Existing Conditions Assessment D

CIVIL ASSESSMENT

Nitsch Engineering has performed research of the existing site conditions for the Pollard Middle School at 200 Harris Avenue 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 Pollard School for any proposed site work.

Nitsch Engineering's research included an initial site visit/walk through 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 Pollard School site.

Nitsch Engineering's observations and findings are summarized below.

Exterior

Existing Site Conditions:

The Pollard School is in a residential area bound by Harris Avenue to the north of the existing school building and the Massachusetts Bay Transportation Authority (MBTA) commuter rail line to the south. The school is bound on the east and west by residential development.

<u>Parking and Access</u>

The main access to the Pollard School has a U-shaped main entrance off Harris Avenue for student drop off by bus or car. There is limited parking for visitors along the entrance drive. A 44 striped parking space lot is just east of the school building. Additional parking in the east lot is achieved by parking on landscaped areas at the edge of the lot. An additional 28-striped parking space parking lot is available for staff. This parking lot is located off Glenwood Avenue to the west of the school. A bicycle parking area of approximately 30 ft by 15 ft of bituminous pavement area is located between the parking lot and drop off drive on Harris Avenue. A 27-space parking lot for staff is located off Glenwood Road adjacent to the west side of the building. Overflow parking occurs on Harris Avenue on landscaped areas under trees off the access drive.

There are sidewalks leading to the school and sidewalks around the campus. The sidewalks leading to the school appear to be handicapped accessible due to stairs and excessive sidewalk grades. However, the sidewalks around the school building are not handicap accessible. In particular, a handicapped accessible route is not available from the existing east parking lot to the school building due to steep slopes.

A site topographic study would be required to determine that all site walkways and ramps are within acceptable requirements.

A drop off with handicapped accessibility is available at the entry drive, which leads to a set of stairs into a sunken concrete plaza. There is an accessible ramp leading into the plaza on the west side of the building.

The Town of Needham commissioned a study, which produced a conceptual parking plan that anticipates an access road off Dedham Avenue, past the tennis courts into an expanded parking lot off Glenwood Road. This expanded parking lot anticipates up to 81 parking spaces, bus drop off and new sidewalks. The conceptual plan has provisions for an additional 38 parking spaces along the new access road.

In the study referenced above, the parking spaces for the Pollard School were calculated at one (1) parking space per staff and with an additional 50% of parking spaces for visitors. For comparison, the Institute of Transportation Engineers (ITE) for Middle Schools indicates a parking ratio of 0.14 spaces per student or 1.6 spaces per employee. In addition, Nitsch Engineering studied three middle schools in Massachusetts and calculated that the parking supply at these middle schools is 0.17 parking spaces per student. Further study revealed a demand of 0.11 parking spaces per student.

<u>Utilities</u>

The Pollard School is serviced by a 4-inch water service off a 12-inch water main in Harris Avenue. An 8-inch water line off Harris Avenue connects to a fire hydrant at the parking lot east of the school and connects to a fire hydrant at the parking lot entrance at Harris Avenue. There is a water line off Dedham Avenue that services a fire hydrant at the back of the school at the edge of the playing field.

A gas line services the Pollard School off Harris Avenue. It should be noted that the volume of natural gas is reduced to the school during extended cold weather so that the school is required to switch their boilers to burn oil for hot water and heating requirements. Nitsch Engineering understands from school officials that the gas main in Harris Avenue is undersized and cannot deliver adequate gas service to the school and surrounding neighborhood in the winter. It appears that the underground oil tank is located just west of the school off the Harris Ave entry drive. Based on information from the school, there may be an additional UST located on site.

Sewer service consists of an 8-inch sewer line. One 8-inch sewer service collects waste at the interior courtyard of the school and sends the waste under the school building to the sewer main on the west side of the school. This sewer line finally discharges into the sewer main in Dedham Avenue (Rte 135) near Glen Terrace.

The drainage system has grown with the original school and has been pieced together over the years. The existing system consists of leaching catch basins, catch basins and area drains that move stormwater toward the west side of the school into the town drainage system. There are no provisions to capture and treat stormwater at the east side of the site. However, there is a large swale that starts at the edge of the east parking lot which routes stormwater to the playing field behind the school where some of the flow is captured in the existing catch basin and into the storm drainage system. Stormwater not captured by the catch basin sheet flows onto the playing field. Roof drains capture all of the roof runoff at the west side of the school and send the flow into the 36-inch drain line main just west of the school. There have been reports of freeze/thaw issues with the roof drains.

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.

Electric service comes from Harris Avenue to an electric riser on the east corner of the school near the administration entrance. Telecommunications service comes in from Harris Avenue parallel to the gas service and into the building.

Permitting

Any site work at the Pollard School would require Planning Board Approvals and potential Conservation Commission Approval if the drainage system is brought to current MADEP Stormwater Standards.

There is a small pocket of wetlands located at the south eastern edge of the site near the MBTA train tracks and a small wetland located on the west side of the fields, also near the MBTA tracks.

Recommendations

Short Term Needs

- Provide Accessible access from the east parking lot to the Pollard Administration entrance;
- Provide a new gas main in Harris Avenue to accommodate gas boiler service and provide consistent, reliable gas service during heating season;
- Review roof drain down spouts and provide recommendation for freeze/thaw issues;
- 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;
- Provide a new gas main in Harris Avenue and gas service line to the building to accommodate gas boiler service and provide consistent, reliable gas service during heating season;
- Continually review circulation plan for busses and parent drop off;
- Provide new sewer and water line connections (more than 50 years old)
- Determine efficient bike storage layout

Architectural Assessment

Background Information

The Pollard Middle School was originally constructed in 1956-58 with significant additions/renovations in 1969 and renovations in 1996. The complete list of documented improvements to the school are as follows:

1956 Original Construction
1969 Significant Renovations and Addition
1992 Addition and Renovations
1996 Handicap Accessibility Renovations
1998 Air Balancing
1999 HVAC/Electrical System Improvements
2002 Modular Addition and Cafeteria & Corridor (to Modulars) Modifications
2010 Improvements related to temporarily relocating Newman Kindergarten & Preschool at Pollard Modular classrooms. Work also includes improved vehicular circulation and additional parking.

The 147,000 sf school is located on 15.6 acres. The modular classrooms were added in 2002 when the school served grades 6-8 and needed additional space. In 2009, the 6th grade moved to the High Rock School after renovations there were completed. The building currently serves approximately 880 students in grades 7-8, with the modulars remaining empty.

In 2011, the modulars are planned to be occupied with Kindergarten and Preschool students while renovations occur at the Newman School. Some of the modular classrooms are expected to be used by 7th and 8th grade in SY 2012-2013 due to a projected increase (bubble) in the middle school population.

Image 1

Image 2

Image 3

Image 4

Image 5

Image 6

Exterior

Foundations:
Foundations are cast-in-place concrete; most appears to be in good condition, with the exception of some areas of the 1958 wing where exposed slab at specific locations of the exterior of the building, for example outside the band room, has severe cracking and is experiencing accelerated deterioration due to continued ponding water/snow.
This should be reviewed in more detail.

Concrete retaining wall and amphitheater (Image 2) is in fair condition with evidence of parging and repairs and some failure evident.

Walls:
Exterior walls of 1958 building are primarily constructed of aluminum storefront framing on top of structural glazed facing tile knee walls and brick veneer with concrete block back-up at end walls.

Exterior brick in several locations at the southwest gym have visible cracks and some bowing. This may be related to water ingress issues. Vertical cracks in the block at locations inside the gym were also noted. Further investigation to address the root cause of these issues is warranted.

Potential thermal transfer from steel framing extending from inside the building to the outside (Image 3). Daylight visible at some locations of exterior wall. Recommend thermal scan to review heat loss areas.

Some areas of the building have vertical wood siding that appears to be in good condition.

The 1969 exterior walls have some brick veneer and wood siding but is mostly constructed of aluminum storefront system with metal and spandrel panels and insulated glass. These were installed during the 1992 improvement project.

The modular classroom building and connecting corridor has vinyl siding, which is in fair to good condition (Image 4). The crawl space below the modulars has a cement-board siding product installed over Tyvek building wrap, over plywood or osb board. Damage to this was evident in places. Generally, the modular classroom building is poorly constructed (non-durable, inexpensive materials) and is not energy efficient. It is not designed to be used as permanent classroom facilities.

Windows and Doors:
Windows throughout the building have an insulated (two-pane) aluminum window system (EFCO-type) that was installed in 1992 and appears to be in good condition.

Exterior doors were recently replaced with insulated flush metal doors and are in very good condition.

Exterior platforms/stairs/handrails
At a number of exits from classrooms, out of the 1958 building, there are metal platforms, stairs and railings. The top rail is constructed of wood and has rotted (Image 5). This should be replaced.

Roof:
There appears have been a history of roof leakage at the Southwest corner of the gym; signs of this are visible from the interior as well as excessive fungal growth on the brick along this entire wall (Image 6). Other areas of roof leaks are evident throughout the building.

Modular classrooms have fully-adhered EPDM rubber membrane.

In several locations at the 1958 building, rainleaders at the corners of the building have failed, causing accelerated deterioration of the brick and foundation (Image 7).

School officials reported that the entire roof system will be replaced over the summer of 2011, therefore a review of the roof was not conducted.

Exterior- *Recommendations*
The concrete retaining wall should be reviewed on an annual basis for repair and sealing of the concrete.


Image 7


Image 8


Image 9


Image 10


Image 11


Image 12


Image 13

The amphitheater should be evaluated to determine if improved access will increase use of this space or if there are alternative uses (ie. flower or vegetable garden, art sculpture garden, etc.). Repair or replacement should be considered in the future depending on the planned use.

Exterior stairs leading out from the gym should be replaced.

Exterior brick at both gyms should be investigated further at problem areas to determine root cause of the issues and develop an appropriate solution. Destructive investigation may be necessary to confirm that brick reinforcing ties are still intact. Based on our intitial observations, it appears that these issues could be due to past roof leaks at the perimeter of the roof edge; the roof is planned for replacement in summer of 2011.

Thermal scan of exterior wall surfaces is recommended, particularly at roof to wall transitions and where potential thermal transfer occurs at steel framing.

When the modular classroom buildings no longer serve their useful purpose to the school district for accommodating students on a temporary basis during construction projects, these buildings should be either sold or demolished. Installed in 2002, these buildings should be slated for removal no later than 2022.

Wood handrails at exterior metal stairways should be replaced with steel.

At areas where brick is damaged adjacent to rainleaders, brick should be replaced and investigation within the wall cavity should occur to confirm extent of potential water ingress. This condition is expected to be addressed during the 2011 re-roofing project.

Interior

Flooring:
Administration areas are carpeted.

Corridors and most classrooms have Vinyl Composition Tile (VCT) (Image 8). Most VCT appeared to be in good condition and well maintained. Separation of VCT along center of lobby space was noted. It appears that the VCT installed over Vinyl Asbestos Tile (VAT) (Image 9), which is an adequate temporary solution as it seals the tile, however if removal of unit ventilators or other built-in casework occurs, VAT tile touched by the work will need to be addressed by haz mat removal procedures. When it comes time to replace the VCT (at the end of its useful life), both layers of flooring will need to be removed. Some areas have original VAT in good condition and well maintained, such as IDF-1 rm.

VCT flooring in the cafeteria is in good condition.

VCT flooring in some areas of the lower level are popping at the corners of the tile, particularly in the corridor near the locker rooms. The VCT in the locker rooms appears to be separating. The ceramic mosaic tile in the locker room shower area has delaminated from the concrete slab. In the hallway leading from the corridor to the locker rooms, some moisture issues were evident at the base of the FRP wall panels. All of these conditions appear to be due to excessive moisture. Further investigation into the extent and source of the moisture is recommended prior to any flooring replacement in these areas.

The two gym floors have a rubber flooring that appears to be original (Image 10), and is in fair to poor condition. This flooring does not appear to have any shock absorption properties. It has delaminated from the concrete slab (Image 11). This is also in vicinity of the corridor and locker areas mentioned above. A rubberized, cushioned floor system, meeting DIN requirements for ball bounce and shock absorption should be considered for both gyms.

Bathrooms are ceramic mosaic tile flooring with structural glazed facing tile (sgft) walls, which are in good condition.

Carpeting in the Library and several spaces in the school is in good condition, while other areas, such as some classrooms in the 1968 wing are in fair condition with seams taped with duct-tape (Image 12).

Image 14

Image 15

Image 16

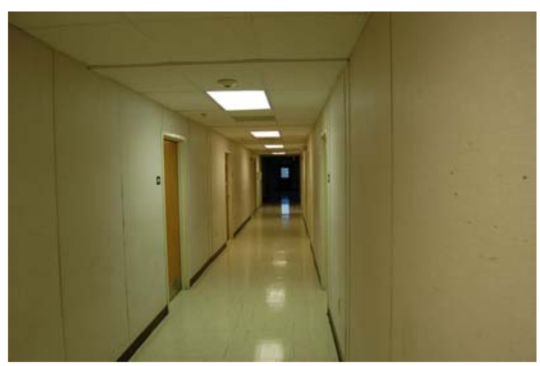


Image 17

Image 18

Image 19

Image 20

Image 21

Stage wood floor is in good condition

The kitchen has quarry tile flooring that is in good condition.

Floors in the Modular classrooms have VCT that are separating. This appears to be due to a moisture expansion and contraction issue. This may be related to a poorly insulated floor structure.

Walls and Doors:
Admin spaces have plaster walls. Water damage noted at interior side of exterior walls at main entrance (Image 13).

Most classrooms in the 1958 building have a combination of plaster and SGFT walls.

Some corridor walls have hard-wood panels.

Multi-stall bathrooms are in need of upgrades, with poor lighting, bowed ceiling tiles, chipped ceramic mosaic tile, rusting metal partitions and sink/counters that are in poor condition (Image 14).

Walls in the 1969 wing are a combination of concrete masonry unit (cmu) and sheetrock, and are generally in good condition.

Doors throughout the school are primarily wood veneer with lever hardware. Doors in the 1958 building are in need of replacement, while the doors in the 1969 wing are generally in good condition. Some appear to have been replaced during subsequent renovations.

Walls and vertical surfaces in the cafeteria have tectum wall panels installed to address noise.

Brick infill is missing at corner of gym where there appears to have been a history of leaks around a roof drain (Image 15). The exposed structural steel framing within the brick wall should be reviewed prior to infilling. Brick should be infilled where it is missing.

Cracks in the masonry were visible at the gym addition (green gym) (Image 16). This condition should be investigated further.

Walls in the Modular classroom building are vinyl-faced wallpaper; these were peeling/delaminating (Image 17). Doors are wood veneer with lever handles.

Ceilings:
Acoustical ceilings and grid in Admin area are very low, 7'-1/2" above finish floor (below code minimum of 7'6") (Image 18). These appear to have been added during a mechanical system retrofit/upgrade. Ductwork installed below bar joists. Ceilings in a few other areas of the 1958 wing are low as well (Image 19)

Several areas around the school have signs of past leaks (Image 20).

Ceiling tiles throughout most of the 1958 building have acoustical ceiling tile in a suspended grid. Ceiling tiles are bowing, which could be a result of high humidity.

Media Center has exposed structural beams with acoustical metal deck (Image 21).

In Room 258, Curriculum Room, in the 1958 wing, a significant amount of rusting of the metal roof deck was visible (Image 22). This condition appears to be localized in this one area. The cause of this rusting should be investigated.

Ceilings in the 1969 wing are in good condition and appear to be fairly new.

The kitchen has vinyl coated ceiling tile, which appears to be in good condition.

Ceilings in the Modular classrooms are suspended acoustical ceiling tile (ACT). Evidence of roof leaks was visible.

Interior- *Recommendations:*
When renovations are planned, it is recommended that both layers of floor tile (VCT and VAT) are removed, the entire floor flash-patched and new VCT

Image 22

Image 23

Image 24

Image 25

Image 26

Image 27

Image 28

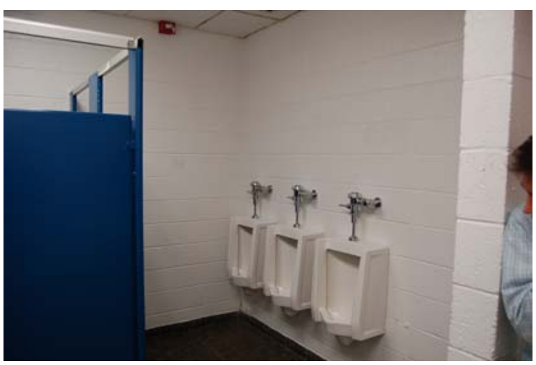


Image 29

flooring installed.

At lower level where floor tiles are separating and/or popping, or the flooring has delaminated from the concrete slab substrate, the flooring products (VCT, ceramic tile or rubber flooring) should be removed, the slab should be flash-patched, moisture resistant primer coating applied and new flooring products installed. Corridor areas should receive VCT. Locker room areas should receive an epoxy coating or ceramic mosaic tile. Gymnasiums should receive cushioned resilient sports flooring. Investigation along perimeter of exterior of building should be investigated to determine if drainage around building foundation should be installed to minimize or mitigate moisture up through the interior slab.

Plaster walls that have been subject to moisture damage should be removed and replaced.

Multi-stall bathrooms should be upgraded with new finishes and be made fully handicap accessible, and fitted with water-saving plumbing fixtures.

Replace doors in 1958 building as they have served their useful life (Image 23). Door openings should be reviewed for clearances per handicap accessibility requirements and for door and/or hardware upgrade requirements per life safety codes. Magnetic hold-opens connected to the fire alarm system should be considered at any doors where doors are currently held open with door stops, rope or chains.

Review steel joist connections at corners of both gyms where brick is missing near roof drains. Infill brick where missing.

Investigate cracks in CMU block in the gyms and address deterioration from past leaks at low end of roof structure.

Any future renovations should consider alternative ways to improve ventilation delivery while being considerate of existing roof structure configuration. Clerestory lights above the ceiling were observed (Image 24 and 25); various options may be available for introducing ducted ventilation systems. An in-depth review of existing conditions should be performed during planning and design phases.

Ceiling tiles that are stained or damaged from past leaks should be replaced. During any ceiling tile replacement, new tiles should be "humidity/sag resistant".

Investigate the cause of excessive rusting of the metal roof deck at room 258 in the 1958 wing.

Handicap Accessibility *-Description*

Requirements for handicap accessibility were non-existent when this school was originally constructed. In 1990, the Americans with Disabilities Act (ADA) was enacted into law by the Federal Government to provide civil rights protections and nondiscrimination on the basis of disability. Since 1990, the original regulations have been updated and new requirements and clarifications have been added. In addition, the Commonwealth of Massachusetts has developed their own regulations (521 CMR Architectural Access Board-AAB) that are in many instances more stringent than the ADA. Regulations are updated and added almost every year.

The school had accessibility renovations completed in 1996, shortly after the ADA was enacted and just prior to a significant change in the AAB in 1998. Since that time, the ADA and AAB guidelines have changed and some of the toilet rooms that once complied with the guidelines at the time, now do not comply with current guidelines. While some toilet rooms are accessible, the majority of toilet rooms throughout the school are not in compliance with handicap accessibility guidelines including ones that are designated as being handicap accessible.

Items of non-compliance or can be considered as barriers for the disabled vary from one room to another but include the following:

1. Lack of proper lavatory faucet handles
2. Lack of insulation on piping below sinks
3. Grab bars are not long enough (42" length req'd) or missing (Image 26)
4. Lack of turning radius/clear space at some toilet room doors (Image 27)
5. HC accessibile lockers were not observed

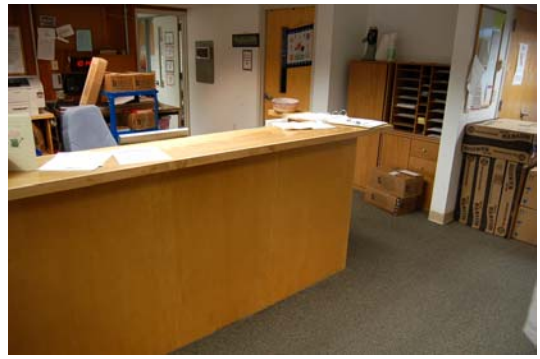


Image 30

Image 31

Image 32

Image 33

6. While Braille signage was noted in numerous areas throughout the school, the installation was not compliant in several areas(i.e. signage mounted on door or above the door instead of 60" above the floor adjacent to latch side of door. (Image 28)
7. At a designated HC accessible bathroom, the clearance adjacent to the door is inadequate and the door swings into the bathroom rather than out .
8. At another designated HC bathroom, there was inadequate turning clearance inside the space due to a framed out box around the phone system (33" to bottom edge) (Image 27).
9. Multi-stall toilet rooms are not equipped with accessible stalls/urinals, door hardware, and clear space (Image 29).
10. Entry desk at Administration office is lacking a low-height counter (Image 30)
11. Lack of access to principal's office spaces; very narrow internal corridor (Image 31)
12. Door from administration office to corridor has adequate width but inadequate clearance on the pull side (Image 32); recommend cutting back counter to allow for adequate clear floor space in front of the door.
13. Water fountains
14. Elevator at 1969 addition is 46" x 60" clear inside with a 32" clear door opening. There is no signage at each level and controls are non-compliant
15. At boys toilet room in 1969 building, conduit mounted vertically on the wall prevents the door from opening 90 degrees (Image 33)
16. Auditorium floor has a continuous slope with no flat spot in the middle (Image 34)
17. The ramp leading to the stage is of adequate slope but does not have compliant handrails or edge guard and inadequate turning radius at the top landing (Image 35)
18. The ramp in the corridor has VCT; should have floor finish with more slip-resistance
19. Lecture Hall is only accessible to the top (back row). This room has 96 seats.
20. The modular classroom building has many accessible features including classroom accessibility and accessible sink/counter in classroom. In the multi-stall toilet room, however, the rear of the HC toilet stall should have a 42" grab bar instead of 36". If these toilet rooms will be used for Kindergarten, they should be modified to meet the "Children" Accessibility guidelines.


Image 34


Image 35

Access to classrooms appear to be adequate in most cases, with 18" provided on pull side.

Handicap Accessibility ***-Recommendation***

Although it appears as though some locations are accessible to the disabled, they may not be. Each of the inaccessible features listed above has an impact on the ability of disabled students or members of the community to access various spaces throughout the school independently. Disabled people may include students with a permanent handicap condition, students that are temporarily disabled from athletic activity, parents or other visitors that could have any form of disability. Any form of renovation plan should incorporate the accessibility of these items to accommodate disabled people to the fullest extent possible.


Image 36

Built-Ins/Furnishings/Equipment- *Description*
Most built-in casework has plastic laminate with hardwood edge and appears to be in good condition (Image 36). Entry desk has wood veneer and is in very good condition.

There are new lockers in corridors that are in good condition.


Image 37

Library furnishings and shelving are in good condition.

Science lab casework in 1958 wing are in very poor condition(Images 37, 38, 39). Some sinks are no longer used; gas has been disconnected. Casework in the Science labs in 1968 wing appear to be in better condition but should also be considered for replacement.


Image 38

Some Science rooms have handicap accessible sinks retrofitted but the rest of the built-in casework is in poor condition.

Classrooms in the 1968 wing have built-in book cases along the perimeter of the room, with plastic laminate tops and hardwood edges; these appear to be in good condition.


Image 39

Most desks are in good condition.

Auditorium seats are in fair to poor condition; many of the springs have failed, some seats are missing, and some seat backs are broken (Image 40). For the amount of use these seats have received over the past 40+ years, they have served their useful life.

Image 40

Image 41

Image 42

Image 43

Lecture Hall seats are in poor condition, with some backs missing entirely (Image 41).

Cafeteria tables appear new and are in good condition.

Folding partition in the gym is in poor condition and does not appear to be used any longer (Image 42).

Built-Ins/Furnishings/Equipment- ***Recommendations***
The school should review their use of space and determine if additional space is necessary to accommodate new programs that have been established since the school was originally constructed.
The condition of built-ins, furniture and equipment varies throughout the building. Some areas have been upgraded with new furniture, while other rooms still have furnishings in fair condition that should be considered for replacement. Prior to a renovation project, we would recommend an inventory of existing furniture be done to determine which furniture and casework should be replaced.

Space Utilization- ***Description***
Outlined below are observations regarding space use, location and aesthetics. These comments are intended to provide some general insight to future planning and considerations.

- The location of the Library is very good, centered in the school with good natural light and appears to be of adequate size.

- Science rooms are significantly undersized compared to MSBA standards, ranging in size from roughly 550 sf to 1,000 sf. MSBA standards require 1,200 sf minimum for a classroom/lab space.

- There is a lack of toilets in close proximity to the Auditorium.

- A room is labeled as a Science Prep room, however electrical distribution panels are located within this space (Image 43). The room appears to be primarily used for storage. Any room with electrical panels should be enclosed in a fire rated room.

- The auditorium seats approximately 432 people. The cafeteria has a posted max. occupancy of 381.

- The Wood shop and Art spaces in the 1969 wing are pleasing spaces, with skylights and high ceilings.

- There appears to be a lack of administrative work space available as the lobby area is used for copying and work-table for administrative staff and/or faculty (Image 44).

Image 44

Space Utilization- ***Recommendation***

When long-range educational programming is being considered, we recommend that an assessment on the current use of space be included in that process. A review of the Science classrooms was conducted as part of this study as this was identified as a focus area. Conceptual options for addressing the Science classrooms were prepared with input from school officials and are identified in another section of this study.

Health and Life Safety- ***Description***

There are a number of issues affecting the health, welfare, and safety of students and staff. From a building environment standpoint, we have observed the following:

1. Fire extinguisher signs pointing to the location of fire extinguishers that were either not there or located within a locked room (Image 45).
2. Exposed wiring visible in corridor where old pay tel. was located. A cover plate should be provided.
3. Doors from corridors to classrooms do not have closers; doors should be equipped with closers to provide a smoke separation.
4. There is a 60’ dead-end condition at rooms 262 to 264 and at several other locations in the building (Image 46). With a fully-sprinklered building, these conditions may be alleviated.
5. It was noted that unit ventilators were covered with books or projects in various classrooms. It is recommended that these are removed to allow for air to flow freely into the space.

Image 45

Image 46

Image 47

6. There is a sprinkler system installed in some locations throughout the school.
7. Corridors were originally constructed with large glass openings in wood frames that were used as borrowed lights (Image 47) and some partially used as display cases. They have since been enclosed with sheetrock on one side, which appears to have been an attempt to improve fire resistance and separation between the corridors and classroom spaces.
8. Corridor doors are held open with door stops and straps; there are no magnetic hold-opens.
9. There may be a better location for the AED unit; currently located behind doors
10. Ceiling heights in some corridors of 1958 wing and in administration offices were below code minimums; 6’11” noted in one hallway (7’6” is code min.).
11. Thumb-turn locks on multi-stall bathrooms and locker rooms should be removed.
12. Lack of exit signage at some designated emergency exits
13. Folding Partition doors are used as emergency exits but are non-compliant
14. Lack of fire rated doors with proper door hardware in several locations
15. Chemical (Science) storage is inadequate
16. Items stored in rooms with electrical distribution panels
17. Lack of adequate ventilation system for some rooms (i.e. computer room has make-shift ducted box on top of unit ventilator)
18. Auditorium and Stage exits are inadequate and non-compliant (stairs are in very poor condition and egress from space appears to be inadequate for number of occupants
19. HIGH PRIORITY: Exit at corridor adjacent to the Band room is blocked off due to condemned bridge. Egress path goes through band room instead- very poor condition with non-compliant exit signage, door construction and hardware, and egress path. Concern with egress path from several spaces within immediate vicinity. Recommend demo and re-build of bridge to provide safe route out of building, and addressing egress compliance issues.
20. Wood sets stored behind stage-not sprinklered and no containment separation from stage
21. Exit from Boiler room exits under condemned bridge and there is only one exit.
22. Custodial office has a spiral staircase with an edge of the stairs at a height low enough to hit one’s head easily.
23. Stairways are not equipped with fire-rated doors or separation
24. Stairways in the 1968 building do not have proper handrail extensions nor do they have guardrails. Underside of stairway should be closed off to eliminate head-hitting condition for the blind. Items stored below stairway should be removed.
25. Choral space is sprinklered and has two exits but one door does not have a closer and the exit sign does not appear to be lit.
26. Choral room has 7’2” height to bottom of duct in center of room
27. The main electrical room has two exits, however they are not equipped with panic hardware.
28. The weight room needs to relocate fitness equipment to keep the 2nd egress door clear.
29. An electrical outlet in the gym is loosely situated in the wall and should be removed or covered.
30. Door closers on the gym exit doors are not operable (broken). It appears that these closers do not have built-in door stops and are not meant for 180 degree openings.
31. At modular classroom building, the Janitor’s closet has an electrical panel, computer hub room, janitor’s sink, and a hot water heater all in the same room with only a 20 min. rated door.

Health and Safety – *Recommendations*
While some of these items may not be triggered until a renovation or addition project is undertaken, they should be reviewed in the context of developing a prioritized list and a determination should be made to address them on an individual basis or part of a larger project.

Energy Efficiency
Outlined below are a few comments from visual observations regarding energy efficiency improvements that could be considered. Additional comments can be found in the mechanical, electrical and plumbing assessments.

1. Exhaust Fans are running continuously at each classroom. These should be replaced with Air to Air Heat Exchangers.

2. It appears that there could be some thermal transfer occurring at steel outriggers at the 1968 building. It is recommended that the school consider an infrared thermal scan be done to verify locations of potential heat loss.

3. The modular classroom building is generally poorly insulated but is considerably poor below the floor level and above the ceiling. The insulation in the crawl space was noted to be falling off; the insulation above the ceilings is not continuous and does not have a continuous vapor barrier installed.

4. At an electrical distribution room in the 1958 building, there is a small hole in the exterior steel beam with visibility directly to the outside. There did not appear to be a thermal barrier along the exterior wall above the windows in this location.

Security/Access- *Description:*
Within the last ten (10) years there has been an increased awareness regarding the safety of children in schools.

Our first impression of the school is that there is a lack of a recognizable main entrance and a lack of visibility of school staff to see people approaching the school. The front of the school has an open, u-shaped courtyard that appears to be where the main entrance should be. However, the actual main entrance is located around the corner. If one parks in the east parking lot, there is no visible defined entrance either. This presents a security concern with the potential for people to wander around the building in search of the entrance. Ideally, visitors should know exactly where the entrance is and the school should have clear visibility to visitors arriving at the school.

We understand that there is a recently installed video camera and electronic access at the main entrance and that the school has lock-down procedures in place.

Security/Access- *Recommendations:*

We recommend that when a long-term visioning and space utilization discussion occurs for the school, the role that security and access plays in the bigger picture of how the visitor and students interact from the site to the building, should be taken into consideration. In addition, a community dialogue night might be considered where faculty, community members, parents, students, school board members and school district officials can discuss their thoughts and views on the various options available to the school for addressing security concerns.

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 The Architects Collaborative dated August 1956; Additions and Renovations drawings prepared by Drummey, Rosane and Anderson, Inc. dated August 1969 and Additions and Renovations drawings prepared by The Office of Michael Rosenfeld dated September 1992.

The building is located at 200 Harris Avenue in Needham and has a mix of single story classroom wings, a two-story media center and single-story core areas and lower basement.

Building Descriptions

Original 1956 Building

Foundations are all traditional cast-in-place concrete footings. The lower and first floor level slabs are 4" concrete on grade. Interior masonry partitions are placed on 12" wide thickened slabs. The second floor slab around the Auditorium/Gymnasium area has open web steel joists at 2'-0" on center supporting 2 ½" deep concrete on form deck. Columns supporting the 21" wide flange girders are typical WF8. The slab over the boiler room has concrete encased steel beams supporting 4" cast-in-place slab to achieve rating.

The roof framing at the gymnasium has a 44" deep plate girder at the center supporting 24" deep open web joists at 4'-0" on center. The roof over the auditorium has steel rigid frame bents at 20' on center supporting 16" deep joists at 4'-7" on center. The roof substrate at the gymnasium has tectum panels on bulb tees while the auditorium and media center have a steel roof deck.

The single story academic wing has steel framing supporting open web joists at 5'-0" on center with steel deck. There is a typical outrigger at a number of locations where 5" columns at each roof joist have a welded 5'-0" cantilevered overhang. These bents are exposed on the exterior.

1969 Addition

This included a gymnasium addition and a two story classroom wing. The gymnasium has traditional cast-in-place concrete foundations with a 5" slab-on-grade at the floor. The roof is supported on a steel frame with 8" wide flange columns and 16" deep beams. Long span joists support a tectum deck system. Exterior walls are un-reinforced CMU. The classroom wing has traditional concrete foundations with a 5" concrete slab-on-grade. The boiler room is depressed 4'-0" and has a 6" concrete slab-on-grade. The second floor framing has typical HSS 6x6 columns with 27" deep girders, 16" deep beams and 1 ½" deep steel deck with concrete fill for an overall depth of 4".

Roof framing consists of 14" deep beams and 16" deep girders along corridor support lines and a 1 ½" deep steel deck. Beams are typically connected over columns and have a 5'-0" cantilever at the roof level. The exterior has block backup with cavity and brick at the first and second floor. Brick is typically hung at the second floor with channels at 4'-0" on center, continuous galvanized angle and kickers back to the slab.

1992 Additions

These involved a two story addition and alteration between the gymnasium and the single story classroom wing. Underpinning and sheet piling were placed against existing footings at the academic wing. Foundations were traditional concrete column footings. The lower level has a 4" slab-on-grade while the upper level has framing which consists of wide flange steel columns supporting steel beams and a 1 ½" steel deck with concrete fill to an overall depth of 3 ½" at the first floor and bent steel beams at the roof level with a 1 ½" deep galvanized steel deck.

Existing Conditions

There are no signs of any foundation settlement or distress. There is localized cracking at the brickwork at the corner of the auditorium and decay at the brick/pavement interface (Refer to Photos 1 – 3). The bridge on the west side of the auditorium is in extremely poor and unstable condition. The concrete and supporting steel is completely corroded (Refer to Photos 4 – 10). The exposed slab along the exterior at the band room is supported on exposed steel beams and exhibits cracking due to ingress of moisture and corrosion to the 8" steel columns above (Refer to Photo 11). There is vertical cracking to the brick at the northwest corner of the gymnasium. The areaways for door access at the southwest corner are in poor condition (Refer to Photo 12). There is decay at the brick/sidewalk interface at the southwest Gymnasium Two corner (Refer to Photo 13). It would appear that there is movement at this corner where localized bowing of the brick has occurred (Refer to Photo 14) as evidenced by cracking (Refer to Photo 15). The remainder of the south gable wall at Gymnasium Two looks to be in good condition.

The exposed structure at the two story academic wing appears to be in sound condition with no evidence of corrosion to steel, brick or siding (Refer to Photo 16). The two story curtain wall at the door (Refer to Photo 17) may be non-compliant with certain wind loading requirements based on the mullion depth. There is cracking to the brick at the course above the overhead door in receiving (Refer to Photo 18).

The temporary classrooms which are built on a substantial slope would not appear to have resistance to lateral wind loading. The height above grade at the low level is approximately 10'. The framing is supported on wood beams that are supported on concrete sonatubes. From a visual at a localized damaged panel, it appears that there is no bracing.

There are no obvious signs of distress to the concrete at the outside of the amphitheater (Refer to Photo 19).

The elevated bridge connecting the academic wings appears to be in sound condition with no evidence of corrosion to the exposed steel. There is distress to the brick at the south corners of the single story academic wing (Refer to Photos 20 and 21) due to rain leader problems. On the interior, there is some cracking in the block at the gymnasium (Refer to Photo 22).

There do not appear to be any expansion joints in the original building and the 1969 additions. There is one expansion joint between the 1992 addition and the original single story classroom.

Summary

In conclusion, other than the deficiencies noted above, there are no major structural issues. No signs of distress were observed at the foundations or the main framing systems.

The buildings were 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. Any proposed additions need to be kept separate from the existing.

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

The 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

The main structural elements are in sound condition; however, repair should be considered to the brick veneer as noted. The elevated connector outside the rear of the auditorium should be demolished and replaced as necessary. The second level slab cracking at the band room exterior should be treated and sealed. The “temporary” classrooms, which appear to have been in place for nearly 20 years, would not qualify as temporary under the current IEBC. The height above grade also gives rise for concern as to the lateral resistance the structure offers. Serious consideration should be given to replacement.

Photographs

Photo 1: Brickwork cracking and decay at brick/pavement interface.

Photo 2: Brickwork cracking and decay at brick/pavement interface.

Photo 3: Brickwork cracking and decay at brick/pavement interface.

Photo 4: Corroded concrete and steel at bridge on west side of auditorium.

Photo 5: Corroded concrete and steel at bridge on west side of auditorium.

Photo 6: Corroded concrete and steel at bridge on west side of auditorium.

Photo 7: Corroded concrete and steel at bridge on west side of auditorium.

Photo 8: Corroded concrete and steel at bridge on west side of auditorium.

Photo 9: Corroded concrete and steel at bridge on west side of auditorium.

Photo 10: Corroded concrete and steel at bridge on west side of auditorium.

Photo 11: Slab cracking due to moisture and corrosion at exterior of band room.

Photo 12: Areaway condition at southwest corner.

Photo 13: Decay at brick/sidewalk interface at southwest Gymnasium Two corner.

Photo 14: Localized bowing of brick at southwest Gymnasium Two corner.

Photo 15: Brick cracking at southwest Gymnasium Two corner.

Photo 16: Condition of two story academic wing.

Photo 17: Two story curtain wall at door.

Photo 18: Brick cracking at course above overhead door in receiving.

Photo 19: Condition of amphitheater concrete.

Photo 20: Brick distress at south corners of single story academic wing caused by rain leader problems.

Photo 21: Brick distress at south corners of single story academic wing caused by rain leader problems.

Photo 22: Interior block cracking at the gymnasium.

Mechanical, Electrical, Plumbing and Fire Protection Assessment

Heating, Ventilation, and Air-conditioning (HVAC)

A. Existing HVAC System Evaluation

1. Main Hot Water Boilers: The existing building HVAC system consists of four, cast iron sectional-type, HB Smith company hot water boilers divided amongst two boiler rooms located on opposite sides of the school. All boilers are capable of burning both natural gas and #2 fuel oil. In one of the boiler rooms, one boiler appears to be either a spare, or shut down in preparation for the change in season. Total heating capacity of all four boilers amounts to approximately 11,400 MBH. It should be noted the school currently curtails natural gas use for the boilers during winter months due to an undersized natural gas main and meter serving the school which creates a noise issue for the surrounding neighborhood when the boilers are operated at full load. It has been reported that the gas utility plans to up-size the existing natural gas main and meter during the summer of 2011.

Typical Existing Hot Water Boiler

2. Fuel Oil System: The existing boilers are fed #2 fuel oil from a single 15,000 gallon underground oil tank which, according to plans, was installed around 1993 and replaced two older oil storage tanks. Fuel oil enters Boiler Room A132 and is distributed to each boiler via two fuel oil pump circuits – one for each boiler room. There is an old Veeder-

Root tank monitoring system in place. Testing has reportedly never been performed on this tank

3. Cooling: There is no central main cooling system in place. Cooling is provided by the occasional window air conditioner or roof mounted split system as needed.

4. Unit Ventilators: Perimeter classrooms get outdoor air and heating from classroom style, floor mount unit ventilators, some interior spaces are also served by concealed, horizontal type, unit ventilators. Approximately half of all unit ventilators appear to have been installed during the 1995 renovation.

Unit Ventilator With Front Cover Removed

5. Finned Tube Radiators: General heating in some spaces is achieved by various finned tube radiators placed throughout the building. An estimated 75% of all finned tube radiators were replaced during the 1995 renovation. Floor mount and ceiling mount radiator types exist.

Finned Tube Radiator

6. Piping: A hydronic heating piping loop distributes hot water to unit ventilators located in classrooms throughout the school. Larger hot water supply and return piping is schedule 40 steel with Victaulic fittings and fiberglass insulation. It was reported that the piping layout was (improperly) designed in such a way to make it impossible for both boiler rooms on opposite sides of the building to operate simultaneously. Switching service from one boiler room to another entails a laborious process of manually accessing valves above ceilings.

Existing Hot Water Boiler With Insulated Piping

7. Controls: The controls for the school are a DDC/pneumatic hybrid system with the front end consisting of an older DDC system and roughly 50% of the actuators being pneumatically driven. It was reported that this system is problematic needs to be replaced soon.

Pneumatic Controls Compressor

8. Ventilation System: Outside air is generally provided via air intakes on unit ventilators located throughout the school along with assistance by dozens of roof mounted exhaust and supply fans. The fans were installed in the early 90's as a response to poor indoor air quality reports. The kitchen contains a 24 foot long, type I, Avtec kitchen exhaust hood with make up air provided by a dedicated unit serving remote ceiling mounted diffusers. A few ducted air handlers also exist. These serve large areas such as the cafeteria & auditorium and offer heating & ventilation only. Ventilation to these units is via ducted connections to exterior wall louvers.


Typical Ducted Unit Ventilator

9. Modular Classroom HVAC Systems: The modular classroom addition to the original school building is isolated from the original building's heating & ventilation system. The modular addition (solely classroom and bathroom space) is heated and cooled by several packaged rooftop units. These units are all gas fired with electric cooling. Ventilation is provided by unit mounted outdoor air intakes.

Modular Classroom Roof Showing Gas Fired Roof Top Units

B. Assessment

1. Condition

a. Main Hot Water Boilers: All four boilers are in fair condition. One appears to have been installed in 1987, another in 1992 and two others in 1994. One of the boilers from 1994 appeared to be shut down during the time of the inspection.

b. Fuel Oil System: Fuel oil piping and pumps are in fair condition. Given the age of the storage tank , it is expected to be in fair to poor condition.

c. Cooling: The variety of window air conditioners present were in varying conditions ranging from good to poor. Currently window air conditioning units get replaced or added on an as-required basis.

d. Unit Ventilators: Roughly half of the unit ventilator's observed were in fair to poor condition. Most fans were not functioning, but were producing significant heat – an indication of either faulty unit ventilator equipment or controls. In a meeting which took place after the site inspection, Needham public schools facilities personnel indicated all hydronic control valves are programmed to default to a 100% open position during unoccupied mode– which explains the heat being produced by the unit ventilators even when their fans are off.

e. Finned Tube Radiators: An estimated 75% of the finned tube radiators are from the early 90's renovation and in fair condition. The remaining 25% are in poor condition and in need of replacement.

f. Piping: The hydronic heating piping and insulation are in fair condition. There is also an existing flaw in the piping design which prohibits the simultaneous use of both boiler rooms.

g. Controls: The pneumatic control system's compressor was observed to be running near continuously, indicating the system is in poor condition and is likely not functioning properly. The DDC system was reported to be functional, but components are reaching the end of their typical life span.

h. Ventilation System: Roughly half of all unit ventilators are beyond their usable life and in fair to poor condition. While on site we observed at least one roof mounted supply fan not working. Reportedly, a priority matrix was created which identifies which roof mounted exhaust or supply fans are in most need or replacement or repair and all roof mounted equipment will undergo repair work during the roof renovation project this summer.

i. Modular Classroom HVAC Systems: The modular classroom's HVAC systems are roughly 8 years old and in good condition.

2. Adequacy

a. Main Hot Water Boilers: Given the age, condition, and capacity of the boilers, with a properly adhered to maintenance schedule, we expect the existing boilers and associated accessory systems to provide service for an additional 5-10 years.

b. Fuel Oil System: Capacity and distribution of the fuel oil system appears to be adequate. However, given the age of the tank and lack of testing, the oil storage tank itself is expected to be in need of replacement.

c. Cooling: Existing cooling capacity is adequate for the present spaces served.

d. Unit Ventilators: Failed unit ventilator fans indicate current ventilation into spaces is not adequate. The majority of floor mounted unit ventilators in the classroom were also observed to have fresh air intakes located too low to the ground. During the winter months they are likely to be covered by deep snow.

e. Finned Tube Radiators: The majority of finned tube radiators range from fair to poor condition. While the overall capacity of the heating system appears adequate, roughly 75% of all finned tube radiators are in need of replacement.

f. Piping: Existing piping & insulation should be inspected throughout the building and repaired/replaced as needed. A specific investigation into the piping system cross-connection is recommended to determine the exact deficiencies which do not allow simultaneous boiler operations.

g. Controls: Based on the rate at which the air compressor was observed to run, it is clear there are many leaks in the existing system. All pneumatic components of the control system should be replaced with new electrically actuated components. Newer DDC components, coupled to a new building automation system, would provide the potential for greater energy savings and improved control for the entire building. The majority of unit ventilator fans were not operational, yet the units were emitting heat. It is expected that the control system is not functioning or configured properly.

h. Ventilation System: It has been reported that the exhaust fans, added in the 90's to aid in providing increased ventilation rates, will be repaired, replaced and relocated during the roof renovation project this upcoming summer. Long term, this configuration should be upgraded to a more energy efficient and newer technology such as energy recovery ventilators. This upgrade would eliminate the additional maintenance of the numerous roof mounted exhaust fans and lower operational energy costs of the overall ventilation systems.

i. Modular Classroom HVAC Systems: The existing rooftop units appear to be functioning properly and are expected, with a properly adhered to maintenance schedule to provide service for an additional 10-15 years.

3. Code Compliance

As a general rule, when it comes to renovation work, if you perform work on a non-code compliant system/piece of equipment, you cannot leave it that way and you bear the responsibility to bring that system/piece of equipment up to current code standards.

a. Main Hot Water Boilers: Boiler Room A132 was observed to get combustion air and ventilation from a 9.68 ft^2 door mounted stationary intake louver with insect screen located in the corridor adjacent to the boiler room. Assuming a 75% free area (allowed per NFPA31-5.6.3) that leaves roughly 7.26 ft^2 of free opening to the outside for combustion air intake & ventilation of the boiler room. Two issues arise from this setup. First, the location/configuration of the combustion and ventilation air intake is not per code. Fuel oil burning appliances in boiler rooms require a combination high/low type of configuration per NFPA 31-5 (much like the one found in the school's other boiler room). Second, the size of the opening is significantly undersized. NFPA 31 dictates <u>each</u> high and low opening shall require 1 in^2 of free opening for every 1MBH of heating capacity located within the space. There is also an issue with the type of screen used on the louver in that it the mesh is finer than ¼" (NFPA 31-5.6.2).

Boiler Room Combustion & Ventilation Air Intake Louver

b. Ventilation System: Observations of stagnant air during inspections indicate problematic ventilation rates. The location of the floor mounted perimeter classroom unit ventilators' intakes are also too low to the ground.

4. Cost Effectiveness

a. Main Hot Water Boilers: Modern hot water boilers offer a significant advantage over older model boilers with regard to energy efficiency. Replacing older boilers with new high efficiency, condensing type, would increase energy savings over the long term.

b. Controls: Replacing the existing leaky pneumatic and antiquated DDC control system in its entirely, along with conversion to an electrically actuated valves and sensors will provide a more reliable and energy efficient control system. Management of classroom set points and night/weekend setback conditions can also further reduce the school's annual energy use.

c. The use of window air conditioners is an inefficient and maintenance intense method of achieving cooling in a space. Installing a new centralized chilled water systems and replacing existing unit ventilators with new 2-pipe heat/cool fan coil units would eliminate the need for window air conditioning units and increase thermal comfort. Using this concept, ventilation could be provided by new energy recovery ventilators with variable speed fans driven by room mounted CO2 sensors to maximize energy savings. Current inefficient roof mounted exhaust fan system could then be removed.

C. Recommendations:

The recommendations below are prioritized in the indicated categories numbered 1 through 6. These categories are further defined in the Appendix. This building is slated to be upgraded to extend its use over the long term. Emphasis is therefore placed on all categories with the highest priority assigned to category 1 and the lowest to category 6.

1. Code Compliance
   a. Rebalance all mechanical ventilation systems to ensure 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 is adequate and functional.

2. Functionality
   a. The pneumatic control system should be removed in its entirety. An estimated 50% of the remaining devices which are actuated by the pneumatic system should also be converted to electronic. A new DDC based building automation system should be provided to replace existing system.
   b. The hydronic heat piping configuration should be examined and re-piped to allow for simultaneous operation of both boiler rooms and sequencing of the boilers. This would extend useful life of the entire heating plant. Additionally, the piping system may be converted to a heat/cool system with seasonal changeover. Note that this may require re-insulation of the systems to ensure vapor barrier tightness.

3. Integrity and Capacity
   a. Remove and abate old underground fuel oil storage tank and associated systems. School heating load may be satisfied using solely natural gas as the fuel source once the gas main and meter have been replaced by gas utility.
   b. Unit ventilators are beyond their useful life. In core or assembly areas, replace with newer technology such as variable air volume packaged heat/cool rooftop air handlers and ducted terminal units. In classrooms, replace unit ventilators with new 2-pipe heat/cool ducted fan coil units. Ventilation in classrooms to be provided by new energy recovery ventilators with CO2 sensor based occupancy sensors, and new distribution ductwork systems.
   c. Inspect and replace an estimated 25% of existing piping distribution &insulation throughout the school.

4. Policy mandated Retrofits
    a. Remove window air conditioning units. If cooling remains desired, provide new centralized chilled water system equipment. Convert hydronic piping to heat/cool system with seasonal changeover. Provide all classrooms with new 2-pipe heat/cool fan coil units. Core areas or assembly areas to be provided with new packaged heat/cool variable air volume roof top air handlers with ducted terminal units.
    b. Remove numerous exhaust fans and replace with new energy recovery ventilation systems ducted to/ from each classroom. Energy recovery ventilators with variable speed fan systems to be controlled by new CO2 occupancy sensors in each occupied.

5. Lifecycle Renewal
    a. Remove old finned tube radiators which are beyond useful life and replace with new 2-pipe heat/cool fan coil units.

6. Lifecycle Efficiency
    a. If replacing hot water boilers, replace with high efficiency natural gas fired condensing type boilers of similar output heating capacity.

7. Other
    a. Reprogram DDC system to reduce interior space temperatures during school vacations & off hours.

    b. Throughout this section of the report there are many recommendations for updating the HVAC system at the Pollard Middle School. As a result, there are a number of non-code based design recommendations the school may choose to implement. The purpose of this summary is to clearly express the recommendations for a benchmark HVAC system which is believed to be best for the Pollard Middle School.

        - Most importantly, the existing hydronic heat piping should be examined and reconfigured to allow for simultaneous operation of the two existing boiler rooms and should be retrofitted to handle heating and cooling with a manual seasonal changeover.
        - Install new natural gas fired condensing type boilers of the same output capacity as existing boilers. Remove and abate old oil storage tank. Provide a new chilled water system sized to handle approximately $300ft^2$/ton of cooling.

- Replace all existing classroom unit ventilators with new 2-pipe heat/cool fan coil units. Replace all finned tube radiators and unit heaters with new 2-pipe heat/cool fan coil units.
- Replace all core or assembly use area unit/heater ventilators with new packaged gas/electric variable air volume roof top units ducted to new terminal units zoned to serve spaces independently.
- Remove all roof mounted exhaust fans which were added in the 90's for IAQ purposes. Provide new ducted variable frequency drive energy recovery ventilators with CO2 based occupancy sensors to provide ventilation to all classroom areas.
- Replace the existing control system with a new DDC control system which will control all new and existing HVAC systems.

This new HVAC system will offer the Pollard Middle School a more energy efficient approach to achieving the school's heating and cooling needs while also taking into consideration the thermal comfort of all occupants.

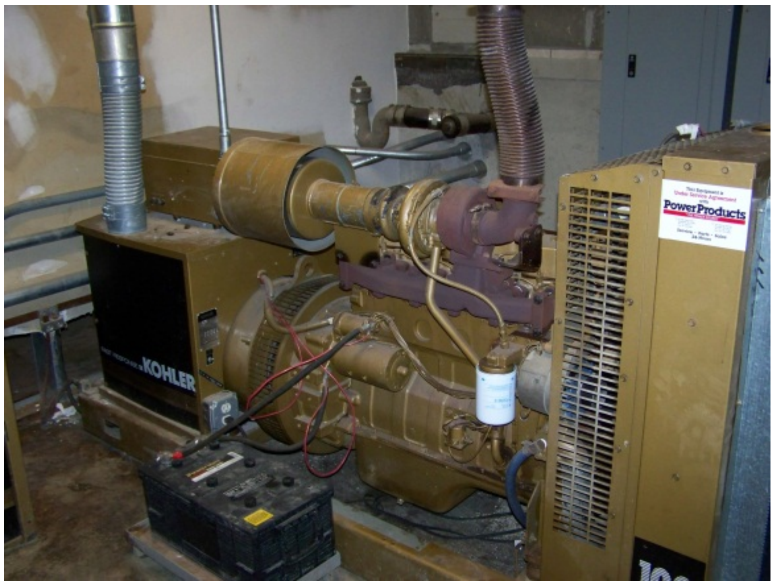
Electrical

A. Existing Electrical Systems Evaluation

1. The building is supplied by two electric services. One service is the main school service which is an underground lateral to a transformer located in a vault below grade. The second service is also an underground lateral to a pad mounted transformer which feeds the modular classrooms.
2. The main school service is 2000Amps, 208Y/120 Volt, 3-phase, 4-wire and feeds a switchboard in the basement level. This switchboard is manufactured by GE and is good condition. From visual observation, there are three 225Amp spaces and one 400Amp space for additional circuit breakers. Current demand on the 2000Amp main is approximately 70% or 1400Amps. There is no space in the electric room for any additional equipment. The distribution system is in generally good condition but typically the panels in the facility contain no spares or available space for additional circuits. The recent technology upgrade added panels to support the new technology equipment only.
3. The second service is rated at 800Amps at 208Y/120 Volt, 3-phase, 4-wire. The service and utility company meter are located in a closet at the modular classrooms. The electric demand is not known on this service. There is no space in this closet for any additional equipment.

Main School switchboard

4. The building has an emergency generator for equipment such as the heating system. Generator rating is 125kVA/100kW, at 208Y/120 Volt, 3-phase, 4-wire. This emergency generator feeds two panels located in the generator room. The emergency generator also limits access to two panels wall mounted behind the generator. Life safety and emergency egress lighting is illuminated with emergency battery units.



Generator

5. The fire alarm system is an addressable type system manufactured by FCI. The fire alarm system consists of the main fire alarm control panel in the switchboard room, three remote extender panels and the fire alarm annunciator in the main entrance lobby. There is an existing fire alarm masterbox located on the outside of the building.

Main Fire Alarm Control Panel

6. The building has the following fire alarm components:
    a. Outside Beacon and Knox Box
    b. Pull Stations
    c. Smoke and Heat Detectors
    d. Horn / Strobes

Fire Alarm Masterbox

Smoke Detector

Typical Fire Alarm Components

7. There is a public address system distributing announcements through-out the building.

8. There is a master clock system in this building. It is reported that 30 to 50% of all the clocks do not work.

9. The bell system sends a tone through the public address system. This system is currently working.

10. The lighting throughout the classrooms is typically 2' x 4', recessed flat prismatic lens type. The fixtures are in good condition and not many burnt-out lamps were in evidence. The balance of lighting consists of 2' x 4' and 2' x 2', parabolic louvered fixtures. Lighting is typically controlled by local area switches. The gym has 400-watt industrial style, pendant mounted fixtures. The lenses on these fixtures appear to be yellowed with age thereby lowering the efficiency of these fixtures. Corridor lighting is generally linear fluorescent either surface mounted or indirect, wall-slot type. This lighting also appears to be in good working order. Lighting in the auditorium is incandescent, utilizing reflector lamp downlights.

Typical Fluorescent Fixtures

Typical gym fixture

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

12. Receptacle quantities, in most rooms, are adequate for this application.

Typical Egress Lighting and Exit Signs

B. Assessment

1. Condition

a. The electrical panelboards serving the building are in good condition. The switchboard does have some amount of electrical capacity for additional panels, but the switchboard room does not have any physical space for additional equipment. The building panels typically do not have any spare capacity.

b. The fire alarm system control panel appears to be in good operating condition. Also, the existing fire alarm devices appear to be in good condition.

c. The public address system, located in the administration office, appears to be in serviceable condition. This system has been upgraded to a telephone based, digital system and performs the necessary functions.

d. The master clock system requires an upgrade and potential replacement in order to restore the system to full operation.

1.

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.

f. Lighting fixtures in both gymnasiums have extremely discolored lenses which reduce fixture efficiency

g. The auditorium sound system is a typical system for this type and age of building. The auditorium lighting system consists of recessed incandescent fixtures. This is a common system in auditoriums due to the ease with which the lamps can be dimmed.

2. Adequacy

a. The existing incoming electrical services appear adequate to support the building for at least the next decade provided there are no additions or expansions. The spare capacity available from the existing services cannot be utilized due to the lack spare circuits in the existing panels. In order to support any additions or expansions to the school, a service increase to 3000Amps would be required. Also, due to the lack of space in the existing electric room, a new interior location for the upgraded service would be required. In order to support a larger electrical service, a new utility company pad-mounted transformer would have to be added to the site.

b. The existing fire alarm system is in good condition and with regular maintenance will provide protection for the facility. A potential inadequacy is the inability to extend and add zones in the existing fire alarm control panel. Currently the system has three remote panels and any expansion in the existing main fire alarm control panel may have been used for these three remotes. This fire alarm system control panel and remote panels would not be able to handle any further expansions and would have to be replaced. The devices connected to the fire alarm system appear to be functional which means that the control panel and the remote panels would be replaced.

c. The public address system is capable of delivering announcements to the school population based on the current building configuration. Due to the age of the system expansion is not possible. Further investigation by the system manufacturer is required in order to determine whether expansion or re-configuration is feasible.

d. The existing lighting through-out the building is adequate for the applications in classroom and office areas. The emergency lighting is also adequately spaced to provide lighting for the means of egress.

e. The gym lighting is inadequate due to the discoloration of the lenses.. This discoloration of the lenses creates a lowered fixture efficiency by diminishing the output of the 400 watt metal halide lamps.

f. The auditorium sound and dimming system was not tested. Based on the age of the systems they have reached the end of their service lives. The sound system appears to be functional for basic public address requirements. The lighting system also appears to be adequate for basic house and stage use.

3. Code Compliance

a. Emergency lighting throughout the facility was adequate in the areas visited. The battery powered lighting was not tested to determine if the batteries were capable of operating the lights for 90 minutes.

b. Exit sign locations were acceptable. The battery back-up in self-powered exit signs was not tested to determine if the batteries were capable of operating the lights for 90 minutes.

c. The generator limits access to two electrical panels in the generator room and does not provide adequate working clearances for these panels.

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

e. Auditorium house lighting dimmer interface (for full bright under emergency conditions) was not tested.

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

4. Cost Effectiveness

a. The fluorescent lighting in the school consists of mainly T8 lamps and the recessed lights in the classrooms are 4-light units.

b. Multi-level switching should be considered for all offices and support spaces.

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 slated to be upgraded to extend its use over a long term. Therefore, emphasis is placed on all categories with the highest priority assigned to category 1 and the lowest to category 6.

1. Code Compliance

a. Test all battery units for 90 minute capacity.

2. Functionality

a. Not applicable.

3. Integrity and Capacity

a. The existing service and distribution will be adequate to support the school for the next decade. Any type of expansion or addition would require the service upgrade described in (i.) below.

i. Upgrade existing 2000Amp service to a 3000Amp, 208Y/120 Volt, 3-phase, 4-wire. This upgrade will include new switchboard, utility company pad-mounted transformer and 2000Amp back feed to existing switchboard.

ii. Add four electric panels per floor,(42ckt, 225Amp bus, MLO) fed from new distribution panels. The two new distribution panels should be

400Amp, 208Y/120 Volt, 3-phase, 4-wire panels fed from the new switchboard.

b. The existing fire alarm system does not have the capacity to handle an expansion. The existing devices do not have to be replaced, as they seem to be functionally adequate. The items to be replaced are the fire alarm control panel and the (3) remote panels.

c. An expansion or major re-configuration of the school will require a replacement of the PA system head end and some re-zoning of the system.

d. The possible re-configuration of the Public Address system at the portable classrooms would require a new control unit located remotely at the portable classrooms. This would allow the portable classrooms to be a separate zone thereby selecting what information is heard over the Public Address system. The two systems would be interconnected and common announcements could still be made.

e. In order to have a complete and operating clock system we recommend a complete replacement with a radio type system.

f. As both a qualitative and energy efficiency upgrade, replace the classroom lighting through-out the school. Modern direct/indirect pendant mounted fixtures provide comfortable and efficient environments. Two rows of 2-lamp fixtures or three rows of 1-lamp fixtures in each classroom would improve the quality of light, use less energy and allow conformance with the energy code.

g. Replace the existing HID (metal halide)gym lights with high efficiency pendant mountedT5 fluorescent fixtures. As a one for one retrofit, the energy savings will be immediate and there is no delay (no warm-up) when the lights are turned on. Additional energy savings measures can be incorporated in a fluorescent system, such as switching for energy saving or multiple levels of light for different functions.

h. The auditorium sound and lighting systems would benefit from a complete upgrade to new equipment. This would make the auditorium a more flexible venue.

4. Policy Mandated Retrofit
   a. Not applicable

5. Lifecycle Renewal

a. Not applicable

6. Lifecycle Efficiency

a. Install new lighting controls and occupancy sensors for all support spaces.

b. To extend the life of the existing classroom lighting systems, retrofit existing 4-lamp fixtures with 3-lampplus reflector units. There is the potential for incentives from the utility company to incorporate “Super T8” lamp/ballast systems.

Plumbing

A. Existing Plumbing System Evaluation

1. Domestic Water Service

A four inch water service from Harris Avenue enters the boiler room of the 1956 wing and appears to be original to the building's construction. The service stubs through the foundation wall overhead and has a flanged OS&Y main shut-off valve.

Water Service Entry

2. Natural Gas Service

A natural gas service from Harris Avenue is provided to the building at the exterior corner of the boiler room of the 1956 wing where a service regulator and meter are located. A 10 inch gas main enters the boiler room and feeds the boilers in this room, a domestic water heater in the boiler room, and the two boilers in the 1969 wing. A gas branch line feeds the kitchen. The gas distribution piping is welded black steel throughout with threaded joints for piping 2 inch and smaller. The piping was installed during the 1992 building renovation and has been in service for about 19 years. Reportedly, the gas meter and/or regulator experiences excessively high flow noise during peak heating demands. When this happens, the school must shut off the gas supply to the boilers and water heater and switch to fuel oil.

3. Domestic Water Distribution

The domestic water service continues from the water service entry at the foundation wall to an interior turbine water meter located in the boiler room. The distribution of cold water continues to the building fixtures. A cold water supply feeds the domestic water heater and master mixing valve. The water heater discharge is piped to the master mixing valve and tempered to a distribution temperature of 120 degrees Fahrenheit. Hot water is circulated throughout the building by means of a circulator located adjacent to the master mixing valve and is controlled by an in-line aqua-stat switch. Another circulated hot water loop at 140 degrees Fahrenheit serves the food service kitchen. 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 dual-fuel (gas/oil) fired storage water heater located in the boiler room of the 1956 wing. It is a vertical 125 gallon storage tank with insulation and jacket and front mounted 800 MBH burner assembly capable of a recovery capacity of about 1000 gallons per hour based on nameplate data. It stores water at 140 degrees Fahrenheit to mitigate microbial growth in the hot water system.

The modular addition constructed in 2002 has an independent electric storage water heater feeding the lavatories in that area.

Domestic Water Heater

5. Sanitary Waste and Vent

The sanitary waste and vent piping is almost entirely concealed within walls and above ceilings so a visual survey of this piping was not possible. However, based on sampling of piping that was visible, 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 of the 1956 wing is provided with a sump pump to lift waste to the sewer.

6. Kitchen Waste

The food service kitchen pot sink is connected to an in-floor grease interceptor.

7. Roof Drainage

Interior storm drainage is mainly run exposed. Typical examples include the corridor along Harris Ave and in the library. Most of the piping appears to have been replaced during the 1992 renovation placing it at about 19 years old. Other areas such as within and outside the gymnasiums appears to be original and is cast iron with lead and oakum joints with some minor repairs.

Typical Roof Drain

8. Plumbing Fixtures

The plumbing fixtures in this facility consist mainly of wall hung water closets and urinals with flushometer valves. The toilets in the modular expansion are floor mounted flush tank type. Also, a couple of toilet rooms in the 1969 addition have floor mounted flush valve toilets although they appear to be an exception. The majority of lavatory sinks are wall mounted although a couple of toilet rooms have counter mounted basins. The majority of lavatory faucets are manual single operator metering type. A small complement of faucets is 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.

Typical Lavatory Fixture

9. Classroom Plumbing Fixtures

Classrooms configured for science curriculum are equipped with sinks. Original sinks are epoxy or perhaps soap stone. Original faucets do not have vacuum breakers although other faucets appear newer and do have vacuum breakers. Certain benched or countertops have what were once gas or air outlets but they appear to have been disconnected.

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. Natural Gas Service

The condition of the natural gas service, meter, and distribution piping is considered good.According to a study performed by the natural gas utility, the natural gas main and meter are currently undersized. Reportedly, both are scheduled to be replaced by the beginning of the next heating season.

c. Domestic Water Distribution

The majority of the domestic water piping in the west half of the building is about 19 years old and is adequate for future service. The portion of piping in the east half of the building is estimated to be over 50 years old with the exception of minor repairs to branch piping and is beyond its expected useful life. Further, piping installed prior to 1986 is considered to be a potential source of lead content in drinking water and should be replaced when possible.

d. Domestic Water Heater

The domestic water heater was installed in 1992 and is about 19 years old. The exterior jacket is exhibiting some signs of corrosion but otherwise 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 aged beyond its expected useful life.

e. 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.

f. Kitchen Waste

The grease interceptor in the food preparation kitchen was not accessed, but it is presumed to be maintained properly.

g. Roof Drainage

The majority of the roof drainage piping in the original 1956 wing appears to have been replaced in 1992. The remainder appears to be original to the 1969 expansion.

h. Plumbing Fixtures

In general the plumbing fixtures are in fair to good condition. A couple of urinals were observed to be out of order, the boy's ADA shower in the locker room is missing the hand spray attachment, and both showers are missing the shower valve handles. Although they are functional, all fixtures should be updated to take advantage of water use reduction offered by f low-consumption fixtures.

i. Classroom Plumbing Fixtures

The classroom sinks and outlets are in poor condition. Some observed waste piping and trapping does not comply with existing waste and vent requirements. Original gas outlets are not functional.

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. Natural Gas Service

The current issues with the size of the natural gas main and meter prevent the heating system boilers from operating at 100% capacity. Both are scheduled to be replaced by the beginning of the next heating season. Once both are replaced, the natural gas service should be adequate enough for the school to operate on natural gas during peak heating season.

c. 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%. A significant portion of the domestic water piping in this building was replaced in 1992. The modular addition was installed in 2002. This piping is adequate for future service. The portion of water distribution piping remaining in the east half of the building was installed prior to 1986 and should be replaced both due to lapse in life expectancy and potential lead content of the solder.

d. Domestic Water Heater

The domestic water heater appears to be functional but has aged beyond 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.

e. 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.

f. Kitchen Waste

The existing grease interceptor in the kitchen is very likely adequate for future service. However, 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.

g. Roof Drainage

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

h. 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 renovation to the building was in 1992 (or more specifically the drawings for this renovation are dated September 1992). It is not entirely clear from the drawings or from field survey whether or not the water closets installed during the 1992 renovations were of the lower water consumption type although it is unlikely because it took a period of time for the plumbing fixture industry to deliver commercial fixtures compliant with this Act. In addition 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.

i. Classroom Plumbing Fixtures

The existing classroom fixtures are not adequate for any future comprehensive upgrades to science teaching functions.

3. Code Compliance

a. The boiler rooms lack containment for fuel oil in the event of a leak or spill.

b. Some science classroom faucets and waste piping do not conform to current codes. Future fit-out of the school will have to address requirements for classroom emergency showers and eyewashes in science instruction rooms.

c. There are no other obvious code discrepancies with the observed plumbing systems that would be considered to require immediate correction.

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 slated to be upgraded to extend its use over a long term. Therefore, emphasis is placed on all categories with the highest priority assigned to category 1 and the lowest to category 6.

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

9. Functionality
    a. None.

10. Integrity and Capacity
    a. Correct the cause of the excessive flow noise through the gas service meter.

11. Policy mandated Retrofit
    a. Re-pipe cold water to all drinking fountains in the east half of the building at a minimum to reduce possible lead content in drinking water. If the nature of renovations permits, the complete replacement of all water distribution piping is recommended.

    b. 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.

    c. Replace water closets, urinals, lavatories, janitor sinks and sinks with newer and more water efficient models.

d. 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.

12. Lifecycle Renewal
    a. Replace water service due to expended useful life.
    b. Replace domestic water heater due to expended useful life.

13. Lifecycle Efficiency
    a. None.

14. Other
    a. Maintain existing natural gas service and distribution after the meter.
    b. Maintain existing sanitary waste and vent piping. Modify as needed to accommodate plumbing fixture upgrades.
    c. Maintain existing roof drainage.

Fire Protection

A. Existing Fire Protection System Evaluation

1. General

This facility was originally built in 1956 and 1969 without an automatic sprinkler system. In 1992, the building was partially fitted with an automatic sprinkler system although the rationale as to the decision to only partly protect the building and which areas took priority is not known. It appears that the addition of the modular classrooms in 1992 may have been a triggering event for the local fire department to require a phased plan to upgrade the entire facility giving priority to paths of egress and to spaces most easily accessible. Several capped connections have been provided with the intent of extending sprinkler coverage to the remainder of the facility in the future.

2. Fire Protection Service

Main Building: In 1992, the existing domestic water service was tapped outside and a new 6 inch sprinkler main was extended to the 1956 boiler room. The original water service from Harris Avenue also feeds the 4 inch domestic service and a fire hydrant.

Modular Addition: The modular classroom addition was provided with a separate fire service that enters through the floor into the sprinkler valve room of the connecting corridor between the two modular units.

3. Sprinkler Riser

Main Building: The 6 inch fire service reduces to a 4 inch supply and continues to a double check valve backflow preventer in the boiler room. After the backflow preventer a 4 inch fire department connection extends up and out the building to a Siamese connection. The system continues to a sprinkler alarm valve riser with main test/drain connection as well as a capped connection for a future alarm valve. The existing alarm valve is further split into two alarmed zones to zone the west half of the building by first floor and second floor. The piping material is Schedule 40carbon steel with rolled groove joints. Valves are flanged OS&Y with tamper switches tied to the building alarm system.

Sprinkler Riser

Modular Addition: The 4 inch fire service reduces to a 3 inch supply and continues to a double check valve backflow preventer. After the backflow preventer a 3 inch fire department connection extends out the building to a Siamese connection accessed from the south side of the school. The system continues to a sprinkler alarm valve riser with main test/drain connection. The piping material is Schedule 40carbon steel with rolled groove joints. Valves are flanged OS&Y with tamper switches tied to the building alarm system.

4. Automatic Sprinkler System

Main Building: The sprinkler riser continues from the boiler room to the building. It appears from the record drawings and the field survey that the original 1956 wing has been sprinklered with the exception of the gymnasium, Music Rooms A220, A224, and A226, and the Auditorium and Stage. A sprinkler main was extended to the south along the upper level of the 1969 wing to provide coverage of certain rooms abutting the modular classroom addition.

Modular Addition: The entire modular addition and the connecting corridor to the main building is fully sprinklered.

B. Assessment

1. Condition

The condition of the existing sprinkler piping, heads, valves, hose valves is considered very good and is adequate for future service.

2. Adequacy

The existing water supply pressure and capacity is not known, however it is assumed to be adequate to support the water demand of the existing sprinkler system and therefore adequate to support the extension of the sprinkler system. It should be noted for clarity that the extension of a sprinkler system that increases its total area of coverage does not increase the required demand of the water supply. A sprinkler system is designed to supply a fixed area in the most remote or most hydraulically demanding location of the building (typically 1,500 square feet). The portions of the building that are sprinklered appear to comply with NFPA 13 installation standards. The system appears to be adequate for the planned extension of sprinkler mains into the remainder of the building.

3. Code Compliance

When a facility is required to be sprinklered by the Building Code, the entire facility is required to have coverage. This school has already had a triggering event leading to the 1992 partial installation of a sprinkler system. The facility is technically not in compliance with the existing State Building Code, but is assumed to have been approved by the local fire department as a phased upgrade to the building.

C. Recommendations

Based on the fact that the building has already been required to be partly sprinklered any new upgrade work to this school will most likely be required to include complete automatic sprinkler coverage in accordance with State law. This Facility Assessment anticipates and therefore recommends the retrofit of a complete automatic sprinkler system. 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.