Exh. JB-2
Docket UE-23____
Witness: Jayson Branch

BEFORE THE WASHINGTON
UTILITIES AND TRANSPORTATION COMMISSION

WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION, Complainant, v. PACIFICORP dba PACIFIC POWER & LIGHT COMPANY Respondent.	Docket UE-23____

PACIFICORP

EXHIBIT OF JAYSON BRANCH

CRSA Life-Cycle Cost Analysis

March 2023

CRSA

APRIL 23, 2021

LIFE-CYCLE COST ANALYSIS

ROCKY MOUNTAIN POWER HEADQUARTERS

1407 W. NORTH TEMPLE

SALT LAKE CITY, UT 84116

PREPARED BY:

CRSA

175 S. MAIN STREET

SALT LAKE CITY, UT 84111

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Executive Summary

This report is a Life Cycle Cost Analysis (LCCA) for Rocky Mountain Power (RMP), specifically comparing the long-term financial implications of renovating its existing headquarters versus constructing a new facility on their site located at 1407 W. North Temple in Salt Lake City.

The current headquarters (including the warehouse), designed by Ashton, Evans and Brazier, was constructed starting in the late 1940s. As RMP predecessor Utah Power and Light grew through the second half of the twentieth century, along with vast population growth throughout the Salt Lake Valley and Utah generally, the headquarters was expanded in a piecemeal fashion. A large three-story addition was constructed west of the original core in 1958. A three-story south wing was added in 1977.

The current facility has experienced regular additions and modifications since 1977 to meet the ever-changing operational needs of RMP. However, it is falling behind modern energy efficiency standards, and the need for a significant renovations, seismic upgrade and/or construction of a new facility to better support staff, workflow and productivity has become apparent to RMP.

CRSA was approached by Giv Development in March 2021 to assist RMP leadership in the decision to build new or renovate the headquarters by evaluating the existing facilities and vetting the RMP standards for a new development. Giv is currently assisting RMP in selecting a master developer for the site, and the fate of the existing RMP building is central to the larger vision of the site and the financial viability of its development.

CRSA evaluated the architectural components of the existing facility and collaborated with the following sub-consultants in compiling this report:

- Calder Richards Consulting Engineers: Structural Engineering
- Spectrum Engineers: Electrical Engineering
- B&D Engineering: Mechanical, Plumbing, and Fire Protection Engineering
- Parametrix: Cost Modelling

Architecture

With any building over fifty years of age, its historical significance should be evaluated and accounted for in demolition vs. renovation decisions. However, the historical integrity of the RMP headquarters has largely been lost through years of renovations, additions, and maintenance-oriented changes. The building was not built with current standards for workplace environment in mind, and it is therefore lacking in quality daylighting, thermal comfort, and high-quality indoor air. Under the Utah-adopted 2018 I-Suite of codes, including the International Existing Building Code (IEBC) and International Energy Conservation Code (IECC), we would address the following deficiencies in addition to standard architectural services and interior design in the case of a renovation to the existing headquarters:

- Additional fire separations to meet maximum fire areas for Type II-B construction (unprotected non-combustible).
- Class B finishes in interior exit stairways/ramps and exit passageways.
- Upgrading accessibility in restrooms and other common areas.
- Upgrading building envelope to meet the IEBC requirements, including adding additional thermal insulation in exterior walls, replacing exterior doors/windows, and upgrading the roof. While we may be able to minimize required insulation under code, a full building upgrade would be ideal to

ease the mechanical system burden, meet RMP standards for workplace conditions, and to meet LEED requirements.

Structural/Seismic Systems

The building withstood the March 2020 Magna Earthquake relatively unscathed, with minor cracking to the unreinforced masonry warehouse walls. However, a major renovation would require seismic upgrades under the current 2018 I-Codes. Because different areas of the building were built at different times under varying contemporary codes, the seismic retrofit items would vary accordingly, including:

- Shear walls and upgraded roof-wall connections in original Warehouse.
- Bracing connection and wall connection upgrades in the 1950 and 1958 portions, which were seismically upgraded in the 1990s.
- Concrete shear walls and upgraded masonry wall connections anticipated in 1970 and mid-1970s additions.
- Further study of 1977 addition (the current system was designed for a six-story building, so it may be sufficient).
- Lateral system upgrades to 1990 Energy Management Building Addition, constructed under 1988 Uniform Building Code.

Electrical Systems

Due to deficiencies at every level, complete demolition and replacement of the electrical system is recommended if the current headquarters is renovated. This assessment is based on observed deficiencies in the medium voltage distribution, lack of a centralized utility yard for electrical service, inefficient panel locations and layouts, and a handful of code violations. Significant electrical system upgrade recommendations include:

- Branch circuits loaded to no more than 80% NFPA 70 standard.
- Copper conductors throughout, sized to prevent voltage drop exceeding 3% at the farthest load.
- Providing min. 20A outlets in code-mandated locations.
- Upgrade the grounding system.
- Lightning protection system is recommended.
- Increased EV charging stations.
- Replacing uninterruptible power system (UPS) and emergency/standby generator system.
- Wholesale replacement of the lighting systems to meet current codes and health department requirements; utilized all LED fixtures and a centralized system to help meet LEED and energy standards.
- New telecom system with special attention to Data Center upgrades.
- Wholesale replacement of security, A/V, and fire alarm systems to meet current codes and RMP requirements.

Mechanical, Plumbing, and Fire Protection Systems

According to the ASHRAE Equipment Life Expectancy Chart and given the most recent system upgrade was completed in 1990, not a single mechanical system in the existing headquarters building has any service life remaining. Therefore, a substantial replacement plan should be developed as a part of any renovation of the current building. With the age of piping running throughout the building and observations of its material characteristics, wholesale replacement of the plumbing and fire protection

systems is also recommended. Some factors which would be considered in replacing the mechanical systems include:

- Working around existing structural systems and other features complicates the mechanical design in any existing building.
- As it stands now, the mechanical design would be calculated based off under-insulated envelope conditions (architect recommends upgrading envelope thermal properties).
- Current energy code requires a fully integrated controls system which allows for trending.
- Current maintenance staff knowledge may limit the options for a new system.
- High cost of seismic restraints under current codes.

Cost Modelling

Existing Building Summary

Almost every aspect of the existing RMP Headquarters Building is deficient to modern office standards. In addition, the demands for seismically stable, environmentally controlled, and physically hardened operations environments will be both difficult and costly to develop within the existing structure. The cost of renovation to meet the demands of RMPs business and operational goals will far exceed the cost of new construction. Work will require building seismic retrofit, wholesale replacement of electrical systems, nearly wholesale replacement of mechanical systems, abatement of any existing hazardous materials (lead paint, asbestos wrapped pipes, etc.), and the retrofit of the structures to better position RMP to support is administrative and operational mandates. **Renovation work is expected to cost more than $300/sf or approximately $77.885 million for the 233,860 sf of primarily office/operations space**.

RMP Proposed Headquarters

While the pro forma for new headquarters facilities include both standard office space as well as 50,000+ sf of operations areas requiring high levels of seismically performance, environmentally controlled, physically hardened and independently operated environments. The need for approximately 150,000 square feet of contemporary office environments is anticipated to cost an average of $466/sf, for **an average total replacement cost of $69.843 million**.

Conclusion

While the current headquarters has served RMP well for over seventy years, its renovation would provide less value to RMP and its ratepayers that a new headquarters. Rapid developments in building codes, especially seismic and energy efficiency standards, along with standards for interior work environments, have largely led to obsolescence in the current headquarters. Bringing that facility up to current standards would not represent a cost savings to the point of financial feasibility compared to a new building. Additionally, the existing headquarters has very little inherent value, in the form of historical or aesthetic value, and a new building would allow RMP to convey its values through architecture, green construction, and branding.

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Rocky Mountain Power Headquarters
Existing Building Architectural Narrative

General

The current Rocky Mountain Power headquarters, located at 1407 W. North Temple, was constructed in multiple phases starting in 1950, with major additions in 1958, 1978, 1980, 1985, and 1990. As a result of this piecemeal development of the facility, it is not organized efficiently and fails to provide the quality of work environment expected in a modern office setting. Furthermore, some sections of the current headquarters do not meet current building codes, accessibility requirements, or environmental regulations.

To mitigate these shortcomings and provide facilities that meet RMP's needs, a substantial renovation of the existing facility would be required. If the project were undertaken currently, the *2018 International Existing Building Code (IEBC)* would govern these alterations. However, given the recent pattern of the release of a new model code every three years, with adoption by Salt Lake City the following July 1, we would expect this project to fall under the upcoming *2021 IEBC*. Because the *2021 IEBC* is only available in outline format at this time (to be released in full December 2021), our code review looks at the potential project through the lens of the *2018 IEBC*.

By virtue of its age, the historic nature of the building should be considered in any plans for its renovation, redevelopment, or demolition. The historic core of the headquarters was designed by notable Salt Lake architecture firm Ashton, Evans & Brazier in the International Style. The exterior of the historic section largely maintains its architectural integrity along the North Temple frontage, although additions to the south and west have negatively impacted the integrity on those sides of the building. As a result, the overall architectural integrity of the building has been diminished, and National Register listing under Criterion C ("Properties significant as representatives of the manmade expression of culture or technology") would be difficult. National Register listing under Criterion A ("Properties significant for their association or linkage to events important in the past") may be feasible given the building's association with the corporate growth of Utah Power and Light Co., but such listing is entirely voluntary, and would be recommend only if RMP or a new owner wishes to pursuit historic preservation tax credits or other such incentives. The building is not listed as a Salt Lake City local landmark or as contributing to a local historic district, so the City has no jurisdiction regarding historic preservation.

Building Code Considerations

As stated above, the renovation of this building would presumably fall under the *2021 IEBC*; however, this model code will not be released until late 2021 and adopted by SLC in July 2022. Therefore, this preliminary code evaluation is through the *2018 IEBC*, a code that "covers repair, alteration, addition and change of occupancy for existing buildings and historic buildings, while achieving appropriate levels of safety without requiring full compliance with the new construction requirements contained in the other I-Codes." The *2018 IEBC* was adopted by Utah on July 1, 2019.

The IEBC lays out three options for designers to meet code requirements: Prescriptive Compliance Method, Work Area Compliance Method, and Performance Compliance Method. We recommend the Prescriptive Compliance Method in this case, as the building is not undergoing a change of occupancy, it is relatively straightforward, and we anticipate a full "gutting" the building to install new mechanical and electrical systems. At its most basic level, the Prescriptive Compliance Method requires alterations, additions, and changes of occupancy to meet the requirements of the International Building Code (IBC), the Utah-adopted model code for new construction of commercial buildings. The following considerations would be addressed during the design process under the *2018 IBC*:

- Occupancy Classification and Use (Cpt. 3): currently Business (Group B) occupancy, no change of use anticipated.

- Special Detailed Requirements (Cpt. 4): the atrium space at the main entry is the only special requirement contained in the building. It connects three stories, so a fire barrier is not required, provided the smoke control system accounts for the full height of the space. Atrium interior finishes must meet a minimum of Class B. The atrium triggers installation of an approved automatic sprinkler system throughout the building. The current wet-pipe sprinkler system is anticipated to remain.

- General Building Heights and Areas (Cpt. 5):

    - Allowable number of stories above grade plan: existing three stories is under the maximum for sprinklered Type I or II construction.

    - Allowable building height: existing 57' height (approx.) is under the maximum for sprinklered Type I or II construction.

    - Allowable area: the allowable area (calculated by equation 5-2 (506.2.3)) is 86,250 square feet per floor for Type II-B construction, which makes up most of the current building. The overall footprint is approximately 135,000 square feet, so some fire separation will be required. The interface between the 1958 building and the 1977 addition already meets the fire separation requirement (as shown on C/A-16 on the 1977 plans). Furthermore, the 1950 building and 1958 addition appear to be isolated based off the 1958 plans. Further analysis is required, but existing fire separations appear to be sufficient based off current information.

- Types of Construction (Cpt. 6): the renovations of the building any additions to it should be constructed of minimum Type II-B construction, as it meets the allowable stories, height, and areas. Type II-B is common in commercial buildings and is defined as a building constructed of non-combustible materials but where materials have no fire resistance.

- Interior Finishes (Cpt. 8): Group B sprinklered buildings shall use Class B finishes for interior exit stairways and ramps and exit passageways. Class C finishes are acceptable for corridors and rooms.

- Means of egress (Cpt. 10): The building has approximately 900 occupants according to Table 1004.5. This number should be fine-tuned as future programs are determined and assembly areas (i.e. conference/training rooms) are laid out. There appears to be sufficient egress currently, though it is difficult to verify that the required egress requirements are met until renovation plans are developed.

- Accessibility (Cpt. 11): The facility is required to be accessible as outlined under *IBC Chapter 11* and in *ANSI A117.1.* While the IEBC contains some exceptions to IBC accessibility requirements, none of these apply to the RMP project.

    - The existing building appears to have an accessible route from accessible parking stalls to accessible entrances.

    - Within the building, the existing building appears to be fully accessible, with accessible routes connecting all spaces and with stories connected by elevators.

    - Restrooms appear to be mostly accessible, along with other plumbing facilities and other employee use areas (break rooms, etc). If a wholesale renovation were undertaken, new restrooms and breakrooms would be designed to meet accessibility codes.

Building Envelope

One key component in the decision to retrofit or to build new is environmental sustainability, achieved largely through efficient mechanical systems and a tight, well-insulated building envelope. The current RMP building was constructed prior to adoption of energy codes, evidenced by drafty facades.

Energy consumption was hardly a consideration in the 1950s. The Ashton, Evans & Brazier plans only call for 1” of rigid insulation sandwiched between the exterior brick veneer and an interior course of brick. While this small amount of insulation provides some thermal separation, there are many thermal bridges in the design. The steel windows are thermally unbroken, allowing the cold air to easily transfer from exterior surfaces to interior ones. Roof insulation in

the 1950s portions was also inadequate, although it is unclear if the roof insulation has been upgraded since the original construction as it is covered by gravel ballast and membranes.

By the time of the 1977 addition, building codes were starting to incorporate energy efficiency, but the addition is still considered under-insulated by today's standards. The primary envelope insulation is composed of 6" batts between metal studs, opening the door to prolific thermal bridging at each stud. Rigid roof insulation in the 1977 section is much closer to what would be designed today, although we cannot confirm the condition of this insulation.

Windows in the 1950s and 1977 portion of the building are also inadequate in their thermal properties, with high U-Factors and Solar Heat Gain Coefficients (SHGC). While most of the glazing is insulated, it represents early technology and is showing signs of wear in most cases.

Under the *2018 International Energy Conservation Code (IECC)*, "Alterations shall be such that the existing building or structure is not less conforming to the provisions of this code than the existing building or structure was prior to the alteration. Alterations to an existing building, building system or portion thereof shall conform to the provisions of this code as those provisions relate to new construction without requiring the unaltered portions of the existing building or building system to comply with this code."

Since the existing building would be entirely altered, the IECC requirements would apply wholesale. For Climate Zone 5, those requirements include:

- Insulation entirely above roof deck: R-30ci. This polyiso insulation would be installed along with a new single-ply roof membrane (TPO or PVC). 2 layers of 2.6" polyiso would yield this R-value, thickness will not be counted as an average R-Value.

- Walls: R-13+R-3.8ci. Fir in existing walls, with a spray-foam layer to provide continuous insulation. Min. 3" closed cell spray foam, which also provides vapor retarder.

- Fixed fenestration: U-0.38 min., see table C402.4: varies from 0.38 to 0.61, depending on orientation and projection factor.

For elements of the building not altered during the renovation, these upgrades would be voluntary. However, these updates would be strongly recommended if LEED certification and a high-performing building are desired.

RMP CORPORATE HEADQUARTERS
Life Cycle Analysis, 04.16.2021

program area name	existing gsf	proposed gsf	L1	L2	L3	tier 1 security level	tier 2 security level	tier 3 security level	Arch. Reqr.	Notes	Hardening measures
Headquarters (HQ)	**233,860**	**150,000**									
Building Entrance	**3,500**	**2,000**	o							guess on sf	
Lobby			o			X				Direct access to UPC, VTRF, elev lobby (T2S)	
Lobby Display			o			X					
Security			o				X				
RMP Employee Enterance			o				X				
Lobby to T2S Airlock/Single Entry Control			o				X			Allowing only in indiv through at a time	
Stair/Elevators			o				X			Hardened	
MDF/IDF/Comm Shaft (Cable Well)			o	o	o		X			Concrete floors, walls ceilings - continuous	
Mail Room			o				X				
Visitor Rooms and Training Facilities (VRTF)	**6,000**	**10,000**	o								
		5,400									
Lg Meeting Room		2,000	o			X				divisible into 2 or 3, outfit with video conferencing	
Training Room		600	o			X				AV package?	
Meeting Rooms		480	o			X				2 @ 240, ea. seat 12, outfit with video conferencing	
Breakout Rooms		720	o			X				6 @ 120, ea. seat 6	
Restrooms		600	o			X					
Breakroom/Lounge		600	o			X					
Chair/Table Storage		400	o			X					
Corp. Office Space (COS)	**127,570**	**69,348**					X			general office space to be used by RMP employees	
Open Office				o	o		X				
Offices				o	o		X				
Training Room				o	o		X			38 seats, divisible to 16 seats/22 seats	
Large Conference Rooms				o	o		X			18-24 seats	
Medium Meeting Rooms				o	o		X			6-8 seats	
Small Meeting Rooms				o	o		X			3-5 seats	
Phone Booths				o	o		X			1-2 seats	
Copy Center				o	o		X				
Refresh Station				o	o		X			sm break service - refrig, sink, coffee, microwave, exhaust, 2 seats	
Break Room				o	o		X				
Indv Selfcare/Mother's Room				o	o		X			80 sf, 1 per floor, small handsink	
IDF/Comm/Elec Closets				o	o		X				
Restrooms				o	o		X				

Customer Care Center (CCC)	**22,000**	**15,152**		X		telephone call center staffed 24-hours
Workstations		7,560	o	X		
Supervisors workstations		470	o	X		
Video Conference Rooms		672	o	X		
Training Room		2,600	o	X		
Lg Meeting Room		2,000	o	X		
Sm Conference Rooms		560	o	X		divisible, Skyfold partition to divide room into 4
Tariff Poilicy Team		403	o	X		
Business Analyst and Managers		403	o	X		
Mission Control, Workforce Mgt, Control Ctr		403	o	X		
Indv Selfcare/Mother's Room		80	o	X		80 sf, 1 per floor, small handsink
Global Security Operations Center (GSOC)	**4,000**	**2,500**		X	20' clear ceilings, 50' x 50' clearspan space, six wall border	24/7 RMP security group providing internal security for HQ and monitors critical electric grid infrastructure remotely
Theater		2,000	o	X	50' x 40', 3 raised tiers, 20' clear ceiling.	six workstations per tier, LED display wall 36' w x 12' h
Conference Room		300	o	X	30' x 10'	Behind and overlooking the Theater. Single conf table plus additional seating. 3 walls have LED displays.
Enclave 1		100	o	X	10' x 10'	adj. to conf rm on upper tier. Use open office medium enclave design standard.
Enclave 2		50	o	X	5' x 10'	adj. to conf rm but opposite from enclave 1. Use open office small enclave design standard.
Foyer		50	o	X	5' x 10'	primary entry point to GSOC. Contains storage for personal belongings and other supplies.
Utah Power Credit Union (UPCU)	**-**	**1,500**		X		employee owned CU with satellite location in HQ
Work Area		240	o			accomodarter 3 staff
Teller Area		144	o			3 stations
Lobby			o			
Conference Room			o			
Breakroom			o			
Supply Storage Room			o			
IT Rack Closet			o			

Control Center Design Requirement Facilities							
IT Data Center (ITDC)	**25,000**	**25,000**	o	X	non-water fire suppression	Tier 4 Data Center (fault tolerant)internal servers, electronic data storage, communications equipment, may be located in HQ or separate due to code requirement or cost desirability, Control Center design criteria plus hardening.Redundant systems. Uninteruptable power systems. Seperate environmental and power systems. Power Usage Effectiveness (PUE) 1.15, 72-hour self-sufficiency, grounding best practices (Motorola R56 standard). ANSI/BICSI 002-2019	operate thru and after an emergency (natural disaster, extreme environmental event, terrorist attack), withstand 7.5 magnitude earthquake, 110 mile per hour winds, 6' snow accumulation, through bad air quality (urban fire or wildfire), multi-layered physical and electronic security (thwart terrorist/rioters)
Control Center Data Center		4,500	o	X	no external windows	mainly traditinal four-post server cabinets	
CIP MDF			o	X		multiple secure cable routes	
Communications Room		6,000	o	X	no external windows	mainly two-post communications racks, overhead power and cable trays, direct connection to MW Tower	
COM DF			o	X		multiple secure cable routes	
Corporate Data Center		7,500	o	X	no external windows		
CORP MDF				X			
Receiving/Storage		2,000	o	X			
Build Room		2,000	o	X		immediatley adj. to recv/stor, data center, comm room	
Main Point of Entry Rooms		1,000	o	X	no external windows	2 rooms, see ITDC Diagram 1	
Backup Power		2,000	o	X		(4) 800 kW emergency backup power generators, for power and cooling	
Loading Dock						access to IDTC storage and/or build room, can have access to RMP controlled freight elevator if ITDC not on ground floor	
Multiple Point of Fiber Entry						multiple rooms to serve CDC, CCDC, CR	

Electric Grid Operations (EGO)	**15,000**	**24,000**	o		X	24/7 control center, Control Center design criteria, may be located in HQ or separate due to code requirement or cost desirability plus hardening	as noted above
EGO Control Room		18,000	o		X	16 seats at contol modules, 2 Skyfold partiotns to divide room into 3	
EGO Support		6,000	o		X		as noted above
Management Office		634	o		X	6 workstations	
Lg. Conference Room			o		X	views into center bay of the Control Room	
Sm. Conference Room			o		X		
Breakroom/Kitchen			o		X		
Emergency Management Systems Support			o		X		
Management Office			o		X		
Training Room			o		X	15 people	
Rest Area/Sleeping Quarters			o		X	2 single restroom/shower rooms, 6 sleeping rooms, lockers	
Communications Room/Comm Support		5,000	o		X	integrated with ITDC requirements	
Communication Tower					X	mounted 120-195' above ground plane with clear line of sight to Travrse Ridge and Ensign Peak. Building mounted or tower mount of. Connection to Gadsby plant. Adj. to ITDC with dedicated conduit path/raceway and bldg entry ports. Distance between tower and ITDC as short as possible.	tower location requires RF safety evaluation for moblie radio transmitter antenna andbldg occupants. Grounding consistent with RMP best practices and Motorola R56 standards.
Warehouse	**30,790**						
New HQ General Requirements						Electric power only, LEED (go for Gold), maximize daylight, high air quality standard, open (grand) stairwell between two floors, min 15' floor-to-floor	

CALDER RICHARDS
CONSULTING ENGINEERS

Sent Via Email

April 2, 2021

Laura Smith, AIA
CRSA
175 S Main Street, Suite 300
Salt Lake City, UT 84111

Reference: **Rocky Mountain Power Facility Structural Survey**
Structural Investigation

Ms. Smith,

Pursuant to your request, our office has been asked to help provide a Life-Use Analysis on the existing Rocky Mountain Power office facility, formerly known as Utah Power and Light. The facility is located at 1407 W. North Temple, Salt Lake City, Utah. Our part within the Life-Use Analysis is to provide a narrative describing the existing structural systems, their integrity, and any foreseen seismic upgrades that may be required. Ballpark square footage costs for structural upgrades are also to be included.

Our narrative is based on structural observations performed on site along with existing drawings that were available for review. Structural items that can easily be identified on site and or within the provided structural drawings will only be addressed in the narrative. Localized demolition and testing have not been performed.

I have performed a couple of site observations and have reviewed the received documents relating to the above referenced building.

RECEIVED DOCUMENTS

I have devoted substantive attention to the following documents.

1. Architectural and Structural Drawings for the 1950 Original Office Building prepared by Ashton, Evans and Brazier Architects and Engineers.
2. Partial 1992 Structural Drawings for the seismic upgrade to the 1950 Original Office Building prepared by MHT Architects and ARW Engineers.
3. Architectural and Structural Drawings for the 1958 General Office Addition prepared by Ashton, Evans and Brazier Architects and Engineers.
4. 1991 Structural Drawings for the seismic upgrade to the 1958 General Office Addition prepared by ARW Engineers.
5. Architectural and Structural Drawings for the 1970 General Office Building Remodel and Additions prepared by Brazier Montmorency Hayes and Talbot Architects.
6. Architectural and Structural Drawings for the 1978 Office Addition prepared by Montmorency, Hayes and Talbot Architects.
7. Architectural and Structural Drawings for the Vertical Office Addition prepared by Montmorency, Hayes and Talbot Architects.
8. Architectural and Structural Drawings for the 1990 Energy Management Building Systems Addition prepared by Richardson Associates Architects and E. W. Allen Associates Engineers.

BUILDING DESCRIPTIONS

The existing office building is a conglomerate of several buildings. The original building had several additions added on over the years of use with each building appearing to be separated by expansion joints. The following is a brief description and current condition of the original building along with each major addition.

The first and original facility consisted of a warehouse type structure on the southeast portion of the site. The date of construction is not precisely known at this time but is presumed to have been built in the mid to late 1940s. Structural drawings were not available for this original structure. However, the structural system is clearly visible since it's an open warehouse. The warehouse is mostly a single-story structure with a barrel framed roof comprised of wood joists and decking along with steel trusses. The trusses and framing are then supported on reinforced concrete pilasters and upper bond beams with infilled unreinforced concrete masonry unit (cmu) walls between them. The structure is then supported

on concrete foundations. The lateral system for the warehouse building utilizes the exterior masonry walls. A few wall cracks, perhaps due to some differential settlement, were observed at the south end of the structure. The warehouse structure appeared to be in satisfactory condition and appears to have performed well over its years of use.

The office building was built after the warehouse structure around the year, 1950. This original facility occurs on the eastern side of the site just north of the warehouse. Structural drawings for the office building along with the 1992 seismic upgrade were available for review. Per the available drawings along with a recent field observation, the following structural systems were observed. The office building is a two-story structure with a basement below. It has steel and concrete framed roof and floors with open web steel joists and wide flange beams. The roof and floors are then supported on double wythe masonry walls with reinforced cavities and interior steel columns. The structural framing is then supported on reinforced concrete foundations with fairly wide, spread footings. During the early 1990s, steel brace frames were added as a seismic upgrade to the original exterior masonry shear wall lateral system. The original office structure appeared to be in good condition and has perform well over its years of use.

The 1958 general office building addition occurs on the west side of the original office building. Structural drawings were available for this addition. The building is predominantly three stories in height with a basement below along with a single story occurring on the west end of the addition. Its roof framing has a concrete deck supported on open web steel joists and wide flange beams. The floors have concrete decks supported on wide flange beams. The roof and floors are then supported by interior steel columns and perimeter double wythe masonry walls with reinforced concrete cavities. The foundations are comprised of reinforced concrete walls, grade beams and pile caps supported on reinforced concrete drilled piers. The original lateral system utilized the exterior reinforced masonry walls and semi rigid steel beam to column connections. During the early 1990s steel brace frames were added as a seismic upgrade to the original exterior masonry shear wall lateral system. The 1958 General Office Addition also appears to be in good shape and has performed well over its years of use.

The 1970 General Office Building Addition occurs just south of the 1958 building addition. Structural drawings were available for this addition. This addition has two stories above grade with a basement below. The structural framing systems for this addition consists of a steel framed roof with open web joists and wide flange beams. The floor is framed with concrete and metal deck supported on wide flange beams. The roof and floors are then supported on interior steel columns with exterior reinforced cmu walls. The foundation system is comprised with reinforced concrete walls, pile caps and drilled piers. The lateral system for this addition utilizes the reinforced cmu perimeter walls. This addition appears to be in good shape and has performed well over its years of use.

Architectural and structural drawings for the addition south of the 1958 General Office Building and east of the 1970 Addition and Remodel were not available. The site plan within the 1970 Building Addition and Remodel drawings does not show this addition. However, the site plan within the 1978 Office Addition does. Therefore, it's presumed that this addition was built around the mid 1970s. Per a recent site visit, the addition has two stories above grade with a basement below. The structural framing system appears to have a steel framed roof with steel and concrete framed floors. The foundations are most likely reinforced concrete with pile caps supported on drilled piers. Since drawings were not available for this addition along with limited visual access, the lateral system for this building is unknown at this time. However, it maybe similar to that of the previous 1970 addition with exterior reinforced masonry walls. This addition appears to be in good shape and has performed well over its years of use.

The 1978 office building addition occurs on the west side of the 1958 addition. Structural drawings were available for this addition. The addition is predominantly three stories tall. The eastern portion of this addition was built on top of the single-story office addition built in 1958. Structural drawings were also provided allowing for an additional three stories to be built on top of the western three story, however, only the original three stories were built. The easter roof framing is comprised of a metal deck with open web steel joists and wide flange beams. The western roof and all floors are framed with concrete and metal decks supported on wide flange beams. The foundations have reinforced concrete walls, grade beams and pile caps all supported on reinforced concrete drilled piers. The lateral system for this addition utilizes steel braced frames. This addition has also performed well over its years of use and appears to be in good shape.

The 1990 Energy Management Systems Addition occurs south of the mid 1970s building addition. Structural drawings for this addition were available for review. The addition is two stories tall with a small basement corridor adjacent to the mid 1970s addition. The roof is steel framed with a metal deck and open web joists along with perimeter wide flange beams. The floor is framed with a concrete and metal deck supported on wide flange beams. The roof and floors are supported with steel columns and then supported on reinforced concrete foundations including walls, grade beams and pile caps all supported on drilled piers. The lateral system is comprised of steel moment frames. This addition has performed well and is in good condition.

OBSERVATIONS & FINDINGS

Salt Lake Valley experienced a moderate size earthquake in March of 2020. The epic center of the earthquake was less than 10 miles from this facility. It was mentioned by a Rocky Mountain Power representative that the earthquake was felt by several employees and the buildings were evacuated for a short period afterwards for safety measures. The structural systems for each building remained in good shape and except for the original warehouse building, only a few non-structural cracks were observed. At the south end of the warehouse, a few diagonal wall cracks were observed. It's likely that those cracks were originally caused by differential settlement and probably were there prior to the earthquake. But it is possible that they may have opened a bit further during the earthquake and aftershocks. As for the non-structural cracks, some wall cracks were observed in the sheetrock near the east side elevator within the original 1950 office building. There were also some brick veneer cracks on the west side of the 1978 addition. Those cracks developed during the earthquake due to the building(s) rocking side to side.

It should be noted that the office facility is located in an area of Salt Lake City that has potentially liquefiable soils. During a significant seismic event, these soils may experience some settlement. For this reason, deep foundation systems were utilized in the structural systems for the newer additions. As mentioned earlier, wide spread footings were used in the original 1950 Office Building. The wide footings are effective to help minimized differential settlement in poor soils, however, they are not as effective as deep foundations. Since the warehouse structure was built prior to the original office building, it's presumed that it also has conventional spread footings but they may be relatively less in width. Hence, the differential settlement, wall cracks observed at the south end.

While on site, it was observed that most of the building additions have expansion joints between them. However, it's unclear if an expansion joint occurs between the original warehouse and office buildings. The 1950 Office Building drawings also do not show an expansion joint. These incorporated expansion joints are a good design and with them, they helped mitigate any structural damage at and between the existing buildings.

The original facility along with its additions were designed and built using different and updated building codes. For example, the seismic upgrades to the 1950 Original Office Building and 1958 General Office Building Addition were designed using the 1991 Uniform Building Code and the 1988 Uniform Building Code respectively. The 1978 Office Building Addition was designed probably using the 1976 Uniform Building Code. At the time of this narrative, the current building code in use is the 2018 International Building Code. The seismic design requirements and design force levels have change throughout the building code updates. With the latest International Building Codes, the ductility requirements have increased greatly and depending on the lateral system, the seismic force levels have also increased in the Salt Lake Valley area. Some very brief calculations were performed in order to compare the relative design force levels under the current code requirements versus that of the 1988 Uniform Building Code for an ordinary brace frame system. The current force level requirement is about double of the older code. If the older brace frame systems qualify as special rather than ordinary, the force level still increases by 16%. In short, it's likely that the majority, if not all, of the buildings have lateral systems that do not meet current code seismic design levels and ductile detailing.

In reviewing the structural drawings provided the following seismic upgrades should be anticipated for each building.

The Original Warehouse Building may be seismically upgraded with the addition of some concrete shear walls strategically placed around the perimeter. The roof framing anchorage to the perimeter walls will also need to be updated.

The 1950 Original Office Building along with the 1958 General Office Building Addition were both upgraded in the early 1990s with the addition of steel braced frames. More study and calculations will need to be performed to determine the extent of any additional upgrade to the brace frames. However, it's very likely that the bracing connections along with the masonry wall connections will need to be upgraded.

The 1970 and Mid 1970s Office Additions could be upgraded if needed with new concrete shear walls. Additional calculations will need to be performed in order to determine the extents of the shear wall upgrades. However, just like the earlier masonry wall structures, the masonry wall connections will most likely need upgrading.

The 1977 Office Building Addition brace frame lateral system may or may not need upgrading since the addition was originally designed as a six story structure but only three stories were built. With that said, the existing connections will need further study in order to determine if they need upgrading or not.

The 1990 Energy Management Building Addition is the latest of additions and was designed using special steel moment frames. However, current code force levels are approximately 29% higher than the 1988 Uniform Building Code force level used in its original design. Also, the original building design utilized wide flange columns in their weaker axis of bending. Current code does not have prequalified moment frame connections using the columns in their weaker axis of bending. Therefore, the lateral system will need to be upgraded.

The information provided above is based on a typical office building with a standard occupancy. In reviewing the drawings and the information provided within them, most of the buildings were designed for a typical occupancy. In one case, the 1958 General Office Building Addition was upgraded using 75% of the lateral design load at that time. This is typically allowed when upgrading an existing building with no change in occupancy type and load. It was mentioned on site that the owner may be interested in an enhanced design to higher level of importance in order for immediate occupancy after a significant event. This level of design could be achieved but is most likely cost prohibitive.

It was mentioned that the owner wanted some ballpark costs to upgrade the buildings seismically if needed. Below are some rough structural square footage costs. These costs have been taken from the Federal Emergency Management Agency (FEMA) 156, Second Edition, Typical Costs for Seismic Rehabilitation of Existing Buildings. The FEMA 156 accounts for a data base of relative seismic upgrade costs from similar building types and construction. Some of the costs taken from the FEMA 156 have been adjusted down a bit for the newer 1990 Addition along with the previously upgraded 1950 and 1958 additions.

Original Warehouse Building	$45 per square foot
1950 Original Office Building	$40 per square foot
1958 General Office Addition	$40 per square foot
1970 Office Building Addition	$55 per square foot
Mid 1970s Office Addition	$55 per square foot
1977 Office Building Addition	$20 per square foot
1990 Energy Management Building Addition	$30 per square foot

When taking into account all of the different buildings and their areas, an average structural upgrade cost of around $40 per square foot can be anticipated.

CONCLUSION

The buildings, at their original time of construction and later seismic upgrades, all appeared to have been designed well with adequate load paths for gravity and lateral. They all appeared to have performed well over their years of use. However, they do not meet current seismic ductility requirements. They definitely do not meet the requirements for immediate occupancy after a significant seismic event. It's possible to upgrade the buildings further to meet current code seismic loading and to a certain extent, the ductility requirements for a typical office building risk category. Rough ballpark costs are shown above. However, upgrading to immediate occupancy will most likely be cost prohibitive.

In conclusion, it should be noted that the above findings are based on a review of the drawings provided and observation of exposed areas on site. Selective demolition was not performed. The findings noted above are based on my experience with structural design and construction for over 27 years. Furthermore, the above findings and recommendations do not express nor imply any warranty of the structure but only addresses conditions noted above.

I appreciate this opportunity to provide you with this report and trust that it meets with your needs. Please call if you have any questions or require further clarification.

Respectfully,

Shaun Packer P.E., S.E.
Managing Partner

ELECTRICAL SYSTEMS

CODES, STANDARDS, AND REFERENCE MATERIALS

Codes which are directly applicable to design of the electrical systems are listed below:

ADA, Americans with Disabilities Act
IECC, International Energy Conservation Code
ASHRAE 90.1, Standard for Energy Conservation in New Building Design
EIA/TIA, Electronics Industries Association/Telecommunications Industry Association
BICSI, Building Industry Consulting Services International
International Building Code (IBC)
IESNA, Illuminating Engineering Society of North America
NFPA, National Fire Protection Association (applicable sections including but not limited to):
- NFPA 70, National Electrical Code 2017
- NFPA 72, National Fire Alarm Code
- NFPA 101, Life Safety Code

UL, Underwriter's Laboratories
State of Utah Fire Marshal Laws, Rules and Regulations

DEFINITIONS AND ABBREVIATIONS

A = Amps or Amperage

IT = Information Technology

kW = Kilowatts

kVA = Kilovolt-Amps

MV = Medium Voltage

NEC = National Electrical Code

NIC = Not in Contract

RMP = Rocky Mountain Power

T1S = Tier 1 Security

T2S = Tier 2 Security

T3S = Tier 3 Security

V = Volts

Electrical Systems Responsibility Summary

System Responsibility Matrix				
REV 0, 04/01/21	Designed By	Furnished By	Installed By	Notes
Power & Lighting				
Outdoor Medium Voltage Switch(es)	Design Team	Contractor	Contractor	Utility
Indoor Medium Voltage Switches / Junctions	Design Team	Contractor	Contractor	Solid Dielectric G&W/ Cooper
Medium Voltage Cabling	Design Team	Contractor	Contractor	
Medium Voltage Transformer(s)	NIC	NIC	NIC	Utility
RMP Utility Raceways	Design Team	Contractor	Contractor	
Emergency/Standby Generator	Design Team	Contractor	Contractor	
Centralized UPS System	Design Team	Contractor	Contractor	Confirm with group
Electrical Sub-Metering	Design Team	Contractor	Contractor	Confirm with group
Photovaltaic (PV) Generation System	NIC	NIC	NIC	
Battery Energy Storage System	TBD	TBD	TBD	
Electric Vehicle Charging Stations	Design Team	Contractor	Contractor	
Lightning Protection System	Design Team	Contractor	Contractor	
Interior Lighting	Design Team	Contractor	Contractor	
Interior Task Lighting	Owner	Owner	Owner	
Exterior Lighting	Design Team	Contractor	Contractor	
Telecomm				
Raceways, Conduit/Cable Tray/J-Hooks	Design Team	Contractor	Contractor	
Fiber Micro Duct	Design Team	Contractor	Contractor	
Site Backbone Airblown Fiber	Design Team	Contractor	Contractor	
Site Backbone Fiber and Copper Cabling	Design Team	Contractor	Contractor	
Site Backbone Copper Cabling	Design Team	Contractor	Contractor	
Fiber Termination Shelves (FPP1, FPP2)	Design Team	Contractor	Contractor	
Copper Building Backbone Cabling	Design Team	Contractor	Contractor	
Riser Patch Panels (RPP1)	Design Team	Contractor	Contractor	
Fuse Protection for Backbone Cabling	Design Team	Contractor	Contractor	
Cat 6 Horizontal Cable	Design Team	Contractor	Contractor	
Cat 6A Horizontal Cable	Design Team	Contractor	Contractor	
Patch Panels/Inserts SPP, WPP	Design Team	Contractor	Contractor	
Horizontal Wire Manager (1RU, 2RU)	Design Team	Contractor	Contractor	
Vertical Wire Manager	Design Team	Contractor	Contractor	
Data ports, Faceplates, Boxes	Design Team	Contractor	Contractor	
Cat 6 and Cat 6A Patch Cords	Owner	Owner	Owner	
Building MDF/IDF Racks	Design Team	Contractor	Contractor	
Building MDF/IDF Ladder Rack	Design Team	Contractor	Contractor	
Active Network Electronics	Owner	Owner	Owner	
Rack PDUs	Design Team	Contractor	Contractor	
Elevator 2 way comm	Design Team	Contractor	Contractor	
Emergency Responder DAS Testing	Design Team	Contractor	Contractor	
Emergency Responder DAS System	TBD	Contractor	Contractor	Confirm with group
Cellular DAS Testing	TBD	Contractor	Contractor	
Cell Phone Booster System and/or DAS	TBD	Contractor	Contractor	Confirm with group
Radio Communication System	Owner	Owner	Owner	
Microwave Communication System	Owner	Owner	Owner	Confirm with group
Antenna Systems	TBD	TBD	TBD	Confirm with group
Security, Fire & Misc.				
Raceways	Design Team	Contractor	Contractor	
Fire Alarm	Design Team	Contractor	Contractor	
CCTV Security Cameras	Design Team	Contractor	Contractor	
CCTV Headend, Programming, Licensing	TBD	TBD	TBD	Confirm with group
Access Controls	Design Team	Contractor	Contractor	
Intrusion Detection	Design Team	Contractor	Contractor	Confirm with group
Emergency Lockdown System	TBD	Contractor	Contractor	
Fire Alarm System	Design Team	Contractor	Contractor	
Mass Notification System	NIC	NIC	NIC	
Wireless Clock System	NIC	NIC	NIC	
A/V				
Raceways	Design Team	Contractor	Contractor	
Audio Systems	Design Team	Contractor	Contractor	
Video Systems	Design Team	Contractor	Contractor	
IVC Systems	Design Team	Contractor	Contractor	
Digital Signage	Design Team	Contractor	Contractor	
Projector Mounts	Design Team	Contractor	Contractor	
Projector Screens	Design Team	Contractor	Contractor	
TV Distribution System	Design Team	Contractor	Contractor	
Intercom/Paging System	Design Team	Contractor	Contractor	Confirm with Users
Monitors / Projectors	Design Team	Contractor	Contractor	
Ops Center AV System	Design Team	Contractor	Contractor	
Demolition				
Medium Voltage	Design Team	Contractor	Contractor	
Power	Design Team	Contractor	Contractor	
Lighting	Design Team	Contractor	Contractor	
Exterior Lighting	Design Team	Contractor	Contractor	
Data/Telecom/AV	Design Team	Contractor	Contractor	
Security & Misc.	Design Team	Contractor	Contractor	
Fire Alarm	Design Team	Contractor	Contractor	

MEDIUM VOLTAGE and SITE ELECTRICAL

Rocky Mountain Power (RMP) owns the medium voltage (MV) distribution system that runs throughout the site and building. The project is served by the RMP medium voltage distribution system and is fed from multiple nearby MV switches located next to building transformers. The existing MV system will most likely need an extensive overhaul throughout the building. There are multiple MV systems running throughout the building. These systems appear to be at or nearing end of useful life on the medium Voltage equipment. There are MV switches (VACpac 4-way Vacuum Switchgear for instance), fused disconnects, junctions, and cable systems that should be replaced and either brought to an outside MV pad mount switch or upgraded in the vault with new switch and equipment to replace the system. The building will also require a new MV switch for one of the building service transformers. See Exhibit A for photos.

There appears to be multiple services coming into the building from the many additions throughout the life of the building. There appears to be both 480/277V services and 208/120V services in the building. There is a 480/277V service is located on Level 1 in the Southwest corner of the building. There are separate services to each generator system which are fed from 2 – 750kVA transformers at 480/277V. These are located on the South-central portion of the building, on the exterior, feeding into the UPS/Emergency electrical rooms. There is a 280/120V service located in the basement near the transformer vault that appears to be at least partially in service still. The service transformers are located in multiple locations throughout the exterior of the building. The project should coordinate to provide a new electrical utility yard for the service equipment, centrally located on the exterior of the building to support the building and distribution. A new site electrical utility yard would help with security and maintenance purposes for the building. These utility areas should be provided with all new equipment. There is other large distribution equipment located throughout the building, mostly in the basement that are no longer in service. The existing metering system will need to be verified with the Owner on any potential upgrades and consolidation for the building, but most likely will be provided with new pad-mounted NEMA 3R metering switchboards located in the new utility yard for the building and shall be sized at 480/277V 2,500 Amps and 208/120V 2,500 Amps. The building load is currently estimated to be between 3,000-3,500 kVA. This will depend greatly on the final programming, layout and loads of the building and will need to be confirmed during design. The project will most likely have two services set up to help with the load of the building. The operating Voltage will be 12,470V, 3-phase on the primary and 480/277V on the secondary of one service and 12,470V, 3-phase on the primary and 208/120V on the secondary of the other service.

This will require all new primary and secondary service conduits and raceways throughout the site and into the existing building.

Telecommunications Utilities

Telecommunication services will be provided through the RMP building. Connectivity will most likely be served through new air blown single mode fiber. Building will have SM fiber to the building demarc then pulled back to the nearest utility network node. The site fiber will be routed in raceways and shall have a minimum of four (4) 4” raceways to the nearest telecom vault. The fiber for the final site telecommunications design shall be coordinated with the Owner during design.

BUILDING SERVICE AND DISTRIBUTION

Main Service

There appears to be three main electrical rooms providing the building with both 480/277V, 3-phase, 4-wire and 208/120V, 3-phase, 4-wire main distribution switchboards. These rooms are located on level 1, 480V main and 480V EM electrical rooms, and in the basement, 208V main. There are also multiple transformer vaults located throughout the building in the basement and level 1, including 3 single phase tub style transformers feeding the penthouse electrical room servicing large HVAC systems. The majority of the electrical service equipment witnessed is more than 40 years old and beyond its end of useful life as called out by manufacturer standards. This equipment should be replaced, combined and consolidated in the center of the building for separate emergency and main distribution electrical rooms for the

remodel. These rooms will be large, minimum of 15’ x 25’ and have two forms of egress on opposite ends with panic hardware.

The main 480/277V distribution switchboard is anticipated to have a rating of approximately 2,000-2,500 Amps, this shall be verified and adjusted as necessary during design. The main 208/120V distribution switchboard is anticipated to have a rating of approximately 2,000-2,500 Amps as well and shall be verified and adjusted as necessary during design. These shall have a main circuit breaker and shall be free-standing and equipped with Owner metering. Additional sub-metering will be required throughout the building and should be discussed during design. The switchboards shall be utilized to provide power to power/lighting panelboards, motors, elevators and large mechanical equipment such as air handlers, pumps, chillers, fans, etc. for 480/277V and 208Y/120V shall be used for distribution that will serve power panelboards, computers, plug loads and other small equipment.

Panelboards

The current electrical layout for the building is very inefficient for maintenance purposes and utilizes a lot of real estate throughout the building. The majority of the electrical distribution equipment witnessed is more than 40 years old and beyond its end of useful life as called out by manufacturer standards. This equipment should be replaced and combined in new distribution and branch electrical rooms for each level of the building. There is currently more than a dozen, possibly 20-30, distribution and branch electrical rooms and locations located throughout the existing building as well as panels located in hallways in some cases. These rooms should be consolidated during the remodel and more centrally located to minimize the number of electrical rooms and equipment per floor. Possibly one branch electrical room on each end of each level, this would allow for the majority of equipment and devices to be fed from 2 locations per level rather than 4 or 5 different locations. These rooms should be vertically stacked to help with ease of running large feeders from level to level. This would greatly increase productivity and downtime of maintenance for the building.

Distribution panelboards shall be provided in the main electrical room and branch electrical rooms on each level and centrally located on each end of each level as much as possible, while taking into account other building and architectural considerations, so that the conductor distance from any panelboard to the most remote outlet is not greater than 150 feet. Each branch electrical room should handle the distribution panelboards for each level. Panelboards should be surface mounted, ease and accessibility of running new and future conduits out of each room is an important consideration in defining the location of the rooms. If inaccessible ceilings surround the room, (5) spare 3/4” conduits from each panelboard shall be stubbed to accessible ceiling areas and tagged as spare. These rooms shall be dedicated to electrical distribution and shall not be used for storage or any other purposes. The main branch electrical rooms for each level shall be sized at 12’ x 10’ and branch electrical rooms at 8’ x 10’ at a minimum but may be larger due to the size of each level. Dedicate an area of each room for current and future riser conduits so that wall-mounted equipment will not impede vertical distribution. Electrical rooms shall have a minimum of 25% additional space for future growth.

All 208/120V power and appliance branch circuit panelboards shall have 100% neutral busses with no isolated ground busses, unless required for the specific application. Computer and electronic loaded panelboards may be equipped with 200% neutral bus panelboards.

Main distribution switchboard, power distribution panels, and branch panelboards shall have copper bussing, 25% excess capacity and 25% spaces/spares for future growth and flexibility.

Distribution equipment such as distribution panels and panelboards shall be located as near as practicable to the loads served. For labs or shop type spaces the electrical distribution equipment may be located within or adjacent to the primary space served.

Metering

Currently there are analog power meters located throughout the building that are manually read that will need to be removed as part of the demolition for the project. Owner main building digital power metering

will be included along with select sub-metering as coordinated with the Owner. Metering for the building may include enhanced sub-metering or load demand response controls meeting LEED requirements and shall be coordinated during design. A building wide metering data collection system may also be integrated and should be coordinated during design.

Electrical Code Violations

There are multiple code violations noted throughout the existing electrical system and code updates that should be addressed from the time the building was built. Some of the code violations noted throughout the building are transformers installed below panelboards in the dedicated electrical space for the panelboard, egress pathways from electrical equipment and clearance requirements. Some of the electrical rooms and spaces were noted to be used for storage. Proper storage rooms should be provided in the new building remodel to ensure no electrical room is used for storage purposes.

Some of the code requirements for newer buildings that should be upgraded are ground fault protection on breakers over 1000 Amps, arc flash reduction on systems 277V to ground and more and 1200 Amps and more, Arc Flash labels on all equipment for personnel protection.

Demolition

It is recommended that the entire electrical system for the building be demolished and replace in its entirety. The demolition of the current electrical system should include the entire system, including, switchboards, panelboards, MCCs, transformers, disconnects, feeders, cabling, conduit, outlets, building entrance/service, etc. Demolition and/or salvaging of Emergency Systems and Lighting will be covered in their respective locations.

Motor Control

All 3-phase motors will be provided with phase-loss protection. Disconnect switches will be provided within sight of all motors. Provide variable frequency drives (VFD's) where required for mechanical equipment in compliance with RMP requirements, and sized at least 10% over the connected motor load. Minimum total harmonic current distortion when measured at the input terminals of the VFD will be not greater than 15%. The design electrical engineer may evaluate the variety of harmonic filtering and mitigation techniques and choose the best method to achieve this performance. A VFD scheme shall be provided with at least a 50% level of redundancy for the HVAC cooling system. This can be done with multiple drives, redundant drives, or bypass on the VFD as determined most economical and practical for the selected mechanical system.

Branch Circuits

Branch circuits will be loaded to no more than 80% of what is allowed by NFPA 70. Where outlets are intended for a specific piece of equipment, the load of the outlet will be based on the equipment nameplate. Allow no more than 6 convenience outlets per circuit in instructional lab spaces and for computer workstations, and 8 convenience outlets per circuit for general purpose use. Sufficient capacity for plug-in task lights and other peripherals typical of desk items will be provided. Outlets with dedicated branch circuits (one outlet on a circuit) are provided for vending machines, copy machines, break room counters, refrigerators, dishwashers, A/V cabinets and other locations likely to have equipment requiring dedicated circuits. Each branch circuit homerun will have no more than 3 circuits per raceway. Dedicated neutrals for each phase conductor will be provided.

Conductors

All conductors will be copper. Conductors for branch circuits will be sized to prevent voltage drop exceeding 3% at the farthest load. The total voltage drop on both feeders and branch circuits will not exceed 5%. For measurement purposes, a load of 180 VA (1.5A) per outlet, with a 50% diversify factor per NEC should be assumed.

Raceways

All wiring will be in raceways, minimum ¾" conduit for power and 1" minimum for telecom. Type MC cable should be reviewed where can be used for the project if allowed by Owner. New cable tray shall be provided throughout the corridors for distribution of low voltage network cabling such that raceways do not extend more than 50' (approx.) to the cable tray. Conduits for telecommunications shall stub to cable tray located in accessible ceiling space. Structured IT cabling will then be run in cable tray to the telecom rooms. Include pull strings in all empty conduits. Include raceway for all security, audio/visual and technology systems as defined in the project building requirements whether furnished as part of the construction contract or furnished by the Owner.

Equipment and Furniture

Refer to the program equipment summary and space plan sheets for equipment requiring electrical rough-in and connections and coordinate during design. All equipment and furniture identified in the program documents, whether it is furnished in this contract or a separate contract, shall be provided with power and raceway rough-in for complete operation.

Fault Current, Coordination, and Arc Flash Study

A fault current, coordination and arc flash study shall be performed by a licensed electrical engineer to indicate available fault current and arc flash at all points in the building distribution systems. New equipment shall be adequately rated for the amount of available fault current. System coordination shall be studied, and fuses or breakers selected to ensure minimum system outage due to overloads or fault currents. Per the 2017 NEC, emergency systems will be selectively coordinated to the extent possible. Breakers with adjustable long time, short time, instantaneous and / or ground fault settings shall be set at levels for optimum system coordination. In addition, an arc flash study shall be provided; electrical equipment shall be provided with labeling per all NEC/NFPA requirements.

Surge Protective Devices

To provide protection against damage to sensitive electronic equipment, due to surges, provide a new surge protective device (SPD) at the main distribution switchboards and at branch circuit panelboards serving sensitive electronic equipment. SPD units will be integral to the panelboard or switchboard.

Provide surge protection for all emergency distribution panelboards as required by NEC.

Outlets

Outlets will be 20A, minimum. The program and space data sheets will be used as a guideline, but user input should be welcomed during the design. Unless noted otherwise, the following will be used as a general guideline where more specific requirements are not elsewhere identified. Each outlet location will be coordinated with the design team and end user during design. Where the term "outlet" is used, this refers to a 20A duplex receptacle outlet (unless otherwise noted).

Offices/Small Rooms: For each workstation, provide one quad outlet dedicated to computer terminals and one additional outlet for every 10' of wall space or one on each wall.

Open Office Areas: For each workstation, provide one quad outlet dedicated to computer terminals where located on walls. Provided systems furniture and/or floorboxes for workstations located in the center of rooms away from walls.

Global Security Operations Center (GSOC): For each workstation, provide a minimum of one quad outlet dedicated to computer terminals, but possibly 2 or 3 quads for multiple monitors, terminal and general purpose. Provide an outlet for each monitor or projector on walls or ceilings and AV equipment rack locations. Provide outlets above counters, including power and A/V for staff tables and at the podium.

Provide floorboxes or poke-thrus throughout to allow for power and data in the multipurpose layout. Provide emergency power outlets as required.

Utah Power Credit Union (UPCU): Provide power and data for offices, reception/teller desk and other areas. Provide a minimum of 2 general convenience outlets per wall. Provide an outlet for each monitor or projector on walls or ceilings and AV equipment rack locations. Provide floorboxes or poke-thrus for power, data, and A/V in the conference rooms. Additional outlets shall be provided for specific equipment.

Customer Care Center (CCC): Outlets sufficient for programmed equipment, plus outlets along work benches or tables – no greater than 2' on center (unless otherwise identified in the space plan sheets). Ensure that there is at least one outlet for each 10' of wall space. Provide floor outlets for stations or equipment for specific operations. Where tables are fixed in place, coordinate power outlets mounted directly into the millwork. Provide furniture feeds for power furniture or desks as required. Provide emergency power outlets as required.

IT Data Center (ITDC): Provide a minimum of 2 general convenience quad outlets per wall on emergency power. Provide quads and 208V power at data cabinets as required. Provide starline busway (or equal) system for racks and cabinets as required. Additional outlets shall be provided for specific equipment.

Electric Grid Operations (EGO): Provide a minimum of 2 general convenience outlets per wall. Provide an outlet for each monitor or projector on walls or ceilings and AV equipment rack locations. Provide floorboxes or poke-thrus throughout to allow for power, data, and A/V in the multipurpose layout. Additional outlets shall be provided for specific equipment. Provide emergency power outlets as required.

Multi-Purpose Rooms: Provide a minimum of 2 general convenience outlets per wall. Provide an outlet for each monitor or projector on walls or ceilings and AV equipment rack locations. Provide floorboxes or poke-thrus throughout to allow for power, data, and A/V in the multipurpose layout and banquet layouts. Additional outlets shall be provided for specific equipment.

Conference and Meeting Rooms: Provide outlets on walls as required by NEC. Provide combination power/communication/AV floor outlets underneath conference room tables for each 215SF of space. Where tables are fixed in place, coordinate power outlets mounted directly into the millwork.

Lounges / Breakrooms / Kitchenettes: GFI Outlets on dedicated circuits every 4' on counter top plus dedicated outlets for refrigerator, microwave, and disposal (switched at counter top), plus one outlet for every 10' of other wall space in room.

Telephone / Data Closets: Provide one 208 Volt outlet near each telecommunications rack on emergency power for a UPS – coordinate amperage requirements with Owner. Provide one 120 Volt quad outlet on emergency power at each rack, plus one quad outlet on emergency power on each wall.

Copy/Mail Rooms: One outlet on every wall plus additional dedicated outlets for printers. Provide above counter outlets.

Mechanical/Electrical Rooms: At least one outlet on emergency power.

Restrooms / Shower Rooms: One GFI outlet near each lavatory counter top.

Corridors, Lobbies: Provide at least one outlet every 25', on alternating sides of the corridor or lobby. Where seating areas are provided, provide at least two outlets per seating area.

Stairs: One outlet at the landing of each level.

Storage Rooms (small), Janitors Closets: One outlet.

Building Exterior: One WP/GFI receptacle near each building entrance/exit.

Other Areas: Refer to individual space plan data sheets, and where not defined coordinate requirements with user during design.

Grounding

The existing grounding system does not appear to provide adequate grounding to all locations such as the building grounding, main electrical room, Data/IT rooms, cable trays, etc. This system should be demolished and replaced along with the electrical system. Provide a grounding riser system throughout the electrical and telecommunication rooms consisting of a ground bus mounted on the wall in each room near the switchboards and telecommunications racks and two grounding conductors (one extending to the main ground bus in the main electrical room and the other extended to building steel). Grounding conductors shall be installed with all feeder and branch circuits.

Specialty grounding systems may exist for Owner provided building systems such as antennas, radio systems, etc. These grounding systems shall be performed as part of the building design.

Lightning Protection

A lightning protection system is recommended by NFPA 780 for the remodeled building and should be verified during design. Provide a lightning protection system for the building with UL master label.

Electric Vehicle (EV) Charging Stations:

The project will include EV charging stations for no less than 50 spaces for Level 2 fast chargers and 100 spaces for Level 1 charging. In addition, another 100 spaces shall be roughed-in for future Level 2 charging stations. These will be part of the LEED points and shall meet LEED requirements. The charger type, quantities, and locations should be coordinated by the design team with the Owner needs.

Uninterruptible Power System (UPS)

A central UPS system is existing for the building. The building at one point had two 500 kVA UPS lineups. It was discussed with the Owner that one of the lineups is no longer in use. The other is 30+ years old. This system shall be verified during design, however is anticipated to be completely demolished and replaced with new along with the electrical system for the building. If the building electrical system were to be replaced, it is our opinion that leaving a 30+ year old UPS system in place for another 5+ years would not be the most efficient due to the extreme remodel of the building and ensuring room for the future UPS system. The UPS system is anticipated to be sized to run all Data Center, PDU's, Telecom Rooms and Critical Operation Center loads. More clarification on the UPS system needs to be made during design, however is anticipated to be at least 1,000 kVA+.

Emergency & Standby Generator System and Distribution:

The current building has a separate Emergency Electrical Room housing two 480/277V 620kW generators from 1990. The current building has a third generator that is 480/277V 700 kW and is located in an ancillary building adjacent to the main building. The generators are located indoors and are fed from an underground day tank system. Similar to the UPS, it is our opinion that leaving 30+ year old generators in service for the new remodeled building would not be the most efficient for the building's future. The generators should be demolished and centralized in an emergency generator room for the future. New generators will most likely be required for the project to house the emergency and standby electrical equipment. This room shall be sized at 40' x 30' at a minimum, but needs to be verified with the actual sizes of the new generator(s) and could be much larger. The generators are estimated to be around 500-1000kW each, actual size shall be determined during design once the exact generator loads have been determined. The current plan is to have two generators for the building with at least 1,500-2,000kW total, to feed two UPS systems, similar to the existing setup. This will need to be verified by the design team. The generator(s) will be indoors and will require fume exhausting. The existing underground day tank system will need to be verified if it can be reused for the future generator installation. If not, the removal of the underground tanks may be required for the project and new in ground tanks and piping

installed for the new generator(s). Fuel supply is anticipated to be minimum 72 hours at full load but should be determined during design. Provide at least two transfer switches and possibly three: one for data center, one for emergency/life safety and possibly one for non-emergency (standby) loads. Annunciate alarms adjacent to fire alarm panel. The following shall be provided with each transfer switch with possible changes or additions during design:

- Emergency
  - Emergency egress and exit lighting
  - Fire Alarm
- Standby
  - Electrical room - outlets
  - Communications rooms - outlets and air conditioning
  - Critical equipment
  - Building loads (if legally required standby is not required)
  - Security Systems
- Data Center

LIGHTING

General

The basis for design shall be the IES and its Recommended Practices for offices, operation centers, multi-purpose rooms, conference rooms, and other applicable spaces and Utah State Health Department Requirements or Codes where applicable, i.e., restrooms. The existing building lighting consists of around ~10% LED Lighting. The majority of the lighting and lighting controls, ~90%, shall be completely demolished and replaced. The existing ~10% LED lighting may be salvaged and reused in the office spaces as required. The exterior lighting does not appear to be LED and should be completely demolished and replaced as part of the project.

For exterior lighting and critical interior spaces, a point-by-point plot of illuminance establishing conformance with the Recommended Practices shall be furnished. Utilize LED fixtures to meet the illumination requirements while maintaining high efficiency and requiring minimal maintenance. Provide task lighting where practical to reduce the overall energy consumption.

IECC requirements shall be met and exceeded to meet the overall project requirement with goals for lighting power density to be minimum 10-20% less than required. Energy savings design techniques such as daylighting control, occupancy sensors, centralized and de-centralized control systems, energy efficient lamps/ballasts shall be used where practical to maximize energy efficiency.

Fixtures should be 4000K color temperature with a minimum CRI of 80. The existing LED lighting in the building appears to be 3500-4000K and should be verified to match the new lighting. If it does not match the new LED lighting preferred by the Owner, the existing LED lighting will need to be replaced. In areas where color rendition is important, fixtures with CRI of 90 or above and color temperature of 5000K shall be utilized. Dimming drivers shall be included with all LED fixtures and shall be compatible with daylighting and dimming controls.

Interior Lighting and Controls

Lighting intensity and uniformity should provide shadow-free and glare-free illumination of work surfaces. Lighting intensity control using dimmers or multi-level switching should be incorporated where computer or other electronic equipment monitors are used.

Pendant indirect or direct / indirect fixtures are ideally suited for the environments that will be encountered and should be used where ceiling heights will allow for suspension of 12-60 inches or more below the finished ceiling or where budget allows. If pendant fixtures are used in rooms with ceiling projectors, carefully coordinate the pendant fixtures with the projected image to eliminate any conflicts such as the

Operation Centers or the Multi-Purpose Rooms. In areas with projectors or flat panel displays, provide a separate zone of lighting control near the projector input location for ease of controlling lighting during presentations.

For spaces where glare control is not required, LED lay-in fixtures may be used. Recessed LED downlights and/or decorative LED fixtures shall be used in areas where aesthetics call for an upgraded appearance, such as in the new building lobby, multi-purpose, and operations centers.

For spaces where wall or floor displays will be shown, accent or wall wash lighting shall be designed where practical like the main lobby.

All interior lighting shall be controlled by some automatic means. This shall include vacancy sensors for regularly occupied spaces and smaller enclosed areas to shut down lighting when areas are not occupied. Lighting in common areas such as corridors and lobbies should be controlled by a programmable networked lighting relay control system with the capability of timed control, sensor inputs and building automation system integration and provided with local wall override switches. Large areas should be designed for multiple zones and light level control with occupancy sensors to allow energy reduction when the maximum light output is not needed. Uniformity must be maintained when in reduced lighting modes.

Provide automatic day light harvesting controls in areas where natural illumination is available as defined by daylight zones within the energy code. Photoelectric sensors should be used to shut down or dim the artificial lighting when it is not needed. In offices where day lighting control is used, utilize continuous dimming to negate the noticeable effects of the on / off cycles of the artificial illumination. Certain areas with security requirements may be exempt from code required dimming, such as the Operation Centers.

As required by the room use, provide variable lighting levels by continuous dimming. In rooms with audio / visual (AV) equipment, provide variable and zoned lighting control, from front to back, to allow for flexibility in lighting scenes for the various room functions. Where central AV control systems are used, provide lighting control / dimming systems with an RS232 AV interface to allow the lights to be controlled from and integrated into the AV system. All offices and instructional spaces shall be provided with manual dimming controls.

Exit and emergency lighting shall comply with the IBC. Emergency lighting for means of egress to 1 fc average, 0.3 fc minimum, shall be provided. Emergency lighting shall also be included in restrooms, electrical rooms, and communication rooms.

The state of Utah has adopted IECC for the state energy code, but IECC has a compliance path allowing the use of ASHRA 90.1, so either energy is acceptable to the state. The lighting load for the facility should target a lighting power density of 0.65-0.70 Watts/SF, this would result in a lighting design between ~10-20% better than baseline. It is anticipated that the increased building energy performance option will be for reduced lighting power densities. The lighting power density baseline values are shown below.

- IECC 2018: 0.79 W/SF (Office)
- IECC 2018, reduced based on table 406.3: 0.71 W/SF (Office)

Task Illuminance

Lighting levels shall be in accordance with the Recommended Illuminance Categories and Illuminance Values for Lighting Design, IES Lighting Handbook. Total lighting load for the facility should not exceed the calculated lighting power budget, minus 10%, as determined by IECC. The lighting levels listed below in footcandles should be used for design purposes. The values listed are average maintained illuminance levels using a maintenance factor of 75%. The numbers listed are target values and should be adjusted to meet the special requirements of individual areas.
The following table summarizes lighting levels and control methods for important spaces (some of the regularly occupied spaces may be changed during design depending on LEED requirements. For

instance, all offices and open offices may be changed to a t-grid mounted indirect fixture rather than a lay-in fixture to help with the Interior Lighting credit).

Function / Space	Fixture Type	Controls Type
Electric Grid Operations (20ft ceiling)	Linear pendants with mostly indirect lighting	Dimming, vacancy, multi-zone, multi-scene
Global Security Operations Center (20ft ceiling)	Recessed or pendant linear w/ direct/ indirect lighting	Dimming, vacancy, multi-zone, multi-scene
North Temple Service Center	Recessed Linear or 2x4 lay-in type	Dimming, vacancy, multi-zone, multi-scene
Offices / Small rooms	Lay-in grid/troffer fixtures	Dimming, vacancy
Open Office Spaces	Lay-in grid/troffer fixtures	Dimming, vacancy, multi-zone
Conference / Meeting Spaces	Pendant with Recessed Downlight Perimeter	Dimming, vacancy, multi-zone, multi-scene
Multi-Purpose Spaces	Varies – lay-in type, upgraded linear recessed or pendants, downlights	Dimming, vacancy, multi-zone, multi-scene
Salt Lake City Service Center	Recessed Linear or 2x4 lay-in type	Dimming, vacancy
Utah Power Credit Union	Recessed Linear or 2x4 lay-in type w/ Upgraded lobby lighting	Dimming, vacancy
IT Data Center	Strip lighting or Lay-in fixtures	On/Off Toggle
Corridors	Troffer Lighting	Time Control, Override
Lobby/Reception	Linear recessed or pendants w/ downlights, upgraded look	Time Control, Override
Lounges / Breakrooms	Troffer or Recessed Downlights	On/Off, vacancy
General Storage	Strip lighting	On/Off, vacancy
Mechanical / Electrical Rooms	Strip lighting	On/Off Toggle
IT Rooms	Strip lighting	On/Off Toggle
Restrooms	Recessed linear and downlight	Occupancy

Function / Space	Illuminance (Avg. Footcandles)
Customer Care Centers	30-50 (ambient) 50-75 (task)
Operation Centers	40-50 (ambient) 50-75 (task)
Multi-Purpose Room	30-50
Offices / Small rooms	30 (ambient) 50 (task)
Open Office Spaces	30 (ambient) 50 (task)
Conference / Meeting Spaces	30-50
Corridors / stairwells	15-20
Lobby/Reception	20
Lounges / Breakrooms	20-30
General Storage	15-30
Mechanical / Electrical Rooms	30
IT Rooms	30
Restrooms	30

EXTERIOR LIGHTING

Design Criteria

The existing parking lot lighting appears to be missing lighting in some areas. The lighting appears to be a mixture of older HPS type lighting and newer LED lighting. These fixtures will need to be verified during design, but it is anticipated that ~25-50% new lighting in the existing parking lots will be provided and refeeding existing LED lighting that may remain from the new electrical system.

The exterior lighting fixtures shall be selected to harmonize with the architectural style of the building. In general, all outdoor lighting shall have full cut-off optics as defined by the IESNA. Dark sky compliance

should be verified with the Owner per IDA. Wall mounted decorative fixtures may be used to draw attention to main entry or circulation areas, but for the most part should be kept to a minimum for energy purposes. Wall mounted fixtures at other locations should be non-decorative with cutoff optics that are designed for the intended use. Fixtures for parking surface areas should consider pole lighting while walkways could be a bollard or pole style light. LED sources should be selected for use in all exterior fixtures to minimize the maintenance. All exterior light fixtures should be robust and suitable for the harsh exterior environment. Preference should be given to fixtures that have design features such as hinging reflectors and removable ballast trays that reduce the cost of lamp replacement and fixture repairs.

Illuminance

Lighting levels should be in accordance with the Recommended Illuminance Categories and Illuminance Values for Lighting Design, IES Lighting Handbook. Total lighting load for the facility should not exceed the calculated lighting power budget as determined by IECC. The lighting levels listed below in footcandles should be used for design purposes. The values listed are average maintained illuminance levels using a maintenance factor of 75%.

Function	Illuminance (Avg. Footcandles)
Parking	0.5-2
Walkways	1
Building Perimeter – Egress/entrance	5

Emergency Illuminance

Select standard building lighting as may be required to achieve the illuminance criteria set forth in the NFPA Life Safety Code, IBC, and local codes. Designate these fixtures as egress lighting fixtures. Where lamp sources of building lighting are not instant on, provide arc keeper devices or battery/inverter units to prevent lamp source from extinguishing until emergency power can be supplied. Provide dedicated branch circuiting from the emergency power branch. Emergency lighting shall be provided on all paths of egress including but not necessarily limited to corridors, large open office or instructional spaces, operation centers, restrooms, mechanical rooms, electrical rooms, and communication rooms. Egress pathways shall be provided with minimum lighting levels of 1 footcandle. Depending on building generator option chosen, the entire building may be provided on emergency backup.

Provide illuminated exit signs in locations as required by the NFPA Life Safety Code, IBC, and local codes. Exit sign shall be cast aluminum LED type. Provide dedicated branch circuiting from the emergency power branch.

LEED

Every effort shall be made where economically feasible to incorporate sustainable design into the electrical systems. The LEED design shall be based on LEED version 4.1. With regard to LEED, below is a summary of electrical related credits and which are currently being pursued:

- LT Green Vehicles - This credit is currently being pursued. Conduit shall be installed for electric vehicle charging stations. This credit requires electric vehicle charging stations for 2% of the parking spaces in addition to meeting the other requirements for this credit.
- SS Light Pollution Reduction - This credit may be pursued if possible depending on property boundaries.
- EA Minimum Energy Performance – The lighting design will target 20% reduction in lighting energy use to aid in this credit.
- EA Building Level Energy Metering – This prerequisite will be met.
- EA Advanced Energy Metering - This credit will not be pursued.
- EA Demand Response – This credit is not planning on being pursued, however needs to be confirmed with the Owner.
- EA Renewable Energy Production – This credit will not be pursued.

- EA Green Power – This credit may be purchased at the discretion of the Owner
- IEQ Interior Lighting – The interior lighting will include lighting controls meeting option 1 and option 2 of this credit will be dependent on indirect lighting in spaces and/or Architectural choices.
- IEQ Daylight – This credit may be pursued depending on building layout

FIRE ALARM SYSTEM

Fire Alarm and Life Safety

The existing fire alarm system appears to be ~40+ years old. With the building additions over the years, this most likely is not fully synchronized across building locations as required by code. The entire system is at or near it's end of useful life and should be demolished and replaced with a new system for the building.

Fire alarm system shall be designed to comply with State of Utah Fire Marshal's "Rules and Regulations".

Based on current intended building use and defined spaces, the building is expected to be a B Occupancy Type with Assembly spaces. This would require the following minimum system features:

- Addressable fire alarm system with control panel and remote supervision
- Remote annunciator(s)
- Pull stations
- Monitoring of the fire sprinkler system
- Building notification via horn and strobe lights.
- Duct detection and fan shutdown
- Elevator initiation, monitoring, and control
- Automatic smoke detection throughout all corridors and spaces open to corridors
- Smoke detection at fire alarm panels
- Exterior water flow horn/strobe

Design strobes visible from all locations except private offices. Provide duct detectors and fan shutdown where required by NFPA and the IMC, including detection of smoke at all return air shafts servicing multiple floors. Provide smoke detectors in elevator lobbies, shafts, and in machine rooms. Provide heat detectors in machine rooms. Coordinate location of the building fire alarm control panel and annunciator panel with the fire marshal. Provide automatic smoke detectors throughout all corridors and spaces open to corridors as required by Owner.

The approved manufacturer shall be coordinated during design and the system shall be furnished and installed by a UL-listed, factory-approved distributor and installer. Data cabling shall be provided at the panel for connection to building network for informational reporting to selected computer terminals.

TELECOMMUNICATION

General

The voice and data system shall consist of four main categories: 1) Data Center 2) Pathways and Spaces to support the voice and data system, 3) The structured cabling system, and 4) Communications Tower.

The existing Data Center will need to be coordinated during design on if the current location will work with the remodel or if it will need to be relocated. The existing Equipment Rooms and Telecommunication Rooms need to also be looked at. These rooms should be separated from the electrical rooms. In many cases these appear to be the same in multiple rooms on many levels. These rooms will most likely need to be relocated in the remodel and an all new telecommunication system including racks, cable trays, pathways, cabling and outlets should be provided.

DATA CENTER

The data center needs have not been identified but should include 20-50 server cabinets and 2 post racks at 4 – 7 kW per cabinet. These cabinets should be considered to have some existing and some new. Not all may be needed at once, so a modular approach to design should be considered. The level of redundancy should meet Tier 4 standards which requires a fault tolerant design. A fault tolerant data center has redundant, isolated systems that provide enough capacity in power and cooling to operate the environment after any data center infrastructure failure and all IT equipment provided dual power. Below are specific recommendations for the electrical systems serving the data center:
Redundant UPS systems: This will consist of two systems in "A+B" redundant configuration, together with all associated upstream and downstream feeders. Upstream, would connect to generators, switchboards and panel gear. Downstream would be all new up to and including the branch panelboards in the data center.
New data center electrical distribution: Initial 150 kVA PDU's with branch circuit wiring to 20-50 racks: two 30A feeders to each rack, one from "A" system, and one from "B" system.
Possibly a starline busway system.
Power for new air conditioning.
New LED lighting.
New fire alarm system and possibly consisting of an air sampling "VESDA" system.
New security system.
Raceways and cable trays for IT cabling.
New IT cabling for racks.

PATHWAYS AND SPACES

There may be one or two main communication rooms, Equipment Room "ER" or MDF. This room shall house the main computer and phone equipment that serves the building. The room shall be located as close to the center of the building as possible. The MDF should be sized to serve the entire building, and will interconnect with all IDF's in the building. The MDF should be sized to hold four racks (15' x 10' at a minimum). A minimum of three walls in the ER/MDF will be covered with ¾" x 4' x 8' sheets of BCX fire rated plywood. All plywood should be painted with a fire-retardant coating that is white.

The building is anticipated to have at least two Telecommunication Rooms "TR" or IDFs on each level to serve the building, to support the horizontal cable length to a telecommunications outlet to ensure no cable exceeds 295 ft. This is the total length of cable from patch panel in the TR to the work area outlet at the work station. The TR/IDF should be sized to hold two racks (10' x 12'). All walls of the TR/IDF will be covered with plywood. ¾" x 4' x 8' sheets of BCX, fire rated plywood. All plywood should be painted with a fire-retardant coating that is white.

A standard network rack should have a planned space of 3' x 3' for proper spacing in the front and rear of the rack. The racks shall have 3' clearance in front and back of each rack as well.

Power should be provided in each MDF/IDF room. Each wall should have one 120V 20A quad outlet mounted at 84" in elevation. Each rack should have one 208V 30A circuits, and one 120V 20A circuit. One circuit should be on utility house power, and one circuit should be on either generator or UPS power, or both. Power outlets dedicated to feeding the racks should be mounted to the rear of the ladder rack raceway mounted above the racks.

A minimum of two (2) 2" conduits shall be run from the communication room on the top level to the roof of the building for roof mounted external wireless communications. All communication rooms shall be located in a stacked configuration and shall be interconnected with at least (4) 4" sleeves. There shall be no water (for example but not limited to restrooms, drinking fountains or janitor sinks) adjacent to or above any of the communications rooms. All communications rooms shall have access directly from a hallway without needing to go through a classroom or office to enter the room.

The cable tray in communication rooms shall be a minimum of 18" wide with a 4" loading depth.

Each telephone/data outlet shall utilize a 4" square by minimum 2-1/8" deep junction box with a single-gang plaster–ring. One 1” conduit with nylon pull rope shall be run from each junction box to the cable tray located in the accessible ceiling space.

In offices where it is anticipated that there could be two (2) workstations or varying locations for a single workstation, provide at least two (2) telephone/data outlets and more as may be required.

STRUCTURED CABLING SYSTEM

General

Backbone fiber and copper cabling shall be extended from new building network to the new building ER/MDF. Backbone will include both fiber and copper backbone cabling. The structured cabling system shall be designed to support high-speed voice/data/video and future high bandwidth applications including VOIP systems. The system should be a Category 6A solution.

The building network service entrance cable and backbone cable shall be fiber-optic. Horizontal cabling to each telephone/data outlet shall be unshielded twisted pair. All backbone cables shall be terminated in a wall-mounted fiber break out enclosure. All horizontal cabling shall be terminated in patch panels located in a 7’-0” high, 19” floor-standing rack. Each communication room shall be provided with floor-standing racks.

Each telephone/data outlet shall have at least two (2) Category 6A RJ-45 4-pair ports with a dedicated horizontal cable ran from the respective communication room on that particular level to each port.

Provide telephone outlets for elevator panels, building automation system, video surveillance cameras, wall phone and other required uses. Each telephone outlet shall have one Category 6A RJ-45 4-pair port with a dedicated horizontal Category 6A cable ran from the respective communication room on that particular level to each port.

Wireless

The user desires that the building and all immediate adjacent outdoor areas be provided with reliable wireless local area network coverage. Provide data outlets at owner designated location for wireless points to cover all interior areas, as well as to spill out into all immediate adjacent outdoor areas. Design wireless access point data outlet with two category 6A, RJ-45 data jack mounted in a 4" square by minimum 2-1/8" deep junction box with a cover plate. The wireless AP coverage and locations shall be determined by the Owner and provided to the design team for documentation and bidding purposes.

COMMUNICATIONS TOWER

Microwave communications equipment must be mounted 120 ft to 195 ft above ground level with clear line-of-sight to Traverse Ridge and Ensign Peak with no path obstructions. The microwave equipment can be mounted on a self-supporting ground mounted communications tower or on a communications tower built on the top of a building, provided the building is specifically designed to accommodate the load of the tower and microwave equipment.

SECURITY

Security Systems - General

During the site walk of the building it was not readily known where all security panels are located. The system should be demolished and locate all security panels in electrical or IT rooms as well as tying into the new security rooms throughout the building. The CCTV system appears to be aging and should be upgraded throughout the building.

All security systems will comply with any established standards and capable of being integrated into a new standard for security systems. Systems will annunciate alarm conditions to security rooms and be completely monitored.

The security system may include panic alarm/lock down function or other similar features for the operation centers and front desk area. The details for the operation of this system will be coordinated with the Owner during design.

Security System devices, cabling, control panels, monitors, terminations, etc. shall be furnished, installed, and connected by Contractor.

The project will include multiple security levels throughout the building, Tier 1, Tier 2, and Tier 3. Tier 1 Security (T1S) level is for facilities that require visitors to check in at the security desk and receive temporary badges to gain access. Tier 2 Security (T2S) level is for facilities that require a RMP employee badge to gain access. Tier 3 Security (T3S) level is for facilities that require an RMP employee badge with special designations to gain access.

Card Access

A complete access control system shall be provided and be compatible with the existing system to salvage any of the existing system that makes sense during design. This will be coordinated with the Owner as design proceeds. The new access control system needs to utilize the existing cards and integrate into the existing system as needed.

The access control system includes control entry to all perimeter entry / exit points and interior spaces to the T2S and T3S spaces, operation centers and other defined spaces as discussed further by the design team. Card readers will be the proximity type, and will comply with any established standards. Card readers will report to a central door controller. Coordinate door hardware to minimize the aesthetic impact to the appearance of the building. Request-to-exit motion detectors will be installed on the secure side of each access-controlled door. Magnetic locks and/or electric strikes will be utilized to secure access-controlled door.

Intrusion Detection

An Intrusion Detection system is currently anticipated for the project. The Intrusion Detection system shall be designed in compliance with RMP security standards. Door position indication shall be provided for all exterior doors, regardless of function (entry/ exit/ exit only/ utility/ etc.) and any interior doors that require separate arm/disarm control as well as Tier 2 and Tier 3 spaces. Motion Detection may also be required in the higher tier spaces and should be coordinated during design.

CCTV Security Systems

A complete video surveillance system shall be provided and be compatible with the existing IP based CCTV system. New cameras shall be provided for all locations.

The CCTV system includes control for visual monitoring of building perimeter, all building entry / exit points, at select main building thoroughfares, elevator lobbies, and at select sensitive interior areas. Additionally, in the T2S and T3S, there will be surveillance located in select locations. These systems may also include intercom and audio recording systems tied to the CCTV system. High megapixel cameras will monitor exterior areas including the building perimeter. Fixed megapixel and/or multi-sensor cameras will monitor designated locations inside the building. Cameras will be installed in appropriately rated enclosures. Signals from cameras will be connected to a central switching / multiplexing system with minimum 21” video monitors for viewing. All camera images will be digitally recorded by NVR’s that are local area network accessible. Additionally, cameras will be capable of being monitored and controlled at

a remote location via the LAN. Provide NVR with 50% spare channels, cameras shall be fixed 1080p HD IP cameras, but shall be finalized with Owner during design. Locations shall be coordinated with Owner and finalized during design as well.

Raceways for Other Low-Voltage Systems

Provide empty raceways for all other low-voltage systems in the building, which will include audio/visual, security, and MATV/CATV. Coordinate with the Owner and/or systems designers.

AUDIO AND VIDEO SYSTEMS

General

Audio and video systems will be specified for installation as part of the building construction work, to be completed with all building trades. Audio and video systems will be specified for full compliance with the industry standards. All video system displays will be planned for low energy consumption utilizing LED and other emerging technologies. Displays will be RoHS compliant, will have built-in eco-power consumption modes, and will be created with no consumables.

All audio and video systems shall be coordinated with the Owner during design for final instruction and systems. All A/V systems are assumed to be new for the remodel. All existing A/V systems will be demolished as part of the demolition for the building.

Operation Centers

The operation centers will be equipped with an audio system for voice reinforcement where required and media source reinforcement. Speaker systems will be designed to provide even sound pressure level throughout the entire seating area with $\pm$ 2 dB at 2 KHz, and a frequency response of at least150 Hz to 15 KHz $\pm$ 2 dB, and a maximum of 12% articulation loss of consonants.

The operation centers will be provided with a technology enabled lectern where required. Several media source devices will be provided and housed at the lectern. These devices will include, but not be limited to inputs for portable computers. Audio originating from these source devices will be selected, processed, and amplified to the speaker system. Video input connections will also be provided at each staff location, in the councils with inputs as required per council.

A video system will be provided for large screen or multi display of presentations. A single large screen front projection system or a multiple display wall will be specified. The projection screen will be sized using industry standard formulas appropriate for the nearest and furthest viewer, and located in close coordination with seating layouts to assure appropriate viewing sight lines.

The projection systems and display systems will be specified in a 16:9 format, with a minimum native resolution of 1080p. As with image sizing, industry standard formulas will be used to calculate the required light output for each projector to assure that images will not be “washed out” by ambient room lighting. Projection systems will be supplemented with multiple smaller flat panel monitors for off center viewing. Basic source devices including a digital television tuner will also be provided as needed.

The operation centers will be equipped with an integrated control panel for control of all audio and video system components, lighting systems, and motorized window coverings (if applicable). To meet this need, a touch screen control panel will be provided. The touch screen control panel will be programmed in full compliance with the end user’s desired button layout, configuration, and labeling. In addition, macros (multiple events) will occur when a button on the touch panel is engaged. Touch screens will be provided at locations coordinated with the Owner.

Multi-Purpose Room

For multi-purpose use, two electric roll-up, tensioned cabled, 16:9 video projection screens will be provided for the display of media content. The projection screens will be sized using AV industry-wide accepted standards for the nearest and furthest viewers. Carefully coordinate the projection screen location with seating layouts to assure appropriate viewing sight lines. Specify a projector with a minimum native resolution of 1920 X 1080 in a 16:9 format. As with screen sizing, apply AV industry-wide accepted standards in calculating the required light output for each projector to assure that images will not be "washed out" by ambient room lighting.

For smaller multi-purpose rooms, a single large or multiple smaller TV monitor displays may take the place of the projector where it makes the most sense and coordinated with the Owner.

An audio system will be provided for reinforcement of media source devices. Speaker systems will be designed to provide even sound pressure level throughout the entire seating area. A multi-channel infrared transmission system will also be provided for private listening to selected media sources.

Control of the video routing system, video control processor, and audio system will be achieved using an integrated control system. User interface will occur using PC based control screens accessible from networked computers, resident touch panels and personal wireless devices

Video conferencing will also be provided in select multi-purpose rooms as required by the Owner.

Conference Rooms

Conference rooms will be equipped with an audio system for media audio reproduction only. Capability for voice reinforcement will not be provided. Speaker systems will be designed to provide even sound pressure level throughout the entire seating area with $\pm$ 2 dB at 2 KHz, and a frequency response of at least150 Hz to 15 KHz $\pm$ 2 dB, and a maximum of 12% articulation loss of consonants.

A video system will be provided for large screen display of presentations. A single large flat panel monitor will be specified for each room, with the size of each monitor depending upon room size. Monitors will be sized using industry standard formulas appropriate for the nearest and furthest viewers.

Display systems will be specified in a 16:9 format, with a minimum native resolution of 1080p. Conference room tables will be equipped with HDMI video inputs, along with their associated audio signals. This connectivity will be provided in "hidden" connection panels with integrated patch cords. Flat panel displays will include digital television tuners as needed.

Conference rooms will be equipped with an integrated control panel for control of all audio and video system components, lighting systems, and motorized window coverings (if applicable). To meet this need, a touch screen control panel will be provided. The touch screen control panel will be programmed in full compliance with the end user's desired button layout, configuration, and labeling. In addition, macros (multiple events) will occur when a button on the touch panel is engaged.

Video conferencing will also be provided in select conference rooms as required by the Owner.

Offices

Select offices will be equipped with an audio system for media audio reproduction only. Capability for voice reinforcement will not be provided. Speaker systems will consist of speakers mounted on the wall below the large flat panel display.

A video system will be provided for large screen display of presentations. A single large flat panel monitor will be specified for each room, with the size of each monitor depending upon room size. Monitors will be sized using industry standard formulas appropriate for the nearest and furthest viewers.

Display systems will be specified in a 16:9 format, with a minimum native resolution of 1080p. Offices will be equipped with HDMI video inputs at outlet height in owner-specified locations. Flat panel displays will include digital television tuners as needed.

Open office areas and customer service areas will be provided with sound masking to minimize cross talk.

Other AV Spaces

Coordinate other AV spaces during design with the Owner such as digital signage, white noise, fitness center, etc.

TV Distribution System

Confirm with the Owner for an RF TV distribution system may be provided by the owner for distribution of audio and video signals throughout the building.

EXHIBIT 1: Existing Photos

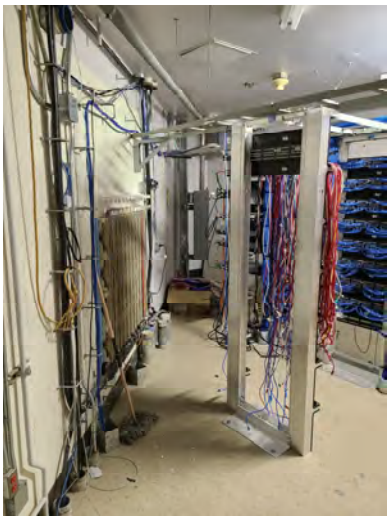
Existing Building Service Transformers

Existing Main 480/277V 3,000 A Switchboard

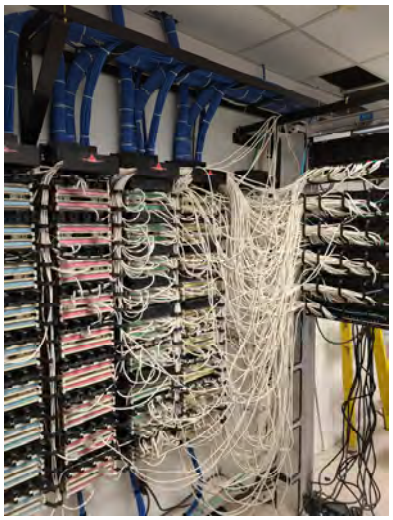
Existing age of Panelboards in Building

Existing 208/120V Main Switchboard located in basement

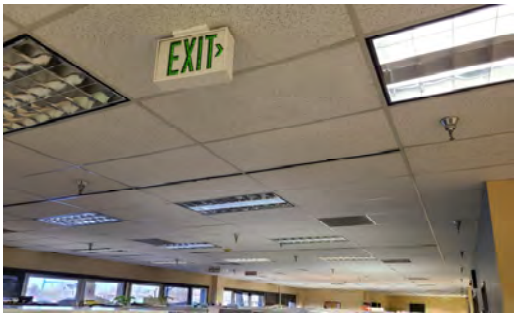
Existing TR Rooms

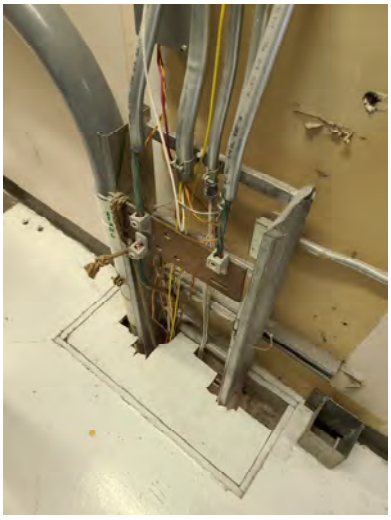


Existing Lighting to be Demolished



Existing Ground Bus in Electrical Room





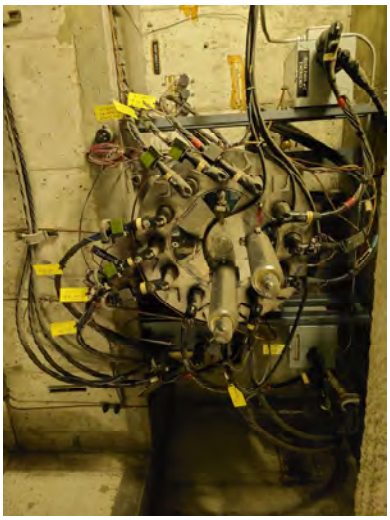
Existing LED Lighting to possibly

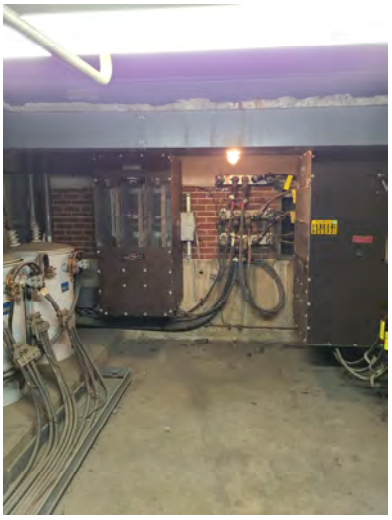
Be reused in Open Office

Existing Fire Alarm Control Panels and Battery Panels

Existing MCCs and VFDs

Existing MV Equipment

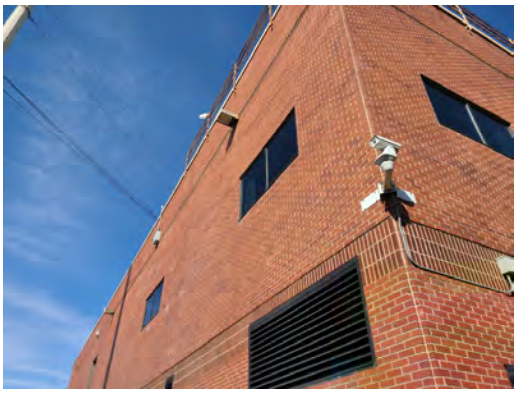




Existing Diesel Generators

Existing UPS System

Existing exterior lighting and CCTV



ELECTRICAL SYSTEMS

CODES, STANDARDS, AND REFERENCE MATERIALS

Codes which are directly applicable to design of the electrical systems are listed below:

ADA, Americans with Disabilities Act
IECC, International Energy Conservation Code
ASHRAE 90.1, Standard for Energy Conservation in New Building Design
EIA/TIA, Electronics Industries Association/Telecommunications Industry Association
BICSI, Building Industry Consulting Services International
International Building Code (IBC)
IESNA, Illuminating Engineering Society of North America
NFPA, National Fire Protection Association (applicable sections including but not limited to):
- NFPA 70, National Electrical Code 2017
- NFPA 72, National Fire Alarm Code
- NFPA 101, Life Safety Code

UL, Underwriter's Laboratories
State of Utah Fire Marshal Laws, Rules and Regulations

DEFINITIONS AND ABBREVIATIONS

A = Amps or Amperage

IT = Information Technology

kW = Kilowatts

kVA = Kilovolt-Amps

MV = Medium Voltage

NEC = National Electrical Code

NIC = Not in Contract

RMP = Rocky Mountain Power

T1S = Tier 1 Security

T2S = Tier 2 Security

T3S = Tier 3 Security

V = Volts

Electrical Systems Responsibility Summary

System Responsibility Matrix				
	Designed By	Furnished By	Installed By	Notes
Power & Lighting				
Medium Voltage Transformer(s)	Owner	Owner	Owner	
Medium Voltage Raceways & Cabling	Owner	Owner	Owner	Raceways by Contractor
Emergency/Standby Generator	Owner	Owner	Owner	
Emergency Generator Equipment	Design Team	Contractor	Contractor	ATS, Cabling, Conduit, Etc.
Centralized UPS System	Design Team	Contractor	Contractor	
Electrical Sub-Metering	Design Team	Contractor	Contractor	
Photovaltaic (PV) Power Generation System	NIC	NIC	NIC	
Battery Energy Storage System	NIC	NIC	NIC	
Electric Vehicle Charging Stations	Design Team	Contractor	Contractor	
Lightning Protection System	Design Team	Contractor	Contractor	
Interior Lighting	Design Team	Contractor	Contractor	
Exterior Lighting	Design Team	Contractor	Contractor	
Telecomm				
Raceways, Conduit/Cable Tray	Design Team	Contractor	Contractor	Boxes, Raceways, Cabletray, Site, ect.
Site Carrier Fiber/Copper	Design Team	Contractor	Contractor	
Fiber Termination Shelves (FPP1, FPP2)	Design Team	Contractor	Contractor	
Copper Building Backbone Cabling	Design Team	Contractor	Contractor	
Riser Patch Panels (RPP1)	Design Team	Contractor	Contractor	
Cat 6A Horizontal Cable	Design Team	Contractor	Contractor	
Patch Panels/Inserts SPP, WPP	Design Team	Contractor	Contractor	
Horizontal Wire Manager (1RU, 2RU)	Design Team	Contractor	Contractor	
Vertical Wire Manager	Design Team	Contractor	Contractor	
Data ports, Faceplates, Boxes	Design Team	Contractor	Contractor	
Cat 6A Patch Cords	Design Team	Contractor	Contractor	
Building MDF/IDF Racks	Design Team	Contractor	Contractor	
Building MDF/IDF Ladder Rack	Design Team	Contractor	Contractor	
Active Network Electronics	Owner	Owner	Owner	
Rack PDUs	Design Team	Contractor	Contractor	
Elevator 2 way comm	Design Team	Contractor	Contractor	
Emergency Responder DAS Testing	Design Team	Contractor	Contractor	Performance Spec
Emergency Responder DAS System	NIC	Contractor	Contractor	Confirm with Owner Group
Cell Phone Booster System and/or DAS	NIC	Contractor	Contractor	Confirm with Owner Group
Antenna Systems	TBD	Contractor	Contractor	Confirm with Owner Group
Microwave/Radio Communication System	TBD	Contractor	Contractor	Confirm with Owner Group
Security, Fire & Misc.				
Raceways	Design Team	Contractor	Contractor	
Fire Alarm	Design Team	Contractor	Contractor	
CCTV Security Cameras	Design Team	Contractor	Contractor	
CCTV Headend, Programming, Licensing	TBD	TBD	TBD	Confirm with Owner Group
Access Controls & Intrusion Detection	Design Team	Contractor	Contractor	
Emergency Lockdown System	TBD	Contractor	Contractor	
Mass Notification System	NIC	NIC	NIC	
Wireless Clock System	NIC	NIC	NIC	
A/V				
Raceways	Design Team	Contractor	Contractor	
Audio Systems	Design Team	Contractor	Contractor	
Video Systems	Design Team	Contractor	Contractor	
Digital Signage	Design Team	Contractor	Contractor	
Flat Panel Monitors / Projectors	Design Team	Contractor	Contractor	
Flat Panel Monitor Mounts	Design Team	Contractor	Contractor	
Projector Mounts	Design Team	Contractor	Contractor	
Projector Screens	Design Team	Contractor	Contractor	
TV Distribution System	Design Team	Contractor	Contractor	
Intercom / Paging System	Design Team	Contractor	Contractor	
Ops Center AV System	Design Team	Contractor	Contractor	

SITE ELECTRICAL

Rocky Mountain Power (RMP) owns the medium voltage (MV) distribution system that runs throughout the site. The project will be served by the RMP medium voltage distribution system. The contractor shall provide the required precast concrete transformer pad/vault, all required primary and secondary conduit, along with the CT/Metering section and main service disconnect. Rocky Mountain Power will provide the transformer, meter, primary cabling and secondary cabling. Due to the anticipated larger power demand and equipment for the building a 480Y/277 Volt service will be provided. There will be project costs from RMP for their portion of the work that will need to be included and covered by the project outside of the electrical Contractor's costs.

The project should coordinate to provide a new electrical utility yard for the service equipment, centrally located on the exterior of the building to support the building and distribution. The building load is currently estimated to be between 3,000-3,500 kVA. This will depend greatly on the final programming, layout and loads of the building and will need to be confirmed during design. The project could use dual services set up to help with the load of the building. The operating Voltage will be 12,470V, 3-phase on the primary and 480/277V on the secondary of one service and 12,470V, 3-phase on the primary and 208/120V on the secondary of the other service.

Telecommunications Utilities

Telecommunication services will be provided through the RMP building. Connectivity will most likely be served through new air blown single mode fiber. Building will have SM fiber to the building demarc then pulled back to the nearest utility network node. The site fiber will be routed in raceways and shall have a minimum of four (4) 4" raceways to the nearest telecom vault. The fiber for the final site telecommunications design shall be coordinated with the Owner during design.

BUILDING SERVICE AND DISTRIBUTION

Main Service

The main electrical room shall be constructed to house the 480/277V, 3-phase, 4-wire main distribution switchboard. This room will be a minimum of 10' x 15' and have two forms of egress with panic hardware. This room should be located as close as possible to the pad-mounted medium voltage transformers to reduce the length of feeder conduit and conductors. Service voltage will be 480Y/277V, 3-phase, 4-wire serving primarily mechanical, motor, and building lighting loads with 208Y/120V stepdown transformers used for 208Y/120V, 3-phase, 4-wire distribution that will serve server, computer, equipment, plug loads and other small equipment.

The main 480/277V distribution switchboard is anticipated to have a rating of approximately 4,000 Amps, this shall be verified and adjusted as necessary during design (this could be reduced with dual services if desired). It shall have a main circuit breaker and shall be free-standing and equipped with both utility and Owner metering.

Panelboards

Distribution panelboards shall be provided in the main electrical room and branch electrical rooms on each level and centrally located on each end of each level as much as possible, while taking into account other building and architectural considerations, so that the conductor distance from any panelboard to the most remote outlet is not greater than 150 feet. Each branch electrical room should handle the distribution panelboards for each level. Panelboards should be surface mounted, ease and accessibility of running new and future conduits out of each room is an important consideration in defining the location of the rooms. If inaccessible ceilings surround the room, (5) spare 3/4" conduits from each panelboard shall be stubbed to accessible ceiling areas and tagged as spare. These rooms shall be dedicated to electrical distribution and shall not be used for storage or any other purposes. The main branch electrical rooms for each level shall be sized at 12' x 10' and branch electrical rooms at 8' x 10' at a minimum but may be larger due to the size of each level. Dedicate an area of each room for current and future riser conduits so

that wall-mounted equipment will not impede vertical distribution. Electrical rooms shall have a minimum of 25% additional space for future growth.

All 208/120V power and appliance branch circuit panelboards shall have 100% neutral busses with no isolated ground busses, unless required for the specific application. Computer and electronic loaded panelboards may be equipped with 200% neutral bus panelboards.

Main distribution switchboard, power distribution panels, and branch panelboards shall have copper bussing, 25% excess capacity and 25% spaces/spares for future growth and flexibility.

Distribution equipment such as distribution panels and panelboards shall be located as near as practicable to the loads served. For labs or shop type spaces the electrical distribution equipment may be located within or adjacent to the primary space served.

Metering

Owner main building digital power metering will be included along with select sub-metering as coordinated with the Owner. Metering for the building may include enhanced sub-metering or load demand response controls meeting LEED requirements and shall be coordinated during design. A building wide metering data collection system may also be integrated and should be coordinated during design.

Motor Control

Provide variable frequency drives with harmonic filtering where required for mechanical equipment in compliance with DFCM requirements and sized at least 10% over the connected motor load. VFD's shall be specified with a 5-year warranty. Minimum total harmonic current distortion when measured at the input terminals of the VFD will be not greater than 15%. The design electrical engineer may evaluate the variety of harmonic filtering and mitigation techniques and choose the best method to achieve this performance. A VFD scheme shall be provided with at least a 50% level of redundancy for the HVAC cooling system. This can be done with multiple drives, redundant drives, or bypass on the VFD as determined most economical and practical for the selected mechanical system.

Branch Circuits

Branch circuits will be loaded to no more than 80% of what is allowed by NFPA 70. Where outlets are intended for a specific piece of equipment, the load of the outlet will be based on the equipment nameplate. Allow no more than 6 convenience outlets per circuit in instructional lab spaces and for computer workstations, and 8 convenience outlets per circuit for general purpose use. Sufficient capacity for plug-in task lights and other peripherals typical of desk items will be provided. Outlets with dedicated branch circuits (one outlet on a circuit) are provided for vending machines, copy machines, break room counters, refrigerators, dishwashers, A/V cabinets and other locations likely to have equipment requiring dedicated circuits. Each branch circuit homerun will have no more than 3 circuits per raceway. Dedicated neutrals for each phase conductor will be provided.

Conductors

All conductors will be copper. Conductors for branch circuits will be sized to prevent voltage drop exceeding 3% at the farthest load. The total voltage drop on both feeders and branch circuits will not exceed 5%. For measurement purposes, a load of 180 VA (1.5A) per outlet, with a 50% diversify factor per NEC should be assumed.

Raceways

All wiring will be in raceways, minimum ¾" conduit for power and 1" minimum for telecom. Type MC cable should be reviewed where can be used for the project if allowed by Owner. New cable tray shall be

provided throughout the corridors for distribution of low voltage network cabling such that raceways do not extend more than 50' (approx.) to the cable tray. Conduits for telecommunications shall stub to cable tray located in accessible ceiling space. Structured IT cabling will then be run in cable tray to the telecom rooms. Include pull strings in all empty conduits. Include raceway for all security, audio/visual and technology systems as defined in the project building requirements whether furnished as part of the construction contract or furnished by the Owner.

Equipment and Furniture

Refer to the program equipment summary and space plan sheets for equipment requiring electrical rough-in and connections and coordinate during design. All equipment and furniture identified in the program documents, whether it is furnished in this contract or a separate contract, shall be provided with power and raceway rough-in for complete operation.

Fault Current, Coordination, and Arc Flash Study

A fault current, coordination and arc flash study shall be performed by a licensed electrical engineer to indicate available fault current and arc flash at all points in the building distribution systems. New equipment shall be adequately rated for the amount of available fault current. System coordination shall be studied, and fuses or breakers selected to ensure minimum system outage due to overloads or fault currents. Per the 2017 NEC, emergency systems will be selectively coordinated to the extent possible. Breakers with adjustable long time, short time, instantaneous and / or ground fault settings shall be set at levels for optimum system coordination. In addition, an arc flash study shall be provided; electrical equipment shall be provided with labeling per all NEC/NFPA requirements.

Surge Protective Devices

To provide protection against damage to sensitive electronic equipment, due to surges, provide a new surge protective device (SPD) at the main distribution switchboards and at branch circuit panelboards serving sensitive electronic equipment. SPD units will be integral to the panelboard or switchboard.

Provide surge protection for all emergency distribution panelboards as required by NEC.

Outlets

Outlets will be 20A, minimum. The program and space data sheets will be used as a guideline, but user input should be welcomed during the design. Unless noted otherwise, the following will be used as a general guideline where more specific requirements are not elsewhere identified. Each outlet location will be coordinated with the design team and end user during design. Where the term "outlet" is used, this refers to a 20A duplex receptacle outlet (unless otherwise noted).

Offices/Small Rooms: For each workstation, provide one quad outlet dedicated to computer terminals and one additional outlet for every 10' of wall space or one on each wall.

Open Office Areas: For each workstation, provide one quad outlet dedicated to computer terminals where located on walls. Provided systems furniture and/or floorboxes for workstations located in the center of rooms away from walls.

Global Security Operations Center (GSOC): For each workstation, provide a minimum of one quad outlet dedicated to computer terminals, but possibly 2 or 3 quads for multiple monitors, terminal and general purpose. Provide an outlet for each monitor or projector on walls or ceilings and AV equipment rack locations. Provide outlets above counters, including power and A/V for staff tables and at the podium. Provide floorboxes or poke-thrus throughout to allow for power and data in the multipurpose layout. Provide emergency power outlets as required.

Utah Power Credit Union (UPCU): Provide power and data for offices, reception/teller desk and other areas. Provide a minimum of 2 general convenience outlets per wall. Provide an outlet for each monitor or

projector on walls or ceilings and AV equipment rack locations. Provide floorboxes or poke-thrus for power, data, and A/V in the conference rooms. Additional outlets shall be provided for specific equipment.

Customer Care Center (CCC): Outlets sufficient for programmed equipment, plus outlets along work benches or tables – no greater than 2' on center (unless otherwise identified in the space plan sheets). Ensure that there is at least one outlet for each 10' of wall space. Provide floor outlets for stations or equipment for specific operations. Where tables are fixed in place, coordinate power outlets mounted directly into the millwork. Provide furniture feeds for power furniture or desks as required. Provide emergency power outlets as required.

IT Data Center (ITDC): Provide a minimum of 2 general convenience quad outlets per wall on emergency power. Provide quads and 208V power at data cabinets as required. Provide starline busway (or equal) system for racks and cabinets as required. Additional outlets shall be provided for specific equipment.

Electric Grid Operations (EGO): Provide a minimum of 2 general convenience outlets per wall. Provide an outlet for each monitor or projector on walls or ceilings and AV equipment rack locations. Provide floorboxes or poke-thrus throughout to allow for power, data, and A/V in the multipurpose layout. Additional outlets shall be provided for specific equipment. Provide emergency power outlets as required.

Multi-Purpose Rooms: Provide a minimum of 2 general convenience outlets per wall. Provide an outlet for each monitor or projector on walls or ceilings and AV equipment rack locations. Provide floorboxes or poke-thrus throughout to allow for power, data, and A/V in the multipurpose layout and banquet layouts. Additional outlets shall be provided for specific equipment.

Conference and Meeting Rooms: Provide outlets on walls as required by NEC. Provide combination power/communication/AV floor outlets underneath conference room tables for each 215SF of space. Where tables are fixed in place, coordinate power outlets mounted directly into the millwork.

Lounges / Breakrooms / Kitchenettes: GFI Outlets on dedicated circuits every 4' on counter top plus dedicated outlets for refrigerator, microwave, and disposal (switched at counter top), plus one outlet for every 10' of other wall space in room.

Fitness Center: Outlets sufficient for programmed equipment. Ensure that there is at least one outlet for each 6' of wall space.

Telephone / Data Closets: Provide one 208 Volt outlet near each telecommunications rack on emergency power for a UPS – coordinate amperage requirements with Owner. Provide one 120 Volt quad outlet on emergency power at each rack, plus one quad outlet on emergency power on each wall.

Copy/Mail Rooms: One outlet on every wall plus additional dedicated outlets for printers. Provide above counter outlets.

Mechanical/Electrical Rooms: At least one outlet on emergency power.

Restrooms / Shower Rooms: One GFI outlet near each lavatory counter top.

Corridors, Lobbies: Provide at least one outlet every 25', on alternating sides of the corridor or lobby. Where seating areas are provided, provide at least two outlets per seating area.

Stairs: One outlet at the landing of each level.

Storage Rooms (small), Janitors Closets: One outlet.

Building Exterior: One WP/GFI receptacle near each building entrance/exit.

Other Areas: Refer to individual space plan data sheets, and where not defined coordinate requirements with user during design.

Grounding

Provide a grounding riser system throughout the electrical and telecommunication rooms consisting of a grounding bus mounted on the wall in each room near the switchboards and telecommunications racks and two grounding conductors (one extending to the main ground bus in the main electrical room and the other extended to building steel). Grounding conductors shall be installed with all feeder and branch circuits.

Specialty grounding systems may exist for Owner provided building systems such as antennas, radio systems, etc. These grounding systems shall be performed as part of the building contract by the contractor

Lightning Protection

A lightning protection system is recommended by NFPA 780 for the remodeled building and should be verified during design. Provide a lightning protection system for the building with UL master label.

Electric Vehicle (EV) Charging Stations:

The project will include EV charging stations for no less than 50 spaces for Level 2 fast chargers and 100 spaces for Level 1 charging. In addition, another 100 spaces shall be roughed-in for future Level 2 charging stations. These will be part of the LEED points and shall meet LEED requirements. The charger type, quantities, and locations should be coordinated by the design team with the Owner needs.

Uninterruptible Power System (UPS)

A centralized UPS system will be included with the new building. The UPS system is anticipated to be sized to run all Data Center, PDU's, Telecom Rooms and Critical Operation Center loads. More clarification on the UPS system needs to be made during design, however is anticipated to be at least 1000 kVA+.

Emergency & Standby Generator System and Distribution:

New generators will be required for the project to house the emergency and standby electrical equipment. This room shall be sized at 50' x 40' at a minimum, but needs to be verified with the actual sizes of the new generators and could be much larger. The generators are estimated to be around 800kW each, actual size shall be determined during design once the exact generator loads have been determined. The current plan is to have four (4) generators for the building, to feed 2-4 UPS systems, similar to RMP existing building setup. RMP will provide and install the generators. The contractor will be responsible for all support equipment and cabling. This will need to be verified by the design team. The generators will be indoors and will require fume exhausting. An underground day tank system will need to be provided for the system. If not, the removal of the underground tanks may be required for the project and new in ground tanks and piping installed for the new generators. Fuel supply is anticipated to be minimum 72 hours at full load but should be determined during design. Provide at least two transfer switches and possibly three: one for data center, one for emergency/life safety and possibly one for non-emergency (standby) loads. Annunciate alarms adjacent to fire alarm panel. The following shall be provided with each transfer switch with possible changes or additions during design:

- Emergency
  - Emergency egress and exit lighting
  - Fire Alarm
- Standby
  - Electrical room - outlets
  - Communications rooms - outlets and air conditioning
  - Critical equipment

Building loads (if legally required standby is not required)
Security Systems
Data Center

LIGHTING

General

The basis for design shall be the IES and its Recommended Practices for offices, operation centers, multi-purpose rooms, conference rooms, and other applicable spaces, Utah State Health Department Requirements or Codes where applicable, i.e., restrooms. For exterior lighting and critical interior spaces, a point-by-point plot of illuminance establishing conformance with the Recommended Practices shall be furnished. Utilize LED fixtures to meet the illumination requirements while maintaining high efficiency and requiring minimal maintenance. Provide task lighting where practical to reduce the overall energy consumption to support net-zero application.

IECC requirements shall be met and exceeded to meet the overall project requirement with goals for lighting power density to be minimum 10-20% less than required. Energy savings design techniques such as daylighting control, occupancy sensors, centralized and de-centralized control systems, energy efficient lamps/ballasts shall be used where practical to maximize energy efficiency.

Fixtures should be 4000K color temperature with a minimum CRI of 80. In areas where color rendition is important, fixtures with CRI of 90 or above and color temperature of 5000K shall be utilized. Dimming drivers shall be included with all LED fixtures and shall be compatible with daylighting and dimming controls.

Interior Lighting and Controls

Lighting intensity and uniformity should provide shadow-free and glare-free illumination of work surfaces. Lighting intensity control using dimmers or multi-level switching should be incorporated where computer or other electronic equipment monitors are used.

Pendant indirect or direct / indirect fixtures are ideally suited for the environments that will be encountered and should be used where ceiling heights will allow for suspension of 12-60 inches or more below the finished ceiling or where budget allows. If pendant fixtures are used in rooms with ceiling projectors, carefully coordinate the pendant fixtures with the projected image to eliminate any conflicts such as the Operation Centers or the Multi-Purpose Rooms. In areas with projectors or flat panel displays, provide a separate zone of lighting control near the projector input location for ease of controlling lighting during presentations.

For spaces where glare control is not required, LED lay-in fixtures may be used. Recessed LED downlights and/or decorative LED fixtures shall be used in areas where aesthetics call for an upgraded appearance, such as in the new building lobby, multi-purpose, and operations centers.

For spaces where wall or floor displays will be shown, accent or wall wash lighting shall be designed where practical like the main lobby.

All interior lighting shall be controlled by some automatic means. This shall include vacancy sensors for regularly occupied spaces and smaller enclosed areas to shut down lighting when areas are not occupied. Lighting in common areas such as corridors and lobbies should be controlled by a programmable networked lighting relay control system with the capability of timed control, sensor inputs and building automation system integration and provided with local wall override switches. Large areas should be designed for multiple zones and light level control with occupancy sensors to allow energy reduction when the maximum light output is not needed. Uniformity must be maintained when in reduced lighting modes.

Provide automatic day light harvesting controls in areas where natural illumination is available as defined by daylight zones within the energy code. Photoelectric sensors should be used to shut down or dim the artificial lighting when it is not needed. In offices where day lighting control is used, utilize continuous dimming to negate the noticeable effects of the on / off cycles of the artificial illumination. Certain areas with security requirements may be exempt from code required dimming, such as the Operation Centers.

As required by the room use, provide variable lighting levels by continuous dimming. In rooms with audio / visual (AV) equipment, provide variable and zoned lighting control, from front to back, to allow for flexibility in lighting scenes for the various room functions. Where central AV control systems are used, provide lighting control / dimming systems with an RS232 AV interface to allow the lights to be controlled from and integrated into the AV system. All offices and instructional spaces shall be provided with manual dimming controls.

Exit and emergency lighting shall comply with the IBC. Emergency lighting for means of egress to 1 fc average, 0.3 fc minimum, shall be provided. Emergency lighting shall also be included in restrooms, electrical rooms, and communication rooms.

The state of Utah has adopted IECC for the state energy code, but IECC has a compliance path allowing the use of ASHRA 90.1, so either energy is acceptable to the state. The lighting load for the facility should target a lighting power density of 0.65-0.70 Watts/SF, this would result in a lighting design between ~10-20% better than baseline. It is anticipated that the increased building energy performance option will be for reduced lighting power densities. The lighting power density baseline values are shown below.

- IECC 2018: 0.79 W/SF (Office)
- IECC 2018, reduced based on table 406.3: 0.71 W/SF (Office)

Task Illuminance

Lighting levels shall be in accordance with the Recommended Illuminance Categories and Illuminance Values for Lighting Design, IES Lighting Handbook. Total lighting load for the facility should not exceed the calculated lighting power budget, minus 10%, as determined by IECC. The lighting levels listed below in footcandles should be used for design purposes. The values listed are average maintained illuminance levels using a maintenance factor of 75%. The numbers listed are target values and should be adjusted to meet the special requirements of individual areas.
The following table summarizes lighting levels and control methods for important spaces (some of the regularly occupied spaces may be changed during design depending on LEED requirements. For instance, all offices and open offices may be changed to a t-grid mounted indirect fixture rather than a lay-in fixture to help with the Interior Lighting credit).

Function / Space	Fixture Type	Controls Type
Electric Grid Operations (20ft ceiling)	Linear pendants with mostly indirect lighting	Dimming, vacancy, multi-zone, multi-scene
Global Security Operations Center (20ft ceiling)	Recessed or pendant linear w/ direct/ indirect lighting	Dimming, vacancy, multi-zone, multi-scene
North Temple Service Center	Recessed Linear or 2x4 lay-in type	Dimming, vacancy, multi-zone, multi-scene
Offices / Small rooms	Lay-in grid/troffer fixtures	Dimming, vacancy
Open Office Spaces	Lay-in grid/troffer fixtures	Dimming, vacancy, multi-zone
Conference / Meeting Spaces	Pendant with Recessed Downlight Perimeter	Dimming, vacancy, multi-zone, multi-scene
Multi-Purpose Spaces	Varies – lay-in type, upgraded linear recessed or pendants, downlights	Dimming, vacancy, multi-zone, multi-scene
Salt Lake City Service Center	Recessed Linear or 2x4 lay-in type	Dimming, vacancy
Utah Power Credit Union	Recessed Linear or 2x4 lay-in type w/ Upgraded lobby lighting	Dimming, vacancy

IT Data Center	Strip lighting or Lay-in fixtures	On/Off Toggle
Corridors	Troffer Lighting	Time Control, Override
Lobby/Reception	Linear recessed or pendants w/ downlights, upgraded look	Time Control, Override
Lounges / Breakrooms	Troffer or Recessed Downlights	On/Off, vacancy
Fitness Center	Troffer Lighting	Dimming, vacancy
General Storage	Strip lighting	On/Off, vacancy
Mechanical / Electrical Rooms	Strip lighting	On/Off Toggle
IT Rooms	Strip lighting	On/Off Toggle
Restrooms	Recessed linear and downlight	Occupancy

Function / Space	**Illuminance (Avg. Footcandles)**
Customer Care Centers	30-50 (ambient) 50-75 (task)
Operation Centers	40-50 (ambient) 50-75 (task)
Multi-Purpose Room	30-50
Offices / Small rooms	30 (ambient) 50 (task)
Open Office Spaces	30 (ambient) 50 (task)
Conference / Meeting Spaces	30-50
Corridors / stairwells	15-20
Lobby/Reception	20
Lounges / Breakrooms	20-30
General Storage	15-30
Mechanical / Electrical Rooms	30
IT Rooms	30
Restrooms	30

EXTERIOR LIGHTING

Design Criteria

The exterior lighting fixtures shall be selected to harmonize with the architectural style of the building. In general, all outdoor lighting shall have full cut-off optics as defined by the IESNA. Dark sky compliance should be verified with the Owner per IDA. Wall mounted decorative fixtures may be used to draw attention to main entry or circulation areas, but for the most part should be kept to a minimum for energy purposes. Wall mounted fixtures at other locations should be non-decorative with cutoff optics that are designed for the intended use. Fixtures for parking surface areas should consider pole lighting while walkways could be a bollard or pole style light. LED sources should be selected for use in all exterior fixtures to minimize the maintenance. All exterior light fixtures should be robust and suitable for the harsh exterior environment. Preference should be given to fixtures that have design features such as hinging reflectors and removable ballast trays that reduce the cost of lamp replacement and fixture repairs.

Illuminance

Lighting levels should be in accordance with the Recommended Illuminance Categories and Illuminance Values for Lighting Design, IES Lighting Handbook. Total lighting load for the facility should not exceed the calculated lighting power budget as determined by IECC. The lighting levels listed below in footcandles should be used for design purposes. The values listed are average maintained illuminance levels using a maintenance factor of 75%.

Function	**Illuminance (Avg. Footcandles)**
Parking	0.5-2
Walkways	1
Building Perimeter – Egress/entrance	5

Emergency Illuminance

Select standard building lighting as may be required to achieve the illuminance criteria set forth in the NFPA Life Safety Code, IBC, and local codes. Designate these fixtures as egress lighting fixtures. Where lamp sources of building lighting are not instant on, provide arc keeper devices or battery/inverter units to prevent lamp source from extinguishing until emergency power can be supplied. Provide dedicated branch circuiting from the emergency power branch. Emergency lighting shall be provided on all paths of egress including but not necessarily limited to corridors, large open office or instructional spaces, operation centers, restrooms, mechanical rooms, electrical rooms, and communication rooms. Egress pathways shall be provided with minimum lighting levels of 1 footcandle. Depending on building generator option chosen, the entire building may be provided on emergency backup.

Provide illuminated exit signs in locations as required by the NFPA Life Safety Code, IBC, and local codes. Exit sign shall be cast aluminum LED type. Provide dedicated branch circuiting from the emergency power branch.

LEED

Every effort shall be made where economically feasible to incorporate sustainable design into the electrical systems. The LEED design shall be based on LEED version 4.1. With regard to LEED, below is a summary of electrical related credits and which are currently being pursued:

- LT Green Vehicles - This credit is currently being pursued. Conduit shall be installed for electric vehicle charging stations. This credit requires electric vehicle charging stations for 2% of the parking spaces in addition to meeting the other requirements for this credit.
- SS Light Pollution Reduction - This credit may be pursued if possible depending on property boundaries.
- EA Minimum Energy Performance – The lighting design will target 20% reduction in lighting energy use to aid in this credit.
- EA Building Level Energy Metering – This prerequisite will be met.
- EA Advanced Energy Metering - This credit will not be pursued.
- EA Demand Response – This credit is not planning on being pursued, however needs to be confirmed with the Owner.
- EA Renewable Energy Production – This credit will not be pursued.
- EA Green Power – This credit may be purchased at the discretion of the Owner.
- IEQ Interior Lighting – The interior lighting will include lighting controls meeting option 1 and option 2 of this credit will be dependent on indirect lighting in spaces and/or Architectural choices.
- IEQ Daylight – This credit may be pursued depending on building layout.

FIRE ALARM SYSTEM

Fire Alarm and Life Safety

Fire alarm system shall be designed to comply with State of Utah Fire Marshal's “Rules and Regulations".

Based on current intended building use and defined spaces, the building is expected to be a B Occupancy Type with Assembly spaces. This would require the following minimum system features:

- Addressable fire alarm system with control panel and remote supervision
- Remote annunciator(s)
- Pull stations
- Monitoring of the fire sprinkler system
- Building notification via horn and strobe lights.
- Duct detection and fan shutdown
- Elevator initiation, monitoring, and control
- Automatic smoke detection throughout all corridors and spaces open to corridors
- Smoke detection at fire alarm panels
- Exterior water flow horn/strobe

Design strobes visible from all locations except private offices. Provide duct detectors and fan shutdown where required by NFPA and the IMC, including detection of smoke at all return air shafts servicing multiple floors. Provide smoke detectors in elevator lobbies, shafts, and in machine rooms. Provide heat detectors in machine rooms. Coordinate location of the building fire alarm control panel and annunciator panel with the fire marshal. Provide automatic smoke detectors throughout all corridors and spaces open to corridors as required by Owner.

The approved manufacturer shall be coordinated during design and the system shall be furnished and installed by a UL-listed, factory-approved distributor and installer. Data cabling shall be provided at the panel for connection to building network for informational reporting to selected computer terminals.

TELECOMMUNICATION

General

The voice and data system shall consist of four main categories: 1) Data Center 2) Pathways and Spaces to support the voice and data system, 3) The structured cabling system, and 4) Communications Tower.

DATA CENTER

The data center needs have not been identified but should include 20-50 server cabinets and 2-post racks at 4 – 7 kW per cabinet. Not all may be needed at once, so a modular approach to design should be considered. The level of redundancy should meet Tier 4 standards which requires a fault tolerant design. A fault tolerant data center has redundant, isolated systems that provide enough capacity in power and cooling to operate the environment after any data center infrastructure failure and all IT equipment provided dual power. Below are specific recommendations for the electrical systems serving the data center:
Redundant UPS systems: This will consist of two systems in “A+B” redundant configuration, together with all associated upstream and downstream feeders. Upstream, would connect to generators, switchboards and panel gear. Downstream would be all new up to and including the branch panelboards in the data center.
New data center electrical distribution: Initial 150 kVA PDU’s with branch circuit wiring to 20-50 cabinets and racks:
two 30A feeders to each rack, one from “A” system, and one from “B” system.
Possibly a starline busway system.
Power for new air conditioning.
New LED lighting.
New fire alarm system and possibly consisting of an air sampling “VESDA” system.
New security system.
Raceways and cable trays for IT cabling.
New IT cabling for racks.

PATHWAYS AND SPACES

There may be one or two main communication rooms, Equipment Room “ER” or MDF. This room shall house the main computer and phone equipment that serves the building. The room shall be located as close to the center of the building as possible. The MDF should be sized to serve the entire building, and will interconnect with all IDF’s in the building. The MDF should be sized to hold four racks (15’ x 10’ at a minimum). A minimum of three walls in the ER/MDF will be covered with ¾” x 4’ x 8’ sheets of BCX fire rated plywood. All plywood should be painted with a fire-retardant coating that is white.

The building is anticipated to have at least two Telecommunication Rooms “TR” or IDFs on each level to serve the building, to support the horizontal cable length to a telecommunications outlet to ensure no cable exceeds 295 ft. This is the total length of cable from patch panel in the TR to the work area outlet at the work station. The TR/IDF should be sized to hold two racks (10’ x 12’). All walls of the TR/IDF will be

covered with plywood. ¾" x 4' x 8' sheets of BCX, fire rated plywood. All plywood should be painted with a fire-retardant coating that is white.

A standard network rack should have a planned space of 3' x 3' for proper spacing in the front and rear of the rack. The racks shall have 3' clearance in front and back of each rack as well.

Power should be provided in each MDF/IDF room. Each wall should have one 120V 20A quad outlet mounted at 84" in elevation. Each rack should have one 208V 30A circuits, and one 120V 20A circuit. One circuit should be on utility house power, and one circuit should be on either generator or UPS power, or both. Power outlets dedicated to feeding the racks should be mounted to the rear of the ladder rack raceway mounted above the racks.

A minimum of two (2) 2" conduits shall be run from the communication room on the top level to the roof of the building for roof mounted external wireless communications. All communication rooms shall be located in a stacked configuration and shall be interconnected with at least (4) 4" sleeves. There shall be no water (for example but not limited to restrooms, drinking fountains or janitor sinks) adjacent to or above any of the communications rooms. All communications rooms shall have access directly from a hallway without needing to go through a classroom or office to enter the room.

The cable tray in communication rooms shall be a minimum of 18" wide with a 4" loading depth.

Each telephone/data outlet shall utilize a 4" square by minimum 2-1/8" deep junction box with a single-gang plaster–ring. One 1" conduit with nylon pull rope shall be run from each junction box to the cable tray located in the accessible ceiling space.

In offices where it is anticipated that there could be two (2) workstations or varying locations for a single workstation, provide at least two (2) telephone/data outlets and more as may be required.

STRUCTURED CABLING SYSTEM

General

Backbone fiber and copper cabling shall be extended from new building network to the new building ER/MDF. Backbone will include both fiber and copper backbone cabling. The structured cabling system shall be designed to support high-speed voice/data/video and future high bandwidth applications including VOIP systems. The system should be a Category 6A solution.

The building network service entrance cable and backbone cable shall be fiber-optic. Horizontal cabling to each telephone/data outlet shall be unshielded twisted pair. All backbone cables shall be terminated in a wall-mounted fiber break out enclosure. All horizontal cabling shall be terminated in patch panels located in a 7'-0" high, 19" floor-standing rack. Each communication room shall be provided with floor-standing racks.

Each telephone/data outlet shall have at least two (2) Category 6A RJ-45 4-pair ports with a dedicated horizontal cable ran from the respective communication room on that particular level to each port.

Provide telephone outlets for elevator panels, building automation system, video surveillance cameras, wall phone and other required uses. Each telephone outlet shall have one Category 6A RJ-45 4-pair port with a dedicated horizontal Category 6A cable ran from the respective communication room on that particular level to each port.

Wireless

The user desires that the building and all immediate adjacent outdoor areas be provided with reliable wireless local area network coverage. Provide data outlets at owner designated location for wireless points to cover all interior areas, as well as to spill out into all immediate adjacent outdoor areas. Design wireless access point data outlet with two category 6A, RJ-45 data jack mounted in a 4" square by minimum 2-1/8" deep junction box with a cover plate. The wireless AP coverage and locations shall be determined by the Owner and provided to the design team for documentation and bidding purposes.

COMMUNICATIONS TOWER

Microwave communications equipment must be mounted 120 ft to 195 ft above ground level with clear line-of-sight to Traverse Ridge and Ensign Peak with no path obstructions. The microwave equipment can be mounted on a self-supporting ground mounted communications tower or on a communications tower built on the top of a building, provided the building is specifically designed to accommodate the load of the tower and microwave equipment.

SECURITY

Security Systems - General

All security systems will comply with any established standards and capable of being integrated into a new standard for security systems. Systems will annunciate alarm conditions to security rooms and be completely monitored.

The security system may include panic alarm/lock down function or other similar features for the operation centers and front desk area. The details for the operation of this system will be coordinated with the Owner during design.

Security System devices, cabling, control panels, monitors, terminations, etc. shall be furnished, installed, and connected by Contractor.

The project will include multiple security levels throughout the building, Tier 1, Tier 2, and Tier 3. Tier 1 Security (T1S) level is for facilities that require visitors to check in at the security desk and receive temporary badges to gain access. Tier 2 Security (T2S) level is for facilities that require a RMP employee badge to gain access. Tier 3 Security (T3S) level is for facilities that require an RMP employee badge with special designations to gain access.

Card Access

A complete access control system shall be provided and be compatible with the existing RMP system. This will be coordinated with the Owner as design proceeds. The new access control system needs to utilize the existing cards and integrate into the existing system as needed.

The access control system includes control entry to all perimeter entry / exit points and interior spaces to the T2S and T3S spaces, operation centers and other defined spaces as discussed further by the design team. Card readers will be the proximity type, and will comply with any established standards. Card readers will report to a central door controller. Coordinate door hardware to minimize the aesthetic impact to the appearance of the building. Request-to-exit motion detectors will be installed on the secure side of each access-controlled door. Magnetic locks and/or electric strikes will be utilized to secure access-controlled door.

Intrusion Detection

An Intrusion Detection system is currently anticipated for the project. The Intrusion Detection system shall be designed in compliance with RMP security standards. Door position indication shall be provided for all exterior doors, regardless of function (entry/ exit/ exit only/ utility/ etc.) and any interior doors that require separate arm/disarm control as well as Tier 2 and Tier 3 spaces. Motion Detection may also be required in the higher tier spaces and should be coordinated during design.

CCTV Security Systems

A complete video surveillance system shall be provided and be compatible with the existing IP based CCTV system. New cameras shall be provided for all locations.

The CCTV system includes control for visual monitoring of building perimeter, all building entry / exit points, at select main building thoroughfares, elevator lobbies, and at select sensitive interior areas. Additionally, in the T2S and T3S, there will be surveillance located in select locations. These systems may also include intercom and audio recording systems tied to the CCTV system. High megapixel cameras will monitor exterior areas including the building perimeter. Fixed megapixel and/or multi-sensor cameras will monitor designated locations inside the building. Cameras will be installed in appropriately rated enclosures. Signals from cameras will be connected to a central switching / multiplexing system with minimum 21” video monitors for viewing. All camera images will be digitally recorded by NVR’s that are local area network accessible. Additionally, cameras will be capable of being monitored and controlled at a remote location via the LAN. Provide NVR with 50% spare channels, cameras shall be fixed 1080p HD IP cameras, but shall be finalized with Owner during design. Locations shall be coordinated with Owner and finalized during design as well.

Raceways for Other Low-Voltage Systems

Provide empty raceways for all other low-voltage systems in the building, which will include audio/visual, security, and MATV/CATV. Coordinate with the Owner and/or systems designers.

AUDIO AND VIDEO SYSTEMS

General

Audio and video systems will be specified for installation as part of the building construction work, to be completed with all building trades. Audio and video systems will be specified for full compliance with the industry standards. All video system displays will be planned for low energy consumption utilizing LED and other emerging technologies. Displays will be RoHS compliant, will have built-in eco-power consumption modes, and will be created with no consumables.

All audio and video systems shall be coordinated with the Owner during design for final instruction and systems.

Operation Centers

The operation centers will be equipped with an audio system for voice reinforcement where required and media source reinforcement. Speaker systems will be designed to provide even sound pressure level throughout the entire seating area with $\pm$ 2 dB at 2 KHz, and a frequency response of at least150 Hz to 15 KHz $\pm$ 2 dB, and a maximum of 12% articulation loss of consonants.

The operation centers will be provided with a technology enabled lectern where required. Several media source devices will be provided and housed at the lectern. These devices will include, but not be limited to inputs for portable computers. Audio originating from these source devices will be selected, processed, and amplified to the speaker system. Video input connections will also be provided at each staff location, in the councils with inputs as required per council.

A video system will be provided for large screen or multi display of presentations. A single large screen front projection system or a multiple display wall will be specified. The projection screen will be sized using industry standard formulas appropriate for the nearest and furthest viewer, and located in close coordination with seating layouts to assure appropriate viewing sight lines.

The projection systems and display systems will be specified in a 16:9 format, with a minimum native resolution of 1080p. As with image sizing, industry standard formulas will be used to calculate the required light output for each projector to assure that images will not be “washed out” by ambient room lighting. Projection systems will be supplemented with multiple smaller flat panel monitors for off center viewing. Basic source devices including a digital television tuner will also be provided as needed.

The operation centers will be equipped with an integrated control panel for control of all audio and video system components, lighting systems, and motorized window coverings (if applicable). To meet this need, a touch screen control panel will be provided. The touch screen control panel will be programmed in full compliance with the end user’s desired button layout, configuration, and labeling. In addition, macros (multiple events) will occur when a button on the touch panel is engaged. Touch screens will be provided at locations coordinated with the Owner.

Multi-Purpose Room

For multi-purpose use, two electric roll-up, tensioned cabled, 16:9 video projection screens will be provided for the display of media content. The projection screens will be sized using AV industry-wide accepted standards for the nearest and furthest viewers. Carefully coordinate the projection screen location with seating layouts to assure appropriate viewing sight lines. Specify a projector with a minimum native resolution of 1920 X 1080 in a 16:9 format. As with screen sizing, apply AV industry-wide accepted standards in calculating the required light output for each projector to assure that images will not be “washed out” by ambient room lighting.

For smaller multi-purpose rooms, a single large or multiple smaller TV monitor displays may take the place of the projector where it makes the most sense and coordinated with the Owner.

An audio system will be provided for reinforcement of media source devices. Speaker systems will be designed to provide even sound pressure level throughout the entire seating area. A multi-channel infrared transmission system will also be provided for private listening to selected media sources.

Control of the video routing system, video control processor, and audio system will be achieved using an integrated control system. User interface will occur using PC based control screens accessible from networked computers, resident touch panels and personal wireless devices

Video conferencing will also be provided in select multi-purpose rooms as required by the Owner.

Conference Rooms

Conference rooms will be equipped with an audio system for media audio reproduction only. Capability for voice reinforcement will not be provided. Speaker systems will be designed to provide even sound pressure level throughout the entire seating area with $\pm$ 2 dB at 2 KHz, and a frequency response of at least150 Hz to 15 KHz $\pm$ 2 dB, and a maximum of 12% articulation loss of consonants.

A video system will be provided for large screen display of presentations. A single large flat panel monitor will be specified for each room, with the size of each monitor depending upon room size. Monitors will be sized using industry standard formulas appropriate for the nearest and furthest viewers.

Display systems will be specified in a 16:9 format, with a minimum native resolution of 1080p. Conference room tables will be equipped with HDMI video inputs, along with their associated audio signals. This connectivity will be provided in “hidden” connection panels with integrated patch cords. Flat panel displays will include digital television tuners as needed.

Conference rooms will be equipped with an integrated control panel for control of all audio and video system components, lighting systems, and motorized window coverings (if applicable). To meet this need, a touch screen control panel will be provided. The touch screen control panel will be programmed in full

compliance with the end user's desired button layout, configuration, and labeling. In addition, macros (multiple events) will occur when a button on the touch panel is engaged.

Video conferencing will also be provided in select conference rooms as required by the Owner.

Offices

Select offices will be equipped with an audio system for media audio reproduction only. Capability for voice reinforcement will not be provided. Speaker systems will consist of speakers mounted on the wall below the large flat panel display.

A video system will be provided for large screen display of presentations. A single large flat panel monitor will be specified for each room, with the size of each monitor depending upon room size. Monitors will be sized using industry standard formulas appropriate for the nearest and furthest viewers.

Display systems will be specified in a 16:9 format, with a minimum native resolution of 1080p. Offices will be equipped with HDMI video inputs at outlet height in owner-specified locations. Flat panel displays will include digital television tuners as needed.

Open office areas and customer service areas will be provided with sound masking to minimize cross talk.

Other AV Spaces

Coordinate other AV spaces during design with the Owner such as digital signage, white noise, fitness center, etc.

TV Distribution System

Confirm with the Owner for an RF TV distribution system may be provided by the owner for distribution of audio and video signals throughout the building.

Date: April 15, 2021
To: Rocky Mountain Power Company
From: B&D Engineering

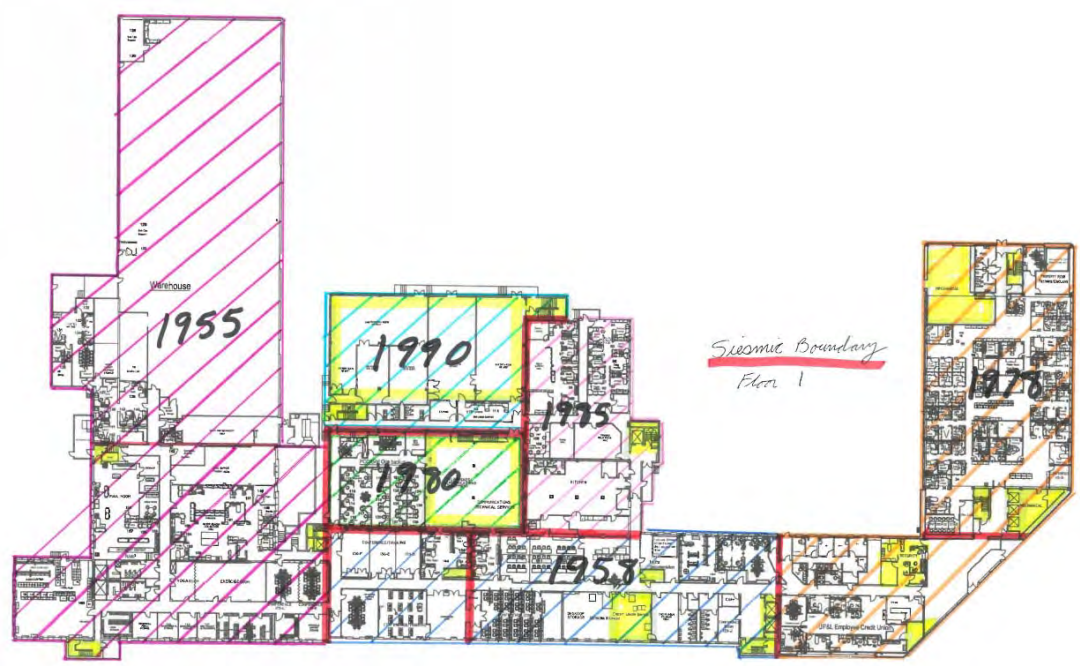
Re: Mechanical and Plumbing Observations and Recommendations at the Rocky Mountain Power Complex

Executive Summary

This report identifies current mechanical and plumbing systems present at the Rocky Mountain Power main campus at 1407 W North Temple, SLC, UT. The mechanical and plumbing items reviewed within this report are divided by discipline. The intent of the report is to provide the viewing party with general/broad overview of the types, condition, and ultimate life expectancy of the existing mechanical and plumbing systems. A brief synopsis of the related mechanical and plumbing system renovation cost associated with keeping the building shall be provided at the end of this report.

General Building Information

The total RMP complex is comprised of six (6) separate buildings phase together starting from 1949 to 1990 – see image below. The approx. total building(s) square footage of the main level is 84,000 – this square footage will be used later in the report for general revision costs. The building structure type has evolved over time, but reinforced concrete appears to be predominated building methodology.



General Existing Mechanical Systems Overview

The following types of existing mechanical equipment/systems are currently installed throughout the complex:

- Chilled Water Systems: Water Base Chillers and Cooling Towers (Condenser Water)
- Chilled Water Systems: Air-Cooled Chillers – No wet side condenser water system.
- Heating water system: Natural Gas Fired Boilers.
- Indoor Air Handlers (AHU's) – served by the chilled and heating water systems.
- Direct Expansion (DX) rooftop mounted HVAC units (RTU's) -Refrigerant Based Packaged Air Handling Systems.
- CRAC Units – Computer Room Air Conditioners
- Heating Water Fintube Baseboard Radiant Heaters – Primarily in the older buildings (1949, 1955, etc.)
- Ductwork Systems (Served by the AHU's):
    - Variable Air Volume (VAV) Zoned Systems - with and without reheat.
    - Multi-duct system (central duct distribution point)
    - Constant Volume – No Zoning – Served by the RTU's)
- HVAC Control Systems:
    - There is no central BMS control system to integrate all the HVAC systems across the campus. From observation, and review of available documentation the following control systems are present: individual zone controllers; pneumatic (air) controls, individual DDC system controls.

The condition and age of each of the above referenced systems ranges greatly – i.e., there are heating water systems that have been in place and operational since 1949. However, to understand what can honestly be expected regarding service life of the installed systems we need to create a control/reference point to evaluate the system under. To do so will use the 'ASHRAE Equipment Life Expectancy Chart' shown below: ******NOTE: evaluation of service life will be based solely on date of construction. B&D has not been provided with information for equipment that has been replaced. ******

ASHRAE Equipment Life Expectancy chart

ASHRAE is the industry organization that sets the standards and guidelines for most all HVAC-R equipment. For additional info about ASHRAE the website is www.ashrae.org .

Equipment Item	Median Years
Air conditioners	
Window unit	10
Residential single or Split Package	15
Commercial through-the wall	15
Water-cooled package	15
Heat Pumps	
Residential air-to-air	15
Commercial air-to-air	15
Commercial water-to-air	19
Roof-top air conditioners	
Single-zone	15
Multi-zone	15
Boilers, hot water (steam)	
Steel water-tube	24 (30)
Steel fire-tube	25 (25)
Cast iron	35 (30)
Electric	15
Burners	21
Furnaces	
Gas- or oil-fired	18
Unit heaters	
Gas or electric	13
Hot water or steam	20
Radiant Heaters	
Electric	10
Hot water or steam	25

Equipment Item	Median Years
Air terminals	
Diffusers, grilles, and registers	27
Induction and fan coil units	20
VAV and double-duct boxes	20
Air washers	17
Ductwork	30
Dampers	20
Fans	
Centrifugal	25
Axial	20
Propeller	15
Ventilating roof-mounted	20
Coils	
DX, water, or steam	20
Electric	15
Heat Exchangers	
Shell-and-tube	24
Reciprocating compressors	20
Packaged chillers	
Reciprocating	20
Centrifugal	23
Absorption	23
Cooling towers	
Galvanized metal	20
Wood	20
Ceramic	34

Equipment Item	Median Years
Air-cooled condensers	20
Evaporative condensers	20
Insulation	
Molded	20
Blanket	24
Pumps	
Base-mounted	20
Pipe-mounted	10
Sump and well	10
Condensate	15
Reciprocating engines	20
Steam turbines	30
Electric motors	18
Motor starters	17
Electric transformers	30
Controls	
Pneumatic	20
Electric	16
Electronic	15
Valve actuators	
Hydraulic	15
Pneumatic	20
Self-contained	10

Based upon the fact the last phase of construction occurred in 1990, there is not a single mechanical system present on the RMP campus that has any service life remaining based upon industry standard calculations. As stated above, this does not include any equipment replaced where the replacement date is unknown. Using the baseline of building construction dates and understanding the existing mechanical systems present are outside the expected service life, Rocky Mountain Power should expect that major mechanical systems failures will begin to occur, and a replacement plan should be developed and implemented as soon as possible if the buildings/campus are to be maintained/renovated.

General Overview and Cost of Replacing Existing Mechanical Systems

In general, the replacement of complete mechanical systems within an existing building comes at a premium. This premium is not just associated to cost of labor and equipment, but many other factors which are usually gone unnoticed. Some of these factors are as follow:

- What is the renovation history of the building(s). Has there been good record keeping/preservation of drawings.
    - Lack of renovation drawings for contractors to use as a reference will add cost to the project. The contractor will have to add time to their budget to verify system layout and approach prior to new work beginning.
    - Lack of renovation drawings also will increase the engineering cost for similar reasons. The engineering team will have to identify each system capacities against calculated loads prior to design. This can open unknown issues of system performance that were not budgeted.
- Workforce downtime: Critical nature of the space served and the disruption to workflow expected and/or to be tolerated.
- Changes in workspace conditioning comfort level during construction, and the adverse effects on workforce productivity.
- Long-term energy costs of conditioning a building with a poor envelope.
    - The new mechanical system designed to replace the existing will have to meet the load of the aged building. Without substantial changes to the windows, and overall building R-value, the energy consumption of the mechanical system will be fair greater in the existing building than in a new one.
- Based upon the size/value of the renovation, the 'Building Code' will require the entire building to be brought up to current code.
    - This item alone can have a massive impact on the renovation budget that was not accounted for in the beginning. A tremendous amount of work will need to occur to bring a 1949 building up to current mechanical code requirements.
- Unknown hazards uncovered during the renovation.
    - Given the age of the buildings there is a high likelihood that the discovery of banned building materials will be found. This will add additional cost to the project via schedule and resolution costs.
- Piping within the buildings will have issues.
    - Given the age of installation and the known properties of piping materials, corrosion and weakening of the piping systems has occurred regardless of the system type the piping serves. The risk associated with cutting into, and/or modifying the existing piping systems given the average age of the complex of buildings is very high.
    - There is also the fact that since the erection of these buildings laws have been passed that outlaws the use of lead-based materials in any potable water systems. If these components are present in an existing system, they will be required to be replaced.
- HVAC systems control upgrades and integration will be expensive.
    - To meet current energy code mandates the complex of buildings will be require a new fully integrated controls systems which allows for trending. This trending of data points is compiled to provide the end user a real time energy model.
    - The labor rate involved in wiring and programming the entire complex for a new DDC control system may be as much as 3 – 4 times the cost of providing the same service for a new building of the same size.
- Maintenance staff knowledge my limit the mechanical options for the building.

  - The cost of retraining the maintenance staff to operate the new systems/software is real consideration that must be quantified.
- The cost of providing seismic restraint on all the mechanical systems present in the building to meet current code will be high, and there is no true return on investment.

Again, the above list of considerations is condensed. A large-scale investigation into the viability of building renovations would be necessary to understand the true financial, energy, as well as the other ramifications.

For the purposes of this report, we will act as though the building renovations are the chosen route. Therefore, what would some of the expected costs be to renovate the mechanical systems for one level of the entire complex.

Expected Mechanical Systems Renovation Costs

For this example, we will use the 84,000-sf alluded to earlier in the report, as well as the known systems present to come up with a $/sf cost for each system type. To come up with costs we will use the following assumptions:

- Labor will be multiplied by 1.54 factor to account for renovation of existing buildings
  - This information was collected from 2020 RS Means.
  - This considers off-peak work hours and overtime.
- Cooling Systems will be based on $3,500/installed ton of cooling – equipment only.
  - Does not include materials and labor associated with piping installation.
  - Does not include required controls materials and labor
  - Estimated tonnage = 294 (One Level Only)
- Heating Systems will be based on $6.85/cfm of installed heating – equipment only.
  - Does not include materials and labor associated with piping installation.
  - Does not include required controls materials and labor
  - Estimated BTUH = 2,520,000 (One Level Only)
- Fans/Ducting/Coils/Dampers/Filters will be based on $15.65/cfm all systems.
  - Does not include materials and labor associated with piping installation.
  - Does not include required controls materials and labor
- Chilled/Condenser/Heating Water Piping will be based upon and average of $130/ft
  - Chilled water supply/return piping length 1,700 ft (1.5) = 2,550 ft
  - Condenser water supply/return piping length 900 ft (1.5) = 1,350 ft
  - Heating water supply/return piping length 2,800 ft (1.5) = 4,200 ft
- Controls will be based upon $1,650/point
  - Includes the device, labor, and programming
  - Approx. 15 – 20 points per chiller
  - Approx. 10 – 14 points per boiler
  - Approx. 10 – 14 points cooling tower
  - Approx. 15 – 20 points per AHU
  - Approx. 4 – 6 points per VAV Box/Fan Coil
- Control's wiring will be based upon $10.35/ft installed.
- Computer Room HVAC
  - Typical Server Rack Energy Consumption 7kW (~24,000 BTUH)
  - 2-tons of cooling per server rack

Expected Mechanical Systems Renovation Costs $ / SF:

SYSTEM TYPE	$ / SF or $ / ton
Chilled/Condenser Water (Equip, piping, labor)	24.75 $ / SF
Heating Water (Equip, piping, labor)	18.30 $ / SF
RTU Replacement (Equip and labor)	17.70 $ / SF
Fans/Ducting/Coils/Dampers/Filters	20.85 $ / SF
Controls (Equip, wiring, programming)	29.95 $ / SF
Computer Room HVAC (Includes ductwork)	2,750 $ / ton

The above cost per square foot is estimated costs based upon normal market activity. Actual renovation costs may be as much as 20 – 30% higher based upon market materials and labor fluctuation. The above cost estimates also do not consider high demand labor markets or the premium incurred.

With that noted, it is realistic to expect the total cost to complete a single level mechanical systems renovation in the current market to value somewhere near **$4,765,400.00 – Mechanical Systems Only.**

The above number does not include Data Room Renovation. For the purposes of this report, it is assumed that the minimum tonnage of the existing Data Room is 60 tons. Therefore, the associated cost of replacement would be **$165,000.00 – Data Room Only**.

NOTE: The cost per level cannot obtained by simply multiplying the building sf by the $/sf. A multitude of factors must be considered to determine the Mechanical System usable square footage. Also, the previously mentioned cost does not include any package RTU replacement as it was assumed only AHU's would be used during the renovation – and those cost are included.

The above cost also does not include any plumbing or fire suppression related renovation costs, which were not a part of this report.

Wet fire suppression systems typical have a 50-year life expectancy, or 25 drains and fills. Plumbing systems have a similar life expectancy. Industry standard ranges from 35 -45 years. Basically, the Fire suppression and plumbing systems also need to be replaced.

Expected Plumbing Systems Renovation Costs $ / SF:

With current labor and materials costs considered, and general $ / SF Plumbing Renovation Cost that can be applied would be **17.70 $ / SF**.

17.70 $ / SF x 84,000 SF = **$1,486,800.00 – Expected Single Level Renovation Cost**

Expected Fire Suppression Systems Renovation Costs $ / SF:

With current labor and materials costs considered, and general $ / SF Fire Suppression Renovation Cost that can be applied would be **11.00 $ / SF**.

11.00 $ / SF x 84,000 SF = **$924,000.00 – Expected Single Level Renovation Cost**

Conclusion

Total Expected Mechanical + Plumbing Systems Renovation Costs:
$4,765,400.00 + $165,000.00 + $1,486,800.00 = **$6,417,200.00 Per Level (@84,000 SF)**

Total Expected Fire Suppression System Renovation Costs (Wet System Only):
$924,000.00 Per Level (@84,000 SF)

This report was formulated under the assumption that all the existing mechanical, plumbing, and fire suppression systems in the RMP complex are antiquated and need replacement based upon industry recommendation. The reality is somewhere in the middle. If the Rocky Mountain complex of buildings are to be retained and renovated, there are many opportunities to execute the replacement of equipment/systems in a financially conservative manner. However, the fact remains the same – all the building's systems, including the Fire Suppression System, are past their life expectancy and will need replacement sooner than later.

Some Additional Thoughts New Construction vs. Renovation:

In preparing the renovation cost estimates for this report it was clear to see that the driving factor for the high cost of renovation were the labor costs. Material costs have also risen substantially over the past few years, but cost of materials will be relevant to new construction as well. The labor market shortage and the subsequent elevated labor costs multiplied by the premium on renovation labor costs have a much greater contribution to the overall renovation costs. Therefore, the argument that money could be saved by erecting a new building is valid. B&D's assessment is constructing a new building cut labor costs 40%+ over a renovation of the existing buildings.

Finally, there is the energy consumption aspect of renovation vs. new. With the advances in construction materials and methods over the last 50+ years, combined with current energy code requirements, it is easy to understand a new buildings energy consumption would be far less than the existing. Better building envelopes equals less load, which equals less and/or smaller capacity equipment, which equals less first cost, and most importantly equals less operating costs over the life of the systems.

SALT LAKE CITY, UTAH

ROCKY MOUNTAIN POWER
RMP HEADQUARTERS BUILDING

EXISTING BUILDING RENOVATION

Feasibility Study Construction Cost Estimate
April 22, 2021

SECTION		UNIT	UNIT COST	COST
SITE IMPROVEMENTS				
Site Improvements				Not Included
HEADQUARTERS (HQ)				
Building Entrance	3,500	SF	485.00	$1,698,000
Visitor Rooms & Training Facilities (VRTF)	6,000	SF	365.00	$2,190,000
Corporate Office Space (COS)	127,570	SF	285.00	$36,357,000
Customer Care Center (CCC)	22,000	SF	335.00	$7,370,000
Global Security Operations Center (GSOC)	4,000	SF	625.00	$2,500,000
Information Technology Data Center (ITDC)	25,000	SF	675.00	$16,875,000
Electric Grid Operations (EGO)	15,000	SF	675.00	$10,125,000
Warehouse	30,790	SF	25.00	$770,000
	233,860	**SF**	**333.00**	**$77,885,000**
TOTAL (Construction)	**233,860**	**SF**	**333.00**	**$77,885,000**

NOTES: Costs are for Construction Only.
Contractor Mark-ups are Included in Unit Costs.
Costs are Based on a Traditional Open Competitive Bid Basis.
Costs are Current and do Not Include Inflation.
For Inflation, Add 4.0% Per Year Compounded.

SALT LAKE CITY, UTAH

ROCKY MOUNTAIN POWER
RMP HEADQUARTERS BUILDING

NEW BUILDING

Feasibility Study Construction Cost Estimate
April 22, 2021

SECTION		UNIT	UNIT COST	COST
SITE IMPROVEMENTS				
Site Improvements				Not Included
HEADQUARTERS (HQ)				
Building Entrance	2,000	SF	500.00	$1,000,000
Visitor Rooms & Training Facilities (VRTF)	10,000	SF	375.00	$3,750,000
Corporate Office Space (COS)	69,848	SF	315.00	$22,002,000
Customer Care Center (CCC)	15,152	SF	350.00	$5,303,000
Global Security Operations Center (GSOC)	2,500	SF	650.00	$1,625,000
Utah Power Credit Union (UPCU)	1,500	SF	425.00	$638,000
Information Technology Data Center (ITDC)	25,000	SF	725.00	$18,125,000
Electric Grid Operations (EGO)	24,000	SF	725.00	$17,400,000
	150,000	**SF**	**466.00**	**$69,843,000**
TOTAL (Construction)	**150,000**	**SF**	**466.00**	**$69,843,000**

NOTES: Costs are for Construction Only.
Contractor Mark-ups are Included in Unit Costs.
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Costs are Current and do Not Include Inflation.
For Inflation, Add 4.0% Per Year Compounded.