Rangely School District RE-4

Facility Maintenance Master Plan

**Updated October 4, 2021*

**Please note the fact that this is a live, ever-evolving document. As time horizons change, so to do associated cost estimates, scopes of work, and plans for innovation. All visible cost estimates and detailed scopes of work are accurate at the time of writing, but will not always remain so, due to inevitable, yet unforeseen circumstances.*

Table of Contents

I. Executive Summary

Mission Statement

The mission statement of Rangely School District is to create a learning community dedicated to high achievement and safety for all.

Vision Statement

Building Champions in Life.
Hard-working - Respectful - Responsible - Confident - Trustworthy - Kind - Positive - Persistent

Assessment Findings

Summary

Rangely School District's leadership and Master Planning team have developed recommended projects that will address the critical infrastructure issues, improving the health and safety of the students within our K-12 facilities, and as such, improving the entire school district. The focus of the project is outlined below.

Overview of BEST Recommendations:

1) **Comprehensive renovations and upgrades of the HVAC systems, which will solve the indoor air quality and comfort issues experienced across the district.**
2) **A modern, centralized building management system that will allow the maintenance team to effectively monitor and control the equipment in each facility from any location.**
3) **A renovation of electrical system components that complement the HVAC scope. Cooling will be added to Parkview Elementary School and Rangely Junior/Senior High School, which means the electrical capacity at the electrical service entrances will need to be increased.**
4) **Full replacement of all existing single-ply membrane roofs. The existing membrane roofs have begun to leak, do not drain well, and have proven extremely difficult to maintain. Roofs allowed to continue to leak can caused major building damage leading to more costly repairs in the future.**

Overview of Bond Recommendations:

1) **New LED lighting fixtures, which will reduce the utility and maintenance costs of the school.**
2) **Interior improvements including select drop ceilings, new carpet, new VCT flooring, and freshly painted interiors. Renewed interior spaces are more enjoyable use and can improve the learning environment.**
3) **New Public Address (PA) systems and new fire alarm systems will increase the overall safety of each site. A new PA system will improve communication across the schools and provide a reliable means for safety announcements.**
4) **Site work, including perimeter sidewalks, select parking lots, and water infiltration issues will be addressed through regrading, repaving, and proper waterproofing where required. These improvements will help to extend the life and function of the facilities.**

The community, the staff, and most importantly the students will benefit immensely from safer, more comfortable, and better ventilated facilities that are easier to maintain. From the beginning, the focus of the effort has been on long-term solutions to the district's most pressing needs in order to maintain and improve the high level of educational programming offered by the Rangely School District.

The long-range risks of not implementing the scope outlined in the master plan would be poor air quality in the facility, escalating maintenance costs due to the aging equipment, and unsafe conditions for the students.

The need to bring this facility up a modern standard is clearly presented and defined throughout the facility master plan and subsequent BEST grant application. Implementing the master plan recommendations will ensure the district is a valuable member of the community for many years to come.

II. History of Rangely School District

Rangely was founded in 1947 after an oil boom brought many to what was called an "oil field camp." Crude oil companies began drilling for oil in 1903 with little success. In 1933, Chevron drilled 6,335 feet under the sandstone and began pumping 230 barrels of oil per day through the Raven A-1 discovery well. This well became the most productive well of its time. Rangely now produces about a third of the oil production in Colorado. It is the largest field in the Rocky Mountain region with 406 producing wells and 351 injection wells that produce about 20,000 barrels per day. Rangely School District began enrollment in 1958. The original school building is no longer in use, nor owned by the district. At present, the district has one Pre-K/ administration building, one elementary school housing grades 1-5, and one junior/senior high school housing grades 6-12, with a total enrollment of 473 students.

III. Rangely Location & Boundaries

Location & Geographic Data:

Lat Long: 39.97012990/ -108.68447520

Elevation: 5,297

County: Rio Blanco

Populations:

District: 2,800

City: 2,365

County: 6,666

http://www.usboundary.com

Nearest Major Cities:

Vernal, UT – 53 miles to the northwest

Grand Junction, CO – 90 miles to the south

Meeker, CO – 58 miles to the east

Nearby Higher Education:

Colorado Northwestern Community College – Rangely, CO

Western Colorado Community College – Grand Junction, CO

Colorado Mesa University – Grand Junction, CO

Primary Location Services:

Rangely District Hospital

Rangely Public Library

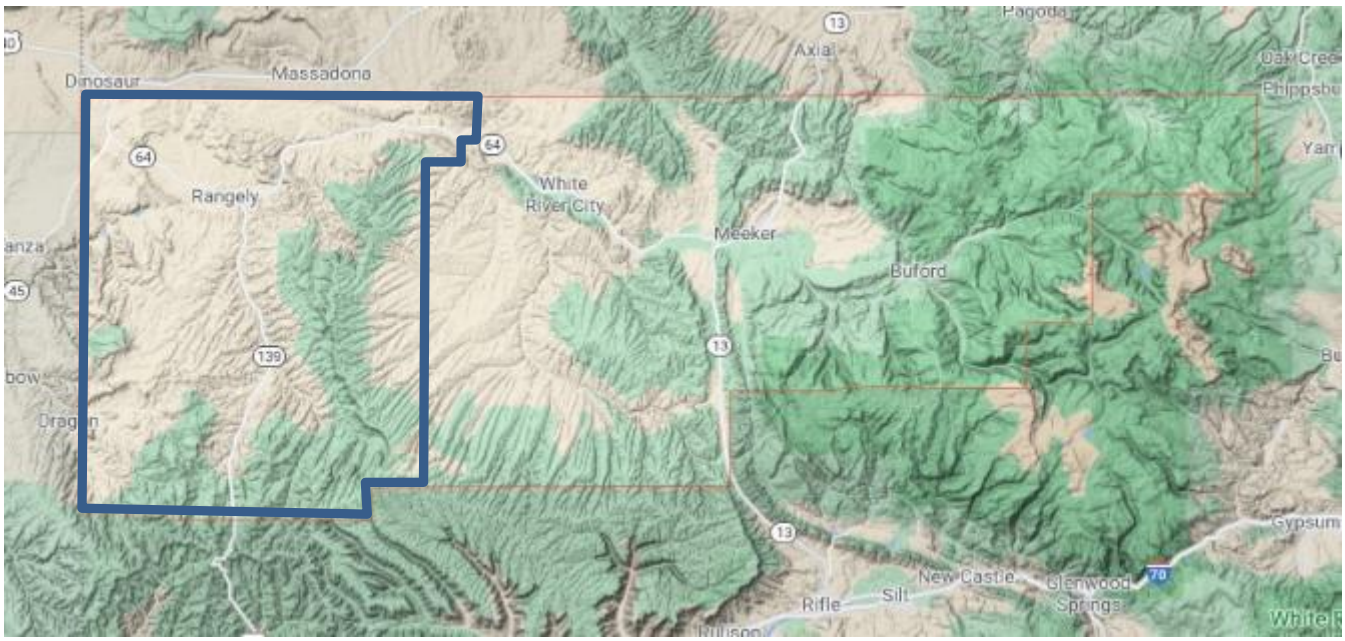
Rangely Fire Department

Western Rio Blanco Recreation Center

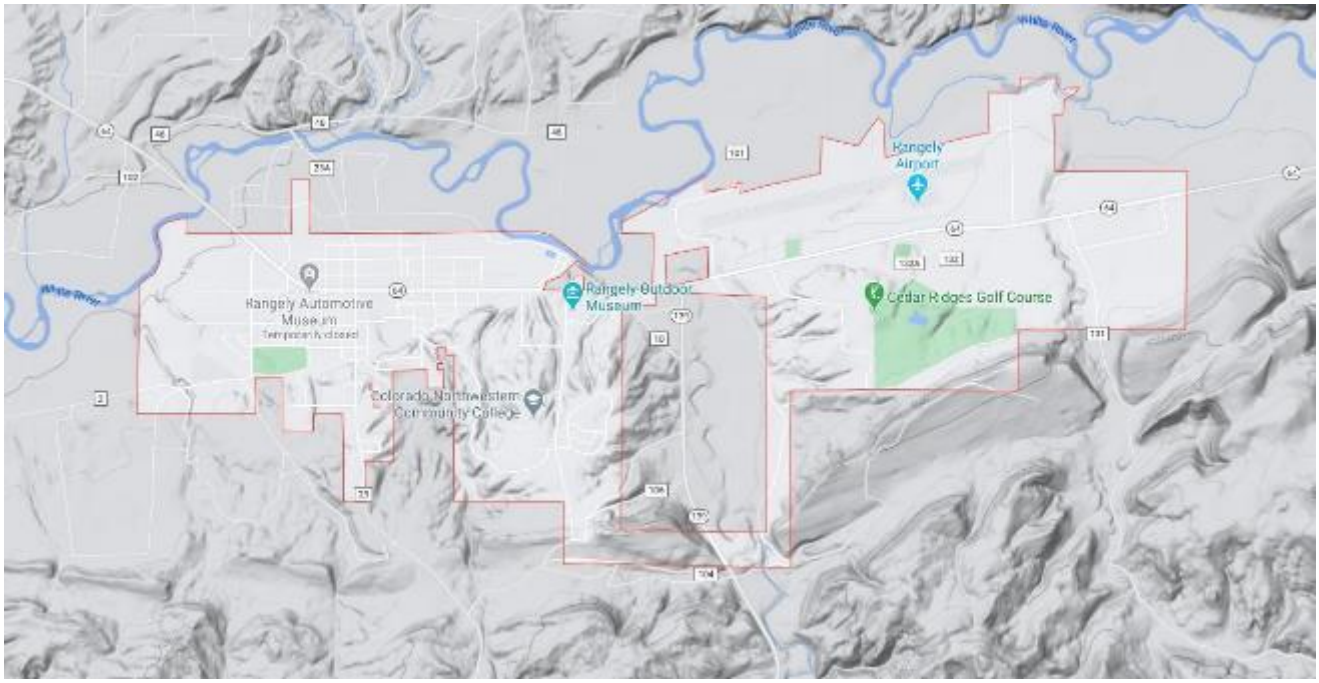
School District Boundary

State View

County View (Rio Blanco)



City View



Location of District Facilities*

*District facilities are identified by the blue boxes

Property Data

Parkview Elementary School

Address: 550 River Road, Rangely, CO 81648

Total Enrollment (2019-20): 220

Property Area: Approx. 473,351 sf. (10.87 acres)

Rangely Junior/ Senior High School

Address: 234 South Jones Ave, Rangely, CO 81648

Total Enrollment (2019-20): 253

Property Area: Approx. 748,050 sf. (17.17 acres)

Rangely Pre-K & Administration Building

Address: 402 W. Main St. Rangely, CO 81648

Total Enrollment (2019-20): 97

Property Area: Approx. 539,069 sf. (12.38 acres)

Rangely, CO Elevation + Climate Trends

Rangely, CO climactic information is summarized in the table below:

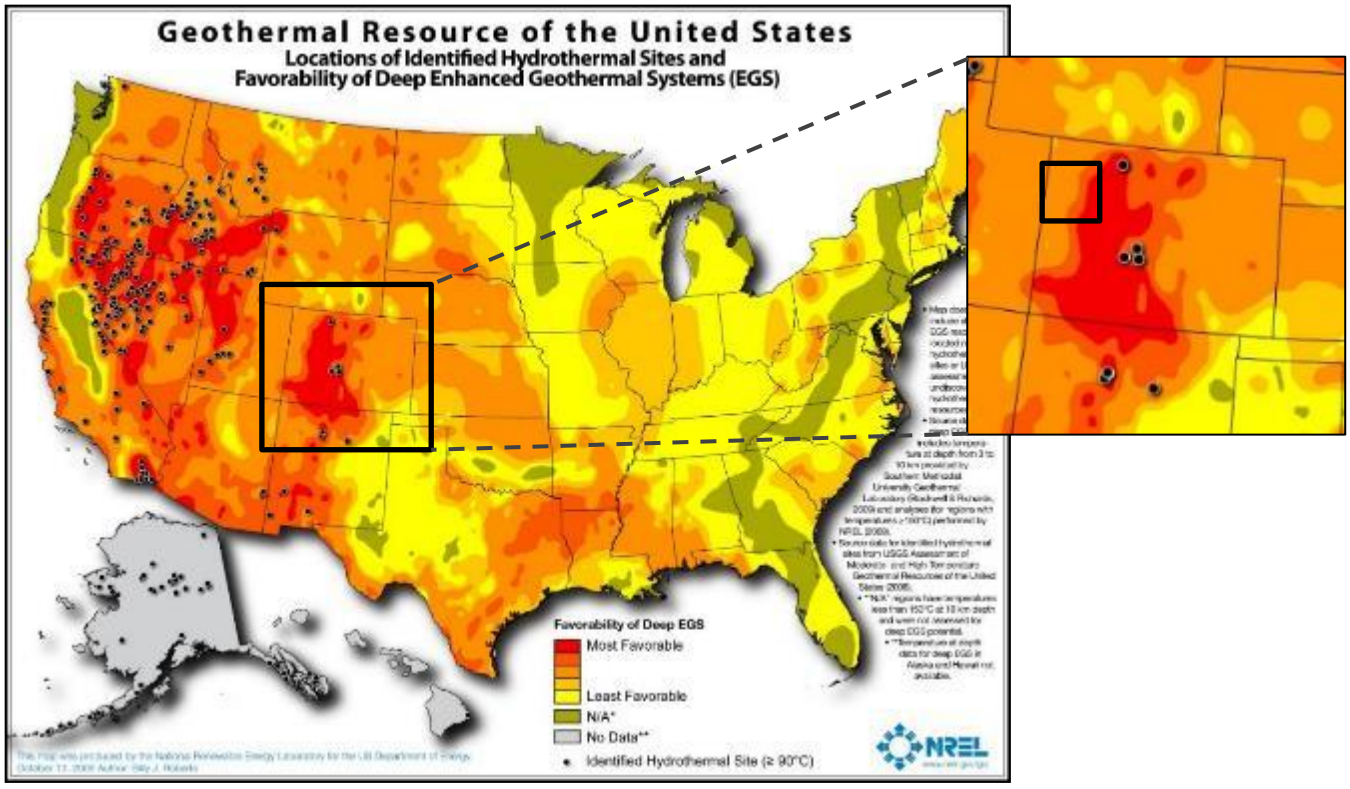
CLIMATE	Rangely, CO	United States
Rainfall (in.)	11.4	38.1
Snowfall (in.)	34.7	27.8
Precipitation Days	70.6	106.2
Sunny Days	241	205
Avg. July High	91.4	85.8
Avg. Jan. Low	6.8	21.7
Comfort Index (higher=better)	6.9	7
UV Index	5.6	4.3
Elevation ft.	5,233	2,443

Source: https://www.bestplaces.net/climate/city/colorado/rangely

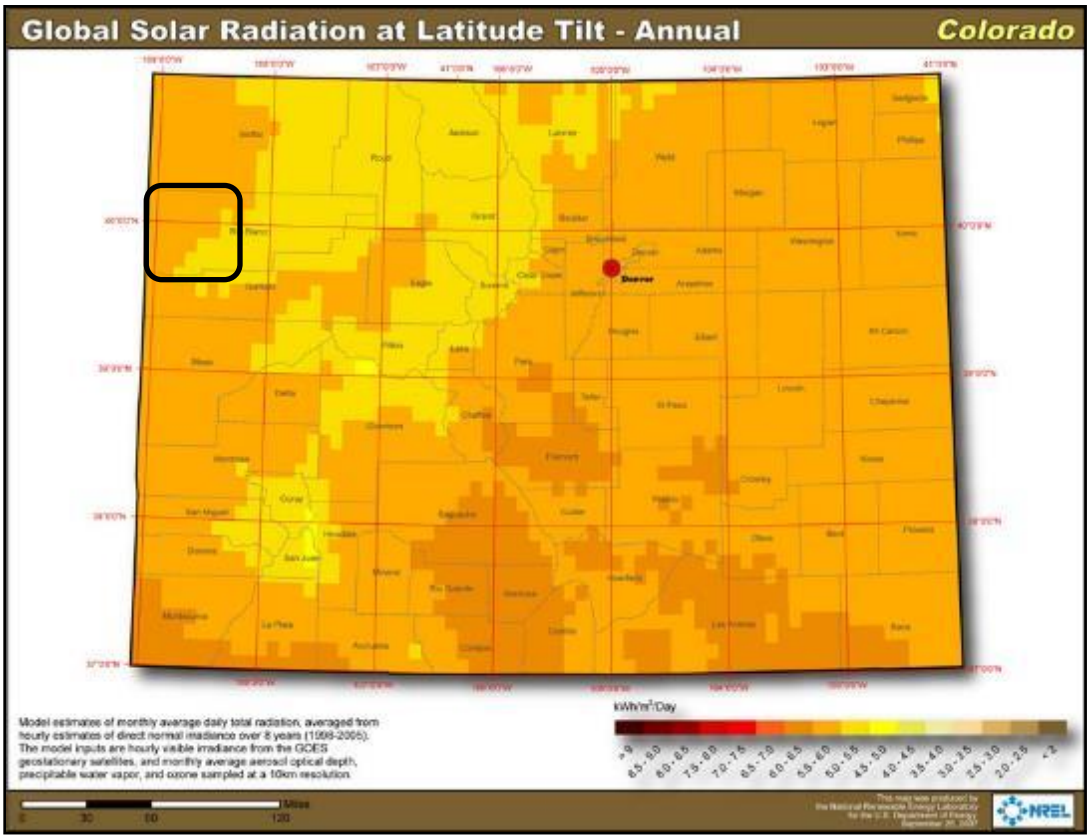
Renewable Energy Options Summary

Colorado is fortunate to have a climate that is conducive to several types of renewable energy sources, and the Rangely School District would potentially be able to benefit from renewable energy sources. Selection of renewable options would be at the direction of the district and the design team of future projects. Based upon initial evaluation of available data, **there are several potential sources, most notably the potential for geothermal.**

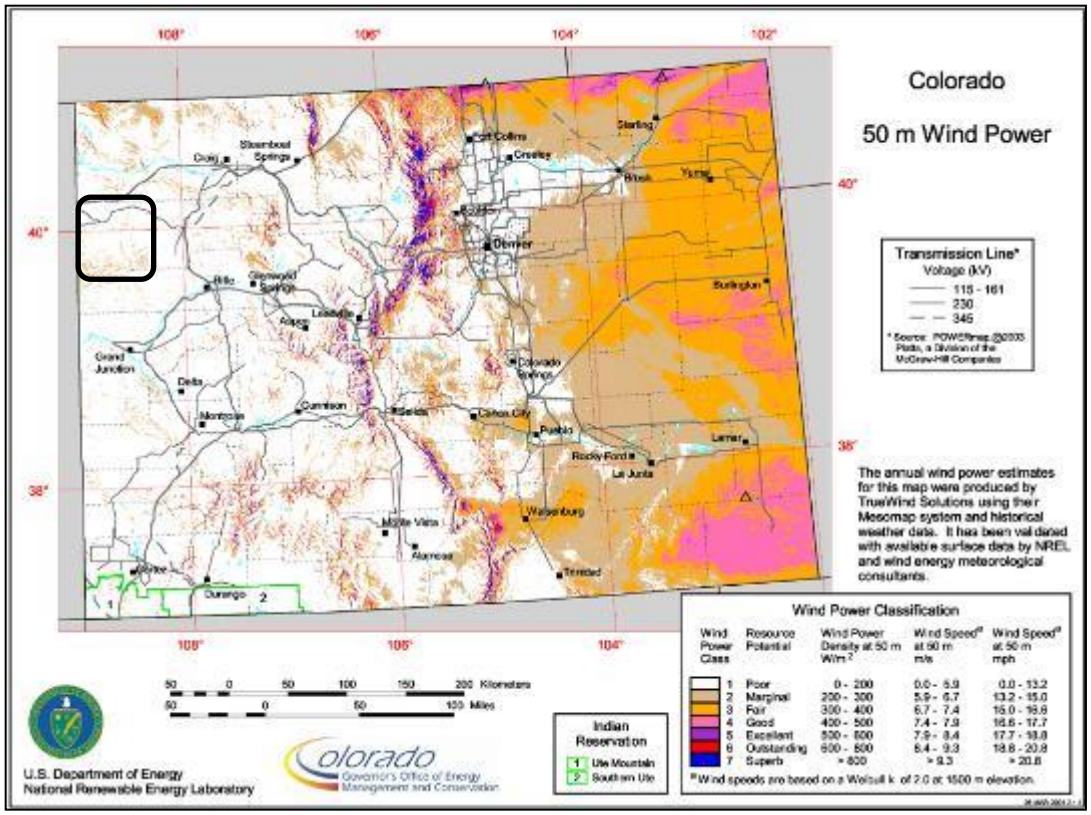
Geothermal Resource Map



Solar Power Resource Map



Wind Power Map



IV. Demographics

District Boundary

Demographic Overview

Source: http://www.usboundary.com

Demographic	Total
Population (District Boundary)	2,800
Hispanic or Latino/ Not Hispanic or Latino	268/2,532
Male/ Female	1,442/1,358
18 Years+/ Under 18	2,142/658
Median Age	32.7
Area (square miles)	1,277.61
Total Households	1,051
Family Households	722

District Population by Age Group

Source: http://www.usboundary.com

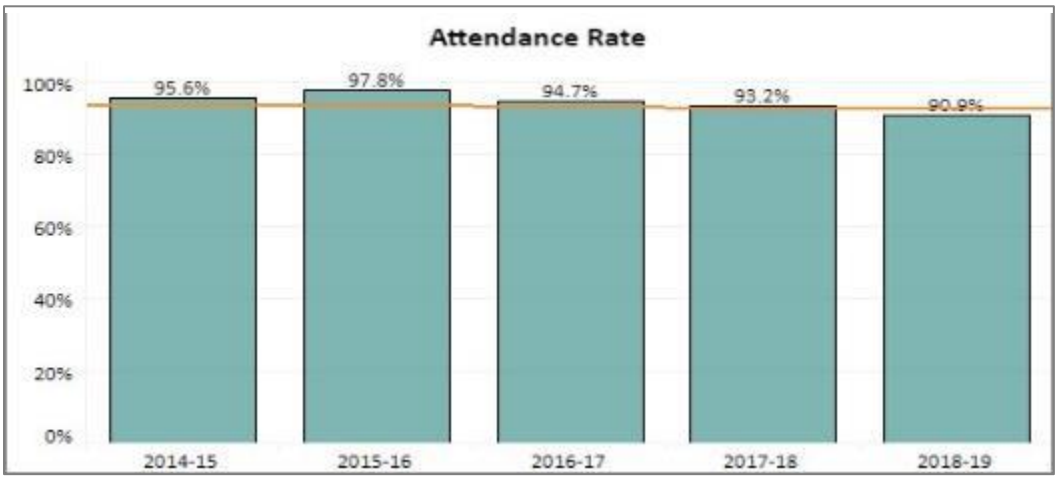
Age Groups	Population (% of Total)	% by Category
Under 5 years	214 (8%)	
5 to 9 years	185 (7%)	
10 to 14 years	154 (5%)	29%
15 to 17 years	105 (4%)	
18 and 19 years	149 (5%)	
20 years	92 (3%)	
21 years	42 (1%)	
22 to 24 years	134 (5%)	23%
25 to 29 years	226 (8%)	
30 to 34 years	169 (6%)	
35 to 39 years	146 (5%)	
40 to 44 years	152 (5%)	
45 to 49 years	210 (8%)	34%
50 to 54 years	274 (10%)	
55 to 59 years	163 (6%)	
60 and 61 years	52 (2%)	
62 to 64 years	64 (2%)	
65 and 66 years	21 (1%)	
67 to 69 years	64 (2%)	14%
70 to 74 years	76 (3%)	
75 to 79 years	59 (2%)	
80 to 84 years	23 (1%)	
85 years +	26 (1%)	

Student Body

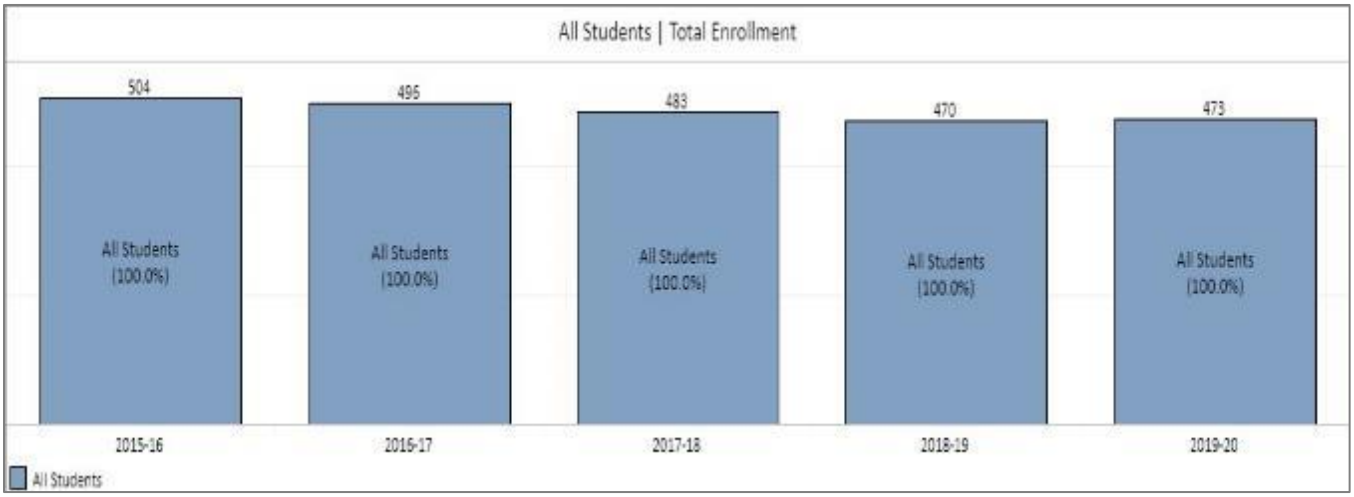
Rangely RE-4 Student Body (2018-19):

Source: cde.state.co.us/district dashboard

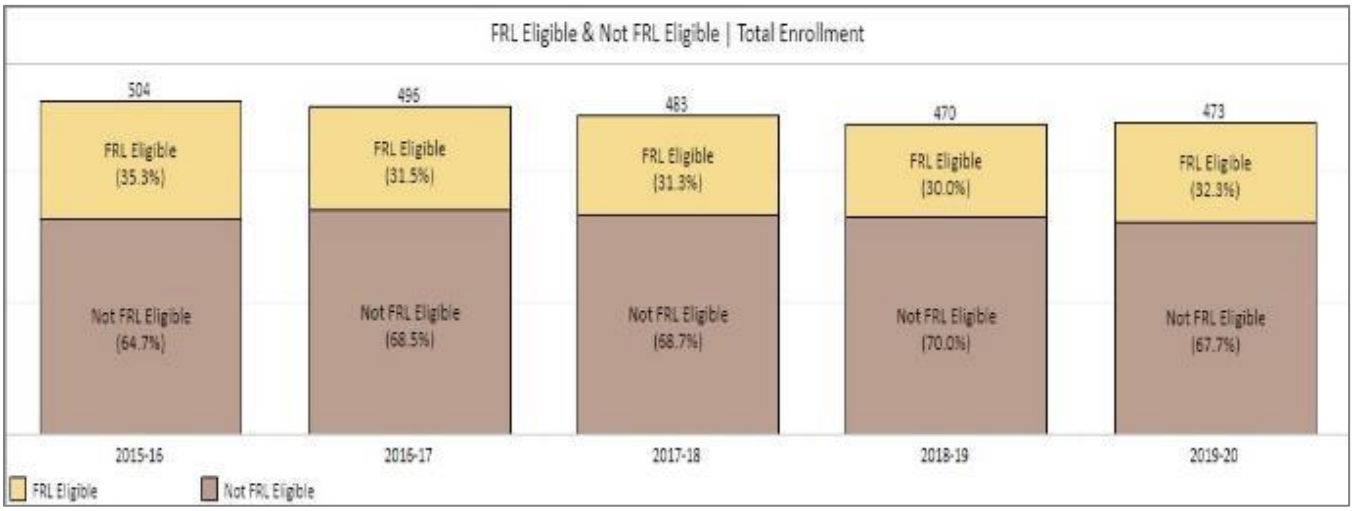
Demographic	Total
Total Enrollment	470
Attendance Rate	90.9%
Male	250 (53.2%)
Female	220 (46.8%)
Total Minority Students	50 (10.6%)
Total Non-Minority Students	420 (89.4%)
Free or Reduced Lunch Eligible	141 (30%)



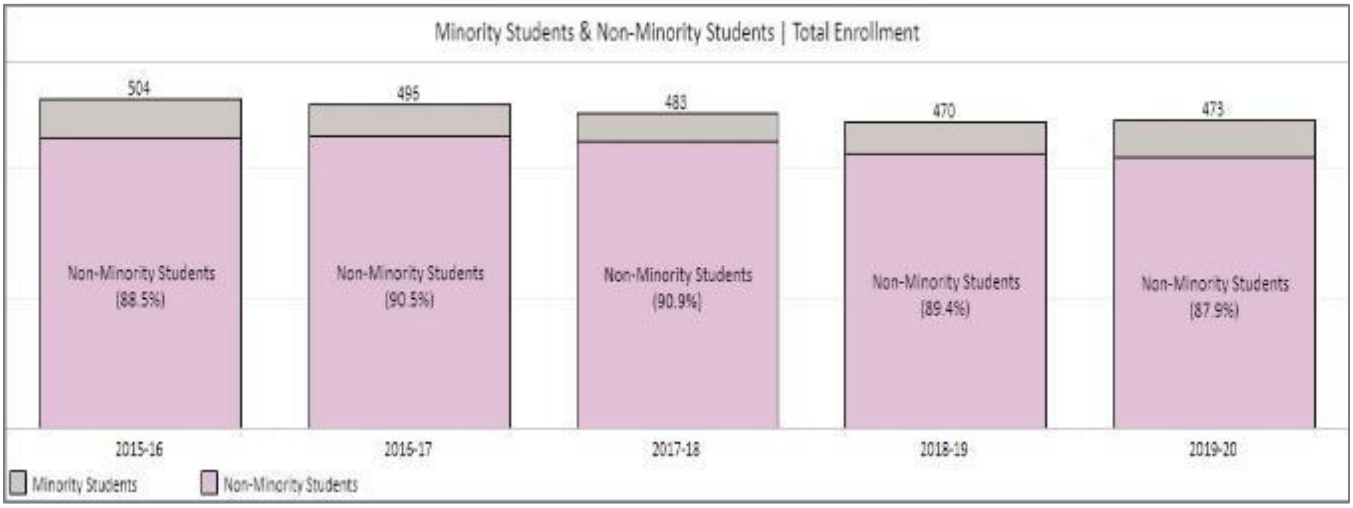
Total Enrollment



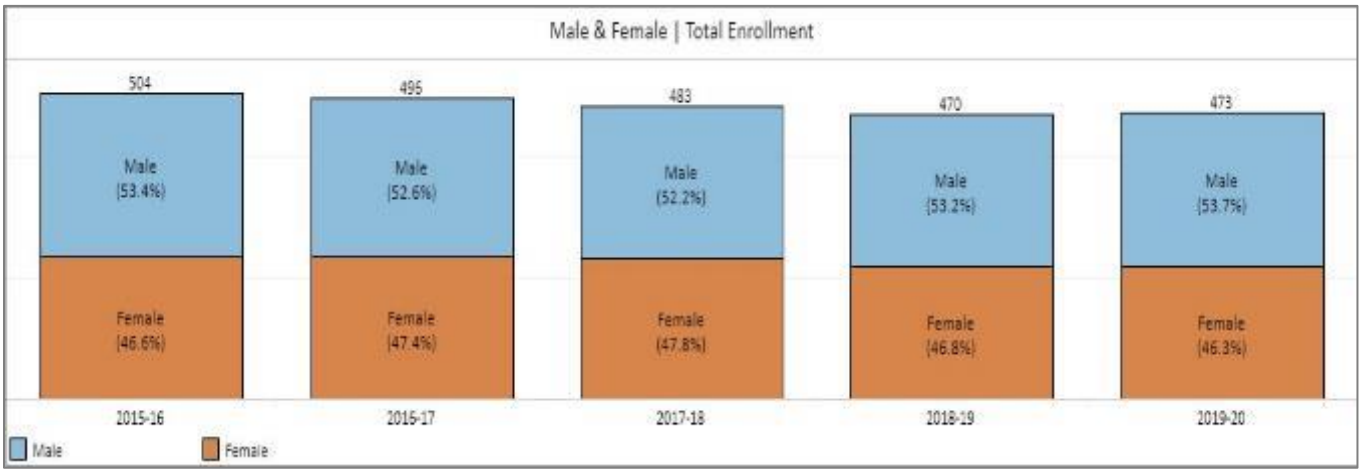
Free & Reduced Lunch Eligible



Minority Students

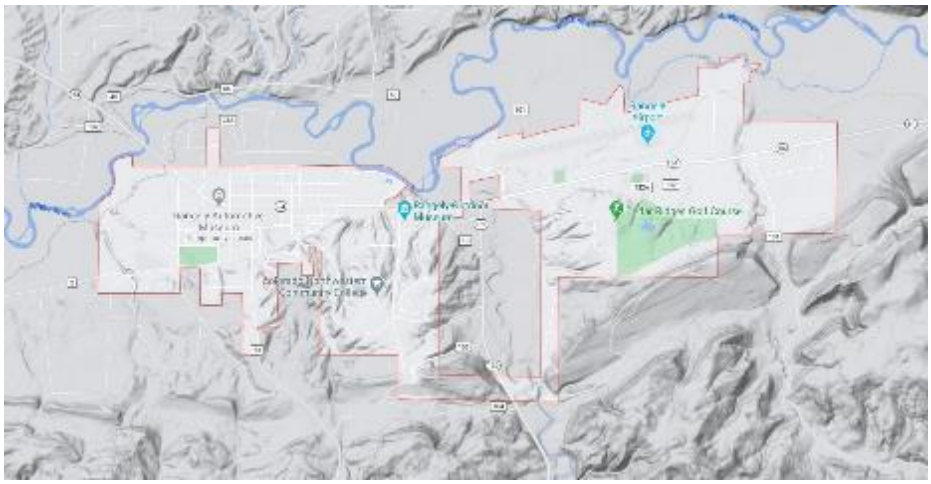


Gender



City of Rangely, CO

Source: https://datausa.io/profile/geo/rangely-co/
Source: 2014-2018 American Community Survey 5-Year Estimates



Population: 2,289

The population of Rangely, CO increased by **5.53%** between 2017-2018, growing from 2,169 to 2,289 people.

Median Age: 33.5

In 2018, the median age of all people in Rangely, CO was 33.5, but **people in Rangely, CO are getting younger,** as the average age of all Rangely, CO residents in 2017 was 35.

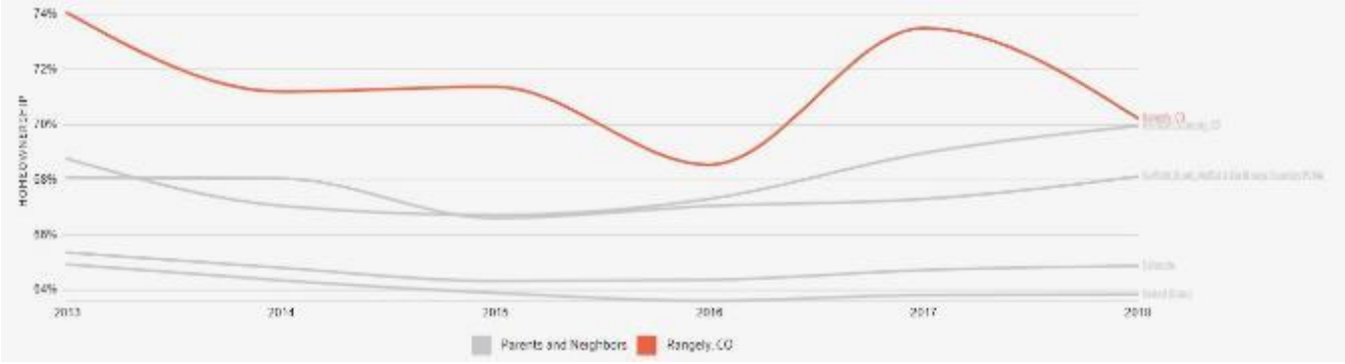
Household Income: $68,295

Median Property Value: $170,600

Between 2017-2018, the median property value increased from $168,400 to $170,600, **a 1.31% increase.**

Homeownership Rate: 70.2%

The homeownership rate of Rangely, CO is 70.2%, which is **higher than the national average** of 63.9%.



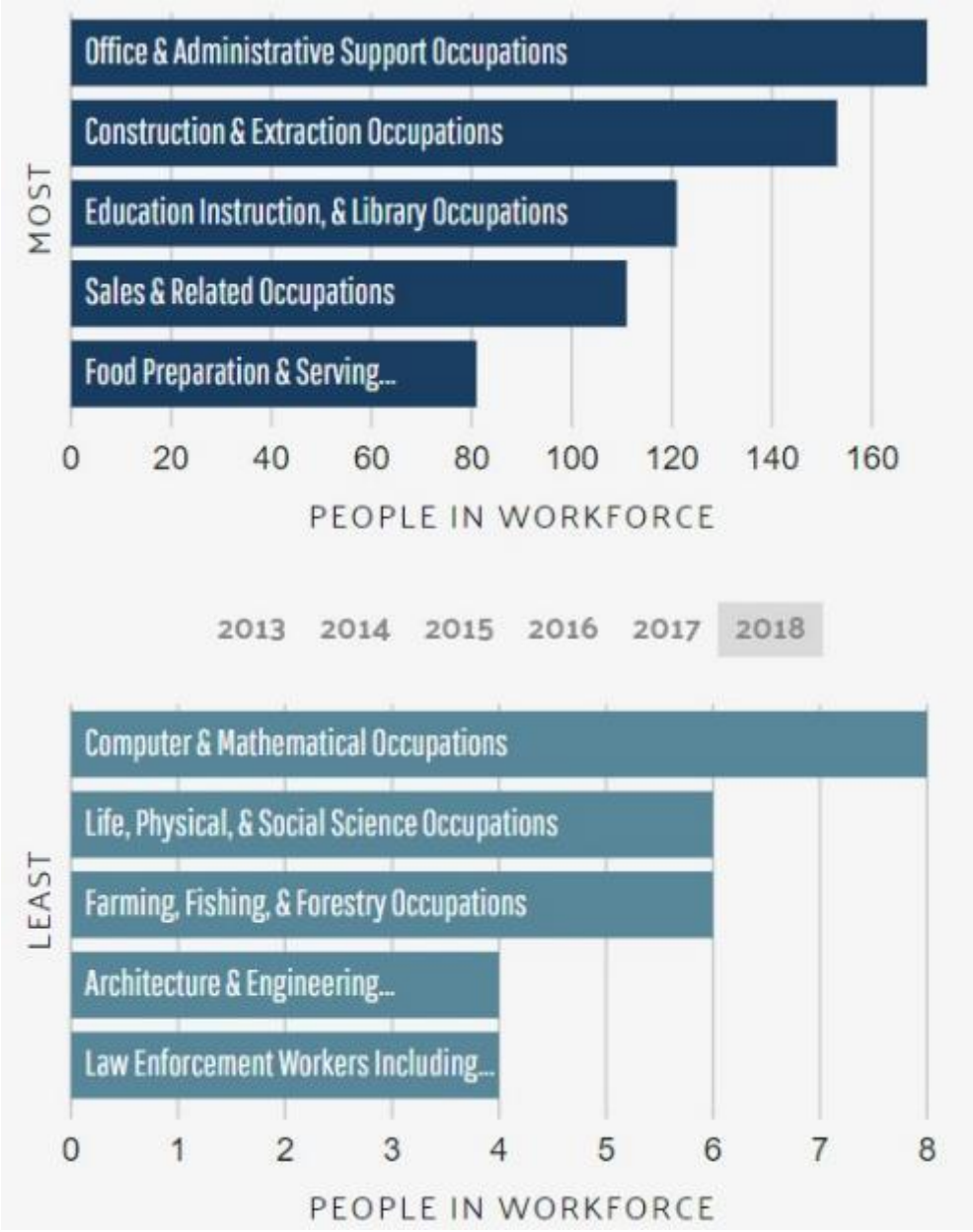
Economic Overview

The economy of Rangely, CO employs 1,130 people and is specialized in construction, gas extraction, education, transportation, office and administrative support, and food preparation.

The largest industries in Rangely, CO are mining, quarrying, oil and gas extraction (243); educational services (199); and retail trade (123). The highest paying industries are wholesale trade ($110,833); mining, quarrying, oil and gas extraction ($67,604); and agriculture, forestry, fishing and hunting, and mining ($67,054).

Households in Rangely, CO had a median annual income of $68,295 in 2018, which was 5.86% lower than the median annual income of $72,550 in 2017.

Most Common Occupations in Rangely, CO



Employment by Industries

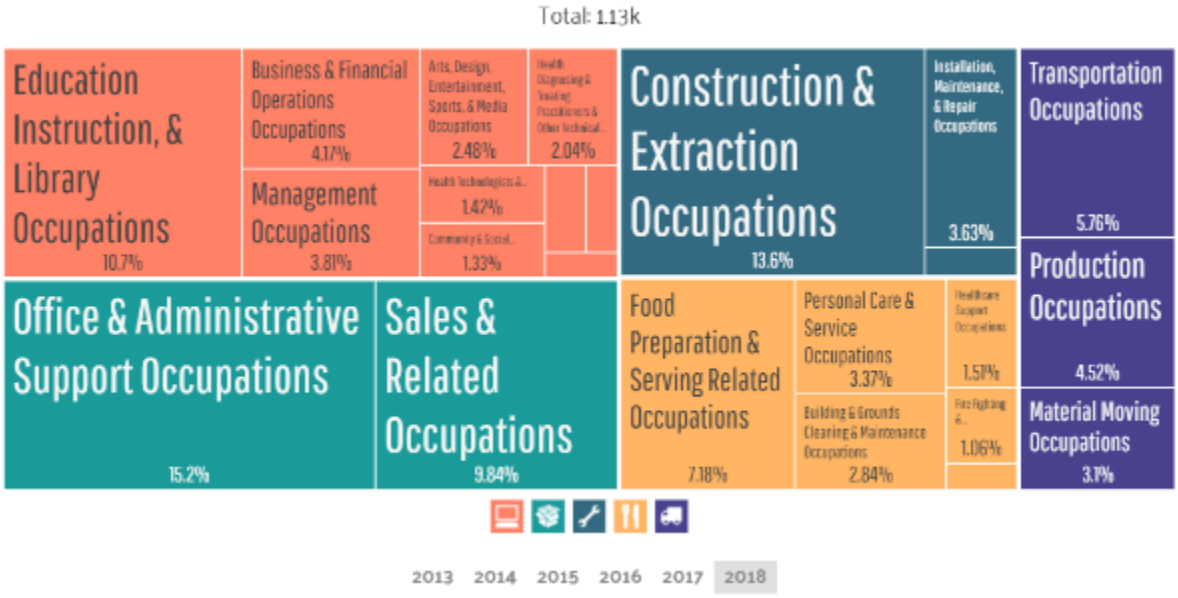
From 2017-2018, **employment in Rangely, CO grew at a rate of 4.06%,** from 1.08k employees to 1.13k employees. The most common employment sectors for those who live in Rangely, CO are mining, quarrying, oil and gas extraction; educational services; and retail trade.

The most common industries in Rangely, CO by number of employees are mining, quarrying, oil and gas extraction; educational services; and retail trade.

Employment by Occupations

The most common job groups, by number of people living in Rangely, CO, are office & administrative support occupations, construction & extraction occupations, and education instruction and library occupations. The most common jobs held by residents of Rangely, CO by number of employees are office and administrative support occupations; construction and extraction occupations; and education instruction and library occupations.

Compared to other census places, Rangely, CO has an unusually high number of residents working as construction and extraction occupations; education instruction and library occupations; and transportation occupations.



V. BEST Facility Assessment

CDE Assessment & Facility Maintenance Master Plan Comparison

The following tables outline the recommendations made in the 2020 BEST Facility Assessment as well as the recommendations made by the Master Planning Team. High-level comparison notes are provided for each building system and these notes identify the similarities and differences between the CDE assessment and the master plan scopes.

Rangely K-12 Facility Recommendations

	Parkview ES	Rangely Jr/ Sr HS	Early Education Center	Ag Shop	Transportation Building
Electrical System	$2,151,409	$2,764,846	$693,430	$287,382	$74,810
Equipment & Furnishings	$0	$0	$0	$0	$0
Exterior Enclosure	$1,411,815	$1,216,061	$784,020	$316,237	$12,550
Fire Protection	$413,520	$583,840	$175,150	$64,230	$0
Furnishings	$0	$0	$0	$0	$0
HVAC System	$3,125,057	$4,412,499	$2,343,770	$693,378	$0
Interiors	$3,787,650	$4,418,664	$1,125,180	$224,730	$250,970
Plumbing System	$425,130	$312,620	$260,340	$68,030	$0
Special Construction	$167,970	$912,170	$0	$0	$376,450
Site	$1,571,000	$2,917,020	$2,625,790	$62,520	$0
Structure	$102,770	$113,890	$0	$0	$0
Addition	$1,167,960	$96,530	$579,150	$0	$0
Totals:	**$14,324,280**	**$17,748,140**	**$8,586,830**	**$1,716,507**	**$714,780**

	Parkview ES	Rangely Jr/ Sr HS	Early Education Center	Ag Shop	Transportation Building	TOTAL
BEST Total	$4,389,060	$5,615,266	$0	$874,617	$0	**$10,878,944**
Tier I Total	$4,852,930	$6,604,414	$6,247,220	$531,820	$87,360	**$18,323,744**
Tier II Total	$2,334,630	$3,745,720	$639,400	$259,390	$0	**$ 6,979,140**
Tier III Total	$2,747,660	$1,782,740	$1,700,210	$50,680	$627,420	**$6,908,710**
Grand Total	**$14,324,280**	**$17,748,140**	**$8,586,830**	**$1,716,507**	**$714,780**	**$43,090,538**

VI. Educational Programming & Adequacy

Rangely School District currently offers programming at the elementary, middle, and high school levels that are primarily consistent with the Colorado Academic Standards at:

- Comprehensive Health and Physical Education
- English Language Proficiency
- Mathematics
- Music
- Reading, Writing, and Communicating
- Science
- Social Studies
- Visual Arts
- World Languages

Adequacy

Programs Currently Within Colorado Model Content

Health and Physical Education, English, Mathematics, Music, Reading and Writing, Science, Social/ Studies, Art, and World Languages.

Programs Currently Offered Outside Colorado Model Content

Vocational Programming: Wood Shop, Basic Shop, and Welding

VII. Complete Inventory of Facilities

Facility Inventory

The table below identifies each building assessed in the Master Plan. The areas represent the total current area of the building:

Building	Address	Use	Area (sf)	Year	Construction Type
Parkview ES Building	550 River Road, Rangely, CO. 81648	K-5 Education	61,787	1984	Steel frame with brick façade, standing seam metal roofs and single-ply membrane roofs
Rangely JR/SR HS Building	234 South Jones Avenue, Rangely, CO. 81648	6-12 Education	102,691	1986	Steel frame with brick façade and single-ply membrane roofs
Early Education Center	402 West Main Street, Rangely, CO. 81648	Pre-K Education, Employee Offices, Board Meetings	6,194	1960	Steel frame with CMU block and brick façade, standing seam metal roofs and single-ply membrane roofs

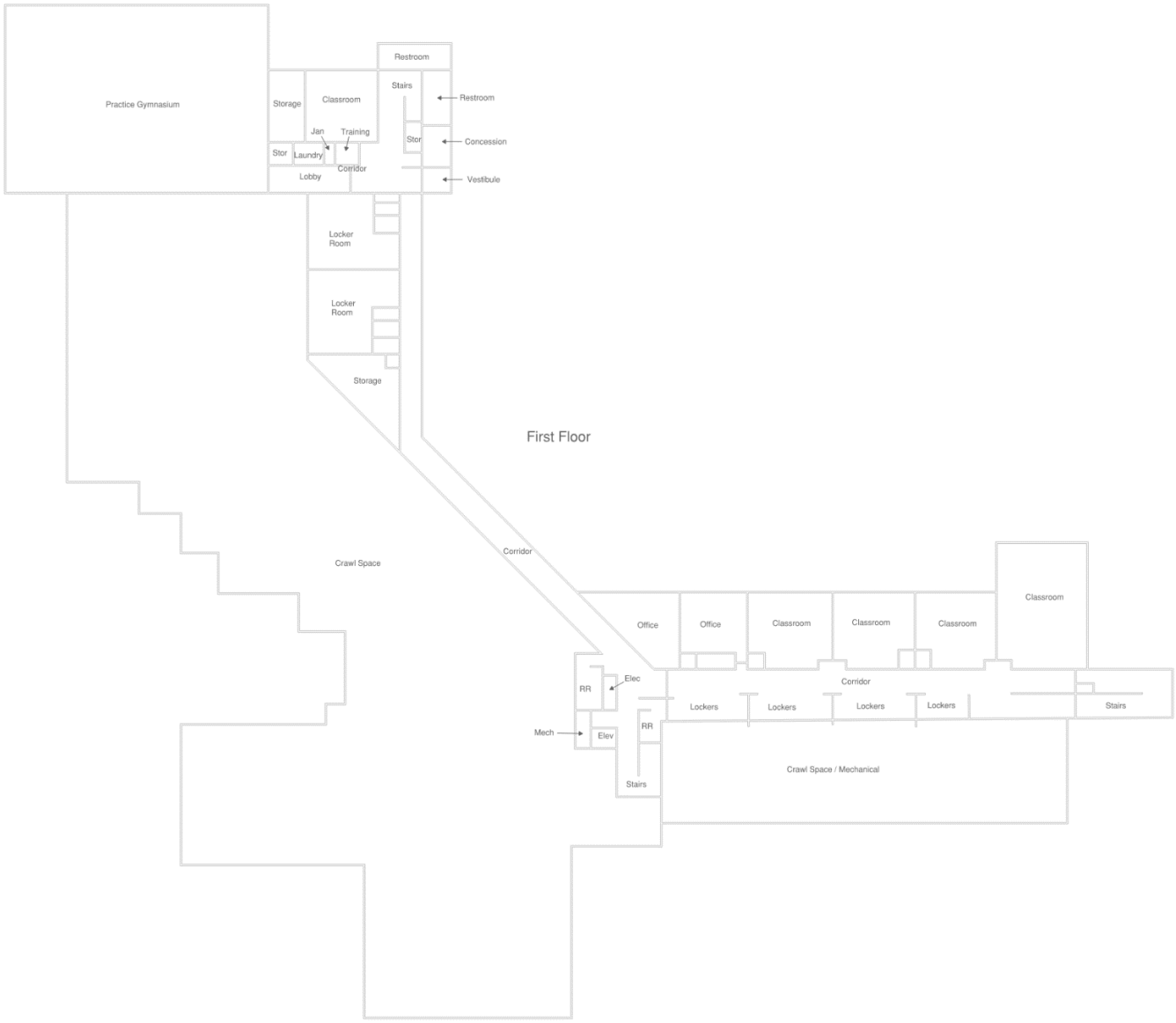
Additions

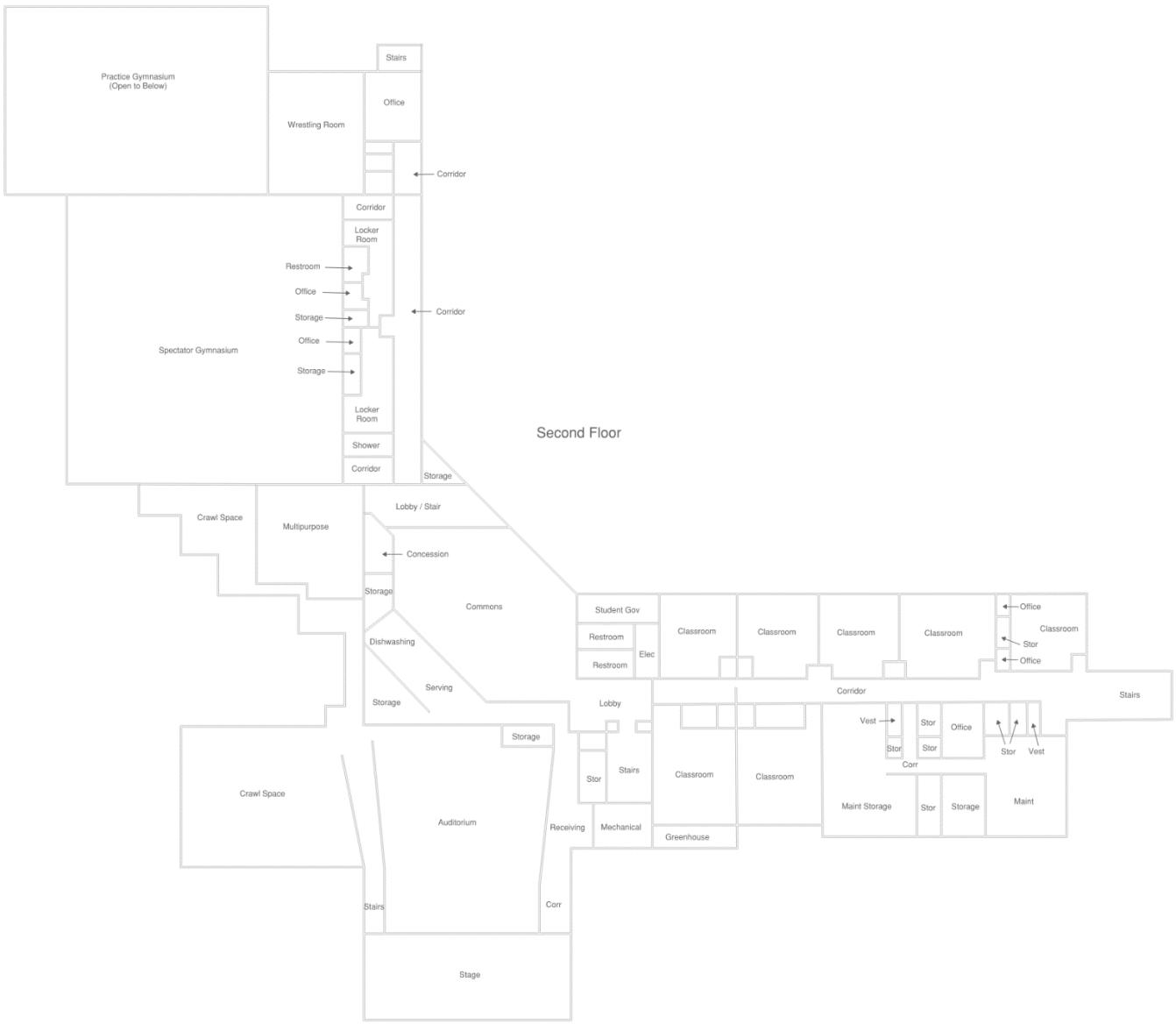
Additions	Year	Area (sf)	Use	Construction
AG Shop Building Addition	1952	10,470	9-12 Education	Steel frame with CMU block and brick façade with a single-ply membrane roofs
Early Education Center	2000	22,590	Pre-K Education, Employee Offices, Board Meetings	Steel frame with CMU block and brick façade, standing seam metal roofs and single-ply membrane roofs

Site Floor Plans

Parkview Elementary School

Rangely Middle/High School




Practice Gymnasium
(Open to Below)
Stairs
Wrestling Room
Office
Corridor
Corridor
Locker
Room
Restroom
Office
Storage
Office
Storage
Corridor
Spectator Gymnasium
Locker
Room
Shower
Corridor
Storage
Second Floor
Crawl Space
Multipurpose
Lobby / Stair
Concession
Storage
Commons
Dishwashing
Serving
Storage
Student Gov
Restroom
Restroom
Elec
Classroom
Classroom
Classroom
Classroom
Office
Classroom
Stor
Office
Corridor
Stairs
Lobby
Vest
Stor
Stor
Office
Stor
Vest
Corr
Storage
Crawl Space
Auditorium
Stor
Stairs
Classroom
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Maint Storage
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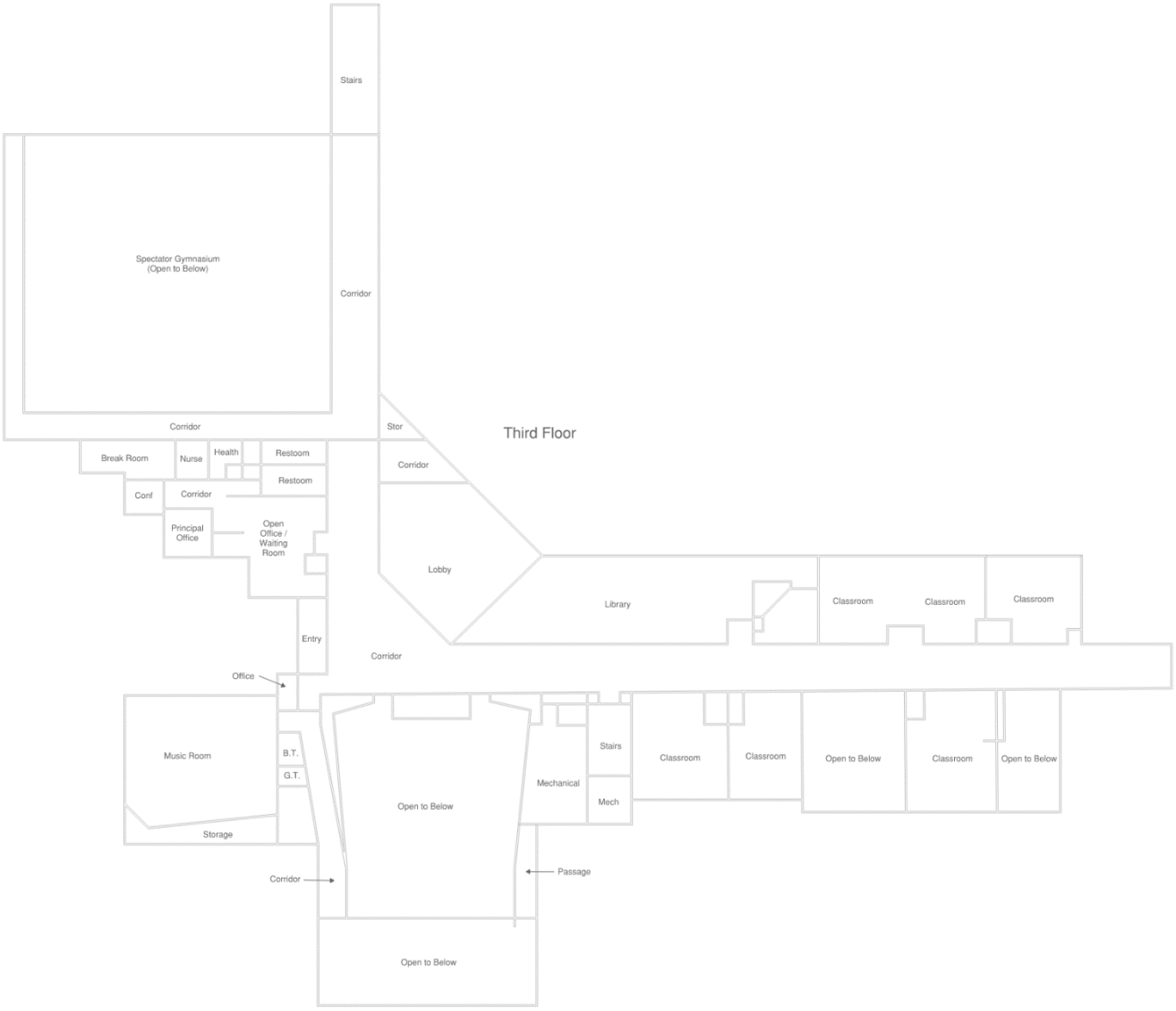
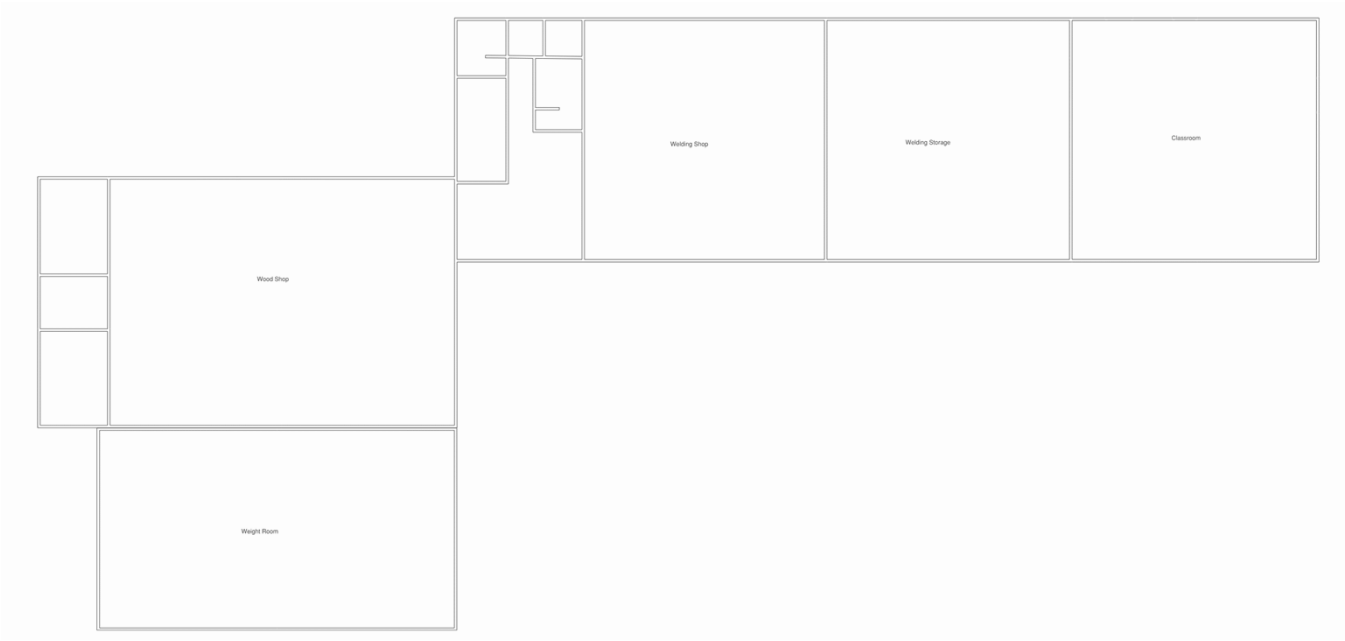
Maint
Receiving
Mechanical
Greenhouse
Stairs
Corr
Stage



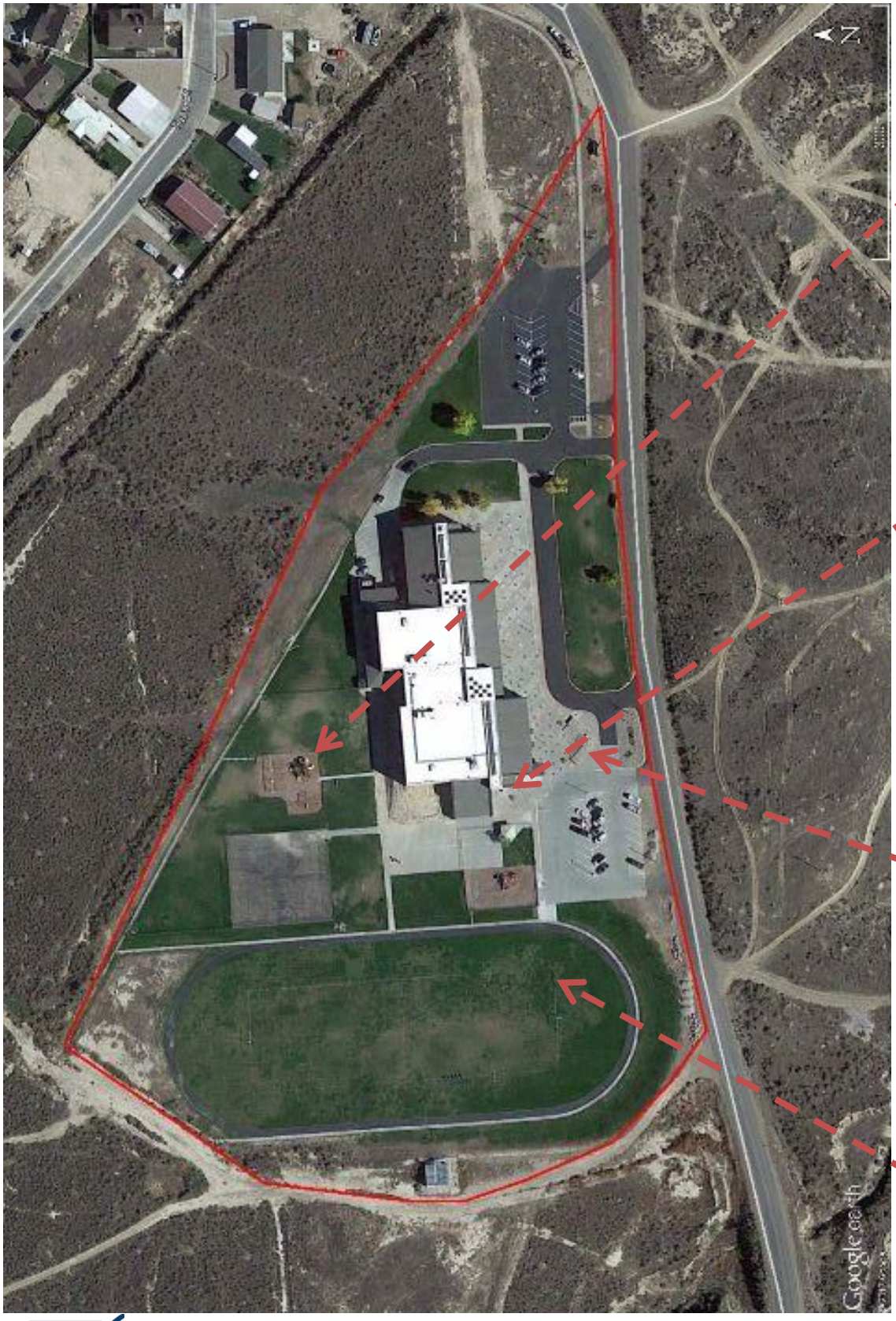
Administration Building

Ag Shop


Welding Shop
Welding Storage
Classroom
Wood Shop
Weight Room

Site Map

Parkview Elementary School



Playground

Overview of the Whole Building

Concrete Seating Section

Track and Field

Rangely Middle/High School

Track and Field

Exterior Stairs

Exterior Building Walls

Parking Lot

Ag Shop

Administration Building

Front Door

Playground

Roof Overhang

School Mural

Parking Lot

VIII. Facility Evaluation

Parkview Elementary School

General Building Information

The Parkview Elementary School was originally constructed in 1984 with major renovations performed in 2009. The renovations included mechanical, electrical, and fire suppression systems as well as complete exterior window replacements.

Parkview Elementary Main Facade

Building Program & Function

Parkview Elementary provides educational classrooms for students ranging from Preschool to fifth grade with most classrooms located on the east wing of the facility. This wing also houses offices for Parkview staff, the art room, and one of the two gymnasiums available in the facility. The East Gymnasium is used as a practice gym for students and the surface finish is an all-purpose indoor sports tile as this gymnasium sees more use and wear than the Spectator Gymnasium, located in the west wing.

Original 1984 Construction Plaque

The west wing contains the Spectator Gymnasium with bleachers on either side for viewing and has a wood flooring surface finish. Women's and Men's Locker Rooms are adjacent to the Spectator Gym and are equipped with showers and lockers. The west wing also serves several different functions such as housing the Parkview preschool, music room and the wrestling room, which is located on the second floor.

Crack propagation can be found in multiple areas throughout the building's exterior.

Building Structure

The building is masonry walls and steel stud construction. The two main types of interior walls are a combination of steel stud construction with painted dry wall and masonry walls. The building is two stories, and steel joists and a metal deck create the structure for the roof.

The structural integrity of the building is in good repair with no evidence of foundation settling or undue stress on the building. However, some of the exterior walkways are observed to have settled and cracked, which is caused by incorrect drainage not pulling water away from the

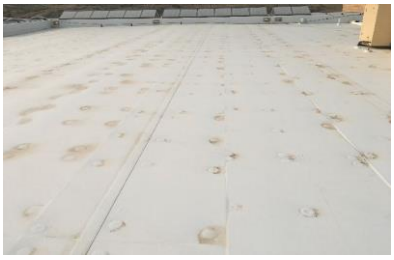
A poor foundation seal has caused drainage issues.

An incomplete sidewalk that is causing drainage issues and safety hazards.

The West Gym wall that is partially below grade.

Poorly Insulated Windows

The exterior doors that are allowing significant amounts of infiltration.



TPO System Roof Condition

building. Other walkways are incomplete and leave the foundation of the building completely exposed to the elements. If left unattended, unwanted settling and erosion of the foundation as well as mortar deterioration will continue to occur, which will lead to more costly repairs.

Building Envelope

Exterior Walls

There is minor step cracking in the brick façade and separation in some of the expansion joints. Additionally, the portion of the West Gymnasium's exterior wall that is below grade is experiencing water infiltration caused by improper drainage and grading and deterioration of the existing waterproofing membrane.

Windows

The exterior window systems were replaced in 2009 with aluminum framed, double pane window systems. However, some of the windows at the main entrance have damaged seals that have led to fogging between the panes of glass.

Exterior Doors

Most of the exterior door hardware is original to the building. The doors have poor seals allowing for additional infiltration. Some exterior doors have been replaced leaving two different exterior doors at some entrances. The main entry door system was replaced in 2009.

Roof

There are two roofing systems serving Parkview Elementary. A sloped standing seam metal roof is in place above perimeter spaces. The second roofing system is an outdated version of Thermoplastic Polyolefin (TPO) that is no longer available or installed in the US. The TPO portions of the roof are in poor condition and prove very difficult to maintain or repair due to the exterior surface material no longer being available. The District has attempted to repair and patch the roof as needed but has found that various patching materials do not adhere well to the existing roof material. Water pooling and leaks are beginning to cause interior damage as evidenced by damaged ceiling tiles and damaged hard ceilings.

Summary of Building Envelope

Core Issues:

1) Some of the window seals in the store-front window system at the main entrance have failed leading to fogging in those windows.

2) Some exterior doors are in poor condition with some rusting on frames and visible gaps around the doors. This allows outside air and water infiltration into the building.

3) Minor step cracking and expansion joint separation in the brick façade is evident. This affects approximating 5% of the façade.
4) The rooftop was also observed to be in poor condition with pooling throughout and evidence of water infiltration into interior spaces.
5) Perimeter walkways have settled and are deteriorating due to improper drainage.
6) Parking curbs were observed to be deteriorating with some sections of curbs completely falling apart.
7) Water infiltration through the below grade gym walls is leading to water damage within the gym.

Recommendations:

1) Replace damaged store-front window systems.
2) Repair or replace select exterior doors.
3) Preform tuckpointing and expansion joint sealing are needed to address minor issues with the brick façade.
4) Replace the TPO sections of the roof with a new, long lasting TPO roof. Repair or replace gutter systems and include snow/ice control strategies.
5) Remove existing perimeter walkways, regrade or implement proper drainage, and pour concrete walkways again. Implement a snow and ice melt system in the walkways at the main entrance. Repave the parking lot curbs that are damaged.
6) Excavate, regrade, and install a new waterproof membrane along the below grade gym walls to mitigate the current water infiltration issues.
7) Touch up rusting trim on circular exterior windows.
8) Replace metal trim and facia, add box gutter, and ice dams.
9) Reseal around perimeter of the building at sidewalk interface.
10) Replace panes in dome area above the main hallway.
11) Demolish out (11) old raised tree beds and pour concrete flush with sidewalk
12) Replace two outdoor, permanent placement, bench/table sets
13) (4) New light poles higher than 12'
14) Resurface the asphalt parking lot
15) Add new parking and driving lane through the front grass area
16) Add all new irrigation
17) Create covered outdoor class area
18) Resurface track with seal coat and painting
19) Add a 4' fence with a gate behind the basketball courts
20) Add 4-square court stripes to the basketball courts
21) Add a wallball wall to the basketball court
22) Move the flagpole to the front of the building near the road by the black fence art
23) Install new bike racks
24) Address drainage issues on the north/northwest side of the property
25) Build an addition for the gym storage off the north wall of the main gym
26) Add seating and a gazebo to the back of the building

Summary of Site Recommendations

1) Replace All Sidewalks & Add Snow Melt System
2) Repair Damaged Parking Lot Curbs
3) Install a Speed Alert Sign on the Road Leading to the School
4) Football Field and Irrigation Renewal
5) Demo Out (11) Old Raised Tree Beds and Pour Concrete Flush with Sidewalk
6) Replace Two Outdoor, Permanent Placement, Bench/Table Sets
7) (4) New Light Poles Higher Than 12'
8) Resurface Asphalt Parking
9) Add New Parking and Drive Lane Through Front Grass Area
10) All New Irrigation
11) Resurface Track- Seal Coat & Paint
12) 4' Fence with Gate Behind Basketball Courts
13) Add Four-Square Stripes to Outdoor Baseball Court
14) Add A Wallball Wall to The Basketball Court
15) Move Flagpole to Front Near Road by Black Fence Art
16) Install New Bike Racks
17) Address Drainage Issues on North/Northwest Side of The Property

Summary of Building/Structure Addition Recommendations

1) Build An Addition for Gym Storage Off the North Wall of The Main Gym
2) Covered Outdoor Class Area
3) Add Seating and Gazebo to Back of Building

Interiors

Most of the interior finishes consist of VCT tiles and carpeted floors, which are found throughout the corridors and classrooms. Epoxy floor can be found in the locker rooms and hardwood flooring is in the gymnasiums. However, the hardwood floor of the practice gym has been covered in plastic tiles. The kitchen contains quarry tile floors and restrooms contain ceramic tiles. The carpeting has begun to show signs of wear and is nearing the end of its useful life. The various types of tile flooring systems are in fair to good condition except at the transition from the quarry tile in the kitchen to the neighboring corridor's VCT floor. This area lacks a proper transition; both types of tiles are becoming damaged.

Painted gypsum board walls and unfinished brick walls account for the majority of the interior walls. Lay-in drop ceilings make up most of the interior ceiling space with hard ceilings in various corridors and exposed metal roofing decks in the gymnasiums. Signs of water damage are visible on various drop ceiling tiles and on some hard ceilings near skylights that have started to leak.

Water leaks visible on the ceiling tiles.

Typical VCT Floor

Fire Protection & Life Safety

Fire extinguisher cabinets, a kitchen hood suppression system, and a wet sprinkler system were installed as part of facility improvements in 2009, and these systems were found to be in good repair. A fire alarm system was also installed in 2009 and has exceeded its expected service life. While the fire alarm system is still functioning properly, replacement of the system should be considered in the near future.

The interior walls have a paint finish.

Summary of Interiors

Core Issues:

1) Carpeted floors are nearing the end of their service life and are showing signs of wear.
2) VCT and quarry tiles have become damaged at the kitchen/corridor transition due to lack of proper transition between the flooring types.
3) The fire alarm system has exceeded its expected service life.

The damaged VCT and quarry tiles at the transition into the kitchen.

Recommendations:

1) Replace all carpet with long lasting, well-wearing carpet.
2) Remove and replace the damaged VCT and quarry tiles and install a proper transition strip to prevent future damage.
3) Replace the fire alarm system with a new, modern fire alarm system.
4) Standardize classroom layout
5) Demolish all old/abandoned in place power and network runs in the classrooms
6) resurface the stairs
7) All new casework throughout the school
8) Repaint the lockers and add tackboard above the lockers

9) Renovate the old computer room
10) Paint all interiors in gym areas
11) Paint the orange bar joists and duct work in the gym white
12) Fix damaged face CMU in the gyms
13) Replace the floor in the practice gym
14) 4 sets of expanding corridor fence/barriers to close off access to portions of the building
15) Standardize flag placement in classrooms
16) Install motorized blinds in both gyms
17) Paint locker room lockers
18) Renovate kitchen to a modern kitchen layout/ function
19) New rubber bases
20) Demolish out the restrooms in the old preschool room to open up the floorplan
21) Replace countertops in greenhouse with new soldi surface counter
22) Re-key and new locks site wide
23) Remove and patch all old brick anchors
24) Demolish all existing CAT-5/5e cabling and infrastructure and place with CAT-6A.
    a. This will require (11) drops per class with (2) on each wall, (2) in the center of the ceil, and (1) at each door. Upgrade all network plugs to RJ45. New patch panels and half racks in IDF rooms.
25) Restain and touch up doors
26) Replace library furniture and add "Tree Support Beam Reading Area"
27) Replace framing where needed (Art room)
28) Add (2) Wi-Fi scoreboards with protective fence in the main gym
29) Add (2) new square glass backboards in the practice gym
30) Install a new PA/Sound System in the main gym
31) Replace the elevator

Mechanical HVAC Systems

Section I: Hydronic System Serving Parkview

Hydronic Plant

Two P-K Thermific natural gas water tube boilers with a standard efficiency of 85% supply the entire facility with heating hot water (HHW). The boilers, pumps, and other hydronic equipment in the plant are at least 11 years old and are in poor condition with one of the boilers having failed already. With only one operable boiler, the central plant has no redundancy, which puts the facility at risk of being without heat if it were to fail. The hydronic plant is located in the mechanical room mezzanine.

A Baltimore Aircoil Company Cooling Tower was installed in 2009 and provides cooled water to the water distribution loop. At 11 years old, it still has a few years of expected service life left, and it is only used when the building needs

Baltimore cooling tower

Thermific boilers with one inoperable

Mechanical room cooling and heating coils

Variable air volume terminal box with hot water reheat

cooling. The cooling tower is located outside and is contained in a fenced enclosure with brick walls on either side. The American Society of Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE) recommends replacing cooling towers after 20 years to prevent unreliable operation and excessive maintenance costs. The lack of chiller plant equipment in the building design was likely made due to the region's weather characteristics of low dew point. Evaporative coolers rely on the process of evaporation to cool water. Energy is released through the phase change dropping the water temperature of the liquid remaining. For Parkview, this produces a delta T of 15°F, with a leaving water temperature of 67 °F. In other words, the evaporative cooler is unable to achieve supply water temperatures that are capable of effectively cooling supply air. In addition, hard water conditions experienced by the facility have caused significant build-up in hydronic distribution systems and the cooling tower.

Air Distribution Systems

There are two primary distribution system types serving Parkview Elementary: rooftop variable air volume (VAV) air handling units (AHUs) with hot water reheat and a built-up VAV system with parallel fan powered VAV terminal boxes. The two rooftop VAV AHUs condition and ventilate the two gymnasiums. These units are 11 years old and contain evaporative cooling sections and heating coils that receive HHW from the boiler loop.

The built-up VAV unit is located in the mechanical room adjacent to the practice gymnasium and provides conditioning and ventilation to all conditioned spaces except for the East and West Gymnasiums and the kitchen. The built-up unit consists of a supply and return fan running off of VFDs, an evaporative cooling section served by the cooling tower, and a heating coil served by the boiler loop. There is also an outdoor air intake damper, return air damper, and air mixing section within the built-up VAV. During the site inspection, the actuator, which controls the position of the outdoor air damper, was found to be broken and disconnected from the damper. Additionally, the outdoor air damper was stuck in the mostly-closed position. This is leading to inadequate outdoor air being brought into the building for ventilation. Parallel fan powered VAV terminal boxes located downstream of the built-up VAV are located in the above-ceiling plenum above classrooms and other spaces they serve. Each terminal box has a hot water reheat coil for condition supply air to each space's desired temperature. The main components of the built-up VAV unit and the VAV terminal boxes are 11 years old.

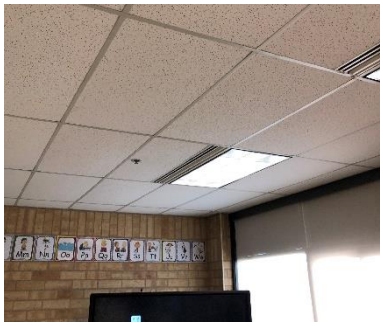
Ductwork is located in the plenum above the lay-in ceiling on the east wing of the facility. Classrooms contain three to four linear slot diffusers that are typically located near the exterior wall. Due to the location of these diffusers in classrooms and the lack of even distribution, the air must be thrown across the room to reach the other side. Return grills on the first floor pull air directly into the plenum. These are scattered around the classrooms and are often located very close to the slot diffusers, which could be disrupting airflow.

Ventilation

The gymnasiums are ventilated by the VAV AHUs, and the remainder of the school is ventilated by the built-up VAV unit. Outside air is mixed with return air at the units and is then ducted to spaces. Classrooms are designed to receive ventilation air through a system of outside air dampers located in the mechanical room. Additionally, when outdoor air temperature is in acceptable ranges, the dampers are designed to economize. During the months of July-September, Parkview is able to achieve adequate amounts of fresh air though economizing; however, during the heating season when temperatures drop below acceptable ranges for economizing, the facility relies on these damper systems for ventilation air. The amount of ventilation air brought in is a function of damper position. As stated above, the current damper system is not functioning properly on the built-up VAV system, and it is likely that many of the spaces in the building are not receiving adequate amounts of outside air, which can be detrimental to indoor air quality.

Additional indoor air quality analysis is provided in section IX: Energy, HVAC, O&M Analysis.

Inadequate outside air intake dampers



Poorly located ceiling air diffusers

Greenheck roof top units

LG heat pump condensing units

Close up view of the Greenheck RTU

Section II: Unitary HVAC Equipment

Make-Up Air Unit: Kitchen

The kitchen received ventilation air via a heating-only make-up air unit located on the roof. It is tied into the kitchen exhaust hood and runs whenever the kitchen hood is in use.

Split-DX Systems: Classrooms

Three classrooms on the second floor along the southwest corner of the building are conditioned by a variable refrigerant flow (VRF) system. The outdoor VRF system condensers are located on the roof.

Each of these three classrooms had two indoor VRF cassettes installed in 2012. The VRF system was installed to supplement the conditioning and ventilation air provided to the spaces by the built-up VAV system.

Unit heaters: Corridors

Ceiling recessed cabinet unit heaters were replaced in 2012 and are now 8 years old.

Summary of Mechanical HVAC Systems

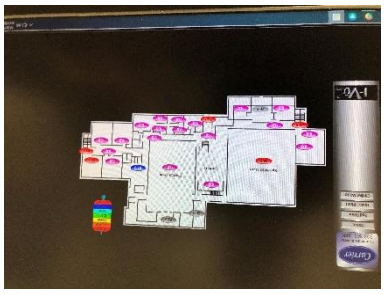
Core Issues:

1) The cooling tower is ineffective because it lacks the capacity to meet the cooling load during the hot times of the year. In addition, it leaks water and is causing pooling on and near the mechanical pad.
2) Outside air dampers are not providing adequate ventilation air through the built-up VAV system and are in disrepair.
3) Some VAV terminal boxes are not functioning properly and need to be replaced.
4) There are systemic comfort problems throughout the school.
5) Boilers are at the end of life and only one of the two is still operable.

Recommendations:

1) Upgrade the built-up VAV system to include cooling via an air-cooled chiller.
2) Repair or replace the outside air dampers and actuators on the built-up VAV units to ensure proper ventilation rates are reached for all spaces.
3) Repair or replace VAV terminals as needed.
4) Replace evaporative cooling VAV AHUs with high efficiency packaged VAV units containing hot water heating coils and DX cooling.
5) Replace existing boilers with properly sized, high-efficiency condensing boilers and upgrade the loop to a variable primary/variable secondary loop.
6) Implement COVID-19 infection mitigation strategies.
7) Add new heating/cooling RTU for the kitchen
8) Replace crawl space Reznor MUA/Unit heater

9) Replace Greenhouse HHW heater with an electric heater



Elementary School BAS front-end

Carrier temperature sensor

Building Management System

The building is managed by a Carrier i-Vu control system that was installed in 2009. The hardware is a mixture of various manufacturers and is 12 years old. Controllers include ABB VFDs on some pumps and fans, which includes the chilled water pump. Outside air temperature control damper actuators for economizing on mechanical room dampers were replaced in 2009 and are integrated with the building management system (BAS). Temperature sensors for the VAV hot water reheat system are Carrier DDC temperature sensors. The VRF system is controlled by a standalone DDC system that is proprietary to the manufacture, and temperature sensors are located inside the spaces. Siemens Butterfly Valve Flow Controllers, installed in 2009, are still in use. Siemens Ball Valve Actuators regulate heated hot water distribution.

Summary of Building Management System

Core Issues:

1) The iVu system is old, ineffective, not optimized for energy conservation, and difficult to maintain.
2) Space temperatures are not well maintained by the current control system.
3) The VRF system is not tied into the main DDC interface.

Recommendations:

1) Install a new building management system as part of the needed HVAC renovations.
2) Replace any controls that are found to be either non-functioning or incompatible with the new system.
3) Ensure all mechanical equipment is tied into the new building management system for easy of control.

Sub Panel Serving Parkview Elementary

Main Distribution Panel

The majority of the building is illuminated by inefficient, 32-Watt T-8 bulbs. The entire school needs to be upgraded to high efficiency LED lighting.

Electrical Service Entrance & Distribution Systems

Main Distribution Panels

The electrical service entrance in Parkview Elementary is located in the electrical room across the hall from the kitchen. The main distribution panel is an 800A panel that is original to the building, making it 37 years old. The main distribution panel still functions well, but it is past the expected service life of 30 years.

Panel Boards

The various panel boards and feeders in the main electrical room are in fair condition but are original to the building and have exceeded their expected service.

Classroom Outlets

The number of outlets in the classrooms are sufficient to meet the electrical demand of a modern classroom. Smart TVs and personal laptop computers are currently in use in most classrooms with no electrical deficiencies reported.

Lighting

The majority of the lighting systems consist of 32-watt T8 lamps. Fixtures are recessed into the acoustic lay-in ceiling. These fixtures are far less efficient than modern LED technology. Gymnasium lighting was recently converted to LED fixtures. LEDs are 65% more efficient and last 2-3 times longer than fluorescent lamps. They also do away with electrical ballasts, which fail frequently saving maintenance costs.

Emergency Power

The site lacks an emergency backup generator.

Intercom System

The intercom system is unreliable. School staff have to rely on hardline phone systems or cellular phones to communicate across the school. The intercom system is ineffective for making announcements and intruder alerts, which compromises the safety of the facility.

Summary of Electrical Systems

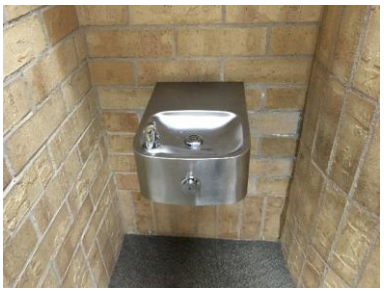
Core Issues:

1) The main distribution panels, panel boards, and feeders in the main electrical room are past their expected service lives.
2) The building is illuminated by inefficient fluorescent tube fixtures.
3) The building does not have emergency lighting and a backup generator.
4) The intercom system is unreliable and has routinely failed.

Recommendations:

1) Comprehensive renovation of the electrical systems to accommodate the HVAC work, which includes upgrading the main switchboard and panel boards in the main electrical room.
2) Install high efficiency LED lights facility-wide to reduce energy use and utility costs.
3) Install a new emergency power generator to backup critical buildings systems.
4) Install a new intercom system in the facility.
5) Replace/Repair (2) outdoor emergency lights near main gym
6) Add dedicated panel/circuits for (1 4-plug) outlet to backwall of each classroom
7) Add power to track building/box behind goalpost
8) Check all receptacles and replace as needed
9) Add rope lights to main hallway skylights

Typical Bathroom Fixtures



Wall-Mounted Water Fountains

Plumbing

Most of the plumbing fixtures in Parkview Elementary are in good shape because they were replaced in 2009. The 2009 renovation of the plumbing fixtures was done with accessible elements in mind, including accessible toilet stalls and door clearances on the push and pull sides of doors.

The domestic water distribution system consists of a domestic hot water boiler that provides 120°F water, two circulation pumps, and domestic water piping. This system services all plumbing fixtures throughout the site. There are issues getting hot water to the fixtures furthest from the domestic hot water heater. It is suspected that a combination of hardwater damage and underperforming circulation pumps are limiting the amount of hot water reaching fixtures at the far ends of the domestic water distribution system.

The kitchen drainage lines have issues such as slow draining and regular back-ups. It is unclear if the underlining issue is partially blocked drainage lines or if the main line has been damaged further down the line. The first step in addressing the drainage issues will be to scope the lines and determine the actual breadth of the issues. In addition to the drainage issues, the dishwasher no longer performs as well as it should.

Summary of Plumbing

Core Issues:

1) Domestic hot water is not sufficiently reaching fixtures towards the end of the distribution lines.
2) The drainage lines serving the kitchen are slow to drain and back-up easily.
3) The dishwasher is in need of replacement.

Recommendations:

1) Replace domestic water circulation pumps with properly sized pumps, address hardwater build-up, and install a water softening system to mitigate future hardwater damage.
2) Scope and address any issues that are found within the kitchen drainage system.
3) Install a new commercial dishwasher.
4) Replace fixtures in outdoor restrooms
5) Add water bottle refill to outdoor fountain
6) Address/fix the drainage issues in the mechanical mezzanine drains
7) Some plumbing lines not working/draining in (1) or (2) restrooms
8) New wash station/sinks in art room
9) Add water bottle refill to all fountains/replace backing of current bottle refill stations

10) Access fire suppression system

Security & Access Control

Security for Parkview includes locks on exterior doors and windows as well as a secure entry vestibule. The 2009 renovation project included a replacement of the existing security system, and motion sensors were installed in various corridor locations.

The old security system used the fire alarm to issue alarms. The replacement system updated existing motion sensors. The new system also included a dialer to indicate which motion sensor was activated, keypads for arming the system, and it interlocked with the access control system.

A key fob system was also installed to allow keyless entry for the staff; however, the key fob system has begun acting up and is now unreliable. The District also recently added high-quality security cameras. The cameras function well and provide good coverage of the site, but the camera servers are in need of an upgrade.

Exterior CCTV Cameras

Exterior Card Access System on Doors

Summary of Security & Access Control

Core Issues:

1) The key fob entry system is malfunctioning and is no longer reliable.
2) The security camera server is outdated.

Recommendations:

1) Replace the key fob system with a functioning, reliable system.
2) Upgrade and centralize the security camera server.
3) Add IP based card reader door access
4) Add panic pull station/button in each room and install CCTV system
5) Security glass on all first floor classroom windows

Hazardous Materials

A 1999 asbestos abatement project removed all remaining asbestos containing material (ACM).

Rangely JR/SR High School

General Building Information

The Rangely Junior/Senior High School was originally constructed in 1986. In 2009, new ceilings, carpet, masonry walls, plumbing fixtures, doors and other architectural work was done to sections of the building. This work was done on all three floors of the school. Additionally, the mechanical and lighting systems were upgraded in 2009.

Overview of the Building's Exterior

Building Program & Function

The building provides educational classrooms for students ranging from 6 – 12 grade. Classrooms are on all three floors of the facility with the first floor housing math, computer, and home economics classrooms. It also houses office spaces and the Practice Gymnasium. A large portion of the first floor is crawl space, which is used for storage of desks and other classroom equipment.

The second floor houses the wrestling room, more offices, classrooms, Spectator Gymnasium, science labs, art room, and auditorium. There is more crawl space on the second floor as well.

The third floor houses more classrooms, offices, and the music room. The gymnasiums are located in the north wing of the facility while the auditorium is located in the south wing. Classrooms are primarily located in the east wing.

1986 and 2009 Construction Plaques

Building Structure

The original building is masonry and steel stud construction. Interior walls are a combination of steel stud construction with dry wall and masonry walls. It is a three-story building. Metal joists and metal decking form the structure of the roof.

The structural integrity of the building is in good repair with no evidence of foundation settling or undue stress on the building. However, some of the exterior walkways are settling and cracking due to incorrect drainage not pulling water away from the building.

Cracking Sidewalks at the MS/HS

Crack Propagation Into the Facility

West Wing Exterior with Deteriorating Walls and Windows

Building Main Façade

Interior Crack Propagation on Gymnasium Walls

The roof atop the 1998 wing is bubbling and draining poorly.

Poor Drainage on Roof

Building Envelope

Exterior Walls

There is minor step cracking in the brick façade and separation in some of the expansion joints. Additionally, the portion of the Practice Gymnasium's exterior walls, that are below grade, are experiencing water infiltration. This is caused by improper drainage and grading and deterioration of the existing waterproofing membrane. This same issue is also evident along portions of the first-floor corridor that are below grade and have an exterior wall.

Windows

The exterior windows were replaced in 2009 with aluminum framed, double pane window systems. These systems appear to be in good condition with no evidence of failed seals or excessive infiltration. Classrooms are equipped with window shades to control the natural lighting in the learning environment, and they provide solar gains and cold air transfer when necessary.

Exterior Doors

Exterior door hardware was also replaced in 2009. Some of the exterior doors have very poor seals. Air gaps between the door and the outside are visible and are contributing further to the issue of infiltration. Other doors systems have experienced settling that makes them difficult to operate.

Roof

The roofing system is an outdated version of Thermoplastic Polyolefin (TPO) that is no longer available or installed in the US. The TPO portions of the roof are in poor condition and prove very difficult to maintain or repair due to the exterior surface material no longer being available. The District has attempted to repair and patch the roof as needed but has found that various patching materials do not adhere well to the existing roof material. Water pooling and leaks are beginning to cause interior damage as evidenced by damaged ceiling tiles and damaged hard ceilings.

Summary of Building Envelope

Core Issues:

1) Some exterior doors are in poor condition caused by a combination of settling and improper expansion joints. These doors require frequent maintenance and can become difficult to operate.

2) Minor step cracking and expansion joint separation in the brick façade is evident. This affects approximating 5% of the façade.

3) The membrane rooftop was observed to be in poor condition with water pooling throughout and evidence of water infiltration into interior spaces.

4) Perimeter walkways have settled and are deteriorating due to improper drainage.

5) Water infiltration through the below grade gym walls and corridor wall is leading to water damage within the gym and corridor.

Recommendations:

1) Repair or replace select exterior doors.
2) Preform tuckpointing and expansion joint sealing where needed to address minor issues with the brick façade.
3) Replace the roof with a new, long lasting TPO roof.
4) Remove existing perimeter walkways, regrade or implement proper drainage, and pour concrete walkways again. Implement a snow and ice melt system in the walkways at the main entrance.
5) Excavate, regrade, and install a new waterproof membrane along the below corridor walls to mitigate the current water infiltration issues. This approach will not work for the gym walls due to placement of an exterior staircase. Instead, drill through the gym wall from the interior and inject expanding sealant to mitigate water infiltration.
6) Add window sliders to all classrooms that do not have them.
7) Masonry work on the visitors side of football stadium by the transportation building with storage underneath

Summary of Site Recommendations

1) Replace All Sidewalks & Add Snow Melt System
2) Repave Parking Lots
3) Football Field Renewal and Drainage Repairs
4) Sod and Irrigation Renewal
5) Add Heating Component Beneath Sidewalk/ Cement Replacement at Front of Building
6) Fix Drainage Issues Occurring at West/ Northwest Side of Building
7) Fill In Crawl Space in Parking Lot
8) Fix Sprinkler System and Irrigation on Island in Front

Summary of Building/Structure Addition Recommendations

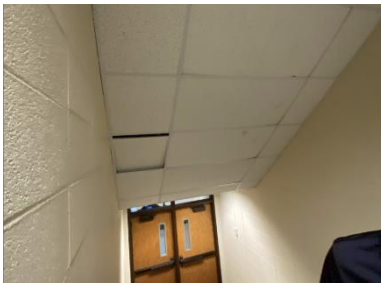
1) Add Gazebos On Both Sides Entrance at Football Field

Interiors

Most of the interior finishes consist of VCT tiles and carpeted floors, which are found throughout the corridors and classrooms. The carpeting and VCT flooring is showing signs of wear and is nearing the end of its useful life. Epoxy flooring can be found in the locker rooms and kitchen with hardwood flooring in the gymnasiums. The hardwood floor of the Practice Gym has been covered in plastic athletic tiles. The hardwood floors in the Main Gym are due for refinishing soon. Site staff notes that the wood floors under the athletic tiles in the Practice Gym have some water damage from the water infiltration through the gym wall as previously mentioned. These hardwood floors are also due for refinishing; however, the water damage will need to be addresses first.

Painted gypsum board walls and unfinished brick walls account for most of the interior walls with sections of painted CMU masonry blocks in select corridors and ancillary spaces. The majority of the interior ceiling space consists of lay-in drop ceilings with hard ceilings in various corridors and exposed metal roofing decks in the gymnasiums. Signs of water damage are visible on various drop ceiling tiles and on some hard ceilings.

A couple of sets of interior double doors have frames that are no longer square and require frequent maintenance to be functional or no longer fully close.



Failing Ceiling Tile

The carpeting that is found in most of the spaces. The Commons and Gym have a Resilient Vinyl System.

Fire Protection & Life Safety

Fire extinguisher cabinets and a wet sprinkler fire suppression system were installed as part of facility improvements in 2009, and these systems were found to be in good repair. A fire alarm system was also installed in 2009 and has exceeded its expected service life. While the fire alarm system is still functioning properly, replacement of the system, including pull stations, strobes, horns, and smoke detectors, should be considered in the near future.

Fire Cabinets in the Hallways

Summary of Interiors

Core Issues:

1) Carpeted floors and VCT flooring are nearing the end of their service life and are showing signs of wear.
2) Wood floors in the gyms are due for refinishing. The Practice Gym's wood floor also has some water damage.
3) The fire alarm system has exceeded its expected service life.

Sprinkler System in Drop Ceiling Tiles

Recommendations:

1) Replace all carpet and VCT flooring.
2) Repair water damaged flooring in the Practice Gym. Refinish wood floors in both gyms.
3) Replace the fire alarm system with a new, modern fire alarm system.
4) Standardize all classroom layouts.
5) All new casework throughout the school.
6) Improve kitchen cooking for large events.

Fire Alarm System with Visual and Audio Responses.

7) Remove shelves in library, install window in hallway to open up the space.
8) Install a new stairway in backstage area of theater to allow easier access to storage space.
9) Science lab (flooring)
10) Science lab (concrete)
11) Add better layout to maximize space/ seating capacity in science rooms (island in center).
12) Art shop facelift (paint and floors)
13) Sensory room facelift (paint and floors)
14) Paint women's locker rooms and repair all lockers that do not work. Replace two doors that were ripped off. Paint school colors. Install impact-resistant, 2x4 ceiling tiles.
15) Make all classroom desks uniform.
16) Replace school elevator.
17) Replace specialty items in science closets.
18) Replace water-damaged ceiling tiles and hard ceilings
19) Repaint interior walls and re-epoxy interior masonry walls
20) Replace damaged interior door system
21) Installation of new path lighting on theater stairs
22) Remove all network connection wiring in two specific rooms that used to be computer lab
23) Add a charging station and internet café inside of library
24) Install new mic and speaker system in theater.
25) Install new pathway lighting on theater stairs.
26) Demolish all existing CAT-5/5e cabling and infrastructure and place with CAT-6A.
    a. This will require (11) drops per class with (2) on each wall, (2) in the center of the ceil, and (1) at each door. Upgrade all network plugs to RJ45. New patch panels and half racks in IDF rooms.

Two Lochinvar Copper Fin II natural gas boilers supply the 1967 wing with hot water.

The air-cooled scroll chiller serving the air handling equipment is 24 years old and due to be retired or replaced.

Dilapidated and inefficient multi-zone air handlers condition the classrooms in the 1967 wing. Air quality, comfort, and fire code issues were observed with these systems.

A multi-zone air handler air intake unit is pulling air into the mechanical room from the corridor, which is a serious violation of fire code.

Mechanical HVAC Systems

Section I: Hydronic System

Hydronic Plant

Hot water heating coils provide most of the heating to Rangely Junior/Senior High School. The heating coils are served by two, benchmark condensing boilers that were installed in 2009. Boiler pumps and other hydronic accessories are in adequate condition. The site is also served by evaporative cooling coil at the air handling units. Just as with Parkview Elementary School, the evaporative coolers are unable to achieve supply air temperatures capable of effectively cooling supply air during the warmest parts of the year. Unlike Parkview, this site does not have a cooling tower to provide lower temperature water to the evaporative cooling coil serving the built-up AHU. Additionally, the evaporative cooling sections of the units are leaking significant amounts of water onto the roof and the floors of the mechanical rooms housing these units. Puddles of water surround the units, and if left unattended, they can cause mold and water leakage into connecting spaces. Rust damage is already evident at the built-up AHU and further damage is likely unless the underlying issues are addressed.

Ventilation & Air Distribution Systems

There are two primary ventilation and air distribution systems serving the conditioned spaces: packaged variable air volume (VAV) air handling units (AHUs) and a built-up VAV system with parallel fan powered VAV terminal boxes. There are three VAV AHUs, which condition and ventilate the large gymnasium, the auditorium, and two large classrooms on the first floor. These units are 11 years old and each contains an evaporative cooling section and hot water heating coils that receive hot water from the boiler loop.

The built-up VAV unit is located in the mechanical crawl space on the first floor and provides conditioning and ventilation to a majority of all conditioned spaces. The built-up unit consists of a supply and return fan both running off of VFDs, an evaporative cooling section, and a hot water heating coil served by the boiler loop. There is also an outdoor air intake damper, return air damper, and air mixing section within the built-up VAV. Parallel fan powered VAV terminal boxes located downstream of the built-up VAV are located in the plenum above classrooms and other spaces they serve. Each terminal box has a hot water reheat coil for condition supply air to each space's desired temperature. The main components of the built-up VAV unit and the VAV terminal boxes are 11 years old.

Ductwork is located in the plenum above the lay-in ceiling throughout the facility. Classrooms each contain three to four linear slot diffusers, which are typically located near the exterior wall. Due to the location of these diffusers in classrooms and the lack of even distribution, the air must be thrown across the room to reach the other side. Return grills

Residential grade split-DX systems provide supplementary cooling to the computer labs and office space in the 1967 wing. These systems have reached the end of their reliable lifespan and need to be retired or replaced.

Many of the rooftop units serving the 1998 wing are 21 years old and due to be retired or replaced.

The kitchen is conditioned by a gas/DX fan coil that is in fair condition. The space lacks a dedicated make-up air unit that is interlocked with the hood exhaust fan. This is serious violation of fire code and needs to be rectified.

on the first floor pull air directly into the plenum. These are scattered throughout the spaces and often are located very close to the slot diffusers, which could be disrupting airflow.

At the VAV AHUs and built-up VAV system, outside air is mixed with return air at the units and is then ducted to spaces. When outdoor air temperature is in acceptable ranges the dampers are designed to economize.

An indoor air quality analysis is provided in section IX: Energy, HVAC, O&M Analysis.

Section II: Unitary HVAC Equipment

Constant Volume Package Units: Gym and Classrooms

There are two constant volume package units located on the roof that serve the Practice Gym, Wrestling Room, and neighboring classroom. These units contain evaporative cooling sections, natural gas furnace heating sections, and are 11 years old. Utilizing a constant volume unit to serve multiple spaces is an inefficient method of conditioning spaces and leads to excessive energy use.

Packaged Rooftop Unit (RTU)

A packaged RTU with DX cooling and natural gas heating serves the multipurpose room. This unit is 11 years old and appears to be in good condition.

Summary of Mechanical HVAC Systems

Core Issues:

1) The current evaporative cooling systems are lacking the capacity to meet the cooling load during the hot times of the year. In addition, many of the evaporative coolers are leaking water and damaging equipment and surfaces.
2) Some VAV terminal boxes are not functioning properly and are in need of replacement.
3) There are systemic comfort problems throughout the school.

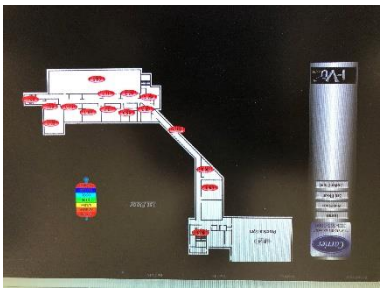
Recommendations:

1) Upgrade the built-up VAV system to include cooling via an air-cooling chiller.
2) Repair or replace VAV terminals as needed.
3) Replace evaporative cooling VAV AHUs with high-efficiency packaged VAV units containing hot water heating coils and DX cooling.
4) Replace the constant volume, evaporative cooling packaged units with high efficiency DX cooling/gas heating packaged units. The unit serving multiple spaces should also be upgraded to a VAV unit with retrofit VAV terminals added to the spaces.
5) Implement COVID-19 infection mitigation strategies.
6) Install new hoods in science rooms

Building Management System

The building is managed by a Carrier i-Vu Control System that was installed in 2009. The hardware is a mixture of various manufacturers and is 12 years old. Controllers include ABB VFDs on some pumps and fans, which includes the chilled water pump. Outside air damper actuators for economizing on mechanical room dampers were replaced in 2009 and are integrated with the BAS. Temperature sensors for the VAV hot water reheat system are Carrier DDC temperature sensors. The VRF system is controlled by a standalone DDC system that is proprietary to the manufacturer, and temperature sensors are located inside the spaces. Siemens Butterfly Valve Flow Controllers, installed in 2009, are still in use. Heating hot water distribution is regulated with Siemens Ball Valve Actuators.

A VFD on air handler connected to the outdated Carrier i-Vu System.



Carrier i-Vu BAS Front-End Control System

Summary of Building Management System

Core Issues:

1) The i-Vu Control System is old, ineffective, not optimized for energy conservation, and difficult to maintain.
2) Space temperatures are not well maintained by the current control system.
3) The VRF system is not tied into the main DDC interface.

Recommendations:

1) Install a new building management system as part of the needed HVAC renovations.
2) Replace any controls that are found to be either non-functioning or incompatible with the new system.
3) Ensure all mechanical equipment is tied into the new building management system for ease of control.

Electrical Service Entrance Overview

The panels throughout the building

Inefficient Gymnasium lighting

The majority of the building is illuminated by inefficient 32-Watt T-8 bulbs. The entire school needs to be upgraded to high efficiency LEDs

Electrical Service Entrance & Distribution Systems

Main Service Entrance Panel

The main service entrance panel is a 1,200A panel that is original to the building, making it 34 years old. The service entrance panel still functions well, but it is past the expected service life of 30 years.

Panel Boards

Distribution equipment, panel boards, and feeders were replaced as part of the 2009 improvements. However, the panel board in the art room is original to the building and has been tripping. It should be replaced.

Classroom Outlets

The number of outlets in the classrooms are sufficient to meet the electrical demand of a modern classroom. Smart TVs and personal laptop computers are currently in use in most classrooms with no electrical deficiencies reported.

Lighting

Lighting throughout the facility is primarily 32-watt fluorescent T8 lamps. Fixtures are recessed into lay-in ceiling. These fixtures require electrical ballasts, which are inefficient when compared to modern LED technology. These ballasts require frequent maintenance - often failing and needing to be replaced. The 32-watt fixtures are 65% less efficient than LED equivalent fixtures.

Emergency Power

The site lacks an emergency backup generator.

Intercom System

The intercom system no longer functions properly and is wholly unreliable. School staff have to rely on hardline phone systems or cellular phones to communicate across the school. This is ineffective for making announcements and intruder alters, and their compromises the safely of the school.

Summary of Electrical Systems

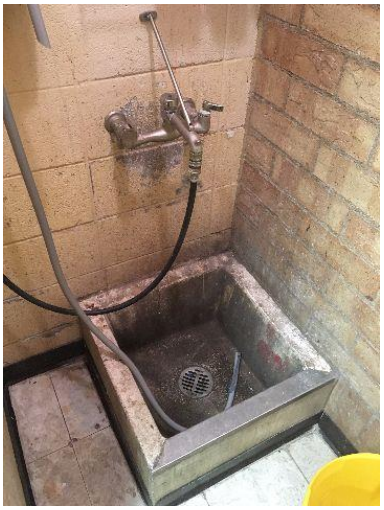
Core Issues:

1) The main service entrance panel and panel board serving the art room are past their expected service lives.
2) The building is illuminated by inefficient fluorescent tube fixtures.
3) The building does not have emergency lighting and a backup generator.
4) The intercom system is unreliable and has routinely failed.

Recommendations:

1) Renovate the electrical systems to accommodate the HVAC work, including upgrading the main service entrance panel and art room panel board.
2) Install high efficiency LED lights facility-wide to reduce energy use and utility costs.
3) Install a new emergency power generator to backup critical buildings systems.
4) Install a new intercom system in the facility.
5) Install new lighting control board in theater.
6) Upgrade football lighting and install new lighting control board.
7) Install a football field sound system

Typical Restroom Fixtures



Custodial Sinks

Plumbing

Most of the plumbing fixtures in Rangely Junior/Senior High were replaced in 2009 and are in good shape. The 2009 renovation of the plumbing fixture was done with accessible elements in mind, which includes accessible toilet stalls and door clearances on the push and pull sides of doors.

The domestic water distribution system consists of a 1,000 MBH domestic hot water boiler that provides 120°F water, two circulation pumps, and domestic water piping. The boiler and pumps were installed in 2009, and the system serves all plumbing fixtures throughout the site. Just as with Parkview Elementary, there are issues getting hot water to the fixtures furthest from the domestic hot water heater. It is suspected that a combination of hardwater damage and underperforming circulation pumps are limiting the amount of hot water reaching fixtures at the far ends of the domestic water distribution system.

Summary of Plumbing Systems

Core Issues:

1) Domestic hot water is not sufficiently reaching fixtures toward the end of the distribution lines.

Recommendations:

1) Replace domestic water circulation pumps with properly sized pumps, address hardwater build-up, and install a water softening system to mitigate future hardwater damage.

2) P-traps are rusting out upper floors

3) Address sewer smell in basement restrooms, likely needs a drain seal to prevent gases from escaping

4) Science lab: plumbing

5) New plumbing fixtures throughout

Security & Access Control

Security includes locks on exterior doors and windows, as well as a secure entry vestibule. The 2009 renovation project included a replacement of the existing security system, which consisted of motion sensors installed in various corridor locations. The old system used the fire alarm to issue alarms. The new system included replacement of the motion sensors, a dialer to indicate which motion sensor was activated, keypads arming the system, and it interlocked with the access control system. The district has also recently added high-quality security cameras. The cameras function well and provide good coverage of the site; however, the camera servers are in need of an upgrade.

Exterior Security Cameras

Summary of Security & Access Control

Core Issues:

1) Outdated security camera server.

Recommendations:

1) Upgrade and centralize the security camera server.
2) Replace burglar alarm system.
3) Install a panic and pull button station in each room and CCTV.
4) Make door access all IP-based.

Integrated Key Pad and Anti-Burglary System

Hazardous Materials

A 1999 asbestos abatement project removed all remaining asbestos containing material (ACM).

Administration and Early Education Center

General Building Information

The Rangely Administrative and Early Education Building was originally constructed in 1960 and served as a junior high school. In 2000, the building received a major renovation and was converted to the Administrative and Early Education Center.

Front Entrance of the Early Education Center

Building Program & Function

Approximately 20% of the building houses the District's administrative offices, 30% consists of the gymnasium, and the remaining 50% is comprised of the Early Education Center classrooms. The Early Education Center serves Pre-K through first graders.


The original building was constructed in 1960. An addition was later added in 2000 to be used primarily as classroom space.

Building Structure

The building utilizes steel stud construction with a painted stucco and brick veneer on the façade. The building is a single story with steel roof joists and metal deck creating the roof structure.

The structural integrity of the building is in good repair with no evidence of settling or undue stress on the building. However, some of the exterior walkways appear to have cracking and water erosion with incorrect drainage away from the building. If left unattended, unwanted settling of the foundation could occur.


Most of the lower half of the building is exterior brick walls with metal stud backup.


The upper half of the exterior façade is EIFS.

Typical window found in the building

The exterior doors are still in good condition and perform as intended.

Sections of the roof on top of the building are draining inadequately and have seen previous repairs. Numerous adhesive materials used for patching have failed.

Water damage on the roof is causing interior damage.

Building Envelope

Windows

The exterior windows and doors were replaced as part of the 2000 renovation. They appear to be providing efficient insulation to the building during winter months without causing unnecessary heat gain in warmer months. The windows are aluminum frame, double-pane window systems that don't show any signs of broken seals.

Exterior Doors

Exterior door hardware was replaced in 2000 and appears to be in fair to good condition. Panic bars are working and do not require excessive force to open the doors. The only damage noted is minor rusting around some of the exterior frames where the paint has worn off.

Roof

The existing roofing system is an outdated version of TPO that is no longer available or installed in the US. The roof is in poor condition and proves very difficult to maintain or repair due to the surface material no longer being available. The District has attempted to repair and patch the roof as needed but has found that various patching materials do not adhere well to the existing roof material. Water pooling and leaks are beginning to cause interior damage as evidenced on damaged ceiling tiles.

Summary of Building Envelope

Core Issues:

1. Some exterior doors and frames have minor rusting and failed weather seals.
2. The roof on top of the building is not draining correctly. A large degree of pooling was observed during the walkthrough. Additionally, leaks appear to be occurring. Many of the interior ceiling tiles are stained with water damage. The existing roofing material is very difficult to properly maintain.
3. Portions of the metal edging on the roof are failing or damaged.
4. The is poor roof drainage on the south side of the building and a failed gutter system that does not direct water away from the building adequately.
5. The windows in the gym are beginning to fail.
6. The exterior walls are in need of refinishing/repainting.

Recommendations:

5) Remove rust from the exterior doors and frames and refinish the doors and frames. Replace weather seals on all doors.

6) Replace the roof with a long-lasting TPO roof and repair or replace the gutter systems.

7) Repair and/or replace the failed and damaged portions of the roof edging.

8) Address the roof drainage issue with new gutters and a drainage system that direct water to the grass area south of the building.
9) Replace the gym windows with double-pane, operable windows.
10) Refinish/repaint the exterior walls.

Summary of Site Recommendations

1) Replace All Sidewalks & Add Snow Melt System
2) Repave Parking Lots
3) Baseball Field and Irrigation Renewal
4) Add a Sidewalk, Curb, and Gutter the Full Length School Front
5) Add New Flag Pool
6) Add New Front Plaza
7) Replace Chain-link Fence Around Baseball Field
8) Add a Gate to the Dirt Road to Restrict Access
9) Cleanup Area Under the Baseball Field Bleachers
10) Add Rubber Play Surface in Playground
11) Address Bus Loop Roof Drainage Issues

Summary of Site Building/Structure Addition Recommendations

1) Add A Locker Room and Restroom to the Baseball Field

Interiors

The primary interior finishes consist of VCT tile floors, carpeted floors, and painted gypsum board walls with lay-in drop ceilings. The gymnasium has a combination of masonry block walls and acoustic sound boards rather than studs with a drywall finish. The restrooms have ceramic tiled walls. Most interior surfaces within the facility are in relatively good repair. However, the carpeted floors and VCT flooring has reached the end of its expected service life and showing signs of wear.

Typical Corridor in the 2000 Addition

Fire Protection & Life Safety

Fire extinguisher cabinets and a wet sprinkler fire suppression system were installed as part of facility improvements in 2000, and these systems were found to be in good repair. A fire alarm system was also installed in 2000 and has well exceeded its expected service life. While the fire alarm system is still functioning properly, replacement of the system, including pull stations, strobes, horns, and smoke detectors, should be considered a top priority.

Carpeting Flooring Found Throughout Hallways and Classrooms

Summary of Interiors

Core Issues:

1) Carpeted floors and VCT flooring are nearing the end of their service life and are showing signs of wear.
2) The fire alarm system has exceeded its expected service life.
3) The plastic athletic floors in the gyms are due for replacing.
4) The bleachers in the gym are dated and require frequent repair to be usable.

Drop ceiling tiles are found throughout the building. The restrooms and Mechanical Room have hard ceilings.

Recommendations:

1) Replace all carpet and VCT flooring.
2) Replace the fire alarm system with a new, modern fire alarm system.
3) Replace the athletic flooring in the gym with a new athletic surface.
4) Replace the bleachers in the gym.
5) Add (4) new basketball hoops that can be lowered and raised automatically.
6) Add a mezzanine above the gym's closet for added storage.
7) Demolish all existing CAT-5/5e cabling and infrastructure and place with CAT-6A.
    a. This will require (11) drops per class with (2) on each wall, (2) in the center of the ceil, and (1) at each door. Upgrade all network plugs to RJ45. New patch panels and half racks in IDF rooms.
8) Install (1) large, commercial grade flatscreen TV in the entry way.

Accessible Bathroom Stall

Two P-K Thermific Natural Gas Boilers supply the building with hot water.

This is one of the four, multi-zone air handling units serving the building.

This is an inside look at dampers and filters located inside the units. The return air damper (left) is fully open, while the outside air damper (right) is closed.

This is a blower section of an air handler on site.

Mechanical HVAC Systems

Section I: Hydronic System Serving

Hydronic Plant

Two P-K Thermific Natural Gas Hot Water Boilers, with an efficiency of 80%, supply the building with hot water. The boilers, pumps, and other hydronic equipment in the plant are 20 years old and are in adequate condition.

Ventilation & Air Distribution Systems

The ventilation and air distribution system consists of four rooftop air handling units (AHUs) with DX cooling, hot water heating, and inlet guide vanes to control supply air volume. These AHUs were installed in 2000 and predate the wide use of VFDs to control fan speed and air volume. Instead of VFDs to control the supply air volume by varying the fan speed, the inlet guide vanes open and close to restrict air flow as needed to maintain setpoints. This means that when less air volume is required and the inlet guide vanes are closed down, the fans have to work harder to provide less air to the spaces. This is a very inefficient method of operation.

Three of the four AHUs serve multiple spaces with fan power VAV boxes and reheat coils located in the ceiling plenum above the spaces. This gives the system the ability to meet varying loads and setpoints within each zone served by a VAV box. The fourth AHU serves the gymnasium space.

The air handlers *should* be obtaining outside air from intake hoods located on the roof, but the balancing dampers in the air handlers are closed to outside air but fully open for return air. On top of this, appropriate outside airflows are not scheduled in the original building plans. Thus, it appears that the building is simply recirculating the same air into the zones at times.

These observed operational deficiencies make it likely that the building is not being supplied with sufficient ventilation air at all times, which has a detrimental effect on indoor air quality. Additionally, all four rooftop units have exceeded their expected service life.

Summary of Mechanical HVAC Systems

Core Issues:

1) The AHUs have exceeded their expected service life and operate inefficiently due to inlet guide vanes being used for air volume control.

2) Proper amounts of ventilation ventilated air are not always being brought into the building through the AHUs.

3) There are systemic comfort problems throughout the school.

4) Many of the damper actuators are failing and need replacing

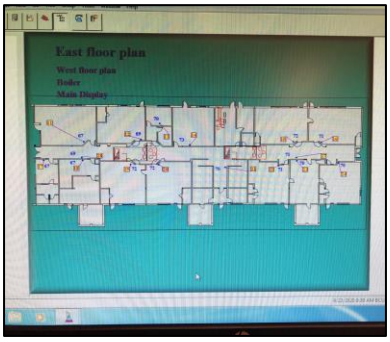
Recommendations:

1) Comprehensive HVAC system renovation to address the comfort, energy, and indoor air quality problems. Maintaining proper ventilation rates is imperative for providing a healthy indoor environment.
2) Implement COVID-19 infection mitigation strategies.
3) Replace all damper actuators.
4) Flush the heating hot water system and clean out the glycol system. The should be replaced with replaced with food grade glycol.
5) Add an emergency shutoff system to the boiler room for safety.

Ductwork coming from the air handling unit serving the Gym. A large trunk with linear slot diffusers spanning the length of the Gym.

Building Management System

The air handlers and the central plant equipment serving the building are controlled by a Trane Tracer Summit Controls Building Management System. The system was installed as part of the HVAC upgrade project in 2000. At 21 years old, it has reached the end of its expected lifespan and is proving difficult to maintain. Additionally, due to the age of the control system, it is unable to implement more modern energy efficient controls strategies.



The outdated Trane Tracer Summit controls front end.

Summary of Building Management System

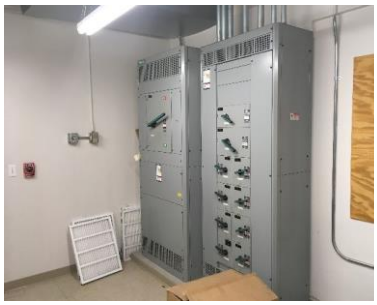
Core Issues:

1) The controls system has exceeded its expected useful life.
2) The system is difficult to maintain and lacks modern efficiency features.

Recommendations:

1) Install a new building management system as part of the needed HVAC renovations.
2) Implement efficient controls strategies to maximize the efficiency of the new equipment.

The electrical service entrance panel is located in the original part of the building.



Main Electrical Service Entrance

The majority of the building is illuminated by inefficient 32-Watt T-8 bulbs. The entire school needs to be upgraded to high efficiency LEDs.

Electrical Service Entrance & Distribution Systems

Main Service Entrance Panel

The main service entrance panel is a 1,200A panel that was replaced as part of the remodel in 2000. The panel is in good condition and has many years of service life left.

Panel Boards

Distribution equipment, panel boards, and feeders were replaced as part of the 2000 improvements.

Lighting

The majority of the building is illuminated by 32-Watt T-8 fluorescent lighting. The light fixtures are in fair condition but are using an excessive amount of electricity. Modern LED equivalents of T-8 lights only consume 12 Watts. Additionally, LED lights generally last twice as long as equivalent fluorescent bulbs. The school already upgraded the gymnasium fixtures to efficient LEDs. The rest of the facility should be upgraded to LEDs to reduce energy and maintenance costs.

Emergency Power

The site lacks an emergency backup generator.

Intercom System

The intercom system no longer functions properly and is unreliable. School staff have to rely on hardline phone systems or cellular phones to communicate across the school. This is ineffective for making announcements and intruder alters, and it compromises the safely of the school.

Summary of Electrical Systems

Core Issues:

1) The building is illuminated by inefficient fluorescent tube fixtures.
2) The building does not have emergency lighting and a backup generator.
3) The intercom system is unreliable and has routinely failed.
4) Electrical receptacle and network port wall plates are broken and discolored.
5) Exterior lighting is made of inefficiency high pressure sodium and metal halide lights fixtures.

Recommendations:

1) Install high-efficiency LED lights facility-wide to reduce energy use and utility costs.
2) Install a new, emergency power generator to backup critical buildings systems.
3) Install a new intercom system at the facility.
4) Replace all electrical receptacle and network port wall plates with metal or non-breakable plates.

5) Replace exterior lighting with LED fixtures site wide and include photocells to control the exterior lighting.

Urinal Fixtures Found in the Restrooms

Wall-mounted Water Fountains Located in Hallways

Plumbing

The plumbing fixtures in the Early Education Center were replaced in 2000 during the major remodel. The fixtures are in good shape but lower flow options are now available. Wall mounted water fountains, installed in 2000, have reached the end of their expected useful life. These fountains still function properly but should be slated from replacement in the coming years.

The domestic water distribution system consists of a 50-gallon residential-style domestic hot water heater that provides 120°F water, circulation pumps, and domestic water piping. The domestic water heater and pumps were installed in 2016, and the system serves all plumbing fixtures throughout the site. The hot water heater has about 5 years left on its expected service life.

As with the other sites, there are issues getting hot water to the fixtures furthest from the domestic hot water heater that were noted during the site inspection. It is suspected that a combination of hardwater damage and underperforming circulation pumps are limiting the amount of hot water reaching fixtures at the far ends of the domestic water distribution system.

Summary of Plumbing

Core Issues:

1) Existing fixtures installed in 2000 are not as efficient as modern fixtures.
2) Wall-mounted water fountains have reached the end of their expected service life.
3) Issues getting domestic hot water to the furthest fixtures.

Recommendations:

1) Replace plumbing fixtures with low-flow options once the existing fixtures have exceeded their expected useful life. The is anticipated to be in 2030.
2) Replace wall-mounted water fountains.
3) Address domestic hot water flow issues.
4) Replace flush valves on all fixtures.
5) Upsize the janitor closet's tub sink.

Security & Access Control

Security includes locks on exterior doors and windows as well as a secure entry vestibule. The 2000 renovation project included a replacement of the existing security system consisting of motion sensors installed in various corridor locations. The security system is now past its expected useful life and is due for replacement. The District has also recently added high-quality security cameras. The cameras function well and provide good coverage of the site, but the camera servers are in need of an upgrade.

The main office entrance has overhead rolling fire doors.

Live CCTV Throughout the Building

Summary of Security & Access Control

Core Issues:

1) Outdated security system
2) Outdated security camera server
3) Lacking panic button/lockdown system.

Recommendations:

1) Replace the security system with a new, modern system, which includes key fob access for staff.
2) Upgrade and centralize the security camera server.
3) Add panic button/lockdown system throughout all classrooms.
4) Add door access via card readers to main exterior doors and interior classroom doors.
5) Add security window film to all office and classroom windows.

Hazardous Materials

A 1999 asbestos abatement project removed all remaining asbestos containing material (ACM).

Ag Shop

General Building Information

The Ag Shop Building was originally constructed in 1952 and has maintenance shops. In 1995, the building was renovated into an Ag Shop where wood, welding, and auto shop programs take place. Another major renovation in 2009 included HVAC, electrical, and envelope improvements. The auto shop was removed, and the building now contains a weight room, wood shop, welding shop, and one classroom.

Front view of the Ag Shop.

Building Program & Function

The primary function of the building is to serve the wood shop and welding shop programs. The wood shop and welding shop occupy about 20% of the building and a classroom occupies an additional 20%. A weight room and welding storage occupy most of the remaining spaces.

The original building was constructed in 1952 with renovations in 1995 and 2009.

Building Structure

The building utilizes steel stud construction. Portions of the building façade have a brick veneer with CMU block backup, and other portions of the building utilize wood shingle siding. The building is a single story with a roof structure comprised of wood roof joists supported by steal columns and a wood deck.

Overall, the structural integrity of the building is in good repair. However, there is evidence of settling along the exterior wall of the wood shop. The building is stable. However, corrective action should be taken to mitigate additional damage to the building, and repairs should be made to the existing damage.

Exterior brick walls have some damage, which is caused by settling.

Wood Shop Window

Classroom Window System

Sections of the roof on top of the building are draining inadequately and have seen previous repairs. Numerous adhesive materials used for patching have failed.

Water damage and failed repairs on roof causing interior damage.

Building Envelope

Windows

Most of the exterior windows and doors were replaced as part of the 1995 renovation. They appear to be providing efficient insulation to the building during winter months without causing unnecessary heat gain in warmer months. The windows are aluminum frame, double pane window systems that don't show any signs of broken seals.

The windows in the classroom space are in adequate condition; however, it is recommended that the existing window system be replaced with operable windows to provide additional fresh air to the classroom.

The operable windows in the wood shop are single-pane window systems that have far exceeded their expected useful life.

Exterior Doors

Exterior door hardware was replaced in 1995 and appears to be in fair to good condition. While the doors are still operational, they are approaching the end of their expected useful life and may need replacing in a few years. Continued regular maintenance will extend the life of the doors.

Roof

The existing roofing system is an outdated version of TPO that is no longer available or installed in the US. The roof is in poor condition and proves very difficult to maintain or repair due to the surface material no longer being available. The District has attempted to repair and patch the roof as needed but has found that various patching materials do not adhere well to the existing roof material. Water pooling and leaks are beginning to cause interior damage as evidenced on damaged ceiling tiles.

Summary of Building Envelope

Core Issues:

1. The classroom windows are not operable.
2. The roof on top of the building is not draining correctly, which results in a large degree of pooling. Additionally, leaks appear to be commonplace. Many of the interior ceiling tiles are stained with water damage. The existing roofing material is difficult to properly maintain.
3. The wood shop windows are outdated single-pane window systems.

Recommendations:

1) Replace the classroom window system with an operable, double-pane window system.

2) Replace the roof with a long lasting TPO roof and repair or replace the gutter systems.

3) Replace the wood shop windows with operable, double-pane windows.
4) Reseal metal frame door and window systems
5) Repaint Exterior
6) Install four new rollup doors
7) Replace certain exterior doors

Summary of Site Recommendations

1) Repave Parking Lots

Summary of Building/Structure Additions Recommendations

1) 100' x 60' Shop Addition

Welding Shop Interior Storage

Interiors

The primary interior finishes consist of polished concrete floors with painted gypsum board and painted masonry walls. The weight room has rubber floor tiles over the concrete floors. Most interior surfaces within the facility are in relatively good repair. However, the concrete floor in the classroom space has settled and cracked.

Fire Protection & Life Safety

Fire extinguisher cabinets were added in 1995 and a wet sprinkler fire suppression system was installed as part of facility improvements in 2009. This system was found to be in good repair. A fire alarm system was also installed in 2009 and has exceeded its expected service life. While the fire alarm system is still functioning properly, replacement of the system, including pull stations, strobes, horns, and smoke detectors, should be considered a top priority.

Welding Shop Fire Suppression System

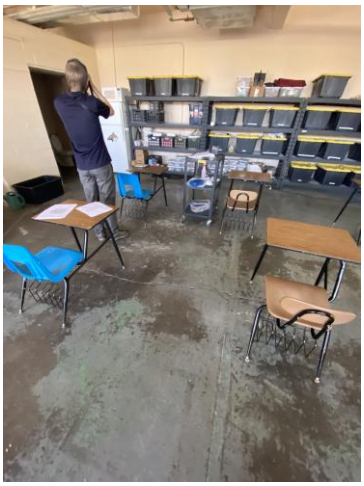
Summary of Interiors

Core Issues:

1) Concrete floor in classroom has cracked and settled.
2) The fire alarm system has exceeded its expected service life.

Recommendations:

1) Mudjack the classroom floor to repair settling and resurface the concrete.
2) Replace the fire alarm system with a new, modern fire alarm system.
3) Install six new workbench tops
4) Demolish old CAT-5 cables and upgrade IT infrastructure
5) Open up wall directly next to classroom with big window
6) Demo the second wall past this one above^
7) Ceiling tile replacements throughout



Damaged Classroom Floor

A failed make-up air unit.

A typical FCU found throughout the building.

Dust Collection System

Mechanical HVAC Systems

Section I: Hydronic System Serving

Hydronic Plant

One P-K Thermific Natural Gas Hot Water Boiler, with an efficiency of 80%, supplies the building with hot water. The boiler, pumps, and other hydronic equipment in the plant are 8 years old and are in adequate condition.

Ventilation & Air Distribution Systems

A packaged make-up air unit with DX cooling and gas heating was installed in 1991 and served the welding shop. This unit failed several years ago and has not been replaced. A still functioning make-up air unit ventilates the wood shop. The welding storage room, wood shop, and classroom are served by two-pipe fan coil units (FCUs). Each FCUs has a supply fan and hot water heating coil. These units only recirculate air from the spaces and do not provide ventilated air.

Two exhaust fan systems also serve the welding shop and welding booth fume hood. These systems are currently functioning but are undersized for the needs of the welding program.

The wood shop has a large, dedicated dust collection system that is still functional. The dust collector is over 20 years old and has surpassed its expected service life.

The observed operational deficiencies make it likely that the building is not being supplied with sufficient ventilation air at all times, which has a detrimental effect on indoor air quality. Additionally, all equipment, except the boiler, has exceeded their expected service lives.

Summary of Mechanical HVAC Systems

Core Issues:

1) One make-up air unit has failed and the other make-up air unit has exceeded its expected service life.
2) FCUs have exceeded their expected service life and are not properly ventilating spaces.
3) The dust collection system has exceeded its expect service life.

Recommendations:

1) Comprehensive HVAC system renovation to address the comfort, energy, and indoor air quality problems. Maintaining proper ventilation rates is imperative for providing a healthy indoor environment.
2) Replace the dust collection system.
3) Implement COVID-19 infection mitigation strategies.

Existing Electrical Panels

4) New heating unit in paint/ stain booth
5) Replace woodshop heater

Building Management System

The building is managed by a Carrier i-Vu Control System that was installed in 2013. The system controls the space temperature setpoint and HVAC equipment scheduling.

While this system is functional, it is recommended that the control system be replaced, so the Ag Shop can be controlled by the same, district-wide control system being proposed for the other sites. This will help ensure better control of the new HVAC systems and keep the control systems consistent across all sites.

Electrical Service Entrance & Distribution Systems

Panel Boards

Distribution equipment, panel boards, and feeders were replaced as part of the 1995 improvements. They appear to be in fair to good condition. However, it is anticipated that the HVAC project will require additional capacity, so it is recommended that the electrical infrastructure be updated as needed.

The majority of the building is illuminated by inefficient linear fluorescent lamps. The entire building needs to be upgraded to high-efficiency LEDs.

Lighting

The majority of the building is illuminated by 40-Watt T-12 linear fluorescent lighting. The light fixtures are in fair condition but are using an excessive amount of electricity and have passed their expected service life. Modern LED equivalents of linear fluorescents lights only consume 12 Watts. Additionally, LED lights generally last twice as long as equivalent fluorescent bulbs. The school already upgraded the gymnasium fixtures to efficient LEDs. The rest of the facility should be upgraded to LEDs to reduce energy and maintenance costs.

Emergency Power

The site lacks an emergency backup generator.

Intercom System

The intercom system no longer functions properly and is unreliable. School staff have to rely on hardline phone systems or cellular phones to communicate across the school. This is ineffective for making announcements and intruder alters, and it compromises the safely of the school.

Summary of Electrical Systems

Core Issues:

1) The building is illuminated by inefficient fluorescent tube fixtures.

2) The building does not have emergency lighting and a backup generator.
3) The intercom system is unreliable and has routinely failed.

Recommendations:

1) Install high-efficiency LED lights facility-wide to reduce energy use and utility costs.
2) Install new emergency power generator to back up critical buildings systems.
3) Install a new intercom system at the facility.
4) Move electrical panels to back wall in Welding room

Existing domestic water heater.

Existing plumbing fixtures.

Plumbing

The plumbing fixtures in the Ag Shop were replaced in 2009 during the renovations. The fixtures are in good shape but lower flow options are now available.

The domestic water distribution system consists of a 50-gallon commercial style domestic hot water heater that provides 120°F water, circulation pumps, and domestic water piping. The domestic water equipment was installed in 1988 and is beyond its expected useful life.

As with the other sites, there are domestic hot water flow issues. It is suspected that a combination of hardwater damage and underperforming circulation pumps are causing the low flow issues.

Summary of Plumbing

Core Issues:

1) The domestic hot water heater is far beyond its expected service life.
2) Low flow issues at fixtures.

Recommendations:

1) Replace the domestic hot water heater with a high-efficiency unit.
2) Address domestic hot water flow issues and install a water softening system.
3) Address drain freeze issues restroom of weight room.

Security & Access Control

Security includes locks on exterior doors and windows. A new burglar alarm system should be considered for the building in an effort to protect the welding and wood shop equipment as well as the weightlifting equipment. A secure entry vestibule is not necessary for this building due to the layout and access to spaces.

Hazardous Materials

A 1999 asbestos abatement project removed all remaining asbestos containing material (ACM).

Summary of Recommendations & Cost Estimates

The following tables summarize cost estimates for each improvement needed for the buildings described in the previous section. Narrowed down recommendations that reflect addressing more immanent needs are highlighted and further detailed in the Strategic Plan for Implementation section of this Master Plan.

Parkview Elementary School

Component	Recommendation	Priority Tier	Cost Estimate [1]
Sitework	Replace All Sidewalks & Add Snow Melt System	Tier I	$224,530
Sitework	Repair Damaged Parking Lot Curbs	Tier I	$16,220
Sitework	Install a Speed Alert Sign on the Road Leading to the School	Tier I	$1,460
Sitework	Demo Out (11) Old Raised Tree Beds and Pour Concrete Flush with Sidewalk	Tier I	$53,090
Sitework	Replace Two Outdoor, Permanent Placement, Bench/Table Sets	Tier III	$38,610
Sitework	(4) New Light Poles Higher Than 12'	Tier III	$77,220
Sitework	Resurface Asphalt Parking	Tier II	$386,100
Sitework	Add New Parking and Drive Lane Through Front Grass Area	Tier III	$361,970
Sitework	All New Irrigation	Tier I	$207,150
Sitework	Resurface Track- Seal Coat & Paint	Tier II	$64,480
Sitework	4' Fence with Gate Behind Basketball Courts	Tier II	$3,380
Sitework	Add Four-Square Stripes to Outdoor Basketball Court	Tier II	$1,650
Sitework	Add A Wallball Wall to The Basketball Court	Tier III	$3,850
Sitework	Move Flagpole to Front Near Road by Black Fence Art	Tier III	$19,310
Sitework	Install New Bike Racks	Tier III	$15,450
Sitework	Address Drainage Issues on North/Northwest Side of The Property	Tier I	$96,530
Building Structure	Excavate, Re-Waterproof, & Re-Grade Gym Foundation	Tier I	$102,770
Building Envelope	Tuckpoint Exterior Façade	Tier I	$78,190
Building Envelope	Replace Roofs & Install Ice Dams	BEST	$704,605
Building Envelope	Replace Front Entrance Store-Front Windows	Tier I	$48,000
Building Envelope	Replace Select Entry Doors	Tier I	$28,870
Building Envelope	Touch Up Rusting Trim on Circular Exterior Windows	Tier I	$9,660
Building Envelope	Replace Metal Trim and Facia Add Box Cutter and Ice Dams	Tier I	$48,270
Building Envelope	Reseal Around Perimeter of the Building at Sidewalk Interface	Tier I	$11,590
Building Envelope	Replace Panes in Dome Area Above Main Hallway	Tier III	$482,630
Interiors	Replace Water Damaged Ceiling Tiles & Hard Ceilings	Tier I	$110,760
Interiors	Replace Carpeting, VCT Flooring, & Refinish Wood Gym Floors	Tier I	$685,180
Interiors	Repaint Interior Walls and Re-Epoxy Interior Masonry Walls	Tier I	$350,000
Interiors	Standardize Classroom Layout	Tier III	$172,300
Interiors	Demo All Old/Abandoned in Place Power and Network Runs in Classrooms	Tier I	$48,270
Interiors	Resurface The Stairs Stairs	Tier II	$9,660
Interiors	All New Case Work Throughout the School	Tier I	$490,550
Interiors	Repaint The Lockers and Add Tackboard Above the Lockers	Tier II	$96,530

Interiors	Old Computer Room Renovation	Tier III	$96,530
Interiors	Paint All Interiors in Gym Areas	Tier II	$55,510
Interiors	Paint The Orange Bar Joists and Duct Work in Gym White	Tier III	$90,500
Interiors	Fix Damaged Face CMU in Gyms	Tier I	$222,010
Interiors	Replace The Floor in The Practice Gym	Tier I	$74,800
Interiors	(4) Sets Of Expanding Corridor Fence/Barriers to Close Off Access to Portions of The Building	Tier II	$19,310
Interiors	Standardized Flag Placement in Classrooms	Tier III	$8,690
Interiors	Install Motorized Blinds in Both Gyms	Tier III	$96,530
Interiors	Paint Locker Room Lockers	Tier II	$30,890
Interiors	Kitchen Renovation to A Modern Kitchen Layout/Function	Tier III	$482,630
Interiors	New Rubber Bases	Tier II	$101,360
Interiors	Demo Out the Restrooms in The Old Preschool Room to Open Up the Floor Plan	Tier III	$28,960
Interiors	Replace Counter in Greenhouse with New Solid Surface Counter	Tier III	$10,860
Interiors	Remove And Patch All Old Brick Anchors	Tier I	$38,610
Interiors	Upgrade IT Infrastucture to Include Removal of Old CAT-5 Cable	Tier III	$298,270
Interiors	Re-Stain and Touch Up Doors	Tier III	$72,400
Interiors	Replace Library Furniture and Add "Tree Support Beam Reading Area"	Tier II	$48,270
Interiors	Replace Framing Where Needed (Art Room)	Tier II	$48,270
Electrical	Replace Main Electrical Service & Distribution Equipment	BEST	$781,419
Electrical	Building Wide LED Retrofits	Tier I	$525,000
Electrical	Replace Electrical Panel in Art Room	Tier I	$11,540
Electrical	Replace Faulty Public Address System	Tier I	$111,340
Electrical	Replace/Repair (2) Outdoor Emergency Lights Near Main Gym	Tier I	$1,940
Electrical	Add Dedicated Panel/Circuits for (1) 4-Plug Outlet to Back Wall of Each Classroom	Tier I	$91,700
Electrical	Add Power to Track Building/ Box Behind Goalpost	Tier II	$48,270
Electrical	Check All Receptacles and Replace as Needed	Tier II	$154,440
Electrical	Add Rope Lights to Main Hallway Skylights	Tier II	$14,480
HVAC	Upgrade VAV Systems, Add Cooling, & Replace Controls System	BEST	$2,895,691
HVAC	Infectious Disease Mitigation Measures	BEST	$7,345
HVAC	New Heat/Cooling RTU For Kitchen	Tier I	$173,750
HVAC	Replace Crawl Space Reznor Make Up Air/Unit Heater	Tier II	$38,610
HVAC	Replace Existing HHW Greenhouse Heater with An Electric Heater	Tier III	$9,660
Plumbing	Address Kitchen Waist Line Drainage Issues	Tier I	$109,350
Plumbing	Address DHW Circulation Issues	Tier I	$68,240
Plumbing	Installed Site Wide Water Softener System	Tier I	$68,950
Plumbing	Replace Fixtures in Outdoor Restrooms	Tier III	$14,480
Plumbing	Add Water Bottle Refill to Outdoor Fountain	Tier III	$38,610
Plumbing	Address/Fix the Drainage Issues in The Mechanical Mezzanine Drains	Tier II	$19,310
Plumbing	Some Plumbing Lines Not Working/Draining In (1) Or (2) Restrooms	Tier I	$38,610

Plumbing	New Wash Station/Sinks in Art Room	Tier II	$9,660
Plumbing	Add Water Bottle Refill to All Fountains/ Replace Backing of Current Water Bottle Refill Stations	Tier II	$57,920
Special Construction	(2) Wi-Fi Scoreboards with Protective Fence in Main Gym	Tier II	$23,170
Special Construction	(2) New Square Glass Backboards in Practice Gym	Tier II	$38,610
Special Construction	New PA/Sound System in Main Gym	Tier II	$19,310
Special Construction	Replace Elevator	Tier III	$86,880
Life Safety	Replace Fire Alarm System	Tier I	$408,690
Life Safety	Assess Fire Suppression System	Tier I	$4,830
Security & Access Control	Replace Burglar Alarm System	Tier II	$118,800
Security & Access Control	Add IP Based Card Reader Door Access	Tier I	$168,920
Security & Access Control	Add Panic Pull Station/Button in Each Room and Install a CCTV System	Tier I	$96,530
Security & Access Control	Security Glass on All First Floor Classroom Windows	Tier I	$27,030
Addition	Build An Addition for Gym Storage Off the North Wall of The Main Gym	Tier II	$926,640
Addition	Covered Outdoor Class Area	Tier III	$144,790
Addition	Add Seating and Gazebo to Back of Building	Tier III	$96,530
		BEST Total	$4,389,060
		Tier I Total	$4,852,930
		Tier II Total	$2,334,630
		Tier III Total	$2,747,660
		Grand Total	$14,324,280

Notes: [1] Cost estimates include soft costs such as architectural, engineering and general contracting fees.

[2] Refer to HVAC system alternatives life cycle cost analysis in XIV. Strategic Plan for Implementation.

Rangely Middle/High School

Component	Recommendation	Priority Tier	Cost Estimate [1]
Sitework	Replace All Sidewalks & Add Snow Melt System	Tier I	$615,010
Sitework	Repave Parking Lots	Tier I	$274,090
Sitework	Sod and Irrigation Renewal	Tier III	$275,000
Sitework	Add Heating Component Beneath Sidewalk/ Cement Replacement at Front of Building	Tier II	$1,476,840
Sitework	Fix Drainage Issues Occurring at West/ Northwest Side of Building	Tier I	$164,100
Sitework	Fill In Crawl Space in Parking Lot	Tier I	$96,530
Sitework	Fix Sprinkler System and Irrigation on Island in Front	Tier I	$15,450
Building Structure	Excavate, Re-Waterproof, & Re-Grade Gym Foundation	Tier I	$113,890
Building Envelope	Tuckpoint Exterior Façade	Tier I	$316,650
Building Envelope	Replace Roofs	BEST	$802,881
Building Envelope	Add Slider Windows to Rooms That Do Not Have Them	Tier I	$28,960
Building Envelope	Masonry Work on Visitors Side of Football Stadium by Transportation Building with Storage Underneath	Tier II	$28,960
Building Envelope	Add Doors/ Window Underneath Home Team Bleachers	Tier I	$38,610
Interiors	Replace Water Damaged Ceiling Tiles & Hard Ceilings	Tier I	$171,840
Interiors	Replace Carpeting, VCT Flooring, & Refinish Wood Gym Floors	Tier I	$1,056,810
Interiors	Repaint Interior Walls and Re-Epoxy Interior Masonry Walls	Tier I	$583,410
Interiors	Replace Damaged Interior Door System	Tier I	$2,720
Interiors	Standardize Classroom Layouts	Tier III	$260,620
Interiors	All New Case Work Throughout the School	Tier I	$544,404
Interiors	Improve Kitchen for Cooking and Serving	Tier II	$482,630
Interiors	Remove Shelves in Library, Install Window in Hallway	Tier II	$21,240
Interiors	Charging Station/ Internet Café Inside of Library	Tier II	$62,750
Interiors	Theater – New Stairs and Walkway to Storage	Tier II	$48,270
Interiors	Installation Of New Path Lighting on Theater Stairs	Tier II	$115,830
Interiors	Science Lab: Add Better Layout to Maximize Space/ Seating Capacity (Island in Center)	Tier II	$225,870
Interiors	Science Lab: Flooring	Tier II	$34,750
Interiors	Science Lab: Concrete	Tier II	$7,730
Interiors	Remove All Network Connection Wiring in Two Specific Rooms That Used to Be Computer Lab	Tier II	$3,870
Interiors	Art Shop Facelift (Paint & Floors)	Tier II	$28,960
Interiors	Sensory Room Facelift (Paint & Floors)	Tier II	$14,480
Interiors	Paint Women's Locker Rooms and Repair All Lockers That Do Not Work, Replace Two Doors That Were Ripped Off	Tier I	$19,310
Interiors	Impact-Resistant 2x4 Ceiling Tiles in Locker Rooms	Tier II	$30,890
Interiors	Upgrade IT Infrastucture to Include Removal of Old CAT-5 Cable	Tier III	$492,280
Interiors	Make All Desks Uniform	Tier II	$210,000
Electrical	Replace Main Electrical Service & Distribution Equipment	BEST	$443,326
Electrical	Building Wide LED Retrofits	Tier I	$881,520

Electrical	Replace Faulty Public Address System	Tier I	$183,160
Electrical	Upgrade Football Lighting and New Lighting Control Board	Tier II	$787,650
HVAC	Upgrade VAV Systems, Add Cooling, & Replace Controls System	BEST	$4,361,060
HVAC	Infectious Disease Mitigation Measures	BEST	$7,999
HVAC	New Hoods in Science Rooms	Tier I	$43,440
Plumbing	Address DHW Circulation Issues	Tier I	$160,410
Plumbing	Installed Site Wide Water Softener System	Tier I	$75,550
Plumbing	P-Traps Are Rusting Out Upper Floors	Tier I	$14,480
Plumbing	Address Sewer Smell in Basement Restrooms Likely Needs a Drain Seal to Prevent Gases Escaping	Tier I	$2,320
Plumbing	Science Lab: Plumbing	Tier I	$9,660
Plumbing	New Plumbing Fixtures Throughout	Tier III	$50,200
Special Construction	Install A Football Field Sound System	Tier I	$193,050
Special Construction	Theater - New Mic and Speaker System	Tier I	$96,530
Special Construction	Replace Elevator	Tier III	$608,110
Special Construction	Science Rooms - Replace Specialty Items in Science Closets	Tier I	$14,480
Life Safety	Replace Fire Alarm System	Tier I	$583,840
Security & Access Control	Replace Burglar Alarm System	Tier II	$165,000
Security & Access Control	Panic Pull Station/Button in Each Room And CCTV	Tier I	$115,000
Security & Access Control	Door Access All IP Based	Tier I	$189,190
Addition	Add Gazebos On Both Sides Entrance at Football Field	Tier III	$96,530
		BEST Total	$5,615,266
		Tier I Total	$6,604,414
		Tier II Total	$3,745,720
		Tier III Total	$1,782,740
		Grand Total	$17,748,140

Notes: [1] Cost estimates include soft costs such as architectural, engineering and general contracting fees.

[2] Refer to HVAC system alternatives life cycle cost analysis in XIV. Strategic Plan for Implementation.

Administration and Early Education Center

Component	Recommendation	Priority Tier	Cost Estimate [1]
Sitework	Replace All Sidewalks & Add Snow Melt System	Tier I	$692,700
Sitework	Repave Parking Lots	Tier I	$369,890
Sitework	Baseball Field and Irrigation Renewal	Tier III	$275,000
Sitework	Add a Sidewalk, Curb, and Gutter the Full Length School Front	Tier III	$382,240
Sitework	Add New Flag Pool	Tier II	$19,310
Sitework	Add New Front Plaza	Tier III	$308,880
Sitework	Replace Chainlink Fence Around Baseball Field	Tier II	$53,090
Sitework	Add a Gate to the Dirt Road to Restrict Access	Tier II	$2,900
Sitework	Cleanup Area Under the Baseball Field Bleachers	Tier II	$15,450
Sitework	Add Rubber Play Surface in Playground	Tier III	$386,100
Sitework	Address Bus Loop Roof Drainage Issues	Tier I	$120,230
Building Envelope	Replace Roofs, Install Ice Dams, & Replace Gutter Systems	Tier I	$452,160
Building Envelope	Tuckpoint Exterior Façade	Tier I	$44,210
Building Envelope	Refinish Exterior Doors and Install New Weather Seals	Tier I	$16,330
Building Envelope	Replace Tectum Deck Under Gym Overhang	Tier I	$17,930
Building Envelope	Replace the Gym Windows with New Operable Windows	Tier I	$130,310
Building Envelope	Repair or Replace Failed and Damaged Roof Edging	Tier I	$28,960
Building Envelope	Address Roof Drainage on Southside of Building	Tier I	$7,240
Building Envelope	Refinish/Repaint Exterior Walls	Tier II	$86,880
Interiors	Replace Water Damaged Ceiling Tiles	Tier I	$43,350
Interiors	Replace Carpeting and VCT Flooring	Tier I	$273,930
Interiors	Repaint Interior Walls and Re-Epoxy Interior Masonry Walls	Tier I	$311,660
Interiors	Replace the Athletic Flooring in the Gym	Tier I	$105,300
Interiors	Replace the Bleachers in the Gym	Tier II	$96,530
Interiors	Add (4) New Basketball Hoops with Automatic Loweres	Tier III	$69,500
Interiors	Add a Mezzanine Above the Gym's Closet for Added Storage	Tier I	$115,830
Interiors	Upgrade IT Infrastucture to Include Removal of Old CAT-5 Cable	Tier III	$109,080
Electrical	Building Wide LED Retrofits	Tier I	$230,580
Electrical	Replace Faulty Public Address System	Tier I	$94,750
Electrical	Replace all Electrical Receptacle and Network Wall Plates	Tier III	$57,920
Electrical	Upgrade all Exterior Lighting with LEDs and Add Photocells	Tier II	$19,310
HVAC	High Efficiency Rooftop VAV Units & Replace Controls System	Tier I	$1,965,560
HVAC	Infectious Disease Mitigation Measures	Tier I	$98,280
HVAC	Replaice Damper Actuators	Tier II	$231,660
HVAC	Flush HHW System, Clean Out and Replace Glycol	Tier II	$38,610
HVAC	Add Emergency Shutoff in Boiler Room	Tier I	$9,660
Plumbing	Address DHW Circulation Issues	Tier I	$73,350
Plumbing	Installed Site Wide Water Softener System	Tier I	$65,840

Plumbing	Replace Fluch Valves on All Fixtures	Tier III	$111,490
Plumbing	Upsize the Tub Sink in the Janitor Closet	Tier II	$9,660
Life Safety	Replace Fire Alarm System	Tier I	$175,150
Security & Access Control	Replace Burglar Alarm System	Tier II	$66,000
Security & Access Control	Upgrade Security Camera Servers	Tier I	$5,500
Security & Access Control	Add Panic Button/Lockdown System Throughout All Classrooms	Tier I	$85,000
Security & Access Control	Add Door Access via card readers to main exterior doors and interior classroom doors	Tier I	$108,110
Security & Access Control	Add security window film to all office and classroom windows	Tier I	$26,260
Addition	Add A Locker Room and Restroom to the Baseball Field	Tier I	$579,150
		BEST Total	$0
		Tier I Total	$6,247,220
		Tier II Total	$639,400
		Tier III Total	$1,700,210
		Grand Total	$8,586,830

Notes: [1] Cost estimates include soft costs such as architectural, engineering and general contracting fees.

[2] Refer to HVAC system alternatives life cycle cost analysis in XIV. Strategic Plan for Implementation.

Ag Shop

Component	Recommendation	Priority Tier	Cost Estimate [1]
Sitework	Repave Parking Lots	Tier I	$62,520
Building Envelope	Replace Roofs	BEST	$155,937
Building Envelope	Replace Windows in Classrooms with Operable Windows	Tier I	$39,090
Building Envelope	Repaint Exterior	Tier II	$16,500
Building Envelope	Replace Woodshop Window	Tier II	$35,200
Building Envelope	Reseal Metal Frame Door/Window Systems	Tier I	$3,870
Building Envelope	(4) New Roll Up Doors	Tier I	$27,030
Building Envelope	Replace Certain Exterior Doors	Tier II	$38,610
Interiors	Mudjack Entrance Concrete Slab & Resurface Classroom Floor	Tier I	$23,950
Interiors	Repaint Interiors	Tier II	$38,500
Interiors	(6) New Workbench Tops	Tier II	$17,380
Interiors	Upgrade IT Infrastucture to Include Removal of Old CAT-5 Cable	Tier III	$50,680
Interiors	Open Up Wall Directly Next to Classroom with Big Window	Tier II	$20,850
Interiors	Demo The Second Wall Past This One Above ^	Tier II	$12,550
Interiors	Ceiling Tile Replacements	Tier II	$60,820
Electrical	Building Wide LED Retrofits	Tier I	$95,070
Electrical	Replace Faulty Public Address System	Tier I	$48,800
Electrical	Replace Main Electrical Service & Distribution Equipment	BEST	$95,572
Electrical	Move Electrical Panels to Back Wall in Welding Room	Tier I	$28,960
HVAC	Implement Make-Up Air/Exhaust System & Add Cooling to Class	BEST	$521,713
HVAC	Upgrade Welding Fume Hood/Capture System	BEST	$97,425
HVAC	Infectious Disease Mitigation Measures	BEST	$3,970
HVAC	Replace Woodshop Dust Collection System	Tier I	$22,000
HVAC	New Heating Unit in Paint/Stain Booth	Tier I	$9,660
HVAC	Replace Woodshop Heater	Tier I	$38,610
Plumbing	Address DHW Circulation Issues	Tier I	$11,390
Plumbing	Installed Site Wide Water Softener System	Tier I	$22,050
Plumbing	Replace Water Heater with High Efficiency Unit	Tier I	$15,280
Plumbing	Address Drain Freeze Issues at Weightlifting Room's Restroom	Tier I	$19,310
Life Safety	Replace Fire Alarm System	Tier I	$64,230
Security & Access Control	Replace Burglar Alarm System	Tier II	$18,980
		BEST Total	$874,617
		Tier I Total	$531,820
		Tier II Total	$259,390
		Tier III Total	$50,680
		Grand Total	$1,716,507

Notes: [1] Cost estimates include soft costs such as architectural, engineering and general contracting fees.

[2] Refer to HVAC system alternatives life cycle cost analysis in XIV. Strategic Plan for Implementation.

Transportation Building

Component	Recommendation	Priority Tier	Cost Estimate [1]
Building Envelope	Seal Around Entire Building	Tier I	$12,550
Interiors	Mezzanine	Tier III	$193,050
Interiors	Drivers Lounge	Tier III	$57,920
Electrical	Building Wide LED Retrofits	Tier I	$74,810
Special Construction	Brush System for Bus Cleaning Bay	Tier III	$231,660
Special Construction	Blow Dryer for Cleaning Bay	Tier III	$144,790
		BEST Total	$0
		Tier I Total	$87,360
		Tier II Total	$0
		Tier III Total	$627,420
		Grand Total	$714,780

Notes: [1] Cost estimates include soft costs such as architectural, engineering and general contracting fees.

[2] Refer to HVAC system alternatives life cycle cost analysis in XIV. Strategic Plan for Implementation.

IX. Energy, HVAC, O&M Analysis

O & M Analysis

The HVAC equipment at the Early Education Center is 21 years old and is plagued by regular maintenance issues. Outside air dampers are not functioning as intended, which causes less ventilation air to reach the spaces making for poor indoor air quality. Additionally, due to the age of the equipment and controls system, space temperature set points are frequently not met, leaving spaces uncomfortable.

The HVAC systems at Parkview Elementary and Rangely Junior/Senior High school utilize evaporative cooling coils, and the majority of these coils have begun to leak water onto roofs or into mechanical rooms. These leaks have become difficult to repair and are causing damage on roofs and in the mechanical rooms. The built-up VAV systems serving most of the spaces at Parkview Elementary and Rangely Junior/Senior High School are also not providing sufficient outdoor air ventilation to spaces due to poorly performing outside air dampers and actuators. Additionally, Parkview Elementary School's boiler loop experiences frequent pump burnouts due undersized pump and motors. One of the two boilers at Parkview Elementary recently quit functioning completely due to hard water damage within the boiler. These issues are taxing on equipment and the maintenance staff, and they cause numerous hot and cold complaints throughout the schools.

While the district's maintenance staff is able to address many of the small HVAC issues that manifest throughout the district, they are unable address some of the larger issues that have become more frequent problems for the maintenance team. When the district must call on an HVAC technician, they are often told it will be weeks before someone can be on site due to the remote location of Rangely. These long lead times for repairs mean that classrooms can be left unconditioned for weeks at a time. During winter, this can cause very cold indoor temperatures, forcing the district to provide temporary heating solutions that don't properly ventilate the space. Additionally, HVAC technicians usually have to the travel from Grand Junction or Denver, which burdens the District with expensive travel charges on top of the HVAC repair costs.

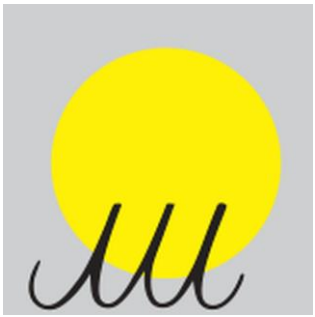
To address the district-wide HVAC issues and to provide HVAC systems that operate reliably, a comprehensive HVAC renovation is recommended for the Early Education Center and Ag Shop and major upgrades are recommended for Parkview Elementary and Rangely Junior/Senior High School.

Utility Analysis

Electricity

The District's buildings are served with electrical power by Moon Lake Electrical Association and are charge based on monthly consumption as follows:

- Energy charge: $0.0394 per kilowatt-hour (kWh), where kWh is the metered amount of electrical energy consumed on a monthly interval.
- Demand Charge: $12.00 per kilowatt (kW), where kW is the monthly peak demand that was measured.
- The blended average rate for the District is $0.0822 per kWh.



Moon Lake Electrical Association provides electricity for the District.

Water

The District's buildings are served with water and wastewater by Rangely and are charge based on monthly consumption as follows:

- $4.147 per 1,000 gallons (kGal) of water.
- $2.415 per kGal of wastewater.

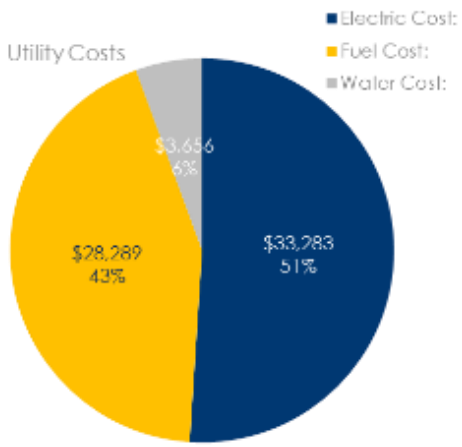
Fuel

The District's buildings receive natural gas produced by Rangely. The District is charged a flat rate of $0.65 per therm of natural gas used, metered and billed in monthly intervals.

Consumption Analysis

The information shown below is designed to visually characterize the annual utility consumption and expenditures experienced by the District. Understanding a building's electricity, fuel, and water usage is paramount to predicting future energy consumption, analyzing various system types' impact, and eventually estimating savings. In all graphs and charts below, blue sections represent current electrical usage, yellow represents current fuel usage, and gray represents water.

Parkview Elementary School



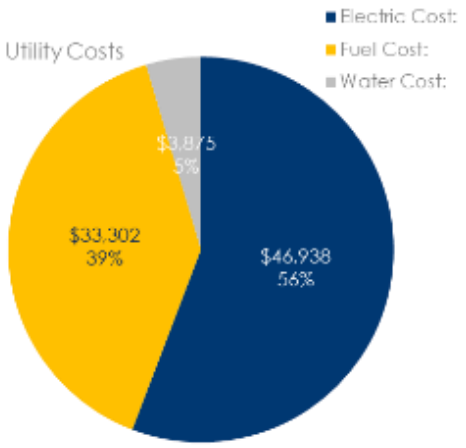
Gross area:	72,500
Total kWh:	456,730
Total kW:	1,189
Electric Cost:	$33,283
Total Therm:	42,838
Fuel Cost:	$28,289
Total kGal:	850
Water Cost:	$3,656
Total Utility Cost:	$65,227
kWh/sf-yr:	6.3
CF/sf-yr	59.1
Total EUI:	80.6
Electric $/sf-yr	$0.46
Fuel $/sf-yr	$0.39
Water $/sf-yr	$0.05
Total $/sf-yr	$0.90

Summary

The building has a relatively high Energy Use Intensity (EUI) of 80.6. On average, most schools have an EUI between 50 and 70. The deficiencies and inefficiencies driving up the energy use and operating cost for the District include:

1) Malfunctioning Building Management System (BMS)
2) Inefficient Boilers
3) Outdated Chiller
4) Poorly Insulated Envelope

Rangely Middle/High School



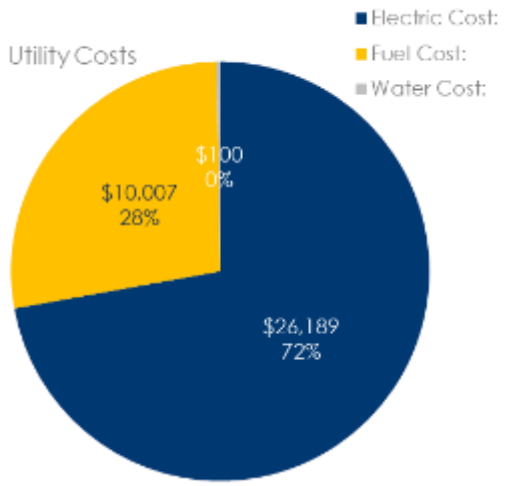
Gross area:	102,000
Total kWh:	612,600
Total kW:	1,870
Electric Cost:	$46,938
Total Therm:	50,903
Fuel Cost:	$33,302
Total kGal:	876
Water Cost:	$3,875
Total Utility Cost:	$84,115
kWh/sf-yr:	6.0
CF/sf-yr	49.9
Total EUI:	70.4
Electric $/sf-yr	$0.46
Fuel $/sf-yr	$0.33
Water $/sf-yr	$0.04
Total $/sf-yr	$0.82

Summary

The building has a relatively high Energy Use Intensity (EUI) of 70.4. On average, most schools have an EUI between 50 and 70. The deficiencies and inefficiencies driving up the energy use and operating cost for the District include:

1) Malfunctioning BMS without efficiency strategies
2) Fans running at excessive speeds to overcome comfort issues
3) Poorly insulated envelope
4) Linear fluorescent lighting

Administration and Pre-K



Gross area:	30,500
Total kWh:	352,330
Total kW:	1,189
Electric Cost:	$26,189
Total Therm:	15,196
Fuel Cost:	$10,007
Total kGal:	29
Water Cost:	$100
Total Utility Cost:	$36,296
kWh/sf-yr:	11.6
CF/sf-yr	49.8
Total EUI:	89.2
Electric $/sf-yr	$0.86
Fuel $/sf-yr	$0.33
Water $/sf-yr	$0.00
Total $/sf-yr	$1.19

Summary

The building has a relatively high Energy Use Intensity (EUI) of 89.2. On average, most schools have an EUI between 50 and 70. The deficiencies and inefficiencies driving up the energy use and operating cost for the District include:

1) Malfunctioning BMS without efficiency strategies
2) Inefficient boilers
3) Inefficient air handling units with inlet guide vanes

Mechanical Systems

Existing Conditions

Early Education Center

The Early Education Center is served by inefficient packaged rooftop multizone units with DX cooling and hot water heating. The existing units were installed in 2000 and rely on inlet guide vanes to control supply air volumes. Inlet guide vane units control supply air volumes by restricting airflow via dampers. This causes supply fans to work harder to provide less air. The rooftop units serve various VAV boxes with reheat coils located in ceiling plenums throughout the site.

A central boiler plant located in a mechanical room provides hot water to the equipment on the roof and the VAV boxes. The P-K Thermific Natural Gas Boilers, pumps, and other hydronic equipment in the plant are 20 years old and are in adequate condition.

Rooftop Package Unit

Parkview Elementary

The majority of Parkview Elementary is served by a built-up VAV system that utilizes evaporative cooling and hot water heating. The main built-up unit has supply and return fans controlled by VFDs, an evaporative cooling coil, and a hot water heating coil. The system serves numerous fan powered VAV boxes with hot water reheat coils located in ceiling plenums above the spaces they serve.

The gymnasiums are served by VAV rooftop units containing evaporative cooling sections and hot water heating coils. These units are 12 years old and in adequate condition.

A central boiler plant located in a mechanical room provides hot water to the built-up VAV system, the VAV boxes, and rooftop units. The P-K Thermific Natural Gas Boilers, pumps, and other hydronic equipment in the plant are 12 years old and are in poor condition. One of the boilers has recently quit functioning, and one of the boiler loop pump motors burns out regularly due to do what is suspected to be an undersized pump and motor design.

Boiler Plant

A cooling tower located on an outdoor mechanical pad provides water to the evaporative cooling coil. The cooling tower and pumps are 12 years old and in poor condition. The cooling tower constantly leaks water onto the mechanical pad and is rusting.

The chiller serving the air handling equipment is 24 years old and due to be retired or replaced.

Three classrooms on the second floor receive supplemental conditioning from a VRF system. There are two indoor VRF cassettes in each of these classrooms and VRF condensing units located on the roof.

Rangely Junior/Senior High

This site is served by the same types of units as Parkview Elementary. A built-up VAV serves the majority of the spaces, and VAV rooftop units serve the Spectator Gymnasium and auditorium. Additionally, two constant volume rooftop units with evaporative cooling

and natural gas heating serve the Practice Gymnasium, Wrestling Room, and a classroom on the north end of the building.

Unlike Parkview Elementary, Rangely Junior/Senior High does not have a cooling tower, which provides reducing temperature water to the evaporative cooling coil on the built-up VAV system.

A central boiler plant located in a mechanical room provides hot water to the built-up VAV system, the VAV boxes, and rooftop units. The Benchmark Condensing Boilers, pumps, and other hydronic equipment in the plant are 12 years old and are in adequate condition.

Ag Shop

The HVAC systems in the Ag Shop and Ag Shop classroom's are severely lacking. The old, packaged unit that once served the spaces quit running and was abandoned. Fan coil units were installed to provide heating to the spaces and some ventilation; however, no ventilation air is provided to the classroom when heating is not needed. Additionally, the exhaust systems serving the wood shop and welding shop are undersized for the space needs.

Thermal Comfort

Due to the age of equipment at the Early Education Center and poor design at Parkview Elementary and Rangely Junior/Senior High School, the sites experience numerous hot and cold complaints throughout the year. Space temperature control is inconsistent and difficult to maintain in some spaces. For example, while most spaces served by the built-up VAV systems are maintaining temperature setpoints, a handful of the spaces can become quite cold in the winter. This is most likely caused by undersized VAV terminal boxes and reheat coils that are unable to provide sufficient heat to these spaces.

Ventilation

Each of the rooftop units and built-up VAV systems should be delivering ventilation air; however, in several instances, the HVAC systems are not providing adequate ventilation air.

As part of this assessment, carbon dioxide (CO2) sensors were placed in classrooms at Parkview Elementary and Rangely Junior/Senior High School to measure a sample of the air quality in these buildings. Four sensors were placed in various classrooms where it was suspected inadequate ventilation air was being supplied in order to get a sampling of the building's current air quality. Two of the sensors were placed at Parkview Elementary and two were placed at Rangely Junior/Senior High is classrooms served by the built-up VAV system to provide data for the main existing HVAC systems.

The sensors were placed in these rooms and recorded CO2 levels every 15 minutes from September 23- October 7. The data collected and analyzed is presented in the following section.

Carbon Dioxide Assessment

As part of this assessment, carbon dioxide (CO2) sensors were placed in classrooms of both Parkview Elementary School and Rangely Junior/Senior High School to measure the air quality in these building. CO2 concentrations are measured in parts per million (PPM)—that is the number of CO2 molecules that are found in one million molecules of air.

Carbon Dioxide Concentration Levels

450 PPM – CO2 concentration levels that match outdoor conditions and are the lowest levels possible in an indoor space.

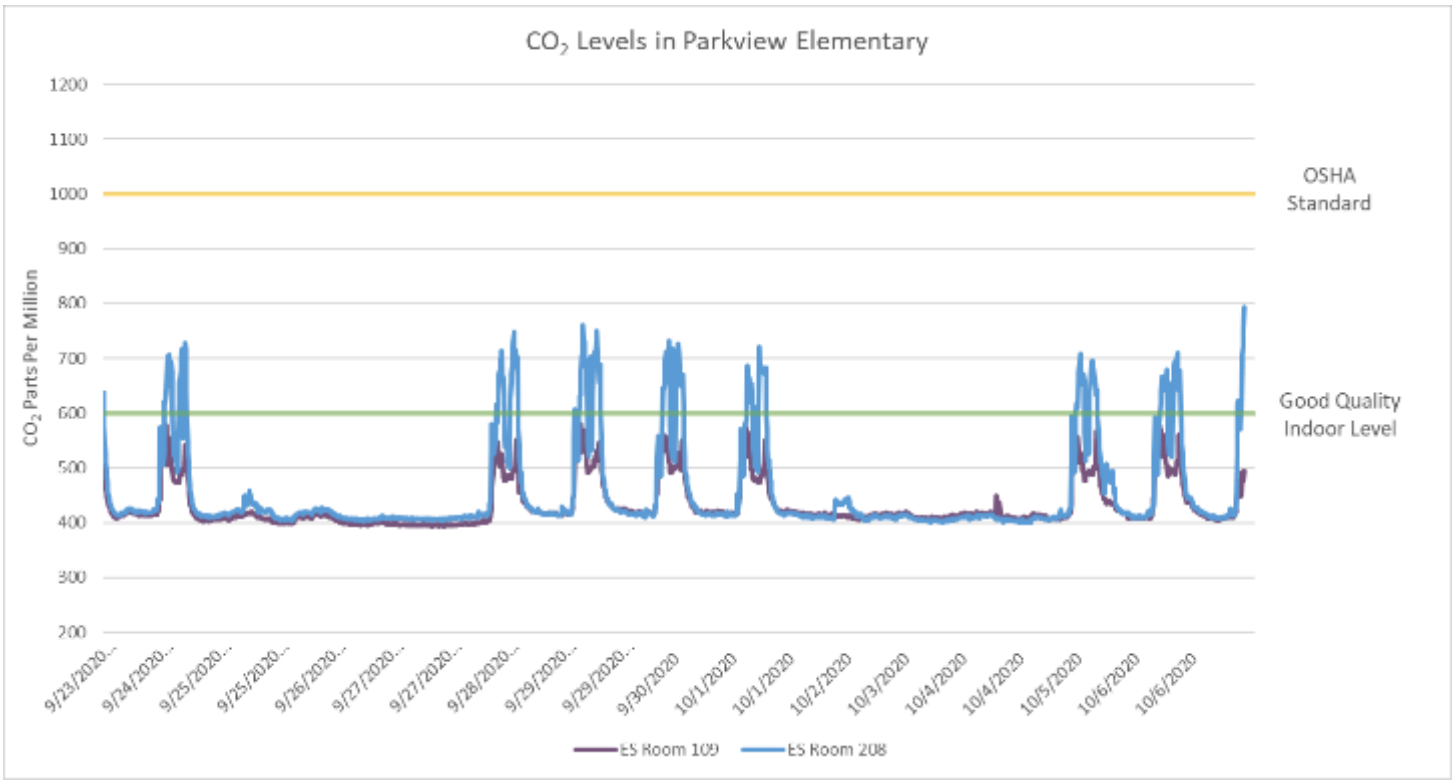
600 PPM – Normally, concentrations of CO2 at or below this level are considered good indoor air quality.

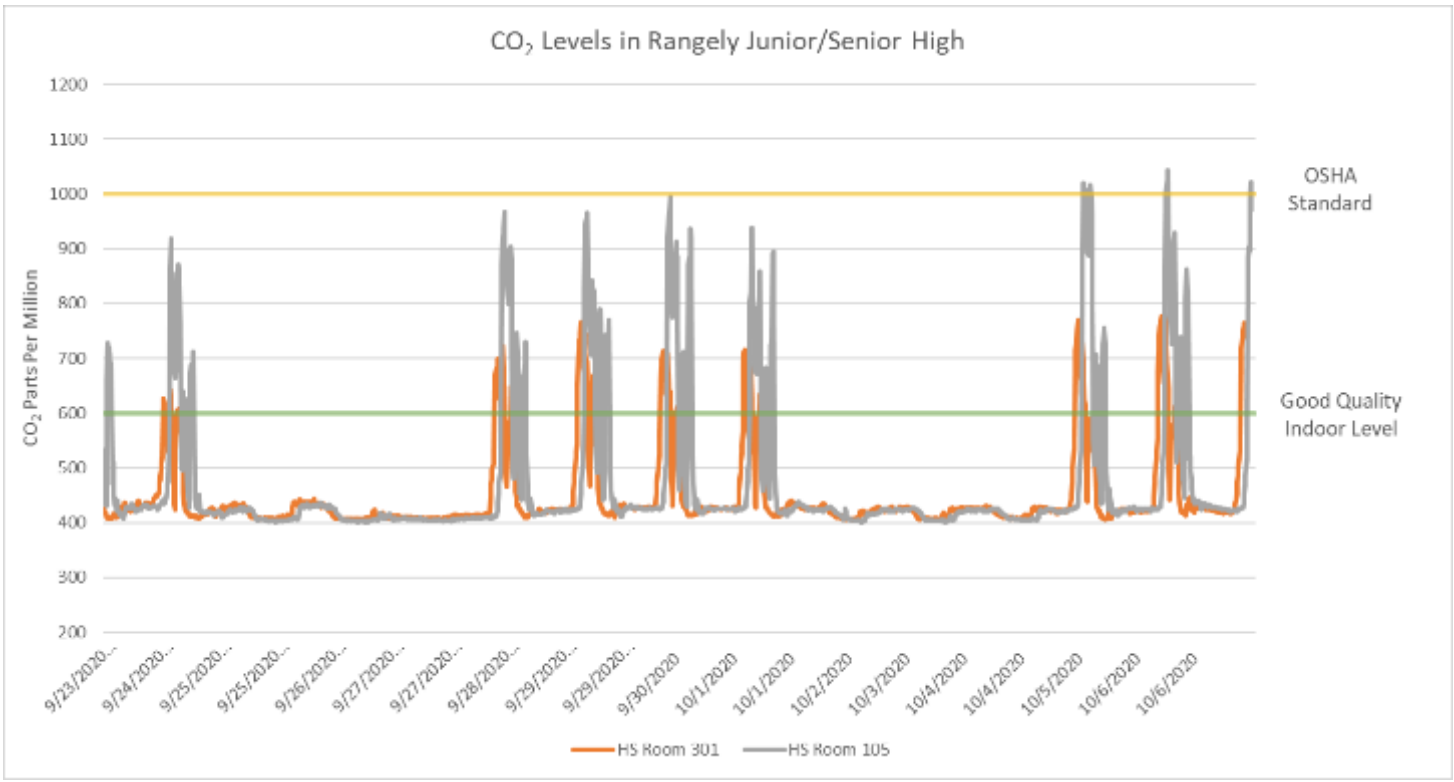
1,000 PPM – The maximum allowed concentration of CO2 that can be designed for supplying ventilation air (according to OSHA and ASHRAE standards). At concentrations above this level, building occupants can begin to experience:

- **Decreased levels of performance, concentration, and productivity**
- Temporary physical symptoms such as **headaches, drowsiness, and eye or throat irritation,** which should resolve quickly after being removed from the exposure.

2,500 PPM – Above these concentration levels, occupants can begin to experience long-term, adverse health effects that do not resolve immediately when they are removed from the unhealthy exposure.

Graphed data collected from the two sites:





Rangely School District CO2 Assessment Summary

To get a sampling of the building's current air quality, four sensors were placed in various classrooms where it was suspected that inadequate ventilation air was being supplied. Two sensors were placed in classrooms at the junior/senior high school, and two were placed in classrooms at the elementary school.

As demonstrated by the graphs above, the spaces where data was collected regularly exceed the 600 PPM threshold for good indoor air quality. Furthermore, the data shows that Room 105 at the junior/senior high school has CO2 levels that peak above the OSHA Standard of 1,000 PPM. This suggests that **the building's mechanical equipment is not providing enough ventilation air at all times.** This data also shows that there is room for improving the indoor air quality of the classrooms across both buildings through design and implementation of improved HVAC systems and controls.

Recommendation Summary

Upgrade the existing HVAC systems to provide proper volumes of ventilation air that meet or exceed current ventilation standards to improve indoor air quality. Design and implement HVAC upgrades that will maintain space temperature setpoints and keep the conditioned spaces more comfortable.

Better indoor air quality and more comfortable spaces can help to improve the learning environment and should be top priorities for the District.

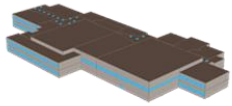
HVAC System Selection: Life-Cycle Cost Analysis

The Goal

Three systems – built-up VAV, water source VRF, and water source heat pumps – were analyzed quantitatively to provide a solid overall picture of the cost of owning and operating each system. Important factors such as annual maintenance and energy cost as well as first cost were accounted for. Additionally, qualitative aspects for each system were considered in order to arrive at a recommendation for which systems will best serve Parkview Elementary and Rangely Junior/Senior High School. More details on HVAC system life cycle cost comparison and the pros and cons of each are outlined below.

Source of Energy Costs of Alternatives:

Energy costs of system options were determined by performing a detailed energy model of the facility in eQUEST.



Source of First Costs:

First cost estimates were performed using the R.S. Means Building Construction Cost Database, local labor rates, and actual equipment quotes from vendors' representatives.

Source of Maintenance Costs:

Maintenance cost estimates are from published estimating guides.

Life-Cycle Cost Analysis

Commonly, the decision on the type of heating and cooling system to use in a building is made based on very little or incomplete information, which often neglects initial cost and operation and maintenance costs. The mechanical systems are often chosen based solely for the convenience of the Contractor, HVAC equipment sales representative, or mechanical engineer. Conversely, in order to provide you with the most accurate information possible to assist you in making informed decisions related to energy management and the operation of your buildings, a thorough life-cycle cost analysis was performed to compare HVAC system alternatives at the middle school.

This more comprehensive financial model considers important factors such as annual maintenance and energy cost as well as first cost, to provide a comprehensive picture of the cost of owning and operating each system. This model provides a means to select the optimal HVAC system type from competing alternatives.

The following HVAC System alternatives were evaluated by considering their 25-year life-cycle costs and outlining the qualitative advantages and disadvantages of each. These two particular systems were chosen because each approach would address the systemic maintenance, ventilation, and comfort issues in the school.

1) Built-Up VAV
2) Water Source VRF

Results of Life-Cycle Cost Analysis

See Section XIII. Strategic Plan for Implementation

Mechanical HVAC System Solution

An example of VRF Circular Cassette Unit that would be installed in the classrooms.

Built-Up VAV Systems

Comprehensive HVAC improvements were implemented at Parkview Elementary and Rangely Junior/Senior High School in 2009; however, only evaporative cooling was included at the time and various pieces of equipment were undersized. Large portions of the existing built-up VAV system's infrastructure, such as most VAV boxes, hot water piping, ductwork, diffusers, etc., still has many years of service life left. It would be both fiscally irresponsible and environmentally unfriendly to completely replace the HVAC system at this time; therefore, upgrading the built-up VAV system is recommended for these sites.

The upgrade should include detailed analysis of the loads and ventilation requirements for each spaced served by the built-up VAV system. This will ensure an adequate volume of ventilation air is being brought into all spaces and the new equipment is properly sized. As needed, undersized or poorly functioning equipment such as VAV boxes, supply fan, and return fans should be replaced.

Example of VRF Condensing Unit and Fan Coils

It is also recommended to add chilled water-cooling coils to the built-up VAV systems and install air cooled chillers to provide the chilled water. By replacing the evaporative cooling system with a chilled water-cooling system, the site will be able to fully control the space temperatures and maintain more comfortable learning environments.

Existing dampers and actuators that control the flow of ventilation and return air should be repaired or replaced. Additionally, dual-temperature outside air economizing should be implemented to take advantage of "free cooling" when the outside air conditions are suitable. This will increase the efficiency of the system while providing a high volume of ventilation air.

Example of new high efficiency rooftop unit.

VAV systems, when designed and implemented properly, operate efficiently and provide year-round comfort control with individual zone temperature setpoints.

Packaged VAV Rooftop Units

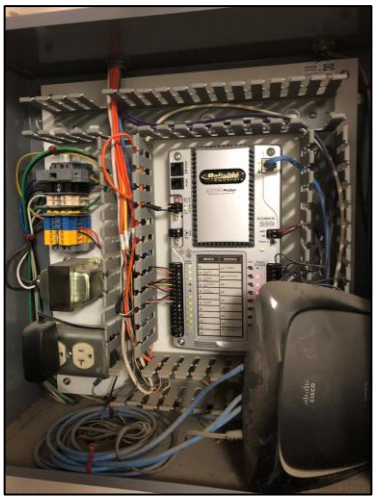
The four packaged inlet guide vane rooftops units serving the Early Education Center should be replaced with high-efficiency VAV packaged units containing DX cooling coils and hot water heating coils. Additionally, it is recommended to replace the existing packaged evaporative cooling/hot water heating units serving various gymnasiums, classrooms, and the auditorium with high efficiency VAV packaged units containing DX cooling coils and hot water heating coils. One of these units currently serves multiple spaces and should be retrofitted to a true VAV system by adding slot-in VAV terminal boxes to provide individual space control.

New packed DX cooling units now incorporate variable air volume strategies, multiple stage or variable speed compressor technology, and other energy efficient strategies to achieve high SEER values.

Hydronic Plants

The current boilers at Parkview Elementary are in poor condition, and one boiler has failed completely. Additionally, the boilers at Early Education Center are nearing the end of their expected service life and aren't as efficient as modern boilers. As part of the district-wide HVAC system improvements, the boiler plants at Parkview Elementary and the Early Education Center should be upgraded to include high efficiency condensing boilers with variable flow primary and secondary hot water loops. Condensing boilers with high turn-down-ratios and variable flow loops allow for high part load efficiencies during the shoulder seasons and increase controllability.

The air-cooled chillers added to Parkview Elementary and Rangely Junior/Senior High School should be equipped with variable speed compressors and serve variable flow chilled water loops to maximize the overall efficiency of the systems.



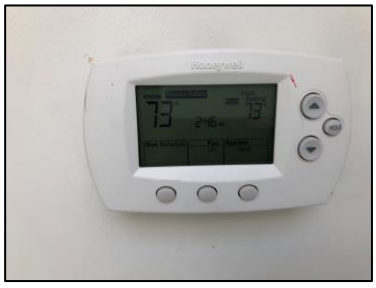
The Reliable Controls system serving the 1967 equipment is broken and needs to be replaced.

Ag Shop

A comprehensive HVAC replacement project is recommended for the Ag Shop. This building has unique HVAC needs due to the wood shop, welding shop, and classroom space located within the building. A new DX cooling and gas heating packaged unit should be installed to serve the classroom space. Each of the shop spaces should receive a dedicated make-up air unit and exhaust fan to provide proper ventilation rates. In-space infrared, gas fired heating units should be installed throughout the shop to provide additional heating.

Additionally, the welding shop should have a welding fume hood and capture system with 12 welding booths added to the space. This will help improve the welding program by increasing the number students that can simultaneously engage in welding.

Building Automation & Control Systems



Individual thermostats control the rooftop units that condition the 1998 wing. The maintenance staff cannot bulk edit schedules and setpoints, which makes it difficult to run the equipment efficiently.

Existing Conditions

A standalone Trane Tracer Summit Controls System, that is 21 years old, is the air handling and hydronic equipment serving the Early Education Center. This system has become difficult to maintain and lacks the ability to implement advanced efficiency control strategies. The HVAC systems serving Parkview Elementary and Rangely Junior/Senior High School are controlled by a Carrier i-Vu Control System accessed via the internet from the maintenance office. This system has started to become unreliable and difficult to maintain due to it being a proprietary controls systems provided by Carrier. The control system requires frequent restarts to gain access to setpoints, and due to its age, it has limited options for high performing controls strategies

Building Automation System Solutions

A new, district-wide Direct Digital Control (DDC) system should be implemented to provide consistent control across all sites. All new HVAC equipment and existing-to-

remain HVAC equipment will be tied into the system, which allows for remote DDC system access making all equipment controllable from a laptop computer and over the internet. The new DDC system should be a non-proprietary system for ease of maintenance and more future upgrade options.

Advanced control sequences can be implemented with these digital controls such as demand controlled ventilation (CO2 control), supply air temperature reset, optimal start, and many more. These sequences are aimed at optimizing comfort and energy efficiency. A large portion of efficient operation of the new HVAC systems will be predicated upon control system optimization.

Air Systems Control Strategies for Optimal Energy Performance

Optimize HVAC Operating Schedules (Space Temperature Setback and Setup)

This control feature will involve implementing optimized night setup and setback temperatures using energy management controls for most of the facilities' spaces. The current HVAC systems cannot be automatically shut off when the building is not occupied. Controls with setup and setback temperatures will be implemented for the HVAC systems. The setup and setback temperatures will be 55ºF during the heating mode and 90ºF during the cooling mode.

Optimal Start of HVAC Systems Based on Outdoor Air Conditions

Equipment start times are normally set earlier than necessary to ensure proper comfort is maintained even during hot or cold weather. An optimal start feature, incorporated into our design, would automatically compensate for building start times if there are changes in weather. If weather is extreme, then equipment is started early enough to properly condition the building before it is occupied. During mild weather, equipment start times can be delayed, allowing for more energy savings.

A complementary feature, Optimal Stop, is used to save energy at the end of each day. This feature takes advantage of a building's "flywheel" effect. In mild weather, equipment can be stopped earlier than usual without adversely effecting indoor temperatures.

Demand-Based Ventilation Control (DCV)

Large assembly spaces, like cafeterias, gymnasiums, and auditoriums, require a large amount of ventilation air when they are fully occupied. Though, most of the time these spaces are vacant or sparsely occupied. Demand control ventilation varies the amount of outside air delivered to these assembly spaces as a function of their occupancy. This is done by measuring the CO2 levels in the spaces and then adjusting the amount of ventilation air to maintain a CO2 setpoint, typically ~700 ppm.

Zone-Level Thermostat Deadband Control

This control feature will involve implementing a space temperature setpoint "deadband" of 6°F using a heating setpoint of 68°F and a cooling setpoint of 74°F. Introducing a deadband allows the system to "float" and not provide mechanical heating or cooling when the space temperature is between 68°F and 74°F.

Commissioning

New HVAC and control systems installed should undergo a rigorous commissioning process, which ensures that issues will be caught and remedied before contractors leave the site. The process furthermore ensures the adherence of the work to the design intent and acts as a method of quality control. Projects that are commissioned use 16% less energy, resulting in a more comfortable building and pass on fewer issues to the customer post-construction.

Reliability

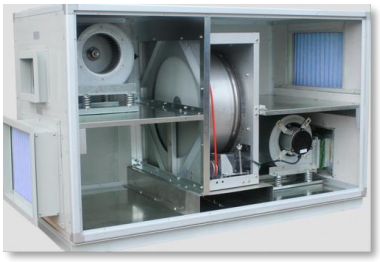
As described in the O&M Analysis section, the reliability of the District's HVAC systems is of paramount importance. Due to the District's remote location, it can take weeks for an HVAC technician to be able to travel out to the district to make repairs on the HVAC or controls systems. These repair calls come at considerable expense to the District due to the travel costs incurred by the HVAC technicians and can leave critical pieces of equipment inoperable for weeks.

Reliability and ease of maintenance should be guiding criteria for designing and selecting a new HVAC and controls system. Proper design and equipment selection, in conjunction with rigorous commissioning and remote controls access, will reduce the maintenance burden on the District and improve operations district-wide.

COVID-19 Infection Mitigation Strategies

To reduce the risk of spreading COVID-19 and other illnesses throughout the District's facilities, as well as to improve indoor air quality, two primary strategies related to building HVAC systems have been identified:

- **Proper Outdoor Air Ventilation**
- **Higher Efficiency Filtration**



Example of a dedicated outdoor air unit

Summary

HVAC equipment that provides proper outdoor air ventilation is recommended for the Early Education Center, Parkview Elementary School, Rangely Junior/Senior High School, and the Ag Shop. A number of the spaces in these building currently lack proper volumes of ventilation air, so the air within the spaces gets recirculated throughout the day. Improper mechanical ventilation rates is generally associated with higher rates of infection transmission. The new and upgraded HVAC systems proposed in the recommended projects will provide the classrooms with the appropriate number of air changes per hour.

Higher Efficiency Filtration is recommended for all of the new packaged units and for the upgraded built-up VAV systems being proposed. This involves upgrading the standard filters that would come with the units to higher Minimum Efficiency Reporting Values (MERV ratings). The standard filters used in most commercial HVAC equipment are rated as MERV 8. A consensus has emerged in the scientific community that MERV 13 filters are optimally effective at removing smaller particles, allergens, and pathogens from the airstream. It is important to note that filters with higher MERV ratings require supply fans to work harder to move air through them. This means that some fans and motors may need to be upgraded to handle the additional static pressure.

Both strategies are explained in further detail below.

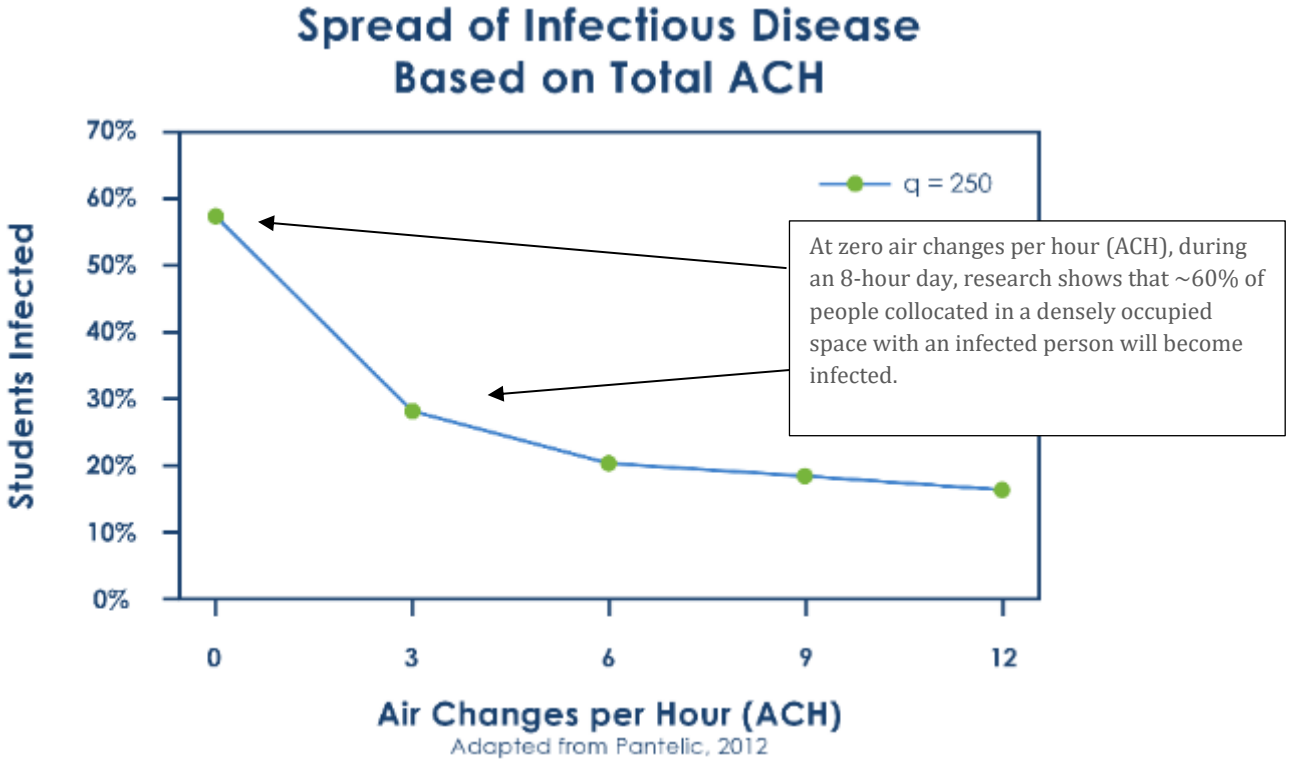
Example of a Rooftop Unit

Example of MERV 13 filters

Proper Outdoor Air Ventilation

Based on extrapolated testing results, it appears numerous spaces across the District are not receiving outside ventilation air required by current code. In the context of COVID-19, this is a particularly concerning issue. We know that we can decrease the risk of spreading infection by utilizing mechanical ventilation, where stale contaminated indoor air is exhausted and replaced with fresh outside air. Current Mechanical Code requires at least 3 outdoor air changes per hour, meaning the entire volume of air inside occupied spaces should be replaced with outside air every 20 minutes.

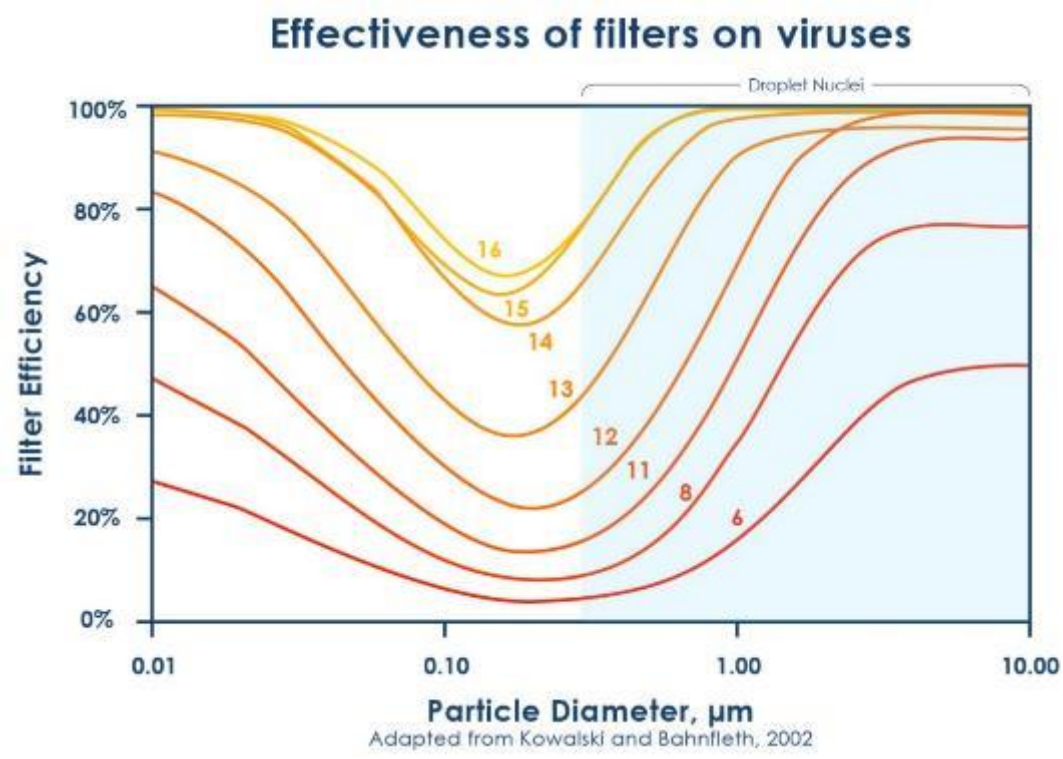
While more air changes are generally better, there are diminishing returns as ventilation rates increase beyond 6 ACH due to additional capital, operation, and maintenance costs associated with higher ventilation rates. The diminishing returns are demonstrated by the following graph:



Recommendation: It is recommended that all proposed packaged unit replacements and built-up VAV upgrades be designed and implemented to deliver above code ventilation rates of 4-6 ACH. The exact quantity of fresh air will depend on the actual number of occupants that are expected to be present in each space. These fresh air quantities will be determined during the detailed design phase.

Higher Efficiency Filtration

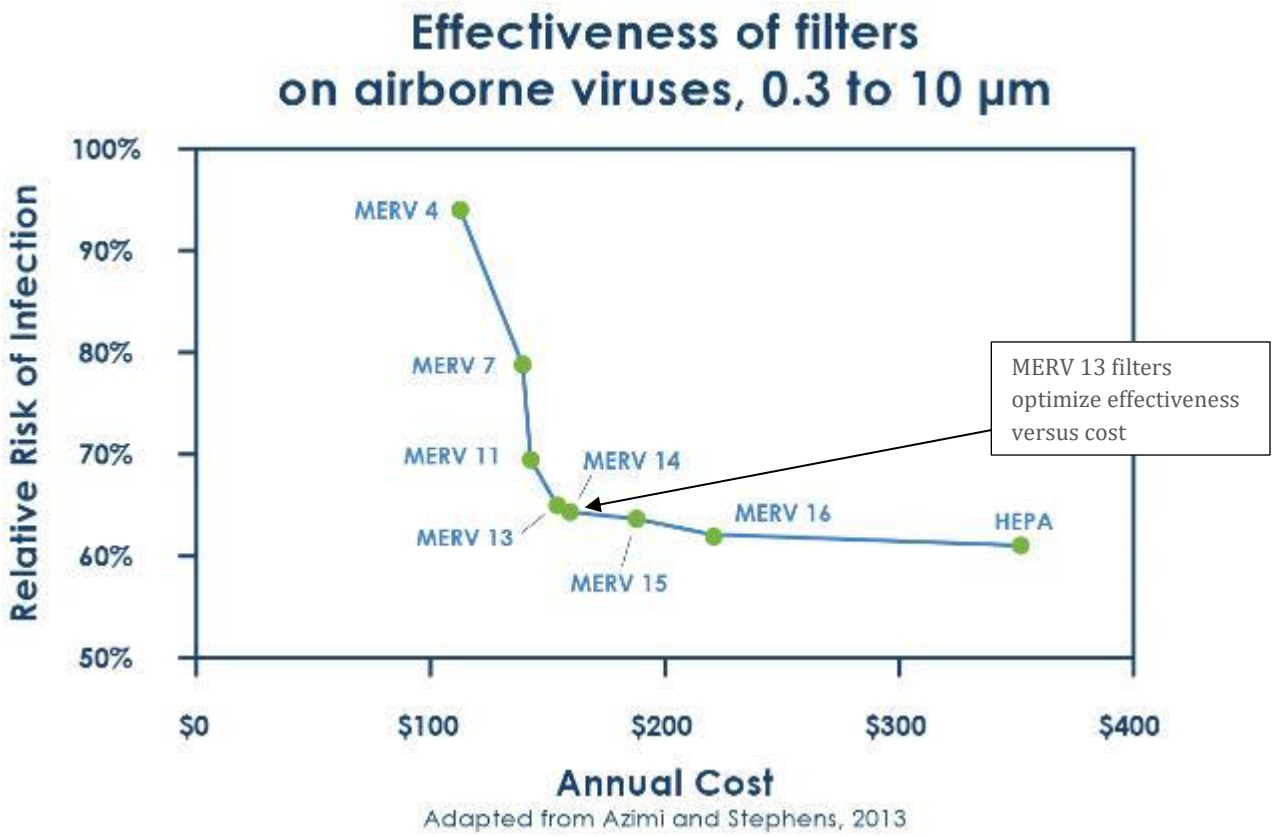
Effectiveness: Most commercial facilities specify filters with MERV 8 rating. This is usually sufficient to protect HVAC equipment, but it does not take infection control or human health into account. In general, the higher the MERV rating of the filter, the more effective the filters are at removing small particles and droplets carrying viruses. However, increased filter values past a MERV Filter rating of 13, have diminishing returns of effectiveness:



In addition to simply looking at filter MERV ratings, other factors must be considered when increasing filtration, including fan power limitations, and filter replacement costs.

Fan Power Limitations: Due to increased pressure drop across the higher-MERV filters, existing supply fans may not be able to handle the extra power required to move air through the tighter spaces in the filters. However, in many cases existing fans are oversized to avoid falling short when calculated power requirements are not accurate enough for a given system. In other cases, fans and motors may need to be upsized to handle the additional static pressure drop across the higher-MERV filters. Each piece of equipment and attached ductwork will be analyzed to determine whether existing supply fans can handle the additional power requirements of MERV 13 filters.

Filter Replacement Costs: As the MERV rating increases, it is no surprise that the cost of filters also increases. For example, HEPA filters are the most effective at removing contaminants of all sizes, but they cost over twice as much as MERV 13 filters. The following graph illustrates the effectiveness of different filters at reducing the risk of infection, compared to the annual cost of filter replacement. It is apparent that spending more money to go higher than MERV 13 or 14 does not yield much benefit with respect to the risk of infection.



Recommendation: Considering the optimal balance between effectiveness, fan-power limitations, and cost, upgrading to MERV 13 filters is recommended wherever feasible. All new HVAC equipment will be specified to include MERV 13 filters.

Plumbing Systems

Existing Conditions

All of the sites are experiencing difficulties in getting domestic hot water out to the plumbing fixtures furthest from the domestic hot water heaters. It takes several minutes of running faucets before the hot water arrives. Based upon initial observations, the issue appears to be caused by a combination of hard water buildup and underperforming circulation pumps.

Additionally, the domestic hot water heater at the Ag Shop is past its expected service life and is in need of replacing.

The existing plumbing fixtures are in poor condition and consume an excessive amount of water relative to modern fixtures.

Plumbing Systems Solutions

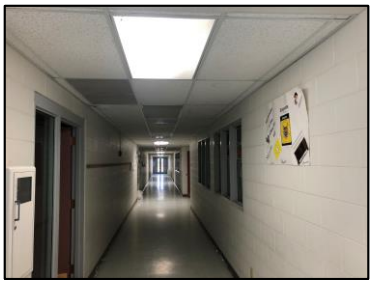
Domestic water lines should be treated and cleaned to remove as much of the hard water buildup as possible. The circulation pumps at each site should be replaced with properly sized pumps, and booster pumps should be added on the longest runs of the domestic water lines. To prevent future hard water buildup, water softening systems should be implemented at each site. Finally, the domestic hot water heater at the Ag Shop should be replaced with a high-efficiency gas fired hot water heater.

High-efficiency water closet

Lighting Systems

Existing Conditions

The lighting systems are primarily T8 linear fluorescent fixtures. The gymnasium was recently retrofitted with high-efficiency, high bay LED fixtures. T8 linear fluorescent fixtures use over 50% more energy than equivalent LED fixtures.



The school is primarily illuminated by T8 fluorescent fixtures.

Lighting Systems Solutions

It is recommended that all T8 lamps and ballasts and external HID fixtures be replaced with the latest and most-efficient product in lighting technology – LED lamps.

LED lamps have an extremely long life. The average life of the lamp is 50,000 hours, compared to typical T8 lamps, which are rated at 20,000 or 25,000 hours. The performance of the LED lamp is also guaranteed by the manufacturer for five years; whereas, T8 fluorescent lamps have only a one-year warranty.

Unlike fluorescent lamps, LED lamps do not require ballasts to operate. LEDs have a built-in driver that converts AC current to DC current to power the diodes, and this driver is covered by the manufacturer's five-year warranty as well. This further reduces the maintenance cost of LED lamps over fluorescents.

Example of LED retrofit tubes

Example of LED retrofit tubes

Exterior LED Lighting

Well-designed outdoor lighting is cost-effective, controls light by directing it where it is needed, reduces glare, distributes illumination evenly, and reduces light trespass.

Example of LED Pole Light

Example of Ceiling Mounted Occupancy Sensor

The most common lamps used for outdoor lighting are high-intensity discharge (HID) metal halide. In recent years, LED lamps have become viable sources for outdoor lighting as well, offering good color quality and better control options than HID sources.

Occupancy-Based Lighting Control

Reducing the connected load of the lighting system represents only one part of the potential for maximizing energy savings. The other part is minimizing the use of that load through automatic controls. Automatic controls switch lighting based on occupancy. Automatic controls will be installed where lighting may be on longer than needed, left on in unoccupied areas, or used when sufficient daylight exists.

Occupancy sensors detect the presence of people in a room and automatically turn off lights in unoccupied areas. They are ideal for food storage areas found in restaurants and grocery stores. They also are suited for areas that are intermittently occupied, meaning unoccupied for two hours or more per day, and where lights typically remain on when the space is unoccupied.

Examples of appropriate applications include offices, classrooms, copy rooms, restrooms, storage areas, conference rooms, warehouses, break rooms, corridors, and filing areas. Site observations revealed that most of the lighting fixtures in the buildings remain on many times when spaces are not being occupied. Energy used for lighting could be significantly reduced by turning off lighting fixtures in spaces when they are unoccupied.

Energy Codes

Rangely School District is mandated to comply with the 2018 International Energy Conservation Code (IECC). The following are areas in which the current HVAC systems may be falling short of this code:

1. C403.4.1.2 Deadband. Where used to control both heating and cooling, zone thermostatic controls shall be configured to provide a temperature range or deadband of not less than 5°F (2.8°C) within which the supply of heating and cooling energy to the zone is shut off or reduced to a minimum.
2. C403.4.2.1 Thermostatic setback. Thermostatic setback controls shall be configured to set back or temporarily operate the system to maintain zone temperatures down to 55°F (13°C) or up to 85°F (29°C).
3. C403.4.1.5 Hot water boiler outdoor temperature setback control. Hot water boilers that supply heat to the building through one or two-pipe heating systems shall have an outdoor setback control that lowers the boiler water temperature based on the outdoor temperature.
4. C403.6.8 Setpoints for direct digital control. For systems with direct digital control of individual zones reporting to the central control panel, the static pressure set point shall be reset based on the zone requiring the most pressure. In such case, the setpoint is reset lower until one zone damper is nearly wide open. The direct digital controls shall be capable of monitoring zone damper positions or shall have an alternative method of indicating the need for static pressure that is configured to provide all of the following:
    a. Automatic detection of any zone that excessively drives the reset logic.
    b. Generation of an alarm to the system operational location.
    c. Allowance for an operator to readily remove one or more zones from the rest algorithm.
5. C403.8.4 Fractional hp fan motors. Motors for fans that are not less than 1/12 hp (0.082 kW) and less than 1 hp (0.746 kW) shall be electronically commutated motors or shall have a minimum motor efficiency of 70 percent, rated in accordance with DOE 10 CFR 431. These motors shall have the means to adjust motor speed for either balancing or remote control. The use of belt-driven fans to sheave adjustments for airflow balancing instead of a varying motor speed shall be permitted.
6. C403.6.5 Supply-air temperature reset controls. Multiple-zone HVAC systems shall include controls that automatically reset the supply-air temperature in response to representative building loads, or to outdoor air temperature. The controls shall be configured to reset the supply air temperature not less than 25 percent of the difference between the design supply-air temperature and the design room air temperature.
7. C405.2.1 Occupant sensor controls. Occupant sensor controls shall be installed to control lights in certain space types.
8. C403.2.2 Ventilation. Ventilation, either natural or mechanical, shall be provided in accordance with Chapter 4 of the International Mechanical Code. Where mechanical ventilation is provided, the system shall provide the capability to reduce the outdoor air supply to the minimum required by Chapter 4 of the International Mechanical Code.
9. C403.7.1 Demand control ventilation. Demand control ventilation (DCV) shall be provided for spaces larger than 500 square feet (46.5 m^2) and with an average occupant load of 25 people or greater per 1,000 square feet (93 m^2) of floor area as established in Table 403.3.1.1 of the International Mechanical Code.

X. Square Footage & Future Use Analysis

Rangely RE-4 School District facility square footages and student metrics are as follows:

Facility	Space Utilization	Ft2	Students	Ft2/Student	Built & Additions
Parkview Elementary School	Classrooms Gym Cafeteria Library Auditorium Offices	61,787	220	281 sq'	1984
Rangely JR/SR High School	Classrooms Gym Cafeteria Library Auditorium Offices	102,691	253	406 sq'	1986
AG Shop	Classrooms Gym	10,470	(Part of HS)	-	1952
EEC & District Administration	Classroom Offices	28,784	97	297 sq'	1960 2000
Total	-	203,732			

Current Capacity of Facilities

All facilities in Rangely RE-4 are being fully utilized throughout providing service from preschool aged students through grade 12.

Future Use Analysis

In consideration to safety and security for the students and staff, an analysis has been completed assessing the current classroom square footage per student. All classrooms are of sufficient size to accommodate current occupancy loads.

XI. Site Evaluation

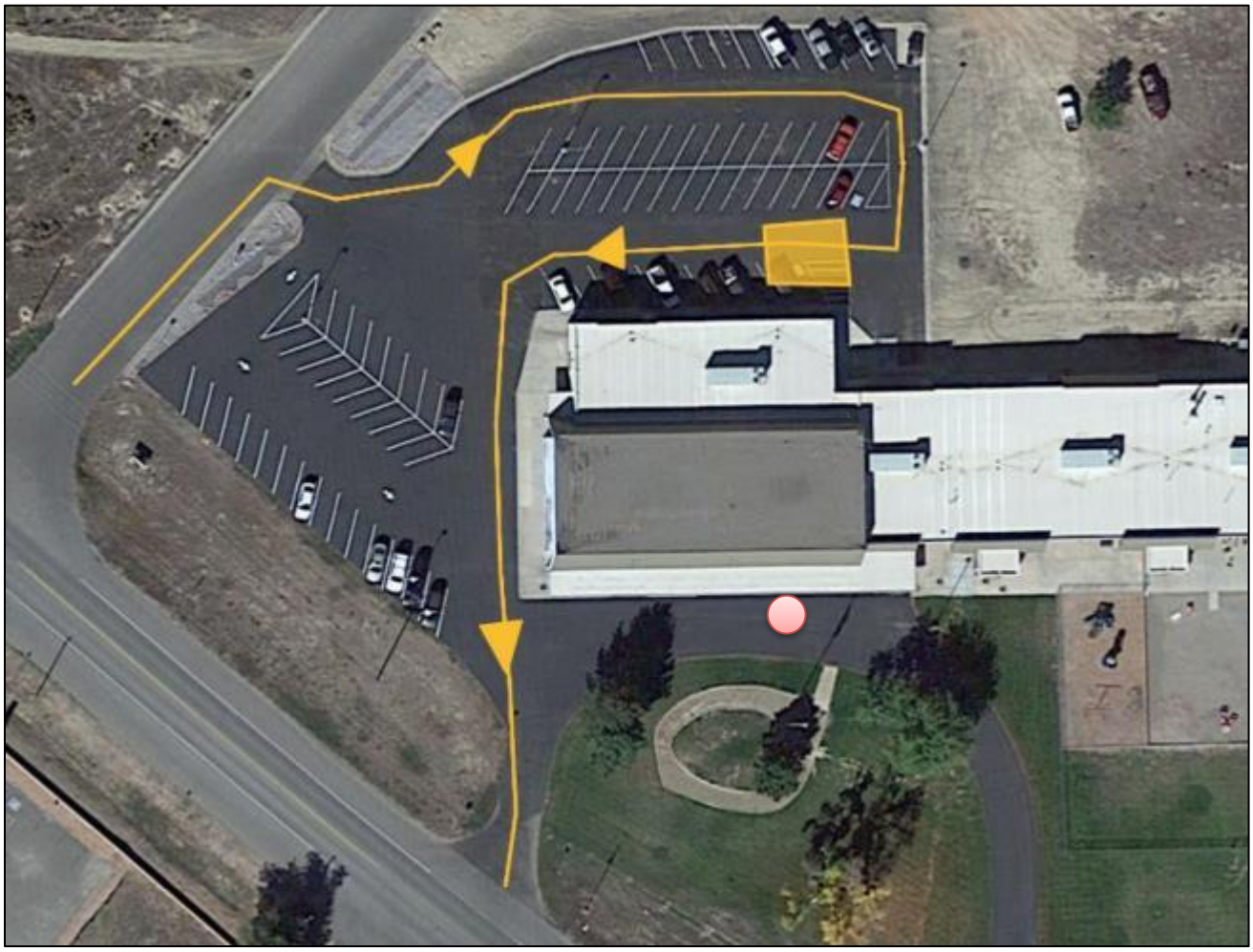
Early Education Center

District Bus Route Pattern for Student Pickup & Drop-off

The Early Education Center uses a dedicated bus loop on the south side of the building as a bus lane for student drop-off and pickups. Morning bus arrivals filter students into the building at the south entrance, and after school buses stage at the top of the loop for afternoon bus pickups.

Parent/Student Drop-off/Pickup Location

Parents pull in at the northwest entrance and make a loop around the north parking lot. They are facing west when dropping off students at the main entrance.



Playground Area and Equipment

There is sidewalk settling and cracking with signs of poor drainage.

A typical building drainage example, which is poorly sloped providing uncontrolled drainage.

Emergency & Fire Department Access

The main entrance into the building provides clearance for emergency response teams. Fire department access is available on all sides of the facility via an access road, the main drive lanes, and surface streets that circumvent the facility.

Parking Lots & Roads

The parking lots have excessive cracking and need repairing and repaving. Addressing issues with the parking lots has recently become a much higher priority for the District due to the increased usage caused by the COVID-19 pandemic. The pandemic has led to a tenfold increase in parking lot usage since more students are being dropped off in passenger vehicles instead of using the bus systems.

Sports Fields & Playgrounds

A sports field is located on the school grounds north of the building and includes a baseball field with associated buildings and seating. A playground is located south of the building and includes playground equipment, a large grass area, and a pea gravel play area. New playground equipment was added in recent years.

ADA Compliance

General site accessibility is acceptable and provides sufficient access to all locations within the school building (entrances & exits) and associated fields.

Site Utilities

The utility transformer and the natural gas service are located on the north side of the building.

Site Drainage

Surface drains from lamb's tongues and downspouts are strategically located around the building to provide controlled drainage. Many areas of perimeter sidewalks have experienced some settling and no longer have a sufficient slope to allow water to flow away from the building foundation. The building perimeter should be regraded prior to replacing the sidewalks to preserve the integrity of the foundation system and overall building for the long term.

Acreage

The district site sits on 12.89 acres.

Signage

Signage around the site is sufficient for the facility's needs.

Parkview Elementary School

District Bus Route Pattern for Student Pickup & Drop-off

Parkview Elementary uses a dedicated bus loop on the west side of the building for student drop-off and pickups. Morning bus arrivals filter students into the building at the south entrance, and school buses stage at the top of the loop for afternoon bus pickups.

Parent/Student Drop-off/Pickup Location

Parents use a drop-off loop on the south side of the building, looping east to west, which drops off students at the main entrance.

Main entrance sidewalks are in good condition.

This shows a damaged section of a curb that needs repairing.

This location shows where the sidewalk failed and was removed.

Emergency & Fire Department Access

The main entrance into the building provides clearance for emergency response teams. Fire department access is available on the east, west, and south sides of the facility via an access road, the main drive lanes, and surface streets.

Parking Lots & Roads

The concrete parking lots and asphalt roadways were repaved in 2015 and are in good repair. There are a few sections of damaged curbs that should be repaired.

Sports Fields & Playgrounds

Sports fields are located on the school grounds east of the main building and include a football field with a quarter mile track and various multi-use grass areas. The main area inside of the track is used for field sports such as soccer and football. Basketball courts, playgrounds, and several open grass areas are also located north of the building.

ADA Compliance

General site accessibility is acceptable and provides sufficient access to all locations within the school building (entrances and exits) and associated fields.

Site Utilities

The utility transformer is located on the northeast side of the building and the natural gas service is located east of the building.

Site Drainage

Surface drains from lamb's tongues and downspouts are strategically located around the building to provide controlled drainage. Many sections of the perimeter sidewalks have experienced settling; some sections have experienced severe damage and even completed failure. Many of the sidewalks no longer have a sufficient slope to allow water to flow away from the building foundation. The building perimeter should be regraded prior to replacing the sidewalks to preserve the integrity of the foundation system and building overall for the long term.

Acreage

The district site sits on 11.95 acres.

Signage

Signage for the site is sufficient for the facility's needs. A speed alert sign is needed on the main road leading to the school to encourage safe driving speeds.

Rangely Junior/Senior High School

District Bus Route Pattern for Student Pickup & Drop-off

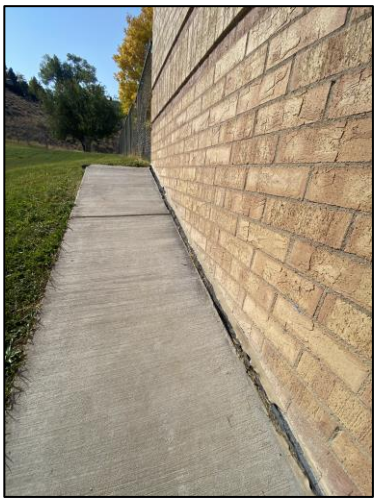
Rangely Junior/Senior High School uses a dedicated bus loop on the northwest side of the building for student drop-off and pickups. Morning bus arrivals filter students into the building at the main entrance, and school buses stage at the top of the loop for afternoon bus pickups.

Parent/Student Drop-off/Pickup Location

Parents use a drop-off loop north of the bus loop that makes its way around the main parking lot, dropping off students just north of the main entrance.

Football Field and Track

A damaged and cracked parking lot.



Signs of settling in perimeter sidewalks.

Emergency & Fire Department Access

The main entrance into the building provides clearance for emergency response teams. Fire department access is available on the north, west, and south sides of the facility via an access road, the main drive lanes, and surface streets.

Parking Lots & Roads

The parking lots and roadways are cracking and showing signs of underlying issues - as seen by a small sink hole that opened up recently. The sink hole was patched but the underlying issues need further investigation before a long-term solution is implemented.

The parking lots have excessive cracking and need repairing and repaving. Addressing issues with the parking lots has recently become a much higher priority for the District due to their increased usage caused by the COVID-19 pandemic. The pandemic has led to a tenfold increase in parking lot usage since more students are being dropped off in passenger vehicles instead of using the bus systems.

Sports Fields & Playgrounds

Sports fields are located on the school grounds northeast of the main building and include a football field with a quarter mile track, and pole vaulting and shot-put courses. The main area inside of the track is used for field sports such as soccer and football. Basketball courts and open grass areas are also located northeast of the building.

ADA Compliance

General site accessibility is acceptable and provides sufficient access to all locations within the school building (entrances and exits) and associated fields.

Site Utilities

The utility transformer and the natural gas service are located on south side of the building.

Site Drainage

Surface drains from lamb's tongues and downspouts are strategically located around the building to provide controlled drainage. There are some areas of the perimeter sidewalks that have experienced settling and are pulling away from the foundation, which effects the slope of the sidewalks (and results in water pooling at times). The building perimeter should be regraded prior to replacing the sidewalks to preserve the integrity of the foundation system and overall building for the long term.

Acreage

The district site sits on 16.09 acres.

Signage

Signage around the site is sufficient for the facility's needs.

XII. Technology

Technology Topology

Type of Cabling: Mix of old Cat5 (10%), Cat5e (90%). Cameras on Cat5E. They have Single-mode (SM) fiber between all buildings. Per building, the MDF is connected to primary IDFs by either MM or SM fiber.

Type and Age of Hardware: The switches are old, donated (graymarket) Cisco switches at least 5 years or older – sometimes much older. Most switches are 1 gbps capable, none are 10 gbps (even on SFP ports), and a few are 10/100 mbps.

Source of Bandwidth and Internet Connectivity: Bandwidth is a shared 600 mbps with Meeker School District. The single shared pipe can burst to 1 gbps.

Network Infrastructure

Data Network Equipment: Switches are old, donated (graymarket) Cisco switches, all about five years or older. Most are 1 gbps capable, none are 10 gbps (even on SFP ports), and a few are 10/100 mbps.

Voice Network Equipment: The Digium VOIP system is fully deployed, which is about three years old.

Firewall & Security: Leased firewall service from Rio Blanco County via their Palo Alto.

Back-up & Recovery: All files are stored on Google Drive, which is backed up to the internal Network-Attached Storage (NAS).

Availability & Campus Connectivity: All five buildings (EEC, PVE, RJSHS, AG, BusG) are connected via county fiber optics to the county data center where all of the servers and layer 3 switches are located.

System Standard & Specifications

Operating Systems: Windows 10. Teachers also have a Promethean board with an Android OPS and a Windows 10 PC attached. All servers are on Windows OS utilizing Microsoft's Hyper-V. Most servers are Windows VMs.

Email Services: Gmail

Wireless Services: Aruba APs

Educational Technology

SMART Boards: 75" touch Promethean boards with both Android OPS and Windows PCs attached.

Staff Equipment: Windows laptops, document cameras, USB DVD drives upon request.

Student Equipment: 1:1 Chromebooks grades K-12. There are also iPAD minis in PreK-1 grade classrooms, which are no longer IT supported and being phased out in lieu of Chromebooks.

Student Lab Equipment: Labs have been greatly reduced in lieu of the 1:1 Chromebook initiative. There is a maker-space style lab in Parkview Elementary School along with about 6 Windows 10 computers. There is a computer science instructional lab in Rangely JR/SR High School, as well as several Windows stations in the library, mostly for student printing purposes.

XIII. Strategic Plan for Implementation

Master Plan Recommendations

Rangely School District's leadership and the Master Planning Team have identified infrastructure and life safety improvement opportunities across the District. The needs of the District are numerous enough that the District can only responsibly address these needs using a phased approach.

The overall goal of the District is to ensure safe, high-quality learning environments for the students of the Rangely School District. To meet and exceed this goal, the District must have sound buildings with HVAC systems capable of providing good indoor air quality and comfort throughout the school year. For these reasons, the Master Plan outlines and prioritizes infrastructure projects that will help keep the Early Education Center, Parkview Elementary School, Rangely Junior/Senior High School, and the Ag Shop buildings operational for years to come and improve the indoor environment of the schools.

Projects without a direct impact on the function of the buildings, quality of the indoor environment, or which do not need to be addressed in the immediate future, received lower tier ratings and should be considered for implementation in later phases of district improvement work.

The focus and top priorities of the first phase of improvements are outlined below.

Overview of BEST Recommendations:

1) **Comprehensive renovations and upgrades of the HVAC systems, which will solve the indoor air quality and comfort issues experienced across the district.**
2) **A modern, centralized building management system that will allow the maintenance team to effectively monitor and control the equipment in each facility from any location.**
3) **A renovation of electrical system components that complement the HVAC scope. Cooling will be added to Parkview Elementary School and Rangely Junior/Senior High School, which means the electrical capacity at the electrical service entrances will need to be increased.**
4) **Full replacement of all existing single-ply membrane roofs. The existing membrane roofs have begun to leak, do not drain well, and have proven extremely difficult to maintain. Roofs allowed to continue to leak can caused major building damage leading to more costly repairs in the future.**

Overview of Bond Recommendations:

1) **New LED lighting fixtures, which will reduce the utility and maintenance costs of the school.**
2) **Interior improvements including select drop ceilings, new carpet, new VCT flooring, and freshly painted interiors. Renewed interior spaces are more enjoyable use and can improve the learning environment.**
3) **New Public Address (PA) systems and new fire alarm systems will increase the overall safety of each site. A new PA system will improve communication across the schools and provide a reliable means for safety announcements.**

4) **Site work, including perimeter sidewalks, select parking lots, and water infiltration issues will be addressed through regrading, repaving, and proper waterproofing where required. These improvements will help to extend the life and function of the facilities.**

The community, the staff, and most importantly the students will benefit immensely from safer, more comfortable, and better ventilated facilities that are easier to maintain. From the beginning, the focus of the effort has been on long-term solutions to the district's most pressing needs in order to maintain and improve the high level of educational programming offered by the Rangely School District.

The long-range risks of not implementing the scope outlined in the master plan would be poor air quality in the facility, escalating maintenance costs due to the aging equipment, and unsafe conditions for the students.

The need to bring this facility up a modern standard is clearly presented and defined throughout the facility master plan and subsequent BEST grant application. Implementing the master plan recommendations will ensure the district is a valuable member of the community for many years to come.

Options for Relevant Recommendations

HVAC System Selection: Life-Cycle Cost Approach

The Goal

Rangely School District desires new, energy-efficient heating, ventilation and air conditioning (HVAC) systems to upgrade and replace the uncomfortable, aging, inefficient systems currently serving Early Education Center, Parkview Elementary School, Rangely Junior/Senior High School, and the Ag Shop buildings. The new HVAC systems will be energy-efficient, capable of handling large load fluctuations that exist in the buildings, provide moderate temperature control with minimum humidity control, and should provide good indoor air quality.

Due to various building constraints, a Life-Cycle Cost Analysis (LCCA) was not performed for the new HVAC systems at the Early Education Center or the Ag Shop as it was unnecessary for selecting the proper system. Parkview Elementary School's HVAC system was the focus of the LCCA. Both Parkview Elementary and Rangely Junior/Senior High School currently have the same types of systems. Therefore, both locations will receive the same types of new systems/ upgrades, so the results of the LCCA can be applied to selecting an HVAC system for both sites. The two HVAC system options outlined below have been evaluated to optimize energy efficiency with life-cycle costs.

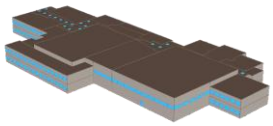
Life-Cycle Cost Analysis

Commonly, the decision on the type of heating and cooling system to use in a building is made based upon very little or incomplete information, often neglecting initial cost and operation and maintenance costs. The mechanical systems are often chosen based solely for the convenience of the contractor, HVAC equipment sales representative, or mechanical engineer. Conversely, in order to provide you with the most accurate information possible, a thorough Life-Cycle Cost Analysis was performed to compare HVAC system alternatives at the middle school

This comprehensive financial model takes into account all important factors such as annual maintenance and energy cost as well as first cost to provide an overall picture of the cost of owning and operating each system. This financial model provides a means to select the optimal HVAC system type from competing alternatives.

Source of Energy Costs of Alternatives:

Energy costs of system options were determined by performing a detailed energy model of the facility in eQUEST.



Source of First Costs:

First cost estimates were performed using the R.S. Means Building Construction Cost Database, local labor rates, and actual equipment quotes from vendors' representatives.

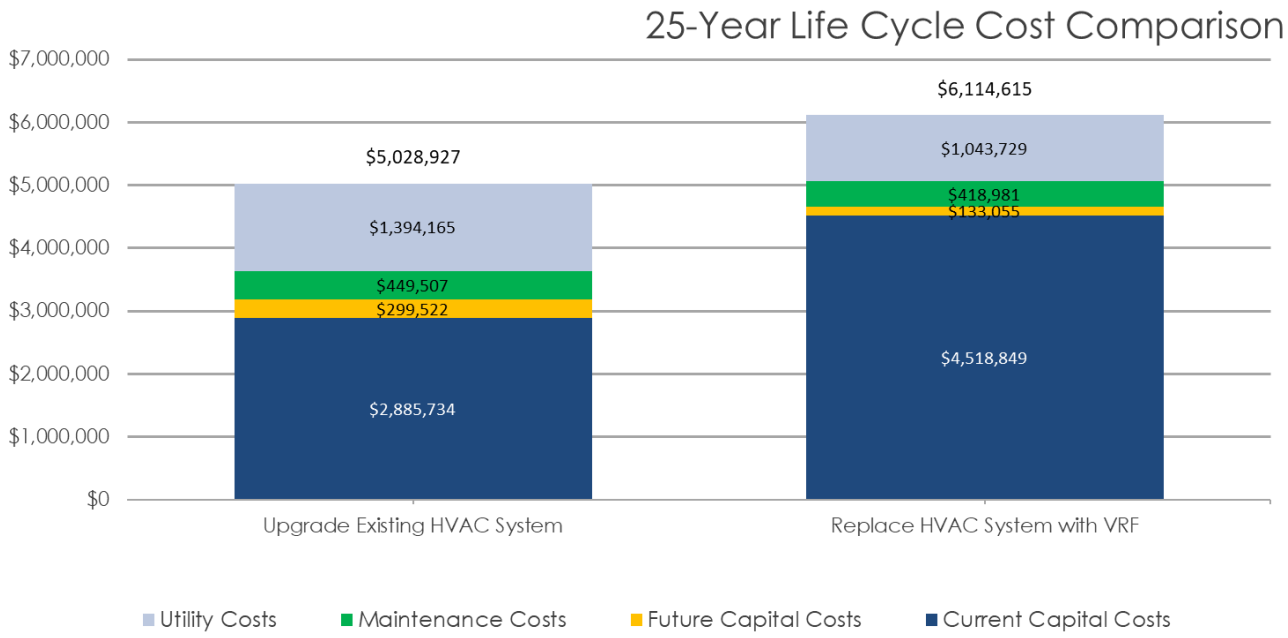
Source of Maintenance Costs:

Maintenance cost estimates are from published R.S. Means estimating guides, which are the industry leading construction cost publications.

The following HVAC system alternatives were evaluated weighing their 25-year life-cycle costs and outlining the qualitative advantages and disadvantages of each. These two particular systems were chosen because they would be conducive to a comprehensive HVAC renovation upgrade project that addresses the needs at Parkview Elementary and Rangely Junior/Senior High School. Each will address the systemic maintenance, ventilation, and comfort issues in the schools.

1) **Improve Existing Built-up VAV and Upgrade Packaged Units**
2) **Water Source VRF**

The figure below highlights the total expected 25-year life-cycle cost of purchasing, owning, maintaining, and operating the HVAC systems evaluated. It should be noted that the initial cost of each system only makes up 58%-74% of the systems total life-cycle cost; energy and maintenance expenditures over 25 years exceeds the cost of purchasing and installing the system.

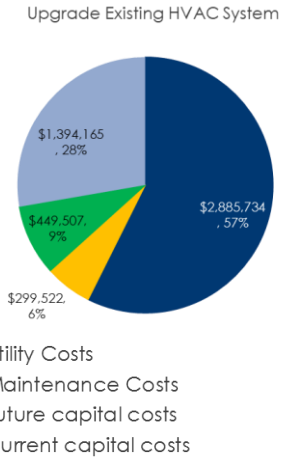


Conclusion

1) Assuming the existing system is properly upgraded to include cooling and adequate ventilation, upgrading the existing systems is a better financial option due to the significantly lower up-front costs.
2) A water source VRF system would result in lower utility costs, but the LCCA is unable to overcome the high first-costs.

Option 1: Upgrade Existing VAV System

Parkview Elementary School and Rangely Junior/Senior High School are currently conditioned and ventilated primarily by one large built-up VAV system at each site. These units each contain evaporative cooling coils, hot water heating coils, VFD controls supply fans, and outside air dampers. They serve VAV boxes with reheat coils throughout the sites. Individual classroom and other spaces are each served by the VAV box, so that the spaces can be controlled individually.



When implemented property, VAV systems are very efficient and provide adequate ventilation to all spaces served by the system. The primary issues with the current VAV systems are the lack of chilled water cooling leading to hot spaces in the summer months and undersized or improperly commissioned equipment leading to cold spaces in the winter months. Additionally, based on CO2 monitoring, some of the spaces are also not receiving enough ventilation air, which is causing poor indoor air quality.

This HVAC option is proposing to add chilled water cooling to the built-up VAV systems via air cooled chillers and chilled water coils at the built-up units. Additionally, all space loads would be calculated and analyzed to determine if any existing equipment is undersized or underperforming. All problematic equipment will be replaced with properly-sized equipment. Malfunctioning outside air dampers and actuators will be replaced and testing will be performed to ensure the required ventilation rates of each space are met or exceeded.

25-Year LCC:	$5,028,927
Typical Life:	15 -25 years
Reliability:	Good
IEQ:	Good
(Indoor Environmental Quality)	
Appearance:	Fair

The existing systems were installed in 2009, and many of the components still have a significant amount of time left before they pass their expected useful life. Therefore, reusing much of the existing system makes sense financially as well as environmentally, as it would be wasteful to discard equipment that is still functioning properly and hasn't exceeded its useful life. The 25-year LCCA also took into consideration the replacement of existing equipment that is reused and then needs replacing during the 25-year period.

As part of this option, all existing packaged units would be replaced with high efficiency VAV packed units with hot water heating and DX cooling. The existing units have only evaporative cooling and many of the units are unable to meet the heating and cooling needs of the spaces they serve.

The system cost estimate assumes that rooftop units will be installed and utilize the best technology available for reducing energy expenditure, such as variable speed fans, variable speed compressors, and outside air economizers.

The new rooftop units will be tied into a modern building management system that will allow maintenance staff to monitor and schedule equipment remotely.

Advantages

- Equipment location allows easy service access without maintenance staff entering or disturbing occupied space.

- Installation is simplified, and field labor costs are reduced because most components are assembled and tested in a controlled factory environment.
- Existing equipment continues to be used so long as it does not negatively impact the upgraded system's function.
- Outside air is readily available for ventilation and economy cycle use.
- Combustion air intake and flue gas exhaust are facilitated if natural gas heat is used.
- Upgraded design features, such as high-efficiency filtration and advanced controls strategies, can be implemented.
- Equipment is relatively simple to service.

Disadvantages

- Maintaining or servicing outdoor units is sometimes difficult, especially in inclement weather.
- Rooftop unit design must be coordinated with structural design because it may represent a significant building structural load.
- In cold climates, provision must be made to keep snow from blocking air intakes and access doors, and the potential for freezing of hydronic heating or steam humidification components must be considered.
- Casing corrosion is a potential problem. Many manufacturers prevent rusting with galvanized or vinyl coatings and other protective measures.
- Outdoor installation can reduce equipment life.

Option 2: Water Source Variable Refrigerant Flow (VRF) System

Variable Refrigerant Flow (VRF) systems first appeared in Japan in 1982 and are now used throughout the world with increasing presence in the U.S. VRF systems are large-capacity, sophisticated versions of ductless multi-split air-conditioning or heat pump systems, which include multiple indoor evaporators connected to a single condensing unit containing one or multiple inverter-driven (variable-speed) compressors. VRF systems have the additional capability of connecting ducted style fan coil units. They do not provide ventilation, so a separate ventilation system is typically necessary for outdoor air requirements.

The term variable refrigerant flow refers to the ability of the system to control the amount of refrigerant flowing to each of the evaporators. This enables the use of many evaporators of differing capacities and configurations, individualized comfort control, simultaneous heating and cooling in different zones, and heat recovery from one zone to another.

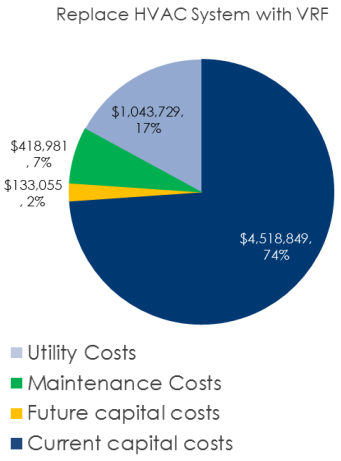
Each condensing unit uses two or three compressors, including an inverter-driven variable-speed compressor. Larger systems combine multiple condensing units to achieve more system capacity. The inverter driven compressors, coupled with efficient indoor unit fan operation, results in heating and cooling efficiencies that are comparable to high-efficiency water-cooled systems. The chart below demonstrates Integrated Energy Efficiency Ratios (IEERS) expected for the different sized non-ducted fan coils from three popular VRF manufacturers. For comparison, efficient water-source heat pumps have EERs of up to 25 Btu/W-hr. Traditional Air-Cooled DX equipment can achieve Seasonal Energy Efficiency Ratios of 18 Btu/W-hr.

Each classroom would be conditioned by a dedicated ceiling mounted VRF Cassette Unit that will provide the space with individual temperature control. The existing built-up VAV systems would be removed and dedicated outside air systems will be installed in their place. The gymnasium, cafeteria, and auditorium spaces will be conditioned by hot water/DX packaged rooftop units rather than VRF units. Covering the large loads of the assembly spaces with the VRF system and outdoor air units would balloon the equipment budget. It is more cost effective to condition these spaces with rooftop units. Additionally, the existing ductwork serving the large spaces can be reused.

With the exception of the outdoor heat pumps and handful of rooftop units, all of the equipment will be located inside the building, which will ease maintenance and increase equipment longevity. A water source VRF system would be necessary due to the very cold winter temperature experienced in the region.

Advantages

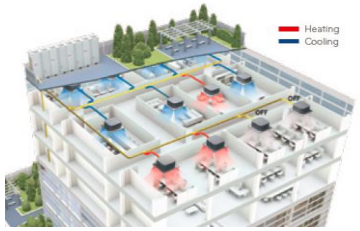
- Allows for exchanging heat from one zone to another for buildings with large load diversities.
- Responds well to fluctuations in space load conditions.



25-Year LCC:	$6,114,615
Typical Life:	20 years
Reliability:	Good
IEQ:	Good
(Indoor Environmental Quality)	
Appearance:	Good

Photos:

Outdoor Unit Installations



Typical System Layout


Typical Cassette-style Indoor Unit

- Suitable for retrofitting buildings without disturbing the structure.
- Design flexibility allows for various sized and style indoor units (ceiling recessed, wall-mounted or floor console) to be added to any single outdoor unit, easing adaptation to future expansion or reconfiguration.
- Feature standardized configurations and sophisticated controls, which allow for near plug-and-play commissioning.
- Many zones are possible, each with precise individual setpoint control, which is an advantage of a variable speed compressor.
- Energy consumption is relatively low compared to central or ducted systems due to elimination of duct losses and the high part-load efficiency of multiple, variable speed compressors.
- Systems are lightweight and modular and easily transportable compared to larger centralized equipment.
- Most equipment is located inside the building, which will ease maintenance and increase equipment longevity.

Disadvantages

- Utilized electricity for 100% of space heating needs resulting in sometimes higher winter operating costs than other system equivalents.
- Outdoor condensing units and indoor compressor life is less than for large central equipment, typically 18-20 years.
- Routine maintenance within occupied spaces is required to maintain capacity.
- Ventilation air capabilities are limited, requiring a separate dedicated outdoor air system (DOAS) to handle outdoor air.
- Operation in cold climates includes modes that run compressors at higher speeds to maintain heat in the system, resulting sometimes in poor heat pump efficiency on the coldest days of the year.
- Long refrigerant piping can increase the possibility of refrigerant leaks, which can be difficult to repair, especially in occupied spaces.

Prioritized Long-Term Project Implementation

Priority Tier I

Facility	Component	Recommendation	Priority Tier	Cost Estimate [1]
Parkview	Sitework	Replace All Sidewalks & Add Snow Melt System	Tier I	$224,530
Parkview	Sitework	Repair Damaged Parking Lot Curbs	Tier I	$16,220
Parkview	Sitework	Install a Speed Alert Sign on the Road Leading to the School	Tier I	$1,460
Parkview	Sitework	Demo Out (11) Old Raised Tree Beds and Pour Concrete Flush with Sidewalk	Tier I	$53,090
Parkview	Sitework	All New Irrigation	Tier I	$207,150
Parkview	Sitework	Address Drainage Issues on North/Northwest Side of The Property	Tier I	$96,530
Parkview	Building Structure	Excavate, Re-Waterproof, & Re-Grade Gym Foundation	Tier I	$102,770
Parkview	Building Envelope	Tuckpoint Exterior Façade	Tier I	$78,190
Parkview	Building Envelope	Replace Roofs & Install Ice Dams	BEST	$704,605
Parkview	Building Envelope	Replace Front Entrance Store-Front Windows	Tier I	$48,000
Parkview	Building Envelope	Replace Select Entry Doors	Tier I	$28,870
Parkview	Building Envelope	Touch Up Rusting Trim on Circular Exterior Windows	Tier I	$9,660
Parkview	Building Envelope	Replace Metal Trim and Facia Add Box Cutter and Ice Dams	Tier I	$48,270
Parkview	Building Envelope	Reseal Around Perimeter of the Building at Sidewalk Interface	Tier I	$11,590
Parkview	Interiors	Replace Water Damaged Ceiling Tiles & Hard Ceilings	Tier I	$110,760
Parkview	Interiors	Replace Carpeting, VCT Flooring, & Refinish Wood Gym Floors	Tier I	$685,180
Parkview	Interiors	Repaint Interior Walls and Re-Epoxy Interior Masonry Walls	Tier I	$350,000
Parkview	Interiors	Demo All Old/Abandoned in Place Power and Network Runs in Classrooms	Tier I	$48,270
Parkview	Interiors	Fix Damaged Face CMU in Gyms	Tier I	$222,010
Parkview	Interiors	Replace The Floor in The Practice Gym	Tier I	$74,800
Parkview	Interiors	Remove And Patch All Old Brick Anchors	Tier I	$38,610
Parkview	Electrical	Replace Main Electrical Service & Distribution Equipment	BEST	$781,419
Parkview	Electrical	Building Wide LED Retrofits	Tier I	$525,000
Parkview	Electrical	Replace Electrical Panel in Art Room	Tier I	$11,540
Parkview	Electrical	Replace Faulty Public Address System	Tier I	$111,340
Parkview	Electrical	Replace/Repair (2) Outdoor Emergency Lights Near Main Gym	Tier I	$1,940
Parkview	Electrical	Add Dedicated Panel/Circuits for (1) 4-Plug Outlet to Back Wall of Each Classroom	Tier I	$91,700
Parkview	HVAC	Upgrade VAV Systems, Add Cooling, & Replace Controls System	BEST	$2,895,691
Parkview	HVAC	Infectious Disease Mitigation Measures	BEST	$7,345
Parkview	HVAC	New Heat/Cooling RTU For Kitchen	Tier I	$173,750
Parkview	Plumbing	Address Kitchen Waist Line Drainage Issues	Tier I	$109,350

Parkview	Plumbing	Address DHW Circulation Issues	Tier I	$68,240
Parkview	Plumbing	Installed Site Wide Water Softener System	Tier I	$68,950
Parkview	Plumbing	Some Plumbing Lines Not Working/Draining In (1) Or (2) Restrooms	Tier I	$38,610
Parkview	Life Safety	Replace Fire Alarm System	Tier I	$408,690
Parkview	Life Safety	Assess Fire Suppression System	Tier I	$4,830
Parkview	Security & Access Control	Add IP Based Card Reader Door Access	Tier I	$168,920
Parkview	Security & Access Control	Add Panic Pull Station/Button in Each Room and Install a CCTV System	Tier I	$96,530
Parkview	Security & Access Control	Security Glass on All First Floor Classroom Windows	Tier I	$27,030
Jr/Sr High	Sitework	Replace All Sidewalks & Add Snow Melt System	Tier I	$615,010
Jr/Sr High	Sitework	Repave Parking Lots	Tier I	$274,090
Jr/Sr High	Sitework	Fix Drainage Issues Occurring at West/ Northwest Side of Building	Tier I	$164,100
Jr/Sr High	Sitework	Fill In Crawl Space in Parking Lot	Tier I	$96,530
Jr/Sr High	Sitework	Fix Sprinkler System and Irrigation on Island in Front	Tier I	$15,450
Jr/Sr High	Building Structure	Excavate, Re-Waterproof, & Re-Grade Gym Foundation	Tier I	$113,890
Jr/Sr High	Building Envelope	Tuckpoint Exterior Façade	Tier I	$316,650
Jr/Sr High	Building Envelope	Replace Roofs	BEST	$802,881
Jr/Sr High	Building Envelope	Add Slider Windows to Rooms That Do Not Have Them	Tier I	$28,960
Jr/Sr High	Building Envelope	Add Doors/ Window Underneath Home Team Bleachers	Tier I	$38,610
Jr/Sr High	Interiors	Replace Water Damaged Ceiling Tiles & Hard Ceilings	Tier I	$171,840
Jr/Sr High	Interiors	Replace Carpeting, VCT Flooring, & Refinish Wood Gym Floors	Tier I	$1,056,810
Jr/Sr High	Interiors	Repaint Interior Walls and Re-Epoxy Interior Masonry Walls	Tier I	$583,410
Jr/Sr High	Interiors	Replace Damaged Interior Door System	Tier I	$2,720
Jr/Sr High	Interiors	All New Case Work Throughout the School	Tier I	$544,404
Jr/Sr High	Interiors	Paint Women's Locker Rooms and Repair All Lockers That Do Not Work, Replace Two Doors That Were Ripped Off	Tier I	$19,310
Jr/Sr High	Electrical	Replace Main Electrical Service & Distribution Equipment	BEST	$443,326
Jr/Sr High	Electrical	Building Wide LED Retrofits	Tier I	$881,520
Jr/Sr High	Electrical	Replace Faulty Public Address System	Tier I	$183,160
Jr/Sr High	HVAC	Upgrade VAV Systems, Add Cooling, & Replace Controls System	BEST	$4,361,060
Jr/Sr High	HVAC	Infectious Disease Mitigation Measures	BEST	$7,999
Jr/Sr High	HVAC	New Hoods in Science Rooms	Tier I	$43,440
Jr/Sr High	Plumbing	Address DHW Circulation Issues	Tier I	$160,410
Jr/Sr High	Plumbing	Installed Site Wide Water Softener System	Tier I	$75,550
Jr/Sr High	Plumbing	P-Traps Are Rusting Out Upper Floors	Tier I	$14,480
Jr/Sr High	Plumbing	Address Sewer Smell in Basement Restrooms Likely Needs a Drain Seal to Prevent Gases Escaping	Tier I	$2,320
Jr/Sr High	Plumbing	Science Lab: Plumbing	Tier I	$9,660

Jr/Sr High	Special Construction	Install A Football Field Sound System	Tier I	$193,050
Jr/Sr High	Special Construction	Theater - New Mic and Speaker System	Tier I	$96,530
Jr/Sr High	Special Construction	Science Rooms - Replace Specialty Items in Science Closets	Tier I	$14,480
Jr/Sr High	Life Safety	Replace Fire Alarm System	Tier I	$583,840
Jr/Sr High	Security & Access Control	Panic Pull Station/Button in Each Room And CCTV	Tier I	$115,000
Jr/Sr High	Security & Access Control	Door Access All IP Based	Tier I	$189,190
EEC	Sitework	Replace All Sidewalks & Add Snow Melt System	Tier I	$692,700
EEC	Sitework	Repave Parking Lots	Tier I	$369,890
EEC	Sitework	Address Bus Loop Roof Drainage Issues	Tier I	$120,230
EEC	Building Envelope	Replace Roofs, Install Ice Dams, & Replace Gutter Systems	Tier I	$452,160
EEC	Building Envelope	Tuckpoint Exterior Façade	Tier I	$44,210
EEC	Building Envelope	Refinish Exterior Doors and Install New Weather Seals	Tier I	$16,330
EEC	Building Envelope	Replace Tectum Deck Under Gym Overhang	Tier I	$17,930
EEC	Building Envelope	Replace the Gym Windows with New Operable Windows	Tier I	$130,310
EEC	Building Envelope	Repair or Replace Failed and Damaged Roof Edging	Tier I	$28,960
EEC	Building Envelope	Address Roof Drainage on Southside of Building	Tier I	$7,240
EEC	Interiors	Replace Water Damaged Ceiling Tiles	Tier I	$43,350
EEC	Interiors	Replace Carpeting and VCT Flooring	Tier I	$273,930
EEC	Interiors	Repaint Interior Walls and Re-Epoxy Interior Masonry Walls	Tier I	$311,660
EEC	Interiors	Replace the Athletic Flooring in the Gym	Tier I	$105,300
EEC	Interiors	Add a Mezzanine Above the Gym's Closet for Added Storage	Tier I	$115,830
EEC	Electrical	Building Wide LED Retrofits	Tier I	$230,580
EEC	Electrical	Replace Faulty Public Address System	Tier I	$94,750
EEC	HVAC	High Efficiency Rooftop VAV Units & Replace Controls System	Tier I	$1,965,560
EEC	HVAC	Infectious Disease Mitigation Measures	Tier I	$98,280
EEC	HVAC	Add Emergency Shutoff in Boiler Room	Tier I	$9,660
EEC	Plumbing	Address DHW Circulation Issues	Tier I	$73,350
EEC	Plumbing	Installed Site Wide Water Softener System	Tier I	$65,840
EEC	Life Safety	Replace Fire Alarm System	Tier I	$175,150
EEC	Security & Access Control	Upgrade Security Camera Servers	Tier I	$5,500
EEC	Security & Access Control	Add Panic Button/Lockdown System Throughout All Classrooms	Tier I	$85,000

EEC	Security & Access Control	Add Door Access via card readers to main exterior doors and interior classroom doors	Tier I	$108,110
EEC	Security & Access Control	Add security window film to all office and classroom windows	Tier I	$26,260
EEC	Addition	Add A Locker Room and Restroom to the Baseball Field	Tier I	$579,150
Ag Shop	Sitework	Repave Parking Lots	Tier I	$62,520
Ag Shop	Building Envelope	Replace Roofs	BEST	$155,937
Ag Shop	Building Envelope	Replace Windows in Classrooms with Operable Windows	Tier I	$39,090
Ag Shop	Building Envelope	Reseal Metal Frame Door/Window Systems	Tier I	$3,870
Ag Shop	Building Envelope	(4) New Roll Up Doors	Tier I	$27,030
Ag Shop	Interiors	Mudjack Entrance Concrete Slab & Resurface Classroom Floor	Tier I	$23,950
Ag Shop	Electrical	Building Wide LED Retrofits	Tier I	$95,070
Ag Shop	Electrical	Replace Faulty Public Address System	Tier I	$48,800
Ag Shop	Electrical	Replace Main Electrical Service & Distribution Equipment	BEST	$95,572
Ag Shop	Electrical	Move Electrical Panels to Back Wall in Welding Room	Tier I	$28,960
Ag Shop	HVAC	Implement Make-Up Air/Exhaust System & Add Cooling to Class	BEST	$521,713
Ag Shop	HVAC	Upgrade Welding Fume Hood/Capture System	BEST	$97,425
Ag Shop	HVAC	Infectious Disease Mitigation Measures	BEST	$3,970
Ag Shop	HVAC	Replace Woodshop Dust Collection System	Tier I	$22,000
Ag Shop	HVAC	New Heating Unit in Paint/Stain Booth	Tier I	$9,660
Ag Shop	HVAC	Replace Woodshop Heater	Tier I	$38,610
Ag Shop	Plumbing	Address DHW Circulation Issues	Tier I	$11,390
Ag Shop	Plumbing	Installed Site Wide Water Softener System	Tier I	$22,050
Ag Shop	Plumbing	Replace Water Heater with High Efficiency Unit	Tier I	$15,280
Ag Shop	Plumbing	Address Drain Freeze Issues at Weightlifting Room's Restroom	Tier I	$19,310
Ag Shop	Life Safety	Replace Fire Alarm System	Tier I	$64,230
Transportation Building	Building Envelope	Seal Around Entire Building	Tier I	$12,550
Transportation Building	Electrical	Building Wide LED Retrofits	Tier I	$74,810
			BEST Total	$10,878,944
			Tier I Total	$17,833,194

Notes: [1] Cost estimates include soft costs such as architectural, engineering and general contracting fees.

Priority Tier II (2-5 Years)

Facility	Component	Recommendation	Priority Tier	Cost Estimate [1]
Parkview	Sitework	Resurface Asphalt Parking	Tier II	$386,100
Parkview	Sitework	Resurface Track- Seal Coat & Paint	Tier II	$64,480
Parkview	Sitework	4' Fence with Gate Behind Basketball Courts	Tier II	$3,380
Parkview	Sitework	Add Four-Square Stripes to Outdoor Basketball Court	Tier II	$1,650
Parkview	Interiors	Resurface The Stairs Stairs	Tier II	$9,660
Parkview	Interiors	All New Case Work Throughout the School	Tier II	$490,550
Parkview	Interiors	Repaint The Lockers and Add Tackboard Above the Lockers	Tier II	$96,530
Parkview	Interiors	Paint All Interiors in Gym Areas	Tier II	$55,510
Parkview	Interiors	(4) Sets Of Expanding Corridor Fence/Barriers to Close Off Access to Portions of The Building	Tier II	$19,310
Parkview	Interiors	Paint Locker Room Lockers	Tier II	$30,890
Parkview	Interiors	New Rubber Bases	Tier II	$101,360
Parkview	Interiors	Replace Library Furniture and Add "Tree Support Beam Reading Area"	Tier II	$48,270
Parkview	Interiors	Replace Framing Where Needed (Art Room)	Tier II	$48,270
Parkview	Electrical	Add Power to Track Building/ Box Behind Goalpost	Tier II	$48,270
Parkview	Electrical	Check All Receptacles and Replace as Needed	Tier II	$154,440
Parkview	Electrical	Add Rope Lights to Main Hallway Skylights	Tier II	$14,480
Parkview	HVAC	Replace Crawl Space Reznor Make Up Air/Unit Heater	Tier II	$38,610
Parkview	Plumbing	Address/Fix the Drainage Issues in The Mechanical Mezzanine Drains	Tier II	$19,310
Parkview	Plumbing	New Wash Station/Sinks in Art Room	Tier II	$9,660
Parkview	Plumbing	Add Water Bottle Refill to All Fountains/ Replace Backing of Current Water Bottle Refill Stations	Tier II	$57,920
Parkview	Special Construction	(2) Wi-Fi Scoreboards with Protective Fence in Main Gym	Tier II	$23,170
Parkview	Special Construction	(2) New Square Glass Backboards in Practice Gym	Tier II	$38,610
Parkview	Special Construction	New PA/Sound System in Main Gym	Tier II	$19,310
Parkview	Security & Access Control	Replace Burglar Alarm System	Tier II	$118,800
Parkview	Addition	Build An Addition for Gym Storage Off the North Wall of The Main Gym	Tier II	$926,640
Jr/Sr High	Sitework	Add Heating Component Beneath Sidewalk/ Cement Replacement at Front of Building	Tier II	$1,476,840
Jr/Sr High	Building Envelope	Masonry Work on Visitors Side of Football Stadium by Transportation Building with Storage Underneath	Tier II	$28,960
Jr/Sr High	Interiors	Improve Kitchen for Cooking and Serving	Tier II	$482,630
Jr/Sr High	Interiors	Remove Shelves in Library, Install Window in Hallway	Tier II	$21,240
Jr/Sr High	Interiors	Charging Station/ Internet Café Inside of Library	Tier II	$62,750
Jr/Sr High	Interiors	Theater – New Stairs and Walkway to Storage	Tier II	$48,270
Jr/Sr High	Interiors	Installation Of New Path Lighting on Theater Stairs	Tier II	$115,830

Jr/Sr High	Interiors	Science Lab: Add Better Layout to Maximize Space/ Seating Capacity (Island in Center)	Tier II	$225,870
Jr/Sr High	Interiors	Science Lab: Flooring	Tier II	$34,750
Jr/Sr High	Interiors	Science Lab: Concrete	Tier II	$7,730
Jr/Sr High	Interiors	Remove All Network Connection Wiring in Two Specific Rooms That Used to Be Computer Lab	Tier II	$3,870
Jr/Sr High	Interiors	Art Shop Facelift (Paint & Floors)	Tier II	$28,960
Jr/Sr High	Interiors	Sensory Room Facelift (Paint & Floors)	Tier II	$14,480
Jr/Sr High	Interiors	Impact-Resistant 2x4 Ceiling Tiles in Locker Rooms	Tier II	$30,890
Jr/Sr High	Interiors	Make All Desks Uniform	Tier II	$210,000
Jr/Sr High	Electrical	Upgrade Football Lighting and New Lighting Control Board	Tier II	$787,650
Jr/Sr High	Security & Access Control	Replace Burglar Alarm System	Tier II	$165,000
EEC	Sitework	Add New Flag Pool	Tier II	$19,310
EEC	Sitework	Replace Chainlink Fence Around Baseball Field	Tier II	$53,090
EEC	Sitework	Add a Gate to the Dirt Road to Restrict Access	Tier II	$2,900
EEC	Sitework	Cleanup Area Under the Baseball Field Bleachers	Tier II	$15,450
EEC	Building Envelope	Refinish/Repaint Exterior Walls	Tier II	$86,880
EEC	Interiors	Replace the Bleachers in the Gym	Tier II	$96,530
EEC	Electrical	Upgrade all Exterior Lighting with LEDs and Add Photocells	Tier II	$19,310
EEC	HVAC	Replaice Damper Actuators	Tier II	$231,660
EEC	HVAC	Flush HHW System, Clean Out and Replace Glycol	Tier II	$38,610
EEC	Plumbing	Upsize the Tub Sink in the Janitor Closet	Tier II	$9,660
EEC	Security & Access Control	Replace Burglar Alarm System	Tier II	$66,000
Ag Shop	Building Envelope	Repaint Exterior	Tier II	$16,500
Ag Shop	Building Envelope	Replace Woodshop Window	Tier II	$35,200
Ag Shop	Building Envelope	Replace Certain Exterior Doors	Tier II	$38,610
Ag Shop	Interiors	Repaint Interiors	Tier II	$38,500
Ag Shop	Interiors	(6) New Workbench Tops	Tier II	$17,380
Ag Shop	Interiors	Open Up Wall Directly Next to Classroom with Big Window	Tier II	$20,850
Ag Shop	Interiors	Demo The Second Wall Past This One Above ^	Tier II	$12,550
Ag Shop	Interiors	Ceiling Tile Replacements	Tier II	$60,820
Ag Shop	Security & Access Control	Replace Burglar Alarm System	Tier II	$18,980
			Tier II Total	$7,469,690

Notes: [1] Cost estimates include soft costs such as architectural, engineering and general contracting fees.

Priority Tier III (5-10 Years)

Facility	Component	Recommendation	Priority Tier	Cost Estimate [1]
Parkview	Sitework	Replace Two Outdoor, Permanent Placement, Bench/Table Sets	Tier III	$38,610
Parkview	Sitework	(4) New Light Poles Higher Than 12'	Tier III	$77,220
Parkview	Sitework	Add New Parking and Drive Lane Through Front Grass Area	Tier III	$361,970
Parkview	Sitework	Add A Wallball Wall to The Basketball Court	Tier III	$3,850
Parkview	Sitework	Move Flagpole to Front Near Road by Black Fence Art	Tier III	$19,310
Parkview	Sitework	Install New Bike Racks	Tier III	$15,450
Parkview	Building Envelope	Replace Panes in Dome Area Above Main Hallway	Tier III	$482,630
Parkview	Interiors	Standardize Classroom Layout	Tier III	$172,300
Parkview	Interiors	Old Computer Room Renovation	Tier III	$96,530
Parkview	Interiors	Paint The Orange Bar Joists and Duct Work in Gym White	Tier III	$90,500
Parkview	Interiors	Standardized Flag Placement in Classrooms	Tier III	$8,690
Parkview	Interiors	Install Motorized Blinds in Both Gyms	Tier III	$96,530
Parkview	Interiors	Kitchen Renovation to A Modern Kitchen Layout/Function	Tier III	$482,630
Parkview	Interiors	Demo Out the Restrooms in The Old Preschool Room to Open Up the Floor Plan	Tier III	$28,960
Parkview	Interiors	Replace Counter in Greenhouse with New Solid Surface Counter	Tier III	$10,860
Parkview	Interiors	Upgrade IT Infrastucture to Include Removal of Old CAT-5 Cable	Tier III	$298,270
Parkview	Interiors	Re-Stain and Touch Up Doors	Tier III	$72,400
Parkview	HVAC	Replace Existing HHW Greenhouse Heater with An Electric Heater	Tier III	$9,660
Parkview	Plumbing	Replace Fixtures in Outdoor Restrooms	Tier III	$14,480
Parkview	Plumbing	Add Water Bottle Refill to Outdoor Fountain	Tier III	$38,610
Parkview	Special Construction	Replace Elevator	Tier III	$86,880
Parkview	Addition	Covered Outdoor Class Area	Tier III	$144,790
Parkview	Addition	Add Seating and Gazebo to Back of Building	Tier III	$96,530
Jr/Sr High	Sitework	Sod and Irrigation Renewal	Tier III	$275,000
Jr/Sr High	Interiors	Standardize Classroom Layouts	Tier III	$260,620
Jr/Sr High	Interiors	Upgrade IT Infrastucture to Include Removal of Old CAT-5 Cable	Tier III	$492,280
Jr/Sr High	Plumbing	New Plumbing Fixtures Throughout	Tier III	$50,200
Jr/Sr High	Special Construction	Replace Elevator	Tier III	$608,110
Jr/Sr High	Addition	Add Gazebos On Both Sides Entrance at Football Field	Tier III	$96,530
EEC	Sitework	Baseball Field and Irrigation Renewal	Tier III	$275,000
EEC	Sitework	Add a Sidewalk, Curb, and Gutter the Full Length School Front	Tier III	$382,240
EEC	Sitework	Add New Front Plaza	Tier III	$308,880
EEC	Sitework	Add Rubber Play Surface in Playground	Tier III	$386,100
EEC	Interiors	Add (4) New Basketball Hoops with Automatic Loweres	Tier III	$69,500
EEC	Interiors	Upgrade IT Infrastucture to Include Removal of Old CAT-5 Cable	Tier III	$109,080
EEC	Electrical	Replace all Electrical Receptacle and Network Wall Plates	Tier III	$57,920
EEC	Plumbing	Replace Fluch Valves on All Fixtures	Tier III	$111,490
Ag Shop	Interiors	Upgrade IT Infrastucture to Include Removal of Old CAT-5 Cable	Tier III	$50,680
Transportation Building	Interiors	Mezzanine	Tier III	$193,050

Transportation Building	Interiors	Drivers Lounge	Tier III	$57,920
Transportation Building	Special Construction	Brush System for Bus Cleaning Bay	Tier III	$231,660
Transportation Building	Special Construction	Blow Dryer for Cleaning Bay	Tier III	$144,790
			Tier III Total	$6,908,710

Notes: [1] Cost estimates include soft costs such as architectural, engineering and general contracting fees.

Cost & Savings Estimate Details

The District is aided by a collective team of engineering and construction management professionals to develop the Facility Maintenance Master Plan, priority project scope recommendations and associated cost estimates detailed in the application and Detailed Project Budget.

This team includes three mechanical engineers (P.E), an electrical engineer (P.E.), and a two professional construction managers as well as additional support staff who are professionally licensed in the State of Colorado. This team is experienced with the development and execution of similar projects, and they understand the construction landscape in the State of Colorado.

Preliminary estimates are derived from the most recently updated R.S. Means construction cost database as well as our team's own historical cost data from recently completed projects. Project scopes are continually refined as additional details and intent are incorporated. Quantities specific to Rangely School District's facilities are derived from numerous in-person site visits, professional field measurements, dimensional and scaled floor plans, and collaborative feedback from the District staff.

The estimates are comprehensive and account for all related costs to complete the work from planning and design through to construction and post-construction services. Line items for each major scope of work included in the BEST Grant application are estimated in collaboration with trade contractors specific to those systems. This includes validation of direct costs for mechanical, electrical, and roofing.

Anticipated cost escalations are factored into the estimate since the project will not be bid by contractors or implemented until 2022, which is based upon the bond timeline and considering rising construction demands in Colorado. Appropriate construction contingency is also added to the project due to the conceptual nature of development to this point. Estimated costs are not based upon final construction documents. Owner's contingency is included for the anticipation of unforeseen change directives in scope. Direct costs are estimated per construction division, and costs for bonds, insurance and general contractor fees are accounted for.

Funding

This district anticipates pursuit of a General Obligation Bond in the amount required to secure Matching Funds for the BEST projects, as well as implementing all remaining Tier I projects identified in pervious sections. At present, the District has fully paid off the bond issue initially undertaken in 2009. There is currently no outstanding bond issue.

Capital Renewal

Annually, this district addresses the facility's capital outlay by collaborating with the administrative team, maintenance personnel, and school board members to best prepare for the upcoming years' capital project needs. As of the 2019-2020 Fiscal Year, approximately $560 per FTE was spent by the district out of the Capital Projects Fund.

The District will include a capital renewal budget estimated at a minimum of $125 per student per year for annual and preventative maintenance of this project's systems and major components. Funds will be set aside to handle the biggest expenses in the future, which, according to ASHRAE and manufacturer data, is the replacement of major equipment in approximately 20-25 years.

With assistance from BEST to complete these major projects, operational funds would be freed up to serve as the primary source for capital renewal and proactive maintenance. We would no longer need to spend limited funds on the upkeep of obsolete systems and equipment, but instead, we would be able to effectively budget and maintain building systems and infrastructure as intended.

Preventative Maintenance Plan

The district's annual expenditures reactive capital costs on the specific systems planned for replacement exceed and average $40,000 per year. Once these major systems are replaced, current budgeted funds will be reallocated into a meticulous Preventative Maintenance Plan. A detailed outline of these anticipated preventative maintenance costs has been provided as a supplementary document with this application.

In summary, we will commit to reallocating an estimated $12,000 towards the proactive upkeep of major systems, including regular seasonal servicing and inspections, filter replacement, and cleaning, and will build additional cash reserves for unexpected repair such as parts replacement after warranties expire.

Additional annual net operational savings are expected as a result of our current and future O&M costs, and these funds will remain in the district's operations and maintenance budget, and be allocated to additional proactive measures, deferred maintenance, and increased support for the Rangely School District Maintenance Staff.

XIV. Conclusion

2020-21 School Board

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Mechanical & Plumbing Engineering

Electrical Engineering

Civil Engineering

Construction Services

Cost Estimating

Master Planning