



**Indoor Environmental Quality + Workplace Environment
UMTC John T. Tate Hall (Tate Hall) Renovation
Minneapolis, MN**

**April 2019, Minneapolis, MN
Sustainable Post-Occupancy Evaluation Survey (SPOES)
B3 Guidelines**

Caren S. Martin, PhD
(contact: caren@mgdesignresearch.com)
Martin & Guerin Design Research, LLC
Minneapolis, MN

Abimbola Asojo, PhD
(aasojo@umn.edu)
Suyeon Bae, PhD
*College of Design
University of Minnesota*

1.0 Overview

The purpose of this report is to examine the connection between sustainable design criteria used in the design and renovation of the UMTC John T. Tate Hall (Tate Hall) facility and occupants' satisfaction with their work environments located in the facility. This report communicates responses from employees about the overall facility and their workplace (WP). The facility was designed using the B3 Guidelines (formerly known as the Minnesota Sustainable Building Guidelines or MSBG), which were in effect at the time that the renovation and addition were funded. It was completed for occupancy in August 2017. 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 work 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 occupants' (hereafter called employees) responses from the survey conducted in late-October through early-November 2018.

This SPOES report focuses on employees' satisfaction with the physical environment as related to 26 indoor environmental 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 also are included. Finally, a brief look at employees' commuting and physical activities within the building are 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). 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 (hindered) to 7 (enhanced).

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 hindered/enhanced. Means that are close to the center of the scale (4) are considered to be neither dissatisfied/hindered or satisfied/enhanced.

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

- 1.00 - 3.50 dissatisfied (or hindered)
- 3.51 - 4.50 neither dissatisfied (or hindered) nor satisfied (or enhanced)
- 4.51 - 7.00 satisfied (or enhanced)

An IEQ Score is also calculated for employees' satisfaction with IEQ criteria in their primary workspaces. This is a statistical combination of all category-level (explained below) IEQ scores, which results in a single IEQ score for all respondents and is reported in an IEQ Scorecard.

2.1 Description of the Questionnaire

Employees 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 work performance and health. Then they respond to questions about their satisfaction with their primary workspaces in relation to IEQ criteria from the B3 Guidelines. Additionally, employees' demographic, physical activity, and commuting practice data are collected to provide context for the study.

In the SPOES questionnaire, the 26 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 employees' ability to hear desired sounds and their ability to limit undesired sounds. There are 12 category-level and 14 attribute level questions. Means are calculated and reported for all category and attribute-level criteria.

An IEQ Satisfaction Score is also calculated for employees' satisfaction with IEQ in their primary workspaces. This is a statistical combination of the 12 category-level criteria only and results in a single, mean IEQ Satisfaction Score for all employees' satisfaction with the physical conditions of their primary workspaces. 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

- Amount of daylighting
- Adjustability of daylighting

Overall Electric Lighting Conditions

- Amount of electric lighting
- Adjustability of electric lighting
- Adjustability of task lighting

Overall Furnishings

- Function of furnishings
- Adjustability of furnishings

Overall Indoor Air Quality

Overall Privacy

Overall Technology

- Access to electric outlets

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

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. This study is limited to employees' perceptions.

3.0 Sample Description

3.1 Description of Building

The Tate Hall facility resides at 116 Church Street SE, Minneapolis, MN. The Tate Hall facility (see Figure 1) is a seven-story, 198,079 square foot building. There is a sub-basement and basement below grade and of the five floors above grade, the fifth is a mechanical floor. This building provides workspace (36,512 square feet) for faculty and staff, principally from the School of Physics and Astronomy and the School of Earth Sciences. To support faculty and staff, the workplace also includes conference and meeting space, and support areas.



Figure 1. Tate Hall (Photo courtesy of Patrick O'Leary, UMN Photographer)

3.2 Project Team

The relevant project team members to the SPOES process for Tate Hall was comprised of the owner, design team, and commissioning agent, and general contractor. They are identified below, relative to their capacity and involvement.

Owner	Regents of the University of Minnesota
Architect	Alliance
Mechanical and Electrical Engineer	Affiliated Engineers, Inc.
Interior Designer	Alliance
Lighting Designer	Total Lighting Designs, Inc.
Landscape Architect	University of Minnesota
Commissioning Agent	University of Minnesota
General Contractor	JE Dunn Construction Group, Inc.

3.3 Description of Respondents

This survey was administered to 160 employees with workspace in the facility during fall semester 2018. The response rate to the questionnaire was approximately 61%. Of those responding, 62% were male, 37% were female, and 1% responded as ‘other.’ The mean age of respondents was 49 years, with a range from 25-88 years of age.

The Tate Hall renovation was completed and ready for operation in August 2018. Since that time, 27% of the respondents reported that they worked in Tate Hall facility for more than two years, 63% of the respondents reported that they worked at the Tate Hall facility for 1-2 years, and over 9% of the respondents spent less than one year at this facility. Relating to hours worked during a typical week at the Tate Hall, 55% of the employees reported they spend 40+ hours a week in the facility, 31% spend 30-40 hours a week at the Tate Hall, over 8% spend 20-29 hours at the facility, and over 5% work there less than 20 hours per week.

Relating to the time employees spend per week in their primary workspace, 52% of the employees reported they spend more than 75% of their weekly time in their primary workspace; over 32% spend 51-75% of their time in their primary workspace; over 12% spend 25-50% of their time in their primary workspace; and 3% spend less than 25% of their time in their primary workspace. These responses indicate the amount of time employees are exposed to IEQ conditions in their workplace environment.

The Tate Hall is a workplace with private offices; enclosed shared offices with or without one 5-foot high partition; and a desk in an open office without partitions, all serving as primary workspaces. Over 53% of employees indicated that their primary workspaces were located within 15 feet of an exterior window and nearly 47% of the employees were not within 15 feet of an exterior window.

4.0 Findings and Discussion

4.1 Tate Hall Facility (Site, Building, and Interior): Overall Satisfaction, Work Performance, and Health

Employees responded to questions concerning the Tate Hall facility (site, building, 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 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, which is identified with a blue mark. The standard deviation is shown by the green/red vertical bar with 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 may be all green or gray and green. This graph is simply a visual image of the findings from Table 1.

Table 1 Tate Hall facility - overall satisfaction, work performance, and health

Overall	Mean	SD	N	Interpretation
Satisfaction	4.61	1.50	98	Satisfied
Work Performance	4.33	1.34	98	Neither Hindered nor Enhanced
Health	4.26	1.11	97	Neither Hindered nor Enhanced

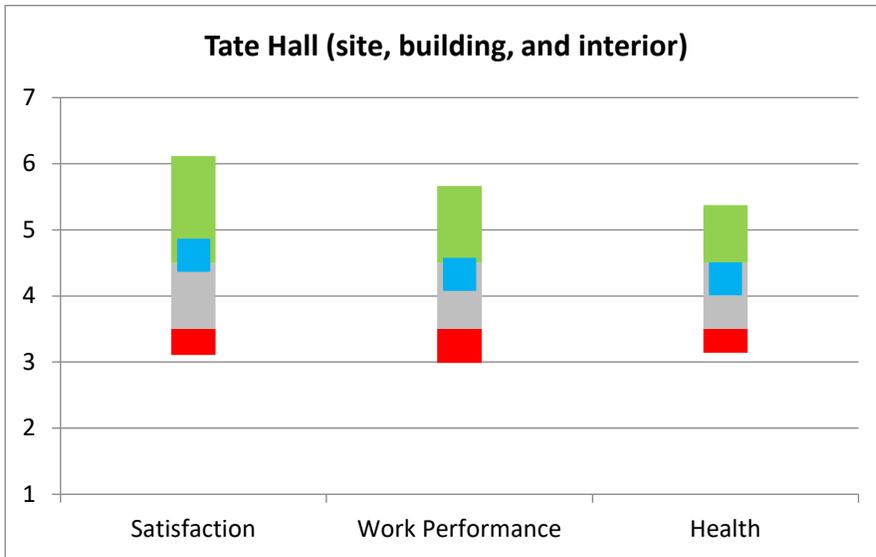


Figure 2. Tate Hall facility - overall satisfaction, work performance, and health

Results indicate that employees were **satisfied (M = 4.61)** with the physical environment of the Tate Hall facility (building, site, and interior) and reported that their overall work performance was **neither hindered nor enhanced (M = 4.33)** by the facility. Employees reported that their overall health was **neither hindered nor enhanced (M = 4.26)** 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, shared office, or other primary workspace). 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; an explanation of the graph was given for Figure 2.

Table 2. Tate Hall primary workspace – overall satisfaction, work performance and health

Overall	Mean	SD	N	Interpretation
Satisfaction	4.22	1.53	97	Neither Dissatisfied nor Satisfied
Work Performance	4.31	1.51	97	Neither Hindered nor Enhanced
Health	4.34	1.17	97	Neither Hindered nor Enhanced

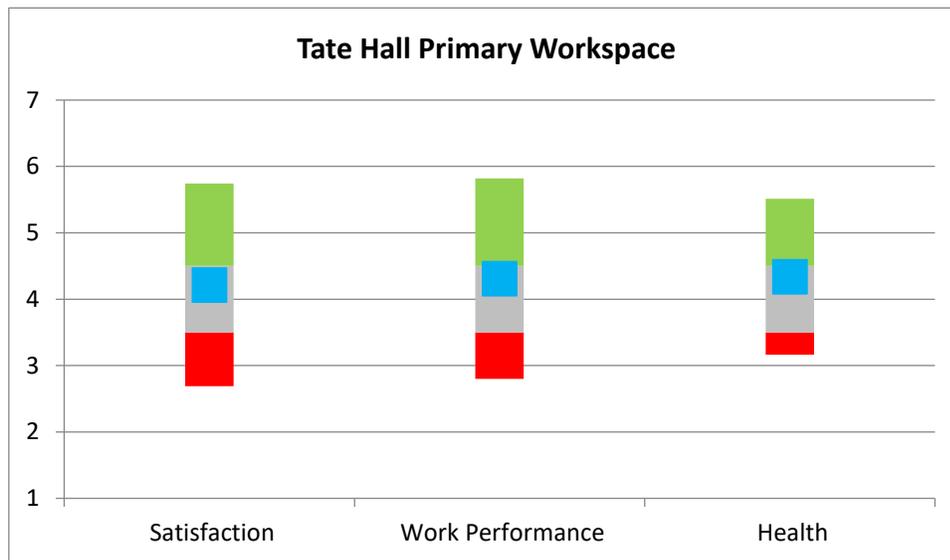


Figure 3. Tate Hall primary workspace - overall satisfaction, work performance, and health

Results indicate that employees were **neither dissatisfied nor satisfied (M = 4.22)** with their primary workspace, their overall work performance was **neither hindered nor enhanced (M = 4.31)** by their primary workspace, and their overall health was **neither hindered nor enhanced (M = 4.34)** by their primary workspace.

4.3 Primary Workspace: Satisfaction with Indoor Environmental 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 shows the means and standard deviations of their responses from highest to lowest mean, as well as how the responses are interpreted. Figure 4 is a visual image of the findings from Table 3; an explanation of the graph was given for Figure 2.

Table 3. Tate Hall primary workspace - satisfaction with IEQ criteria

#	IEQ Criteria (1-26) (Category level criteria are bold face)	Mean	SD	N	Interpretation (D = Dissatisfied) (S = Satisfied)
1	Overall vibration and movement	4.81	1.39	96	Satisfied
2	Overall indoor air quality	4.76	1.55	96	Satisfied
3	Overall cleaning and maintenance	4.72	1.53	96	Satisfied
4	Function of furnishings	4.51	1.55	96	Satisfied
5	Amount of electric light	4.44	1.60	96	Neither S or D
6	Humidity (dry or moist)	4.38	1.68	96	Neither S or D
7	Adjustability of furnishings	4.35	1.67	95	Neither S or D
8	Overall appearance (aesthetics)	4.29	1.65	96	Neither S or D
9	Overall technology	4.20	1.57	96	Neither S or D
10	Amount of daylighting	4.19	2.05	95	Neither S or D
11	Ability to hear desired sounds	4.17	1.74	96	Neither S or D
12	Overall daylighting conditions	4.16	1.92	96	Neither S or D
13	Overall view conditions	4.13	2.08	94	Neither S or D
14	Overall furnishings	4.13	1.67	95	Neither S or D
15	Air velocity (drafty or stagnant)	4.01	1.70	96	Neither S or D
16	Overall electric lighting conditions	3.91	1.68	95	Neither S or D
17	Overall privacy (sound and visual privacy)	3.81	1.85	95	Neither S or D
18	Adjustability of daylighting	3.66	1.99	95	Neither S or D
19	Access to electric outlets	3.63	1.83	96	Neither S or D
20	Adjustability of task lighting	3.57	1.84	95	Neither S or D
21	Overall thermal conditions	3.42	1.78	96	Dissatisfied
22	Adjustability of task lighting	3.36	1.85	90	Dissatisfied
23	Temperature (hot or cold)	3.30	1.86	96	Dissatisfied
24	Overall acoustic quality	2.94	2.01	96	Dissatisfied
25	Ability to limit undesired sounds	2.91	1.86	95	Dissatisfied
26	Adjustability of thermal conditions	2.07	1.58	96	Dissatisfied

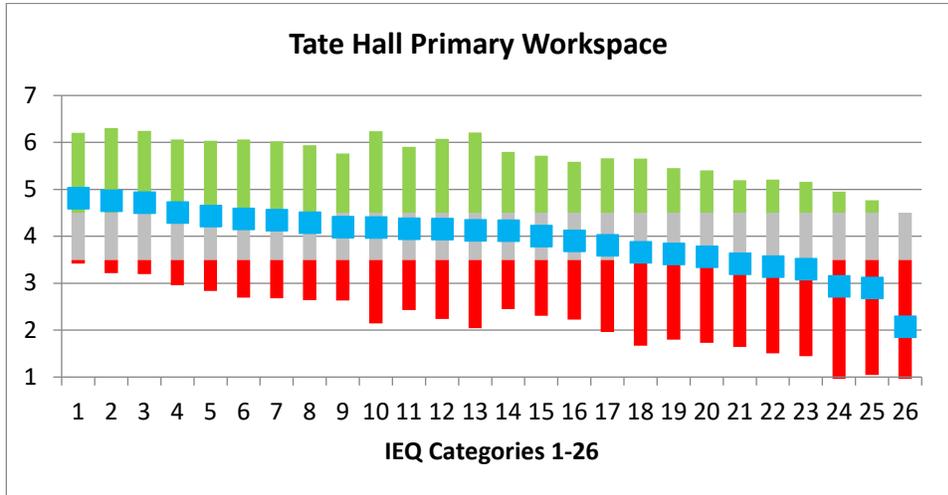


Figure 4. Tate Hall primary workspace - satisfaction with IEQ criteria (IEQ 1-26 refer to Table 3)

Results indicate that employees were **satisfied** with four (4) of the IEQ criteria in their primary workspaces, i.e., means at or above 4.50. Satisfied means ranged from **4.81** (Overall vibration and movement) to **4.51** (function of furnishings). Employees were **neither satisfied nor dissatisfied** with 16 IEQ criteria, ranging from a mean of **4.44** (amount of electric light) to **3.57** (adjustability of task lighting). Employees were **dissatisfied** with six (6) of the IEQ criteria, ranging from a mean of **3.42** (Overall thermal conditions) to **2.07** (adjustability of thermal conditions). The criteria in the ‘neutral’ satisfaction range should be considered for change in addition to those in the dissatisfied range; together they comprise 22 of the 26 IEQ criteria. Potential for change 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 the 12 ‘Overall’ category level IEQ criteria. At this time, criteria are weighted equally in this calculation as little evidence exists that provides rationale for weighting some criteria heavier than others. The IEQ mean is representative of a fair overall IEQ score and can serve as a benchmark of employees’ satisfaction with the physical environment of their primary workspace. As shown in Figure 5, the **IEQ Satisfaction Score** for the Tate Hall is **4.11**, which falls in middle quadrant of the neither dissatisfied nor satisfied range, i.e., a moderately low IEQ Score.

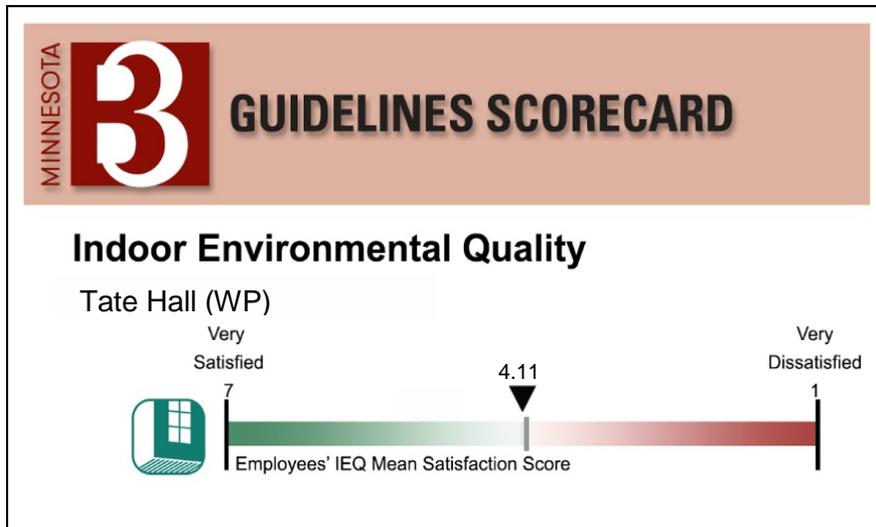


Figure 5. Tate Hall primary workspace - IEQ Satisfaction Score

As shown in Table 3, satisfaction with the Overall vibration and movement, Overall indoor air quality, and Overall cleaning and maintenance were the categories with the highest satisfaction means (4.51 or higher), near the lower end of the satisfied range. In combination with the remaining nine (9) lower mean scores, the satisfied scores were unsuccessful in pulling the IEQ Satisfaction Score in a positive direction. Seven (7) of the remaining 12 mean scores were in the neutral range, between 4.29 (Overall appearance) and 3.81 (Overall privacy, sound and visual). The remaining two (2) mean scores fell into the dissatisfied range, with scores of 3.42 (Overall thermal conditions) and 2.94 (Overall acoustic quality). 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, employees responded to questions regarding their overall physical activity while at Tate Hall (site, building, 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 Tate Hall facility

Tate Hall (site, building, and interior)	Mean	SD	N	Interpretation
Overall physical activity (walking, stair use, etc.)	4.82	1.29	96	Enhanced

Results indicate that employees felt that Tate Hall **enhanced (M = 4.82)** their physical activities (walking, stair use, etc.).

5.2 Commuting Practices

The Tate Hall facility resides in the center of the East Bank of the Twin Cities campus of the University of Minnesota. It is accessible via the Northrop Mall, Church Street Pedestrian Mall, or the Gopher Way Tunnel, with campus transportation via the East Bank Circulator on either Washington Avenue or Pillsbury Drive SE. Secure bicycle storage is available and vehicle parking at on-campus parking garages and parking lots. Note that the overall percentages may not total 100%, due to rounding.

Table 5 provides results on employees' primary mode of transportation; Table 6 summarizes commuting distances between home and the Tate Hall facility; and Table 7 summarizes employees' ability to commute using alternative choices (walk, public transit, bike, van, or carpool, etc.). These results, although not related to IEQ, do offer insight into employees' commuting behaviors and opinions. These data can provide important information about commuting practices that can reduce transportation energy consumption.

Table 5. Commuting Practices – Tate Hall Primary mode of transportation

Primary Mode of Transportation (N=121)	Drive Alone (or w/children <16)	Public Transit	Bicycle	Walk	Van or Carpool	Tele-Commute	Other
Commuting to Tate Hall	40%	20%	20%	8%	7%	1%	3%

Related to primary modes of transportation, 40% of employees drive alone (or with children under 16), 20% of employees use public transportation or bicycle, while 8% walk, 7% participate in a van or carpool. Telecommuting employees constitute 1% of the occupants, while 3% use modes of transportation other than those listed. No employees used a motorcycle or moped to get to work.

Table 6. Commuting Practices – Tate Hall Commuting distance traveled

Miles Traveled (N=96)	0-5	6-15	16-30	31-45	46-60	>61
Home-to-Tate Hall (One-way)	49%	40%	10%	0%	1%	0%

Results indicate that 49% of employees commute 0-15 miles one-way between home and the Tate Hall, followed by 40% who commute 6-15 miles, and 10% who commute 16-30 miles. Only 1% commute 46-60 miles. These are one-way miles.

Table 7. Commuting practices – Tate Hall location and alternative commuting behaviors

Alternative Commuting	Mean	SD	N
Ability to commute in alternative ways	4.67	1.42	95

Results indicate that location of the Tate Hall **enhanced (M = 4.67)** employees' ability to commute to work in alternative ways, e.g., walk, bicycle, public transit, van or carpool, etc.

6.0 Conclusions

6.1 Summary

A post-occupancy evaluation was conducted of employees of the Tate Hall at approximately 14 months after it was first occupied. About 61% of faculty and staff responded to the survey, reporting their satisfaction with the physical environment of the facility and their primary workspace. Results indicate that over 86% of employees spend more than 30 hours per week in the Tate Hall facility, and over 84% of employees spend more than 50% of their time at the Tate Hall in their primary work space.

The survey included questions related to employees' satisfaction with the facility (site, building, and interior) and influence of the facility on their work performance and health. Employees were **satisfied** with the facility (**M = 4.61**); they found the facility **neither hindered nor enhanced** their work performance (**M = 4.33**) and **neither hindered nor enhanced** their health (**M = 4.26**). In addition, similar results were reported when employees were asked these same questions about their primary workspaces (private office, shared office, workstations, etc.). They reported **neither dissatisfaction nor satisfaction** (**M = 4.22**) with their primary workspaces, that their work performance was **neither hindered nor enhanced** (**M = 4.31**), and their health was **neither hindered nor enhanced** (**M = 4.34**) by their primary workspace. As the range of scores was from 1-7, the majority of scores showed a moderately lower level of satisfaction with the facility and especially the primary workspace. (The satisfaction/enhancement range is 4.51-7.00, whereas the neutral range is 3.51-4.50.)

Most of the survey questions related to employees' satisfaction with the IEQ criteria in their primary workspaces (private office, workstations, etc.). Employees' responses showed they were **satisfied** with only four (4) of the 26 IEQ criteria. The mean satisfaction scores ranged from **4.81** (Overall vibration and movement) to **4.51** (function of furnishings). Again, this shows a moderate positive level of **satisfaction**. However, employees responded **neither dissatisfied nor satisfied** to 16 IEQ criteria, with mean satisfaction scores ranging from **4.44** (amount of electric light) to **3.57** (adjustability of task lighting). The remaining four (4) IEQ criteria feel within the dissatisfied range. Those mean satisfaction scores ranged from **3.42** (Overall thermal conditions) to **2.07** (adjustability of thermal conditions).

From employees' responses, an IEQ Score was developed and shows respondents' neutral level of satisfaction with the majority of all IEQ category level criteria. For the Tate Hall, the IEQ Satisfaction Score was **4.11**. This score reflects the influence of the moderate satisfaction level of three (3) of the 12 categories, the neither dissatisfied nor satisfied level of seven (7) of the 12 IEQ categories, as well as the dissatisfied level of the remaining two (2) of 12 IEQ categories. Finally, employees reported that the Tate Hall **enhanced** (**4.82**) their physical activity, which is one of the sustainable design criteria that influences occupant behavior.

It seems obvious that employees' satisfaction can be improved by addressing the categories that had 'neither dissatisfied nor satisfied' or 'dissatisfied' scores. However, the rest of the criteria would benefit from some attention as well. The following recommendations can help address change in these criteria to further improve employees' satisfaction. Exploring these areas in more detail and making adjustments may increase overall satisfaction at the primary workspace. It must be noted that the expense of building and operating a facility is second only to employee-related expenses over the life of the building. Therefore, maintaining or improving employees' satisfaction is a sound investment, which, in turn affects their performance and their health.

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 moderately lower 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.

6.2 Recommendations

Several IEQ criteria satisfaction scores are in the positive direction, however, improvement on the 'neutral' and 'dissatisfied' criteria 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 workspaces. 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., collaborative work spaces now located adjacent to focused work areas, individual workstations).
- Develop specialized acoustical performance requirements to support functional programming employees' 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, and air conditioning) running.
- Identify employees' privacy concerns via focus groups and/or log complaints relative to acoustical conditions for further evaluation.
- Consider employees' tasks within shared spaces to determine if spatial layout changes can be made for increased acoustic control.

Lighting Conditions

- Identify employees' lighting performance criteria that are to be met to achieve goals by conducting onsite measurements of existing illumination and compare them to standards for employees' tasks as identified by the Illuminating Engineering Society (IES).
- Determine if any task areas differ now from original intent to be sure illumination level and quality of lighting 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 what 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 a log of complaints relative to adjustability.
- Provide education to employees about any existing/achievable adjustment options (e.g., furnishings, air diffusers, lighting, temperature control, etc.)

Privacy Conditions

- Identify employees' 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 employees' task areas differ now from original layout to determine if air flow is meeting systems design intent.
- Review conditions that affect thermal comfort using the applicable version of ASHRAE Standard 55, or Human Factors Design Handbook (see B3 Guidelines). For additional information, consider reviewing Human Factors and Ergonomics Design Handbook, Third Edition (2016), by Barry Tillman, published by McGraw-Hill, NY.

Appendix A. Open-Ended Responses

Employees had the opportunity to raise specific concerns on the overall facility and their primary workspaces. Important information can be gleaned from the open-ended survey responses. The Tate Hall employees raised many general and very specific concerns and positive comments related to acoustics and privacy, amenities, appearance (aesthetics), daylighting/electric lighting and lighting controls, furnishings, indoor air quality (IAQ)/ventilation, operations and cleaning/maintenance, safety and security, spatial layout, technology/electrical, thermal conditions and control, and wayfinding and movement throughout the building. Generally, the comments are shown exactly as written.

Overall Positive/Negative

- In general, outstanding. It's a great place to work.
- The atrium is nice as is the grand stair case.
- Large open atrium space a complete waste.
- Things are coming together very slowly.
- Besides the horrible doors, the graduate commons areas are nice.
- Poor communication during the planning stage was a real hindrance.
- It can be improved!!! A good start is to discard the architects' opinions (and tell them that they failed).
- Tate is an unmitigated disaster of design.
- Tate is a disaster and it has seriously affected my work performance and my level of overall anxiety. Everyone associated with planning and carrying out this project should be ashamed of themselves, and that includes the so-called architects, the builders, and the people in upper echelons of the department and the university who let this all happen without putting up a sufficient fight to get things done properly or communicate in a professional manner.
- Tate is a disaster but can be improved by overriding the designers' attitudes. There are two huge defects plus some ordinary ones. The "social" atmosphere is worse than any other academic building that I can remember. The layout isolates groups of people from each other, it discourages students from approaching faculty, it discourages routine faculty interactions.
- The building is pretty, but the inefficiency of space is concerning and disappointing because it didn't seem to be a concern or thought in the design. We already don't have enough office space for people in our building and there are many on the verge of retirement. It's disappointing to say the least. Updated office and classroom space is what was needed. Not a revamp with 3/4 of the building (atrium and hall ways) of unusable space.
- The Tate building does not 'work' in a practical everyday sense. Too many lights have no controls, too many thermostats are located in obscure surprising places (often inaccessible), and so forth. Frankly, some persons on the design team deserve to be demoted. The physics department should never have approved any acceptance document.
- The walls here are paper thin. Overall, the construction of this building could be of better quality.
- Cheap finishing touches (whiteboards particularly) detract from the overall atmosphere.
- The physical systems are awful.
- I don't think they have put a final coat of paint anywhere in this building. The workmanship is poor and there are many aspects of this building that feel unfinished.
- In all a very poorly designed building. Input from users was ignored in the design. Shoddy workmanship abounds, not very useable teaching space; the list goes on and on (even perhaps asbestos in the new drywall). Overall has a "cheap" feel.

- Overall poor planning and construction of the workspace with walls too thin to mount anything on, poor quality paint that collects dirt marks just by looking at it (I have never seen anything like this). Dead places in the room without any electrical outlets or lighting and idiosyncratic placement of network outlets.
- Walls seem very thin. The door bounces the whole wall when it closes. The metal studs are very thin and inadequate for anything other than a poster. Wall mounted monitors have required significant reinforcement.
- Whoever designed the physical spaces did not really think about how we would be using them.
- Overall, Tate Hall has been an incredible time sink and source of frustration during planning, construction, and moving. While it is surely better than Pillsbury Hall, the benchmark cannot be comparing it against a 120-year-old building in dire need of renovations. As a brand-new workspace, it is quite a failure and I do not understand where the money went."
- It's extremely noisy and the overall appearance is rapidly declining. The walls in the public areas, which I don't think have been painted, are scuffed and dinged. The quality of the construction seems poor and cheap.
- Overall the building is hostile. It is people unfriendly. The design hinders interaction. The large lecture rooms are terrible.
- The public spaces are very showy and nice. I think it's good that some effort has been made to provide seating/study space for students. Overall, I think the building is nice and I love the janitorial staff. They are doing a great job.
- Amazingly, after a \$95 million expenditure, the physics department does not have enough classrooms and I am teaching one class in the chemistry building this fall. The space per student in the student labs is smaller than it was in the previous building and is inadequate. "
- Some of the student spaces are extremely cramped considering the intended use. The space constraints and overcrowding make it difficult to support the technology and education resources required.
- The halls and atrium would benefit from more benches/seating for the comfort of students. Teaching space and lecture hall consultation was horrible, results were horrible.
- The commons spaces are a disaster. The atrium is enormous and not welcoming. It is a colossal waste of space and energy.
- The large flat-screen display panels in the public areas with their constantly changing images are quite irritating and a very poor way to display important information.
- The teaching spaces that I've had are abominable. Lecture halls are poorly designed, difficult to see students, noisy fans, inability to make dark, etc.
- The only commons spaces for faculty and other teaching staff are in the institutes for theoretical physics and astrophysics, where there are not the traditional comfortable chairs, the lighting is bad and much of the reading material is in locked cabinets.
- The entry from Church street is a design mess. One enters to a blank wall decorated with some attractive but irrelevant 'art ' on which I'm sure abundant funds were expended while items like the furniture budget were cut.
- Another disaster is the facility for teaching demonstrations: For most of the lecture rooms, the demonstration staff must transport demonstration equipment up an elevator to get to the lecture halls, whereas in the previous building all the main lecture halls were directly accessible to the demonstration preparation room. This was pointed out repeatedly as a good feature by faculty and department management but was totally ignored in the design. It directly affects productivity and teaching effectiveness.

- I find what I consider important design glitches for its function. It appears as though emphasis was placed on being a large teaching space, without enough consideration of the other academic units of faculty in the building.
- Bicycle lanes are badly needed on Church Street.

Acoustic Quality and Privacy

- Wish it had better soundproofing. I often end up listening to music with headphone to drown out the conversation going on in next offices. It's very disconcerting when I can hear every word.
- The entire building has way too much noise coming mostly from the air conditioning to the point that it makes working incredibly uncomfortable. It also already had very negative effects on the work environment as most people now have to keep their doors shut due to the noise from the hallways.
- Noise has been an ongoing problem. The fire alarm in the first floor goes off frequently for no reason, disturbing everyone whose offices are near it. At least in this case, after months of requests, it seems that facilities management has, at least temporarily, fixed the problem.
- A very poorly designed work environment, noise levels loud and intolerable for intensive, focused work (many colleagues forced to wear ear-buds, noise cancelling headsets). Absolutely no noise dampening materials in walls separating offices.
- The doors to the main offices are INCREDIBLY loud and obnoxious. Additionally, they don't block sound from the building entrance so passing times are very loud.
- The door to the office suite is very, very loud. It is one of those glass doors that locks and is so noisy when it opens and closes that I can hear it 30 feet way with my private office door shut.
- Several seminar rooms are almost unusable because of high air-conditioning noise in the back rows and otherwise poor acoustics.
- Poor acoustics in some of the lecture halls.
- The sound system in the large classroom (B50) was completely inadequate last year and the recent fix has only partially corrected it. In the same room the noise from the ventilation system was reduced after complaints but it is still quite loud.
- When the door is open to the hallway, it can be very loud if anyone is in the hall and having a conversation.
- The walls are very thin, I can hear conversations outside my office and in other offices very clearly.
- I find the spaces very distracting. Sound travels easily due to all the hard surfaces. This means it is very difficult to have private conversations which are of a sensitive nature and are required by law to be kept confidential.
- The main issue is the easy travel of sound along the corridor outside my office. Otherwise very quiet with little noise from elsewhere in the building.
- Poor hallway acoustics mean that meetings with students must occur with door mostly closed to avoid distrusting neighbors.
- The office itself is quiet, but the hallway ventilation is extremely loud, which means I have to shut my door in order to have quiet (and means it gets even colder). My window looks directly into others' windows, which is awkward for privacy considerations.
- My office is receiving very little daylight--I appreciate the large window I have, but it's internal, and I look onto suites of grad student offices. Even on sunny days, the office is dark when not lit by electric lighting (I'm pleased with my electric lighting). There is little privacy--I needed to bring in giant plants so that the graduate students don't see everything I do, and I don't see everything

they do. This is a balancing act--privacy versus daylight, for pulling down blinds or bringing in plants block the little daylight I get.

- The acoustics in the row of faculty offices are so poor that one can hear conversations in the offices 4 doors away.
- The acoustics are terrible- walls are thin; I can hear someone sneeze who is in an office outside of the main office area. This is mostly a concern due to the private nature of many conversations as well as the ability to concentrate on the job at hand.
- I was surprised that in such a modern building with supposed sound insulation I can easily hear conversations and laughter from rooms far down the hallway.
- My office is adjacent to a kitchenette in which secretarial staff are constantly preparing snacks for various events as well as heating up their lunches while loudly chattering.
- Other than acoustical privacy, my physical environment is excellent. I can hear every conversation taking place in the offices of both sides, as well as in nearby hallway with my office door closed.
- My biggest issue is the total absence of sound absorption through the walls. I can hear every conversation in adjacent offices. My writing on the white board in my office (which I do frequently) has been reported to me as very disturbing to my neighbor.
- The noise from the hall is much too loud, requiring me to keep office door closed which doesn't enable interactions with other faculty, students, etc.
- Sound gets very strong from outside areas on the floor. For some time, there was a vibration in the floor.
- Noise levels are uncomfortable throughout the entire building.
- Glass on walls in lecture halls inhibit use of experiments, distract students (from knocking on glass by individuals), and is a security and FERPA risk.

Amenities

- The lack of sanctioned indoor bike storage is unfortunate.
- There are many features that were not included in the building that are beneficial to the employees and student body. One such example is an indoor bike room for more secure storage of bikes for those who commute to work that way. Given the percent of people in Earth Sciences and Physics who ride their bike (and that the University would like to encourage this for health and space issues) this would have been a nice addition.
- It is very disappointing to me that a new building at the University did not include a lactation space for mothers. Having recently had a baby I know that the University hospitals strongly encourage all mothers to nurse and it is extremely disappointing to me that the University does not then follow up by providing the resources needed to their staff and the student body to support women in this endeavor. There are very few spaces provided on campus and, in my opinion, this should be included in all new construction and renovated on campus.
- Why can't we open our windows? My office is on the first floor. Fresh air is nice.
- I wish windows could be opened
- I hate that my windows don't open. The inability to open the window and access the sounds and scents from outside is one unfortunate consequence of living in a renovated building on campus.
- I can longer open a window for fresh air.
- I no longer have keyless entry to my lab.
- The whiteboard is too small.
- White boards are sub-standard. Several of us are purchasing new units. The boards are completely inadequate for our job duties as theoretical physicists. If you have seen the TV series

“The Big Bang Theory,” you would know that we spend a large fraction of our time writing mathematical equations on our boards. This is a job-related important issue that should have been address by the design and construction team.

- There are no bulletin boards outside the offices for posting information for the public about ongoing research, which is traditional in physics departments and was possible in the old building. (The head is trying to correct that last deficiency.)
- Kitchen space is 5 yards from my office door. Smells and noise are a daily nuisance. The kitchen itself is not functional. Barely space for one microwave and a huge granite counter. Don't know who designed that kitchen, but it is worth taking a look.

Appearance (Aesthetics)

- Overall, it is a pleasant, cleaning work environment, just has a little antiseptic feel to it.
- Adding art will help.
- Everything is a very sterile white.
- While the corridors and atrium have a pleasant openness, they seem quite barren, lacking, for example, any woodwork or interior tile or brick.
- The interior fabric of the building -- the walls, etc. -- are intensely sterile. The all-white scheme seems to come from a 1968 Stanley Kubrick movie, and it does NOT help most people psychologically. This can be fixed! Any sensible administration would absolutely disregard the architects' opinions and would employ a few hundred gallons of brightly colored paint: bold stripes, horizontal in some places and vertical in others and diagonal or patterned on other walls. Similarly replace the ground-floor public tables and chairs with brightly colored substitutes, encourage plants and decorations. (By decorations, I do not mean the stereotyped physics and astronomy pictures that appear in most physics-astronomy buildings. Instead I recommend fresher, less familiar pictures or designs.)
- In the entrance area, the geologists have made their walls far less hostile than the physics-astronomy regions. Second, to illustrate some of the above comments, simply take a walk around the central areas of Keller Hall. It has color, it has some natural trim (i.e., wood-like trim strips), and the student study areas are infinitely better than either of the two physics buildings.
- With the available lighting, it would be really nice to facilitate large indoor planters to increase the green/organic aesthetic inside the building. Having some larger, geologically relevant plants would be a really nice addition to the 1st floor.
-

Daylighting/Electric Lighting and Lighting Controls

- My office is great because I won the fight for a window so I'm quite pleased. The office I was supposed to go in is terrible and I would be miserable in it.
- The presence of natural light, even sunlight, in the atrium is very welcome. The level of electric lighting there seems excessive.
- There is no view or daylight whatsoever, none of the office spaces with windows have transoms to allow daylight into the halls.
- The so-called “interaction” spaces are ill-lit, provided with ridiculously small display screens, and sometimes claustrophobic.
- The use of narrow atria along the north and south sides of the building to bring in natural light to internal offices through internal windows seems like a very nice idea.
- Windows directly onto graduate student offices impose a choice between privacy (lowering blinds) and maximizing the limited natural light.

- No windows.
- There are no external or internal windows in my office, so I have to have the door open for external light/daylighting. The overhead lighting is very harsh. I can only tolerate having half the lights on (having them all gives me eye strain and a headache after a short period of time). I had to bring in my own yellow light to supplement the overhead lighting.
- A big problem is windowless offices for the postdocs. That is extremely unfortunate; these are people the university should treat well, they are here for 2 to 3-year positions and sticking them in windowless offices for the duration is not nice and not good for recruiting. Even more bizarre is that one of the walls of these offices is the wall for the beautiful open atrium, with all of its natural light. There is no good excuse not have windows cut into this wall. Privacy concerns, which is one I heard, are silly; anyone wishing for privacy can close window blinds or curtains.
- I do not have any window in my office and therefore lack completely of natural lighting. The electrical lighting is not good enough to compensate this and I sometimes feel that I am in a dark environment.
- The electric lighting is poorly located leading to dark corners in places where I actually have to work (e.g., the sink).
- We have no task lighting provided for us. I brought mine from home. People keep telling me I should invest in task lighting that will provide some UV light to help my mood/productivity. This seems a bit unfair to ask people to furnish their own lighting.
- In B50 there are not sufficiently diverse light options. Energy efficient light controls are very poorly designed. Occupancy sensors that can turn lights on in response to motion are much superior to the vacancy sensors in Tate, which can turn off lights at unpredictable times and leave individuals completely in the dark (when working nights or in windowless offices). The light controls in Tate they are at best inconvenient and borderline unsafe, and at worst they are unpredictable and unreliable.
- The lighting situation is ridiculous. Multiple offices, besides mine, have had many issues with malfunctioning lights. Issues range from relatively minor nuisances (lights turning on even after switches have been turned off) to much more serious conditions (people having to constantly wave their arms to not be in the dark while working, and even some people whose lights have simply stopped working or remain on all the time).
- What is troubling is how widespread the issues are across different offices in different floors. Worst of all, facilities management has been unable to fix anything - electricians claim they have no idea how the wireless light system works. Why weren't they trained? If I had built a new house and after 1 year the allegedly modern lighting system was not working properly, I would leave very bad reviews for the manufacturer and never use their products again. If the purpose was energy efficiency, this has been an utter failure, since lights keep turning on without people on the offices. What actions will the responsible unit take? Keep in mind that proper lighting is one of the very few items essential for most of us to be able to work.
- We have had numerous issues with the lighting, mainly with it turning off at inconvenient times. There is no central lighting in the Atrium because it is supposed to take advantage of the daylight, however, when it is cloudy, it makes the entire building look gloomy and uninviting.
- Lighting going on and off seemingly at random is irritating.
- The lighting is horrible and not adjustable.
- The lighting technology in Tate is a disaster. I am sick of having the lights quit on me whenever I am trying to think.
- The lights are hard to operate. Shouldn't have two light switches.

- Lighting malfunctions: unable to turn off manually (it turns back on in 30 seconds). Lights turn off after some time even when I am in the office.
- Biggest irritation is the automatic lights turning off and on apparently at random. No information on how to adjust or alter the sensors that routinely turn off the lights when I am working in the office and also apparently at random turn them on.
- The light switches are ridiculous.
- Most room lighting is good, but a) the complexity of the switches makes on/off trickier than necessary; and b) many lab spaces are too dark, with no task lighting provided.
- Overhead lights are confusing and programmed differently in every room.
- The lights go on and off at random while I am working, and I have no control of that.
- I gave up getting the auto light sensing adjusted and now use a desk lamp that I provided. The tendency of lights to go on and off spontaneously is a bit disturbing, but I have adapted. Rumor has it that some new walls in the building contain asbestos, although we don't know which ones. That is a bit disconcerting.
- The light switches are programmable, but we have had only one chance to make any changes. A good old-fashioned light switch would have been much simpler.
- The motion-controlled lighting didn't work correctly in the lab so they disabled it, it's now manual lighting.
- The motion sensors are poorly located in most spaces and sensitivity and duration are not consistently set.
- Annoying automatic turnoff of lights while the room is occupied"
- Lights go off even when I am in the room and working.
- The light switches go crazy and nobody knows how to fix them.
- Motion sensors are mostly a hindrance to working.
- A main issue for me are the automated light system turning the lights off when I am in a room.
- Fix the !@#\$%^ light sensor so the lights stop turning on and off at random.
-

Furnishings

- Sit/stand desk is great!
- The furniture in the atrium is inadequate and uncomfortable and for two years there were dozens of students sitting on the floor. Recently a few uncomfortable benches have been added but seating is still inadequate.
- The desk is so poorly made that it comes apart if you try to lift it by lifting on the top.
- Furniture is cheap and hard to adjust to each occupant needs.
- Desk chairs and desks are great, but our conference room chairs are cheap, uncomfortable, not adjustable.
- The furniture choices were very limited and overall the furniture looks quite cheap. Gun metal gray is not a very attractive color for an office. My colleagues with remodeled space at other Universities (e.g. other Big 10 Universities have much nicer and more functional office furniture). We were told we had to get rid of office furniture that was of higher quality before we were shown what was available.
- The plugging in of desktop items is not very easy. The things on the right side of my desk do not reach the plugs and crawling under the desk to route them through trays and adding extension cords is not ideal either.
- Furniture choices - fabrics do not match! It's weird.

- Magnetic tack board is not very magnetic and mostly impervious to tacks.
-

IAQ/Ventilation

- There is no outside ventilation and, though I have a very capable immune system, I find that I am often sneezing after visiting the kitchenette and I suspect that many viruses are present in the air in this complex.
- The noise of the ventilation system is very loud
- The ventilation noise in the corridor is very loud and I have to close the door of my office to have some quiet.
- The HVAC system in the hallway outside my office (239) is unreasonably loud and forces all of us to close our doors in order to get anything done. This diminishes the atmosphere and collaborative nature of our lab, reduces the chance for visitors to our national lab to interact with us, and gives the office a stressful feel. The level of noise from the HVAC system never rises to the level that it exceeds occupational noise limits (85 decibels), but it is 70 decibels just standing in the hallway (equivalent to a nearby vacuum cleaner), and 55 decibels sitting at my desk with my office door closed. It makes it very difficult to work, and I really hope that there is something that can be done to minimize this noise. For information about noise levels please see <http://www.industrialnoisecontrol.com/comparative-noise-examples.htm>
- The corridors with no ceilings have very loud HVAC sounds. It is difficult to work in an office adjacent to one of these corridors -- conversation in the office is difficult unless the door is closed and people knocking on the door can't hear someone inside tell them to come in. It is difficult to have a conversation in the hallway.
- Loud vent that runs permanently lies just outside my office door. Very loud.
- Fix the loud fan noise on 3rd floor Tate
- Hallway ventilation is very loud.
- A main issue for me are the loud HVAC sounds.
- Please address the HVAC noise! It will make all of us significantly happier and more productive!
- Loud HVAC in hall outside Tate 360 forces me to close office door to eliminate distracting white noise.
- The HVAC in the hallway is so loud I have to keep my door closed the entire time I'm in my office. When people knock on the door they can't hear me tell them to come in.
- There is a very loud forced air vent outside our office that is on constantly. There is no way that I know of to shut it off. It is very loud and annoying and the only way to reduce or eliminate the noise is by shutting the door but that deters our students from coming to our offices. This is on the 3rd floor of Tate - South Interior wing
- The air handling is exceptionally loud (sounds like an airplane hangar. Would be good for colicky babies).
- HVAC outside office extremely noisy even with door shut.
- Air handling is noisy.
- Fan/motor noise from hallway is extremely loud.

Operations and Maintenance/Cleaning

- The view is ok from the windows, but the windows are very dirty.
- Although I very much like and appreciate the view out onto the Mall, the windows have streak marks on the inside of the panes of glass (between the old and new windows) and will be there forever.
- The overall maintenance of the building is a little disappointing. It doesn't seem like the building is cleaned very often. To clarify, things are picked up and garbage is emptied efficiently but the window sills were orange/yellow with rust from an above sprinkler head. I finally ordered some soft scrub and got the stains out. I also dusted the window sills on the second floor because they were full of dust and hadn't been cleaned. There are numerous marks and scuff marks throughout the building already and it will only get worse. I wish there would have been more thought into flat white paint for every wall in this building.
- Whoever thought to install motion-sensor activated feminine hygiene disposals in the bathrooms was clearly male and a moron. Now I always have them snapping at me like a Hungry-Hungry-Hippo and showing off the bloody napkins of other people. I wish I would know how to take out the batteries.
- The elevator servicing the subbasement breaks constantly and as it is the only elevator going there it creates a real hindrance to working in the building.
- Loading dock/ Church street vehicle access is a problem.
- The continued limited access to the loading dock has been a giant hindrance for work, taking me hours what should take only tens of minutes.
- There have been a number of issues with fume hoods.
- A number of the finishes look hastily done (e.g., drawer faces crooked, bolts not completely secured on mobile workstations, low purity DI water terminations not converted to standard usable threads, but instead left as proprietary plumbing joints, etc.
- The walls in, especially the public areas, got smudged very quickly and when we had inquired with FM to clean up the smudges in prep for the Grand Opening, they said that they were going to paint over the walls again (it seems that the project either used inferior paint or it was only the primer) - not done yet.
- The white walls were painted with flat paint, which means that every time someone brushes up against them, they leave marks. The building already looks dingy in several public areas and we have only had a year and a half of occupancy. What is it going to look like in five years?
- At times, there is strong chemical and diesel smell in the workspace that I have complained multiple times about, but nobody seems to follow up on it. No action from the UMN. My users are complaining, and my engineer told me that he worries about his health.
- Low obstacles in the sub-basement ceiling have protective foam held in place with masking tape.
- Railings on stairs are not one continuous piece and are not mechanically connected making them give a little and creating an uneven surface where your hand runs.
- At least one grad-student area often stinks of lunch food and looks like a setting for a not-very-good TV sitcom.
- Sink baseboard (below cabinets) is just a hole, not finished.
- A year later and the whiteboards still aren't hung.
- The sewage smells from the traps in the plumbing are obnoxious.

Safety and Security

- Lights are reduced in the evenings in the subbasement which makes me feel very uncomfortable and unsafe.
- The graduate student spaces are still not secure after over one year in the building. Although I understand that the project team is working on the solution, the issues with those sliding door locks have been horrendous - students cannot secure their space; FM has spent many hours trying to fix the hardware as issues came up to no avail.
- The main office doors are glass and hooked up to the card reader/locking system - the doors/latches are LOUD and extremely distracting. Very bad design and/or installation (when we first moved in, the door had major issues locking so our office was not secure!)
- Offices have been unsecured (doors do not lock properly) since the opening of the building. No fix has been implemented in over a year of knowing about the issue and after multiple thefts that were made possible because of the dysfunctional doors.
- Locks work poorly - have to jiggle keys extensively. Office door lock already had to be repaired.

Spatial Layout

- Isolation from students quite apparent.
- There are no nearby interaction spaces (in fact, there are none at all except for conference rooms, which serve a different purpose entirely), and (relatedly) no nearby place to put a group coffee machine/microwave which would serve as an informal focus point. Other physics buildings I've worked in all have such spaces, and they are **extremely** important to stimulate and enable ready collaboration.
- The absence of interaction spaces for research groups in Tate is a really big negative and disappointing to see in a new building. Everyone becomes siloed into their own offices, and there's a much bigger barrier to striking up productive discussions through serendipitous interactions.
- My office gives onto a discussion area/break room. I need to leave my office open when I am working, in order for people to understand that I am at work and available, as is the case with every other office giving onto this break / discussion area. This leads to a frustrating dichotomy: either the discussion area doesn't get used as a discussion area with any frequency in order to spare the people working in the offices around it, or, everyone regularly gets to hear all about everybody else's arguments. This makes little to no sense in an academic environment where focus is paramount. The sole advantage is that the discussion room doubles as a break room, which is convenient, but does not outweigh the inconvenience of the noise pollution.
- The wall mounted shelf and board in my office were installed without any input regarding desk placement, height, etc., and are placed in a fairly inconvenient location.
- Overall, the space is conducive to my work environment, except that two people are crammed into a space suitable for one.
- The office is at least 30% smaller than the one I had in same building before renovation, requiring major adjustment.
- Meeting rooms are completely nonexistent in the building. In order to have small group meetings, we have to go to another building on campus.
- Classrooms have many deficiencies, many of which seem really inexcusable: I lectured last spring in a room in which there were many seats from which the whiteboard at the front was not visible. The white board had a totally inadequate area and was so tall that I could not reach the top in order to write on it. Failure to adopt the innovative and very successful arrangement of lecture halls around a central lecture preparation area in the old Tate.

- Lecture halls are poorly designed and lack the ability for any interactive activities.
- Poor shape of some of the lecture halls.
- Some of the lecture rooms have shapes that make them unsuitable.
- Adding benches to the open spaces is helping (there should be more so that the students don't need to sit on the floor).

Technology/Electrical

- Cell phone reception is almost nil in office.
- Location and number of outlets is awful.
- Outlets in office are very limited.
- Electrical outlets and ethernet jacks are poorly located.
- Waited a year for wired internet jack at desk.
- Wiring for computer monitor in wall for presentations is wrong size and position.
- Not all the outlets were hooked up to work and some still are not working.
- There were not really enough electrical outlets in my office, but I have worked around that.
- The limited number of electrical/data outlets constrains work in the office.
- Only one functioning internet ethernet jack, need to use a splitter. Internet connection is often slow.
- IT issues (phone, internet) have been problematic since the beginning: dozens of calls, emails, and meetings have been required to fix problems, most of which were not the fault of the design but of UMN IT services.
- Outlets are few and far between in public areas making it difficult to utilize spaces efficiently. We have one public space with no outlets in the walls, one in the middle of the floor. How are we supposed to plug in items without causing tripping hazards?
- They put too many outlets on a single circuit at too low an amperage, causing the circuits to pop. FM does not see this an emergency, so it can take several days for them to reset the switch, during which time our fridge/microwave is unable to function. One would think that kitchen areas would have been designed with higher amp circuits to prevent this from happening.
- Placement of outlets and especially of computer wall fittings (ethernet) is not well thought out relative to desk/bookcase locations
- I'm not able to access electrical outlets that work. The ones I can access don't work.
- It was absurd that they put outlets behind wall to wall bookcases and then had to cut a hole in the back of the furniture. What were they thinking?
- My phone jack is in a bizarre place, behind my bookshelves, rather than right by my desk as my electrical outlet is, and I have to keep my phone not on my desk, but in a drawer in my bookshelves.
- Very deficient in the number and placement of electrical outlets for a laboratory space.
- Two microwave ovens were installed in the kitchenette, but they immediately started blowing circuit breakers, so instead of installing a different circuit breaker, a microwave oven was removed.

Thermal Conditions and Control

- Temperature varies widely among different offices. Whatever temperature control system exists, is clearly not working properly. There have been offices whose occupants had to bring heaters in the summer(!) because the air conditioner was out of control. How can this be energy efficient? Like the lighting issues, it seems that no one from facilities management is able to fix anything.

- Luckily, I have a corner office that required a thermostat controlling my office only.
- Thermal conditions not adjustable - and often undesirable.
- Climate control in the office is not existing, while the window cannot be opened.
- Air is too dry year-round.
- There is zero humidity control leading to constant static shocks in the winter
- Incredibly low humidity that gives me electric shocks all the time (and endangers my two million dollars analytical instrument).
- Users complaining that they are feeling uncomfortable and parched and need to drink much more water when working in the lab.
- Low humidity makes me constantly apply creams to my face and hands and I bought humidifiers for several of my workspaces (but they cannot supply enough for the high air volume turnover).
- I especially dislike having multiple rooms on a single thermostat. When the person with the thermostat in their office gets cold, they increase the temperature, making my office uncomfortably warm. The building is also extremely dry, which causes issues (bloody noses, cracking skin).
- The fact that no one was even able to tell us that our thermostats are not adjustable is an absolute failure in communication, I am not the only person who spent quality time pressing buttons to no effect.
- No individual thermostats.
- My office is consistently freezing to the point where I need a long sleeve shirt, a sweater, and a blanket. There are times that it gets so cold in my office that I require gloves because my hands will be so cold it hurts to type. No one should have to work like this.
- Cold and drafty in the winter.
- Cold. Both during the summer and during the winter. Our small conference is always very frigid- the thermostat was put on the wall where a large flat screen was installed and therefore sits behind the monitor.
- It's always freezing cold in my office, even when my thermostat says 75 degrees.
- We have absolutely no control of the temperature in any of our offices. A professor near me has to wear a coat and a hat during winter because he is too cold. Worse, all of our offices are fitted with what seems like an AC control box, which in reality serves absolutely no purpose as it does not control anything.
- I find that the thermostatically maintained temperature in the office and adjoining corridor are too cold for primarily sedentary work. Indeed, in the summer it is distractingly cold unless one brings warm clothing to the office which is completely unsuitable for the outside temperature conditions.
- Cool season (fall, winter, spring) temperatures are generally much too cold, and not at all adjustable. We have resorted to installing electric space heaters under desks, and repeatedly calling UMN Facilities Management to change room temperatures, both of which are disastrously inefficient.
- Too cold - all year round. Raising the temperature would reduce space heater use and save money in the end. Should not need a space heater in July.
- The AC does not have an off-button, air is constantly flowing, resulting in an incessant, loud, humming. The temperature is never quite right, despite the hallways being much better. It is either too hot or too cold, sometimes switching within a matter of minutes. The centralized heating/cooling does not work, offices that supposedly should be related have vastly different temperatures and airflow. It is beyond me how these designs were ever approved for wide use.

- Our office is connected to a thermostat several offices down. This has given multiple problems with temperature, heating, excess airflow etc.
- The sharing of thermostats between offices in a row is not ideal.
- The temperature hasn't been correct in my lab since we moved in.
- The lack of personal control over temperature regime is a big demerit.
- Temperature control is inadequate. It was reset once already. Temperature sensor seems to be near the door and records a temperature that is very different than near windows, where desks are.
- Temperature is generally too high (74 degrees in my office now and not adjustable), the temperature variation is high, the heater is on in the middle of the summer (!).
- Temperature differences between the new construction and the pre-existing building are significant both in winter and summer. The roof of the atrium behaves as a greenhouse in summer, so the AC overcompensates to try to cool the enormous volume of the atrium and consequently overcools the older building. The opposite effect appears to operate in the winter so one needs to employ an electric heater in the older building.
- Temperature control has been spotty. Sometimes too warm. And sometimes a little chilly.
- Temperature fluctuates too much, but mostly too cold. Cold air poured onto the floor last winter and it was determined that the exterior walls (facing west) were not insulated; also, there was a hole under the radiator where the cold air was pouring- FM plugged the hole but the wall is still cold to the touch.
- Commissioning was out several times to adjust but temperature and, even though my own thermometer says it is 70 in my office I have to wear a sweater or scarf and my hands are cold. It is unfortunate that we have had to start using space heaters, full well knowing that it messes up the 'thermostat' but there is no alternative.
- Environmental controls failed to take into full account radiant heating for rooms and the presence of high-performance work stations which generate a lot of heat (Watts).
- My office is too cool, summer and winter, and I have no access to any thermostat to adjust it.
- I am persistently cold in my office, which causes me to carry tension and I am injuring my shoulders from the shiver-tension.
- My office and entire hallway are very cold!! This affects my work--it makes me lethargic, even when I bring in blankets and wear my coat all day. It doesn't seem possible to adjust the temperature. Please, please raise the temperature in the building or make it possible to regulate how individual offices are heated.
- Uncomfortable lack of ability to choose thermostat setting.
- The office is always too cold and I can't adjust the temperature. Only one of the 5 offices on my wing has a thermostat that controls (to some degree) all of our offices. This is a terrible set-up.
- Cold winds blow from vents and temperature is not adjustable.
- Temperature varies dramatically from office to office and in the lab.
- The temperature tends to be on the low side, although this can be dealt with by wearing a sweater or jacket in the building year-round.
- Temperatures in my office, and most of those on my hallway, are extremely cold. Multiple complaints over the past year have not succeeded in correcting this. I have to wear outdoor-appropriate gear in my office in the morning in order to be comfortable. The people in the office next to mine wear winter coats most of the time (even in the summer).
- It is impossible to control temperature and it is therefore too cold in the office for people working at a desk without moving for several hours.
- It is often cold in my office (both winter and summer).

Wayfinding and Movement Throughout the Building

- Although we are told that the building is ADA compliant, there are many areas where someone with a wheelchair or crutches would have a hard time accessing.
- The stairways just inside the East entrance seem too narrow, especially in the case of an emergency evacuation of the building.
- The signage for the X75 and X85 offices for the 2nd and 3rd floors is confusing, and students are often lost or unable to find the offices of their professors.

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 is 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).