May 31, 2017

Feasibility Study

Arlington Education Center

Arlington Public Schools

Stantec

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Executive Summary

INTRODUCTION.

The purpose of this feasibility study is to ascertain the viability of converting the existing Arlington Education Center from its current business use classification (B) to educational classification (E). Arlington Public Schools intends to modify the existing Ed Center for use as a high school facility. Schematic plan layouts have been created based on general programmatic direction provided by APS leadership and staff. Recommendations contained in this report are specific to these layouts.

The Arlington Education Center was originally constructed in 1967. It is located adjacent to Washington and Lee High School and the David M. Brown Planetarium. The building is a steel frame structure with composite metal deck floors and roof. The exterior enclosure appears to be precast concrete with original curtainwall glazing. The structure is built partially into the grade, with the primary front entry one level above the rear. Currently the building is used for school administrative functions including offices and meeting rooms and as the central Information Services hub.

A previous study was produced in 2011 by Bowie Gridley Architects with a similar scope and purpose. This report was reviewed by our team and is referenced herein.

Our design team, consisting of two architects, a mechanical engineer, an electrical engineer, and a structural engineer, visited the site on May 4, 2017 and conducted a visual floor by floor assessment (including the exterior envelope) taking photographs, notes and field measurements. No destructive investigation was undertaken.

VIABILITY / IMPACTS.

While the existing building is generally in good condition, converting to a high school will require major upgrades to all building systems. Any educational program involving teaching and support spaces will require complete removal of all existing partitioning and finishes. All toilet rooms will need to be demolished and reconstructed to achieve the required fixture count and meet accessibility requirements. The existing enclosed stairs are, for the purpose of this study, assumed to remain. These stairs will be the limiting factor in how many occupants will be allowed on a floor. Refer to the code study analysis included with this report.

The floor plates are generally in the 10,000 – 12,000 SF range which are well within allowable maximums for the existing construction classification and expected use. The relatively small floor areas combined with locations of the existing stairs are not expected to pose travel distance issues.

At five (5) stories, the building exceeds the allowable height of three (3) stories for the current construction classification and anticipated change in use (including sprinkler exception). There is one viable option to address this issue:

1. The construction classification would need to change to IB through the use of spray applied fire resistive coatings on the structure and floor / roof assemblies.

An additional complication posed by a 5 story building is the requirement for one egress stair to extend to the roof. Modifying the existing stair enclosure to achieve this will be a significant cost.

The bank of two (2) elevators are generally in compliance and could continue to serve the building.

The building is currently sprinklered on all floors except the first. In order to comply to the higher hazard requirements posed by the change in use, all floors of the building must be sprinklered.

The exterior enclosure of the building appears to be well maintained and in adequate condition. The fenestration is recommended to be replaced as part of a major renovation as it looks to be original and at the end of its useful life. The glazing is single pane and frames are not thermally broken. Replacing these assemblies with modern curtainwall / storefront and high-performance insulated glazing units would make a significant positive impact on the energy performance of the envelope. The areas of exterior enclosure between the sections of fenestration are likely not insulated. The interior finish should be removed and insulation added. The membrane roofing appears to be well maintained though lacks any positive slope and likely has little insulation beneath. A new membrane roof with tapered insulation is recommended. The cast stone panels appear to be in good condition. Joint sealant replacement / maintainance is likely required.

Site issues were not studied in depth but we would recommend that non-complying guardrails be replaced at the terrace as well as the entry steps handrails. Terrace paving and waterproofing appeared to be in good condition, but should be considered for replacement given any substantial re-investment in the facility.

THE LEARNING ENVIRONMENT.

The small footprint and radial geometry of the existing building creates both challenges and opportunities for the development of a contemporary learning environment. The success of the scheme proposed scheme will depend on providing a variety of flexible spaces to support a variety of programs.

Ground Floor – The ground floor level is dominated by a large Dining Commons combined with an adjacent Media Center. Movable partitions, flexible furniture and equipment, durable finishes, and dedicated storage will allow this space to be used for a wide variety of large group activities including foodservice, performance/presentation, and fitness. A new outdoor terrace supports these programs and provides a buffer to the existing parking area.

THE LEARNING ENVIRONMENT (CONT.)

First Floor – The first floor level includes the administration suite with associated support spaces along with four standard classrooms. A primary entry provides secure access to the building. Existing plaza area at front and back allows these programs to access the outdoors.

2nd & 3rd Floors – The second and third levels are dedicated to classrooms. A variety of sizes and types of spaces are provided for instruction. Movable partitions, flexible furniture and equipment, and dedicated storage provide adaptability to meet the needs of learners. Dedicated professional workspace allows for a higher utilization of instructional space.

4th Floor – The fourth level is dedicated to various labs and associated storage and prep rooms. A larger floor plate allows these spaces to be slightly larger than the instructional areas on lower levels and roof access allows for effective ventilation. Some of these could be "dry" labs supporting various programs like math, earth science, physics, engineering, and robotics. Others could be "wet" labs supporting programs like biology, chemistry, and art. Dedicated professional workspace allows for a higher utilization of instructional space.

STUDENT CAPACITY.

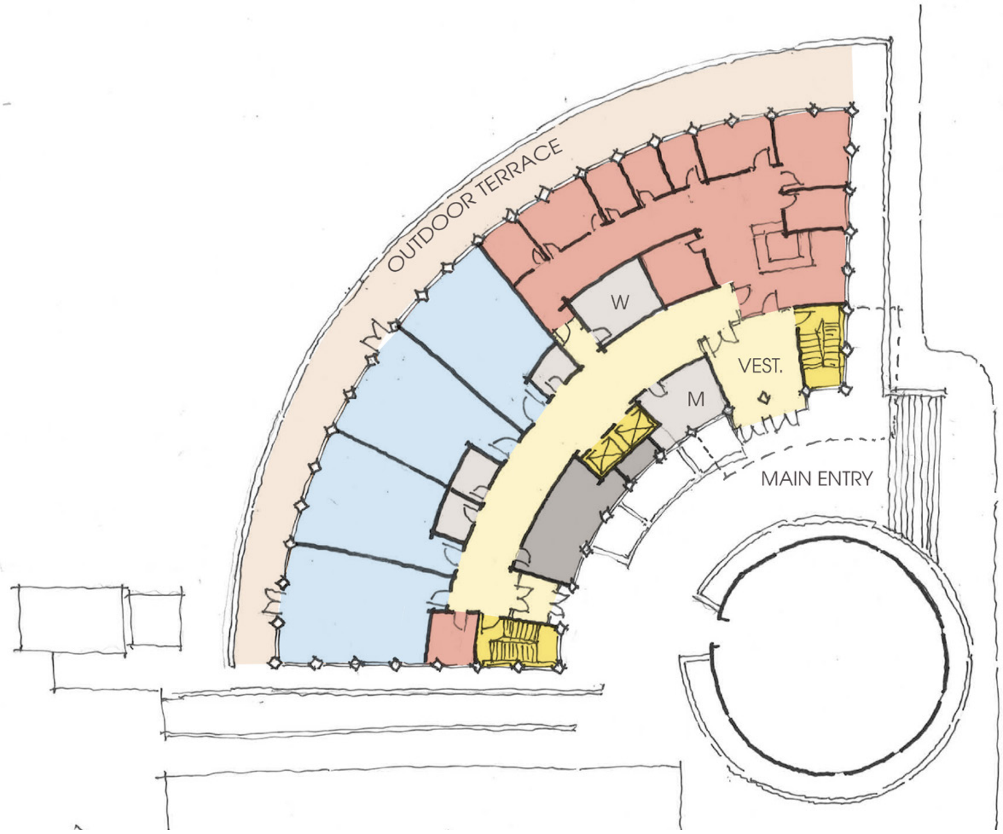
In addition to 24 learning spaces the schematic layout included in this report includes an administrative suite and the following core spaces: a dining commons with kitchen, a physical education space and a media center/ multi-purpose room. This layout would allow the building to be used for a relatively independent high school program. 21 students per classroom is used for capacity calculations at other APS high schools. With this capacity and a utilization model, under which the 24 learning spaces would be used seven out of seven periods per day, the layout shown in the report would provide a capacity of approximately 500 students. If the administrative suite and/or some or all of the core spaces were not required the capacity of the building would rise to 600 or more students

CONCLUSION.

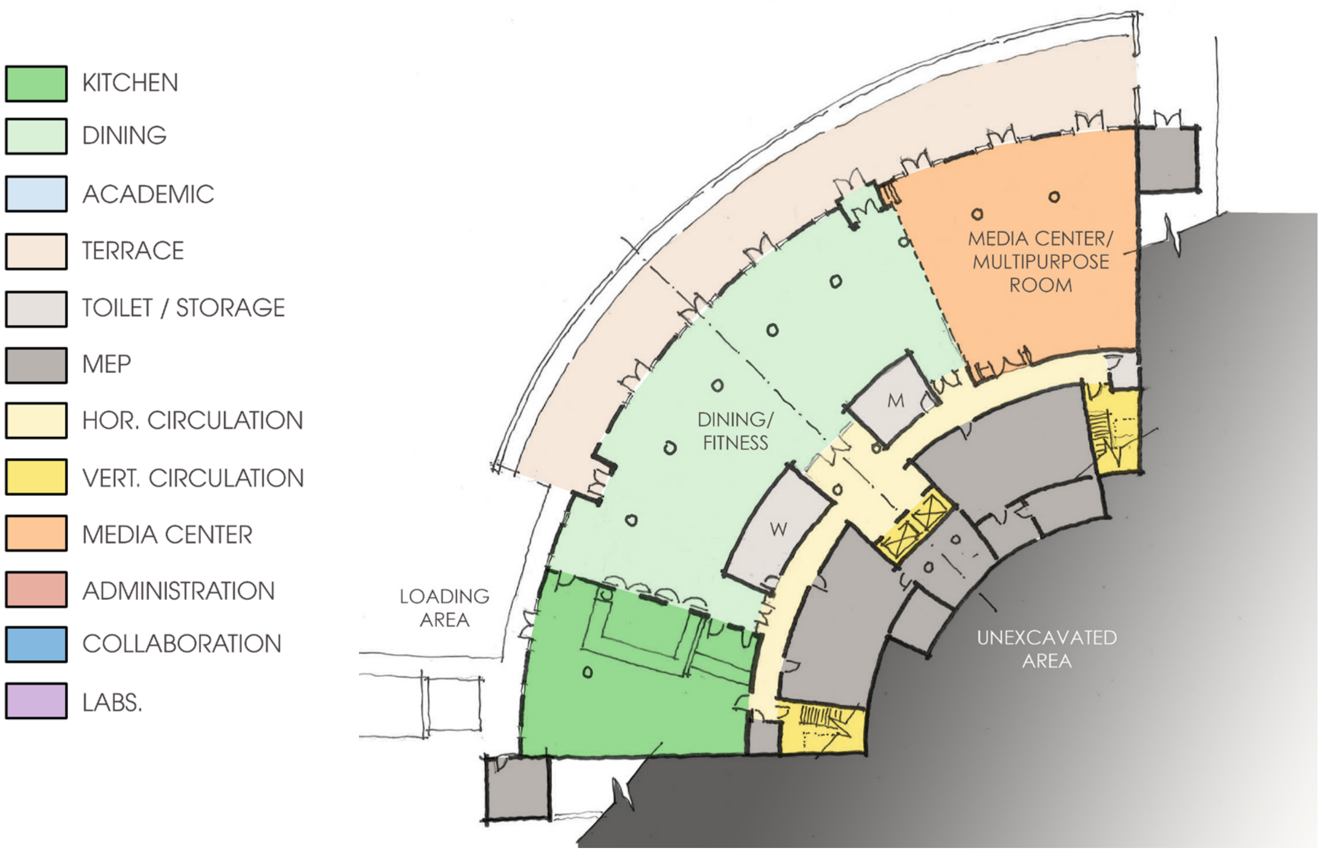
It is reasonably feasible to convert the Arlington Education Center to an educational use (specifically a high school), though there are several issues that pose significant code, constructability, or cost challenges. These include:

- The fact that the building exceeds the allowable height requiring a change in construction type.
- A relatively small floor plate and odd plan shape restrict design options.
- Existing egress stairs determine maximum allowable occupants on each floor.

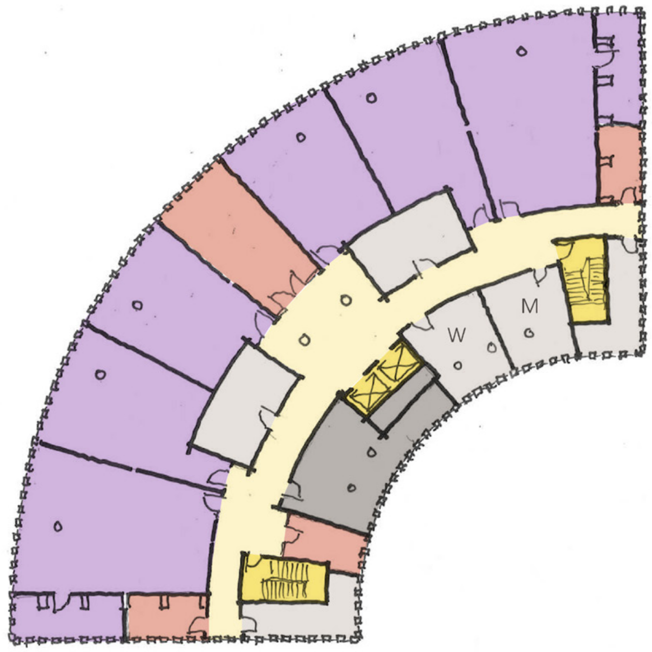
Following are detailed sections that address code compliance, structural conditions, and mechanical, electrical, plumbing, fire suppression systems analysis. A cost estimate is included at the end of this report as a means for fully evaluating feasibility. The schematic layouts illustrate the possibilities, limitations and compromises inherent given the challanges listed above.



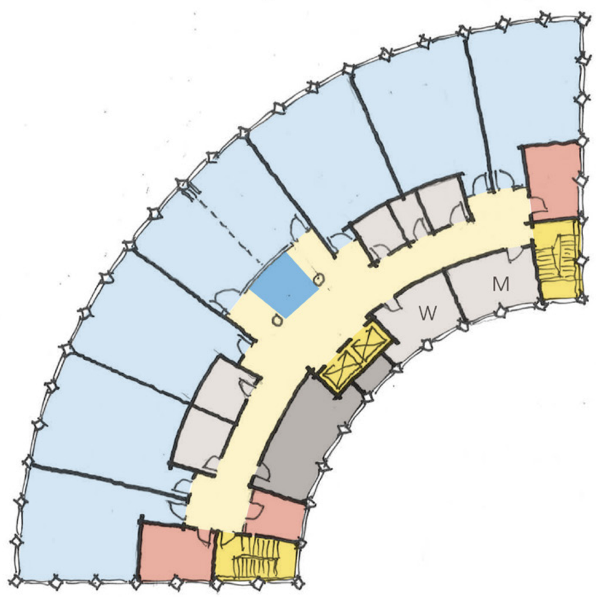
FIRST FLOOR PLAN NTS



GROUND FLOOR PLAN NTS



4TH FLOOR PLAN NTS



2ND & 3RD FLOOR PLAN NTS

RELEVANT CODES.

As part of the Educational Center analysis, the following codes applicable include:

- Virginia Construction Code (VCC) 2012 (incorporates IEBC 2012)
- Virginia Rehabilitation Code (VRC) 2012 (incorporates IBC 2012)
- ADAAG 2010
- International Plumbing Code (IPC) 2012
- International Mechanical Code (IMC) 2012
- NFPA 70 2012 International Fuel Gas Code (IFGC) 2011
- International Energy Conservation Code (IECC) 2012

OCCUPANCY CLASSIFICATION.

The Educational Center is proposed to change from a current "Business (B)" occupancy to a "Educational (E)" occupancy. Per table 1012.4 of the IEBC, this raises the hazard category of the building from Relative Hazard Group 4 to Relative Hazard group 3. This results in the requirement to provide means of egress compliant with the current VCC/ IBC 2012, and also requires all stairways be fully enclosed on all floors. Per VRC section 410.4.2, a complete change of occupancy will also require:

1. At least one accessible building entrance.
   a. Currently the entries on the ground floorl and the first floor are accessible and compliant.
2. At least one accessible route from an accessible building entrance to primary function areas.
   a. There are no level changes within the floors, so the building is compliant.
3. Signage complying with Section 1110 of the International Building Code.
   a. All signage in the building will need to be updated as the program spaces are changed.
4. Accessible parking, where parking is being provided.
   a. Accessible parking is provided to the south of the building. Calculations will need to be performed to determine if sufficient accessible parking is available based on current zoning regulations.
5. At least one accessible passenger loading zone, when loading zones are provided.
   a. No loading zones are currently present. Buses were observed unloading on the east of the building to access the planetarium, and this loading area is not accessible due to the large stairway and grade change. Future drop off / pick up could occur at the ground floor level.
6. At least one accessible route connecting accessible parking and accessible passenger loading zones to an accessible entrance.
   a. See response to item 4 above.

ACCESSORY OCCUPANCIES.

The change in occupancy analysis above assumes the entire building is being changed to an Education occupancy. Accessory unseparated assembly occupancies are allowed based on their percentage of the floor area. Any other occupancies planned will require the use of separated construction using fire walls or fire barriers. Any multi story spaces, hazardous materials storage, and stages or platforms will require additional code analysis to determine compliance, per VRC section 1002.1.

ALTERATION LEVEL.

As the proposed change to the building is anticipated to require a complete interior renovation, the work will be classified as a Level 3 Alteration per VRC section 505.1. As such the renovation will need to comply with the requirements of both the 2012 VCC and the 2012 VRC.

CERTIFICATE OF OCCUPANCY.

The proposed occupancy change requires a new Certificate of Occupancy be issued by the local building department per VRC 103.2 as well as approval by the Arlington County Board.

OCCUPANT LOAD.

Per VRC section 805.3.1 and section 1012.4.3, the occupant load of each floor must be calculated in accordance with the VCC and IBC. As the stair towers are existing and are assumed to remain as configured, the allowable occupant load of each floor will be determined by the existing means of egress capacity.

For example, the existing egress stair width is 42" clear between the stringers. Per IBC section 1005.3.1 exception 1, the egress width factor is 0.2. This results in an allowable occupant load of 210 persons per stairway. As there are two stairs on each floor, the maximum egress load of each floor is assumed to be 420 occupants per floor. This will limit the types of spaces allowable for each floor- it assumed higher occupancy spaces such as assembly areas would need to be located on a floor with direct egress capability.

CONSTRUCTION TYPE.

In order to meet the height restrictions of the VCC/ IBC 2012, the building must be brought up to IB construction. This will require the entire building structure be fire proofed as well as fully sprinklered- see sprinkler analysis below.

Existing steel structure, floor and roof deck will require spray applied fireproofing

ACCESSIBILITY.

All building components altered as part of a renovation or reconfiguration must comply with ADAAG 2010 per section 36.402.b.

BUILDING HEIGHT.

The existing building is classified as a five-story building, per the IBC Chapter 2 definition of a "Story above Grade Plane."

In regards to allowable building height, the change from business to education places the building into a higher hazard category. As such, the building height must comply with Chapter 5 of the IBC. For IB construction, the maximum allowable building height is 5 stories for educational use. The building will not be compliant under any other construction type.

As the building is more than two stories, several other code sections become applicable. Any load bearing walls must be fire rated per IBC section 704.3. Shaft enclosures must be 2 hour rated per IBC section 713.4.

ALLOWABLE FLOOR AREA.

The current floor areas of the Education center are 9,300 SF for the 1st through 3rd floors. The ground floor and 4th floor are approximately 12,000 SF. Per IBC table 503, for IB construction, unlimited floor area is allowed for an Education occupancy. The building has a 100% open perimeter for fire truck access.

SPRINKLER AND FIRE PROTECTION SYSTEMS.

The building is currently fully sprinklered with the exception of the ground floor. To comply with VRC section 804.2, the entire building must be fully sprinklered, and the existing system reconfigured to meet the new proposed floor plan. Refer to the plumbing narrative for further information. An approved fire alarm system must be installed per VRC section 804.4. With the automatic sprinkler protection provided in accordance with VRC Section 804.2 and connected to the building fire alarm system, automatic heat detection will not be required per VRC section 804.4. A standpipe system is required per section 905.3.1.

STAIRS.

Per VRC section 805.3.1.2.3, Stairs must be at least 22 inches wide with risers not more than, and treads not less than 8 inches deep. Landings at the foot of stairs shall not be less than 40 inches wide by 36 inches long and located not more than 8 inches below the door. The current stairs appear to be compliant with these requirements.

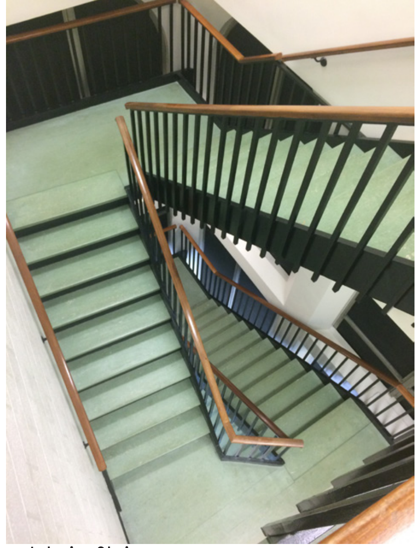
The current handrails on the stairs in the Education Center do not meet the current VCC and ADAAG requirements. Handrails and guards must be replaced as part of the change in occupancy per VRC section 403 and section 1012.4. Note that there is an exception to the handrail extension requirement per VRC 403.1 exception 2, where handrail extensions are not required if such extensions would be hazardous due to plan configuration.

Per VRC section 1012.7, all stairways, vertical shafts and floor openings must be fully enclosed and protected with not less than a 1 hour fire rating. All penetrations must be fully sealed with the appropriate rated sealant.

The existing stairs are signed as "areas of refuge" but do not comply with the communication or size requirements for such. Areas of refuge are not required in a fully sprinkler building. It is recommended that all "area of refuge signage" be removed.

Note that per section 1009.16, in buildings of four or more stories, at least one stairway must extend to the roof. Currently the building is not compliant with this, as the only egress to the roof is through a roof ladder in the fourth floor mechanical room.


Exterior Stairs


Interior Stairs


Restrooms

Elevators

ELEVATORS.

The existing elevator door widths (36") complies with the requirements of the ADAAG. The cab dimensions (48" x 67" are short of the requirements of table 407.4.1. However, the ADAAG under section 36.402.c does provide alterations to comply "to the maximum extent feasible." Elevator shaftway size increases may be exempted from the requirements if the local jurisdiction allows. We understand that these units are a constant maintainence problem and are likely at the end of their useful life.

MAXIMUM TRAVEL DISTANCE.

The maximum travel distance allowed for E occupancies in fully sprinklered buildings is 250 feet. Common paths of travel will have to be evaluated based on the proposed floor plans.

DOORS.

Panic hardware will be required for all egress doors per VRC section 805.4.4.

FINISHES AND MATERIALS.

Due to the occupancy change, hazard level change and alteration level, all interior finishes are required per VRC section 702 to comply with IBC2012 Chapter 8.

RESTROOMS.

The current restrooms do not meet VCC/IBC or ADAAG regulations. It is recommended the rooms be reconfigured with new fixtures to comply with current regulations. The fixture count for each level will be determined based on the new occupant load for the building.

EXTERIOR ENCLOSURE.

Due to the change in occupancy and resultant increase in electrical and fossil fuel consumption, the building will be required to meet the requirments of the 2012 IECC (International Energy Conservation Code - Section C101.4.4). The glazing and window (storefront and curtainwall systems) must be replaced. The roof system will be replaced, and the exterior walls insulated.

INTRODUCTION.

A visual structural survey was performed on the existing five-level office building located at 1454 N. Quincy Street in Arlington, VA. The purpose of the survey was to identify potential structural defects, document the typical framing conditions in the visually assessable areas of the building and provide an initial determination regarding the impact of the potential change in use of the building from an office to a school.

PROCEDURE.

All of the items identified in this report were obtained through a visual survey. Areas covered by existing architectural finishes were observed at isolated areas only where the structure could be seen without damaging the existing finishes. The first-floor structure and roof structure were the most accessible areas. The majority of the ground floor was observed from the mechanical space where no existing ceilings were present. The roof was accessible through an attic hatch in the ceiling of the 4th floor. At the second and third floors the existing structure was covered by the ceiling and was visually accessible only at the mechanical rooms. The existing base building structural drawings were not available for review as a part of this study.

OBSERVATIONS.

In general, the building appears to be in a good structural condition. No areas of significant floor deflection or foundation settlement were observed. The structure of the building is steel framed consisting of 2-inch steel composite deck with a concrete topping spanning to steel filler beams spaced at approximately 10-feet on center that are supported by steel girders. See Photo #1. It is likely that headed steel studs were used to make the beams composite with the slabs but this was not visible during the survey. Non-composite steel deck was observed at the underside of the roof structure.


Photo #1: Typical beam -column connection detail


Photo #2: Typical bolted seat angle moment connection


Photo #3: Steel girder to concrete pilaster connection at 1st floor

Photo #4: Stacked CMU at top of dunnage beams

Photo #5: Cantilevered dunnage base plates

The building being radial in shape, has been framed with (3) radial column grid lines. Wide flange steel columns appear to be used at each of the grid lines running perpendicular to the radial grids. CMU walls were used at the stair wells of the building. Bolted steel moment frames were observed where the radial girders join the columns at the multiple floor levels in the building, See Photo #2. This indicates that the building was likely designed with rigid steel frames for lateral force resistance. The exterior concrete foundation walls extend up to the underside of the first-floor structure. Concrete pilasters occur beneath the exterior steel column locations. See Photo #3.

A change from commercial office use to an educational use is unlikely to trigger any extensive required live load upgrades to the structure of the building. It is only at assembly areas and possibly storage areas that the floor live load upgrades could be required. New shafts required through the various floor levels could be accommodated relatively easily by providing steel angle framing between the filler beams to support the deck edges around the perimeter of the openings. It is assumed that the shafts could be located between the existing filler beam and girder beam locations.

The existing roof dunnage platform was also observed. The steel supporting the RTU's is lightly corroded but appears to still be in a serviceable condition. CMU blocks have been stacked on to the top of several of the dunnage beams. See Photo #4. It is believed that the blocks have been added to dampen vibrations as there were no vibration isolators installed between the RTU's and the dunnage beams. Additionally, several of the existing dunnage posts are misaligned with the supporting roof curb causing the post base plates to cantilever off of the edge of the curb. See Photo #5.

CODE REVIEW.

According to the 2012 IEBC, a renovation of this magnitude will likely be classified as a Level 3 Alteration. The existing structure will need to be evaluated in accordance with Section 907. Since the anticipated work in the building is not anticipated to result in any substantial structural alterations, the existing gravity and lateral load-resisting systems will only need to be evaluated in accordance with code sections 807.4 and 807.5. These sections permit existing gravity load members having a load increase of 5 % or less and lateral load-resisting members having a load increase of 10% or less to be accepted as is without requiring additional code conformance analysis work.

Outdoor condensing unit

Indoor chiller

CENTRAL PLANT – COOLING.

The existing plant consists of a hydronic chilled water system with two indoor chillers, two remote air cooled condensing units mounted on the roof, and primary constant volume pumping.

The outdoor air cooled condensing units were manufactured in 1995 by Carrier and are approximately 22 years old; however, ASHRAE's median service life (useful life) is 20 years for such equipment.

Total capacity is 100 tons per chiller, or 200 tons total for the plant. Based on initial calculations for an educational use at 400 square feet per ton of cooling density, the capacity is adequate.

The chillers use R-22 refrigerant which has been phased out.

Based on a complete building renovation to educational use, the plant would likely have capacity to serve the new building function, however due to age, condition, and maintenance cost for an R-22 refrigerant based chiller, the chilled water central plant is recommended to be replaced in its entirety or replaced with an alternate system type (suggested VRF, see 'Air Handling Units' section below).

We understand that the existing mechanical room on the ground floor was flooded a few days after our site visit and rendered the chillers inoperable and likely irreparable.

Gas fired boilers

CENTRAL PLANT – HEATING.

The existing plant consists of hydronic heating hot water served by central gas fired boilers. The boilers are A.O. Smith copper upflow hydronic boilers. They were manufactured in 1982 and are approximately 35 years old. The 2015 ASHRAE Systems and Equipment published useful life for this type of boiler is 25 years.

The efficiency of this equipment is at current energy code requirements of 80% for gas fired hydronic boilers, however 90-100% efficient condensing boilers are now widely available.

Hydronic heating pumping is accomplished with two end suction pumps located in the ground level mechanical room. Pumping is constant volume. Pumps appeared to be in poor condition and likely beyond their useful life.

Due to the age, remaining useful life, low efficiency, and additional maintenance cost associate with such equipment, full heating hot water system and boiler replacement is likely required.

AIR HANDLING UNITS.

Each floor is served by a centrally located variable air volume modular air handling unit with a chilled water coil, hot water coil, fan, and filters. With the exception of the 4th Floor, all units were observed to be in poor condition and components beyond their useful remaining life. It is recommended that all units be replaced. Future building use as education will require additional outdoor air to comply with Virginia Mechanical Code. This additional outdoor air is likely to trigger the Energy Code requirement for energy recovery at each unit. This requirement will create additional component requirements in each unit and additional space. It is likely that the existing lack of service space will only become considerably worse when new units accommodating some form of heat recovery are introduced. It is also anticipated that coil sizes will become larger due to the required increase of outdoor air for an educational use facility.

A future alternate proposed system is VRF with DOAS (Variable Refrigerant Volume fan coil system with Dedicated Outdoor Air Units). This system would allow for smaller air handling units (the DOAS units), smaller ductwork, and the potential for greater energy efficiency. This system type will eliminate the need for a new central chilled water and heating hot water plant.

DISTRIBUTION – DUCTWORK.

The existing duct distribution system is not adequate to serve reconfigured educational spaces and is recommended to be replaced in its entirety. In addition, existing insulation and seams appeared compromised which creates potential condensation issues as well as code compliance implications.

Ductwork

DISTRIBUTION – HYDRONIC PIPING.

Much of the piping inspected in the central mechanical room and the secondary mechanical rooms was in poor condition. Corrosion at joints, fittings and valves was apparent. It is recommended that all hydronic piping, including accessories such as isolation valves, be replaced or completely removed if VRF is utilized for the future building use.

Hydronic piping

VARIABLE AIR VOLUME TERMINAL UNITS.

The existing office spaces are currently served by variable air volume terminal units (VAV's) with hot water reheat. ASHRAE 2015 Systems and Equipment published useful life for VAV's is approximately 20 years. It is unlikely that these units have the remaining useful life and/or capacity to serve new spaces. It is recommended that all VAV terminals be replaced unless system type is modified for future use as an educational facility.

PERIMETER FIN TUBE HEATING.

The existing hydronic hot water fin tube heating at the building exterior perimeter is likely beyond its useful life. However, with the current building envelope and glazing, it is unlikely this system component could be fully eliminated due to the large exterior envelope load. The existing units are recommended to be replaced. Unless the exterior envelope glazing is upgraded, some form of supplemental perimeter conditioning is anticipated to be required.

CRITICAL ZONE COOLING.

The existing IT/server room on the ground floor is served by two dedicated Liebert air cooled split units. The units appeared relatively new and in good working order. We understand from APS that this function will be relocated to another building and thus will not be a factor in any renovation.

BUILDING AUTOMATION SYSTEM.

The existing building has a combination of pneumatic and DDC controls. The central plant equipment and air handling unit hydronic control valves are pneumatic. It appeared that most of the space thermostats and temperature sensors had been updated to DDC. It is recommended to replace all controls, both existing digital and pneumatic, with new DDC controls. This will include new air handling unit controls, VAV controllers, space sensors, and supplemental controls for miscellaneous building systems (domestic hot water heater/pump integration, sump pumps, pulse energy meters, etc.). The new DDC shall be open protocol, BACnet, with remote internet access integrated to a County wide BAS (if available).

DOMESTIC HOT AND COLD WATER.

The existing domestic hot water system consisted of a central gas fired water heater, 75 gallon storage capacity with 75 MBH input and circulation pump. It was manufactured in 10/2000. Due to the age of the heater, it is recommended to be replaced.

The domestic water service is 3" and believed to have adequate capacity for the new building function as educational. The existing insulation appeared to be damaged in many of the visible locations. Distribution piping will require replacement based on new fixture layouts and demand.

SANITARY SEWER AND VENT.

The existing sanitary sewer is 5" and constructed of hub and spigot cast iron piping believed to be primarily original vintage to building construction. The Cast Iron Soil Pipe Institute does not publish a life span for cast iron pipe, rather recommends pipe wall thickness evaluation to determine feasibility for reuse. In Stantec's experience, average life in a commercial building of this age and type is approximately 50-60 years. It is recommended that sanitary sewer pipe within the building be evaluated, including underground, above ground, and vent piping, as visible signs of corrosion and failure were evident. It is likely that a total replacement will be required.

STORM.

The existing storm piping appeared to be cast iron hub and spigot and vintage to the building construction. Most of the storm piping was concealed and could not be visually evaluated, however what was visible appeared to be in poor condition. A hub in the fourth floor mechanical room was cracked, presumably due to age and wear due to proximity to maintenance space. The Cast Iron Soil Pipe Institute does not publish a life span for cast iron pipe, rather recommends pipe wall thickness evaluation to determine feasibility for reuse. In Stantec's experience, average life in a commercial building of this age and type is approximately 50-60 years. It is recommended that storm pipe within the building be further evaluated for future use. It is likely that a total replacement will be required.

Storm piping

PLUMBING FIXTURES.

Existing fixtures are anticipated to require full replacement due to restroom reconfiguration, fixture ADA requirements, and flow requirements.

NATURAL GAS.

The existing natural gas service is assumed to be adequate for future use as an educational occupancy as the existing loads for domestic hot water and hydronic heating hot water are not anticipated to change significantly. Other future loads, such as lab gas or otherwise could impact this assumption. The existing pressure reducing valve and meter will require evaluation for potential re-use based on actual future loads.

FIRE PROTECTION SPRINKLER SYSTEM.

The wet pipe sprinkler system serves all floors with the exception of the ground floor. A fire pump, zone valves with tamper switches, and riser in stairwell provide fire water to the floors. The sprinkler layout and heads shall be reconfigured and replaced to support the new building function. The existing fire water service at 4" is assumed to be adequate based on future building use, however will require full evaluation by a certified fire protection designer once full building function is identified. In addition, while the fire pump is assumed to have adequate capacity for re-use, a current water flow/pressure test will be required for full evaluation. The ground floor which is currently unprotected will require full sprinkler per code for an educational use. The fire sprinkler main shall be extended from the riser and zone valve in the stairwell. New distribution and sprinkler heads shall be provided to the entire ground level for the protection levels required (anticipated to be primarily Light Hazard and Ordinary Hazard Group 1). Piping shall be black steel with mechanical couplings.

Existing electrical main disconnect along exterior north wall

Existing electrical main switchgear in mechanical room

ELECTRICAL SERVICE.

The existing electrical service is rated at 800A, 480/277V and originates from Switchboard #1 in Washington-Lee High School which is adjacent to the Education Center. The electrical service main disconnect switch is located along the north exterior wall of the building at the basement level. The service feeds a main switchgear located within the main mechanical room on the basement level. The existing switchgear is rated at 1000A, 480/277V.

The existing electrical service provides approximately 665kVA of power or 12.5W/SF based on 53,000 total square feet. Educational facilities are typically provided with at least 20W/SF to allow for enough capacity for cooling, heating, lighting, warming/catering kitchen (non-commercial), and miscellaneous loads. If a full commercial kitchen will be provided, it may adversely affect the total size of the service. Based on this power allowance, it is suggested that the electrical service as well as the existing switchgear be replaced to accommodate 1200A, 480/277V. A study must be performed on Switchboard #1 in Washington-Lee High School to determine if it can accommodate the upgraded electrical service to the Education Center. The study should be based on the actual peak demand determined by the electrical utility bills over the past 12 months or longer if the data is available. If Switchboard #1 can accommodate the upgraded service, additional conduits may be required between the buildings. If Switchboard #1 cannot accommodate the upgraded service, then a new pad mounted utility transformer and service conduits will be required dedicated to the Education Center. In either case, the new switchgear will be provided with an integral electronic meter and surge protective device. A full short circuit and coordination study should also be performed to determine the proper fault current rating of the switchgear.

In addition, it is suggested that the new switchgear be relocated from the present location. The existing switchgear is located in the main mechanical room with numerous pipes, ducts, expansion tanks, etc. over and around the switchgear without any protection as required per NEC 110.26. According to information received from the on-call engineers, the facility experienced a flood in this mechanical room when a cold water pipe serving the domestic water heater burst sometime during the night / morning of May 7, 2017. The flood caused damage to the existing chillers and space heating boilers but was contained only to the mechanical room. The electrical equipment was not damaged and is presently fully functional. Notwithstanding this, it is suggested that the switchgear be opened and properly assessed by a licensed forensic electrical investigator to determine if there is further damage. It is highly suggested that the new electrical switchgear be placed on a 6" housekeeping pad located in a main electrical room to separate it from mechanical equipment to properly protect the equipment and also provide the NEC required clearances around it.


Existing generator and fenced enclosure


Existing 800A ATS

EMERGENCY POWER.

The facility is presently provided with an exterior diesel generator with belly tank for standby power requirements located in a fenced in area at the northwest corner of the lower parking lot of the building. According to existing documents, the generator is rated at 2,000kW, 480/277V and is diesel-fired with an integral 4000 gallon belly tank and approximately 39 hours of backup fuel. The generator feeds an ATS in Switchboard #1 in Washington-Lee High School. Therefore, the generator provides emergency power to the entire Education Center.

It is anticipated that the new high school will require emergency power for egress lighting, fire alarm, and a fire pump/jockey pump. A discussion is required to determine if all loads within the building must be provided with emergency power. Alternatively, emergency power may be provided for only code required loads / selected loads by the Owner. A study must be performed on the existing generator to determine if it can accommodate the proposed loads in the Education Center. Dependent on the final loads of the Education Center, the generator may have capacity to handle the emergency loads. If it has capacity, no additional conduits will be required between Washington-Lee High School and the Education Center. If it is determined that the generator cannot accommodate the Education Center, then a new pad mounted gas-fired diesel generator with integral belly tank and approximately 48 hours of backup fuel will be required dedicated to the Education Center.

The generator should be mounted on a 6" housekeeping pad and provided with neoprene and spring isolators. The associated ATS's and emergency panels would be in located in the main electrical room. A remote life safety panel will be located within an electrical distribution closet on the 3rd floor that will service life safety loads on the 2nd, 3rd, and 4th floors

POWER DISTRIBUTION.

The existing facility is provided with 208/120V distribution via 225kVA, 480-208/120V step-down transformer which feeds a main distribution panel next to the main switchgear. The distribution panel then feeds local panelboards on each floor.

All existing power distribution equipment shall be demolished. Within each floor, a new electrical distribution closet will be provided with a 480/277V panel, step-down transformer, and 208/120V distribution panel(s). The new panels will be provided to serve all lighting, receptacles, mechanical/plumbing, and miscellaneous loads.

LIGHTING.

The existing lights in a mixture of fluorescent, incandescent and HID lighting. All existing fixtures shall be removed and replaced with new high efficiency volumetric LED lighting in classrooms and more decorative fixtures in public areas. The lighting fixtures will be selected such that the total lighting power density meets or is below the threshold required by 2012 IECC.

LIGHTING CONTROLS.

The existing lighting controls is a mixture of local manual switching and occupancy sensors. No central lighting system was found. All existing lighting controls will be replaced to be compatible with the selected LED lighting fixtures while also meeting the requirements of 2012 IECC. New occupancy sensors will be provided throughout the building with a central system to provide time clock control of all fixtures.

All exterior lighting will be replaced with LED fixtures. As much as possible, the exterior lighting will be replaced in the same location and controlled via local photocell and time clock. Site lighting poles will similarly be replaced with LED fixtures in the same location and controlled via time clock.

FIRE ALARM.

The existing fire alarm system is manufactured by a Simplex 4020 fire alarm control panel (FACP) and is obsolete. The entire existing fire alarm system including the FACP, NAC panels, power extender panels, local audible and visual devices, etc. will be replaced since it is not compatible with current addressable devices and equipment.

A new fully addressable fire alarm system with voice evacuation will be provided. The fire alarm system will be provided with life safety power and also be provided with backup batteries. Similar to the main switchgear, it is suggested that the main fire alarm panel and equipment be located within the main electrical room or the MDF to keep it separated from mechanical and plumbing equipment. New NAC, fire alarm power panels, terminals cabinets, etc. will be provided on each floor and located either within the electrical distribution room or the IDF on the associated floor. New devices will be located throughout the building to meet all current NFPA 72 requirements.

LOW VOLTAGE / TELECOMMUNICATIONS.

The existing incoming telephone/data services shall be modified and upgraded as necessary to meet the educational use requirements of the building. New MDF and IDF rooms will be provided on each floor to accommodate new low voltage equipment.

EXISTING DATA CENTER/CENTRAL SERVER ROOM.

The existing data center / central server room located in the basement will be completely demolished. Demolition of all telecom and network equipment shall be coordinated with the owner to determine if any shall be salvaged.

Existing fire alarm control panel and equipment

Typical fire alarm NAC panel

Project Cost Summary

Arlington Public Schools - Arlington Education Center

Tier 1 Renovation: Base Renovation including VAV HVAC System

- Base building renovation to achieve functioning high school program including any code related requirements such as:

  Fireproofing to achieve Type IB construction

  Additional sprinklering

  Stair to roof

  Exterior handrails and guardrails

  Replace exterior plaza waterproofing and pavers

  New roof and insulation

  New windows (curtainwall and storefront)

  Insulate exterior walls

	Subtotal	$14,664,196
Design Contingency	20%	$2,932,839
		$17,597,035
Escalation to mid point assumed to 1st Quarter 2019	6.20%	$1,091,016
		$18,688,051
Soft Costs	25%	$4,672,013
	Total	**$23,360,064**

Tier 2 Renovation: Base Renovation with Upgraded HVAC System

• Base building renovation to achieve functioning high school program including any code related requirements.		$14,664,196
• Add in premium for VRF HVAC system over VAV system		$237,432
	Subtotal	$14,901,628
Design Contingency	20%	$2,980,326
		$17,881,954
Escalation	6.20%	$1,108,681
		$18,990,635
Soft Costs	25%	$4,747,659
	Total	**$23,738,293**

Tier 3 Renovation: Full Renovation

• Base building renovation to achieve functioning high school program including any code related requirements.		$14,664,196
• Add in premium for VRF HVAC system over VAV system		$237,432
• Additional architectural features		
Terrace screening and paving at Lower Level		$115,000
Entry canopy		$240,000
Elevator replacement		$300,000
	Subtotal	$15,556,628
Design Contingency	20%	$3,111,326
		$18,667,954
Escalation	6.20%	$1,157,413
		$19,825,367
Soft Costs	25%	$4,956,342
	Total	**$24,781,708**

* Back-up documentation for base building renovation not attached

Arlington Public Schools

Stantec