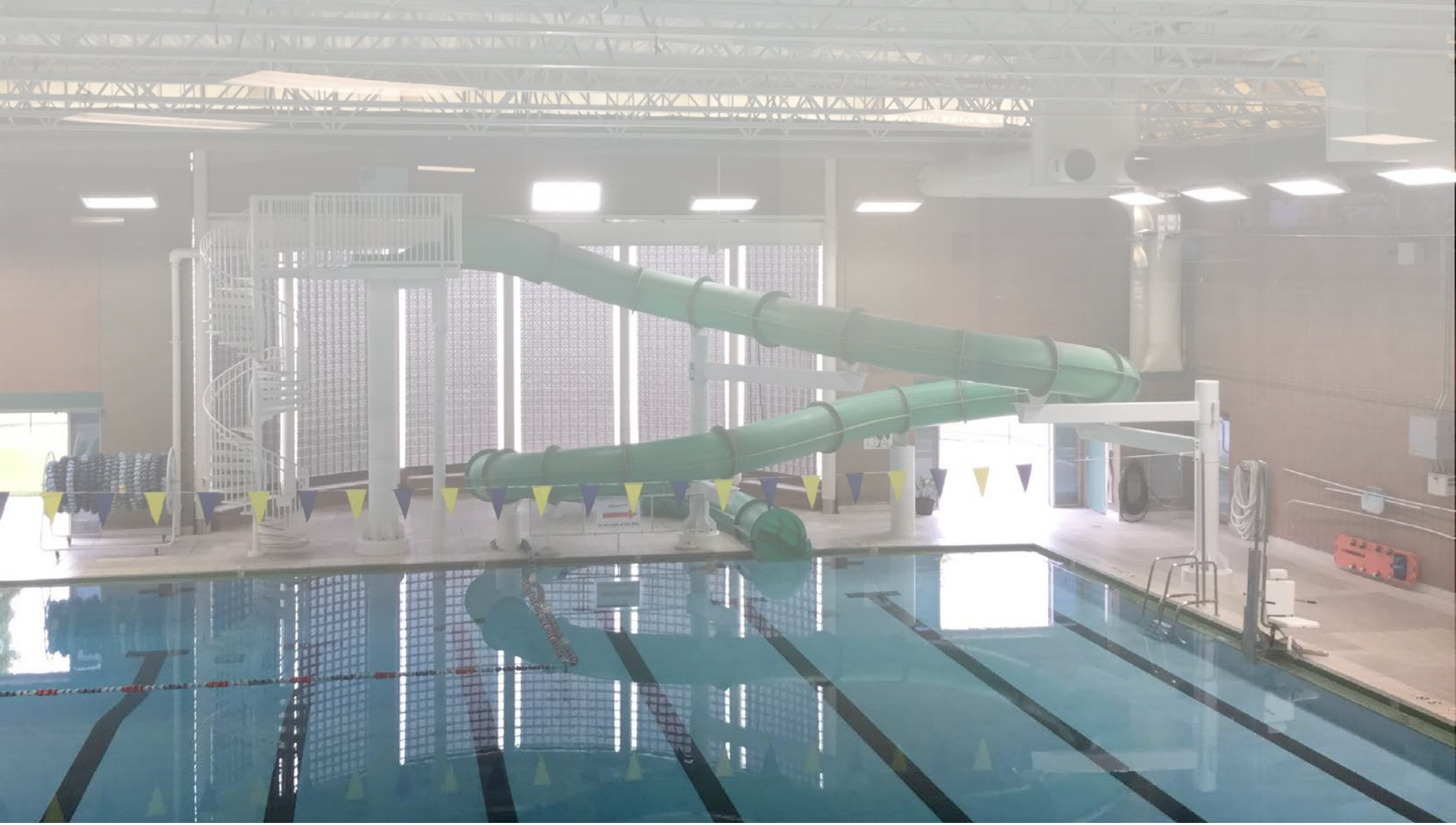

Farnsworth GROUP

November 11, 2016

Commerce City Recreation Center Facility Condition Assessment and Energy Use Analysis

Commerce City, Colorado

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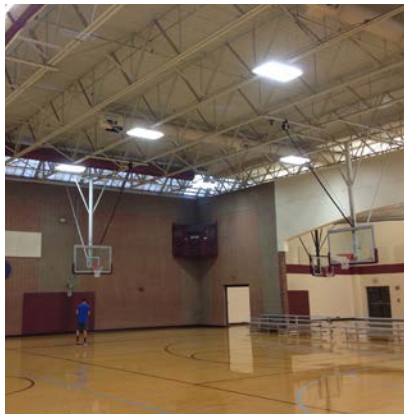


SCOPE OF EFFORT

Commerce City has contracted with Farnsworth Group, Inc. to provide a facility condition assessment focused on MEP systems and an energy analysis for the Recreation Center located at 6060 Parkway Drive. This document and it's appendices is intended to provide the following project objectives:

Roof Condition Assessment

- Provides replacement recommendation and cost opinion

Mechanical, Electrical, Plumbing (MEP) Equipment Condition Assessment

- Provides equipment condition, install date, expected service life, replacement cost opinion, and recommendations for service and improvements
- Provides brief discussion on system expandability
- Provides replacement recommendations

Energy Audit/ Assessment

- Includes analysis of utility use and compares performance against other similar facilities
- Provides recommendations where we see Opportunities available for Energy Conservation

EXECUTIVE SUMMARY

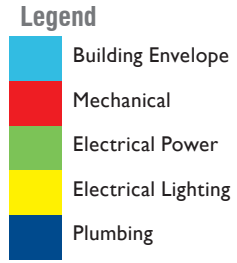
Facility Condition Assessment

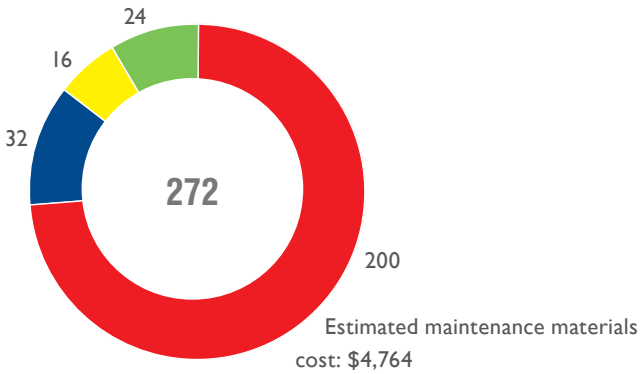
Overall the facility appears to be in good shape and well maintained though many systems and equipment are beyond their expected service life. A planned capital improvements process for systems and equipment replacement will help keep the facility in good working condition.

List of Acronyms
AHU - Air Handling Unit
BTU - British Thermal Unit (kBTU=1000 BTU)
CUH - Cabinet Unit Heaters
DDC - Direct Digital Control
DHW - Domestic Hot water
DX - Direct Expansion (Air Conditioner)
EA - Exhaust Air
ECI - Energy Cost Index ($/ft2/Yr)
ECM - Energy Conservation Measures
ECO - Energy Conservation Opportunities
ESCO - Energy Services -Co
EDC - Electric Duct heater
EF - Exhaust Fan
EPDM - Ethylene Propylene Diene Monomer
EUI - Energy Utilization Index (kBTU/ft2/yr)
HRU - Heat Recovery Unit
MDP - Motor Distribution Panel
MEP - Mechanical, Electrical, and Plumbing
MMBTU - Million British Thermal Units
OA - Outside Air
RTU - Rooftop Unit
SPD - Surge Protective Device
TVSS - Transient Voltage Surge Suppressor
VVT - Variable Volume Temperature
WH - Water Heater

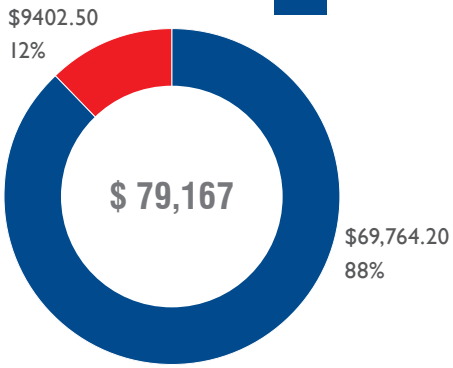
Overall Condition: Good

Condition based on 103 observed systems and equipment.

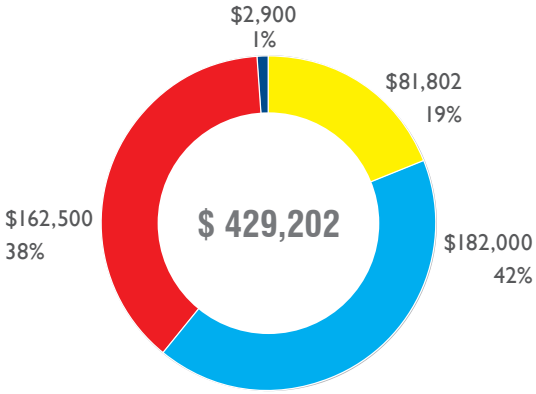




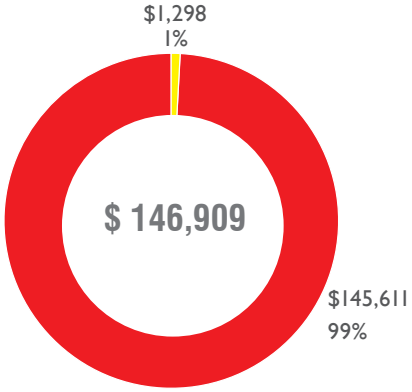
Required Maintenance Hours



Recommended Repair



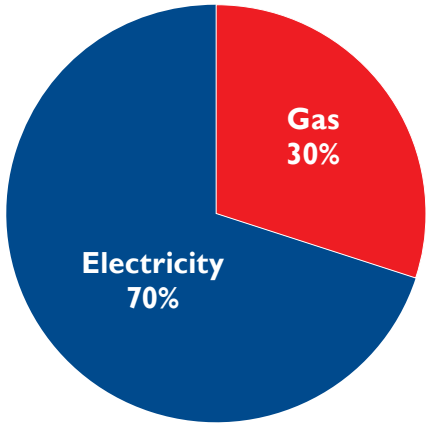
Recommended Replacement / Capital Improvement



Energy Conservation Opportunities

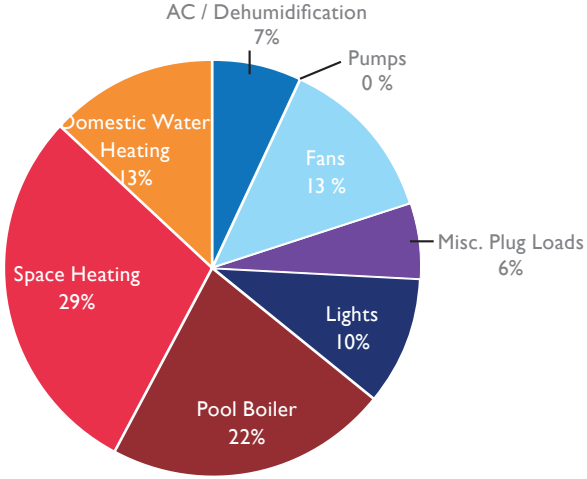
EXECUTIVE SUMMARY

Energy Audit

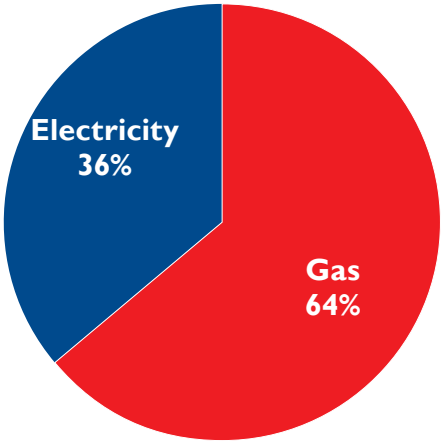


Existing Annual Energy Cost

Electricity:	$92,969
Natural Gas:	$40,061
Total:	$133,731
ECI:	$2/ft²/year

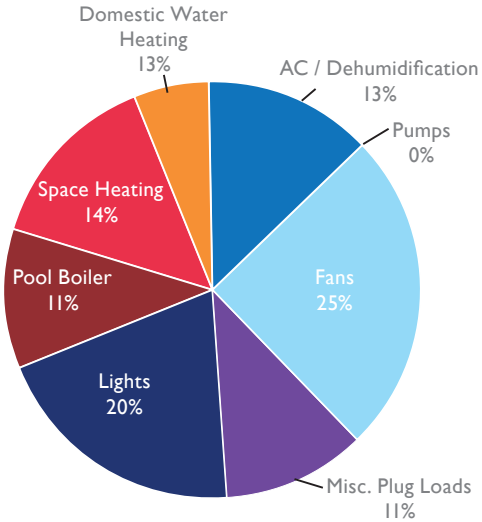


End Use Profile



Existing Annual Energy Use

Electricity:	1,083,480 kwh
Natural Gas:	65,890 therms
EUI:	153.5kBTU/ft²/year



End Use Cost

Overall Performance: Very Good

In regards to Recreation Centers including pools, this facility is one of the most efficient we've seen. Energy Star reports a benchmark similar facility in Denver would be expected to operate with an EUI of 197 and an ECI of $2.09, your facility is operating 22% more efficient and 4.5% more cost effective than expected. In comparison with other facilities we've had experience with in the region it is not uncommon to see recreation centers operating at $4.11, $4.35, $3.42 per square foot and with EUI's of 414, 372, and 148 kBTU/sf/yr.

BUILDING DESCRIPTION / ENVELOPE CONDITION ASSESSMENT

Building Envelope Components

Envelope Component	Existing Conditions	Recommended Improvements	Observed Condition
Exterior Wall	4-inch block, 2-inch rigid continuous insulation, air gap 4-inch block.	N/A	Good, reliable heavy mass building envelope supports the overall building energy efficiency
Roof Assembly	Ballasted single-ply membrane Continuous rigid insulation over steel deck and steel joists	Fully adhered EPDM roof	Very poor, recommend replacement
Windows	Double-pane, clear, aluminum fram, ~25% operable less than 10% overall WWR	Further investigation may be warranted, not part of this scope	Fair, replacement would improve occupant comfort, little economic return
Floor	4-inch slab on grade with 2-inch rigid insulation around inside perimeter of foundation wall	N/A	Good

Building Description

Square Footage
~67,000

Stories
2

Year Built
1987, 1995 Addition

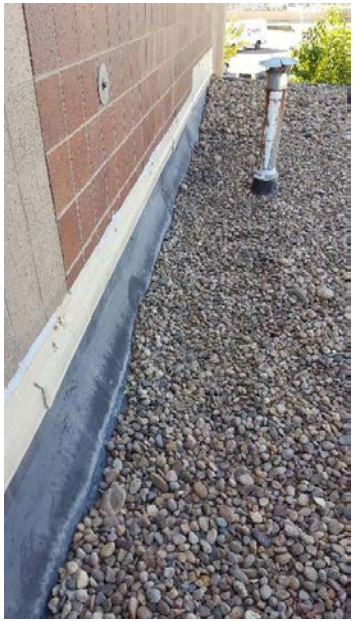
Operating Hours
M-F 5:30am-9:30pm
Sat-Sun 8:00am-5:30pm

Recommended Replacement - Roof

Condition
Very Poor

Cost Opinion:
$182,115
$43,140 Recommended Contingency for replacing 50% of existing insulation
Escalation 5% per year

Recommendation
Replace with EPDM roof, similar to (E) pool roof
See Appendix A "Roof Assessment"



Recommended Improvement - Lightning Protection System

Condition
Does not exist

Cost Opinion:
$80,400

Recommendations
For most efficient cost, consider providing in conjunction with roof replacement project

$15,000 DVR replacement caused by lightning strike this year

$9,00-$15,000 EA IT switch replacement. 3 replaced in the past few years

Also note, a Transient Voltage Surge Suppression System or SPD installed between the service entrance and panelboards could improve the effectiveness of a lightning protection system and incoming power issues.

Recommended Option:
The traditional lightning protection system is comprised of air terminals (rods that are about 3 feet long) that are installed around the perimeter of the roof and on equipment that is mounted on the roof. The air terminals are connected together by bare wire cables and are connected to ground rods that are located at the corners of the building or structure and are driven into the ground. This system, when installed by a certified lightning protection system installer, will receive a UL master label and is FM recognized. Insurance carriers will usually provide a discount on the buildings insurance for a UL labeled system.

Alternate Option:
A mast system, comprised of one or more tower mounted air terminals. These towers usually extend about 20 or more feet above the roof of the building. They are connected to ground rods in a similar manner to the traditional system. These systems are not UL labeled or FM approved. Insurance carriers in the past have not recognized these systems.

FUNCTIONAL SPACE UTILIZATION

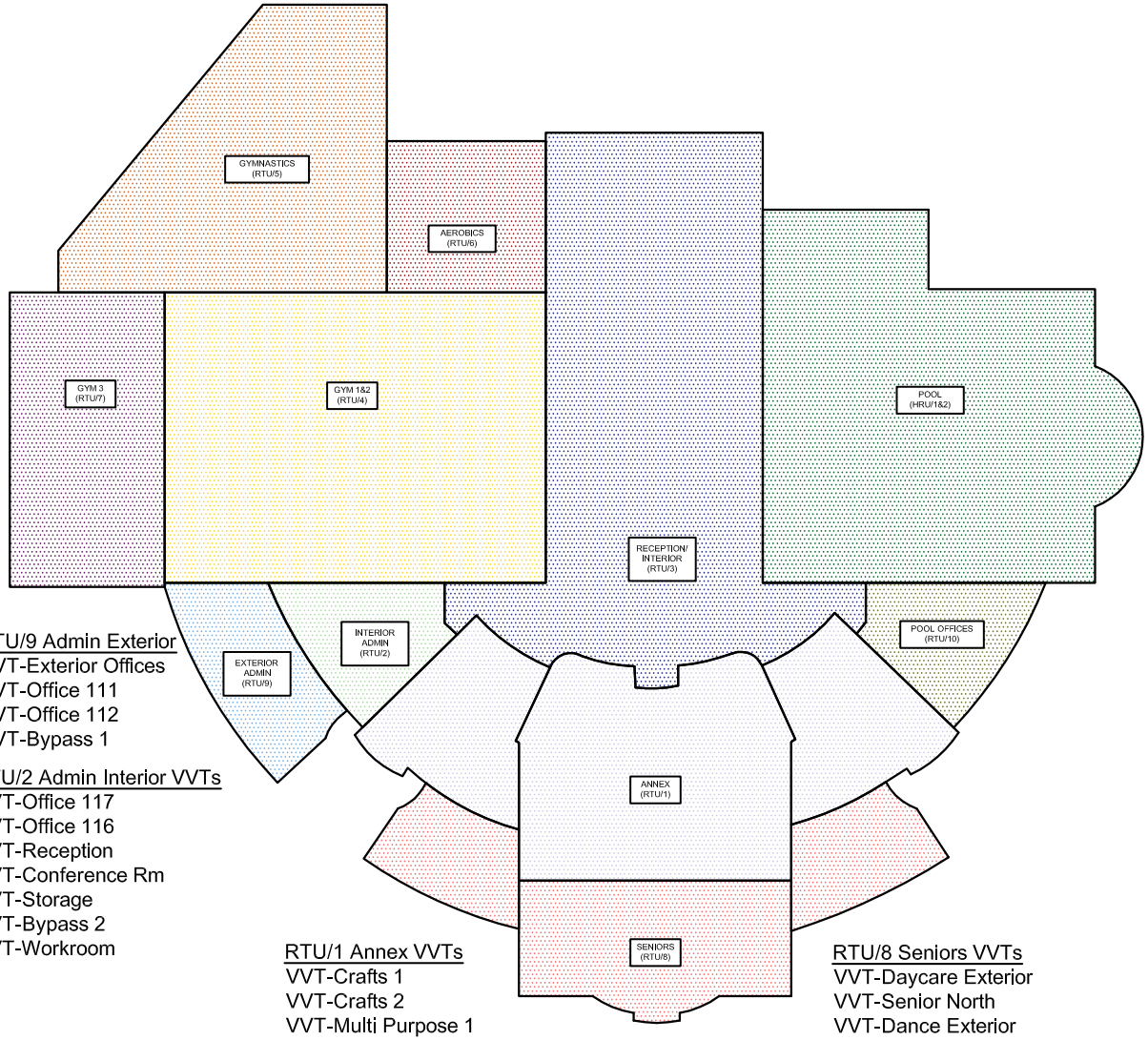
Area Name	Associated use/ space	Approx Area (ft²)	Operating Hours/Week	Weekly Total Hours	Peak Daily Occupants	Average Daily Occupants	Issues / Concerns common to space
Admin Exterior	Exterior zone offices	1,650	M-F 8:30-5:30	45	18	18	Inconsistent room temperatures
Admin Interior	Interior offices, reception, workrooms	1,450	M-F 8:30-5:30	45	30	30	Inconsistent room temperatures
Aerobics		2,210	M-F 7:00-8:30	67.5	35*	16*	"Lack of airflow. * average occupancy through-out the day"
Annex	Multi-Purpose, Crafts, Billiards (interior), Daycare (Interior), Teen Room, Work Room, Registration, Storage, Corridors	8,900	M-F 5:30-9:30 S-S 8:00-5:30	99	200	100	HVAC noise excessive in multipurpose rooms. Low air flow in rooms to cool or heat.
Gymnasium 1 & 2	Basketball	10,000	M-F 5:30-9:30 S-S 8:00-5:30	99	250	50	
Gymnasium 3	Volleyball	4,040	M-F 5:30-9:30 S-S 8:00-5:30	99	75	20	
Gymnastics	Gymnastics and Associated Storage	6,180	M-F 9:00-11:00am M-F 4:00-9:00pm S-S 9:00-1:00	43	50	20	Feels stuffy in space, would like more air circulation
Pool	Natatorium	10,370	M-F 6:00-9:00 S-S 8:30-5:00	92	150	100	Uncomfortably warm at 88 degrees in space
Pool Offices	Pool Offices, Lifeguard Station, Laundry, Staff Break room, Pool Mech Room	1,440	M-F 5:30-9:30 S-S 8:00-5:30	99	12	6	Corrosion in pool pump room
Reception	Reception, Interior Storage, Restrooms, Racquetball Courts, Upstairs Weight room, Locker Rooms, Steam Room	15,420	M-F 5:30-9:30 S-S 8:00-5:30	99	100	30	Restrooms and Lockers under-ventilated
Track		4,050	M-F 5:30-9:30 S-S 8:00-5:30	99	12	4	None Reported
Seniors	Senior Activities, Senior Offices, Kitchen, exterior portion of Billiards and Daycare)	5,640	M-F 5:30-5:30	60	45	45	Infiltration/Draft near Exterior Doors

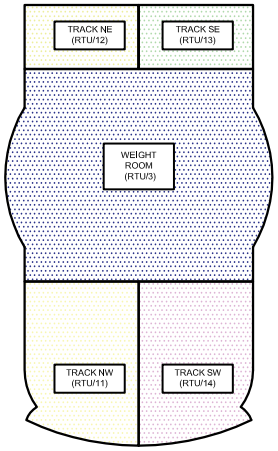
Our understanding of your spaces, uses, and area issues help us make better recommendations for your facility. Following is a summary of our understanding of your facilities space utilization

Pool Surface Area
5,310 SF

Note
The issues / concerns common to space are provided with recommended corrective actions thorough this report in the form of recommended equipment repair, replacement, or capital improvements

HVAC Zones





RTU/9 Admin Exterior
VVT-Exterior Offices
VVT-Office 111
VVT-Office 112
VVT-Bypass 1

RTU/2 Admin Interior VVTs
VVT-Office 117
VVT-Office 116
VVT-Reception
VVT-Conference Rm
VVT-Storage
VVT-Bypass 2
VVT-Workroom

RTU/1 Annex VVTs
VVT-Crafts 1
VVT-Crafts 2
VVT-Multi Purpose 1
VVT-Billiards
VVT-Corridor
VVT-Multi Purpose 2
VVT-Lobby
VVT-Dance Interior
VVT-Daycare Interior

RTU/8 Seniors VVTs
VVT-Daycare Exterior
VVT-Senior North
VVT-Dance Exterior
VVT-Senior Office West
VVT-Senior Office East
VVT-Senior Reception
VVT-Senior South
VVT-Kitchen
VVT-Senior North

RTU/3 Reception VVTs
VVT-Corridor/Storage
VVT-Corridor/Interior RRs
VVT-Workroom/Mens RR
VVT-Registration/Womens RR
VVT-Fitness/Weights North
VVT-Fitness/Weights South
VVT-Track North
VVT-Track South
VVT-Raquet Courts

NORTH

Rooftop Equipment Map

EXISTING MECHANICAL SYSTEMS & EQUIPMENT

Asset Management - Roof Top Unit & VVTs

Equipment/Asset Title	Service	Observed Condition	Year Installed	Service Life	Remaining Life	Replacement Value
RTU-1	Zone- Annex	Good	2013	15	12	$ 57,000.00
VVT's (10 EA)		Good-Poor	2008	20	7	$ 750.00
RTU-2	Zone- Admin Interior	Fair	2008	15	7	$ 9,600.00
VVT's (7 EA)		Good	2008	20	12	$ 750.00
RTU-3	Zone- Reception	Fair	2004	15	3	$ 120,000.00
VVT's (9 EA)		Good	2008	20	12	$ 750.00
RTU-4	Gymnasium 1&2	Good	2004	20	8	$ 81,000.00
RTU-5	Gymnastics	Fair	2011	20	15	$ 33,660.00
RTU-6	Aerobics	Good	2013	20	17	$ 13,820.00
RTU-7	Gymnasium 3	Good	2011	20	15	$ 52,800.00
RTU-8	Zone- Seniors	Poor	1996	15	-5	$ 35,400.00
VVT's (8 EA)		Good	2008	20	12	$ 750.00
RTU-9	Zone- Admin Exterior	Good	2013	15	12	$ 8,700.00
VVT's (4 EA)		Good	2008	20	12	$ 750.00
RTU-10	Pool Offices	Very Good	2013	20	12	$ 7,880.00
RTU-11	Track NW	Good	2013	15	12	$ 12,000.00
RTU-12	Track NE	Good	2013	15	12	$ 12,000.00
RTU-13	Track SE	Good	2013	15	12	$ 12,000.00
RTU-14	Track SW	Good	2013	15	12	$ 12,000.00

System Expandability: Limited at best, facility served with unitary equipment dedicated to the spaces served. Expansion would require new systems and equipment for new spaces, an opportunity exists for implementation of a central hydronic heating plant to serve domestic and pool heating water.

Note: For more detailed description of observations and recommendations, please go to Appendix C- Mechanical Recommendations

Recommended Maintenance

Maintain routine filter changes, check belt tensions/alignment, Implement routine cleaning of cotton build-up on intakes, set OA minimums, Provide User Interface for on-site maintenance control of space set-points, develop consistent nomenclature for service and tracking.

Recommended Repair

Revise Air balance in accordance with Appendix H to maintain positive space pressurization. ESCO (Temperature controls company contracted with the City) to confirm operation of VVT's and confirm economizer operations. Relocate T-stats off exterior walls. Clean chalk dust from RTU/5 Return air duct. Service call for RTU/6 compressor short cycling.

Recommended Replacement / Capital Improvement

Recommended Replacement/Capital Improvement: RTU/8 most in need of replacement. RTU/5 replace with Gymnastics area renovation due to harsh indoor environment.

Energy Conservation Opportunities

RTU/4 is a nice unit but the R-22 refrigerant limits how much service and repair should be done could be replaced with Variable Volume single zone AHU when the time is right. Separate EA/OA streams within RTU/7. Demand control ventilation where it makes sense. RTU/1 re-orient unit when replaced.

Asset Management - Natatorium HVAC Equipment

Equipment/Asset Title	Service	Observed Condition	Year Installed	Service Life	Remaining Life	Replacement Value
Destratification fans	Pool	Fair	2008	15	7	$ 1,500.00
Dry cooler	Pool	Fair	2008	20	12	$ 4,450.00
HRU/1	Pool	Good	2008	15	7	$ 93,500.00
HRU/2	Pool	Good	2008	15	7	$ 93,500.00
PEF-1&2	Pool	Very Good	2008	20	12	$ 6,000.00
Pool Boiler 1	Pool	Fair	2006	25	15	$ 40,000.00
Pump 1	Pool	Fair	2006	20	10	$ 8,200.00
Steam Room boiler	Steam Room	Fair	2008	15	7	$ 4,300.00

System Expandability: N/A

Boiler Plant Replacement

	Quantity	Material	Installation	Total
Boiler	2	$ 36,000.00	$ 4,000.00	$ 76,000.00
Expansion tank	1	$ 4,350.00	$ 220.00	$ 4,570.00
Circ Pump	2	$ 3,050.00	$ 430.00	$ 6,530.00
Pipe	380	$ 4,408.00	$ 10,966.00	$ 15,374.00
Pipe covering	380	$ 2,109.00	$ 2,850.00	$ 4,959.00
				$ 107,433.00

Boiler plant to replace existing pool and domestic hot water heaters. Redundant system 2 boilers @ 100% load

Recommended Maintenance

Continue filter replacements, check belt tensions and pulley alignments, check economizer operation, consider lowering pool space temperature to 85 degrees.

Recommended Repair

service call on HRU's with harsh pool environment, provide annual thorough cleaning.

Recommended Replacement / Capital Improvement

Steam Room boiler is frequent source of maintenance due to hard water and infrequency of use. Pool Boiler is in rough shape for it's age. Provide surge pit exhaust to slow corrosion on equipment in pool mechanical room. Steam room boiler is replaced every 5-6 months, 2 man days required for each replacement, consider elimination, water quality prevents reliable operation.

Energy Conservation Opportunity

Combined heating plant for pool and domestic hot water. Pool HRU's should be studied prior to replacement, current dehumidification with DX is expensive, in addition lack of modulating gas valves on furnaces burns excess energy and provides for less precise space temp control, consider hydronic heat for these units if a combined heating plant is considered.

Note: For a more detailed description of observations and recommendations, please go to Appendix C- Mechanical Recommendations

Asset Management - Unitary HVAC Equipment

Equipment/Asset Title	Service	Observed Condition	Year Installed	Service Life	Remaining Life	Replacement Value
CUH Daycare	Daycare- Exterior	Good	1995	13	-8	$ 2,500.00
CUH Main Entry	Main Entry Vestibule	Good	1995	13	-8	$ 2,500.00
CUH Seniors	Senior North	Fair	1995	13	-8	$ 2,500.00
EDC-1 Men's Locker	Mens Locker Room	Fair	1995	13	-8	$ 750.00
EDC-1 Women's Locker	Womens Locker Room	Fair	1995	13	-8	$ 750.00
EF-1	Restrooms Reception	Good	2008	20	12	$ 725.00
EF-2	Restroom Seniors	Fair	2006	20	10	$ 540.00
EF-3	Breakroom 154	Good	2006	20	10	$ 725.00
EF-5	Workroom	Good	2006	20	10	$ 1,800.00
EF-6	Workroom	Fair	2006	20	10	$ 925.00
EF-7	Restrooms 182 & 183	Good	2006	20	10	$ 1,800.00
EF-8	Elevator Mech Room	Good	2006	20	10	$ 925.00
EF-9	Kitchen	Poor	1995	20	-1	$ 925.00
EF-10	Daycare- Interior	Good	1995	20	-1	$ 540.00
EF-11	Mens Locker Room	Good	1995	20	-1	$ 1,400.00
EF-12	Pool Equipment Room	Good	1995	20	-1	$ 1,400.00

System Expandability: N/A

Recommended Maintenance

Check all CUH's for proper operation prior to coming winter. Check Fan belt tensions.

Recommended Repair

Repair Vestibule Cabinet heaters. Align sheaves and tighten belts on EF's. Check EDC's in locker rooms, likely in need of replacement.

Recommended Replacement / Capital Improvement

EDC's (Electric Duct Heaters) in locker rooms are beyond expected service life and may not be operational. EF-9 may not be used often enough to justify replacement now, but should probably be put on the list for the next 5 years.

Energy Conservation Opportunities

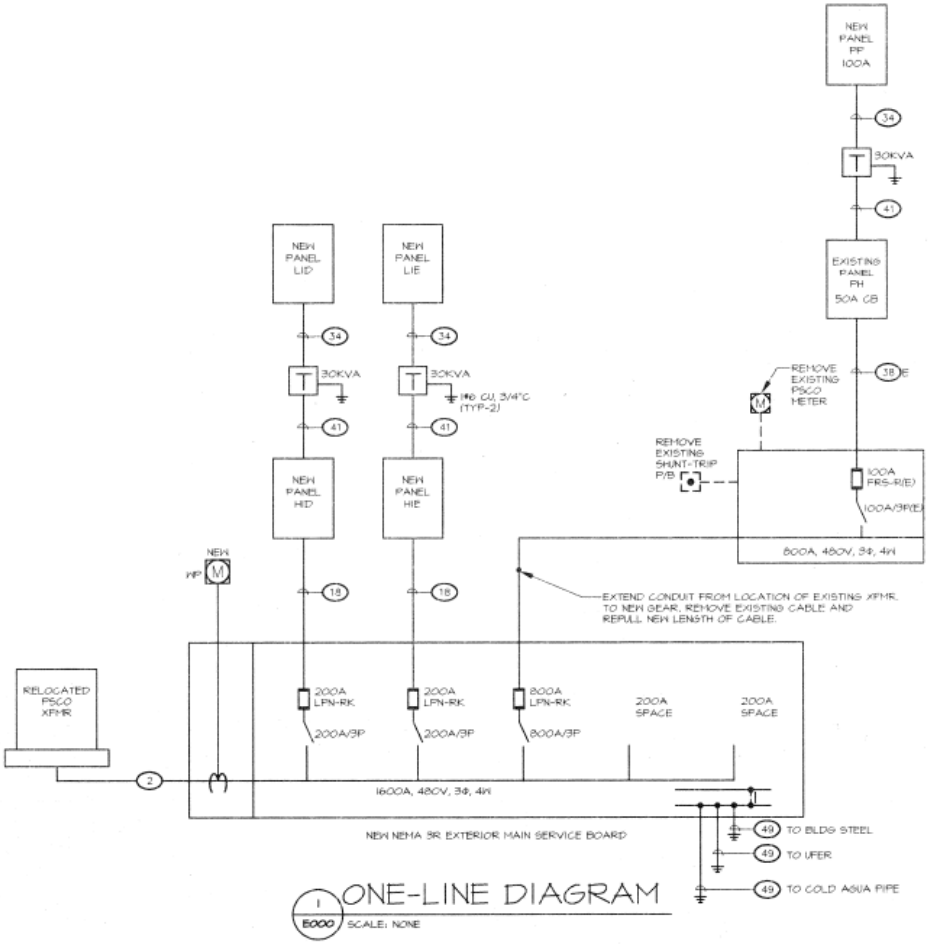
None noted at this time.

Note: For more detailed description of observations and recommendations, please go to Appendix C- Mechanical Recommendations

Asset Management - Power Distribution

Equipment/Asset Title	Service	Observed Condition	Year Installed	Service Life	Remaining Life
Electrical Power Building Service	Original Building, 800 A	Good	1986	40	10
Electrical Power Building Service	Whole Facility, 1200 A	Good	1996	40	20

System Expandability: 400 Amps of unused space at main distribution panel. Existing panel boards and power distribution within facility does not have space available.



Recommended Maintenance

Remove storage items from in front of and on top of transformer in electric room 174. Trace circuit for convenience receptacle on RTU/9.

Recommended Repair

Maintain access to building side of exterior MDP for operations and maintenance.

Recommended Replacement / Capital Improvement

Install TVSS or SPD at exterior service board. Building Power distribution has limited space, new distribution panels could be fed from space in MDP.

Note: For more detailed description of observations and recommendations, please go to Appendix D- Electrical Recommendations

Asset Management - Lighting

Equipment/Asset Title	Service	Observed Condition	Year Installed	Service Life	Remaining Life	Replacement Value
Exterior Building Lighting	Exterior Building	Poor	1986	10	-20	$ 600.00 ea
Lighting: Admin Exterior	Zone- Admin Exterior	Fair	1996	15	-5	$ 380.00 ea
Lighting: Admin Interior	Zone- Admin Interior	Fair	1996	15	-5	$ 380.00 ea
Lighting: Annex	Zone- Annex	Good	1996	15	-5	$ 380.00 ea
Lighting: Gymnasium 1&2	Gymnasium 1 &2	Very Good	2010	15	9	$ 580.00 ea
Lighting: Gymnasium 3	Gymnasium 3	Very Good	2010	15	9	$ 580.00 ea
Lighting: Gymnastics	Gymnastics	Very Good	2010	15	9	$ 580.00 ea
Lighting: Pool High Bay	Pool	Good	2010	15	9	$ 580.00 ea
Lighting: Pool pendants	Pool	Poor	1987	15	-14	$ 450.00 ea
Lighting: Pool Office	Pool Offices	Good	1999	15	-2	$ 380.00 ea
Lighting: Reception	Zone- Reception	Fair	1996	15	-5	$ 380.00 ea
Lighting: Seniors	Zone- Seniors	Good	1996	15	-5	$ 380.00 ea
Lighting: Track	Zone- Track	Fair	1996	15	-5	$ 380.00 ea
Lighting: Weight Room	Weight Room	Good	1996	15	-5	$ 380.00 ea
Lighting:Aerobics	Aerobics	Good	1996	15	-5	$ 580.00 ea
Site Lighting	Parking Lot	Good	2016	25	25	$ 2,500.00 ea

System Expandability: N/A, No Centralized Lighting Controls

Note: Lighting replacement with LED's subject to available rebates from Xcel Energy.

Recommended Maintenance

Remount wall pack at SE exterior entrance.

Recommended Repair

None, recommend replacement for anything greater than bulb replacement.

Recommended Replacement

Wall packs and exterior building lights. Children's pool area. Interior offices. Any remaining Metal Halide lights (reception).

Energy Conservation Opportunities

Energy Conservation Opportunities: Vacancy sensors for intermittent occupied spaces (Gymnasium, Gymnastics, Aerobics, Multi-Purpose). Consider dimmable LED's for spaces with Skylights providing some daylighting opportunities.

Note: For more detailed description of observations and recommendations, please go to Appendix D- Electrical Recommendations

EXISTING PLUMBING SYSTEMS & EQUIPMENT

Asset Management - Plumbing

Equipment/Asset Title	Service	Observed Condition	Year Installed	Service Life	Remaining Life	Replacement Value
Plumbing Systems						
Circ Pump	Upstairs Mechanical Room	Very Good	2009	10	3	$ 580.00
Water softeners	Entire Building	Very Poor	1986	15	-15	$ 2,900.00
WH-1A	Entire Building	Fair	2009	10	3	$ 15,000.00
WH-1B	Entire Building	Good	2014	10	8	$ 15,000.00
Gas Service	Entire Building	Good	1986	40	10	$ N/A

Equipment/Asset Title	Service	Observed Condition	Year Installed	Service Life	Remaining Life	Replacement Value
Plumbing Fixtures						
Lavatories	Entire Building	Fair	1986	20	-10	$ 408.00 ea
Shower fixture	Entire Building	Fair	1986	20	-10	$ 1,336.00 ea
Urinals	Entire Building	Fair	1986	20	-10	$ 651.00 ea
Water closet	Entire Building	Fair	1986	20	-10	$ 1,218.00 ea

System Expandability:
Gas Service: 3-inch MPG line into building estimate 30-inc W.C. (1 psi) service pressure appears to be good expandability for the future expansion but would require design specific Review.

Domestic Hot Water: System recommended for replacement in conjunction with pool boiler to provide more flexibility and reliability.

Note: For more description of observations and recommendations, please see Appendix E- Plumbing Recommendations

Recommended Maintenance
Locker room showers slow to drain. West Urinal in Men's restroom valve sticks, water bottle fill in hallway handle broke.

Recommended Repair
Insulate DHW lines in the mechanical room for safety and energy efficiency.

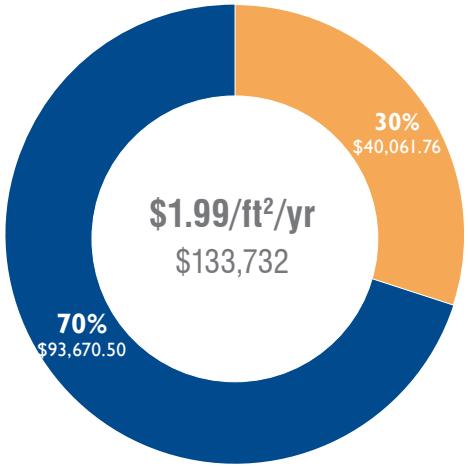
Recommended Replacement / Capital Improvement
Water Softener for building domestic water service. Replace Domestic hot water system similar to Civic Center.

Energy Conservation Opportunities
Combined heating water plant for Domestic Hot Water and Pool.

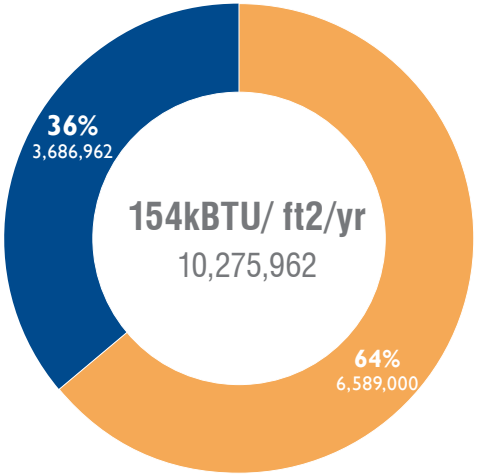
Water Conservation Opportunities/ Recommended Repair
Develop replacement program for plumbing fixtures with water efficient equipment. All fixtures observed are beyond the expected service life.

FACILITY ENERGY AUDIT

6.1 Total Building Energy Comparison



Existing Facility Energy Cost



Existing Facility Energy Usage (kBTUs)

	Commerce City Rec Center	Benchmark Facility	Notes
Natural Gas Usage (kBtu/Year)	6,589,000	10,117,000	
Natural Gas Cost ($/Year)	$40,061.76	$61,714	2
Natural Gas EUI (kBtu/SF/Year)	98	151	1
Natural Gas ECI ($/SF/Year)	$0.60	$0.92	1
Electric Usage (kBtu/Year)	3,696,834	3,075,300	
Electric Cost ($/Year)	$92,969.81	$78,121	3
Electrical EUI (kBtu/SF/Year)	55	45.9	1
Electrical ECI ($/SF/Year)	$1.39	$1.17	1
Combined EUI (kBtu/SF/Year)	154	197	
Combined ECI ($/SF/Year)	$1.99	$2.09	

Notes:

1. The EUI and ECI calculations for Commerce City Rec Center are based on a total building square footage of 67,000ft².
2. The annual natural gas cost for the benchmark facility was calculated using the current natural gas rates and the annual usage for the benchmark facility.
3. The annual electrical cost for the benchmark facility was calculated using the current electrical rates and the annual usage for the benchmark facility.

electricity gas

6.2 Electrical Energy

6.2.1 Electrical Energy Usage and Performance

Based on existing electric utility bills from January 2013 through December 2015, the average annual electrical consumption was 1,083,480 kWh (55.2 kBTU/ft2/yr). The average annual electrical cost was approximately $92,969. (1.39 $/ft2/yr)

6.2.2 Electrical Utility Billing

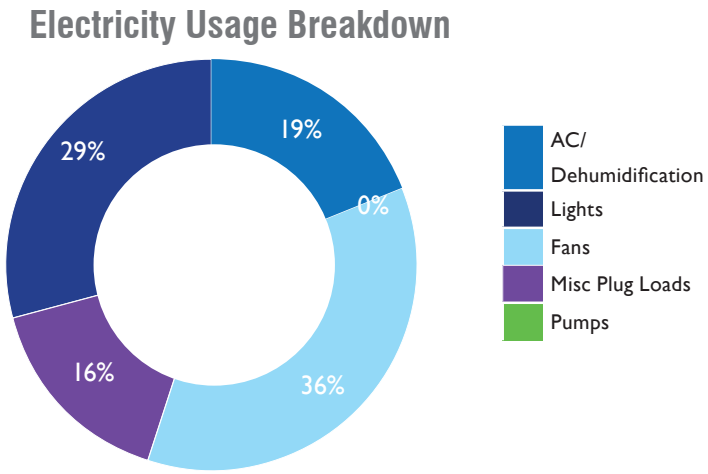
Xcel Energy provides electrical power to the Commerce City Rec Center with a rate schedule of; Secondary General Service (SG). The Secondary General Service rate is applied to general buildings with electric power supplied at secondary distribution service.

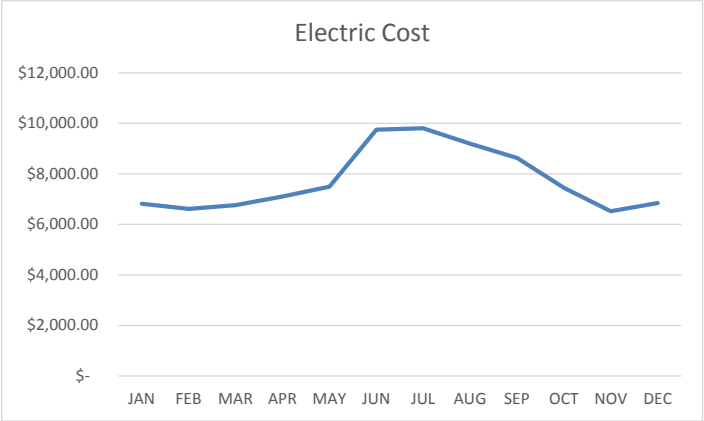
Table 1.1.A Xcel Electrical Rates (from utility bills for 2016)

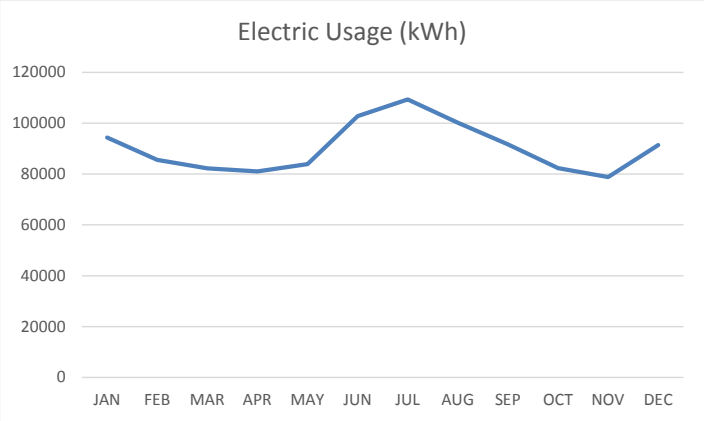
Item	Rate SG	
Service & Facility	$	40.00
Secondary General per kWh	$	0.004730
Electric Commodity Adj per kWh	$	0.03009
Distribution Demand per kW	$	4.840
Gen & Transm Demand – Summer per kW	$	10.96
Gen & Transm Demand – Winter per kW	$	8.0000
Transmission Cost Adjustment per kW	$	0.2700
Demand Side Mgmt Cost per kW	$	0.4000
Purchased Cap Cost Adj. per kW	$	1.800
Clean Air-Clean Jobs Act per kW	$	1.31
Renew. Energy Standard Adj.	$	2%
General Rate Schedule Adj.	$	14.9%
Summed Charges per kWh*	$	0.03482
Rec Center Paid per kWh (2015)	**$**	**0.08459**

* Price per kWh does not include State Tax, recommend verification whether taxes apply

On peak periods Oct. – Mar: 4 p.m. to 10 p.m. M-F
On peak periods Apr – Sept: 3 p.m. to 7 p.m. M-F
Off Peak-Periods: all other hours plus legally observed Holidays







6.3 Natural Gas Energy

6.3.1 Natural Gas Energy Usage and Performance

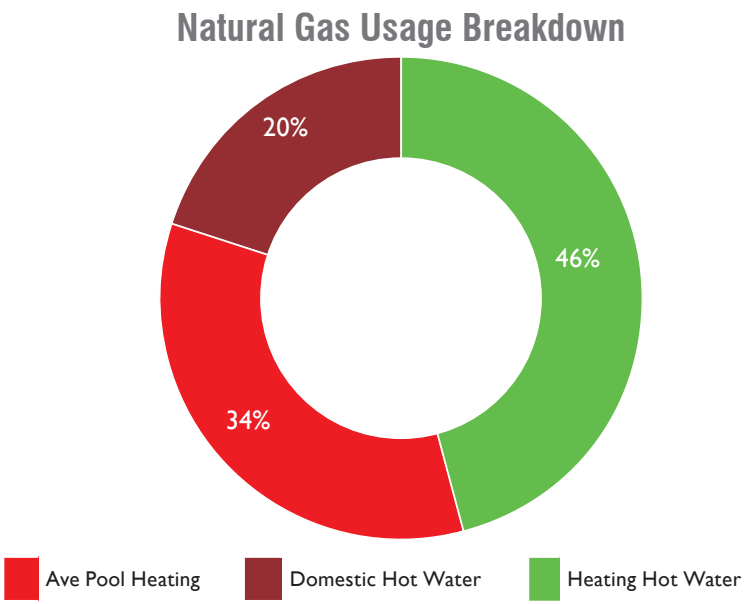
Based on existing natural gas utility bills for Jan 2013 through Dec 2015, the average annual natural gas consumption was approximately 65,890 therms (98.3 kBTU/sf/yr). The annual natural gas utility cost averages $40,061 (1.39 $/ft2/yr).

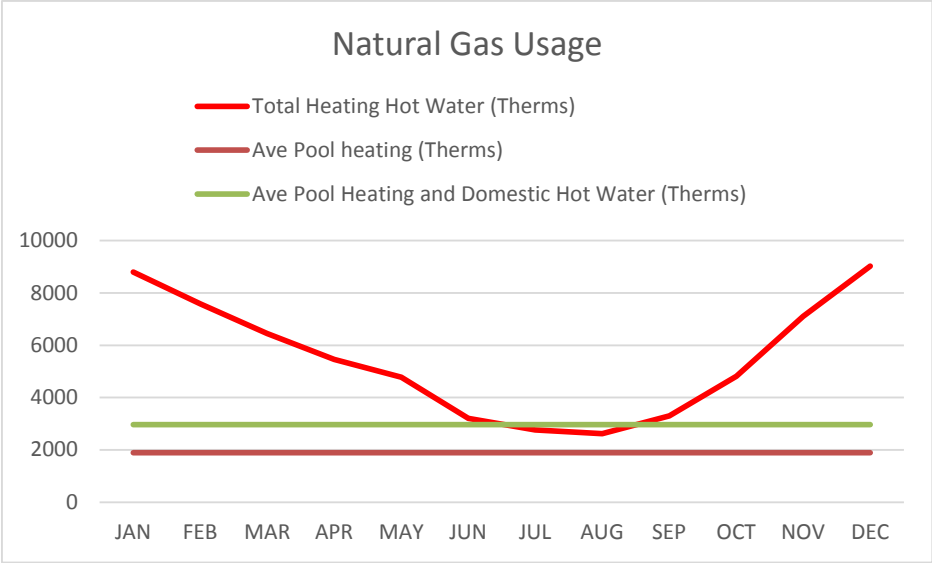
6.3.2 Natural Gas Utility Billing

CenterPoint Energy provides natural gas utility service to the rec center under the rate structure. The total natural gas consumption rates are outlined in the table below.

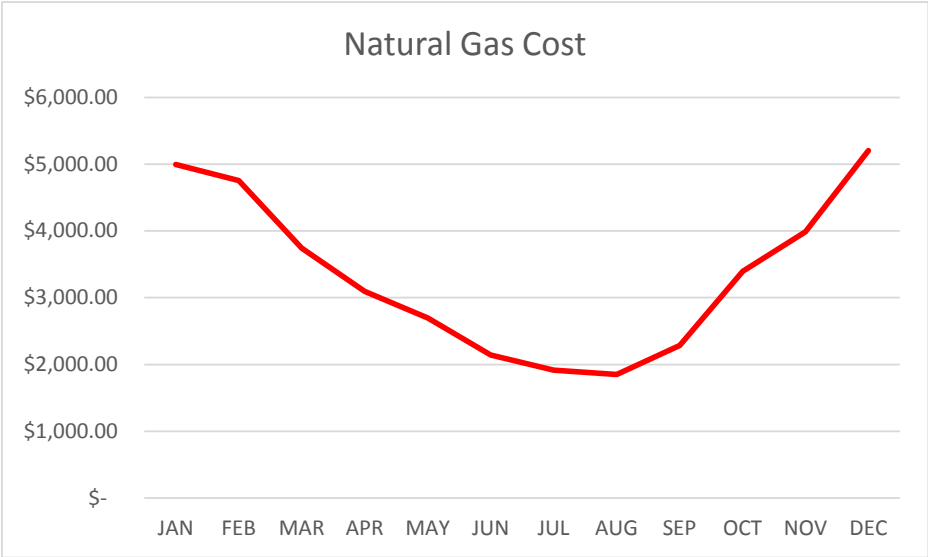
Table 1.2.A Natural Gas Rates (from CenterPoint Energy rates June/2016)

Item	Rate SG	
Gas Capacity Charge, per MMBtu	$2.25	per MMBtu
PSCO Transport	$685.56	
Per MMBtu Average	$4.98	per MMBtu
USOC paid avg (2015)	$0.59	per therm





The Pool Heating Energy and Domestic Hot Water Heating Energy are estimated averages and are indicative of approximate usages only.



6.4 Water Usage

6.4.1 Water Usage and Performance

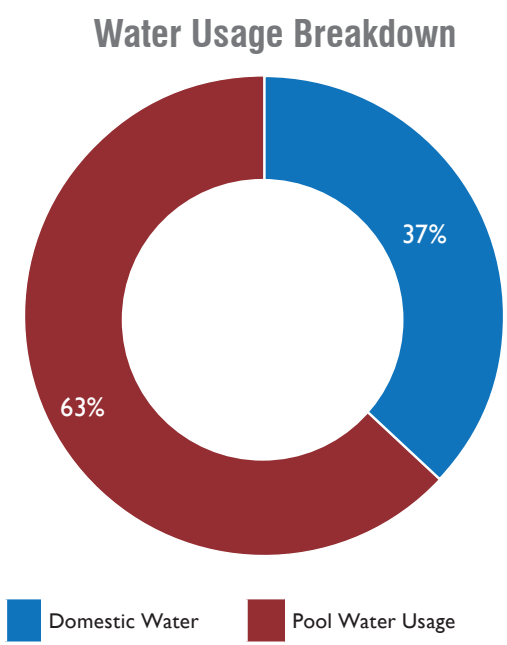
Based on existing water utility bills from Jan 2013- Dec 2015, the average annual water consumption was 258,000 gallons. The average annual water cost for this period was approximately $15,822. After service charges are assessed, the total annual consumption charges for water are approximately $11,224.

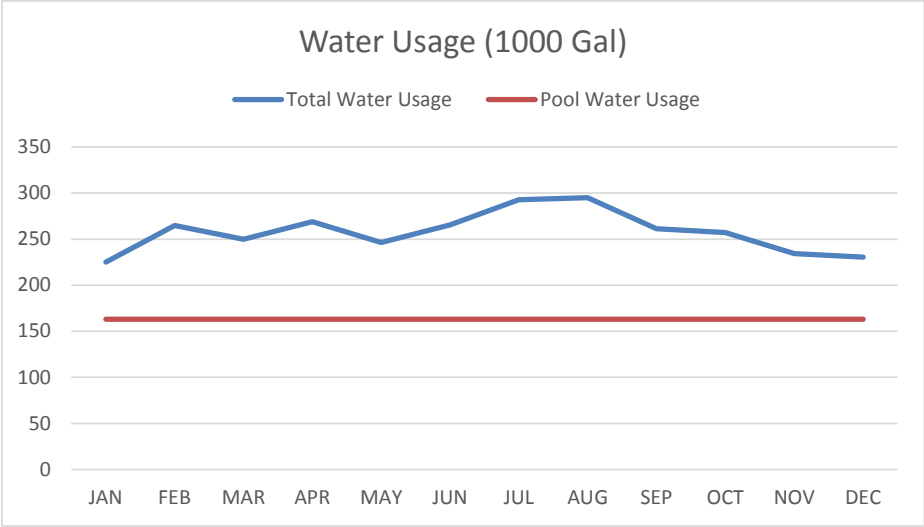
6.4.2 Water Utility Billing

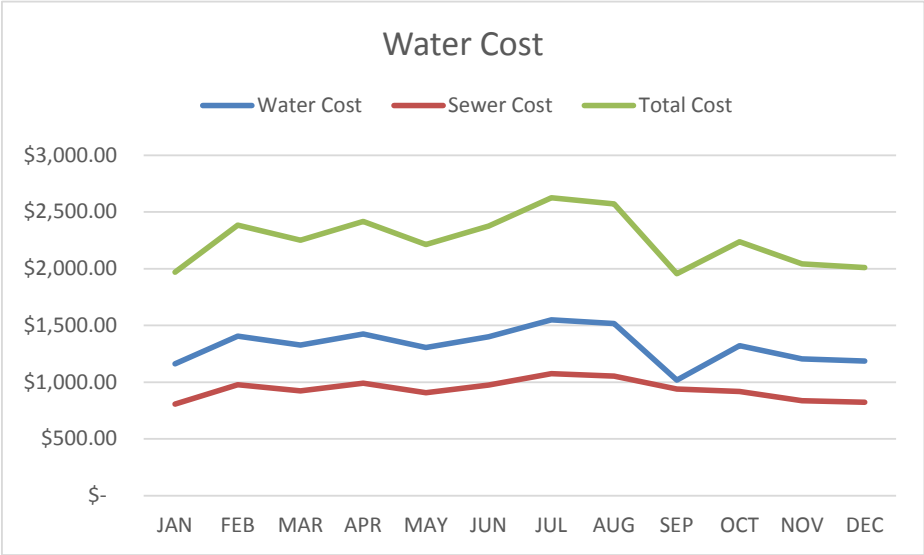
South Adams County Water & Sanitation district provides domestic water service to the Rec center in accordance with the Commercial Water rate schedule. South Adams County also provides wastewater treatment for the site and bill monthly for sanitary sewer service.

Table 1.3.A Water Rates

Item	Domestic Water Supply		Wastewater Treatment	
Minimum Service Charge	$123.86	per month	$191.59	per month
Commodity Charge	$5.63	per 1000 gal	$3.91	per 1000 gal







Recommended Maintenance

Asset	Service	Discipline	Priority	Cost	Labor Hrs
RTU/10	supply fan squeaking, align belts and pulleys, recommended maintenance priority, without attention could lead to repairs required.	Mechanical	High	$ 25.00	8
RTU/2	Fan belt/bearing squeaking, balance fan, align pulleys, check belt tension, lube bearings. High priority maintenance to prevent repair required.	Mechanical	High	$ 109.00	16
RTU/6	Belt on supply fan appears loose, tighten belt on supply fan, listed as high priority to prevent failure leading to repair required.	Mechanical	High	$ 25.00	8
Electrical Power Building Service	ELEC. RM 174 – Main Electrical Room - Remove items from in front and on top of transformer. Reduced airflow increases operating temperature and decreases service life of transformer.	Electrical	Moderate		8
Exterior Building Lighting	wall pack light hanging by conductors, recommend remounting	Lighting	Moderate	$ 780.00	16
HRU/1	Pool doors propped open during site visit, Pool HVAC units in full heat to overcome OA at 65 degrees. Pool HVAC equipment operates to maintain the space at 88, 2 degrees above the pool water temperature of 86 degrees. Opening doors to the exterior wastes energy and can cause the HVAC systems to loose control of the space conditions (temperature, relative humidity, etc.) which can in turn hinder control of pool water chemical treatment. Recommend maintenance emphasize importance of keeping doors closed.	Mechanical	Moderate		0
Reception	Locker Rooms and Restrooms smells, under ventilated. Recommend further investigation to add the appropriate amount of exhaust and properly balance facility.	Mechanical	Moderate		0
RTU/10	OA intake moisture eliminators full of cotton, recommend cleaning and adding to routine maintenance around beginning of July. Ag extension office indicates Cotton is at it's worst in late June, remedy after cotton has subsided and prior to peak Cooling season, also inspect Condenser coils at this time, subject to similar conditions.	Mechanical	Moderate		8
RTU/2	Comfort Issues Common to Space, inconsistent space temperature.	Mechanical	Moderate		0
RTU/2	OA intake is clogged with cotton recommend cleaning and adding to routine maintenance around beginning of July. Ag extension office indicates Cotton is at it's worst in late June, remedy after cotton has subsided and prior to peak Cooling season, also inspect Condenser coils at this time, subject to similar conditions.	Mechanical	Moderate		8
RTU/2	Filters are loaded, replace filters.	Mechanical	Moderate	$ 140.00	8
RTU/8	Filters are loaded along with the coils, clean coils and replace filters.	Mechanical	Moderate	$ 200.00	16
RTU/9	Comfort Issues Common to Space, Inconsistent room temp.	Mechanical	Moderate	$	0
RTU/9	unit improperly labeled rtu/1, seems minor, but a consensus on Equipment names and clear understanding of area's served will lead to better communication and improved maintenance. Recommended zoning and naming convention attached, extracted from 1986, 1995, and 1998 drawings.	Mechanical	Moderate		8
Seniors	When exterior doors are opened air comes in (hot/cold).	Mechanical	Moderate		8
Aerobics	Comfort Issues Common to Space. lack of airflow	Mechanical	Low		0
Annex	Comfort Issues Common to Space, low airflow in spaces for cooling/heating.	Mechanical	Low		0
EF-2	The top cap of fan has hail damage, no functional concern at this time.	Mechanical	Low	$ 250.00	8
EF-5	Fan has excessive noise and is vibrating. Maintenance high priority to prevent issue causing required repair.	Mechanical	Low	$ 810.00	16
EF-6	Baffle and top cap of fan are damaged, most likely from hail. No Functional concern at this time.	Mechanical	Low	$ 250.00	8
EF-9	Fan rusted on outside, seems to operate alright, no excessive noise. If used frequently, recommend replace.	Mechanical	Low	$ 1,925.00	32
RTU/9	no power to convenience receptacle, trouble shoot. Verify power connected to receptacle, locate breaker and confirm status. Suspect power has never been run to receptacle, if desired maintenance may wish to have a circuit pulled for Operations and Maintenance while servicing RTU/9.	Electrical	Low	$ 10.00	16
RTU-13	Filters in unit are loaded.	Mechanical	Low	$ 140.00	8
RTU-13	No Screen on OA intake	Mechanical	Low	$ 100.00	8
Sanitary Waste	Showers in locker rooms are slow to drain and subject to frequent back-ups. Review of the drawings indicates the shower drains are connected to 2" san lines, which seems small for a bank of 4 showers. Consider replacing shower heads with 1.5 gpm, also recommend scoping drains to verify condition and slope of drain piping to determine if remedial action is required. Avoid tying into these lines with any expansion in the future, consider new drains for these areas if expansion or re-model comes close to this area.	Plumbing	Low		32
VVT-Senior Reception (RTU-8)	3 Thermostats in or near space. Not clear which controls VVT. Recommend labeling t-stats as to VVT and space served.	Mechanical	Low		32
			Totals	**$ 4,764.00**	**272**

Recommended Repair

Asset	Service	Discipline	Priority	Cost
RTU/6	Unit short cycled from cooling with compressors to heating within about 5 minutes. recommend cycling through modes and ensuring proper operation, continued operation in this state will shorten the life of the equipment. If this continues to be a problem, unit may be recommended for replacement.	Mechanical	High	$ 480.00
VVT-Exterior Offices (RTU-9)	Exterior Spaces are cold in winter and warm in summer, Tsat located behind shelves. Moving Thermostat so it communicates with air movement in space may improve controllability of zone.	Mechanical	Moderate	$ 390.00
CUH Seniors	Tstat lever broken. no clear indication if heater operates. Replace thermostat and set to desired vestibule minimum temperature. Should help to improve comfort within space and prevent freezing of sprinkler piping in vestibule.	Mechanical	Moderate	$ 437.50
RTU/1	Tstat in daycare on exterior wall. likely forces space to overheat in winter time and over cool in the summertime, may consider relocating to interior partition for more accurate space temperature reading. Note, this can also be improved by using spray foam in the wall behind the thermostat if relocating is not an option.	Mechanical	Moderate	$ 438.50
RTU/8	Noisy fan, Service fan to reduce noise and vibration. Balance fan, align pulleys, replace belt. If unit is replaced, consider variable volume unit with premium efficiency direct drive supply fan.	Mechanical	Moderate	$ 812.00
RTU/5	chalk dust coating RA stream, clogging filters, recommended maintenance item. coils appear to have been protected by routine filter changes. Replace return air ductwork with space renovation.	Mechanical	Moderate	$ 200.00
Plumbing Fixtures	Replace Plumbing Fixtures at end of life	Plumbing	Moderate	$ 69,764.20
VVT-Crafts 1 (RTU-1)	Appears the VVT does not modulate and is constant volume.	Mechanical	Low	$ 832.50
Annex	Too much noise from RTU in Multi-Purpose rooms.	Mechanical	Low	$ 812.00
Electrical Power Building Service	Locked access to building side of main distribution center, should be available for access by building maintenance and operations.	Electrical	Low	$ -

Recommended Replacement

Asset	Service	Discipline	Priority	Cost
Pool Equipment Room	Pool mech room subject to unusually high corrosion. Observed the pool surge pit is not continuously ventilated, and can be a prominent source of corrosion and poor air quality in space. Recommend providing continuous surge pit exhaust as a source capture method to improve the air quality in the rest of the space.	Mechanical	High	$ 1,800.00
Lightning Protection	No lightning protection system currently exists at the facility. The facility experiences multiple lightning strikes per year, wreaking havoc on internal electrical and low voltage systems. Concurrent to roof replacement, implementation of building lightning protection would provide long term value to this facility.	Electrical	High	$ 80,400.00
Roof	Ballasted roof and parapet, well beyond useful life, continuous source of maintenance. Replacement recommended in accordance with attached FGI Roof Assessment Report.	Architectural	High	$ 182,000.00
RTU/8	Condenser coils damaged by hail, repair required for cooling operation. ECM/Improvement opportunity available if equipment is replaced.	Mechanical	High	-
RTU/4	Unit charge with R-22 refrigerant, new refrigerant will not be available after 2020, replacement parts for refrigeration circuit not manufactured since 2010, increasing regulations, recommend planned replacement prior to refrigerant phase out in 3 years. Maintenance and service costs are anticipated to increase sharply as availability of refrigerant is reduced.	Mechanical	Moderate	$ 81,000.00
RTU/8	Equipment charged with R-22 refrigerant, equipment cannot be manufactured with R-22 refrigerant since 2010 and the refrigerant itself will be phased out in 2020 due to ozone depleting characteristics. Service and maintenance costs are increasing associated with this equipment due to the phase-out of the refrigerant. Unit is at the end of it's expected service life, recommend replacement with new more efficient equipment.	Mechanical	Moderate	$ 35,400.00
Lighting: Reception	Racquetball lights are a good candidate for replacement with LED for energy conservation and for reduced maintenance in high bay difficult access locations.	Lighting	Moderate	-
Lighting: Reception	Metal Halide fixtures high in space require lifts to change out bulbs, recommend replacing with LED for energy savings and improved maintenance.	Lighting	Moderate	
Lighting: Pool	POOL – East pool area – replace insufficient and ineffective lighting in East pool area. Area has lower ceiling than rest of pool area and is open ceiling to structure. Existing direct-only downlights on perimeter of space aren't well suited to light the space. Recommend replacement with direct/indirect light source.	Lighting	Moderate	$ 17,100.00
Site Lighting	"PARKING LOT – add or modify lighting to reach owner-desired FC level in parking lots. Parking lots were observed during day, but owner complaint was registered regarding parking lot lighting. Poles were noted to be shorter than the surrounding properties. Shorter poles prevent the use of higher powered fixtures. Possible options: • Add poles in areas that aren't covered by existing lighting. •Use existing pole locations, but replace poles to increase pole height. Then replace existing fixtures with higher power LED fixtures.	Lighting	Moderate	-
Exterior Building Lighting	Exterior Building lights in need of replacement in many locations. Recommend ECM to replace with LED wall packs. For example the exterior wall pack on the East face of the SouthEast corner of the pool is suspended by the conductors feeding it.	Lighting	Moderate	$ 19,102.00
Electrical Power Building Service	Building Power distribution has no more space available in existing indoor panel boards.	Electrical	Moderate	-
Water Softeners	Water Softeners at end of life	Plumbing	Moderate	$ 2,900.00
Pool Boiler	Replace pool boiler	Mechanical	Moderate	$ 40,000.00
Steam Room boiler	Boiler has to be disconnected and swapped out annually with spare boiler to avoid scaling and failure. Anticipate this issue to be resolved with the replacement of water softeners.	Mechanical	Low	$ 4,300.00
Lighting: Admin Exterior	Lighting in the offices could use updating and replacement. Good candidate for recessed grid mounted 2x4 indirect LED lighting with room vacancy switches. Consider dimming capabilities for LED's. Also there is a desire to update the lighting in the admin areas.	Lighting	Low	$ 24,225.00
Lighting: Admin Interior	Lighting in the interior offices could use updating and replacement. Good candidate for recessed grid mounted 2x4 indirect LED lighting with room vacancy switches.	Lighting	Low	$ 21,375.00

Energy Conservation Measures

ECM #	Asset	Discipline	Priority	Cost	Benefit
ECM 1	Repair Economizer	Mechanical	High	$ 8,190.88	$ 8,546.00
ECM 2	Demand Control Ventilation	Mechanical	High	$ 1,935.18	$ 1,173.00
ECM 4	DDC Upgrade	Mechanical	High	$ 28,000.00	$ -
ECM 3	Boiler Plant Replacement	Mechanical	Moderate	$ 107,485.00	$ 5,477.00
ECM 6	Lighting Controls	Lighting	Moderate	$ 1,298.33	$ 138.84
ECM 5	HRU: Modulating Gas Furnace	Mechanical	Low	$ 8,927.00	$ 490.00

Appendix A

Roof Assessment Report

Farnsworth
GROUP

Farnsworth GROUP

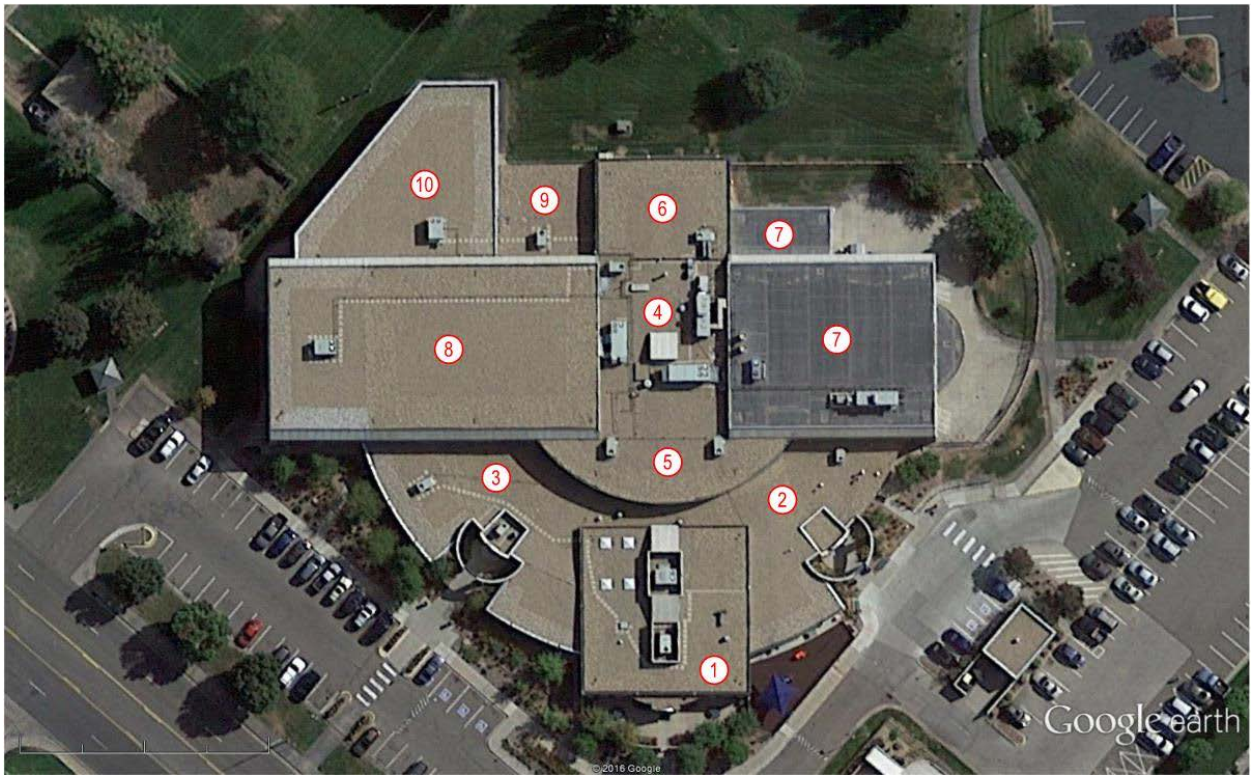
5613 DTC Parkway, Suite 1100
Greenwood Village, Colorado 80111
p 303.692.8838 f 303.692.0470

www.f-w.com | www.greennavigation.com

October 4, 2016

Re: Commerce City Recreational Facility
Roof Assessment

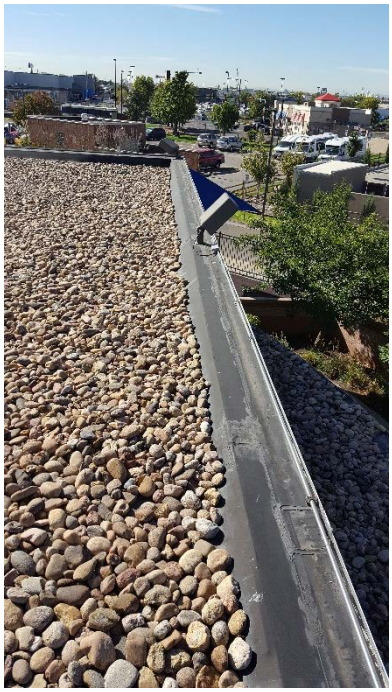
On September 29, 2016, Farnsworth architectural representative Mark Ruckoldt visited the project site to conduct a preliminary assessment of the existing roof conditions. Accompanied by Senior Building Engineer, Mike Goudy, the following observations were made:



Roof Plan Area Legend

<u>Lower Roof Sections</u>
1 – Crafts, Multi-Purpose Rooms, and Senior Activities Center
2 – NW Entry, Storage, Laundry, Break Room, Boiler Room, and Dance Studio
3 – NE Entry, Adminstrative Offices, and Billards

<u>Upper Roof Sections</u>
4 – Fitness / Locker Rooms
5 – Foyer / Reception Area
6 – Racquet Ball Courts
7 – Swimming Pool
8 – Gymnasium
9 – Aerobics
10 – Gymnastics

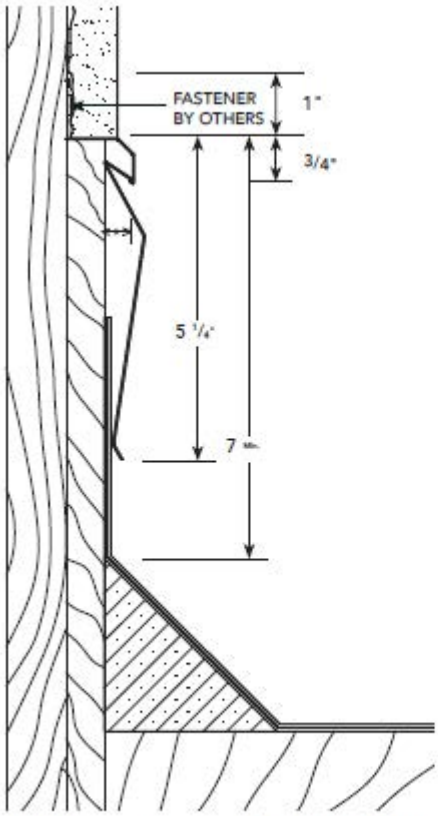


Roof Section 1

- Observations:
  1.1. Along the entire bottom perimeter of the mechanical screen walls, the existing membrane has detatched itself from both the roof deck and wall, causing the membrane to stretch out and lose it's elacticity, creating tears and damage to the wall finishes, resulting in continual roof leaks and emergency repairs. This is most likely due to vortices produced by wind uplift, pulling at the membrane. Because of the age of the of the membrane, these areas will continually be susceptible to additional tears.

1.2. The same issue has occurred along the entire permiter of the roof edge and are susceptible to additional tearing.
1.3. No issues were observed within the screened areas where the RTU's reside.

- Recommendations:
  - Replace the existing ballasted roof system with a fully adhered EPDM (Ethylene-Propylene-Diene-Monomer) roof system, where the rubber membrane is bonded directly to the roof without the need for gravel to to hold it down. It is also recommended that a cant strip be installed where the roof meets a wall.
    - Since the existing membrane runs up and over the entire height of the mechanical screen wall, the membrane, along with a portion of the existing stucco finish, will need to be cut along the entire perimeter where the new membrane can be installed. Below the cut, a new reglet and flashing strip will be installed, where the new membrane will terminate. The height of the cut and where the relet is mounted should be determined per the manufacturer's recommendations. Refer to the illustration below as an example:



*Actual dimension between wall and the inside flange of reglet is 7/8".
See separate sheet for product installation instructions. Drawings are not to scale.

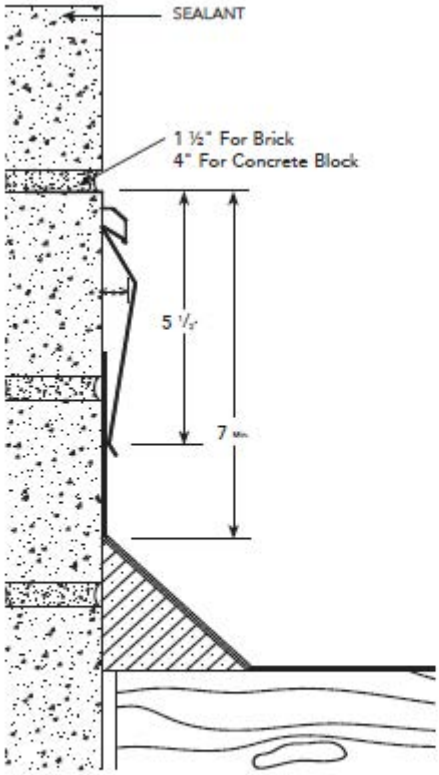
  - Leave the areas within the screened walls as-is

- Estimated costs:
  - Approximate Roof Area = 6,700 SF

▪ Remove / salvage existing gravel	$0.47 / SF	=	$ 3,150
▪ Remove membrane	$0.45 / SF	=	$ 3,015
▪ Replace gravel stops	$12.00 / LF	=	$ 3,800
▪ Install cant stips	$3.73 / LF	=	$ 1,600
▪ Install new reglet + flashing	$4.82 / LF	=	$ 725
▪ Install new EPDM roofing (45 mil)	$2.30 / SF	=	$ 15,410
	Sub-total	**=**	**$ 27,700**

<u>Roof Section 2</u>

- Observations:
  2.1. Similar to section 1, the existing membrane has detatched itself from the roof deck, walls, roof edges, and mechanical roof curbs.
  2.2. The exsting reglet mounted to the face of the masonry walls should have been inset and sealed within one the horizontal grout joints in order to prevent water from seeping through via the vertical grout joints (refer to illustaration below). The way it's installed now, each vertical grout needs to be sealed and maintained to ensure that water doesn't get behind the regelt and underneath the roof membrane.



*Actual dimension between wall and the inside flange of reglet is 7/8".
See separate sheet for product installation instructions. Drawings are not to scale.

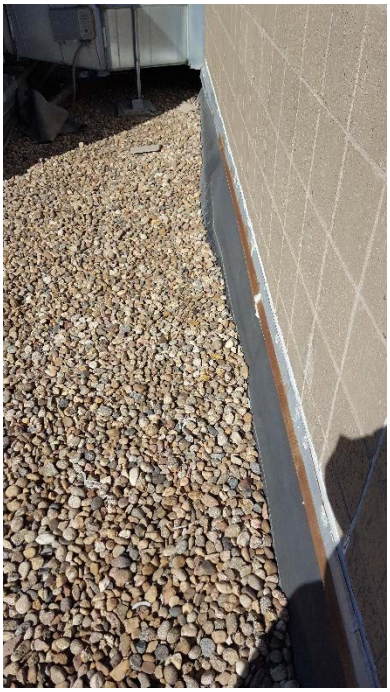
- Recommendations:
  - Replace the existing ballasted roof system with a fully adhered EPDM (Ethylene-Propylene-Diene-Monomer) roof system.
  - Replace the old reglet and flashing with new. Although saw-cutting into the existing grount joints and insterting a continuous strip of flashing would be preferred, it may introduce a whole new set of of problems in the future. Therefore, it is recommended that the same face-mounted application with a continuous seal along the top be utilized, paying close attention to the seals at all vertical grout joints behind the reglet.
- Estimated costs:
  - Approximate Roof Area = 4,500 SF

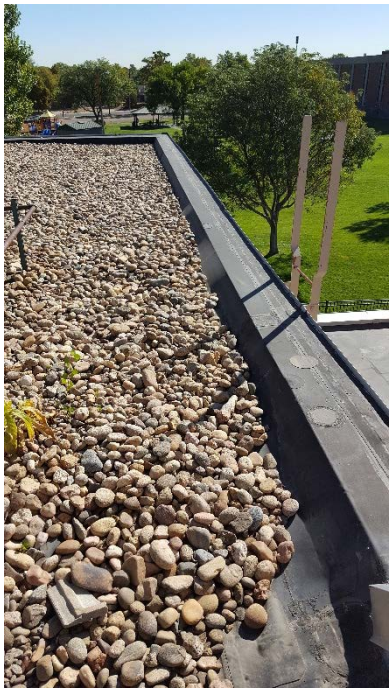
▪ Remove / salvage existing gravel	$0.47 / SF	=	$ 2,115
▪ Remove membrane	$0.45 / SF	=	$ 2,025
▪ Replace gravel stops	$12.00 / LF	=	$ 1,680
▪ Install cant stips	$3.73 / LF	=	$ 450
▪ Install new reglet + flashing	$4.82 / LF	=	$ 580
▪ Install new EPDM roofing (45 mil)	$2.30 / SF	=	$ 10,350
	Sub-total	**=**	**$ 17,200**

Roof Section 3

- Observations:
  3.1. Same as section 2
- Recommendations:
  - Same as section 2
- Estimated costs:
  - Approximate Roof Area = 4,500 SF

▪ Remove / salvage existing gravel	$0.47 / SF	=	$ 2,115
▪ Remove membrane	$0.45 / SF	=	$ 2,025
▪ Replace gravel stops	$12.00 / LF	=	$ 1,680
▪ Install cant stips	$3.73 / LF	=	$ 450
▪ Install new reglet + flashing	$4.82 / LF	=	$ 580
▪ Install new EPDM roofing (45 mil)	$2.30 / SF	=	$ 10,350
	Sub-total	**=**	**$ 17,200**





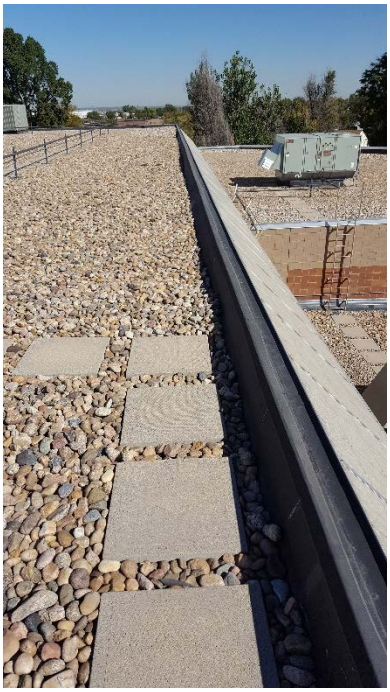
Roof Sections 4, 5 and 6

- Observations:
  4.1. Similar to previous sections, the existing membrane has detatched itself from the roof deck, walls, roof edges, and mechanical roof curbs.
- Recommendations:
  - Replace the existing ballasted roof system with a fully adhered EPDM (Ethylene-Propylene-Diene-Monomer) roof system.
- Estimated costs:
  - Approximate Roof Area = 11,500 SF

▪ Remove / salvage existing gravel	$0.47 / SF	=	$ 5,405
▪ Remove membrane	$0.45 / SF	=	$ 5,175
▪ Replace gravel stops	$12.00 / LF	=	$ 3,360
▪ Install cant stips	$3.73 / LF	=	$ 635
▪ Install new reglet + flashing	$4.82 / LF	=	$ 820
▪ Install new EPDM roofing (45 mil)	$2.30 / SF	=	$ 26,450
	Sub-total	**=**	**$ 41,845**

Roof Section 7

- Observations:
  7.1. This secton has already been re-roofed with an EPDM system since the original 1986 construction. No issues were observed. Installed 2001. Area 10,400 ft^2.
- Recommendations:
  - None
- Estimated costs:
  - None



Roof Section 8

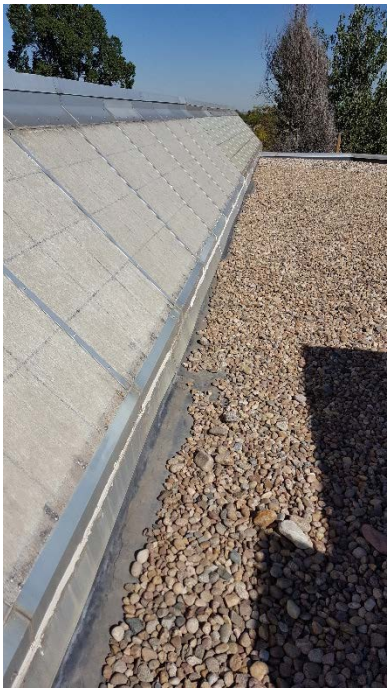
- Observations:
  8.1. There didn't appear to be any major issues within this section
- Recommendations:
  - Replace the existing ballasted roof system with a fully adhered EPDM (Ethylene-Propylene-Diene-Monomer) roof system regardless to avoid any potential issues in the future and to have a consistent roofing system for the entire building.
- Estimated costs:
  - Approximate Roof Area = 12,900 SF

▪ Remove / salvage existing gravel	$0.47 / SF	=	$ 6,065
▪ Remove membrane	$0.45 / SF	=	$ 5,805
▪ Replace gravel stops	$12.00 / LF	=	$ 1,920
▪ Install cant stips	$3.73 / LF	=	$ 1,195
▪ Install new EPDM roofing (45 mil)	$2.30 / SF	=	$ 29,670
	Sub-total	**=**	**$ 44,655**

Roof Section 9

- Observations:
  9.1. Similar to other sections, the existing membrane has detatched itself from the roof deck, walls, roof edges, and mechanical roof curbs.
- Recommendations:
  - Replace the existing ballasted roof system with a fully adhered EPDM (Ethylene-Propylene-Diene-Monomer) roof system.
- Estimated costs:
  - Approximate Roof Area = 2,200 SF

▪ Remove / salvage existing gravel	$0.47 / SF	=	$ 1,035
▪ Remove membrane	$0.45 / SF	=	$ 990
▪ Replace gravel stops	$12.00 / LF	=	$ 600
▪ Install cant stips	$3.73 / LF	=	$ 525
▪ Install new reglet + flashing	$4.82 / LF	=	$ 675
▪ Install new EPDM roofing (45 mil)	$2.30 / SF	=	$ 5,060
	Sub-total	**=**	**$ 8,885**



Roof Section 10

- Observations:
  - 10.1. Similar to other sections, the existing membrane has detatched itself from the roof deck, walls, roof edges, and mechanical roof curbs.
  - 10.2. The flashing system at the base of the skylights should overlap one another from the top down for proper drainage. It appears that the flashing above is inset from the flashing below, requiring sealant to close the gaps.
- Recommendations:
  - Replace the existing ballasted roof system with a fully adhered EPDM (Ethylene-Propylene-Diene-Monomer) roof system.
  - Replace the flashing at the base of the skylights with the proper base and counterflashing
- Estimated costs:
  - Approximate Roof Area = 5,900 SF

▪ Remove / salvage existing gravel	$0.47 / SF	=	$ 2,775
▪ Remove membrane	$0.45 / SF	=	$ 2,655
▪ Replace gravel stops	$12.00 / LF	=	$ 2,760
▪ Install cant stips	$3.73 / LF	=	$ 375
▪ Install new flashing	$7.00 / LF	=	$ 700
▪ Install new EPDM roofing (45 mil)	$2.30 / SF	=	$ 13,570
	Sub-total	**=**	**$ 22,835**

Summary

- Observations:
  - All roof areas, with exception to section 7, appeared to be well beyond their age and in need of replacement.
  - New leaks occur annually. Patching is required at least 2-3 times a year.
  - Drainage slopes appear to be working well. No history of standing water within any given area.
- Recommendations:
  - Replace all existing roof sections, except section 7, with a fully adhered EPDM system.
- Estimated costs:
  - Approximate Roof Area = 48,200 SF (excluding section 7)

Remove / salvage existing gravel	$0.47 / SF	=	$ 22,660
Remove membrane	$0.45 / SF	=	$ 21,690
Replace gravel stops	$12.00 / LF	=	$ 16,400
Install cant stips	$3.73 / LF	=	$ 5,230
Install new reglets + flashing	$4.82 / LF	=	$ 5,275
Install new EPDM roofing (45 mil)	$2.30 / SF	=	$110,860
	Total	**=**	**$182,115**

Assumptions

The following assumptions were made:

- The exsiting membrane at all roof sections, except section 7, is the original membrane from when the building was first constructed in 1986.
- The rigid insulation underneath the existing roof membrane is still intact and does not need to be replaced. If, after removing the old membrane, it is discovered that the rigid insulation needs to be replaced, use $1.10 per SF per 1” to calculate the estimated replacement costs.
- Costs were derived from RS Means 2016 and include O&P

Exclusions

The following excludions were made

- Contingencies
- Inflation costs

Appendix B

Building Recommendations

Farnsworth
GROUP

Recommended Replacement/ Capital Improvement 2 records

CHK-107-1 RECOMMENDED REPLACEMENT/ CAPITAL IMPROVEMENT HIGH

No lightning protection system currently exists at the facility. The facility experiences multiple lightning strikes per year, wreaking havoc on internal electrical and low voltage systems. Concurrent to roof replacement, implementation of building lightning protection would provide long term value to this facility.

Assigned To Matt Thomason
Asset Lightning Protection
Discipline Architectural
Due Date 10/17/2016
Created By Corey Chinn
Identified On 10/3/2016 11:15 AM

Over the years, 3 IT switches have been replaced at a cost of $9,000-$15,000 depending on type. The DVR was damaged this year at a cost of approximately $15,000.

Matt Thomason on **10/17/2016** at **09:37 AM**

Commerce City to provide $ cost for repairs from this years lightning strikes.

Corey Chinn on **10/11/2016** at **08:48 AM**

Recommended concurrent work with roof replacement.

Corey Chinn on **10/11/2016** at **08:46 AM**

CHK-106-1 RECOMMENDED REPLACEMENT/ CAPITAL IMPROVEMENT HIGH

Ballasted roof and parapet, well beyond useful life, continuous source of maintenance. Replacement recommended in accordance with attached FGI Roof Assessment Report.

Asset Roof
Roof
Discipline Architectural
Due Date 10/17/2016
Created By Corey Chinn
Identified On 10/3/2016 10:42 AM

Recommend concurrent work with addition of Lightning protection.

Corey Chinn on **10/11/2016** at **08:47 AM**

CxAlloy

Appendix C

Mechanical Recommendations

Recommended Maintenance 22 records

CHK-109-1 RECOMMENDED MAINTENANCE MODERATE

Comfort Issues Common to Space, Inconsistent room temp.

Asset RTU/9
RTU
RTU/9 VVTs
Zone- Admin Exterior
Admin Exterior
Discipline Mechanical
Due Date 10/26/2016
Created By Corey Chinn
Identified On 10/12/2016 11:34 AM

CHK-110-1 RECOMMENDED MAINTENANCE MODERATE

Comfort Issues Common to Space, inconsistent space temperature.

Asset RTU/2
RTU
RTU/2 VVTs
Zone- Admin Interior
Admin Interior
Discipline Mechanical
Due Date 10/26/2016
Created By Corey Chinn
Identified On 10/12/2016 11:26 AM

CHK-111-1 RECOMMENDED MAINTENANCE LOW

Comfort Issues Common to Space. lack of airflow

Asset RTU/6
RTU
Aerobics
Aerobics
Discipline Mechanical
Due Date 10/26/2016
Created By Corey Chinn
Identified On 10/12/2016 11:23 AM

CHK-112-2 RECOMMENDED MAINTENANCE LOW

Comfort Issues Common to Space, low airflow in spaces for cooling/heating.

Asset RTU/1
RTU
RTU/1 VVTs
Zone- Annex
Annex
Discipline Mechanical
Due Date 10/26/2016
Created By Corey Chinn
Identified On 10/12/2016 11:19 AM

CxAlloy

CHK-120-1 RECOMMENDED MAINTENANCE MODERATE

When exterior doors are opened air comes in (hot/cold).

Asset RTU/8
RTU
RTU/8 VVTs
Zone- Seniors
Seniors
Discipline Mechanical
Due Date 10/26/2016
Created By Corey Chinn
Identified On 10/12/2016 11:06 AM

Proper space pressurization and repair of the vestibule CUH should improve this issue.

Corey Chinn on **10/12/2016** at **11:06 AM**

CHK-9-1 RECOMMENDED MAINTENANCE LOW

Fan rusted on outside, seems to operate alright, no excessive noise. If used frequently, recommend replace.

Asset EF-9
Exhaust Fan
Kitchen
Seniors
Discipline Mechanical
Due Date 10/17/2016
Created By Corey Chinn
Identified On 10/3/2016 3:48 PM

Fan is used quite infrequently, seems to be operating well. Recommend Continuing maintenance, exterior grease duct could have the rust removed then paint with high temp epoxy paint and get another 10 years out of it.

Corey Chinn on **10/11/2016** at **08:50 AM**

CxAlloy

CHK-116-1 RECOMMENDED MAINTENANCE MODERATE

Pool doors propped open during site visit, Pool HVAC units in full heat to overcome OA at 65 degrees. Pool HVAC equipment operates to maintain the space at 88, 2 degrees above the pool water temperature of 86 degrees. opening doors to the exterior wastes energy and can cause the HVAC systems to loose control of the space conditions (temperature, relative humidity, etc.) which can in turn hinder control of pool water chemical treatment. Recommend maintenance emphasize importance of keeping doors closed.

Asset HRU/1
Pool
Pool
Discipline Mechanical
Due Date 10/17/2016
Created By Corey Chinn
Identified On 10/3/2016 2:48 PM

During meeting on 10/4 discussed lowering the space temperature set-point 1 degree F each week until space temp set-point is a minimum of 85 degrees or occupants complain that space is cold. Another opportunity for improving comfort in this space in the summer time would be to lower the relative humidity set-point, say from 50% to 40%, the perception to the folks on deck would be that the space is cooler.

Corey Chinn on **10/11/2016** at **08:45 AM**

Also note that ASHRAE does not recommend a space temperature greater than 85 degrees even with warmer water temps, so you could potentially reduce the space temperature set-point, especially in summer from 88 to 85 degrees and it may help with the doors. See attached ASHRAE guideline for Natatorium design conditions.

Corey Chinn on **10/03/2016** at **02:53 PM**

Note, you may consider lowering the pool temperature set-point to 84 degrees in the summer and resetting up in the winter. I know this may not be popular with the senior population, but most recreational pools we work with tend to keep the water temperature around 83 degrees.

Corey Chinn on **10/03/2016** at **02:51 PM**

CHK-118-1 RECOMMENDED MAINTENANCE MODERATE

Locker Rooms and Restrooms smells, under ventilated. Recommend further investigation to add the appropriate amount of exhaust and properly balance facility.

Asset RTU/3
RTU
RTU/3 VVTs
Zone- Reception
Reception
Discipline Mechanical
Due Date 10/17/2016
Created By Corey Chinn
Identified On 10/3/2016 2:34 PM

CHK-37-2 RECOMMENDED MAINTENANCE LOW

Filters in unit are loaded.

Asset RTU-13
RTU
Track SE
Track
Discipline Mechanical
Due Date 10/12/2016
Created By Brandon Howell
Identified On 9/28/2016 3:51 PM

Recommend replacing filters

Brandon Howell on **09/28/2016** at **03:51 PM**

CxAlloy

CHK-37-1 RECOMMENDED MAINTENANCE LOW

No Screen on OA intake

Asset RTU-13
RTU
Track SE
Track
Discipline Mechanical
Due Date 10/12/2016
Created By Brandon Howell
Identified On 9/28/2016 3:50 PM

Recommend installing screen or moisture eliminator on outside air intake

Brandon Howell on **09/28/2016** at **03:50 PM**

CHK-3-1 RECOMMENDED MAINTENANCE LOW

The top cap of fan has hail damage, no functional concern at this time.

Asset EF-2
Exhaust Fan
Restroom Seniors
Seniors
Discipline Mechanical
Due Date 10/11/2016
Created By Brandon Howell
Identified On 9/27/2016 3:24 PM

CxAlloy

CHK-6-1 RECOMMENDED MAINTENANCE LOW

Baffle and top cap of fan are damaged, most likely from hail. No Functional concern at this time.

Asset EF-6
Exhaust Fan
Workroom
Admin Interior
Discipline Mechanical
Due Date 10/11/2016
Created By Brandon Howell
Identified On 9/27/2016 3:13 PM

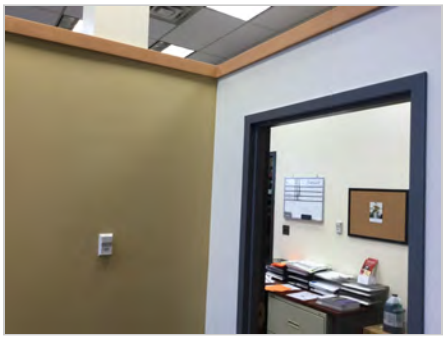
CHK-91-1 RECOMMENDED MAINTENANCE LOW

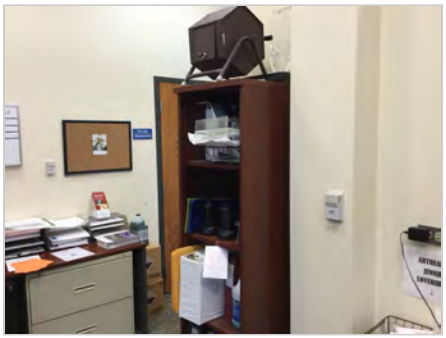
3 Thermostats in or near space. Not clear which controls VVT. Recommend labeling t-stats as to VVT and space served.

Assigned To Controls Contractor
Asset VVT-Senior Reception (RTU-8)
RTU/8 VVTs
Senior Reception
Seniors
Discipline Mechanical
Due Date 9/29/2016
Created By Brandon Howell
Identified On 9/15/2016 6:03 PM

Recommend ESCO label stat's in regards to VVT identifier and spaces served.

Corey Chinn on **10/11/2016** at **09:29 AM**





CxAlloy

CHK-19-1 RECOMMENDED MAINTENANCE MODERATE

Filters are loaded along with the coils, clean coils and replace filters.

Asset RTU/8
RTU
RTU/8 VVTs
Zone- Seniors
Seniors
Discipline Mechanical
Created By Brandon Howell
Identified On 9/14/2016 1:38 PM

CHK-17-1 RECOMMENDED MAINTENANCE HIGH

Belt on supply fan appears loose, tighten belt on supply fan, listed as high priority to prevent failure leading to repair required.

Asset RTU/6
RTU
Aerobics
Aerobics
Discipline Mechanical
Due Date 9/13/2016
Created By Corey Chinn
Identified On 9/14/2016 9:35 AM

CHK-21-3 RECOMMENDED MAINTENANCE HIGH

supply fan squeaking, align belts and pulleys, recommended maintenance priority, without attention could lead to repairs required.

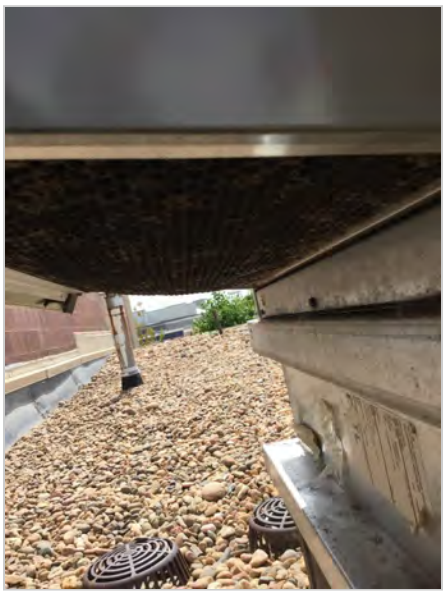
Asset RTU/10
RTU
Pool Offices
Pool Offices
Discipline Mechanical
Due Date 9/13/2016
Created By Corey Chinn
Identified On 9/14/2016 9:35 AM

CxAlloy

CHK-21-1 RECOMMENDED MAINTENANCE MODERATE

oa intake moisture eliminators full of cotton, recommend cleaning and adding to routine maintenance around beginning of July. Ag extension office indicates Cotton is at it's worst in late June, remedy after cotton has subsided and prior to peak Cooling season, also inspect Condenser coils at this time, subject to similar conditions.

Asset RTU/10
RTU
Pool Offices
Pool Offices
Discipline Mechanical
Due Date 9/13/2016
Created By Corey Chinn
Identified On 9/14/2016 9:35 AM



CHK-20-2 RECOMMENDED MAINTENANCE MODERATE

unit improperly labelled rtu/1, seems minor, but a consensus on Equipment names and clear understanding of area's served will lead to better communication and improved maintenance. Recommended zoning and naming convention attached, extracted from 1986, 1995, and 1998 drawings.

Asset RTU/9
RTU
RTU/9 VVTs
Zone- Admin Exterior
Admin Exterior
Discipline Mechanical
Due Date 9/13/2016
Created By Corey Chinn
Identified On 9/14/2016 9:35 AM

CxAlloy

FO-3-1 RECOMMENDED MAINTENANCE LOW

Fan has excessive noise and is vibrating. Maintenance necessary to prevent issue causing required repair.

Asset EF-5
Exhaust Fan
Workroom
Admin Interior
Discipline Mechanical
Due Date 9/13/2016
Created By Brandon Howell
Identified On 9/14/2016 9:03 AM

CHK-13-4 RECOMMENDED MAINTENANCE MODERATE

OA intake is clogged with cotton recommend cleaning and adding to routine maintenance around beginning of July. Ag extension office indicates Cotton is at it's worst in late June, remedy after cotton has subsided and prior to peak Cooling season, also inspect Condenser coils at this time, subject to similar conditions.

Asset RTU/2
RTU
RTU/2 VVTs
Zone- Admin Interior
Admin Interior
Discipline Mechanical
Due Date 9/13/2016
Created By Brandon Howell
Identified On 9/14/2016 9:03 AM

CHK-13-2 RECOMMENDED MAINTENANCE MODERATE

Filters are loaded, replace filters.

Asset RTU/2
RTU
RTU/2 VVTs
Zone- Admin Interior
Admin Interior
Discipline Mechanical
Due Date 9/13/2016
Created By Brandon Howell
Identified On 9/14/2016 9:03 AM

CxAlloy

CHK-13-1 RECOMMENDED MAINTENANCE HIGH

Fan belt/bearing squeaking, balance fan, align pulleys, check belt tension, lube bearings. High priority maintenance to prevent repair required.

Asset RTU/2
RTU
RTU/2 VVTs
Zone- Admin Interior
Admin Interior

Discipline Mechanical
Due Date 9/13/2016
Created By Brandon Howell
Identified On 9/14/2016 9:03 AM

CxAlloy

Recommended Repair 3 records

CHK-73-1 RECOMMENDED REPAIR LOW

Appears the VVT does not modulate and is constant volume.

Asset VVT-Crafts 1 (RTU-1)
RTU/1 VVTs
Crafts 1 West
Annex
Discipline Mechanical
Due Date 10/27/2016
Created By Brandon Howell
Identified On 10/13/2016 10:26 AM

CHK-112-1 RECOMMENDED REPAIR LOW

Too much noise from RTU in Multi-Purpose rooms.

Asset RTU/1
RTU
RTU/1 VVTs
Zone- Annex
Annex
Discipline Mechanical
Due Date 10/17/2016
Created By Corey Chinn
Identified On 10/3/2016 3:14 PM

Also, a sound dampening return boot and perhaps larger supply diffusers sized to reduce air noise and some acoustic liner in supply branch. Lots of relatively low cost ways to reduce air noise.

Corey Chinn on **10/11/2016** at **08:59 AM**

VVT zone may not be modulating, appears to be full airflow or no airflow, recommend ESCO confirm proper operation.

Corey Chinn on **10/11/2016** at **08:59 AM**

CHK-37-3 RECOMMENDED REPAIR LOW

Economizer not functioning properly.

Asset RTU-13
RTU
Track SE
Track
Discipline Mechanical
Due Date 10/12/2016
Created By Brandon Howell
Identified On 9/28/2016 3:51 PM

Recommend ESCO confirm minimum damper position set-points on all RTU's.

Corey Chinn on **10/11/2016** at **09:19 AM**

Appendix D

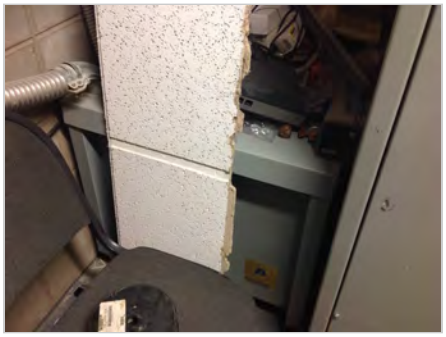
Electrical Recommendations

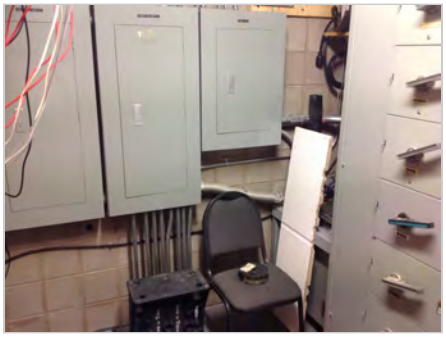
Recommended Maintenance 3 records

CHK-54-3 RECOMMENDED MAINTENANCE MODERATE

ELEC. RM 174 – Main Electrical Room - Remove items from in front and on top of transformer. Reduced airflow increases operating temperature and decreases service life of transformer.

Asset Electrical Power Building Service
Building Electrical Service
Discipline Electrical
Due Date 10/17/2016
Created By Corey Chinn
Identified On 10/3/2016 8:39 AM

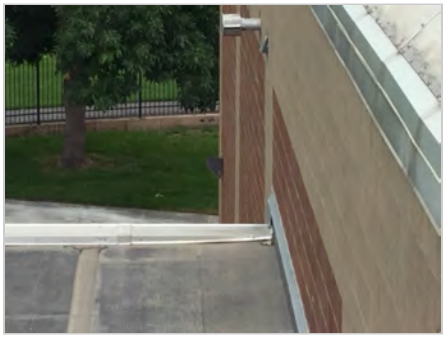




FO-1-1 RECOMMENDED MAINTENANCE MODERATE

wall pack light hanging by conductors, recommend remounting

Asset Exterior Building Lighting
Lighting- Exterior
Discipline Lighting
Due Date 9/13/2016
Created By Corey Chinn
Identified On 9/14/2016 9:35 AM



CxAlloy

CHK-20-1 RECOMMENDED MAINTENANCE LOW

no power to convenience receptacle, trouble shoot. Verify power connected to receptacle, locate breaker and confirm status. Suspect power has never been run to receptacle, if desired maintenance may wish to have a circuit pulled for Operations and Maintenance while servicing RTU/9.

Asset RTU/9
RTU
RTU/9 VVTs
Zone- Admin Exterior
Admin Exterior

Discipline Electrical
Due Date 9/13/2016
Created By Corey Chinn
Identified On 9/14/2016 9:35 AM

CxAlloy

Recommended Repair 1 records

CHK-54-1 RECOMMENDED REPAIR LOW

Locked access to building side of main distribution center, should be available for access by building maintenance and operations.

Asset Electrical Power Building Service
Building Electrical Service
Discipline Electrical
Due Date 10/10/2016
Created By Corey Chinn
Identified On 9/26/2016 4:24 PM

Lock on door at time of visit without facilities access, facilities cut and replaced lock during site visit. Door still recommended for repair.

Corey Chinn on **09/26/2016** at **04:24 PM**

CxAlloy

Recommended Replacement/ Capital Improvement 9 records

CHK-54-4 RECOMMENDED REPLACEMENT/ CAPITAL IMPROVEMENT LOW

Consider adding Transient Voltage Surge Suppressor or Surge Protection Device at exterior main distribution board. This will support surge protection due to power spikes, dips in service lines.

Asset Electrical Power Building Service
Building Electrical Service
Discipline Electrical
Due Date 11/9/2016
Created By Corey Chinn
Identified On 10/26/2016 3:54 PM

CHK-62-2 RECOMMENDED REPLACEMENT/ CAPITAL IMPROVEMENT MODERATE

Racquetball lights are a good candidate for replacement with LED for energy conservation and for reduced maintenance in high bay difficult access locations.

Asset Lighting: Reception
Lighting- Interior
Interior Lighting
Zone- Reception
Reception
Discipline Lighting
Due Date 10/21/2016
Created By Corey Chinn
Identified On 10/7/2016 4:42 PM

CHK-39-1 RECOMMENDED REPLACEMENT/ CAPITAL IMPROVEMENT LOW

Lighting in the offices could use updating and replacement. Good candidate for recessed grid mounted 2x4 indirect LED lighting with room vacancy switches. Consider dimming capabilities for LED's. Also there is a desire to update the lighting in the admin areas.

Asset Lighting: Admin Exterior
Lighting- Interior
Interior Lighting
Zone- Admin Exterior
Admin Exterior
Discipline Lighting
Due Date 10/21/2016
Created By Corey Chinn
Identified On 10/7/2016 4:29 PM

CHK-55-1 RECOMMENDED REPLACEMENT/ CAPITAL IMPROVEMENT LOW

Lighting in the interior offices could use updating and replacement. Good candidate for recessed grid mounted 2x4 indirect LED lighting with room vacancy switches.

Asset Lighting: Admin Interior
Lighting- Interior
Interior Lighting
Zone- Admin Interior
Admin Interior
Discipline Lighting
Due Date 10/21/2016
Created By Corey Chinn
Identified On 10/7/2016 4:25 PM

CHK-62-1 RECOMMENDED REPLACEMENT/ CAPITAL IMPROVEMENT MODERATE

Metal Halide fixtures high in space require lifts to change out bulbs, recommend replacing with LED for energy savings and improved maintenance.

Asset Lighting: Reception
Lighting- Interior
Interior Lighting
Zone- Reception
Reception
Discipline Lighting
Due Date 10/20/2016
Created By Corey Chinn
Identified On 10/6/2016 5:56 PM

CHK-60-1 RECOMMENDED REPLACEMENT/ CAPITAL IMPROVEMENT MODERATE

POOL – East pool area – replace insufficient and ineffective lighting in East pool area. Area has lower ceiling than rest of pool area and is open ceiling to structure. Existing direct-only downlights on perimeter of space aren't well suited to light the space. Recommend replacement with direct/indirect light source.

Asset Lighting: Pool
Lighting- Interior
Interior Lighting
Pool
Pool
Discipline Lighting
Due Date 10/17/2016
Created By Corey Chinn
Identified On 10/3/2016 5:12 PM

CHK-53-1 RECOMMENDED REPLACEMENT/ CAPITAL IMPROVEMENT MODERATE

PARKING LOT – add or modify lighting to reach owner-desired FC level in parking lots. Parking lots were observed during day, but owner complaint was registered regarding parking lot lighting. Poles were noted to be shorter than the surrounding properties. Shorter poles prevent the use of higher powered fixtures. Possible options:
• Add poles in areas that aren't covered by existing lighting.
• Use existing pole locations, but replace poles to increase pole height. Then replace existing fixtures with higher power LED fixtures.

Asset Site Lighting
Lighting- Exterior
Discipline Lighting
Due Date 10/17/2016
Created By Corey Chinn
Identified On 10/3/2016 9:46 AM

see attached file from Merit Electric, with prices and recommendations previously received by Commerce City

Corey Chinn on **10/03/2016** at **09:49 AM**

CxAlloy

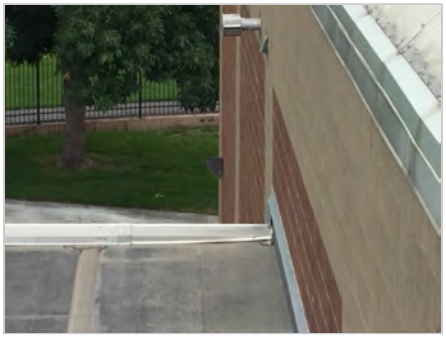
CHK-52-1 RECOMMENDED REPLACEMENT/ CAPITAL IMPROVEMENT

Exterior Building lights in need of replacement in many locations. Recommend ECM to replace with LED wall packs. For example the exterior wall pack on the East face of the SouthEast corner of the pool is suspended by the conductors feeding it.

Asset Exterior Building Lighting
Lighting- Exterior
Discipline Lighting
Due Date 10/17/2016
Created By Corey Chinn
Identified On 10/3/2016 8:46 AM

see attached file from Merit Electric with some replacement options, previously received by Commerce City

Corey Chinn on **10/03/2016** at **09:50 AM**



CHK-54-2 RECOMMENDED REPLACEMENT/ CAPITAL IMPROVEMENT MODERATE

Building Power distribution has no more space available in existing indoor panel boards.

Asset Electrical Power Building
Service
Building Electrical Service
Discipline Electrical
Due Date 10/10/2016
Created By Corey Chinn
Identified On 9/26/2016 4:31 PM

• From GE switchboard rep: “In looking at the pictures, it appears that you have a space on each side of an existing switch on top and on the bottom. Assuming that those are really spaces, you can convert those spaces in to switches, but it will be a whole lot easier just to procure new dual branch switches.”
• More research would be needed to determine the optimal upgrades, but it appears that expansion is possible with the existing equipment.

Corey Chinn on **10/03/2016** at **08:35 AM**

Does appear to be expandability from building service given space available in MDP; however, would require capital improvements to expand building side distribution.

Corey Chinn on **09/26/2016** at **04:31 PM**

CxAlloy

Energy Conservation Opportunity 4 records

CHK-56-1 ENERGY CONSERVATION OPPORTUNITY LOW

Dimmable LED fixtures could provide some opportunity for taking advantage of skylights for daylighting opportunities. Daylighting could be manual or automatic control, manual is probably sufficient.

Asset Lighting: Annex
Lighting- Interior
Interior Lighting
Zone- Annex
Annex
Discipline Lighting
Due Date 10/21/2016
Created By Corey Chinn
Identified On 10/7/2016 4:34 PM

CHK-57-1 ENERGY CONSERVATION OPPORTUNITY LOW

good candidate for vacancy sensors, manual on/auto off

Asset Lighting: Gymnasium 1&2
Lighting- Interior
Interior Lighting
Gymnasium 1 &2
Gymnasium 1 & 2
Discipline Lighting
Due Date 10/21/2016
Created By Corey Chinn
Identified On 10/7/2016 3:36 PM

CHK-58-1 ENERGY CONSERVATION OPPORTUNITY LOW

Good candidate for vacancy sensor, manual on/auto off. Appears to already be low voltage switches at reception desk.

Asset Lighting: Gymnasium 3
Lighting- Interior
Interior Lighting
Gymnasium 3
Gymnasium 3
Discipline Lighting
Due Date 10/21/2016
Created By Corey Chinn
Identified On 10/7/2016 3:10 PM

CHK-59-1 ENERGY CONSERVATION OPPORTUNITY LOW

Gymnastics space often empty, good candidate for vacancy sensor for manual on, auto off.

Asset Lighting: Gymnastics
Lighting- Interior
Interior Lighting
Gymnastics
Gymnastics
Discipline Lighting
Due Date 10/20/2016
Created By Corey Chinn
Identified On 10/6/2016 6:09 PM

CxAlloy

Closed 1 records

CHK-62-3 CLOSED LOW

Restroom and Locker room lights may be original and still T12's review with O&M staff. These lights could be a good candidate for replacement and given the fact that they are on continuous during occupied hours, may provide energy savings opportunity.

Asset Lighting: Reception
Lighting- Interior
Interior Lighting
Zone- Reception
Reception

Discipline Lighting
Due Date 10/21/2016
Created By Corey Chinn
Identified On 10/7/2016 4:46 PM

Matt Miller confirmed lamps are T8's. ECM and replacement, probably not recommended.

Corey Chinn on **10/12/2016** at **12:11 PM**

CxAlloy

Appendix E

Plumbing Recommendations

Recommended Maintenance 1 records

FO-1-4 RECOMMENDED MAINTENANCE LOW

Showers in locker rooms are slow to drain and subject to frequent back-ups. Review of the drawings indicates the shower drains are connected to 2" san lines, which seems small for a bank of 4 showers. Consider replacing shower heads with 1.5 gpm, also recommend scoping drains to verify condition and slope of drain piping to determine if remedial action is required. Avoid tieing into these lines with any expansion in the future, consider new drains for these areas if expansion or re-model comes close to this area.

Asset Sanitary Waste
Discipline Plumbing
Due Date 11/9/2016
Created By Corey Chinn
Identified On 10/26/2016 1:23 PM

CxAlloy

Recommended Repair 1 records

FO-1-3 RECOMMENDED REPAIR MODERATE

Plumbing fixtures all original, 1.5 gpm lavs, 2.5 gpm showers, 1.6 gpf water closets and urinals. All are beyond expected service life, recommend replacement program with water efficient fixtures: 0.5 GPM lavs, 1.5 GPM showers, 1 gpf w.c., .125 GPF urinals, etc.

Asset Plumbing Fixtures
Discipline Plumbing
Due Date 11/9/2016
Created By Corey Chinn
Identified On 10/26/2016 12:14 PM

CxAlloy

Recommended Replacement/ Capital Improvement 1 records

FO-3-2 RECOMMENDED REPLACEMENT/ CAPITAL IMPROVEMENT MODERATE

Water Softener system abandoned in year 2000. Plumbing systems and equipment have had ongoing issues associated with hard water, recommend replacing system.

Asset Water softeners
Discipline Plumbing
Due Date 11/9/2016
Created By Corey Chinn
Identified On 10/26/2016 12:04 PM

CxAlloy

Energy Conservation Opportunity 1 records

FO-1-2 ENERGY CONSERVATION OPPORTUNITY MODERATE

Domestic water heaters are a consistent source of maintenance headaches, water heaters are replaced rather frequently, would like to see system similar to Civic Center.

Asset Domestic Hot Water Generation/Distribution
Discipline Plumbing
Due Date 11/9/2016
Created By Corey Chinn
Identified On 10/26/2016 12:09 PM

Recommend combining replacement with Pool Boiler to take advantage of lower install cost and greater system flexibility and energy efficiency.

Corey Chinn on **10/26/2016** at **12:09 PM**

CxAlloy

Appendix F

Master Equipment List

Equipment/Asset Title	Service	Observed Condition	Year Installed	Remaining Life	Replacement Value
Roof	Entire Building	Very Poor	Various		
Domestic Hot Water					
Circ Pump	Upstairs Mechanical Room	Very Good	2009	3	$ 580.00
Water softeners	Entire Building	Very Poor	1986	-15	$ 2,900.00
WH-1A	Entire Building	Fair	2009	3	$ 15,000.00
WH-1B	Entire Building	Good	2014	8	$ 15,000.00
Plumbing Fixtures					
Lavatories	Entire Building	Fair	1986	-10	
Shower fixture	Entire Building	Fair	1986	-10	
Urinals	Entire Building	Fair	1986	-10	
Water closet	Entire Building	Fair	1986	-10	
Gas Service	Entire Building	Good	1986	10	
Lighting					
Exterior Building Lighting	Exterior Building	Poor	1986	-20	
Lighting: Admin Exterior	Zone- Admin Exterior	Fair	1996	-5	
Lighting: Admin Interior	Zone- Admin Interior	Fair	1996	-5	
Lighting: Annex	Zone- Annex	Good	1996	-5	
Lighting: Gymnasium 1&2	Gymnasium 1 &2	Very Good	2010	9	
Lighting: Gymnasium 3	Gymnasium 3	Very Good	2010	9	
Lighting: Gymnastics	Gymnastics	Very Good	2010	9	
Lighting: Pool High Bay	Pool	Good	2010	9	
Lighting: Pool pendants	Pool	Poor	1987	-14	
Lighting: Pool Office	Pool Offices	Good	1999	-2	
Lighting: Reception	Zone- Reception	Fair	1996	-5	
Lighting: Seniors	Zone- Seniors	Good	1996	-5	
Lighting: Track	Zone- Track	Fair	1996	-5	
Lighting: Weight Room	Weight Room	Good	1996	-5	
Lighting:Aerobics	Aerobics	Good	1996	-5	
Site Lighting	Parking Lot	Good	2016	25	
Electrical Power Building Service	Entire Building	Good	1986	10	
Natatorium HVAC Equipment					
Destratification fans	Pool	Fair	2008	7	$ 1,500.00
Dry cooler	Pool	Fair	2008	12	$ 4,450.00
HRU/1	Pool	Good	2008	7	$ 93,500.00
HRU/2	Pool	Good	2008	7	$ 93,500.00
PEF-1&2	Pool	Very Good	2008	12	$ 6,000.00
Pool Boiler 1	Pool	Fair	2006	15	$ 40,000.00
Pump 1	Pool	Fair	2006	10	$ 8,200.00
Steam Room boiler	Steam Room	Fair	2008	7	$ 4,300.00
Unitary HVAC Equipment					
CUH Daycare	Daycare- Exterior	Good	1995	-8	$ 2,500.00
CUH Main Entry	Main Entry Vestibule	Good	1995	-8	$ 2,500.00
CUH Seniors	Senior North	Fair	1995	-8	$ 2,500.00
EDC-1 Men's Locker	Mens Locker Room	Fair	1995	-8	$ 750.00
EDC-1 Women's Locker	Womens Locker Room	Fair	1995	-8	$ 750.00
EF-1	Restrooms Reception	Good	2008	12	$ 725.00
EF-10	Daycare- Interior	Good	1995	-1	$ 540.00
EF-11	Mens Locker Room	Good	1995	-1	$ 1,400.00
EF-12	Pool Equipment Room	Good	1995	-1	$ 1,400.00
EF-2	Restroom Seniors	Fair	2006	10	$ 540.00
EF-3	Breakroom 154	Good	2006	10	$ 725.00
EF-5	Workroom	Good	2006	10	$ 1,800.00
EF-6	Workroom	Fair	2006	10	$ 925.00
EF-7	Restrooms 182 & 183	Good	2006	10	$ 1,800.00
EF-8	Elevator Mech Room	Good	2006	10	$ 925.00
EF-9	Kitchen	Poor	1995	-1	$ 925.00
RCP-1	Senior	Not Installed	1995	-11	$ -
Roof Top Units and VVTs					
RTU-1	Zone- Annex	Good	2013	12	$ 57,000.00
VVT-Billiards (RTU-1)	Billiards Interior	Good	2008	12	$ 750.00
VVT-Bypass 3 (RTU-1)	Zone- Annex	Poor	2008	12	$ 750.00
VVT-Corridor (RTU-1)	Corridor	Good	2008	12	$ 750.00
VVT-Crafts 1 (RTU-1)	Crafts 1 West	Poor	2008	12	$ 750.00
VVT-Crafts 2 (RTU-1)	Crafts 2 East	Poor	2008	12	$ 750.00

VVT-Dance Interior (RTU-1)	Dance- Interior	Good	2008	12	$	750.00
VVT-Daycare Interior (RTU-1)	Daycare- Interior	Good	2008	12	$	750.00
VVT-Lobby (RTU-1)	Lobby Restrooms	Good	2008	12	$	750.00
VVT-Multi Purpose 1 (RTU-1)	Multi-Purpose 1	Good	2008	12	$	750.00
VVT-Multi Purpose 2 (RTU-1)	Multi-Purpose 2	Good	2008	12	$	750.00
RTU-2	Zone- Admin Interior	Fair	2008	7	$	9,600.00
VVT-Bypass 2 (RTU-2)	Zone- Admin Interior	Good	2008	12	$	750.00
VVT-Conference Rm (RTU-2)	Conference Rm	Good	2008	12	$	750.00
VVT-Office 116 (RTU-2)	Office 116	Good	2008	12	$	750.00
VVT-Office 117 (RTU-2)	Office 117	Good	2008	12	$	750.00
VVT-Reception (RTU-2)	Reception	Good	2008	12	$	750.00
VVT-Storage (RTU-2)	Storage	Good	2008	12	$	750.00
VVT-Workroom (RTU-2)	Workroom	Good	2008	12	$	750.00
RTU-3	Zone- Reception	Fair	2004	3	$	120,000.00
VVT-Corridor/Interior RRs (RTU-3)	Lobby Corridors	Good	2008	12	$	750.00
VVT-Corridor/Storage (RTU-3)	Locker Corridors	Good	2008	12	$	750.00
VVT-Fitness/Weights North (RTU-3)	Weight Room	Good	2008	12	$	750.00
VVT-Fitness/Weights South (RTU-3)	Weight Room	Good	2008	12	$	750.00
VVT-Raquetball Courts (RTU-3)	Raquetball Courts	Good	2008	12	$	750.00
VVT-Registration/Womens RR (RTU-3)	Registration	Good	2008	12	$	750.00
VVT-Track North (RTU-3)	Track NW	Good	2008	12	$	750.00
VVT-Track South (RTU-3)	Track SW	Good	2008	12	$	750.00
VVT-Workroom/Mens RR (RTU-3)	Workroom	Good	2008	12	$	750.00
RTU-4	Gymnasium 1 &2	Good	2004	3	$	81,000.00
RTU-5	Gymnastics	Fair	2011	10	$	33,660.00
RTU-6	Aerobics	Good	2013	12	$	13,820.00
RTU-7	Gymnasium 3	Good	2011	10	$	52,800.00
RTU-8	Zone- Seniors	Poor	1996	-5	$	35,400.00
VVT-Dance Exterior (RTU-8)	Dance- Exterior	Good	2008	12	$	750.00
VVT-Daycare Exterior (RTU-8)	Daycare- Exterior	Good	2008	12	$	750.00
VVT-Kitchen (RTU-8)	Kitchen	Good	2008	12	$	750.00
VVT-Senior North (RTU-8)	Senior North	Good	2008	12	$	750.00
VVT-Senior Office East (RTU-8)	Senior Offices East	Good	2008	12	$	750.00
VVT-Senior Offices West (RTU-8)	Senior Office West	Good	2008	12	$	750.00
VVT-Senior Reception (RTU-8)	Senior Reception	Good	2008	12	$	750.00
VVT-Senior South (RTU-8)	Senior South	Good	2008	12	$	750.00
RTU-9	Zone- Admin Exterior	Good	2013	12	$	8,700.00
VVT-Bypass 1 (RTU-9)	Zone- Admin Exterior	Good	2008	12	$	750.00
VVT-Exterior Offices (RTU-9)	Exterior Offices	Good	2008	12	$	750.00
VVT-Office 111 (RTU-9)	Office 111	Good	2008	12	$	750.00
VVT-Office 112 (RTU-9)	Office 112	Good	2008	12	$	750.00
RTU-10	Pool Offices	Very Good	2013	12	$	7,880.00
RTU-11	Track NW	Good	2013	12	$	12,000.00
RTU-12	Track NE	Good	2013	12	$	12,000.00
RTU-13	Track SE	Good	2013	12	$	12,000.00
RTU-14	Track SW	Good	2013	12	$	12,000.00

Appendix G

ECM Calculations

ECM Summary Table - Commerce City Recreation Center

1	2	3	4	5	6	7	8	9	10	11
ECM #	Description/Name[a]	ECM Capital Cost ($)	Annual Electricity Savings (kWh/yr)	Annual Electricity Savings ($/yr)	Annual Gas Savings (Therms/yr)	Annual Gas Savings ($/yr)	Annual Water Savings (gal/yr)	Annual Water Savings ($/yr)	Total Annual Utility Savings ($/yr)	Simple Payback[c] (yrs)
ECM 1:	Repair Economizer	$8,191	99,374	$8,546	0	$0	0	$0	$8,546	1.0
ECM 2:	Demand Control Ventilation	$1,935	3,611	$311	1,414	$863	0	$0	$1,173	1.6
ECM 3:	Boiler Plant Replacement	$107,485	0	$0	8,978	$5,477	0	$0	$5,477	19.6
ECM 4:	DDC Upgrade	$28,000	0	$0	0	$0	0	$0	$0	TBD
ECM 5:	HRU: Modulating Gas Furnace						0	$0	$0	TBD
ECM 6:	Lighting Controls	$1,298	1,614	$139	0	$0	0	$0	$139	9.4

[a] All ECM economic calculations are performed as an opinion of probable cost.

[b] ECM design cost is not factored into the simple payback calculations.

[c] Simple payback for ECM is the adjusted payback based on an energy efficient upgrade over like-kind replacement cost.

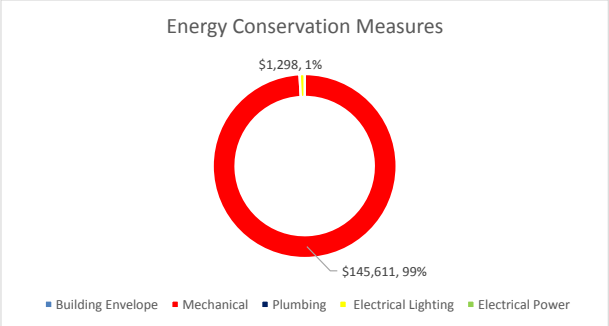
ECM Summary Table - Column Descriptions

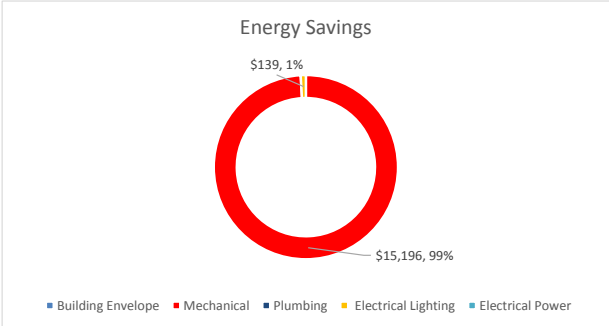
1	Energy Conservation Measure #.
2	Description of the ECM.
3	ECM Capital Cost. Difference in opinion of capital cost between replacing existing equipment with similar efficiency and higher efficiency.
4-9	Annual energy savings and utility expense savings for Electricity, Gas and Water.
10	Annual utility savings in $/year. The sum of 5, 7 and 9. Used to calculate Simple Payback (column 11).
11	Simple Payback 10 divided by 3.

Electric Cost Per kWh	Gas Cost Per Therm	Water Cost Per 1000 gals
0.86 $/kWh	0.6100 $/Therm	5.1000 $/1000 gals

	Annual kWh Savings	Annual Therms Savings	Annual Gallons Savings	Total Combined Dollar Savings ($)
Electric	102,985			$88,567
Natural Gas		10,392		$6,339
Water			-	$0
Total Combined Savings				$94,906

	savings	cost
Building Envelope		
Mechanica	$15,196	$145,611
Plumbing		
Electrical L	$139	$1,298
Electrical Power		





Add Economizer

DATE: 20-Oct-2016

Opportunity Narrative and Special Considerations:

This ECM is a result of correcting the economizer operation of all RTUs. The units economizer control were not functioning correctly at the time of our site visit. Correction would require a service call from your service contractor, ESCO. The savings are realized from reducing the compressor energy for cooling.

Energy/Water Savings Summary

GAS:	0	Therm,	0 MMBtu,	savings of	$	-	per year
ELECTRIC:	99,374	kWh,	339 MMBtu,	savings of	$	8,546	per year
WATER:	0	x1,000 Gal,		savings of	$	-	per year
SEWER:	0	x1,000 Gal,		savings of	$	-	per year
TOTAL ENERGY SAVINGS:			**339 MMBtu,**	**$ SAVINGS:**	**$**	**8,546**	**per year**

Adjustment Factor of 0% applied

Project Accounting Summary

Programmed Amount Cost:	**$ 8,191**	**Simple Payback Period (yrs):**	**0.96**
Economic Analysis Period:	**10 years**	**Savings to Investment Ratio (SIR):**	**10.43**

Global Assumptions:

Utility Rates:

Gas-- $ 0.6100 /therm, Electric-- $ 0.0860 /kWh, Water-- $5.14 /1,000 Gal Sewer-- $3.63 /1,000 Gal

Assumptions:

[a]	Discharge air temperature (DAT) in economizer mode:	55	ºF
[b]	Return air temperature (RAT) in economizer mode:	71	ºF
[c]	Minimum economizer damper position in economizer mode:	15%	
[d]	Supply air flow rate:	85,310	CFM
[e]	Minimum outdoor air flow rate:	21,032	CFM
[f]	Cooling Efficiency:	1.2	kW/Ton

Calculations:

[1] Outdoor Air CFM = ((DAT * SA CFM) - (RAT * SA CFM)) / (OAT - RAT)
[2] Mixed Air Temp. = ((OA CFM * OAT) + (RA CFM * RAT)) / (SA CFM)
[3] Cooling Coil ΔT = Mixed Air Temperature - Discharge Air Temperature
[4] Energy Consumption = (1.08 * SA CFM * ΔT * BIN hours * Chiller Efficiency) / (12,000 Btu/Ton)
[5] Outdoor Air CFM = (SA CFM * Existing max economizer damper position)
[6] Total Annual Energy Savings = (Existing Annual Energy Consumption - ECM Annual Energy Consumption)

ECM Annual Energy Consumption in Economizer Mode						
BIN Temperature MID-Points	BIN Hours	Outdoor Air CFM [1]	Return Air CFM	Mixed Air Temperature [2]	Cooling Coil ΔT [3]	Energy Consumption (kWh) [4]
71	183	21,032	64,278	71.0	16.0	26,977
69	299	21,032	64,278	70.5	15.5	42,719
67	205	21,032	64,278	70.0	15.0	28,358
65	202	85,310	0	65.0	10.0	18,611
63	216	85,310	0	63.0	8.0	15,921
61	225	85,310	0	61.0	6.0	12,438
59	121	85,310	0	59.0	4.0	4,459
57	201	85,310	0	57.0	2.0	3,704
55	192	85,310	0	55.0	0.0	0
Total Energy Consumption with a Full Operating Economizer Damper (kWh):						**153,187**

Existing Annual Energy Consumption in Economizer Mode						
BIN Temperature MID-Points	BIN Hours	Outdoor Air CFM [5]	Return Air CFM	Mixed Air Temperature [2]	Cooling Coil ΔT [3]	Energy Consumption (kWh) [4]
71	183	12,797	72,514	71.0	16.0	26,977
69	299	12,797	72,514	70.7	15.7	43,251
67	205	12,797	72,514	70.4	15.4	29,087
65	202	12,797	72,514	70.1	15.1	28,103
63	216	12,797	72,514	69.8	14.8	29,454
61	225	12,797	72,514	69.5	14.5	30,059
59	121	12,797	72,514	69.2	14.2	15,831
57	201	12,797	72,514	68.9	13.9	25,742
55	192	12,797	72,514	68.6	13.6	24,058
Total Energy Consumption with a 50% Operating Economizer (kWh):						**252,561**

ECM Savings		
Existing Annual Energy Consumption in Economizer Mode (kWh)	ECM Annual Energy Consumption in Economizer Mode (kWh)	Total Annual Energy Savings (kWh) [6]
252,561	153,187	99,374

Add Economizer

DATE: 20-Oct-2016

Opportunity Narrative and Special Considerations:

This ECM is a result of correcting the economizer operation of all RTUs. The units economizer control were not functioning correctly at the time of our site visit. Correction would require a service call from your service contractor, ESCO. The savings are realized from reducing the compressor energy for cooling.

Item	Description	Quantity	Units	Unit Labor	Total Labor ($)	Unit Material	Total Material ($)	Total Cost ($)
1	Control Programming	14	ls	$ 500	$ 7,000	$ -	$ -	$ 7,000
2								
3								
				Construction Cost Subtotals:	$ 7,000		$ -	$ 7,000
				Contractor Labor & Material Mark-up:	$ 1,750		$ -	$ 1,750
				Construction Cost Totals:	$ 8,750		$ -	$ 8,750
				Labor Adjusted for Region Factor:	$ 7,446			$ 7,446
SIOH				10%	per appendix EE			$ 745
Design Cost				0%	per appendix EE			$ -
Cost Subtotal:								$ 8,191
Salvage Value of Existing Equipment								$ -
Public Utility Company Rebate Incentive								$ -
Programmed Amount Cost								$ 8,191

Demand Control Ventilation

DATE: 20-Oct-2016

Opportunity Narrative and Special Considerations:

Recommend adding demand control ventilation for the the units that are called upon to operate during normally occupied hours, but the spaces are intermittently occupied. Demand control ventilation would require the monitoring of space air contaminants, primarily CO2, to allow the OA dampers to close below the code minimum rate without demand control ventilation. it's also important that the building maintain positive pressurization during these times so spaces with relatively high transfer air for space exhaust should be avoided. We recommend implementation for RTU/4, 5, 6, and 7 (Gymnasium 1&2, 3, Aerobics, and Gymnastics). The savings estimate may be low, it's based upon the assumption that the current min OA damper position is 15% across the board, similar to the economizer calc, if the percentage is higher, the savings here will increase, the economizer savings will decrease in proportion.

Energy/Water Savings Summary

GAS:	1,414	Therm,	141	MMBtu,	savings of	$ 863	per year
ELECTRIC:	3,611	kWh,	12	MMBtu,	savings of	$ 311	per year
WATER:	0	x1,000 Gal,			savings of	$ -	per year
SEWER:	0	x1,000 Gal,			savings of	$ -	per year
TOTAL ENERGY SAVINGS:			**154**	**MMBtu,**	**$ SAVINGS:**	**$ 1,173**	**per year**
Adjustment Factor of		0% applied					

Project Accounting Summary

Programmed Amount Cost:	**$ 1,935**	**Simple Payback Period (yrs):**	**1.65**
Economic Analysis Period:	**20 years**	**Savings to Investment Ratio (SIR):**	**12.12**

Global Assumptions:

Utility Rates:

Gas-- $ 0.6100 /therm, Electric-- $ 0.0860 /kWh, Water-- /1,000 Gal Sewer-- /1,000 Gal

Assumptions:

[a]	Cooling Discharge air temperature (DAT):	55	ºF
[b]	Return air temperature (RAT):	72	ºF
[c]	Existing minimum OA damper position:	15%	
[d]	Supply air flow rate:	31,365	CFM
[e]	Existing minimum outdoor air flow rate:	5,850	CFM
[f]	Existing return air CFM:	25,515	
[g]	Cooling Efficiency:	1.2	kW/Ton
[h]	Mechanical Cooling is locked out below:	40.0	
[i]	ECO Average OA percent	11.0%	
[j]	ECO Minimum outdoor air flow	3,360.0	
[k]	ECO Return air flow	28,005.0	
[l}	Gas Furnace Efficiency	0.8	

Calculations:

[1] Energy (BTU) = 1.08 x CFM x(MAT - DAT) x Bin Hours
[2] Heating Energy (therms) = [1] * Burner efficiency/100000
[3] Energy (Ton-hrs) = [1] / 12000
[4] Energy (kWh) = [3] x Chiller efficiency
[5] Energy Savings = Existing Energy - ECO Energy
[6] Total Annual Energy Savings = (Existing Annual Energy Consumption - ECM Annual Energy Consumption)

ECM Annual Cooling Energy Consumption

		Existing Energy Calculations			ECO Energy Calculations			Savings
BIN Temperature MID-Points	BIN Hours	[1] Existing Energy (BTU)	[3] Existing Energy (Ton-hrs)	[4] Existing Energy (kWh)	[1] ECO Energy (BTU)	[3] ECO Energy (Ton-hrs)	[4] ECO Energy (kWh)	[5] Energy Savings (kWh)
105	1	208,494	17.4	20.8	119,750	10.0	12	9
103	2	391,716	32.6	39.2	224,986	18.7	22	17
101	2	366,444	30.5	36.6	210,470	17.5	21	16
99	4	682,344	56.9	68.2	391,910	32.7	39	29
97	18	2,843,100	236.9	284.3	1,632,960	136.1	163	121
95	7	1,017,198	84.8	101.7	584,237	48.7	58	43
93	45	5,970,510	497.5	597.1	3,429,216	285.8	343	254
91	67	8,042,814	670.2	804.3	4,619,462	385.0	462	342
89	94	10,096,164	841.3	1,009.6	5,798,822	483.2	580	430
87	158	14,973,660	1,247.8	1,497.4	8,600,256	716.7	860	637
85	107	8,788,338	732.4	878.8	5,047,661	420.6	505	374
83	149	10,355,202	862.9	1,035.5	5,947,603	495.6	595	441
81	155	8,813,610	734.5	881.4	5,062,176	421.8	506	375
79	146	6,456,996	538.1	645.7	3,708,634	309.1	371	275
77	82	2,590,380	215.9	259.0	1,487,808	124.0	149	110
75	171	3,241,134	270.1	324.1	1,861,574	155.1	186	138
							Total Savings	3,611

ECM Annual Heating Energy Consumption

BIN Temperature MID-Points	BIN Hours	[1] Existing Energy (BTU)	[2] Existing Energy (Therms)	[1] ECO Energy (BTU)	[2] ECO Energy (therms)	[5] Energy Savings (Therms)
59	121	7,950,571	63.6	5,708,102	45.7	18
57	201	15,239,016	121.9	10,940,832	87.5	34
55	192	16,497,562	132.0	11,844,403	94.8	37
53	195	18,726,552	149.8	13,444,704	107.6	42
51	283	30,038,299	240.3	21,565,958	172.5	68
49	204	23,715,245	189.7	17,026,330	136.2	54
47	213	26,914,680	215.3	19,323,360	154.6	61
45	209	28,521,979	228.2	20,477,318	163.8	64
43	222	32,540,227	260.3	23,362,214	186.9	73
41	116	18,175,622	145.4	13,049,165	104.4	41
39	226	37,695,715	301.6	27,063,590	216.5	85
37	184	32,550,336	260.4	23,369,472	187.0	73
35	228	42,638,918	341.1	30,612,557	244.9	96
33	313	61,699,061	493.6	44,296,762	354.4	139
31	175	36,265,320	290.1	26,036,640	208.3	82
29	149	32,383,541	259.1	23,249,722	186.0	73
27	120	27,293,760	218.4	19,595,520	156.8	62
25	144	34,208,179	273.7	24,559,718	196.5	77
23	65	16,098,264	128.8	11,557,728	92.5	36
21	88	22,684,147	181.5	16,286,054	130.3	51
19	76	20,359,123	162.9	14,616,806	116.9	46
17	36	10,007,712	80.1	7,185,024	57.5	23
15	42	12,100,234	96.8	8,687,347	69.5	27
13	19	5,665,982	45.3	4,067,885	32.5	13
11	17	5,241,413	41.9	3,763,066	30.1	12
9	17	5,413,262	43.3	3,886,445	31.1	12
7	7	2,299,752	18.4	1,651,104	13.2	5
5	4	1,354,579	10.8	972,518	7.8	3
3	7	2,441,275	19.5	1,752,710	14.0	6
					Total Savings	1,414

Demand Control Ventilatio

DATE: 20-Oct-2016

Equip. Tag: 0

Opportunity Narrative and Special Considerations:

Recommend adding demand control ventilation for the the units that are called upon to operate during normally occupied hours, but the spaces are intermittently occupied. Demand control ventilation would require the monitoring of space air contaminants, primarily CO2, to allow the OA dampers to close below the code minimum rate without demand control ventilation. it's also important that the building maintain positive pressurization during these times so spaces with relatively high transfer air for space exhaust should be avoided. We recommend implementation for RTU/4, 5, 6, and 7 (Gymnasium 1&2, 3, Aerobics, and Gymnastics). The savings estimate may be low, it's based upon the assumption that the current min OA damper position is 15% across the board, similar to the economizer calc, if the percentage is higher, the savings here will increase, the economizer savings will decrease in proportion.

Item	Description	Quantity	Units	Unit Labor	Total Labor ($)	Unit Material	Total Material ($)	Total Cost ($)
1	Control Programming	1	ls	$ 500	$ 500		$ -	$ 500
2	CO2 Sensor	3	ea	$ 50	$ 150	$ 250	$ 750	$ 900
				Construction Cost Subtotals:	$ 650		$ 750	$ 1,400
				Contractor Labor & Material Mark-up: 25%	$ 163		$ 188	$ 350
				Construction Cost Totals:	$ 813		$ 938	$ 1,750
				Labor Adjusted for Region Factor:	$ 691			$ 1,629
SIOH				10%	per appendix EE			$ 163
Design Cost				8%	per appendix EE			$ 143
Cost Subtotal:								$ 1,935
Salvage Value of Existing Equipment								$ -
Public Utility Company Rebate Incentive								$ -
Programmed Amount Cost								$ 1,935

Boiler Plant Upgrade

DATE: 20-Oct-2016

Opportunity Narrative and Special Considerations:

This ECM calculates the savings from replacing the boiler plant with a higher efficient system. Replacement would be recommended with 2 boilers each sized at 100% of the peak expected simultaneous load to provide for redundancy, space for the heating plant should be allocated with the planned therapy pool and the therapy pool load could be figured in as well, for the most cost effective approach. In depth integrated design would likely have a stronger return on investment in our opinion, the cost of this programmed amount has not been reduced by the amount which the existing system replacement would cost, with replacement cost figured in we'd expect this ECO to pay for itself in year 1 as a combined plant would likely have a lower/similar cost to the seperated plants. This should be a strong consideration when planning for the therapy pool expansion.

Energy/Water Savings Summary

GAS:	8,978 Therm,	898 MMBtu,	savings of	$	5,477	per year
ELECTRIC:	0 kWh,	0 MMBtu,	savings of	$	-	per year
WATER:	0 x1,000 Gal,		savings of	$	-	per year
SEWER:	0 x1,000 Gal,		savings of	$	-	per year
TOTAL ENERGY SAVINGS:		**898 MMBtu,**	**$ SAVINGS:**	**$**	**5,477**	**per year**

Adjustment Factor of 0% applied

Project Accounting Summary

Programmed Amount Cost:	**$ 107,485**	**Simple Payback Period (yrs):**	**19.63**
Economic Analysis Period:	**20 years**	**Savings to Investment Ratio (SIR):**	**1.02**

Global Assumptions:

Utility Rates:

Gas-- $ 0.6100 /therm, Electric-- $ 0.0860 /kWh, Water-- $5.14 /1,000 Gal Sewer-- $3.63 /1,000 Gal

Assumptions:

[a] Yearly Natural Gas Consumption of [E] Existing Pool and Domestic HW Boilers:	35,633	Therms
[b] Existing Boiler Efficiency (derated for age, hx efficiency, and fouling):	76%	
[c] ECM Boiler Efficiency:	94%	

CALCULATIONS:

[1] $Therms_{(E)}$ = Yearly Gas Consumption * Boiler Percentage

[2] $Therms_{(ECM)} = Therms_{(E)} * (1-((1 / Efficiency_{(E)}) - (1 / Efficiency_{(ECM)})))$

[3] Boiler Therm Savings = $Therms_{(E)} - Therm_{(ECM)}$

BOILER SAVINGS CALCULATIONS:

(E) Therms [1]	(ECM) Therms [2]	Boiler Therm Savings [3]
35,633	26,655	8,978
Annual Gas Therm Savings:		**8,978**

Add Economizer

DATE: 20-Oct-2016

Opportunity Narrative and Special Considerations:

This ECM calculates the savings from replacing the boiler plant with a higher efficient system. Replacement would be recommended with 2 boilers each sized at 100% of the peak expected simultaneous load to provide for redundancy, space for the heating plant should be allocated with the planned therapy pool and the therapy pool load could be figured in as well, for the most cost effective approach. In depth integrated design would likely have a stronger return on investment in our opinion, the cost of this programmed amount has not been reduced by the amount which the existing system replacement would cost, with replacement cost figured in we'd expect this ECO to pay for itself in year 1 as a combined plant would likely have a lower/similar cost to the seperated plants. This should be a strong consideration when planning for the therapy pool expansion.

Item	Description	Quantity	Units	Unit Labor	Total Labor ($)	Unit Material	Total Material ($)	Total Cost ($)
1	Demo Existing Boiler	2	ea	$2,225	$4,450	$0	$0	$4,450
2	Condensing Boiler (990 MBH)	2	ea	$9,263	$18,525	$28,000	$56,000	$74,525
3	3-inch pipe (Steel)	20	lf	$19	$385	$32	$640	$1,025
4	fittings (Steel)	1	ls	$154	$154	$206	$206	$360
4	3-inch pipe (PVC Flue)	40	lf	$16	$626	$11	$442	$1,068
5	fittings (PVC)	1	ls	$250	$250	$127	$127	$377
3								
				Construction Cost Subtotals:	$ 24,390		$ 57,415	$ 81,805
				Contractor Labor & Material Mark-up:	25%	$ 6,098	$ 14,354	$ 20,451
				Construction Cost Totals:	$ 30,488		$ 71,769	$ 102,257
				Labor Adjusted for Region Factor:	$ 25,945			$ 97,714
SIOH				10%	per appendix EE			$ 9,771
Design Cost				0%	per appendix EE			$ -
Cost Subtotal:								$ 107,485
Salvage Value of Existing Equipment								$ -
Public Utility Company Rebate Incentive								$ -
Programmed Amount Cost								$ 107,485

DDC Upgrade

DATE: 20-Oct-2016

Opportunity Narrative and Special Considerations:

The savings for the DDC upgrade are to be determined. Program amount cost is shown below. Providing for local operability of DDC controls is crucial to Commerce City's ability to meet the comfort needs of the occupants and provides the basic tool for implementing recommendations and tracking operational success. That which gets measured gets managed, an on-site user interface helps you accomplish this. ESCO is your current temperature controls provider and they have provided costing for the basic implementation of on site controls graphics and access.

Energy/Water Savings Summary

GAS:	0 Therm,	0 MMBtu,	savings of	$	-	per year
ELECTRIC:	0 kWh,	0 MMBtu,	savings of	$	-	per year
WATER:	0 x1,000 Gal,		savings of	$	-	per year
SEWER:	0 x1,000 Gal,		savings of	$	-	per year
TOTAL ENERGY SAVINGS:		**0 MMBtu,**	**$ SAVINGS:**	**$**	**-**	**per year**
Adjustment Factor of	0% applied					

Project Accounting Summary

Programmed Amount Cost:	**$ 28,000**	**Simple Payback Period (yrs):**	**#DIV/0!**
Economic Analysis Period:	**10 years**	**Savings to Investment Ratio (SIR):**	**0.00**

Global Assumptions:

Utility Rates:

Gas-- $ 0.6100 /therm, Electric-- $ 0.0860 /kWh, Water-- $5.14 /1,000 Gal Sewer-- $3.63 /1,000 Gal

DDC Upgrade

DATE: 20-Oct-2016

Opportunity Narrative and Special Considerations:

The savings for the DDC upgrade are to be determined. Program amount cost is shown below. Providing for local operability of DDC controls is crucial to Commerce City's ability to meet the comfort needs of the occupants and provides the basic tool for implementing recommendations and tracking operational success. That which gets measured gets managed, an on-site user interface helps you accomplish this. ESCO is your current temperature controls provider and they have provided costing for the basic implementation of on site controls graphics and access.

Item	Description	Quantity	Units	Unit Labor	Total Labor ($)	Unit Material	Total Material ($)	Total Cost ($)
1	Controls Upgrade Cost	1	ea	$0	$0	$28,000	$28,000	$28,000
				Construction Cost Subtotals:	$ -		$ 28,000	$ 28,000
				Contractor Labor & Material Mark-up:	0%	$ -		$ -	$ -
				Construction Cost Totals:	$ -		$ 28,000	$ 28,000
				Labor Adjusted for Region Factor:	$ -			$ 28,000
SIOH				0%	per appendix EE			$ -
Design Cost				0%	per appendix EE			$ -
Cost Subtotal:								$ 28,000
Salvage Value of Existing Equipment								$ -
Public Utility Company Rebate Incentive								$ -
Programmed Amount Cost								$ 28,000

Modulating Gas Furnace

DATE: 31-Oct-2016

Opportunity Narrative and Special Considerations:

This ECO combines several opportunities, The current gas burners have only 2 position control which causes the space to overheat. Additionally, the exterior doors to the pool space are often left open. Opening the doors to the exterior, wastes energy and can cause the HVAC systems to loose control of the space conditions (temperature, relative humidity, etc.) In order to capture the effect of leaving the doors open during the summer months, the space temperature is approximated at 89°F.

Energy/Water Savings Summary

GAS:	804 Therm,	80 MMBtu,	savings of	$	490	per year
ELECTRIC:	0 kWh,	0 MMBtu,	savings of	$	-	per year
WATER:	0 x1,000 Gal,		savings of	$	-	per year
SEWER:	0 x1,000 Gal,		savings of	$	-	per year
TOTAL ENERGY SAVINGS:		80 MMBtu,	$ SAVINGS:	$	490	per year
Adjustment Factor of	0% applied					

Project Accounting Summary

Programmed Amount Cost:	$ 8,927	Simple Payback Period (yrs):	18.20
Economic Analysis Period:	10 years	Savings to Investment Ratio (SIR):	0.55

Global Assumptions:

Utility Rates:

Gas-- $ 0.6100 /therm, Electric-- $ 0.8600 /kWh, Water-- $5.140 /1,000 Gal Sewer-- $3.6300 /1,000 Gal

Assumptions:

[a] Existing Building U-Factor:	0.0486381	Btu/hr*ft^2*°F
[b] Total Space Area:	10,370	ft^2
[c] Existing Heating Setpoint:	88	°F
[d] ECO Heating Setpoint:	85	°F
[e] Heating Efficiency:	80%	
[f]: Min Outside Airflow	5,000	CFM

CALCULATIONS:

[1] Heating Delta-T = Heating Setpoint - BIN Temp Mid-pts
[2] Heating Delta-T Set-Back = Heating Set-Back Setpoint - Bin Temp Mid-pts
[3]Gas Heating BTU = Building U-value * Building Area * BIN Hours * Heating Delta-T
[4]OA Heating BTU = (1.08 * Min OA Flow * Delta-T * BIN Hours)

Occupied Existing				
CONDUCTION HEATING SAVINGS CALCULATIONS: Annual				OA HEATING CALCS: Annual
BIN Temp Mid-pts	BIN Hours (E)	Heating Delta-T [1]	Gas Heating BTU [3]	OA Gas Heating BTU [4]
87	145	1	73,135	783,000
85	98	3	148,287	1,587,600
83	133	5	335,411	3,591,000
81	134	7	473,106	5,065,200
79	124	9	562,885	6,026,400
77	71	11	393,919	4,217,400
75	134	13	878,625	9,406,800
73	125	15	945,708	10,125,000
71	136	17	1,166,121	12,484,800
69	223	19	2,137,047	22,879,800
67	142	21	1,504,054	16,102,800
65	145	23	1,682,099	18,009,000
63	156	25	1,967,072	21,060,000
61	172	27	2,342,329	25,077,600
59	94	29	1,374,933	14,720,400
57	146	31	2,282,812	24,440,400
55	154	33	2,563,246	27,442,800
53	145	35	2,559,715	27,405,000
51	217	37	4,049,646	43,356,600
49	153	39	3,009,620	32,221,800
47	163	41	3,370,754	36,088,200
45	162	43	3,513,493	37,616,400
43	147	45	3,336,457	35,721,000
41	82	47	1,943,871	20,811,600
39	151	49	3,731,889	39,954,600
37	126	51	3,241,129	34,700,400
35	152	53	4,063,265	43,502,400
33	208	55	5,770,078	61,776,000
31	109	57	3,133,697	33,550,200
29	95	59	2,827,036	30,267,000
27	73	61	2,245,993	24,046,200
25	103	63	3,272,905	35,040,600
23	36	65	1,180,243	12,636,000
21	46	67	1,554,491	16,642,800
19	48	69	1,670,498	17,884,800
17	26	71	931,081	9,968,400
15	21	73	773,211	8,278,200
13	9	75	340,455	3,645,000
11	15	77	582,556	6,237,000
9	8	79	318,767	3,412,800
7	3	81	122,564	1,312,200
5	1	83	41,863	448,200
3	4	85	1,836,000	
Subtotal Heating BTU/yr:			78,587,552	841,379,400
		Total		919,966,952

Occupied with Lower Setpoint				
CONDUCTION HEATING SAVINGS CALCULATIONS: Lower Setpoint				OA HEATING CALCS: Annual
BIN Temp Mid-pts	BIN Hours (E)	Heating Delta-T [1]	Gas Heating BTU [3]	OA Gas Heating BTU [4]
85	98	0	0	0
83	133	2	134,164	1,436,400
81	134	4	270,346	2,894,400
79	124	6	375,257	4,017,600
77	71	8	286,486	3,067,200
75	134	10	675,866	7,236,000
73	125	12	756,566	8,100,000
71	136	14	960,335	10,281,600
69	223	16	1,799,619	19,267,200
67	142	18	1,289,189	13,802,400
65	145	20	1,462,695	15,660,000
63	156	22	1,731,023	18,532,800
61	172	24	2,082,070	22,291,200
59	94	26	1,232,698	13,197,600
57	146	28	2,061,895	22,075,200
55	154	30	2,330,224	24,948,000
53	145	32	2,340,311	25,056,000
51	217	34	3,721,297	39,841,200
49	153	36	2,778,111	29,743,200
47	163	38	3,124,114	33,447,600
45	162	40	3,268,366	34,992,000
43	147	42	3,114,026	33,339,600
41	82	44	1,819,794	19,483,200
39	151	46	3,503,406	37,508,400
37	126	48	3,050,475	32,659,200
35	152	50	3,833,268	41,040,000
33	208	52	5,455,346	58,406,400
31	109	54	2,968,766	31,784,400
29	95	56	2,683,288	28,728,000
27	73	58	2,135,534	22,863,600
25	103	60	3,117,053	33,372,000
23	36	62	1,125,770	12,052,800
21	46	64	1,484,887	15,897,600
19	48	66	1,597,868	17,107,200
17	26	68	891,739	9,547,200
15	21	70	741,435	7,938,000
13	9	72	326,837	3,499,200
11	15	74	559,859	5,994,000
9	8	76	306,661	3,283,200
7	3	78	118,024	1,263,600
5	1	80	40,350	432,000
3	4	82	165,436	1,771,200
Subtotal Heating BTU/yr:			71,720,453	767,858,400
			Total	839,578,853

Heating Savings		804
	ECM 1	643
	ECM 2	161

Modulating Gas Furnace

DATE: 20-Oct-2016

Opportunity Narrative and Special Considerations:

This ECO combines several opportunities, The current gas burners have only 2 position control which causes the space to overheat. Additionally, the exterior doors to the pool space are often left open. Opening the doors to the exterior, wastes energy and can cause the HVAC systems to loose control of the space conditions (temperature, relative humidity, etc.) In order to capture the effect of leaving the doors open during the summer months, the space temperature is approximated at 89°F.

Item	Description	Quantity	Units	Unit Labor	Total Labor ($)	Unit Material	Total Material ($)	Total Cost ($)
1	Demo Furnace	1	ea	$480	$480	$0	$0	$480
2	Gas Fired Duct Heater	1	ea	$485	$485	$7,900	$7,900	$8,385
				Construction Cost Subtotals:	$ 965		$ 7,900	$ 8,865
				Contractor Labor & Material Mark-up:	$ 241		$ -	$ 241
				Construction Cost Totals:	$ 1,206		$ 7,900	$ 9,106
				Labor Adjusted for Region Factor:	$ 1,027			$ 8,927
SIOH				0%	per appendix EE			$ -
Design Cost				0%	per appendix EE			$ -
Cost Subtotal:								$ 8,927
Salvage Value of Existing Equipment								$ -
Public Utility Company Rebate Incentive								$ -
Programmed Amount Cost								$ 8,927

Vacancy Sensors

DATE: 20-Oct-2016

Opportunity Narrative and Special Considerations:

This ECM calculates the savings from implementing vacancy sensors in the high bay areas. Due to the low return because of the relatively high efficiency of your existing lighting in these areas, this would probably only be recommended with a space renovation project.

Energy/Water Savings Summary

GAS:	0 Therm,	0 MMBtu,	savings of	$	-	per year
ELECTRIC:	1,614 kWh,	6 MMBtu,	savings of	$	139	per year
WATER:	0 x1,000 Gal,		savings of	$	-	per year
SEWER:	0 x1,000 Gal,		savings of	$	-	per year
TOTAL ENERGY SAVINGS:		**6 MMBtu,**	**$ SAVINGS:**	**$**	**139**	**per year**

Adjustment Factor of 0% applied

Project Accounting Summary

Programmed Amount Cost:	**$ 1,298**	**Simple Payback Period (yrs):**	**9.35**
Economic Analysis Period:	**10 years**	**Savings to Investment Ratio (SIR):**	**1.07**

Global Assumptions:

Utility Rates:

Gas-- $ 0.6100 /therm, Electric-- $ 0.0860 /kWh, Water-- $5.14 /1,000 Gal Sewer-- $3.63 /1,000 Gal

ASSUMPTIONS:

[a] Operating Hours per Week for Offices and Classroom: 99 hours

[b] Power reduction from Occupancy Sensors in common areas: 20%

[c] Power reduction from Occ Sensors in Restrooms, Conferences and Storag 30%

Power and energy savings for Occupancy Sensors from the following sources:

IES Paper #43, "An Analysis of the Energy and Cost Savings Potential of Occupancy Sensors for Commercial Lighting Systems"

ASHRAE Standard 90.1-2004

[d] Electricity Rate: $0.086 dollars/kWh

CALCULATIONS:

[1] Operational $Hrs/Yr_{(E)}$ = Operational Hrs/Week * (52 Weeks/Yr)

[2] Operational $Hrs/Yr_{(ECM)}$ = Operational Hrs/Week * % Reduction * (52 Weeks/Yr)

[3] $kWh_{(E)}$ = Operational $Hrs/Yr_{(E)}$ * ($Watts_{(E)}$) * (Fixture Qty) / (1000 W/kW)

[4] $kWh_{(ECM)}$ = Operational $Hrs/Yr_{(ECM)}$ * ($Watts_{(E)}$) * (Fixture Qty) / (1000 W/kW)

[5] ECM kWh Savings = $kWh_{(E)}$ - $kWh_{(ECM)}$

LIGHITNG CONTROLS ENERGY SAVINGS CALCULATION:

Restroom, Conference, Storage?	Location	Fixture Qty	(E) Fixture Description	(ECM) Control Description	(E) Watts	Hours/Year (E) [1]	Hours/Year (ECM) [2]	(E) kWh [3]	(ECM) kWh [4]	ECM kWh Savings [5]
N	Gymnasium 1&2	12	(8 lamp) T5HO	Dual Sensor	56	5,148	4,118	3,459	2,768	692
N	Gymnasium 3	8	(12 lamp) T5HO	Dual Sensor	56	5,148	4,118	2,306	1,845	461
N	Gymnastics	8	(12 lamp) T5HO	Dual Sensor	56	5,148	4,118	2,306	1,845	461
N	Aerobics	54	Pendant Mounted T8	Dual Sensor	56	5,148	4,118	15,568	12,454	3,114
Total Fixtures		**82**	**Annual Lighting kWh Savings**							**1,614**

Vacancy Sensors

DATE: 20-Oct-2016

Opportunity Narrative and Special Considerations:

This ECM calculates the savings from implementing vacancy sensors in the high bay areas. Due to the low return because of the relatively high efficiency of your existing lighting in these areas, this would probably only be recommended with a space renovation project.

Item	Description	Quantity	Units	Unit Labor	Total Labor ($)	Unit Material	Total Material ($)	Total Cost ($)
1	Wall Sensor	0	ea	$20	$0	$70	$0	$0
2	Dual Sensor	4	ea	$60	$240	$185	$740	$980
				Construction Cost Subtotals:	$ 240		$ 740	$ 980
				Contractor Labor & Material Mark-up:	$ 60		$ 185	$ 245
				Construction Cost Totals:	$ 300		$ 925	$ 1,225
				Labor Adjusted for Region Factor:	$ 255			$ 1,180
SIOH				10%	per appendix EE			$ 118
Design Cost				0%	per appendix EE			$ -
Cost Subtotal:								$ 1,298
Salvage Value of Existing Equipment								$ -
Public Utility Company Rebate Incentive								$ -
Programmed Amount Cost								$ 1,298

Appendix H

Recommended Building Pressurization

Appendix H

	Space	Area	Total Supply Airflow	Existing Scheduled OA	Adjusted OA for PA	EA + PA	PA	EA	Return Air
RTU-4	Gymnasium 1&2	10000	13500	2700	2700	1350	1350	0	12150
RTU-5	Gymnastics	6200	5610	800	800	561	561	0	5049
RTU-6	Aerobics	2200	3455	600	600	345.5	345.5	0	3109.5
RTU-7	Gymansium 3	4000	8800	1750	1750	880	880	0	7920
			31365	5850	5850				
RTU-11	Track NW		3000	550	550	300	300	0	2700
RTU-12	Track NE		3000	550	550	300	300	0	2700
RTU-13	Track SE		3000	550	550	300	300	0	2700
RTU-14	Track SW		3000	550	550	300	300	0	2700
RTU-1	Annex		9500	1400	3870	3870	950	2920	5630
RTU-2	Admin Interior		2400	500	500	240	240	0	2160
RTU-3	Reception		20000	4000	6400	6400	2000	4400	13600
RTU-8	Seniors		5900	600	1565	1565	590	975	4335
RTU-9	Admin Exterior		2175	200	200	217.5	217.5	0	1957.5
RTU-10	Pool Offices		1970	200	447	447	197	250	1523
		Total	53945	9100	15182				

Appendix I

Utility Analysis

Commerce City Rec Center Energy Utilization Index
Total GSF: 67,000

Natural Gas	
FY 2013-2016 Average Annual Usage (therms)	65,890
FY 2013-2016 Average Usage (kBtu)	6,589,000
Use Intensity (kBtu/SF)	98.3
FY 2013-2016 Average Annual Cost	$ 40,061.76
Cost Intensity ($/SF)	$0.60
Electric Usage	
FY 2013-2016 Average Annual Usage (kWh)	1,083,480
FY 2013-2016 Average Usage (kBtu)	3,696,834
Use Intensity (kBtu/SF)	55.18
FY 2013-2016 Average Annual Cost	$ 92,969.81
Cost Intensity ($/SF)	$1.39
Combined Energy Usage (kBTU)	**10,285,834**
Combined EUI (kBTU/SF/Year)	**153.52**
Combined ECI ($/SF/Year)	**$ 1.99**

	Commerce City Rec Center	Benchmark Facility	Notes
Natural Gas Usage (kBtu/Year)	6,589,000	10,117,000	
Natural Gas Cost ($/Year)	$ 40,061.76	$61,714	2
Natural Gas EUI (kBtu/SF/Year)	98	151	1
Natural Gas ECI ($/SF/Year)	$0.60	$0.92	1
Electric Usage (kBtu/Year)	3,696,834	3,075,300	
Electric Cost ($/Year)	$ 92,969.81	$78,121	3
Electrical EUI (kBtu/SF/Year)	55	45.9	1
Electrical ECI ($/SF/Year)	$1.39	$1.17	1
Combined EUI (kBtu/SF/Year)	**154**	**197**	
Combined ECI ($/SF/Year)	**$1.99**	**$2.09**	

Notes:
1. The EUI and ECI calculations for Commerce City Rec Center are based on a total building square footage of 67,000ft². See Table 9 for explanation of how the Benchmark Facility EUI was calculated.
2. The annual natural gas cost for the benchmark facility was calculated using the current natural gas rates and the annual usage for the benchmark facility.
3. The annual electrical cost for the benchmark facility was calculated using the current electrical rates and the annual usage for the benchmark facility.

Benchmark Facility Energy Usage

Facility Type	Square Footage	Annual kBTU	EUI (kBTU/SF/YR)	Notes
Public Assembly	67,000	13,192,300	197	1

Notes:
1. The Benchmark Facility EUI was found using Target Finder Energy Star.

EUI Comparison

Average Facility EUI (kBtu/SF/YR)	Rec Center EUI (kBtu/SF/YR)
197	**154**

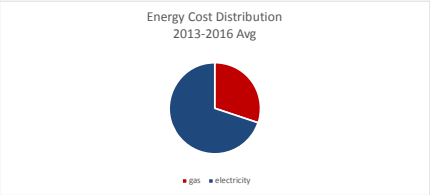
EUI % Comparison
22% Better than Average

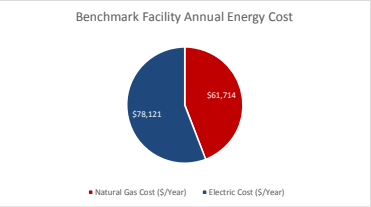
Benchmark Energy Utilization Index
Total GSF: 67,000

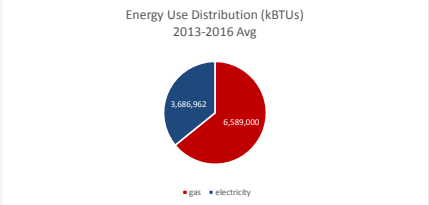
Facility Benchmark Usage and Cost

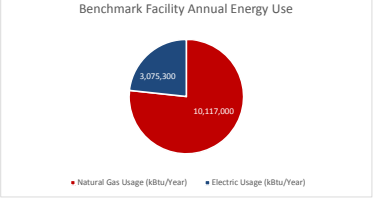
Natural Gas	
Average Annual Usage (kBtu)	10,117,000
Use Intensity (kbtu/SF/Yr)	151.0
Average Cost ($)*	$61,714
Cost Intensity ($/SF/Yr)	$0.92

Electric Usage		
Average Annual Usage (kBtu)	3,075,300	kbtu
Use Intensity (kBtu/SF/Yr)	45.9	
Average Cost ($)*	$78,121	*Average Cost is found by using the calculated average facility usage rates from data.
Cost Intensity ($/SF/Yr)	$1.17	



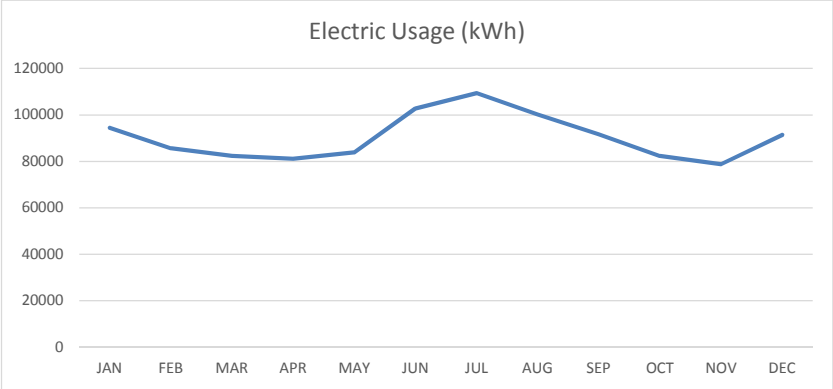


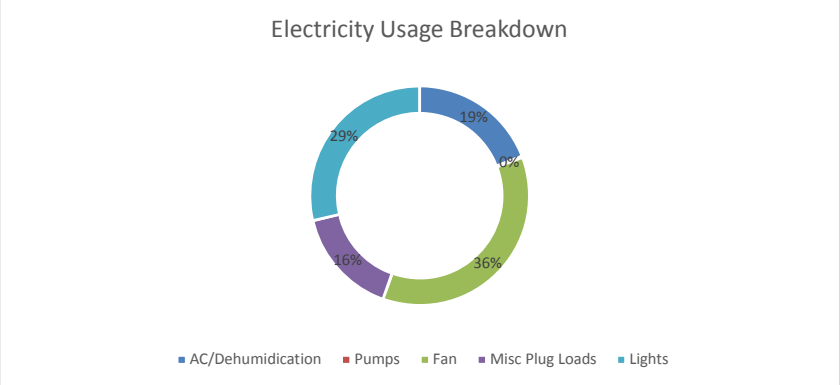


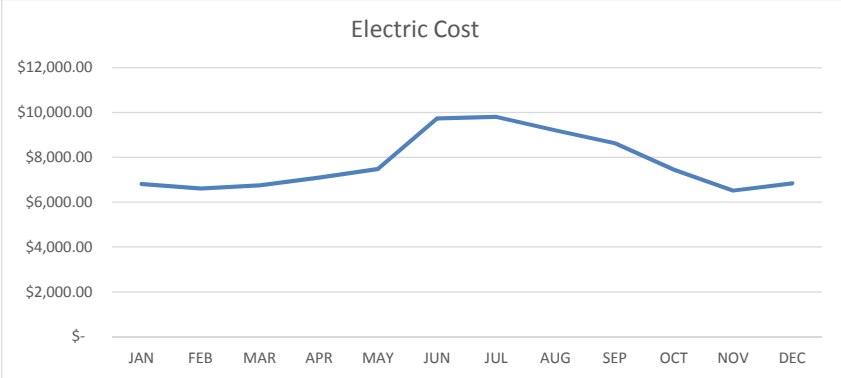


year	(All)

Row Labels	Average of kWh Used	Average of Electric Service Cost			
JAN	94360	$ 6,819.49			
FEB	85600	$ 6,613.87			
MAR	82240	$ 6,758.64			
APR	81000	$ 7,099.52			
MAY	83880	$ 7,492.55			
JUN	102720	$ 9,746.23			
JUL	109360	$ 9,801.79			
AUG	100213	$ 9,195.47			
SEP	91627	$ 8,629.77			
OCT	82347	$ 7,450.34			
NOV	78773	$ 6,517.49			
DEC	91360	$ 6,844.66			
Average Usage per month	**90456**	**$ 7,749.80**			
Sum of Monthly Averages	**1083480**	**$ 92,969.81**	**$**	**0.08581**	**$/kWh**
			$	1.39	



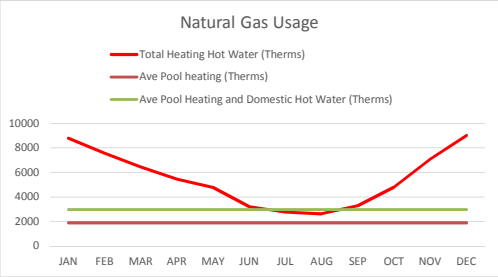


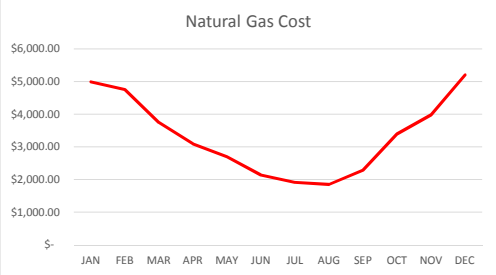


year	(All)

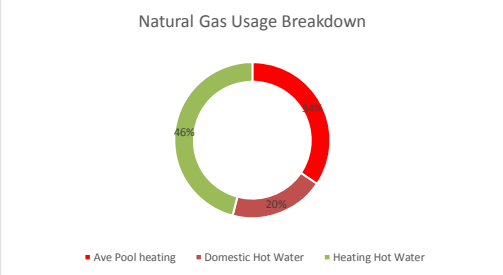
Row Labels	Average of therms used	Average of Gas Service Cost
JAN	8803	$ 4,993.80
FEB	7580	$ 4,756.33
MAR	6448	$ 3,741.46
APR	5463	$ 3,095.17
MAY	4780	$ 2,695.11
JUN	3198	$ 2,143.82
JUL	2760	$ 1,915.51
AUG	2623	$ 1,851.25
SEP	3297	$ 2,286.89
OCT	4813	$ 3,393.97
NOV	7107	$ 3,984.40
DEC	9020	$ 5,204.07
Average Usage per Month	**5505**	**$ 3,337.82**

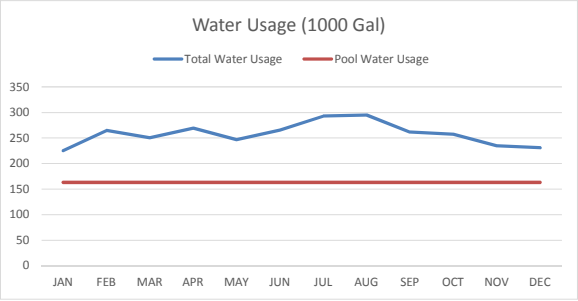
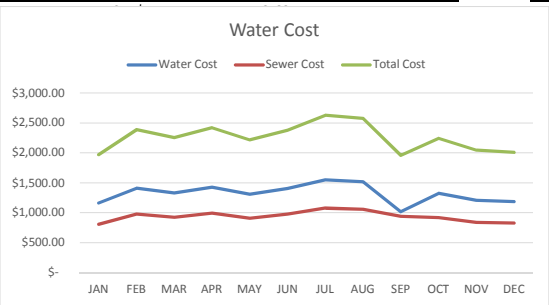
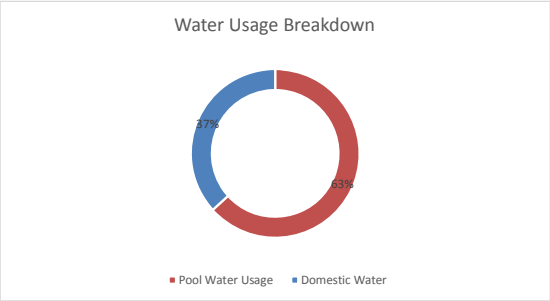
		0.61		
		*from pool evaporation rate		
		Ave Pool heating (Therms)	Ave Pool Heating and Domestic Hot Water (Therms)	Domestic Hot Water (Therm space heating
JAN	8803	$ 4,993.80	1891	2969	1078
FEB	7580	$ 4,756.33	1891	2969	1078
MAR	6448	$ 3,741.46	1891	2969	1078
APR	5463	$ 3,095.17	1891	2969	1078
MAY	4780	$ 2,695.11	1891	2969	1078
JUN	3198	$ 2,143.82	1891	2969	1078
JUL	2760	$ 1,915.51	1891	2969	1078
AUG	2623	$ 1,851.25	1891	2969	1078
SEP	3297	$ 2,286.89	1891	2969	1078
OCT	4813	$ 3,393.97	1891	2969	1078
NOV	7107	$ 3,984.40	1891	2969	1078
DEC	9020	$ 5,204.07	1891	2969	1078
Sum of monthly averages	**65890.0**	**$ 40,061.76**	**22692.0**		**12940.5**
			$ 0.61	**$/therm**	





Ave Pool heating
Domestic Hot Water
Heating Hot Water



year	(All)

Row Labels	Total Water Usage	Average of Water Cost	Average of Sewer Cost	Average of Total Cost	Pool Water Usage
JAN	225	$ 1,162.69	$ 807.33	$ 1,970.02	163.1
FEB	265	$ 1,406.22	$ 976.96	$ 2,383.18	163.1
MAR	250	$ 1,327.61	$ 922.34	$ 2,249.95	163.1
APR	269	$ 1,425.40	$ 990.30	$ 2,415.71	163.1
MAY	246	$ 1,305.24	$ 906.81	$ 2,212.05	163.1
JUN	266	$ 1,401.17	$ 973.45	$ 2,374.62	163.1
JUL	293	$ 1,548.92	$ 1,076.12	$ 2,625.03	163.1
AUG	295	$ 1,517.50	$ 1,054.46	$ 2,571.96	163.1
SEP	261	$ 1,017.00	$ 938.36	$ 1,955.36	163.1
OCT	257	$ 1,320.88	$ 917.86	$ 2,238.74	163.1
NOV	234	$ 1,204.73	$ 837.16	$ 2,041.89	163.1
DEC	231	$ 1,185.14	$ 823.54	$ 2,008.68	163.1
Average Usage per Month	**258**	**$ 1,326.62**	**$ 937.85**	**$ 2,264.47**	
Sum of Monthly Averages	**3092**	$ 15,822.49	$ 11,224.69	**$ 27,047.18**	**1957.2**