Mitchell Elementary School E

Mitchell Elementary School

Civil Assessment

Nitsch Engineering has performed research of the existing site conditions for the Mitchell School at 187 Brookline Street in Needham, Massachusetts. Nitsch Engineering also conducted a site visit on April 19, 2011 to observe the overall site, take pictures and provide a preliminary outline of short and long term needs for the school. Nitsch Engineering also included anticipated site permitting requirements for the Mitchell School for any proposed site work.

Nitsch Engineering's research included an initial site visit around the school and review of existing conditions plans compiled by Dore and Whittier Architects. Nitsch Engineering also had a conversation with the Needham Public Facilities Department and school personnel about issues at this school.

Nitsch Engineering's observations and findings are summarized below.

Exterior

Existing Site Conditions:

The Mitchell School is in a residential neighborhood located at the top of a hill off Brookline Avenue. The entry to the school is a U-shaped driveway off Brookline Street. The entry width allows for a double lane configuration that allows student drop off via bus and private vehicles along the front of the school.

A stream and wetland area is located at the bottom of the slope, east of the school.

Hard surface and grassed play areas are located to the west of the school building. Two baseball fields are located at the in the northern section of the grassed play areas. There are wooded areas further west of the play fields and just east of the school building.

Parking and Access

There is a 41 space-striped parking lot off Brookline Street for visitors and staff. Additional parking is provided at the rear entrance to the school via Tower Avenue. Tower Avenue opens out to a cul-de-sac where drop off service is provided along the curb. An adjacent parking lot off the cul-de-sac provides 30 striped parking spaces for staff. Sidewalks are available to the front and back entrances of the school.

Ramps for the front and rear entrances to the school are available.

Parking in the residential area is discouraged.

Utilities

The Mitchell School is serviced by the municipal sewer and water services.

The water main in Brookline Street is an 8-inch service with a tap and sleeve that reduces to a four inch cast iron service which then enters the school at the west side of the school. There are two fire hydrants along Brookline Street : one hydrant is near the school driveway entrance and the other hydrant is close to 215 Brookline Street.

The existing 6-inch cement sewer exits on the west side of the school and connects to the vitrified clay sewer main in Brookline Street. A new six-inch asbestos cement sewer line was added during the school expansion in 1969. This line exits the building on the east side of the building and connects directly to the sewer manhole at station 15+00, in front of house number 176 in Brookline Street.

Drainage for the Mitchell School consists of two catch basins at the start of the cul-de-sac on Tower Avenue. It appears that some of the roof is captured and directed to the drainage system around the east side of the school building and into the Tower Avenue drain system. There is an area drain in the landscaped area in the entry drive. In general, the drainage for the Mitchell School consists of sheet flow from the parking lots, sidewalks and asphalt play areas into the surrounding area.

It appears that the drainage system is adequate for moving stormwater off the site. However, the existing drainage system does not meet current Massachusetts Department of Environmental Protection (MADEP) Stormwater Standards.

A 2-inch plastic gas service is in Brookline Street and ends near 219 Brookline Street. Further investigation is required to determine if gas service is available to the Mitchell School.

An underground storage tank is located on the west side of the school in the grassed area of the entry drive.

Permitting

Any site work at the Mitchell School would require Planning Board Approvals and Conservation Commission Approval for work in the Conservation Area. All drainage systems would need to be brought up to current MADEP Stormwater Standards. The possibility of ledge may preclude underground infiltration systems.

Recommendations

Short Term Needs

- Determine parking requirements for School and possible parking expansion locations on site;
- Determine efficient site circulation for busses and parent drop off. Include Safe Routes to School program

Long Term Needs

- Provide new drainage structures and pipe including water quality structures, review overall drainage system for the site;

- Continually review circulation plan for busses and parent drop off;
- Provide new sewer and water line connections (more than 50 years old);
- Determine gas service to school and determine if new line is necessary.
- Determine efficient bike storage layout

Mitchell Elementary School

Architectural Assessment

Image 1

The William Mitchell Elementary School is a single story, approximately 49,000 sq. ft. masonry building constructed between 1949 and 1951 with additions in 1958, and 1968. The school is located on two parcels of land totaling 12.5 acres in a single residence (SRB) zoned neighborhood. The main entrance to the school is on Brookline Street with a secondary entrance on Tower Ave on the North side of the school. The Tower Ave entrance provides additional parking as well as carpool pick up and drop off. Only two buses arrive and depart from the school each day, all other students walk or arrive via carpool. Undeveloped land boarders the school on the East side while open playing fields and woodlands are located on the West side of the school. The school serves approximately 477 students in grades K- 5 with an average class size of 20 students.

Exterior

Image 2: Foundation at Kindergarten area of 1958 construction.

Foundation

The original cast in place concrete foundation, which varies in height and accessibility to a basement storage area and mechanical room, is in good condition. Some spalling of the concrete has occurred on the West side where asphalt pavement has been poured up to the concrete wall and aggregate is visible along much of the foundation wall.

Image 3: Cracks in foundation wall

In the 1958 addition the foundation wall is not exposed, the brick as well as the flashing between the brick wall and the concrete foundation (depicted in the construction documents) are below grade or pavement in almost all areas. This condition can trap water and moisture within the wall cavity creating mold, efflorescence, and cracking of the brick wall in the freeze thaw cycle. In the kindergarten area (1958 addition) the foundation wall is exposed, this area shows signs of stress with spalling, horizontal cracking and deterioration of the foundation wall.

The foundation of the 1968 addition is in poor condition in many areas with horizontal cracking at the base of the brick wall and at window and door locations.

Exterior Walls

The exterior brick walls in general are in fair condition with some areas in poor condition. The original structure shows the least deterioration with a small amount of efflorescence and brick decay. Regrouting and repointing is needed in various areas and the expansion joint between the 1958 kindergarten addition and the original building is in need of repair with the appropriate expansion joint materials. The 1958 addition shows some efflorescence and fungal growth in several areas and there are signs of brick movement in some locations (Image 5). There are areas where the bricks have cracked, or have damage that appears to be from an impact load (Image 7 and 8).

Image 5

Deterioration on some of the exterior surfaces was observed in some areas of the 1958 and 1968 additions. Each of these instances appears to be due to water movement either inadequate shedding of water or from leaks through the roof or exterior wall. Further investigation into each area should be pursued and addressed, and the damaged areas repaired to prevent further water ingress.

Image 6

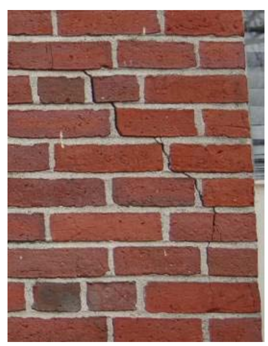


Image 7

Image 8

Windows and Vents

Windows located in the original building are steel sash with hopper style venting at both the top and bottom of the window units. The glazing is single pane non insulated glass and is not energy efficient; this is typical throughout the building. In the 1958 addition the windows are a mix of steel frame and wood frame, both are in need of maintenance and repair. Several of the wood frame windows are located close to grade and show signs of wood rot. The 1968 addition metal frame windows are rusting and allowing water to enter the window frame.

Image 9

Most of the exterior vents are damaged and need of replacement. The condition of these vents not only interferes with the performance of the equipment or spaces requiring venting but also provides a place for birds to nest causing further damage.


Image 10

Window wells on the West side have been filled in with asphalt or concrete with the screen and glazed window left in place. This is an improper method of filling the window well and can lead to additional issues as water and snow seep between the window screen and window frame causing rust and rotting of the existing window frame. Alternative solutions should be reviewed.


Image 11

Doors

Many of the exterior doors throughout the Mitchell School have been replaced with new door(s) and hardware however these new doors have been set into the existing frames that are in poor condition. Some of the remaining existing doors are in fair to poor condition, and should be replaced. The new doors do not fit properly in the old frames, the metal frames are rusting and wood frames are rotting at the base. Many doors do not have the proper weather stripping leaving large gaps for air flow around the doors. Several doors do not latch properly making them unable to be secured and will cause the doors to warp over time. Images below show both a metal door frame and a wood door that have significant deterioration, leaving large gaps.

Image 12


Image 13


Image 14


Image 15


Image 16

Accessible Entrance

The main entrance has a ramp that allows for accessibility for physically disabled persons to enter the building. This ramp is in good condition; however the handrails do not meet the current ADA or MAAB requirements for handrail extensions. At the rear entrance (Tower Ave) a ramp is also provided; however the Tower Ave ramp does not meet ADA or MAAB requirements for accessibility. Handrails are not provided on each side, the ramp is greater than a 1:12 slope, and the deterioration of the concrete surface would impede the use of crutches or walkers and considered is a tripping hazard for the able body persons as well. A non-conforming ramp is also provided on the West side of the building to access the playground from the main building corridor. This ramp is the only entrance / exit to the playground area from the corridor; all other exits to the west side of the building are through classroom spaces or the gymnasium. Per ADA & MAAB handrails must be provided on both sides of a ramp and extend horizontal to the landing for 12" beyond the ramp at both the top and the bottom. The ramp to the Kindergarten rooms is to steep and does not provide handrails, additionally the landing at the top of the ramp is not wide enough for a wheel chair bound person to open the door making this ramp non-conforming as well.

Image 17
Tower Ave Entrance

Image 18: Entrance to Kindergarten Rooms

Image 19
Ramp on West Side of building

Roof

The roof of the original building is a pitched steel frame structure with tongue and groove wood sub structure. Architectural shingle roofing material is used on the sloped sections with asphalt built up roofing in the flat center portion. There is some ponding or standing water at the edges of the flat roof, and areas where the roofing material is showing signs of age and cracking.

Image 20

The 1958 and 1968 buildings have flat built-up roofs with internal drains. Ponding was not visible on these roofs at the time of our visit.

An area of concern is at the entrance / exit to the playground on the west side (Image 23). Water drains from the sloped roof via gutter and downspout, to the lower roof over the entrance. Gutters often fill with leaves and it was reported that water in this area falls onto the exterior landing and seeps back into the building causing pooling and flooding inside the building hallway. The smaller roof overhang at the gymnasium door also had standing water at the time of our visit.

Image 21

One of the moret significant issues at the Mitchell School is the lack of insulation in the attic space of the 1949 building. There was approximately 2” to 3” of fiberglass batt insulation observed directly on top of the plaster ceiling (Image 22). This insulation was inconsistent in many areas due to ductwork, piping, electrical conduit penetrating through the ceiling. It was evident that some of the insulation had been moved, most likely by various workers over the years accessing the space to maintain, repair and upgrade the building systems. The insulation system was inadequate as originally installed and is a difficult system to maintain continuity. Our recommendation is to shift the location of the thermal envelope to the roof level to provide a continuous thermal envelope and insulate the transition from the wall to the roof. This system should still provide for venting of the asphalt shingle roof system.

Image 22

Interior

Floors

The main entrance flooring and the adjacent corridor and classrooms of the 1958 addition has a VCT and AT flooring that is in good condition, the original flooring in this area was asphalt tile (per the construction documents). The VCT flooring varies throughout this area in color and age but appears to be in good condition (Image 23)


Image 23

The boy's restrooms in the 1958 addition has the original mosaic ceramic thin set tile and it appears to be in good condition. In the girls restroom the tile has been replaced with a textured 12 x 12 ceramic tile with light colored grout. This tile and grout although in good condition appear to be difficult to maintain.


Image 24

The corridor of the 1968 addition has a VCT floor which is in good condition, and the restrooms in this area have 1x1 ceramic tile floor in good condition. The library flooring is carpet which is in good condition with the exception of the area in front of the entrance door where the carpet squares are "popping up" and creating a tripping hazard (Image 24).


Image 25

In the main corridor of the original building the flooring is 1x1 ceramic tiles. This flooring is the original flooring and is good condition, although this floor seemed slippery on the two occasions that we visited the site. Classrooms and office spaces in this area have VCT or AT flooring in good condition. The girl's restroom in this area has the original 1x1 ceramic tile floor, and the boy's restroom appears to have an 8x8 quarry tile floor.

Walls

The interior face of exterior walls in general are in good condition with the exception of the areas noted above where mold and dampness were noticeable on the exterior wall and may have caused damage on the interior face of the wall. The most noticeable example of this is in the 1958 storage room addition adjacent to the cafeteria (Image 26). Efflorescence was noticeable on the interior face of the cmu wall and there are cracks in the cmu wall above the window.


Image 26

The interior demising walls of the original structure are 4" steel stud with plaster finish. These walls are in good condition with a few areas that have cracking, pealing or water damage. In the corridors the walls have a ceramic tile wainscot approximately ¾ of the wall. In the 1958 addition the interior walls are structural cmu walls with a glazed finish on the corridor side and painted finish on the interiors of the classrooms. These walls are generally in good condition as well. There are some obvious areas in need of repair as noted in Image 25.

Ceilings

Most ceilings are in good condition although water damage and staining from hvac units was visible in many areas. 2x4 Tectum ceiling tiles were used in most classrooms and corridors and there are a few rooms with 2x4 ACT ceilings. The ceiling grid is some class rooms is in need of repair.

Image 27

Perforated ceiling tiles are installed in a few areas, some of these are badly damaged and falling apart. The tiles shown in Image 28 are located in an area used for tutoring; many of these tiles are broken and sagging. A similar tile (non perforated) exists in the kitchen area. These tiles are not washable and therefor are not the appropriate ceiling for a commercial kitchen.

Image 28

Image 29

Image 30

Doors

Throughout the school the interior doors are solid wood, some doors have visions panels of single pane glazing some of wired glass. Several of the classroom doors have upgraded lever hardware however many doors, classrooms and restrooms included, still have knobs which are not ADA / MAAB approved. Most of the classroom doors were 32" clear opening width which meets accessibility requirements, however many do not have the required clearance adjacent to the door or in front of the door for handicap accessibility.

Image 31

Most interior doors are in good condition but several do not latch properly or are missing closers

Image 32

Built-in Fixtures and Equipment

Mitchell Elementary School has a fully functioning kitchen and serves 5 lunch cycles per day. The kitchen is in the original wing of the school and has not been expanded since its construction. A former chair storage area now has a walk in freezer and a small office and receiving area has been added. The equipment appeared to be in good condition.

Image 33

The cafeteria / auditorium has lunch tables in good condition. This area is also used for music lessons and performances. Chairs are stored in a corner of the cafeteria while some tables and other storage items are located in the stage stairway. An open storage room is used for afterschool materials. A door should be added to this storage area to prevent children from entering, stored items are piled high and should not be accessible to children.

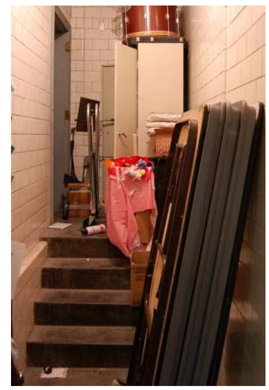


Image 34

Metal lockers exist throughout the school and most are in good condition. There is no dedicated locker room or changing area associated with the gymnasium.

The library is equipped with freestanding wood book shelves as well as a few tables and loose chairs. The library furnishings appear to be in good condition.

Health and Life Safety

Building codes have changed significantly since the original construction and additions to the Mitchell School. There are a number of issues affecting the health, welfare, and safety of students, staff, and visitors that have emerged based on these changes to the building codes and our general understanding and definition of building health and safety.

Image 35

Because the building does not feature automatic sprinklers, storage rooms, boiler rooms and other incidental use area should be separated from the remainder of the building with fire resistant construction to contain fires that start in unintended areas. At the Mitchell School an open stairway that is an emergency exit path is open to the storage room and boiler room below (Image 36), this same stairway is also used as an area for tutoring and small group lunches (Image 37).

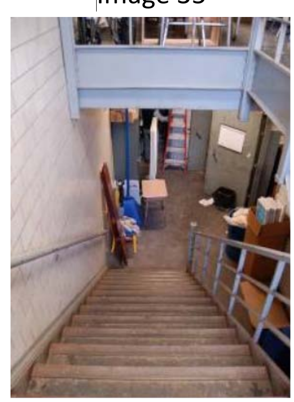


Image 36

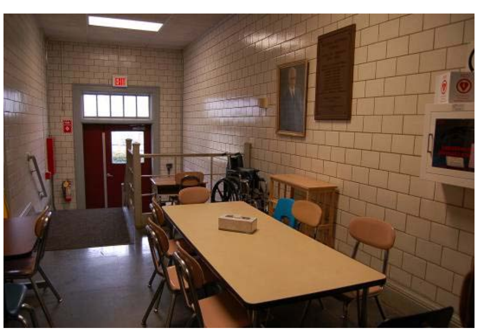


Image 37

Exits and egress paths should be clear of storage, equipment, and protruding objects. During our visits hallways were used for both temporary and permanent storage of equipment and recycle bins, as well as for student tutoring. We also noted a collapsible gate used to close off a portion of the school. This gate should be removed; if securing this area is required doors with emergency egress hardware should be installed to provide continuous access to the emergency exits. Exit signs should be lit and exit doors should not be blocked.

Image 38

Image 39

Image 40

Existing corridors are not adequately separated from adjoining spaces; most classroom doors are not self-closing, and windows to the corridor do not feature required fire ratings. Several corridor and assembly space doors are push-pull with no latch and do not meet the smoke or fire separation requirements of the current code.

Image 41

Stairs are required to have guard rails at 42" high and baluster openings that do not exceed 4". The stairways noted in Images 34 and 36 do not conform to these requirements. Additionally handrails are required to extend beyond the top and bottom risers on both sides of the stairway. Handrails are also required on both sides of the interior ramps.

Image 42

We understand that the termite infestation in the lower kindergarten room was being remediated during the 2011 April vacation week; steps should be taken to prevent the continued entrance of pests into the school.

Handicap Accessibility

As previously noted of the two major entrances only the front entrance has an accessible ramp that meets the current ADA and MAAB accessibility code requirements; however once inside the front door access to other major spaces is limited without traveling a great distance or exiting the building.

A stairway separates the entrance level from the main office so a student, parent, teacher, or visitor confined to a wheel chair would need to travel around the entire school to visit the main office. Once at the main office it would be near impossible to check in with the secretary or visit with the principal due to the lack of clear floor area. Other major areas of the school are inaccessible from within the building as well, these include restrooms, the lower kindergarten, and the gymnasium. There is an interior ramp that provides access from the older wing (at the higher level) and the 1958 and 1968 additions. Although this ramp is at the correct slope handrails are required by ADA / MAAB. Additionally since music class takes place on the stage in the cafeteria accessibility should be provided to this space for physically disabled students.

Signage for the visually impaired is missing throughout the building including at classrooms, restrooms, and major gathering spaces.

Restrooms are missing proper size stalls, grab bars, insulated pipes at the sinks, urinals at the proper height, dispensers at the proper height, entrance and turning circle clearance, pull side clearance at the doors, and the correct door hardware to meet ADA / MAAB requirements.

ADA / MAAB does not allow objects including drinking fountains to extend into the path of travel more than 4”.

Image 43

Image 44

Image 45

Mitchell Elementary School

Structural Assessment

Introduction

The purpose of this report is to describe, in broad terms, the structure of the existing building, to comment on the condition of the existing building and on the feasibility of renovation and expansion of the facility.

Scope

1. Description of the existing structure.
2. Comments on the existing condition.
3. Comments on the feasibility of renovation and expansion.

Basis of the Report

During our April 19th, 2011 walk-through site visit, we did not remove any finishes and took only sample measurements, so, our understanding of the structure is limited to visual observations and the information contained in the available drawings.

The available documents include the original drawings prepared by William G. Upham Architect and Gilbert Small Engineers, Inc. dated October 1949; Additions and Alterations prepared by Rich Tucker Associates, Inc. Architects and Cleverdon Varney & Pike Engineers dated June 1958; Additions and Renovations prepared by Rich Phinney Laing & Cote, Inc. Architects and Albee, Harold & Hirth, Inc. Engineers dated October, 1968 and Interior Masonry Wall Stabilization prepared by Gale Associates , Inc. dated April 2000.

Building Descriptions

Original 1949 Building

The single story building has a crawl space and a lower level at boiler room and storage areas. Foundations are traditional, cast-in-place concrete with interior pilasters on footings and concrete walls at the exterior. The first floor level is cast-in-place flat concrete slab construction supported on the pilasters and on steel concrete encased beams above the occupied lower areas. 8" interior wide flange columns and exterior masonry walls support steel framing at the attic level consisting of wide flange beams and bottom chord of steel trusses. Roof framing has the trusses with 8" and 10" steel purlins. The roof substrate has 1 ½" wood plank spiked to purlins and trusses. There is a slab at the ceiling level (fan room) which has cast-in-place concrete supported on steel beams. Exterior walls appear to be solid brick with steel lintels supporting veneer. There is interior masonry steel stud with plaster.

1958 Additions

This consisted of a single story classroom and connectors to the existing. Foundations are traditional cast-in-place concrete while the first floor has 4” concrete slab-on-grade. The roof framing is supported on steel columns both on the corridor and exterior. 12” girders and 10” deep steel spandrel beams support 14” deep open web steel joists at 2’-6” on center with 2 ½” perlite on steeltex.

The expansion at the playroom has open web 24” long span joists at 6’-0” on center supporting 3” precast concrete roof slabs at the roof level. The exterior walls have curtain wall with masonry to sill level consisting of varying materials, solid brick and concrete breeze block. Cavities vary from 1” to 2”.

1968 Additions

These include a single story classroom and instructional materials center. Foundations are traditional cast-in-place and the first floor is a 4’ concrete slab-on-grade. Steel columns and beams support open web steel joists spaced at 4’-0” on center with a 1 ½” deep steel deck. The roof at the materials center is higher and has 24” deep open web steel joists at 4’-0” on center with a 1 ½” steel deck. Columns are typically 5” wide flange or 4x4 tube sections. Exterior walls are typically CMU backup cavity and veneer brick. Recessed windows at the materials center are framed from vertical precast concrete elements.

Existing Conditions

The original building and additions are in sound structural condition; there is no evidence of any distress or settlement at the foundations. The exterior walls, other than some localized conditions (Refer to Photos 1-3) where brick is spalling and mortar is decaying at joints on the wall at the north end of the original building (Refer to Photo 4) are in reasonable condition.

ROOF LOADING

We have examined the existing roof structures for loading and it would appear that, in most areas, there is capacity for added insulation and, depending on the weight, photo voltaic panels. There are existing drifted snow conditions, but, it would appear that these are close to code requirements. Any additional roof-top equipment would require assessment for potential increase in loading.

PRIMARY STRUCTURAL CODE ISSUES RELATED TO THE EXISTING STRUCTURES

If any repairs, renovations, additions or change of occupancy or use are made to the existing structure, a check for compliance with 780 CMR, Chapter 34 “Existing Structures” (Massachusetts Amendments to The International Existing Building Code 2009) of the Massachusetts Amendments to the International Building Code 2009 (IBC 2009) and reference code “International Existing Building Code 2009” (IEBC 2009) is required. The intent of the IEBC and the related Massachusetts Amendments to IEBC is to provide alternative approaches to alterations, repairs, additions and/or a change of occupancy or use without requiring full compliance with the code requirements for new construction.

The IEBC provides three compliance methods for the repair, alteration, change of use or additions to an existing structure. Compliance is required with only one of the three compliance alternatives. Once the compliance alternative is selected, the project will have to comply with all requirements of that particular method. The requirements from the three compliance alternatives cannot be applied in combination with each other.

The three compliance methods are as follows:

1. Prescription Compliance Method.
2. Work Area Compliance Method.
3. Performance Compliance Method.

Comment

The approach is to evaluate the compliance requirements for each of the three methods and select the method that would yield the most cost effective solution for the structural scope of the project. The selection of the compliance method may have to be re-evaluated after the impact of the selected method is understood and after analyzing the compliance requirements of the other disciplines, Architectural, Mechanical, Fire Protection, Electrical and Plumbing.

Prescriptive Compliance Method

In this method, compliance with Chapter 3 of the IEBC is required. As part of the scope of this report, the extent of the compliance requirements identified are limited to the structural requirements of this chapter.

Additions

Based on the project scope, the following structural issues have to be addressed:

- All additions should comply with the code requirements for new construction in the IBC.
- For additions that are not structurally independent of the existing structure, the existing structure and its addition, acting as a single structure, shall meet the requirements of the code for new construction for resisting lateral loads, except for the existing lateral load carrying structural elements whose demand-capacity ratio is not increased by more than 10 percent, these elements can remain unaltered.
- Any existing gravity, load-carrying structural element for which an addition or its related alterations cause an increase in design gravity load of more than 5 percent shall be strengthened, supplemented or replaced.

Alterations

- Any existing gravity, load-carrying structural element for which an addition or its related alterations cause an increase in design gravity load of more than 5 percent shall be strengthened, supplemented or replaced.
- For alterations that would increase the design lateral loads or cause a structural irregularity or decrease the capacity of any lateral load carrying structural element, the structure of the altered building shall meet the requirements of the code for new construction, except for the existing

lateral load carrying structural elements whose demand-capacity ratio is not increased by more than 10 percent, these elements can remain unaltered.

Work Area Compliance Method

In this method, compliance with Chapter 4 through 12 of the IEBC is required. As part of the scope of this report, the extent of the compliance requirements identified are limited to the structural requirements of these chapters.

In this method, the extent of alterations, additions, change of use, etc., have to be classified into LEVELS OF WORK based on the scope and extent of the alterations to the existing structure. The LEVEL OF WORK can be classified into LEVEL 1, LEVEL 2 or LEVEL 3 Alterations. In addition, there are requirements that have to be satisfied for Change of Occupancy and/or additions to the existing structure.

The extent of the renovations (includes Architectural, FP and MEP renovations) for this project would likely exceed 50 percent of the aggregate area of the building, thus the LEVEL OF WORK for this project will be classified as LEVEL 3 Alterations. This would require compliance with provision of Chapter 6, 7 and 8 of the IEBC. The scope of the project would also likely include new additions to the existing structures, thus, this would trigger compliance with provisions in Chapter 10 of the IEBC.

Level 3 Alterations

- Any existing gravity, load-carrying structural element for which an alteration causes an increase in design gravity load of more than 5 percent shall be strengthened, supplemented or replaced.
- For alterations where more than 30 percent of the total floor area and roof areas of the building or structure have been or proposed to be involved in structural alterations within a 12 month period, the evaluation and analysis shall demonstrate that the altered building complies with the full design wind loads as per the code requirements for new construction and with reduced IBC level seismic forces.
- For alterations where not more than 30 percent of the total floor and roof areas of the building are involved in structural alterations within a 12 month period, the evaluation and analysis shall demonstrate that the altered building or structure complies with the loads at the time of the original construction or the most recent substantial alteration (more than 30 percent of total floor and roof area). If these alterations increase the seismic demand-capacity ratio on any structural element by more than 10 percent, that particular structural element shall comply with reduced IBC level seismic forces.
- For alterations where more than 25 percent of the roof is replaced for buildings assigned to seismic design category B, C, D, E or F, all un-reinforced masonry walls shall be anchored to the roof structure and un-reinforced masonry parapets shall be braced to the roof structure.

Additions

- All additions shall comply with the requirements for the code for new construction in the IBC.

- Any existing gravity, load-carrying structural element for which an addition or its related alterations cause an increase in design gravity load of more than 5 percent shall be strengthened, supplemented or replaced.

- For additions that are not structurally independent of the existing structure, the existing structure and its addition, acting as a single structure, shall meet the requirements of the code for new construction in the IBC for resisting wind loads and IBC Level Seismic Forces (may be lower than loads from code for new construction in the IBC, except for small additions that would not increase the lateral force story shear in any story by more than 10 percent cumulative. In this case, the existing lateral load resisting system can remain unaltered.

Performance Compliance Method

Following the requirements of this method for the alterations and additions may be onerous on the project because this method requires that the altered existing structure and the additions meet the requirements for the code for new construction in the IBC.

PARTICULAR REQUIREMENTS OF COMPLIANCE METHODS

For a full renovation project, in order to meet compliance with one of the two compliance methods "Prescriptive Compliance Method" or the "Work Area Compliance Method", we have to address the following:

Prescriptive Compliance Method

Additions

Any proposed addition will be designed structurally independent of the existing structure, thus, would not impart any additional lateral loads on the existing structure.

Any proposed addition would increase the design gravity load on portions of the existing low roof members and these members would have to be reinforced and this incidental structural alteration of the existing structure would have to be accounted for in the scope of the alterations to the existing school and would trigger requirements for alterations.

Alterations

Alterations that would increase the design gravity loads by more than 5 percent on any structural members would have to be reinforced. In this case, the proposed renovations do not increase the design gravity loads on any existing structural members, thus, this requirement has no impact on the structural scope of the project.

Incidental alterations of the structure may increase the effective seismic weight on the existing structure due to the greater snow loads from the drifted snow against the proposed addition. The increase of the effective seismic weight from the drifted snow would require that the existing lateral load resisting system comply with the requirements of the code for new construction in the IBC and it would increase the demand-capacity ratio on certain structural elements of the existing lateral load resisting system. Experiences over the past winter from heavy snow loading should lead to investigation of conditions at the existing where drifted snow has not been taken into account for earlier additions. Roofs would need to be reinforced as necessary.

Work Area Compliance Method

Level 3 Alterations

If the proposed structural alterations of the existing structure are more than 30 percent of the total floor and roof areas of the existing structure, we would have to demonstrate that the altered structure complies with the wind loads per the International Building Code (IBC). Those structural elements whose seismic demand-capacity ratio is increased by more than 10 percent shall comply with reduced IBC level seismic forces. The percentage increase in seismic demand-capacity ratio on any particular structural element from the added snowdrift load against the proposed addition would be fairly low, thus, this would not have any major impact on the existing lateral load resisting system, though we would have to verify that the increase in seismic demand-capacity ratio on any of those particular structural elements is not greater than 10 percent.

The seismic design category (SDC) of the existing structure is 'B'; thus, the replacement of the existing roof would trigger anchorage of un-reinforced masonry walls to the roof structure and bracing of un-reinforced masonry parapets to the roof structure. All un-reinforced masonry walls in the existing school will have to be identified. These un-reinforced masonry walls are required to be anchored to the roof structure. There do not appear to be any existing un-reinforced masonry parapets, thus, this requirement does not have any impact on the structural scope of the project.

Additions

The proposed additions will be designed structurally independent of the existing structure, thus, would not impart any additional lateral loads on the existing structure.

Comment

The compliance requirements of the two methods, in most respects, are very similar. The Work Area Compliance Method would trigger anchorage of un-reinforced masonry walls, if re-roofing of the existing structure is included as part of the scope for this project. The Prescriptive Compliance Method would require that the existing lateral load resisting system meet the requirements of the code for new construction of the IBC, even for small increases of design lateral loads. Based on this, we would recommend the Work Area Compliance Method for the project.

Summary

Any structurally independent addition shall be designed per the requirements of the code for new construction in the IBC. Following the requirements of the Work Area Compliance Method for the project, any portion of low roofs affected by the greater snow loads against an addition would be required to be reinforced. We will also have to demonstrate that the existing structure complies with the loads applicable at the time of the original construction and any structural element whose seismic demand-capacity ratio is increased by more than 10 percent shall comply with reduced IBC level seismic forces. All un-reinforced masonry walls are required to be anchored to the roof structure if replacement of the roof of the existing school is part of the scope for this project.

FEASIBILITY OF RENOVATION AND EXPANSION OF THE STRUCTURE

The building was not designed for any future stories and, a check on the structure revealed that both foundations and superstructure have no inherent capacity to support any additional loading.

A vertical expansion would require vacating the building, underpinning existing foundations or placing new foundations, erecting a new structural system and installing bracing to resist wind and seismic loads per current Massachusetts State Building Code requirements. The existing roof systems do not have the size or profile to act as future floors. Costs for this type of expansion would be prohibitive, out-weighing the cost of new, isolated construction.

Any proposed additions need to be kept structurally separate from the existing by use of expansion joints.

Based on IEBC (International Existing Building Code) 2009 which as been adopted as the 8th Edition of the Massachusetts State Building Code (Repair, Alteration, Addition and Change of Use of Existing Buildings) any future renovations need to be assessed in relation to the provisions contained in this chapter.

EXECUTIVE SUMMARY & RECOMMENDATIONS

In our opinion, the structure is in sound condition with only minor distress evident at the south wall of the academic wing and other localized areas of exterior brick veneer.

There is no capacity for any vertical additions and any horizontal additions should be kept structurally separate.

Careful consideration should be given to decisions on the interior and exterior masonry walls. Interior masonry will need to be restrained at the floors and roofs, and, our experience has been that when exposed, there is little or no ability to resist small seismic loads and it is more cost effective to replace rather than restrain. In this instance, there are few interior masonry partitions other than at the 1968 addition.

Care should be taken, during any renovation work, to avoid removal of major lateral load resisting elements at the requirements of the 8th Edition of the Massachusetts State Building Code could have a major economic impact on upgrading these or providing new systems.

Photographs

Photo 1: Exterior wall conditions.

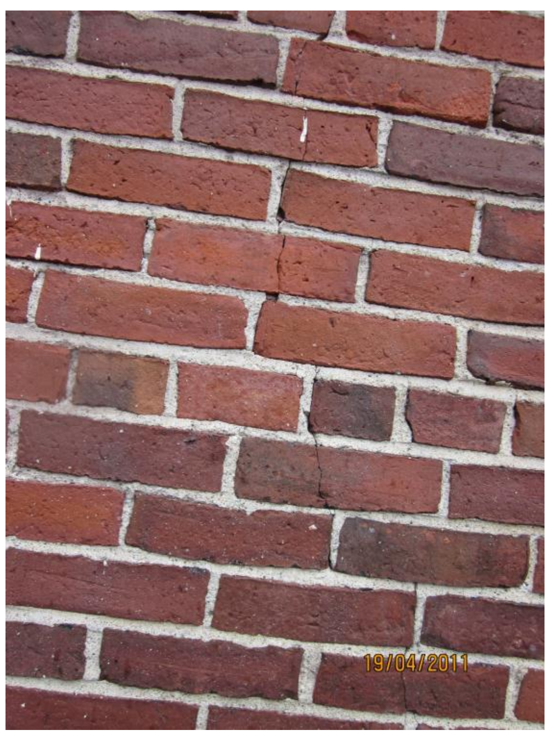


Photo 2: Exterior wall conditions.

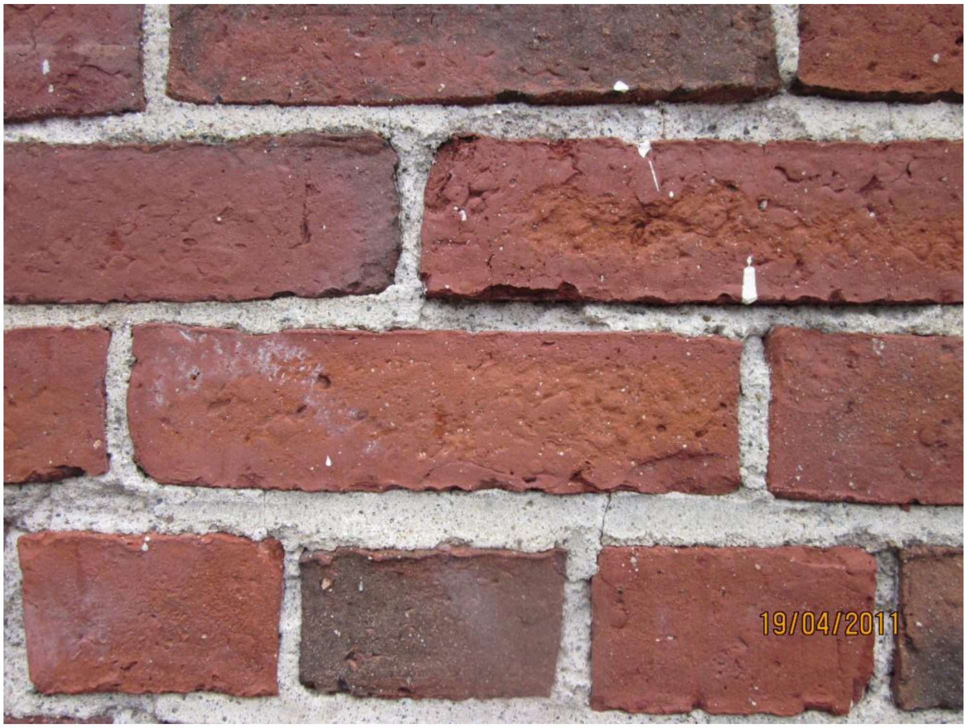


Photo 3: Exterior wall conditions.

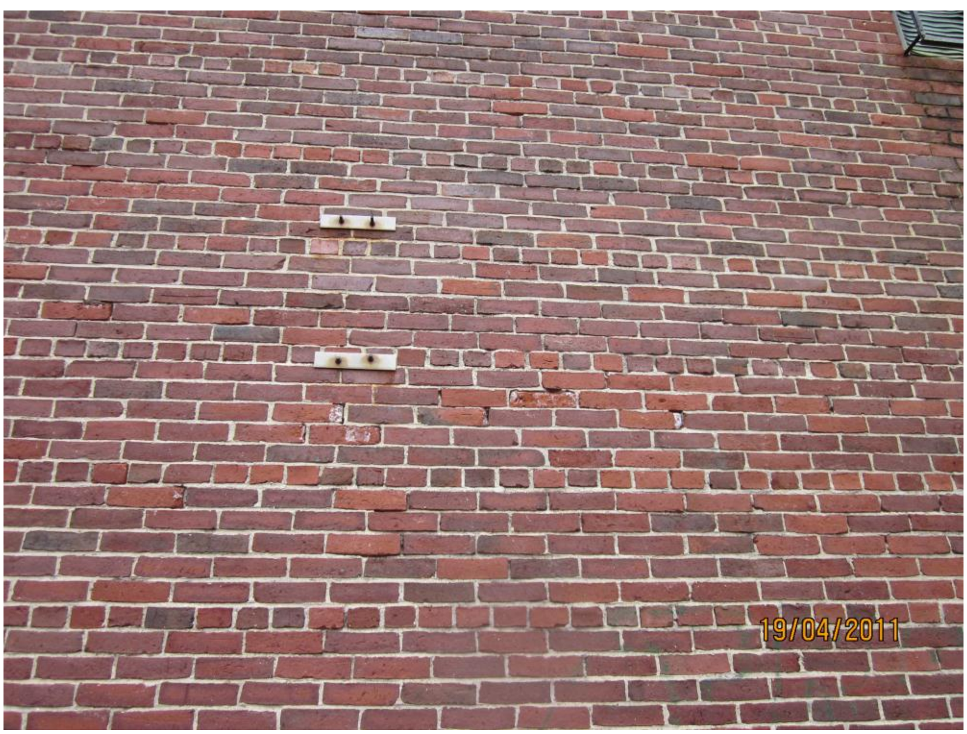


Photo 4: Decaying mortar at joints on north end wall of original building.

Mitchell Elementary School

Heating, Ventilation and Air Conditioning (HVAC)

A. Existing HVAC System Evaluation

1. Main Steam Boilers: The existing building HVAC system consists of two, cast iron, sectional, HB Smith low pressure steam boilers. Both boilers burn #2 fuel oil. Total heating capacity of both boilers is approximately 6,000 lbs/h of steam or 5,700 MBH.

Boiler Room

2. Fuel Oil System: The existing boilers are fed #2 fuel oil from a roughly 20 year old 10,000 gallon underground oil storage tank. Fuel oil enters the boiler room and is distributed to each boiler via three fuel oil pumps. There is an older Veeder-Root tank monitoring system in place. The underground storage tank has reportedly never been tested. While no leak has been detected into or out of the storage tank, it was reported that there have been three fuel oil spills inside the boiler room in the last three years. It has also been reported that NSTAR was considering installing a natural gas main in the area. At a meeting we had with the town of Needham's DPW it was stated that if this occurred, they may consider removing the underground oil storage tanks and convert to 100% natural gas fuel.

Old Veder-Root Tank Monitoring System

3. Cooling: There is no main cooling system in place. Local space cooling is provided by the occasional window air conditioner.

Window Air Conditioner Installed In Operable Window Space

4. Unit Ventilators: Classrooms get their outdoor air and heating from 1970's era floor mount unit ventilators with through-the-wall style outdoor air intakes. The few interior spaces use concealed horizontal type unit ventilators. All unit ventilators were recomissioned two years ago during the building HVAC recomishioning project.

Very Old Classroom unit Ventilator

5. Finned Tube Radiators/Convectors: General heating of many spaces is achieved by the various finned tube radiators and convectors located throughout the building. The majority of the radiators and convectors were installed in the late 1950’s. During an addition which took place in the late 1960’s, a hot water hydronic loop was also added for the new unit ventilators and finned tube radiators. There is no glycol in this hydronic loop.

Typical Convector Recessed In Wall

6. Piping: The Mitchell school contains both steam and hydronic heating piping. The steam piping is from the original building construction in the late 1950’s while the hydronic piping is from the late 1960’s addition. Piping insulation in the boiler room appears to be newer, installed during the recomishioning project which took place 2 years ago.

7. Controls: The school currently uses a Barber Coleman Network 8000 Microzone DDC control system. This system was installed during the recomishioning project 2 years ago and is used to control all unit ventilators, finned tube radiators and air handling units throughout the school.

Barber-Colman Network 8000 DDC control System

8. Ventilation System: Outside air is generally provided by unit ventilators located throughout the school as well as operable windows. It was noted that many operable windows throughout the school have been blocked and/or used as openings for window air conditioners.

B. Assessment

1. Condition:

a. Main Steam Boilers: The two boilers are both in fair condition. One appears to have been installed in 1997 while the other appears to be a decade or so older (there was no age information on the nameplate data).

b. Fuel Oil System: Fuel oil piping and pumps appear to be in poor condition. As stated above, the underground storage tank is roughly 20 years old and the leak detection system is of a similar vintage. The underground storage tank is likely in poor condition.

c. Cooling: The variety of window air conditioners present were in a varying conditions ranging from good to poor with roughly 50% of all classroom window air conditioners in need of being replaced.

d. Unit Ventilators: Given the fact that the majority of the unit ventilators throughout the school were repaired during a recomishioning project two years ago, the general condition of the unit ventilators is considered fair with roughy 25% of all unit ventilators expected to be in need of replacement.

e. Finned Tube Radiators/Convectors: In the original portion of the school, the steam finned tube radiators and convectors are in poor condition. Radiators and convectors served by the newer hot water hydronic loop are in similar condition.

f. Piping: Both the older steam and newer hot water heating piping distribution both appear to be in fair condition. Additionally, it appears as if all of the piping within the boiler room was reinsulated during the recomishioning project two years ago.

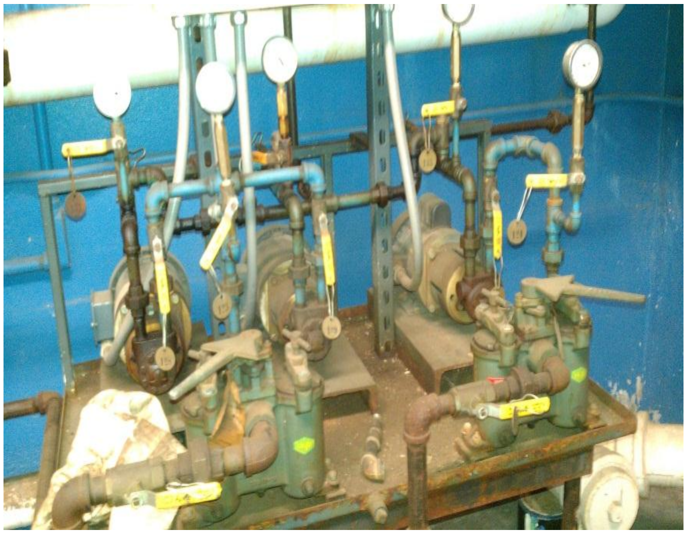
g. Controls: The DDC system was installed two years ago. The controls system has been reported to be in good condition. We observed during our site visit (which occurred during a school vacation week) the boilers ran almost continuously while all fan functions ceased and valves defaulted to full open position – this condition created a hot indoor environment during an unoccupied time period. Time schedule programming should be investigated.

h. Ventilation System: The ventilation system is generally in poor condition. General stuffiness was reported throughout the building and many operable windows were blocked off in order to house air conditioners. While the unit ventilators were recomishoned only two years ago, their ability to bring in the proper quantities of fresh air should be investigated further.

2. Adequacy:

a) Main Steam Boilers: Given the age, condition and capacity of the boilers, with a properly adhered to maintenance schedule, we expect the existing hot water boilers and associated systems should last for the next few years without major issues.

b) Fuel Oil System: The capacity of the fuel oil system appears to be adequate. The condition of the underground storage tank and fuel oil distribution system is questionable and should be replaced with a new tank of equal storage capacity. The leak detection system is also in need of replacement. In general, the entire fuel oil system needs to be replaced. Conversion to natural gas should be seriously considered if gas service becomes available.



Fuel Oil Pumps & Piping

c) Cooling: If cooling is desired in the school, a new centralized cooling system should be considered. Currently, window air conditioners are putting a tremendous strain on the existing electrical system and should be removed entirely.

d) Unit Ventilators: As mentioned, all of the unit ventilators were repaired during the recommissioning project two years ago. We expect the unit ventilators to operate satisfactorily for the next few years, however, an estimated 25% of all unit ventilators are in need of replacement.

e) Finned Tube Radiators/Convectors: All of the finned tube radiators and convectors are old and are in need of replacement.

f) Piping: Both the hydronic and steam piping distribution systems (in the boiler room) appear to be in good condition. New insulation was also observed in this area. Given the age of these systems, it is expected that 50% of the piping and insulation throughout the rest of the building is in marginal condition and should be replaced.

g) Controls: The DDC system was installed two years ago and appears to be functioning properly. Consideration should be given to reducing indoor space temperatures during unoccupied heating mode.

h) Ventilation System: Ventilation is very poor at the school. The existing unit ventilators do not bring in the correct amount of outdoor air and operable windows are blocked in order to install window air conditioners. Though the unit ventilators were recommissioned two years ago, roughly 25% of all unit ventilators require replacement. Window air conditioners should be removed and valuable operable window area should be reclaimed in all areas.

3. Code Compliance:

The general rule when it comes to renovation work is the following: Once work is performed on a non-code compliant system/piece of equipment, that system/piece of equipment must be brought up to current code standards.

a. Main Steam Boilers: The boiler room was observed to get its combustion air and ventilation mechanically from two intake fans with motorized dampers and intake louvers mounted high on the wall combined with a motorized damper for pressure relief. The quantity of outdoor air should be investigated to ensure the proper amount is being supplied to satisfy mechanical codes.

Boiler Room Ventilation/Combustion Air Intake & Exhaust

b. Ventilation System: Stagnant air indicates non code compliant ventilation rates. Boarded up operable windows effectively reduced ventilation rates throughout the building. Operable window areas should be reestablished and all unit ventilators should be rebalanced in order to achieve proper ventilation rates.

4. Cost Effectiveness:

a. Main Steam Boilers: Modern hot water boilers offer a significant advantage over older model boilers with regard to energy efficiency. Replacing older boilers with new condensing type of the same output capacity would increase energy savings. Also, switching the entire school over to a hydronic heating system would be beneficial towards reducing energy use. This would require replacing roughly 75% of the existing piping.

b. Ventilation System: Newer methods of venting spaces, such as energy recovery ventilators, offer greater efficiency over old unit ventilators; reducing costs associated with ventilation. This is achieved by reclaiming energy in exhaust air streams.

c. Controls: Reducing the indoor air temperature during school vacation weeks would provide significant energy savings.

d. The use of window air conditioners is an inefficient method of achieving cooling in a space. Modern centralized split systems offer greater efficiency, save energy and maintenance costs, and reduce demand on the existing electrical system.

C. Recommendations

The following recommendations are prioritized in the indicated categories numbered 1 through 6. These categories are further defined in Appendix __. This building is presumed to be maintained only on a short term basis (about 5 years or less). Therefore, emphasis is placed only on categories 1, 2 and 3. The remaining recommendations in categories 4, 5 and 6 are to illustrate what would be required to upgrade the building systems for a significant extension of the building's future service.

1. Code Compliance
   a. Rebalance all mechanical ventilation systems to ensure all ventilation rates in each space are per latest mechanical code. In areas where natural ventilation is used, ensure adequate quantity of operable window area in each space.

2. Functionality
   a. None.

3. Integrity and Capacity
   a. If natural gas will not be available from the gas utility at any point in the near future, remove, abate & replace existing underground oil storage tank. Replace with new double wall tank (of equal storage capacity) & EPA compliant monitoring system
   b. Replace the estimated 25% of all unit ventialtors which are in need of replacement.
   c. Replace an estimated 50% of all piping distribution & insulation outside of boiler room.

4. Policy mandated Retrofit
   a. Remove all window air conditioning units. If cooling is desired, provide a newer, more energy efficient centralized technology.

5. Lifecycle Renewal
    a. Remove old finned tube radiators & convectors, which are beyond useful life, and replace with new.

6. Lifecycle Efficiency
    a. None.

7. Other
    a. Convert oil fired steam boiler over to high efficiency natural gas fired hot water boilers.
    b. Convert to 100% hydronic heat system, replace steam units with hydronic.
    c. Reprogram DDC system to reduce interior space temperatures during school vacations & off hours.

Electrical

A. Existing Electrical System Evaluation

1. The building is supplied by an underground electric service. In the basement the service is split into a metered 600Amp section and a metered 200Amp and 100Amp section. The building is served at 208Y/120 Volt, 3-phase, 4-wire, and the equipment appears to be the original service switches and panels. All panels are full with no spares or spaces.

Main Service Equipment

2. Life safety and emergency egress lighting is illuminated with emergency battery units.

3. The fire alarm system is a zoned, analog type system manufactured by FCI. This system is in fair condition. The fire alarm control panel is wall-mounted close to the main entrance and also serves as the annunciator. There is an existing fire alarm masterbox and Knox box located on the outside of the building. The system does not have any smoke detection, only heat detectors.

Main Fire Alarm Control Panel

4. The building has the following fire alarm components:

- Outside Beacon and Knox Box
- Pull Stations
- Heat Detectors
- Horn / Strobes

Fire Alarm Masterbox

Heat Detector

5. There is a public address system distributing announcements through-out the building. The system appears to be functioning properly. The public address system operates through the telephones as does the bell system.

6. A clock system is in place and it is reported that approximately 90% of the clocks operate properly.

7. The lighting in some classrooms consists of 1’ x 4’, surface mounted, wrap-around lens type arranged in continuous rows. The fixtures are in good condition and have a 2-lamp cross-section. Lighting in the office area, other classrooms and corridors consists of recessed flat prismatic lens type type fluorescent fixtures. In the corridors the fixtures are 2-lamp and in the offices and classrooms they are 4-lamp. Lighting in the gym consists of industrial high bay fluorescent, pendant mounted fixtures. Lighting in the cafeteria consists of industrial high bay fluorescent, surface mounted fixtures.

Classroom Fluorescent Fixtures

Classroom and Office fixture

Gym Fixture

Cafeteria Fixture

8. Emergency battery wall units and LED exit signs with integral batteries are located throughout.

Typical Egress Lighting and Exit Signs

9. Technology distribution is minimal compared to modern classrooms. The existing technology in the building appears to be outdated and upgrading the existing is questionable.

10. Receptacle quantities are not adequate for this application as evidenced by the quantity of extension cords and power strips in the classrooms.

Photo 9: Typical Technology Receptacle

B. Assessment

1. Condition

a. The electrical panelboards and main service have reached the end of their service life. The circuit breakers in the panels are obsolete and unavailable making maintenance an impossibility. The service distribution equipment cannot be upgraded and is in bad condition. The building panels do not have any spare capacity.

b. The fire alarm system appears to be in good operating condition. The existing fire alarm devices appear to be in good condition. The system is expected to be expandable to meet the needs of additional devices.

c. The public address and bell system are adequate for the existing facility.

d. The clock system is adequate for this facility.

e. The lighting is functional and in fair condition. Some of the emergency battery wall units may need replacement as they are nearing the end of their useful life. A number of surface mounted wraparounds have lenses that no longer attach to the body properly.

f. The auditorium sound system is a typical system for this type and age of building. The system appears to be functional for basic public address requirements.

2. Adequacy

a. The existing incoming electrical service is not adequate to support the needs of this facility.

b. The existing fire alarm system is in good condition and with regular maintenance will provide protection for the facility. Since the fire alarm control panel is an analog unit expansion is highly problematic.

c. There are reports that the public address system does not cover the entire facility.

d. The existing lighting through-out the building is adequate for the applications in classroom and office areas.

e. The auditorium sound system was not tested.

3. Code Compliance

    a. Emergency lighting throughout the facility was adequate in the areas visited.

    b. Exit signage was acceptable.

    c. Current energy codes require additional lighting controls and place watts per square foot limits on installed lighting.

    d. The fire alarm system appears to have adequate coverage for both the audible and visual signaling elements.

4. Cost Effectiveness

    a. The fluorescent lighting and switching is adequate for the near future. A retrofit would be appropriate if the school will be in service longer than a few years.

C. Recommendations

1. Code Compliance

    a. Not applicable

2. Functionality

    a. Not applicable

3. Integrity and Capacity

    a. Provide a new electric service. This new service would be large enough to support a technology upgrade and distribute power through-out the school to support present day needs.

    b. Provide additional receptacles in classrooms, requires a service upgrade.

    c. Based on the amount of time that this school is to be in service, we would not recommend expansion of existing capacity of the public address system or repair of the clock system.

4. Policy Mandated Retrofit

    a. Not applicable

5. Lifecycle Renewal

    a. Not applicable

6. Lifecycle Efficiency

a. Upgrade the school lighting system.

Plumbing

A. Existing Plumbing System Evaluation

1. Domestic Water Service

A four inch water service from Brookline Street enters the boiler room of the 1949 wing and appears to be original to the building's construction. The service stubs through the foundation wall overhead and has a flanged non-rising stem main shut-off valve.

Water Service Entry

2. Natural Gas Service

This building does not have a natural gas service.

3. Domestic Water Distribution

The domestic water service continues from the water service entry at the foundation wall to an interior 2 inch turbine water meter located in the boiler room. The distribution of cold water continues to the building fixtures. Original pipe material appears to be threaded red brass. More recent alterations are soldered copper tube and fittings. A cold water supply feeds the domestic water heater. Hot water is circulated throughout the building by means of a circulator located adjacent to the water heater and is controlled by an in-line aqua-stat switch. Domestic water connections to equipment appear to be made with approved backflow prevention devices.

4. Domestic Water Heater

Domestic hot water is generated with an oil-fired storage water heater located in the boiler room. It is a vertical 84 gallon storage tank with insulation and jacket and front mounted 315 MBH burner assembly capable of a recovery capacity of about 264 gallons per hour based on nameplate data. It stores water at 120 degrees. The kitchen dishwasher has a local electric hot water booster.

Domestic Water Heater

5. Sanitary Waste and Vent

The pipe materials appear to be cast iron with lead and oakum joints with some minor repairs made with no-hub jointed cast iron. With the exception of the boiler room drains, the entire facility appears to drain by gravity to the site sewer system. The boiler room is provided with a sump pump to lift waste to the sewer.

Boiler Room Sump Pump

6. Roof Drainage

The original 1949 building has a pitched hip roof with eave gutters and exterior sheetmetal downspouts connecting to cast iron boots at the foundation wall that collect to an interior cast iron storm drainage system that exits the building from the boiler room. The 1958 and 1968 additions are flat roof construction with interior roof drainage that is mainly concealed in walls or chases.

7. Plumbing Fixtures

The plumbing fixtures in this facility consist mainly of floor mounted water closets and wall hung urinals with flushometer valves. The lavatory sinks are wall mounted. The majority of lavatory faucets are manual single operator metering type. A small complement of faucets are two lever. Janitor sinks appear to be trap-standard design or mop basins and have installed atmospheric vacuum breakers on the faucets. Drinking fountains are a combination of different styles.

Basement Plumbing Fixtures

8. Classroom Plumbing Fixtures

Classrooms are typically equipped with stainless steel counter mounted sinks and bubblers. Some classrooms have wall mounted vitreous china sinks for wash-up.

B. Assessment

1. Condition

a. Domestic Water Service

An external assessment of the water service does not indicate any obvious problems with condition or corrosion. However, the water service is estimated to be over 50 years old and is beyond its useful life expectancy. In addition, given the age of the service, the interior of the pipe is most likely constricted by mineral build up (scaling or tuburculation) or accumulation of sediment.

b. Domestic Water Distribution

The domestic water system is estimated to be 40 to 60 years old with the exception of minor repairs to branch piping and is beyond its expected useful life.

c. Domestic Water Heater

The domestic water heater and circulation pump was installed in 1999 or 2000 and is about 11 years old. The exterior jacket appears to be in reasonably good condition. Water heaters of this type are at about 83% thermal efficiency. Warranty period for the burner is typically 5 years and the tank warranty is usually 15 years. Therefore, the water heater is considered to be nearly aged beyond its expected useful life.

d. Sanitary Waste and Vent

The sanitary waste and vent system appears to be largely original to the construction of the respective wings placing it from 40 to 60 years old.

e. Roof Drainage

The storm drainage piping age ranges from 40 to 60 years old.

f. Plumbing Fixtures

The plumbing fixtures in this facility are 40 to 60 years old although some fixtures have been replaced in intervening years. Although they are functional, all fixtures should be updated to take advantage of water use reduction of low-consumption fixtures.

g. Classroom Plumbing Fixtures

The classroom sinks and outlets are in fair to poor condition.

2. Adequacy

a. Domestic Water Service

The domestic water service has no obvious signs of deterioration, but the age of the piping makes the necessity of replacement of this water service highly likely.

b. Domestic Water Distribution

The entire building's water distribution system is aged beyond the expected useful life for copper piping.

c. Domestic Water Heater

The domestic water heater appears to be functional but is approaching its expected useful life. Any future repairs are not covered by manufacturer warrantee and cost of repair and operation is expected to increase over time. Also, although not critical, a duplex arrangement of water heaters is recommended to allow one unit to be taken off line for maintenance or repair without disrupting domestic hot water to the facility.

d. Sanitary Waste and Vent

With the exception of minor sections of piping that may be corroded, the existing sanitary waste and vent piping appears adequate for further service.

e. Roof Drainage

With the exception of minor sections of piping that may be corroded, the existing roof drainage piping appears adequate for further service.

f. Plumbing Fixtures

The life expectancy of vitreous china fixtures, faucets and flush valves is typically about 20 to 25 years. For a renovation expected to extend the use of this facility for another decade, the replacement of all fixtures in the building is recommended.

g. Classroom Plumbing Fixtures

The existing classroom fixtures are not adequate for any future comprehensive upgrades.

3. Code Compliance

There is a lack of containment for fuel oil in the boiler room.

There are no other obvious code discrepancies with the observed plumbing systems.

C. Recommendations

The following recommendations are prioritized in the indicated categories numbered 1 through 6. These categories are further defined in Appendix __. This building is presumed to be maintained only on a short term basis (about 5 years or less). Therefore, emphasis is placed only on categories 1, 2 and 3. The remaining recommendations in categories 4, 5 and 6 are to illustrate what would be required to upgrade the building systems for a significant extension of the building's future service.

1. Code Compliance
    a. Install oil detection interlock to boiler room sump pump with level alarm to contain a fuel oil spill event.

2. Functionality
    a. None.

3. Integrity and Capacity
    a. None.

4. Policy Mandated Retrofit

    a. Re-pipe the kitchen waste system and provide a new grease interceptor to comply with the current edition of the plumbing code, 248 CMR Chapter 10, Section 10.09.
    b. Replace water closets, urinals, lavatories, janitor sinks and sinks with newer and more water efficient models.
    c. Replace all classroom sinks with new fixtures. Provide atmospheric vacuum breakers on all faucets. Any further program requirements including air, gas, etc. should be evaluated to meet the needs for future upgrades.

5. Lifecycle Renewal
    a. Replace water service due to expended useful life.
    b. Replace domestic water distribution due to expended useful life.
    c. Replace natural gas service due to expended useful life.
    d. Replace domestic water heater due to expended useful life.
    e. Replace all classroom fixtures.

6. Lifecycle Efficiency
    a. None.

7. Other
    a. Maintain existing sanitary waste and vent piping. Modify as needed to accommodate plumbing fixture upgrades.
    b. Maintain existing roof drainage.

Fire Protection

A. Existing Fire Protection System Evaluation

This facility is not equipped with an automatic sprinkler system.

B. Assessment

1. Condition

Not applicable.

2. Adequacy

Not applicable.

3. Code Compliance

State law does not compel the retrofit of unsprinklered buildings unless some triggering event occurs. Triggering events are either the addition of the building footprint that increases the aggregate gross square footage beyond 7,500 square feet or if a “major” alteration or modification is planned.

C. Recommendations

Based on the fact that this building is in a condition that would require major upgrades to extend its useful life, this building will likely be required to be fully sprinklered. However, the responsibility for the application of State laws and codes in the retrofit of sprinkler systems is generally the responsibility of the local fire department. The following is a Code summary and interpretation supporting the retrofit recommendation if the building is to be significantly upgraded for future service.

Applicable Codes and Regulations

780 CMR, Eighth Edition

Chapter 9, Fire Protection Systems, Table 903.2: Buildings of Use Group E greater than 12,000 square feet shall be provided with a complete automatic sprinkler system designed and installed in accordance with NFPA 13. This requirement negates alternatives or exceptions allowed under Section 901.2 where a partial system may be installed or alternative means of compliance may be considered.

Chapter 34, Existing Structures (International Existing Building Code 2009), Section 102.2.1.1: When existing buildings or portions thereof undergo additions or alterations, M.G.L. c. 148, § 26G may apply with respect to automatic sprinkler requirements. Requirements of this statute are enforced by the fire official.

M.G.L. c. 148 § 26G: Every building or structure, including any additions or major alterations thereto, which totals, in the aggregate, more than 7,500 gross square feet in floor area shall be protected throughout with an adequate system of automatic sprinklers in accordance with the provisions of the state building code.

An advisory memorandum issued by the State Automatic Sprinkler Appeals Board dated October 14, 2009 further clarifies that M.G.L. c. 148 § 26G applies when certain triggering events occur, one of which is when “major alterations or modifications are planned for an existing building.” According to this memorandum, existing case law has found that a sprinkler system will be required if the “extra cost of installing sprinklers would be moderate in comparison to the total cost of the work contemplated.” Also, the triggering factor seems to be based on a philosophy that if the walls and ceilings are to be opened and replaced as a part of renovations, a required sprinkler system should be installed at that time. In addition, the removal or relocation or upgrade to a significant portion of the building’s HVAC, plumbing or electrical systems involving the access or penetration of walls, floors or ceilings may be deemed to be of such cost that a sprinkler system would be a “moderate” added cost. Finally, this memorandum indicates that alterations would be considered “major” if the scope affects 33% or more of the total gross square footage or the costs not including sprinkler installation are estimated to be 33% or more than the assessed value of the building. With the exception of the cost of the sprinkler system itself, this rule of thumb does not exclude any other costs associated with the modifications.