace). Table 2 and Figure 3 show a summary and interpretation of their responses.

Table 1. Overall satisfaction, work performance, and health related to primary workspace

Primary Workspace	Mean (1-7)	SD	N	Interpretation
Overall satisfaction	5.00	1.22	51	Satisfied
Overall work performance	5.14	1.42	51	Enhances
Overall health and well-being	4.98	1.67	51	Enhances

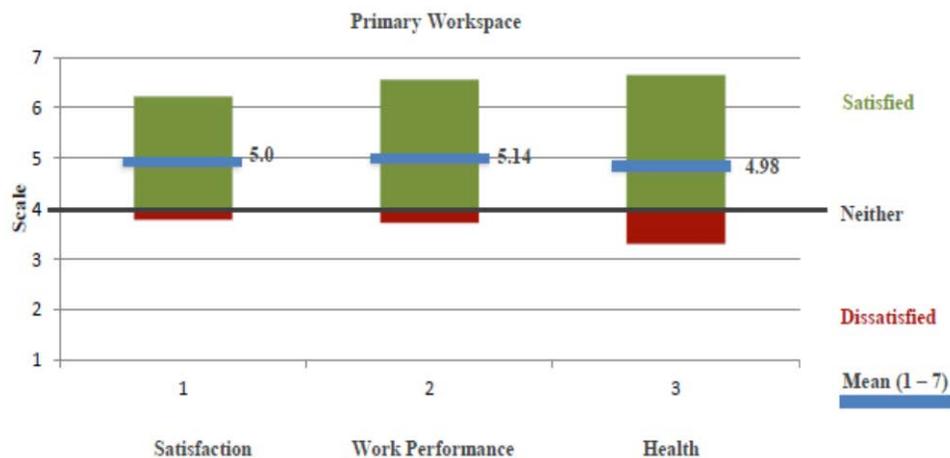


Figure 3. Overall satisfaction, work performance, and health related to primary workspace

Results indicated that employees were **satisfied (M =5.00)** with their primary workspace, their overall work performance was **enhanced (M = 5.14)** by their primary workspace and their overall health was **enhanced (M = 4.98)** by their primary workspace.

Further, employees' responses to questions regarding their overall satisfaction, work performance, and health with their primary workspace are summarized below:

- 69% indicated that they were satisfied, 16% said they were neither dissatisfied or satisfied, and 15% were dissatisfied;
- 69% indicated that their overall work performance was enhanced, 18% were neither enhanced nor hindered, and 13% stated their work performance was hindered by their primary workspace; and
- 57% indicated their overall health and well-being was enhanced, 37% stated their overall health was neither enhanced nor hindered, and 6% stated their overall health was hindered.

### 4.3 Primary Workspace: Satisfaction with Indoor Environment Quality (IEQ)

Employees responded to questions concerning their satisfaction with IEQ categories (thermal conditions, indoor air quality, acoustic conditions, etc.) related to their primary workspace (e.g., private office, workstation, or other primary workspace). Table 3 and Figure 4 show a summary of the means, standard deviations, and interpretation of their responses.

Table 3. Satisfaction with IEQ as related to primary workspace

	IEQ Criteria	Mean (1-7)	SD	N	Interpretation
1	Furnishings	5.78	1.08	51	Satisfied
2	Technology	5.76	1.21	51	Satisfied
3	Appearance (aesthetics)	5.71	1.25	51	Satisfied
4	Function	5.51	1.36	51	Satisfied
5	Lighting conditions	5.43	1.58	51	Satisfied
6	Vibration and movement	5.35	1.67	51	Satisfied
7	Indoor air quality	5.08	1.87	51	Satisfied
9	Cleaning and maintenance	4.89	1.60	51	Satisfied
9	View conditions	4.40	2.22	51	Neither S/D
10	Daylighting conditions	4.30	2.25	51	Neither S/D
11	Electric lighting conditions	4.30	1.66	51	Neither S/D
12	Privacy conditions	4.27	2.03	51	Neither S/D
13	Thermal conditions	3.76	1.69	51	Dissatisfied
14	Acoustic conditions	3.41	2.00	51	Dissatisfied
15	Personal adjustability conditions	2.94	1.67	51	Dissatisfied

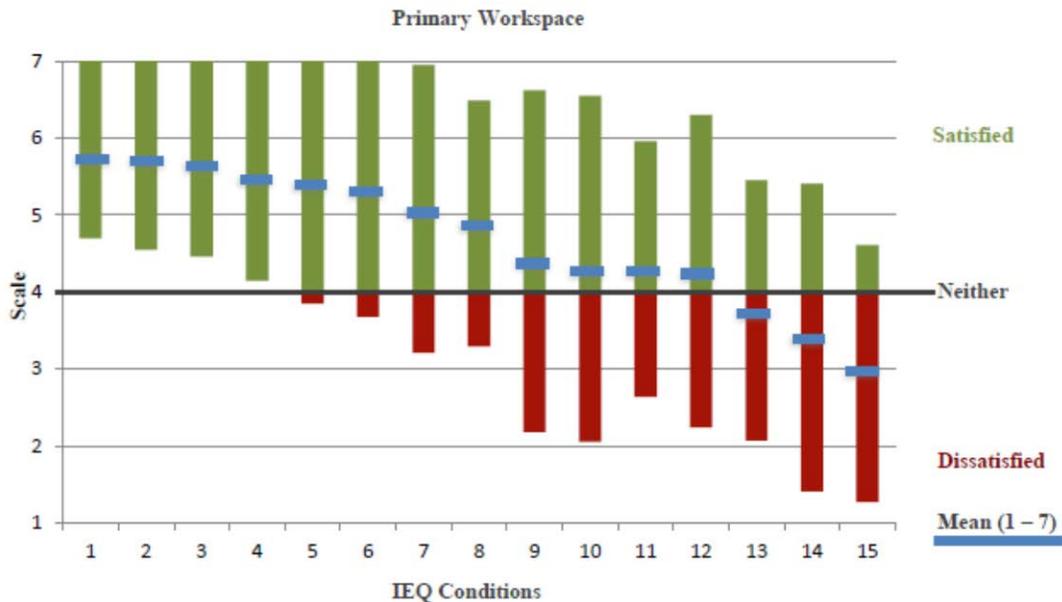


Figure 2. Satisfaction with IEQ criteria with the primary workspace (IEQ criteria 1-15 are listed in Table 3 above)

Results indicate that employees were satisfied with the following IEQ conditions in their primary workspaces:

- Furnishings
- Technology
- Appearance
- Function
- Lighting conditions
- Vibrations and movements
- Indoor air quality
- Cleaning and maintenance

Employees were neither dissatisfied nor satisfied with IEQ conditions for the following:

- View conditions
- Cleaning and maintenance
- Electric lighting conditions
- Daylighting conditions
- Privacy conditions

Employees were dissatisfied with IEQ conditions for the following:

- Thermal conditions
- Acoustic conditions
- Personal adjustability conditions

#### 4.4 IEQ Satisfaction Scorecard

The IEQ Satisfaction Score is determined by developing weighted factors of all categories, which is more representative of a fair overall IEQ score. For example, it might be more important for an

employee to have satisfying thermal conditions than to have satisfying indoor air quality. Thus, if the employee gives a high thermal satisfaction score and a lower indoor air quality satisfaction score, the overall IEQ satisfaction will be scored much higher than one with the inverse statistics.

The weighted scoring system was developed by employing the following procedures:

1. **Factor analysis** (a multivariate statistical procedure) was conducted to determine the importance of various IEQ categories.
2. The factor loading of each IEQ category was regarded as the individual weight.
3. The weighted sum score was used to calculate the final mean score illustrating how well a particular building performed in terms of satisfying its occupants' IEQ needs. This becomes the IEQ Score.

As shown in Figure 5, the **IEQ satisfaction score for STSS is 5.00**.

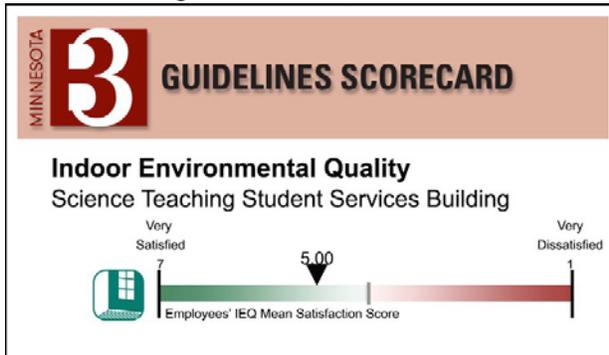


Figure 5. IEQ satisfaction score for STSS

Overall, employees showed a moderately positive satisfaction with IEQ as indicated by the weighted mean score of **5.00**. Satisfaction with **Electric lighting** of employees' primary workspace was identified as the category that contributed most to the IEQ Satisfaction Score, followed by satisfaction with **Appearance then Function** of their primary workspace. They determine IEQ satisfaction more strongly than other categories and differ slightly from the ranking of the mean scores where **Furnishings, Technology, and Appearance** were the top satisfaction scores. Overall **Thermal conditions** was the least contributing category to the IEQ Satisfaction Score. This concurs with the dissatisfaction score shown in Table 3. This score of **5.00** validates the overall satisfaction score in Table 2 (5.00). They are the same, however the IEQ Score provides knowledge about the contribution to satisfaction each category makes.

## 5.0 Physical Activity Engagement and Commuting Practices

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

### 5.1 Physical Activity Engagement

Providing employees with opportunities for alternative paths of travel around the workplace, e.g., taking stairs as opposed to the elevator, provides opportunities to engage in additional types of

physical activities. Engaging in physical travel throughout the work environment can be associated with healthier lifestyles.

Table 4. Overall physical activity (walking, stair use, etc.) affected by the STSS facility

STSS facility (site, building, and interior)	Mean (1-7)	SD	N	Interpretation
Overall physical activity (walking, stair use, etc.)	4.14	0.94	51	Neither hinders nor enhances

Results indicated that employees felt that STSS **enhanced** ( $M = 4.78$ ) their physical activities (walking, stair use, etc.). Further, 53% said the facility **enhances** their overall physical activity; 44% said it **neither enhances nor hinders**, and 3% said it **hinders**.

## 5.2 Commuting Practices

The STSS building is located on the East Bank campus along Mississippi River in the heart of the UMN Minneapolis campus. The East Bank campus is north of the metropolitan hub, providing bus and light rail transit service through the campus environment. The University provides several parking facilities, bike paths, and sidewalks throughout the campus and adjacent to the STSS building.

Tables 5 provides results on employee commuting mileage, mode of transportation, commuting distances, and use of alternative modes of commuting. These results, although not related to IEQ, do offer the University insight into employees' commuting behaviors and opinions. These data can provide important information about commuting practices that can reduce transportation energy consumption.

Table 5. Primary mode of transportation

Primary Commuting Mode	Drive alone (or with children < 16)	Carpool or vanpool	Public transit	Bicycle	Walk	Other
Mode of transportation	55%	16%	26%	4%	0%	0%

The most frequent mode of transportation to STSS was driving alone (or with children under 16) (55%), followed by public transit (26%), carpool or vanpool (16%), and bicycle (4%). No respondents indicated walking or other mode of transportation.

## 6.0 Conclusions

### 6.1 Summary

A post-occupancy evaluation was conducted of employees of STSS at approximately one year after it was first occupied. Approximately 53% of the employees responded to the survey.

The survey included questions related to employees' overall satisfaction with the building (site, facility, and interior) and influence of the facility on their overall work performance and health. Employees were **satisfied** with the facility ( $M = 5.06$ ); they found the facility **enhances** their overall work performance ( $M = 4.96$ ) and **enhances** their overall health ( $M = 5.03$ ). In addition, similar results were reported when employees were asked these same questions about their primary workspaces (private

office, shared office, laboratory, etc.). They reported overall **satisfaction (M = 5.00)** with their primary workspaces, and that their overall work performance (**M = 5.14**) and their overall health were **enhanced (M = 4.98)** by their primary workspace. However, as the range of scores was from 1-7, this is a lower level of satisfaction, although still positive.

Most of the survey questions related to employees' satisfaction with the IEQ categories in their primary workspaces (private office, laboratory, etc.). Employees were **satisfied** with eight of the IEQ categories. The mean satisfaction scores ranged from **4.89** (cleaning and maintenance) to 5.78 (furnishings). Again, this shows a positive but moderate level of satisfaction. Five of the categories received **neither dissatisfied nor satisfied** scores from **4.27** (privacy conditions) to **4.40** (view conditions). Employees were **dissatisfied** with three IEQ conditions with scores ranging from **2.94** (personal adjustability) to **3.76** (thermal conditions).

From the employees' responses, an IEQ Scorecard was developed and shows respondents' satisfaction with all categories and the contribution of each category to that satisfaction score. For STSS, the IEQ Satisfaction Score was **5.00**, with satisfaction with **Appearance** and **Indoor air quality** of their workspaces as the two categories that influenced their satisfaction level most. This score reflects the moderate satisfaction level of the other categories. Finally, employees reported that STSS **neither hinders nor enhances** their physical activity, which is one of the sustainable design criteria that influences occupant behavior.

## 6.2 Recommendations

The satisfaction scores are certainly in the positive direction, however, improvement may be possible. For IEQ categories that have physical measurement possible, e.g., thermal, acoustic, and lighting, it is recommended that these measurements be taken in both overall workspaces and primary, individual workspaces. Recommendations follow that will help management stay ahead of any IEQ problems.

### Lighting Conditions

- Identify performance criteria that are to be met to achieve goals.
- Determine if any task areas differ now from original intent.
- Develop additional quality lighting criteria as needed for special facility issues such as employees' ages, duration of task, influence of daylight quality or quantity.
- Conduct onsite measurements using Illuminating Engineering Society standards for employees' tasks.
- Log complaints related to lighting conditions overtime.

### Acoustic Conditions

- Identify acoustic criteria for overall requirements.
- Determine if any task areas differ now from original intent.
- Measure acoustic performance onsite with full systems running overtime.
- Log noise and other sonic environment complaints.
- Develop any additional special acoustical performance requirements to support functional programming of facility. (E.g. sources of recurrent noise that needs to be controlled, special user populations which may have distinct auditory performance limitations, multiple uses of facility spaces which may have different acoustic criteria. Investigate and choose appropriate acoustics modeling software for the project.

**Thermal Conditions**

- Determine special thermal comfort requirements or problems that may be encountered in the facility due to work activities or sitting or design considerations.
- Determine if any task areas differ now from original intent.
- Review conditions that affect thermal comfort using ASHRAE Standard 55-2004 or *Human Factors Design Handbook*.
- Measure performance variables on site overtime.
- Log complaints related to thermal conditions.

**Privacy Conditions**

- Identify employees' privacy concerns via focus groups or log complaints.
- Determine if any task areas or responsibilities differ from ordinal intent.
- Consider adding noise masking equipment and/or visual screening depending on nature of complaints.
- Educate and promote quite behaviors among employees.
- Compare acoustic privacy problem areas with acoustic measurements to pinpoint specific problem areas. Eliminate causes or sources of peak events.

**Cleaning and Maintenance**

- Create an orderly protocol for maintenance requests.
- Provide office cleaning supplies in accessible areas.
- Schedule office clean-up days throughout the year.
- Clean highly utilized, public areas (restrooms) more frequently.
- Open showering rooms for staff to use.

**Personal Adjustability**

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

It seems obvious that employees' satisfaction can be improved by addressing categories that had lower 'satisfied' or 'neither dissatisfied nor satisfied' scores. The above recommendations can help address change in these categories. However, what is not quite so obvious is that because appearance and indoor air quality of the primary workspace are the two IEQ categories that contribute most to employees' satisfaction, and these two categories received higher satisfied mean scores individually, employees' satisfaction could be increased with greater attention paid to these two categories.

This study investigated employees' satisfaction with the facility and primary workspaces. IEQ satisfaction is individual, but the results of the survey show a central tendency of moderate satisfaction to satisfaction with the facility and most of the IEQ categories. The results can be used as a diagnostic tool to aid in improving IEQ conditions for employees and to set the benchmarks from which improvement can be measured in the future.

## Appendix A. Open-Ended Responses

Employees had the opportunity to raise specific concerns about the overall facility and their primary workspace. Important information can be gleaned from the open-ended responses given in three categories that employees found to be or neither dissatisfied nor satisfied (personal adjustability, cleaning and maintenance, and privacy conditions).

### Acoustic Conditions

- The acoustics in my private office space are poor. Lots of noise from the hallways drift over the wall space near the ceiling and come into the 2nd floor office space easily.
- What affects my satisfaction the most is the lack of privacy. Our space is so open so you can really hear everything that is going on in the large office space. This makes it difficult when you have a private meeting.
- The main issue is the fact that our office feels like a glass fishbowl. Any drafts or sounds outside the office get dropped right into my cube.
- Noise is also a problem. Doors on 3rd level squeak when opened and carries throughout the building.
- This is not a user friendly environment for noise. If the architect had to sit here to think or make phone calls or wanted to discuss anything semi-private, he would be shocked at his ignoramus design. Our offices are open at the top for approximately 18 inches. This means I intimately hear people on phone calls in the hallway. Likewise I deal with finances and students I have to turn my head inward keep my voice very soft and low so my conversation does not bounce off the hard scape interior glass and enter the hallway.
- Visually a very nice building, but very noisy with very little acoustical buffering.
- My office looks out onto an interior hallway. It is dreary and depressing. The hallway traffic is distracting and loud.

### Cleaning and Maintenance

- Our work spaces need to be vacuumed more frequently.
- Cleaning schedule and duties can seem inconsistent.

### Daylighting

- I sit in the back corner. Absolutely no natural light. It is very depressing.
- I would really like to be near a window.
- Sometimes the glare of direct sunlight, particularly in the late afternoons in the winter is problematic.
- That is probably impacts staff in the cubicles more than offices, but I frequently have to close my door to eliminate the glare that come off of the mirror-like finishes on the outside posts by the windows.

### Furnishings, Finishes, Technology

- A standing computer workstation needs to be an option.
- The special paint they used is like water on the walls and if you walk around the building you will see wear marks from students leaning on the wall. .Carpet pieces are pulling up and missing and the proverbial exterior doors are ALWAYS breaking.

- The battery operated hand towel and soap dispensers were out and the automated air hand dryers have gunk on the electrical conduit from water, soap being pushed down.
- As I tell people, nice looking building you just don't want to work in it.
- I think the exterior is very nice, But the bathrooms are so loud and gross. Sometimes the warm water at the sinks does not come out. Also the hand dryers are very, very loud. I hate the bathrooms. I do not think it is a healthy building.
- An updated telephone would be nice.
- The interior office furniture were chosen with little consultation from people working in the space and focused more on look than function. Storage is an issue and desks have the ability to raise but run into the permanent cabinets so can't use this feature.
- Bathrooms are in an awkward location. A lot of flushing noise coming from each bathroom.
- The dots on the window make it very hard to see outside.
- The way how the exit/entrance doors are built in STSS is a bit strange. Many people only know the center stairway as the way to enter and exit STSS. The weather such as the wind can prevent the door in STSS from being open regardless of entering or exiting without using a lot of force.
- Would be great if we could add some more color to the walls. Feels very institutionalized with all the blank white walls. Very sterile. Maybe add some student artwork to liven things up a bit in the hallways!

### Thermal Conditions

- Given that I am in a cubicle with an open top, and the building's open floor plan, any issues with the building are also reflected in my primary workspace. The temperature is not regulated (or maybe it just is not regulated well) in the building (especially in the winter). It is impossible to regulate sound which is a big distraction in the building as a whole
- The ability to adjust vents is difficult and odd.
- Everything is great about this building and my work space except that it is often cold. I prefer a warmer air temperature.
- It is VERY cold in STSS - especially when students are not around and in the open-air cubicle.
- The building gets so cold in the winter so anyone using cubicles on the 5th floor is often very cold
- I need to have a fan in the summer to help with airflow in my office.
- There are some doors that creak/squeak which gets VERY annoying while working. Sound carries. I have talked to my colleagues, but it gets loud in the open area, and can be difficult when talking with students about challenging topics.
- Every day, I feel vibrations on my desk (not sure why). However, I still love working in this beautiful building.
- Individual temperature control is not very adjustable. In early January, before classes resumed, our office space was quite COLD (so cold it affected productivity).
- It was extremely cold in the whole building during winter break. It is also consistently colder on Mondays in the winter months. Sun glare on computer screens can also be a problem in the late afternoon.
- Someone needs to absolutely figure out something for the north (3rd floor) exit only door. It is pulled open by the wind (or remains open from the wind when someone exits that door). It is letting out much of the warm air (letting in very cold air) in the winter and it reduces the benefits of this LEED certified building. It has been looked at many times, but seems easily solvable with an automatic door closer/arm attached to the door and hinge. It's a shame for this type of building.
- The need to fix the exterior doors and put in revolving doors. This would alleviate the hot/cold air problem as well as the doors being stuck open in the wind.
- The building is cold and drafty. I have an office door that closes but I can still hear my neighbors.
- Temperature in the winter is WAY TOO COLD (both in general spaces and in my personal office space).

- Some days my cube is 56 degrees in the winter and 90 plus in the summer. The ventilation is disastrous.

### **Ventilation**

- Bathrooms need better ventilation.
- The fresh air is non-existent in the building. I am happy when I see the door open because then we can get some fresh air. This will become a 'sick" building soon. Even hospitals are starting to put in windows that open because it reduces illness.
- Airflow has it pushing up through the floor vents into the air. All the grime, dust & junk just get thrown up on top of our desks. People are constantly coughing, sneezing sitting in the offices.
- I'm pretty disappointed with the airflow system. The vent on my floor makes a whistling sound during periods when it's in heavy use (on cold days like today). I complained about it a lot when the building opened, and its better now, but they never eliminated the problem. I'm not confident that even if I complained now, anything could be done.
- I wish we could open a window.
- Overall, I appreciate how the building was designed, I just wish there were more window opportunities on the second floor working area.

### **Overall**

- Great building, poor acoustics, poor temperature regulation, and poor floor planning.
- We had a lot of say on what was in the offices and how many offices we had. We had virtually no say on how the department was laid out, where it would be, how many windows it would have, etc...
- It makes a HUGE difference that the showers are finally open. Before winter, I used them at least once/week and plan to do so again post-winter. It allows me to work out over lunch.
- I love working in STSS. I especially appreciate the shower, as I will use my lunch hour to go for a run, and then shower upon my return. I have noticed that I have not gotten sick as often since working in STSS as in my previous job - I'm guessing the environment has a lot to do with that. I also love view.
- Great building; sexiest building on campus!
- I gave a lot of information on the physical design of our office during design/build; but most was ignored by the designers, as it did not fit their vision of the building. The designers did not seem to take into account the work that would be done by the staff who would work in our office.

## 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.

### **Factor analysis**

A multivariate statistical procedure that is used to identify and group together general dimensions or factors that underlie a large number of variables in a set of data. The procedure transforms the variables into new principal components or orthogonal factors. Variables within each factor are related to each other but have no relationship to variables in other factors.

### **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 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).