

CHAPTER 34 NARRITIVE

FRAMINGHAM FULLER SCHOOL
FRAMINGHAM, MA

Prepared For:



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SUBMITTED: NOVEMBER 8, 2017

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DOCUMENT HISTORY

Chapter 34 Design Narrative..... November 1, 2017

This document – Chapter 34 Design Narrative is intended for use by the design team to understand the code requirements if the existing Framingham Fuller School were to be renovated. This document contains the code basis for the building design, functionality of the egress system, fire protection recommendations, and a comprehensive code outline.

This document is a preliminary draft based on the existing building plans sent from Johnathan Levi Architects on November 1, 2017.

PURPOSE

The purpose of this report is to outline the requirements from Chapter 34 of the Massachusetts State Building Code for the Framingham Fuller School. This report will explain the required upgrades for each level of renovation on the existing school.

APPLICABLE CODES AND REQUIREMENTS

The following codes are presently adopted in the State of Massachusetts:

- **Building** Massachusetts State Building Code (MSBC), 9th Edition, which is an amended version of the 2015 International Building Code and the 2015 International Existing Building Code (IEBC).
- **Accessibility** Massachusetts Architectural Access Board (MAAB), 521-CMR.
2010 ADA Standards for Accessible Design
- **Electrical** Massachusetts Electrical Code, 527-CMR, 12.00. The Massachusetts Electrical Code is an amended version of the 2017 National Electrical Code (NFPA 70).
- **Elevators** Massachusetts Elevator Regulations, 524-CMR.
- **Energy** 2015 Edition of the International Energy Conservation Code (IECC) as amended by the State of Massachusetts
- **Fire Prevention** 527 CMR Massachusetts Fire Prevention Code, NFPA 1, 2012 Edition
- **Mechanical** International Mechanical Code, 2015, as adopted and amended by the MSBC (Chapter 28).
- **Plumbing** Massachusetts Fuel Gas and Plumbing Codes, 248-CMR.
- **Other** National Fire Protection Association (NFPA) Standards, as referenced by the MSBC and the MFPR.

PROJECT DESCRIPTION

Howe Engineers has prepared this report to document and provide the code compliance requirements for the existing Framingham Fuller School. The existing school is a one (1) story building with an approximate footprint area of 247,000 square feet. The school contains a basement that contains a boiler room and mechanical equipment. The main level of the school contains a gymnasium, classrooms, the library, cafeteria, auditorium, and the administrative offices. This narrative addresses requirements contained in the 9th edition of the 780 CMR, The Massachusetts State Building Code (MSBC).

GENERAL OPERATING ASSUMPTIONS

The following general operating assumptions serve as the basis for the Life Safety and Fire Protection design and should be incorporated into the new facilities operations plan. It is the responsibility of the Owner/Operator to ensure that these assumptions are enforced:

- Storage is restricted to 12 feet in height or less except where specifically designed fire sprinkler systems are provided.
- The materials used shall meet the interior finish requirements of the International Building, and NFPA 1.

CHAPTER 34 SCOPING REQUIREMENTS

COMPLIANCE METHODS

Section 301.1 of Chapter 34 of the MSBC presents the various options available to evaluate the code requirements applicable to repair, alteration, change of occupancy, addition, or relocation projects to existing buildings. Users elect one of the available compliance methods to evaluate the existing building based on the proposed scope of work of the project. The three compliance options available are as follows:

a. Prescriptive Compliance Method:

Users electing to use this compliance method should follow the requirements outlined in Section 4 of Chapter 34 to perform the existing building evaluation. This section has vague requirements that would require multiple complex discussions with local officials. Although, Howe Engineers anticipates that some issues will be required to be discussed, it is our opinion that this option leaves to much discretion to the building official and does not provide enough guidance.

b. Work Area Compliance Method:

Users electing to use this compliance method should follow the requirements of Sections 5 through 13 of the MSBC Chapter 34 to perform the existing building evaluation.

c. Performance Compliance Method:

Users electing to use this compliance method should follow the requirements of Section 14 of Chapter 34 of the MSBC to perform the existing building evaluation. This method generally requires more upgrades than the work area method would require and thus has not been chosen.

The work area compliance method has been selected for use on this project based on the clear requirements and the ability to limit upgrades largely to the work area.

GENERAL MASSACHUSETTS AMENDED REQUIREMENTS (780 CMR 34.00)

Section 101.4.5 Fire Prevention:

This section states all references to the International Fire Code (IFC) shall be considered reference to 527 CMR: Board of Fire Prevention Regulations. This stipulates that the requirements of the Massachusetts General Laws Chapter 148 Section 26G may apply with respect to automatic sprinkler system requirements. In general, this section of the Massachusetts General Laws requires sprinkler protection to be provided in occupancies where the altered area exceeds 7,500 square feet.

If more than 7,500 square feet of the building were to be renovated, the entire school would need to be supplied with a sprinkler system.

Section 102.6.4 Existing Means of Egress, Lighting and Ventilation

These special provisions address means of egress in all buildings and are designed to ensure a minimum acceptable level is maintained. The specifics of these provisions must be satisfied regardless of any project work. The requirements are enforced at the discretion of the approving authorities. The specifics of these requirements are as follows:

- a. The number of means of egress serving every space and/or story as required by Chapter 10 of the MSBC. Table 1006.3.1 requires that the following number of exits be provided per floor based on the occupant load:

Table 1

Occupant Load Per Story	Minimum Number of Exits or Access to Exits from Story
1-500	2
501-1000	3
More than 1000	4

Refer to the occupant load and egress analysis tables below. A sufficient number of means of egress is provided from the building in accordance with the table above.

- b. The capacity of means of egress provided from each story and space must satisfy the criteria of Section 1005.1 of the MSBC.

Section 1005.1 provides requirements for the proper sizing of egress components. Components are given a capacity factor that determines, based on their size, what occupant load they are individually capable of handling. So long as the capacity is in excess of the occupant load, the means of egress are in compliance with the code. The total width of means of egress should not be less than the total occupant load served by the means of egress multiplied by 0.30 inches per occupant for stairways and by 0.20 inches per occupant for other egress components. If the building were to be sprinklered, the egress capacities would decrease to 0.15 inches per occupant for doors, and .2 inches per occupant for stairs.

The following tables show the occupant load and the capacity for the building:

Space	Size (sq. ft.)	Loading Factor (sq. ft. per occupant)	Occupancy
Assembly (unconcentrated)	10,953	15	732
Auditorium	4,258	7	609
Business / Offices	13,843	100	150
Classrooms	46,230	20	2339
Kitchen	3,357	200	17
Lab Classrooms	24,201	50	495
Library	3,237	100	33
Locker Rooms	22,652	50	455
Stage	2,128	15	143
Storage	18,572	300	89
Total			5,062

Area	Exit Description	Clear Width of Limiting Component (in)	Capacity Factor (in/occ.)	Exit Capacity (people)
Egress Serving First Floor	Door 1	127	0.2	635
	Door 2	63	0.2	315
	Door 3	63	0.2	315
	Door 4	31.5	0.2	158
	Door 5	63	0.2	315
	Door 6	63	0.2	315
	Door 7	31.5	0.2	158
	Door 8	31.5	0.2	158
	Door 9	63	0.2	315
	Door 10	63	0.2	315
	Door 11	63	0.2	315
	Door 12	62	0.2	310
	Door 13	63	0.2	315
	Door 14	63	0.2	315
	Door 15	63	0.2	315
	Door 16	64	0.2	320
	Door 17	55.5	0.2	278
Total				5,167

As shown in the tables above, the egress capacity exceeds the occupant load calculated within the space and is compliant with the requirements of the building code for egress capacity.

- c. Any means of egress which is not so arranged as to provide safe and adequate means of egress, including exit signage and emergency lighting in accordance with Chapter 10 of the MSBC.

Adequate emergency signage will need to be provided as part of the school renovation. Currently the school emergency lighting is provided by battery backup. An emergency power backup system is not currently provided to the building. Adequate ventilation should be confirmed by the mechanical engineer.

EXISTING BUILDING EVALUATION – MSBC WORK AREA METHOD

GENERAL

A MSBC Chapter 34 evaluation of the existing building is required to determine the required fire protection and life safety improvements when any alteration or renovation work is undertaken.

Each of the following classes of work has an associated chapter within the MSBC Chapter 34 which outlines the provisions for that type of work on an existing building.

Repairs:

Repairs are defined as “the reconstruction or renewal of any part of an existing building for the purpose of its maintenance or to correct damage”. These include the restoration of materials, elements, equipment or fixtures for the purpose of maintaining a good or sound condition.

Alteration Level 1:

Alterations are defined as “any construction or renovation to an existing structure other than repair or addition.” Level 1 alterations include, “removal and replacement or the covering of existing materials, elements, equipment, or fixtures using new materials, elements, equipment, or fixtures that serve the same purpose.”

Alteration Level 2:

A Level 2 alteration consists of the reconfiguration of space, addition or subtraction of a door or window, the reconfiguration of any system, or adding any equipment to the building. Level 2 alterations should also comply with the provisions for a Level 1 alteration.

Alteration Level 3:

A Level 3 alteration consists of the reconfiguration of more than 50% of the building area. Level 3 alterations should also comply with the provisions for a Level 1 and 2 alterations.

Additions:

Additions are any extension to a building which increases the floor area, number of stories, or height of the building.

Change In Use:

Portions of buildings where a change in purpose or level of activity occurs which involves a change in the application of the requirements of the applicable codes.

This report will outline the requirements for each level of renovation.

REQUIREMENTS FOR REPAIRS & ALTERATIONS – LEVEL 1, 2 & 3-

Alteration Level 1

A Level 2 or 3 alteration is anticipated, which requires that the provisions of Level 1 also be complied with.

Interior Finish:

All newly installed interior finishes should comply with the flame spread requirements of the MSBC Chapter 8 (MSBC Ch.34 702.1). New carpeting used as an interior floor finish material should comply with the radiant flux requirements of Section 804 of the MSBC (MSBC Ch.34 702.2).

All new interior finishes must comply with the requirements of the MSBC. As per MSBC Table 803.11, the following interior finish ratings are required at a minimum:

Sprinklered Educational

- **Exit Enclosures and Exit Passageways: Class A or B**
- **Corridors: Class A, B, or C**
- **Rooms and Enclosed Spaces: Class A, B, or C**

Non-Sprinklered Educational

- **Exit Enclosures and Exit Passageways: Class A**
- **Corridors: Class A or B**
- **Rooms and Enclosed Spaces: Class A, B, or C**

Classification of interior finishes will be provided in accordance with ASTM E 84 / UL 723.

Alteration Level 2

MSBC Ch.34 801.2 of Level 2 alterations requires that alterations categorized as Level 2 comply both with the requirements of Chapter 7, Alterations Level 1, and Chapter 8, Alterations Level 2.

Fire Protection Systems:

Section 804.2.2 requires that a sprinkler system be installed if the work area is greater than 50 percent of the floor area. Additionally, as noted previously, according to the Massachusetts General Laws Chapter 148 Section 26G, if more than 7,500 square feet of the building is renovated, a sprinkler system will be required in the entire school.

Fire Alarm System:

The fire alarm system within the work areas will be required to be upgraded and should include new audio and visual devices. The fire alarm in the work area would need to be upgraded to provide voice communication. Where the work area is more than 50 percent of the floor area, the fire alarm throughout the

floor must be upgraded. From our survey it was seen that the current fire alarm system is non-addressable. Smoke detection may be permitted to be removed if the building is fully sprinklered.

Interior Finish:

Refer to the Level 1 Alterations interior finish section. In addition, where the *work area* on any floor exceeds 50 percent of the floor area, Section 803.4 should also apply to the interior finish in exits and corridors serving the *work area* throughout the floor.

Means of Egress - General:

The means of egress within work areas are required to comply with the following requirements of this section if the following conditions exist: (MSBC Ch.34 805.2).

Number of Means of Egress:

The minimum number of exits is required to be in accordance with Section 102.6.4 (see report section above).

Room A3A, and D30 will need to be provided a second means of egress.

Guards:

Guards are required to be provided for floors that are more than 30-inches above the floor or grade below that is currently not provided with guards or with guards that are in danger of collapsing (MSBC Ch.34 803.5 & 805.11).

Door Swing:

In the work area and in the egress path from the work area to the exit discharge, all egress doors serving an occupant load greater than 50 should swing in the direction of exit travel (MSBC Ch.34 805.4.2). Where the work area exceeds 50 percent of the floor area, all doors on the floor of the work area are required to swing in the direction of egress where serving an occupant load that is greater than 50 (MSBC Ch.34 805.4.2).

All doors in the work area serving an occupant load greater than 50 will need to swing in the direction of travel.

Door Closing:

In any work area, all doors opening onto an exit passageway at grade or an exit stair should be self-closing or automatically closing by listed closing devices. This requirement applies unless the exit enclosure is not required by the MSBC or if the means of egress are not within the work area (MSBC Ch.34 805.4.3).

As the MSBC requires the corridors in an un-sprinklered educational building to be one (1) hour rated, all doors leading to the corridor must be self-closing. During the site survey it was noted that the classroom

doors are not self-closing. If the building is sprinklered throughout, the corridors are not required to be rated and in turn the doors leading the corridor are not required to be rated.

Dead Ends:

Dead-end corridors in any work area should not exceed 35-feet (MSBC Ch.34 805.6). **Based on our survey of the building, dead ends were observed in the main corridors where doors swinging in a single direction bisect the corridor. These doors could potentially be removed (if the building is fully sprinklered), or replaced with bi-swing doors to eliminate the dead ends.**

Openings in Corridor Walls:

MSBC Ch.34 805.5.3 requires such openings are sealed with materials consistent with the corridor construction.

If the building remains un-sprinklered, all openings in the corridor will need to be sealed. If the building is sprinklered, then the openings in the corridor will be allowed.

Means of Egress Lighting:

The means of egress lighting in all work areas should conform to the requirements of the MSBC for new construction. Where the work area on any floor exceeds 50 percent of that floor area, the entire floor is subject to the new construction requirements of the MSBC for means of egress lighting (MSBC Ch.34 805.7).

The means of egress lighting in the building will need to comply with new construction requirements in the MSBC.

Exit Signs:

The exit signs in all work areas should conform to the requirements of the MSBC for new construction. Where the work area on any floor exceeds 50 percent of that floor area, the entire floor is subject to the new construction requirements of the MSBC for exit signage (MSBC 34 805.8).

The exit signage in the building will need to comply with the requirements of the MSBC for new construction. During the site survey paper exit signs were noted and will need to removed and replaced with internally illuminated exit signage.

Accessibility:

The requirements of 521 CMR apply to the project. Refer to the Accessibility portion of this report.

Energy Conservation:

Level 2 alterations to existing buildings or structures are permitted without requiring the entire building or structure to comply with the energy requirements of the International Energy Conservation Code. The alterations (e.g. new work) should conform to the energy requirements of the International Energy Conservation Code as they relate to new construction only.

Structural Requirements:

The structural requirements contained within the Alteration Level 1 and 2 requirements should be evaluated by the design team's structural engineer.

Alteration Level 3

If more than 50 percent of the entire floor area of the school is renovated then the renovations must comply with the requirements of Level 3 Alterations. MSBC Ch.34 901.2 of Level 3 alterations requires that alterations categorized as Level 3 comply both with the requirements of Chapter 7, Alterations Level 1, Chapter 8, Alterations Level 2, and Chapter 9, Alterations Level 3.

Existing Shafts and Openings

Existing stairways that are part of the means of egress must be enclosed in accordance with MSBC Ch. 34 903.1 from the highest work area floor to, and including, the level of exit discharge and all floors below.

Section 1016.1 of the MSBC will allow 50 percent of the stairwells to remain open provided that they do not connect more than 2 stories and the exit access travel distance is measured along the stairwell.

Interior finish:

Interior finish in exits serving the work area must comply with MSBC Ch.34 803.4 between the highest floor on which there is a work area to the floor of exit discharge.

Automatic Sprinkler Systems:

Section 904.1, and 804.2.2 require that a sprinkler system be installed if the work area is greater than 50 percent of the floor area. Additionally, as noted previously, according to the Massachusetts General Laws Chapter 148 Section 26G, if more than 7,500 square feet of the building is renovated, a sprinkler system will be required in the entire school.

Fire alarm and detection systems:

Fire alarm and detection systems complying with Sections 804.4.1 and 804.4.3 must be provided throughout the building in accordance with the MSBC for new construction.

The fire alarm in the entire school would need to be upgraded, this includes smoke detection, new visual and audio devices. The new fire alarm must provide voice communication. Smoke detection may be permitted to be removed if the building is fully sprinklered.

Means-of-egress lighting:

Means of egress from the highest work area floor to the floor of exit discharge must be provided with artificial lighting within the exit enclosure in accordance with the requirements of the MSBC for new construction.

Means of egress throughout the school will need to be provided per the requirements of the MSBC for new construction.

Exit signs:

Means of egress from the highest work area floor to the floor of exit discharge must be provided with exit signs in accordance with the requirements of the MSBC for new Construction.

Exit signs will need to be provided throughout the school per the requirements of the MSBC for new construction. During the site survey paper exit signs were noted and will need to be removed and replaced with internally illuminated exit signage.

Accessibility:

The requirements of 521 CMR apply to the project. Refer to the Accessibility portion of this report.

Structural Requirements:

The structural requirements contained within the Alteration Level 1, 2, and 3 requirements should be evaluated by the design team's structural engineer.

Energy Conservation:

Level 3 alterations to existing buildings or structures are permitted without requiring the entire building or structure to comply with the energy requirements of the International Energy Conservation Code. The alterations must conform to the energy requirements of the International Energy Conservation Code as they relate to new construction only.

ADDITION

General

An *addition* to a building or structure should comply with the *MSBC* as adopted for new construction without requiring the *existing building* or structure to comply with any requirements of those codes or of these provisions, except as required by this chapter. Where an *addition* impacts the *existing building* or structure, that portion should comply with the *IEBC*.

An addition should not create or extend any nonconformity in the *existing building* to which the *addition* is being made with regard to accessibility, structural strength, fire safety, means of egress, or the capacity of mechanical, plumbing, or electrical systems.

Other Work

Any *repair* or *alteration* work within an *existing building* to which an *addition* is being made should comply with the applicable requirements for the work as classified in Chapter 5 (*MSBC* Ch.34 1101.3).

Height and Area Evaluation

No *addition* shall increase the height of an *existing building* beyond that permitted under the applicable provisions of Chapter 5 of the *MSBC* for new buildings. No *addition* should increase the area of an *existing building* beyond that permitted under the applicable provisions of Chapter 5 of the *International Building Code* for new buildings unless fire separation as required by the *MSBC* is provided.

From the site survey conducted on October, 19 2017, it was found that the building is constructed out of Type IIB Unprotected, Noncombustible Construction. This is because the building is constructed out of concrete and unprotected steel, which was observed throughout the building. According to Table 504.4 and 506.2 of the MSBC, a Type IIB Educational Building can be constructed up to two (2) stories with an area of 14,500 square feet. The area is increased by 75 percent as the school is provided with 100 percent open perimeter. This means that the school can be constructed up to 2 stories in height with an area of 25,375. If the school is sprinklered the allowable height is increased by one story and the area is increased by an additional 200 percent. This means that if the school were to be sprinklered it would be allowed to have a height of 3 stories and an area of 54,375 square feet.

Since the existing building is already larger than what is allowed for new construction (196,000 square feet), an addition cannot be made to the existing school unless the construction type of the existing school is upgraded, the addition is limited to a single story and the requirements for the Unlimited Area Provisions are met, or the addition is separated from the school with a fire wall creating a separate building. If the entire building except the auditorium were demolished than the structural steel in the auditorium could be required to be protected if it was desired for the building to be of Type I construction.

ACCESSIBILITY

For each Level of Alteration defined above, The Massachusetts Architectural Access Board (MAAB) separately governs accessibility requirements. The MAAB requirements are only applicable to public spaces in a building. In the Framingham Fuller School most spaces appeared to be accessible to the public (e.g. students can visit them including professor's offices) and thus MAAB is applicable. MAAB is not applicable to employee only areas.

MAAB application criteria for existing buildings are identified in MAAB Section 3.3. There are three (3) thresholds used to determine the extent of compliance required with MAAB provisions. These thresholds are determined over a rolling 36 month period and are as follows:

1. If the work being performed costs less than \$100,000, then only the work being performed must comply with MAAB.

Exception: General maintenance and on-going upkeep of existing, underground transit facilities will not trigger the requirement for an *accessible entrance* and toilet unless the cost of the work exceeds \$500,000 or unless work is being performed on the *entrance* or toilet.

2. If the work being performed costs more than \$100,000 but less than 30% of the full and fair cash value of the building, then the work being performed must comply with MAAB and the following features must be provided:
 - a. An accessible public entrance;
 - b. A public accessible toilet room;
 - c. An accessible telephone; and
 - d. An accessible drinking fountain.

Exception: Whether performed alone or in combination with each other, the following types of *alterations* are not subject to **521 CMR 3.3.1**, unless the cost of the work exceeds \$500,000 or unless work is being performed on the entrance or toilet. (When performing exempted work, a memo stating the exempted work and its costs must be filed with the permit application or a separate building permit must be obtained.)

3. If the work being performed costs more than 30% of the full and fair cash value of the building, then the entire building must be made to comply with MAAB. Work performed that is limited solely to electrical, mechanical, or plumbing systems and that does not involve the alteration of any elements or spaces required to be accessible by MAAB, and has a total value of less than \$500,000 are excluded from this threshold review [MAAB 3.3.2 (b)]. However, if any non-exempt work is permitted within the 3 year period, all exempt work must be included.

When determining the appropriate Level of work as described above, the cost of the work to be used in the calculation for item 3 is all permitted work over a 3 year period.

ADAAG REQUIREMENTS

ADAAG is applicable to all public and private places of work. ADAAG does not requires upgrades be made for alteration work that is limited to work similar to re-roofing, maintenance, mechanical systems etc. Further, alterations include, but are not limited to, remodeling, renovation, rehabilitation, reconstruction, historic restoration, changes or rearrangement in structural parts or elements, and changes or rearrangement in the plan configuration of walls and full-height partitions. Normal maintenance, reroofing, painting or wallpapering, asbestos removal, or changes to mechanical and electrical systems are not alterations unless they affect the usability of the building or facility.

This is different than MAAB, which does “count” this work. However, any work that does affect the primary function of the building should be made to be compliant. In addition, up to 20% of the project cost may be spent on accessibility upgrades before it is considered disproportionate.

Costs that may be counted as expenditures required to provide an accessible path of travel may include:

1. Costs associated with providing an accessible entrance and an accessible route to the altered area, for example, the cost of widening doorways or installing ramps;
2. Costs associated with making restrooms accessible, such as installing grab bars, enlarging toilet stalls, insulating pipes, or installing accessible faucet controls;
3. Costs associated with providing accessible telephones, such as relocating the telephone to an accessible height, installing amplification devices, or installing a text telephone (TTY); and
4. Costs associated with relocating an inaccessible drinking fountain

In choosing which accessible elements to provide, priority should be given to those elements that will provide the greatest access, in the following order

1. An accessible entrance;
2. An accessible route to the altered area;
3. At least one accessible restroom for each sex or a single unisex restroom;
4. Accessible telephones;
5. Accessible drinking fountains; and
6. When possible, additional accessible elements such as parking, storage, and alarms

It is assumed that the renovation of the school will trigger full compliance with MAAB given that the cost of the project will be more than 30% of the assessed value of the building. Given this, the following items would be required to be accessible.

The following accessibility features should be provided in the building:

- All bathrooms must be accessible.
- All entrances and grade exit doors must be accessible
- All doors and doorways must be accessible
- Accessible seating must be provided in the auditorium and gym.

- Sinks and counters in classrooms must be accessible
- 5% of the lockers in each locker room must be accessible
- 5% of all lockers in the school corridors must be accessible
- 5% of all showers, but not less than one in each locker room must be accessible
- The kitchen including any transaction desks must be accessible
- 5%, but not less than one of each type of Science Laboratory space must be accessible
- Accessible parking must be provided
- All exterior pathways must be accessible
- All Classrooms must be accessible
- Assembly areas should be accessible and provide assisted listening devices

During the survey conducted on October, 19 2017, the following accessibility deficiencies were found in the school:

- In general approximately 90 percent of the doors in the school do not provide 32 inches of clear width and in turn are not accessible. This includes office, classroom, and entrance doors.
- In general approximately 90 percent of the doors in the school are provided with door knobs instead of accessible hardware and in turn are not accessible.
- The auditorium is not accessible:
 - Accessible Seating (Wheelchair spaces, and Armless seats) are currently not provided in accordance with 521 CMR 14.2 (MAAB).
 - A route from the seating locations to the stage/performing area is provided (stairs) but an associated accessible route is not provided (ramp or lift). 521 CMR 14.6 (MAAB) requires that where access is provided to the stage from within the place of assembly, an accessible route that is within the place of assembly from the wheelchair seating location must be provided to the stage.
 - A landing at the top of the auditorium aisle is not provided prior to the exit access doors.
 - Handrails are not provided in the slopped aisles in accordance with 521 CMR 24.5 (MAAB).
 - The control booth within the auditorium is not accessible due to a sloped floor and large lip at the entrance.
 - The ramped aisles in the Auditorium exceed the maximum rise of 30 inches for any run, and appropriate landings are not provided in accordance with 521 CMR 24.2.2 (MAAB).
- Doors into classrooms and offices off of the main corridors do not provide at least 18 inches of pull clearance and 12 inches of push clearance (push clearance not required if door does not have a closer). This configuration is typically seen where built in closets are present adjacent to the doorway.
- No fully accessible bathrooms are present in the facility, for either students or faculty. Some of the individual unisex bathrooms have appropriate clearances and could be altered to be accessible. However, most of the student bathrooms would require reconfiguration of the space.
- Integrated (not separate) accessible seating in the gymnasium needs to be confirmed.
- In general drinking fountains were observed to not be accessible.
- An accessible shower in the boy's, or girl's locker room is not provided.
- 5% of Lockers in the boy's or girl's locker room are not accessible.

- Bathroom in the boy's or girl's locker room are not accessible.
- Pull stations are mounted at 54 inches, they should be mounted no higher than 48 inches.
- In general there are no accessible laboratory benches, or sinks in the lab classrooms.

AUDITORIUM

There may be a desire for the auditorium to remain while demolishing other portions of the facility. Based on preliminary discussions with MAAB there may be opportunities to pursue variances for some of the items noted in the accessibility section of this report. However, it is Howe Engineers opinion that significant upgrades would need to be made to the auditorium in conjunction with the approval of these variances. This would include providing, at a minimum of one accessible route from the auditorium entrance to the first row of seating. Providing accessible seating, and an accessible route that is within the place of assembly from the wheelchair seating location provided to the stage. Further discussion would be required with MAAB to provide a finalized approach to allowing the existing auditorium to remain with modifications.

PLUMBING FIXTURES

The following tables contain the required number of plumbing fixtures for the planned occupant load within the school. A table is also provided showing the available capacity from the provided plumbing fixtures. The existing fixture counts are based on the information gathered on the October 19, 2017 site survey. The total occupant load presented in these table is based on the program load of the school. Using this program load would require approval from the plumbing official.

Occupancy	Subcategory	Water closets			Lavatories		Drinking Fountains
		Male	Female	Urinals	Male	Female	
Educational	Secondary	1 per 90	1 per 30	1 per 90	1 per 90	1 per 90	1 per 75
Staff	Staff	1 per 25	1 per 20	33%	1 per 40	1 per 40	

Existing Building

Area	Room	Water Closet	Water Closet Capacity	Urinal	Urinal Capacity	Lavatory	Lavatory Capacity	Capacity Provided Per Area
First Floor	Men	24	2,160	28	2,520	32	2,880	2,160 Men 720 Women
	Women	24	720	-	-	23	2,880	
Total		48	2,880	28	2,520	55	5,760	2,160 Men 720 Women

Planned Occupant Load

Occupancy	Subcategory	Total Occupant Load	Water closets			Lavatories		Drinking Fountains
			Male	Female	Urinals	Male	Female	
Students	Secondary	630	4	11	4	4	4	9
Staff	Educational	96	2	3	up to 33%	2	2	
TOTALS		726	6	14	Varies	6	6	9

Toilet Travel distance

According to the Massachusetts Plumbing code the maximum allowable toilet travel distance from the most remote point is 300 feet. **Staff is allowed to travel up or down one story, but students are not permitted to travel up or down one story to access the facilities.**

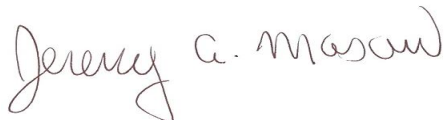
CONCLUSION

The renovations to the Framingham Fuller School would be conducted in accordance with the requirements of the Massachusetts Building Code. The following items would be required in the school if it were to be renovated.

1. The school would need to be protected throughout with an automatic sprinkler system if the work area is greater than 7,500 square feet.
2. From our survey it was seen that the current fire alarm system is non-addressable, in turn, if a Level 2 or 3 Alteration is desired, the entire fire alarm must be upgraded to provide voice communication, and appropriate smoke detection, and audio/visual notification. Smoke Detection may not be required if the building becomes fully sprinklered.
3. If the renovation triggered full accessibility compliance, then
 - a. Approximately 90 percent of the doors would need to be altered to provide 32 inches of clear width and would require the door knob hardware to be replaced with an accessible latch,
 - b. All doors would need to be altered to provide an 18 inch pull clearance and a 12 inch push clearance,
 - c. All of the restrooms would need to be altered to be accessible,
 - d. Accessible sinks and counters in labs would be required to be provided,
 - e. Accessible entrances for the building would be required,
 - f. The Auditorium would need to be provided with accessible route to accessible seating, as well as the stage.
4. Egress should be provided as outlined in this report.

Please contact our office if you have any questions regarding the items addressed in this letter.

Prepared by,



Jeremy A. Mason, P.E

Project Director



Fuller School Existing Conditions

Fuller School is located on the north side of Flagg Drive. The site is relatively flat and is surrounded by woods. Along the north, and east, as well along the opposite side of Flagg Road are wetland areas within the woods, subject to local and state wetland regulations.

Water Service

An existing water main is present along Flagg Drive directly in front of the school, along with two water lines on either side of the school each servicing separate hydrants, additional hydrants are located along Flagg Drive itself. The adjacent Farley School building is shown with a looped water system, also with additional hydrants. The school appears to be serviced by a 1-3/4" domestic water service, and is currently un-sprinklered.

Sewer Service

An existing sewer main is present along Flagg Drive directly in front of the school.

Gas Service

A gas main is present along this portion of Flagg Drive. The heating system for the building is comprised of 3 gas boilers.

Stormwater

The on-site drainage system appears to be a simple system comprised of catch basins and manholes which either discharge directly into the adjacent wetlands, or connect out to the existing street drainage system, which in turn discharges into the nearby wetlands.

Flood Plain

The site does not appear to be in a flood plain.

Potential Site Improvements

Water Service

The existing 1-3/4" water service may need to be upgraded or relocated depending on current flow conditions and anticipated demands due to renovations or other building upgrades. A separate fire service connection may be required to comply with current building codes.

Sewer Service

The existing sewer service may need to be upgraded or relocated depending on anticipated demands due to renovations or other building upgrades. Additionally, if the existing sewer service is original and was installed using clay pipe typical of the time, consideration should be given to upgrade to a more durable material such as PVC or ductile iron, given the possible age and general condition of the sewer service.

Gas Service

The existing gas service may need to be upgraded or relocated depending on anticipated demands due to renovations or other building upgrades.



Stormwater

The existing on-site drainage system does not appear to meet current stormwater management standards. Depending on the proposed site improvements the existing system will need to be upgraded to provide mitigation to reduce stormwater runoff, increase groundwater infiltration, and increase stormwater discharge quality. These improvements could include above or below ground stormwater infiltration/detention systems, deep sump catch basins, and water quality structures.



**FULLER MIDDLE SCHOOL
FRAMINGHAM, MASSACHUSETTS
STRUCTURAL EXISTING CONDITIONS REPORT
NOVEMBER 1, 2017**

Existing Construction

The Fuller Middle School is a one-story building built in 1958. The building is supported on cast-in-place concrete tapered piles with 65 ton capacity, located approximately 12 to 18 feet on center in each direction. The first floor is framed with a 2½" to 3½" draped mesh concrete slab and concrete joists spaced at 24" on center, spanning to reinforced concrete girders. The first floor is suspended over a 6-foot crawl space. Steel columns, which are primarily located to coincide with the corridors, rise up from the piles to support the roof framing. The roof over the classroom space is supported on 8" steel purlins bearing on 16" steel girders. The roof deck is 2" poured gypsum over 1" acoustical form boards with steel bulb tees spanning 6 feet. Over the larger volumes, such as the gymnasium and auditorium, there are 33"-36" wide flange girders to create a column-free space. In addition to the 8" steel purlins and gypsum roof at the gymnasium and auditorium, there is horizontal steel cross-bracing.

Structural Conditions Assessment

1. Roof Framing

The steel roof framing appears to be in good condition and well maintained. There is widespread evidence of roof leaks, which causes the gypsum to be saturated with water. Prolonged exposure to entrapped water will compromise all properties of gypsum. Gypsum roof decks are a composite system that derives its strength from the sum of the parts (gypsum, wire reinforcement and steel tees), so a reduction in gypsum strength reduces the overall capacity of the roof deck system. Also, any mechanical fasteners that are screwed into the gypsum will see a reduced embedment capacity from the water-logged material.

2. First Floor Framing

There is a significant area of the first floor that exhibits rusted and delaminated rebar on the concrete joists and girders. The worst area, under the garage space bound by grids N-T-0-5 is currently shored to grade. This should be considered a temporary fix considering no repair to the existing rebar was performed. The area of reduced structural capacity extends along the south wing (under classrooms B36-B48) in a similar fashion. The bottom rebar in the concrete joists have rusted, delaminated, and caused the concrete cover to spall and fall off. The current condition of the rebar is worse than noted in the 2013 Feasibility report since there is now rebar section loss rather than just concrete cover removal. Furthermore, it was noted from the maintenance workers that the spalled concrete damages the pipes underneath when the heavy concrete pieces fall.

3. CMU Partitions

The existing partitions in the building are constructed from unreinforced CMU. Although customary in 1950's construction, these non-load bearing partitions are not up to current code since there is no positive attachment to the floor or roof diaphragms. Also, it is not obvious that every masonry opening has a lintel or bond beam to span over the opening. Some of the interior

CMU walls exhibit cracking, which is not necessarily a structural concern, but could be remedied by some well-placed masonry joints.

4. Exterior Envelope

The first floor slab cantilevers over the concrete grade beam to support the exterior façade. There are some isolated areas of exposed rusted rebar and spalled concrete that can be repaired locally. The concrete exposed on the exterior is a thermal bridge to the interior conditioned space, which is a challenge to remedy if the building was renovated.

Structural Recommendations

1. Renovation Option

a. Repair deficiencies

- i. Address roof leaks and drainage. Replace areas of gypsum roof decks that are saturated with metal roof deck.
- ii. Repair or replace damaged first floor slab. Address cause of rusted rebar, such as adding a vapor barrier and slab in the crawl space and better ventilation.
- iii. Patch exterior concrete and repair rusted rebar.

b. Seismic Upgrade

The original design of the building did not consider lateral loads. By default, the lateral stiffness is provided by the unreinforced CMU partitions. A renovation of the building will likely result in removed or relocated CMU partitions, and therefore a lateral design will be required based on the current code. If the CMU walls are not removed, RSE still recommends a seismic upgrade due to the significant financial investment and prolonged life expectancy of the building.

- i. Replace the entire gypsum roof deck with a metal deck that can distribute diaphragm loads. Gypsum is a brittle material that by nature does not have sufficient ductility to transfer diaphragm loads to the lateral system. Add supplemental steel framing (such as 8" steel beams) at the diaphragm edges that don't have existing steel beams. These are required because the 8" purlins sit above the girders and the load path is broken at the diaphragm edges.
- ii. Add a lateral system for the entire building, such as steel braced frames. Add grade beams or braced frames in the crawl space to transfer lateral loads to the ground. Reinforce brace frame columns as required. New piles might be required depending on location of braced frames, which will be difficult to install given the low clearance in the crawl space for the pile rig.
- iii. Brace CMU partitions to the roof diaphragm. If the gypsum roof is not replaced, supplemental steel will be required above the CMU partitions where the gypsum has been affected by roof leaks since fastening to saturated gypsum is not reliable.

See the Seismic Upgrade Sketch on page 3 for an illustrative clarification.

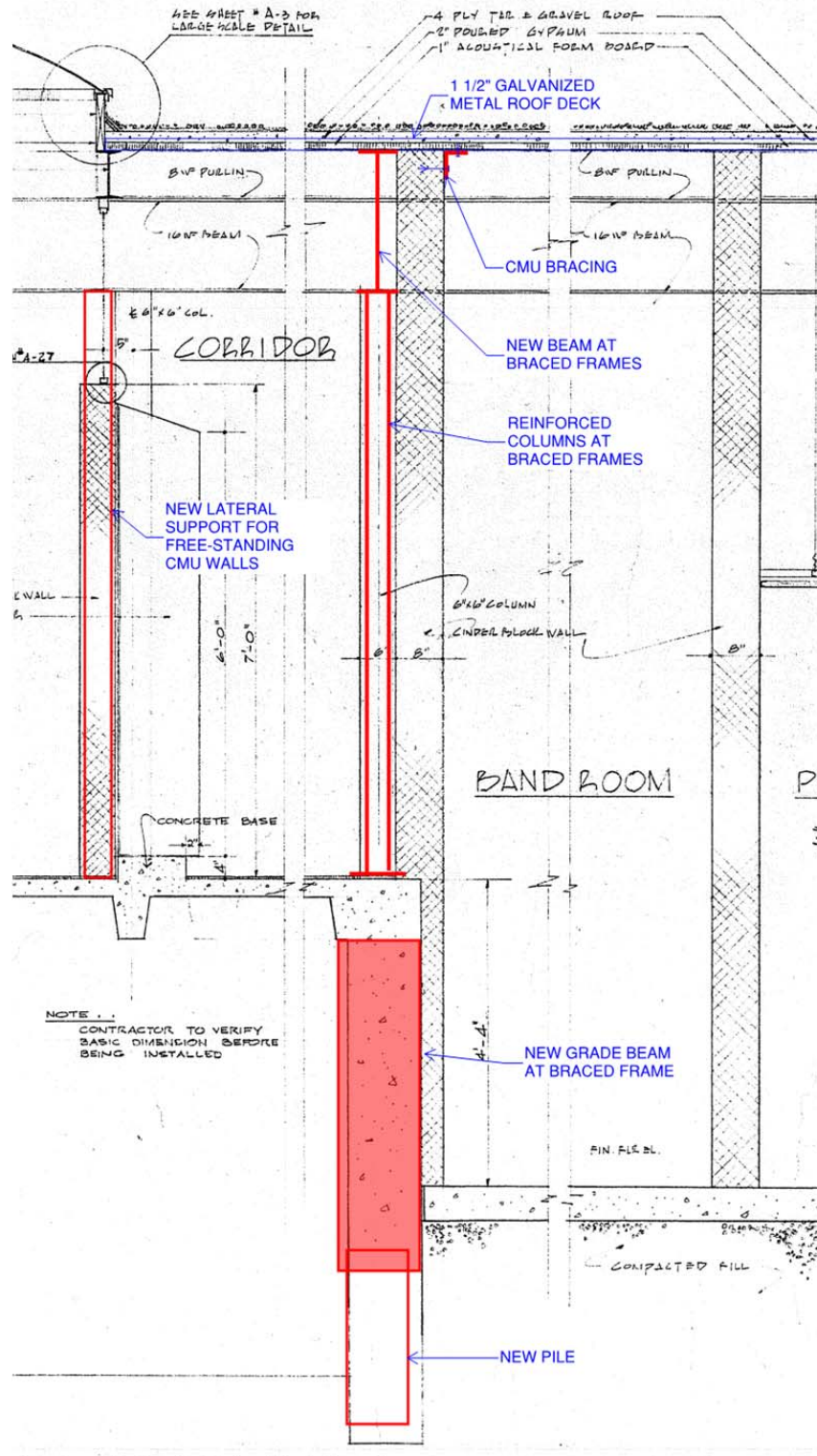
2. Renovation and Addition Option

It is structurally possible to demolish a portion of the building and renovate the remainder. The large volume spaces (such as the auditorium) lend themselves to this approach since the structure can be isolated from the rest of the building during demolition and the lateral elements can be added at the boundaries. The renovated portion would be tied to the new building and the entire building would be designed per the latest code.

3. New Construction Option

Any new construction will be designed to the latest code and specific programming suited to the client.

Seismic Upgrade Sketch



Photos



Roof leaks causing rusted steel tees and water-logged gypsum slab.



No lintel observed.
Top of CMU is tight up against gypsum roof deck but not positively attached.



CMU cracking at irregularities



Exterior concrete rebar rusted and spalling



Temporary shores in crawl space



Additional concrete joists with spalling concrete (unshored)

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FIRE PROTECTION

Executive Summary

The Building does not contain an automatic sprinkler system.

In general, Massachusetts General Law M.G.L. c.148, s26G requires that any existing building over 7,500 square feet that undergoes major alterations or modifications or building addition must be sprinklered.

Examples of major alterations are demolition or reconstruction of existing ceilings or installation of suspended ceilings; removal of sub flooring; demolition and/or reconstruction of walls, doors, or stairways; or removal or relocation of a significant portion of the building's mechanical or electrical systems. Alterations are considered major when such work affects 33% or more of the building area or when total work (excluding sprinkler installation) is equal to 33% or more of the assessed value of the building.

The proposed scope of work needs to be determined if project is a major alteration. If the work is considered a major alteration, then an automatic combined sprinkler/standpipe system is required for the entire existing building and any additions.

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PLUMBING

Executive Summary:

Presently, the Plumbing Systems serving the building are cold water, hot water, sanitary, waste and vent system, storm drain piping, and natural gas. Municipal sewer and municipal water service the Building.

The majority of the plumbing systems are original to the building and its additions. Portions of the system have been updated as part of building renovation and upgrade projects. The plumbing systems, while continuing to function, have served their useful life. Due to its age, a complete new water piping system is recommended. The copper piping is in fair condition and has served its useful life.

The plumbing fixtures are in fair condition. The gang toilet rooms have had the lavatories up graded to one piece countertop with integral sinks. In general, the fixtures appear to have served their useful life. Current Access Code requires accessible fixtures wherever plumbing is provided. In terms of the water conservation fixtures, their use is governed by the provisions of the Plumbing and Building Code. Essentially, the code does not require these fixtures to be upgraded, but where new fixtures are installed, as may be required by other codes or concerns, the new fixtures need to be water conserving type fixtures. All new fixtures are recommended.

Cast iron is used for sanitary and storm drainage. Rainwater from roof areas is collected by interior rain leaders which appear to discharge to a below grade drainage system. Where visible, the cast iron pipe appears to be in fair condition. Smaller pipe sizes appear to be copper. In general, the drainage piping can be reused where adequately sized for the intended new use.

The existing domestic hot water is supplied from one (1) Weil-McLain boiler piped to three (3) 120 gallon storage tanks. There is a master Leonard mixing valve and one B&G hot water return pump. The system is in good condition.

Fixtures:

The water closets are predominately wall hung vitreous china with manual flush valves.

Urinals are wall hung vitreous china with manual flush valves.

Lavatories are wall hung vitreous china. The majority of lavatories have been retrofitted with push handle faucets, no mixing valve provided.

Shower rooms have gang type showers with main mixing valve and control valve.

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Typical Bathroom Fixtures & Showers

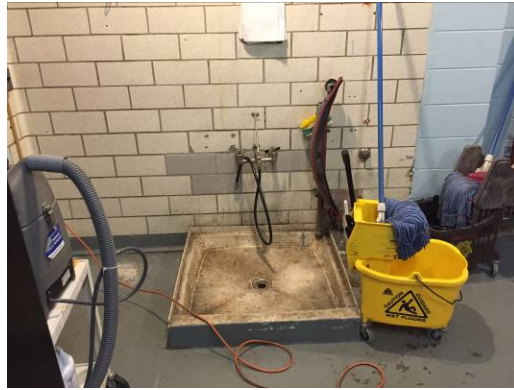
Drinking fountains consist of wall hung stainless steel, non-accessible.



Drinking Fountain

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Janitor's rooms are provided with floor mounted mop receptor and wall hung service sink. Floor mounted mop receptor is not provided with faucet, it is used only for waste drainage. The service sink is provided with faucet with vacuum breaker and the faucet has hose connection.



Typical Janitor's Room

Science classroom sinks are resin type with cold and hot water faucets. Faucets are equipped with vacuum breakers. Classrooms contain an emergency shower fixture fed by the cold water system. Sinks are piped to an interior lime stone chip acid neutralization system located in the crawl space that ultimately discharges to the municipal sewer. The benches are provided with gas turrets, the gas is not turned on to the benches. No master gas valve shut off was provided.



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Typical Science Classroom

Kitchen area fixtures are in poor condition. The pot washing sinks are fitted with grease interceptor located in the crawl space. The gas fired equipment is not provided with master gas shut off valve.



Typical Kitchen Equipment

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Water Systems:

The main domestic water service is located in the Basement Mechanical/Boiler Room. The service is 6" in size and reduces to 4" and includes a 4" meter. The water main reduces to 3" with 2" by-pass and backflow preventer. The system gauge reading was between 70-80 PSI. The main domestic cold-water distribution is 3" in size. A 3" pressure reducing backflow preventer is provided after the meter. The majority of the domestic distribution piping is located in crawl space throughout the building.



Domestic Water Service



HVAC Equipment Make-Up

Piping, where exposed, appears to be copper with sweat joints. The majority of the piping is insulated. Due to the lack of accessibility a major renovation should include all new domestic water piping.

Domestic hot water in Buildings and the Science Classrooms are generated through one (1) Weil-McLain boiler piped to three (3) 120 gallon storage tanks. There is a master Leonard mixing valve and one B&G hot water return pump. The system is in good condition.



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Domestic Water Heater System

Gas:

Natural gas is supplied to the building. Exterior gas meter is located at front of the building. Natural gas is distributed throughout the building in the crawl space.



Gas Meter

Gas piping is black steel with a combination of screwed and welded joints and fittings depending on the time of installation.

Natural gas is provided in the science classrooms. Classrooms are not equipped with emergency shutoff valves.

Natural gas is provided for kitchen cooking equipment. Kitchen supply is not equipped with an automatic shutoff valve.

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Gas Connection

Drainage Systems:

Cast iron is used for sanitary and storm drainage. Where visible, the cast iron pipe appears to be in fair condition. Smaller pipe sizes appear to be copper

In general, the cast iron drainage piping can be reused even in a major renovation where adequately sized for the intended new use.



Crawl Space



Roof

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Garage Systems:

Cast iron drains with gasoline/oil separator located in crawl space.



Recommendations:

- Replace all domestic water piping.
- Provide all new plumbing fixtures and science room equipment.
- Replace all natural gas piping.

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Heating, Ventilation, and Air Conditioning – HVAC

Boiler Room:

The building is primarily heated by a standard efficiency dual fuel (natural gas and No. 2 fuel oil) hot water boiler heating plant. The boiler plant consists of three (3) cast iron steel sectional Weil McLain Model 88-12 Boilers equipped with Webster dual fuel burners with Autoflame controller. The boilers each have a capacity of 3753 MBH gas input/26 GPH oil input, 3,000 MBH gross output and 2608 MBH net hot water heating output. The boilers were installed in 2003, therefore are approximately 14 years old and are past the midpoint of their expected useful service life of 20-25 years. Each boiler appears to be provided with proper operating and safety controls.



Hot Water Boilers



Hot Water Pumps

The boilers currently only use natural gas. It is our understanding that the fuel oil tank has been removed, and that the existing fuel oil pumps, monitor control panel and fuel oil piping within the boiler room have been abandoned in place.



Fuel Oil Pumps



Fuel Oil Monitor Panel

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The overall hot water piping system is schedule 40 black steel and is insulated with fiberglass insulation. Some sections of piping are uninsulated, and some piping insulation fitting may contain asbestos. Most of the hot water piping within the boiler room was installed in 2003, whereas the remainder of the hot water piping is largely original to the building and was installed circa 1957. The boiler plant generates low-pressure low temperature heating hot water, which is distributed by a primary secondary constant flow hot water piping distribution system. The hot water loop does not have glycol solution, and according to facilities staff, hot water coils have frozen in past years but not within the past three years. The hot water circulates throughout the main building hot water loop by two (2) primary/standby end suction base mounted pumps equipped with 15 hp motors that are installed in the boiler room. These pumps appear to be in good condition and were installed circa 2003. The pumps are constant flow and are not equipped with variable speed drives.

The boilers are each vented with insulated steel boiler breeching to a common breeching stack which terminates above the building roof with a single wall steel breeching equipped with a rain cap. Previously the original boilers were individually vented. Currently two of the steel breeching vents have been capped and abandoned in place.



Boiler Breeching



Boiler Breeching w/ Vent Cap

There are four ceiling suspended horizontal and one (1) vertical bladder style un-insulated expansion tanks located in the boiler room. It is our understanding that the vertical expansion tank is no longer operable and that only one (1) of the horizontal expansion tanks is connected to the system.



Expansion Tanks

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Piping Distribution System:

The majority of hot water piping is distributed from the Boiler room to the building heating equipment through a crawlspace. Most piping appears to be insulated and painted black, except for the pipe main fittings, which could possibly contain asbestos, and the piping adjacent to the secondary pump sets. The piping adjacent to pumps P-5&6 is missing sections of insulation, and the piping adjacent to pump set, P-7&8, appears to be newer fiberglass insulation. There are two (2) sets of primary/standby secondary hot water pumps located in the basement crawlspace area. Two of the pumps, P7&8 are equipped with 10 hp motors, appear to be in fair condition and serve the Area D (Cafeteria, Gym, Locker Room) portion of the building. Two of the other pumps, P-5&P-6 are equipped with 5 hp motors, appear to be in poor condition and serve the Area A (Classroom Wing) portion of the building. The pumps are constant flow and are not equipped with variable speed drives.



Crawlspace - Hot Water Pump P-5&P-6



Crawlspace – Expansion Tank



Crawlspace - Hot Water Pump P-7&P-8



Crawlspace – Hot Water Piping

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Automatic Temperature Controls:

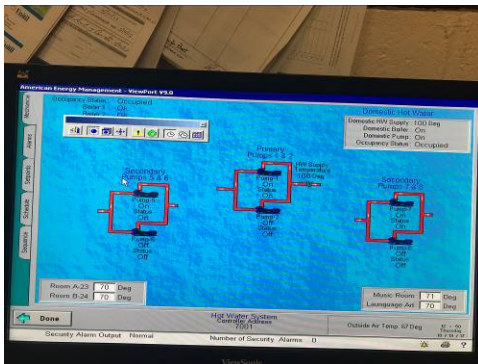
The Automatic Temperature Control (ATC) system is a combination direct digital (DDC) and pneumatic control system. The DDC components were installed by AEM (Advanced Energy Management) Inc. The DDC control system uses an Advanced Energy Management Viewport front end software with operates on Windows XP. The DDC control system was installed circa 2000, and as part of the DDC system installation the controls for the air handling units, boiler plant and unit ventilators were converted from pneumatic to DDC controls. Some heating equipment, air handling dampers and unit ventilators still operate using pneumatic controls. The pneumatic control air compressor is located in the Boiler room. Originally the building control system was largely manufactured by Johnson Controls. Overall the ATC system is antiquated in comparison to current systems, and only provides minimal monitoring, scheduling and setpoint control functionality. There is no ability for the Facility staff to make programming sequence changes for the HVAC equipment.



Pneumatic Control Panel



Pneumatic Control Air Compressor



Front End DDC Workstation



Exhaust Fan Relays and Starters

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Rooms/zones with HVAC equipment that is controlled by the DDC system typically have newer AEM thermostat temperature sensors, whereas rooms/zone with HVAC equipment controlled by Pneumatic controls have older Johnson control pneumatic thermostats.



Typical DDC Tstat (left) and Pneumatic Thermostat (right)

Crawlspace - Air Handling and Exhaust Equipment:

There are five (5) indoor hot water heating and ventilation (HV) air handing units located in the crawlspace of the building. These units HV-5,6,7,8,13 and 14 respectively serve the Library, Library Offices, Administration offices, Girls Locker room, Boys Locker Room and Cafeteria. Black painted uninsulated ductwork is routed up from the units to the areas they serve. All of the units were installed circa 1957, and the units and associated ductwork, piping and control components appear to be in poor conditions. Most of the HV Unit fans are not equipped with pulled guards. Due to the damp crawlspace environment, unit casing, control components and ductwork show signs of visible corrosion. In addition, duck leakage is a potential concern for reduced building indoor air quality in these areas as the crawlspace area air can potential infiltrate the HV system ductwork and spread to the areas the HV units serve.



Crawlspace – HV Unit



Crawlspace – HV Unit Ductwork

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There are approximately nine (9) utility vent set style centrifugal exhaust air fans located in the crawlspace area which generally serve classroom and bathroom exhaust air systems. The exhaust fans and ductwork are generally all original equipment and systems that were installed in 1957. The fans show visible signs of corrosion, and the ductwork is generally uninsulated, painted black and some ductwork sections shows signs of corrosion and damage. Most of the exhaust fans are not equipped with pulled guards.



Crawlspace – Exhaust Fans

Roof – Ventilation and Exhaust Equipment:

There are approximately forty-four (44) roof mounted exhaust air fans, with most fans being originally installed equipment from 1957. Some exhaust fans have been repaired and replaced since their original installation, however most of the fans are in need of replacement. There are also many intake and relief air hoods located on the roof. The intake and relief hoods serve heating and ventilation equipment and exhaust air fan systems located throughout the building.



Roof – Exhaust Fans and Intake/Relief Hoods

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Shop Areas:

The Shop areas are typically heated and ventilated by a combination of wall mounted unit ventilators, fin tube radiation and unit heaters. The majority of equipment is originally installed equipment, circa 1957, and in need of replacement. The unit ventilators were noted to have a source of outside ventilation air, supply fans, filters, and a heating hot water coil with valve control. The general condition of the unit ventilators, unit heaters and radiation heating equipment observed were in poor condition.



Shop area Unit Ventilator



Shop Area – Fintube Radiation

Some of the shop areas are also provided with local exhaust air fan systems, such as paint booth exhaust and capture hood exhaust fan systems which generally are in poor condition. The vehicle garage shop area has a ducted exhaust air system which appears to have been abandoned in place and a wall type propeller exhaust air fan appears to provide the majority of room exhaust.



Abandoned Exhaust Ductwork



Wall Propeller Fan

There is a dust collection system for the woodworking shop; much of the ductwork is damaged and in need of replacement. The dust collector unit, which is manufactured by AAF Co. (Model D Roto Clone, Size 8) is showing signs of corrosion.

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Wood Shop Exhaust Ductwork



Dust Collector



Exhaust Capture Hood



Paint Booth

Auditorium:

The Auditorium is served by heating and ventilation unit, HV-2, which has a capacity of 7,500 cfm and was installed in 1957. The HV unit is located in an adjacent mechanical room and the unit is ducted to overhead round supply air diffusers located in the Auditorium. The HV unit is originally installed equipment which is in need of replacement. A utility style centrifugal exhaust air fan that was installed in 1957, located in the mechanical room adjacent to the HV unit, removes exhaust air from the Auditorium.



Auditorium Supply Diffusers



Auditorium HV Unit and Exhaust Fan

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Music Rooms:

The Music Rooms are served by heating and ventilation units, HV-3 (3,400 cfm) and HV-4 (2,750 cfm), HV units are located within mechanical closets adjacent to the Music Rooms. Utility style centrifugal exhaust air fans remove exhaust air from the music rooms. The HV unit and exhaust fans are originally installed equipment that requires replacement. Sidewall supply and exhaust air diffusers and grilles are located high on the walls of the Music rooms.



Music Rooms – Supply and Exhaust Sidewall Diffusers and Registers

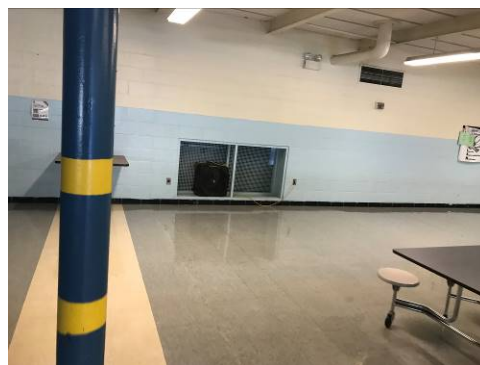
Cafeteria:

The cafeteria is served by a combination of one indoor HV unit (HV-14 – 10,200 CFM) that is located in the Crawlspace and was installed in 1957 and five (5) vertical style hot water unit ventilators. Each unit ventilator is provided with a heating hot water coil, supply fans, filters, and a source of outside ventilation air. The Cafeteria is also served by an exhaust air fan system.

It appears that a source of the supply air from the cafeteria is transferred to the kitchen via low wall mounted transfer grilles. These registers were slightly dirty, but do appear to function.



Cafeteria Unit Ventilators



Cafeteria Transfer Grille and Exhaust Grille

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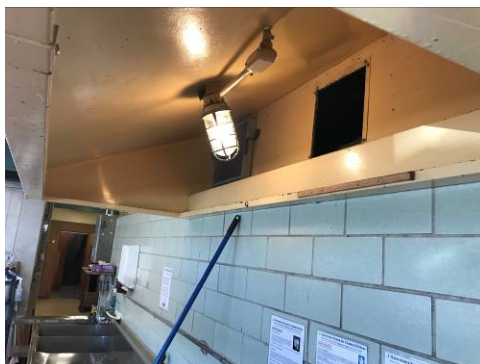
Kitchen:

The kitchen is provided with a double-sided steel kitchen exhaust hood that is located over the cooking equipment and appears to be of adequate size and height to serve the intended purposes. The kitchen hood is provided with cleanable filters, and appear to have an Ansul type fire protection system installed. As we understand it from maintenance personnel, the exhaust hood does operate; however, we cannot be certain that it operates efficiently or per code requirements.

The kitchen area is heated with wall mounted fin tube radiation heating. The kitchen does not have a direct source of make-up air ventilation other than operable windows and the transfer air from the adjacent Cafeteria. The kitchen does not have any mechanical cooling systems. Instead a large propeller stand type fan is used to provide spot cooling during warmer days while cooking and dishwashing operations are taking place. There is a canopy exhaust hood located over the dishwashing sink. There is a refrigeration cooler with air cooled condensing section located within the kitchen that adds a significant heating load to the kitchen. Consideration should be given to replacing this unit with a split system type cooler unit.



Kitchen Exhaust Hood



Kitchen Dishwashing Area Hood



Kitchen Fin Tube Radiation and Propeller Fan

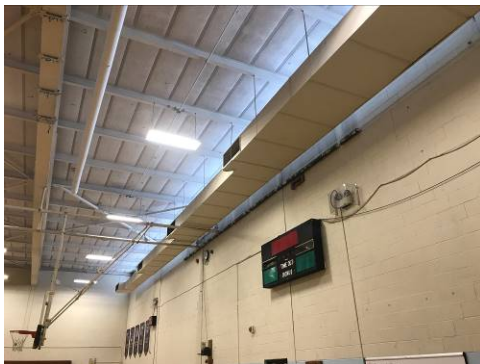
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Kitchen Refrigeration Cooler

Gymnasium:

The gymnasium is provided with two individual air-handling units located in roof penthouse mechanical rooms. Heating and ventilation unit HV-9 serves the West half of the Gym and has a capacity of 7,500 cfm, and HV-10 serves the East half of the Gym and has a capacity of 7,500 cfm. Each unit is provided with a heating hot water coil, supply fans, filters, and a source of outside ventilation air. Each air-handling unit serves a supply air duct with side wall diffusers located high above the floor and provides heating and ventilation air to the entire space through these two supply ductwork and diffuser assemblies. Also, located within the gymnasium are individual low wall return air registers, which return the supply air back to each air-handling unit exhaust air fan located within the same mechanical room. These registers were noted to be slightly damaged and dirty and generally in need of replacement.



Gym Supply Duct and Diffusers



Gym Return Register



Penthouse Mech Rm - Gym HV Unit



Penthouse Mech Rm - Gym Exhaust Fan

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Multi-Purpose Gymnasium:

The Multi-purpose gymnasium is provided with two individual air-handling units located in roof penthouse mechanical rooms. Heating and ventilation unit HV-11 serves the West half of the gym and has a capacity of 4,000 cfm, and HV-12 serves the East half of the Gym and has a capacity of 4,000 cfm. Each unit is provided with a heating hot water coil, supply fans, filters, and a source of outside ventilation air. Each air-handling unit serves a supply air duct with side wall diffusers located high above the floor and provides heating and ventilation air to the entire space through these two supply ductwork and sidewall diffuser assemblies. Also, located within the gymnasium are individual low wall return air registers, which return the supply air back to each air-handling unit exhaust air fan located within the same mechanical room. These registers were noted to be slightly damaged and dirty and generally in need of replacement.



Multi-Purpose Gym Supply Diffusers



Multi-Purpose Gym – Return Register



Multi-Purpose Gym HV Unit

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Locker Areas:

Both the girls and the boys locker rooms are each served by an indoor heating and ventilation air-handling unit, which includes a hot water heating coil, supply fan, filters, and a source of outside ventilation air. Ventilation air is provided overhead through a supply distribution system to various diffusers located throughout. The HV units are located in the crawlspace area and appear to be in poor condition. HV-8 serves the Girl's locker room and has a capacity of 5,825 cfm and HV-13 serves the Boy's locker room and has a capacity of 5,600 cfm. There are also side wall mounted and overhead exhaust air grilles that are connected to exhaust air. The system appeared to be functioning properly, however the diffusers, ductwork and fans appear to be originally installed equipment and systems that should be replaced. The locker rooms are also heated by perimeter wall mounted fin tube radiation heating.



Typical Locker Room Fintube



Typical Locker Room Exhaust

Library:

The Library and adjacent Library offices are heated and ventilated by two (2) indoor heating and ventilation units located in the crawlspace area below the Library, and are ducted to sidewall supply air diffusers. HV-5 serves the Library and has a capacity of 1,750 cfm and HV-6 serves the library offices and has a capacity of 1,880 cfm. Both units appear to be in poor condition and were installed in 1957. The Library is also heated with supplemental perimeter fin tube radiation heating, and is air conditioned by window AC units.



Library - Window AC Units and Fin Tube



Library Supply Diffusers

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Classrooms:

Classrooms are typically provided with wall-mounted vertical discharge unit ventilators, which include a hot water heating coil with valve control, a source of outside ventilation air, supply fans and filters. These units were installed in 1957 and are in poor condition. Overall there are approximately seventy-five unit ventilators installed throughout the building, with the majority being installed in classroom areas. Exhaust air grilles are typically located low within an architectural enclosure on the interior corridor side of the classroom. The exhaust air grilles are ducted to exhaust air ductwork and fan systems located in the crawlspace areas below the Classrooms. Many classrooms also have supplemental fin tube radiation heating along the exterior perimeter walls. Most of the unit ventilators are controlled by the DDC system and much of the hot water radiation heating is controlled by the pneumatic control system.



Classroom Unit Ventilator



Classroom Exhaust Grille

The Science Classroom has an old fume hood and exhaust air fan system which appears to have been originally installed equipment and in poor physical condition. Many of the Classrooms observed appear to have window air conditioners installed



Science Classroom Fume Hood



Classroom Fintube Radiation

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Classroom – Unit Ventilator Louvers and Window AC Units



Horizontal Classroom Unit Ventilators

Corridors:

The various circulating corridors throughout the building do not appear to be provided with code required ventilation air. Ventilation air is required by code in corridors, therefore this condition should be corrected. Majority of corridors are heated by hot water fin tube radiation equipment which appears to be originally installed equipment that has exceeded its expected service life.



Corridor – Fin Tube Radiation Heating

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Restrooms:

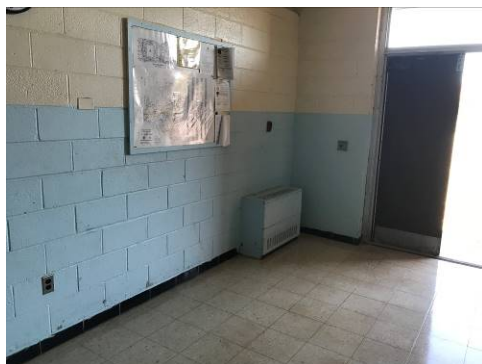
The restrooms observed during our site visit appear to be properly exhausted with exhaust air fan systems. Make up air for larger restrooms is typically provided by door grilles. Restrooms are typically heated by fin tube radiation heating. The exhaust air and heating systems appear to be original to the building, circa 1957, and therefore should be replaced.



Restroom – Exhaust Grille and Fintube Radiation Heating

Door Entrances and Vestibules:

The individual entranceways throughout the building are typically heated by a combination of hot water cabinet style unit heaters, convectors, or hot water fin tube radiation heating. These cabinet heaters and fintube enclosure generally were noted to be slightly dirty and some had damaged casing; however, we understand most of the units do operate. The entranceways are not provided with any vestibule interlocks and therefore infiltration air does circulate throughout when the doors are open. It is recommended that vestibule interlocks be provided at each doorway and all cabinet heaters be replaced with a higher output unit.



Entryway – Hot Water Cabinet Unit Ventilator (left) and Convector(right)

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Administration Offices and Nurse's Office:

The main administration office area is heated and ventilated by an indoor heating and ventilation unit, HV-7 – 870 cfm) that is located in the crawlspace below the office area. The administration area is also heated by supplemental fin tube radiation heating and is primarily air conditioned by window AC units. The HV unit and fin tube radiation are originally installed equipment, circa 1957. One of the teacher's offices is air conditioned by a Window AC unit that is installed in an interior wall. This unit can cause condensate to drop from the unit and on to the floor during humid days. The Nurse's office is air conditioned by a ductless split system AC unit.



Administration Office



Office with Window AC installed in Interior Wall



Nurse's Office Ductless AC unit

Building and Grounds Office Area:

The Buildings and Grounds office area is primarily heating, ventilated and air conditioned by a packaged rooftop unit equipped with gas fired heating and direct expansion electric cooling. The unit was manufactured by Trane, has a capacity of 5 tons and was installed circa 2001. The unit appears to be in fair condition, but is nearing the end of its expected useful service life of 15-20 years. The B&G office area is also heated by supplemental hot water fin tube radiation.

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B&G Office - Packaged Rooftop Unit



B&G Office Supply Diffusers



B&G Office Fintube Radiation

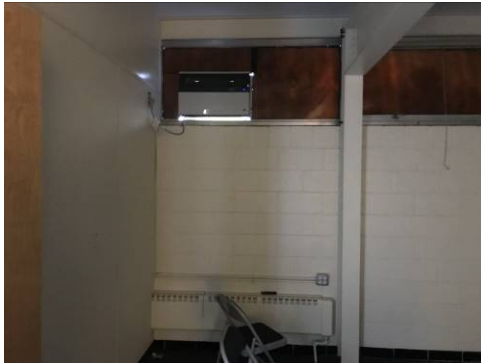
Community Health Area:

The Community Health area is primarily heated by perimeter fin tube radiation heating, and is air conditioned by a combination of Window AC and ductless split system AC units. Ventilation air is provided by a combination of operable windows and a ceiling suspended energy recovery (ERV) unit. The ductless split system unit and ERB unit appear to have been installed approximately 3-4 years ago.



Community Health – Ductless AC Unit and Associated Roof Condensing Units

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*Community Health - Window AC Unit
and Fintube Radiation*



Community Health – ERV Unit

Recommendations for Renovation and Repair Project:

Based upon our site visit observations and review of existing condition drawings we offer the following recommendations for repair and replacement of the existing HVAC systems:

- Existing hot water boilers should be replaced with high efficiency gas fired condensing hot water boiler plant consisting of (3) new hot water gas-fired condensing boilers, associated breeching, accessories, pumps and controls. The new pumps should be equipped with VFD drives and provided with differential pressure controls and power wiring to replace the three (3) sets of existing hot water pumps (Quantity of 6 pumps).
- All existing heating and ventilation units (Qty. of 14) should be replaced. Consideration should be given to adding energy recovery to the HV units, and possibly adding air conditioning to the new units. These units presently serve the Gym, Multi-Purpose Gym, Library and library offices, Cafeteria, Locker rooms, Music Rooms, Auditorium and Administration office. It is highly recommended that replacement units are not installed within crawlspace areas due to difficulty for service and maintenance, and the potential for reduced service life of the equipment.
- A dedicated make-up air unit should be installed for the Kitchen, and the existing Kitchen and Dishwasher hoods and exhaust air fans system should be replaced.
- All existing unit ventilators should be replaced (Qty. of 75). Adding new CO2 demand ventilation and/or energy recovery should be considered as part of a potential UV replacement project. Under a large building renovation project, potential alternative HVAC systems should be studied as part of a potential solution to replace the Unit Ventilators and Window AC unit that currently serve the Classrooms.
- All existing originally installed exhaust air fans should be replaced with new exhaust air fans.
- All originally installed existing HVAC system ductwork and piping should be replaced and new insulated ductwork and piping should be installed.
- New cabinet unit heaters and/or convectors should be installed at Entryways.

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- New fume hood and exhaust air system should be provided for Science classrooms if required.
- The Shop area HVAC systems should be replaced including Unit ventilators, exhaust air systems and the dust collector unit and associated ductwork.
- Ventilation air system should be provided for the corridors and classroom/office areas that lack mechanical ventilation.
- The existing direct digital control building energy management system should be replaced and upgraded to a full DDC system. Existing pneumatic controls should be removed.
- All new HVAC systems should be tested, adjusted, balanced and commissioned.

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ELECTRICAL

Executive Summary:

The original building was constructed in the late 1950s with a minor classroom renovation during 1967. Most of the systems are original to the building and although functioning, have outlived their intended useful life. The facility's four electrical services are provided by Eversource and are primary metered. Other incoming utilities include telephone, cable TV, fiber, and fire alarm.

The power distribution system is original and generally in poor condition. Most of the lighting systems have been retrofitted with new lamps and ballasts, but most light fixtures, switches and wiring were reused. The fire alarm system control panel has been upgraded however it is still non-addressable. The system wiring, notification and detection were reused. System coverage is generally inadequate and not code compliant.

The existing generator has been removed. The emergency lighting systems consist of self-contained battery units with inadequate coverage. Exit signs are generally old and some do not have battery back-up and provide inadequate coverage

The existing communications and security systems are minimal and should be replaced with state of the art integrated systems.

We recommend replacement of the Electrical and Communications/Security systems under a renovation program.

Power Distribution System:

The primary three phase service runs overhead along Flagg Drive. The facility is serviced by three vaults with four electrical services. Primary service No. 1, originates on utility pole and runs underground into a utility transformer located inside vault "A" on the west end of the building.

Primary service No. 2 runs in (1) 3" conduit in the crawl space from vault "A" into Vault "B" on the central part of the building.

Primary service No. 3 runs in (1) 3" conduit in the crawl space from Vault "B" into Vault "C" on the east end of the Building.

Each vault has access through an areaway from the exterior of the building, available only to the utility company. Secondary services between the vaults and the switchboards consists of General Electric busduct.

Vault "A" has two transformers, A & K. Transformer "A" feeds an 800 ampere, 120/208V, 3 phase, 4 wire switchboard "A" which services the west side of the building.

Transformer "K" feeds a 1000 ampere, 277/480V, 3 phase, 4 wire distribution panelboard which services the kitchen complex.

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Vault “B” has one transformer “B” which feeds a 1600 ampere, 120/208V, 3 phase, 4 wire switchboard “B” feeding the central portion of the building.

Vault “C” has one transformer “C” which feeds a 2000 ampere, 120/208V, 3 phase, 4 wire switchboard “C” feeding the east side of the building.

The vault mounted transformers are owned by the utility company and due to their age are likely to contain PCBs.

The switchboards, distribution panels and panelboards are of the breaker type.



Typical Corridor Panels



Kitchen Panel



Entryway to Vault



Vault Transformer

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The busduct and switchboards were manufactured by General Electric and are generally in fair to poor condition.



Busduct to Vault



Switchboard



Switchboard

The Electric Rooms and vaults are located in the crawl space and have been subjected to moisture and water seepage. Door and door hardware are not in compliance with current codes which require panic hardware.

Local and remote panels, generally installed flush in Corridors, are of the breaker type, are generally full and in poor condition. Most panelboards are original General Electric panels.

Most switchgear is original to the building and is obsolete. Replacement parts are scarce as switchgear is no longer manufactured. The switchgear, due to its age and condition, should be replaced under a renovation program.

Interior Lighting:

The interior lighting has been retrofitted over the years with T8 lamps and electronic ballasts, however most existing fixtures, wiring and switches are original. Corridor lighting generally consists of surface acrylic drums with screw in CFL and LED lamps as well as 1x4 surface acrylic wraparound fixtures with two T8 lamps. Corridor lights are locally switched.

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Corridor Lights



Corridor Lights

Classroom lights consist of three continuous rows of 12" pendant mounted acrylic wraparound fixtures with a single T8 lamp. Fixtures are multi-switched by row. Classrooms do not have occupancy sensors or dimmable photosensors.



Classroom Lights

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The Gymnasium and fitness center have 2x4 fluorescent high bays with three T5HO lamps with lens and wireguards. Space is well lit. Lights are breaker controlled.



Gymnasium Lights

Cafeteria lighting consists of pendant wraparound fixtures with two T8 lamps.



Cafeteria Lights



Shop Lights

Shops have pendant industrial strips with (2) T8 lamps locally switched.

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Kitchen/Servery has pendant wraps with two T8 lamps. Fixtures are not damp/wet location rated. Light switches exceed ADA height. Kitchen hood has globe fixtures with wireguards.



Servery's Fixtures



Hood Lights

Auditorium has recessed downlights with LED screw-in par lamps for house lighting. Isle lights integral to seat arm rest being used. Lights are controlled with preset dimmable door entry stations.



Stage Dimming Rack



Auditorium Lights



Stage Lights

Stage work lights consists of industrial strips of RLM fixtures.

Performance lighting consist of two wall mounted trims each with four fixtures and front of house fresnels. Stage has two electrics with border lights and fresnels.

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The original Major dimming rack is still in place but has been augmented with a newer strand lighting 24 dual dimmer rack and controls.

Typical Toilet Room has wraparound fixture on a local switch.

Locker Rooms have continuous rows of wraparound fixtures with T8 lamps on local switches. Fluorescent vapor tight/wet location exist over showers.



Office Lights



Shower Lights



Toilet Room Lights

The office areas are lit with recessed 2x2 parabolic fixtures with T8U lamps and wraparound fixtures with T8 lamps.

The interior lighting is generally in fair to poor condition. Lighting has been upgraded with T8 lamps and electronic ballasts.

School does not have occupancy sensors or dimmable sources to conserve energy.

The facility does not have an automated lighting control system.

Lighting is functional with most spaces fairly well lit however fixtures are original and of utility grade and in need of upgrade.

The lighting systems should be replaced with LED sources under a renovation program.

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Exterior Lighting

The exterior lighting for the front parking area consists of utility poles with HID floods located across the street. The side parking has (1) utility pole with a cobra head.



Pole with Mini-Flood

The parking areas are inadequately lit.

HID wall packs are located around building perimeter including over egress doors. Fixtures are not of the cut-off type. Fixtures do not have quartz restrike for instant lighting upon a power loss.



Exterior Wall Pack

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The Main Entrance canopy has recessed HID fixtures with acrylic lens and ceiling mounted wall packs.



Canopy Fixtures

The exterior lighting should be replaced with LED sources of the cut-off type.

Emergency Standby System:

The facility does not have a generator. The original natural gas generator used for emergency lighting has been removed.

Emergency lighting consists of battery units with integral heads. Emergency lighting coverage is generally inadequate.



Battery Unit

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Exterior doors do not have emergency lights, currently required by code.

Exit signs range from newer functional internally lit with battery back-up to original exit signs without battery back-up. Coverage is inadequate in many spaces.



Old Functional Exit

The life safety systems are original and no longer code compliant. These systems should be replaced under a renovation program.

Fire Alarm System:

The fire alarm system for the facility consists of a newer replacement zoned (non-addressable) Mircom FA-1000 series fire alarm control panel located in the Boiler Room. A remote LED annunciator is located outside the Main Lobby. The newer panel replaced the former FACP now used as a splice box. The existing zones were extended and monitored with addressable modules. The existing horn circuits were reconnected to the new panel.



Fire Alarm Control Panel

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The form of alarm transmission is via a local energy master box connected with IMSA Cable located outside the main lobby.



Master Box, Annunciator, & Key Box

Smoke detectors exist in corridors but generally exceed NFPA spacing standards.

Horn/strobes exist but are not ADA compliant and generally offer inadequate coverage, some exceed ADA mounting height. Classrooms do not have horn/strobes.



Horn/Strobe

Toilet Rooms generally do not have strobes. Nurse's Suite does not have smoke, CO detector or horn/strobe.

Pull stations exist at egress doors however some exceed ADA mounting height.

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Corridor doors do not have magnetic held-open devices. Doors are held open with wooden blocks.

Kitchen hoods suppression system is not connected to fire alarm system.

Although a newer control panel was installed, existing wiring and devices were generally reused.

Current codes require voice evacuation for PK-12 Schools in lieu of horns. Voice evacuation enables the transmission of alert messages, pre-recorded or live, over the fire alarm speakers as well as over the paging speakers.

The existing fire alarm system does not meet current codes and should be replaced under a renovation program.

Communications/Security/Miscellaneous:

Telephone, Cable TV, fiber, and fire alarm enter building underground into Main Electric Room in 3” conduits.

The data cabling infrastructure is generally CAT5 and CAT6. Typical IDF communications racks are located throughout the school. Racks are not located within conditioned dedicated rooms. Wireless access nodes exist throughout school. Typical classroom does not have data outlets.

The paging system console, located within the Administration Area, is a Bogen Model MCP-3A. Paging is through a desktop digital telephone handset. Paging speakers exist throughout the school.



Paging Console



Corridor Speaker & Wireless Access Node

Each classroom has a Cisco desk-mounted telephone handset to communicate with the Main Office. A push button, wall speaker, and clock also exist.

The Auditorium has front of house wall mounted loud speakers. Auditorium local sound system is portable.

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Various system clocks have failed and have been replaced with battery clocks.

The Lathem Bell and master clock system controller is located in the Main Office.



Clock/Speaker & Pushbutton



CCTV Camera

There is an intercom station at the Main Entrance with door release at administration via desk phones. Four exterior cameras exist located at Main Entrance and dumpsters. Cameras connect to remote site via fiber. Camera display monitor exists at main office.

Card access proximity readers exist at selected exterior doors.



Security Keypad



Door/Intercom & Proximity Reader



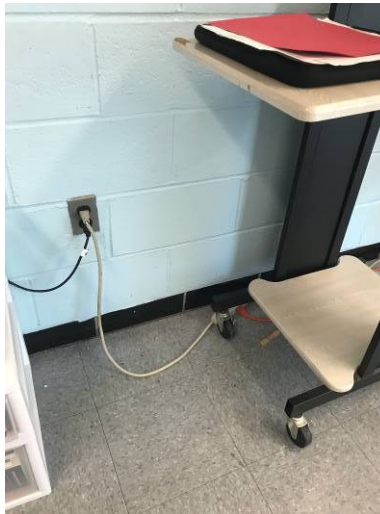
Desk Phone

Corridors have intrusion system passive infrared, PIR sensors.

The facility does not have a lightning protection system.

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The receptacle coverage is inadequate in most spaces. Typical classroom has one duplex receptacle per wall. Extension cords were noted being used throughout Classrooms and Labs. The use of extension cords for permanent wiring is a code violation.



Classroom Extension Cord Use

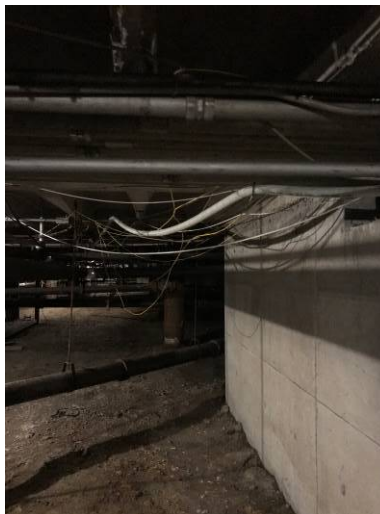
Various receptacles near sinks are not GFI type including Nurse's suite and kitchen.

There is no emergency power off devices in the Kitchen to kill power to equipment under hood.

Boiler Rooms do have emergency power off, EPO stations at entrance door to kill power to boilers during an emergency.

The facility does not have a bi-directional antenna system used to enhance communications with portable radios by First Responders.

Most wiring runs within crawl space.



Crawl Space Wiring

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Recommendations:

Main Distribution System:

- The existing electrical services should be upgraded with a single 277/480 volt system to provide the required capacity for the building load based on 10 watts per square foot power consumption. A new pad-mounted transformer with new primary and secondary service should be provided. The vault-mounted transformers would be removed when no longer needed.
- The proposed secondary switchgear should be installed in a dedicated main electric room, and sized in accordance with current NEC minimum workspace requirements. New panelboards should be provided as required. The new panelboards should be located in electrical rooms located in each wing of the building. The electrical rooms should be sized in accordance with current NEC minimum workspace requirements.
- Computer grade panelboards with double neutrals and with surge protective devices should be provided for computer receptacles to mitigate harmonic distortion of non-linear computer loads.
- Additional duplex receptacle for general purpose power should be provided throughout the facility as required. Additional duplex receptacles for computer workstations in classrooms/labs should be installed and circuited to the computer grade panelboards outlined above.
- Each classroom should have a minimum of 2 duplex receptacles per teaching wall and 2 double duplex receptacles on dedicated circuits at classroom computer workstations. The Teacher's workstation should have a double duplex receptacle also on a dedicated circuit.
- Office areas will generally have 1 duplex outlet per wall. At each workstation a double duplex receptacle will be provided
- Corridors should have a cleaning receptacle at approximately 30-40 foot intervals.
- Exterior weatherproof GFI receptacles should be installed at exterior doors.

Emergency Distribution System:

- Provide a new exterior emergency generator and automatic transfer switches to provide emergency backup power for life safety and critical standby loads (i.e.; freezers, communications and security equipment, boilers, pumps, etc.) Dedicated 2-hour fire rated emergency rooms shall be provided within the building. Life safety system will feed all code required egress lighting and exit signs.
- Emergency life safety lighting shall be provided for all egress ways and should be provided in toilet areas and other public spaces as required by NFPA 101 Life Safety Code.

Lighting System:

- In general, the existing lighting system should be upgraded as required based on the proposed architectural renovations.
- Classroom lighting fixtures will consist of surface or pendant-mounted direct/indirect luminaires with LED lamps and electronic drivers. The fixtures will be pre-wired for automatic dimming control where natural daylight is available and also for multi-level switching. Occupancy sensors and dimming sensors will be provided.

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- Office lighting fixtures will consist of acrylic recessed direct fixtures with LED lamps and electronic drivers for dual-level switching. Fully dimmable drivers will be provided where natural daylight is available. Lighting levels will be approximately 30 foot candles in classrooms and offices.
- Cafeteria and Auditorium lighting will be upgraded with LED sources and electronic drivers. Theatrical lights with a dimming system will be provided for performances. Large Gym lighting could be reused.
- Corridor lighting will be comprised of recessed acrylic fixtures with LED lamps and electronic drivers. The corridor light level will be designed for approximately 20-foot candles.
- Kitchen and Served lighting will consist of surface 2'x4' acrylic lensed troffers with aluminum frame doors with LED lamps and electronic drivers. Light levels will be approximately 50-75 foot candles.
- Each area will be locally switched and designed for multi-level controls. Each classroom, office space and toilet room will have an occupancy sensor to turn lights off when unoccupied. Daylight sensors will be installed in each classroom and perimeter spaces for automatic dimming of light fixtures.
- The entire school will be controlled with an automatic lighting control system using addressable networked controls for programming lights on and off.
- Exterior site lighting for area lighting will be pole mounted long life, energy efficient LED luminaires in the parking areas. Building perimeter fixtures will be wall mounted LED over exterior doors. The exterior lighting will be connected to the automatic lighting control system for photocell on and timed off operation. All exterior lighting will be of the cut-off type.

Fire Alarm System:

- A fire alarm and detection system in compliance with ADA should be provided with battery back-up. The system will be of the addressable type where each device will be identified at the control panel and remote annunciator by device type and location to facilitate search for origin of alarms. Smoke detectors will be provided in open areas, corridors, and other egress ways. The sprinkler system will be supervised for water flow and tampering with valves. Voice evacuation speaker/strobes will be provided in egress ways, classrooms, assembly spaces, open areas and other large spaces.
- Strobe only units will be provided in single toilets and conference rooms.
- Manual pull stations will be provided at exit discharge doors.
- The system will be remotely connected to automatically report alarms to fire department via the master box.

Uninterruptable Power System (UPS):

- A three phase centralized Uninterruptible Power Supply (UPS) system should be provided with battery backup. The system will provide conditioned power to sensitive electronic loads and telecommunication systems to bridge over power interruptions of short duration and allow an orderly shutdown of servers during a prolonged power outage. The UPS system will also be connected to the stand-by generator.

Fuller Middle School Feasibility Study
Framingham, MA
Electrical Existing Conditions Systems Report
J#680 015 00.00
L#58621/Page 17/November 1, 2017

Lightning Protection System:

- A system of lightning protection should be provided. The system will be installed in compliance with the provisions of the latest “Code for Protection Against Lightning” for buildings as adopted by the National Fire Protection Association and the Underwriters’ Laboratories, Inc. for a UL Master Label System. The lightning protection equipment will include air terminals, conductors, conduits, fasteners, connectors, ground rods, etc.

Security/Communications:

- Remove and replace the existing intrusion system and replace with a new addressable system with better coverage using motion detectors on all perimeter rooms on the first level and all corridors on each level. Each exterior door will have door contacts for monitoring door position and security keypads provided at each major entry point to the facility. An integrated CCTV and access control system should be provided with building mounted IP cameras covering the perimeter of the building and each major entrance. Card readers should be provided at major entrances to the building.
- The existing classroom intercom system should be replaced with a state of the art intercom system with web based software. Each classroom should be wired back as an individual home run for private conversations. New speakers should be located throughout the facility to ensure adequate coverage and capable of flexible selective zone paging. The existing master clock system should be replaced with a new GPS based wireless master clock system with repeaters in the IDF closets and 120V wireless secondary clocks located in each classroom, office and large space as needed.
- Tel/Data wiring should be replaced with CAT6 plenum rated cable throughout. Located in conditioned and properly sized MDF/IDF rooms. New outlet locations should be reviewed to accommodate the facilities new technology equipment plan. A new head end room with 50 micron laser optimized multimode and single mode cable to remote dedicated IDF rooms should be provided for gigabit connectivity to the desktop. The new dedicated data closets will ensure that present and future data needs are accommodated.
- The classroom A/V infrastructure should be updated to accommodate the need for A/V equipment. This would include wall mounted projection and box/conduit provisions for updated local sound systems. The local sound system in the large spaces including the gymnasium, cafeteria, and auditorium should be replaced/provided with new up-to-date systems.



CDW CONSULTANTS, INC.
CIVIL & ENVIRONMENTAL ENGINEERS

November 7, 2017

Philip Gray
Associate Principal
Jonathan Levi Architects
266 Beacon Street Boston MA 02116

RE: Hazardous Materials *Preliminary Costs*
Fuller Middle School
Framingham, Massachusetts

Dear Mr. Gray:

CDW Consultants, Inc. (CDW) is pleased to present this preliminary estimate of abatement construction costs based upon the findings of the feasibility hazardous materials survey of the Fuller Middle School in Framingham, Massachusetts.

The associated costs for the asbestos abatement and other hazardous materials are presented in the tables on the next page, a reflect a renovation/or phased demolition scenario and abatement of all materials.

Under a full demolition scenario with some bulk loading of materials there may be a cost savings of 20-25 percent.

Under a demolition scenario whereas ½ is sealed off for use and ½ demolished, there may be a cost savings of 10 percent.

Please call if you have any questions or require additional information.

Very truly yours,

CDW CONSULTANTS, INC.

Susan Cahalan, PG, ISSP-SA
Project Manager

Table 1
Abatement Cost Estimates
Fuller Middle School
Framingham, Massachusetts

Material Description	Location	Est. Quantity	Units	Unit Cost	Total Cost
Pipe Fittings and Insulation	Behind Walls, Crawlspace etc.	17,000	LF	\$ 17.00	\$ 289,000.00
Roof Drain Insulation	A-24, B-8, B-18, B-15A, B-20, B-22, B-28, B-46, C-8, C-27, C-22, C-09, C-15, D-31, D-16, D-29, D-33	450	LF	\$ 17.00	\$ 7,650.00
Gaskets	On Steam and Hot Water Lines and Valves, Crawlspace	250	EA	\$ 25.00	\$ 6,250.00
Round Light Gaskets	Round Lights in Boiler Room Area	25	EA	\$ 30.00	\$ 750.00
ACM Debris on Soil	Dirt Floor of Crawlspace	25	CY	\$ 250.00	\$ 6,250.00
Vibration Isolators on HVAC	Crawlspace, HV-1, HV-2, HV-3, HV-4, HV-5, HV-6, HV-7, HV-8, HV-9, HV-10, HV-11, HV-12, HV-13, HV-14, A-21, B-1A, B-26, C-13, D-9	40	EA	\$ 100.00	\$ 4,000.00
9x9 Floor Tiles and associated Mastic	Throughout, Halls Outside Auditorium and Locker Rooms, Halls outside C-14, B-32, B-35, B-37, B-39, A-8, C-1, B-1, Select Classrooms	108,000	SF	\$ 4.50	\$ 486,000.00
Wood Flooring Paper and Mastic	Stage and Music Room Stage	4,000	SF	\$ 12.00	\$ 48,000.00
Wood Wall Paneling Glue	Auditorium	2,000	SF	\$ 12.00	\$ 24,000.00
Wire Insulation	Auditorium Stage	60	LF	\$ 5.00	\$ 300.00
Fire Curtain	Auditorium Stage	1	EA	\$ 500.00	\$ 500.00

**Table 1
Abatement Cost Estimates
Fuller Middle School
Framingham, Massachusetts**

Material Description	Location	Est. Quantity	Units	Unit Cost	Total Cost
Wood Flooring Paper and Mastic	Gym and Fitness Center	14,500	SF	\$ 12.00	\$ 174,000.00
Fiber Reinforced Paneling	B-9 Lab Hood, D-31 Exhaust Vent, D-6 Upper Wall Vent	210	SF	\$ 12.00	\$ 2,520.00
Mastic Behind Heaters	Classrooms	3,200	SF	\$ 12.00	\$ 38,400.00
Slate Board Glue Daubs	Classrooms, Average 3 Per Classroom	250	EA	\$ 150.00	\$ 37,500.00
Black Science Table Tops	Science	320	SF	\$ 12.00	\$ 3,840.00
Interior Window Glaze	At Classrooms and Hall Intersection B Classrooms, C Classrooms, D Classrooms	550	EA	\$ 150.00	\$ 82,500.00
Interior Window Glaze	Fancy Wood Framed Windows at Admin Offices, "A" Offices, Library. 4x4, 8x4 and 2x4 Sections	150	EA	\$ 150.00	\$ 22,500.00
Black Sink Coating	Standard Sinks, B-5, Art, Nurses, Other Areas	30	EA	\$ 50.00	\$ 1,500.00
Interior White-Gray Caulk	Between Steel Beams and CMU in Classrooms, Intermittent in Halls	3,500	LF	\$ 12.00	\$ 42,000.00
Interior Hard Yellow Caulk	Between Steel Beams and CMU 1/2 Wall Interior Side of Courtyard Near Main Office	320	LF	\$ 14.00	\$ 4,480.00
Black Mastic/Insulation	Walk in Refrigerator and Freezer Coating	2	EA	\$ 2,000.00	\$ 4,000.00
Exterior Gray Window Caulk	At Sides of Long Window Banks, Between Bank and Brick	300	LF	\$ 14.00	\$ 4,200.00
Exterior Window Glaze	Interior of Exterior Window Banks. Each Window Defined by Aluminum Frame above Solid Steel Panel.	175	Each	\$ 250.00	\$ 43,750.00

Table 1
Abatement Cost Estimates
Fuller Middle School
Framingham, Massachusetts

Material Description	Location	Est. Quantity	Units	Unit Cost	Total Cost
Exterior Door Caulk	Exterior Doors	420	LF	\$ 14.00	\$ 5,880.00
Exterior Vapor Barrier	Behind Brick Façade	6,000	SF	\$ 12.00	\$ 72,000.00
Remnant Roofing Tar	Remnant	10,000	SF	\$ 12.00	\$ 120,000.00
Subsurface Transite	Not Seen - Contingency	2,000	LF	\$ 35.00	\$ 70,000.00
				Total	\$ 1,601,770.00

**TABLE 1A
Other Hazardous Materials
Fuller Middle School
Framingham, Massachusetts**

Material Description	Location	Est. Quantity	Units	Unit Cost	Total Coat	Comments	
Compact Fluorescent Bulbs	Throughout	200	EA	\$1	\$200		
Fluorescent Bulbs (Mercury)	Throughout	18000	Tubes	\$1	\$18,000		
Electronic and DPHE Light Ballasts	Throughout	9000	Each	\$5	\$45,000		
Thermostats and Switches (Mercury)	Throughout	500	Ampules	\$20	\$10,000		
Emergency Light Batteries (Lead)	Throughout	80	EA	\$20	\$1,600		
Refrigerants Associated With HVAC	Throughout	5000	Gallons	\$5	\$25,000		
Fire Extinguishers (Compressed Gas)	Throughout	150	EA	\$0	\$0	Reuse Recommended	
Refrigerants Associated with Water Bubblers	Throughout	25	Gallons	\$5	\$125		
Exit Signs (Tritium)	Throughout	150	EA	\$20	\$3,000		
Laboratory Chemicals	Science Lab	NA	NA	\$0	\$0	Reuse Recommended	
Air Conditioning Units	Window Mounted	100	EA	\$100	\$10,000		
Chemicals, Mercury and Lead	Science Sink Traps and Acid Tank	25	Gallons	\$100	\$2,500		
Older Door Retractors (Hydraulic Fluid)	Doors	150	EA	\$50	\$7,500		
Hydraulic Fluid	Old Lifts Under Floor	100	Gallons	\$25	\$2,500		
PCBs in Caulking	Assumed	4200	LF	\$35	\$147,000		
PCB Fluid	Old Transformer	150	Gallons	\$50	\$7,500		
		TOTAL				\$279,925	



CDW CONSULTANTS, INC.
CIVIL & ENVIRONMENTAL ENGINEERS

November 10, 2017

Philip Gray
Associate Principal
Jonathan Levi Architects
266 Beacon Street Boston MA 02116

RE: Hazardous Materials Photos
Fuller Middle School
Framingham, Massachusetts

Dear Mr. Gray:

Attached are select photographs of asbestos containing materials (ACM) and other hazardous materials at the Fuller Middle School in Framingham, Massachusetts.

Very truly yours,

CDW CONSULTANTS, INC.

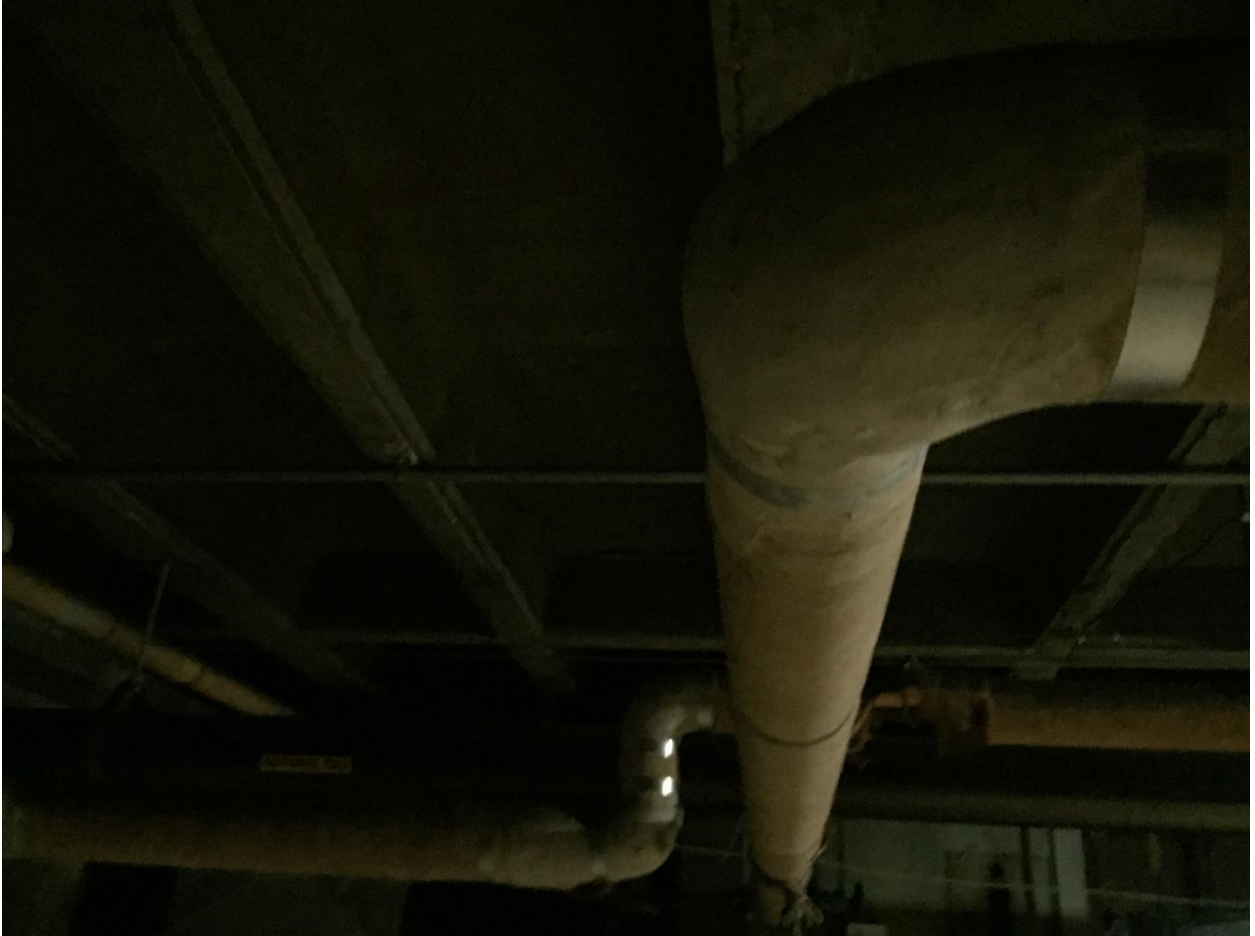
Susan Cahalan, PG, ISSP-SA
Project Manager



Typical 9x9 ACM Floor Tile, Differing Colors Throughout



ACM Window Glaze, Interior Side of Exterior Window



Typical ACM Pipe Fitting



Typical Suspect ACM Vibration Isolator on HVAC



Interior Window Glaze Associated with Classrooms



Old Door Retractor, Located throughout (Hydraulic Oil)



ACM Caulk Located at Steel Beams and ½ Wall CMU Interior of Courtyard



Interior ACM Window Glaze Associated with Wood Framed Windows



ACM Caulk Associated with Steel Beams (Intermittent)



Roof Drain with ACM Fittings



ACM Door Caulk



Exterior ACM Window Caulk at Edges of Window Banks



Old Transformer with PCB Fluid