Technical Site Study Assessment

Draft Progress Report
September 27, 2019

Cora Kelly Elementary School
3600 Commonwealth Ave.

George Mason Elementary School
2601 Cameron Mills Rd.

Alexandria City School Board dba Alexandria City Public Schools (ACPS)
1340 Braddock Place, Suite 620

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Introduction and Executive Summary

Site and Zoning Cora Kelly

Cora Kelly Zoning Review

Address	3600 Commonwealth Ave	
Tax Map	15.02	7.04
Zoning	RB	POS
Lot Size	197,673	1,953,958
Current SF	69,516	
FAR	0.75	
Allowed SF	148,255	
Setbacks	Front- 20'	
	Side- 25', 1:1 ratio	
	Rear- 25', 1:1 ratio	
Max Height	45'	
Parking	~36 reqd, ~72 exst	

Notes:

Existing school and modular classrooms encroach on POS parcel

FAR is maxed out for RB parcel only, school used POS lot to build modular classroom addition in 2010.

Introduction and Executive Summary

Site and Zoning George Mason

George Mason Zoning Review

Address	2601 Cameron Mills Road
Tax Map	23.04
Zoning	R8
Lot Size	407,290
Current SF	50,935
FAR	0.35
Allowed SF	142,552
Setbacks	Front- 30'
	Side- 25', 1:1 ratio
	Rear- 25', 1:1 ratio
Max Height	40'
Parking	~27 reqd, ~28 exst

Notes:

Introduction

The Department of Curriculum and Instruction is responsible for ACPS 2020 Goal 1: Academic Excellence and Educational Equity. ACPS strives for an inclusive culture which allows every student to grow academically, socially, and culturally. Supporting these goals and qualities not only require a curriculum which practices these objectives, but buildings and spaces that can support an environment of learning and growth. Alexandria is experiencing a population growth which subsequently affects student enrollment capacities and building occupancy capacities. Furthermore, the increase of student enrollment and the lack of space to support such growth directly hinders the ideal learning environment which is firmly established in the ACPS curriculum.

This executive summary and following assessments exhibit the current infrastructural quality of Cora Kelly and George Mason Elementary School. Studio 27 Architecture established 4 key topics that holistically convey the spatial and functional qualities of the schools. The four topics Include:

- **Educational Specifications in relation to Capacity, Program, and Adjacencies.**
- Building Assessments **in relation to Safety and Security, Accessibility, Building Systems, and Envelope**
- Site Assessments **in relation to Site Access and Circulation, Utilities, and Play Spaces,**
- Life Cycle Costs **in relation to Operational and Maintenance costs.**

Educational Specifications Capacity and Program

In the 2019-2020 school year (SY), Cora Kelly enrolled 394 students (Cora Kelly actual building capacity is 429 students) while George Mason enrolled 460 Students (George Mason actual building capacity is 368 Students). Current ACPS student per classroom capacities range between 20-26 students per classroom, which fall within Virginia Facility Guidelines but are slightly higher than the ACPS Educational Specifications which ranges between 18-25 students per classroom.

Programmatically both schools exhibit an over all deficiency both in gross building area (GBA) and net programmatic area (NPA). Cora Kelly **has an overall GBA deficiency of 19,190 square feet (19.98% deficiency) and an NPA deficiency of 15,440 square feet (17.40% deficiency) ; George Mason has an overall GBA deficiency 35,155 square feet (36.61% deficiency) and an NPA deficiency of 31,395 square feet (35.37% deficiency).** **A more detailed analysis which presents all capacities can be found on Tables 1 – 8.**

Educational Specifications Adjacencies

The Cora Kelly (Figure 1a) academic wings are very remote from the shared spaces like the cafeteria, gym, and library. To get between these two sides of the school many students must take a long, circuitous route. These larger gathering spaces should be in a more central location to facilitate class transitions. The admin. program is adjacent to noisy, high traffic areas, when it would be better served distributed throughout more quiet wings of the school. Another item of concern is the lack of a private service/delivery access point. The service/delivery circulation crosses paths with the recreation center traffic and is visible from the rec center main entry.

George Mason Elementary (Figure 1b) has a more central cafeteria however the multi-purpose room is located such that students have to travel through quieter academic wings to get there. Students must also travel through the multi-purpose room to reach the outdoor play areas which is not ideal if the multi-purpose room is already in use. George Mason also lacks a separate service/delivery access point. Service traffic currently crosses paths with staff parking and is visible from adjacent homes.

Building Assessments Safety and Security

The categories of largest concern for Cora Kelly Elementary are Building Layout (See Tables 9 & 10), Building Materials and Visitor Management. Interior circulation paths are long and illogical, with poor sight lines along corridors and from staff spaces for passive surveillance. Interior finishes were adequate when installed but are now in poor condition. Building entrances are lacking a walk off mat or non-slip surface. The security item of most concern at Cora Kelly is the lack of a secured entry vestibule and security desk with clear sightlines of the approach to the school.

The categories of largest concern for George Mason Elementary are Building Layout, Building Materials, Visitor Management, and Vehicular and Pedestrian Traffic. Interior circulation paths have many blind spots.

Staff spaces are isolated to the front entrance and do not have views of major circulation paths. Interior finishes were adequate when installed but are now in poor condition. While the school has a very small entrance vestibule, there is no security desk and sightlines are very restricted from the entrance lobby. The security item of most concern at George Mason is the Vehicular and Pedestrian traffic on site. It is very dangerous for all drop off to occur along public roads. Bus and car drop off should occur in individual designated lanes separate from public roads and pedestrian traffic should not cross these lanes if possible.

Building Assessments Accessibility

The highest priority item of concern for Cora Kelly Elementary School is that the school does not have an elevator. The second story of the building contains areas of primary function to the school curriculum that students in wheelchairs can not currently access.

Studio27 also observed many plumbing fixtures and facilities at Cora Kelly that are not ADA accessible. This includes water fountains in the corridors, sinks in classrooms, and bathroom in classrooms. The majority of the Library is not accessible because of the sunken 'pit' design of the central area.

George Mason has similar accessibility deficiencies. Water fountains, classroom sinks, and bathroom facilities are not up to current standards. The majority of entrances do not have ramps and mot exterior stair railings are not ADA or code compliant (GM-4, GM-5). Also, most play areas are not connected to accessible paths, and no accessible play equipment was observed.

Building Assessments Building Systems

Cora Kelly

In a replacement scenario it is not recommended to repurpose any RTU units.

The ventilators are in fair to poor condition. It is recommended to plan on replacement of roof exhaust ventilators.

It is not anticipated that any existing mechanical infrastructure in renovated areas will be utilized for future use.

Recommend replace all building original piping with new.

Domestic water piping that was observed appeared to be original which is 60+ years old and past its rated useful life. Recommend replace all building original piping with new.

Most of the Panel boards appear to be antiquated and original to the building and it is recommended that they and their associated feeders be replaced.

The fluorescent lighting is estimated to be near or past its rated useful life, in addition is very inefficient as compared to current LED lighting solutions. Recommend replacement with new LED light fixtures. This will assist with energy efficiency and help lower electric utility costs.

Wiring that is existing to building is estimated to be approximately 63 years old. The useful life expectancy for wiring is 50 years. It is recommended that all wiring that is original to the facility be replaced with new.

Devices throughout the facility are past their useful life. Recommend complete replacement of FA devices and antiquated system components.

The existing building is not fully sprinklered. Recommend extension and/or expansion of the fire suppression system to cover the entire building.

Generally the structure of the building is in good working condition with only minor deficiencies observed. The building envelope and exterior wall system has age related deterioration and these issues will continue to progress and require periodic maintenance. The gypsum roof system used in the original building construction is susceptible to degradation if exposed to water. Water damage to the roof was not observed in the survey, but it is possible that this type of damage has occurred and is hidden from view. To identify and locate damage of this type the roofing would need to be removed and the gypsum deck inspected.

George Mason

In a replacement scenario it is not recommended to repurpose any DX Split System units.

It is recommended that all Fan Coil Units be replaced.

The boilers appear to be approximately 15 years old. Expect to replace in the next 3-5 years.

It is not anticipated that any existing mechanical infrastructure in renovated areas will be utilized for future use.

Recommend replace all building original piping with new

Domestic water piping that was observed appeared to be original which is 60+ years old and past its rated useful life. Recommend replace all building original piping with new. In addition it is recommended to relocate the service entrance to an area where it can be serviced. A check valve was not observed

Many of the Panel boards appear to be antiquated and original to the building and it is recommended that they along with their feeders be replaced.

The fluorescent lighting is estimated to be near or past its rated useful life, in addition is very inefficient as compared to current LED lighting solutions. Recommend replacement with new LED light fixtures. This will assist with energy efficiency and help lower electric utility costs.

Recommend complete replacement of FA devices and antiquated system components; the building is not equipped with a fire suppression system, which is a critical life safety measure.

Generally the structure of the building is in good working condition with only minor deficiencies observed. The gypsum roof system used in the original building construction is susceptible to degradation if exposed to water. The roof leaks described by the building staff are likely related to holes in the membrane caused by tarping the roof. Water damage to the roof was not observed in the survey, but it seems probable that some damage has occurred and is hidden from view. To identify and locate any damage, the roofing would need to be removed and the gypsum deck inspected. The exterior masonry walls of the building have age related deterioration. This deterioration will continue to progress and require periodic maintenance.

Building Assessments Envelope

The largest concern for Cora Kelly is the continued maintenance of the masonry, EIFS system, entrances and envelope penetrations. There is visible masonry cracking at multiple locations, and damage to the EIFS system. Exterior grilles are in poor condition and stains on the brick below window sills. Water appears to pool where the play surface meets the exterior brick. Most entrance doors are in poor condition with visible rust and large undercuts allowing unwanted thermal transfer between the interior and exterior.

Due to the sprawling nature of Cora Kelly's plan the envelope is much larger in surface area than it needs to be for a new school with the same interior square footage. This larger form factor has a big impact on the energy use, and consequently higher operations costs.

The Cora Kelly envelope is in fair condition. All windows in the school are thermal and in good condition, and the school is in the process of receiving a new roof.

The George Mason envelope is in poor condition. The two areas of largest concern are the windows and roof. School leaders reported concerns with the condition of the windows. Windows have been replaced in different areas of the building at different times, and there are unique issues related to each type. Older wood windows are water damaged and have non-thermal single pane glass. The newer replacement windows are very poor quality, leak, and do not lock.

School leaders also reported that the roof leaks often, and S27 observed that there is visible ponding at drain locations Other issues to note are visible cracks in the masonry, Exterior entrances are in poor condition with visible rust and flaking paint, as well as large undercuts that allow unwanted thermal transfer. Floor slab and exterior settlement cracking can be seen from the interior of the building at the main entrance and in classrooms.

Like Cora Kelly, George Mason also has a very high form factor, which has a negative impact on building energy efficiency and use.

Site Assessments Access and Circulation

he main issue with site circulation at Cora Kelly is the overlap of bus, parent car, and staff car circulation paths. Ideally these 3 types of circulation would all be separate from each other. It is a safety concern having children cross car drive paths and parking spaces on their route from the

bus to the school.

George Mason has critical site concerns relating to parking capacity and site circulation. Currently only 25 parking spaces are provided on site. Currently the school staff has an agreement with the church next door that lets them use spaces in their lot to be a self-sufficient site. The school would need to add 49 spaces to reach adequate parking capacity.

The item of larger concern is the lack of a drop off lane on the George Mason site. Currently cars and buses drop off and pick up students along Cameron Mills Road. This is a major safety concern. Pedestrian fatalities (while loading and unloading school buses) account for approximately three times as many school bus-related fatalities, when compared to school bus occupant fatalities. Having a dedicated and protected bus loading/unloading zone on a school site decreases this risk.

Site Assessments Utilities

Studio 27 is waiting to receive up to date property surveys for both Cora Kelly Elementary School and George Mason Elementary School. Until then we can not accurately evaluate the locations and capacities of the sites utilities and infrastructure.

Site Assessments Play Space

Due to the configuration and siting of George Mason and the abrupt adjacency to George Mason Park to the East, play space is heavily deficient. George Mason averages around 34,000 square feet of play area making it 49,600 square feet deficient.

The adjacencies between play equipment are tighter than the recommend spacing and zoning per the Ed specs. In order to achieve proper adjacencies, clearly zoned and defined boundaries between age groups are recommend.

Cora Kelly is heavily deficient compared to the Ed Spec recommend play space area. Cora Kelly currently has 28,970 square feet of play space, which is 54,670 sf deficient of the recommend play space area.
The current play equipment is in acceptable condition, but are limited in quantity, variety, and placement per the Ed Spec requirements.

Cora Kelly sits on two property, sharing its building and lot lines with a recreation center to the West and Four Mile Run Park to the North East. In addition to zoning constraints, the siting and form of the building limits its expanse of open space.

Life Cycle Cost Maintenance

The Life Cycle Cost analysis will be created once the Masterplan options have been established. Comparison of costs will be established for complete new construction compared to substantial renovations and additions.

Educational Specifications Adjacencies

The “ideal” adjacency diagram (Figure 1) illustrates relevant adjacencies for the typical elementary school model. The rooms and spaces illustrated in this educational specification compose a number of program “clusters”. The school as a whole is a collection of these “clusters” organized according to adjacencies required to best support the educational mission of ACPS.

Academic clusters are located in the quiet areas of the building that can be isolated during off-hours. Noisier and shared programmatic clusters are grouped toward parking, public and play areas and allow for after-hours access. A single main entry is a specific determination of ACPS’s security plan and that entrance is supported by administration and family welcome center functions. Informal “break- out” or Extended Learning Areas happen throughout the building along with opportunities for distributed dining areas. Studio27 Architecture compared simplified adjacency diagrams of Cora Kelly and George Mason elementary to the “ideal” organization in the following pages.

Assessment

The Cora Kelly (Figure 1a) academic wings are very remote from the shared spaces like the cafeteria, gym, and library. To get between these two sides of the school many students must take a long, circuitous route. These larger gathering spaces should be in a more central location to facilitate class transitions. The admin. program is adjacent to noisy, high traffic areas, when it would be better served distributed throughout more quiet wings of the school. Another item of concern is the lack of a private service/delivery access point. The service/delivery circulation crosses paths with the recreation center traffic and is visible from the rec center main entry.

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Both schools are lacking extended learning area spaces, which is further addressed in the “Program” section of the report.

Figure 1 Ideal Adjacency

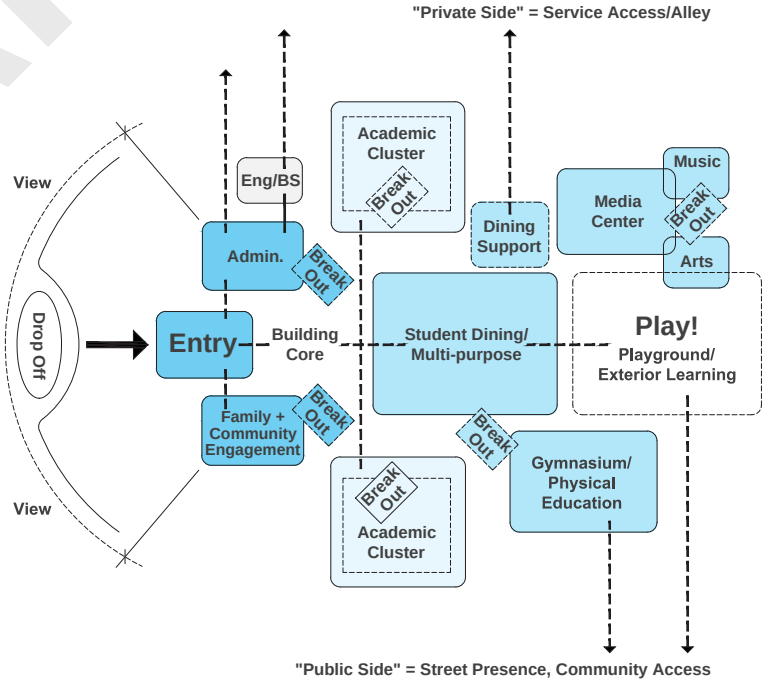


Figure 1 Ideal Adjacency

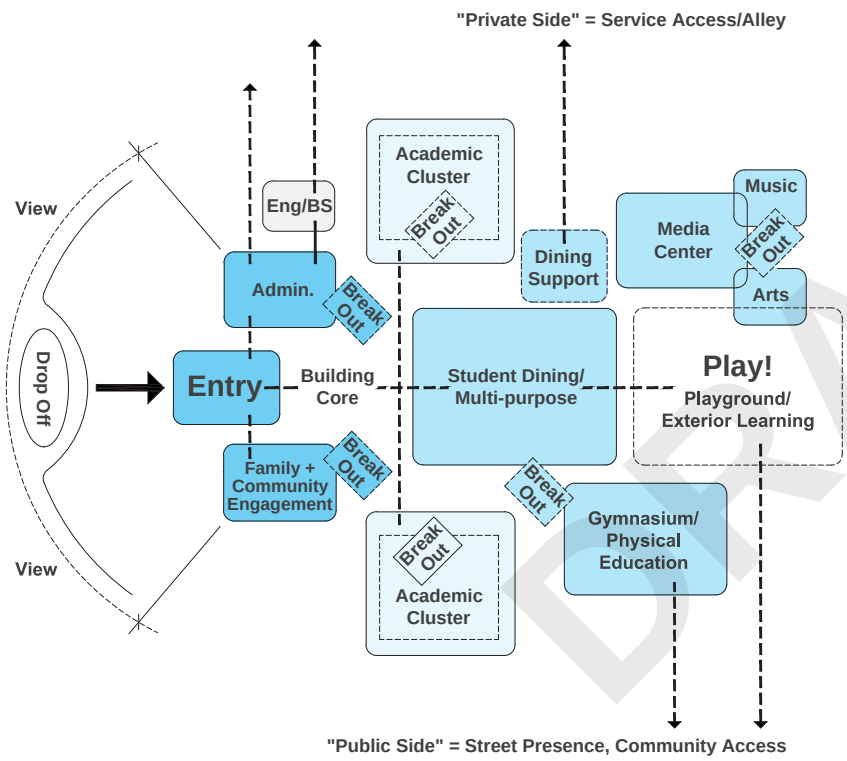


Figure 1a Cora Kelly Adjacency

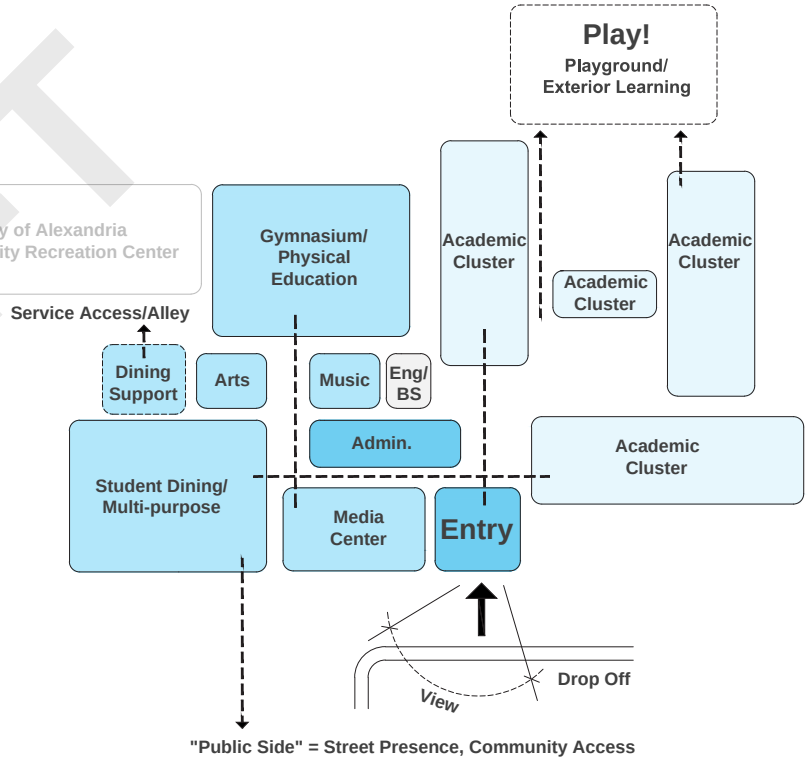


Figure 1 Ideal Adjacency

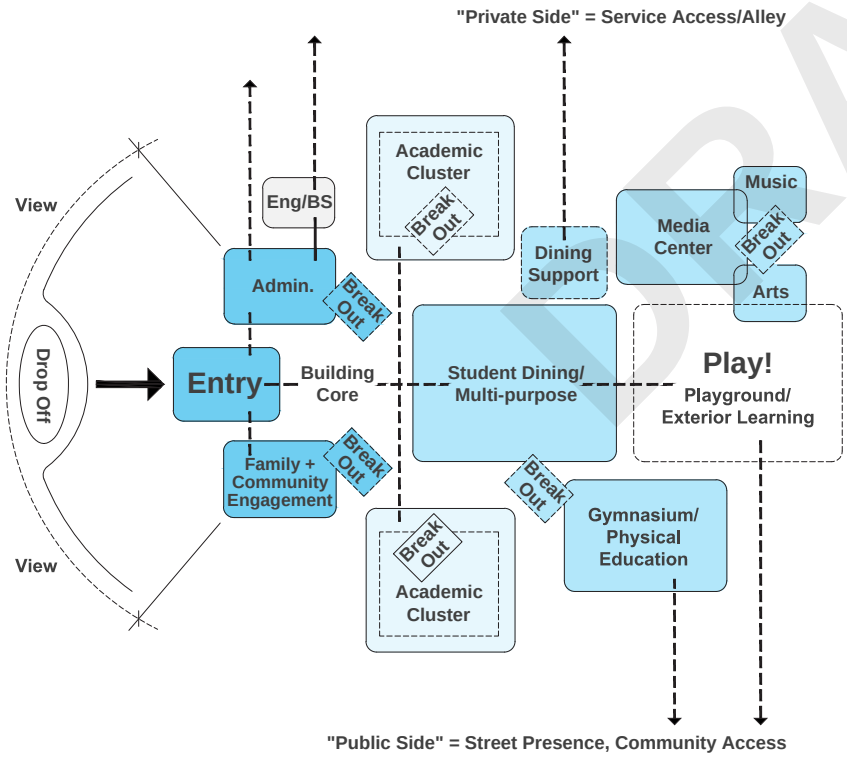
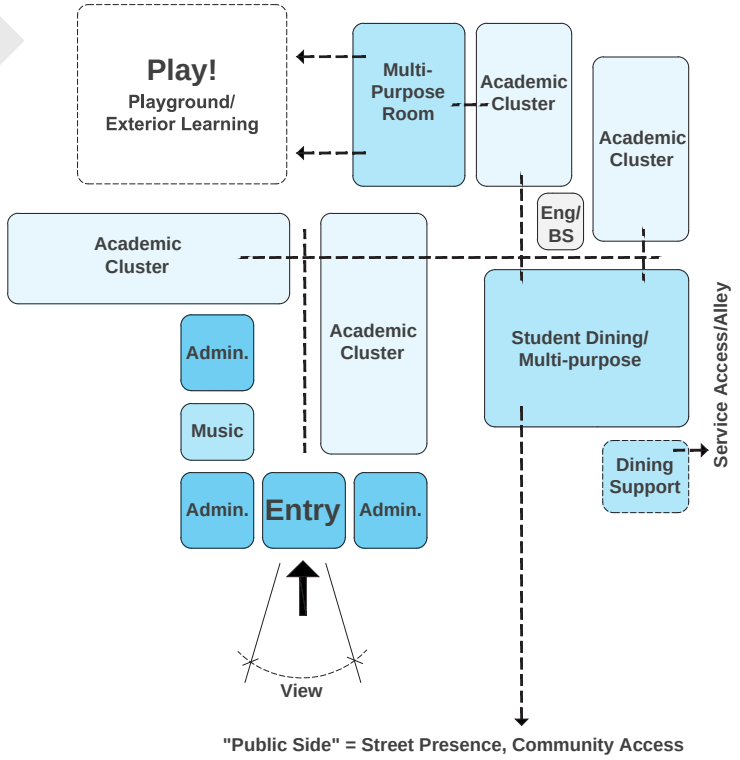


Figure 1b George Mason Adjacency



Educational Specifications Capacity and Program

The desire to teach whenever and wherever drives the need for future facilities to implement a spatial organization that provides both formal and informal learning spaces and maximizes collaboration and interaction between students and faculty.

Every school project begins with establishing the number of students that will be served when the project is complete or the 'capacity'. Capacity is the primary driver in determining the number, type, and size of the spaces in the new or modernized building. Nationally, the average school size is 600 (540 in Virginia) with smaller schools in urban cores. Simply defined, school capacity is a product of the number of classrooms at a school and the student stations assigned to each room type. For elementary schools, small instructional spaces and specialized labs including art, music, or resource are not part of the capacity calculation.

Studio 27 Architecture assessed the capacity in relation to student count, programmatic spaces (i.e. academic, shared, administrative, and support spaces), and the feasibility of accommodating the capacity and program within the existing structure. The ACPS Educational Specifications were used as a reference model for capacities, quantities, and square footage areas of a 600 student elementary school.

Assessment

In the 2019-2020 school year (SY), Cora Kelly enrolled 394 students (Cora Kelly actual building capacity is 429 students) while George Mason enrolled 460 Students (George Mason actual building capacity is 368 Students). Current ACPS student per classroom capacities range between 20-26 students per classroom, which fall within Virginia Facility Guidelines but are slightly higher than the ACPS Educational Specifications which ranges between 18-25 students per classroom.

Spatially both schools exhibit an over all deficiency both in gross building area (GBA) and net programmatic area (NPA). Cora Kelly has an over-**all GBA deficiency of 19,190 square feet (19.98% deficiency) and an NPA deficiency of 15,440 square feet (17.40% deficiency) ; George Mason has an overall GBA deficiency 35,155 square feet (36.61% deficiency) and an NPA deficiency of 31,395 square feet (35.37% deficiency).** A more detailed analysis which presents all capacities can be found on Tables 1 – 8.

Programmatically each school exhibits a deficiency in instructional spaces, Cora Kelly has a 5,725 square foot deficiency (15.17%) in core academic spaces (Tables 1 & 5); George Mason has a 15,000 square foot deficiency (39.80%) of Core Academic space. It is important to note that Cora Kelly provide additional core academic classes that are not part of the Ed Specs. Both schools exhibit substantial deficiencies in Visual arts and Media (Tables 2 & 6) and George Mason exhibits substantial deficiency in its physical education spaces. Cora Kelly currently shares its gym with the neighboring recreation center.

In the next phase Studio 27 Architecture will present master plan options of how to accommodate the deficiency of program. This current assessment not only focuses on capacities as a catalyst for the master plan, but on other crucial elements such as site, existing building systems, and costs, which will further convey the wholistic challenge of an increased student population and further clarify the pros and cons of a substantial renovation and addition versus demolition and new construction.

Educational Specifications Capacity and Program

Cora Kelly Capacity and Program Core Academic

Table 1

		Cora Kelly Existing Program			Ed Spec 600 Student Model		
Use	**Program Space**	**# of spaces**	**Avg SF / Room**	**Total SF**	**# of Spaces**	**SF / Room**	**Total SF**
Core Academic	Pre-K	1		830	*4*	*1,175*	*4,700*
	Kindergarten	3	1,062	3,185	*4*	*1,175*	*4,700*
	K-2	1		965			
	1st Grade	3	773	2,320	*4*	*900*	*3,600*
	2nd Grade	3	715	2,145	*4*	*900*	*3,600*
	3rd Grade	3	800	2,400	*4*	*900*	*3,600*
	4th Grade	3	710	2,130	*4*	*900*	*3,600*
	5th Grade	3	778	2,335	*4*	*900*	*3,600*
	Extended Learning Area	2	775	1,550	*5*	*600*	*3,000*
	Classroom Bathroom						
	Special Ed	2	775	1,550	*3*	*250*	*750*
	Resource Classroom (Other)				*2*	*250*	*500*
	TAG	1	800	800	*1*	*900*	*900*
	Student Project Storage				*1*	*150*	*150*
	Headstart	2	873	1,745			
	Citywide ED Program	4	733	2,930			
	STEM Specialist	1		1,255			
	Math Specialist	1		710			
	Reading Specialist	1		770			
	Sensory Room	1		275			
	Misc. Pullout	1		160			
	ELL	4	713	2,850			
	Student Services				*4*	*100*	*400*
	Psychologist	1		215			
	Counselor	1		340			
	Speech Language Provider (SLP)	1		255			
	Occupational Therapist (OT)	1		310	*1*	*400*	*400*
	Storage				*4*	*200*	*800*
	Teacher Collab Room				*5*	*250*	*1,250*
	Early Childhood Learning				*1*	*2,000*	*2,000*
	Early Childhood Storage				*1*	*200*	*200*
	Total			**32,025**			***37,750***

***5,725* SF Deficiency** **15.17% Deficiency**

Educational Specifications Capacity and Program

Cora Kelly Capacity and Program Shared

Table 2

Use	Program Space	Cora Kelly Existing Program # of spaces	Avg SF / Room	Total SF	Ed Spec 600 Student Model # of Spaces	SF / Room	Total SF				
Visual Art / Music / Science	Art Lab	1		805	*1*	*1,200*	*1,200*				
	Kiln Room				*1*	*75*	*75*				
	Art Storage	1		300							
	General Music Room				*1*	*1,200*	*1,200*				
	Instrumental Music Room				*1*	*1,000*	*1,000*				
	General Music Storage				*1*	*150*	*150*				
	Instrument Storage				*1*	*250*	*250*				
	Orchestra/Music	1		870							
	Total			**1,975**			***3,875***	***1,900***	***SF Deficiency***	***49.03%***	***Deficiency***
Media Center / Library	Reading / Learning / Circulation	1		4,375	*1*	*3,000*	*3,000*				
	Technical Processing Room				*1*	*200*	*200*				
	Combined Office / Workroom				*1*	*200*	*200*				
	Device / Changing Room				*1*	*150*	*150*				
	Storage				*1*	*200*	*200*				
	Small Group Room				*2*	*150*	*300*				
	Computer Lab	1		755							
	Total			**5,130**			***4,050***	***-1,080***	***SF (Excess)***	***-26.67%***	***(Increase)***
Physical Education	Gymnasium	1		9,265	*1*	*6,500*	*6,500*				
	PE Office				*2*	*150*	*300*				
	PE Storage				*2*	*250*	*500*				
	Multi-Purpose	-		-	*1*	*1,500*	*1,500*				
	Total			**9,265**			***8,800***	***-465***	***SF (Excess)***	***-5.28%***	***(Increase)***
Student Dining and Food Services	Student Dining Area	1		3,725	*1*	*3,000*	*3,000*				
	Chair and Table Storage				*1*	*350*	*350*				
	Serving Area				*1*	*700*	*700*				
	Kitchen Suite	1		1,655	*1*	*2,150*	*2,150*				
	Stage with Storage				*1*	*1,100*	*1,100*				
	Total			**5,380**			***7,300***	***1,920***	***SF Deficiency***	***26.30%***	***Deficiency***

Educational Specifications Capacity and Program

Cora Kelly Capacity and Program Admin and Support

Table 3

		Cora Kelly Existing Program			Ed Spec 600 Student Model					
Use	**Program Space**	**# of spaces**	**Avg SF / Room**	**Total SF**	**# of Spaces**	**SF / Room**	**Total SF**			
Administration	**Lobby**	1		565	*1*	*700*	*700*			
	Welcome Center	1		390	*1*	*450*	*450*			
	Conference Room	1		230	*1*	*250*	*250*			
	Principals Office	1		220	*1*	*180*	*180*			
	Asst. Principals Office				*1*	*150*	*150*			
	Misc. Office	1		270						
	Administrators' Workroom	2		370	*1*	*200*	*200*			
	Teacher Lounge	1		450						
	Mail Room				*1*	*125*	*125*			
	Records Room				*1*	*150*	*150*			
	Family and Community Engagement				*1*	*470*	*470*			
	Staff Toilet				*1*	*50*	*50*			
	Student Services Office				*2*	*150*	*300*			
	Student Services Conference				*1*	*200*	*200*			
	Health Suite	1		650	*1*	*900*	*900*			
	Child and Family Network	1		710						
	Data/Instructional Coach	1		235						
	After School Storage				*1*	*250*	*250*			
	Total			**4,090**			***4,375***	***285***	***SF Deficiency***	***6.51%***	***Deficiency***
Maint./ Custodial Services	**Total**			**60**			*850*	***790***	***SF Deficiency***	***92.94%***	***Deficiency***
Building Services and Restrooms	Corridors			12,625			*13,400*				
	Other Services and Restrooms			2,760			*8,600*				
	Total			**15,385**			***22,000***	***6,615***	***SF Deficiency***	***30.07%***	***Deficiency***

Educational Specifications Capacity and Program

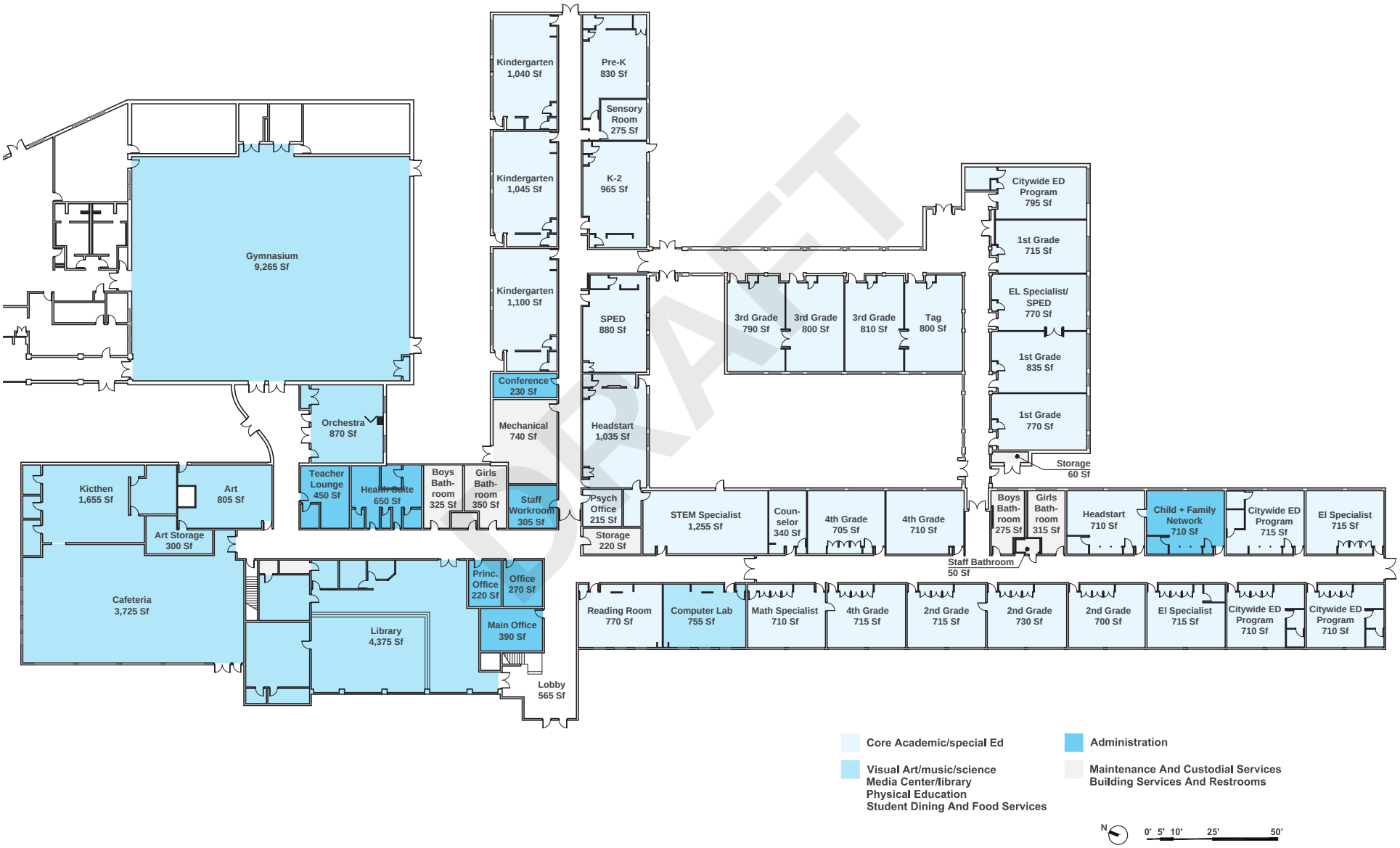
Cora Kelly Capacity and Program NPA and GBA

Table 4

	Cora Kelly Existing Program				Ed Spec 600 Student Model						
	Use	Program Space	# of spaces	Avg SF / Room	Total SF	# of Spaces	SF / Room	Total SF			
Total Net Area (sf)					73,310			*88,750*	***15,440***	***SF Deficiency***	***17.40%***	***Deficiency***
Total Gross Bldg. Area (sf)					76,840			*96,030*	***19,190***	***SF Deficiency***	***19.98%***	***Deficiency***

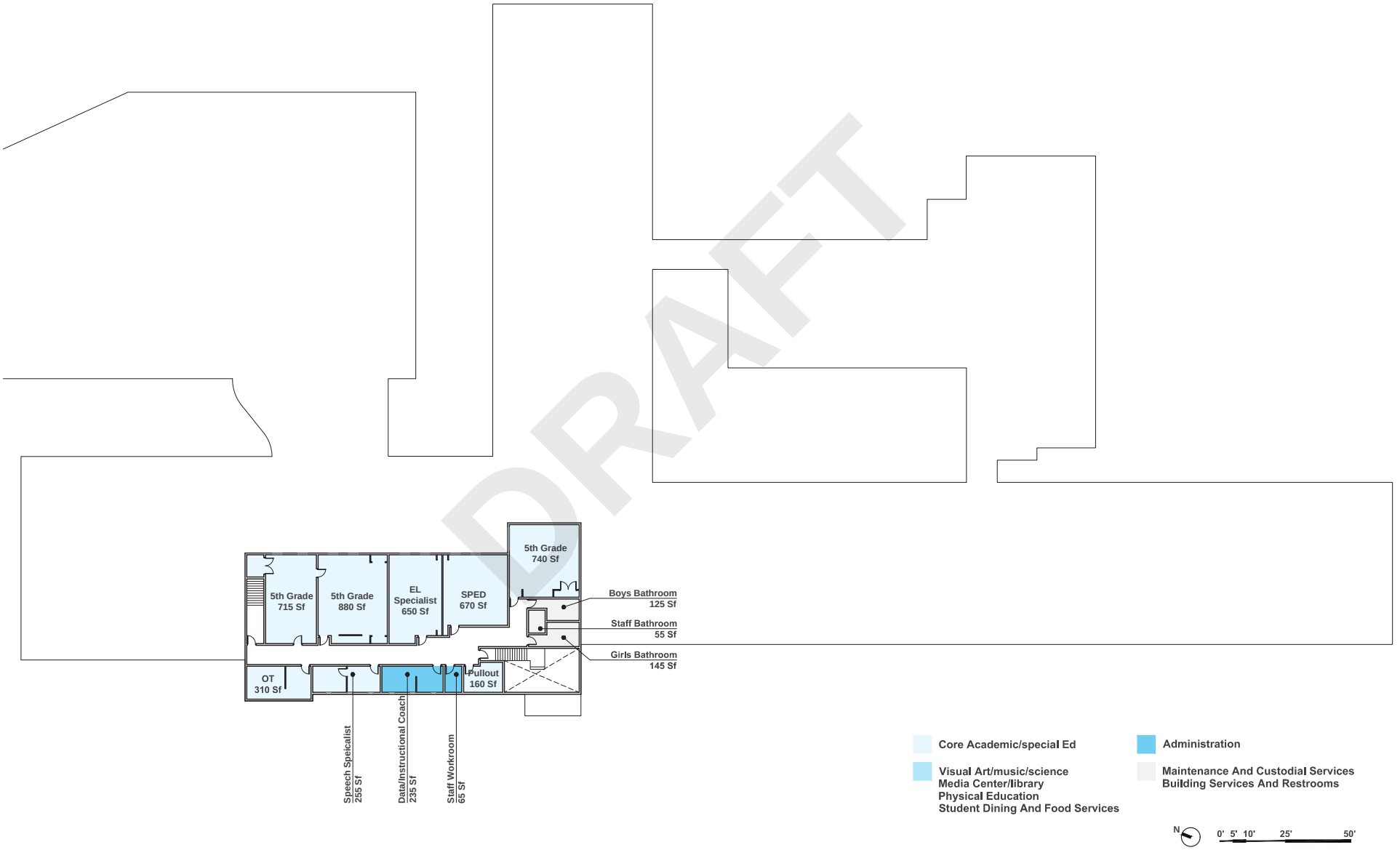
Educational Specifications Capacity and Program

Cora Kelly Capacity and Program Existing 1st Floor plan



Educational Specifications Capacity and Program

Cora Kelly Capacity and Program Existing 2nd Floor plan



Educational Specifications Capacity and Program

George Mason Capacity and Program Core Academic

Table 5

		George Mason Existing Program			Ed Spec 600 Student Model		
Use	**Program Space**	**# of spaces**	**Avg SF / Room**	**Total SF**	**# of Spaces**	**SF / Room**	**Total SF**
Core Academic	Pre-K				*4*	*1,175*	*4,700*
	Kindergarten	4	983	3,930	*4*	*1,175*	*4,700*
	K2						
	1st Grade	4	881	3,525	*4*	*900*	*3,600*
	2nd Grade	4	710	2,840	*4*	*900*	*3,600*
	3rd Grade	4	795	3,180	*4*	*900*	*3,600*
	4th Grade	4	715	2,860	*4*	*900*	*3,600*
	4th+5th Grade	1	715	715			
	5th Grade	3	715	2,145	*4*	*900*	*3,600*
	Extended Learning Area				*5*	*600*	*3,000*
	Classroom Bathroom						
	Special Ed	1	350	350	*3*	*250*	*750*
	Resource Classroom (Other)				*2*	*250*	*500*
	TAG	1	715	715	*1*	*900*	*900*
	Student Project Storage						*150*
	Reading Specialist	5	316	1,580			
	ELL						
	Student Services	1	275	275	*4*	*100*	*400*
	Counselor	1	340	340			
	Speech Language Provider (SLP)	1	270	270			
	Occupational Therapist (OT)				*1*	*400*	*400*
	Storage				*4*	*200*	*800*
	Teacher Collab Room				*5*	*250*	*1,250*
	Early Childhood Learning				*1*	*2,000*	*2,000*
	Early Childhood Storage				*1*	*200*	*200*
	Total			**22,725**			***37,750***

***15,025* SF Deficiency** **39.80% Deficiency**

Educational Specifications Capacity and Program

George Mason Capacity and Program Shared

Table 6

		Cora Kelly Existing Program			Ed Spec 600 Student Model				
Use	**Program Space**	**# of spaces**	**Avg SF / Room**	**Total SF**	**# of Spaces**	**SF / Room**	**Total SF**		
Visual Art / Music / Science	Art Lab	1	775	775	*1*	*1,200*	*1,200*		
	Kiln Room				*1*	*75*	*75*		
	General Music Room				*1*	*1,200*	*1,200*		
	Instrumental Music Room				*1*	*1,000*	*1,000*		
	General Music Storage				*1*	*150*	*150*		
	Instrument Storage				*1*	*250*	*250*		
	Orchestra/Music	3	varies	2,190					
	Total			**2,965**			***3,875***	***910* SF Deficiency**	***23.48%* Deficiency**
Media Center / Library	Reading / Learning / Circulation	1	2,925	2,925	*1*	*3,000*	*3,000*		
	Technical Processing Room				*1*	*200*	*200*		
	Combined Office / Workroom				*1*	*200*	*200*		
	Device / Changing Room				*1*	*150*	*150*		
	Storage				*1*	*200*	*200*		
	Small Group Room				*2*	*150*	*300*		
	Total			**2,925**			***4,050***	***1,125* SF Deficiency**	***27.78%* Deficiency**
Physical Education	Gymnasium				*1*	*6,500*	*6,500*		
	PE Office				*2*	*150*	*300*		
	PE Storage				*2*	*250*	*500*		
	Multipurpose	1	4,760	4,760	*1*	*1,500*	*1,500*		
	Total			**4,760**			*8,800*	***4,040* SF Deficiency**	***45.91%* Deficiency**
Student Dining and Food Services	Student Dining Area	1	5,355	5,355	*1*	*3,000*	*3,000*		
	Chair and Table Storage				*1*	*350*	*350*		
	Serving Area				*1*	*700*	*700*		
	Kitchen Suite	1	2,600	2,600	*1*	*2,150*	*2,150*		
	Stage with Storage				*1*	*1,100*	*1,100*		
	Total			**7,955**			***7,300***	***-655* SF (Excess)**	***-8.97%* (Increase)**

Educational Specifications Capacity and Program

George Mason Capacity and Program Administration and Support

Table 7

Use	Program Space	Cora Kelly Existing Program # of spaces	Cora Kelly Existing Program Avg SF / Room	Cora Kelly Existing Program Total SF	Ed Spec 600 Student Model # of Spaces	Ed Spec 600 Student Model SF / Room	Ed Spec 600 Student Model Total SF		
Administration	**Lobby**	1	355	355	*1*	*700*	*700*		
	Welcome Center	2	varies	1,005	*1*	*450*	*450*		
	Conference Room	1	425	425	*1*	*250*	*250*		
	Principals Office				*1*	*180*	*180*		
	Asst. Principals Office				*1*	*150*	*150*		
	Misc. Office	2	190	380					
	Administrators' Workroom	1	150	150	*1*	*200*	*200*		
	Teacher Lounge	1	550	550					
	Mail Room				*1*	*125*	*125*		
	Records Room				*1*	*150*	*150*		
	Family and Community Engagement				*1*	*470*	*470*		
	Staff Toilet				*1*	*50*	*50*		
	Student Services Office				*2*	*150*	*300*		
	Student Services Conference				*1*	*200*	*200*		
	Health Suite	1	305	305	*1*	*900*	*900*		
	Child and Family Network								
	After School Storage				*1*	*250*	*250*		
	Total			**3,170**			***4,375***	***1,205* SF Deficiency**	***27.54%* Deficiency**
Maint./ Custodial Services	**Total**			**120**			***850***	***730* SF Deficiency**	***85.88%* Deficiency**
Building Services and Restrooms	Corridors			7,870			*13,400*		
	Other Services and Restrooms			4,865			*8,600*		
	Total			**12,735**			***22,000***	***9,265* SF Deficiency**	***42.11%* Deficiency**

Educational Specifications Capacity and Program

George Mason Capacity and Program NPA and GBA

Table 8

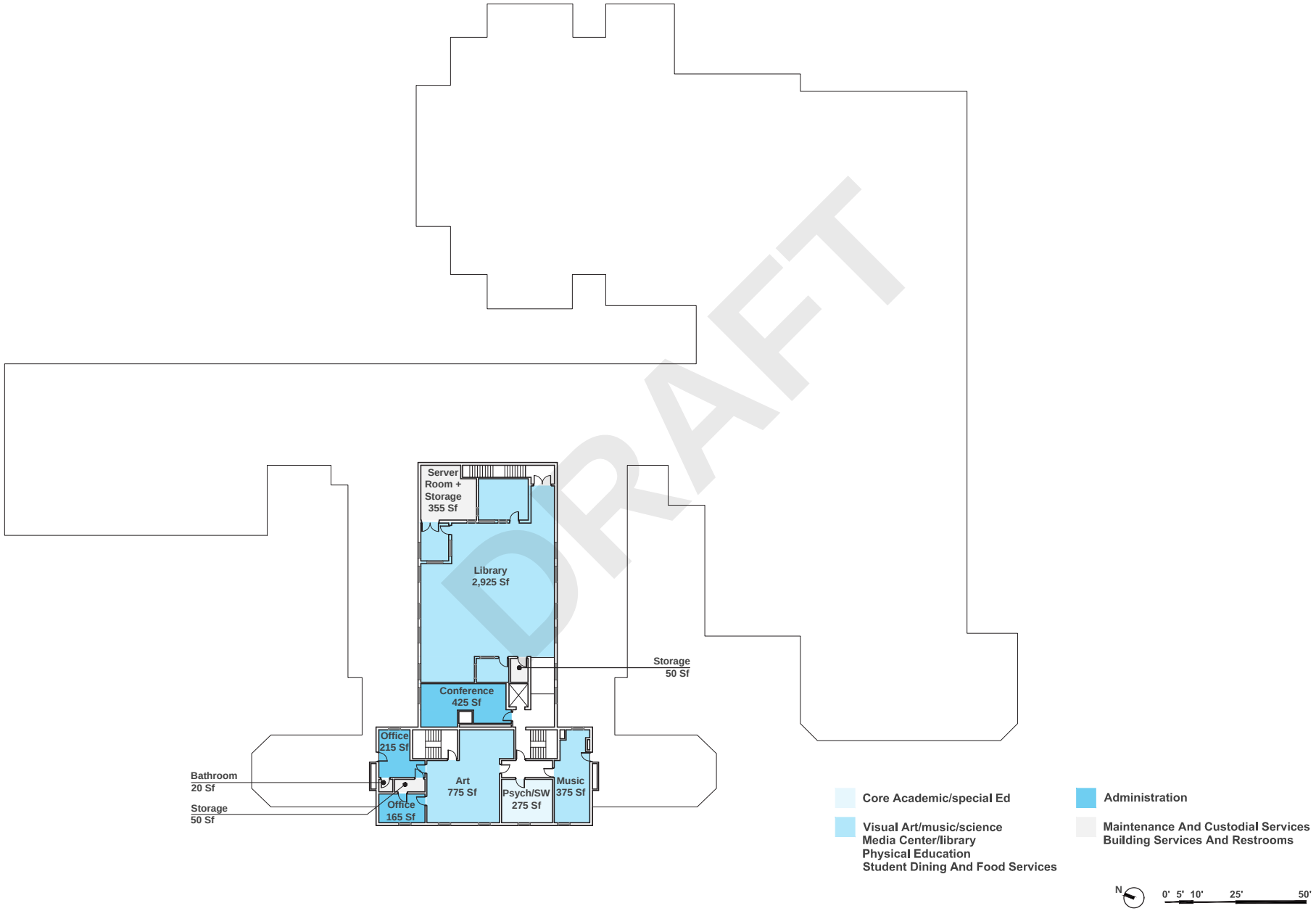
		Cora Kelly Existing Program			Ed Spec 600 Student Model				
Use	**Program Space**	**# of spaces**	**Avg SF / Room**	**Total SF**	**# of Spaces**	**SF / Room**	**Total SF**		
Total Neta Area (SF)				**57,355**			*88,750*	***31,395*** ***SF Deficiency***	***35.37%*** **Deficiency**
Total Gross Bldg. Area (sf)				**60,875**			*96,030*	***35,155*** ***SF Deficiency***	***36.61%*** **Deficiency**

Educational Specifications Capacity and Program

George Mason Capacity and Program Existing 1st Floor plan

Educational Specifications Capacity and Program

George Mason Capacity and Program Existing 2nd Floor plan



Site Assessment Site Access and Circulation

2 key considerations when evaluating the safety, efficiency, and capacity of a school site are parking space counts, and site circulation patterns. The ACPS Educational Specification recommends a total of 74 parking spaces for an elementary school with 600 students. 60 of these spaces serve teachers, ancillary staff, administration, custodial and maintenance staff, and food service staff; and 14 spaces are reserved for visitors.

Site circulation should be organized for safety and efficiency. This is accomplished through careful separation of vehicular traffic, including the separation of school buses, parent cars, and staff cars. Particular consideration should be given to providing safe passage to pedestrian traffic. Sufficient queuing space should be provided to prevent congestion of busy streets. Sight lines for drivers at site access points, within the parking area, and through the drop-off/pick-up area should also be considered.

Studio27 assessed both site circulation patterns and parking capacity at Cora Kelly and George Mason with the goal to provide recommendations for ways to improve traffic safety, reduce congestion, and accommodate all staff and visitor parking.

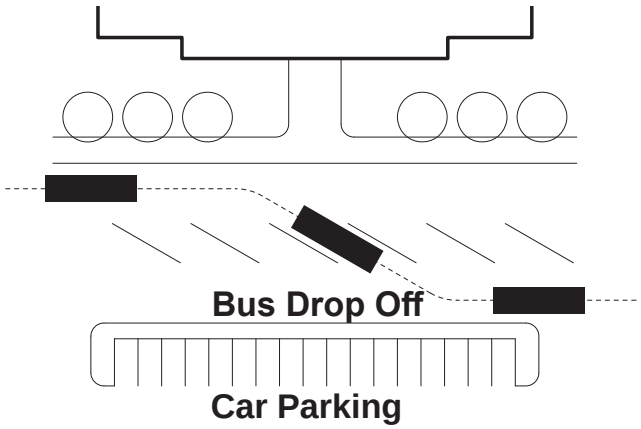
Assessment:

Cora Kelly Elementary School currently provides 73 parking spaces (not including spaces in the shared rec. center lot). This number is one space short of the 74 parking spaces that are required, therefore parking capacity at Cora Kelly is adequate. Also, Cora Kelly is successful in separating pedestrian circulation from vehicle circulation.

The main issue with site circulation at Cora Kelly is the overlap of bus, parent car, and staff car circulation paths. Ideally these 3 types of circulation would all be separate from each other. It is a safety concern having children cross car drive paths and parking spaces on their route from the bus to the school.

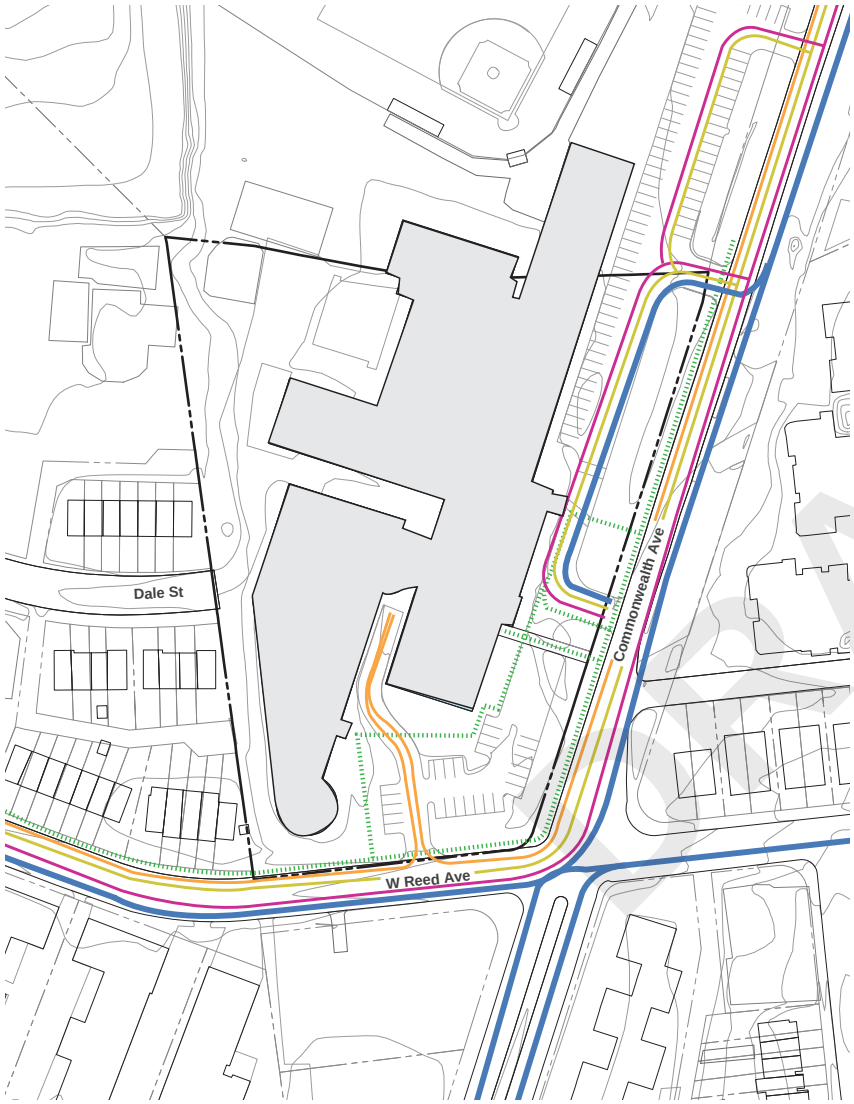
George Mason has critical site concerns relating to parking capacity and site circulation. Currently only 25 parking spaces are provided on site. Currently the school staff has an agreement with the church next door that lets them use spaces in their lot to be a self-sufficient site. The school would need to add 49 spaces to reach adequate parking capacity.

The item of larger concern is the lack of a drop off lane on the George Mason site. Currently cars and buses drop off and pick up students along Cameron Mills Road. This is a major safety concern. Pedestrian fatalities (while loading and unloading school buses) account for approximately three times as many school bus-related fatalities, when compared to school bus occupant fatalities. Having a dedicated and protected bus loading/unloading zone on a school site decreases this risk.



Site Assessment Site Access and Circulation

Existing Site Circulation Cora Kelly and George Mason



Cora Kelly

George Mason

Service / Delivery Staff Cars Buses Drop-off Cars Pedestrian

Site Assessment Playspace

This educational specification recommends a hybrid approach by providing for two separate dining areas: one for the early childhood grades (Pre-K and K) and one for grades one through five. The early childhood dining area should be located adjacent to the classrooms where it can also function as the ELA and an indoor play area in a fashion similar to the distributed dining concept.

All play areas should be protected from vehicular and pedestrian traffic, so students can be assured of a safe and secure environment on the entire school site.

Alexandria school sites are urban in nature and most current and future sites cannot accommodate the recommendations outlined in the Guidelines for School Facilities in Virginia's Public School. However, every elementary school site should accommodate non-structured or natural play areas as well as at least one playground. It is recommended that architects work with ACPS and RPCA to prioritize types of outdoor space development on a site-specific basis.

Architects should endeavor to design new schools or future renovations in a way that will maximize available open space. Ideally, all elementary schools will be designed to accommodate one multiuse field play area that conforms to the state guidelines.

Assessment

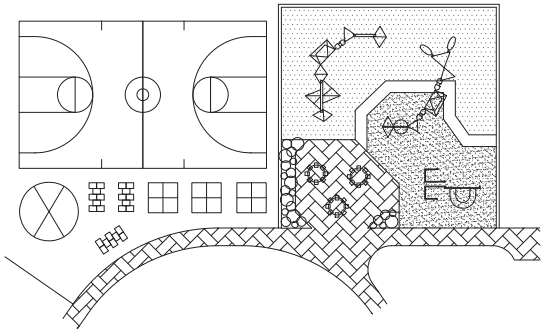
The Ed. Specs recommend approximately 73,400 - 83,640 square feet of play area for a 600 student population. Due to the configuration and siting of George Mason and the abrupt adjacency to George Mason Park to the East, play space is heavily deficient. George Mason averages around 34,000 SF of play area making it 49,600 square feet deficient.

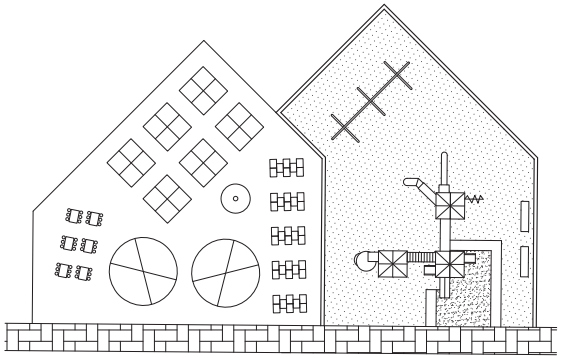
The adjacencies between play equipment are tighter than the recommend spacing and zoning per the Ed specs. In order to achieve proper adjacencies, clearly zoned and defined boundaries between age groups are recommend (See diagrams to the right).

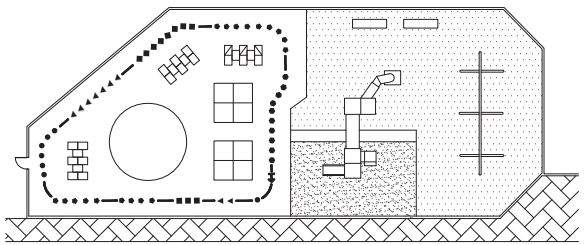
George Mason Park is used extensively by the community and Alexandria Sport Association.

Cora Kelly is heavily deficient compared to the Ed Spec recommend play space area. Cora Kelly currently has 28,970 sf of play space, which is 54,670 sf deficient of the recommend play space area.
The current play equipment is in acceptable condition, but are limited in quantity, variety, and placement per the Ed Spec requirements.

Cora Kelly sits on two property, sharing its building and lot lines with a recreation center to the West and Four Mile Run Park to the North East. In addition to zoning constraints, the siting and form of the building limits its expanse of open space.





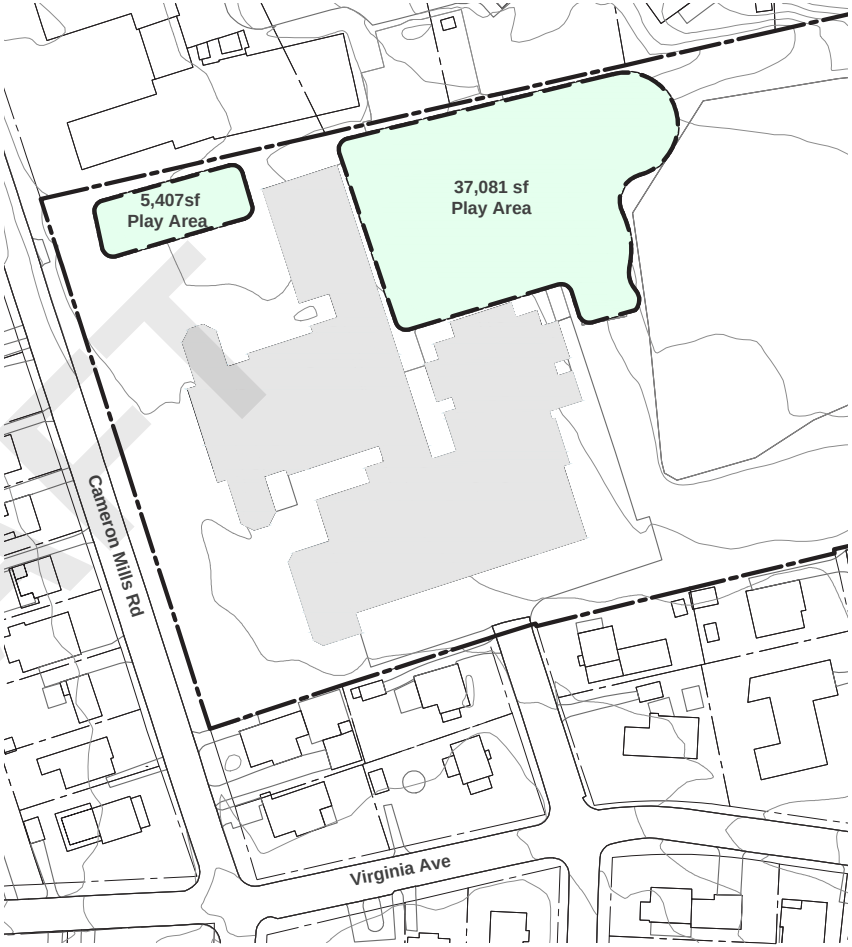


Playground Diagrams
Ed Spec playground diagrams for Pre-k and Intermediate age

Site Assessment Playspace

Existing Play Areas Cora Kelly and George Mason

Cora Kelly



George Mason

Site Assessment Utilities

Studio 27 is waiting to receive up to date property surveys for both Cora Kelly Elementary School and George Mason Elementary School. Until then we can not accurately evaluate the locations and capacities of the sites utilities and infrastructure.

Requested Information from ACPS

Building Assessment Safety and Security

ACPS wants to maintain an inviting and de-institutionalized environment, while simultaneously providing a safe environment for students, staff, and community who use the facility and adjacent support services. The organization and design of a school will have a major impact on student behavior and safety concerns.

Building security can be addressed in an active or a passive manner: active security is based on security systems; passive security is based on program design, building configuration, and community participation. Schools should be based on passive concepts with applied active concepts where necessary. Studio27 Architecture evaluated the safety and security of each school in 6 categories: Building Layout, Building Materials, Uses of Technology, Visitor Management, Vehicular and Pedestrian Traffic, and Other Site Concerns.

Assessment

The categories of largest concern for Cora Kelly Elementary are Building Layout, Building Materials and Visitor Management. Interior circulation paths are long and illogical, with poor sight lines along corridors and from staff spaces for passive surveillance. Interior finishes were adequate when installed but are now in poor condition. Building entrances are lacking a walk off mat or non-slip surface. The security item of most concern at Cora Kelly is the lack of a secured entry vestibule and security desk with clear sightlines of the approach to the school.

The categories of largest concern for George Mason Elementary are Building Layout, Building Materials, Visitor Management, and Vehicular and Pedestrian Traffic. Interior circulation paths have many blind spots. Staff spaces are isolated to the front entrance and do not have views of major circulation paths. Interior finishes were adequate when installed but are now in poor condition. While the school has a very small entrance vestibule, there is no security desk and sightlines are very restricted from the entrance lobby. The security item of most concern at George Mason is the Vehicular and Pedestrian traffic on site. It is very dangerous for all drop off to occur along public roads. Bus and car drop off should occur in individual designated lanes separate from public roads and pedestrian traffic should not cross these lanes if possible.

Building Assessment Safety and Security

Cora Kelly Safety and Security Evaluation

Table 9

Category	Consideration	Rating	*Notes*
Building Layout	Maintain clear lines of sight along circulation paths and avoid blind spots, corners, and cubby holes	Poor	
	Locate administrative and teacher preparation with good visual contact of major circulation areas	Poor	
	Develop spatial relationships that naturally transition from one location to another	Inadequate	
	Locate toilets in close proximity to classrooms	Fair	
	Design Toilets to balance the need for privacy with the ability to supervise	Fair	
	Locate areas likely to have significant community use (after school) close to parking and where these areas can be closed off from the rest of the building	Fair	*Location is acceptable, however doors to close off these spaces from academic wings do not exist*
Building Materials	Use durable wall surfaces and maintainable flooring material that are easy to clean so graffiti and dirt can be removed	Fair	*Glazed block in corridors is very durable and graffiti resistant however it is in bad condition*
	Operational windows should high above ground to prevent access	Poor	
	Install non-slip floors and walk-off mats at points of entry	Inadequate	
	Use of interior glass to create a transparent environment within the school	Inadequate	
	Use of colors, natural day lighting, and interior furnishings to create an environment that is aesthetically pleasing in order to support student and faculty pride within the building	Poor	
Uses of Technology	Phones in every instructional and support area	Fair	*Phones located in most classrooms*
	Building wide all-call or intercom system to be heard throughout the school and in outdoor play spaces when needed	Fair	*Speakers are located in classrooms, exterior unknown*
	Exterior and interior video security cameras	Fair	*Exterior security cameras were observed, interior unknown*
	Motion or infra-red detectors	TBD	
	Smoke and heat detectors location throughout the building	Fair	
	Magnetic locking systems and carefully selected door hardware to facilitate lock downs if needed	TBD	
Visitor Management	The main lobby should be welcoming and inviting for students, staff, and visitors and a central visitor registration area should be prominent upon entry	Fair	
	Clear wayfinding signage should be included that directs visitors upon campus arrival to visitor registration as well as throughout the building to provide overall building guidance	Poor	
	A secured double vestibule system with either clear sight lines to a security desk or a video enabled front intercom buzzer system should be provided to manage visitor entry	Inadequate	
	Front lobby and security desk should have clear views to parking lot and building approach	Inadequate	
Vehicular and Pedestrian Traffic	Bus drop off area should be separated from other vehicular traffic	Poor	
	Clear wayfinding signage and pavement striping should direct vehicular traffic on where to go	Fair	
	Sperate staff and community parking areas	Poor	
	Sperate pedestrian traffic from vehicular traffic and if possible avoid having pedestrian traffic cross vehicular drive lanes	Good	
Other Site Concerns	Use native high trees and low bushes (less than 3'-0" high) to deter hiding	Fair	
	Use aesthetically pleasing fencing around perimeter of the building	Poor	*Perimeter fence around some play areas*
	Non-intrusive lighting should light all areas or site, according to the LEED light pollution credit guidelines with no lighting to leave the property line	Fair	
	Provide security lighting around building and parking lots with photocell timer, motion sensor, and on/off capacity	Poor	

Building Assessment Safety and Security

George Mason Safety and Security Evaluation

Table 10

Category	Consideration	Rating	*Notes*
Building Layout	Maintain clear lines of sight along circulation paths and avoid blind spots, corners, and cubby holes	Poor	
	Locate administrative and teacher preparation with good visual contact of major circulation areas	Inadequate	
	Develop spatial relationships that naturally transition from one location to another	Poor	
	Locate toilets in close proximity to classrooms	Good	
	Design toilets to balance the need for privacy with the ability to supervise	Fair	
	Locate areas likely to have significant community use (after school) close to parking and where these areas can be closed off from the rest of the building	Good	
Building Materials	Use durable wall surfaces and maintainable flooring material that are easy to clean so graffiti and dirt can be removed	Fair	*Glazed block in corridors is very durable and graffiti resistant however it is in bad condition*
	Operational windows should high above ground to prevent access	Inadequate	
	Install non-slip floors and walk-off mats at points of entry	Poor	
	Use of interior glass to create a transparent environment within the school	Inadequate	
	Use of colors, natural day lighting, and interior furnishings to create an environment that is aesthetically pleasing in order to support student and faculty pride within the building	Poor	
Uses of Technology	Phones in every instructional and support area	TBD	
	Building wide all-call or intercom system to be heard throughout the school and in outdoor play spaces when needed	TBD	
	Exterior and interior video security cameras	Poor	*No interior or exterior security cameras were observed*
	Motion or infra-red detectors	TBD	
	Smoke and heat detectors location throughout the building	Poor	*Smoke detectors are present however there is no sprinkler system*
	Magnetic locking systems and carefully selected door hardware to facilitate lock downs if needed	TBD	
Visitor Management	The main lobby should be welcoming and inviting for students, staff, and visitors and a central visitor registration area should be prominent upon entry	Poor	
	Clear wayfinding signage should be included that directs visitors upon campus arrival to visitor registration as well as throughout the building to provide overall building guidance	Poor	
	A secured double vestibule system with either clear sight lines to a security desk or a video enabled front intercom buzzer system should be provided to manage visitor entry	Inadequate	
	Front lobby and security desk should have clear views to parking lot and building approach	Inadequate	
Vehicular and Pedestrian Traffic	Bus drop off area should be separated from other vehicular traffic	Inadequate	
	Clear wayfinding signage and pavement striping should direct vehicular traffic on where to go	Inadequate	
	Sperate staff and community parking areas	Inadequate	
	Sperate pedestrian traffic from vehicular traffic and if possible avoid having pedestrian traffic cross vehicular drive lanes	Inadequate	
Other Site Concerns	Use native high trees and low bushes (less than 3'-0" high) to deter hiding	Fair	
	Use aesthetically pleasing fencing around perimeter of the building	Inadequate	*No perimeter fence*
	Non-intrusive lighting should light all areas or site, according to the LEED light pollution credit guidelines with no lighting to leave the property line	Fair	
	Provide security lighting around building and parking lots with photocell timer, motion sensor, and on/off capacity	Poor	

Building Assessment Accessibility

ACPS has made it a strong priority to make their facilities accessible to all students and staff. 'Universal Design' is one of ACPS's 10 driving design principles, establish in the 2015 Educational Specifications. Universal design is the design of buildings and environments to make them accessible to all people, regardless of age, disability, or other factors.
Since 2012, accessibility in schools has been the law. Title II of the Americans with Disabilities Act prohibits disability discrimination by all public entities, including schools, at the local and state level.

Assessment

The highest priority item of concern for Cora Kelly Elementary School is that the school does not have an elevator. The second story of the building contains areas of primary function to the school curriculum that students in wheelchairs can not currently access.

Studio27 also observed many plumbing fixtures and facilities at Cora Kelly that are not ADA accessible. This includes water fountains in the corridors (CK-9), sinks in classrooms (CK-10), and bathroom in classrooms (10). The majority of the Library is not accessible because of the sunken 'pit' design of the central area (CK-8).

While ramps are present at some building entrances, no ramp handrails are compliant with current ADA or building code standards (CK-6, CK-7). Also, most play areas are not connected to accessible paths, and no accessible play equipment was observed (CK-1, CK-2, CK-4, CK-5).

George Mason has similar accessibility deficiencies. Water fountains (GM-6), classroom sinks (GM-7), and bathroom facilities (GM-8, GM-9) are not up to current standards. The majority of entrances do not have ramps and mot exterior stair railings are not ADA or code compliant (GM-4, GM-5). Also, most play areas are not connected to accessible paths, and no accessible play equipment was observed (GM-1, GM-2, GM-3).

Building Assessment Accessibility

Cora Kelly Accessibility Photos

CK-1

CK-2

CK-3

CK-4

CK-5

CK-6

Building Assessment Accessibility

Cora Kelly Accessibility Photos

CK-7

CK-8

CK-9

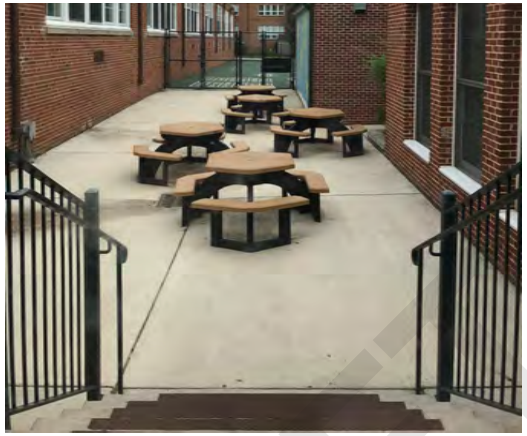
CK-10

CK-11

Building Assessment Accessibility

George Mason Accessibility Photos

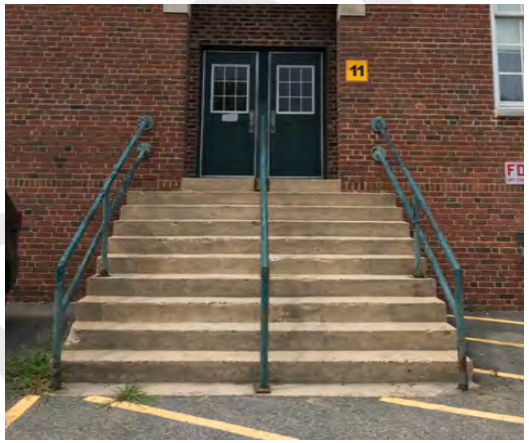
GM-1



GM-2

GM-3

GM-4



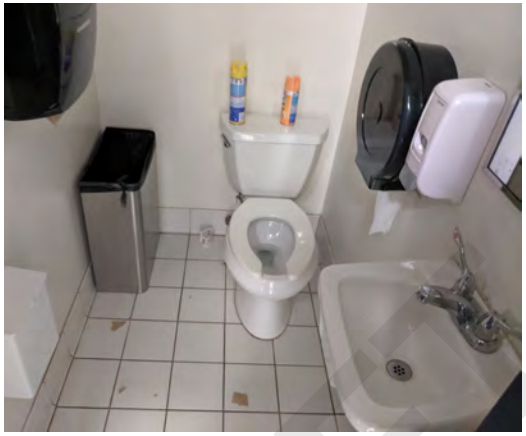
GM-5

GM-6

Building Assessment Accessibility

George Mason Accessibility Photos

GM-7



GM-8

GM-9

Building Assessment Envelope

Both Cora Kelly and George Mason Elementary schools are housed in ageing facilities that have been added onto in different stages over the years. Studio 27 Architecture interviewed school leaders and visited both schools to assess the current conditions of the building envelopes and evaluate the impact of the observed envelope issues.

Looking beyond the condition of the school's envelope, the form, or shape of the building has a large impact on the building's energy efficiency. This can be evaluated by studying the buildings "Form Factor" which is the total sum of the area of the envelope, divided by the total floor area. A larger number indicates a building with more exterior envelope surface area in relation to its floor area, meaning more opportunity for heat transfer between the interior and exterior. A lower number indicates a more compact, energy efficient building.

Assessment

The Cora Kelly envelope is in fair condition. All windows in the school are thermal and in good condition, and the school is in the process of receiving a new roof. The largest concern for Cora Kelly is the continued maintenance of the masonry, EIFS system, entrances and envelope penetrations. There is visible masonry cracking at multiple locations (CK-1, CK-2), and damage to the EIFS system (CK-5, CK-6). Exterior grilles are in poor condition and stains on the brick below window sills (CK-3). Water appears to pool where the play surface meets the exterior brick (CK-4). Most entrance doors are in poor condition with visible rust (CK-8) and large undercuts allowing unwanted thermal transfer between the interior and exterior (CK-9).

Due to the sprawling nature of Cora Kelly's plan the envelope is much larger in surface area than it needs to be for a new school with the same interior square footage. This larger form factor has a big impact on the energy use, and consequently higher operations costs.

The George Mason envelope is in poor condition. The two areas of largest concern are the windows and roof. School leaders reported concerns with the condition of the windows. Windows have been replaced in different areas of the building at different times, and there are unique issues related to each type (GM-12, GM-13). Older wood windows are water damaged and have non-thermal single pane glass. The newer replacement windows are very poor quality, leak, and do not lock.

School leaders also reported that the roof leaks often, and S27 observed that there is visible ponding at drain locations (GM-5) Other issues to note are visible cracks in the masonry (GM-1-GM-3), Exterior entrances are in poor condition with visible rust and flaking paint, as well as large undercuts that allow unwanted thermal transfer (GM-6-GM-9). Floor slab and exterior settlement cracking can be seen from the interior of the building at the main entrance and in classrooms (GM10, GM-11).

Like Cora Kelly, George Mason also has a very high form factor, which has a negative impact on building energy efficiency and use.

Building Assessment Envelope

Cora Kelly Envelope Photos

CK-1

CK-2

CK-3

CK-4

CK-5

CK-6

Building Assessment Envelope

Cora Kelly Envelope Photos

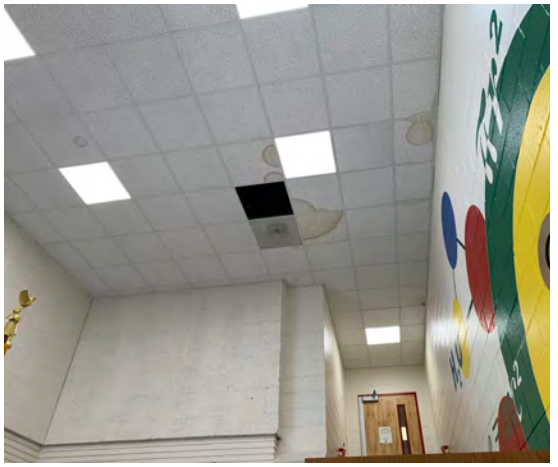
CK-7

CK-8

CK-9

CK-10

CK-11



CK-12

Building Assessment Envelope

George Mason Envelope Photos

GM-1

GM-2

GM-3

GM-4

GM-5

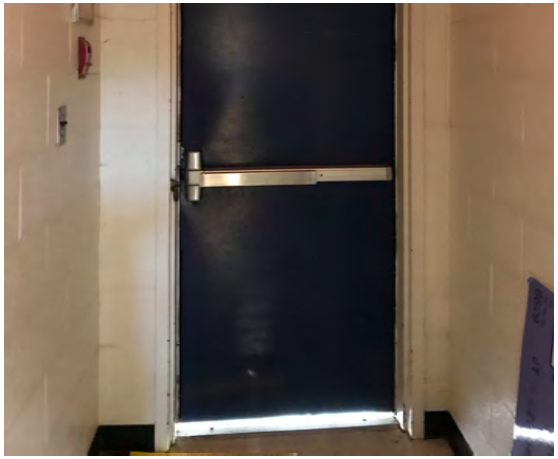
GM-6

Building Assessment Envelope

George Mason Envelope Photos

GM-7

GM-8



GM-9

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Building Assessment Envelope

George Mason Envelope Photos

GM-13

GM-14

Structural Systems

Structural Introduction

The purpose of this technical site assessment is to review the existing building structures and to provide structural input on possible renovation or replacement solutions to meet the growing capacity needs of the Alexandria City Public School system. Our evaluation included visits to each site to observe the existing building. Existing structural drawings were not available for our use on either school. A visual observation was performed to determine the type of construction and basic building components. The surveys included the entire roof, and perimeter of the buildings. For the interiors, ceiling tiles were removed in select locations to allow for structural observation. No other finishes where removed and in many areas hard ceilings, equipment and furnishing limited our review to structural elements that were exposed to view.

Cora Kelly Elementary School

The existing school was constructed in 1955 and two additions have been built in the years since. In 1991, a community center and gymnasium were added on the south-west corner of the site. The gymnasium is shared between the community center and the school and may not be included in future renovations. The gymnasium is connected to the school building through a hallway and the music room. In 1996 a classroom addition was constructed on the north-west portion of the site between the original classroom wings enclosing an interior courtyard. The original building is a mainly a one-story structure, with a second floor over the main entrances, offices and library. The gymnasium and classroom additions are one story structures.

Existing Structural Systems

The original building roof system typically uses open web steel joists with bulb tee purlins supporting gypsum sheathing. Often with this type of construction a shallow layer of gypsum topping is poured on the sheathing, but this could not be verified as it was hidden by the roofing. The additions typically use open web steel joists with metal decking for the roof structure. A portion of the classroom addition has an extensive green roof system with a growing medium depth of approximately six inches. The structure supporting the green roof was hidden from view but would need to be more robust compared the typical roof system we observed. The roof structure is typically flat, or shallowly sloped for drainage. Mechanical units are supported on the roof with steel dunnage or curbs above the roof structure. There is a recessed mechanical well above the hallway of the west classroom wing. A steel framed roof mounted screen wall shields the mechanical equipment zone on the classroom addition. There is a steel framed canopy structure over the main entrance to the building that is not original to the building. It was likely added concurrent with one of the building additions. The second-floor construction was not verified due to lack of access. Typically, the ground floors are concrete grade slabs. The vertical support for the floors and roof is a combination of structural steel beams and columns, and load bearing masonry walls. The building is likely supported on shallow spread footings which are commonly used for buildings of this type. The original 1955 building has multi-wythe masonry perimeter bearing walls with punched window openings. The perimeter walls of the classroom addition have a masonry base, and exterior insulation and finish system (EIFS) above. The classroom wings of the original building appear to have been modified to match the classrooms of the 1996 addition. The original brick was removed from the roof down to the same height as the masonry base on the addition walls. The upper portion of the walls were infilled with an EIFS system with windows incorporated into it.

Existing Conditions Assessment

A site visit was performed on August 26th, 2019 by Lee Ressler, PE. Generally, the existing building complex is in good structural condition with no significant structural deterioration or deficiencies observed. The existing roof-

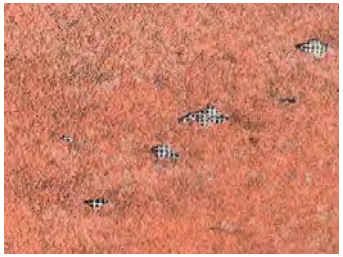

Photo #1
Typical EIFS Deterioration

Photo #2
Typical EIFS Deterioration Bearing

Photo #3
Typical Brick Crack and Repair Repairs

Photo #4
Typical Brick Crack Repairs

ing was being replaced on portions of the building while we were on site, and the remaining areas of the roofing had been recently replaced.

The EIFS exterior wall system has deteriorated and generally is in poor condition. In many locations, the exterior stucco finish has cracked and spalled, exposing the reinforcing mesh (see photos #1 and #2).

Around the exterior perimeter of the original building, there were a few cracks observed in the brick masonry. Many of these cracks were around openings and appeared to be related to thermal movement, restraint cracking, and rust jacking of the lintels (see photos #3 thru #5). In select locations, repairs have been made previously to damaged areas of brick. These repairs included repointing of the mortar joints and replacement of damaged brick (see photos #3 and #5).

At the front entry of the building, the steel framed canopy is bearing on a multi-wythe masonry brick wall with decorative punched openings. The canopy beam is bearing directly above one of these openings and brick is beginning to deteriorate (see photo #6).

Summary

Generally the structure of the building is in good working condition with only minor deficiencies observed. The building envelope and exterior wall system has age related deterioration and these issues will continue to progress and require periodic maintenance. The gypsum roof system used in the original building construction is susceptible to degradation if exposed to water. Water damage to the roof was not observed in the survey, but it is possible that this type of damage has occurred and is hidden from view. To identify and locate damage of this type the roofing would need to be removed and the gypsum deck inspected.

George Mason Elementary School

The existing school was constructed in 1939 with numerous additions in the years since. A classroom wing was built on the south-east end of the building in 1949 and a second level was added above the central portion of the original building. In 1961 a multipurpose room was built to the east of the original building. In 2014, the space between the multi-purpose room and the 1949 classroom wing was filled with additional classrooms and the cafeteria was expanded on the west side. Apart from the second story addition, the remainder of the building is one story. There are two mechanical and electrical rooms that are constructed below grade, one in the original building, and one in the 1949 addition.

Existing Structural Systems

The roof systems are typically open web steel joists with bulb tee purlins supporting gypsum sheathing. Often with this type of construction a shallow layer of gypsum is poured on top of the sheathing, but this could not be verified as it was hidden by the roofing. The typical roof is flat or slightly sloped for drainage. There is a gabled roof over the west entrance and the kindergarten classrooms that was part of the original building. The cafeteria expansion also features a gabled roof; that likely is framed with prefabricated trusses. Access to the attic spaces of the gable roofs to verify the structural framing was not possible. Mechanical units are supported with steel dunnage or curbs above the roof structure. A steel framed roof mounted screen wall shields the mechanical equipment zone on the 2014 classroom addition.

The 2014 classroom addition was built using modular construction. Each classroom is formed with two prefabricated units that were manufactured off site. The roofs of these modular units are framed with cold formed steel channels with steel deck. The ground floors are typically concrete grade slabs. The building is likely supported on shallow spread footings which are commonly used for buildings of this type. Typically, the vertical support for the floors and roof are load bearing masonry walls. The load bearing walls are a mixture of multi-wythe brick and concrete masonry block. The modular classroom units have cold formed steel stud bearing walls. The base-

Photo #5
Typical Brick Deterioration and Repair

Photo #6
Brick Deterioration at Canopy Bearing

Photo #7
Typical Brick Deterioration and Repairs

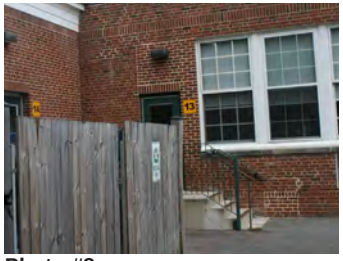

Photo #8
Typical Brick Deterioration and **Repairs**

ment walls for the mechanical and electrical rooms are a combination of mult-wythe brick and concrete block masonry.

Existing Conditions Assessment

A site visit was performed on August 27th, 2019 by Lee Ressler, PE. Generally, the existing buildings are in good structural condition, with no significant deteriorations or deficiencies observed. The existing roof membrane appeared to have been replaced within the last fifteen years, although we understand that it leaks in numerous locations. Many loose roofing screws were observed scattered on the low slope roof surfaces, and in a few instances, sticking through the membrane. From conversations with the building staff, we understand that these screws are left over from the roof being tarped in anticipation of heavy rains that were expected from a hurricane.

Around the exterior perimeter of the original building, there are a few cracks observed in the brick masonry. Many of these cracks were around openings and appeared to be related to thermal movement, restraint cracking, rust jacking of the lintels, and minor settlement of the building. (see photos #7 thru #10). In select locations, cracked mortar joints have been routed and repointed (see photos #7 and #8).

Several roof drains were observed clogged or filled with debris. This problem typically occurred where trees were in close proximity to the roof structure (see photos #11 and #12).

At one of the stairs down to the below grade mechanical rooms, the structural steel supporting the roof of the stairwell was badly rusted. This is likely caused by water intrusion, and being in direct contact with masonry basement walls (see photo #13).

Summary

Generally the structure of the building is in good working condition with only minor deficiencies observed. The gypsum roof system used in the original building construction is susceptible to degradation if exposed to water. The roof leaks described by the building staff are likely related to holes in the membrane caused by tarping the roof. Water damage to the roof was not observed in the survey, but it seems probable that some damage has occurred and is hidden from view. To identify and locate any damage, the roofing would need to be removed and the gypsum deck inspected. The exterior masonry walls of the building have age related deterioration. This deterioration will continue to progress and require periodic maintenance.

Limitations

The services provided were limited to visual observation of the condition of the building structure. No physical testing was performed and no analysis or calculations have been performed to determine the adequacy of the structural systems. Portions of the buildings and building systems were below grade or finished with materials which made them inaccessible and unobservable. In these areas, latent problems may exist which could not be identified. This report has been prepared solely and exclusively for the client to assist in the evaluation and rehabilitation of this project. It is not intended for use by others or for other than the stated purpose. The conditions reported are as visually observed on the denoted timeframes. We reserve the right to amend this report in the future, if and when previously unknown or unseen conditions are discovered or additional information becomes available.

Ehlert Bryan has strived to perform the services in a manner consistent with that level of care and skill ordinarily exercised by members of the architectural/ engineering profession currently practicing in the same locality under similar conditions. No other representation, express or implied, and no warranty or guarantee is included or intended in this repo

Photo #9, #10
Typical Brick Crack and Deterioration

Photo #11
Clogged Roof Drain

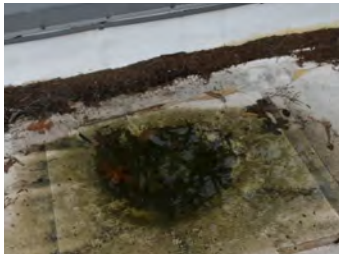

Photo #12
Clogged Roof Drain

Photo #13
Rusted Steel Roof Over Mechanical Room Stair

MEP Narrative Cora Kelly Elementary School

Current Code and Standard Compliance:

2015 Virginia Statewide Building Code (VUSBC)

2015 International Building Code (IBC) with Virginia Amendments

2015 International Mechanical Code (IMC) with Virginia Amendments

2015 International Plumbing Code (IPC) with Virginia Amendments

2015 Virginia Statewide Fire Prevention Code
NFPA 90A

2014 National Electric Code / NFPA 70

2015 International Fuel Gas Code (IFGC) with Virginia Amendments

2015 International Energy Conservation Code (IECC) (or ASHRAE equivalent)

ASHRAE 90.1-2010

ASHRAE 55-2013

2005 SMACNA HVAC Duct Construction Standards - Metal and Flexible

Existing Facility Mechanical

Overview

The majority of the existing building is served by rooftop mounted VAV air handling units that were manufactured in 2000. Some rooftop units were indicated to have been manufactured in 2012. RTUs are gas fired and DX cooled. In a replacement scenario it is not recommended to repurpose any of these units.
Building air is exhausted with roof mounted exhaust ventilators. The ventilators are in fair to poor condition. It is recommended to plan on replacement of roof exhaust ventilators.
All existing units, associated ductwork, controls, and air devices in areas to be renovated shall be removed. Existing terminal equipment, such as unit heaters, VAVs, etc. shall be removed. It is not anticipated that any existing mechanical infrastructure in renovated areas will be utilized for future use.

Demolition of existing equipment shall be performed in a phased manner as required by overall project phasing. Scope of Work

New Facility Mechanical

If it is determined that the existing building will be demolished or be required to have a major renovation, see the following recommendations for new system design.

Replacement Design Conditions

The design criteria listed below shall be used for conceptual HVAC design, payback evaluation, and heating/cooling load calculations.

Site Data:

Building Location: Alexandria, VA
Physical Address: 3600 Commonwealth Ave
Square Footage of Renovated Area: See Architectural sq. ft.
Main Building Total Area: See Architectural sq. ft.
Latitude: 38.84 / Longitude: -77.055, Elevation: 20 feet
Building Orientation: Main entrance faces East/Southeast
ASHRAE 90.1 Climate Zone: 4A

Outdoor Design Conditions

Based on ASHRAE 2017 Handbook - Fundamentals for Ronald Reagan Washington Natl, VA, USA

Heating - ASHRAE 99.6% Peak Design Condition: 17.9 deg F DB
Cooling - ASHRAE 0.4% Peak Design Condition: 94.7 deg F DB / 75.5 deg F MCWB

Indoor Design Conditions

Equipment shall be sized and designed to maintain the following setpoints within a 2 degree deadband. Maximum class size is assumed to be 24 students and one teacher.

Building Assessments Systems

Classrooms / Support Spaces:

Heating Season:	**Occupied Mode:**	**70 deg F DB / no humidity control**
	Vacant Mode:	**68 deg F DB**
	Unoccupied Mode:	**60 deg F DB**
Cooling Season:	**Occupied Mode:**	**75 deg F DB / 40-60% RH**
	Vacant Mode:	**78 deg F DB**
	Unoccupied Mode:	**85 deg F DB**

Toilet Rooms / Group Restrooms: Ventilated/Exhausted

Cafeteria:

Heating Season:	**Occupied Mode:**	**70 deg F DB / no humidity control**
	Vacant Mode:	**68 deg F DB**
	Unoccupied Mode:	**60 deg F DB**
Cooling Season:	**Occupied Mode:**	**78 deg F DB / 40-60% RH**
	Vacant Mode:	**82 deg F DB**
	Unoccupied Mode:	**85 deg F DB**

Building Occupancy & Schedule

The facility is anticipated to be occupied Monday through Friday, 7am-5pm and Saturday/Sunday based on a special event scheduling only. The building will not be utilized year-round. The administration area (out of scope) is the only area that was stated to have year round occupancy. Detailed occupancy and loading schedules shall be provided as part of future space by space analysis.

System Options

System modeling and selection will be determined during the design phase. For budgeting purposes, two probable system options are as follows:

Option 1 - Geothermal Heat Pumps with DOAS

This option has been explored by CMTA due to energy performance and overall system simplicity as it relates to controls and operation.

The HVAC system for this option consists of unitary geothermal heat pumps for zone thermal comfort control and dedicated outdoor air handling units (DOAS) with fixed-plate energy recovery for delivery of code required outside air. The ventilation (outside) air is de-coupled from the HVAC heating and cooling with each space (or zone) receiving outside air separately utilizing demand control ventilation.

Each heat pump will be a high efficiency, variable speed compressor heat pump unit (below 5 tons) with an ECM fan motor. Units can be horizontally hung and installed in the plenum space above ceiling or floor mounted in closets outside of classroom. Each heat pump unit will utilize refrigerant R-410A and will have an ozone depleting potential (ODP) of 0.05 or less.

Each classroom zone is anticipated to have its own heat pump and space temperature sensor, one per room or shared (1 per two adjacent classrooms – TBD). The unit will operate by maintaining the temperature of the space based on the adjustable space temperature setpoint. Each space temperature sensor shall have a push-button override for a 2-hour (adjustable) override to the occupied mode of operation.

Each office and corridor zone is anticipated to have a shared heat pump with VAV diffusers to allow thermal comfort control in each office. The unit will operate with a static pressure reset controlling the ECM fan motor. Each space temperature sensor shall have a push-button override for a 2-hour (adjustable) override to the occupied mode of operation.

The Cafeteria will each have a new single-zone VAV geothermal water-cooled packaged RTU installed. The unit will operate by maintaining the temperature of the space based on averaging multiple space temperature sensors. Each space temperature sensor shall have a push button override for a 2-hour (adjustable) override to the occupied mode of operation.

Where demand control ventilation is applied, spaces will include a CO2 sampling/measuring port and occupancy sensors. The thermostat (and associated sensors), CO2 and occupancy sensors are to interface to the building automation system. The CO2 measuring port and occupancy sensor inputs will be utilized to control the space ventilation terminal unit and space temperature set points.

All heat pump units shall have fully ducted supply and return with sheet metal ductwork. Each heat pump unit will include a duct-mounted pre-filter rack. The pre-filters shall be 24”x24” Flanders/FFI PrePleat 40. Each heat pump shall include an integral disconnect switch. Condensate for each unit will be disposed of through a floor drain or open receptacle into the sanitary system.

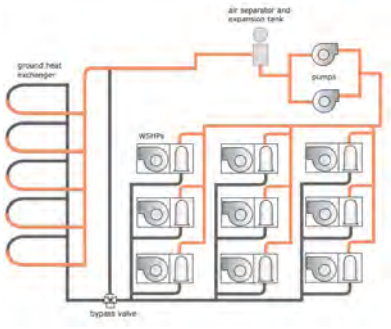

Figure 3- Ground Loop Heat Pumps

Figure 4- Water Source Heat Pump

Approximate sizes are as follows:

- Classrooms - The heat pump unit zones serving classrooms will utilize units sized between 2-6 tons, depending on classroom size and location within the building.
- Corridors - The heat pump unit zones serving corridors will utilize units sized at approximately 2 tons.
- Offices - The heat pump unit zones serving offices will utilize units sized at approximately 2 -3 tons, depending on office zone size and location within the building.
- Cafeteria – The water-cooled packaged RTU will be sized for approximately 25-tons

Ventilation Systems (DOAS)

The DOAS unit shall provide ventilation air as described in Option 2. However, it shall be configured as a water-cooled unit with listed manufacturers as Trane, Valent, or Carrier or other approved equal.

Geothermal Well Field and Piping System

The well field geothermal system pumping system shall consist of two variable flow pumps (one operational – one 100% standby) for pumping the water to all heat pumps and geo AHU's/RTU's throughout the building. The pumps shall be located in the Mechanical Room and circulate water throughout the well field.

Option 2 – 4-Pipe Fan Coil Units and Dedicated Outdoor Air System (DOAS)

The HVAC system for this option shall utilize 4-pipe fan coil units for zone thermal comfort control and outside air handling units with fixed-plate energy recovery for delivery of code required outside air. A central air-cooled chiller, pumping system, and chilled water piping network will be utilized to circulate chilled water to each unit. Chiller shall be equal to Trane Stealth, tonnage to be determined. Chiller contains two refrigerant circuits. The boilers shall be gas-fired, high-efficiency condensing style boilers to reduce energy consumption. Boilers shall be equal to Viessmann Vitocrossal 300, 3,000 MBH, 2 each.

The ventilation (outside) air is de-coupled from the HVAC heating and cooling with each space (or zone) receiving outside air separately utilizing demand control ventilation.

Figure 1- Fan Coil Units

Each fan coil unit will be equipped with an ECM fan motor, 1" disposable MERV 8 filter, hydronic heating and cooling coil, piping package with two-way modulating control valve, strainer, balance valve, and isolation valves. Units can be configured horizontally (hung and installed in in the plenum space above ceiling) or vertically (floor-mounted in the space). Unit controller shall either be provided by Temperature Controls Contractor and field installed or provided by Unit Manufacturer and factory installed.

Hydronic (chilled water and heating hot water) piping and insulation shall be as follows:

2" and smaller: Type L drawn-copper tubing with brazed or pressure-seal (Propress) joints and wrought, cast copper fittings, brazed or pressure-seal. Mineral fiber preformed pipe insulation with all service jacket for indoor, concealed piping.

2 ½" and larger: Carbon steel, Schedule 40, with wrought-steel fittings and wrought-cast or forged-steel flanges and flange fittings, welded and flanged joints. Mechanical grooved couplings may be considered as a bid alternate. Mineral fiber preformed pipe insulation with all service jacket for indoor, concealed piping. Outdoor exposed piping shall have stucco embossed aluminum jacket.

Each classroom zone is anticipated to have its own unit and space temperature sensor, one per room. The unit will operate by maintaining the temperature of the space based on the adjustable space temperature set-point. Each space temperature sensor shall have a push button override for a 2-hour (adjustable) override to the occupied mode of operation. Each office zone is anticipated to have a shared unit with VAV diffusers to allow thermal comfort control in each office or a dedicated unit. The unit will operate with a static pressure reset controlling the ECM fan motor for variable flow with shared units. Each space temperature sensor shall have a push button override for a 2-hour (adjustable) override to the occupied mode of operation.

The Cafeteria will be served by a single-zone VAV Air Handling Unit, 4-pipe. The unit will operate by maintaining the temperature of the space based on averaging multiple space temperature sensors. Each space temperature sensor shall have a push button override for a 2-hour (adjustable) override to the occupied mode of operation.

IT Rooms shall be served by air-cooled DX split systems, approximately 1 to 1.5 tons each.

Where demand control ventilation is applied, spaces will include a CO2 sampling/measuring port and occupancy sensors. The thermostat (and associated temperature sensors), CO2 and occupancy sensors are to interface to the building automation system. The CO2 measuring port and occupancy sensor inputs will be utilized to control the space ventilation terminal unit and space temperature set points.

All fan coil units mounted above ceiling shall have fully ducted supply and return with sheet metal ductwork. Each unit shall include an integral disconnect switch. Condensate for each unit will be gravity drained where possible.

Approximate sizes are as follows:

- Classrooms - The zones serving classrooms will utilize units sized between 2-6 tons, depending on classroom size and location within the building.
- Corridors - The zones serving corridors will utilize units sized at approximately 2 tons.
- Offices - The zones serving offices will utilize units sized at approximately 2 -3 tons, depending on office zone size and location within the building.
- Cafeteria – The RTU will be sized for approximately 25-tons.

Ventilation Systems (DOAS)

The outside air systems for the building shall be de-coupled from the conditioning systems. In general, outside air shall be provided directly to the occupied zone. The dedicated outside air handling unit will be outdoor, roof mounted, double wall construction, and include dual supply/exhaust plenum fans. The units shall be variable volume energy recovery type units utilizing building exhaust and general exhaust air to precondition the outside air through a total energy recovery enthalpic plate. All conditioned outside air ductwork and building exhaust air ductwork will not be insulated – this applies to positive pressure outside air ductwork and negative pressure exhaust air ductwork. All un-conditioned air ducts shall be insulated with 3" thick, ¾ pcf duct wrap with vapor barrier – this applies to negative pressure outside air ductwork and positive pressure exhaust air ductwork.

The DOAS unit shall be a packaged air-cooled, DX cooling, natural gas heat, unit with listed manufacturers as Trane, Valent, Carrier, or other approved equal. The outside air units will consist of the following sections/components: stacked and in the direction of air flow will be an inlet filter, enthalpic plate, plenum type, dual exhaust air fans (each sized at 50% airflow), on the bottom will be an inlet filter, enthalpic plate, access, gas-fired heating section, access, plenum type, dual supply air fans (each sized for 50% airflow), and final filter bank. Each fan bank will be controlled by a VFD for varying airflow conditions. During low ventilation conditions, only one of the fans would be needed to meet the ventilation requirements. The exhaust fan is sized at 20% reduction in capacity (thus maintaining building pressurization). The supply air distribution system will supply outside air to terminal units for distribution of outside air to each zone. The outside air conditioning system will be provided with an air-cooled DX circuit. The resulting winter supply temperature is approximately 70 degrees F and summer supply air temperature shall be approximately 68 degrees F DB/63 degrees F WB.

To control outside air, a central CO2 monitoring system (Aircuity) will be provided to take advantage of building diversity. Each variable occupied area/room will contain a CO2 measuring port with a high quality central CO2 sensor. The VAV terminal will modulate in accordance with the space CO2 measurements. The VAV terminal will also be interlocked with a room occupancy sensor. The ventilation rate will be modulated based on occupied and vacant spaces conditions. The total space by space occupancy count is expected to exceed actual building occupancy. Designing a variable ventilation system based on actual building occupancy reduces the central ventilation system by approximately 30 percent, thus reducing the overall HVAC load.

Figure 2- DOAS Unit with Heat Recovery

Building Automation System (BAS) / HVAC Controls

All new packed equipment shall be provided with DDC controllers for integration to BAS. All existing equipment shall be integrated into new BAS. The following shall be included as part of the controls scope of work:

- Control or integration of new terminal equipment (fan coil units). Control devices (valves, sensors, etc.) and controller by TCC or equipment manufacturer has not yet been determined.
- Integration of new Air Handling Units and DOAS Units. It is anticipated that unit level controls and controller will be provided by unit manufacturer.
- Integration of rooftop HVAC units (gym, etc).
- Integration of HVAC central plant (boilers/chillers)
- Control of hydronic pumps
- Exhaust fan control for toilet rooms, restrooms, etc.
- Supplemental heater control (unit heaters, cabinet heaters, etc.)
- IT Server / MDF rooms – space temperature monitoring and alarming
- Plumbing –domestic hot water heater temperature monitoring and alarming
- Plumbing –domestic water circulation pump control and monitoring
- Kitchen –makeup air unit monitoring and cooler/freezer temperature monitoring and alarming
- Energy Meters – monitoring and BTU/energy tabulation for primary natural gas and electric consumption

Existing Facility Plumbing

Overview

The existing building plumbing systems, including domestic hot and cold water, sanitary and vent piping. The existing piping systems in the original building appears to be original to building.

Natural Gas Service

- A metered natural gas service is currently supplied to the building by Washington Gas. The service serves the RTUs and domestic hot water heaters . No documentation was found to indicate the age of the existing piping system. The exterior piping has flaking paint and is beginning to rust on surface and at flanges. Recommend refinish/paint exposed piping if building is to remain and be renovated.

Plumbing Waste and Vent Piping

Waste and Vent piping that was observed appeared to be original which is 60+ years old and past its rated useful life. Recommend replace all building original piping with new.

Roof Drains and Piping

Roof Drains appear to have been recently replaced and are in fair to good condition. Storm piping that was observed throughout the building appears to be original which is 60+ years old and is past its rated useful life. Recommend replace all building original piping with new

Domestic Water Piping

Domestic water enters the building into a classrooms casework on Commonwealth Ave side of the building. The service size is approximated as 2 1/2". Domestic water piping that was observed appeared to be original which is 60+ years old and past its rated useful life. Recommend replace all building original piping with new. In addition it is recommended to relocate the service entrance to an area where it can be serviced. A check valve was not observed.

Plumbing Fixtures

Plumbing fixtures appear to be original to building.

- Water closets – White vitreous china; with battery or manual operated flush valve
- Urinals – White vitreous china; with battery operated flush valve
- Sinks – Wall mounted are white vitreous china
- Sinks – Wall mounted gang are solid surface (3) gang; sensor operated
- Sinks – Counter mounted are stainless steel.
- Electric water fountains in facility are found to wall mounted and free standing.

New Facility Plumbing

If it is determined that the existing building will be demolished or be required to have a major renovation, see the following recommendations for new system design.

Plumbing Waste and Vent Piping

Extra Heavy Hubless Cast Iron pipe and fittings shall be manufactured from gray cast iron and shall conform to ASTM A 888 and CISPI Standard 301. All pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute ® and listed by NSF® International. Hubless Couplings shall conform to CISPI Standard 310 and be certified by NSF® International. Heavy Duty couplings shall conform to ASTM C 1540 and shall be used. Gaskets shall conform to ASTM C 564. All pipe and fittings to be produced by a single manufacturer and are to be installed in accordance with manufacturer's recommendations and applicable code requirements. Couplings shall be installed in accordance with the manufacturer's band tightening sequence and torque recommendations. Tighten bands with a properly calibrated torque limiting device. The system shall be hydrostatically tested after installation to 10 ft. of head (4.3 psi maximum).

Type DWV copper drainage piping with cast bronze drainage pattern fittings with solder joints.

The sanitary piping will require cleanouts at every pipe direction change and on 75 foot centers. All sanitary and roof drainage piping shall service weight cast iron hub and spigot piping with compression gasket joints. All plumbing vents shall terminate a minimum of 50 feet from any outdoor air intake.

Roof Drains and Piping

The primary roof drainage system shall consist of standard round dome type drains with cast iron body, flashing clamp, sump receiver, and 15" cast iron locking strainers. The secondary roof drainage system shall consist of overflow scuppers provided on flat roof areas with parapets or roof drains adjacent to the primary drains with standard round dome type drains, cast iron body, flashing clamp, sump receiver, 15" cast iron locking strainers, and 4" pipe overflow extension.

Domestic Water Piping

The domestic water system for the building shall be served by a NSF 61 compliant water supply with gate service valves and ASSE or CSA compliant reduced pressure zone backflow preventer located in the main mechanical room. A domestic water booster pump is not anticipated to be required.

Domestic water distribution within the building will serve the toilet rooms, janitor closets, classrooms, kitchen, health unit, pantries, drinking fountains, hose bibbs and non-freeze wall hydrants. Piping shall be NSF 61 compliant type L Hard Copper with lead free solder and 150 lb, flanged or screwed, gate or ball, bronze valves. Piping insulation shall be a minimum of 1 inch for all hot water and a minimum of 0.5 inch for cold water 4 inches and above.

Domestic Hot Water shall be provided by two (2) hydronic natural gas-fired condensing style boilers, and indirect storage tank, ASME rated thermal expansion tank, in-line circulating pumps, and ASSE 1017 compliant central thermostatic mixing valve. Domestic hot water shall be designed for 140 deg F supply distribution temperature and a 120 deg F return water temperature at peak demand.

Plumbing Fixtures

Plumbing fixtures shall be lead-free, low flow, Water Sense type and ADA compliant. All water closets, lavatories, sinks, drinking fountains, emergency showers, floor drains, etc. shall be commercial grade.

- **Student water closets shall be Water Sense and ADA compliant floor-mounted type with "Capacitive sensor" type handsfree top spud flush valves with side mounted operator and a maximum flow rate of 1.28gpf. Power source shall be (4) "C" size battery or self-generating with battery backup.**
- **Adult water closets shall be Water Sense and ADA compliant wall-mounted type with "Capacitive sensor" type handsfree, top spud flush valves with side mounted operator and a maximum flow rate of 1.28gpf. Power source shall be (4) "C" size battery or self-generating with battery backup.**
- **Urinals shall be Water Sense and ADA compliant wall-mounted type with "Capacitive sensor" type handsfree, top spud flush valves with side mounted operator and a maximum flow rate of 0.125gpf. Power source shall be (4) "C" size battery or self-generating with battery backup.**
- **Lavatory faucets shall be Water Sense and ADA compliant "Capacitive sensor" type handsfree faucets with a maximum flow rate of 0.5gpm. Power source shall be battery or self-generating with battery backup. Lavatories shall have an ASSE 1070 compliant manual thermostatic mixing valve w/ lockable box centrally located to control a maximum of 4 lavatories.**
- **Sinks serving pantries, classrooms and art areas shall be stainless steel type with a maximum flow rate of 2.5gpm and local sediment**

interceptors provided as required. Classroom sinks shall have a 5.25" radius gooseneck faucet, less bubbler, centered on the back ledge with lever handles.

- Electric water cooler and drinking fountains shall be bi-level ADA compliant with manually operated bubbler controls. Indoor electric water coolers shall have bottle fillers and filters while the exterior non-chilled drinking fountains shall be non-freeze type units.
- Floor drains shall be provided to serve mechanical equipment, drain discharges, bathrooms, kitchens, and washdown areas. Floor drains shall be of size and type suitable for the application.

Existing Facility Electrical

Electrical Distribution

The facility is served by a 480Y/277 volt, 3-phase,4 wire 1600A electric service. The main electric switchboard is manufactured by GE with a bus rated at 1600A with a 1600A switch. The switchboard is in fair condition. Recommend annual maintenance, infrared scanning as well as completion of a short circuit/coordination/arc flash hazard study. Surge protection was not observed on the main switchgear or on any of the secondary panel boards. The addition of surge protection is recommended to minimize the effects of electrical transients that may be transmitted on the incoming power lines. Voltage surges and other electrical transients can cause damage to equipment resulting in untimely equipment replacement or repair.

The switchboard serves multiple 480:208/120V step down transformers that in turn feed branch panel boards throughout the space. The transformers are estimated to be approximately 20 years old. The transformers are surrounded by storage materials. It is recommended that the room be cleared out and all materials around the transformers be removed to allow the transformer to vent.

The normal power main switchboard and some distribution panel boards are located in the main Electric Room. Branch panel boards are located throughout the school in hallways, classrooms, etc. Most of the Panel boards appear to be antiquated and original to the building and it is recommended that they and their associated feeders be replaced. Infrared scanning is recommended for all electrical connections in the panel boards that are to remain to ensure proper operation and prevent future failures.

All new panel boards that are installed to replace old shall be hinged cover (door-in-door) construction. All feeders and exposed branch circuits shall be insulated copper conductors routed in EMT conduit.

Emergency Electrical Distribution

Building is not served by an emergency generator. The Emergency lighting is provided by emergency light sets as well as integral battery packs. These fixtures are past their useful life and should be replaced.

Interior Lighting

Most areas in the facility utilize linear fluorescent lighting. Linear fluorescent fixtures in the facility are typically 2'x4' troffers with acrylic or parabolic lens with T-8 lamps. The fluorescent lighting is estimated to be near or past its rated useful life, in addition is very inefficient as compared to current LED lighting solutions. Recommend replacement with new LED light fixtures. This will assist with energy efficiency and help lower electric utility costs. Other lighting such as specialty lighting in private restrooms and closets appears to be original to building. It is recommended that these fixtures be replace with new LED lighting fixtures.

Exterior Lighting

Exterior lighting is provided by wall mounted high intensity discharge wall packs. These are inefficient and should be replaced.

Wiring Devices

Switches and receptacles that were observed in the original sections of the school appeared to be original. Multiple layers of paint has been applied to the devices which can affect their operation. In addition, some of the light switches did not appear to be switching normally and were a little "spongy". It is recommended that all wiring devices that are original to the facility be replaced with new.

Wiring

Wiring that is existing to building is estimated to be approximately 63 years old. The useful life expectancy for wiring is 50 years. It is recommended that all wiring that is original to the facility be replaced with new.

Fire Alarm

The building is served by multiple FA systems.. (1) antiquated Simplex analog type and (1) Honeywell addressable system. Devices throughout the facility are past their useful life. Recommend complete replacement of FA devices and antiquated system components.

New Facility Electrical

If it is determined that the existing building will be demolished or be required to have a major renovation, see the following recommendations for new system design.

Electrical Distribution

Underground primary electric service shall be routed to a new pad mounted utility transformer located near the new building. A new secondary service will be extended from the utility transformer to feed new 2000A/277/480V/3PH/4W (est) switchgear located in the main electric room. Each floor of the building shall have dedicated electrical spaces with 277/480V/3PH/4W and 120/208V/3PH/4W branch circuit panel boards separated for specific loads such as mechanical equipment, lighting, receptacles, etc.

A multi-circuit sub-metering device connected to the building automation system shall monitor all building load categories including renewable energy and report to the energy dashboard system.

All wiring shall be copper, minimum #12AWG installed in conduit, minimum size ¾". MC cable is not acceptable. Power connections and code required disconnecting means will be provided for all HVAC and plumbing equipment. Combination starter/fusible disconnects will be provided for selected equipment as required.

Integral surge protective devices will be provided for the main service switchgear and all branch circuit panels. Main Circuit breaker on the switchgear will be equipped with Phase loss monitors and undervoltage/overvoltage trip settings.

Receptacles will be located at each teacher workstation location, equipment locations and on each wall for convenience. All collaboration spaces in the corridors will be provided with additional power per classroom standards.

Emergency Electrical Distribution

A new 150kW diesel generator (BOD: Cummins) with 48-hour dual-wall sub-base fuel tank will be provided for life-safety and general emergency loads.

All Life safety emergency electrical distribution equipment will be housed in a separate room from the normal power equipment. The Emergency system shall consist of two automatic transfer switches - one each for life-safety and general branch, two distribution transformers - one each for life-safety and general branch and a limited number of life-safety and general branch panel boards. All life-safety emergency loads shall be selectively coordinated to 0.1 seconds. A remote generator annunciator panel will be provided.

Interior Lighting

Interior artificial lighting will be accomplished with recessed high-performance LED direct/indirect fixtures throughout the building with more decorative LED lighting in selected spaces such as Media Center, Entry Lobby, Dining, etc. Alternate pricing shall be provided for Dynamic Lighting fixtures (tunable white) in all classrooms with the ability to independently raise/lower lighting intensity and CCT. Lighting in the Gymnasium will be LED high bays with semi -diffuse acrylic lens. Lighting throughout will meet the latest Illuminating Engineering Society of North America (IESNA)

Interior egress lighting shall be connected to the life-safety branch of emergency power.

100% occupancy/vacancy sensor coverage will be provided throughout except in electrical and mechanical rooms. Occupancy sensors will be automatic on/automatic off. Vacancy sensors will be manual on/automatic off. Automatic daylight dimming will be employed in all daylight zones. Dimming controls/scene controls will be provided in all classrooms and offices. All interior lighting controls will be stand-alone systems (BOD: nLight).

Exterior Lighting

Dark sky compliant LED exterior lighting will be provided at all exit doors for egress lighting. Site pathway lighting will be post top LED fixtures (BOD: Lithonia #DSX) on straight round aluminum poles and in accor-

dance with the site guidelines. Color temperature shall be 4000K. Backlight shielded optics will be utilized to minimize glare to adjacent properties as necessary. Exterior lights will also feature integral motion sensing for reduced glare, energy usage and extended LED lamp life. Exterior egress lighting shall be connected to the life-safety branch of emergency power.

Exterior lighting will be controlled through a photocell/timeclock combination. A lighting contactor will be provided with HOA option and tied into the BAS system. Exterior light fixtures will feature integral motion sensors for reduced glare, energy usage and extended LED lamp life.

Fire Alarm

A new fully addressable voice evacuation type fire alarm system (BOD: Simplex) shall be provided with notification and initiation devices per NFPA requirements. All peripheral devices shall be installed per ADA requirements. Manual pull stations will be located within five (5) feet of each exterior egress door, and within 150 feet of an egress door. Fire alarm strobe/audio devices will be provided to comply with ADA requirements. Smoke detectors will be photoelectric type. Connections will be provided to all fire suppression equipment, air handling units over 2,000CFM, door access controls, etc. A Graphic annunciator panel will be placed at the main entrance to the building and at each fire department entrance into the building.

Technology

Telephone/Data

The contractor will provide all rough-in's, faceplates, cabling paths, cabling and patch panels for all telephone and data systems. Telephone system shall be IP based. Owner shall provide active components including wireless access points. Minimum stub-out conduit size will be 1" and cabling paths will consist of 12" cable tray with J-hook assemblies on 48" centers.

The horizontal data network will utilize CAT 6 infrastructure. Wireless coverage will be provided for the entire school utilizing CAT 6A cabling.

WAPs will be laid out to create a fence to fence coverage pattern both on the interior of the building and the exterior of the building.

The phone system will be as per owner's specification.

Fiber backbone will consist of 12 strand multimode OM3 fiber optic cable with LC connectors supporting full 10gig uplinks.

Public Address System

A building wide Public Address System will be integrated into the Unified Communications system with visual devices in select rooms that will be determined as design progresses.

Electronic Safety & Security

A new ESS system will include interior and exterior Video Management Systems (VMS) coordinated with Dedicated Micros and a Security Management Control System (SMS) (BOD: Software House).
The SMS includes door access and logic capabilities such as visitor management, time schedules, intrusion detection and digital signage for emergency notification features. VMS will include security cameras that will be specified along with servers and analytics (motion detection) that run them. Both VMS and SMS systems will be integrated with a single web portal interface at a later time after this project is complete by the District.

Lightning Protection

See attached document for lighting protection risk analysis. Building shall feature a complete Lightning Protection System certified to NFPA 780 standards. System shall comply with UL #96A. Building steel shall not be used as a down conductor. Down conductors shall be concealed within the building. Each down conductor shall be terminated to a dedicated ground rod. Surge protective devices shall be provided for all systems identified in NFPA 780.

Fire Protection

The existing 6" fire service currently serves the newer addition, leaving the remainder of the facility without sprinklers. The existing building is not fully sprinklered.

Recommend extension and/or expansion of the fire suppression system to cover the entire building.

MEP Narrative George Mason Elementary School

Current Code and Standard Compliance:

2015 Virginia Statewide Building Code (VUSBC)

2015 International Building Code (IBC) with Virginia Amendments

2015 International Mechanical Code (IMC) with Virginia Amendments

2015 International Plumbing Code (IPC) with Virginia Amendments

2015 Virginia Statewide Fire Prevention Code
NFPA 90A

2014 National Electric Code / NFPA 70

2015 International Fuel Gas Code (IFGC) with Virginia Amendments

2015 International Energy Conservation Code (IECC) (or ASHRAE equivalent)

ASHRAE 90.1-2010

ASHRAE 55-2013

2005 SMACNA HVAC Duct Construction Standards - Metal and Flexible

Existing Facility Mechanical

Overview

George Mason Elementary School was built in 1939. The building had two major renovations, in 1949 and 1977. Other building renovations took place in 1988, 1997 and 2005. In 2014 the school had an expansion which included an enlarged cafeteria, and four new classrooms.

The majority of the existing building is served by floor mounted fan coil units, rooftop mounted VAV air handling units that were manufactured in 2013, DX split systems as well as VRF systems in the newer addition. RTUs are gas fired and DX cooled. In a replacement scenario it is not recommended to repurpose any of these units.

Fan coil units are in poor condition. They are no longer being controlled with thermostats and are extremely noisy. It is recommended that these unit be replaced.

The rooftop units are in fair condition and have 5-10 years of remaining expected useful life.

DX split system was observed to be inoperable. It was noted from the building staff that the unit was not connected and is inoperable. It is recommended that this unit be investigated and repaired/replaced.

The VRF system in the new addition were in good condition. These systems have an additional expected useful of 10-12 years.

Hydronic piping is noted that it is experiencing leaks and throughout the system. It is recommended that the existing building piping be replaced. Heating hot water for the fan coil units is produced via (2) Fulton Gas Fired pulse combustion boilers. The boilers appear to be approximately 15 years old. Expect to replace in the next 3-5 years.

Chilled water for the fan coil units is produced by a Carrier air cooled chiller. The chiller appears to be new and in good condition.

Heating hot water and chilled water is distributed throughout the facility by centralized pumps with variable frequency drives. The pumps appear to be in fair condition.

Building air is exhausted with roof mounted exhaust ventilators. The ventilators are in fair condition.

All existing units, associated ductwork, controls, and air devices in areas to be renovated shall be removed. Existing terminal equipment, such as unit heaters, VAVs, etc. shall be removed. It is not anticipated that any existing mechanical infrastructure in renovated areas will be utilized for future use.

Demolition of existing equipment shall be performed in a phased manner as required by overall project phasing. Scope of Work

New Facility Mechanical

If it is determined that the existing building will be demolished or be required to have a major renovation, see the following recommendations for new system design.

Replacement Design Conditions

The design criteria listed below shall be used for conceptual HVAC design, payback evaluation, and heating/cooling load calculations.

Site Data:

Building Location: Alexandria, VA
Physical Address: 3600 Commonwealth Ave
Square Footage of Renovated Area: See Architectural sq. ft.
Main Building Total Area: See Architectural sq. ft.
Latitude: 38.82 / Longitude: -77.07, Elevation: 60 feet
Building Orientation: Main entrance faces East/Southeast
ASHRAE 90.1 Climate Zone: 4A
Outdoor Design Conditions:

Based on ASHRAE 2017 Handbook - Fundamentals for Ronald Reagan Washington Natl, VA, USA

Heating - ASHRAE 99.6% Peak Design Condition: 17.9 deg F DB

Cooling - ASHRAE 0.4% Peak Design Condition: 94.7 deg F DB / 75.5 deg F MCWB

Indoor Design Conditions

Equipment shall be sized and designed to maintain the following setpoints within a 2 degree deadband. Maximum class size is assumed to be 24 students and one teacher.

Classrooms / Support Spaces:

Heating Season:	**Occupied Mode:**	**70 deg F DB / no humidity control**
	Vacant Mode:	**68 deg F DB**
	Unoccupied Mode:	**60 deg F DB**
Cooling Season:	**Occupied Mode:**	**75 deg F DB / 40-60% RH**
	Vacant Mode:	**78 deg F DB**
	Unoccupied Mode:	**85 deg F DB**

Toilet Rooms / Group Restrooms: Ventilated/Exhausted

Cafeteria:

Heating Season:	**Occupied Mode:**	**70 deg F DB / no humidity control**
	Vacant Mode:	**68 deg F DB**
	Unoccupied Mode:	**60 deg F DB**
Cooling Season:	**Occupied Mode:**	**78 deg F DB / 40-60% RH**
	Vacant Mode:	**82 deg F DB**
	Unoccupied Mode:	**85 deg F DB**

Building Occupancy & Schedule

The facility is anticipated to be occupied Monday through Friday, 7am-5pm and Saturday/Sunday based on a special event scheduling only. The building will not be utilized year-round. The administration area (out of scope) is the only area that was stated to have year round occupancy. Detailed occupancy and loading schedules shall be provided as part of future space by space analysis.

System Options

System modeling and selection will be determined during the design phase. For budgeting purposes, two probable system options are as follows:

Option 1 - Geothermal Heat Pumps with DOAS

This option has been explored by CMTA due to energy performance and overall system simplicity as it relates to controls and operation. The HVAC system for this option consists of unitary geothermal heat pumps for zone thermal comfort control and dedicated outdoor air handling units (DOAS) with fixed-plate energy recovery for delivery of code required outside air. The ventilation (outside) air is de-coupled from the HVAC heating and cooling with each space (or zone) receiving outside air separately utilizing demand control ventilation.

Each heat pump will be a high efficiency, variable speed compressor heat pump unit (below 5 tons) with an ECM fan motor. Units can be horizontally hung and installed in the plenum space above ceiling or floor mounted in closets outside of classroom. Each heat pump unit will utilize refrigerant R-410A and will have an ozone depleting potential (ODP) of 0.05 or less.

Each classroom zone is anticipated to have its own heat pump and space temperature sensor, one per room or shared (1 per two adjacent classrooms – TBD). The unit will operate by maintaining the temperature of the space based on the adjustable space temperature setpoint. Each space temperature sensor shall have a push button override for a 2-hour (adjustable) override to the occupied mode of operation.

Each office and corridor zone is anticipated to have a shared heat pump with VAV diffusers to allow thermal comfort control in each office. The unit will operate with a static pressure reset controlling the ECM fan motor.

Each space temperature sensor shall have a push button override for a 2-hour (adjustable) override to the occupied mode of operation.
The Cafeteria will each have a new single-zone VAV geothermal water-cooled packaged RTU installed. The unit will operate by maintaining the temperature of the space based on averaging multiple space temperature sensors. Each space temperature sensor shall have a push button override for a 2-hour (adjustable) override to the occupied mode of operation. Where demand control ventilation is applied, spaces will include a CO2 sampling/measuring port and occupancy sensors. The thermostat (and associated sensors), CO2 and occupancy sensors are to interface to the building automation system. The CO2 measuring port and occupancy sensor inputs will be utilized to control the space ventilation terminal unit and space temperature set points.

All heat pump units shall have fully ducted supply and return with sheet metal ductwork. Each heat pump unit will include a duct-mounted pre-filter rack. The pre-filters shall be 24”x24” Flanders/FFI PrePleat 40. Each heat pump shall include an integral disconnect switch. Condensate for each unit will be disposed of through a floor drain or open receptacle into the sanitary system.

Approximate sizes are as follows:

- **Classrooms - The heat pump unit zones serving classrooms will utilize units sized between 2-6 tons, depending on classroom size and location within the building.**
- **Corridors - The heat pump unit zones serving corridors will utilize units sized at approximately 2 tons.**
- **Offices - The heat pump unit zones serving offices will utilize units sized at approximately 2 -3 tons, depending on office zone size and location within the building.**
- **Cafeteria – The water-cooled packaged RTU will be sized for approximately 25-tons.**

Ventilation Systems (DOAS)

The DOAS unit shall provide ventilation air as described in Option 2. However, it shall be configured as a water-cooled unit with listed manufacturers as Trane, Valent, or Carrier or other approved equal.

Geothermal Well Field and Piping System

The well field geothermal system pumping system shall consist of two variable flow pumps (one operational – one 100% standby) for pumping the water to all heat pumps and geo AHU's/RTU's throughout the building. The pumps shall be located in the Mechanical Room and circulate water throughout the well field.

Option 2 – 4-Pipe Fan Coil Units and Dedicated Outdoor Air System (DOAS)

The HVAC system for this option shall utilize 4-pipe fan coil units for zone thermal comfort control and outside air handling units with fixed-plate energy recovery for delivery of code required outside air. A central air-cooled chiller, pumping system, and chilled water piping network will be utilized to circulate chilled water to each unit. Chiller shall be equal to Trane Stealth, tonnage to be determined. Chiller contains two refrigerant circuits. The boilers shall be gas-fired, high-efficiency condensing style boilers to reduce energy consumption. Boilers shall be equal to Viessmann Vitocrossal 300, 3,000 MBH, 2 each.

The ventilation (outside) air is de-coupled from the HVAC heating and cooling with each space (or zone) receiving outside air separately utilizing demand control ventilation.

Each fan coil unit will be equipped with an ECM fan motor, 1" disposable MERV 8 filter, hydronic heating and cooling coil, piping package with two-way modulating control valve, strainer, balance valve, and isolation valves. Units can be configured horizontally (hung and installed in the plenum space above ceiling) or vertically (floor-mounted in the space). Unit controller shall either be provided by Temperature Controls Contractor and field installed or provided by Unit Manufacturer and factory installed.

Hydronic (chilled water and heating hot water) piping and insulation shall be as follows:

2" and smaller: Type L drawn-copper tubing with brazed or pressure-seal (Propress) joints and wrought, cast copper fittings, brazed or pressure-seal. Mineral fiber preformed pipe insulation with all service jacket for indoor, concealed piping.

2 ½" and larger: Carbon steel, Schedule 40, with wrought-steel fittings and wrought-cast or forged-steel flanges and flange fittings, welded and flanged joints. Mechanical grooved couplings may be considered as a bid alternate. Mineral fiber preformed pipe insulation with all service jacket for indoor, concealed piping. Outdoor exposed piping shall have stucco embossed aluminum jacket.

Each classroom zone is anticipated to have its own unit and space temperature sensor, one per room. The unit will operate by maintaining the temperature of the space based on the adjustable space temperature set-point. Each space temperature sensor shall have a push button override for a 2-hour (adjustable) override to the occupied mode of operation.

Each office zone is anticipated to have a shared unit with VAV diffusers to allow thermal comfort control in each office or a dedicated unit. The unit will operate with a static pressure reset controlling the ECM fan motor for variable flow with shared units. Each space temperature sensor shall have a push button override for a 2-hour (adjustable) override to the occupied mode of operation.

The Cafeteria will be served by a single-zone VAV Air Handling Unit, 4-pipe. The unit will operate by maintaining the temperature of the space based on averaging multiple space temperature sensors. Each space temperature sensor shall have a push button override for a 2-hour (adjustable) override to the occupied mode of operation.

IT Rooms shall be served by air-cooled DX split systems, approximately 1 to 1.5 tons each.

Where demand control ventilation is applied, spaces will include a CO2 sampling/measuring port and occupancy sensors. The thermostat (and associated temperature sensors), CO2 and occupancy sensors are to interface to the building automation system. The CO2 measuring port and occupancy sensor inputs will be utilized to control the space ventilation terminal unit and space temperature set points.

All fan coil units mounted above ceiling shall have fully ducted supply and return with sheet metal ductwork. Each unit shall include an integral disconnect switch. Condensate for each unit will be gravity drained where possible.

Approximate sizes are as follows:

- Classrooms - The zones serving classrooms will utilize units sized between 2-6 tons, depending on classroom size and location within the building.
- Corridors - The zones serving corridors will utilize units sized at approximately 2 tons.
- Offices - The zones serving offices will utilize units sized at approximately 2 -3 tons, depending on office zone size and location within the building.
- Cafeteria – The RTU will be sized for approximately 25-tons.

Ventilation Systems (DOAS)

The outside air systems for the building shall be de-coupled from the conditioning systems. In general, outside air shall be provided directly to the occupied zone. The dedicated outside air handling unit will be outdoor, roof mounted, double wall construction, and include dual supply/exhaust plenum fans. The units shall be variable volume energy recovery type units utilizing building exhaust and general exhaust air to precondition the outside air through a total energy recovery enthalpic plate. All conditioned outside air ductwork and building exhaust air ductwork will not be insulated – this applies to positive pressure outside air ductwork and negative pressure exhaust air ductwork. All un-conditioned air ducts shall be insulated with 3" thick, ¾ pcf duct wrap with vapor barrier – this applies to negative pressure outside air ductwork and positive pressure exhaust air ductwork.

The DOAS unit shall be a packaged air-cooled, DX cooling, natural gas heat, unit with listed manufacturers as Trane, Valent, Carrier, or other approved equal. The outside air units will consist of the following sections/components: stacked and in the direction of air flow will be an inlet filter, enthalpic plate, plenum type, dual exhaust air fans (each sized at 50% airflow), on the bottom will be an inlet filter, enthalpic plate, access, gas-fired heating section, access, plenum type, dual supply air fans (each sized for 50% airflow), and final filter bank. Each fan bank will be controlled by a VFD for varying airflow conditions. During low ventilation conditions, only one of the fans would be needed to meet the ventilation requirements. The exhaust fan is sized at 20% reduction in capacity (thus maintaining building pressurization). The supply air distribution system will supply outside air to terminal units for distribution of outside air to each zone. The outside air conditioning system will be provided with an air-cooled DX circuit. The resulting winter supply temperature is approximately 70 degrees F and summer supply air temperature shall be approximately 68 degrees F DB/63 degrees F WB.

To control outside air, a central CO2 monitoring system (Aircuity) will be provided to take advantage of building diversity. Each variable occupied area/room will contain a CO2 measuring port with a high quality central CO2 sensor. The VAV terminal will modulate in accordance with the space CO2 measurements. The VAV terminal will also be interlocked with a room occupancy sensor. The ventilation rate will be modulated based on occupied and vacant spaces conditions. The total space by space occupancy count is expected to exceed actual building occupancy. Designing a variable ventilation system based on actual building occupancy reduces the central ventilation system by approximately 30 percent, thus reducing the overall HVAC load.

Building Automation System (BAS) / HVAC Controls

All new packed equipment shall be provided with DDC controllers for integration to BAS. All existing equipment shall be integrated into new BAS.

The following shall be included as part of the controls scope of work:

- Control or integration of new terminal equipment (fan coil units). Control devices (valves, sensors, etc.) and controller by TCC or equipment manufacturer has not yet been determined.
- Integration of new Air Handling Units and DOAS Units. It is anticipated that unit level controls and controller will be provided by unit manufacturer.
- Integration of rooftop HVAC units (gym, etc).
- Integration of HVAC central plant (boilers/chillers)
- Control of hydronic pumps
- Exhaust fan control for toilet rooms, restrooms, etc.
- Supplemental heater control (unit heaters, cabinet heaters, etc.)
- IT Server / MDF rooms – space temperature monitoring and alarming
- Plumbing –domestic hot water heater temperature monitoring and alarming
- Plumbing –domestic water circulation pump control and monitoring
- Kitchen –makeup air unit monitoring and cooler/freezer temperature monitoring and alarming
- Energy Meters – monitoring and BTU/energy tabulation for primary natural gas and electric consumption

Existing Facility Plumbing

Overview

The existing building plumbing systems, including domestic hot and cold water, sanitary and vent piping. The existing piping systems in the original building appears to be original to building.
Natural Gas Service

- A metered natural gas service is currently supplied to the building by Washington Gas. The service serves the RTUs and domestic hot water heaters . No documentation was found to indicate the age of the existing piping system. The exterior piping has flaking paint and is beginning to rust on surface and at flanges. Recommend refinish/paint exposed piping if building is to remain and be renovated.

Plumbing Waste and Vent Piping

Waste and Vent piping that was observed appeared to be original which is 60+ years old and past its rated useful life. Recommend replace all building original piping with new.

Roof Drains and Piping

Roof Drains appear to have been recently replaced and are in fair to poor condition. Storm piping that was observed throughout the building appears to be original which is 60+ years old and is past its rated useful life. Recommend replace all building original piping with new. Some roof drains were observed as being blocked with plants growing out of them recommend walking the roof and cleaning out all roof drains.

Domestic Water Piping

Domestic water enters the building into a classrooms casework on Commonwealth Ave side of the building. The service size is approximated as 2 1/2". Domestic water piping that was observed appeared to be original which is 60+ years old and past its rated useful life. Recommend replace all building original piping with new. In addition it is recommended to relocate the service entrance to an area where it can be serviced. A check valve was not observed.

Plumbing Fixtures

Plumbing fixtures appear to be original to building.

- Water closets – White vitreous china; with battery or manual operated flush valve
- Urinals – White vitreous china; with battery operated flush valve
- Sinks – Wall mounted are white vitreous china
- Sinks – Wall mounted gang are solid surface (3) gang; sensor operated
- Sinks – Counter mounted are stainless steel.
- Electric water fountains in facility are found to wall mounted and free standing.

New Facility Plumbing

If it is determined that the existing building will be demolished or be required to have a major renovation, see the following recommendations for new system design.

Plumbing Waste and Vent Piping

- Extra Heavy Hubless Cast Iron pipe and fittings shall be manufactured from gray cast iron and shall conform to ASTM A 888 and CISPI Standard 301. All pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute ® and listed by NSF® International. Hubless Couplings shall conform to CISPI Standard 310 and be certified by NSF® International. Heavy Duty couplings shall conform to ASTM C 1540 and shall be used. Gaskets shall conform to ASTM C 564. All pipe and fittings to be produced by a single manufacturer and are to be installed in accordance with manufacturer's recommendations and applicable code requirements. Couplings shall be installed in accordance with the manufacturer's band tightening sequence and torque recommendations. Tighten bands with a properly calibrated torque limiting device. The system shall be hydrostatically tested after installation to 10 ft. of head (4.3 psi maximum).
- Type DWV copper drainage piping with cast bronze drainage pattern fittings with solder joints.
- The sanitary piping will require cleanouts at every pipe direction change and on 75 foot centers. All sanitary and roof drainage piping shall service weight cast iron hub and spigot piping with compression gasket joints. All plumbing vents shall terminate a minimum of 50 feet from any outdoor air intake.

Roof Drains and Piping

The primary roof drainage system shall consist of standard round dome type drains with cast iron body, flashing clamp, sump receiver, and 15" cast iron locking strainers. The secondary roof drainage system shall consist of overflow scuppers provided on flat roof areas with parapets or roof drains adjacent to the primary drains with standard round dome type drains, cast iron body, flashing clamp, sump receiver, 15" cast iron locking strainers, and 4" pipe overflow extension.

Domestic Water Piping

The domestic water system for the building shall be served by a NSF 61 compliant water supply with gate service valves and ASSE or CSA compliant reduced pressure zone backflow preventer located in the main mechanical room. A domestic water booster pump is not anticipated to be required.

Domestic water distribution within the building will serve the toilet rooms, janitor closets, classrooms, kitchen, health unit, pantries, drinking fountains, hose bibbs and non-freeze wall hydrants. Piping shall be NSF 61 compliant type L Hard Copper with lead free solder and 150 lb, flanged or screwed, gate or ball, bronze valves. Piping insulation shall be a minimum of 1 inch for all hot water and a minimum of 0.5 inch for cold water 4 inches and above.

Domestic Hot Water shall be provided by two (2) hydronic natural gas-fired condensing style boilers, and indirect storage tank, ASME rated thermal expansion tank, in-line circulating pumps, and ASSE 1017 compliant central thermostatic mixing valve. Domestic hot water shall be designed for 140 deg F supply distribution temperature and a 120 deg F return water temperature at peak demand.

Plumbing Fixtures

Plumbing fixtures shall be lead-free, low flow, Water Sense type and ADA compliant. All water closets, lavatories, sinks, drinking fountains, emergency showers, floor drains, etc. shall be commercial grade.

- Student water closets shall be Water Sense and ADA compliant floor-mounted type with "Capacitive sensor" type handsfree top spud flush valves with side mounted operator and a maximum flow rate of 1.28gpf. Power source shall be (4) "C" size battery or self-generating with battery backup.
- Adult water closets shall be Water Sense and ADA compliant wall-mounted type with "Capacitive sensor" type handsfree, top spud flush valves with side mounted operator and a maximum flow rate of 1.28gpf. Power source shall be (4) "C" size battery or self-generating with battery backup.
- Urinals shall be Water Sense and ADA compliant wall-mounted type with "Capacitive sensor" type handsfree, top spud flush valves with side mounted operator and a maximum flow rate of 0.125gpf. Power source shall be (4) "C" size battery or self-generating with battery backup.
- Lavatory faucets shall be Water Sense and ADA compliant "Capacitive sensor" type handsfree faucets with a maximum flow rate of 0.5gpm. Power source shall be battery or self-generating with battery backup. Lavatories shall have an ASSE 1070 compliant manual thermostatic mixing valve w/ lockable box centrally located to control a maximum of 4 lavatories.
- Sinks serving pantries, classrooms and art areas shall be stainless steel type with a maximum flow rate of 2.5gpm and local sediment interceptors provided as required. Classroom sinks shall have a 5.25" radius gooseneck faucet, less bubbler, centered on the back ledge with lever handles.
- Electric water cooler and drinking fountains shall be bi-level ADA compliant with manually operated bubbler controls. Indoor electric water coolers shall have bottle fillers and filters while the exterior non-chilled drinking fountains shall be non-freeze type units.
- Floor drains shall be provided to serve mechanical equipment, drain discharges, bathrooms, kitchens, and washdown areas. Floor drains shall be of size and type suitable for the application.

Existing Facility Electrical

Electrical Distribution

The facility is served by a 208Y/120 volt, 3-phase,4 wire 2500A electric service. The main electric switchboard is manufactured by Siemens in 2003 with a bus rated at 2500A with a 2500A switch. The switchboard is in fair condition. It was noted that the facility has experienced ingress of storm water from outside and into electrical room through and around the switchboard area. It is recommended that this be fully investigated and that the switchboard be repaired/maintained to prevent future damage. Recommend annual maintenance, infrared scanning as well as completion of a short circuit/coordination/arc flash hazard study. Surge protection was not observed on the main switchgear or on any of the secondary panel boards. The addition of surge protection is recommended to

minimize the effects of electrical transients that may be transmitted on the incoming power lines. Voltage surges and other electrical transients can cause damage to equipment resulting in untimely equipment replacement or repair.

The normal power main switchboard and some distribution panel boards are located in the main Electric Room. Branch panel boards are located throughout the school in hallways, classrooms, etc. Many of the Panel boards appear to be antiquated and original to the building and it is recommended that they along with their feeders be replaced. Infrared scanning is recommended for all electrical connections in the panel boards that are to remain to ensure proper operation and prevent future failures.

Emergency Electrical Distribution

Building is served by a 150KW diesel fueled emergency generator. The generator is located on the exterior of the building. It is estimated that the generator and associated automatic transfer switch was manufactured and installed in 2003/2004. There is no reported issues with the operation of the generator. It is recommended that ACPS continue with regular scheduled maintenance and plan for replacement in the next 3-5 years.

Interior Lighting

Most areas in the facility utilize linear fluorescent lighting. Linear fluorescent fixtures in the facility are typically 2'x4' troffers with acrylic or parabolic lens with T-8 lamps. The fluorescent lighting is estimated to be near or past its rated useful life, in addition is very inefficient as compared to current LED lighting solutions. Recommend replacement with new LED light fixtures. This will assist with energy efficiency and help lower electric utility costs. Other lighting such as specialty lighting in private restrooms and closets appears to be original to building. It is recommended that these fixtures be replace with new LED lighting fixtures.

Exterior Lighting

Exterior lighting is provided by wall mounted high intensity discharge wall packs. These are inefficient and should be replaced.

Wiring Devices

Switches and receptacles that were observed in the original sections of the school appeared to be original. Multiple layers of paint has been applied to the devices which can affect their operation. In addition, some of the light switches did not appear to be switching normally and were a little "spongy". It is recommended that all wiring devices that are original to the facility be replaced with new.

Wiring

Wiring that is existing to building is estimated to be approximately 63 years old. The useful life expectancy for wiring is 50 years. It is recommended that all wiring that is original to the facility be replaced with new.

Fire Alarm

The building is served by a Firelite addressable fire alarm system. Devices throughout the facility are both newer and those that are past their useful life. Recommend complete replacement of FA devices and antiquated system components.

New Facility Electrical

If it is determined that the existing building will be demolished or be required to have a major renovation, see the following recommendations for new system design.

Electrical Distribution

Underground primary electric service shall be routed to a new pad mounted utility transformer located near the new building. A new secondary service will be extended from the utility transformer to feed new 2500A/208/120V/3PH/4W (est) switchgear located in the main electric room. Each floor of the building shall have dedicated electrical spaces with 208/120V/3PH/4W branch circuit panel boards separated for specific loads such as mechanical equipment, lighting, receptacles, etc.

All new panel boards that are installed to replace old shall be hinged cover (door-in-door) construction. All feeders and exposed branch circuits shall be insulated copper conductors routed in EMT conduit.

A multi-circuit sub-metering device connected to the building automation system shall monitor all building load categories including renewable energy and report to the energy dashboard system.

All wiring shall be copper, minimum #12AWG installed in conduit, minimum size ¾". MC cable is not acceptable. Power connections and code required disconnecting means will be provided for all HVAC and plumbing equipment. Combination starter/fusible disconnects will be provided for selected equipment as required.

Integral surge protective devices will be provided for the main service switchgear and all branch circuit panels. Main Circuit breaker on the switchgear will be equipped with Phase loss monitors and undervoltage/ overvoltage trip settings.

Receptacles will be located at each teacher workstation location, equipment locations and on each wall for convenience. All collaboration spaces in the corridors will be provided with additional power per classroom standards.

Emergency Electrical Distribution

A new 150kW diesel generator (BOD: Cummins) with 48-hour dual-wall sub-base fuel tank will be provided for life-safety and general emergency loads.

All Life safety emergency electrical distribution equipment will be housed in a separate room from the normal power equipment. The Emergency system shall consist of two automatic transfer switches - one each for life-safety and general branch, two distribution transformers - one each for life-safety and general branch and a limited number of life-safety and general branch panel boards. All life-safety emergency loads shall be selectively coordinated to 0.1 seconds. A remote generator annunciator panel will be provided.

Interior Lighting

Interior artificial lighting will be accomplished with recessed high-performance LED direct/indirect fixtures throughout the building with more decorative LED lighting in selected spaces such as Media Center, Entry Lobby, Dining, etc. Alternate pricing shall be provided for Dynamic Lighting fixtures (tunable white) in all classrooms with the ability to independently raise/lower lighting intensity and CCT. Lighting in the Gymnasium will be LED high bays with semi -diffuse acrylic lens. Lighting throughout will meet the latest Illuminating Engineering Society of North America (IESNA)

Interior egress lighting shall be connected to the life-safety branch of emergency power.

100% occupancy/vacancy sensor coverage will be provided throughout except in electrical and mechanical rooms. Occupancy sensors will be automatic on/automatic off. Vacancy sensors will be manual on/automatic off. Automatic daylight dimming will be employed in all daylight zones. Dimming controls/scene controls will be provided in all classrooms and offices. All interior lighting controls will be stand-alone systems (BOD: nLight).

Exterior Lighting

Dark sky compliant LED exterior lighting will be provided at all exit doors for egress lighting. Site pathway lighting will be post top LED fixtures (BOD: Lithonia #DSX) on straight round aluminum poles and in accordance with the site guidelines. Color temperature shall be 4000K. Backlight shielded optics will be utilized to minimize glare to adjacent properties as necessary. Exterior lights will also feature integral motion sensing for reduced glare, energy usage and extended LED lamp life. Exterior egress lighting shall be connected to the life-safety branch of emergency power.

Exterior lighting will be controlled through a photocell/timeclock combination. A lighting contactor will be provided with HOA option and tied into the BAS system. Exterior light fixtures will feature integral motion sensors for reduced glare, energy usage and extended LED lamp life.

Fire Alarm

A new fully addressable voice evacuation type fire alarm system (BOD: Simplex) shall be provided with notification and initiation devices per NFPA requirements. All peripheral devices shall be installed per ADA requirements. Manual pull stations will be located within five (5) feet of each exterior egress door, and within 150 feet of an egress door. Fire alarm strobe/audio devices will be provided to comply with ADA requirements. Smoke detectors will be photoelectric type. Connections will be provided to all fire suppression equipment, air handling units over 2,000CFM, door access controls, etc. A Graphic annunciator panel will be placed at the main entrance to the building and at each fire department entrance into the building.

Technology

Telephone/Data

The contractor will provide all rough-in's, faceplates, cabling paths, cabling and patch panels for all telephone and data systems. Telephone system shall be IP based. Owner shall provide active components including wireless access points. Minimum stub-out conduit size will be 1" and cabling paths will consist of 12" cable tray with J-hook assemblies on 48" centers.

The horizontal data network will utilize CAT 6 infrastructure. Wireless coverage will be provided for the entire school utilizing CAT 6A cabling. WAPs will be laid out to create a fence to fence coverage pattern both on the interior of the building and the exterior of the building.

The phone system will be as per owner's specification.

Fiber backbone will consist of 12 strand multimode OM3 fiber optic cable with LC connectors supporting full 10gig uplinks.

Public Address System

A building wide Public Address System will be integrated into the Unified Communications system with visual devices in select rooms that will be determined as design progresses.

Electronic Safety & Security

A new ESS system will include interior and exterior Video Management Systems (VMS) coordinated with Dedicated Micros and a Security Management Control System (SMS) (BOD: Software House).

The SMS includes door access and logic capabilities such as visitor management, time schedules, intrusion detection and digital signage for emergency notification features. VMS will include security cameras that will be specified along with servers and analytics (motion detection) that run them. Both VMS and SMS systems will be integrated with a single web portal interface at a later time after this project is complete by the District.

Lightning Protection

See attached document for lighting protection risk analysis. Building shall feature a complete Lightning Protection System certified to NFPA 780 standards. System shall comply with UL #96A. Building steel shall not be used as a down conductor. Down conductors shall be concealed within the building. Each down conductor shall be terminated to a dedicated ground rod. Surge protective devices shall be provided for all systems identified in NFPA 780.

Fire Protection

The building currently does not have a fire suppression system.

Masterplan Options

Masterplan options to be provided in next phase of report.

Life Cycle Cost Maintenance

The Life Cycle Cost analysis will be created once the Masterplan options have been established. Comparison of costs will be established for complete new construction compared to substantial renovations and additions.