



CU DENVER BUILDING

University of Colorado Denver

Infrastructure
Replacement
and Renovation

Office of Institutional Planning

February 19, 2021



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Executive Summary

The CU Denver Building Infrastructure Renewal and Renovation project is comprised of two components: infrastructure work that address critical issues and 30,605 GSF of renovation on portions of four floors of the building that support the academic programs in the building. The total project cost is \$34,998,500, of which CU Denver proposes to fund \$9,099,610 and is requesting \$25,898,890 in capital construction funds from the State of Colorado.

Between 2015 and 2020, CU Denver requested funding for a renovation of the CU Denver Building that included 126,000 GSF of renovation and approximately \$11M in infrastructure work for an estimated cost (in 2020) of \$60M. Recognizing the growing number of critical infrastructure needs, CU Denver removed the renovation project from consideration and put forward a capital renewal project for FY 2021 funding that would address a broader range of infrastructure items. The CU Denver Building Infrastructure Renewal and Renovation project, to be submitted for consideration for funding in FY 2022, maintains a focus on the critical infrastructure needs, but adds carefully selected renovation projects that address the most critical needs of the building occupants and take advantage of opportunities made possible by several groups vacating the building.

The CU Denver Building is one of six buildings owned by CU Denver. It was built in 1977 for the Dravo Company of Pittsburgh. The building is located at 1250 14th Street at the edge of Larimer Square and adjacent to the Cherry Creek. The building contains 205,128 gross square feet contained within an eight-story tower and a two-story annex, and has two levels of underground parking. The building has been occupied by CU

Denver since 1983, and was purchased by CU Denver in 2006 after master leasing the building from the Auraria Foundation from 1995 to 2006.

CU Denver has invested nearly \$7.5M in deferred maintenance projects in the CU Denver Building over the last 15 years. However, the deferred maintenance backlog remains at \$25,188,227 and much of the original building equipment remains. The Facilities Condition Index for the building is 67%, making it the poorest performing of all of CU Denver's assets. The infrastructure work outlined in this program plan is intended to eliminate the deferred maintenance backlog and shift the operational strategy from stopgap, emergency repairs to preventative maintenance that achieves optimal building performance. The project will also result in significant operational cost savings. Year 1 savings are anticipated to exceed \$150,000. In addition, the project will reduce building





greenhouse gas emissions 54% from 2019 levels, and reduce indirect water usage by 690,000 gallons per year. Below is a brief summary of the infrastructure work that is being proposed:

1. Cooling System: Replace an existing chiller, associated pumps and heat exchanger
2. Heating System: Replace Xcel steam system with natural gas boiler system
3. Air Handling Unit: Replace the existing air handler
4. Electrical System: Replace electrical switchgear and main distribution system
5. Fire Alarm System: Replace existing Silent Knight Fire Alarm system
6. Sanitary Riser System: Repair or replace sanitary piping risers
7. Storm Drain System: Repair collapsed storm drain
8. Plaza Drains and Piping: Replace the majority of plaza drains and piping
9. Parking Garage: Replace mechanical and electrical systems and make minor structural repairs and Install and prewire electric vehicle charging stations
10. Annex Accessibility: Upgrade ADA accessibility including, restrooms, mechanical and electrical replacements

11. Lighting Systems: Upgrade remainder of facility lighting to LED
12. On-Site Renewable Energy Production: Install 225kW PV solar array
13. Building-wide Signage Standardization: Standardize signage and wayfinding across the entire building and site

Several items, including the electric vehicle charging stations, LED lighting replacement and installation of a 225kW photovoltaic solar array on the roof, support of Governor Polis' executive order D 2019 016 (amending and replacing Executive Order D 2018 026 Concerning the Greening of State Government).

The CU Denver Building's primary occupants are the College of Architecture and Planning (CAP) and a portion of the College of Arts and Media (CAM). Most of the renovation work recommended in this project is in support of these two colleges, and collectively addresses the following issues: mis-alignments in room capacities that create enrollment pressures, outdated classroom technology, rooms that don't allow for modern, interactive teaching pedagogies, and alleviating enrollment pressures on a program. There are also projects that support the broader needs of the institution, and others that leverage the unique location of the building to highlight the learning, research and creative work being undertaken at CU Denver and encourage community participation and partnerships. Finally, there are projects that will assist CU Denver's partner institutions at Auraria in moving forward with their own capital projects. The list of renovation projects includes:

- Relocating and consolidation the CAP fabrication operation to improve safety, simplify the movement of materials.
- Modifying instructional labs for Digital Design that will support CAM's typical cohort size and relieve enrollment pressure.
- Re-purposing an under-used recording space into an instructional lab that can be used by multiple CAM programs.
- Relocating Visual Arts from the Boulder Creek Building to allow Community College

of Denver to move forward with renovation of that building.

- Expanding a CAP instructional computer lab to better accommodate desired cohort sizes.
- Replacing dated instructional spaces in CAP with obsolete technology and poor sight lines with modern instructional spaces with modern technology.
- Provide space for instruction in emerging technologies such as visualization and virtual reality for CAP and CAM.
- Relocate active, engaging uses to the ground floor of the building to create interest from pedestrians in Larimer Square or on 14th Street.

If funded for FY 2022, the estimated completion date for the project is November of 2024.





Introduction and Background

A. INSTITUTIONAL BACKGROUND

HISTORY

CU Denver originated in 1912 as an extension of the University of Colorado Boulder. In 1964, the extension division was renamed the University of Colorado Denver Center and granted the authority to offer undergraduate and graduate degree programs. In 1973, the University Of Colorado Board Of Regents established the University of Colorado System to be led by a president and comprised of four distinct and independently accredited institutions - The University of Colorado Boulder, the University of Colorado at Denver, The University of Colorado Colorado Springs, and the University of Colorado Health Sciences Center. The CU System is now the state's largest public university system.

In 1977, the University of Colorado at Denver became part of an innovative multi-institutional campus known as the Auraria Higher Education Center (AHEC). The AHEC Campus is located on the edge of downtown Denver and is shared by the University of Colorado Denver, Metropolitan State University of Denver, and the Community College of Denver and is managed by AHEC. The location and boundaries of the Auraria Campus are shown in Figure II.A.

In 2004, the University of Colorado Board of Regents approved the consolidation of the University of Colorado at Denver and the University of Colorado Health Sciences Center into a single institution. The consolidated university was initially named the University of Colorado at Denver and Health Sciences Center, and subsequently in 2007, was renamed the University of Colorado Denver - one institution with two campuses, CU Denver in downtown

Denver and CU Anschutz Medical Campus in Aurora, CO. CU Denver and CU Anschutz are a legally consolidated university. Each campus operates independently, though several functions - including facilities, information technology, academic and student affairs, administration and finance, and human resources - are provided through consolidated units.

Beginning in 2006, CU Denver purchased several buildings in downtown Denver that lie outside the boundaries of the Auraria Campus. The CU Denver Building, purchased in 2006, is home to the College of Architecture and Planning and lies directly adjacent to Larimer Square, a popular historic district in Denver. The Lawrence Street Center, also purchased in 2006, houses the School of Public Affairs, the School of Education and Human Development, and many administrative units. The Business School, which reaches into the heart of downtown, was purchased in 2008 and renovated to accommodate and consolidate the school's various programs, departments and centers.

Also in 2006, the Campus Village Apartments (CVA) opened immediately adjacent to the Auraria



Campus' western boundary. For the first time, CU Denver students could essentially live on campus and have a traditional, residential college experience. CVA is managed by CU Denver and is currently owned by the University of Colorado Property Corporation (CUPCO).

In 2007, the Auraria Master Plan ushered in the concept of institutional neighborhoods - areas of the campus designated for each of the three AHEC institutions. The area of the campus along Speer Boulevard, directly adjacent to Denver's central business district, was established as the CU Denver Neighborhood. The concept allowed for a measure of institutional autonomy and identity not seen before on the campus. For CU Denver, it led to a period of significant change. Student Commons was built in 2014 and consolidated many student services into one location. As the first CU Denver-owned building constructed on the Auraria Campus, Student Commons anchors the CU Denver neighborhood.

In 2011, students voted to create a CU Denver-specific mascot and Milo the Lynx was introduced

in 2013. In 2015, students initiated and led a referendum to construct the Lola and Rob Salazar Student Wellness Center, a facility devoted to enriching all dimensions of wellness for CU Denver students. It opened in August 2018 and is the first named building for CU Denver. Club sports are also expanding and now include 15 teams. The buildings purchased or recently constructed by CU Denver, the current boundaries of the campus neighborhoods, and the location of Campus Village Apartments are all shown in Figure II.A

CU Denver serves a distinctive role as Colorado's public urban research university. It combines academic rigor with immersive real-world experiences to educate students through quality academics, relevant research, creative work and civic engagement in the heart of Denver. More than 14,000 on-campus students thrive in a diverse cultural, professional and experiential setting, benefitting from CU Denver's unparalleled internship, career and networking opportunities. All of these opportunities are within easy reach of the central business district, lower downtown (LoDo), the state capitol, and the global and regional headquarters of major companies, high-tech startups, non-profits and cultural organizations. CU Denver offers more than 100 degree programs housed within several academic schools and colleges. CU Denver is also a major contributor to the Colorado economy, with a direct impact of more than \$800 million annually.

MISSION & VISION

In 2007, the University of Colorado Denver began a strategic planning process with three primary intents:

1. To guide and to drive the University of Colorado Denver's strategic future.
2. To respond to a request from the University of Colorado Board of Regents for a strategic plan from each of its institutions.
3. To serve as the foundation for the University of Colorado Denver's renewal of accreditation in 2010-11 by the Higher Learning Commission of the North Central Association of Colleges and Schools (NCA).



The process began with appointing an ad hoc group, the University Planning and Accreditation Committee (UPAC) that consisted of senior university officers and elected leadership of the faculty, staff, and students. The convening of the UPAC was followed by the appointment of seven task forces involving more than 200 faculty, staff, and students. Each task force focused on one of the following areas:

- Mission, Vision, and Values
- Learning
- Discovery, Creativity, and Innovation
- Health Care
- Engagement
- Institutional Image and University Communications
- Resource Needs, Infrastructure, and Development

The Strategic Plan 2008-2020 was created using concepts developed by the task forces. The Board of Regents approved the strategic plan in January 2008 and again in March 2008. The Mission and Vision of the University of Colorado Denver, as defined in the 2008 Strategic Plan, are as follows.

Mission

The University of Colorado Denver is a diverse teaching and learning community that creates, discovers and applies knowledge to improve the health and well-being of Colorado and the world.

Vision

By 2020, the University of Colorado Denver will be a leading public university with a global reputation for excellence in learning, research and creativity, community engagement and clinical care.

B. RELATION TO ACADEMIC OR INSTITUTIONAL STRATEGIC PLANS

Relation to Strategic Plan

In 2007, the University of Colorado Denver began a strategic planning process with three primary intents:

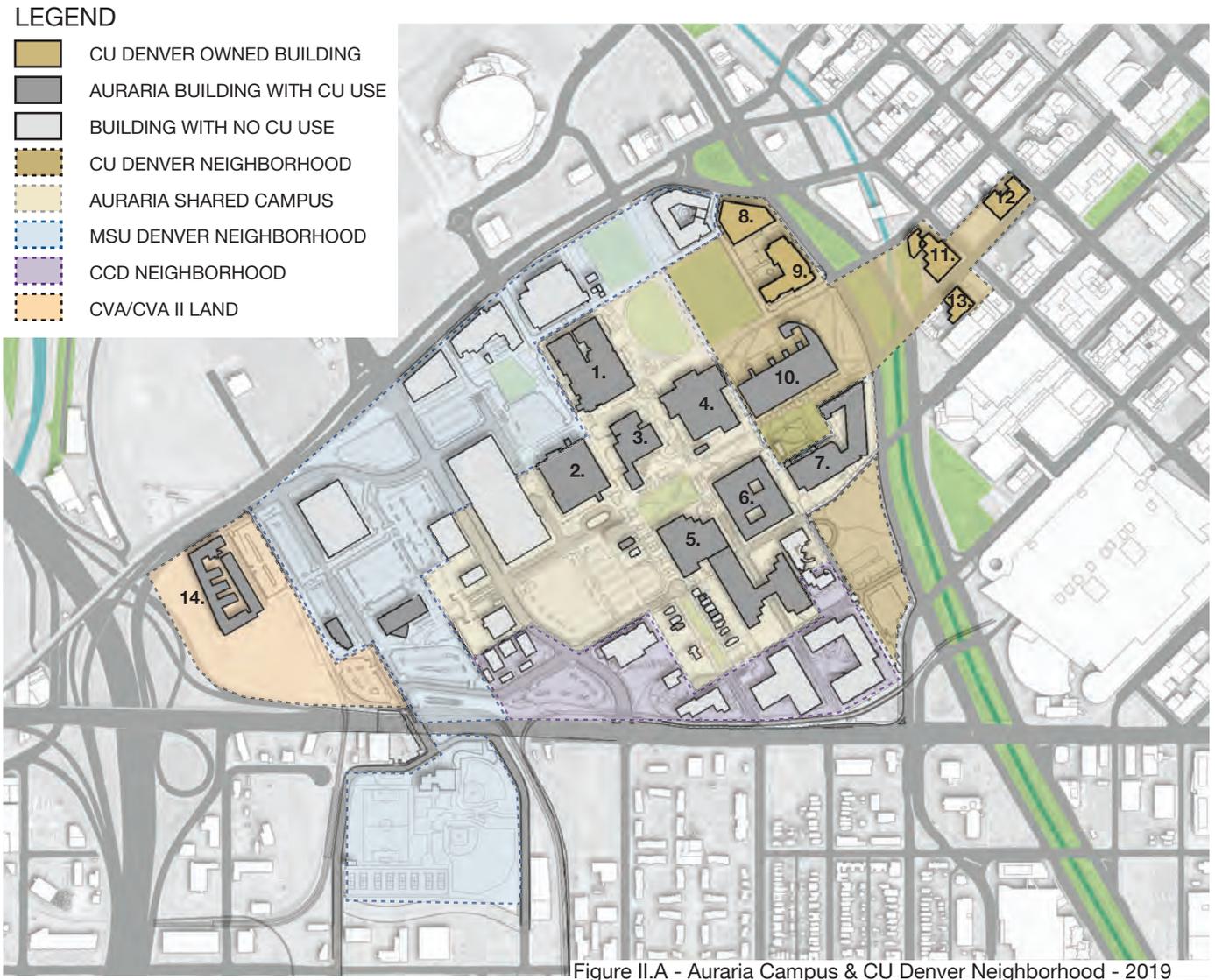
1. To guide and to drive the University of Colorado Denver's strategic future.
2. To respond to a request from the University of Colorado Board of Regents for a strategic plan from each of its three institutions.
3. To serve as the foundation for the University of Colorado Denver's renewal of accreditation in 2010-11 by the Higher Learning Commission of the North Central Association of Colleges and Schools (NCA).

The process began with the appointing of a permanent group, the University Planning and Accreditation Committee (UPAC) that consisted of senior university officers and elected leadership of the faculty, staff, and students. The convening of the UPAC was followed by the appointment of seven task forces involving more than 200 faculty, staff, and students. Each task force focused on one of the following areas:

- Mission, Vision, and Values
- Learning
- Discovery, Creativity, and Innovation
- Health Care
- Engagement
- Institutional Image and University Communications
- Resource Needs, Infrastructure, and Development

Strategic Plan 2008-2020 was created using concepts developed by the task forces. The Board of Regents approved that plan in January 2008 and again in March 2008. The specific academic goals and objectives that are supported and advanced by the CU Denver Building Infrastructure Replacement and Renovation project are listed below. The goal and objective numbers are taken directly from the strategic plan document.

Figure II.A - Auraria Campus & CU Denver Neighborhood - 2019



- | | | |
|---|--|---|
| <ul style="list-style-type: none"> 1. Tivoli Student Union 2. King Center 3. Plaza Building 4. PE Events Center 5. Arts Building | <ul style="list-style-type: none"> 6. Auraria Library 7. Science Building 8. Lola and Rob Salazar
Student Wellness Center 9. Student Commons | <ul style="list-style-type: none"> 10. North Classroom 11. CU Denver Building 12. Business School 13. Lawrence St Center 14. Lynx Crossing |
|---|--|---|

Goal 2.1 Deliver superior educational programs on multiple campuses and academic centers across the state, nation, and around the world.

Objective 2.1.1 Build and sustain superior education facilities and infrastructure.

The CU Denver Building Infrastructure Replacement and Renovation project advances this objective in several ways. The first is through the infrastructure work that will replace the original, under-performing mechanical systems of the building. The second is through the select, targeted renovations identified for the 1st, 4th, and 8th floors and both levels of the annex building. These both involve sustaining the valuable assets already under ownership by CU Denver, albeit in different ways.

Objective 2.4.1 Increase the undergraduate student population to between 14,000 and 16,000 undergraduate students by 2020.

The renovation work proposed in the program plan, particularly the work on the 1st and 8th floors, will allow for enrollment growth in the College of Arts and Media and the College of Architecture and Planning. Consolidating fabrication space on the ground floor will improve efficiency and utilization for the College of Architecture and Planning. Consolidating smaller teaching labs into larger ones on the 8th floor will allow for larger student cohorts in the Digital Design and Digital Animation programs in the College of Arts and Media.

Goal 7.2 Invest in providing the infrastructure (services and facilities) necessary for a world-class learning and discovery environment for the benefit of our students, faculty, staff, and communities.

Objective 7.2.2 Implement the University



of Colorado Denver facilities capital plan to provide cost-effective, adaptable, maintainable, sustainable, and accessible facilities.

As discussed in section III.h. (Relation to Master Plan) this project does support the recommendations outlined in the 2017 CU Denver Facilities Master Plan and is consistent with the university's 10-year capital plan.

Relation to CDHE Master Plan (Colorado Rises- 2017)

The project contributes towards all four Strategic Goals in the State and CDHE's Colorado Rises master plan:

Increase Credential Completion: Multiple programs housed in the CU Denver Building are essential to credentialing and professional certification within the broader Colorado business community. These include the College of Architecture and Planning and the College of Arts and Media.

Erase Equity Gaps: The College of Architecture and Planning (CAP) has increased enrollment by 27% over the past 5 years. Over that same time period, underrepresented communities have grown from 22% to 35% of the College's student population.

Improve Student Success: CAP degrees awarded continue to rise along with enrollment. Conferred undergraduate degrees, first awarded in 2015, are growing exponentially. From 2015 to 2019, undergraduate Architecture degrees awarded has risen from 24 to 89.

Invest in Affordability and Innovation: This project will address the majority of CU Denver's accumulated deferred maintenance backlog. This will help the university focus more future resources on student



C. PROJECT HISTORY

CU Denver purchased the CU Denver Building in 2006, but has occupied space in the building dating back to 1983. Currently, the largest occupant in the building is the College of Architecture and Planning (CAP), the only comprehensive design school in Colorado.

Over the last decade, as occupants have vacated the CU Denver Building to occupy space in new or renovated buildings (funded by CU Denver as cash projects), two things have happened:

1. The College of Architecture and Planning has assumed more space in the building.
2. CU Denver has funded renovations of several of the floors in the building, including the following:
 - In 2010, a majority of the ground floor of the main CU Denver Building (the tower) was renovated.
 - In 2013, after the Business School vacated for their new building at 1475 Lawrence Street, the 2nd floor of the tower was renovated and subsequently occupied by CAP.
 - In 2015, after the Math Department moved into the Student Commons Building, the 6th floor of the tower was renovated and subsequently occupied by CAP.

Beginning with the 2015-2016 capital request cycle and ending in 2020-2021, CU Denver submitted a project titled CU Denver Building Renovation for consideration for capital funding. The project request was based on a 2013 conceptual study that had been conducted in-house. The project \$11M infrastructure work (including some of the work proposed in the CU Denver Building Infrastructure Replacement and Renovation project) and 126,064 GSF of renovation in areas of the building that had not been altered in 15 years or more. The total cost of that project in 2020-2021 was \$60M. That project was not funded. For the FY 21-22 request cycle, CU Denver decided to focus on the significant infrastructure needs of the building and submitted a Capital Renewal project titled CU Denver Infrastructure Renewal. The work proposed in this project was based on a series of extensive reviews of the CU Denver Building that had been conducted by MEP Engineers. The project request included building infrastructure work only, and the total project cost was \$22M. Since that submittal, several of the programmatic deficiencies in the building have grown worse, and anticipated space vacancies have created opportunities to re-align uses and improve efficiencies on several floors. The project described in this document, the CU Denver Building Infrastructure Replacement and Renovation, maintains all of the elements of the Capital Renewal request for FY 21-22, but includes \$11M of high value renovation projects (30,605 GSF) that require significantly less funding than the projects proposed in the CU Denver Building Renovation project.



D. STATEMENT OF NEED AND BENEFIT

The CU Denver Building Infrastructure Replacement and Renovation is a response to needs and opportunities that fall into the following categories:

Academic Needs

Many of the renovation projects proposed are in broad terms addressing one or more of the following issues: mis-alignments in room capacities that create enrollment pressures, outdated classroom technology, rooms that don't allow for modern, interactive teaching pedagogies, and opportunities that alleviate enrollment pressures on a program. Some examples of renovation projects that will address these issues include:

- Combining two Digital Animation labs on the 8th floor of the building to better align with the average cohort size in the programs. Labs that are too small either result in students being turned away or additional sections with very few students.
- Re-purposing an under-used recording space on the 8th floor into an instructional lab that can be used by multiple CAM programs.
- Expanding the CAP instructional computer lab to better accommodate desired cohort sizes.
- Replacing static instructional spaces in CAP with old technology and poor sight lines with modern instructional spaces with modern technology.
- Supporting program growth. CAP has grown over 30% since 2015, and expects to launch two new certificate programs in the fall of 2021.
- Both CAP and CAM would like to offer courses and resources in visualization and virtual reality, but lack the space to launch these initiatives. This represents a great partnership opportunity between these two colleges.

Efficiency

There are opportunities in this project to improve efficiencies in the operations of the academic programs that occupy the building. One opportunity is to consolidate fabrication spaces for the College of Architecture and Planning on the first floor, making supervision easier and improving safety, simplifying the movement of materials, and creating efficiencies by allowing students to engage in multiple fabrication activities in the same area. Another opportunity involves moving visual arts labs out of the Boulder Creek building, and consolidating the CAM professional practice programs in one building (Illustration, Digital Design, Digital Animation).



Place-Making

Opportunities to leverage CU Denver's urban location and invite the public to observe and become a part of the community are numerous in the CU Denver neighborhood. No building exemplifies this more than the CU Denver Building, which sits at the edge of Larimer Square along the active 14th Street corridor and only blocks from the Theatre District and Denver Performing Arts Center. On the ground floor of the eight-story main tower of the building, and the two levels of the annex, lie many opportunities to put learning on display, and communicate the value that CU Denver provides to the downtown community, the larger Denver area, the region, and beyond.

Supporting the Auraria Partnership

The Community College of Denver has submitted a capital project request for a renovation and expansion of the Boulder Creek Building on the Auraria Campus. CU Denver's College of Arts and Media (CAM) and College of Engineering,

Computing and Design (CEDC) both occupy space in that building. The CEDC Boulder Creek occupants will move into the CU Denver Engineering building, which is CU Denver's #2 capital priority in the 22-23 capital submittal cycle. Some or all of the CAM space in Boulder Creek could be accommodated in the CU Denver Building Infrastructure Replacement and Renovation project.

Sustainability

CU Denver's goal is to achieve a 50% reduction in GHG emissions campus-wide by 2030, with 2006 levels as the benchmark, and to reduce Energy Use Intensity (EUI). Both metrics will be positively impacted by virtually every aspect of the infrastructure work. It is anticipated that 2030 emissions from this building will reduce by 54% from 2019 actual levels, and 71% from 2006 baseline levels. In addition, CU Denver is anticipating a 25% reduction in EUI, 12% from on-site renewable generation and an additional 13% from mechanical system efficiency improvements.

Water use will also be reduced as a result of the infrastructure projects. Indirect water use is expected to be reduced by 690,000 gallons per year. This is attributed to no longer using the Xcel steam service, which cannot collect condensate return because of the its aging infrastructure.

The project will also advance the sustainability goals of the State of Colorado. The project will qualify for compliance with the state's High-Performance Certification Program (HPCP) for existing buildings. The project cost is more than 25% of the current replacement value, impacts more than 5,000 GSF, and includes HVAC system improvements. The project will utilize a 3rd party



commissioning agent to help develop and track compliance with the HPCP requirements. CU Denver's goal for all HPCP eligible projects is to meet LEED Gold standards.

In support of Governor Polis' executive order D 2019 016 (amending and replacing Executive Order D 2018 026 Concerning the Greening of State Government) CU added the following projects into the infrastructure list:

- Install and Prewire electric vehicle charging stations in the CU Denver Building. The building currently has no vehicle charging stations. A total of 20% of parking spaces will be pre-wired for vehicle charging stations (30), and 5% will have EV chargers installed (10).
- Upgrading lights to LED that have not already been upgraded. The total area of the building that is affected is 61,100 gross square footage.
- Install a 225kW PV solar array on the roof the building. The expected annual production is 332,958kWh. The addition of on-site solar production is anticipated to offset 12% of the building's electrical usage. Year 1 greenhouse gas (GHG) emission reductions as a result of on-site solar generation will be 155 MTCO_{2e}, a 10% reduction. Over the 20-year lifespan of the solar array, total GHG reductions would exceed 1,800 MTCO_{2e}

Savings and Building Operations

The following operational savings and improvements will be achieved through the infrastructure projects being proposed:

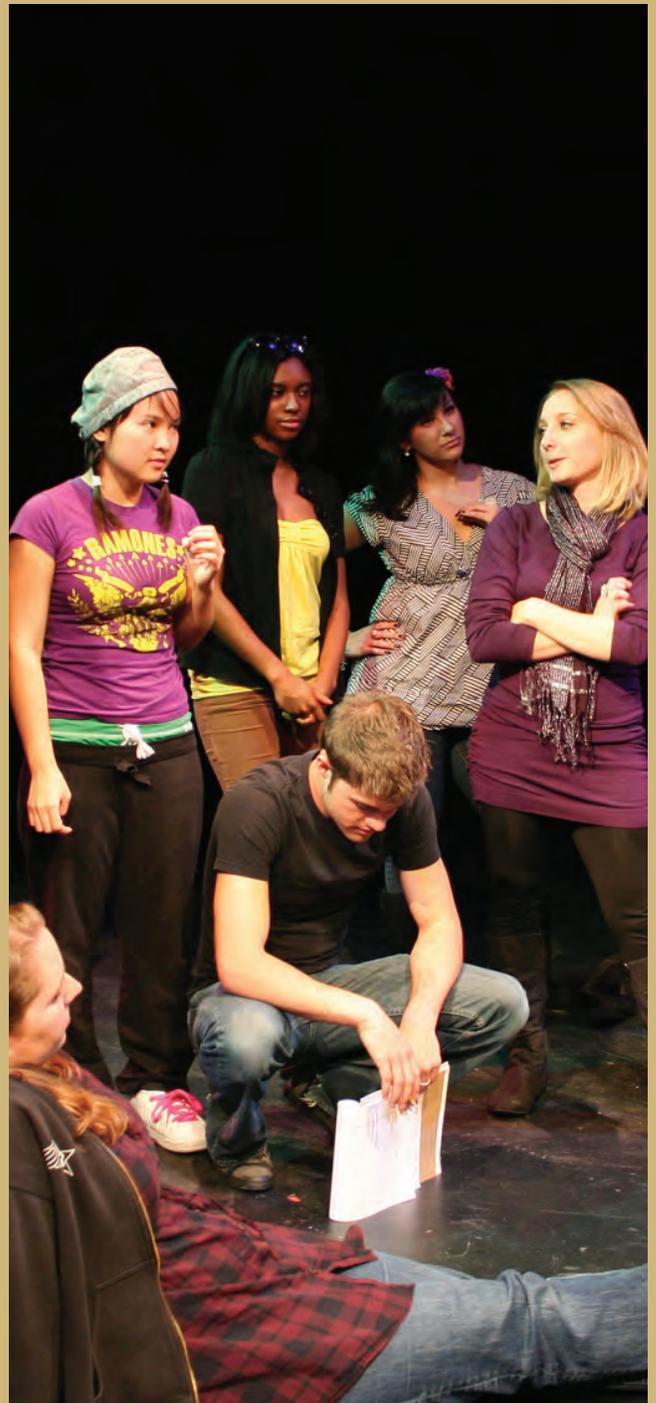
- Transitioning from Xcel steam to natural gas boilers will result in year 1 savings of \$130,000
- On-site solar generation is anticipated to reduce year 1 utility expense by \$25,000.
- Utilizing actual 2020 Xcel electricity rates and the average market price for Solar Renewable Energy Credits (SRECs), the payback period of the on-site solar PV system is 15 years. Given the system's useful life of 20 years, this is a good financial investment.

- The infrastructure work includes the replacement of chiller #1. When CU Denver self-funded the \$825K replacement of the 230-ton #2 chiller in 2018 due to unrepairable mechanical failure, the result was an annual savings of \$23,000. Similar savings can be expected for the chiller #1 replacement.
- The CU Denver Building, originally named Dravo Plaza, was re-named at a time when CU Denver did not own any buildings. Now that CU Denver owns six buildings, “CU Denver Building” name is a source of confusion for students, staff and faculty. The building also has two different numbering systems- four- digit numbers in spaces that have been renovated in the last 15 years, and three-digit numbers for those that have not. It was CU Denver’s intention to transition to the new numbering system as renovations are completed, but at the current rate this could take more than a decade. The CU Denver Building Infrastructure Replacement and Renovation project includes funding to change building signage to accommodate a name change and to transition all rooms to the new, four-digit room number standard.
- Reliability continues to be a concern for the original equipment that serves this 44-year-old building. The CU Denver Building was constructed in 1977 and most of its mechanical and electrical systems are original to construction and greatly in need of replacement. The risk of loss of use due to major system failure is significant. Given the number of computer labs (College of Arts and Media, College of Architecture and Planning), fabrication spaces (College of Architecture and Planning, College of Engineering, Design and Computing), and other teaching spaces supported by technology (live remote), loss of use would have significant impacts to all of these programs. CU Denver does not have equivalent swing space to provide to these academic units in the event of a system failure.
- Many of the building issues identified in the MEP Engineers report (Appendix A) meet the criteria for Level 1 controlled maintenance, and involve health, life safety and code issues. For reference, on the next page is a chart listing the cash-funded deferred maintenance projects that CU Denver has undertaken in the CU Denver Building.



Cash-Funded Deferred Maintenance Projects

History of Appropriated Projects funded with controlled maintenance, capital renewal, capital construction, emergency CM repairs, cash, or operational funds completed within the last fifteen (15) years or ongoing projects that can be associated with either this CC/CR building or infrastructure request.			
Project No.	Project Title	Project Cost \$	Completion date or status
2007 0013	Elevator refurbishment	\$358,406	Completed Sept 2008
2005 0031	Dravo – Emergency Generator	\$233,385	Completed May 2010
326747	CU Bldg – 150 Conference Room Remodel	\$21,301	Completed June 2011
621987	CU Denver Suite 150 Reno Phase 2	\$33,899	Completed Nov 2011
2009 0034	Floor 7 renovation	\$961,851	Completed Sept 2012
2009 0021	Floor 1 renovation	\$1,366,856	Completed Oct 2013
680384	Floor 2 & 3 CAP renovation	\$1,981,108	Completed Oct 2014
828750	CU Denver Bldg., XMBA 150 Add AV Electrical	\$74,204	Completed August 2015
861766	AB1 Backfill – CU Denver 1 st Floor Suite 100 Reno For InWorks	\$225,626	Completed April 2016
15-149372	CU Bldg – 8 th Floor Remove Wall Between 815C/D	\$134,454	Completed May 2016
15-108630	Annex Building updates (Design-Build Program)	\$179,439	Completed May 2017
17-199313	CU Denver Annex 1 st Floor Electrical For Equipment	\$40,386	Completed May 2018
16-114091	Chiller #2 replacement	\$824,097	Completed June 2018
2018-DM2	Parking garage LED retrofit (P2 Level only)	\$25,000	Completed July 2018
18-115993	CityCenter renovation	\$488,332	Completed Dec 2018
19-147050	Air compressor replacement	\$10,000	Completed Feb 2019
19-129300	Cooling Tower refurbishment	\$77,397	Completed June 2019
19-106280	Domestic Water booster pump installation (planned summer 2020)	\$342,353	In design
20-112393	14 th Street Entrance replace main doors	\$68,750	In design
	TOTAL	\$7,446,844	



Project Description

A. BUILDING SITE

The CU Denver Building is located at 1250 14th Street in downtown Denver. Two other properties owned CU Denver- the Lawrence Street Center (1380 Lawrence Street) and the Business School (1475 Lawrence Street), lie nearby. The CU Denver Building is bordered by 14th Street, Larimer Street, Lawrence Street, and Creekfront Park (which backs up to the Cherry Creek).

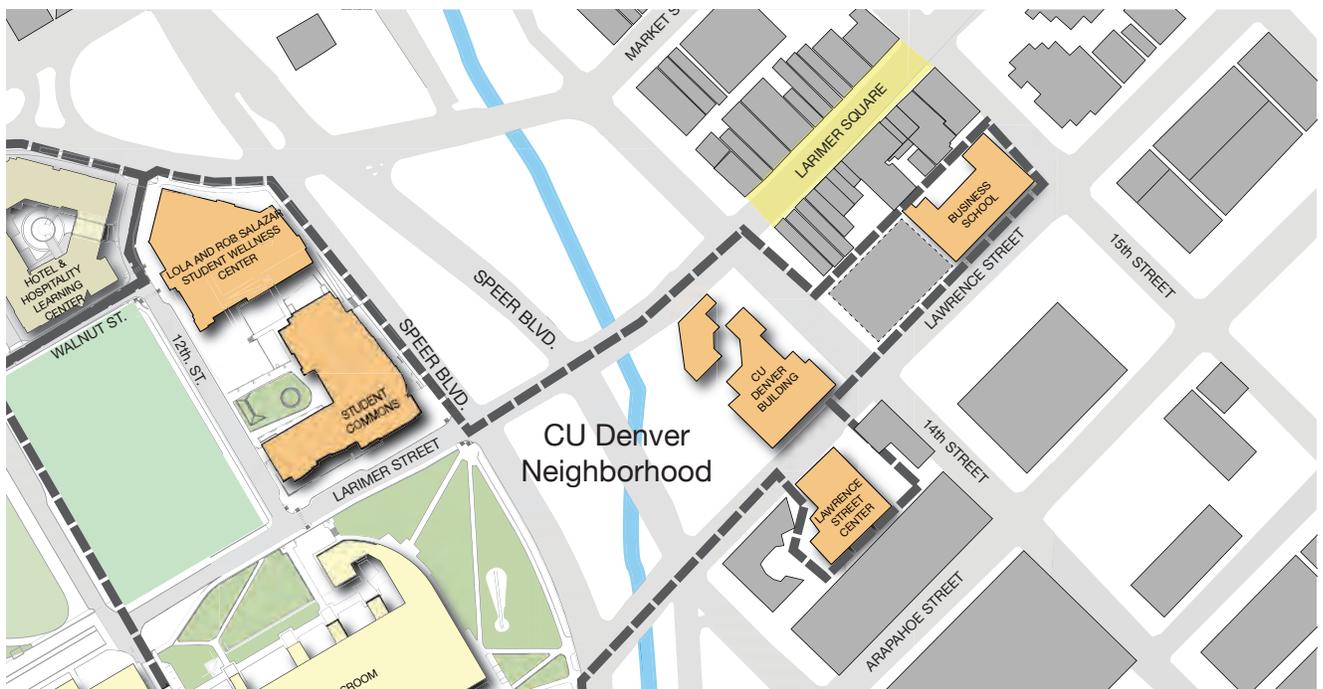
The CU Denver Building is also adjacent to Larimer Square, a popular retail shopping district that features historic storefronts. See the area map below for the building location in relation to other CU Denver properties and Larimer Square.

B. BUILDING INFORMATION

Overview

The CU Denver Building is comprised of an eight-story tower (with an enclosed mechanical penthouse) and a two-story split-level annex, separated by a small plaza. These two structures total 205,128 square feet. The building sits on a 57,687 square foot parcel. The building also features two levels of underground parking with a total of 155 parking spaces. The building represents 28% of the total academic space owned or managed by CU Denver.

The main entrance to the building lies on 14th Street, which forms the northeastern border of the building. The building is bordered on the southeast by Lawrence Street and northwest by



Larimer Street. Creekfront Park, and just beyond it, the Cherry Creek sits on the southwest side of the building.

History

In 1977, a building known as the Dravo Plaza was constructed at 1250 14th Street to serve as headquarters for the Dravo Corporation of Pittsburgh. The building was designed by Muchow Associates. CU Denver began leasing space in what is now known as the CU Denver Building in 1983, starting with offices for the University's central administration. By 1987, the administrative offices were joined by the School of Education (now the School of Education and Human Development) and a portion of the College of Architecture and Planning, bringing CU Denver's total occupancy to 43,000 rentable square feet. By 1992, CU Denver occupied 132,571 of the 149,663 rentable square feet in the building. In 1995, to guarantee space into the foreseeable future, CU Denver entered into a master lease agreement with the Auraria Foundation, who purchased the building from Equitable Life Assurance on behalf of the University. CU Denver acted as master lessee until 2006, when they purchased the building from the Auraria Foundation for \$36.5M.

Occupants

The CU Denver Building is home to the following academic programs: College of Architecture and Planning, College of Arts and Media, College of Engineering, Design and Computing and the Executive MBA program- a CU System academic program that represents a partnership between the Business Schools at CU Denver, University of Colorado, Colorado Springs (UCCS) and CU Boulder. The building is also home to CityCenter, which matches faculty experts and university resources with civic and business leaders interested in exploring innovative solutions to some of the toughest issues facing our community, and the Office of Institutional Planning.



C. SUMMARY OF INFRASTRUCTURE PROJECTS

This infrastructure projects are divided into 13 general categories. Each category is further divided into sub-projects. Major project details were identified by two engineering and cost studies prepared by MEP Engineering Consultants, dated 5/20/19 and 2/28/2020. The 2020 report is included as Appendix A. Some additional items are supported by different consultant work (Architectural Workshop, Walker Parking and Facility Engineering Associates). The 13 general categories of improvements addressed by the request are as follows:

1. Cooling System
2. Heating System
3. Air Handler
4. Electrical System
5. Fire Alarm System
6. Sanitary Riser System
7. Storm Drain System
8. Plaza Drains and Piping
9. Parking Garage
10. Annex Accessibility
11. Lighting System
12. On-Site Renewable Energy
13. Building-wide Signage Standardization

System Descriptions and Project Scope:

Cooling System

The building's cooling is provided by two chillers with an original combined capacity of 460 tons. Chilled water is supplied to the main air handler and is distributed down to Z-boxes, VAV boxes and Fan Coil Units in various parts of the building. The chiller system is supported by one (1) Marley cooling tower, two (2) chilled water pumps, one (1) chilled water booster pump, two (2) condenser water pumps and one (1) flat plate heat exchanger, associated air separator and expansion tank.

Cooling System Sub-Project #1: Replace Chiller

Replace the original 1977 vintage 230-ton #1 chiller with a high efficiency magnetic bearing, water-cooled centrifugal chiller with variable frequency drive and associated piping, temperature controls, motor control electrical gear and accessories. Spare parts for this chiller are no longer available, and compromised integrity

of approximately 25% of the condenser tubes has reduced the capacity of the chiller by an equivalent percentage.

Note: CU Denver self-funded the \$825K replacement of the 230-ton #2 chiller in 2018 due to unrepairable mechanical failure. The success of that single project resulted in an overall reduction in building-wide electricity use of almost 7%, which equates to annual utility savings of \$23k and reduced greenhouse gas emissions of 87 MTCO₂e per year.

Cooling System Sub-Project #2: Replace Pumps Associated with Chilled and Condenser Water

Replace the original 1977 vintage cooling system pumps with new, highly efficient, variable speed drive pumps. This includes two chilled water pumps, one booster pump, and two cooling tower condenser water pumps, associated piping and accessories. Upgrading to new technology will improve system performance and the ability to control occupant comfort, as well as result in tangible electrical savings and reduced maintenance costs.

Cooling System Sub-Project #3: Replace Heat Exchanger

The cooling system has the capability of utilizing "free cooling" during the winter months by circulating chilled water from the cooling tower through an existing 1996 vintage plate and frame heat exchanger. This partially offsets the need to use mechanical cooling from the chiller during certain months of the year. The existing heat exchanger is beyond its useful life and operates at a significantly reduced capacity. This project will replace the heat exchanger with a modern, larger unit that will greatly improve the capacity and operation of the system. This will result in tangible electrical savings and reduced maintenance costs of the chilled water system.

CU Denver self-funded a \$100k refurbishment of the building's cooling tower in 2019. The tower's gearbox and fill material were replaced, and the interior of the entire tower was cleaned and coated with anti-corrosion material. This is expected to extend the useful life of this critical asset for another 10 to 15 years. At this time no further improvement of this system is requested.

Heating System

The primary intent in upgrading the building heating system is to eliminate the Denver District Heating Steam System service to the building and establish a standalone central heating water plant on the premises. Denver District steam was connected to the building in 1990 and its primary components are beyond their useful life. Denver District steam is also plagued by inefficiency, high emissions and costs that are considerably higher than onsite generation. The installation of modern, highly efficient natural gas boilers will result in greatly reduced utility costs and greenhouse gas emissions. Further details of the anticipated cost savings and greenhouse gas (GHG) reductions are outlined below.

Note: In an effort to comply with the Governor's Executive Order D 2019 016, the university explored the feasibility of installing electric boilers vs. natural gas. Due to the increased electrical demand of the fully electric system the existing Xcel service would need to be doubled, which significantly inflates the initial cost of the system. There is also an annual negative impact to operational costs of \$130,000. The combination of these factors makes the NPV of this option negative. In addition, a fully electric system has a negative impact on GHG emissions. For natural gas, year 1 emissions will drop by 325 MTCO_{2e} versus the existing Xcel steam service. For fully electric, year 1 emissions will increase by 440 MTCO_{2e}. Over the anticipated 30-year lifespan the fully electric system will result in 16.5% more GHG than the natural gas system, over 4,200 MTCO_{2e} more. This analysis assumed that Xcel Energy will hit their target of 100% clean energy production by 2040, of which there is no guarantee.

It is the intent of the university to revisit the feasibility of electrification when the heating water system comes due for its next replacement cycle in 2050.

The five following heating system sub-projects combined have been submitted as part of CU Denver's 21-22 controlled maintenance request. They will be removed from this 22-23 capital request if they are funded as controlled maintenance in 21-22.

Heating System Sub-Project #1: Remove Steam Heat Exchanger

Remove the entire steam-to-hot water system components located in the building's heat exchanger room within Parking Level P1. This includes the heat exchanger, tank, condensate pump and associated meters. The existing heating water supply and return piping within the room, being in relatively good condition, will be reused and connected to the new central heating plant.

Heating System Sub-Project #2: Replace Heating Hot Water Pumps

Replace the original 1977 vintage heating water pumps, located in the penthouse. The replacement pumps will be of matching configuration, capacity, flow rate, electrical capacity, and will incorporate variable frequency drives to match building load and maximize energy performance.

Heating System Sub-Project #3: Install New Gas-Fired Boiler Plant

The new heating water boiler plant will consist of three (3) new gas-fired condensing type boilers of similar size and capacity. The new boilers will have an input capacity of 4,500,000 Btu/hr each (approx. 3,825,000 output at altitude) and be a minimum of 86% efficient at 100% capacity and provide 160 degree leaving water temperature. The new boilers will have the capability of modulating their firing rate based on return water temperature and will employ an outdoor air reset schedule. The boilers will be located on Parking Garage Level P1 in a new dedicated mechanical room.

The boiler plant heating water pumps will consist of two (2) hydronic heating water pumps to handle 100% of the total system capacity, and will operate in a primary/stand-by configuration and be sized to accommodate just the flow rate necessary to move the heating water from the new boiler room to the heating water pumps located in the penthouse. The pumps will be equipped with variable frequency drives to match load and maximize energy performance.

Heating System Sub-Project #4: Install New Gas Service

The addition of the recommended gas-fired boiler plant will trigger the need for a new gas service to the building, as one currently does not exist. The new gas service to the building will have a minimum capacity of 6,000 CFH, with a delivery pressure of approximately 2.0 PSI. The new service will include a pressure regulator, gas meter,

test port and dirt leg. It will be located as close as possible to the new boiler plant mechanical room with the routing of the service closely coordinated with the serving utility, Xcel Energy.

It should be noted that CU Denver, in partnership with CU Anschutz, conducts its own natural gas purchasing on the open market, combining the gas demand of both campuses to maximize economies of scale. Xcel Energy is simply the transmission partner in this strategy and their pipelines are utilized to access the market-purchased gas supply. This strategy saves the CU Denver and Anschutz Medical Campuses in excess of \$1M annually.

Heating System Sub-Project #5: Build New Boiler Room

The new boiler plant mechanical room will consist of rated steel framed wall assembly, with elevated sloping slab and double man-door assembly. The rated walls will initiate tight to the floor slab and terminate at the bottom of the rated deck above. All mechanical equipment will be provided with inertia base housekeeping pads that are sized to accommodate the mechanical equipment footprint, weight and vibration constraints as provided by the equipment manufacturer.

In addition to the new boiler room assembly, there will be a requirement to accommodate boiler flue and combustion air pathways to the exterior of the building and that terminate a minimum of 10'-0" above finished grade. This will require the assembly of two (2) separate rated shafts located directly above the mechanical room on the exterior wall of the room above. These shafts will provide for the necessary pathways of the boiler flue and combustion air distribution from the boiler room to the atmosphere. Louvers will be provided at the termination point and be mounted flush with the face of the building.

Air Handling System

There is one main air handler in the penthouse that services the 2nd through the 8th floors and occupies approximately half of the mechanical penthouse. The unit provides 137,850 CFM at 55°F through a central building shaft adjacent to the elevator core. The unit includes two (2) supply fans, three (3) outdoor air louvers, one (1) filter bank, and two (2) cooling coils.

The 1st floor of the main building is handled by local fan coil units, none of which need repair or replacement. The Annex building's air handling system is separate and is addressed below.

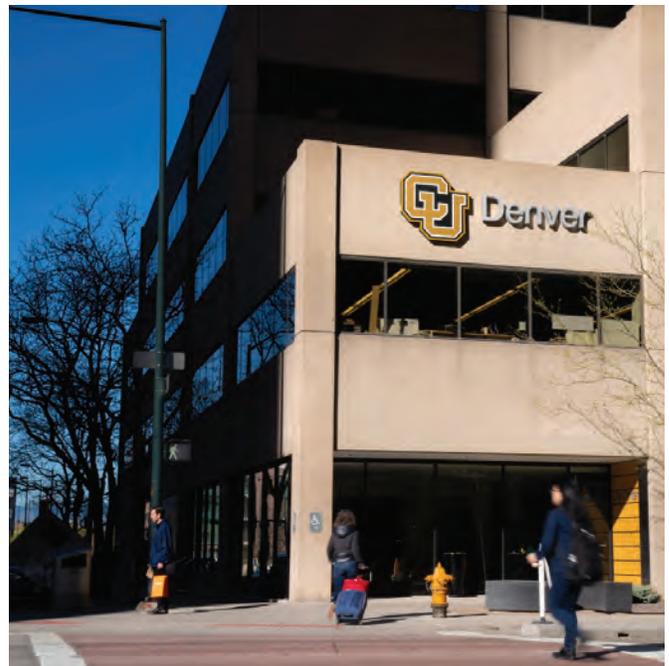
The five following air handling system sub-projects combined have been submitted as part of CU Denver's 21-22 controlled maintenance request. They will be removed from this 22-23 capital request if they are funded as controlled maintenance in 21-22.

Air Handling Sub-Project #1: Replace Main Building Supply Air Fans

Replace the original 1977 vintage main building supply air fans, SF-1 and SF-2, located in the penthouse, as they are beyond their useful life. This replacement includes the two supply fans, associated inlet and discharge housings, flexible connections, variable frequency drivers, temperature controls and accessories. Replacement will be with similar high-efficient, direct drive, inline vane axial supply air fans that will maintain the same air flow capacity and static pressure capability. Modification of the air handling instrumentation, controls and programming will occur, updating it to current university standards (Siemens).

Air Handling Sub-Project #2: Add Airside Economizer to Outdoor Air Louvers

To improve the airside efficiency in the building



the project will provide more outdoor air to the building and manage the increased airflow by installing an economizer/mixing box assembly in the penthouse return air plenum room. The project will provide permanent outdoor air louvers/dampers, and a modulating actuator and controls along the north face of the wall in the return-air plenum room. It will extend the existing divider wall in the return-air plenum room to the north and terminate into the face of the north wall and provide louvers/dampers in a new wall section with a modulating actuator and controls. Finally, the project will provide instrumentation, controls and programming (Siemens).

Air Handling Sub-Project #3: Replace Filter Bank

Replace the original 1977 vintage filter bank with a new filter bank to match the existing configuration, which includes 24" wide by 20" high filters in an arrangement of 7 rows high and 6 rows wide typical of each coil. The project will also provide minimum Merv 8 pleated filters.

Air Handling Sub-Project #4: Replace Cooling Coil Bank

Replace the original 1977 vintage cooling coil bank with a new cooling coil bank to match the existing configuration, which includes two (2) cooling coils. Each coil will be a fan inlet air (mixed air) coil that is supplied with chilled water only. Chilled Water Supply and Chilled Water Return will be supplied to the coils through a 4" pipe. Each coil will be three (3) rows deep covering an overall area of 12' wide by 11' high and divided into three (3) horizontal sections.

Air Handling Sub-Project #5: Add General Building Exhaust/Pressure Relief Fan(s) to Return Air

The building does not currently have general building exhaust. Provide new exhaust/pressure relief fan(s) to support the addition of the economizer assembly referenced above. The fan(s) will be capable of delivering 140,000 CFM to match 100% of the building supply air capability. The fan(s) will be located in the return air stream ahead of the new demising wall (with dampers). The fan(s) will be equipped with variable frequency drives to match demand and maximize energy efficiency.

Electrical System

The primary metered electrical service is provided by Xcel Energy. The utility service enters the building through the garage and then four (4) primary electrical feeder cables extend up through the structure in four (4) 4-inch PVC conduits encased in the elevator wall. The conduit and cable terminate on the roof where three (3) building service transformers are located on the penthouse level. There are three (3) single phase transformers rated at 500kVA each for a total of 1500kVA electrical load capacity for the entire building.

The seven following electrical system sub-projects combined have been submitted as part of CU Denver's 21-22 controlled maintenance request. They will be removed from this 22-23 capital request if they are funded as controlled maintenance in 21-22.

Electrical Sub-Project #1: Replace Main Distribution Center

Replace the original 1977 vintage "MDC" switchgear which is 4,000A, 480V/277V, 3-phase, 4-wire. The Main Distribution Center should be replaced because it has exceeded its recommended service life and is not in compliance with NEC Article 230.71 (Maximum Number of Service Disconnecting Means).

New "MDC" will be breaker type with a 4,000A ground fault protection main. In addition to matching the size and quantities of the existing fused switches, additional spare breakers will be added for future building electrical requirements. The existing single 400A feed to two (2) 150kVA transformers will be separated into two (2) 200A feeds. Wire and conduit will need to be modified to accommodate this new configuration and relocated from Panel "EPP." Panel "EPP" will be removed. Wire and conduit will need to be re-routed from the new Distribution Center to existing connection in Panel "EPP."

Electrical Sub-Project #2: Remove Emergency Distribution Board

Remove the original 1977 vintage "EPP" switchgear which is 400A, 480V/277V, 3-phase, 4-wire. The switchboard should be removed because it has exceeded its recommended service life and does not meet the current requirements for an emergency distribution system. Existing loads for Automatic Transfer Switch "ATS-1" and elevator will be relocated.

Electrical Sub-Project #3: Meter Automatic Transfer Switch “ATS-2”

Provide 30-day continuous metering of “ATS-2” to determine available spare capacity.

Electrical Sub-Project #4: Connect Elevator to Generator via “ATS-2”

Pending results of “ATS-2” 30-day metering, the existing generator will be fed from Panel “EHP.” Panel “EPH” will also need to be investigated to determine the feasibility of adding a 200A breaker. (2015 IBC Section 403.6.1 and 3007.1 through 3007.9)

Electrical Sub-Project #5: Provide Maintenance By-Pass Disconnect for Diesel Generator

Install new 400A generator maintenance bypass disconnect with camlocks to allow for portable generator connection when service to the primary generator is required. (2017 NEC, Article 700.3 (F)).

Electrical Sub-Project #6: Replace Original Lighting and Mechanical 480V/277V Panelboards

The original 1977 vintage building-wide lighting and mechanical panelboards have exceeded recommended service life and must be replaced.

Electrical Sub-Project #7: Replace Original General Power 208V/120V Panelboards

The original 1977 vintage building-wide general panelboards have exceeded recommended service life and must be replaced.

Fire Alarm System

The existing fire alarm system consists of Silent Knight Remote stations and is intelligent and addressable. This system is continuously monitored by a Class 1 remote supervising station, in compliance with NFPA 72. The system is not up to university standards for type and functionality and does not support mass notification to the building occupants. It is highly desirable to upgrade the system to current technology and functionality, similar to other university buildings.

Fire Alarm Sub-Project #1: Remove existing Silent Knight fire alarm system

Provide new EST Fireworks Incident Management System with mass notification. Replace existing notification devices (wall strobes, horns, etc.) with EST Genesis Series devices. Replace existing detection devices with EST Signature Series

modular devices for smoke, heat and carbon monoxide detection.

Sanitary Sewer System

The primary 6” sanitary sewer is original to the building. The sanitary sewer enters the building on Parking Level P1 and runs to the center core of the building, then turns straight up to serve the toilet groups at each floor of the building.

In addition to the primary 6” service line there is a secondary 4” line that serves the Annex building, and it is also original to the building. This sewer line also enters the building on Parking Level P1 and runs to the center core of the Annex building, serving the toilet group on Level 1 of the Annex building only.

The sanitary sewer piping material is cast iron and is experiencing internal corrosion and intermittent leaks are discovered frequently.

Sanitary Sewer Sub-Project #1: Replace Existing Sanitary Sewer Riser

Replace the primary cast-iron sanitary sewer services and risers from their entry locations on Parking Level P1 up through the entire main building to the stack vent termination, and across to the Annex building. This process will require select demolition of walls, ceilings and finishes at most of the toilet groups up through the building where the sanitary riser primarily exists.

Storm Drain System

The 6” storm sewer line is original to the building. The connection to the city main along 14th Street is blocked and may have collapsed. The line enters the building on Parking Level P1 and splits to serve various roof drain risers and the plaza area drains.

Storm Drain Sub-Project #1: Replace Existing Storm Sewer Line

Replace the 6” primary cast-iron storm sewer line connection to the city main along 14th Street. The sewer line sits below the street easement area and will require a special permit to access and city involvement to reconnect to the sewer main.

Plaza Drainage System

The courtyard plaza between the main building and the Annex is a brick paver open breezeway that serves as public access between Larimer Square, the Cherry Creek trail and a City of Denver park on the far side of the building. Storm runoff is served by a series of storm drains located within the paver plaza. Several drains have been replaced over the years by CU Denver, as well as large portions of the brick pavers that protect the water proofing layer underneath. The integrity of the brick pavers and the water proofing layer are critical, as the plaza is situated directly over the parking garage level P1.

Plaza Drain Sub-Project #1: Replace Existing Plaza Drains and Piping

Replace the plaza drains serving the plaza area on the exterior of the building between the main building and the Annex building. In addition to the drains themselves being replaced, the associated storm water piping located in the overhead of parking Level P1 just below the plaza will be replaced.

Garage Systems

The building is constructed above a two (2) level, below grade parking structure that is original to the building. Several projects have been identified to repair system deterioration. Details of these projects are in the attached Walker Parking study dated July 14, 2016. All identified projects in this study are being included in the renewal project request.

Garage Sub-Project #1: Entrance Ramp

The existing slab-on-grade concrete will be removed and replaced and a recommended snowmelt system will be embedded within the replaced concrete slab. Current snow melt is accomplished via overhead infrared lights that are beyond their useful life. Adequate room within the parking structure will be provided to accommodate the new snow melt boiler room and controls. The project will replace existing ramp light fixtures with new LED Light fixtures.

Garage Sub-Project #2: Replace Level P1 Lighting

Replace existing fluorescent light fixtures with new LED light fixtures (similar type as Level P2) for Level P1.

CU Denver self-funded the \$21k upgrade of Parking Level P2 lighting to new LED technology in 2018.

Annual cost savings of over \$1,700 are being realized, giving this retrofit a 12-year payback.

Garage Sub-Project #3: Replace Fire Sprinkler System

The garage dry pipe sprinkler system is original to the building. It is beyond its useful life and needs a full replacement. The project will provide all necessary fire protection piping distribution mains, branch distribution and sprinkler heads for a full replacement of the existing system on Levels P1 and P2.

Garage Sub-Project #4: Repair General Garage Condition(s)

The project will repair:

- Concrete: Cracks, cast-in-place concrete and welded tee flange connections.
- Waterproofing: Deteriorated or failing sealants will be removed and flexible urethane sealants will be installed at all deteriorated sealant locations.

Greening of Colorado Executive Order Scope: Electric Vehicle Charging System

In an effort to comply with Executive Order D 2019 016, this phase of the project will add Electric Vehicle infrastructure to meet the stated requirements. There are currently no EV stations installed in this facility. CU Denver will look at all available grants and programs to help offset the purchase and installation cost. Any grant funds received will go toward increasing the number of EV chargers installed.

EV Charging Stations Sub-Project #1: Provide New Electric Vehicle Charging Stations

Provide documentation or plans showing that at least 20% of parking spaces will be pre-wired for charging, and that at least 5% will have EV chargers installed. The project will provide all necessary panelboards, breakers, wire, conduit and EV chargers on Parking Levels P1 and P2 to meet this requirement.

- Quantity of Pre-Wired EV Charging Parking Stalls: 30
- Quantity of Fully Installed EV Charging Parking Stalls: 10
- Total Affected Parking Stalls: 40

Greening of Colorado Executive Order Scope: On-Site Renewable Energy

In an effort to comply with Executive Order D 2019 016, and in keeping with the university's sustainability goals and objectives, this phase of the project is assessing available roof space for installation of photovoltaic (PV) solar arrays for on-site electrical generation. CU Denver will look at all available grants and programs to help offset the purchase and installation cost. Any costs that are offset from grant funds will be 100% reinvested in other energy conservation projects on campus.

On-Site Renewable Energy Sub-Project #1: Provide New On-Site Renewable Energy Generation

Based on available roof space, this project will provide a new 227.2kW PV solar array system on existing roof structure. The estimated production of a new system is 332,958kWh/year (based on PV Watts / not including shading). The project will provide full installation of a functional, code-compliant system, including all required equipment and labor. Full system documentation including permitting, invoices, instructions and warranty information will be provided during system installation.

Annex Building Accessibility and Code Corrections

The Annex portion of the building consists of two (2) stories and just over 10,000 GSF of usable space. All systems are original to the building. The 1st floor is used for the College of Architecture and Planning's Design-Build Program and houses the Annex building's only restrooms. The 2nd floor is currently used for temporary maker space and to display student work. It is not permanently habitable due to the lack of restrooms and ADA accessibility. The intent of this portion of the project is to correct accessibility issues and upgrade all mechanical and electrical systems to support future occupancy and use of both floors.

Annex Building Sub-Project #1 thru 6: Building MEP Systems and ADA Upgrades

Provide building systems and ADA upgrades to the Annex building. Replace hydronic chilled water piping, hydronic heating water piping and fan coil units with like for like capacity and quantity throughout the Annex. Replace electrical power distribution and add panel boards to meet current code requirements. Upgrade lower-level restroom

group to meet ADA requirements. Add restroom group to second floor to meet code and ADA requirements. Upgrade accessibility by adding elevator and secondary means of egress with external stairwell to meet ADA and egress-code requirements. Relocate existing IT equipment room to accommodate new elevator. Upgrade fire detection and sprinkler systems in the entire Annex building.

Building Lighting System

The building's lighting systems are a mix of aged fluorescent and newer LED systems. As CU Denver has renovated floors and areas of the building, lighting systems have typically been updated. It is estimated that the lighting in approximately 61,000 GSF of the building needs immediate replacement and upgrade to current technology. This includes portions of the main building, the Annex building and exterior site lighting.

LED Lighting Sub-Project #1 thru 2: Replace Main Building, Annex Building, and Site Lighting Fixtures

Replace existing light fixtures with new LED light fixtures in all areas where LED fixtures have not already been installed. Overall affected square footage of interior lighting to be updated is approximately 61,100 GSF. Replace exterior site lighting to LED.

The IECC 2015 will be utilized to establish the baseline for lighting system energy usage; local codes will take precedence where alternative procedures are dictated or where minimum lighting levels in specific areas are required. Energy Code limits on connected lighting loads will take precedence over IESNA-recommended illumination levels, apart from illumination levels required by code for emergency safety-of-life functions, such as emergency egress lighting.

Building-wide Signage Standardization

As a result of the planned modifications to electrical, mechanical and fire alarm systems in the building, this scope will accomplish the following:

Replace all interior code required signage (Types D, L, M1, M2, N and P), room identification signage (Types B1, B2 and B3), door identification

signage (Type E, F and G), directional signage (Types A1 and A2), lobby directory signs (Custom), and exterior building name signage (Custom). During the design of the new signage, the designer shall renumber and rename all relevant building spaces, stairs, elevators, and doors to comply with current functional use and CU standards. All sign types shall comply with CU Denver Guidelines and Design Standards dated July 7, 2017 (attached for reference). At a minimum, the signage scope shall include coordination and reprogramming of the BAS and fire alarm systems as well as replacement of all fire annunciator panel maps. Further coordination shall occur with the related proposed scope identified elsewhere in this Capital Renewal Plan, including: (1) electrical panelboard and distribution center (Electrical Sub-Projects #1, #5, #7), (2) modification to instrumentation, controls and programming (Air Handling Sub-Project #5), and (3) replacement of the fire alarm system (Fire Alarm Sub-Project #1).



D. SUMMARY OF RENOVATION PROJECTS

In 2020, a series of interviews were conducted with staff from the College of Architecture and Planning (CAP) and the College of Arts and Media (CAM) to determine the most pressing challenges of delivering their academic programs in the CU Denver Building. The outcomes of those meetings are captured in the conceptual document Seeing Opportunity (2020), and discussed in greater detail in section II.D. What arose from the meetings were a list of what were termed opportunities, or targeted renovation projects that could have a profound affect on these two academic colleges but also the university as a whole. These projects all support one or more of the four opportunity areas described in the section II.D.

The areas to be renovated as part of this funding request are described below. Specific uses and outcomes are proposed for some areas. For other areas (primarily the first floor and both levels of the annex), activity types have been used to describe the range of potential uses that would make the best use of the space based on location and other features. Some areas will include aspects of multiple activity types. The activity types will be used to guide discussions with the user groups when the formal design process begins. These discussions will also consider post-pandemic context and how higher education operations and the delivery have changed.

The activity types are the following:

Active Lab - an instructional environment that is by nature more active and engaging. This use type allows for observation by the public and other building occupants. The goal is to showcase “learning on display” and invite people to approach the area to observe the process of learning and creating in real time.

Branding – areas with the ability to convey messages about the University or a specific school/college or department. Areas that are highly visible to street-level public are ideal for branding. As a passive use, branding can be incorporated into other use types.

Classroom - a traditional classroom setting. This traditional setting is not considered ideal for spaces that are public-facing, due to the lack of pedestrian interest. This use type is more enclosed and private.

Community - an area that would be ideal for gathering community. This can be defined as the university community or the broader surrounding community. This type of use should be easily accessible and visible to the targeted user group.

Display – exhibit spaces displaying process pieces and finished works from students and the broader community. These spaces should be well-lit, visible and accessible to the public and for loading purposes. Like branding, display could be a secondary use that co-exists with the primary use of the space (i.e. events, active lab).

Events – spaces capable of hosting gatherings, both internal and external. It aligns with the community space type but may be more purpose-built for events. This type of use should be easily located by visitors and could be visible to the public.

Fabrication – spaces for creating and making. The ideal location for this use type will be driven by accessibility for receiving and moving materials, space that is adequately proportioned for large machinery, and access to services to run the machinery. This is a broad category. Some fabrication areas could be suitable for highly visible locations if they are active and generate interest from passersby and the other criteria can be met. Other fabrication areas are noisy and messy and are better located away from the public.

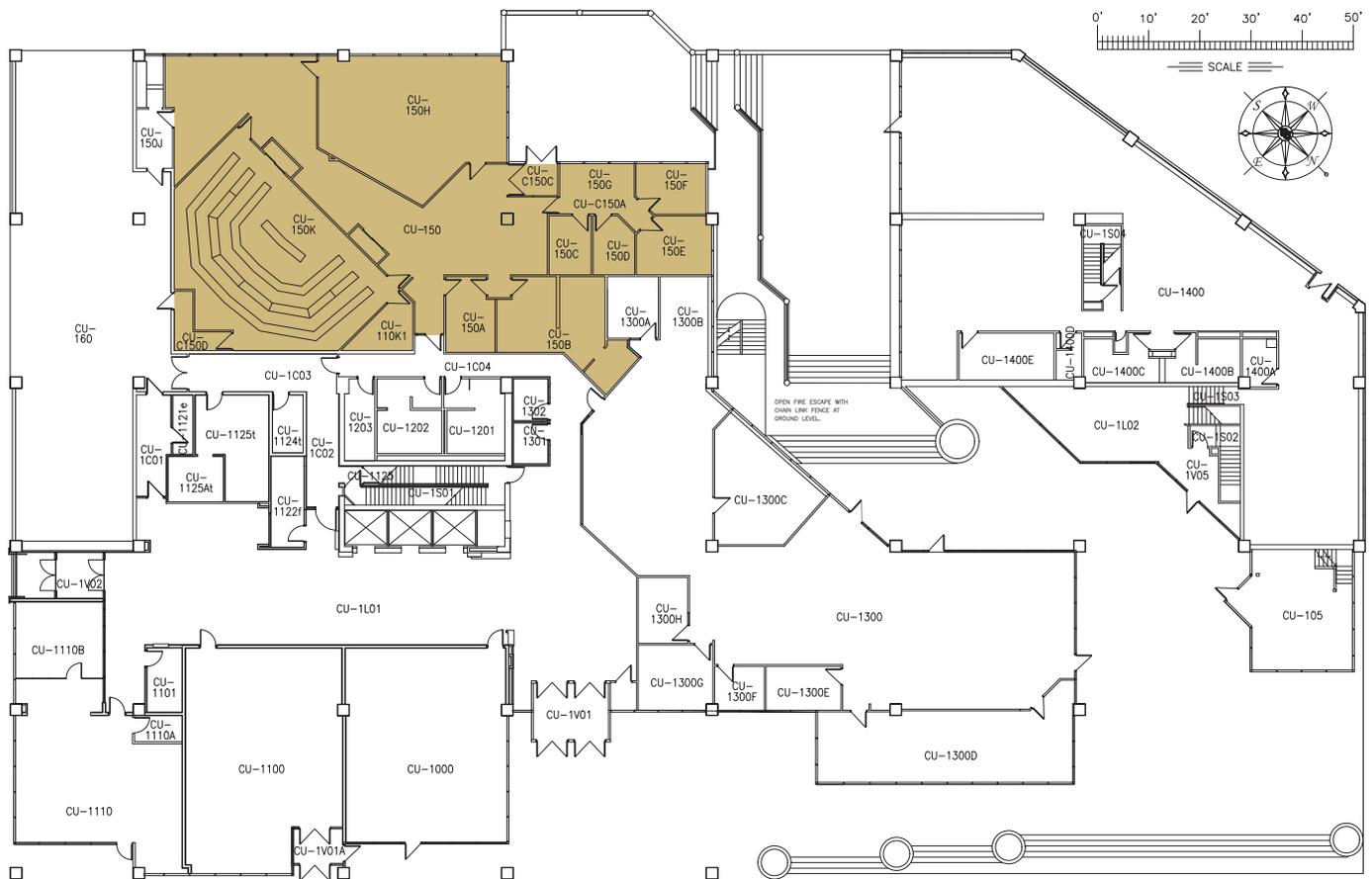


Renovation Areas

First Floor:

Suites 150

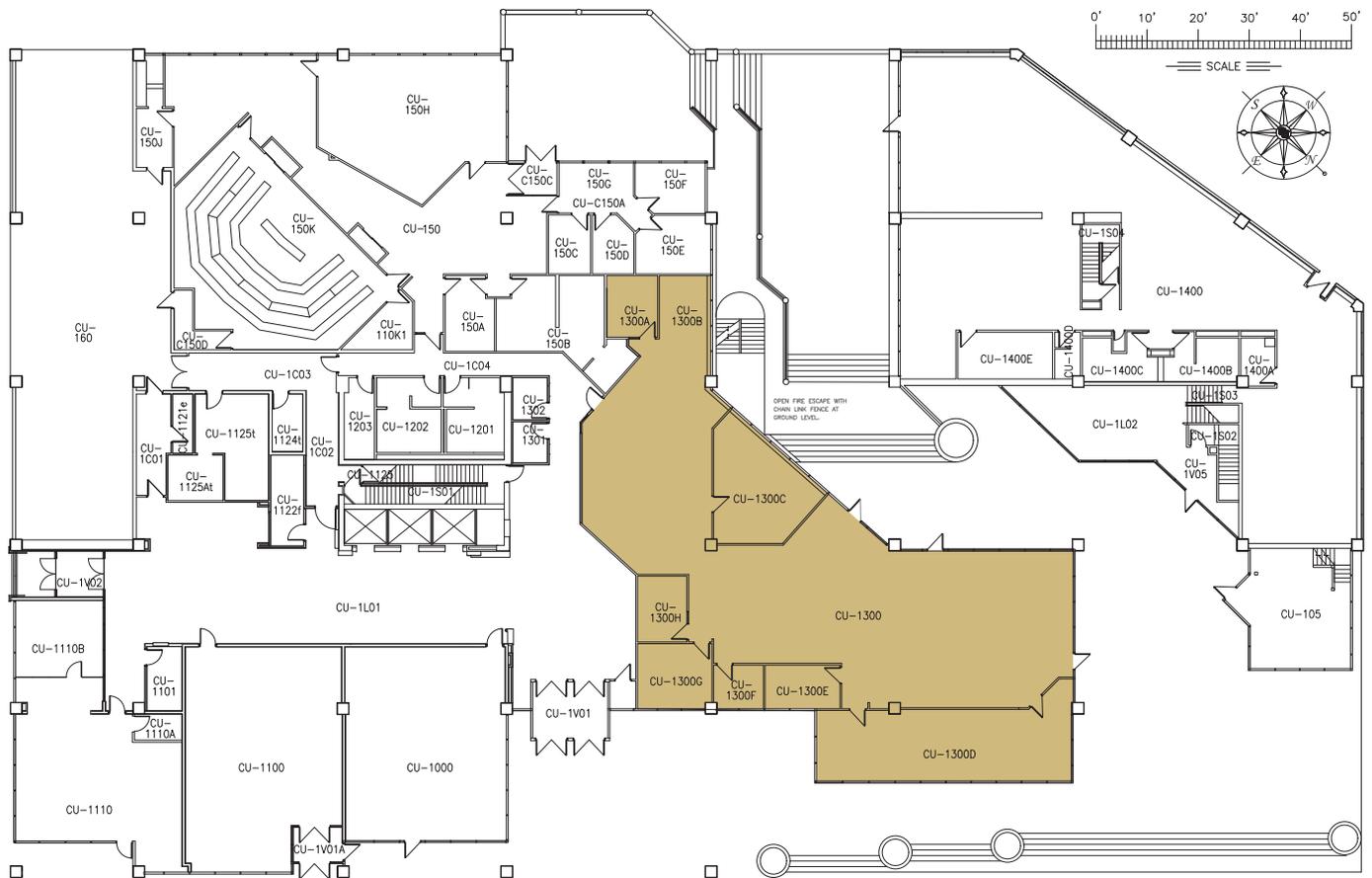
Suite 150 is currently occupied by the Executive MBA program, a program that is overseen by the CU System office and represents a partnership between the Business Schools at CU Denver, CU Boulder and CU- Colorado Springs. The suite is 3,319 square feet and is comprised of office, classroom and storage space. The Executive MBA program will be relocating to the Business School before this project is undertaken. The suite is easily accessible by the public but less visible than other spaces in this project. This area is best suited for Classroom, Community, Events and Fabrication activities. It does have branding potential, and discussion of uses for this area should consider how the space could be used to better activate Creekfront Park, possibly by leveraging the outdoor deck. The existing floor plan for suite 150 is shown below.



Suite 150

Suite 1300

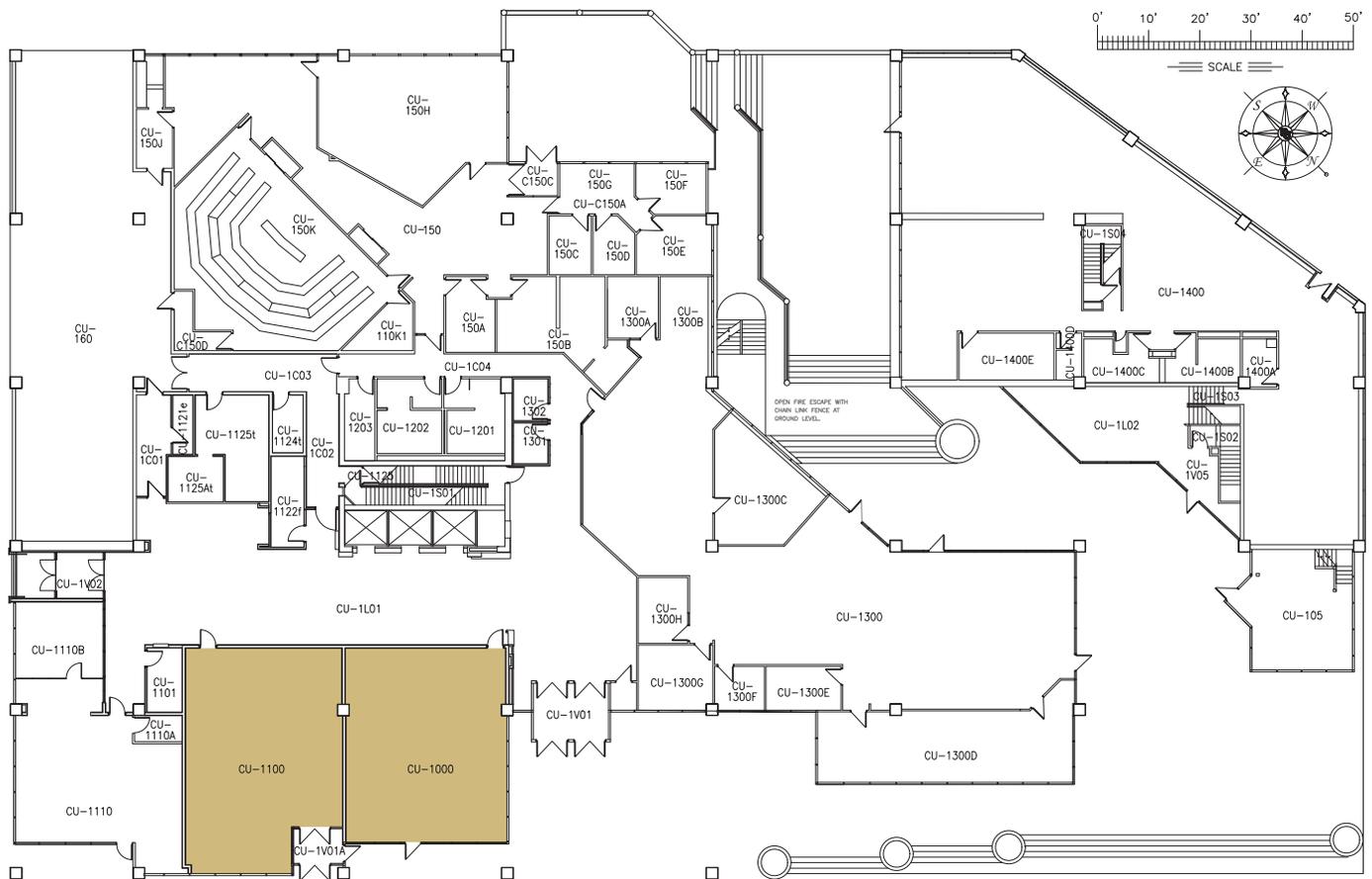
Suite 1300 is home to inWorks, an innovation lab that is part of the College of Engineering, Design and Computing. The space is comprised of open office, a large fabrication area with a variety of machinery, a classroom and a conference room. The area is 4,975 square feet. This program plan assumes that inWorks will be relocated prior to the start of the project. This area is one of the most public-facing, transparent and accessible spaces in the project. The area is best suited for Active Lab, Community, Display, Events, and Fabrication. There are significant opportunities for branding in this area. Any discussion of uses and design for this area should carefully consider how the space will be perceived by those in Larimer Square and walking past along 14th Street. The existing floor plan for suite 1300 is shown below.



Suite 1300

Rooms 1100 and 1000

These rooms are currently used as traditional classrooms, and offer very little of interest to the many people walking along 14th Street. With more emphasis on hybrid and remote learning options for students, CU Denver is proposing that these classrooms be taken offline and the space be re-purposed to uses that leverages of the locational advantages of the space. These rooms are best suited for Active Lab, Community, Display, and Events, and offer great branding opportunities. Any discussion of uses and design for these rooms should carefully consider how the space will be perceived by those walking past along 14th Street and from the lobby of the building. The existing floor plan for rooms 1100 and 1000 are shown below.

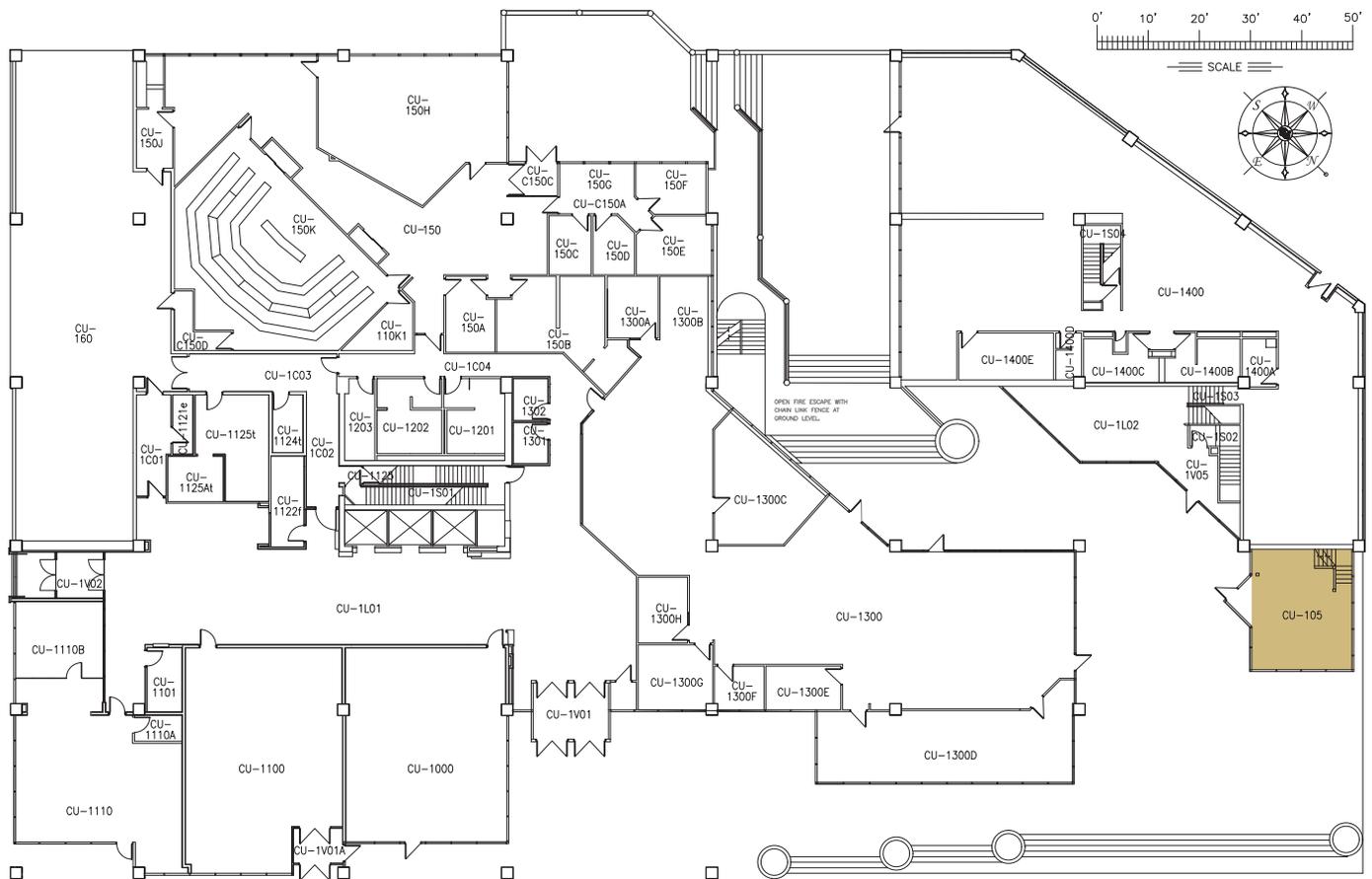


Suite 1100 and 1000

Suite 105

Suite 105 is a small, 448 square foot space that is currently occupied by the Office of Institutional Planning, Facilities Operations and Facilities Projects. These groups will be relocating prior to the start of the project. The suite has no running water and is not connected to the remainder of the annex building. It is a highly visible space, both from 14th Street and from Larimer Square. This suite is best suited for Active Lab Community, and Display and offers perhaps the best branding opportunity in the project. Any discussion of uses and design for this area should carefully consider how the space will be perceived by those in Larimer Square and walking past along 14th Street.

The existing floor plan for suite 150 is shown below.

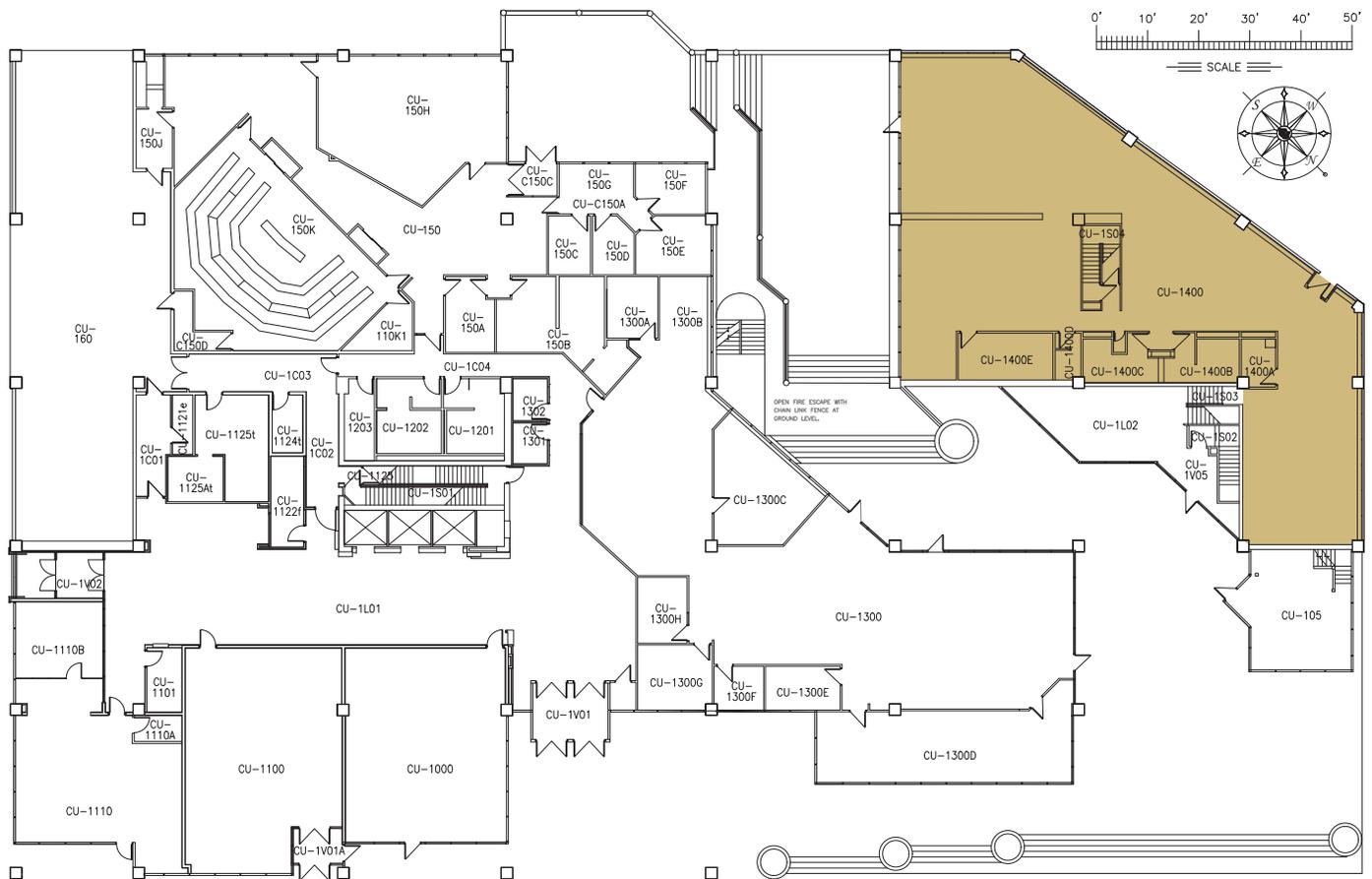


Suite 105

Suite 1400 (Annex Level 1)

Level one of the annex is currently used by CAP for welding and casting and houses a plasma cutter and a CNC router. In addition to the use of the space for fabrication, the area is used for instruction by the Design Build program and for other fabrication-intensive courses. The space is 4,749 square feet. Ideal uses for the space include Active Lab, Community, Display, and Fabrication. It is possible that the space could be modified to better function as a fabrication space while exploring options to better connect to Creekfront Park. If the current uses are relocated, they will need to be accommodated in this project, possibly in a consolidated fabrication area to include new fabrication areas and those moving from the 4th floor. The annex in general does little to activate the park either through visual appeal or providing the perception of safety through transparency from/to the building. Branding opportunities from 14th street and the park are numerous. Any discussion of uses and design for this area should carefully consider how the space will be perceived from the park and explore the possible of activating the lower plaza between the tower and the annex.

The existing floor plan for Annex Level 1 is shown below.

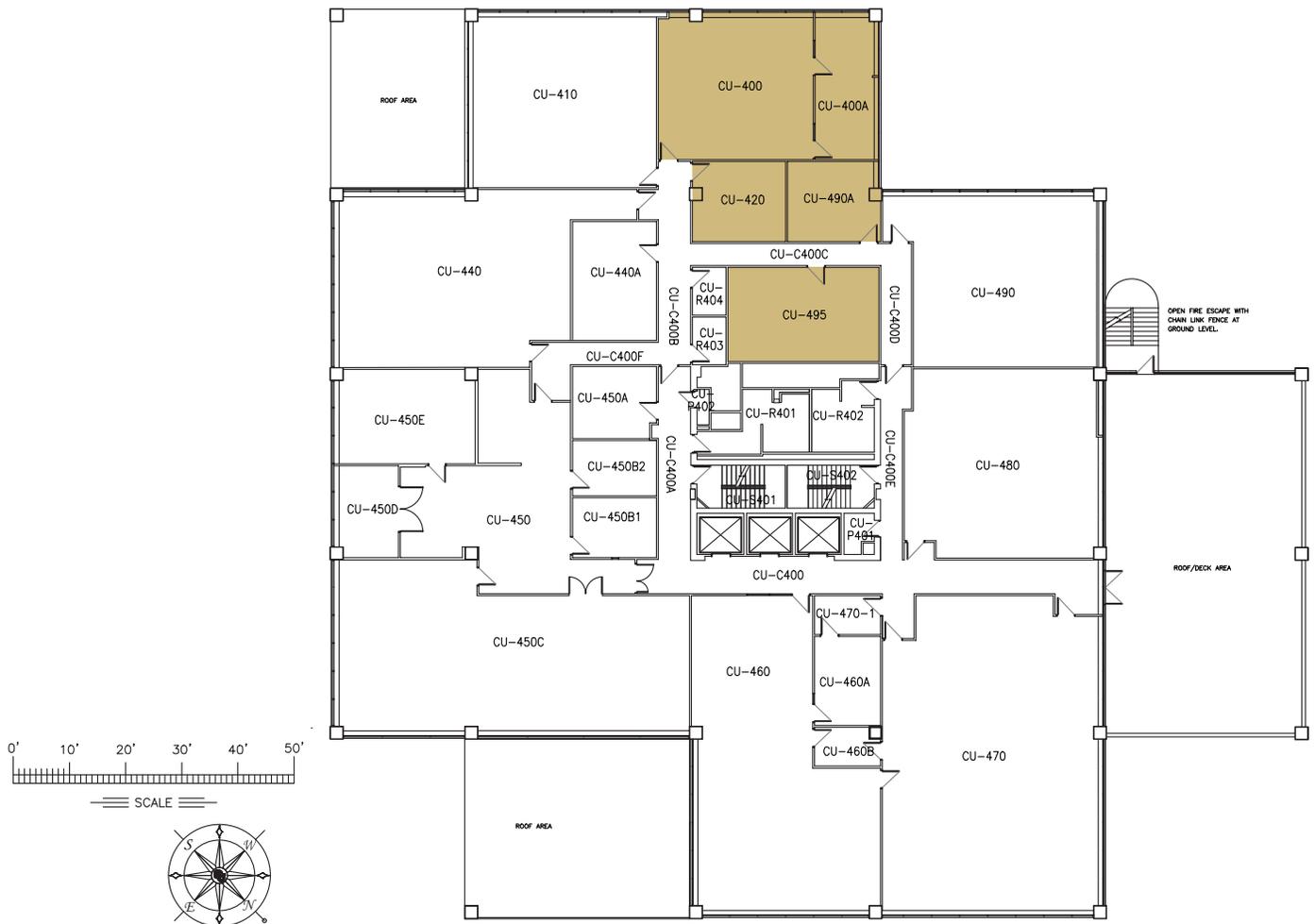


Suite 1400

Fourth Floor:

Rooms 400, 420, 490A and 495

Room 400 currently acts as a student lounge and offices for PhD students. Room 420 is the photo room. Room 490A is the Visual Resource Center (VRC) and Room 495 is a classroom. Collectively, these spaces total 1,612 GSF square feet. All are spaces that have not been renovated in some time, and merit exploring whether they are ideal for that location, are served well by the space as currently laid out, or could be improved by renovation and stay in their current location. CAP needs that align with these areas include critique space, nice community spaces, and modern teaching spaces supported by technology.

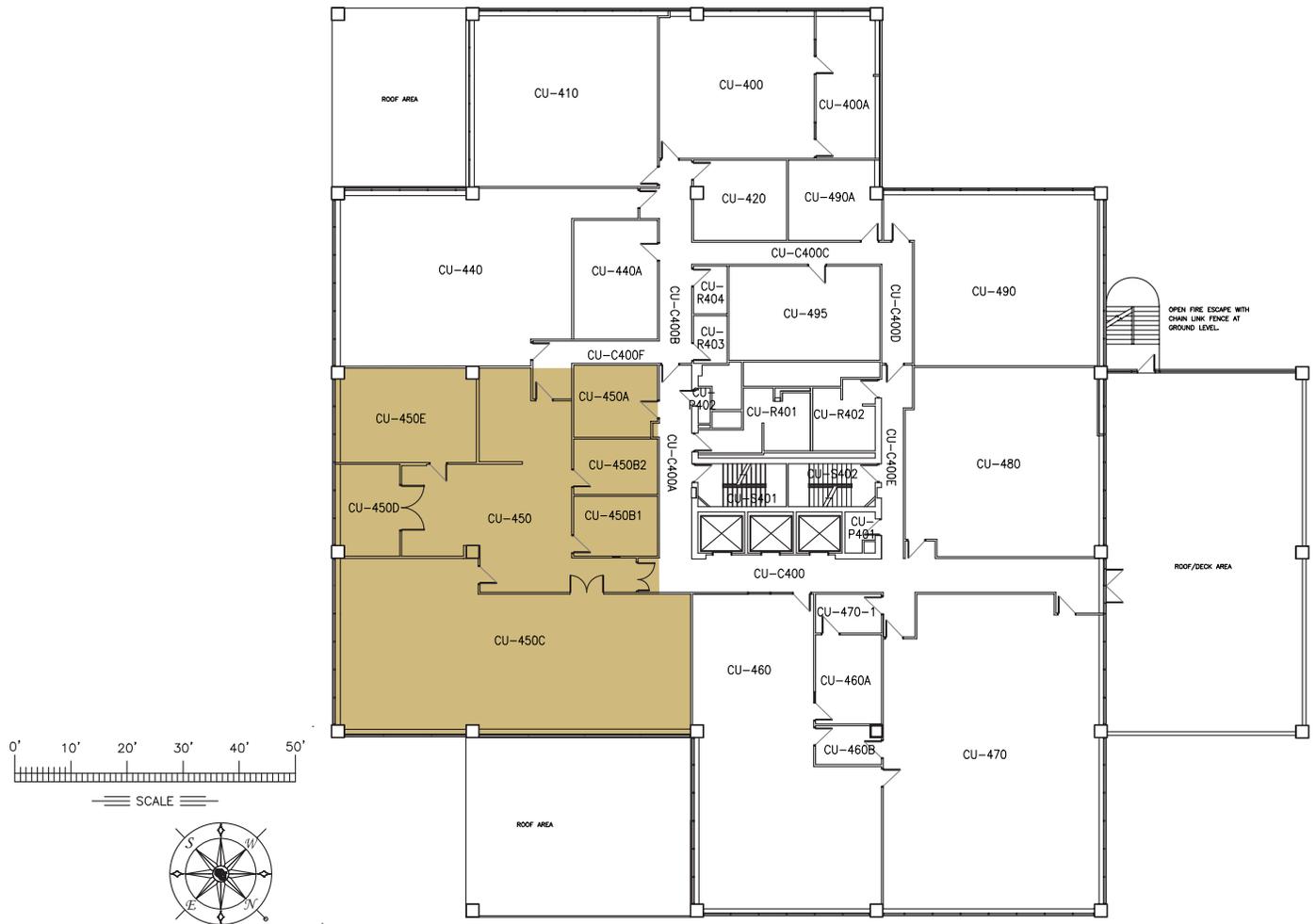


Rooms 400, 420, 490A and 495

Room 450

Room 450 is currently home to the fabrication spaces for CAP and the offices for staff that support those spaces. This includes the wood shop, spray booth, compressor, laser lab, and storage for wood projects. The space totals 3,647 square feet. One of the primary goals of this project is to consolidate the existing fabrication operation on the 4th floor along with other fabrication areas such as robotics and 3D printing onto the ground floor and/or annex. This makes it much easier to supervise the work occurring in these spaces safely, to provide proper ventilation and other services to these spaces, and to move materials to and from these spaces safely and more efficiently. Moving fabrication will create an opportunity on the 4th floor for other uses. Teaching labs and modern classrooms, both a need of the university overall and for CAP and CAM, will be considered among other potential uses for these spaces.

The existing floor plan for room 450 is shown below.



Room 450

Eighth Floor:

Rooms 805A and 810

These two rooms total 847 square feet, and both are instructional labs that support the Digital Animation program. Each room is too small to meet the cohort size needs of the program (18-22 students), and additional sections with very low enrollment need to be added every semester to meet demand. These two rooms will be combined into one, larger room and the technology and furnishings will be upgraded. Some of the technology upgrades are made possible by the infrastructure work being done as part of this project.

The existing floor plan for rooms 805A and 810 are shown below.

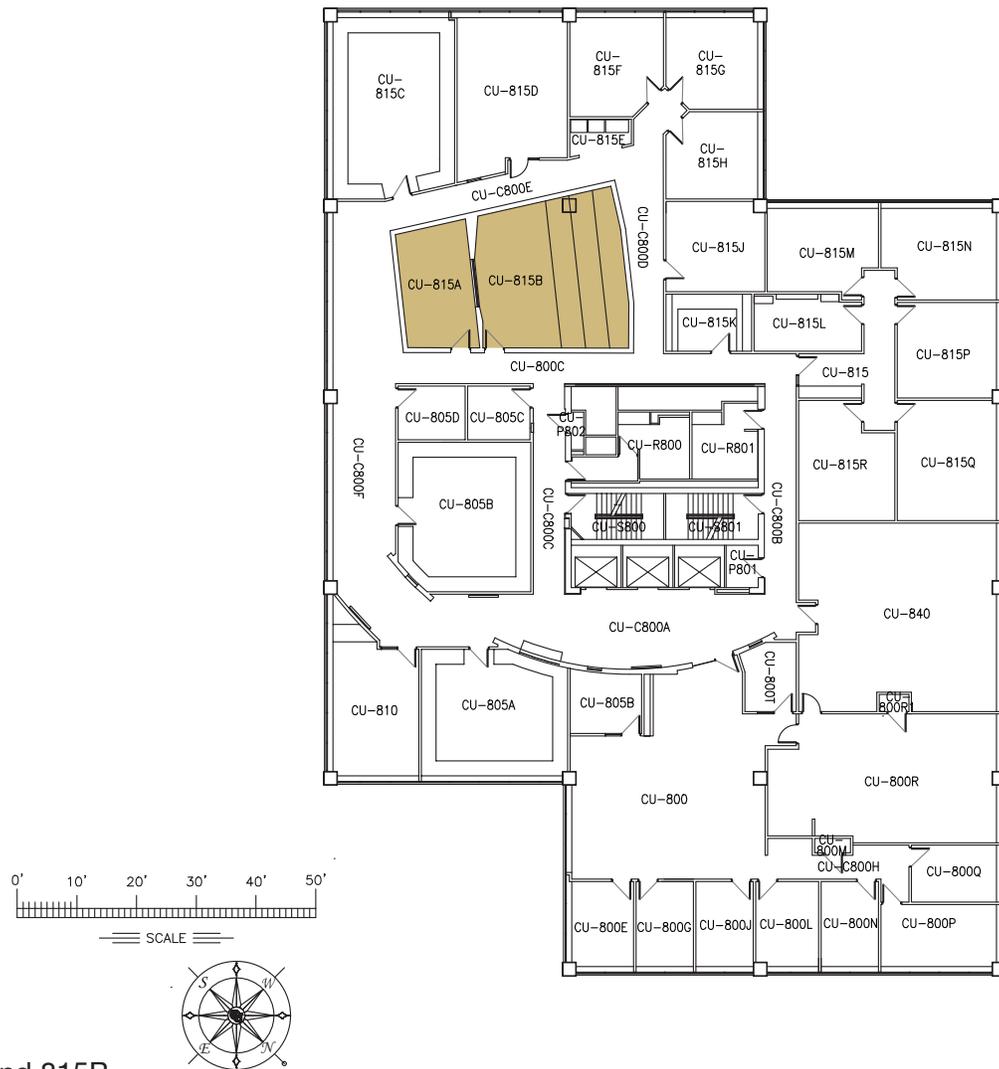


Room 805A and 810

Rooms 815A and 815B

These two rooms were designed more than 15 years ago to function as a recording room (815A) and a classroom and playback room to compliment the recording room (815B). Room 815A is no longer used for recording, and 815B is used primarily as a screening room for the digital animation and digital design programs and to teach art history courses. These two rooms will be combined and the floors levelled to create one larger, flat-floored teaching lab that can serve the needs of the growing Digital Design and Digital Animation programs and continue to support Art History. It could also accommodate some of the visual arts space that needs to relocate from the Boulder Creek Building. The two rooms total 848 square feet.

The existing floor plan for rooms 815A and 815B are shown below.

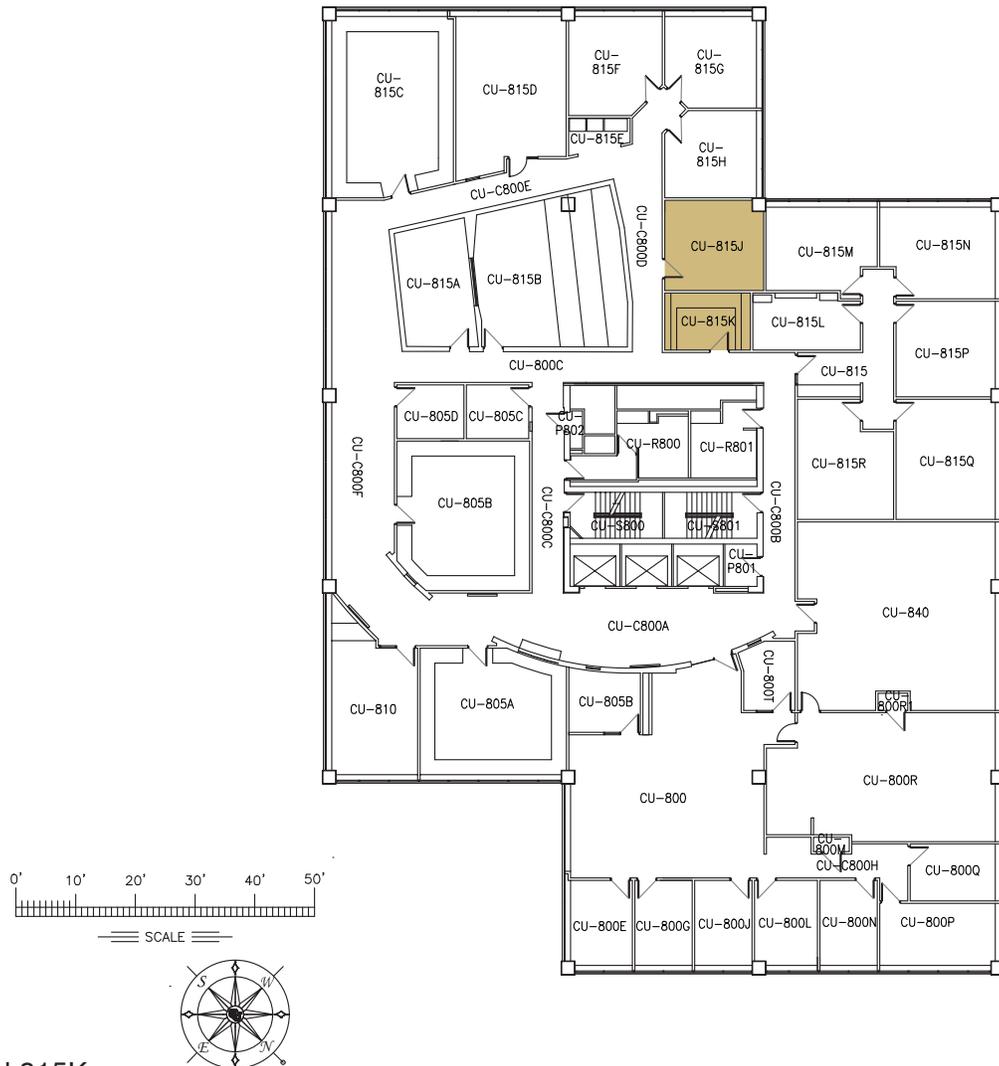


Rooms 815A and 815B

Rooms 815J and 815K

These rooms currently function as break out space for the Digital Animation and Digital Design programs (815J) and a small communal kitchen, cutting and gluing area (815K). The needs of the CAM programs on the 8th floor would be better served by combining the rooms into one larger drop-in lab or seminar room. Either could still provide functionality as a break out space. The total square footage of both rooms is 387.

The existing floor plan for rooms 815J and 815K are shown below.



Room 815J and 815K

E. PROJECT FUNDING AND COST

The total cost of the CU Denver Building Infrastructure Replacement and Renovation project is \$34,998,500. Of the total, 26% (\$9,099,610) will be cash funded by CU Denver and 74% (\$25,898,890) is being requested from the State of Colorado. The cash fund sources will include a mix of cash reserves and proceeds from debt issued by the University.

CU Denver used the MEP report (attached as Appendix A), current Denver market conditions, RS Means, and subcontractor survey data to estimate construction costs for this project. CU Denver then applied the university's fully vetted, historical averages for soft costs (architect and engineering fees, site surveys and preparation work, code reviews and inspections, 3rd party commissions and HPCP costs, asbestos abatement allowances, contractor's general conditions, and overhead and profit) to arrive at a total project estimate.

The 2019 costs that were part of the 21-22 capital renewal submittal have been inflated 3.5% for 2 years to reflect Denver market inflation assumptions between project submittal, approval and anticipated project kickoff in July 2022.

For costs assumptions related to the installation of photovoltaic panels on the roof, Solar Renewable Energy Credits were assumed to be the current 3rd party average market price of \$200/MW, inflated at 1.5% per year thereafter.

The project CC-C form, which shows project costs broken down by category, is on page 40.

CC-C Form

CAPITAL CONSTRUCTION/CAPITAL RENEWAL PROJECT REQUEST- COST SUMMARY (CC_CR-C)*								
(A)	(1) Funding Type (Cash, CCF, Cash & CCF):	State Funded		(2) Intercept Program Request? (Yes/No):		No		
(B)	(1) Institution:	University of Colorado Denver		(2) Name & Title of Preparer:		Jay Campbell, Associate Vice Chancellor of Facilities Management		
(C)	(1) Project Title:	CU Denver Building Infrastructure Replacement and Renovation		(2) E-mail of Preparer:		jay.campbell@ucdenver.edu		
(D)	(1) Project Phase (Phase 1 of 1):	Phase 1 of 1		(2) State Controller Project # (if continuation):				
(E)	(1) Project Type (CC or CR):	Capital Construction		(2) Institution Signature Approval:		Date		
(F)	(1) Year First Requested:	FY 2022/23		(2) CDHE Signature Approval:		Date		
(G)	(1) Priority Number (Leave blank for continuation projects):	1 of 3		(2) OSPB Signature Approval:		Date		
(1)		(a) Total Project Costs	(b) Total Prior Appropriation	(c) Current Budget Year Request	(d) Year Two Request	(e) Year Three Request	(f) Year Four Request	(g) Year Five Request
Land /Building Acquisition								
(2)	Land Acquisition/Disposition	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
(3)	Building Acquisition/Disposition	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
(4)	Total Acquisition/Disposition Costs	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Professional Services								
(5)	Planning Documentation	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
(6)	Site Surveys, Investigations, Reports	\$ 347,443	\$ -	\$ 347,443	\$ -	\$ -	\$ -	\$ -
(7)	Architectural/Engineering/ Basic Services	\$ 3,815,542	\$ -	\$ 3,815,542	\$ -	\$ -	\$ -	\$ -
(8)	Code Review/Inspection	\$ 145,027	\$ -	\$ 145,027	\$ -	\$ -	\$ -	\$ -
(9)	Construction Management	\$ 681,124	\$ -	\$ 681,124	\$ -	\$ -	\$ -	\$ -
(10)	Advertisements	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
(11)	Third Party Commissioning	\$ 368,258	\$ -	\$ 368,258	\$ -	\$ -	\$ -	\$ -
(12)	Inflation Cost for Professional Services	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
(13)	Inflation Percentage Applied		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
(14)	Total Professional Services	\$ 5,357,394	\$ -	\$ 5,357,394	\$ -	\$ -	\$ -	\$ -
Construction or Improvement								
(15)	Infrastructure Service/Utilities	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
(16)	Infrastructure Site Improvements	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
(17)	Structure/Systems/ Components:							
(18)	Cost for New (GSF):	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
(19)	New at \$ _____ X _____ GSF							
(20)	Cost for Renovation (GSF):	\$ 6,557,950	\$ -	\$ 6,557,950	\$ -	\$ -	\$ -	\$ -
(21)	Renovation at \$214.28 X 30,605 GSF							
(22)	Cost for Capital Renewal (GSF):	\$ 17,162,879	\$ -	\$ 17,162,879	\$ -	\$ -	\$ -	\$ -
(23)	Renewal at \$83.67 X 205,128 GSF							
(24)	Other (Specify)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
(25)	High Performance Certification Program	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
(26)	Inflation for Construction	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
(27)	Inflation Percentage Applied		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
(28)	Total Construction Costs	\$ 23,720,829	\$ -	\$ 23,720,829	\$ -	\$ -	\$ -	\$ -
Equipment and Furnishings								
(29)	Equipment	\$ 750,000	\$ -	\$ 750,000	\$ -	\$ -	\$ -	\$ -
(30)	Furnishings	\$ 646,375	\$ -	\$ 646,375	\$ -	\$ -	\$ -	\$ -
(31)	Communications	\$ 431,596	\$ -	\$ 431,596	\$ -	\$ -	\$ -	\$ -
(32)	Inflation for Equipment & Furnishings	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
(33)	Inflation Percentage Applied		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
(34)	Total Equipment & Furnishings Cost	\$ 1,827,971	\$ -	\$ 1,827,971	\$ -	\$ -	\$ -	\$ -
Miscellaneous								
(35)	Art in Public Places	\$ 175,534	\$ -	\$ 175,534	\$ -	\$ -	\$ -	\$ -
(36)	Relocation Costs	\$ 220,203	\$ -	\$ 220,203	\$ -	\$ -	\$ -	\$ -
(37)	Hazardous Materials Abatement & Monitoring	\$ 514,887	\$ -	\$ 514,887	\$ -	\$ -	\$ -	\$ -
(38)	Other Costs [specify]	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
(39)	Other Costs [specify]	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
(40)	Other Costs [specify]	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
(41)	Total Misc. Costs	\$ 910,624	\$ -	\$ 910,624	\$ -	\$ -	\$ -	\$ -
Total Project Costs								
(42)	Total Project Costs	\$ 31,816,818	\$ -	\$ 31,816,818	\$ -	\$ -	\$ -	\$ -
Project Contingency								
(43)	5% for New	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
(44)	10% for Renovation	\$ 3,181,682	\$ -	\$ 3,181,682	\$ -	\$ -	\$ -	\$ -
(45)	Total Contingency	\$ 3,181,682	\$ -	\$ 3,181,682	\$ -	\$ -	\$ -	\$ -
Total Budget Request								
(46)	Total Budget Request	\$ 34,998,500	\$ -	\$ 34,998,500	\$ -	\$ -	\$ -	\$ -
Funding Source								
(47)	Capital Construction Fund (CCF)	\$ 25,898,890	\$ -	\$ 25,898,890	\$ -	\$ -	\$ -	\$ -
(48)	Cash Funds (CF)	\$ 9,099,610	\$ -	\$ 9,099,610	\$ -	\$ -	\$ -	\$ -
(49)	Reappropriated Funds (RF)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
(50)	Federal Funds (FF)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
TOTAL		34,998,500	-	34,998,500	-	-	-	-

F. PROJECT SCHEDULE

The following schedule is anticipated for the CU Denver Building Infrastructure Replacement and Renovation project:

Pre-Design: July 2022- September 2022

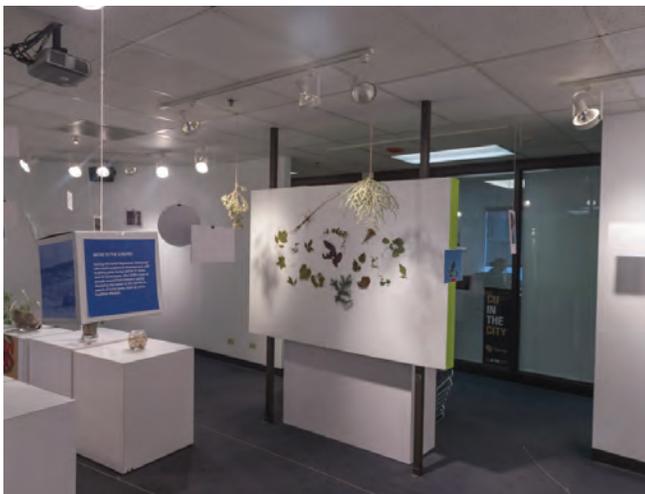
Design: September 2022- May 2023

Construction: May 2023- September 2024

FF&E/Other: June 2024- September 2024

Occupancy: October 2024- November 2024

This schedule will be reviewed when a contractor has been hired and will be adjusted as needed. Every effort will be made to minimize disruption to the building occupants, including prioritizing disruptive construction activities during non-peak times of the year (summer, winter break) and times of the day.



G. RELATION TO MASTER PLAN

The most recent master plan for CU Denver was approved by the Board of Regents in November of 2017. The master plan was amended in 2019 and that amendment, which now serves as the master plan of record for CU Denver, was approved by the Board of Regents in April of 2019.

Below are the guiding principles from the 2019 Master Plan Amendment. The CU Denver Building Infrastructure Replacement and Renovation projects supports these guiding principles in the

ways indicated in each section:

Growth in Academics and Research:

Improving the efficiency of CAP fabrication space and renovating CAM instructional labs to match the desired cohort sizes will allow for growth within these two programs. The 4th floor space made available by relocations to the ground floor presents another opportunity to provide instructional space for growing programs such as the BA in Architecture.

Emphasis on Student Life

The CU Denver Building is lacking in community spaces that support the students who take courses in CAP and CAM. These students often spend long hours in labs or in studio, and could greatly benefit from places to connect with each other and with faculty. This project presents an opportunity to provide those spaces that enrich student life.

Improving Physical Connections

The CU Denver building sits on the edge of one of the most iconic areas of downtown Denver-Larimer Square. The building, however, has never been able to harness the energy of Larimer Square and falls short of providing exciting, transparent spaces that invite the public to explore what we do, what we create, and how we support Denver and Colorado. This project provides CU Denver with the opportunity to do that, by renovating the most public areas of the building.

It was specifically recommended in the master plan that a renovation of the CU Denver Building be undertaken in 0-5-year time frame. The project was envisioned as a mix of infrastructure work and significant renovation. All of the work proposed in the CU Denver Building Infrastructure Replacement and Renovation project aligns with intent of the project that was described in the master plan.

H. PROJECT ALTERNATIVES

There are several alternatives to designing and constructing the project as described in this program plan. At this time, for the reasons stated below, CU Denver requests that the project be approved and funded as described in this document.

No Project

One alternative is to withdraw the project and continue to use, operate and maintain the building without benefit of the improvements described in this document.

This course of action would have significant and costly impacts. If these items are not funded, CU Denver will continue to prioritize the deferred maintenance backlog of this building above all other buildings on campus. However, due to the overwhelming infrastructure need and the sheer volume of backlog inherited in this 44-year-old building, there is no scenario where the critical needs could be funded internally at a level sufficient to address the entirety of the issue. There is a high likelihood that future emergency controlled maintenance funds would need to be requested from the State Architect to address critical system failures. There is an efficiency in addressing the infrastructure needs all at once and avoiding costly emergency repairs. Emergency failures would also be very disruptive to the academic programs in the building.

On the renovation side, not funding the project would leave the following unresolved issues or lost opportunities:

- Safety, efficiency and service issues related to having fabrication space on the 4th floor in a building without a service elevator will be unresolved.
- ADA and code issues that make the annex building legally inhabitable will be unresolved.
- Instructional laboratory size mis-alignments in Digital Design and Digital Animation that cause students to get turned away or cause small-enrollment sections to be added will continue.
- Technological and pedagogical shortcomings in CAP classrooms will continue to affect the student experience.

- The opportunity to create much needed space on campus for university and community events.
- The opportunity to renovate the vacated XMBA space on the first floor
- The opportunity to renovate the vacated inWorks space on the first floor
- The opportunity to leverage the CU Denver Building's unique location within downtown Denver to allow for greater community engagement

Undertake a Capital Renewal Project Without Renovation

CU Denver did submit a capital renewal request for this building for consideration in the FY 2021-2022 funding cycle. The decision to add renovation projects and submit as a capital request for FY 22-23 is a combination of several factors. The first is that with each passing year, the issues identified in this plan that would be addressed by the renovations grow worse. The second is that there are opportunities available through renovation that weren't available during the previous capital submittal cycle. One example is the opportunity to renovate space that will be vacated by the XMBA program. Third, there are cost savings achieved by doing all of the work (infrastructure and renovation) at once with a single AE team and contractor. More work yields better pricing, and there are some project costs that would be duplicative if the work is done as multiple projects over a longer period of time. Lastly, completing all of the projects together shortens the period of disruption for the building occupants.

CU Denver's increase in the cash funding match from 1% last year for the capital renewal project (\$224,407) to 26% this year (\$9,099,610) reflects the importance of the renovation projects and the desire to move forward with them as quickly as possible.



Appendix

A. UCD 1250 14TH STREET BUILDING INFRASTRUCTURE SUPPLEMENTAL REPORT

CU Denver: Supplemental Report

*1250 14th St,
Denver, CO 80202*

February 28th, 2020



MEP
ENGINEERING INC.
CLIENT CENTRIC CONSULTING

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PROJECT INFORMATION

STUDY PURPOSE

The CU Denver Building located at 1250 14th Street is a valuable asset for the University of Colorado Denver and functions as an integral part of the downtown campus. This study will focus on the mechanical and electrical infrastructure upgrades required to keep this facility operating for CU Denver with a focus on the specific cost impacts the University should expect for the proposed upgrades.

This is a supplement report that provides additional analysis of the CU Denver Building in addition to areas previously assessed in the original report "CU Denver: Mechanical and Electrical Infrastructure Cost Study" dated May 20th, 2019. Items highlighted in yellow below are the focus of this supplement report:

1. Cooling System: No additional content.
2. Heating System: Replacing steam system with an all-electric boiler system.
3. Air Handler: No additional content.
4. Electrical System: Replacing electrical switchgear & distribution system to include previous proposed recommendations and an all-electric boiler plant system.
5. Fire Alarm System: No additional content.
6. Sanitary Riser System: No additional content.
7. Storm Drain System: No additional content.
8. Plaza Drains and Piping: No additional content.
9. Parking Garage: No additional content.
10. Annex Building: Replacing mechanical, electrical and plumbing systems and updating Annex Building to be ADA compliant.
11. Building Lighting: Upgrade all lighting to be LED.
12. EV Charging Stations: Add electric vehicle charging stations and infrastructure.
13. On Site Renewable Energy: Add photovoltaic system to existing roof areas.

The proposed recommendations will consider the system capacities necessary to include the future requirements/upgrades for the pending renovations of floors 4, 5 and 8.

CODES, STANDARDS AND REGULATIONS

All local codes and amendments should be incorporated into the design of the project should it proceed as a follow up to this cost study. All local codes and amendments shall be followed through the design and construction phases of the project should it proceed.

State of Colorado - Approved State Building Codes (Rev. 7/2018):

- (a) 2015 International Building Code (IBC)
- (b) 2015 International Existing Building Code (IEBC)
- (c) 2015 International Mechanical Code (IMC)
- (d) 2015 International Energy Conservation Code (IECC)
- (e) 2017 National Electric Code (NEC)
- (f) 2015 International Plumbing Code (IPC)
- (g) 2015 International Fuel Gas Code (IFGC)
- (h) National Fire Protection Association Standards (NFPA)
- (i) 2012 International Fire Code (IFC)
- (j) American Society of Heating, Refrigeration and Air Condition Engineers (ASHRAE)

Smoke Evacuation in the City and County of Denver: The City and County of Denver and State of Colorado continuously adopt and modify existing international codes. As recently as April of 2019, smoke evacuation including stairway, elevator shaft and area of refuge in existing buildings undergoing renovation has been a primary concern for City and County of Denver, State of Colorado and the Denver Fire Department. This assessment and associated cost analysis do not take into consideration any potential requirements from these authorities regarding smoke evacuation.

DEFINITIONS AND ABBREVIATIONS

ACH – Air Changes Per Hour
ADA – Americans with Disabilities Act
AHJ – Authority Having Jurisdiction
ATS – Automatic Transfer Switch
BTU – British Thermal Unit
CFM – Cubic Feet per Minute
CHWR – Chilled Water Return
CHWS – Chilled Water Supply
DDC – Direct Digital Control
ESPC – Energy Savings Performance Contracting
EV – Electric Vehicle
EWT – Entering Water Temperature
FCU – Fan Coil Unit
GPM – Gallons Per Minute
HP – Horse Power
HVAC – Heating, Ventilation and Air Conditioning
HWR – Heating Water Return
HWS – Heating Water Supply
LED – Light-Emitting Diode
LWT – Leaving Water Temperature
MBH – Thousands of Btu's / Hour
OA – Outside Air
PV – Photovoltaic
RA – Return Air
SA – Supply Air
SF – Square Feet
UH – Unit Heater
V – Volts
VAV – Variable Air Volume

BUILDING OVERVIEW

FACILITY HISTORY

The building is located at 1250 14th Street, Denver, CO 80202. The eight (8) story building with two-levels of below grade parking was originally constructed in 1977 and has been repurposed from its original design as a commercial building to serve as classroom, lecture, office, meeting, critique, studio, and workshop spaces for multiple CU Denver users.

Most of the interior spaces are Assembly Group A-3 or Business Group B occupancies as defined by the 2015 IBC. The total gross interior building area is 152,237 square feet, including the annex, broken down as follows:

Floor	Gross Floor Area (SF)
1 st (including Annex)	26,524 (5,010)
2 nd (including Annex)	25,964 (6,248)
3 rd	21,728
4 th	17,392
5 th	15,308
6 th	15,100
7 th	15,111
8 th	15,110
OCCUPIED SQUARE FEET	152,237

Parking Garage Level 1	35,000
Parking Garage Level 2	16,500
Penthouse	7,000

GENERAL BUILDING LAYOUT

Existing conditions of 1250 14th Street's General Building Layout are covered in the original 'CU Denver: Mechanical and Electrical Infrastructure Cost Study' dated May 20th, 2019.

Supplemental Information:

Annex Building

The building's Annex is a two-story free-standing structure adjacent to the tower at the plaza level. The lower level is approximately 5,150 SF and is currently occupied by the College of Architecture and Planning's fabrication workshop. The lobby and second level are approximately 6,350 SF combined including a small retail 'glass box'. The second level including the 'glass box' are being used for general office occupancy.

DESIGN PARAMETERS

Design considerations included within this assessment are outlined to align with the currently adopted codes for State of Colorado Approved building codes. The State of Colorado is the primary AHJs for the continued operation of this facility. Major equipment recommended for replacement is assumed to be 1 for 1 capacity of existing equipment. Additional design consideration will need to be verified by the engineer of record during the design phase to ensure all applicable codes are met.

ENERGY SAVINGS PERFORMANCE CONTRACT (ESPC)

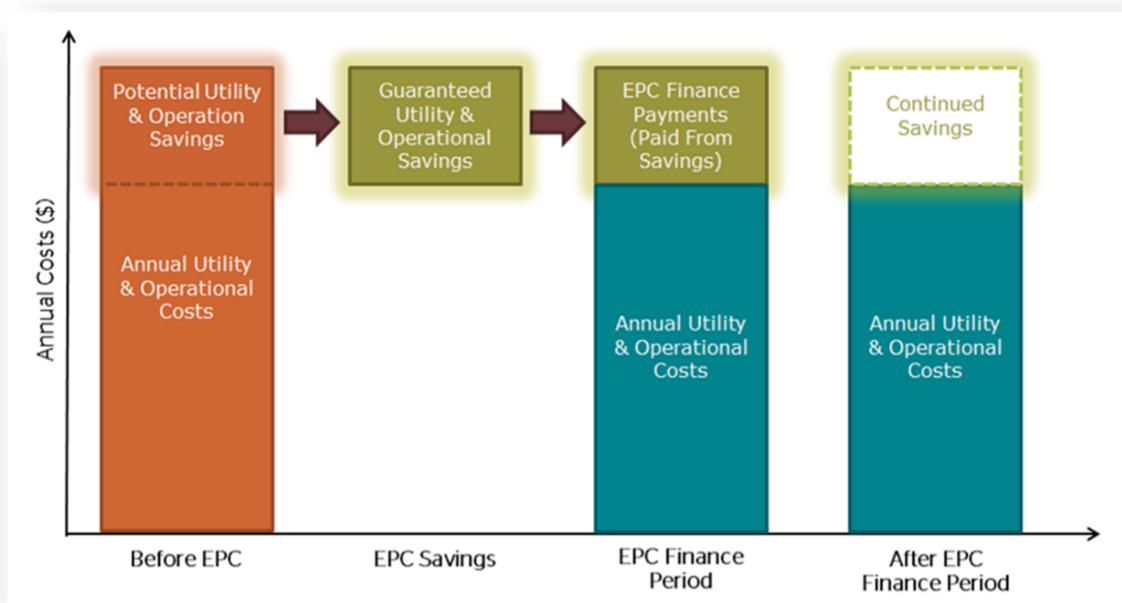
Supplemental Information:

An Energy Savings Performance Contract (ESPC) is a financing mechanism designed to achieve cost effective energy conservation measures in buildings. A facility owner can partner with an Energy Service Company (ESCO) can use an ESPC to pay for today's facility upgrades with tomorrow's energy savings.

The ESCO conducts a comprehensive energy audit for the facility and identifies improvements to save energy. In consultation with the owner, the ESCO designs and constructs a project that meets the owner's needs and arranges the necessary financing. The ESCO guarantees that the improvements will generate energy cost savings enough to pay for the project over the term of the contract. After the contract ends, all additional cost savings accrue to the owner.

ESPCs allow building owners to accomplish energy savings projects without up-front capital costs. At all times, the savings are guaranteed to exceed the fee. The savings in energy costs are used to pay back the capital investment of the project over a 5-20-year period or reinvested into the building to allow for capital upgrades that may otherwise be unfeasible. If the project does not provide returns on the investment, the ESCO is responsible to pay the difference.

"An innovative contracting mechanism which provides the funding for facility improvements today through future utility and operational cost savings", Energy Services Coalition.



A successful ESPC requires a highly communicative partnership between the owner and the ESCO. Each client requires a customized approach to best fit the needs and overall goals of the performance contracting program. Also, the partnership can provide invaluable insight into how the client's energy use is impacting their business or organizational goals.

Steps for implementing ESPC process (Office of Energy Efficiency & Renewable Energy):

1. Facility owner decides to utilize the ESPC process and competitively selects an ESCO.
2. Owner issues a contract to the ESCO, to conduct energy audit of the facilities and develop and implementation proposal, which identifies potential energy conservation measures (ECMs). A wide variety of measures can be part of an ESPC project. State legislation is often open ended on the types of measures that may be included, but legislation may restrict the budget categories that can be used to pay for such measures. The ESCO will identify each potential measure and estimate the itemized cost and saving, but the bottom line is what determines which bundle of measures can be included in the ESPC project. That is, some measures with short payback periods (e.g., lighting) can offset the longer payback periods of boiler and chiller replacements or renewable energy systems, if they're bundled under one contract.
3. Owner and ESCO negotiate and finance ESPC and arrange for upfront financing. To date, one of the most common financing mechanisms for a government ESPC project is a municipal tax-exempt lease-purchase agreement. Several national-level financing companies are knowledgeable about this ESPC approach, seek out such financing opportunities, and provide this type of agreement. Also, consider internal financing or bonds and compare the rates and benefits.
4. ESCO implements agreed-upon ECMs, then monitors energy savings success through measurement and verification.

MEP Engineering recommends CU Denver explore an Energy Savings Company for this capital renewal project should the traditional methods of funding not support the project. Components of the mechanical, electrical and plumbing recommendations of this assessment will qualify for ESPC. The overall proposed Cost Estimate does not include ESPC cost saving mechanisms. By engaging an ESPC during the next phase of this project, CU Denver can provide more value to the lifecycle of this building.

EXISTING CONDITIONS

1. COOLING SYSTEM

Existing conditions of 1250 14th Street's cooling system are covered in the original 'CU Denver: Mechanical and Electrical Infrastructure Cost Study' dated May 20th, 2019.

No supplemental information added.

2. HEATING SYSTEM

Existing conditions of 1250 14th Street's heating system are covered in the original 'CU Denver: Mechanical and Electrical Infrastructure Cost Study' dated May 20th, 2019.

No supplemental information added.

3. AIR HANDLER

Existing conditions of 1250 14th Street's air handler are covered in the original 'CU Denver: Mechanical and Electrical Infrastructure Cost Study' dated May 20th, 2019.

No supplemental information added.

4. ELECTRICAL SYSTEM

Existing conditions of 1250 14th Street's electrical system are covered in the original 'CU Denver: Mechanical and Electrical Infrastructure Cost Study' dated May 20th, 2019.

Supplemental Information:

UTILITY METERS

In addition to the primary metered (Meter # 59 961 109) electrical service provided by Xcel Energy. There are (4) additional metered electrical services within the building. The meters include meter # 48 399 667, meter # 45 130 850, meter #45 130 915, and meter # 45 130 912.

Calculated Total Peak Demand: The calculated total peak demand based on actual energy usage during the 2019 calendar year is 602.2kW. The calculated total is based on 125% of the actual 481.76kW metered load per the National Electrical Code requirements for meter load justification.

Actual Total Peak Demand = 481.757kW

Month	Meter Number				
	59 961 109	48 399 667	45 130 850	45 130 915	45 130 912
Nov – Dec 19	414kW	18.4kW	1.319kW	23.915kW	11.053kW
Oct – Nov 19	384kW	19.294kW	1.378kW	23.991kW	11.725kW
Sept – Oct 19	389kW	19.25kW	1.378kW	24.553kW	10.711kW
Aug – Sept 19	413kW	19.676kW	1.162kW	23.794kW	9.18kW
Jul – Aug 19	419kW	20.525kW	1.245kW	25.003kW	9.233kW
Jun – Jul 19	375kW	19.5kW	1.208kW	24.403kW	10.837kW
May – Jun 19	309kW	17.678kW	1.649kW	21.874kW	11.102kW
Apr – May 19	407kW	19.127kW	1.303kW	24.535kW	10.951kW
Mar – Apr 19	361kW	18.879kW	2.12kW	27.323kW	12.455kW
Feb – Mar 19	356kW	18.109kW	2.454kW	25.728kW	12.184kW
Jan – Feb 19	329kW	18.167kW	1.801kW	27.074kW	11.928kW
Dec 18 -Jan 19	293kW	17.812kW	1.116kW	24.965kW	11.148kW
PEAK DEMAND	419kW	20.525kW	2.454kW	27.323kW	12.455kW

Information provided by CU Denver through Xcel Energy monthly utility bills from November of 2018 through December of 2019.

5. FIRE ALARM SYSTEM

Existing conditions of 1250 14th Street’s fire alarm are covered in the original ‘CU Denver: Mechanical and Electrical Infrastructure Cost Study’ dated May 20th, 2019.

No supplemental information added.

6. SANITARY RISER SYSTEM

Existing conditions of 1250 14th Street’s sanitary sewer system are covered in the original ‘CU Denver: Mechanical and Electrical Infrastructure Cost Study’ dated May 20th, 2019.

No supplemental information added.

7. STORM DRAIN SYSTEM: CONNECTION AT 14TH STREET

Existing conditions of 1250 14th Street’s storm drain system are covered in the original ‘CU Denver: Mechanical and Electrical Infrastructure Cost Study’ dated May 20th, 2019.

No supplemental information added.

8. PLAZA DRAINS AND PIPING

Existing conditions of 1250 14th Street’s plaza drains and piping are covered in the original ‘CU Denver: Mechanical and Electrical Infrastructure Cost Study’ dated May 20th, 2019.

No supplemental information added.

9. PARKING GARAGE – MECHANICAL, ELECTRICAL, AND STRUCTURAL

Existing conditions of 1250 14th Street's parking garage are covered in the original 'CU Denver: Mechanical and Electrical Infrastructure Cost Study' dated May 20th, 2019.

No supplemental information added.

10. ANNEX BUILDING

Supplemental Information:

GENERAL DESCRIPTION

The Annex Building is a two-story free-standing structure. The lower level is approximately 5,150 SF and is currently occupied by the College of Architecture and Planning's fabrication workshop. The lobby and second level are approximately 6,350 SF combined including a small retail 'glass box'. The second level including the 'glass box' are being used for general office occupancy.

First Level Typical: College of Architecture and Planning Workshop Space



Second Level Typical: College of Architecture and Planning Workshop Space



The building has been modified throughout the years to accommodate different end users as recently as 2016 and 2017. It is observed that the base building systems have been maintained but are original to the building. The main mechanical, electrical and plumbing components are at the end of their useful life. The building, as it currently exists, is not ADA compliant and does not meet life safety standards for fire detection / fire alarm and means of egress.

MECHANICAL SYSTEMS



Annex Chase: The base building mechanical and plumbing systems are routed through a chase located near the primary stairwell. This chase includes outdoor air intake, toilet exhaust, hot and chilled water supply and return lines, and plumbing riser.



Heating and Cooling: Heating and cooling is provided by the main building boiler and chiller plant through hot and cold water supply and return lines routed from the mechanical penthouse in the main building down through the parking garage level 1 (piping chase) and fed up into the annex building to distribution on each floor. The hot and chilled water is distributed to fan coil units for each zone throughout the first and second levels.

Outside Air: Outside air in the annex building is provided by a dedicated outdoor air unit located at the top of the mechanical and plumbing chase. Outdoor air intakes are located at the annex roof. Outside air is ducted to each fan coil unit and mixed with return air prior to entering the fan coil unit.

Toilet Exhaust: Toilet is exhausted through the same mechanical and plumbing chase to an exhaust fan located on the roof of the annex building.

ELECTRICAL SYSTEMS



Electrical service for the annex building is provided by the main building's Xcel's 1500kVA transformer bank and MDC located in the penthouse electrical room. Please review *existing conditions of 1250 14th Street's electrical systems in the original 'CU Denver: Mechanical and Electrical Infrastructure Cost Study' dated May 20th, 2019 for further information.*

Panel "H1A" is located in the southeast electrical room on the first level of the Annex.

Existing Electrical Infrastructure:

- Panel "HSM" – 100A3P
- Panel "HIBA" – 100A3P
 - 30KVA Transformer – 480-120/208V – 3PH, 4W
 - Panel "LIBB" – 60/3
- 75KVA Transformer "TLIBC" – 480-120/208V – 3PH, 4W
 - Panel "LIBC" – 250/3MCB
- 15KVA Transformer – 480-120/208V – 3PH, 4W
 - Panel "LIBA" – 60/3

Lighting on the first floor has been upgraded to LED during a recent renovation. Lighting on the second floor has not been upgraded.

PLUMBING SYSTEMS



Existing domestic water heater is located in the janitor's room on the first floor.

Existing Plumbing Services: All existing plumbing utilities are connected to the main building systems. Estimated existing utilities based on the original construction documents include:

- 1 1/2" Cold Water Line
- 3" Storm Water
- 3" Vent Stack
- 4" Sanitary Sewer Line

Existing Plumbing Fixtures: The first floor has (1) single occupant restroom and men's/ women's restroom group. Combined there are (6) water closets, (1) urinal and (5) lavatories. There are no restroom groups on the second floor. The second floor has a small breakroom.

SPECIALTY SYSTEMS

The first floor is the School of Architecture's workshop space. This room includes many pieces of specialty equipment including an air compressor, CNC machine, dust collector, panel saw, table saw and welder. These pieces of equipment require dedicated electrical, plumbing and mechanical systems. During site observation, it was observed that additional equipment has been installed without approval of the University of Colorado Facilities Department approval. Consideration for maintaining this use and the specialty equipment within it will need to be included during the renovation of this building.

ADA AND LIFESAFETY

Exterior Entries: The building has (4) entry points. The primary entry is from the plaza on the south east corner of the building. This opens into a lobby area with open stairs down or up to the first floor or second floor. There is no ADA accessible way to access either floor from this entry. There is a door on the northwest corner of the building that access the first floor. This door is not ADA accessible in its current condition. There is a door adjacent to the garage door on the south side of the building. This door is ADA accessible in its current condition but provides ADA access to the first floor only. There is a door to the 'glass box' retail part of the building.

North East Door (Not ADA Compliant)



South Door (ADA Compliant)



ADA Compliant Restrooms: The building has (1) ADA complaint restroom located on the first floor. This is a single occupant restroom.

Egress: The building includes (1) primary stairwell in the interior of the building and (1) open atrium stairwell that connects the lobby level with the first and second floors.

11. BUILDING LIGHTING

Supplemental Information:

INTERIOR LIGHTING

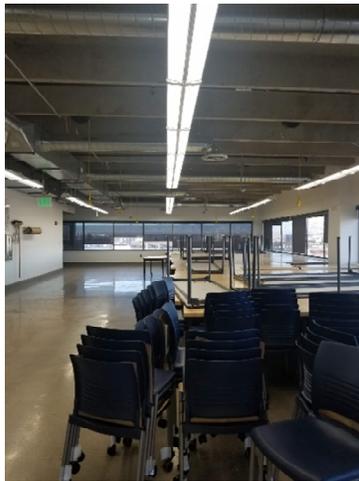
Interior lighting has been updated in various places throughout the building. The 1st, 3rd, 6th and 7th floors received lighting upgrades during recent renovations.

Total interior area requiring lighting upgrades is approximately 61,000 SF.

Floor	Gross Floor Area (SF)	LED Lighting Required
1 st (including Annex)	26,524 (5,010)	Updated
2 nd (including Annex)	25,964 (6,248)	6,248
3 rd	21,728	Updated
4 th	17,392	17,392
5 th	15,308	15,308
6 th	15,100	Updated
7 th	15,111	Updated
8 th	15,110	15,110
OCCUPIED SQUARE FEET	152,237	

Parking Garage Level 1	35,000	Updated
Parking Garage Level 2	16,500	Updated
Penthouse	7,000	7,000

Upgraded Light Fixtures:



Parking Garage Lighting: The existing fluorescent light fixtures on the P1 Level of the parking garage do not satisfy the minimal lighting standards recommend by the Illuminating Engineers Society of North America (IESNA). IESNA recommends a daytime horizontal illuminance of 5 foot-candles in the parking areas and 50-foot candles at the entrance. The University replaced lighting fixtures on P2 recently with LED fixtures. The new energy efficient lighting provides the right performance for the parking structure.

P2: LED Lighted Level



P1: Unrenovated Level



SITE LIGHTING

Existing Site Lighting: Existing recessed downlights provide lighting for the plazas. There are building mounted lights above doorways. There are pole lights at the west side of the plaza area.



12. EV CHARGING STATIONS: PARKING GARAGE

Supplemental information:

Under executive order D 2019 01, Item III.iv, University of Colorado is directed to provide plans showing at least 20% of parking spaces are pre-wired for EV charging and at least 5% will have EV chargers installed.

There are no existing EV charging stations within the parking garage. Infrastructure to support EV charging stations is described under Electrical.

Parking Analysis: This building is in an urban facility with two levels of below-grade parking. All other parking requirements are met by street parking, nearby public parking and public transportation options.

The existing parking garage currently has spaces for 150 vehicles as it was originally designed. Required EV charging stations were determined by the following calculations based on existing parking garage size:

Pre-Wired EV Charging: $150 \text{ Existing Parking Stalls} \times 20\% = 30 \text{ Parking Stalls (Minimum)}$

Fully Installed EV Charging: $150 \text{ Existing Parking Stalls} \times 5\% = 7.5 \text{ Parking Stalls (Minimum)}$

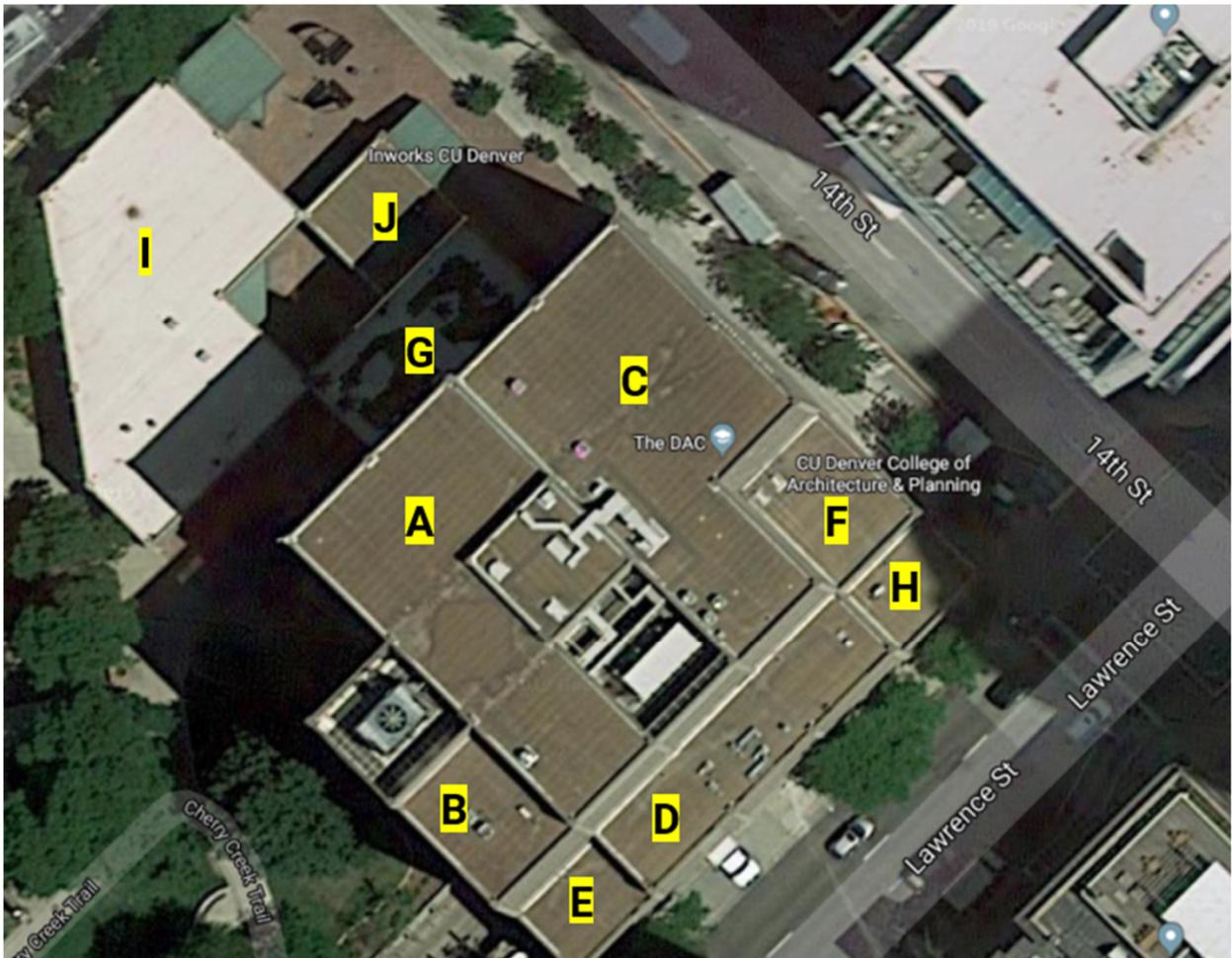
13. ONSITE RENEWABLE ENERGY: ROOF AREA AND STRUCTURE

Supplemental information:

Under executive order D 2019 01, Item III.ii, University of Colorado is directed to analyze on-site renewable energy generation. To analyze the feasibility of onsite renewable energy, the following rooftop areas were identified as potential locations for a rooftop mounted PV system.

EXISTING ROOFTOP AREA

Level	Map Label	Square Feet
Roof of Penthouse	A	5,888 SF (does not include ducted area)
At Penthouse Level	B	1,280 SF
At Penthouse Level	C	5,888 SF
At Level 6	D	2,304 SF
At Level 5	E	768 SF
At Level 5	F	1,280 SF
At Level 4	G	1,584 SF
At Level 3	H	768 SF
At Level 3 (Roof of Annex)	I	5,954 SF
At Level 2	J	768 SF
Total Available Roof		26,482 SF



SYSTEM ANALYSIS AND RECOMMENATIONS

1. COOLING SYSTEM

System analysis and recommendations of 1250 14th Street's cooling system are covered in the original 'CU Denver: Mechanical and Electrical Infrastructure Cost Study' dated May 20th, 2019.

No supplemental information added.

2. HEATING SYSTEM

System analysis and recommendations of 1250 14th Street's heating system are covered in the original 'CU Denver: Mechanical and Electrical Infrastructure Cost Study' dated May 20th, 2019.

Supplemental Information: This supplemental recommendation replaces HS #3 and HS #4 from the original report.

Electrification involves substituting electric technologies for combustion-fueled technologies for end users where other fuels are being used – most notably space heating and water heating by natural gas in the State of Colorado. MEP Engineering understand CU Denver's desire to remove 1250 14th St from the City of Denver's Central Steam System. In the original 'CU Denver: Mechanical Electrical Infrastructure Cost Study' dated May 20th, 2019, MEP Engineering proposed a recommendation (HS#3) to "Install New Gas-Fired Boiler Plant" and supporting (HS #4) "Install New Gas Service" as the primary option for removing the building off of City of Denver's central steam system. This supplement information provides an alternative (HS#3 Option 2) - "Install New All-Electric Boiler Plant" in response to Executive Order D 2019 016 Concerning the Greening of the State Government, Section III. Directives, 2. Energy Efficiency and Renewable Energy. Item V. Provide documentation that the Agency or Department explored options for the electrification of building systems.

Consideration for HS#3 – Option 2 will require an electrical service upgrade if pursued. (Electrical #8) "New Electrical Service and Equipment Replacement" outlines the necessary electrical scope of work required to pursue Option 2.

When considering an All Electric Boiler Plant, there are a few items to consider:

1. The trade off between installing a new gas service and upgrading the existing electrical service. Comparison in this report can be made between HS#4 – "Install New Gas Service" and Electrical #8 – "New Electrical Service and Equipment Replacement."
2. Energy Costs: The utility cost of natural gas in the State of Colorado is a driving force of why so many of Colorado buildings use combustion-fueled heating systems. Estimated comparison of electrical utility cost could be as high as 350% the cost of natural gas. A more detailed lifecycle cost analysis should be considered to fully understand the implications of utility rate changes.
3. On Site Renewable Energy: Onsite renewable energy is an opportunity to help offset the cost of higher utility rates. Installation of PV solar panels are analyzed within this report.

4. Emergency Backup Power: This building currently has a generator on site that supports life safety and end user critical systems. Consideration will need to be made to consider the emergency backup power of an all-electric boiler system. Upgrade of the electrical generator to accommodate this concern has not been included within this report.

HS #3: Option 2: Install New Electric-Fired Boiler Plant: The new heating water boiler plant will consist of (3) three new electric hot-water-type boilers of similar size and capacity. The (3) three new boilers will have an input capacity of 5,000,000 Btu/hr each (approx. 4,250,000 output at altitude) and be a minimum of 86% efficient at 100% capacity and provide 160 degree leaving water temperature. The (3) new boilers will require each 1530 BH (Input KW) at 1842 Amps (480/360) each. The new boilers will have the capability of modulating their firing rate based on return water temperature and will employ an outdoor air reset schedule. The boilers will be located on Parking Garage Level P1 in a dedicated mechanical room. The boiler plant heating water pumps will consist of (2) two hydronic heating water pumps to handle 100% of the total system capacity, and will operate in a primary/stand-by configuration and be sized to accommodate just the flow rate necessary to move the heating water from the new boiler room to the heating water pumps located in the penthouse. The pumps will be provided with variable frequency drives (VFD's). The pumps will be in-line cast iron body pumps with bronze impellers. Provide vibration isolation as recommended by manufacturer.

3. AIR HANDLER

System analysis and recommendations of 1250 14th Street's air handler are covered in the original 'CU Denver: Mechanical and Electrical Infrastructure Cost Study' dated May 20th, 2019.

No supplemental information added.

4. ELECTRICAL SYSTEM

System analysis and recommendations of 1250 14th Street's electrical system are covered in the original 'CU Denver: Mechanical and Electrical Infrastructure Cost Study' dated May 20th, 2019.

Supplemental Information: This supplemental recommendation is in addition to all Electrical recommendations from the original report.

Electrical #8: Option 1: New Electrical Service and Equipment Replacement

The three new 480V, 1,842-amp electrical boilers will require the addition of a new electrical service and modifications to the building's existing electrical distribution as the new load exceeds the capacity of the current system. The building will require (2) electrical services fed from separate utility transformers. One new (Service 1) for two of the new boilers and one replacement * (Service 2) for the third boiler, and EV charging stations as well as the building's existing electrical requirements. We anticipate the new transformers will be located on the south east corner of the property adjacent to the garage ramp.

* As part of this upgrade, the existing roof mounted transformers and associated primary and secondary feeds shall be removed and replaced with a new Xcel Energy grade mounted transformer.

New service equipment will be located in a new main electrical room that is approximately 200 sq. ft. located adjacent to the new mechanical room.

Service 1 (New)

A new 4,000A, 480V/277V, 3-phase, 4-wire electrical distribution switchboard will be located in the new electrical room. Service shall be fed from a new 277/480V, 2,500kVA, Xcel Energy transformer. This switchboard shall be supplied with current transformers for utility metering and consist of the following equipment;

- (2) 2,000A GFCI Subfeed breakers for (2) Boilers

Service 2 (New and Replacement)

Modifications to the existing electrical service will also be required to accommodate the remaining boiler, and EV charging stations as well as the building's existing electrical requirements. A new 4,000A, 277/480V, 3-phase, 4-wire service rated switchboard will be located in the new electrical room that is fed from a new 2,500kVA transformer. This board will consist of the following equipment;

- 4,000A Main GFCI Breaker
- 2,000A Subfeed breaker for (1) Boiler
- 1,000A Subfeed breaker to back feed existing electrical requirements. (Existing peak demand for the building is 724.6A)
- 400A feed for new EV charging station distribution

5. FIRE ALARM SYSTEM

System analysis and recommendations of 1250 14th Street's fire alarm are covered in the original 'CU Denver: Mechanical and Electrical Infrastructure Cost Study' dated May 20th, 2019.

No supplemental information added.

6. SANITARY RISER SYSTEM

System analysis and recommendations of 1250 14th Street's sanitary sewer system are covered in the original 'CU Denver: Mechanical and Electrical Infrastructure Cost Study' dated May 20th, 2019.

No supplemental information added.

7. STORM DRAIN SYSTEM: CONNECTION AT 14TH STREET

System analysis and recommendations of 1250 14th Street's storm drain system are covered in the original 'CU Denver: Mechanical and Electrical Infrastructure Cost Study' dated May 20th, 2019.

No supplemental information added.

8. PLAZA DRAINS AND PIPING

System analysis and recommendations of 1250 14th Street's plaza drains and piping are covered in the original 'CU Denver: Mechanical and Electrical Infrastructure Cost Study' dated May 20th, 2019.

No supplemental information added.

9. PARKING GARAGE – MECHANICAL, ELECTRICAL, AND STRUCTURAL

System analysis and recommendations of 1250 14th Street's parking garage are covered in the original 'CU Denver: Mechanical and Electrical Infrastructure Cost Study' dated May 20th, 2019.

No supplemental information added.

10. ANNEX BUILDING

Supplemental Information: This supplemental recommendation is a new recommendation and is not covered in the original report.

The building has been renovated throughout the years for tenant improvements to meet specific department needs. It is MEP Engineering's opinion these renovations did not address updates to base building systems or life safety requirements in an adequate way to ensure the entirety of the annex meets current code and life safety requirements. The following systems need to be updated to bring this building up to current code standards and to improve the expected life cycle of this portion of the 1250 14th Street building.

Means of egress is a continuous and unobstructed path of vertical and horizontal egress travel from any occupied portion of a building or structure to a public way. A means of egress consists of three separate and distinct parts: the exit access, the exit and the exit discharge. In order to provide the correct means of Egress for this facility, recommendations Annex #3 and Annex #4 must occur.

Annex #1: Replace Existing Mechanical System: Replace existing hot water supply and return piping to riser. Replace existing chilled water supply and return piping to riser. Replace fan coil units throughout the building with like for like size / capacity. Replace dedicated outdoor air unit and ductwork distribution. Replace toilet exhaust fan and ductwork distribution.

Annex #2: Upgrade / Add Restroom Group(s): Renovate existing (1) single occupant restroom and men's / women's restroom group for ADA compliance on first floor. Replace all plumbing fixtures. Add new restroom group to second floor. Add all new plumbing fixtures. Replace hot water heater with appropriately sized new water heater to service all new plumbing fixtures. Replace or modify toilet exhaust system to meet new restroom group layout.

Annex #3: Add elevator to existing facility for ADA compliance: Provide new elevator structural core, elevator equipment, elevator and controls. Relocate IT closet on the first floor to new location to accommodate proposed elevator location. Repair, patch and modify architectural elements surrounding new elevator landings on the first level, and second level.

Annex #4: Provide Exterior Stair for Secondary Egress: Provide new 2-story stairwell exterior to the existing building. Interior and exterior stairs that are part of a means of egress shall comply with ADA Chapter 5. Provide architectural and structural design for exterior stairwell. Provide lighting as required by code. Recommendation to match similar structure and style to exterior stairwell for the main building.

Annex #5: Provide ADA Architectural Requirements: Provide updated site modifications to ensure ADA accessible site arrival point. Provide updated entrance doors and doorways (southeast, northwest, and south entries) to ensure compliance with ADA Chapter 4.

Annex #6: Replace Fire Detection System: Provide Fire Detection System to remove existing Silent Knight fire alarm system. Provide Fire Alarm System to align with current code requirements including

11. BUILDING LIGHTING

Supplemental Information: This supplemental recommendation is a new recommendation and is not covered in the original report.

Building Lighting #1: Replace Remaining Building & Annex Building Lighting Fixtures with LED: Replace existing light fixtures with new LED light fixtures in all areas where LED have not already been installed. Overall affected square footage of lighting to be updated is approximately 61,100 SF

Building Lighting #2: Replace Remaining Site Lighting with LED: Replace building mounted lighting with new LED fixtures. Replace plaza lighting with new LED fixtures.

All new light fixtures shall be 277V and lamp color temperature of 4000K unless otherwise noted. Exterior lighting controls shall remain. The IECC 2015 will be used to establish the baseline for lighting system energy usage; local Codes will take precedence where alternative procedures are dictated or where minimum lighting levels in specific areas are required. Energy Code limits on connected lighting load shall take precedence over IESNA-recommended illumination levels, with the exception of illumination levels required by Code for emergency safety-of-life functions, such as emergency egress lighting.

12. EV CHARGING STATIONS: PARKING GARAGE

Supplemental Information: This supplemental recommendation is a new recommendation and is not covered in the original report.

EV Charging Station #1: Provide New Electric Vehicle Charging Stations

Provide all necessary Electric Vehicle rough-ins and full installation to meet the compliance requirements indicated in Executive Order D 2019 016 Concerning the Greening of the State Government, Section III. Directives, 2. Energy Efficiency and Renewable Energy. Item IV. Provide documentation or plans showing that at least 20% of parking spaces will be pre-wired for charging, and that at least 5% will have EV chargers installed. Provide all necessary panelboards, breakers, wire and conduit, EV chargers on Levels P1 and P2 to meet this requirement.

- Quantity of Pre-Wired EV Charging Parking Stalls: 30
- Quantity of Fully Installed EV Charging Parking Stalls: 10
- Quantity of Affected Parking: 40 Total Spaces

13. ONSITE RENEWABLE ENERGY: ROOF AREA AND STRUCTURE

Supplemental Information: This supplemental recommendation is a new recommendation and is not covered in the original report.



On-Site Renewables #1: Provide PV Solar Array

System: Provide new 227.2kW PV solar array system on existing roof structure. Provide functional, code compliant system, including all required equipment. Provide all AC electrical connections, including system interconnection by a Colorado Certified Master Electrician. Provide all DC electrical work overseen by NABCEP certified staff.

System Size: 227.2kW

Estimated Production: 332,958kWh/year (based on PV Watts / not including shading).

System Layout: Single Panel: 5.58ft tall X 3.31ft wide. Panel Arrangement: All panels in landscape orientation using a 10-degree tilt, ballasted mounting system.

Equipment Requirements:

- Panels: 710 Silfab SL320 NL solar panels @ 320watts (or equivalent) – MADE IN USA
- Inverter: 355 SolarEdge P860 optimizers + 2 SolarEdge SE100-US 277/480 inverters
- Mounting Equipment: Unirac RM10 Ballasted Roof Mount system
- Monitoring: SolarEdge Remote Energy Monitoring System

Assumptions:

- Additional structural professional engineering costs required for permitting, if applicable, have not been included.
- Grid-tie connection: A master electrician analysis is required by Active Energies; no charge. All electrical connection costs have been included
- Conduit Location: Some exposed conduit will be required to be run on the roof and exterior wall. Customer input is encouraged to limit aesthetic impact.
- Roofing Safety: Project roofing contract to supply permanent roof tie offs at the system location.
- Internet Access: Project IT contractor to supply hardwired internet access at inverter location for monitoring.

Non-Financial Benefits of Solar: A 227.2kW PV system each year (www.solarenergy.org):

- Prevents 204.5 tons of coal from being mined
- Prevents 409.0 tons of CO₂ from entering the atmosphere
- Keeps 286,272 gallons of water from being consumed
- Offsets 602,762 miles from being driven
- Is equivalent to planting 1,363 trees
- Keeps NO and SO₂ from being released into the environment
- Help free yourself from the utility company by limiting your exposure to increasing energy

COST ANALYSIS

SUMMARY OF TOTAL ESTIMATED COST FOR ALL PROPOSED RECOMMENDATIONS

This summary table is a combined table from the original 'CU Denver: Mechanical and Electrical Infrastructure Cost Study' dated May 20th, 2019. The highlighted line items below are the supplemental recommendation included within this report. The highlighted line items below are the original recommendations that are replaced by new recommendations within this report. Please see the original report for the detailed breakdown of total estimated cost for each original recommendation.

CS #1: Replace Chiller #1	\$990,375
CS #2: Replace Cooling System Pumps	\$245,875
<i>CS #3: Option 1: Add Additional Plates - Upgrade Heat Exchanger</i>	<i>\$84,075</i>
CS #3: Option 2: Replace Flat Plate Heat Exchanger - Upgrade Heat Exchanger	\$197,365
COOLING SYSTEM SUBTOTAL (assumes CS#3 - Option 2)	\$1,433,615
HS #1: Remove Steam Heat Exchanger	\$26,365
HS #2: Replace Heating Hot Water Pumps	\$111,865
<i>HS #3: Option 1: Install New Gas-Fired Boiler Plant</i>	<i>\$641,250</i>
HS #3: Option 2: Install New All-Electric Boiler Plant	\$976,125
<i>HS #4: Option 1: Install New Gas Service</i>	<i>\$60,565</i>
HS #5: Build New Boiler Room	\$188,815
HEATING SYSTEM SUBTOTAL	\$1,303,170
AH #1: Replace Main Building Supply Air Fans SF-1 & SF-2	\$314,925
AH #2: Add Airside Economizer to Outdoor Air Louvers	\$128,250
AH #3: Replace Filter Bank	\$57,000
AH #4: Replace Cooling Coil Bank	\$99,750
AH #5: Add General Building Exhaust/Pressure Relief Fan(s) to Return Air	\$267,190
AIR HANDLER SUBTOTAL	\$867,115
Electrical #1: Replace Main Distribution Center "MDC"	\$783,750
Electrical #2: Remove Emergency Distribution Board "EPP"	\$7,125
Electrical #3: Meter Automatic Transfer Switch "ATS-2"	\$5,400
Electrical #4: Connect Elevator to Generator Via "ATS-2"	\$47,025
Electrical #5: Provide Maintenance By-Pass Disconnect for Diesel Generator	\$48,450
Electrical #6: Replace Original 1976 Lighting and Mechanical Panelboards	\$349,125
Electrical #7: Replace Original 1976 General Power Panelboards	\$456,000
Electrical #8: Option 1: New Electrical Service and Equipment Replacement	\$1,838,250
ELECTRICAL SYSTEM SUBTOTAL	\$3,535,125
FA#1: Remove existing Silent Knight fire alarm system	\$785,625
FIRE ALARM SYSTEM SUBTOTAL	\$785,625

SS #1: Option No. 1 Epoxy Lining - Improve Existing Sanitary Sewer Riser	\$149,625
SS #1: Option No. 2 Full Replacement - Replace Existing Sanitary Sewer Riser	\$349,125
SANITARY RISER SYSTEM SUBTOTAL (assumes SS#1 - Option 1)	\$149,625
SD #1: Replace Existing Storm Sewer Line	\$85,500
STORM DRAIN SYSTEM SUBTOTAL	\$85,500
PD #1: Replace Existing Plaza Drains & Piping	\$78,375
PLAZA DRAINS AND PIPING SUBTOTAL	\$78,375
Garage #1 – Mechanical, Electrical, and Structural	\$887,775
GARAGE SUBTOTAL	\$887,775
Annex #1: Replace Existing Mechanical System	\$619,875
Annex #2: Upgrade/ Add Restroom Group(s)	\$1,660,125
Annex #3: Provide Elevator	\$741,000
Annex #4: Provide Exterior Stair for Egress	\$242,250
Annex #5: Provide ADA Architectural Requirements	\$548,625
Annex #6: Provide Fire Detection System to remove existing Silent Knight fire alarm system	\$178,125
ANNEX BUILDING SUBTOTAL	\$3,990,000
Building Lighting #1: Replace Remaining Main Building & Annex Building Lighting Fixtures with LED	\$2,337,000
Building Lighting #2: Replace Remaining Site Lighting with LED	\$919,125
BUILDING LIGHTING SUBTOTAL	\$3,256,125
EV Charging Stations #1: Provide EV Charging Stations to Parking Garage	\$498,750
EV CHARGING STATIONS SUBTOTAL	\$498,750
On Site Renewables #1: Provide PV Solar Array System	\$1,603,125
ON SITE RENEWABLES SUBTOTAL	\$1,603,125
TOTAL ESTIMATED COST	\$18,473,925

DETAILED BREAKDOWN OF TOTAL ESTIMATED COST FOR EACH RECOMMENDATION

1. COOLING SYSTEM

No supplemental information added.

2. HEATING SYSTEM

Supplemental Information: This supplemental recommendation replaces HS #3 and HS #4 from the original report.

HS #3: Option 2: Install New Electric-Fired Boiler Plant:

Description	Total Cost
Demolition (Includes A, S, M, E & P Systems)	\$20,000
Equipment (Boilers, Pumps & Flue Systems)	\$350,000
Mechanical and Plumbing Infrastructure	\$25,000
Electrical Infrastructure	\$75,000
HVAC Temperature Controls	\$30,000
Architectural Infrastructure	\$40,000
Structural Infrastructure	\$20,000
Labor Costs	\$125,000
Subtotal Construction Costs	\$685,000
5% Mobilization / 2.5% Bond	\$51,375
10% Contingency	\$68,500
15% Overhead and Profit	\$102,750
10% Design Costs	\$68,500
Total Estimated Cost	\$976,125

3. AIR HANDLER

No supplemental information added.

4. ELECTRICAL SYSTEM

Supplemental Information: This supplemental recommendation is in addition to all Electrical recommendations from the original report.

Electrical #8: Option 1: New Electrical Service and Equipment Replacement

Description	Total Cost
(2) New 2,500kVA Xcel Transformers	\$500,000
Service 1 - Equipment (New 4,000A Switchgear)	\$150,000
Service 2 - Equipment (New 4,000A Switchgear)	\$200,000
Electrical Infrastructure (Wire and Conduit)	\$245,000
Labor Costs	\$195,000
Subtotal Construction Costs	\$1,290,000
5% Mobilization / 2.5% Bond	\$96,750
10% Contingency	\$129,000
15% Overhead and Profit	\$193,500
10% Design Costs	\$129,000
Total Estimated Cost	\$1,838,250

5. FIRE ALARM SYSTEM

No supplemental information added.

6. SANITARY RISER SYSTEM

No supplemental information added.

7. STORM DRAIN SYSTEM: CONNECTION AT 14TH STREET

No supplemental information added.

8. PLAZA DRAINS AND PIPING

No supplemental information added.

9. PARKING GARAGE – MECHANICAL, ELECTRICAL, AND STRUCTURAL

No supplemental information added.

10. ANNEX BUILDING

Supplemental Information:

Annex #1: Replace Existing Mechanical System

Description	Total Cost
Demolition (Includes A & E Systems)	\$30,000
Equipment (FCU's, Hydronic Piping & Controls)	\$200,000
Electrical Infrastructure	\$65,000
Architectural Infrastructure	\$15,000
Labor Costs	\$125,000
Subtotal Construction Costs	\$435,000
5% Mobilization / 2.5% Bond	\$32,625
10% Contingency	\$43,500
15% Overhead and Profit	\$65,250
10% Design Costs	\$43,500
Total Estimated Cost	\$619,875

Annex #2: Upgrade / Add Restroom Group(s)

Description	Total Cost
Demolition (Includes A, S, M, P & E Systems)	\$150,000
Equipment (Room Renovation & Assembly)	\$120,000
Equipment (Plumbing Fixtures & Equipment)	\$95,000
Architectural Infrastructure	\$100,000
Structural Infrastructure	\$200,000
Mechanical Infrastructure	\$50,000
Plumbing Infrastructure	\$135,000
Electrical Infrastructure	\$65,000
Labor Costs	\$250,000
Subtotal Construction Costs	\$1,165,000
5% Mobilization / 2.5% Bond	\$87,375
10% Contingency	\$116,500
15% Overhead and Profit	\$174,750
10% Design Costs	\$116,500
Total Estimated Cost	\$1,660,125

Annex #3: Add Elevator to Existing Facility for ADA Compliance

Description	Total Cost
Demolition (Includes A, S, M, P & E Systems)	\$20,000
Equipment (Elevator Equipment)	\$65,000
Equipment (Hoistway Assembly)	\$80,000
Architectural Infrastructure	\$25,000
Structural Infrastructure	\$100,000
Mechanical Infrastructure	\$10,000
Plumbing Infrastructure	\$25,000
Electrical Infrastructure	\$65,000
Labor Costs	\$130,000
Subtotal Construction Costs	\$520,000
5% Mobilization / 2.5% Bond	\$39,000
10% Contingency	\$52,000
15% Overhead and Profit	\$78,000
10% Design Costs	\$52,000
Total Estimated Cost	\$741,000

Annex #4: Provide Exterior Stair for Secondary Egress

Description	Total Cost
Demolition (Includes A & S Systems)	\$10,000
Equipment (Stair Equipment)	\$35,000
Equipment (Structural Support Assembly)	\$25,000
Architectural Infrastructure	\$10,000
Structural Infrastructure	\$35,000
Electrical Infrastructure	\$5,000
Labor Costs	\$50,000
Subtotal Construction Costs	\$170,000
5% Mobilization / 2.5% Bond	\$12,750
10% Contingency	\$17,000
15% Overhead and Profit	\$25,500
10% Design Costs	\$17,000
Total Estimated Cost	\$242,250

Annex #5: Provide ADA Architectural Requirements

Description	Total Cost
Demolition (Includes A, S & E Systems)	\$35,000
Equipment (Access, Doors, Stairs & Egress)	\$110,000
Architectural Infrastructure	\$45,000
Structural Infrastructure	\$80,000
Electrical Infrastructure	\$25,000
Labor Costs	\$90,000
Subtotal Construction Costs	\$385,000
5% Mobilization / 2.5% Bond	\$28,875
10% Contingency	\$38,500
15% Overhead and Profit	\$57,750
10% Design Costs	\$38,500
Total Estimated Cost	\$548,625

Annex #6: Replace Fire Detection System

Description	Total Cost
Demolition (Includes A & E Systems)	\$25,000
Equipment (EST Addressable FA Panel)	\$20,000
Equipment (Initiating/Annunciation Devices)	\$30,000
Electrical Infrastructure (Cabling)	\$15,000
Labor Costs	\$35,000
Subtotal Construction Costs	\$125,000
5% Mobilization / 2.5% Bond	\$9,375
10% Contingency	\$12,500
15% Overhead and Profit	\$18,750
10% Design Costs	\$12,500
Total Estimated Cost	\$178,125

11. BUILDING LIGHTING

Supplemental Information:

Building Lighting #1: Replace Remaining Main Building & Annex Building Lighting Fixtures

Description	Total Cost
Demolition (Existing Lighting Systems)	\$185,000
Equipment (Lighting Fixtures & Controls)	\$950,000
Electrical Infrastructure	\$300,000
Architectural Infrastructure	\$55,000
Labor Costs	\$150,000
Subtotal Construction Costs	\$1,640,000
5% Mobilization / 2.5% Bond	\$123,000
10% Contingency	\$164,000
15% Overhead and Profit	\$246,000
10% Design Costs	\$164,000
Total Estimated Cost	\$2,337,000

Building Lighting #2: Replace Remaining Site Lighting Fixtures

Description	Total Cost
Demolition (Existing Lighting Systems)	\$75,000
Equipment (Lighting Fixtures & Controls)	\$355,000
Electrical Infrastructure	\$125,000
Architectural Infrastructure	\$25,000
Labor Costs	\$65,000
Subtotal Construction Costs	\$645,000
5% Mobilization / 2.5% Bond	\$48,375
10% Contingency	\$64,500
15% Overhead and Profit	\$96,750
10% Design Costs	\$64,500
Total Estimated Cost	\$919,125

12. EV CHARGING STATIONS: PARKING GARAGE

Supplemental Information:

EV Charging Station #1: Provide New Electric Vehicle Charging Stations

Description	Total Cost
Demolition (Includes A, S & E Systems)	\$45,000
Equipment (EV Chargers & Rough-In Power)	\$80,000
Electrical Infrastructure	\$75,000
Architectural Infrastructure	\$20,000
Structural Infrastructure	\$15,000
Labor Costs	\$115,000
Subtotal Construction Costs	\$350,000
5% Mobilization / 2.5% Bond	\$26,250
10% Contingency	\$35,000
15% Overhead and Profit	\$52,500
10% Design Costs	\$35,000
Total Estimated Cost	\$498,750

13. ONSITE RENEWABLE ENERGY: ROOF AREA AND STRUCTURE

Supplemental Information:

On Site Renewables #1: Provide New On-Site Renewable Energy Generation

Description	Total Cost
Demolition (Includes A, S & E Systems)	\$45,000
Equipment (PV Panels, Mounting & Controls)	\$650,000
Electrical Infrastructure	\$75,000
Architectural Infrastructure	\$25,000
Structural Infrastructure	\$175,000
Labor Costs	\$155,000
Subtotal Construction Costs	\$1,125,000
5% Mobilization / 2.5% Bond	\$84,375
10% Contingency	\$112,500
15% Overhead and Profit	\$168,750
10% Design Costs	\$112,500
Total Estimated Cost	\$1,603,125

Appendix

B. THIRD PARTY VERIFICATION LETTER