Baltimore City Public Schools

Frederick Elementary School

No. 260

Comprehensive Feasibility Study
December 31, 2013

MT Project No. 13245

Addendum #1
April 24, 2014

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Executive Summary: Introduction

Purpose

As part of Baltimore City Public School's 21st-Century Buildings Initiative, the purpose of this study is to assess the recommendations for redevelopment of Frederick Elementary PK-5 School #260 as identified by the 2011 Facilities Condition Assessment for City Schools and subsequent 2012 State of School Facilities Report, completed by the Jacobs firm. Due to the anticipated closure of nearby Samuel F.B. Morse and Sarah M. Roach Elementary Schools, the study will also address the needed increase in capacity for the school as a result of the projected population growth to accommodate students transferring from those schools.

This study provides an assessment of the existing facilities and site conditions to evaluate the value and limitations associated with the existing building as well as evaluation of design options and related costs to meet the educational requirements of its student enrollment, satisfy school and community concerns and provide a cost effective, energy efficient and safe facility to meet the future needs of the school. Four design alternatives are analyzed in consideration of the Educational Specification, objectives of the school and community, physical limitations of the existing building and site and applicable codes and regulations. The result of the study is a comparison of the relative costs and the advantages and disadvantages of each proposed option.

Methodology

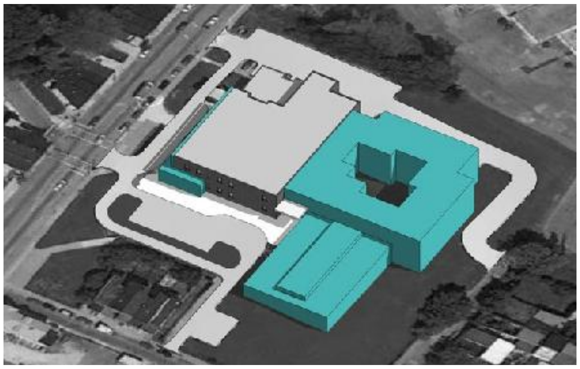
An evaluation of the existing school was conducted by the design team of architects and engineers for its potential reuse to meet proposed program requirements and also its ability function efficiently as a 21st-Century school. The methodology employed included a thorough review of all data and drawings that were available with respect to existing building and site conditions, visits to the site to conduct an existing conditions survey, meetings with members of the community, Frederick Elementary, Samuel F.B. Morse and BCPS staff, incorporation of review comments and objectives of the Educational Specifications and the development of design alternatives in response to the educational program and existing limitations.

Overview

Constructed in 1983, Frederick Elementary #260 is a Pre-K through 5th grade school located on the corner of Millington and Frederick Avenue in in southwest Baltimore. The school is approximately 47,273 SF on a 3.8 acre corner site. The school currently has 334 students enrolled for the 2013-2014 school year with a current student teacher ratio of 17:1. The school is a traditional City Schools-ran elementary school. Currently, grade levels are grouped together within the building on two floors. Lower grades (Pre-K, K and 1st) are on the first floor and higher grades (2nd, 3rd, 4th and 5th) are on the second floor. Two dedicated Classrooms are provided for each grade, utilizing a total of 14 Classrooms between all of the grade levels. Both Classrooms for each grade level are located in close proximity to the other. The two Pre-K Classrooms share one large space that has been divided with a 3/4 height partition. Common spaces are shared between the two Pre-K Classrooms, such as hallways, storage and a student toilet.

Additionally, there are several Classroom spaces which are shared amongst all grade levels. These include an Art Classroom, Special Education Classroom, Computer Classroom, a Reading Room, Flex Classroom, Gymnasium and the Media Center. All are located on the second floor of the building, with the exception of the Gymnasium, which is located on the a half floor level below the first floor. Currently there is a lack of a Science Classroom and Music Classroom at the School.

Executive Summary: Concept Introduction

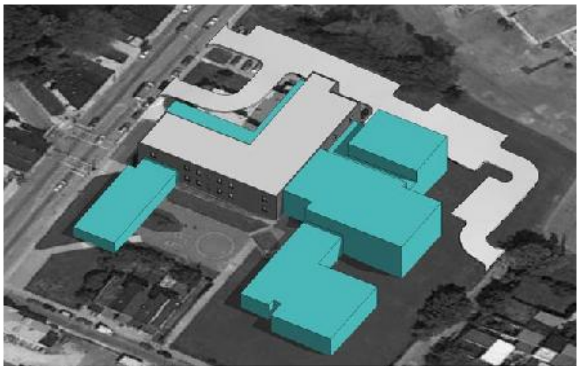


Design Concept A: Collaborative Courtyard

This Concept features an interior courtyard which provides a secure outdoor space for extended student learning and play. The existing Gym is renovated in place; with the SW wall extended to allow for expand floor space to meet program requirements. A large Community Space is located adjacent to the Cafeteria, and all the first floor classrooms are located in the new addition. Pre-K and Kindergarten spaces feature a large Collaborative Learning Area, while 1st and 2nd grades have views into the courtyard. The Second floor features Art, Music, and the Media Center in the existing structure as well as the 3rd grade classrooms. The 4th and 5th Grade classrooms are located within the new addition, along with Science and Technology.

Design Concept B: Flexible Commons

This Concept incorporates a new access drive and parking area at the existing traffic light in front of the school. The Community Space is centrally located within the first floor adjacent to the Cafeteria, Media Center and Administration areas creating a flexible "learning commons". The Cafeteria and Kitchen are expanded within the existing building with the Gym and classroom wings constructed as part of the new addition.



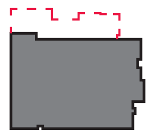
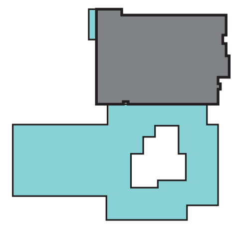
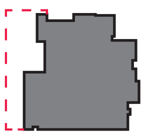
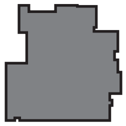
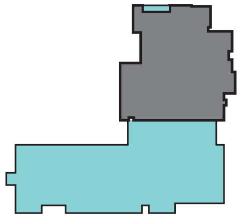
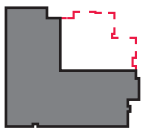
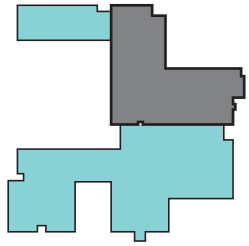
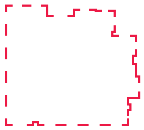
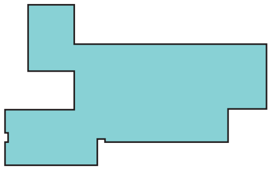
Design Concept C: Community Campus

In this Concept, the north corner of the existing building is demolished to accommodate an access drive from Frederick Avenue, and re-positions the main entrance to face the drive creating a new Lobby and gathering space. The Community Space is located in a new wing along Frederick Avenue to activate the street-edge and allow for a more secure separation from the classroom wings. The concept features a new classroom wing with a large “outdoor classroom” accessible from the collaborative space outside of the Pre-K, K and 1st Grade classrooms. The Cafeteria and Kitchen are relocated within the existing building and a Gym and classroom wings are constructed as part of the new addition.

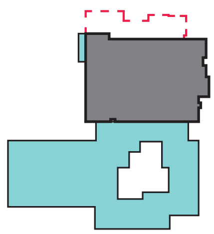
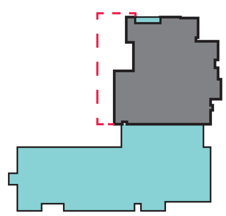
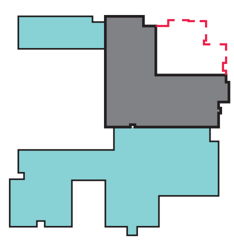
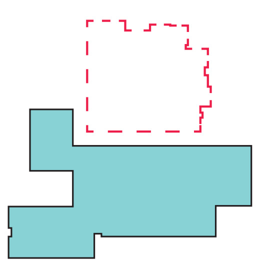
Design Concept D: Fresh Start

This Concept represents the notion of an entirely New Construction for Frederick Elementary School, with the complete demolition of the existing building. The new building will represent the final approved building square footage as determined by Baltimore City Public Schools and the State of Maryland; as well in relationship to the Site Specific Ed Spec created for Frederick Elementary School, which is currently approximately 88,690 square feet. There are two approaches to constructing a new building on the existing site: build behind and around the existing School, thus providing uninterrupted education and keeping the existing building in-tact until the new building is complete; or, incorporate demolition and new construction simultaneously with organized phasing of both tasks such that more of the existing site can remain open for the much needed outdoor play and learning functions. Both options provide the amount of Classrooms required for a Section 3 School, per the Site Specific Ed Specs, as well as all Administrative support spaces, Dining, Kitchen, Gymnasium, Media, Technology and Community Space necessary to aptly serve the Students who will ultimately attend Frederick Elementary School.

Executive Summary:
Square Footage Summary Matrix

	Demolish	Modernize	Construct	Total
Design Concept A	 1st 4,723 SF 2nd 3,937 SF Total 8,660 SF	 1st 22,165 SF 2nd 16,448 SF Total 38,613 SF	 1st 33,966 SF 2nd 19,434 SF Total 53,400 SF	1st 56,131 SF 2nd 35,882 SF Total 92,013 SF
Design Concept B	 1st 5,502 SF 2nd 5,502 SF Total 11,004 SF	 1st 21,387 SF 2nd 14,882 SF Total 36,269 SF	 1st 28,944 SF 2nd 23,613 SF Total 52,557 SF	1st 50,331 SF 2nd 38,495 SF Total 88,826 SF
Design Concept C	 1st 6,362 SF 2nd 3,262 SF Total 9,624 SF	 1st 20,527 SF 2nd 17,122 SF Total 37,649 SF	 1st 36,205 SF 2nd 12,508 SF Total 48,713 SF	1st 56,732 SF 2nd 29,630 SF Total 86,362 SF
New Construction	 1st 26,887 SF 2nd 20,386 SF Total 47,273 SF	1st 0 SF 2nd 0 SF Total 0 SF	 1st 46,498 SF 2nd 42,192 SF Total 88,690 SF	1st 46,498 SF 2nd 42,192 SF Total 88,690 SF

Executive Summary:
Cost Comparison Matrix

Description	Total Cost		
<u>Collaborative Courtyard</u> + introverted: looks in on itself for maximized security and student supervision + the courtyard and the wide, naturally lit cooridors provide flexible space for students to work together and be creative  Collaboration	31.92 MILLION	92,013 SQ. FT.	Design Concept A
<u>Flexible Commons</u> + common use spaces are grouped together and open to each other resulting in a variety of simultaneous use options by students during the school day or by the community after hours.  Flexibility	29.34 MILLION	88,826 SQ. FT.	Design Concept B
<u>Community Campus</u> + extroverted: the dedicated community wing reaches out and welcomes the community while reinforcing the street edge + classroom access to south facing outdoor space  Community	28.17 MILLION	86,362 SQ. FT.	Design Concept C
<u>Fresh Start</u> + starting over allows for better fine tuning of adjacencies and spatial configuration without the constraints of the existing structure and systems + simplified phasing  Fresh Start	33.50 MILLION	88,690 SQ. FT.	New Construction

Executive Summary: Recommendations

Purpose

This Feasibility Study provides three renovation & expansion options and one new build option for Frederick Elementary School. While several design ideas were explored during this process, weighing several factors related to the existing building, site, community and users, the critical concepts of access, security, learning environments, community space, sustainability and viability can be seen throughout each of the four options presented.

To aid in determining our recommendations for the most viable of the three renovation design option, a Scoring Criteria has been developed. While these categories may not align with the possible methods the City and/or State may use to determine final recommendations for Frederick Elementary School, they could certainly factor into the equation. Note, with the assumption that a new build option would score well relative to educational and community goals, that option was not scored but was evaluated with respect to a more effective use of the site, both for short term use and long term expansion, and whether it could be competitive in relation to cost. The scoring categories are as follows:

Educational Goals

Does the option adequately answer the functional and programmatic requests of all stakeholders?

Phasing

Does the option have a straightforward approach to implementation?

Cost

Does the option provide for the most economical means to produce the best product?

Community Impact

Does the option provide for a positive approach to community integration within schools?

If each of the three renovation design options as presented in this Feasibility Study are ranked on a scale of 1-5 (1=low, 5=high), based on the categories listed above, it is our opinion that the options score out as follows:

Concept A

Educational Goals	5
Phasing	4
Cost	3
Community Impact	4
Total	16

Concept B

Educational Goals	5
Phasing	5
Cost	4
Community Impact	3
Total	17

Concept C

Educational Goals	3
Phasing	3
Cost	5
Community Impact	4
Total	14

Overall Recommendations

Based on the criteria outlined above, our recommended option is Concept B, followed closely by A and then C and D.

Concept B creates a more visible and appropriately sighted location for the Main Entry of the school and aligns a new entrance drive for pick up, drop off and parking with the partial demolition of the west portion of the existing building. An efficiently planned addition to the south and west of the site still leaves several areas for outdoor play and athletic space as well as the opportunity to extend the existing parking lot on the east with an access drive to Lehman Avenue south of the site. The interior demolition is relatively minor compared to the other renovation options, while keeping existing building services and commercial kitchen spaces in place with expansion as necessary.

Concept A provides the idea of a corridor loop surrounding an internal outdoor courtyard. While there are several positive and interesting architectural benefits to this scheme, the separateness and distance felt with the creation of the courtyard may be difficult to manage by school staff. With the additional exterior wall surface and use of glazing to provide natural light from and visual transparency through the courtyard, this scheme also has the potential for added costs over the other schemes.

Concept C requires extensive additional demolition and rebuild of the existing Kitchen space, which is a burden that is avoided by the other renovation options. Concept C also provides entry points on three sides of the building. Although a way to provide separate entries for Community, Students and Visitors of the school, multiple entries could prove to be difficult for administration and security to monitor.

Concept D: While the Jacobs Report conducted on Frederick Elementary School suggested that a renovation/ addition would be the most adequate course of action for the project, we also have provided the option of a New Construction (Design Concept D). Concept D was developed with the notion that a new build option would be most viable if the building could be constructed, in full, while students remained in the existing facility. Due to the location of the existing school in a central portion of the site and the extent to which the five single family residences along Millington Avenue intervene on the west side of the property, the location of a new building is limited to the “rear” of the site which does not make this new build option significantly more desirable than any of the other proposed renovation/ addition schemes since it is higher in cost and is limited with respect to long term expansion. However, if the city would be able to purchase the 5 private residences and consolidate the property, then a new build option using the entire site would provide a higher value when evaluated against any of the renovation/ addition schemes. The building could be located on the northwest corner of the property, providing a stronger street edge presence along both Frederick Avenue and Millington. Vehicular drop off and parking could be more efficiently laid out on the north edge of the site with better access to the school’s main entrance and community component. And, the southern portion of the site could be preserved for open play area and possible building expansion in the future.

School and Community Response

Our team was able to present all of our design options to the Frederick Elementary school community, which included the school’s Principal, several Teachers, some Community members and attendees from Baltimore City Public Schools in early March, 2014. Each design option was presented and discussed with the group, and we were able to hear feedback on several of the options. Based on feedback at this meeting, Concept A was the most preferred option, as the layout provided the best visibility of the students during recess and the best outdoor learning space via the interior courtyard. Swapping the 3rd and 5th grade classrooms on the second floor was requested (which, the plans provided in this Addendum #1 shows), and locating the main entrance for the building on the West side, similar to Concept B.

Existing Conditions:
Community Description and History

The tile mural in the existing cafeteria includes references to William Willkens' factory and the early history of the neighborhood.

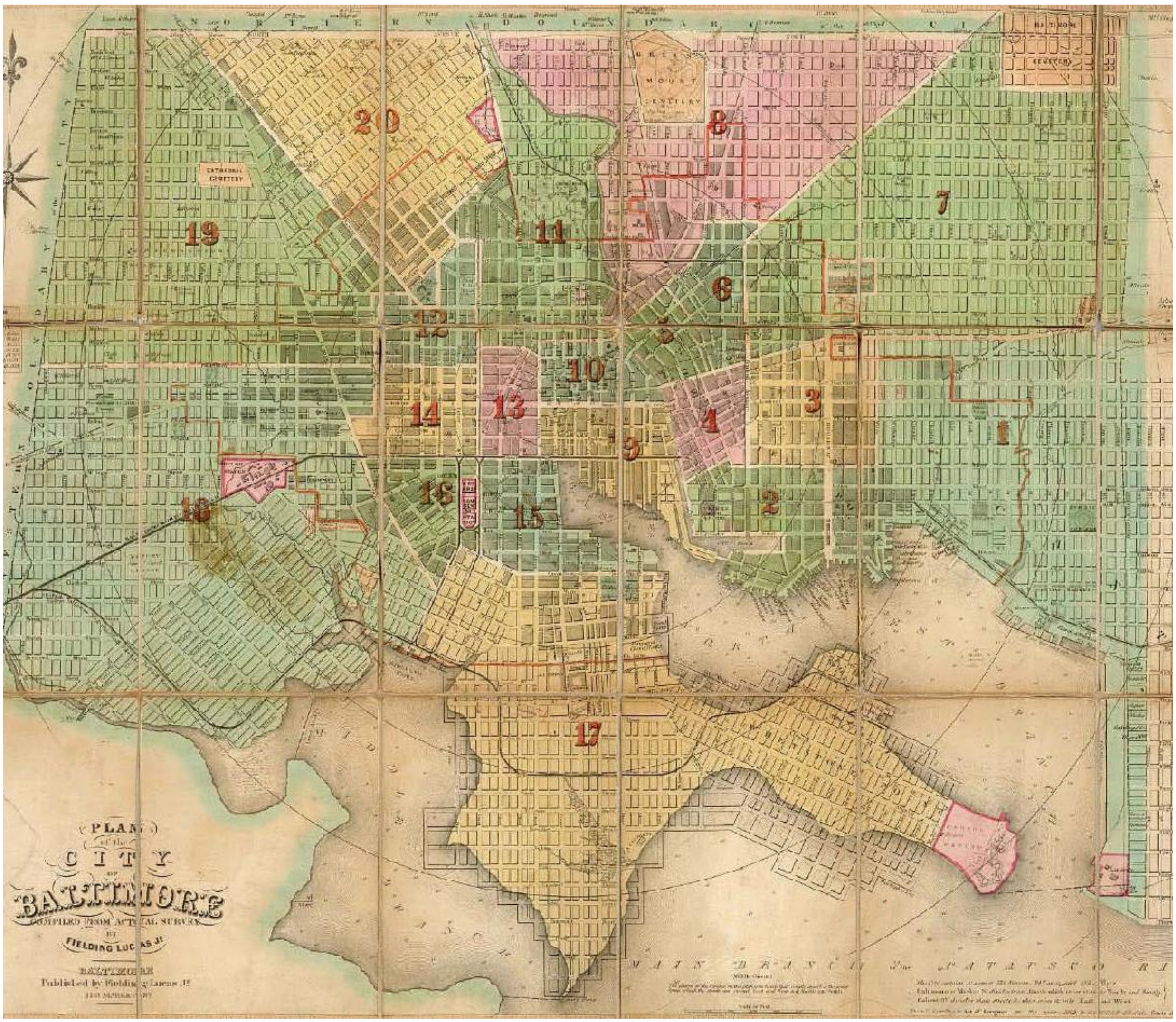
Early History - William Wilkens

Mr. William Wilkens was a highly esteemed citizen of Baltimore in the mid-1800s. Emigrating from Germany, he arrived in America at age 19 impoverished with 18 cents to his name. However; Wilkens was an enterprising individual and went on to establish a curled hair, glue, and hairbrush factory and earn his fortune. The factory was located on Frederick Avenue at the existing location of the Westside Shopping Center directly adjacent to Frederick Elementary.

The factory consisted of 15 acres along with an additional 150 acres of surrounding land which Wilkins developed into housing. Many residents of the surrounding neighborhood worked at the Wilkens & Co factory. Wilkens and his family lived in an estate house north of the plant on Frederick Avenue in the community of Shipley Hill.

Many of the houses around the factory were originally sold at $1,250.00 a piece and came equipped with a full basement, complete wiring, piping for natural gas and sewage, and hot air heating. When Wilkens located his factory, it was on the edge of the growing city. His speculative street grid and rowhouse development was described as "suburban" in his obituary in 1879.

Present day streets such as McHenry, Monroe, Bentalou and, of course, Wilkens Avenue fall within the original boundaries of Wilkens' land. Some of the streets were named after members of his family - Catherine (his wife), Wilhelm and McHenry (his sons). Thirty three acres of land were also donated to the city by William Wilkens in 1870 to become Wilkens Avenue which was then a terraced street with a wide park-like median. The median included decorated pewter urns, cupids, fountains and white maple and silver poplar trees. The median was removed when the street width needed to be expanded to alleviate congested traffic. Wilkens Avenue, also known as Route 1, was once the major artery between Washington DC, Baltimore, and east coast cities.



The Lucas City Plan from 1852. The pink zone in Section 18 is the location of Frederick Elementary and the Historic Location of Wilkens & Co.

Existing Conditions: Community Description and History (cont'd)

Architecture

The firm that designed Frederick Elementary School was a Baltimore firm which won awards for its design of numerous schools throughout Maryland. It also took part in the design of the city's Central Booking and Intake Center and many buildings comprising the Keswick Multi-Care Center.

Many of the rowhouses in the neighborhood are 1912 interpretations of late 19th century Italianate row/townhouses. Each house is two or three bays wide and two-stories tall. The facades are made up of marble bases and steps, the first and second floors are of yellow/orange brick, and a white molded cornice. Each residence can be distinguished by brackets with ornamental balls at the cornice line, visually separating the houses. The first story windows and doors received special treatment by having lead or stained glass transoms. Finally, each window and doorframe is accentuated by marble trim. Currently, it is evident that several of the rowhomes in the surrounding area of Frederick Elementary are either abandoned or in a severe state of disrepair.

2500 Block of Frederick Avenue

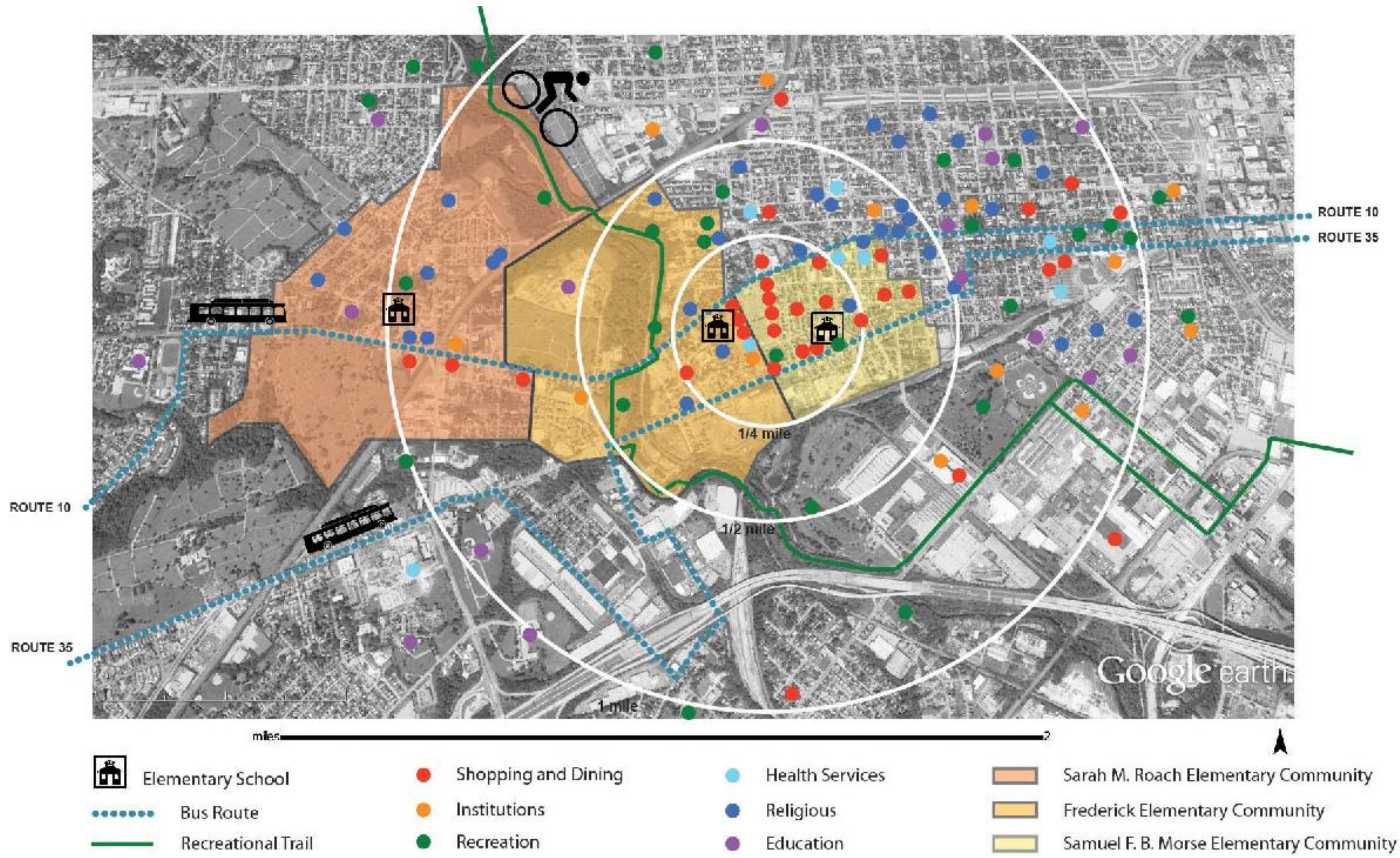
Other Unique/Historic Items of Note

The City's longest block of rowhouses stretches for more than 1,800 feet and is located just a few blocks from Frederick Elementary. Just a couple blocks further can be found the Guinness Book of World Records shortest residential street.

The clay for the brick for many of the houses was extracted from the hills on either side of Wilkens Avenue.

Baltimore's first telephone line was set up between the Wilkens Company plant and Wilkens' warehouses on Pratt Street.

View of Frederick Elementary School from the corner of Frederick and Millington



Surrounding Neighborhoods

The Frederick Elementary and Samuel F.B. Morse Elementary Communities are composed of the following neighborhoods: Mill Hill, Carrolton Ridge, Shipley Hill, and Carroll-South Hilton.

Demographics and Statistics

- Multi-ethnic and multi-racial
- General past decline in population
- Population Density 9,809 per square mile
- 60% rental, Median Rent: $775 ($722 city)
- Median home value: $86,700
- Median household income: $26,043
- Unemployment rate 22.7%
- Education Level: 69.3% high school degree or higher
- Percentage of population below poverty level: 37.2% (25.1% city)

Services

- Average Walkscore 69 – highly walkable
- Average Transit Score 54 – ample access to transportation

Residents have access to shopping and dining, health services, religious institutions, recreation and education. While services are available, further analysis is required to understand the quality of services.

Existing Conditions: Introduction

Aerial view of Samuel FB Morse ES

Aerial view of Frederick ES

Frederick Elementary School

Frederick Elementary School (School #260) is a Pre-K through 5th grade school located on the corner of Millington Avenue and Frederick Avenue in southwest Baltimore. The school is approximately 47,273 SF on a 3.8 acre corner site.

The school currently has 334 students enrolled for the 2013-2014 school year. The student to teacher ratio is currently 17:1. With some students from Samuel F.B. Morse and Sarah M. Roach elementary schools anticipated to join the Frederick Elementary School population, the total enrollment is expected to almost double these current figures.

Samuel F.B. Morse Elementary School

Constructed in 1979, Samuel F.B. Morse Elementary School (School #98) is located at 424 S. Pulaski Street in Baltimore. The school is approximately 66,966 SF on a 1.4 acre site. The cost of repairs needed, coupled with declining enrollment and the proximity of other elementary schools has prompted BCPS to combine Samuel F.B. Morse Elementary with Frederick Elementary.

The 2012 Jacobs Report found that the Frederick site, at 3.8 acres, has the space necessary for possible expansion; the Samuel F.B. Morse site, at 1.4 acres, is too small to accommodate additional program.

View of playground and neighboring houses and church, looking north from playground

View of Frederick Elementary School from the South

Existing Conditions: Site Analysis

Parking

Off-street parking at Frederick Elementary School is provided in an existing lot on the east side of the building. This lot must accommodate staff, visitors and parents throughout the day. The lot is in good condition and includes 25 parking spaces including 2 handicapped spaces. Currently the existing number of parking spaces in this lot does not provide for enough parking space for every staff person at the School, and in some instances double parking and blocking in cars occurs to allow for a few extra cars to fit. On-street parking is available on the streets surrounding the School, within the allowable parking times as directed by the City.

Delivery and service vehicles use both the building access off of the east parking lot and the on-street parking lane in front of the building. Often at times when delivery trucks are parked in the east parking lot, vehicles are not able to access the lot, or are blocked in by the delivery trucks as there is not a dedicated truck parking zone in that lot.

Accommodating additional off-street parking for the proposed staffing and visitors for Frederick Elementary School will be essential. Expanding the size of the existing parking lot may be difficult due to the site topography.

Service access

Service access is currently provided within the existing parking lot on the east side of the School. This current service access layout is awkward and tight for trucks to access, especially when cars are double parked due to the limited off-street parking capacity. An additional parking lot will alleviate the parking load at this location and will allow for greater ease of access to the loading dock and trash pick-up zone in the rear of the existing parking lot.

Vehicle and pedestrian access

Currently most students who attend Frederick Elementary School either walk from surrounding neighborhoods or are dropped off and picked up by parents in personal vehicles. Use of City School buses is not currently a main mode of transportation, however City MTA bus service is provided in front of the school in both the east and west bound directions of Frederick Avenue.

Vehicular access to Frederick Elementary occurs on Frederick Avenue to the north and Millington Avenue to the west. Pedestrian access to the School occurs along the same surrounding streets, but also reaches out farther into the surrounding neighborhoods, as a significant portion of students who attend Frederick Elementary School walk to school.

Currently there is not a vehicular drop off zone near the front of the School. There is an adequate exterior concrete paved area and sidewalk outside of the Main Entry doors where students and parents congregate during drop off and pick up, however the proximity to Frederick Avemie at the front of the building creates a hectic atmosphere.

Playing fields/courts/yards

The surrounding open areas around the building include a softball field and fence, two playground and play court areas with play equipment also surrounded by low fences and set on rubberized play turf material. The two play court areas are connected by paved concrete zones which also reach out to sidewalks leading to the front of the building as well as the southwestern side of the site towards Millington Avenue.

The Frederick Elementary School site lot has a significant amount of open space on the southern half of the site, which extends from the eastern most to western most boundaries. The eastern edge of the property slopes down to the rear of the Westside Shopping Center, and the Lehman Street alley which bounds the property on the south is underutilized and appears to be untraveled by through traffic.

Natural environmental areas

An existing raised planter bed exists along the north wall of the School along Frederick Avenue. This bed is maintained with grass and the brick walls appear to be in sound condition and serve as an edge for visitors to sit on near the main entry to the building.

Utilities

As the School was built in the early 1980's the existing on-site utilities serving the building should be in fair to good condition. The building is served by a 6" water connection and a 6" sewer connection. Both would be sufficient in their current configurations to accommodate a building addition/expansion.

The location of the existing utilities serving the School were designed and likely installed in a way to allow for a building addition on the south of the building off of the Gymnasium which would allow the existing services to stay in place, hopefully avoiding any major rework or reconfigurations.

Stormwater Management

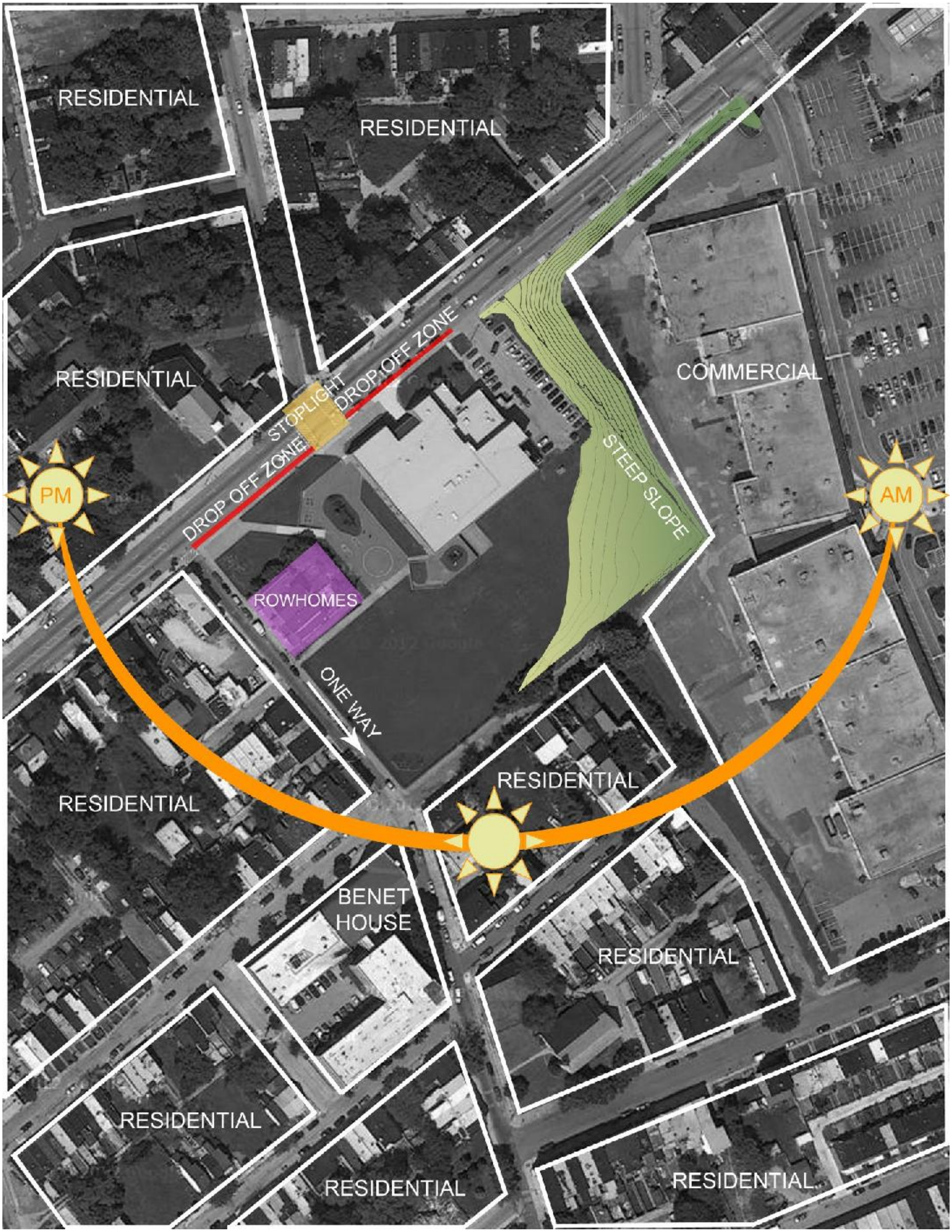
Storm water from the site is collected in several existing inlets and connects to the public storm drain system in Lehman Street. The current on-site storm drain design will need to be reconfigured to accommodate the proposed site changes. Drainage inlets may need to be added and/or relocated. Gas and electric service is delivered to the site from Frederick Avenue through the existing parking lot and can remain as-is.

Existing Conditions:
Site Analysis (cont'd)

View of school and grounds looking east from Millington

View looking South-East from site showing steep slope to rear of adjacent Shopping Center

Site Analysis
2501 Frederick Avenue, Baltimore, MD



Existing Conditions: Building Condition

Roof
The roof is a built-up or modified bitumen roof and is in generally good condition; however, in periods of heavy rain over a few days, the perimeter leaks. The flashing at the perimeter parapet walls should be assessed and replaced as necessary.

Exterior Walls
The exterior walls are composed of concrete masonry units and brick veneer. The brick appears to be in good condition. Exterior walls do not meet current insulation values for code. A full analysis of the r-value of the existing wall and the benefit of additional insulation is recommended.

Exterior Doors and Windows
Windows are mostly original to the building and have metal frames. Both fixed and awning style windows are currently in place on the building. Most window glazing has been obscured with paint. All windows should be replaced with new energy efficient windows. Exterior doors are steel flush doors with small vertical viewing windows. Most viewing windows are obscured with paint. Many doors are dented. Many egress doors were locked with padlocks. New exterior doors with secure, Code compliant hardware should be installed at all egress doors.

View of existing Main Entry and painted clerestory windows in double-height lobby interior

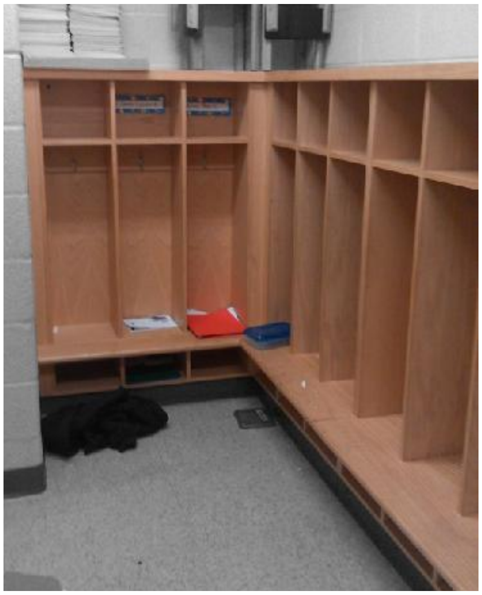
Floor Finishes
Floors are standard VCT throughout including classrooms and corridors. The Media Center is currently carpeted. All floors with the exception of maintenance and mechanical areas are recommended to be replaced.

Interior Walls
Interior walls are either painted concrete masonry units, or painted drywall. All existing walls that are slated to remain should be repainted.

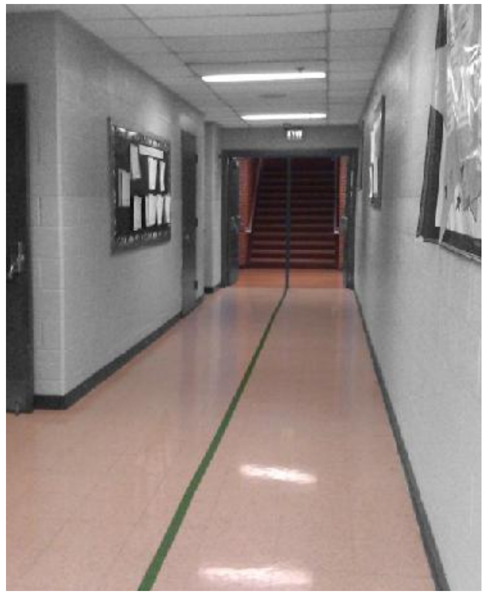
Ceilings
Ceilings are typical dropped acoustical tile. Ceilings are yellowed and dingy. Acoustic tile ceilings should be replaced throughout.

Interior Doors:
Many interior doors have limited function due to being too tight in the frame or rubbing the floor. Doors do not have accessible hardware. Some doors have small vertical windows with expanded metal security grills. Visibility is limited by the grilles as well as painted and papered glazing. It is recommended that all interior doors be replaced.

Casework and Lockers
Every Classroom has a work counter with sink. It appears that some cabinets are in better shape than others and have been replaced in the past few years; however, all casework appears dated. Casework in the Media Center is underutilized. It is recommended that all casework be replaced. Lockers and cubbies are all located inside the Classrooms in all grades. Pre-K and Kindergarten cubbies should continue to be located inside the Classroom. Lockers for students in Grades 1-5 should be relocated to the hallways. It is recommended that all cubbies and lockers be replaced.



Typical casework/cubbies



View of double-loaded corridor with wayfinding tape

View of locked rear door with painted windows

Elevator

The existing elevator is functional; however, it does show its age and it has been reported that it gets stuck occasionally. The elevator is not at peak function for daily use. The elevator is used most heavily by the maintenance staff and as necessary by teachers and students with disabilities but not all that often. If the elevator were to remain as existing in the current location, it would require updates to meet current Code and functionality requirements.

Technology

Some Classrooms have been updated with advanced instructional equipment including teaching walls with short throw projectors and smart boards. There is a large Computer Lab which accommodates a full class of students as well as a mobile laptop cart with devices. There is Wi-Fi in the building, however, service is spotty. Updated technology systems, instructional equipment and devices should be provided.

Security

All doors are locked from the outside at all times, except for during arrival and dismissal. There is a call box and camera at the front door for visitor access. Teachers and Administration are present at arrival and dismissal. The main office is directly adjacent to the Entrance Lobby. The building has minimal windows and doors. There are multiple cameras on site. Cameras are monitored in the Main Office on a flat panel screen. Security measures should be adjusted to make sure that locked doors are Code compliant and enhanced with additional cameras if necessary. Cameras must be vandal resistant and located to efficiently monitor all sides of the building as well as all entrances and exits.

Natural Light and Air

There are internal Classrooms without windows. Where windows do exist, many are stuck closed or covered over with reduced visibility. Visibility through and operation of all windows should be provided. Additional natural light should be interspersed throughout building with new or larger windows and skylights.

Additional Architectural Features

The Entrance Lobby is characterized by a double height space and an open stair. Interior glazing surrounds the stair and opening to the Lobby below from the Second Floor.

Integral tile wall murals can be found in the Entrance Lobby and in the Cafeteria. The mural in the Cafeteria ties to the history of the site as it references the Wilkens & Co Factory.

The Art Classroom on the northeastern corner of the Second Floor is located such that it is able take advantage of the evenly distributed northern light.

The existing Gymnasium is a two-story space located on the Lower Level of the building. This Lower Level has a floor elevation 6'-0" lower than the than First Floor elevation and is accessible by a stair and the existing elevator. Additionally, the floor of the adjacent main Mechanical Room is another 5'-6" lower than the Gym floor - thus providing a full two-story Mechanical space.

Existing Conditions: Code and Accessibility

Existing Building Conditions

The existing building complies with the Building Code of Baltimore City and the State of Maryland Fire Prevention Code as well as the Energy Conservation Standards contained in ASHRAE 90-75 as of 1981. Observed code and accessibility deficiencies include a lack of accessible bathrooms, ramps over maximum allowable slopes, and egress doors locked from the inside.

Shafts, chases, corridors, and stairs are 1-hour rated. The kitchen, machine room, and elevator shaft are 2-hour rated. The boiler room is 3-hour rated.

Gross building area: 47,273 sq. ft.
Type: slow burning, sprinklered

Codes

The following is a list of the related applicable codes currently enforced by Baltimore City and is the basis used for the recommended alterations indicated within this report:

1. 2012 Maryland Building Performance Standard (MBPS, COMAR 05.02.07)
2. Department of Housing and Community Development, Building and Material Codes, Maryland Accessibility Code (COMAR 05.02.02)
3. 2012 International Building Code (IBC)
4. 2012 International Existing Building Code (IEBC)
5. 2011 National Electrical Code (NEC)
6. 2012 International Fuel Gas Code (IFGC)
7. 2012 International Mechanical Code (IMC)
8. 2012 International Plumbing Code (IPC)
9. 2012 International Fire Code (IFC)
10. 2012 International Energy Conservation Code (IECC)

Accessibility

Department of Housing and Community Development - Building and Material Codes -Maryland Accessibility Code (COMAR 05.02.02)

.03 Scope
B. This code applies to all new construction, additions, alterations, and changes of use of certain buildings and facilities in Maryland, as follows: (2) State and local government buildings and facilities.

.04 Relationship to Federal Law
A. Where more restrictive than this code, federal law shall control.

.07 Applicable Standards
B. New Construction, alterations, Additions and Changes of Use of State and Local Government Buildings and Facilities
(1) All state and local government-owned buildings and facilities shall comply with Title II of ADA and 28 CFR 35.
(2) The federal regulations require that all State and local government owned buildings comply with either (a) UFAS or (b) ADAAG, with some exceptions

Recommendations

A comprehensive code analysis is recommended for renovated components. Deficient items are to be reconfigured for compliance with the codes listed above as applicable. New construction components are to be constructed to comply with current codes at the time of permitting.

Existing Conditions: Structure

General Description

The original construction drawings were prepared by Skarda and Rickert Structural Engineers and dated June 16, 1981. The existing two-story structure is framed with bar joists bearing on wide-flange steel beams supported by steel columns with brick veneer on 8" masonry block wall exterior walls. The foundation consists of shallow spread footings and continuous wall footings with an assumed soil bearing capacity of 2500 psf. The second floor construction is a 3 ½" concrete slab on 28 gauge slab-form deck over bar joists spaced at 2'-0" on center. The roof framing is 1 ½" 20 gauge roof metal over bar joists at 4'-0" on center. The portion of the building located over the gymnasium space is framed with 8" hollow-core plank bearing on steel beams. Non-bearing 8" masonry block partition walls are located throughout the building along the corridors and classroom partitions. The existing lateral stability is likely provided by a combination of the steel frame and masonry shear walls.

Site Observations

The building exterior appears to be in good condition. Minor veneer cracks appear to have been repaired at the walls of the loading dock. The primary structural framing members could not be viewed at the time of the field observations; however no signs of structural deficiencies such as cracking or deflection were noted.

Lower Level Floor Elevations

Several varying finished floor elevations are observed on the Lower Level (refer to Existing Structure Diagram). The existing Gymnasium is approximately 6'-0" below the First Floor elevation, not a full floor height below the First Floor. This likely will provide additional consideration factors to the building renovation/addtion schemes.

Existing Structure Diagram

Structural Column Grid

Steel Column

Existing Conditions: Mechanical and Plumbing

General Building Information

The structure consists of three floors: ground, first and second with a total area of approximately 47,273 square feet. Based on information presented at the site observation, the majority of the HVAC equipment, plumbing equipment, piping and ductwork is original to the construction of the building and was installed in 1982/1983. However, some central plant equipment has recently been replaced.

Existing building systems comprise of the following:

- Hydronic heating coils that are integral to the air handling units and min/max boxes. Heating water is provided by a gas fired boiler, distribution pumps and piping. Perimeter spaces were heated by hydronic convectors, hydronic unit heaters and hydronic baseboards.
- Cooling coils are integral to the air handling units. Cooling (Chilled) water is provided by an exterior air cooled chiller.
- The piping configuration used in the building is commonly called a four pipe system. Heating and cooling can be provided at the same time throughout the building.
- Natural gas piping to the boiler.
- Pneumatic controls.

In general, spaces are cooled and/or heated by air handling units with associated ductwork.

Heating is provided along the perimeter of the building in various spaces (including Classrooms), hydronic convectors, hydronic unit heaters and hydronic baseboards are used.

A ductless split system air conditioning unit (outdoor condenser is located on roof) is used in the IT (Information Technology) room off the Library to provide cooling only.

Toilet rooms are located in the interior of the building and not along the perimeter. Toilet rooms have no direct air conditioning or heating. Indirectly, the makeup air for the exhaust system would be pulled from the adjoining spaces and would cool or heat the toilet rooms.

Heating System

The central heating system has recently been replaced and installed (2013), this includes the following: two (2) boilers; two (2) pumps for Zone 1; two (2) pumps for Zone 2; two (2) pumps for Zone 3; an air separator and expansion tank.

View of one new boiler in Lower Level Mechanical Room

- Each of the cast iron boilers have a thermal efficiency of 82.7 and approximately 2,249 MBH output capacity, Smith Boilers 28HE series. This efficiency meets the current IECC.
- Flues are routed to the chimney behind the boilers.
- No Variable Frequency Drives (VFD's) were installed on the new pumps.
- Distribution piping and valving between the boilers and pumps were replaced. Piping and valving beyond the new pumps are existing.
- Pipe insulation was replaced on new piping and the expansion tank was also wrapped.
- In various additional locations, piping/valves were leaking, rusting and insulation was falling apart.

Heating water produced from the boilers is distributed through piping to heating water coils in air handling units, min/max boxes, convectors, baseboard and unit heaters to provide heating for various areas of the building. As indicated above, the heating system is divided into three Zones. Zone 1 serves the baseboards, unit heaters and convectors; Zone 2 serves the min/max coils and Zone 3 serves the air handling unit coils.

Cooling System (chilled water)

The cooling system general components consists of an air cooled chiller, pump and distribution piping. Chilled water is provided by an air cooled

Existing scroll chiller near basement Mechanical Room

scroll chiller (approximately 124 tons) located next to the mechanical room and parking lot. This unit provides chilled water that serves cooling coils in the air handling units.

The refrigerant used in the air cooled chiller is R-22. Per Montreal Protocol, the U.S. must decrease HCFC (such as R-22) consumption and production, culminating in a complete HCFC phase-out in 2030. It will be harder and more expansive to acquire R-22 as the reduction of production continues. However, reclaim of the R-22 from this system can be used on other facilities owned by the school system.

- System has only one chilled water pump.
- Various locations piping/valves were rusting and insulation was falling apart.

Air Handling Equipment

The building is served by four air handling units and distribution ductwork.

These systems and components provide a constant air temperature which is distributed throughout ductwork to various rooms or several rooms per Zones. At each Zone, a min/max box is installed in the ductwork to serve and sense the conditions within that Zone. Min/max boxes modulate airflow as required to satisfy a Zone's thermostat or a space sensor. Thermostat/space sensor are located in each Zone. Each min/max box include a heating coil (heating water from a boiler) which can be energized to heat the Zone as required to satisfy the Zone thermostat/sensor. Cooling is provided from the air handling unit, since the air is supplied at a constant air temperature the damper in the min/max box will modulate to provide cooling to the Zone.

AHU-1 serves the first floor and is approximately 60 tons (cooling capacity). This unit is located in the upper level of the mechanical room and has pneumatic variable inlet vanes. AHU-1 is considered as a variable air volume (VAV) type system. AHU-1 system includes chilled water coil, heating water coil and associated piping. AHU-1 uses a return air plenum, this concept uses the cavity between the ceiling and structure to capture the returning air from the space through slots in the light fixtures to the associated air handling unit. AHU-1 has approximately 21 zones. Basically, each classroom has its own min/max box and thermostat/sensor.

Existing Conditions: Mechanical and Plumbing (cont'd)

AHU-2 serves the second floor and is approximately 55 tons (cooling capacity). This unit is located in the upper level mechanical room and has pneumatic variable inlet vanes. AHU-2 is considered as a variable air volume (VAV) type system. AHU-2 system includes chilled water coil, heating water coil and associated piping. AHU-2 return air plenum, this concept uses the cavity between the ceiling and structure to capture the returning air from the space through slots in the light fixtures to the associated air handling unit. AHU-2 has approximately 28 zones. Basically, each classroom has its own min/ max box and thermostat/sensor.

AHU-3 serves the administration office and is approximately 5 tons (cooling capacity). This unit is located in a mechanical room on the second floor. This air handling unit is a constant volume unit (fan runs constantly) which provides a constant airflow throughout ductwork to the various rooms in the administration area. The thermostat/space sensor is located in the administration area. The unit will either heat or cool to satisfy thermostat/space sensor. AHU-3 system includes chilled water coil, heating water coil and associated piping and uses a ducted return.

AHU-4 serves the gymnasium and is located in the mechanical room on the first floor. This unit provides heating and ventilation to the space and the system includes heating water coil and associated piping. AHU-4 uses a ducted return.

In general, all distribution ductwork insulation was not secured and was falling apart. From visual observations of the duct connections, they were leaking.

Ventilation

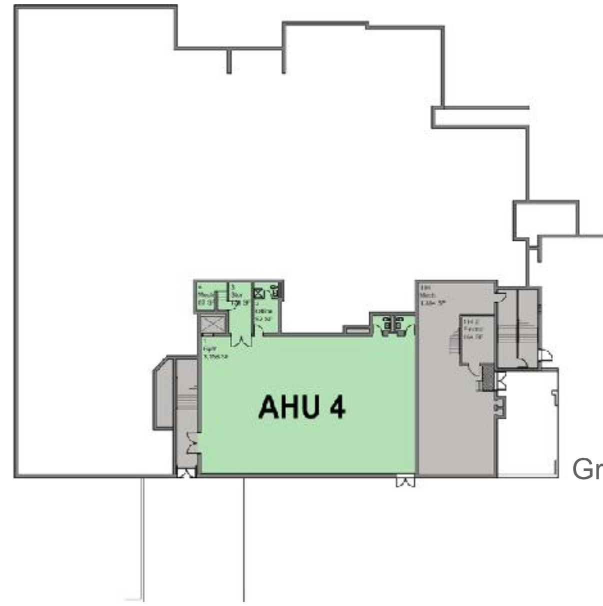
Ventilation is provided to the spaces served by AHU-1 and AHU-2 through intake air louvers located in the mechanical room exterior wall. Relief air is discharged into the mechanical room (using the room as a plenum) from both of these air handling units, then the air is relieved through an exterior louver located above the stair. AHU-3 utilizes an intake air louver in the soffit to provide ventilation for this system. Ventilation air is obtained through a rooftop louvered penthouse for AHU-4.

Exhaust System

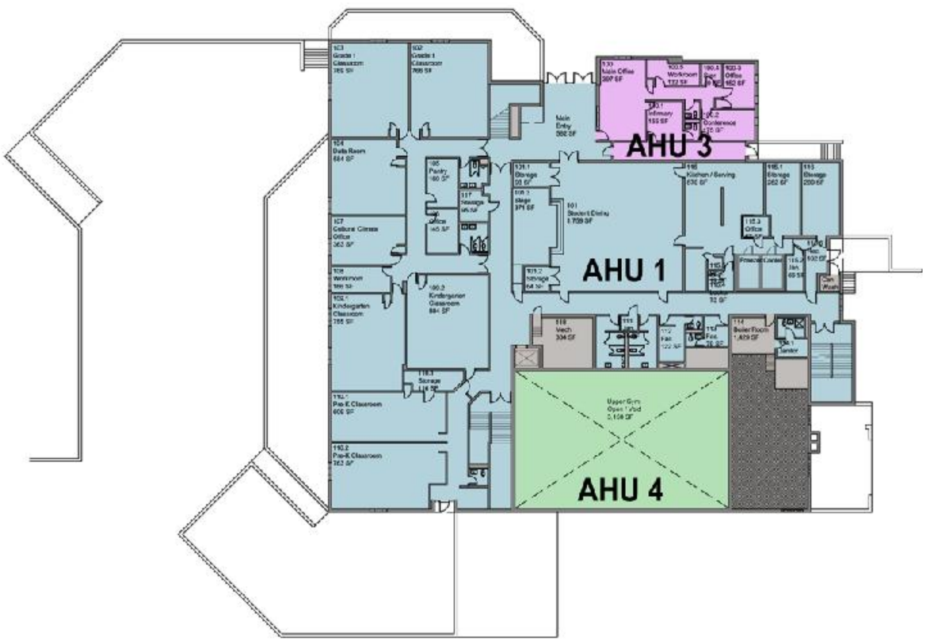
Exhaust is provided for toilet rooms and janitor closets through associated air devices and are discharged outside by means of roof mounted centrifugal exhaust fans.

Kitchen Hood

A grease-laden hood serves the kitchen equipment. The hood is exhausted by an upblast exhaust fan located on the roof. A gas fired makeup air unit is also located on the roof and supplies untempered air directly to the kitchen hood. The makeup air unit provides approximately 80% of the exhaust air and the other 20% additional makeup is acquired from the building. Transfer ducts and air devices between the Kitchen and Cafeteria provide the makeup air for the hood in addition to providing minimum heating and cooling for the Kitchen area except the Kitchen Office.



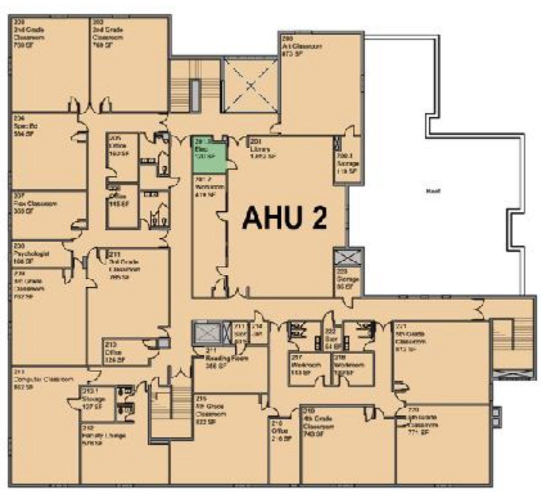
Ground Level Floor Plan



First Level Floor Plan

AHU Service Diagram

- AHU 1
- AHU 2
- AHU 3
- AHU 4



Second Level Floor Plan

Existing Conditions: Mechanical and Plumbing (cont'd)

View of existing heating element in hallway

View of new water pump in Mechanical Room

Typical Equipment Service Life Estimates

- Air Handling Units: 15 years
- Cabinet Heaters: 20 years
- Unit Heaters: 20 years
- Boilers: range 15-35 years
- Burners: 21 years
- Heating/Chilled Water Coils (located in the units): 20 years
- Ductwork : 30 years
- Insulation: 20-24 years
- Air devices: 27 years
- Dampers: 20 years
- Fans (centrifugal): 25 years
- Chillers: 23-25 years
- Condensers: 20 years
- Controls: 15-20 years
- Motors: 18 years
- Base mounted pumps: 20 years

For comparison purposes, note that equipment service life expectancies indicated above are based on ASHRAE guidelines.

Based on being installed in 1982/1983, it is estimated that a majority of the equipment/material/components have reached their service life expectancy, except for the new heating system.

Controls

Existing controls are pneumatic (pressurized air based control). Pneumatic controls are an older technology and were typically installed in buildings between the 1960's and 1980's. The compressor which produces the pressurized air is located in the lower level mechanical room.

Energy Efficiency

Compared to newer HVAC equipment of the same capacity, the equipment currently in place at the school uses more energy.

Domestic Water Piping System
The existing 6" water service is a combination domestic water and fire line. It enters the northeast corner of the mechanical room and is compact. There is little to no clearance around the valving. Once inside the mechanical room, the piping splits into a 6" fire line and a 3" domestic water line.

The piping is showing wear, in several locations the piping has been replaced due to leaks. Domestic pipe insulation is not intact in some areas. Where visible, piping is copper but in older schools galvanized piping was commonly used. If galvanized piping is used in the domestic water line, this is considered not safe due to the lead content and needs to be removed.

Pressure is assumed to be adequate since a pressure reducing valve is installed and there is use of flush valve type plumbing fixtures throughout the building.

Sanitary Piping System:
A single 6" sanitary pipe serves the building fixtures and exits the southeast side of the building.

Storm Water Piping System
Roof drains tie into an 8" storm water line which exits the on northeast side of the building.

Natural Gas Piping System
A 6" natural gas pipe enters the building in the mechanical room. A new gas booster is installed. Piping appeared to be in good condition. Size of the pipe and pressure would need to be evaluated once the new equipment load is added.

Plumbing Fixtures
Plumbing fixtures are visually worn, discolored and some were missing parts.

- Water closets are floor mounted, vitreous china and flush valve type.
- Urinals are wall hung, vitreous china and flush valve type.
- Lavatories are vitreous china, wall hung with metered faucets.
- Classroom sinks are stainless steel. Faucets are mainly gooseneck or swivel neck. Some rooms have bubblers at the sink.
- The breakroom sink was stainless steel with a swivel neck and single lever faucet.
- Drinking fountains are not operational and missing parts.
- Service sinks are typically vitreous china and wall mounted.

Grease Interceptor
No visual grease interceptor was noted for the kitchen.

Hot Water
Existing gas fired water heater (85 gallons) serves the building's plumbing fixtures and is located in the Mechanical Room. The main mixing valve assembly located in the Mechanical Room is utilized for the lavatories' and hand sinks' tempered water. Piping shows signs of leaking and rusting. Recirculating water was provided for system.

Existing Conditions: Fire Protection

General Description

The building has Simplex make, hard wired fire alarm system. The main control panel is located in the main electrical room and is the original equipment installed in 1981. Some air handling units do not have duct smoke detectors.

The fire alarm system does not meet the latest NFPA 72 requirements such as there is no pull station near exterior door for the mechanical room, no devices within 15 feet from the end of corridors, only one fire alarm device in the cafeteria area (may not cover the entire space in performances), no device for stage area, and in addition there are other spaces where there are no fire alarm devices.

Overall the existing fire alarm system is very old, and does not meet the NFPA 72 requirements. The entire fire alarm system will need to be replaced with a new state of the art addressable microprocessor based, power limited, supervised, 24v DC, non-coded, fire alarm system.

Damage to existing fire safety equipment is evident; updated equipment will need to be installed

Fire Protection System existing Configuration

The existing 6” water service is a combination domestic water and fire line. It enters the mechanical room and is compact. The zone valves are located high under the mezzanine floor and located in various locations in the mechanical room.

Kitchen Hood

The existing kitchen hood is served by an ansul system.

Existing Conditions: Electrical

Typical condition of existing electrical receptacles

Normal Power Distribution System

The building is equipped with electric service which enters in the CT cabinet and then into the switchboard (both CT cabinet and switchboard are located in the main electrical room). The switchboard is a 700 amp, 480Y/277 volt, 3 phase, 4 wire switchboard and is the original switchboard installed in 1981. The switchboard is manufactured by Cutler Hammer, 8A45B22 type. The switchboard has an 800 amp main circuit breaker set at 700 amp. The existing switchboard has no space and/or spares available for any future growth. There is no surge protection device (SPD) on the electrical service.

The main electrical room also houses the fire alarm system panels, motor control center, automatic transfer switch, emergency distribution panels, wall mounted transformer, distribution panels and telephone service for the building.

A motor control center (MCC) provides the power to all exhaust fans and other small mechanical loads in the building. The MCC equipment is original to the building.

There are two transformers in place in the building. A 112.5kva transformer serves all the 208Y/120 volt panels throughout the building. There is no overcurrent protection on the load side of this transformer. A 75kva transformer serves distribution panel NC1 (located in the MDF room on first floor) for the computer loads.

Electrical panels throughout the building are a mix of original panels installed in 1981 and new load centers installed for computer loads. Most of the panels are located in dedicated electrical closets and electrical rooms except two kitchen panels which are located in the kitchen.

Upon physical inspection, all panels appear to be in good condition, but only a few panels have available spares. Some of the distribution equipment is not in compliance with National Electrical Code requirements; for example, the transformer in the back side of the electrical room does not have any main disconnect on the load side of the transformer.

Emergency Generator and Distribution

The building has 30kw, 480Y/277 volt, 3 phase, 4 wire, natural gas ONAN emergency generator located in the mechanical room. An ONAN, 60 amp, 480 volt, 3 pole automatic transfer switch is located in the main electrical room. The generator has only 3569 running hours. Generator appears to be in good condition, but this could not be confirmed by testing or speaking with building staff.

208Y/120 volt distribution is derived from a wall mounted 9kva transformer, which has no overcurrent protection on the secondary side of the transformer. Existing grounding for the transformer was not confirmed on site.

The generator serves building life safety loads such as exit lights, emergency lighting fixtures in the path of egress, and other loads such as the fire alarm system, sound system, clock system, TV system and a few other unidentified loads.

Wiring Devices (Receptacles)

Existing wiring devices are building standard and most of them were installed in 1981. A sufficient number of receptacles were noticed in the classrooms. Similarly, office areas have an adequate number of receptacles. All general receptacles were found in good conditions.

Power poles and wiring were noticed all over the floor in the computer lab. Receptacles for computer loads in classrooms, computer lab, offices, and such other areas are mounted in wiremold 4000 series surface mounted raceways.

Some devices were found to have no cover plates. This can be hazardous with students in the school.

Lighting System

Existing lighting in the school is a mix of suspended, recessed, and surface mounted fluorescent lighting fixtures. Most of the lighting fixtures utilize T8 lamps. There are a few incandescent lamp fixtures such as in the stage area. Most of the classrooms and offices have recessed 1X4 fixtures with 2-T8 lamps.

The Cafeteria has a combination of suspended up-lights and 2X2 recessed fluorescent lighting fixtures with T-8 lamps. An existing dimming system for the Stage is working but very old, installed back in 1981.

Most of the corridors have 1X4 fluorescent lighting fixtures with 2-T8 lamps.

Mechanical rooms have industrial type fluorescent lighting fixtures with T8 lamps with no wire guards for protection.

Most of the restrooms have wraparound type surface mounted fluorescent lighting fixtures. Few acrylic lens were noticed as missing in some areas. Staircases have wall mounted lighting fixtures at each landing.

The Media Center has a combination of suspended up-lights and 2X2 recessed fluorescent lighting fixtures with T-8 lamps.

The Computer lab has 1X4 recessed lighting fixtures similar to the type found in the standard Classrooms.

Office areas have 2X4 recessed lighting fixtures with T-8 lamps.

All exit signs are old and green. In some locations, the illumination appeared to not be working but verification whether they have gone bad or were disconnected could not be determined.

Exterior lighting is very minimal. There is no exterior lighting in the front and on the play ground side of the building. A few pole mounted fixtures (only 2) and wall mounted flood lights were noticed in the parking side of the building.

Toggle switches are used to control most of the lighting fixtures in each space. No occupancy sensors or auto-off devices or day light sensors were noticed in the entire building.

Current lighting does not meet ASHRAE 90.1 requirements

Emergency Lighting Fixtures

The layout of the exit signs are not sufficient to meet current life safety code requirements.

Lighting fixtures are required to be connected on emergency power in the path of egress to meet the life safety code requirements, but existing connections could not be determined during site visit.

Existing Conditions: Communication and Information Technology

General Description

The voice, video and data communications infrastructure is of the vintage of the Technology in Maryland Schools (TIMS) installed in 1990's. The communications infrastructure is designed in the traditional star configuration with a central Telecommunication Equipment Room (TER) and one (1) Telecommunication Room (TR). Corridor pathways for communications cabling is above the ceiling tile throughout the two story building. The overall installation or rack, cabinets, cabling and pathways in all telecommunications rooms is fair and in need of conditioning.

Telecom Spaces

The Telecommunications Equipment Room (TER) is in Room 201-1 located in an electrical room off the Media Center on the second floor. The 12' x 12' room is air conditioned and consists of a floor data rack, wall board for video splitters and voice cable terminations, and a video head-end floor cabinet.

The floor rack contains:

- Fiber distribution center
- One 48 port patch panel
- Two 24 port patch panels
- Four 48 port switches
- One CISCO ME 3400 switch
- One Canago Perkins switch

Cabinet #1 contains:

- Video head-end equipment
- Floor UPS

Telecommunications Room #1 is located in storage room 101-1 of the cafeteria. The 12' x 8' room contains a floor data rack which contains:

- Fiber Patch Panel
- Two 48 port patch panel
- One 48 port extreme switch
- One 24 port switch
- Two 48 port Extreme switches
- Floor UPS
- Wall board with video splitters and phone 110 blocks.

Data Network

The existing data network was installed under the TIMS program of 1998/99, and consists of category 5E UTP cabling in the horizontal and fiber optic backbone cabling. Switches provide 10/100 to the desktop and Gigabit Ethernet in the backbone. The TER has 48 port Extreme switches. The Data Network is very consistent between the TER and the TR. The TR use Extreme switches, UPS (uninterrupted power supply), and consists of 24 and 48 port patch panels. TR equipment seems to be in good working condition

Most classrooms have 2 data drops at the teaching station with multiple drops in the rear of the classroom for student workstations as per the old TIMS standards

Security System

For the security system the school uses motion sensors and video surveillance security cameras. A small number of security cameras are located near elevator, gym, front door and cafeteria. The cameras are enclosed in wall or ceiling mounted smoked domes.

Intercom System

The public address system (PA) is a Bogen Quantum Multicom IP system. The PA is located in the main school office as shown above and is reportedly in good working condition.

Classroom Audio-Visual

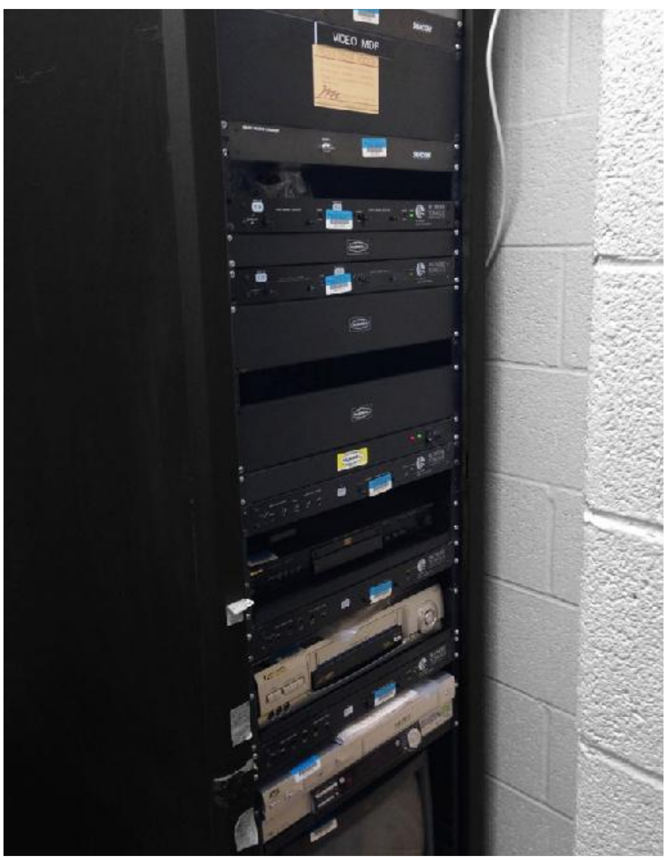
All classrooms have TIMS vintage high-low wall mounted AV harness with an outlet near the teachers' desk with connectivity to a high mounted television. No electronic whiteboards where observed.

Video Distribution System

An analog coaxial “Tap and drop” distribution system is currently in place in all sections of the building. Amps have been located in telecom spaces. The head-end equipment is located in a floor mounted cabinet in the TER. The video demarc is in the un-numbered room in the boiler room.

Telephone System

The telephone network enters the building in the demarc, an un-numbered the room located in the boiler room, and contains a Meridian phone system. School personnel report that the system is operational. Fax lines and an emergency POTS line have been extended to the office area. The cable plant consists of category 5E horizontal cabling and multi-pair UTP for backbone.



View of existing IT cabinet

View of existing IT floor rack

Existing Conditions: Program Analysis

General Description

Frederick Elementary School #260 is a traditional City Schools-ran elementary school with grades Pre-K through 5. It is projected that the School enrollment boundary will be revised to include students which currently attend other elementary schools nearby, specifically Samuel F.B. Morse and Sarah M Roach. Anticipated staffing levels will increase to 60-65 and enrollment numbers will increase to 587.

Grade Levels and Classrooms

Currently, grade levels are grouped together within the building on two and a half floors. Lower grades (Pre-K, K and 1st) are on the first floor and higher grades (2nd, 3rd, 4th and 5th) are on the second floor. Two dedicated Classrooms are provided for each grade, utilizing a total of 14 Classrooms between all of the grade levels. Existing classrooms are too small for current education recommendations and class sizes. Additional Classrooms will be required to accommodate the increased enrollment.

Both Classrooms for each grade level are located in close proximity to the other. The two Pre-K Classrooms share one large space that has been divided with a 3/4 height partition. Common spaces are shared between the two Pre-K Classrooms, such as hallways, storage and a student toilet.

Shared Classrooms

There are several Classroom spaces which are shared amongst all grade levels. These include an Art Classroom, Special Education Classroom, Computer Classroom, a Reading Room, Teacher Offices, Gymnasium and the Media Center. There is currently no Media Specialist on staff so formal Media services are unavailable to the students at this time. Music, Science, and Flex Space Classrooms are currently unaccounted programs and spaces in the existing facility. All shared Classroom spaces are located on the second floor of the building, with the exception of the Gymnasium, which is located on a half floor level below the first floor. Given the high level of student interest in basketball, the Gymnasium is too cramped with the basketball court and the spectator benches along the perimeter. Basketball is crucial to the school culture and there is an elementary school basketball team.

Support Spaces

The Main Entrance Lobby and administration waiting area are too small to accommodate the student body and parents at arrival and dismissal times. Students are dismissed at intervals to reduce overcrowding and confusion; however, the space is still too small.

The Cafeteria, which is adjacent to the Main Entrance, doubles as the auditorium space with a small stage opening up into the dining area. The current size mandates two lunch shifts as well as two shifts for presentations to students and or parents. The Cafeteria is too small considering the increase in enrollment. The Kitchen is well organized and is large enough to accommodate more students.

Restrooms are dispersed throughout the building; however, they are not accessible to students and teachers with disabilities. There are no public restrooms near assembly areas convenient for use by adult visitors. Not all Pre-K and Kindergarten Classrooms have access to individual toilet rooms.

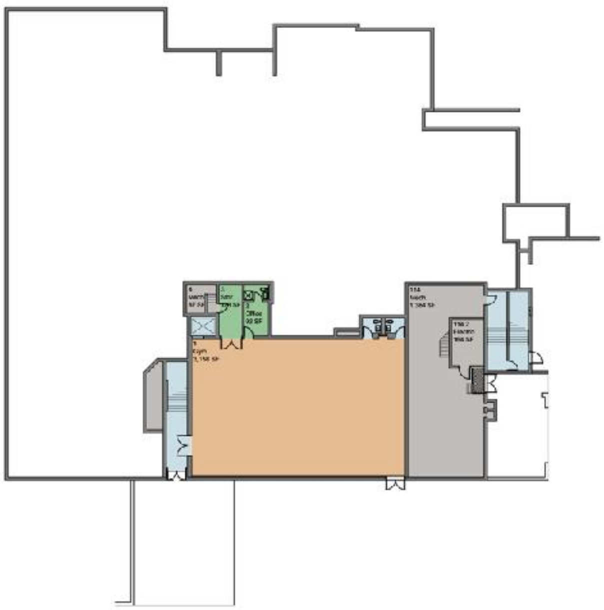
Community Space

Frederick Elementary School currently has a dedicated space for the use as a Community Pantry program, which collects food and clothing donations. This program is an important quality of the Frederick Elementary School community as an opportunity to provide outreach to the surrounding neighborhood. The current room which houses this program is too small for the quantity of donations and pantry visitors. Samuel F.B. Morse Elementary School is currently a Community School and includes a Recreation Center for community use.

Program Comparison Chart

	Room / Space	Frederick Elementary Existing Building			Frederick Elementary Site Specific Ed-Spec			Difference - Existing vs. Site Specific Ed-Spec (Sq. Ft.)
		# of Spaces	Sq. Ft. (ea.)	Total	# of Spaces	Sq. Ft. (ea.)	Total	
Administration								
	Main Office	Varies	Varies	905	Varies	Varies	1,785	
	Faculty Lounge	Varies	Varies	779	Varies	Varies	300	
Total				**1,684**			**2,085**	**401**
Student Services								
	Guidance	Varies	Varies	790	Varies	Varies	675	
	Health	Varies	Varies	155	Varies	Varies	840	
	Support Services	Varies	Varies	1,432	Varies	Varies	475	
Total				**2,377**			**1,990**	**(387)**
Classrooms								
	Special Education	1	584	584	2	900	1,800	
	Special Ed. - Misc. Spaces	0	Varies		2	Varies	525	
	Pre-K	2	Varies	1,372	3	1,000	3,000	
	Kindergarten	2	Varies	1,559	3	1,000	3,000	
	Pre-K-2 Toilet	Varies	Varies		12	50	600	
	Grade 1-2	2	Varies	3,073	6	900	5,400	
	Grade 3-4-5	2	Varies	4,695	9	900	8,100	
	Flex Classroom	2	Varies	721	6	900	5,400	
	Collaborative Learning	0	0	0	5	900	4,500	
	Resource/Planning	Varies	Varies	1,561	10	275	2,750	
	Storage	Varies	Varies		5	200	1,000	
Total				**13,565**			**36,075**	**22,510**
Specials Classrooms								
	Science	0	0	0	1	1,000	1,000	
	Technology	1	862	862	1	980	980	
	Physical Education	1	3,158	3,158	1	4,400	4,400	
	Art	1	873	873	1	1,400	1,400	
	Music	0	0	0	2	1,075	2,150	
	Media	1	1,852	1,852	1	2,550	2,550	
	Dining / Stage	1	2,130	2,130	1	4,075	4,075	
Total				**6,745**			**16,555**	**9,810**
Community Space								
	Family Resource Suite	0	0	0	Varies	Varies	350	
	Out of School Time Support	1	160	160	Varies	Varies	250	
	Service	0	0	0	Varies	Varies	2,400	
Total				**160**			**3,000**	**2,840**
Food Services								
	Kitchen	1	1	1,842	1	1	2,135	
Total				**1,842**			**2,135**	**293**
Building Services								
	Maintenance/Mech., Etc.	Varies	Varies	3,557	Varies	Varies	1,210	
	Staff Toilet	Varies	Varies	201	Varies	Varies	300	
Total				**3,758**			**1,510**	**(2,248)**
Building NSF				***30,131***			***63,350***	***33,219***
Building GSF				***47,273***			***88,690***	

Existing Conditions: Program Analysis



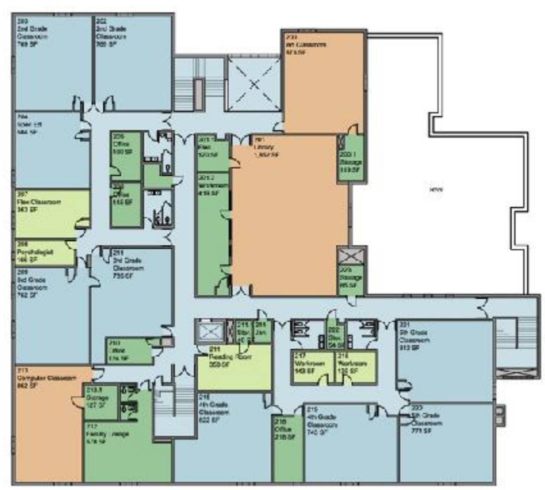
Ground Level Floor Plan

First Level Floor Plan

scale 1/64” = 1’-0”

0 32 64 128

- Classrooms
- Administration
- Specials Classrooms
- Circulation
- Collaborative Learning Area
- Kitchen
- Mechanical



Second Level Floor Plan

Concept Plans: General Design Recommendations

Objectives and Goals
The following critical concepts are woven throughout the schemes:

Access
Pedestrian access, vehicular access, community access to services and gathering spaces, accessibility for people with disabilities, access to technology, access to natural light and connections to the outdoors.

Security
Secure outdoor play and learning spaces, visibility of exterior spaces to deter vandalism and unwanted activity, interior building circulation which allows for a high level of student supervision, location of administration as a filter for student supervision and community access, layered security access between public community spaces and private classroom spaces.

Learning Environments
Innovative classroom spaces tailored to academic learning while maintaining maximum flexibility, classrooms clustered around collaborative spaces to maximize creativity, specialty classrooms and spaces located logically to maximize connectivity, flexibility, and overlapping uses.

Community Space
Dedicated community space tailored to the needs of the neighborhood as well as the potential use of spaces such as the gym and the cafeteria by the community.

Sustainability
Building systems for maximized energy efficiency, building massing for maximized solar orientation, thoughtful selection of materials and construction types, the building as a teaching tool for sustainable concepts, realistic assessment of the reuse of existing structure and life cycle costs.

Viability
Smart use of resources, improved community image and investment, the building as a tool for improved academic performance, realistic maintenance over time, and flexibility for the future.

Summary of Schemes
The conceptsincluded in this study were developed through rigorous research and exploration including research and dialogue with city stakeholders, school administration and teachers as well as community members. The design concepts represent a variety of viable, distinct, best-fit scenarios. Each scheme is presented with corresponding advantages and disadvantages to streamline the critical decision making process.

All of the schemes accommodate 587 students while promoting the individual culture and betterment of the surrounding community. The schemes coordinate with the Site Specific Education Specification developed simultaneously with the design concepts.

Common elements to the renovation/ addition schemes include:

1. Site work will be fairly significant with a new curb cut along Frederick Avenue, and the existing parking lot reconfigured and extended to meet Lehman Avenue with a new retailing wall along the property edge of the adjacent shopping center.

2. Much of the existing interior partitions will be removed with only the steel framing, floor slabs, roof decks, some exterior walls, and some existing original components of the 1980 building being retained.

3. The interior will be significantly reconfigured, with most non load-bearing partitions being reconstructed in a new interior space plan that will rectify some of the deficiencies of the existing

building and create new program areas.

4. Construction activities will be heavy and extensive and students will have to be moved around multiple times as the phased project moves forward. Some of the most disruptive work can be limited to summers and evenings, but this will incur cost and time premiums which are reflected in our estimated cost. Even with extensive measures taken to minimize the project’s impact, it will still be disruptive to students and staff and may limit the possibilities for summer, evening, and community use programs to continue during construction.

5. Structural steel framing and load bearing walls will remain with only minor modifications in selected locations. Exterior masonry walls will be reconstructed, the roof will be completely replaced, and new exterior doors and windows will be installed at most locations.

6. The classrooms are clustered with adjacency to collaborative learning spaces – both a “learning commons” and an “extended learning area” concept are used.

7. The kitchen generally remains in the same location, but is expanded to meet space program requirements.

8. The existing elevator is relocated.

Concept Plans: Program Recommendations

General Recommendations

The Site Specific Education Specification for Frederick Elementary has been developed simultaneously along with this document and it is recommended that the development of the space program coordinate with that specification as tailored specifically to Frederick Elementary.

Grade Levels and Classrooms

In general, the proposed renovated school will maintain a similar separation between the lower and upper grades that currently exists in the school. With the additional student population anticipated through the merging with Samuel FB Morse and Sarah M. Roach Elementary Schools, there will be three Classrooms per grade at the renovated Frederick Elementary School compared to the two currently provided for at the school. Pre-K and Kindergarten grades would be grouped near each other and situated on the ground floor (first floor) in order to possibly provide direct access to the exterior for recess and play time. Grades 3, 4 and 5 will be grouped near each other and will be located on the upper floor, to promote the social interaction and growth of the older elementary students. Currently in the conceptual design options being explored, grades 1 and 2 are either located on the upper or lower floor, but would ideally be placed in proximity to each other, as there are similar teaching methodologies and overlapping collaboration by Teachers in those two grades.

Shared Classrooms

Other program factors to consider at Frederick Elementary School include the Co-Teaching services provided for grades 3, 4 and 5; the layouts of the Collaborative Learning Areas (CLA) – where several grades have either similar CLA arrangements appropriate to their grade levels; the full inclusion of Special Education into the dedicated Classrooms; and the overall desire to disperse the specials or resource type program Classrooms around the building – those being Physical Education, Music, Science, Art, Media and Computer Lab. Several of these spaces will also benefit from certain adjacencies to the anticipated Community programmed spaces for dual use such as the Gym, Art Classroom and Stage (part of the Music program space).

The Collaborative Learning Area for Pre-K and Kindergarten grades are most suited as a large shared space in the center of those Classrooms which will promote play areas, group reading space and shared learning. For 1st and 2nd grades, the CLA's may be smaller than in Pre-K/Kindergarten and situated in a zone directly outside of the Classrooms, and adjoining to the circulation space. In grades 3, 4 and 5, the CLA's are most suitable to be located between the Classrooms, so they are accessible by the circulation space as well as by two Classrooms at the same time to provide maximum flexibility.

Several Flex Classroom spaces will also be provided in the program to help accommodate the future enrollment projections anticipated. This will also provide for the additional Teaching Stations required for the varying number of pupils per classroom trends between each grade at this School. As the State average projects 23 students per classroom, Frederick anticipates seeing higher numbers for grades K, 1, 2, & 3. The additional Flex Classrooms above the standard requirement will help handle the variations that are expected at Frederick ES.

Main Entrance and Administration Areas

A dedicated Waiting Area was requested to be included by the School's Principal. The current function of the Main Office at Frederick ES becomes overcrowded due to consistent immersion by parents and students waiting in the active zone which is also shared by Teachers and Administrators. The desired dedicated Waiting Area space would be a public area directly adjacent to the Reception desk, but separated from more private administrative space that is to be provided under the Standard Ed Spec.

Restrooms
Restrooms are dispersed throughout the building, however, those that remain in place should all be renovated to provide required accessibility; additional restrooms for Pre-K and Faculty should also be provided. In addition, Public Restrooms for adult use should be provided near dedicated public spaces.

Community Space
The Family Resource Suite, Out of School Time Support, and Community Services Suite are all components of the Community Space as determined by the Educational Specification. The Community Services Suite includes a Pantry, Personal Care space with shower, and Laundry space for use by the community. A Wellness Suite and general community gathering space are recommendations based on community member feedback. In addition, Samuel F.B. Morse, which is to close and combine with this school, currently houses a Recreation Center. Additional spaces may be required to maintain and enhance the current level of recreation services available in the surrounding Frederick neighborhood which may be housed in the Community Spaces within the Elementary School. The community spaces are recommended to be located so that visitors can receive services outside the hours of the typical school day.

The Family Resource Room program is described by the School Principal as a room that would be a large benefit to the School and Community at Frederick ES. The location of this room would ideally fall where it could be accessed simultaneously by Students, Parents, Administrators and Community members. The size of this space has is recommended to be able to provide for flexible use, such that open seating, an area for displays of programs and outreach materials could preside, as well as possibly hold a small conference area for private conversations. A dedicated Family Resource Room was a strong desire for the School's Principal, and its anticipated frequent daily use led to the increased size of the space.

In addition to the Community Space specifically programmed by the Educational Specification, further, yet to be determined program and services should be accommodated by the school. Services may include an after school program for students, day care services, social services facilities, counseling facilities, offices, conference rooms, recreational spaces and multi-purpose use spaces. Building square footage allocated for additional Community Space should be designed for maximum flexibility and adaptability over time. The need that public Community use space be integrated into the School could be accommodated through several possible flexible arrangements of rooms, spaces, offices, gathering spaces and commons areas. Community connection to educational spaces within the school would also be appropriate – such as to the Gym, Dining, Stage and Art Classroom. Both direct and separate connections between these areas are recommended. This would allow for private operation of both entities but open access for certain occasions. Ideally some of these spaces will take on mixed-use and shared capacity, to possibly be used for large gathering spaces by the School; or Community meetings or various outreach events during the evenings. Direct adjacencies to the planned Family Resource Suite and Pantry program are also recommended.

Concept Plans:
General Site Recommendations

Parking

The school site is in B-3-2 zoning which requires 1 parking space per every 2 teachers and employees plus 1 parking space per 12 auditorium (or other public assembly facility) seats. The anticipated staffing is approximately 60-65 people. The largest assembly space currently in the building holds approximately 270 people. Therefore, as per current City zoning code, 52-55 off-street parking spaces are required at a minimum.

Providing an auxiliary parking lot for the necessary additional required parking spaces is suggested to help relieve the demand for off-street parking. The suggested design would be a one-way drive aisle with angled parking spots on each side. The parking lot could be parallel with Millington Avenue and contain one entrance and one exit. This design will maximize the number of parking spots added while minimizing an increase of impervious pavement. An estimated 30 to 40 parking spots can be gained using this design approach. There is also potential to add a drop-off area and new parking lot elsewhere on the site depending on the configuration of the selected renovation/addition scheme. Also, if the existing parking lot were to be extended to the south, there is potential to connect to Lehman Street which connects to Millington Avenue.

Vehicle and Pedestrian Access

A new vehicular and pedestrian drop off area would be appropriate to reposition the location of vehicular and pedestrian access away from the busy Frederick Avenue traffic. A pull-off or through loop could allow for buses and cars to drop and pick students up throughout the day in a location that would provide direct access to the Main Lobby of the school, provide security and supervision, and serve as temporary parking for short-term visitors, service and delivery trucks. Curb cuts will be required to provide an 8-foot wide lane on either side of the main entrance. An estimated 4-6 vehicle spaces can be created on either side of the main entrance which could also fit one school bus. Accessible pathways would be able to be implemented adjacent to vehicular access drives to provide level and direct connections into the building.

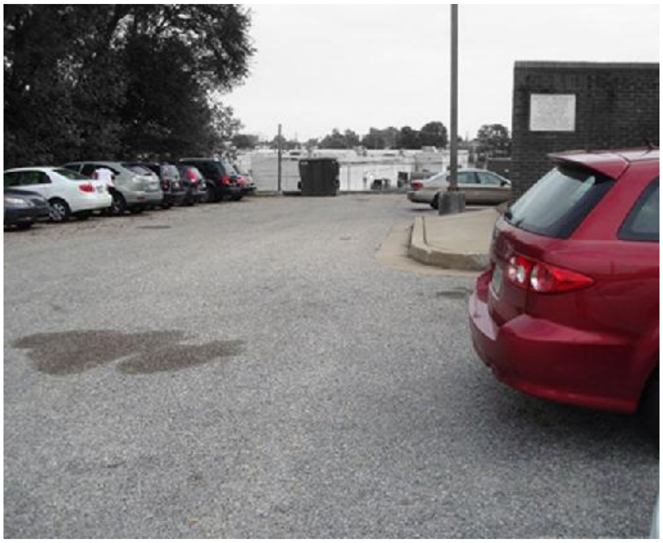
Playing fields/courts/yards

While some of the available lot size will be utilized for a building expansion and addition, incorporating and providing suitable play areas, fields / courts and open space will also be possible. Several opportunities for improvement are available including providing an outdoor basketball court for use by the School and Community, play equipment, an outdoor area with a connection to the elementary physical education program of the School, site lighting, enclosed fenced areas and additional security measures.

Natural Environmental Areas

Opportunities for new exterior garden plots would be possible along the west side of the building and in the open spaces on the south side of the site. This would create an area for an outdoor Classrooms with direct connection to the interior Classrooms, providing an environmental educational component

View of existing parking area



to the curriculum. A garden plot would also be feasible, if desired, as well as additional landscaping along the building edges with larger trees and shrubbery providing edges to the school lot on both the eastern and southern boundaries.

Utilities

Depending on final the architectural design of the building addition footprint, existing water, sewer, and storm drains on site may need to be relocated and reconfigured.

The existing water meter vault located along the south edge of the property can be re-used; however, the 6-inch water line running from the water meter vault to the school building may need to be relocated to accommodate the proposed building addition. A 6-inch water service should be adequate for the proposed building addition but that will need to be confirmed during the design process.

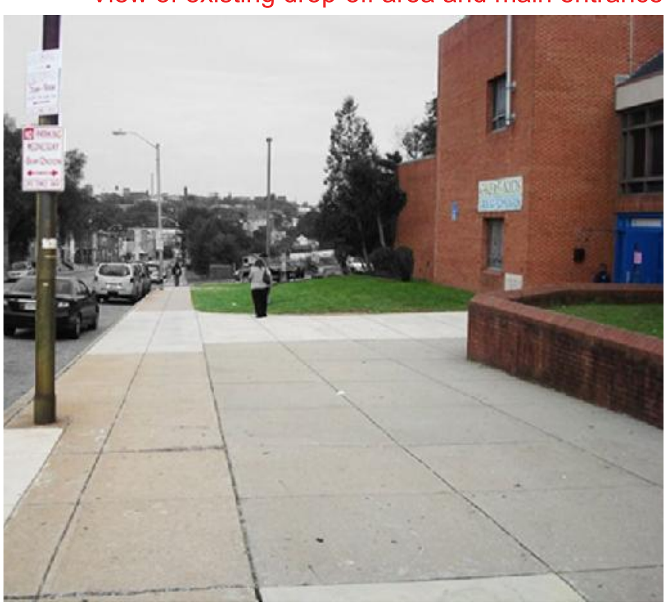
View of potential parking area off of Millington Ave

Concept Plans:
General Site Recommendations (cont'd)

The school currently has a 6-inch sanitary sewer connection leaving the south side of the building toward Lehman Street where it connects to a public sanitary sewer system. Once again, this 6-inch sanitary sewer service may need to be relocated to accommodate the proposed building addition. A 6-inch sanitary sewer service should be adequate for the proposed building addition but that will need to be confirmed during the design process.

Storm water from the site is collected in several existing inlets and connects to the public storm drain system in Lehman Street. The current on-site storm drain design will need to be reconfigured to accommodate the proposed site changes. Drainage inlets may need to be added and/or relocated. Gas and electric service is delivered to the site from Frederick Avenue through the existing parking lot and can remain as-is.

View of existing drop-off area and main entrance



Additional site lighting will need to be provided. It is recommended that additional site lighting fixtures be installed around all areas of the site to provide ample coverage and maintain a secure and well lit outdoor school environment. This could be accomplished with mid-height pole fixtures as well as adequate building mounted light fixtures.

Stormwater Management

Stormwater management requirements will need to be addressed for all new construction. The stormwater management design techniques could be incorporated as an environmental literacy learning tool for the school. One option would include harvesting the rainwater from the building addition in above ground tanks or in an underground cistern. The harvested rain water could then be used to irrigate the school garden, landscaping, and grass fields, or could also be used in a gray water system for toilet water in the school.

Other options include installing bio retention facilities or rain garden facilities around the perimeter of the proposed auxiliary parking lot to capture and treat runoff from the paved surface. This facility could be meticulously landscaped and could also serve as an environmental literacy learning tool. Permeable pavement material for the auxiliary parking lot could also be explored as a stormwater management technique if the existing soils showed to have adequate infiltration capabilities. These techniques can be used in combination or series to achieve stormwater management goals.

Green roof areas are an option to investigate for the building addition which could serve as both an outdoor learning space and also a stormwater management technique. Some drawbacks to implementing a green roof exist, such as the high construction cost and maintenance concerns; however a green roof system would contribute to the requirements of the City's stormwater control requirements.

Sustainable Strategies

- An erosion and sediment control plan to prevent eroded soils from washing off of the site and polluting water during construction
- Provide bike racks to encourage the use of bicycles
- Provide preferred parking for low-emitting and fuel-efficient vehicles and carpool vehicles in order to reduce pollution
- Reduce post-development runoff through Stormwater Management practices
- Install water efficient landscaping with native species
- Provide landscaped shading for the site hardscape
- Provide exterior lighting only in areas as required for safety and comfort
- Retain or harvest rainwater for use in plumbing for toilets and urinals

View of existing planter and playgrounds

Concept Plans:
General Structural Recommendations

Structure

The existing steel-framed structure allows for considerable flexibility for enlarging or adding openings in the existing exterior walls and interior partition masonry walls. However, demolition of large portions of masonry walls may impact the lateral stability of the existing structure, and may necessitate additional lateral load resisting elements such as steel moment frames or masonry shear walls. Based on the extent of demolition for proposed Options A, B, and C the alterations will require the existing building to be retrofitted for applicable seismic loads per Section 3404 regarding Alterations in the 2012 International Building Code. Our recommendations for additional seismic resisting members would be a combination of steel moment frames or masonry shear walls in the new addition and new exterior masonry shear walls along the demolished portions of the existing building.

Based on the existing foundation system, it can be assumed that an expansion structure would utilize shallow spread footing foundations as well. The proposed construction should consist of bar joists bearing on steel beams supported by steel columns similar to the existing construction. The steel frame would include moment frames to resist lateral wind and seismic forces. The option to use composite beam framing bearing on masonry walls, in which the masonry corridor walls provide the lateral stability for the proposed structure, can also be explored.

The possibility of adding another framed floor above the existing structure was explored, particularly at the low roof area over the kitchen space. Based on the sizes of the existing footings shown on the original drawings, the footings would not be sufficient to support the additional loads. Note that increasing existing footings would require extensive demolition of the interior slab on grade. The roof framing members would also require reinforcing.

Concept Plans: General Mechanical Recommendations

Codes
The following is a list of the related applicable codes currently enforced by Baltimore City and was the basis used for the recommended alterations indicated within this report:

- 2012 International Building Code (IBC)
- 2011 National Electrical Code (NEC)
- 2012 International Fuel Gas Code (IFGC)
- 2012 International Mechanical Code (IMC)
- 2012 International Plumbing Code (IPC)
- 2012 International Energy Conservation Code (IECC)
- 2012 International Fire Code (IFC)

General
Equipment shall be energy efficient, comply with the International Energy Conservation Code (IECC) and where applicable, energy star.

Controls shall be direct digital control (DDC) with open BACnet protocol. The benefits of DDC over pneumatic controls is that it improves the control effectiveness, improves operation efficiency and increases the energy efficiency.

Improved control effectiveness: DDC provides more effective control of HVAC systems by providing more accurately sensed data. Compared to pneumatic controls, the electronic sensors are more accurate when sensing such parameters of temperature, humidity and pressure. Also, in a DDC system, it is more flexible in changing reset schedules, setpoints and the overall control logic. Owners can implement energy saving features and optimize their system performance.

Improved operation efficiency: The alarming capabilities are strong and most systems have the ability to route alarms to various locations. The trending capabilities allow a technician to diagnostic or troubleshoot system/control problems.

Increase energy efficiency: There are many energy-efficient control strategies employed in pneumatic logic that can be easily duplicated in DDC logic. The overall demand to a facility can be monitored and controlled by resetting various system setpoints. Equipment can also be centrally scheduled on or off in applications where schedules frequently change such as a community component or evening activities.

Several options were evaluated for this report. Each option considered Baltimore City Public Schools criteria which included: Initial cost, thermal comfort, energy efficiency, renewable energy, equipment life expectancy, equipment space requirements and other factors to determine the most cost effective/ beneficial system.

Central Plant (Option #1)

Description
System components for this option include but are not limited to:

- Hydronic heating coils that are integral to the air handling units and variable volume boxes with reheat hydronic coils. Heating water is provided by a gas fired boiler, distribution pumps and piping. Perimeter spaces (spaces that do not require cooling and near entrances) can be heated by convectors, unit heaters and baseboards. Leaving heating water temperature from boilers shall range from 180%%DF to 200%%DF with a degree delta range of 20-40. Redundancy is recommended for boilers and each boiler would be sized at approximately 75% of the building heating load.
- Cooling coils that are integral to the air handling units. Cooling (Chilled) water is provided by an air cooled chiller with multiple compressors. Chiller shall be sized based on 100% of the building cooling load. Provide integral chilled water pumps.
- Four pipe configuration to allow heating and

cooling at the same time throughout the building. Heating of individual zones shall be accomplished by the reheat coils in the boxes.

Tempered ventilation air can be provided by DOAS or Energy Recovery Unit (ERU)

- *Dedicated Outdoor Air System (DOAS).*
  - Rooftop DOAS system shall be variable air volume units (two units- one to serve the existing building and the other to serve the new addition). Units would be located on the new addition roof so the existing structural members will not be effected.
  - A separate ductwork distribution system shall be routed throughout the building to each space.
  - Each of the units shall have an energy recovery wheel, heating coil (gas fired or heating water) and cooling coil (chilled or DX).
  - Exhaust from toilet rooms shall be collected and routed to DOAS units.

- *Energy recovery unit*
  - A combined distribution ductwork system would be used to the spaces from the air handling unit. The tempered outdoor air is ducted to the air handling unit mixing box. This configuration would reduce mixing with the return air problems as compared to a DOAS.
  - Exhaust from toilet rooms shall be collected and routed to ERU.
  - Natural gas piping to the boiler.

Existing Central Plant

- Basically except for boilers, the entire mechanical system shall be demolished.
- If the motor construction allow, provide VFD's on the heating water pumps. If the motor construction do not allow for VFD operation, pump will need to be replaced.
- Replace equipment/materials that are at or past their life expectancy.
- Replace piping, valving and insulation throughout the building.
- Replace air handling units, coils, min/max boxes, controls and distribution ductwork.
- Replace the air cooled chiller and pump. Recommend two pumps for this system, this provides longer equipment service life to the pumps as well as redundancy.

Common to all Design Schemes

- A new mechanical room will need to be created due to the lack of space in the existing mechanical room. Pumps and fans shall be provided with VFD (variable frequency drives).

- Phasing would allow the existing central plant to remain in operations while the addition was being built. Once the addition is completed and the central plant operational, demolition and construction of the existing building can be performed.

- Variable air volume (VAV) air handling units with heating and cooling coils shall be located in the new mechanical room. The units will provide a constant air temperature which is distributed throughout ductwork to various rooms or several rooms per zones. At each zone, a variable air volume box is installed in the ductwork to serve and sense the conditions within that zone. Variable air volume boxes modulate airflow as required to satisfy a zone's thermostat or a space sensor. A thermostat/space sensor is located in each zone. Each variable air volume box shall include a heating coil (heating water from a boiler) which can be energized to heat the zone as required to satisfy the zone thermostat/sensor. Cooling is provided from the air handling unit, since the air is supplied at a constant air temperature the damper in the variable air volume box will modulate to provide cooling to the zone.

- If higher R values are used for the building components such as but not limited to walls, roofs and windows, the equipment sizes may be reduced.

Comments

This system is the same as the existing system but with new refrigerants, energy recovery, better energy efficiencies and less maintenance/repair required.

Pros

- Technicians are familiar with this system.
- Abundance of experienced contractors able to work on this type of system.
- Air cooled chillers have a lower first cost than water cooled chillers.
- Air cooled chillers can be supplied with integral chilled water pumps which allows for a smaller mechanical room.
- It is easier to measure the outdoor air flow rate into each space with DOAS.
- Avoids imposing ventilation loads on air handling units when implementing a DOAS.
- A single distribution ductwork with AHU and ERU configuration has a lower first costs than a DOAS.
- Combined airflow reduces air volume and consequently fan energy (AHU and ERU configuration compared to DOAS).
- Better mixing of outdoor air and return air from space (AHU and ERU configuration compared to DOAS).
- Used for any size space and occupancy.

Cons

- Requires floor space (mechanical rooms). Typically, larger mechanical room required other than the compared systems noted in this report.
- DOAS requires a separate ductwork distribution, therefore increases first cost.
- Space may not be available for two separate duct distribution systems (DOAS and
- Adequate mixing of air may not be provided due to separate air devices for the DOAS and air handling units.
- Separate parallel paths for airflow increases overall airflow to the space which can increase overall fan energy consumption.
- Air handling units or DOAS must operate whenever ventilation is required, regardless whether or not the sensible load has been met.
- Air handling unit's capacity would be larger due to addition of the ventilation load.

Geothermal (Option #2)

Description

System components for a geothermal include but are not limited to:

- Wells/ closed ground loop
- Heat pumps
- Pumps and distribution piping.
- DOAS

A geothermal system uses a fluid which typically consists of water and polypropylene glycol that passes through the vertical closed ground loop. The vertical ground loop system typical consists of wells spaced 15 to 20 feet apart and depth range between 150-500 feet depending on the soil conductivity tests. Within a few feet below grade the ground temperatures remain at a relatively constant year round temperature, approximately 55 degrees Fahrenheit. The ground loop is basically used like a large heat exchanger. As the fluid is pumped through the ground loop it collects heat from the ground in the winter and expels/releases heat to the ground during summer. This fluid is then delivered to the heat pump. From the heat pump, air is delivered through distribution ductwork to each zone. Typical maximum heat pump unit size is five (5) tons.

Tempered ventilation air shall be provided by

Dedicated Outdoor Air System (DOAS):

- Rooftop DOAS system shall be variable air volume units (two units- one to serve the existing building and the other to serve the new addition). Units would be located on the new addition roof so the existing structural members will not be effected.
- A separate ductwork distribution system shall be routed throughout the building to each space.
- Each of the units shall have an energy recovery wheel, heating coil (gas fired or heating water) and cooling coil (chilled or DX).
- Exhaust from toilet rooms shall be collected and routed to DOAS units.

Common to all Design Schemes

- If higher R values are used for the building components such as but not limited to walls, roofs and windows, the equipment sizes may be reduced.
- Several smaller mechanical rooms located throughout the building close to the zones which heat pumps will serve. Recommend locating units outside of classroom.
- Mechanical room size (based on one unit per room): Approximately 6'x3'.
- A mechanical room will be needed where the ground loop enters the building with a total approximate size 100 square feet.

Pros:

- There is an enormous amount of thermal energy deep within the earth, that is replenished at a very high rate. This amount is estimated to be higher than all the fossil fuels and uranium combined.
- Geothermal energy is not susceptible to price fluctuation like crude oil.
- It is considered the most "green" of all renewable energy types, primarily because there are no products of combustion like in all fossil fuel energy generation operations.
- No flame (no danger of explosion) or flues (no danger of carbon monoxide poisoning).
- Equipment lifetime costs of geothermal operations are lower than other types of energy.
- Low maintenance for the geothermal system.
- It is easier to measure the outdoor air flow rate into each space with DOAS.
- Avoids imposing ventilation loads on heat pump units when implementing a DOAS.

Cons:

- Initial cost is higher than other systems.
- May need to have wells drilled deep into the ground to accomplish loads.
- Possible lack of aequate space on school property to locate wells depending on Design Concept Selected.
- Multiple wells may be required depending on the conductivity of the ground.
- Horizontal ground loops require a lot of space compared to vertical wells.
- Adequate mixing of air may not be provided due to separate air devices for the DOAS and heat pump units.
- A separate DOAS is needed for ventilation requirements.
- Multiple mechanical rooms spotted throughout the building. Must be located near zones due to limited external static pressures.

Packaged Rooftop units with hydronic variable volume boxes (Option #3)

Description

System components for this option include but are not limited to:

- Variable volume packaged rooftop unit(s)
- Variable volume boxes with heating water coils
- Distribution ductwork
- Gas or heating water piping to the rooftop unit for heating of ventilation air
- Gas piping to the boiler
- Electrical connections to the variable air volume packaged rooftop unit(s), variable air volume boxes and boiler
- Distribution piping from boiler to each heating water coil

A variable air volume (VAV) type system and components provide a constant air temperature which is distributed throughout ductwork to various rooms or several rooms per zones. At each zone, a variable air volume box is installed in the ductwork to serve and sense the conditions within that zone. Variable air volume boxes modulate airflow as required to satisfy a zone's thermostat or a space sensor. A thermostat/space sensor is located in each zone. Each variable air volume box shall include a heating coil (heating water from a boiler) which can be energized to heat the zone as required to satisfy the zone thermostat/sensor. Cooling is provided from the packaged rooftop unit. Since the air is supplied at a constant air temperature the damper in the variable air volume box will modulate to provide cooling to the zone.

Concept Plans:
General Mechanical Recommendations (cont'd)

Common to all Design Schemes

- No new mechanical room will be needed except if phasing cannot be accomplished with reuse of the existing mechanical room.

- Phasing would allow the existing central plant to remain in operations while the addition was being built. Once the addition is completed and the packaged rooftop units/system is operational, demolition and construction of the existing building can be performed.

- If higher R values are used for the building components such as but not limited to walls, roofs and windows, the equipment sizes may be reduced.

Pros

- Heating and cooling can be provided at the same time throughout the building.
- Heating for the space or several rooms is done from the volume air volume box serving the zone.
- Heating of the ventilation air is done at the rooftop unit.
- Ventilation is provided at the unit.
- Individual zone control
- When the fan is energized, the fan will modulate as needed by the system.
- Multiple stages of cooling.
- Multiple stages of heating.
- Controls can be accessed remotely or by an existing computer.
- Humidity control is available.
- Smaller mechanical rooms or reuse of existing mechanical room.

Cons

- Roof mounted unit physical size and weight may require the building's structure to be reinforced.
- Installation of roof mounted unit will require cutting, patching and flashing.
- Roof mounted units are generally large and require additional visual screening elements.

Variable Refrigerate Flow -VRF (Option #4)

Description

VRF uses refrigerant as the cooling and heating medium, and allows one outdoor condensing unit to be connected to multiple indoor units. Each of the indoor units would be individually controllable by the occupant. By operating at varying speeds, VRF units work only at the needed rate allowing for substantial energy savings at partial-load conditions. Condensing units shall be located on the roof. Indoor units can be located above the ceiling (concealed), floor mounted, wall mounted or ceiling mounted.

For the classrooms and offices, an energy recovery ventilation (ERV) unit would be provided for each area. This unit allows the space air to pass through a heat exchanger to pre-warm or pre-cool the ventilation air. ERV should be controlled as an integral part of the VRF system. ERV shall be located concealed above the ceiling. Each ERV will have two ducts that penetrate the exterior wall.

For larger areas (areas that require ventilation above the ERV capacity, such as gymnasiums), ventilation air shall be provided by rooftop Dedicated Outdoor Air System (DOAS). This unit(s) shall be variable air volume units (two units- one to serve the existing building and the other to serve a new addition). Units would be located on the new addition roof so the existing structural members will not be effected. A separate ductwork distribution system shall be routed to each space. Exhaust from toilet rooms shall be collected and routed to DOAS units.

This option is based on either room floor mounted, room ceiling mounted or room wall mounted units. Maximum size per unit used for this report is two

MECHANICAL SYSTEMS COMPARISON				
	OPTION 1	OPTION 2	OPTION 3	OPTION 4
EFFICIENCY AND OPERATIONS SAVINGS	AVERAGE	HIGH	AVERAGE	HIGH
INITIAL COST	MEDIUM	HIGH	MEDIUM	HIGH
EQUIPMENT INVOLVED	DOAS, AHU, CHILLER, BOILER	HEAT PUMPS, DOAS, GEOTHERMAL FIELD	VAV RTU, VAV BOXES, BOILER	VRF, ERV, DOAS
HUMAN COMFORT	HIGH	HIGH	HIGH	HIGH
HUMIDITY CONTROL	YES	YES	YES	YES
DUCTWORK COST	HIGH	MEDIUM	HIGH	MEDIUM
OUTSIDE AIR CONTROLLABILITY	HIGH	HIGH	HIGH	HIGH
TEACHER CONTROL	HIGH	HIGH	HIGH	HIGH
GREEN/LEED BENEFITS	AVERAGE	HIGH	AVERAGE	HIGH
MAINTENANCE/ OPERATIONAL EFFORT	HIGH	MEDIUM	MEDIUM	LOW
CLASSROOM NOISE (W/O SOUND ATTENTUATION)	MEDIUM	MEDIUM	LOW	LOW

(2) tons.

System components for this option include but not limited to:

- Variable Refrigerate Flow indoor units
- Outdoor Condensing units
- Energy Recovery Ventilation Units
- Distribution piping.
- DOAS

Common to all Design Schemes

Phasing would allow the existing central plant to remain in operation while the addition is being built. Once the addition is completed and the packaged rooftop units/system is operational, demolition and renovation of the existing building can be performed.

If higher R values are used for the building components such as but not limited to walls, roofs and windows, the equipment sizes may be reduced.

Pros

- Smaller ducts throughout the building and located in or near the space being served.
- Piping tends to have greater piping length allowances than DX systems. Use of copper piping with small diameters, which makes them suitable for buildings with low-ceiling spaces or for adaptive reuse and minimal destruction during installation.
- No mechanical space required.
- Reduced installation time
- Low operating sound
- Conserves space
- Great option for phasing of construction.

Cons

- DOAS is required for larger spaces beyond the ERV unit's capacity.
- Approximately 20%- 40% more costly compared to central plant.
- Most efficient system during part loads
- Depending on the configuration limited capacity could mean more indoor units.

Concept Plans: General Plumbing Recommendations

General

Confirmation on whether existing line sizes can be reused shall be dependent on the architectural layout and testing. New pipes may be added in particular areas to meet the needs of additional loads.

Domestic Water

Remove domestic water piping and accessories in their entirety due to age and wear. Domestic water piping and components shall comply with NSF 61. The pipe size shall be approximately 3" and sized for the total building.

Piping material in the building shall be copper tube piping with insulation.

Where the domestic water piping enters the building, a backflow preventer is required. The type of backflow preventer shall be per 2012 International Plumbing Code (IPC). A new floor drain shall be required near the backflow preventer for reduced pressure zone backflows.

The phasing of building additions may require a new line to enter into the new mechanical room. A valve and cap for future extension can be provided for the renovation of the existing building. In turn, the existing 3" water line can be valved and capped.

Sanitary

Pipe sizes and inverts must be verified and tested by a contractor. Confirmation on whether existing line sizes can be reused shall be dependent on the architectural layout and testing. New pipes may be added in the existing building as required. Where required based on architectural layout, the existing sanitary shall be capped where fixtures are to be removed.

Testing shall include but not limited to camera/video scan and leakage tests.

In the new addition, a new sanitary line shall be added (approximately 6") and routed to appropriate fixtures. Location, invert and size shall be coordinated with Civil Engineer.

Storm Water Piping System

Pipe sizes and inverts must be verified and tested by a contractor. Existing piping may be required to be modified to accommodate architectural layout. Roof drains or piping shall be replaced as required.

Roof drains and secondary roof drainage shall be provided on the new building addition. A new line shall be sized for the building additions accordingly. Location, invert and size shall be coordinated with Civil Engineer.

Natural Gas Piping System

Phasing of a building addition may require a new line to enter into the new mechanical room. A new gas booster (if required) shall be located in the new mechanical room and sized for the total building load. Valve and cap for future extension can be provided for the renovation of the existing building. In turn, the existing 6" gas line can be removed. Location shall be coordinated with Civil engineer.

New Plumbing Fixtures Provided

- Fixtures shall be low flow and water sensing plumbing fixtures.
- ADA compliant fixtures where applicable.
- Provide temperature limit devices on lavatories and sinks.
- Solid interceptor in Science and Art Classroom sinks.
- Fixtures shall be per the educational specification.

Conventional Domestic Water Heating System (Option #1)

This option requires two gas fired water heaters (tank type) to serve the building's plumbing fixtures. One would serve the new addition and should be located in a new mechanical room. The second would serve the existing renovated portion of the building and should be located in the existing mechanical room. However, for Concept D a single gas water heater with recirculation should be provided. Size of the water heaters shall be based on number of plumbing fixtures that require hot water. Tempered water would serve lavatories and hand washing fixtures. The disadvantage for this system is heating hot water when none is needed-wasting energy.

Energy efficiency shall meet or exceed the 2012 International Energy Conservation Code (IECC).

Tankless Domestic Water Heating System (Option #2)

Provide a tankless water heater serving the building's plumbing fixtures. Quantity and size of the water heaters shall be based on number of plumbing fixtures that require hot water. Water heaters shall be located in the new addition and existing mechanical room. Tempered water would serve lavatories and hand washing fixtures. Phasing would allow the new addition to have hot water while the existing building is renovated. The disadvantage for this system is a larger gas input for the water heaters. Advantage would be that the heaters will only heat the water when needed which is highly energy efficient.

Energy efficiency shall meet or exceed the 2012 International Energy Conservation Code (IECC).

Solar Domestic Water Heating System (Option #3)

A solar water heating system is made up of several key components including:

- Solar collectors
- Storage tank
- Pump
- System controls/controller
- A back-up water heater (conventional water heater).

In order to heat water using solar energy, a collector, fastened to a roof or a wall facing the sun, heats fluid that is pumped through it. The collector could be made of a simple glass-topped insulated box with a flat solar absorber made of sheet metal, attached to copper heat exchanger pipes and dark-colored, or a set of metal tubes surrounded by an evacuated (near vacuum) glass cylinder. Heat is stored in a storage tank. The volume of this tank needs to be larger with solar heating systems in order to allow for bad weather. The heat transfer fluid from the collector to the storage tank contains anti-freeze and a corrosion inhibitor which delivers heat to the tank through a heat exchanger (commonly a coil of copper heat exchanger tubing within the tank). Copper is used because of its high heat conductivity, resistance to atmospheric and water corrosion.

Quantity and size of the water heaters shall be based on the number of plumbing fixtures that require hot water.

Energy efficiency shall meet or exceed the 2012 International Energy Conservation Code (IECC).

Probable Cost of Construction

- Option 1 : $40/SF
- Option 2 : $68/SF
- Option 3 : $37/SF

Recommendations

Option # 3 would be recommended based on lower initial cost of construction, serviceability, service personnel experience, better flexibility of individual temperature controls and less necessary program space.

Concept Plans:
General Plumbing Recommendations (cont'd)

Fire Protection System

Sprinkler zoning
For each new Design Concept all existing sprinkler devices will be updated with new areas being provided with new sprinkler coverage.

- One zone should be provided for each floor level in the new addition.
- In Design Concept C - one zone would be for the Community Center Wing.
- Provide new valving and connect to the existing sprinkler zones in the existing building.

There is an assumption that a fire pump is not required since the existing incoming water line has a pressure reducing valve installed. An updated flow test will be required to confirm pressure and volume.

Hazard Occupancy Classification (generally):

- Electrical and Mechanical Equipment Rooms: Ordinary Hazard, Group 1.
- General Storage Areas: Ordinary Hazard, Group 1.
- Educational, Office and Public Areas: Light Hazard, Group 2

Piping to be schedule 40 black steel.

The fire protection system shall be installed in a new mechanical room. The system shall include main and branch piping, backflow preventer, OS&Y, sprinkler heads, valving, hangers for a complete operable system.

Concept Plans: General Electrical Recommendations

Normal Power Distribution System

The existing electrical service of 800 amp (set at 700 amp) will not be sufficient for new anticipated loads (for existing building and new building addition) and will need to be upgraded. There is no surge protection device for the service. There are no spares and spaces in the existing switchboard to serve any new loads.

Recommendations include upgrading electrical service to 1600 amp, 480Y/277 volt, 3 phase, 4 wire system. A new 6 way 4 inch duct bank will be provided from an exterior pad mounted transformer to new switchboard. Service conductors will be provided by electrical provider. CTs and PTs, ground fault protection and surge protection device will be located in the new switchboard.

The existing main electrical room has only one door. National Electrical Code requires that rooms which have electrical service equipment rated greater than 1200 amp shall have two exit doors. So it is recommended that the new electrical service will be brought to a new electrical room in the building addition and then back feed the existing panels/ switchboard.

The existing CT cabinet located in the main electrical room, and the meters will be removed as the new service will be located in the new addition. This will provide space for the second ATS-2 and other emergency panels and transformer, which will be required to meet NEC.

The existing switchboard will be removed and replaced with a new panel. All other panels will be replaced with new panels to provide more spare circuit breakers and equip spaces for future growth. All existing feeders have out-lived their life of 30 plus years and should be replaced.

The 112.5 kva transformer, distribution panel, and 208Y/120 volt feeders will be removed and local transformers will be installed in the electrical closets to serve the 208Y/120 loads. This will provide better distribution and more flexibility on the distribution system.

The existing 75kva K-13 transformer and its distribution panels will remain and will be used to serve the computer loads for renovated classrooms and office spaces.

Surge Protection Device

A surge protection device (SPD) with integral disconnect will be provided outside the main 480-volt switchboard to protect the entire normal power distribution system. A feeder for the SPD will be served from the switchboard. The system modules will contain a symmetrically balanced metal oxide varistors (MOV) array. Surge protection devices will be UL 1449, 3rd Edition, listed and tested to meet ANSI/IEEE C62.41 and 45 requirements.

Grounding System

It is recommended that a grounding grid system (grounding counter poise) be provided around the perimeter of the building for grounding the building and lightning protection system. The grounding grid will consist of ¾-inch diameter 10-foot ground rods and #4/0 AWG bare copper grounding conductors to interconnect the rods and test wells.

Transformers

Dry type transformers will be used to transfer the 480 volt system to the 208Y/120 volt system. All transformers will be copper wound and will be designed to have 20% spare capacity for future growth.

Panelboards

All panelboards will have copper buses and the overcurrent protective devices (circuit breakers) will be adequately rated to withstand available short circuit currents. All panelboard circuit breakers will be bolt-on type. All panelboards will have spare capacity (at least 20%) for future growths.

Variable Frequency Controllers (VFC) and Starters

VFCs with manual by-pass and disconnect switches will be provided for major mechanical loads. Combination type magnetic motor starters with thermal overload protection, HOA switch, control power transformers etc. will be provided for other mechanical loads. All fractional horse power motors will be provided with manual motor starters with thermal overload protection and HOA switches.

Raceways

Separate systems will be provided for normal lighting, normal power, emergency power, emergency lighting, fire alarm system and other special systems. Raceways, pull boxes, and junction boxes will be color coded according to School System Standards to differentiate the different systems.

All interior conduit runs for the branch circuit and feeder wiring will be installed concealed in the chases and/or above ceiling spaces except in unfinished areas such as mechanical and electrical areas and where there is no architectural ceiling provided. Electrical metallic tubing (EMT) will be used for branch circuits and feeders in the building for concealed areas, while galvanized rigid steel conduit will be used for all exterior exposed areas, where subject to damage and for all feeder wiring.
MC Cable will be allowed for all recessed lighting fixtures. MC Cable will be allowed for the horizontal runs in the walls for the receptacles. MC Cable will only be allowed for all interior dry locations concealed above ceiling or behind drywall (excluding home runs and 3-phase motor branch circuits). MC Cable will not be allowed in any exposed location such as electrical rooms, mechanical rooms, communication rooms, dimming rooms, AV rooms, etc. MC cable will not be allowed for any feeder wiring, for any damp and wet location, fire alarm system, security system and other special systems.

In damp or wet areas, the conduits will be liquid-tight flexible metallic conduits. Flexible non-metallic conduits will not be allowed. A U.L. listed ground fitting will be installed for all flexible metallic conduits and bonded to the building grounding system.

Conductors

All wires and cables will be copper with THHN/THWN type of insulation rated for 600-volt at 75 degree Celsius. Sizes will be designed to have current carrying capacities and voltage drop limits to meet NEC requirements. Minimum conductor size will be #12 AWG for power wiring and #14 AWG for control wiring. Wire sizes #10 AWG and smaller will be solid and wires #8 AWG and larger will be stranded in accordance with ASTM standards. All feeder conductors for normal and emergency power panels will have 20 percent spare current carrying capacities for future use. All branch circuit wiring will have separate neutral.

Emergency Generator and Distribution System

From the running time and physical evaluation, the existing emergency generator appears to be in good condition. The generator shall be tested, repaired, and made to be in adequate working condition. A 30kw generator will be sufficient to provide emergency power for existing building loads and new addition loads.

National Electrical Code and Life Safety Code requires that the life safety loads can’t be combined with any other building loads. Existing ATS and distribution does not meet the National Electrical Code and Life Safety Code requirements. Existing automatic transformer switch, transformer and panels shall be removed.

Two new (2) automatic transfer switches (ATS) will be provided. ATS-1 will serve only the life safety loads such as exit lights, emergency lights, fire

Concept Plans: Electrical Recommendations (cont'd)

alarm system. ATS-2 will serve all other loads such as clock system, security system, sound system, and other small loads.

Provide new emergency power distribution panels and transformers and associated feeders.

The generator will serve the following loads:

- Life safety loads including egress lighting and exit signage
- Fire alarm system
- Security system and Central clock system
- Heat tracing if needed
- Power to the small UPSs in telephone closets
- Small mechanical loads such as sump pumps, receptacles in elevator machine rooms and pit etc.

Wiring Devices

New wiring devices will be provided based on the new layout of the classrooms and other spaces. Child proof wiring devices will be provided in the cafeteria, classrooms and other areas as required by codes. General power duplex receptacles will be rated at 20A, 125V, 3 wire grounding type heavy duty UL grade, and will be NEMA 5-20R configuration.

At least one duplex receptacle per wall will be provided in the offices and other areas except on the exterior walls. In addition to the regular receptacles, more receptacles will be provided where required for computer outlets, desks etc. Receptacle layout will be coordinated with the furniture and workstation's layout.

Lighting System

The entire existing lighting system will be replaced with new lighting fixtures. Illumination levels in the interior spaces will be based on the functional category.

Interior lighting power allowance will be determined in accordance with latest edition of ASHRAE/IESNA 90.1 All lighting fixtures will utilize LED lamps and/or T5 lamps, programmed electronic ballasts. All lighting fixture selection will be coordinated with \ the proposed architectural ceilings.

ASHRAE/IESNA 90.1 requires automatic shut off in all spaces. Occupancy sensors with dual technology and day lighting controls will be used to dim the lights in response to natural light for all perimeter conference rooms, offices, and classrooms. Interior rooms such as offices, restrooms, and storage spaces will also be provided with occupancy sensors.

New toggle switches will be single unit toggle, butt contact, quiet AC type specification grade with an integral mounting strap with provisions for back wiring and side wiring.

Replace all exterior lighting with new lighting in the parking area. Provide new lighting in the playground area and new parking area.

The entire lighting system will be controlled via a central lighting control system.

Emergency Lighting fixtures

All exit lights will be replaced with new LED exit lights. Provide additional exit lights where needed to provide better directions in case of emergency.
Provide lighting fixtures on the emergency power system in classrooms, mechanical room, electrical room, main office, and corridors in the path of egress. Provide lighting fixtures at the egress doors as required by code.

Electrical Testing

All electrical equipment such as the 480Y/277-volt switchboard and panels, and the 208Y/120-volt transformers, feeders, variable frequency controllers, starters etc will be tested in accordance with equipment manufacturer's recommendations and NETA.

Fire Alarm System

An updated fire alarm system must be capable of providing the following functions:

- Integral clock/calendar
- Alarm verification
- Functional walk test of all initiating and signaling devices
- Indicate all alarm and trouble events at both remote fire annunciator panels and record the same using integral printer.
- All alarm signals received in either mode will automatically be transmitted to a central monitoring station via telecommunication lines.

A fire alarm system shall be comprised of smoke detectors, heat detectors, duct smoke detectors, manual pull stations, strobes, audio-visual devices, speakers, magnetic door holders, water flow switches, tamper switches and other accessories.

Smoke detectors and heat detectors shall be provided in the elevator shafts, elevator pits and elevator machine rooms. Smoke detectors shall be provided in all storage and janitor closets.

A new fire alarm system control panel shall be sized to accommodate a future 20 percent expansion. A fire alarm annunciation panel will be provided in the main entrance vestibule. Remote HVAC shut-off controls (for the Fire Department) will be located the near annunciator panel.

Concept Plans:
Electrical Recommendations (cont'd)

ITEM NO.	LOAD DESCRIPTION		CONNECTED LOAD (KVA)	DEMAND FACTOR	DEMAND LOAD (KVA)
NEW ELECTRICAL SERVICE CALCULATIONS					
	Existing service is 700 amp				
	Existing Building (Sq Ft)	47,273			
	New Addition (Sq Ft)	52,557			
	Total Building (Sq Ft)	88,826			
	Existing Max Demand		192.2	1.25	240.28
	New building load (assumed 9w/sq ft)		473.0	1.0	473.01
	New Kitchen load		30.0	1.0	30.00
	Miscellaneous		30.0	1.0	30.00
	Total Loads				**773.29**
	Facility Demand Factor				1.00
	Facility Demand				**773.29**
	Future Growth 30%				**231.99**
	Total Electrical Service				**1005.28**
	Amp on 480 volt, 3 phase, 4 wire system				**1209.20**
	Switchboard Designed				**1000 Amp**
	Service Requested				**1200 Amp**
	Note: Design Option B square footage amounts are used in the above calculations as a median selection.				

EMERGENCY LOAD CALCULATIONS					
ITEM NO.	LOAD DESCRIPTION		CONNECTED LOAD	DEMAND FACTOR	DEMAND LOAD (KVA)
	Existing Bldg Area (SF)	**47,273**			
	New Addition (SF)	**52,557**			
	Total Area (SF)	**88,826**			
1	Mechanical Loads (Maximum)		5.0	1.0	5.0
2	Life Safety Lighting (Interior)	0.12	10.7	1.0	10.7
3	Exterior Lighting (Doors and Site lighting)		2.0	1.0	2.0
4	Other miscellaneous loads such as		5.5	1.0	5.5
	fire alarm system, telecom system				
5	Heat Tracing		2.0	1.0	2.0
6	Elevator - Receptacles etc		1.0	1.0	1.0
7	Miscellaneous		1.0	1.0	1.0
	Total Load				**27.2**
	Facilty Demand Factor				1.00
	Facilty Demand				**27.2**
	Future Load 15%				**4.1**
	Total Emergency Loads				**31.2**
					25.0
	Note: Existing 30kw generator shall be OK based on the assumptions. Actual size shall be calculated in the design				
	Note: Design Option B square footage amounts are used in the above calculations as a median selection.				

Concept Plans: General CIT Recommendations

Structured Cabling System (Telephone and Data)

Because the currently installed cabling system is co-located in programmed spaces (offices and storage areas), the cabling in place will most likely need to be removed and replaced with category 6 cabling. Fiber optic backbone cabling should also be installed, connecting all telecom spaces back to the main telecom equipment room. A major renovation of the school that included new systemic system upgrades would require replacement of the communications infrastructure systems. Wireless connectivity should be available throughout the building

Video Distribution

Due to the architectural changes of the facility, a new tap and trunk coaxial CATV system is recommended since equipment locations will be shifting. The new system should consist of a rack mounted CATV headend located in the new MDF. The new headend will allow for incoming CATV service to be processed and distributed over a new bi-directional cable infrastructure. The CATV infrastructure shall consist of forward and reverse channel distributed over RG-11 quad shield coaxial cable connected to 860 MHz bi-directional amplifiers located in new telecommunications spaces. The bi-directional amplifiers shall continue distribution of RG-11 or RG-6 quad shield coaxial cable to 1000 MHz taps and splitters. RG-6 quad shield coaxial cable shall be used from taps and splitters to outlet locations around the facility where CATV distribution is required. These spaces include classrooms, certain offices spaces and public areas of the facility. The system shall allow for local content and channel insertion intended for redistribution throughout the facility.

Classroom Technology

Existing televisions in classrooms and labs should be replaced with ceiling-hung LCD projectors and electronic whiteboards or short throw electronic whiteboards. An AV cabinet should be located at the teacher's station. An audio enhancement system with ceiling mounted speakers should be installed in all instructional areas to equalize sound levels. Each classroom should have a minimum of (6) data drops for computer connections including (4) student drops and wireless

Security Systems

Architectural changes necessitate the installation of new security equipment that will be current to BCPSS standards and included warranted equipment. The security systems shall include Video Surveillance (CCTV), Intrusion Detection, Access Control and Entry Door Video Intercom systems.

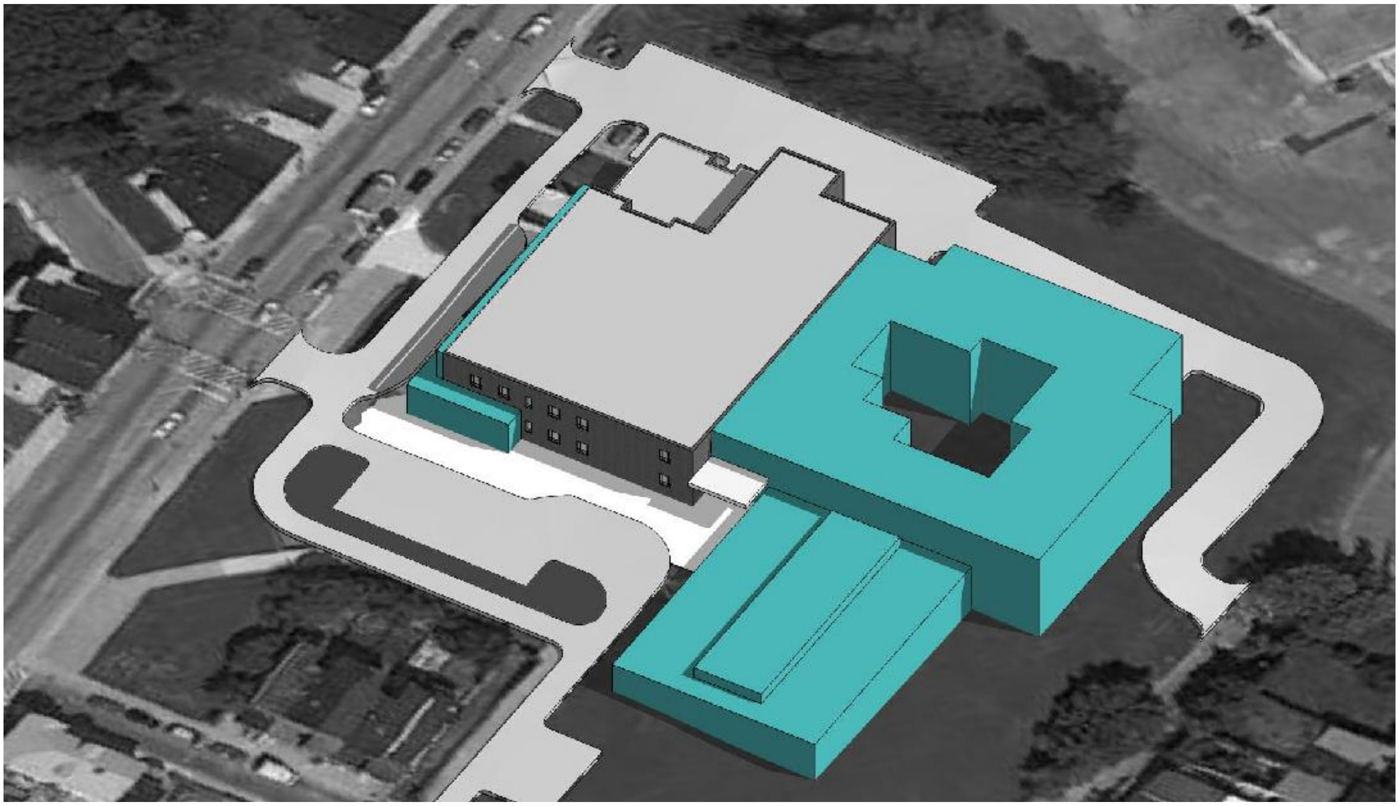
CCTV equipment shall include UTC Interlogix servers, network video recorders, digital video recorders and control software located in the new MDF. Associated CCTV cameras shall be located strategically throughout the facility to monitor entry/egress, public spaces and sensitive areas. Camera infrastructure shall be Cat 6 UTP cables and dedicated switching/distribution equipment.

The Intrusion Detection system shall consist of a DSC main panel with associated motion detection and perimeter door contacts sensors. Two and Four conductor cable shall be used to connected panels and sensors to monitor various zones of the facility. The system shall be locally and remotely monitored and accessed.

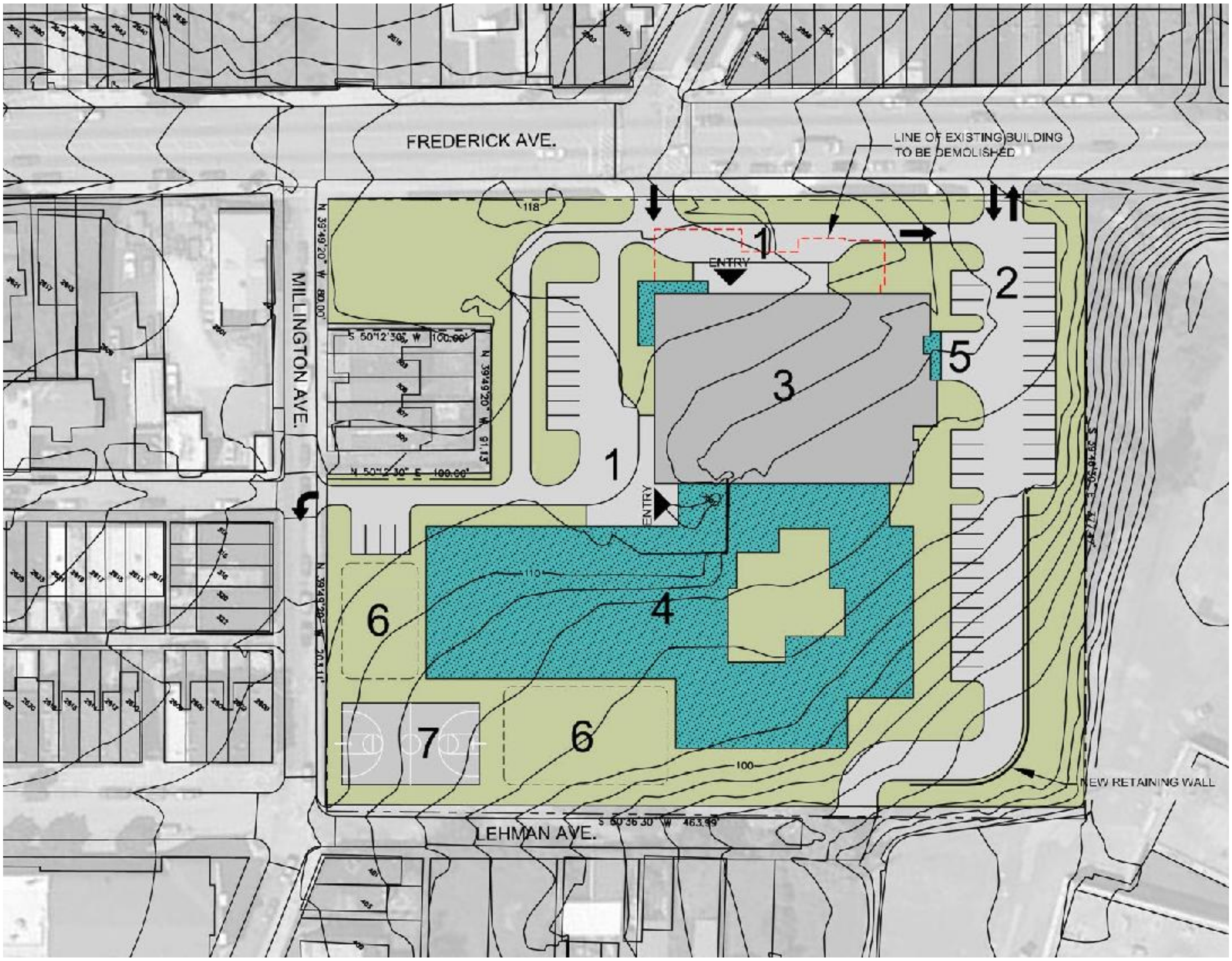
Telecommunication Rooms

A standard sized (8' x 10') Telecommunication Room should be provided for every 70,000 square feet of floor space. These rooms should contain good environmental conditioning including air conditioning, emergency power-protected circuits, and good lighting. The main Telecommunication Equipment Room should be better sized for a more technology rich school and located near the media center.

Concept Plans:
Design Concept A - Collaborative Courtyard

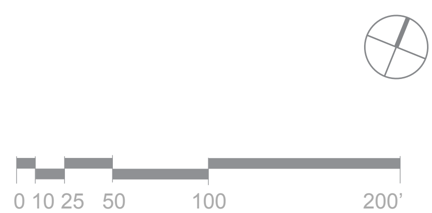


	Advantages	Disadvantages
Building Design	Reuses much of the existing building's structure. Main entry becomes more defined. Well organized layout addressing 21st-Century teaching and learning spaces.	Some program spaces such as gymnasium and cafeteria would need to be relocated to temporary facilities during construction. Requires that a fair portion of the existing building be demolished in order to accommodate the access drives.
Site Design	Provides a clear access drive and parking coordinated with the main entrance.	Reduces the amount open play field area based on amount of new construction footprint. Requires an extensive re-grading and new retaining wall to accommodate additional parking.
Construction Activities	Kitchen and Dining remain in the same location - avoiding more expensive demolition and replacement.	Construction activities will be heavy and extensive and students will have to be moved around multiple times as the phased project moves forward.



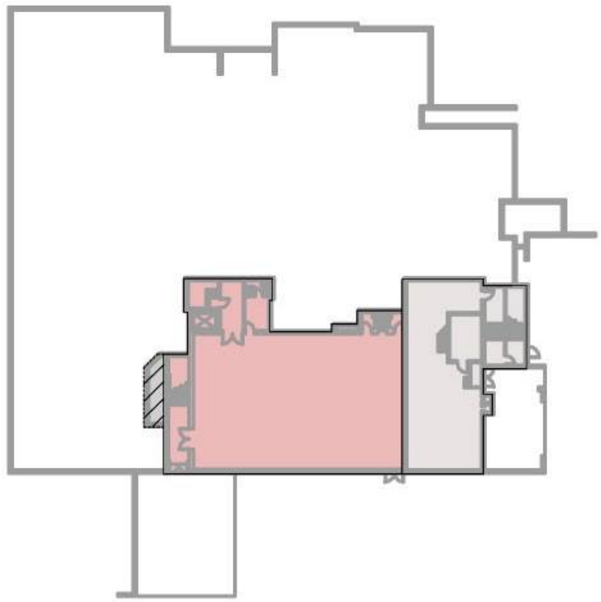
Drawing Key:

1 Drop-Off Loop
2 Parking
3 Existing Building
4 New Construction
5 Service Access
6 Play Area
7 Hard Surface Play Area

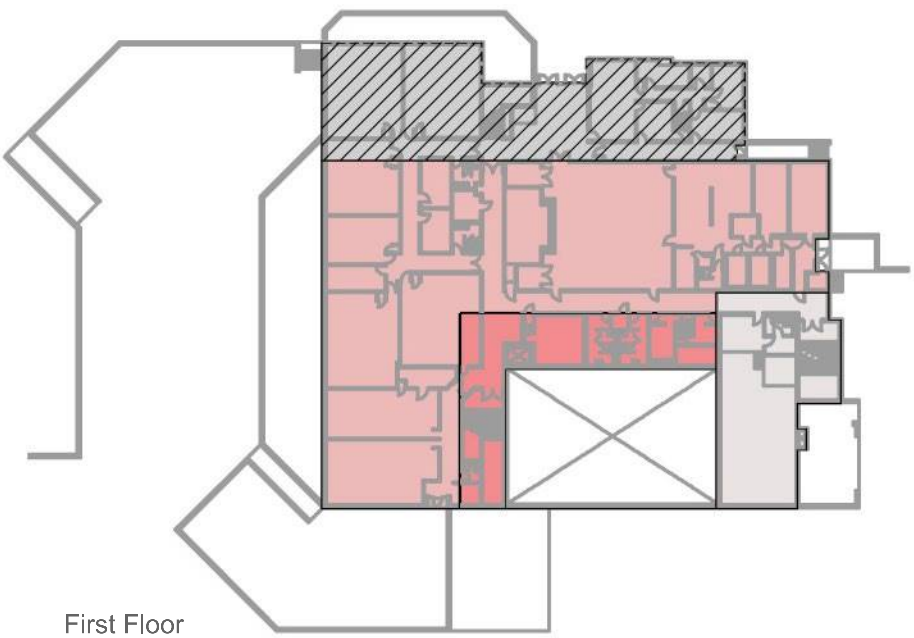


Notable Attributes to Design Concept A:

- Interior Courtyard provides a secure play-space and outdoor learning area.
- 1st, 2nd, 3rd, and 4th grades are relocated on the south of the building in a new addition. Collaborative Learning Areas are incorporated in the Circulation space and the Courtyard is directly connected to those spaces.
- Pre-K and Kindergarten Classrooms are relocated to the single story extension on the south west corner of the new addition.
- A large, interior collaborative plaza is located adjacent to these rooms.



Ground Floor



First Floor

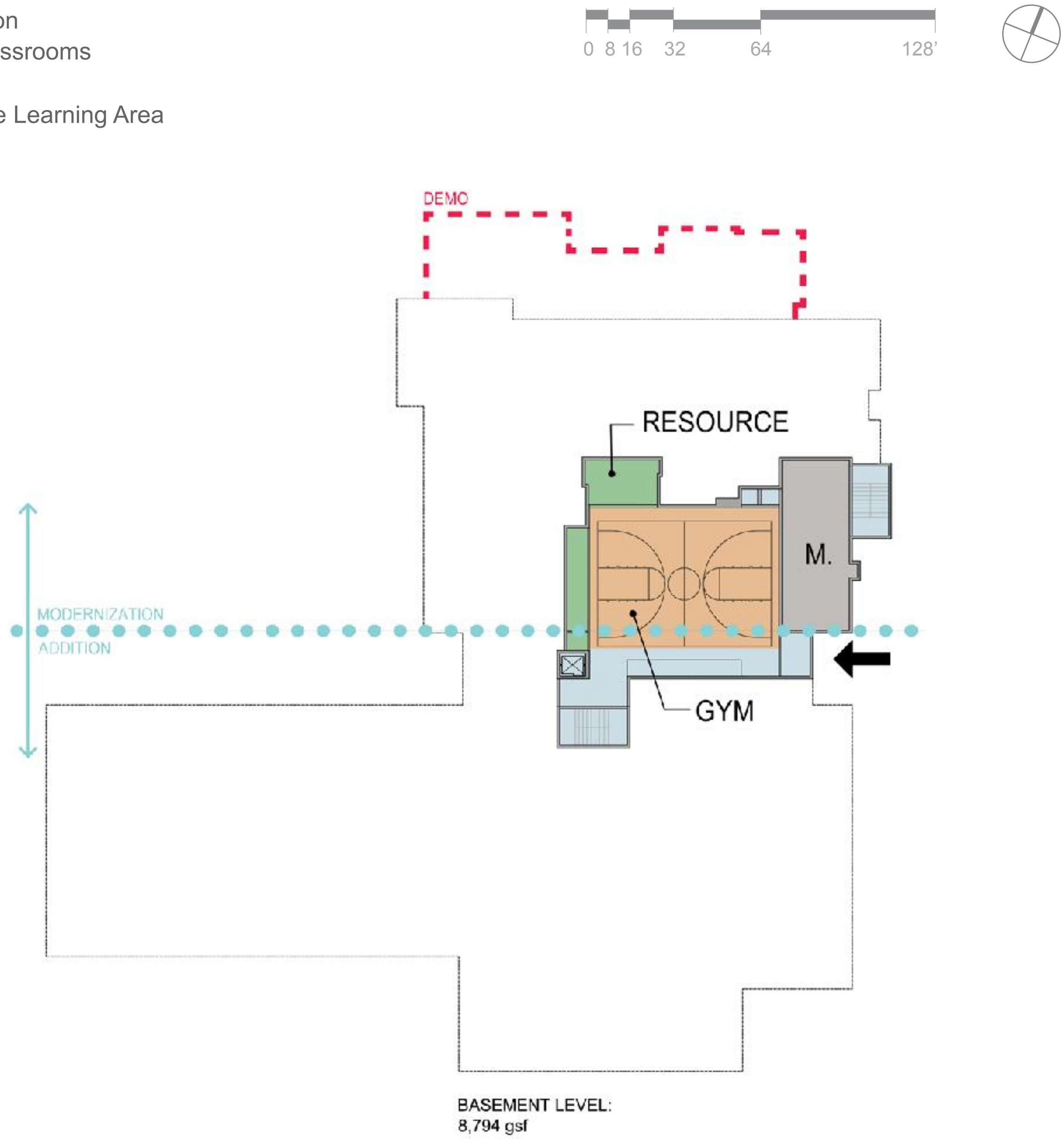
Second Floor

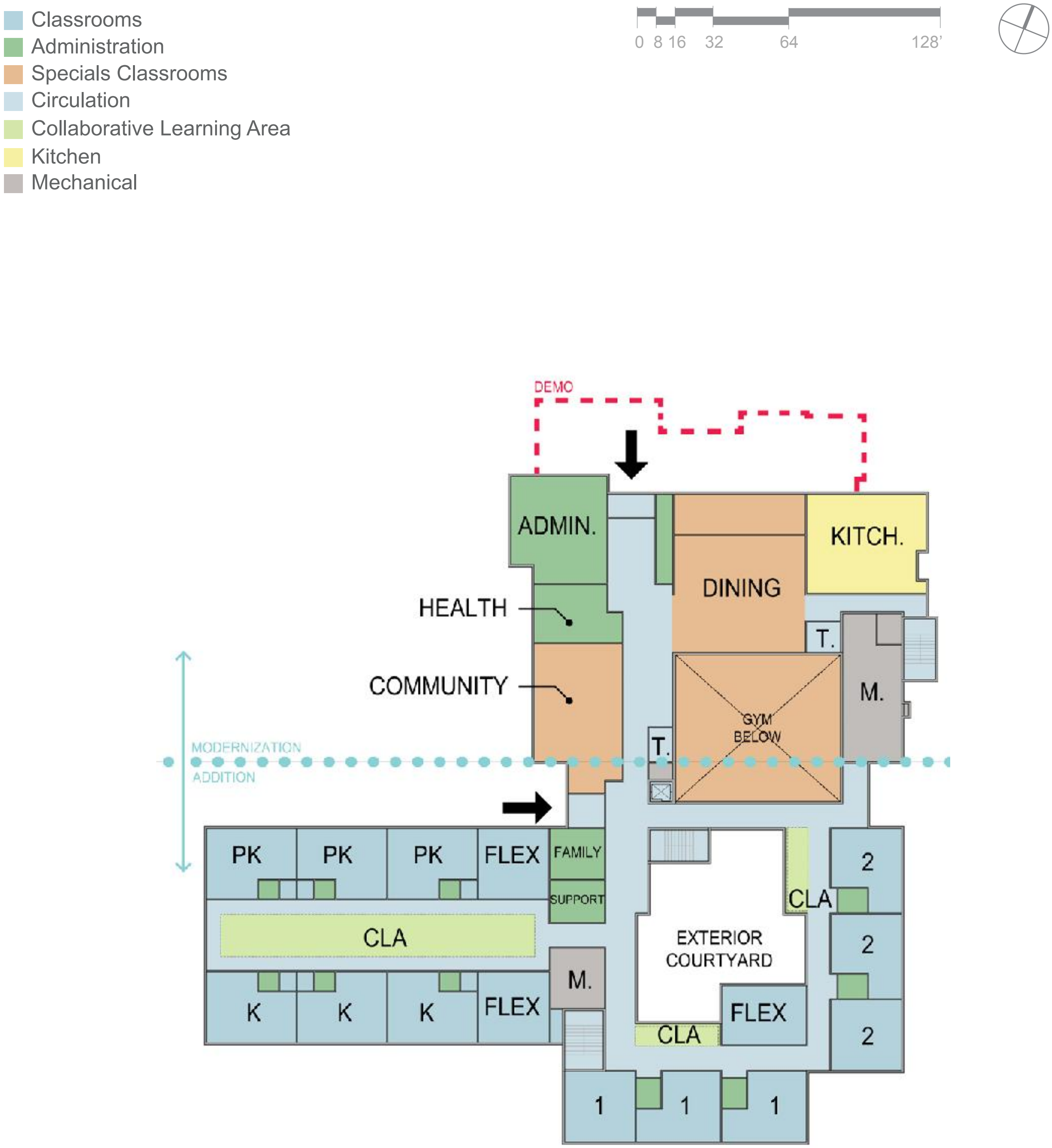
Concept A: Demolition / Renovation Analysis

- Light Demolition / Renovation
- Medium Demolition / Renovation
- Heavy Demolition / Renovation
- Complete Demolition

Concept Plans:
Design Concept A - Collaborative Courtyard (cont'd)

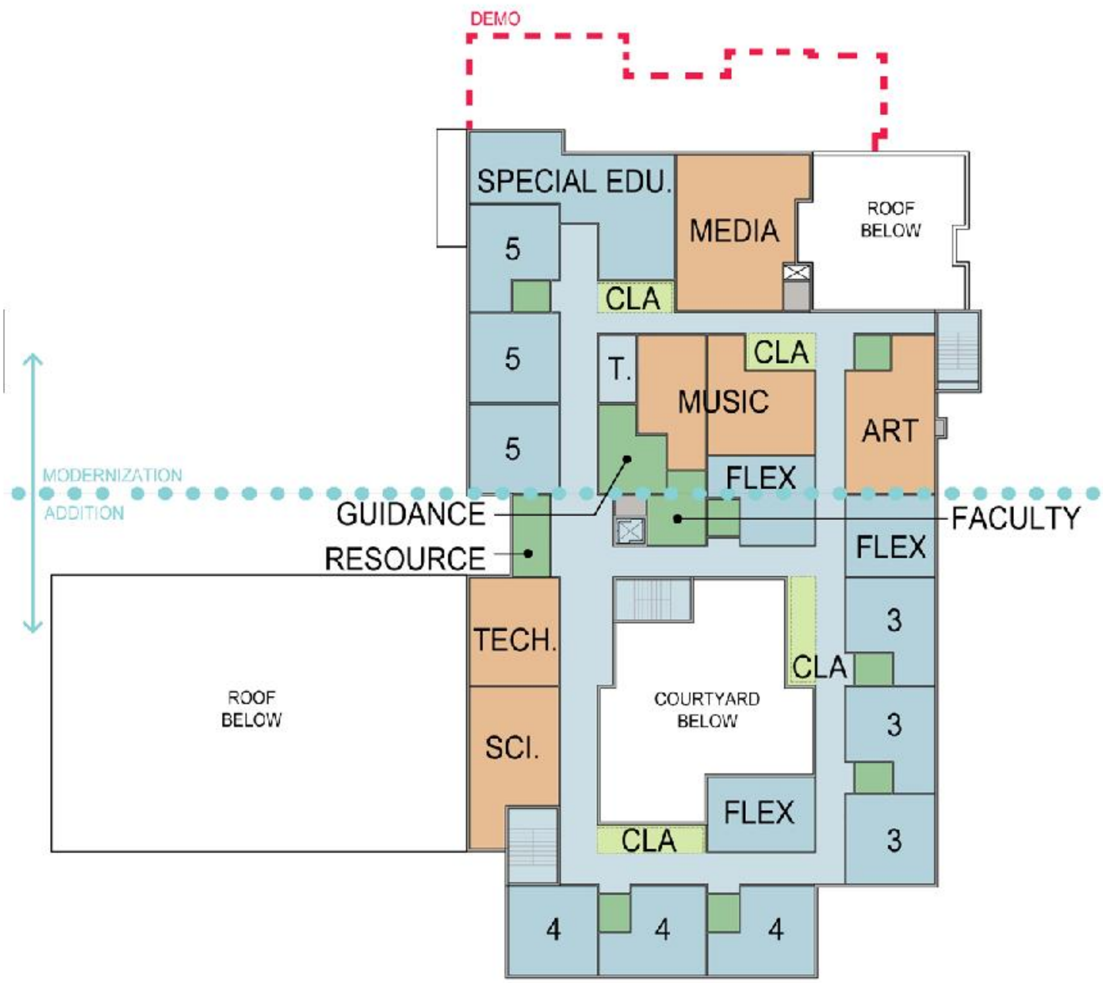
- Classrooms
- Administration
- Specials Classrooms
- Circulation
- Collaborative Learning Area
- Kitchen
- Mechanical





LEVEL 1:
56,036 gsf
-4325 Courtyard
-4374 Upper Gym
47,337 gsf

Classrooms
Administration
Specials Classrooms
Circulation
Collaborative Learning Area
Kitchen
Mechanical



LEVEL 2:
40,207 gsf
-4325 Courtyard
35,882 gsf

Concept Plans:
Design Concept A - Collaborative Courtyard (cont'd)

STRUCTURE

General Description

Renovations for Option A include demolition of the northern-most portion of the existing structure including the administration offices and health suite as defined by existing column line G. This option also includes removing the existing exterior wall along the entire length of the gymnasium and considerable relocation of interior masonry partition walls. As such, the lateral stability of the existing structure must be assessed. A 36"- 40" deep steel girder or truss across the length of the gymnasium will be necessary to support the existing second floor plank framing over the gymnasium.

MECHANICAL

Central Plant (Option #1)

- Heating System: Additional boilers will need to be added to provide approximately 1,100 MBH each. Two pumps per zone will be required depending on the zoning. These pieces of equipment will be located in a new mechanical room.
- Cooling System (chilled water): Provide an exterior air cooled chiller with 410A refrigerant located outside the new mechanical room (approximately 222 tons). Two pumps for the chilled water system would be located in a new mechanical room.
- Additional mechanical space needed will be a total of approximately 2,500 square feet. Location of this room will need to consider the moving the equipment into the room and coil pulls.

Geothermal (Option #2)

- System (cooling and heating): Total of approximately 347 tons, based on five (5) ton units, 70 units for the building would be utilized.

Packaged Rooftop units with hydronic variable volume boxes (Option #3)

- Heating System: Additional boilers will need to be added to provide approximately 750 MBH each. Two pumps per zone will be required depending on the zoning.
- Cooling System: Cooling will be provided by the packaged rooftop unit and distributed to zones (347 tons).

Variable Refrigerate Flow -VRF (Option #4)

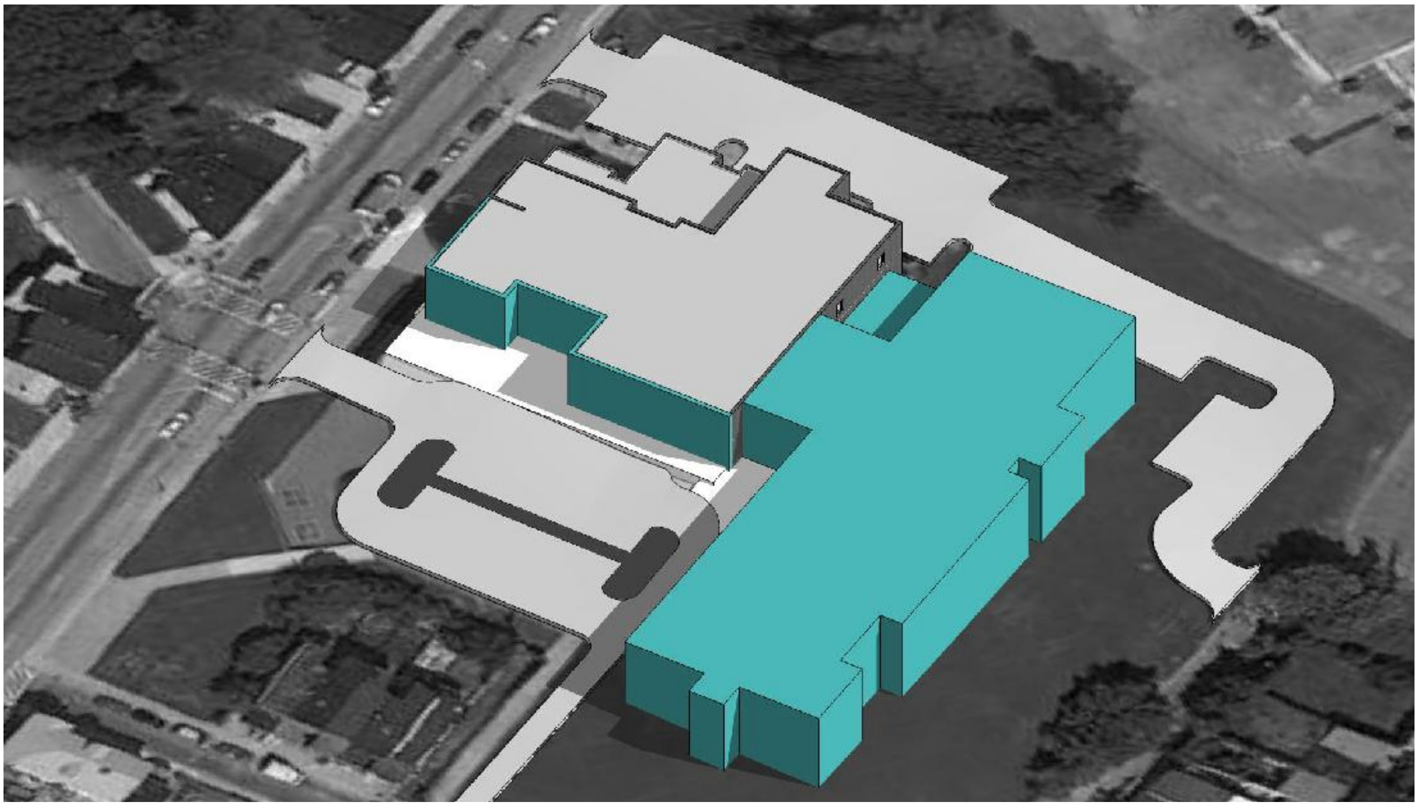
- System (cooling and heating): Total of approximately 347 tons, based on two (2) ton units, 174 units for the building would be utilized.

INFORMATION TECHNOLOGY

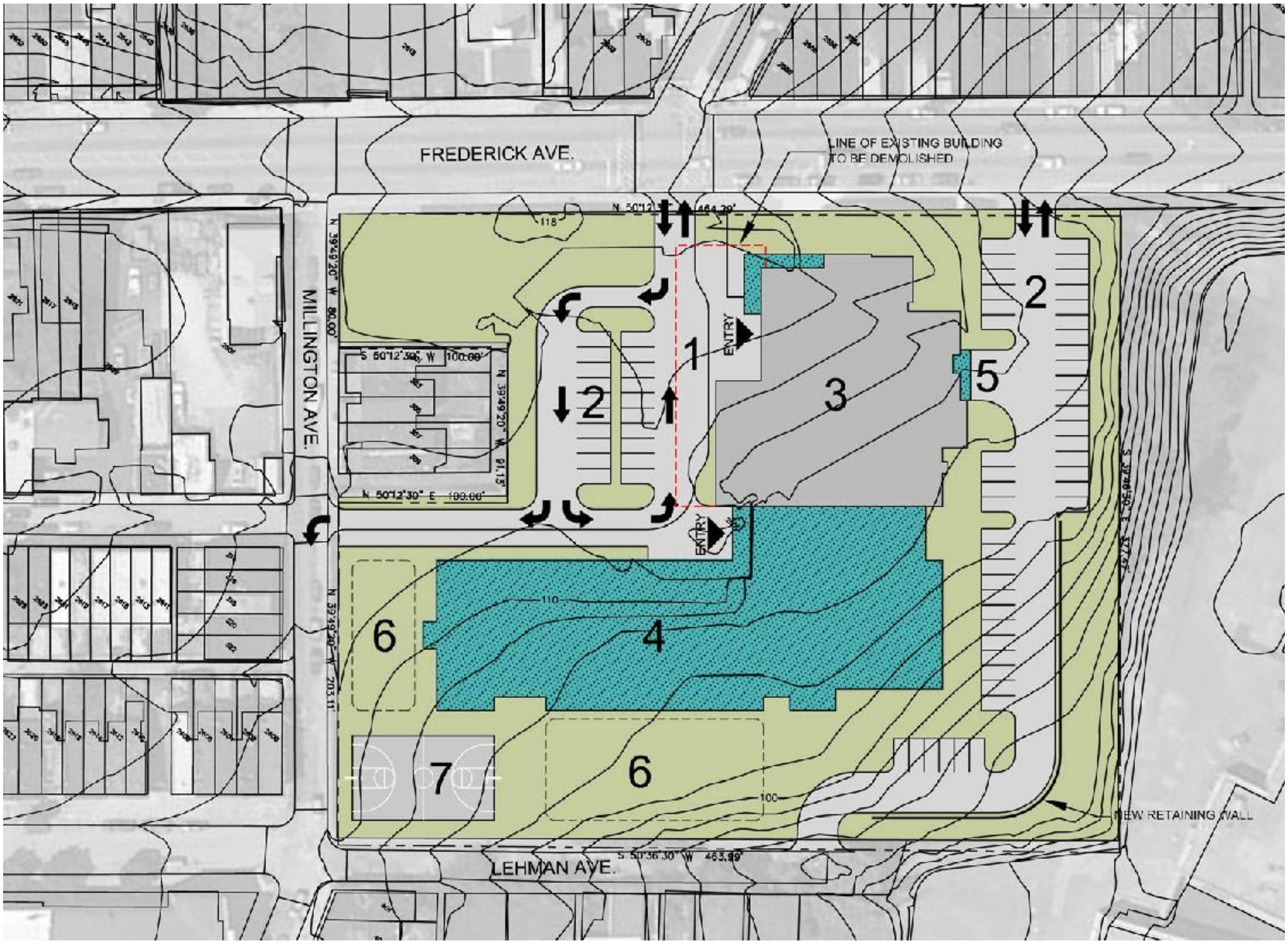
The general location of telecommunication rooms should be as follows:

- TER could remain located in the storage room off media center (second floor).
- TR #1 could remain in the storage room 101-1 of the cafeteria.
- TR #3 should be located near the first grade classrooms on first floor.
- TR #4 should be located near the four grade classrooms on second floor directly above TR #3.

Concept Plans:
Design Concept B - Flexible Commons

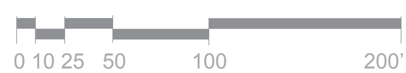


	Advantages	Disadvantages
Building Design	Main entry becomes more defined. Provides a large, central Public "Commons" for after-hours and weekend use. Incorporates a modern Gymnasium for students and the public.	Some program spaces such as gymnasium and cafeteria would need to be relocated to temporary facilities during construction.
Site Design	Provides a clear access drive and parking coordinated with the main entrance. Provides defined arrival points for staff and the public.	Requires an extensive re-grading and new retaining wall to accommodate additional parking. Requires that a fair portion of the existing building be demolished in order to accommodate the access drives.
Construction Activities	Kitchen and Dining remain in the same location - avoiding more expensive demolition and replacement.	Construction activities will be heavy and extensive and students will have to be moved around multiple times as the phased project moves forward.



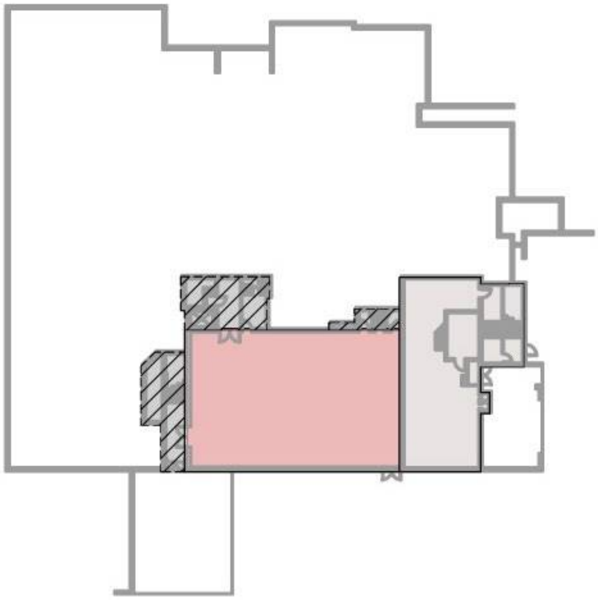
Drawing Key:

1	Drop-Off Loop
2	Parking
3	Existing Building
4	New Construction
5	Service Access
6	Play Area
7	Hard Surface Play Area



Notable Attributes to Design Concept B:

- A new Gymnasium is proposed on the southeast corner of the New Construction.
- The Community Space is located centrally within the building.
- 1st, 2nd, 3rd, 4th and 5th grades are relocated in the new construction in a large wing. Collaborative Learning Areas are included adjacent to the Classrooms.
- Pre-K and Kindergarten Classrooms are located on the First Floor of the New Construction.



Ground Floor

First Floor

Second Floor

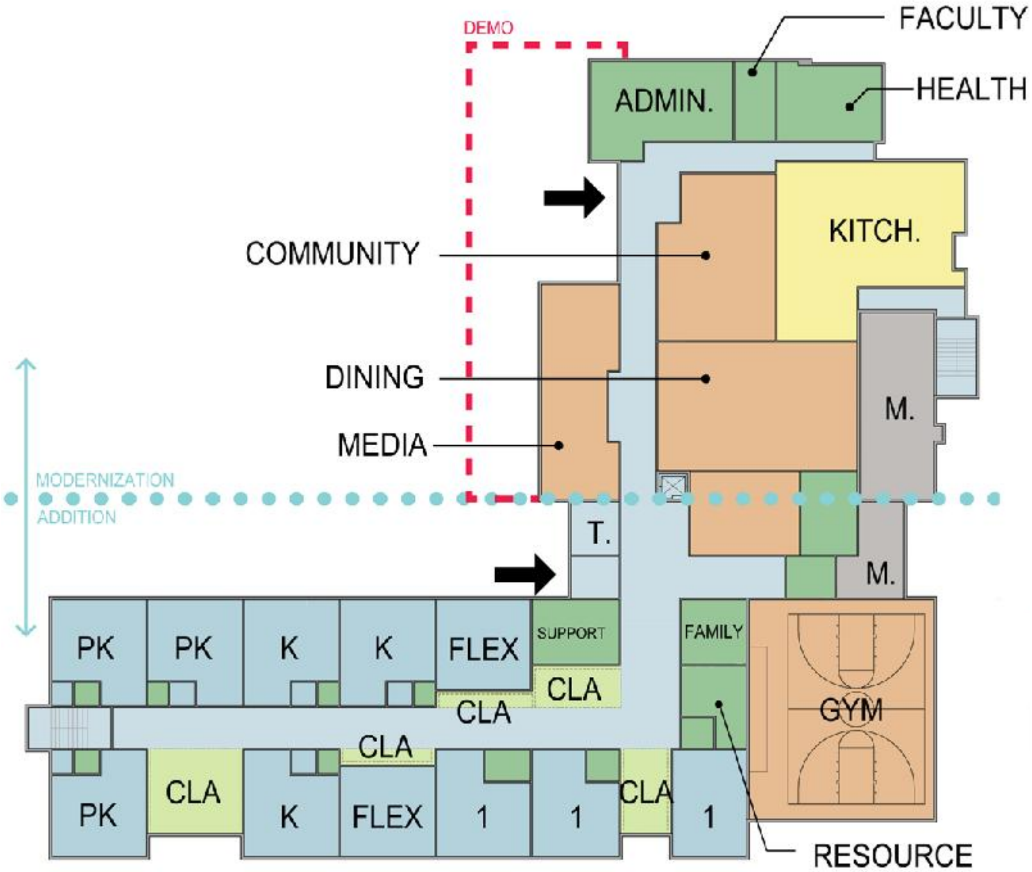
Concept B: Demolition / Renovation Analysis

- Light Demolition / Renovation
- Medium Demolition / Renovation
- Heavy Demolition / Renovation
- Complete Demolition

Concept Plans:
Design Concept B - Flexible Commons

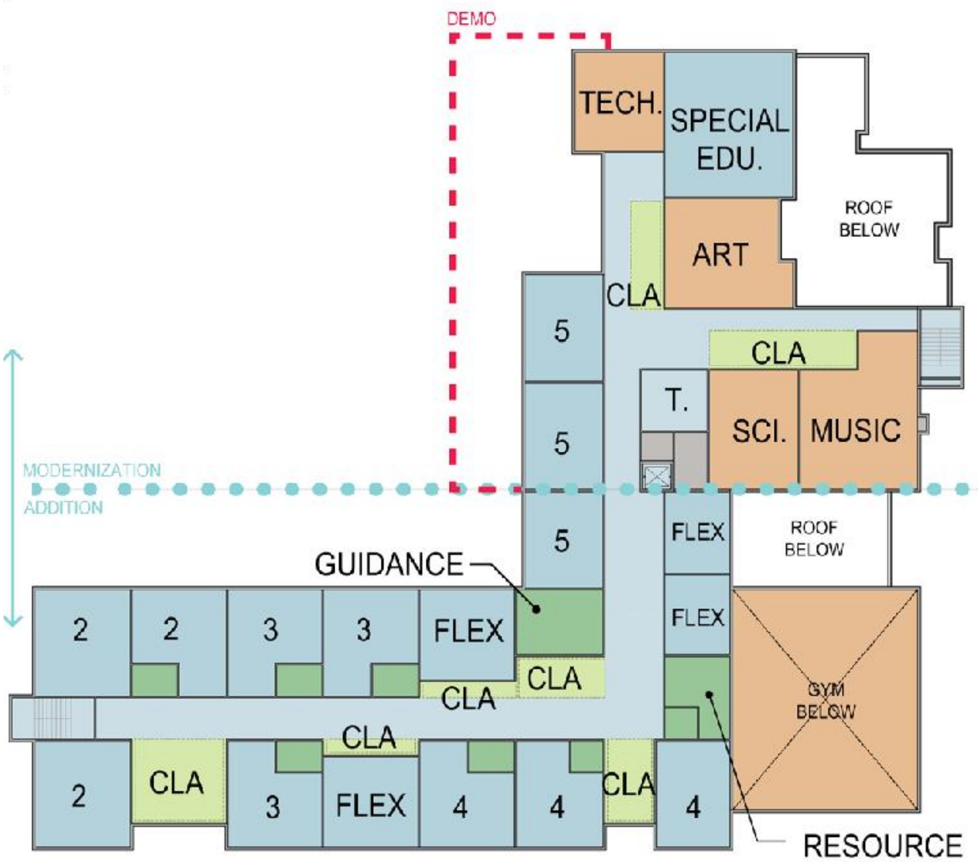
Classrooms
Administration
Specials Classrooms
Circulation
Collaborative Learning Area
Kitchen
Mechanical

- Classrooms
- Administration
- Specials Classrooms
- Circulation
- Collaborative Learning Area
- Kitchen
- Mechanical



LEVEL 1:
48,155 gsf

- Classrooms
- Administration
- Specials Classrooms
- Circulation
- Collaborative Learning Area
- Kitchen
- Mechanical



LEVEL 2:
43,135 gsf
-4640 Upper Gym
38,495 gsf

Concept Plans:
Design Concept B - Flexible Commons (cont'd)

STRUCTURE

General Description

Renovations for Option B include demolition of the northwest corner of the existing structure. We recommend that the proposed demolition terminate along column/beam lines for structural simplicity. The removal of a significant portion of exterior masonry walls will require an investigation of the lateral stability of the existing building. The primary structural challenge for Option B involves infilling the existing gymnasium space with a concrete slab on steel joists at the first floor level. The capacity of the existing framing and foundations supporting the proposed infill slab must be evaluated. This option includes reconfiguration of many interior partition masonry walls.

MECHANICAL

Central Plant (Option #1)

- Heating System: Additional boilers will need to be added to provide approximately 1,100 MBH each. Two pumps per zone will be required depending on the zoning. These pieces of equipment will be located in a new mechanical room.
- Cooling System (chilled water): Provide an exterior air cooled chiller with 410A refrigerant located outside the new mechanical room (approximately 222 tons). Two pumps for the chilled water system would be located in a new mechanical room.
- Additional mechanical space needed will be a total of approximately 2,500 square feet. Location of this room will need to consider the moving the equipment into the room and coil pulls.

Geothermal (Option #2)

- System (cooling and heating): Total of approximately 335 tons, based on five (5) ton units, 67 units for the building would be utilized.

Packaged Rooftop units with hydronic variable volume boxes (Option #3)

- Heating System: Additional boilers will need to be added to provide approximately 1,345 MBH. Two pumps per zone will be required depending on the zoning.
- Cooling System: Cooling will be provided by the packaged rooftop unit and distributed to zones (335 tons).

Variable Refrigerate Flow -VRF (Option #4)

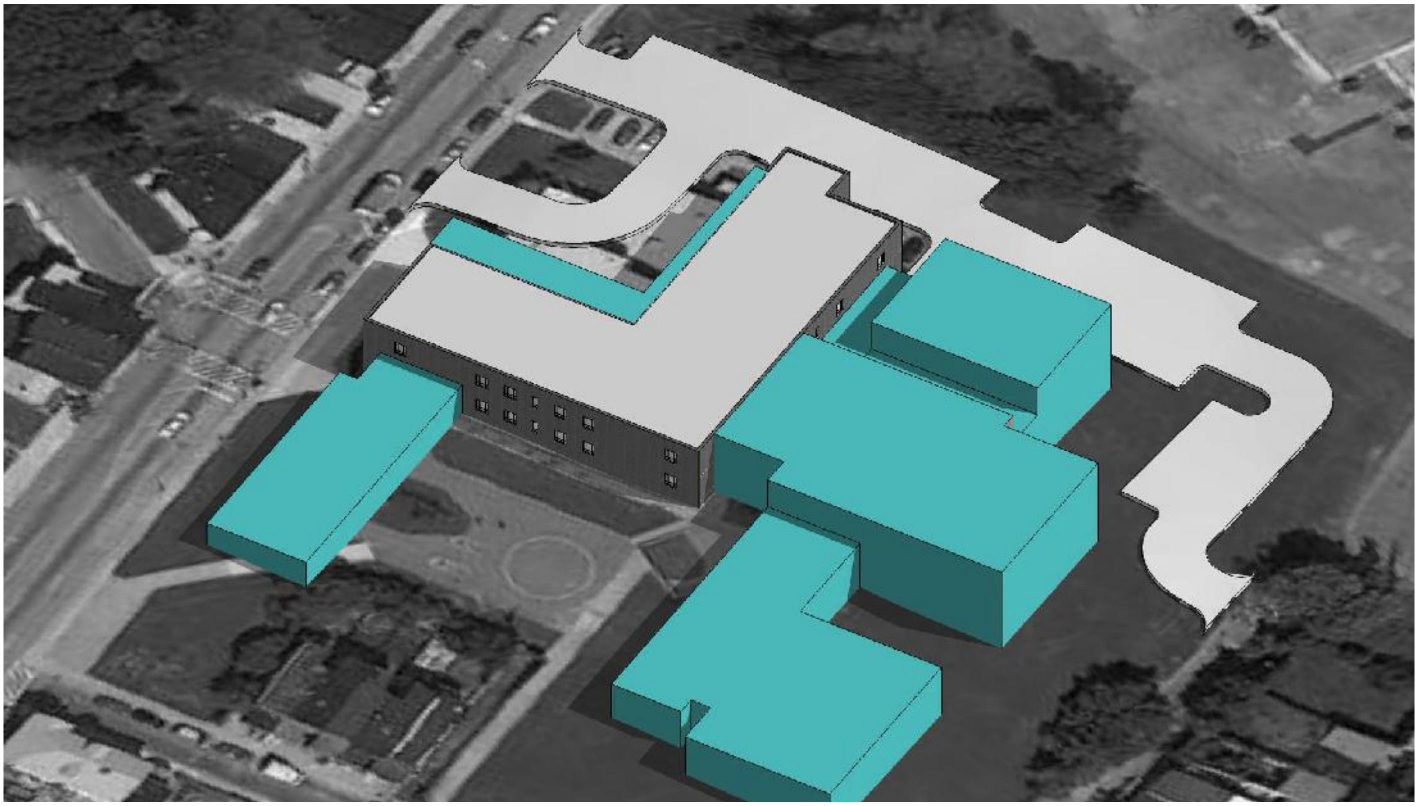
- System (cooling and heating): Total of approximately 335 tons, based on two (2) ton units, 168 units for the building would be utilized.

INFORMATION TECHNOLOGY

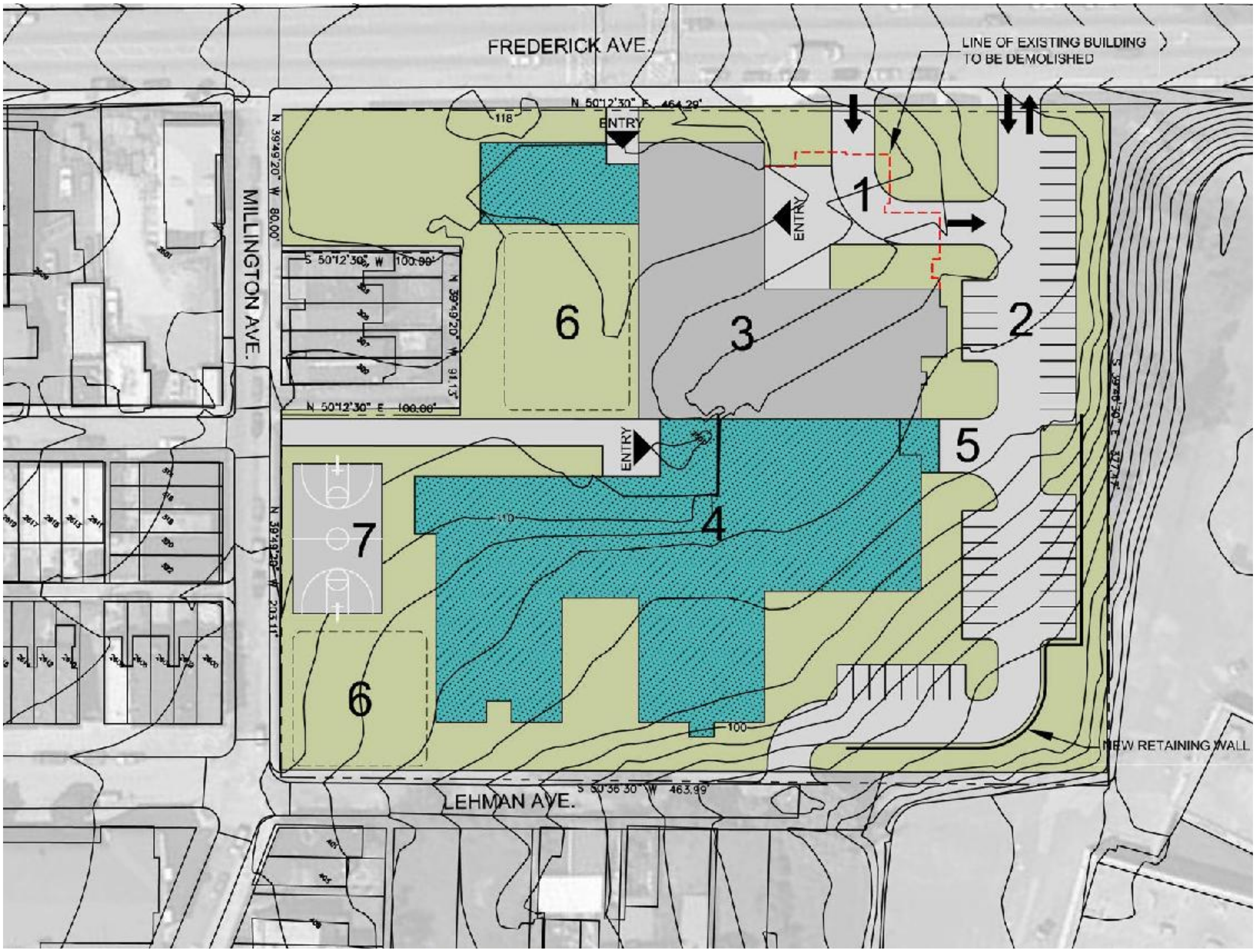
The general location of telecommunication rooms should be as follows:

- The TER could remain located in the storage room off media center (second floor)
- TR #1 could remain in the storage room 101-1 of the cafeteria
- TR #2 should be located near the science classroom in the middle of the second floor.

Concept Plans:
Design Concept C - Community Campus



	Advantages	Disadvantages
Building Design	Provides a large, exterior "Classroom Courtyard" for outdoor learning. Incorporates a modern Gymnasium for students and the public. Incorporates a clearly defined Community extension	Demolition and Relocation of Commercial Kitchen Facilities. Condensed footprint creates formal corridor on 2nd Floor- inhibiting free-flowing collaborative space
Site Design	Provides a clear access drive and parking coordinated with the main entrance. Provides multiple scales of outdoor programming for student and teacher use.	Requires an extensive re-grading and new retaining wall to accommodate additional parking.
Construction Activities	Minimal Classroom disruption due to demolition.	Construction activities will be heavy and extensive and students will have to be moved around multiple times as the phased project moves forward.

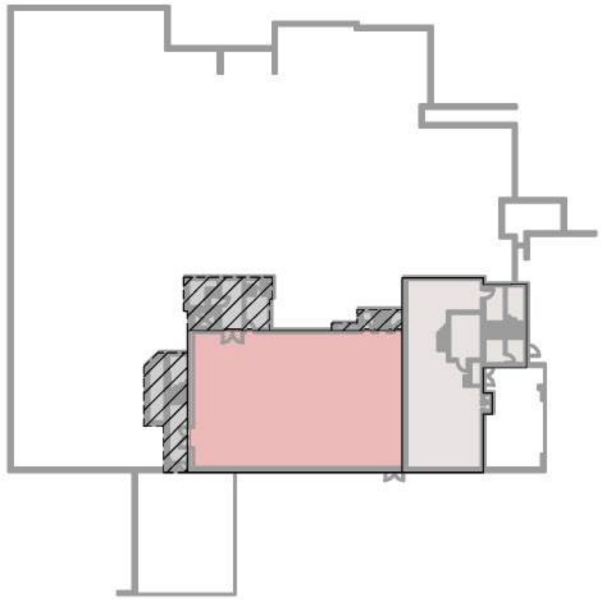


Drawing Key:

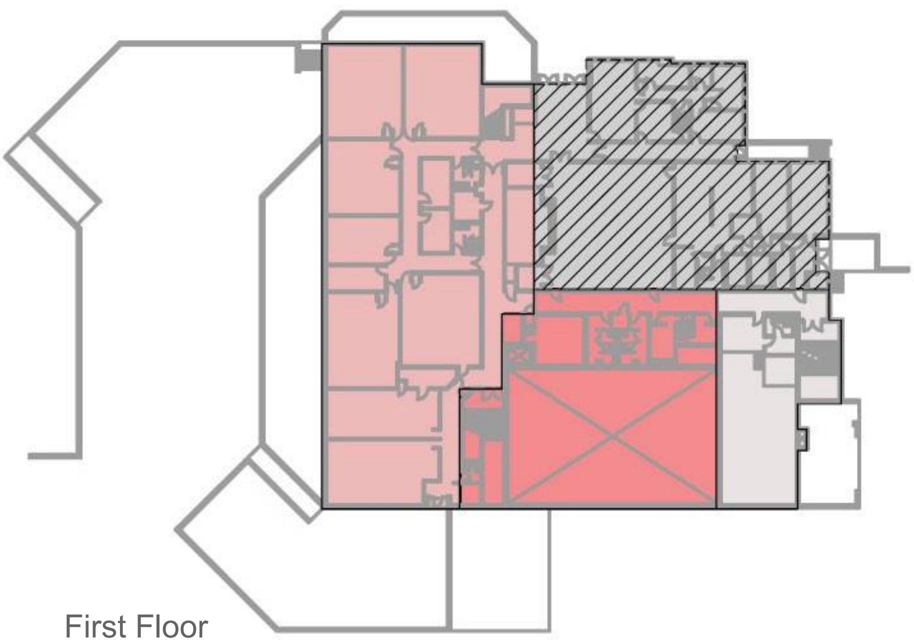
1 Drop-Off Loop
2 Parking
3 Existing Building
4 New Construction
5 Service Access
6 Play Area
7 Hard Surface Play Area

Notable Attributes to Design Concept C:

- The Community Space is located along Frederick Avenue to create a clear separation for after-school access.
- Pre-K and Kindergarten Classrooms are relocated to the single story extension on the south west corner of the building.
- 2nd and 3rd grades are relocated on the south of the building. Collaborative Learning Areas are included in the Circulation space.
- An exterior “Classroom” Courtyard is accessible from the Pre-K and Kindergarten wing.
- Pre-K and Kindergarten are relocated to the single story extension on the south west corner of the building. A large, interior collaborative plaza is located adjacent to these rooms.



Ground Floor



First Floor

Second Floor

Concept C: Demolition / Renovation Analysis

- Light Demolition / Renovation
- Medium Demolition / Renovation
- Heavy Demolition / Renovation
- Complete Demolition

Concept Plans:
Design Concept C - Community Campus

Classrooms
Administration
Specials Classrooms
Circulation
Collaborative Learning Area
Kitchen
Mechanical
0 8 16 32 64 128'
FAMILY
COMMUNITY
TECH.
DEMO
GUIDANCE
ADMIN.
ADMIN.
SUPPORT
HEALTH
M.
DINING
KITCH.
T.
MODERNIZATION
ADDITION
FACULTY
MUSIC
MUSIC
K
K
K
1
GYM
MEDIA
CLA
FLEX
CLA
PK
RES
1
1
PK
PK
FLEX
FLEX
LEVEL 1:
54,556 gsf


Classrooms
Administration
Specials Classrooms
Circulation
Collaborative Learning Area
Kitchen
Mechanical
0 8 16 32 64 128'
DEMO
ROOF BELOW
SPECIAL EDU.
4
4
4
FLEX
ART
5
CLA
T.
SCI.
5
5
MODERNIZATION
ADDITION
RESOURCE
3
3
3
ROOF BELOW
GYM BELOW
ROOF BELOW
CLA
2
2
2
FLEX
FLEX
LEVEL 2:
29,630 gsf

Concept Plans:
Design Concept C - Community Campus

STRUCTURE

General Description

Option C includes demolition of the northeast corner of the existing structure along existing column lines M and 4. This option involves relocation of many existing interior masonry partition walls. The primary structural challenge for Option C involves infilling the existing gymnasium space with a concrete slab on steel joists at the first floor level. The capacity of the existing framing and foundations supporting the proposed infill slab must be evaluated. This option includes reconfiguration of many interior partition masonry walls.

MECHANICAL

Central Plant (Option #1)

- Heating System: An additional boilers will need to be added to provide approximately 1,000 MBH each. Two pumps per zone will be required depending on the zoning. These pieces of equipment will not fit in the current mechanical room and a new mechanical room will need to be created. A separate zone can be utilized for the community center.
- Cooling System (chilled water): Provide an exterior air cooled chiller with 410A refrigerant located outside a new mechanical room (approximately 205 tons). Two pumps for the chilled water system would be located in the new mechanical room.
- Additional mechanical space needed will be a total of approximately 2,500 square feet. Location of this room will need to consider the moving the equipment into the room and coil pulls.

Geothermal (Option #2)

- System (cooling and heating): Total of approximately 330 tons, based on five (5) ton units, 66 units for the building would be utilized.

Packaged Rooftop units with hydronic variable volume boxes (Option #3)

- Heating System: Additional boilers will need to be added to provide approximately 1,295 MBH. Two pumps per zone will be required depending on the zoning.
- Cooling System: Cooling will be provided by the packaged rooftop unit and distributed to zones (330 tons).
- A separate rooftop shall be provided on the community center for separation of systems.

Variable Refrigerate Flow - VRF (Option #4)

- System (cooling and heating): Total of approximately 330 tons, based on two (2) ton units, 165 units for the building would be utilized.

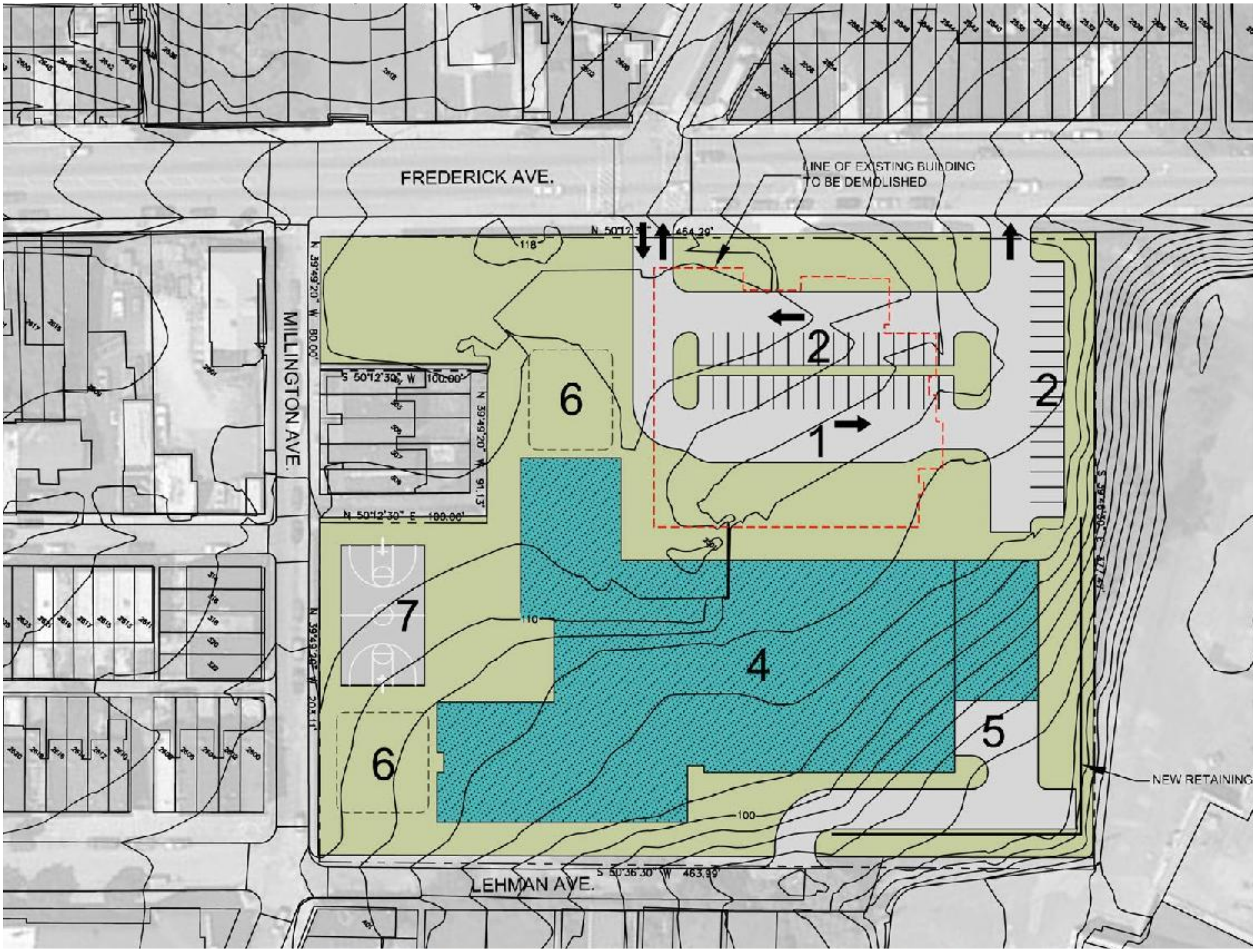
INFORMATION TECHNOLOGY

The general location of telecommunication rooms should be as follows:

- The TER could remain located in the storage room off media center (second floor).
- TR #1 could remain in the storage room 101-1 of the cafeteria.
- TR #2 should be located in the storage area adjacent to the first grade classrooms on first floor.

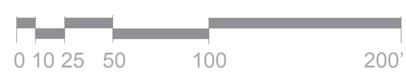
Concept Plans:
Design Concept D - Fresh Start

	Advantages	Disadvantages
Building Design	Possibility of completely new 21st Century School product with full demolition of existing building. Planning of program space locations can be more free-flowing with developing a completely independent new building footprint.	Loss of aspects of existing building which may be unnecessary to demolish or relocate. In a phased construction approach on the site, program spaces may not be located in ideal locations should a cleared site be available for the new building outright.
Site Design	Possibility to develop the most suitable site plan and circulation sequence appropriate for the School. Phased construction of new building and demolition of existing building could preserve more of the southern property for play & open areas in final layout.	Existing 5 private residences on western side of site hinder development on that side of property should they remain in place. Phased construction with the existing building to remain in place will place a majority of the new building to the south of the site, leaving the main entrance points of the new building further away from Frederick Ave. which would may lose community presence.
Construction Activities	Portions of new building could be built in phases while existing building remained occupied and undisturbed. A full new building could be constructed on the site behind the existing building giving a set boundary for construction work to occur.	Phased construction could be more expensive with the possible need to work during evenings and on weekends when school is not in session. Phased demolition of existing building could prove challenging for the occupied school to manage considering security, visibility of students and safety factors.



Drawing Key:

1 Drop-Off Loop
2 Parking
3 Existing Building
4 New Construction
5 Service Access
6 Play Area
7 Hard Surface Play Area



Notable Attributes to Design Concept D:

- Optimize building orientation and site
- Pre-K and Kindergarten Classrooms can be located in a single story near the main entrance with dedicated outdoor play area.
- All grade levels can be easily organized in grade level clusters. Collaborative areas can be provided in arrangements suitable to grade level.
- Food service, dining, and gymnasium can be more easily designed to meet Ed-Spec requirements in regard to size and adjacency.

Concept Plans:
Design Concept D - Fresh Start (cont'd)

STRUCTURE

General Description

Option D is for an entirely new school structure. Similar to the addition portions of Options A, B, and C, we anticipate shallow spread footing foundations for the proposed structure. The framed slab construction shall consist of bar joists bearing on steel beams supported by steel columns. The exterior masonry walls shall serve as shear walls for resisting wind and seismic lateral forces.

MECHANICAL

Central Plant (Option #1)

- Heating System: Boilers will be approximately 3,190 MBH each (total of 2). Two pumps per zone will be required depending on the zoning.
- Cooling System (chilled water): Provide an exterior air cooled chiller with 410A refrigerant located outside the mechanical room (approximately 332 tons). Two pumps for the chilled water system would be located in the mechanical room.
- Along an exterior wall a centrally located mechanical space needed will be a total of approximately 3,600 square feet. Location of this room will need to consider the moving the equipment into the room and coil pulls.

Geothermal (Option #2)

- System (cooling and heating): Total of approximately 332 tons, based on five (5) ton units, 67 units for the building would be utilized.

Packaged Rooftop units with hydronic variable volume boxes (Option #3)

- Heating System: Boilers will be approximately 2,855 MBH each (total of 2). Two pumps per zone will be required depending on the zoning.
- Cooling System: Cooling will be provided by the packaged rooftop unit and distributed to zones (330 tons).

Variable Refrigerate Flow - VRF (Option #4)

- System (cooling and heating): Total of approximately 332 tons, based on two (2) ton units, 166 units for the building would be utilized.

INFORMATION TECHNOLOGY

The general location of telecommunication rooms should be as follows:

- The TER could remain located in the storage room off media center (second floor).
- TR #1 could remain in the storage room 101-1 of the cafeteria.
- TR #2 should be located in the storage area adjacent to the first grade classrooms on first floor.