



**Indoor Environmental Quality + Workplace Environment  
Rochester Community and Technical College:  
Workforce Center Colocation (RCTC-WCC)**

**May 2016, 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 MnSCU Rochester Community and Technical College: Workforce Center Colocation (RCTC-WCC) facility and occupants' satisfaction with their work environments located in the facility. The RCTC-WCC 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 building was funded. It was completed for occupancy in August 2014. 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 March 2016.

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 (hinders) to 7 (enhances).

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

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

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

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 RCTC-WCC facility is located within the Heinz Center with its own unique address at 2070 College View Road East, Rochester, MN. The building (see Figure 1) is a one-story 25,539 square foot building. It contains an 18,900 square foot Workforce Center office space that includes private offices, enclosed shared offices, workstations, and open desk areas for employees. There are also employee support areas, storage areas, and toilet rooms within the Workforce office space. Only the overall facility and primary workspaces were included in this study. The building serves as the home to the Workforce Center, which is leased out by RCTC to the Department of Employment and Economic Development (DEED) and then DEED subleases part of the space to Workforce Development, Inc.



Figure 1. RCTC-WCC (Photo courtesy of RCTC-WCC)

### 3.2 Description of Respondents

This survey was administered to 56 employees with workspace in the facility during March 2016. The response rate to the questionnaire was approximately 48%. Of those responding, 27% were male and 73% were female. The mean age of respondents was 48 years, with a range from 31-65 years of age.

The RCTC-WCC was completed and ready for operation in August, 2014. Since that time, 35% of the respondents reported that they worked at the RCTC-WCC for more than 2 years, 54% have worked at the facility for 1-2 years, and 12% of the respondents have spent less than one year at this site.

Relating to hours worked during a typical week at RCTC-WCC, 54% of the employees reported they spend 40+ hours a week in the facility; 38% spend 30-40 hours a week at RCTC-WCC; 4% spend 20-29 hours or less; and 4% spend less than 20 hours a week at RCTC-WCC.

Relating to the time employees spend per week in their primary workspace, 65% of the employees reported they spend more than 75% of their weekly time in their primary workspace; 27% spend 51-75% of their time in their primary workspace; 4% spend 25-50% of their time in their primary workspace; and 4% 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.

RCTC-WCC is a workplace with private offices and shared enclosed offices; workstations (cubicles) with high partitions, low partitions, and those with both low and high partitions; and desks in open office areas serving as primary workspaces. Some of the private offices are also used as hoteling space for people who work remotely to conduct interviews. Employees indicated that 54% of their primary workspaces were located within 15 feet of an exterior window and 38% of the employees were not within 15 feet of an exterior window; 8% did not know the distance.

#### **4.0 Findings and Discussion**

##### **4.1 RCTC-WCC Facility (Site, Building, and Interior): Overall Satisfaction, Work Performance, and Health**

Employees responded to questions concerning the RCTC-WCC 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. RCTC-WCC facility - overall satisfaction, work performance, and health

<b>Overall</b>	<b>Mean</b>	<b>SD</b>	<b>N</b>	<b>Interpretation</b>
Satisfaction	5.15	1.89	27	Satisfied
Work Performance	5.08	1.90	27	Enhanced
Health	5.11	1.61	27	Enhanced

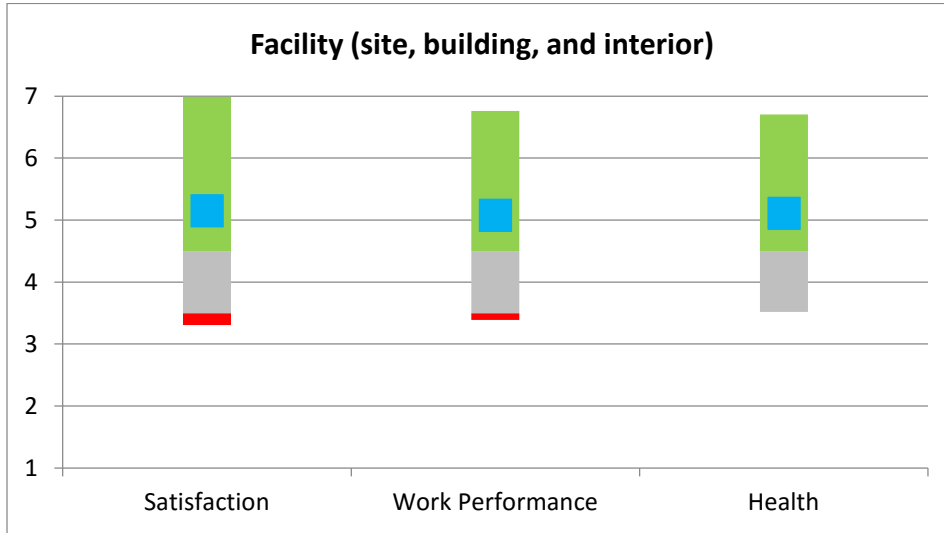


Figure 2. RCTC-WCC facility - overall satisfaction, work performance, and health

Results indicate that employees were **satisfied (M = 5.15)** with the RCTC-WCC physical environment of the 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 = 5.11)** 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. RCTC-WCC primary workspace – overall satisfaction, work performance, and health

Overall	Mean	SD	N	Interpretation
Satisfaction	4.78	1.89	27	Satisfied
Work Performance	4.70	1.90	27	Enhanced
Health	5.00	1.61	27	Enhanced

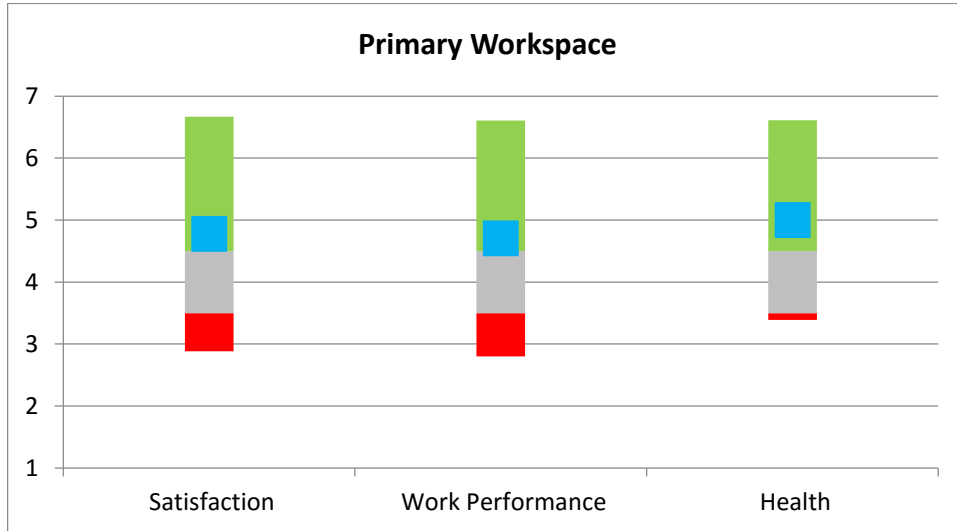


Figure 3. RCTC-WCC primary workspace - overall satisfaction, work performance, and health

Results indicate that employees were **satisfied (M = 4.78)** with their primary workspace, their overall work performance was **enhanced (M = 4.70)** by their primary workspace, and their overall health was **enhanced (M = 5.00)** 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. RCTC-WCC 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	Amount of electric light	5.19	1.66	27	Satisfied
2	Amount of daylighting	5.11	1.71	27	Satisfied
<b>3</b>	<b>Overall technology</b>	<b>5.11</b>	<b>1.42</b>	<b>27</b>	<b>Satisfied</b>
<b>4</b>	<b>Overall daylighting conditions</b>	<b>5.08</b>	<b>1.73</b>	<b>26</b>	<b>Satisfied</b>
<b>5</b>	<b>Overall indoor air quality</b>	<b>5.04</b>	<b>1.77</b>	<b>27</b>	<b>Satisfied</b>
<b>6</b>	<b>Overall electric lighting conditions</b>	<b>5.04</b>	<b>1.75</b>	<b>27</b>	<b>Satisfied</b>
7	Air velocity (drafty or stagnant)	4.93	1.76	27	Satisfied
<b>8</b>	<b>Overall cleaning and maintenance</b>	<b>4.89</b>	<b>1.64</b>	<b>27</b>	<b>Satisfied</b>
9	Humidity (dry or moist)	4.74	1.97	27	Satisfied
10	Adjustability of daylighting	4.70	1.86	27	Satisfied
<b>11</b>	<b>Overall vibration and movement</b>	<b>4.70</b>	<b>1.72</b>	<b>27</b>	<b>Satisfied</b>
12	Adjustability of task lighting	4.63	1.89	27	Satisfied
13	Access to electric outlets	4.56	1.73	27	Satisfied
<b>14</b>	<b>Overall thermal conditions</b>	<b>4.48</b>	<b>1.62</b>	<b>27</b>	<b>Neither S or D</b>
15	Ability to hear desired sounds	4.48	2.10	27	Neither S or D
16	Adjustability of task lighting	4.48	2.08	25	Neither S or D
17	Temperature (hot or cold)	4.41	1.75	27	Neither S or D
<b>18</b>	<b>Overall appearance (aesthetics)</b>	<b>4.37</b>	<b>1.68</b>	<b>27</b>	<b>Neither S or D</b>
19	Function of furnishings	4.15	1.71	27	Neither S or D
<b>20</b>	<b>Overall furnishings</b>	<b>3.93</b>	<b>1.82</b>	<b>27</b>	<b>Neither S or D</b>
21	Adjustability of furnishings	3.89	1.85	27	Neither S or D
<b>22</b>	<b>Overall acoustic quality</b>	<b>3.78</b>	<b>2.11</b>	<b>27</b>	<b>Neither S or D</b>
<b>23</b>	<b>Overall privacy (sound and visual privacy)</b>	<b>3.78</b>	<b>2.10</b>	<b>27</b>	<b>Neither S or D</b>
<b>24</b>	<b>Overall view conditions</b>	<b>3.70</b>	<b>2.02</b>	<b>27</b>	<b>Neither S or D</b>
25	Ability to limit undesired sounds	3.67	2.07	27	Neither S or D
26	Adjustability of thermal conditions	3.59	2.10	27	Neither S or D



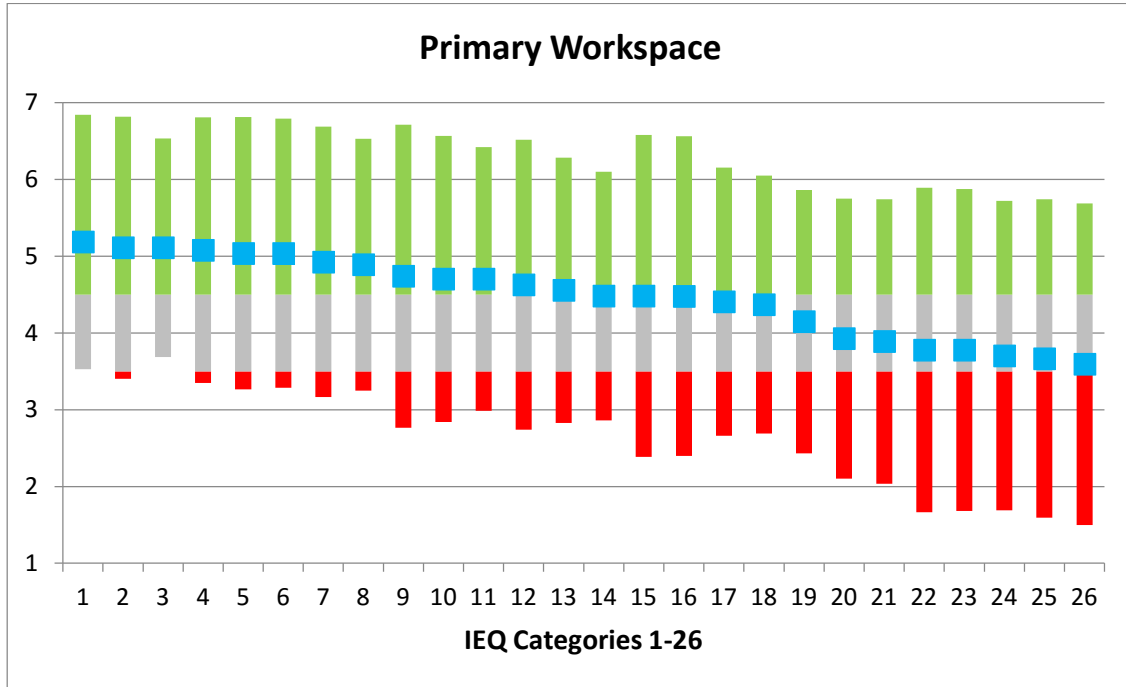


Figure 4. RCTC-WCC primary workspace - satisfaction with IEQ criteria (IEQ 1-26 refer to Table 3)

Results indicate that employees were **satisfied** with 13 of the IEQ criteria in their primary workspaces, i.e., means at or above 4.50. Employees were **neither satisfied nor dissatisfied** with 13 of the IEQ criteria, ranging from a mean of 3.59 (adjustability of thermal conditions) to 4.48 (Overall thermal conditions). None of the IEQ criteria were identified by employees in the **dissatisfied** range. Half of the IEQ criteria were rated by employees in the 'neutral' satisfaction range and should be considered for change. 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 RCTC-WCC is **4.49**, which falls at the high end of the neither satisfied nor dissatisfied range. The large number of categories with scores near or below the mean contribute to this low IEQ Score.

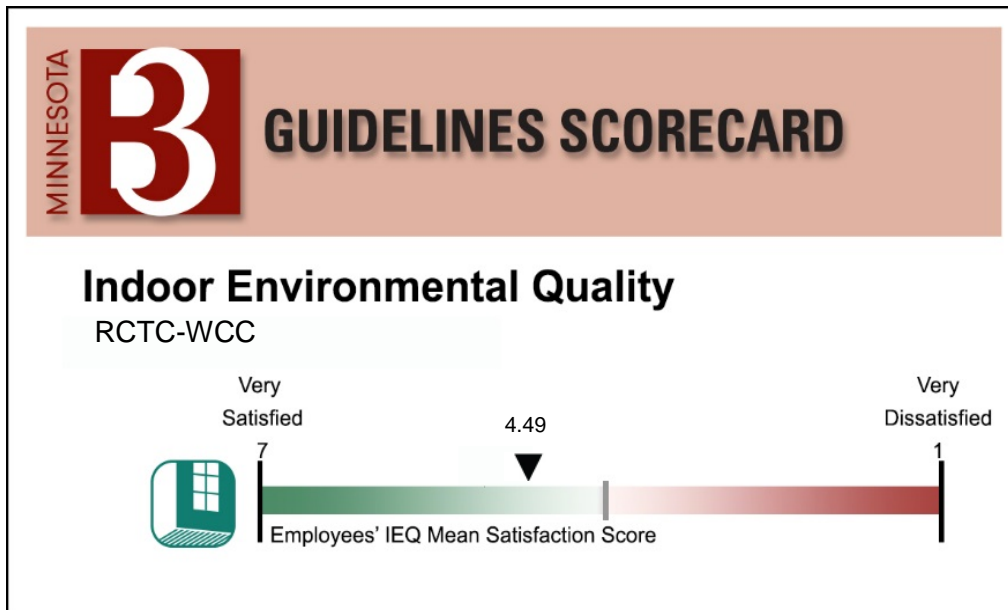


Figure 5. RCTC-WCC primary workspace - IEQ Satisfaction Score

As shown in Table 3, satisfaction with Overall technology, Overall daylighting conditions, Overall indoor air quality, and Overall electric lighting conditions were the criteria with the highest satisfaction means (5.04 or higher) and pulled the IEQ Satisfaction Score in a positive direction. However, six mean scores below 4.5 out of 12 category-level criteria pulled the IEQ Score down. 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 RCTC-WCC (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 RCTC-WCC facility

RCTC-WCC facility (site, building, and interior)	Mean	SD	N	Interpretation
Overall physical activity (walking, stair use, etc.)	5.33	1.24	27	Enhanced

Results indicate that employees felt that RCTC-WCC **enhanced (M = 5.33)** their physical activities (walking, stair use, etc.).

#### 5.2 Commuting Practices

RCTC-WCC is located on the southeast side of Rochester near Hwy. 14 East and 30<sup>th</sup> Avenue. The building has parking available for employees, and there is a city bus stop on College View Road East, near the northeast corner of the Heintz Center.

Table 5 provides results on employees' primary mode of transportation; Table 6 summarizes commuting distances between home and the RCTC-WCC 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 – RCTC-WCC Primary mode of transportation

Primary Mode of Transportation (N=27)	Drive Alone (or w/children <16)	Van or Carpool	Motorcycle or Moped
Commuting to RCTC-WCC	93%	4%	4%

Related to primary modes of transportation, 93% of employees drive alone (or with children under 16), 4% carpool or vanpool with others, and 4% drive a motorcycle or moped to the facility. (Note that percentages have been rounded to the nearest percentage point, so the total does not add up to 100%.)

Table 6. Commuting Practices – RCTC-WCC Commuting distance traveled

Miles Traveled (N=27)	0-5 miles	6-15 miles	16-30 miles	31-45 miles	46-60 miles
Home-to- RCTC-WCC (One-way)	26%	22%	30%	11%	11%

Results indicate that 26% of employees commuted 0-5 miles one-way between home and the RCTC-WCC, followed by 22% who commute 6-15 miles, 30% commute between 16-30 miles, 11% commute 31-45 miles to the RCTC-WCC facility, and 11% commute 46+ miles to the facility. All of these are one-way miles.

Table 7. Commuting practices – RCTC-WCC location and alternative commuting behaviors

Alternative Commuting	Mean	SD	N
Ability to commute in alternative ways	3.35	1.60	26

Results indicate that location of the RCTC-WCC **hinders** (M = 3.35) 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 RCTC-WCC at approximately 19 months after it was first occupied. This RCTC-WCC facility is used to provide diverse education and training opportunities and experiences for the Rochester area workforce. This survey reports the responses from employees and their satisfaction with the physical environment of the facility and their primary workspace. Results indicate that 92% of employees spend more than 30 hours per week in the RCTC-WCC facility, and 92% of employees spend more than 50% of their time at RCTC-WCC 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 = 5.15**); they found the facility **enhanced** their work performance (**M = 5.08**) and **enhanced** their health (**M = 5.11**). In addition, similar results were reported when employees were asked these same questions about their primary workspaces (private office, shared office, cubicles, etc.). They reported **satisfaction** (**M = 4.78**) with their primary workspaces, that their work performance was **enhanced** (**M = 4.70**), and their health was **enhanced** (**M = 5.00**) by their primary workspace. As the range of scores was from 1-7, scores showed a moderate level of satisfaction and enhancement.

Most of the survey questions related to employees' satisfaction with the IEQ criteria in their primary workspaces (private office, cubicles, etc.). Employees' responses showed they were **satisfied** with 13 of the 26 IEQ criteria. The mean satisfaction scores ranged from **4.56** (access to electric outlets) to **5.19** (amount of electric light). Again, this shows a moderately positive level of **satisfaction**. Employees responded **neither dissatisfied nor satisfied** to 13 IEQ criteria, with mean scores that ranged from 3.59 (adjustability of thermal conditions) to 4.48 (Overall thermal conditions), and three of the criteria (Overall thermal conditions, ability to hear desired sounds, and adjustability of task lighting) were near the satisfied range (4.50). None of the employees responded **dissatisfied** to any IEQ criteria in their primary workspaces.

From employees' responses, an IEQ Score was developed and shows respondents' satisfaction with the IEQ of all category level criteria. For RCTC-WCC, the IEQ Satisfaction Score was **4.49**. This score reflects the influence of the moderately low satisfaction level with the other categories. Finally, employees reported that RCTC-WCC **enhances** (**5.33**) 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' scores. However, the rest of the criteria could 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 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.

## **6.2 Recommendations**

Half of the 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 ASHRAE Standard 55-2004 or *Human Factors Design Handbook* (see B3 Guidelines).

## **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. RCTC-WCC employees raised specific concerns about the following themes: acoustic conditions, cleaning and maintenance, furnishings, space/layout, and thermal conditions. Though these qualitative responses overall appear as if the employees are dissatisfied; it does not mean they represent the overall sentiment from employees. However, the comments do give insight into specific issues that should be addressed by building management. Generally, the comments are summarized below.

### **Overall Positive**

- It's wonderful!
- Overall it is a very wonderful space. Thank you!
- It's wonderful! Professional, clean, bright, great for our customers and staff.
- We have a new building no complaints! 100% improvement from our last building!

### **Overall Negative**

- For people with diagnosed attention disorders, this environment increases negative consequences of disability and makes it harder to utilize treatment methods and interventions to stay on task and focused during the work day. Addition of CTEC building with noise, vibration, mud, dust, etc., makes for a very poor environment.
- Also, the carpet was either installed incorrectly or when staff arranged the desks they did not lift them. Carpet in my office has been ripped off the floor under the desk supports.
- Signage was put up poorly. It is not centered in the window frame. Taking a couple moments and a measuring tape could have fixed this and created a symmetrical look that clients don't ask about. Yes, I have been asked by customers why it isn't centered.

### **Acoustic Conditions**

- Extremely loud environment. Restrooms can be heard all day long, including the noise created with using a toilet. Beeping of doors being unlocked with badge is continuous and loud. Should be reduced to avoid interference and distraction of workers/clients.
- The cubes suck--you may as well have us all sitting around a table--there is ALWAYS noise from the neighboring cubes, down the halls, breakroom.
- You can hear every sound and conversation being had from one end of the hall to the other end of the hall at all times.
- Way too loud and no way to block all of the noise.
- Privacy concerns.

### **Cleaning and Maintenance**

- It would be nice if vacuuming happened more often and garbage cans were emptied more often.
- I'd like to see the trash emptied on a daily basis with other cleaning done as currently scheduled.

### **Furnishings**

- The desks are too large for the room forcing counselors to apologize to people with disabilities and people of larger height/weight when they are unable to fit in the space designed for them as a customer. It is rather demeaning when a larger person has to be reminded of their size when they attempt to fit in an office. Especially since the Reception area was specifically outfitted with larger heavy duty chairs to accommodate the growing percentage of our population that is overweight, thus needing a larger chair.
- Please take a moment to visit the smaller private offices and actually sit in the customer chair to see how difficult it is for clients to maneuver.

### **Space / Layout**

- All in all the building is great. The problem is that when it came to actual offices where direct one-on-one services are provided to clients, the attention to detail was lacking.

### **Thermal**

- Humidity control during summer months substandard. Temperature control poor.
- The temperature swings are terrible. It's often either terribly hot or terribly cold.



## 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).