CAL POLY HUMBOLDT

ENGINEERING & TECHNOLOGY BUILDING AND STUDENT HOUSING BUILDING PROJECT

PROGRAMMING & FEASIBILITY STUDY REPORT

6 SEPTEMBER 2022

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INTRODUCTION

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1.1 EXECUTIVE SUMMARY

This feasibility study was commissioned by Facilities Planning, Design and Construction at Cal Poly Humboldt (CPH) to develop the vision pillars, project goals, evaluation criteria, space program, adjacency priorities and conceptual test-fits, and basis of design criteria for two buildings of new construction – 1) the Engineering + Technology (E+T) Academic Building and 2) a 250 Bed Housing building that is adjacent to the academic building and connected by protected courtyards. The contents of this document also include baseline performance requirements for both stand along buildings to inform a Collaborative Design Build procurement.

OVERVIEW

With the State of California's historic $458 million investment in designating Cal Poly Humboldt as the third polytechnic institution within the California State University system, 27 new academic and experiential programs are expected to be added by 2029, beginning with 12 launching in 2023. This will be the catalyst for greater investments over the coming decade to fuel a vitally relevant polytechnic education in Northern California.

Beginning with a foundational core that combines the liberal arts with creative interdisciplinary approaches to solving real world problems facing our society, Cal Poly Humboldt will prepare a new generation of resilient thinkers and doers to lead a restorative future centered on environmental and social justice.

The facilities will support five primary programs focused on engineering and technology of physical systems that will include existing programs - Environmental Resources Engineering B.S. degree and M.S. Environmental Systems E.R.E. option - while also launching three new programs in 2023- Energy Systems Engineering B.S., Mechanical Engineering B.S., and Engineering & Community Practice M.Eng., which is being developed and offered as an interdisciplinary collaboration between the Native American Studies department and engineering faculty.

Complementing the new Engineering and Technology building will be a student housing component and academic social spaces to support the Placed Based Learning Community (PBLC) programs that reinforce student persistence goals.

[1]In the prospectus this program was renamed "Engineering Leadership." We anticipate continued deliberation and conversation to identify the final name.

PROJECT SCOPE OVERVIEW

In this context, the project will be comprised of two buildings. An academic building (approximately 90,000 GSF) that will serve as a welcoming hub for the College of Natural Resources and Sciences that will foster collaboration and interdisiplinary learning focused on applied Engineering and Technology instruction

1 In the prospectus this program was renamed "Engineering Leadership." We anticipate continued deliberation and conversation to identify the final name.

which will consist of instructional and research laboratories, a lecture hall, student support services and resource spaces, meeting rooms, and faculty offices for each respective department, academic advising and supporting adminstration for the College. Additionally, a second building will provide 250 beds of student housing and support services (approximately 40,000 GSF) primarily for freshmen enrolled in the engineering and tech programs and will consist of doubles and some singles. The ground floor will consist of student life spaces including a multipurpose room for place based learning community activities and service/resource spaces will support student life functions.

The project site is prominently located on an empty lot at the culmination of Harpst Street and is bounded with B Street on the west, 17th Street on the south, Wildlife Lane on the east and Science B / Science E buildings to the north.

VISION PILLARS AND PRIORITIES

Based on strategic stakeholder engagement workshops conducted at the beginning of the Feasibility Study process, the following vision pillars and priorities were defined for both the Engineering and Technology academic building and the housing building respectively. In the Visioning phase of feasibility, stakeholders were asked to consider these framework areas in determinging project goals, challenges, metrics of success, and success factors. These vision pillar definitions are in alignment with the Cal Poly Humboldt Prospectus and Implementation strategic plans.

Engineering and Technology Academic Pillars

- **Innovative Excellence** – Develop human-centered innovative learning environments that support engineering and technology that aligns with social, economic and environmental priorities; Applied problem solving with direct relevance to real world challenges with purpose and impact.
- **Future Ready Resilience** – Engage and retain students with hands on learning opportunities that prepare them for a rapidly changing and challenging future. Flexible spaces that support interdisciplinarity and mixed methods of research and instruction to bridge the gap between hardware, software and convening.
- **Student Persistence** – Create a welcoming and inclusive learning community that is a valued resource and actively demonstrates sustainability practices. Educational environments and student support spaces foster collaboration, mentorship and applied learning opportunities that parallel development of identity, confidence, holistic belonging and well-being.
- **Social and Environmental Justice Leadership** – Demonstrate commitment to sustainability where growth meets social, economic, and environmental balance, as well as achieves Carbon Net Zero and LEED Gold. Provide a place that prioritizes human centered and ecologically restorative practices including and community resilience.
- **Future Proofing** - Provide Infrastructure that is flexible and adaptable to support microgrid testing and an evolving industry.

Housing / Student Life Defining Pillars

Additionally, the feasibility team and student life stakeholders explored the following vision pillars and priorities were derived for the 250 Bed E+T Housing. Derived from the 8 dimensions of wellness, these definitions are paired and support student persistence goals. In the Visioning phase of feasibility, stakeholders were asked to consider these framework areas in determinging project goals, challenges, metrics of success, and success factors.

- **Physical / Environmental** - Encompasses the symbiotic relationship between Physical health of human body, Environmental impacts on our Physical well-being and healthy stewardship of our environmental realms - natural and built
- **Spiritual / Emotional** - Encompasses the symbiotic relationship between well-being of spiritual aspects of meaning, purpose and connection to something greater than ourselves. with emotional aspects of navigating, managing and adapting to stresses and adverse situations.
- **Financial / Occupational** - Encompasses the symbiotic relationship between well-being of career aspirational aspects including career development, skill resiliency, and academic persistence with Financial aspects of economic literacy, planning and resiliency.
- **Social / Intellectual** - Encompasses the symbiotic relationship between well-being of Social aspects including belonging, relationships, and living authentically with Intellectual aspects including cognitive and creative exploration and growth.

SPACE PROGRAM SUMMARY

The Feasibility Study initiated with a Baseline Space Program for both buildings: the Academic Building is represented at 55,375 ASF (92,292 GSF) and the Housing Building is represented at 28,380 ASF (40,700 GSF).

This baseline programs for the respective buildings represented the following primary features:

Engineering and Technology Academic Building

- Engineering Instructional Laboratories, Design and Applied Engineering Studios, Research Labs and support spaces. Technology focused Teaching Labs
- Engineering and Technology Faculty, Department Chairs, Dean's Offices and administrative shared workspaces and support spaces .
- Maker Spaces including Metal and Wood Machine Shops, Indoor and Outdoor Fabrication spaces and support
- Student support spaces and success center including advising and PBLC offices, Graduate student workspace and meeting, dedicated group project spaces, and club spaces.
- Shared campus academic spaces including a Large lecture hall and computational methods instructional labs
- Shared resources including large, medium and small conference rooms, faculty/staff break room, kitchenettes, copy and storage.

E+T Student Housing and Amenities

- 250 Beds with the majority as doubles with smller ratio of singles
- Rooms for Resident Advisors and apartment for Resident Life Coordinator Shared resources including large, medium and small conference rooms, faculty/staff break room, kitchenettes, copy and storage.
- Shared student life resources including study lounge alcoves, kitchenette, multipurpose space and meetings rooms
- Support functions including reception, mailroom, resident life offices and on-site laundry room.

1.2 PROCESS + FRAMEWORK

The Engineering + Technology Academic Building and Student Housing Feasibility Study summarizes the results of a visioning, programming and planning efforts for Cal Poly Humboldt. The process of this study also introduces a new framework of stakeholder engagement that embodies the values and culture while also supporting the goals identified in Cal Poly Humboldt Future Forward Strategic Plan 2021-2026, Cal Poly Humboldt Prospectus, and Cal Poly Humboldt Implementation Plan.

The Feasibility Study scope includes the following sections:

- Project Vision Pillars, Goals
- Space Program Requirements
- Site Analysis and Concept Test Fits
- Design Process Framework
- Integrated Sustainability Approach
- Systems criteria outlines for Civil, Architecture, Laboratory Planning, Structural, Mechanical, Plumbing, Electrical, Audio-Visual and Telecommunications
- Building Code Analysis

The feasibility study process for this project started with a comprehensive strategic visioning framework in alignment with Cal Poly Humboldt newly adopted Future Forward Strategic Plan 2021-2026. The feasibility consultant team hosted several workshops to define project specific vision pillars, understand the program's goals and challenges, site related issues, success factors, metrics of success and empathy building. The goal of these workshops was to strengthen stakeholder engagement, trust and understanding while also defining project priorities and building consensus. The Cal Poly Humboldt Engineering + Technology, student housing and Facilities working group members collectively determined a clear set of evaluation criteria based on the declared vision pillars and project priorities. Subsequently, the evaluation criteria are leveraged to streamline decision making during the concept test fits strategies and constraints – promoting discussion and health debate about advantages and unresolved challenges of each concept.

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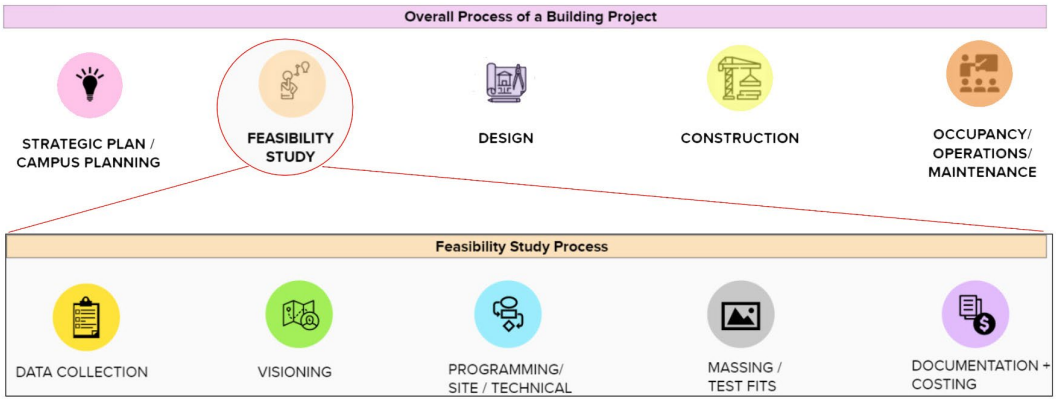
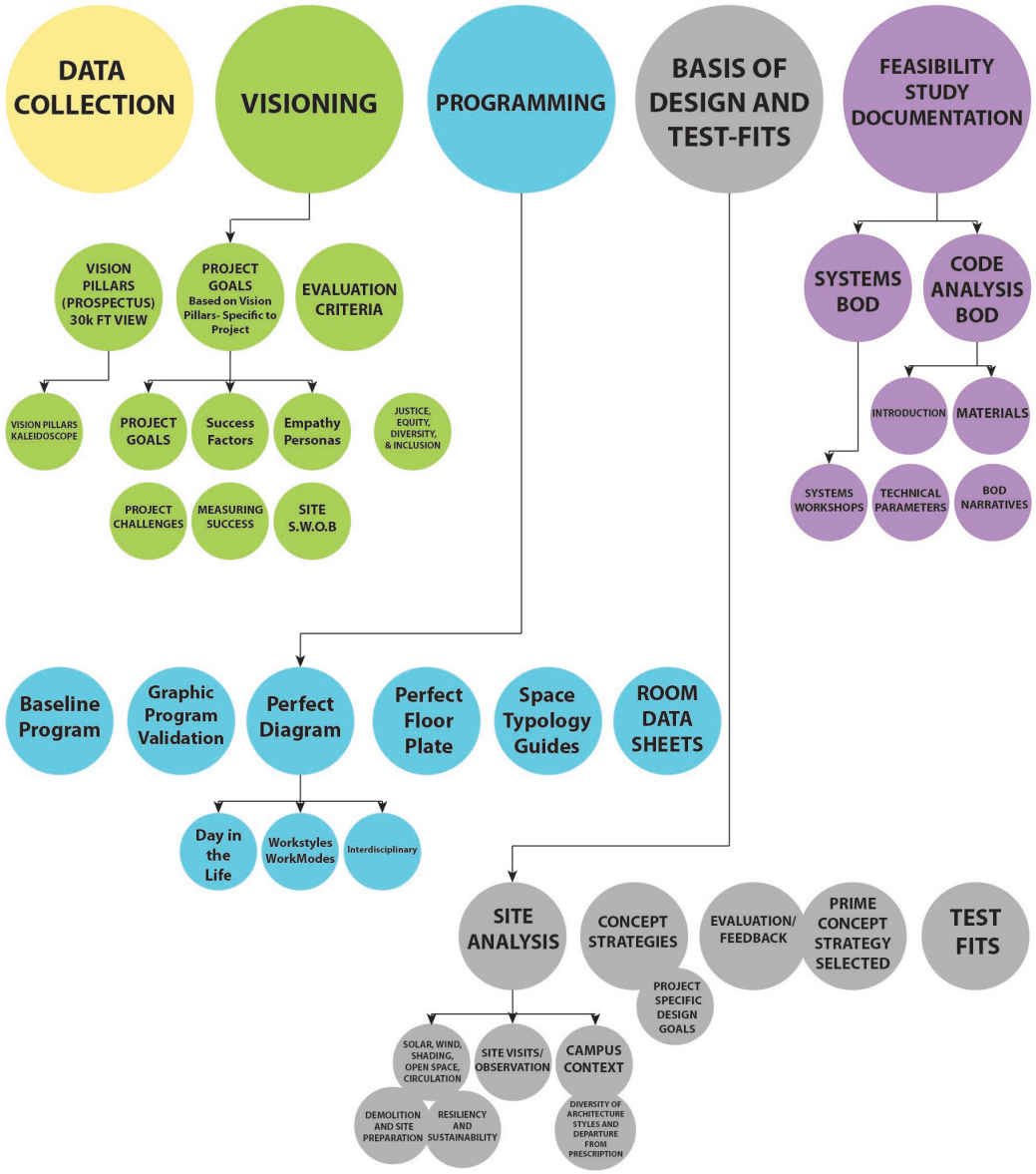
PROJECT PROCESS DIAGRAM



FEASIBILITY STUDY STRUCTURE



1.3 FEASIBILITY STUDY TEAM

Campus Teams

Engineering and Technology

- Eric Riggs
- Elizabeth Eschenbach
- Dale Oliver
- Liza Boyle
- Colin Wingfield
- Kaitlin Goldenberg
- Nicole Jean Hill
- Michelle Williams

Student Housing

- Steve St. Onge
- Todd Larsen
- Donyet King
- Yashvin Madhak

Facilities

- Michael Fisher
- Kassidy Banducci
- Howard Maxwell

Office of Sustainability

- Katy Koscielak
- Morgan King
- Jennifer Ortega
- Andrea Alstone

Project Team

Architecture - Suarez-Kuehne Architecture

- John Suarez

Architectural Consultant - SmithGroup

- Rosa Sheng
- Laura Allen
- Rich Kirr
- Bill Katz
- Diane Kase
- Jason Campbell
- Siyu Chen
- Aaron Fu
- Rishika Gokhale
- Andrew Thurlow

Civil Engineering - Sherwood

- John Leys
- Andy Leahy
- Andrea Fortun
- Maika Nicholson

Landscape - SmithGroup

- Todd Kohli
- Meghan Storm

Structural - Rutherford & Chekene

- David Bleiman

Mechanical - SmithGroup

- Stet Sanborn
- John McDonald

Plumbing - SmithGroup

- Jennifer Ma

Electrical - SmithGroup

- Harold Pintes

Energy-Grid Consulting - SmithGroup

- Katrina Kelly-Pitou

AV / IT - Salter

- Kenneth Graven
- Ryan Raskop

Telecom - TEECOM

- Adam Wrzeski
- Arnel Avila
- Lloyd Ranola

Lighting - SmithGroup

- Matt Aleman
- Nathan Sharnas

Acoustic - CSDA

- Randy Waldeck
- Aditya G Balani

Life Safety - H & S Associates

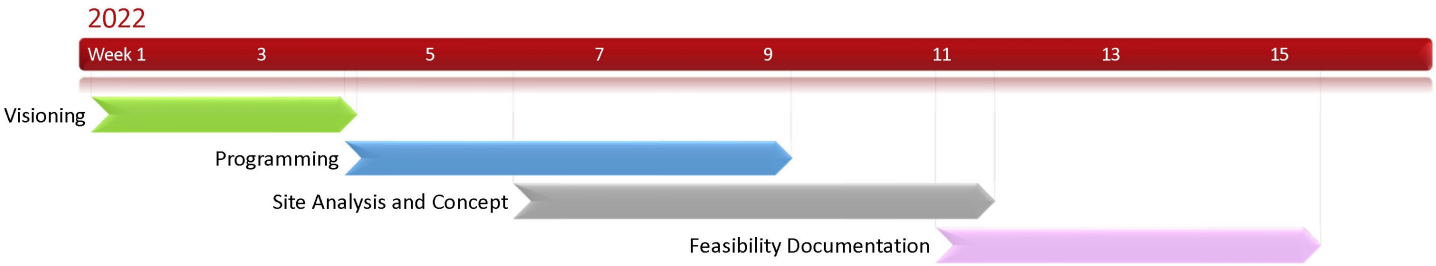
- Hans Hennerbeque

Cost - OCMI

- Conor Clarke
- Heike Salewski
- Abdullah Al-hourani

1.4 SCHEDULE

The Feasibility Study was a 6-month process commencing in February 2022 and concluding in August 2022. Following the Feasibility Study, the Engineering + Technology Academic and Housing buildings are anticipated to be delivered via Cal Poly Humboldt's (CPH) Collaborative Design-Build delivery method. Phase 1 of this process (design) is intended to be executed in September 2022. Phase 2 (design-build) is planned to commence Q1 2023. The project is expected to be completed by July 2025 in time for occupancy by the fall semester.



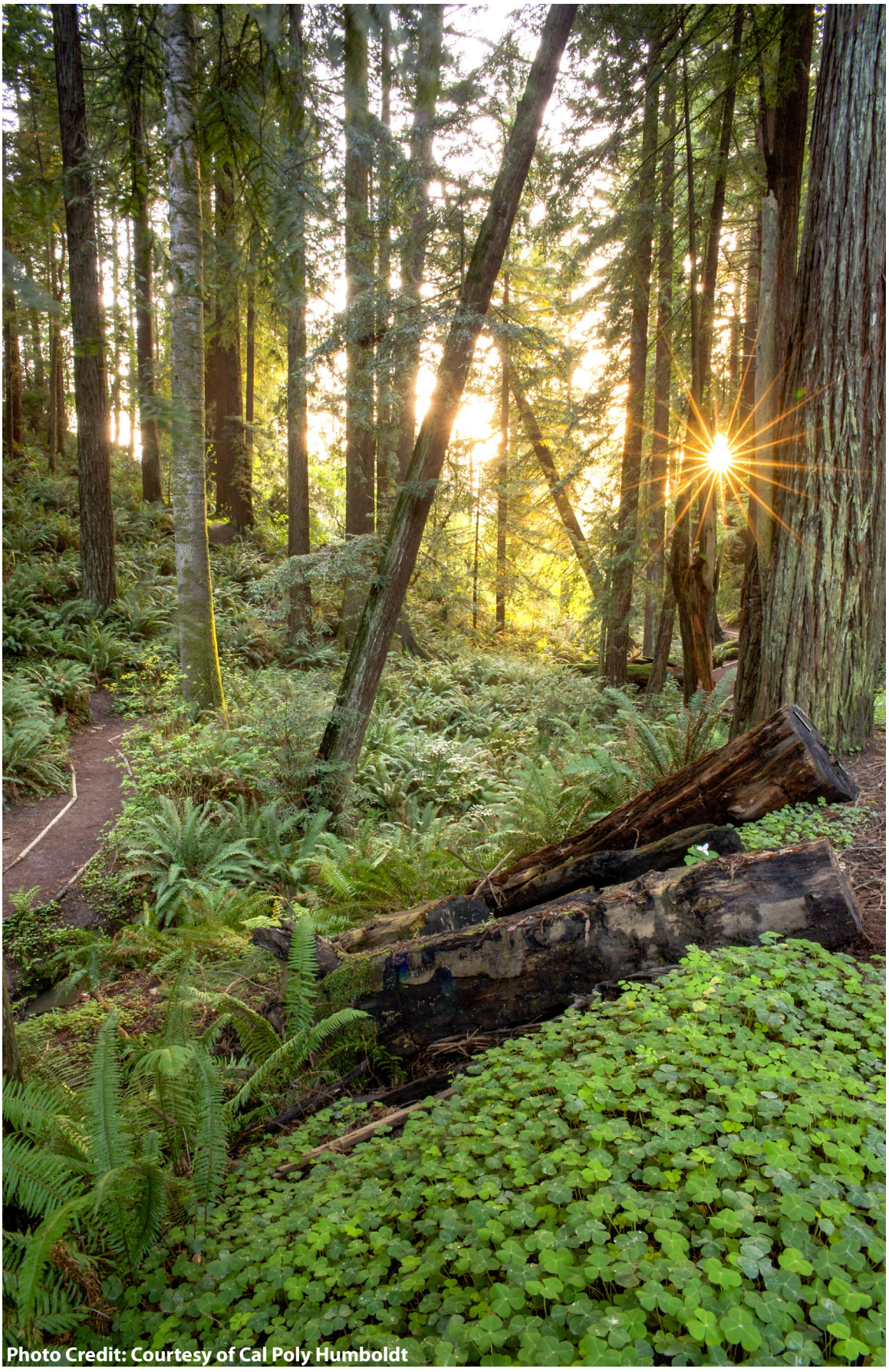


Photo Credit: Courtesy of Cal Poly Humboldt

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PROJECT VISION

2.1 VISIONING SUMMARY

The feasibility study process for this project started with a comprehensive strategic visioning process in alignment with Cal Poly Humboldt Future Forward Strategic Plan 2021-2026, the Cal Poly Prosepectus and Cal Poly Implementation. The feasibility consultant team hosted several workshops to define project specific vision pillars, understand the program's goals and challenges, site related issues, success factors, metrics of success and empathy building. The goal of these workshops was to strengthen stakeholder engagement, trust and understanding while also defining project priorities and building consensus. From these early workshop sessions, the Cal Poly Humboldt Engineering + Technology and Student Life working group members collectively determined a clear set of evaluation criteria based on the declared vision pillars and project priorities as defined in Section 01: Vision Pillars and Priorities – Innovative Excellence, Future Ready Resilience, Student Persistence, Social and Environmental Justice Leadership, Future Ready Resiliences for the academic building and focus on the 8 dimensions of wellness for the student housing. Subsequently, the evaluation criteria were leveraged to streamline decision making during the concept test fits strategies and constraints – promoting discussion and health debate about advantages and unresolved challenges of each concept.

2.2 ALIGNMENT OF PURPOSE

In defining the work and alignment of vision and goals for this project, it is important to understand and combine the purpose and vision of the prime project stakeholders at various levels – Cal Poly Humboldt at the institutional campus level, the College of Natural Resources & Sciences and Housing & Residence Life at the project scope level.

2.2.1 CAL POLY HUMBOLDT

The purpose of Cal Poly Humboldt is: To provide the highest quality and affordable college education built on the contributions of diverse students, staff, and faculty who are committed to a just and sustainable world.

> **The Diversity, Equity & Inclusion Council recommended a change of Humboldt's "Mission" to "Purpose" to acknowledge that Humboldt sits on unceded land initially occupied by the first people of this area. The word "Mission" for many connotes colonial language.*

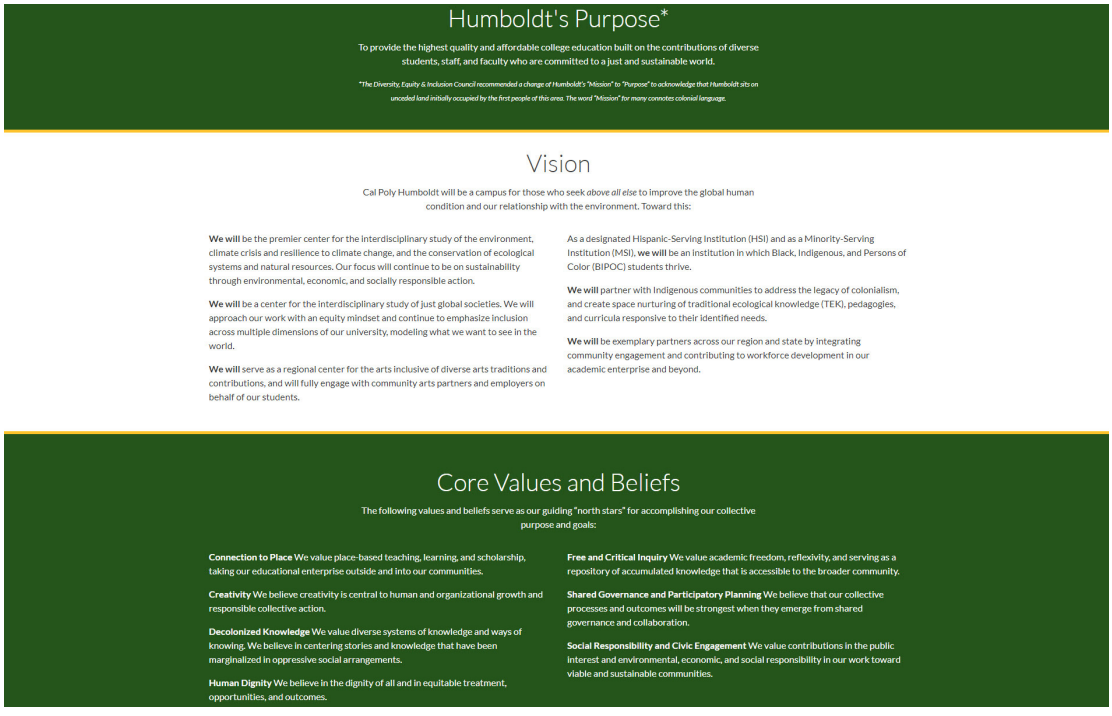
Since its beginning in 1913, California State Polytechnic University, Humboldt (reffered to as Cal Poly Humbodt) has provided generations of students with unique educational experiences built upon the motto, Discere Faciendo or Learning by Doing in a place-based, inclusive learning community of faculty, staff, and students who live, work, and study within a residential Northern California setting. Today, Cal Poly, Humboldt is a comprehensive university serving not only the local region, but also the state, the nation, and the world, through instruction, research, and public service.

Cal Poly Humboldt announced a bold new vision in its "Future Forward: 2021-2026 Strategic Plan," which outlines the University's purpose, values, and goals for the next five years. The plan articulates the University's vision "to be a campus for those who seek, above all else, to improve the global human condition and our relationship with the environment."

To support that vision, the University has established six key themes:

- **Academic Roadmap**: Providing recommendations for advancing academic excellence and access. The Humboldt Academic Roadmap promotes distinctive, innovative academic programs and ways of instruction centered on the curricular needs for well-prepared students, including our support and development of programs that assist Humboldt in achieving the polytechnic designation.
- **Community Collaboration & Shared Success**: Working together, sharing resources, communicating openly, and creating an inclusive and welcoming environment.
- **Employee Engagement & Success**: Ensuring all Humboldt employees—faculty, stateside and auxiliary staff, administrators, and student employees—have what they need to be involved in, enthusiastic about, and committed to their work and to Humboldt.
- **Future Proofing Humboldt**: Creating the type of university that can adapt and thrive in the future and respond effectively to internal and external challenges and opportunities.
- **Resources Stewardship & Sustainability**: Promoting goals that appropriately generate, manage, and invest resources toward the purpose of the University and its adopted guiding plans, through the common lens of "student first,"equity, inclusivity, and sustainability.
- **Student Experience & Success**: Identifying and building strategies that promote positive and meaningful student engagement experiences and success.

Figure 2.2.1 - Humboldt Purpose, Vision, and Core Values and Beliefs



2.2.2 COLLEGE OF NATURAL RESOURCES & SCIENCES

The purpose of the College of Natural Resources and Sciences is to provide a high quality education through student-centered, hands-on learning in inclusive learning environments; collaborates with campus and community partners; serves the region and the State of California; prepares students to be scientifically literate global citizens who incorporate diverse cultural and cross-disciplinary knowledge systems into their work; and carries out transformative research that advances scientific understanding and benefits all members of society.

The Vision of the College of Natural Resources & Sciences is:

- To deliver instruction in culturally inclusive and equitable learning environments that reflect the diversity of our students and broaden participation in STEM disciplines,
- To provide a socially and academically supportive learning environment that allows student excitement for the sciences to flourish,
- To meet the Humboldt Graduation Initiative 2025 Goals established by the Chancellor's Office,
- To be a regional center for interdisciplinary research that addresses challenges such as sustainable use of natural resources and climate change,
- To establish a robust budget model that funds the curriculum, faculty and staff development, facilities (e.g., new Science Building), and undergraduate and graduate student research experiences.

Figure 2.2.2 - College of Natural Resources & Sciences

2.2.3 HOUSING & RESIDENCE LIFE PURPOSE AND VISION

Commitment to Academics

Recognizing the connections between holistic well-being and education persistence while practicing the necessary skills to be successful in and out of the classroom. Key objectives for residents include:

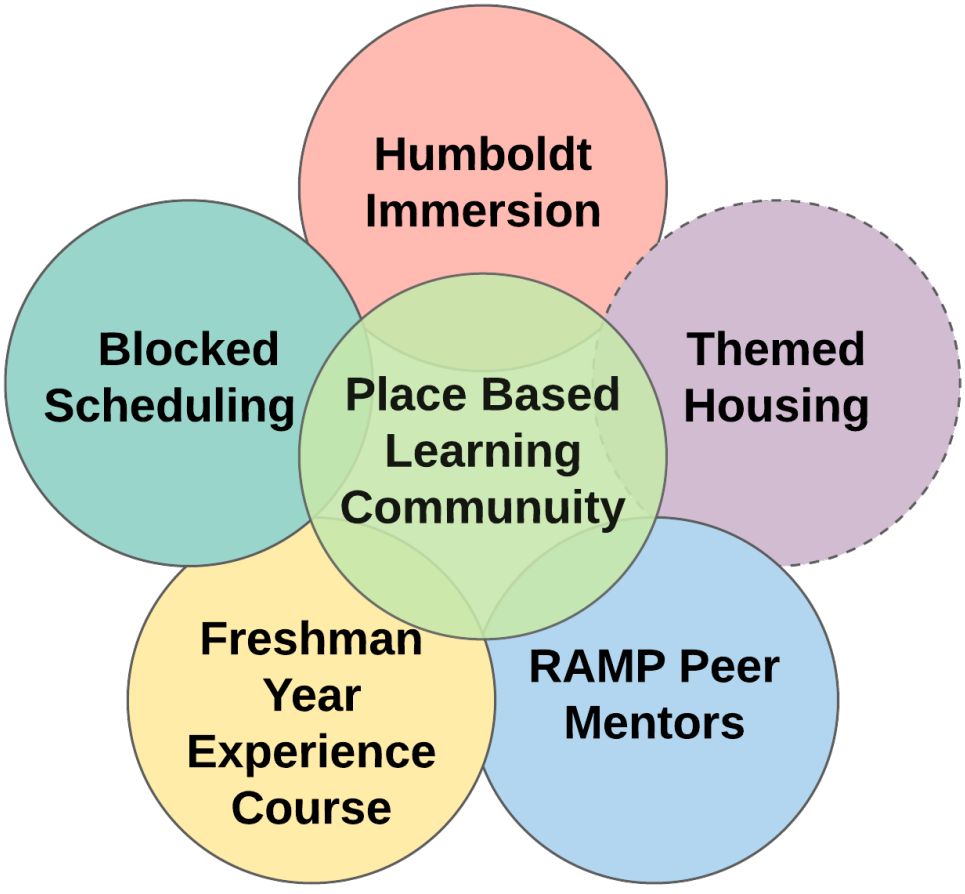
- Identify available campus resources to assist in their academic success
- Apply academic knowledge to out-of-the-classroom experiences and career aspirations
- Implement a personal set of academic skills and study techniques

Social Justice

Valuing social justice means gaining the knowledge to support and promote allyship and advocacy for a more equitable society; and being the voice for change within your community. Key objectives for residents include:

- Access available campus and community resources to address incidents of bias and to support mental and physical health
- Engage in dialogue about systems of power, oppression and intersectionality
- Develop an understanding of one's own identity in social contexts and the impact this has on their communities

Figure 2.2.3.1 - Housing & Residence Life Purpose and Visions



Environmental Justice

Honoring our environment means acknowledging that Humboldt sits on unceded land belonging to the Wiyot Tribe; framing our education and learning within that context; and working towards lessening our footprint on the land through individual actions. Key objectives for residents include:

- Incorporate different strategies and resources to help them live a more sustainable and environmentally conscious life

Community Engagement

Engaging in the community means making an effort to be an active participant in the community around you; recognizing the positive and negative impact that your actions may have on others; and making your mark. Key objectives for residents include:

- Identify campus resources that exist to further connect them to the campus and local community
- Practice holding themselves and others accountable for their actions and the impact on the larger community
- Actively engage in their housing and/or university communities

Holistic Health

Holistic health is defined as acquiring skills to be independent and build resiliency; reflecting on and developing your identities, values, and goals; and implementing self-care strategies. Key objectives for residents include:

- Engage in critical reflection as a means for personal and professional growth
- Set goals and develop strategies to achieve them
- Utilize strategies to ensure self-care and balance

Figure 2.2.3.2 - Housing & Residence Life Purpose and Vision

2.3 POLYTECHNIC VISION

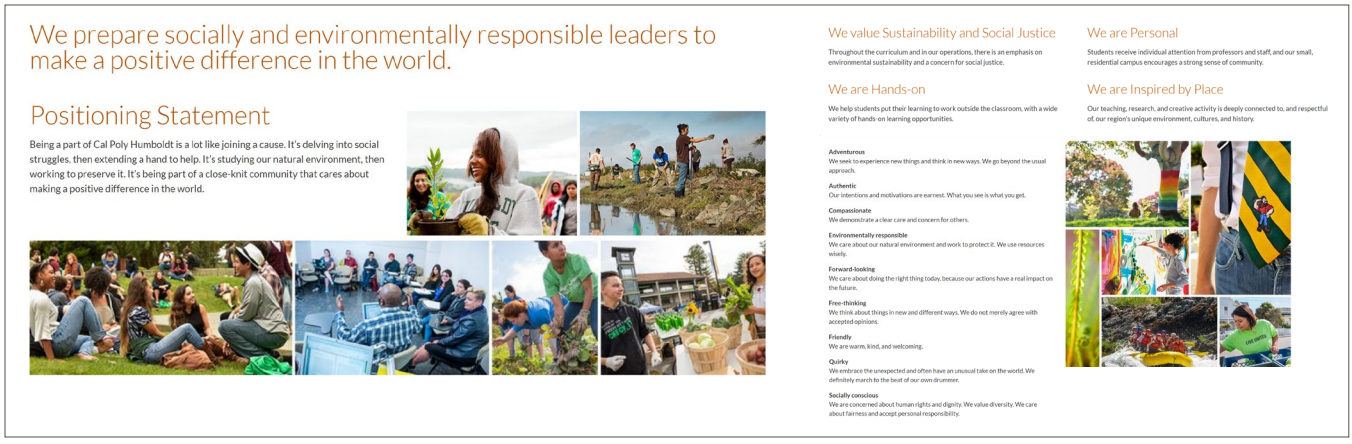
A focus on applied learning is what sets a polytechnic university apart from a traditional university. Also known as experiential learning, it combines the in-depth study found at universities with practical, technology-based skills training. Polytechnic institutions specialize in STEM courses, providing students with hands-on learning and educational experiences in addition to a strong liberal arts foundation.

In preparation to becoming a polytechnic university, Cal Poly Humboldt was required to submit an in-depth and honest look at strengths and aspirations. The community worked together on a comprehensive self-study – the Polytechnic Prospectus, conducted with critical input and collaboration from staff, faculty, students, alumni, and stakeholders.

Recognizing the impact of the California State University on the state's economy and workforce, the State of California made a significant investment of $458 million in the 2021-22 state budget to help propel Humboldt State University's transition to become a polytechnic university. The funding will enable California State Polytechnic University, Humboldt to add new academic programs that will help fill workforce gaps, modernize existing facilities, and build new infrastructure and increase access for the state's students seeking science, technology, engineering and math (STEM) degrees.

After the self-study process was completed and the polytechnic prospectus was submitted to the CSU Board of Trustees, an unprecedented effort began. Working groups were charged with the Polytechnic Implementation of the University's polytechnic vision with bold, innovative, and forward-looking plans.

Figure 2.3 - Positioning Statement



2.4 PROJECT PARAMETERS

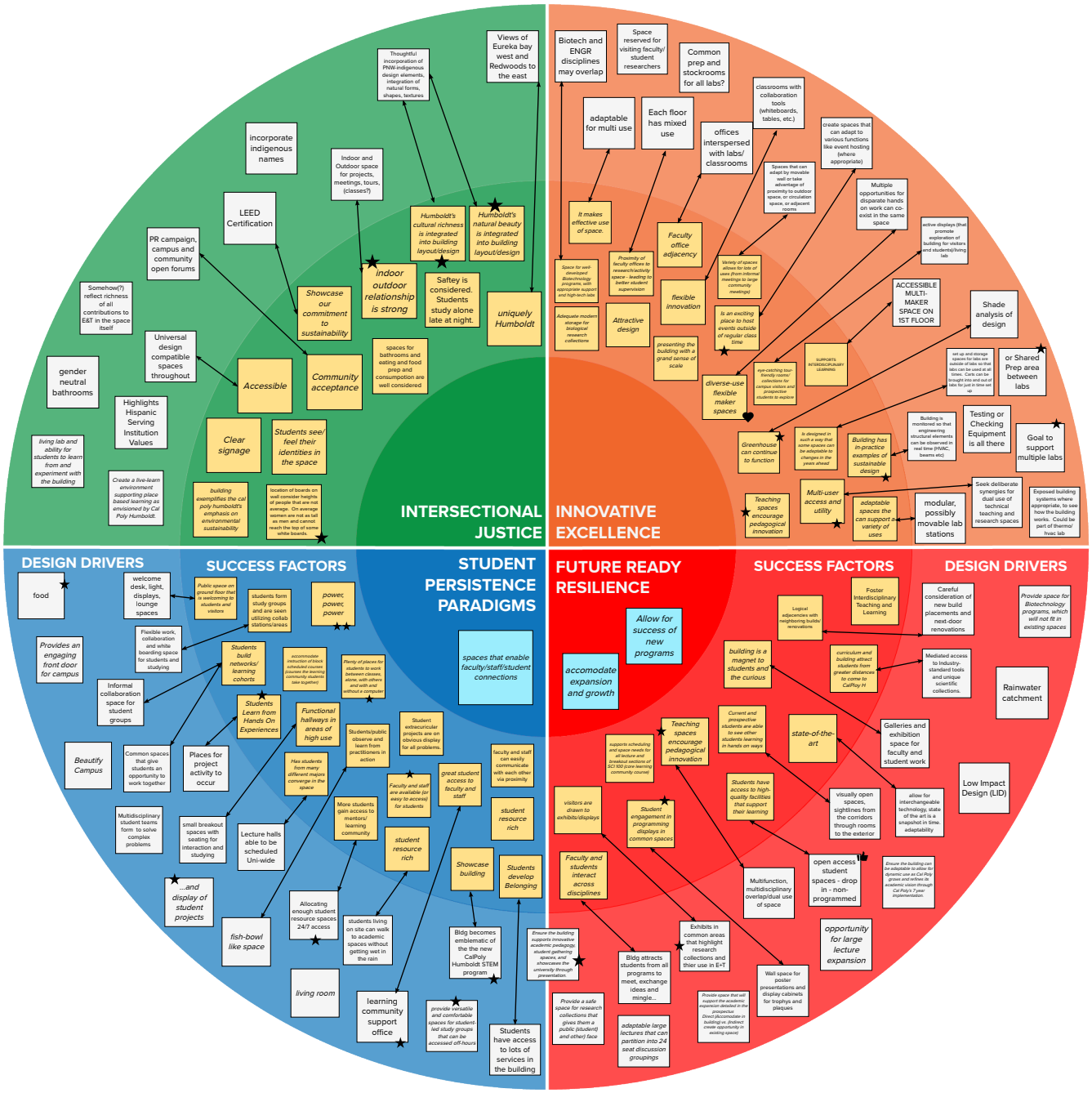
As part of the Polytechnic Implementation plan's the Engineering and Technology Academic Building will house five programs focused on engineering of physical systems that are anticipated to start in Fall 2023. Of the five, three new programs are being newly developed for launch in 2023. The Engineering & Community Practice Mechanical Engineering, a one-year practice-based masters, is being developed and offered as an interdisciplinary collaboration between the Native American Studies department and engineering faculty. The other new programs, Energy Systems and Mechanical Engineering, are being developed by the engineering faculty in consultation with others on campus. The project will provide updated facilities and equipment to support applied learning that is critical to Engineering and Technology instruction. Additionally, the building provide much needed space to attract and retain faculty as well as provide academic persistence resources, study and collaborative spaces.

Complimenting the Academic building functions will be a 250 bed student housing building with residential and student spaces that support placed based learning community objectives. Housing units of mainly doubles and some singles will support first year students that enroll in the College of Natural Resources and Sciences, Engineering and Technology programs.

2.5 VISION PILLARS AND SUPPORTING GOALS

In the visioning section of the feasibility study, the Engineering & Technology Acadmic Building and Student Life / Housing working group's stakeholders were prompted with a series of workshop exercises that captured the collective goals and challenges, success factors, metrics of success, and observational strength, weaknesses, opportunities and barriers attitudes about the project's proposed site location. As defined in Section 1, the Vision Pillars for Engineering + Technology Academic Building and the Student housing were used to frame the exercises for Project Goals, Challenges, Metrics of Success and Succes Factors respectively for each building's needs. Each building had separate Visioning exercises to best serve the program development. The pie diagram represents the culmination of responses gathered from the following exercises which are also summarize by each workshop process conducted and key outcomes to note in the above-mentioned areas.

Figure 2.5 - Vision Pillar Strategic Goals



2.5.1 EXERCISE 1: PROJECT GOALS AND CHALLENGES

PURPOSE

This exercise supported stakeholders in voicing their aspirations and concerns about the project in a crowdsourced format on virtual post-its followed by discussion. The format promotes interdisciplinarity, allows for transparent discussion in a safe forum while maximizing feedback and promoting healthy debate and listening to differing points of view. The exercise was conducted virtually, and participants were asked to populate the board with multiple goals and challenges prior to the discussion.

SUMMARY OF PRIORITIES - ACADEMIC BUILDING

Key project GOALS for the group include the following:

- Develop a hub for the academic campus that is a visual centerpiece capturing the values of the university.
- Provide an engaging gateway and front door for the heart of the campus at the intersection of Harpst Street and B Street.
- Create a live-learn environment supporting place based learning as envisioned for the new Cal Poly Humboldt campus.
- Design a building project that integrates formal and informal interior environments with dynamic exterior spaces.
- Create a living lab environment showcasing the ability for students to learn from and experiment with the building and surrounding site.

Key project CHALLENGES for the group include the following:

- Creating a flexible building with spaces for programs that have not been developed yet supported by faculty and staff that have not been hired yet.
- Balancing an inclusive design and vision with exclusive and necessary dedicated uses.
- Developing a synergistic relationship between the academic building and the housing building while balancing the needs for showcased learning and residential privacy.
- Avoiding shading the adjacent greenhouse building with its rare plant collection.

SUMMARY OF PRIORITIES - STUDENT HOUSING / LIFE

Key project GOALS for the group include the following:

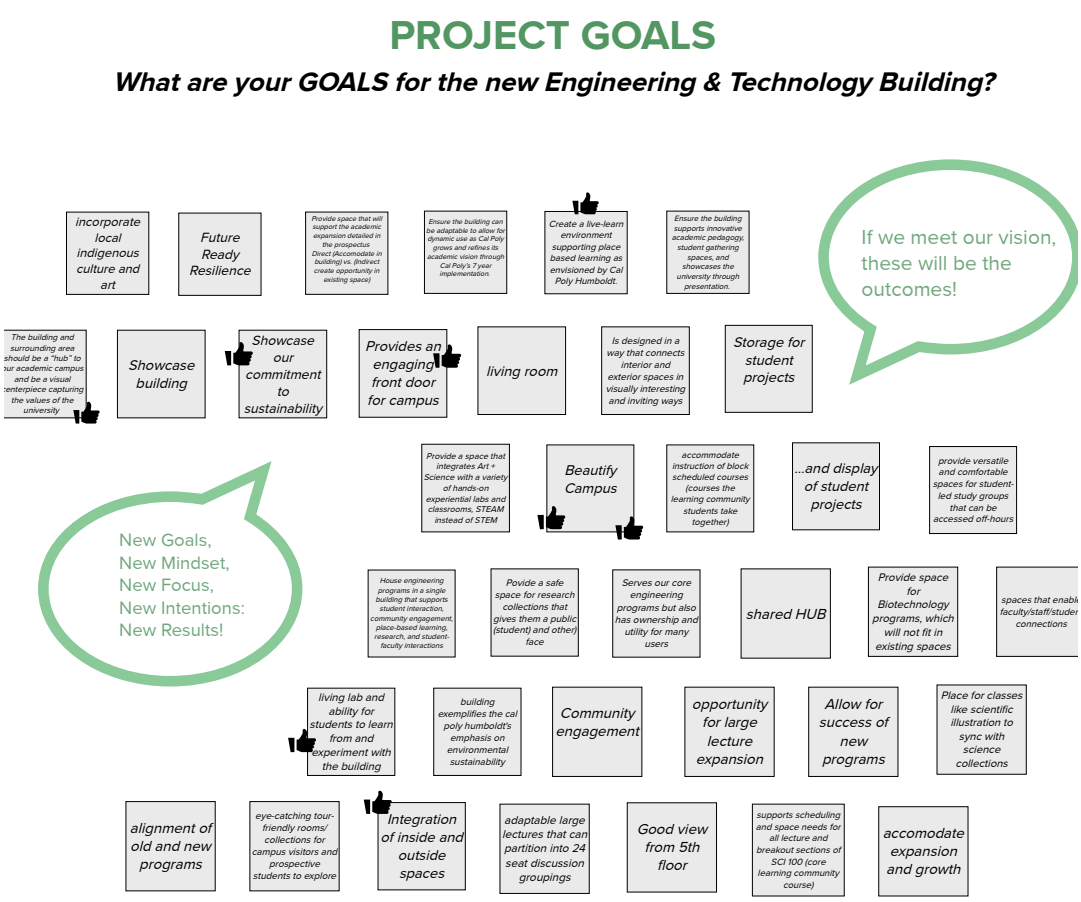
- A building that is welcoming and balanced with the build site and context of other buildings
- Good flow with organic feeling, modern aesthetic that feels warm and inviting.
- A space focusing to support students basic and social needs
- Represents a holistic living and learning ecosystem

Key project CHALLENGES for the group include the following:

- Constrained building site and adjacent functions – greehouse and wildlife neighbors

- Getting the right mix of social program spaces to foster community
- Noise and privacy concerns from the academic building visitors
- Access and loading for residential that is competing with academic needs

Figure 2.5.1 - Project Goals and Challenges



Some things to consider:

What are your high level goals for the project?
How can this project be a catalyst for the new Cal Poly Vision?
How can this project represent the Cal Poly Humboldt mission and vision?

2.5.2 EXERCISE 2: SUCCESS FACTORS AND MEASURING SUCCESS

PURPOSE

This exercise built upon the established project goals and challenges and asked the working group stakeholders to provide more detailed descriptions of success factors and metrics of success that would begin to shape ideas of physical characteristics of spaces within the program. The success factors and metrics would also be leveraged to make connections between vision pillars, goals/challenge to establish criteria for creating program adjacency priorities and evaluating concept test fit options.

SUMMARY OF PRIORITIES - ACADEMIC BUILDING

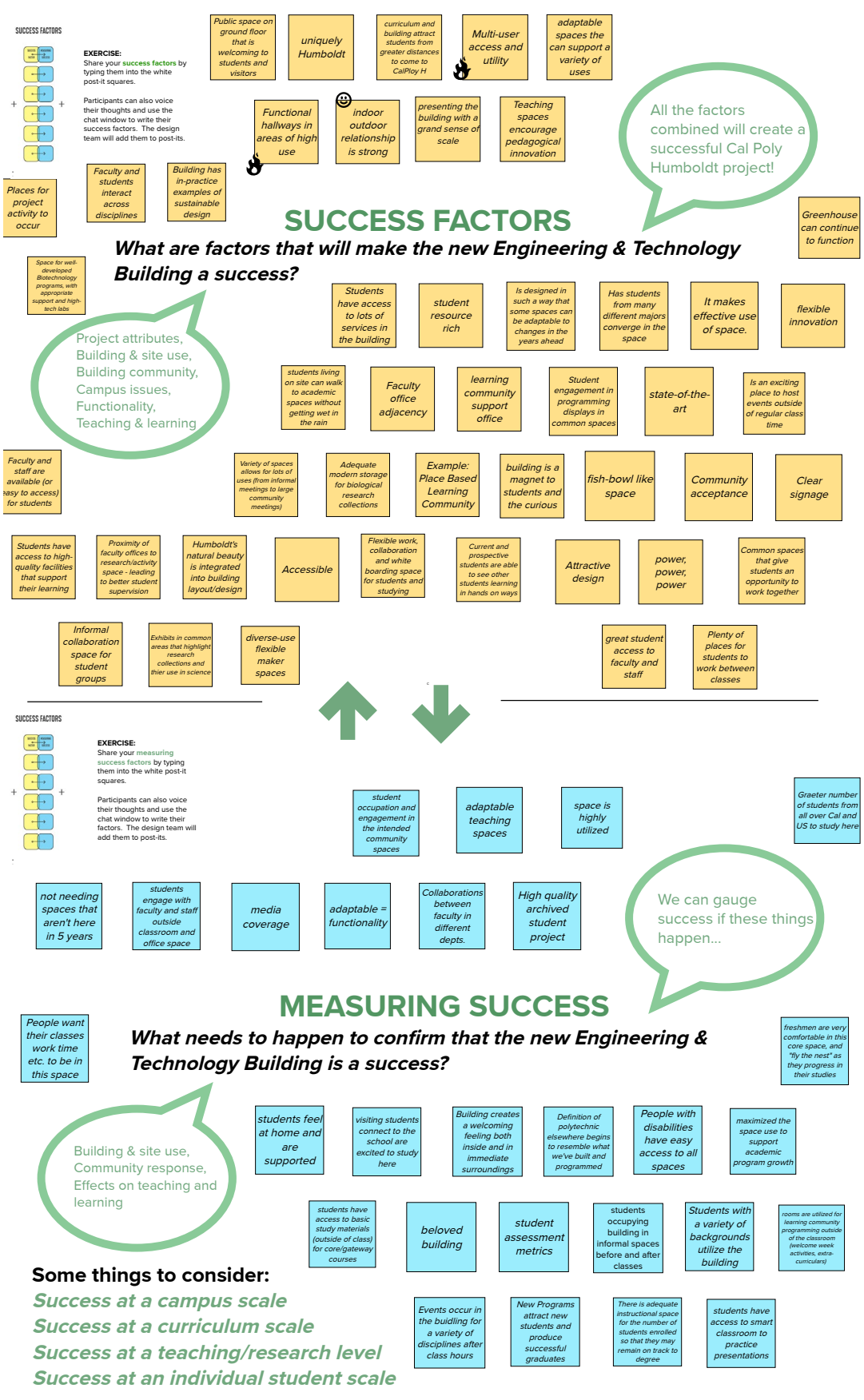
Key project SUCCESS FACTORS for the group include the following:

- Building includes space for well-developed Biotechnology programs, with appropriate support and high technology labs.
- The project includes in-practice examples of sustainable design.
- The building encorporates highly flexible and adaptable spaces that can support a variety of uses.
- The inclusion of a strong network of student resource and engagement spaces to allow for informal learning / gathering and student work / collections display opportunities.
- Creating an inviting building with opportunities to showcase the hands-on learning spaces fo roccupants and visitors.
- Students embrace the live / learn philosophy creating a unique experience for those living on-site.

Key project METRICS OF SUCCESS for the group include the following:

- Increased interest from diverse high performing students across the country an the globe.
- Clear opportunities for student engagement with faculty and staff outside the formal classroom and office spaces.
- Showcase labs and hands-on learning spaces become a magnet on campus for the science focused and the science curious.
- Outdoor spaces that are comfortable and flexible year-round. These spaces relate to the adjacent teaching spaces and help t oattract attention to the state-of-the-art lab spaces.
- The on-site housing become an integral part of the learning experience for Engineering + Technology.

Figure 2.5.2 - Success Factors and Measuring Success



SUMMARY OF PRIORITIES – STUDENT HOUSING / LIFE

Key project SUCCESS FACTORS for the group include the following:

- Increase the rates of persistence for students living here
- Increase in enrollment/selection of this housing location
- Active use of social and collaborative spaces
- Creating narrative for the interactions of programs and building users.

Key project METRICS OF SUCCESS for the group include the following:

- Survey of holistic wellness of residents to understand what is working
- Assess mental health and basic needs with academic progress
- Data of satisfaction for students housed on campus and in placee based learning community
- Tracking First and Second year retention rates of Engineering and Technology programs students
-

2.5.3 EXERCISE 3: SITE STRENGTHS, WEAKNESSES, OPPORTUNITIES, AND BARRIERS

PURPOSE

This exercise allowed for the working group stakeholders to assess, share and discuss key perceptions about the site characteristics both in existing conditions and future potential for this project. Strengths and weaknesses provided focus on the current state of the site, while Opportunities and Barriers provided focus on the future state of the site. The exercise also encouraged the group to evaluate in the context of campus mobility, land uses, program adjacencies, ecology and orientation, and image/identity.

SUMMARY OF PRIORITIES

Key Perceived SITE STRENGTHS for the group include the following:

- Prominent location creating a major campus gateway, destination and hub.
- Ideally located to capture existing pedestrian traffic on campus.
- Proximate location to nearby Engineering spaces.

Key Perceived SITE WEAKNESSES for the group include the following:

- Loss of a large central campus greenspace.
- Potential for shade effecting functionality of the adjacent greenhouse building.
- Noise concerns for residential functions in predominantly academic core.

Key Perceived SITE OPPORTUNITIES for the group include the following:

- The project can set the tone for the pedestrian friendly transformation of B Street.
- The centralized project site will really showcase the hands-on active learning spaces.
- An opportunity to create a signature presence and welcoming hub at a main campus entry point.
- Increase housing access and support integration of learning and living with PBLC.

Key Perceived SITE BARRIERS for the group include the following:

- Requirements and needs for adjacent buildings may affect the project design.
- Loading access points for the buildings may be limited.
- The scale of surrounding buildings may not align with size of the new development.
- Mobility and connectivity of academic and housing with similar, potentially competing needs.

Figure 2.5.3 - SWOB Exercise

Some things to consider:

What is the project's role at a site and campus scale?
Can the project become a HUB for the adjacent buildings and campus?
How collections are stored and utilized.
How this project can help improve adjacent buildings and their programs.

2.5.4 EXERCISE 4: EMPATHY BUILDING

PURPOSE

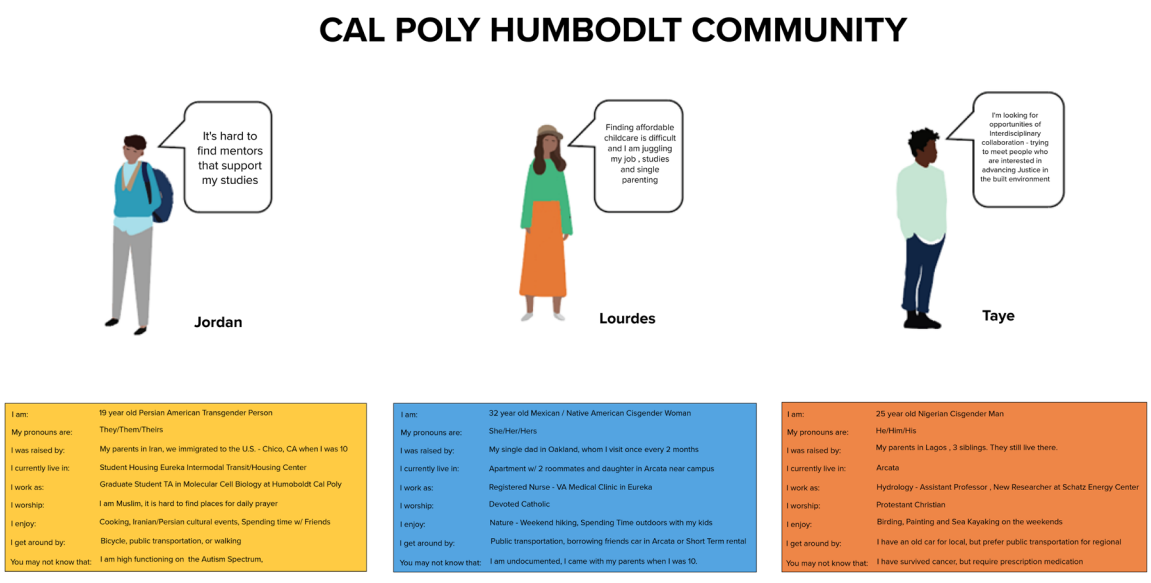
This exercise was conducted with stakeholders in person to gain insights of student perspectives prior to a larger outreach opportunity to gain student feedback. Each participant was asked to assume the identity of a student persona that highlighted intersectional identities and unique lived experiences which include a spectrum of implicit challenges and potential bias for these individuals. Based on their persona, each stakeholder was also asked to identify potential challenges and opportunities that the student may encounter in approaching and utilizing the resources of this project.

SUMMARY OF PRIORITIES

Key observations from the Empathy Building personas exercise:

- Accessibility and Mobility challenges given lack of existing accessible pathways, and grade changes around campus.
- Stigmas and bias about who may be perceived as belonging given the safety concerns for injury around engineering equipment and access for those who are non-staff members while trying to maintain the welcoming nature of the building.
- Provision of "third space" student study/collaboration space for students who don't have access to on-campus housing while balanced with the programmed functions that would promote learning communities.
- Addressing needs for a wide range of building users – ie., mother's room, all gender restroom accommodations, showers for non-vehicular commuters, quiet room for nuerodiverse, etc.
- Increase access to affordable housing accommodations that support belonging of a range of student needs. Increase access to food in and around the building – given long hours for researchers and students working on projects.

Figure 2.5.4 - Empathy Building



2.6 EVALUATION CRITERIA

Based on the defined priorities from the Visioning workshop exercises and outcomes described above, the feasibility team facilitated the development of the evaluation criteria for the Engineering + Technology academic and housing concept test fits. The following is a summary of the evaluation criteria priorities in four main areas: Site Context, Function, Staff/Student User Experience, and Community.

1. Creates a strong presence and welcoming to campus from the Harpst Street approach. (Site)
2. Establishes visual and physical connections to the neighboring academic buildings along B St. and 17th St. (Site)
3. Respectful of campus context (limit impact of reducing daylight for greenhouse) and user accessibility. Improves mobility and circulation. (Site)
4. E+T program and adjacencies support flexibility and future teaching/research needs. (optimize functions) (Function)
5. Building as teaching tool - i.e., height, orientation and solar exposure, water management supports sustainability and resilience practices. (Function)
6. Fosters high collaboration between Engineering, Technology and Environmental Sciences users as well as learning community. (Function)
7. HEART SPACE - supports student belonging, curiosity, and engagement in formal and informal learning spaces. (Staff/Student UX)
8. Organization supports collaboration between students and faculty while space resources offer multiple uses and flexibility. (Staff/Student UX)
9. Spaces promote holistic wellness - welcoming, ease of navigation, natural light, views, indoor/outdoor connections. (Staff/Student UX)
10. Alignment with Prospectus - provide Welcoming Hub with clear wayfinding and ease of navigation for all. (Community)
11. Community resources are easy to locate and highly visible areas for public gathering and support. (Community)
12. Accessible to All - universal access to site resources including, provisions to support exchange with larger community. (Community)

Photo Credit: Courtesy of Cal Poly Humboldt

03
PROGRAM

3.1 PROGRAM DEVELOPMENT

The Engineering & Technology Academic Building and Student Housing Project programming process began with the Feasibility Team working closely with the working group stakeholders in a parallel process for the Visioning workshops to develop and align the Space Program. Through a series of workshops and meetings, these baseline assumptions were reviewed, tested and refined to arrive at the Feasibility Study Space Program on the following pages. The Baseline Space Program and the Feasibility Study Space Program (Summary and Detailed) are described in further detail in the following narrative.

Additionally, the University desired programmatic elements beyond those that could be accommodated within the project's cost parameters. These additional spaces are captured in a Growth & Flexibility Component.

3.2 INITIAL PROGRAM DESCRIPTION

The Feasibility Study Process initiated with the following program description:

3.2.1 ENGINEERING & TECHNOLOGY PROGRAM

The Engineering & Technology academic building will be approximately 90,000 GSF of program area for the purposes of supporting STEM polytechnic expansion.

Overview of Engineering and Technology Academic Program:

The project will house five programs focused on engineering of physical systems that are anticipated for Fall 2023. Three new programs are being newly developed for launch in 2023. The Engineering & Community Practice Mechanical Engineering, a one-year practice-based masters, is being developed and offered as an interdisciplinary collaboration between the Native American Studies department and engineering faculty. The other new programs, Energy Systems and Mechanical Engineering, are being developed by the engineering faculty in consultation with others on campus. The project includes classroom and office space for the Technoloy department supporting Computer Science as well as four new programs: Software Engineering, Computer and Information Technology, Cybersecurity and Data Science.

The academic building program will support the following curriculum:

Engineering:

- Existing Environmental Resources Engineering B.S. degree
- Existing M.S. Environmental Systems E.R.E. option, and
- Three new programs:
  - Energy Systems Engineering B.S.,
  - Mechanical Engineering B.S.,
  - Engineering & Community Practice M.Eng.

Technology:

- Existing B.S. in Computer Science, and
- Four new programs
  - Software Engineering B.S.
  - Computer and Information Technology B.S.,
  - Cybersecurity B.S., and
  - Data Science B.S.

3.2.2 STUDENT HOUSING PROGRAM

The Student Housing building (approximately 40,000 GSF) will be sited adjacent to Engineering & Technology Academic Building with accessible routes. 250 beds consisting of mostly doubles will be provided with student life spaces, student services, and collaborative space connected to placed based learning goals.

3.3 BASELINE SPACE PROGRAM

3.3.1 PROCESS

During the programming process, adjustments to the Baseline Space Program were made in Working Group Meetings and reviewed and approved with the Stakeholder Working Group. An Overall Space Summary and Detailed Space List have been prepared and are included on the following pages.

3.3.2 DEFINITIONS

The space list uses the following terms or categories to describe the space requirements:

- Net or Assignable Area (ASF). The area of each space, as measured from interior wall to interior wall. Circulation space to or from the space is excluded, except at open workstations and enclosed offices that are part of a larger office environment or office suite.
- Building Gross Area (GSF). The total area of the building, including all primary circulation routes, shared vertical circulation, exterior walls and all mechanical shafts, plumbing chases, and telecommunications and electrical support spaces.

3.3.3 SPACE PROGRAM SUMMARY

3.3.3.1 ENGINEERING & TECHNOLOGY ACADEMIC BUILDING

Figure 3.3.3.1 - Space Program Summary - Academic Building

Department	Functional Category			Feasibility		
	Classroom - 100	Research and Teaching Laboratories - 200	Office Facilities - 300	Total ASF	% ASF	Stations
Engineering		22715	4,690	27,405	52%	418
Technology		2310	3370	5,680	11%	109
CNRS			1,580	1,580	2%	12
Shared	5130	7,590	4900	17,620	34%	343
Function Subtotal	5,130	32,615	14,540			
% ASF	10%	62%	28%			
Total Area / Assignable Square Feet (ASF)				52,285		
Efficiency Factor				60.00%		
Total Area / Gross Square Feet (GSF)				87,142		

Space Program Summary for the Engineering & Technology Academic Building is organized around the following primary categories:

- Engineering
- Technology
- College of Natural Sciences (CNRS) Offices
- Shared Academic and Resource Spaces

3.3.3.2 STUDENT HOUSING BUILDING

Space Program Summary for the Student Housing Building is organized around the following primary categories:

- Housing
  - Housing Units – Doubles and Singles, Resident Advisors, Resident Life Coord. Apartment
  - Resident Life Offices and Support
  - Shared Student Resource Spaces
- Academic
  - PBLC Classroom

Figure 3.3.3.2 - Space Program Summary - Student Housing

Department	Functional Category				Feasibility			
	Classroom - 100	Office Facilities - 200	General Use - 600	Residential - 900	Total ASF	% ASF	Beds	Stations
Housing		1,170	2,025	26505	29,700	97%	265%	63
Academic	980				980	3%		36
Function Subtotal	980	1,170	2,025	26,505				
% ASF	3%	4%	7%	86%				
Total Area / Assignable Square Feet (ASF)					30,680			
Efficiency Factor					70.00%			
Total Area / Gross Square Feet (GSF)					43,829			

3.3.4 DETAILED SPACE LIST

The Detailed Space List further segregates the primary organizational components into each of its functional space types (e.g. Teaching Lab, Laboratory Support, Research, Office, etc.) Within each sub-group the following have been identified:

- room name
- quantity of each room
- student stations per room
- student stations total based on quantity of rooms
- ASF of each room
- ASF total based on quantity of rooms
- Module quantity (where occurs)

Figure 3.3.4.1 - Detailed Space List - Academic Building

	Space Catagory	No.	Stations	Total Stations	FTE	ASF	# Modules / Space	Total # of Modules	Total Modular ASF	Total GSF
ENGINEERING + TECHNOLOGY PROGRAM								**212**	**52,285**	**87,142**
SHARED SPACES								**97**	**17,620**	**29,367**
Shared Academic Spaces								**19**	**5,130**	**8,550**
Large Lecture	Classroom	1	140	140		2,160	10	10	2,160	
Computational Methods Instruction Lab	Teaching Lab	3	24	72		990	3	9	2,970	
Shared Resources								**4.33**	**1,410**	**2,350**
Large Conference Room	Office Facilities	1	18	18		500			500	
Small Conference Room	Office Facilities	1	6	6		150			150	
Kitchenette	Meeting Space	2		0		55			110	
Faculty & Staff Breakroom w/ Kitchenette	Office Facilities	1		0		400			400	
Workroom - copier and work table	Office Facilities	1		0		250			250	
Student Support Space								**11.33**	**3,490**	**5,817**
Eng + Com Practice Grad Student Flexible Workspace	Office	1	10	10		900			900	
Eng + Com Practice / Env. Sys Grad Student Meeting Space	Office Facilities	1	10	10		400			400	
Professional Advising	Office	4	1	4		110	0.33	1.32	440	
Pathways to Careers	Office	1	1	1		150			150	
Student Clubs Coordination, Storage and Admin Space	Office Facilities	1	20	20		600			600	
Student Project and Homework Group Collaboration Space	Office Facilities	4	12	48		250			1,000	
Maker Space								**63**	**7,590**	**12,650**
Metal Maching Shop (High Bay)	Shop	1	12	12		3,000	9	9	2,970	
Wood Machine Shop (High Bay)	Shop	1				1,650	5	5	1,650	
Student Project Storage	Storage	4				220	0.67	2.68	880	
Haz Storage	Storage	1				220	0.67	0.67	220	
Fabrication Space Indoor (High Bay) - Adjacent to Outdoor	Teaching Lab	1				1,650	5	5	1,650	
Fabrication Space Outdoor (High Bay) - Adjacent to Indoor	Teaching Lab	1				2,500	6	6	0	
Office	Office	2	1	2		110	0.33	0.66	220	

	Space Catagory	No.	Stations	Total Stations	FTE	ASF	# Modules / Space	Total # of Modules	Total Modular ASF	Total GSF
ENGINEERING + TECHNOLOGY PROGRAM								**212**	**52,285**	**87,142**
CNRS								**17**	**1,580**	**2,633**
Faculty Workspace								**16.50**	**1,580**	**2,633**
Dean CNRS	Office	1	1	1		200			200	
Associate Dean (Student Affairs)	Office	1	1	1		150			150	
Dean's Office Space	Office Facilities	1	3	3		500			500	
PBLC Director	Office	1	1	1		110			110	
PBLC Department Office	Office Facilities	1	4	4		400			400	
Program Administrator/Program Analyst	Office	2	1	2		110	0.33	0.67	220	
ENGINEERING								**97**	**27,405**	**45,675**
Faculty Workspace								**16.50**	**4,690**	**7,817**
Engineering Faculty Director	Office	1	1	1		150			150	
Eng Department Office	Office Facilities	1	2	2		300			300	
Eng Department Mail/Copy	Office Facilities	1				100			100	
Faculty Offices	Office	30	1	30		110	0.33	10	3,300	
Faculty Shared Workspace	Office Facilities	1	8	8		400			400	
Huddle Room	Office Facilities	4				110			440	
Research Lab								**14.00**	**4,620**	**7,700**
Indigenous Science and Community Practices Labs	Teaching Lab	1	8	8		1,320	4	4	1,320	
Engineering Research Large	Teaching Lab	1	18	18		1,320	4	4	1,320	
Engineering Research Medium	Teaching Lab	2	6	12		660	2	4	1,320	
Engineering Research Medium (Clean Room)	Teaching Lab	1	2	2		660	2	2	660	
Instructional and Research Support								**54.83**	**18,095**	**30,158**
Machine Shop with Welding Booth	Shop	1				660	2	2	660	
Machine Shop Office	Office	1	1	1		110	0.33	0.33	110	
Wastewater/Bioprocess Lab	Teaching Lab	1				495	1.50	1.50	495	
Water Quality Lab	Teaching Lab	1	24	24		1,650	5	5	1,650	
Waste/Water Chem & Instrument storage	Teaching Lab	1				660	2	2	660	
Thermodynamics Design Lab (JH214)	Teaching Lab	1	24	24		990	3	3	990	
Mechatronics Lab	Teaching Lab	1	24	24		1,650	5	5	1,650	
Hydraulics Lab - Testing Only	Teaching Lab	1				990	3	3	990	
Materials Science Lab - Testing Only	Teaching Lab	1				990	3	3	990	
Storage	Teaching Lab Support	3				990	1	3	990	
Design and Applied Engineering Instruction Studio - Medium	Teaching Lab	5	24	120		990	3	15	4,950	
Design and Applied Engineering Instruction Studio - Large	Teaching Lab	3	48	144		1,320	4	12	3,960	
TECHNOLOGY								**18**	**5,680**	**9,467**
Faculty Workspace								**11**	**3,370**	**5,617**
Technology Faculty Director	Office	1	1	1		150			150	
Tech Department Office	Office Facilities	1	2	2		300			300	
Tech Department Mail/Copy	Office Facilities	1				100			100	
Tech Faculty Offices (T/TT)	Office	20	1	20		110	0.33	6.6	2,200	
Tech Faculty Shared Workspace (Lecturers, etc.)	Office Facilities	1	1	8		400			400	
Huddle Space	Office Facilities	2	3	6		110	0.33	0.7	220	
Instructional and Research Support								**7**	**2,310**	**3850**
CS Teaching Lab	Teaching Lab	1	24	24		990	3	3	990	
CS Teaching lab - Active/Collaborative learning	Teaching Lab	1	48	48		1,320	4	4	1,320	

Figure 3.3.4.2 - Detailed Space List - Student Housing / Life

	Space Catagory	No.	Beds	Total Beds	Stations	Total Stations	ASF	Total ASF	Total GSF
STUDENT HOUSING PROGRAM								**30,680**	**43,829**
HOUSING								**29,700**	**42,429**
UNITS								**25,035**	**35,764**
Singles	Sleeping Unit	12	1	12			100	1,200	
Doubles	Sleeping Unit	121	2	242			180	21,780	
RA Unit	Sleeping Unit	7	1	7			180	1,260	
RLC Apartment	Sleeping Unit	1	4	4			795	795	
Shared Spaces								**4,665**	**6,664**
Reception	Office	1			1	1	500	500	
Office	Office	2			1	2	110	220	
Mailroom	Support	1					200	200	
Medium Meeting Room	Meeting Room	1			12	12	250	250	
Living Room/Gathering Space	Support	1			48	48	825	825	
Student Shared Lounge/Kitchenette	Shared	3					400	1,200	
Resident Hall Restrooms	Shared	3					390	1,170	
Laundry	Support	1					300	300	
ACADEMIC								**980**	**1,400**
Classroom								**980**	**1,400**
Multipurpose Classroom	Classroom	1			36	36	980	980	

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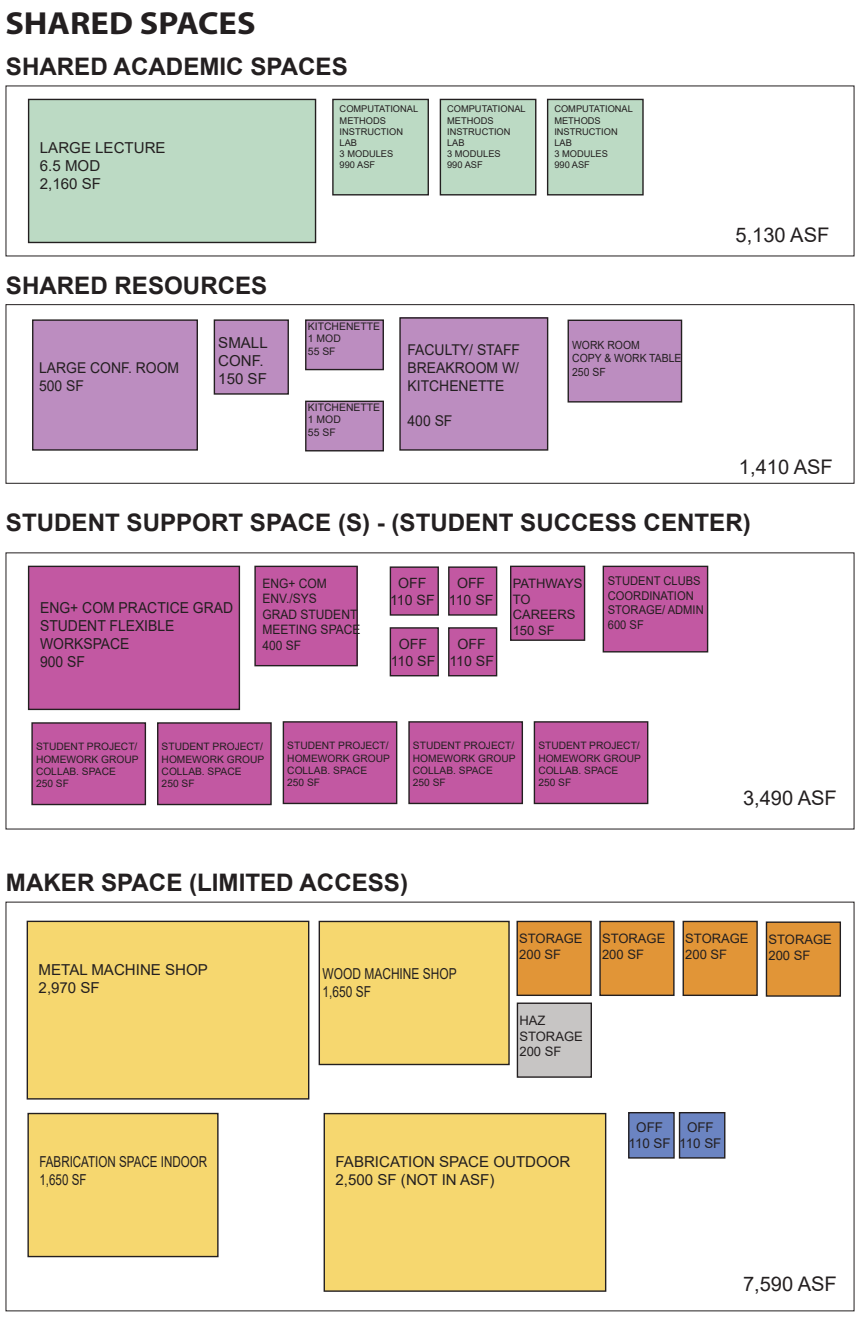
3.3.5 GRAPHIC PROGRAM

The following is a graphic depiction of each respective program summaries for the academic building and housing. Each shape indicates the size and number of each area of assignable square feet included in the program. The size of each space shown is proportional to the amount of area it occupies relative to the other areas in the building. For clarity, the graphic program is organized by the major program areas and color-coded to the conceptual plan test-fit in Section 4.

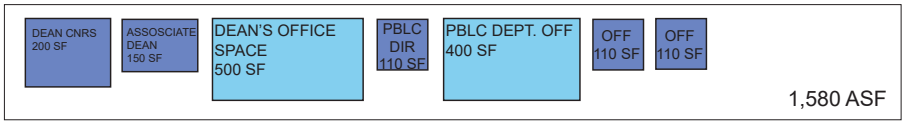
3.3.5.1 ACADEMIC BUILDING

Figure 3.3.5.1 - Graphic Program - Academic Program



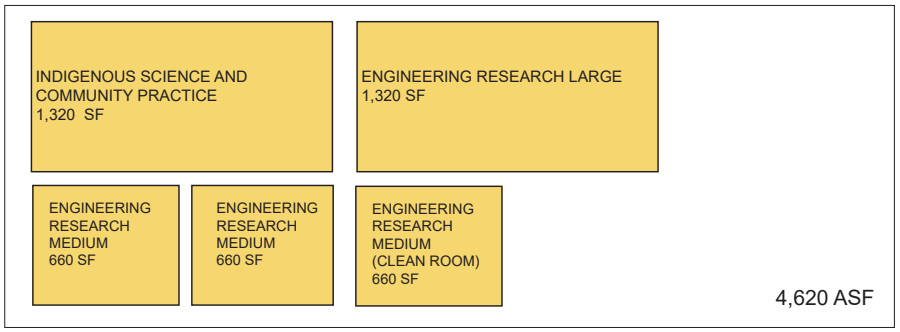
CNRS

FACULTY WORKSPACE

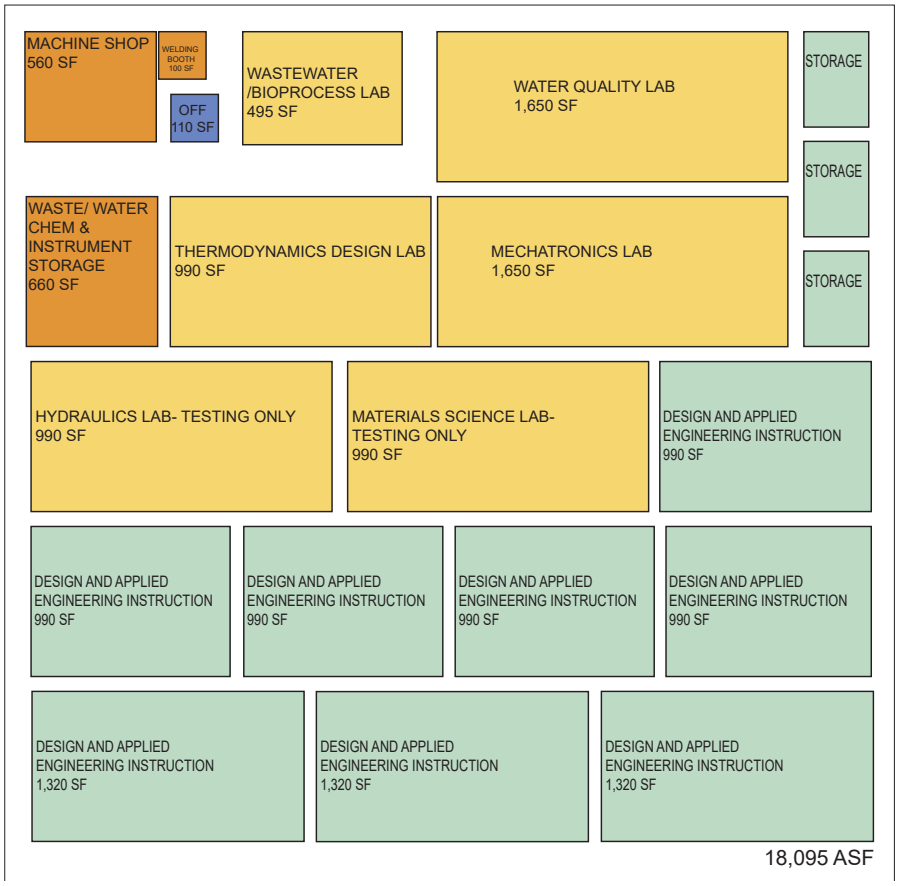


ENGINEERING

RESEARCH LAB(S)

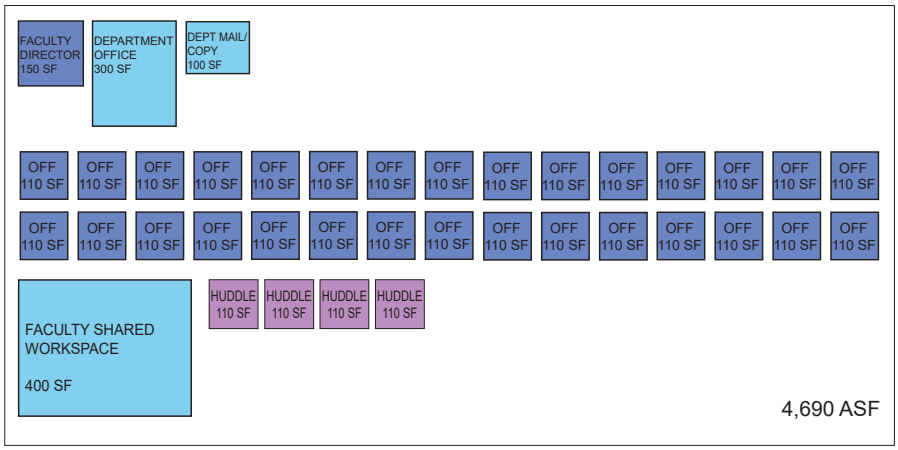


INSTRUCTIONAL AND RESEARCH SUPPORT



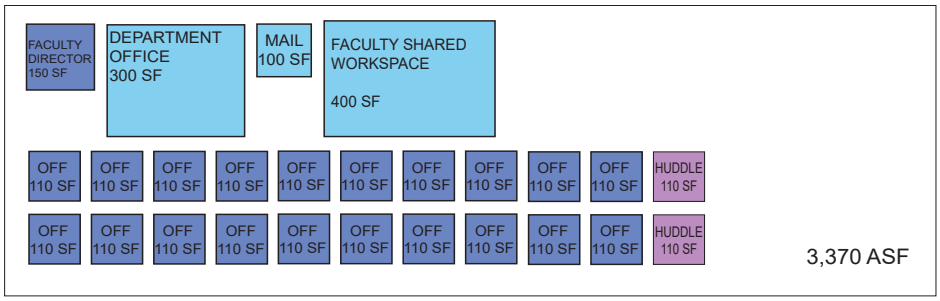
ENGINEERING

FACULTY WORKSPACE

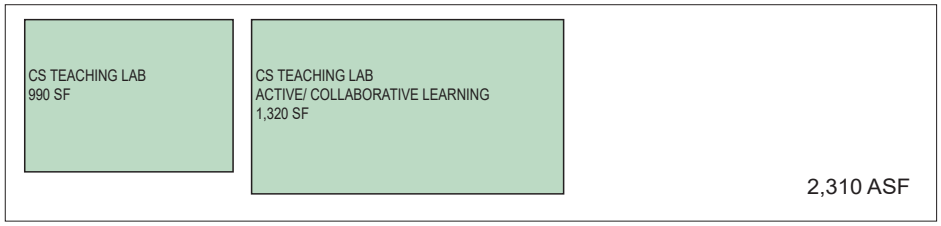


TECHNOLOGY

FACULTY WORKSPACE



INSTRUCTIONAL AND RESEARCH SUPPORT

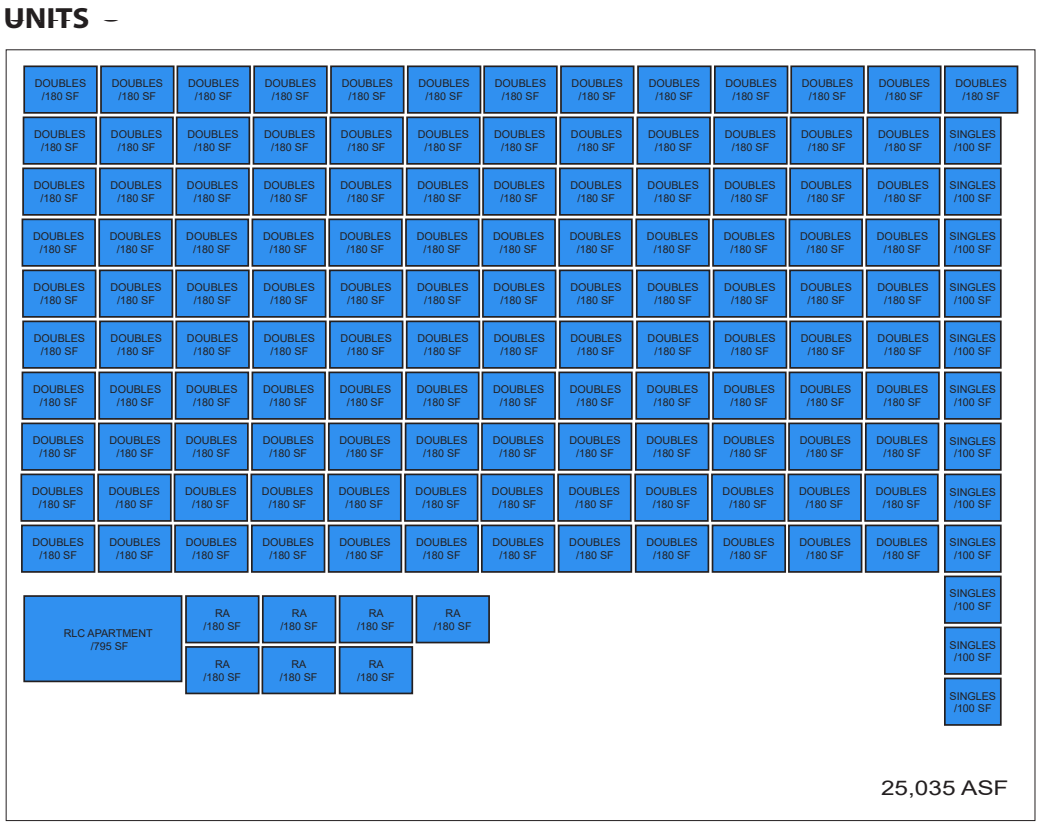


PROGRAM COLOR INDEX

- CLASSROOMS
- PRIVATE OFFICES/ PI OFFICES
- ADMIN/ ADMIN OPEN OFFICES
- INTERACTION/ GATHERING /CONFERENCE
- OPEN LABS/ LABS
- LAB SUPPORT
- BUILDING SUPPORT
- SPECIALITY (TUTORING CAREER SERVICES, ETC)

3.3.5.2 STUDENT HOUSING / LIFE

Figure 3.3.5.2 - Graphic Program - Student Housing / Life



3.3.6 GROWTH & FLEXIBILITY

The following programmatic elements were identified by the University and Stakeholders as a priority but identified to be beyond the allocated GSF for the project:

3.3.6.1 LECTURE HALL

The baseline program required a 144 seat lecture hall, and the 2,160 ASF allocated for the lecture hall in the Feasibility Program is calculated at 15 sf/pp. However, the stakeholders have identified the following for consideration:

- Flexible/Active Learning layout: The stakeholders requested a Lecture Hall that could accommodate a flexible and active learning pedagogy with moveable furniture. In order to achieve an active learning environment for 144 students, a factor of 20-25 sf/pp would need to be utilized resulting in 2,880 – 3,600 ASF for the Lecture Hall.
- Premier Lecture Hall: Premier Lecture Halls with an "in the round" fixed seating configuration for up to 244 students at 3,000 asf. were discussed with the leadership team as areas for exploration during the Collaborative Design Build Phase 1.

Lecture Hall size and student seat quantities to be verified with the University at the start of the Program Validation effort to define current campus needs. Campus Planning efforts will provide additional data for assessment of lecture utilization of existing campus facilities and should be reviewed at the beginning of DBE Phase 1.

See Section 7 Appendix for example of Lecture Hall layouts discussed.

3.4 ADJACENCY WORKSHOP: THE PERFECT DIAGRAM

PURPOSE

The following workshop exercise was conducted to have working group stakeholders describe the key functions that would be conducted amongst the program spaces identified in an idealized "diagram" without the constraints of a physical reality. Key considerations of this exercise encouraged stakeholders to have a "blue sky" ideation mindset with "yes, and.." being the prompt to consider these factors:

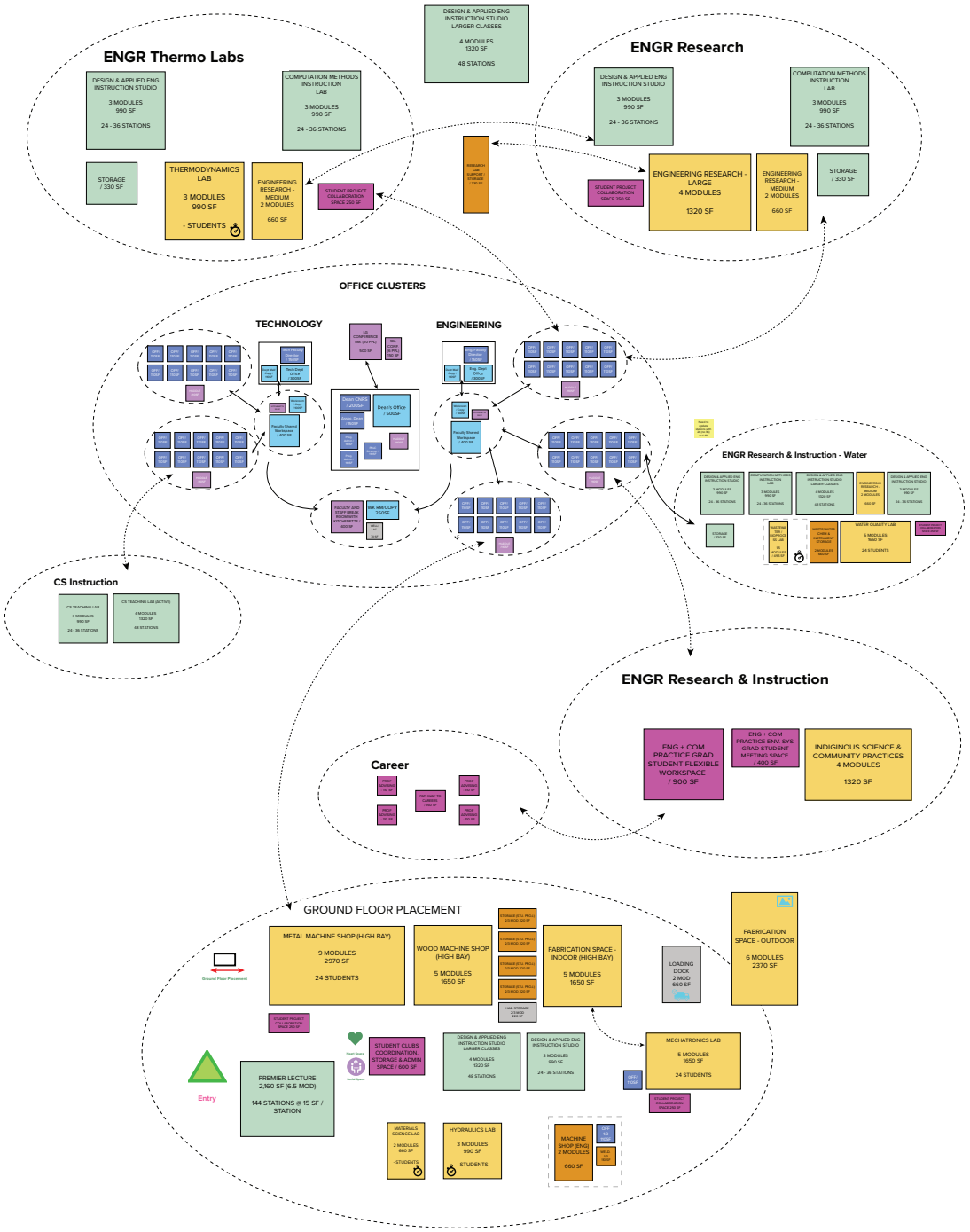
- arrival sequence for different user types and purpose,
- primary and secondary adjacencies,
- direct access,
- indoor/outdoor relationships,
- presence and identity,
- acoustical separations,
- daylighting/orientation,
- transparency or privacy,
- security,
- loading,
- amenities and
- visibility

The exercises were conducted as an iterative process with the workshop and follow up meetings to validate the feasibility team's understanding of the desired adjacencies.

SUMMARY OF PRIORITIES - Academic Building

- The primary level adjacencies include functional requirements for the high bay spaces such as the metal and wood machine shops, indoor/outdoor fabrication spaces, and loading dock having access. The Mechatronics Lab, Materials Science Lab and Hydraulics Lab also required ground floor access given the equipment and functions. The Lecture Hall and a few of the Design/Applied Engineering Instructional Studios, Student Club spaces was complimentary program to activate the first floor presence.
- The other key adjacencies requested was to have Design/Applied Engineering Instructional Studios clustered with instructional and research laboratories and shared support lab prep spaces.
- Faculty and Staff Offices are clustered in groups on each floor adjacent to Department Chair offices. The Dean's Offices and Administrative support are located near conference room and near other Department Chairs.

Figure 3.4.1 - Programmatic Adjacency Diagram - Academic Building



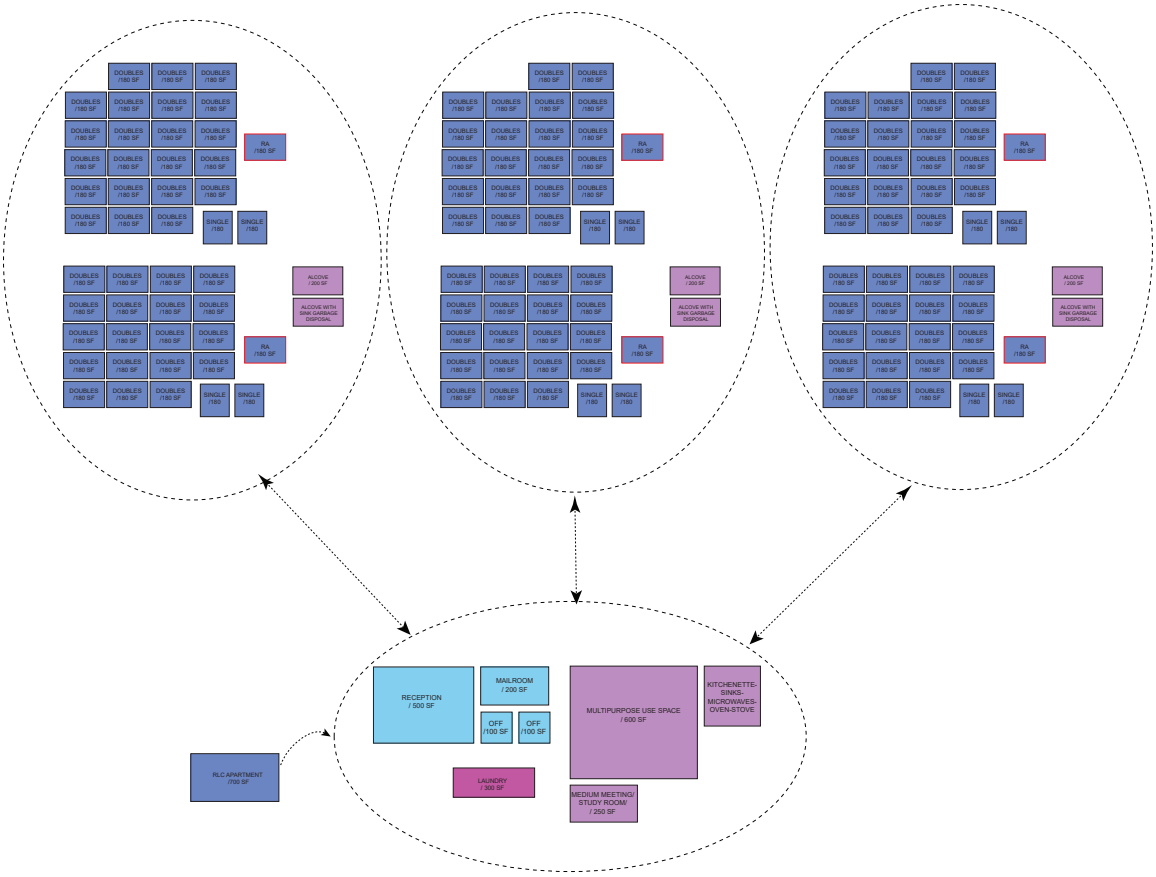
PROGRAM COLOR INDEX

- CLASSROOMS
- PRIVATE OFFICES/ PI OFFICES
- ADMIN/ ADMIN OPEN OFFICES
- INTERACTION/ GATHERING /CONFERENCE
- OPEN LABS/ LABS
- LAB SUPPORT
- BUILDING SUPPORT
- SPECIALITY (TUTORING CAREER SERVICES, ETC)

SUMMARY OF PRIORITIES - Student Housing / Life

- Neighborhood clusters of Doubles and Some Singles desired of 42 students per Resident Advisor with approximately two clusters sharing lounge and kitchenette resources.
- First floor amenities grouped to create welcoming hub for collaboration and learning communities including multi-purpose room, meeting room, laundry reception area with drop down seating and offices/mailroom and public restroom facilities for non-residents.
- Resident Life Coordinator Apartment desired to be more private with a separate entry point from main housing entry area.

Figure 3.4.2 - Programmatic Adjacency Diagram - Student Housing / Life



Note: Housing adjacency diagram completed prior to program finalization. See Section 3.3.4 for final Detailed Space List.

PROGRAM COLOR INDEX

- ADMINISTRATIVE OFFICES
- INTERACTION/ GATHERING /CONFERENCE
- SPECIALITY (TUTORING/ CAREER SERVICES)
- DORMITORY
- ENCLOSED COLLABORATION SPACE
- CLASSROOMS
- BUILDING SUPPORT

3.5 ROOM DATA SUMMARY MATRIX

The Room Data Matrix gives an overview of the functional and utility requirements for each of the typical room types described in the Space Program. Similar to the Space Program, the matrix is categorized by department.

The Room Data Summary Matrix was prepared initially by the design team based on experience with each room type from similar environmental systems buildings in the CPH system. It was then refined after being reviewed by the user groups and incorporating their comments.

The matrix tracks the following functional and utility requirements:

- Room Air
- Services
- Specialty Gases
- Power
- Communications
- Temperature

Figure 3.5.1 - Room Data Matrix - Academic Building

□ Required for space
■ Requested - To be discussed at time of Design-Build Project
--- Not-Applicable

Room name	Room Air			Services										Power								Communications						Environmental			
	100% Exhausted	AC Rate Occupied (Minimum)	AC Rate Unoccupied (Minimum)	Safety Shower	Eye Wash	Hot & Cold (H/C) or Cold (C)	RO/DI Water	Process Cooling Water (CHWS&R)	House Vaccum (LV)	Compressed Air (15-30psi with Regulator) CA	Compressed Air (100psi with Regulator) CA	Specialty Gas	Medium Pressure Steam for Autoclave	120 V	120 V, Standby to generator	208 V, 1ph	208 V, 1ph, Standby to generator	208 V, 3ph	480 V	Ground	Dedicated Circuit	Fiber Optic	Video/ Cable	Data Connection	Audio System	Projection / Monitors	Wi-Fi	Required 24/7/365 HVAC	Temp - Winter (min.)	Temp - Summer (max.)	Relative Humidty (min)
Premier Lecture	---	6	3	---	---	---	---	---	---	---	---	---	---	□	---	---	---	---	---	---	---	---	---	□	---	□	□	□	68°	75°	30%
Computational Methods (Instruction Lab)	---	6	3	---	---	---	---	---	---	---	---	---	---	□	---	---	---	---	---	---	---	---	---	□	---	□	□	□	68°	75°	30%
Large Conference Room	---	6	3	---	---	---	---	---	---	---	---	---	---	□	---	---	---	---	---	---	---	---	---	□	---	□	□	□	68°	75°	30%
Small Conference Room	---	6	3	---	---	---	---	---	---	---	---	---	---	□	---	---	---	---	---	---	---	---	---	□	---	□	□	□	68°	75°	30%
Kitchenette	---	6	3	---	---	□	---	---	---	---	---	---	---	□	---	---	---	---	---	---	□	---	---	□	---	---	□	□	68°	75°	30%
Breakroom w/ Kitchenette	---	6	3	---	---	□	---	---	---	---	---	---	---	□	---	---	---	---	---	---	□	---	---	□	---	---	□	□	68°	75°	30%
Work Room	---	6	3	---	---	---	---	---	---	---	---	---	---	□	---	□	---	---	---	---	□	---	---	□	---	---	□	□	68°	75°	30%
Eng + Com Practice Grad Student Flexible Workspace	---	6	3	---	---	---	---	---	---	---	---	---	---	□	---	---	---	---	---	---	---	---	---	□	---	---	□	□	68°	75°	30%
Eng + Com Practice / Env. Sys Grad Student Meeting Space	---	6	3	---	---	---	---	---	---	---	---	---	---	□	---	---	---	---	---	---	---	---	---	□	---	---	□	□	68°	75°	30%
Professional Advising	---	6	3	---	---	---	---	---	---	---	---	---	---	□	---	---	---	---	---	---	---	---	---	□	---	---	□	□	68°	75°	30%
Pathways to Careers	---	6	3	---	---	---	---	---	---	---	---	---	---	□	---	---	---	---	---	---	---	---	---	□	---	---	□	□	68°	75°	30%
Student Club	---	6	3	---	---	---	---	---	---	---	---	---	---	□	---	---	---	---	---	---	---	---	---	□	---	---	□	□	68°	75°	30%
Student Project / Homework Group Collaboration	---	6	3	---	---	---	---	---	---	---	---	---	---	□	---	---	---	---	---	---	---	---	---	□	---	---	□	□	68°	75°	30%
Metal Maching Shop (High Bay)	---	6	3	□	□	□	---	---	---	---	□	□	---	□	---	□	---	□	□	□	□	---	---	□	---	---	□	□	68°	75°	30%
Wood Machine Shop (High Bay)	---	6	3	□	□	□	---	---	---	---	□	□	---	□	---	□	---	□	□	□	□	---	---	□	---	---	□	□	68°	75°	30%
Student Project Storage	---	6	3	---	---	---	---	---	---	---	---	---	---	□	---	---	---	---	---	---	---	---	---	□	---	---	□	□	68°	75°	30%
Haz Storage	---	6	3	---	---	---	---	---	---	---	□	---	---	□	---	---	---	---	---	□	---	---	---	□	---	---	□	□	68°	75°	30%
Fabrication Space indoor (High Bay) - Adjacent to Outdoor	---	6	3	□	□	□	---	---	---	---	□	□	---	□	---	---	---	---	---	---	---	---	---	□	---	---	□	□	68°	75°	30%
Fabrication Space outdoor (High Bay) - Adjacent to Indoor	---	---	---	---	---	---	---	---	---	---	---	---	---	□	---	---	---	---	---	---	---	---	---	---	---	---	□	---	---	---	---
Faculty / Staff Offices	---	6	3	---	---	---	---	---	---	---	---	---	---	□	---	---	---	---	---	---	---	---		□	---	---	□	□	68°	75°	30%
Indigenous Science & Community Practice	---	6	3	□	□	□	□	---	□	---	□	---	---	□	---	□	---	□	---	---	□	---	---	□	---	□	□	□	68°	75°	30%
ENGR Research - Large	---	6	3	□	□	□	□	---	□	---	□	---	---	□	---	□	---	□	---	---	□	---	---	□	---	---	□	□	68°	75°	30%
ENGR Research - Small	---	6	3	□	□	□	□	---	□	---	□	---	---	□	---	□	---	□	---	---	□	---	---	□	---	---	□	□	68°	75°	30%
ENGR Research - Small (Clean)	---	6	3	□	□	□	□	---	□	---	□	□	---	□	---	□	---	□	---	---	□	---	---	□	---	---	□	□	68°	75°	30%

□ Required for space
■ Requested - To be discussed at time of Design-Build Project
--- Not-Applicable

Room name	Room Air			Services										Power								Communications						Environmental			
	100% Exhausted	AC Rate Occupied (Minimum)	AC Rate Unoccupied (Minimum)	Safety Shower	Eye Wash	Hot & Cold (H/C) or Cold (C)	RO/DI Water	Process Cooling Water (CHWS&R)	House Vaccum (LV)	Compressed Air (15-30psi with Regulator) CA	Compressed Air (100psi with Regulator) CA	Specialty Gas	Medium Pressure Steam for Autoclave	120 V	120 V, Standby to generator	208 V, 1ph	208 V, 1ph, Standby to generator	208 V, 3ph	480 V	Ground	Dedicated Circuit	Fiber Optic	Video/ Cable	Data Connection	Audio System	Projection / Monitors	Wi-Fi	Required 24/7/365 HVAC	Temp - Winter (min.)	Temp - Summer (max.)	Relative Humidty (min)
ENGR Research - Small (Clean)	---	6	3	□	□	□	□	---	□	---	□	□	---	□	---	□	---	□	---	---	□	---	---	□	---	---	□	□	68°	75°	30%
ENGR Machine Shop (Technician's Space)	---	6	3	□	□	□	---	---	---	---	□	---	---	□	---	□	---	□	□	□	□	---	---	□	---	---	□	□	68°	75°	30%
ENGR Machine Shop Office	---	6	3	---	---	---	---	---	---	---	---	---	---	□	---	---	---	---	---	---	---	---	---	□	---	---	□	□	68°	75°	30%
Machine Shop Office	---	6	3	---	---	---	---	---	---	---	---	---	---	□	---	---	---	---	---	---	---	---	---	□	---	---	□	□	68°	75°	30%
Wastewater / Bioprocess Lab	---	6	3	□	□	□	---	---	□	---	□	□	---	□	---	□	---	□	---	---	□	---	---	□	---	---	□	□	68°	75°	30%
Water Quality Lab	---	6	3	□	□	□	---	---	□	---	□	---	---	□	---	□	---	□	---	---	□	---	---	□	---	□	□	□	68°	75°	30%
Waste / Water Chem & Inst Storage	---	6	3	□	□	□	---	---	□	---	□	□	□	□	---	□	---	□	---	---	□	---	---	□	---	---	□	□	68°	75°	30%
Thermodynamics Lab	---	6	3	□	□	□	---	---	□	---	□	□	---	□	---	□	---	□	---	---	□	---	---	□	---	---	□	□	68°	75°	30%
Mechatronics Lab	---	6	3	□	□	□	---	---	□	---	□	---	---	□	---	□	---	□	---	---	□	---	---	□	---	□	□	□	68°	75°	30%
Hydraulics Lab	---	6	3	□	□	□	---	---	□	---	□	□	---	□	---	□	---	□	---	---	□	---	---	□	---	---	□	□	68°	75°	30%
Materials Science Lab	---	6	3	□	□	□	---	---	□	---	□	□	---	□	---	□	---	□	---	---	□	---	---	□	---	---	□	□	68°	75°	30%
Lab Support (Student Prep) / Storage	---	6	3	□	□	□	□	---	□	---	□	□	---	□	---	□	---	□	---	---	---	---	---	□	---	---	□	□	68°	75°	30%
Design & Applied Engineering Studio - 24	---	6	3	---	---	□	---	---	---	---	---	---	---	□	---	---	---	---	---	---	---	---	---	□	---	---	□	□	68°	75°	30%
Design & Applied Engineering Studio - 48	---	6	3	---	---	□	---	---	---	---	---	---	---	□	---	---	---	---	---	---	---	---	---	□	---	---	□	□	68°	75°	30%
Computer Science Lab - 24	---	6	3	---	---	---	---	---	---	---	---	---	---	□	---	---	---	---	---	---	---	---	---	□	---	□	□	□	68°	75°	30%
Computer Science Lab - 48	---	6	3	---	---	---	---	---	---	---	---	---	---	□	---	---	---	---	---	---	---	---	---	□	---	□	□	□	68°	75°	30%
Wellness / Lactation	---	6	3	---	---	□	---	---	---	---	---	---	---	□	---	---	---	---	---	---	---	---	---	□	---	---	□	□	68°	75°	30%
IDF	---	6	3	---	---	---	---	---	---	---	---	---	---	□	---	---	---	---	---	---	---	---	---	□	---	---	□	□	68°	75°	30%
MPOE / MDF	---	6	3	---	---	---	---	---	---	---	---	---	---	□	---	---	---	---	---	---	---	---	---	□	---	---	□	□	68°	75°	30%
Restrooms	---	6	3	---	---	□	---	---	---	---	---	---	---	□	---	---	---	---	---	---	---	---	---	□	---	---	□	□	68°	75°	30%

Figure 3.5.2 - Room Data Matrix - Student Housing / Life

□ Required for space
■ Requested - To be discussed at time of Design-Build Project
--- Not-Applicable

Room name	Room Air			Services										Power								Communications						Environmental			
	100% Exhausted	AC Rate Occupied (Minimum)	AC Rate Unoccupied (Minimum)	Safety Shower	Eye Wash	Hot & Cold (□) or Cold (C)	RO/DI Water	Process Cooling Water (CHWS&R)	House Vaccum (LV)	Compressed Air (15-30psi with Regulator) CA	Compressed Air (100psi with Regulator) CA	Specialty Gas	Medium Pressure Steam for Autoclave	120 V	120 V, Standby to generator	208 V, 1ph	208 V, 1ph, Standby to generator	208 V, 3ph	480 V	Ground	Dedicated Circuit	Fiber Optic	Video/ Cable	Data Connection	Audio System	Projection / Monitors	Wi-Fi	Required 24/7/365 HVAC	Temp - Winter (min.)	Temp - Summer (max.)	Relative Humidty (min)
Dormitory - Single Units	---	6	3	---	---	□	---	---	---	---	---	---	---	□	---	---	---	---	---	---	---	---	---	□	---	---	□	□	68°	75°	30%
Dormitory - Double Units	---	6	3	---	---	□	---	---	---	---	---	---	---	□	---	---	---	---	---	---	---	---	---	□	---	---	□	□	68°	75°	30%
Dormitory - Residence Advisor (RA) Units	---	6	3	---	---	□	---	---	---	---	---	---	---	□	---	---	---	---	---	---	---	---	---	□	---	---	□	□	68°	75°	30%
Dormitory - Residence Life Coordinator (RLC) Units	---	6	3	---	---	□	---	---	---	---	---	---	---	□	---	---	---	---	---	---	---	---	---	□	---	---	□	□	68°	75°	30%
Dormitory - Double Units	---	6	3	---	---	□	---	---	---	---	---	---	---	□	---	---	---	---	---	---	---	---	---	□	---	---	□	□	68°	75°	30%
Lounge Alcove w/ Sink	---	6	3	---	---	□	---	---	---	---	---	---	---	□	---	---	---	---	---	---	---	---	---	□	---	---	□	□	68°	75°	30%
Multipurpose Space	---	6	3	---	---	□	---	---	---	---	---	---	---	□	---	---	---	---	---	---	---	---	□	□	□	□	□	□	68°	75°	30%
Kitchenette	---	6	3	---	---	□	---	---	---	---	---	---	---	□	---	---	---	---	---	---	□	---	---	□	---	---	□	□	68°	75°	30%
Mailroom	---	6	3	---	---	---	---	---	---	---	---	---	---	□	---	---	---	---	---	---	---	---		□	---	---	□	□	68°	75°	30%
Medium Meeting Room	---	6	3	---	---	□	---	---	---	---	---	---	---	□	---	---	---	---	---	---	---	---	□	□	□	□	□	□	68°	75°	30%
Laundry Room	---	6	3	---	---	---	---	---	---	---	---	---	---	□	---	□	---	---	---	□	□	---		□	---	---	□	□	68°	75°	30%
Office	---	6	3	---	---	---	---	---	---	---	---	---	---	□	---	---	---	---	---	---	---	---		□	---	---	□	□	68°	75°	30%
Reception Area	---	6	3	---	---	---	---	---	---	---	---	---	---	□	---	---	---	---	---	---	---	---		□	---	---	□	□	68°	75°	30%

3.6 ROOM DATA SHEETS

A Room Data Sheet has been completed for most of the spaces identified in the Space Program. The Room Data Sheets are intended to be graphic representations of potential room layouts, including equipment, laboratory benches, office furniture, etc. Also indicated on each sheet are preferred overall room dimensions, shown to the inside face of each wall. Detailed room services, such as electrical and data outlets, are intentionally not shown at this time and will be developed during future design phases. These room diagrams are the basis for understanding the capacity of the space program as well as testing the program on the proposed site. They are not intended to be the final layout.

The Academic Building Room Data Sheets as follows:

3.6.1 SHARED ACADEMIC SPACES

- LARGE LECTURE
- COMPUTATIONAL METHODS (INSTRUCTION LAB)

3.6.2 SHARED RESOURCES

- LARGE CONFERENCE ROOM
- SMALL CONFERENCE ROOM
- BREAKROOM WITH KITCHENETTE
- WORKROOM
- KITCHENETTE

3.6.3 STUDENT SUPPORT SPACES

- ENG+COM PRACTICE GRAD STUDENT WORKSPACE
- ENG+COM PRACTICE / ENV. SYS MEETING SPACE
- PROFESSIONAL ADVISING
- PATHWAYS TO CAREERS
- STUDENT CLUB
- STUDENT COLLABORATION SPACE

3.6.4 MAKER SPACES

- METAL MACHINE SHOP
- WOOD MACHINE SHOP
- FABRICATION SPACE - INDOOR
- FABRICATION SPACE - OUTDOOR
- STORAGE (STUDENT PROJECT)
- HAZARDOUS STORAGE
- 3D PRINTER AND LASER CUTTER
- OFFICE

3.6.5 ENGINEERING RESEARCH LAB

- INDIGENOUS SCIENCE & COMMUNITY PRACTICES
- ENGR RESEARCH - LARGE
- ENGR RESEARCH - MED
- ENGR RESEARCH - MED (CLEAN)

3.6.6 ENGINEERING+TECHNOLOGY INSTRUCTIONAL AND SUPPORT

- ENGR MACHINE SHOP (TECHNICIAN S SPACE)
- ENGR MACHINE SHOP OFFICE
- MECHATRONICS LAB
- THERMODYNAMICS LABS
- WATER QUALITY LAB
- HYDRAULICS LAB
- MATERIALS SCIENCE LAB
- WASTEWATER / BIOPROCESS LAB
- LAB SUPPORT (STUDENT PREP)/STORAGE
- WASTE / WATER CHEM & INST STORAGE
- DESIGN & APPLIED ENGINEERING STUDIO - 24 A
- DESIGN & APPLIED ENGINEERING STUDIO - 24 B
- DESIGN & APPLIED ENGINEERING STUDIO - 48
- COMPUTER SCIENCE LAB - 24
- COMPUTER SCIENCE LAB - 48

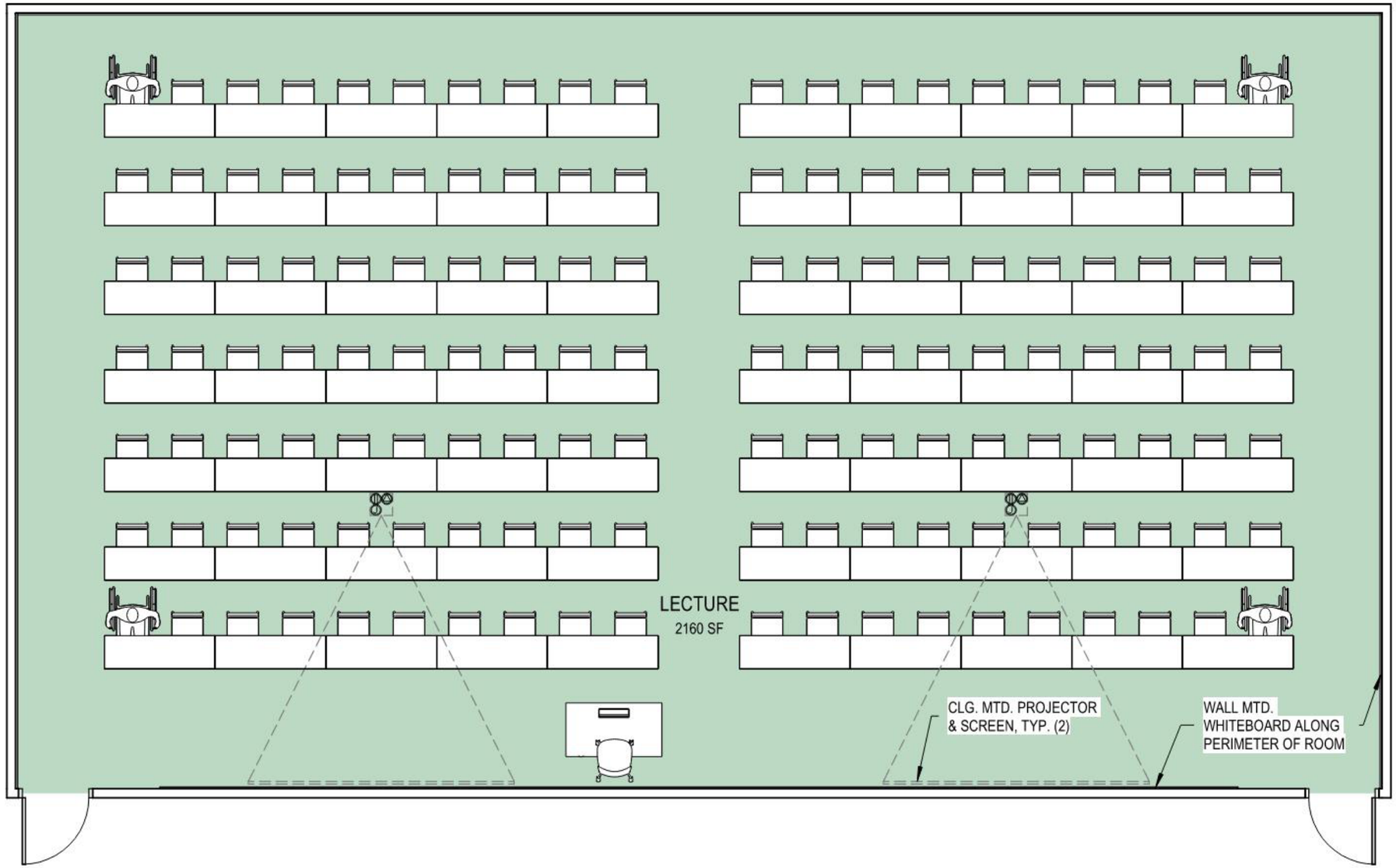
3.6.7 FACULTY AND ADMIN WORKSPACE

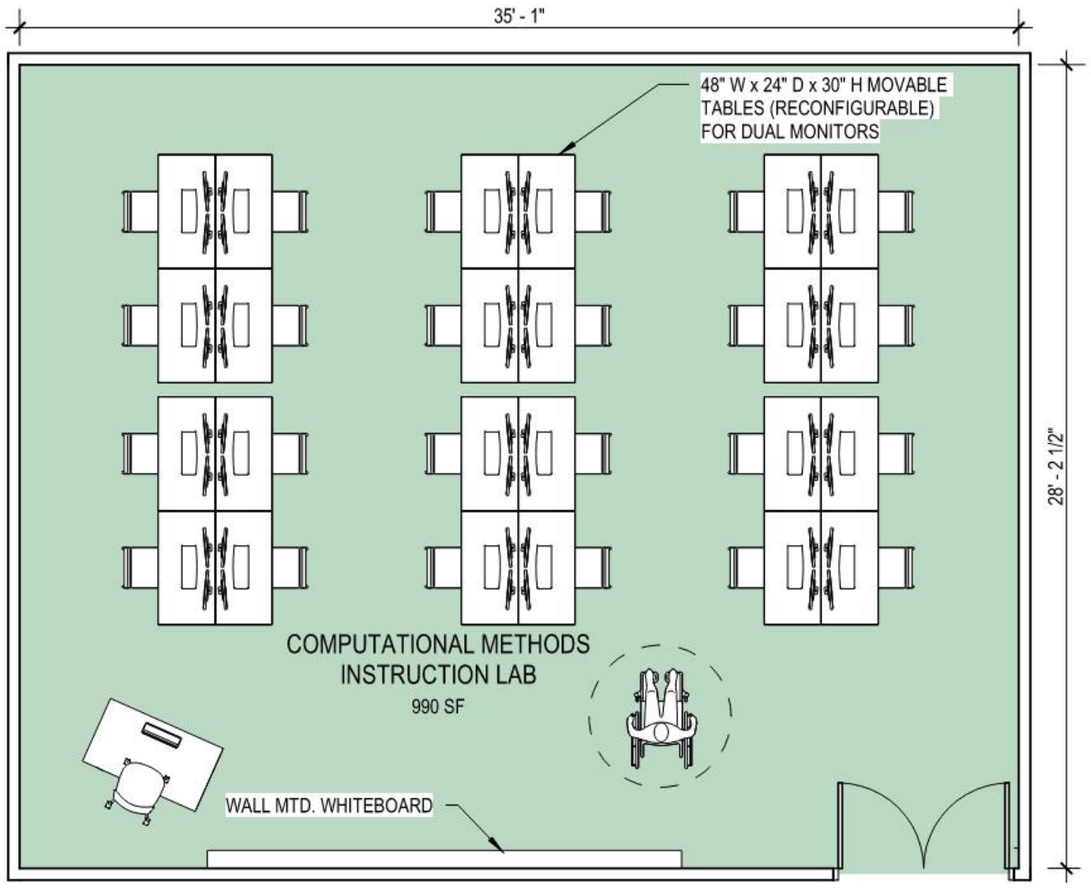
- ASSOC. DEAN
- FACULTY SHARED SPACE
- DEAN'S OFFICE SPACE
- DEPARTMENT OFFICE

LARGE LECTURE

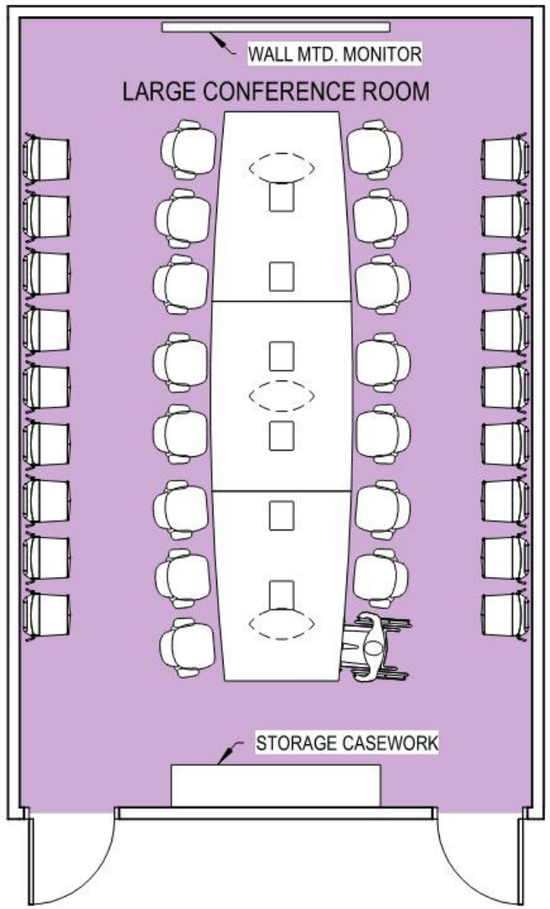
GUIDE PLATE - E+T

Scale: 3/16" = 1'-0"





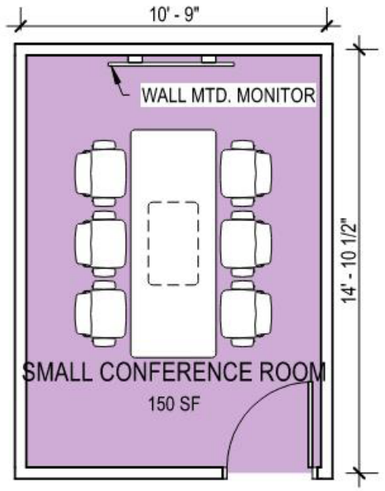
COMPUTATIONAL METHODS
INSTRUCTION LAB
GUIDE PLATE - E+T
Scale: 3/16" = 1'-0"



LARGE CONFERENCE ROOM

GUIDE PLATE - E+T

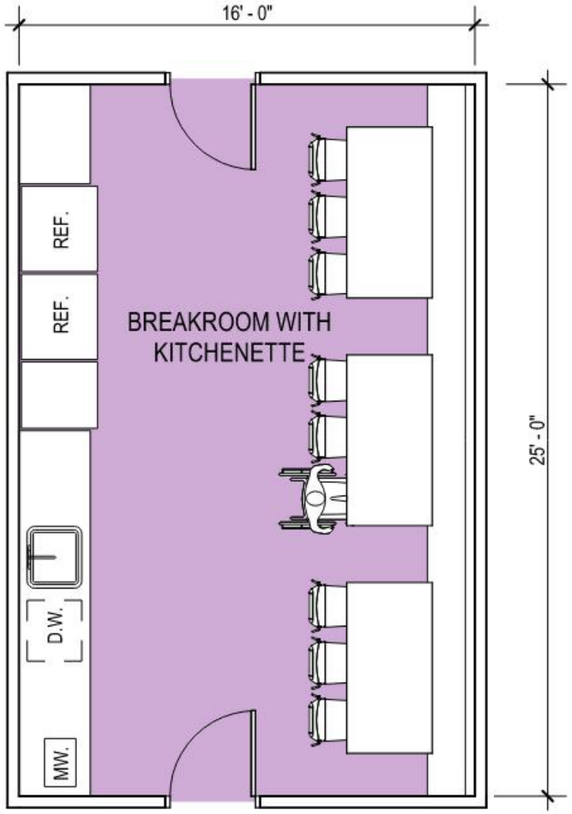
Scale: 3/16" = 1'-0"



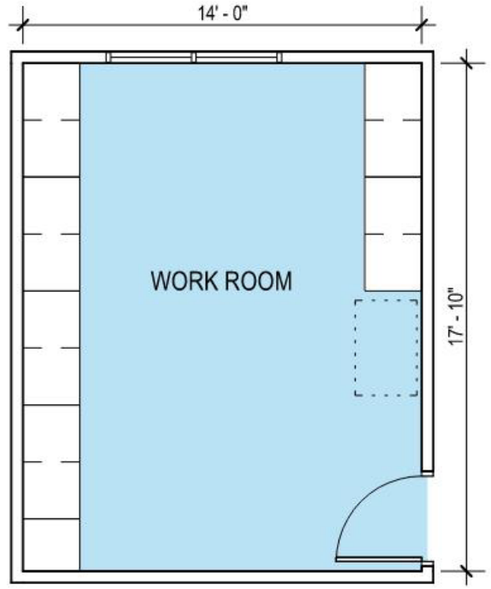
SMALL CONFERENCE ROOM

GUIDE PLATE - E+T

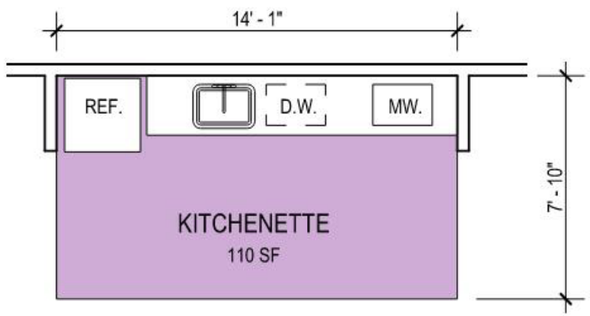
Scale: 3/16" = 1'-0"



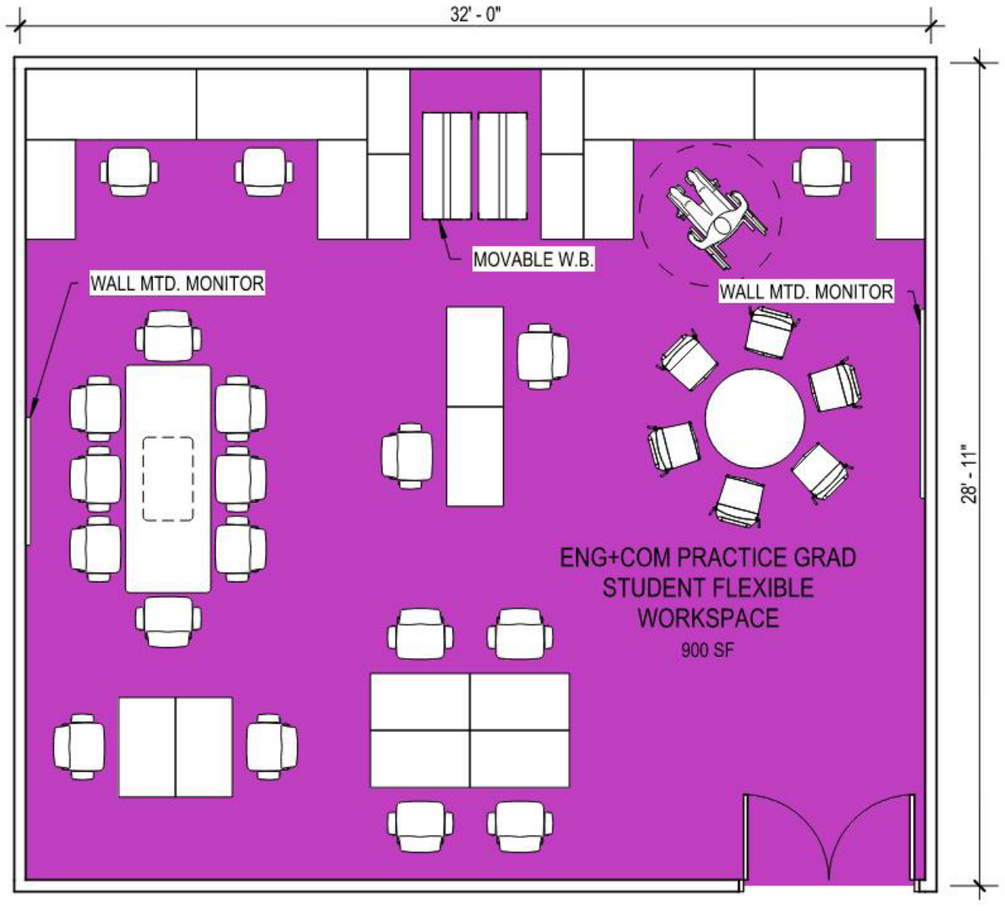
BREAKROOM WITH KITCHENETTE
GUIDE PLATE - E+T
Scale: 3/16" = 1'-0"



WORK ROOM
GUIDE PLATE - E+T
Scale: 3/16" = 1'-0"



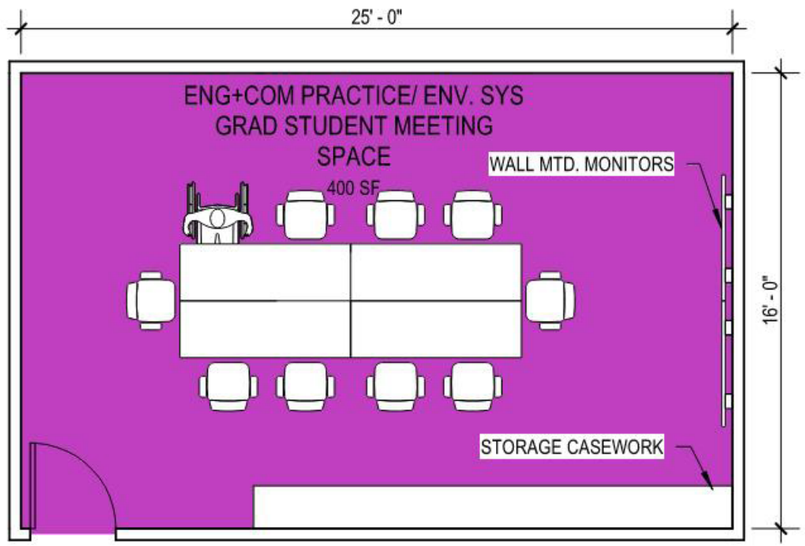
KITCHENETTE
GUIDE PLATE - E+T
Scale: 3/16" = 1'-0"



ENG+COM PRACTICE GRAD
STUDENT WORKSPACE
GUIDE PLATE - E+T
Scale: 3/16" = 1'-0"

ENG+COM PRACTICE/ ENV. SYS MEETING SPACE
GUIDE PLATE - E+T

Scale: 3/16" = 1'-0"



PROFESSIONAL ADVISING

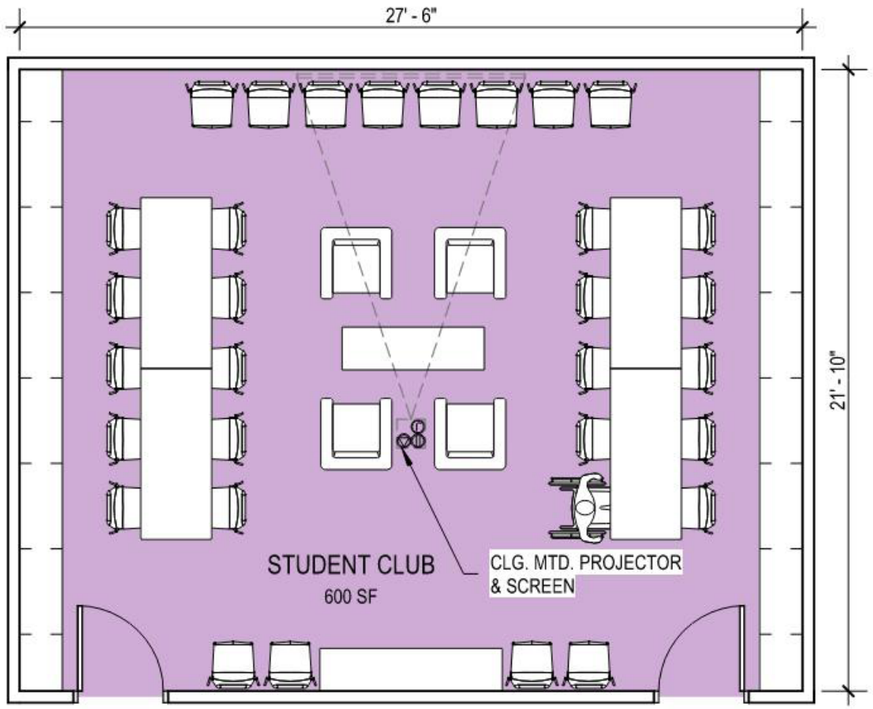
GUIDE PLATE - E+T

Scale: 3/16" = 1'-0"

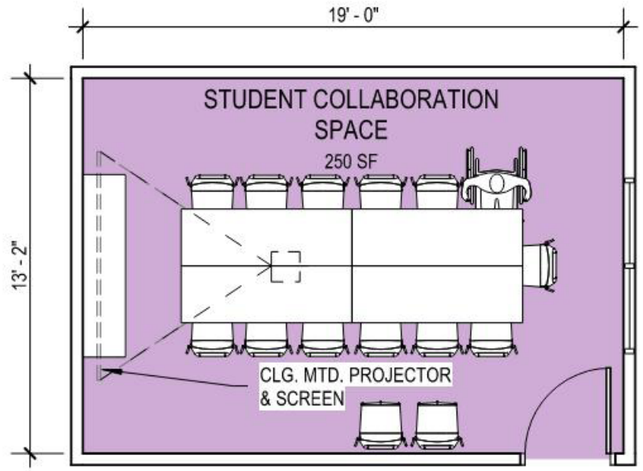
PATHWAYS TO CAREERS

GUIDE PLATE - E+T

Scale: 3/16" = 1'-0"



STUDENT CLUB
GUIDE PLATE - E+T
Scale: 3/16" = 1'-0"



STUDENT COLLABORATION
SPACE
GUIDE PLATE - E+T
Scale: 3/16" = 1'-0"

METAL MACHINE SHOP

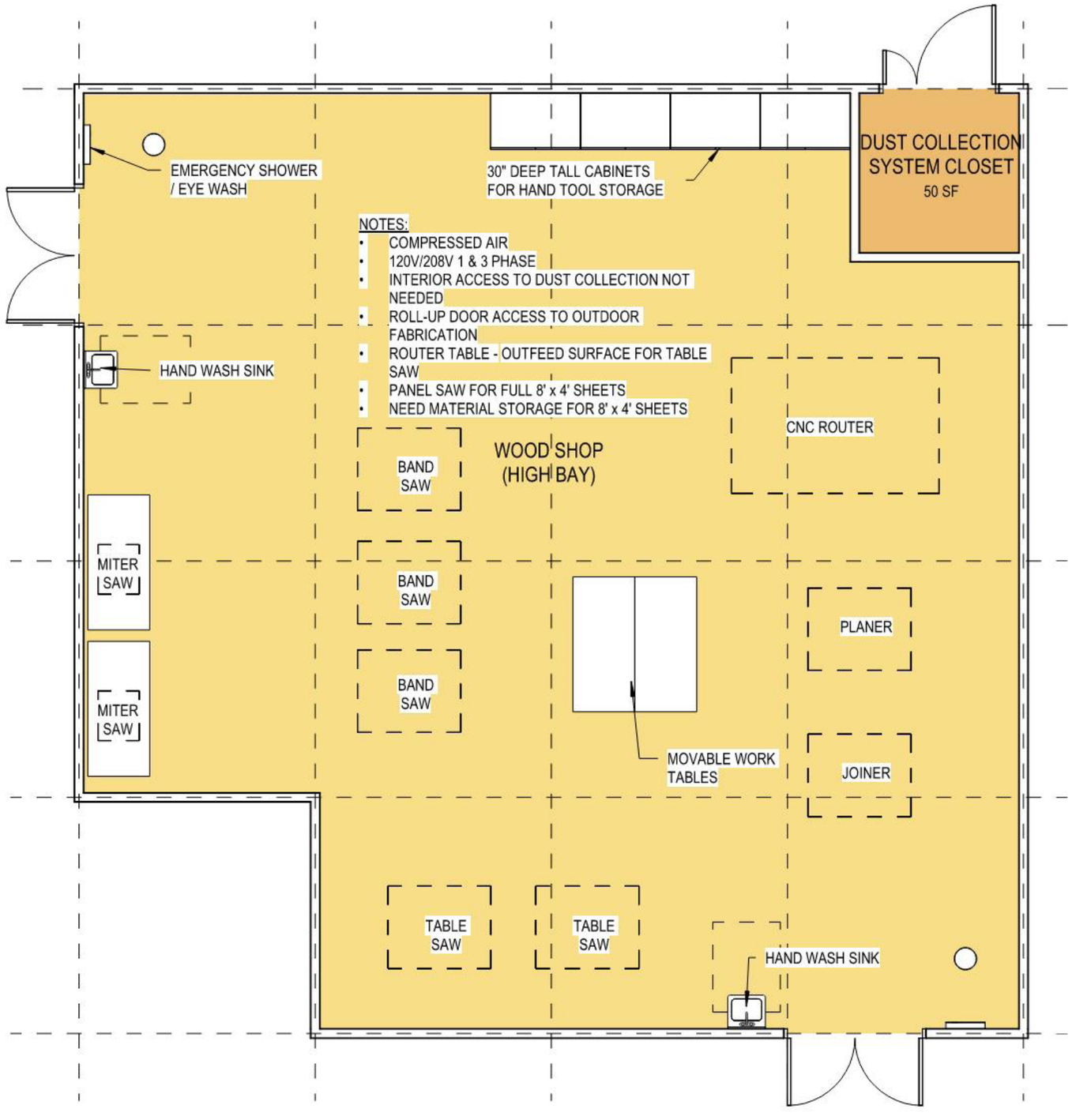
GUIDE PLATE - E+T

Scale: 3/16" = 1'-0"

24" x 45" HUSKY CART
24" x 45" HUSKY CART
24" x 45" HUSKY CART
30" DEEP TALL STORAGE (LOCKING) TOOL STORAGE
TOOLING ROOM
24" DEEP TALL, OPEN STORAGE
TALL FLAMMABLE STORAGE (LOCKING)
24" x 45" HUSKY CART
STOCK ROOM
18" DEEP TALL, OPEN STORAGE
DRILL PRESS
DRILL PRESS
LASER CUTTER
EMERGENCY SHOWER / EYE WASH

NOTES:
- TORCH & WELDING TO OCCUR IN FABRICATION AREA OR IN MACHINE SHOP NEAR FABRICATION.
- WANT ROLL UP DOORS TO OUTDOOR FABRICATION AREA FROM MACHINE SHOP.
- NEED MATERIAL STORAGE FOR 10 FT BAR / TUBE STCK AND SHEET GOODS.
- OFFICE TO OVERSEE THE LATHES & MILLING MACHINES.
- WATERJET & LASER CUTTERS ARE DIRTY, CAN BE ISOLATED LIKE THE WELDING AREA

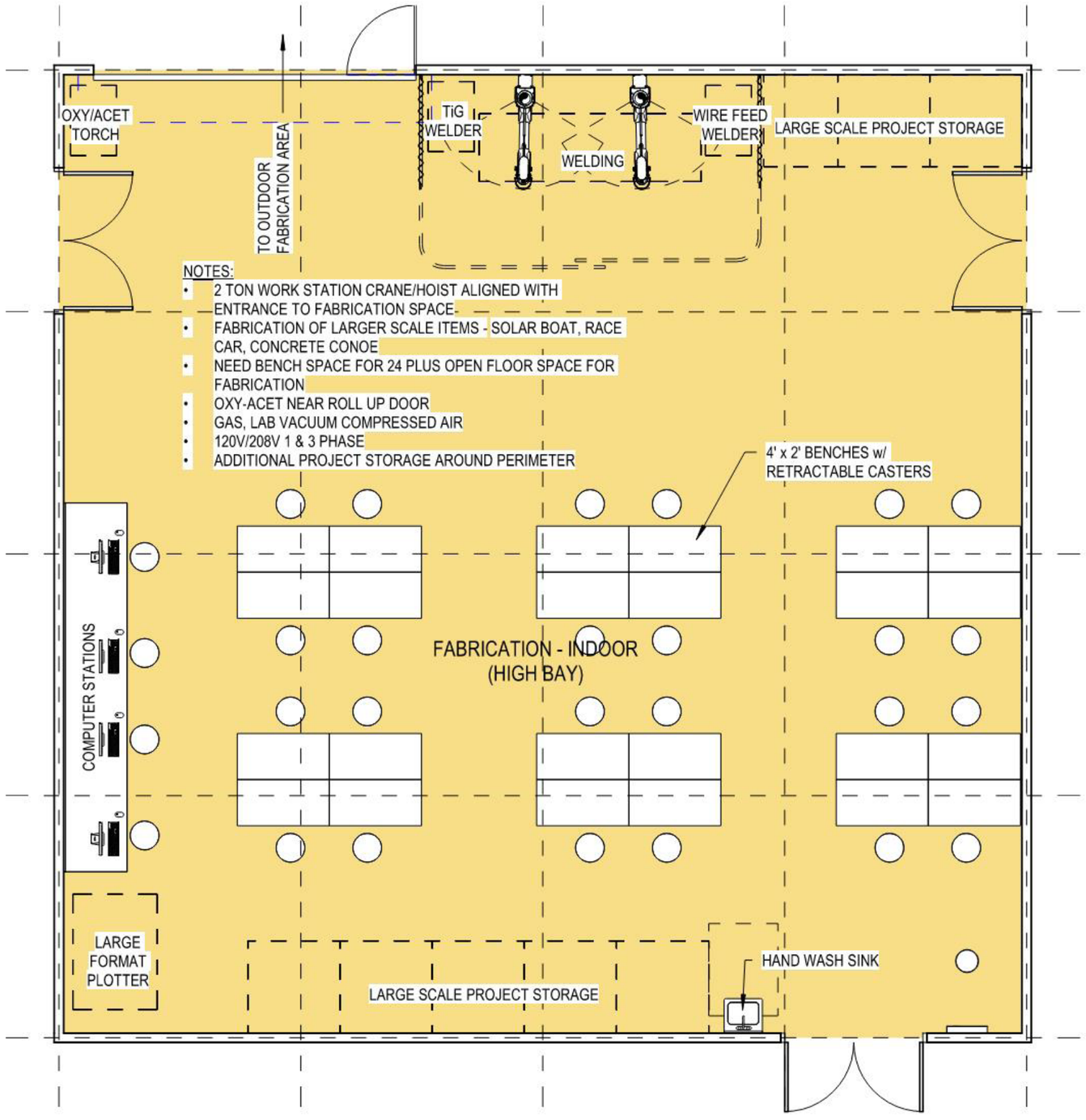
TO INDOOR FABRICATION AREA
HAND WASH SINK
HORIZONTAL BANDSAW
SHEET MATERIAL STORAGE
PARTS WASHER
SANDER
GRINDER
VERTICAL MILLING MACHINE
VERTICAL MILLING MACHINE
VERTICAL MILLING MACHINE
VERTICAL MILLING MACHINE
VERTICAL MILLING MACHINE
MACHINE SHOP (HIGH BAY)
SAND BLASTER
HAAS MINI MILL
LATHE
LATHE
LATHE
LATHE
OFFICE
PLASMA CUTTER STATION W/ SNORKEL
HAAS MINI MILL
LATHE
VERTICAL BANDSAW
TUBE BENDER
COMPUTER STATIONS FOR DRAFTING OR CHECKING CAD, ETC.
3-D PRINTERS
3D PRINTER (METAL)
3D PRINTER (CARBON)
TOOL CABINET
BENCH SPACE W/ STORAGE UNDERNEATH
SHEET METAL SHEAR / BRAKE
O.H. DOOR - 10'W x 9'H



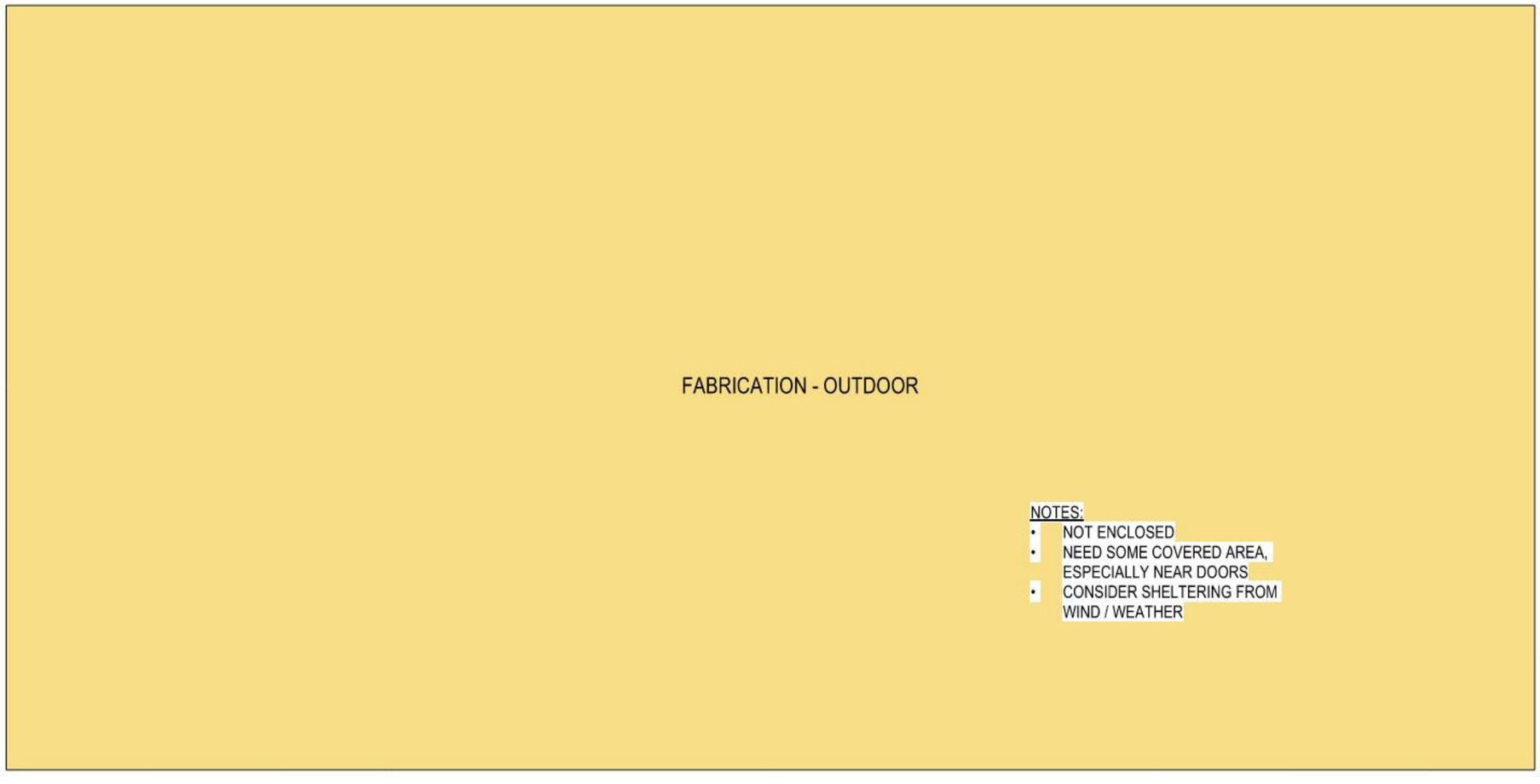
WOOD MACHINE SHOP

GUIDE PLATE - E+T

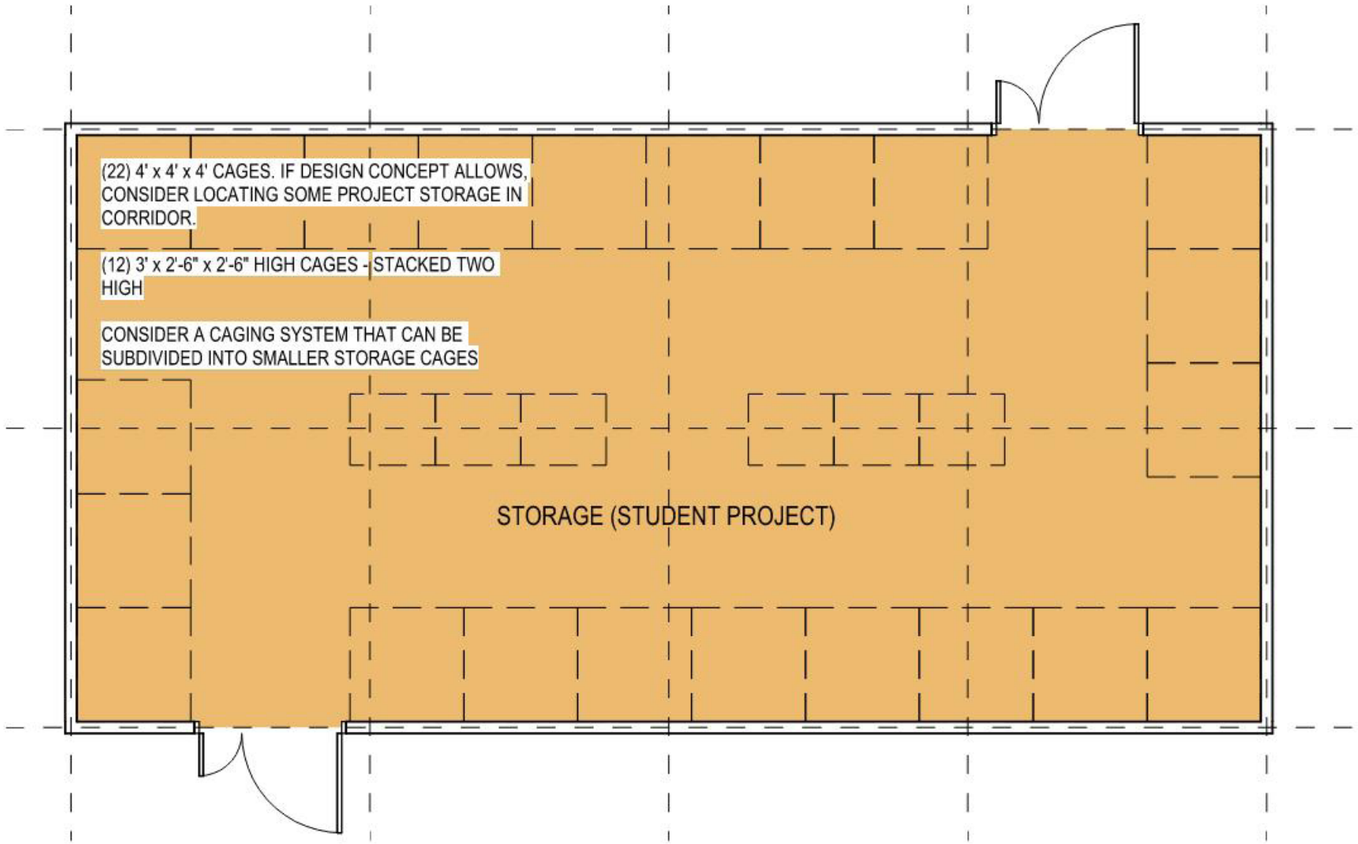
Scale: 3/16" = 1'-0"



FABRICATION SPACE - INDOOR
GUIDE PLATE - E+T
Scale: 3/16" = 1'-0"



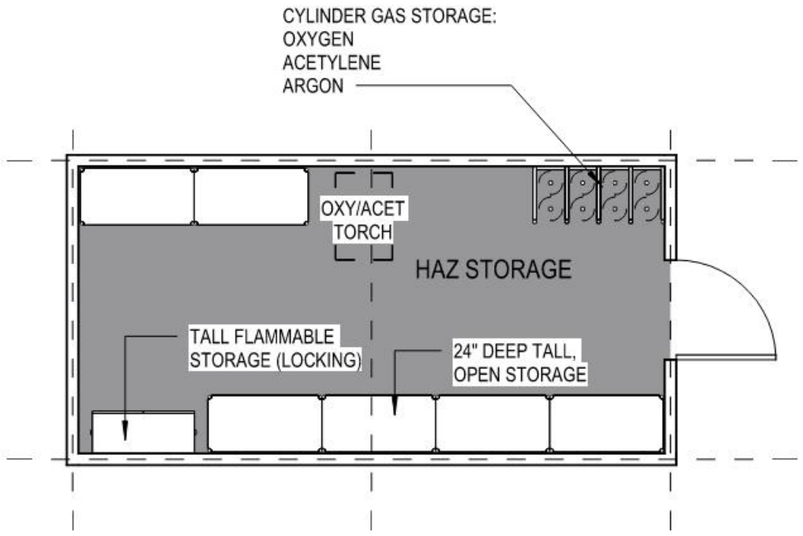
FABRICATION SPACE - OUTDOOR
GUIDE PLATE - E+T
Scale: 3/16" = 1'-0"

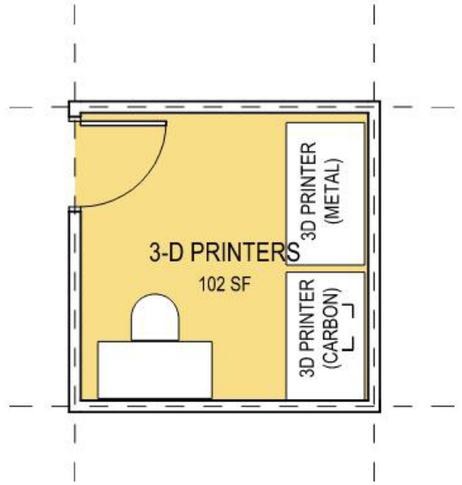


STORAGE (STUDENT PROJECT)
GUIDE PLATE - E+T
Scale: 3/16" = 1'-0"

GUIDE PLATE
E+T
HAZARDOUS STORAGE

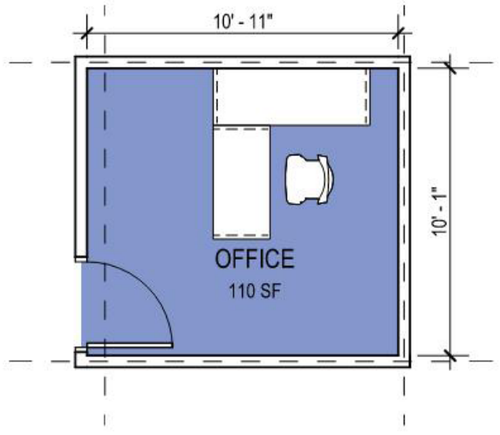
Scale: 3/16" = 1'-0"





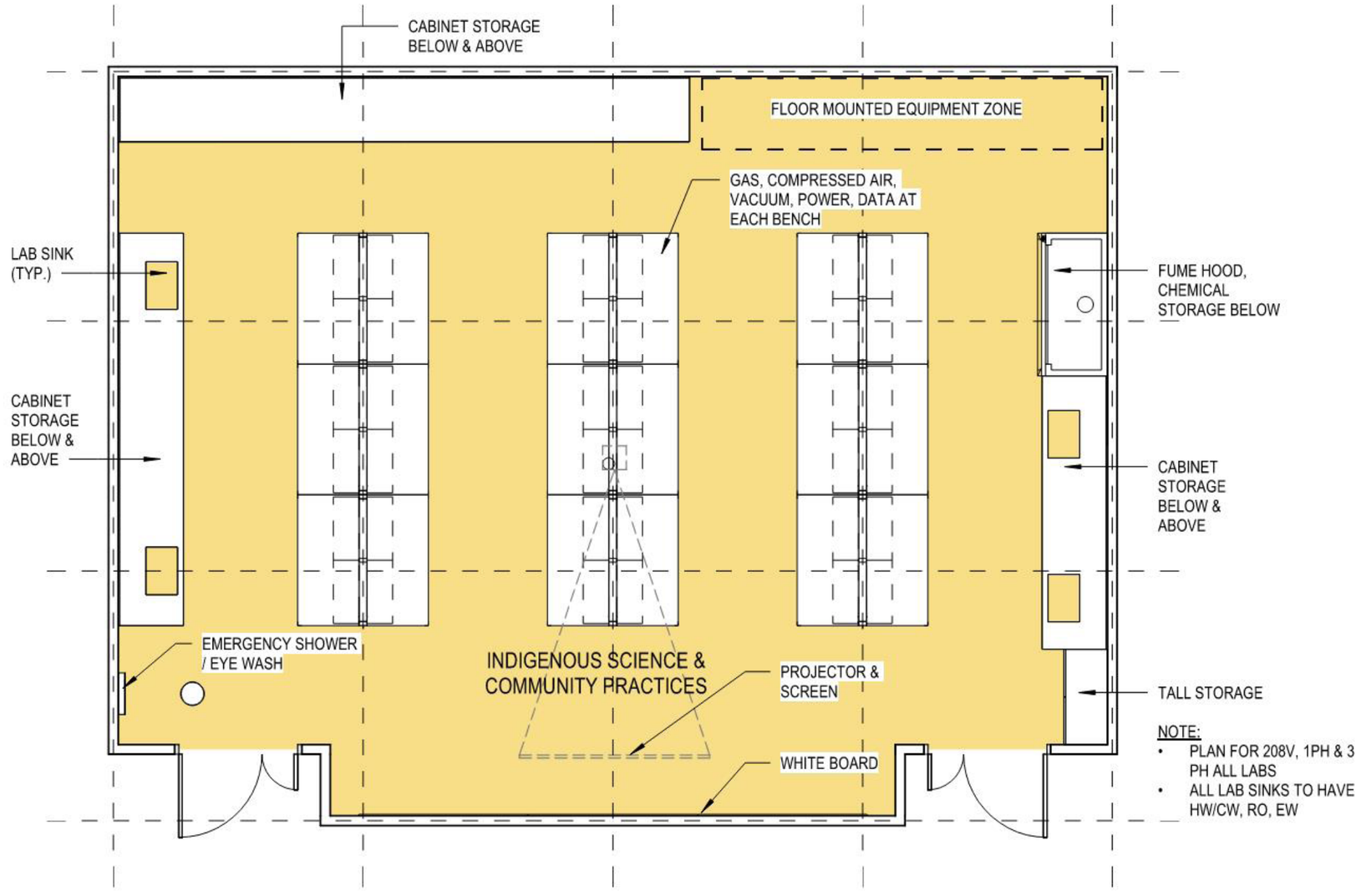
3D PRINTER AND LASER CUTTER
GUIDE PLATE - E+T

Scale: 3/16" = 1'-0"



OFFICE
GUIDE PLATE - E+T

Scale: 3/16" = 1'-0"

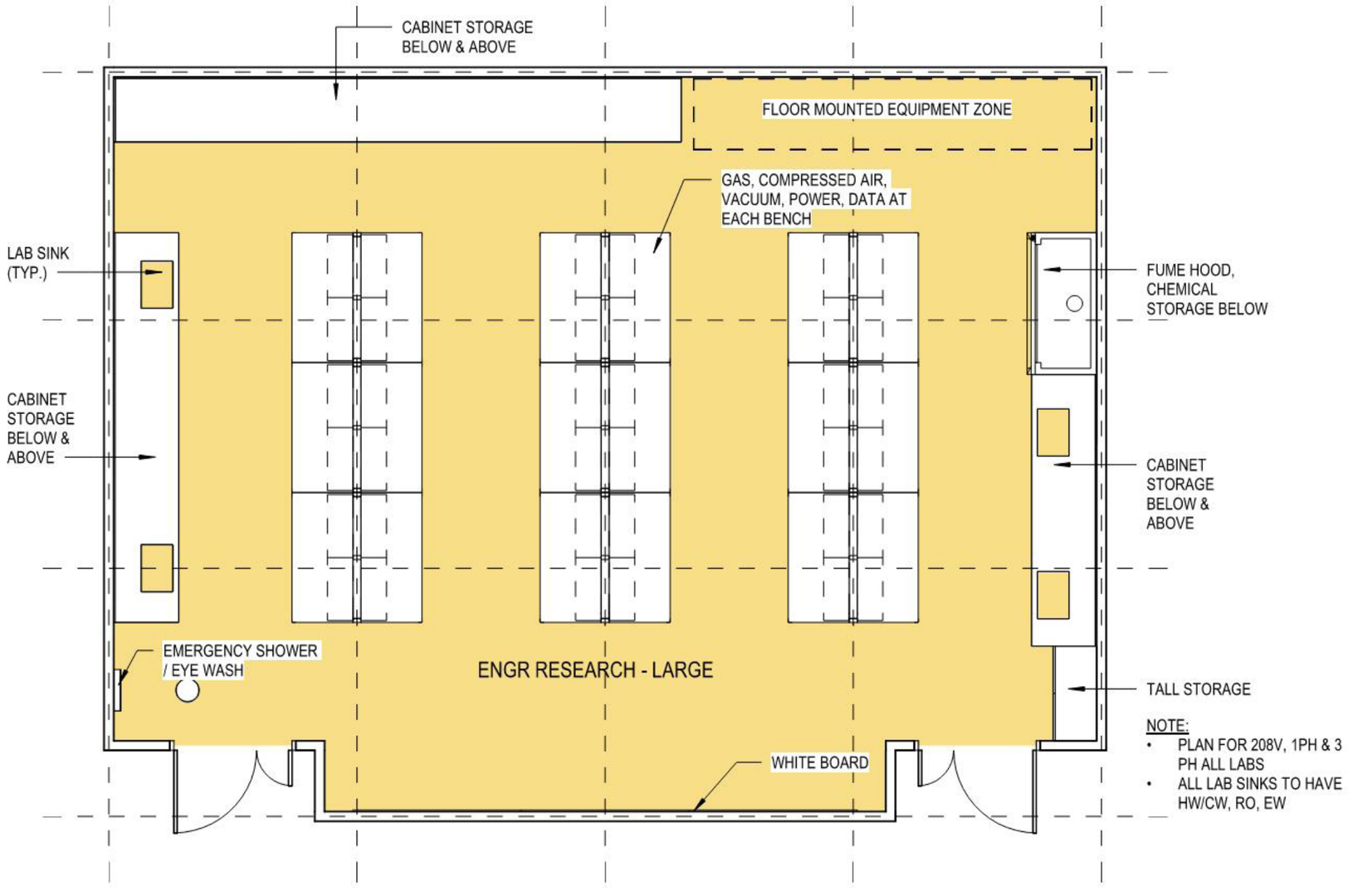


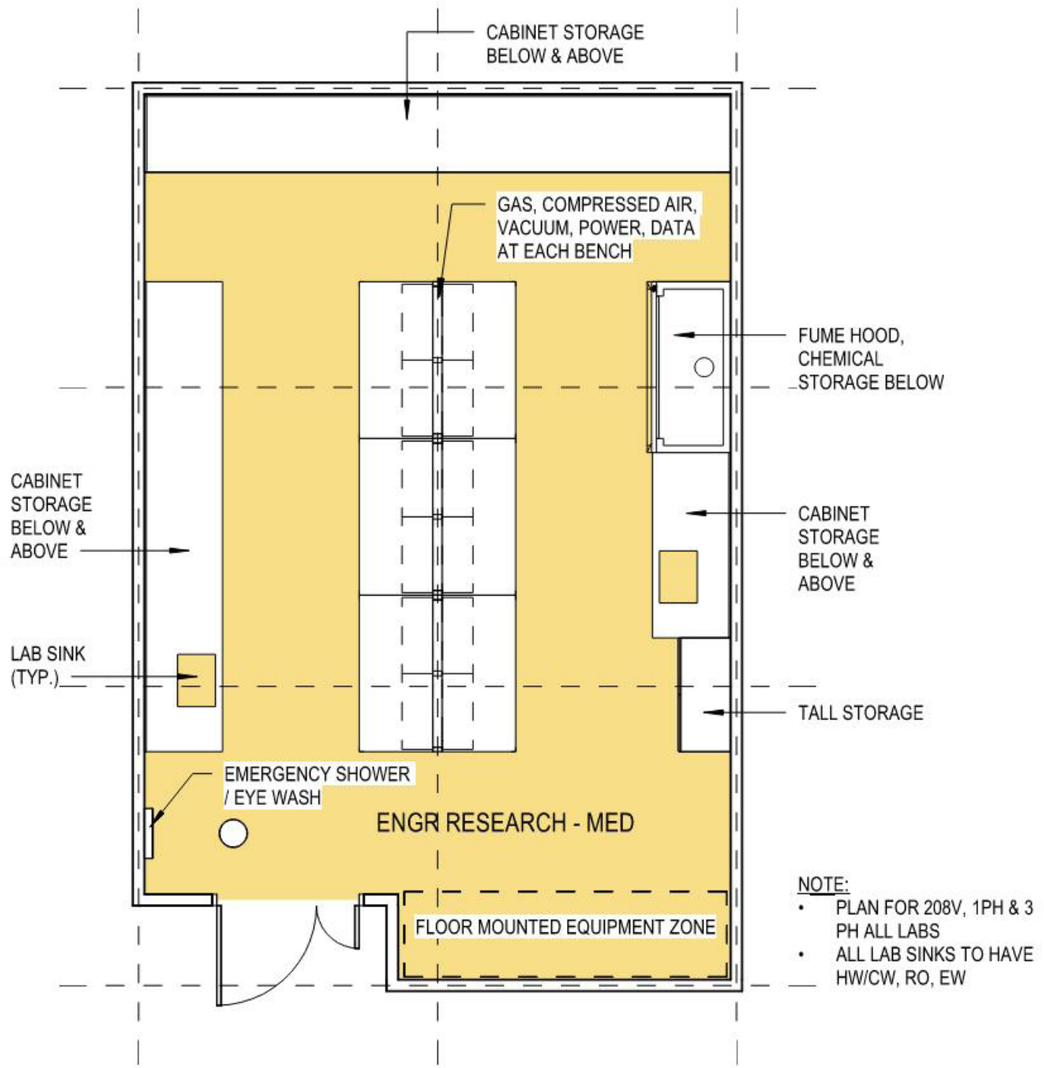
INDIGENOUS SCIENCE & COMMUNITY PRACTICES
GUIDE PLATE - E+T
Scale: 3/16" = 1'-0"

ENGR RESEARCH - LARGE

GUIDE PLATE - E+T

Scale: 3/16" = 1'-0"



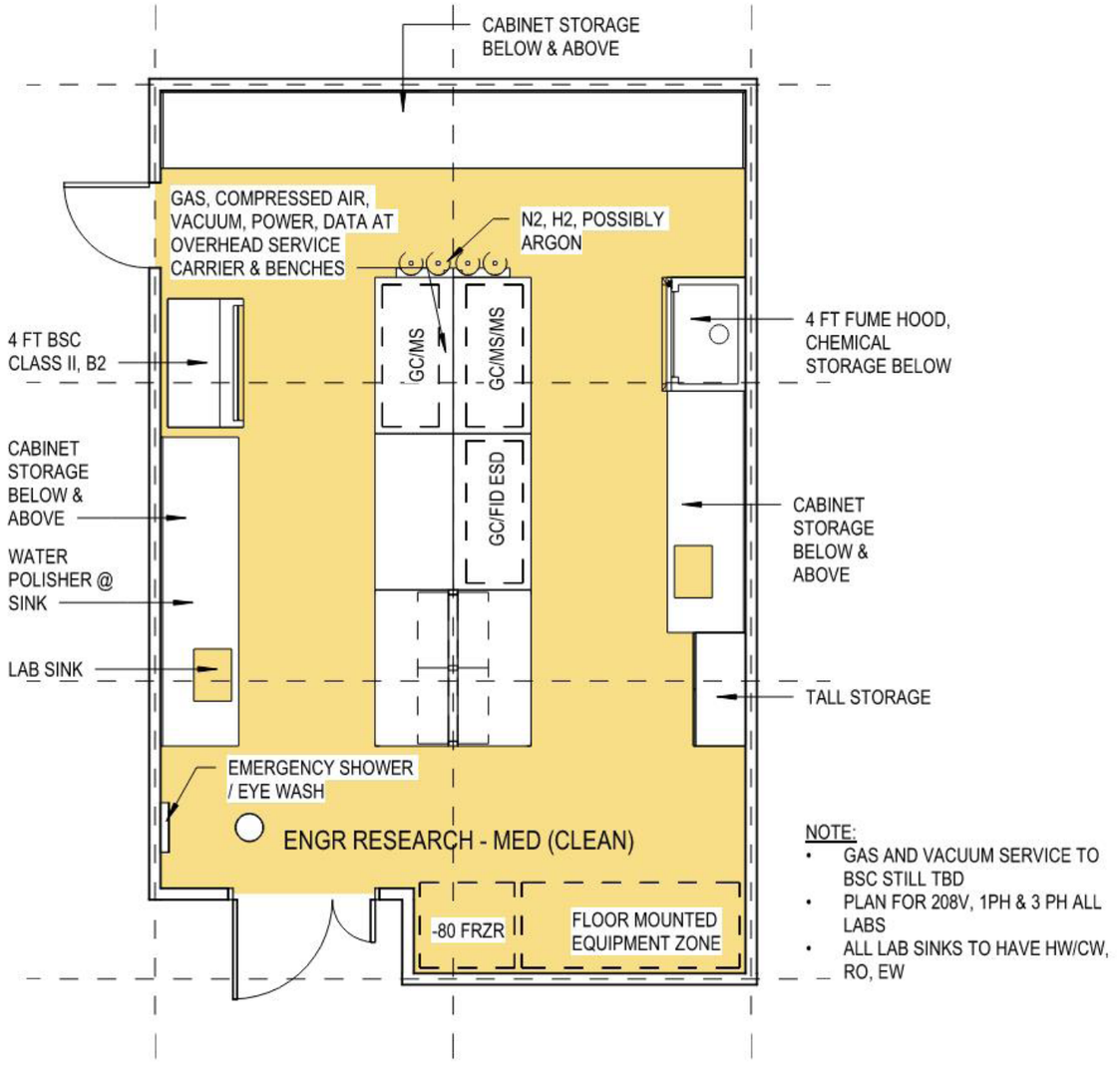


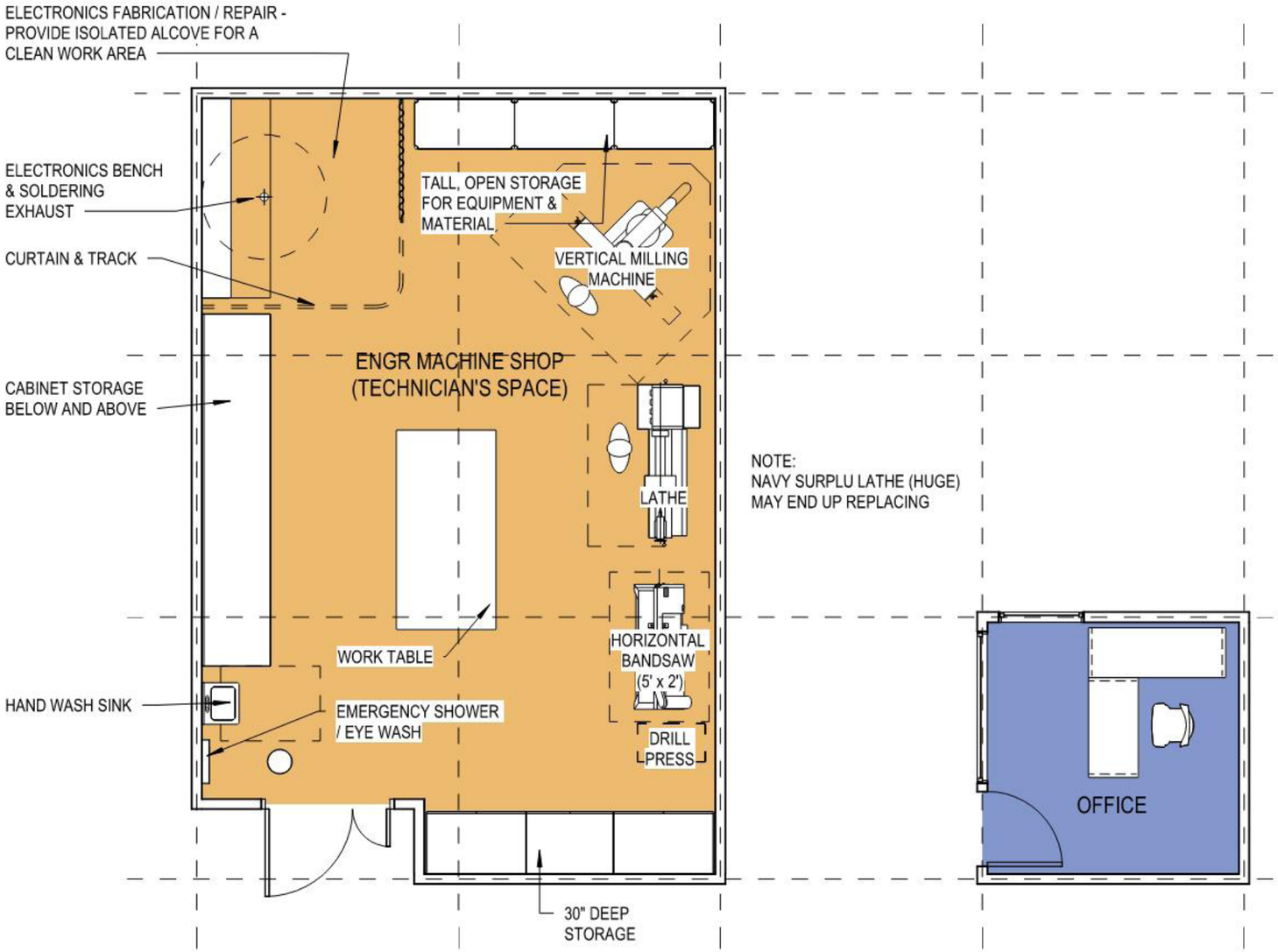
ENGR RESEARCH - MED

GUIDE PLATE - E+T

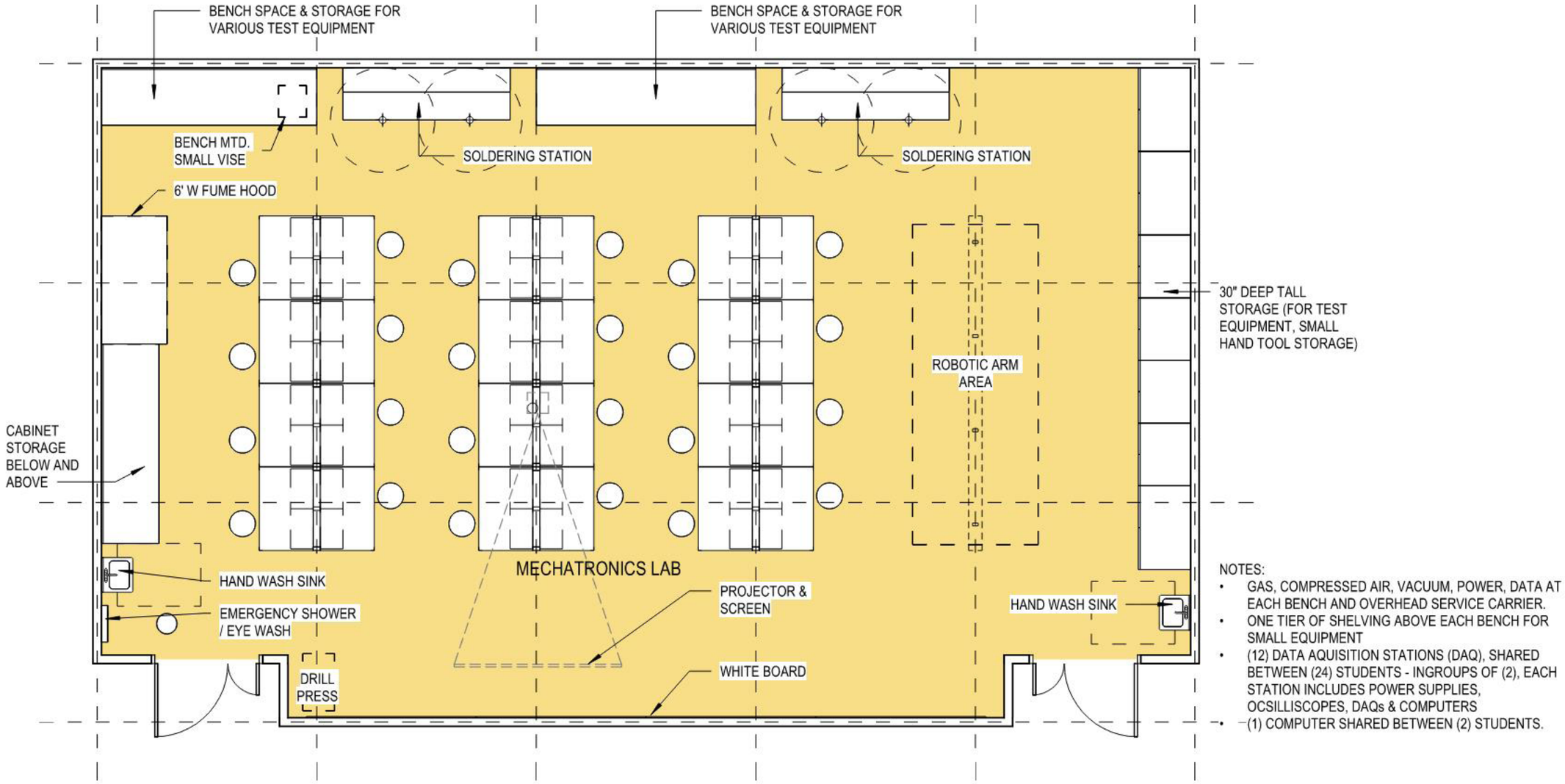
Scale: 3/16" = 1'-0"

ENGR RESEARCH - MED (CLEAN)
GUIDE PLATE - E+T
Scale: 3/16" = 1'-0"





ENGR MACHINE SHOP
(TECHNICIAN S SPACE)
GUIDE PLATE - E+T
Scale: 3/16" = 1'-0"

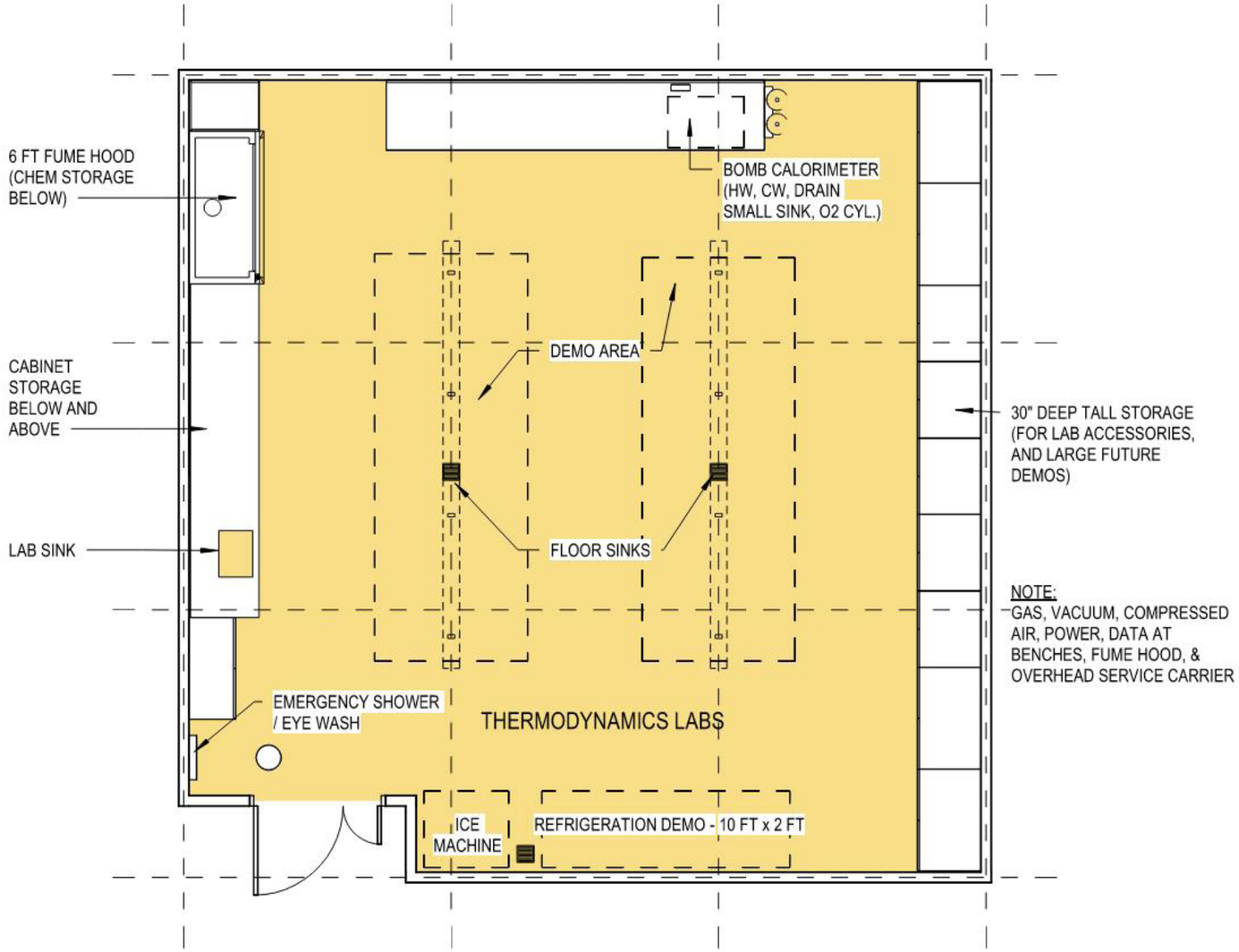


NOTES:
- GAS, COMPRESSED AIR, VACUUM, POWER, DATA AT EACH BENCH AND OVERHEAD SERVICE CARRIER.
- ONE TIER OF SHELVING ABOVE EACH BENCH FOR SMALL EQUIPMENT
- (12) DATA AQUISITION STATIONS (DAQ), SHARED BETWEEN (24) STUDENTS - INGROUPS OF (2), EACH STATION INCLUDES POWER SUPPLIES, OCSILLISCOPES, DAQs & COMPUTERS
- (1) COMPUTER SHARED BETWEEN (2) STUDENTS.

MECHATRONICS LAB

GUIDE PLATE - E+T

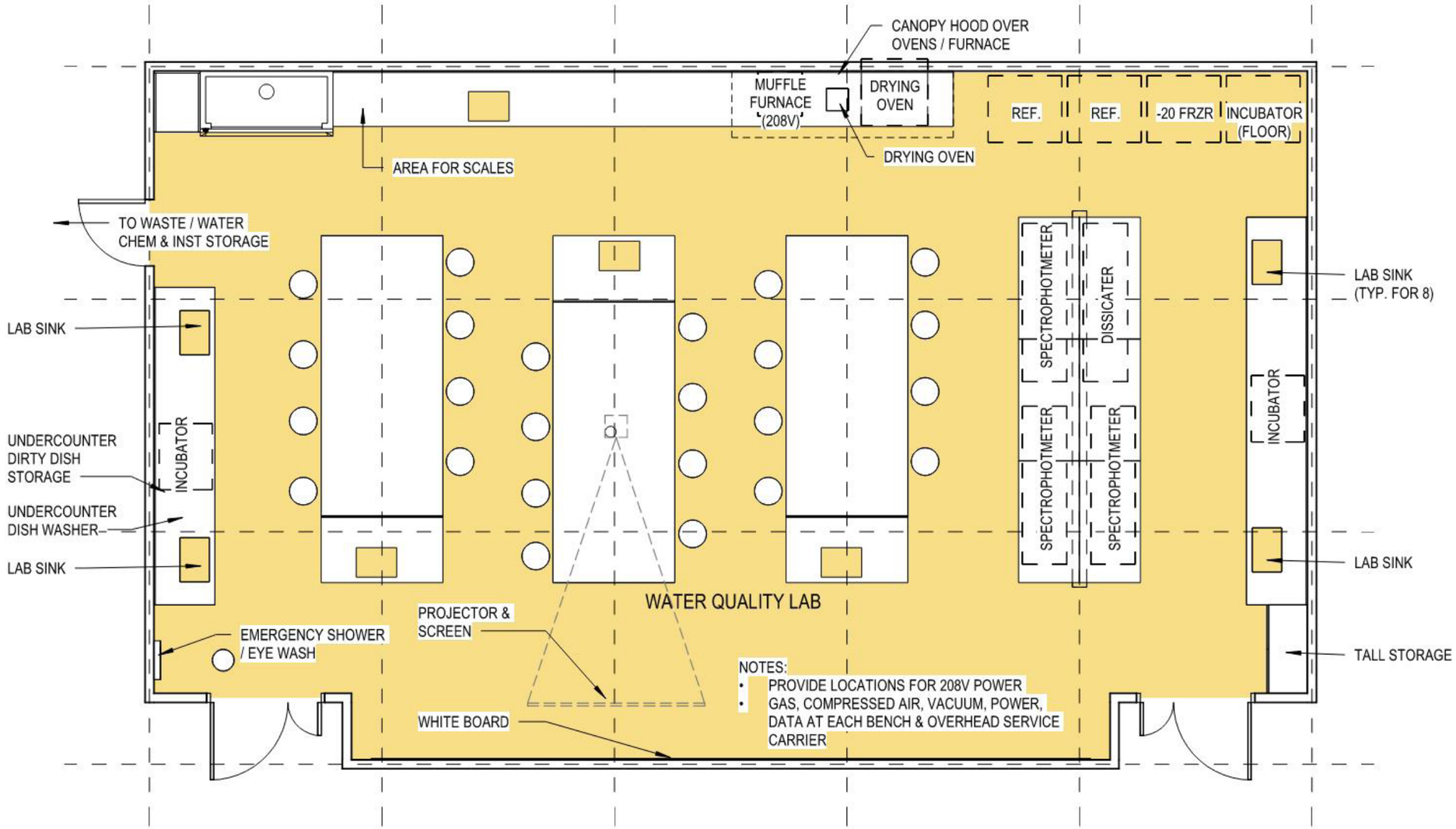
Scale: 3/16" = 1'-0"



THERMODYNAMICS LABS

GUIDE PLATE - E+T

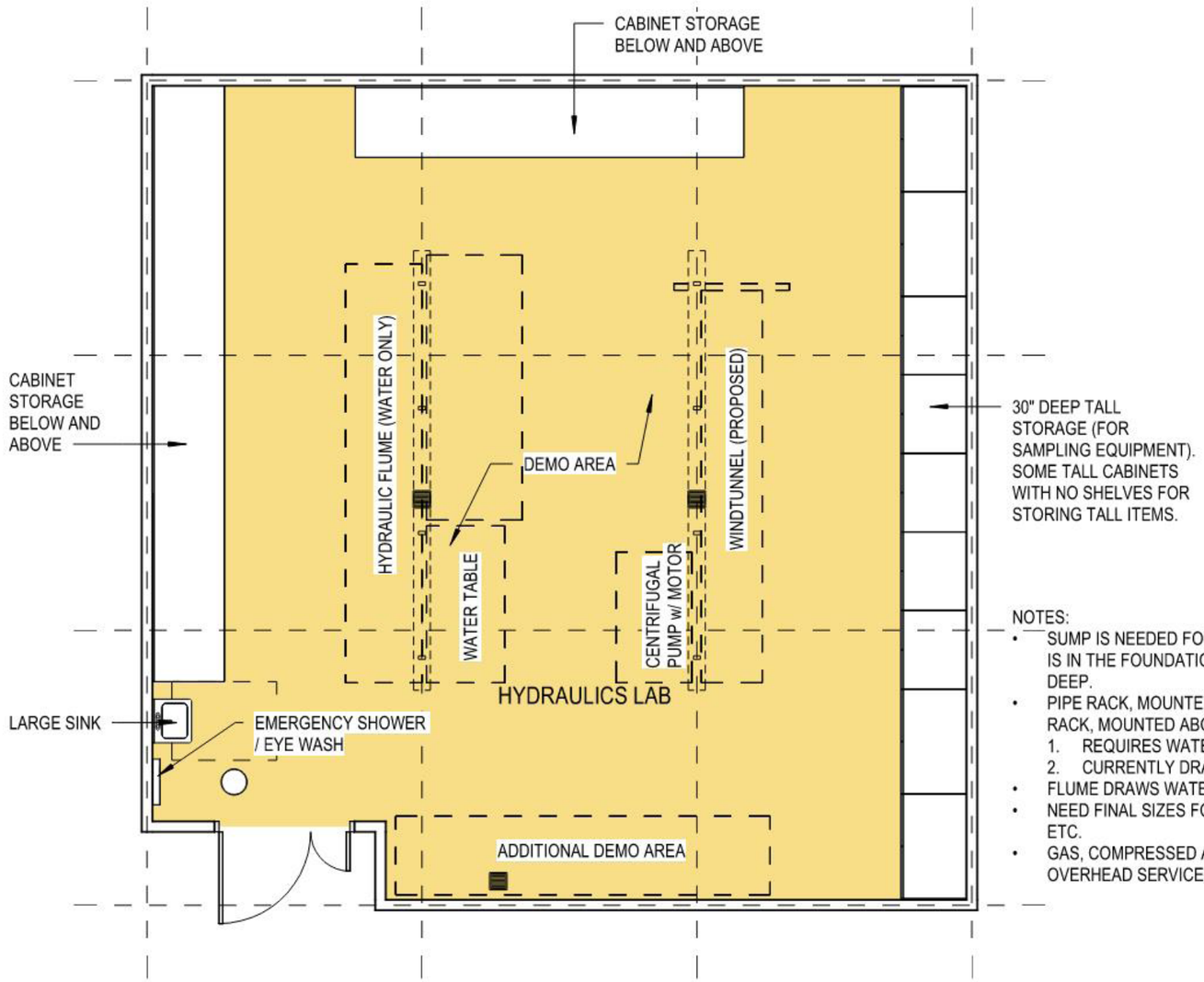
Scale: 3/16" = 1'-0"



WATER QUALITY LAB

GUIDE PLATE - E+T

Scale: 3/16" = 1'-0"



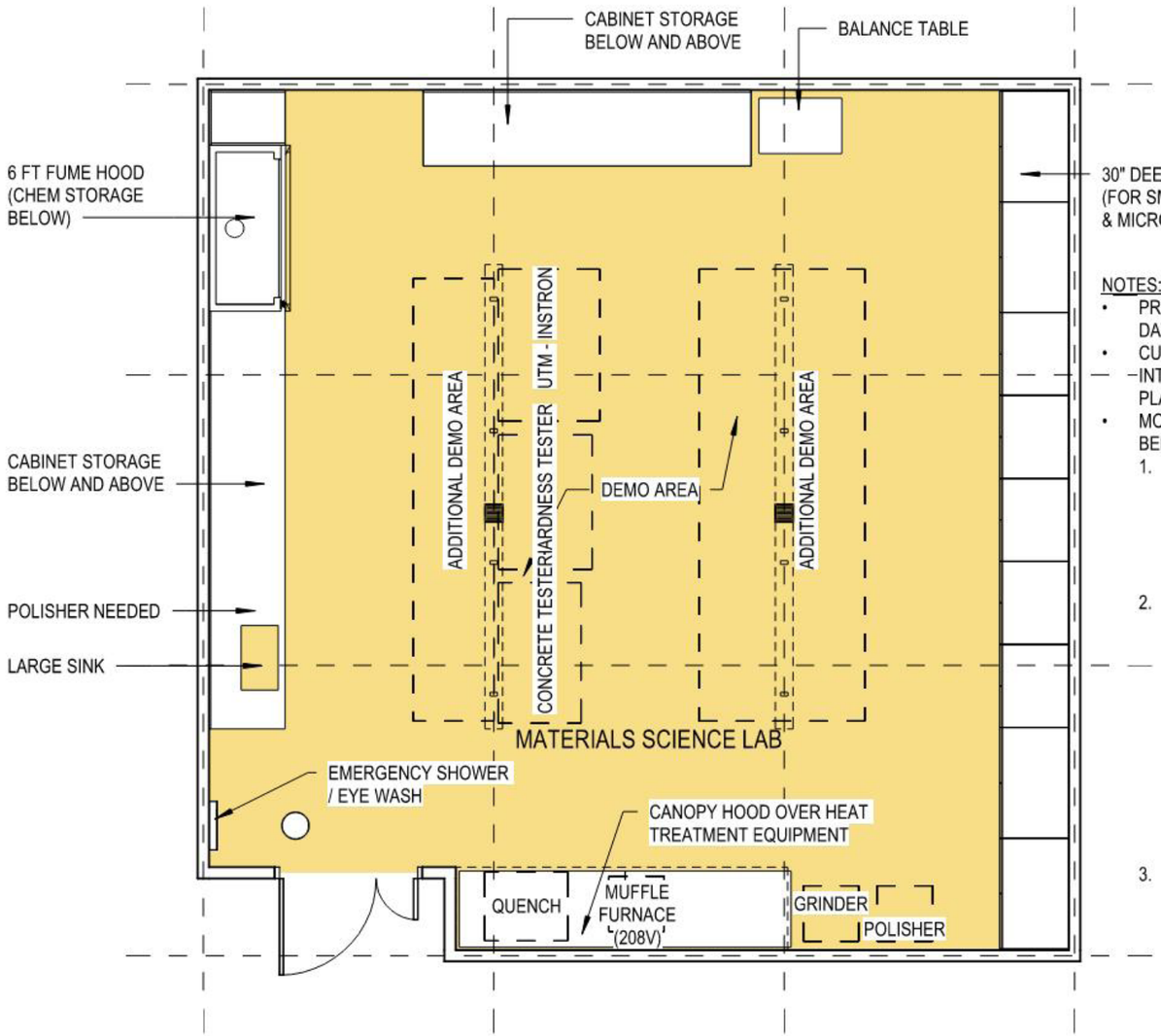
NOTES:

- SUMP IS NEEDED FOR FLUME AND PIPE RACK. CURRENT SUMP IS IN THE FOUNDATION, APPROXIMATELY 10 FT x 6 FT x 6 FT DEEP.
- PIPE RACK, MOUNTED ON WALL, MAXIMIZE LENGTH OF PIPE RACK, MOUNTED ABOVE BENCH TOP.
  1. REQUIRES WATER AND DRAIN CONNECTIONS
  2. CURRENTLY DRAWS WATER FROM THE SUMP
- FLUME DRAWS WATER FROM SUMP
- NEED FINAL SIZES FOR SUMP, FLUME, WIND TUNNEL, PIPE RACK, ETC.
- GAS, COMPRESSED AIR, VACUUM, POWER (208V, 3PH), DATA AT OVERHEAD SERVICE CARRIERS AND BENCHES

HYDRAULICS LAB

GUIDE PLATE - E+T

Scale: 3/16" = 1'-0"



NOTES:

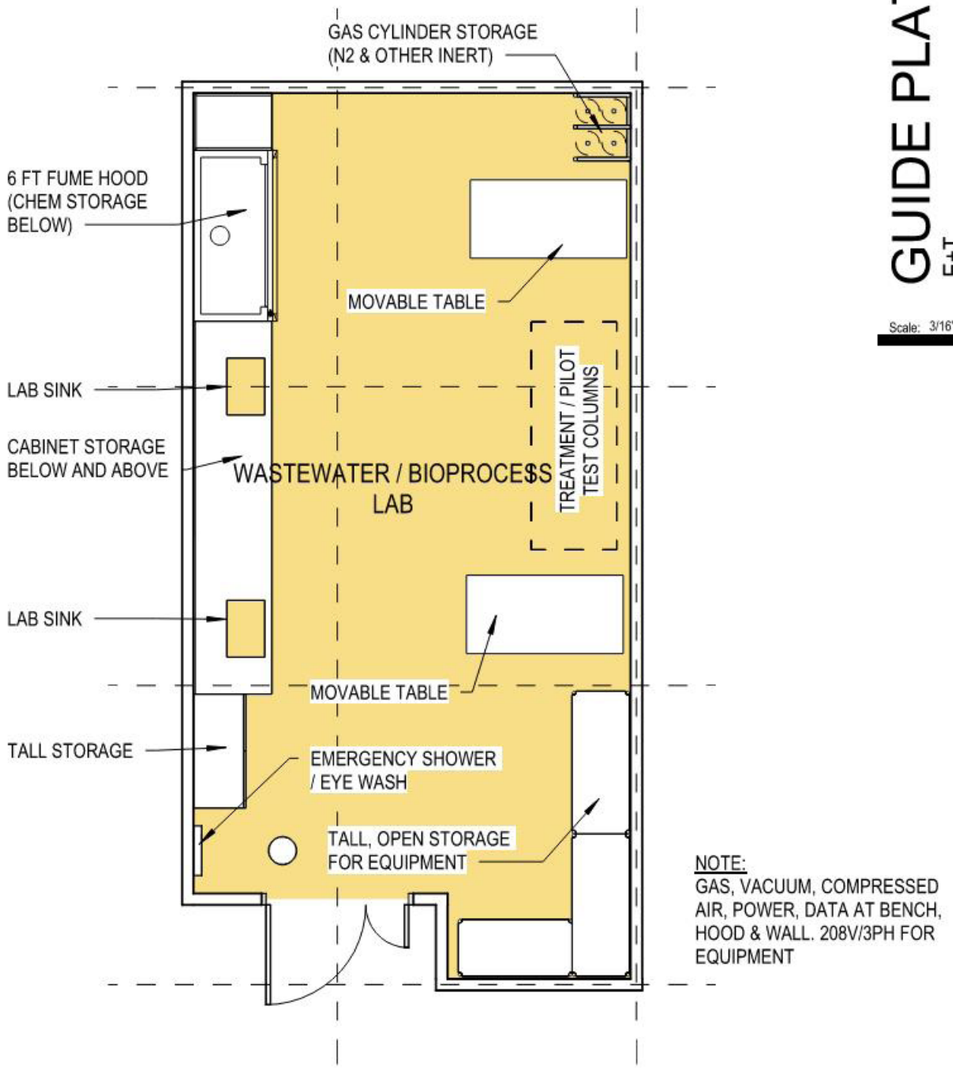
- PROVIDE GAS, COMPRESSED AIR, POWER (INCLUDING 208V, 1PH & 3 PH), DATA, WATER TO BENCHES & OVERHEAD SERVICE CARRIER
- CURRENTLY NO FACULTY ON STAFF FOR THIS SPACE. CPH IS INTERVIEWING CANDIDATES. THE FOLLOWING IS WHAT COULD BE PLANNED FOR THIS SPACE:
- MOST INSTRUMENTS WILL BE MID TO SMALL IN SIZE SITTING ON BENCHES. COULD INCLUDE:

1. PROCESSING:
   - A. MUFFLE FURNACE
   - B. ROLLING MACHINE (USUALLY IN MACHINE SHOP)
   - C. SAMPLE PREPARATION
   - D. HOT MOUNTING PRESS
   - E. METALLOGRAPHIC GRINDING / POLISHING MACHINES
2. TESTING - PROPERTIES:
   - A. HARDNESS TESTER
   - B. UNIVERSAL MATERIALS TESTING (TENSILE / COMPRESSIVE PROPERTIES)
   - C. THREE POINT BENDING FIXTURE (FLEXURAL PROPERTIES)
   - D. CHARPY IMPACT TESTER (TOUGHNESS)
   - E. FATIGUE TESTER (FATIGUE)
   - F. CREEPING TESTER DEVICE (CREEPING)
   - G. CANTILEVER TESTING DEVICE (FLEXURAL STRENGTH OF A BEAM)
   - H. PRECISE WEIGHT BALANCE (WEIGHT LOSS MEASUREMENT FOR CORROSION TESTS)
3. MICROSTRUCTURE / DEFECTS - CHARACTERIZATION:
   - A. OPTICAL MICROSCOPY (GRAIN, PHASE, DEFECTS, ETC.)
   - B. ULTRASONIC TESTING DEVICE (INTERNAL CRACKS)
   - C. SUPPLIES FOR DEFECTS CHARACTERIZATION (DYE PENETRATION, FLUORESCENT MAGNETIC PARTICLES, ETC.

MATERIALS SCIENCE LAB

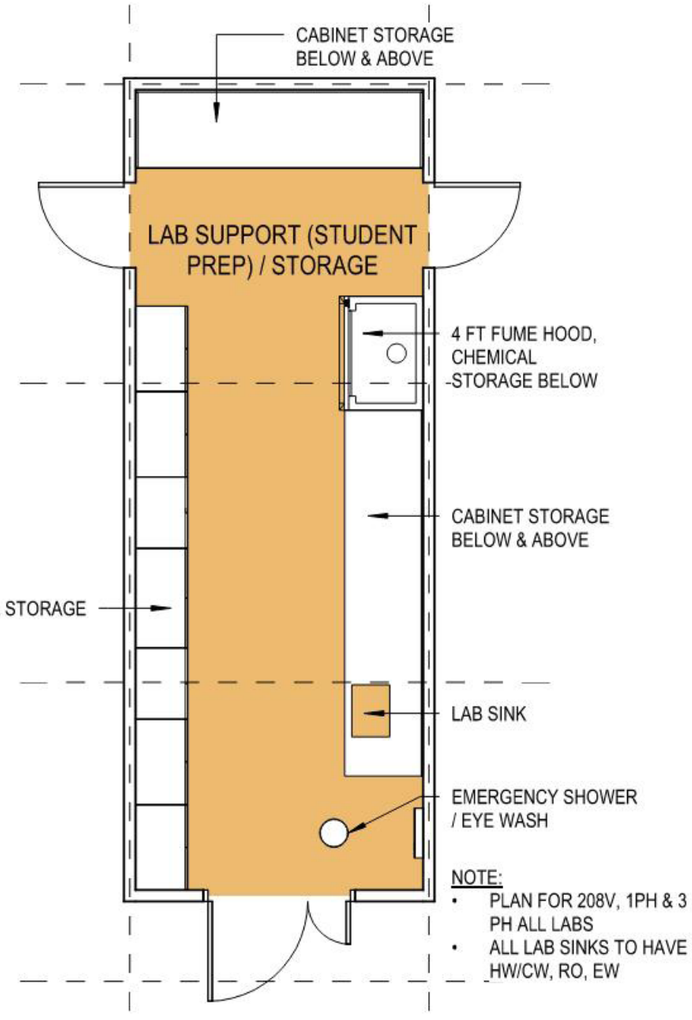
GUIDE PLATE - E+T

Scale: 3/16" = 1'-0"



GUIDE PLATE
E+T
WASTEWATER / BIOPROCESS LAB

Scale: 3/16" = 1'-0"



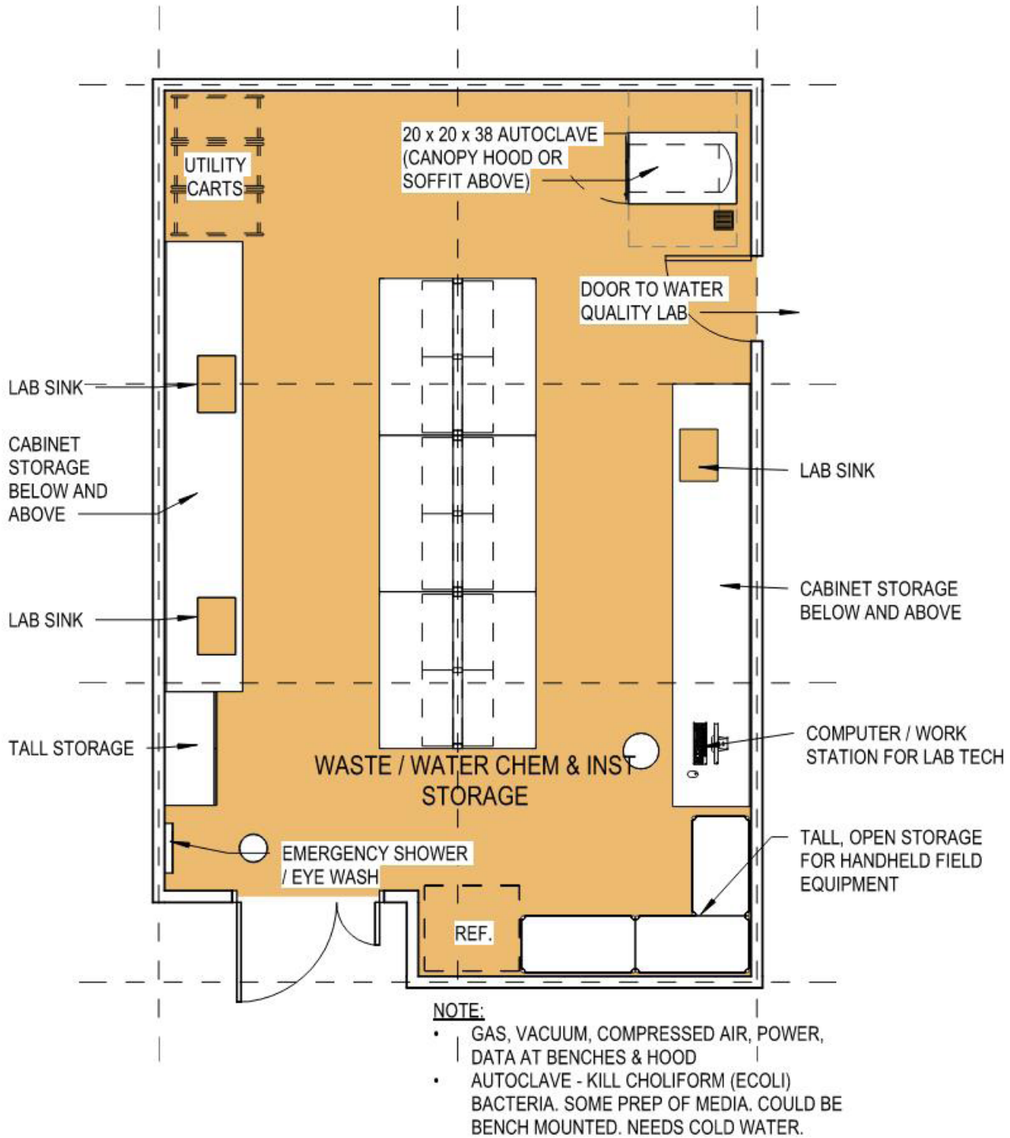
GUIDE PLATE
E+T
LAB SUPPORT (STUDENT PREP) /
STORAGE

Scale: 3/16" = 1'-0"

GUIDE PLATE

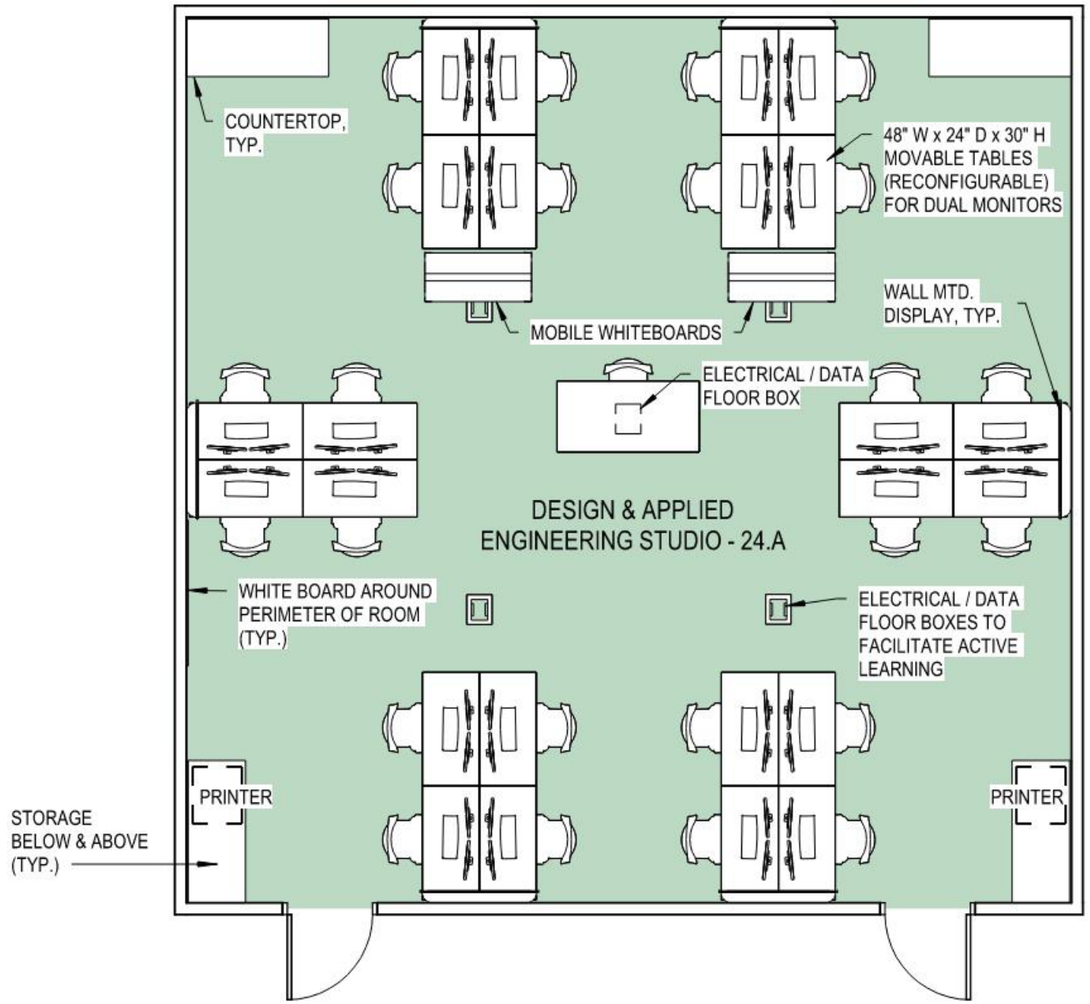
E+T
WASTE / WATER CHEM & INST
STORAGE

Scale: 3/16" = 1'-0"



NOTE:

- GAS, VACUUM, COMPRESSED AIR, POWER, DATA AT BENCHES & HOOD
- AUTOCLAVE - KILL CHOLIFORM (ECOLI) BACTERIA. SOME PREP OF MEDIA. COULD BE BENCH MOUNTED. NEEDS COLD WATER.



DESIGN & APPLIED ENGINEERING STUDIO - 24.A

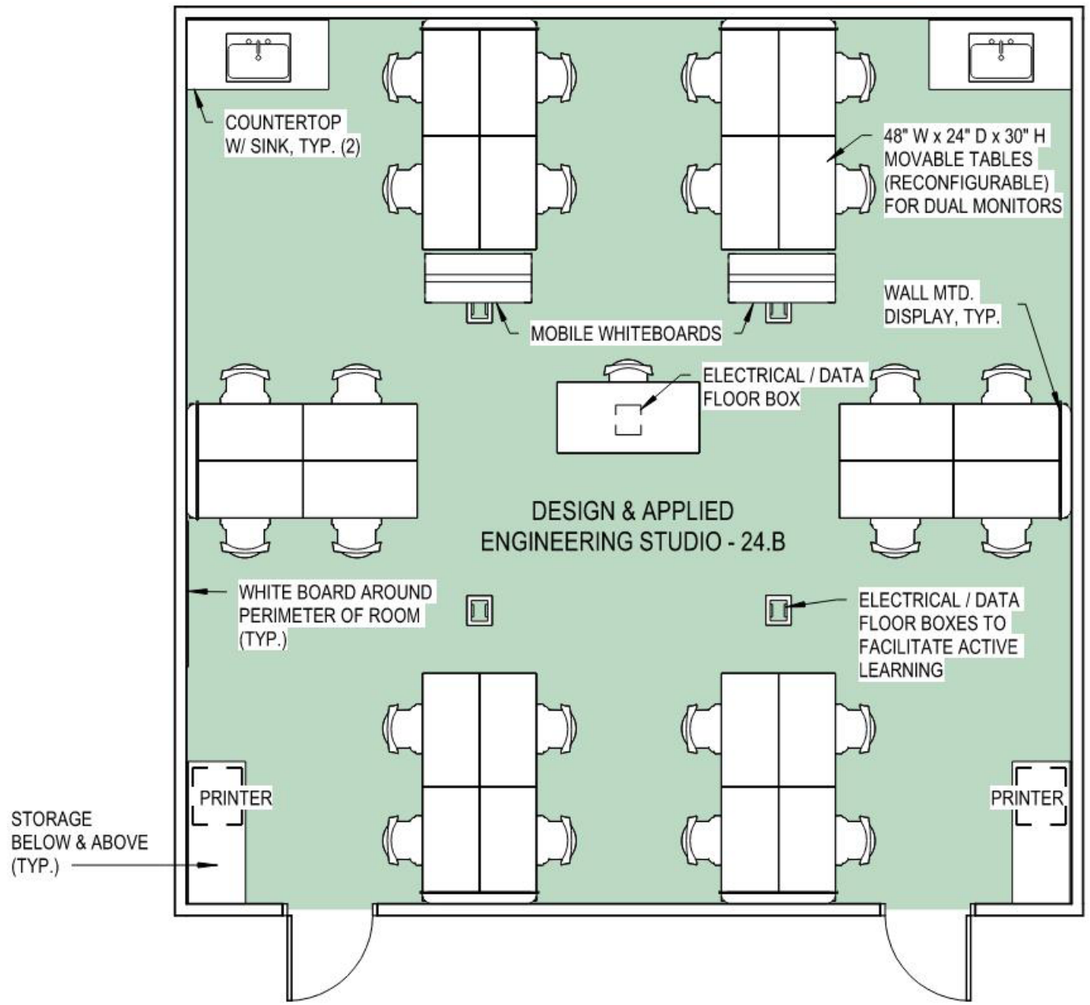
GUIDE PLATE - E+T

Scale: 3/16" = 1'-0"

NOTES:

- MONITORS AT EACH STUDENT GROUP FOR STUDENTS TO PROJECT FROM THEIR LAPTOP. OVERALL CONTROL AT INSTRUCTOR'S STATION.
- PLAN INFRASTRUCTURE FOR (2) PRINTERS IN EACH STUDIO PLUS IN CORRIDOR ALCOVES FOR STUDENT ACCESS.
- AREA FOR LARGE FORMAT PRINTER (3' x 6') NEEDED. IDEALLY OUTSIDE TEACHING AREAS.

DESIGN & APPLIED ENGINEERING STUDIO - 24.B
GUIDE PLATE - E+T
Scale: 3/16" = 1'-0"



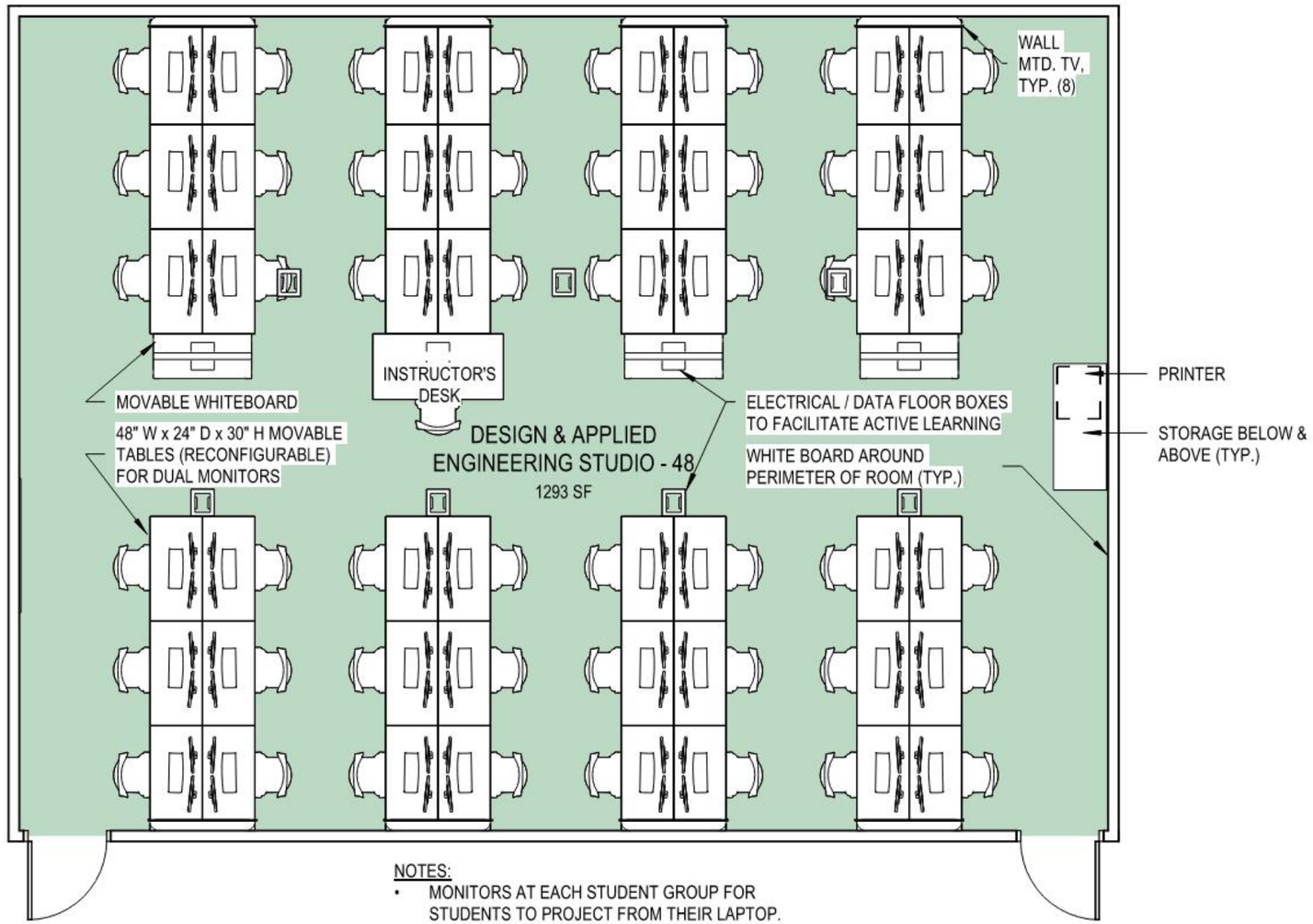
NOTES:

- PLAN INFRASTRUCTURE FOR (2) PRINTERS IN EACH STUDIO PLUS IN CORRIDOR ALCOVES FOR STUDENT ACCESS.
- PROVIDE SINKS IN 1-2 OF THE 24 PERSON DESIGN STUDIOS.
- AREA FOR LARGE FORMAT PRINTER (3' x 6') NEEDED. IDEALLY OUTSIDE TEACHING AREAS.

DESIGN & APPLIED ENGINEERING STUDIO - 48

GUIDE PLATE - E+T

Scale: 3/16" = 1'-0"



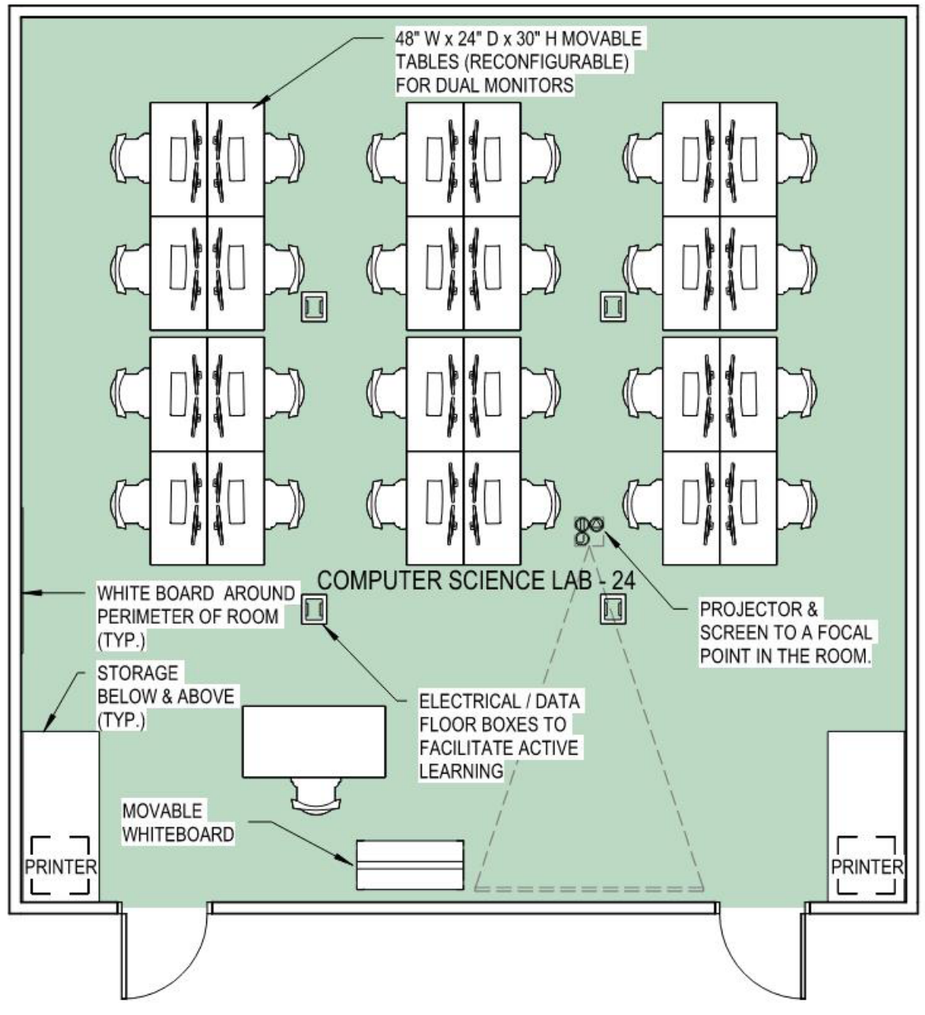
NOTES:

- MONITORS AT EACH STUDENT GROUP FOR STUDENTS TO PROJECT FROM THEIR LAPTOP. OVERALL CONTROL AT INSTRUCTOR'S STATION.
- PLAN INFRASTRUCTURE FOR (2) PRINTERS IN EACH STUDIO PLUS IN CORRIDOR ALCOVES FOR STUDENT ACCESS.

COMPUTER SCIENCE LAB - 24

GUIDE PLATE - E+T

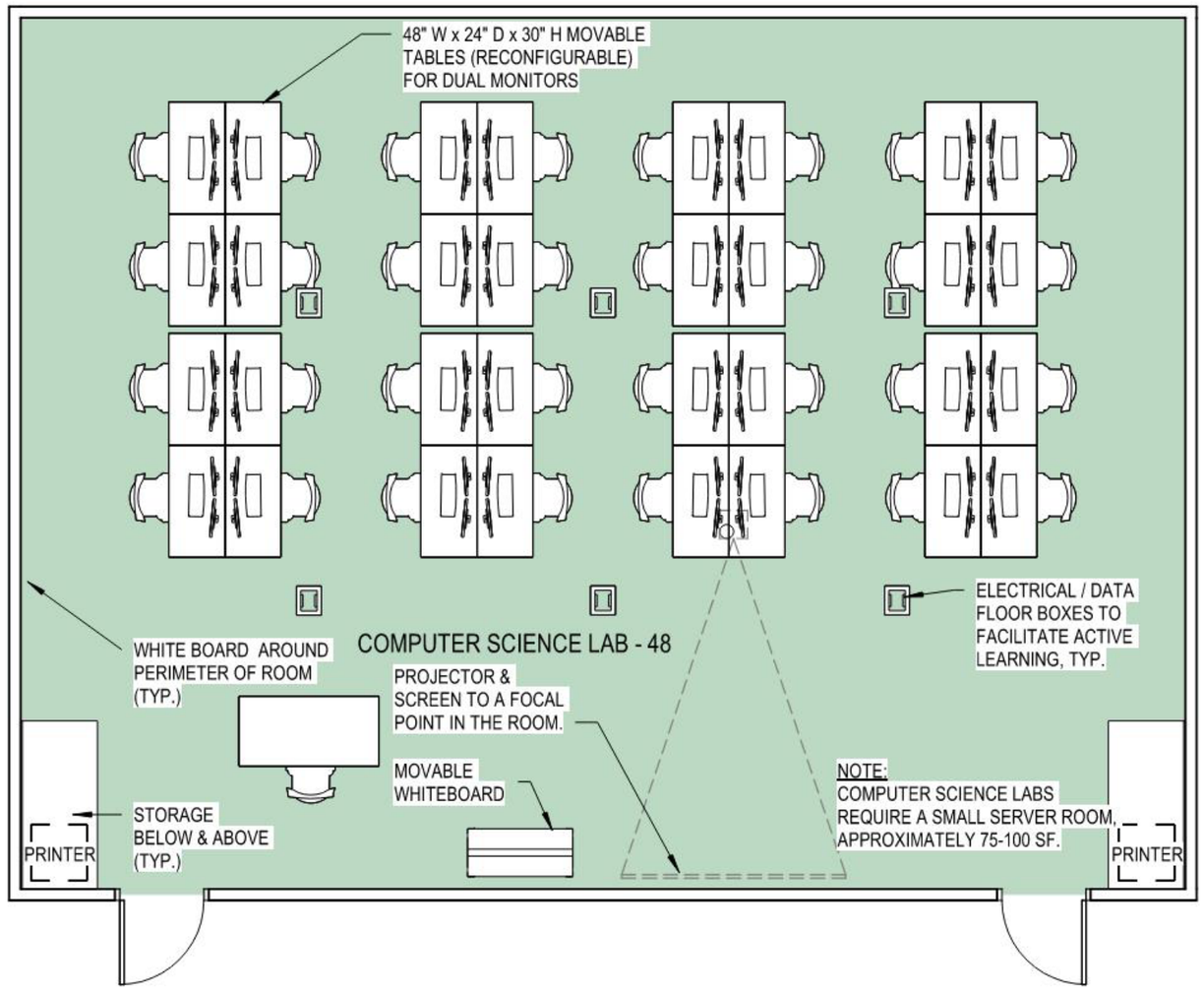
Scale: 3/16" = 1'-0"



NOTES:

- COMPUTER SCIENCE LABS REQUIRE A SMALL SERVER ROOM, APPROXIMATELY 75-100 SF.
- AREA FOR LARGE FORMAT PRINTER (3' x 6') NEEDED. IDEALLY OUTSIDE TEACHING AREAS.

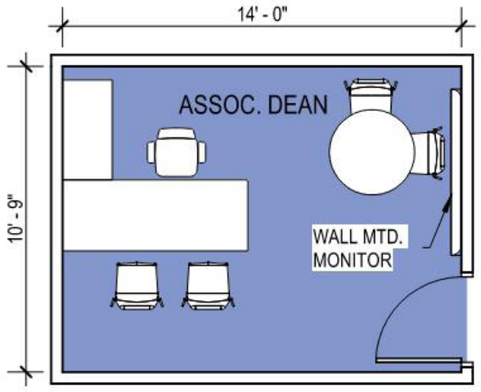
COMPUTER SCIENCE LAB - 48
GUIDE PLATE - E+T
Scale: 3/16" = 1'-0"

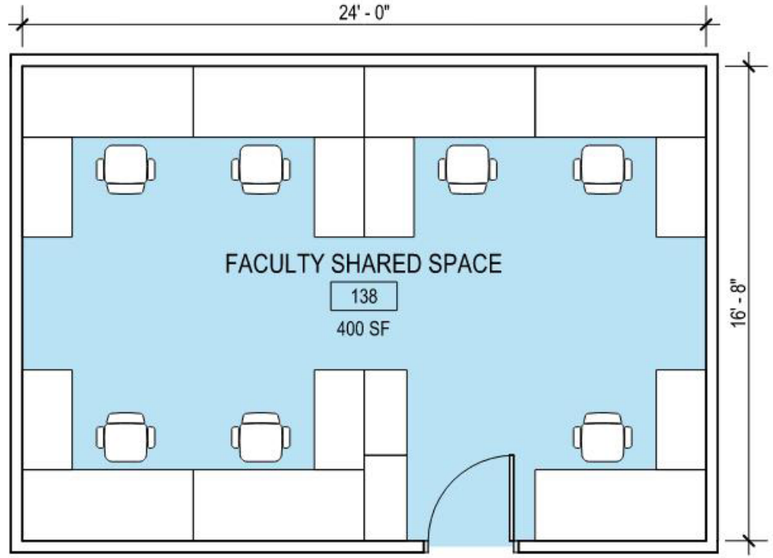


ASSOC. DEAN

GUIDE PLATE - E+T

Scale: 3/16" = 1'-0"

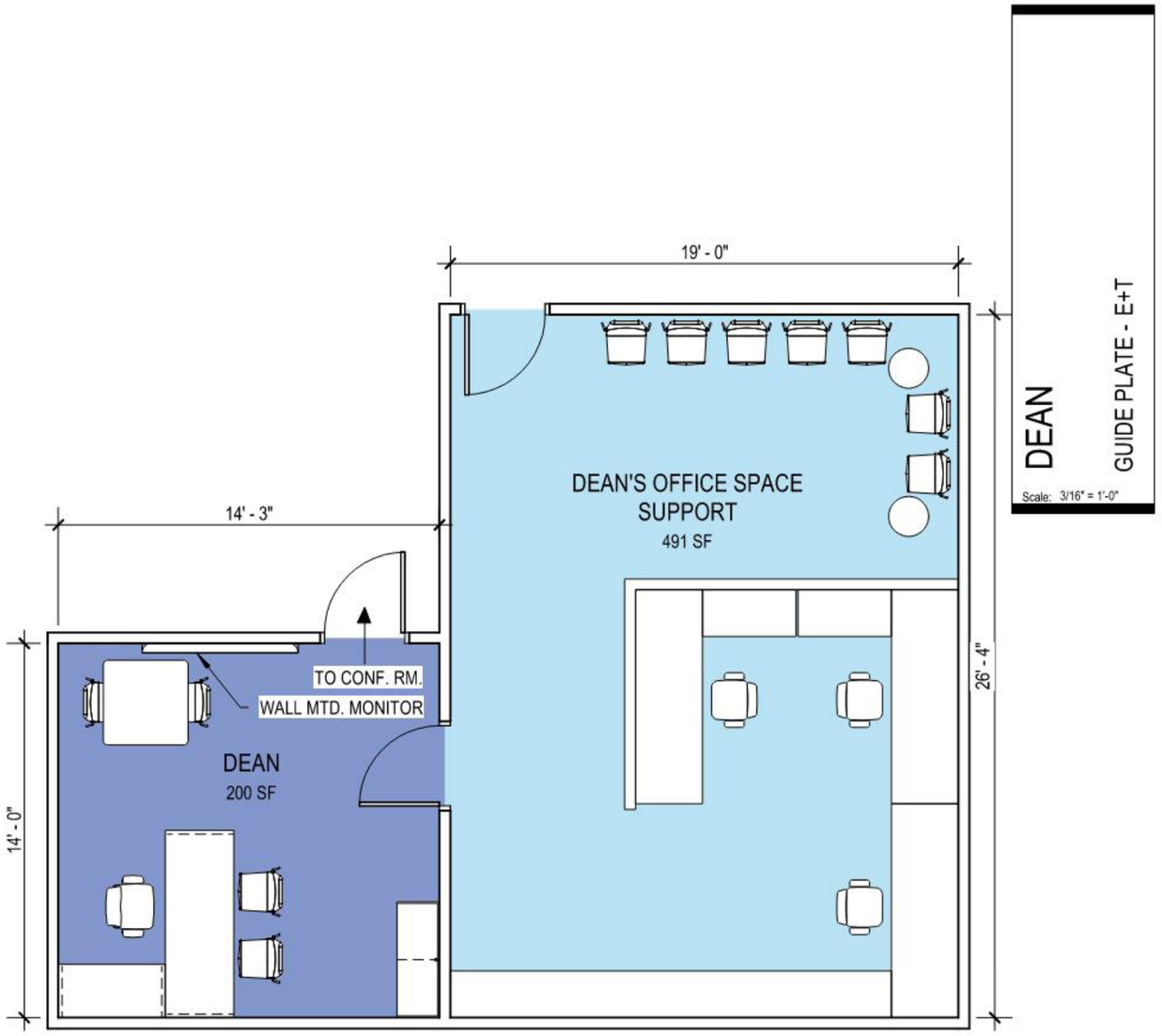


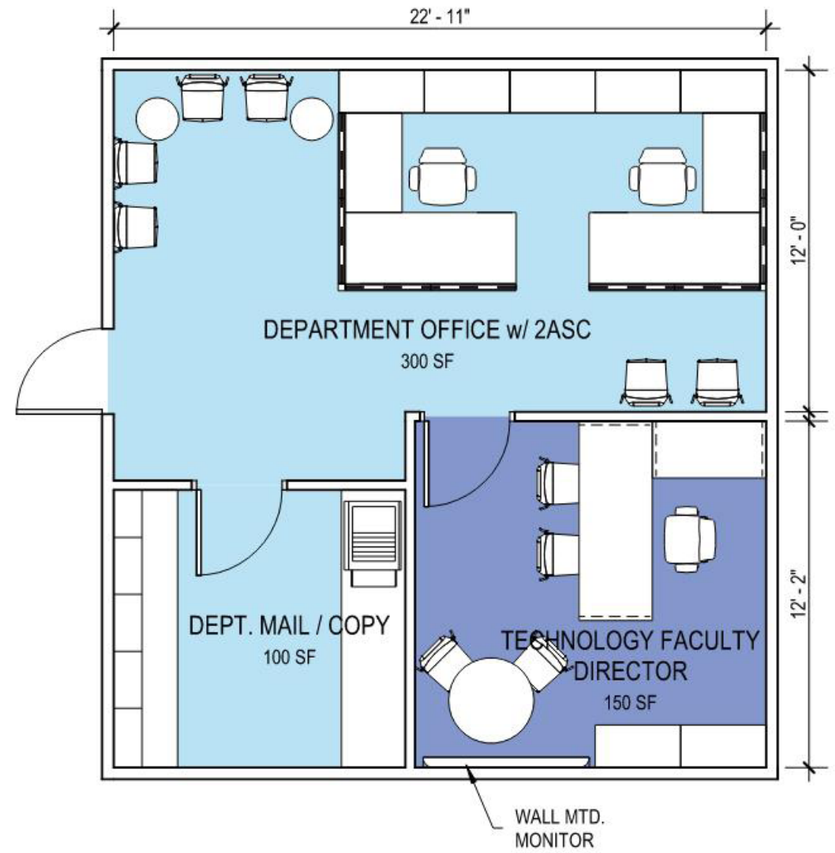


FACULTY SHARED SPACE

GUIDE PLATE - E+T

Scale: 3/16" = 1'-0"


19' - 0"
14' - 3"
DEAN'S OFFICE SPACE
SUPPORT
491 SF
TO CONF. RM.
WALL MTD. MONITOR
DEAN
200 SF
14' - 0"
26' - 4"
DEAN
GUIDE PLATE - E+T
Scale: 3/16" = 1'-0"


22' - 11"
12' - 0"
DEPARTMENT OFFICE w/ 2ASC
300 SF
DEPT. MAIL / COPY
100 SF
TECHNOLOGY FACULTY
DIRECTOR
150 SF
12' - 2"
WALL MTD.
MONITOR
DEPARTMENT OFFICE w/
2ASC
GUIDE PLATE - E+T
Scale: 3/16" = 1'-0"

The Student Housing Room Data Sheets as follows:

3.6.8 RESIDENTIAL UNITS

- SINGLE
- DOUBLE
- RA ROOM
- RLC APARTMENT

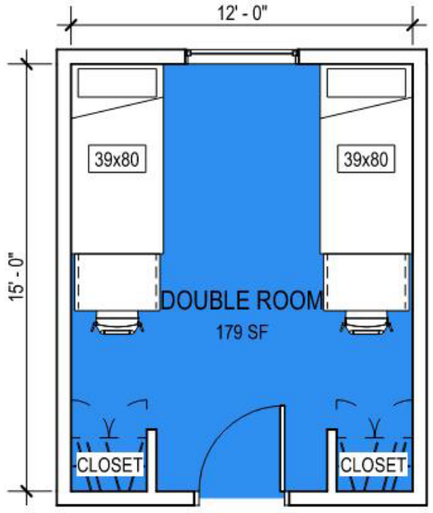
3.6.9 SHARED RESOURCES

- MEDIUM MEETING / STUDY ROOM
- STUDENT SHARED LOUNGE / KITCHENETTE
- MAILROOM
- RLC OFFICE
- LAUNDRY ROOM
- MULTIPURPOSE CLASSROOM
- LIVING ROOM / GATHERING SPACE
- RECEPTION AREA

SINGLE

GUIDE PLATE - HDH - HOUSING

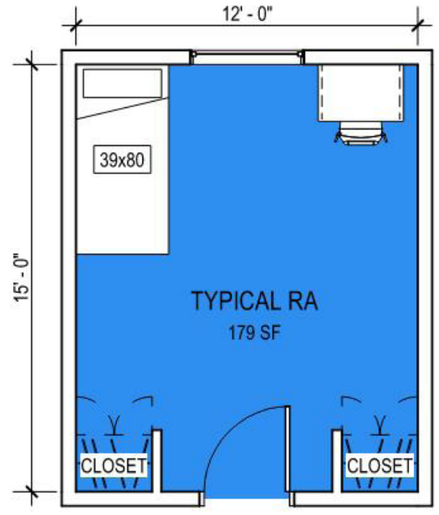
Scale: 3/16" = 1'-0"



DOUBLE

GUIDE PLATE - HDH - HOUSING

Scale: 3/16" = 1'-0"



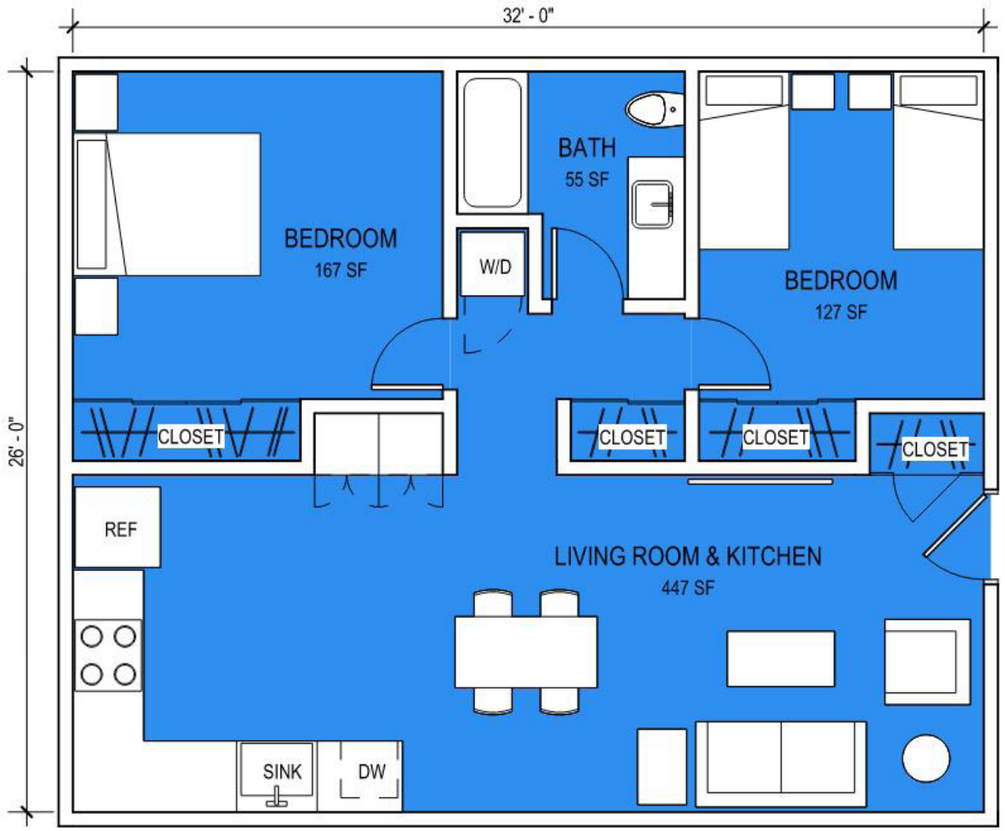
RA ROOM

GUIDE PLATE - HDH - HOUSING

Scale: 3/16" = 1'-0"

RLC APARTMENT

GUIDE PLATE - HDH - HOUSING



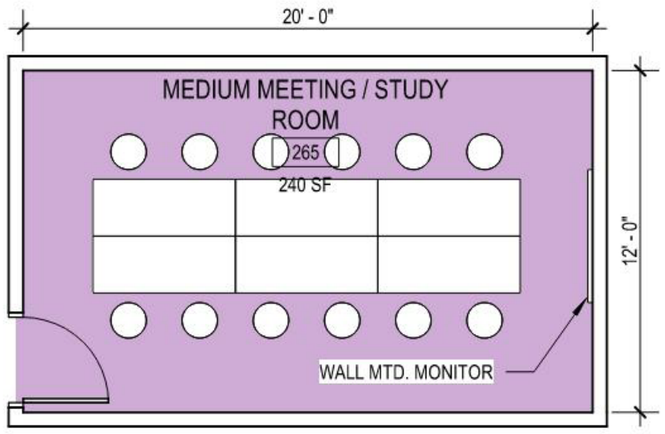
Scale: 3/16" = 1'-0"

ASF: 795 SF

MED MEETING / STUDY ROOM

GUIDE PLATE - E+T

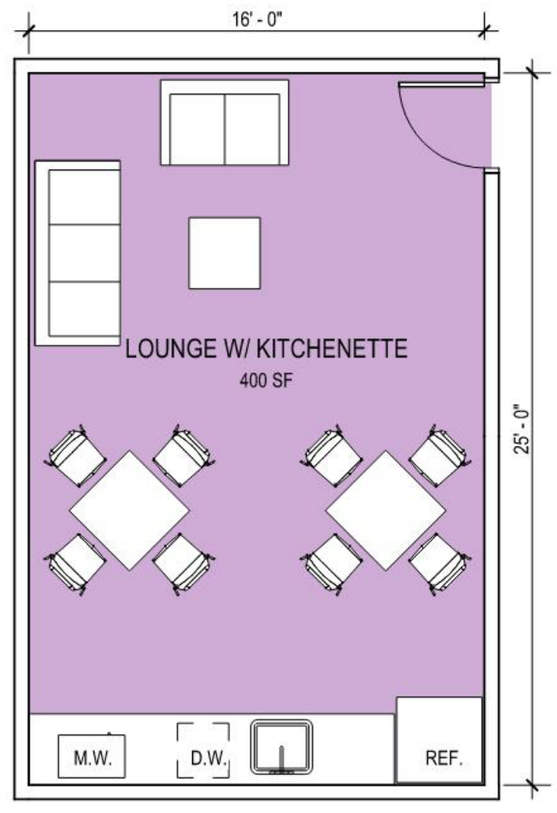
Scale: 3/16" = 1'-0"

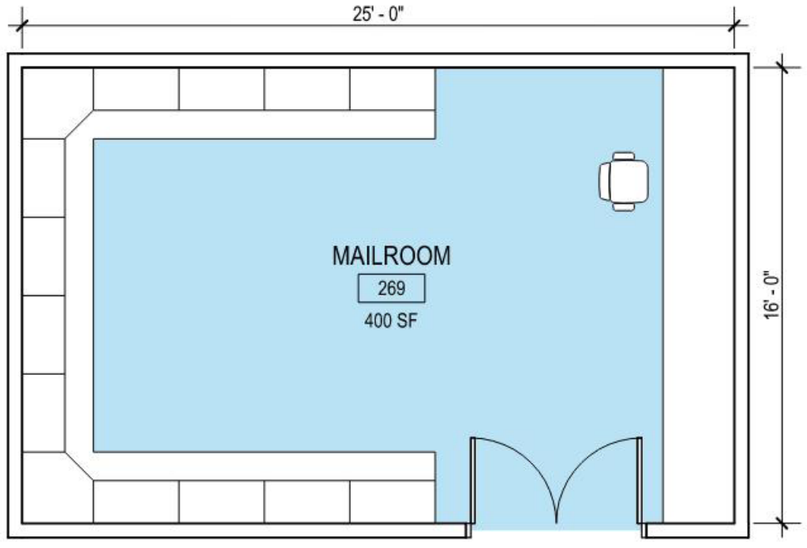


LOUNGE + KITCHENETTE

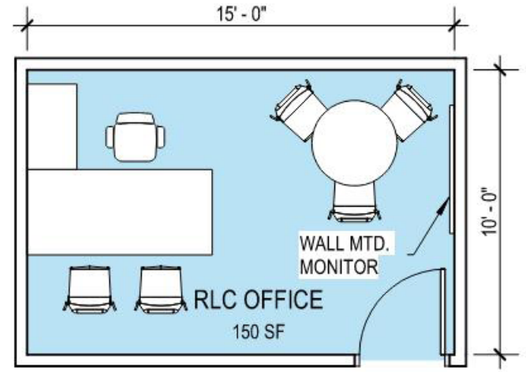
GUIDE PLATE - E+T

Scale: 3/16" = 1'-0"

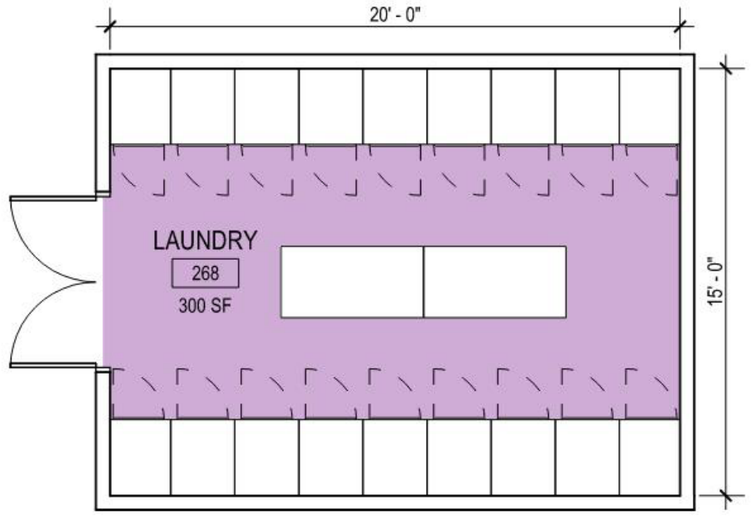




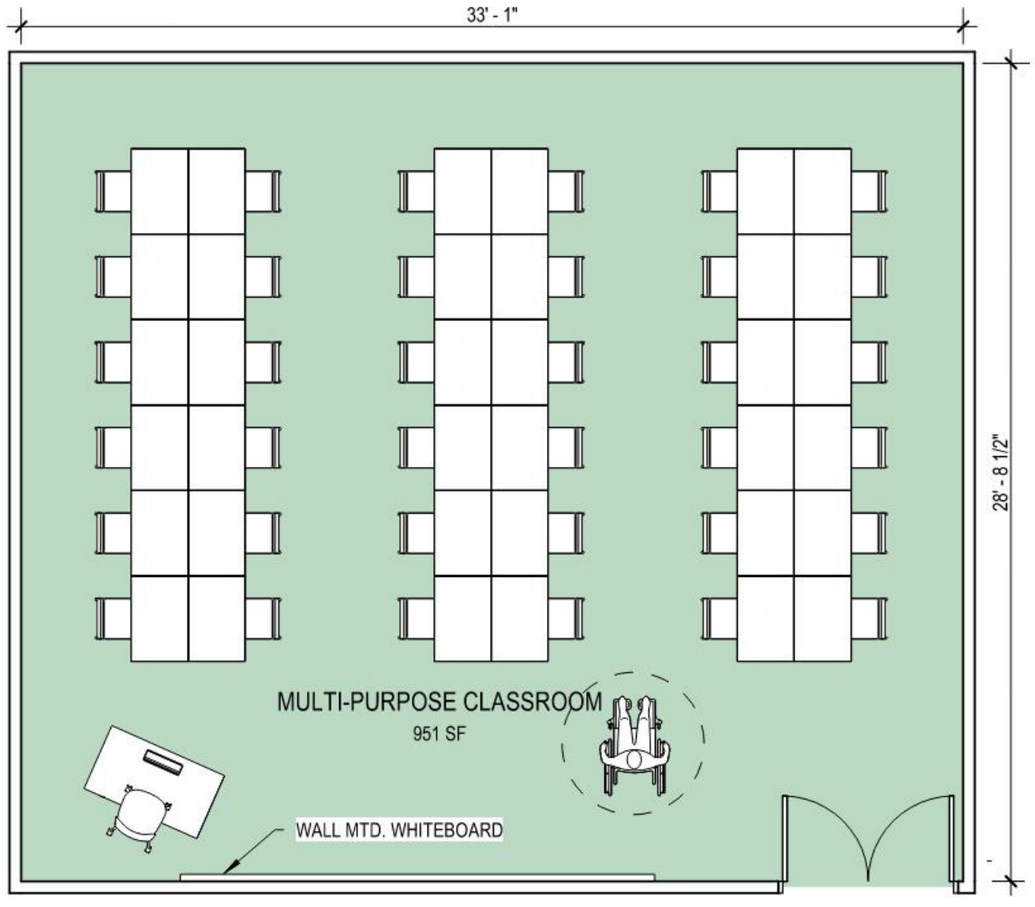
MAILROOM
GUIDE PLATE - E+T
Scale: 3/16" = 1'-0"



RLC OFFICE
GUIDE PLATE - E+T
Scale: 3/16" = 1'-0"



LAUNDRY ROOM
GUIDE PLATE - E+T
Scale: 3/16" = 1'-0"



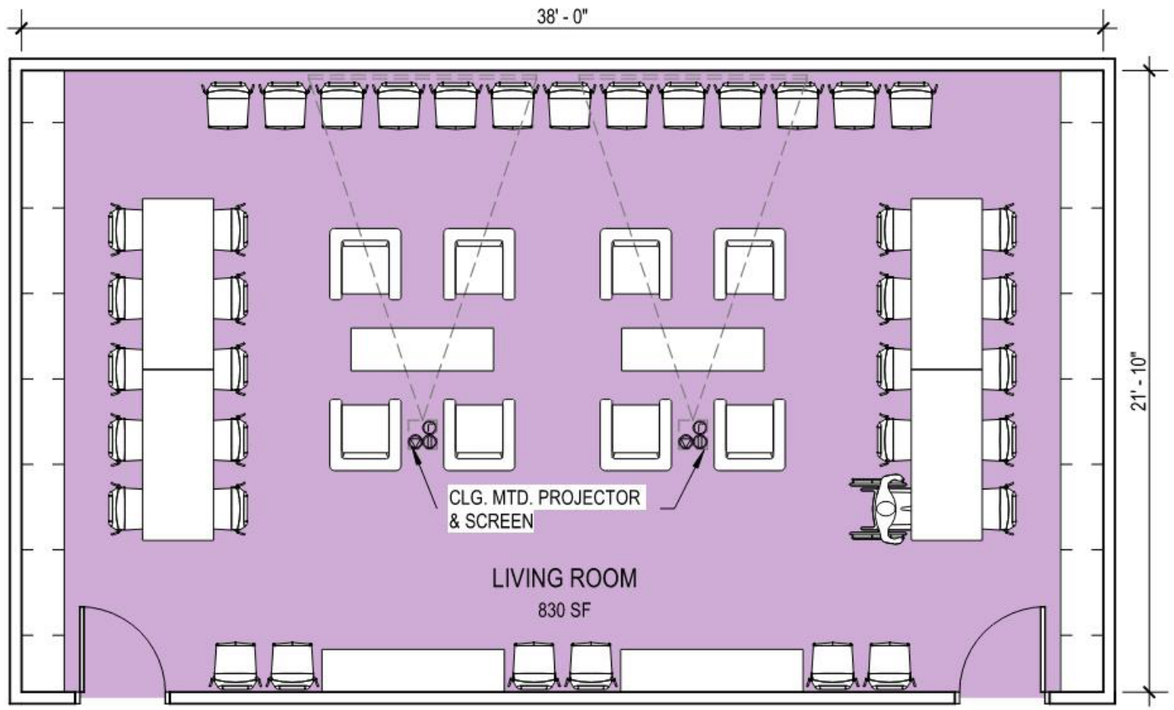
MULTI-PURPOSE CLASSROOM
GUIDE PLATE - E+T

Scale: 3/16" = 1'-0"

LIVING ROOM

GUIDE PLATE - E+T

Scale: 3/16" = 1'-0"



RECEPTION AREA

GUIDE PLATE - E+T

Scale: 3/16" = 1'-0"

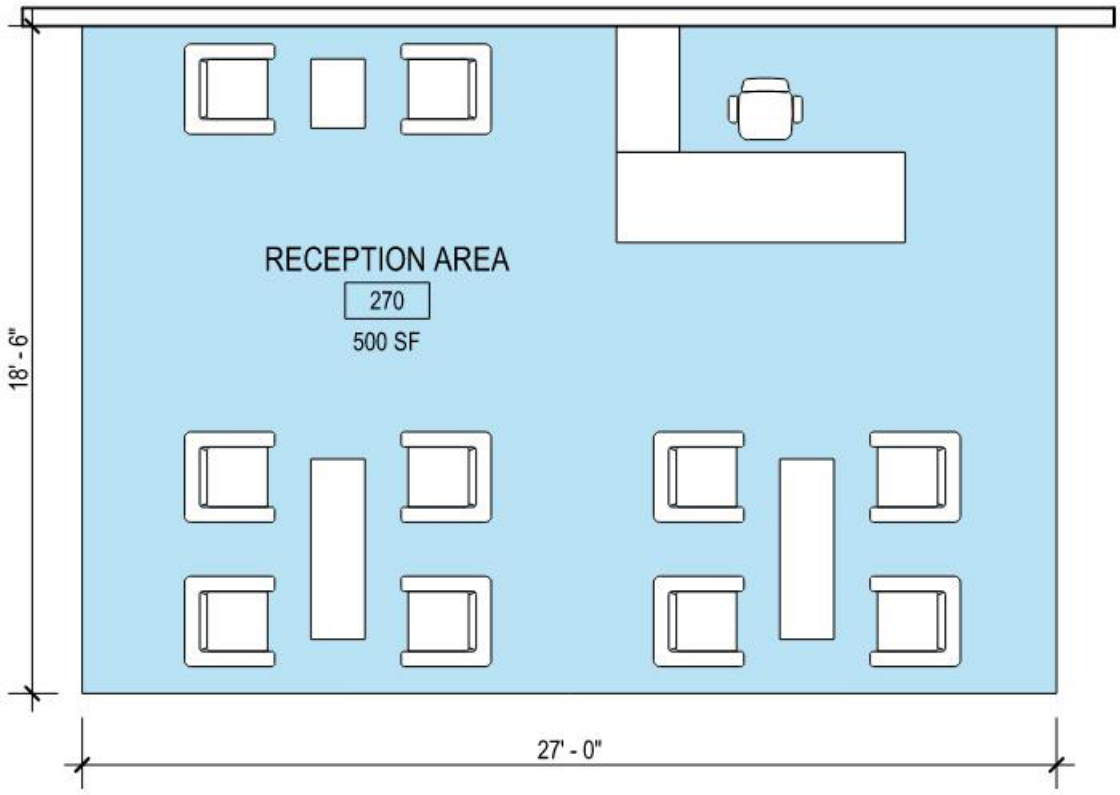


Photo Credit: Courtesy of Cal Poly Humboldt

04

SITE CONTEXT AND CONCEPT TEST FITS

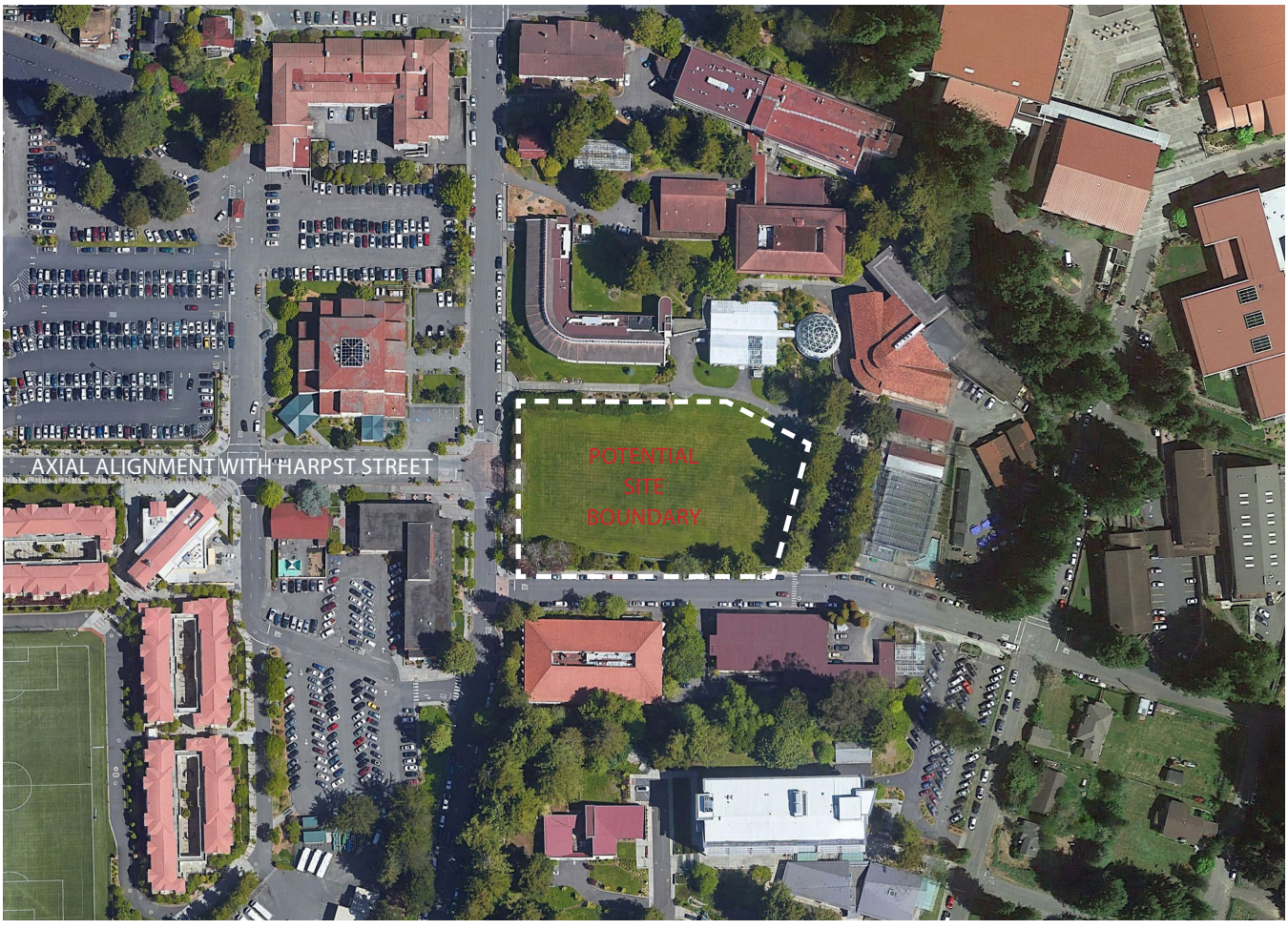
4.1 SITE ANALYSIS

4.1.1 SITE LOCATION AND CONTEXT

The project site for the Engineering & Technology Building and Student Housing Building is located at the eastern end of Harpst Street where it terminates at B Street. (Figure 4.1.1). This intersection represent a significant campus entry and gateway from the west, along the highly used pedestrian and vehicle corridor of B Street. The site is bounded by Alistair McCrone Hall (Science D) and the Dennis K Walker Greenhouse to the north and the Natural Resources and Forestry buildings along 17th Street to the south. The western edge of the site sits along an access drive at the Wildlife Game Pens and Fisheries.

The Diagram below highlights the potential site boundary for the Engineering & Technology and Student Housing buildings.

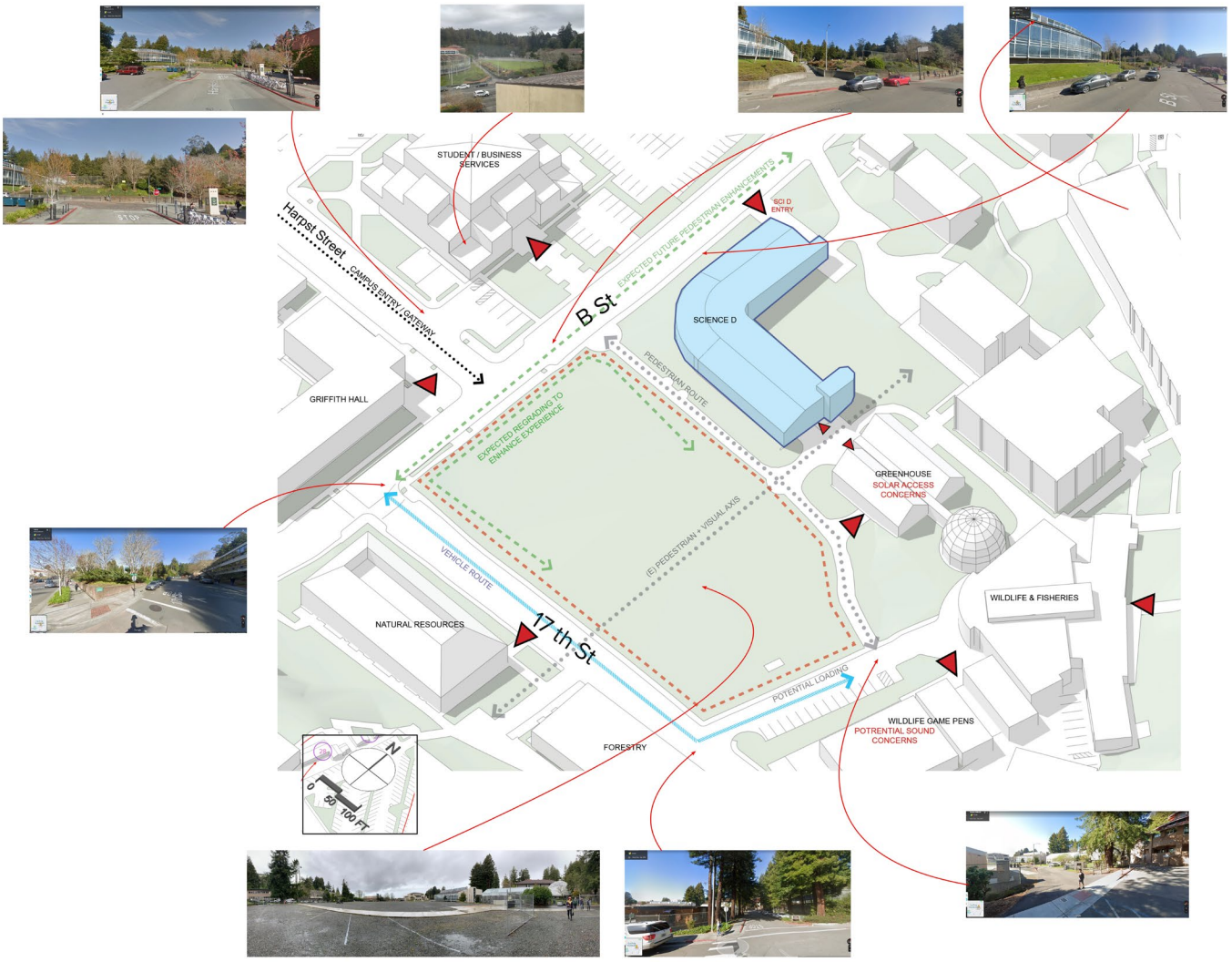
Figure 4.1.1.1 - Campus Events Field Site Aerial Photo



4.1.2 SITE OBSERVATIONS

The site is currently unoccupied, and has been mostly used as a shared outdoor open space. It has recently been used to locate temporary structures for various campus uses. The western B Street edge sits along a main campus connector street that is expected to have some pedestrain enhancements in the future. Regrading of the site's westen edge is expected to create a more welcoming environment and an activated B Street edge. Future building loading is best located on the eastern site boundary and if required, off of 17th Street to the south. It is critical to minimize any shading on the adjacent Dennis K Walker Greenhouse to avoid effecting the sensitive work taking place inside. An existing north-south pedestrian walking route runs through the center of the site inbetween Alistair McCrone Hall (Science D) and the Dennis K Walker Greenhouse running down inbetween Natural Resources and the Forestry building. Development on the project site should respect and incorporate this pedestrian route. There is an apprximately 15 ft grade change on the project site running east west. The project should take advantage of this condition when desiging structures and varied open spaces.

Figure 4.1.2.1 - Existing Forces



4.1.3 CLIMATE FACTORS

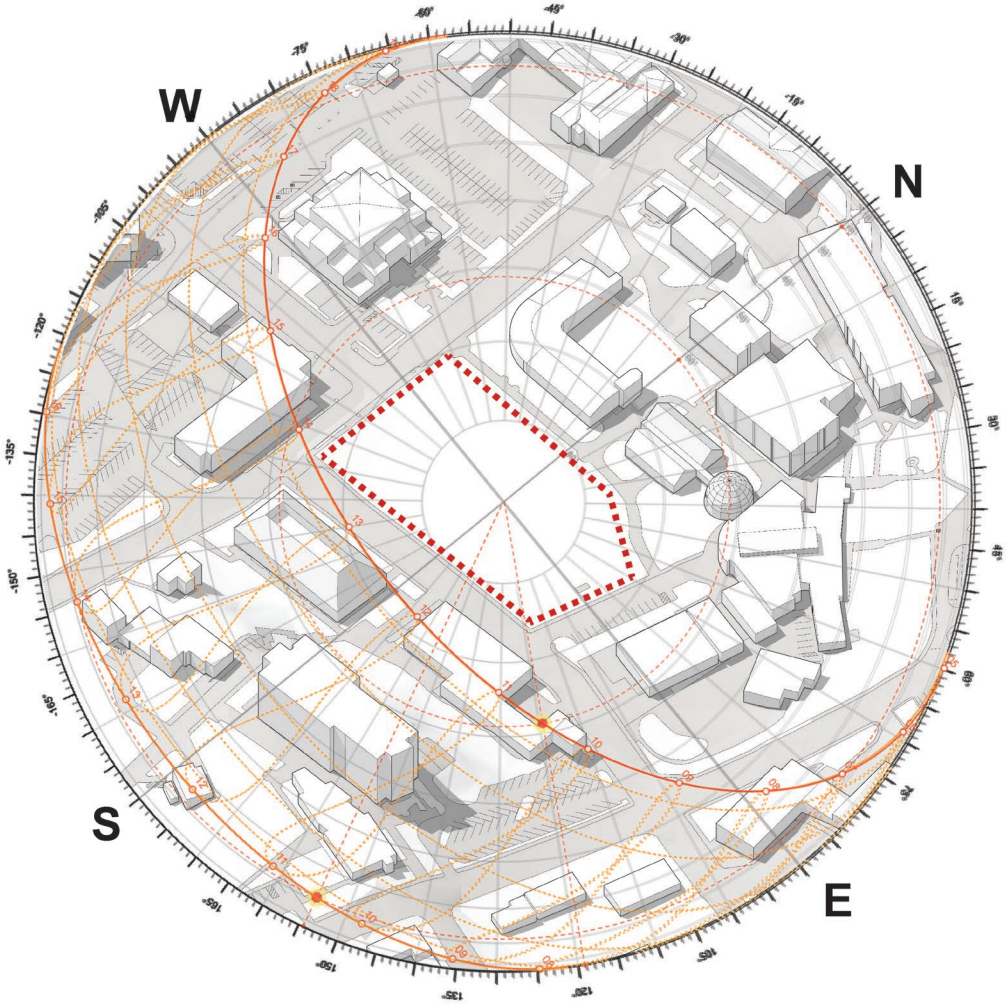
The temperature in Arcata is mild with highs in the upper 60s in the summer and lows in winter in the lower 40s. Typically, the change in temperature over a given day is 15 degrees. The summer is mostly clear of clouds, but in the winter, the sky is cloudly up to 67% of the time. Rain is frequent in Arcata in the Fall, Winter and Spring, Arcata gets 46 inches of rain on average per year; the US average is 38 inches. The rain reaches a peak in December with an average of 15 days of rain in the month and a volume of 9 inches.

4.1.4 SITE SOLAR CONDITIONS

As shown in the solar diagram (Figure 4.1.4), the project site receives most of its sunlight from the south-southwest, along 17th Street and B Street. Given the current open condition character of the site with its Campus Events Field lawn area, the site receives a generous amount of sunlight from all sides. During the summer and winter months, early morning and late afternoon sun will reach all portions of the site. The current Campus Events Field has trees at its perimeter on the eastern, southern and western edges. Depending on how many of these perimeter trees are retained, portions of the open areas of the site will receive less direct sun.

https://weatherspark.com/y/310/Average-Weather-in-Arcata-California-United-States-Year-Round#Sections-Sun

Figure 4.1.4.1 - Solar Diagram - Summer and Winter Solstice

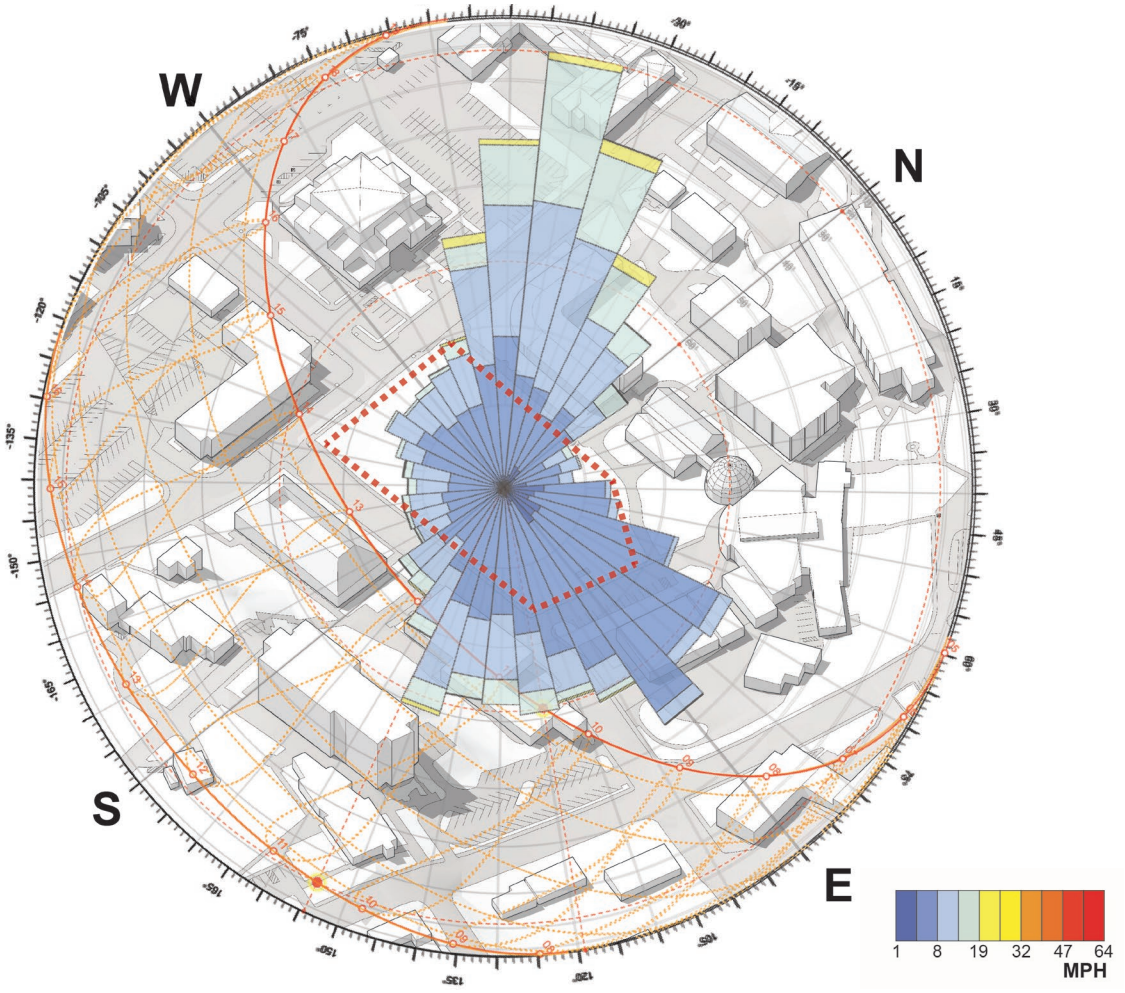


4.1.5 SITE WIND CONDITIONS

The wind analysis diagram (Figure 4.1.5) shows that the prevailing winds during both the summer and winter months are out of either the northwest or southeast. The double row of trees to the eastern portion of the site will mitigate the amount of wind that the relatively flat topography of the Campus Events Field area will receive. This allée provides a wind break to shelter the site from the prevailing easterly and south-easterly winds.

https://weatherspark.com/y/310/Average-Weather-in-Arcata-California-United-States-Year-Round#Sections-Wind

Figure 4.1.5.1 - Annual Wind Diagram



4.1.6 SITE CONTEXT

The academic context surrounding the site is varied both in terms of program and character. Directly adjacent to the site is the Alistair McCrone Hall (Science D).

Figure 4.1.6.1 - Surrounding Context

003A Science A
003B Science B
003C Science C
003D Alistair McCrone Hall (Science D)
003E Dennis K Walker Greenhouse
004 Harry Griffith House
005 Forestry
011 Wildlife & Fisheries
018 Brookins House
029 Experimental Greenhouse
031 Swetman Child Development Lab
034 Wildlife Game Pens
035 Fish Hatchery
040 Natural Resources
040A Schatz Energy Research Center
089 Behavioral & Social Sciences
097 Buck House
100 Student & Business Services

Figure 4.1.6.2 - Surrounding Context

003A Science A

003B Science B

003C Science C

003D Alistair McCrone Hall (Science D)

003E Dennis K Walker Greenhouse

004 Harry Griffith House

005 Forestry

011 Wildlife & Fisheries

018 Brookins House

029 Experimental Greenhouse

031 Swetman Child Development

034 Wildlife Game Pens

035 Fish Hatchery

040 Natural Resources

040A Schatz Energy Research Center

089 Behavioral & Social Sciences

097 Buck House

100 Student & Business Services

4.1.7 SITE TOPOGRAPHY

The topography of the site is a relatively flat lawn area that rises from the southwest corner of the site to the northeast corner, and which contains a variety of mature tree species located at the perimeter of the site along the easter, southern and western flanks. There is a 15 foot differential in grade change from the southwest to the northeast; the site itself is located on a lawn which subtly slopes downward from north-east to south-west.

https://weatherspark.com/y/310/Average-Weather-in-Arcata-California-United-States-Year-Round#Sections-Topography

Figure 4.1.7.1 - Site Sections

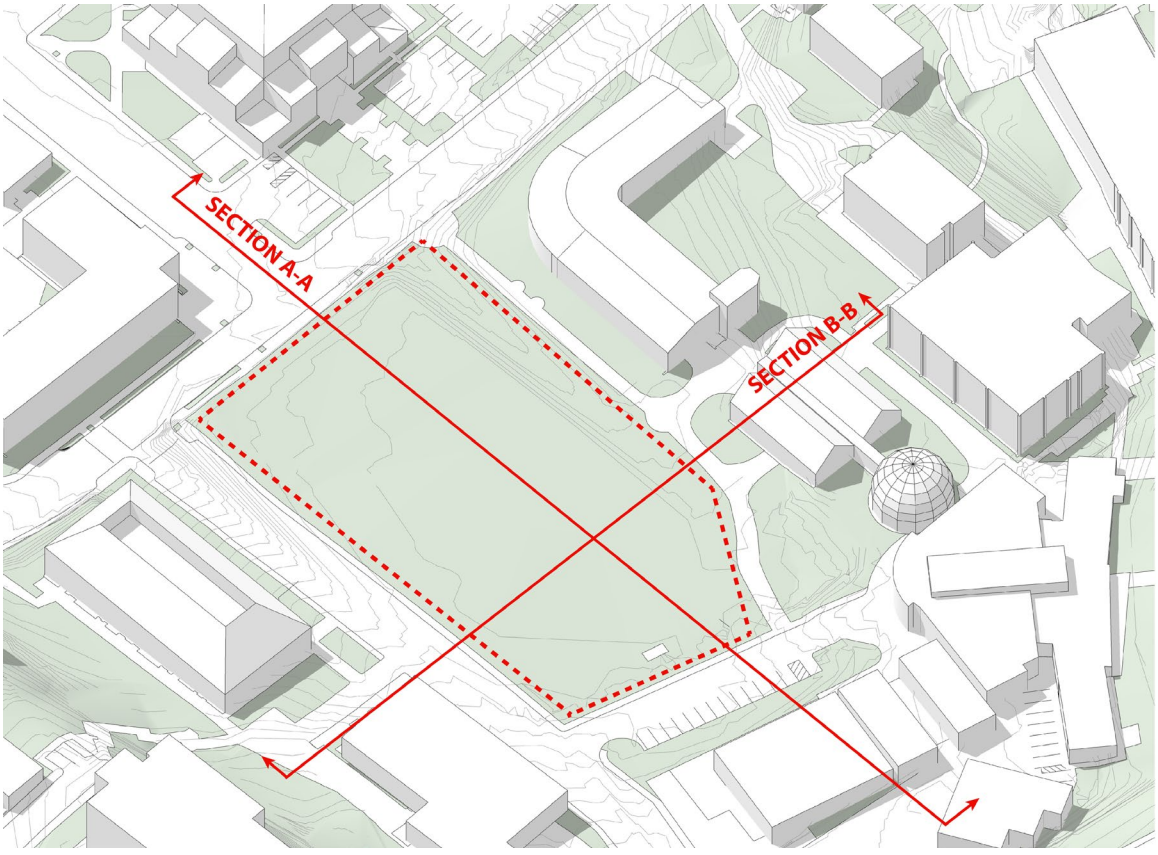
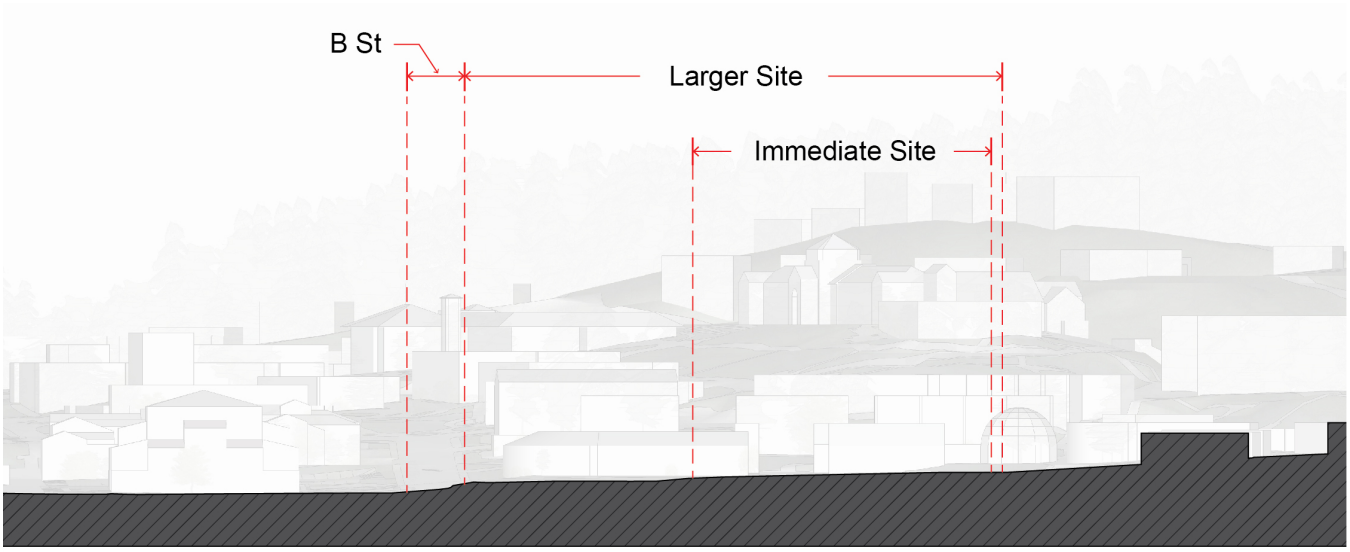


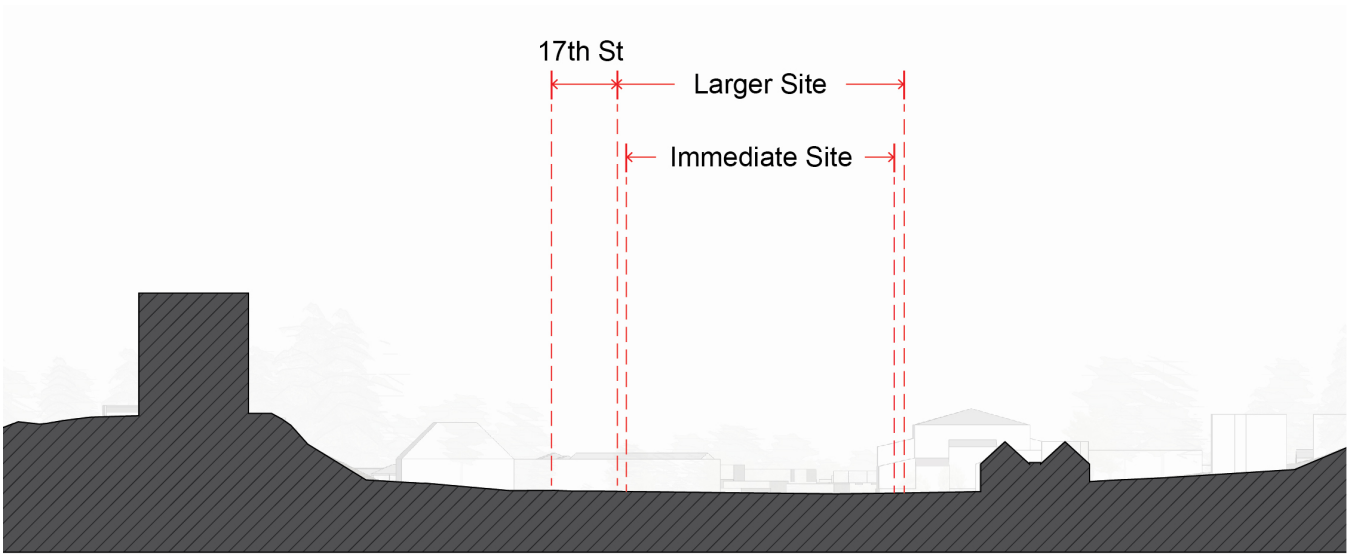
Figure 4.1.7.2 - Site Section East - West



E+T EAST - WEST SECTION

0 50 100 200 300 FT

Figure 4.1.7.3 - Site Section North - South



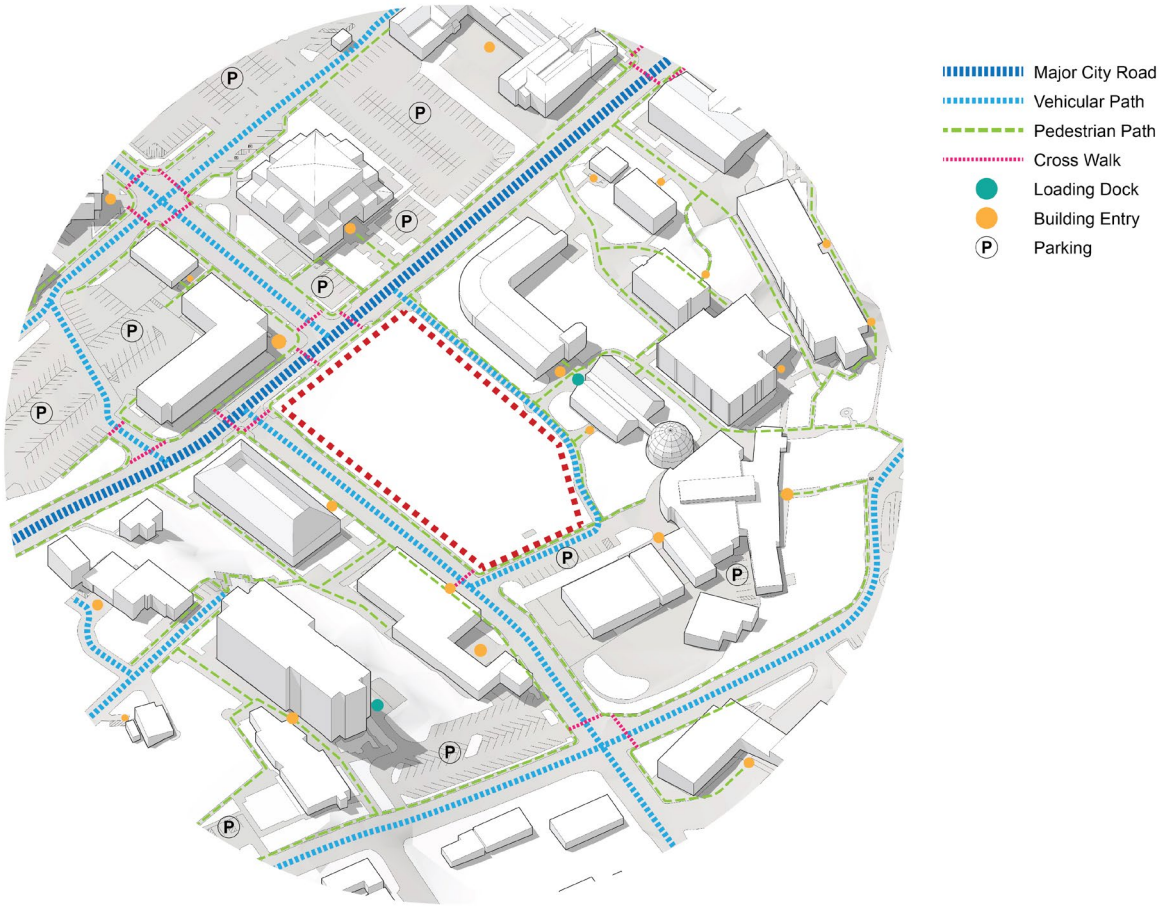
E+T NORTH - SOUTH SECTION

0 50 100 200 300 FT

4.1.8 SITE CIRCULATION

With its location at the southern portion of the campus core, north of 17th Street and east of B Street, the project site is well served by a variety of transportation modes. As shown in the Site Circulation Diagram (Figure 4.1.8), major and minor pedestrian pathways surround the site. These pathways connect the southern campus area to the northern campus area and link the E+T and Housing building site to the Alistair McCrone Hall (Science D) and Science A, B, and C buildings located to the north of the site. Currently the large lawn area known as the Campus Events Field connects from the southwestern corner of the site from B Street to the service street on the eastern edge of the site. Service access to the site is provided from the service drive located to the eastern side of the site. Vehicular parking for the site is provided in an on-grade lots directly west of the site. The site has direct access to bicycle circulation along B Street and 17th Street and serves as a parking location for riders who commute by bike.

Figure 4.1.8.1 - Site Circulation Diagram

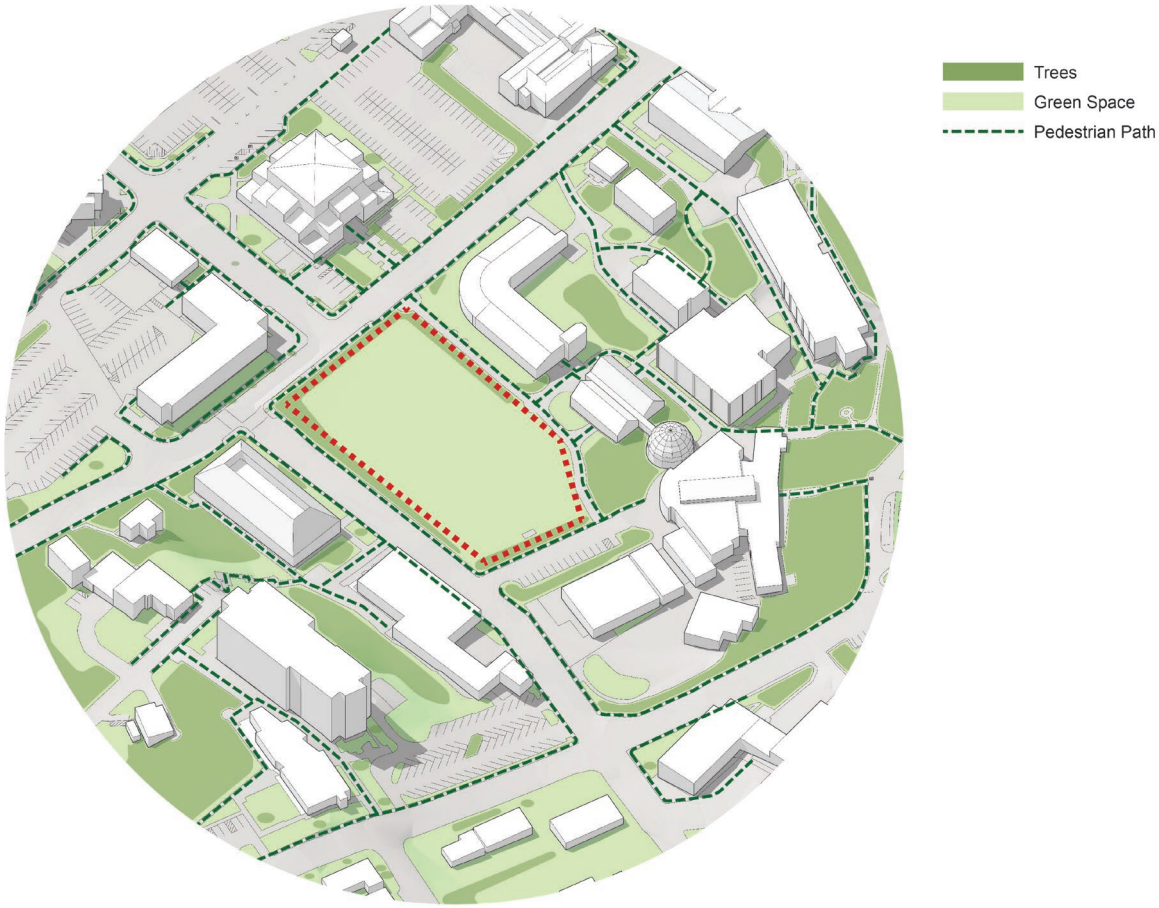


4.1.9 SITE OPEN SPACE

The building is planned to work with the large, flat area of the Campus Events Field creating opportunities to provide open spaces for the buildings on the site itself and reducing erasure of the perimeter trees.

There is a desire to maintain the formal grid of the campus and existing circulation pathways that currently surround the site. The existing formal pathways running from west to east-- both north and south of the site-- provide perimeter access along the long axis of the site. It is the intent that the final building should navigate creating singular or multiple open exterior areas that are defined by the building massing, and that the building massing does not create a shadow on the surrounding greenhouses.

Figure 4.1.9.1 - Open Space Connection Diagram



4.1.10 RESILIENCY & SUSTAINABILITY

The projects will be designed with the following site sustainability metrics in consideration:

- LEED v4.1 New Construction - Gold
- AASHE – STARS- Gold (Sustainability Tracking, Assessment and Rating System)

The project team shall review best practice sustainable goals include a project that will be evaluated with the project budget for implementation. Areas for consideration include:

- Designed to maximize natural lighting and passive solar heating
- Zero net energy/all-electric
- Rainwater catchment
- Greywater treatment
- Rain gardens to capture run-off
- Living wall
- Solar array on roof

4.1.11 SITE PREPARATION

4.1.11.1 SITE IMPROVEMENTS

Preparation of the site for the Engineering + Technology Building and Student Housing buildings and associated site improvements within the project area will require minimal building demolition at the site. There is expected to be excavation to allow for the new design and to open the site to the west along B Street. These improvements include outdoor plaza areas, bike parking and minor service/loading areas. Existing streetscape improvements along B Street, 17th Street, and Wildlife Lane may inclde the sidewalk, possible minor retaining walls pending final design, and the street lights. The existing curb cuts locations should also be retained and incorporated into the site circulation design. The major pedestrian walkways on the north, east, west, and south sides of the site should be preserved as these are part of the campus fabric and extend well beyond the edges of the site. More information on site demolition can be found in the Section 5 Civil narrative.

4.1.11.2 SITE UTILITIES

The project site contains a number of existing utilities. The normal power to the building will be served from an existing Central Utility Plant. See Section 5 additional information on the existing electrical systems and requirements for ensuring capacity for this and future building projects. See the Section 5 Civil narrative for a description of the utility extensions required to provide water supply to the site.

4.1.11.3 SITE PREPARATION

A geotechnical report has not yet been prepared for the site. Preparation of the site should follow the requirements outlined in the forthcoming geotechnical report to be prepared for the project. Prior to starting demolition and site preparation, the site should be fenced and appropriate pedestrian and traffic controls put in place. More detailed information on site preparation can be found in the Section 5 Civil narrative.

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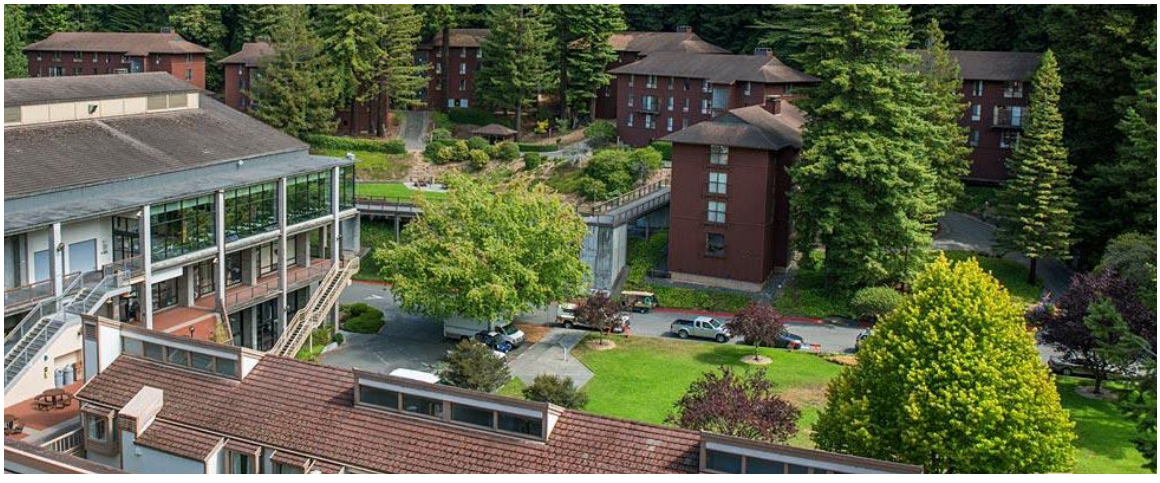
4.1.12 SITE VISITE / OBSERVATION

The following photographs represent some of the most prominent architectural features of the campus context.

Figure 4.1.12.1 - Campus Vocabulary




BEHAVIORAL

4.2 CONCEPT STRATEGIES

For the purposes of the feasibility study, three conceptual test fit options were presented for consideration to address visioning goals and challenges for this program, considering adjacencies, and site related factors. Each option also provided analysis diagrams that supported the evaluation criteria topic areas: Site Context, Function, Staff/Student User Experience, and Community. These diagrams explored mobility/flow, open space, connections between major program areas and indoor/outdoor relationships. The following summary describes each of the concepts and defining features explored.

Figure 4.2.1 - Existing Site and Generic Massing

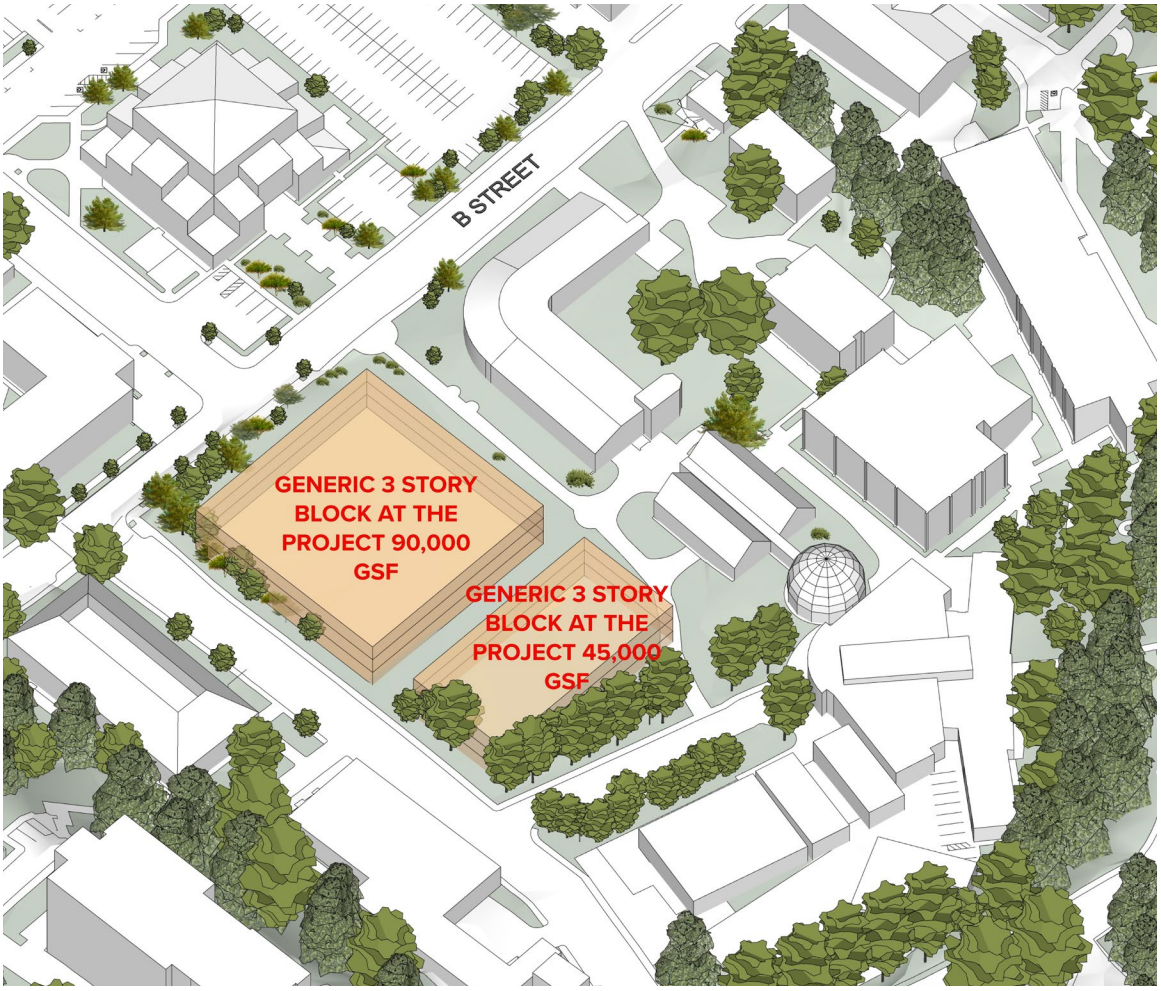
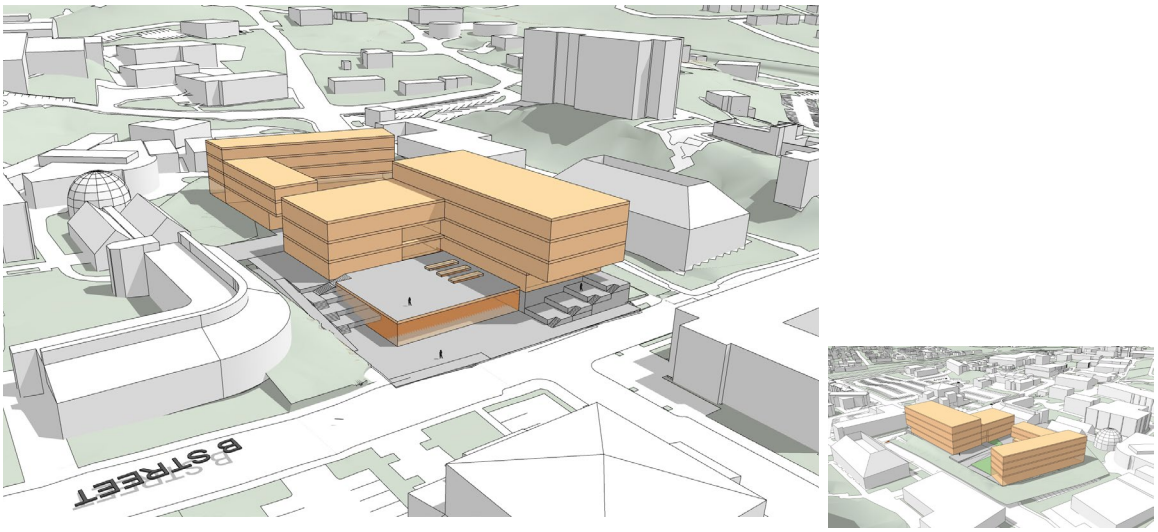


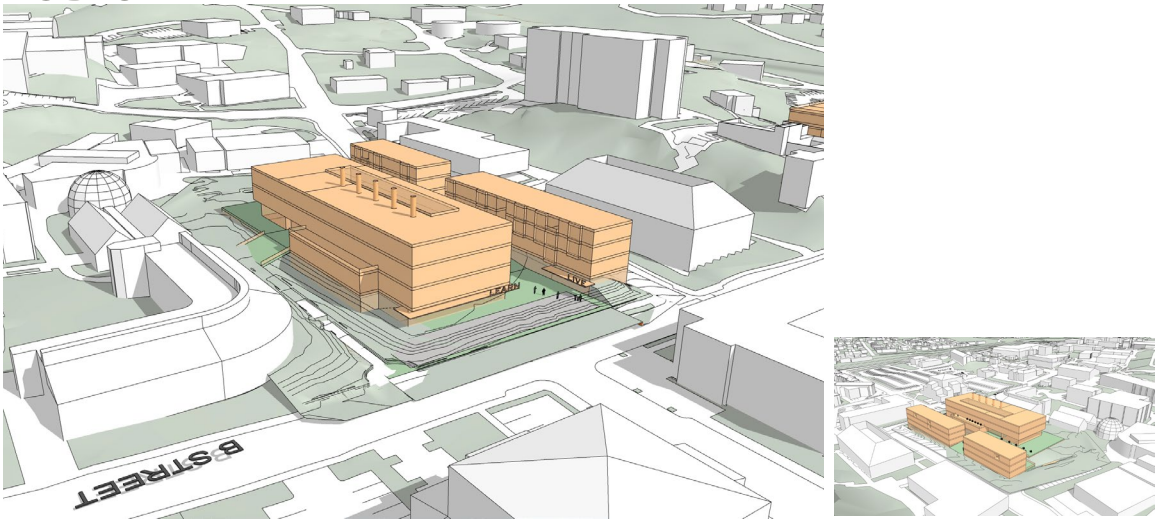
Figure 4.2.2 - Massing Scenarios

DUAL-COURT



QUAD

PODIUM

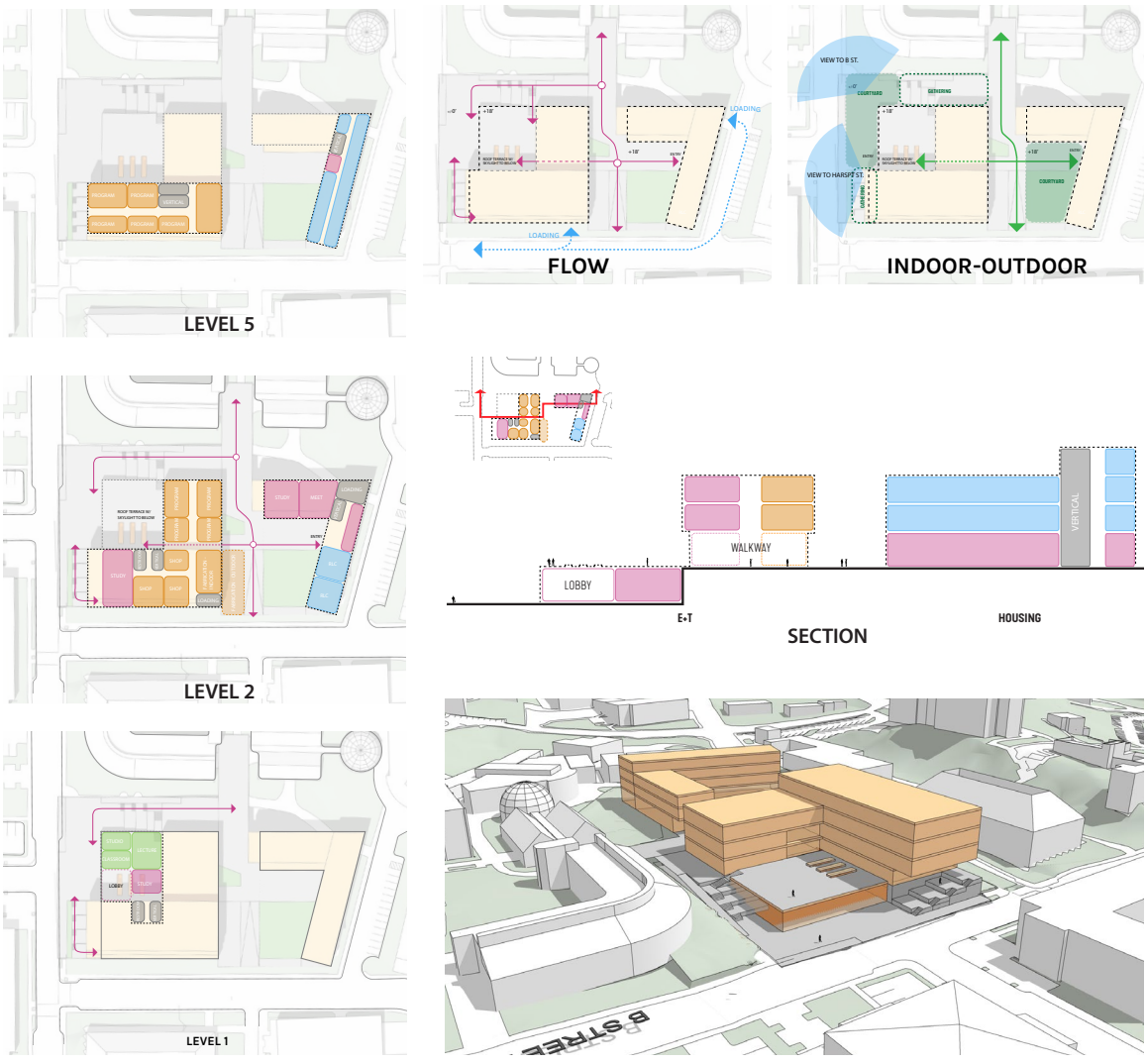


4.2.1 DUAL-COURT

Concept: The Dual-Court design concept forms two interconnected L-shaped buildings that together define two exterior courtyard spaces with varied yet synergistic properties. The western courtyard, shaped by wings of the Engineering + Technology building, creates an active focus for the gateway arrival to campus from Harpst Street. The eastern courtyard, cradled by the student housing, offers an outdoor community destination along the existing north-south pedestrian link.

1. Ground level program spaces in both the Engineering + Technology building and the housing have a strong connection to each other and to the adjacent outdoor courtyards.
2. An east-west pedestrian connection through the two structures links the community spaces.
3. Other defining features for comparison:
    - Defined, varied outdoor gathering spaces along B Street
    - Raised terrace for gathering and informal learning
    - E+T loading off of 17th Street

Figure 4.2.1.1 - Massing Scenario : Dual-court

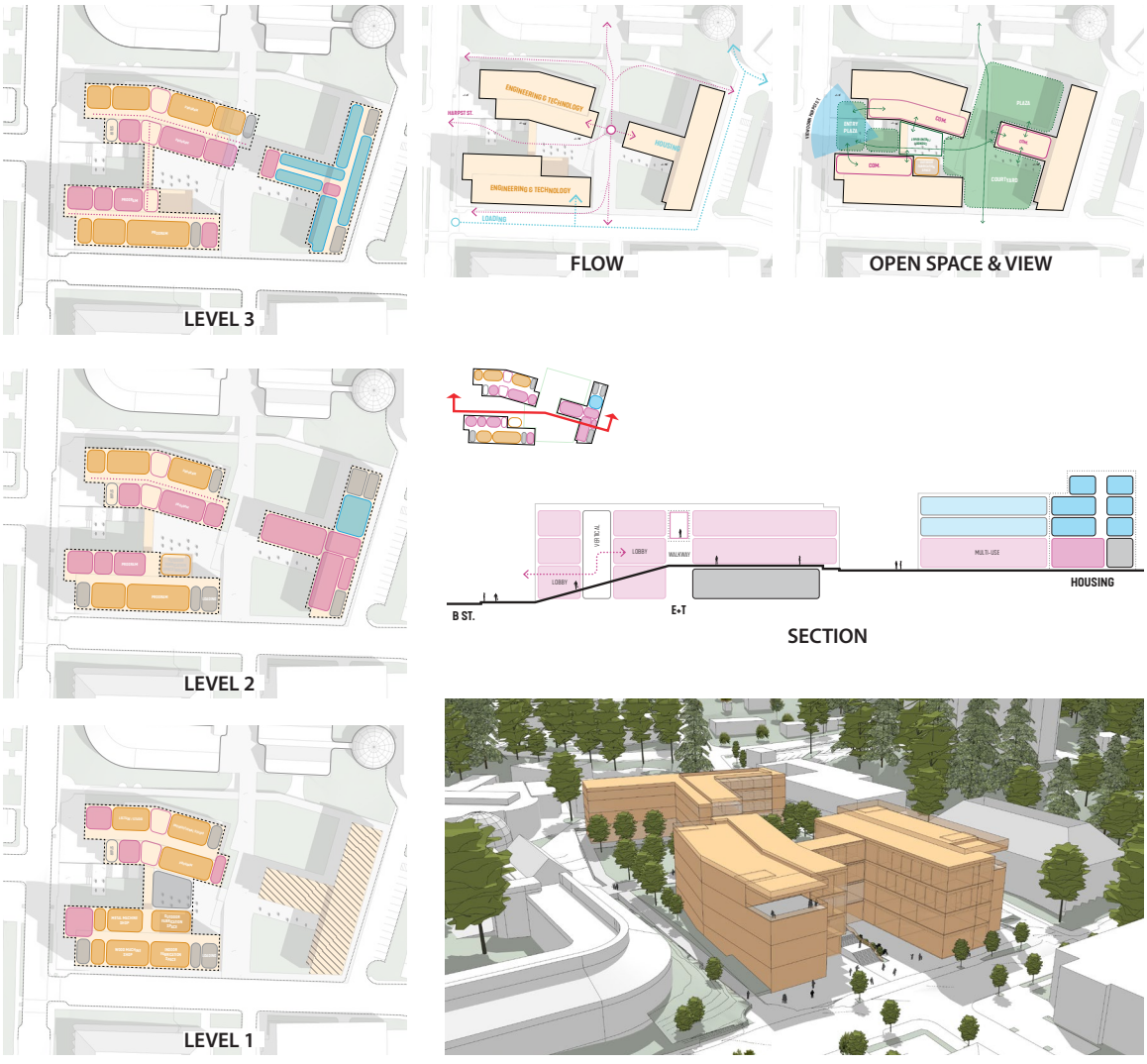


4.2.2 QUAD

Concept: The Quad design concept extends the gateway feel of Harpst Street through the site transforming it into a collection of varied community informal learning and gathering places surrounded by active learning spaces on-display. The building massing scale is broken down with three dynamic wings connected by indoor and outdoor informal connector spaces.

1. A connected network of student resource spaces links the two Engineering + Technology building wings.
2. Shading onto adjacent sensitive buildings is minimized.
3. Other defining features for comparison:
    - A visible showcase of active learning spaces
    - Upper-level terraces with grand campus views
    - Retained north-south pedestrian campus connection through the site

Figure 4.2.2.1 - Massing Scenario : Quad

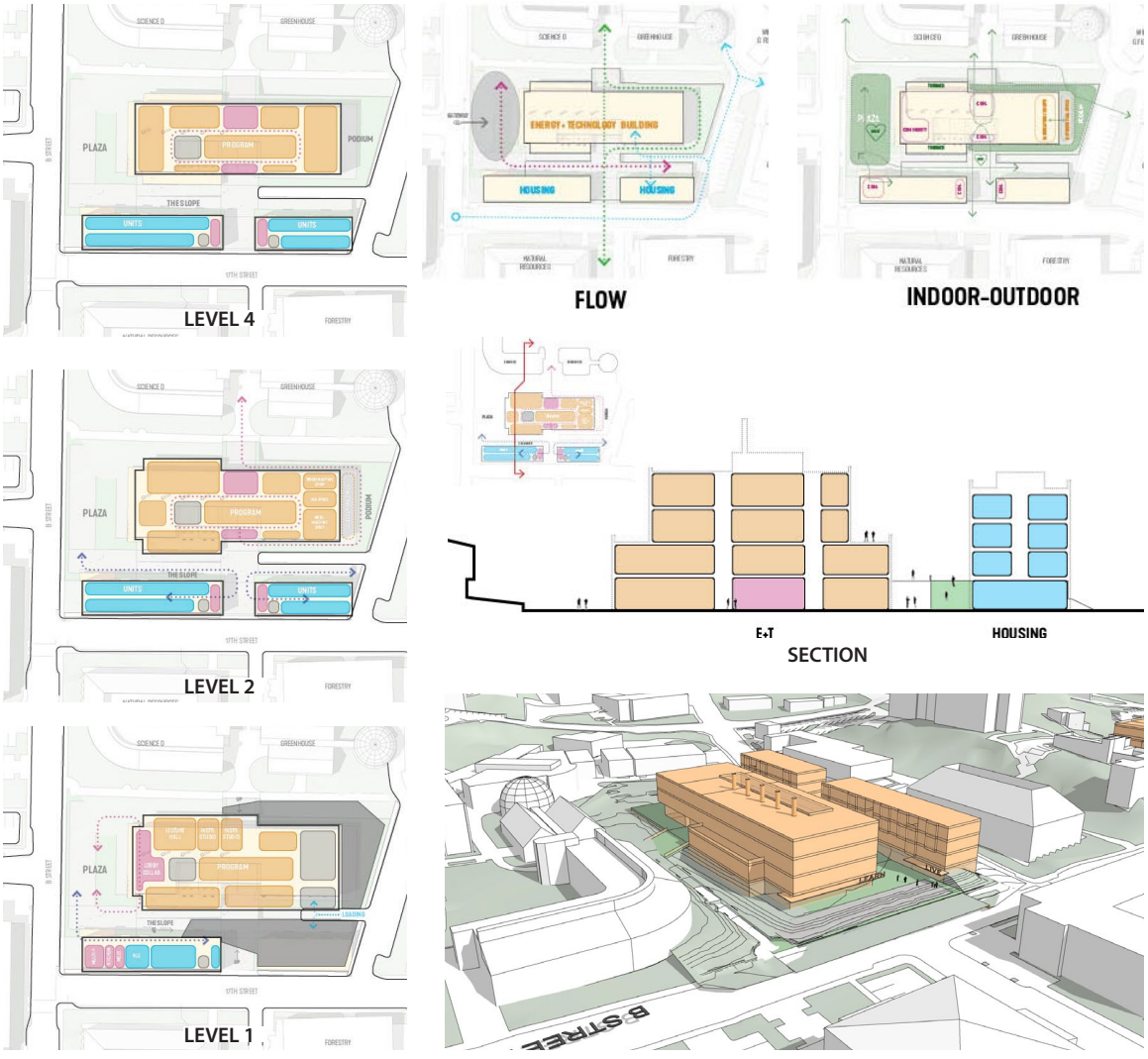


4.2.3 PODIUM

Concept: A podium level unifies the buildings on site, creating a connected community level filled with showcase active learning spaces, student resource spaces and community student resources. A residential row is created along 17th Street with a split residential configuration. The Engineering + Technology building rests on the community podium with a dynamic public plaza to the west and an outdoor fabrication area to the east.

1. The north-south campus connection continues through the E+T building in the form of a glazed in collection of student resource spaces.
2. A raised terrace in the eastern plaza celebrates the end of the Harpst Street gateway to campus.
3. Other defining features for comparison:
    - Compact Engineering + Technology building footprint
    - All loading off of eastern access drive
    - Outdoor star step terracing to the northwest

Figure 4.2.3.1 - Massing Scenario : Podium



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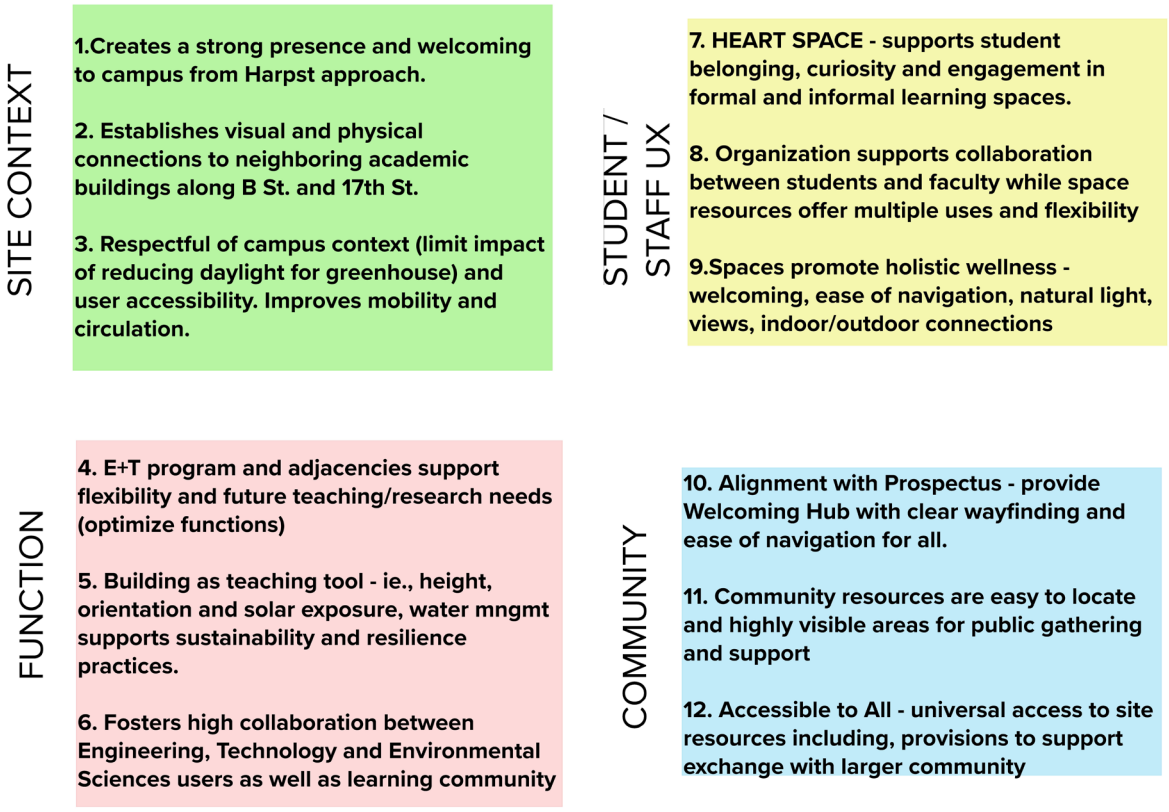
4.3 CONCEPT EVALUATION CRITERIA / FEEDBACK

The 3 Massing Scenarios were evaluated using criteria in four areas: Site Context, Function, Student/ Staff UX and Community with the specific priorities identified below. Then, through a process of voting on the options based on the criteria topic and providing detailed notes that influenced their decisions – the data results and comments were revealed to the group for further discussion and consideration.

1. Creates a strong presence and welcoming to campus from the Harpst Street approach. (Site)
2. Establishes visual and physical connections to the neighboring academic buildings along B St. and 17th St. (Site)
3. Respectful of campus context (limit impact of reducing daylight for greenhouse) and user accessibility. Improves mobility and circulation. (Site)
4. E+T program and adjacencies support flexibility and future teaching/research needs. (optimize functions) (Function)
5. Building as teaching tool - i.e., height, orientation and solar exposure, water management supports sustainability and resilience practices. (Function)
6. Fosters high collaboration between Engineering, Technology and Environmental Sciences users as well as learning community. (Function)
7. HEART SPACE - supports student belonging, curiosity, and engagement in formal and informal learning spaces. (Staff/Student UX)
8. Organization supports collaboration between students and faculty while space resources offer multiple uses and flexibility. (Staff/Student UX)
9. Spaces promote holistic wellness - welcoming, ease of navigation, natural light, views, indoor/ outdoor connections. (Staff/Student UX)
10. Alignment with Prospectus - provide Welcoming Hub with clear wayfinding and ease of navigation for all. (Community)
11. Community resources are easy to locate and highly visible areas for public gathering and support. (Community)
12. Accessible to All - universal access to site resources including, provisions to support exchange with larger community. (Community)

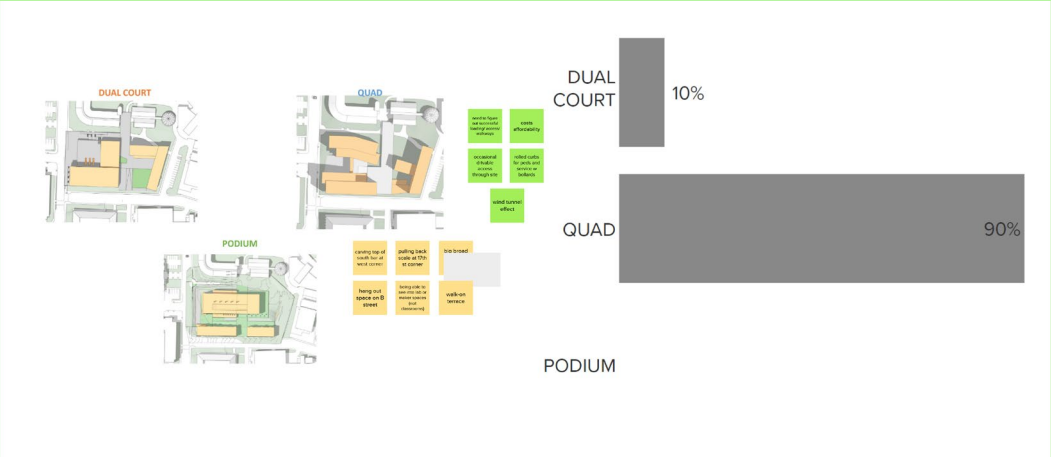
The following 8 pages show the results of the evaluation for the 3 concept strategies presented based on the criteria defined above. From the voting outcomes it is important to note that the prevailing option that was selected for each criteria prompt was only half of the answer. The detailed reasons for these preferences were very effective in communicating nuanced attitudes and concerns about each proposed option that prompted productive discussion with the stakeholders.

Figure 4.3.1 - Concept Option Evaluation

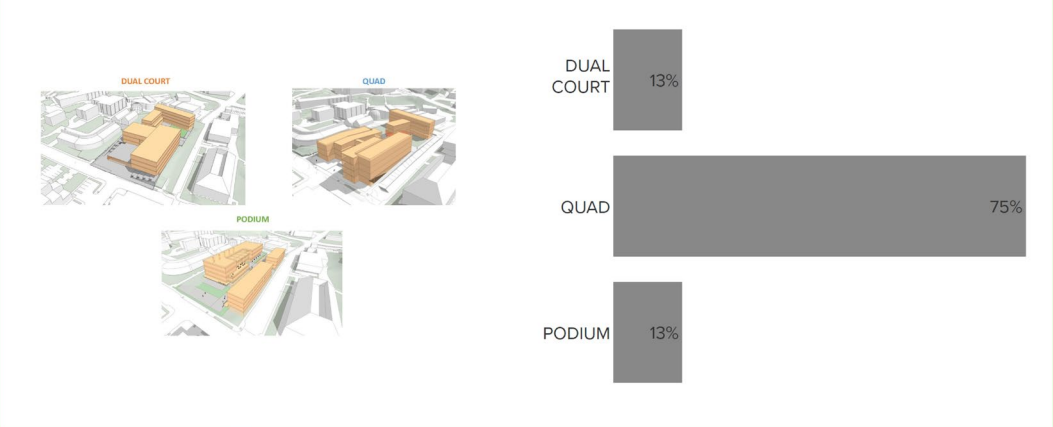


4.3.1 SITE CONTEXT

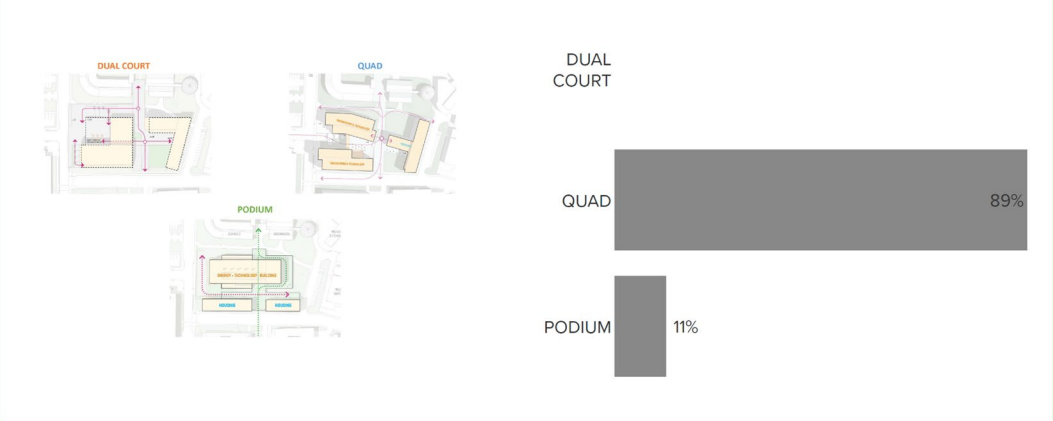
1. Which option creates a strong and welcoming presence to campus at B Street for the Harpst approach?



2. Which option establishes a strong visual and physical connections to neighborhing academic buildings along B Street and 17th Street.



3. Which option is repsectful of campus context and user accessibility? Improves mobility and circulation?



1 SITE/CONTEXT: 1. What aspects/features motivated your decision?

Top

- I like how it's broken up and how traffic flows through the center.
- site lines and connections to existing buildings and pathways. concept doesn't overshadow the greenhouse. strong presence at end of harpst st. showcasing new build.
- The staircase leading up from the street between the two buildings feels like a continuation from Harpst and feels as if it draws you in. Next I find Dual court the most welcoming from Harpst street and then finally podium. I like the way Dual court has the ability to look into learning spaces.
- I like the gateway feel of the quad best, although the Podium is a a close second.
- Concerns from our office/students are that such a large building could be too imposing from the B street entrance, and doesn't feel genuine to our small campus in the woods vibe. The students feel like it is losing some of the heart of the university - natural beauty, small town, small classes.
- The showcase space and plaza at the end of the Harpst entrance makes a striking impression, and one that mixes learning space with lounging space well in the same sightline. Our student staff really loved the plaza idea, and thought students would love to hang out there and watch people go by.
- Front of building with quad presents well from B st. Symmetry between wings.
- Combination of outdoor space and building. Terraced outdoor space draws the eye up and invites you into the building.
- Combination of open space and building, terraced outdoor space draws the eye up and invites people into the building.
- physical layout
- like the dual quad approach, more visually appealing and conducive to community building and engagement
- Like the openness of the entry in the Quad design, extending from Harpst St into the project.
- Quad captures Harpst street and brings it through the Site.

2 SITE/CONTEXT: 2. What aspects/features motivated your decision?

Top

- architecturally interesting and modern.
- The layout appears feasible (4-corners, simple buildings).
- In this concept, the housing element isn't in the background of the E+T building, but instead feels integrated between the E+T and Natural Resources/Forestry buildings.
- This one was tough for me. Almost a tie between Dual Court and Quad. I like the way Dual Court does not go to the edge of the lot in all directions. Quad has a nice interaction between the E&T and Dorm building that is pleasant. Podium's proximity to 17th is harsh.
- The open walkways to the north, south, and East as shown in the quad options are the most clearly connected for me.
- The buildings have a nice flow with each other, and the lines and walkways seem to naturally flow out to the other science buildings. The student staff agreed this model felt more like a natural centerpiece to a science complex and was more likely to become a natural "hub."
- This makes a statement without dominating the buildings around it. One of our student staff felt sad that the larger buildings would overshadow the forestry and natural resource buildings and they'd be too hidden away.
- This design felt more genuine to the existing campus feel, and the student staff loved the two smaller buildings because it feels less like a big city school. They indicated that if had wanted a big school with big buildings, they would have chose that.
- Accessible from most sides. Symmetry of outdoor spaces on Housing lawns
- Quad is least disruptive to greenhouses. Housing layout in the back works best for privacy, adjacent to parking spots for move in/out.

3 SITE/CONTEXT: 3. What aspects/features motivated your decision?

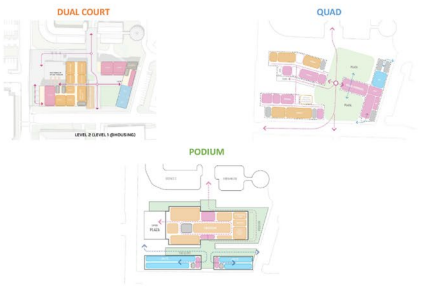
Top

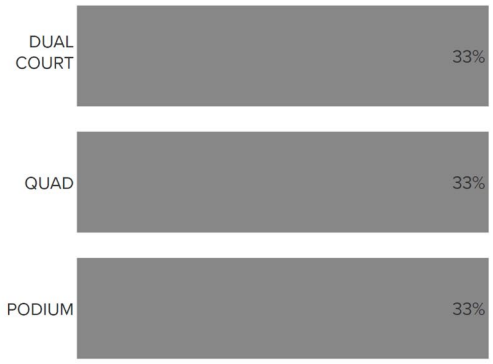
- entry/exit points may work better for mobility-impaired persons.
- strong visual connections for wayfinding
- According to the "Characteristics" on the murals, Quad shades the least. I did not like Podiums lower walkway. It seemed it might feel unsafe at night. Others had this impression. All three options have good flow and connection.
- The orientation of the masses in the quad alternative provides for winter afternoon sunlight more than the other options.
- Our student staff said this design reminded them of the Cal Academy of Science food court, in a good way. They imagined students would naturally want to hang around the path/stairs between the buildings, the lower floors, and the green spaces.
- The housing is off the main roads, which is respectful of tenants. It has some separation from the E+T building, which the student staff appreciated, but it still feels associated with it because of the west to east building lines.
- This design follows natural walking paths for multiple through points, and is wheelchair accessible from multiple entries to the complex.
- This is the only model not shading the greenhouse in the winter. Our students were extremely concerned about the greenhouse, especially since the dome is where...
- Accessible from mulitple levels. Least shading of greenhouse.
- Least impact on the greenhouse, good variation of outdoor space, good walk-throughs for people moving around campus.
- Like the more open style of the Quad design, not so monolithic as the others.

This is the only model not shading the greenhouse in the winter. Our students were extremely concerned about the greenhouse, especially since the dome is where the tropical plants are kept.,This design follows natural walking paths for multiple through points, and is wheelchair accessible from multiple entries to the complex.,The housing is off the main roads, which is respectful of tenants. It has some separation from the E+T building, which the student staff appreciated, but it still feels associated with it because of the west to east building lines.,Our student staff said this design reminded them of the Cal Academy of Science food court, in a good way. They imagined students would naturally want to hang around the path/stairs between the buildings, the lower floors, and the green spaces.

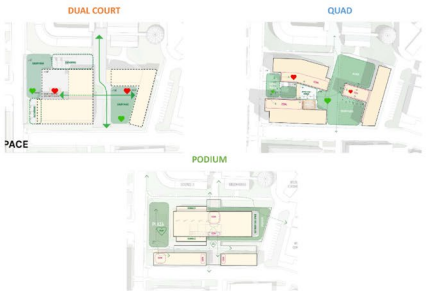
4.3.2 FUNCTION

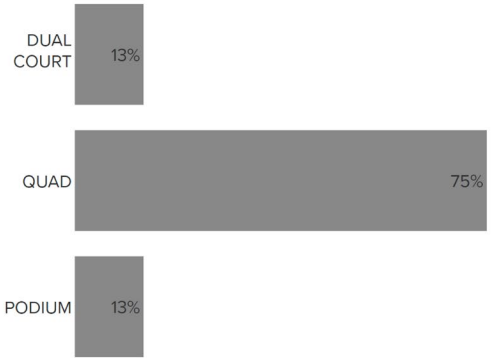
1. Which option promotes E+T program and adjacencies and supports flexibility and future reaching/ research needs to optimize functions?



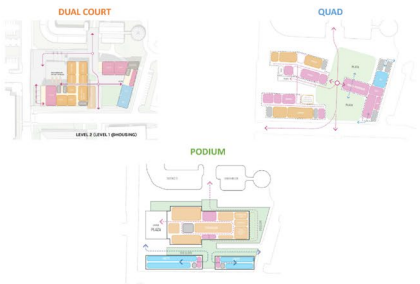


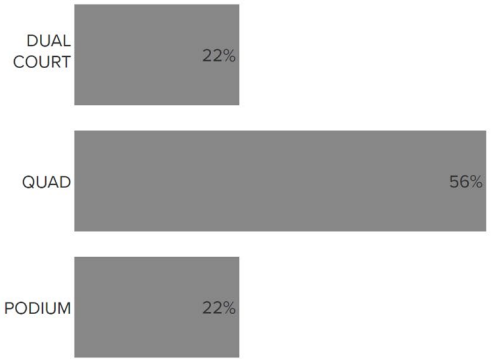
2. Which option best supports the building as a teaching tool -ie., height, orientation, and solar exposure, water management, supports sustainability and reslience practices?





3. Which option fosters high collaboration amongst Engineering, Technology and Environmental Science users and supports living/learning community?





4 FUNCTION: 4 What aspects/features motivated your decision?

Top

- all functions "under one roof" and not separated into two buildings
- Quad has connecting community spaces within all buildings - nice design. By connecting two E&T buildings well, it will help the E&T community connection. Loading on 17th is hard. However, 17th could be closed to just emergency and service vehicles. Single buildings in Dual court are good.
- Not so sure on this one...but the "Podium" alternative is a close second for me because the academic programming is more clearly connected within the same mass.
- I think because the Quad is in two pieces, it would feel more natural to have Engineering still occupy space in Harry Griffith Hall as they grow. I think that any growth spillover that needed to happen would feel more awkward if the rest of the department was in one large building.
- Most connection between main spaces - opportunities to renovate in the future as needed. (Although I don't like the space below the big patio on the north-west side - it feels disconnected from the rest of the space)
- Podium concept keeps all academics in one continuous building. We discussed how the Quad version separates by a bridge on our zoom, and faculty seemed okay with trying that out too.

5 FUNCTION: 5 What aspects/features motivated your decision?

Top

- concept has the least impact on greenhouse, large out door space that can be flexible between academic and living.
- Quad has the most potential for natural light for E&T residents. All options have opportunity for living labs for resource management.
- Having all academic spaces together may provide some level of efficiency.
- I can't fully speak to the specifics in the prompt, but this option feels more harmonious with the landscape. Our student staff mentioned needing to prioritize natural beauty with the landscaping and green areas available. This factored into their decision to choose the school.
- Greater amount of outdoor area
- No strong opinion. There is not good ground-level outdoor space in the podium option which could impact teaching/learning student community building.
- Housing section has a nice greenery area in Quad. Quad also has least shading on adjacent greenhouses. Dual Court seems to massive/ block structure. Podium doesn't work well for Housing having the 250 units separated with 2 entries.

6 FUNCTION: 6 What aspects/features motivated your decision?

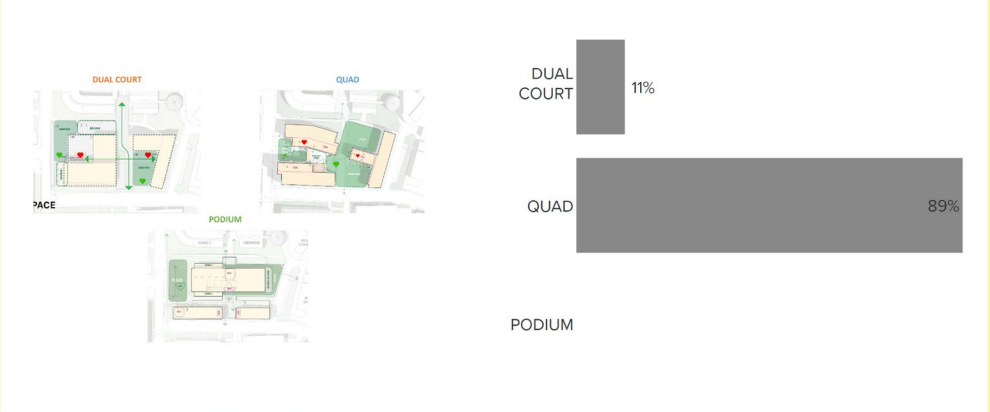
Top

- outdoor space is most open and flexible between academic and living and will promote chance or perhaps unexpected interactions and connections amongst students, staff, faculty
- Quad has open spaces for students, nicely tied together community spaces on bottom floors of all buildings. Three buildings tie together well, open spaces around them. Living space is off of 17th so it is quieter. I liked Dual Court's the ability to look into learning spaces from B street.
- Having a single academic building on the site may promote collaboration.
- Our student staff loved the two green spaces by the residence halls. They said students will absolutely use these areas on nice days. They also felt that non-residents would feel comfortable using those areas as well because they didn't feel as "owned" by the residence hall.
- The student staff also really liked that the residence hall felt associated with the E+T building with the orientation and shapes of the buildings, but it doesn't feel like you're "living at school" like the podium option did for them.
- Our student staff described this option as "a natural heart to the STEM area of campus." There will be people from different areas of campus and surrounding bu...
- Southern exposure on large lawn between housing and labs
- Most connected E&T space.
- Not really much of a difference for this question.

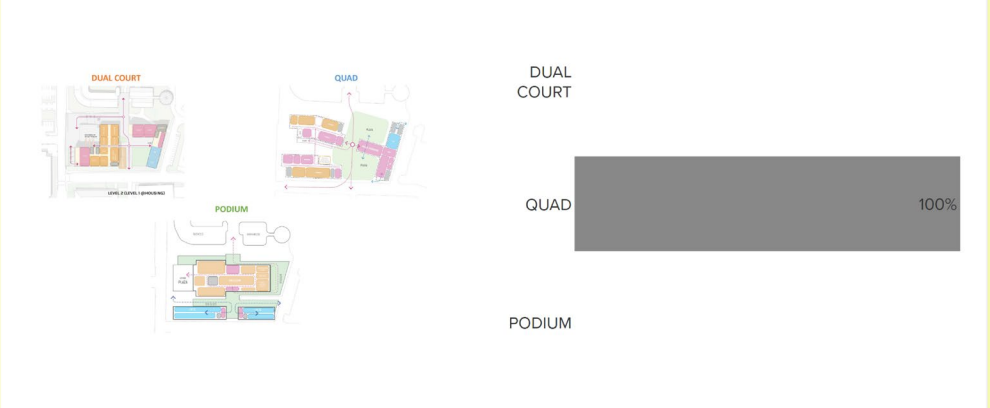
Our student staff described this option as "a natural heart to the STEM area of campus." There will be people from different areas of campus and surrounding buildings walking through the two directions, running into collaborators/student/staff/faculty, and facilitates conversation,The student staff also really liked that the residence hall felt associated with the E+T building with the orientation and shapes of the buildings, but it doesn't feel like you're "living at school" like the podium option did for them.,Our student staff loved the two green spaces by the residence halls. They said students will absolutely use these areas on nice days. They also felt that non-residents would feel comfortable using those areas as well because they didn't feel as "owned" by the residence hall.

4.3.3 STUDENT/STAFF USER EXPERIENCE

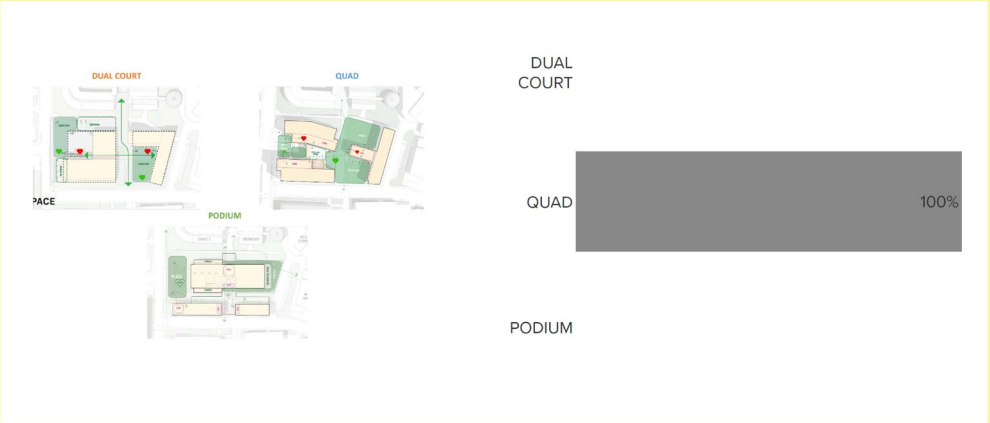
1. Which option best supports HEART SPACES – indoor and outdoor that reinforces student/staff belonging?



2. Which option best supports collaboration between students and faculty with student space resources and offers multiple uses and flexibility?



3. Which option is best promotes holistic wellness – access to natural light, views, indoor/outdoor connections?



7 STAFF/STUDENT UX: 7 What aspects/features motivated your decision?

Top

- natural light, open outdoor spaces. visual connections from interior to exterior in academic and housing spaces
- This one was close between Dual-Court and Quad, but I really like how the community spaces run on either side of E&T buildings and then into first floor of dorm space. Also Quad has spaces that look like you could play on the grass easily. Dual-Court has some nice space in front of B street.
- My response is a best guess.
- Our student staff loved the example pictures of stairs with seating and wanted to see that incorporated in the outdoor space between the E+T buildings. They loved the idea of sitting there and looking down Harpst St, especially in fall when the maples are changing color.
- The student staff also really liked the upper, indoor walkway connecting the two E+T buildings and suggested it could be made bigger and add barstool/counter seating that looks out down Harpst St.
- This just seems so much more rich with opportunity to run into people, find a spot to sit and chat, to study, to eat.
- A variety of outdoor spaces with differing exposure.
- Good variety of outdoor spaces (sunny, shaded, protected from wind). Could include more covered outdoor space as well - these are appreciated as transition spaces for umbrellas etc.
- Quad makes best use of open space for outdoor relaxation and space.

8 STAFF/STUDENT UX: 8 What aspects/features motivated your decision?

Top

- multiple opportunities for spill out spaces of varying scales
- Similar answers as to 14. The community spaces along the ground floors seem very inviting.
- Again, this is a best guess.
- This design offers so much opportunity for student spaces and variety of uses - eat, study, play on the lawn, watching people go by. Our student staff said they really like studying in a cozy spot near windows they can look out of and like that idea with this design.
- No strong opinion
- Openness of Quad concept allows more interaction between residents and academics.

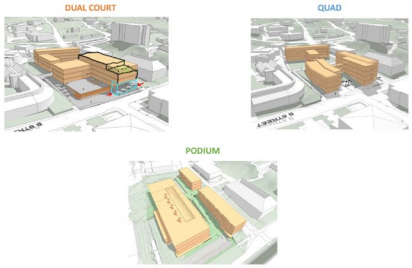
9 STAFF/STUDENT UX: 9 What aspects/features motivated your decision?

Top

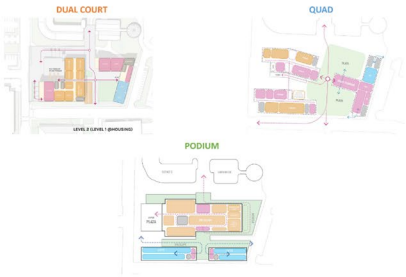
- Quad has more surface area, so more opportunities for connections with outside as well as for natural light on the inside.
- The student staff suggested a moss wall in the outdoor corridor between buildings, a roof patio, or living roof to bring in even more of an outdoor connection.
- More opportunity for windows, feels more harmonious with the environment, more green space, a number of different types of places to gather with others or sit solo.,The student staff suggested a moss wall in the outdoor corridor between buildings, a roof patio, or living roof to bring in even more of an outdoor connection.
- Appears to have the most windows, outdoor/ indoor interface.
- Most access to windows and outdoor space. Most inviting
- Quad is visually most open, making good use of sun and space.

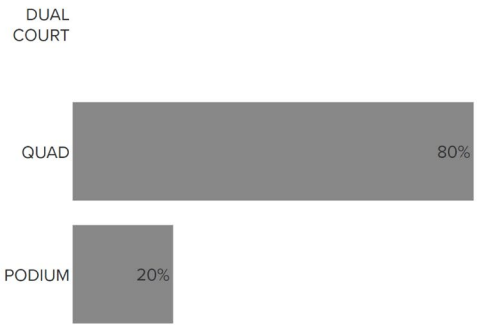
4.3.4 COMMUNITY

1. Which option best represents alignment wit the Cal Poly Humboldt Prospectus – ie., provide innovative, sustainable and welcoming hub that supports curiosity for learning and scholarly exchange with the greater community?

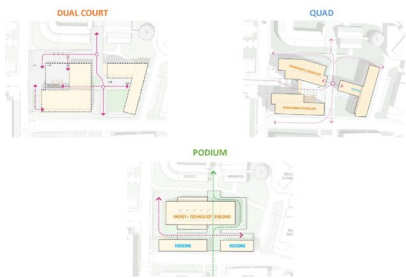


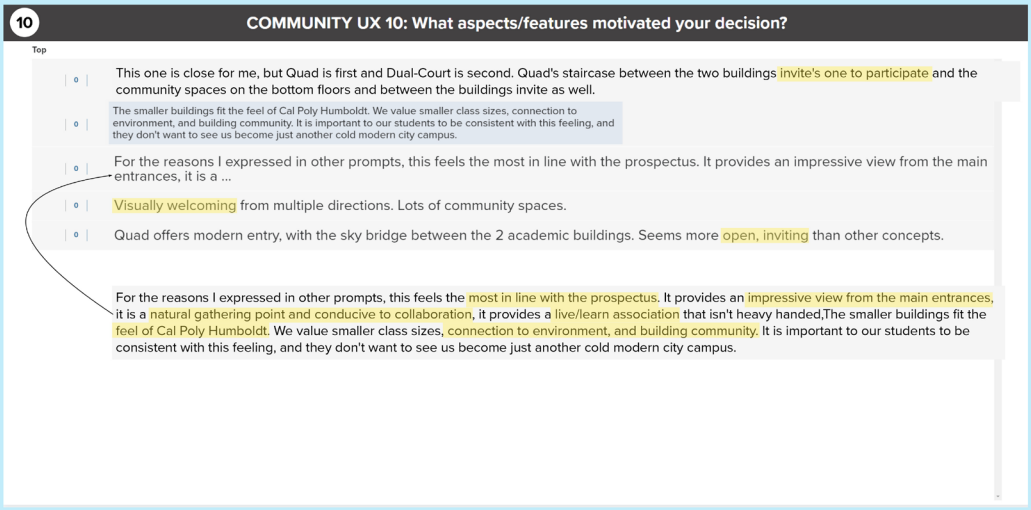
2. Which option promotes access to Community resources that are prominent features and highly visible for public gathering and support?

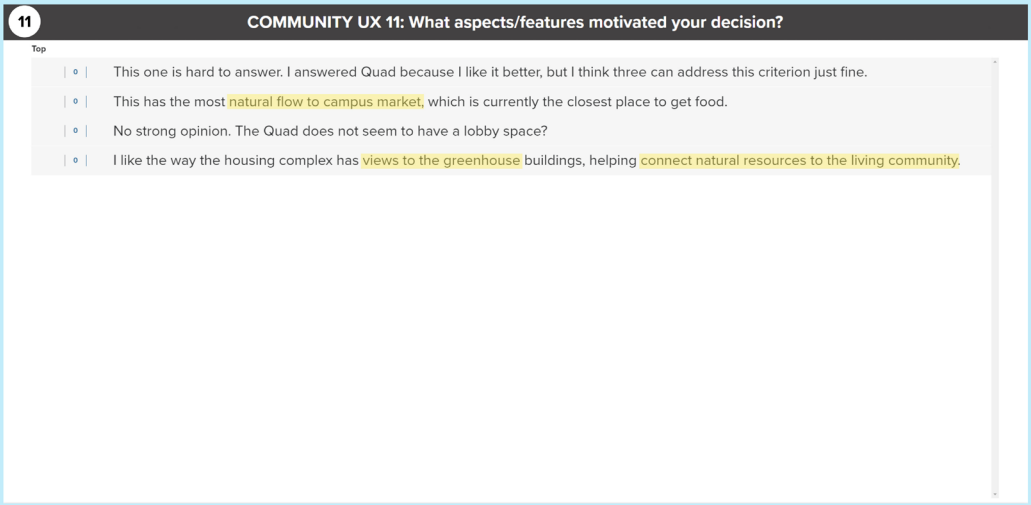


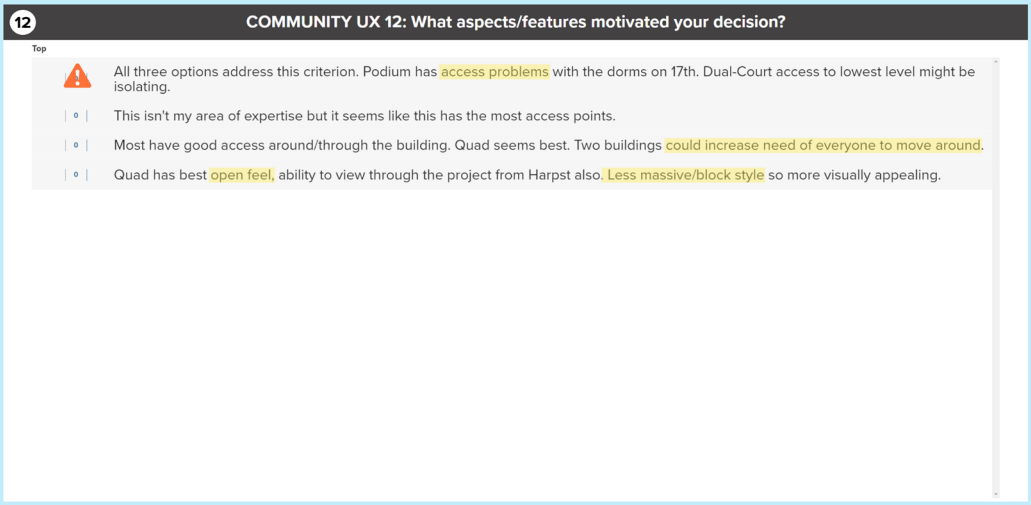


3. Which option best supports universal access to site resources including provisions to support exchange with the larger community – ie., loading and parking, pedestrian/bike friendly, multiple pathways to get around itnernally and externally?




10
COMMUNITY UX 10: What aspects/features motivated your decision?
Top
This one is close for me, but Quad is first and Dual-Court is second. Quad's staircase between the two buildings invite's one to participate and the community spaces on the bottom floors and between the buildings invite as well.
The smaller buildings fit the feel of Cal Poly Humboldt. We value smaller class sizes, connection to environment, and building community. It is important to our students to be consistent with this feeling, and they don't want to see us become just another cold modern city campus.
For the reasons I expressed in other prompts, this feels the most in line with the prospectus. It provides an impressive view from the main entrances, it is a ...
Visually welcoming from multiple directions. Lots of community spaces.
Quad offers modern entry, with the sky bridge between the 2 academic buildings. Seems more open, inviting than other concepts.
For the reasons I expressed in other prompts, this feels the most in line with the prospectus. It provides an impressive view from the main entrances, it is a natural gathering point and conducive to collaboration, it provides a live/learn association that isn't heavy handed,The smaller buildings fit the feel of Cal Poly Humboldt. We value smaller class sizes, connection to environment, and building community. It is important to our students to be consistent with this feeling, and they don't want to see us become just another cold modern city campus.


11
COMMUNITY UX 11: What aspects/features motivated your decision?
Top
This one is hard to answer. I answered Quad because I like it better, but I think three can address this criterion just fine.
This has the most natural flow to campus market, which is currently the closest place to get food.
No strong opinion. The Quad does not seem to have a lobby space?
I like the way the housing complex has views to the greenhouse buildings, helping connect natural resources to the living community.

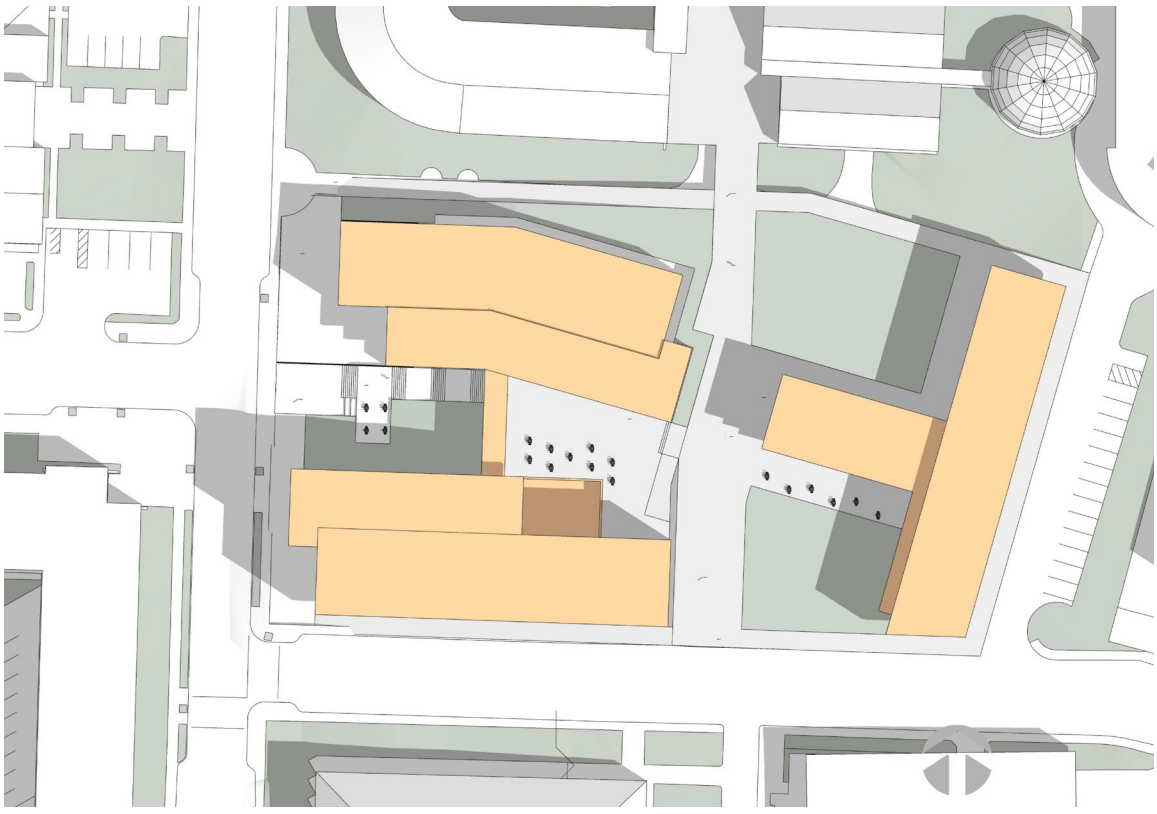

12
COMMUNITY UX 12: What aspects/features motivated your decision?
Top
All three options address this criterion. Podium has access problems with the dorms on 17th. Dual-Court access to lowest level might be isolating.
This isn't my area of expertise but it seems like this has the most access points.
Most have good access around/through the building. Quad seems best. Two buildings could increase need of everyone to move around.
Quad has best open feel, ability to view through the project from Harpst also. Less massive/block style so more visually appealing.

4.4 PRIME CONCEPT STRATEGY SELECTED

Based on the data from the evaluation criteria polling and discussion of detailed drivers behind the selections, the massing option labeled "Quad" was selected for the most successful delivery of desired criteria goals including the following:

- The concept that best addresses site and context priorities of creating a community gateway destination at the end of Harpst Street, providing varied activated outdoor spaces that have a strong relationship with ground floor programs and addressing solar needs of existing adjacent buildings.
- The concept option promotes the Engineering and Technology program and desired adjacencies while creating a clear and flexible organization of formal and informal learning spaces.
- The concept massing creates a strong and dynamic connection between the academic and housing buildings. This relationship is reinforced with the exterior space concepts and their relationship to the showcased academic programs and shared community spaces.
- The concept that is most in line with the campus prospectus to support student and community belonging, creating a natural gathering point and reinforcing the live/learn association.
- The concept that maximizes access to natural light while creating a connected network of student resource spaces that enhance both the staff and student experience.
- The concept that provides a strong and complementary relationship between the academic and student housing buildings that creates a sense of place and belonging to support place based learning communities.

Figure 4.4.1 - QUAD Massing Scenario



HARPST ST VIEW TOWARDS THE EAST

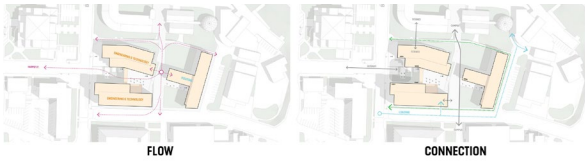
VIEW LOOKING NORTH TOWARDS PLAZA

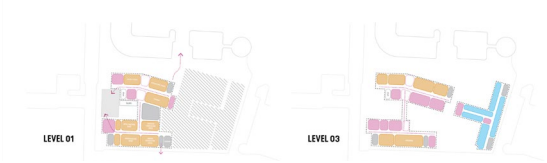
VIEW LOOKING WEST TOWARDS HARPST ST.

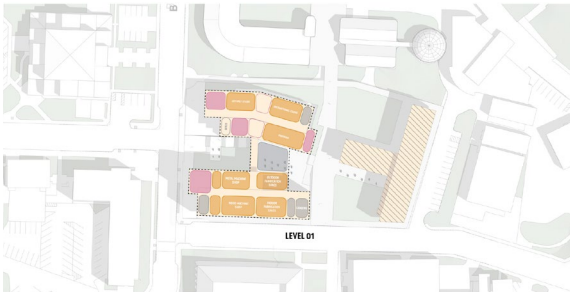
BIRD'S EYE VIEW TOWARDS THE NORTHWEST

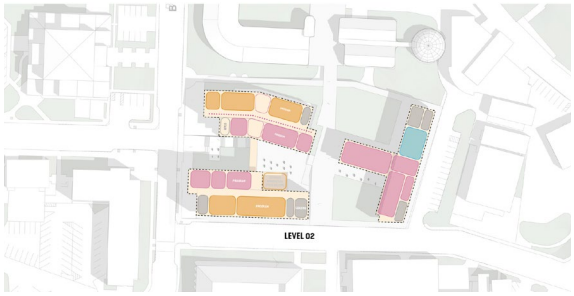
BIRD'S EYE VIEW TOWARDS THE SOUTHWEST

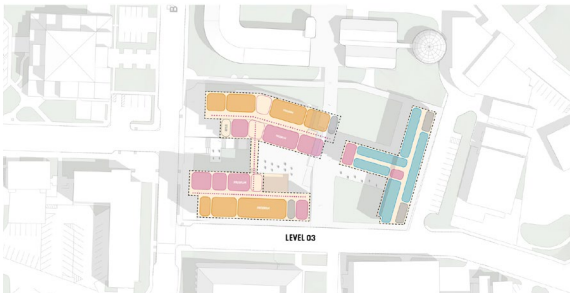
BIRD'S EYE VIEW TOWARDS THE SOUTHEAST

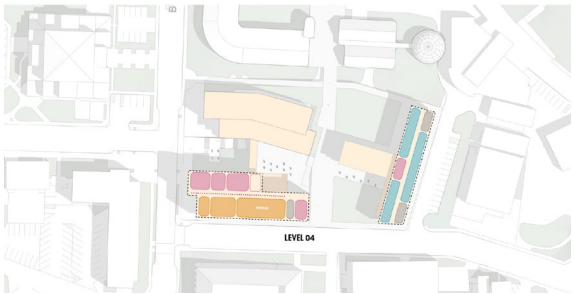


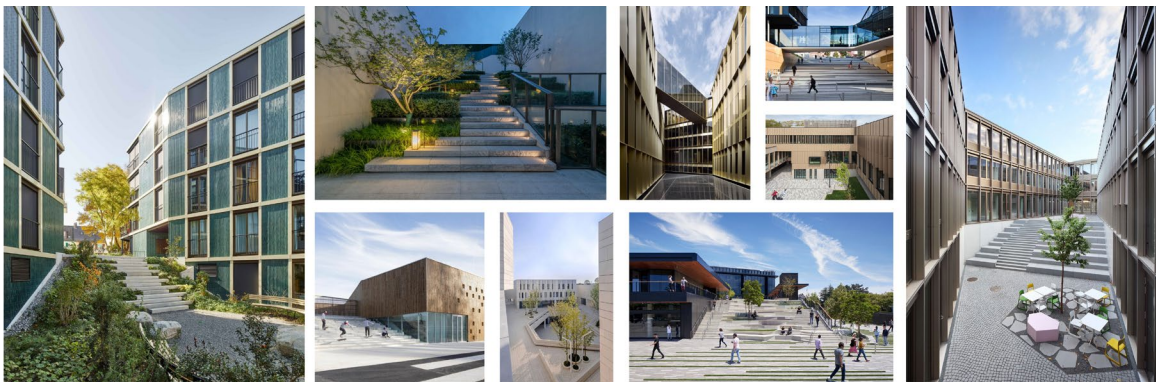








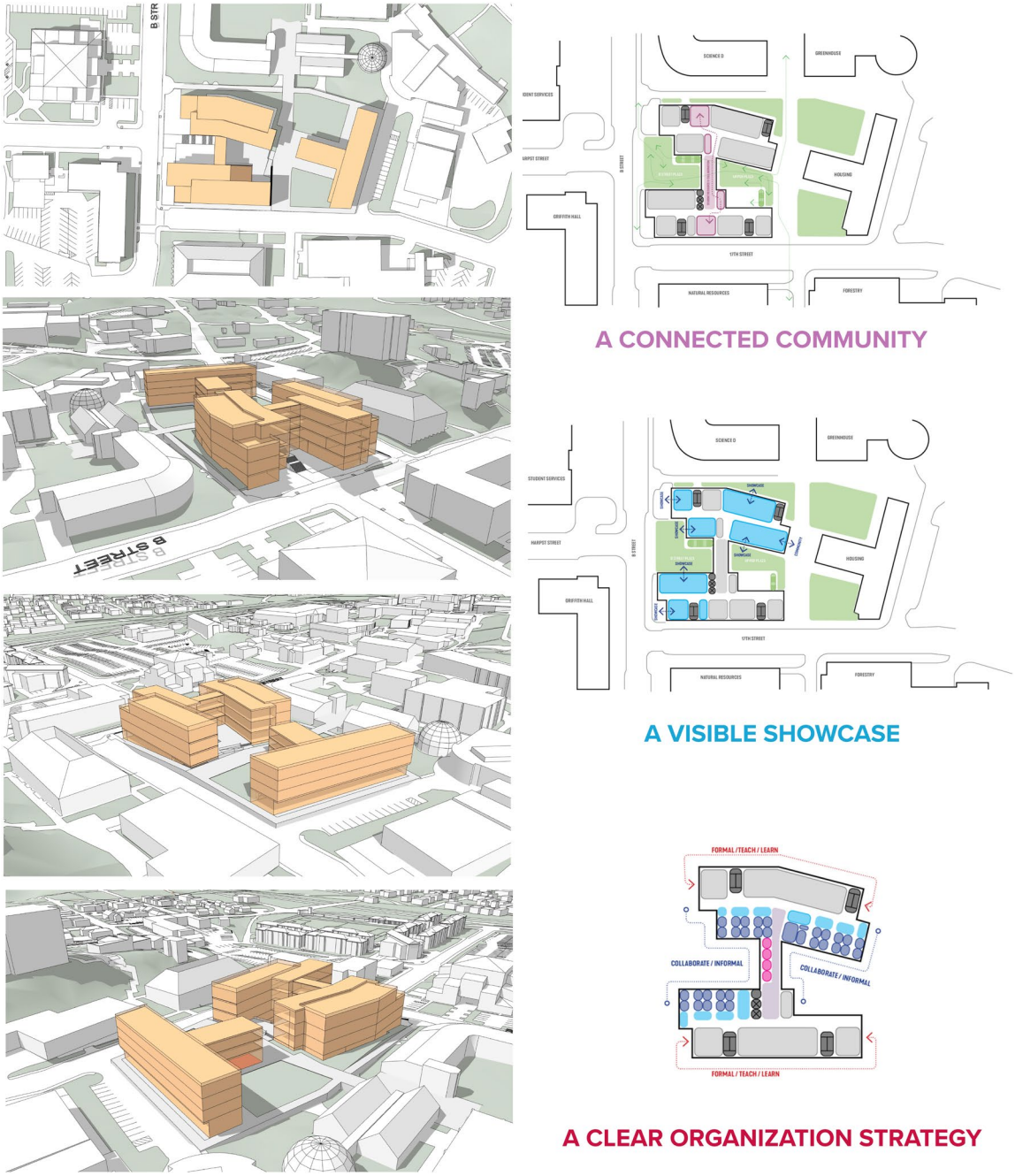




4.5 PLANNING TEST FIT

In order to validate the proposed space program, a departmental test-fit diagram was completed based on the "QUAD" massing scenario (Figure 4.5.1.1). With priorities identified by the working group stakeholders during Visioning and Programming sections of this study the following planning concepts were derived:

Figure 4.5.1 - 3D Views and Program Concept Diagrams

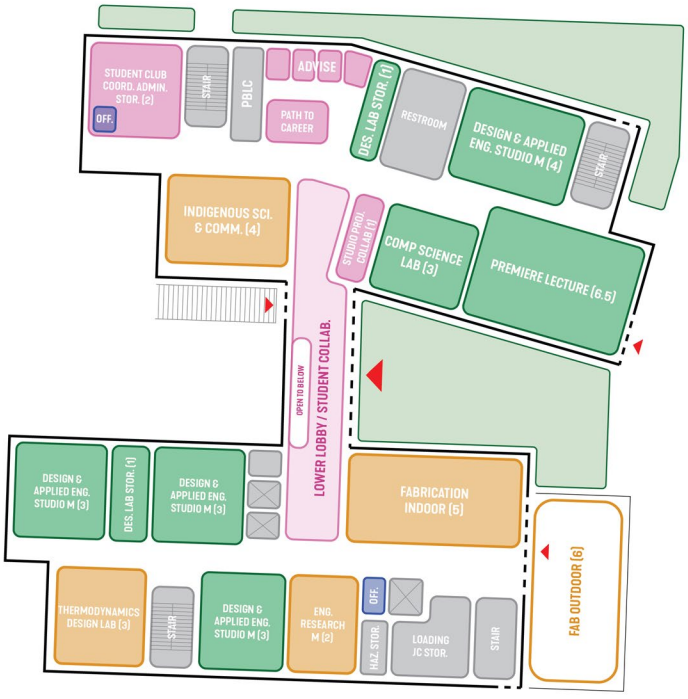


4.5.1 ENGINEERING & TECHNOLOGY ACADEMIC BUILDING

ENGINEERING & TECHNOLOGY PLAN TEST-FITS LEVELS 1 & 2 -The test fit key strategy is a dual-level building entry centered between the two building wings, connecting the level 1 and 2 outdoor plazas. Interior learning spaces are visible to adjacent outdoor spaces and have the ability to directly connect to those areas. Community spaces and student amenity areas are linked north-south with the lobbies.

Figure 4.5.1.1 - Academic Building Test Fit - Level 1

Figure 4.5.1.2 - Academic Building Test Fit - Level 2



Note: Adjacencies between Shops and Fabrication spaces to be reviewed during program validation.

ENGINEERING & TECHNOLOGY PLAN TEST-FIT UPPER LEVELS 3 & 4 OPTION A - Key strategies of the detailed plan test fit explored in this option include: Upper level community spaces and student amenity areas are linked north-south with centralized huddle/meeting spaces. Formal learning spaces are located on the northern and southern building perimeter while offices and informal learning spaces populate the inner area connected by the community "bridge". Offices line the perimeter in this option, allowing for exterior windows in each office.

Figure 4.5.1.3 - Academic Building Test Fit - Level 3 - Option A

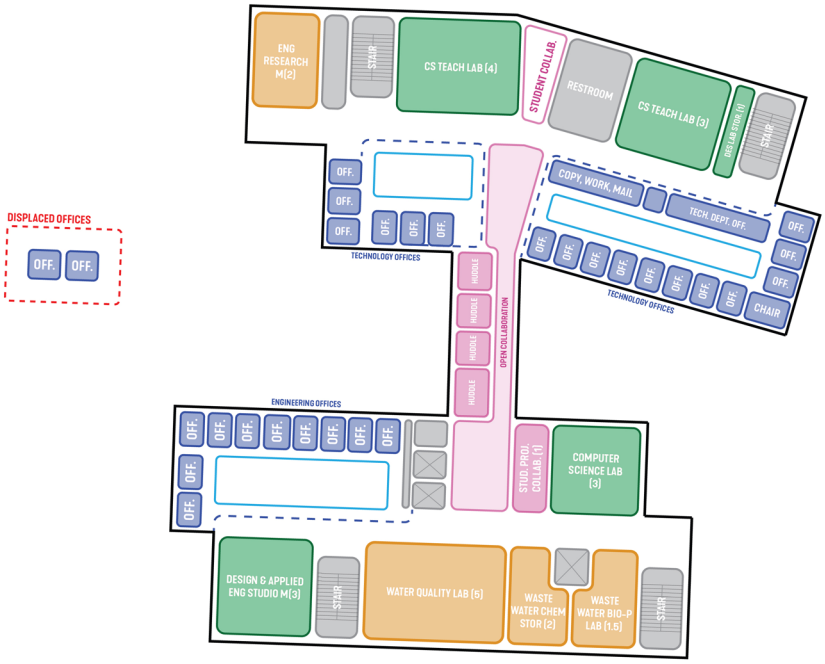
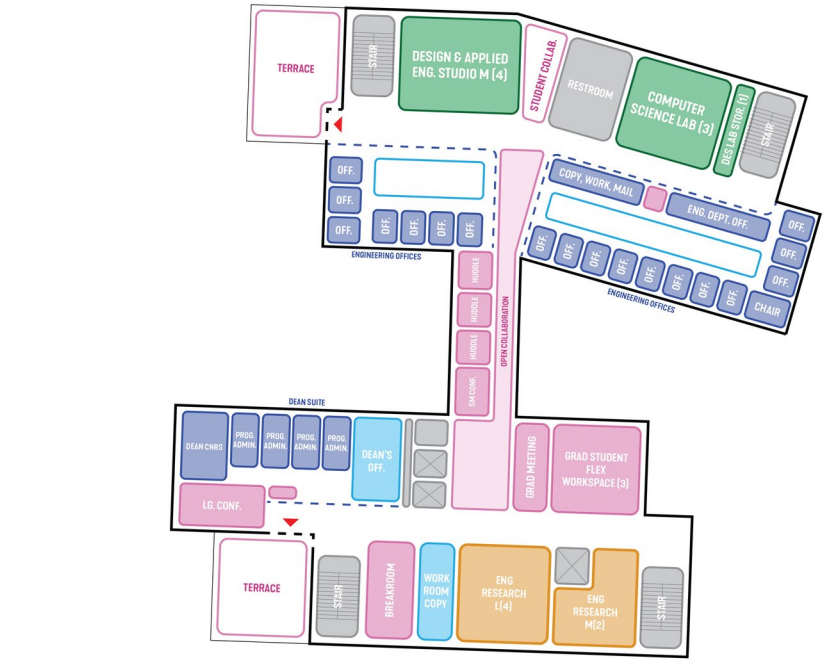


Figure 4.5.1.4 - Academic Building Test Fit - Level 4 - Option A



Note: Option A is the preferred option of the Engineering faculty but fails to accomodate all requested offices.

ENGINEERING & TECHNOLOGY PLAN TEST-FIT UPPER LEVELS 3 & 4 OPTION B - Key strategies of the Option B test fit mirror the approach in Option A with one exception: office layout. In Option B, offices are stacked perpendicularly to the exterior creating access/light/view corridors to the open office areas within. Inner offices receive shared natural light through these corridors.

Figure 4.5.1.5 - Academic Building Test Fit - Level 3 - Option B

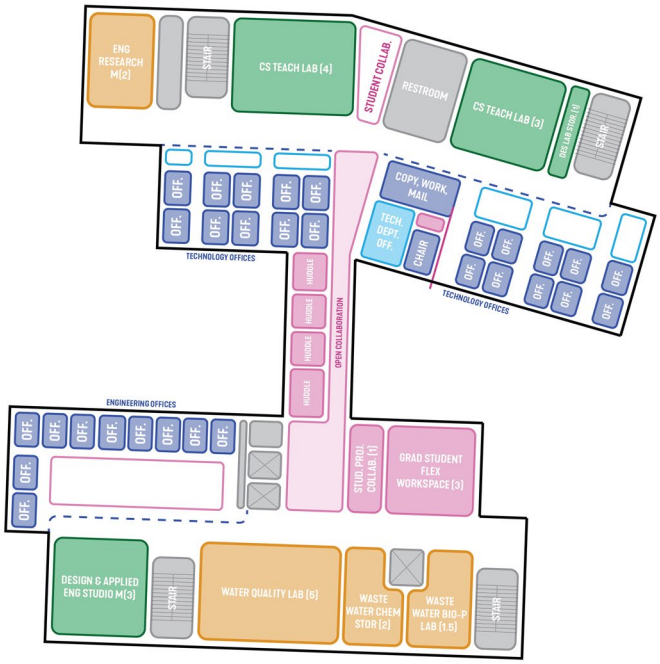


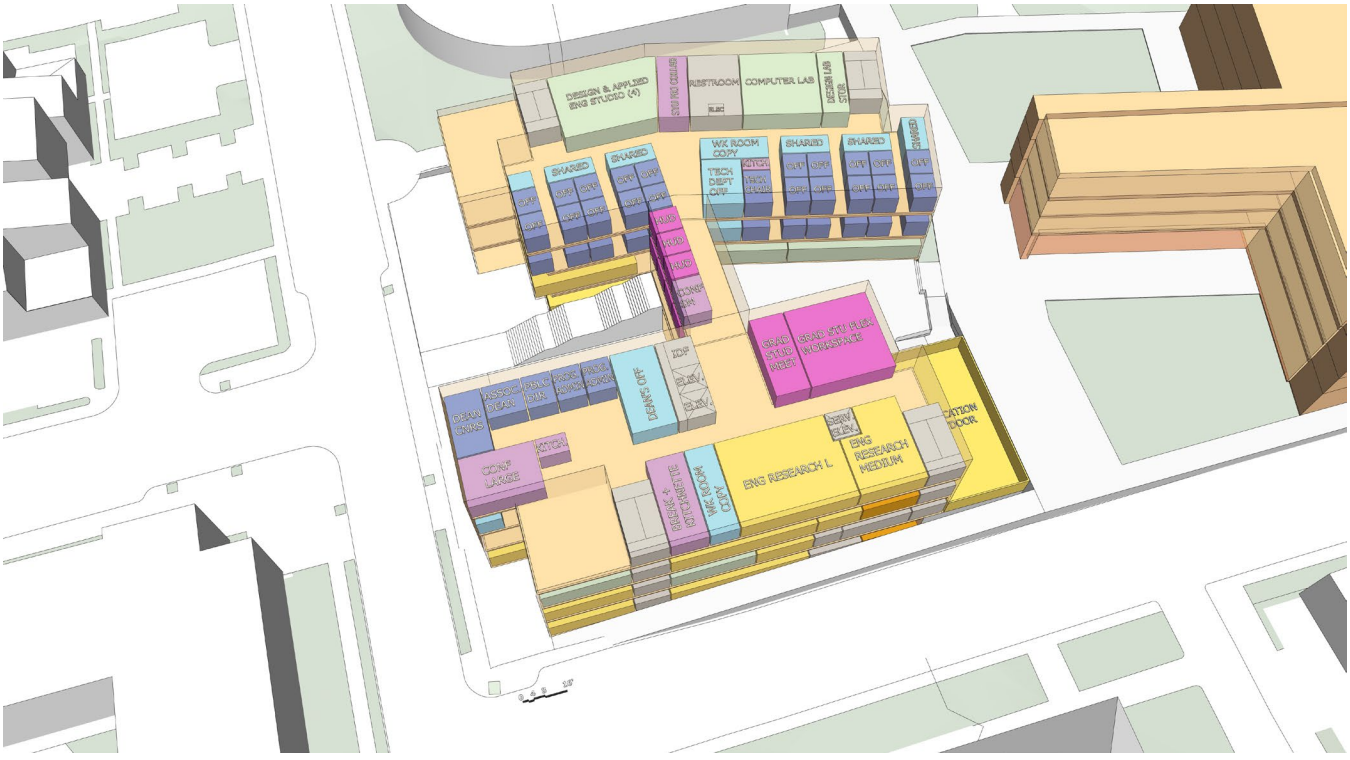
Figure 4.5.1.6 - Academic Building Test Fit - Level 4 - Option B

Figure 4.5.1.7 - Academic Building Stacking Diagram - Level 1

Figure 4.5.1.8 - Academic Building Stacking Diagram - Level 2

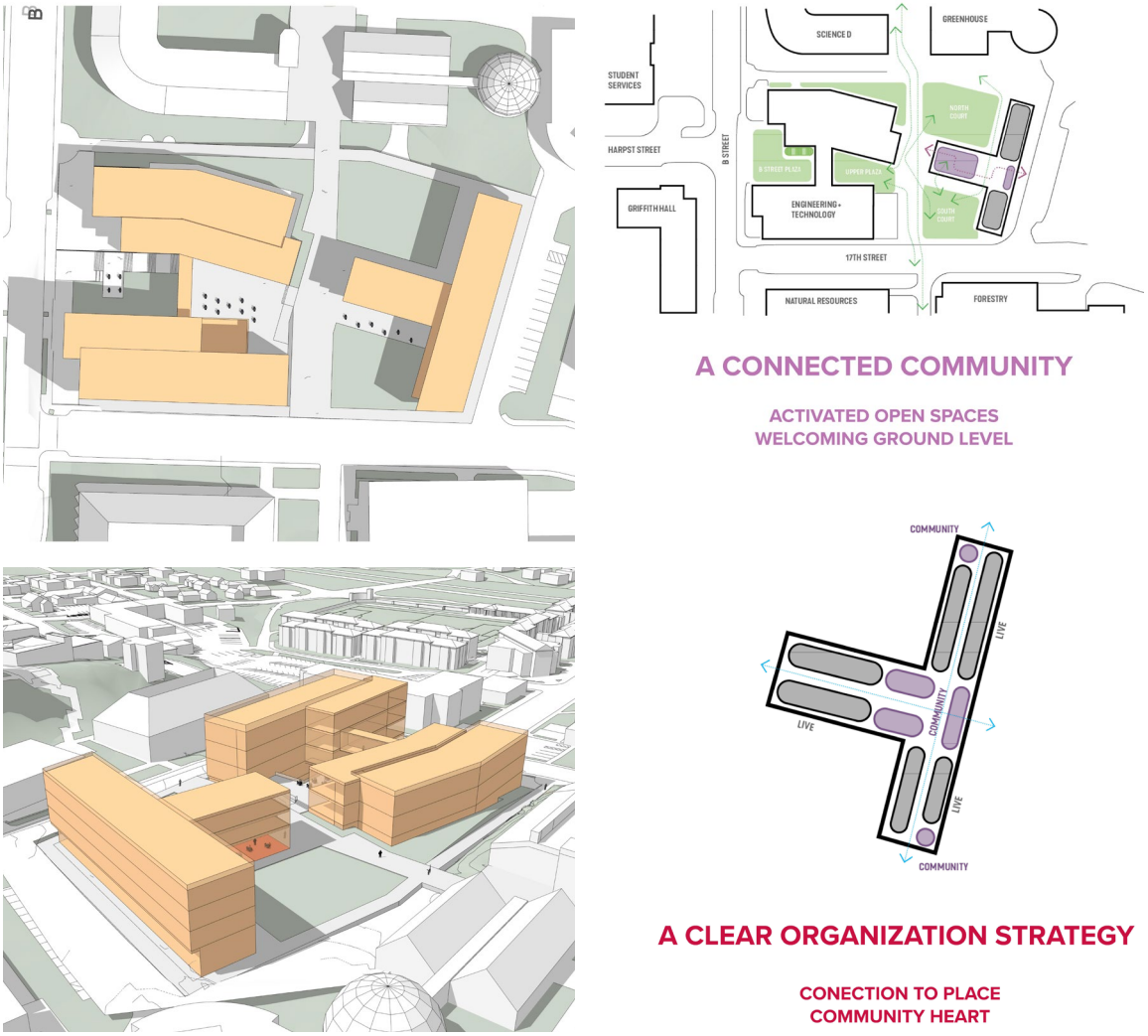
Figure 4.5.1.9 - Academic Building Stacking Diagram - Level 3

Figure 4.5.1.10 - Academic Building Stacking Diagram - Level 4



4.5.2 STUDENT HOUSING BUILDING

Figure 4.5.2.1 - 3D Views and Program Concept Diagrams



STUDENT HOUSING PLAN TEST-FIT - Key strategies of the detailed plan test fit explored in this option include: A connected community concept at level one, highlighted with multi-purpose space and social/ amenity function spaces opening out onto exterior plazas. A shared community heart on each level or neighborhood located at the building's crossing.

Figure 4.5.2.2 - Student Housing - Level 1

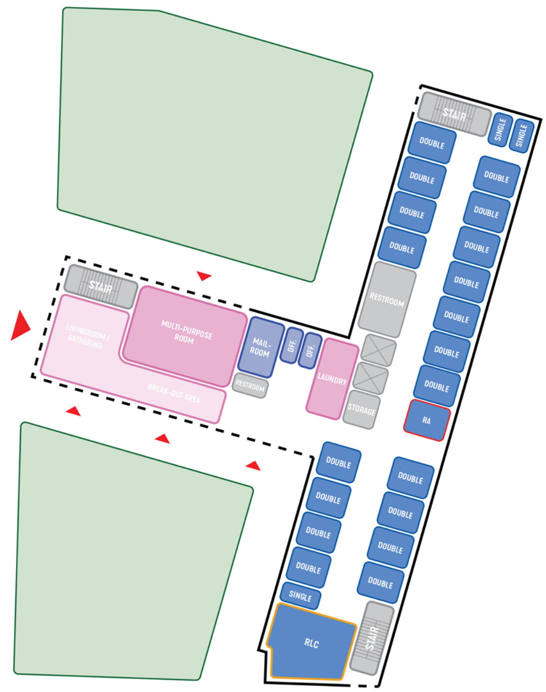


Figure 4.5.2.3 - Student Housing - Typical Layout - Level 2-4

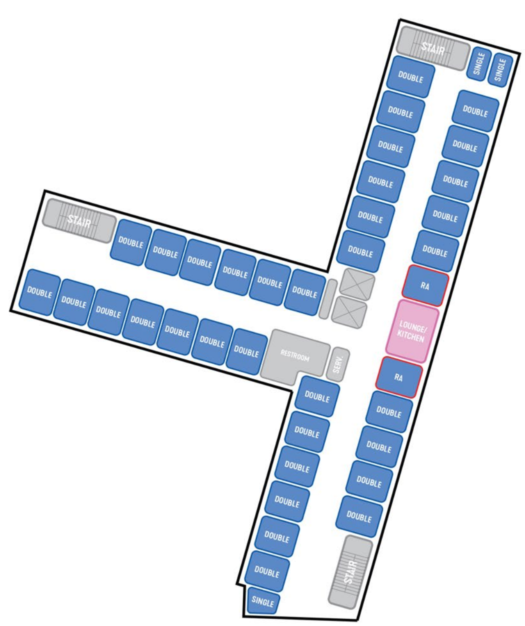


Figure 4.5.2.4 - Student Housing Building Stacking Diagram - Level 1

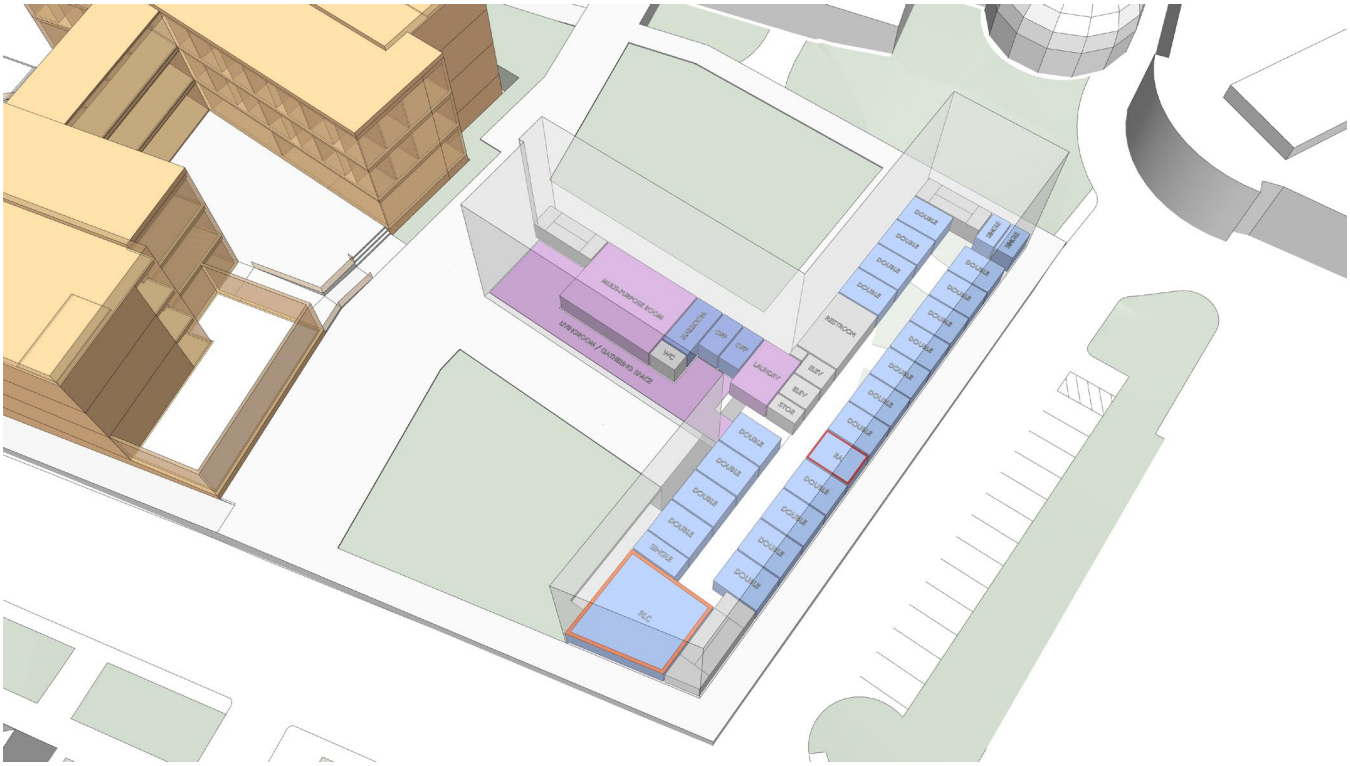


Figure 4.5.2.5 - Student Housing Building Stacking Diagram - Level 2

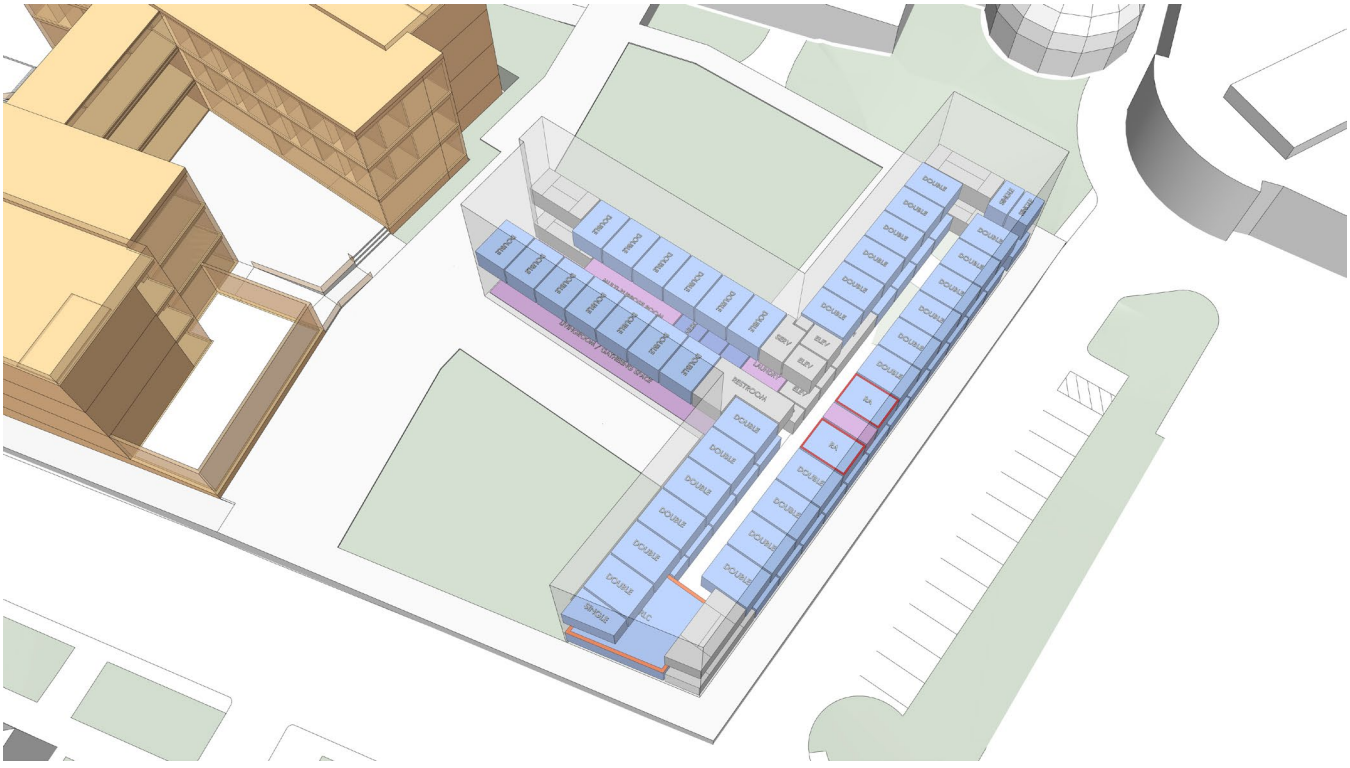


Figure 4.5.2.6 - Student Housing Building Stacking Diagram - Level 3

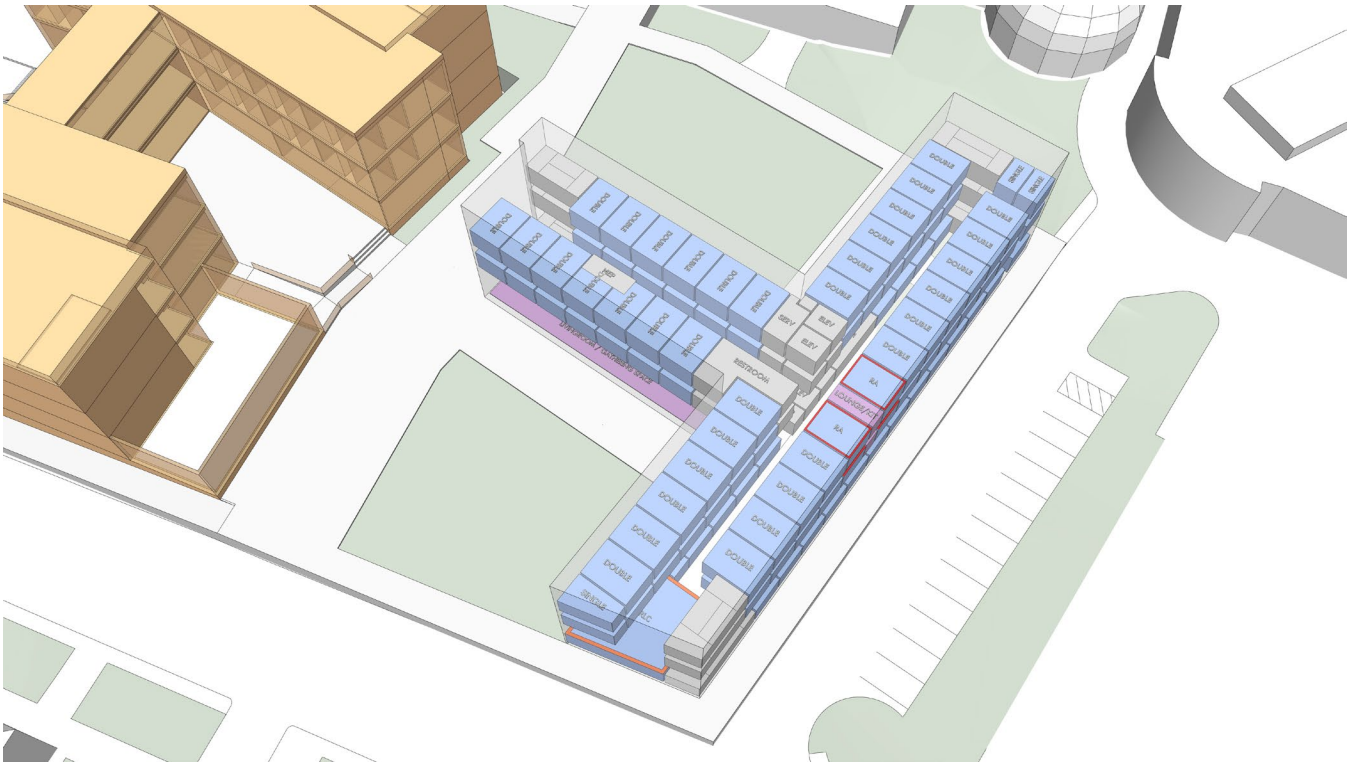


Figure 4.5.2.7 - Student Housing Building Stacking Diagram - Level 4

Photo Credit: Courtesy of Cal Poly Humboldt

05

BASIS OF DESIGN AND SYSTEMS APPROACH

5.1 LANDSCAPE ARCHITECTURE

The landscape architecture design of the new Engineering + Technology and Housing Buildings shall offer a beautiful, safe, accessible, and welcoming environment closely supporting the engineering research elements on display at this new building—along with wellness and comfort of students residing in the new housing building. It should complement and reinforce the architectural character of the new buildings and will be cohesive with the 144-acre campus, downtown Arcata, and the Humboldt community. The term 'landscape' is inclusive of all non-building and non-vehicular paving portions of the site and includes planting areas. Planting will be provided throughout the site by means of tree lined streetscapes, along the new building faces, courtyards, and the on-structure exterior terraces. Refer to the civil engineering narrative for further discussion on infrastructure, grading, retaining walls, materials, water requirements, and other related aspects that are tied to the landscape.

Site circulation, views, and vistas for students, visitors, and staff, enhanced accessibility, access to green and respite open space, and a holistic approach around site life-cycle management shall be key elements to the site plan. The site plan should prioritize safety of all users and maximizes the visual and physical connection to nature. Access to all public portions of the site and building shall be provided in compliance with applicable codes. The landscape shall guide and reinforce site circulation and provide clear and defined view corridors with minimal conflict between vehicles and pedestrians. The design should also include sustainable and environmentally responsible features to the greatest extent possible to meet CalGreen Code requirements and if pursued, LEED design credits. The landscape shall be compliant with ADA standards for accessible design, Water Efficient Landscape Ordinance (AB1881), as well as any other applicable governmental jurisdiction requirements that may be applicable to this site.

5.1.1 CONCEPTUAL DESIGN

The landscape design for the site should work in concert with the building to establish a unique presence on campus for engineering education and follow the overarching goals for the site:

- Equitable access, safety, and comfort throughout the site
- Designing spaces that teach = express sustainable features
- Interior / exterior / community engagement
- Hands-on learning experiences
- Preservation of existing valued trees, views, and connections.

Site design concept should aim to respond to site specific goals of blending the building and the pedestrian experience into the existing landscape as seamlessly as possible--creating a weaving of sustainability and environmental understanding by design through compassion, collaboration, and connection to complement the tapestry of the Cal Poly Humboldt Campus. The landscape design should also support engineering exercises that may take place outside at the new facility.

The following are key site components:

- **On Structure exterior space:** 2 Exterior terraces on the 4nd floor provide opportunities for a series

of outdoor respite spaces that can accommodate small group gatherings at the residential building. The perimeter of the exterior terrace spaces could have fixed planters with native grasses. For seating, lounge furniture could be considered.

- **Plazas:**
  - The E+T lower plaza is the terminus of Harpst Street and acts as a significant focal point of the university. Consider design elements that help to enhance this visually important intersection. The lower plaza is accessible from the intersection of B street and Harpst St. and acts as the front arrival & entry forecourt to the Engineering and Technology building. The design of the lower plaza will include steps to make up the +/- 20'-0" grade change from level 1 to level 2 and move pedestrians from B street to the 2nd floor building entrances. Terraced seat steps with planting may be considered. A flat portion of the lower plaza is directly outside the fist level of the south wing and could contain low planting & deciduous trees to showcase the transparency created by the façade.
  - The E+T upper plaza creates the link between the E+T and Housing buildings and will be a social and active space. The E+T plaza should support outdoor learning and engineering on display. The upper plaza will also have the accessible entrances to the E+T building.
  - Housing plazas could have exterior furniture, seat walls and planting that supports both social gathering. The design of the upper plaza should emphasize and help animate the confluence of the north & south as well as the east & west pedestrian connections.
- **Streetscape**: Add planting strips to sidewalks along adjacent roadways to create a buffer between pedestrians and vehicular drives.
- **Accessible pedestrian paths**: Where possible, seamlessly integrate ADA accessible pathways from nearby parking and sidewalks to the plazas and entrances to the buildings.
- **Existing trees**:Retain as many of the healthy tree specimens located on site as possible

Safety of students, visitors, and staff is the top priority with the design of the landscape. The final design should consider the following goals:

1. A simple and clean planting palette will use a limited number of native species to meet the function of the landscape.
2. The landscape will be designed to be cohesive with the surrounding area and to reflect the unique culture and character of the campus.
3. The landscape will complement the architectural character of the building.
4. The design will provide various landscape areas that respond to the intended use of the site. Higher intensity landscape and hardscape should be considered near the exterior engineering work areas. Secondary landscape zones in key view areas such as street frontage and building perimeter will provide visual interest.
5. Accessible pedestrian paving will be provided at all public entries with emphasis on a pedestrian connection between the existing campus, parking, and the new building.
6. The design will provide enjoyable exterior spaces for students, visitors, and staff that is inclusive of

seating areas with pleasant views.

7. The design will provide aesthetically pleasing landscape views from the building windows (all floors) and use tree and shrub planting to screen unwanted views.
8. Clear views will be maintained throughout the landscape areas for security and will provide defined access for pedestrians.
9. The planting design will provide visual relief using shape and color, plant form, and leaf color and texture in key areas, utilizing biophilic design interventions.
10. Unless specifically needed for screening, trees will be pruned up to provide a minimum of 7' from the ground to the underside of the canopy.
11. The design will utilize trees and other plantings to help mitigate the climate. Deciduous trees in the south and west facing building exposure will allow for solar gain and protection from wind in the winter and provide for cooler outdoor spaces in the summer.
12. Where used, planting areas will use shrubs, perennials, and groundcovers that will remain low to maintain clear views throughout.

5.1.2 HARDSCAPE

Exterior hardscape shall be designed to be code-compliant and meet the functional needs of the site and the building. Materials and design shall be durable and long lasting, complementary to the building, lobby interior, greater campus, and provide clear and defined access. The hardscape will also conform to the forthcoming master plan and guidelines.

1. The design will provide code-compliant accessible concrete sidewalks and/or modular paving from public streets and accessible drop-off space to entries to the new building. Pedestrian walkways will be designed to minimize crossings between pedestrians and vehicles. At the drop off areas, vehicular paving may be modified to reinforce pedestrian use. Plantings shall be low in those areas to allow for visibility.
2. Exterior terrace paver assembly should conform to the forthcoming master plan, but the pavers shall be manufactured by a west coast entity such as StepStone, QCP, or ColdSpringUSA Granite, with the preferred pedestals being Bison.
3. Some sidewalks and paving areas may be designed to slope toward the planting areas instead of the curb and gutter to direct storm and irrigation run-off into planting areas instead of the storm drain.
4. If used, color of pavers should meet necessary SRI requirements for LEED and sustainable practices.
5. Sidewalks shall be poured in place concrete with saw-cut joints. If used, Integral color selection will match the greater campus.
6. Due to site slopes, retaining walls adjacent to the pathways and buildings may be necessary in some areas.
7. The design should incorporate a pedestal paver system for the 2nd floor roof terrace.

5.1.3 FURNISHING

Site furnishings, where used should complement the historic campus context as well as the architectural style of the new building and conform to the forthcoming master plan and guidelines. Site furnishings such as benches, trash receptacles, and bike racks will be located at key areas to be used by employees and students. Sustainable materials, location of manufacturing facility in proximity to the university, and site appropriateness of materials are some of the factors that should be considered when choosing site furnishing

1. All bench furnishings shall incorporate a back and arms to meet any accessibility code requirements or local guidelines.
2. Consider moveable furnishings in gathering spaces. The final quantity and types of flexible seating should be coordinated with forthcoming campus standards
3. Consider illuminated bollards at drop-off areas and other spaces where pedestrian-vehicular paths intersect
4. Small landscape path lights may be considered at areas of respite in lieu of full-size lighted bollard.
5. An art feature could be considered in one of the plaza or garden areas to create a focal point.
6. For flexible seating, moveable tables and chairs may be considered in at the south-facing outdoor roof terrace.
7. Manufacturer for fixed above-grade planters at the roof terrace includes Tournesol as Basis of Design.
8. Bike parking shall be incorporated in highly visible, accessible locations near entries at the new facility in accordance with state or local codes. The final quantity and types of bike parking should be coordinated with forthcoming campus standards.

5.1.4 PLANTING

The planting plan shall provide for an effective and functional landscape that meets the needs of the buildings, promotes safety, and uses relatively low water. Planting may frame and help to differentiate various exterior user spaces. Planting should complement the existing landscape while enhancing the character of the new building and reflecting the character of the campus. Plants will be selected from the campus Landscape Committee planting palette. The plant palette should respond to site elements, such as wind, and plant material should be placed in such a way to help mitigate areas that are uncomfortable due to climate. Plants will be chosen to perform well and require the least amount of on-going maintenance and conform to the forthcoming master plan and guidelines.

1. Plant species that are appropriate for the climate, the site, and ease of maintenance will be utilized.
2. Plants will be selected and spaced at the time of planting to be appropriate for the intended use and their size at maturity. Selected plant species will provide for:
    - A safe site with clear views.
    - Reduction in maintenance hours associated with pruning.

- Better health of the plants.
- Reduction in generation of green waste.

3. Consider a palette of drought-tolerant / low-water using plants for reduction in irrigation demand.
4. Planting will be designed in hydrozones of similar water needs. The irrigation will be designed to comply with the planting hydrozones. Hydrozones will be based on plant water needs, sun exposure, slope, and soil conditions.
5. A combination of ornamental and deciduous trees in informal massing to provide perimeter screening.
6. Trees will be planted away from light poles. The optimal lighting location will be coordinated with tree locations.
7. All planted landscape areas are to be covered with minimum 3" of bark mulch and, if flow through planters are required, will have a 3" lift of la paz stones 3" in diameter.
8. Lawn areas may be considered for functional use in the exterior plaza spaces (picnic, sports, etc).
9. Plants shall be installed at sizes that are appropriate for the intended use and typical of planting techniques.
10. Trees will be planted at minimum 24" box size with staking such as the hidden platypus deadman guying system below surface, similar to: https://platipus.us/wp-content/uploads/2018/05/Platipus-Brochure-Tree-USA.pdf
11. If used, focal point trees will be planted at 48" box size with staking or guying.
12. If used, specimen trees will be planted at 60"-72" box size with staking or guying.
13. If used, shrubs will be planted from 5-gallon and 1-gallon size containers and spaced as needed based on their mature size – typically 4' – 6' on center.
14. If used, groundcover will be planted from 1-gallon size containers and spaced as needed based on their mature size – typically 24" – 48" on center.
15. After mass grading and prior to planting, soil fertility test shall be performed from two-to-three areas of the site. Soil amendments, fertilizers, and ratio of mixture with the native soil shall be installed per the recommendations of that report.

5.1.5 IRRIGATION

The permanent irrigation system shall be designed for long-term function with quality components and for ease of maintenance. Irrigation to apply the optimal amount of water based on the needs of the plants. Plants will be placed in hydrozones based on their water use requirements, and the irrigation will be designed specific to those hydrozones.

1. Planting will be designed to meet the requirements of the city and the state-mandated Water Efficient Landscape Ordinance (WELO - AB 1881). This ordinance limits the amount of irrigation water that can be used based on site specific calculations to determine the maximum water allowance as well as

minimum irrigation efficiencies.

2. Irrigation will be predominately drip emitters or bubblers at each plant for shrub and groundcover areas.
3. Irrigation will be designed for no overspray onto hardscape.
4. Irrigation controller will be a smart controller that will automatically self-adjust based on real-time weather updates (via cellular update from the manufacturer or on-site weather station) or soil moisture sensors. The model and manufacturer are to match existing controllers and allow for integration into the sitewide irrigation system.
5. Quick couplers and isolation gate valves will be placed throughout the landscape areas per the direction of hospital maintenance staff.
6. All piping, including drip tubing is to be buried and not placed on the surface of the soil. Only emission devices, such as emitters or the top of pop-up sprinklers shall be on the surface.

5.1.6 DRAINAGE

All landscape areas to effectively drain and/or serve as storm water run-off filtration and storage areas. Bioswales will be incorporated throughout site where possible. Drainage shall also conform to the forthcoming master plan report. Refer to the civil engineering narrative for further discussion on drainage and stormwater management.

1. All landscape areas that are not designed for storm water filtration or storage shall have swales and/or drainage catch basins to drain excess water
2. Catch basins and swales shall be provided adjacent to the building to move water away from the foundation.
3. When possible, use swales to move run-off in lieu of drainage piping.
4. Storm water shall not be allowed to puddle in any vehicular or pedestrian paving areas.
5. Swales and basins shall be designed at the service area and parking lot to filter storm water run-off prior to entering the storm drain system where possible.
6. Site sidewalks may be designed to slope toward landscape and away from curbs and gutter to the greatest extent possible with swales in the landscape to move water away from the walks.
7. Landscape drainage facilities will be constructed of durable materials such as NDS, Rainbird, ACCO or similar high-quality products.
8. Slopes shall be planted and/or covered with slope stabilization fabric to eliminate/minimize drainage erosion.
9. Bioswale areas will incorporate various sized boulders and river rock. Groundcovers, shrubs, and perennials shall be used on edges and interior of bioswale areas. Species will be chosen for adaptability of water to flow through as well as adapt to dry conditions.

5.2 CIVIL ENGINEERING

Sherwood Design Engineers has evaluated the capacity of the utility infrastructure systems listed below to serve the planned Engineering Technology Building (1A), which will be an academic building, together with the separate Student Housing Building (1B), In addition, some of the modifications that may be required to serve or accommodate the proposed buildings have been identified.

- Water supply.
- Wastewater collection, treatment and disposal.
- Stormwater management and control.

5.2.1 SITE CONDITIONS & CONSTRAINTS

5.2.1.1 EXISTING CONDITIONS

The planned Engineering+Technology building and Student Housing building would occupy the existing Campus Events Field. The field is bounded by B Street on the west, Wildlife Lane on the east, 17th Street on the south, and a paved walkway/driveway on the north that connects B Street to Wildlife Lane, serving Alistair McCrone Hall and the Dennis K. Walker Greenhouse. The driveway portion extends west from Wildlife lane to the east end of McCrone Hall to provide delivery and maintenance access for the two buildings. It then transition to a walkway that descends between parallel retaining walls to B Street.

There are no existing buildings on the site, only a gravel pad surrounding a few areas of concrete pavement. The 12" (+/-) thick pad extends north and west from the southeast corner, covering nearly two thirds of the site. It includes an approximately 8 foot wide pathway that connects the east end to an existing concrete staircase in the southwest corner of the field that leads down to 17th Street. The main portion of the pad was apparently installed on top of the grassed field as a leveling foundation for a number of modular buildings that have now been removed. The remaining sections of concrete pavement that originally interconnected the buildings provide hard surface walking paths that link 17th Street to the McCrone Hall/Walker Greenhouse driveway.

Because 17th Street slopes down more than 20 feet from Wildlife Lane to B Street, the southerly edge of the level Events Field is defined by a vegetated bank that begins a short distance west of Wildlife Lane and grows to a height of about 15 feet by the time it reaches B Street. The bottom of this bank transitions into a four to five foot high concrete retaining wall just before B Street, at the bottom of the concrete stairs in the southwest corner of the field. The wall and vegetated bank both wrap around onto B Street, which slopes up approximately four feet between 17th Street and the McCrone/Walker walkway. The wall maintains a nearly constant height along B Street to the walkway, after which it transitions into a low curb separating the sidewalk from the McCrone Hall lawn. Because the wall height does not change along the field's B Street frontage, the height of the tree covered bank behind the wall decreases from approximately twelve feet at B Street to about eight feet at the McCrone/Walker Greenhouse walkway. Along the south sid of the walkway, the bank and the retaining wall gradually diminish in height as they proceed east until the walk reaches field grade at the east end of McCrone Hall.

Other than the previously described concrete pavement and gravel pad, the only site improvements are a chain link fence and what appears to be electrical and/or telecommunications cabinets that most likely served the now-removed modular buildings. The fence runs along the edges of the field adjacent to B Street, 17th Avenue and Wildlife Lane. In addition, a few short fence sections close off the northeast corner of the gravel pad area between the north end of the Wildlife Lane fence and a short staircase that connects the elevated concrete paving to the McCrone/Walker Greenhouse driveway. The electrical/telecommunications cabinets are located just outside this portion of the fence, adjacent to Wildlife Lane.

The only trees on the site are located around the perimeter of the field, covering most of the 17th Street and B Street landscape banks and also running alongside Wildlife Lane. Areas of the field not covered by the gravel pad consist of open lawn.

The following sections provide additional existing site information obtained from the campus utility maps. Prior to finalizing any plans for the installation of utility improvements to serve the Engineering+Technology and Student Housing buildings, on-site surveys should be performed as required to confirm the extent and condition of all existing utilities.

5.2.1.2 DEMOLITION

Construction of the Engineering+Technology and Student Housing buildings as currently planned would require removal of the existing electrical/telecommunications cabinets, concrete paving and gravel pad, although it is expected the pad material could be reused for foundation preparation. It is unknown to what extent, if any, underground conduits connect the cabinet with previously occupied portions of the site, but they would have to be removed wherever they conflict with building foundations. The existing staircases and B Street retaining wall appear to be in good condition, but it appears both will conflict with the planned building locations and site design and will likely have to be removed.

In addition to the electric/telecommunication cabinets, campus utility maps indicate the site contains existing water, storm drain and a limited number of sanitary sewer pipes that would all have to be completely removed within any areas proposed for building construction. The small diameter water lines shown in various locations throughout the field are labeled as abandoned, and were probably part of a former irrigation system. It is assumed two short sewer lines in the northeast corner of the site were installed to serve the former modular buildings, so are now probably also abandoned and can be removed. The site's existing storm drain infrastructure, described in following sections, is more extensive and portions of it remain in service. As explained below, these facilities will have to be relocated prior to building construction.

5.2.1.3 SITE GRADING & DRAINAGE

Although it looks level, the Events Field lawn falls very gradually (less than 1% slope) from east to west. The gravel pad appears to have been placed at a uniform height above the field, so it also has a slight slope from east to west. At the east end of the field, the pad appears to be a couple of feet below the elevation of Wildlife Lane, but it is separated from the Lane by a shallow drainage swale and a row of mature redwood trees. Slopes on the landscaped banks that border much of the field vary widely, going

from relatively flat to between 2:1 and 3:1 (horizontal to vertical) near the corner of B Street and 17th Street. There is probablynegligible runoff from the highly pervious gravel pad, but heavy rains may generate minor surface flows across the lawn to the east. Most rain probably seeps into the lawn (after first passing through the gravel on the east end of the field), where it is collected in an extensive underdrain network that discharges to storm drain inlets at the east and west ends of the field. As a result, it is expected very little runoff makes it to the top of the landscaped banks that surround the field on the south and west, as well as along half of the northerly site boundary.

Preliminary sections through the planned development site indicate all or at least most of the B Street retaining wall will have to be removed. The face of the building nearest to B Street (south wing of Building 1B) would be offset approximately nine feet from the back of sidewalk. A basically level plaza would extend east from the sidewalk, between the building wings, to a first floor entrance at the face of a proposed breezeway connecting the wings. An exterior staircase adjacent to the plaza would lead to a second floor entrance at the north end the breezeway, where it connects to the north wing of Building 1B. The grade of the proposed plaza would extend across the B Street frontage, which will require some type of low retaining structure or slope transition to accommodate proposed grades below the street sidewalk at the north end of the parcel and along the McCrone/Walker walkway, and above the sidewalk at the south end of the parcel near 17th Street. On 17th Street, the south wing of Building 1B would be nearly adjacent to the rising B Street sidewalk, causing the surface to rise along the building face. This will require a separate retaining wall or else the grade transition will have to be made directly against the wall of the building.

The remaining portion of the site, located east of the Student Housing building, would be essentially level with existing field grade. This upper plaza would rise gently from west to east, connecting second floor elevation at the back of the Student Housing breezeway to first floor elevation on the west side of the Engineering Technology building. Because this will make the area roughly level with the McCrone/Walker driveway, it should be possible to provide handicap access routes into both buildings with a minimum of on-site transition grading. On 17th Street, either a wall or a landscape bank will have extend east from the south wing of Building 1B to Wildlife Lane, to provide a transition up to east plaza level.

5.2.2 WATER SUPPLY

Water is provided to the Cal Poly Humboldt campus by the City of Arcata, which currently obtains all of its supply from the Humboldt Bay Municipal Water District (HBMWD), but also has a currently off-line groundwater well with a capacity of 182 million gallons per year. In 2020, the City used approximately 50% of its 1,186 acre feet (386 million gallons) annual allotment from HBMWD, and projects this will rise to 63% by 2045. Because the City's demand projections include the anticipated growth of the community (which includes the Cal Poly Humboldt campus), it is not expected that supply constraints would affect the City's ability to serve the campus in either the short or long term. However, continued campus development

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1. For the purposes of this study, if "City" is used by itself, it is intended to mean the "City of Arcata" and or the "City of Arcata's" officials and departments.

could potentially affect the City's local storage facilities, which it maintains to meet peak domestic and fire flow demands. As a result, the City Engineer has indicated they would like the campus to provide advance notice of all planned increases in demand so the collective impact of ongoing development throughout the City's service area on both storage and distribution facilities can be continually evaluated.

Water is delivered to Cal Poly Humboldt through a City distribution system that abuts the campus on three adjacent roadways; LK Wood Boulevard, 14th Street and Union Street. In addition, a large diameter water main cuts across the campus on Harpst Street, B Street and 17th Street, connecting main water lines on LK Wood Boulevard and Union Street. The B Street main also runs south to connect with the main on 14th Street, and continues north past Harpst Street to a dead end near the middle of the Student and Business Services building. This network of pipelines provides multiple points of connection between the City and the campus distribution system, which delivers water to all existing campus buildings and facilities. There is no separate fire system. Both potable and fire suppression supplies, including building sprinklers and fire hydrants, are supplied by the same distribution system.

Maps of the campus distribution system show existing 10" campus water lines paralleling the City mains on 17th Street and B Street. The B Street main continues north to Laurel Drive, where it joins a network serving the north end of campus. A 6" line connected to B Street runs east along the McCrone Hall/Walker Greenhouse walkway/driveway to provide service for both existing buildings. The final water facility in the vicinity of the site is a 6" line connected to 17th Street that runs north on Wildlife Lane to serve a fire hydrant and fire department connection located just north of the east end of the McCrone Hall/Walker Greenhouse driveway.

It is assumed the estimated 1,450 gpm combined domestic plus fire water demand for the two planned buildings could be met by either of the 10" campus water lines on 17th Street and B Street. The 6" dead end lines in Wildlife Lane and the McCrone Hall/Walker Greenhouse walkway/driveway can probably not meet this threshold by themselves, in addition to the existing demands they already serve. As a result, if a combined service for the entire project is to be provided from either the north or east side of the site, it may be necessary to interconnect the existing lines with an approximately 200 foot long, 6" diameter extension running along the site's northerly boundary, past the greenhouse and its adjacent parking lot.

There are three existing fire hydrants in the project vicinity, one located on 17th Street near the middle of the site, one on B Street just north of the McCrone Hall/Walker Greenhouse walkway/driveway, and one where the driveway portion meets Wildlife Lane at the northeast corner of the site. This last hydrant may require a minor relocation because it would be immediately adjacent to the east wall of the proposed ET building. As currently defined, it appears that most of the new building complex would be within the State Fire Code's maximum 250 foot hose pull allowance from an existing fire hydrant, except for the west side of the Student Housing breezeway and portions of the building wings on either side of the breezeway. Depending on how the final design is evaluated by the State Fire Marshall, it may be necessary to install an additional hydrant on B Street, north of 17th Street.

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2. Peak domestic demand is estimated at 200 gpm for the residential building and 250 gpm for the engineering building, equaling 450 gpm total. Fire flow, which only has to be counted for a single building at a time, is estimated to be 250 gpm for sprinkler demand and 750 gpm for standpipes, or 1000 gpm total.

5.2.3 WASTE WATER COLLECTION, TREATMENT AND DISPOSAL

The City of Arcata treats and disposes of all campus wastewater in the City's wastewater treatment facility located adjacent to the north end of Humboldt Bay. The facility includes the Arcata Marsh Wildlife Sanctuary, which provides enhanced treatment for the secondary treated effluent from the treatment plant's oxidation ponds. Overflow from the ponds is discharged to Humboldt Bay in accordance with the City's National Pollutant Discharge Elimination System operating permit.

The City is currently upgrading the treatment facility, primarily to address numerous discharge violations. These violations mainly concerned the quality of effluent being discharged to the Bay, so the upgrades are focused on improving the facility's treatment processes, rather than increasing treatment capacity. Once complete, the facility will be able to treat a design average day flow of 2.3 million gallons per day (mgd) in accordance with the water quality requirements set forth in the operating permit. This flow rate, along with a 5.9 mgd peak wet weather flow capacity, was established in 2017, and both reflected a 20% increase over existing rates to accommodate build-out of the City's General Plan. No estimate of wastewater generation by the Engineering+Technology and Student Housing project is currently available, but because the City's wastewater improvement program is underway, it is not expected development of this project would adversely affect the City's ability to comply with all discharge requirements. The City Engineer, however, has asked to be informed of any campus development plans that entail increased wastewater production.

Wastewater is conveyed to the treatment facility through the City's collection system, which campus utility maps indicate abuts the campus on LK Wood Boulevard, 14th Street, a portion of Union Street, and on a pedestrian path south of College Creek Field that connects the south end of Rossow Street to 14th Street. Cal Poly Humboldt sewers extend throughout the campus, with two existing 6" diameter lines in the McCrone Hall/Walker Greenhouse walkway/driveway and another in 17th Street, which all feed into an 8" line in B Street. The B Street sewer flows south to the Parking Lot G12 driveway, where it turns west and connects with the 8" Rossow Street line that discharges into the City sewer beginning at the south end of Rossow Street.

The more northerly of the walkway/driveway sewers serves only McCrone Hall, while the parallel southerly sewer serves Walker Greenhouse and continues east and north to the north end of Founders Hall, serving an undetermined number of buildings. If the slope of these 6" sewers follows the overlying terrain, they should have conservative (half-full) flow capacities in excess of 500 gpm. It is expected this is more than enough to carry peak wastewater discharges from both of the planned buildings, but it is unlikely either sewer is deep enough to serve the planned lowest level of the Student Housing building. As a result, this building will probably require a direct connection to B Street. If the driveway sewer that runs past the east half of the development site to Founders Hall is low enough to serve the Engineering+Technology building, it would first have to be confirmed that it has sufficient excess capacity to accommodate additional peak discharges. If not, the 17th Street sewer should provide an easy to access alternate point of connection

5.2.4 STORMWATER MANAGEMENT

5.2.4..1 STORM DRAIN INFRASTRUCTURE

Stormwater runoff on the Cal Poly Humboldt campus is routed through a network of on-site storm drains. These pipes drain most of the central campus, including the Engineering+Technology and Student Housing project site, into an extension of the City of Arcata stormwater collection system that begins at 14th Street, near the north end of D Street. This extension consists of a 42" diameter pipe that runs northeast from 14th Street, paralleling the pedestrian path that runs past the south end of the College Creek Field to the south end of Rossow Street. An open swale carries runoff along a portion of this path, but the City pipe system continues north from the upstream end of the swale to Rossow Street, then cuts across Parking Lot G12 to the driveway entrance on B Street. In B Street, parallel culverts run north to the B Street/17th Street intersection, where pipes that run up the east side of B Street and the north side of 17th Street come together. The City's utility map indicates its B Street line ends at the McCrone Hall/Walker Greenhouse walkway. Campus maps, however, show that pipes continue up B Street past McCrone Hall to Laurel Street and beyond, so system ownership beyond the walkway has not been determined. On 17th Street, the City system runs east and surrounds the block bounded by 17th Street, Union Street, 16th Street and Spring Street, with another segment that runs a short distance north on Union Street.

Downstream of the campus, the 14th Street storm drain discharges into a Caltrans culvert that runs south in the median of Highway 101 from a beginning point underneath the G Street overpass. This culvert carries most of the campus runoff, including some areas located south of Plaza Drive along LK Wood Boulevard that drain into City storm drains that discharge directly to the highway. Most runoff from the north end of the campus flows west into the Jolly Giant Creek culvert that crosses Highway 101 and continues west into Shay Park and the open channel continuation of Jolly Giant Creek. The highway culvert that serves the City's 14th Street storm drain continues south in the median to just north of 7th Street, where it shifts west outside the Caltrans right of way. It then crosses 7th Street and discharges into an open channel that eventually makes its way to a network of slough channels within a wetland located between Samoa Boulevard, G Street and Highway 101. Pipes carry runoff from the wetland underneath G Street and the Northwestern Pacific Railroad to a final junction with Butcher Slough at the north end of Humboldt Bay.

According to campus utility maps, there are a large number of existing stormwater facilities on and around the project site, including an 6" diameter storm drain that runs west in the McCrone Hall/Walker Greenhouse driveway and increases to 8" at the beginning of the walkway. These pipes collect runoff from both McCrone Hall and Walker Greenhouse, but not from the Events Field, and the 8" segment discharges into the previously described City-owned storm drain on the east side of B Street. On the east side of the field, 8" and 6" diameter pipes, as well as a previously noted swale that begins on the north side of the driveway, parallel Wildlife Lane just inside the field fence. They all converge at a stormwater inlet located approximately halfway between the McCrone/Walker Greenhouse driveway and 17th Street. This inlet, which also picks up runoff from a pipe system in the Lane, discharges to a 24" diameter pipe that cuts diagonally across the Events Field to a manhole located near the top of the stairs in the southwest corner. From this manhole, the 24" pipe drops down the landscaped bank and intersects the City storm

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3. A Caltrans representative was not able to comment on development-related drainage issues that may affect Highway 101 infrastructure until they can be evaluated as part of the CEQA review process. However, it is expected that implementation of the City discharge limitations described in this section will prevent project development from adversely affecting the capacity of the highway culverts that receive runoff from the campus through the City storm drain system.

drain system in B Street, just north of the 17th Street intersection.

As previously noted, the Events Field is underlain by a network of underdrains. This network is divided into eastern and western segments, with the eastern segment draining to the inlet adjacent to Wildlife Lane and the western segment to the top of stairs manhole in the southwest corner of the field. Both structures discharge into the 24" under-field pipe that connects to the B Street storm drain. All underdrains, as well as the 24" pipe would have to be removed prior to project development. Because the 24" pipe serves areas located upstream of the site, it would have to be relocated, most likely into 17th Street, where the existing City storm drain plus a parallel campus storm drain may have sufficient capacity to accommodate the additional flow.

5.2.4..2 STORMWATER CONTROL

The City Engineer has indicated the storm drain system serving the campus has adequate capacity to convey existing peak rates of stormwater runoff to Humboldt Bay. To ensure this capability is not compromised, the City would require any projects that might increase runoff (by increasing the area covered by impervious surfaces) to mitigate potential impacts on downstream piping systems by limiting the rate of post-development discharge to the existing rate under predevelopment conditions. This is typically accomplished by detaining a portion of a storm's runoff until the period of peak rainfall has passed and the capacity of downstream facilities is no longer at risk of being exceeded. For the proposed project, it is estimated this could require as much as 1,440 cubic feet (10,770 gallons) of storage to fully attenuate the peak flow increase associated with a 10-year recurrence interval storm. Standard detention options include the installation of buried storage (such as empty culverts, stormwater chambers and/or gravel beds) or routing the runoff into a modified bioretention facility, as described in Section 5.1.3c below.

5.2.4.3 WATER QUALITY PROTECTION

In addition to the City's requirement to control post-construction peak discharge rates, the building project would also have to comply with applicable provisions of the National Pollutant Discharge Elimination System (NPDES) Small Municipal Separate Storm Sewer Systems (MS4s) General Permit, as administered by the State Water Resources Control Board. The principal goal of this permit is to prohibit the discharge of contaminants by proposed development projects into downstream water bodies, both during construction and after a project is completed. For construction, the Engineering+Technology and Student Housing development team would have to prepare a Stormwater Pollution Prevention

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4. Pre and post project runoff rates were calculated using the Soils and Conservation Service TR-55 methodology and a 24 hour rainfall total of 4.68 inches. Impervious areas were assigned a Runoff Curve number of 98, and pervious areas a number of 74 (in the absence of site specific soil data, good grass cover over Type C soils was assumed). When this data, along with pre and post project estimates of impervious cover, was inserted into a hydrologic model, it was determined approximately 1030 cubic feet of runoff would have to be detained to maintain discharge rates no higher than under existing conditions. This volume was then increased by 25% to allow for inefficiencies that typically occur when routing stormwater runoff through detention facilities.

   One reason this storage volume is so high was the conservative assumption that the entire field (except for small areas of remaining concrete surfacing and portions of the McCrone Hall/Walker Greenhouse driveway that will have to be replaced) absorbs runoff like a typical pervious surface. It is likely the underdrain system diverts a higher percentage of infiltrated rainfall into the storm drain system than would be expected with no underdrains. Therefore, the City engineer may agree that a higher existing condition Runoff Curve number is warranted, which would reduce the required detention storage volume. For example, using a pre-construction pervious area Runoff Curve number of 80 (the classification for good grass over less permeable Type D soils) could lower the detention requirement to less than 650 cubic feet.

Plan (SWPPP) for implementation by the general contractor. These plans typically focus on preventing sediment from entering storm drain facilities that will carry it into streams or other downstream receiving waters. This is mainly accomplished by not disturbing natural areas until they are ready to be developed, stabilizing disturbed slopes immediately after grading is complete, and filtering or impounding sediment-laden runoff until it can be safely released.

Per the MS4 permit, post-construction pollution controls must be designed to trap the contaminants that accumulate on impervious surfaces and are washed into stormwater runoff. This is achieved by retaining on site the "first flush" of all impervious surface runoff (retained stormwater is never discharged, whereas detained stormwater, as discussed in the previous subsection, is only held temporarily). In the north coast region, the first flush includes all runoff generated by storms up to and including the 85th percentile rainfall event, which, around Humboldt Bay, equals 0.65 inches of rain. As currently planned, there would be approximately 64,650 square feet (sf) of impervious surfaces (37,510 sf building; 27,140 sf site paving) on the Engineering+Technology and Student Housing building site. These areas would generate just over 3,500 cubic feet of runoff in the design rainfall event, which would typically be retained in some type of below ground storage facilities.

Since there are no opportunities for recycling captured runoff on campus, and no current plans for reuse within the building, stormwater can only be retained by infiltration into the ground. Although a Type C soils were assumed in a footnote in the previous subsection, a geotechnical study prepared prior to installation of the now-removed modular buildings found shallow groundwater perched above denser layers of compacted fill comprised of material that ranges from gravel to sandy clay. This indicates infiltration rates are slow and the underdrain system may no longer be functioning effectively. If this is the case, and in the absence of other retention options, the Regional Water Quality Control Board would permit the runoff to be slowly discharged to Humboldt Bay through the local storm drain system. If this is a permitted option, the full 3,500 cubic feet of retention storage would not be required. The project would still have to provide the detention storage discussed in Subsection 5.3.1b, but the biotreatment facility(ies) described below would only be required to include a 12" gravel storage layer below the upper layer of filtration soils.

In order to protect the quality of both groundwater (in the case of infiltrated runoff) and surface waters (in the case of slowly released runoff), the first flush of runoff would first have to flow through a biotreatment facility to remove contaminants. Per sizing criteria set forth in the Humboldt Low Impact Development Stormwater Manual, such facilities must have a surface area equal to no less than 4% of the impervious area being treated. For the estimated 64,650 sf of impervious surfaces on the Engineering+Technology and Student Housing site, this would require a biotreatment facility of approximately 2,600 sf. This does not represent an overly large area on a site this size, so it should be possible to incorporate one large or a couple of smaller basins into the site landscaping. This would be in accordance with the site design provisions of the Humboldt Low Impact Development Manual, which encourage project proponents to integrate water quality protection facilities into the surrounding landscape wherever possible, mimic natural patterns of flow, and maximize the incorporation of green infrastructure into project open spaces.

5. Biotreatment refers to the contaminant removal achieved by filtering runoff through a layer of soil and organic material, whereas a bioretention facility combines biotreatment with a gravel reservoir that holds the runoff until it can infiltrate into the ground. If the runoff simply passes through the soil and gravel prior to discharge, so little or nothing is "retained," it is more accurately referred to as a biotreatment facility.

5.3 ARCHITECTURAL

5.3.1 EXTERIOR CLADDING

The following section provides a summary of the relevant Architectural criteria and recommendations for the "Engineering + Technology Building (1A)" which will be an academic building and well as the separate "Student Housing (1B)" building.

The exterior skin system for the planned buildings will be durable, water-resistant, compatible with the surrounding context, cost-effective and appropriate for the intended use.

Several types of metal and window systems are available within varying cost allowances and different materials will be analyzed for their cost effectiveness to meet the budget. The final choice of systems will be made during the Schematic Design phase of work. Contrast and texture in the use of exterior materials will be studied carefully for visual interest and for the relationship to the interior function of each of the buildings. Careful attention will be given to avoid water and moisture intrusion at areas where different materials or building systems are joined, such as at exterior windows and door conditions. The minimum R-value for exterior walls will be R-19. If using rain-screen type cladding systems, preference will be given to systems that can work with non-metallic support systems.

Metal flashings at walls and openings shall be made from stainless steel to maximize the longevity of the exterior systems. Stainless steel flashing shall be provided at grade to conceal exposed slab edges and to cover transitions of subgrade waterproofing to vertical surface vapor barrier transitions.

Glazing will be utilized to provide natural light into the occupied building areas and to provide views out-wards into the surrounding campus. Sun shading, screening and glazing types will be studied to limit the effects of undesirable heat gain and visual glare. The window system may be painted aluminum, structural curtain wall, or other appropriate quality system and will be investigated during design. In parts of the façade, smaller punched openings may be developed where less light is required within the adjacent spaces. Careful consideration will be given to the location of exterior windows with respect to maximizing daylight, possible furniture locations, and final locations of specialty equipment.

At exterior door entries, canopies or recessed entries will provide the necessary protection for inclement weather. The features at the entries, canopy or other, should also be used to give the building presence and as a way-finding tool.

5.3.2 ROOFING & WATERPROOFING

The selection of roofing systems will be considered to reduce heat island effect and to limit glare if visible from occupied spaces. The roofing system will also be selected to withstand the long-term effects of sun, wind and rain, and to accommodate on-going roofing maintenance and eventual replacement. All fasteners and flashings shall be of stainless steel to maximize longevity of the system, unless the flashings and fasteners are specifically part of the warrantable roofing system itself. Roofing color and material may be considered so to complement the existing campus aesthetic.

The roofing system will provide thermal insulation having a minimum value of R-30. If making use of low-sloped roofing, among acceptable roofing membranes are PVC, EPDM and Multi-Ply SBS-Modified Bitumen Membrane systems and minimum slope shall be 2% minimum at the valley of any low sloped

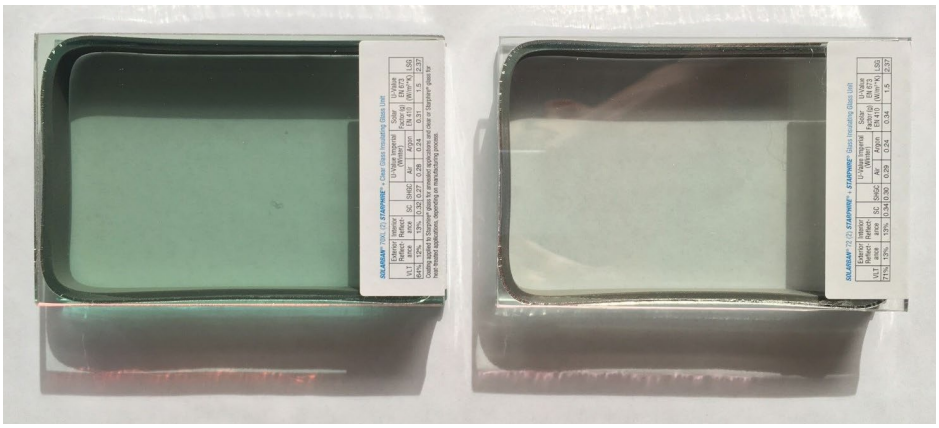


Figure 5.3.2.1 Glass Simple Comparison

roof. Other roofing materials may be considered depending on the final design and will need to be reviewed with the University. Performance criteria is a minimum and shall be designed per Code and California State University requirements.

In schematic design, the locations of the air-handling units and exhaust fans will be studied - if located on the roof, they will be installed with vibration isolation. Exposed, roof-mounted equipment will be located behind a parapet wall or equipment screen made of durable materials to withstand the environment, screened from view and kept to a minimum. Roof screens structural systems shall be hot-dipped galvanized at all surfaces. Roof-mounted equipment will be grouped together and rest upon common curbs to the extent possible. The rooftop equipment shall be well organized visually and functionally. Roof penetrations for piping and ductwork will be minimized and appropriately detailed. The roof area will be evaluated for its potential to accommodate photovoltaic (PV) panel arrays.

- Where different waterproofing and weatherproofing systems meet, details shall be reviewed by manufacturers and ensured to be warrantable.
- Below grade waterproofing at the retaining walls and slab on grade shall be designed so to prevent a build-up of water at the earthen sides of structure.

5.3.3 STAIRS & ELEVATOR

Stairs and elevator will be located to maximize flexibility for future internal space changes and to comply with the building's exiting requirements. Stairs and elevators shall be designed to meet all applicable standards and codes, particularly the Americans with Disabilities Act.

5.3.3.1 STAIRS

There is a gradual slope across the site from east to west. The Engineering + Technology Building on the west side of the site is sited so that it is built into grade with the lowest level accessible from grade on the west side but and level 2 accessible from grade on the east side. There will be interior egress stairs located at end of each wing of the building as required so to meet egress requirements as well as to provide direct exit for the Assembly occupancies from the upper terraces.

The Student Housing Building is sited on the east portion of the site with anticipated direct exits from level 1 onto grade. There will be interior egress stairs located as required to meet egress requirements.

At both the Engineering + Technology Building and the Student Housing, roof access may be through a penthouse space depending on final design and final mechanical system needs. The roof access may or may not be continuous from one of the egress stairs

5.3.3.2 ELEVATOR

The Engineering + Technology Building is expected to have three elevators. It is intended that there be a pair of elevators near the core to serve both passengers and that there will be a separate service/freight elevator which will be dedicated to the delivery of materials within the building. None of the elevators will not provide service to the roof. The elevators will be machine room less (MRL) type unit and shall conform to accessibility requirements

The Student Housing Building is expected to have a pair of elevators. It is intended that the elevators serve both passengers as well as movement of delivery of materials within the building. Neither elevator will not provide service to the roof. The elevator will be machine room less (MRL) type unit and shall conform to accessibility requirements.

5.3.3.3 GLAZING

A key indicator of excellent glass is the ratio of light transmission to the solar heat gained. The more Light to Solar Gain (LSG), the better. Solarban 72 on Starphire glass is an example of industry leading high performance glass, with a VLT of 0.71 and an SHGC of 0.30. This resultant LSG of 2.37 is unparalleled by other glass types, and is the most visually clear double pane low-e IGU currently available.

While the final glazing specification may be driven more by the SHGC requirement than the VLT, choosing a glass type that achieves a LSG of at least 2.1 is recommended.

All partitions shall be finished with gypsum board to a smooth finish (Level 4), ready for paint. Storage rooms and building support spaces shall be finished in a light texture (Level 3) and ready for paint. Above finished ceilings and at concealed spaces a fire-taped level of finish is acceptable. All gypsum board wall surfaces exposed to view shall be painted. Where ceramic tile, concrete, concrete unit masonry or metal surfaces occur, those surfaces may be left unpainted and their natural finish exposed. Latex enamel interior paint with a satin finish will be the typical paint used at partitions.

5.3.3.4 CEILINGS

Finished ceilings may not be appropriate for all spaces and will be omitted where a ceiling system is neither necessary nor desirable. Finished ceilings may be omitted for aesthetic effect in public areas such as the building lobby, office areas, or possibly some laboratories. Consideration will be given to the nature of adjacent spaces when determining whether the finish ceiling may be omitted. Finished ceilings will be provided in utility spaces that adjoin and may be visible on a regular basis from high profile public areas.

Acoustics in the areas where open ceilings occur will be studied to achieve appropriate sound levels. Finished ceilings will be omitted in mechanical rooms, electrical rooms, telephone/data room, and other similar spaces.

Where the control of noise or vibration is necessary, the ceiling design may be required to include additional layers of gypsum board, 3-1/2" acoustical batt insulation laid above the ceiling, and/or vibration isolated hanger devices.

Gypsum board ceilings shall be installed primarily in toilets, locker rooms and showers, and other areas where there will be exposure to water vapor. Gypsum board ceilings shall also be installed as required to control noise and vibration in spaces with high levels of equipment or fixture-generated noise or where aesthetic effects are warranted. All gypsum board ceilings shall be constructed with ceiling framing independent of walls and columns and be attached with resilient channels or resilient hangers to the structure above. All joints between floors, walls, and ceilings shall have an acoustic seal.

Gypsum board ceilings in spaces with little to no exposure to water vapor, such as public areas, offices, or other similar spaces where gypsum board is used solely for noise control or aesthetic effect, shall be constructed with standard gypsum board. Standard gypsum board shall be 5/8" thick and comply with the requirements of ASTM C36.

Gypsum board used on ceilings shall be finished smooth (Level 4), ready for paint. Satin finish, latex enamel interior paint shall be applied to ceilings in general use spaces where there is little or no exposure to vapor. Semi-gloss finish, latex enamel interior paint shall be applied to ceilings in areas with low to moderate exposure to vapor. Semi-gloss finish, alkyd enamel paint shall be applied to ceiling above showers and other spaces with high exposure to water vapor.

Exposed structure with concrete elements, structural steel elements, and metal deck exposed to public view

should be painted or may be left unfinished as if desired by Owner for appropriate for aesthetic effect. It should be considered when exposing mechanical, electrical and plumbing systems as well that all exposed items meet the same desired aesthetic where such materials may be exposed to public view.

5.3.3.5 INTERIOR FABRIC SHADES

Where shades are provided, shades shall be manually controlled. Where shades are used and placed at heights not accessible by all building occupants, motorized shades are to be considered.

If a fabric shade system is pursued, the following shade fabric specifications to maximize performance shall be met:

- PVC-free shade cloth material
- Medium to light grey or medium-light tone in color (avoid whites that become too bright when struck by direct sun, and avoid dark colors and black that do not diffuse sufficient ambient daylight into the space when struck by direct sun).
- 1% openness factor on east and west facades
- 3% openness factor on south facade
- 5% openness factor on north façade

5.4 STRUCTURAL

5.4.1 PROJECT DESCRIPTION

The following section provides a summary of the relevant Structural criteria and design recommendations. for the "Engineering + Technology Building (1A)" which will be an academic building and well as the separate "Student Housing (1B)" building.

The Academic Building will be approximately 90,000 gsf and four levels tall. The first level is at the sloped portion of the site and will be exposed on the West side of the building and will be within grade at the East side of the Academic Building. The Academic Building will be separated into two parallel masses connected by a corridor that provides passage through the site at ground level. The housing will be a separate building that is approximately 45,000 gsf and three stories tall. Please refer to the architectural concept drawings for more details.

Floor to Floor heights are assumed to be:

Academic Building:

Level 1	18' 6"
Level 2, 3 & 4	15'

Housing:

Level 1	18' 6"
Level 2, 3 & 4	12'

Foundations

A geotechnical report is not available for this site but given the low rise construction shallow foundations will probably be the preferred option assuming no layers of soft soil underlay the site.

Code: California Building Code 2022 with amendments in conformance with CSU Seismic Requirements dated Mach 5, 2020

Live Loads:

Stairs and Exit Corridors:….....100 psf

Housing……. 40 psf

Classrooms:……40 psf

Laboratories……80 psf

Roof (areas without equipment):..... 20 psf + 5 psf allowance for solar

Mechanical Areas:....100 psf or weight of equip. + 50 psf

Deflection Control:

Defections shall be in conformance with CBC 2022 criteria for roofs and floors

½" maximum at exterior walls or based on compatibility with glazing systems

Elevators supports in accordance with elevator manufacturer guidelines

Site Seismic Design Parameters will be in conformance with CSU standards once a soils investigation compliant with CBC 2022 requirements is complete. See Table 1 – CSU Campus Seismic Ground Motion Horizontal Response Spectral Acceleration Parameters for the seismic parameters which vary depending on the site class.

Risk Category:.....II or III will depend on occupancy count and types of chemical stored on site

Seismic Importance Factor:.....Ie =1.o or 1.25 depending on Risk Category

Wind Speed:..... V3S = 100 mph

Exposure:.....C

5.4.2 MATERIALS

Concrete Compressive Strength …

Mix "A" Foundation Elements:……4,000 psi

Mix "B": For slab-on-ground, normal-weight fill over steel deck

formed slabs and beams, curbs and equipment pads, stair pan fills : ……4,000 psi

Mix "C" & "D": For walls and columns……5,000 psi

Reinforcing Bars…… ASTM A615, grade 60

Welded Reinforcing Bars……ASTM A706, grade 60

Concrete Masonry

CMU Block……f'm 1500 psi

Grout…… f'c 2,000 psi

Steel

W-Shapes……ASTM 992, Grade 50

Angles, Channels and Bent Plates ……ASTM A36

Square Round or Rectangular Tube ……ASTM A500, Grade B

Pipe Columns ……ASTM A501 Fy=36 ksi

Plates ……ASTM A572 Fy=50ksi, typical ASTM 36 where noted

High Strength Bolts……ASTM 325 Slip Critical

Machine Bolts and Thru Bolts……ASTM A307

Standard.Anchor Bolts……ASTM F1554, Grade 36

High Strength Anchor Bolts …… ASTM F1554, Grade 105

Shear Connector Studs ……AWS d1.1, Type B, Automatic End Weld

Expansion or Wedge Anchors……Hilti KWIK BOLT TZ expansion anchor or equal

Steel Members at Exterior ……Hot Dipped Galvanized

Metal Deck

Roof Deck……ASTM A653, Grade 33, Galvanized G50 at interior, G90 at exterior

Cross Laminated Timber

CLT……APA PRR 410-2021

5.4.3 FRAMING SYSTEMS

Engineering and Technology Building (E+T Building):

The E+T building will need a steel frame structure with a concrete deck and fill floors. The fill can be normal or light weight concrete fill over metal deck. Light weight concrete has the advantage of reducing the steel and foundation cost because the floors weigh less. However, these mixes are not suitable as exposed surfaces and can have issues related to flooring adhesive because of vapor emission. Normal weight concrete floors add to the seismic and gravity mass of the building but have the advantage of providing a surface that can be exposed and it is easier for flooring sub-contractors to install their flooring. Local concrete suppliers should also be consulted for availability of the materials needed for these two mix designs before a system is selected.

The seismic lateral system is normally either a Special Moment Frame system or a Buckling Restrained Brace Frame System. Both systems will be suitable for this application.

In areas of the E+T Building providing laboratory programing there may also be a need to have additional floor vibration requirements depending on the type of scientific instrumentation used in the room. Most programs for CSU laboratories use a minimum requirement of 8,000 mips and prospective bidders should plan to meet these standards on floors above level 1.

The ground floor slab should be a minimum of 5" thick. Areas that house CNC machines or heavy industrial machines should have a minimum of 8" slab on grade and may require more depending on equipment anchorage requirements.

Housing:

Housing can be built with a wide variety of structural framing systems. The most common systems are:

- Wood Frame with plywood floors, wood joists and plywood shear walls for the lateral system
- Metal Stud Framing uses cold formed steel studs and joist for wall and floors with SureBoard sheathing for shear walls
- CLT uses cross laminated timber planks for the flooring system which is supported on wood posts 12-15 feet apart. These systems do not require joists or girders and resemble a concrete flat plate building. The lateral system can be wood stud plywood shear walls or CLT walls.
- Concrete Flat Slab Systems use post tensioned flat slabs, usually 8" thick with concrete shear walls

normally concentrated at the elevator, stairs and bathrooms which stack up through the height of the building.

Selecting a structural system from these choices will depend on a variety of factors including:

- Construction Cost
- Fire Rating
- Speed of Construction
- Sustainability of the material (Carbon Content)
- Durability and long term maintenance

5.4.4 SUSTAINABILITY

Starting in 2022 projects funded by the State of California will need to comply with the "Buy Clean California Act", see website: https://www.dgs.ca.gov/PD/Resources/Page-Content/Procurement-Division-Resources-List-Folder/Buy-Clean-California-Act

This establishes the maximum acceptable GWP (Global Warming Potential) for new construction:

Figure 5.4.4.1 Maximum Acceptable GWP Limit Summary

Eligible material	Maximum acceptable GWP limit (unfabricated)
Hot-rolled structural steel sections	1.01 MT CO_2 eq./MT
Hollow structural sections	1.71 MT CO_2 eq./MT
Steel plate	1.49 MT CO_2 eq./MT
Concrete reinforcing steel	0.89 MT CO_2 eq./MT
Flat glass	1.43 MT CO_2 eq./MT
Light-density mineral wool board insulation	3.33 kg CO_2 eq./1 m^2
Heavy-density mineral wool board insulation	8.16 kg CO_2 eq./1 m^2

In addition, concrete has a large embodied footprint because of the carbon emitting process used to make the portland cement. By some estimates production of portland cement is responsible for 5% of the global CO2 emissions. Fly ash may be substituted for portland cement to reduce the embodied carbon of the concrete.

The following recommendations apply to concrete mix designs available in the area and consider the quality of locally available aggregate. 15% fly ash substitution may be made without impacting strength for concrete with up to f'c = 5 ksi. At this level of substitution, it improves the workability of the concrete and is less expensive than the Portland cement it replaces. Up to 25% substitution for f'c less than or equal to 5 ksi may be used although concrete quality begins to degrade because it is harder to work and strength is impacted. 35% may be used in foundations or retaining walls where there is little need to work the concrete but strength is limited to f'c = 4 ksi and is determined based on 56 days rather than the traditional 28 days.

Cast-in-place concrete should utilize cementitious and aggregate materials produced locally as much as possible.

5.5 MECHANICAL

The following section provides a summary of the relevant heating, ventilation, and air conditioning (HVAC) criteria and recommendations for the "Engineering + Technology Building (1A)", which will be an academic building, as well as the separate "Student Housing (1B)" building. The project will be provided with mechanical systems that are cost-effective, energy-efficient, environmentally friendly, easily maintainable, and appropriate for the coastal location's corrosive moist air. Strategies will be employed to conserve energy in conjunction with various sustainability and wellness strategies. Design of the mechanical system shall promote forward thinking in engineering and be flexible in design incorporating minimum requirements needed to ensure a safe and healthy building while applying guidelines to minimize the environmental impact.

All mechanical systems shall be designed to promote reliability, serviceability, flexibility, and capacity for future renovation. Mechanical systems and equipment shall be all-electric, with an emphasis on heat pumps for supplying comfort heating and cooling (if required), and be sized to accommodate worst-case operational conditions. The system shall be designed to accommodate and promote the four "S's" of grid-integration: Shape, Shift, Shed, Shimmy. In addition, wherever possible, natural refrigerants, or refrigerants with global warming potentials of 500 or less should be used.

5.5.1 DESIGN CONDITIONS

Cal Poly Humboldt campus is located in Arcata, CA, which has the following CA T24 Part 6 design conditions:

Climate Zone:	1
Latitude:	41.0°N
Longitude:	124.1°W
Elevation:	203 ft
Cooling 0.1% Drybulb:	75°F
Cooling 0.1% MCWB:	61°F
Heating 0.2% Drybulb:	31°F
Heating Degree Days:	5029 HDD

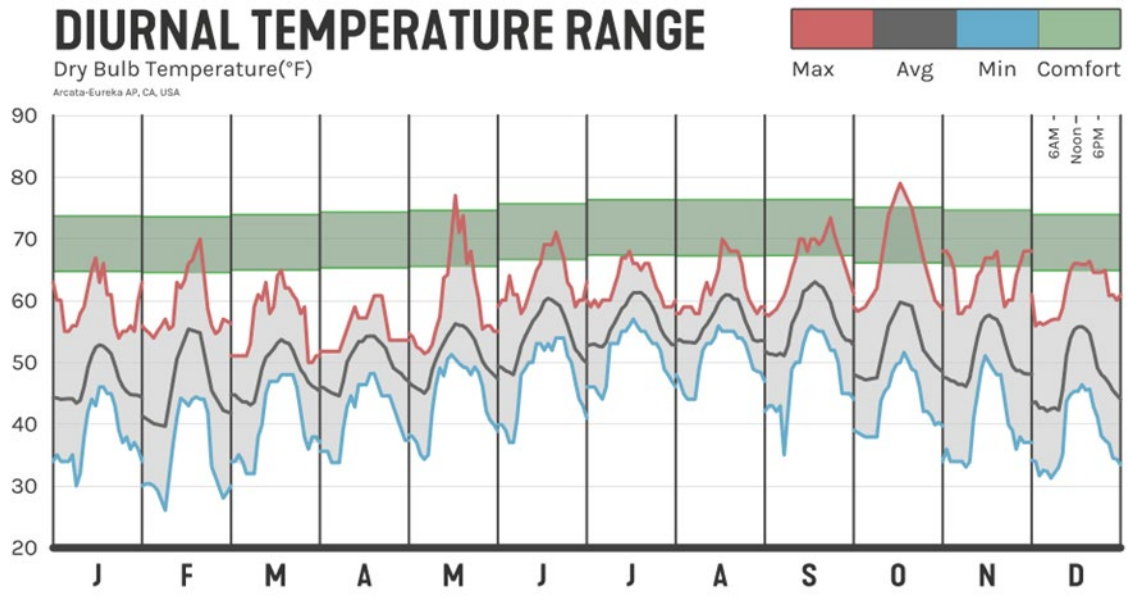


Figure 5.5.1.1 Historical Diurnal Temperature Range, Arcata, CA

With Climate Change, projected temperatures in Arcata are anticipated to increase. The HVAC design should reflect the anticipated increases in temperatures and the potential impact this will have on design loads for both heating and cooling. Where cooling may not have been historically needed in this climate zone, increasing peak day conditions may necessitate the inclusion of active cooling.

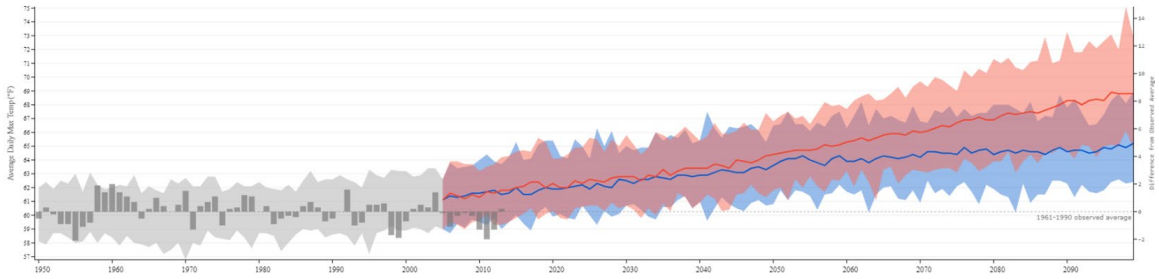


Figure 5.5.1.2 Anticipated Future Temperature Ranges
Under a high and low Global Emissions Model for Arcata, CA

5.5.2 HEATING AND COOLING SYSTEMS – ENGINEERING AND TECHNOLOGY BUILDING

The Engineering and Technology building heating and cooling loads will likely be similar to a medium load classroom building. Although the program includes many lab spaces, the lab spaces are very similar to educational labs with light internal equipment. Few spaces are anticipated to have high computational uses, such as a data center. The resulting heating and cooling demands will be most closely aligned to classroom uses. Given the moderate load characteristics, the following HVAC modes are anticipated.

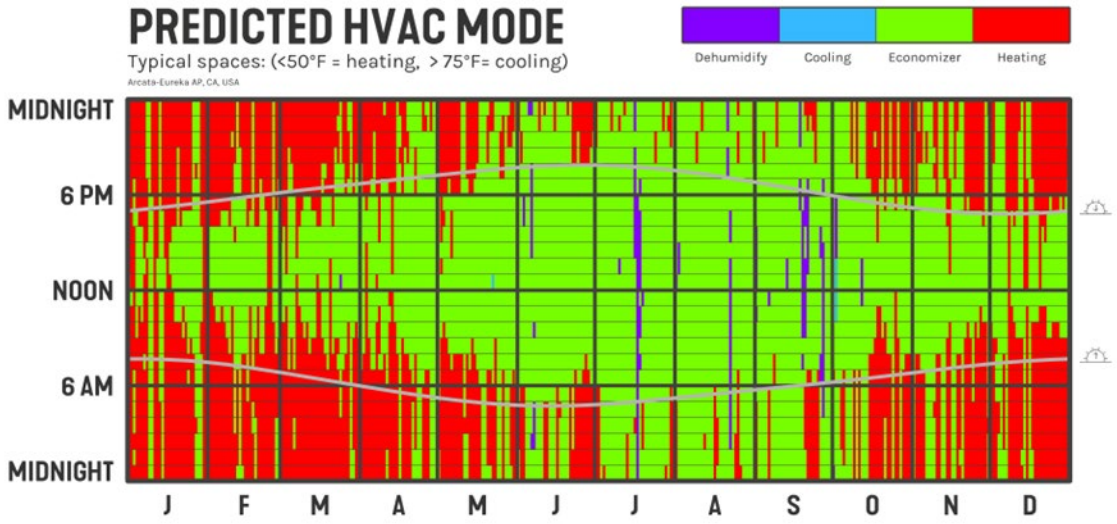


Figure 5.5.2.1 Anticipated HVAC Mode for an all-air System

The following system options are recommended to provide the highest level of efficiency:

- Option 1 – VAV with Reheat AHUs:
  - 4-Pipe Heat Recovery Air-Source Heat Pump and hydronic distribution to Rooftop mounted Air Handlers
  - Classrooms: VAV with Reheat Overhead Diffusers, Supply and Return
  - Lecture Hall: VAV with Reheat Overhead Diffusers, Supply and Return
  - Metal Shop, Wood Shops, Fabrication Shops: Dedicated DOAS VAV Air Handlers with Heat Recovery
- Option 2 – Radiant Panels + DOAS + Ceiling Fans
  - 4-pipe Heat Recovery Air-Source Heat Pump with hydronic distribution throughout building.
  - Classrooms: Radiant Ceiling Panels with 6-way control valves + Ceiling Fans
  - Lecture Halls: Displacement Ventilation augmented with Radiant Ceiling Panels
  - Metal Shop, Wood Shops, Fabrication Shops: Dedicated DOAS VAV Air Handlers with Heat Recovery
- Option 3 – Variable Refrigerant Flow + DOAS
  - Heat Recovery VRF with rooftop mounted condensers
  - All Spaces Served by VRF Fan Coils
  - Ventilation provided by rooftop DOAS units ducted to VRF fan coils.

Temperature Regimes for ASHP Options (1 and 2 above)

To enable exceptional efficiency, and to assist with meeting a net zero energy goal, the supply water temperature for a heat pump-based heating system is critical. The following chart indicates the relationship between Coefficient of Performance, Outside Air Temperature, and the supply water temperature of an

air-source heat pump. Given Arcata's cool climate and predominantly heating conditions, the selected supply water temperature is critical for energy performance.

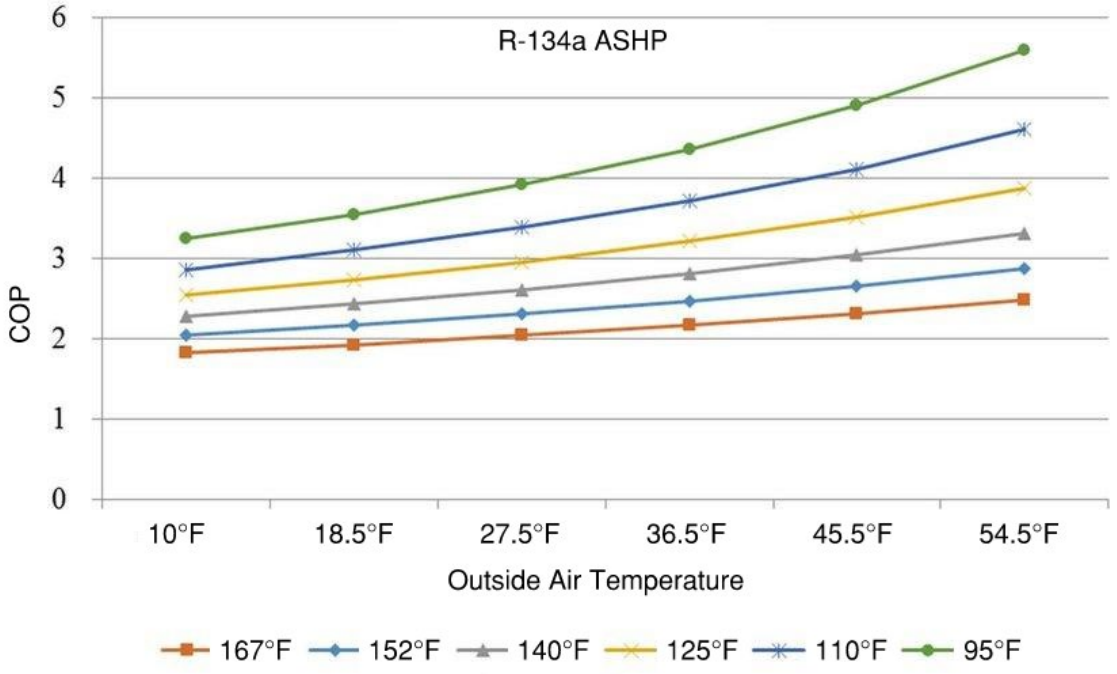


Figure 5.5.2.2 Supply Water Temperature

For efficient performance in Climate Zone 1, the design team should design any heating hydronic systems around the following criteria:

•	Heating Hot Water Systems	95°F - 110°F
•	Medium Chilled Water Systems	55°F - 60°F
•	Dehumidification	Where required, consider the use of a dedicated low temp chilled water loop or DX system.

Special consideration should be given to Wetbulb temperatures during the heating season in this coastal climate zone. Air-source Heat Pumps (ASHP's) in heating dominated coastal zones can experience excessive frost build up on the evaporator coil. This buildup of frost will trigger significant hours of defrost cycle for the heat pump. The defrost cycle in most ASHP's significantly reduces the heating capacity if not eliminating it all together. Pairing the ASHP with thermal energy storage, including an acceptable system volume, and/or adding supplemental ASHP units is crucial to meeting the system heating demand.

Thermal Energy Storage (Optional Add-On to Hydronic Options above)

It is highly recommended that the project include thermal energy storage (TES). TES can provide significant load shifting capacity to the HVAC system. In addition, the strategic use of TES can provide

demand charge savings as well as resilience. TES can play a critical role in a fully integrated Micro-grid, providing both load shaping and shifting capacity.

5.5.3 VENTILATION – ENGINEERING AND TECHNOLOGY BUILDING

Ventilation is critical to the health and wellbeing of students, staff and faculty. Workshops, fabrication labs, classrooms and lecture spaces all require special attention to providing appropriate levels of ventilation. Ventilation rates will be the higher of CA Title 24 and 30% above ASHRAE 62.1 requirements for each space type, whichever is greater. In response to the COVID pandemic, and in alignment with ASHRAE Epidemic Taskforce, the project will limit the potential for exhaust air re-entrainment. The design team should review design solutions that include Dedicated Outdoor Air Systems (DOAS). Such systems do not recirculate ventilation air within the building.

Heat/Energy Recovery

It is advised to include air-to-air heat recovery devices if a DOAS system is used. Given the heating dominated climate zone and potentially high air-change rates associated with the lab spaces, heat recovery ventilation will reduce peak heating loads on the central heating heat pumps as well as reduce energy use. Reducing peak loads will reduce the heat pump sizes and potentially reduce cost.

Exhaust Systems

Where the room program and/or equipment within the space requires dedicated exhaust, exhaust shall be provided in accordance with the California Mechanical Code.

Figure 5.5.3.1 Spaces Requiring Dedicated Specialty Exhaust Systems

The Machine shop, materials lab, wood shop, and engineering machine shop shall each be provided dedicated equipment for dust collection and exhaust. The systems shall be segregated, not allowing for the mixture of wood dust with metals or plastics. All systems shall be appropriately fitted with deflagration protection in accordance with NFPA 68 – Standard on Explosion Prevention through Deflagration. Dust collection/storage shall be located outdoors and be easily accessible for removal of dust by an approved campus vendor.

In addition to Code Required Ventilation Rates and Dust Collection, all shop spaces shall have localized on-demand Recirculating HEPA filtration systems fitted with 2-stage prefiltration, MERV-8 and MERV-13.

5.5.4 HEATING AND COOLING SYSTEMS – HOUSING BUILDING

The Housing building will have more of an envelope driven load profile. It is recommended that the design team consider designing the building to meet the Passive House Building Standard, in order to greatly reduce the heating energy demand within the housing building. If this is not done, the resulting heating and cooling demands will be higher than necessary. The graphic below indicates an anticipated HVAC operating mode with a code compliant building envelope.

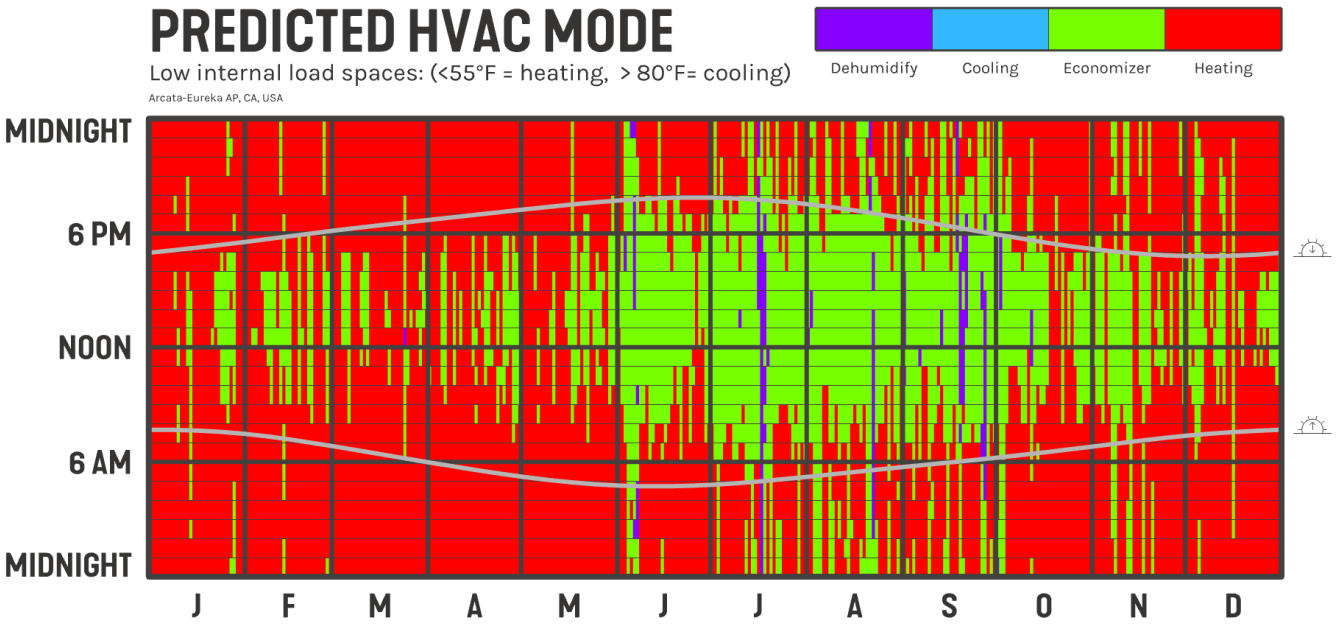


Figure 6: Low Internal Load Building Predicted HVAC Operation – Heating Load Dominated

Figure 5.5.4.1 Low Internal Load Building Predicted HVAC Operation – Heating Load Dominated

The following system options are recommended to provide the highest level of efficiency in the housing building:

- Option 1 – Hydronic FCU's in each Resident Room:
  - 4-Pipe Heat Recovery Air-Source Heat Pump and hydronic distribution to in unit FCUs.
  - Ducted Ventilation Air to each residence from floor-by-floor Air Handler.
- Option 2 – VRF FCU's in each Resident Room
  - VRF Fan Coils in each resident room
  - Ducted Ventilation Air to each residence from floor-by-Floor Air Handler

5.5.5 MAINTENANCE AND SERVICEABILITY

The California coast is extremely corrosive to mechanical equipment. All equipment that is able to be installed indoors should be located within conditioned space. For equipment that must be located outdoors, such as ASHP's, exhaust fans, and exterior louvers, all equipment should be specified with the highest level of corrosion resistance the project can afford. In addition, the design team should consider putting equipment below protective roofs and/or screens where appropriate to reduce environmental exposure wherever possible.

5.6 PLUMBING

The following section provides a summary of the relevant Plumbing criteria and recommendations for the "Engineering + Technology Building (1A)", which will be an academic building, as well as the separate "Student Housing (1B)" building. The project will be provided with plumbing systems that are cost-effective, energy-efficient, environmentally friendly, and easily maintainable. Strategies will be employed to conserve energy in conjunction with various sustainability and wellness strategies. Design of the plumbing system shall promote forward thinking in engineering and be flexible in design incorporating minimum requirements needed to ensure a safe and healthy building while applying guidelines to minimize the environmental impact.

All plumbing systems shall be designed to promote reliability, serviceability, flexibility, and capacity for future renovation. Plumbing systems and equipment shall be all-electric, with heat pumps being the preferred recommendation, and be sized to accommodate worst-case operational conditions. The design of the systems and materials shall not compromise the systems' required cleanliness or purity levels.

5.6.1 DOMESTIC WATER

A metered domestic water service with backflow preventer will serve each building. Meter will be capable of connecting to BMS for usage data collection. Minimum of 35 psi shall be delivered at the most hydraulically remote fixture.

Pending flow test results, a booster pump may be needed to provide adequate water pressure.

Non-potable industrial water systems will be provided for laboratory fixtures and make-up water for equipment, as required. The non-potable water systems will be separated from the domestic water systems through reduced pressure backflow preventers.

Emergency showers and eyewashes will be supplied with tepid water per the ANSI Z358.1 definition of tepid water.

5.6.2 DOMESTIC HOT WATER

Option 1: Central Domestic Hot Water Heat Pumps

Provide a central, recirculating hot water system served by electric heat pump units, complete with refrigerant-to-water heat exchangers, as needed, storage, and swing tanks. Heat pump units may be of the air-source type, or pending the mechanical HVAC system, water-source type with the ability to simultaneously generate chilled water.

A separate heat pump system will be provided to produce domestic industrial hot water.

Any equipment located outdoors shall be provided with protective coatings for corrosive environments.

Option 2: Point-of-Use Electric Water Heaters

Pending fixture quantity and layout for the Engineering and Technology Building only, it may be more effective to provide localized tankless water heaters below each fixture requiring hot water.

The domestic hot water system will also support mixing valves, if required, at emergency safety showers and eyewashes.

5.6.3 SANITARY WASTE & VENT

The buildings will be provided with a sanitary waste & vent system. At this time, it is assumed a sewage ejector is not needed and all sanitary waste will discharge from the building by gravity.

5.6.4 LAB WASTE & VENT

A laboratory waste and vent system will be provided to serve laboratory fixtures and equipment per program.

Lab waste & vent shall not interconnect with the sanitary waste & vent system.

Prior to connection to the sanitary waste system, a centralized, monitored neutralization tank and sample port to be provided outside with vault/manholes accessible from grade.

5.6.5 STORM DRAIN

A storm drainage system will be provided to convey rainwater from the roof of both buildings and any balconies / plazas to point of discharge outside the building. An overflow drain system will be daylit to the exterior of the building.

At this time, it is assumed a sump pump is not needed and all storm drainage will discharge from the building by gravity.

5.6.6 LAB VACUUM, AIR, AND GAS

A central air compressor for the Engineering and Technology Building shall be factory packaged, single point connection, expandable, triplex/quadplex scroll compressor with wet and dry receiver tanks, desiccant dryer, and pre-and-post filtration. Compressed air will be distributed via copper piping to lab rooms and outlets as defined by the building program. Provide isolation valves at each laboratory module and pressure regulators as required.

Central lab vacuum system shall be factory packaged, single point connection, expandable, 'oil-less' vacuum pump triplex/quadplex package with receiver tank. All branch take offs into each individual laboratory shall have isolation valves. Exhaust from vacuum pump shall be discharged outdoors above the roof with minimum distance of 25 feet away from air intakes or any building openings.

Gases shall be distributed from cylinders/tanks located in a code-approved storage and distributed to the point of use (fixture or equipment) terminating in a quick disconnect. Auto-switchover manifolds to

be provided. Relief valves to be provided downstream of the manifolds and piped to vent through roof.

Oxygen deficiency monitors to be provided in every room with cylinder storage/racks. Output from monitors to provide visual and audible alarm within the space and outside doors to adjacent spaces.

5.6.7 LAB WATER

Lab water conforming to CAP/NCCLS Type II standards to be supplied. Lab water will be continuously circulated in closed loops to users throughout the lab bldg. Loops will be routed full size down within the walls to within proximity to the point of dispensing and configured to minimize uncirculated dead-leg sections.

Project scope will include a stand-alone RO/DI system. System shall consist of reverse osmosis and reservoir, distribution system to include integrated storage tank, pumps, ultraviolet, micron membrane filtration with mixed-bed ion exchange.

Type I reagent grade water will be provided by owner furnished and installed local polishing units fed by the Type II reagent grade water system. Valved stubs to be provided for polishers.

5.6.8 PLUMBING FIXTURES

All applicable fixtures in the Engineering and Technology and Housing buildings will meet the American Disabilities Act (ADA) for accessibility. The design team will use advanced innovative, water-efficient plumbing fixtures to help attain water conservation goals. Plumbing Fixtures shall be highly efficient, decreasing total water demands without negatively impacting the quality of life.

Emergency Fixtures

Emergency fixtures will be provided in rooms where corrosive or hazardous materials are handled or as required by the building program.

5.7 ELECTRICAL

The following section provides a summary of the relevant Electrical criteria and recommendations for the "*Engineering + Technology Building (1A)*" which will be an academic building and as well as the separate "*Student Housing (1B)*" building. Both buildings are 4-story and will be built next to each other sharing a common outdoor space.

The objectives of the Electrical Design are to establish uniformity of design, best overall cost-effective installation, and construct an Electrical system that is robust and consistent with exceptional research and educational buildings. The design of the Electrical systems shall meet the program requirements with commitment to sustainability and energy-efficiency.

Power and distribution systems are intended to have ample capacity to meet future demand. The systems shall include provisions for future loads as determined by the project. This building shall be All-Electric not relying on natural gas for water and space heating. Laundry dryers, cooking appliances and range shall be electric.

The *Engineering + Technology Building* programming consists of the following facilities:

- Academic and Instructional Spaces
- Faculty Offices
- Maker Spaces
- Research Labs
- Machine Shops

The *Student Housing Building* programming consists of the following facilities:

- (1) Resident Apartment
- Double Dorm Rooms
- Offices, Mailroom
- Laundry, Restrooms, Kitchenette
- Study Room, Lounge

5.7.1 CODE AND STANDARDS

The Electrical design shall comply with the latest edition of the applicable codes and standards as listed below. In addition, the system shall comply with other relevant safety guidelines as required by the program.

Applicable Codes:

- California Administrative Code Part 1, Title 24, California Code of Regulations (CCR)

- California State Fire Marshal Regulations
- City of Arcata Municipal Codes
- California Building Code (CBC) – Part 2, Title 24, CCR
- California Electrical Code (CEC) – Part 3, Title 24, CCR
- California Mechanical Code (CMC) – Part 4, Title 24, CCR
- California Plumbing Code (CPC) – Part 5, Title 24, CCR
- California Energy Code (CEC) – Part 6, Title 24, CCR
- California Fire Code (CFC) – Part 9, Title 24, CCR
- California Green Building Standards Code – Part 11, Title 24, CCR
- NFPA 101 – Life Safety Code
- NFPA 70E – Standard for Electrical Safety in the Workplace

Applicable Standards

- IEEE – Institute of Electrical and Electronic Engineers
- IESNA – Illuminating Engineering Society of North America Handbook
- ICEA – Insulated Cable Engineers Association
- NEMA – National Electrical Manufacturers Association
- NFPA – National Fire Protection Association
- UL – Underwriters Laboratories
- ADA – American with Disabilities Act
- ASTM – American Society of Testing and Materials
- OSHA – Occupational Safety and Health Administration
- ANSI – American National Standards Institute

Applicable Guidelines

- CSU Campus Design Guidelines

5.7.2 ELECTRICAL SERVICE

A load analysis was completed for each building. It was based on a volt- amperes (VA) per square foot calculation utilizing the gross square footage (GSF) of building areas, and estimated VA load of large equipment such as HVAC.

Engineering + Technology Building load

Space Description	Proposed Area (SF)	HVAC (VA/SF)	Plumbing (VA/SF)	Recept/Eqpt (VA/SF)	Lighting (VA/SF)	Total VA/SF per space
Common and Support Spaces	37,923	5	3	2.5	1	11.5
Meeting, Office and Workspace	17,300	10	.5	5	1.3	16.8
Labs	22,825	15	5	10	3	33
Classroom	5,130	10	.5	2.5	3	16
Maker Space	7,590	15	2	20	3	40

Table 5.7.2.1 E+T Building Load

Large Equipment Load

Elevators – (3) 50HP

Domestic Water Pump – 25HP

Compressed Air – 15HP

Vacuum Pumps – 15HP

Overall Building Load (KVA) = 2,071KVA

+25% Spare Capacity (KVA) = 2,589KVA

Service Load (Amps at 480V) = 2,491A

+25% Spare Capacity (Amps) = 3,114A

Engineering + Technology Bldg Service:

Service Main Switchboard Rating = 4,000A

Space Description	Proposed Area (SF)	HVAC (VA/SF)	Plumbing (VA/SF)	Recept/Eqpt (VA/SF)	Lighting (VA/SF)	Total VA/SF per space
Common and Support Spaces	14,050	5	3	2.5	1	11.5
Housing Dorm and Apartment	24,100	5	3	.5	2	10.5

Table 5.7.2.2 Housing Building Load

Large Equipment Loads

Elevators – (2) 50HP

Domestic Water Pump – 25HP

Overall Building Load (KVA) = 540KVA

+25% Spare Capacity (KVA) = 675KVA

Service Load (Amps at 480V) = 649A

+25% Spare Capacity (Amps) = 811A

Recommended Student Housing Bldg Service:

Service Main Switchboard Rating = 1,000A

Site medium voltage MV distribution transformation can be approached with (2) options.

Option 1

Provide a single MV transformer to serve both the Engineering + Technology and Student Housing bldgs. This option is cost effective and requires the least site space. This option includes the following:

- 3,750KVA MV transformer
- MV voltage interrupter switch to connect from MV feeder #6 or MV feeder #4.

Option 2

Provide dedicated MV transformer for each E+T and Housing bldgs. This option provides resiliency and controllability with campus grid management. This option includes the following:

- 2,500KVA MV transformer for E+T bldg
- MV voltage interrupter switch for E+T to tie to MV feeder #6
- 750KVA MV transformer for Housing bldg
- MV voltage interrupter switch for Housing to tie to MV feeder #4.

Refer to the Campus MV Distribution Site Plan below.

5.7.3 SITE ELECTRICAL UTILITIES

The normal power to the building will be served from an existing Central Utility Plant with 12.47kV service. Capacity of the Central Utility Plant should be evaluated in detail and confirm that the campus MV service has capacity. It was noted that it currently has sufficient capacity for the addition of these building. New underground conduit duct bank with several 5" conduits to be installed from the nearest manhole. Quantities of conduits shall be different depending on whether the service is consolidated or separate.

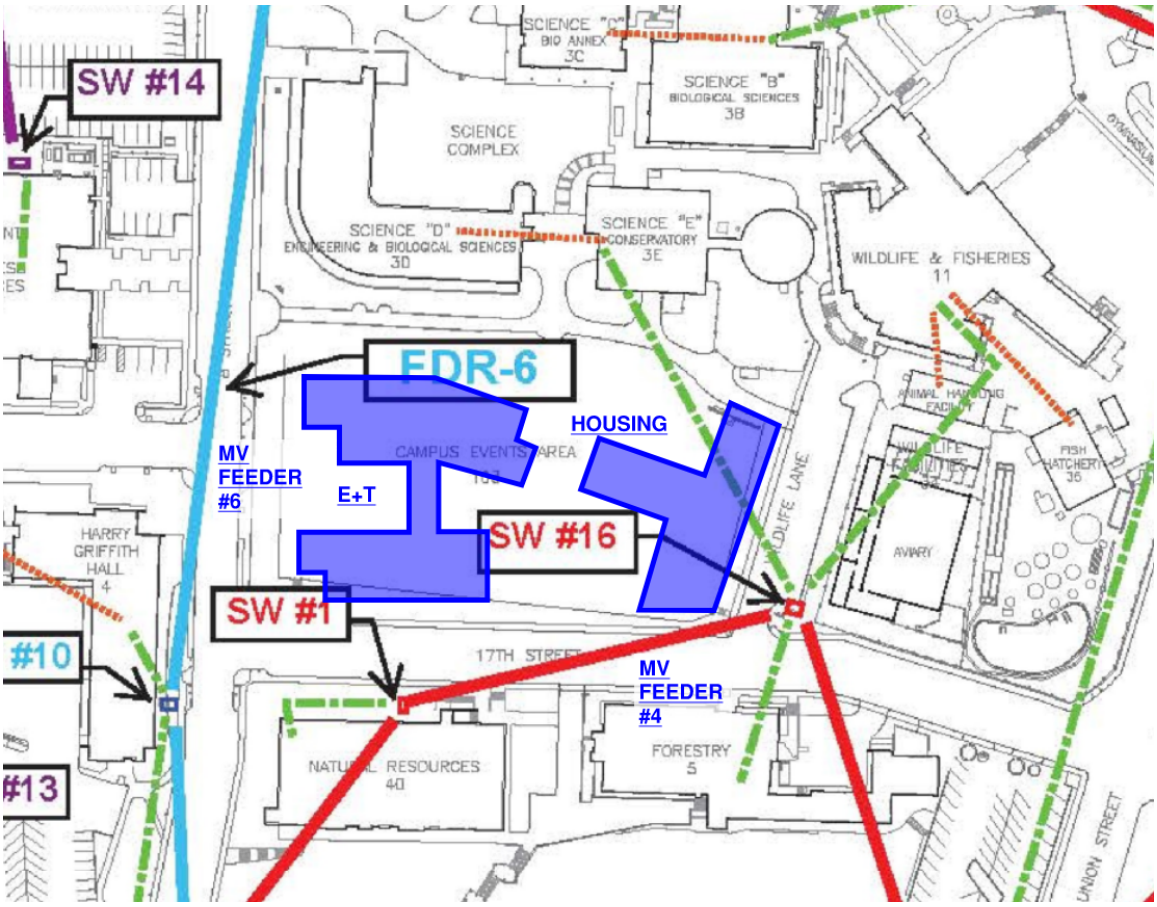


Figure 5.7.3.1 Campus MV Distribution Site Plan

Service feeders shall terminate to an outdoor medium voltage interrupting switch, The building MV transformer(s) shall be 12.47kV-480/277V 3-ph 4-w pad mounted medium voltage transformer, natural esther oil-filled type. An outdoor electrical utility yard shall house these equipment to protect from vandalism.

5.7.4 EMERGENCY POWER

The buildings are not high-rise and will not utilize elevators for egress. The emergency power needs for the building are to serve the emergency egress lighting to meet the code. A central emergency lighting inverter UL 924 shall provide minimum 90-minute battery backup.

Fire Alarm Control Panels shall be provided with built-in batteries for emergency power back up.

There are potential conditions that a generator will be considered in the design:

1. If the elevator's use include egress, per building code, an emergency back up power is required for (1) elevator in each elevator bank. An alternative source is a dedicated battery back up rated for elevator use. This is typically a UPS with a capacity to support the motor starting amps.
2. Refrigerator and freezers in the Engineering + Technology laboratory. An alternative method is to manage the campus grid power and re-route an available normal power to the building, thru grid

management.

5.7.5 POWER DISTRIBUTION

The building transformer shall support the HVAC, Plumbing equipment, motors, receptacles, appliances, lighting and low voltage systems that enable the building space to function. The following are recommended distribution.

5.7.5.1 *Engineering + Technology Building* Distribution

- 4,000A, 480/277V, 3-phase, 4-wire main switchboard
- 1,200A capacity total with (2) HVAC Distribution Boards.
- 400A capacity total with (2) Plumbing Panels
- 225A capacity total with (4) Lighting Panels
- (8) 112.5KVA Transformers
- 2,500A capacity total with (8) – (16) Receptacle Panels

5.7.5.2 *Student Housing Building* Distribution

- 1,000A, 480/277V, 3-phase, 4-wire main switchboard
- 400A capacity total with (2) HVAC Panels
- 200A Plumbing Panel
- 100A capacity total with (4) Lighting Panels in feed-thru configuration
- (1) 150KVA Transformer
- 600A capacity total with (4) – (6) Receptacle Panels

The grounding system for the building shall be provided complete with main service grounding utilizing ground rods, Ufer or concrete encased electrode, and cold-water pipe. Provide ground busbar in electrical rooms, MDF and IDF rooms.

5.7.6 METERING AND POWER QUALITY

On-board digital metering system shall be provided within all switchboard, distribution boards and data center panelboards. The metering system shall report power quality issues to the BMS or other power monitoring system.

To protect sensitive electronic and sensitive equipment, Surge Protective Device (SPD) level 1 and 2 shall be provided at all switchboards and distribution boards serving laboratory, maker space and sensitive equipment.

Variable Frequency Drive (VFD) Controllers for HVAC and plumbing equipment generates nuisance

harmonics. Active harmonic filtering system shall be provided if built-in filters at each VFD cannot be provided.

5.7.7 GENERAL MATERIALS

Distribution panels and power panels will be circuit breaker-type. Molded-case and insulated-case breakers will be used. Lighting panels will be commercial-type with bolt-on circuit breakers. Bussing will be copper. Panelboards will be provided with a "door-in-door" construction to allow for entire front cover to swing open for easy maintenance.

Transformers will be provided to convert 480 volt power to 208Y/120 volt for receptacle and equipment needs. Transformers shall be NEMA 1 or 3R as required. Transformers shall be standard high efficiency, NEMA STP TP1 dry-type rated for 115o C rise. Windings will be copper. Transformers shall be floor mounted within electrical rooms, as much as possible. Transformers serving sensitive loads shall be equipped with Electrostatic Shielding, and shall be K-rated according to the application.

All floor mounted large distribution equipment shall be provided with concrete pad.

Disconnect switches will be heavy-duty fuse type.

All distribution equipment shall be consistent of the same manufacturer.

All outdoor electrical equipment shall be with enclosure rated for marine environment equal to NEMA 4X rated stainless steel for corrosion resistance.

Raceways

- Rigid steel conduit – feeders, branch circuits, exposed.
- PVC – feeders and branch circuit underground.
- EMT – feeder, branch circuits, and low voltage.
- Flexible Metallic Conduit (FMC): May be used in dry locations for connections from adjacent outlet boxes to motors, transformers, vibrating equipment and machinery and lighting fixtures installed in suspended ceilings, minimum sizes shall be 3/8" for lighting fixtures and control wiring and ½" for motor and transformer connections.
- Liquid tight Flexible Metallic Conduit (LFMC): May be used in damp and wet locations for the same applications as for Flexible Metallic conduit specified under this Section. Connections to all pump motors, solenoid valves, float switches, flow switches and similar devices shall be made using liquid tight flexible metallic conduit. Minimum sizes shall be 3/8" for lighting fixtures and control wiring and ½" for motor and transformer connections.

Conductors

- Provide insulated copper conductors for all low voltage wires and cables. Use stranded conductors for AWG #8 and larger sizes. Medium voltage wires and cables shall be aluminum.
- Provide minimum AWG #12 Cu for all power and lighting branch circuits. Provide minimum AWG #14 Cu for all signal and control circuits.

- Feeders and branch circuit wiring shall contain a separate green insulated grounding conductor
- Use NEC type THW, THWN or Type XHHW for feeders and branch circuits in wet or dry locations. Use NEC type THHN for branch circuits in dry locations.
- Use NEC type XHHW, rated 90 degrees C in dry locations and 75 degrees C in wet locations, for exterior branch circuit wiring and for circuits served by ground fault interrupting circuit breakers.

Boxes

- Four inch square by 1-1/2" minimum sheet metal boxes for interior use.
- Two inch wide by three-inch long steel switch boxes, ganged together for multiple switches.

Devices

- Receptacles – 20 amp, 125 volt, duplex, grounding type, specification grade, convenience outlets. Receptacles shall be white or as specified by electrical identification or architect. Provide 20 amp GFCI receptacles in locations where required by code. Controlled receptacles shall be green in color and labeled as controlled by an industry standard method.
- Switches – low-voltage momentary contact compatible with lighting control system. Switches shall be white.
- Cover plates shall be stainless steel in Lab and Maker spaces and thermoplastic white elsewhere.

5.7.8 LIGHTING CONTROLS

The lighting control system will be designed to comply with the requirements of Title 24.

Multilevel lighting controls shall be provided as required with the appropriate dimming scheme and local override controls. Areas with dimming control will include all spaces with a lighting power density greater than 0.5 W/ft^2 and larger than 100 ft^2.

The automatic shut-off controls for the building will be a combination of a lighting control system for common areas and localized occupancy sensors in restrooms, utility rooms, and other small spaces.

Dual-technology (passive infrared/ultrasonic) occupancy sensors will be used for control of storage spaces, bathrooms, janitorial rooms, private offices, conference rooms and other areas subject to intermittent occupancy. Occupancy sensors will be provided with auxiliary inputs and will integrate with the BMS system to control VAVs where specified by the mechanical engineer.

Daylight sensors will be used to lower lighting levels when natural lighting is sufficient. Areas requiring automatic daylight control include primary and secondary sidelit zones. Reduction in lighting output will be provided by continuous dimming.

5.7.9 ON-SITE RENEWABLE ENERGY & BATTERIES

Starting effective in January 2023, Title 24 Section 140.10 code will require all newly constructed building with types such as High-rise Multi-Family, Offices, Schools, Auditoriums, and Libraries. It is anticipated

that the Engineering + Technology Building will have to comply with the code. The Student Housing Building does not fit the type as the code requires it specifically for high-rise multi-family building type.

The photovoltaic (PV) system shall be sized not less than the smaller of the PV system size determined by the code Equation 140.10-A or the total of all available Solar Access Roof Areas (SARA) multiplied by 14W/sqft.

The PV system shall also have a battery storage system meeting the minimum requirements. The rated energy capacity and the rated power capacity shall be not less than the values determined by the code Equation 140.10-B and Equation 140.10-C, respectively.

Table 140.10-A – PV Capacity Factors

-	Factor A – Minimum PV Capacity (W/ft² of conditioned floor area)		
Climate Zone	**1, 3, 5, 16**	**2, 4, 6-14**	**15**
Grocery	2.62	2.91	3.53
High-Rise Multifamily	1.82	2.21	2.77
Office, Financial Institutions, Unleased Tenant Space	2.59	3.13	3.80
Retail	2.62	2.91	3.53
School	1.27	1.63	2.46
Warehouse	0.39	0.44	0.58
Auditorium, Convention Center, Hotel/Motel, Library, Medical Office Building/Clinic, Restaurant, Theater	0.39	0.44	0.58

Table 140.10-B – Battery Storage Capacity Factors

-	Factor B – Energy Capacity	Factor C – Power Capacity
Storage-to-PV Ratio	**Wh/W**	**W/W**
Grocery	1.03	0.26
High-Rise Multifamily	1.03	0.26
Office, Financial Institutions, Unleased Tenant Space	1.68	0.42
Retail	1.03	0.26
School	1.87	0.46
Warehouse	0.93	0.23
Auditorium, Convention Center, Hotel/Motel, Library, Medical Office Building/Clinic, Restaurant, Theater	0.93	0.23

5.8 AV / IT / TELECOMMUNICATIONS

5.8.1 TELECOM

Engineering + Technology Building

- The following provides a description of telecom systems for Cal Poly Humboldt - Engineering + Technology Building in a narrative form.
- Systems shall meet or exceed standards and guidelines found in CSU Telecommunications Infrastructure Design Standards v5.1 and shall supersede details in this Feasibility Document where applicable.

5.8.1.1 OVERVIEW

The scope of work for the telecommunications system consists of the following components:

- Telecommunications Spaces
- Pathways
- Backbone Cabling
- Horizontal Cabling
- Firestopping
- Grounding and Bonding
- Testing and Labeling

5.8.1.2 EQUIPMENT SPACES

5.8.1.2.1 Equipment Spaces – MDF/MPOE

The building will have a minimum point of entry (MPOE) for telecommunications utilities combined with the building's main distribution facility (MDF).

The MPOE will house demarcation equipment (copper and fiber optic facilities) originating from the campus OSP network.

Telephone and Internet services are already provided elsewhere on campus and will route to this building over Cal Poly Humboldt's network.

The MDF/MPOE will be located on a floor that resides in the center of the building (depending on the final quantity of building stories) and will house the following equipment:

- Base Building Network Equipment
- Backbone Cabling Terminations
- Horizontal Cabling Terminations

- Mechanical Cooling Equipment
- Electrical UPS

Architectural Requirements:

- The MDF is approximately 180 sq. ft. (12'x15')
- Floor: durable, anti-static floor covering
- Ceiling: open to the deck above
- Walls: Two-hour rated full height walls with 3/4" fire retardant plywood. Paint plywood with a low-gloss white paint masked around the fire-retardant labels on plywood.
- Door: 7' 0" high by 3' 0" wide, no sill

Electrical Requirements

- Support a load of 3kW per rack or cabinet
- Each cabinet will receive two dedicated NEMA L5-20R receptacles. Mount receptacles on cable tray above each cabinet.
- Provide one duplex convenience receptacle per wall, mounted at 18" AFF.
- For each network equipment rack, provide a vertical rack mount smart PDU.
- Include a dedicated 100A panelboard.

Mechanical Requirements:

- Support a connected load of 3 kW per rack or cabinet.
- Provide continuous 24/7/365 cooling with local control.
- Maintain a temperature range between 65F and 80F.

Lighting Requirements:

- Provide a minimum light level of 50 foot-candles at 3' 0" AFF.
- Install lights on either side of racks – lights should not be located directly above the racks
- Provide cages on light fixtures (recommended).
- Provide a light switch near the door.

Fire Protection Requirements:

- Equip sprinkler heads with protective cages.

Security Requirements:

- Electronic key access (card reader)

Bonding Requirements:

- A Telecommunications Primary Bonding Busbar (PBB) is provided within the main electrical room.
- A Secondary Bonding Busbar (SBB) will be installed within the MDF. Provide a 1/0 AWG conductor from the TMGB to the TGB in the MDF. Use an irreversible connection method to connect the

conductor, preferably an exothermic weld.

- Provide bonding conductors from the TGB to the following components within the MDF:
  - Equipment Racks
  - Equipment Cabinets
  - Termination Equipment
  - Cable Runway
  - Cable Tray
  - Building Steel (if available)
  - Electrical Panel
  - Security Panel
  - Conduits and sleeves entering the room
  - Armored Fiber Optic Cables

Telecommunications Equipment Requirements:

- Minimum of four, four-post racks will be required for the MDF/MPOE.

5.8.1.2.2 Equipment Spaces – Telecommunication Rooms (TRs)(IDFs)

IDFs connect back to the MDF in star-topology with home runs of fiber and copper.

The IDFs will house the following equipment:

- Base Building Network Equipment
- Backbone Cabling Terminations
- Horizontal Cabling Terminations
- Security System Equipment
- Mechanical Cooling Equipment
- Electrical UPS

Architectural Requirements:

- Each IDF is approximately 120 sq. ft (10'x12') and will be centrally located (to minimize cabling distances) and stacked.
- Vertically stacked through the building.
- Floor: durable anti-static floor covering
- Ceiling: open to deck above
- Walls: Two-hour rated full height walls with ¾" fire retardant plywood. Paint plywood with a low-gloss white paint masked around the fire-retardant labels on plywood.
- Door: 7' 0" by 3' 0" wide, no sill

Electrical Requirements:

- Support a connected load of 2.5 kW per rack
- Each rack will receive two dedicated NEMA L5-20R receptacles. Mount receptacles on cable tray above each cabinet.
- Install a rack-mounted UPS unit. Size the UPS systems to support the full connected equipment load for a minimum of 15 minutes.
- Provide one duplex convenience receptacle per wall, mounted at 18" AFF.
- Provide a vertical rack mount smart PDU.

Mechanical Requirements:

- Support a connected load of 2.5 kW per rack or cabinet.
- Provide continuous 24/7/365 cooling with local control.
- Maintain a temperature range between 65F and 80F.

Lighting Requirements:

- Provide a minimum light level of 50 foot-candles at 3' 0" AFF.
- Install lights on either side of rack – lights should not be located directly above the rack
- Provide cages on light fixtures (recommended).
- Provide a light switch near the door.

Security requirements:

- Electronic key access (card reader)

Fire Protection Requirements:

- Provide sprinklers with high temperature heads and protective cages

Bonding Requirements:

- Provide a 1/0 AWG conductor from TMGB to the TGB in each IDF room.
- Provide bonding conductor from the TGB to the following components within the IDF:
    - Equipment Racks
    - Cable Runway
    - Cable Tray
    - Building Steel (if available)
    - Electrical Panel
    - Security Systems Panel
    - Conduits and Sleeves Entering the Room
    - Armored Fiber Optic Cables

Telecommunications Equipment Requirements

- Minimum of two, 2-post racks will be required for each IDF.

5.8.1.3 BASE BUILDING PATHWAYS

5.8.1.3.1 Cable Tray (Primary Pathways)

Size cable tray based on quantity of telecom cabling per initial installation with 30% spare capacity for future growth. Standard tray is a 4" high (4" loading depth) wire mesh style cable tray. Width varies based on cable quantities. Cable tray will run in areas with accessible ceilings. Powder-coat (factory-painted) visible cable tray to match ceiling space color or as directed by the Architect.

Provide seismic bracing to conduit systems as approved by the structural engineer.

Provide fire rated assemblies where cable tray passes through fire rated walls. Determine quantities of sleeves based on quantity of telecom cabling per initial installation with 30% spare capacity for future growth.

Provide supports at each connection point (junction of 2 or more straight sections), direct transitions, at the end of each run and at other locations necessary to attain a fully supported and seismically braces cable tray system using structurally approved anchoring system.

Cable tray system shall maintain a 12" minimum bend radius throughout (no hard 90 degree turns).

Bond cable tray to telecommunications grounding and bonding system.

Provide blind ends where tray termination is exposed.

5.8.1.3.2 Conduits and Boxes (Primary Pathways)

Each conduit needed for the project is not shown on the plans. Apply the following guidelines in conjunction with conduits shown on the drawings for complete conduit installation.

- Provide (4) 4" conduits from the MDF stubbed out 10ft from the building perimeter for connection to OSP facilities.
- Provide (4) 4" conduits from the MDF to each IDF. Stacked IDFs will have (4) 4" sleeves interconnecting them vertically.
- Provide conduits where ceiling is inaccessible.
- Provide pull boxes as necessary to facilitate proper cable placement, including the following:
    1. No more than 180 degrees bend between placement points
    2. No more than 100 feet conduit length
- To meet AHJ requirements
    1. Provide seismic bracing to conduit systems as approved by the structural engineer.
    2. Provide expansion joints and/or fittings to conduit where necessary. Expansion joints/ fittings shall be approved by a structural engineer licensed in the state of Washington.
- Label each conduit with permanent labels at both ends and on pull box lids indicating use for

telecommunications purposes and the far-end destination.

- Provide fire rated assemblies when penetrating fire rated partitions.
- Paint exposed conduits in the ceiling space to match ceiling color or as directed by the Architect.
- Bond conduits to telecommunications grounding and bonding system.

5.8.1.3.3 User Space Pathways – Cable Hangers (Secondary Pathways)

- Provide conduits between primary pathways and work area pathways and/or outlet locations.
- Secondary pathways conduits are to run from the outlet/box directly to the nearest primary pathway (typically cable trays).
- Maximum conduit length, bends, and pull-box requirements shall match primary pathway rules.
- Cable hangers (J-hooks) may not be used.

5.8.1.4 CABLING

5.8.1.4.1 Backbone Cabling

Backbone cabling is provided to interconnect the main telecom room with other telecom rooms in a standard star-topology configuration.

Backbone fiber optic cabling will be a will originate from the MDF and terminate to each IDF:

- OS2 single-mode, CMR rated, and with a minimum strand quantity of 24.

All backbone copper cabling will originate from the MDF and terminate on 25 port rack mount patch panels in the IDF:

- 24 AWG, CMR rated, 16 pairs.

5.8.1.4.2 Horizontal Cabling

Outlets on floors are served by IDF/MDF on the same floor. A telecommunications room will only serve one floor, and a maximum of 20,000sqft.

Each standard telecom outlet receives two cables and a two-port faceplate. The cable configuration for each standard outlet is as follows:

- All cables will be CAT6, CMP (plenum).
- All cables will be U/UTP.
- Terminate cables to TIA-568A standard.
- All cables will have a maximum outside diameter of 0.24in (6.3mm)

- Each cable run shall be a continuous single cable; splices are not permitted.
- Overall jacket color will be yellow.

All CAT6 cabling will be terminated on rack mounted CAT6 rated patch panel.

Terminate cables in patch panels in MDF/IDF.

Maintain a maximum tested cable length of 90 meters (295 feet) from the termination in the telecom room to the termination at the user's outlet faceplate.

5.8.1.5 LABELING

Label all cables with permanent labels at both ends with the serving telecom room designation and outlet destination.

Final labeling scheme is to be provided by Cal Poly TNS

- Serving telecom room
- Rack number
- Patch panel number
- Patch panel port number.

5.8.2 AUDIOVISUAL

Engineering + Technology Building

- The following provides a description of audiovisual systems for Cal Poly Humboldt - Engineering + Technology Building in a narrative form
- Audiovisual system descriptions are presented as an assessment for the Owner to determine the design direction in order establish a basis of design.

5.8.2.1 DESIGN CRITERIA AND GOALS

5.8.2.1.1 Standards:

- General Requirements
  - Audiovisual enabled rooms will be designed to meet the current Cal Poly Humboldt and design standards including AV equipment selection.
  - Refer to California State University TIP Standards v5.1 03-2022
- Reliability:
  - The systems should operate with minimum start-up time, minimum maintenance, and maximum availability based on the features that the selected technology can provide.
- Quality:

- The video systems will provide high-quality image reproduction.
- Provide display sizes and placement for student viewing at all seats for each room.
- Program and speech audio must be clear, intelligible, and of appropriate volume in all spaces.
- Assisted listening devices (where they are required) must be interconnected with all display systems and must be configured to allow for interconnection to changing technology

- Operation
  - System operation will be simple, intuitive, and provide a consistent control experience in rooms of similar layout and functionality throughout the building. Auto-switching and other methods of automation should be used where possible.
- Expandability
  - Infrastructure and pathway capacity should be designed with expandability in mind to support present and foreseeable user requirements.
  - Each classroom must have the basic infrastructure to support instructor- controlled display and computing equipment, even if the systems will not initially be installed.
- Flexibility
  - AV systems should support various collaboration and instructional methods and have sufficient flexibility to meet emerging instructional trends.

5.8.2.2 AV SYSTEMS DESCRIPTIONS

5.8.2.2.1 Training Lab:

- General: Interactive, classroom-style instruction in a Lab setting
- Display: Ceiling mounted video monitor for viewing of instructor content
- Sources: Owner-furnished computer, laptop input at instructor location, wireless presentation option
- Audio: Content playback via ceiling loudspeakers and wall mounted speakers; lavalier and handheld microphone for speech reinforcement; assisted listening system
- Control: Touch or button panel for system on/off, volume, source selection located at Instructor table or nearby wall; Typically, an instructor will cue up all media sources before beginning a lecture, placing the equipment in a "hot standby" mode.

5.8.2.2.2 Premier Lecture:

- General: Large-style instruction with the options of a "cluster layout" (grouped pods)
- Display: Two primary displays to accommodate a wide room viewing angle. Minimum WUXGA resolution, minimum 8,000 lumen brightness (depending on ambient light), laser

projector and appropriately sized, motorized projection screen OR direct-view LED displays at the front of the room; multiple direct view displays at the sides and rear of the room and/or at participant group "pods"

- Video: Pan/tilt/Zoom video camera (with software options for auto-tracking) aimed at Instructor; videoconferencing/recording option (USB to instructor PC) for remote student participation; monitor at instructor station to monitor sources and camera angles
- Sources: Owner-furnished computer, laptop input at instructor location, wireless presentation option; software-defined routing for wireless input sources for multiple displays throughout the room
- Audio: Content playback via ceiling loudspeakers and wall mounted speakers; lavalier and handheld microphone for speech reinforcement; USB connection to instructor PC for videoconferencing; assisted listening system
- Control: Touch or button panel for system on/off, volume, source selection located at Instructor station; Typically, an instructor will cue up all media sources before beginning a lecture, placing the equipment in a "hot standby" mode.
- Storage: The teaching station will have a built-in equipment rack

5.8.3 SECURITY

Engineering + Technology Building

- The following provides a description of security systems for Cal Poly Humboldt - Engineering + Technology Building in a narrative form
- Security system descriptions are high level and presented for review and feedback of the Owner to note any additional requirements beyond industry best practices or campus specific requirements.

5.8.3.1 OVERVIEW

This basis of design criteria will cover security systems, including the following:

- Access Control and Alarm Monitoring System (ACAMS)
- Video Surveillance System (VSS)
- The security subsystems will also require interfaces to other systems which may include but are not limited to the following building systems:
  - Voice Fire Alarm System
  - Electrical System
  - Door Hardware (electrified)

5.8.3.2 GOALS AND POLICES

5.8.3.2.1 Goals

- Protection
  - Increase the safety and security of Cal Poly Humboldt students, educators, staff, parents/ visitors, and assets
- Flexibility
  - Capable of interfacing with other base building systems, and access through web-based interfaces and mobile applications.
- Scalability
  - Expandable to accommodate additional building security devices.
- Efficient
  - Improve efficient use of other areas of the building for after-hours community events.

5.8.3.2.2 Policies

- Normal Operating Hours
  - Defined as 7:00 AM to 10:00 PM. The building will be controlled during normal operating hours. After-hours access available to Cal Poly Humboldt staff via the ACAMS located at designated entry points. Final policy will be outlined in future versions of this program narrative.
- Staffing
  - Will be defined in future versions of this narrative. It is assumed campus police and security personnel will be available.

5.8.3.2.3 Coordination

The ACAMS will be integrated with the Division 8 (door hardware). As well as Division 14 (Elevators) with card readers in the elevators.

5.8.3.2.4 Security Systems Criteria

The ACAMS will allow Cal Poly Humboldt to manage access to the building perimeter, lobbies, garage, individual levels, and administrative suites, elevators, and base building utility spaces (MDF/MPOE, IDF, Utility Rooms, etc.). The system will generate reports and monitor status of designated points in the facility. The overall ACAM system will be RS2 which is compatible with the campus wide system.

The ACAMS will consist of multi-format (13.56 MHz & 125 KHz) credential readers (mag-stripe, optional, depending on student card system utilized), door monitoring alarm contacts, request-to-exit motion detectors, and interfaces to electrified door hardware at designated locations.

The ACAMS utilizes a client/server topology and communicates across the building LAN/WAN. This configuration allows future flexibility in monitoring locations, integration with other building systems, and capable of being scaled to support any future security system requirements.

The ACAMS will integrate through software with the VSS system to provide automatic display of an associated VSS cameras based upon a selected ACAMS

The ACAMS will monitor emergency exit only doors utilizing door position contacts and local audible alarms.

Security devices will wire back to security control panels and power supplies located in the nearest IDF Room.

Emergency lock-down functionality will be provided to lock doors in the event of an emergency (utilizing RS2 based system and buttons).

5.8.3.3 VIDEO SURVEILLANCE SYSTEMS (VSS)

Cal Poly Humboldt has a minimal approach to video surveillance systems so care must be used in placing cameras only where deemed absolutely necessary.

The building video surveillance system will consist of High Definition (HD) IP fixed and 360-degree cameras selectively located to minimize appearance and quantities of cameras.

VSS fixed camera views will be recorded for a minimum of 30 days at 15 frames-per-second and at a minimum resolution of 2 Megapixels (1920x1080P).

VSS 360-degree camera views will be recorded for a minimum of 7 days at least 15 frames-per-second per imager and at a minimum resolution of 8 Megapixels. The cameras will have four imaging sensors.

Video Surveillance Cameras will be managed and recorded by a video management system that can be deployed using a commercial off the shelf server located in the MDF/MPOE room or through a Cal Poly Humboldt server located elsewhere.

Archival storage retrieval and live viewing of camera views can be done on security client workstations located at the lobby, private offices, or remotely via the internet (with authorized credentials).

Security cameras will utilize telecommunications category cable to the nearest IDF room and connect to commercial grade PoE switches.

The following table shows the proposed video surveillance locations:

Area	Coverage	Field of View
Building Exterior	Yes	General overview of the perimeter of the building.
Building Entry/Exits	No	-
Lobby	No	-
Corridors	No	-
Elevator Cabs	No	-
Stairwells	No	-
Classrooms	No	-

5.8.3.4 LIGHTING RECOMMENDATIONS

The success of any security program critically depends on the presence and amount of exterior lighting. During nighttime operation, exterior lighting provides:

Illumination to allow the proper operation of the exterior Video Surveillance System (VSS) camera system.

A sense of security to Cal Poly Humboldt staff and students using the building.

Site lighting design shall meet all City and local building codes.

Minimum lighting levels as recommended by the IES and by VSS camera manufacturers consist of:

- Building perimeter – 1 foot-candle (10 lux)
- Entrances – 5 foot-candles (50 lux)
- The average to minimum uniformity ratio shall not exceed four to one

Exterior lighting shall operate continuously during hours of darkness in these areas:

- Building perimeter
- Building entrances

5.8.4 WI-FI / NETWORK

Engineering + Technology Building – Feasibility Study

- The following provides a description of audiovisual systems for Cal Poly Humboldt - Engineering + Technology Building in a narrative form.
- Systems shall meet or exceed standards and guidelines found in CSU Telecommunications Infrastructure Design Standards v5.1 and shall supersede details in this Feasibility Document where applicable.

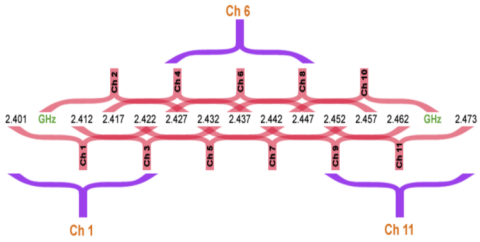
5.8.4.1 OVERVIEW

An enterprise wireless network shall be provided for the new Jameson building. These access points (APs) in conjunction with wi-fi controllers will provide 802.11ax (Wi-Fi 6) coverage for both Cal Poly Humboldt staff, student, vendor, and guest wireless connectivity. Wireless coverage will include all interior spaces with the exception of the parking garage areas.

A comprehensive predictive model will be used to determine optimal placements and configuration of APs within the interior space.

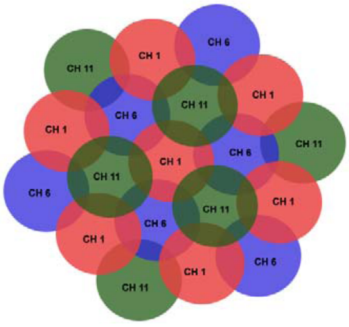
5.8.4.2 REQUIREMENTS

802.11abg and n support 14 channels, each one 22MHz wide. In the USA and Canada, channels 1 through 11 are allowed. Each of these channels overlaps significantly with their neighboring channels and somewhat with their neighbor's channels. The only four non-overlapping channels are 1, 6 and 11 as shown below.



Industry best practice recommends that the channels for each AP be set such that their signals do not overlap with other APs on the same channel if possible. This will minimize interference (channel overlap) between APs. If all APs are set to the same channel, the system will in most cases still work. However, because each AP will interfere with each other, throughput is likely to be degraded and will be unacceptable for Cal Poly Humboldt's deployment of wireless.

The recommended channel strategy will be implemented similar to the following diagram:



Support for 802.11ax (Wi-Fi 6) will be required, with Wi-Fi 6E (utilizing the 6GHz spectrum) to also become used in the future. This technology has significant performance features such as multiple-user + multiple-input / multiple-output (MU-MIMO), channel bonding, and Orthogonal frequency-division multiple access (OFDMA). Because the 2.4 GHz spectrum is limited in frequency bands. It is recommended that Wi-Fi 6 be implemented within the 5 GHz spectrum to allow for channel bonding without interfering with non-bonding channels.

Cal Poly Humboldt will retain the wireless survey model and data internally for future modifications and adjustments. Hence the predictive, passive, and active survey data will be included within the as-built documentation.

An example predictive model signal strength heat-map.

A few considerations and criteria for the future wireless deployment:

- Mobile computers will be deployed
- Expanded use of VoIP over wireless
- Support 802.11ax (Wi-Fi 6) features such as MIMO, channel bonding and OFDMA.
- 1 AP per 1,500 sq. ft

Manufacturers:

- Aruba 500 (or 600) series

5.8.5 DAS-ERRCS

Engineering + Technology Building – Feasibility Study

- The following provides a description of audiovisual systems for Cal Poly Humboldt - Engineering + Technology Building in a narrative form

5.8.5.1 DISTRIBUTED ANTENNA SYSTEMS (DAS)

An optional Distributed Antenna System (DAS) will consist of a head end that houses a wide band transceiver located in the MDF (or dedicated DAS room). This head end system will be a common interface node; collocated with signal source equipment for wireless service providers. Integration with these providers will be turnkey and include antenna, cabling, mounts, equipment installation and integration with all wireless systems. This system is not code-required, and it is to be determined if it will be included as part of this project.

The transport medium for DAS can take many forms, from traditional off-air repeater, small cell, or Base Transceiver Station (BTS) connected to architecture consisting of coaxial, fiber optic, or hybrid fiber/coaxial solution.

For a building of this size, and campus considerations, there are two recommended approaches to the DAS.

- Small cell (sometimes referred to as "cloud-based") source injected into a hybrid passive/active DAS.
- Base-station transceivers co-located with owner DAS equipment.

Small cell source consists of an Internet connected device which communicates with wireless service providers servers to receive a wireless signal which is then output either by the small cell device itself, or, by connecting its antenna outputs to a passive/active DAS. This is suitable for projects where the off-air source is too weak and distributing the signal within the building would not provide any noticeable increases in the quality of service.

Base-station transceivers consist of carrier provided cabinets that house all of the signal origination equipment that would commonly be found either at a cell tower "hut" or at the carriers central office. This equipment receives a fiber connection from the carrier, and then the signal is outputted via coaxial jumpers into the Point of Interface (POI) cards of the owner's DAS.

Since the building is approximately 15,000 sq. ft., it is recommended that either, A: an off-air repeater system be provided if the building is to be stand-alone. Or, B: a campus DAS head-end is created (or an existing one connected back-to, as discussed in the Sustainability Research Center narrative).

If a base-station head-end is created, then this would then become the head-end for the entire campus feeding all buildings carrier signals.

5.8.5.1.1 Passive DAS Components

The passive DAS architecture is comprised of three main elements, the wireless portal, the vertical riser cable or feeder, and the horizontal cable that connects to antennas.

The wireless portal is the DAS head-end that receives signal sources. This portal consists of a combination of band pass filters and combiners. These signals are summed and provide a single common output. The function of these lumped devices is to precondition the input signals, balance input signal levels, combine them with minimum loss, and feed them into one common wide frequency band spectrum output.

The combined output port is connected to the riser feeder cable that runs vertically transporting the combined signal throughout the building.

High precision broadband "taps" and splitters are used to extract the combined signals at each floor. The combined signal is power divided, or coupled with the Horizontal cable distribution system for that particular floor area.

Based on the physical obstruction of signals and building design of each floor, the floor area is divided into coverage segments (typically 5,000 to 7000 square feet). The horizontal cable distribution system is deployed with multiple broadband antennas in a predetermined fashion (based on predictive modeling in software) providing a custom design unique to the floor. This design will provide the required area coverage segments, capacity and signal levels throughout the floor.

The passive DAS network does not require any monitoring or control equipment to maintain coverage and service. The system is grounded at the portal and on each floor at the Riser cable with building ground.

5.8.5.1.2 Active DAS Components

The Active DAS architecture is comprised of three main elements, the Master Unit, the Fiber Optic Transport (Radio over Fiber), and the Remote units.

The system's basic function is to extend the coverage beyond what could typically be carried by a passive DAS only. Or, where long runs of bulky and inflexible "hard-line" coaxial riser cables are impractical.

The Master unit is DAS head-end that receives signal sources. This system consists of a series of band pass filters specially tuned to a specific carrier frequency, bidirectional amplifiers for the uplink and downlink signals, where they feed to a media converter subsystem module (Radio over Fiber).

The uplink and downlink signals are transported over Fiber to the Remote Units that could be located anywhere in the building, and the signal loss is insignificant.

At the Remote Unit the signal is distributed over traditional passive DAS infrastructure (splitters, taps, coaxial cable, antennas, etc.).

5.8.5.1.3 Supported Signals

The DAS shall be designed to support the following systems and frequencies:

Wireless Operators: Verizon, AT&T, T-Mobile/Sprint

- LTE (700 MHz) - Verizon (4G)
- Cellular (850 MHz) - AT&T, Verizon (2.5G & 3G)
- PCS (1900MHz) - Verizon, T-Mobile/Sprint (2.5G & 3G)
- AWS (1700/2100 MHz) - AT&T, T-Mobile/Sprint (3G /4G LTE)

5.8.5.1.4 Distribution Areas

The System shall distribute radio-frequency (RF) coverage at levels outlined below in the following areas of the building(s) – herein specified coverage areas:

All floors and areas including:

- Stairwells
- Elevators
- General Use spaces (break rooms, staff rooms)
- Restrooms
- Classrooms
- Large gathering spaces
- Circulation

5.8.5.1.5 Additional Requirements

The system shall have the capability for separate control over each service (or wireless operator) to allow the ability to adjust and control power levels without disturbing other services/operators.

The system shall support multiple services in a modular architecture so services can be added or removed without requiring new infrastructure, without readjustment of signal power levels, or disturbing existing services.

The system shall enable services to be added without requiring additional cable plant or antenna systems.

The system shall not impede any management features or functionality of any attached network and/or device management system. The System shall allow for proactive management and end-to-end alarming of active electronics. The System shall be able to engage with 3rd party SNMP-based element management systems and provide fault management information.

The DAS network shall support the use of legacy cellular enhancement and technologies such as GSM, EDGE, and UMTS-HSPA technologies.

The DAS must be FCC certified and in compliance with FCC's and regional regulatory authority's emission rules for wireless devices.

5.8.5.2 EMERGENCY RESPONDER AUDIO COVERAGE SYSTEMS (ERRCS)

A code-required (Chapter 510 of the CFC) ERRCS shall be provided.

This is a wholly separate DAS from cellular carriers and is provided to extend the coverage of emergency responder radio signals throughout the building.

The infrastructure of the ERRCS is nearly identical to cellular DAS as described previously in this narrative with the exception that the ERRCS is almost always an off-air source system.

5.8.5.2.1 Requirements

All channels shall be -95 dBm or stronger as specified by any local ordinance.

The ERRCS will support the following local systems:

- CAL FIRE 450MHz
- Humboldt County Sheriff (150MHz / 450MHz)
- Cal Poly Humboldt (150MHz)

Currently, the existing systems are legacy LMR systems. The ERRCS shall not only accommodate these legacy systems, but also the latest advancement in 2-way communication radio systems, such as the P25 project, which is an IP based simulcast network that supports both digital, and analog 2-way communication systems.

The ERRCS riser pathways and head-end equipment must be protected by 2-hour rated assemblies.

In addition, the head-end equipment must be contained in a NEMA 4 enclosure to protect it from sprinkler or fire hose water sources so that in the event of a fire emergency responders and still use the in-building ERRCS.

Due to the more complicated construction assemblies involved in a 2-hour rated pathway, it is recommended that the ERRCS riser stack vertically in order to reduce any horizontal runs of backbone cabling. Such horizontal runs may require either custom 2hr rated soffits, or fire-wrapped conduits in order to protect the cabling.

It is also recommended that the ERRCS head-end receive its own room at the top floor of the building to reduce the length of passive coaxial cabling that connects from antennas on the roof of the building to the ERRCS head-end unit. Typically, a small 6' by 6' closet is all that is required to house this equipment. This closet's construction assemblies shall be 2-hour rated.

The ERRCS shall also have its system status connected to the building's fire alarm system so that it can be monitored in the event any fault in the ERRCS occurs. If a fault occurs the fire alarm systems annunciator panel will be triggered to show the fault.

The ERRCS must be FCC certified and in compliance with FCC's and regional regulatory authority's emission rules for wireless devices, as well as approved by the local authority having jurisdiction (AHJ).

5.9 LIGHTING

Lighting for the Engineering and Technology building seeks to reinforce a high level of efficiency and simplicity. To this end, lighting will focus primarily on illumination for the highly functional requirements of the spaces while offer flexibility for various scenarios. Lighting systems will also aid in the user experience with added focus on common areas such as the lobby and clarifying wayfinding throughout.

Lighting for the Student Housing building seeks to provide a functional and supportive environment for student residence and study. To this end, lighting will focus primarily on illumination for the multiuse requirements and offer flexibility for various scenarios.

Light fixture selection for both buildings will also consider visual comfort, maintenance, economic value, and sustainability.

5.9.1 INTERIOR LIGHTING SYSTEMS

Engineering and Technology

The lighting system and controls for the interior spaces throughout the Engineering and Technology building will target the following attributes:

- Luminaires throughout the building will be LED type, 3500K CCT, 90 CRI, with lumen packages selected to provide light level in accordance with the recommendations of the Illuminating engineering Society of North America (IESNA) handbook and recommend practice guides and local ordinances.
- All lighting shall be LED with dimmable drivers.
- Storage and unfinished areas will be provided with 2' x 4' standard lensed troffers or industrial type strip fixture.
- Emergency egress lighting: selected light fixtures shall be connected to the generator system to provide egress lighting along the egress paths in accordance with California building code. 1.0 FC average, 0.1 FC minimum, 40:1 uniformity ratio.
- Illuminated exit signs will also be used along the path of egress, allowing a sign to be seen at any one time. Exit signs will be LED and UL listed with red lettering and an operating voltage of 277-volts..

illumination Design Criteria

Area	Illumination Levels
Lobby	5fc at floor, 15fc at desk
Collaboration	20fc at 2.5ft
Premier Lecture	30fc at task, 50fc at demonstration
Computer Lab	15fc at 2.5ft
Work Room	10fc at floor, 30fc at task
Kitchenette/Breakroom	20fc at task
Seminar/Classroom	40fc at 2.5ft
Conference	30fc at 2.5ft
Huddle	30fc at 2.5ft
Private Office	30fc at task
Open Office	30fc at task
Shops	100fc at task
High Bay Shops	100fc at task
Labs	50fc at 3ft, 75fc at 3ft demonstration
Lab Support	50fc at 3ft
Corridors	5fc at floor
Restrooms	5fc at floor, 10fc at Task, 20fc at vanity
Storage	20fc at floor

Table 5.9.1.1 Illumination Design Criteria

Lobby:

The lobby employs a multi-level lighting system to provide required functional lighting levels, articulate specific ceiling and wall surfaces, reinforce intuitive wayfinding, and provide accent for special programmatic elements such as donor wall, information wall, and art pieces. Recessed small aperture louvered downlights provide functional light levels. Continuous linear with mitered corners accent architectural ceilings. Recessed continuous perimeter coves and recessed asymmetric wall wash fixtures highlight strategic wall surfaces.

Collaboration:

Various informal collaboration areas will utilize low profile recessed downlights for general lighting. Continuous recessed linear fixtures provide functional illumination. Architecturally concealed continuous cove lighting will provide indirect accent for strategic wall surfaces.

Premier Lecture:

The premier lecture space will utilize a multi-level lighting system to provide general lighting levels, presentation capabilities, and future flexibility. Functional lighting will utilize a pattern of suspended direct indirect lighting. Recessed asymmetric wall wash lighting will highlight perimeter teaching walls.

Computer Lab:

The classrooms will employ direct-indirect linear pendants with high performance widespread indirect distribution. Separate control will be provided for direct and indirect light components. Additional teaching walls will be illuminated with recessed asymmetric wall wash fixtures.

Work Room:

Linear recessed light fixtures provide general lighting to the space. Under cabinet lighting will be provided

to increase function light levels at counter/task plane.

Kitchenette/Breakroom:

Linear recessed light fixtures provide general lighting to the space. Under cabinet lighting will be provided to increase function light levels at counter/task plane. Additionally recessed wall wash fixtures will accent strategic walls.

Seminar/Classroom:

Continuous pendant direct indirect light fixtures will provide ambient and task lighting at desks. Teaching walls will be illuminated with recessed linear wall wash fixtures and controlled from separate switch.

Conference:

Recessed louvered linear fixtures will provide functional task illumination at table. Perimeter walls will be uniformly washed with recessed baffled wall wash fixtures.

Huddle:

Wall mounted direct and indirect light fixtures will provide task illumination on work surface as well as ambient fill light on ceiling. Baffled downlights will provide additional light as needed.

Deans Office:

The dean's office will utilize direct indirect linear pendants with high performance widespread indirect distribution for task illumination. Pendant mounted direct indirect lights will accent seating areas. Strategic walls will be accented with recessed linear wall slot fixtures.

Private Office:

A task-ambient lighting approach will be utilized to reduce energy and provide individual control. The ambient system will be comprised of pendant mounted direct/indirect LED fixtures. Furniture mounted LED under-cabinet task light fixtures will provide elevated lighting levels at the work plane.

Open Office:

A task-ambient lighting approach will be utilized to reduce energy and provide individual control. The ambient system will be comprised of pendant mounted direct/indirect LED fixtures. Furniture mounted LED under-cabinet task light fixtures will provide elevated lighting levels at the work plane.

Shops:

The shop spaces will utilize either direct indirect linear pendants or pendant mounted circular low bay fixtures for functional task lighting.

High Bay Shops:

The shop spaces will utilize either direct indirect linear pendants or pendant mounted circular high bay fixtures for functional task lighting.

Labs:

A task-ambient lighting approach will be utilized for lab spaces. The lighting system for this space will primarily utilize direct/indirect pendants centered between benches to provide the ambient lighting layer. The task system will vary depending on the lab bench type. For typical lab benches, under-cabinet

LED task lights will be used to enhance lighting levels at the work plane. For open benches recessed adjustable spot fixtures located in the ceiling directly above the bench will provide enhanced lighting levels.

Lab Support:

Lab support spaces will utilize continuous recessed linear fixtures or recessed 2x2 troffers for functional illumination.

Corridors:

The hallways employ recessed downlights for general illumination. Classroom entry alcoves will be accented with asymmetric linear wall wash fixtures for wayfinding and vertical brightness.

Restrooms:

The restroom will employ continuous perimeter recessed wall slot lighting for general illumination. Downlights will provide additional lighting where needed.

Storage:

Standard strip light fixtures will be provided where no ceiling occurs. Recessed lensed linear fixtures will be provided where ceilings are placed.

Secondary Stair:

Secondary stairs will utilize surface mounted linear lighting at landings for functional illumination of stair tread.

Student Housing

The lighting system and controls for the Student Housing building will target the following attributes:

- Luminaires throughout the building will be LED type, 2700K CCT, 80 CRI, with lumen packages selected to provide light level in accordance with the recommendations of the Illuminating engineering Society of North America (IESNA) handbook and recommend practice guides and local ordinances.
- All lighting shall be LED with dimmable drivers.
- Storage and unfinished areas will be provided with 2' x 4' standard lensed troffers or industrial type strip fixture.
- Emergency egress lighting: selected light fixtures shall be connected to the generator system to provide egress lighting along the egress paths in accordance with California building code. 1.0 FC average, 0.1 FC minimum, 40:1 uniformity ratio.
- Illuminated exit signs will also be used along the path of egress, allowing a sign to be seen at any one time. Exit signs will be LED and UL listed with red lettering and an operating voltage of 277-volts.

Area	Illumination Levels
Bedroom	4fc at floor, 40fc at desk
Living area	30fc at floor
Kitchen (in-suite)	50fc at 3ft
Private bathroom	5fc at floor, 10fc at Task, 20fc at vanity
Community Restroom	5fc at floor, 10fc at Task, 20fc at vanity
Study room	30fc at 2.5ft
Lounge	15 - 30fc at 2.5ft
Kitchenette	50fc at 3ft
Mailroom	5fc at floor, 10fc at box faces
Laundry	30fc at 3ft
Office	30fc at 2.5ft
Reception	15fc at 2.5ft
Corridors	5fc at floor
Storage	20fc at floor

Table 5.9.1.2 Illumination Design Criteria

Bedroom:

Lighting for the bedrooms will employ a combination of wall mounted direct indirect lighting for ambient and functional light. Separate control for direct and indirect components will provide flexibility for higher light levels at desk locations.

Living Area:

Lighting for the living area will employ a combination of wall mounted direct indirect lighting for ambient and functional light. Separate control for direct and indirect components will provide flexibility. Additional downlights will be utilized as needed.

Kitchen (in-suite):

Recessed continuous lensed light fixture will provide functional lighting for the kitchen tasks.

Private Bathroom:

Bathrooms will utilize a wall mounted vanity light for illumination of general tasks. Additional wet rated recessed downlight will be used for shower illumination.

Community Restroom:

Bathrooms will utilize a wall mounted vanity light for illumination of sinks. Recessed downlights will provide general illumination. Additional wet rated recessed downlights will be used for shower illumination.

Study Room:

Wall mounted direct and indirect light fixtures will provide task illumination on work surface as well as ambient fill light on ceiling. Baffled downlights will provide additional light as needed.

Lounge:

The lounge will look to provide a comfortable and relaxing multiuse space for students. A combination of recessed downlights for functional light requirements and suspended round direct indirect lights will be utilized.

Kitchenette:

Linear recessed light fixtures provide general lighting to the space. Under cabinet lighting will be provided to increase function light levels at counter/task plane. Additionally recessed wall wash fixtures will accent strategic walls.

Mailroom:

Linear recessed light fixtures provide general lighting to the space. Linear light location to provide proper illumination of mailbox faces. Under cabinet lighting will be provided to increase function light levels at counter/task plane if needed.

Laundry:

Linear recessed light fixtures provide general lighting to the space.

Office:

The office will employ linear suspended direct indirect light fixtures provide general lighting to the space.

Reception:

Linear recessed light fixtures provide general lighting to the space. Additionally recessed wall wash fixtures will accent strategic walls.

Corridors:

Corridor lighting will utilize recessed downlights for general illumination. Strategic graphics walls will be illuminated with recessed wall wash fixtures to aid in wayfinding.

Storage:

Standard strip light fixtures will be provided where no ceiling occurs. Recessed lensed linear fixtures will be provided where ceilings are placed.

5.9.2 EXTERIOR LIGHTING SYSTEMS

The lighting systems and controls for the exterior will target the following attributes:

- Fixtures throughout the site and building exterior will be LED type, 3000K CCT, with lumen packages selected to provide light level in accordance with the recommendations of the Illuminating Engineering Society of North America (IESNA) handbook and recommended practice guides and Local Ordinances.
- All exterior light fixtures must utilize marine grade materials, copper free alloys, fully gasketed IP65 enclosures, marine rated powder coating, and stainless-steel hardware with stainless-steel inserts where applicable.

- MLO LZ2 will be used for outdoor lighting ordinances and for determining light pollution reduction targets.
- All exterior and site lighting fixtures will be fully shielded and adhere to B.U.G. rating recommendations for MLO LZ2.
- Light pollution reduction will also be addressed via controls and a curfew based on programmatic requires. Occupancy based site lighting controls will be used where possible.
- LED wall packs will be used above exterior doors connected to emergency power circuit.
- LED pole mounted fixtures on 12'-15' poles will be used for pedestrian walkway lighting.
- Pole mounted LED lighting fixtures will be used for roadways. Poles will be round tapered aluminum, 20'-25' high with single or double arm mounted fixtures.

Area	Illumination Levels
Roadway	2.0fc avg. 0.9fc min., 4:1 avg./min.
Pedestrian Path	0.5fc min. and 1.0fc avg.
Entry	1.0fc min.
Plaza	0.5fc min. and 1.0fc avg.

Table 5.9.2.1 Illumination Design Criteria

Building Exterior/Facade:

Main building entries will be accented to provide an increased sense of wayfinding to denote main entry points to facility. Building exterior overhangs will be accented with soft up light to highlight building massing and stacking. Up lighting will be contained within overhang to eliminate light pollution. Building façade lighting will be curfew controlled.

Exterior Stair:

Exterior stairs will be illuminated with a combination of stair integrated linear under tread lighting and handrail integrated LED lighting.

Plazas:

The terrace will utilize a combination of typical pedestrian area pole lights, linear bench integrated continuous under glow, and strategic landscape accent with ground mounted floodlights.

Outdoor Fabrication:

The outdoor fabrication space will be illuminated with wall mounted architectural area flood lights to provide multi-level illumination of the area during both normal and working conditions.

5.10 ACOUSTICS

The following section provides a summary of the relevant acoustical criteria and acoustical recommendations for the "Engineering + Technology Building (1A)" which will be an academic building as well as the separate "Student Housing (1B)" building. The focus of this section is:

- Sound Isolation: Coordination of interior partitions to reduce airborne noise transfer between spaces as well as structure borne (e.g., footfall, machinery) noise.
- Room Acoustics: Coordination of acoustically absorptive finishes to meet the reverberation time requirements and support clear speech and hearing within spaces as well as reducing noise build-up.
- MEP and Elevator Noise and Vibration: Coordination of engineered building systems such as mechanical, electrical, plumbing, and elevator.
- Exterior noise intrusion (such as traffic noise).

We understand LEED Gold BD+C: New Construction is being pursued for the Engineering + Technology building.

5.10.1 CRITERIA

5.10.1.1 ENGINEERING + TECHNOLOGY BUILDING (1A)

The California State University (CSU) Guidelines and Standards does not contain acoustical criteria. The following criteria is based on similar California State University projects, industry standards, ANSI Standard S12.60, LEED, and ASHRAE guidelines.

- CalGreen Section 5.507 "Environmental Comfort," stipulating a maximum Leq of 50 dBA inside of occupied hours due to exterior (environmental noise).
- All indoor academic and academic support spaces shall meet the requirements as described in LEED for New Construction – Indoor Environmental Quality Credit: Acoustic Performance, including both HVAC Background Noise and Sound Transmission Standards.
- All core learning and ancillary learning spaces shall meet the requirements as described in ANSI Standard S12.60-2010 – Performance Criteria, Design Requirements and Guidelines for Schools, Part 1: Permanent Schools.
- Exterior Noise Control: Project-generated noise shall comply with State and local City noise ordinances.

LEED v4.1, ANSI Standard S12.60-2010, and ASHRAE's guidelines contain quantitative acoustical criteria for schools and office space.

Table 1 summarizes the relevant criteria from the sources noted above.

Space	Room Acoustics	Sound Isolation	Background Noise [a]
Classroom/Teaching Lab (10,000 ft^3 or less)	Maximum Reverberation Time: 0.6 seconds	**Airborne Noise** STC 45: Adjacent to corridor, stairwell, office, or conference room. STC rating does not include doors (doors to be STC 30). STC 50: Adjacent to other classrooms/labs or similar spaces requiring a high degree of acoustical privacy STC 55: Adjacent to restrooms STC 60: Adjacent to MEP equipment room/IT room [b] **Impact Noise** IIC 45: When a classroom/lab is above a core learning space IIC 40: When a classroom/lab is above an ancillary learning space **Maximum Hourly L_{eq} due to Exterior Noise Sources** 35 dBA in Classroom / Teaching spaces	NC: 30 35 dBA
Lecture/Seminar Classroom (above 10,000 ft^3, less than 20,000 ft^3)	Maximum Reverberation Time: 0.7 seconds		NC: 30 35 dBA
Lecture/Seminar Classroom (above 20,000 ft^3)	Recommended Reverberation Time: 1.0 seconds; wall panels as well as ceiling absorption required		NC 30 / 35 dBA with speech amplification; NC 25 / 30 dBA w/o speech amplification
Labs – Group Teaching	Maximum Reverberation Time: 1.0 seconds		NC 35 40 dBA
Corridors	No requirement, recommend reverberation time of 1.2 seconds or less		NC: 40 45 dBA
Conference Rooms/Seminar/Workshop Space	Incorporate acoustically absorptive ceiling (NRC 0.80 minimum) or maximum reverberation time of 0.6 seconds	**Airborne Noise** STC 40: At corridors (with door) STC 50: Between adjacent conference rooms/huddle/private offices/shared offices/break room/stairwell/open plan/occupied spaces/corridor STC 55: At restrooms STC 60: Adjacent to MEP equipment room/IT room [b] **Impact Noise** IIC 45 **Maximum Hourly L_{eq} due to Exterior Noise Sources** 40 dBA	NC: 30 35 dBA
Huddle/Private Office/Lactation/Small Meeting Rooms	Incorporate acoustically absorptive ceiling (NRC 0.75 minimum) or maximum reverberation time of 0.6 seconds	**Airborne Noise** STC 35: At corridors (with door) STC 45: Between adjacent huddle/private offices/shared offices/break room/stairwell/open plan/occupied spaces/corridor STC 55: At restrooms STC 60: Adjacent to MEP equipment room/IT room [b] **Impact Noise** IIC 40 **Maximum Hourly L_{eq} due to Exterior Noise Sources** 40 dBA	NC: 30 35 dBA
Shared Workspace/Shared Offices	Incorporate acoustically absorptive ceiling (NRC 0.75 minimum) or maximum reverberation time of 0.6 seconds	**Airborne Noise** STC 35: At corridors (with door) STC 45: Between adjacent huddle/private offices/shared offices/break room/stairwell/open plan/occupied spaces/corridor STC 53: At restrooms	NC: 35 40 dBA

Table 5.10.1.1 Acoustical Criteria

Space	Room Acoustics	Sound Isolation	Background Noise [a]
		STC 60: Adjacent to MEP equipment room/IT room [b] **Impact Noise** IIC 40 **Maximum Hourly L_{eq} due to Exterior Noise Sources** 50 dBA	
Open Plan/Waiting Areas	Incorporate acoustically absorptive ceiling (NRC 0.80 minimum) or maximum reverberation time of 0.8 seconds	**Maximum Hourly L_{eq} due to Exterior Noise Sources** 50 dBA	NC: 40 45 dBA
Work Rooms/Copier/Breakroom	Incorporate acoustically absorptive ceiling (NRC 0.75 minimum) or maximum reverberation time of 0.6 seconds	STC 35: At corridors (with door) STC 45: Adjacent to huddle/private offices/shared offices/break room/stairwell/open plan/occupied spaces/corridor. STC 50: Adjacent to conference, classrooms/labs or similar spaces requiring a high degree of acoustical privacy **Maximum Hourly L_{eq} due to Exterior Noise Sources** 50 dBA	NC: 40 45 dBA
Maker Space/Machine Shops/3D Printing &Laser Cutter/Dirty Labs	Incorporate acoustically absorptive ceiling (NRC 0.75 minimum) or maximum reverberation time of 0.6 seconds	STC 40: At corridors STC 60: Adjacent to acoustically sensitive space [b] **Maximum Hourly L_{eq} due to Exterior Noise Sources** 50 dBA	NC: 40 45 dBA
Lobby/Entry	Incorporate acoustically absorptive ceiling (NRC 0.80 minimum) or maximum reverberation time of 1.0 second	**Maximum Hourly L_{eq} due to Exterior Noise Sources** 50 dBA	NC: 40 45 dBA
MEP Rooms/Data Center/IT Room	Incorporate acoustically absorptive ceiling (NRC 0.75 minimum)	STC 40: At corridors STC 60: Adjacent to acoustically sensitive space [b]	--
Bathrooms/Kitchen	--	STC 40: At corridors STC 55: Adjacent to acoustically sensitive space	NC: 40 45 dBA

[a] Background noise level from continuous interior sources (e.g., fan coil units, VAV boxes, etc.). Equipment such as fume hoods and other intermittent devices may be louder if they are user-controllable (i.e., they can be turned off). Both A-weighted (dBA) and NC criteria are presented, as dBA is easier to measure/utilize during commissioning/post-construction measurements.

[b] If it can be demonstrated that equipment in the Maker Space, Machine Shops, MEP and IT/Data Center room meets the background noise limits specified in the adjacent space, STC rating of wall can be reduced to no lower than STC 45.

Table 5.10.1.1 Acoustical Criteria

5.10.1.2 STUDENT HOUSING (1B) BUILDING

1. COMMERCIAL SPACES - CALIFORNIA GREEN BUILDING CODE

Section 5.507 of the 2019 California Green Building Standards Code (CALGreen) stipulates noise criteria for commercial spaces. If exterior hourly noise levels at the project site are above LEQ 65 dBA, then interior noise levels in commercial/office spaces must not exceed LEQ 50 dBA during the noisiest

hour of operation (Performance Method). This CALGreen standard applies to the Level 1 commercial / office spaces and upper floor kitchenette spaces.

The Level 1 commercial spaces (offices, multi-purpose, meeting / study room, lounge, kitchenette, reception, lobby, mailroom, laundry) are subject to the commercial portion of the California Green Building Code (CALGreen). CALGreen stipulates that partitions separating tenant spaces, and partitions separating tenant spaces from public spaces, should achieve a minimum STC 40 rating.

2. RESIDENTIAL SPACES - CALIFORNIA BUILDING CODE

The 2019 California Building Code (CBC), California Code of Regulations, Title 24, Part 2, Section 1207.4, stipulates that an interior noise level attributed to exterior sources shall not exceed DNL 45 dBA for any habitable room in a residential building.

The California Building Code (CBC) stipulates the following criteria applicable to common interior walls, partitions and floor-ceiling assemblies between adjacent dwelling units and sleeping units, or between dwelling units and sleeping units and adjacent public areas such as halls, corridors, stairways or service areas. This applies to the housing units.

- Airborne Sound: Minimum STC rating of 50 (45 when field tested)
- Structure-borne (Impact) Sound: Minimum Impact Insulation Class (IIC) rating of 50 (45 when field tested); criterion does not need to be met at spaces located over non-habitable spaces such as garages/mechanical rooms/storage areas

For this project, we recommend the STC and IIC criteria be increased by five points between adjacent dwelling units (i.e., STC/IIC 55), as the Code criteria is a minimum standard. FYI, the STC 55 recommendation is similar to that recommended by the U.S. Department of Housing and Urban Development (HUD) in their multi-family guidelines document.

3. INTERIOR ROOM ACOUSTICS AND ROOM FINISH TREATMENTS

Table 2 summarizes the amount of sound build-up recommended (measured as Reverberation Time, in seconds).

Table 2: Recommended Reverberation Time

Space	Max. Reverberation Time (RT_{60}) in sec.
Lobby / Reception	1.2
Community / Multi-Purpose Spaces / Lounge	0.8
Study Room / Meeting Rooms / Offices	0.6
Residences	N/A
Support Spaces	N/A

4. MEP/HVAC NOISE LEVELS

Table 3 summarizes the MEP/HVAC noise criteria, based on ASHRAE guidelines.

Table 3: Background Noise (HVAC) Criteria

Space	Noise Criteria (NC)
Bedroom	Max. 35
Kitchen/Dining	Max. 35 (when kitchen exhaust fans are off) (rate kitchen exhaust fans up to 4.5 sones)
Living Room	Max. 35
Bathroom Exhaust Fans	0.6 to 1.5 sones
Public Spaces, Corridors	40
Lobby	40
Community / Multi-Purpose Spaces / Kitchenettes	40
Study Room / Meeting Rooms / Offices / Lounge	35

5.10.2 RECOMMENDATIONS

5.10.2.1 PARTITION SOUND ISOLATION

Airborne sound isolation is the amount of noise reduction afforded by constructions (doors, windows, partitions, floor-ceiling, etc.). Constructions with high levels of noise reduction, such as concrete walls, are described as providing greater amounts of airborne sound isolation. Sound isolation recommendations are expressed in terms of laboratory STC rating.

To achieve the STC ratings listed in the criteria section above, sound-rated partitions will be necessary. The field-measured Noise Isolation Class (NIC) value of the installed wall assembly shall not be more than 5 decibels below the STC rating of the demising assembly.

We have found that partitions with fewer layers of gypsum board incorporating "acoustical" studs, staggered studs, or double-stud assemblies may cost less than single-stud partitions with multiple layers of gypsum board. We recommend the Cost Estimator provide input on the most efficient partition design.

Sound-Rated partitions shall follow these guidelines:

- Offset gypsum board layer seams by 24". Mud and tape all joints between gypsum board layers.
- Provide full depth insulation in all stud cavities; do not compress insulation.
- Hold back the face layer of gypsum board ¼" from intersecting surfaces and caulk airtight with non-hardening resilient acoustical sealant.
- Minimize the number of penetrations in sound-rated partitions.
- Oversize full perimeter of penetrations (maximum ¼" gap) to avoid direct contact between the penetrating element and partition framing elements and layers. Seal all penetrations with closed cell foam backer rod, if necessary, and non-hardening, resilient acoustical sealant.
- Rough-in boxes should be fully backed with putty pads (minimum ¼"-thick intumescent clay pads).
- Rough-in boxes should not be placed back-to-back; offset boxes by a minimum of 16" horizontally.
- Seal gaps airtight where full height walls meet structural decks above (see following section).
- Double-stud walls should not be laterally bridged; at metal stud walls, we recommend following the UL U493 design which does not require lateral bridging across stud rows.

Schematic detail options for each STC rating are provided as follows:

1. ENGINEERING + TECHNOLOGY BUILDING (1A)

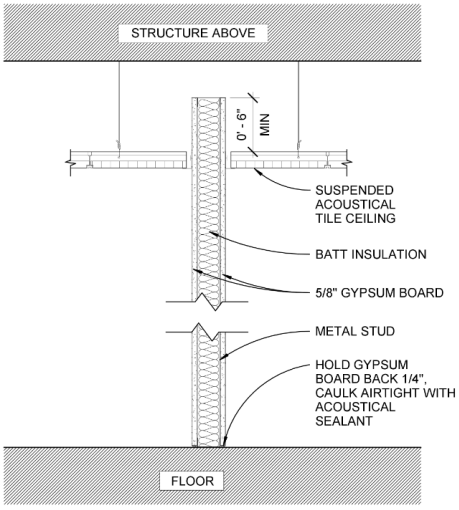


Figure 5.10.2.1 STC 35 Partition

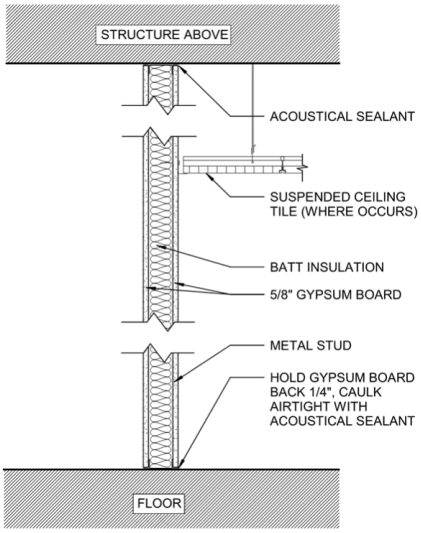


Figure 5.10.2.2 STC 40 Partition

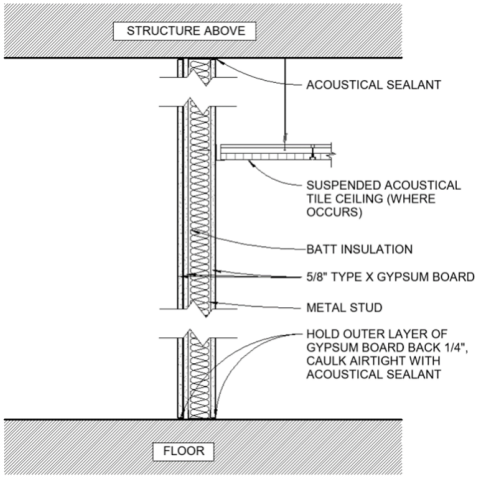


Figure 5.10.2.3 STC 42 Partition

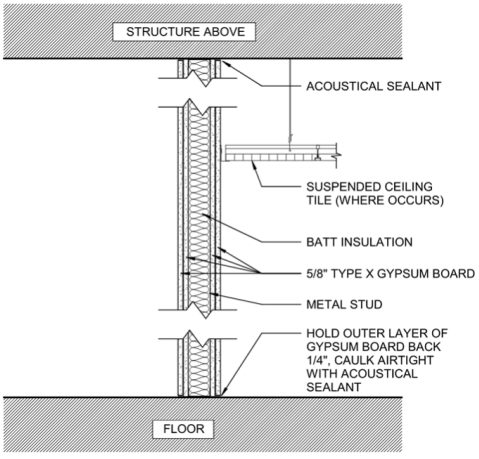


Figure 5.10.2.4 STC 45 Partition

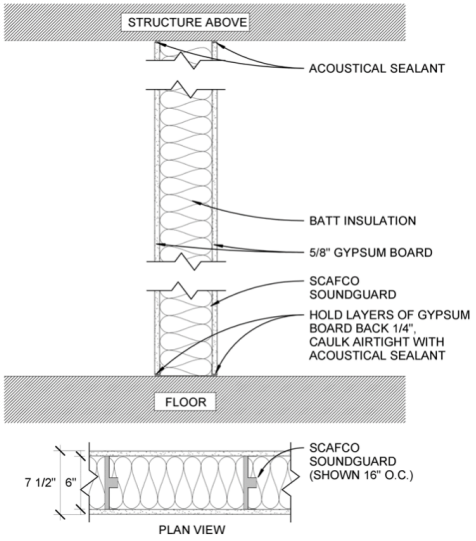


Figure 5.10.2.5 STC 50 Acoustic Stud Partition (SCAFCO SoundGuard)

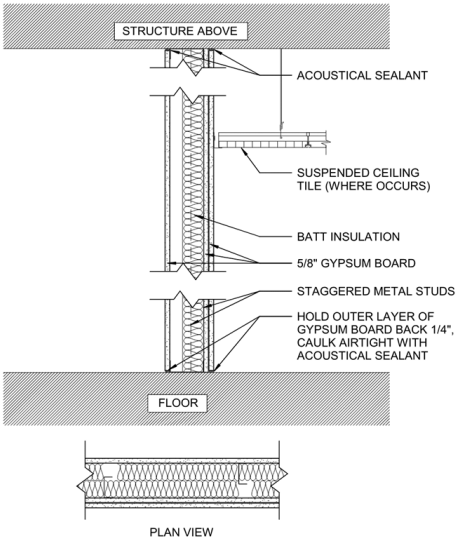


Figure 5.10.2.6 STC 50/53 Staggered Stud Partition

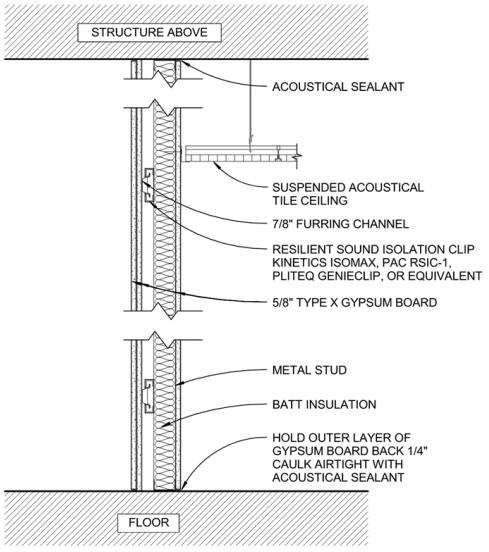


Figure 5.10.2.7 STC 50/53 Acoustic Clip Partition

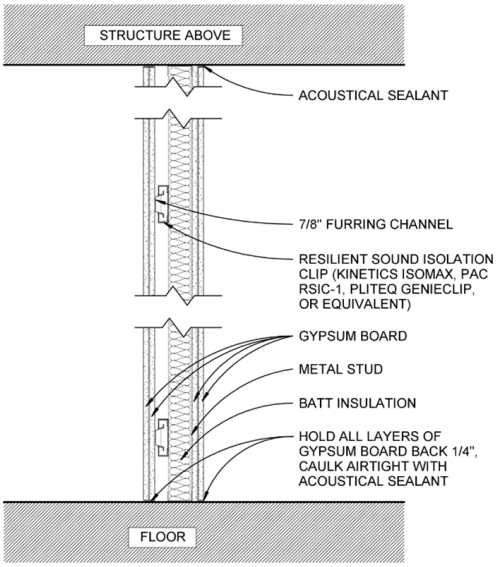


Figure 5.10.2.8 STC 55 Acoustic Clip Partition

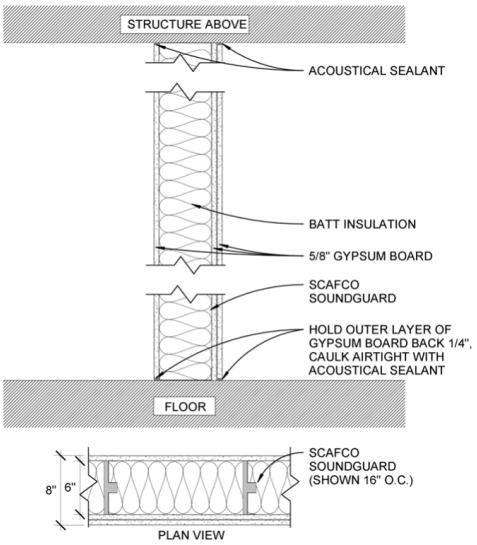


Figure 5.10.2.9 STC 55 Acoustic Stud Partition
(SCAFCO SoundGuard)

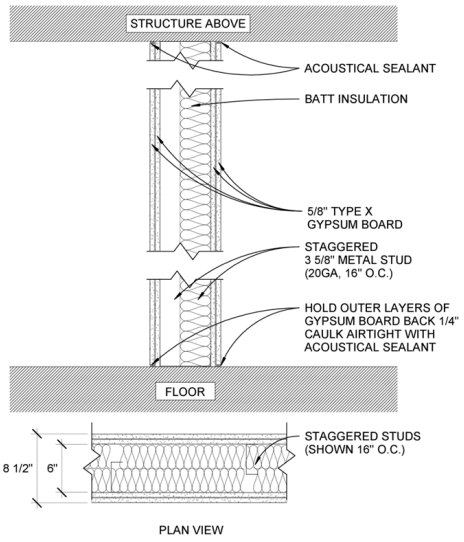


Figure 5.10.2.10 STC 55 Staggered Stud Partition

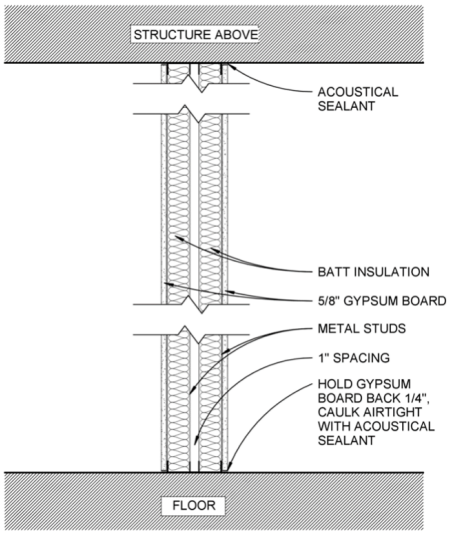


Figure 5.10.2.11 STC 55 Double-Stud Partition

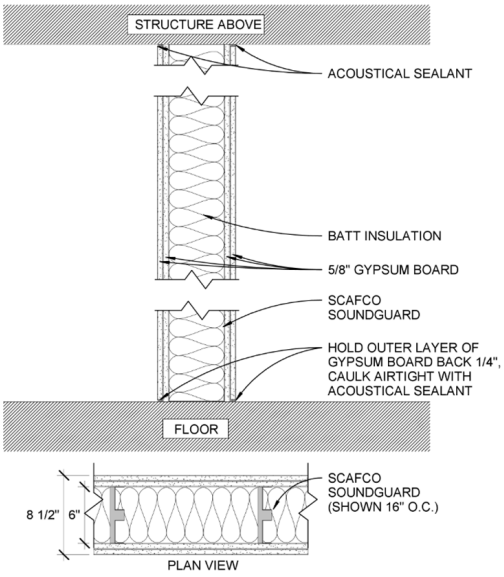


Figure 5.10.2.12 STC 60 Acoustic Stud Partition
(SCAFCO SoundGuard)

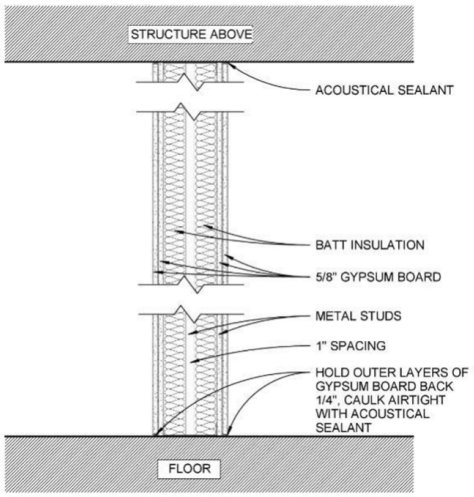


Figure 5.10.2.13 STC 60 Double-Stud Partition

2. STUDENT HOUSING (1B) BUILDING

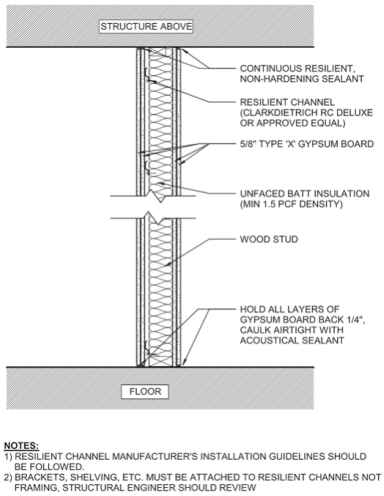


Figure 5.10.2.14 STC 50 Resilient Channel Stud Partition (Corridor)

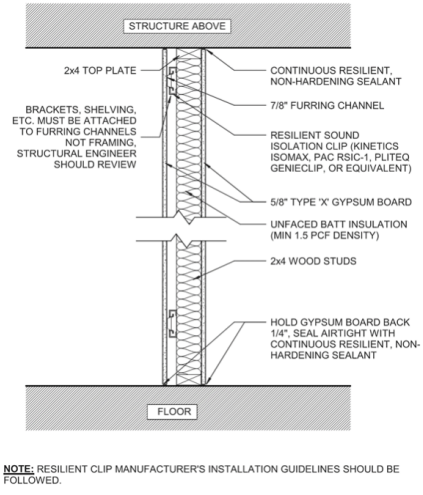


Figure 5.10.2.15 STC 50 Resilient Clip Partition (Corridor)

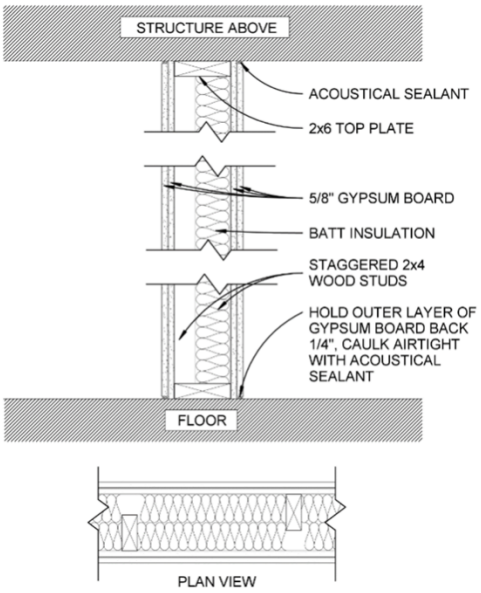


Figure 5.10.2.16 STC 50 Staggered Stud Partition (Corridor)

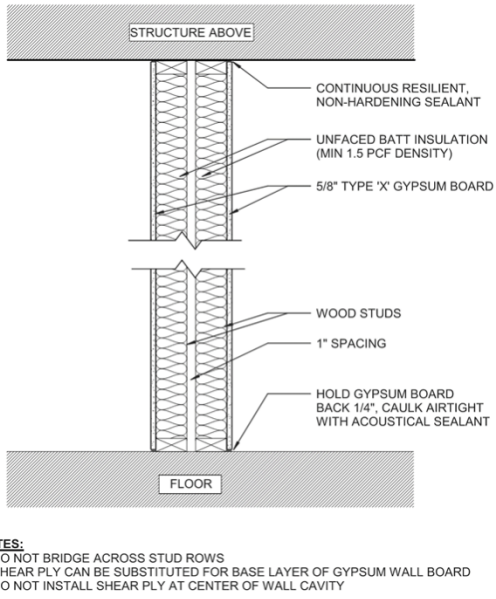


Figure 5.10.2.17 STC 55 Double-Stud Partition (Demising)

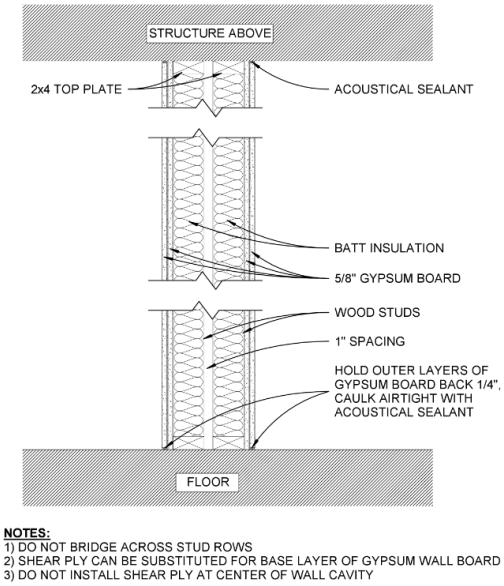


Figure 5.10.2.18 STC 65 Double-Stud Partition (Demising between unit and noise emitting rooms - restrooms, kitchenettes, MEP)

Residents should not be allowed to install recessed loudspeakers or other recessed items in party walls, as the sound isolation performance of the wall would be compromised.

5.10.2.2 PARTITION SOUND ISOLATION SPECIALTIES

Partitions at shafts, MEP rooms, Telecom Rooms, Data Center / IT Rooms, IDF rooms, Machine Shops, Maker Space and other noise emitting rooms should be evaluated and recommended STC ratings should be refined as the equipment is scheduled and noise calculations are completed; prescriptive STC recommendations are provided in Table 1.

Some sound-rated partitions that terminate at the exterior windows can be an acoustical "weak link" in the wall assembly and will compromise the performance of the demising partition. The intersection should be treated with an acoustical mullion product such as the Mull-it-Over, Emseal QuietJoint, or Piedmont Plug products.

The acoustical treatment of penetrations, partition intersections, and outlet boxes is critical to achieve the STC ratings presented in the Criteria section. The following details should be incorporated into the architectural drawings and noted on the floor plans, sections, etc. as appropriate.

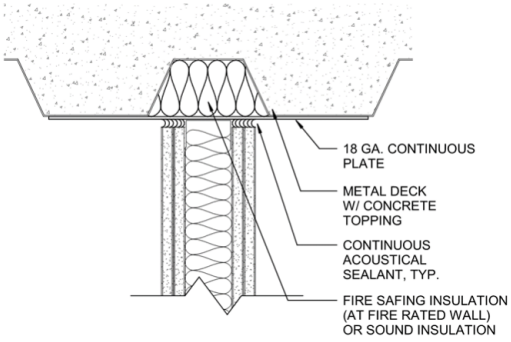
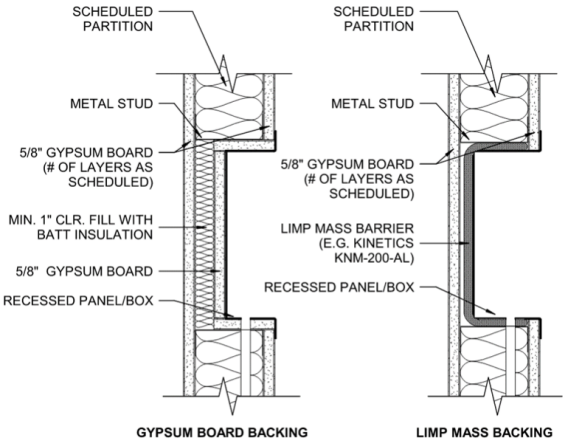
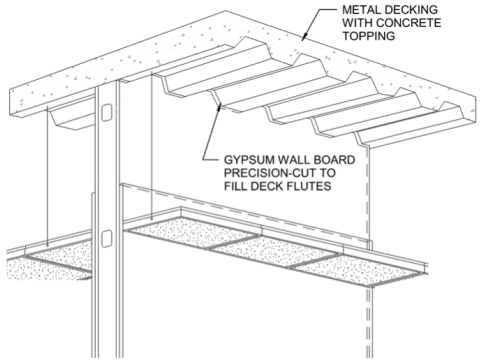


Figure 5.10.2.19 Partition Termination Parallel to Metal Deck



NOTES:
1) LIMP MASS BARRIER AVAILABLE FROM ACOUSTHETICS (415) 753-1301

Figure 5.10.2.21 Recessed Panels and Fixtures



NOTE:
1) IF AN ACOUSTICAL TILE CEILING IS LOCATED ON BOTH SIDES OF THE PARTITION, HILTI SPEED PLUGS OR SIMILAR CAN BE USED TO PLUG THE DECK FLUTES IN LIEU OF PRECISION CUTTING THE TOP OF THE GYPSUM BOARD.

Figure 5.10.2.20 Partition Termination Perpendicular to Metal Deck

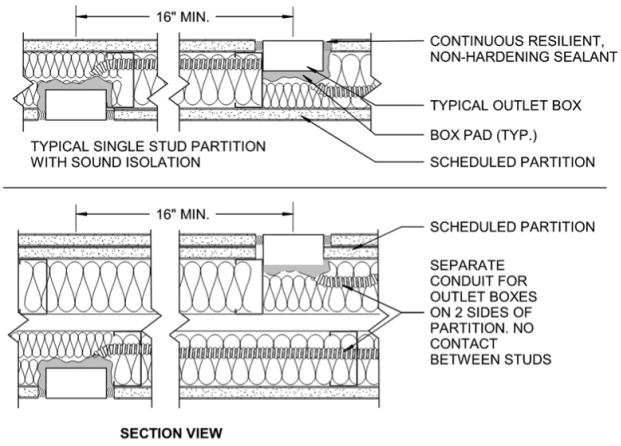


Figure 5.10.2.22 Junction Box Isolation

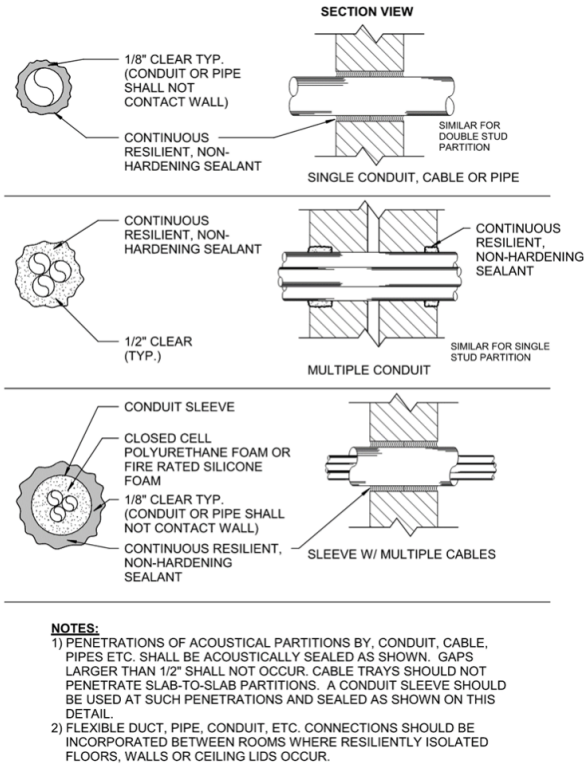


Figure 5.10.2.23 Partition Penetration Details

5.10.2.3 DOORS

Doors and vision windows between adjacent sound sensitive spaces (such as classroom to classroom or conference room to conference room) should be avoided, otherwise STC rated sound control door and window assemblies equal to the STC demising wall rating listed in the criteria section will be required to maintain sound isolation.

Entry doors to occupied spaces should be solid core wood or insulated hollow metal with a minimum surface density of 5 psf. Entry doors to core learning spaces as well as conference rooms (and other rooms where speech privacy is a concern) and Maker Space / MEP / IT / Elevator Machine Rooms (or any other noise emitting rooms) should incorporate rubber bulb gasketing and automatic door bottoms. These doors should provide STC 30 (NIC 28) minimum sound isolation performance. Door undercuts shall be no more than 1/4". A typical entry door with automatic door bottom is shown below.

				AUTOMATIC DOOR BOTTOM	
MANUFACTURER	PERIMETER	ASTRAGAL	SHOE	MORTISE	SURFACE MOUNT
PEMKO	S-88	355CS	234	434A/420A	
NATIONAL GUARD	5050	109N		423N	420N
REESE	797		DB591F	371	521
ULTRA				DB 043	
ZERO		1840	253A	369	367

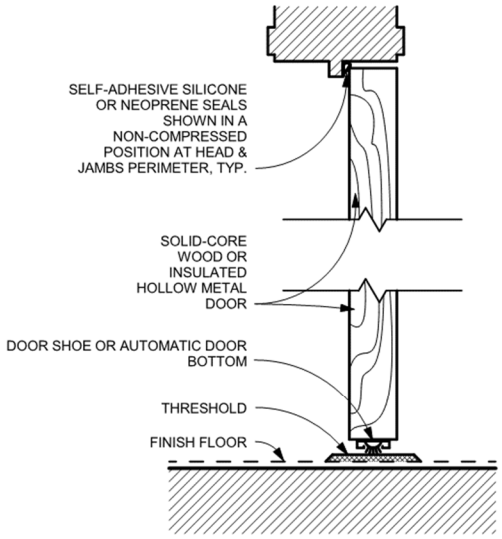


Figure 5.10.2.24 Doors to Core Learning Spaces and Other Noise-Sensitive Spaces

Doors to rooms with noise generating equipment such as Maker Space / MEP / IT / Elevator Machine Room should not open into acoustically sensitive spaces, otherwise STC rated sound control door will be required.

Entry doors at housing residences should be solid-core wood doors or insulated hollow metal doors with full-perimeter gaskets (such as Pemko S-88 self-adhesive bulb seals) with an automatic door bottom (such as Pemko 434) or a door shoe (such as Pemko 234). Door panel weight should be a minimum of 5 lbs./sq. ft. The multipurpose room, MEP rooms, offices, study, laundry, and meeting rooms should also include similar door treatment.

5.10.2.4 INTERIOR GLAZING

Glazing located at office/conference room fronts or at Core Learning Spaces can be an acoustical "weak link." When glazing is located adjacent to a door (e.g., a sidelite), 1/2" thick glazing is sufficient. However, if glazing is located in a partition without a door or a wall is fully glazed, then a more robust glazing system (e.g., dual pane with 2" airspace) will be necessary.

5.10.2.5 OPERABLE PARTITIONS

If operable partitions are added, close coordination with the operable partition design is important to verify that the perimeter conditions (e.g., head, base, sides) of the operable partition do not compromise the sound isolation performance of the operable partition. Generally, an operable partition should have an STC rating equal to or higher than that of a standard framed wall. For most adjacencies, an operable partition should have a STC rating of 50 and NIC rating of 42. The STC rating listed by operable partition manufacturers should be for the assembly, and not only the panel.

Depending on its location, it may be recommended that the facing of the operable partition incorporate acoustically absorptive materials to reduce reverberation in the space.

5.10.2.6 FLOOR-CEILING ASSEMBLY SOUND ISOLATION

1. ENGINEERING + TECHNOLOGY

The Engineering + Technology building structural system will be steel deck with concrete fill. Where hard-surface floors are planned, an acoustical underlayment will be necessary. The thickness and type of underlayment is as follows:

- Carpet tile with pad: no underlayment required. Pad underneath carpet must be minimum 1/4-inch thick.
- Vinyl: 2mm thick Pliteq RST, Ecore, or Acousticork or cushioned vinyl should be used. If a third party underlayment is used, the flooring manufacturer needs to review the assembly. See figure below:

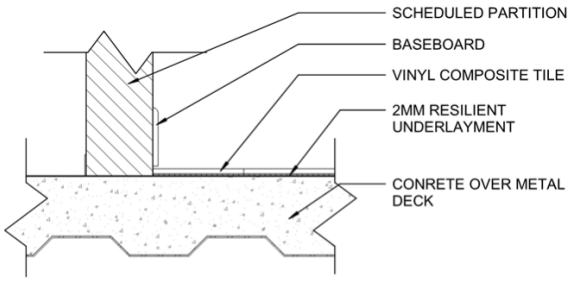


Figure 5.10.2.25 Floor Assembly with Vinyl Flooring and Underlayment

- Hardwood or Tile: 5mm thick Pliteq RST, Ecore, or Acousticork
- Polished Concrete: Will require a topping slab with underlayment if there is no suspended ceiling below (see figure below)

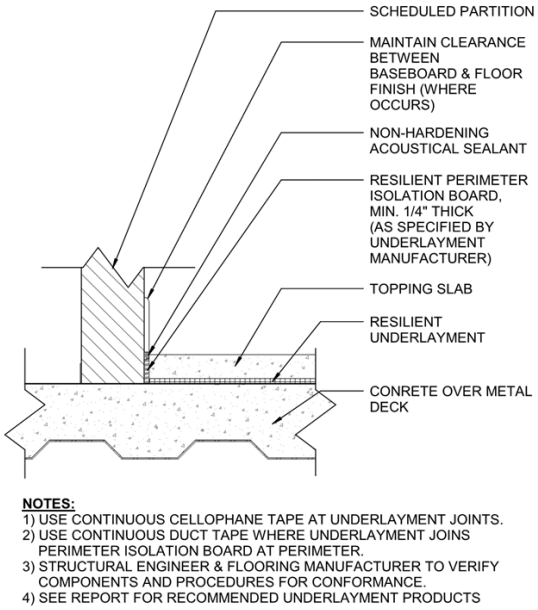


Figure 5.10.2.26 Floor Assembly with Topping Slab (for Polished Concrete)

To meet the STC 50 criterion between core learning spaces, a composite metal-concrete deck with a total thickness of at least 5-1/2″inches (measured from bottom of flute to top of concrete) is necessary.

2. HOUSING

The housing building will be either a Type IV or Type VA building.

A 1/4″ acoustical underlayment (Acoustimat Premium or similar) plus 1.25″ gypsum/lightweight concrete above the plywood subfloor is recommended. Additionally, two layers of gypsum board on Clark Dietrich RCSD resilient channels to the underside of the wood joist assembly is recommended. The floor-ceiling details must incorporate perimeter isolation as shown below.

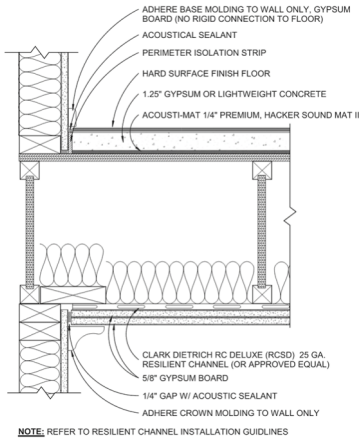


Figure 5.10.2.27 Floor-Ceiling Assembly (Between Residential Units)

Level 2 units above non-residential spaces should also include a minimum 2mm acoustical underlayment underneath the floor finish.

Where resilient underlayments are installed, perimeter isolation should be installed. The perimeter isolation should be no less than 1/4-inch thick and be approved by the manufacturer of the resilient underlayment. Perimeter isolation should be used at all penetrations in the floor and at the entire perimeter including the junction at the corridor. The resilient underlayment should be required below bathrooms tubs and showers.

Recessed lights or other fixtures in the gypsum board ceiling should be enclosed with gypsum board, consist of a double-wall (IC) fixture with a Tenmat recessed light cover, or be acoustically rated such as the dmfLighting DRDHNJD fixture.

Furred soffits should be carefully built to avoid shorting the resilient channels in the ceiling.

5.10.2.7 STAIRS

Stairs should be supported at the landings and stringers should not be connected to the wall shared with a housing unit, learning space, conference room, or other noise-sensitive space. Stair treads and landings should be concrete-filled.

5.10.2.8 LABORATORY TOOLS - VIBRATION

Equipment and instruments that are extremely sensitive to vibration should be identified during the early stages of design and located on slab-on-grade to minimize the transient structure-borne vibration. Provisions of an isolated slab should be considered. Pneumatic and piezoelectric isolations should be used, as required, on specified highly sensitive equipment. Installation and vibration requirements from the tool / instrument manufacturer must be met.

5.10.2.9 LAUNDRY ROOM

We recommend selecting "quiet" units in the Laundry room in the housing building. We recommend installing the washer/dryers on rubber mounts such as Mason BM mounts.

5.10.2.10 MULTIPURPOSE ROOM

We recommend STC 65 double stud wall between the multipurpose room and adjacent Level 1 rooms in the housing building. A gypsum hard lid ceiling on resilient clips such as Kinetics Isomax or Pac-International RSIC-1 recommended for this room to reduce noise to units above. An acoustical ceiling tile recommended below the gypsum lid. Alternate is to use surface mounted acoustical treatment on the underside of the gypsum lid.

5.10.2.11 TRASH CHUTES (HOUSING)

Isolating trash chutes are important for reducing noise to adjacent acoustically sensitive spaces. We suggest including the following information in the project documents:

- Avoid offsets in trash chute.
- The chutes should be supported with resilient mounts equal to Mason Industries ND, Kinetics AC-222E or equal.
- The chute stanchions at the basement should be isolated with resilient mounts equal to Mason Industries ND, Kinetics AC-222E or equal.
- The chutes should not come into contact with the trash compactor.
- The chutes shall be provided with a damping compound equal to Soundcoat GP-1, Kinetics Noise Control KDD or KDC, or approved equal.
- Trash chutes should be vibration-isolated as shown in image below.

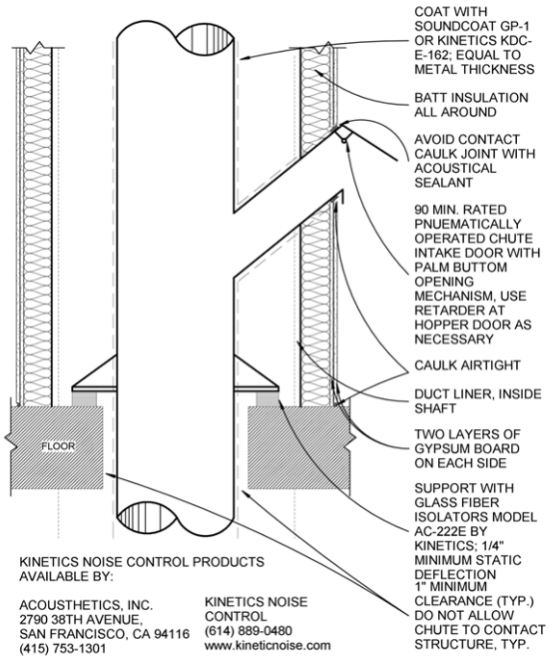


Figure 5.10.2.28 Trash Chute Acoustical Treatment

5.10.2.12 MISCELLANEOUS HOUSING RECOMMENDATIONS

The following recommendations are included as additional options for the design teams' consideration. These recommendations provide further sound isolation by acoustically treating noisy items within residences.

- Casework: Casework located on or adjacent to party (residential) walls or other sound-rated walls (e.g., at offices, conference rooms, classrooms) should incorporate slow-closing hinges, drawer slides, and felt pads at closure points to reduce impact noise.
- Garbage Disposals: "Quiet" garbage disposals, or units with internal vibration isolation, should be specified to reduce disposal noise transfer into sensitive spaces (e.g., residences, classrooms, conference rooms).

5.10.2.13 EXTERIOR SOUND ISOLATION

The project shall comply with the acoustical requirements of the criteria section above for environmental noise. In order to reduce distractions and allow for a more conducive learning environment, more stringent criteria are provided for specific rooms within the Engineering and Technology building in the criteria table above. The acoustical impact of environmental and all new and existing outdoor equipment (mechanical and electrical) noise on interior noise levels within rooms that may be impacted by the exterior noise should be quantified. Acoustical recommendations in the form of the equipment selections, building facade recommendations, noise control recommendations for the new and existing equipment should be provided so that exterior noise intrusion from all sources is limited to the values in the criteria table. Exterior windows must have an STC rating of at least 35, unless outdoor and indoor noise levels can be verified to justify a lower rating. An environmental noise study should be conducted to determine building facade recommendations for the Engineering + Technology and Housing buildings.

5.10.2.14 ROOM ACOUSTICS

To achieve the reverberation time criteria, acoustically absorptive finish materials are required. Typically, this is accomplished by specifying a sound absorbing ceiling (e.g., a suspended acoustical tile ceiling). Where a suspended acoustical tile ceiling is not planned, surface applied wall panels or ceiling panels can be specified (e.g., Autex, Kirei, Euromat). The minimum NRC rating of the selected acoustically absorptive material should be NRC 0.75 and most spaces require approximately 70 to 80% of the room's ceiling area (in terms of square feet) in absorptive materials to achieve the criteria. The acoustic ceiling tile products (e.g., Armstrong Ultima High NRC, Certainteed Performa, Armstrong Optima, USG Mars) can meet NRC 0.75.

If hard-surfaced flooring is planned at classrooms or other spaces (e.g., concrete, vinyl), then acoustically absorptive wall panels at 20% to 30% of the wall area will likely be needed (depending on total room volume and the space criteria). Reverberation time calculations should be performed when floor finish selections are made.

You may consider the addition of acoustically absorptive materials in corridors and circulation spaces to reduce noise build-up and disruption to adjacent classes/spaces. The necessity for this is dependent on whether there will be large numbers of people utilizing the corridors while class is in session. This can also be considered as a "Day 2" (post-construction) option. For budgeting purposes, assume that the required number of square feet is equal to the floor area (absorptive materials can be placed on the ceiling or upper wall areas).

Where it is important to utilize acoustically absorptive materials that can be easily cleaned, product options include Conwed Metro Rebound, Decoustics High Impact Resistant, Kinetics High Impact Hardside (PVC face).

5.10.2.15 MECHANICAL / HVAC NOISE AND VIBRATION

Note: These guidelines should be considered general in nature and it may be necessary to modify these guidelines to meet fire, structural, and/or other project requirements.

- Where possible, ducts should be sized to limit maximum air velocities as indicated in Table 4 below, to ensure that regenerated noise due to air movement does not cause the relevant design noise criteria to be exceeded.

Location	Noise Criterion - NC				
	45	40	35	30	25
Riser - rectangular duct	2500	2250	2000	1750	-
Main branch above suspended ceiling - rectangular duct	2500	1800	1550	1300	-
Exposed duct in occupied areas - rectangular duct	2000	1700	1450	1150	-
Duct within 10 to 20 feet of supply diffuser (S) / return grille (R)	900(S)/ 1000(R)	850(S)/ 950(R)	800(S) /900(R)	700(S) /800(R)	550(S) / 650(R)
Duct within 0 to 10 feet of supply diffuser (S)/return grille (R)	700(S)/ 800(R)	650(S)/ 750(R)	600(S) / 700(R)	500(S) / 600(R)	450(S) / 500(R)
Supply Diffuser - 'free' velocity	550	500	450	400	300
Return Grille - 'free' velocity	650	600	550	500	400
Open return duct above ceiling	850	750	650	-	-

Table 5.10.2.1 Design Guidelines for Maximum Air Velocities in Ducts in Feet Per Minute (FPM)

- Supply air diffusers and return air grilles should be selected with manufacturer's noise rating 5 NC points below the HVAC design noise criterion of the area served. Where possible, connections to diffusers should utilize lined flex-duct to reduce any noise generated by flow through individual takeoffs.
- Where possible, flex-duct should consist of a flexible vapor barrier jacket with a wire reinforced inner core containing 1 1/2-inch thick resilient glass fiber insulation faced with reinforced coasted glass fabric; conforming to NFPA Standard 90A. Regenerative noise due to air turbulence within the duct shall not exceed the following sound power levels for a 12-inch diameter duct with an air speed of 1,000 FPM.

	Sound Power Levels, dB re: 10-12 Watts, at each octave band center frequency, Hz				
	125	250	500	1k	2k
Max. Regenerative Noise, dB	30	31	30	22	20

- Acoustically acceptable flex-duct products include:
  - Genflex IL
  - Casco Silentflex
  - Cody West type NILS
  - Flexmaster Acoustical Flex
  - Casco Acoustical Flex Duct (SF-181M)
  - Thermaflex Acoustical Flexible Air Duct
- The need for duct silencers (sound traps) and internal duct lining should be evaluated as the design progresses. A sufficient length of ductwork should occur between the AC unit and the silencer.

Typically, there should be at least one and preferably two duct "diagonal(s)" of straight duct at either end of the attenuator prior to connections to equipment or fittings such as elbows. Silencers should be sized for a maximum pressure drop of 0.25 inches w.g.

- Fan coil units should not be located above any space with noise criteria of NC 30 or lower. Otherwise, a solid gypsum board ceiling or enclosure will be needed.
- Supply and return ductwork for the fan coil units should be internally lined with 1" duct lining. There should be 5 feet of acoustical flex duct at diffusers and grilles.
- Ducted indoor VRF or mini-split system should be designed to 0.5" or less static pressure.
- Where possible, volume control boxes should not be located within the acoustically sensitive rooms, and in general should be selected with a manufacturer's noise rating 10 NC points below that of the room served and the room over which the box is located for both discharge and radiated noise.
- A combination of acoustically lined ductwork and standard flexible duct will typically be required downstream of the VAV box to control discharge noise. If this cannot be accommodated, boxes may need to be oversized to reduce the overall noise levels generated.
- As far as is practical, HVAC systems serving acoustically sensitive occupied areas should be "self-balancing." Balancing dampers should not be located immediately upstream of diffusers. There should be a minimum of 5 feet of acoustical flexible duct or internally lined sheet metal duct between the damper and the connection to the diffuser. Dampers should not be incorporated into grilles, and diffuser blades should not be used for balancing of the air system.
- Recommendations for crosstalk control between occupied spaces should be provided as the design develops. It is acoustically preferred that return air systems be fully ducted where crosstalk is a concern. If this is not the case, crosstalk control may be required at air transfer openings.
- At open returns (i.e., where the return grille opens to the ceiling plenum) in enclosed, noise-sensitive rooms, duct boots should be used to reduce cross-talk. The duct boot opening should be pointed in the opposite direction from the entry door and not connected to the transfer grille; see image below.

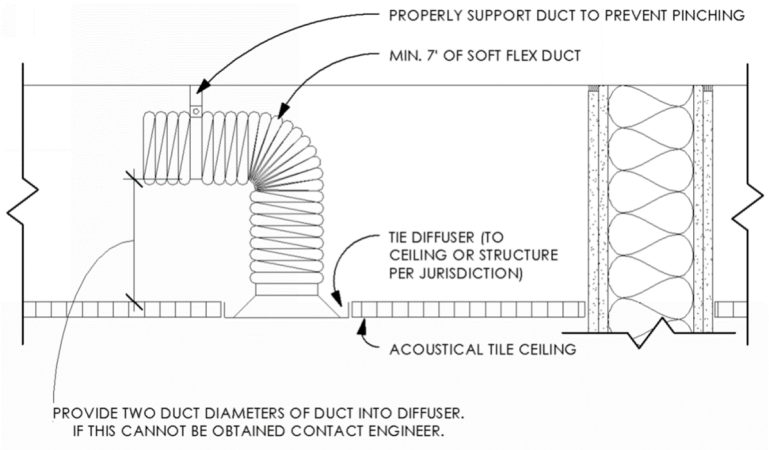


Figure 5.10.2.29 Duct Boot at Plenum Returns

- Return air transfer grilles at enclosed, noise-sensitive spaces (i.e., conference rooms, meeting rooms, and spaces with automatic door bottoms) should incorporate a transfer grille silencer, such as the Commercial Acoustics TS-4 or Ruskin GSV4 or use a lined transfer elbow (see image below). Transfer grilles should be located above doors and not located in sound-rated partitions (e.g., partitions separating adjacent classrooms, conference rooms, etc.) without doors.

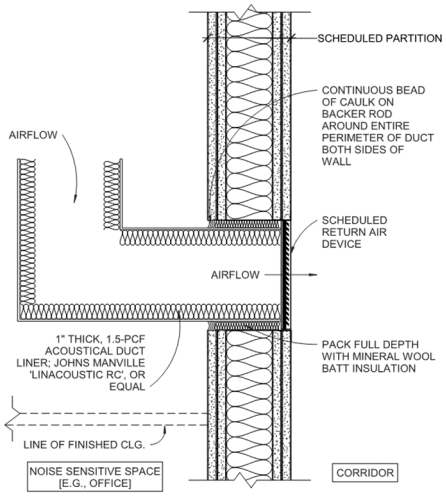


Figure 5.10.2.30 Return Air Transfer Duct Grille

- The following vibration isolation recommendations are based on ASHRAE guidelines.
  - All spring mounts should be unhoused and incorporate a neoprene pad or cup. We recommend that floor-mounted springs be Mason Type SLFH or equal; where necessary, Mason Z-1225 seismic snubbers or restrained springs equal to Mason Type SLR should be used.
  - Spring hangers should have a spring in series with neoprene and must allow for up to 30 degrees of misalignment; spring hangers should be Mason 30N or equal. Where equipment requires springs and is mounted on a roof curb, the roof curb should include integral springs (e.g., Mason RSC).
  - Double deflection neoprene should have a molded unit type neoprene element with a projecting bushing lining rode clearance hole. The neoprene element should be a minimum 1 3/4 inch (45 mm) thick with a steel retaining box encasing the neoprene mounting; neoprene should be Mason HD or equal.
  - Neoprene waffle pad should have a ribbed or waffled design, with a minimum thickness of 0.75-inch (19 mm). Pads should be selected for adequate durometer to handle loads and reduce over compression. We recommend that pads be Mason Super W or equal.
  - All connections to vibration isolated equipment should be flexible; this includes electrical service, plumbing/piping, and duct. Where possible, service loops should be provided. Duct connections should be canvas style, high pressure fluid lines should be twin sphere (e.g., Mason SFDEJ) or steel braided with a minimum length of 12 inches. Generator flue exhaust should utilize an open

pitch style steel braided hose with a length equal to four (4) times the diameter, with a minimum length of 12 inches and a maximum length of 24 inches.

- Suspended piping and pipe risers will be resiliently isolated from the building structure.
- Table 5 provides vibration isolation guidelines for various types of mechanical equipment; the structural engineer should confirm that the deflection of the support structure due to the weight of the mechanical equipment is no more than 8-10% of the specified vibration isolator deflection.

(On grade and above-grade installations with spans < 20ft and speeds > 500 RPM)		
Equipment Type	**Isolator Type**	**Static Deflection (inches)**
Fans (including AHU, ERU, RTU)	Spring & Neoprene	2
Horizontal Fan Coil Units / Heat Pumps	Spring & Neoprene	1
Vertical Fan Coil Units	Neoprene	0.3
Cooling Towers (above NC 40 spaces)	Spring & Neoprene	2
Cooling Towers (above residential or < NC 35 spaces)	Spring & Neoprene	3
Dry coolers, Air-Cooled Condenser, Air-Cooled Chillers, Air-Cooled Equipment	Spring & Neoprene	2
Mechanical & Domestic Pumps ≥ 5hp (Concrete Inertia Base)	Spring & Neoprene	2
Mechanical & Domestic Pumps less than 5hp	Double-deflection Neoprene	0.3
Condensate Pumps	Neoprene Waffle Pad	0.1
Heat Exchangers	Spring & Neoprene	1
Boilers	Neoprene	0.3
Hot Water Generators, Boilers (Skid Mounted)	Spring & Neoprene	1
Air Compressors	Spring & Neoprene	1
Generators	Spring & Neoprene	2
Transformers < 150 kVA	Double-deflection Neoprene	0.3
Transformers ≥ 150 kVA	Spring & Neoprene	1

Table 5.10.2.2 Vibration Isolation Guidelines

- Do not penetrate sound-rated partitions with flex duct.
- Where possible, rooftop units should not be located above acoustically sensitive spaces. Locate equipment to avoid increased noise levels within building.
- Ducts should be properly sealed to avoid leaks which generate duct whistling/airflow noise.
- Exhaust fans should be isolated with springs.
- Screen all rooftop and ground mounted equipment from street views.

5.10.2.16 PLUMBING NOISE AND VIBRATION

- Plumbing should not be routed through partitions at rooms designated as NC 30 or below. For NC 30 to 45 rooms, if piping is located above an acoustical (mineral tile) ceiling, piping should be wrapped

within mass-loaded vinyl or acoustical equivalent with a minimum surface weight of 2.0 psf over 1" thick fiberglass insulation.

- To reduce water-flow noise at sensitive spaces, all supply, hot-water heating, waste, HVAC, and drain piping must be vibration isolated when located adjacent to sensitive spaces.
  - For pipes one inch diameter or less, Acousto-Plumb or Hubbard Holdrite Silencer clamps should be used.
  - For waste pipes and supply pipes greater than one-inch diameter, isolate riser clamps with neoprene waffle pads and/or utilize the Armaflex or Trisolator isolators.

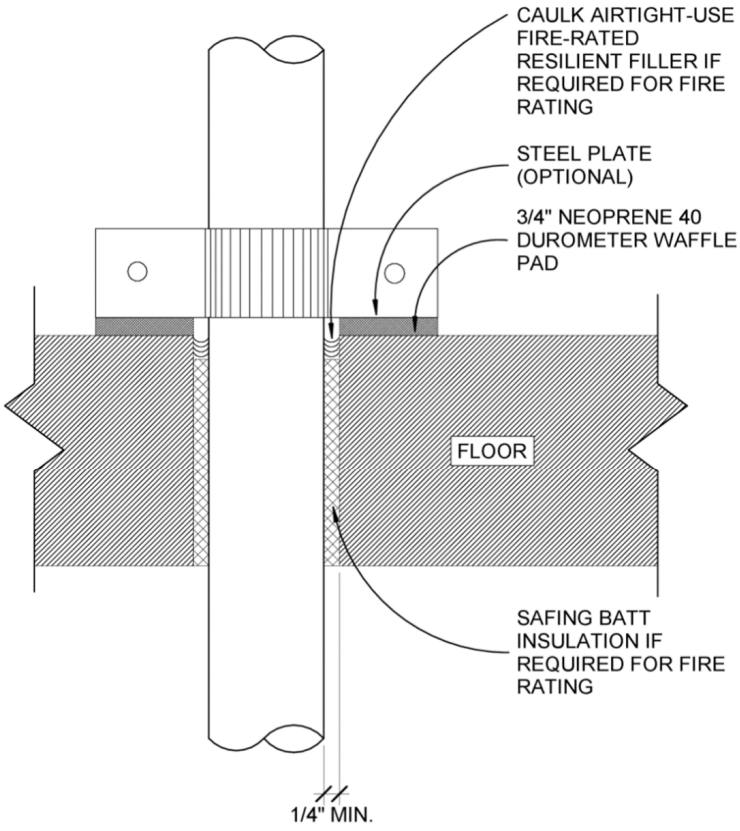


Figure 5.10.2.31 Plumbing Riser Isolation

- For trapeze piping supports, utilize combination neoprene/spring isolators at trapeze or other pipe hangers for the first three points of support or 50 feet (whichever is greater) after a pump or other vibration isolated equipment if the connection to the equipment is not flexible. See image below. For pipes greater than five-inches in diameter, flexible connections should be used at the outlet of the pump or other vibration-generating equipment.

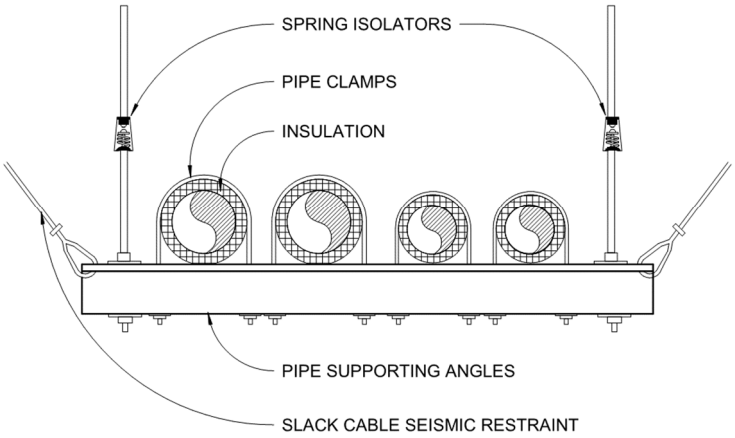


Figure 5.10.2.32 Trapeze Piping Acoustic Isolation

- Do not allow piping, pipe connectors, pipe hangers, or valves to directly touch the structure, studs, gypsum board, or other pipes.
- Support pipe as required by Uniform Plumbing Code.
- Plumbing penetrations should be sealed airtight with acoustical sealant.

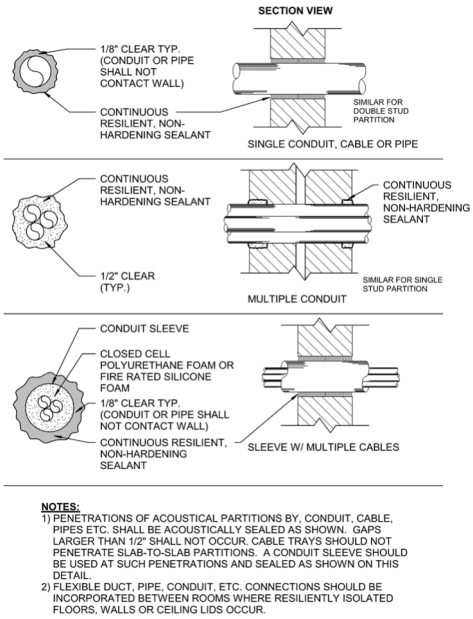


Figure 5.10.2.33 Partition Penetration Details

- Cast iron waste pipe is recommended; if ABS or other lightweight/thin wall material is planned, then pipe must be wrapped with Lowry's pipe wrap.
- Horizontal, cast-iron sanitary waste pipes above noise-sensitive spaces (e.g., bedrooms, living rooms) should be wrapped with pipe wrap such as Lowry's pipe wrap.

- Size supply piping for a maximum water-flow rate as shown in Table 6.

Pipe Diameter (in.)	Maximum Water Flow Velocity (fps)	Maximum flow rate (gpm)
1/2	4	3
3/4	4	6
1	4	10
1-1/4	4	15
1-1/2	4	25
2	4	42
2-1/2	5	74
3	6	138
4	7	277
6	8	720

Table 5.10.2.3 Maximum Plumbing Flow Rates

- Plumbing walls should be sized to permit installation of piping, clamps and brackets without contact with studs or wallboard. Do not locate supply or wastewater pipes closer than one inch from gypsum board in walls or ceilings of sensitive spaces (e.g., conference rooms, etc.). All stud bays containing plumbing piping adjacent to sensitive spaces should contain batt insulation.

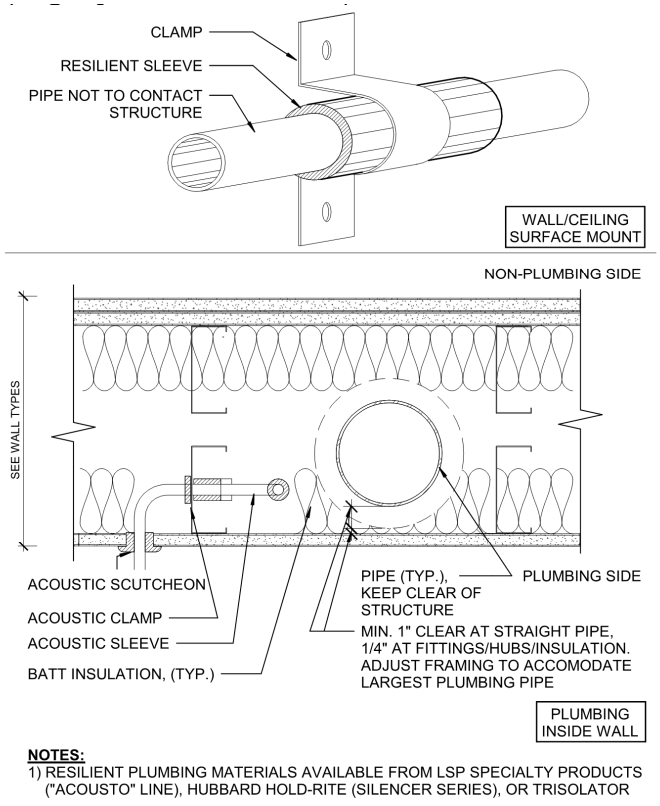


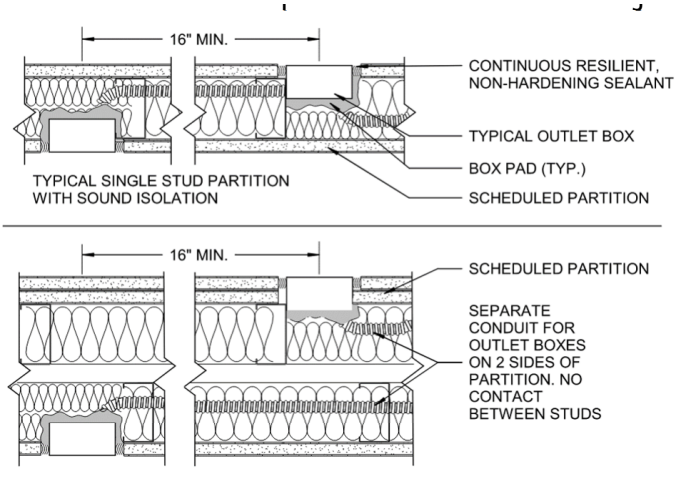
Figure 5.10.2.34 Plumbing Isolation at Noise-Sensitive Spaces

- Walls at sensitive spaces containing plumbing should have batt insulation in the stud or joist cavity containing the piping.
- Piping, clamps, or brackets must not bridge stud rows in double-stud walls.
- Holes cut in plates should be big enough to allow 1/2-inch clearance around pipe. It may be necessary to use a 6-inch, rather than 4-inch, plate to achieve this.

- Avoid placing rainwater leaders in sound-rated partitions at sensitive spaces.
- Stormwater and waste pipes should not be routed over or through noise-sensitive spaces and should be cast iron.
- Base-mounted pumps should be isolated with springs having a two-inch static deflection; inline pumps should be isolated with springs having one-inch static deflection.

5.10.2.17 ELECTRICAL NOISE AND VIBRATION

- Isolate all transformers as shown in Table 5. Transformers should be floor mounted.
- Transformers should not be mounted on framed walls that are adjacent to sensitive spaces.
- Place inverters at least 2 feet from any gypsum board framed wall (if associated with public/sensitive space) and vibration isolate similar as the transformers.
- Electrical connections to HVAC units, motors or other rotating equipment should be made with flexible conduit.
- In double-stud partitions, conduit should not bridge stud rows. Conduit should be routed only in the studs on the side of the unit served and should not be placed in the gap between stud rows.
- Outlet boxes on opposite sides of sound-rated partitions should be separated by at least 16 inches and provide backing equivalent to Lowry's outlet box pads. See image below. Ring-and-string for low voltage cabling is not allowed in sound-rated partitions. A traditional junction box should be used.



TYPICAL DOUBLE STUD PARTITION
WITH SOUND ISOLATION (SIMILAR FOR STAGGERED STUDS)

NOTES:
1) PLACE OUTLET BOXES IN SEPARATE STUD SPACES
2) BACK-TO-BACK OUTLETS NOT RECOMMENDED.
3) PLUG ALL UNUSED KNOCK-OUTS IN OUTLET BOXES WITH KNOCK-OUT CAPS.
4) PROVIDE BACKING EQUIVALENT TO "LOWRY'S" OUTLET BOX PADS (HARRY A. LOWRY & ASSOCIATES INC. (800) 225-8231)
5) DEPTH OF OUTLET BOX MUST BE COMPATIBLE WITH STUD SIZE IN ORDER TO ACCOMMODATE BOX PAD.
6) ACOUSTICAL BOX PAD REQUIREMENT APPLIES TO ALL PARTITIONS WITH UNFACED BATT INSULATION (MIN 1.5 PCF DENSITY).
7) USE OF MUD RINGS WITHOUT ELECTRICAL BOXES SHOULD NOT BE ALLOWED.

APPLIES TO POWER, PHONE, COMMUNICATIONS, ETC.

Figure 5.10.2.35 Junction Box Treatment

- Recessed panels, etc. should be treated as shown in image below.

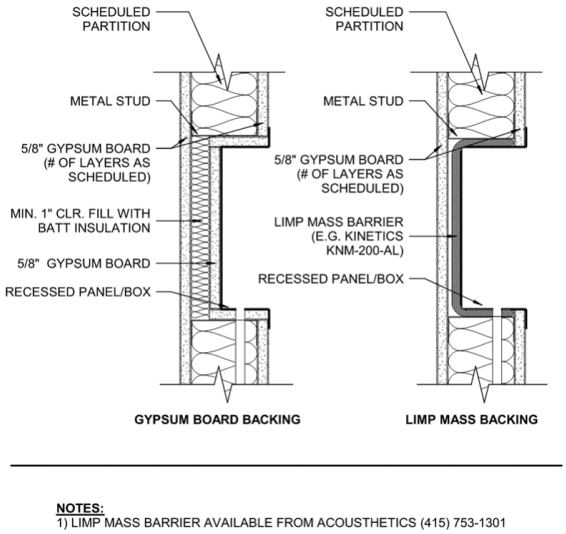


Figure 5.10.2.36 Recessed Panels and Fixtures

- Do not allow electrical conduit or boxes to come into contact with plumbing.
- Cable tray and conduit penetrations in partitions should be packed tightly with heavy density putty once the cables are pulled.

5.10.2.18 ELEVATOR NOISE AND VIBRATION

Elevator machine rooms shall not be located adjacent to rooms with an NC criterion of 40 or lower. If this cannot be avoided, elevator machine rooms should be located on grade level and STC 60 minimum walls and floor/ceiling assemblies shall be constructed around the rooms so that elevator machine room noise is not audible in adjacent rooms with an NC 35 or lower background noise level criterion. If the elevator machine room cannot be located on grade and is located above a room with an NC 40 or lower background noise criterion, the elevator machine room should be equipped with a 4-inch thick concrete floating floor to provide airborne sound isolation to the noise sensitive room below. The concrete floating floor should consist of 4-inch normal weight concrete supported by neoprene mounts with a 2-inch minimum airspace between the structural slab and floated concrete slab.

The power unit (motor/pump/tank) shall be vibration isolated from the building structure via seismically restrained neoprene mounts (e.g., Mason BR) that provide 0.35-inch minimum static deflection under the operational load of the power unit.

Isolate hydraulic pipes from the building structure via neoprene lined clamps from the tank to the piston base. Hydraulic pipes shall be isolated from walls and floors at penetrations via foam neoprene pipe insulation. Pipe should not come in rigid contact with the building structure. Provide an oil line muffler in the oil line near the pump. Provide Isolation Couplings in the oil line near the pump unit and near the jack unit. Electrical conduit and raceway connections made to the power unit shall be resiliently mounted to building structure via neoprene pads or mounts so as to not transmit airborne or structure-borne noise to adjacent spaces.

5.10.3 APPENDIX A: DEFINITION OF TERMS

ASHRAE: American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.; Chapter 49. Noise and Vibration Control.

Ceiling Attenuation Class (CAC): CAC rates a ceiling panel's noise reduction performance; higher values correspond to increased noise reduction.

Impact Insulation Class (IIC): A single-number laboratory rating which quantifies the property of a floor/ceiling construction to reduce footfall-generated noise. Increasing IIC values correspond to improved impact insulation.

Noise Criteria (NC): Noise Criteria ratings approximate the human perception of "noisiness" within buildings. The NC rating is based on 8 octave band sound pressure level measurements in which building machinery normally produce sound which can be annoying to the occupants. These eight measurements are compared with a family of curves. The highest curve under which all the data fall is the rating. This rating is not applicable to pure tones where a penalty must be added since they are perceived to be more "noisy." High NC ratings are louder and an increase by 10 points approximates a doubling of perceived loudness.

Noise Reduction Coefficient (NRC): A measure of the acoustical absorption performance of a material, calculated by averaging its sound absorption coefficients at 250, 500, 1000 and 2000 Hz, expressed to the nearest integral multiple of 0.05.

Reverberation Time (RT60): The time it takes for sound to decay 60 dB in a room. Large rooms with hard surfaces, such as concert halls, have reverberation times around 2 seconds. Smaller rooms with sound absorbing surfaces have shorter reverberation times. Music sounds richer in rooms with long reverberation times, but speech may be difficult to understand. Speech is more intelligible in rooms with shorter reverberation times, but music may sound dry.

Mid-frequency Reverberation Time (Tmf): The average reverberation times in the 500 Hz, 1 kHz and 2 kHz octave bands; it is an appropriate metric for speech communication.

Sound Transmission Class (STC): A single-figure laboratory rating used to compare walls, floor-ceiling assemblies and doors for their sound insulating properties with respect to reducing airborne noise.

A-Weighted Sound Level: A term for the A-Weighted sound pressure level. The sound level is obtained by use of a standard sound level meter and is expressed in decibels. Sometimes the unit of sound level is written as dB(A).

L_{eq}: The time-weighted average noise level during the stated measurement period.

5.10.4 APPENDIX B: REFERENCE STANDARDS

2019 California Green Building Code - The CalGreen building code places limits on interior noise levels of non-residential buildings due to exterior noise that exceeds an hourly A-weighted level of 65 dBA during any hour of operation. If a noise sensitive space requires a lower background noise level than 50 dBA, then additional facade noise control measures shall be taken to achieve the required interior noise levels.

California State University (CSU) Guidelines and Standards. There are no binding acoustical criteria in these standards.

ASTM C 423 "Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method"

ASTM E 90 "Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements"

ASTM E 336 "Standard Test Method for Measurement of Airborne Sound Attenuation between Rooms in Buildings"

ASTM E 413 "Classification for Rating Sound Insulation"

ASTM E1007 "Test Method for Field Measurement of Tapping Machine Impact"

ANSI Standard S12.60-2010 – Performance Criteria, Design Requirements and Guidelines for Schools, Part 1: Permanent Schools.

LEED v4.1 for New Construction – Indoor Environmental Quality Credit: Acoustic Performance

ASHRAE (2019) – Chapter 49 Noise and Vibration Control

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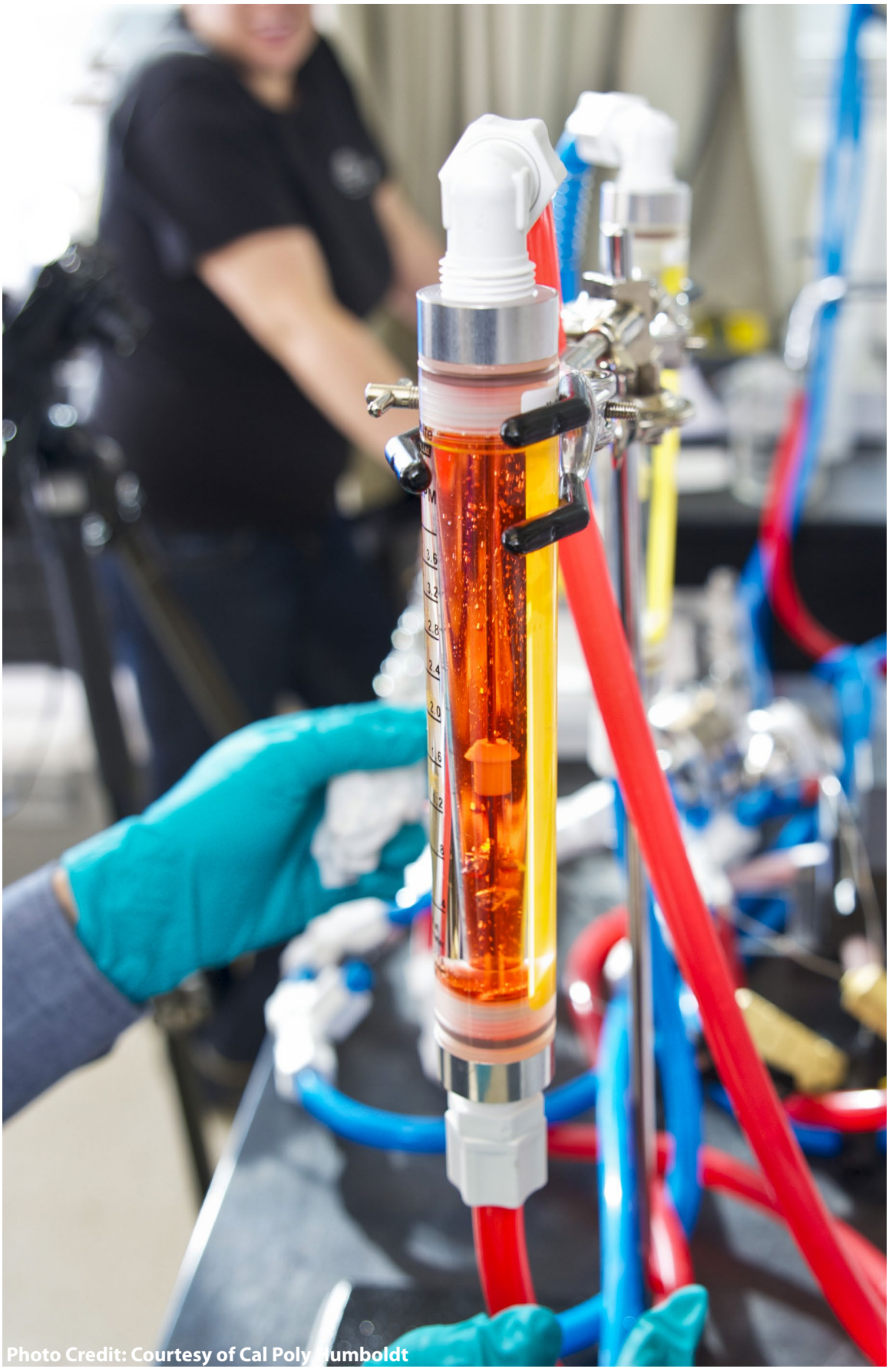

Photo Credit: Courtesy of Cal Poly Humboldt

06
CODE ANALYSIS

6.1 PRELIMINARY BUILDING CODE ANALYSIS

The following section provides a code analysis for two separate buildings, the "Engineering + Technology Building (1A)" which will be an academic building and the separate "Student Housing (1B)" building.

The following preliminary code analysis is based on the California Code of Regulations, Title 24, Part 2 - the 2022 California Building Code (CBC) Volumes 1 and 2. During Schematic Design, a comprehensive code analysis will be developed. The following analysis may vary with subsequent editions of the building code. Code edition is determined at the time of submittal of construction plans, this review is based on the 2022 code.

6.1.1 ENGINEERING + TECHNOLOGY BUILDING (1A)

Type of Construction is a choice by the designer/owner. Type I-B construction has been selected as the best feasible construction type for meeting program requirements.

Building Description:	The building is four stories tall and approximately 105,000 GSF total. The occupied floors are composed predominately of teaching labs, offices and maker spaces with a large lecture hall at grade on Level 2. The building contains primarily B Occupancies with some A-3, a small amount of A-2, and a small amount of S-2.	
Building Code:	2022 California Building Code	
Building Area:	105,000 GSF	
Occupancy:	Mixed A-3 and B with minor S-2	
Construction Type:	Type I-B	
Allowable Area: (Table 506.2)	Unlimited	
Maximum Number of Stories: (Table 504.4)	Allowed – Proposed –	12 stories at A2 4 stories at A3 6 stories at B 6 stories at S2 4 stories
Maximum Building Height: (Table 504.3)	Allowable B = 180 feet, Allowable A - 160 feet Proposed - 68' (Level 1 = 0'; Level 2 = 18'; Level 3 = 33', Level 4 = 48', Roof = 63' , Parapet = 68')	

High-Rise Classification:	Non high-rise
Highest Occupied Floor: (Section 403)	Allowed - 75' Proposed - 48' (Level 4)
Chemical Quantities and Control Areas: (Section 307.1(1))	The Maximum Allowable Quantities (MAQ's) of hazardous materials will be in accordance with the CBC and CFC for indoor control areas. The number of control areas per floor will be determined in Schematic Design following an analysis of the chemicals used.
Fire Sprinkler System:	The building is required to be provided with automatic fire sprinklers (AFSS) throughout the building.
Occupancy Separation:	No separation is required between occupancies per CBC 508.3.3. Building is to being considered as A-3 (most restrictive).
Elevator Lobby:	Not required per CBC Section 3006.3-5. The elevators are not being used as a means of egress.
Opening at Level 2:	There is currently an opening at Level 2 floor connector between the North and South wings of the building. This is permitted as long as the opening is between no greater than 2 stories.
Outdoor Terrace	The Terrace will most likely be used for public assembly (gathering of people) for different types of assembly, including fund raising. These activities may involve serving alcohol thus the occupancy would be an A-2 instead of an A-3, this is not a significant change for egress except for possible occupant load calculation. It is recommended that the design consider the most restrictive occupancy use and occupant load calculation. Where the occupant load of the A spaces exceeds 100 and below 300 a direct exit may be required (see CBC 1029.3)
Mass Notification	CFC 917 notes that as mass notification risk analysis be conducted prior to construction of buildings with an occupant load of 1,000 or more. The anticipated occupant load of this building may likely exceed 1,000 occupants, triggering the need for a risk analysis to be performed.
High Fire Severity Zones	CalFire online maps for location of High Fire Severity Zones were reviewed as part of this analysis. It appears that the campus is within a Local Responsibility Area High or Moderate severity zone, thus CBC Wildland Urban Interface (WUI) requirements may apply. This should be verified with the Arcata Fire Department.

ERRCS	Emergency Responder Radio Coverage (ERRCS) is required, however depending on the construction, a system may or not be needed. We recommend that the infrastructure for a system be planned for and testing conducted upon completion of the major elements of construction.
Construction Type	The construction type of IB has been chosen as the least allowable type of construction allowed. Typically a 4-story building could use Type IIB construction as a lesser and more economical construction type, however due to the A (assembly) occupancies located on the 4th floor the Type IIB is not allowed as A occupancies are limited to 3 stories for Type IIB construction.
Fire Separation Distance	The minimum fire separation distance for this building to an imaginary property line is 30 feet without having to provide any rating to the exterior walls, unless required to be rated based on the type of construction. Thus, this building must be at least 60 feet away from the E&T Student Housing and 40 feet from the adjacent existing building (assumed to be Type IIB) to not be rated per CBC 705.5.

Fire-Resistance Rating for Building Elements: (per Table 601)	Primary Structural Frame	2-hrs
	Bearing Walls Exterior	2-hrs
	Bearing Walls Interior	2-hrs
	Non-bearing walls/partitions Interior	**
	Non-bearing walls/partitions Interior	0-hr
	Floor construction	2-hrs
	Roof Construction	1-hr

** This will need to be reviewed against the final design

6.1.2 STUDENT HOUSING (1B)

Type of Construction is a choice by the designer/owner. Type V-A construction has been used here in consultation with the AOR as the best feasible choice for meeting program requirements.

Building Description:	The building is four stories tall and approximately 45,600 GSF total. The occupied floors are composed predominately of double bed dormitory units, with some minor office space, multipurpose, and laundry on Level 1. The building contains primarily R-2 Occupancies with some A-3 (at Level 1 only), and a small amount of S-2.

Building Code:	2022 California Building Code	
Building Area:	46,500 GSF	
Occupancy:	R-2 (primary) and A-3 and S-2	
Construction Type:	Type V-A	
Allowable Area: (Table 506.2)	36,000 sf allowed per floor	
Maximum Number of Stories: (Table 504.4)	Allowed – Proposed –	4 stories at R2 4 stories
Maximum Building Height: (Table 504.3)	Allowable R2 = 70 feet Proposed - 68' (Level 1 = 0' ; Level 2 = 18'-6" ; Level 3 = 30'-6", Level 4 = 42'-6"', Roof = 54'-6" , Parapet = 59'-6')	
High-Rise Classification: Highest Occupied Floor: (Section 403)	Non high-rise Allowed - 75' Proposed - 42'-6" (Level 4)	
Chemical Quantities and Control Areas: (Section 307.1(1))	The Maximum Allowable Quantities (MAQ's) of hazardous materials will be in accordance with the CBC and CFC for indoor control areas. The number of control areas per floor will be determined in Schematic Design following an analysis of the chemicals used.	
Fire Sprinkler System:	The minimum type of construction of VA is based on the installation of an NFPA-13 standard automatic fire sprinkler system (AFSS). With the installation of an NFPA-13 AFSS any of the higher types of construction may also be used. For R-2 occupancies an NFPA-13R (residential) system may be allowed, but then the minimum type of construction must be at least Type IV-C or higher.	
Occupancy Separation:	For all of the R-2 areas, the building will also require 1-hour fire-resistance rated corridors per CBC 1020.1. The corridor walls are constructed as a fire-partition but California does not allow only fire damper in penetrations of the corridor partition, they must be fire/ smoke dampers. The R-2 areas shall also be separated from the non-R2	

	areas by 1-hour fire-resistance construction. No separation is required between the remaining occupancies per CBC 508.3.3.
Elevator Lobby:	Not required per CBC Section 3006.3-5. The elevators are not being used as a means of egress.
Laundry:	The communal laundry area and type of laundry machine should also be addressed. Per the CBC where fuel-fired (natural gas or propane) appliance are used, CO detection must be provided for the space and adjacent space where the appliances are located. However, when adopting this regulation, the legislature exempted all state owned buildings. We recommend that if fuel-fired appliances are used, CO detection should be provided.
Mass Notification	CFC 917 notes that as mass notification risk analysis be conducted prior to construction of buildings with an occupant load of 1,000 or more. The anticipated occupant load of this building should not exceed 1,000 occupants, however other planned project on this campus probably will exceed this number, thus a risk analysis may be required. The risk analysis should be campus wide. If it is required for other buildings, the University may opt to include it for this project also. University should be made aware of this requirement.
High Fire Severity Zones	CalFire online maps for location of High Fire Severity Zones were reviewed as part of this analysis. It appears that the campus is within a Local Responsibility Area High or Moderate severity zone, thus CBC Wildland Urban Interface (WUI) requirements may apply. This should be verified with the Arcata Fire Department.
ERRCS	Emergency Responder Radio Coverage (ERRCS) is required, however depending on the construction, a system may or not be needed. We recommend that the infrastructure for a system be planned for and testing conducted upon completion of the major elements of construction.
Fire Separation Distance	The minimum fire separation distance for this building to an imaginary property line is 30 feet without having to provide any rating to the exterior walls, unless required to be rated based on the type of construction. Thus this building must be at least 60 feet away from the E&T building to not be rated per CBC 705.5.

Fire-Resistance Rating	Primary Structural Frame	1-hrs
for Building Elements:	Bearing Walls Exterior	1-hrs
(per Table 601)	Bearing Walls Interior	1-hrs
	Non-bearing walls/partitions Exterior	**
	Non-bearing walls/partitions Interior	0-hr
	Floor construction	1-hrs
	Roof Construction	1-hr

** This will need to be reviewed against the final design

6.2 APPLICABLE CODES AND STANDARDS

Applicable State Codes (latest edition)

- Title 24, Part 1 - California Building Standards Administrative Code
- Title 24, Part 2 - California Building Code (CBC)
- Title 24, Part 3 - California Electrical Code (CEC)
- Title 24, Part 4 - California Mechanical Code (CMC)
- Title 24, Part 5 - California Plumbing Code (CPC)
- Title 24, Part 6 - California Energy Code (Title 24)
- Title 24, Part 9 - California Fire Code (CFC)
- Title 24, Part 11 - California Green Building Standards Code (CALGreen)
- Title 24, Part 12 - California Referenced Standards Code
- California Code of Regulations; Title 8, Title 19

Applicable National Codes (latest adopted edition)

- ADA - Americans with Disabilities Act Accessibility Guidelines
- IESI - Illuminating Engineering Society of North America
- NEMA - National Electrical Manufacturers Association
- National Fire Protection Association (NFPA) Guidelines and Standards

Guidelines and Standards (latest adopted edition)

- ACGIH Industrial Ventilation - A Manual of Recommended Practice
- ANSI Z358.1 Emergency Eyewash and Shower Equipment
- ANSI/AIHA Z9.5 - Laboratory Ventilation Standard
- ASHRAE Standard 62.1 Ventilation for Acceptable Indoor Air Quality
- ASHRAE Standard 110 - Method of Testing Performance of Laboratory Fume Hoods
- LEED (Leadership in Energy and Environmental Design)
- OSHA (Occupational Safety and Health Administration Standard) 29 CFR 1926 and 29 CFR 1910

Photo Credit: Courtesy of Cal Poly Humboldt

07
APPENDIX

7.1 TELECOMMUNICATIONS CORRESPONDENCE

Gmail

Kassidy Banducci <kdh30@humboldt.edu>

E+T Building Telecom

4 messages

Erik E Mendes <Erik.Mendes@humboldt.edu> Tue, Jul 19, 2022 at 5:08 PM
To: Kassidy Banducci <Kassidy.Banducci@humboldt.edu>
Cc: Duncan Hughes <Duncan.Hughes@humboldt.edu>

Hi Kassidy,

Thanks for including us in the E+T conversation. Does Lloyd, the telco designer (?), have access to the TIPS document or do we need to email it to him?

Also, I'm curious what other schools are doing for Ethernet outlets per student / dorm room in new builds. Do you know off-hand or have examples of schools doing new builds? I think I heard Santa Cruz on the call.

If you have any questions or concerns, please contact me.

Erik Mendes

Information Technology Consultant

CAL POLY HUMBOLDT | HOUSING & RESIDENCE LIFE

355 Granite Ave, Arcata, CA 95521
Office: (707) 826-5529 | housing.humboldt.edu

Duncan M Hughes <Duncan.Hughes@humboldt.edu> Wed, Jul 20, 2022 at 7:49 AM
To: Erik E Mendes <Erik.Mendes@humboldt.edu>
Cc: Kassidy Banducci <Kassidy.Banducci@humboldt.edu>

Good morning,

Here is a link to the new 5th edition of TIPS
https://www.calstate.edu/csu-system/doing-business-with-the-csu/capital-planning-design-construction/Documents/TIP-Standards.pdf

And from section 2.7.3.6. Residence Halls of the document:
Rather than "common" outlets shared by all users in a given room, every residence hall student should have his/her own voice, data, and video telecommunications outlet.

My interpretation of this wording would be that 2 telecommunications outlets should be provided per bed.

Thanks
[Quoted text hidden]
--
Duncan Hughes
Telecommunications and Network Services (TNS) Lead
Information Technology Services
Cal Poly Humboldt
1 Harpst Street, Arcata, CA 95521 (707) 826-3815
Submit a support ticket or check systems status at:

Cal Poly Humboldt ITS
Pronouns (he/him/his)

Erik E Mendes <Erik.Mendes@humboldt.edu> Wed, Jul 20, 2022 at 3:32 PM
To: Duncan M Hughes <Duncan.Hughes@humboldt.edu>
Cc: Kassidy Banducci <Kassidy.Banducci@humboldt.edu>

Maybe we can get away with a single Ethernet and single phone line per wallplate. 99% of students use wi-fi and in the very rare case someone needs a second Ethernet outlet, that phone line may be repurposed as one. We would need to put in the infrastructure to support phone service for any offices and/or RA rooms that require an on campus phone extension, so perhaps the rooms can be wired up to that... I definitely don't want coax. That has been a pain and leaves the door open for students to get Suddenlink services like internet/wifi and TV

If you have any questions or concerns, please contact me.

Erik Mendes

Information Technology Consultant

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Office: (707) 826-5529 | housing.humboldt.edu

[Quoted text hidden]

Duncan M Hughes <Duncan.Hughes@humboldt.edu> Wed, Jul 20, 2022 at 3:37 PM
To: Erik E Mendes <Erik.Mendes@humboldt.edu>
Cc: Kassidy Banducci <Kassidy.Banducci@humboldt.edu>

Yeah, I agree. Two Ethernet jacks per bed that can be used for data or phone. I don't see any need for coax either.
[Quoted text hidden]

7.2 PREMIER LECTURE HALL CASE STUDIES

Lecture Spaces/Classrooms in the Round

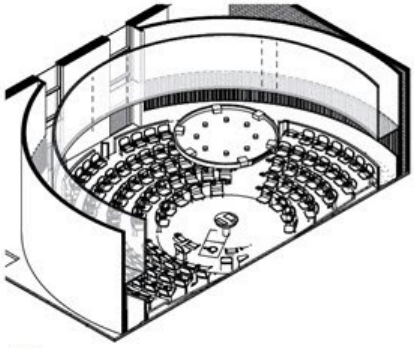
Small Arena (ILCB 205)

Small Arena

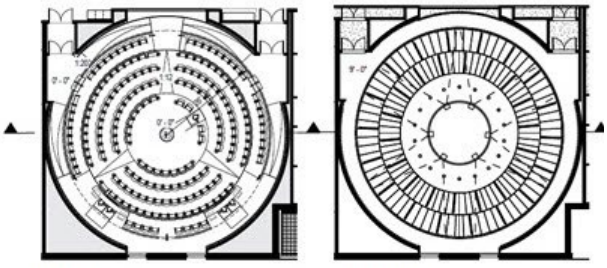
The small arena is five rows deep and seats 204 students.

SMALL ARENA

SEAT COUNT: 204 total (199 seats, 5 wheelchair spaces)
PODIUM: Round podium in center of room, 270 degree rotation
PROJECTION: 360 drum projection surface (6 projectors)
CEILING: Lower soffit at perimeter, ceiling above classroom at 20'-0"

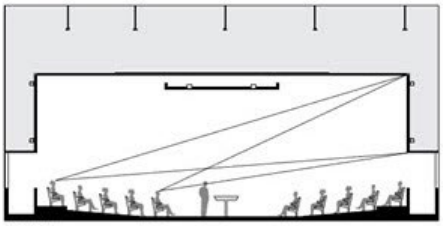


AXON



FLOOR PLAN

CEILING PLAN



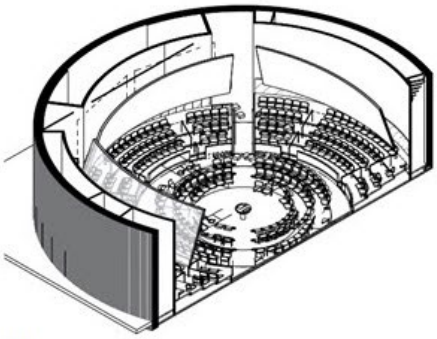
SECTION

Medium Arena

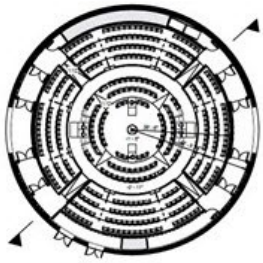
The medium arena is seven rows deep and seats 356 students.

MEDIUM ARENA

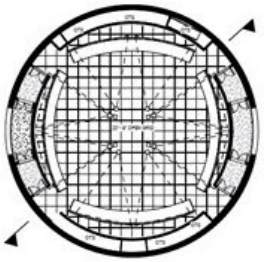
SEAT COUNT: 356 total (350 seats, 6 wheelchair spaces)
PODIUM: Round podium in center of room, 270 degree rotation
PROJECTION: Four 'floating object' screens (8 projectors)
CEILING: Lower soffit in entry vestibules, open to structure in classroom



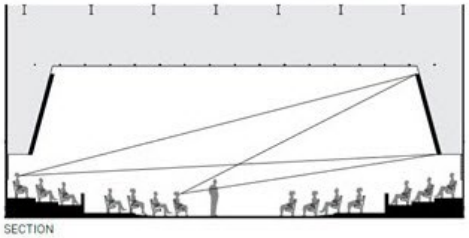
AXON



FLOOR PLAN



CEILING PLAN



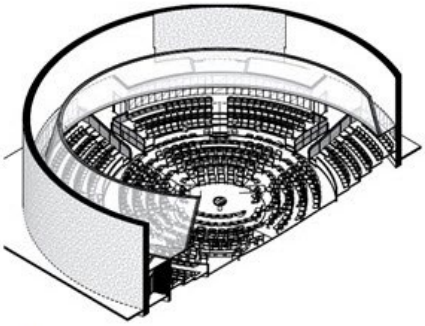
SECTION

Large Arena

The large arena is ten rows deep and seats 605 students.

LARGE ARENA

SEAT COUNT: 605 total (598 seats, 7 wheelchair spaces)
PODIUM: Round podium in center of room, 270 degree rotation
PROJECTION: 360 drum projection surface (8 projectors)
CEILING: Lower soffit at perimeter, open grid ceiling above drum (open to structure above)



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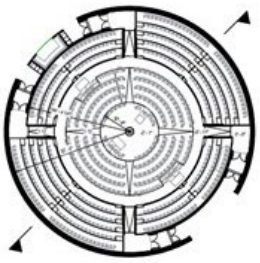
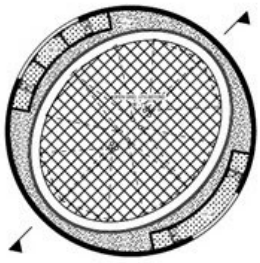


FLOOR PLAN



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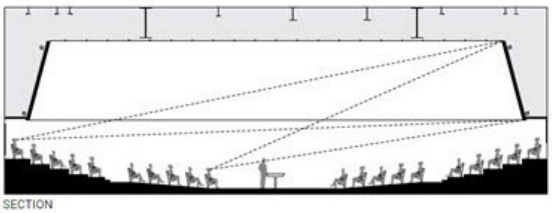


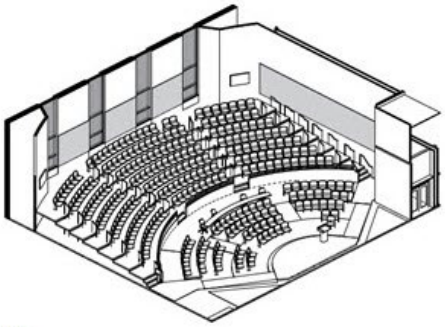
SECTION

Fan Lecture Hall

This traditional lecture space seats 293 students.

FAN LECTURE HALL

SEAT COUNT: 293 total (288 seats, 5 wheelchair spaces)
PODIUM: Located on the teaching platform
PROJECTION: 3 projection screens at teaching wall
CEILING: Acoustic ceiling at 25'-0"



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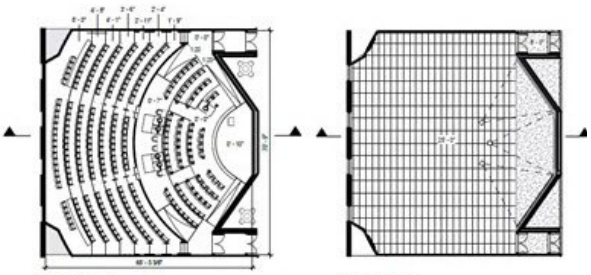
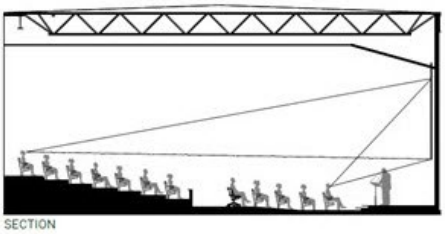


FLOOR PLAN

CEILING PLAN



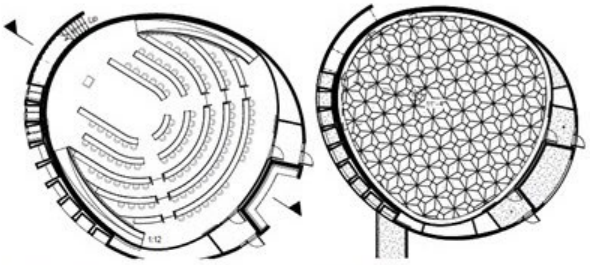
SECTION

Egg Classroom

The egg classroom seats 104 students.

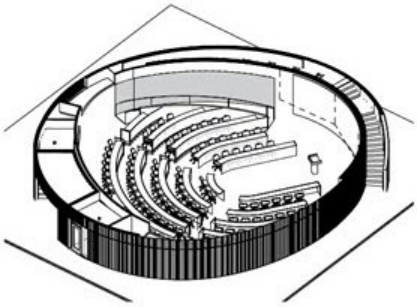
EGG CLASSROOM

SEAT COUNT: 104 total (Wheelchair access to back and front rows) PODIUM: Located at front of room
PROJECTION: 3 projecton screens at teaching wall
CEILING: 11'-6" acoustical, patterned ceiling

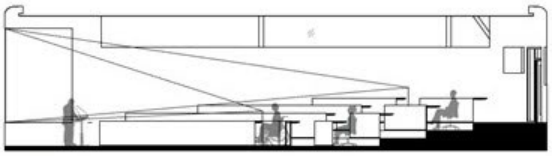


FLOOR PLAN

CEILING PLAN



AXON



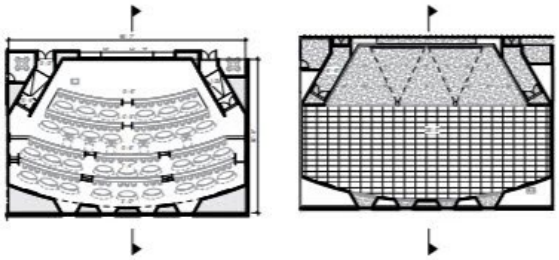
SECTION

Large Tiered Collab

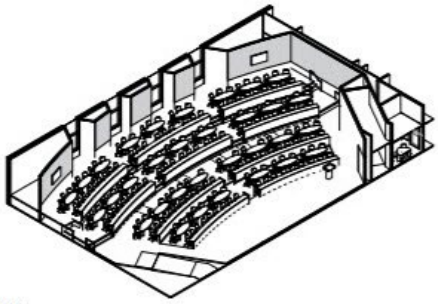
The Large Tiered Collab seats 192 students.

LARGE TIERED COLLAB

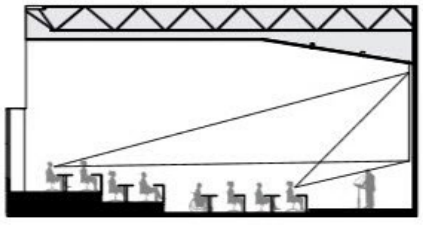
SEAT COUNT: 192 total (Wheelchair access to second tier)
PODIUM: Located on the teaching platform
PROJECTION: 2 projection screens at teaching wall
CEILING: Acoustic ceiling at 25'-0"



FLOOR PLAN CEILING PLAN



AXON

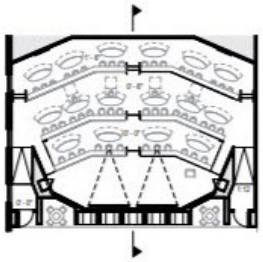


Small Tiered Collab

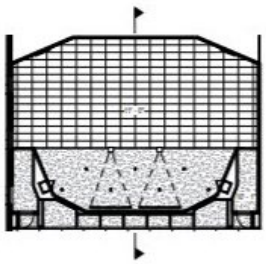
The Small Tiered Collab seats 96 students.

SMALL TIERED COLLAB

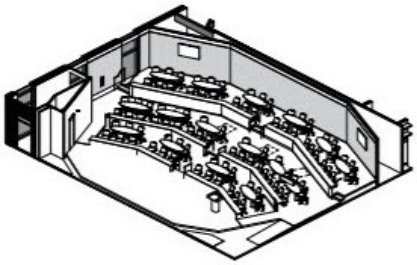
SEAT COUNT: 96 total (Wheelchair access to second tier)
PODIUM: Located on the teaching platform
PROJECTION: 2 projection screens at teaching wall
CEILING: Acoustic ceiling at 11'-6"



FLOOR PLAN



CEILING PLAN



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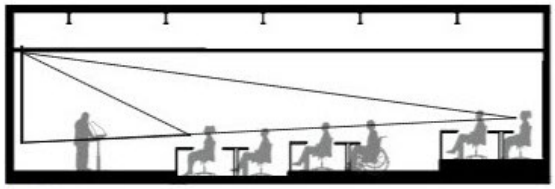


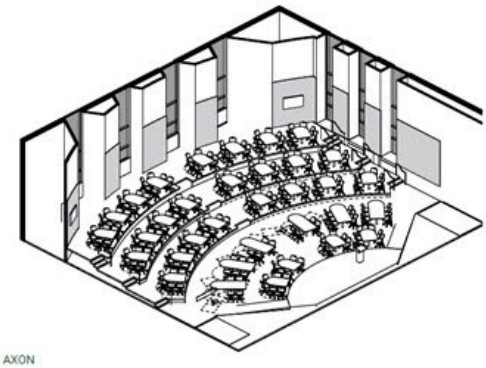
SECTION

Tiered Learning Studio

The Tiered Learning Studio seats 216 students.

TIERED LEARNING STUDIO

SEAT COUNT: 216 total (Wheelchair access to first two rows of tables)
PODIUM: Located on the teaching platform
PROJECTION: 3 projection screens at teaching wall
CEILING: Acoustic ceiling at 25'-0"



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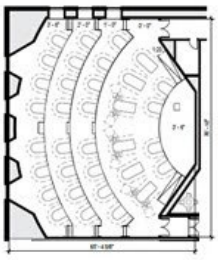
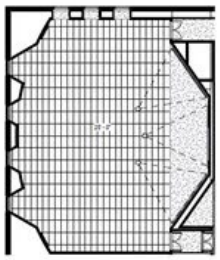


FLOOR PLAN



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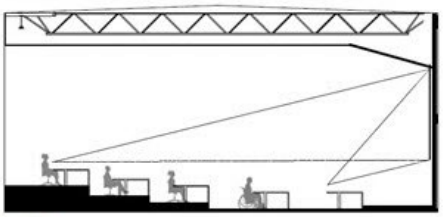


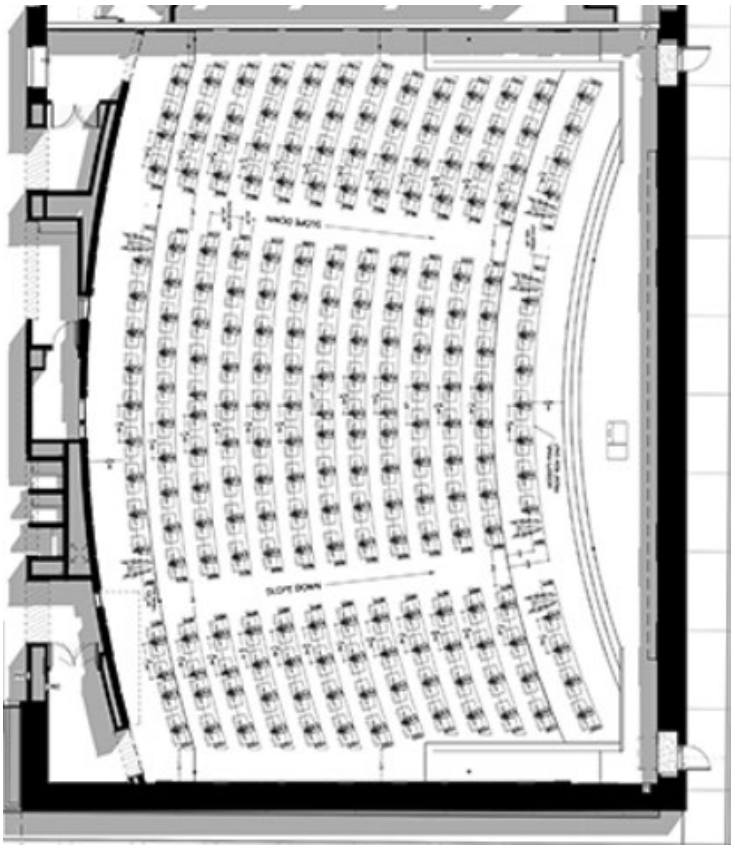
SECTION

7.2 PREMIERE LECTURE HALL CASE STUDIES, CONTINUED

Lecture Spaces - Sloped Floor Clamshell - Large

Description:
This 426 seat classroom features a continuous low grade sloping floor that is optimized for viewing angles and universal access to the classroom while eliminating handrails.

Swivel chairs that are yoked to the fixed tables provide ample space for laptops, notebooks, etc.



Lecture Spaces - Sloped Floor Clamshell - Medium

Description:
This 175 seat classroom features a continuous low grade sloping floor that is optimized for viewing angles and universal access to the classroom while eliminating handrails.
Swivel chairs that are yoked to the fixed tables provide ample space for laptops, notebooks, etc.