

# PROGRAMMING DOCUMENT

BEEBE HALL MAKERSPACE

📍 Ithaca, NY

DEA 4590: PROBLEM-SEEKING  
THROUGH PROGRAMMING

Professor Lorraine E. Maxwell  
Julia Jaffe

TEAM 2

Angie Ko  
Arden Van Hollebeke  
Lucy Wang  
Julia Zhang

# TABLE OF CONTENTS

---

1

- INTRODUCTION | 2  
Mission Statement | 2  
Executive Summary | 2  
Programming Approaches | 3  
Site & Context | 4

2

- FINDINGS | 6  
Data Collection | 6  
Surveys | 6  
Interviews | 10  
Focus Group | 13  
Observations | 14  
Summary of Main Issues | 18

3

- RECOMMENDATIONS | 21  
Goals, PR Statements, & Concept Diagrams | 21  
Line-by-Line Program | 32  
Adjacency Diagram | 36  
Detailed Program | 37

4

- APPENDICES | 73  
Appendix A - References | 73  
Appendix B - Survey Questions | 75  
Appendix C - Survey Analysis (Cont.) | 79  
Appendix D - Interview Questions | 80  
Appendix E - Individual Duties | 83

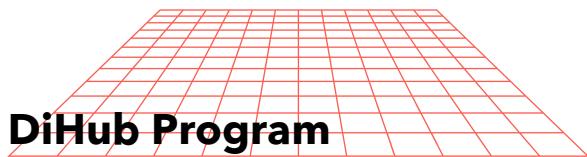
# INTRODUCTION

---

## MISSION STATEMENT

To provide a program for a makerspace at Beebe Hall that serves as a vibrant design hub where Cornell community members of diverse disciplines and abilities can come together to learn, innovate, and create.

## EXECUTIVE SUMMARY



The purpose of this program is to support the development of a new makerspace, Cornell Design Innovation Hub (DiHub), at Beebe Hall. The space will primarily serve as a collaboration hub for cross-disciplinary innovation. As part of our process, we aim to identify strengths and limitations of existing spaces on campus and use these insights to inform design recommendations for DiHub.

In developing our program, we employed three different programming approaches: User Profile Approach, Social/Psychological Functions Approach, and User Participation Approach. Through surveys, semi-structured interviews, focus groups, and observations, we gathered qualitative data on existing makerspaces and their users as well as identified opportunities for the new makerspace.

Through surveys of students, faculty, and custodial staff, we found the most common problem with existing makerspaces to be the lack of space, including types of workspaces and storage space. Our interviews and focus group interview provided additional insights into users' needs, with an emphasis on environmental characteristics and safety, among other factors. Our field observations revealed important considerations for fostering an environment conducive to collaboration, such as spatial zoning and assets.

Key categories of our recommendations include spatial zoning, storage, branding, signage, environmental characteristics, accessibility, safety, and electrical components. Ultimately, these recommendations serve to foster a collaborative atmosphere for creativity, innovation, and interdisciplinary engagement for the entire Cornell community.

# PROGRAMMING APPROACHES

## USER PROFILE APPROACH

The **User Profile Approach** allows programmers to divide potential users into groups, or distinct personas, based on environmental needs. In the context of the new makerspace, we defined different usage patterns among these user groups, as students come from varying disciplines. Likewise, faculty and custodial staff use the space for different purposes than students. This approach helps ensure that the program meets the needs of a wide range of users. For this approach, we employed surveys and interviews to gather qualitative data about potential users.

## SOCIAL/PSYCHOLOGICAL FUNCTIONS APPROACH

The **Social/Psychological Functions Approach** focuses on the impact of an environment on individuals' social/psychological functions. This approach involves identifying spatial characteristics that support or suppress these processes. For the purpose of this program, we will observe student interactions with existing makerspaces to identify how collaboration is supported or suppressed by the environment. This information will inform design requirements, thus ensuring that DiHub supports positive collaboration among students. We conducted observations for this approach.

## USER PARTICIPATION APPROACH

The **User Participation Approach** involves users at every stage of the design process. Since the primary intended users of the new makerspace are students, their active involvement allows programmers to gain a comprehensive understanding of students' needs and preferences with respect to the constraints of the project. For our program, we will engage focus groups as well as carry out follow-up dialogue to generate ideas and guide design decisions.

# SITE & CONTEXT

## BACKGROUND

Beebe Hall is an underused space tucked behind Mann Library on Cornell University's main campus in Ithaca, NY. While its location is relatively convenient to campus, many students remain unaware of the building's existence due to a lack of signage and poor visibility from high-traffic routes and focal points, among other things. The two-story building is currently used as a large office unit for university faculty and graduate researchers—albeit an underpopulated one. The space spans 14,744 gross square feet, with approximately 11,000 net square feet dedicated to office space. Both the first and second floors boast expansive, open areas, which are currently occupied by office cubicles. The second floor features a lofted ceiling with skylights, opening into a paved outdoor space furnished with tables and chairs.

## USERS

**Students** All Cornell students will have continuous (24-hour) access to the makerspace. Students will have the option to undergo training to access advanced machinery requiring designated skills to operate.

**Makerspace Staff** The makerspace staff range from employees and volunteers to student workers. Student workers will provide assistance with machinery as well as lead machinery training sessions during their work hours. Employees will manage the café, materials store, and closed-access zones.

**Faculty** Faculty members will have continuous access to the makerspace, primarily for research and instruction purposes. They may lead specialized workshops or mentor students on advanced projects in the space.

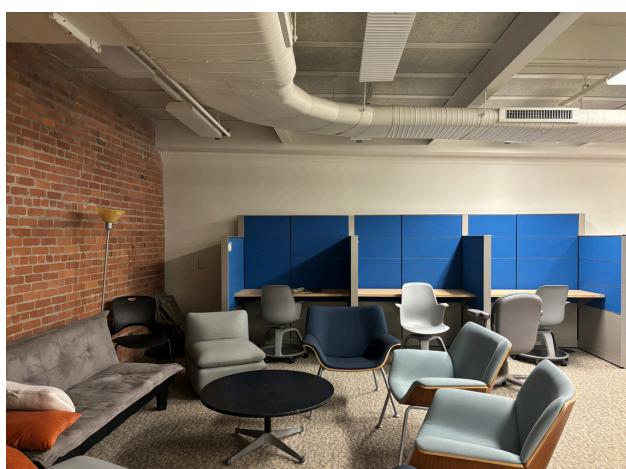
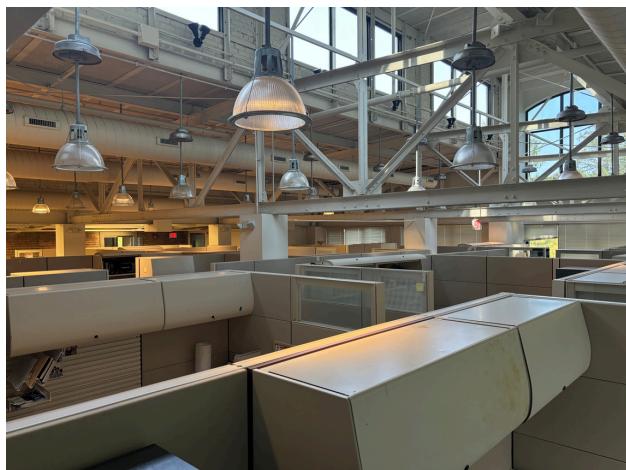
**Custodial Staff** Custodial staff are responsible for maintaining the cleanliness and upkeep of the makerspace. They will clean the space every day to ensure a safe environment for all users.

## STAKEHOLDERS

This project is funded by a 10 million dollar donation to the Cornell Human Ecology, and is led by Project Director Kristine Mahoney and Co-Director Eddy Man Kim.

## SITE & LOCATION

Beebe Hall was constructed in 1910 by New York State as the heating plant for the network of state facilities at Cornell, and had undergone renovations to be changed to an academic building. It is located at 110 Arboretum Road, approximately 1500 ft from Mann Library—a five-minute walk on a trail behind the library. It is also accessible by car, with twenty-three parking spots to accommodate employees. The nearest bus stop is at Bradfield Hall on Tower Road, a six minute walk from the building. Nestled in the woods, Beebe Hall is also located near the Cornell Botanic Gardens.



Arden Van Hollebeke, 2024

# FINDINGS

---

## DATA COLLECTION

### SURVEYS

The User Profile Approach involves developing archetypal profiles that represent distinct types of users based on shared characteristics, behaviors, and needs. For this approach, we conducted surveys and interviews to gain a comprehensive understanding of the various types of users who may use the space. Then, we created user profiles by analyzing common answers in survey responses (i.e., tool usage, makerspaces frequented, etc.). Additionally, we employed convenience sampling to gather qualitative data from various users. That is, we gathered data from an easily accessible group of participants with whom we had strong connections and could reliably depend on to fill out the survey. This method likely influenced the demographic composition of our survey respondents, most of whom came from a design background. Hence, it is important to note that our sample is not wholly representative of the target population.

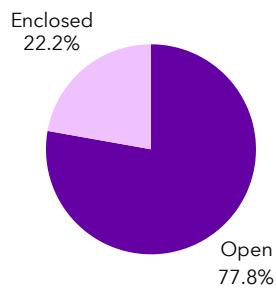
We constructed surveys for three predefined categories: students, faculty, and custodial staff. We sent our survey to approximately 100 students, faculty, and custodial staff and received a total of 43 responses (18, 10, and 15, respectively). The results are as follows:

## Key Survey Takeaways

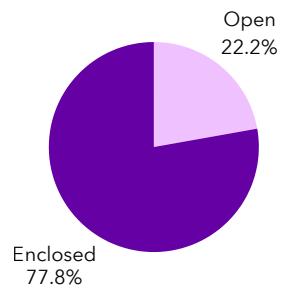
| User Type       | Description   | Activity  | Space Needs  |
|-----------------|---|---|--|
| Students        | Undergraduate and graduate students from diverse disciplines who use a makerspace weekly, primarily in the afternoons | Primarily used for prototyping, individual projects & homework, and team projects                     | Ample storage space; a mix of enclosed and open workspaces; specialized group workstations; whiteboards/ chalkboards; open layout; ample outlets; comfortable seating; diverse tools; natural lighting |
| Student Workers | Students who serve other students, typically at night   | Primarily used for providing instruction on tool usage and offering support on projects               | Ample space; ample machinery   |
| Faculty         | Professors who use makerspaces on a case-by-case basis, mostly in the afternoon                                       | Primarily used for prototyping, physical fabrication, research & development, and instruction         | Ample workspace and storage space; ample large-scale, advanced machinery; availability for instruction; trained staff  |
| Custodial Staff | Members of Building Care responsible for cleaning and maintaining makerspaces daily, usually in the early morning     | Primarily used for mopping and sweeping floors, dusting and disinfecting surfaces, and waste disposal | Durable hard floor installations in workable areas; multi colored high quality carpeting; ample storage space; large, accessible trash and recycling units; ample outlets                              |

## Students

When working on a **group project**, do you prefer to work in an open or enclosed space?

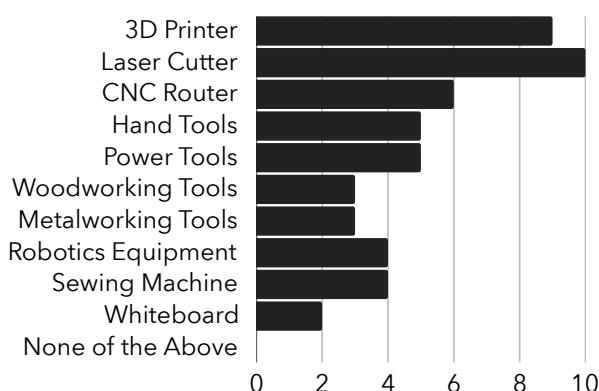


When working on an **individual project**, do you prefer to work in an open or enclosed space?

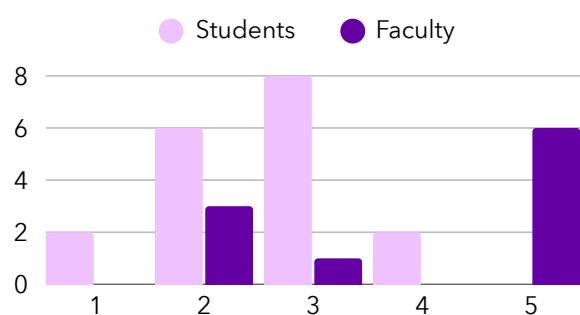


## Faculty

Which of the following **tools** would be most useful to you in the new makerspace?

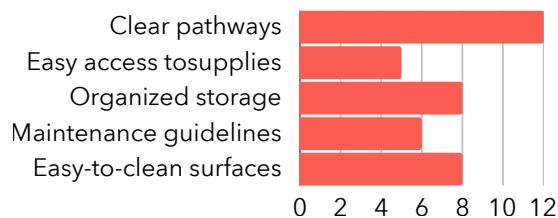


Considering Beebe Hall is about a 5 minute walk beyond Mann Library, **how likely are you to use** the new makerspace?

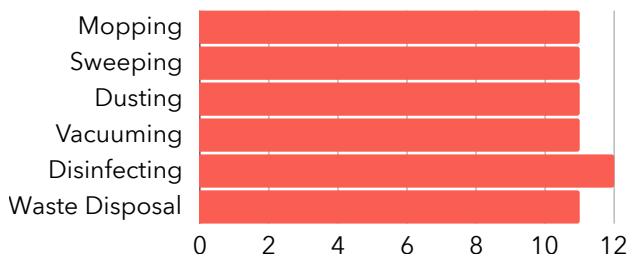


## Custodial Staff

What **features or considerations** regarding maintenance are most important to you?



How do you **clean** makerspaces?



\*See Appendix A for survey questions.

## Survey Analysis

### Cornell Students

- Approximately **89%** of students reported that they were neutral or unlikely to use the new makerspace at Beebe Hall.
- **100%** of students reported that the inclusion of either a café or snack area, an outdoor workspace, and a materials store would incentivize them to use the space.
  - Approximately **78%** of students reported that the inclusion of a café or snack area would incentivize them to use the space.
  - Approximately **39%** of students reported that the inclusion of an outdoor workspace would incentivize them to use the space.
  - Approximately **72%** of students reported that the inclusion of a materials store would incentivize them to use the space.
- Approximately **61%** of students prefer an enclosed space when working on an individual project.
- Approximately **78%** of students prefer an open space when working on a group project.

### Faculty

- Approximately **89%** of faculty reported using their makerspace in the afternoon.
- Approximately **80%** of faculty reported using their makerspace for prototyping and physical fabrication.
- **100%** of faculty reported that a laser cutter would be a useful tool to them in the new makerspace.
- **90%** of faculty reported that a 3D printer would be a useful tool to them in the new makerspace.
- Approximately **89%** of faculty reported that the inclusion of either a café or snack area, an outdoor workspace, and a materials store would incentivize them to use the space.
  - **100%** of faculty reported that the inclusion of a café or snack area would incentivize them to use the space.
  - Approximately **44%** of faculty reported that the inclusion of an outdoor workspace would incentivize them to use the space.
  - Approximately **67%** of faculty reported that the inclusion of a materials store would incentivize them to use the space.

- |                        |  |
|------------------------|--|
| <b>Custodial Staff</b> | <ul style="list-style-type: none"><li>• <b>80%</b> of custodial staff clean makerspaces by disinfecting/wiping surfaces.</li><li>• <b>73.3%</b> of custodial staff clean makerspaces by mopping, sweeping, dusting, and waste disposal.</li><li>• <b>80%</b> of custodial staff reported that clear pathways were important in their experience maintaining makerspaces.</li><li>• <b>53.3%</b> of custodial staff reported that organized storage and easy-to-clean were important in their experience maintaining makerspaces.</li></ul> |
| <b>Other Insights</b>  | <ul style="list-style-type: none"><li>• Overlapping needs expressed by the user types include ample space, machinery, and outlets.</li><li>• Faculty generally expressed greater enthusiasm for using the makerspace than students.</li></ul>  |

\*See Appendix B for complete survey analysis.

## INTERVIEWS

Based on interviews with project directors and relevant faculty, we identified key categories for features of the new makerspace at Beebe Hall.

### Project Directors

**Kristine Mahoney** | Project Director

**Eddy Kim** | Project Co-leader

Our interviews with the project leads revealed a vision for the makerspace that prioritizes Cornell Human Ecology's values for inclusion, interdisciplinarity, impact, and innovation. Interviewees emphasized that the essential features of the space extend beyond equipment—it is also about fostering a culture of collaboration, learning, empowerment, and community. Beebe Hall is a space where students can create freely while maintaining ownership of their intellectual property. Additionally, the space can include a combination of low-barrier and high-barrier spaces to support different activities. There is also an apparent need to address Beebe Hall's hidden geographic location through signage. Finally, to enhance accessibility, the makerspace can offer flexible hours that accommodate students' schedules as well as adjustable seating options.

## **Faculty**

**Niti Parikh** | Director of Cornell University's Learning Spaces and MakerLABs

**Jennifer Birkeland** | Assistant Professor of Landscape Architecture

**Van Hunter Adams** | Lecturer of Electrical and Computer Engineering

**Lauren Stulgis Swanson** | Director of Student Project Teams of College of Engineering

**Ken Rother** | Director of Ithaca Startup Works and eLab

**Charles Beach, Jr.** | Manager of Digital Design and Fabrication Studio of Cornell Human Ecology

**Rana Zadeh** | Associate Professor of Human Centered Design

Through interviews with faculty, we learned that we should ensure accessibility and inclusivity for users of all disciplines and skill levels. Open layouts with dedicated zones for collaborative activities and individual activities are accommodating to various user needs. For example, the spaces can be easily adapted for presentations, prototyping, or group projects. Moreover, to support diverse creative endeavors, the space should be flexible—with movable partitions, chairs, and tables—to accommodate various making activities and user preferences. The makerspace can also incorporate features such as adjustable lighting, acoustic partitions, and proper ventilation. Lastly, safety is a priority, especially in a makerspace where users deal with advanced machinery. The makerspace should ensure clear protocols for equipment usage as well as unobstructed exits.

## **Custodial Staff**

**Brenda S. Conklin** | Building Care Staff

**Cynthia Lockwood** | Building Care Staff

**Hazel M. Hall** | Building Care Staff

Upon interviewing Building Care Staff, we learned that the custodial staff typically clean in the early mornings when buildings are closed for most students. Since Beebe Hall is a low-use space, the custodial staff only clean there about twice per week. On the other hand, the custodial staff clean other spaces on campus every day. For spaces with continuous access, the custodial staff must adapt to work around students, some of whom may be present during the early mornings. For this reason, it can be difficult to clean these types of spaces.

## Key Interview Takeaways

| Features                      | Values  |
|-------------------------------|---|
| Branding                      | A vibrant, collaborative space that promotes student engagement and reflects Cornell Human Ecology's values for inclusion, interdisciplinarity, impact, and innovation              |
| Accessibility                 | Flexible hours and accessible, adjustable furniture to accommodate to individuals' varying needs and preferences  |
| Signage                       | Easily visible and legible signage both inside and outside the building that increase awareness of the building's location and direct users to specific zones within the makerspace |
| Spatial Zoning & Assets       | Spatial zoning to separate spaces with different functions and flexible furniture that support diverse group sizes and activities   |
| Environmental Characteristics | Features like circadian lighting, movable acoustic partitions, and effective ventilation enhance users' comfort   |
| Safety                        | Clear safety protocols, emergency equipment, unobstructed egress routes, and mandatory machine training are vital for user safety and accessibility                                 |

## FOCUS GROUP

### Key Focus Group Takeaways

For the User Participation Approach, we conducted a focus group interview with five members of the Cornell Maker Club. The participants included both undergraduate and graduate students. We identified three key categories of issues (inflexible lighting, inadequate space for photography, and insufficient power access) and associated values to be addressed in the new makerspace. The results are as follows:

| Issue  | Values   |
|--|--|
| <b>Inflexible Lighting</b><br>Makerspace features harsh, nonadjustable lighting, contributing to discomfort  | Flexible, adjustable lighting options to accommodate diverse user preferences and activities; more natural lighting and soft, diffused lights of the same brightness |
| <b>Inadequate Space for Photography</b><br>Students experience difficulty finding a clean background for project photography                           | A dedicated photo zone for portfolio and project photography, featuring adequate lighting and multiple background colors   |
| <b>Insufficient Power Access</b><br>Makerspace lacks sufficient power outlets in convenient locations for the large number of students using the space | Ample ceiling outlets and power strips for both machine equipment and personal electronics   |
| <b>Lack of Space</b><br>Limited space leads to overcrowding, clutter, and difficulty accommodating large projects                                      | Ample table surfaces, storage space, and open areas for laying out larger projects   |
| <b>High Noise Levels</b><br>Constant background noise from ventilation disrupts work   | Allocated closed-access spaces for noisy equipment that are separate from open-access workspaces   |

Weeks following the focus group interview, we probed all five participants with additional questions regarding the makerspace:

1. Would you use an outdoor area for making and collaboration?
2. Would you use an outdoor area for making and collaboration?
3. Do you ever use the makerspace for socialization? If yes, how so?

The answers we received are summarized as follows: users expressed interest in using an outdoor area during the warmer months, particularly for projects that require spray painting or other messy tools. Additionally, users would appreciate a social and relaxation area to provide work breaks. However, since they do not normally use the makerspace for socialization, they would prefer a clear separation between work areas and social areas to avoid interruptions during focused work.

## OBSERVATIONS

In conducting observations for the Social/Psychological Functions Approach, we observed dHIVE, a makerspace for Human Centered Design students in Cornell Human Ecology, and Mann Library. Mann Library consists of several spatial zones accommodating different group sizes and activities. From these observations, we drew several key takeaways related to features that support and suppress collaboration: reconfigurable layouts, movable partitions, adjustable furniture, individual focus zones, outdoor collaboration spaces, social areas, informal collaboration spaces, and snack areas.

Reconfigurable layouts with mobile tables and chairs offer flexibility for various modes of collaboration, providing users with more options to suit their needs. Movable partitions, such as whiteboards and pinup boards, allow for the creation of private spaces, blocking visual distractions. Furniture should be adjustable, accessible, and flexible in order to accommodate users of different heights or those with disabilities. Individual focus zones promote privacy and minimize social distractions; acoustic privacy is essential to enhance concentration. Outdoor collaboration spaces should be designed for maximum use, with regular maintenance, comfortable furniture, and ample power outlets.

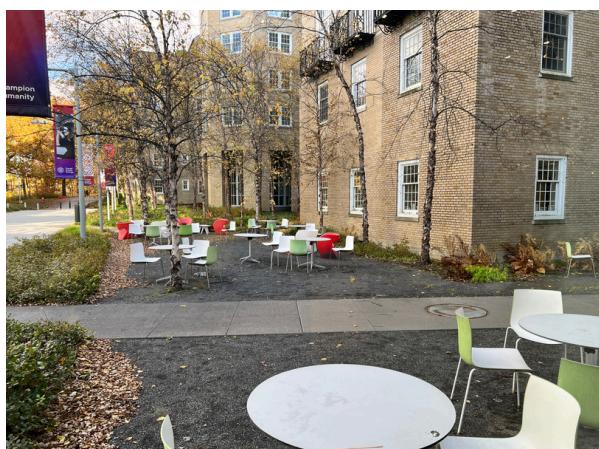
Social areas with comfortable lounge furniture promote relaxation and facilitate informal interactions, such as coffee chats, small talks, and casual conversations. Informal collaboration spaces with soft bean bags also encourage relaxation and sociality among friends and peers. Snack areas in study spaces support productivity and well-being by helping users maintain high energy levels.



Lucy Wang, 2024

### **Adjustable Furniture**

In this semi-closed collaboration zone, the furniture is inflexible, which may pose challenges for users of different heights and abilities. The table and chairs are fixed at a single height and lack stability. Additionally, the chairs offer poor ergonomics, with insufficient back support and an uncomfortable design.



Julia Zhang, 2024

### **Outdoor Collaboration**

Students underuse this outdoor collaboration space due to a lack of maintenance and power sources.



Julia Zhang, 2024

### **Reconfigurable Collaboration**

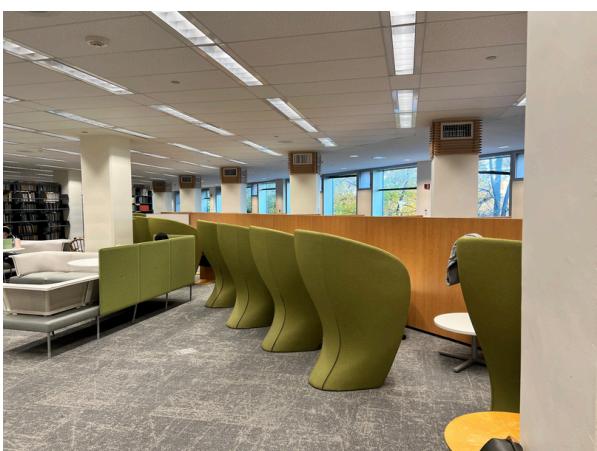
This space exhibits reconfigurable furniture, including mobile tables and chairs, which can be rearranged to support various modes of collaboration and other user needs.



Julia Zhang, 2024

### **Social Area**

A social area is an excellent space for relaxation and small talk with comfortable lounge seating.



Julia Zhang, 2024

### **Individual Focus Zone**

This space features individual lounges with comfortable, high back seating made of acoustic felt to ensure acoustic privacy. Individual focus lounges face the wall to enhance privacy and support focused work.



Julia Zhang, 2024

### Movable Partitions

This serves as an example of separations for adaptation of use. It appears that the student has used a movable partition to block visual distractions and create a personal, private space. Partitions can be used to create different zones based on the user's preference.



Julia Zhang, 2024

### Informal Collaboration

Comfortable bean bag chairs and acoustic lounge chairs are located in spaces between ceiling-based partitions. Working near to the ground creates a scene for informal collaboration for friends and peers. Given the seating is flexible, users can arrange it to fit their needs.



Julia Zhang, 2024

### Snack Area

Snack machines or cafés should be provided in studying spaces to support students' productivity and well-being. Convenient food options help maintain energy levels.

## SUMMARY OF MAIN ISSUES

|                                    |  |
|------------------------------------|--|
| <b>SPATIAL ZONING &amp; ASSETS</b> | While many makerspaces already exhibit an open layout, they lack spatial zoning to separate and differentiate different types of workspaces with different functions. Some makerspaces are too small to accommodate many different zones, which may lead to crowding and high noise levels. Furthermore, some spaces lack assets that support spontaneous communication and interaction networks, such as flexible furniture. Spatial zoning also allows for the allocation of ample space for equipment, addressing a space need of both faculty and student workers. |
| <b>STORAGE</b>                     | Makerspaces lack sufficient storage to accommodate large numbers of users. Students, student workers, faculty, and custodial staff alike emphasize the need for more space—both storage space and workspace. Students require storage space for their belongings and unfinished projects. Faculty and student workers need additional space to accommodate more machinery. Custodial staff value designated storage space for users to ensure projects are safely stored and not accidentally discarded.   |
| <b>BRANDING</b>                    | Since the makerspace will be closely associated with Cornell Human Ecology, it is important that the interior environment and exterior facade represent the college's values for inclusion, interdisciplinarity, impact, and innovation through signage, types of machinery, and other spatial assets.   |

**SIGNAGE** Beebe Hall lacks exterior wayfinding to help users identify the building. Hidden in the woods behind Mann Library and accessible by trail, Beebe Hall is especially difficult to locate for those unfamiliar with the building. Additional signage is needed to aid navigation to the building for students arriving on foot, by car, or by bus, both during the daytime and nighttime.

**ENVIRONMENTAL CHARACTERISTICS** Custodial staff prefer hard flooring over carpeting. In particular, hard flooring is optimal in workable areas, which are prone to spills and dust accumulation. Any carpeting should be multi-colored and high-quality to conceal stains and resist wear from foot-traffic. Moreover, the space should exhibit flexible lighting, acoustic partitions, and effective ventilation systems to enhance users' comfort.

**ACCESSIBILITY** Beebe Hall's location is isolated in relation to the rest of Cornell University's campus and is not located on a major commuting route for students travelling between classes, which physically separates it from potential users. Accessibility of the new makerspace may be limited by spatial layouts and furniture that impede wheelchair access or are not easily reconfigurable, respectively. Interviews revealed a need to accommodate individuals with diverse physical needs through flexible, adjustable furniture. Additionally, makerspace users—particularly students and faculty—expressed a desire for continuous access to Beebe Hall.

**SAFETY** Interviews revealed a need for clear safety protocols to ensure that all users are prepared to safely navigate the space. Emergency equipment, such as fire extinguishers and first aid kits, must be easily accessible at all times. Egress routes must remain unobstructed to allow for efficient evacuation of the space. Additionally, mandatory machinery training helps minimize risks and ensures that users are aware of potential hazards.

**ELECTRICAL COMPONENTS** Existing makerspaces on campus lack sufficient power outlets in convenient spaces, leading many users to avoid using the space altogether. Some makerspace users have also noted that the unshaded LED light strips cause excessive glare.

# RECOMMENDATIONS

---

## GOALS, PR STATEMENTS, & CONCEPT DIAGRAMS

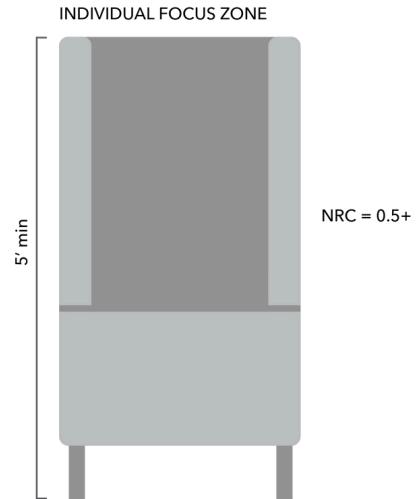
### SPATIAL ZONING & ASSETS

**Goal 1** | The makerspace will feature various types of workspaces to accommodate different user preferences and functions.

#### Performance Requirements (PR) Statements

**PR 1.1** The Individual Focus Zone should include high-backed seating with a Noise Reduction Coefficient (NRC) of 0.5+ and a height of over 5 feet to ensure acoustic and visual privacy.

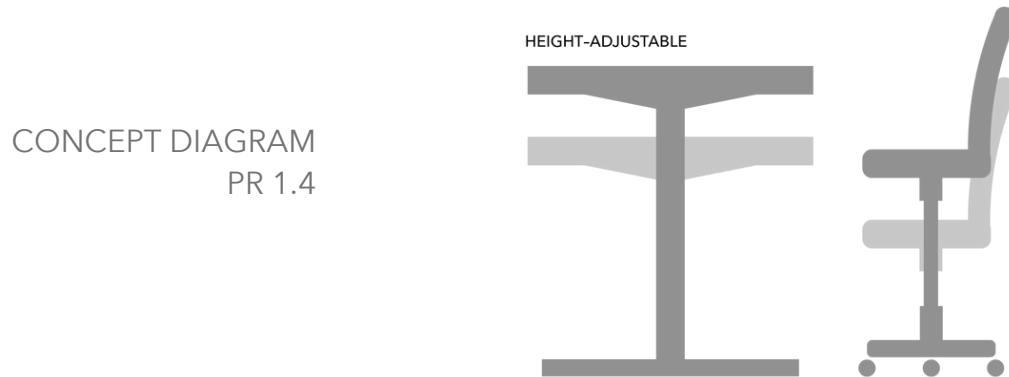
CONCEPT DIAGRAM  
PR 1.1



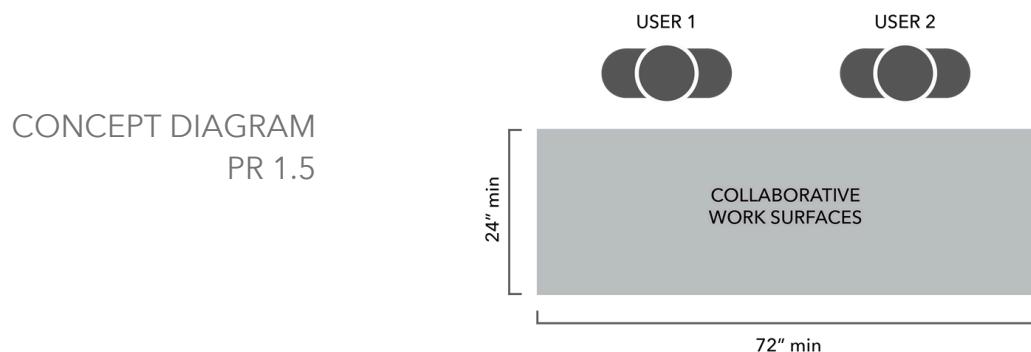
**PR 1.2** The Social Lounge should contain multiple clusters of upholstered seating oriented around a central point with no more than 5 feet between each seat to encourage social interactions.

**PR 1.3** The Collaborative Work Zone will feature flexible seating that accommodates small and large group collaborations as well as large group gatherings, such as lectures and events.

- PR 1.4** The tables and chairs should be height-adjustable to suit individual differences and body postures.



- PR 1.5** The Collaborative Work Zone should include work surfaces measuring at least 72" x 24" to support shared use, promote proximity between users, and accommodate large projects (Orel et al., 2019).



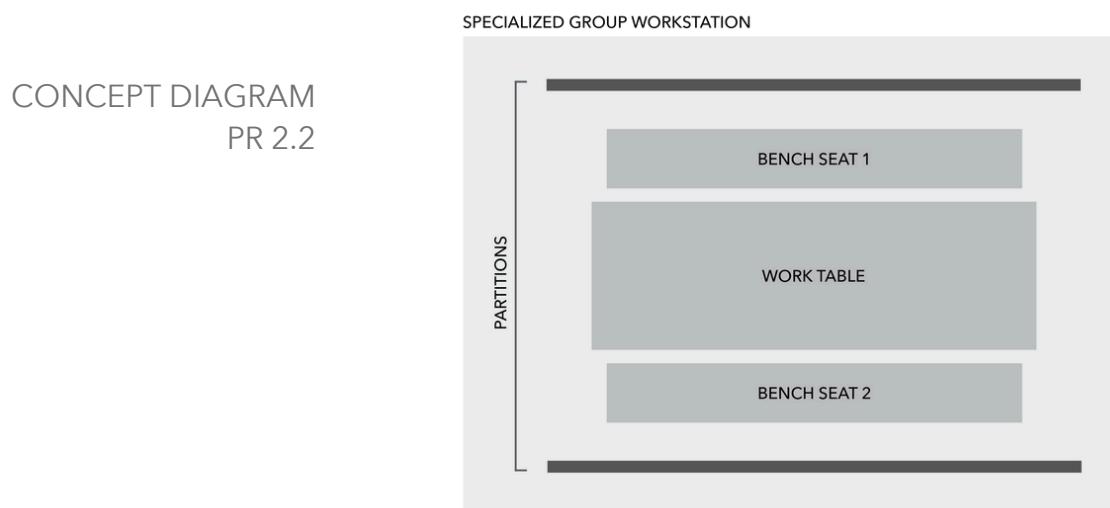
- PR 1.6** The Photo Zone should include adjustable lighting levels and multiple backdrop options to support professional-quality photography of projects.
- PR 1.7** The breakout rooms should be equipped with speakers and projection screens for hybrid meetings and presentations.

**Goal 2** | The majority of workspaces in the makerspace will exhibit elements conducive to collaboration.

### Performance Requirements (PR) Statements

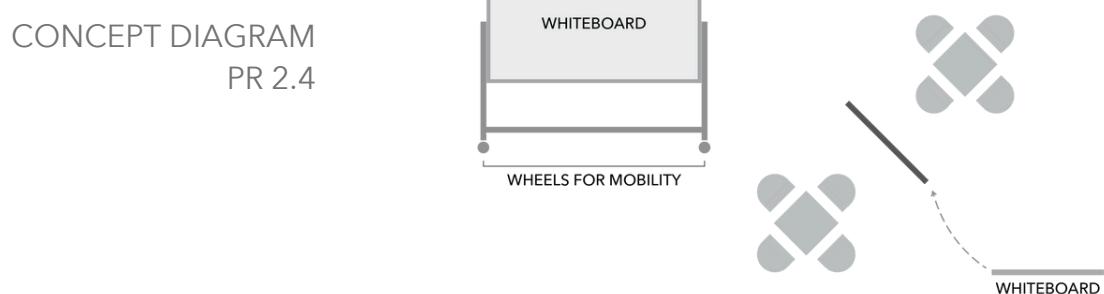
**PR 2.1** The makerspace should exhibit an open layout to promote spontaneous communication and interaction networks (Orel et al., 2019).

**PR 2.2** Each specialized group workstation should include a table with two bench seats on opposite sides and partitions behind the benches to facilitate focused group work.



**PR 2.3** Tables and chairs in the Reconfigurable Collaboration Zone should include wheels to enhance circulation and allow users to easily adapt the space to their needs.

**PR 2.4** The makerspace should incorporate mobile whiteboards to create an easily adaptable workspace and support users' privacy when needed.

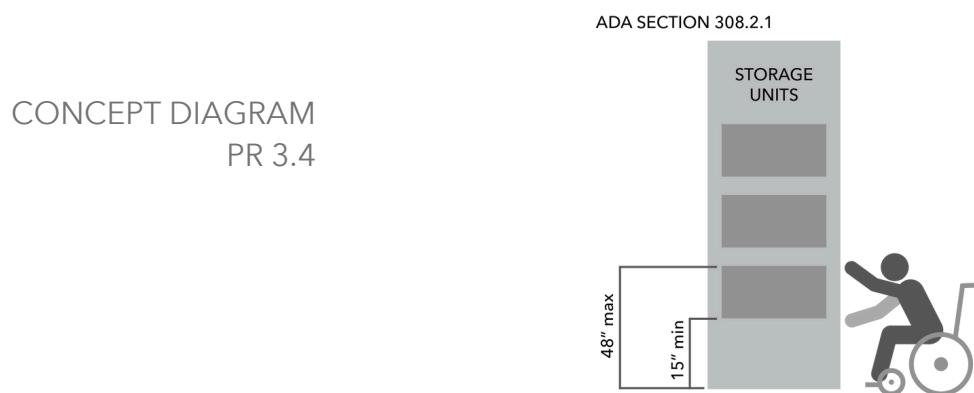


## STORAGE

**Goal 3** | The makerspace will include personal storage lockers, project shelving, and dedicated areas for equipment and other spatial assets to ensure the organization of the space.

### Performance Requirements (PR) Statements

- PR 3.1** The Collaborative Work Zone should feature 30 modular shelving and built-in shelving no larger than 48 inches high and 20 inches deep, to store and display student work (ADA Section 308.3.2).
- PR 3.2** The Closed-Access Work Zone should feature 30 storage shelves, with separate zones for tools and materials.
- PR 3.3** The Collaborative Work Zone should include a dedicated area for storing flexible seating to provide more options for seating arrangements.
- PR 3.4** At least one level of storage lockers or shelving should be positioned within the reach range of 15 to 48 inches above the ground in the Collaborative Work Zone, the Open-Access Zone, and the Closed-Access Zone (ADA, Section 308.2)



- PR 1.5** Each storage locker should be labeled with a unique number, ensuring smooth identification and navigation of student work.
- PR 1.6** There should be a communal storage area in the Tool Workstation for scraps and donated material in order to maximize the lifespan of a material and promote sustainability.
- PR 1.7** Each floor of the makerspace will include a designated storage area for custodial staff, enabling them to efficiently store and access cleaning supplies for maintaining a tidy and organized space.

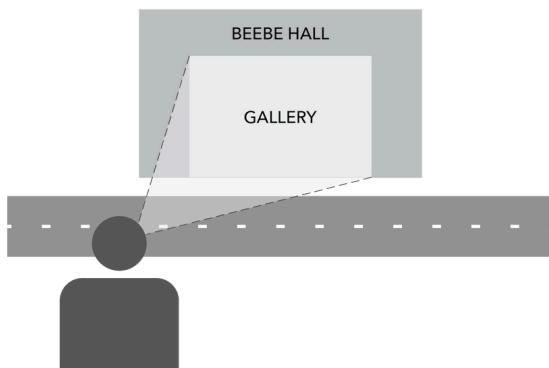
## BRANDING

**Goal 4** | The makerspace will represent Cornell Human Ecology's cornerstone principles of inclusion, interdisciplinarity, impact, and innovation to foster a sense of belonging.

### Performance Requirements (PR) Statements

- PR 4.1** The makerspace should provide a range of different facilities and equipment to account for the needs of all disciplines at Cornell to reflect Cornell Human Ecology's value for interdisciplinarity.
- PR 4.2** An installation display inspired by Cornell Human Ecology's PolyForm should be presented and visible at the first-floor entrance to embody the College's interdisciplinary, human-centric mission spanning science, technology and design.
- PR 4.3** Cornell Human Ecology's brand color palette should be consistently applied throughout Beebe Hall's interior and exterior, including in signages, to reinforce the College's brand and maintain a cohesive theme throughout.
- PR 4.4** The Gallery should be visible from the road to attract attention and draw in potential users of various disciplines.

CONCEPT DIAGRAM  
PR 4.4



- PR 4.5** Signposts should be placed along the pathways around the building showcasing images of student work in order to highlight the interdisciplinary projects that have been created within the space.

## SIGNAGE

**Goal 5** | The makerspace will feature large and legible signage for both interior and exterior navigation.

### Performance Requirements (PR) Statements

- PR 5.1** Beebe Hall's interior should include raised characters and braille mounted to walls at a height between 48 and 60 inches from the floor to the bottom of the lowest raised lettering, placed at major intersections and entry points to each zone (ADA, Section 703.4).
- PR 5.2** All signs should exhibit dark characters on a light, non-glare background with a sans serif font a minimum size of  $\frac{5}{8}$  inch to ensure readability from a distance (ADA, Section 703.5.1; ADA, Section 703.5.5).



- PR 5.3** The navigation on the flooring and signage should use consistent colors to enhance wayfinding and ensure clear, intuitive guidance throughout the space.

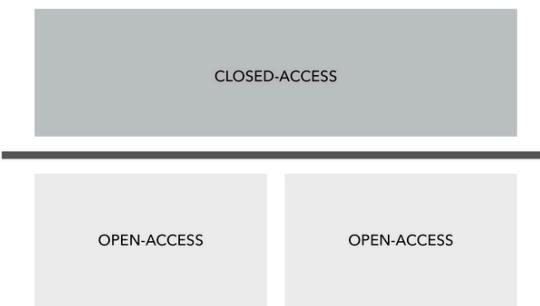
# ENVIRONMENTAL CHARACTERISTICS

**Goal 6** | The makerspace will incorporate flexible fixtures and amenities to support users' health and well-being.

## Performance Requirements (PR) Statements

- PR 6.1** The makerspace should include flexible lighting, allowing users to adjust brightness and color temperature based on their preferences and functions, supporting a comfortable and adaptive work environment.
- PR 6.2** The makerspace should integrate movable acoustic pinboards to reduce noise distractions and improve focus.
- PR 6.3** The Open-Access Zone should feature non-glare, circadian lighting that automatically adjusts to natural light levels in order to reduce eye strain.
- PR 6.4** The materials and finishes used in the renovation should conform to the US EPA Green Building Standards and should release low or no Volatile Organic Compounds (VOC) to optimize indoor air quality.
- PR 6.5** The Outdoor Work Area should have natural or artificial shading to provide coverage for the seating area
- PR 6.6** The Collaborative Work Zone should feature large windows with the placement of windows to maximize natural light in the space.
- PR 6.7** Closed-access zones should be physically separated from other zones to reduce noise levels and thus, minimize distractions in other zones.

CONCEPT DIAGRAM  
PR 6.7

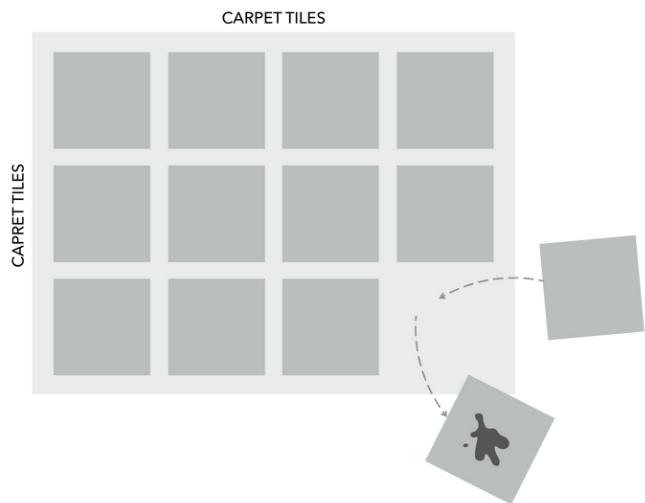


**Goal 7** | The makerspace will incorporate easy-to-clean materials to optimize maintenance and upkeep.

### Performance Requirements (PR) Statements

- PR 7.1** The makerspace should incorporate durable hard floor installations with a minimum wear rating of ASTM F510, ensuring slip resistance (ADA, Section 302.1).
- PR 7.2** The Individual Focus Zone should feature carpet tiles that could be easily replaced if stained.

CONCEPT DIAGRAM  
PR 7.2



**PR 7.3** The makerspace should feature multi-colored flooring with a stain-resistant finish and a Commercial Wear Rating of 4 or higher to maintain cleanliness and appearance (ADA, Section 302.2).

**PR 7.4** Trash and recycling units should be provided for every work zone.

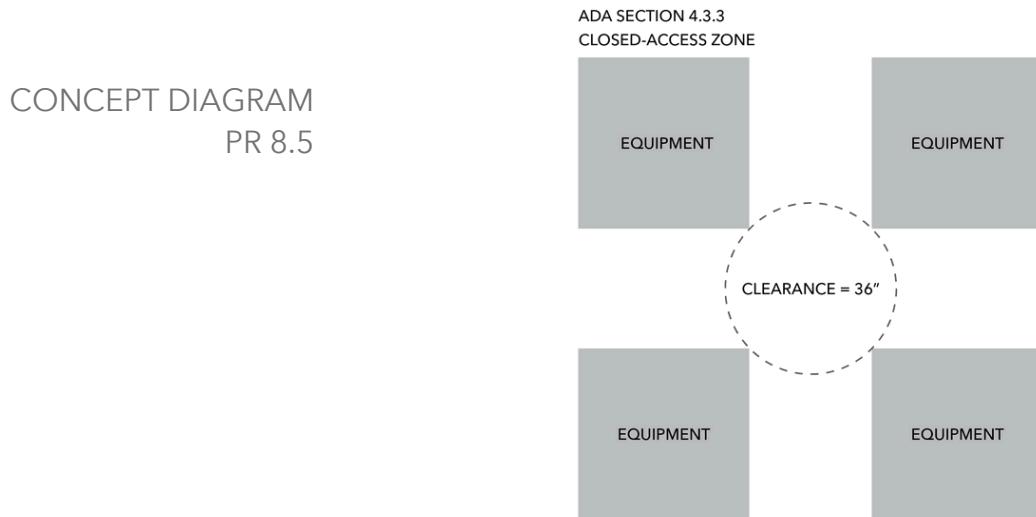
**PR 7.5** Cleaning supplies should be accessible to every work zone.

# ACCESSIBILITY

**Goal 8** | The building will ensure universal access for users of all abilities.

## Performance Requirements (PR) Statements

- PR 8.1** Beebe Hall should provide continuous access, with doors and entryways that are fully automated or accessible via a Cornell ID after hours, ensuring unrestricted access at all hours (ADA, Section 404.3).
- PR 8.2** The underside of the table should provide at least 27 inches of knee clearance, and a minimum of 30 inches by 48 inches of clear floor space for wheelchair access (ADA, Section 306.3.1).
- PR 8.3** The elevator should be visible at the entrance with a minimum clear floor space of 60 inches by 80 inches (ADA, Section 407.4.1).
- PR 8.4** A Class A freight elevator should be accessible from the parking and unloading areas, providing the ability to transport materials and large projects between floors efficiently.
- PR 8.5** The Closed-Access Zone should exhibit 36 inches of clearance between each piece of equipment for an accessible path and to avoid injuries from accidental collisions (ADA, Section 4.3.3).



- PR 8.6** All closed-access spaces should require keycard access to ensure users' safety.

## **SAFETY**

**Goal 9** | The makerspace will enable secure and efficient evacuation in the case of an emergency.

### **Performance Requirements (PR) Statements**

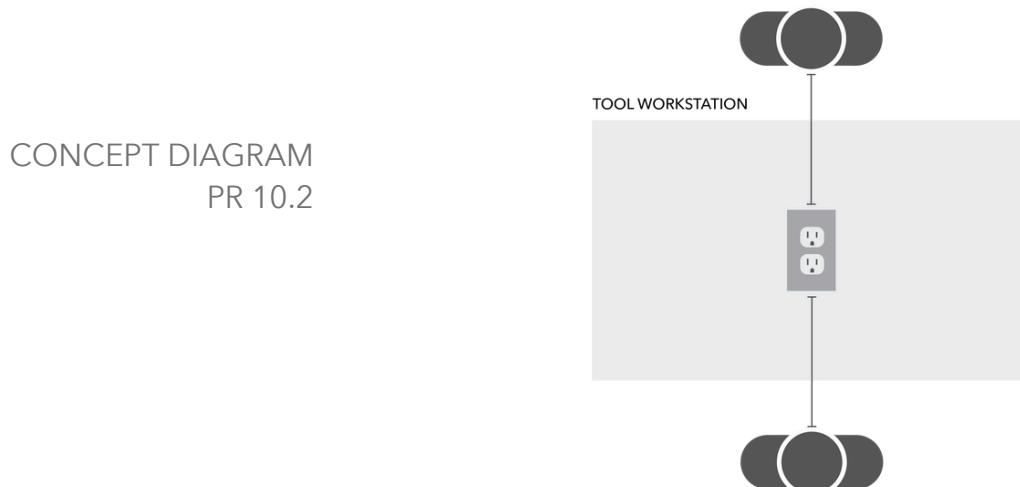
- PR 9.1** The makerspace should feature clear, visible exit signs with a minimum text height of 6 inches, ensuring all users can quickly identify evacuation routes in case of an emergency (ADA, Section 216.4).
- PR 9.2** The makerspace should have emergency alarms that include both audible and visual signals, such as flashing lights, to accommodate individuals with hearing impairments and ensure comprehensive alerting in case of an emergency (ADA, Section 702.1).

## ELECTRICAL

**Goal 10** | The space should provide ample electrical components to fulfill the power demands of the users.

### Performance Requirements (PR) Statements

- PR 10.1** Power outlets should be spaced at regular intervals along the walls, ensuring no point along the wall is more than 6 feet from an outlet apart from each other so the seating choice will not be limited by the availability for charging (National Electric Code, Section 210.52).
- PR 10.2** At the Tool Workstation, each user should have equal access to at least 1 embedded power outlet at the center of the table.



- PR 10.3** The Social Lounge should include warm lighting of 200 to 300 lux to contribute to a homey atmosphere.
- PR 10.4** All ceiling lighting fixtures should have diffuser panels to avoid direct glare to the eyes.

## LINE-BY-LINE PROGRAM

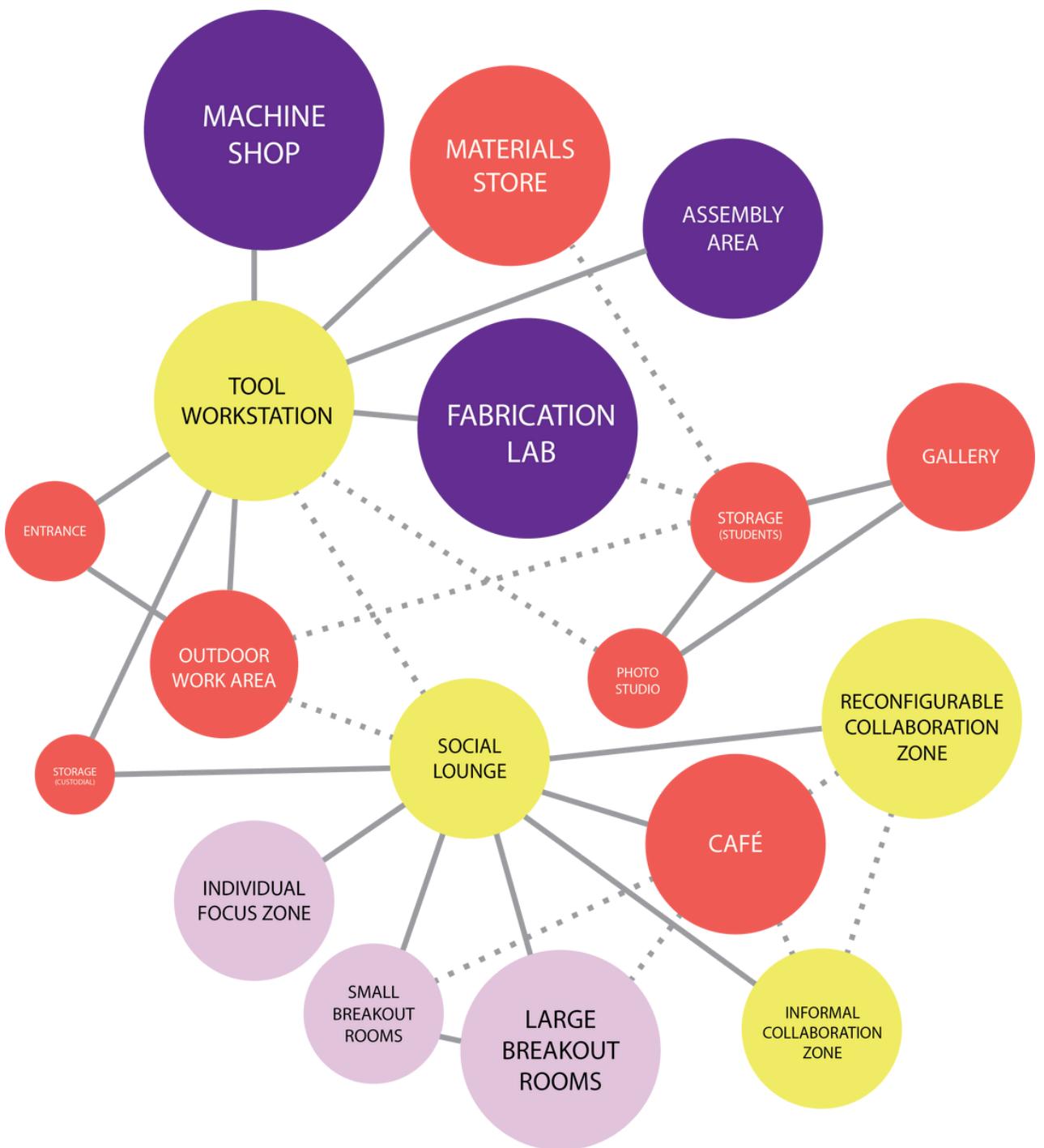
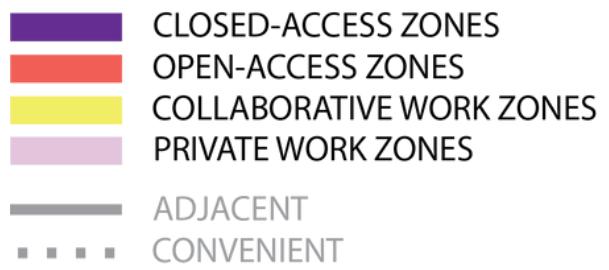
| <b>Space Name</b>   | <b>No.</b> | <b>Sq ft</b> | <b>Total Sq ft</b> | <b>Comments</b>  |
|---------------------|------------|--------------|--------------------|--|
| CLOSED-ACCESS ZONES |            |              |                    |  |
| Machine Shop        | 1          | 1,500        | 1,500              | Heavy duty machinery and tools; ventilation system; safety equipment; key card access  |
| Fabrication Lab     | 1          | 1,300        | 1,300              | Digital fabrication equipment; computer stations; materials scrap bin; key card access |
| Assembly Area       | 1          | 900          | 900                | Large table; power tools; woodworking & metalworking tools; outlets; key card access   |

| <b>Space Name</b>            | <b>No.</b> | <b>Sq ft</b> | <b>Total Sq ft</b> | <b>Comments</b>   |
|------------------------------|------------|--------------|--------------------|---|
| OPEN-ACCESS ZONES            |            |              |                    |   |
| Café                         | 1          | 900          | 900                | Bistro tables and chairs; high-top tables and stools; back of house; located on the first floor |
| Gallery                      | 1          | 600          | 600                | Ample wall space (pinboards); flexible seating; limited windows, if any                         |
| Storage<br>(Custodial Staff) | 2          | 100          | 200                | One room per floor  |
| Storage<br>(Students)        | 2          | 200          | 400                | Wall of lockers (first floor) and shelving (second floor)                                       |
| Materials Store              | 1          | 1,000        | 1,000              | Diverse material inventory; student workers; located on first floor                             |
| Photo Studio                 | 1          | 300          | 300                | Adequate lighting; multiple background colors   |
| Outdoor Work Area            | 1          | 600          | 600                | Weather-resistant tables and umbrellas  |

| <b>Space Name</b>                 | <b>No.</b> | <b>Sq ft</b> | <b>Total Sq ft</b> | <b>Comments</b>   |
|-----------------------------------|------------|--------------|--------------------|---|
| <b>COLLABORATIVE WORK ZONES</b>   |            |              |                    |   |
| Tool Workstation                  | 1          | 1,000        | 1,000              | Pegboards and organization bins for tools; stationary, height-adjustable workstations |
| Reconfigurable Collaboration Zone | 1          | 1,000        | 1,000              | Mobile furniture  |
| Social Lounge                     | 1          | 700          | 700                | Comfortable sofas and chairs; multi-colored high quality carpeting                    |
| Informal Collaboration Zone       | 1          | 700          | 700                | Bean bags; lounge chairs; whiteboards; multi-colored high quality carpeting           |
| Materials Store                   | 1          | 1,000        | 1,000              | Diverse material inventory; student workers; located on first floor                   |
| Photo Studio                      | 1          | 300          | 300                | Adequate lighting; multiple background colors   |
| Outdoor Work Area                 | 1          | 600          | 600                | Weather-resistant tables and umbrellas  |

| <b>Space Name</b>         | <b>No.</b> | <b>Sq ft</b> | <b>Total Sq ft</b> | <b>Comments</b>   |
|---------------------------|------------|--------------|--------------------|---|
| <b>PRIVATE WORK ZONES</b> |            |              |                    |   |
| Individual Focus Zone     | 1          | 700          | 700                | Ample wall space; individual lounge cubicles and tables; multi-colored high quality carpeting |
| Small Breakout Rooms      | 2          | 250          | 500                | Small table seating 2-5 people; screen projection   |
| Large Breakout Rooms      | 2          | 500          | 1,000              | Large table seating 6-10 people, screen projection; white boards                              |

## FUTURE ADJACENCY DIAGRAM



## DETAILED PROGRAM

|                         |   |
|-------------------------|---|
| ENTRANCE                |   |
| Users                   |   |
| Users Types             | Cornell students, faculty, custodial staff, employees   |
| Dimensions              | <p>Large enough to accommodate large, heavy-duty machines and furniture</p> <p>Minimum width requirement of 32 inches for clear passage</p> <p>High ceilings and wide doorways</p> <p>(Reference: Occupational Safety and Health Administration. (1972, May 15). Letter of interpretation on aisle width recommendations. U.S. Department of Labor)</p> |
| Activities              |   |
| To Support              | Easy access, ADA compliant, easy maintenance, safe egress   |
| To Suppress             | Overcrowding, blockage, accidents   |
| Environmental Qualities |   |
| Lighting                | <p>An average of 50 lux to balance safety and comfort in circulation areas</p> <p>(Reference: Illuminating Engineering Society. (2011). The Lighting Handbook: 10th Edition. New York, NY: Illuminating Engineering Society)</p>  |
| Signage                 | <p>Emergency exit signs and ADA guidance</p> <p>Clearly marked signs for makerspace</p>   |

|                 |   |
|-----------------|---|
| Access          |   |
| Visual Access   | Strong visual access, glass windows or doors for visual transparency                                  |
| Physical Access | Wide, ADA-compliant doors with automatic access or via Cornell ID after hours for unrestricted access |
| Equipment       |   |
| Equipment       | Security system to monitor entry and exit<br>Sanitizing stations to promote hygiene                   |

## CLOSED-ACCESS ZONES

|                         |   |
|-------------------------|---|
| Machine Shop            |   |
| Users                   |   |
| Users Types             | Cornell students, faculty, employees  |
| Capacity                | 10-25 users   |
| Activities              |   |
| To Support              | Safety, efficient workflow, storage, model-making   |
| To Suppress             | Crowding around machines, noise, dust and debris  |
| Environmental Qualities |   |
| Lighting                | <p>Average illuminance of 300-500 lux for general lighting to clearly see materials and workspace<br/>           (Reference: Illuminating Engineering Society. (2011). The Lighting Handbook: 10th Edition. New York, NY: Illuminating Engineering Society)</p> <p>Supplement task lighting near each machine to improve visibility for precision tasks and safety<br/>           (Reference: Illuminating Engineering Society. (2021). ANSI/IES RP-7-21: Recommended Practice: Lighting Industrial Facilities. New York, NY: Illuminating Engineering Society)</p> |
| Acoustics               | <p>Sound-absorbing walls and ceiling panels to reduce noise levels and barriers around extremely loud machinery are needed</p> <p>Provide noise-cancelling headphones for PPE for users</p>   |
| Ventilation             | <p>Robust ventilation and dust extraction system to handle fumes and dust from machining</p> <p>Exhaust fans near machines that emit fumes or smoke</p>   |
| Signage                 | <p>Safety signages are used to display safety procedures, emergency stop instructions, PPE requirements, and machine-specific instructions.</p>   |

| Access                               |  |
|--------------------------------------|--|
| Visual Access                        | Large windows or panels to have visual access from inside to outside for natural views and outside to inside for wayfinding  |
| Physical Access                      | Wide doorways and heavy-traffic flooring to accommodate the movement of heavy materials and equipment<br>Physically separated from other zones to reduce noise levels and minimize distractions in other zones.  |
| Furniture,<br>Fixtures,<br>Equipment |  |
| Furniture                            | <p><u>Workbench</u>: Height-adjustable workbenches for machining and material preparation</p> <p><u>Storage cabinets</u>: Storing PPE, tools, and small equipment</p> <p><u>Seating</u>: Ergonomic stools for short breaks</p> <p><u>Small work table</u>: Small work tables for convenient use</p> <p><u>Tool organizer</u>: Organizer of work bins and trays</p> <p><u>Tool rack and holder</u>: Smaller tools, wrenches, drill bits</p> |
| Equipment                            | <p><u>Heavy-duty machines</u>: CNC machines, lathe, drill presses, milling machines, grinders, bandsaw, welding machines, sheet metal machinery, cutting machines, sanders, hydraulic press</p> <p><u>Safety equipment</u>: Air compressors, fire extinguishers, first-aid kits, eyewash stations, PPEs</p> <p><u>Dust collection system</u></p>   |

|                         |  |
|-------------------------|--|
| Fabrication Lab         |  |
| Users                   |  |
| Users Types             | Cornell students, faculty, employees   |
| Capacity                | 15-20 users  |
| Activities              |  |
| To Support              | Safe equipment usage, efficient workflow, model making, material storage   |
| To Suppress             | Overcrowding, accidents, hazards   |
| Environmental Qualities |  |
| Lighting                | General illuminance of 300-500 lux for visibility for precision work<br>Focused task lighting near workbenches for tasks requiring detailed work<br>(Reference: Illuminating Engineering Society. (2011). The Lighting Handbook: 10th Edition. New York, NY: Illuminating Engineering Society) |
| Acoustics               | Sound absorbing materials in walls, and acoustic panels in ceiling to reduce noise impacts<br>Availability of sound-blocking headphones as PPE for machines with heavy noise   |
| Ventilation             | Ventilation system to handle dust, fumes, and airborne particles generated by manufacturing equipment<br>Direct exhaust systems near high-dust production machines like lasers and saws<br>Air compressor system for machines like laser cutters   |
| Signage                 | Safety signages with safety guidelines, machine operating instructions, emergency button instructions, and emergency procedures  |

|                                      |   |
|--------------------------------------|---|
| Access                               |   |
| Visual Access                        | Visual access could be provided to the fabrication lab  |
| Physical Access                      | Wide doorways and unobstructed pathways to facilitate the movement of materials and equipment   |
| Furniture,<br>Fixtures,<br>Equipment |   |
| Furniture                            | <p><u>Workbench</u>: Height-adjustable workbenches for machining and material preparation</p> <p><u>Storage cabinets</u>: Storing PPE, tools, materials</p> <p><u>Seating</u>: Ergonomic stools for short breaks</p> <p><u>Small work table</u>: Small work tables for convenient use</p> <p><u>Tool organizer</u>: Organizer of work bins and trays</p> <p><u>Tool rack and holder</u>: Smaller tools</p> <p><u>Material scrap bins</u>: recycle wasted material</p> |
| Equipment                            | <p><u>Machines and tools</u>: Laser cutters, 3D printers, CNC6 machines, saws and sanders (bandsaw, table saw, belt sanders), hand tools (drills, screwdrivers, clamps), and large and miniature sewing machines</p> <p><u>Computer stations</u>: Computers</p>   |

|                         |  |
|-------------------------|--|
| Assembly Area           |  |
| Users                   |  |
| Users Types             | Cornell students, faculty, employees   |
| Capacity                | 10-15 users  |
| Activities              |  |
| To Support              | Fabrication work, model-making, prototypes   |
| To Suppress             | Overcrowding, accidents, hazards   |
| Environmental Qualities |  |
| Lighting                | <p>General illuminance of 300-500 lux with lighting across work surfaces for assembly tasks</p> <p>Adjustable task lights for detailed assembly work</p> <p>(Reference: Illuminating Engineering Society. (2011). The Lighting Handbook: 10th Edition. New York, NY: Illuminating Engineering Society)</p> |
| Acoustics               | Acoustic panels are used to absorb noise from tools and model-making, as well as sound-absorbing materials for walls   |
| Ventilation             | <p><u>Air circulation</u>: Sufficient airflow to maintain a comfortable environment, especially if adhesives are used</p> <p><u>Fume extraction</u>: Localized ventilation to mitigate fumes from assembly processes</p>   |
| Signage                 | <p><u>Safety signage</u>: Assembly safety procedures, emergency protocols, safety guidelines, machine operating instructions, and emergency procedures</p>   |

| Access                               |  |
|--------------------------------------|--|
| Visual Access                        | Visual access can be provided to the assembly area   |
| Physical Access                      | Physical access to the workshop area and study lounge<br>Limited physical access to the storage area   |
| Furniture,<br>Fixtures,<br>Equipment |  |
| Furniture                            | <p><u>Workbenches</u>: Height-adjustable benches for ergonomic comfort during assembly</p> <p><u>Seating</u>: Stools or chairs for users needing seated assembly work</p> <p><u>Large tables</u>: Large table surface for hand fabrication projects</p> <p><u>Storage bins</u>: Bins or trays for organizing small parts</p> |
| Equipment                            | <p><u>Hand tools</u>: Screwdrivers, wrenches, pliers, assembly tools</p> <p><u>Power tools</u>: Drills, portable power tools</p> <p><u>Woodworking tools</u>: Saws, chisels, hammers, sanding</p> <p><u>Metalworking tools</u>: Wrenches, pliers</p> <p><u>Adhesive</u>: Glue guns and adhesives</p>                         |

## OPEN-ACCESS ZONES

|                         |   |
|-------------------------|---|
| Café                    |   |
| Users                   |   |
| Users Types             | Employees, students, faculty, visitors  |
| Capacity                | 10-20 users   |
| Activities              |   |
| To Support              | Casual breaks, social conversation, relaxation  |
| To Suppress             | Overcrowding, excessive noise   |
| Environmental Qualities |   |
| Lighting                | Average ambient illuminance of 150-200 lux at table levels<br>Adjustable task lighting at high-top tables for individual activities<br>Warm, diffused lighting for a warm atmosphere<br>(Reference: Illuminating Engineering Society. (2011). The Lighting Handbook: 10th Edition. New York, NY: Illuminating Engineering Society)                        |
| Acoustics               | Freestanding sound-absorbing furniture, sound absorbing partitions, acoustic ceiling panels to control noise  |
| Ventilation             | Controlled humidity levels for longevity of food<br>Proper air circulation for preservation of food<br>(References: U.S. Food and Drug Administration. (2017). Food Code: 2017. U.S. Department of Health and Human Services. <a href="https://www.fda.gov/food/fda-food-code/food-code-2017">https://www.fda.gov/food/fda-food-code/food-code-2017</a> ) |
| Signage                 | Instructions for waste disposal (compost, recycling, trash bins)<br>Menu boards or displays for ordering food   |

|                                      |   |
|--------------------------------------|---|
| Access                               |   |
| Visual Access                        | Open plan for visual connection with communal workspaces  |
| Physical Access                      | Tables and chairs designed to accommodate diverse body types and need   |
| Furniture,<br>Fixtures,<br>Equipment |   |
| Furniture                            | <p><u>Bistro tables</u>: Circular or square tables with seating for 1-4 people</p> <p><u>High-top tables and stools</u>: Tall tables with stools for casual use</p> <p><u>Furniture</u>: Lightweight, stackable, or wheeled</p> |
| Equipment                            | <p><u>Waste disposal units</u>: Recycling, trash, and compost bins</p> <p><u>Café assets</u>: Coffee machine, vending machine, mini-fridge, snack machines, water fountains</p>   |

|                         |   |
|-------------------------|---|
| Gallery                 |   |
| Users                   |   |
| Users Types             | Students, faculty, visitors   |
| Capacity                | 5-10 users  |
| Activities              |   |
| To Support              | Display student works, host exhibition, community engagement  |
| To Suppress             | Disorganization, noise distraction, overcrowding  |
| Environmental Qualities |   |
| Lighting                | <p>Adjustable and focused lighting to highlight exhibits (spotlights or track lighting)</p> <p>Ambient lighting of 100-200 lux for overall visibility</p> <p>(Reference: Illuminating Engineering Society. (2011). The Lighting Handbook: 10th Edition. New York, NY: Illuminating Engineering Society)</p>   |
| Acoustics               | Acoustic panels on walls and ceiling to dampen noise and echo   |
| Ventilation             | <p>Controlled humidity levels for longevity of displayed items</p> <p>Proper air circulation for preservation of displayed works</p> <p>(References: Canadian Conservation Institute. (n.d.). Environmental guidelines for museums – Temperature and relative humidity. Government of Canada. Retrieved from <a href="https://www.canada.ca/en/conservation-institute.html">https://www.canada.ca/en/conservation-institute.html</a>)</p> |
| Signage                 | <p>Informative exhibit descriptions, project details, and acknowledgements</p> <p>Directional signages guiding visitors</p> <p>Labels for interactive display</p>   |

|                                      |   |
|--------------------------------------|---|
| Access                               |   |
| Visual Access                        | Glass partitions or windows for visual transparency   |
| Physical Access                      | Barrier free access to exhibit pathways<br>Adjustable display stands to accommodate diverse user needs and exhibit needs<br>(References: U.S. Department of Justice. (2010). 2010 ADA standards for accessible design. Retrieved from <a href="https://www.ada.gov/2010ADAsstandards_index.htm">https://www.ada.gov/2010ADAsstandards_index.htm</a> ) |
| Furniture,<br>Fixtures,<br>Equipment |   |
| Furniture                            | <u>Display stands</u> : Modular stands or reconfigurable stands<br><u>Wall panel</u> : Moveable panels for mounting visual displays<br><u>Seating</u> : Minimal seating such as benches or stools<br><u>Partitions</u> : Movable partitions for organizing layout<br><u>Storage cabinets</u> : Lockable display cases, storage cabinets               |
| Equipment                            | <u>Digital display</u> : Projector or TV stands   |

|                         |  |
|-------------------------|--|
| Storage<br>(Students)   |  |
| Users                   |  |
| Users Types             | Students   |
| Capacity                | 30 lockers   |
| Activities              |  |
| To Support              | Safe storage, organization   |
| To Suppress             | Disorganization, misplacement  |
| Environmental Qualities |  |
| Lighting                | Adequate task lighting with average of 100-150 lux inside lockers and storage areas<br>Motion activated LED lights in the locker interior                    |
| Acoustics               | Sound absorbing materials in walls   |
| Ventilation             | Sufficient airflow to prevent odor buildup in lockers<br>Optional ventilation slots in locker walls for projects involving materials require air circulation |
| Signage                 | Clear labels and numbering on lockers<br>Directional signage for communal storage zones<br>Instructions for proper use and maintenance                       |

|                                      |   |
|--------------------------------------|---|
| Access                               |   |
| Visual Access                        | Minimal visual access to maintain security and privacy  |
| Physical Access                      | <p>Wide aisles and unobstructed pathways for large items<br/> At least one level of storage lockers or shelving should be positioned within the reach range of 15 to 48 inches above the ground</p> <p>(References: U.S. Department of Justice. (2010). 2010 ADA standards for accessible design, § 308.2.1. U.S. Department of Justice. <a href="https://www.ada.gov/2010ADAsstandards_index.htm">https://www.ada.gov/2010ADAsstandards_index.htm</a>)</p> |
| Furniture,<br>Fixtures,<br>Equipment |   |
| Furniture                            | <p><u>Locking system</u>: Locker walls, locking mechanism<br/> <u>Shelving units</u>: Adjustable shelves for communal storage<br/> <u>Cubbies</u>: Open storage cubbies</p>   |
| Equipment                            | <p><u>Labeling</u>: Labeling system, storage bins</p>   |

|                              |   |
|------------------------------|---|
| Storage<br>(Custodial Staff) |   |
| Users                        |   |
| Users Types                  | Custodial staff   |
| Capacity                     | 3-4 users   |
| Activities                   |   |
| To Support                   | Storage cleaning supplies, efficient retrieval                                |
| To Suppress                  | Clutter space, overfilled space   |
| Environmental Qualities      |   |
| Lighting                     | Bright lighting of 200-300 lux to ensure visibility                           |
| Acoustics                    | Sound absorbing materials in walls  |
| Ventilation                  | Exhaust fan or air purifier to ensure air circulation                         |
| Signage                      | Labels for categorizing cleaning supplies                                     |
| Access                       |   |
| Visual Access                | Transparent cabinet doors for quick visual checks without opening the cabinet |
| Physical Access              | Wide doorways for carts and trolleys  |

|                                      |  |
|--------------------------------------|--|
| Furniture,<br>Fixtures,<br>Equipment |  |
| Furniture                            | <u>Metal shelving</u><br><u>Lockable cabinet</u> : Hazardous chemicals   |
| Equipment                            | <u>Cleaning tool organizers</u> : Mops and brooms<br><u>Mobile carts</u> |

|                         |  |
|-------------------------|--|
| Materials Store         |  |
| Users                   |  |
| Users Types             | Employees, students, faculty   |
| Capacity                | 5-10 users   |
| Activities              |  |
| To Support              | Material retrieval, access to materials  |
| To Suppress             | Delays and confusion, material wastage   |
| Environmental Qualities |  |
| Lighting                | Bright lighting of 300-500 lux to clearly display material types and labels<br>Adjustable task lighting for detailed material inspection<br>(Reference: Illuminating Engineering Society. (2011). The Lighting Handbook: 10th Edition. New York, NY: Illuminating Engineering Society) |
| Acoustics               | Acoustic panels or sound absorbing materials   |
| Ventilation             | Localized ventilation or exhaust systems for materials prone to emitting odors<br>Proper airflow to preserve materials sensitive to temperature or humidity  |
| Signage                 | Clearly labeled sections for material types (wood, metal, fabric, plastic, etc)<br>Instruction for proper handling, cutting and disposal<br>Safety guidelines for special handling (flammable or toxic substance)  |

|                                      |   |
|--------------------------------------|---|
| Access                               |   |
| Visual Access                        | Open shelving or transparent storage bins   |
| Physical Access                      | Wide aisles for bulky materials and carts<br>ADA compliant shelving heights and pathways  |
| Furniture,<br>Fixtures,<br>Equipment |   |
| Furniture                            | <u>Shelvings units</u> : Adjustable shelving<br><u>Bins and containers, work tables</u> : Pre-fabrication activities  |
| Equipment                            | <u>Digital inventory system</u> : Tracking stocks<br><u>Storage carts/trolleys</u> : Transporting materials<br><u>Woodworking materials</u> : Plywood, fiberboard, solid wood, balsa wood, veneer sheets, laminate sheets<br><u>Metalworking materials</u> : Aluminum sheets and bars, steel sheets, rods, tubes, brass and copper sheets, perforated sheets<br><u>Plastics and composites</u> : Acrylic, polycarbonate, ABS sheets, foam board, 3d printing (PLA, ABS), carbon fiber sheets, fiberglass panels<br><u>Textiles</u> : Cotton, linen, wool, polyester, canvas, denim, nylon, fabrics, felt and foam, threads, zippers, buttons, sewing supplies<br><u>Electronics and circuitry</u> : Resistors, capacitors, diodes, LEDs, switches, buttons, microcontrollers, sensors, breadboards, jumper wires, batteries and chargers, adaptors, voltage regulators<br><u>Paper and cardboard</u> : Construction paper, drafting paper, vellum, corrugated sheets, cardboard, sketch papers, sandpapers<br><u>Paint and finishes</u> : Acrylic, spray paints, stains and varnishes<br><u>Utility</u> : Masking tape, duct tape, cutting mats, cutting knives<br><u>Fasteners</u> : screws, nails, bolts, glue, epoxy, clamps, nuts, bolts, washers, welding rods, solder |

|                         |  |
|-------------------------|--|
| Outdoor Work Area       |  |
| Users                   |  |
| Users Types             | Students, faculty  |
| Capacity                | 10-15 users  |
| Activities              |  |
| To Support              | Assembly and prototyping<br>Collaboration<br>Use materials unsuitable for indoor settings                      |
| To Suppress             | Disruption from weather (rain, winds, snow)  |
| Environmental Qualities |  |
| Lighting                | Combination of natural daylight and supplemental outdoor lighting  |
| Acoustics               | Venetation or outdoor partitions to buffer sound   |
| Ventilation             | Open air ventilation   |
| Signage                 | Weather related warning for outdoor spaces<br>Clear signs indicated designated task areas (painting, assembly) |
| Access                  |  |
| Visual Access           | N/A  |
| Physical Access         | Weather resistant flooring for mobility devices  |

|                                      |   |
|--------------------------------------|---|
| Furniture,<br>Fixtures,<br>Equipment |   |
| Furniture                            | <p><u>Weather resistant tables</u>: Waterproof surfaces</p> <p><u>Umbrellas or canopies</u>: Shade and rain protection</p> <p><u>Seating</u>: Water resistant benches and stools</p> <p><u>Storage racks</u>: Racks with portable tool kits</p> |
| Equipment                            | <u>Outdoor power outlets (with protective covers)</u>   |

|                         |   |
|-------------------------|---|
| Photo Studio            |   |
| Users                   |   |
| Users Types             | Students, faculty   |
| Capacity                | 3-6 users   |
| Activities              |   |
| To Support              | Portrait and product photography, documentation of projects   |
| To Suppress             | Excessive noise, overcrowding   |
| Environmental Qualities |   |
| Lighting                | Adjustable lighting ranging from 300-1000 lux to support detailed photography work<br>Glare free lighting using softboxes and non-reflective flooring |
| Acoustics               | Sound dampening materials on walls and ceilings<br>Acoustic panels on walls and ceilings  |
| Ventilation             | Ventilation system to maintain consistent airflow and reduce equipment heat   |
| Signage                 | Clear signages for equipment use instructions and studio rules  |
| Access                  |   |
| Visual Access           | Minimal visual access to control unwanted lights when taking photography  |
| Physical Access         | Maintain physical access to tool workstation and gallery and storage  |

|                                      |   |
|--------------------------------------|---|
| Furniture,<br>Fixtures,<br>Equipment |   |
| Furniture                            | <p><u>Storage cabinets</u>: Storage for backdrops, props, and small equipment</p> <p><u>Height-adjustable tables and stools</u></p>                               |
| Equipment                            | <p><u>Professional lighting equipments</u>: Softboxes, ring lights</p> <p><u>Adjustable backdrops with stands</u></p> <p><u>Cameras, tripods, stabilizers</u></p> |

## COLLABORATIVE WORK ZONES

|                         |   |
|-------------------------|---|
| Tool Workstation        |   |
| Users                   |   |
| Users Types             | Students, faculty   |
| Capacity                | 15-25 users   |
| Activities              |   |
| To Support              | Storage, retrieval, organization of stools, assembly and prototyping  |
| To Suppress             | Disorganization, distraction  |
| Environmental Qualities |   |
| Lighting                | Bright, concentrated task lighting of 300-500 lux at the workstation level<br>Ambient task lighting with adjustment capability for detailed tool work   |
| Acoustics               | Acoustic panels on walls and ceiling to absorb noise<br>Padding with rubber mats or dampers under tools for less vibration<br>(References: U.S. Green Building Council. (n.d.). Indoor environmental quality: Acoustic comfort strategies. U.S. Green Building Council. <a href="https://www.usgbc.org/">https://www.usgbc.org/</a> )                                   |
| Ventilation             | Adequate ventilation to avoid dust and debris buildup<br>Portable vacuum or dust collection systems integrated near points of high dust<br>(References: Occupational Safety and Health Administration. (2013). Controlling dust hazards in the workplace. U.S. Department of Labor. <a href="https://www.osha.gov/dust-hazards">https://www.osha.gov/dust-hazards</a> ) |

|                                      |   |
|--------------------------------------|---|
| Signage                              | Tool types and storage locations should be labeled clearly on pegboard and shelving<br>Visual indicator of check-out/check-in procedures for tools  |
| Access                               |   |
| Visual Access                        | Open layout with tools on pegboards to facilitate easy identification and selection   |
| Physical Access                      | Workstation heights ergonomic for all users<br>ADA compliance with the pathways and clearances around the workstation   |
| Furniture,<br>Fixtures,<br>Equipment |   |
| Furniture                            | <u>Workbenches</u> : Height-adjustable with heavy duty surfaces<br><u>Pegboard</u> : Wall mounted with hooks for organized tool storage<br><u>Shelving</u> : Larger tools and accessory   |
| Equipment                            | <u>Hand tool</u> : Wrenches, screwdrivers, hammer, pliers<br><u>Power tools</u> : Drill, impact drivers, rotary tools<br><u>Measuring tools</u> : Tape measures, levels, calipers<br><u>Accessories</u> : Clamps, fasteners, cutting mats, cutting knives<br><u>Safety</u> : Safety goggles, gloves, hearing protection |

|                                   |   |
|-----------------------------------|---|
| Reconfigurable Collaboration Zone |   |
| Users                             |   |
| Users Types                       | Students, faculty   |
| Capacity                          | 8-20 users depending on configuration   |
| Activities                        |   |
| To Support                        | Flexible group collaboration, interaction workshop and presentation   |
| To Suppress                       | Fixed layout limits adaptability, underutilized space   |
| Environmental Qualities           |   |
| Lighting                          | Ambient lighting of 300-400 lux for overall visibility<br>Adjustable task lighting for different activities<br>Balanced natural light through windows and diffused artificial light<br>(Reference: Illuminating Engineering Society. (2011). The Lighting Handbook: 10th Edition. New York, NY: Illuminating Engineering Society) |
| Acoustics                         | Movable acoustic partitions and soft furnishing to dampen sound<br>Acoustic ceiling panels and wall panels<br>(References: U.S. Green Building Council. (n.d.). Indoor environmental quality: Acoustic comfort strategies. U.S. Green Building Council. <a href="https://www.usgbc.org/">https://www.usgbc.org/</a> )             |
| Ventilation                       | Air circulation supported by portable fans or exhaust systems for comfort during group sessions   |

|                                      |   |
|--------------------------------------|---|
| Signage                              | <p>Clear signage indicating the space's reconfigurability and intended use</p> <p>Instructions for rearranging furniture and equipment</p>  |
| Access                               |   |
| Visual Access                        | Open sightlines to adjacent spaces for connectivity with surroundings   |
| Physical Access                      | <p>Accessible to social lounge, café and informal collaboration zone</p> <p>Adjustable furniture heights, ample clearance for users with different disabilities</p> <p>Mobile acoustic partitions create different physical zones based on configurations of tables and chairs</p>  |
| Furniture,<br>Fixtures,<br>Equipment |   |
| Furniture                            | <p><u>Mobile tables</u>: Lightweight tables on wheels for reconfiguration</p> <p><u>Mobile chairs</u>: Stackable or wheeled chairs with adjustable heights</p> <p><u>Whiteboards</u>: Movable whiteboards for brainstorming</p> <p><u>Partitions</u>: Mobile acoustic partitions to create adaptable zones within the space</p> <p><u>Storage bins</u>: Bins and racks for collaboration supplies</p> |
| Equipment                            | <p><u>Digital displays</u>: Projectors, TV stands for presentation</p> <p><u>Collaboration tools</u>: Sticky notes, flip charts, markers</p>  |
| Electrical<br>Requirements           |   |
| Power Access                         | <p>Power outlets and charging stations like power strips as code requires</p> <p>Every workstation has 1</p>  |

|                         |   |
|-------------------------|---|
| Social Lounge           |   |
| Users                   |   |
| Users Types             | Students, faculty   |
| Capacity                | 10-15 users   |
| Activities              |   |
| To Support              | Relaxation, informal conversation, social networking  |
| To Suppress             | Excessive noise, overcrowding   |
| Environmental Qualities |   |
| Lighting                | <p>Warm ambient lighting of 200-300 lux for a cozy atmosphere<br/>           Adjustable task lighting for different activities<br/>           Natural light through large windows<br/>           (Reference: Illuminating Engineering Society. (2011). The Lighting Handbook: 10th Edition. New York, NY: Illuminating Engineering Society)</p>                                   |
| Acoustics               | <p>Soft furnishings, carpets, acoustic panels to absorb sound<br/>           Designated zones for quiet conversation versus normal volume conversations<br/>           (References: U.S. Green Building Council. (n.d.). Indoor environmental quality: Acoustic comfort strategies. U.S. Green Building Council. <a href="https://www.usgbc.org/">https://www.usgbc.org/</a>)</p> |
| Ventilation             | Comfortable temperature control through HVAC system for a pleasant relaxation environment   |
| Signage                 | Clear signage for maintaining cleanliness and noise levels to perverse the space's environment  |

|                                      |  |
|--------------------------------------|--|
| Access                               |  |
| Visual Access                        | Open sightlines into and out of the lounge to foster a welcoming feel  |
| Physical Access                      | ADA compliant pathways and entrances<br>Accessible to individual focus zones, reconfigurable collaboration zone, café, large and small breakout rooms, outdoor and assembly area   |
| Furniture,<br>Fixtures,<br>Equipment |  |
| Furniture                            | <u>Seating</u> : Comfortable sofas, armchairs, upholstered chairs, supportive cushion lounge pieces<br><u>Tables</u> : Coffee table for personal items<br><u>Carpeting</u> : Soft, durable carpet for acoustic absorption<br><u>Storage racks</u> : Racks for games, magazines, books, pamphlets for leisure |
| Equipment                            | <u>Power source</u> : Power outlets and USB ports integrated into furniture  |

|                             |   |
|-----------------------------|---|
| Informal Collaboration Zone |   |
| Users                       |   |
| Users Types                 | Students, faculty   |
| Capacity                    | 8-12 users  |
| Activities                  |   |
| To Support                  | Group discussion and brainstorming, casual teamwork, informal study   |
| To Suppress                 | Excessive noise, disorganization  |
| Environmental Qualities     |   |
| Lighting                    | Soft, ambient lighting of 200-300 lux for a relaxed environment<br>Adjustable task lighting with movable base for different activities<br>Access to natural light to reduce fatigue<br>(Reference: Illuminating Engineering Society. (2011). The Lighting Handbook: 10th Edition. New York, NY: Illuminating Engineering Society) |
| Acoustics                   | Sound dampening assets like rugs, soft furnitures to control noise<br>Wall and ceiling based acoustic panels to control noise<br>Acoustic partitions to create semi-private zones   |
| Ventilation                 | HVAC system for consistent temperature and airflow  |
| Signage                     | Fun and welcoming signage indicating the space's informal and flexible nature   |

|                                      |   |
|--------------------------------------|---|
| Access                               |   |
| Visual Access                        | Open sightlines to encourage use of the space   |
| Physical Access                      | ADA compliant layout with wide pathways for accessibility<br>Flexible seating options, bean bags and stools at accessible heights<br>Accessible to café and reconfigurable collaboration zone and social lounge   |
| Furniture,<br>Fixtures,<br>Equipment |   |
| Furniture                            | <u>Seating</u> : Bean bags for relaxed and casual seating options<br><u>Lightweight and movable stools</u> : Easy movement<br><u>Tables</u> : Low, small and mobile tables for placing laptops and materials<br><u>Partitions</u> : Whiteboards on wheels for brainstorming |
| Equipment                            | <u>Tools</u> : Markers, erasers, magnets for whiteboards<br><u>Power sources</u> : Power outlets and USB charging stations<br><u>Digital Display</u> : Projectors or display screens  |

## PRIVATE WORK ZONES

|                         |   |
|-------------------------|---|
| Individual Focus Zones  |   |
| Users                   |   |
| Users Types             | Students, faculty   |
| Capacity                | 15-25 users   |
| Activities              |   |
| To Support              | Individual Focus, quiet personal study  |
| To Suppress             | Overcrowding, noise distractions  |
| Environmental Qualities |   |
| Lighting                | <p>Adjustable task lighting with 300-500 lux for reading and detailed work</p> <p>Soft ambient lighting of 200-300 lux for a calm environment</p> <p>(Reference: Illuminating Engineering Society. (2011). The Lighting Handbook: 10th Edition. New York, NY: Illuminating Engineering Society)</p> |
| Acoustics               | <p>Acoustic panels on walls and ceiling, and cubicle partitions to absorb sound</p> <p>High back enclosures to ensure acoustic privacy</p>  |
| Ventilation             | HVAC system maintaining consistent temperature and air quality  |
| Signage                 | N/A   |

| Access                               |  |
|--------------------------------------|--|
| Visual Access                        | Cubicles facing walls or semi-enclosed to minimize visual distractions of people walking and working<br>Strategic placement away from high-traffic areas to ensure privacy   |
| Physical Access                      | Height-adjustable furniture to accommodate users with different needs<br>Accessible to the social lounge   |
| Furniture,<br>Fixtures,<br>Equipment |  |
| Furniture                            | <u>Individual lounge cubicles</u> : High back, sound absorbing acoustic felt, semi-enclosed for privacy<br><u>Tables</u> : Small tables for laptops or notebooks<br><u>Seating</u> : Comfortable chairs with ergonomic support |
| Equipment                            | <u>Power source</u> : Integrated power outlets and USB charging ports in each cubicle<br><u>Light</u> : Task lamps with adjustable brightness levels<br><u>Storage</u> : Storage shelves or hooks for personal items           |

|                         |  |
|-------------------------|--|
| Small Breakout Rooms    |  |
| Users                   |  |
| Users types             | Students, faculty  |
| Capacity                | 2-5 users per room   |
| Activities              |  |
| To Support              | Small group discussion, private study groups, hybrid work  |
| To Suppress             | Noise distraction, overcrowding  |
| Environmental Qualities |  |
| Lighting                | Bright adjustable lighting of 300-400 lux for focused work<br>Adjustable task lighting for different user needs<br>Balanced natural light through windows<br>(Reference: Illuminating Engineering Society. (2011). The Lighting Handbook: 10th Edition. New York, NY: Illuminating Engineering Society)                                      |
| Acoustics               | Acoustic panels on wall and ceiling for sound absorption<br>Soft materials of carpeting and upholstered furniture to absorb sound<br>(References: U.S. Green Building Council. (n.d.). Indoor environmental quality: Acoustic comfort strategies. U.S. Green Building Council. <a href="https://www.usgbc.org/">https://www.usgbc.org/</a> ) |
| Ventilation             | Individual room climate control for comfort during group sessions<br>Quiet HVAC systems to ensure minimal noise intrusion  |
| Signage                 | Clear guidelines for booking rooms, expected behaviors like cleaning and time limits   |

|                                      |  |
|--------------------------------------|--|
| Access                               |  |
| Visual Access                        | Frosted glass or partially transparent partitions for balance of privacy and openness  |
| Physical Access                      | ADA compliant doorways and pathways<br>Height-adjustable furniture for users with different disabilities<br>Accessible to large breakout room, social lounge, and café   |
| Furniture,<br>Fixtures,<br>Equipment |  |
| Furniture                            | <u>Tables</u> : Sturdy, height-adjustable tables suitable for laptops or materials<br><u>Seating</u> : Comfortable, height-adjustable, ergonomic chairs and small stools<br><u>Whiteboards</u> : Wall mounted or mobile for brainstorming and note taking  |
| Equipment                            | <u>Power source</u> : Power outlets and USB charging stations integrated into walls or tables<br><u>Digital display</u> : Digital screens, monitors or TV stands for small presentations or video conferencing<br><u>Audio-Visual Tools</u> : Integrated speakers, microphones, and camera setups for hybrid meetings or video conferencing<br><u>Collaboration tools</u> : Markers, sticky notes, portable stands |

|                         |  |
|-------------------------|--|
| Large Breakout Rooms    |  |
| Users                   |  |
| Users types             | Students, faculty  |
| Capacity                | 6-10 users per room  |
| Activities              |  |
| To Support              | Group discussion, team meeting, hybrid work  |
| To Suppress             | Noise distraction, overcrowding  |
| Environmental Qualities |  |
| Lighting                | <p>Adjustable ambient lighting of 300-400 lux for overall visibility<br/>           Adjustable task lighting at tables for reading or writing<br/>           Access to natural light through windows<br/>           (Reference: Illuminating Engineering Society. (2011). The Lighting Handbook: 10th Edition. New York, NY: Illuminating Engineering Society)</p>   |
| Acoustics               | <p>Acoustic panels on wall and ceiling to reduce noise<br/>           Soft materials like carpet and upholstered furniture to reduce noise<br/>           (References: U.S. Green Building Council. (n.d.). Indoor environmental quality: Acoustic comfort strategies. U.S. Green Building Council. <a href="https://www.usgbc.org/">https://www.usgbc.org/</a>)</p> |
| Ventilation             | HVAC system ensures a comfortable temperature for group sessions   |
| Signage                 | <p>Clear guidelines for booking rooms and equipment use<br/>           Clear instructions for operating screen projection and digital tools<br/>           Clear signage indicates room numbers</p>  |

|                                      |   |
|--------------------------------------|---|
| Access                               |   |
| Visual Access                        | Frosted glass or semi-transparent glass for a balance of privacy and visibility   |
| Physical Access                      | ADA compliant doorways and pathways<br>Height-adjustable furniture for users with different disabilities<br>Accessible to small breakout room, café and social lounge   |
| Furniture,<br>Fixtures,<br>Equipment |   |
| Furniture                            | <u>Tables</u> : Large collaborative tables for 6-10 users<br><u>Chairs</u> : Ergonomic chairs with adjustability for comfort<br><u>Whiteboard</u> : Wall mounted or mobile boards for brainstorming   |
| Equipment                            | <u>Digital display</u> : Screen projectors or large digital screen for presentations<br><u>Power source</u> : Power outlets, USB ports and HDMI connections for laptops and devices<br><u>Audio-Visual Tools</u> : Integrated speakers, microphones, and camera setups for hybrid meetings or video conferencing<br><u>Collaboration tools</u> : Markers, sticky notes, portable stands |

# APPENDICES

---

## APPENDIX A

### REFERENCES

- Allen, K. H., Balaska, A. K., Aronson, R. M., Rogers, C., & Short, E. S. (2023, October 22). Barriers and benefits: The path to accessible makerspaces.  
<https://dl.acm.org/doi/pdf/10.1145/3597638.3608414>
- American National Standards Institute/American Society of Heating, Refrigerating and Air-Conditioning Engineers. (2022). ANSI/ASHRAE Standard 62.1-2022: Ventilation for acceptable indoor air quality. American Society of Heating, Refrigerating and Air-Conditioning Engineers.
- Austin, D., Coache, C. D., Hannahs, C., Hohengasser, E., & Sargent, J. (Eds.). (2022). National electrical code handbook (16th ed.). National Fire Protection Association.
- Bernstein, E. S., & Turban, S. (2018, August 19). The impact of the “open” workspace on human collaboration. Philosophical Transactions of the Royal Society of London. Series B, Biological Sciences.  
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6030579/>
- Canadian Conservation Institute. (n.d.). Environmental guidelines for museums - Temperature and relative humidity. Government of Canada.  
<https://www.canada.ca/en/conservation-institute.html>
- Department of Justice. (2010, September 15). 2010 ADA standards for accessible design. <https://www.ada.gov/assets/pdfs/2010-design-standards.pdf>
- Illuminating Engineering Society. (2011). The lighting handbook: 10th edition. New York, NY: Illuminating Engineering Society.
- Northwestern University. (n.d.). The garage at Northwestern - Innovation & entrepreneurship. <https://www.thegarage.northwestern.edu/>
- Occupational Safety and Health Administration. (1972, May 15). Letter of interpretation on aisle width recommendations. U.S. Department of Labor.
- Occupational Safety and Health Administration. (2013). Controlling dust hazards in the workplace. U.S. Department of Labor. <https://www.osha.gov/dust-hazards>

Orel, M., & Alonso-Almeida, M. del M. (2019, September). The ambience of collaboration in coworking environments. ResearchGate.

[https://www.researchgate.net/publication/333451101\\_The\\_Ambience\\_of\\_Collaboration\\_in\\_Coworking\\_Environments](https://www.researchgate.net/publication/333451101_The_Ambience_of_Collaboration_in_Coworking_Environments)

U.S. Department of Justice. (2010). 2010 ADA standards for accessible design. U.S. Department of Justice. [https://www.ada.gov/2010ADASTANDARDS\\_index.htm](https://www.ada.gov/2010ADASTANDARDS_index.htm)

U.S. Food and Drug Administration. (2017). Food code: 2017. U.S. Department of Health and Human Services. <https://www.fda.gov/food/fda-food-code/food-code-2017>

U.S. Green Building Council. (n.d.). Indoor environmental quality: Acoustic comfort strategies. U.S. Green Building Council. <https://www.usgbc.org/>

University of Southern California. (2024, September 5). Baum family maker space - Admission & student engagement: Current undergraduate students.

<https://viterbiundergrad.usc.edu/bfms/>

University of Washington. (n.d.). Innovation spaces.

<https://www.washington.edu/innovation/spaces/>

## APPENDIX B

### SURVEY QUESTIONS

#### **Students/Faculty**

- What is your field of study?/What is your affiliation with the university?
- What is your class level?/What department/college do you work in?
- If you currently use a makerspace on campus, which one(s) do you use?
- What do you use your makerspace(s) for?
- How often do you use your makerspace(s)?
  - Every day
  - Weekly
  - Monthly
  - Rarely
  - Never
- What time of day do you use your makerspace(s)?
  - Morning (5am - 12pm)
  - Afternoon (12pm - 5pm)
  - Evening (5pm - 9pm)
  - Night (9pm - 5am)
- What types of activities might you use the new makerspace for?
  - Prototyping
  - Physical Fabrication
  - Multimedia and digital fabrication
  - Coding, electronics, and robotics
  - Art and creative projects
  - Individual projects and homework
  - Team projects
  - Research and development
  - Workshops and educational events
  - Community building and networking
  - Instruction
  - None of the above
  - Other:

- Which of the following tools would be most useful to you in the new makerspace?
  - 3D printer
  - Laser cutter
  - CNC router
  - Hand tools
  - Power tools
  - Woodworking tools
  - Metalworking tools
  - Robotics equipment
  - Sewing/embroidery machine
  - Whiteboard
  - None of the above
  - Other:
- Considering Beebe Hall is about a 5 minute walk beyond Mann Library, how likely are you to use the new makerspace? (1 for very unlikely and 5 for very likely)
- What additional features of the new makerspace would incentivize you use it?
  - Café or snack area
  - Outdoor workspace
  - Materials store
  - None of the above
  - Other:
- When working on an individual project, do you prefer to work in an open or enclosed space?
  - Open
  - Enclosed
  - Other:
- When working on a group project, do you prefer to work in an open or enclosed space?
  - Open
  - Enclosed
  - Other:
- What is your favorite space to collaborate on campus? Why?

- In your experience, which of the following features are conducive to collaboration?
  - Open layout
  - Group workstations
  - Modular furniture
  - Shared equipment
  - Whiteboards/chalkboards
  - Ideation/teaming/consultation rooms
  - Other:
- Is there anything in particular you like about your makerspace(s)? Please explain.
- Is there anything in particular you dislike about your makerspace(s)? Please explain.
- What would make the new makerspace more appealing than your makerspace(s)?
- Do you have any additional feedback or ideas for the new makerspace?

## **Custodial Staff**

- What is your affiliation with the university?
- What department/college do you work in?
- Do you clean any makerspaces? (Yes/No)
- If you clean any makerspaces, which one(s) do you clean?
- If you clean any makerspaces, which one(s) do you clean?
  - Morning (5am - 12pm)
  - Afternoon (12pm - 5pm)
  - Evening (5pm - 9pm)
  - Night (9pm - 5am)
- How often do you clean the makerspace(s)?
  - Every day
  - Weekly
  - Monthly
  - Rarely
  - Never
- How do you clean the makerspace(s)?
  - Mopping
  - Sweeping
  - Dusting
  - Vacuuming
  - Disinfecting/wiping surfaces
  - Waste disposal
  - Other:
- What features or considerations regarding maintenance are most important to you?
  - Clear pathways for cleaning
  - Easy access to cleaning supplies and equipment
  - Organized storage of tools and materials
  - Equipment maintenance guidelines
  - Easy-to-clean surfaces (i.e., hard flooring, etc.)
  - Systems for reporting issues (i.e., broken equipment, spills, etc.)
  - Other:
- Are there specific features (i.e., flooring, surfaces) that you believe would make the new makerspace easier to clean and maintain? If so, please explain.
- What challenges do you encounter in cleaning the makerspace(s), if any?
- Do you have any additional concerns or suggestions to ensure the new makerspace is easy to maintain and supports the work of custodial staff?

## APPENDIX C

### **SURVEY ANALYSIS (CONT.)**

#### **Students**

- Approximately 55% of students reported using their makerspace weekly.
- No students reported using their makerspace at night (9pm to 5am).
- Most students reported that the features most conducive to collaboration include specialized group workstations, whiteboards/chalkboards, and an open layout.
  - Approximately 88% of students reported that specialized group workstations are conducive to collaboration.
  - Approximately 78% of students reported that whiteboards/chalkboards are conducive to collaboration.
  - Approximately 72% of students reported that open layouts are conducive to collaboration.

#### **Faculty**

- Faculty reported using the makerspace with varying frequency: daily, weekly, monthly, and rarely.
- Approximately 89% of faculty reported using their makerspace in the afternoon.

#### **Custodial Staff**

- 100% of custodial staff clean makerspace in the early morning.
- 75% of custodial staff clean a makerspace(s) every day.

## APPENDIX D

### INTERVIEW QUESTIONS

**Charles V. Beach, Jr. (Digital Design and Fabrication Studio (D2FS) Manager) on October 3, 2024**

1. What are some safety requirements for a makerspace?
2. From your observation of D2FS and DHive, what are some things you like? What are some things you suggest us to add for Beebe Hall makerspace?
3. Walk us through a typical student experience at D2FS and DHive?
4. How do people know about D2FS? What are some ways to improve visibility?

**Dr. Rana Zadeh (Associate Professor of Human Centered Design) on October 2, 2024**

1. What characteristic of space do you think is essential for learning?
2. How can a space encourage collaboration between students?
3. Are there different modes/types of collaboration when working together?
4. What different collaboration spaces do you suggest we program in Beebe Hall?
5. We want to program the maker space so students come here for collaboration and community, and they don't necessarily need to use these machines. Do you have suggestions for designing the maker space to show the community? Could you comment on the branding aspect?
6. Since Beebe Hall is away from the rest of central campus, what do you suggest we can do to make more students find out about us?
7. With Beebe Hall's accessibility issues, what do you suggest to keep a consistent group of student users working here?
8. How would you resolve the conflicting needs for stable furnitures in a makerspace and flexibility?

**Niti Parikh (Director of Learning Spaces and MakerLABs, Cornell Tech) on September 16, 2024**

1. What are your main responsibilities as directors of maker lab for Cornell Tech?
2. What is the most commonly done work at Maker Lab?
3. What's the spatial arrangement?
4. What are some types of group learning that students may engage in for a makerspace?
5. What other efforts did you make in the space to engage collaboration?
6. What qualities of Maker Lab do you notice that brought students here?
7. What characteristic of space do you think is important for learning?
8. What are some specific functionality for Beebe Maker space?
9. What safety protocols do you use?
10. Does student background matter? Is it just the safety protocols that matter?
11. Are there lots of Walk-ins?
12. What do you think we can do to make more students find out about us?

**Eddy Man Kim (Director of CHE/HCD makerspace and co-leader of the project) on September 16, 2024**

1. What are some challenges you face in makerspace?
2. What are other challenges you face?
3. How do you create community?
4. What do you think success means for the new makerspace?
5. How do Beebe Hall keep a consistent group of student user?

**Kristine Mahoney (Director/Leader of the project) on September 19, 2024**

1. What is your role as the senior director of strategic initiatives and how do you interact with the design or making community here at Cornell?
2. How do you define "making?" How do you envision "making?"
3. Are there particular maker spaces that we are benchmarking to? How do you see it thriving in the maker space "landscape" in the US? How do you think it'll compare with maker spaces across other colleges/institutions?
4. Are there any limitations or challenges for the program?

**Jennifer Birkeland (Assistant Professor of Landscape Architecture) on September 22, 2024**

1. Were you involved in implementing the lab? How was that process?
2. How often do students use the space?
3. What classes do you teach?
4. How does the space support your classes?
5. Is space ever an issue in the lab?
6. Are student projects individual or group-based?
7. What skills do students gain from using the lab that they wouldn't in a traditional studio?
8. Do students use the lab outside of classes?
9. Is the lab exclusive to landscape students?
10. Thoughts on expanding lab facilities for more access?
11. How could we make the lab less intimidating for non-expert users?

# APPENDIX E

## INDIVIDUAL DUTIES

|                                     | Angie | Arden | Lucy | Julia |
|-------------------------------------|-------|-------|------|-------|
| Project Manager                     |       |       |      | X     |
| Literature Review                   | X     | X     |      |       |
| Site Visit                          | X     | X     | X    | X     |
| Mission Statement                   |       | X     |      |       |
| Executive Summary                   |       | X     |      |       |
| Programming Approaches              |       | X     |      |       |
| Site & Context                      |       | X     |      | X     |
| Surveys                             | X     | X     |      |       |
| Survey Analysis                     |       | X     |      |       |
| Interview with Kristine Mahoney     | X     |       |      | X     |
| Interview with Eddy Kim             |       |       | X    |       |
| Interview with Niti Parikh          |       |       | X    |       |
| Interview with Jennifer Birkeland   |       |       |      | X     |
| Interview with Rana Sagha Zadeh     | X     | X     | X    | X     |
| Interview with Charles V. Beach Jr. | X     |       | X    | X     |
| Interview with Custodial Staff      |       |       |      | X     |
| Interview Analysis                  |       | X     | X    |       |
| Observations                        |       |       | X    | X     |
| Observations Analysis               |       |       | X    |       |
| Focus Group Interview               | X     |       | X    | X     |
| Focus Group Analysis                |       | X     | X    |       |
| Summary of Main Issues              |       | X     | X    | X     |
| Goal Statements                     |       | X     |      | X     |
| PR Statements                       | X     | X     |      | X     |
| Concept Diagrams                    | X     |       |      |       |
| Line-by-Line Program                |       | X     |      |       |
| Adjacency Diagram                   | X     |       |      |       |
| Detailed Program                    |       |       | X    |       |
| Practice Presentation Slides        | X     | X     | X    | X     |
| Final Presentation Slides           |       | X     | X    |       |
| Final Program Document              | X     |       |      | X     |
| Proofreading & Editing              | X     | X     | X    | X     |