

April 16, 2024



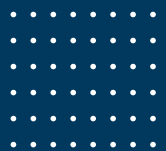
Data-Driven Capital Planning

Future of SMART Building Technologies

University of Colorado – Denver

University of Colorado – Anschutz Medical Campus

McKinstry, Capital Planning Consultants



Credit(s) earned on completion of this course will be reported to American Institute of Architects (AIA) Continuing Education Session (CES) for AIA members.

Certificates of Completion for both AIA members and non-AIA members are available upon request.

Questions to specific materials, methods or services will be addressed at the conclusion of this presentation.

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Data-Driven Capital Planning

It's challenging to grasp exactly what needs to be done across your buildings. After added spaces, piecemeal projects, staff turnover, and various tenant improvements, institutions are often left with big gaps in what we know. When were all the parts and pieces installed? What's the condition of each piece of equipment? How do you prioritize when you don't know what you don't know? Facility and operations data is the key to uncovering the condition of your assets, putting them to best use today, and planning projects and capital improvements for the future.

Attendees of this presentation will learn how to improve Capital Planning on your campus, and how to empower your Finance & Operational teams with critical data.



Introductions



Gregory Gibson

Executive Director, University of Colorado Denver | AMC Building Maintenance & Operations



David Tilton

Senior Operations Manager, University of Colorado Denver Building Maintenance & Operations



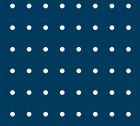
Joe Kimitch

Engineer, University of Colorado Anschutz Medical Campus Building Maintenance & Operations



Derek van Zijl

Account Manager, McKinstry Technical Services



Learning Objectives

1. What are the common challenges campuses will face through the Capital Planning process?
2. How to prioritize projects across your portfolio with more than just cost and age.
3. Best practices for engaging stakeholders, partners, and facilities staff to build a single source of truth for master planning.
4. How comprehensive data in facilities can be translated into user-friendly visuals that enable high quality decision-making.

1

University Profiles

University of Colorado Denver

Colorado's premier public urban research University



15,000

Students

1/2

Of Undergraduates are students of color

1/2

Of Undergraduates are first generation college students

1.2 M

GSF

8

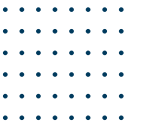
Buildings

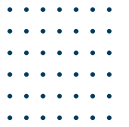
7

Schools & Colleges

Auraria Campus

Traditional territories and ancestral homelands of the Cheyenne, Arapaho, and Ute nations





University of Colorado Anschutz Medical Campus

Largest academic health center in the Rocky Mountain Region



4,500

Students

2

Nationally ranked
hospitals

60+

Health science
centers and institutes

4.2 M

GSF

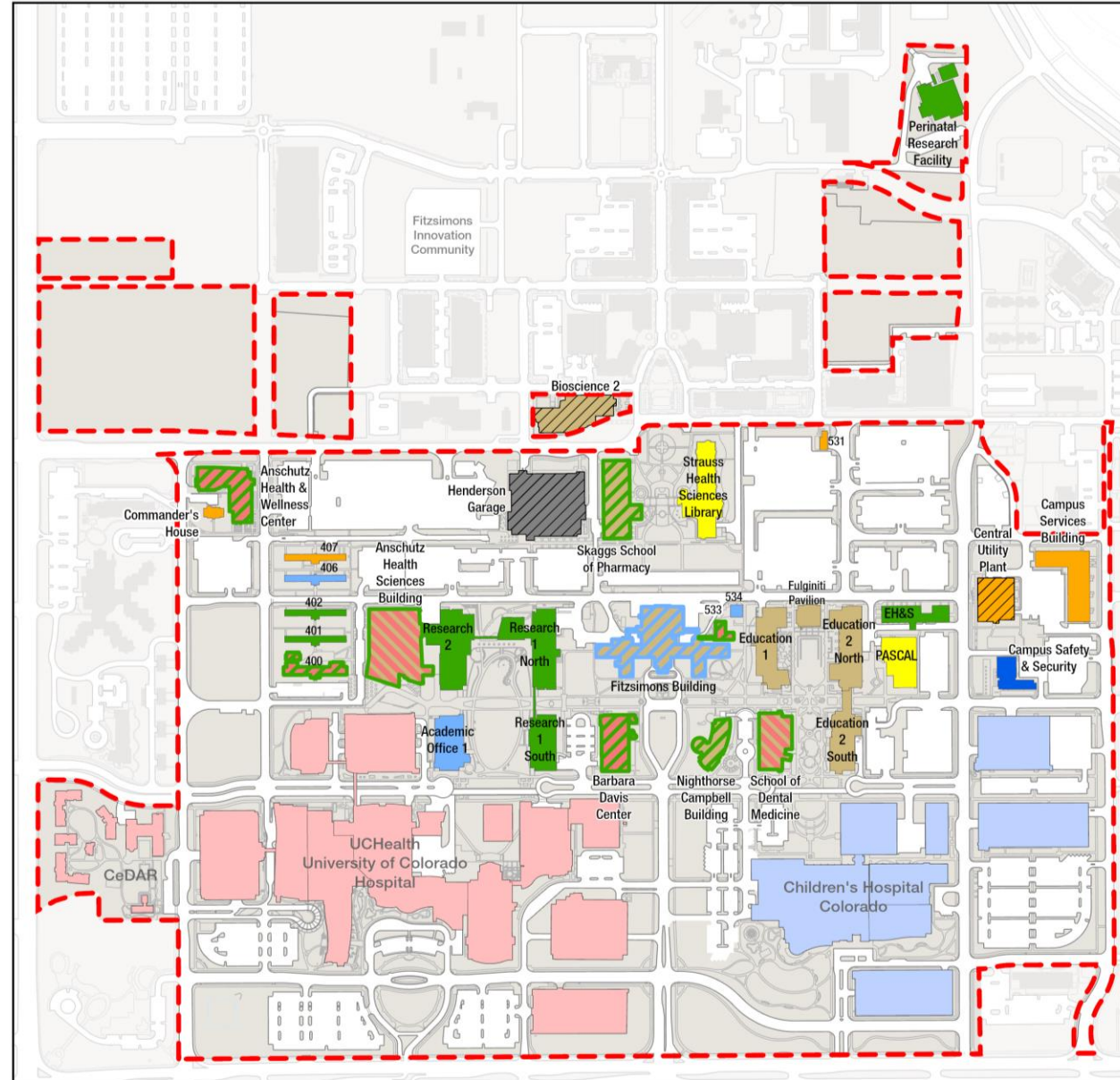
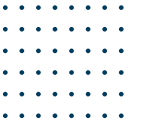
36

Buildings

6

Schools & Colleges

University of Colorado Anschutz Medical Campus



- Anschutz Medical Campus
- Research (9) 1,203,108 GSF
- Academic (5) 521,425 GSF
- Research/Clinical/Academic (2) 511,539 GSF
- Academic/Administrative (1) 479,660 GSF
- Research/Clinical (4) 244,198 GSF
- Administrative (3) 227,758 GSF
- Research/Academic (2) 216,812 GSF
- Facilities (5) 179,851 GSF
- Student Support (2) 141,911 GSF
- Public Safety (1) 26,889 GSF
- Parking Structure (1) 495,499 GSF
- UHealth
- Children's Hospital Colorado
- Other Building

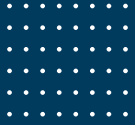
University of Colorado Anschutz Medical Campus

School of Medicine, College of Nursing, Skaggs School of Pharmacy and Pharmaceutical Sciences, School of Dental Medicine, Colorado School of Public Health, and the Graduate School



2

Vision Alignment



Facility Condition Assessments Terminology

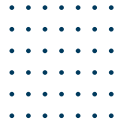
An FCA is a **process to document, analyze, and benchmark the current condition of a building's assets and make data actionable** by using asset data to develop capital plans—and master plans—maintenance tasking and scheduling, and detailed asset management strategies.

An FCI is a key benchmarking tool used to compare the condition and maintenance needs of a facility to its replacement value

$$\text{FCI} = \frac{\text{Total Cost of Deficiencies}}{\text{Current Replacement Value}}$$

Facility Condition Categories	Facility Condition Index (FCI)
Targeted Condition:	0.85 - 1.0 (85% - 100%)
Fair - Good Condition:	0.61 - 0.84 (61% - 84%)
Poor - Fair Condition:	0.35 - 0.60 (35% - 60%)
Poor Condition:	0 - 0.34 (0% - 34%)

Anschutz Medical Campus



Past Process

- Disjointed tracking of deferred maintenance
- Focus on short-term needs at the system level and FCI reporting
- Increasing gap between needs and funding

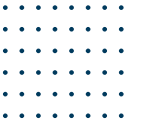
Challenges

- Burden on staff
- Assessment by committee
- Lacking documentation



Anschutz Medical Campus

Facilities Condition Reporting



Inspection Report

FCI-M20-HVAC-Team2
 Equipment: AHU1; Location: M20-Roof

Overall condition

(1) Needs Replacement (2) Needs Estimate (3) Needs Work order (4) No Repair Needed

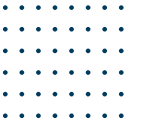
Overall Grade: 3.8

Overall Comments: Interior central AHU system with Chilled Water, Heating Water, and Variable Air Volume supply and return fans. Unit in overall good condition. The middle door handle / latch is loose and needs adjustment, repair, or replacement.

Calculation

Facilities Audit Calculation Page (HVAC/GROUP-TEAM 2)						
Barbara Davis Center M20		Date:	16-Dec-14		C.R.V. =	unknown
		Year Blt:	unknown	office, clinic, research	Cost per Sq Ft =	#VALUE!
112,000 S.F.		Occupancy Type:				
Component/subcomponent	Useful Life	Grade (input field - enter data only in yellowed section)	Calculation of Rating and Deficiency Cost			
Grade: 4=good condition, 3=fair condition, 2=needs work, 1=poor condition			Deficiency Rating	Comp Multiplier	Comp Value	Cost of Deficiency
Structure						
Foundation System	#####	n/a		0.12	#VALUE!	
Exterior Walls	#####	n/a		0.08	#VALUE!	
Roofing	#####	n/a		0.05	#VALUE!	
Windows & Doors	#####	n/a		0.07	#VALUE!	
Interior Finishes	#####	n/a		0.10	#VALUE!	
Elevators	#####	n/a		0.03	#VALUE!	
sub-total:		0.00	0%	0.45	#VALUE!	#VALUE!
HVAC						
Central Delivery Equipment (AHU): fan systems	#####			0.08	#VALUE!	
Central Delivery Equipment (hydronics): coils/piping	#####			0.05	#VALUE!	
Ancillary Equipment: steam, condensate return	#####	n/a		0.02	#VALUE!	
Distribution & Terminal Units (air)	#####			0.04	#VALUE!	
Distribution & Terminal Units (water)	#####			0.04	#VALUE!	
Temperature Control & Automation (Siemens)	#####	n/a		0.03	#VALUE!	
sub-total:		0.00	0%	0.26	#VALUE!	#VALUE!
Plumbing						
Central Equipment (heat exchangers)	#####	n/a		0.01	#VALUE!	

CU Denver Campus

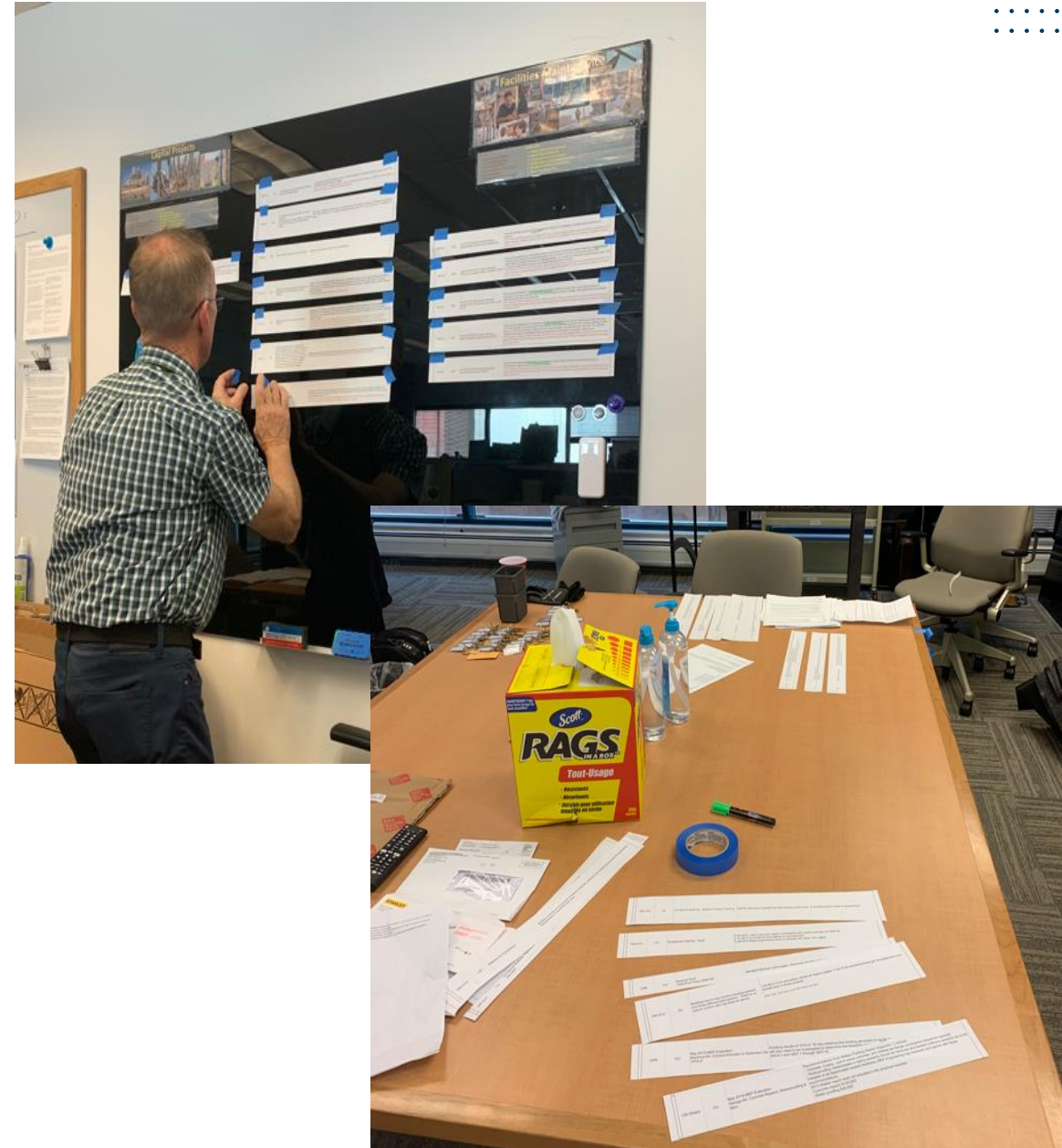


Past Process

- In-house facilities assessments with Trades staff
- Inconsistencies in scoring & reporting
- No estimated cost
- Focused on major equipment
- \$33 million in Deferred Maintenance - 102 items
- 5 year forecasting
- Controlled Maintenance request

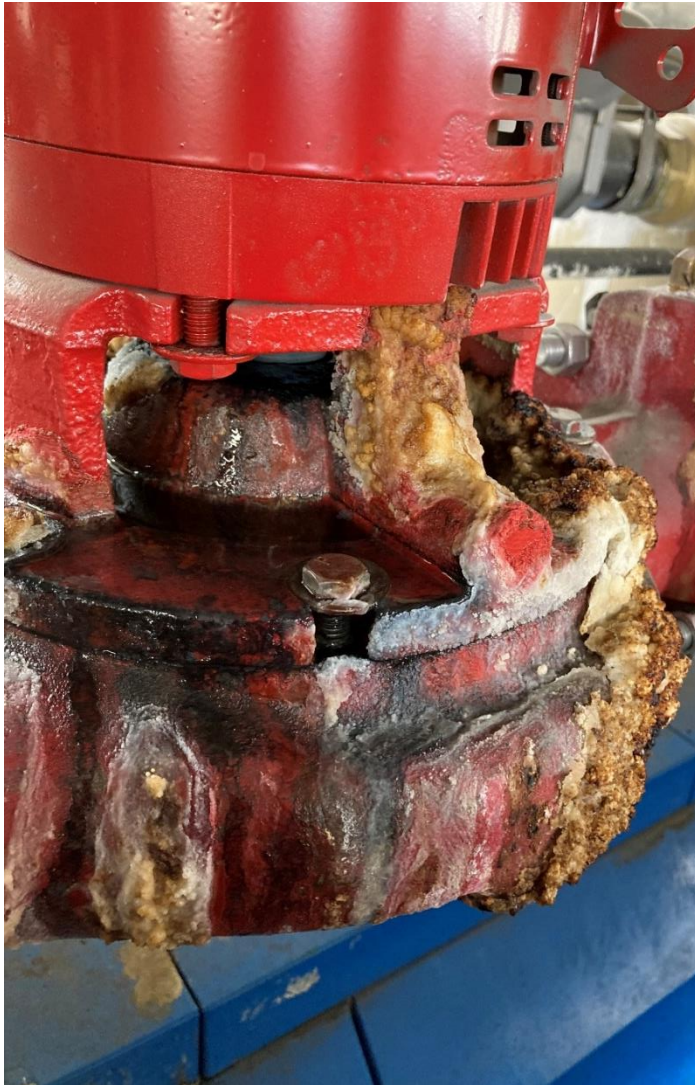
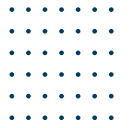
Priorities

- **Student Success**
- Fire life safety
- Code, Compliance, and ADA
- System Performance / Program Disruptions
- Energy / Utility Savings
- Regulatory Requirements



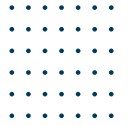
CU Denver Campus

What led us to the new FCA



- ✓ Methodology for prioritizing asset replacement
- ✓ Improving asset management practices
- ✓ Validation for efforts through targeted funding for DM
- ✓ Developing cost estimates for all assets
- ✓ Extending capital planning forecast
- ✓ Business case for leadership through reports and visualization tools

Anschutz Medical Campus



What led us to the new FCA

- ✓ Not business as usual
- ✓ Growing inventory
- ✓ Built-in business case
- ✓ Visualization of assets and priorities
- ✓ Planning for success



Anschutz Medical Campus

Begin with the end in mind

Pilot building

Data Consistency

Responsibilities:

- Vendor quality control
- Resolving immediate issues
- Database integrity



3

Engineering Considerations



Who is McKinstry?

National leader in designing, constructing, operating and maintaining high-performing buildings

- Founded in 1960
- Privately held
- \$1 billion annual revenue
- 3,000 employees
- 3 Major Lines of Business
- National footprint with 26 regional Offices
- 4 fabrication hubs



Higher Education
Focus

15

Colorado
Institutions

19

States

Map of McKinstry's National Higher Education experience

McKinstry's FCA Process



Prioritization

Asset Scores

High Score = High Priority

Variable	Value ▶	Points X	Weight =	Product
Asset Condition	3	3	200%	6.0
Occupant Impact	2	2	100%	2.0
Energy Impact	1	1	300%	3.0
Life Remaining	12 yrs	1	100%	1.0
Est. Replacement Cost	\$813,340	5	100%	+5.0
Total Score:				17.0

BEST	GOOD	AVERAGE	POOR	VERY POOR
5	10	15	20	25

SCORE VARIABLES

Asset Condition

Observed condition of the asset where:

<i>Very Poor Condition</i>	<i>5 pts</i>
<i>Poor Condition</i>	<i>4 pts</i>
<i>Expected Condition</i>	<i>3 pts</i>
<i>Good Condition</i>	<i>2 pts</i>
<i>Great Condition</i>	<i>1 pts</i>

Occupant Impact

Expected impact on using workspaces for business needs should the asset fail:

<i>Space Is Unusable</i>	<i>5 pts</i>
<i>High Impact</i>	<i>4 pts</i>
<i>Moderate Impact</i>	<i>3 pts</i>
<i>Mild Impact</i>	<i>2 pts</i>
<i>Little/No Impact</i>	<i>1 pts</i>

Estimated Life Remaining

Years remaining before the asset is expected to fail. Values are converted to a 5-point scale where:

<i>2 years or less</i>	<i>5 pts</i>
<i>3 to 4 years</i>	<i>4 pts</i>
<i>5 to 7 years</i>	<i>3 pts</i>
<i>8 to 9 years</i>	<i>2 pts</i>
<i>10 years or more</i>	<i>1 pts</i>

Energy Impact

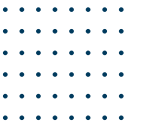
Level of potential energy impact:

<i>Very High Impact</i>	<i>5 pts</i>
<i>High Impact</i>	<i>4 pts</i>
<i>Moderate Impact</i>	<i>3 pts</i>
<i>Mild Impact</i>	<i>2 pts</i>
<i>Little/No Impact</i>	<i>1 pts</i>

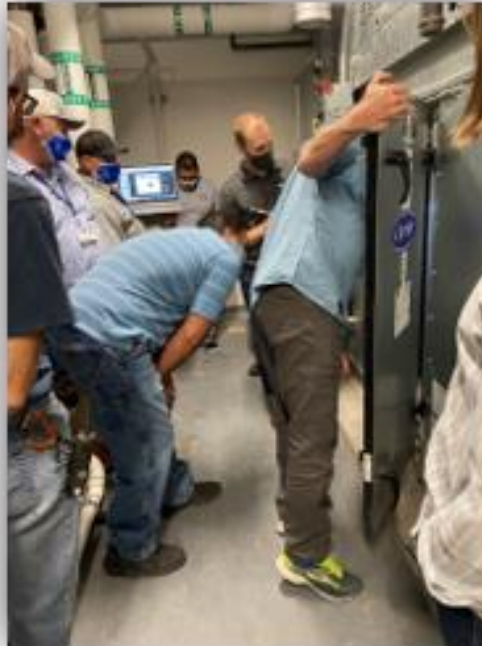
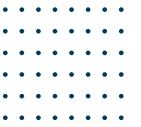
Estimated Replacement Cost

Estimated replacement cost in nominal dollars. Values are normalized and converted to a 5-point scale where:

<i>\$200,001 or more</i>	<i>5 pts</i>
<i>\$150,001 to \$200,000</i>	<i>4 pts</i>
<i>\$100,001 to \$150,000</i>	<i>3 pts</i>
<i>\$20,001 to \$100,000</i>	<i>2 pts</i>
<i>\$20,000 or less</i>	<i>1 pts</i>



FCA Process & Deliverables



Condition Report

What is broken and what can be fixed?

Asset Inventory

What is actually in the building?

Capital Plan

When do I have to replace things?

Cost Estimates

What's it going to cost?

Step 1: Learn



CUSTOMER PAIN POINTS



- Ongoing unresolved problems
- Projects failing to solve issue
- Staffing concerns
- Code violations
- Technology burdens
- End client requirements
- Leadership requires supporting data

ASSESSMENT DATA TYPES

Asset Condition

Operational Data

Organizational Need

Step 2: Audit



QUANTITATIVE ASSESSMENT

Count/Quantity

Make/model/serial number

Installation date

Design life

Remaining life



QUALITATIVE ASSESSMENT

Condition

Deficiency

Recommended action

Energy conservation

Impact of failure

Risk

Serviceability



The boiler shown here appears to be in good condition, but the audit discovered a leak in the return line



AUDIT

Step 3: Analyze



ANALYZE



DATA ANALYSIS

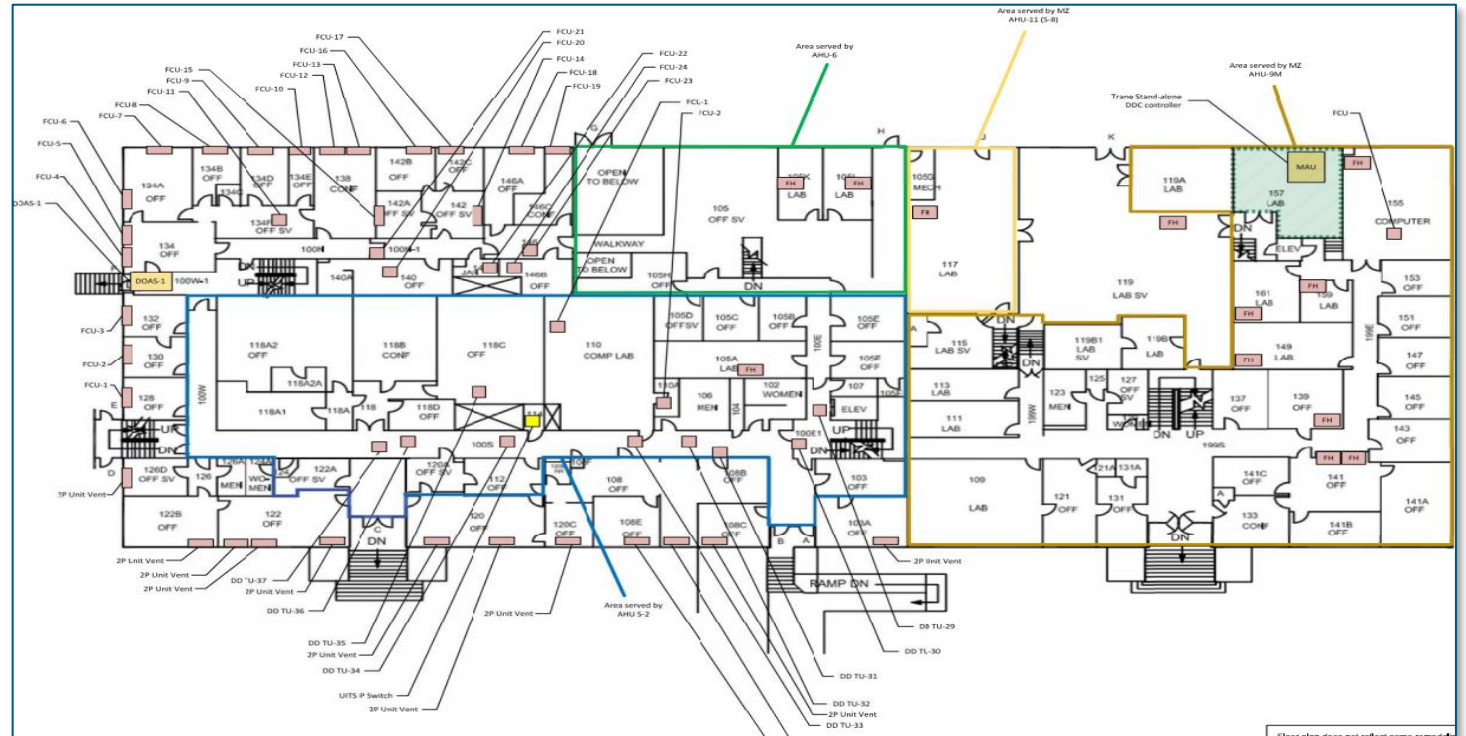
Analyze audit data

- Quantitative
- Qualitative

Generate repair or replacement costs

- Consistency with existing cost data
- Identify opportunities for efficiency

Consider stakeholder interviews



Step 4: Reporting



SUMMARY

Report Deliverable
 Workbook Deliverable
 Visualization Tool

PRIORITY SCORE SUMMARY – CENTRAL UTILITY PLANT



CENTRAL UTILITY PLANT (\$34)

BUILDING TYPE: Plant

YEAR BUILT: 2001

GROSS SQUARE FOOTAGE: 82,156

DATE ASSESSED: Jan. 20-21, 2022

FCI TARGET: 90%

FCI SCORE: 77%

CRV: \$114,423,966

OVERALL PRIORITY SCORE: 11.1



SUBSYSTEM	DESCRIPTION	PRIORITY SCORE
B20 – Exterior Vertical Enclosures	Exterior cast-in-place walls with brick veneer appear to be "weeping" in sections, especially on the west face. A Structural Engineer from Martin & Martin was contracted by Facility Management to assess whether this was as a result of deficient design (lack of vapor barrier in wall construction). M&M report determined that no design deficiency exists and recommended that a silane/siloxane clear sealant be applied to all exterior wall surfaces.	10.0
B30 – Exterior Horizontal Enclosures	Roof consists of a rolled asphalt base that has been re-sealed in 2016. Recommend replacement of roof within nine years.	16.0
C10 – Interior Construction	Interior CMU and drywall walls are expected to require replacement in 30 years, as are the hollow metal doors.	11.5
C20 – Stairs	One interior stairwell serves four levels including roof access. Expected to require replacement in 55 years.	10.0
C30 – Interior Finishes	Minimal interior finish. Carpet and acoustic tile will require replacement in approximately 7 years. Sealed concrete floors are expected to last another 15 years, but it is recommended that they be re-sealed in 5 years.	11.0
D10 – Conveying	Single elevator serves four floors. Replace in 15 years.	12.0
D20 – Plumbing	Six feedwater pumps and the sewage ejector pumps are expected to require replacement within the next two years. Also, four water meters and three side stream filters are expected to require replacement within the next two years.	10.3
D30 – HVAC	Substantial HVAC upgrades are expected within the next ten years including the replacement of four steam boilers, eight cooling towers, and numerous large pumps associated with the chilled and condenser water systems.	13.6
D40 – Fire Protection	Wet sprinkler system will require replacement in 15 years. Fire Alarm System is expected to require replacement in 5 years.	15.0
D50 – Electrical	Numerous electrical upgrades have recently been made. Interior fluorescent lighting and incandescent exterior wall pack lighting will require replacement in the next two years.	9.2

System priority scored from 5 (low priority) to 25 (high priority) based on condition, occupant impact, energy impact, estimated replacement cost, and observed remaining life. [≤10 = green, 11-15 = yellow, ≥16 = red]

Step 4: Reporting (Workbook)



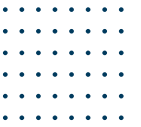
REPORT

Reveal ID	Reveal TreemapLabel	Customer Name	Building Name	Building Number	Level	Location	Area Served	Equipment Tag	Asset Number	Equipment Name	Reveal Subsystem (Uniformat Level 2)	Reveal Asset Type (Uniformat Level 4)	Uniformat Level 2 Code	Uniformat Level 3 Code	Manufacturer
FCAID-00001	Q20 Exterior: Doors - Coiling	CU Anschutz Medical Campus	Fitzsimons Building (Q20)	Q20	Exterior	Exterior	Various	N/A	N/A	Q20 Exterior: Doors - Coiling	B20 - Ext. Enclosure	Coiling Door	B20	B2030	N/A
FCAID-00002	S-21 Generator: Exterior Coiling	CU Anschutz Medical Campus	Fitzsimons Building (Q20)	Q20	Exterior	Exterior	S-21 Generator Outbuilding	N/A	N/A	S-21 Generator: Exterior Coiling Doors	B20 - Ext. Enclosure	Coiling Door	B20	B2030	Raynor
FCAID-00003	Q20 Exterior: Walls - Stone	CU Anschutz Medical Campus	Fitzsimons Building (Q20)	Q20	Exterior	Exterior	Exterior - 1st Floor Perimeter & Main Entrance	N/A	N/A	Q20 Exterior: Walls - Stone	B20 - Ext. Enclosure	Exterior Enclosure	B20	B2010	N/A
FCAID-00004	Q20 Exterior: Sliding Automatic Double Doors	CU Anschutz Medical Campus	Fitzsimons Building (Q20)	Q20	Exterior	Exterior	Various	N/A	N/A	Q20 Exterior: Sliding Automatic Double Doors	B20 - Ext. Enclosure	Glass/Storefront Door	B20	B2030	Stanley
FCAID-00005	Q20 Exterior: Swinging Automatic Double Doors	CU Anschutz Medical Campus	Fitzsimons Building (Q20)	Q20	Exterior	Exterior	Various	N/A	N/A	Q20 Exterior: Swinging Automatic Double Doors	B20 - Ext. Enclosure	Glass/Storefront Door	B20	B2030	Stanley
FCAID-00006	Q20 Exterior: Walls - Solid	CU Anschutz Medical Campus	Customer Name:	Building Name	Building ID	Address	Square Feet	Latitude	Longitude	Year Built	Estimated Capital Replacement Costs (7 Year)	Building Replacement Cost	FCI Score	Facility Condition Score	Legacy FCI Score
FCAID-00007	Q20 Exterior: Hollow Metal	CU Anschutz Medical Campus	CU Anschutz Medical Campus	Academic Office 1 (L15)	L15	12631 E 17th Ave, Aurora, CO 80045	204,974	39.744086	-104.840751	2007	\$ 11,983,030	\$ 54,917,463	0.22	78%	81%
FCAID-00008	Q20 Exterior: Hollow Metal	CU Anschutz Medical Campus	CU Anschutz Medical Campus	Barbara Davis Center (M20)	M20	1775 Aurora Ct # A140, Aurora, CO 80045	112,646	39.743996	-104.838307	2005	\$ 7,348,130	\$ 48,589,113	0.15	85%	84%
FCAID-00009	S-21 Exterior: Hollow Metal	CU Anschutz Medical Campus	CU Anschutz Medical Campus	Bldg 260: Perinatal (AK32)	AK32	13243 E 23rd Ave, Aurora, CO 80045	24,128	39.751383	-104.833477	1980	\$ 7,557,820	\$ 12,921,107	0.58	42%	65%
FCAID-00010	Q20 Exterior: Windows - Aluminum	CU Anschutz Medical Campus	CU Anschutz Medical Campus	Bldg 400 (Q09)	Q09	12469 E 17th Pl, Aurora, CO 80045	31,331	39.744922	-104.842760	1940	\$ 5,546,630	\$ 8,389,281	0.66	34%	70%
			CU Anschutz Medical Campus	Bldg 401 (R09)	R09	1784 Racine St, Aurora, CO 80045	22,656	39.745256	-104.842720	1940	\$ 4,038,220	\$ 6,066,437	0.67	33%	70%
			CU Anschutz Medical Campus	Bldg 402 (S09)	S09	1402 N Revere Ct, Aurora, CO 80045	22,632	39.745539	-104.842756	1940	\$ 4,829,590	\$ 6,060,011	0.80	20%	68%
FCAID-00011	S-21 Generator: Exterior Vents	CU Anschutz Medical Campus	CU Anschutz Medical Campus	Bldg 406 (T09)	T09	12477 E 19th Ave, Aurora, CO 80045	19,485	39.745953	-104.842723	1940	\$ 4,005,240	\$ 5,217,361	0.77	23%	72%
			CU Anschutz Medical Campus	Bldg 407 (U09)	U09	12454 E 19th Pl, Aurora, CO 80045	19,509	39.746172	-104.842770	1942	\$ 3,832,570	\$ 5,223,787	0.73	27%	71%
			CU Anschutz Medical Campus	Bldg 531 (X28)	X28	1997 Uvalda Court, Aurora, CO 80045	4,829	39.747452	-104.835209	1940	\$ 622,730	\$ 1,293,027	0.48	52%	75%
FCAID-00012	Q20 Exterior: Windows - Wood	CU Anschutz Medical Campus	CU Anschutz Medical Campus	Bldg 533 (Q34/R24)	R24	13001 E 17th Pl, Aurora, CO 80045	5,080	39.745310	-104.836736	1980	\$ 325,980	\$ 1,360,236	0.24	76%	69%
			CU Anschutz Medical Campus	Bldg 534 (Q34/S25)	S25	13001 E 17th Pl, Aurora, CO 80045	3,299	39.745546	-104.836485	1990	\$ 187,760	\$ 883,350	0.21	79%	66%
			CU Anschutz Medical Campus	Campus Services Bldg (T36)	T36	1945 Wheeling St, Aurora, CO 80045	68,333	39.746043	-104.831445	2007	\$ 4,276,000	\$ 27,305,482	0.16	84%	89%
FCAID-00013	Q20 3rd Floor: Roof Access	CU Anschutz Medical Campus	CU Anschutz Medical Campus	Central Utility Plant (S34)	S34	13350 E 19th Ave, Aurora, CO 80045	82,156	39.745693	-104.832741	2002	\$ 26,665,950	\$ 114,423,966	0.23	77%	87%
			CU Anschutz Medical Campus	Dental School (L26)	L26	13065 E 17th Ave, Aurora, CO 80045	116,060	39.744142	-104.836039	2005	\$ 12,265,590	\$ 54,314,011	0.23	77%	89%
FCAID-00014	Q20 8th Floor: Roof Access	CU Anschutz Medical Campus	CU Anschutz Medical Campus	Education 1 (P26)	P26	13070 E 19th Ave, Aurora, CO 80045	115,251	39.745261	-104.836069	2007	\$ 7,116,100	\$ 54,139,831	0.13	87%	85%
			CU Anschutz Medical Campus	Education 2 North (P28)	P28	13120 E 19th Ave, Aurora, CO 80045	160,454	39.745178	-104.834902	2007	\$ 9,528,010	\$ 59,321,400	0.16	84%	89%
FCAID-00015	Q20 8th Floor: Roofing - EPDM	CU Anschutz Medical Campus	CU Anschutz Medical Campus	Education 2 South (L28)	L28	E 17th Pl, Aurora, CO 80045	114,922	39.743956	-104.835010	2007	\$ 7,410,210	\$ 42,487,778	0.17	83%	89%
			CU Anschutz Medical Campus	EH&S (R30)	R30	13178 E 19th Ave, Aurora, CO 80045	21,022	39.745476	-104.833981	2004	\$ 2,191,200	\$ 8,657,226	0.25	75%	87%
			CU Anschutz Medical Campus	Fisher House (V07)	V07	1954 Quentin Street, Aurora, CO 80045	5,024	39.746688	-104.844284	1993	\$ 673,200	\$ 1,360,046	0.49	51%	88%
FCAID-00016	Q20 9th Floor: Roofing - EPDM	CU Anschutz Medical Campus	CU Anschutz Medical Campus	Fitzsimons Building (Q20)	Q20	13001 E 17th Pl, Aurora, CO 80045	479,660	39.745404	-104.837600	1941	\$ 52,597,480	\$ 192,070,779	0.27	73%	73%
			CU Anschutz Medical Campus	Fulginiti Bioethics/Humanities (R27)	R27	13080 E 19th Ave, Aurora, CO 80045	19,475	39.745446	-104.835430	2007	\$ 1,087,970	\$ 11,039,454	0.10	90%	92%
FCAID-00017	Q20 Roofing - EPDM	CU Anschutz Medical Campus	CU Anschutz Medical Campus	Health & Wellness Center (V08)	V08	2348 E Montview Blvd, Aurora, CO 80045	95,141	39.747054	-104.844026	2012	\$ 2,348,830	\$ 40,633,271	0.06	94%	85%
			CU Anschutz Medical Campus	Nighthorse Campbell Native Health (M24)	M24	13055 E 17th Ave, Aurora, CO 80045	45,396	39.743952	-104.836857	2002	\$ 4,179,550	\$ 21,109,560	0.20	80%	85%
			CU Anschutz Medical Campus	PASCAL (P30)	P30	13188 E 19th Ave, Aurora, CO 80010	28,906	39.745040	-104.834044	2001	\$ 1,766,040	\$ 11,971,107	0.15	85%	90%
			CU Anschutz Medical Campus	Perinatal Modular East (AL32B)	AL32B	13243 E 23rd Ave, Aurora, CO 80045	4,014	39.751691	-104.833330	2005	\$ 1,216,450	\$ 806,100	1.51	0%	85%
			CU Anschutz Medical Campus	Perinatal Modular West (AL32A)	AL32A	13243 E 23rd Ave, Aurora, CO 80045	729	39.751652	-104.833542	2015	\$ 27,320	\$ 2,072,531	0.01	99%	85%
			CU Anschutz Medical Campus	Pharmacy & Pharmaceutical Sciences Bldg (V20)	V20	2850 E Montview Blvd, Aurora, CO 80045	171,416	39.746825	-104.838311	2011	\$ 4,184,530	\$ 80,538,467	0.05	95%	90%
			CU Anschutz Medical Campus	Research 1 North (P18)	P18	12800 E 17th Ave, Aurora, CO 80045	344,703	39.745334	-104.839337	2004	\$ 43,174,830	\$ 228,566,090	0.19	81%	82%

4

VizTool

CU Denver VizTool

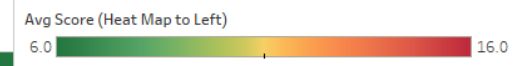
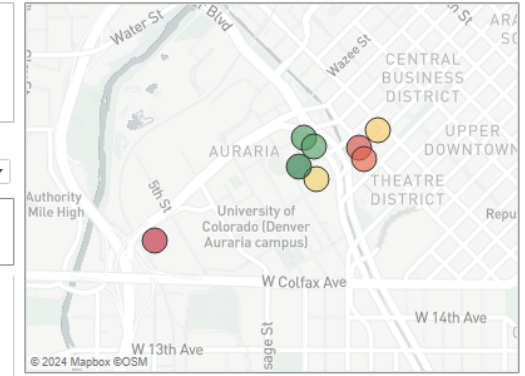


Asset Condition: 1 to 5 slider
 Occupant Impact: 1 to 5 slider
 Energy Impact: 1 to 5 slider
 Remaining Life: 1 yrs to 73 yrs slider
 Est Replacement Cost: \$400 to \$6,632,120 slider

Asset Score: 5.0 to 24.0 slider
 Score Isolation: Total Combined Score dropdown
 Asset Grouping: Group All Assets dropdown
 NPV Real Costs: Net Present Value dropdown
 Replacements to Include: 1st, 2nd, and 3rd Replacements dropdown

Asset Count	Observed Remaining Life	Avg Asset Score	Life Cycle Years	Life Cycle Capital Costs
4,409	13.6	10.0	73	\$688,180,462

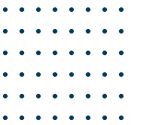
Building Name	Facility Condition Score	All Systems											
		B20 - Ext. Enclosure	B30 - Roofing	C10 - Int. Construct.	C20 - Stairs	C30 - Int. Finishes	D10 - Conveying	D20 - Plumbing	D30 - HVAC	D40 - Fire Prot.	D50 - Electrical	E10 - Equipment	G40 - Site Electric
North Classroom	49%	Red	Red	Orange	Yellow	Orange	Orange	Green	Green	Yellow	Yellow	Red	Green
Lawrence Street Center	59%	Yellow	Red	Orange	Yellow	Orange	Red	Yellow	Orange	Orange	Green	White	Green
CU Denver Building	72%	Yellow	Red	Orange	Green	Orange	Orange	Yellow	Orange	Yellow	White	White	Green
Lynx Crossing Residence Hall	81%	Green	Red	Orange	Yellow	Orange	Orange	Green	Orange	Green	White	White	Green
Business School	94%	Green	Red	Yellow	Yellow	Orange	Orange	Green	Green	Orange	Green	White	Green
Student Commons	97%	Green	Red	Yellow	Orange	Orange	Orange	Green	Green	Orange	Green	White	Green
Wellness Center	99%	Green	Orange	Green	Yellow	Green	Yellow	Green	Green	Orange	Green	White	Green
City Heights Residence Hall	100%	Green	Orange	Green	Green	Orange	Green	Green	Green	Orange	Green	White	Green



Building: (All) dropdown
 Building Number: (All) dropdown
 System: (All) dropdown
 Subsystem: (All) dropdown
 Equipment Type: (All) dropdown
 Equipment Tag: (All) dropdown
 Facility Condition Score: 49% to 100% slider
 Inclusions: (All) dropdown
 Exclusions: (All) dropdown



CU Denver VizTool

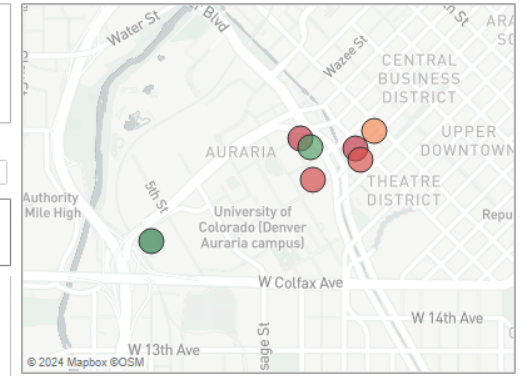


Asset Condition: 1 5
 Occupant Impact: 1 5
 Energy Impact: 1 5
 Remaining Life: 1 yrs 3 yrs
 Most Replacement Cost: \$400 \$6,632,120

Asset Score: 10.0 29.0
 Score Isolation: Total Combined Score
 Asset Grouping: Group All Assets
 NPV Real Costs: Net Present Value
 Replacements to Include: 1st, 2nd, and 3rd Replacements

Asset Count	Observed Remaining Life	Avg Asset Score	Life Cycle Years	Life Cycle Capital Costs
546	1.9	18.9	3	\$104,883,581

Building Name	Facility Condition Score	All Systems									
		B20 - Ext. Enclosure	B30 - Roofing	C10 - Int. Construct.	C30 - Int. Finishes	D10 - Conveying	D20 - Plumbing	D30 - HVAC	D40 - Fire Prot.	D50 - Electrical	E10 - Equipment
North Classroom	49%	Green	Red	Orange	Green	White	Green	Green	White	Green	Orange
Lawrence Street Center	59%	Green	White	Green	Yellow	White	Green	Green	Red	Green	White
CU Denver Building	72%	Green	Red	White	Green	Orange	Green	Green	White	Green	White
Lynx Crossing Residence Hall	81%	White	White	White	Green	White	Green	Green	White	Green	White
Business School	94%	White	White	White	Green	White	Green	Green	Orange	Green	White
Student Commons	97%	White	White	White	Green	White	White	White	White	White	White
Wellness Center	99%	White	White	White	White	White	Green	Green	White	White	White



Building: (All)
 Building Number: (All)
 System: (All)
 Subsystem: (All)
 Equipment Type: (All)
 Equipment Tag: (All)
 Facility Condition Score: 49% 100%
 Inclusions: (All)
 Exclusions: (All)



CU Anschutz Medical Campus | Visualize and Filter

Campus Map



Asset Condition 1 5

Occupant Impact 1 5

Energy Impact 1 5

Remaining Life 1 yrs 68 yrs

Est Replacement Cost \$0 \$39,464,330

Asset Score 5.0 24.0

Score Isolation Total Combined Score

Asset Grouping Group All Assets

NPV Real Costs Net Present Value

Replacements to Include 1st, 2nd, and 3rd Replacements

Asset Count	Observed Remaining Life	Avg Asset Score	Life Cycle Years	Life Cycle Capital Costs
16,310	9.9	10.6	68	\$2,796,093,467

All Sites

Max. Score
5.0 24.0

Building (All)

Building Number (All)

System (All)

Subsystem (All)

Equipment Type (All)

Equipment Tag (All)

Facility Condition Score
0% 99%

Highlight Building Name

Proprietary and Confidential - November 2022

CU Anschutz Medical Campus | Visualize and Filter

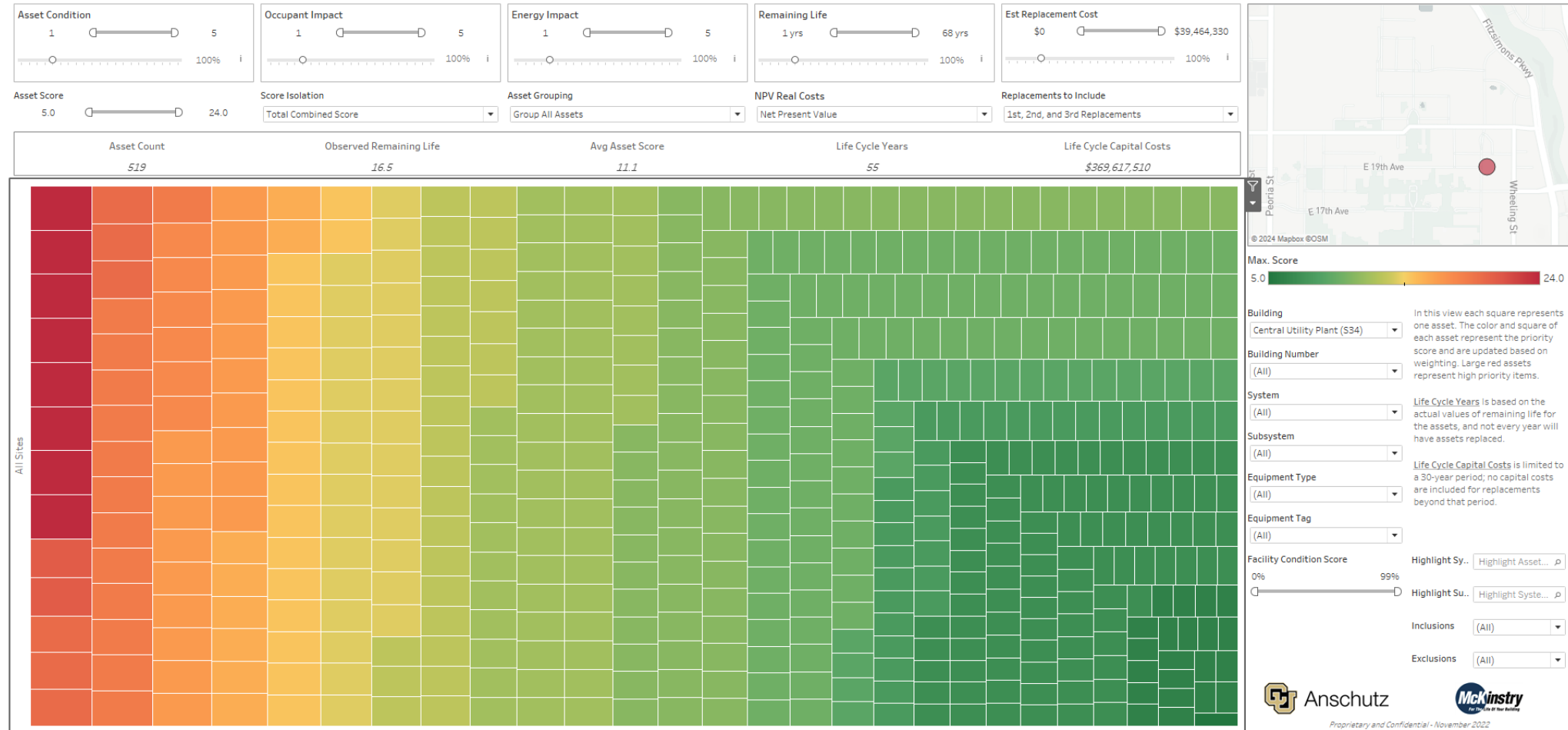
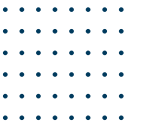
Filter the data for capital needs by assets



Proprietary and Confidential - November 2022

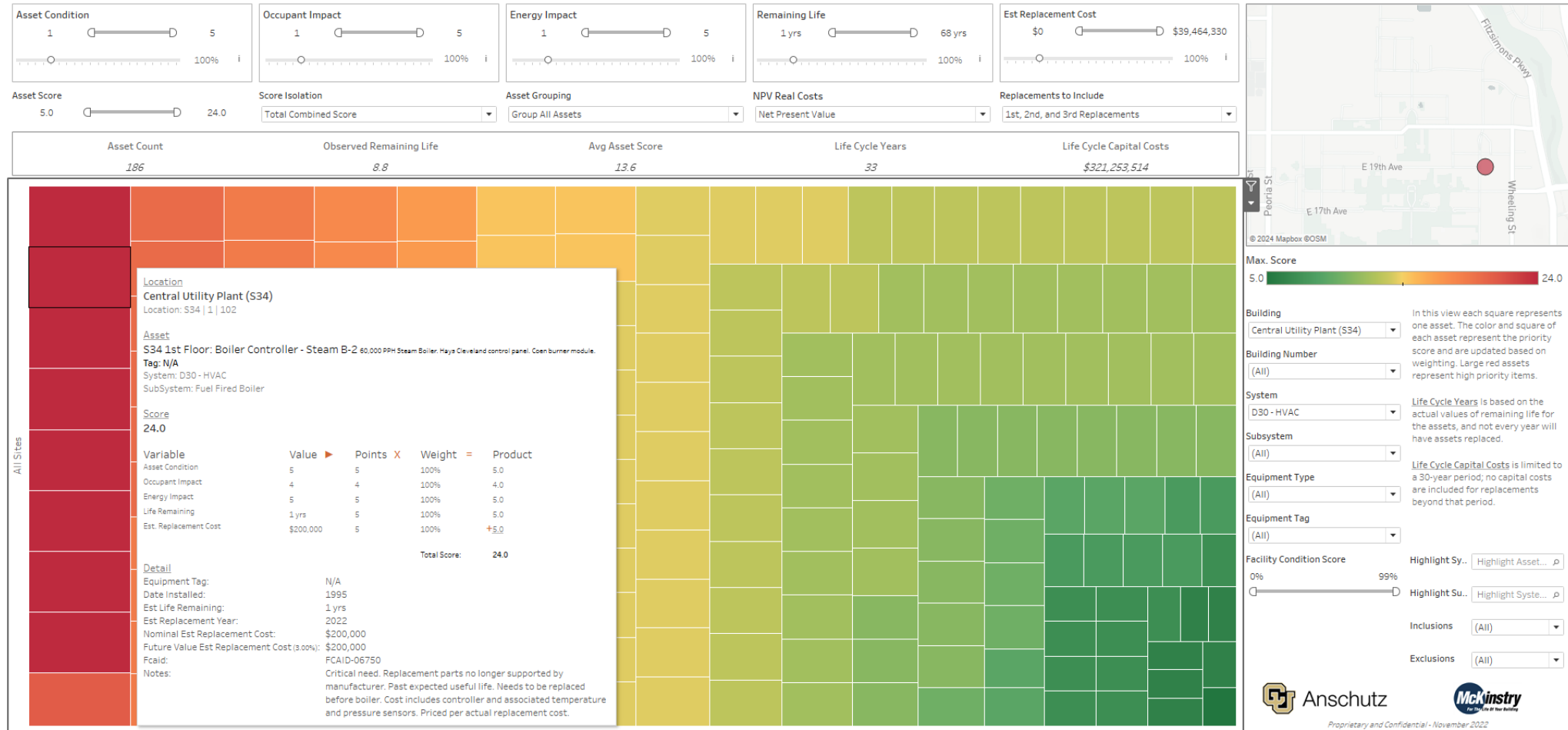
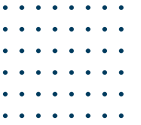
CU Anschutz Medical Campus | Visualize and Filter

Filter the data for capital needs by individual buildings



CU Anschutz Medical Campus | Visualize and Filter

Filter the data for capital needs by asset type in individual buildings

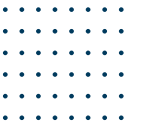


5

Results and Takeaways

Present – Data Driven Decisions

CU Anschutz Medical Campus



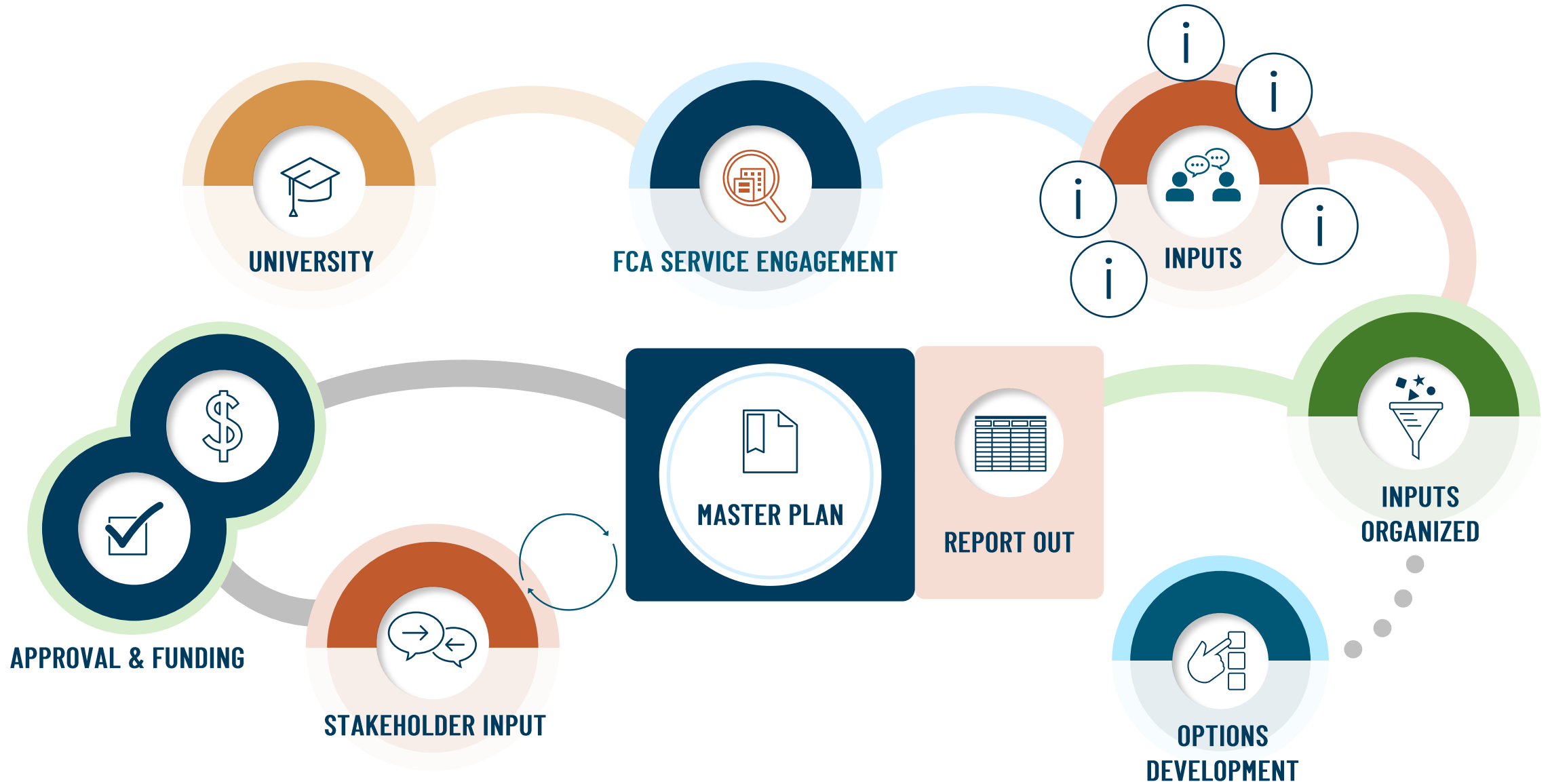
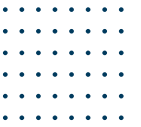
Priorities

- End of useable life
- Occupant safety
- Code compliance and standards
- Student success
- Asset viability
- Sustainability impact
- Unforeseen maintenance emergencies

17 projects totaling \$100M with 10-year forecasting.

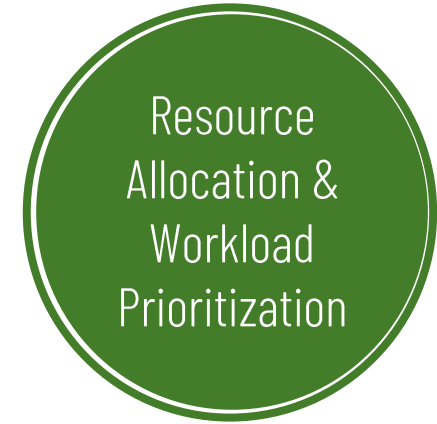
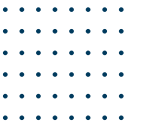
Building Name	Building ID	Square Feet	Year Built	Estimated Capital Replacement Costs (7 Year)	Building Replacement Cost	Prior Facility Condition Score (October 2021)	Facility Condition Score (November 2022)	Difference in FCI prior to FCA Program	
Bldg 402 (S09)	S09	22,632	1940	\$4,829,590	\$6,060,011	68%	20%	-48%	↓
Bldg 406 (T09)	T09	19,485	1940	\$4,005,240	\$5,217,361	72%	23%	-49%	↓
Bldg 407 (U09)	U09	19,509	1942	\$3,832,570	\$5,223,787	71%	27%	-44%	↓
Bldg 401 (R09)	R09	22,656	1940	\$4,038,220	\$6,066,437	70%	33%	-37%	↓
Bldg 400 (Q09)	Q09	31,331	1940	\$5,546,630	\$8,389,281	70%	34%	-36%	↓
Bldg 260: Perinatal (AK32)	AK32	24,128	1980	\$7,557,820	\$12,921,107	65%	42%	-23%	↓
Fisher House (V07)	V07	5,024	1993	\$673,200	\$1,360,046	88%	51%	-37%	↓
Bldg 531 (X28)	X28	4,829	1940	\$615,310	\$1,293,027	75%	52%	-23%	↓
Fitzsimons Building (Q20)	Q20	479,660	1941	\$52,597,480	\$192,070,779	73%	73%	0%	=
EH&S (R30)	R30	21,022	2004	\$2,191,200	\$8,657,226	87%	75%	-12%	↓
Bldg 533 (Q34/R24)	R24	5,080	1980	\$325,980	\$1,360,236	69%	76%	7%	↑

Strategic Planning



Informing Capital Planning with CMMS Data

Piloting asset tagging to link FCA asset information with CMMS



- Prioritize corrective maintenance work orders
- Metrics indicating total cost of ownership for equipment
- Resource planning aligned with capital planning
- Moving from reactive to proactive maintenance

Open Work Orders Filter > 🔍 📄 📥 📱

Work Order	Description	Work Type
22-124618	Repairing light poles by the park behind the CU Building	CM
22-124687	CU: Repairing light poles by the park behind the CU Building	CM
23-149137	AB1: Replace heat trace on cooling tower. PO#1001805916	CM
24-106932	CU 8th Floor: Split System A/C Unit 805A Contact (Sean Koto)	PM
24-106934	CU 8th Floor: Split System A/C Unit 805B Contact (Sean Koto)	PM
24-106936	CU 8th Floor: Split System A/C Unit 805D Contact (Sean Koto)	PM
24-106938	CU 8th Floor: Split System A/C Unit 810 Contact (Sean Koto)	PM
24-106940	CU 8th Floor: Split System A/C Unit 815C Contact (Sean Koto)	PM

Location
CU Denver Building
 Location: D808 | 8 | 815C

Asset
D-808: Split System A/C 815C 2 Ton
Tag: SPLIT-808-08-005
 System: D30 - HVAC
 SubSystem: Split System

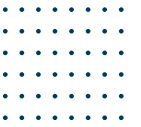
Score
9.0

Variable	Value	Points	X	Weight	=	Product
Asset Condition	2	2		100%		2.0
Occupant Impact	3	3		100%		3.0
Energy Impact	2	2		100%		2.0
Life Remaining	11 yrs	1		100%		1.0
Est. Replacement Cost	\$10,870	1		100%		+1.0
Total Score:						9.0

Detail

Equipment Tag:	SPLIT-808-08-005
Date Installed:	2018
Est Life Remaining:	11 yrs
Est Replacement Year:	2033
Nominal Est Replacement Cost:	\$10,870
Future Value Est Replacement Cost (3.00%):	\$14,608
Fcaid:	FCA-0206
Notes:	Contact: Lawrence Hass 303-352-3770; Belt: AX48/ Filters: (3) 16x25x1

Building Performance Optimization & Sustainability



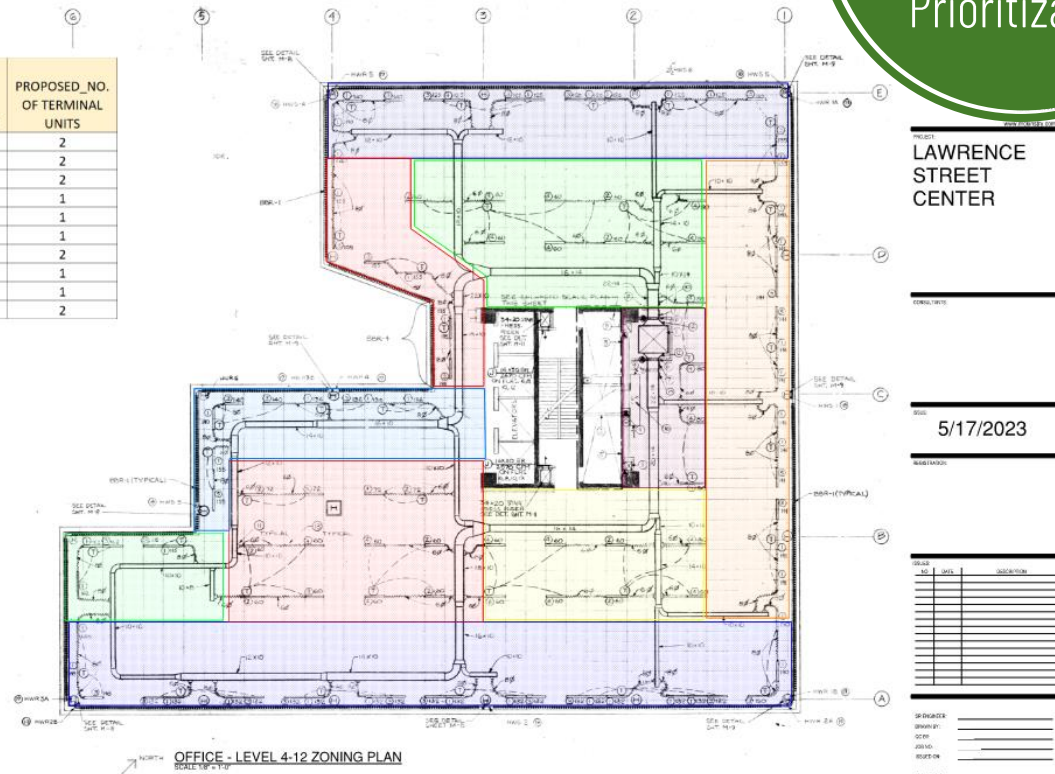
May 24, 2023

FY2024-25 CONTROLLED MAINTENANCE PROJECT REQUEST - COST SUMMARY (CM CS)			
A. Project Title:	University of Colorado - Denver, Lawrence Street Center VAV Retrofit Project		
B. Agency/Institution:	University of Colorado - Denver		
C. (1) Project Phase:	1	(2) State Controller Project #:	
D. Revision Date:			Date

Professional Services				Cost (\$)
1	Site Surveys, Investigations, and Reports:			
2	Arch/Exp/Basic Services:	12.0%		\$126,243
3	Code Review/Inspection:	1.5%		\$15,750
4	Other (Explain):			\$0
5	Inflation Percentage/Dollar Amount (This Phase):	0.0%		\$0
6	Total of Professional Services:			\$142,623
Construction Improvement (by CSF Division format, (insert additional rows as necessary) (attach updated detailed cost estimate)				
	WORK ITEM (Labor/Material/Equipment)	QUANTITY (sq. ft., etc.)	UNIT COST (\$/unit)	EXTENDED COST (\$)
7	Infrastructure, Utility Services:			
10	Infrastructure, Site Improvements:			
13	Structure/Systems/Components:			
	Demoition - Sheet Metal	28000 SF	\$ 0.42	\$11,760
	Demoition - Module Terminals	28000 SF	\$ 0.42	\$11,760
	Demoition - Existing Control Pneumatics	28000 SF	\$ 0.25	\$7,000
	Demoition - Ceiling Tiles	1800 SF	\$ 0.26	\$468
	L&M - Sheet Metal	3000 LF	\$ 67.50	\$202,770
	L&M - Floor Duct	800 LF	\$ 20.28	\$16,224
	L&M - Duct Insulation	3000 LF	\$ 3.13	\$9,390
	L&M - Ceiling Diffuser	100 EA	\$ 126.74	\$12,674
	L&M - Ceiling Tiles & Grid	2100 SF	\$ 18.25	\$38,325
	L&M - HW piping w/ Hangers	8000 LF	\$ 20.28	\$162,240
	L&M - Local Loop tie-in VAV Boxes	2000 LF	\$ 3.80	\$7,600
	L&M - Pipe Insulation	10000 LF	\$ 1.27	\$12,700
	Labor - FPVAV	18	\$ 1,763.33	\$31,740
	Material - FPVAV	18	\$ 2,555.56	\$46,000
	Labor - SDVAV	12	\$ 881.67	\$10,580
	Material - SDVAV	12	\$ 1,910.28	\$22,923
	L&M - Electric - power to motor	18	\$ 1,955.34	\$35,196
	L&M - Electrical Panel Replace for VAV	8	\$ 2,663.90	\$16,103
	Controls - VAV	30	\$ 2,435.29	\$73,059
	Controls - Front End	1	\$ 50,000.00	\$50,000
	T&S - Airside	30	\$ 76.04	\$2,281
	T&S - Waterside	30	\$ 76.04	\$2,281
	Commissioning Services	2	\$ 10,000.00	\$20,000
17	CONSTRUCTION SUB-TOTAL:			\$803,071
20	Presaving Wages:		7.00%	\$56,215
21	Accessibility:		1.00%	\$8,031
22	Contractor's General Conditions:		8.00%	\$64,248
23	Contractor's Overhead & Profit:		15.00%	\$120,481
24	Inflation Percentage/Dollar Amount (This Phase):		0.00%	\$0
25	Total of Construction Improvement Costs:			\$1,652,623
26	Miscellaneous Costs (List Items)			
27	(Specify)			
28	Total of Miscellaneous Costs			\$0
Project Contingency				
29	Calculate contingency percentage for total of professional services, construction improvements, and miscellaneous costs at 10%:			\$119,405
Cost of Current Phase				
30	Total cost of the Project (or this phase if multi-phased project) = all professional services, construction improvements, miscellaneous costs, and contingency. (Copy this amount to OSA-CMPPRN, Section D, Project Phasing Cost Information tables, per Fiscal Year)			\$1,313,451
Project Summary				
31	Total square feet/total feet of CONSTRUCTION IMPROVEMENT area:			28000
32	Overall cost per square foot/total cost of CONSTRUCTION IMPROVEMENT area:			\$28
TOTAL PROJECT COSTS for All PHASES (Updated automatically)				\$7,291,100

Note: Agency or Contractor Cost Estimates shall accompany this page.

ZONE	AREA	EXIST_CFM	PROPOSED_NO. OF TERMINAL UNITS
1	N. PERIMETER	1955	2
2	E. PERIMETER	1686	2
3	S. PERIMETER	3270	2
4	W. PERIMETER (GREEN)	716	1
5	SW. PERIMETER (BLUE)	1274	1
6	E. PERIMETER (RED)	1345	1
7	N. INTERIOR	660	2
8	E. INTERIOR	240	1
9	SE. INTERIOR (YELLOW)	520	1
10	SW. INTERIOR	768	2



Resource Allocation & Workload Prioritization

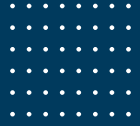
PROJECT:	LAWRENCE STREET CENTER
DATE:	5/17/2023
SCALE:	
SHEET NO.:	
SHEET LABEL:	M-100



What is next?

- Existing Building Commissioning
- Energy Performance Contracting
- Renovations
- Space Usage Assessments





Lessons Learned

- Recommend multiple cost opinions
- Difficulty factor
- Rightsizing – Master Plan
- Business hours
- Consider the long-term space needs and changes to building usage



If everyone is moving forward together, then success takes care of itself.”

—Henry Ford



Conclusion

1. What are the common challenges campuses will face through the Capital Planning process?
2. How to prioritize projects across your portfolio with more than just cost and age.
3. Best practices for engaging stakeholders, partners, and facilities staff to build a single source of truth for master planning.
4. How comprehensive data in facilities can be translated into user-friendly visuals that enable high quality decision-making.

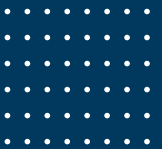


Thank You

Questions & Discussion

Questions for McKinstry?

Derek van Zijl
520.243.9043 | DerekV@mckinstry.com



This concludes The American Institute of Architects Continuing Education Systems Course