FACILITY AUDIT

Mt Greylock Regional High School

August 2, 2002

Focus Facility Services
187 Main St
Williamstown, MA 01267

Mt Greylock Regional School District
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Overview

The purpose of the Facility Audit is to provide a tool for use by the Administrators and School Committee Members in development of a Capital Expenditure Plan. The scope of the survey will be as follows:

- Develop a thorough inventory of all mechanical, plumbing and electrical systems including life safety. The inventory will include documentation of existing equipment size, capacity, efficiency, etc. and an estimate of remaining useful life.
- Evaluate the building shell for structural integrity and make recommendations for preserving and upgrading where necessary. This will include the roof and window systems.
- Meet with faculty, administrators and service people to further develop a needs assessment.
- Prepare budget estimates for recommended upgrades and improvements. Note, estimates will be cursory and conservative. As the program develops, specialists in each area should prepare more detailed estimates.

As indicated above the budget figures are intended for planning only and are not detailed enough to be used for final budget decisions, rather they should be used in relationship to each other in order to prioritize work and to establish preliminary budget impacts.

This report has been prepared with the help and assistance of the Mt Greylock Staff, in particular Marti Mellor and Alan Christiansen, who have been particularly helpful.

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Structural

The building construction is a slab on grade foundation with brick and masonry exterior bearing walls and structural columns as necessary to supplant the masonry supports. The interior partitions are constructed of masonry or sheetrock on metal studs. The roof is a flat metal pan system supported by bar joists. None of the supporting steel is fireproofed.

The construction class per the Building Code, 780 CMR is 2C, unprotected.

The structural integrity is good. Masonry walls appear sound and the structural steel shows no sign of deterioration. Some minor spalling (surface cracking of the brick caused by the expansion of frozen moisture trapped behind the surface) of the brick is evident at several of the wing walls that project form the building and are not heated from inside. The most notable is the wall at the entrance near the principal's office. Some of the exterior columns between the windows of the library are exhibiting the same problem. This does not pose a major problem at this time, but should be addressed in the next 5 years. Over time the wall will fail and require complete replacement. One other small area on the West side of the "Science Wing". should be attended to. In six places provisions were made for future openings in the brick wall, possibly for through the wall air conditioners. Steel lintels were installed to carry the brick above the opening. Water has gotten behind the mortar and pushed it away revealing the steel lintel. This should be caulked to prevent further deterioration. It is a simple job now and will prevent major problems in the future.

Roof

The entire roof system was replaced in 1985 with a single ply PVC membrane manufactured by J P Stevens and 4" of rigid insulation was installed to reduce heat loss. This level of insulation is very adequate for this application. The gym roof failed recently and the vendor replaced it under warranty. The balance of the roof is nearing the end of its life as evidenced by the appearance of the scrim (the woven reinforcing fabric that is embedded in the material to provide strength, flexibility and tear resistance). As the roof wears the scrim becomes more visible indicating wear of the surface material.

Typical PVC system life is 20-25 years and this roof is now 17 years old, but there are a number of areas where the scrim is now fully visible and all of the material above the scrim is completely worn away. This roof should be replaced no later than next summer. Aggressive maintenance will be required until then to prevent leaks from damaging the insulation below. At present a new roof can be laid directly over the existing roof, but if the insulation is damaged by moisture it will have to be removed at a significantly higher cost.

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Windows

All the windows are the original aluminum frame awning style with single pane glass. In the late 70's a second layer of glass was added by installing storm sash on the interior. They are in good condition and have a reasonable thermal efficiency, but lack several of the features available in windows today.

Modern aluminum windows have a thermal break in the sash itself, which restricts heat loss through the metal; aluminum has a very high coefficient of thermal transmission. Today's glazing systems now have much better ratings. Two and three layers of glass are now available with sealed cavities filled argon and enhanced with a low "E" film. This film restricts the escape of long wave radiation from objects in the building by trapping that energy in itself resulting in better thermal efficiencies and a warmer inner glass surface. This raises the mean radiant temperature of the surfaces in the space improving comfort. The best example of this effect is the supermarket. The temperature is the same everywhere, but when you walk down the frozen food aisle and are surrounded by the cold glass cases you will feel colder than when you are in the bread aisle. The space temperature never changes, but the mean radiant temperature does, so you feel cooler.

New glazing systems will save money and improve comfort, but do not produce acceptable paybacks. A typical 4 X 6 window loses energy equivalent to 16 gallons of oil per year. Replacement windows would reduce that to 9 gallons, a savings of only 7 gallons or roughly $7 / year. Replacement windows will cost $300-500 each. Energy savings alone do not justify replacement. Functionality and comfort do, but at this time the windows are functional.

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Boiler Room

The original boiler room was equipped with two York Shipley fire tube boilers that produce 7,088,000 Btu's per hour each. A third boiler, Iron Fireman, was added in 1970 to handle the extra load created by the new addition. It has a capacity of 8,375,000 Btu's per hour. All three boilers use #4 oil, a hybrid made by diluting #6 oil with residential grade #2 oil. The result is a higher Btu value fuel that costs less per gallon than #2 oil, however it is more difficult to handle and must be preheated before it can be burned effectively. Maintenance on burners of this type is high and competent service people are hard to find. Consider contacting Clark Heating, in Springfield, MA, 413-788-8150, because they have an excellent service record and are less than two hours away.

Fire tube boilers are made from welded steel in the shape of a horizontal drum. Inside the drum is a series of small (1-1 ½ ") pipes that carry the hot flue gasses, hence the name fire tube. The space between the large drum and the fire tubes is filled with water that is heated by the fire tubes and then pumped around the building. The tubes in boilers 1&2 were replaced in 1985 and the burners upgraded in 1986. Boiler # 3 has not been retubed.

Given the actual heating load of the building, See Appendix C, the boiler plant has significant excess capacity, almost 300%. The total capacity is 22,551,000 Btus per hour, while the actual connected heating load is only 10,747,400 Btus per hour, moreover the capacity of the pumps to distribute that heat is only 7,290,000 Btus per hour. This is not unusual due to diversity, i.e. not all devices use heat at the same time. Some classrooms may be receiving solar heat during the day, at night the ventilation systems will be off and the auditorium is rarely used at full capacity at the same time. Typically, large systems are never sized to handle the entire connected load; rather a diversity factor of about 70% is applied. So, the pumps are properly sized, but the boilers are oversized.

Redundancy is important however. When large boilers fail repair times can easily stretch into days and a standby boiler should be there to carry the load. In this case any one boiler could carry the load with some prudent operating procedures. There is a cost however, unfortunately, idle boilers, boilers that are hot but not contributing to the load, lose heat up the stack and consequently have a negative impact on operating efficiencies. In the short run boilers 1 & 2 should be run and #3 left cold until needed, or any other combination of the three.

All three boilers are near the end of their useful lives, (25-30) years. Retubing extends the life of a fire tube boiler, but not indefinitely. The burners are also now over 15 years old and have only 5-10 years of useful life remaining. The oil handling equipment is also old and will require updating. Due to the higher viscosity of the #4 oil, separate pumps and electric preheaters are required to deliver the oil to the burner. All in all, this equipment should be replaced.

It should be pointed out that the replacement of the boilers will result in a change from #4 oil to #2 oil, but the cost impact will be marginal. Based on Hess Oil's current NY Harbor prices, #2 oil is actually less expensive ($0.745 vs $0.775) than #4. As part of their efforts to comply with the Clean Air Act, DEP is requiring conversion to cleaner fuels when boilers are replaced.

Oil Tank

The existing underground oil tanks were installed in 1991, two 10,000 gal. #4 oil and one 1,000 gal diesel. The tanks are fiberglass and are monitored by a Gilbarco System, which monitors fuel level, water level and leakage, in both the interstitial space and in the monitoring wells. In addition the staff performs weekly manual tests for water, fuel level and leakage in the monitoring wells. This system is in compliance with all DEP regulations and has a good life expectancy, 20 + years remaining. The existing tanks are acceptable for storage of #2 oil.

Pumps

The entire building is heated by hot water, all of which originates here. A series of dedicated pumps, 7 total, move the hot water around the building to various locations, e.g. auditorium, classrooms and shops. In order to provide better control and to save energy the water temperature supplied by 5 of these pumps is adjusted in accordance with the outside temperature, i.e. as it gets colder outside the water gets hotter, varying between 100 °F and 180 °F. All five pumps are connected to a common header, one of which is reserved as a standby pump that can be switched over by merely adjusting the proper valves. The other two pumps (one is a standby) send high temperature hot water to the Gym Penthouse. This is not tempered because it is used to make domestic hot water for the gym showers.

In general these pumps are small and easily repaired and serviced. One consideration might be to replace them with a pair of larger pumps. This will reduce the number of pumps from 5 to 2, but will require the installation of balancing valves on each loop and the pump would have to be selected for the highest loop pressure drop. A further energy reduction can be achieved through the installation of a variable speed drive for the pumps. Drives vary the pump speed so it only uses as much energy as needed to complete the task of moving water around the building. Drives are relatively new. Before their introduction pumps were selected for the worst case and safety factors added, which resulted in oversized pumps, but the designer could be confident that the pumps would actually deliver the required flow. This resulted in excessively large pumps that use more energy than necessary. Mass. Electric also provides energy conservation rebates for the installation of drives.

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Gym Wing Heating and Ventilating

This section of the building currently houses athletics for both men and women, and originally housed the cafeteria and kitchen. In the 1970 addition, the cafeteria and kitchen were moved to the new wing and the gym floor was expanded to the west. The old kitchen now houses weights and Nautilus equipment and the cafeteria is now used for free exercise and wrestling.

Most of the H&V equipment is located in a penthouse over the boy's locker room; with the exception of two ceiling mounted H&V units in the Gym and wall mounted Unit Ventilators in the locker rooms, both men & women.

Additionally an air-to-air heat recovery ventilator was installed in the Boy's Locker Rm. It is believed that this unit was installed to counteract the deterioration of the ceiling in the shower area. A major portion of the plaster has fallen down and has not been repaired. This unit is capable of correcting the situation if operated properly, however it does not appear to be doing so at present.

Moreover, most of the equipment in this area is not functioning properly. The two original gym ventilation units are operating in the manual mode only, e.g. the fresh air dampers do not open automatically, and the H&V units for the former kitchen and cafeteria are not operating at all. All of this equipment is in poor condition, filters are dirty and the coils on the gym air handlers appear to be leaking. None of the equipment is equipped with proper belt guards. An OSHA inspection would result in a citation. The lack of guards is not a maintenance item; these units were manufactured before guards were universally required, never the less, guards should be installed on operating equipment.

Hot water for heating is distributed in this area by a series of small Bell and Gossett pumps mounted on a header in the penthouse, and the water temperature is modulated according to outdoor air temperature through a three-way valve, in the same manner as the system in the boiler room. There are five total, one is a standby. These pumps are small and have been replaced on an as-needed basis. Most are in fair to good condition. A dedicated pair of pumps in the boiler room, P-6&7, feed hot water directly to them. These pumps are reliable, readily available and easily serviced.

Due to the lack of proper ventilation the walls and ceilings in the boys locker room have deteriorated significantly. Plaster has fallen down and the paint is peeling. All of this should be corrected, but not until the ventilation issues are corrected.

Auditorium

The auditorium is heated and ventilated by central supply and exhaust fans located in the penthouse above the rear of the auditorium. The supply fan is in fair condition. The casing is rusty, the outside air dampers do not work, the outside air duct is uninsulated and the filters are in need of replacement. The automatic control switchover between occupied and unoccupied is not working. The return/exhaust fan is in good condition, but needs a belt guard.

The automatic relief dampers that ventilate the fly loft over the stage have been boarded up. The covering should be removed and the dampers made operable again.

Library

The Library is heated, cooled and ventilated by a roof top HVAC unit manufactured by Dunham Bush. This unit is in very poor condition and should be replaced. The housing is rusty and leaking and many of the components need repair or replacement.

Classroom Unit Ventilators

Every classroom is ventilated by unit ventilators. While a program to open the outdoor air dampers was begun, some outdoor air dampers appear to still be sealed, thus preventing proper ventilation. This is a major issue and should be corrected. Proper ventilation is the foundation of good Indoor Air Quality. Contaminant source control is important, but dilution is necessary in those cases where control is difficult or inherent, i.e. occupants with colds. Moreover several studies have shown that good IAQ is important not only for health and safety, but for improved performance as well. Schools with good IAQ have better attendance ratios and higher test scores.

All classrooms in the "1961" Wing are heated and ventilated by units manufactured by Schemenauer. Each classroom has two units, one for supply air and one for exhaust air. The unit inspected was in good condition. Based on a discussion with the Johnson Control service technician all of these units are in generally good working order. The automatic controls are complete and functional and include a two-speed switch, a room thermostat for day/night control, a discharge thermostat and a freeze protection thermostat. The enclosures are very rugged; approximately 10 gage (1/8"), and are in good condition, except for their appearance, which has suffered over the years. They are scratched and discolored but have very few dents and can be kept operational for another 10 years or more.

In the "1970" addition the Unit Ventilators are manufactured by the Trane Co., and unlike the Schemenauer ventilators, these units bring in outside air, which is exhausted by a series of roof mounted exhaust fans, 38 in total, rather than by a second wall mounted unit. In the unit inspected the Outdoor Air damper motor was missing and the outdoor air grille was sealed up with fiberglass insulation.

The enclosures on these units are not as rugged as the Schemenauer units and consequently are in worse condition even though they are 10 years younger. The top grille on the unit inspected was removed and replaced with unpainted expanded metal, which is functional but architecturally unacceptable. In general these units are near or at the end of their useful lives. The roof top exhaust fans are in good condition.

They are reliable and easily serviced and repaired. Moreover they sit on standard curbs and can be easily replaced when needed.

Miscellaneous Equipment

Air Conditioning

Three areas of the school are mechanically cooled, the Superintendent's Office, the Principal's Office and the Guidance Office. All of these systems have limitations. The unit in the Superintendent's Office is very old and appears to have been relocated from another use because it sits in the middle of the supply closet and takes up valuable floor space. Moreover the door to the closet has a large louver in it for return air. There is no return duct system. While it functions adequately, it is in need of replacement.

The Principal's office system is newer, but also in poor condition. It is also in a closet, but in this case it was designed for that location. Again it uses a central return and as a consequence is very noisy. A new unit will be more efficient, reliable and quieter.

The Guidance Office is cooled by a freestanding Liebert Unit. These units are designed for computer room cooling. They do not have ductwork connected to them and are noisy. Noise is less of an issue in a computer room. Thus, while the unit probably cools the core space, offices receive cooling only tangentially and only if the door is open. Because it is relatively new it will operate for another 10 years without major work, but is limited in its functionality.

Automatic Temperature Controls

The building HVAC systems are controlled by a Johnson Controls pneumatic control system. All of the equipment is operated and controlled pneumatically, e.g. classroom thermostats, ventilating units, hot water mixing valves, etc. The system is in good condition and is kept working through an annual maintenance contract with Johnson Controls. The maintenance contract should be continued and the system kept in place. There are newer DDC (Direct Digital Control) Systems that offer superior features, but are very costly. The existing system works well and can continue to do so for 10 yrs or more.

The main logic is provided by a DSC8500 controller. This unit is old and nearing obsolescence, so it should be upgraded.

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Plumbing

The distribution system for hot and cold water is in good condition and requires no upgrade at this time. The same is true for the waste and vent systems. All water piping is copper and insulated and the waste and vent piping is cast iron, copper or galvanized. All systems are in good condition.

Most of the fixtures are also in good condition. The water closets and lavatories are still firmly attached and are not chipped or broken. Many of the faucets are dripping or worse. In one Boy's bathroom 2 of the five faucets were running a solid stream and one was dripping. Otherwise the toilet rooms are in good condition. I am told that the faucet replacement is scheduled for completion this summer

The water for the school is supplied from two wells. Water is pumped from submersible pumps, one on the north side and one on the south side and stored in 3,000 gallon storage/compression tanks located in the penthouse over the Boy's locker room and in the boiler room. Storage capacity is adequate, but both tanks are nearing the end of their useful lives and should be scheduled for replacement. Pressure is controlled by a combination of pump pressure and air pressure. The tanks are fitted with three McDonnel Miller level controllers, one low limit, one high limit and one operating control. Tank pressure is augmented by an air compressor that adds additional pressure to help reduce pump cycling. All potable water in the building is protected from cross contamination by approved backflow preventors located on critical equipment.

During inspection the air safety relief valve on the north compression tank released resulting a very loud noise. This is a frequent occurrence, which is not acceptable. Safety devices are intended to operate infrequently and are not designed for high cycles. Improper functioning of the limit controllers causes this overpressure. The main operating control is not functioning as intended. The well pump does not start until the low limit contact is made and does not shut off until the high limit contact is made. There are two probable causes, improper wiring or accumulation of dirt in the float bowls of the limit controllers. All three float chambers should be removed and cleaned. If the problem persists verify the wiring sequence. A new wiring diagram is included.

Hot water is made in two locations, the gym penthouse and the boiler room. The gym has a 1,000 gallon storage tank while the boiler room has no storage. It uses tankless heaters mounted directly in the boilers. All hot water is heated by circulating boiler water; consequently one boiler must be operating in order to have hot water in the building. This is not the most energy efficient way to make hot water in the spring and fall.

Hot water is then tempered by mixing valves to lower the temperature to code mandated levels before it is distributed to the showers and lavatories. This is an effective method of reducing storage capacities. This system should be revamped and gas fired heaters installed for spring and fall use.

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Electrical

The facility receives its power from Massachusetts Electric Co. They provide the transformer, 500 KVA, which is located in a vault adjacent to the boiler room. In addition there are two diesel emergency generators that will provide essential services in the event of a loss of power from Mass Electric, one 55 kW for the "60" wing and one 15kW for the "70" wing. The larger unit powers the boilers, pumps, telecom and emergency lights. The smaller unit handles emergency lighting. The kitchen freezers are not protected. Both units are now very old, not in terms of run time, which are low, but in terms of serviceability. Both units should be replaced with one new unit capable of carrying the existing load plus the freezers.

The main service is 2,000 amp, three phase, 208 volts and enters the building in the boiler room. Most of the distribution equipment is original, (dating from1960), with the exception of the main circuit breaker, which has been replaced. This new circuit breaker has an AIC rating of 65,000 Amps, which exceeds the potential available fault current from the MECO transformer. The service entrance has good fault current protection. This is an important safety feature, because circuit breakers must be sized to protect the wire and devices from dangerous overloads, and be rated for the available fault current.

This is the first step. A coordination study, (each circuit breaker downstream of the main circuit breaker is evaluated to determine its available fault current and then compared to its rating) should be performed to determine the extent of protection and assess any further potential problems. For the purpose of this study it will be assumed that the distribution circuit breakers will require replacement at a future date.

The above notwithstanding, the electrical distribution and wiring in the facility are in good condition. The distribution panels are in good condition and the wiring inside appears to be sound. All of the wire is copper and the insulation is not frayed or brittle. The panels do not have main breakers, which is not a Code issue, but main breakers are preferable and should be included whenever a panel is replaced or modified.

Sample outlets in the walls were removed for inspection purposes. The wire is solid copper with THW or RHW insulation. The insulation is still pliable and has not become brittle indicating that there is residual life, at least another 10 years, in the distribution wiring. All of the outlets are of the grounding type, but they are not directly connected to the box, rather they rely on the screws that secure the outlet to the back box for that connection. Current Code requires a supplemental ground wire between the ground terminal of the outlet and the back box. This does not constitute a major deficiency, but should be corrected whenever outlets are replaced.

In some classrooms it was noted that additional outlets have been added by running WireMold along the surface of the walls. In general the distribution panels are full, i.e. there is no room to add additional breakers, but most circuits have adequate capacity to add another outlet or two depending on the intended use. A licensed electrician can

advise on the capacity of any circuit to carry additional load. All future additions must be done with surface wiring because all of the partitions are concrete block and there are very few opportunities to hide the wire.

The lighting is in very good condition. All of the fluorescent fixtures have been upgraded from T-12 lamps to the newer, more efficient T-8 lamps and corresponding electronic ballasts. Light levels are also good. No work is required here.

Fire Alarm System

The building is equipped with a limited coverage, twelve-zone, Simplex Model 2002 Fire Alarm Panel. The annunciator panel is located in the Principal's Office. A written description of the zones is available, but is not clearly posted. In general the system consists of Manual Pull Stations, Smoke Detectors in the hallways, library, cafeteria, auditorium, boiler room and gym, and Horns and Strobe Lights for annunciation. The ceiling mounted smoke detectors in the hallways should be spaced a maximum of 30' apart. Some were noted to be farther apart than the 30-foot limit and some are missing. This should be corrected. In general the system is limited and does not meet the current code requirements.

It should be replaced with a new system that conforms to the current Building Code, CMR 780, which requires a full coverage system, "Protected Premises Fire Alarm System, NFPA 72", that would include a smoke detector in every classroom, closet, bathroom etc. Additional alarm annunciation devices (horns and strobes) are also required to improve overall audibility, especially in bathrooms and locker rooms.

The pull stations are too high (67" above the floor). Current ADA standards require all accessible devices to be mounted no more than 54" for side reach and 48" for front reach. This should be corrected when the new system is installed.

Existing buildings are exempted from the requirements of the Building Code, CMR 780, but Article 34 of the code links fire alarm systems to alterations and renovations. A new system is required whenever "substantial" work is done. The Building Inspector is the arbiter of "substantial". Thus, whenever the building is renovated it is very likely that a new fire alarm system will be required.

Sprinklers

There is no sprinkler coverage in the building and again sprinklers are not required at present, but would be in a new facility. Article 34 applies in this instance as well. While the installation of the piping is relatively straight forward, a reliable source of water is not. The wells constitute a special circumstance and necessitate a system for storage and pumping. This could very well add significant cost to the installation of a sprinkler system. I recommend careful study of this requirement before any "substantial" renovations are undertaken.

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Energy

Appendix F details annual energy and water consumption for the past eleven years. The most telling statistics are the gallons per degree-day and the Btu's per square foot per year. As you can see on the chart, weather varies from year to year and degree-days provide a common base so consumption can be compared on a year-to-year basis. On average the school uses about 12 gallons per degree-day, with a high of 13.9 and a low of 10.6. All-in-all consumption is relatively consistent. Some of the variation may also be due to timing of the large deliveries. Oil is delivered in tan trucks that typically carry 6,000 to 7,000 gallons.

The second number, Btu's per square foot per year provides an index for comparing the institution's consumption with other comparable institutions. The range is from 88,000 to 108,000 Btu's per square foot per year. This is very good for a building of this age and condition. The Hotchkiss School in Connecticut uses approximately 94,000 Btu's pre square foot per year and Williams College uses about 125,000 Btu's per square foot per year.

Water consumption is up slightly, about 320,000 gallons over the prior years. Some of this is attributable to the leaking faucets and should decline now that the leaks have been stopped.

Thus, opportunities for energy conservation are limited. New boilers will be more efficient, but those efficiencies will be offset by the restoration of proper ventilation. The new water heaters will save some energy also. All lighting has been retrofitted with low energy T-8 lamps and electronic ballasts. The envelope is sound and well insulated. The roof has adequate insulation and the windows are double-glazed. Continued use of the maintenance contract with Johnson Controls is necessary to ensure continued low consumption. Properly calibrated controls and a working night setback system are the most important components of a good energy conservation control system.

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Budget Estimates

1. Roof Replacement		$ 400,000
2. IAQ		
o Classroom Unit Vents	$40,000	
o Gym Ventilation	$58,000	
o Auditorium ventilation	$ 4,000	
		$ 103,000
3. Library Rooftop HVAC Unit		$ 45,000
4. Domestic Water Storage Tanks		$ 59,800
5. Gas Water Heaters		
o Gym	$10,000	
o Kitchen	$ 7,500	
o Boiler Rm	$ 4,000	
		$ 21,500
6. AC Systems		
o Principal's Office	$ 6,500	
o SPED	$ 5,000	
o Computer Rm	$ 5,000	
o Guidance	$10,000	
o Superintendent	$ 6,500	
		$ 33,000
7. Fire Alarm System		$ 75,000
8. New Boilers		$ 250,000
9. Emergency Generator		$ 75,000
10. Unit Ventilators		$ 360,000
11. DSC 8500		$ 10,000
12. Coordination Study & Electric Panel Upgrades		$ 50,000
Total		**$1,482 ,300**

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Recommended Improvements (Listed in order of priority)

1. Replace the roof during the summer of 2003

2. Improve Indoor Air Quality
   - Restore fresh air to the classroom unit ventilators.
   - Restore / replace the exhaust and make-up air fans in the Gym Wing.
   - Reconnect / repair the fresh air dampers and repair the ductwork and insulation in the Auditorium.

3. Replace the roof top Air Conditioning unit serving the Library.

4. Replace both 3,000-gallon water tanks. The hand holes are very rusty indicating potential failure.

5. Improve the Hot Water system by installing new gas fired systems for the Gym, Kitchen and Main building. Local gas fired units will save energy because the large boilers will not have to run until required for heating.

6. Upgrade, add or replace AC. Systems
   - Principal's Office –Unit is old and noisy
   - Computer Rooms – No AC at present, replace the unit vent with a new unit ventilator with AC.
   - SPED Office – No AC at present, replace the unit vent with a new unit ventilator with AC.
   - Guidance – Replace the Liebert Unit with a new quieter unit and add fresh air ducts.
   - Superintendent's Office – Replace the existing unit to achieve more storage and flexibility.

7. Replace the Fire Alarm System with a new "Protected Premises" system to provide full coverage for all areas.

8. Replace the existing boilers with 4 new cast iron, 3,000 MBH capacity boilers firing #2 oil.

9. Replace the existing emergency generators with one new 100 KVA unit and add the kitchen freezers.

10. Replace the unit ventilators
    - Replace the units in the "70" Wing
    - Replace the units in the "60" Wing

11. Replace the DSC 8500 Temperature Control

12. Perform Coordination Study and upgrade electrical distribution panels

APPENDIX A
Mount Greylock Regional School District
Williamstown, MA

Mechanical Equipment List

Fan:H-1 Area Served: Class Rooms "70" Unit Ventilator
Location: _____
Mfgr:Trane

Model: _____
Serial #: _____
CFM:500
Pressure: _____ " Water
Coil Type:Htg Length: _____ Width: _____ Mbh: 41.3
Coil Type:_____ Length: _____ Width: _____ Mbh: _____
Filter Type:Fiberglass Length: _____ Width: _____ Thickness: _____ Qty: _____
Motor HP: _____ Speed: _____RPM Frame: _____
Belts: Direct Drive
Condition / Notes:
Average condition for their age. Outdoor dampers are not functioning for ventilation

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Fan:H-2 Area Served: Class Rooms "70" Unit Ventilator
Location: _____
Mfgr:Trane

Model: _____
Serial #: _____
CFM:750
Pressure: _____ " Water
Coil Type:Htg Length: _____ Width: _____ Mbh: 62.0
Coil Type:_____ Length: _____ Width: _____ Mbh: _____
Filter Type:Fiberglass Length: _____ Width: _____ Thickness: _____ Qty: _____
Motor HP: _____ Speed: _____RPM Frame: _____
Belts: Direct Drive
Condition / Notes:
Average condition for their age. Outdoor dampers are not functioning for ventilation

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Fan:H-3 Area Served: Class Rooms "70" Unit Ventilator
Location: _____
Mfgr:Trane

Model: _____
Serial #: _____
CFM:1,000
Pressure: _____ " Water
Coil Type:Htg Length: _____ Width: _____ Mbh: 82.6
Coil Type:_____ Length: _____ Width: _____ Mbh: _____
Filter Type:Fiberglass Length: _____ Width: _____ Thickness: _____ Qty: _____
Motor HP: _____ Speed: _____RPM Frame: _____
Belts: Direct Drive
Condition / Notes:
Average condition for their age. Outdoor dampers are not functioning for ventilation

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APPENDIX A
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Mechanical Equipment List

Fan:H-4 Area Served: Cafeteria/Lockers Unit Ventilators
Location: _____
Mfgr:Trane
Model: _____
Serial #: _____
CFM:1,250
Pressure: _____ " Water
Coil Type:Htg Length: _____ Width: _____ Mbh: 103.2
Coil Type:_____ Length: _____ Width: _____ Mbh: _____
Filter Type:Fiberglass Length: _____ Width: _____ Thickness: _____Qty: _____
Motor HP: _____ Speed: _____RPM Frame: _____
Belts: Direct Drive
Condition / Notes:
Average condition for their age. Outdoor dampers are not functioning for ventilation

---

Fan:H-5 Area Served: Library
Location: Rooftop
Mfgr:Dunham Bush
Model: RTMZ-30-C-Q
Serial #: RC-68-6206
CFM:12,000
Pressure: _____ " Water
Coil Type:Htg Length: _____ Width: _____ Mbh: 829
Coil Type:Clg Length: _____ Width: _____ Mbh: 298
Filter Type:_____ Length: _____ Width: _____ Thickness: _____Qty: _____
Motor HP: _____ Speed: _____RPM Frame: _____
Belts: _____
Condition / Notes:
Poor- Unit must be replaced

Fan:H-6 Area Served: Gymnasium
Location: Gym Ceiling
Mfgr:_____
Model: _____
Serial #: _____
CFM:3,125
Pressure: _____ " Water
Coil Type:Htg Length: _____ Width: _____ Mbh: 275
Coil Type:_____ Length: _____ Width: _____ Mbh: _____
Filter Type:_____ Length: _____ Width: _____ Thickness: _____Qty: _____
Motor HP: _____ Speed: _____RPM Frame: _____
Belts: _____
Condition / Notes:
Average for their age
2 Units provide heating and ventilation

APPENDIX A
Mount Greylock Regional School District
Williamstown, MA

Mechanical Equipment List

Fan:H-7/8 Area Served: "70" Admin Offices
Location: Closet
Mfgr:Trane
Model: _____
Serial #: _____
CFM:1,800
Pressure: _____ " Water
Coil Type:AC/DX Length: _____ Width: _____ Mbh: 48
Coil Type:_____ Length: _____ Width: _____ Mbh: _____
Filter Type:_____ Length: _____ Width: _____ Thickness: _____Qty: _____
Motor HP: _____ Speed: _____RPM Frame: _____
Belts: _____
Condition / Notes:
Average to Poor, Very Noisy

Fan:H-29 Area Served: Guidance
Location: Ceiling
Mfgr:_____
Model: _____
Serial #: _____
CFM:700
Pressure: _____ " Water
Coil Type:Htg Length: _____ Width: _____ Mbh: 14.4
Coil Type:_____ Length: _____ Width: _____ Mbh: _____
Filter Type:_____ Length: _____ Width: _____ Thickness: _____Qty: _____
Motor HP: _____ Speed: _____RPM Frame: _____
Belts: _____
Condition / Notes:
Average - no outdoor air connection for ventilation. Interior spaces have no fresh air. Exterior offices have windows for natural ventilation.

Fan:H-1 Area Served: Class Rooms "60" Unit Ventilators
Location: Lockers
Mfgr:Schemenauer
Model: _____
Serial #: _____
CFM:1,500
Pressure: _____ " Water
Coil Type:Htg Length: _____ Width: _____ Mbh: 110
Coil Type:_____ Length: _____ Width: _____ Mbh: _____
Filter Type:_____ Length: _____ Width: _____ Thickness: _____Qty: _____
Motor HP: _____ Speed: _____RPM Frame: _____
Belts: Direct Drive
Condition / Notes:
Good - built from higher gauge sheet metal.

APPENDIX A
Mount Greylock Regional School District
Williamstown, MA

Mechanical Equipment List

Fan:H-3 Area Served: Class Rooms "60" Unit Ventilators
Location: _____
Mfgr:Schemenauer

Model: _____
Serial #: _____
CFM:1,000
Pressure: _____ " Water
Coil Type:Htg Length: _____ Width: _____ Mbh: 88
Coil Type:_____ Length: _____ Width: _____ Mbh: _____
Filter Type:Fiberglass Length: _____ Width: _____ Thickness: _____ Qty: _____
Motor HP: _____ Speed: _____RPM Frame: _____
Belts: Direct Drive
Condition / Notes:
Good - built from higher gauge sheet metal.

Fan:H-4 Area Served: Audio Visual
Location: _____
Mfgr:Schemenauer

Model: _____
Serial #: _____
CFM:750
Pressure: _____ " Water
Coil Type:Htg Length: _____ Width: _____ Mbh: _____
Coil Type:_____ Length: _____ Width: _____ Mbh: _____
Filter Type:Fiberglass Length: _____ Width: _____ Thickness: _____ Qty: _____
Motor HP: _____ Speed: _____RPM Frame: _____
Belts: _____
Condition / Notes:
Good - built from higher gauge sheet metal.

Fan:H-8 Area Served: Gymnasium
Location: Mech Penthouse
Mfgr:Schemenauer

Model: _____
Serial #: _____
CFM:5,400
Pressure: _____ " Water
Coil Type:Htg Length: _____ Width: _____ Mbh: 550
Coil Type:_____ Length: _____ Width: _____ Mbh: _____
Filter Type:_____ Length: _____ Width: _____ Thickness: _____ Qty: _____
Motor HP: _____ Speed: _____RPM Frame: _____
Belts: _____
Condition / Notes:
Outdoor air connections have been permanently closed and dampers disconnected
There are two units, unit to the west was running, east unit was not running

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APPENDIX A
Mount Greylock Regional School District
Williamstown, MA

Mechanical Equipment List

Fan:H-9 Area Served: Auditorium
Location: Aud Penthouse
Mfgr:Schemenauer

Model: _____
Serial #: _____
CFM:6,000
Pressure: _____ " Water
Coil Type:Htg Length: _____ Width: _____ Mbh: 600
Coil Type:_____ Length: _____ Width: _____ Mbh: _____
Filter Type:Fiberglass Length: 80" Width: 16" Thickness: 2"Qty: 4
Motor HP: _____ Speed: _____RPM Frame: _____
Belts: _____
Condition / Notes:
Poor - Coil appears to be leaking
Casing very rusty
Ventilation switchover not working

Fan:H-24 Area Served: Aud Exh
Location: Aud Penthouse
Mfgr:American Standard

Model: 222 DS
Serial #: M8-94126A
CFM:3,000
Pressure: _____ " Water
Coil Type:_____ Length: _____ Width: _____ Mbh: _____
Coil Type:_____ Length: _____ Width: _____ Mbh: _____
Filter Type:_____ Length: _____ Width: _____ Thickness: _____Qty: _____
Motor HP: _____ Speed: _____RPM Frame: _____
Belts: _____
Condition / Notes:
Average

Fan:EF 1/2 Area Served: Boy'sShowers and Toilets
Location: Gym Penthouse
Mfgr:American Standard

Model: 90 AT
Serial #: _____
CFM:2,700
Pressure: _____ " Water
Coil Type:_____ Length: _____ Width: _____ Mbh: _____
Coil Type:_____ Length: _____ Width: _____ Mbh: _____
Filter Type:_____ Length: _____ Width: _____ Thickness: _____Qty: _____
Motor HP: _____ Speed: _____RPM Frame: _____
Belts: _____
Condition / Notes:
EF-1 has no motor
No belts installed

APPENDIX A
Mount Greylock Regional School District
Williamstown, MA

Mechanical Equipment List

Fan:EF-3 Area Served: Weight Rm
Location: Gym Penthouse
Mfgr:American Standard
Model: 135 BT
Serial #: _____
CFM:_____
Pressure: _____ " Water
Coil Type:_____ Length: _____ Width: _____ Mbh: _____
Coil Type:_____ Length: _____ Width: _____ Mbh: _____
Filter Type:_____ Length: _____ Width: _____ Thickness: _____Qty: _____
Motor HP: _____ Speed: _____RPM Frame: _____
Belts: _____
Condition / Notes:
Exhaust fan for H&V unit for Weight Rm
H&V unit is not operational, motor is missing

Fan:EF-4/5 Area Served: Gym
Location: Gym Penthouse
Mfgr:American Standard
Model: 200CT
Serial #: _____
CFM:2,700
Pressure: _____ " Water
Coil Type:_____ Length: _____ Width: _____ Mbh: _____
Coil Type:_____ Length: _____ Width: _____ Mbh: _____
Filter Type:_____ Length: _____ Width: _____ Thickness: _____Qty: _____
Motor HP: _____ Speed: _____RPM Frame: _____
Belts: _____
Condition / Notes:
No Belts Installed
Provide exhaust air for Gym H&V units, H-8

Fan:EF-6 Area Served: Boys Lockers
Location: Gym Penthouse
Mfgr:American Standard
Model: 105 AT
Serial #: _____
CFM:_____
Pressure: _____ " Water
Coil Type:_____ Length: _____ Width: _____ Mbh: _____
Coil Type:_____ Length: _____ Width: _____ Mbh: _____
Filter Type:_____ Length: _____ Width: _____ Thickness: _____Qty: _____
Motor HP: 1/6 Speed: 1725RPM Frame: _____
Belts: _____
Condition / Notes:
Unit is operational, but not running at time of visit

APPENDIX A
Mount Greylock Regional School District
Williamstown, MA

Mechanical Equipment List

Fan:EF-7 Area Served: Boys Shower
Location: Gym Penthouse
Mfgr:American Standard

Model: 90 AT
Serial #: _____
Pressure: _____ " Water

CFM:_____
Coil Type:_____ Length: _____ Width: _____ Mbh: _____
Coil Type:_____ Length: _____ Width: _____ Mbh: _____
Filter Type:_____ Length: _____ Width: _____ Thickness: _____ Qty: _____
Motor HP: 1/6 Speed: 1725RPM Frame: _____
Belts: _____
Condition / Notes:
No Belts or motor

Fan:_____ Area Served: _____
Location: _____
Mfgr:_____

Model: _____
Serial #: _____
Pressure: _____ " Water

CFM:_____
Coil Type:_____ Length: _____ Width: _____ Mbh: _____
Coil Type:_____ Length: _____ Width: _____ Mbh: _____
Filter Type:_____ Length: _____ Width: _____ Thickness: _____ Qty: _____
Motor HP: _____ Speed: _____RPM Frame: _____
Belts: _____
Condition / Notes:

Fan:_____ Area Served: _____
Location: _____
Mfgr:_____

Model: _____
Serial #: _____
Pressure: _____ " Water

CFM:_____
Coil Type:_____ Length: _____ Width: _____ Mbh: _____
Coil Type:_____ Length: _____ Width: _____ Mbh: _____
Filter Type:_____ Length: _____ Width: _____ Thickness: _____ Qty: _____
Motor HP: _____ Speed: _____RPM Frame: _____
Belts: _____
Condition / Notes:

APPENDIX B
Mount Greylock Regional School District
Williamstown, MA

Mechanical Equipment List

Pump: P-1 Area Served: Classroom Wing "60"
Location: Boiler Rm
Mfgr:B&G Model: 1531 21/2 AB 5BF
Serial #:
GPM:208 Pressure: 82Ft
Motor HP: 7.5 Speed: 3450RPM Frame: 215
Condition / Notes:

Pump: P-2 Area Served: Shops & Auditorium
Location: Boiler Rm
Mfgr:B&G Model: 1531 21/2 AB 5BF
Serial #: _____
GPM:90 Pressure: 44Ft
Motor HP: 7.5 Speed: 3600RPM Frame: 215
Condition / Notes:

Pump: P-3 Area Served: Admin Wing
Location: Boiler Rm
Mfgr:B&G Model: 1531 21/2 AB 5BF
Serial #: _____
GPM:41 Pressure: 50Ft
Motor HP: 7.5 Speed: 3600RPM Frame: 215
Condition / Notes:

Pump: P-4 Area Served: Spare
Location: Boiler Rm
Mfgr:B&G Model: 1531 21/2 AB 5BF
Serial #: _____
GPM:208 Pressure: 82Ft
Motor HP: 7.5 Speed: 3600RPM Frame: 215
Condition / Notes:
Should be 10 Hp to back-up P-5 at 220 Gpm and 100'

APPENDIX B
Mount Greylock Regional School District
Williamstown, MA

Mechanical Equipment List

Pump: P-5 Area Served: New Wing "70"
Location: Boiler Rm
Mfgr:B&G
Model: 1531 2 1/2 AB 5 1/2 Br
Serial #: 1485422
GPM:220
Pressure: 100Ft
Motor HP: 10 Speed: 3600RPM Frame: 215
Condition / Notes:

Pump: P-6 Area Served: Gym Penthouse
Location: Boiler Rm
Mfgr:B&G
Model: 1531 2 1/2 AB 5 BF
Serial #: _____
GPM:170
Pressure: 130Ft
Motor HP: 10 Speed: 3600RPM Frame: 215
Condition / Notes:
Direct line to Gym Penthouse
Water is not mixed, always 180 F

Pump: P-7 Area Served: Gym Penthouse
Location: Boiler Rm
Mfgr:B&G
Model: 1531 2 1/2 AB 5 BF
Serial #: _____
GPM:170
Pressure: 130Ft
Motor HP: 10 Speed: 3600RPM Frame: 215
Condition / Notes:
Standby for P-6

Pump: P-4 Area Served: Standby
Location: Gym Penthouse
Mfgr:B&G
Model: 1522 3TH 1 1/4 AAB
Serial #: _____
GPM:43
Pressure: 39Ft
Motor HP: 1/2 Speed: _____RPM Frame: _____
Condition / Notes:
Number as indicated on JCI Control Panel

APPENDIX B
Mount Greylock Regional School District
Williamstown, MA

Mechanical Equipment List

Pump: P-5 Area Served: Gym H&V units
Location: Gym Penthouse
Mfgr:B&G
Model: 1522 3TH 1 1/4 AAB
Serial #: _____
GPM:67
Pressure: 17Ft
Motor HP: 1/2 Speed: _____RPM Frame: _____
Condition / Notes:
Number as indicated on JCI Control Panel

Pump: P-6 Area Served: Old Kit & Cafe
Location: Gym Penthouse
Mfgr:B&G
Model: 1522 3TH 1 1/4 AAB
Serial #: _____
GPM:43
Pressure: 39Ft
Motor HP: 1/2 Speed: _____RPM Frame: _____
Condition / Notes:
Number as indicated on JCI Control Panel

Pump: P-7 Area Served: Boys Lockers
Location: Gym Penthouse
Mfgr:B&G
Model: 1522 3TH 1 1/4 AAB
Serial #: _____
GPM:13
Pressure: 24Ft
Motor HP: 1/2 Speed: _____RPM Frame: _____
Condition / Notes:
Number as indicated on JCI Control Panel

Pump: P-8 Area Served: Girls Lockers
Location: Gym Penthouse
Mfgr:B&G
Model: 1522 3TH 1 1/4 AAB
Serial #: _____
GPM:68
Pressure: 53Ft
Motor HP: 1/2 Speed: _____RPM Frame: _____
Condition / Notes:
Number as indicated on JCI Control Panel
An additioanl pump was added in 1970, it appears to have been removed. It is assumed that P-8 serves both Girls Lockers and the two H-6 H&V units.

APPENDIX C

Boiler Capacity Analysis
Mount Greylock Regional School District
Williamstown, MA

AHU's & Unit Ventilators

1961 Bldg - Schemenauer

Unit	CFM	BtuH	Qty	Use	Total Load
H-1	1,500	110,000	7	Cafeteria/ Lockers	770,000
H-2				Not Used	0
H-3	1,000	88,000	45	Class Rooms	3,960,000
H-4	750	57,000	2	Misc	114,000
H-8	5,400	550,000	2	Gym	1,100,000
H-9	6,000	600,000	1	Auditorium	600,000
			57		
1970 Addition - Trane					
H-1	500	41,300	8		330,400
H-2	750	62,000	2		124,000
H-3	1,000	82,600	10		826,000
H-4	1,250	103,200	15		1,548,000
H-5	12,000	825,000	1	Roof Top Library	825,000 (25 tons)
H-6	3,120	275,000	2	Gym	550,000
			38		

Total Load Connected to Boiler **10,747,400 Btuh**

Pumps

Boiler Rm

Unit	Mfr	Model	Gpm	Use	Ft Hd	Hp
P-1	B&G	1531	208	Class Rm Wing "61"	82'	7.5
P-2	B&G	1531	90	Shops & Aud	44'	7.5
P-3	B&G	1531	41	Admin Wing	50'	7.5
P-4	B&G	1531	208	Spare	82'	7.5
P-5	B&G	1531	220	Class Rm "70" Add	100'	10
P-6	B&G	1531	170	Gymnasium	130'	10
P-7	B&G	1531	170	Spare	130'	10
			729			
Gym Penthouse - (Fed by P-6/7 in Boiler Rm)						
P-1	B&G	1522	13	Boys Lockers	24'	0.5
P-2	B&G	1522	67	Gymnasium	17'	0.5
P-3	B&G	1522	43	Café/ Weight Rm	39'	0.5
P-4	B&G	1522	15	Girls Lockers	35'	0.5
P-5	B&G	1522		Stdby		0.5
P-6	B&G	1522	68	"70" Add HV-6	53'	0.5
			206			

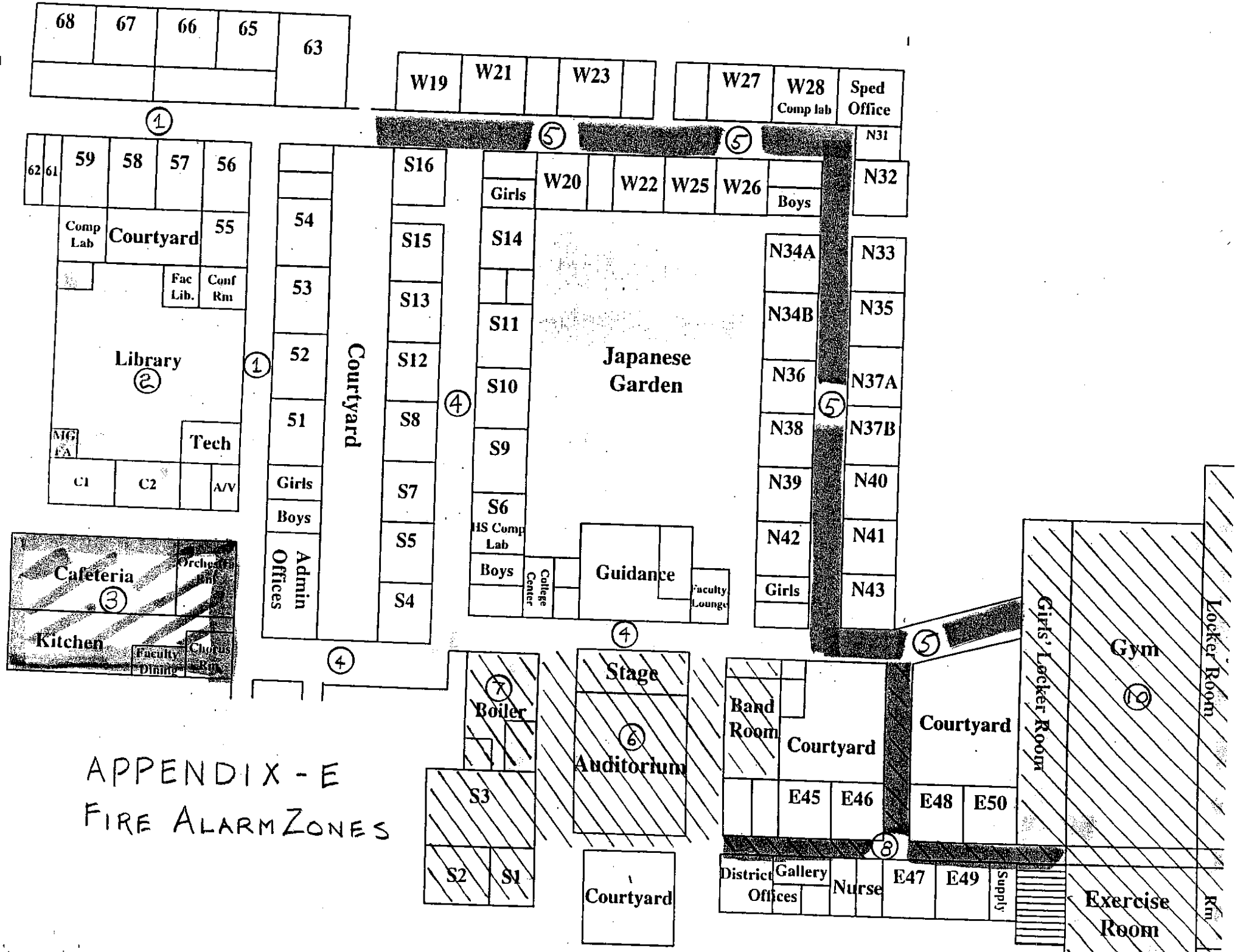
Total Pump Capacity in Btu's/hr **7,290,000 Btuh**

Boilers	Mfgr	#4 Oil gph	Model	SN	BtuH Gross
#1	York Shipley	56	YSM59W-175-AHPM	60-6296	7,088,000
#2	York Shipley	56	YSM59W-175-AHPM	60-3299	7,088,000
#3	Iron Fireman	68.8	302-W-250	13823	8,375,000

Total Boiler Capacity **22,551,000 Btuh**

APPENDIX D
Mount Greylock Regional High School
Energy Analysis

Total Energy and Utility Consumption													
		90/91	91/92	92/93	93/94	94/95	95/96	96/97	97/98	98/99	99/00	00/01	01/02
#4 OIL	$	$54,776	$39,851	$43,408	$41,845	$43,024	$43,001	$51,313	$36,853	$31,134	$57,108	$71,956	$53,529
	Gals	78,502	69,522	75,268	84,517	84,354	75,029	81,042	67,523	64,500	76,509	81,002	73,512
	$/Gal	0.698	0.573	0.577	0.495	0.510	0.573	0.633	0.546	0.483	0.746	0.888	0.728
	MMBtu	*11,932*	*10,567*	*11,441*	*12,847*	*12,822*	*11,404*	*12,318*	*10,263*	*9,804*	*11,629*	*12,312*	*11,174*
	Degree Days	*6,260*	*5,568*	*6,678*	6,909	6,074	7,100	6,599	6,079	6,168	6,217	6,757	5,533
	Gals/DD	12.54	12.49	11.27	12.23	13.89	10.57	12.28	11.11	10.46	12.31	11.99	13.29
Propane	*$*	$1,982	$2,472	$1,924	$2,425	$2,777	$2,919	$3,141	$2,809	$2,483	$3,143	$4,404	$4,850
	Gals	1,885	2,424	1,701	1,978	2,005	1,871	2,351	2,123	1,884	1,910	2,566	3,769
	$/Gal	1.051	1.020	1.131	1.226	1.385	1.560	1.336	1.323	1.318	1.646	1.716	1.287
	MMBtu	*189*	*242*	*170*	*198*	*201*	*187*	*235*	*212*	*188*	*191*	*257*	*377*
C Elec	*$*	$65,074	$67,920	$70,499	$56,801	$56,525	$62,560	$66,766	$64,703	$58,652	$61,852	$67,604	$72,372
	KWH	703,500	736,440	733,800	631,050	624,150	669,780	692,760	666,870	733,920	789,000	782,100	733,800
	$/KWH	0.0925	0.0922	0.0961	0.0900	0.0906	0.0934	0.0964	0.0970	0.0799	0.0784	0.0864	0.0986
	MMBtu	*2,401*	*2,513*	*2,504*	*2,154*	*2,130*	*2,286*	*2,364*	*2,276*	*2,505*	*2,693*	*2,669*	*2,504*
Water	*$*	$5,426	$3,749	$4,930	$2,672	$4,190	$6,148	$4,479	$7,015	$5,635	$5,840	$7,248	$10,657
	CCF	2,222	1,567	2,166	1,059	1,545	2,109	1,475	2,315	1,727	1,734	2,161	2,533
	$/CCF	$2.44	$2.39	$2.28	$2.52	$2.71	$2.92	$3.04	$3.03	$3.26	$3.37	$3.35	$4.21
	Gals	1,666,500	1,175,250	1,624,500	794,250	1,158,750	1,581,750	1,106,250	1,736,250	1,295,250	1,300,500	1,620,750	1,899,750
Total Cost		$127,258	$113,992	$120,761	$103,743	$106,516	$114,628	$125,699	$111,380	$97,904	$127,943	$151,212	$141,408
Total MMBtu		14,522	13,323	14,115	15,198	15,153	13,877	14,918	12,752	12,497	14,513	15,238	14,055
Btu/sq ft/yr		82,519	75,708	80,209	86,362	86,103	78,857	84,769	72,461	71,014	82,470	86,590	79,867
Facility Size Sq Ft		175,982											



APPENDIX - E
FIRE ALARM ZONES

APPENDIX F

Mount Greylock Regional School District
Williamstown, MA

Note: The full version of this report includes 16 pages of pictures not included in this version