Hillside Elementary School

Civil Assessment

Nitsch Engineering has performed research of the existing site conditions for the Hillside School at 28 Glen Gary Road 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 included anticipated site permitting requirements for the Hillside 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 about the Hillside School site.

Nitsch Engineering's observations and findings are summarized below.

Exterior

Existing Site Conditions:

The Hillside School is in a residential area located near the intersection of Glen Gary Road and Castle Place. The parking lot and bus/parent drop off is south of the school building. Residential development is to the south and east of the school. There is a large wetland/marsh meadow and Rosemary Brook within the wetland west of the site which prohibits any potential expansion.

An asphalt play surface and grass play-field are directly west of the school building. There is a baseball field on the northern edge of the school site. Additional play structures are located to the east of the school between the building and the wooded hill.

Parking and Access

There are approximately 50 striped parking spaces (including 2 handicapped parking spaces and 4 visitor spaces) at the Hillside School with additional parallel parking along the outer curb of the parking lot. Bus and parent drop off is split at the entrance to the school. Busses drop off to the right and parents drop off to the left. Parents pass through the school parking lot to the left and circle back onto Glen Gary Road. There are sidewalks available from the residential area to the school.

A ramp for accessible access to the building entrance is provided along with adequate drop off area and sidewalk ramp access.

Parking is inadequate for the site and there is no room for parking lot expansion due to the extensive wetland adjacent to the parking lot and play area north of the existing parking lot. The parking lot asphalt and curbing is in good condition and the striping application appears to be new.
Parking in the residential area is discouraged.

Utilities

The Hillside school is serviced by municipal sewer and water service.

The main water service starts as a four inch line at the building and becomes an eight (8) inch line that leaves the site and goes into Glen Gary Road. There is a six (6) inch fire protection line off the 8-inch main that feeds a fire hydrant. Another fire protection line (size unknown) feeds the hydrant at the front of the school. It appears from the Town water records that the six and four inch water lines may be cast iron and the 8-inch line is asbestos concrete.

There are two sewer connections that extend from the west side of the school that connect into the sewer line in the 20-foot easement that passes to the west of the school. The size and material of the sewer lines is unknown.

A 20-foot wide sewer interceptor easement runs on the west side of the school under the play area generally in a north-south direction. The sewer easement then angles to the south toward Rosemary Brook. Another 20-foot wide sewer extends west from Glen Gary Road and meets the main sewer easement as it angles toward Rosemary Brook and eventually the sewer pumping station on West Street.

There are two catch basins and a drain man hole on Glen Gary Road that lead to the sewer easement off Glen Gary Road. The 12-inch drain line then discharges stormwater into the adjacent wetland.

There is one double catch basin in the parking lot near the wetland that discharges stormwater in a concrete pipe less than 100 feet into the wetland. There were no water quality structures or other drainage structures noted in the parking lot. No other catch basins were noted in the play areas.

A 12-inch drainage outfall is located to the north of the school building which discharges into the wetland. This drainage system appears to capture the roof runoff of the modular units north of the main school building.

All other roof runoff appears to drain at grade and sheet flow off the hard surface play area toward the wetland.

All drainage outfalls pipes are silted over to some degree.

There are two monitoring wells located on the edge of the grass play field adjacent to the wetland.

School officials noted that the utility tunnel under the Hillside School had an unspecified chemical leak. The soil was remediated at the spill site and that monitoring of the area occurs about once per week. Also, the tunnel floods occasionally and needs to be pumped out.

Gas service is available on Glen Gary Road and is presumed to be used at the school. Additional information from the gas service provider is required.

Permitting

Any site work at the Hillside School would require Planning Board Approvals and Conservation Commission Approval for work in the buffer zone and possible Riverfront Area. All drainage systems would need to be brought up to current MADEP Stormwater Standards. A high groundwater table may preclude underground infiltration systems.

Additional permitting with the State may be required for work performed to alleviate the tunnel flooding under the school.

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

Hillside Elementary School

Architectural Assessment

Image 1

The Hillside school is a two story masonry building constructed in 1961 with an addition in 1968. A modular addition was added in 1996. The building is aligned slightly west of a north south axis. The main entrance and only vehicle entrance is from Glen Gary Road. The building is surrounded by trees and a sloping ridge to the east and open grass athletic fields to the west. The west side of the building also has a paved play area that is used for overflow parking. The entry and gymnasium side wall face south and have good solar exposure. The 47,000 sf school currently serves 435 students in grades K-5.

Image 2

Exterior

Foundation System

Building foundations under the original building are uninsulated, cast-in-place concrete and lose substantial heat to the ground. The requirement for a vapor barrier under concrete slabs was not introduced into model codes until much later so it is likely that moisture is moving freely between the ground and interior. Limited concrete spalling is occuring in places on the 1968 addition and some steel embedments can be seen exposed to the outside (see Image 4).

Image 3

The original building and the 1968 addition have a system of underground pipe trenches, commonly referred to as “tunnels”, that frequently fill up with water. Ground water detection systems are installed in the building to notify the maintenance staff when the water rises to a level that requires emergency pumping. The continued flooding has caused significant deterioration to the underside of the floor structure (see Image 18). According to the original drawings, a typical pipe trench in the 1959 building

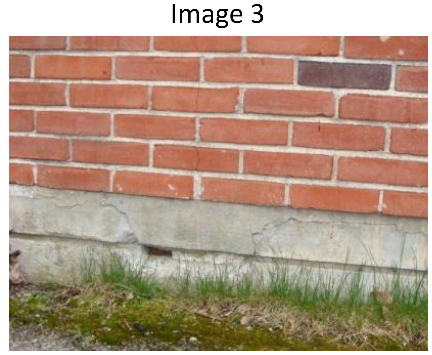

Image 4

measures 5'-0"wide, only 3'-11" tall and over 300' long. This space constriction poses significant problems when considering maintenance, repair or upgrades.

The Modular building is up on peirs with a pumped concrete ground cap.

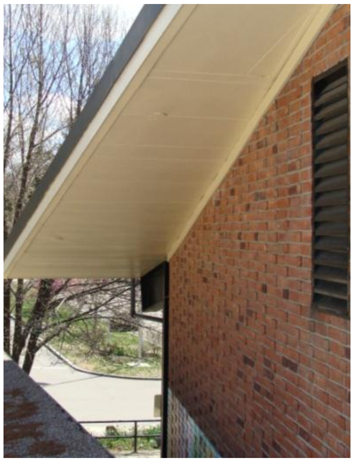

Image 5

Walls

The brick veneer part of the wall system around the 1959 building, while not constructed or detailed as it would be today, it is visually in satisfactory condition. Many of the walls have intricate brick design details known as corbelling that add visual interest and texture. As indicated in the existing drawings, the brick walls in the original building are constructed of two layers of 4" brick separated by an air space that drains out the bottom of wall by way of thru wall flashing and weep holes. These walls are without any insulation.

Image 6

Brick veneer is also the primary wall component of the 1969 addition. Exterior walls are constructed of 4" concrete block inside and 4" brick veneer outside separated by 1" of insulation and an air space. Water staining can be seen in the wall on the east side.

The modular building exterior walls are finished with a composite paper sheathing painted gray. The sheathing is severely water damaged in several places where it comes in contact with ground water (see Image 7).

Image 8

Image 9

Image 7

Windows and Vents

The original building and the 1968 addition still have single pane glass set in metal frame and some have metal panels in the frames lower to the ground. The window frames around the stair between the cafeteria and gymnasium are rusting out at the bottoms. Many of the original windows on the original construction and 1968 addition have been replaced with translucent acrylic panels bearing a yellow cast. Building overheating is apparent by the presence of thru-wall air conditioning units added to most rooms. These units are traditionally not well sealed and allow for the free passage of air.

Exterior wall louvers bring unconditioned outside air into each room through the unit ventilators. Powered thru-wall vents have also been added to the east side of the building.

Doors

The original doors have been replaced with bright red doors finished with flush aluminum pulls, metal panel faces and full or partial, single pane vision panels on most. Weather stripping is generally in good condition.

These doors appear to be insulated and are suitable for continued use.

Image 10

Image 11

Image 12

Recommendation

- Building maintenance staff should be made aware of clear floor area requirements around doors and assist in the immediate relocation of items currently being stored within those areas.

Image 14

Accessible Entrance and Exiting

Image 15

The front entry of the school has a handicap accessible ramp in good condition. It is missing edge protection and its dimensions would not meet current code but it is a way for a disabled person to get into the second floor of the school. Railings at the front stairs to the main entrance do not have proper extensions projecting beyond the first stair and would not meet current code. Handicapped access to the first floor is either thru the cafeteria or by way of a wooden ramp at modular buildings. There is no way for a disabled person move from floor to floor within the building.

Image16

Classrooms on the first floor have exit doors to the outside. The doors to the east side of the kindergarten are free of steps which allows for disabled persons to safely exit the building in the event of an emergency. The remaining exits from classrooms and the library have steps and would not allow for a disabled person to safely exit.

Image 17

Recommendation

- Provide acessable path and ramp to library so disabled persons could use that space.
- Provide access to the library.
- Provide edge protection on ramp at main entrance.

Roof

The main part of school has had a new roof (image 18) put on in 2003 consisting of gravel surfaced built up roof system set in hot asphalt, with insulation levels varying from 1-3". The modular buildings have a single ply membrane roof (Image 24) with 1-3" of insulation. The entire roof would require approximately 3" of additional insulation to meet current energy code. Built up roofs of this type usually last approximately 15 to 20 years before a re-roof is required. The Roof overhang on the west side of the 1968 building has areas of significant concrete spalling and exposed rebar (see Image-19).

Image 18

Interior

Image 19

Floors

The school has primarily Vinyl Composite Tile (VCT) in the halls and classrooms which is generally in good condition and well maintained. The design pattern of the front entry is not particularly attractive but is fit for continued use. The carpet in the library is low pile and in fair condition. Bathroom floors are finished with tile and are generally in good condition. Utility spaces are unfinished concrete and are in good condition. The gymnasium floor is hard wood and there is large crack that has developed near the north wall due to movement in the structure.

Image 20

The condition of the first floor structure is of concern due to continued flooding and moisture in the tunnel area, see Image 20 which shows the rusting of structural steel members located in the tunnel.

Walls

Image 21

The walls in the 1968 wing are concrete block and not very aesthetically appealing. There is cracking over most conditions where the roof cantilevers over the first floor on the west side of the building. Because they are only lightly insulated, it would be cold and uncomfortable to sit near one of these walls in the winter. If you are in close proximity to a unit ventilator heator, you are probably too warm. This uneven heat distribution is typical of buildings of this age.

Many of the walls in the original 1959 construction are finished with a pleasing mix of exposed brick and glazed ceramic block. The condition of these walls is good and fit for continued use.

Image 22

Ceilings

Ceiling in the original 1959 portion of the building are perforated metal panels with flush mounted fluorescent lights.   The 1968 addition has precast concrete plank ceilings (Image 24) and some ACT tile as well.

Image 23

Image 24

Doors

The condition of the doors is generally good and typically operate well. Analyzing interior doors is particularly complex because they interconnect with many other aspects of a building's safety system. As is typical of buildings of this time, these doors could not have been designed to meet codes that did not yet exist at the time, but we can still gain a better understanding of the building as a whole through their analysis. From a handicapped accessibility point of view, many of the doors in the school lack both the size, clear floor area and proper hardware to meet current code. In some situations, simply reversing the door swings could greatly improve the ability for a disabled person to use a particular bathroom even if it is not fully code compliant. None of the doors in the school are fire rated, as would be required now, but neither are the walls they occupy. Doors in the hallway are too small to meet current egress code and at times swing in the opposite direction of the path of egress. Double doors should latch shut and most of the doors lack proper handles or panic hardware to meet accessibility code. Revising existing doors to meet both fire and accessibility code would be cost prohibitive.

Recommendation

- Building maintenance staff should be made aware of clear floor area requirements around doors and assist in the immediate relocation of items currently being stored within those areas.

Space Utilization

There is a definite lack of storage in the school which is made obvious by frequent use of hallways and other egress areas for teaching space and storage purposes. Combustible materials should not be stored in the direct path to an exit.

There is a significant lack of administrative space as much of the entry lobby and corridor area is occupied by administrative staff, copiers, paper, and special education tutoring. This is a significantly pressing issue with the building as it has an impact on the path of egress.

Built-Ins/Equipment and Furnishings

Existing cabinets are generally in good to fair to good condition (see Image 25). Lockers are generally in good condition and fit for continued use. There is a lack of handicapped accessible lockers.

Image-25

Health and Life Safety

The chemical monitoring system report is ongoing and a report dated 3-8-2011 and is on file with the town.

The railings around the cafeteria stair, library stair and hallway stair are too low to meet current codes for fall protection. Other concerns with the stairs include openings in railings being too large, insufficient stair egress width, non-rated wall assemblies, lack of closers on doors or doors being blocked open. Some of these issues are "grandfathered" and do not technically need to be addressed unless triggered by a renovation or addition project but realistically should be considered and evaluated as part of long-term planning.

Recommendation

- Remove all items currently being stored at the bottom of the cafeteria stair as they are tripping hazard on the stair as well as a fire hazard.
- Building maintenance staff should be made aware of clear floor area requirements in front of electrical panels and assist in the immediate relocation of items currently being stored within those areas.
- Remove all combustible materials from paths of egress including bulk paper and school supplies.
- Add appropriate height guard rails to existing stairs and limit the clear opening between railings to 4".
- Inspect and organize electrical and communications wiring in kindergarten rooms.
- Inspect and replace sconce lights in kindergarten rooms.

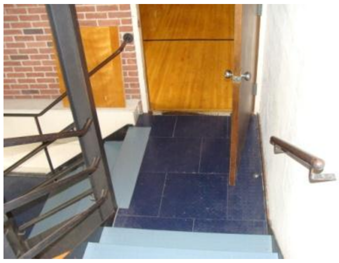

Image 26

Image 27

Image 28

Handicap Accessibility

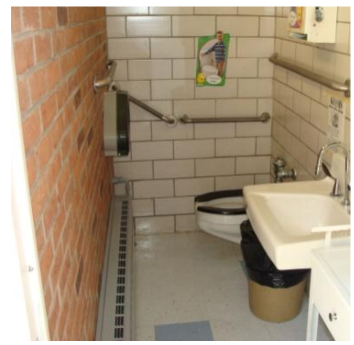

Image 29

Hillside School has many physical barriers that would limit a disabled student or staff from functioning comfortably within the building. There have been numerous, positive alterations made to the school to improve the *degree* of accessibility such as resurfacing the ramp on the first floor, adding grab bars and reversing the door swings to better accommodate disabled persons. Improvements like these are necessary in any building built before 1990 when the Americans with Disabilities act was passed into law.

Image 30

The most serious issue is the inability for someone to access all parts of the building. It appears that the only fully accessible bathroom is in the modular building wing on the first floor and there is no way to get from the second floor to the first within the building. Many of the bathrooms, like the one shown in Image 29, are severely undersized. The Library is not accessible from either floor or outside.

Recommendation

- Modify bathrooms on second floor to improve handicapped accessibility.
- See also recommendations listed under Accessible Entrance section of this report.

Hillside 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

The available documents include the original drawings prepared by TAC Architects and Morengroth & Associates Engineers dated August 1959, and the Renovation and Additions drawings prepared by TAC Architects dated October 1968.

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.

Building Description

The building is located on Glen Gary Street in Needham, Massachusetts

Original 1959 Building

With the site sloped east to west, there is a two story wing on the west side and at ancillary areas. The cafeteria is located below the multi-purpose room. There is a single story classroom area on the east side. Foundations are traditional cast-in-place concrete footings. The slab at the low level is cast-in-place concrete on grade. The upper floor framing has long span steel deck with concrete fill supported on steel beams and columns. The roof framing has steel bents over the multi-purpose room and steel beams at the classroom wing again supporting deep long span steel deck. There are locations where horizontal frames are described as bracing at both areas.

The exterior steel framing is generally exposed and roof beams cantilever to form roof overhang. The slab-on-grade is typically cantilevered out beyond the curtainwall at the classrooms. 4” masonry walls are present at classroom partitions and at corridor walls. There are trenches around the perimeter of the inside of the building for mechanical services

1968 Additions

The part two story and single story classroom addition has traditional cast-in-place foundations and retaining walls. The lower level slab is cast-in-place concrete-on-grade with mechanical trenches around the perimeter at the inside. The upper slab has cast-in-place concrete on grade at the single story and 8" precast pre-stressed concrete plank with 2" topping supported on steel columns and beams on the exterior and masonry bearing walls and steel lintels on each side of the corridor.

The roof has 8" precast pre-stressed plank with concrete topping supported on steel columns and beams at the exterior and masonry walls and steel lintels at the corridor.

Existing Conditions

There are no obvious signs of any settlement or distress to the foundations other than some localized cracking at the cantilevered slabs on grade at the exterior (Refer to Photos 1 – 2). The exterior exposed steel shows no signs of corrosion and internally the exposed structure both floors and roof substrate are in sound 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 and these would need to be carefully assessed, especially based on events this past winter. 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 8^{th} 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.

RECOMMENDATIONS

In our opinion, the structures for both original building and addition are in sound condition other than some minor shrinkage cracking at exterior slabs

As noted, there is no capacity for any vertical additions and any horizontal additions should be kept structurally separate.

The slenderness of the interior masonry walls should be considered during any renovation project as restraint (required per IEBC) can be both unknown and onerous. The perimeter trenching while structurally stable should be considered as there are usually air quality issues.

We understand that ground water problems have been encountered in the past; however, other than the impact it may have had on the trenching, (rusting of the structural members as shown in image 20) no other structural concerns relating to such are apparent.

Photographs

Photo 1: localized cracking at exterior cantilevered slabs on grade.

Photo 2: localized cracking at exterior cantilevered slabs on grade.

Hillside ElementarySchool

Mechanical, Electrical, Plumbing and Fire Protection Assessment

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 type, Weil McLain low pressure steam boilers. The boilers appear to be from a 1998 renovation. Both boilers burn #2 fuel oil. Total heating capacity of both boilers amounts to approximately 7,100 lbs/h of steam or 6,700 MBH.

Existing Boilers From 1998 Boiler Room Renovation

2. Fuel Oil System: The existing boilers are fed fuel oil from a 6,500 gallon underground oil storage tank which reportedly is the original tank from 1958. Fuel oil enters the boiler room and is distributed to each boiler via three fuel oil pumps. There is no tank monitoring system in place and the underground storage tank has never been tested.

Fuel Oil Pumps

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

Window Air Conditioning Unit & Wall Exhauster

4. Unit Ventilators & Wall Exhausters: Classrooms get outdoor air and heating from late 1960's era floor mount unit ventilators and wall exhausters.

5. Finned Tube Radiators: General heating of many spaces is achieved by finned tube radiators located throughout the building. The majority of the radiators and convectors were installed in the late 1960's. All finned tube radiators are steam.

6. Piping: Steam piping runs through an underground trench system. This trench is prone to annual flooding. Steam piping and insulation in the boiler room appears to be newer, likely from the 1998 boiler room renovation. The distribution piping appears to be in poor condition and is likely from original building construction.

View Into The Underground Trench
Where Steam Piping Runs

7. Controls: A Barber-Colman Network 8000 Microzone DDC control system is installed. This system is used to control all unit ventilators, finned tube radiators and air handling units.

Newer DDC Wall Sensor

8. Ventilation System: Outside air is generally provided by unit ventilators as well as the operable windows. It should be noted that many operable windows have been boarded up and used as openings for window air conditioners or blocked by book shelves.

B. Assessment

1. Condition:

a. Main Steam Boilers: The two boilers are both in good condition. Both appear to have been installed in 1998 during the boiler room renovation and can be expected to last another 10 years.

b. Fuel Oil System: Fuel oil piping and pumps appear to be in good condition. The underground storage tank is likely original, and has never been tested. The underground storage tank is expected to be in poor condition.

c. Cooling: The existing window air conditioners present were in varying conditions ranging from good to poor. An estimated 50% of all window air conditioners are in poor condition.

d. Unit Ventilators & Wall Exhausters: It is estimated that 75% of all unit ventilators and wall exhausters throughout the school are from the 1960's, are generally in poor condition, and in need of repair.

e. Finned Tube Radiators: Finned tube radiators range from fair to poor condition with an estimated 75% being in need of replacement.

f. Piping: Piping within the boiler room was reinsulated during the boiler room renovation project in 1998 and is generally in good condition. Piping outside the boiler room runs through underground trenches, is prone to annual flooding, and is expected to be in poor condition.

g. Controls: It was reported the DDC system was installed only a few years ago and is in good condition. However it was 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 created a hot indoor environment during an unoccupied time period. Schedule programming errors should be further investigated.

h. Ventilation System: The ventilation system, which consists of unit ventilators, is in poor condition. General stuffiness was reported throughout the building. Most operable windows are blocked off in order to house air conditioners or are too small. The unit ventilators' ability to bring in the proper amount 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 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. Because of the condition, the entire fuel oil system needs to be replaced. Conversion to natural gas fuel should be seriously considered if services become available.

c. Cooling: If cooling is desired in the school, a new centralized cooling system should be considered. The current method of cooling the school is adequate for their needs. Replacing the estimated 50% of window air conditioners that are in poor condition should be considered. A new, more efficient system would offer better comfort with reduced strain on the existing electrical system. Operable window areas may also be reclaimed.

d. Unit Ventilators & Wall Exhausters: The level of stuffiness and odors encountered during the site visit indicate a lack of ventilation. Unit ventilators and wall exhausters responsible for ventilating spaces are not properly ventilating the building. Operable windows – which have essentially been removed throughout the school exacerbate this condition. An estimated 75% of all unit ventilators and wall exhausters should be repaired in order to reestablish proper ventilation rates.

e. Finned Tube Radiators: The finned tube radiators are in poor condition and should be replaced throughout the school.

f. Piping: The steam piping distribution system (in the boiler room) appears to be in good condition. Given the fact that the piping is older and the trenches tend to flood every year, the condition of the piping and insulation in the trenches throughout the rest of the building is expected to be in poor condition and should be replaced in its entirety.

g. Controls: The DDC system was installed a few years ago and appears to be functioning properly. Consideration should be given to reducing indoor space temperatures during heating mode when the school is on vacation or shut down.

h. Ventilation System: Ventilation is very poor at the school. The expected cause is a combination of existing unit ventilators not bringing in the correct amount of outdoor air and operable windows being blocked in order to install window air conditioners. The unit ventilators and wall exhausters should be replaced with a newer, more efficient systems. Window air conditioners should be removed and operable window area should be reclaimed in all areas.

2. 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 gets its combustion air and ventilation air mechanically from a single intake fan mounted high on the boiler room wall with another ducted opening located about a foot off the floor. The quantity of outdoor air should be investigated to ensure the proper amount of outdoor air is being supplied to satisfy mechanical code.

Boiler Room Combustion/Ventilation Air Intake Fan

b. Ventilation System: Stagnant air indicates non-code compliant ventilation rates. Also, boarded up operable windows effectively reduce ventilation rates throughout the building. Operable window area should be reestablished and all unit ventilators should be rebalanced or replaced in order to achieve proper ventilation rates per given space.

3. 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. Additionally, switching the school heating plant over to a hydronic, natural gas fueled heating system would increase comfort and energy savings.

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 which is currently being lost due to current ventilation design.

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 the quantity of operable window area in each space.

2. Functionality
   a. None.

3. Integrity and Capacity
   a. Remove, abate & replace old underground oil storage tank. Replace with new 6,500 gallon double wall tank & EPA compliant monitoring system.
   b. Unit ventilators and wall exhausters are beyond their useful life. Replace with newer technology such as central roof top units or ducted split system heat pumps.
   c. Replace all steam piping distribution outside of boiler room with hydronic systems. Relocate to areas not prone to annual flooding.

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

5. Lifecycle Renewal
   a. Remove old steam radiators which are beyond useful life and replace with newer hydronic type.

6. Lifecycle Efficiency
   a. None.

7. Other
   a. Convert oil fired steam boiler over to natural gas fired hot water boiler if natural gas utility service becomes available.
   b. If converting over to hydronic heating system, replace all existing steam units with new hydronic units.

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. The service originates from a pole-mounted transformer, transitions underground and then travels in conduit to the service equipment in the basement. In the basement the service is split into a metered 400Amp section and a metered 600Amp 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. Panels in corridors have been extended by tapping the panel feeder in an effort to add circuits for various loads. One panel that was extended feeds a number of window air conditioners and a report from one of the custodial staff is that the circuit breakers trip constantly when the air conditioners are running. All panels are full with no spares or spaces.

2. The fire alarm system is an addressable type system manufactured by FCI. This system was upgraded in 2001 and is in good 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.

Main Fire Alarm Control Panel

3. The building has the following fire alarm components:

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

Fire Alarm Masterbox

Smoke Detector

4. There is a public address system distributing announcements through-out the building. The system operates through the telephone system and appears to be functioning properly.

5. This school does not have a bell system.

6. The lighting throughout the classrooms is typically a nominal 1' x 4', recessed flat prismatic lens type arranged in continuous rows, recessed in a metal, perforated ceiling. The fixtures are in good condition and custom fit for this type of ceiling with a 1-lamp cross-section. Lighting in the office area and corridors consists of surface mounted, wrap-around lense type fluorescent fixtures. In the corridors the fixtures are 1-lamp and in the offices they are 2-lamp. Lighting in the gym consists of industrial 'lowbay' type HID, pendant mounted fixtures. The lighting in the modular classrooms mimics the building classrooms regarding appearance. The difference is the ceiling is tile instead of metal.

Typical Classroom Fluorescent Fixtures

Typical office fixture

Modular classroom fixture

Typical gym fixture

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

Typical Egress Lighting and Exit Signs

8. Technology distribution is minimal based on modern classrooms. The existing technology in the building appears to be outdated and upgrading the existing is questionable. The main technology rack is located in a closet in the basement that a hatch in the floor that covers a sump pit.

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

Extension Cords and Strips

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 existing public address system is in good condition and serves the needs of the school.

d. 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.

e. 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. A potential problem may be future expansion due to the mounting location.

c. The existing public address system is adequate for the short term needs of the school.

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

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. Not Aplicable

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. A new service will also support potential HVAC upgrades.

   b. Add receptacles in all classrooms at teacher locations.

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 Glen Gary Road enters the basement boiler room and appears to be original to the building's construction. The service stubs through the foundation wall and appears to reduce down immediately to a three inch pipe.

Water Service Entry

2. Natural Gas Service

The school does not have a natural gas service connection to utilities. Heat and hot water systems are fueld via an existing fuel oil system. See Heating, Ventilation and Air Condition section for more information.

3. Domestic Water Distribution

The three inch 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 (it is not uncommon for a water meter to be sized one trade size smaller than the main service to improve accuracy). The 3 inch cold water main continues to the building fixtures. 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 a steam-to-water storage water heater located in the boiler room. It is a horizontal insulated storage tank. Nameplate data on the water heater is not available. It stores water at 120 degrees. The kitchen dishwasher has a local hot water booster.

Domestic Hot Water Tank

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.

6. Kitchen Waste

The pot sink in the food preparation kitchen is provided with an in-floor grease interceptor. This interceptor has been covered with rags wich is assumed to be due to failure of the cover gasket.

Kitchen Grease Interceptor, Aged and Failing

7. Roof Drainage

The building is flat roof construction with interior roof drainage that is mainly concealed in walls or chases. The gymnasium has a pitched roof.

8. Plumbing Fixtures

The plumbing fixtures in this facility consist mainly of wall mounted water closets and wall hung urinals with flushometer valves. The lavatory sinks are wall mounted. The majority of lavatory faucets are separated hot and cold manual. 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.

Typical Bathroom Fixtures

9. Classroom Plumbing Fixtures

Classrooms are typically equipped with enameled cast iron counter mounted sinks and bubblers. Kindergarten classrooms were provided with boy's and girl's toilet rooms but one set has been removed and the rooms are now used for storage.

B. Assessment

4. 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 52 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 distribution system is 40 to 50 years old. It exhibits some signs of age and pitting corrosion but is functional. However, the piping system has aged beyond its useful life expectancy.

c. Domestic Water Heater

The domestic water heater appears to be original to the 1959 construction. 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 50 years old.

It is not clear whether the sump pump in the boiler room is coupled to an "oil-minder" level control that can sense the presence of non-conductive oil instead of water to prevent the operation of the pump in the event of a fuel oil spill in the room.

e. Kitchen Waste

The in-floor grease interceptor access cover is apparently stuffed with a rag. The maintenance staff reports that this grease trap is corroded and is scheduled for replacement this year.

f. Roof Drainage

The storm drainage piping age ranges from 40 to 50 years old.

g. Plumbing Fixtures

The plumbing fixtures in this facility are 40 to 50 years old although some fixtures may 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.

h. Classroom Plumbing Fixtures

The classroom fixtures are in fair to poor condition.

i. Pipe Trench

The building foundation includes a pipe trench extending from the boiler room to the north end of the building. The trench contains pipe runs for steam, condensate and water. Apparently, this trench is subject to flooding. During the survey, some standing water was observed in the trench and a small sump pump and hose has been placed below the access hatch into the trench to manage dewatering. The exact cause or source of the water is not evident from this survey, but it is assumed to be ground water entering through the foundation wall. The water may be coming from up the hill on the east side of the property.

Water In Piping Trench

5. 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

In 1986, Congress banned the use of lead solder containing greater than 0.2% lead, and restricted the lead content of faucets, pipes and other plumbing materials to 8.0%. With the exception of possible minor repairs since 1992, the entire building's water distribution system contains lead solder and is aged beyond the expected useful life for copper piping.

c. Domestic Water Heater

The domestic water heater appears to be functional but is well beyond its expected useful life. 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. Kitchen Waste

The existing grease interceptor is evidently experiencing problems with the seal of the access cover and interior corrosion. Currently, only the pot sink discharges to the grease interceptor. Long term upgrades to this facility will likely require all drains and points of discharge in the food preparation area to be piped to a central grease interceptor in accordance with the current plumbing code.

f. Roof Drainage

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

g. Plumbing Fixtures

The Federal Energy Policy Act of 1992 mandated low-flow toilet fixtures using no more than 1.6 gallons per flush (gpf). The latest addition to the building was in 1968. The life expectancy of vitreous china fixtures, faucets and flush valves is typically about 20 to 25 years.

h. Classroom Plumbing Fixtures

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

i. Pipe Trench Drainage

The ingress of ground water into the pipe trench needs to be addressed through site drainage improvements, foundation drainage improvements or repairs and (as a safeguard), the installation of a sump pump for maintenance.

6. Code Compliance

   a. There is a lack of oil containment in the boiler room.
   b. There are no other obvious code discrepancies with the observed plumbing systems requiring immediate attention.

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. Replace existing grease interceptor.
   b. Install a sump pump to manage ongoing groung water infiltration into the pipe trench.

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.

5. Lifecycle Renewal
   a. Replace water service due to expended useful life.
   b. Replace domestic water distribution due to expended useful life.
   c. Replace domestic water heater due to expended useful life.
   d. 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

The building is not equipped with an automatic sprinkler system. The food service cooking hood is not equipped with a fixed fire suppression 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 if future work other than system repairs are performed. 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.

The cooking ventilation hood in the food service kitchen should be upgraded to include a wet-chemical fire suppression system.

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.

b. Maintain existing roof drainage.

Fire Protection

A. Existing Fire Protection System Evaluation

The building is not equipped with an automatic sprinkler system. The food service cooking hood is not equipped with a fixed fire suppression 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 if future work other than system repairs are performed. 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.

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