

WHEELLOCK SCHOOL



Location: 17 Elm Street

Year Built: 1968

Condition: Good to Fair

Assessors: Map 33 Parcel 092

Building area: 65,190 sq ft

Land area: 44.25 acres

1.0 PURPOSE and LIMITATIONS

The purpose of this Property and Conditions Report (the Report) is to assist the Town of Medfield to assess the general physical condition and maintenance status of the property and to recommend repair and maintenance items considered significant for the property to continue its current operations.

The information reported was obtained through sources deemed reliable, a visual site survey of areas readily observable, access through building “owners” and information presented by the Town. Findings, conclusions, and recommendations in this Report are based on the methods described above, industry standards, and general observations of the equipment and its visible condition.

The report is focused on existing conditions, lifecycle of existing materials, and non-code compliant conditions. Recommendations will include items needed to bring the space/component to a safe, code compliant, and generally accepted facilities condition. The Report does not anticipate change of use, reconfiguration of space, or change in current program.

Estimated Costs are based on professional judgment and the probable or actual extent of the observed defect inclusive of the cost to design, procure, construct and manage corrections.

1.1 Condition

The Report uses terms describing conditions of the various site, building and system components. The terms used are defined below. It should be noted that a term applied to an overall system does not preclude that a part, component, or section of the system may be in a different condition.

Excellent	The component or system is in new or like new condition, and little or no deferred maintenance is recommended, or the scheduled maintenance can be accomplished with routine maintenance.
Good	The component or system is in sound condition and performing its function. It may show signs of normal aging or wear and tear, and some remedial and routine maintenance or rehabilitation work may be necessary.
Fair	The component or system is performing adequately at this time but is obsolete or is approaching the end of its useful life. The component or system may exhibit Deferred Maintenance, evidence of a previous repair, or workmanship not in compliance with common accepted practices. Significant repair or replacement may be recommended to prevent further deterioration, prevent premature failure, or to prolong its useful life.
Poor	The component or system has either failed or cannot be relied upon for continued use performing its original function, exhibits excessive Deferred Maintenance or is clearly in a state of disrepair. Repair or replacement is recommended.

1.2 Abbreviations

The Report may use abbreviations to describe various site, building, or system components of legal descriptions.

ACT	Acoustical Ceiling Tile	GFI	Ground Fault interrupt (circuit)
AHU	Air handling unit	GWB	Gypsum Wall Board
BTU	British Thermal unit (heat measurement)	HVAC	Heating, Ventilating, Air Conditioning
CMU	Concrete Masonry Unit	HWH	Hot Water Heater
EDPM	Rubber membrane roofing	MDP	Main electrical distribution panel
EUL	Expected Useful Life (life cycle)	PTAC	Package through wall A/C unit
FCU	Fan Coil Unit	RTU	Roof top Unit
FHA	Forced Hot Air	MSBC	Massachusetts State Building Code
IBC	International Building Code	VAV	Variable Air Volume box
ACM	Asbestos containing material	VCT	Vinyl Wall covering (floor tile)
ADA	Americans with Disabilities Act	MAAB	Mass. Architectural Access Barriers

2.0 SITE CONDITIONS

2.1 Topography

Description:

Building is situated on a relatively flat lot with at-grade egress points around the perimeter. There are playfields and playgrounds as well as community gardens on the site.

Condition and Observations:

The site appears to be well-graded and no issues observed. School and Town events use the surrounding soccer fields. As a result uncontrolled parking occurs all over the site.

Greenspaces are regularly parked on and traffic wear is readily observed. Telephone poles are laid across edge as an attempt to regulate parking from entering greenspace, with varying degree of success.

Recommendations:

Develop a masterplan as to parking and how the school wants to use its green space and address parking needs. Install a landscape buffer and barrier to prevent parking on greenspaces the Town wants to preserve. Create a policy to share with all user groups to promote site use and protection of green spaces. Master Plan \$100,000

2.2 Pavement, Parking and Drainage

Description:

A paved driveway provides bus & public access to the front (street-facing) elevation of the facility, as well as some perpendicular parking.

This front area has drainage catch basins and some loose concrete curb stops.

There is some signage designating certain restrictions for some parking spaces, no vehicle areas and accessible parking spaces.

Paving continues around the entire facility providing delivery access to loading dock, access to dumpsters and ultimately forms a student pedestrian area to the rear and east-west sides.

The paving also provides walkways to the playground and paved basketball court, as well as the After School Center

Pavement markings provided at cross walks and fire lanes only.

There is pole-mounted site lighting and building-mounted illumination at some egress doors.

Condition and Observations:

The bituminous asphalt paving has been replaced in some areas in the front and at some exterior doors, but all the remaining paving is broken, cracked, loose and in general disrepair. There are many hazards within the accessible routes and other paved areas including pot holes, large cracks, tripping hazards at ramps and doors.

The paving at the accessible parking spaces appears to exceed the maximum 2% slope in all directions as required by MAAB regulations. The accessible curb cuts, constructed using bituminous asphalt paving, do not meet MAAB regulations for slope or transition. In most cases, the existing paving slopes up to exterior egress doors without a level landing area.

Pavement markings at cross walk and fire lanes has faded and non-existent anywhere else.

There are bituminous walkways with asphalt berm along some driveway areas

There does not seem to be an accessible route to all the playfield areas from the school building or parking areas.

Although handrails are provide at After School Center ramp, they do not meet MAAB regulations for smooth continuous surface or extensions at top & bottom.

The signage designating accessible parking spaces does not meet MAAB regulations for height. Other sign posts are significantly bent.

Curb stops are scattered about from snow plowing.

The site lighting and egress door lighting does not appear to be modern, energy-efficient lamps.

Recommended Repairs:

Remove and replace all the remaining pavement. Recommend that existing bituminous be reclaimed, sub-grades regraded and new binder & topcoat be installed according to Town of Medfield road construction standards. \$200,000

Recommend bituminous asphalt berm be used in lieu of loose curb stops at perpendicular parking areas and along lawn areas to restrict vehicle access.

Areas with sloped paving right up to exterior doors should be replaced with a minimum of a 5' x 5' concrete landing meeting MAAB regulations of 2% max slope. \$20,000

Replace Sidewalks and bituminous berm along driveway areas \$80,000

Curb cuts need to be reconstructed using concrete with new transition curbs. Almost impossible to construct a compliant curb cut with bituminous asphalt. Remaining sidewalks along driveway could be bituminous, but recommend concrete walks and curbing along the front walk area.

Provide new compliant sign posts and remount handicap parking signs.

Eliminate lip in paving to provide flush condition at After School Center ramp. \$3,000

Install energy-efficient exterior lighting throughout – grant and rebate programs available for this. \$50,000

2.3 Landscaping

Description:

Areas around the facility are a combination of lawns, some shade trees, a public garden, playfields, ball fields and playground surfaces.

The playground equipment areas have a suitable impact-resistant surface with perimeter plastic berm. There is fixed seating and picnic tables in the play area as well.

There is also a paved drip-strip along some areas of the front of the facility.

The dumpsters are placed on paving at the loading dock area and easterly side of facility.

Gutter downspouts are connected to underground collection system.

A concrete jersey barrier is installed near loading dock as protection for generator.

Condition and Observations:

Obviously there is some lawn damage due to snow plow activity, and lawn is worn in many places due to vehicular parking.

The playground surface is delineated by a plastic curb which may not provide for accessibility to all playground equipment.

No accessible route found to baseball field or public gardens.

The dumpsters are located on the pavement and are not screened with any enclosure. Very unsightly when you drive in.

Recommended Repairs:

Repair damaged lawn areas and provide new berm in areas where vehicles have routinely driven over grass. \$20,000

Provide compliant accessible routes to all school facilities and public gardens. \$10,000

Provide certain amount of accessible picnic tables and fixed seating. \$5,000

Replace jersey barrier with concrete filled bollards \$5,000

Provide concrete pad with screened enclosure & bollards for all dumpsters. \$5,000

3.0 BUILDING CONDITIONS

3.1 Foundation

Description:

Building is a slab on grade with little exposed concrete except at loading dock.

Loading dock is covered and has a depression for truck deliveries with concrete steps up to floor level

Area is partially protected with guardrails.

Condition and Observations:

All exposed metal components at loading dock are rusted and in need of paint.
Concrete steps need some repair and a portion of guardrail is missing.

Recommended Repairs:

Scrape and paint existing metal components and guardrail. \$3,000

Repair concrete steps and provide new galvanized piperail where missing. \$8,000

3.2 Super Structure:

The 1968 structural framing is a combination of structural steel framing, structural CMU masonry block and face brick, with metal trusses supporting a gypsum plank decking. On the two story structure, structural steel supporting a poured concrete floor deck. The upper sections of the wall below the metal fascia are pre-cast panels. Typical openings are supported by steel lintel angles.

Majority of the structure could not be observed, and no indication of problems with the structural components, other than those highlighted in the Section 3.3 Facades.

Based on age and construction type, the building meets no current code requirements for seismic .

Description:

This Wheelock School was built in the 1960's. The front (north section is a one story structure, which transitions to the rear two story. This structural masonry construction exterior walls in combination with light frame steel frame trusses is in generally good shape.

The office and classroom walls are a solid **masonry wall** sections with a light weight metal framed glass and precast masonry veneer infill. The large west gymnasium is a brick and CMU block masonry wall approximately 24 foot tall, and the east side gym is a brick and CMU block masonry wall approximately 12 ft tall.

At each egress is a cast in place concrete and steel lintel that supports the masonry wall and acts as a small vestibule roof.

3.3 Facades

Condition and Observations:

3.3 A Façade (Brick /Precast)

The original brick and mortar is in good condition. Some previous repairs to brick was observed, and some areas are now in need of additional repairs. There are several specific areas of concern that will need a structural engineer to inspect and investigate as to the cause of the structural cracking. The cracking appears to be created due to the lateral movement of the building, the lack of expansion joints, possible settlement of specific areas of the foundation, and possible past water/moisture penetration within the brick that caused expansion and cracking due to freeze thaw. **Specific areas that will require further investigation of the structure are North elevation structural crack, west side loading dock**

brick facade, west side boiler room wall, main gym (wall cracking observed on interior walls) and wall/cast in place concrete vestibule roof locations. At these locations, the cracking is pronounced and radiate through the wall.

No weepholes were observed in a large majority of the masonry wall. Throughout the various wall facade areas efflorescence was readily observed. The day of the observation, snow melting on the roof was occurring. It was easily observed that water was entering the brick wall from the roof flashing, and saturating the brick to the point where exterior moisture staining was readily observed. These observations indicate that specific areas throughout the structure require roof, flashing, caulking repairs to keep the moisture from entering the wall. Area that have suffered cracking need to be repaired/replace/repointed to prevent additional moisture penetration.

There are some cracked bricks and unsealed penetrations where water could infiltrate.

The precast concrete caps over covered entrances are porous and allowing water to infiltrate below into light fixtures and adjoining brick work. The cap is minimally sloped, with no weather protection or flashing into adjoining vertical brick surfaces.

The various control joints between dis-similar masonry cladding materials have sealant that in most cases, appears to have exceeded its intended life. Replacement in its entirety is required. Some sealants have cracked and failed, others have mildew or have separated from adjoining surfaces.

Gaps were observed around existing electrical service penetrations on west side and at some random penetrations that could also allow water infiltration.

All exterior sealants have been identified as having asbestos and in some cases PCB. Therefore all work considered must be addressed by a HAZMAT specialist.

3.3 B (Fenestrations)

Hollow metal exterior doors are set in hollow metal frames appear to be in fair condition, showing normal wear. The latching hardware on most doors looks original and does not conform to ADA or MAAB standards.

The hollow metal sidelight frames are peeling and in need of paint. Most doors provide minimal energy efficiency. Replacement of all exterior doors is recommended.

The garage doors are delaminating and are in need of paint.

Windows appear in fair condition, but have exceeded their life expectancy. These original windows are aluminum framed single pane glass that have no thermal break or energy efficiency. The thermal break in the metal frame reduces the exterior cold from radiating into the building. Many of the windows have been altered to install residential style air conditioning units. These alterations contribute to the lack of energy efficiency. Commercial window frames are not designed for an air conditioner retrofit and are considered a poor installation. At a couple locations, the window AC units protrude into a sidewalk area and become an obstruction. Replacement due to age and energy in-efficiency is recommended.

As highlighted in the brick facade, all caulking has exceeded its life expectancy and provides minimal to no weather protection. Existing caulking should be first tested for ACM content prior to removal and replacement.

The mechanical dampers/hoods are installed within the metal framed window and precast panel veneer.

Many of the mechanical louvers are rusted, others dented and need of paint. There are also many abandoned electrical boxes & fixtures causing rust staining on the brick.

Recommended Repairs:

3.3 A Façade (Brick/Precast)

Hire a structural engineer and exterior envelope specialist to evaluate areas of concern and create repair documents as well as review entire building envelope. \$70,000

Repair all damaged walls identified by the engineer. \$500,000

Any broken bricks should be removed and replaced.

Joints in water table bricks should be raked out and repointed, or in some cases, add sealant as a soft joint.

Areas of poorly repointed areas should be redone to an acceptable level. \$100,000

The concrete caps over some covered egress doors are porous and unprotected.

All existing control joints should be raked out and re-sealed. If no backer rod was originally provided, new should be added now. Rake out old sealants where precast meets adjoining surfaces/materials and provide new with backer rod. (existing caulking should be tested for ACM) \$200,000

Concrete caps at covered entries needs an adhered membrane flashed into vertical wall behind.

Edges should receive metal coping. \$25,000

Remove random rusted fasteners and fill holes with sealant or mortar.

The entire area of brick would benefit by a cleaning and then an application of (2) coats of brick sealer.

A restoration detergent is recommended. \$100,000

Recommended Repairs:

3.3 B (Fenestrations)

Sand, repair and Repaint all exterior doors and frames. \$50,000

Replace non-compliant latching hardware with new compliant lever latches. Check closers for proper operation (effort & closing speed) \$50,000

Replace delaminated garage doors

Add handrails to steps leading from side door on east, possibly eliminate steps toward yard and install guardrail. \$6,000

Existing window caulking should be raked out and replaced with new. \$200,000

Scrape and repaint all exposed metal components particularly at truck dock. \$50,000

Scrape and paint existing painted louvers, replace dented and rusted louvers. Refasten existing louvers to UV's so tight to wall. \$10,000

Provide sealant around all louvers and electrical service penetrations. \$2,000

3.4 ROOF

Description:

Excerpts from the Russo Barr Engineering report:

3. RALPH WHEELLOCK SCHOOL

The Ralph Wheelock School is a multi-story, steel framed building with brick masonry walls and pre cast concrete window panels. The total area of roofing is approximately 48,000 square feet. There is one type of roofing at this site: modified bitumen built-up roofing with gravel surfacing (BUR). There have been sporadic leaks throughout the facility. There are no active leaks reported. Sporadic repairs have been performed on most areas of the roofs.

A. BUR Roofs

The modified bitumen built-up roofing with gravel surfacing, appears to be over 20 years old. The condition of the BUR roofs is poor. Built-up flashings at metal roof edges are separating from the sheet metal and seams are failing at curbed penetrations. Walkway pads are curling. Skylight domes are aged, cracked and deteriorated. Recent boiler installations included new flue penetrations that are poorly flashed. Slope to drain is minimal at best. Several gutters were bent by trespassers. One access ladder leading to the Auditorium roof is loose.

There are many canopy roofs consisting of cast-in place-concrete only. At least one of these canopies leak. We recommend that a liquid applied coating be applied to the weathering surfaces of these canopies.

This roof is near the end of its service life. Complete removal and replacement within 1 year is recommended.

B. Recommendations

Short Term: Short-term repairs should include the following:

- Replacement of failed base flashings.
- Replacement of defective skylight domes with fall protection.
- Properly flash recent boiler flue penetrations.
- Secure loose access ladder.

The estimated cost to perform short-term repairs and investigations is **\$20,000 to \$25,000.**

Long Term: Long-term repairs should include the following:

- Promptly remove and replace all BURGS roofing and underlying insulation. Tapered insulation will be required at some areas.
- Remove and replace all roof drains. Snake all roof drain lines.
- Remove and rebuild disrupted brick masonry. Repoint defective mortar joints.

The estimated cost to perform long-term repairs is **\$1.2M to \$1.5M.**

Recommended repairs:

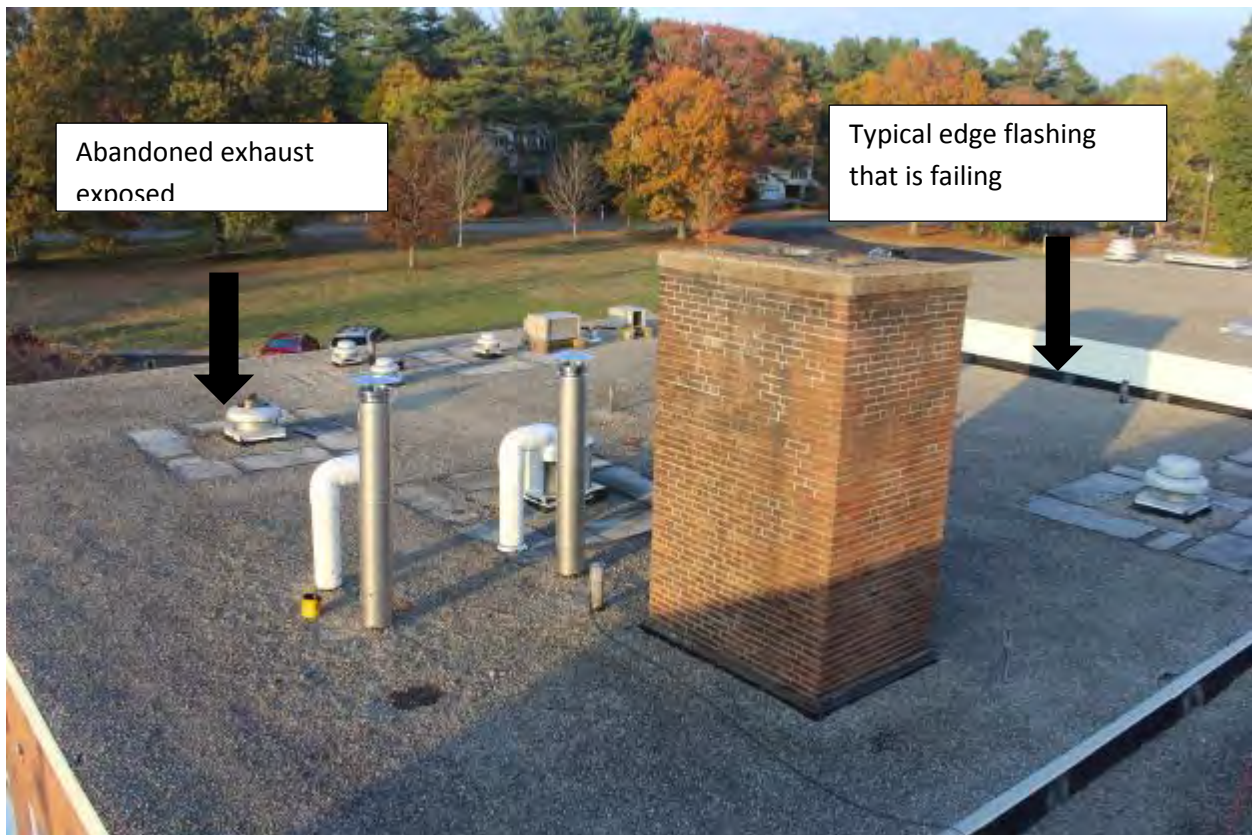
Short term repairs should budget \$10,000 yearly until roof replacement is made.

Roof engineer: \$150,000

Roof replacement: \$1,500,000



BUR roof Thinning stone ballast, walk pad failing, curb flashing is separating from vertical rise.



PHOTOGRAPHIC DOCUMENTATION of RALPH WHEELLOCK SCHOOL, MEDFIELD, MA

2.2 PAVING, PARKING, DRAINAGE



Main Entrance with no 5' level landing and non-compliant slopes. Continuation of egress path into driveway should have cross walk markings



Showing poor condition of paving on west side and routine parking on lawn areas



Showing front driveway / parking area with dislodged curb stops and lack of pavement markings



Showing deteriorated pavement and pothole at rear driveway area



Deteriorated paving at egress path from exits



Poorly constructed curb cut and worn pavement markings



Egress door lacking 5' level landing before slope to curb cut, and deteriorated paved walkway



Accessible parking spaces lacking pavement markings & non-compliant sign height



Signage needing repairs



Showing lack of pavement markings and excessive slope at accessible parking space



Showing tripping hazard lip at edge of ramp and non-compliant rail system at After School Center

2.3 LANDSCAPING



Showing unenclosed dumpsters in visually prominent location



Showing excessive slope in basketball play area



Showing lack of accessible route to ballfield from parking and lawn area used for parking



Showing non-accessible picnic area and berm obstacle around play area beyond

3.1 FOUNDATION



Showing deteriorated concrete steps, lack of handrail and areas needing paint



Showing lack of 5' level landing at egress door and HM frames needing paint



Another example of no 5' level landing at egress doors, currently poorly patched with bituminous



Another example of no 5' level landing at egress door

3.2 SUPER STRUCTURE



South elevation showing typical façade treatment of windows/ brick / precast and covered entry



East elevation showing brick veneer and covered entry and curb cuts



West elevation showing loading dock area



Rusted metal components at covered truck dock (West)

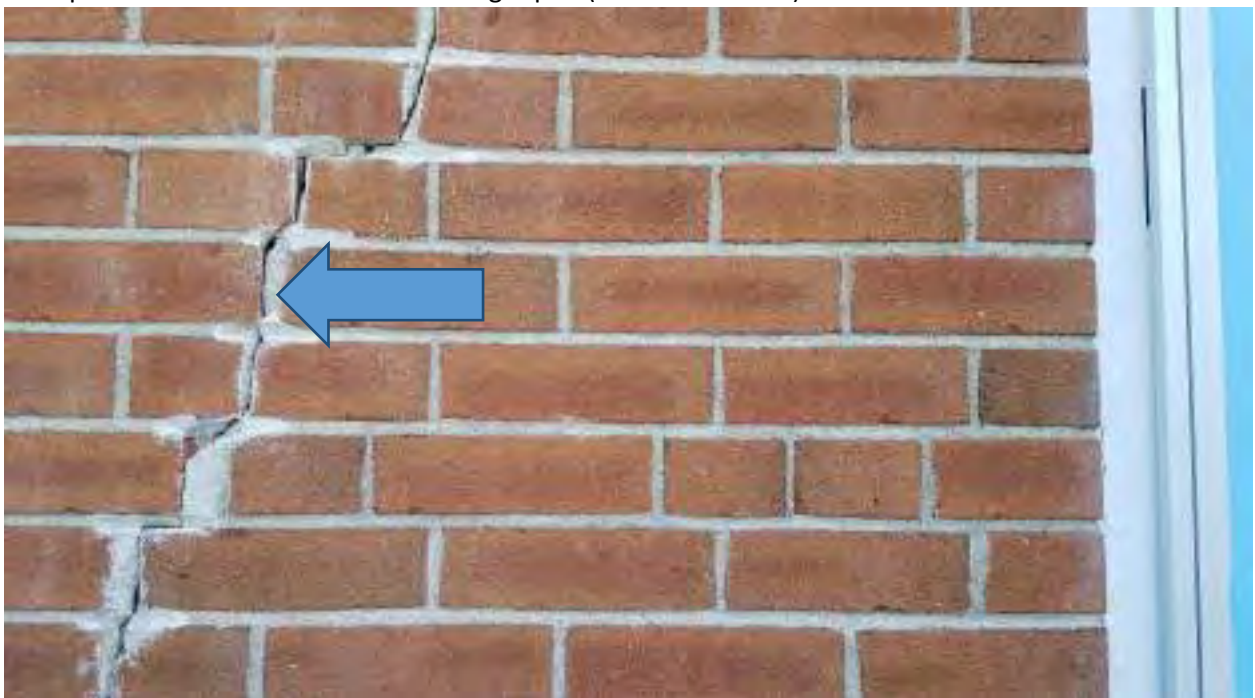


Outdated incandescent fixture and water-stained ceiling of covered entry

3.3A FAÇADE (BRICK/PRECAST)



Example of cracks in brick veneer needing repair (north elevation)



Example of cracks in brick veneer needing repair (west elevation)

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Example of brick veneer exterior surface condition needing cleaning & sealing



Showing water penetration through concrete entry cap deteriorating brick (efflorescence shown)



Signs of water infiltration and associated brick damage (previously repaired) and mildew on flashing



Example of brick penetrations needing sealant (west elevation)



Example of abandoned exterior fixtures that should be capped or removed and infilled with brick





Example of old fasteners that should be removed and patched with mortar or caulking



Another typical example of porous concrete entry cap that has caused brick deterioration

3.3 B FENETRATIONS



Typical entry showing non-compliant door latching hardware and hollow metal frames needing paint



Another example of accessible entrance needing compliant latching hardware



Showing delaminated veneer on garage doors



Another example of non-compliant hardware and previous repair of brick damage



Typical window with single-pane, uninsulated glass



Potential hazard of protruding air-conditioner along walkway



Poor installation of air-conditioner using scrap wood- potential to damage window glass



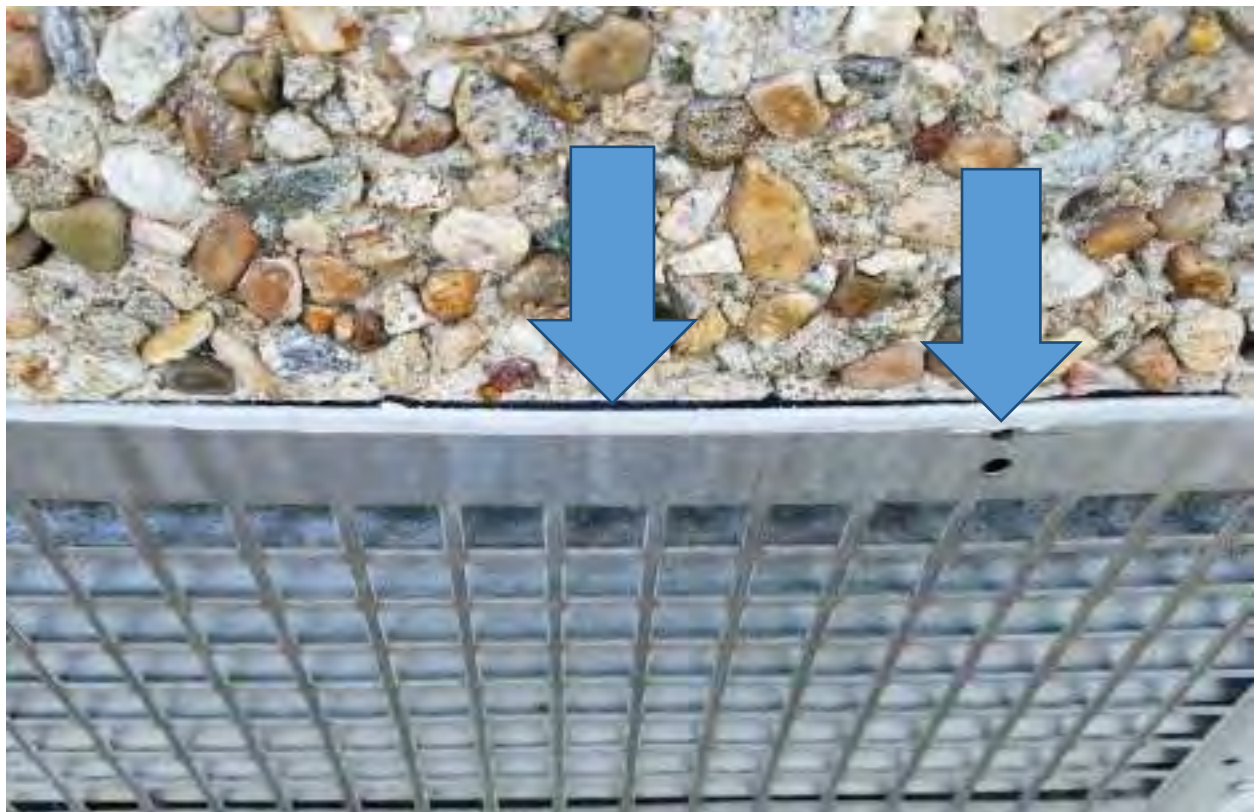
Typical rusted condition of second floor UV louver hood needing replacement



Example of mechanical louver needing repair/replacement



Mechanical louver needing replacement



Gaps around UV louver needing refastening and new sealants



Typical horizontal joint needing to be resealed



Typical joint between precast and brick needing to be re-sealed

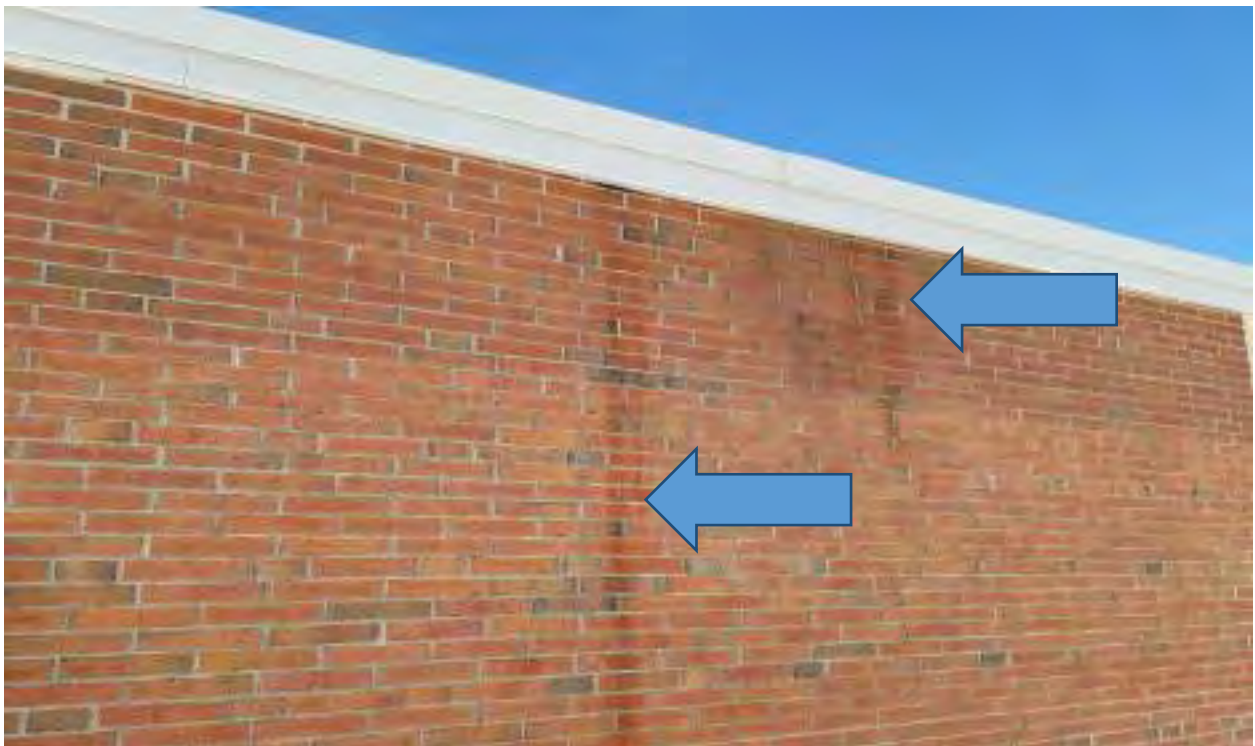


Typical joint between precast members needing to be resealed

3.4 ROOF



Showing stains from water infiltration from above / unsecured electrical conduits and moist brick



Additional example of moist brick from apparent leak in metal coping system above



Sloped concrete entry cap with no protective membrane and no flashing to vertical brick surface – also signs of brick deterioration and previous repairs



Poor roof flashing transition and open brick joints needing repair (north elevation)



Another example of poor flashing transtion (South elevation)

3.6 ADA Compliance

The Americans with disabilities Act (ADA) and the State of Massachusetts Accessibility Code governs public accommodations and commercial properties. This report will only look at accommodations and access to public facilities that are equal or similar to those available to the general public. This report will identify areas of non-compliance, or will be in compliance if upgrades and renovations are made to the facility that trigger mandatory resolutions. However this report is not a full ADA or Accessibility Code assessment. Being "Public" facilities, upgrades to allow for employee or the general public need to be addressed to meet the provisions of Title III of the ADA Act.

Condition: Meets basic needs, but if upgrades or change of use of the facility is to occur a separate toilet facility and door hardware would need to be modified. There are some interior doors that may need to be widened or have door openers installed. All joint children's bathrooms between classrooms are non-compliant. There is not enough room to make these units compliant. Decision must be made as to what is the future of these bathrooms. Major renovation, under the Mass. State Building Code will require these bathrooms to be addresses.

Perform a full ADA compliance evaluation in conjunction with a full use and needs assessment to determine future course of action with this building. \$20,000



Current undersized bathrooms at classrooms. Non ADA compliant and operationally extremely small.



Gang bathroom retrofit for ADA compliance. Removed an adjoining toilet and installed handrail bars

3.7 Interior Finishes and Components

Typical Interior Finishes			
Area or room	Floor	Walls	Ceiling
Gym	synthetic	CMU Block painted	Gypsum deck
Offices	VCT tile over ACT tile	Sheetrock/plaster	Plaster ceiling/metal lathe
Bathrooms	Ceramic tile	Ceramic tile	plaster ceiling
Classroom	VCT tile over ACT tile	CMU block and plaster, glued on acoustical ceiling tile was applied to block walls to mitigate sound.	plaster ceiling

Conditions:

All rooms appear to be in good to fair condition. All areas show normal wear for a building of this age.

Painting of walls and trim is recommended on a regular basis as part of routine maintenance.

Replacement Reserves are recommended for interior refurbishment.

Interior doors appear in fair condition. Handicap accessible hardware should be installed to meet handicap compliance. In a major upgrade some doors will require variances or the addition of automatic door openers.

Flooring was observed to be in fair condition. However, it should be acknowledged that ACT(asbestos containing tile) in the offices and classroom has met its life expectancy. In several classrooms, the VCT tile is lifting and the existing damaged ACT tile is exposed. Any work/replacement of floors should be done with the knowledge of this material exists.

All plaster appears in relatively good shape.

Cabinetry within the classroom has exceeded its life expectancy. The wood has been damaged and some plywood assemblies have begun to delaminate.

Bathroom ceramic tile was painted over with what appears to be an epoxy deck paint. The paint is failing making the bathroom appear not to be clean.

Recommended Immediate Repairs, Near Term Repairs, or Replacement Reserves:

Replacement of acoustical tiles would aesthetically improve the general look of the space. \$50,000

Replacement reserves for removal and replacement of ATC (asbestos) floor tiles. \$500,000

Upgrade classrooms to address the work and “tired” looking interiors. \$20,000 per classroom
\$1,000,000 total

Replace all bathroom floors. \$300,000

4.0 BUILDING SYSTEMS

4.1. *Plumbing*

Description:

The observed supply piping is copper, and the waste lines are cast iron. The plumbing fixtures are vitreous china with chrome trim. The Heat Maker water heater is nearing the end of its life cycle and reportedly serves the needs of the building. Piping has areas wear staining and discoloration indicates that the pipe is reaching the end of its life cycle. Many of the shut off valves are frozen in the open position do to age and the corrosive nature of the water supply. These valves need to be replaced as a safety measure to protect the building in case of a plumbing failure. Filtration and testing are regularly performed due to the trace elements of lead in the water.

Welded and threaded black iron pipe is used for gas piping within the subject property.

All toilet rooms and adult bathrooms are undersized to the current code requirements.

Condition:

Water heater condition is in fair. Replacement should be budgeted within the next five years. Life span for water heaters is generally 15 years. Due to all the minerals in the water, the piping and balancing valve assembly has failed.

Recommended Immediate Repairs, Near Term Repairs, or Replacement Reserves:

Replacement reserves for replacement of water heater \$80,000

Replacement of all zone shut off valves that are frozen open. \$10,000

Replace supply piping, zone valves, shutoffs throughout the building due to corrosive water, remove lead content most likely found in the soldered joints. \$200,000

4.2 *HVAC*

a. Heating Plant

Description:

System is a gas fired 2016 Lochivar energy efficient boiler that supplies hot water to a hot water heating loop. The loop feeds two large AHU units in the gym, fan coil units throughout the building classrooms, and radiant baseboard in the small office areas and corridor.

Condition: good to fair

As reported the new boiler plant is less than 1 year old. A 20 year life cycle for a boiler is industry standard. The hot water pumps are new units with VFD drives to promote energy efficiency. There is some concern that the supply piping that distributes water throughout the building may require systematic valve. The valves in many locations are frozen open and will not allow for shutting off zones or equipment in the case of failure.

b. Distribution system (VAV, FCU, exhaust)

Large Gym has two ceiling hung AHU units that are original to the building. The operational units are large and appears oversized for the current use. The concern is the units have exceeded their life expectancy. Component replacement of motors, bearings, and coils should be anticipated in the near future.

The East or “mango” gym ceiling hung fancoil unit over the door have had component failure and replacement. The units have exceeded the life expectancy.

The classrooms are heated using original Nesbitt Fancoil units. These units are simple controlled heat actuated units that the blower motor is manually controlled by the teacher. The blower motors have been regularly failing because of age. The concern is the valving of the hot water is old and in many cases frozen to the open position.

Hot water piping generally appears in fair condition. . The concern is several zone valves are simply frozen open. These above ceiling locations have small access panels making replacement extremely difficult without the removal of portions of the metal lath ceiling. Several valves have mineral build-up which may indicate slight leakage. The concern is deactivated valves gasketing could dry up leaving the valve inoperable. Decommissioned piping could be rusting on the inner walls, affecting the condition and future use of the piping. Several areas at elbows and joints appear to have asbestos pipe insulation. While the state of the insulation appears intact, future work may require removal of this insulation.

Description:

Hot Water supply pumps: The main boiler room pumps are newer units and in good condition. The outlying pumps in the office side of the building appear to be older units.

Radiant Base Board: Remainder of the smaller spaces is heated with radiant baseboard convection which is locally controlled through a thermostatically active flow valve.

Other classroom areas are serviced by window mounted air conditioning units that appear old, inefficient and provide little benefit to the overall space.

Temperature control system is a pneumatic compressed air system that ties back to a basic Johnson Controls Energy Management control. The system acts as a time clock to determine occupied and unoccupied mode, and helps the new boiler installation regulate base on outdoor air.

Condition:

The boiler plant and main distribution pumps are in good condition.

GYM AHU's are in fair condition. The age of the unit (46 years) dictates that a thorough investigation be a mechanical contractor take place. The heating coil may show signs of the copper walls thinning and require replacement. Motor (assuming it has not been replaced), has long past its life cycle of 20 years. Flow and actuator valves are also past its life cycle.

The pneumatics compressor is in fair shape. The pneumatic line, thermostats and actuators while operational have exceeded the life expectancy of the equipment. Partial component failure and air leakage appear to be the cause of excessive run time on the compressor.

Recommended Immediate Repairs, Near Term Repairs, or Replacement Reserves:

Engineering review of the building is strongly recommended , all classroom units have exceeded their lifecycle and upgrades may be done in a comprehensive renovation. \$50,000

Replacement of failed or frozen valves is an immediate repair to assure operation in case of failure during the winter. \$10,000

The AHU unit in the gym should be evaluated. Component replacement of bearings and motors needs to be anticipated. 30,000

Replace pneumatic temperature controls. 100,000

Systematic replacement of the room fancoil units \$7,000 per classroom

4.3 Electric

Description:

The 1200 amp. The building has had little renovation or upgrades and therefore appears to be adequate for the building. All observed subpanels, outlets and power feeds appear to be in adequate shape.

Then classroom spaces, computer room spaces, and general overall electric outlet distribution is inadequate. Most classrooms have just three outlets in the room, with many of the rooms using power strips to provide power to a modern classroom use. The computer room servicing 20 approximately computers, relied on several power strips to energize the computers. Although working, this reliance on the existing power to address this near capacity circuit is not good practice.

Condition: Fair

The main electric panel and subpanels all have breakers.

Recommended Immediate Repairs, Near Term Repairs, or Replacement Reserves:

Near term repair is to have an electrical specialist survey company inspect all circuit breakers or operation and effectiveness. The pro-active survey will determine if there are any circuit breaker concerns. Table 1

Assess classroom needs for power distribution and upgrade accordingly. Electrical engineer
\$20,000

Electric upgrade rooms. \$200,000

4.4 Building Fire Suppression, Fire Alarm and Life Safety

Description:

No Fire Suppression exists

Fire alarm system is a basic multiple zone Fire alarm control panel, hardwired smoke and heat detectors and pull stations.

Life safety items such as battery backup exit lights and emergency lights exist throughout the structure.
Fire extinguishers are strategically located around the facility.

Condition:

If the Town has plans to significantly upgrade the facility and use, replacement of the fire detection system per MSBC/IBC with additional coverage would be required.

Recommended Immediate Repairs, Near Term Repairs, or Replacement Reserves:

Replacement Reserves should be planned for to replace main fire alarm panel and components.
\$15,000

5.0 CODE/OPERATIONAL CONCERNS

Description:

Asbestos: Based on age floor tiles and AHERA Report most areas are to be considered to be Asbestos containing material. (ACM) The town should also assume ACM materials exist in the glue which bonds the tile to the floor and all pipe insulation. \$500,000

Window caulking/ expansion joint materials in buildings constructed in this time frame should also suspect as ACM materials. Based on the amount of hazardous material found in the window replacement done three years prior, it could safely be assumed that this material exists in the remainder of the windows and doors. \$200,000

Energy consumption: The construction of building in 1960's had little thought for energy conservation.

Wheelock School

CAPITAL PLANNING BUDGET

System	sq ft 65,190																					
	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2032	2034	2035	2036	2037	2038	
Site work																						
2.2 Various site work Design/Master plan			100,000																			
2.2 Paving							300,000															
2.2 walkways				10,000			100,000															
2.3 Cut back trees on site																			10,000			
2.3 ADA access site			50,000																			
Building envelope																						
3.1 Kitchen loading dock																						
3.3 Façade																						
3.3 Brick façade engineering				40,000																		
3.3 Brick façade repair					400,000											5,000					5,000	
3.3 Sealant replacement					200,000						5,000											
Windows																						
3.3 windows curtain wall café																					7,000	
3.3 sealants																						
3.3 auditorium fire vent																						
3.3 Repair window arms/operation															40,000							
Door																						
3.3 Metal doors			50,000						5,000					5,000						5,000		
3.3 door hardware				30,000																		
3.3 Door replacement				6,000																		
3.3 Doors (interior)				20,000																3,000		
3.3 Weatherization				20,000				10,000		3,000		10,000		3,000			3,000			20,000		
3.4 ROOF																						
engineering roof				150,000																		
roof repair	5,000	5,000	5,000	5,000												5,000			5,000			
Roof replacement					1,500,000																10,000	
3.6 ADA Compliance				10,000																		
3.7 Interior																						
Carpet (15+ years)			20,000														20,000					
VCT flooring (includes asbestos removal)						15,000		15,000			15,000			15,000			15,000		15,000			
Upgrade built in furniture						20,000		20,000	40,000		20,000			20,000			20,000		20,000			
Paint						3,000		3,000			3,000			3,000			3,000		3,000			
Bathroom floors replace						20,000		20,000							10,000						10,000	
4.1 Plumbing																						
Fixtures			5,000							2,000		1,000										
regROUT tile					8,000			8,000			2,000											
Replace tempering valve			10,000																			
Replace Hotwater heater			80,000																			
Replace water shut off valves	15,000		15,000					5,000			5,000			5,000				80,000				
Replace dishwasher			30,000																			
4.2 HVAC																						
Boiler 2016											10,000						500,000					
ATC computer controls													40,000								40,000	
HVAC engineer			40,000										20,000									
Fluid pumps																						
gym units				10,000							4,000								4,000			
Valves fan coil units				30,000										200,000								
Backflow preventers				2,000																		
Duct Cleaning									2,000						2,000						2,000	
Fan coil units 45 units						5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	
4.3 Electrical																						
Branch circuits testing			10,000																			
redistribution upgrades			20,000	8,000							100,000											
Fire Alarm										20,000											15,000	
5.0 Code operational																						
Asbestos removal (component removal)			10,000	100,000																		
Total Yearly Expenditure	20,000	5,000	455,000	431,000	2,171,000	20,000	405,000	86,000	52,000	44,000	155,000	16,000	65,000	256,000	47,000	40,000	566,000	85,000	19,000	76,000	94,000	
2018	3.0%	\$25,335	\$6,524	\$611,482	\$596,605	\$3,095,327	\$29,371	\$612,599	\$133,985	\$83,445	\$72,725	\$263,877	\$28,056	\$117,397	\$476,235	\$90,057	\$76,644	\$1,150,561	\$177,971	\$40,975	\$168,818	\$215,065

BLAKE MIDDLE SCHOOL



Location: 24 Pound Street

Year Built: 1960/ renovated 1995

Condition: Good

Assessors: Map 38 Parcel 001

Building area: 111,310 sq ft

Land area: 61.49 acres

1.0 PURPOSE and LIMITATIONS

The purpose of this Property and Conditions Report (the Report) is to assist the Town of Medfield to assess the general physical condition and maintenance status of the property and to recommend repair and maintenance items considered significant for the property to continue its current operations.

The information reported was obtained through sources deemed reliable, a visual site survey of areas readily observable, access through building “owners” and information presented by the Town. Findings, conclusions, and recommendations in this Report are based on the methods described above, industry standards, and general observations of the equipment and its visible condition.

The report is focused on existing conditions, lifecycle of existing materials, and non-code compliant conditions. Recommendations will include items needed to bring the space/component to a safe, code compliant, and generally accepted facilities condition. The Report does not anticipate change of use, reconfiguration of space, or change in current program.

Estimated Costs are based on professional judgment and the probable or actual extent of the observed defect inclusive of the cost to design, procure, construct and manage corrections.

1.1 Condition

The Report uses terms describing conditions of the various site, building and system components. The terms used are defined below. It should be noted that a term applied to an overall system does not preclude that a part, component, or section of the system may be in a different condition.

Excellent	The component or system is in new or like new condition, and little or no deferred maintenance is recommended, or the scheduled maintenance can be accomplished with routine maintenance.
Good	The component or system is in sound condition and performing its function. It may show signs of normal aging or wear and tear, and some remedial and routine maintenance or rehabilitation work may be necessary.
Fair	The component or system is performing adequately at this time but is obsolete or is approaching the end of its useful life. The component or system may exhibit Deferred Maintenance, evidence of a previous repair, or workmanship not in compliance with common accepted practices. Significant repair or replacement may be recommended to prevent further deterioration, prevent premature failure, or to prolong its useful life.
Poor	The component or system has either failed or cannot be relied upon for continued use performing its original function, exhibits excessive Deferred Maintenance or is clearly in a state of disrepair. Repair or replacement is recommended.

Middle School

1.2 Abbreviations

The Report may use abbreviations to describe various site, building, or system components of legal descriptions.

ACT	Acoustical Ceiling Tile	GFI	Ground Fault interrupt (circuit)
AHU	Air handling unit	GWB	Gypsum Wall Board
BTU	British Thermal unit (heat measurement)	HVAC	Heating, Ventilating, Air Conditioning
CMU	Concrete Masonry Unit	HWH	Hot Water Heater
EDPM	Rubber membrane roofing	MDP	Main electrical distribution panel
EUL	Expected Useful Life (life cycle)	PTAC	Package through wall A/C unit
FCU	Fan Coil Unit	RTU	Roof top Unit
FHA	Forced Hot Air	MSBC	Massachusetts State Building Code
IBC	International Building Code	VAV	Variable Air Volume box
ACM	Asbestos containing material	VCT	Vinyl Wall covering (floor tile)
ADA	Americans with Disabilities Act	MAAB	Mass. Architectural Access Barriers

2.0 SITE CONDITIONS

2.1 Topography

Description:

Site is a flat and treed along the rear. Actual building site sits slightly above the road elevation. Large shared Playing fields about the property.

Condition and Observation:

Recommended Repairs: See 2.2

2.2 Pavement, Parking, and Drainage Structures

Description:

Site is paved to accommodate the use. Parking and access appears adequate.

Condition and Observation:

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Asphalt area in general looks in good shape. Areas of wear and asphalt degradation can be observed in the area of the bus circle. The heavy wear in this area will require a monitoring and spot repair. Other areas of the drive/parking require crack sealing and relining of pavement marking.

Recommended Immediate Repairs, Near Term Repairs, or Replacement Reserves:

The bus drop off circle of the parking lot will need spot repair and crack sealing. Cost \$10,000

2.3 Landscaping

Description:

Minimal landscaping exist. The flat site has lawn areas around most of the structure. The northwest corner of the lot has a fenced Baseball field. The east side of the building is open soccer/practice football field and softball fields.

Condition and Observations:

Trees in the south west corner of the school need some pruning to prevent branches from getting close to the access road and create other issues. Low shrubs in front are in need cut back and pruning.

The Court yard has a maturing deciduous tree and ornamental grasses. The area has no design focus. Front of the building has minimal landscape,

Recommended Repairs

Landscape designer to determine what is the best design of low maintenance materials to install In the courtyard to promote use. Evaluate the existing court yard tree to determine the best approach to pruning to prevent future damage of the building by the tree. \$10,000 for design

Landscape implementation \$50,000

Repair concrete sidewalks that have suffered damage due to age or excessive salt usage. \$10,000

2.4 Municipal Services and Utilities

a. Water and sewer

Medfield has its own water and sewerage

b. Gas

Columbia Gas

c. Electric

Eversource

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3.0 BUILDING CONDITIONS

3.1 Sub Structure/Foundation

Poured concrete foundation walls and poured slab on grade. The foundation walls are assumed to have spread footing.

Condition and Observation:

Generally the foundation appears to be in good shape. No visible sign of cracking or movement were observed.

Recommended Immediate Repairs, Near Term Repairs, or Replacement Reserves: None

3.2 Super Structure

Description:

The Building super structure is steel columns, beams, and steel roof trusses. The steel frame and cmu cavity wall structure supports the exterior brick façade. The older front section was built in 1960 and the masonry walls of the cafeteria and Gym are load bearing masonry.

Condition and observation:

The condition is in good shape.

Recommended Immediate Repairs, Near Term Repairs, or Replacement Reserves: None

3.3 Facades

a) Description Facades: (Brick, aluminum facia,)

The brick façade of the original 1960 steel and load bearing masonry is a solid construction with no cavity wall.

Steel lintels that support the masonry in several locations are rusting which is an indication that excessive moisture has reached the lintel. If not addressed, the rusting could begin to swell the steel lintel causing upward as well as lateral force on the brick façade. This continued expansion forces result in mortar joint failure, brick and mortar joints breaking and further exposing the brick and facade to excessive moisture. (see roof)

The cast concrete sills at a number of the window locations have had the mortar joints fail. The mortar has separated or have fallen out of the butt joint. Rain and exterior moisture running of the window face saturates this concrete sill, and with the exposed butt joint has allowed for excessive moisture to enter into this brick assemble. Freeze/thaw cycles have created movement in this concrete lintel to the point where several concrete sills have moved out of

Middle School

position. This movement jeopardizes the integrity of the brick cavity wall at these window locations.

Weatherization study performed in 2014 identified a multitude of poor sealant, caulking, and construction details that have allowed for excessive air infiltration into the school. Beyond the energy savings, this air has contributed to rusting, material fatigue and paint failure

Recommended Immediate Repairs, Near Term Repairs, or Replacement Reserves:

Evaluation of the cast concrete sill assembly by an exterior envelop engineer is required to determine the integrity of the cast sill/brick façade, and solution as to best practices to address flashing and assembly. Evaluate all exterior façade concerns with regards to water penetration.

Exterior envelope consultant \$20,000 Exterior envelope repairs \$300,000

Implement the installation of sealant and weatherization measures in the Northern Energy Services 2014 report \$300,000

Remove rust and paint lintels to extend its life. \$40,000

Spot repointing of localized mortar joint failures. \$10,000

Condition: GOOD/FAIR

b) Description Windows and Doors:

The windows are double glazed energy efficient aluminum framed window typically found in commercial construction with a metal spandrel panel. These windows were replaced in the 1994 renovation and addition. Condition appears to be in Good condition, however need operational upgrades. Windows have an operable awning sash. The windows sashes have had extensive use since 1994, and many windows operational arms have bent or are worn to the point where smooth operation is not found. A program of arm replacement has occurred. Weathertight integral gasket ting of the windows sash has deteriorated and fallen out or worn to a point where replacement is required. Windows were not properly sealed along the casing and at the sill. Removal of the sill shows no air seal at the top of the brick and under the sill. Air infiltration is noticeable.

At the window buck frames the joint above the drop ceiling above the window system in the 100 section of the building was not sealed properly. Sealant was not installed between the top of window and structural steel. Air leakage has contributed to rusting and failure of the exterior panel.

All exterior caulking has met its lifecycle and is failing. Missing caulking, caulking that has pulled away from the masonry of aluminum frame, or caulking cracking exposes the window to

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exterior moisture and weather. Most joints could be considered not weathertight and have failed.

Cafeteria curtain wall system original installation appears not to be installed in a weathertight manner. Gaps exceeding 2" can be seen at the head of the curtain wall and under the structural steel. To prevent air infiltration, poorly installed after construction foam sealant was applied to prevent air flow. Detail investigation is required, but resealing this critical joint and the installation of a break metal "cap" over the entire joint to provide a better waterproof joint and protect the sealant is required.

Main entry is a double glazed aluminum commercial store front system typically found on commercial construction. Condition appears to be in good condition but all need weatherstripping and operational tune-ups.

Several door frames have rusting conditions occurring at the base of the frame. Rusting on a couple doors may require removal of the damaged area and re welding a patch. Weatherstripping of the doors has deteriorated and significant gaps can be observed.

Auditorium exhaust venting are metal framed, spring loaded vents that are operated on a fusible link and are a thru wall metal assembly. The units have had extensive weathering. The rusting of the metal has swelled the steel frame and has started to "delaminate" the steel. The units appeared not to be weather tight. Signs of moisture penetrating the frame/caulk joints and getting into the brick cavity can be seen by the extensive mortar cracking and separating from the brick.

Recommended Immediate Repairs, Near Term Repairs, or Replacement Reserves:

Life cycle of caulking and sealants needs to be inspected and evaluated. Removal and Replacement of the all caulking joints at the windows is required due to life cycle failure.
\$200,000

Address the cafeteria curtain wall head joint \$20,000

Evaluation of the Auditorium Fire Vent assembly by an exterior envelope engineer is required to determine the integrity assembly and flashing and develop a solution as to best practices to address flashing and assembly. \$100,000

Evaluate and replaced damaged window arms \$40,000

Remove rust on frames and repaint all exterior door \$50,000

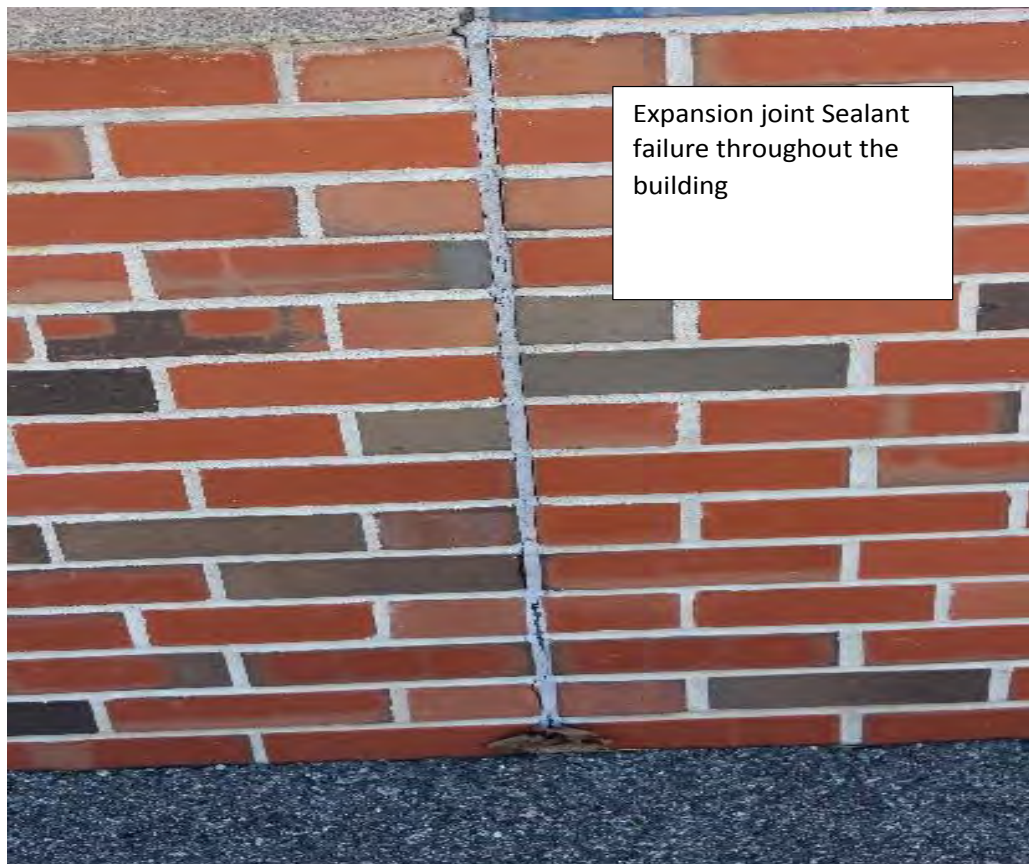
Replace and re-install weatherstripping at all door locations \$20,000

Weatherization, sealing, and caulking of the entire structure required to prevent air infiltration as an energy savings measure, and stop rusting conditions.

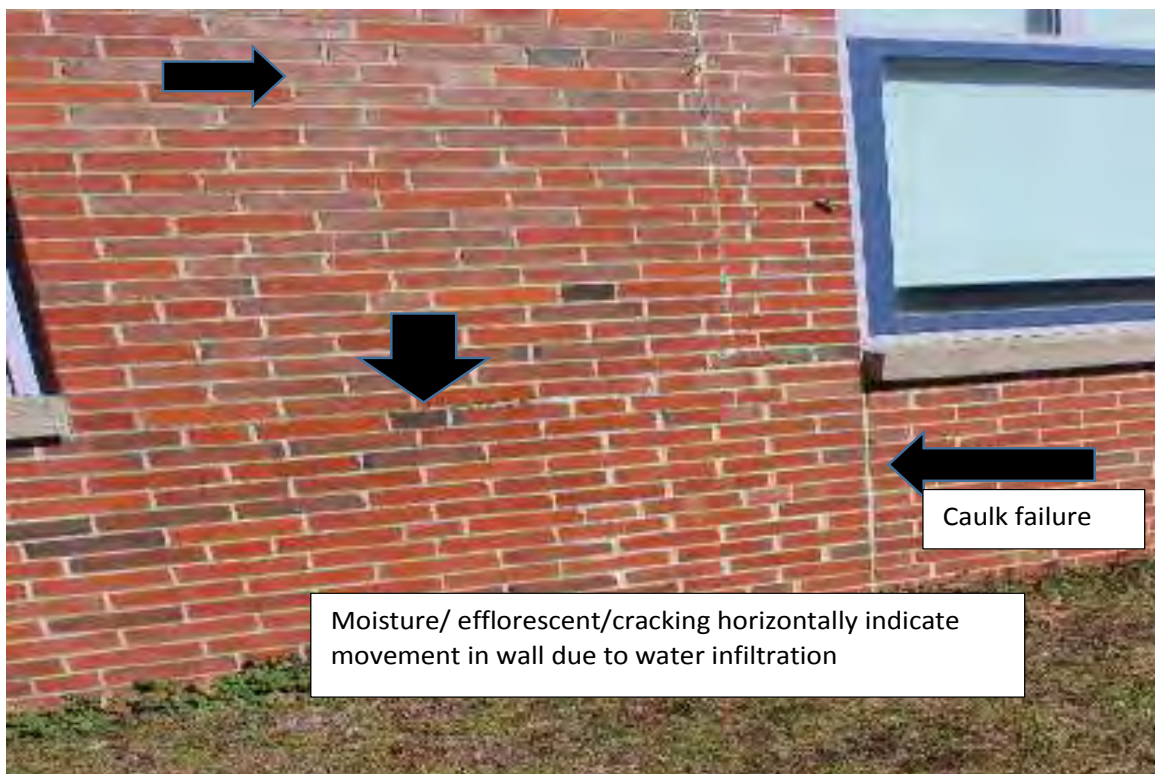
Middle School



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Expansion joint Sealant failure throughout the building



Caulk failure

Moisture/ efflorescent/cracking horizontally indicate movement in wall due to water infiltration

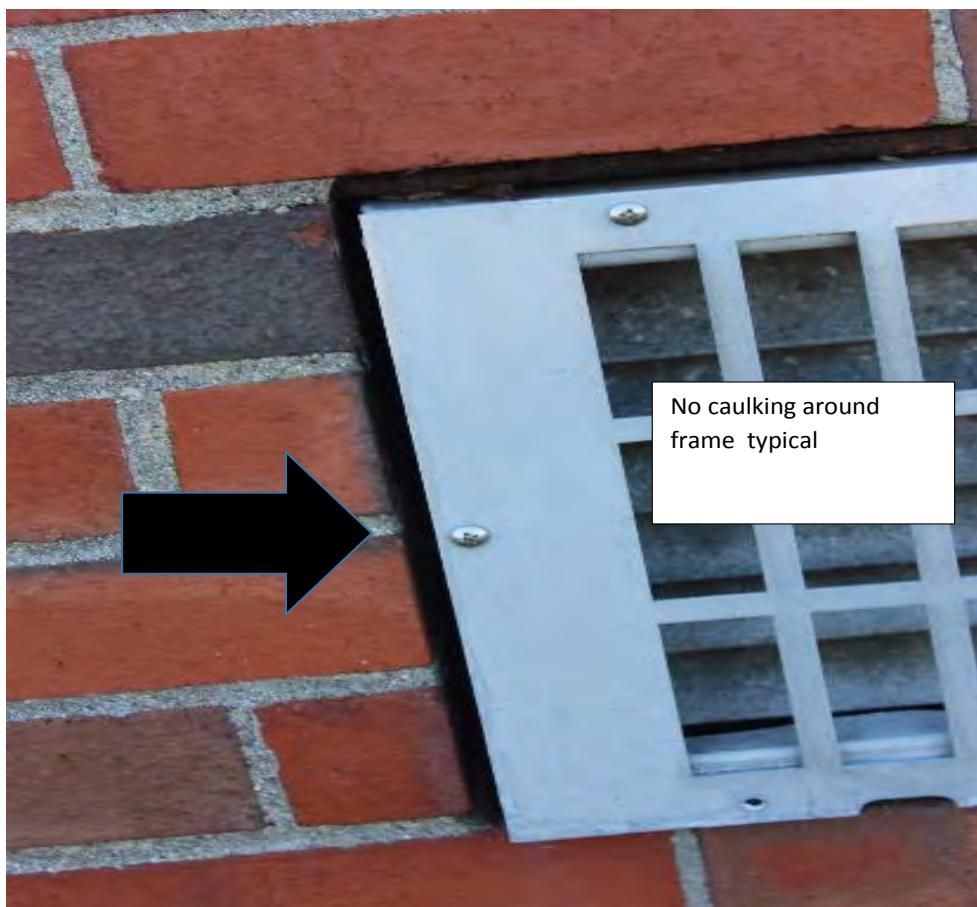
Middle School



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3.4 Roofing

Excerpts from the Russo Barr roof report:

OBSERVATIONS & RECOMMENDATIONS

1. BLAKE MIDDLE SCHOOL

The Blake Middle School is a single story, steel framed building with brick masonry walls and includes two additions of varying ages. The total area of roofing is approximately 125,700 square feet. There are two types of roofing at this site: adhered PVC and adhered EPDM (rubber). There have been sporadic leaks throughout the facility. Persistent leakage below the south and west walls of the original auditorium have been reported. Numerous and extensive repairs have been performed on all areas of the roofs.

A. PVC Roofs

The adhered PVC roof system covers approximately 114,000 square feet and is believed to have been installed in 1995 when the major addition was constructed. The PVC roof membrane is adhered to flat and tapered rigid board roof insulation that is attached to concrete plank or cementitious wood fiber roof decks.

The condition of the PVC roofs is poor to failed. Despite the use of tapered insulation and extended drain sumps, ponded water is evident on most areas except the sloped gymnasium roof. The PVC membrane is brittle and is cracked at many areas including joints in perimeter edge metal assemblies, at corners of curbs and at ridges at insulation joints. Underlying wet rigid board roof insulation is expected to exist in many locations. There are numerous repairs evident. There is debris that is clogging roof drain strainers and collecting in corners.

There are current leaks. Leaks are reported to occur adjacent to the original Auditorium. The south Auditorium brick masonry wall is extensively cracked and has failed sealant and mortar joints. The roof below this wall is tied to the wall using a reglet counterflashing detail that cannot intercept any moisture traveling within the masonry wall (not a throughwall flashing). Sealant applied to the reglet flashing is failed. This wall should be covered 100% with a watertight covering (sheet metal cladding or roof membrane) tied into the roof below. Leaks are also reported to occur along the west Auditorium wall and we believe the sources of these leaks are the low wall flashing heights and deteriorated smoke release vents located within the brick masonry wall. The south gutter serving the sloped gymnasium roof is leaking in several locations and we believe the cause of these leaks is failed seams.

Middle School

There are other defective building conditions that may lead to leaks but are not necessarily roof related. These defects include deteriorated brick masonry at the chimney, poorly pitched windowsill flashings that directs water toward the building and failed sealant joints applied to various wall components. Some insulated glazing that is part of the main entrance canopy is fogged/failed and although not a leak source, is unsightly. We observed an electric outlet that is hanging from a roof soffit and is not protected from the weather. Plastic skylight domes are brittle/aged.

This roof is near the end of its service life. Complete removal and replacement within 1 year is recommended.

B. EPDM Roof

The adhered EPDM roof system covers approximately 11,700 square feet and appears to be approximately 10 years old. The EPDM roof membrane is adhered to flat rigid board roof insulation. The condition of this roof is good except for one issue. There was a leak at a natural gas supply roof penetration. This penetration includes an elbow located approximately 3" above the roof surface that is very difficult to properly flash. A recent repair using bituminous roof cement apparently stopped water leakage for now but eventually, the bituminous material will degrade the EPDM roofing and the leak will resume. A proper repair could include removal of the bituminous material; reworking the gas supply line and installing a proper EPDM pipe wrap detail.

C. Recommendations

Short Term: Short-term repairs should include the following:

- Application of sealants to defective mortar joints in the south auditorium wall.
- Replacement of failed sealants related to reglet counterflashing.
- Application of sealant to splits in PVC flashing at roof edges and at curbs.
- Welding of PVC patches at splits in the gymnasium gutter.
- Reconfigure and re-flash the gas pipe penetration at the EPDM roof.

The estimated cost to perform short-term repairs is **\$8,000 to \$10,000**.

Long Term: Long-term repairs should include the following:

- Remove and replace all PVC roofing and underlying insulation. Tapered insulation will be required at most areas.
- Remove and replace all roof drains. Snake all roof drain lines.

Middle School

- Remove and replace low throughwall flashings. Clad certain deteriorated exterior masonry walls. Replace/relocate auditorium smoke release vents. Repoint defective mortar joints.
- Remove and replace skylight domes, defective insulated glazing panels and reconfigure windowsills.

The estimated cost to perform long-term repairs is **\$2.9M to \$3.4M**.

Recommended Immediate Repairs, Near Term Repairs, or Replacement Reserves:

Near term replacement is recommended. While not in failure, the roof replacement should be scheduled in 2-3 years on the PVC roof. Design \$350,000

Aggressive patch and repair program to address constant roof leaking yearly until replacement \$10,000

Complete roof replacement \$3,400,000



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3.5 Basements / Attics

Description:

NONE EXIST

3.6 ADA Compliance

The Americans with disabilities Act (ADA) and the State of Massachusetts Accessibility Code governs public accommodations and commercial properties. This report will only look at accommodations and access to public facilities that are equal or similar to those available to the general public. This report will identify areas of non-compliance, or will be in compliance if upgrades and renovations are made to the facility that trigger mandatory resolutions. However this report is not a full ADA or Accessibility Code assessment. Being "Public" facilities, upgrades to allow for employee or the general public need to be addressed to meet the provisions of Title III of the ADA Act.

Condition:

The current building is compliant. Upgrades address in the 1994 addition met the codes at that time for compliance. No non conformities were observed.

3.7 Interior Finishes and Components

Descriptions:

Typical Interior finishes:

Locations	Floor	Walls	Ceilings
Offices	Carpet	Painted sheetrock	Acoustical tile
Corridors	VCT	Painted CMU walls/ glazed block	Acoustical tile
Bathrooms	Tile	Painted sheetrock/ glazed block	Acoustical tile
Class rooms	VCT / carpet squares	Painted sheetrock/ painted CMU block	Acoustical tile
Library	Carpet	Painted sheetrock	Acoustical tile
Gym	Wood floor	Painted cmu	Exposed tectum panels

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Conditions:

Most areas are in good condition. Carpeted areas are showing their age and replacement is suggested. Replacement of the Main office carpet is required. Auditorium has carpet “pulls” and replacement should be planned for.

The VCT tile in the Cafeteria is in fair condition. The constant wear and tear of the cafeteria floor has cracked and loosened the vct tile. Periodic removal and replacement has been ongoing.

Classrooms with carpet squares have far exceeded their life expectancy. These carpet squares are over 20 years of age and the fibers of the carpet are so worn they have compressed and offer little benefit.

Recommended Immediate Repairs, Near Term Repairs, or Replacement Reserves:

Repair possible replacement of the cafeteria flooring. Observations indicate that the sub surface slab has defects that transmit thru the vct tile creating natural failure points on the floor Removal and proper subbase treatment is required. . \$20,000

Replace auditorium carpet runners \$10,000

Replace all carpet squares in all classrooms (assume vct) \$10,000 per classroom \$200,000

Repaint school interiors (refinish doors, frames walls) \$100,000 every 4 years

In various classrooms, replace the acoustical tile ceilings that have been damages or need upgrade due to age. \$50,000

LOCKERROOMS:

The locker rooms in the Middle school require a programmatic study to determine the need and use of this facility. The entire area appears to be underutilized, and used as a bulk storage area. For the intent of this report, the area will be viewed as a viable locker room.

All metal lockers appear to be operable, but through use, rusting, and interim cheap repairs, are in need of upgrades. Repair/replacement of damaged parts, Sandblasting and new electrostatic painting are required. \$40,000

Ceilings have spot areas which need repair and paint. \$10,000

All painted floors and tile work need substantial scrubbing, grouting, and paint \$100,000

Middle School

4.0 BUILDING SYSTEMS

4.1. *Plumbing*

Description:

The domestic service enters the building from the west side into the main water service/fire service area in the basement. The water service has a main backflow preventer and separate fire service valving. The observed supply piping is copper, and the waste lines are cast iron. The plumbing fixtures are vitreous china with chrome trim. The 1994 main gas fired hot water heater with two 1000 gallon water storage tanks with circulating pumps supply domestic hot water to the school. Welded and threaded black iron pipe is used for gas piping within the subject property.

Electric hot water heater with circulating pump supplies all eyewash stations in the science lab.

The main water tempering valves have heavy mineral deposits and appear not to be working properly. Flow and temperature balancing cannot be adequately adjusted to assure hot water is reaching remote appliances.

The locker rooms fixtures appear to have excessive mineral deposits, most shower units are deemed inoperable.

Recent energy studies have determined that the domestic hot water capacity is oversized for the existing use. Significant amount of energy is used to keep the 1000 gallons of water at 120 degrees. The system designed was based on a use as a high school, and oversized for middle school use.

Condition: Fair /poor

There were no reported or observed problems with the plumbing size, operation or capabilities of the building in general. Many shut off valves and faucets have mineral deposit build up due to corrosive action between the water and the piping. These shut-offs provide no safety if water leaking occurs down stream. The locker room is minimally used by the middle school students. Many of these fixtures have the faucets and valves have restricted water flow.

The Domestic hot water heater is nearing its life expectancy of 25 years.

Recommended Immediate Repairs, Near Term Repairs, or Replacement Reserves:

Replace the water tempering valve assembly and pumps \$20,000

Replace Domestic hot water heater \$200,000

Replace water shut off valves throughout the building that are frozen due to mineral deposits.
\$20,000

Replace all men's and women's showers and shut-offs that are inoperable. \$20,000

Middle School

4.2 HVAC

a. Heating Plant

Description:

The building is serviced by a gas fired HB SMITH package boiler plant in the mechanical room which supplies hot water to various AHU units to support the building and its classroom Fan Coil units. The units were installed in the 1993 with the original construction. The main supply pumps are also located in the space.

The main office, library, and learning center room are serviced with roof top air handling units (AHU) that provide both heating and cooling.

The gym, café, gym support areas and auditorium have AHU units that both roof and ceiling mounted units that provide heat and air changes only.

Hot water tank is gas fired also installed in the 1995 renovation to the building and is located in the Mechanical room.

The building is controlled with a Trane building management system that relies on a pneumatic air system to open and control pneumatic actuators (1993 install). The system upgrade occurred in the 1996 renovation and is controlled at the High School head end equipment.

Condition: Fair

b. Distribution system (VAV, FCU,, exhaust)

Description:

The building is supplied with conditioned air through three air handling units that provide conditioned air in three zones. The communications/IT closet on the second floor requires year round air movement to cool the equipment.

Exhaust fans and in the gym(an open roof mounted barometric damper) are relied on to exhaust make up air. This early and simple design is a huge energy loss. The fans are large and over designed. The barometric damper passive exhaust in the gym allows for excessive cold air to enter the gym in the winter. This excessive cold air was witnessed during heavy wind conditions, where the gym could not attain temperatures in excess of 60 degrees despite full heat operation.

Kitchen has an originally gas fired Resnor unit (1960) is a make up air unit. The unit supplies and exhaust air in the kitchen area. The unit has had recent repairs done to the fire chamber. The blower motor has had repairs to the frame. Unit has exceeded its life expectancy.

Gym: the two Nesbitt ceiling mounted Nesbit units are original installation. Units were converted steam to hot water in 1993. Component failure with the unit is being to materialize. Bearing replacement on *Middle School*

blower motors is scheduled. A complete overhaul needs to be anticipated. AHU roof units that service the weight rooms, gym offices, and locker rooms are newer Trane units and are in good shape and need only a commissioning.

The Home economics area has exhaust for the clothes dryer that was tied into the old kitchen stove exhaust system. The system duct work was never completed in the 1995 renovation and stops short of the exterior discharge location allowing outside air to freely enter the building. This is a poor installation. Duct should be direct to the exterior. Re-evaluation of the duct work in this room is required to properly distribute and terminate uncompleted assembly.

The main office, library, learning center room units were installed in 1993 and must be considered for a major overhaul. The units have a cooling component that uses R22 refrigerant. These units and associated duct work have not been properly insulated, It is readily observed that repairs have been attempted to prevent condensate leakage. These areas also have been reported to have poor local controls and air balancing. Overheating and cooling is a constant problem since installation. A 1999 study reported these same inconsistencies within the building. To compound the problems, re-allocation of spaces and uses within the space never took in account the hvac design.

Classroom air conditioners: As quick fixes to address student/teacher needs, window air conditioner units have been installed in approximately 15 locations. The existing aluminum window frames are altered, and the unit are installed. The units provide no thermal barrier in the winter and a big source of heat loss. The window units are not a long term repairable item and are considered a throw away when the break down because the replacement cost equals a service all.

Condition: Fair

The building distribution of the HVAC and hot water was also installed during the 1996 construction project. The building is a combination of heated air in common areas and a fan coil units in the classroom as the heat source.

The communications/IT closet on the second floor does not have enough supply or exhaust air to cool the space. Ceiling tiles were removed from ceiling to allow hot air to leave the machine space.

Recommended Immediate Repairs, Near Term Repairs, or Replacement Reserves:

General comment - many of the components of the HVAC system are nearing the end of the lifecycle. Motors, pumps, BMS control software lifecycles are 10 to 15 years. The Middle School has experience some of these components failing due to age. A system component replacement budget needs to be implemented. Pumps, actuators, motors, condenser/contactors should be planned for replacement in the near term.

Immediate replacement/upgrade of the energy management system should be addressed. Upgrade of the system is required, and re-commissioning should be addressed during this

Middle School

upgrade to assure proper operation of the HVAC equipment. (Utility supplier may offer some rebates for this upgrade/re-commissioning work) \$40,000

A complete engineering review of the HVAC system to develop solutions to correct long standing design, operation and control issues. \$20,000

Replace gym barometric passive air exhaust with a CO2 motorized damper operation as a major energy savings /heat loss prevention measure. \$15,000

Replace the pneumatic compressor and tanks that control the hvac controls. Excessive oil leak have occurred for several years and equipment is nearing life expectancy. \$15,000

Water heater is nearing its lifecycle and should be a near term repair before failure occurs. This in combination of the removal of the two 1000 gallon storage tanks could result in significant energy savings. \$300,000

The TRANE building management system is in need of updating and a recommissioning. The system was identified in an energy audit as a software version that needs upgrade. Generally the industry upgrades software and the communication platform every ten years. \$40,000

Roof top AHU units are in Fair shape, but components within the units (blower motors, furnace ignition/fire chambers) are nearing the life cycle. Replacement of components needs tom be anticipated and budgeted for.

4.3 Electric

Description:

1200 amp electric service with new sub panels installed in the 1995 construction project.

Emergency power is supplied by a natural gas fueled emergency generator system.

All interior lighting is direct/indirect fluorescent lighting. Exterior lighting is metal halide broadcast lighting. Lights have been added to insure security and safety. These installations were not done in a good manner. Plastic emt conduit was used and has distorted over time, resulting in the connections failing, exposed wiring readily observable, and operationally not energy efficient. Recent Energy studies identify this building as a candidate for lighting replacement for energy efficiency. The priority in addressing lighting should be complete replacement of the exterior lighting with LED lighting and replacement of all recessed can lighting with LED.

Condition:

All systems are in good condition.

Middle School

Recommended Immediate Repairs, Near Term Repairs, or Replacement Reserves:

Near term repair is to have an electrical specialist survey company inspect all circuit breakers or operation and effectiveness. The pro-active survey will determine if there are any circuit breaker concerns. \$10,000

Past renovations left abandoned or old sub-panels that have the “knock-outs” missing with older circuits that are not identified. Electrical “recommissioning” to cleanup and properly remove old or abandoned equipment. \$10,000

Upgrade all exterior lighting and poor installations with energy efficient LED lights. \$50,000

Upgrade and replace all interior lighting for energy efficiency. \$100,000

4.4 Building Fire Suppression and Fire Alarm

Description:

The property is protected by a multi-zone Fire Alarm control panel, hard wired smoke and heat detectors, pull stations, illuminated exit lights, emergency battery lighting units, horn/light enunciators, fire extinguishers, and full coverage 4” wet sprinkler system with check valves and tamper/flow switches. The Fire department Siamese connections are located on the exterior of the building.. A fire hydrant is located on a municipal sidewalks adjacent to the property. The sprinkler system and Fire Alarm control panel is reportedly tested annually.

Condition: GOOD

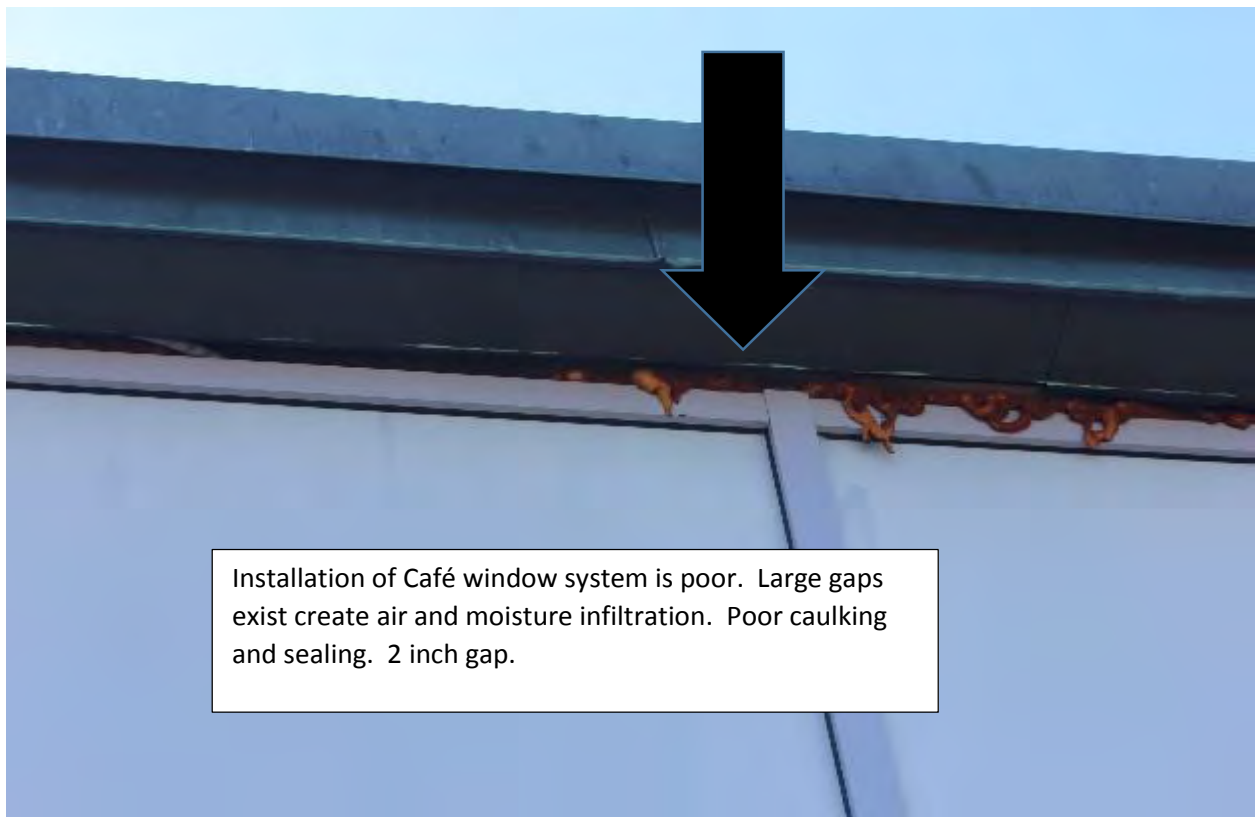
Recommended Immediate Repairs, Near Term Repairs, or Replacement Reserves: None

5.0 CODE/OPERATIONAL CONCERNS

Description:

Asbestos: Due to its age and AHERA testing, the building still has asbestos containing material in the building. The material currently is in good shape. All proposed work in the building must go thru testing process and if need be asbestos removal prior to work being performed. This issue must be factored in any estimate of work to be performed.

Middle School



Middle School



Middle School



Auditorium fire dampers. Rusted and not weather tight.



Ext view of auditorium fire dampers. Caulk failure, large air gaps, mechanical failure

Middle School



Middle School

Blake Middle School

CAPITAL PLANNING BUDGET

System	sq ft 111,310																					
	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2032	2034	2035	2036	2037	2038	
Site work																						
2.2 Various site work Design		10,000																				
2.2 Paving				10,000					10,000						10,000					10,000		
2.2 walkways								15,000														
2.3 Cut back trees on site			20,000																			
2.3 Landscape affecting buildings			50,000		70,000												5,000				10,000	
Building envelope																						
3.3 Façade																						
3.3 Brick façade engineering					20,000																	
3.3 Brick façade repair						300,000																
3.3 Sealant replacement masonry			20,000								10,000							10,000				
3.3 exterior painting				40,000											40,000							
Windows																						
3.3 windows curtain wall café						30,000															7,000	
3.3 sealants at window/doors			10,000			200,000											10,000					
3.3 auditorium fire vent						100,000																
3.3 Repair window arms/operation				40,000											40,000	10,000					10,000	
Door																						
3.3 Metal doors			50,000						5,000					5,000						5,000		
3.3 Doors (interior)										3,000				3,000			3,000			3,000		
3.3 Weatherization				10,000		10,000														10,000		
3.4 ROOF																						
engineering roof				300,000																		
roof repair	5,000	5,000	5,000	5,000																		
Roof replacement			10,000		3,400,000											10,000					10,000	
3.6 ADA Compliance																						
3.6 Replace HP door closers			12,000											12,000								
3.7 Interior																						
Carpet (25+ years)																						
VCT flooring (25+ years)			10,000	10,000	10,000		170,000		60,000	40,000												
Paint							100,000				10,000											
Acoustic ceilings							50,000					10,000			10,000				10,000		10,000	
Lockerroom lockers								40,000	40,000													
Lockerroom floors								100,000								10,000					10,000	
4.1 Plumbing																						
Fixtures												2,000									1,000	
regROUT tile																						
Replace tempering valve		12,000									2,000						2,000					
Replace Hotwater heater (1996)			200,000															200,000				
Replace water shut off valves			20,000																			
Replace All shower valves			15,000																10,000			
4.2 HVAC																						
Boiler 1994								100,000	800,000													
ATC computer controls			40,000																		40,000	
HVAC engineer			40,000																			
Fluid pumps																						
Roof top unit	6,000			10,000	12,000	10,000		4,000	4,000									4,000	4,000	10,000		
Valves (ahu/vav)			500	500	500							8,000					10,000					
Backflow preventers			1,000									500	500	500								
Duct Cleaning																						
Fan coil units 20 units						15,000	15,000															
Vent /exhaust fan					15,000																	
pneumatic compressor control	10,000						5,000							50,000								
4.3 Electrical																						
Branch circuits testing			10,000																			
lighting				15,000																		
service repair				10,000							10,000											
Fire Alarm										5,000											15,000	
Generator										10,000									200,000			
4.4 Fire Suppression																						
Comprehensive inspection and head replacement									10,000												5,000	
Total Yearly Expenditure	21,000	27,000	513,500	450,500	3,527,500	665,000	340,000	259,000	930,000	60,000	32,000	19,500	78,500	70,500	101,000	55,000	48,000	222,000	227,000	43,000	122,000	
2018	3.0%	\$26,602	\$35,229	\$690,101	\$623,597	\$5,029,372	\$976,575	\$514,281	\$403,514	\$1,492,377	\$99,171	\$54,478	\$34,193	\$141,780	\$131,151	\$193,526	\$105,386	\$97,574	\$464,819	\$489,546	\$95,515	\$279,127

HIGH SCHOOL



Location: 88R South Street

Assessors: Map 38 Parcel 001

Year Built 1966/ renovated1996

Building area: 186,487 sq ft

Condition: Good

Land area: (shared w/Blake MS)

[Type text]

1.0 PURPOSE and LIMITATIONS

The purpose of this Property and Conditions Report (the Report) is to assist the Town of Medfield to assess the general physical condition and maintenance status of the property and to recommend repair and maintenance items considered significant for the property to continue its current operations.

The information reported was obtained through sources deemed reliable, a visual site survey of areas readily observable, access through building “owners” and information presented by the Town. Findings, conclusions, and recommendations in this Report are based on the methods described above, industry standards, and general observations of the equipment and its visible condition.

The report is focused on existing conditions, lifecycle of existing materials, and non-code compliant conditions. Recommendations will include items needed to bring the space/component to a safe, code compliant, and generally accepted facilities condition. The Report does not anticipate change of use, reconfiguration of space, or change in current program.

Estimated Costs are based on professional judgment and the probable or actual extent of the observed defect inclusive of the cost to design, procure, construct and manage corrections.

1.1 Condition

The Report uses terms describing conditions of the various site, building and system components. The terms used are defined below. It should be noted that a term applied to an overall system does not preclude that a part, component, or section of the system may be in a different condition.

Excellent	The component or system is in new or like new condition, and little or no deferred maintenance is recommended, or the scheduled maintenance can be accomplished with routine maintenance.
Good	The component or system is in sound condition and performing its function. It may show signs of normal aging or wear and tear, and some remedial and routine maintenance or rehabilitation work may be necessary.
Fair	The component or system is performing adequately at this time but is obsolete or is approaching the end of its useful life. The component or system may exhibit Deferred Maintenance, evidence of a previous repair, or workmanship not in compliance with common accepted practices. Significant repair or replacement may be recommended to prevent further deterioration, prevent premature failure, or to prolong its useful life.
Poor	The component or system has either failed or cannot be relied upon for continued use performing its original function, exhibits excessive Deferred Maintenance or is clearly in a state of disrepair. Repair or replacement is recommended.

HIGH SCHOOL

1.2 Abbreviations

The Report may use abbreviations to describe various site, building, or system components of legal descriptions.

ACT	Acoustical Ceiling Tile	GFI	Ground Fault interrupt (circuit)
AHU	Air handling unit	GWB	Gypsum Wall Board
BTU	British Thermal unit (heat measurement)	HVAC	Heating, Ventilating, Air Conditioning
CMU	Concrete Masonry Unit	HWH	Hot Water Heater
EDPM	Rubber membrane roofing	MDP	Main electrical distribution panel
EUL	Expected Useful Life (life cycle)	PTAC	Package through wall A/C unit
FCU	Fan Coil Unit	RTU	Roof top Unit
FHA	Forced Hot Air	MSBC	Massachusetts State Building Code
IBC	International Building Code	VAV	Variable Air Volume box
ACM	Asbestos containing material	VCT	Vinyl Wall covering (floor tile)
ADA	Americans with Disabilities Act	MAAB	Mass. Architectural Access Barriers

2.0 SITE CONDITIONS

2.1 Topography

Description:

Site is a flat and treed along the rear. Actual building site sits slightly above the road elevation. Large shared playing fields abut the property.

Condition and Observation:

Recommended Repairs: See 2.2

HIGH SCHOOL

2.2 Pavement, Parking, and Drainage Structures

Description:

Site is paved to accommodate the use. Parking and access appears adequate. Last renovation of asphalt was done in 1996.

Condition and Observation:

Asphalt area in general looks in good shape . Areas of wear and asphalt degradation can be observed in the area of the bus drive to the Middle school. The heavy wear in this area will require a monitoring and spot repair. Other areas of the drive/parking require crack sealing and relining of pavement marking.

Recommended Immediate Repairs, Near Term Repairs, or Replacement Reserves:

The Bus drive to the Middle School will need spot repair and crack sealing. \$20,000

2.3 Landscaping

Description:

Minimal landscaping exists. The flat site has lawn areas around most of the structure.

Condition and Observations:

Trees in the south East corner of the school need some pruning to prevent branches from getting close to the access road and create other issues. Low shrubs in front are in need cut back and pruning.

Recommended Repairs

Repair concrete sidewalks that have suffered damage due to age or excessive salt usage. \$20,000

2.4 Municipal Services and Utilities

a. Water and sewer

Medfield has its own water and sewerage

b. Gas

Columbia Gas

c. Electric

Eversource

HIGH SCHOOL

3.0 BUILDING CONDITIONS

3.1 Sub Structure/Foundation

Poured concrete foundation walls and poured slab on grade. The foundation walls are assumed to have spread footing.

Condition and Observation:

Generally the foundation appears to be in good shape. No visible sign of cracking or movement were observed.

Recommended Immediate Repairs, Near Term Repairs, or Replacement Reserves: None

3.2 Super Structure

Description:

The Building super structure is steel columns, beams, steel bar joist, and steel roof trusses. The steel frame and cmu cavity wall structure supports the exterior brick façade. Additions and renovations in 1996 have blended into the original design. A 1996 steel entrance canopy to the north side circle with a Kalwall skylight highlights a contemporary style to a standard brick and mortar façade.

Condition and observation:

The main building condition is in good shape. The 1996 entrance canopy brick columns (steel superstructure with brick façade) have significant water infiltration. Efflorescence and severe water staining is readily observed. Moisture can be seen coming out of the wall during rainy conditions.

The 1996 entrance canopy was found to have defects in the roof drainage system which created excessive moisture problems in the brick column façade. (see Russo Barr report) Roof drains are inside the brick façade and are leaking and are broken creating water issues. Investigation of the Brick facade columns recommends redesign and replacement.

The west side brick façade at then second floor level at the gym wall has significant crack in a limited area in the brick. The gap could result in excess moisture to enter the brick façade.

Recommended Immediate Repairs, Near Term Repairs, or Replacement Reserves:

The 1996 entrance canopy requires further engineering inspection and repair drawings. \$10,000

Repair/replace brick columns and plumbing on the 1996 canopy \$50,000

West side brick wall at the roof line/gym wall has cracking if the brick face. Further investigation of the cracking and repair required. \$50,000

HIGH SCHOOL



Internal roof drains may have split and come apart and allowed water to saturate the columns masonry from the interior to exterior. Excessive efflorescence, calcification, and structural cracking has occurred in the brick façade.

HIGH SCHOOL

3.3 Facades

Condition: GOOD

a) Description Facades: (Brick, aluminum facia,)

The brick façade of the original 1966 masonry is a solid construction with no cavity wall.

As noted in Section 3.2 super structure, the west side brick veneer has large cracking and movement.

The cast concrete sills at a number of the window locations have had the mortar joints fail. The mortar has separated or fallen out of the butt joint.

Weatherization study performed in 2014 identified a multitude of poor sealant, caulking, and construction details that have allowed for excessive air infiltration into the school. Areas of concern are at the roof wall intersection of the original sections of the building. (rooms 123-126 and rooms 216-235). The roof overhang and wall intersection has a gap of up to $\frac{3}{4}$ on an inch staffed with batt insulation. Air penetration is readily observed by the insulation being black with dust and dirt. The differential pressure and air leakage thru the insulation makes the insulation act as a filter, which is a tell tale sign of air leakage. The 2014 report performed smoke tests which demonstrate significant air leakage. The report also highlighted the overhang at the main entry glass curtain wall as an area that was improperly sealed at the time of construction. This area was determined to be excessive and in need of resealing. Estimated area open to weather is 10 square feet of air leakage.

Recommended Immediate Repairs, Near Term Repairs, or Replacement Reserves:

Perform an exterior envelope design to address air infiltration as a major energy savings measure. \$40,000

Implement the installation of sealant and weatherization measures in the Northern Energy Services report 2014/ exterior envelope design along the wall roof intersection and at the glass curtain wall. \$400,000

b) Description Windows and Doors:

The windows are double glazed energy efficient aluminum framed window typically found in commercial construction with a metal spandrel panel. These windows were replaced in the 1996 renovation and addition. Condition appears to be in Good condition. Windows have an

HIGH SCHOOL

operable awning sash. Weathertight integral gasketing of the windows sash has deteriorated and fallen out or worn to a point where replacement is required.

All exterior caulking is nearing its lifecycle. Missing caulking, caulking that has pulled away from the masonry of aluminum frame, or caulking cracking exposes the window to exterior moisture and weather.

Main entry is a double glazed aluminum commercial store front system typically found on commercial construction. Condition appears to be in good condition.

At the window buck frames the joint above the window system in hallway outside room 232 (and at other similar locations) was not sealed where the window system meets the structural header. Sealant was not installed between the top of window and structural steel has resulted in significant energy loss. (identified in the 2014 energy study)

Interior sealant at the window frame was never installed or is missing. The gap between the frame and interior casing allows for air leakage through the rough window opening accounting for heat loss in the classroom. (identified in the 2014 energy study)

Several door frames have light rusting conditions occurring at the base of the frame. Weather stripping of the doors has deteriorated and gaps can be observed.

Recommended Immediate Repairs, Near Term Repairs, or Replacement Reserves:

Life cycle of caulking and sealants needs to be inspected and evaluated. Removal and Replacement of the all caulking joints at the windows is required due to life cycle failure. Weatherization, sealing, and caulking of the entire structure required to prevent air infiltration as an energy savings measure, and stop rusting conditions. \$300,000

Evaluate and replaced damaged window weather stripping \$100,000

Remove rust on frames and repaint all exterior doors \$30,000

Replace and re-install weather stripping at all door locations \$30,000

3.4 Roofing (See Russo Barr Report)

Description:

The High School has two roof materials on the structure and these are reflective of the age of the areas added or renovated. The EDPM roofed areas cover approximately 76,600 sq ft and installed in or around 1996. The Built Up Roofing (BUR) covers approximately 53,500 square feet of area and includes the area of the original structure. This roof appears to be 20-25 years of age.

HIGH SCHOOL

Condition:

The EPDM roofing appears in generally good condition. Areas of concern are pitch pockets and the curved wall through wall flashing/membrane intersection.

The BUR roofing is in fair to poor condition due to its age. Roof patches (poor quality), separation of the metal flashing from the BUR material, and wind scouring of ballast areas exposing the BUR materials and pre-mature cracking can be readily observed.

Excerpt from the Russo Barr report:

2. MEDFIELD HIGH SCHOOL

The Medfield High School is a multi-story, steel framed building with brick masonry walls that includes one addition constructed approximately 15 years ago. The total area of roofing is approximately 130,100 square feet. There are two types of roofing at this site: modified bitumen built-up roofing with gravel surfacing (BUR) and adhered EPDM. There have been sporadic leaks throughout the facility. Persistent leakage near the Auditorium has been reported. Sporadic repairs have been performed on most areas of the roofs.

A. BUR Roofs

The modified bitumen built-up roofing with gravel surfacing, covers approximately 53,500 square feet and appears to be over 20 years old. This roof system was apparently installed over the original High School Building.

The condition of the BURGS roofs is poor. Built-up flashings at metal roof edges are separating from the sheet metal and seams are failing at curbed penetrations. Seams in expansion joints are split. Walkway pads are curling. Gravel has been wind-scoured from many corners of various roofs. Many areas have received relatively large EPDM patches.

This roof is near the end of its service life. Complete removal and replacement within 1 year is recommended.

B. EPDM Roofs

The adhered EPDM roof system covers approximately 76,600 square feet, appears to be approximately 15 years old and is original to the High School addition. The EPDM roof covering is adhered to flat rigid board roof insulation. The condition of this roof is good except for isolated issues. There is a +/- 120 SF area of roof insulation that is soft under foot – usually indicating moisture saturated roof insulation. There are several pitch pockets that are failing and may allow moisture entry. Certain sheet metal window flashings pitch inward, towards windows. Various masonry wall areas are distressed and disrupted.

HIGH SCHOOL

The head custodian reported three (3) leaks; one at Door 18, one +/- 65' north of Door 18 and one above the entrances to the auditorium addition. The leak at door 18 appears to be a site drainage issue where water runs under the doorway due to a poorly pitched sidewalk. The leak just north of Door 18 is directly beneath a large roof top unit and may be related to the actual unit. The leak above the Auditorium lines up with curved masonry throughwall flashings that are notoriously difficult to properly construct and appear to have poorly sealed seams.

C. Recommendations

Short Term: Short-term repairs should include the following:

- Application of sealants to defective sealant joints.
- Application of sealant to splits in pitch pocket penetrations.
- Replace suspected underlying wet insulation at EPDM roof.
- Perform additional investigations into potentially leaking throughwall flashings and HVAC equipment.

The estimated cost to perform short-term repairs and investigations is **\$10,000 to \$12,000.**

Long Term: Long-term repairs should include the following:

- Promptly remove and replace all BURGS roofing and underlying insulation. Tapered insulation will be required at some areas.
- Remove and replace EPDM roof systems in approximately 10 years.
- Remove and replace all roof drains associated with the BURGS roofs. Snake all roof drain lines.
- Remove and rebuild disrupted brick masonry. Repoint defective mortar joints.
- Reconfigure windowsills.

The estimated cost to perform long-term repairs is **\$1.4m to \$1.6M (BUR) and \$2.0M to \$2.4M (EPDM).**

Recommended Immediate Repairs, Near Term Repairs, or Replacement Reserves:

Near term replacement is recommended for BUR roof. While not in failure, the roof replacement of the BUR roofing areas should be scheduled within 5 years.

Design cost \$100,000 Replacement \$1,600,000

Resealing flashing separation, fixing pitch pockets and general repairs of failing areas should be addressed immediately. \$10,000 per year until replacement.

HIGH SCHOOL

3.5 Basements / Attics

Description:

NONE EXIST

3.6 ADA Compliance

The Americans with disabilities Act (ADA) and the State of Massachusetts Accessibility Code governs public accommodations and commercial properties. This report will only look at accommodations and access to public facilities that are equal or similar to those available to the general public. This report will identify areas of non-compliance, or will be in compliance if upgrades and renovations are made to the facility that triggers mandatory resolutions. However this report is not a full ADA or Accessibility Code assessment. Being "Public" facilities, facility upgrades, for staff or the general public, need to be addressed, to meet the provisions of Title III of the ADA Act.

Condition:

The current building is compliant. Upgrades address in the 1996 addition met the codes at that time for compliance. No non conformities were observed.

3.7 Interior Finishes and Components

Descriptions:

Typical Interior finishes:

Locations	Floor	Walls	Ceilings
Offices	Carpet	Painted sheetrock	Acoustical tile
Corridors	VCT	Painted CMU walls/ glazed block/sheetrock	Acoustical tile
Bathrooms	Tile	Painted sheetrock/ glazed block	Acoustical tile
Class rooms	VCT	Painted sheetrock/ painted CMU block	Acoustical tile
Library	Carpet	Painted sheetrock	Acoustical tile
Gym	Wood floor	Painted cmu	Metal deck

HIGH SCHOOL

Conditions:

Most areas are in good condition. Carpeted areas are showing their age. Replacement of the Main office carpet is required.

Recommended Immediate Repairs, Near Term Repairs, or Replacement Reserves:

Replace office Carpeting \$20,000

Replace auditorium carpet runners \$8,000

Replace library carpet \$50,000

Repaint school interiors \$50,000

Acoustical tiles in gym halls suffer from constant vandalism and need upgrades. \$30,000

4.0 BUILDING SYSTEMS

4.1. Plumbing

Description:

The domestic service enters the building from the west side into the main water service/fire service area in the basement. The water service has a main backflow preventer and separate fire service valving. The observed supply piping is copper, and the waste lines are cast iron. The plumbing fixtures are vitreous china with chrome trim. The 1996 main gas fired hot water heater with two 200 gallon water tanks with circulating pumps supply domestic hot water to the school. One unit is 1996, the other units **2010** high efficiency hot water heater. Welded and threaded black iron pipe is used for gas piping within the subject property.

Condition: Good/Fair

There were no reported or observed problems with the plumbing size, operation or capabilities of the building in general. Some shut off valves and faucets have mineral deposit build up due to corrosive action between the water and the piping. Several valves have small drip leaks o to corrosive action art the valve and will need replacement.

Above ceiling of the administration wing, domestic piping joints have begun to weep indicating failure. Replacement is planned for summer of 2017.

The Domestic hot water heater is nearing its life expectancy of 20 years.

HIGH SCHOOL

Recommended Immediate Repairs, Near Term Repairs, or Replacement Reserves:

Replace the water tempering valve assembly \$20,000

Replace Domestic hot water heater \$80,000

Repair pipe leaks in administration wing \$5,000

4.2 HVAC

a. Heating Plant

Description:

The building is serviced by a gas fired HB SMITH package boiler plant (3 boilers) in the mechanical room which supplies hot water to various AHU units to support the building and its classroom Fan Coil units. The units were installed in the 1996 with the original construction. The main supply pumps are also located in the space.

There **are XXX gas fired roof** mounted Air Handling Units (AHU) and **xxx unit Roof Top** Units (RTU). The large roof top units service the Gym, Café, Auditorium/auditorium foyer, and chorus roofs, Four units have heat recovery wheels which promote energy efficiency. The RTU units supply conditioned air to larger spaces/ hallways. Classrooms are heated with local fan coil units with hot water from the main boiler plant

The building is controlled with a TRANE building management system. The system updates occurred in the 1996 renovation.

Condition: Good

b. Distribution system (VAV, FCU,, exhaust)

Description:

The building is supplied with conditioned air through three air handling units that provide conditioned air in three zones. The communications/IT closet on the second floor requires year round air movement to cool the equipment.

Condition: good

The building distribution of the HVAC and hot water was also installed during the 1996 construction project. The building is a combination of heated air and a radiant baseboard wall wash as a supplemental heat source.

HIGH SCHOOL

The communications/IT closet on the second floor does not have enough supply or exhaust air to cool the space. Ceiling tiles were removed from ceiling to allow hot air to leave the machine space

Recommended Immediate Repairs, Near Term Repairs, or Replacement Reserves:

General comment - many of the components of the HVAC system are nearing the end of the lifecycle. Motors, pumps, BMS control software lifecycles are 10 to 15 years. The building has experience some of these components failing due to age. A system component replacement budget needs to be implemented. Pumps, actuators, motors, condenser/contactors should be planned for replacement in the near term.

Immediate replacement/upgrade of the energy management system should be addressed. Upgrades of the system is required, and re-commissioning should be addressed during this upgrade to assure proper operation of the HVAC equipment. (Utility supplier may offer some rebates for this work upgrade/re-commissioning work) \$40,000

The small RTU units are considered light duty commercial use and have a life expectancy of 20-25 years. The use within the school puts a heavy load on these units. Currently two units are in failure. Three units have had the fire boxes replaced due to failure and the other units are past the life cycle. The units that have air conditioning are \$25,000 per unit

Water heater is nearing its lifecycle and should be a near term repair before failure occurs. \$100,000

The TRANE building management system is in need of updating and a recommissioning. The system was identified in an energy audit as a software version that needs upgrade. Generally the industry upgrades software and the communication platform every ten years.

Roof top AHU units are in good shape, but components within the units (blower motors, furnace ignition/fire chambers) are nearing the life cycle. Replacement of components needs to be anticipated and budgeted for.

4.3 Electric

Description:

1200 amp electric service with new sub panels installed in the 1998 construction project.

Emergency power is supplied by a diesel fueled emergency generator system.

Condition:

All systems are in good condition.

HIGH SCHOOL

Recommended Immediate Repairs, Near Term Repairs, or Replacement Reserves:

Near term repair is to have an electrical specialist survey company inspect all circuit breakers or operation and effectiveness. The pro-active survey will determine if there are any circuit breaker concerns. \$10,000

4.4 Building Fire Suppression and Fire Alarm

Description:

The property is protected by a multi-zone Fire Alarm control panel, hard wired smoke and heat detectors, pull stations, illuminated exit lights, emergency battery lighting units, horn/light enunciators, fire extinguishers, and full coverage 4" wet sprinkler system with check valves and tamper/flow switches. The Fire department Siamese connections are located on the exterior of the building.. A fire hydrant is located on a municipal sidewalks adjacent to the property. The sprinkler system and Fire Alarm control panel is reportedly tested annually.

Condition: GOOD

Recommended Immediate Repairs, Near Term Repairs, or Replacement Reserves: None

5.0 CODE/OPERATIONAL CONCERNS

Description:

Asbestos: Due to its age and AHERA testing, the building still has asbestos containing material in the building. The material currently is in good shape. All proposed work in the building must go thru testing process and if need be asbestos removal prior tom work being performed. This issue must be factored in any estimate of work to be performed.

Security:

HIGH SCHOOL



HIGH SCHOOL



BUR flashing at HVAC and poor pitch pocket

HIGH SCHOOL

Medfield High School

CAPITAL PLANNING BUDGET

System	sq ft 186,487																				
	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2032	2034	2035	2036	2037	2038
Site work																					
2.2 Various site work Design		20,000									10,000						10,000				
2.2 Paving											50,000										100,000
2.2 walkways				10,000														100,000			
2.3 Cut back trees on site				20,000											10,000						5,000
Building envelope																					
3.3 Façade																					
3.3 Canopy engineering/façade repair		10,000	150,000																		
3.3 Brick façade repair						50,000															
3.3 Sealant replacement					30,000	300,000					10,000					5,000					5,000
Windows																					
3.3 windows weatherstripping													20,000						20,000		
3.3 sealants			10,000																		
3.3 Repair window arms/operation				40,000											40,000						
Door																					
3.3 Metal doors			20,000						10,000												5,000
3.3 Doors (interior)										3,000				5,000							3,000
3.3 Weatherization				10,000				10,000						3,000		10,000	3,000				10,000
3.4 ROOF																					
engineering roof						150,000															200,000
roof repair	5,000	5,000	5,000	5,000	5,000																
Roof replacement			10,000				1,500,000									10,000					2,000,000
3.6 ADA Compliance																					
3.7 Interior																					
Carpet (25+ years)					20,000					60,000											
VCT flooring (25+ years)													8,000			8,000			100,000	8,000	
Paint									100,000										10,000		
Acoustic ceilings									50,000												
Lockerroom lockers								40,000	40,000				10,000								10,000
Lockerroom floors								40,000													
4.1 Plumbing																					
Fixtures																					
regROUT tile										2,000		1,000									1,000
Replace tempering valve											2,000										
Replace Hotwater heater						100,000												200,000			
Replace water shut off valves						10,000															
Replace All shower valves						8,000															
4.2 HVAC																					
Boiler 1996								100,000	800,000			5,000							20,000		40,000
ATC computer controls			40,000																		
HVAC engineer			40,000										40,000								
Fluid pumps				20,000				4,000	4,000				20,000								
Roof top unit (15 units)				10,000		10,000				30,000		30,000		200,000	30,000		30,000			30,000	
Valves (ahu/vav)				500		500						500		500							
Backflow preventers					1,000					1,000						1,000					1,000
Duct Cleaning							15,000	15,000													
Fan coil units 100 units												1,000	1,000			15,000	15,000				
Vent /exhaust fan					15,000													10,000			
Air Handling unit 4 units					5,000		5,000							50,000				5,000			
4.3 Electrical																					
Branch circiuts testing			20,000																		
lighting											100,000										
service repair				10,000																	
Fire Alarm										5,000											15,000
4.4 Fire Suppression																					
Comprehensive inspection and head replacement									10,000												10,000
Total Yearly Expenditure	5,000	35,000	295,000	125,500	194,500	795,500	1,670,000	194,000	925,000	40,000	172,000	37,500	99,500	259,500	81,000	48,000	60,000	339,000	134,000	258,000	2,187,000
Escalated cost 2018 3.0%	\$6,334	\$45,667	\$396,455	\$173,721	\$277,310	\$1,168,219	\$2,526,025	\$302,246	\$1,484,353	\$66,114	\$292,818	\$65,756	\$179,708	\$482,746	\$155,204	\$91,973	\$121,968	\$709,791	\$288,983	\$573,093	\$5,003,698

Municipal Facilities

APPENDICES

ROOF CONDITION SURVEY REPORT

Various School & Town Buildings Medfield, MA

January 30, 2017

RBA Project No. 2017003

Prepared by:



**55 Sixth Road, Suite 6
Woburn, MA 01801
tel: 781-273-1537
fax: 781-273-1695**

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Russo Barr Associates, Inc.

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Woburn, MA 01801

781-273-1537 tel

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January 31, 2017

Mr. Gerald McCarty, Director of Facilities
Medfield Public Schools
459 Main Street
Medfield, MA 02052

Re: Roof Condition Survey Project
Various School & Town Buildings
Medfield, Massachusetts
RBA Project No 2017003

Mr. McCarty:

Pursuant to your recent request, we are pleased to submit our Roof Condition Survey Report for six (6) buildings. The project goal is to perform a brief overview assessment in an effort to identify general concerns and to provide corrective repair recommendations with associated construction cost budgets. Our assessment is based upon visual examinations and did not include test cuts or infrared moisture testing. Short-term recommendations are defined as minimal roof repairs to be implemented immediately in an effort to minimize leakage into the building until the long-term recommendations can be implemented. Long-term recommendations are defined as long lasting repairs (minimum 20-year life cycle) to be implemented in an effort to eliminate leakage into the building.

EXECUTIVE SUMMARY

- **Building #1 – Blake Middle School:** The PVC roofing is in poor to failed condition (22 years old at 114,000 SF). The EPDM roofing is in good condition (10 years old at 11,700 SF).
Long-Term Repairs: Replace PVC roofing & perform certain repairs within 1-year; Estimated Construction Cost = **\$2.9M to \$3.4M**.
Short-Term Repairs: Perform certain repairs as soon as possible; Estimated Construction Cost = **\$8,000 to \$10,000**.
- **Building #2 – Medfield High School:** The Built-Up Roofing (BUR) is in poor condition (20+ years old at 53,500 SF). The EPDM roofing is in good condition (15 years old at 76,600 SF).
Long-Term Repairs: Replace BUR roofing & perform certain repairs within 1-year; Estimated Construction Cost = **\$1.4M to \$1.6M**. Replace EPDM roofing & perform certain repairs within 5 to 7 years; Estimated Construction Cost = **\$2.0M to \$2.4M**.
Short-Term Repairs: Perform certain repairs as soon as possible; Estimated Construction Cost = **\$10,000 to \$12,000**.
- **Building #3 – Wheelock School:** The Built-Up Roofing (BUR) is in poor condition (20+ years old at 48,000 SF).
Long-Term Repairs: Replace BUR roofing & perform certain repairs within 1-year; Estimated Construction Cost = **\$1.2M to \$1.5M**.
Short-Term Repairs: Perform certain repairs as soon as possible; Estimated Construction Cost = **\$20,000 to \$25,000**.
- **Building #4 – Memorial School:** The Built-Up Roofing (BUR) is in poor condition (20+ years old at 32,700 SF). The Modified Bitumen roofing with a black mineral cap sheet is in failed

condition (20+ years old at 4,800 SF). The Modified Bitumen roofing with a white mineral cap sheet is in fair to poor condition (15 years old at 23,300 SF).

Long-Term Repairs: Replace BUR roofing and Modified Bitumen roofing & perform certain repairs within 1-year; Estimated Construction Cost = **\$1.5M to \$1.9M.**

Short-Term Repairs: Perform certain repairs as soon as possible; Estimated Construction Cost = **\$8,000 to \$10,000.**

- **Building #5 – Medfield Public Library:** The Slate roofing is in fair to good condition (20 years old at 9,200 SF). The EPDM roofing is in poor to failed condition (17 years old at 1,300 SF).

Long-Term Repairs: Replace EPDM roofing & perform certain repairs within 1-year; Estimated Construction Cost = **\$35,000 to \$45,000.**

Short-Term Repairs: We understand Titan Roofing will be performing repairs to the slate roofing sometime in the near future.

- **Building #6 – Medfield Town Hall:** The Shingle roofing is in fair condition (15 years old at 9,100 SF).

Short-Term Repairs: Perform certain repairs as soon as possible; Estimated Construction Cost = **\$20,000 to \$25,000.**

OBSERVATIONS & RECOMMENDATIONS

1. BLAKE MIDDLE SCHOOL

The Blake Middle School is a single story, steel framed building with brick masonry walls and includes two additions of varying ages. The total area of roofing is approximately 125,700 square feet. There are two types of roofing at this site: adhered PVC and adhered EPDM (rubber). There have been sporadic leaks throughout the facility. Persistent leakage below the south and west walls of the original auditorium have been reported. Numerous and extensive repairs have been performed on all areas of the roofs.

A. PVC Roofs

The adhered PVC roof system covers approximately 114,000 square feet and is believed to have been installed in 1995 when the major addition was constructed. The PVC roof membrane is adhered to flat and tapered rigid board roof insulation that is attached to concrete plank or cementitious wood fiber roof decks.

The condition of the PVC roofs is poor to failed. Despite the use of tapered insulation and extended drain sumps, ponded water is evident on most areas except the sloped gymnasium roof. The PVC membrane is brittle and is cracked at many areas including joints in perimeter edge metal assemblies, at corners of curbs and at ridges at insulation joints. Underlying wet rigid board roof insulation is expected to exist in many locations. There are numerous repairs evident. There is debris that is clogging roof drain strainers and collecting in corners.

There are current leaks. Leaks are reported to occur adjacent to the original Auditorium. The south Auditorium brick masonry wall is extensively cracked and has failed sealant and mortar joints. The roof below this wall is tied to the wall using a reglet counterflashing detail that cannot intercept any moisture traveling within the masonry wall (not a throughwall flashing). Sealant applied to the reglet flashing is failed. This wall should be covered 100%

with a watertight covering (sheet metal cladding or roof membrane) tied into the roof below. Leaks are also reported to occur along the west Auditorium wall and we believe the sources of these leaks are the low wall flashing heights and deteriorated smoke release vents located within the brick masonry wall. The south gutter serving the sloped gymnasium roof is leaking in several locations and we believe the cause of these leaks is failed seams.

There are other defective building conditions that may lead to leaks but are not necessarily roof related. These defects include deteriorated brick masonry at the chimney, poorly pitched windowsill flashings that directs water toward the building and failed sealant joints applied to various wall components. Some insulated glazing that is part of the main entrance canopy is fogged/failed and although not a leak source, is unsightly. We observed an electric outlet that is hanging from a roof soffit and is not protected from the weather. Plastic skylight domes are brittle/aged.

This roof is near the end of its service life. Complete removal and replacement within 1 year is recommended.

B. EPDM Roof

The adhered EPDM roof system covers approximately 11,700 square feet and appears to be approximately 10 years old. The EPDM roof membrane is adhered to flat rigid board roof insulation. The condition of this roof is good except for one issue. There was a leak at a natural gas supply roof penetration. This penetration includes an elbow located approximately 3" above the roof surface that is very difficult to properly flash. A recent repair using bituminous roof cement apparently stopped water leakage for now but eventually, the bituminous material will degrade the EPDM roofing and the leak will resume. A proper repair could include removal of the bituminous material; reworking the gas supply line and installing a proper EPDM pipe wrap detail.

C. Recommendations

Short Term: Short-term repairs should include the following:

- Application of sealants to defective mortar joints in the south auditorium wall.
- Replacement of failed sealants related to reglet counterflashing.
- Application of sealant to splits in PVC flashing at roof edges and at curbs.
- Welding of PVC patches at splits in the gymnasium gutter.
- Reconfigure and re-flash the gas pipe penetration at the EPDM roof.

The estimated cost to perform short-term repairs is **\$8,000 to \$10,000.**

Long Term: Long-term repairs should include the following:

- Remove and replace all PVC roofing and underlying insulation. Tapered insulation will be required at most areas.
- Remove and replace all roof drains. Snake all roof drain lines.
- Remove and replace low throughwall flashings. Clad certain deteriorated exterior masonry walls. Replace/relocate auditorium smoke release vents. Repoint defective mortar joints.
- Remove and replace skylight domes, defective insulated glazing panels and reconfigure windowsills.

The estimated cost to perform long-term repairs is **\$2.9M to \$3.4M.**

2. MEDFIELD HIGH SCHOOL

The Medfield High School is a multi-story, steel framed building with brick masonry walls that includes one addition constructed approximately 15 years ago. The total area of roofing is approximately 130,100 square feet. There are two types of roofing at this site: modified bitumen built-up roofing with gravel surfacing (BUR) and adhered EPDM. There have been sporadic leaks throughout the facility. Persistent leakage near the Auditorium has been reported. Sporadic repairs have been performed on most areas of the roofs.

A. BUR Roofs

The modified bitumen built-up roofing with gravel surfacing, covers approximately 53,500 square feet and appears to be over 20 years old. This roof system was apparently installed over the original High School Building.

The condition of the BURGS roofs is poor. Built-up flashings at metal roof edges are separating from the sheet metal and seams are failing at curbed penetrations. Seams in expansion joints are split. Walkway pads are curling. Gravel has been wind-scoured from many corners of various roofs. Many areas have received relatively large EPDM patches.

This roof is near the end of its service life. Complete removal and replacement within 1 year is recommended.

B. EPDM Roofs

The adhered EPDM roof system covers approximately 76,600 square feet, appears to be approximately 15 years old and is original to the High School addition. The EPDM roof covering is adhered to flat rigid board roof insulation. The condition of this roof is good except for isolated issues. There is a +/- 120 SF area of roof insulation that is soft under foot – usually indicating moisture saturated roof insulation. There are several pitch pockets that are failing and may allow moisture entry. Certain sheet metal window flashings pitch inward, towards windows. Various masonry wall areas are distressed and disrupted.

The head custodian reported three (3) leaks; one at Door 18, one +/- 65' north of Door 18 and one above the entrances to the auditorium addition. The leak at door 18 appears to be a site drainage issue where water runs under the doorway due to a poorly pitched sidewalk. The leak just north of Door 18 is directly beneath a large roof top unit and may be related to the actual unit. The leak above the Auditorium lines up with curved masonry throughwall flashings that are notoriously difficult to properly construct and appear to have poorly sealed seams.

C. Recommendations

Short Term: Short-term repairs should include the following:

- Application of sealants to defective sealant joints.
- Application of sealant to splits in pitch pocket penetrations.
- Replace suspected underlying wet insulation at EPDM roof.
- Perform additional investigations into potentially leaking throughwall flashings and HVAC equipment.

The estimated cost to perform short-term repairs and investigations is **\$10,000 to \$12,000.**

Long Term: Long-term repairs should include the following:

- Promptly remove and replace all BURGS roofing and underlying insulation. Tapered insulation will be required at some areas.
- Remove and replace EPDM roof systems in approximately 10 years.
- Remove and replace all roof drains associated with the BURGS roofs. Snake all roof drain lines.
- Remove and rebuild disrupted brick masonry. Repoint defective mortar joints.
- Reconfigure windowsills.

The estimated cost to perform long-term repairs is **\$1.4m to \$1.6M (BUR) and \$2.0M to \$2.4M (EPDM)**.

3. RALPH WHEELOCK SCHOOL

The Ralph Wheelock School is a multi-story, steel framed building with brick masonry walls and pre cast concrete window panels. The total area of roofing is approximately 48,000 square feet. There is one type of roofing at this site: modified bitumen built-up roofing with gravel surfacing (BUR). There have been sporadic leaks throughout the facility. There are no active leaks reported. Sporadic repairs have been performed on most areas of the roofs.

A. BUR Roofs

The modified bitumen built-up roofing with gravel surfacing, appears to be over 20 years old. The condition of the BUR roofs is poor. Built-up flashings at metal roof edges are separating from the sheet metal and seams are failing at curbed penetrations. Walkway pads are curling. Skylight domes are aged, cracked and deteriorated. Recent boiler installations included new flue penetrations that are poorly flashed. Slope to drain is minimal at best. Several gutters were bent by trespassers. One access ladder leading to the Auditorium roof is loose.

There are many canopy roofs consisting of cast-in place-concrete only. At least one of these canopies leak. We recommend that a liquid applied coating be applied to the weathering surfaces of these canopies.

This roof is near the end of its service life. Complete removal and replacement within 1 year is recommended.

B. Recommendations

Short Term: Short-term repairs should include the following:

- Replacement of failed base flashings.
- Replacement of defective skylight domes with fall protection.
- Properly flash recent boiler flue penetrations.
- Secure loose access ladder.

The estimated cost to perform short-term repairs and investigations is **\$20,000 to \$25,000**.

Long Term: Long-term repairs should include the following:

- Promptly remove and replace all BURGS roofing and underlying insulation. Tapered insulation will be required at some areas.
- Remove and replace all roof drains. Snake all roof drain lines.
- Remove and rebuild disrupted brick masonry. Repoint defective mortar joints.

The estimated cost to perform long-term repairs is **\$1.2M to \$1.5M.**

4. MEMORIAL SCHOOL

The Memorial School is a single story, steel framed building with brick masonry walls that includes additions of varying ages. The total area of roofing is approximately 60,800 square feet. There are three (3) types of roofing at this site: modified bitumen built-up roofing with gravel surfacing (BUR) and two ages of modified bitumen built-up roofing with mineral cap sheet surfacing (Mod Bit). There have been sporadic leaks throughout the facility. Numerous and extensive repairs have been performed on all areas of the roofs.

A. BUR Roofs

The BUR roof system covers approximately 32,700 square feet and appears to be over 20 years old. The condition of the BUR roofs is poor. Built-up flashings at metal roof edges are separating from the sheet metal and seams are failing at curbed penetrations. Walkway pads are curling. Slope to drain is minimal at best. Two pitch pockets have failed sealer. Ponding water exists at many areas near roof edges and the ponding appears to coincide with leak locations. This roof is near the end of its service life. Complete removal and replacement is recommended.

B. Mod Bit Roofs (white cap sheet)

The Mod Bit roofing system (with white cap sheet) covers approximately 23,300 square feet and appears to be approximately 15 years old. The roof covering is adhered to flat rigid board insulation applied to roof decks are nearly flat or slope at approximately 3" per foot to gutters. The condition of this roof is fair to poor; much of the lower roof edges negatively slope. Tie-ins to other roof systems are cracked and split open. The resulting ponded water also coincides with reports of leakage into the building. Extensive patching of the roof edges may perform well for a very short term but proper repair should include reconstruction of the roof edges to promote positive drainage. This roof is near the end of its service life. Complete removal and replacement is recommended.

C. Mod Bit Roofs (black cap sheet)

The Mod Bit roofing systems (with black cap sheet) covers approximately 4,800 square feet and appear to be greater than 20 years old. These roofs slope to roof drains at approximately 3" per foot. The condition of these roofs is failed. Much of the lower roof edges negatively slope. The resulting ponded water also coincides with reports of leakage into the building. This roof is near the end of its service life. Complete removal and replacement is recommended.

D. Recommendations

Short Term: Short-term repairs should include the following:

- Remove ponded water and seal all laps in the Mod Bit cap sheets.
- Strip in all splits in bituminous membranes.

The estimated cost to perform short-term repairs and investigations is **\$8,000 to \$10,000.**

Long Term: Long-term repairs should include the following:

- Promptly remove and replace all BURGS and Mod Bit roofing and underlying insulation. Tapered insulation will be required at some areas.
- Remove and replace all roof drains. Snake all roof drain lines.

- Rebuild roof edges are required to eliminate low spots.

The estimated cost to perform long-term repairs is **\$1.5M to \$1.9M**

5. MEDFIELD PUBLIC LIBRARY

The Medfield Public Library is a two story, steel and wood framed building with brick masonry walls that includes one addition built in 1998. The total area of roofing is approximately 10,500 square feet. There are two types of roofing at this site: natural slate and adhered EPDM. There have been sporadic leaks throughout the facility. Numerous and extensive repairs have been performed on EPDM roofing. There are no current leaks reported at this site.

A. Slate Roofs

The natural slate roof system covers approximately 9,200 square feet and appears to be 19 years old. The slate roofing is applied to wood roof decks that slope at 12" per foot. The condition of the slate roofing is fair to good. There are approximately 40 slates that are missing or broken. Four areas of copper ridge cap have become loose. There is approximately 30 linear feet of gutter that appears to have been damaged by snow slide. We understand Titan Roofing will be performing the needed repairs soon.

B. EPDM Roofs

The adhered EPDM roof system covers approximately 1,300 square feet and is reported to be 17 years old. The EPDM roof covering is adhered to rigid board roof insulation at the center of the complex and at dormers built into the slate roof slopes. The center roof is heavily congested with HVAC equipment. There is a build-up of debris. The condition of the roofs at dormers is fair. The condition of the EPDM roof in the center of the complex is poor. Extensive repairs have been performed and we expect future abuse by tradesmen when servicing the HVAC equipment. We found many small punctures and tears in the EPDM roof membrane where the EPDM roof is applied to sloped roof decks below the slate roofing.

C. Recommendations

Long Term: Long-term repairs should include the following:

- Promptly remove and replace the EPDM roofing and underlying insulation. Tapered insulation will be required.
- Snake all roof drain lines.

The estimated cost to perform long-term repairs is **\$35,000 to \$45,000.**

6. MEDFIELD TOWN HALL

The Medfield Town Hall is a multi-story, wood framed building with brick masonry bearing walls. An addition was added in 1997. The total area of roofing is approximately 9,100 square feet.

A. Shingle Roofs

There is one type of roofing at this site: heavy weight, tabbed, asphalt shingles. The style of shingles indicates that the shingles are "Slateline" as manufactured by CertainTeed. The shingles are installed at a very steep slope estimated at 18" per foot. There are no active leaks reported. The asphalt shingle roofing is reported to be approximately 15 years old. Generally, the heavy weight asphalt shingles are warranted against defects in

materials for 40 years for commercial applications. There are stronger warranties that are available that may be applicable to this project.

The condition of the shingle roof is fair. Approximately 70 shingle tabs are missing. The missing shingles may be due to poor installation, poor wind seal adhesive or the lack of hand sealing the tabs (often a requirement when working on very steep slopes). These deficiencies may exist throughout the project. Depending upon the extent of warranty provided with the installation, the cost of repair may be covered. We recommend that the Owner review the project files to determine if a warranty exists and the extent of coverage.

B. Recommendations

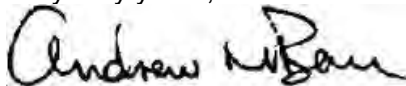
Short Term: Short-term repairs should include the following:

- Replace all missing shingle tabs.

The estimated cost to perform short-term repairs (if warranty coverage is not available) is **\$20,000 to \$25,000**. Note: Hand sealing of shingle tabs may be required but at this stage it is unknown if this is needed; estimate cost does not include any hand sealing of shingle tabs.

After your review, we recommend a meeting promptly take place with all involved parties to review the report.

Very truly yours,



Andrew N. Barr, P.E., MCPPO

Principal

Phone: 781-273-1537 X20

Email: abarr@russobarr.com

PHOTOGRAPHIC DOCUMENTATION

Roof Condition Survey Project
Various School & Town Buildings
Medfield, MA



Photo 1

Blake Middle School

Aerial view of the Blake Middle School.



Photo 2

Blake Middle School

Typical PVC roof area. Sloped gymnasium roof is in the background.

PHOTOGRAPHIC DOCUMENTATION

Roof Condition Survey Project
Various School & Town Buildings
Medfield, MA



Photo 3

Blake Middle School

EPDM roof area.



Photo 4

Blake Middle School

PVC seams patched with incompatible bituminous materials.

PHOTOGRAPHIC DOCUMENTATION

Roof Condition Survey Project
Various School & Town Buildings
Medfield, MA



Photo 5

Blake Middle School

PVC roof with tapered insulation still ponds water.



Photo 6

Blake Middle School

Many corners of the PVC roof membrane are split.

PHOTOGRAPHIC DOCUMENTATION

Roof Condition Survey Project
Various School & Town Buildings
Medfield, MA



Photo 7

Blake Middle School

South wall of the Auditorium is deteriorated allowing water to bypass the reglet counterflashing below.



Photo 8

Blake Middle School

West Auditorium wall has very low flashing heights and deteriorated smoke vent doors.

PHOTOGRAPHIC DOCUMENTATION

Roof Condition Survey Project
Various School & Town Buildings
Medfield, MA



Photo 9

Medfield High School

Aerial view.



Photo 10

Medfield High School

General view of a typical built-up roof with gravel surfacing.

PHOTOGRAPHIC DOCUMENTATION

Roof Condition Survey Project
Various School & Town Buildings
Medfield, MA



Photo 11

Medfield High School

General view of a typical EPDM roof.



Photo 12

Medfield High School

Built-up roof system has delaminated from edge metal.

PHOTOGRAPHIC DOCUMENTATION

Roof Condition Survey Project
Various School & Town Buildings
Medfield, MA



Photo 13

Medfield High School

Seams in the expansion joints are failing.



Photo 14

Medfield High School

Brick masonry is disrupted and sealants joints are failed in certain locations.

PHOTOGRAPHIC DOCUMENTATION

Roof Condition Survey Project
Various School & Town Buildings
Medfield, MA



Photo 15

Medfield High School

Throughwall flashing in the curved wall above the auditorium do not appear to be sealed.



Photo 16

Medfield High School

Failing pitch pocket.

PHOTOGRAPHIC DOCUMENTATION

Roof Condition Survey Project
Various School & Town Buildings
Medfield, MA



Photo 17

**Ralph Wheelock
School**

Aerial view.



Photo 18

**Ralph Wheelock
School**

Typical view of
the bituminous
built-up roof
system.

PHOTOGRAPHIC DOCUMENTATION

Roof Condition Survey Project
Various School & Town Buildings
Medfield, MA



Photo 19

Ralph Wheelock School

Curling walkway pads.



Photo 20

Ralph Wheelock School

Failed base flashings.

PHOTOGRAPHIC DOCUMENTATION

Roof Condition Survey Project
Various School & Town Buildings
Medfield, MA



Photo 21

**Ralph Wheelock
School**

Damaged gutter.



Photo 22

**Ralph Wheelock
School**

Poorly flashed
boiler flues (white
PVC pipes).

PHOTOGRAPHIC DOCUMENTATION

Roof Condition Survey Project
Various School & Town Buildings
Medfield, MA



Photo 23

Ralph Wheelock School

Damaged/
deteriorated
skylight domes.



Photo 24

Ralph Wheelock School

Cast in place
concrete
canopies.

PHOTOGRAPHIC DOCUMENTATION

Roof Condition Survey Project
Various School & Town Buildings
Medfield, MA



Photo 25

Memorial School

Aerial view.



Photo 26

Memorial School

Typical built-up
roof system.

PHOTOGRAPHIC DOCUMENTATION

Roof Condition Survey Project
Various School & Town Buildings
Medfield, MA



Photo 27

Memorial School

Typical newer
Mod Bit roof
system.



Photo 28

Memorial School

Typical older Mod
Bit roof system.

PHOTOGRAPHIC DOCUMENTATION

Roof Condition Survey Project
Various School & Town Buildings
Medfield, MA



Photo 29

Memorial School

Poorly pitched roof edges allow ponded water and possible leaks.



Photo 30

Memorial School

Poorly pitched roof edges at the older Mod Bit roofs allows ponded water and possible leaks.

PHOTOGRAPHIC DOCUMENTATION

Roof Condition Survey Project
Various School & Town Buildings
Medfield, MA



Photo 31

Memorial School

BUR flashing
edges are worn.



Photo 32

Memorial School

Extensive
patching
throughout the
older Mod Bit roof
systems.

PHOTOGRAPHIC DOCUMENTATION

Roof Condition Survey Project
Various School & Town Buildings
Medfield, MA



Photo 33

Medfield Library

Aerial view.



Photo 34

Medfield Library

Typical view of a
slate roof surface.
Note the broken
slate.

PHOTOGRAPHIC DOCUMENTATION

Roof Condition Survey Project
Various School & Town Buildings
Medfield, MA



Photo 35

Medfield Library

Typical view of center EPDM roof system.



Photo 36

Medfield Library

Two of many punctures and tears in the EPDM roof.

PHOTOGRAPHIC DOCUMENTATION

Roof Condition Survey Project
Various School & Town Buildings
Medfield, MA



Photo 37

Medfield Library

Failing EPDM
seam.



Photo 38

Medfield Library

Damaged gutter.

PHOTOGRAPHIC DOCUMENTATION

Roof Condition Survey Project
Various School & Town Buildings
Medfield, MA



Photo 39

Medfield Town Hall

Aerial view.



Photo 40

Medfield Town Hall

Typical view –
dark spots on roof
are missing
shingle tabs.

PHOTOGRAPHIC DOCUMENTATION

Roof Condition Survey Project
Various School & Town Buildings
Medfield, MA



Photo 41

Medfield Town Hall

Typical view – dark spots on roof are missing shingle tabs.



Photo 42

Medfield Town Hall

Typical view – dark spots on roof are missing shingle tabs.

The Town of Medfield Energy Reduction Plan

Prepared by the Metropolitan Area Planning Council in coordination with the Town of Medfield & the Medfield Energy Committee



In fulfillment of the
Massachusetts Green Communities Grant Program Criterion 3

November 2016

I. Purpose and Acknowledgements

A. Letters from Both the Town Administrator and the Superintendent Verifying Adoption of the ERP

B. List of Contributors:

The collaborative efforts of many municipal stakeholders served to produce this energy reduction plan.

This plan was written by the Metropolitan Area Planning Council (MAPC), in coordination with Medfield municipal staff and the Medfield Energy Committee.

Much of the information in this plan was derived from energy audits performed by Rise Engineering (led by Sam Nutter), AECOM (led by Derrek Brown), municipal staff and Energy Committee members. Preliminary discussions regarding audit feasibility and coordination were advised by Eversource representative Steve Grattan and Columbia Gas representative Ernie Robinson. Additional resources and calculations were provided by the Fred Davis Corporation for streetlight measures and by MAPC for behavioral-based and fuel-efficient vehicle measures.

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II. Executive Summary

A. Narrative Summary of the Town

The Town of Medfield is a Norfolk County community situated about 17 miles southwest of Boston. Medfield was first settled in 1649, and was officially incorporated in 1651. With an area of 14.4 square miles, Medfield has a population of 12,024 according to the 2010 Census. The Town is governed by a Board of Selectmen with Open Town Meeting.

B. Green Communities Designation Progress

In 2008, the Medfield Board of Selectmen appointed an Energy Committee to look at the Town's energy use, as well as residents' and businesses' energy use and explore energy efficiency solutions. With diligent work by Town Departments, energy use has declined 26% from 2008 through 2016. An objective of the Energy Committee since 2011 has been to qualify Medfield as a Department of Energy Resources (DOER) Green Community. To meet the Green Communities Criteria #1 & #2, a Solar By-Law was passed at the 2014 Town Meeting. In 2015, an Energy Efficient Vehicle Policy was adopted to meet Criterion #4. The Stretch Energy Code meeting Criterion #5 was adopted at the 2016 Town Meeting, leaving only the acceptance of a 5 year plan for energy reduction (Criterion #3) to meet all the necessary criteria to become a Massachusetts Green Community.

Criteria already met (as of Nov 3, 2016)	Designation Criteria	Description	Year of Adoption
✓	Criterion 1	Provide as-of-right siting in designated locations for renewable/alternative energy generation (or research & development, or manufacturing facilities)	2014
✓	Criterion 2	Adopt an expedited application and permit process for as-of-right energy facilities	2014

	Criterion 3	Establish an energy use baseline and develop a plan to reduce energy use by 20% within five years	
✓	Criterion 4	Purchase only fuel-efficient vehicles	2015
✓	Criterion 5	Set requirements to minimize life-cycle energy costs for new construction; one way to meet these requirements is to adopt the new Board of Building Regulations and Standards (BBRS) Stretch Code.	2016

This document is Medfield's 5 year plan for reducing energy usage by 20% or more. With the adoption by the School Committee and the Select Board, this Energy Reduction Plan, together with the documentation meeting the other four criteria will be submitted to DOER by or before November 21, 2016, so that that Town meets all requirements to become a Green Community.

This Energy Reduction Plan will serve as a basic blueprint to guide the Town's energy efficiency activities through 2020, and may be subject to change. The plan will integrate with the Town's Capital Improvements Plan, and together will be synergistic in meeting goals of efficiency, cost savings, and overall municipal building needs.

Energy Conservation Measures (ECMs) identified in this report and accompanying Table 4 spreadsheet, will require further engineering and cost analysis prior to procuring equipment and installation services.

C. Summary of Municipal Energy Uses

- Total Number of Municipal Buildings: 14
- Total Number of Municipal Vehicles: 113
- Total Number of Street Lights and Traffic Lights: 347 streetlights and 6 traffic lights
- Water and Sewer: owned and operated by the Town of Medfield
- Wastewater Treatment Plant: 1
- Pumping and Flow Stations: 1 Water Pumping; 8 Sewer Pumping, 6 Sewer Flow

Table 1: Municipal Energy Use Summary

	Number	Ownership
Buildings (14)		
Oil Heat	1	
Natural Gas Heat	10	
Propane Heat	1	
Biomass Heat	0	
Other Heat Type	0	
Vehicles		
Non-Exempt	3	
Exempt	111	
Street Lights	347	Eversource
Traffic Lights	6	Municipality
Water and Sewer		
Wastewater Treatment Plant	1	Municipality
Water Pump Station	1	Municipality
Sewer Pump Stations	8	Municipality
Sewer Flow Stations	6	Municipality

D. Summary of Energy Use Baseline and Plans for Reduction

Table 2b: Summary of Municipal Energy Use: Baseline Year FY 2015

Category	Energy Consumption in MMBTU (FY2015)	Weather Normalized Baseline Energy Use in MMBTU	% of Total Baseline Energy Consumption
Buildings	45,369		75.93%
Vehicles	7,318		12.25%
Street/Traffic Lights	390		0.65%
Water/Sewer/Pumping	6,623		11.08%
Open Space	53		0.09%
Total	59,753	56,759	100.00%

III. Energy Use Baseline Inventory

A. Identification of the Inventory Tool Used – The Town of Medfield used the Department of Energy Resources’ (DOER) MassEnergyInsight (MEI) web-based energy inventory and analysis tool.

B. Identification of the Baseline Year – Fiscal Year (FY) 2015 will serve as the baseline year. FY 2015 ran from July 1, 2014 to June 30, 2015. This means that the Town aims to have a five-year plan for FY 2016 through FY 2020.

C. Weather Normalization – The 20% energy reduction goal, per DOER's requirements, will be measured using annual weather-normalized energy consumption data. However, weather-normalized data is only available at the overall Town consumption level, and not for individual facilities. Therefore, for the purposes of the analysis that follows in the document, non-weather-normalized data was used.

D. Municipal Energy Consumption for the Baseline Year (FY 2015) – During the FY 2015 baseline year, the municipality used 59,753 MMBTUs of energy. The weather-normalized energy-use for FY 2015 is 56,759 MMBTUs

Table 2b: Summary of Municipal Energy Use: Baseline Year FY 2015 and Projected Energy Savings from selected Energy Conservation Measures (ECMs)

Category	Energy Consumption in MMBTU (FY2015)	Weather Normalized Baseline Energy Use	% of Total MMBTU Baseline Energy Consumption	Projected Planned MMBTU Savings	Savings as % of Total MMBTU Weather-Normalized Baseline Energy Consumption
Buildings	45,369		75.93%	10,391	89.55%
Vehicles	7,318		12.25%	994	8.57%
Street/Traffic Lights	390		0.65%	218	1.88%
Water/Sewer/Pumping	6,623		11.08%	0	0.00%
Open Space	53		0.09%	0	0.00%
Total	59,753	56,759	100.00%	11,603	100.00%

In order to reach the Green Communities goal of reducing energy consumption by 20%, Medfield will need to reduce its overall weather-normalized energy consumption in FY2015 by 11,352 MMBTUs.

Table 3a and 3b present energy-use for each municipal facility in native units and MMBTUs.

Buildings: Medfield's 14 buildings used 45,369 MMBTUs, around 75.9% of Medfield's total municipal energy use. Among municipal buildings, school buildings made up 79.3% of energy consumption. The buildings with the greatest energy use is Medfield High School (14,030 MMBTUs), followed by Blake Middle School (8,766 MMBTUs).

Table 2c: Summary of Energy Use in Buildings: Baseline Year FY 2015

Buildings		Building Energy Consumption in MMBTU (FY2015)	% of Total Building Energy Consumption (FY2015)	
School Buildings' Energy Consumption:	Medfield HS	14,030	30.92%	79.32%
	Blake MS	8,766	19.32%	
	Dale Street ES	5,423	11.95%	
	Memorial ES	4,268	9.41%	
	Wheelock ES	3,497	7.71%	
Non-School Buildings' Energy Consumption:	Town Garage	5,983	13.19%	20.68%
	Medfield Public Library	1,003	2.21%	
	Town Hall	801	1.77%	
	Council on Aging: Center at Medfield	639	1.41%	
	Police Dept	604	1.33%	
	Fire Dept	182	0.40%	
	Solid Waste	107	0.24%	
	MEMA	58	0.13%	
	Pfaff Center	7	0.02%	
		45,368	100.00%	100.00%

New Construction:

In 2016, following the selected energy-use baseline year (FY2015), the Town of Medfield constructed a new Public Safety Building to replace its Police and Fire Station buildings listed in the baseline year. The new Public Safety will be

operational in Fall 2016 and will have a gross square footage of 40,690 sq ft. This will replace the existing Police and Fire Station buildings' gross square footage of 11,400 sq ft. Due to its larger size, this building will increase the Town's energy load once it goes online.

Per consultation with DOER, the Town will incorporate this building stock change in its first annual report, after the building is in operation. For replacements of existing buildings, DOER requires that energy-use be apportioned according to the difference in square footage of the old and new building. "If the new building is larger than the replaced building, then the energy use will be apportioned according to the difference in their square footages. For example, if a 1000 sq foot building was replaced with a 1500 sq feet (an additional 33%), then 67% of the energy bills for the building would be accounted for in monitoring the community's progress towards meeting its 20% energy reduction target."

Street/Traffic Lights: There are 347 streetlights in Medfield. Additionally, Medfield has 6 traffic lights. Traffic and street lights consume 390 MMBTUs, 0.65% of the Town's energy use.

Vehicles: Medfield's 114 municipal vehicles use 12.3% of the baseline total, or 7,318 MMBTUs.

Water/Sewer Facilities: Water supply and waste water treatment consume 11% of total municipal energy consumption, or 6,623 MMBTUs. Medfield is serviced for wastewater by the Town. The Town also owns and operates drinking water wells and pumping stations. In 2016, following the selected energy-use baseline year, the Town of Medfield applied solar energy to its Wastewater Treatment Plant, which is expected to generate 300,000 kilowatt-hours of electricity a year and provide 40 percent of the plant's yearly power consumption.

This renewable energy generation project at the Wastewater Treatment Plant will be complementary to the energy efficiency efforts of the Town, enhancing the Town's overall sustainability activities. It is important to note, however, that

the electricity generated at the Wastewater Treatment Plant will be considered a fuel source once operational, and should be included as a type of energy usage in future Green Communities annual reporting. The Massachusetts Department of Energy Resources (DOER) does not allow renewable energy projects to be used towards the 20% reduction for the Green Communities program.

E. Energy Consumption for Baseline Year FY2015

The following tables illustrate detailed energy-use by facility.

Table 3a: Municipal Energy Consumption for Baseline Year FY 2015 (Native Units)

ERP Guidance Table 3a - Municipal Energy Consumption for 2015 (Native Fuel Units)

		2015				
		Electric (kWh)	Gas (therms)	Oil (gallons)	Gasoline (gallons)	Diesel (gallons)
Building	Medfield High	1,452,974	90,726			
	Dale Street Elementary	205,956	47,207			
	Memorial Elementary	370,920	30,025			
	Wheelock Elementary	215,040	27,637			
	Blake Middle	655,145	65,302			
	Garage	194,068	53,210			
	Town Hall	126,400	3,695			
	Police	119,080	1,976			
	Pfaff Center	1,932				
	Solid Waste	31,503				
	MEMA	17,110				
	The Center at Medfield	64,880	4,174			
	Library	116,480	6,060			
	Fire	52		1,309		
	Total	3,571,540	330,012	1,309		
Open Space	McCarthy Park	516				
	Hinckley Swim Pond	4,000				
	Metacomet Park	4,583				
	Meeting House Pond Park	1,240				
	Baxter Park	5,262				
	Total	15,601				
Street/Traffic Lights	Street Lighting	106,586				
	Traffic Lights	7,596				
	Total	114,182				
Vehicle	Gasoline				23,806	
	Diesel					31,409
	Total				23,806	31,409
Water/Sewer	Wastewater Treatment Plant	806,400	2,078			
	Water Pump Stations	939,891	58			
	Sewer Pump Stations	130,511	40			
	Sewer Flow Stations	500				
	Total	1,877,302	2,176			
Grand Total		5,578,625	332,188	1,309	23,806	31,409

Table 3b: Municipal Energy Consumption for Baseline Year FY 2015 (MMBTU)

ERP Guidance Table 3b - Municipal Energy Consumption for 2015 (MMBTU)

Please make sure that any data submitted to DOER contains complete Data!

		2015				
		Diesel	Electric	Gas	Gasoline	Oil
						Total
Building	Medfield High		4,958	9,073		14,030
	Dale Street Elementary		703	4,721		5,423
	Memorial Elementary		1,266	3,003		4,268
	Wheelock Elementary		734	2,764		3,497
	Blake Middle		2,235	6,530		8,766
	Garage		662	5,321		5,983
	Town Hall		431	370		801
	Police		406	198		604
	Pfaff Center		7			7
	Solid Waste		107			107
	MEMA		58			58
	The Center at Medfield		221	417		639
	Library		397	606		1,003
	Fire		0			182
	Total		12,186	33,001		45,369
Open Space	McCarthy Park		2			2
	Hinckley Swim Pond		14			14
	Metacomet Park		16			16
	Meeting House Pond Park		4			4
	Baxter Park		18			18
	Total		53			53
Street/Traffic Lights	Street Lighting		364			364
	Traffic Lights		26			26
	Total		390			390
Vehicle	Gasoline				2,952	2,952
	Diesel	4,366				4,366
	Total	4,366			2,952	7,318
Water/Sewer	Wastewater Treatment Plant		2,751	208		2,959
	Water Pump Stations		3,207	6		3,213
	Sewer Pump Stations		445	4		449
	Sewer Flow Stations		2			2
	Total		6,405	218		6,623
Grand Total		4,366	19,034	33,219	2,952	59,753

IV. Energy Reduction Plan

A. Narrative Summary

See the accompanying Table 4 in the attached Excel spreadsheet for the Energy Conservation Measures that the Town will pursue in order to achieve 20.44% energy consumption reductions in 5 years. Those measures are also listed below:

1. Overview of Goals for Years 1-3:

- Two new boilers replaced end-of-life boilers at Wheelock Elementary School in Summer 2016, bringing the efficiency from 80% to 92%.
- Town Garage HVAC controls commissioning was completed in Spring 2016.
- Lighting retrofits were made at the Waste Water Treatment Plant in 2016.
- Interior and exterior lighting retrofits were made at the Council of Aging building, the Medfield Public Library and Town Hall are currently underway.
- Weatherization at Council of Aging building entrance is underway.
- Retrofit interior and exterior lighting with energy efficient fixtures and bulbs at Blake Middle School, Dale Street Elementary School, Medfield High School, Memorial Elementary School, Wheelock Elementary School and Town Hall (parking lights).
- Perform a comprehensive retro-commissioning of the EMS system at Medfield High School and Memorial Elementary School.
- Install Domestic Hot Water (DHW) measures such as low-flow aerators, spray valves and showerheads at Blake Middle School, Dale Street Elementary School, Medfield High School, Memorial Elementary School, Medfield Public Library, Town Hall, and Wheelock Elementary School.
- Insulate roof at time of roof replacement at Blake Middle School.
- Replace domestic hot water storage tanks with more efficient tanks at Blake Middle School.
- Implement a behavioral-based electricity-use reduction strategy at Blake Middle School and Medfield High School, in coordination with the administration, teachers, students and the facilities department.

- Install steam traps at Dale Street Elementary School.
- Conduct weatherization and HVAC upgrades at Medfield Public Library.
- Adopt a city-wide “No Idling” policy for all municipal vehicles.
- Incorporate a switch to 100% synthetic oil for all municipal vehicles’ oil replacement.
- Closely monitor vehicle tire air pressure to maintain vehicle fuel efficiency.
- Institute the use of a Digital Fleet Management System.
- Retrofit streetlights.

2. Overview of Goal for Years 4-5:

- Retrofit interior lighting with energy efficient fixtures and bulbs at Medfield High School and Town Garage.
- Perform a comprehensive retro-commissioning of the EMS system at Blake Middle School and Town Hall.
- Install an EMS at Medfield Public Library.

B. Path to 20% Energy Use Reduction by the end of Fiscal Year 2020

1. Program Management Plan for Implementation, Monitoring, and Oversight

The Town Energy Committee, in collaboration with the Facilities Director, will be responsible both for oversight of the Energy Reduction Plan and for implementation of energy conservation measures within the Town. Medfield’s Energy Committee and Facilities Director, Gerard McCarty, will be responsible for the annual reporting requirements to maintain designation and eligibility for annual competitive grant funding.

In order to ensure progress in reaching the Town’s 20% goal, the Town will designate the Facilities Director, Gerard McCarty to develop a progress update to the Energy Committee every quarter and will update the Board of Selectmen and School Committee on progress annually. In addition, progress updates on

the Energy Reduction Plan will be included in the Energy Committee's annual report to the Board of Selectmen and Town Administrator.

The Town would also benefit from having a full- or part-time Energy Coordinator to execute these and other energy efficiency and renewable energy activities. The Energy Conservation Measures identified through the energy auditing process and those not yet realized could bring significant energy and cost savings to the municipality, and those annual cost-savings often exceed the salary needed for a full- or part-time energy coordinator.

DOER's Energy Management Basics Report¹ notes that "In some local governments, energy cost savings are: -put in the general fund, -returned to individual departments for their own use to encourage saving energy, or – used to fund more energy efficiency upgrades."

2. Summary of Energy Audit(s) or Other Sources for Projected Energy Savings

The attached spreadsheets and audit reports detail efficiency interventions that reduce overall municipal energy consumption by 20.44% over the next four to five years as identified by Rise Engineering, AECOM, the Town of Medfield, the Fred Davis Corporation, and MAPC.

References for each measure are cited in Table 4 and referenced reports are included as appendices to the Energy Reduction Plan. Projected MMBTU savings for each category (buildings, vehicles, street and traffic lights, water and sewer, and open space) are subtotaled to arrive at a municipal grand total of 11,603 MMBTUs.

Energy Management Systems across Municipal Facilities:

The Facilities Director will lead a comprehensive analysis on building controls across many municipal facilities, and will bring in a third-party to assess the functionality and effectiveness of existing energy management systems (software and hardware), as well as looking into needs for new energy management systems.

¹ <http://www.mass.gov/eea/docs/doer/green-communities/ems/energy-basics-7-15-13-update.pdf>

General Measures:

Other projects (not listed in Table 4) that the Town would like to further assess and pursue include:

- Weatherization (installed insulation and weather-stripping) of the Pfaff Center. Existing estimates anticipate annual energy savings of 160 MMBTUs and annual cost savings of \$1,440.
- Roof replacement with insulation upgrades at Wheelock Elementary School.
- Energy-efficient window replacements at Wheelock Elementary School.
- Building Operator Certification (BOC) Training for the Facilities Director and/or future Energy Coordinator/Manager. Data shows that having a BOC certified operator can bring annual electricity savings of 100,500 kwhs and 1,400 therms.²

3. Street Lighting

The Town will develop a plan to purchase its 347 streetlights from Eversource. The price of purchase as stated by Eversource is \$1 total. The plan to convert all lights to LED will be developed as the maintenance and repair options are clarified. This project will save the Town more than \$35,000/year in energy costs.

C. Summary of Long-Term Energy Reduction Goals – Beyond 5 Years

1. Municipal Buildings (including schools)

To better strategize for the long-term maintenance and management of municipal buildings, Medfield will work with internal schools and Town staff as well as outside consultants, when necessary, to assess and document the condition of major municipal buildings on an annual basis. In addition to exposing continuing opportunities for energy use reductions, this effort will provide the Town with a clear, long-term asset management strategy for the effective budgeting and maintenance of buildings.

² <http://www.theboc.info/wp-content/uploads/2015/09/BOC-Energy-Savings-FAQ-2015.pdf>

Additionally, the Town could take the following measures for municipal buildings:

- Adopt a Certified Green Building Standard (e.g., LEED Silver or Gold, Living Building Challenge) as the design and construction minimum for the renovation and new construction of all municipal facilities, and
- Implement a routine load-shedding program whereby peak demand energy use is reduced and operational changes are instituted (e.g. higher AC set points in summer, consolidated facility use during off-hours) to lessen overall energy demand year-round.

2. Vehicles (including schools)

The Fuel-Efficient Vehicle policy will have become engrained within municipal purchasing practices after 5 years, and the Town will seek to explore even more efficient policies and tracking systems to enable more efficiency.

3. Perpetuating Energy Efficiency

An annual municipal audit by Town and Schools staff can tap into the knowledge of the employees who use and maintain the building every day. It can empower building staff to develop a detailed repair and management schedule and collect data on problems and inefficiencies that may be missed by traditional third party audits. Web-based application systems such as See Click Fix can be considered to create additional real-time opportunities for efficiencies in operation and maintenance.

The Town of Medfield will grow its capacity to retrofit and build more efficient facilities, purchase more efficient vehicles, and illuminate the Town through more efficient lighting throughout the 5-year period. These practices will become more engrained in the culture of the Town and will provide opportunities to instill the ethos into additional policies and programs for more dedicated long-term funding streams and strategies.

V. Appendix A.: Town of Medfield Energy Audits – Rise Engineering

VI. Appendix B: Town of Medfield Energy Audits – AECOM

VII. Appendix C: Town of Medfield Energy Measures – Town of Medfield

VIII. Appendix D: Town of Medfield Energy Measures – MAPC

IX. Appendix E: Town of Medfield Streetlight Measures – Fred Davis Corporation

X. Appendix F: MMBTU Conversion Chart – DOER

MMBTU Conversion Chart³

Fuel Energy Content of Common Fossil Fuels per DOE/EIA

BTU Content of Common Energy Units – (1 million BTU equals 1 MMBTU)

- 1 kilowatt hour of electricity = 0.003412 MMBTU
- 1 therm = 0.1 MMBTU
- 1 ccf (100 cubic foot) of natural gas = 0.1028 MMBTU (based on U.S. consumption, 2007)
- 1 gallon of heating oil = 0.139 MMBTU
- 1 gallon of propane = 0.091 MMBTU
- 1 cord of wood = 20 MMBTU
- 1 gallon of gasoline = 0.124 MMBTU (based on U.S. consumption, 2007)
- 1 gallon of E100 ethanol = 0.084 MMBTU
- 1 gallon of E85 ethanol = 0.095 MMBTU
- 1 gallon of diesel fuel = 0.139 MMBTU
- 1 gallon of B100 biodiesel = 0.129 MMBTU
- 1 gallon of B20 biodiesel = 0.136 MMBTU⁴
- 1 gallon of B10 biodiesel = 0.137 MMBTU⁷
- 1 gallon of B5 biodiesel = 0.138 MMBTU⁷
- 1 barrel of residual fuel oil = 6.287 MMBTU

³ If a conversion factor for a fuel you use is not provided, please contact DOER.

⁴ Calculated Values from those of diesel and B100 biodiesel

Medfield Library

HVAC Report

February 8, 2012



image used with permission from Richard Smith, Adams & Smith Architects and Consultants

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Notes
Description of systems
Observations of systems
History of service
Recommended repairs
Improvements
Next steps
Photographs, diagrams and support documents

Introduction

The Library is a blend of historic and modern construction that experiences significant demand on its infrastructure due to heavy usage and traffic. The HVAC system was designed and installed as part of the 1997-1998 remodel. As a public building, supported by both professional and volunteer staff, the thermal comfort and operational ease of the HVAC systems is paramount to the actual and perceived value of the space.

This report summarizes the data collected through experience of servicing the HVAC systems in the Library, through staff interviews, and research.

The goal of this report is to provide decision makers with the information needed to make the appropriate maintenance and capital expenditures on the HVAC systems for the Library and through informed decisions to protect the Town's investment in the building and in its infrastructure.

This report does make specific recommendations, but it also is intended to create dialog about ways to achieve the desired comfort goals that effectively provide comfort to the occupants with safe and energy efficient equipment and operating controls.

Notes

This report and associated documents refer to "pumps" and "circulators" interchangeably. For the purpose here there is no significant difference.

Roof mounted heating and cooling units are often referred to as "gas-electrics", meaning the units burn gas to heat and use electricity to cool. The industry's acronym for this type of unit is RTU, which we will use in this report.

It is helpful to think of mechanical systems (in this case HVAC systems) as having two main sections; the "power plant" section and the "distribution" section. Boilers, controls, pumps, blowers, roof-mounted units, and thermostats are all examples of the power plant portion of the system. Ductwork, heating elements, grilles, piping, and flue vents are all examples of the distribution system. Generally power plants require more frequent repair and replacement; these are the systems with moving parts, electronics, or motors. These systems are also generally where operating costs can be reduced most effectively. The distribution systems are generally longer lived, i.e., they tend last for decades. For example the same ductwork is often used for three or more different HVAC units.

Description of Systems

The building is served by both forced air heating/cooling and forced water heating only systems.

Forced Hot Water Heating

The primary (or first stage) heating scheme is a forced hot water system. Two natural gas-fired boilers provide heat. These boilers are piped in parallel. Either one or both boilers are fired to maintain the desired water temperature for the given ambient temperature. The combined heat of the boilers is distributed throughout the building by one of two main circulators. The two circulators are piped and wired in parallel. Only one of the circulators operates at a time. An electronic control system operates the boiler based on indoor and outdoor temperatures.

The heated water circulates to 33 zones that are located throughout the building. Wall-mounted thermostats control the opening and closing of two-way valves, which in turn allow the flow of heated water to the various heating elements.

Forced Hot Air Heating

The secondary (or stage two) heating scheme is provided by roof-mounted combination heating and cooling units. These units operate on natural gas for heating. A blower, mounted in each of the eight units, circulates air through ceiling mounted grilles connected by steel ductwork. When the heat provided by the hot water system is inadequate to heat the space, a wall-mounted thermostat within the space activates the forced hot air circuit. Each roof-mounted unit is independent of the others and of the forced hot water heating system.

The number of forced hot water zones (33) is much greater than the number of forced hot air zones (8). Therefore, when the heating portion of a roof-mounted unit operates it delivers heat to more than one forced hot water zone.

Forced Cold Air Cooling

All of the cooling for the building is provided by one of the eight roof-mounted combination heating and cooling units. Each of these units operates independently of the other systems in the building. A blower, (the same as that used for the heating portion of the system) circulates air through ceiling mounted grilles connected by steel ductwork.

Ventilation

Ventilation air, or fresh air, is provided by the roof-mounted heating and cooling units. Each of the eight units is equipped with a motorized fresh air intake damper and filter assembly. These fresh air assemblies (commonly referred to as "hoods" due to their shape) are set to provide a minimum fresh air volume whenever the blower motor is operating. The fresh air hoods are also equipped with a control that allows the intake of a large volume outdoor air whenever there is a call for cooling and the ambient air temperature is sufficiently low to provide cooling for "free" (without operating the refrigeration circuit.)

Exhaust

There are two roof mounted exhaust fans which remove air from the lavatories. These fans operate 24 hours per day.

Observations of systems

The overall design philosophy and system implementation is typical for a building of this volume, renovated at that period in time. The selection of equipment, the layout of the distribution systems and the operating control system used are all mainstream—neither the highest or lowest quality available. The following observations are based on what is present and what was originally intended. Please refer to the section “improvements” in this report for ways the systems may be modified to provide more comfort or lower cost to operate.

Forced Hot Water Heating

The main circulators and the associated valves and fittings in the mechanical room are leaking and rusting.

The well-type aqua-stats are leaking.

The electronic control system for boiler and circulator control is in need of repair.

The two-way valves that control heated water flow to heating zones are starting to show signs of increased failure rate.

The floor drain in the boiler room is not placed at the lowest point in the room. Fluid leaks in the room travel out the entry door to the rear exit hallway.

There is a general state of corrosion at the points of intersection (mechanical joints, transitions, etc.) in all equipment and controls. The corrosion is due to age or joint failure or both.

Forced Air Systems

Airflow at three to five locations is inadequate for effective cooling during warm weather.

The six original roof-mounted units are showing signs of increased failure rate.

History of service

The majority of HVAC (heating, ventilation and cooling) systems serving the building were installed fourteen years ago in the major renovation and expansion project of 1997-1998. Since the original installation two of the eight roof-mounted heating and cooling units were replaced in late 2009.

Our firm has been providing service and maintenance to the library since FY2009. A summary of repairs and replacements from October 2008 through January 2012 follows:

Forced Hot Water Heating

- FY 2009** Gas valve and pressure relief valves
Thermostats in meeting room, second floor reception room and custodian's room
- FY2010** Combustion air actuators for boilers
- FY2011** Gas valve and low water cut offs for boilers
Expansion tank
Compression fitting on main header
- FY2012** Pressure relief for right hand boiler
Zone valve
Warm weather shut down setting

Roof-Mounted Heating and Cooling Units

- FY2009** RTU #1 Inducer motor
RTU #2 Gas valves and inducer
RTU #3 Ignition control and wiring harness
RTU #3 Condenser fan motor
RTU #4 Blower motor
RTU #6 Ignition control, electrode, and flame sensor
RTU #8 Inducer motor
- FY2010** RTU #3 New RTU (later that year)
RTU #4 Transformer
RTU #4 New RTU (later that year)
RTU #6 Compressor contactor
RTU #7 Compressor contactor and low voltage harness and contractor
- FY2011** RTU #5 Thermostat sub-base
RTU #5 Condenser motor, blade and capacitor
RTU #7 Blower motor
- FY2012** RTU #4 Warranty compressor

Recommended repairs

The following is a list of presently known repairs. As the systems age, the decision of repair versus replacement becomes more complex. Some of these items may be left as is if equipment is to be replaced soon.

The electronic boiler and pump control system does not function properly. The controller is aware of the outdoor temperature but is not able to regulate the boiler temperature effectively to reap the cost savings by lowering the loop temperature according to the outdoor ambient. We recommend a budget of \$ 500.00 for repairs to this system.

The near-boiler piping and controls is subject to the greatest wear and tear. The gauges, temperature limit controls and associated wiring are weeping. We recommend a budget of \$ 1,000.00 to replace, re-wire and clean up the corrosion of all these near-boiler monitoring and controlling components.

The heating system has two circulator pumps. Each pump has an associated check valve, flow control valve, vibration isolation, and shut off valves. The fittings for the far pump (furthest from the boilers) vibration and union seal are leaking. We recommend a budget of \$ 1,000.00 for repairs to this equipment.

The roof-mounted heating and cooling units require the following repairs. We recommend a budget of \$ 2,000.00 for these repairs.

RTU #2	Gas combustion relay
RTU #5	Gas valve control board and blower contactor
RTU #7	Blower relay and gas combustion relay
RTU #8	Blower contactor

One roof-mounted heating and cooling unit serves the main desk and staff office. Airflow to the offices is inadequate. We propose improving air flow through changes to the main blower drive. If these changes do not provide all the airflow required we will add additional branch ductwork and grilles from the main trunk ductwork. We recommend a budget of \$ 1,400.00 for this work. There are physical limits to the volume of air that can be directed to the space without altering the walls and ceilings.

Improvements

The improvements listed here are based on the premise that maintaining the base design philosophy used in the 1997-1998 renovation is preferable to altering the systems due to the extraordinary cost to revise the delivery systems. In particular, the use of roof-mounted HVAC systems, which are generally the least efficient method of conditioning a space, is too costly to alter. For example, eliminating the roof-mounted units and providing heating, cooling and ventilation through other means would cost an estimated \$ 200,000. Therefore the improvements listed are made with the intent to improve the effectiveness of the existing systems.

Thermostat upgrade

Forty-one thermostats control the heating and cooling temperature in the building. Eight thermostats control the operation of the roof-mounted heating and cooling units, and 33 thermostats control the operation of the forced-hot water heating loops. The thermostats have the ability to be programmed for different temperatures at different times and days of the week.

Empirical evidence shows that these thermostats are not effective in public/commercial environments. The temperature settings and dates/times are often inconsistently manipulated. This results in the spaces being over heated (in winter) or over cooled (in summer).

We recommend the installation of new thermostats with remote control capability. The remote control will allow an authorized user(s) to change all the settings from one location. The control will allow individual (thermostat by thermostat) changes as well as global or grouped (all thermostats or all thermostats on a given floor) changes. This will allow, for example, the ability to change the desired temperature from the typical daily settings for an unusual event or space need. The central control will also reset any temporary individual thermostat change. For example, if a thermostat in the children's reading room was changed during the day, its setting would be returned to the predetermined value at the end of the day or three hours after the change was made. Central control can also allow remote access through an internet connection. Remote access could, for example, allow all thermostats to be set for "unoccupied" when a snow-day is declared.

There is a wide range of options for this type of system. The final thermostat selected, the type of control interface (smart phone apps, number of users, using the library's existing computer, using a using a dedicated computer) and amount of programming vary. We have investigated five options of the many options available. Options A, B and C are based on the Ecobee thermostats and options D and E are based on the Omnicontrol thermostat. We have shown the budget difference for replacing just the eight thermostats serving the roof-mounted heating and cooling units as well as the budget for replacing all 41 thermostats in the building. The Ecobee thermostats must be located within a wireless internet signal area for remote access.

- **Option A: Eight Ecobee Smart thermostats**
We recommend a budget of \$ 5,200.00 for the installation of eight Ecobee Smart type thermostats for the roof-mounted heating and cooling units.
- **Option B: Eight Ecobee Energy Management thermostats**
We recommend a budget of \$ 6,400.00 for the installation of eight Ecobee EMS type thermostats for the roof-mounted heating and cooling units.

- **Option C: Forty one Ecobee Energy Management thermostats**
We recommend a budget of \$ 28,000.00 for the installation of forty one Ecobee EMS type thermostats for the heating-cooling as well as heating-only thermostats.
- **Option D: Eight Omnitouch thermostats**
We recommend a budget of \$ 12,200.00 for the installation of eight Omnitouch thermostats for the roof-mounted heating and cooling units.
- **Option E: Forty one Omnitouch thermostats**
We recommend a budget of \$ 25,500.00 for the installation of forty one Omnitouch thermostats for the heating-cooling as well as heating-only thermostats.

Boiler Replacement

The building is currently served by two gas-fired boilers. The operating efficiency is approximately 82%. We recommend replacing at least one of the two boilers with boiler rated at 93% + operating efficiency. If one of the existing boilers remains, it should serve as support for the new boiler. We recommend a budget of \$ 15,500.00 to replace one boiler, or a budget of \$ 30,000.00 to replace both at the same time. The typical lifespan for boilers of this type is twenty years. These boilers have been exposed to external water damage from a main header leak, which has reduced their lifespan. Although we have not observed any imminent failure points, we do recommend changing at least one boiler in a planned way due to condition and operating efficiency.

Ventilation - Fresh air dampers

The eight roof-mounted heating and cooling units are equipped with outdoor air intake hoods. These hoods are the main source for fresh air to the building. The volume of fresh air that each unit draws into the space is determined by a setting made at the unit, which must be done by a mechanic. The position of the dampers is set to provide the amount of fresh air needed for the library at maximum capacity. This design, which is typical in buildings like this, is too crude for the wide range of building use the library experiences. In addition, the units draw in fresh air 24 hours per day.

During unoccupied times, we recommend that the blowers for the rooftop HVAC units be shut down. This will reduce the volume of fresh air introduced to the building. This can be accomplished most easily by the thermostat upgrade. There is no significant cost associated with this work.

All habitable spaces require fresh air to replace carbon dioxide and odors. The minimum quantity of fresh air required is set by governmental regulation. The mechanized introduction of fresh air for the library is through the combination of the eight roof-mounted HVAC units (air intake) and the two exhaust fans (air exhaust). The other source of fresh air is through infiltration and traffic through the doors. There are numerous sources for infiltration, particularly in the older portions of the building. Your traffic data averages approximately 60 patrons per hour with two door-openings per patron or 120 doors openings per hour, which introduces a significant volume of fresh air. Because of the relatively high volume of unintentional fresh air, the mechanized air can be reduced.

Exhausts and ventilation

The two lavatory exhausts operate 24 hours per day. These fans can be shut down during unoccupied times. Additional controls are required to make these fans automatic. The fan controls would also be connected to a central timer system. Again, this would work well with a central thermostat/control system. We suggest a budget of \$ 1,800.00 for this work.

Variable speed heating pumps - existing pumps

The heated boiler water is circulated through the building by one of two pumps. The volume of water needed varies as zones open and close based on the thermostat set points. As the volume of water needed by the zones decreases the excess water is simply re-circulated. By lowering the volume of water to match the needs of the various zones, energy is saved. We recommend the existing motors be equipped with variable speed controls. These controls monitor the pressure in the system, varying the speed of the motors to maintain a constant system pressure. Energy is saved any time the motors operate at less than 100% capacity. We suggest a budget of \$ 4,000.00 for the installation of two variable speed drives and pressure differential devices to the existing pumps.

Variable speed heating pumps - new pumps

An alternative to adding variable speed drives to the existing pumps is the replacement of the pumps with built-in variable speed drives. These pumps are more efficient when operating at full speed than the existing pumps. We suggest a budget of \$ 9,500.00 to replace both pumps.

Roof-mounted heating and cooling

Six of the original eight roof-mounted heating and cooling units are approximately fourteen years old. The average life expectancy of units of this type is fifteen years. We recommend replacing all of the older units. We suggest a budget of \$ 55,800.00 to replace all six units.

In the past we discussed the replacement of the roof-mounted HVAC units at a rate of one or two per year. This plan was suggested as a way to reduce the capital expense within any one fiscal year. However, the hidden cost of this approach is the additional maintenance cost of older equipment as well as the varied equipment models (varied internal components, wiring methods, etc.) that will be installed.

Note: Externally-mounted equipment, like the RTUs, have a significantly higher component failure rate than internally-mounted equipment.

Wireless Internet Access

The current wireless access in the Library is inconsistent and in some locations unusable. To operate the Ecobee thermostats (or other wireless models) remotely the thermostats must be able to access the Internet. We are also aware of the need to increase the wireless access for the Library patrons and staff. We suggest a budget of \$ 5,500.00 to increase the number of wireless access points (WAP's) in order to provide full coverage within the library and in the immediate surrounding areas. We also suggest a budget of \$ 1,200.00 to provide a dedicated WAP to serve the Historical Society building adjacent to the library.

Next steps

At a minimum the repairs to the roof-mounted HVAC units, boiler controls, pumping station and airflow improvements should be done.

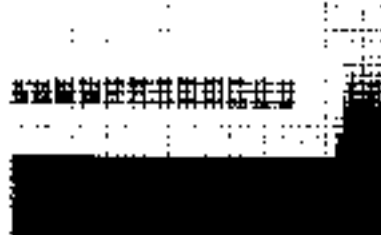
If funds allow, the roof-mounted HVAC unit replacement program should continue, replacing the six older (original) units as soon as possible. In addition, the thermostats for the eight roof-mounted HVAC units should be installed.

Ideally all of the above should be done along with the remaining thirty three heat-only thermostats, exhaust fan changes and wireless Internet access improvements. Financial provisions should be made to allow the heating system pumping station to be upgraded to pressure-controlled variable frequency drive pumps now, so that when there is a failure, or failure is imminent, improvements can be made quickly.

Photographs, diagrams and support documents



Typical control thermostat



Typical hydronic heating element



Gas-fired boilers



Wide angle view of boiler room



Boilers and water heater with flow



Typical two-way hydronic zone valve



Hydronic heat circulators, flow control and vibration fittings



Vibration reduction fitting



Flow control valve



Boiler control and outdoor reset



Main circulator (pump) control



Correction at high limit control thermostat



Roof-mounted HVAC unit



*Economizer intake and exhaust
 ports*



Heat exchanger and gas valve



Blower drive motor



Gas control and valve



*Internal return and
 economizer dampers
 and control*



Compressor cabinet



*Combustion vent motor and
 flueing*



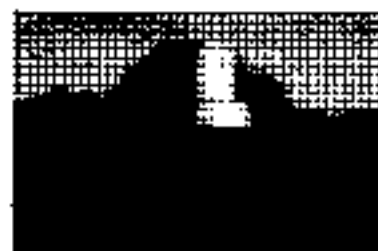
Economizer control



*Burner logs at base of heat
 exchanger*



Building exhaust blower



Building exhaust blower

Medfield Public Library
Rooftop Unit Layout

LF 2



RTU - 1
Lennox
M# GCS24-953-200-1Y
SN 5697J 03284

1st Floor Children's Area
(Right)

RTU - 2
Lennox
M# GCS24-953-200-1Y
SN 5696M 00503

1st Floor Children's Area
(Left)

Note:
"Right" and "Left" are when you
are facing the entrance of the
building.

RTU - 3
Lennox
M# TGA09HS2BM1Y
SN 5487J 10431

Main Floor Library
(Information)

RTU - 4
Lennox
M# TGA09HS2BM1Y
SN 5487J 10431

Lower Level Library
(Left)

RTU - 5
Lennox
M# GCS24-953-200-1Y
SN 5697J 01500

Main Floor Entry
Reception/Staff Office

RTU - 6
Lennox
M# GCS20-060-120-1Y
SN 5697J 03679

Lower Level Library
(Right)

RTU - 7
Lennox
M# GCS20-060-120-1Y
SN 5697J 03986

Lower Level Meeting Room

RTU - 8
Lennox
M# GCS24-953-200-1Y
SN 5697J 03223

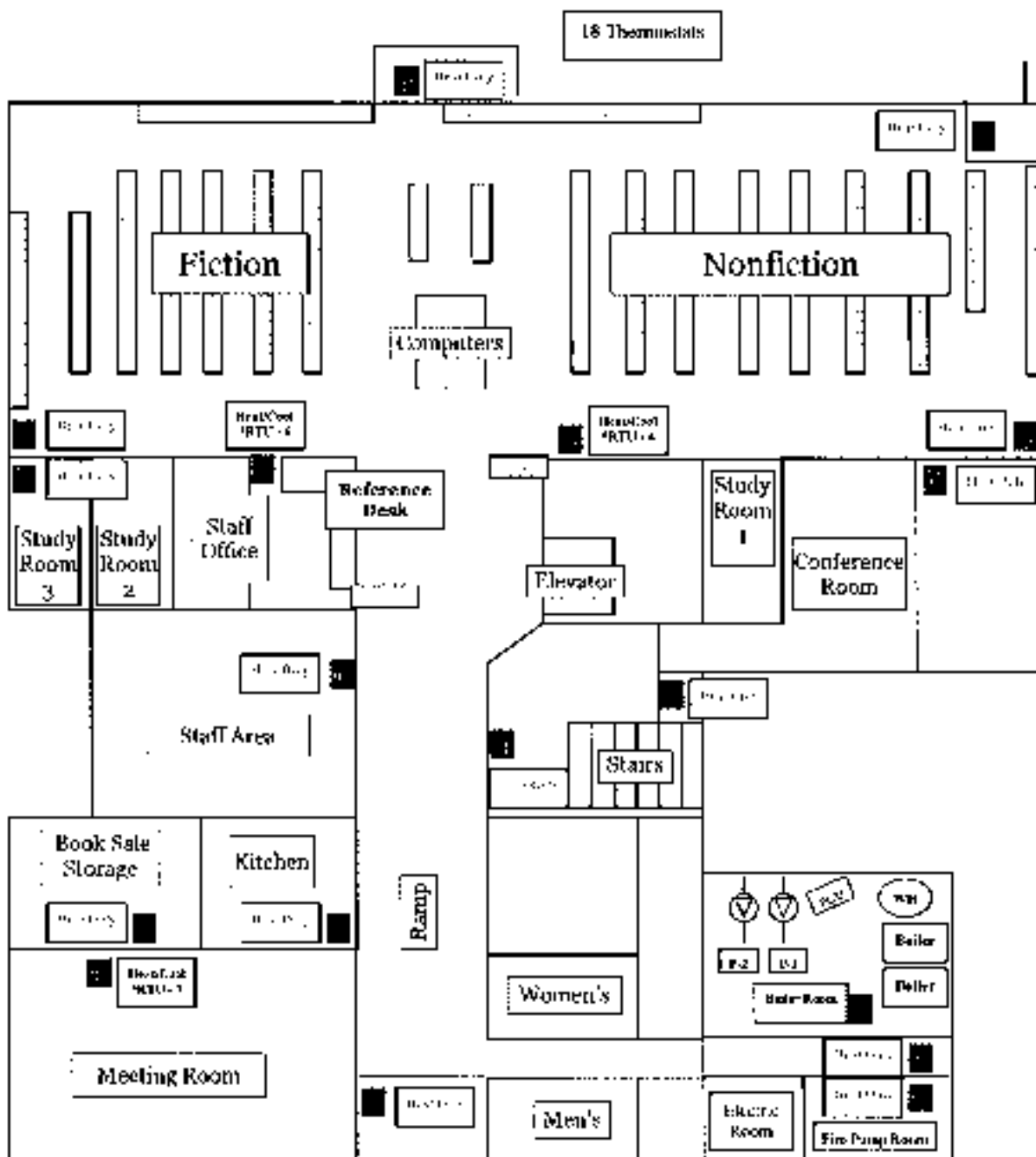
Main Floor Reference
Room

Roof Access
Hatch



RF 1

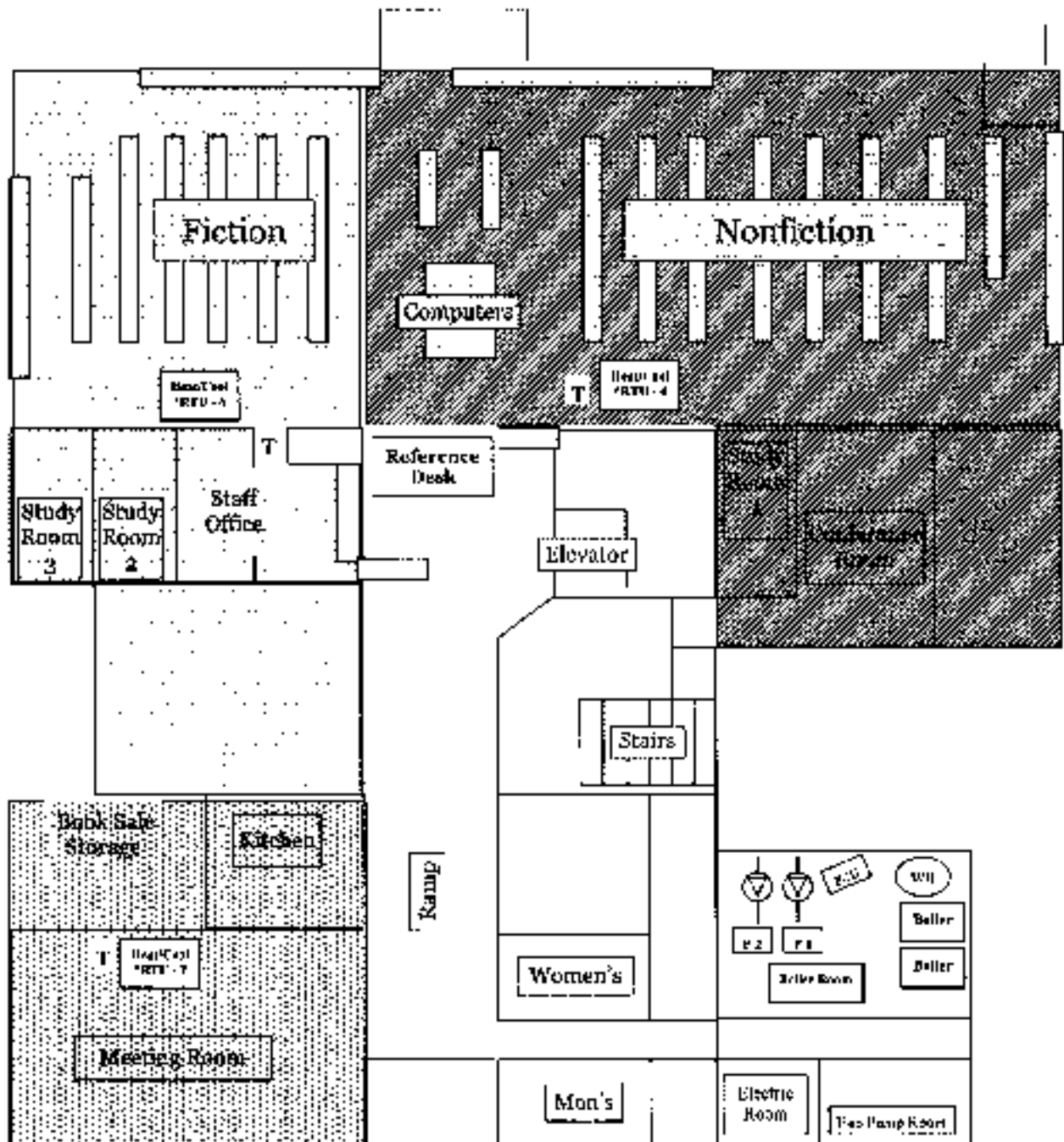
Lower Level



Medfield Public Library

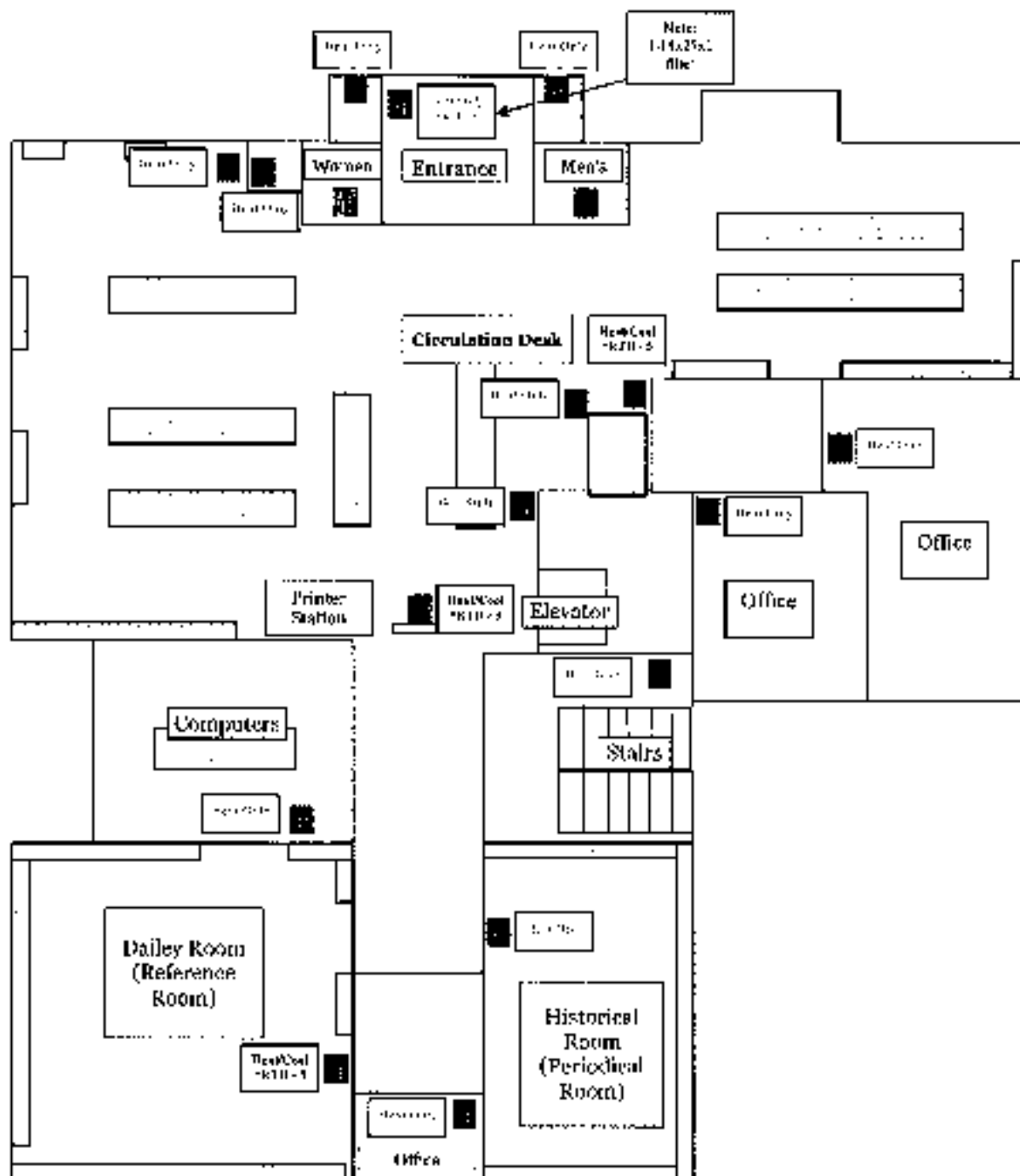
Lower Level Cooling Zones

-  RLL-4
-  RLL-6
-  RLL-7



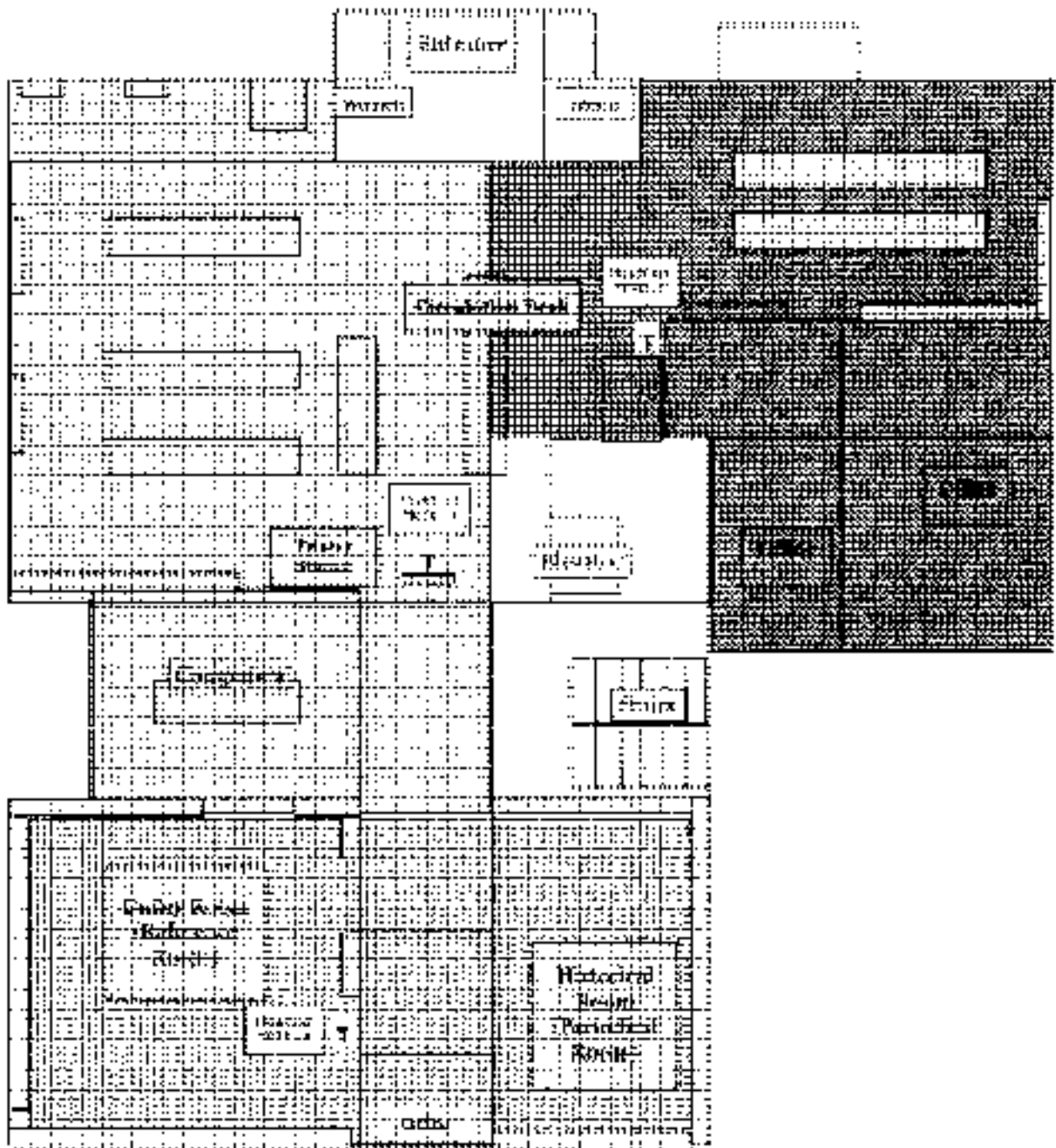
Medfield Public Library

Main Floor



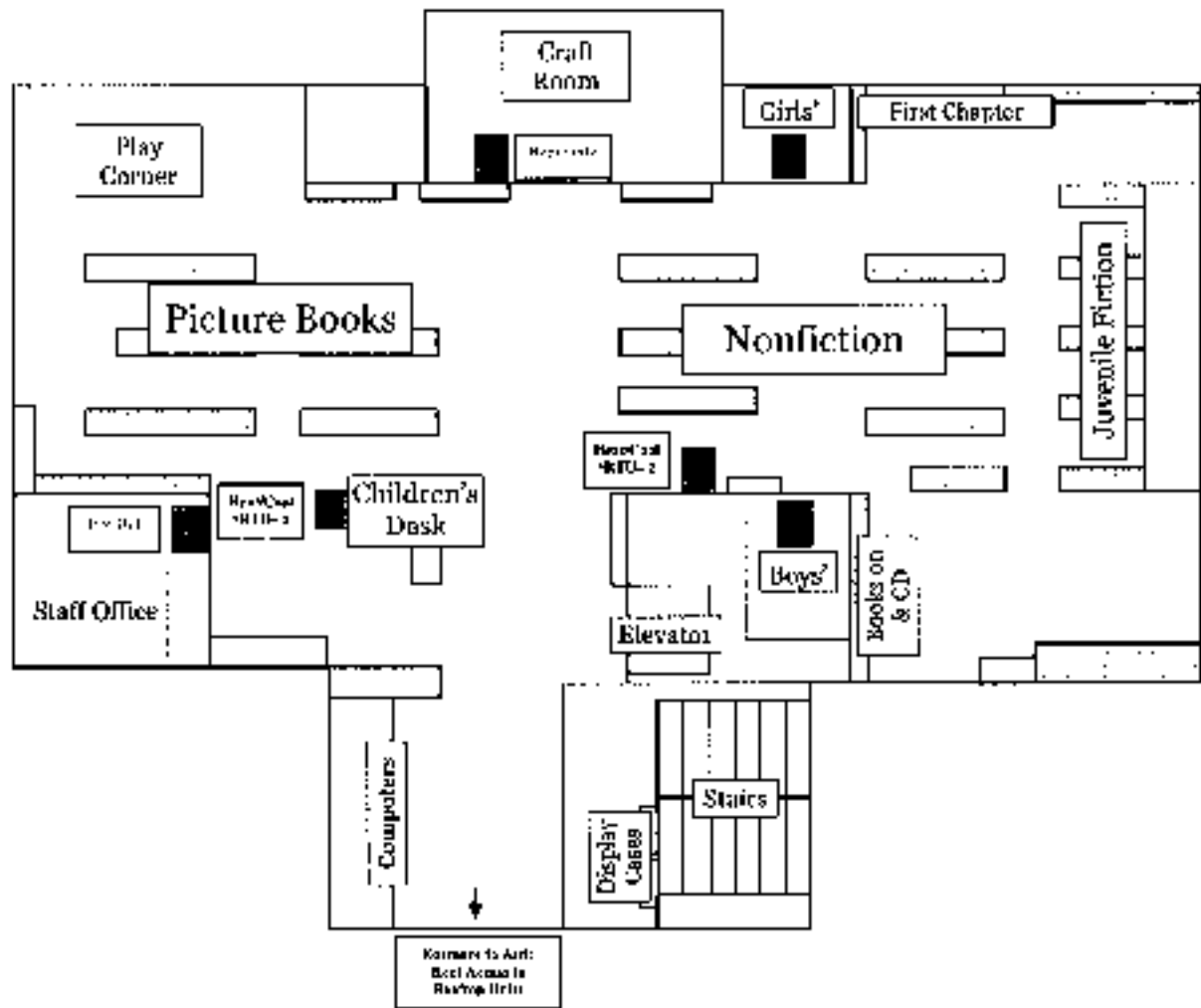
Main Floor Cooling Zones

■ RUI—K



Medfield Public Library

Children's Room



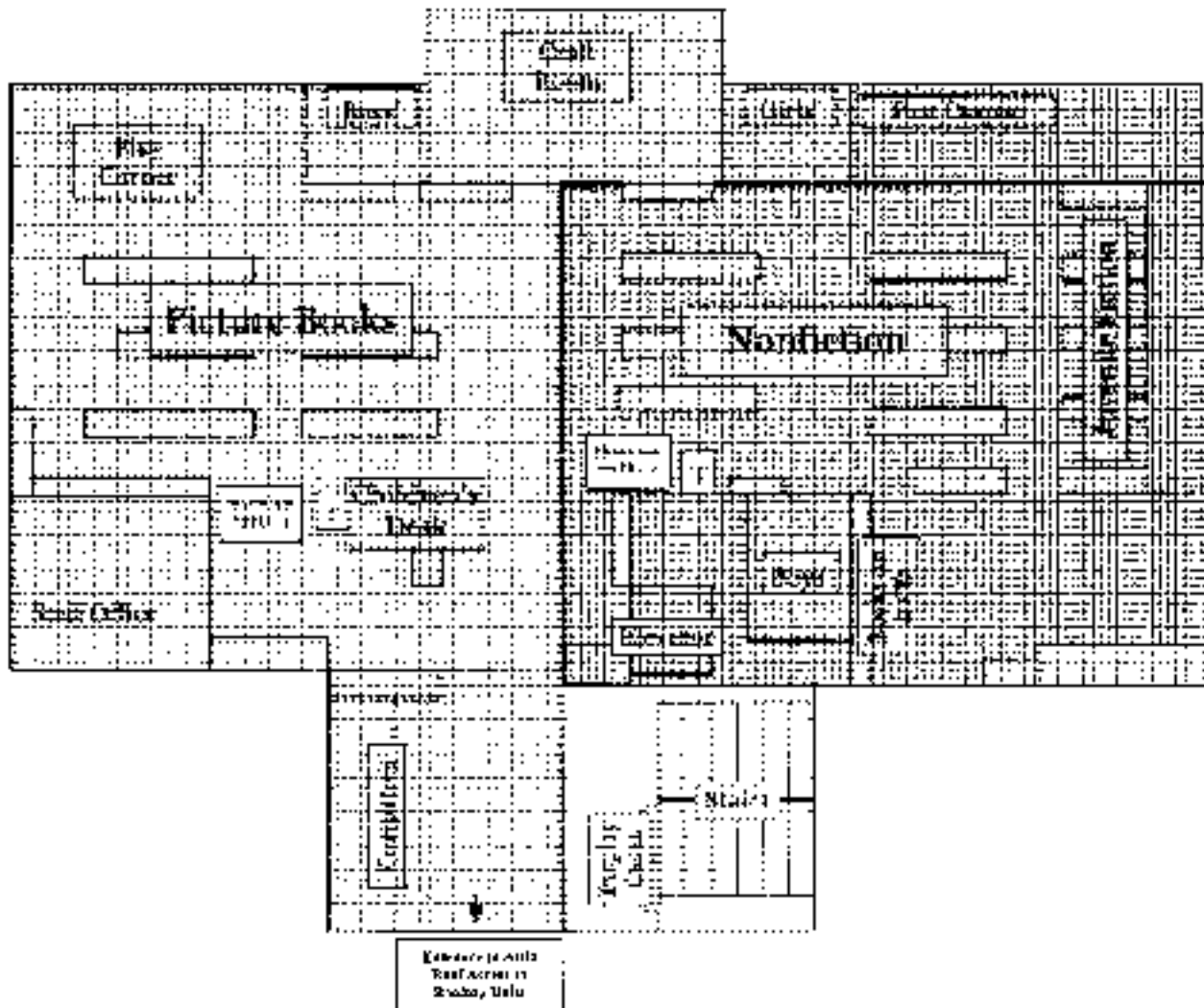
Medfield Public Library

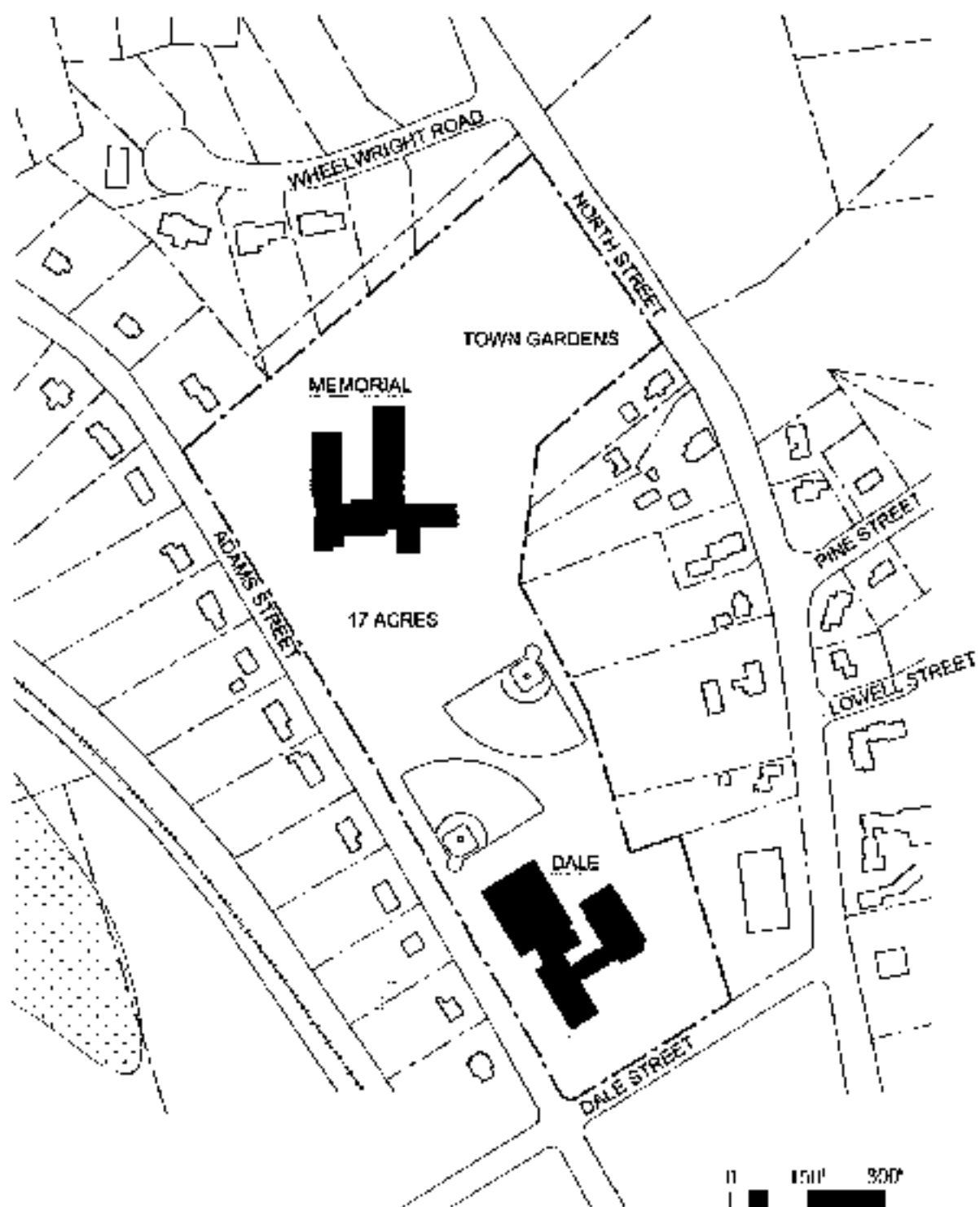
Children's Room

Cooling Zones

□ RTU-1

□ RTU-2



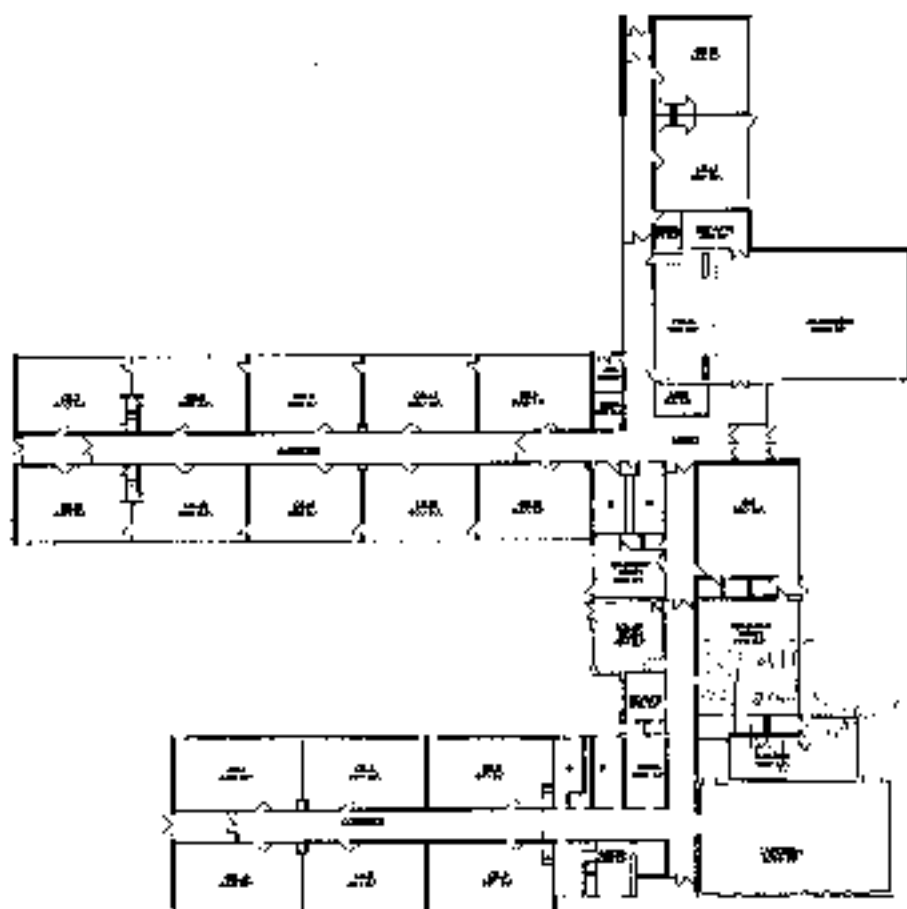


SITE PLAN

DALE STREET & MEMORIAL SCHOOLS

Medfield, Massachusetts





TOTAL GROSS SF 96,191.80

FLOOR PLAN

MEMORIAL SCHOOL

Medfield, Massachusetts



I. SITE ANALYSIS

Existing Conditions: The school is located on Adams Street adjacent and north of the Dale Street School. The schools are separated by a large open lawn area used for physical education. The driveway and parking area pavement is deteriorated with depressions and cracking. It appears that the bus and parent traffic may be congested based on the configuration of the pavement and markings. The paved path around the perimeter of the school is also in poor condition. This walk has markings for games. There is a walk connected towards North Street. The parking and drive are lighted by the Boston Edison, flood-type lights with overhead wires.

There are two areas of play equipment. The Play area on the west side of the building is well equipped with swings, slides, climbing apparatus and is handicapped accessible. The play area on the southeast side contains pre-school equipment. Both areas have a shredded wood surface.

The large lawn between the schools appears to be uneven with a number of depressions. There is a skinned area sized for softball and lite league baseball. Part of the field is used for soccer.

Analysis: We recommend a study of the vehicular circulation (cars, buses and deliveries) to evaluate the effectiveness of the layout and determine improvements. Such improvements will include resurfacing of the drives and parking. Pedestrian access should be considered at the same time.

A topographic survey should be prepared for the site especially the lawn area to permit an analysis of the grading and drainage of the fields. And both playgrounds should be evaluated to determine their capacity of serve the school needs and whether or not they meet handicap and safety codes.

II. BUILDING DESCRIPTION

A. General Description:

The Memorial School is a one story, slab-on grade, brick masonry and curtain wall building with predominately flat roofs of varying heights. It is comprised of an original building built in 1953 and a subsequent addition in 1955. The style of the building is typical of modern architecture in the '50s. The small scale and understated nature of the building allow it to fit fairly comfortably with the neighborhood.

The original building consisted of a six classroom academic wing, multi-purpose gym/cafeteria, kitchen, administration, and one kindergarten classroom. The 1955 addition more than doubled the size of the school with a ten classroom academic wing, new entry lobby, an additional kindergarten classroom, a multipurpose room with a platform, and two additional specialty classrooms.

B. Technical Description:

The building is located on Adams Street adjacent to the Dale Street School. The original 'front door' of the building is on Adams Street with a new entry/turnaround area further into the site facing the rear of the Dale Street School. The building measures approximately 280' x 280' at its widest point. The building is divided into various educational and administrative spaces totaling 36,334 s.f. They are as follows:

<u>1953 Building</u>	<u>Square Feet</u>
Administration	500
Classroom 1	860
Classroom 2	854
Classroom 3	857
Classroom 4	860
Classroom 5	854
Classroom 6	857
Cafeteria	2,038
Kitchen	700
Resource Room	1,275
Health Suite	225
Subtotal Net SF	9,880
<u>1955 Addition</u>	<u>Square Feet</u>
Library	1,160
Teacher Workstation	355
Classroom 7	800
Classroom 8	800
Classroom 9	800
Classroom 10	800
Classroom 11	800
Classroom 12	800
Classroom 13	800
Classroom 14	800
Classroom 15	800
Classroom 16	800
Administration	150
Music	555
Gymnasium	2,520
Classroom 17	830
Classroom 18	830
Subtotal Net	14,400 SF
TOTAL NET	24,280
TOTAL GROSS	36,334
Efficiency Factor	1.5
(Efficiency Factor = Gross Area ÷ Net Area)	

NOTE: For planning purposes an efficiency factor of 1.50 is desirable

III. CONDITIONS OF EXISTING CONSTRUCTION

The following is based upon detailed inspection by Mount Vernon Group, Inc., Architects & Planners, and their consulting engineers.

A. STRUCTURAL SYSTEMS

Existing Conditions: The building is structurally in good condition. A one-story building, constructed in 1955 and extended in 1956, consists of masonry walls, steel beams and metal deck roofing. Traces of roof leakage could be found. The roof is scheduled to be replaced this year.

Analysis: With the exception of the roof, no major problems could be found and no additional structural work is anticipated.

General Comment: All schools should be reviewed with respect to seismic code requirements as part of future renovations.

B. EXTERIORS

1. Walls

Existing Conditions: The existing building is a steel frame structure and consists predominately of 4" face brick and 4" and 8" cinder block back-up, steel sash/glass block, cast stone sills, porcelain enamel fascia, and spandrel panels. The south facade of the cafeteria is experiencing spalling of the face of brick at approximately 5% of the area. An exterior exposed steel "Arie Soliel" provides sun shading at the south facing specialty classrooms and library. The exterior canopy at the 1955 entry is constructed with 4" diameter steel columns with tongue and groove wood decking.

Analysis: The exterior brick portions of the walls appear to be in good condition with only minor cracking evident at the ends of the classroom wings. New control joints should be cut to minimize future cracking. A major concern with the exterior walls is the lack of insulation. Any future additions/renovations to this school should address the overall thermal envelope, possibly turning the exterior walls and providing rigid insulation. Refer to "Doors and Windows" and "Roof" sections of the report for additional information.

2. Doors and Windows

Existing Conditions: The windows in the original 1953 building and the 1956 addition are the original painted steel sash windows. The classroom wings have steel sash with glass block above. Clerestory openings in the kindergarten and library areas have glass block in-fill, much of which is cracked.

The existing exterior doors and frames are typically painted hollow metal with a metal threshold to the concrete stoops.

Analysis: Because of the age of much of these systems within the building and their relative ineffectiveness in regard to insulation, it is recommended that all windows be replaced with modern insulated glass windows that feature a thermal break frame and operable sash. Any major renovation would call for the replacement of all the doors and thresholds.

2. Roofs

Existing Conditions: The roof of the original 1953 building and the 1955 addition is a built-up roof of tar and fells and is experiencing a significant amount of leaking throughout the facility.

Analysis: It is our understanding that the School Department is planning a re-roofing project in the summer of 1999, including the replacement of the existing metal fascias.

C. INTERIORS

1. Walls

Existing Conditions: The existing interior corridor walls consist of structural glazed facing tile (SGFT) to a height of 6'-8" AFF with a SGFT cove base. Hollow metal frames with wire glass above the SGFT provide for daylight into the corridor from the classrooms. Typical interior partitions at the classrooms and library are painted cinder block with vinyl base. The cafeteria walls are painted brick with vinyl base. The multipurpose/gymnasium walls have wood paneling to 7'-0" AFF with painted cinder block above.

Analysis: The walls in general appear to be in sound structural condition. As part of a renovation project the walls should be repaired as required, repainted, and a new base be installed.

2. Ceilings

Existing Conditions: The original 1953 building and the 1955 addition have an exposed perforated acoustical metal panel deck/ceiling assembly and exposed steel roof framing with a painted finish.

Analysis: The existing ceiling/deck assembly appears to be in sound condition but requires painting. Due to the hard, non-absorbent nature of the finishes in classrooms, library, cafeteria, gymnasium, acoustical wall treatment (panels) may be required to provide for a better, quieter learning environment.

3. Floors

Existing Conditions: The majority of the floors in the original building and the 1955 addition have vinyl asbestos floor tile (VAT). The library, classroom 17, classroom 18, and the original administration areas have carpet over the existing VAT. Several of the classrooms have loose area rugs. The lobby of the 1955 addition has a terrazzo floor. The toilet rooms have ceramic tile floors.

Analysis: The existing vinyl asbestos tile and carpeted areas should be removed and replaced with new 12" x 12" vinyl composition tile. The areas that have carpet should have both carpet and the tile beneath removed and the concrete surface prepared for installation of new carpet. The existing ceramic tile floors in the toilet rooms will require replacement with new ceramic tile due to the major renovations.

4. Interior Doors

Existing Condition: The majority of the existing interior doors within the school are solid core wood doors with vision panels (clear finish) and painted hollow metal frames. All the doors appear to be original and have knob type hardware. The majority of the doors in the classroom areas are 3'-0" with accessible approaches.

Analysis: All existing solid core wood doors will be replaced with new solid core wood doors (clear finish) and solid core labeled (rated) wood doors in the appropriate locations. The majority of existing frames can remain in place with new butt hinges and lever type door hardware installed.

5. Toilets/Drinking Fountains

Existing Conditions: There are presently fourteen (14) toilet room locations. All of the single fixture toilet rooms in the classrooms, administration, kitchen, etc., are approximately 25-35 s.f., not large enough for handicapped access. The gang toilet rooms in the classroom wings have no provisions for handicapped access, nor proper clearances for entering and exiting the toilet rooms.

Analysis: It is recommended that during any renovation or addition project to this building, all toilet room areas be reconfigured to provide proper handicapped access. All existing locations of drinking fountains should have accessible drinking fountains installed.

6. Kitchen

Existing Conditions: Much of the existing kitchen equipment is original and has outlived its serviceable life.

Analysis: Replacement and upgrade of equipment is recommended. A new suspended mylar faced ceiling system should be installed.

D. CODE ISSUES

1. Building Type Summary

The Memorial School is a three-story building which has a gross footprint area of 21,856 square feet on a 1.7 acre site. The existing building is constructed of concrete slab on grade and masonry brick and backup block with interior walls of block. The exterior walls are load bearing with load bearing interior corridor walls. First and second floor framing is cast-in place concrete joists. The typical roof framing is comprised wood framed joists. The roof framing at the auditorium is steel trusses with double angles spanning between the trusses. The square footage of the building comprised with the unprotected noncombustible structure could classify the present construction type of this building as a nonconforming 2C building. The use group is E-Educational.

The building is presently nonconforming because Table 503 of the Sixth Edition of the Massachusetts State Building Code indicates that an unprotected Type 3B building of use group E has an allowable two story height and 14,400 s.f. area per floor. The existing building exceeds the allowable square footage by 7,256 s.f. on the first floor.

2. Height and Area Limitations

The designer, faced with these conditions, is guided by the provisions of Chapter 34 of the Massachusetts State Building Code §3404.0 "Requirements for continuation of the same use group or change to a use group resulting in a change in hazard index of one or less".

The existing building is in excess of the allowable square footage or height requirements as set forth in Table 503 for a building of Type 3B Unprotected Construction. The building is presently constructed of brick and block masonry with no firewalls constructed to partition the building. An addition to this building would require separation by firewall.

Area limitations of the existing building structure could be modified to comply if the building has more than 25% fronting on a street or unoccupied space, which allows an increase of 2% for every 1% of such excess frontage as per §506.2. If buildings are equipped with an automatic sprinkler system as per §506.3 this would allow a 100% increase in area for buildings more than two stories. With these requirements in place, the allowable square footage floor area would be 50,400s.f.. New fire walls must still be constructed to separate the original building from any new addition.

3. Egress Issues

Egress from the existing building is not code compliant. Most of the entrances to the building not accessible from the stair landings. §3400.5 assists the designer in arranging proper egress for the building and §1009.0 provides direction on widths of exits to provide a safe and adequate means of egress.

4. Remediation

Any improvements in the existing building must address the following issues:

All exit signing, exit lighting and fire detection and annunciation systems must be upgraded to contemporary codes, replacing existing equipment with new. §3404.7, §3404.8 and §3404.12 address exit sign and lights, means of egress lighting and fire protection systems. This equipment must in the renovated building, conform to the provisions of the most current codes.

Energy Code Requirements. §3407.1 and §3407.2 of the Massachusetts State Building Code require that alterations of an existing building in which the use group is not changed, must comply to the energy conservation values detailed in Table 3407 of the code for any building elements (walls, windows, doors, roofs, or mechanical systems) which are altered in the course of renovation.

Handicapped Access. "Architectural Access Board Rules and Regulations" 521 CMR 3 require that any renovation of a building in which the cost amounts to 30% or more of the assessed value of the building, the entire building is required to comply with the latest provisions for handicapped access as documented in 521 CMR and the Americans with Disabilities Act.

Elevators and Vertical Lifts. §3001.1 provides that elevators vertical lifts and similar equipment shall conform to the elevator regulations of 521 CMR. §3001.2 shall construction shall comply with 780 CMR §710.0 vertical shafts. These provisions allow guidance in designing the appropriate equipment for floor grade changes.

E. MECHANICAL SYSTEMS

Boiler Room:

The boiler room is provided with two (2) cast iron sectional fire tube boilers manufactured by Scannell Boiler Co. Each boiler is provided with a natural gas burner and each boiler is rated at two million four hundred fifty thousand (2,450,000) BTU/H. Each boiler is provided with two (2) low water cut-offs and all operating and safety controls and the entire installation does meet minimum code requirements. Each boiler generates low pressure steam and distributes throughout the boiler room through a schedule forty (40) black steel piping system. From an external position the piping does appear to be in good condition and there have been no indications of leaking brought to our attention by maintenance personnel, however before an exact determination can be made to the overall pipe quality sections should be removed and examined internally for corrosion. All gas regulators are vented to the exterior of the building per code requirements. The overall condition of each boiler is appears average to below average considering the approximate forty-five (45) year age of the entire power plant. Consideration should be given to an upgrade base purely on age of the system at this time. Also located throughout the boiler room is a fuel oil distribution piping system which has been abandoned in place when the burners were converted to natural gas approximately five (5) years ago. The underground fuel oil storage tank, as we understand it, has been completely removed. Condensate return from the complex is through a combination of two (2) individual systems. The original building is provided with a vacuum return system which draws condensate from the individual heating apparatus to a storage tank within the boiler room. This storage tank is provided with a discharge pump which feeds a secondary unit where the condensate is distributed to each boiler through secondary condensate return pumps. The condensate receiver is provided with a primary and a stand-by pumping system and the entire system is considered in average condition. The vacuum receiver appears to be an original installation to the building and is showing signs of severe wear and does appear to be reaching its maximum serviceable life. Vacuum return systems are very sensitive to the overall pipe quality in the condensate system and any leak within the condensate system can be detrimental to the operation of a vacuum return system. Considering the overall age of the entire mechanical system we have serious concerns as to the longevity of the present installation. The secondary condensate return system is showing signs of surface contamination on the tank and both pumps are presently in need of service at this time, however maintenance personnel has indicated that these pumps will be serviced during the summer. The addition building is provided with a gravity condensate return system which is collected through a sub-floor mounted condensate receiver within the boiler room. This condensate receiver is provided with a single condensate return pump which discharges condensate to the secondary receiver for redistribution to the boilers. This sub-floor receiver and pump is extremely antiquated and is showing signs of wear and has certainly reached its maximum serviceable life and consideration should be given to an upgrade at this time. Both the base building and the addition building are provided with a trenching system which circulates throughout each building which contains a low pressure steam line as well as a condensate return. It was not possible to determine if this pipe was insulated nor was it possible to determine the overall pipe condition however maintenance personnel has indicated that the piping system has not shown any signs of leakage and has not been a problem in the past. Considering the age of the system and its location within the building we would certainly believe that the piping system has reached its maximum serviceable life and should be replaced at this time. Breaching from each boiler is through a black steel insulated breaching system which discharges to a masonry chimney. Each boiler is further provided with an induced draft fan and the entire installation is extremely antiquated. If the present system is going to be continued to be reused consideration should be given to insulating the breaching system. Combustion air for the entire power plant is through one

(1) high combustion air inlet. Present code does require two (2) individual openings of equal size one (1) discharging high in the room and one (1) discharging low in the room, each with motor operated dampers installed to open and close as the boiler circuitry fires. As it is presently installed the combustion system is non-code compliant and should be improved upon.

Automatic Temperature Controls:

The automatic temperature control system is made up of two (2) individual air storage tanks each provided with a single compressor. It appears that each tank is original to the building however, it does appear that each compressor has been serviced recently and appears to be in good operating order however, the entire system is extremely antiquated and consideration should be given to an upgrade. Both air storage tanks feed to a common distribution line which is provided with both day/night air pressure as well as a refrigerated air dryer and oil water separator. Both air storage tanks as well as the refrigerated air dryer are provided with blowdown valves however, there is no adjacent floor drains and all blow down must be collected to tanks and disposed of. Consideration should be given to a complete up grade of the entire automatic temperature control system.

Classrooms:

The classrooms within the original building are provided with wall mounted classroom unit ventilators with valve control. Each unit operates under low pressure steam and is provided with a source of outside air through a wall mounted outside air intake louver. Many of the louvers serving the unit ventilators are damaged and are in need of replacement at this time. The unit ventilators were original to the building and in many cases showing signs of surface contamination and in slight need of cleaning at this time however, considering their age would be considered in good condition. Overall future life expectancy would be limited and consideration should be given to a replacement at this time. The unit ventilators in the original building are each provided with wall mounted pneumatic thermostats which control valves in the individual unit ventilators however, in the addition building two (2) zone thermostats control the steam flow to each of the individual unit ventilators. This limited amount of control in the addition building does relate to very poor temperature control throughout the individual spaces and at times overheating and underheating of the spaces is noted. Consideration should be given to an upgrading of the control system. The addition building classrooms are provided with wall mounted exhaust registers which communicate to what appears to be a galvanized sheetmetal exhaust system to various roof mounted exhaust fans. It does appear that these systems are operating although extremely antiquated and in need of replacement. The original building however, is provided with galvanized sheetmetal exhaust risers and operate under gravity flow, no mechanical ventilation is provided. This condition is non-code compliant and a complete upgrade of the system is required. It was noted that in many of the classrooms that these exhaust registers both the gravity system and the mechanical system were blocked off by furnishings within the space. This condition is resulting in a lack of exhaust air within the classrooms and hampering the overall flow of the code required ventilation air. The communicating corridors in both the original building and the addition building are provided with varying lengths of fin tube radiation which is covered with a stamped grill as well as cabinet heaters located at the ceiling. Wall mounted convectors are located at entrance doors. Many pieces of this heating apparatus were not provided with any means of control and it was noted that at one location a convector had been removed at a doorway and not replaced. All of the corridor heating including the door heaters is extremely antiquated and in need of upgrading at this time. It was noted that there was no corridor ventilation, either supply or exhaust, and this condition is non-code compliant and should be improved.

Gymnasium:

The gymnasium is provided with an air handling unit located over the stage distributing to galvanized sheet metal duct work to sidewall diffusers at each side of the stage. The air handling unit is provided with a wall mounted manual switch which is started when the need arises and no automatic controls are provided for the system operation. In recent years a wall has been assembled which divides the stage area from the gymnasium which created a separate room where the stage once existed. The air handling unit for the gym is actually at the ceiling of the newly created room therefore preventing return air from the gym to reenter the air handling unit. This condition has created a total imbalance of the air in the gymnasium as well as the music room behind the stage and all adjacent corridors. This condition should be improved upon. Also noted was an exhaust located below the stage which is designed to remove the code required amount of ventilation air introduced at the air handling unit. As we understand it, this exhaust system has not operated in some time and consideration should be given to a complete upgrade to improve ventilation conditions. Adjacent to the gymnasium are various internal spaces, one of which is used as an office, and these spaces are not provided with any heat or means ventilation air. This condition should be improved upon.

Music:

The music room which is the area recently created behind the stage of the gymnasium is provided with a length of fin tube radiation located under fixed glass. This radiation is controlled from a wall mounted thermostat and as we understand it does operate in a satisfactory manner. The windows located within the space are all fixed glass and it was noted that there is no ventilation air either supply or exhaust to meet code requirements. This overall lack of ventilation must be corrected. Also with the air handling unit for the gymnasium located within the music room the return air opening in the air handling unit is drawing air from all adjacent corridors creating an overall imbalance in space conditions. This condition should be improved upon.

Cafeteria:

The cafeteria is provided with a single air handling unit located in an adjacent storage room. The air handling unit distributes to overhead diffusers through a galvanized sheet metal duct distribution system and this system is not insulated. The overall condition of the air handling unit would be considered average considering its age and consideration should be given to an overall upgrade. The air handling unit is located with a low wall return air register which is damaged and in need of replacement. Also provided is a galvanized sheet metal duct which communicates directly from the cafeteria to the adjacent kitchen where it ties into the exhaust duct of the kitchen exhaust hood. This condition is non-code compliant and should be improved upon. The kitchen is provided with a single wall galvanized steel hood located over the cooking area. It does appear that the size of the hood is adequate for the cooking area served however, the entire system is antiquated. It was noted that the exhaust duct connecting to the hood is also provided with various branch ducts which remove exhaust within the kitchen. This condition is non-code compliant and should be improved upon. The dishwasher located adjacent to the kitchen is provided with a stainless steel exhaust hood over the dishwasher which connects to a galvanized steel duct to a remote exhaust fan. As we understand it this system is operating in a satisfactory manner. Make-up air for the dishwasher and the kitchen is through the opening of exterior doors and windows as well as openings between the cafeteria and the kitchen itself. This lack of make up air does create temperature control problems during the winter as well as limiting the amount of exhaust air capable through all exhaust apparatus. This condition should be improved upon. Also located within the kitchen are varying lengths of fin tube radiation along the exterior wall. The fin tube radiation is extremely old and is showing surface contamination and damage and consideration should be given to improvement.

Toilet Areas:

All toilet areas are provided with exhaust ventilation through a combination of wall exhaust registers communicating to roof exhaust fans through a galvanized sheetmetal exhaust system. The registers appear to be in need of cleaning however, as we understand it all exhaust fans are operating and maintaining good odor control within the spaces. All systems are extremely antiquated and consideration should be given to an upgrade. Make-up air for the toilet rooms is through a combination of undercut doors and louvered doors and the overall system does appear to operate in a satisfactory manner. Also provided within various toilet rooms were wall mounted convectors however, these convectors were not provided with any means of temperature control, and consideration should be given to an improvement. It was also noted that many interior spaces located throughout the original building and the addition building were not provided with any means of either supply or exhaust ventilation air. This condition is non-code compliant and should be improved upon.

Administration Area:

The administration area is a combination of exterior and interior spaces and is not provided with any means of either exhaust or supply ventilation air. This condition is non-code compliant and should be improved upon. It was noted that the exterior rooms were provided with operable windows which do appear to meet the building code for natural ventilation, however considering the nature of the spaces consideration should be given to a mechanical ventilation system. Each space was provided with a window air-conditioning unit although noisy does maintain reasonable temperature control in warmer months. The spaces are also provided with fin-tube radiation and as we understand it, this radiation was recently installed and does operate in a satisfactory manner. It was noted that many sections of the fin-tube radiation piping insulation has been damaged or is not insulated and consideration should be given to repairing the insulation as well as providing a steel covering to avoid future damage.

F. PLUMBING SYSTEMS

Existing Conditions:

1. The systems were installed in 1955 and 1956.
2. Natural gas is provided for usage to the domestic hot water heaters, and kitchen.
3. Domestic hot water is provided by two hot water heaters in the boiler room.
4. The building contains storm and sanitary drainage systems.
5. The building contains boy's and girl's gang toilets, single toilet rooms, janitor's closets and drinking fountains.
6. The classrooms have sinks with hot and cold water.
7. The kitchen contains a gas fired boiler providing steam for the kettles, gas ovens, dishwasher with electric hot water booster and various utility sinks with an associated grease trap.

Updating of Systems:

1. The two (2) gas fired hot water heaters were placed circa 1989 and 1997 respectively
2. The gas ovens in the kitchen were replaced in 1995.

Analysis:

1. All systems and fixtures appear to be adequate and functioning properly with the following exception:
 - a. The grease trap for the kitchen area is reported to be malfunctioning.

G. FIRE PROTECTION

There is no sprinkler system in the building.

H. ELECTRICAL SYSTEMS

Existing Conditions:

Electric Service: The main electric is a 115/230 volts single phase, three wire, 60 hertz system. The main service disconnect is rated 400 amps.

Interior Distribution: Associated feeders and circuit breaker panelboards are old, installed as part of the original equipment circa 1956.

Emergency Lighting: The emergency system is provided by a portable type natural gas operated 7.5 to 10 Kw emergency generator which provides standby power to the building lighting system only.

Fire Alarm: The fire alarm system consists of 1950's equipment with manual pull stations and horn alarm units. The system is very basic and does not meet today's code requirements including ADA requirements.

Paging and Intercom System: Consist of speakers and intercom call in switches located in all classrooms. The auditorium/cafeteria speaker system is a separate system.

Master Clock and Program System: None was noted in this facility.

Security Alarm Systems: There is no security system in this building.

Cable Television Antenna System: Cables were installed exposed through corridors but the system was never completed.

Interior Lighting: Is generally fluorescent throughout the classroom and teaching spaces. Classroom lighting consists of two rows of fixtures. Corridor lighting is provided by 6" wide plastic lens fluorescent fixtures. Lighting levels in general appear to be lower than recommended levels.

Exterior Lighting: Is provided by the electric utility co.

Analysis:

A review of the existing facility and its electrical services and systems has demonstrated that all systems have been in service beyond their intended life and are in need of replacement.

The existing electric service will not support the requirements of a renovated project and would need replacement.

In addition life safety systems including fire alarm, emergency lighting and illuminated exit signs are not in compliance with present codes.



ENERGY STAR® Benchmarking Initiative

ENERGY EFFICIENCY OPPORTUNITY ASSESSMENT REPORT

Prepared for:
Dale Street School
45 Adams Street
Medfield, MA 02052

Operated By:
Medfield Public Schools
459 Main Street
Medfield, MA 02052



Prepared by
ICF Consulting

November 2005



ENERGY STAR® Benchmarking Initiative

I. INTRODUCTION

Medfield Public Schools is a participant in the NSTAR ENERGY STAR Benchmarking Initiative, a program designed to help business customers assess the energy performance of their buildings and identify opportunities for improvement. They chose to participate with their Dale Street School located in Medfield, MA.

The performance of this building was assessed using the Portfolio Manager benchmarking tool from ENERGY STAR. For the twelve months ending August 2005, the building received an energy performance rating of 13. The rating represents the percentile ranking of this building compared to others of its type in the United States. Buildings that receive a rating of 75 or greater are eligible for an ENERGY STAR label. A Statement of Energy Performance, generated by Portfolio Manager, is included as the last page of this report.

Energy Performance Rating: 13

To identify opportunities to improve energy performance, an Energy Efficiency Opportunity Assessment was conducted by ICF Consulting on October 26, 2005. Charles Kellner, Bernie Spillane, and Wayne Brown were present during the site survey.

II. SUMMARY OF FINDINGS

This facility is a 53,029 square foot elementary school, built in 1941. There are 519 students in the school. The facility is occupied an average of 65 hours per week, including some evenings and weekends. Energy consumption and costs for the building are summarized in the table below.

Summary of Energy Consumption and Costs

(Based on use and cost for 09/04 to 08/05, normalized for meter read dates. Costs were not entered into Portfolio Manager, so costs are estimated based on average unit costs for similar buildings.)

Fuel Type	Annual Consumption	Annual Cost	Average Cost
Electricity	235,450 kWh	\$ 28,254	\$ 0.120/ kWh
Natural Gas	64,062 therms	\$ 76,875	\$ 1.20/ therm
Total	136 kBtu/sq ft	\$ 105,129	-----

Opportunities to improve the energy efficiency of the facility are summarized in the table on the following page. The recommendations are divided into low cost/no cost opportunities, opportunities requiring capital outlay, and opportunities requiring further study. Each of the opportunities is described in more detail in the remainder of the report. Rough estimates for energy savings and simple payback are provided to help customers prioritize their actions, along with information on NSTAR incentives that can offset implementation costs. NSTAR will provide additional technical support and resources as customers work towards implementing the recommended improvements. If all of the recommendations are implemented, an energy performance rating of 75 could be achieved by this facility.



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Dale Street School Summary of Energy Efficiency Opportunities

	Estimated Savings/yr (kWh)	Estimated Savings/yr (therms)	Estimated Savings/yr (\$)	Simple Payback (years)	Applicable NSTAR Rebate Program
Low Cost/No Cost Energy Efficiency Opportunities					
Review and Adjust HVAC Controls and Operation	23,545	16,016	\$22,000	0-6 months	
Steam Trap Maintenance	0	1,750	\$2,100	0-3 months	
Allow Unrestricted Air Flow from Unit Ventilators				Immediate	
Control Energy Use of PC Monitors and Hard Drives	31,661	0	\$3,800	0-3 months	
Energy Education Program	2,355	641	\$1,100	3-6 months	
Control Domestic Hot Water Recirculation Pumps with a Timer or Aquastat	0	270	\$300	1 year	
Reduce Air Infiltration Through the Building Envelope				0-3 months	
Energy Efficiency Opportunities Requiring Capital Outlay					
Install Occupancy Sensors to Control Lighting	23,227	0	\$2,800	1-4 years	Small Business Solutions
Control Exhaust Fans with Timers	24,204	0	\$2,900	3 months - 1 year	
Control Kitchen Exhaust Hoods with a Variable Speed Drive	6,465	0	\$800	1-4 years	Custom Application
Energy Efficiency Opportunities Requiring Further Study					
Convert to Hot Water Heating Distribution					
Install a Direct Digital Control (DDC) system					
Total Energy Savings	111,456	18,677	\$35,800		

Notes:

1. The energy savings presented in this report are based on a visual inspection of the facility and are estimates. More detailed study and analysis may be required in order to refine these estimates. Cost saving estimates are based on average energy prices in effect at the time this report was prepared. Energy prices are subject to change.
2. This facility is eligible for NSTAR's Small Business Solutions program, which provides rebates of up to 80% of the total cost for replacing qualifying lighting and mechanical systems. For more details on NSTAR rebates, contact your Account Executive, Pam Pandolfi, at 781-441-8925.
3. The mention of particular equipment manufacturers or suppliers, or equipment models in this report does not constitute endorsement by either NSTAR or ICF Consulting.

III. RECOMMENDATIONS

A. Low Cost/No Cost Energy Efficiency Opportunities

1. Review and Adjust HVAC Controls and Operation

Energy savings can be achieved through proper operation of HVAC equipment, by adjusting existing controls and setting up proper operating procedures. Heat is provided to this facility by a gas-fired steam boiler, and is distributed to the space by unit ventilators and radiators in the class rooms, and air handling units in the cafeteria, library, and gym. The heating system is controlled by thermostats in each space and a pneumatic control system, but much of the equipment is still operated manually. The heating costs last winter were extremely high relative to similar school buildings. The facility has made some significant changes to operations in the past year that should result in energy savings, but there is still some room for improvement. Several strategies that the facility should consider, if they are not already in place, are listed below:

- Setback temperatures at night. The existing pneumatic control system has this capability, but it is not clear if it is functioning.
- Keep boilers from operating when not needed. The boilers reportedly ran more than necessary on nights and weekends last year. The maintenance staff is currently shutting them down manually. The existing control system should be able to control the boilers automatically.
- Turn off the fans in air handling units and unit ventilators at night, either manually or through the control system. The unit ventilators are reportedly on a timeclock, but it is not clear what the time schedule is or if it is functioning.
- Check the outdoor air dampers on the unit ventilators and air handling units to determine if they are functioning properly. One air handling unit appeared to have the pneumatic controls disconnected.
- Change HVAC filters. The facility reportedly has a schedule for replacing filters, but the air handling units appeared to be overdue.
- Replace the programmable thermostats for the modular classrooms with a more advanced model that can control temperatures on weekends and fan use on nights and weekends.



Savings from these operational changes are estimated to be 25% of gas consumption and 10% of electric consumption. To ensure proper operation of equipment and lower energy costs, it is recommended that the facility document the operations procedures for all equipment and the daytime and nighttime temperature setpoints for all spaces.

► **Action Steps:** *Work with in-house staff or a mechanical contractor to adjust controls.*

2. Steam Trap Maintenance

As described above, heat is provided to the building through steam boilers and delivered through unit ventilators and cast iron radiators in the classrooms. Steam traps allow condensate formed in the heating process to be drained from the equipment. When steam traps fail, they often fail in the open position, resulting in live steam being discharged from the system. This can waste large amounts of energy. Steam trap failures are often not detectable without regular maintenance checks. It is good practice to keep up regular maintenance, because steam leaks can be very costly. Savings from steam trap maintenance will depend on the number of leaks found. Each steam leak can waste approximately 7 therms per day. (This will vary based on the size of the leak and the pressure in the lines, but this is a reasonable approximation for the facility.) Assuming that 3 faulty steam traps go unnoticed for a period of 3 months, the extra energy cost to the building is \$1,500-\$2000 per year in energy costs. Because the steam distribution system is over 50 years old, the maintenance staff has had some trouble trying to repair steam leaks, with the traps breaking off the piping. These problems should be investigated in more detail, and the cost of repairing the leaks should be weighed against the potential savings.

► **Action Steps:** *Work with in-house or external maintenance personnel to check steam traps.*

3. Allow Unrestricted Airflow from Unit Ventilators

Heating and ventilation is provided to the space by unit ventilators. Supply air leaves the top of the cabinet, and return air enters through front of the cabinet near the floor. The unit ventilators will run more efficiently and more effectively if the air flow is unrestricted. During the site visit, multiple unit ventilators were observed with blocked airflow, including one classroom that has a child with allergies. A sample classroom is shown on the right, with the unit ventilator located behind and under bookshelves and storage units. Teachers should be educated on the importance of maintaining unrestricted air flow from the unit ventilators. The principal has reportedly sent an email encouraging teachers to remove papers from unit ventilators, but further action appears to be necessary. Energy consumption and cost savings from this recommendation are difficult to quantify, so specific values are not included in this report. There is no cost for implementation, so it is recommended regardless of the dollar value of the savings.



► **Action Steps:** *Work with maintenance staff and teachers to remove materials from unit ventilators.*

4. Control Energy Use of PC Monitors and Hard Drives

Computer energy use can be controlled through a combination of automatic power management features and manual shut down by users. Organizations can use a standardized setting so that all



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monitors go into sleep mode after 10 minutes of inactivity. Power management can also be enabled for computer hard drives, but may require some investigation and testing before full implementation. In addition, employees should be educated on proper procedures for shutting down computers and monitors each night. Savings calculations in this report are based on an estimated 92 computers at this facility. The typical savings per computer ranges from \$20 to \$120 per year, depending upon the equipment and practices within the facility. At this facility, there are expected to be more savings from the computers located in the classrooms than those in the computer room, based on current practices as reported by the staff. There are no costs to implement the power management, other than internal labor. Additional information is available on the ENERGY STAR website at www.energystar.gov/powermanagement.

- **Action Steps:** *Work with in-house IT staff to adjust power management settings. ICF Consulting can provide support with this process.*

5. Energy Education Program

An energy education program can raise awareness among teachers and students about how energy is used in the building, and provide recommendations on how they can help save energy and reduce costs. Energy-saving tips can include proper operation of thermostats, personal computers, light switches, copy machines and printers. Savings estimates for energy education programs are difficult to quantify and vary widely. Savings were conservatively estimated at 1% of current consumption and cost. Costs will vary based on the level of sophistication of the program.

- **Action Steps:** *An energy education program can be developed by internal employees or with help from external organizations. The ENERGY STAR website has resources that can help with energy education efforts.*

6. Control Domestic Hot Water Recirculation Pumps with a Timer or Aquastat

The hot water is distributed throughout this facility by a recirculating system. Recirculating systems are used in large buildings to keep the water in the lines warm, so that occupants don't have to wait for hot water. In some buildings, recirculating pumps run 24 hours per day. Energy can be saved by controlling the operation of recirculating pumps with a return line aquastat, which can turn off the pumps as long as the hot water return temperature remains above a certain setpoint. A setpoint of 110F is appropriate for most commercial applications. Alternatively, a timer can be used to turn off the pumps overnight. Both control strategies will reduce heat losses and pump energy. Controlling hot water recirculating pumps can typically save 5-10% of the energy required for hot water heating in a facility. Savings are estimated at 7.5% for this facility.

- **Action Steps:** *Work with a mechanical contractor to install controls.*

7. Reduce Air Infiltration Through the Building Envelope

Outside air can penetrate a building through the windows, doors, walls, and roof. A leaky building envelope can result in an increase in building heating and cooling loads, and potentially electrical loads if occupants use space heaters or fans. The escape of conditioned air forces the HVAC systems to work longer and harder to provide the required space temperature. In addition, drafts created by improperly sealed windows and doors can cause significant occupant discomfort and decreased productivity of teachers and students. Problems in this facility were observed with the windows. Windows are single pane glass, which have poor insulation properties, and there is little sealing around the window frames. There are storm windows, but they were not in use at the time of the visit, despite teachers complaining about the cold temperatures. (The visit occurred at a time that some repairs were being made to the boiler, which was the primary cause of the complaints.) To reduce infiltration, it is important to tighten the existing building by locating all air leaks in the windows, doors, walls, and roofs. They should be sealed with the appropriate materials and techniques such as weather-stripping on doors, sealing and caulking on windows, and proper insulation distribution on walls, ceilings and roofing. Occupants should be educated to understand proper operation of the windows and doors. Costs and savings associated with these recommendations are difficult to quantify.

► **Action Steps:** *Work with in-house staff or to seal air leaks.*

B. Energy Efficiency Opportunities Requiring Capital Outlay

1. Install Occupancy Sensors to Control Lighting

Energy savings can be achieved by reducing the hours of operation of the lighting in a facility. For areas where there is no regular schedule or occupancy is intermittent, the best means of control is through occupancy sensors. For this facility, opportunities for occupancy sensors exist in the classrooms and office space. The sensors will turn on lights when they sense motion, and turn off lights after a programmed delay time, which can range from 5 – 30 minutes, depending on the application. Savings calculations for this report are rough estimates based on the estimated floor area for which the occupancy sensors are recommended, and an average reduction in lighting runtime of 4 hours per day.



To offset installation costs, NSTAR provides rebates of up to 80% of the total project cost for qualifying lighting systems through the Small Business Solutions program. Through this program, RISE has conducted a more complete survey of the building, and can provide detailed costs and savings calculations. According to preliminary comments from RISE, the simple payback of installing sensors at this facility will be higher than typical installations because there are no drop ceilings. The high payback associated with this retrofit may affect the percent of the installation cost than can be covered by NSTAR.



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- **Action Steps:** *Work with a RISE to obtain a more detailed survey and proposal. The NSTAR Program Manager for this facility can provide assistance with determining appropriate financial incentives.*

2. Control Exhaust Fans with Timers

Exhaust fans for classrooms and restrooms often run 24 hours per day, resulting in excess energy being consumed. Up until recently, this was reportedly the case at this facility. The runtime on the exhaust fans can be decreased by controlling the fans with timers. The largest exhaust fan was put on a timer this summer. For the remaining fans, the maintenance manager would like the maintenance staff to control the fans manually for now, in order to encourage more familiarity with the equipment in the boiler room. As the staff and the operations procedures in the facility become more advanced, it is recommended that all of the fans be put on timers. Savings for this facility are estimated based on the estimated horsepower of the exhaust fans and the reduction in runtime.

- **Action Steps:** *Work with a mechanical contractor to install timers.*

3. Control Kitchen Exhaust Hoods with a Variable Frequency Drive

Kitchen exhaust hoods typically exhaust a constant volume of air. There are control systems available that will sense the steam, smoke and exhaust air temperature, and use a variable speed drive to reduce the exhaust fan speeds by as much as 70% during periods of low activity. The controls will save energy for fan motor operation, as well as reduce costs for heating and cooling makeup air. The opportunity at this facility will depend on the size of the existing exhaust fans. Typical savings range from \$1000 to \$5000 per year, with a payback of one to four years. Incentives may be available for the installation through NSTAR's Custom Application. For measures that meet their cost-effectiveness criteria, they will cover 50% of the installation cost, or buy the project down to a 2-year payback, whichever amount is lower.

- **Action Steps:** *Work with the controls vendor to obtain more detailed survey and proposal.*

C. Energy Efficiency Opportunities Requiring Further Study

4. Convert to Hot Water Heating Distribution

Heat is provided to the facility by two Weil McLain gas-fired steam boilers that are approximately 8-10 years old, and sent through a steam distribution system to unit ventilators in the classrooms and air handlers in the common areas. The distribution system is over 50 years old. Hot water systems are more efficient than steam in distributing heat, and are less susceptible to heat loss through leaks in the distribution system. It is recommended that the facility consider converting to a hot water system. Two other schools in the system have been converted from steam to hot water, the high school in the early 1990's, and Memorial School within the last couple of years. Further study is necessary to determine the costs and savings of a new distribution system.



ENERGY STAR® Benchmarking Initiative

- **Action Steps:** *Work with a design firm, mechanical contractor, or an energy services company specializing in performance contracting to obtain more detailed costs and savings calculations. The NSTAR Program Manager for this facility can provide assistance in pursuing a technical assistance study.*

5. Install a Direct Digital Control (DDC) system

Direct digital controls can provide greater accuracy of control than pneumatic systems, and DDC systems can provide opportunities to expand to new control strategies that will increase energy savings for the facility. A DDC control system would be only be recommended if the heating system was replaced at the facility. Further investigation is necessary to determine the savings associate with a new DDC system.

- **Action Steps:** *Work with an energy management system vendor to obtain a more detailed proposal.*

IV. NEXT STEPS

The ENERGY STAR Benchmarking Initiative provides ongoing support as customers work toward implementing the recommended improvements. ICF Consulting will review the recommendations in this report with the appropriate contact at the facility, and help them develop an action plan. For recommendations that are eligible for NSTAR incentive funding, the NSTAR Program Manager for this facility can provide assistance with locating implementation contractors and obtaining financial incentives. For the remaining measures, ICF Consulting will provide implementation support. Over the course of the next year, ICF will work with the facility to continuously benchmark their energy consumption and monitor improvements to the energy performance rating that result from the energy efficiency upgrades. Please call one of the following contacts with any questions:

NSTAR Program Manager
Pamela Pandolfi
781-441-8925

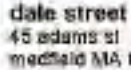
ICF Consulting Account Manager
Sara Lisauskas
978-658-1650

STATEMENT OF ENERGY PERFORMANCE

dale street school

Building ID: 1079852

For 12-month Period Ending: August 31, 2005



dale street school

45 adams st
medford MA, 02052

Overholt

Contact:

Gross Building Area: 53,029 sf
Year Built: 1941

Facility Space Use Summary

Space Type	Area(ft ²)	Number of Students	Number of PCs	Cooling Percent
K-12 School	53,029	519	92	10

Site Energy Use Summary

Electricity (kBtu)	800,432
Natural Gas (kBtu) ⁽¹⁾	6,405,275
Total Energy (kBtu)	7,205,707

Professional Verification

License Number:
State:

Results

Energy Performance Rating ¹ (1-100)	13
--	----

Energy Intensity⁴

Site ($\text{kJha}^{-1}\text{-yr}$)	136
Source ($\text{kJha}^{-1}\text{-yr}$)	169

Emissions

CO ₂ (1000 Btu/lb)	1.183
-------------------------------	-------

Indoor Environment Criteria^a

Indoor air pollutants controlled? **Not Assessed**

Adequate ventilation provided? Not Assessed

Thermal conditions met?	Not Assessed
-------------------------	--------------

Adequate illumination provided? Not Assessed

Professional Engineer Stamp:

Based on the conditions observed at the time of my visit to this building, I certify that the information contained on this statement is accurate.

140259

* Information for ENERGY STAR must be submitted to EPR within 6 months of the fiscal year end. Was it if ENERGY STAR is not an eligible applicant (see below for EPR).

2. Natural Gas values in units of volume (Btu/cubic feet) are converted to kWh with adjustments made for elevation based on Factor 10.024.

3. An energy performance rating of 15 or less (maximum required rating) will be awarded a score for ENERGY STAR.

4. Values represent energy density, standardized to a 300-day calendar.

5. Based on meeting ASTM E Standard 82-100 for middle frequency, ASTM E Standard 55-100 for thermal conductivity, and ESEM (Energy Dispersive Spectroscopy) analysis.



Construction Technologies Management, Inc.

Date: July 18, 2008

Project: #0802

Dale St. School
Adams St.
Medfield, MA 02052

Building Condition Survey

Prepared for: Charles L. Ketnor
Director of Finance and Operations
Medfield Public Schools
459 Main Street
Medfield, MA 02052

Building Condition Survey

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 - 11.0 Ancillary Structures
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- IV. ADA Barriers Check List
- V. Appendix
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 - Appendix B - Limiting Conditions Statement
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I. Executive Summary

The following Executive Summary provides the client with an at-a-glance summary of the highlights of this report.

Generally, the property appears to be in fair to poor, overall condition. There is significant deterioration in the electrical system, Heating & Ventilation system, exterior trim, interior doors and hardware.

No visual evidence of substantive structural problem conditions was observed.

Building Condition Deficiencies of Note Observed or Suspected:

- The heating and ventilation system in the original 1941 building is in need of replacement.
- Sections of the front entry platform, brick walls and exterior trim are deteriorated. Some settlement and freeze-thaw deterioration is apparent.
- The west (side) entry masonry platform and steps are significantly deteriorated; substantial repair/replacement is required. Railings have been removed.
- Exterior trim on the 1962 addition is significantly deteriorated. Some members require replacement and all requires scraping and repainting.

Conceptual Corrective Budget

Based on visual observations we have conceptually estimated the corrective costs for the above reported condition deficiencies to be: See Appendix A

Pending Violations

- No pending Building Department violations were reported.

As-Built Documentation

- As-Built construction documents were requested for review. An overview of construction documents provided was performed. Based on a scan of these documents they should not be considered "As-Built" as discrepancies were observed.

The above is a summary of major findings only. The client should review this report in its entirety.

II. Building Condition Observations & Conceptual Corrective Costs Estimates

CTM performed a Building Condition Survey (at overview level) of the subject property at 45 Dale Street, Medfield Massachusetts. The inspections were conducted during the weeks of July 7, 14, 21, 2008. Mr. Charles L. Kellner, Director of Finance and Operations for the Medfield School Department was present for the first inspection. Visual building condition observations were made by CTM representative Jack Ferguson in the performance of this assessment.

The scope and objective of this Building Condition Survey is to perform a visual review to observe and report evidence of major physical condition deficiencies either observed or suspected. This assessment does not include a review for asbestos, hazardous material or lead paint (if present). In addition, this assessment and report is performed within certain limitations including, but not limited to, visual assessment of readily accessible areas of the building. This review does not include fields or site improvements.

The report prepared by Dr. Robert Berardi, dated 6/23/08, was reviewed. In particular, the concerns for maintenance, repairs and energy raised in that report were investigated.

General Description of Property

The facility is comprised of structures built in 1941, 1962, and 1996. The original facility was designed as a Junior - Senior High School by William C. Upham, Architect of Norwood Massachusetts. The drawings CTM received for review were Dated Nov. 12, 1940. They included drawings 1-10 and E 1-2. The main classroom structure is two stories high built with cast in place footings and foundations with load bearing masonry walls. The roof framing is steel with wood planking and a slate roof. The construction drawings indicate the main structure has a flat roof of approximately 13' x 75' that runs north / south and flattens the top portion of the hip and it is shown as composite roofing. The remaining two portions of the original building are single story of similar construction with slate roofs. The locker room portion attached to the north elevation of the gym has a pitched flat roof. The two story section is 8,246 square feet per floor with a total of 16,492 square feet. The connecting link which is utilized for music and art is 2,664 square feet. And the auditorium/gymnasium is 9,703 square feet. The building totals approximately 28,886 square feet. The first addition was constructed in 1962. The addition totaled 20,000 square feet. It is typical school construction for this period. CTM received partial construction drawings for this section of the facility. The drawings were prepared by Rich & Tucker Associates, 350 Parker Square Building, Boston, MA. The set included drawings A 1-9, S 1-2, HV 1-2, P 1-2, and E 1-4.

CTM also reviewed the recommendations provided by MBA International / Architects letter to Mr. Kellner dated Jan. 14, 2005. We also reviewed their Capital improvement Cost Analysis, (undated).

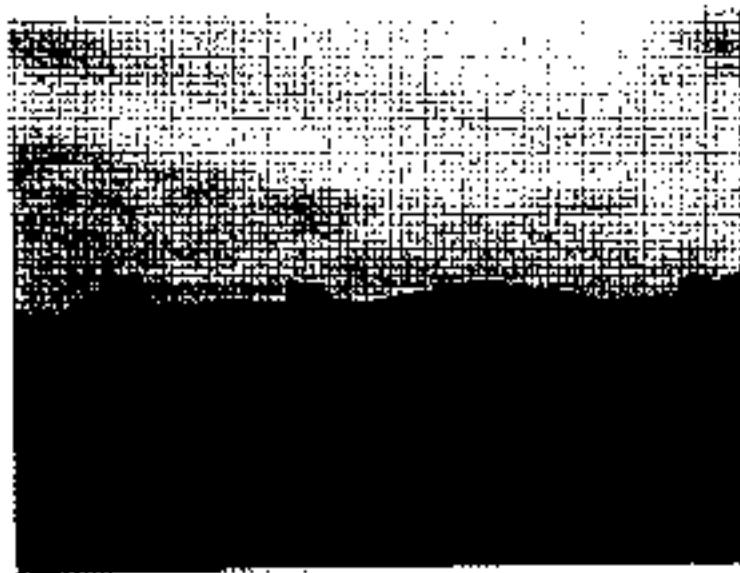
The structure is comprised of cast in place reinforced concrete footing and foundations with a steel frame and bulb "T" and Tectum roof deck. This addition included:

- 10 classrooms
- Kitchen

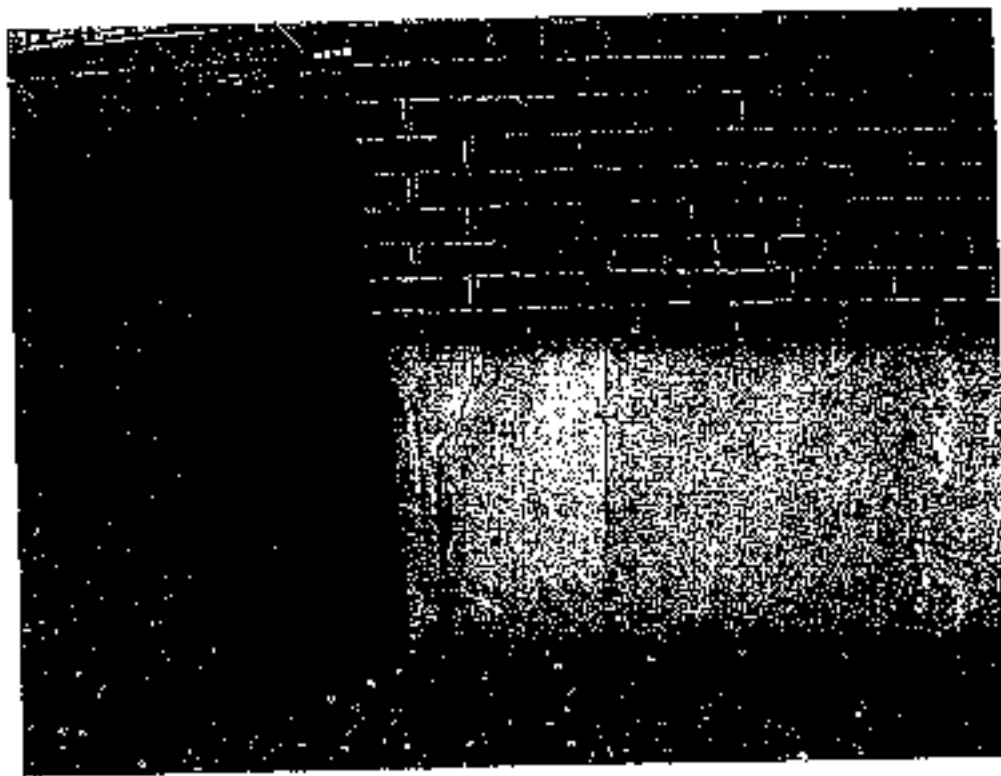
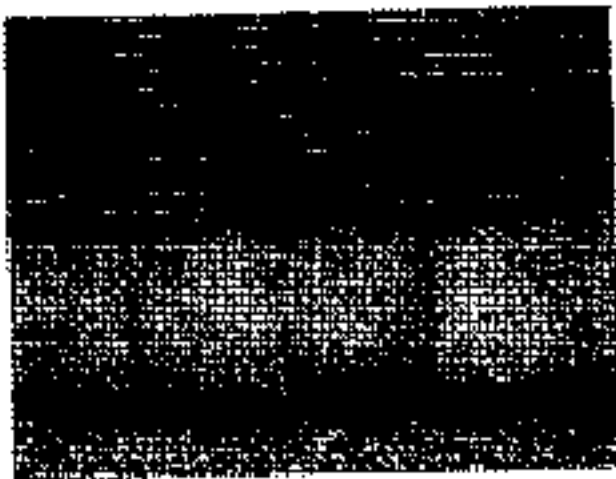
Cafeteria /assembly
Activity room (now functioning as a media /computer center)
Storage
2 gang toilets
Teacher's room
2 individual staff toilets
Administrative area, principal's office, reception/clerical, clinic

This portion of the facility is in good condition with the exception of the exterior window system, exterior trim, and the doors and frames. Interior painting was being performed during our inspections of the cafeteria.

The third portion of this facility is identified as "portable" classrooms. They would be more accurately described as modular. There are two classrooms and two toilets.



These units sit on cast in place foundation and have a flat roof structure. There are signs of cracking in the foundation.



They are serviced by unit ventilators with gas fired HVAC roof top units.
The building has 2' x 4' acoustic ceilings with 2' x 4' lay-in light fixtures.

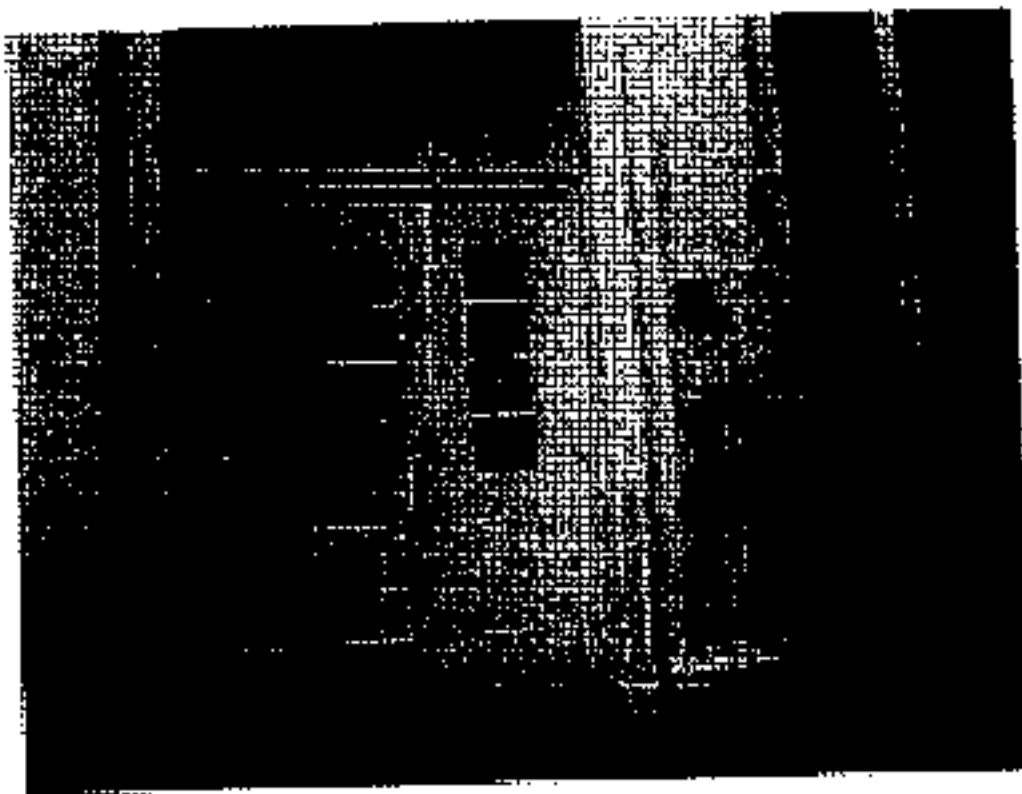
Construction Documents

A limited review of the construction documents prepared by Rich & Tucker Associates and William G. Upham was performed. These drawings were incomplete sets of construction documents and did not contain specifications. Based on our limited review and observations, it is recommended that these not be considered As-Built documents.

1.0 Foundations & Substructures

Type:	
Footings	Cast in place reinforced concrete spread footings
Foundation walls	Cast in place reinforced concrete
Grade Beams	Present only in the original building cast in place reinforced concrete
Insulation	None observed. It is suspected that only the modular classroom structure has foundation insulation as it was constructed after the adoption of the energy code.
Slab on grade	cast in place reinforced concrete of varying thickness.
Waterproofing and underdrains	Waterproofing is indicated in both the original and 1962 structures

The foundation consists of poured concrete footings, foundation walls and floor slab. The 1996 modular classrooms have a ventilated crawlspace. The 1942 building was built as a bomb shelter and Civil Defense signage is still present to the right of the front door. The exterior trim is scheduled for repair and painting this summer.



Visually observed evidence of major deficiencies:

No substantive deficiencies were observed (i.e. such as evidence of differential settlement, lateral displacement, heavy cracking etc.).

No evidence of substantive water infiltration was observed; the basement was dry. Some settlement cracking of the basement floor slabs was observed. The basement boiler room is a two (2) hour rated room.

2.0 Superstructures:

Floor systems:

The original 1941 building is constructed with a cast in place reinforced concrete coffered pan system. This was a very high quality system for the time and is rarely used today because it is so labor intensive to build. It is in excellent condition. It is exposed to view in the two story section. The 1962 building is slab on grade.

Roof systems:

The 1941 building is a steel frame with wood planking and slate roofing. The 1962 building is a steel frame with bulb "T" and Tectum decking.

Platforms and walkways:

The concrete and stone platforms and walkways are in poor condition in both the 1941 and 1962 buildings.

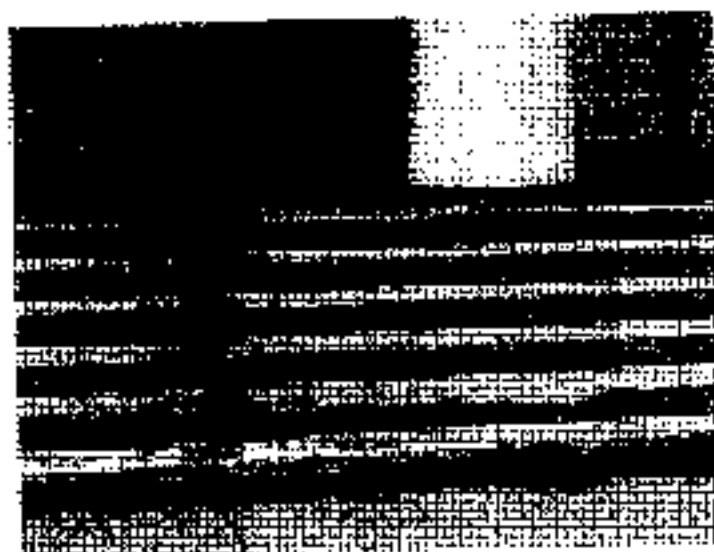
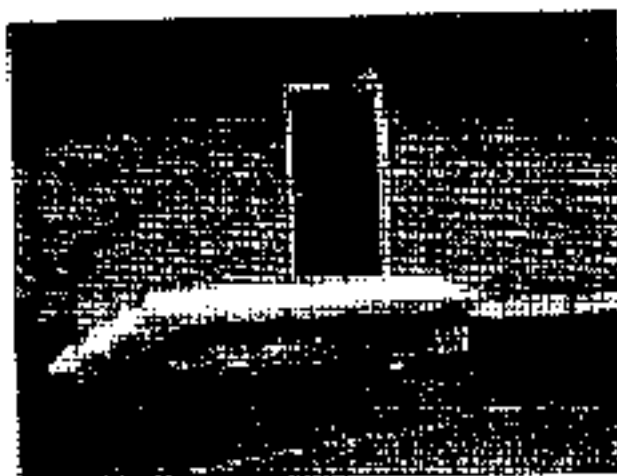
Pre-engineered buildings:

There are two classrooms and two toilets that have been added to the north elevation of the 1962 structure that fall into this category. They are on cast in place concrete foundations as noted above.

Stairs:

There are 9 sets of exterior stairs constructed of concrete or limestone servicing the 1941 building. They are in varying stages of deterioration.

The long steps to the entrance of the 1962 building are cast in place concrete and show extensive cracking. The railing has been removed. A handicapped ramp has been installed with railings.



Structural framing systems:

The original building is a combination of load bearing masonry and steel. The 1962 building is a steel frame structure.

Visually observed evidence of major deficiencies:

No substantive deficiencies were observed.

Deterioration in the exterior stairs and platforms exist. See photos

3.0 Exterior Walls & Closures:

Chimneys and exhaust stacks:

The chimney on the original building was not inspected. The 1942 building has a large belt driven exhaust fan mounted in the attic and a smaller unit that serves the toilets.

Entrances:

The exterior entrance to the Dale Street gym shows extensive deterioration. This is true of the fascia and soffits as well as the columns. Action is required to prevent further damage. That action is scheduled for this summer and work had started during the course of this report. A detailed inspection should be included as part of that remediation to determine the extent of restoration needed. It may be prudent to replace the original wood columns with fiberglass and reconstruct the fascias, freeze boards and soffits with newer more weather resistant materials.

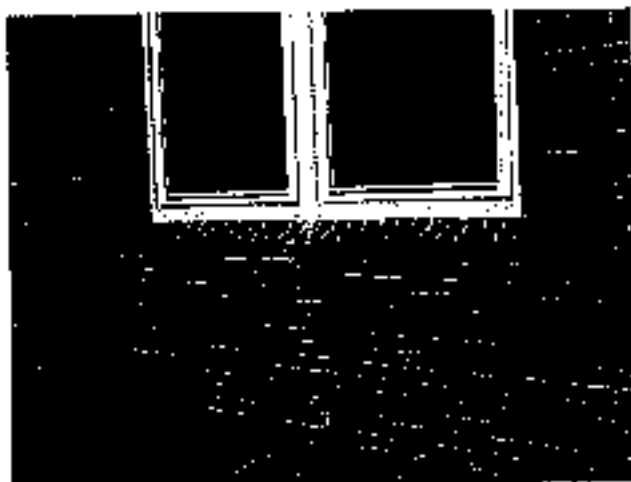
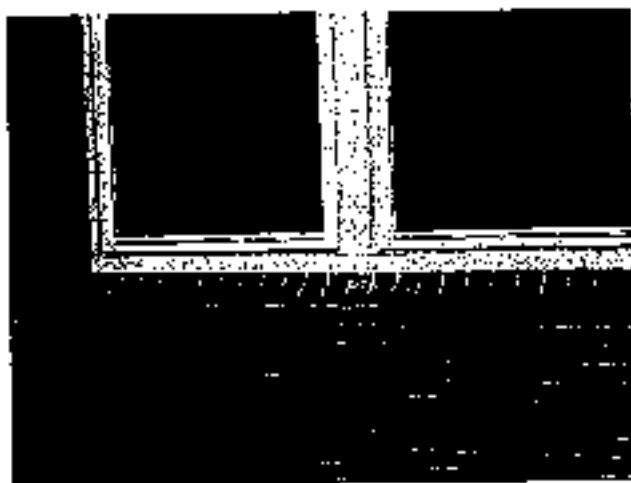
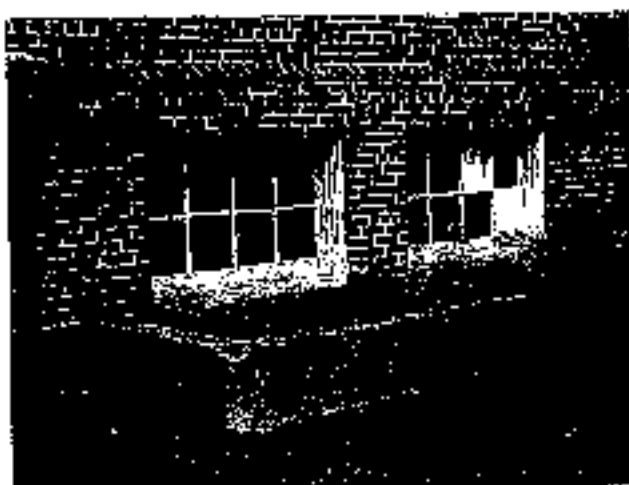
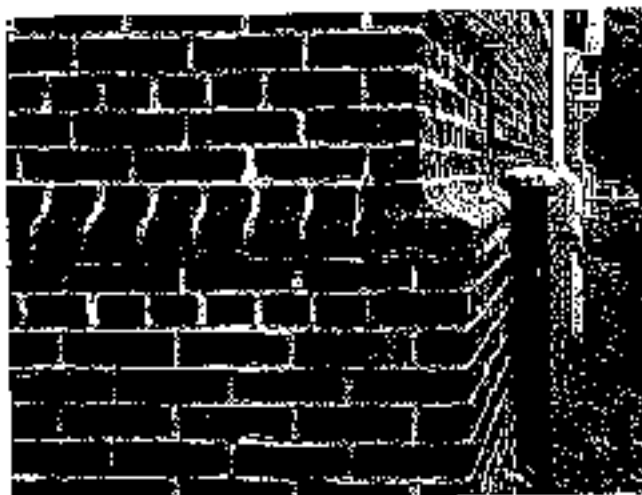


Exterior doors and frames:

The exterior doors and frames on the original building are in fair condition. Most show signs of past repair and improvement. It appears that most of the entrances to the original building are not in daily use. The main entrance to the facility is through the Adams Street entrance. These are hollow metal doors and frames with wire glass vision panels set into a hollow metal curtain wall system. The hollow metal is in need of painting. The doors and closures appear to be functioning properly.

Exterior walls:

The exterior walls of three sections are brick veneer. The brick on the 1962 and 1996 buildings is in good condition. The brick work on the 1941 building is in good condition for its age however, there are signs of deterioration.



Exterior windows:

The exterior wood windows in the original building are deteriorated and a program is in place to replace these windows. Presently, the windows on the east elevation of the two story building are replaced. All exterior trim is scheduled to be painted this summer.

The window wall system in the 1962 building is galvanized hollow metal. As shown in the attached photos, the units are deteriorating and need to be scraped and painted before they are rusted beyond repair. The library gable end window wall system was replaced three years ago.



Visually observed evidence of major deficiencies:

Deficiencies were observed.

The Exterior doors and frames as well as the window wall system in the 1962 building are in need of cleaning and painting. If this is not addressed soon, permanent damage will occur. This is particularly true of the gym entrance facade.

The window replacement program for the 1941 building is scheduled to continue with some replacement of the Adams Street side this year.

4.0 Roofing Systems

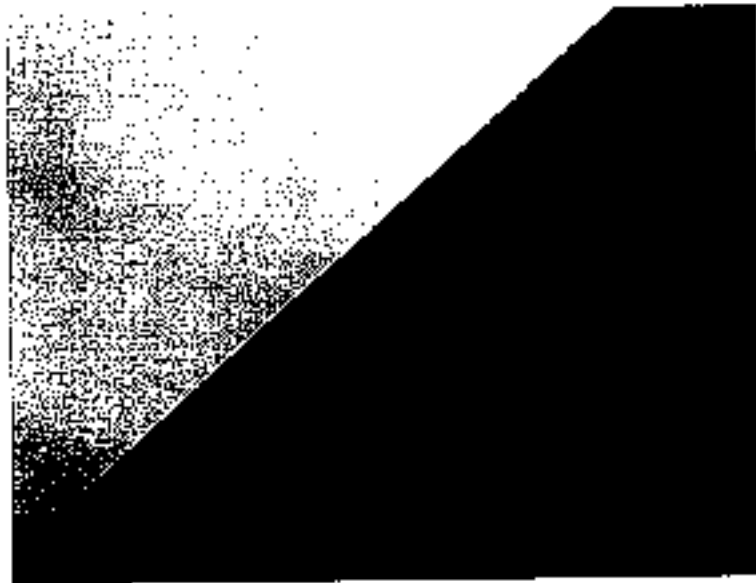
Roofing:

The slate roofing on the original building appears in good condition. There are several slates missing and evidence where slates have been replaced. This roof should be inspected yearly but caution should be taken to avoid damaging the roof in the process. It can be inspected from the ground.

The membrane roof on the 1962 building is in fair condition and should also be inspected yearly. This roof was replaced in the early 90's. Allowances should be made to replace this roof within the next 5 years. We recommend that this asphalt based roofing be replaced with a rubber membrane. A budget of \$600,000 to \$700,000 should be allowed. The roofing of the modular classrooms was not inspected. It is a flat rubber membrane. School personnel advised that it was in good condition.

Flashings, expansion joints, and gravel stops:

The metal work on the 1941 building is in fair condition. The metal work on the 1962 building is in poor condition and is scheduled for repair this summer.



Gutters and downspouts:

Most of the original wood gutters on the '41 building have been replaced. The remaining gutters should be carefully inspected and replacement should be scheduled when convenient. They are long passed their normal life cycle and the damage from a gutter failure is costly. Replacement is good insurance. There are missing down spouts that should be replaced.

Roof and smoke hatches:

None observed

Visually observed evidence of major deficiencies:

Substantive deficiencies were observed.

Fascia, soffits, flashing and trim on the 1962 building need to be replaced, repaired and painted. The exterior hollow metal window systems on the 1962 building need to be cleaned and painted. Minor repair and replacement as noted on the 1941 building.

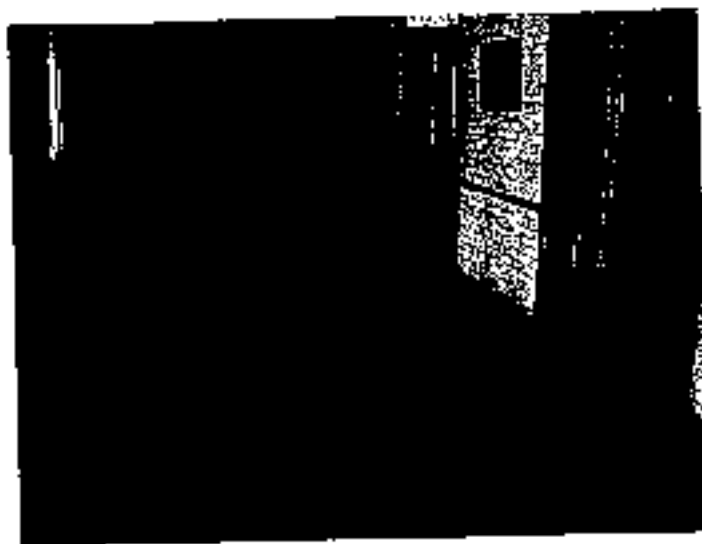
5.0 Interior Construction

Ceiling systems:

Systems vary throughout the facilities from exposed bulb "T" and Tectum to lay-in acoustical panels to splined acoustical tiles. They range from good to poor condition.

Floor coverings:

Floor coverings are typically VCT (Vinyl Composition Tile) and VAT (Vinyl Asbestos Tile). It is in good condition in the '62 building and the '96 building. Floor covering in the '41 building is typically VAT and in poor condition. It should be noted however, that none appears to be in a friable condition.



Interior wall and partition systems:

Finishes are mixed throughout the facility and are generally in good condition

Specialties:

None noted

Visually observed evidence of major deficiencies:

Substantive deficiencies were observed.

Interior doors and hardware are deteriorated and require replacement. Ceilings are in need of repair or replacement. Asbestos tile does not appear to be in a friable condition.

6.0 Conveying Systems & Vertical Movement

There are two chair lifts in the facility. The first allows travel from the Adam's Street entrance to the first floor of classrooms in the 41 building. There is no handicapped accessibility to the second floor classrooms. The second lift is in the auditorium/gym. It allows access to the gym floor but does not allow access to the stage. There is a pending application to the Architectural Access Board for a variance to install a portable lift to remedy this condition



Other Vertical Movement:

The two stairs in the 1941 building do not meet the present code. Exterior stairways on the original building, addressed elsewhere in this report, do not comply with current codes.

Visually observed evidence of major deficiencies:

Substantive deficiencies were observed.

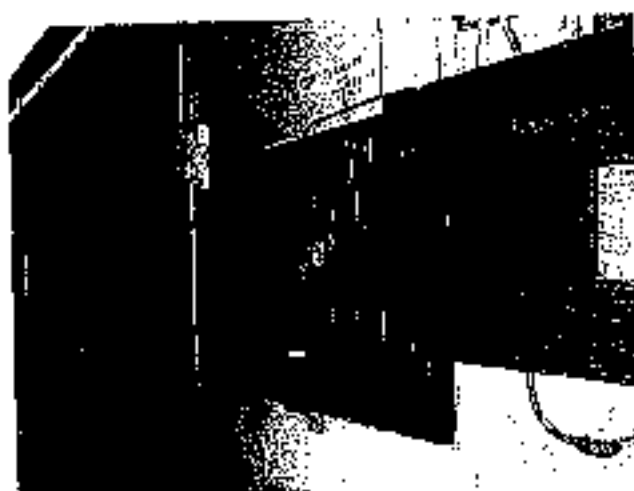
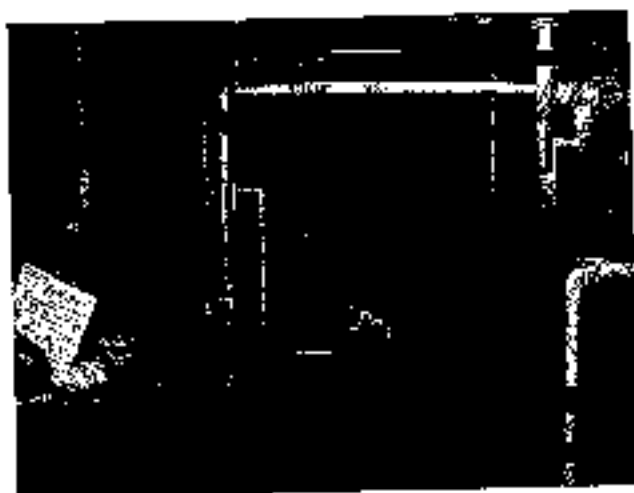
There is no access to the second floor classrooms. The construction of an elevator is recommended. This could take many forms but a reasonable budget for this modification, including interior modifications and site considerations would approximate \$500,000.

7.0 Mechanical:

HVAC
Plumbing
Fire protection

Heating and Ventilation:

The 1941 and 1962 buildings rely on two gas fired sectional boilers located in the boiler room of the original building. The original boilers have been abandoned in place. One of these units can be utilized as emergency backup if needed. Other equipment related to the original steam generation and heating have also been abandoned in place. One of the original three boilers has been removed to allow space for the present configuration. There is a simple pneumatic control system in place. Thermostats in each room control diaphragm valves on room units.



The condition of the unit vents in the 1962 building is in better condition than the equipment in the 1941 building. The 1996 building is stand alone and operates from two gas fired roof top units.

Air-Conditioning

The building does not utilize a chilled water system; there is no cooling tower associated with the building. Air conditioning is provided by thru-wall a/c room units. These can be seen readily in the attached photos. The modular classrooms have roof top A/C units.

Plumbing/ Sanitary:

Domestic hot water is generated by three gas fire hot water heaters. Two units supply hot water to the toilets rooms. One of these is temporarily out of service. The third unit provides hot water to the dishwasher. All utilize the original storage tank designed as a steam transfer system from the boilers. There are gang toilets and staff toilets throughout the facility. The second floor of the '41 building has "point of use" heaters mounted under the sinks. The original gymnasium has locker rooms associated with it that include gang showers. These showers are no longer in use.



Sprinklers:

There are no sprinklers installed in the facility

Fire protection & Life Safety Equipment

A Fire Command Station was observed in the Lobby. Audible alarms were observed; no visual alarms (i.e. strobe lights) were observed. Battery-pack emergency lighting was observed throughout the building as were lighted exit signs.

Visually observed evidence of major deficiencies:

Substantive deficiencies were observed.

The heating system, in particular the temperature control system, has reached its operable limit. The pneumatic controls are antiquated. The original exhaust system does not operate in a manner that allows balancing of fresh air for each room. This steam system should be replaced but the cost will be driven by the process. It is recommended that this be undertaken during a total building renovation process. There are steps that can in the interim to reduce energy costs and provide for a consistent and reliable environment. Replacement of the pneumatic controls with a digital localized controller is

recommended. An investment of \$75,000 to \$100,000 in controls work would generate a very short payback in energy savings. A renovation would include conversion from steam to hot water and replacement of piping and incorporation of isolation valves. Isolation valves are not present.

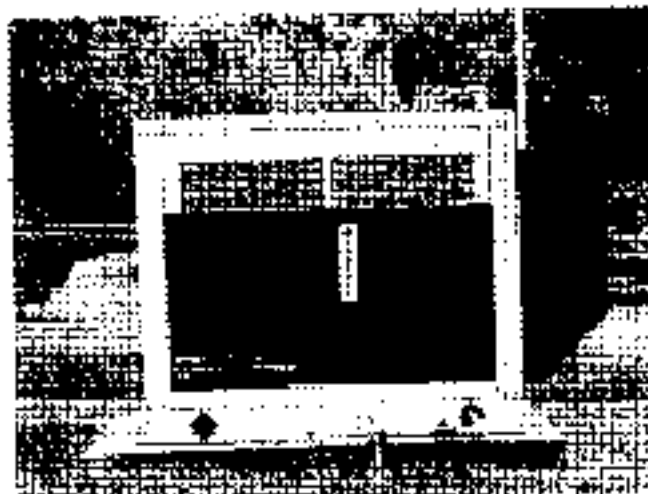
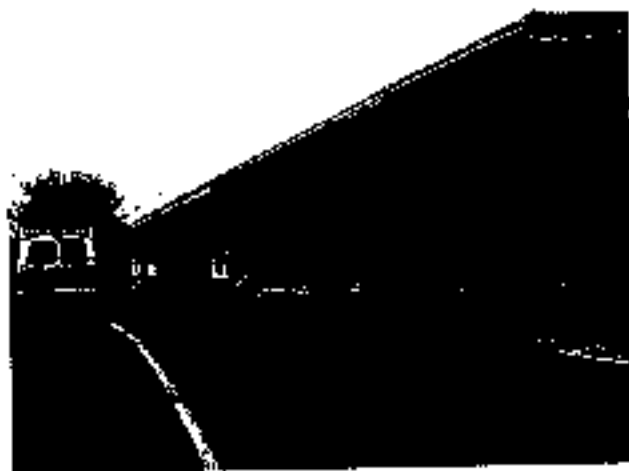
The domestic hot water system is functioning on half its capacity with one heater. The second unit is scheduled for repair this summer. Use of the original steam transfer hot water tank is inefficient. That tank could be replaced now or during the time of renovation.

Life safety and building safety is compromised as there is no sprinkler system and the fire alarm system is antiquated.

8.0 Electrical

The 1996 building has isolated services for power, phone and fire. All are in good operating condition.

The power and light for the 1962 building are distributed from the main switch gear in the 1941 building. That switch gear has been replaced but it has no spare capacity. The power and lighting distribution system is obsolete. The generator operates the refrigerator, freezer and minimal other circuitry. The emergency lighting is battery pack. A new transformer has been placed outside the kitchen loading dock. This services the 1941 and the 1962 buildings.



Power, data and communication wiring are, for the most part, surface mounted in wire mold in the old building. Fixtures are four foot long strip fixtures surface mounted.

Fire alarm is substandard and surface mounted in the original building. Only bells were observed on the exterior of the facility.

Visually observed evidence of major deficiencies:

Substantive physical condition deficiencies were observed.

The electrical power, lighting and fire alarm systems are operating at capacity and have passed their expected life cycle. They are in need of replacement.

9.0 Special Construction:

None.

Visually observed evidence of major deficiencies:

No substantive physical condition deficiencies were observed.

10.0 Site Work:

Site work and improvements were not investigated as part of the report.

11.0 Ancillary Structures:

None

Visually observed evidence of major deficiencies:

No substantive physical condition deficiencies were observed.

III. Pending Violations

Town of Medfield Building Department was contacted.
There was no indication of current building code or fire code violations.

The School department advised that an AHERA report was on file and that a program was in place to address all asbestos containing materials. The AHERA report is not reviewed as part of this investigation.

IV. ADA Barriers Check List

An overview level ADA review was performed. The present building owner does not have an ADA Compliance Plan in place. Therefore, it may be prudent to consider the preparation of an ADA Compliance Plan in order to meet readily achievable goals. Based on overview level observations this plan may need to address the following items:

- Self actuating automatic door operators
- Signage.
- Vertical lift
- Elevator markings and signals.
- Toilet Room conditions.

A complete compliance review will require further investigations and technical/feasibility analysis.

V. Appendix

Appendix A: Cost Estimates and Recommendations for Remedial Action

The following analysis has been prepared with the objective to develop the most cost effective long term use of this facility and to preserve and maintain the original appearance of the 1941 facade. The assumptions and projections contained herein are based on the field observation and experience of our personnel and discussions and interviews with the maintenance and janitorial staffs of this facility. They are not based on detailed knowledge or operational experience of the facility or its systems. No in depth equipment testing or exploratory investigations were undertaken

There are a number of repairs which should be undertaken to assure the present and continued use of this facility. This facility however is not a candidate for partial or targeted renovation. The age and condition of this facility warrant a complete and thorough renovation.

Care should be taken to perform only those tasks necessary to maintain life safety and the integrity of the structure to allow the building to remain in operation until such time as it can be removed from service and time allowed for its complete renovation. We therefore do not recommend the replacement of major systems at this time. The replacement of major systems at this time would be expensive and cost prohibitive. A piecemeal approach to improving this facility would be more expensive in the long term than a complete renovation. We would not recommend the full scope of repairs and improvements outlined to the report provided by MBA International.

We have not designed a renovation project for this facility so our analysis is conceptual in nature and based on assumptions which the School Department would need to validate. Our assumptions include the demolition of the modular classrooms and maintaining the student population equal to the present enrollment. The original 1941 building facade would be retained with adjustment for accessibility only. The construction of an elevator to access all floors of the existing two story classroom structure and the entrance level would be required. The 1962 building may be significantly adjusted and reconfigured to accommodate future programmatic needs. The rebuilding of floor space to replace the two demolished modular classrooms would be included.

The renovation of the original 1941 building would require a gutting of the structure. This would include all finishes and all systems, plumbing, mechanical, and electrical. This would allow structural

modification for seismic stability as required by code. This would also allow improvements to isolate the stair towers, add an elevator shaft, modify door openings to accommodate handicapped access, etc.

The costs associated with this proposed renovation are as follows:

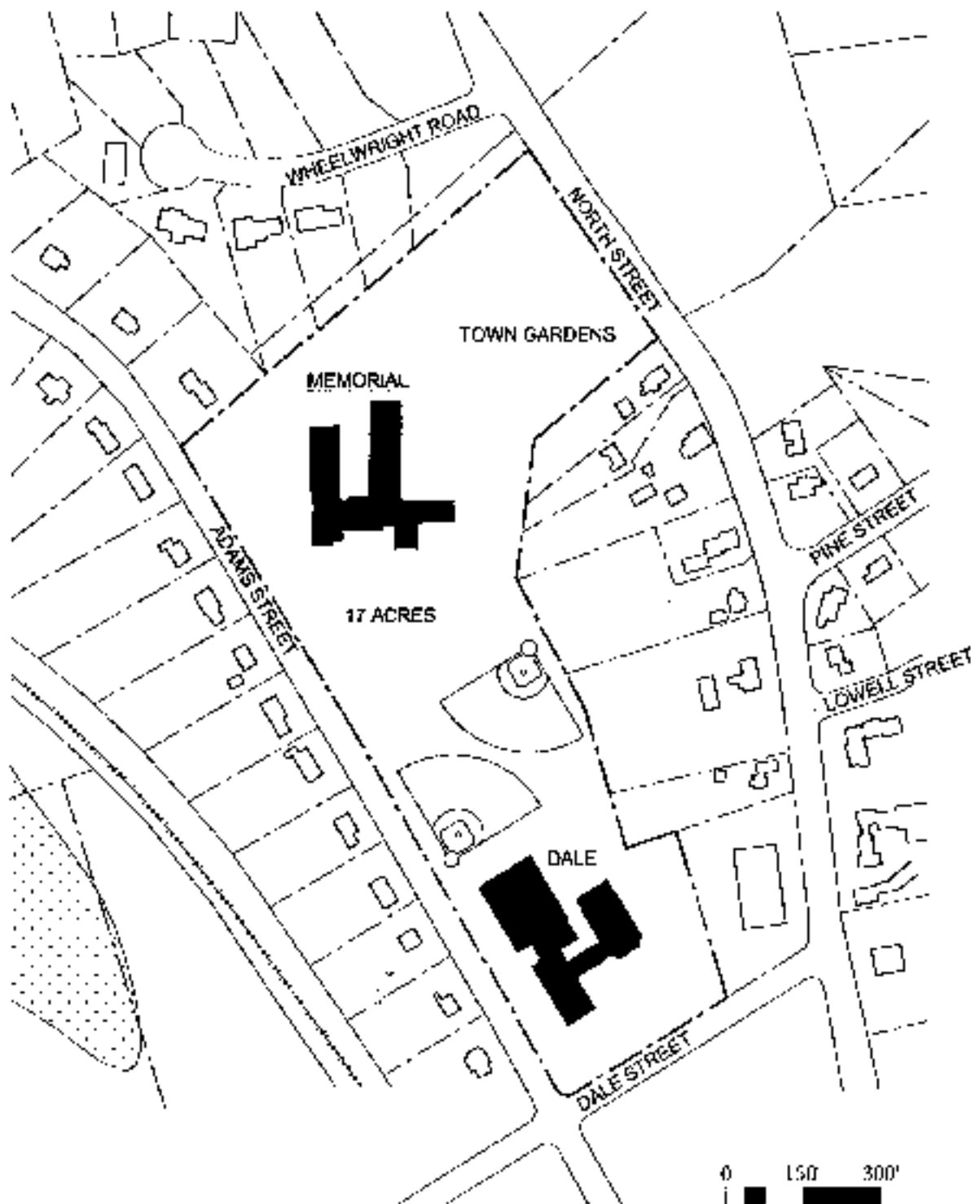
1. Selective demolition and renovation of 1941 building \$475 per sq ft; 28,900 sq ft	13,727,500.-
2. Addition of a 3 stop elevator	500,000.-
3. Renovation of to the 1962 building \$210 -/sq ft; 20,000 sq ft	4,200,000.-
4. Demolition of existing modular classrooms \$40. - / sq ft; 20,000 sq ft	800,000.-
5. Replacement of modular classrooms \$185/ sq ft; 20,000 sq ft	3,700,000.-
6. Site modifications for access and entrances	\$5,000.-
Total	22,982,500.-

Appendix B: Limiting Conditions Statement

LIMITING CONDITIONS STATEMENT

This limited report, is based on visual observations only. The BCO (Building Condition Overview) is a general report of existing physical condition. It is not a code compliance audit or study, an all encompassing building department violation study or search, nor an all encompassing and exhaustive report of condition. Information obtained from local agency files/staff is assumed to be correct. These services and report are specifically not intended to provide a certification of proper architectural or engineering design. The objective of the BCO is to alert the client to visually observed major deficiencies and suspected deficiencies. Conceptual corrective budgets, that may be included in the report, are based on preliminary information and conceptual scope of repair work. This report is not intended to be a warranty of any existing system, structure or enclosure, and it is not a guarantee of any system or its life expectancy. Construction Technologies Management Inc. (CTM) assumes no responsibility for any system, structure, or finished condition. This report is for the benefit of the client only. The client shall not release any portion of this report to other parties without obtaining written consent from CTM.

Appendix C: Additional Photos (attached)



SITE PLAN

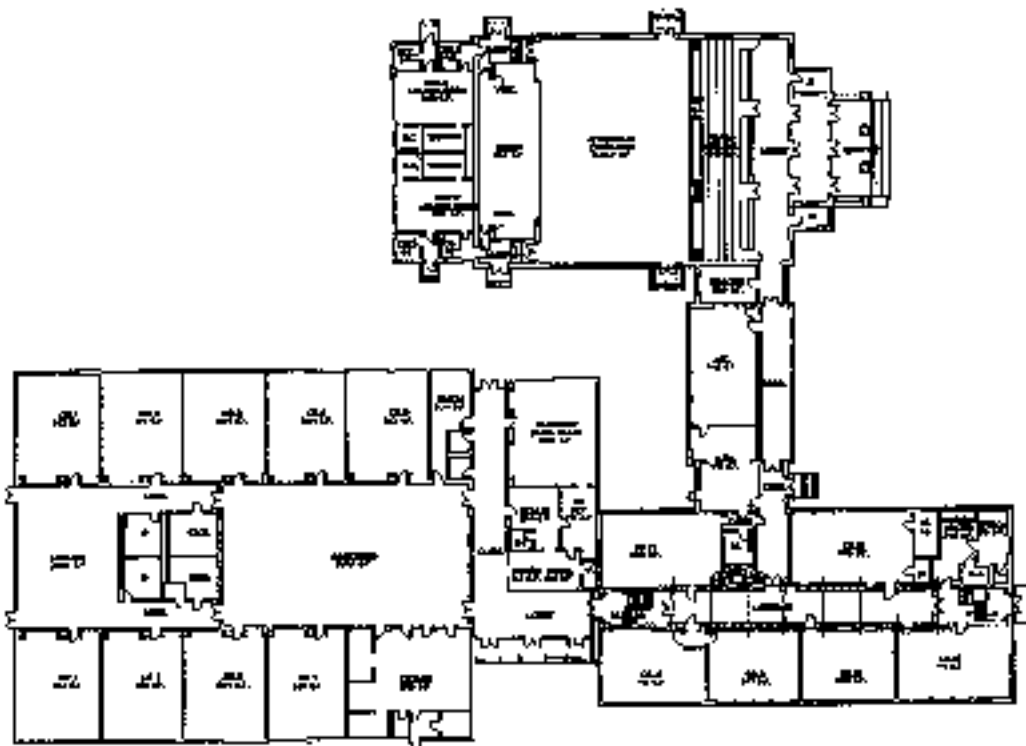
DALE STREET & MEMORIAL SCHOOLS

Medfield, Massachusetts



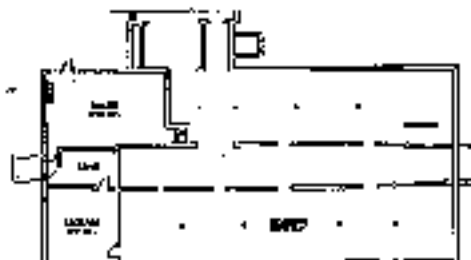


SECOND FLOOR PLAN



FIRST FLOOR PLAN

BASMENT- 4,612 SF
FIRST FLOOR- 43,357 SF
SECOND FLOOR- 2,010 SF
TOTAL GROSS SF 50,029 SF



BASMENT PLAN

FLOOR PLANS

DALE STREET SCHOOL
Medfield, Massachusetts



I. SITE ANALYSIS

Existing Conditions: The Dale Street school has vehicular and pedestrian access from Adams Street. The driveway is a loop off which in the primary pedestrian entrance as well as service area with dumpster are located. There is limited parking on this loop forcing parking onto Adams Street. There appears to be no storm drainage system in the street. There is parking in a lot just south and adjacent to the school. However the observed crowded parking areas confirmed the comments at the school that there is a shortage of parking.

There is an area of play equipment of fairly new vintage at the northeast corner of the school adjacent to the large lawn area between this school and the Memorial School. In a paved area adjacent to the school there are several basketball hoops. On the edge of the lawn area is a field hockey shed. It is understood that the total acreage for these two schools is approximately 14 acres.

Analysis: While the need to resurface the drive and parking areas and to add curbing is obvious, the layout of the drive, parking and circulation of buses, vehicles, truck deliveries and pedestrian should be studied for function, safety and appearance. The physical education program and perhaps the after school use of the fields should be evaluated to determine the adequacy of the existing facilities. As at the other school sites, the site utilities should be considered to ascertain their conditions and capacities.

II. BUILDING DESCRIPTION**A. General Description:**

The Dale Street School consists of an original building built in 1942 comprised of a two-story classroom wing with basement and a one and a half story Auditorium/Gymnasium wing connected to the classroom wing with a narrow connector. This building is a masonry building with concrete floor framing and steel roof framing. In 1960 a cafeteria, library, classroom addition was built which also included a link piece which includes administration, health clinic, and teachers' workroom. This addition is a one-story, slab-on-grade masonry building with steel roof structure.

The original 1942 building is an attractive neo-classical building nicely scaled to its suburban residential context. The 1960 addition is a non-descript slope roofed box (typical of this era) which is joined uncomfortably to the original building with a link that shows little regard for the original. The new addition relocated the main entry from Dale Street to Adams Street.

B. Technical Description:

The building is situated at the intersection of Dale and Adams Streets and as described above the main entry is located in Adams Street since the 1960 addition, although the obvious "front door" of the building is on Dale Street. The building measures approximately 320' north to south and 225' east to west measured at its widest points. The gross footprint area is ±41,200s.f. with a total gross square footage of ±51,300s.f. distributed as follows:

Auditorium Building	10,350 s.f.
Art & Music Link	2,880 s.f.
Original Classroom Wing	18,200 s.f.
1960 Link	3,200 s.f.
1960 Wing	<u>16,670 s.f.</u>
Total Gross	53,029 s.f.

The building is divided into various educational and administrative spaces totaling 36,872 s.f.. They are as follows:

<u>1960 Wing</u>	<u>Square Feet</u>
Classroom 1	812
Classroom 2	812
Classroom 3	809
Classroom 4	809
Classroom 5	809
Psychology	304
Library	1,408
Cafeteria	3,140
Classroom 6	812
Classroom 7	812
Classroom 8	809
Classroom 9	809
Kitchen	1,315
Subtotal Net	13,460
<u>1960 Link</u>	
Waiting/Admin	278
Principal's Office	213
Health	254
Teachers' Workroom/Lounge	830
Subtotal Net	1,575
<u>Basement in Classroom Wing</u>	
Storage	2,890
Bolter	690
Subtotal Net	3,780

First Floor Original Classroom Wing

Classroom 10	718
Classroom 11	657
Classroom 12	653
Classroom 13	791
Classroom 14	808
Classroom 15	853
Learning Center	243
Speech	153
Subtotal Net	4,954

Second Floor Original Classroom Wing

Classroom 16	713
Classroom 17	641
Classroom 18	677
Classroom 19	714
Classroom 20	715
Class Room 21	909
Class Room 22	647
Subtotal Net	5,022

Art & Music Link

Reading	278
Art Room	792
Music Room	513
Subtotal Net	1,533

Auditorium Building

Gymnasium/Auditorium	3,360
Boys Lockers	456
Girls Lockers	456
Tiered Seating Area	1,342
Stage	934
Subtotal Net	6,548

TOTAL NET 36,872

TOTAL GROSS 53,028

Efficiency Factor 1.44

Note: For planning purposes an efficiency factor of 1.50 is desirable.

III. CONDITIONS OF EXISTING CONSTRUCTION

The following is based upon detailed inspection by Mount Vernon Group, Inc., Architects & Planners, and their consulting engineers

A. STRUCTURAL SYSTEMS

Existing Conditions: The original structure was completed in 1945, and an extension was added in the 60's. The original two story building, consists of brick masonry walls and deep pan concrete waffle slabs and the extension is a one story, three span steel frame system with sloping high roof and masonry walls. Several joints at high inter or walls had cracked and have been repaired. The repair work appears to be working and no additional cracks could be found. The structure is in good condition.

Analysis: Previous repairs are holding up well, and no major structural work is required.

B. ARCHITECTURE/EXTERIOR

1 Walls

Existing Conditions: The predominant exterior material of the original building and addition is brick masonry with large areas of wood such as the main entry of the Auditorium building which has wood columns, cornices, entablature and pediment. There are also wood pilasters and entablature at the entry to the classroom wing. The entry at the 1960 wing features hollow metal frames with full height glazing and steel doors. There is also a sloping wood soffit at this area. The 1960 wing features brick exterior walls with wood framed spancels and fascias.

Analysis: The major concern with exterior walls in buildings of this vintage is the lack of adequate insulation even in the 1960 wing. Little or no insulation is used. The exterior walls of this building must be addressed for installation of proper insulation (most likely rigid insulation) within new formed out interior walls. The nature of the masonry technology employed also provides no assurances against water infiltration.

2 Doors and Windows

Existing Conditions: The windows in the 1942 building are wood double-hung single glazed windows. These windows are original and have outlived their useful life. The windows in the 1960 addition are steel framed single glazed casements and awning sashes in steel frames. In the large end wall glazing in the library there is a combination of wood and steel framing.

The doors in the 1960 vestibule link are steel doors that appear to be a recent retrofit. Other doors throughout the building appear to be from different periods and in various stages of disrepair.

Analysis: Because of the age of much of these systems within the building and their relative ineffectiveness in regard to insulation, it is recommended that all windows be replaced with modern insulated glass windows that feature a thermal break frame and operable sash. Any major renovation would call for the replacement of many or all doors.

3. Roofs

Existing Conditions: The 1942 building features slate roofs on all sloping surfaces. This is obviously the original roof. The 1960 addition was built with a tar and gravel roof. There may have been repairs and updates over the years, but if so they are undocumented.

Analysis: Any funded renovation project at the Dale School will require the installation of a new roof. It has been the position of S.B.A. to ask for a new warranted roof as a part of any funded project in which the existing roof is near or past its warranty expiration.

C. **INTERIORS**

1. Walls

Existing Conditions: The walls of the 1942 building are predominately brick and plaster. Plaster finishes on the first floor are often over a masonry substrate except over the lockers, in which case steel stud construction was employed. The second floor classroom walls and interior partitions are plaster on steel studs. Exposed brick is the wall material in the auditorium, as well as the stairwells.

There are numerous wall materials used in the 1960 addition: most predominately Concrete Masonry Units (CMU), structural glazed tile, and vertical wood planking with wood cap.

Analysis: The walls for the most part are in fair to poor condition and various measures must be taken to improve their condition or change locations. All the walls appear to be in sound structural condition.

2. Ceilings

Existing Conditions: The 1942 building has various ceiling types some original and some added. The classrooms have 12" x 12" acoustic ceiling tile glued to the existing substrate. The first floor corridor was an exposed concrete waffle slab painted and the second floor corridor has a plaster ceiling. The link (which was originally a kitchen) has 12" x 12" acoustic ceiling panels and the gymnasium/auditorium building has a combination of plaster and acoustic ceilings, except for the stage area which has exposed structure. The 1960 addition has exposed steel structure in the cafeteria, classroom, and media center which features tectum roof panels supported by bulb Ts. The kitchen has a plaster ceiling; the office areas and lobby have 12" x 12" acoustic ceiling tiles; and the teachers' workroom has exposed steel with tectum planks in bulb Ts.

Analysis: The ceilings throughout the school are in various conditions; however, it is recommended the new acoustical suspended ceilings be reinstalled throughout most areas both for acoustic and insulation reasons, as well as to conceal the likely sprinkler system which should be part of any addition renovation project.

3. Floors

Existing Conditions: The floors in the 1942 original building are generally finished with vinyl asbestos tiles; however, carpet has been installed in Class Rooms 10, 14, 12, 15, 21 and 22. It is likely that this carpet was installed over the existing V.A.T. The gymnasium/auditorium area has a wood floor, as does the stage. The foyer has 12" x 12" vinyl composition tile, and the vestibule features 6" x 6" quarry tile. The 1960 wing is predominately 9' x 9' VAT flooring with the exception of the kitchen which appear to be V.C.T. in 12" x 12" tiles. Toilets feature ceramic tile floors.

Analysis: The floor tiles and carpet throughout should be removed and replaced by 12" x 12" V.C.T. or carpet because the toilet rooms are not handicapped compliant and extensive remediation would be required to make them so. It is also recommended that they be removed and replaced. The wood flooring the gymnasium/auditorium is nearly 60 years old and should be replaced, as should the stage floor.

4. Stairs

Existing Conditions: There are two stairs located in the classroom wing of the 1942 building. They are constructed of steel with rubber treads and riser in fills; the rails are steel.

Analysis: The present configuration of the stairs and rails are not code compliant. The stairs present nosings which are not permitted by ADA and the rails do not meet current codes. It should also be noted that stairs in the gymnasium/auditorium area at the seating as well as the stage are not code worthy and vertical lifts or ramps are required. The two-story nature of the classrooms in the 1942 building will also require the installation of an elevator.

5. Interior Doors

Existing Conditions: The doors through the building are wood and for the most part appear to be original. They have no handicap accessible hardware and do not appear to meet the fire rating requirements now in place. They are for the most part installed in hollow metal frames. It should be noted that many of the doors in the 1960 addition are set in pockets that make the doors inaccessible to the handicapped.

Analysis: Interior doors throughout the building should be replaced with code compliant doors and hardware. They may also necessitate the replacement of all existing frames. In the 1960 addition it will also be necessary to substantially alter the wall configuration at many door openings in order to provide the proper push/pull clearance required under ADA.

D. CODE ISSUES

1. Building Type Summary.

The Memorial School is a three-story building which has a gross footprint area of 21,656 square feet on a 17-acre site. The existing building is constructed of concrete slab on grade and masonry brick and backup block with interior walls of block. The exterior walls are load bearing with load bearing interior corridor walls. First and second floor framing is cast-in place concrete joists. The typical roof framing is comprised wood framed joists. The roof framing at the auditorium is steel trusses with double angles spanning between the trusses. The square footage of the building comprised with the unprotected noncombustible structure could classify the present construction type of this building as a nonconforming 2C building. The use group is E-Educational.

The building is presently nonconforming because Table 503 of the Sixth Edition of the Massachusetts State Building Code indicates that an unprotected Type 3B building of use group E has an allowable two story height and 14,400 s.f. area per floor. The existing building exceeds the allowable square footage by 7,256 s.f. on the first floor.

2. Height and Area Limitations

The designer, faced with these conditions, is guided by the provisions of Chapter 34 of the Massachusetts State Building Code §3404.0 "Requirements for continuation of the same use group or change to a use group resulting in a change in hazard index of one or less"

The existing building is in excess of the allowable square footage or height requirements as set forth in Table 503 for a building of Type 3B Unprotected Construction. The building is presently constructed of brick and block masonry with no firewalls constructed to partition the building. An addition to this building would require separation by firewall.

Area limitations of the existing building structure could be modified to comply if the building has more than 25% fronting on a street or unaccounted space, which allows an increase of 2% for every 1% of such excess frontage as per §506.2. If buildings are equipped with an automatic sprinkler system as per §506.3, this would allow a 100% increase in area for buildings more than two stories. With these requirements in place, the allowable square footage floor area would be 50,400s.f. New fire walls must still be constructed to separate the original building from any new addition.

3. Egress Issues

Egress from the existing building is not code compliant. Most of the entrances to the building not accessible from the stair landings. §3400.5 assists the designer in arranging proper egress for the building and §1009.0 provides direction on widths of exits to provide a safe and adequate means of egress.

4. Remediation

Any improvements in the existing building must address the following issues:

All exit signing, exit lighting and fire detection and annunciation systems must be upgraded to contemporary codes, replacing existing equipment with new. §3404.7, §3404.8 and §3404.12 address exit sign and lights, means of egress lighting and fire protection systems. This equipment must in the renovated building conform to the provisions of the most current codes.

Energy Code Requirements: §3407.1 and §3407.2 of the Massachusetts State Building Code require that alterations of an existing building in which the use group is not changed, must comply to the energy conservation values detailed in Table 3407 of the code for any building elements (walls, windows, doors, roofs, or mechanical systems) which are altered in the course of renovation.

Handicapped Access: "Architectural Access Board Rules and Regulations" 521 CMR 3 require that any renovation of a building in which the cost amounts to 30% or more of the assessed value of the building, the entire building is required to comply with the latest provisions for handicapped access as documented in 521 CMR and the Americans with Disabilities Act.

Elevators and Vertical Lifts: §3001.1 provides that elevators vertical lifts and similar equipment shall conform to the elevator regulations of 524 CMR. §3001.2 shaft construction shall comply with 780 CMR §710.0 vertical shafts. These provisions allow guidance in designing the appropriate equipment for floor grade changes.

E. MECHANICAL SYSTEMS

Boiler Room:

The boiler room is provided with a total of four (4) boilers. Two (2) boilers are HB Smith series 44 mills water tube boilers which were installed during the original construction of the building. In recent years one (1) boiler has completely failed and is completely out of service however, the unit is still in place in the boiler room. The second (2nd) of the original boilers is used entirely as a stand-by unit and is available to come on in the need of heat, however generally speaking this boiler is not used. The overall condition of this boiler is extremely antiquated and old and certainly has reached its maximum serviceable life. If this boiler were used for any extensive period of time the reliability of this boiler could not be assured and consideration should be given to a replacement if the need for additional heat is required. Approximately five (5) years ago two (2) new Weil McLain cast iron sectional boilers model number 68B were installed to take the place of the existing boilers within the power plant. The boilers generate low pressure steam and distribute to the existing piping system through a schedule forty (40) black steel low pressure steam piping system. The new piping is insulated with fiberglass insulation with an all service jacket and the entire installation would be considered excellent. Each boiler is provided with dual low water cut-offs and all operating and safety controls and the entire installation is code compliant. All boilers, including the original boiler, are provided with gas only burners and all gas regulators are vented to the exterior per code requirements. Adjacent to the new boilers are two (2) floor mounted condensate receivers which receive condensed steam from a main vacuum return system which was installed during the original construction. The new condensate receivers are uninsulated and are of steel construction and provide condensate return for each boiler. Each receiver is provided with a single boiler feed pump and the entire installation is excellent. The original low pressure steam piping appears to be

schedule forty (40) black steel and is insulated with fiberglass insulation with what appears to be a canvas jacket. It was noted that much of the insulation had surface damage however, not considered a serious concern at this time. There were no complaints of pipe leaks within either the condensate or the steam piping system however, before an exact determination can be made as to overall pipe condition sections of the existing piping should be removed and examined internally for corrosion. The condensate piping appears to be schedule 80 black steel however there was no insulation on this piping system. Also, there were no signs of leaks however, sections of the pipe should be examined internally and if corrosion does exist consideration should be given to a complete replacement of the entire system. Condensate is returned to a floor mounted vacuum return system which returns condensate from the entire building to the boiler room under a vacuum. It was noted that this vacuum system continues to operate in a satisfactory manner however, as the piping system continues to age and leaks do develop this vacuum will be reduced and condensate return to the boiler room could be a problem. Considering the extreme old age of the entire condensate system consideration should be given to an upgrade at this time. Combustion air for the entire boiler room is through a ceiling mounted classroom unit ventilator which receives outside air directly through a galvanized sheetmetal duct to the outside. Also provided within the space is an individual duct which goes from the outside directly to the floor level to provide a convection flow of air within the boiler room. It does appear that the entire installation is code compliant and operating in a satisfactory condition at this time. It was noted that the entire system is antiquated and the system should be upgraded. The breeching for the new boilers appear to be galvanized steel uninsulated. The breeching from the original boilers is black steel insulated with calcium silicate. It was noted that the old boiler is provided with an induced draft fan which discharges into a breeching system common with the new boilers. Within the new boiler breeching system is a barometric damper at the discharge side of the induced draft fan which could allow combustion gases to enter the boiler room through the barometric damper if the original boiler were ever used. This condition is non code compliant and consideration should be given to repairing this incorrect design. Generally throughout the existing boiler room are numerous abandoned pieces of equipment which has cluttered the boiler room and does make general maintenance of the equipment very awkward. Considering the limited space available, consideration should be given to removing all abandoned and out of service equipment as well as piping to free up additional boiler room space. The steam distribution and condensate return piping system of the original building is provided in a basement area. The entire piping system appears to be schedule forty (40) black steel for steam and schedule eighty (80) black steel for the condensate. The entire piping system where exposed was insulated with what appears to be fiberglass insulation with a canvas jacket however, as we understand it the elbows have been confirmed to contain asbestos and consideration should be given to a removal of all asbestos insulation on piping elbows and replace with fiberglass insulation.

Automatic Temperature Controls:

The automatic temperature control system is made up of two (2) individual air storage tanks each containing a single compressor and motor. Each system appears to be approximately ten (10) years old. The system is provided with a common refrigerated air dryer to each compressor. Each air tank, as well as the refrigerated air dryer, are provided with blowdown lines however, each device discharges to a receptor located on the floor. Consideration should be given to installing a floor drain along with an automatic blowdown control from each device. An oil water separator is also provided in the common air line and this along with the remaining components of the system is extremely antiquated and the entire automatic temperature control system should be upgraded at this time.

Classrooms:

The original building classrooms are each provided with classroom unit ventilators with adjacent cast iron radiators. The unit ventilators are provided with an outside air intake louver which introduce ventilation air to each space. The air is heated through a unit mounted coil and is distributed through a discharge grill on the top of the unit ventilator. A wall mounted pneumatic thermostat controls the coil valve with the control valves on each cast iron radiator and maintains space control. Although extremely antiquated the entire system does appear to maintain good temperature control as well as air quality. Also provided in each space is a masonry wall opening located low at the floor which is designed to remove ventilation air introduced by the unit ventilator. These ducts rise and collect in the attic in a galvanized sheetmetal exhaust system, and through a fan located in the attic discharges the air above the roof. The entire system is extremely antiquated and in need of replacement. It was also noted that the various window air conditioning units were installed in each of the individual rooms and during warm months do maintain reasonable temperature control however they are noisy, old and are in need of replacement. The addition building classrooms are also provided with wall mounted classroom unit ventilators which also include intake louvers for ventilation air and a control valve to maintain space temperature. The control valve is operated through a pneumatic wall mounted thermostat and generally, reasonable space temperature control is maintained. Each classroom is provided with floor to ceiling glass adjacent to the unit ventilator however, it was noted that there was no fin tube radiation in front of this glass. This condition would promote drafts during the colder months and consideration should be given to improvement. Each classroom is also provided with a wall mounted register at the floor to remove the amount of ventilation air brought in at the unit ventilator. These registers were slightly dirty however, not affecting overall performance. The exhaust registers communicate directly to inline fans located in the attic through a galvanized sheetmetal exhaust system. These exhaust fans discharge to roof goosenecks for the discharge of exhaust air. All systems are operating and are in reasonably good condition considering their age. No recommendations for improvement are made to these areas except for that noted. Corridors throughout the original building are provided with cast iron radiators which are each provided with control valves operated through a wall mounted pneumatic thermostat. The entire installation is extremely antiquated and in need of replacement at this time. All toilet areas throughout the original building, as well as the addition, are provided with exhaust systems which communicate through a series of wall mounted exhaust fans as well as two (2) attic fans with galvanized sheetmetal ductwork. All systems in the original building are extremely antiquated and are in need of replacement. Those systems within the new building are slightly dirty however, the systems were operating in a satisfactory manner and maintaining reasonable odor control. It was also noted that the toilet spaces within the addition building were provided with wall mounted fin tube radiation located at the ceiling and all systems were operating and maintaining reasonable space temperature control.

Media Area:

The media center is provided with an air handling unit located in an attic area which distributes supply air through side wall diffusers located approximately ten (10) feet above the floor. The return air system is also located high on the wall and through a galvanized sheetmetal system is returned air back to the air handling unit where it is mixed with outside air and redistributed to the space. It was noted that in the high glass areas there was no fin tube radiation installed and this condition would promote drafts during colder months. This condition should be improved upon. Also located in the Media Area was a low wall exhaust register which communicates directly to the attic through a galvanized sheetmetal exhaust system. The system is slightly dirty however, the systems are operating and maintaining reasonable space odor control.

Cafeteria:

The Cafeteria is similar to the Media Center where it is provided with a central air handling unit with sidewall diffusers located approximately ten (10) feet above the floor. Also located adjacent to the supply diffusers were a series of return air registers returning the air back to the air handling unit through a galvanized sheetmetal duct system. This air is mixed with a percentage of outside air for overall ventilation control throughout the space. The systems were noted to be slightly dirty however, not detrimental to the operation of the systems. Also located within the Cafeteria was a low wall exhaust register which is designed to remove the amount of air brought into through the air handling unit. This register was slightly dirty and was noted to be slightly damaged and in a need of replacement. It does appear however, that this system is operating in a satisfactory manner. The hood located over the cooking area is of the painted galvanized steel type and it was noted that much of the surface area of the hood had been blanked off. This condition is non-code compliant and should be improved upon. At the ceiling of the kitchen was a single unit ventilator providing make-up air for the kitchen hood. It does appear that the amount of ventilation to this unit ventilator is inadequate for the amount of exhaust air and consideration should be given to an improvement. The dishwasher is also provided with two (2) exhaust connections from the dishwasher and through a stainless steel exhaust system distributes to a roof mounted exhaust fan. It was noted that this system needs to be cleaned and that the amount of make up air provided to the dishwasher room appears to be undersized for its application.

Auditorium:

The auditorium is provided with two (2) individual air handling units located on each side of the stage. The air handling units free blow the air through a single sidewall diffuser at each air handling unit. Return air to the air handling unit is directly to the bottom of the unit with no return air ductwork. It was noted that these return air dampers were slightly dirty and in need of cleaning at this time. Under the stage is a central exhaust system that allows air to enter under the stage through a series of perforated registers where it is collected through a galvanized sheetmetal system and distributes to roof exhaust fans. These registers were clean and appear to be operating in a satisfactory manner at this time. Also located in the auditorium are a series of recessed cast iron radiators within the exterior wall. These cast iron radiators are covered over with a face plate. The bottom opening of each radiator had been blocked off limiting the amount of heat that could be diffused into the individual enclosures. Consideration should be given to opening the flow of air around each cast iron radiator to improve heating output. Consideration however should be given to a complete upgrading of the entire heating and ventilating system of the entire Auditorium.

Administration Area:

The Administration Area is generally made up of a group of interior and exterior rooms. It was noted that the interior spaces were not provided with any means of supply ventilation air although an exhaust system was present. All toilets were also exhausted through a galvanized sheetmetal system to roof mounted exhaust fans and all systems appear to be operating in a satisfactory manner. It was noted that all systems were clean and no improvements are suggested at this time. Finned tube radiation was also provided for the individual rooms to maintain automatic temperature control and systems do appear to operate in a satisfactory manner. Within the space where window type air conditioning units for general cooling, and as we understand it, reasonable temperatures are maintained however, the systems are noisy and consideration should be given to an overall improvement of the heating, ventilating, and air conditioning system of the Administration Area. It was also noted that the windows in the exterior spaces were operable allowing for natural ventilation for these exterior rooms however, consideration should be given to mechanical ventilation.

F. PLUMBING SYSTEMS

Existing Conditions:

1. The systems were installed in 1945 and circa 1965.
2. Natural gas is provided for usage to the domestic hot water heaters and kitchen.
3. Domestic hot water is provided by two hot water heaters and an associated hot water storage tank in the boiler room.
4. The building contains storm and sanitary drainage systems.
5. The building contains boy's and girl's gang toilets, single toilet rooms, janitors closets and drinking fountains.
6. The classrooms have sinks with hot and cold water.
7. The two single toilet rooms adjacent to the gymnasium have cold water only.
8. The kitchen contains a gas fired boiler providing steam for the kettles, gas ovens, dishwasher with electric hot water booster and various utility sinks with an associated grease trap.

Updating of Systems:

1. The hot water storage tank was reinsulated (date unknown).
2. The two (2) gas fired hot water heaters were replaced in 1995.
3. The toilet fixtures in the gang toilets of the 1965 wing were replaced in 1997.
4. The sinks in the gang toilets of the 1945 wing were replaced in 1997.

Analysis:

1. All systems and fixtures appear to be adequate and functioning properly with no reported deficiencies.
2. The domestic water piping systems have asbestos insulation which is encapsulated as required and inspected annually.

G. FIRE PROTECTION SYSTEMS

There is no sprinkler system in the building.

H. ELECTRICAL SYSTEMS

Existing Conditions:

Electric Service: The main electric service is 600 amps 120/208 volts three phase, four wire, 60 hertz. Metering is at the secondary voltage.

The main disconnect switch and distribution panel is located in the basement boiler room. The equipment appears to be original equipment. The original school was built in the mid 1940's with an addition in 1960's.

Interior Distribution: Panelboards and distribution system equipment includes a mixture of original (1940's) to equipment added or replaced in the future building addition (1960).

Emergency Lighting: A gas fired 10-12 Kw emergency generator provides some emergency lighting throughout the buildings corridors and egress areas during power outages and power to telephone system, fire alarm and kitchen refrigeration. Some areas of the building are provided with battery light units. The battery units appear to have reached their useful life expectancy. The illuminated exit signs are connected to the standby power source and many appear to be the original equipment and in need of repair or replacement.

Fire Alarm: The existing fire alarm system has (12) zones and includes manual pull stations, horn/light units. The existing system is 1960's equipment and appear to be functioning adequately. There are deficiencies in alarm units coverage in certain instances. Some pull stations are not located within code required distances from egress doors or at correct mounting height for handicap access. The visual alarms do not include the strobe light component as required by ADA.

Public Address System: The existing system console is a 1960's unit and appears to be operating satisfactorily. The system includes classroom speakers and call-in switches.

Master Clock and Program System: The master unit is relatively new and although portions of the system components are old, it is operating satisfactorily.

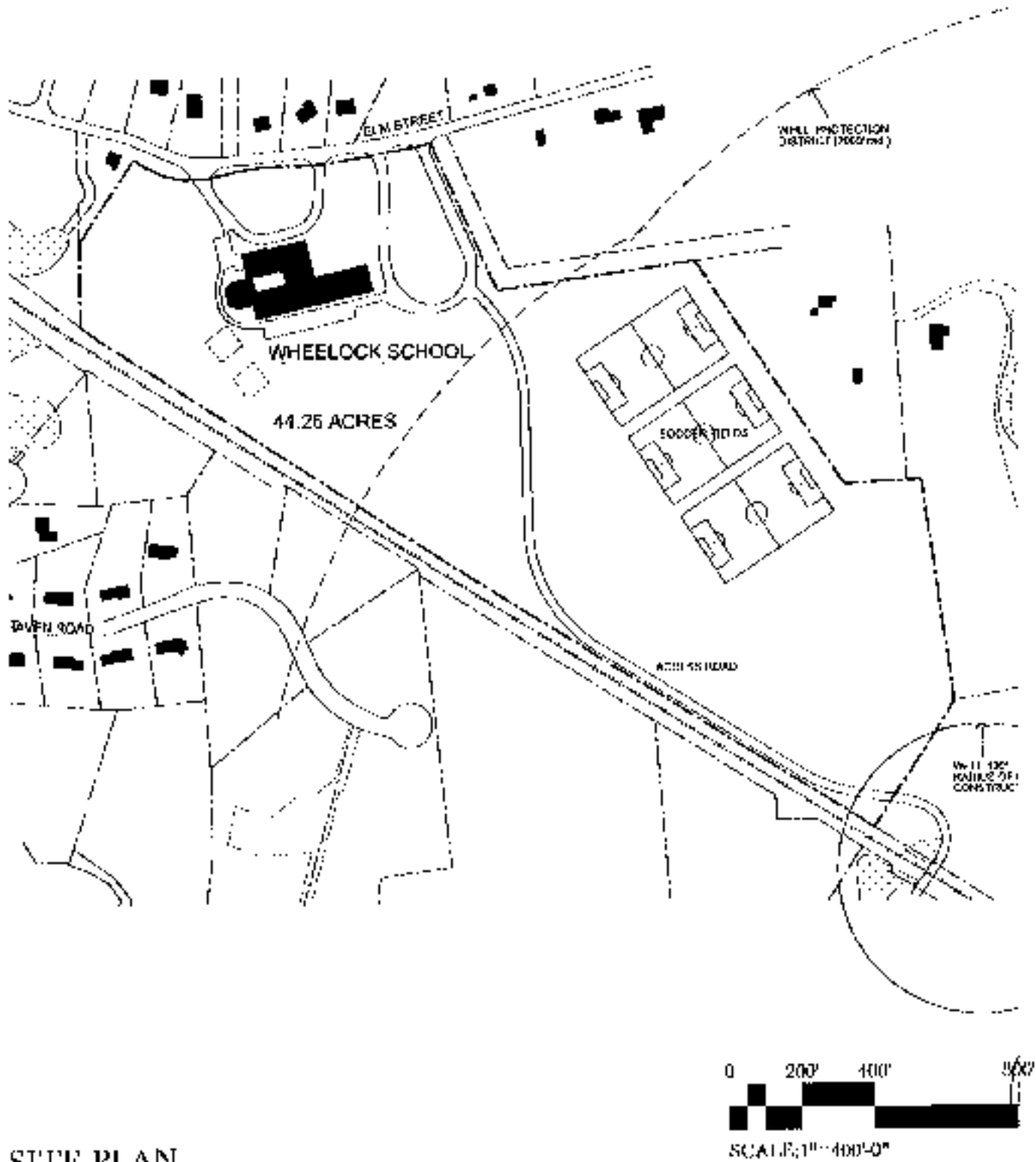
Security Systems: There is not a security system in this building.

Interior Lighting: In general lighting fixtures are fluorescent throughout. Classroom lighting consists of (9) rows of louvered fixtures controlled via local switches. Light levels appear to be reasonable. In some instances the fixtures are in need of replacement due to discoloration of lenses, louvers or lamp deterioration which may indicate ballast failure. It is doubtful that in all instances the existing fixtures are furnished with energy efficient ballasts and lamps.

Exterior Lighting: Lighting is basically provided by flood lights on street poles provided by the electrical utility company. No other building controlled site lighting was observed.

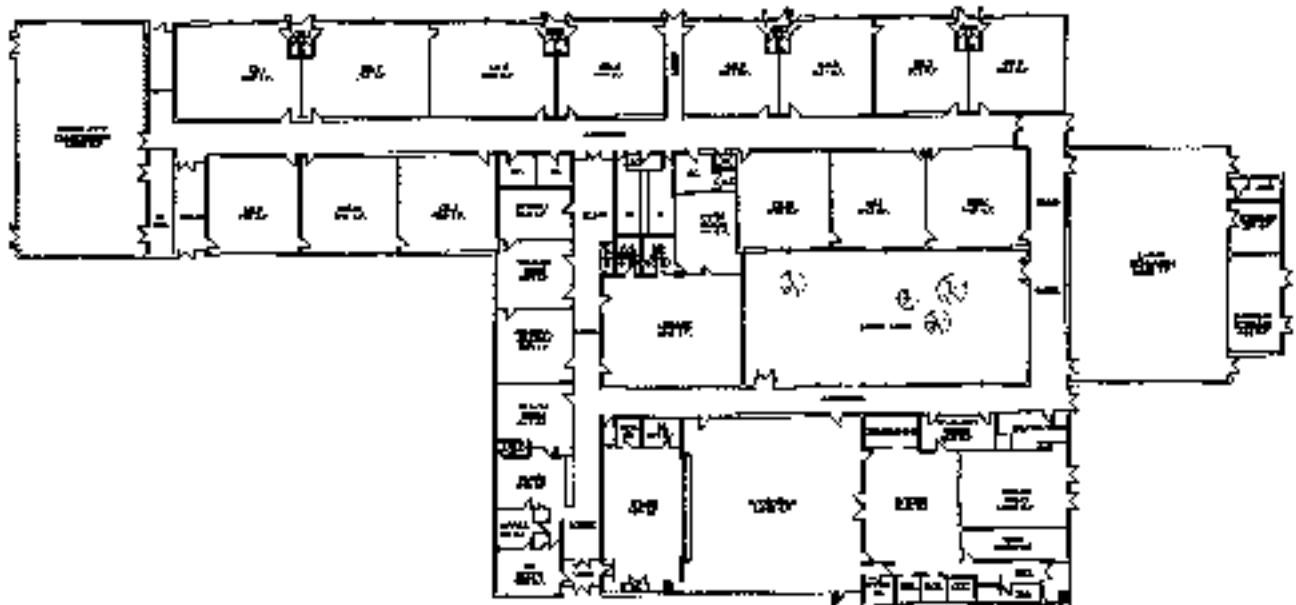
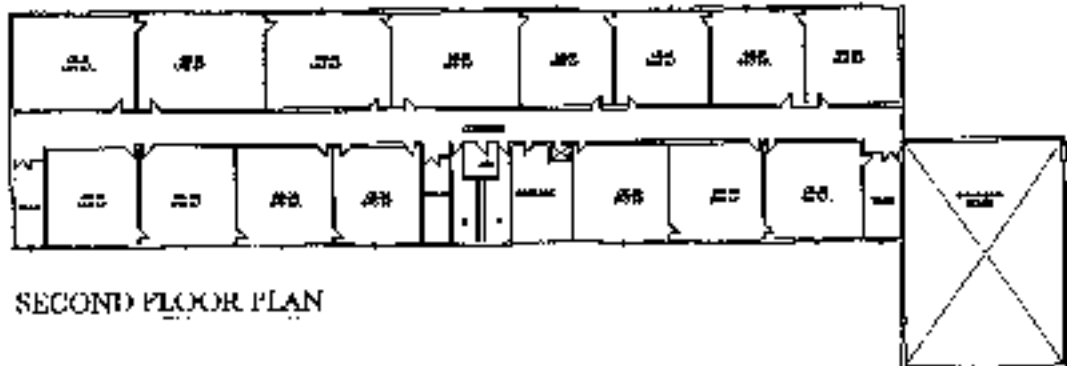
Analysis:

The immediate concern would be the implementation of upgraded fire alarm, emergency lighting and illuminated exit signs systems to meet present codes. Any renovation project would require evaluation of remaining electrical systems i.e., electrical service, distribution equipment, lighting etc. To provide for new program spaces.



SITE PLAN

RALPH WHELOCK SCHOOL
Medfield, Massachusetts



FIRST FLOOR PLAN

FIRST FLOOR	43,000 SF
SECOND FLOOR	20,600 SF
TOTAL GROSS SF	63,600 SF

FLOOR PLANS

RALPH WHEELOCK SCHOOL

Medfield, Massachusetts



I. SITE ANALYSIS

Existing Conditions: The school built in 1969 is located on a relatively large site on Elm Street. There is a loop entrance drive with parking with the paving continuing around the school building to service locations and additional parking. The curbing is generally white painted, bituminous concrete and it and the paving are generally in poor condition.

On the southwestern corner of the building is large play structure built of wood and rubber tires probably with a community group. Just south of the building are soccer fields used by the students. These fields are irrigated. The surface is uneven and the turf is poor condition. Evidence of the on going maintenance program is a new guard rail to keep vehicles off the fields. In front of the school is a garden area with shed and composting area which is identified as the Medfield Gardens.

The small field in front of the school is poorly drained with an uneven turf surface. East of the school is a very large complex of soccer fields, Wheelock Soccer Fields. A sign promises more fields for the Fall of 1999. It appears as of our early May visit, that these fields need work to make the surface more even and to renovate the worn lawn areas.

Analysis: In the need of resurfacing of all paved areas including drive, parking, service and walks, we recommend consideration of using granite curbing. The site lighting system might be evaluated from a cost point of view as well as safety and security considerations.

The play equipment might be inspected for handicap accessibility and any maintenance needs as well as the capacity of service the physical education requirements. In concert with the analysis and improvements to the buildings, a detailed review of the site facilities should be conducted so that any improvements can be coordinated with the school building program and budget.

II. BUILDING DESCRIPTION

A. General Description

The Wheelock School is a two story brick masonry building with flat roofs of varying heights. The building is composed of a one story core facility that includes the administration, stage, cafeteria, kitchen, library and gymnasium around a courtyard. A two story double loaded academic classroom wing abuts the courtyard to the south. The academic wing also includes a small gymnasium/multi purpose room at the east end.

B. Technical Description

The building as described above is a one story core facility abutting a two story academic classroom wing.

The building measures approx 415 feet east to west and 185 feet north to south. The gross foot print area is 45,242 square feet with a total gross square footage of 61,037 sf. distributed as follows:

First Floor	40,357 SF
Second Floor	20,680 SF
TOTAL GROSS	61,037 SF

The building is divided into various educational and administrative areas totalling 40,136 SF. They are as follows:

<u>Core Facility</u>	<u>Square Feet</u>
Administration	551
Health	462
Reading	552
Faculty	507
Speech	355
Library/Comp	2,202
Stage	1,281
Cafetorium	3,043
Kitchen	2,143
Gymnasium & Storage	4,380
Subtotal Net	15,490
<u>1st Floor Academic</u>	<u>Square Feet</u>
Multipurpose/PE	2,880
Classroom 1	1,122
Classroom 2	1,122
Classroom 3	1,122
Classroom 4	949
Classroom 5	827
Classroom 6	827
Classroom 7	827
Classroom 8	834
Classroom 9	878
Classroom 10	893
Classroom 11	930
Classroom 12	870
Workroom	491
Art	870
Music	950
Subtotal Net	16,332

<u>2nd Floor Academic Wing</u>	<u>Square Feet</u>
Classroom 13	1,149
Classroom 14	1,173
Classroom 15	1,154
Classroom 16	1,168
Classroom 17	865
Classroom 18	880
Classroom 19	860
Classroom 20	860
Classroom 21	880
Classroom 22	890
Classroom 23	895
Classroom 24	840
Classroom 25	890
Classroom 26	885
Classroom 27	925
Subtotal Net	14,314
Total Net	46,136
Total Gross	61,037
Efficiency Factor	1.32

Efficiency Factor = Gross Area + Net Area

Note for planning purposes an efficiency factor of 1.50 is desirable

III. CONDITIONS OF EXISTING CONSTRUCTION

The following is based upon detailed inspection by Mount Vernon Group, Inc., Architects & Planners, and their consulting engineers.

A. STRUCTURAL

Existing Conditions: The building is a two story structure consisting of masonry walls and steel joist framing and was built in 1988. The structure is in good condition. One diagonal crack was found at the exterior wall at the boiler room. A second, vertical was found on the inside of the exterior gymnasium wall. The crack does not extend through the exterior brick facing.

Analysis: The building does not require major structural work, with the exception of the two masonry cracks found.

B. ARCHITECTURAL/EXTERIOR

1. Walls

Existing Conditions: The existing building is a steel framed structure and consists predominantly of 4" face brick with 8" CMU back-up with no insulation. Typical exterior openings in the brick/CMU walls are spanned with steel lintel angles. The upper portions of the walls below the metal fascias are precast concrete panels. Vertical precast concrete fins are typical components in the window opening assemblies. Typical windows are aluminum frames with single glazing and stone aggregate precast concrete spandrel panels.

Analysis: The exterior brick portions of the walls appear to be in good condition with no noticeable problems. The cast concrete canopies at the south wall of the two story academic wing are exhibiting signs of thermal movement and cracking at the connection point of canopy to brick pier. Further investigation will be required to remedy the problem.

The west wall of the boiler room has experienced potential water infiltration and 'blown out' brick. The wall has been repaired and seems to be stable.

2. Doors and Windows

Existing Conditions: The building is fitted with the original single glazed anodized aluminum window frames and entry storefronts. The aluminum thresholds at the entry doors are not handicapped accessible. The remainder of the exterior doors are hollow metal frames and doors.

Analysis: The original windows are thermally inefficient with the single glazing and although they are in good condition should be replaced with modern energy efficient windows. New perimeter sealant should be installed at all new/existing door and window frames. All existing hollow metal frames to remain shall be cleaned of any rust and damaged, primed and re-painted.

3. Roofs

Existing Conditions: The existing roofs were replaced in 1998 with a built-up tar and gravel roof.

Analysis: No work Required.

C. INTERIORS

1. Walls

Existing Conditions: Typical corridor walls in the core facility portion of the building have ceramic tile wainscot with 12" x 12" acoustical panels above to the ceiling, height of ceramic tile varies. Typical corridor walls in the academic classroom wings have an 8" structural glazed facing tile base (96 SGFT) concrete block wall to 6'-8" AFF and 12" x 12" acoustical panels from 8'-8" AFF to ceiling. Typical walls in the administration area and core areas such as the library and gymnasium are painted concrete blocks. Typical classrooms have stud concrete block walls along the corridor walls and the exterior wall and metal truss walls with plaster finish at the demizing walls between classrooms.

Analysis: The existing interior walls are in good condition and require only painting and new vinyl base to replace existing. Many of the interior walls will require demolition and patching of similar materials at locations of doors that do not have the proper clearances for handicapped accessibility. Refer also to section related to DOORS.

2. Ceilings

Existing Conditions: The typical ceiling throughout the building is suspended metal lat and plaster. The auditorium, stage and large gymnasium all have an exposed painted steel structure and form board/gypsum deck assembly.

Analysis: Although the existing ceiling assemblies are in good condition, the ceilings must be removed to allow for installation of new electrical, plumbing, mechanical and fire protection systems. New 2' x 2' and 2' x 4' suspended acoustical ceiling should be installed at the height of the existing assemblies wherever possible.

3. Floors

Existing Conditions: The typical floor system throughout the building is vinyl asbestos tile (VAT) and rubber base. The administration area has carpet, most likely over the original VAT. The library has carpet. The large gymnasium and small gymnasium/multipurpose room have a recently installed "sports carpeting". The existing toilet rooms typically have ceramic tile floors and base. The stage has a wood floor.

Analysis: The existing areas of vinyl asbestos tile should be removed, surface prepared for installation of new 12" x 12" vinyl composition tile. With the exception of the two gymnasiums all the existing carpet should be removed and new carpet and vinyl base should be installed. The existing ceramic tile floor in the toilet rooms will require replacement with new ceramic tile due to the extensive renovations for handicapped compliance.

4. Stairs

Existing Conditions: The existing stair assemblies are constructed of steel stringer and steel pan stairs with precast terrazzo treads and concrete filled landings. The handrail assembly is composed of two 1 1/4" horizontal steel pipes at 1'-3" AFF and 1'-9" AFF. The existing stage has wood framed stair construction with wood risers and treads.

Analysis: The stairs of the two story portion of the building will require re-construction of the hand/guard rail assembly to comply with present code requirements. Existing overhanging risers will require steel plate riser in-fills to be welded in place and painted. The existing stage/music room has no handicapped access. A new ramp or lift is required. Riser in-fills will be required if the existing wood stage stairs are to remain.

5. Interior Doors

Existing Conditions: Typical classroom doors are solid core wood doors with vision panels in painted hollow metal frames. Typical "smoke doors" in the corridor are 2' - 8" wide metal doors and frames. Typical doors in the toilet rooms and other smaller rooms in the building are 2' - 8" wide metal doors and frames.

Analysis: Typical 3'-0" wide wood classroom doors to be replaced with solid core wood doors (clear finish) and lever type accessible doors. All non-compliant "smoke doors" shall be removed, including the hollow metal frames and replaced with new hollow metal frames and 3' - 0" solid core wood doors (labeled where required). All other non compliant 2' - 0" wide doors and frames shall be removed including adjacent wall construction as required for the installation of new 3'-0" hollow metal frames and solid core wood doors. All new doors shall have lever type accessible hardware.

6. Elevator

Existing Conditions: The existing elevator cab is ± 3' - 0" x 6' - 0" clear inside dimension with a 1'-0" clear door opening to the cab.

Analysis: The present elevator is not sized for stretcher capacity and will have to be replaced if any major renovations or additions are constructed.

7. Toilet/Drinking Fountains

Existing Conditions: There are presently (16) toilet locations. All of the single fixture toilet rooms are approximately 25-35 sq. ft., not large enough for handicapped access. The gang toilet rooms in the classroom wings have no provisions for handicapped access nor the proper clearances for entering or exiting the toilet rooms.

Analysis: It is recommended that during any renovation or addition project to this building, all toilet room areas be reconfigured to provide proper handicapped access. All existing locations of drinking fountains should have accessible drinking fountains installed.

U. Kitchens

Existing Conditions: Much of the existing kitchen equipment is original and curtailed its serviceable life.

Analysis: Replacement and upgrade of equipment is recommended.

D. **CODE ISSUES**

1. Building Type Summary.

The Wheelock School is a two-story building which has a gross footprint area of 45,242 square feet on a 44.26-acre site. The existing building is constructed of concrete slab on grade and masonry brick and backup block with interior walls of block. The exterior walls are load bearing with load bearing interior corridor walls. First and second floor framing is cast in place concrete joists. The typical roof framing is comprised wood framed joists. The roof framing at the auditorium is steel trusses with double angles spanning between the trusses. The square footage of the building comprised with the unprotected noncombustible structure could classify the present construction type of this building as a nonconforming 2C building. The use group is E-Educational.

The building is presently nonconforming because Table 503 of the Sixth Edition of the Massachusetts State Building Code indicates that an unprotected Type 3B building of use group E has an allowable two story height and 14,400 s.f. area per floor. The existing building exceeds the allowable square footage by 7,256 s.f. on the first floor.

2. Height and Area Limitations.

The designer, faced with these conditions, is guided by the provisions of Chapter 34 of the Massachusetts State Building Code §3404.0 "Requirements for continuation of the same use group or change to a use group resulting in a change in hazard index of one or less".

The existing building is in excess of the allowable square footage or height requirements as set forth in Table 503 for a building of Type 3B Unprotected Construction. The building is presently constructed of brick and block masonry with no firewalls constructed to partition the building. An addition to this building would require separation by firewall.

Area limitations of the existing building structure could be modified to comply if the building has more than 25% fronting on a street or unoccupied space, which allows an increase of 2% for every 1% of such excess frontage as per §506.2. If buildings are equipped with an automatic sprinkler system as per §506.3, this would allow a 100% increase in area for buildings more than two stories. With these requirements in place, the allowable square footage floor area would be 50,400s.f. New fire walls must still be constructed to separate the original building from any new addition.

3. Egress Issues

Egress from the existing building is not code compliant. Most of the entrances to the building not accessible from the stair landings. §340C.5 assists the designer in arranging proper egress for the building and §1009.0 provides direction on widths of exits to provide a safe and adequate means of egress.

4. Remediation

Any improvements in the existing building must address the following issues.

All exit signing, exit lighting and fire detection and annunciation systems must be upgraded to contemporary codes, replacing existing equipment with new. §3404.7, §3404.8 and §3404.12 address exit sign and lights, means of egress lighting and fire protection systems. This equipment must in the renovated building, conform to the provisions of the most current codes.

Energy Code Requirements: §3407.1 and §3407.2 of the Massachusetts State Building Code require that alterations of an existing building in which the use group is not changed, must comply to the energy conservation values detailed in Table 3407 of the code for any building elements (walls, windows, doors, roofs, or mechanical systems) which are altered in the course of renovation.

Handicapped Access: "Architectural Access Board Rules and Regulations" 521 CMR 3 require that any renovation of a building in which the cost amounts to 30% or more of the assessed value of the building, the entire building is required to comply with the latest provisions for handicapped access as documented in 521 CMR and the Americans with Disabilities Act

Elevators and Vertical Lifts: §3001.1 provides that elevators vertical lifts and similar equipment shall conform to the elevator regulations of 524 CMR. §3001.2 shaft construction shall comply with 780 CMR §710.0 vertical shafts. These provisions allow guidance in designing the appropriate equipment for floor grade changes.

E. MECHANICAL SYSTEMS

Boiler Room: The boiler room is provided with two (2) Cleaver Brooks fire tube boilers installed in 1988 with the original construction. Each boiler appears to be of the one hundred (100) horsepower design and are provided with natural gas burners only. Each natural gas burner and its associated regulators are vented individually to the exterior meeting all code requirements. Each boiler is provided with a single low water cut-off and all code required operating and safety controls. It was noted that each boiler was showing signs of surface contamination on the shell of the boilers primarily due to valves and circulators located overhead leaking and dripping down on the shell of the boilers. This condition should be repaired as soon as possible to prevent a wide spread contamination of the boiler shell. We have been advised that the boilers are inspected annually and that the fire tubes within each boiler are not showing any signs of pitting or corrosion and each boiler is operating in a satisfactory manner at this time. Breaching from each boiler is through a black steel insulated breaching system which discharges to a masonry chimney. The breaching is insulated with calcium silicate with a troweled canvas jacket finish and the entire installation is considered excellent and operating in a satisfactory manner at this time. Combustion air for the entire boiler room is

through a single wall mounted louver which is provided with a motor operated damper for control however, this motor operated damper has been disconnected and is left in the open position at this time. In addition a small ventilation louver is provided over an exterior door. This is not provided with any mechanical damper and one should be considered to prevent pipe freezing during winter months. In addition to the wall louvers a third (3rd) combustion opening is provided at the roof of the boiler room which is also intended for summer ventilation. This roof opening is not provided with any motor operated damper and consideration should be given to prevent pipe freezing in winter. The entire combustion system does meet code requirements and should be upgraded to add motor operated dampers as suggested. Air elimination for the heating hot water system is through a series of ceiling suspended uninsulated air elimination tanks. The entire air elimination system is in good condition and no recommendation for improvements are made. The heating hot water system throughout the entire building is of the schedule forty (40) black steel pipe and is insulated with fiberglass insulation. From an outward standpoint it does appear that the piping system is considered to be in very good condition, however sections of the pipe should be removed and examined internally for corrosion and if it is noted a recommendation made at that time. The building is provided with four (4) individual hot water zones. Two (2) are intended for primary heating hot water distribution to the heating apparatus throughout the building. This system is provided with a primary and standby base mounted end suction pump. These pumps are showing slight surface contamination which appear to be due to leaking valves overhead. It appears that those base mounted pumps are operating in a satisfactory manner and no improvement is suggested at this time. A third (3rd) heating hot water zone is through a primary and stand-by inline circulator which provides heating hot water to an added supplementary heating zone. These circulators are located over boiler no. 2 and are presently leaking oil and water. These pumps do require rebuilding at this time to prevent wide spread damage to the boiler shell below. A fourth (4th) hot water zone is out of service which originally served heat exchangers for domestic hot water. These circulators have been taken out of service since the domestic hot water distribution system was rebuilt recently. The primary heating hot water zones are provided with two (2) individual compensated water three-way mixing valves. These valves receive signals from outside air sensors and adjust supply water temperature based on outside air for energy conservation. The three-way valves are operating and considered to be in good condition at this time and no improvement are recommended. The heating hot water system is also provided with a chemical shot feeder located at the ceiling over boiler no. 1. Visual observations do indicate extensive surface contamination in and around the vessel and considering its very awkward location for installing chemicals, consideration should be given to installing a new chemical shot feeder at an elevation serviceable for maintenance personnel.

Automatic Temperature Controls:

The automatic temperature control system is of the pneumatic design and appears to be an original installation to the 1968 building. The compressed air system is provided with dual compressors and a single air storage tank. It was noted that there was slight oil leaks on and around the air storage tank however, this appears to be due to maintenance and not a problem with either compressor. It does appear that at least one (1) compressor was recently replaced for reasons we are not sure. The system is also provided with a refrigerated air dryer which also appears to be original equipment and considering its age should be considered for replacement. Both the refrigerated air dryer and the air compressor storage tank

are each provided with blow down valves however, these valves discharge to floor mounted receptors and there is no floor drain adjacent. Consideration should be given to the installation of a floor drain with automatic blow down from both devices. The pneumatic system provides day/night control with two (2) operating main pressures for oil heating and ventilating apparatus. The entire automatic temperature control systems appears to be original to the building and considering its age should be considered for a complete upgrade at this time.

Classrooms:

The classrooms are heated and ventilated by wall mounted classroom unit ventilators. The classroom unit ventilators are provided with valve control design and are provided with an outside air intake louver. The general condition of the unit ventilators would be considered average considering their age of approximately thirty (30) years. It was noted that various units were in need of slight cleaning at this time and it was further noted that many of the units were damaged slightly on a surface and are presently showing their age. Consideration should be given to a complete upgrade of all unit ventilators at this time. Each classroom is further provided with a wall mounted exhaust register which communicates to the roof through a galvanized sheetmetal exhaust system. The systems are terminated by a roof mounted exhaust fans designed to remove the code required amount of ventilation air introduced to each space through the classroom unit ventilators. As we understand it, all systems are operating satisfactorily and appear to be maintaining reasonable space temperature and ventilation control. It was noted that the systems were slightly dirty and antiquated and consideration should be given to a complete upgrade at this time. Each space is also provided with a pneumatic wall mounted thermostat which is designed to maintain space temperature conditions by modulating the valve in the unit ventilator. As we understand it, the control system is operating satisfactorily; however, many complaints have been brought to our attention of overheating in spaces which appears to be related to occupants of the space manually shutting down the unit ventilators causing the automatic control valve to go full open. This full open condition is causing the rapid overheating of the space and consideration should be given to removing manual controls from the unit ventilators. Further, it was noted that in many instances the area over the unit ventilator was used for book storage preventing the discharge of heated and ventilated air to the space and consideration should be given to completely opening the area on top of the unit ventilator to provide an unobstructed flow of heated and ventilated air. The general corridors circulating throughout the entire building were not provided with any means of either supply or exhaust ventilation air. Many of the corridors were provided with varying lengths of fin tube radiation as well as cabinet heaters and convectors generally located at each vestibule or entrance to the building. All equipment is original to the building and in many instances the heating equipment has been damaged. Considering the lack of code required ventilation air in all of the corridors and the general condition of the heating apparatus consideration should be given to a complete upgrading of the corridor ventilation and heating systems.

Toilet/Support Areas:

The various toilet areas located throughout the building are provided with wall exhaust registers communicating to roof mounted exhaust fans through a galvanized sheetmetal exhaust system. It does appear that the exhaust systems are clean and operating in a satisfactory manner however, many of the wall registers throughout the toilet spaces were damaged quite severely and consideration should be given to an overall upgrade of the system at this time. Many of the second floor toilet spaces were further provided with varying lengths of fin tube radiation which was noted to be abused and consideration should be given to an upgrade at this time.

Kitchen/Cafeteria:

The cafeteria is provided with three (3) individual wall mounted classroom unit ventilators very similar to a typical classroom each of which is provided with a wall mounted exterior louver for the introduction of outside air for ventilation. It was noted that these unit ventilators have been abused and varying amounts of surface damage is present. It was noted that the units were in need of cleaning however, all systems are operating. It was brought to our attention that one (1) unit is presently operating with one (1) bad motor and is intended to be repaired this summer. Each unit is of the valve control design and is operating from a wall mounted pneumatic thermostat. Considering the thirty (30) year age and the general condition of the unit ventilators consideration should be given to a complete replacement at this time. The cafeteria is further provided with a wall mounted exhaust register located low on the wall adjacent to the stage area. It does appear that the exhaust system is operating satisfactorily however considering the overall age, consideration should be given to an upgrade at this time. The adjacent kitchen is provided with a single wall stainless steel exhaust hood which entirely covers the cooking area and appears to be code compliant. The overall condition of the hood is good and is operating in a satisfactory manner. Make-up air for the kitchen hood is through a small amount drawn directly from the cafeteria as well as through a ceiling mounted unit ventilator diffusing make-up air directly into the kitchen. In an adjacent space is a dishwasher which also has separate exhaust directly to a roof mounted exhaust fan. This system is also operating in a satisfactory manner however, considering the overall exhaust quantity taken from the kitchen and dishwasher area it does appear that the amount of make-up drawn from the ceiling unit ventilator and adjacent cafeteria is inadequate and consideration should be given to a complete upgrade of the make-up air system at this time.

Large Gym:

The large gym is provided with two (2) individual air handling units located at the ceiling. Each air handling unit has a free blow discharge directly to the space and return air is drawn also at the ceiling directly to the air handling unit. There was no distribution or return air ductwork associated with the air handling units. This design would promote very uneven air quality and temperature control due to the short circuiting effect associated with the close proximity of the supply and return within the air handling unit. Each air handling unit is provided with what appears to be the code required amount of outside air for ventilation. It was noted that a single exhaust register at the floor level does maintain the code required amount of outside ventilation and it does appear clean and operating in a satisfactory manner.

Small Gym:

The small gym is provided with three (3) ceiling suspended classroom unit ventilators each of which is provided with an outside air intake louver for the code required amount of ventilation air. Each unit ventilator is of the valve control design and is controlled from a single wall mounted thermostat. It was noted that the ceiling unit ventilators were slightly damaged particularly the supply diffusers of each unit ventilator and consideration should be given to an upgrade at this time. Also provided is a wall exhaust register which communicates to a roof mounted exhaust fan through a galvanized sheetmetal exhaust system. It was noted that there was slight surface contamination on the exhaust grills and they are in need of cleaning however, as we understand it all systems are operating in a satisfactory manner.

Administration Area:

The administration area is provided with a series of fan coil units along the perimeter of the area. Each unit is provided with an outside air intake louver which supplies heated and ventilation air to each perimeter occupied space. It was also noted that these perimeter spaces were provided with window mounted air conditioning units. Although antiquated it does appear that the fan coil units are maintaining good ventilation control as well as adequate temperature control, however the window units are noisy and are limited in the amount of air conditioning they can provide. It was further noted that there were no central exhaust systems however, the toilet areas within the administration area were provided with exhaust which communicates directly to roof mounted exhaust fans through a galvanized sheetmetal ducting system. These systems were noted to be in need of cleaning however as we understand it all systems are operating in a satisfactory manner. It was also noted that there were varying lengths of fin tube radiation located throughout the administration area all of which are controlled through various wall mounted pneumatic thermostats. Considering the overall age, condition, and lack of ventilation consideration should be given to a complete upgrading at this time.

F. PLUMBING

Existing Conditions.

1. The systems were installed in 1968.
2. Natural gas is provided for usage in the domestic hot water heaters and kitchen.
3. Domestic hot water is provided by three (3) heaters and three (3) associated hot water storage tanks in the boiler room.
4. The building contains storm and sanitary drainage systems.
5. The building contains boy's and girls gang toilets, single toilet rooms, janitor's closets and drinking fountains.
6. The classrooms have sinks with hot and cold water and single toilet rooms.
7. The kitchen contains a gas fired boiler providing steam for the kettles, gas ovens, dishwasher with electric hot water booster and various utility sinks with an associated grease trap.

Updating of Systems:

- 1 The three (3) hot water storage tanks were replaced in 1996.
- 2 The three (3) gas fired hot water heaters were replaced on 1996

Analysis:

- 1 All systems and fixtures appear to be adequate and functioning properly with no reported deficiencies

G. FIRE PROTECTION

There is no sprinkler system in the building.

H. ELECTRICAL SYSTEMS

Existing Conditions:

Electric Service: The main electric service is 1200 amps, 120/208 volts three phase, four wire, 60 hertz. Metering is at the secondary voltage. The switchboard is located in the basement mechanical room. The equipment appears to be original installed in 1968.

Interior Distribution: Panelboards and distribution system equipment appear to be mostly original equipment approximately 30 years old.

Emergency Lighting: A gas fired 55 Kw emergency generator provides emergency lighting throughout the buildings corridors and egress areas and to mechanical and refrigeration equipment during power outages. The illuminated exit signs are connected to the standby power source and many appear to be the original equipment and in need of repair or replacement.

Fire Alarm: The existing fire alarm includes manual pull stations, horn/light units. The system however does have deficiencies in alarm units coverage in certain areas of the building. Some pull stations are not located within code required distances from egress doors or at correct mounting height for handicap access. The alarms do not include the strobe light component as required by ADA.

Public Address System: The existing system is functioning but needs remedial work. The system includes classroom speakers and call-in switches.

Master Clock and Program System: The master clock unit appears new and no problems were noted with system operation.

Security Systems: The facility does not have a security alarm system.

Interior Lighting: In general lighting fixtures are fluorescent throughout. Classroom consists of three rows of surface mounted acrylic lens unit. Light levels appear to be adequate. In some instances the fixtures are in need of replacement due to discoloration of lenses or lamp deterioration which may indicate ballast failure. It is doubtful that in all instances the existing fixtures are furnished with energy efficient ballasts and lamps.

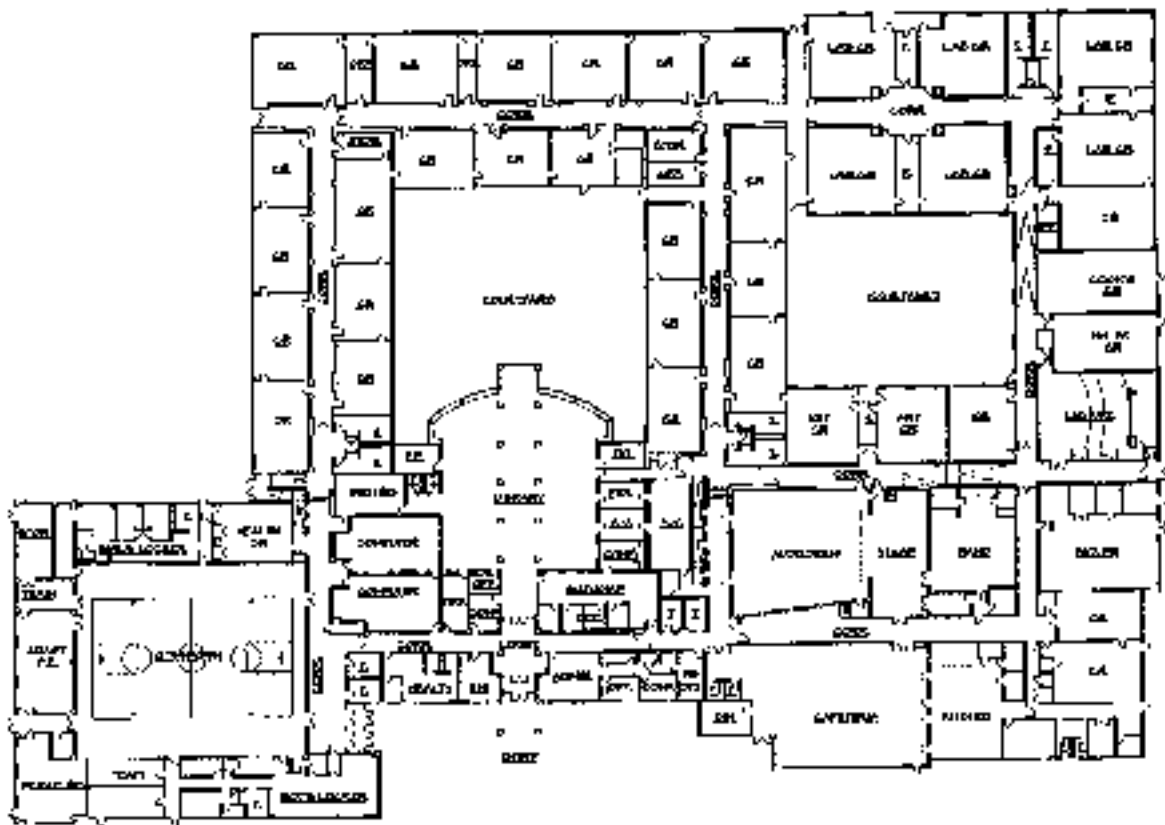
Exterior Lighting: Is provided by the electrical utility company and consists of pole mounted flood lights. No other site lighting was noted.

Analysis:

Existing conditions review would indicate that deficiencies in code compliance are existing especially fire alarm, audio/visual unit coverage and illuminated exit signs. Any renovation project would certainly require code upgrades and serious consideration of replacement of those systems which are considered beyond intended life expectancy.

THIS IS CURRENT MS

Mount Vernon Group
Architects and Planners



TOTAL GROSS SF 111,405 SF

FLOOR PLAN

AMOS CLARK KINGSBURY HIGH SCHOOL.
Medfield, Massachusetts

Mount Vernon Group
Architects and Planners
1000 1st Street, N.W.
Washington, D.C. 20004



I. SITE ANALYSIS

Existing Conditions: The general vehicular circulation is for one-way traffic entering from South Street and continuing past the Middle School to the High School and exiting towards Main Street. (The estimate is that about 90% of the students are bused.) The roads are scheduled for resurfacing during the summer of 1999 and the deteriorated parking pavement is to be repaired. (There appears to be a very progressive maintenance program for the schools buildings and grounds.) The curbing around the drives and parking consists of concrete and bituminous concrete curbing and there are some speed bumps. The walks are bituminous concrete. Around the High School building is a wood-edged, gravel surface drive approximately 15 feet wide that is used as a maintenance/emergency vehicle access. Some of the chain-link fencing.

There is obviously a premium on parking especially in front of the High School. Consideration be being given to paving an area behind the Middle School for parking buses and providing space for about 25 additional parking places.

The athletic fields are generally in good condition. Some of the fields are irrigated and others are watered by using a water cannon. The nearby brook becomes blocked causing flooding of some of the athletic fields at the High School. (Measures are underway to correct this situation.)

The football field inside the running track is crowned and has perimeter drainage and lights for night play. The track is metric and appears to have been resurfaced within the last few years. The two tennis courts and basketball courts are in good condition. The Grind Skateboard Park near the Middle School was recently constructed. There is no large paved area for outdoor activities for the Middle School.

Largely, the site lighting uses floodlights, probably leased from Boston Edison. Overhead wires connect these lights.

Analysis. We recommend that the following site improvements be considered:

- a. Study of vehicular and pedestrian circulation including resurfacing of existing parking areas and development of additional parking.
- b. Irrigation of all athletic fields.
- c. Study site lighting to review adequacy for safety and security and to consider placing wiring underground.
- d. Replacement of bituminous and perhaps concrete curbing with granite curbing.

II. BUILDING DESCRIPTION

A. General Description:

Originally built in 1960 as the Amos Clark Kingsbury High School, and expanded and renovated in 1985, the Medfield Senior High School is a one-story, slab-on-grade, steel framed masonry building with flat and sloped roofs at various heights. The exterior of the building is brick masonry.

B. Technical Description:

The building measures 326' north to south and 486' east to west, measured at its widest points, and contains two courtyards of approximately 80' x 100' and 70' x 96'. The gross footprint area is 111,405 s.f. which is equal to its gross floor area and is distributed as follows:

Part I (Includes IMC/Admin/Gym/Cafe/Auditorium)	53,222 s.f.
Part II (includes Science and Classrooms)	<u>55,183 s.f.</u>
TOTAL GROSS	111,405 s.f.

The building is divided into various educational and administrative spaces totaling 63043 s.f., they are as follows:

PART I	<u>Square Feet</u>
Classroom 104	798
Gym Office	90
Adaptive Physical Education	994
Weight Room	988
Gym Office	100
Gym Office	75
Gymnasium	7,501
Writing Room 107	528
Computer Room 105	976
Computer Room 101	931
Workroom	241
Librarian's Office	87
Conference Room	180
Guidance	696
Guidance Office	95
Guidance Office	95
Guidance Office	95
Guidance Office	95
Conference	187
A.V. Workroom	280
Periodicals	237
A.V. Tech	620
Tutorial	220
Nurse	372
Nurse's Office	84

Teachers' Room	290
Administration	400
Office	170
Conference	160
Office	249
Teachers Dining	322
Cafeteria	3,820
Kitchen and Dishwash	1,450
Auditorium	2,700
Stage	1,262
Band	1,403
Classroom 203	918
Classroom 204	702
Subtotal Net	30,411

PART II

Square Foot

Lecture Hall	1,538
Control Room	361
Classroom 207	870
Art 208	870
Art 209	870
Classroom 210	1,000
Home Economics 211	1,000
Teacher Ed 212	1,012
Physics 213	860
Environmental 214	960
Prep	290
Biology 215	815
Prep	247
Biology 216	908
Chemistry 217	935
Prep	290
Chemistry 218	955

Classroom 106	851
Classroom 108	823
Classroom 109	738
Classroom 110	834
Classroom 111	818
Classroom 112	752
Classroom 113	989
Classroom 114	980
Office	319
Classroom 116	969
Classroom 117	805
Office	206
Classroom 118	873
Classroom 119	713
Classroom 120	886
Classroom 121	825
Classroom 122	892
Classroom 124	942
Classroom 125	758
Classroom 126	738
Classroom 127	787
Classroom 128	980
Classroom 129	776
Classroom 130	801
Subtotal Net	32,832
TOTAL NET	63,043
TOTAL GROSS	111,405
Efficiency Factor:	1.77
(Efficiency Factor = Gross Area - Net Area)	

NOTE: For planning purposes an efficiency factor of 1.50 is desirable for raw space. The above net square footages are calculated exclusive of all fixed equipment and fixed furnishings, therefore, the efficiency factor of 1.77 is acceptable.

II. CONDITIONS OF EXISTING CONSTRUCTION

The following is based upon detailed inspection by Mount Vernon Group, Inc., Architects & Planners, and their consulting engineers.

A. STRUCTURAL SYSTEMS

Existing Conditions. The building is a one level structure with masonry walls and open web steel joist roof framing. The building was completed in 1960. The structure is in very good condition, with one crack found on the inside of a masonry wall in the boiler room. This is directly under a roof mounted disk antenna, but does not extend through the exterior brick masonry.

Analysis. The building does not require major structural work and is in very good condition after recent renovations.

B. EXTERIORS

1. Walls

Existing Conditions: The existing building exterior is comprised primarily of brick masonry. The 1996 addition features banding of light and dark brick and incorporates the use of such devices as soldier coursing, stack bonding, and glazed bricks, to create visual effects especially around masonry openings. The windows are aluminum awning type. Aluminum fascias are used all around the flat roof portions of the building. The 1960 portions of the building are comprised of brick masonry exterior walls with retro-fit aluminum windows. Metal spandrel panels are used above many of these windows to fill the masonry opening. Aluminum fascias are used around the flat roof portions of this building but the sloped roof area of the Gymnasium featured wood eaves and rake boards.

Analysis: The masonry walls are for the most part in good to excellent condition. However, there are some broken bricks at the corners of the feature columns at the main entry canopy. The aluminum window and storefront systems are in good to excellent condition, however, some racking is noticeable, some problems have risen from broken canvas of the screen access panels which are provided for access to window handles.

Metal spandrel panels at the window heads in the 1960 building are showing some signs of rust-through, the rusting is significant in some areas, especially outside rooms 106 through 112. All metal spandrels should be repaired. Many of the fascia clips on the aluminum fascias have failed and must be reattached and aligned. The rake boards and eaves on the gymnasium building should be scraped and painted; the wood should also be examined for rot.

Exterior doors are in good condition.

2. Roofs

Existing Conditions: Single-ply membrane roofs were installed on all the 1996 new addition and on the classroom and administrative areas of the 1960 building. The roofs of the gymnasium, cafeteria, auditorium, boiler room, lecture hall, and some adjacent rooms are the roofing that was in place in 1995 and remained following the renovations.

Analysis. The age and terms of all roofing warranties should be examined in order to determine their salvagability. If a funded project is undertaken at the High School, it has been the position of the S.B.A. to insist on fully warranted roofs on funded projects.

C. INTERIORS

1. Walls

Existing Conditions: Various wall materials are used throughout the building. The materials vary from brick at the main entry and at the interface of new and old buildings, to painted CMU and glazed CMU in corridors, cafeteria, gymnasium, and auditorium. Classroom areas, as well as library and administration, have GWB walls and CMU walls. Classroom areas in the 1960 building have structural glazed tiles and painted CMU walls.

Analysis: The walls through the building are in good to excellent condition, however, there are instances in the 1960 building (specifically the classrooms) in which it may be necessary to remove portions of wall around the doors to provide the required 12" clearance on the push side of doors to comply with A.D.A. requirements. The walls in question are all a combination of structural glazed facing tiles and concrete masonry units (see Code section of this report).

2. Ceilings

Existing Conditions: The ceilings through most of the building are predominately 2x4 scored acoustic ceiling tiles suspended on metal "T" runners. Some major accent areas, most notably the library, have plaster finished drywall ceilings and soffits. The gymnasium and cafeteria have open structure and the auditorium features an ACT "cloud". The gym open structure consists of tectum panels supported by bulb "Ts" which are in turn supported by steel purlins on structural steel arches.

The cafeteria open structure consists of tectum panels supported by bulb "Ts" supported by steel bar joists.

Analysis: The ceilings throughout appear to be in good to excellent condition.

3. Floors

Existing Conditions: Most classroom floors are finished in carpet with the exception of science rooms which feature lab flooring which is a composite roll stock specialty made for labs for its impervious nature to staining and chemicals. Library and office areas are also finished in carpet. The kitchen area is finished in quarry tile. The cafeteria has vinyl tile. The corridors are predominately vinyl tile with some rubber flooring at ramps and steps. The auditorium floor is comprised of carpet and painted cove and the stage floor is wood. The gymnasium has a maple athletic floor with a vented base and the weight room has a rubber interlocking tile floor. Most rest areas such as toilet rooms, showers, etc., feature ceramic mosaic floor tiles. There are some porcelain floor tiles in feature areas such as the main vestibule.

Analysis: The floors throughout the building are in good to excellent condition.

4. Interior Doors

Existing Condition: The interior door assemblies are for the most part wood doors in hollow metal frames with code worthy hardware. Many doors are in frame systems which contain side lights.

Analysis: All interior doors in the building are new or replaced and are code-worthy in regards to hardware.

D. CODE ISSUES

1. Building Type Summary:

The Medfield Senior High School has a gross footprint area of 111,405 s.f. located on a site shared with the Middle School. The original building was constructed in 1960 and an addition and renovation was undertaken in 1995. The original building and the subsequent addition are constructed of a concrete and steel column and roof framing. The 1995 addition/renovation project, provided for the entire building to be fully sprinklered.

The square footage of the building combined with the protected non-combustible structure classifies the construction type of this building as 2B. The use group is E-Educational.

E. MECHANICAL SYSTEM

Boiler Room:

The power plant is provided with two (2) cast iron sectional boilers. The original boiler was installed in 1968 and a second cast iron sectional boiler was installed in a 1993 renovation. The new HB Smith boiler is the primary boiler and the original boiler is used primarily as a stand-by, and as we understand it is energized but has never come on line to supplement heating requirements of the building. The original cast iron boiler is showing severe wear as well as extensive damage to the insulation around the entire unit. There are signs of leaks occurring around the return nipples at the mud drums and consideration should be given to replacement. If the original boiler should ever fail we believe the existing boiler, although operable, could not sustain a long term operation of the facility. Each boiler is powered by natural gas and is piped to each burner unit through a common overhead distribution system. The gas regulator from both boilers are vented individually to the exterior of the building per code requirements. Each boiler is provided with all operating and safety controls and the entire firing circuit of each boiler would be considered code compliant. The original building was provided with an underground fuel oil storage tank as well as a fuel oil distribution system to the boiler room however, in recent years the fuel oil storage tank has been removed but the piping system has been abandoned in place. Combustion air for the boiler room is through an overhead fan system which provides heated combustion air to the entire boiler room which is ducted from an exterior wall louver. The entire condition is code compliant. Combustion gasses from each boiler is vented to a common masonry chimney. The original boiler is provided with an induced draft fan which ducts independently to the masonry chimney. The new boiler is individually vented to the masonry chimney and is provided with a barometric damper. It appears that the existing breeching is black steel with a calcium silicate and canvas jacket however, the new breeching appears to be of the double wall aluminum insulated type. The entire combustion venting system is considered to be in very good condition. Heating hot water circulates throughout the boiler room and the building through a schedule 40 black steel piping system. The entire piping system is insulated with fiberglass insulation with an air service jacket and the entire installation appears to be in excellent condition at this time. The pumping system for the heating hot water supply is generated through two (2) individual base mounted end suction pumps. The system operates as a single primary with a one hundred percent (100%) stand-by. The entire installation is considered excellent at this time. Air elimination for the heating hot water system is controlled through a pressurized diaphragm air control system located within the boiler room. All expansion tanks are operating in a satisfactory manner at this time.

Automatic Temperature Controls:

The automatic temperature control system is a combination of pneumatic distribution for all control devices with a direct digital control interface for system control and feedback. The entire system was installed in the recent 1993 renovation and is of the Barber Coleman design. The compressed air system is provided with a single tank with dual compressor and motor arrangement. The compressed air system is provided with a refrigerated air dryer as well as an oil water separator and delivers day/night control pressure to all heating and air conditioning apparatus. There was no evidence of oil leakage around the compressor however, as we understand it there are numerous leaks in the pneumatic air mains circulating throughout the building. It appears this is causing wide variations and the

temperature control being maintained. We further understand that various control valves throughout the building are not operative due to a poor installation in the 1993 renovation. The refrigerated air dryer and the air storage tank are each provided with individual blow down lines which discharge to the floor and the entire installation would be considered adequate, however attention should be given to repairing the air leaks in the mains as well as the repairing of the faulty control valves.

Instructional Spaces:

Heating and ventilation of the classroom areas of the "C & D" wing are through a combination of classroom unit ventilators in each classroom as well as varying lengths of fin tube radiation. The individual classrooms are each provided with a single classroom unit ventilator which were rebuilt during the 1993 renovation. All units were converted from low pressure steam to heating hot water through the installation of a new piping system as well as the replacement of automatic control valves for each unit. Also provided were new operating controls which include a coil mounted freuzostat. As we understand it various control valves on the unit ventilator coils have failed and are in need of replacement at this time. It has been brought to our attention that many of the space occupants manually turn off the classroom unit ventilators due to noise and inconsistent temperatures. This condition should be modified so that all spaces receive tempered air to meet code requirements during occupied periods. Each classroom is provided with an exhaust register which is a stamped faced grill located low on the wall. This grill removes the code required amount of ventilation air through a common galvanized sheet-metal exhaust system which discharges to individual roof mounted exhaust fans. Many of the roof mounted exhaust fans were replaced in the 1993 renovation and were balanced at that time. It was noted that many of the fans were not running at this time however, maintenance personnel has advised us that all fans are capable of operating. An investigation should be undertaken to determine the cause of the shut down presently existing. It was noted that the exhaust grills as well as the classroom unit ventilators were in slight need of cleaning at this time. Each classroom unit ventilator is provided with an outside intake louver which introduces the code required amount of ventilation air to each unit ventilator where it is heated and diffused to the individual spaces. The controls do appear operate and are maintaining the code required ventilation air at this time. Interior support areas adjacent to the classrooms which include offices as well as computer classrooms are served by a central heating and ventilating unit located above the ceiling. This heating and ventilating unit diffuses a combination of return air and outside air to each occupied space with the proper amount of code ventilation air. The entire duct system is galvanized sheet metal which is uninsulated and supplies air at the ceiling in each occupied space. In addition, each computer classroom is provided with an additional ceiling mounted air conditioning unit which distributes one hundred percent (100%) re-circulated air which is air conditioned to each computer room. The units are provided with individual temperature control. This supply duct system is insulated with fiberglass insulation with a vinyl vapor barrier and the entire system is operating in a satisfactory manner at this time. It was brought to our attention that occasionally condensate from the cooling system does leak from the air handling unit in the computer room and does occasionally stain ceiling tiles. The problem should be corrected to prevent wide spread damage to the space.

Science Wing Addition:

The science wing addition was constructed in 1993 and is provided with a central heating and ventilation air handling system providing tempered code supply air to each occupied space. The supply and return ductwork is overhead galvanized sheet-metal which is uninsulated and supplies the code required amount of air to each space through ceiling mounted diffusers. Each space is further provided with a low wall mounted exhaust register which removes the code required amount of air through a common galvanized sheet-metal exhaust system to roof mounted exhaust fans. The entire ventilation system is code compliant and is operating in a satisfactory manner at this time. In addition, each occupied space is further provided with varying lengths of fin tube radiation which receives heating hot water through the central recirculating heating hot water system. All radiation is controlled by wall mounted pneumatic thermostats and the entire installation is considered in excellent condition at this time.

Toilet/Support Areas:

All of the toilet areas which include the existing within the original building renovated in 1993, as well as all new lavatories included in the 1993 addition are provided with ceiling mounted exhaust registers which communicate to central roof mounted exhaust fans. Make-up air for all toilet spaces is generally through louvers in the entrance doors, undercutting of doors, and in some instances a supply of ventilation air was provided directly to each space. All spaces are receiving the code amount of ventilation air and operating in a satisfactory condition at this time. Many of the larger toilet spaces were provided with heating hot water fin tube radiation located high on the wall to offset space heat loss. This radiation is controlled through wall mounted thermostats and all systems are operating in a satisfactory manner at this time.

Kitchen/Cafeteria:

The kitchen and cafeteria area are served from a single air handling unit located over the ceiling in an adjacent storage room. The air handling unit is original condition to the building, however in the 1993 renovation new heating coils were installed of the hot water design. Heated and ventilation air is provided through an overhead galvanized sheet-metal system which is uninsulated and supplies the code required amount of air to the kitchen through an exposed overhead distribution system. Return air is drawn back to the air handling unit through a low wall mounted return air register. An amount of exhaust air communicates directly to the kitchen for exhausting through the hood. In addition heated and ventilated air is provided at the ceiling of the kitchen area through a galvanized sheet-metal distribution system. Located within the kitchen is a double wall hood which provided a percentage of direct unheated outside air to the hood as well as the code required amount of exhaust air. The entire hood is code compliant and in good condition at this time. The adjacent dishwasher room is also provided with specialized dishwasher exhaust both on the inlet and outlet of the dishwasher which discharges directly to a roof mounted exhaust fan. The entire system is operating and is considered to be in good condition at this time.

Media Center:

The media center is provided with a central heating, ventilating, and air conditioning system which is located overhead, and distributes in a galvanized sheet-metal duct distribution system. Located over the ceiling in an adjacent storage room is an air handling unit which is provided with a heating hot water coil as well as a direct expansion cooling coil circulated to a roof mounted air cooled condenser. Air distribution to and from the space is through an insulated galvanized duct distribution system to an overhead ceiling diffusers. The entire distribution system including the air handling units are considered to be in very good condition at this time. Also located within the media center are varying lengths of fin tube radiation along the exterior wall. This fin tube radiation receives heating hot water through the central recirculating hot water loop and is controlled by wall mounted thermostats. The entire system is operating and is considered good at this time.

Gymnasium:

The gymnasium is heated and ventilated through two (2) individual ceiling mounted air handling units. The air handling units are original equipment however, were converted from low pressure steam to heating hot water in the 1993 renovation. All systems within the gym appear to be operating in a satisfactory manner and would be considered to be in good condition at this time. The adjacent locker rooms are also provided with an air handling unit located in an adjacent storage room which distributes heated and ventilated air to each locker room through an exposed spiral galvanized sheet-metal distribution system. Also provided is a return air system as well as an exhaust system also of the galvanized sheet-metal type. All systems are operating and maintaining the code required amount of ventilation air to the gym and all locker room spaces.

Administration Area:

The administration area is served by a central heating and ventilating unit located in an adjacent storage room. Located within this distribution system is a direct expansion cooling coil which is circuit to a roof mounted air cooled condensing unit. Heated, ventilated, and air conditioning air is provided to each office area through an overhead galvanized sheet metal duct distribution system which is insulated with fiberglass with a vinyl vapor barrier. The entire office area is controlled through a single wall mounted thermostat and as we understand it has presented automatic temperature control problems in the past. Also provided in the area is varying lengths of wall mounted fin tube radiation which receives heat through the recirculating heating hot water system. Wall mounted thermostats control the heat flow to the radiation and all systems are operating in a satisfactory manner. Consideration should be given to investigating the cause for the air conditioning problems and possibly providing additional control to many of the interior uncontrolled spaces.

F. PLUMBING SYSTEMS

Existing Conditions: The systems were installed in 1960 and 1985. Natural gas is provided for usage to the domestic hot water heaters, kitchen and economic and science classrooms. Domestic hot water is provided by two hot water heaters and two (2) associated hot water storage tanks in the boiler room. The building contains storm and sanitary drainage systems. The building contains boy's and girl's gang toilets and locker rooms, single toilet rooms, janitor's closets and drinking fountains. The economic and science classrooms have gas ranges or outlets for burner applications and sinks with hot and cold water are provided. The kitchen contains a gas fired boiler providing steam for the kettles, gas ovens, dishwasher with electric hot water booster and various utility sinks with an associated grease trap.

Upgrading of Systems: The hot water storage tanks were re-insulated in 1995. The two (2) gas fired hot water heaters were replaced in 1995.

Analysis: All systems and fixtures appear to be adequate and functioning properly with no reported deficiencies.

G. FIRE PROTECTION

Existing Conditions: A wet sprinkler system utilizing city water pressure was installed in 1995. A separate dry sprinkler system, complete with zone valve was installed for the computer rooms and library also in 1995.

H. ELECTRICAL SYSTEMS

Existing Conditions: The main electric switchboard is rated for 1200 amps, 120/208 volts three phase, four wire, 60 hertz. The switchboard is located in the main electric room and has recently been installed as part of the 1995 renovation.

The building is served by a three phase 300 KVA transformer located in the utility company vault. Metering is at the secondary voltage.

Interior Distribution: Panelboards are circuit breaker type and are located in electric closets throughout building. Feeders and branch wiring are installed in metallic raceways.

Emergency Lighting: Is provided by a natural gas generator located exterior to the building serving emergency lighting, and kitchen refrigeration. Illuminated exit signs are also connected to the emergency system.

Fire Alarm: The existing fire alarm system is a multi-zone type Model 4002 as manufactured by Simplex and is municipally connected to the Town of Medfield Fire Department via the master box. The system consists of manual pull stations and audible/visual strobe light alarm units located throughout the building. The audible/visual alarms and locations of manual pull stations do meet ADA handicap requirements.

Public Address System: This system is new equipment consisting of speakers located in each classroom with call-in switch. The central console is located in the main office. The system provides for two-way conversation and appears to be functioning satisfactorily. The auditorium does have a dedicated sound system.

Master Clock and Program System: The system is new and operational.

Cable Television: Antenna system satellite is presently wired into a teaching space and is assumed to be operational.

Security Systems: The existing system is new and consists of motion sensors and magnetic door alarm switches at perimeter doors.

Interior Lighting: Classroom lighting consists of two rows of continuous 1' x 4' suspended direct/indirect fluorescent fixtures. Corridor lighting fixtures are 2' x 2' parabolic. Light levels are very good.

Exterior Lighting: Exterior lighting has been added at specific locations served from utility company poles.

Analysis: The building is well maintained and in very good condition. Electric Services and systems are in good condition and operating satisfactorily with no obvious problems.



MEDFIELD MIDDLE SCHOOL
24 POUND ST, MEDFIELD, MA
WEATHERIZATION AND VFD PROPOSAL



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Executive Summary

Northern Energy Services surveyed Algonquin Regional High School for energy savings potential. Based on our survey, Northern Energy is pleased to report that the following measure may result in energy savings with a favorable financial payback period, for the 79 Bartlett St. facility:

- ECM 1: Variable Frequency Drive Installation
- ECM 2: Weatherization

Because surveyors performed a Level One walkthrough audit, only the most advantageous measure is included in this report. All savings numbers presented in this report should be considered estimates. If executed, these measures could result in the savings potential enumerated below:

Project Savings

	Energy Conservation Measures	kW	kWh/yr	Therms	Eff. Inc.	Fuel
ECM #						
1	VFD	7	60,597	0	0.4%	0.0%
2	Weatherization	0	1,920	3,452	0.2%	6.7%
TOTAL		7	61,717	3,452	0.6%	6.7%

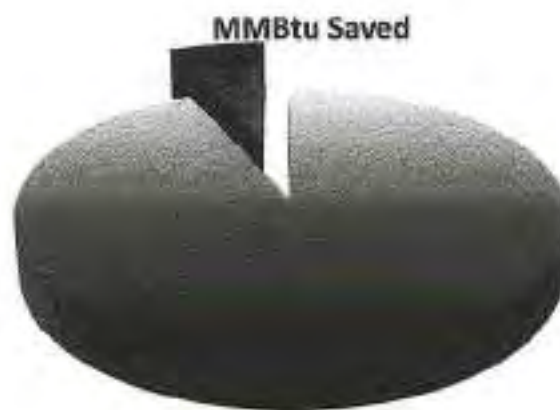
Estimated Costs

	Energy Conservation Measures	Parts	Labor	Tax	Measure Cost
ECM #		\$	\$	\$	\$
1	VFD	\$11,701	\$8,855	\$0	\$20,556
2	Weatherization	\$16,880	\$5,705	\$0	\$22,585
TOTAL		\$28,581	\$14,560	\$0	\$43,202

Payback

	Energy Conservation Measures	Estimated Energy Saved	U&M	Total Estimated Savings	Measure	Estimated Incentive	Customer	ROI	Simple
ECM #		\$/yr	\$/yr	\$/yr	Cost	\$	Cost		Payback
1	VFD	\$8,434	\$0	\$8,434	\$20,510	\$5,185	\$14,431	58.8%	1.7
2	Weatherization	\$3,932	\$0	\$3,932	\$22,500	\$6,433	\$16,152	24.3%	4.1
	TOTALS	\$12,415	\$0	\$12,415	\$43,202	\$12,616	\$30,584	40.6%	2.5

Estimated Savings Graphs



Baseline

The savings calculations herein are based upon the building operator's description of operating conditions. These numbers represent the **estimated** energy reduction from these conditions only. These calculations **do not** include potential variations due to changes in building occupancy, extreme weather conditions, and alterations to the building's interior or exterior spaces, alterations to the schedule of occupants and/or equipment, or any other condition that would significantly alter building consumption from this baseline. Predicting future energy usage is complex and holistic, and as such the savings figures contained herein are estimated. Below is the billing data provided by the customer:

Usage (kWh)	Total Amount (\$)
841,328	\$76,959

kWh and cost

Usage (Therms)	Cost (\$)
51900	\$57,090

Gas therms and cost

In lieu of complete utility cost data, a cost of \$.12/kWh and \$1.10/therm was used for this proposal. Calculations for these measures are the result of an ASHRAE LEVEL 1 energy audit. This was a free audit performed by Northern Energy Services for the customer. The conclusions contained within this report are subject to the limitations of this type of audit [See Below].

Audit Types:

Type of Audit	Brief Description
Level 1	<ul style="list-style-type: none"> ▪ Brief on-site survey of the building ▪ Savings and cost analysis of most obvious/advantageous Energy Conservation Measures (ECMs) ▪ Identification of potential capital improvements meriting further consideration
Level 2	<ul style="list-style-type: none"> ▪ More detailed building survey ▪ Spot readings and metering ▪ Breakdown of energy use ▪ Savings and cost analysis of all ECMs ▪ Identification of ECMs requiring more thorough data collection and analysis (Level 3)
Level 3	<ul style="list-style-type: none"> ▪ Attention to capital-intensive projects identified during the Level 2 audit ▪ More detailed field analysis ▪ Data logging/longitudinal data collection ▪ More rigorous engineering analysis ▪ Cost and savings calculations with a high level of accuracy

Energy Conservation Measure #1

Variable Flow Loop Conversion

Existing Operation

The two 25 HP pumps associated with the building's water-source HVAC system currently operate continuously at design rate. Though this operation provides sufficient heating/cooling during peak demand periods, it also causes the pumps to use more power than necessary during off-peak demand periods.

Proposed Operation

Northern Energy Services Inc. proposes the installation of variable frequency drives and two-way valves on the pump system, thus converting it to a variable flow loop. The drives will directly affect pump speed and power draw in accordance with system demand. The VFD system will sense system demand through the installation of two-way valves on guest-room heat pumps.

Scope of Work

Northern Energy Services proposes the following:

- Furnish and install two (2) 25 HP Variable Frequency Drives.
- Furnish and install necessary two-way valves on air handling units.

Note: Pricing and scope for this project are estimated and subject to change.

Energy Conservation Measure #2

Weatherization

Existing Operation

The building's current envelope contains gaps sufficient to allow for significant leakage of heated and cooled indoor air. This leads to wasted energy, in the same way as would a door continuously left open. Limiting gaps and spaces in the building's envelope would lessen the quantity of heated and cooled air necessary to achieve setpoint temperature.

Proposed Operation

Northern Energy proposes the sealant of gaps and spaces within the building's envelope at the expert suggestion of B|E Retrofit. Gaps and spaces were measured using the ASHRAE crack measurement standard, and will be filled on a custom basis by B|E Retrofit using industry standard materials.

Scope of Work:

See attached B|E Retrofit proposal.

Qualifications/Exclusions

This report is not for general use and is the intellectual property of Northern Energy Services. All savings estimates and rebates must be considered estimated until reviewed and approved by the utility. Additionally, pricing and scope for the included VFD project is to be considered an estimate until Northern Energy Services receives final pricing from its contractor. *These qualifications and exclusions apply to this proposal in its entirety.*

Prices contained herein do not include:

- Asbestos abatement or removal.
 - In the event asbestos is found, customer is responsible for removal.
- Hazardous waste disposal not specified.
- Change orders required by customer.
- Change orders required by inspectors.
- Costs to repair any existing equipment not specified.
 - In the event defective equipment is found, Northern Energy Services will generate a price to correct the deficiency.
 - Customer is not obligated to have Northern Energy effect any non-specified repair.
- Overtime, premium time, or non-first-shift labor hours.

Appendix A

Estimated Savings (Weatherization)

Infiltration

<u>Infiltration Sites</u>						
Description	Qty	Length		Total In.	Crack	Total Sgin
Exterior Doors (Sin.)	8	134		268	0.083353333	178.7
Exterior Doors (Doub.)	3	42		84	0.1	25.2
Windows	1	300		800	0.041666667	25.0
Buck Frame	1	672		8054	0.0525	504.0
Description	Qty			Total In.	Crack	Total Sgin
Roof/Wall Joint	1	670		8040	0.186866667	1,340.0
Misc Cracks				0	0.0625	0.0
Custom Auditorium	10	12		144	0.0625	90.0
						2,162.9

Shelter Class:	1	50%	Bldg Infiltration Adjustment Factor
Number of Floors	2	99%	Infiltration Reduction Factor
Wind Coefficient	0.0157	9	EER
Stack Coefficient	0.0298	1.3	kW/Ton
Assumed wind spd	6 MPH	80%	Combustion Efficiency

Estimated Savings (VFD)

Title	Northern Energy Services
Date	
Project	
Building	

Input Variables

Pump type Heating and Cooling

Hot Water Pumps

Pump Design GPM	650
Pump Design Head	95
System Head (ft)	65.0
Pump HP	25
Motor RPM	1750
Existing Motor Efficiency	94.1%
Proposed Motor Efficiency	94.1%
3D Valve Position (% open)	100%

Assumptions and Constants:	
Building Balance Point	°F
% Pump motor Loading	85%
Pump Efficiency	69%
% Minimum Speed with VFD	82%
VFD Efficiency	97%
VFD Exponent	3

Appendix B

Cur Sheets

ENERGY EFFICIENCY OPPORTUNITY BENCHMARKING REPORT

Prepared for Medfield High School

22 Pound Street – Medfield, MA 02052



Prepared by
EMA - Energy Management Associates, Inc.
www.EMA-Boston.com

September 2008

INTRODUCTION

Medfield High School is a participant in the NSTAR ENERGY STAR Benchmarking Initiative, a program designed to help business customers assess the energy performance of their buildings and identify opportunities for improvement. They chose to participate with their facility located at 22 Pound Street, Medfield, MA.

The performance of this building was assessed using the Portfolio Manager benchmarking tool from ENERGY STAR. For the twelve months ending July 31, 2008, the building received an energy performance rating of 10. The rating represents the percentile ranking of this building compared to others of its type in the United States. Buildings that receive a rating of **75** or greater are eligible for an ENERGY STAR label. A Statement of Energy Performance, generated by Portfolio Manager, is included as the last page of this report. To identify opportunities to improve energy performance, Steve DiGiacomo, P.E., CEM, of Energy Management Associates, Inc (EMA) on September 4th and September 8th 2008, conducted an Energy Efficiency Opportunity Assessment. We would like to recognize the Town's Director of Finance and Operations, Mr. Charles Kellner who provided valuable assistance as well as the High School's Barry Glassman who providing pertinent engineering documents and a walkthroughs. We thank them for their time, interest and invaluable assistance during the audit process.

Energy Performance Rating: 10

FACILITY DESCRIPTION

Building Description

This 160,473 SF, two floor, red brick circa 2005 modern High School is home to 1,020 students, teachers and administrators. Walls are comprised of red brick, and double-glazed inoperable and some operable windows.

Lighting & Controls

The entire school except the gym uses a combination of high efficiency electronically ballasted PL and T8 lamp technologies. All classrooms contain motion detectors. There are (36) 400W MH lamps in the gym. There is a Douglas Lighting system that is supposed to perform astronomical and photocell functions as well as light sweeps. We are unsure if the system has the correct time; may be on standard time.

HVAC

Classrooms are served by fifty-eight (58) Trane unit ventilators. Balance of the building is served by twenty-three (23) RTUs and ten (10) AHUs.

Unit ventilators are comprised of fan, hot water coil outfitted with face and bypass dampers, and 2-way modulating control valves. All hot water systems contain a 35% propylene glycol solution.

The RTUs fall into 2 categories. Category-1 RTUs are CAV RTU with gas heat and Energy Recovery Wheels and they serve the auditorium (DX AC) & gym (no/AC). Category-2 RTUs are CAV RTU with gas heat and they serve the café, auditorium lobby, hallways, math science offices, Library (DX), Guidance (DX), computer / language lab (DX) and the main office (DX).

Nine of the ten air handlers are heating ventilators outfitted with hot water coils equipped with 2-way valves and face and bypass dampers. One AHU also has a DX coil. Areas served include locker rooms, weight room, drama, corridors, nurse area and chemical prep area.



ENERGY STAR® Benchmarking Initiative

Boiler Plant

The boiler plant is comprised of three (3) Smith cast iron sectional boilers each rated at 3,000,000 BTU per hour. Each boiler is outfitted with a Power Flame low / high fire 750 / 3172 MBH burner. Each boiler was recently retrofitted with inline circulator (after market) pumps to mitigate thermal shock. We understand that they have remained off each heating season. The boiler plant has two (25) hp primary 94.1% premium efficient hot water pumps; one is a spare. Again, all heating hot water systems contain a 35% propylene glycol solution. Domestic hot water is produced by two (2) 400 gallon PVI gas ifred hot water heaters equipped with fractional hp circulators. Mixing valve maintains water temperature in the range of 100 °F to 105 °F.

HVAC Controls

A Trane Trace Summit® system provides ddc control of RTUs, AHUs, UVs and the boiler plant. BAS provides night set back, morning warm up routines, time of day (TOD) hard starts and stops. Discharge air temperature set point is ddc controlled to maintain space temperature. Classrooms and offices do not have thermostat, just temperature sensors with no adjustment capability. Economizer is dry bulb based. Currently the BAS is not performing optimal start/stop routines. When OAT < 40 °F, valves open full on UVs and face-bypass controls provide DAT setpoint.

Space occupied set-points are: Winter / Summer 71 / 74 °F

Space unoccupied set-points are: Winter / Summer 62 / 85 °F

Schedules

Classes: Monday through Friday 7:40 to 2:07 PM

HVAC systems: Monday through Friday 6:00 to 6:00 PM

Faculty & Admin: Monday through Friday 6:45AM – 7:15 PM

HW Pumps snap on when OAT < 60 °F

Douglas Lighting System

Interior lights: Monday through Saturday sweep ON at 5:30 AM (hallways)

Interior lights: Monday through Saturday sweep OFF at 11:30 PM, midnight and 3:30 AM (hallways)

Exterior lights: Daily – Midnight through 4:30 sweep OFF

4:30 AM through Midnight - photoeye can turn on whenever there is insufficient lighting

Unsure if Astronomical features are functioning at this time

Classroom lights are shut off via motion detectors / occupancy sensors.

Energy Use

Fuel Type: Electricity kWh				Fuel Type: Natural Gas (therms)			
Start Date	End Date	Energy Use	Cost - US Dollars	Start Date	End Date	Energy Use	Cost - US Dollars
6/25/2008	7/27/2008	111,120	\$18,677	7/4/2008	8/3/2008	167	\$437
5/25/2008	6/25/2008	158,220	\$25,618	6/4/2008	7/3/2008	363	\$677
4/25/2008	5/25/2008	155,730	\$21,125	5/4/2008	6/3/2008	3,314	\$4,307
3/25/2008	4/25/2008	176,130	\$23,661	4/4/2008	5/3/2008	8,971	\$11,981
2/25/2008	3/25/2008	177,300	\$23,698	3/4/2008	4/3/2008	19,026	\$25,263
1/25/2008	2/25/2008	170,790	\$22,818	2/4/2008	3/3/2008	23,845	\$31,603
12/25/2007	1/25/2008	182,040	\$24,049	1/4/2008	2/3/2008	26,998	\$35,752
11/25/2007	12/25/2007	166,020	\$21,631	12/4/2007	1/3/2008	26,476	\$35,065
10/25/2007	11/25/2007	200,910	\$24,496	11/4/2007	12/3/2007	22,868	\$30,317
9/25/2007	10/25/2007	184,950	\$24,322	10/4/2007	11/3/2007	6,115	\$7,813
8/25/2007	9/25/2007	168,660	\$25,096	9/4/2007	10/3/2007	1,093	\$1,566
7/25/2007	8/25/2007	158,490	\$23,111	8/4/2007	9/3/2007	531	\$874
		369	2,010,360			366	139,767
		365	1,988,567			365	139,385
			\$275,285				\$185,148

ENERGY STAR® Benchmarking Initiative

Benchmarks

Occ kW	Un-Occ'd kW	kWh/sf	Occ watt/sf	Un-Occ'd watt/sf	Equiv Therms per SF	Site kBTU /sf	Source kBTU/sf	EPA National Ranking
350	150	12.39	2.18	0.93	0.87	129	223	10

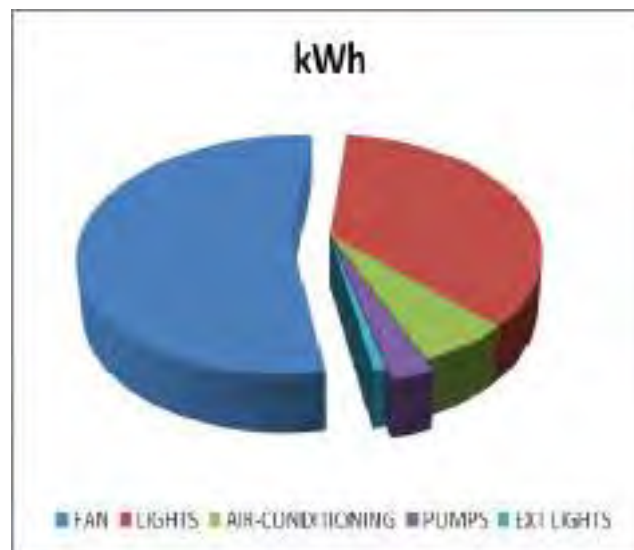
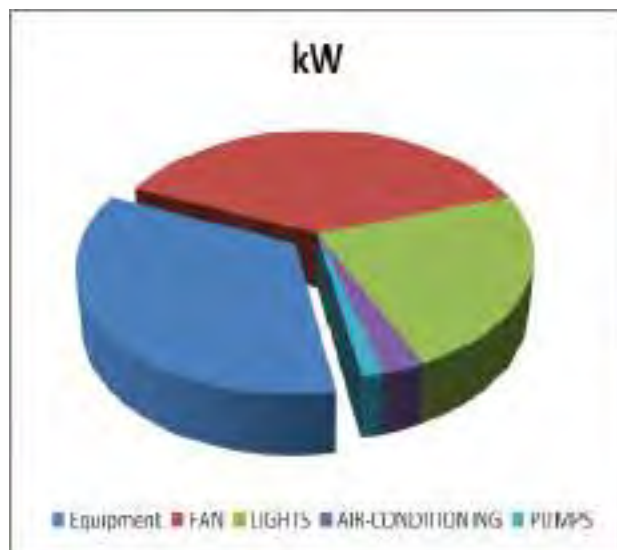
* Additional benchmarks & metrics may be derived by subscribing to Energy Link for \$95 per month.

Unoccupied kW watts per SF seem high and bear further examination.

Below are metrics if EEMs are implemented. These metrics includes the full 12-month projected benefits of the HVAC schedule changes that were recently made last June 2008.

Occ kW	Un-Occ'd kW	kWh/sf	Occ watt/sf	Un-Occ'd watt/sf	Equiv Therms per SF	Site kBTU /sf	Source kBTU/sf	EPA National Ranking
340	150	9.38	2.12	0.93	0.35	57	133	58

Electric Distribution

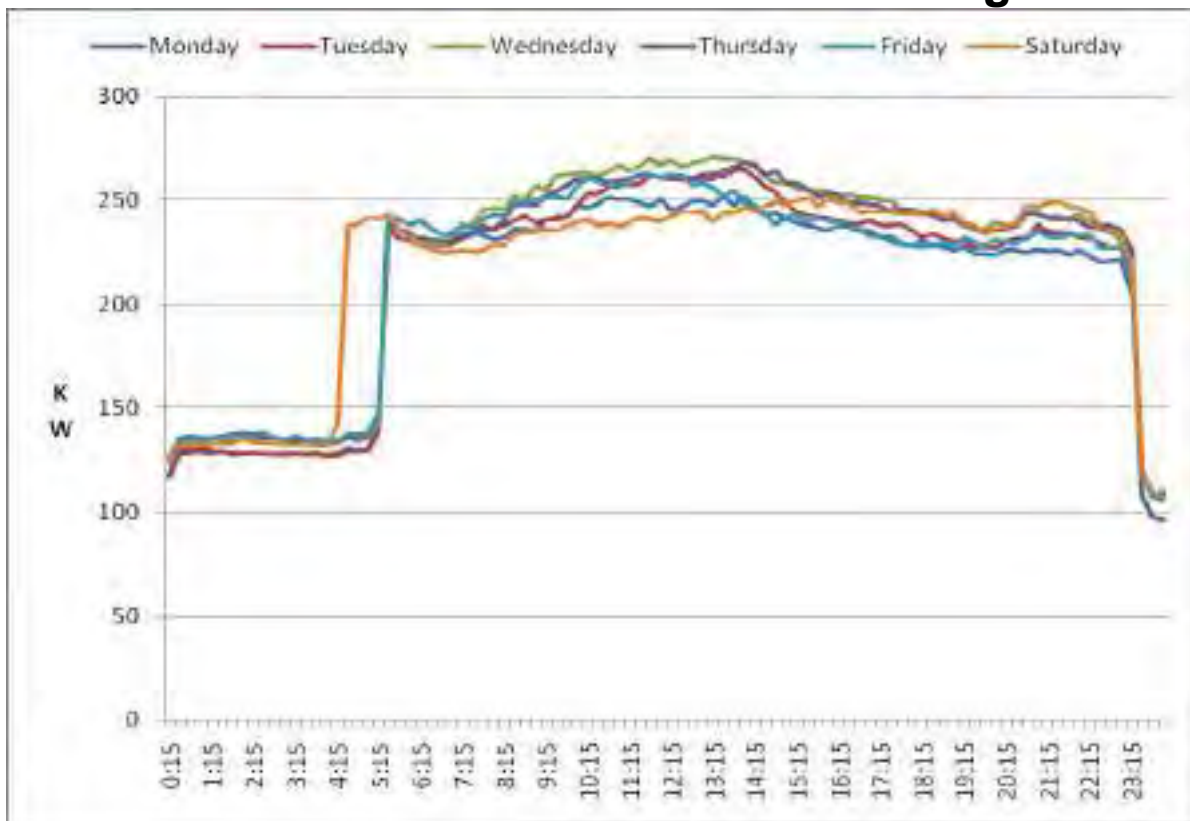


Equipment	kW	hours	kWh
FAN*	188	6000	1,126,746
LIGHTS	208	3600	748,800
AIR-CONDITIONING	128	1000	128,000
PUMPS	15	4000	58,188
EXT LIGHTS	8	2190	17,520
Total			2,079,254

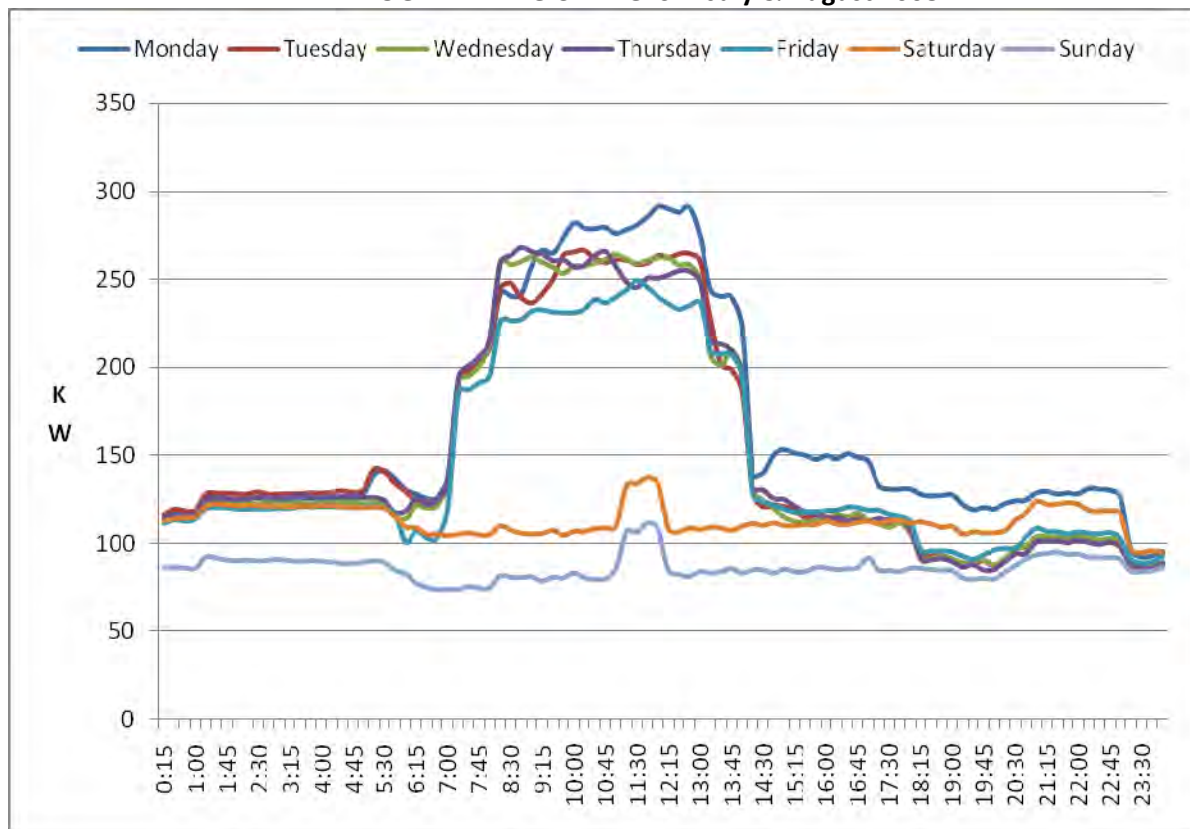
*Fan hours are prior to June 2008. June changes in conjunction with the recommended EEMs will provide a new EPA ranking of 40%. In June 2008 we have seen evidence that the new operating schedule is providing significant electric savings. Previous low scores were primarily due to excessive runtimes in higher than code required ventilation rates, i.e auditorium min. fresh air is for 1100 people when there are only 550 seats. Hallways and classrooms are being chronically and acutely over-ventilated

BEFORE PROGRAMMING CHANGES – July & August 2008

ENERGY STAR® Benchmarking Initiative

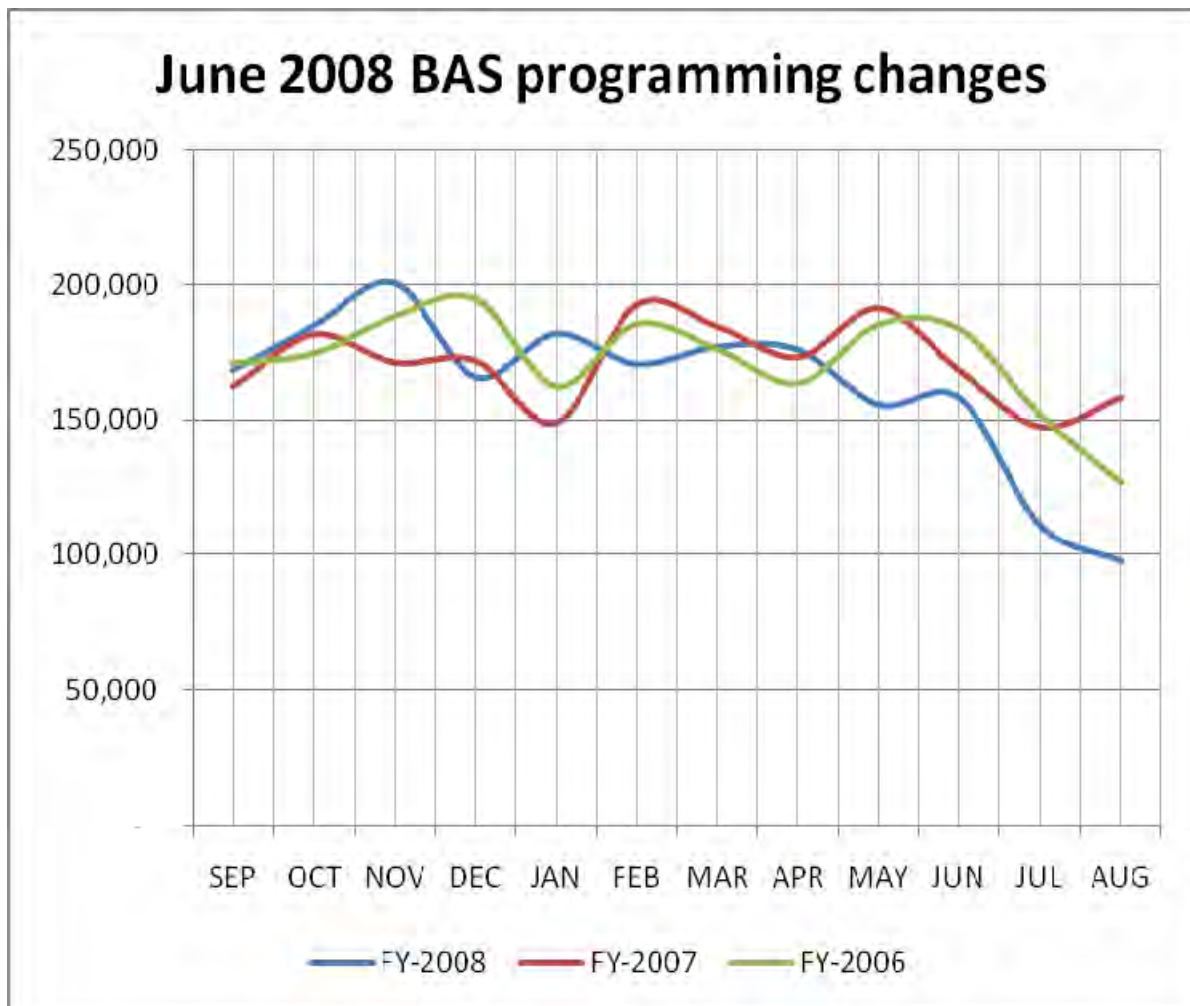


AFTER PROGRAMMING CHANGES - July & August 2008



ENERGY STAR® Benchmarking Initiative

Note that some BAS program changes implemented at the end of June 2008 can be seen below and are estimated at ~20% reduction in overall kWh over the next year.



Month	FY-2008	FY-2007	FY-2006
SEP	168,660	162,600	171,000
OCT	184,950	181,830	174,540
NOV	200,910	171,390	188,100
DEC	166,020	172,140	194,670
JAN	182,040	149,070	162,450
FEB	170,790	192,750	185,370
MAR	177,300	184,620	176,130
APR	176,130	173,430	163,530
MAY	155,730	191,430	185,250
JUN	158,220	168,420	183,480
JUL	111,120	147,600	151,980
AUG	97,560	158,490	127,290
Totals	1,949,430	2,053,770	2,063,790



ENERGY STAR® Benchmarking Initiative

ENERGY EFFICIENCY OPPORTUNITIES

EEM #		Q	Cost	Est'd Savings kWh	Est'd Savings Therms	Est'd Svgs per Yr	Simple PB	Pot'l Rebate	PB after Rebate	Applicable NSTAR Program
Low Cost / No Cost Energy Efficiency Opportunities										
1	Control Energy use of PC-Monitors & PC-Hard Drives	719	\$0	35,950	0	\$4,598				
2	Employee Energy Education Program	1	\$0	9,943	697	\$2,746				
3	Vending Mizor Beverage Controls	1	\$180	800	0	\$102		\$75		
Energy Efficiency Opportunities Requiring Capital Outlay										
4	Replace 400 watt Gym Metal Halide fixtures with High Bay Fluorescent fixtures and occupancy sensors to automatically control lights on/off as needed	36	\$14,400	26,172	0	\$3,347	4.3	\$4,320	3.0	Business Solutions
5	Replace Kitchen Hood Lights	6	\$30	90	0	\$12	2.6	\$0	2.6	Business Solutions
6	Control lights with photocell in Main & Auditorium lobbies	1	\$4,000	4,800	0	\$614	6.5	\$2,000	3.3	Business Solutions
7	CO2 Demand-Controlled Ventilation for General Classrooms	38	\$45,600	0	11,546	\$20,783	2.2	\$11,546	1.6	Business Solutions
8	CO2 Demand-Controlled Ventilation for Chorus	1	\$2,500	0	318	\$572	4.4	\$318	3.8	Business Solutions
9	CO2 Demand-Controlled Ventilation for Band	1	\$2,500	0	205	\$369	6.8	\$205	6.2	Business Solutions
10	CO2 Demand-Controlled Ventilation for Wellness & Maintenance	1	\$2,500	0	389	\$700	3.6	\$389	3.0	Business Solutions
11	CO2 Demand-Controlled Ventilation for Auditorium 550 seat auditorium (ventilation for 1100 people)	1	\$10,000	9,290	48,483	\$88,458	0.1	\$0	0.1	Business Solutions
12	CO2 Demand-Controlled Ventilation for Auditorium Lobby	1	\$2,500	0	591	\$1,064	2.4	\$591	1.8	Business Solutions
13	CO2 Demand-Controlled Ventilation for Library (High Roof)	1	\$4,000	1,084	630	\$1,273	3.1	\$1,630	1.9	Business Solutions
14	VOC / CO2 Demand-Controlled Ventilation for Science Classrooms 202 & 203	2	\$3,000	0	1,159	\$2,086	1.4	\$1,159	0.9	Business Solutions
15	Science Classroom UV Hi /Lo minimum fresh air interlock with Fume Hood Exhaust	8	\$14,600	0	2,319	\$4,174	3.5	\$5,969	2.1	Business Solutions
16	4 hours per day savings via BAS re-Programming accomplished in June 2008; Cost is for additional training	1	\$10,000	350,400	15,924	\$73,479	0.1	\$0	0.1	Business Solutions
17	Convert Gym from CAV to VAV	4	\$24,000	44,853	0	\$6,728	3.6	\$8,400	2.3	Business Solutions
18	Reduce Make-up Air 5000 CFM when Kitchen exhaust is OFF and 4300 CFM when Hood operates prior to lunch via adjustment to min OA damper and CO2 DCV	1	\$5,000	0	888	\$1,598	3.1	\$888	2.6	Business Solutions
Totals			\$144,810	483,382	83,149	\$212,704	0.68	\$37,490	0.50	
Total % Savings				24%	60%					



ENERGY STAR[®] Benchmarking Initiative

Incentive rebates are estimates only. NSTAR Electric & Gas and Energy Management Associates, Inc. (EMA) neither has control of nor assumes control of the actual building processes and equipment operation and climatic conditions. Accordingly, EMA does not expressly or implicitly warrant or represent that EMA's energy and cost estimates of the building or equipment operation will be the actual operation energy and cost.

Special Notes:

1. The energy savings & incentives presented in this report are based on a visual inspection of the facility and are Estimates Only. More detailed study and analysis may be required in order to refine these estimates. Cost-saving estimates are based on average energy prices in effect at the time this report was prepared. Energy prices are subject to change.
2. NSTAR's Business Solutions program provides rebates of up to 50% of the total project cost for upgrading existing equipment, and can provide comprehensive rebates of up to 75% of project cost. Specific rebate amounts will depend on the equipment installed. For more details on NSTAR rebates, contact your Program Manager, listed at the end of this report.
3. The mention of particular equipment manufacturers or suppliers, or equipment models in this report does not constitute endorsement by either NSTAR or EMA.
4. Due to the drastic reduction in fresh air you may wish to review with RDK Engineers who provided the mechanical design.
5. Additional areas for further investigations is hallway ventilation. Intermittent hallway use has prompted large amounts of ventilation when not necessary. The preferred method is to allow classroom ventilation to flow to the hallway and then exhaust this air via ducts located in the hallway because the students are in one place or the other, but not both. RDK or others could evaluate permanently shutting-off classroom exhaust & hallway make-up, while keeping hallway exhaust running. Alternatively the hallway make-up air and hallway exhaust could be slowed down with VFDs. Note – some bathroom exhaust is tied into hallway exhaust therefore shutting down hallway exhaust is not an option without adding dedicated exhausts.
6. Conversion of CAV to VAV for offices would require a TA Study
7. Language classroom (3) UV-3 size units could benefit for CO2 DCV, but I am waiting for a student head count.
8. Art Study has (3) UV-4 size units and further investigation / site visits are necessary to fully evaluate.

RECOMMENDATIONS

Low Cost/No Cost Energy Efficiency Opportunities

(1) Control Energy Use of PC Monitors and Hard Drives

Computer energy use can be controlled through a combination of automatic power management features and manual shut down by users. Organizations can use a standardized setting so that all monitors go into sleep mode after 10 minutes of inactivity. Power management can also be enabled for computer hard drives, but may require some investigation and testing before full implementation. Savings calculations in this report are based on an estimated 1764 computers at 143 kWh saved per PC. The typical savings per computer ranges from \$20 to \$120 per year, depending upon the equipment and practices within the facility. There are no costs to implement the power management, other than in-house efforts. Insist on 80% or greater energy efficient power supplies and visit www.80plus.org. Additional information is available on the ENERGY STAR website at www.energystar.gov/powermanagement.

► **Action Steps:** *Work with in-house IT staff to adjust power management settings. EMA can provide support with this process.*

(2) Employee Energy Education Program

An employee energy education program can raise awareness among employees about how energy is used in the building, and provide recommendations on how employees can help save energy. Energy-saving tips can include shutting off lights when leaving a room, use revolving doors whenever possible, and bring a sweater to work. Periodically verify lighting schedules. Savings estimates for energy education programs are difficult to quantify and vary widely. Savings were conservatively estimated at 0.5% of current consumption. Costs will vary based on the level of sophistication of the program.

► **Action Steps:** *An energy education program can be developed by internal employees or with help from external organizations. The ENERGY STAR web site has resources that can help with energy education efforts.*

(3) Install Controls for Vending Machines and/or Beverage Coolers

This school has this technology, but we have included to remind the town that this technology is available and can be readily used in perhaps some of the older schools. Refrigerated beverage coolers typically consume energy 24 hours per day, in the form of lights and refrigeration. Energy savings can be achieved by installing an occupancy-based controller that will turn the lights off and reduce the compressor runtime when the area is unoccupied. The cost for each beverage machine is \$180. NSTAR offers rebates of \$75 for each beverage vending machine. To qualify for the rebate, a vending machine sensor must be installed on a unit located indoors and scheduled to remain in NSTAR's territory for a minimum of three years. A single unit can be used to control a bank of vending machines for additional savings at no additional cost. The most popular controllers are the Energy Miser series from USA Technologies. We have assumed 500 kWh savings per beverage machine.

(www.usatech.com/energy_management).

<http://www.nstar.com/docs3/misc/Vending%20Brochure.pdf?unique=20070526111315>



ENERGY STAR[®] Benchmarking Initiative

► **Action Steps:** Purchase Vending Misers directly or work with an installing contractor. The NSTAR Program Manager for this facility can provide assistance with obtaining financial incentives.

Energy Efficiency Opportunities Requiring Capital Outlay

(4) Replace Gymnasium 400W MH lights with T-5 with Motion Detectors

This technology will provide 50% energy savings, reduce shadows on the court and will provide superior lumens and color rendering. Unlike the current lighting which takes many minutes to warm-up, T-5 are instantaneous “ON” therefore motion detectors can turn ON and OFF lighting when not in use. This EEM qualifies for energy star incentives.

(5) Replace Kitchen Hood Lights with Compact Fluorescent Lamps(CFL)

The kitchen hood is using incandescent lamps. Replace with screw-in compact fluorescent for attractive energy savings. Also, these lamps will last at last 10 times longer.

- **Action Steps:** Work with your Operations Staff to install CFLs; not technology does not qualify for an incentive

(6) Day lighting Controls for Atrium - Lobbies

There are two atriums outfitted with skylights that can take advantage of ample natural sunlight. We estimated a 4 hour per day savings for 240 days that these lights can be turned off via photocell.

- **Action Steps:** Work with your Operations Staff to install photocells

(7) – (13) Provide CO₂ based Demand Controlled Ventilation (CO₂ DCV)

Classroom, auditorium, chorus, band, and library all provide excessive amounts of fresh air given the number of people occupying those areas. With CO₂ sensors, we can automatically vary and provide the correct amount of ventilation as the occupancy of the spaces varies. Savings are achieved by reducing the amount of energy required to heat cold winter air, and for those areas that have air conditioning; electric savings are achieved by reducing the amount of energy required to cool hot, moist summer air. No savings were included for July and August. Science classroom will have a combination CO₂ and VOC to provide additional ventilation during anatomy.

- **Action Steps:** Work with Trane Summit Controls.

(15) Science Classroom Hi/Lo minimum fresh air

These classrooms are outfitted with fume hoods and drag-off “glove” boxes and are controlled with a 2-pole switch. The UVs currently provide full make-up air regardless of switch position. Have Trane tie the switch status in to Trane Trace Summit BAS and control the minimum to 500 CFM when the switch is ON and 1250 when the switch in ON.

- **Action Steps:** Work with Trane summit Controls.

(16) BAS Programming Changes

These changes were made at the end of June and are providing at least 350,000 kWh per year savings

- **Action Steps:** Monitor throughout year.



ENERGY STAR® Benchmarking Initiative

(17) Convert Gymnasium from CAV to VAV

The gym units RTU-14 and RTU-15 provide are 100% OA units with heat wheel. Maintain space temperature by reducing fan speed. CO2 sensors could be added to guarantee that minimum fresh air requirements are being met. Savings are based on fan bhp energy only.

► **Action Steps:** *Work with Trane summit Controls.*

(18 Reduce Kitchen MAU when Kitchen Hood Exhaust is OFF

Currently, RTU-16 provides a minimum of 9300 CFM of OA regardless of whether the kitchen exhaust fan rated at 5000 CFM is running or not. Assuming RTU-16 runs 6 – 6, and the hood is in operation from 6 – 3, for approximately 3 hours a day via programming changes RTU-16 (MAU) min OA can be reduced by 5000 CFM to 4300 CFM and continue to easily provide adequate ventilation to well over 200 students. With the addition of CO2 sensors we can also capture 4300 CFM whenever the hood is running and the café has no students, say an additional 3 hours per day from 6 AM to 10 AM and 3 hours from 3 PM to 6 PM for a total of 6 hours.

Action Steps: *Work with Trane summit Control programming changes and balancing.*

NEXT STEPS

The ENERGY STAR Benchmarking Initiative provides ongoing support as customers work toward implementing the recommended improvements. EMA will review the recommendations in this report with the appropriate contact at the facility, and help them develop an action plan. For recommendations that are eligible for NSTAR incentive funding, the NSTAR Program Manager for this facility can provide assistance with locating implementation contractors and obtaining financial incentives. For the remaining measures, EMA will provide implementation support. Over the course of the next year, EMA will work with the facility to continuously benchmark their energy consumption and monitor improvements to the energy performance rating that result from the energy efficiency upgrades. Please call one of the following contacts with any questions:

NSTAR Lead Program Manager

Nelson Medeiros

781-441-8703

Nelson.Medeiros@nstar.com

NSTAR Program Manager

Cherie Miles

781-441-8037

Cherie.Miles@nstar.com

EMA – Energy Management Assoc., Inc

Steve Di Giacomo, P.E, CEM

508.533.1128

Steve@EMA-Boston.com

NSTAR Account Executive – Strategic Accounts

James Sayers

781-441-3824

James.Sayers@nstar.com

Statement of Energy Performance

FACILITY SUMMARY REPORT

Medfield High School

For 12-month Period Ending: July 31, 2008

Date Generated: September 08, 2008

This document was generated using EPA's Portfolio Manager system. All information shown is based on data provided by the Portfolio Manager account holder. Depending on the use of the SEP Facility Summary, building owners or managers may want to have a professional engineer (PE) verify that the underlying data is accurate. Blank space has been left intentionally on the SEP Facility Summary for a PE stamp.

22 Pound Street
Medfield, MA 02052

Year Built: 2005

Gross Floor Area: (ft²) 160,473

Facility Space Use Summary

K-12 School

Space Name	Gross Floor Area (ft ²)	Number of Students	Number of PCs	Weekly operating hours	Cooking Facility	% Cooled	% Heated	Months	Ventilated
High School	160,473	1,000	719	40	Y	20	100	11	Y

Energy Performance Comparison

Results	Current (07/31/2008)	Baseline (04/30/2008)	Delta	Target	Industry Average	ENERGY STAR
Energy Performance Rating	10	8	2		50	75
Energy Intensity (kBtu/ft ²)						
Site	129	133	-4		80	64
Source	233	241	-8		145	115
Energy Cost						
\$/year	0	0	0		0	0
\$/ft ² /year	0.00	0.00	0.00		0.00	0.00
CO ₂ Emissions (tons/year)	1775	1837	-62		1103	876

More than 50% of your building is defined as K-12 School. Please note that your rating accounts for all of the spaces listed. If you cannot see a rating, you will be compared to the national average of K-12 School.



NSTAR[®] Benchmarking Initiative Action Plan

9/18/2008

Facility Name: Medfield High School

Primary Contact: Charles Kellner

Year Ending	7/31/2008	10/31/2008	1/31/2009	7/31/2009
Energy Performance Rating	10			
Energy Intensity (kBtu/square foot)	223.0			
Pounds of CO2 per GSF	22.1			

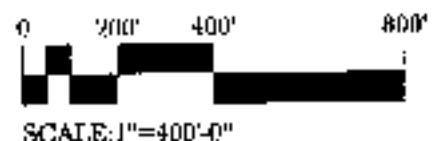
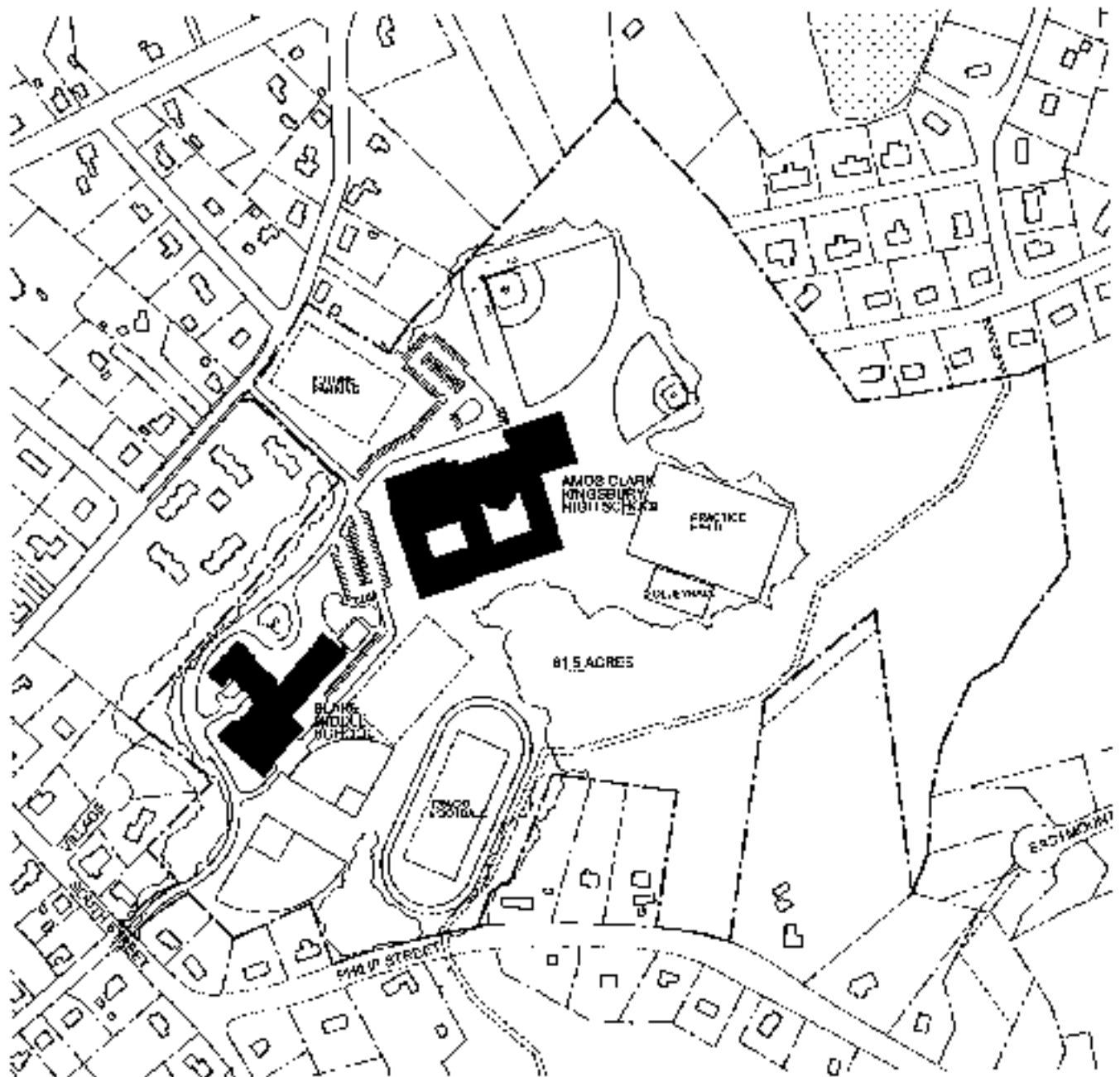
Recommendation	Plans (Personnel Responsible, Funding available, etc.)			Date to be Completed
Control Energy use of PC-Monitors & PC-Hard Drives				
Employee Energy Education Program				
Vending Mizor Beverage Controls				
Replace 400 watt Gym Metal Halide fixtures with High Bay Fluorescent fixtures and occupancy sensors to automatically control lights on/off as needed				
Control lights with photocell in Main & Auditorium lobbies				
CO2 Demand-Controlled Ventilation for General Classrooms				
CO2 Demand-Controlled Ventilation for Chorus				
CO2 Demand-Controlled Ventilation for Band				
CO2 Demand-Controlled Ventilation for Wellness & Maintenance				
CO2 Demand-Controlled Ventilation for Auditorium 550 seat auditorium (ventilation for 100 people)				
CO2 Demand-Controlled Ventilation for Auditorium Lobby				
CO2 Demand-Controlled Ventilation for Library (High Roof)				
VOC / CO2 Demand-Controlled Ventilation for Science Classrooms 202 & 203				
Science Classroom UV Hi /Lo minimum fresh air interlock with Fume Hood Exhaust				
4 hours per day savings via BAS re-Programming accomplished in June 2008; Cost is for additional training				
Reduce Make-up Air 5000 CFM when Kitchen exhaust is OFF and 4300 CFM when Hood operates prior to lunch via adjustment to min OA damper and CO2 DCV				
Recommendation	Expected Savings (\$/yr)	Installed Cost	Rebate	Date Completed
Total	\$0	\$0	\$0	

1999 PRE SWITCH OF SCHOOL

Mount Vernon Group

THIS IS MS PRIOR TO ADULT CONVERSION

Architects and Planners

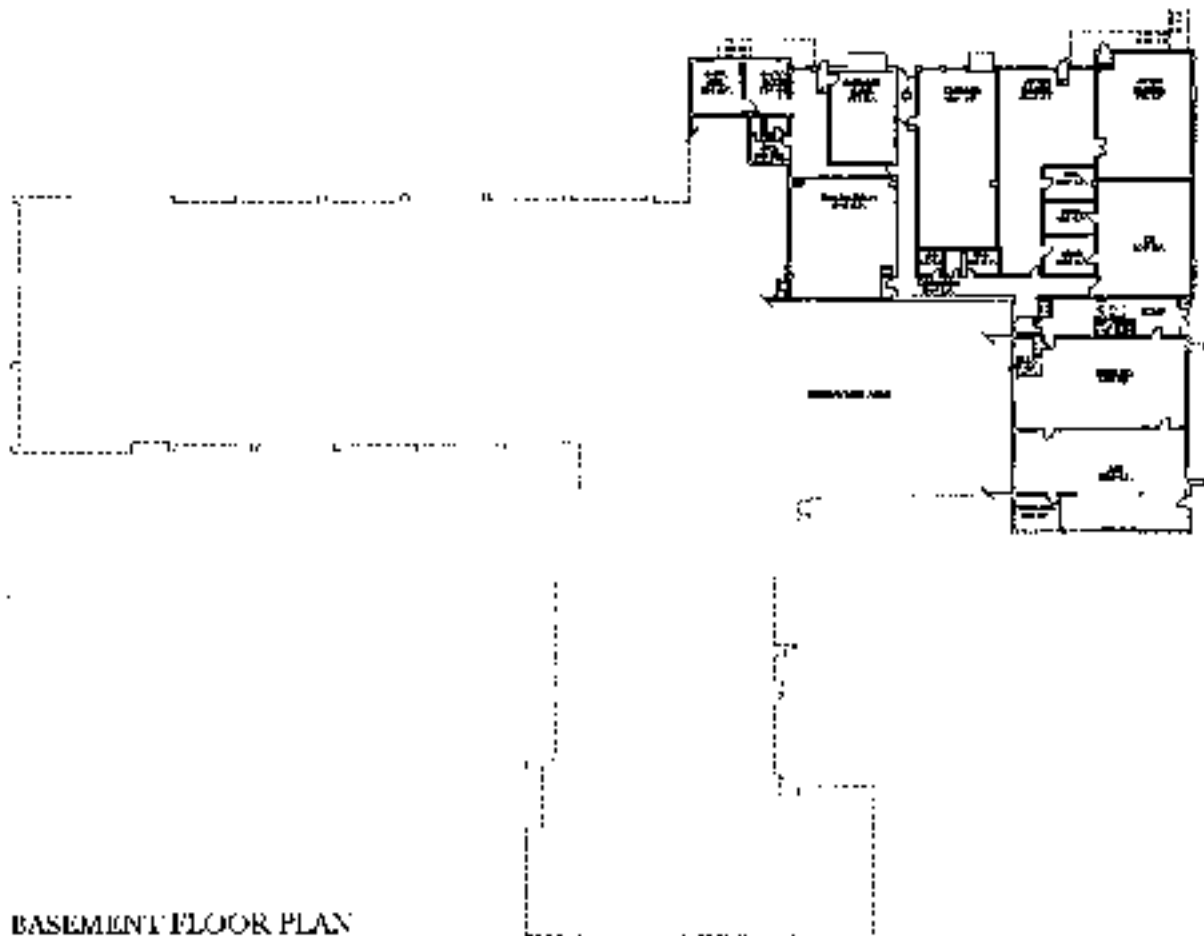


SITE PLAN

BLAKE MS & KINGSBURY HHS

Medfield, Massachusetts





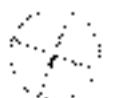
BASEMENT FLOOR PLAN

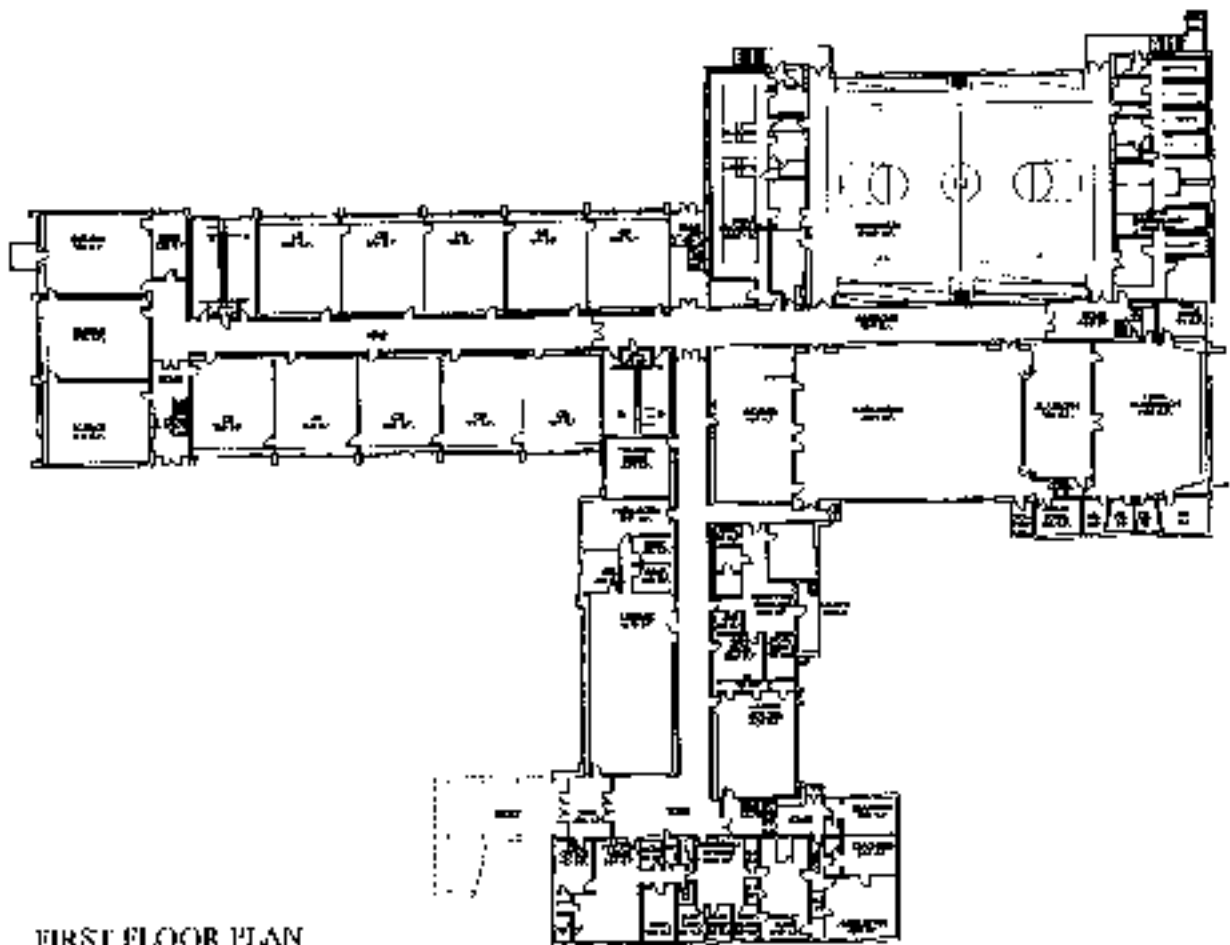
BASEMENT	14,500 SF
FIRST FLOOR	57,400 SF
SECOND FLOOR	26,966 SF
TOTAL GROSS SF	98,866 SF

BASEMENT FLOOR PLAN

THOMAS BLAKE MIDDLE SCHOOL

Medfield, Massachusetts

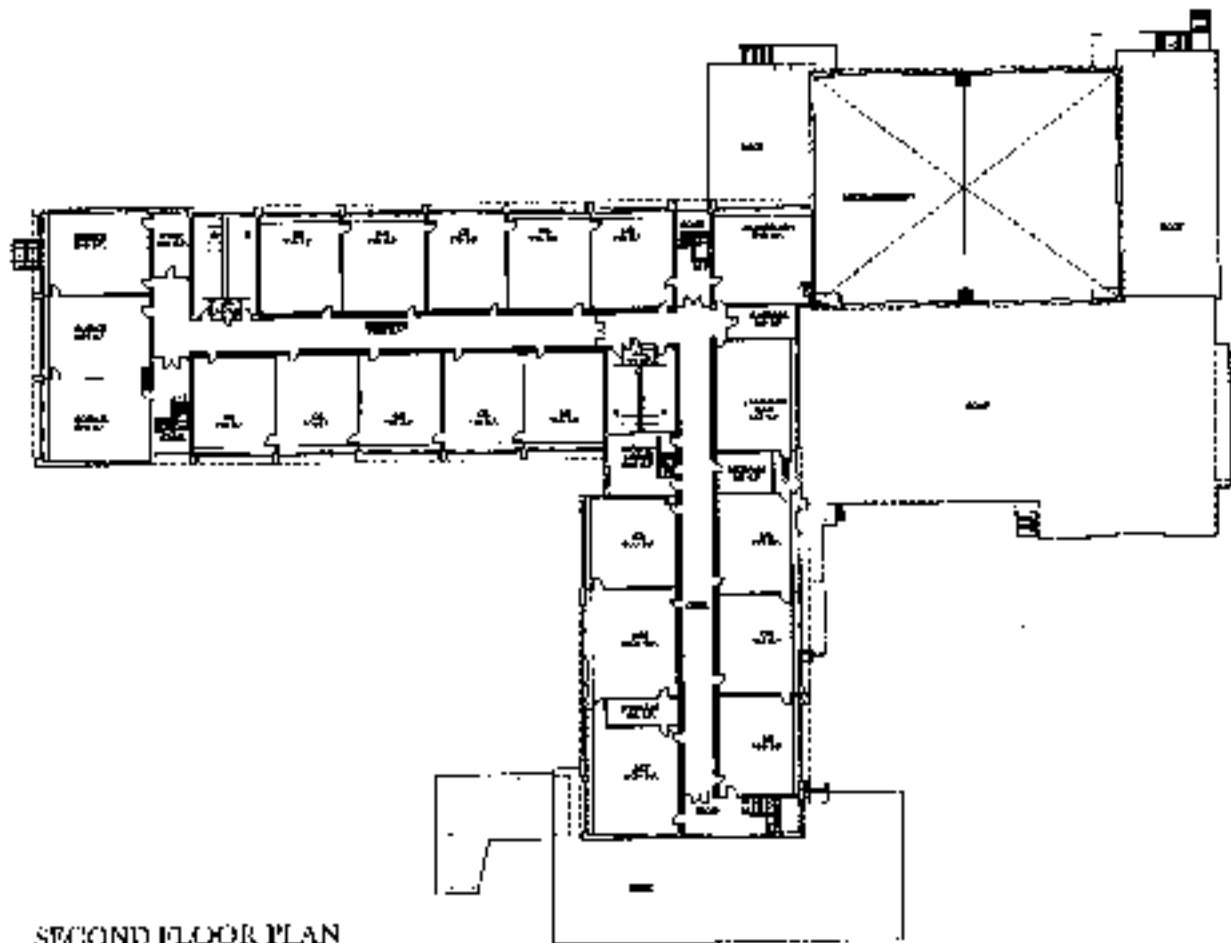




FIRST FLOOR PLAN

THOMAS BLAKE MIDDLE SCHOOL

Medfield, Massachusetts

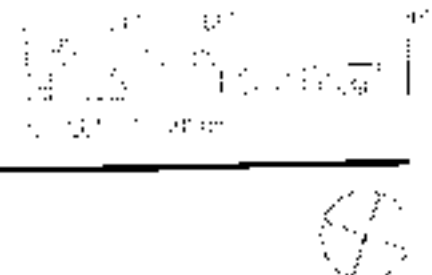


SECOND FLOOR PLAN

SECOND FLOOR PLAN

THOMAS BLAKE MIDDLE SCHOOL

Medfield, Massachusetts



I. SITE ANALYSIS

Existing Conditions. The general vehicular circulation is for one-way traffic entering from South Street and continuing past the Middle School to the High School and exiting towards Main Street. (The estimate is that about 90% of the students are bused.) The roads are scheduled for resurfacing during the summer of 1999 and the deteriorated parking pavement is to be repaired. (There appears to be a very progressive maintenance program for the schools buildings and grounds.) The curbing around the drives and parking consists of concrete and bituminous concrete curbing and there are some speed bumps. The walks are bituminous concrete. Around the High School building is a wood-edged, gravel surface drive approximately 15 feet wide that is used as a maintenance/emergency vehicle access. Some of the chain-link fencing

There is obviously a premium on parking especially in front of the High School. Consideration be being given to paving an area behind the Middle School for parking buses and providing space for about 25 additional parking places

The athletic fields are generally in good condition. Some of the fields are irrigated and others are watered by using a water cannon. The nearby brook becomes blocked causing flooding of some of the athletic fields as the High School. (Measures are underway to correct this situation)

The football field inside the running track is crowned and has perimeter drainage and lights for night play.. The track is metric and appears to have been resurfaced within the last few years. The two tennis courts and basketball courts are in good condition. The Grind Skateboard Park near the Middle School was recently constructed. There is no large paved area for outdoor activities for the Middle School.

Largely the site lighting uses floodlights, probably leased from Boston Edison. Overhead wires connect these lights.

Analysis We recommend that the following site improvements be considered:

- a. Study of vehicular and pedestrian circulation including resurfacing of existing parking areas and development of additional parking.
- b. Irrigation of all athletic fields.
- c. Study site lighting to review adequacy for safety and security and to consider placing wiring underground
- d. Replacement of bituminous and perhaps concrete curbing with granite curbing.

II. BUILDING DESCRIPTION

A. General Description

The Blake Middle School is a 1 1/2 to 2 story brick masonry building with flat roofs of varying heights. The building is made up of 3 distinct parts; a large classroom 2 story with a large gym/cafetorium, 1 1/2 story with a partial basement, and a small 1 story administrative area. The building was built in 1966 in a style typical of the period.

The major exterior material is brick masonry with pre-cast concrete panels and pilasters. The windows are single glazed aluminum with operable awning sashes. The spandrel panels are pre-cast concrete with exposed stone aggregate

B. Technical Description

The building as described above is built in a style appropriate to its time and has been well maintained.

The building measures approximately 190 feet from north to south and approximately 140 feet from east to west measured to its widest points. The gross footprint area is 5,108 square feet with a total gross footage of 92,558 distributed as follows:

<u>Basement Floor</u>	<u>Square Feet</u>
After School	1,988
After School	1,175
Classroom	1,100
Home Economics	1,564
Art	1,682
Subtotal Net	7,509

<u>1st Floor Core</u>	<u>Square Feet</u>
Administration	1,192
Guidance	631
Health	496
Teacher Workroom	1,021
Student Activity	681
Library	2,418
Teacher Dining	407
Kitchen	1,189
Cafeteria	3,519
Platform	766
Music	2,310
Girls Locker Room	2,257
Boys Locker Room	2,255
Gymnasium	6,768
Subtotal Net	28,138

<u>1st Floor Academic Wing</u>	<u>Square Feet</u>
Biology	935
Science	878
Science	878
Classroom	768
Classroom	768
Classroom	768
Classroom	768
Classroom	725
Classroom	785
Classroom	768
Classroom	788
Classroom	771
Classroom	754
Subtotal Net	10,394

<u>2nd Floor Academic Wing</u>	<u>Square Feet</u>
Science	893
Science	884
Science	893
Classroom	776
Classroom	778
Classroom	776
Classroom	776
Classroom	793
Classroom	898
Classroom	703
Classroom	776
Classroom	776
Classroom	778

Classroom	768
Language Lab	865
Classroom	802
Classroom	779
Classroom	779
Classroom	785
Art	1,054
Art	1,124
Teacher Lounge	338
Subtotal Net	10,588
Total Net	61,980 SF
Total Gross	92,568
Efficiency Factor	1.49

Efficiency Factor = Gross Area - Net Area

Note for planning purposes an efficiency factor of 1.50 is desirable

III CONDITIONS OF EXISTING CONSTRUCTION

The following is based upon detailed inspection by Mount Vernon Group, Inc., Architects & Planners, and their consulting engineers.

A. STRUCTURAL SYSTEMS

Existing Conditions: The two story building with a partial basement for boiler room and shops was completed in 1966. Walls consist of masonry with a brick exterior, and the structural framing is steel columns and beams with open web joists. The building is in good condition with the exception of an area adjacent to the gymnasium which houses the boys locker room. It appears that parts of the building are settling and causing walls to pull away from ceilings and masonry joints to open up and widen. The exterior ground at this corner of the building is sloping away from the building towards swampy areas of the site. No major distress, with the exception of two cracks, could be found at the exterior of the walls in this area.

Analysis: With the exception of the area at the boys locker room, no major repair or rehabilitation work is required.

B. ARCHITECTURAL/EXTERIOR**1. Exterior Walls**

Existing Conditions: The Blake Middle School is a steel framed structure with an exterior skin of brick masonry and pre-cast panels. The exterior wall is a masonry bearing wall system supporting the steel roof framing and steel floor framing at the 2 story classroom wing. The exterior walls are common bond face brick footed into a concrete masonry unit back-up. This system provides no insulation and there is no real cavity in the wall to allow for the simple expulsion of water.

The exterior also features pre-cast standard panels at the exterior. The lower spandrels are veneer panels on cement backup. The upper spandrels are full depth (6") pre-cast spandrel. The lower panels have a stone aggregate finish. A pre-cast concrete sloping sill is present at windows and lower spandrel panels.

Analysis: The exterior brick masonry walls are, for the most part, in good condition. The major problems involved with walls of this type are due to lack of insulation and water infiltration. There are no major problems from water infiltration visible. Several methods can be explored to improve insulation.

2. Exterior Doors and Windows

Existing Conditions: The building is fitted with single glazed aluminum windows offering no thermal insulation. Aluminum doors and frames are used at the indoor entry. Metal doors and frames are used at exterior locations.

Analysis: The original windows which are in place offer no insulating value at all and should be replaced with modern thermally efficient windows. The existing doors should be replaced as needed and care should be taken to ensure handicap access.

3. Roof

Existing Conditions: The existing roofs were replaced in 1998 with a built-up tar and gravel roof.

Analysis: No work Required.

C. INTERIORS**1. Walls**

Existing Conditions: Typical corridor walls in the core facility portion of the building have ceramic tile wainscot with 12' x 12" acoustical panels above to the ceiling. Height of ceramic tile varies. Typical corridor walls in the academic classroom wings have an 8" structural glazed facing tile base (96 SGFT) concrete block wall to 6'-8" AFF and 12" x 12" acoustical panels from 6'-6" AFF to ceiling. Typical walls in the administration area and core areas such as the library and gymnasium are painted concrete blocks. Typical classrooms have stud concrete block walls along the corridor walls and the exterior wall and metal truss walls with plaster finish at the demising walls between classrooms.

Analysis: The existing interior walls are in good condition and require only painting and new vinyl base to replace existing. Many of the interior walls will require demolition and patching of similar materials at locations of doors that do not have the proper clearances for handicapped accessibility. Refer also to section related to DOORS.

2. Ceilings

Existing Conditions: The typical ceiling throughout the building is suspended metal lath and plaster. The cafeteria, stage and large gymnasium all have an exposed painted steel structure and form board/gypsum deck assembly.

Analysis: Although the existing ceiling assemblies are in good condition, the ceilings must be removed to allow for installation of new electrical, plumbing, mechanical and fire protection systems. New 2' x 2' and 2' x 4' suspended acoustical ceiling should be installed at the height of the existing assemblies wherever possible.

3. Floors

Existing Conditions: The typical floor system throughout the building is vinyl asbestos tile (VAT) and rubber base. The administration area has carpet, most likely over the original VAT. The library has carpet. The large gymnasium and small gymnasium/multipurpose room have a recently installed "sports carpeting". The existing toilet rooms typically have ceramic tile floors and base. The stage has a wood floor.

Analysis: The existing areas of vinyl asbestos tile should be removed, surface prepared for installation of new 12" x 12" vinyl composition tile. With the exception of the two gymnasiums all the existing carpet should be removed and new carpet and vinyl base should be installed. The existing ceramic tile floor in the toilet rooms will require replacement with new ceramic tile due to the extensive renovations for handicapped compliance.

4. Stairs

Existing Conditions: The existing stair assemblies are constructed of steel stringer and steel pan stairs with precast terrazzo treads and concrete filled landings. The handrail assembly is composed of two 1 1/4" horizontal steel pipes at 1'-3" AFF and 1'-9" AFF. The existing stage has wood framed stair construction with wood risers and treads.

Analysis: The stairs of the two story portion of the building will require reconstruction of the hand/guard rail assembly to comply with present code requirements. Existing overhanging risers will require steel plate riser in-fills to be welded in place and painted. The existing stage/music room has no handicapped access. A new ramp or lift is required. Riser in-fills will be required if the existing wood stage stairs are to remain.

5. Interior Doors

Existing Conditions: Typical classroom doors are solid core wood doors with vision panels in painted hollow metal frames. Typical "smoke doors" in the corridor are 2' - 8" wide metal doors and frames. Typical doors to the toilet rooms and other smaller rooms in the building are 2' - 8" wide metal doors and frames.

Analysis: Typical 3'0" wide wood classroom doors to be replaced with solid core wood doors (clear finish) and lever type accessible doors. All non-compliant "smoke doors" shall be removed, including the hollow metal frames and replaced with new hollow metal frames and 3' - 0" solid core wood doors (labeled where required). All other non-compliant 2' - 0" wide doors and frames shall be removed including adjacent wall construction as required for the installation of new 3'0" hollow metal frames and solid core wood doors. All new doors shall have lever type accessible hardware.

6. Elevator

Existing Conditions: The existing elevator cab is ± 3' - 8" x 6' - 0" clear inside dimension with a ±3'0" clear door opening to the cab.

Analysis: The present elevator is not sized for stretcher capacity and will have to be replaced if any major renovations or additions are constructed.

7. Toilet/Drinking Fountains

Existing Conditions: There are presently (16) toilet locations. All of the single fixture toilet rooms are approximately 25-35 sf., not large enough for handicapped access. The gang toilet rooms in the classroom wings have no provisions for handicapped access nor the proper clearances for entering or exiting the toilet rooms.

Analysis: It is recommended that during any renovation or addition project to this building, all toilet room areas be reconfigured to provide proper handicapped access. All existing locations of drinking fountains should have accessible drinking fountains installed.

8. Kitchens

Existing Conditions: Much of the existing kitchen equipment is original and cultivated its' serviceable life.

Analysis: Replacement and upgrade of equipment is recommended.

D. CODE ISSUES

1. Building Type Summary

The Memorial School is a three-story building which has a gross footprint area of 21,656 square feet on a 61.5-acre site. The existing building is constructed of concrete slab on grade and masonry brick and backup block with interior walls of block. The exterior walls are load bearing with load bearing interior corridor walls. First and second floor framing is nail-in place concrete joists. The typical roof

framing is comprised wood framed joists. The roof framing at the auditorium is steel trusses with double angles spanning between the trusses. The square footage of the building comprised with the unprotected noncombustible structure could classify the present construction type of this building as a nonconforming 2C building. The use group is E-Educational.

The building is presently nonconforming because Table 503 of the Sixth Edition of the Massachusetts State Building Code indicates that an unprotected Type 3B building of use group E has an allowable two story height and 14,400 s.f. area per floor. The existing building exceeds the allowable square footage by 7,256 s.f. on the first floor.

2. Height and Area Limitations

The designer, faced with these conditions, is guided by the provisions of Chapter 34 of the Massachusetts State Building Code §3404.0 "Requirements for continuation of the same use group or change to a use group resulting in a change in hazard index of one or less".

The existing building is in excess of the allowable square footage or height requirements as set forth in Table 503 for a building of Type 3B Unprotected Construction. The building is presently constructed of brick and block masonry with no firewalls constructed to partition the building. An addition to this building would require separation by firewall.

Area limitations of the existing building structure could be modified to comply if the building has more than 25% fronting on a street or unoccupied space, which allows an increase of 2% for every 1% of such excess frontage as per §506.2. If buildings are equipped with an automatic sprinkler system as per §506.3, this would allow a 100% increase in area for buildings more than two stories. With these requirements in place, the allowable square footage floor area would be 50,400s.f. New fire walls must still be constructed to separate the original building from any new addition.

3. Egress Issues

Egress from the existing building is not code compliant. Most of the entrances to the building not accessible from the stair landings. §3400.5 assists the designer in arranging proper egress for the building and §1009.0 provides direction on widths of exits to provide a safe and adequate means of egress.

4. Remediation

Any improvements in the existing building must address the following issues:

All exit signing, exit lighting and fire detection and annunciation systems must be upgraded to contemporary codes, replacing existing equipment with new. §3404.7, §3404.8 and §3404.12 address exit sign and lights, means of egress lighting and fire protection systems. This equipment must in the renovated building, conform to the provisions of the most current codes.

Energy Code Requirements: §3407.1 and §3407.2 of the Massachusetts State Building Code require that alterations of an existing building in which the use group is not changed, must comply to the energy conservation values detailed in Table 3407 of the code for any building elements (walls, windows, doors, roofs, or mechanical systems) which are altered in the course of renovation.

Handicapped Access: "Architectural Access Board Rules and Regulations" 521 CMR 3 require that any renovation of a building in which the cost amounts to 30% or more of the assessed value of the building, the entire building is required to comply with the latest provisions for handicapped access as documented in 521 CMR and the Americans with Disabilities Act.

Elevators and Vertical Lifts. §3001.1 provides that elevators vertical lifts and similar equipment shall conform to the elevator regulations of 524 CMR. §3001.2 shaft construction shall comply with 780 CMR §710.3 vertical shafts. These provisions allow guidance in designing the appropriate equipment for floor grade changes.

E. MECHANICAL SYSTEMS

Existing Conditions.

Boiler Room: The power plant consists of two (2) HB Smith cast iron sectional boilers model 609. Each boiler is of the twenty-one section design and each boiler is original to the building which were installed in approximately 1958. Each boiler is provided with a single low water cut-off and all safety and operating controls are in place and operating in a satisfactory manner. Each boiler is equipped with a single fuel natural gas burner which was retrofitted to each boiler approximately five (5) years ago. The entire combustion system is operating in a satisfactory manner and all gas regulators are vented to the exterior individually per code requirements. Presently abandoned in place is a schedule forty (40) black steel fuel oil piping system to each burner. When the boilers were converted to gas the fuel oil system was abandoned in place which included the removal of a buried fuel oil storage tank. Presently left in place is a boiler which was intended to heat hot water provided to a circular coil submerged within the fuel oil tank. As we understand it, that coil had failed and a new shell and tube heat exchanger with pump assembly was installed in an adjacent room to the boiler room. This also has been abandoned in place. It was noted that boiler no. 1 has had one cast iron section taken from service due to an apparent nipple leak which was never repaired. This one section being taken from service has reduced the output capacity of the overall boiler by approximately five percent (5%). Each boiler is also provided with an induced draft fan at the outlet of each boiler which discharges to a steel insulated breeching system. The entire breeching system is covered with what appears to be calcium silicate and trowel finish all of which appears to be in average condition noting small cracks. The breeching discharges to a vertical masonry chimney which discharges above the roof. The boilers which are approximately forty-two (42) years old would be nearing their maximum serviceable life, however it does appear that all the boilers have received very good maintenance over the years. Combustion air for the entire boiler room is provided through an overhead heating and ventilating unit which discharges through a free blow distribution collar. Outside air is ducted directly to this heating and ventilating unit from an exterior wall mounted louver. The duct system between the louver and the air handling unit is insulated and it does appear that the system is operating in a satisfactory manner. It does appear that this equipment is original equipment and consideration should be given to an upgrade. Air elimination for the heating hot water system was originally designed through a series of ceiling mounted air elimination tanks. In recent years the existing tanks have failed and new pressurized

diagram tanks were installed on the floor which have maintained adequate hot water expansion and air elimination and the entire system would be considered in excellent condition at this time. Heating hot water is distributed throughout the boiler room and the entire building through what appears to be a schedule forty (40) black steel piping system. It does appear that the piping system is in good condition and there have not been any signs of apparent leaks however, before an exact determination can be made to overall pipe quality sections of pipe should be removed and examined internally for corrosion. The entire piping system is covered with fiberglass insulation with a canvas jacket. It does appear that many piping elbows could be insulated with asbestos and test should be undertaken to sample this elbow material and if asbestos is present a remediation program should be undertaken. Circulation of the heating hot water is through a series of base mounted end suction centrifugal pumps. The entire building is sub divided into two (2) individual primary heating zones which include a primary and stand-by pump for each system. It does appear that each pump is original. Two (2) of the four (4) pumps are showing severe signs of fatigue and near failure. There has been repair work completed on all pumps over recent years and although they are operating, they are reaching their maximum serviceable life and consideration should be given to replacement. It was noted that a chemical shot feeder for the introduction of system chemicals was present and although it is showing signs of contamination it does not appear to compromise the system operation. Consideration should be given to upgrading the system.

Automatic Temperature Controls:

The automatic temperature control system is of the pneumatic design and is a combination of Honeywell and Powers. The system is provided with a single air storage tank with two (2) compressors and two (2) motors. In recent years one (1) compressor has been replaced and the (2nd) second compressor is in need of replacement at this time. The system is also provided with a refrigerated air dryer and oil water separator. The entire system is extremely antiquated and consideration should be given to a complete upgrade at this time. It was noted that condensate drains are provided for the air tank and the refrigerated air dryer however, there was no floor drain in the adjacent area to allow for the discharge of condensed water. This condition should be upgraded. The automatic temperature control panel is extremely antiquated however, many sections of the panel do still operate however, with the approximate forty (40) years of service we would have to conclude that the overall system is nearing its maximum serviceable life and consideration should be given to a complete upgrading at this time.

Instructional Spaces:

The classrooms are heated and ventilated by wall mounted classroom unit ventilators. The classroom unit ventilators are provided with valve control design and are provided with an outside air intake blower. The general condition of the unit ventilators would be considered below average. It was noted that the units were in slight need of cleaning at this time and some units were damaged slightly on the surface and many of the units are showing their age. Each classroom is further provided with an exhaust register which communicates to the roof through a galvanized sheet metal exhaust system. This system is terminated by a roof mounted exhaust fan which is designed to remove the cold required amount of ventilation air introduced to each space through the classroom unit ventilator. As we understand it all systems are operating satisfactorily and are maintaining reasonable space temperatures and ventilation control when the units are operated. It was brought to our attention that many of the space occupants manually shut down the unit ventilators which cause the control valves to go full open and through a convective heating cycle overheat the space dramatically. This is not a failure of the automatic control system but a failure in the way the systems are operated and consideration should be given to instructing occupants not to shut down the unit ventilator equipment. It was noted that the exhaust

systems were slightly dirty and should be cleaned however, it was not considered a problem at this time. Each space is also provided with a pneumatic thermostat which is designed to maintain space conditions by modulating the valve in each unit ventilator. As we understand it when the systems are operating overall temperature control is satisfactory. The general corridors circulating throughout all of the buildings were provided with a limited amount of exhaust ventilation and the overall condition as it is presently installed is non code compliant and consideration should be given to providing supply make-up air as well as exhaust air from all corridors. All of the corridors are provided with various lengths of fin tube radiation and convectors as well as cabinet heaters at entrance ways. All equipment is original to the building and it is showing its signs of age and consideration should be given to a complete upgrading at this time. It was noted that various classrooms are utilized as computer classrooms however the overall installation is identical to a typical classroom, however window air conditioning units were installed for cooling. At the time of our visit the window air conditioning units were maintaining only marginal control. It was noted that the spaces were extremely warm and uncomfortable. Consideration should be given to an upgrade of the air conditioning system for all computer classrooms.

Media Center:

The Media Center is provided with typical classroom unit ventilators as well as exhaust registers connecting to galvanized sheetmetal ductwork terminating at roof mounted exhaust fans. The condition is very similar to that noted in classrooms and all systems were operating and maintaining reasonable air quality and temperature control however, due to their age, consideration should be given to a complete upgrade at this time.

Gymnasium:

The Gymnasium is provided with two (2) ceiling mounted air handling units each provided with a heating hot water coil and a source of outside air which is mixed with a percentage of return air for redistribution to the space. Supply air which is heated is provided to the space through an overhead galvanized sheet metal duct distribution system to various ceiling diffusers. The outside air ductwork to each air handling unit is insulated with what appears to be fiberglass insulation and the entire system appears to be in good condition. The overall condition of the air handling units and associated components would be considered average considering its age of forty (40) years. As we understand it, the entire system is operating satisfactorily and maintaining reasonable space temperatures and air quality. It was also noted that an exhaust system is provided which removes the code required minimum of ventilation air directly to roof mounted exhaust fans. The system is provided with the series of galvanized sheetmetal exhaust ductwork and wall mounted exhaust registers. It was noted that these registers were dirty and in need of replacement at this time. The overall system is extremely antiquated and consideration should be given to a complete upgrading.

Cafeteria:

The Cafeteria is provided with four (4) wall mounted classroom unit ventilators typical to those installed in all the classrooms. These unit ventilators were severely damaged on the exterior surface and the units were internally cluttered with debris and in need of cleaning at this time. It was noted that these units do operate however, one (1) unit appears to be failing due to a damaged fan shaft. Each unit is provided with an individual outside air intake louver and an automatic control valve for the modulation of heat. All systems were extremely old and in need of replacement at this time. The cafeteria is also provided with a wall mounted exhaust register which removes a portion of ventilation air through a galvanized sheetmetal exhaust system to roof mounted exhaust fans. The registers were slightly dirty and in need of cleaning at this time however, it would not be considered serious or detrimental at this point. The systems were extremely antiquated and consideration

should be given to upgrading at this time. It was noted that a percentage of ventilation air is drawn from the cafeteria to the adjacent kitchen to assist in make-up air for the exhaust hood. The exhaust hood is of the single wall stainless steel design and it is considered to be in very good condition and operating in a satisfactory manner. The kitchen is also provided with a separate make-up air system diffusing ventilation air through sidewall diffusers around the kitchen. The system is antiquated however it is operating in a satisfactory condition at this time.

Administration Area:

The Administration Area is a combination of interior and exterior wall offices. It was noted that there was no mechanical means to provide either supply or exhaust ventilation to the interior spaces and this condition is non-code compliant and should be improved upon. The exterior offices were provided with operable windows which do satisfy the natural ventilation code requirement for ventilation air. Although this does meet code requirements it does not achieve an acceptable level of ventilation and consideration should be given to upgrading and providing a complete mechanical ventilation and exhaust system for all interior and exterior spaces. All exterior spaces were provided with wall mounted fin tube radiation with control through a separate wall mounted pneumatic thermostat. It was also noted that various window air conditioning units were provided however these units are noisy and do not provide any cooling to the interior spaces. Consideration should be given to a complete upgrading of all systems.

Toilet Areas:

It was noted that all toilet areas throughout the entire school were provided with exhaust registers located generally in walls which transfer to roof mounted exhaust fans through galvanized sheetmetal ductwork. All systems do operate however, they are antiquated and appear to be reaching their maximum serviceable life. Also provided in various toilet rooms was varying lengths of fin tube radiation many of which were severely damaged due to abuse. Considering the age of approximately forty (40) years consideration should be given to a complete upgrading of the ventilation and heating system in all toilets.

Emergency Generator:

The building is provided with an emergency generator located in an adjacent room to the boiler room. This emergency generator is provided with a ducted radiator exhaust as well as ducted make-up air to the generator room. Each duct is provided with a motor operated damper which is interlocked with the operation of the emergency generator to open when the generator starts. The entire installation would be considered very good and is operational at this time. No improvements are suggested to the emergency generator ventilation system.

F. PLUMBING*Existing conditions:*

1. The systems were installed in 1966.
2. Natural gas is provided for usage to the domestic hot water heaters, kitchen and economic and science classrooms.
3. Domestic hot water is provided by two hot water heaters and an associated hot water storage tank in the boiler room.
4. The building contains storm and sanitary drainage systems.
5. The building contains boy's and girl's gang toilets and locker rooms, single toilet rooms, janitor's closets and drinking fountains.
6. The economic and science classrooms have gas ranges or outlets for burner applications. Sinks with hot and cold water are provided along with eye washers in the science classrooms.
7. The kitchen contains a gas fired boiler providing steam for the kettles, gas ovens, dishwasher with electric hot water booster and various utility sinks with an associated grease trap.

Updating of systems:

1. The hot water storage tank was replaced in 1989.
2. The two (2) gas fired hot water heaters were replaced in 1993.
3. The gas fired boiler in the kitchen was replaced in 1999.

Analysis:

1. All systems and fixtures appear to be adequate and functioning properly with no reported deficiencies.

G. FIRE PROTECTION

There is no sprinkler system in the building.

H. ELECTRICAL SYSTEMS*Existing Conditions:*

Electric Service: The main electric switchboard is rated for 1200 amps, 120/208 volts three phase, four wire, 60 hertz. Metering is at the secondary voltage.

The switchboard is located in the basement electric room. The equipment appears to be original installed in the 1960's.

Interior Distribution: Panelboards and distribution system equipment in general appears to be original equipment with the exception of minor renovations.

Emergency Lighting: A gas fired 85 kW emergency generator provides emergency lighting throughout the buildings corridors and egress areas during power outages and power to boilers, refrigerated equipment, telephone and fire alarm systems. The illuminated exit signs are connected to the standby power source however, many appear to be the original equipment and in need of repair or replacement. The generator appears to be in poor condition, and is leaking oil.

Fire Alarm: The existing fire alarm includes manual pull stations and horn units. There are deficiencies in alarm units coverage in certain instances. Some pull stations are not located within code required distances from egress doors or at correct mounting height for handicap access. The alarms do not include the strobe light component as required by ADA.

Public Address System: The existing system is original equipment and is functioning. The system includes classroom speakers and call-in switches. The console was replaced approximately 10-12 years ago.

Master Clock and Program System: The system was updated approximately 12 years ago however the system operation has deteriorated over time.

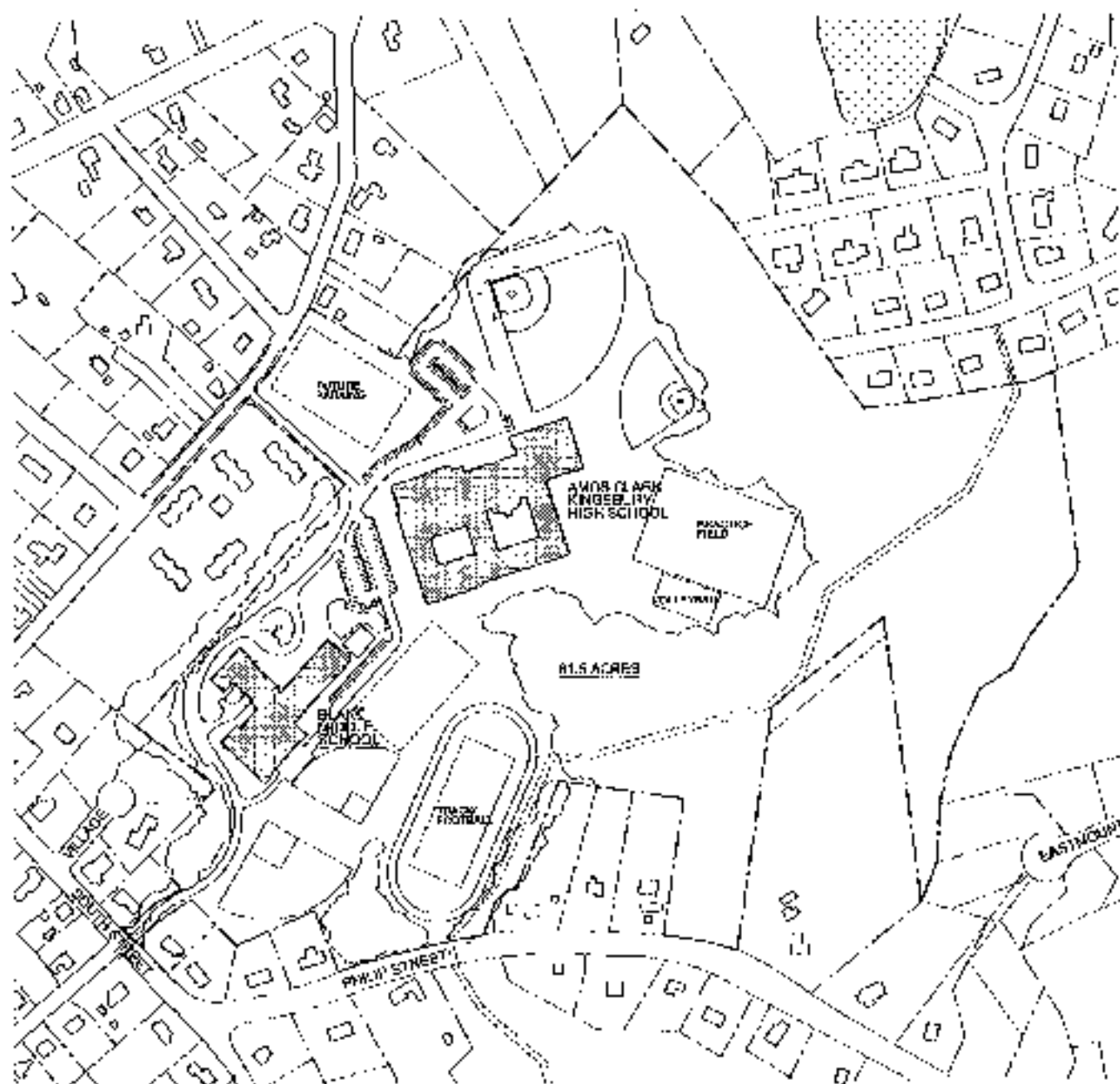
Security Systems: The facility does not have a security alarm system.

Interior Lighting: In general lighting fixtures are fluorescent throughout. Classroom lighting is controlled by local room switches. Light levels appear to be adequate. In some instances the fixtures are in need of replacement due to discoloration of lenses or lamp deterioration which may indicate ballast failure. It is doubtful that in all instances the existing fixtures are furnished with energy efficient ballasts and lamps.

Exterior Lighting: Is provided by the electrical utility company and consists of pole mounted flood lights. No other site lighting was noted.

Analysis:

As indicated under existing conditions and although functioning at the present time, upgrade of all systems should be considered especially if physical changes to the facility occur. In particular, code required fire alarm and illuminated exit signs are not in compliance.



SITE PLAN

BLAKE MS & KINGSBURY HS

Medfield, Massachusetts





B|E RETROFIT

(FEEL THE SAVINGS)

Medfield Public Schools

Buildings: Blake Middle School, Medfield High School

Findings and Recommendations Report: Building Envelope Measures

**Prepared for:
Northern Energy Services**

**Prepared by:
B|E Retrofit**

**Date submitted:
November 16, 2013**

REPORT OVERVIEW

Owner	Medfield Public Schools
Buildings/ Sites	Blake Middle School, Medfield High School



This Findings and Recommendations Report highlights building envelope weaknesses and recommends weatherization measures that will save energy, reduce utility costs and improve occupant comfort. The Report is organized in four sections:

1. **Executive Summary**
The Executive Summary of the Report includes an overview of findings and recommendations for all buildings.
2. **Building Reports**
Building Reports are specific to each building and include: findings, recommendations, pictures, energy savings calculations and highlighted floor plans.
3. **Installation Factsheets**
Installation Factsheets provide the rationale behind recommended measures, the installation process and the materials used to complete the measure.
4. **Glossary**
The Glossary includes details on energy savings calculation methodologies, the formulas used and underlying assumptions and inputs. A Glossary of Terms is included as a reference for a new reader of a BJB Retrofit Report.

1. EXECUTIVE SUMMARY

Findings

A B|E Retrofit building envelope assessment evaluates all six sides of the building, including the attics/roofs, walls and floors and all of intersections connecting the building's assemblies. Our assessments identify locations of air leakage losses and thermal transfer – the two primary modes of energy loss in buildings.

There are excellent opportunities for weatherization to save energy in the buildings that were assessed.

Note: See Section 2, Building Reports for complete building-specific Assessment Findings.

Recommendations

This report recommends weatherization measures that save energy by reducing loads on space conditioning equipment. Tighter and better insulated buildings allow mechanical equipment to run less often and still maintain the desired interior environment. The results of a successful weatherization project are reduced fuel consumption, reduced utility costs and improved occupant comfort.

Weatherization measures that will have the most significant energy saving impact on the buildings are:

- Air Sealing Measures
 - Roof-Wall Intersection Air Sealing
 - Overhang Air Sealing
 - Door Weather Stripping
 - Window Casing Sealing
 - Window Buck Frame Sealing
 - Custom – Window Weatherization

Note: See Section 2, Building Reports for specific weatherization recommendations for each building.

Calculation Inputs

The following inputs were used to develop energy savings estimates and project investment figures. Any changes in utility rates, wage requirements or access constraints during installation may impact the savings and/or investment of the recommended weatherization measures.

Energy Calculation Inputs	
Weather Data Station	Walpole, MA Weather Station
Heating Degree Days	6,109
Cooling Degree Days	539
Primary Heating Fuel and Rate	Data provided by NES, \$1.22 / therm
Primary Cooling Fuel and Rate	Data provided by NES, \$0.12 / kWh
Labor Calculation Inputs	
Prevailing Wage	Required
Union Labor	Not Required
Work Installation Schedule	TBD

2. BLAKE MIDDLE SCHOOL

FindingsInfiltration

- **Roof-Wall Intersection Air Sealing** - the roof-wall intersection in the 200s Area (1995 addition), the end-walls of the 300s Area and the entry on the left-side of the cafeteria are sources of unwanted air leakage. The exterior roof and wall finishes at these areas are not air-tight and gaps at the framing of the roof-wall intersection are allowing infiltration/ exfiltration.
- **Door Weather Stripping** - deteriorated weather stripping materials and daylight showing at the perimeter of door systems create direct pathways for unwanted infiltration/ exfiltration. The door bottom sweeps as well as the center astragal weather stripping at the double doors are the most significant bypasses at the doors.
- **Window Casing** - sealant is missing at the sides and top of the perimeter casing joints of window systems in the newest addition, 300s Area. There is a gap between the window and the interior casing that allows air to leak around the window system, through the rough wall opening and into or out of the building.
- **Window Buck Frame** - the joint above the drop ceiling above the window systems in the 100s Area of the building was not properly sealed. Sealant was not installed between the top of the window systems and the beam above. Unwanted air infiltration/ exfiltration at this joint is likely a contributor to the failure of the exterior panels above the windows at the 100s Area. The panel was likely the wrong material, but air leakage can contribute to the rusting issue.
- **Opaque Auditorium Hopper Windows** - the windows that are hinged at the bottom and tilt-out at the upper level of the stage area have large gaps between the operable panel and the jamb that allows daylight to shine through. The custodian reported that he had never seen the windows operated using the tie-off system. If the windows are not used, BJE Retrofit recommends fastening and sealing the windows shut. Water penetration is likely to occur at these windows in addition to the unwanted air leakage.

Note: See pictures on the following pages for visual support of the Findings above

2. BLAKE MIDDLE SCHOOL

Recommendations

- Installation Factsheets, provided in Section 3 for the measures below at the bold round bullets, provide the rationale for a measure and the installation specifications and materials.
- For specifications that vary from the Installation Factsheets or where measures do not have Installation Factsheets notes are included at square bullets below.

Air Sealing

- Roof-Wall Intersection Air Sealing
- Door Weather Stripping
- Window Casing Sealing
- Window Buck Frame Sealing
- Custom – Window Weatherization
 - There is no Factsheet for this measure.
 - Fasten the existing operable panels shut; install sealant at the perimeter of the formerly operable window system for an air-tight seal.

Exclusions

- The exterior and operational issues at the window systems that were identified – glazing and exterior caulking issues, the hinge issue at the administrative office and the deterioration of the exterior panels above the windows in the 100s Area – are excluded from this weatherization scope of work. A glazing contractor is likely the best fit to address these issues.

Note: Highlighted floor plans on the following pages provide the locations for installation

2. BLAKE MIDDLE SCHOOL



Roof-Wall Intersection Air Sealing – the exterior flashing and finishes at the roof-wall intersection are not constructed to stop air leakage.



Roof-Wall Intersection Air Sealing – gaps between the roof deck and wall framing are pathways for unwanted infiltration/exfiltration.



Door Weather Stripping – clear daylight around the door shows a direct pathway for unwanted air leakage.



Door Weather Stripping -- clear daylight around the door shows a direct pathway for unwanted air leakage.



Door Weather Stripping – the gasket material has deteriorated. There is no compression seal at the perimeter of the door and as a result the door is allowing infiltration/exfiltration.



Window Casing Sealing – the joints at the perimeter of the window system are not properly sealed.

2. BLAKE MIDDLE SCHOOL



Window Back Prime Sealing - the exterior panels above the window systems in the 100s are failing; the paint was likely the wrong material, but air exfiltration at the joint shown at the right is likely contributing to deterioration.



Window Back Frame Sealing - the rough opening gap at the window between the wall and the window frame was not sealed above the drop ceiling in the 100s; this gap is allowing air leakage around the window system.



Custom Window Weatherization - the opaque operable "windows" in the auditorium tilt-out; this is not a good design for controlling rain water. Daylight is clear at the perimeter of the windows, which is a pathway for unwanted air leakage.



Custom Window Weatherization - the opaque operable "windows" in the auditorium tilt-out; this is not a good design for controlling rain water. Daylight is clear at the perimeter of the windows, which is a pathway for unwanted air leakage.

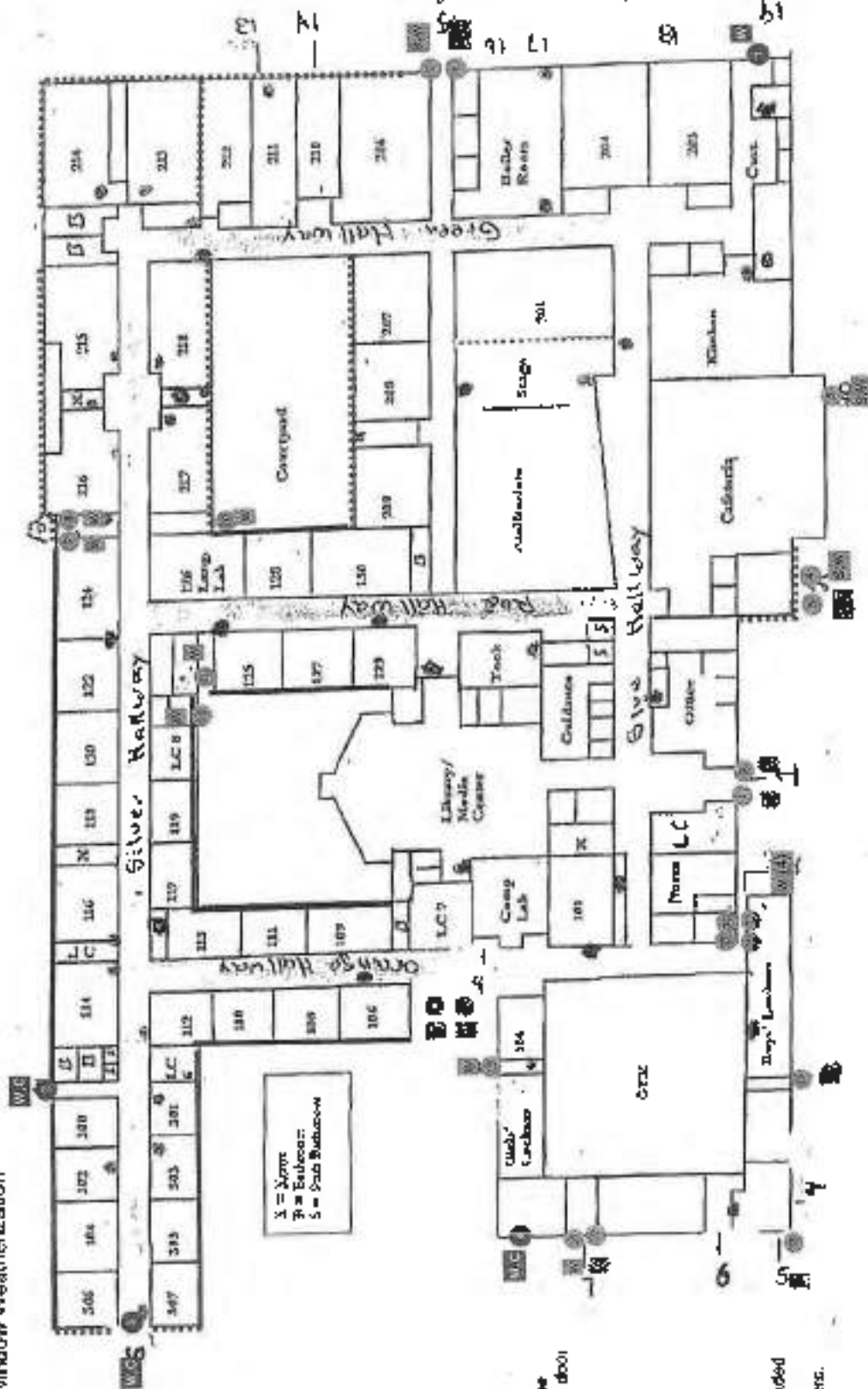
BLAKE MIDDLE SCHOOL

WEATHERIZATION DATA FOR CALCULATIONS

Measure	Location	Crack Width	Length of Crack: Unit	Total Crack Length	Leakage Area	Savings (CFM)
Air Sealing Measures						
Roof-Wall Intersection Air Sealing						
Seal	200s Area, See Floor Plan	1/6 in.	556 LF	556 LF	7.7 SF	523 CFM
Seal	300s Area, See Floor Plan	1/10 in.	60 LF	60 LF	0.5 SF	34 CFM
Seal	Cafeteria Entry, See Floor Plan	1/6 in.	36 LF	36 LF	0.5 SF	34 CFM
Total Roof-Wall Intersection Air Sealing					8.7 SF	591 CFM
Door Weather Stripping						
Single Door - Sides, Sweep	See Floor Plan	1/12 in.	16 LF	80 LF	0.6 SF	38 CFM
Single Door - Sweep	See Floor Plan	1/10 in.	3 LF	54 LF	0.5 SF	30 CFM
Double Door - Sweep, Center	See Floor Plan	1/10 in.	12 LF	39 LF	0.3 SF	22 CFM
Double Door - Sweep	See Floor Plan	1/10 in.	6 LF	6 LF	0.1 SF	3 CFM
Total Door Weather Stripping					1.4 SF	93 CFM
Window Casing Sealing						
Seal - Sides and Top	300s Area, See Floor Plan	1/120 in.	306 LF	306 LF	0.2 SF	14 CFM
Window Buck Frame Sealing						
Seal	100s Area, See Floor Plan	1/16 in.	672 LF	672 LF	3.5 SF	237 CFM
Custom - Window Weatherstripping						
Make Secondary Seal	Auditorium Till-Out Floppers	1/16 in.	12 LF	111 LF	0.6 SF	39 CFM
Total Air Sealing Measures					14.4 SF	974 CFM

THOMAS A. BLAKE MIDDLE SCHOOL EVACUATION MAP

- Roof-Wall Interaction Air Sealing (Seal)
- Single Door Weather Stripping
- Double Door Weather Stripping
- Window Casing Sealing
- Window Duck Frame Sealing
- Custom - Window Weatherization



Door Weather Stripping
Weather stripping is to be installed at all sides of a door. Units are noted otherwise.

Notes stand for:
S = 800S
T = top
W = 800W
C = 800C

Only doors with standard recommendations are numbered. Floor plan numbering is NOT intended to match any existing building security numbers.

Doc: 7 Store Room, access to gym

Doc: 16 Electrical Room, no access to building

Fire Watch

Fire Extinguisher

2. MEDFIELD HIGH SCHOOL



Findings

Infiltration

- **Roof-Wall Intersection Air Sealing** – the roof-wall intersection in the original sections of the building are allowing unwanted air leakage. In the areas of the original building with the pronounced overhang the exterior vent plugs direct outside air straight at the vulnerable roof-wall intersection. Fiberglass batt is stuffed at the roof-wall intersection in these areas, but the material is air-permeable; severe discoloration on the fiberglass batt material is the clear sign of unwanted air leakage.
- **Overhang Air Sealing** – the 2nd story overhang that extends beyond the main entry is not properly sealed at the plane of the curtain-wall system, which is the surface that separates the conditioned space from the outdoors. Bypasses around and above the curtain-wall above the drop ceiling are allowing excessive infiltration/ exfiltration at this weak point in the building envelope.
- **Door Weather Stripping** – deteriorated weather stripping materials and daylight showing at the perimeter of door systems create direct pathways for unwanted infiltration/ exfiltration. The door bottom sweeps as well as the center astragal weather stripping at the secondary entry double doors are the most significant bypasses at the doors.
- **Window Casing** – sealant is missing at the sides and top of the perimeter casing joints of window systems in the original building and at the addition. There is a gap between the window and the interior casing that allows air to leak around the window system, through the rough wall opening and into or out of the building.
- **Window Buck Frame** – the joint above the window system in the hallway outside of Room 232 was not properly sealed. Sealant was not installed between the top of the window system and the structural header leading to unwanted air infiltration/ exfiltration at this joint.

Note: See pictures on the following pages for visual support of the Findings above.

Recommendations

- Installation Factsheets, provided in Section 3 for the measures below at the bold round bullets, provide the rationale for a measure and the installation specifications and materials
- For specifications that vary from the Installation Factsheets or where measures do not have Installation Factsheets notes are included at square bullets below.

2 MEDFIELD HIGH SCHOOL

Air Sealing

- Roof-Wall Intersection Air Sealing
- Overhang Air Sealing
- Door Weather Stripping
- Window Casing Sealing
- Window Buck Frame Sealing

Exclusions

- The weak flashing details at the perimeter of the large rooftop HVAC unit that were highlighted during our site visit are excluded from this weatherization scope of work. It is best to use a roofing contractor to address these issues and any other issues related to the roof.

Note: Highlighted floor plans on the following pages provide the locations for installation.

2. MEDFIELD HIGH SCHOOL



Roof-Wall Intersection Air Sealing - there are exterior vent plugs in place; this construction directs outdoor air at the weak seal (see top right picture) at the roof-wall intersection, leading to excessive infiltration/exfiltration.



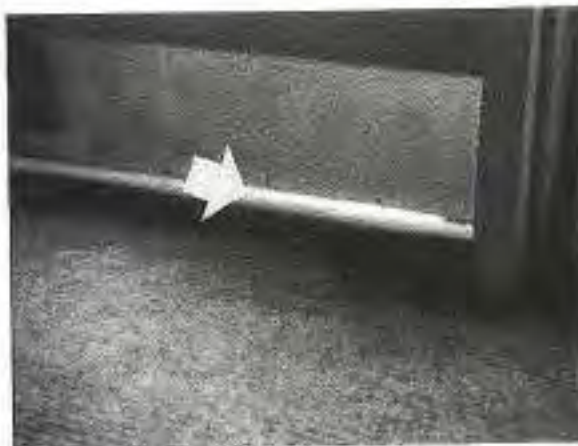
Roof-Wall Intersection Air Sealing - black discoloration of the fiberglass batt is a clear indicator of unwanted air leakage; fiberglass "filters" out dirt and debris as air pass through the material.



Roof-Wall Intersection Air Sealing - the exterior finishing and finishes at the roof-wall intersection are not constructed to stop air leakage.



Roof-Wall Intersection Air Sealing - air exfiltration shown by smoke tracer testing at the roof-wall intersection.



Door Weather Striping - clear daylight around the door shows a direct pathway for unwanted air leakage.

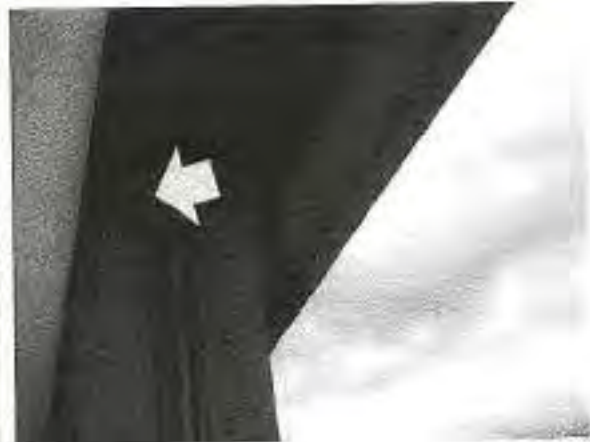


Door Weather Striping - clear daylight around the door shows a direct pathway for unwanted air leakage.

2. MEDFIELD HIGH SCHOOL



Window Casing Sealing – the perimeter of the interior casing was not sealed properly. The gaps allow air leakage at the rough opening (the gap between window and wall), interior smoke tracer testing leaked outside.



Window Casing Sealing – the joints at the perimeter of the window system are not properly sealed and are allowing unwanted air leakage around the window system.



Window Back Frame Sealing – the rough opening gap at the window between the wall and the window frame was not sealed above the drop ceiling; this gap is allowing air leakage around the window system.

MEDFIELD HIGH SCHOOL

WEATHERIZATION DATA FOR CALCULATIONS

Measure	Location	Crack Width	Length of Crack: Unit	Total Crack Length	Leakage Area	Savings (CFM)
Air Sealing Measures						
Roof-Wall Intersection Air Sealing Seal	Original Building. See Floor Plan	1/8 in.	711 LF	711 LF	9.9 SF	669 CFM
Overhang Air Sealing Seal	See Floor Plan	1/8 in.	34 LF	34 LF	0.5 SF	32 CFM
Door Weather Stripping Single Door - Sweep	See Floor Plan	1/10 in.	3 LF	21 LF	0.2 SF	12 CFM
Double Door - Sweep, Center	See Floor Plan	1/10 in.	13 LF	39 LF	0.3 SF	22 CFM
Double Door - Sweep	See Floor Plan	1/10 in.	6 LF	78 LF	0.7 SF	44 CFM
Total Door Weather Stripping					1.2 SF	78 CFM
Window Casing Sealing Seal - Sides and Top	See Floor Plan	1/320 in.	5,045 LF	5,045 LF	3.5 SF	237 CFM
Window Sash Frame Sealing Seal	See Floor Plan	1/16 in.	8 LF	8 LF	0.0 SF	3 CFM
Total Air Sealing Measures					15.4 SF	1,019 CFM

Lower Level




Door Weather Stripping is to be installed at all sides of a door unless noted otherwise.

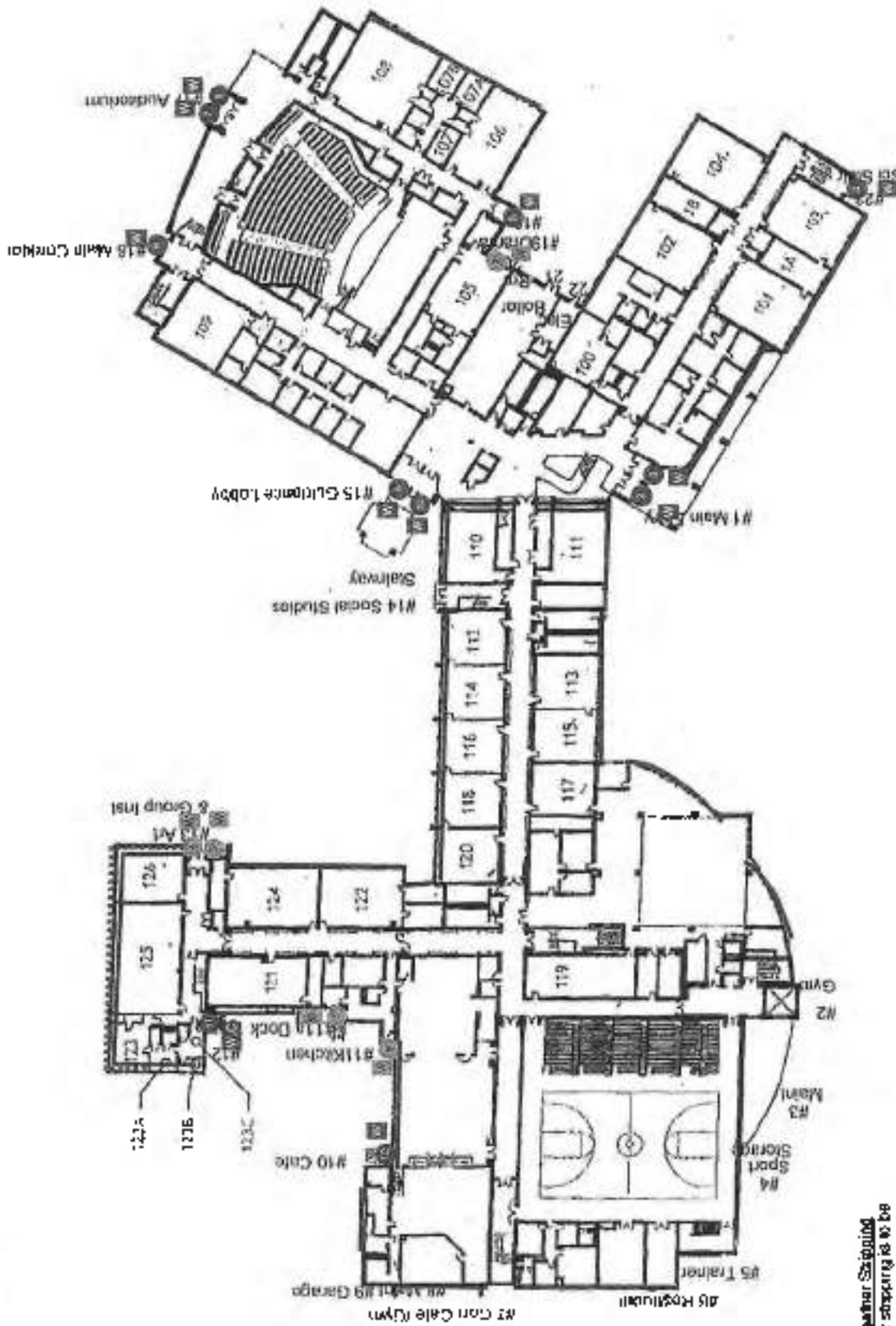
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npoles = 4
s = sides
t = top
w = dwelt
c = color

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Only doors with retrofit recommendations are numbered. Floor plan numbering is NOT intended to match any existing building security numbers.

- **Roof-Wall Intersection Air Sealing (Seal)**
- **Overhang Air Sealing (Seal)**
-  **Single Door Weather Stripping**
-  **Double Door Weather Stripping**
- **Window Casing Sealing**
- **Window Buck Frame Sealing**



.... Roof-Wall Intersection Air Sealing (Seal)

--- Overhang Air Sealing (Seal)

● Single Door Weather Stripping

● Double Door Weather Stripping

— Window Casing Sealing

— Window Buck Frame Sealing

Door Weather Stripping

Weather stripping is to be installed at all slides or a door unless noted otherwise. Notes stand for:

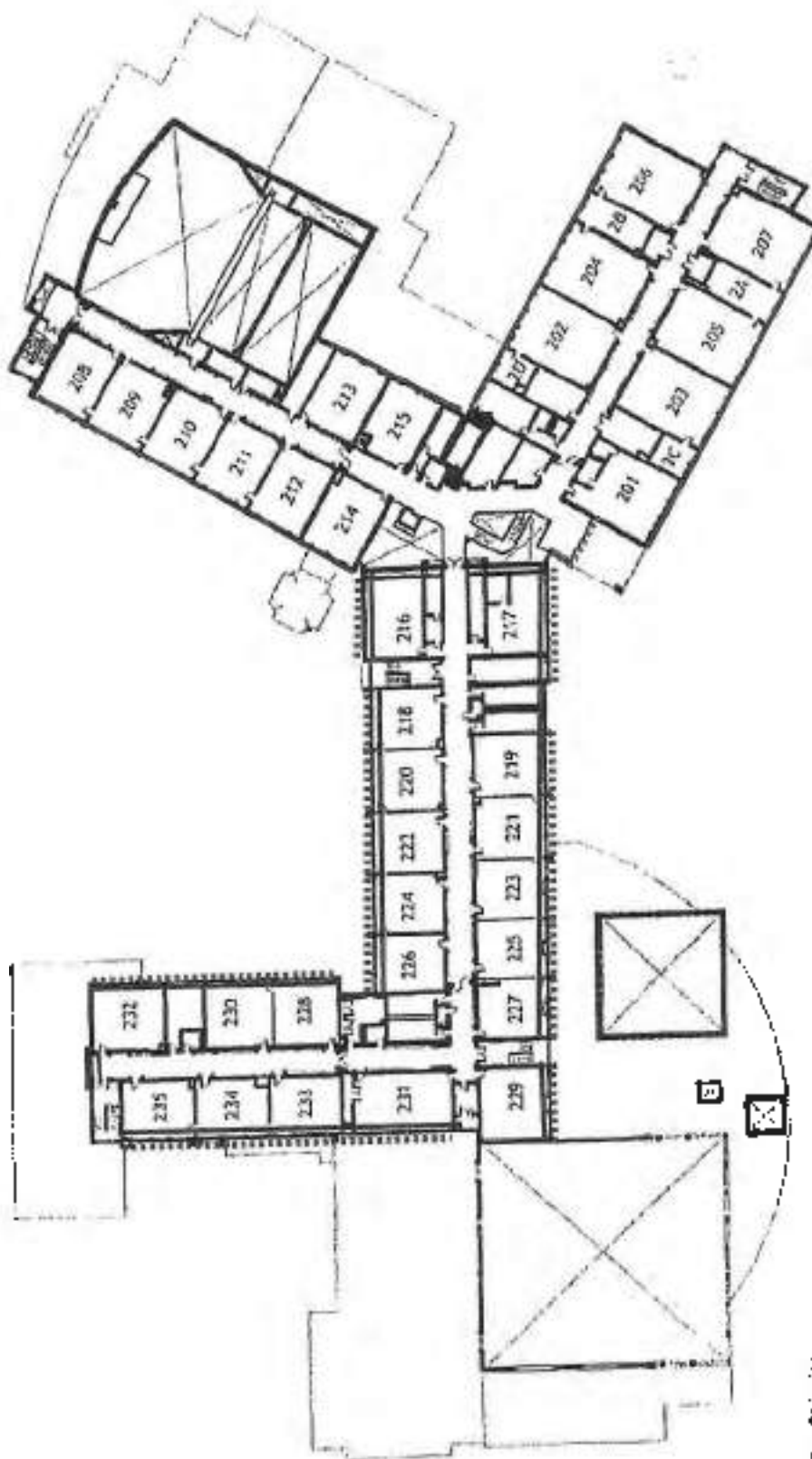
T = top

W = outside

C = center

Only doors with retrofit recommendations are numbered. Floor plan numbering is NOT intended to match any existing building security numbers.

MAIN LEVEL MEDFIELD HIGH SCHOOL



--- Roof-Wall Intersection Air Sealing (Seal)

.... Overhang Air Sealing (Seal)

○ Single Door Weather Stripping

● Double Door Weather Stripping

— Window Casing Sealing

— Window Buck Frame Sealing

UPPER LEVEL MEDFIELD HIGH SCHOOL

Door Weather Stripping
Weather stripping is to be installed at all sides of a door unless noted otherwise. Notes stand for:

s = sides

1 = top

w = swing

c = center

Only doors with retrofit recommendations are numbered. Floor plan numbering is NOT intended to match any existing building security numbers.

INSTALLATION FACTSHEET – ROOF-WALL INTERSECTION AIR SEALING

Rationale

- The roof-wall intersection is a significant contributor to overall building air leakage losses.
- The top of the building is critically important because pressure differentials between the inside and outside are greatest at the top of the building. The roof-wall joint is one of the largest air leakage pathways and wraps the entire perimeter of the top of the building.
- The roof-wall intersection is often accessible above suspended ceilings and as a result can be an extremely cost-effective measure (high savings potential and relatively low cost).

Installation Specifications

- Drape a protective sheet over furnishings and the wall below the drop ceiling.
- Remove ceiling tiles as necessary to access the roof-wall intersection.
- Install an approximately 4 inch – 6 inch wide and 2 inch deep bead of high-density spray polyurethane foam at the air leakage pathway.
- Replace the drop ceiling tiles and clean the area.

Materials

- Dow Froth-Pak – Froth-Pak is 2-part high density closed cell spray polyurethane foam. Dow Froth-Pak is NFPA 286 compliant and is approved to be left exposed (without a fire protection covering) at the roof-wall intersection.

Note: 2-part spray polyurethane sealant has a short period of "run gassing," as the foam cures. It is best to install the foam without any occupants in the surrounding areas. We typically install this measure as part of a 2nd shift installation.

- Dow Thermax Rigid Insulation Board Stock – Thermax is rigid insulation product. In oversized pathways at the roof-wall intersection Thermax board is used as a block to seal in place. Thermax is building code compliant to be left without a fire protection covering.
- Tough 'n Seal All Seasons Gun Foam – 1-part polyurethane foam is used at leakage pathways that require the precision of a gun foam product.

Pictures



INSTALLATION FACTSHEET - ROOF-WALL INTERSECTION AIR SEALING



INSTALLATION FACTSHEET – OVERHANG AIR SEALING (SOFFITS)

Rationale

- Overhangs are often misunderstood during the building process. Builders incorrectly include the cavity above the exterior overhang as part of the building's conditioned space. This is a big break in the continuity of the air and thermal barrier.
- Many overhangs have exterior recessed lights and other pathways where unconditioned air can easily leak past the ceiling and reach the interior spaces of the building.
- Overhangs are often one of the largest holes in an entire building.

Installation Specifications

- Drape a protective sheet over furnishings and the wall below the drop ceiling.
- Remove ceiling tiles as necessary to access the space.
- Install Dow Thermax poly-isocyanurate rigid insulation to block the entire air leakage pathway.
- Seal the perimeter and seams of the rigid insulation board with a foam or tape sealant.

Materials

- Dow Froth-Pak – Froth-Pak is 2-part high density closed cell spray polyurethane foam. Dow Froth-Pak is NFPA 286 compliant and is approved to be left exposed (without a fire protection covering) at the roof-wall intersection.

Note: 2-part spray polyurethane sealant has a short period of "on-graining" as the foam cures. It is best to install the foam without any occupants in the surrounding areas. We typically install this measure as part of a 2nd shift installation.

- Dow Thermax Rigid Insulation Board Stock – Thermax is rigid insulation product. In oversized pathways at the roof-wall intersection Thermax board is used as a block to seal in place. Thermax is building code compliant to be left without a fire protection covering.
- Touch 'n Seal All Seasons Gun Foam – 1-part polyurethane foam is used at leakage pathways that require the precision of a gun foam product.
- Steel studs, screws and screw plates, sheathing tape and other common building materials.

Pictures



INSTALLATION FACTSHEET – OVERHANG AIR SEALING (SOFFITS)



INSTALLATION FACTSHEET – DOOR WEATHER STRIPPING

Rationale

- Doors are often installed out of square or out of plumb. Installation weaknesses, poor weather stripping product selection and deterioration of weather stripping products create air leakage pathways around doorways.
- Proper weather stripping materials and installation practices can provide a durable seal. Along with energy benefits, improving weather stripping is often a deferred maintenance item and can have comfort benefits for occupants.

Installation Specifications

- Ensure door operates and closes appropriately. Notify prime contractor and/or client when doors are damaged.
- Install heavy duty weather stripping with aluminum carrier at door sides and top jamb. Install for 40% - 60% weather strip compression. Caulk behind weather strip carrier for air-tight seal.
- Cut aluminum carrier weather strip at locks, swing arms or any other hardware where necessary.
- Install door bottom sweep with aluminum carrier.
- For double doors install astragal at center meeting.
- Note: weather stripping materials are selected from the options included below to best fit the existing conditions of the door system.

Materials

- Visco Weatherseal Products – Sides and Tops – DS050 or DX1000; aluminum carrier; soft-cell foam insert with thermoplastic cover. ORS296; aluminum carrier; offset nylon brush strip insert.
- Visco Weatherseal Products – Astragals – FS325; aluminum carrier; wool pile brush with fin seal.
- Visco Weatherseal Products – Sweeps – FS300; aluminum carrier; wool pile brush with fin seal. TS100 and TS150; aluminum carrier; triple vinyl strip. BS196; aluminum carrier; nylon brush strip.
- Schlegel Surface Mount Weather Stripping (PF102, PF114, PF512, QDS375).

Pictures



INSTALLATION FACTSHEET – WINDOW CASING SEALING

Rationale

- Windows are installed in rough openings in the shell of the building. Installers often do not properly seal the perimeter of the window in the rough opening prior to installing finish casing and trim.
- The pathway between the perimeter of the window and the rough opening in the shell of the building is often large because windows are regularly “shimmed” into place in out-of-square openings.
- Installers often do not caulk the joints of the finish casing and trim.
- Caulking/ sealing the perimeter of windows at perimeter casing and trim materials will prevent air infiltration / exfiltration previously flowing through the pathway between the rough opening and the window.
- Surface sealing windows by using interior casings or trim as part of the interior surface air barrier is a cost-effective way to reduce air infiltration and exfiltration.

Installation Specifications

- Notify the prime contractor if the window assembly is damaged.
- Caulk the non-operational components of the jamb, casing or trim that have been identified as pathways for air leakage. Install hacker rod as required at large gaps.

Materials

- DuPont AIRTITE Siliconized Acrylic Latex Caulk.
- Todal EZ Flo-Gun Foam – Todal 1-component polyurethane foam is used at small leakage pathways that require the precision of a gun foam product.

Pictures



INSTALLATION FACTSHEET • WINDOW BUCK FRAME SEALING

Rationale

- Windows are installed in rough openings in the shell of the building. Installers often do not properly seal the perimeter of the window in the rough opening prior to installing finish casing and trim.
- The pathway between the perimeter of the window and the rough opening in the shell of the building is often large because windows are regularly “shimmed” into place in out-of-square openings.
- Installers often do not caulk the joints of the finish casing and trim; sealant at joints above drop ceilings and in concealed areas are often missed by installers.
- Sealing the perimeter of windows at the buck frame or rough opening will prevent air infiltration / exfiltration previously flowing through the pathway between the rough opening and the window.
- Surface sealing windows by using interior casings or trim as part of the interior surface air barrier is a cost-effective way to reduce air infiltration and exfiltration.

Installation Specifications

- Notify the prime contractor if the window assembly is damaged.
- Seal the joints at the buck frame/ rough opening that have been identified as pathways for air leakage.

Materials

- DuPont AIRTITE Siliconized Acrylic Latex Caulk.
- Touch 'n Seal All Seasons Gun Foam – 1-part polyurethane foam is used at leakage pathways that require the precision of a gun foam product.

Pictures



4. GLOSSARY – SAVINGS CALCULATIONS AND IMPLICATIONS

Infiltration and assembly U-values are the two primary factors in a heat loss calculation; they are the two most important factors that determine how much energy will be lost from the building. In a building with lots of air leakage loss and lots of thermal heat loss, the mechanical equipment must compensate for these losses to maintain a comfortable interior environment.

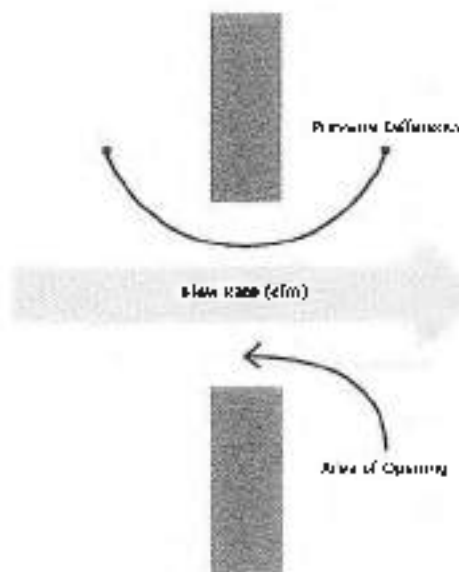
An effective building envelope retrofit project targets the main sources of stress on mechanical equipment – a successful project stops excessive air leakage and thermal heat losses. When equipment (the equipment must be properly controlled) no longer needs to overcome the weaknesses of a leaky and poorly insulated building envelope, mechanical equipment is under less stress, runs less frequently and uses less energy. Existing mechanical equipment will last longer and new equipment can be downsized to reflect the post-retrofit air leakage and insulation values.

Savings from building envelope improvements are calculated in two separate categories: air leakage control and thermal transfer.

Air Leakage Control

A 2005 study by the National Institute of Standards and Technology settled the debate on the importance of air leakage control, showing that an effective air barrier system in new construction can generate up to 40% heating energy savings relative to a baseline building in a cold climate.¹

In retrofit work savings potential needs to be modified downward due to reduced access and opportunity. Based on published research and experience, we believe that a 10% reduction in heating energy use is a conservative estimate for a robust and effective air leakage control retrofit.



BIE Retrofit uses an air leakage control savings calculation methodology that was developed by the National Research Council in Canada called EC128. This system is grounded in the ASHRAE crack method of estimating air leakage driven energy loss.

The physics of air leakage are simple: in order for air to leak both an opening and a pressure difference across a surface need to exist. The diagram at the left shows the basis for the Calculation Methodology ($\text{CFM Reduction} = \text{Constant} \times \Delta P \times A$).

¹ *Investigation of the Impact of Commercial Building Airtightness on HVAC Energy Use*, 2005, National Institute of Standards and Technology.

4. GLOSSARY - SAVINGS CALCULATIONS AND IMPLICATIONS

The physics of air leakage (shown above) guide the requirements for the design of an effective air leakage control retrofit project.

- **Big Holes = Area**
Sealing big holes and/or a lot of small holes generates savings.
- **Big Pressure Differentials = ΔP**
Sealing surfaces that have the highest pressures acting on them generates savings: at the top and bottom of the building (stack pressure), spaces that are pressurized or depressurized (mechanical pressure) and surfaces that are most exposed to the elements (wind pressure).
- **Big Temperature Differentials = ΔT or HDD**
Sealing interior-to-exterior air leakage pathways generates savings. Isolating interior spaces (or compartmentalizing) is effective only across interior spaces with very different interior environment needs.

Thermal Upgrade

BJE Retrofit uses standard heat loss calculations (U, A, ΔT) to estimate savings from thermal barrier improvements.

As with air leakage, the physics of thermal heat loss guide the requirements for the design of an effective energy saving insulation upgrade project.

- **Weak Existing Insulation Values: U-Value**
Insulating surfaces with the weakest existing insulation values generates savings.
- **Big Surface Areas: Area**
Insulating large surface areas generates savings.
- **Big Temperature Differentials: ΔT or Degree Days**
Insulating interior-to-exterior surfaces (attic surfaces are included in this category) generates savings. Isolating interior surfaces (or compartmentalizing) is effective only across interior spaces with very different interior environment needs.

AIR LEAKAGE CONTROL (ALC) SAVINGS CALCULATION METHODOLOGY

Heating Savings

		Flow Factor				$(\Delta P)^{1/2}$				A		CFM Reduction
1) Q	=	Constant, 11.1	x	Wind Pressure	x	Aggregate Air Leakage Pathway Hole	=	Cubic Feet / Minute (CFM)				
		Q		HDD		Fuel \$/MMBTU						
2) Savings	=	CFM	x	HDD for Location	x	Fuel Cost in \$	=	Savings in Dollars				
		Fuel / Mechanical Efficiency Factor										
		Efficiency Factor										
3) Savings from Air Leakage Control	=						Savings in Dollars				
4) Project Investment	=						Investment in Dollars				
5) Simple Payback	=						Investment / Savings				

AIR LEAKAGE CONTROL (ALC) SAVINGS CALCULATION METHODOLOGY

Cooling Savings

	Flow Factor	x	$(\Delta P)^{1/n}$	x	A	=	CFM Reduction
1) Q	Constant, 11.1		Wind Pressure		Aggregate Air Leakage Pathway Hole		Cubic Feet / Minute (CFM)

	Constant	x	CFM Reduction	x	Enthalpy	=	Tons
2) Tons	4.5		CFM Reduction x 0.7		14.7		Tons
			12,000				

	Efficiency Factor	x	Constant	x	CDD	=	kWh
3) kWh Savings	Tons / Tons		1.2		CDD for Location		kWh
	kWh / kWh		Constant / 0.8		kWh		kWh Savings

	kWh	x	Fuel Cost/kWh	=	Savings in Dollars
4) Savings	kWh Savings		Fuel Cost In \$		

5) Savings from Air Leakage Control		= Savings in Dollars
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6) Project Investment		= Investment in Dollars
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7) Simple Payback		= Investment / Savings
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THERMAL UPGRADE SAVINGS CALCULATION METHODOLOGY

Heating and Cooling Savings

1) Pre-retrofit Heat Loss

$$\text{Heat Loss} = \frac{\text{U-Value} \times \Delta T \times A}{1,000,000} = \text{Pre-retrofit Heat Loss in MMBtu}$$

Existing U *24 hrs/day * 0.75 Surface Area

HDD (or CDD)

Convert MMBtu

$$\text{Heat Loss} = \frac{\text{Pre-Retrofit Heat Loss in MMBtu} \times \text{\$/Unit}}{\text{Cost / MMBtu}} = \text{Pre-retrofit Heat Loss in \$}$$

2) Post-retrofit Heat Loss is the Same Calculation as Above = Post-retrofit Heat Loss in \\$

$$\text{Savings} = \text{\#1 Result} - \text{\#2 Result} = \text{Savings in Dollars}$$

$$\text{Project Investment} = \text{Investment in Dollars}$$

$$\text{Simple Payback} = \frac{\text{Investment}}{\text{Savings}}$$

4. GLOSSARY – BUILDING ENVELOPE AND WEATHERIZATION TERMS

1. Terms Used to Describe Building Conditions

The terms in this section relate primarily to existing conditions of a building and findings during an assessment.

Building Envelope

The system of building components that provides environmental separation between the conditioned space and the outside environment. The building envelope includes all six sides of the building (roof, walls, and floors) and all of the joints and intersections that connect building components.

Air Barrier

The air barrier is the surface that stops air from leaking out of the occupied / conditioned spaces; it is the barrier that keeps conditioned air within the building. In order for an air barrier to be effective all bypasses that air can leak around or past must be blocked and sealed.

Thermal Barrier

The thermal barrier is the surface that slows thermal heat transfer out of (or into) the occupied / conditioned spaces; it is the barrier that keeps thermal heat within (or out of) the building.

Air Barrier vs. Thermal Barrier

The air barrier and the thermal barrier serve separate functions. The *air barrier blocks air leakage around or past bypasses*. The *thermal barrier slows thermal heat transfer through a surface*. In certain applications (when a material like foam insulation air seals and insulates) the air barrier and thermal barrier can be the same surface or material.

Conditioned Space / Occupied Space

The conditioned spaces are the parts of the building that is designed to be thermally conditioned for occupant comfort. The air barrier and thermal barrier should be a continuous "wrap" around the conditioned spaces of the building.

Unconditioned Space

Unconditioned spaces are areas within the shell of the building that are not thermally conditioned for occupant comfort. The air barrier and thermal barrier should isolate unconditioned spaces from conditioned spaces. Common examples of unconditioned spaces are attics and loading docks.

Labeled Insulation Value vs. Effective Insulation Value

These terms are often used in reference to fiberglass batt insulation. A 6" fiberglass batt is *Labeled* at the hardware store as having an insulation value of R-19. Common conditions in buildings like poor surface coverage and air leakage through the material can degrade the *Effective* value (or actual value) of the product by more than 60%.

R-Value

R-value is a measure of a material or assembly resistance to thermal heat transfer. High R-values allow less heat transfer ($R\text{-value} = 1 / U\text{-value}$).

4. GLOSSARY – BUILDING ENVELOPE AND WEATHERIZATION TERMS

U-Value

U-value is a measure of the thermal heat transmittance of a material or assembly. Low U-values allow less heat transfer ($U\text{-value} = 1 / R\text{-value}$).

Vapor Barrier

The vapor barrier is the surface that controls (stops or slows) the movement of water by vapor diffusion.

2. Terms Used to Describe the Installation Process

The terms in this section relate primarily to the installation process and fixing building envelope weaknesses.

Weatherization Retrofit Measures

Weatherization Retrofit Measures encompasses all of the solutions that we implement. All of the items included in a retrofit project are Weatherization Retrofit Measures.

Air Leakage Control (ALC) Measures

ALC Measures is a category of Weatherization Retrofit Measures. The primary goal of ALC Measures is to fix air barrier weaknesses and stop unwanted air leakage losses.

Air Sealing

Air Sealing is used to describe certain Air Leakage Control Measures. "Attic Bypass Air Sealing" and "Roof-Wall Intersection Air Sealing" are ALC Measures that can be implemented in a building.

Thermal Upgrade Measures

Thermal Upgrade Measures is a category of Weatherization Retrofit Measures. The primary goal of Thermal Upgrade Measures is to fix thermal barrier weaknesses and stop unwanted thermal heat transfer.



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February 28, 2017

Mr. Gerald McCarty, Director of Facilities
Medfield Public Schools
459 Main Street
Medfield, MA 02052

Re: Bus Canopy Investigation
Medfield High School
Medfield, Massachusetts
RBA Project No 2017003

Mr. McCarty:

Pursuant to your recent request, we are pleased to submit our investigative report for the Medfield High School bus canopy. This report is augmented with photographic documentation attached.

The Medfield High School Bus Canopy is a steel framed structure with brick masonry columns, stucco covered, steel stud framed, soffits and low-sloped EPDM roof coverings. The center of the canopy has sloped metal roofing topped with a pyramid shaped skylight. The canopy is approximately 15 years old. Test cuts were performed by Ace Restoration Co. and detailed observations were performed on 2/23/17 when the weather was dry with temperatures around 50+°F. Melting snow was observed along all sides of the canopy.

The four (4) canopy columns are experiencing vertical cracks and severe efflorescence (efflorescence is white salt emanating from masonry construction) buildup. 3 of the 4 columns were wet on 2/23/17. Water was reported to squirt out of the columns on a dry day. One brick was removed from one column and one column has had weep holes drilled into the brick masonry. The stucco soffits on three sides of the canopy are cracked and were leaking water on 2/23/17. Reportedly, the wet column conditions have existed since the High School addition was constructed.

Test cuts into one of the columns revealed an 8" nominal steel wide flange column with a 2" inside diameter, insulated, steel drain line, concrete brick and mortar fill surrounding the column and drain line, all encased in brick masonry matching the School's façade. All materials encountered were moisture saturated. The steel column appeared sound and only lightly rusted at the top and bottom of the column. The drain line piping appeared corroded. Openings that were previously installed at 2 columns are an apparent means of draining the columns.

Two openings were made into the north canopy soffit. We observed that the top surface of the soffit had standing water and that the surface was slightly higher than the top of the masonry encased column. The soffit was draining through cracks in the soffit and was also draining into the top of the masonry encased column. A +/- 3' section of roof drain leader pipe was found to be disconnected from the drain line and was resting on the top surface of the soffit. Ace Restoration Co reinstalled this drain line. (Although not a leak related issue, the stucco covered soffit is poorly sealed to sheet metal roof edge treatments.)

It appears that the drain lines serving 3 of the 4 canopy roof drains are leaking into the soffit and eventually into the masonry encased steel canopy columns. We suspect that the canopy drain line joint connections were either never properly secured or were pushed off by frozen drain lines. The leaking drain lines saturated the soffits and masonry column components. Masonry components appear to have been split by freeze/thaw action.

Icy conditions at the bus canopy should be avoided and we therefore recommend repairing the canopy drainage systems, soffits and columns. We recommend the following scope of work:

- Remove all soffits necessary to access the canopy drain lines.
- Remove the brick masonry and mortar fillers exposing all 4 steel columns.
- Inspect the drain lines and repair/replaced as required. Utilize drain line video services to inspect the inside of all pipes. Install electric heat trace tapes.
- Inspect the steel columns and repair/paint as required.
- Replace the brick veneer surrounding the steel columns. Allow a cavity between the brick and steel column/drain lines.
- Replace the removed soffits with a removable sheet metal soffit system. Seal the soffits to the sheet metal roof edge treatments.

The preliminary estimated construction cost to perform these repairs is \$75,000 to \$100,000. We recommend that this work be bid expeditiously to allow work this summer.

We trust this information meets your needs at this time. Please contact me at your convenience to pursue timely repairs.

Sincerely,



Michael J. Flaherty
Senior Project Manager
Email: mflaherty@russobarr.com
Enclosure

PHOTOGRAPHIC DOCUMENTATION

Bus Canopy Investigation

Medfield High School

Medfield, MA



Photo 1

Medfield High School Bus Canopy

Aerial of Bus Canopy.



Photo 2

Medfield High School Bus Canopy

EPDM and sheet metal roofing and translucent skylight appeared in sound condition.

PHOTOGRAPHIC DOCUMENTATION

Bus Canopy Investigation

Medfield High School

Medfield, MA



NORTHEAST CANOPY COLUMN

Photo 3

Medfield High School Bus Canopy

North and west sides of canopy.



Photo 4

Medfield High School Bus Canopy

Northeast canopy column has severe efflorescence and vertical cracking. Some horizontal cracking was also observed here. Location of upper masonry test cut.

PHOTOGRAPHIC DOCUMENTATION

Bus Canopy Investigation

Medfield High School

Medfield, MA



Photo 5

Medfield High School Bus Canopy

Severe efflorescence at the northwest canopy column. One brick was previously removed some time ago resulting in extraordinary efflorescence.



Photo 6

Medfield High School Bus Canopy

Test cut at top of northeast canopy column, south side, revealed a steel column that has surface rust but appeared in sound condition.

PHOTOGRAPHIC DOCUMENTATION

Bus Canopy Investigation
Medfield High School
Medfield, MA



Photo 7

Medfield High School Bus Canopy

Test cut at bottom of northeast canopy column, east side revealed saturated masonry, deteriorated pipe insulation and corroded steel pipe.



Photo 8

Medfield High School Bus Canopy

Cracked stucco covered soffit is actively leaking due to snowmelt.

PHOTOGRAPHIC DOCUMENTATION

Bus Canopy Investigation
Medfield High School
Medfield, MA



Photo 9

Medfield High School Bus Canopy

North canopy drain bowl is not connected. Note that the steel components appeared sound.



Photo 10

Medfield High School Bus Canopy

Missing piping found on top of soffit. Pipe was reinstalled using existing hardware.

PHOTOGRAPHIC DOCUMENTATION

Bus Canopy Investigation
Medfield High School
Medfield, MA



Photo 11

Medfield High School Bus Canopy

Interior of north bus canopy soffit. Drain line runs to the east side of the northeast column shown and then turns down into the underground drain line. Note the standing water on the top surface of the soffit.

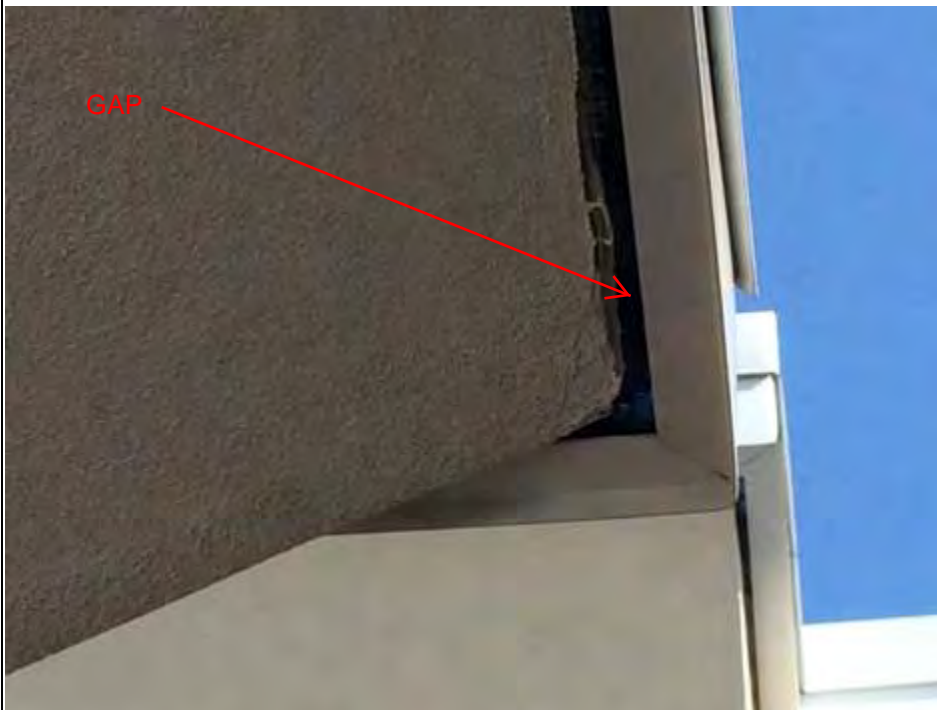


Photo 12

Medfield High School Bus Canopy

Many areas of soffit are poorly sealed to the sheet metal roof edge.



MEDFIELD ATHLETIC FIELDS MASTER PLAN STUDY

PREPARED FOR:
THE TOWN OF MEDFIELD

PREPARED BY:
PARE CORPORATION
BIRCHWOOD DESIGN GROUP



WHO WE ARE ?

JAMES ASPRINIO, LEED AP
PROJECT ENGINEER



ARTHUR J. EDDY, ASLA, LEED AP
PRINCIPAL



TASK:

REVIEW SIX EXISTING ATHLETIC FACILITIES IN TOWN:



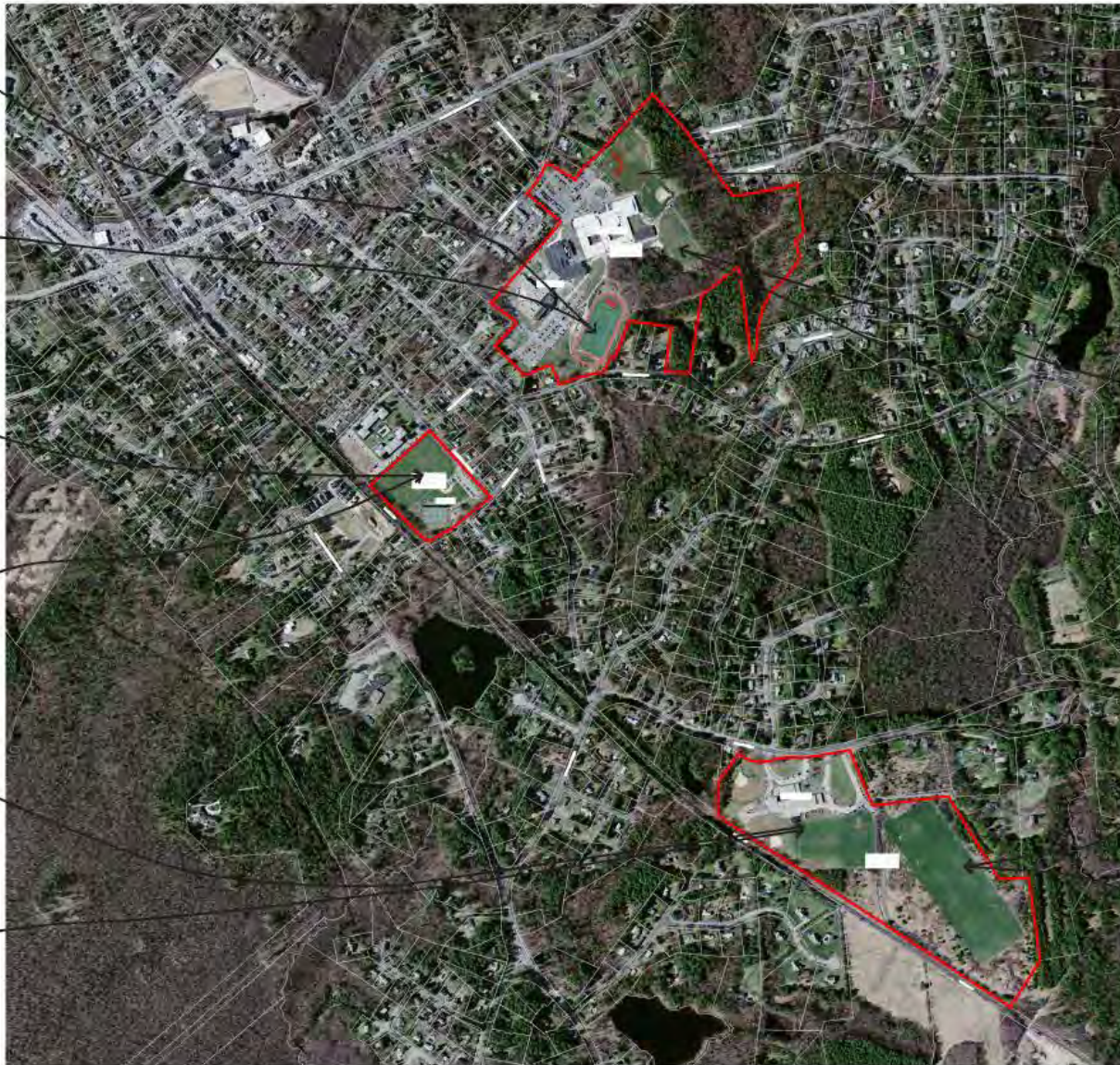
FIELD A:
HIGH SCHOOL MULTI-
USE SYNTHETIC FIELD
AND TRACK



FIELD D:
METACOMET PARK
FIELDS



FIELD E:
RALPH WHELOCK
MULTI-USE FIELDS



FIELD B:
MIDDLE SCHOOL
BASEBALL/SOFTBALL



FIELD C:
MIDDLE SCHOOL
PRACTICE FIELD



FIELD F:
RALPH WHELOCK
SOCCER COMPLEX

MEDFIELD ATHLETIC FIELDS MASTER PLAN

THE PROCESS

1

KICK-OFF MEETING WITH TOWN

2

INVENTORY OF EXISTING CONDITIONS:

FIELD GEOMETRY
ENVIRONMENTAL CONDITIONS
PLAYING SURFACE
IRRIGATION
DRAINAGE
ELECTRICAL
FIELD LIGHTING
FENCING
FIELD EQUIPMENT
FREESTANDING STRUCTURES
VEGETATION
PARKING
ADA COMPLIANCE
OVERALL APPEARANCE

3

CONSTRAINTS MAPPING

4

MEETING WITH STAKEHOLDERS

5

DESIGN OPTIONS/COST ESTIMATES

6

EVALUATION OF TURF OPTIONS

7

PRIORITIZATION

8

RECOMMENDATIONS

VISION

Medfield is a community steeped in athletic tradition and excellence. The community has long provided places for residents both to recreate and participate in athletics. Whether this participation is purely for health, enjoyment or competition, the community will provide athletic fields that are safe and provide a high level of performance for all users both young and old .

FINDINGS:

FIELD A: HIGH SCHOOL MULTI-USE SYNTHETIC FIELD AND TRACK



- TURF IS STARTING TO DEGRADE WHICH WILL DECREASE THE SAFE PLAY ON THE FIELD
- TRACK IS READY FOR AN OVERSPRAY
- THERE ARE CURRENTLY ISSUES WITH THE BASE BELOW THE TURF
- THERE ARE DRAINAGE ISSUES IN THE FIELD
- GRASS IN THE FIELD IS NOT A GREAT DESIGN CHOICE
- THE FACILITY NEEDS ADA PARKING
- ATHLETIC FIELD LIGHTING IS IN WORKING CONDITION BUT, NEEDS TO BE UPDATED
- THE CONCESSION STAND SHOULD BE UPGRADED TO MODERN CODES
- STORAGE ON THE SITE SHOULD BE ORGANIZED
- BASIC AMMENITIES WOULDHELP TO IMPROVE THE FACILITY

FINDINGS:

FIELD B: MIDDLE SCHOOL BASEBALL/SOFTBALL



- THE FIELD IS GENERALLY IN GOOD CONDITION
- IT IS RECOMMENDED TO ADD 8' CHAIN LINK AT BOTH THE SOFTBALL AND BASEBALL DUGOUT
- FIELD WILL NEED TO BE REPLACED IN THE NEXT 5 TO 7 YEARS
- ATHLETIC FIELD LIGHTING WOULD EXTEND THE USE OF THE FIELD BUT, LOCATION NEAR NEIGHBORS MAY NOT BE APPROPRIATE
- THE TOWN SHOULD INVESTIGATE THE EXPANSION OF TURF DURING THE NEXT REPLACEMENT
-
- THE EDGE OF THE SYNTHETIC TURF FIELD AND GRASS SHOULD BE ADDRESSED ANNUALLY
-
- THERE ARE SOME GRADING ISSUES WITH THE INFIELD OF THE SOFTBALL FIELD THAT SHOULD BE ADDRESSED

FINDINGS:

FIELD C:
MIDDLE SCHOOL PRACTICE FIELD



- THE FIELD IS IN THE WORST CONDITION OF ALL THE FIELDS
- THE FIELD IS UNDERSIZED FOR ANY SPORT EXCEPT FOR FOOTBALL
- TRACK THROWING EVENTS OCCUR IN THIS AREA
- THERE ARE WETLANDS AND A STREAM ON THE OUT SKIRTS OF THE FIELD
- THE FIELD IS SURROUNDED BY FOREST AND SECLUDED FROM NEIGHBORS

FINDINGS:

FIELD D: METACOMET PARK FIELDS



- THE FIELD IS SURROUNDED BY RESIDENTIAL NEIGHBORS TO THE NORTH, EAST AND WEST.
- THE FIELD IS LARGE AND IN GOOD CONDITION.
- PARKING IS LIMITED AND THERE ARE SIGNS OF PARKING ON THE STREET.
- DRAINAGE FLOWS TO THE SOUTHWEST
- THE FIELD IS ORIENTED MORE EAST/WEST THAN THE PREFERED NORTH/SOUTH
- THE FIELD COULD USE ADA ACCESS IMPROVEMENTS

FINDINGS:

FIELD E:
RALPH WHEELOCK SCHOOL MUTLI-USE FIELDS



- THE FIELDS ARE HEAVILY USED
- ONE OF THE FIELDS IS NOT ORIENTED THE PREFERED NORTH/SOUTH DIRECTION
- PARKING IS AN ISSUE, PARKING IS ON THE GRASS
- DRAINAGE FLOWS TO A SWALE TO THE EAST
- THE FIELD COULD USE ADA ACCESS IMPROVEMENTS
- THE FIELDS ARE SURROUNDED BY FOREST TO THE SOUTH AND EAST

FINDINGS:

FIELD F:
SOCCER COMPLEX AT RALPH WHEELLOCK



- PARKING IS LIMITED TO THE FACILITY
- THE FIELDS COULD USE ADA ACCESS IMPROVEMENTS
- FIELDS ARE GENERALLY IN GOOD CONDITION WITH IRRIGATION
- FIELDS ARE SURROUNDED BY FOREST AND WOODED AREAS
- FIELDS ARE HEAVILY USED

PRIORITIZATION:

FIELD A:
HIGH SCHOOL MULTI-USE SYNTHETIC FIELD AND TRACK



1

THE FIELD NEEDS TO BE REPLACED AS THE TURF IS BREAKING DOWN AND THE CONDITION OF THE SURFACE WILL BECOME UNSAFE.

FIELD C:
MIDDLE SCHOOL PRACTICE FIELD



2

THE FIELD PROVIDES ADJACENT PARKING AND IS NOT ADJACENT TO RESIDENTIAL PROPERTIES. THIS FIELD WOULD BE IDEAL FOR REPLACEMENT. ADDITIONALLY, THE REPLACEMENT WOULD TAKE ADDITIONAL PRESSURE OFF OTHER FIELDS.

FIELD B:
MIDDLE SCHOOL BASEBALL/SOFTBALL



3

THIS FIELD WILL NEED TO BE REPLACED IN 5-7 YEARS. IT IS RECOMMENDED THAT THIS FIELD IS ADDRESSED WHEN TIME COMES UP FOR REPLACEMENT.

FIELD D:
METACOMET PARK FIELDS



4

THE FIELD IS SURROUNDED BY RESIDENTIAL NEIGHBORS. IT IS RECOMMENDED THAT MINOR IMPROVEMENTS OCCUR ON AT THIS FACILITY

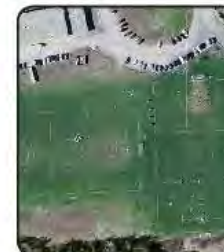
FIELD F:
SOCCER COMPLEX AT RALPH WHELOCK



5

THIS FACILITY IS IN THE BEST CONDITION. IT IS RECOMMENDED THAT THESE FIELDS RECEIVE MINOR IMPROVEMENTS AND WHEN FUNDS ARE AVAILABLE, A NEW RESTROOM, CONCESSION, AND PARKING FACILITY ARE PROVIDED

FIELD E:
RALPH WHELOCK SCHOOL MULTI-USE FIELDS



6

IT IS UNDERSTOOD THAT THIS SCHOOL WOULD POTENTIALLY BE REPLACED OR UNDERGO AN ADD/RENO. ANY IMPROVEMENTS COULD POTENTIALLY BE DISRUPTED BY THE FUTURE IMPROVEMENTS.

The synthetic track has clear base issues at the long-jump triple-jump areas. It is highly recommended that the "D-Zone Areas" are built to include synthetic track surfacing which will also assist in the function of the areas when running track meets. The track has been over-sprayed once to date. The track has reached an age in which it should be sprayed again. This should occur during this process. It should be noted that a track can only be sprayed a minimum of three times which should make the track functional for an additional five to six years.

- Alternate #1: A higher grade of synthetic turf which is a mixture of a monofilament fiber and a slit film fiber reducing the splash of infill during play. This turf will have a face weight and more fiber which will provide a product which will perform well and stand up to the rigors of use. Additionally, it is recommended that a coated sand infill would be used. The coated sand provides an infill system that creates a firm, fast playing surface. The use of coated sand and the current warranties allow for an infill that can be reused for up to two cycles. Lastly, the alternate includes a shock pad. The shock pad provides absorbency within the field structure. This will reduce the overall Gmax in the field. Current warranties include a maximum Gmax for the life of the warranty which ranges between 20-25 years.
- Alternate #2: A standard 2" turf with SBR Rubber and Sand Infill. Included in this alternate is a shock pad.
- Alternate #3: Includes 5 storage units with concrete pads. An allowance for upgraded athletic field equipment.

Opinion of Probable Cost - Medfield High School Multi-Use Synthetic Field and Track

TOTAL COSTS SAVINGS FOR ALTERNATES FOR MULTI-USE FIELD/TRACK REPLACEMENT

Item	Quantity	Unit	Unit Price	Total
Alternate #1: Option A				
Base Bid			\$	1,387,000.00
Deduct SBR Rubber and Sand			\$	(336,285.00)
Upgraded Turf, Coated Sand, Infill, and Shock Pad			\$	583,912.50
Alternate #1 Total				\$ 1,635,000.00
Alternate #2: Option B				
Base Bid			\$	1,387,000.00
Deduct SBR Rubber and Sand			\$	(336,285.00)
SBR Rubber, Sand, and Shock Pad			\$	472,850.00
Alternate #2 Total				\$ 1,524,000.00
Alternate #3				
Equipment & Closeout	1	LS	\$ 20,000.00	\$ 20,000.00
Storage Units with Pads	5	EA	\$ 12,000.00	\$ 60,000.00
Alternate #3 Total				\$ 90,000.00

