

MINNESOTA



**POST-OCCUPANCY
EVALUATION**

**Indoor Environment Quality + Workplace Environment
Center for Magnetic Resonance Research (CMMR)
University of Minnesota, Minneapolis, MN
Report 2**

**February 2015, Minneapolis, MN
Sustainable Post-Occupancy Evaluation Survey (SPOES)
B3 Guidelines**

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1.0 Overview

The purpose of this report is to examine the connection between sustainable design criteria used in the design of the Center for Magnetic Resonance Research facility (CMRR) and occupants' satisfaction with their work environments located in the CMRR. The CMRR facility was designed using the B3 Guidelines (formerly known as the Minnesota Sustainability Guidelines or MSBG) and completed for occupancy in 2011. The B3 Guidelines tracks 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 at 36 months post-occupancy. The survey was conducted in February 2015 and is the second of two required survey events for this building.

This SPOES report focuses on employees' satisfaction with the physical environment as related to 25 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 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 (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** (average of all responses), **standard deviations** (SD) (how different scores are from each other and the mean), and **number of responses** (N) for each question analyzed. The mean for a 7-point scale is 4.00. Lower or higher means reflect stronger tendencies towards dissatisfaction/satisfaction and hinders/enhances. Means that are close to the center of the scale (4) are considered to be neither dissatisfied/hinders or satisfied/enhances.

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

- 1.0 - 3.50 dissatisfied (hinders)
- 3.51 - 4.50 neither satisfied (enhances) nor dissatisfied (hinders)
- 4.51 - 7.00 satisfied (enhances)

An IEQ Score is also calculated for 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 (site, building, and interior) and the influence of their physical environment on their perception of their work performance and health. Then they responded to questions about their satisfaction with their primary workspaces in relation to IEQ criteria from the B3 Guidelines.

In the SPOES questionnaire, the 25 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 13 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 weighted mean 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

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

Additionally, employees' physical activities, commuting practices, and recycling behaviors within the building were investigated.

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

The CMRR facility is located at 2021 Sixth Street SE Minneapolis, MN. The building (see Figure 1) is part of the University of Minnesota's Biomedical Discovery District on the East Bank campus. The CMRR houses the largest and most powerful imaging magnet in the world. Offices, laboratories, seminar rooms, common spaces, and a courtyard are distributed across two floors and 102,400 square feet. A 41,000 square foot renovation and a 61,400 expansion were completed in 2011.



Figure 1. Center for Magnetic Resonance Research Building (Photo: Shawn Sullivan)

3.2 Description of Respondents

The CMRR had approximately 85 employees with assigned workspace in the facility during the spring semester period and administration of the survey event. The response rate to the questionnaire was approximately 46%. Of those responding, 53% were male and 47% were female. The mean age of respondents was slightly over 39 years, with a range of 22 to 78 years.

The CMRR was housed in its facility since 1991, however the renovation and expansion were completed in 2011. Since that time, 66.7% of the respondents reported that they had worked at the CMRR for more than 3 years, 11.1% had been there 2-3 years, 13.9% had been there for 1-2 years, and 8.3% of the respondents spent less than 1 year at this site. Relating to hours worked during a typical week at CMRR, 61.5% of the employees reported they spend 40+ hours a week in the facility; 25.6% spend 30-40 hours a week at CMRR; 5.1% spend 20-29 hours at CMRR; and 7.7% spend less than 20 hours in the CMRR facility. Relating to the percentage of time employees spend per week in their primary workspace, 61.5% of the employees reported they spend more than 75% of their time per week in their primary

workspace; 25.6% spend 51-75% of their time per week in their primary workspace; 7.7% spend 25-50% of their time per week in their primary workspace; and 5.1% spend less than 25% of their time per week in their primary workspace.

CMRR is a research facility with offices, workstations (cubicles), and laboratories serving as primary workspaces. Results indicated 34.2 % of the employees share private offices with other people, 23.7% have private offices, 26.3% work in a cubicle (enclosed by partitions), 10.5% work at a desk in an open area, and 5.3% work in a laboratory setting. Employees also indicated that 59% of their primary workspaces were located within 15 feet of an exterior window and 41% of the employees were not within 15 feet of an exterior window.

4.0 Findings and Discussion

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

Employees responded to questions concerning the CMRR 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 shows the mean for each question 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). This graph is simply a visual image of the findings from Table 1.

Table 1. CMRR facility - overall satisfaction, work performance, and health

CMRR Facility (site, building, and interior)	Mean (1-7)	SD	N	Interpretation
Overall satisfaction	5.62	1.07	39	Satisfied
Overall work performance	5.08	1.20	39	Enhances
Overall health	4.79	1.03	39	Enhances

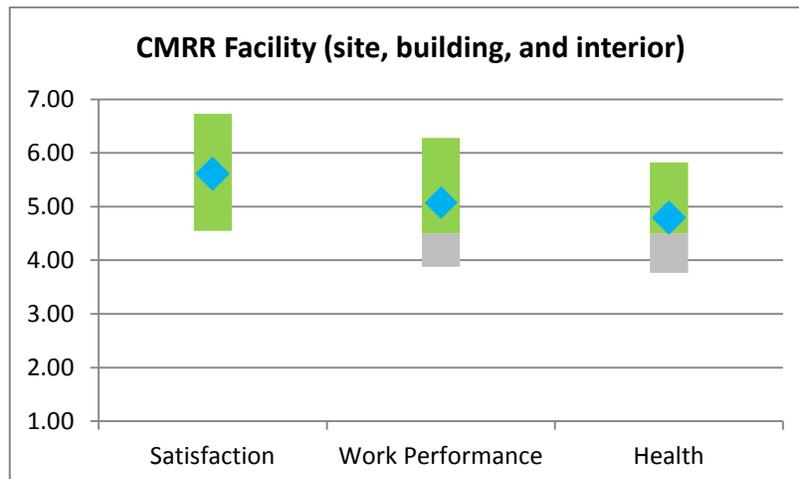


Figure 2. CMRR facility - overall satisfaction, work performance, and health

Results indicated that employees were **satisfied (M = 5.62)** with the CMRR facility (building, site, and interior) and reported that their overall work performance was **enhanced (M = 5.08)** by the facility. Employees reported that their overall health was **enhanced (M = 4.79)** 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 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. Primary workspace – overall satisfaction, work performance and health

Primary Workspace	Mean (1-7)	SD	N	Interpretation
Overall satisfaction	4.90	1.55	39	Satisfied
Overall work performance	4.64	1.66	39	Enhances
Overall health	4.53	1.41	38	Enhances

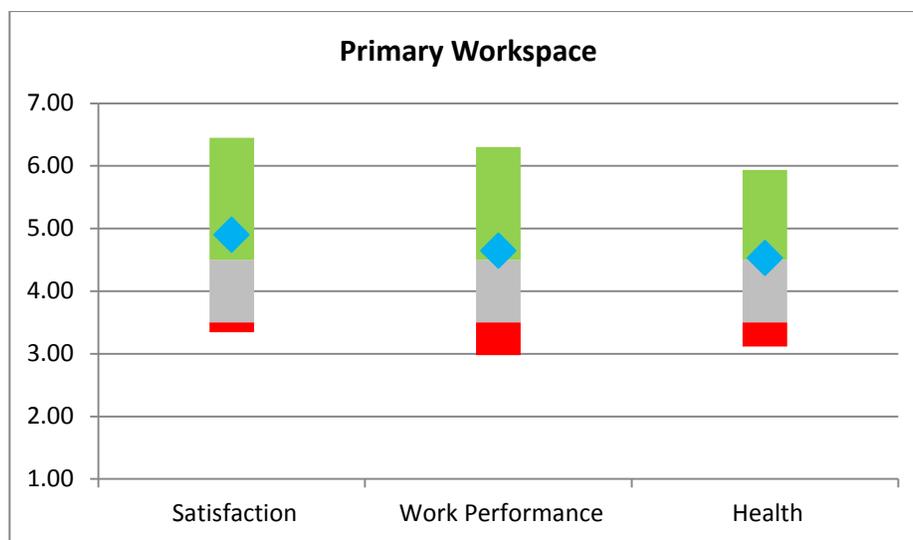


Figure 3. Primary workspace - overall satisfaction, work performance, and health

Results indicated that employee were **satisfied (M = 4.90)** with their primary workspace, their overall work performance was **enhanced (M = 4.64)** by their primary workspace, and their overall health was **enhanced (M = 4.53)** by their primary workspace.

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 shows the means and standard deviations of their responses as well as how the responses are interpreted. Figure 4 is a visual image of the findings from Table 3; an explanation of the graph was given for Figure 2.

Table 3. Primary workspace - satisfaction with IEQ conditions

IEQ Criteria (1-25) (Category Level Criteria are Boldface)		Mean	SD	N	Interpretation (D = Dissatisfied) (S = Satisfied)
1	Overall vibration and movement	5.54	1.39	39	Satisfied
2	Overall technology	5.46	1.41	39	Satisfied
3	Humidity (dry or moist)	5.41	1.25	39	Satisfied
4	Amount of electric light	5.38	1.48	39	Satisfied
5	Overall cleaning and maintenance	5.33	1.59	39	Satisfied
6	Ability to hear desired sounds	5.18	1.59	39	Satisfied
7	Air velocity (drafty or stagnant)	5.08	1.78	38	Satisfied
8	Adjustability of task lighting	5.00	1.72	39	Satisfied
9	Overall electric lighting conditions	5.00	1.72	39	Satisfied
10	Overall daylighting conditions	5.00	1.55	36	Satisfied
11	Overall appearance (aesthetics)	4.97	1.53	39	Satisfied
12	Overall indoor air quality	4.95	1.83	39	Satisfied
13	Amount of daylighting	4.87	1.70	39	Satisfied
14	Overall furnishings	4.77	1.61	39	Satisfied
15	Function of furnishings	4.77	1.71	39	Satisfied
16	Adjustability of task lighting	4.74	2.01	39	Satisfied
17	Overall view conditions	4.67	1.71	39	Satisfied
18	Adjustability of daylighting	4.59	1.58	39	Satisfied
19	Overall thermal conditions	4.56	1.73	39	Satisfied
20	Adjustability of furnishings	4.45	1.81	38	Neither S or D
21	Temperature (hot or cold)	4.38	1.84	39	Neither S or D
22	Overall acoustic quality	4.15	1.84	39	Neither S or D
23	Ability to limit undesired sounds	4.00	1.97	39	Neither S or D
24	Overall privacy (sound/visual privacy)	3.85	1.89	39	Neither S or D
25	Adjustability of thermal conditions	3.03	2.03	39	Dissatisfied

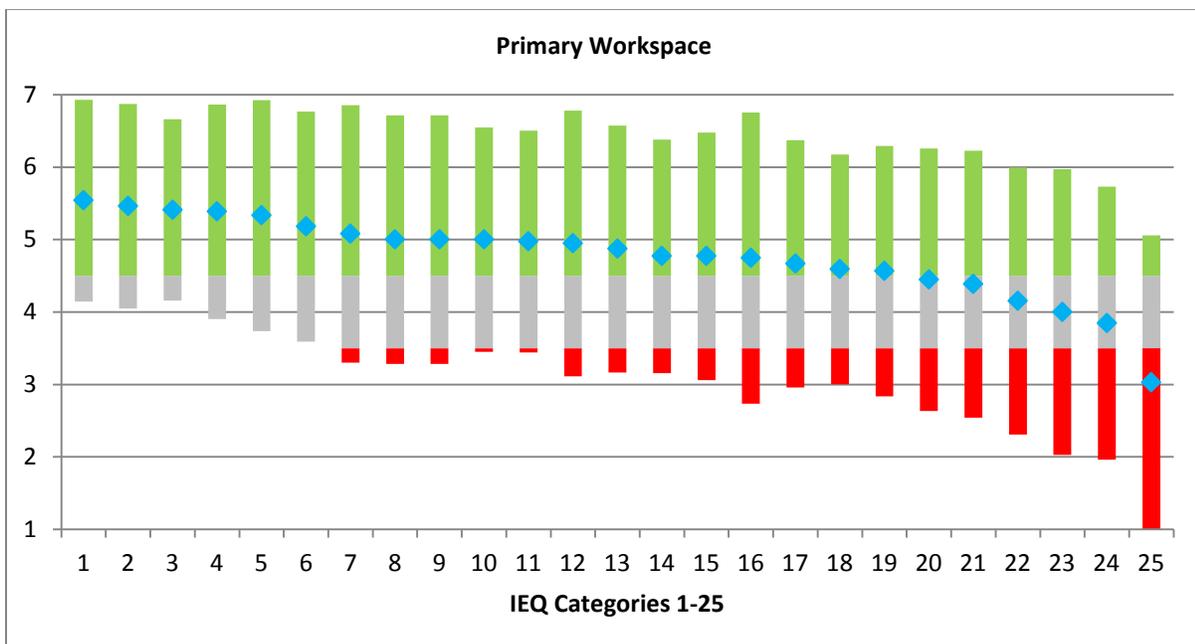


Figure 4. Primary workspace - satisfaction with IEQ categories (IEQ 1-25 are listed in Table 3 above)

Results indicate that employees were satisfied with 19 of the IEQ criteria in their primary workspaces, i.e., means at or above 4.50. They were neither dissatisfied nor satisfied with six IEQ criteria, and dissatisfied with only one criterion, the adjustability of thermal conditions. The bottom seven criteria are ripe for change to improve employees' satisfaction with their primary workspaces and will be addressed in Section 6.2 Recommendations. Further explanation of these scores also can be found in Appendix A. Open-Ended Responses.

4.4 IEQ Satisfaction Scorecard

The IEQ Satisfaction Score is determined by calculating a weighted mean of all category variables (Overall). At this time, all variables are weighted equally in this calculation as little evidence exists that provides rationale for weighting some variables heavier than others. The weighted 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 CMRR is **4.84**.



Figure 5. Primary Workspace - IEQ Satisfaction Score

Overall, the employees showed a positive, but low level of satisfaction with IEQ as indicated by the weighted mean score of **4.84**. As shown in Table 3, satisfaction with the [lack of] **vibration and movement** in the workplace, their **technology**, and the **humidity** levels were the criteria with the highest satisfaction and pulled the IEQ Satisfaction Score in a positive direction. However, neutral satisfaction with two category level criteria, **acoustic quality** and **privacy** as well as the somewhat low **thermal conditions** mean pulled the IEQ Score down. These issues can be addressed by building management to increase employees' satisfaction. Please note that the IEQ Satisfaction Score only uses the category level criteria (those labeled 'Overall'; see section 2.1, paragraph 3 for explanation). There were neutral and dissatisfied mean scores with other criteria that must be addressed as well. These will be noted in Section 6.2 Recommendations.

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 CMRR (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 CMRR facility

CMRR facility (site, building, and interior)	Mean (1-7)	SD	N	Interpretation
Overall physical activity (walking, stair use, etc.)	4.97	.84	39	Enhances

Results indicated that employees felt that CMRR moderately **enhanced (M = 4.97)** their physical activities (walking, stair use, etc.). Further, of the 39 respondents to this set of questions, 72% said they were **satisfied** with the facility’s influence on their overall physical activity; 26% said they were **neither dissatisfied nor satisfied**; and 3% were **dissatisfied**. (Note: does not equal 100% due to rounding.)

5.2 Commuting Practices

CMRR is located on the northeastern side of the East Bank of the University of Minnesota. The east bank campus is located north of 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 CMRR facility.

Table 5 provides results on employees’ primary mode of transportation; Table 6 summarizes commuting distances between home and the CMRR 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 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. Commuting Practices – CMRR Primary mode of transportation

CMRR - Daily commute						
Primary mode of transportation	Drive alone (or with children < 16)	Public transit	Motorcycle / moped	Bicycle	Combo drive/bike	Walk
Primary mode of transportation	61%	18%	11%	5%	3%	3%

Related to primary modes of transportation, 71% of employees drive alone (or with children under 16), 18% use public transit, 11% use a motorcycle or moped, 5% use a bicycle, 3% walk, and 3% use a combination of commuting options (e.g., driving and biking).

Table 6. Commuting Practices – CMRR Commuting distance traveled

Commuting distance - One-way to CMRR					
Miles Traveled	0-5 miles	6-15 miles	16-30 miles	31-45 miles	61-75 miles
Home-to-CMRR (One-way)	32%	37%	24%	5%	3%

Results indicated that 32% of employees commuted 0-5 miles one-way between home and the CMRR, followed by 37% who commute 6-15 miles, 24% commute between 16-30 miles, 5% commute between 31-45 miles, and 3% commute between 61-75 miles. All of these are one-way miles.

Table 7. Commuting practices – CMRR location and alternative commuting behaviors

CMRR - Ability to commute in alternative ways				
F (SBI) Location	Mean	SD	N	Interpretation
Alternative commuting options	4.50	1.56	38	Enhances

Results indicated that the location of the CMRR **enhanced** (M = 4.5) employees ability to commute to work in alternative ways, e.g., walk, bicycle, public transit, van or carpool, etc. Further, of the 38 respondents to this set of questions, 58% said the location **enhanced** their commuting options, 18% were **neither hindered nor enhanced** by the location of CMRR, and 24% indicated that the location **hindered** their ability to commute in alternative ways.

6.0 Conclusions

6.1 Summary

A post-occupancy evaluation was conducted of employees of CMRR at approximately two years after it was first occupied. Nearly 46% of the employees responded to the survey.

The survey included questions related to employees’ overall satisfaction with the facility (site, building, and interior) and influence of the facility on their overall work performance and health. Employees were **satisfied** with the facility (M = 5.62); they found the facility **enhances** their overall work performance (M = 5.08) and **enhances** their overall health (M = 4.79). In addition, slightly lower 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 = 4.90) with their primary workspaces and that their overall work performance was **enhanced** (M = 4.64) by their primary workspaces. However, their overall health was **enhanced** (M = 4.53) by their primary workspace. As the range of scores was from 1-7, scores that showed satisfaction are in a low to mid-level range, 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’ responses showed they were **satisfied** with the majority of the IEQ categories. The mean satisfaction scores ranged from 4.56 (Overall thermal conditions) to 5.54 (Overall vibration and movement). Again, this shows a positive but moderate level of **satisfaction**. Employees responded **neither dissatisfied nor satisfied** with Adjustability of furnishings (4.45), Temperature (4.38), Overall acoustic quality (4.15), Ability to limit undesired sounds (4.00), and Overall privacy (3.85). Lastly employees were **dissatisfied** with the Adjustability of thermal conditions with a mean of 3.03.

From the employees’ responses, an IEQ Score was developed and shows respondents’ satisfaction with the IEQ of all category level criteria. For CMRR, the IEQ Satisfaction Score was 4.84. This score reflects the moderate satisfaction level with the other categories. Finally, employees reported that CMRR **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:

Thermal Conditions

- Determine special thermal comfort requirements or problems that may be encountered in the building due to work activities or sitting or design considerations. Focus groups can be useful in identifying problem locations.
- Determine if any employees' task areas differ now from original intent to be sure air flow is the same as originally designed.
- Review conditions that affect thermal comfort using ASHRAE Standard 55-2004 or Human Factors Design Handbook.
- Measure performance variables on site.
- Log complaints related to thermal conditions.

Lighting Conditions

- Identify employees' performance criteria that are to be met to achieve goals.
- Determine if any task areas differ now from original intent to be sure light patterns, quantity, and quality are not impeded by changing walls, ceilings, or fixtures.
- 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.
- Identify problem locations that may be affected most by lack of control over daylighting, which can cause glare and eyestrain.

Acoustic Conditions

- Identify acoustic criteria for overall requirements.
- Determine if any task areas differ now from original intent including collaborative work spaces now being located adjacent to focus work areas (individual workstations).
- Develop any additional special 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. Investigate and choose appropriate acoustics modeling software for the project.
- Measure acoustic performance onsite with full systems running.
- Identify employees' privacy concerns via focus groups or log complaints.
- Consider employees' tasks within shared spaces to determine if change can be made for increased acoustic control.

Privacy Conditions

- Identify employees' privacy concerns via focus groups or log complaints to determine if visual or audio privacy is most affected.
- 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.
- Compare acoustic privacy problem areas with acoustic measurements to pinpoint specific problem areas.

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 the categories that had 'dissatisfied' or 'neither dissatisfied nor satisfied' scores. The above recommendations can help address change in these criteria. The criterion employees were dissatisfied with, i.e., adjustability of thermal conditions, can be addressed by the above recommendations. However, as the mean satisfaction scores hovered just above 'neutral,' it is reasonable to begin addressing some of 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 employee expense is second only to the cost of the actual facility in most business operations. It is a good investment to improve employees' satisfaction, 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 moderate 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 on the overall facility and their primary workspaces. Important information can be gleaned from the open-ended responses. CMRR employees raised specific concerns about the following themes: appearance (aesthetics), building services amenities, furnishings, indoor air quality (IAQ), lighting, space organization/layout/function, thermal conditions, and vibration and movement/acoustics (noise). There were positive comments as well, which included an overall satisfaction with the building and the building services amenities, specifically the unisex bathrooms. Though these qualitative responses overall appear as the employees are dissatisfied; it does not mean they represent the overall sentiment from employees. For example thermal conditions, appearance, IAQ, vibrations/movement, and function reflected positive employees' satisfaction in their primary workspaces making the case that the open-ended responses reflect a small part of the sample. Following are qualitative responses to the criteria. Generally, the comments are shown as written.

Overall Facility (site, building, and Interior)

- All office spaces should have a window.
- Temperature control remains an issue.
- Heating and cooling variations are my most major concern.
- Forced to sit for long hours to do job. Need standing desk options.
- I stated that this site enhances my health because my office is on another floor from my work area. As a result, I take the stairs many times each day.
- Lack of sufficient heating, necessitating the use of space heaters to not catch colds.
- A few major doors lack windows, resulting in many collisions. The inability to use the courtyard as an area to enjoy the outdoors is a waste of space.
- Yes, having unisex showers onsite enables me to bike commute regularly.
- When we use anesthetic gases, we really should have a snorkel or some other engineering control to avoid exposure. A small tube is used as a WAG and setup near the mouse during studies. However, I am not convinced this small tube is adequate for anesthetic released when opening the knockout box and transferring animals to the probe for imaging.
- Waste anesthetic gas is a problem; there needs to be an upgrade. Spot Wags are not strong enough suction and cannot be put over subject area easily. Also, the rooms where anesthetic gas are used need hoods. The front desk is not designed to be used to work at. There isn't enough space on the desk to place the keyboard and also work.

Primary Workspace

- Lighting and HVAC controls are consolidated for energy management, which is a good thing, but this has an overall negative impact on working conditions.
- Can often hear conferences next door.
- Walls are "thin" for closed offices.
- Blinds for interior glass should have been included.
- Very noisy ventilation system.
- Non-adjustable or arrange-able workstation. Constantly noisy hallway.
- Can't control temperature...usually is too cold.
- No task lighting.
- Can't hear PA system announcements in office.
- Trash disposal and cleaning is not sufficient, sometimes not at all. Can't lock door. Needed to have several adjustments of temperature, but now it's good.

Appendix B. Glossary

Descriptive statistics

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

Frequency

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

Likert-type scale

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

Mean

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

N

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

Reliability

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

Standard deviation

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

Validity

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

Weighted Mean

Similar to an arithmetic mean or 'average' of a set of numbers, where instead of each criteria value contributing equally to the final mean/average, some criteria values contribute more than others. In this study, because there is not sufficient evidence to assign more weight to specific criteria, the weighted mean process is used but all criteria are weighted equally.