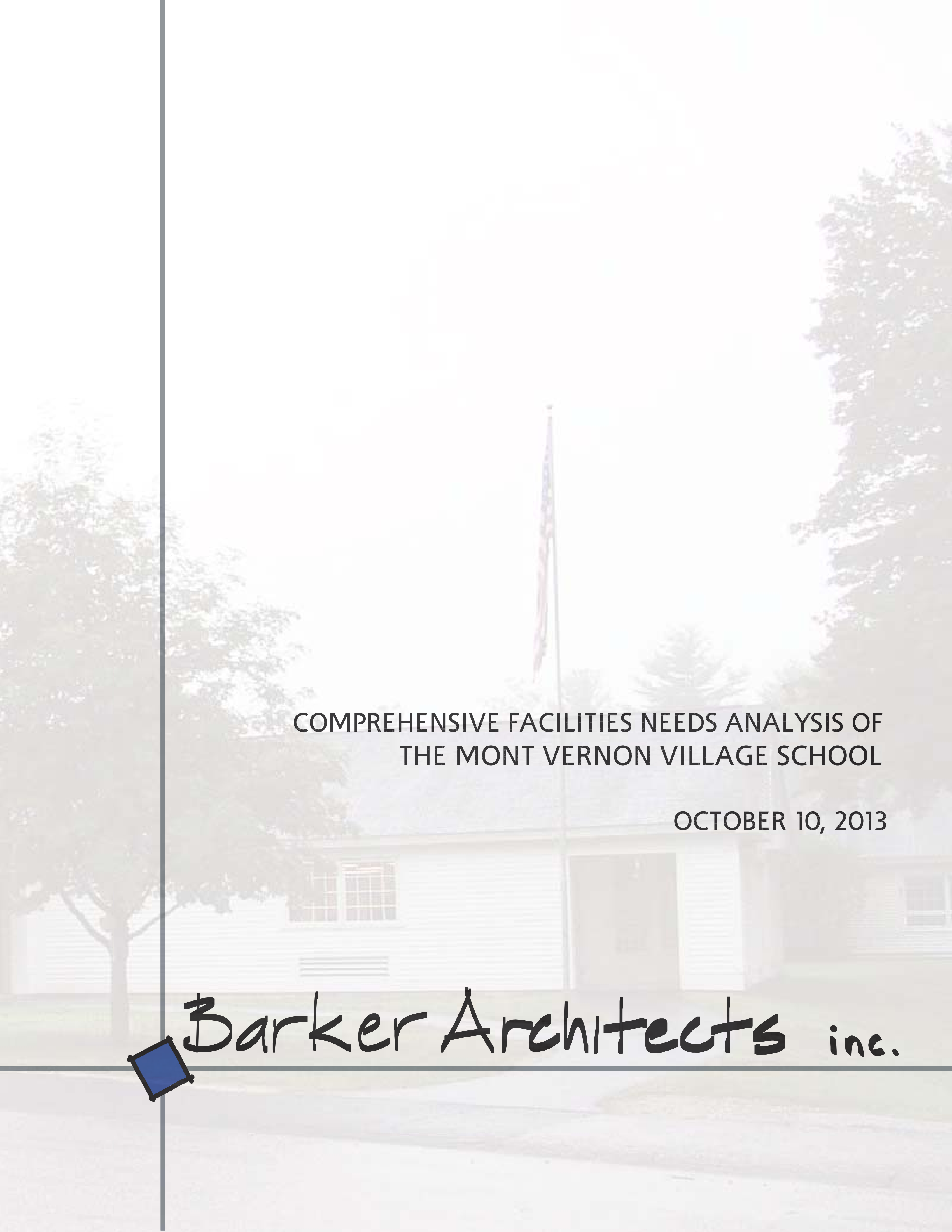

COMPREHENSIVE FACILITIES NEEDS ANALYSIS OF THE MONT VERNON VILLAGE SCHOOL

OCTOBER 10, 2013

Barker Architects inc.

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PURPOSE

Barker Architects, Inc. was hired in October, 2012 to perform a facilities assessment study. Barker Architects had previously (under the name "Jordan & Barker") performed a similar study in 2003. The result of that study was a comprehensive building performance renovation project that included: reroofing, foundation drainage, insulation upgrades and miscellaneous other improvements. This project did not, however, cover every item indicated in the original report.

Since the original report and subsequent improvement project many changes have been made and many and the building itself has continued to age. This report will attempt to bring up to date the issues that have been with the building and to add to it new issues or issues that have arisen due to changes in code or policies.

ASSUMPTIONS

Existing Conditions

Members of this firm toured the facility and interviewed key personnel on November 5th, 2012. Construction documents for the existing facility were obtained. On February 25th, 2013 an energy audit employing blower door pressurization tests and infrared scans was performed by IBEA, an engineering consultant to this firm. Additional information was obtained from Granite State Plumbing and Heating and Wilson Technologies, two maintenance contractors for the school district.

The results of this report are representative of the information obtained through the site visits and information provided by the Owner. Invasive or destructive testing was not performed. If additional information is discovered or conditions are found that were not readily apparent during the tour, this may affect the outcome of this report.

Building and Life Safety Codes

Code requirements change on a regular basis. Most codes are updated every three years but the date of adoption of those codes can vary. There are many codes and regulations that could impact the facility but there are essentially three to be concerned with:

- The State Fire Code (notably; 2009 NFPA 101- Life Safety Code)
- The State Building Code (notably: 2009 International Codes)
- Americans with Disabilities Act

Of the three categories only the Building Code has provisions for being "grandfathered". The Fire Code and ADA always need to be met, although enforcement is often deferred to a time when there is a major project at the facility.

This report will analyze the facility based on the codes as if all aspects were being enforced. It is advisable to communicate with the local authorities having jurisdiction and possibly the State Fire Marshal to identify what their priorities are before finalizing future work tasks.

Additionally there are no codes for security but since the Sandy Hook tragedy improvements for school security has intensified. It is recommended to include the local police department in discussions and to solicit input from the public to ascertain the proper level of security that this particular community requires.

Program Data

The space needs for a school is always unique to each district. We worked to identify the characteristics of this particular school and then we compared it to benchmarks to assess potential needs.

The first step in identifying space needs is to develop the program or a list of spaces and their correlating size. To do this we rely on several sources including; NH Department of Education Standards, Council for Educational Facility Planners Inc., other State Standards, examples of other similar projects and our own experience.

Most importantly we rely on the Owner to supply us information for their programs. This was done by interviewing the Principal and by analyzing how the building is currently used. Future changes is this data (e.g. convert to full day kindergarten) would therefore change the results in this report.

It is also important to note that we did not always use the "minimum" standards when analyzing the data. Class size in particular can greatly affect the space needs of a school. Current trends are to limit class sizes. For this study we used numbers that were neither the absolute maximum nor minimum. In fact we understand that students do not come in packages of 25 and therefore give ranges of number to try to reflect the reality of varying enrollments year to year.

Costs

The costs are all based on this year's cost. There are also sources that we rely on for costs such as RS Means and other projects in the area of similar types. For a report of this broad a scope, however, it is not possible to produce accurate estimates. These costs are based mostly on average cost per square foot. This will give us an "Order of Magnitude" estimate on cost for determining budgets. Individual line items may change under scrutiny, but total budget figures should be reasonably accurate.

There are a number of line items that are so detailed as to be impossible to estimate. These items may be small enough for staff or volunteers to accomplish. Essentially any item of less than $5000 is merely a place-holder item to be used as a checklist. These tasks should be done but any decent estimate is still only an "educated guess".

Expectations

As with any renovation project there are areas that will be left undone. It is not economically feasible to upgrade every aspect of an older building to meet the same criteria of new construction. It is important to set limits on expectations to avoid an endless amount of project growth.

ENROLLMENT PROJECTIONS

The most direct influence on space needs is the anticipated student enrollment. Projecting student enrollments however is very difficult. We use the "Cohort Survival Method" to create enrollment projections and we try to isolate known variables. The result is a potential range of anticipated student enrollments. The School Board and Administration however needs to weigh all the data and make the final determination.

In general there are two factors that affect student enrollments: Birth Rates and Immigration.

Birth Rates

Birth rates are very unpredictable and are influenced by social, economic and political factors. The most dramatic example of this is the "Baby Boom" generation of the 1950's.

This generation is still affecting our economy and our schools. This generation is 20% larger than any other generation currently alive and is 30% larger than the generation currently in peak child-bearing years. The children of the Baby Boomers are the next largest group and they are just reaching early adulthood.

The result is that current birth rates are low due to the fact that the parents are part of the smallest group of the three main generations capable of reproducing.

Immigration

The state is currently experiencing a net out-migration. This is not evenly distributed through the age groups. The older demographic (over 55) is experiencing an increase in population where the younger demographic (under 25) is declining in population.

Locally the analysis of historic enrollments shows a general increase in year-over-year student enrollments. This indicates that Mont Vernon is a desirable community and attracts families with school age children. The cost and availability of housing may have a dampening effect on the rate of immigration.

Long Term Predictions

Generally enrollment predictions for elementary schools are only as accurate as there is data for and that is limited to the last 5 years of births. Beyond that we need to estimate what we feel is going to be the birth rate based on our knowledge of the demographics.

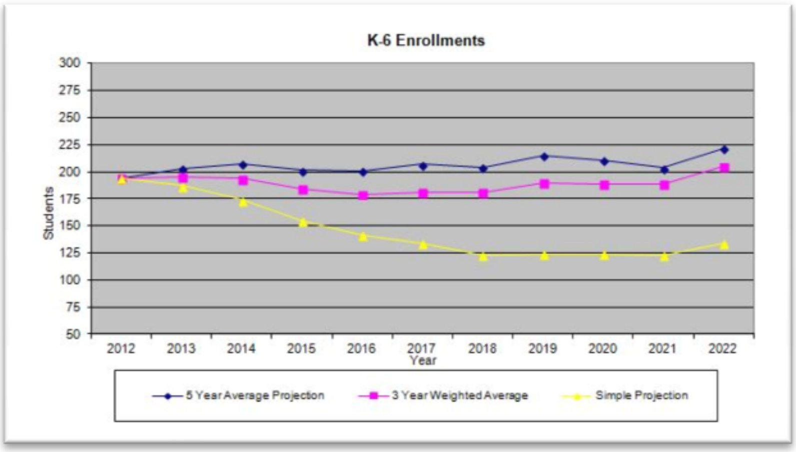

Figure 1 - Enrollment Projection Graph

The net effect is one of near flat enrollments with short term decline and very slow long-term growth. Initially, student enrollments will continue to remain low but may increase over the next ten years as the children of the Baby Boom generation start to have children of their own. This will be modified by the immigration both out (due to movement of younger demographic) and in (due to desirable character of the community).

<u>PROGRAM ANAYLSIS</u>

Overall the Mont Vernon Village School meets educational standards very well. With a few exceptions program areas appear almost ideal in size and arrangement.

Class Size

The State Department of Education limits class sizes to 25 in grades 1 and 2 and to 30 in higher grades. The average elementary school class size for the state is 19. Mont Vernon is well below those figures with an average class size of roughly 15.

Capacity Calculations

The calculation for the student capacity of a school is not an exact science. Adding one more student is always possible but as more students are added the quality of education is reduced. As enrollments are increasing it puts stress on program space to the point where as the Core Capacity is reach, adequate education is almost impossible.

To determine the capacity of this school we calculated the number of students that the school could hold if every classroom were populated with the likely minimum number of students and then with the absolute maximum number of students the rooms would hold. Those numbers are multiplied by a utilization factor to represent the inability to occupy every room 100% of the time. The resulting numbers we use as the Design Capacity and the Core Capacity.

The Design Capacity is the enrollment that is the optimum for education in this facility. The Core Capacity is the theoretical maximum this facility could handle, although not likely to experience. All core areas (library, gym, general office…) should be designed at the core capacity in order to account for the potential single year fluctuations in grade size.

Table B shows these calculations and identifies the Design Capacity as 209 and the Core Capacity as 291. However, the calculations of the individual core spaces reveal rooms that are below the Core Capacity. What this indicates is that although these spaces may not be experiencing difficulty at the current enrollment levels, if enrollment increases or if there is a single year surge, those individual programs may become stressed.

Future Program Changes

Many districts are embracing new techniques in delivering education. The current trend appears to be on collaborative learning and flexible learning. These methods can be delivered in traditional "double-loaded corridor" arrangements but benefit greatly if new spaces are introduced. These spaces would include:

- Arrangement of classrooms in "teams".
- Common open space off team areas.
- Decentralized teacher and student support areas.
- Small group rooms for general education as well as special education.

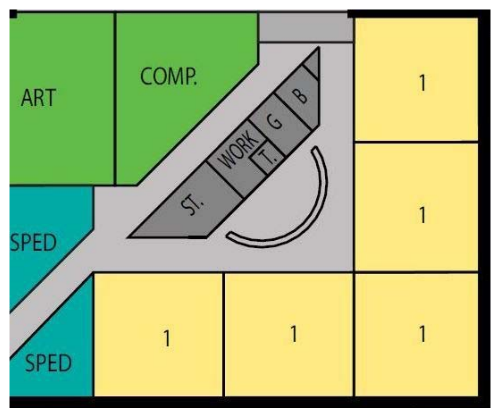

Figure 2 - "Learning Community" Design

It would be possible to retrofit Mont Vernon Village School to have a similar layout but it would require sacrificing a classroom in each wing to become a team area with small group and support.

Problem Areas

The lowest capacity space is the Nurse. The state dictates a 300 square foot minimum for nurse stations. At 190 square feet, it is undersized for the population and for the state requirements.

The next area of concern is the Art/Music room. This space appears to be functioning well now at the current enrollments, but if enrollments increase by about 20% there would likely be scheduling problems between the two programs.

Similarly the Multi-Purpose room could experience scheduling conflicts. This space serves as both a cafeteria and gymnasium. The utilization of the space is not the problem here. This area is more affected by scheduling because set up and clean up of dining tables takes up time. Noise and distractions of the types of activities here make overlap impossible. A more intense utilization than what is currently being experience would likely cause conflicts.

The Multi-purpose room is also used for large group meetings. There is a stage but the size of the stage is relatively small for any type of production. Because the Multi-purpose room is designed more as a gym it lacks good acoustics, thus hampering the effectiveness of the room for large functions and public meetings.

PHYSICAL PLANT ANALYSIS

Our method for physical plant analysis is to quantify all possible capital improvements in a prioritized matrix. By separating the tasks into priorities we give the Owner some flexibility in decision making.

- The high priority item are code required or health related issues that should be addressed in a 1-2 year period.
- The medium priority items are those with that do not pose risk but have health, educational or energy benefits that suggest some ergency. These should be addressed in a 3-5 year period.
- The low priority items are those items that are worth considering due to improved facility condition or energy performance. It may make sense to include these items with others for savings.

The tasks are meant to be capital improvements not maintenance items but the line between the two may become blurred. There may be many other items that are similar but not listed. This list is then more of a guideline to use to generate a final scope and cost when the tasks are planned.

Table E lists potential work items, their estimated cost and priority category. Drawings #2 indicates the location in plan (where applicable). Following are descriptions of some of the more major issues.

General Observations

Overall the facility is well maintained as compared to other similar schools. The issues discovered where mainly materials reaching end-of-life. There are several exceptions.

Ductboard: The majority of the ductwork installed in the 1980's addition is a material called "Ductboard". It is constructed of fiberglass insulation with a thin metallic outer coating and no interior lining. This is generally residential quality construction. There are a number of problems with this including issues of indoor air quality and energy efficiency.

There is no clear consensus on the safety of ductboard. There are industry reports in support of the use of ductboard and independent studies suggesting problems. The following can be reasonable assumed:

- Fiberglass is a known irratant.
- Dust is collecting on the inside of the duct.
- Taped seams and connections are failing allowing air to escape.
- The metalic outer coating has become brittle and is deteriorating.
- Fiberglass is not an air barrier thus reducing the effectiveness of the insulation and creating resistance to the air flow reducing the efficiency of the air handling units.

Figure 3 - Interior of Ductboard showing build-up of dust.

There is a product that coats the interior of ductboard with a polymer surface to create a smooth surface. However, the product is applied with pressure and the installer has indicated that the condition of the ductboard is too brittle to withstand the installation.

This only leaves replacement with metal ductwork the only remedial option. It may be worth cleaning and repairing the ductboard as is until new ductwork can be budgeted for.

Sprinklers and Fire Alarm: The only major code deficiency is the absence of an automatic sprinkler system. The building met the code requirement when built and therefor is grandfathered. Any future additions or alterations would certainly require installation of a sprinkler system since it no longer meets current code.

Regardless of the code requirements, the presence of an automatic sprinkler system is a benefit to the school for safety and property protection.

Site

There are few problems on the site. There may be several upgrades worth considering and several items of long term maintenance that should be budgetted for.

There is one area that does not drain properly. This is a low spot on the site and was used in the 2005 renovations as a dry-well location for drainage from the building. Apparently the dry-well is overwhelmed and the rainwater is not percolating into the water table. An additional dry-well located above the water table but downslope of the currnet dry-well would help with capacity.

Figure 4 - Drywell during construction in 2005.

Better utilization of McCollom field has been discussed but no clear plan is currently proposed. The playground also is due for some improvements. Reconfiguring the roadway at this area of the site could allow improvments and upgrades to the drainage and playstructures. A current trend in playground design that is worth considering is "Natrual" play structures which create most of the play spaces with landscaping materials and few manufactured pieces.

Figure 5 - "Natural" play structures.

Building services such as the septic and oil tank are aging and although not in need of replacement any time soon, will eventually need attention. It is recommended to set aside some funds to address these in the distant future.

Building Envelope / Energy

In 2005 the renovation project repaired most high priority issues including many building envelope problems. At that time the roof condition had created a safety hazard. Ice dams had caused roof leaks that damaged the building and caused ceilings to collapse. School was closed for a week due to the leaking.

Figure 6 - Picture taken before renovations showing R=19 attic insulation not properly installed.

The renovation project repaired the leaks, replaced the roof and has mostly prevented ice dams. The renovation project did not upgrade the envelope beyond a standard functioning level.

The energy audit shows the facility performing at average to slightly below average. The reasons include:

- Deteriorating ductwork.
- Code minimum insulation.
- Improperly installed insulation.
- Poorly performing air barriers.
- Inadequate door weatherstripping

The issue of the ductwork has been discussed but for this section it is worth discussing the performance. Warm air is being delivered through the existing ductwork and leaks into the attic space are causing a loss of energy. The amount duct insulation is no longer to code minimums and the effectiveness of what is there is suspect. Replacing the ductwork would obviously save on energy cost but the exact amount is hard to predict.

Figure 7 - Exit doors with no weather-stripping

The next major energy issue is the type and quality of the insulation and its installation. The amount of insulation was designed to code minimum at the time of construction. It is fiberglass insulation in the walls and the attic space. Fiberglass works well as insulation only if protected by an air barrier and fully lofted (not compressed). The energy audit discovered areas that could be improved. The attic insulation by its nature is exposed to air movement. Adding blown-in cellulose on top of the fiberglass would not only add insulation to the attic but protect the fiberglass from air movement and allow it to perform to its maximum.

Air sealing can be one of the most effective and cost efficient energy retrofits. Research has shown that air infiltration is more responsible for energy loss than heat transmission. The existing vapor barrier was install using standard practice at the time but now we have a better understanding of its importance.

The renovations in 2005 repaired many of the most problematic areas however there is always room for improvement. Some areas, such as the top of wall condition, may be impossible or impractical to address. The best recommendation is to develop a policy of sealing all penetrations into the drywall where air movement is present and continue to upgrade and maintain the air barriers.

Building Services

The boiler is 25 years old but recently rebuilt and in relatively good condition. There is no reason to believe that it could not perform as designed for the foreseeable future. As the boiler ages, maintenance may become more frequent and replacement will be necessary at some point.

Plumbing fixtures appear to be adequate in number and in reasonable shape. Infrared sensor faucets and flush valves would be a benefit by reducing the transmission of germs through touching the faucets and would help keep toilets clean.

The facility experiences occasional partial power outages. This is probably due to one or more phases of the three phase power being dropped from the power entering the building. This should be confirmed by contacting the utility company.

Figure 8 - Power strips plugged into power strips are against fire code.

If this is the case and it is determined that the power entering the building is somewhat unreliable, it could cause problems with equipment in the building that requires 3-phase power. Lighting and most electrical devices require single phase power to operate. Larger pieces of equipment and some mechanical motors require 3-phase power and can be damaged if the phasing is off.

Any equipment using 3-phase power should be turned off when a power outage of this type happens. Long term it may be possible to protect this equipment by providing 3-phase generator backup with an automatic transfer switch.

It was observed in several classrooms where power strips were "daisy-chained" to create multiple additional outlets. This does not meet fire code. Additional power outlets should be installed. It may be necessary to install additional sub-panels to provide the necessary breaker space.

Lighting throughout has mostly been updated to energy efficient models. Technology is changing rapidly and it is possible that within 5 years it will be cost effective to consider replacement. Any fixtures not already replaced should be upgraded and occupancy sensors would provide an almost immediate payback.

Life Safety / Building Code

There are relatively few code compliance issues. In general it is important to maintain the quality and operation of the exit doors and to provide and maintain fire rated construction through the path of egress.

Figure 9 - Boiler room ceiling has breaches in the fire rating.

Figure 10 - Door with built-in door stop prevents closer from operating.

Any penetrations into the corridor need to be properly sealed. These were mostly taken care of during the last renovations but often new installations of wiring or other improvements will happen and not get properly sealed.

There are several corridor doors that are not fire rated. Additionally many classroom doors are being held open by "door chocks". If keeping the doors open is important, then providing magnetic hold-opens tied to the fire alarm system would allow them to stay open while meeting code.

HC Accessibility

In general the building provides reasonable access and an accessible route throughout the building. There are handicap toilet facilities available and all spaces required for services are accessible. There are a number of improvements that could be made. Access to classrooms is inhibited by the lack of door clearances, knob handles still exist in a number of areas and the toilet rooms provided for teachers are not handicap accessible.

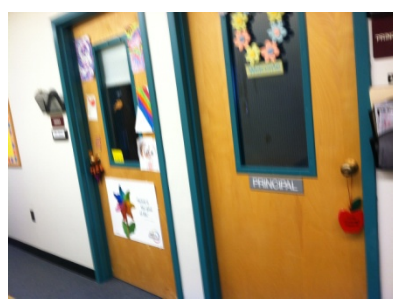

Figure 11 - The Principal's office is one of the doors that is not HC accessible.

Since the American Disabilities Act is a civil rights law and not a building code it is difficult to say what would immediately be required. It is reasonable to suggest that the accessible route into the classrooms be a priority and that the toilet facilities can be a future upgrade since some adequate facilities do exist.

Indoor Environmental Quality / Interior Finishes

This facility has mechanical ventilation throughout and all classrooms have operable windows making fresh air availability not a problem. There are some improvements that could be made. The kindergarten does have a problem of cold fresh air entering the room making it uncomfortable. The main air handling system does not have Demand Control which would be capable of reducing the amount of fresh air based on CO2 levels. The system is also not capable of energy recover that newer systems provide. Upgrading or replacing the air handling at the same time the ductwork is replaced is recommended.

Air Conditioning throughout the school would improve comfort during the shoulder months of May, June and September and would also allow the building to be used during the summer. The most efficient systems that provide some of the best performance are Variable Refrigerant Flow Heat Pumps. VRF Heat Pumps have the additional benefit of having the ability to switch to heat mode. This would provide an energy efficient heat source that could supplement the main boiler system.

The kitchen is experiencing overheating, over what would be expected in a kitchen. Equipment is being relocated as this report is being done which will help the problem. Additional suggestions are: Install an exhaust hood over the dishwasher and install an energy make-up air vent at kitchen hood.

As mentioned in the energy section of this report, new energy efficient lighting can be a very quick return on investment, even if new lighting has been installed within the last 5 years. More importantly, lighting quality can be significantly improved with new technology. New parabolic or pendant direct/indirect lights provide high quality ambient lighting that is easier on the eyes and improves the quality of the classroom.

Acoustical performance is now recognized as an important part of educational design. Mechanical systems and lighting ballasts create hums that can be hard to hear over. If the mechanical system is upgraded it would be an appropriate time to install vibration isolators or dampening materials. Many schools are installing sound amplification devices that are worn by that are hard of hearing.

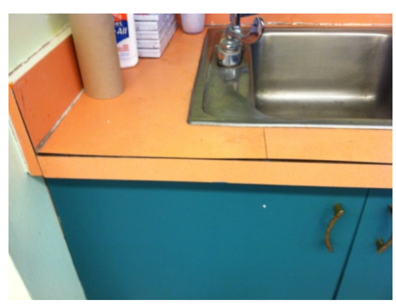

Figure 12 - Plastic Laminate counter delaminating.

Interior finishes are mostly in very good condition. The notable exception is the casework in the older classroom wing of the building. Here the cabinets do not have a smooth surface and the countertops are delaminating. There are also pieces of missing baseboard or damaged walls from past water problems. Addressing the condition of the finishes is important for maintaining cleanliness as well as esthetics.

Security

Security is a difficult topic due to the uncertainty and the emotion attached to it. Since the Sandy Hook tragedy in Connecticut, security has received more attention but there is still very little consensus on design. We have determined through speaking with school administrators and law enforcement officials that the following standards are best practices for design of security in schools:

- Secure front entrance vestibule with direct connection to main office. Most visitors not allowed past the vestibule or main office.
- All other doors remain locked during the day. Proximity or card readers for public entrances favored in lieu of multiple keys.
- Laminated glass on all first floor windows to reduce the possibility of intrusion. Blinds or shades that are easily drawn on windows and doors.
- Classroom locksets (capable of being locked from both sides) on all classrooms.
- Security cameras located on all major entrances, the parking lot and the main corridors.
- A direct connection to the police department.

The major issue found here is that the front entrance is not directly connected to the main office and that if someone is allowed into the building, they immediately begin to mingle with students because both the kindergarten and the multi-purpose room are located off the same lobby that the main office is.

Figure 13 - Front Entrance and adjacent Kindergarten. Main office is behind kindergarten to the right.

Although the Sandy Hook incident is the worst-case scenarios, a common problem is parents entering the school without visitor passes. If the main office cannot control the front entrance it is possible for a parent to enter a classroom and leave with a child without the administration's knowledge. Furthermore the main office does not have a view of the exterior and rely entirely on cameras.

A solution would be to move the main office into the current kindergarten. This would allow the office to have a direct connection with the entrance and have a better view of the exterior. The office and kindergarten are roughly the same square footage and each has toilet facilities making the swap relatively easy. An alternate would be a small addition next to the kindergarten which would allow space for the office staff who monitor the front door.

Alternative Energy

The practicality of alternative energy is increasing as the technology improves and the cost falls. There are also sources for creative financing or grants that can aid school districts.

This office has installed wood pellet boilers in school facilities and the results have been very favorable. The savings in fuel costs are almost 50%. Additionally we have found other benefits that were not expected which include:

- Wood cleaner, less fumes and easier to handle than oil.
- Wood boilers more easliy understood by maintenance staff.
- More efficient (higher burn temperature, lower stack temperature).
- Community support for green technology.

Figure 14 - Boiler similar to one installed in the Greeville School

Photovoltaics has recently gained usage in educational facilities. Cost per watt of power has declined considerably in the last few years. Systems are very simple, install easily and long lasting.

Figure 15 - Solar panels installed on the offices of Barker Architects.

We would suggest for this facility that any alternative energy system be connected in parallel with the existing system to allow for traditional energy backup. A biomass boiler could be housed in a small addition next to the existing boiler room and connect into the existing distribution. This would allow the school to operate on a dual fuel basis. Photovoltaics would be installed to utilize reverse metering. There would be no batteries or equipment to maintain and any additional electricity needed beyond what is supplied by the solar panels would be supplied by the utility company, same as always.

The VRF Heat Pump system suggested for thermal comfort could also be considered an alternative energy source. These systems are much more energy efficient at heating, particularly in the shoulder months, that traditional oil boilers. They do qualify for energy rebates and incentives.

There are programs that help finance alternative energy projects. There are grants from sources such as RGGI that will go directly to pay for portions of projects. There are performance related programs and rebates that pay consumers based on actual reductions. There are also Power Purchase Agreements that pay for up-front capital expenses and then sell the power to the consumer at a discounted rate. Usually after a period of time the equipment becomes the property of the district.

CONCLUSIONS

In general the Mont Vernon Village School is in good condition and well designed for the population. Improvements, maintenance upgrades and even capital projects are likely good investments as long as they are well planned and executed.

Future needs are difficult to predict due to the dynamics of population and educational philosophy changes. These trends should be routinely monitored and compared to the situation of the school. At some point the right conditions of needs, finances and support will exist.

Recommendations

Our recommendations are for the district to fund high priority items on an immediate basis and to also create a long-term maintenance and capital improvement fund. This would allow for immediate results and also a major project roughly every 10 years. All issues could be addressed in about a 20 year span which is also about the life-cycle of many of the materials of the building. Then a new evaluation and plan would be needed.

The following items are grouped together to form a comprehensive package that would accomplish the goal of solving immediate problems but also incorporating sensible upgrades that enhance the performance of the overall package. Included in the cost are the construction costs plus soft costs.

PROJECT GROUP #1 – SAFETY AND SECURITY

- Replace plumbing faucets and valves with "hands-free" devices.
- Upgrades to power entrance and installation of additional power outlets in classrooms.
- Replace outdated door hardware for both life safety and handicap accessibility.
- Repair any damaged drywall. Patch and repair any fire rated assembles that are compromised.
- Install door hold-open devices at classrooms.
- Upgrade fire alarm to digital, voice evacuation and additional detection.
- Replace casework in older classrooms.
- Renovate entrance for secure check-in.
- Install additional security cameras and card-reader access.

The Cost for Group #1 is $210,000.

PROJECT GROUP #2 – ENVIRONMENTAL QUALITY AND ENERGY EFFICIENCY

- Replacing weather-stripping at exterior doors.
- Fixing damaged insulation, reposition sagging insulation.
- Air-seal using foam or cellulose insulation at targeted areas including: attic, roof edge and around windows and doors.
- Install energy efficient water heaters.
- Add occupancy sensors to lighting.
- Install CO2 sensors and demand control ventilation mechanisms.
- Replace ductwork with metal insulated ductwork.

The Cost for Group #1 is $285,000 for the base items.

- (Optional) Install new biomass boiler. Add $100,000
- (Optional) Install new VRF Heat Pump system. Add $250,000
- (Optional) Install Photovoltaic System through a PPA arrangement. Add $0

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End Report

Student Historic Enrollements

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012			
Births	23	20	16	23	23	12	20	22	11	17	17	0.5	18	17
Grade														
K	21	40	26	36	26	27	28	27	28	27	18		27	28
1	26	22	42	29	44	32	34	31	31	24	29		32	29
2	32	30	24	44	32	47	34	32	28	33	25		34	31
3	34	35	31	26	48	38	48	32	35	31	30		36	33
4	46	36	31	35	25	50	36	48	33	35	30		38	39
5	39	46	34	34	38	25	52	32	48	33	35		39	44
6	40	38	50	38	35	37	25	50	33	48	27		38	36
Tot.Elem	*238*	*247*	*238*	*242*	*248*	*256*	*257*	*252*	*236*	*231*	*194*		*34.92*	*34.1*

Cohort Survival Ratios

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	5 year	3 year V	Simple
K						1.1739	1.4	1.6875	1.2174	1.1739	1.5	1.3958	1.3442	1
1		1.0476	1.05	1.1154	1.2222	1.2308	1.2593	1.1071	1.1481	0.8571	1.0741	1.187	1.1785	1
2		1.1538	1.0909	1.0476	1.1034	1.0682	1.0625	0.9412	0.9032	1.0645	1.0417	1.0446	1.0028	1
3		1.0938	1.0333	1.0833	1.0909	1.1875	1.0213	0.9412	1.0938	1.1071	0.9091	1.0648	1.0089	1
4		1.0588	0.8857	1.129	0.9615	1.0417	0.9474	1	1.0313	1	0.9677	1.0159	0.9894	1
5		1	0.9444	1.0968	1.0857	1	1.04	0.8889	1	1	1	1.0223	0.9578	1
6		0.9744	1.087	1.1176	1.0294	0.9737	1	0.9615	1.0313	1	0.8182	1.0165	0.9764	1
Avg. 2-6		*1.056*	*1.008*	*1.095*	*1.054*	*1.054*	*1.014*	*0.947*	*1.012*	*1.034*	*0.947*	*1.033*	*0.987*	*1*

Mont Vernon Village School
Mont Vernon School District

Enrollment Projections

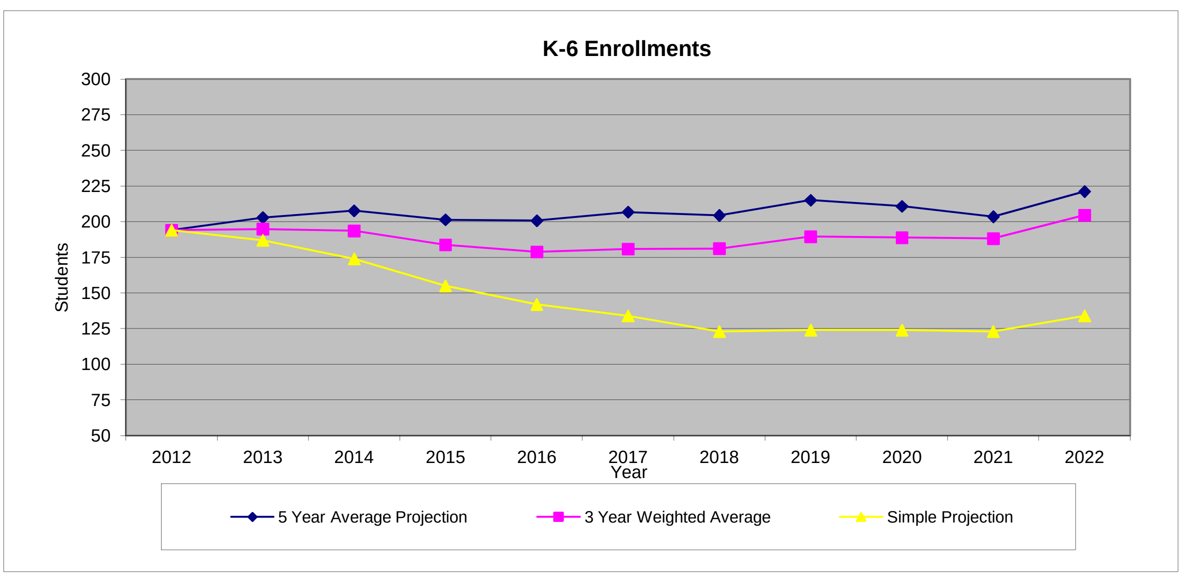


Table A

Barker Architects, Inc. **10/9/2013**

Mont Vernon Village School
Mont Vernon School District

Existing Student Capacity Analysis

Core Capacity	291	90%	Utilization Rate
Design Capacity	209	5	Periods Per Day
Lowest Core Space Capacity	201		

	ELEMENT	CAPACITY						EXIST SPACE			COMMENT
		SF Per Stud.	Target Stud. Per Room	Max Stud. Per Room	Mtg. per Week	Target Cap.	Max. Cap.	#	SIZE	TOTAL	
EDUCATIONAL SPACES	Kindergarten	50	16	28		16	28	1	1403	1403	
	Classrooms	36	18	25		198	275	11	900	9899	
	Science	60	18	20	5	18	20	1	1224	1224	
	Special Ed. /Specialists	50	5	5	5	40	216	8	270	2156	
CORE SPACES	Art / Music	60		20	2		247	1	1187	1187	
	Phys Ed / Gymnasium	110		48	2		201	2/3		5300	
	Food Service										
	Cafeteria	15		353	5		294	1/3		5300	
	Kitchen	5		185	5		369	2/5		923	
	Platform (performances)										
	Library	40		32			321	1		1285	
	Computer CR				1						
	Offices	4.0					383			1530	
	Admin./Guid.	2.5		427					1068		
	Faculty / Work	1.5		308					462		
	Nurse	0.8					238			190	
	Subtotal									30397	
	Misc. -Circ, Mech, Toilets, Janitor Storage									7283	
	Totals									37680	

Table B

Barker Architects, Inc. 10/9/2013

Mont Vernon Village School
Mont Vernon School District

Program Analysis

Design Capacity	238
Core Capacity (Theoretical Max.)	308
Periods Per Day	5
Number of grades (include K)	7

Subject	Students/grade	Min. Size	Max Size	Teaching Stations
Kindergarten (1)	34	17	22	1.0
1st Grade Classrooms	34	17	22	2.0
2nd Grade Classrooms	34	17	22	2.0
3rd Grade Classrooms	34	17	22	2.0
4th Grade Classrooms	34	17	22	2.0
5th Grade Classrooms	34	17	22	2.0
6th Grade Classrooms	34	17	22	2.0
6th Grade Science (one of classrooms above) (2)				1.0

	% enrolled	Total	Max. Class	Meetings / Week	Required Stations
Special Ed. /Specialists (3)	10%	31	8		4.0
Art	100%	308	22	1	1.0
Music (4)	100%	308	22	1	1.0
Phys. Ed. (5)	100%	308	44	2	1.0
Computer	100%	308	22	1	1.0

1 Kindergarten is a half-day program.

2 Science counted as regular classroom for purposes of calculating capacity.

3 Sped/Specialist rooms assumed to average 1/2 a regular classroom size (60 s.f. per student). Actual Special Ed and Specialists required spaces varies considerably from school to school. Above calculation is solely for computing purposes. Required spaces should be base on actual programs.

4 Art and Music can be combined if scheduling allows.

5 Phys. Ed. Assumes (2) classes in gym at once.

Table C

Barker Architects, Inc. 10/9/2013

Mont Vernon Village School **Space Needs**

Design Capacity 238
Core Capacity 308

	ELEMENT	DESIGN			EXISTING			COMMENT
		#	SIZE	TOTAL	#	SIZE	TOTAL	
Educational Spaces	Kindergarten	1	1400	1400	1	1403	1403	
	Classrooms	11	900	9900	11	900	9899	
	Science	1	1200	1200	1	1224	1224	
	Art	1	1200	1200	1	1187	1187	
	Music	1	1200	1200	0	0	0	
	Special Ed. /Specialists	4	450	1800	8	270	2156	
CORE SPACES	Phys Ed / Gymnasium			6000			5300	Shares MPR with Food Service
	Storage, offices, changing			1500			606	
	Library			1800			1406	
	Computer CR	1	900	900				
	Offices			1200			1530	
	Admin./Guid.		900			1068		
	Faculty / Work		300			462		
	Nurse			300			190	
	Platform (performances)			1000			612	
	Food Service							
	Cafeteria			1540				Shares MPR with Phys. Ed.
	Kitchen			1000			1402	
	Subtotal			31940			26915	
	Misc. -Circ, Mech, Toilets, Janitor Storage			12776			10765	
	Totals			44716			37680	

Sq. Ft. / Student (Design Cap.)			188		158	
Sq. Ft. / Student (Core Cap.)			145		122	
State Funding Cap	308 Students	120 s.f./student	36960 s.f.	$180	per s.f.=	$6,652,800 plus site and soft costs

Table D

Barker Architects, Inc. **10/9/2013**

Mont Vernon Village School
Mont Vernon School District

Physical Plant Analysis

	Lower Floor	Total
Area	37,680	37,680
Perimeter	1,386	

Cat	Item	Problem	Corrective Measure	Cost / Priority High	Medium	Low
Site	1 Minimum Size Lot	No deficiencies noted.				
	2 Water and Septic	Concern over the age of the system.	Plan for replacement and monitor.			$ 50,000
	3 Traffic Safety	Loop road not paved.	Pave loop road, relocate connection by play area to road.		$ 100,000	
	4 Parking	No deficiencies noted.				
	5 Playground/Playfields	Playground in need of improvement. Possible better use of playfield.	Relocate driveway to improve access and area for playgound. Consider natural playground improvements.			$ 50,000
	6 Grading/Drainage	Poor drainage in play area near where drywell was installed.	Add drywells to handle load.		$ 4,000	
	7 Oil, Propane Tank Age/Condition	Concern over the age of the tank.	Tank can remain if monitored and maintained. Budget for future replacement.			$ 40,000
Envelope	8 Roof Condition	Some leaks persist at valley and north facing section of building.	Investigate and repair as necessary.			$ 5,000
	9 Wall Condition (insulation and moisture protection)	Damaged during roof leaks of 2003-2004 but not extensive.	Air sealing more effective than added insulation.		$ 7,000	
	10 Door Condition (energy efficiency and operation)	Steel doors beginning to rust. Double doors have gaps.	Clean, repaint and adjust all exterior doors.		$ 4,000	
	11 Window Condition (energy efficiency and operation)	No deficiencies noted.	Budget for future upgrades as required.			$ 12,000
	12 Foundation Condition (insulation and moisture protection)	No deficiencies noted.				
Energy	13 Door Weatherstripping	Gaps at doors allowing energy loss	Install new Weatherstripping at all exterior doors		See Item #10	
	14 Ventilation	Existing ventilation ductboard seams have opened.	Repair and/or replace ductowork.		See Item #65	
	15 Attic Air Barrier	Air Barrier leaks, particularly at roof edge.	Repair with tape and/or spray foam.		See Item #9	
	16 Louvers and Vents	Combustion air louver leaky	Install direct vent to boiler		$ 1,000	
	17 Stratification	No deficiencies noted.				
	18 Attic Insulation	Attic insulation not performing as well as possible due to misposition.	Reposition fiberglass batting to be in full contact with vapor barrier.		$ 20,000	
		Attic insulation designed to code minimum.	Install additional loose cellulose insulation.			$ 190,000
Build. Services	19 Boiler	Boilers 25 years old but in good shape and recently maintained.	Continue regular maintenance and budget for replacement in the future.			$ 35,000
	20 Heat Distribution	Heat loop above library has frozen in the past.	Add glycol to eliminate the possibility of frozen pipes.		$ 5,000	
	21 Plumbing / Fixture Condition	Paddle handles at sinks break over time. Toilet flush valves inefficient.	Install infrared or metering faucets and infrared sensor toilet flush valves.		$ 9,000	
	22 Plumbing / Fixture Count	Toilets available for assemblies is inadequate for room capacity.	Make toilet rooms in other parts of the buidling available during large (over 520) assemblies.		$ -	
	23 Domestic Hot Water	Small Storage, on system with boiler.	Add point-of-use water heaters throughout building.		$ 5,000	
	24 Main Electrical Service	Main power experiences unusual power outages and some partial outages.	Power service may be unreliable. Install automatic trasfer switch to generator power.		$ 5,000	
	25 Power Distribution	Computers in some rooms have "daisy-chained" power strips.	Add wiremold outlets in classrooms. May required new subpanel.	$ 17,000		
	26 Lighting (efficiency and operation)	Most recently replaced. Very few occupancy sensors.	Add occupancy sensors to save energy. Plan for future upgrades.		$ 9,000	
	27 Phone, Intercom	Systems are dated but servicable.	Replace only as needed or if part of renovations.			

Life Safety	28 K-2 location based on LED	N/A				
	29 Panic devices	Older hardware should be replaced.	Upgrade as required.	$ 5,000		
	30 Stair Details (Rise/Run, Railings)	N/A				
	31 Areas of Refuge	N/A				
	32 Capacity of Means of Egress	No deficiencies noted.				
	33 Corridor Width	No deficiencies noted.				
	34 Number of Exits	No deficiencies noted.				
	35 Dead-end Corridors	No deficiencies noted.				
	36 Exits through Intervening Rooms	No deficiencies noted.				
	37 Door Arrangement	Does not comply. Front lobby reduces egress width.	Reduce number of active leaves from Gym.			$ 1,000
	38 Travel Distance	Complies.				
	39 Means of Escape	N/A				
	40 Protection of Vertical Openings	N/A				
	41 Protection of Hazards	Several leaks have occurred in and around boiler exhaust and chimney.	Replace exhaust pipe and drywall. Seal for fire rating		$ 5,000	
	42 Protection of Corridors	Door hold-open devices interupt protection.	Install magnetic hold-opens if necessary.			$ 6,000
	43 Protection of Corridors	Door frames in older classrooms are not fire rated.	Replace doors and frames.	$ 8,000		
	44 Smoke Compartments	No deficiencies noted.				
	45 Fire Alarm, Emergency lights and Exit lighting	Fire Alarm is not digital No voice evacuation in gym.	Upgrade for current codes.			$ 65,000
	46 Furnishings, Decorations and Personal Effects in the Corridor	No deficiencies noted.				
Building Code	47 Height and Area Limitations	Existing Building is over limits.	Install automatic sprinkler system.		See Item #51	
	48 Construction Classification	No deficiencies noted.				
	49 Fire Rated Construction	No deficiencies noted.				
	50 Interior Finishes	No deficiencies noted.				
	51 Sprinklers - fire area, length and use groups.	Individual fire areas meet for area and length but the aggregate is over the limit.	Install automatic sprinkler system.			$ 240,000
	52 Fire Protection	No deficiencies noted.				
Structural	53 Roof Condition - Snow Load Capacity	No deficiencies noted.				
	54 Wall Condition (seismic capacity, cracks or deflection)	No deficiencies noted.				
	55 Foundation Condition	No deficiencies noted.				
Accessibility	56 Parking	No deficiencies noted.				
	57 Building Access	No deficiencies noted.				
	58 Accessible Route	No deficiencies noted.				
	59 Door Clearances	Doors into classrooms that are pocketted do not have adequate clear floor space.	Rebuild and eliminate pockets.	$ 8,000		
	60 Door Hardware	Knob handles still exist in some offices and storage rooms.	Replace hardware with lever handles.	$ 5,000		
	61 Stair Details	N/A				
	62 Toilet Facilities	Teacher's toilets are not HC accessible.	Bring toilets up to code as they are renovated for other purposes or readily achievable.			$ 10,000
	63 Toilet Facilities	Existing gang toilets do not meet code. Single occupant HC toilet room is available.	Upgrade gang toilets as is feasible.			$ 10,000
	64 Elevator	N/A				

Indoor Environmental Quality	65	Ventilation	Most of ventilation supplied through ducts made of "duct board".	Immediately patch existing ductwork. Replace with metal duct.	$ 35,000	$ 180,000	
	66	Ventilation	Kindergarten has ventilation through unit ventilator and roof exhaust which is uncomfortable.	Fix or replace unit ventilator.		$ 5,000	
	67	Ventilation	Aging air handler energy inefficient.	Install demand ventilation control and Energy Revovery Ventilators.			$ 20,000
		Thermal Control	Need potential for summer use of facility and better comfort in sholder months.	Add cooling with Variable Refridgerant Flow Heat Pump.		$ 225,000	
	68	Thermal Control	Kitchen has a problem with heat. Dishwasher not vented. Cooler and Freezer exhausts into dishwasher room.	Install vent at dishwasher. Install new walk-in cooler/freezer with condensers vented to exterior. Install make-up air ventilation at hood.	$ 5,000		
	69	Indoor Air Quality	No deficiencies noted.				
	70	Lighting	Public spaces complies. Some non-public could have better lighting.	Replace as required or as renovated for other purposes.			$ 5,000
	71	Sanitation	No deficiencies noted.				
	72	Acoustics	Mechanical System is loud.	Add isolators to mechanical units. Possibly install amplifier system.		$ 5,000	$ 20,000
Interior Finishes	74	Ceilings	No deficiencies noted.				
	75	Walls	Walls show deterioration at exterior doors.	Patch and repair as required. Use moisture resistent material.		$ 10,000	
	76	Floors	No deficiencies noted.				
	77	Cabinetry	Cabinets in older classrooms have rough finish and plastic laminiate is in poor condition.	Replace cabinets.	$ 24,000		
	78	Visual Display Boards	No deficiencies noted.				
Security	79	Lock-down of public areas	Library not located to be locked down.	Install additional security cameras.		See Item #83	
	80	Lock-down of public areas	Key system means that multiple keys may be available in community.	Install card-reader access locks.		$ 10,000	
	81	Secure Visitor Check-in	Main office remote from front door.	Redesign to place main office where kindergarten is and redesign entry.	$ 50,000	$ 80,000	$ 50,000
	82	Visibility	Parking only visible through cameras.	Redesign to place main office where kindergarten is and redesign entry.			
	83	Technology	Security system is relatively new but limited.	Add cameras and capacity inside in corriodors. Add sensors at all outside doors.	$ 10,000		
Other	84	Alternative Energy	Biomass and Solar could reduce energy costs.	Research costs including PPA. Plan for future upgrades.			$ 75,000
	85	Learning Community Design	Layout does not support progressive styles of education.	Convert one classroom in each wing to become a "Learning Commons" with open areas and support.			$ -
					$ 167,000	$ 689,000	$ 884,000
				Total	$ 1,740,000		

CODE NOTES

IDENTIFICATION OF CODES

NEW HAMPSHIRE STATE FIRE CODE — 2009 NFPA 101 - LIFE SAFETY CODE
2009 INTERNATIONAL BUILDING CODE — 2009 INTERNATIONAL BUILDING CODE

USE AND OCCUPANCY CLASSIFICATION:

LSC = EXISTING EDUCATIONAL
IBC = E
ANCILLARY USES = MULTI-PURPOSE ROOM = ASSEMBLY (W/ OUT FIXED SEATING)
OFFICES = BUSINESS

CONSTRUCTION CLASSIFICATION (IBC 602)

5b - COMBUSTIBLE

OCCUPANT LOAD (LSC 7.3.1.2)

EDUCATIONAL = 809
ASSEMBLY = 785
BUSINESS = 21

MEANS OF EGRESS

EGRESS COMPONENT DESIGN CAPACITY (BASED ON NFPA 101/7.3.3.1)

LEVEL COMPONENTS AND RAMPS: 0.2 INCHES PER OCCUPANT

MINIMUM CORRIDOR WIDTH = 44" (BASED ON NFPA 101/38.2.3.2):
MINIMUM NUMBER OF EXITS (NFPA 101/38.2.4.2)

A SINGLE EXIT SHALL BE PERMITTED FOR A ROOM OR AREA WITH A TOTAL OCCUPANT LOAD OF FEWER THAN 100 PERSONS.

MAXIMUM DEAD-END CORRIDOR (BASED ON NFPA 101/14.2.5.2):
20 FEET (WITHOUT SPRINKLER EXCEPTION)

MAXIMUM COMMON PATH OF TRAVEL (BASED ON NFPA 101/38.2.5.3.3):
75 FEET (WITHOUT SPRINKLER EXCEPTION)
MAXIMUM TRAVEL DISTANCE (BASED ON NFPA 101/38.2.6):
200 FEET (WITHOUT SPRINKLER EXCEPTION)

PROTECTION

FIRE AREA SEPARATION WALLS TO BE (2) HOUR (IBC/707.3.9)
HAZARDOUS ROOMS (STORAGE, JANITORS CLOSET, MECHANICAL ROOMS...)
TO BE (1) HOUR FIRE RATED NFPA 101/38.3.2.1 (1)
CORRIDORS TO BE PROTECTED WITH (1/2) HOUR FIRE RATING (NFPA 101/15.3.6)
BUILDING TO BE SUBDIVIDED BY A (1) HOUR WALL AT CORRIDOR OVER 300' (NFPA 101/15.3.7)
RATED WALL SIGNS (IBC 703.1) INDICATE RATED ASSEMBLIES ABOVE CEILINGS EVERY 30'

FIRE ALARM SYSTEM

A FIRE ALARM SYSTEM SHALL BE PROVIDED (LSC 9.6)
EXISTING SYSTEM IS NOT ADDRESSABLE
EXISTING SYSTEM DOES NOT HAVE VOICE EVACUATION IN ASSEMBLY AREAS

INTERIOR FINISHES

INTERIOR WALL AND CEILING FINISHES

EXIT ENCLOSURES AND EXIT ACCESS = CLASS B OR BETTER
REMAINING INTERIOR SPACES = CLASS C OR BETTER

INTERIOR FLOOR FINISHES

EXIT ENCLOSURES AND EXIT ACCESS = CLASS II OR BETTER

EMERGENCY LIGHTS

EMERGENCY LIGHTS PROVIDED THROUGHOUT

PLUMBING REQUIREMENTS

EDUCATIONAL

WATER CLOSETS:	1 PER 50 OCCUPANTS	(13) PROVIDED
LAVATORIES:	1 PER 50 OCCUPANTS	(13) PROVIDED
DRINKING FOUNTAINS:	1 PER 100 OCCUPANTS	(3) PROVIDED

ASSEMBLY

WATER CLOSETS:	1 PER 125 MALE / 1 PER 65 FEMALE OCCUPANTS	(8) PROVIDED
LAVATORIES:	1 PER 200 OCCUPANTS	(6) PROVIDED
DRINKING FOUNTAINS:	1 PER 500 OCCUPANTS	(1) PROVIDED

NOTE:
ASSEMBLY DOES NOT MEET CODE REQUIREMENTS FOR FIXTURE QUANTITIES FOR THE MULTI-PURPOSE ROOM CAPACITY UNLESS ACCESS IS GIVEN TOOTHER TOILETS IN THE EDUCATIONAL SECTIONS OF THE BUILDING.

BUSINESS

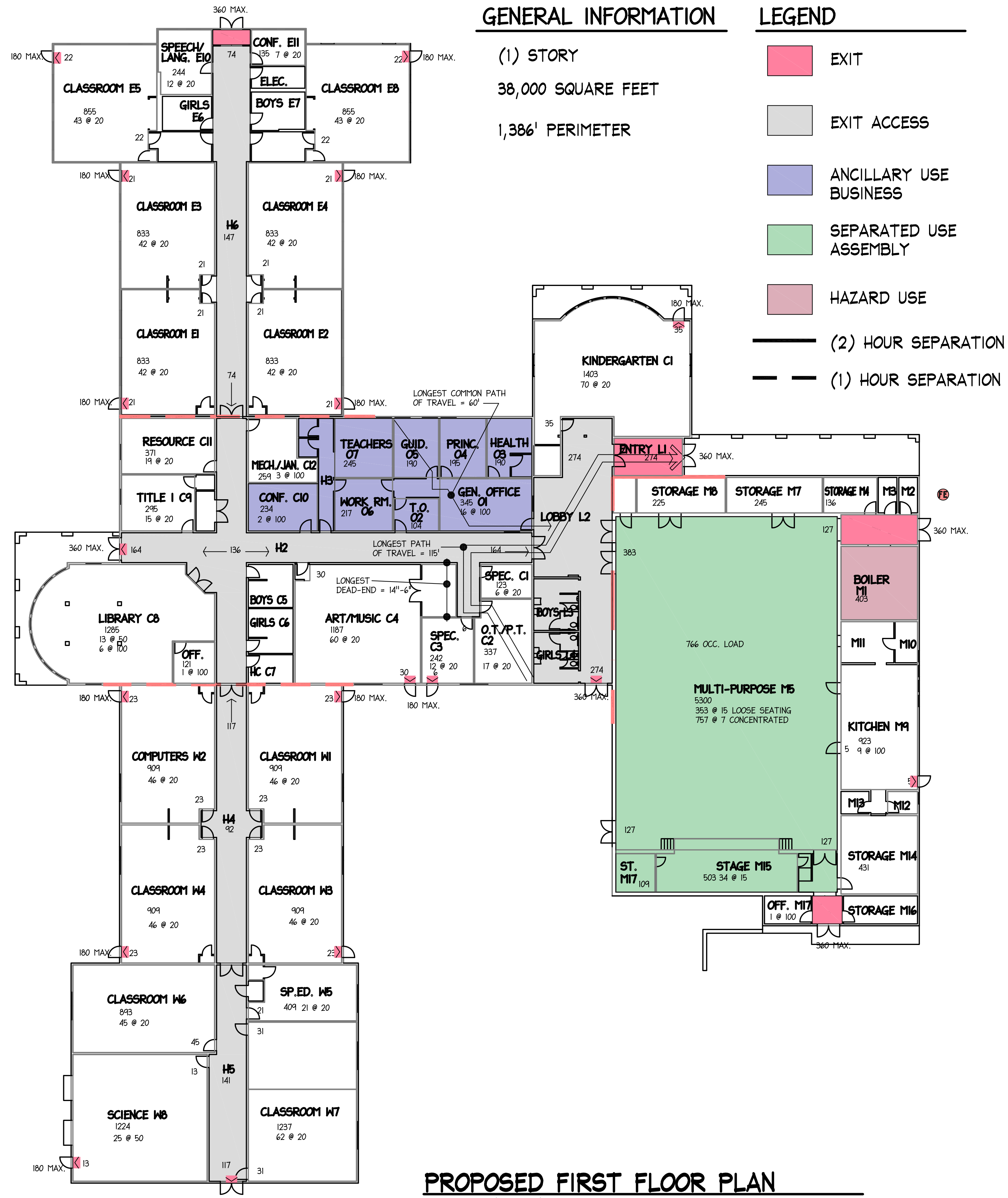
WATER CLOSETS:	1 PER 50 OCCUPANTS	(2) PROVIDED
LAVATORIES:	1 PER 50 OCCUPANTS	(2) PROVIDED
DRINKING FOUNTAINS:	1 PER 100 OCCUPANTS	(0) PROVIDED

GENERAL INFORMATION

(1) STORY
38,000 SQUARE FEET
1,386' PERIMETER

LEGEND

EXIT
EXIT ACCESS
ANCILLARY USE BUSINESS
SEPARATED USE ASSEMBLY
HAZARD USE
(2) HOUR SEPARATION
(1) HOUR SEPARATION



PROPOSED FIRST FLOOR PLAN

SCALE: 1/32" = 1'-0"

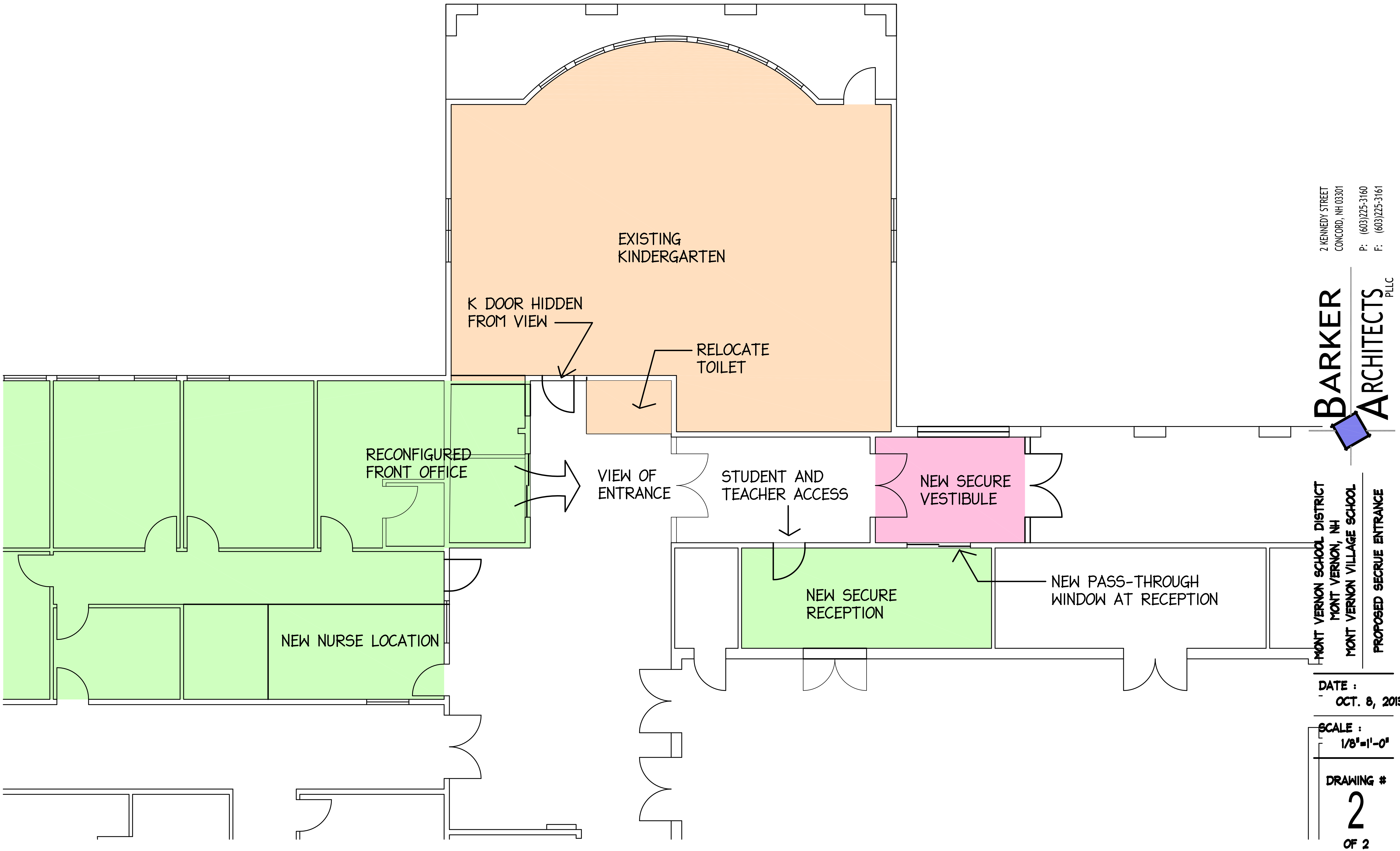
BARKER ARCHITECTS INC.
2 KENNEDY STREET
CONCORD, NH 03301
P: (603)225-3160
F: (603)225-3161

MONT VERNON SCHOOL DISTRICT
MONT VERNON, NH
MONT VERNON VILLAGE SCHOOL
CODE REVIEW PLAN

DATE : JUNE 18, 2013

SCALE : 1/32"=1'-0"

DRAWING # 1 OF 2


EXISTING KINDERGARTEN
K DOOR HIDDEN FROM VIEW
RELOCATE TOILET
RECONFIGURED FRONT OFFICE
VIEW OF ENTRANCE
STUDENT AND TEACHER ACCESS
NEW SECURE VESTIBULE
NEW SECURE RECEPTION
NEW PASS-THROUGH WINDOW AT RECEPTION
NEW NURSE LOCATION
2 KENNEDY STREET
CONCORD, NH 03301
P: (603)225-3160
F: (603)225-3161
BARKER ARCHITECTS PLLC
MONT VERNON SCHOOL DISTRICT
MONT VERNON, NH
MONT VERNON VILLAGE SCHOOL
PROPOSED SECRUE ENTRANCE
DATE :
OCT. 8, 2013
SCALE :
1/8"=1'-0"
DRAWING #
2
OF 2

Conway Engineering MEPF LLC

PO Box 688
Brookline, NH 03033

May 20, 2013

Barker Architects, Inc.
8 Kearsarge Street
Concord, NH 03301

RE: Mont Vernon Village School Review

Kyle,

The walk down that we did that the Mont Vernon Village School clearly showed that all electrical systems were well maintained and in good repair. There are three areas that should be considered for further investigations. These areas are the use of fiber board ductwork in the attic, the entrance security systems and the possibility of a second electrical feed the the building.

Because of the truss systems, it is clear that the use of fabricated in place fiberboard ductwork was the only practical way to install the needed ducts. You had concerns that there were possible health issues with this type of ductwork. This type of fiberboard is still being manufactured and sold. I could not find any documented health problems associated with this type of ductwork.

My only concerns are the fiber board ducts can get dirtier that metal ducts and should be cleaned on some regular schedule. The Code requirements duct insulation have increased since this school was built. I think that it could save a significant amount of energy if additional insulation was installed around the outside of all ducts in the attic. To meet the current energy standards ducts in unconditioned spaces are required to meet the following:
Supply ducts need 75#, 3.0” thick with an as-installed R value of 8.3
Return ducts need 75#, 2.3” thick with an as-installed R value of 6.5
Exhaust ducts need 75#, 1.5” thick with an as-installed R value of 4.2
Fresh Air ducts need 75#, 1.5” thick with an as-installed R value of 4.2

In light of the events what occurred at Sandy Hook, I recommend the a security evaluation of the perimeter systems.

When we were discussing the new electrical service, one of the school personnel mentioned that the old service may be still active. The codes allow only one electrical service for a building. If some or all of the old electrical service is active this could be a significant hazard to school personnel

Regards

James N. Conway PE

INTEGRATED BUILDING ENERGY ASSOCIATES LLC

Building Infiltration Report

Presented to:

Barker Architects

Presented By:

Brian C Adams, Project Manager LEED AP
Integrated Building Energy Associates, LLC

March 22, 2013

In response to Barker Architects, Inc., Integrated Building Energy Associates (IBEA) conducted a whole building infiltration test at the Mont Vernon School (MVS) located at 1 Kittredge Road Mont Vernon. This report is meant to highlight air sealing opportunities at the school building and assist Barker Architects and the MVS in developing appropriate work scopes for future building improvements. IBEA recommends the following improvements to increase building durability, occupant comfort and reduce operating costs associated with heating the facility.

Recommended Buidling Envelope Improvements
Repair or install double door exterior weather stripping
Repair ventilation fiberboard duct work where seams have broken open
Repair attic air barrier with strong adhesive tape and strategic air sealing with spray foam
Adjust and reinstall attic fiberglass batting
Install 12" loose cellulose insualtion

Blower Door Test Results

<u>Ambient conditions 2/25/13:</u>
Outside temperature: 45 °F
Inside temperature: 65 °F
Wind conditions: gusts 0-5 mph
Time of day: 1:00 pm

Table 1 highlights the results from the infiltration test. Particular attention should be paid to the Minneapolis Leakage Ratio (MLR) result, the measured CFM50 divided by the above grade surface area of the building. MLR normalizes the leakage rate by accounting for the amount of envelope surface through which air leakage can occur. Buildings with an MLR above 1.0 have the greatest potential for cost-effective reductions in infiltration, typically achieved using blower door guided infiltration and insulation techniques. In buildings with a calculated MLR in the 0.5 to 1.0 range, it is often more difficult to achieve economical improvements in airtightness.

Table 1: Summary results

Temperature adjusted CFM @ 50Pa.	Cubic feet of Building Volume	Air changes per hour @ 50Pa.	Square Feet of Above Grade Building Shell	Minneapolis Leakage Ratio
60,099	433,560	8.31	55,074	1.09

Building Comparison

Table 2 below shows how the MVS compares to other buildings of similar construction. MVS is above the U.S. national average for commercial buildings. Based on the blower door test results, there exists opportunity to tighten up the building envelope

Table 2: Building Comparison

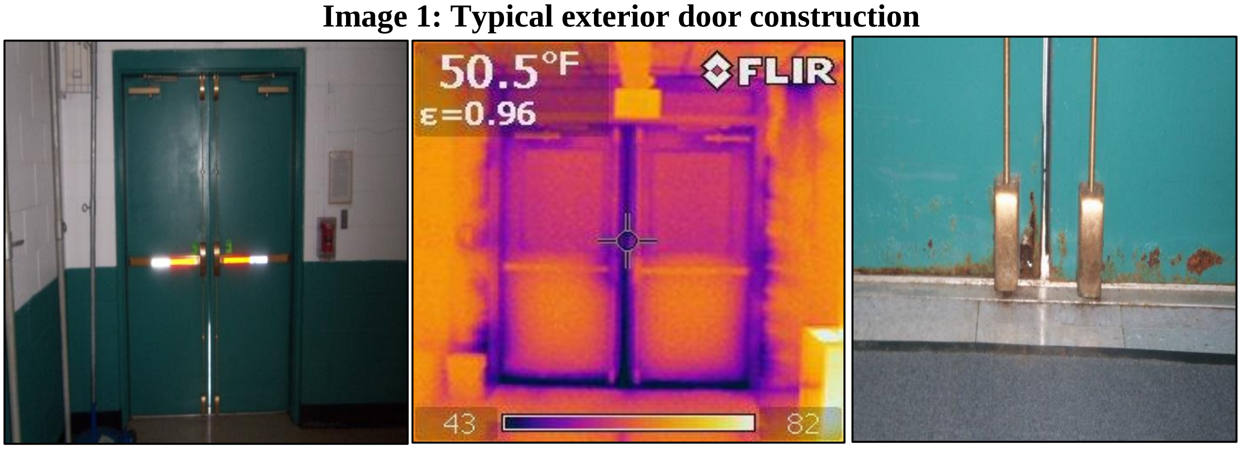
Building Type	CFM50/Square Feet of Exposed Shell
Mont Vernon School	1.09
Elementary School, 1955 & 1990, block and brick	0.99
Jr. High school, block and brick 1940 with 1994 addition	0.94
US National Average for Commercial Buildings	0.93
Typical Modern Construction	0.75
Elementary school, block and brick 1960 with 2004 addition	0.54
Elementary School, 1995, block and brick	0.44
Elementary School, 1990, block and brick	0.29
Local High Performance Building (major renovation to a high school)	0.17
Local High Performance Building (new construction, middle school)	0.19

Diagnostic Findings

Doors and Windows

The exterior doors are in good working order and comprised of metal and glass. To reduce infiltration, the double doors need weather stripping length wise between each door. With rusting bottoms from years exposed to the elements, a few exterior doors are in need of replacement as well. We recommend installing commercial-grade weather strip kits along the middle portion of the double doors.

Image 1: Typical exterior door construction



The windows are ½" double glazed, vinyl frame with an effective R-value of 2.8 (U= 0.35). An infrared survey found these windows to be of low concern for leakage.

Attic

The attic presents the biggest opportunity to reduce infiltration and increase thermal resistance. Viewed from inside the building (excluding the multi-purpose room), the ceiling assembly is constructed of acoustic tile ceiling panels, an average of two feet interstitial space (used for running cables and light fixtures), a 6mil polyethylene air barrier supporting R-30 and R-19 fiberglass batting. The architectural plans call for all R-30 fiberglass batting. Image 2 depicts the challenges of installing fiberglass batting in the attic (left image) and a professional installation job (right image). Ideally, all the insulation should look like the image on the right. Adding 12" of cellulose insulation would benefit significantly increase the thermal resistance of the ceiling assembly.

Image 2: Attic truss and R-30 fiberglass insulation design. R-19 fiberglass was also present

The air and thermal barriers in the attic were installed in 2005. Eight years later, the air barrier is in poor condition and no longer performing as a solid air barrier. The attic air barrier has holes and edges/seams that were not sealed during installation. As a result, there is a free flow of conditioned air leaking into the attic (winter conditions) and hot air leaking into the building (summer). The thermal barrier has varying levels of optimal installation. A fiberglass batt that lies flat against an air barrier and is fully encapsulated on all six sides will perform to the listed R-value. Fiberglass batting is never fully encapsulated in attics. However, fiberglass batting can perform quite well if it's installed properly. Much of the fiberglass batting in the MVS attic was originally installed to manufacturer's specifications. However, over time the fiberglass batting has fallen down (on the knee walls), been moved and not replaced (during wire or HVAC installations) or is now missing. See images 3 and 4 for a depiction of poorly installed knee wall insulation.

Image 3: Attic knee walls with poorly sealed HVAC penetrations

Image 4: Attic knee walls with poorly installed insulation

The insulation in image 5 has been installed to manufacturer's specifications. Fully lofted no gaps or compression points and fully encapsulated with an air barrier. Image 6 depicts the challenges in maintaining a continuous sealed air barrier and high performing fiberglass insulation. The best management practice for the HVAC penetration would involve sealing around the metal duct work – where ever the air barrier exists – and reinstalling insulation around the duct work.

Image 5: Properly installed insulation. Fully lofted and encapsulated with an air barrier

Image 6: HVAC penetrations through the sheetrock ceiling above the

Image 7 depicts the result of an improperly sealed air barrier and underperforming thermal barrier. The electrical chases extend through the acoustic tile ceiling, puncture through the air barrier with fiberglass batting plugging the hole against leakage.

Image 7: Penetrations through the attic into the conditioned space

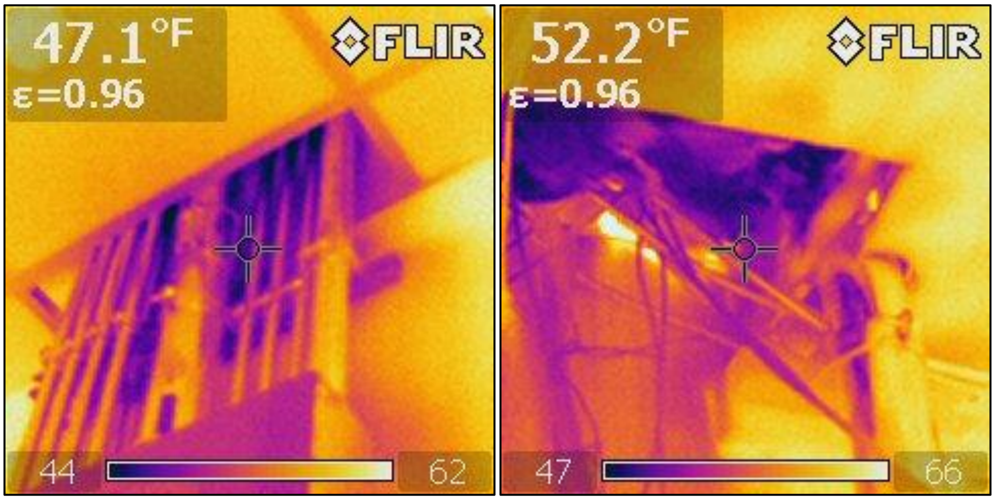


Image 8: A properly sealed vapor barrier, but poorly installed insulation

Image 9: A fair air barrier (with limited penetrations) and thermal barrier over duct work

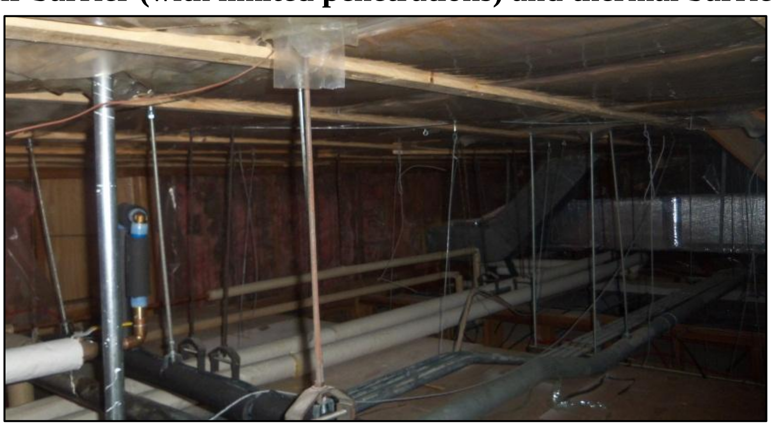


Image 10: Not sure why this HVAC closet over the library was so diligently sealed

Image 11: Ventilation duct work in the attic with open joints

Attic Infrared Imaging

Using a blower door to simulate depressurized conditions (the effect of 20 mph winds blowing against the exposed surfaces), the following infrared images highlight the effects of pressure, temperature and the science of building performance. Dark colors represent cold temperatures. Bright colors represent hot temperatures.

Image 12: Cold air leaking into classrooms from HVAC diffusers, ceiling tiles and fixtures

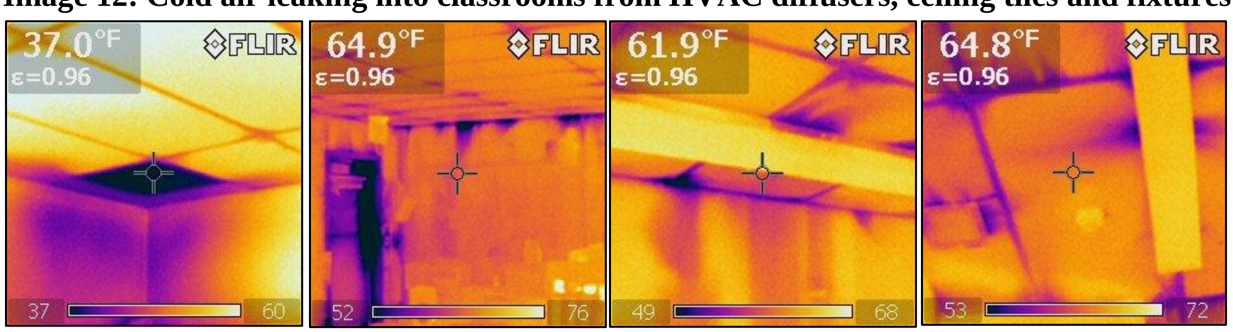


Image 13: Outside air leaking into interior walls from the attic

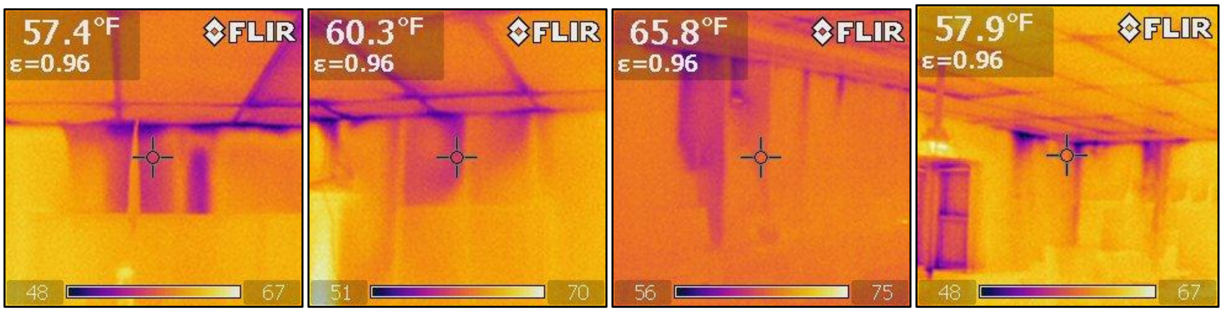
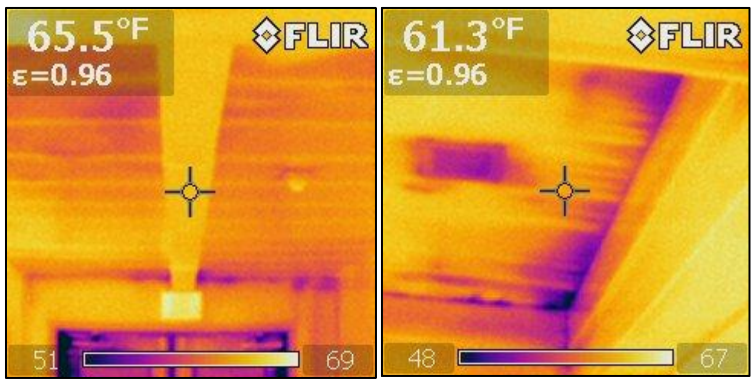


Image 14: The ceiling insulation is not in full contact with the gypsum board air barrier



Dampers, Louvers and Vents

Ultra low leakage mechanical dampers (4 or less CFM/square foot of damper area at 1" water column) should be used for exhaust fans that will be kept in place and new installations alike. The combustion air intake dampers in the boiler room are leaky. We recommend installing a dedicated combustion air intake kit directly to the burners.

Exterior Walls

Excluding the multi-purpose room, the walls of the school are comprised of exterior wood clapboard siding with a Tyvek® drainage plane, ½" and CDX sheathing. A 6" fiberglass batt is used as the thermal barrier, finished with ½" gypsum board on the interior. The multi-purpose room exterior walls have the same exterior wood clapboard siding with ½" extruded polystyrene rigid insulation board over concrete masonry block construction. Exterior walls that might be disassembled during construction should be insulated with vapor permeable insulation to the maximum R-value that is available in the space using closed cell spray foam. With finished surfaces, the exterior wall system has little opportunity for increasing thermal performance. If MVS undergoes a renovation or expansion, the exterior walls should be upgraded to reflect current practices**.**

Conclusions

The United States Department of Education reports that K-12 schools spend more than $8 billion on energy, making energy the second-highest operating expenditure for schools after personnel costs. One way to save money is to reduce energy costs through smart design of new construction and modernization projects, and changes in operations, maintenance and individual behavior in existing facilities. Saving energy not only conserves precious local dollars but also conserves our finite resources and provides students with safe, healthy, educationally appropriate learning environments. Spending funds on energy efficiency requires long term vision. Energy efficiency is an investment in your building. The district has taken the first steps to understanding energy use in the Mont Vernon School.

Benchmarking the building through the New Hampshire EnergySmart Schools Program is the first step in understanding how the Mont Vernon School uses energy and how it performs compared to other New Hampshire schools. The benchmark report highlights that the Mont Vernon School is slightly below average with a total energy use of 62.6 kBtu per square foot per year. This total energy figure is higher than 53% of New Hampshire K-12 schools. This report highlights opportunities to increase occupant comfort and reduce energy costs. The next step involves deeper analysis of specific energy conservation measures (ECM). Energy and financial analysis of each ECM can make the financial case for energy retrofitting. Immediate energy savings, long term reduced maintenance costs, increased building durability and enhanced occupant comfort are a few of the benefits from energy retrofitting. IBEA is ready to assist with then next steps. We look forward to assisting the Mont Vernon School realizing the benefits of lower energy costs.

Kyle Barker, AIA

From: Desrosiers, Jeff [jdesrosiers@gsphinc.com]
Sent: Friday, June 07, 2013 3:43 PM
To: Kyle Barker, AIA
Subject: RE: Mont Vernon School

Follow Up Flag: Follow up
Flag Status: Flagged

I did talk with our sister company and they would recommend sealing the duct board system with their polymer sealer. They are worried about blowing it apart because they have to pressurize the system for the polymer to find leaks and seal them up, plus the ductwork needs to be cleaned ahead of time for the polymer to stick so they avenue is out.
The best avenue is changing to sheet metal, it's a shame they don't have it now.
Did you say they might be interested in going to wood pellet boiler system too? If so how much oil do they burn a year. I could provide a scope and ROI for consideration if they are interested, let me know.
Jeff

From: Kyle Barker, AIA [mailto:kyle@barkerarchitects.com]
Sent: Friday, June 07, 2013 3:36 PM
To: Desrosiers, Jeff
Subject: RE: Mont Vernon School

Great. Thanks.
-Kyle

From: Desrosiers, Jeff [mailto:jdesrosiers@gsphinc.com]
Sent: Friday, June 07, 2013 2:28 PM
To: Kyle Barker, AIA
Subject: RE: Mont Vernon School

Here is the quote for new duct work form our vendor. This is a budget and includes FSK duct wrap per energy code requirements. I haven't reached out to our sister company yet on seal the ductwork but I will inquire today.

Jeff Desrosiers
Service Estimator / Sales

Granite State Plumbing & Heating, LLC
10 North Riverdale Road
Weare, NH 03281
Tel. (603) 529-3331
Fax (603) 529-4888
Cell (603) 351-8241
COMFORT SYSTEMS USA
Quality People. Building Solutions.

Ability is what you're capable of doing. Motivation determines what you do. Attitude determines how well you do it." - Lou Holtz

QUOTATION

Rockingham Sheet Metal, Inc.
1 Industrial Park Dr. Unit #22
Pelham, NH 03076-2161

Quote Number: 15930
Quote Date: Jun 7, 2013

Voice: 603 886-1799
Fax: 603 595-8002

Quoted To:

Granite State P&H, LLC
10N. Riverdale Rd.
Weare, NH 03281

Job Name:

Mont Vernon Village School

Customer ID	Good Thru	Payment Terms	Sales Rep
Granite S P&H	7/7/13	Net 30 Days	William A. Spirdione

Description	Amount
Demolition of ductwork. Supply and install galvanized ductwork and duct wrap.	
BUDGET PRICE:	**179,600.00**

TOTAL QUOTED PRICE: 179,600.00

Barker Architects inc.
8 Kearsarge Street, Concord, NH 03301
Phone: (603)225-3160 Fax: (603)225-3161