Designpartnership OF CAMBRIDGE INC

MASTER PLAN AND FEASIBILITY STUDY FOR RENOVATIONS TO BELMONT HIGH SCHOOL

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MASTER PLAN AND FEASIBILITY STUDY FOR RENOVATIONS TO BELMONT HIGH SCHOOL

SUPERINTENDENT'S ADVISORY COUNCIL ON THE FUTURE BUILDING NEEDS OF BELMONT HIGH SCHOOL

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Curriculum Director Representatives	Dennis Fitzpatrick Bill Pappazisis
Faculty Representatives	Martha Reagan Ben DeLorio
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Master Plan and Feasibility Study for Renovations to Belmont High School

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SECTION 1

Master Plan and Feasibility Study for Renovations to Belmont High School

EXECUTIVE SUMMARY

I. Parameters of the Study

Design Partnership (DPC) and our consultants have been charged by the Superintendent's Advisory Committee to perform the following tasks:

- Investigate and document the existing conditions of the Belmont High School building and surrounding site.
- Compile a list of conditions to be corrected with associated cost estimates. Assume that the facility is to be completely renovated to provide a further 35 to 50-year useful life without additional major work.
- Through interviews with school administration and Curriculum Directors as well a written survey of faculty, determine the likely and desired direction for evolution of the academic program over the next decade.
- Assist the School Department in creating an educational specification reflecting this direction and providing for an assumed modest increase in student population.
- Create an associated program of required spaces and present to the Committee alternative concept designs incorporating this program within the existing building and such additions of new space as may be necessary or desirable.
- Illustrate how the resulting project can be phased to allow continued use of the building and site at essentially its present level throughout the construction process.
- For the approved concept design develop a detailed estimate of probable project cost, including escalation factors based on a March 2008 project start.
- Develop an associated project schedule based on the premise of a single, continuous project accomplished by one general contractor.
- As an alternative, develop an estimate of project cost predicated on sequential, but separate, projects, each project representing a phase, with a two-year hiatus between each contract.
- In order to compare the cost effectiveness of a renovation/addition program, assess the cost implications of constructing a new high school to the west of, and connected to, the Fieldhouse and Pool and, at the completion of this construction, demolishing the existing building except for the Fieldhouse and Pool which would remain and be renovated.
- Present the above material in its final form to the Advisory Committee, the School Committee, the Permanent Building Committee and to Town Meeting.

II. Introduction

Belmont High School is situated on the eastern boundaries of the downtown village area, resting in a pastoral setting separated from Concord Avenue by a wide swath of parkland and scenic Claypit Pond. It shares a campus with the Town's indoor skating rink, football stadium and several well cared for playing fields for various sports. In this dense residential community the sweeping, open campus provides an inviting, unbroken stretch of green in relief to the more built up areas surrounding it.

The present building was constructed in 1970 as a replacement for an older wood framed structure in a different location, destroyed by fire. The "new" High School was designed by the respected architectural firm of Korslun, LeNorman and Quan from Foxboro, Massachusetts. The design was, and remains, well conceived and well realized. The building is correct and efficient in its relationships and largely adequate in its spaces. A steel and concrete frame supports brick exterior walls with precast concrete trim, and brick and other masonry is used extensively on the interior also. The quality of interior finish is high with many high-use areas featuring quarry tile flooring and other low-maintenance materials. The construction is, over all, extremely substantial. As a further response to the fate of its predecessor, the High School design, besides employing exclusively non-combustible materials, makes liberal use of spray-on fireproofing. (This is significant mainly because this material's asbestos content adds to the difficulty and cost of repair and renovation work proposed in later sections of this Study.) As an additional great benefit to both the Town and the school, more relaxed regulations of the School Building Assistance Bureau in 1970 allowed the school's program to include a Fieldhouse and an indoor recreational and competition Pool. Today these expensive spaces would not be considered eligible for State funding assistance, although at that time the State's reimbursement program extended to include them.

III. Existing Conditions Review and Recommendations

Design Partnership (DPC), Richard D. Kimball Company (RDK) and Larson Associates (LA) each reviewed original architectural and engineering documents provided by the School Department facilities staff. This was followed by a thorough field review and documentation of existing conditions. Conversations with the maintenance staff, school administrators and the Town's public safety officials further illuminated the condition of the building and its systems. Previous studies, notably a building conditions assessment by ARCADD done in 1999 and a study to expand the Library by Tappe Associates done during the same time period, were also made available to us as information resources. However, our team chose to ignore these in the initial stages of our own investigation, preferring to generate fresh data from personal observation and conclusion. We did use these reports to backcheck our findings, which proved to be generally consistent with previous information.

Exterior Architectural Systems

In virtually all of its components and systems, Belmont High School shows at once its ruggedness and the care that has been devoted to its upkeep, and at the same time that it has seen hard use by a demanding clientele for almost 35 years. The only major replacement project accomplished since its construction has been a new roof, installed approximately 5 years ago. As DPC's evaluation showed, all other elements of the exterior envelope – the windows, the "Kalwall" panels at the Field House and Pool, the spandrel panels, the brickwork, precast concrete and caulking – are due for either replacement (e.g. the windows) or repair (e.g. the masonry).

Interior Architectural Systems

The interior of the building is in similar condition. Most of the finishes are tired. Those that aren't – the quarry tile and brick walls – are dark and provide no spark of energy to the décor. As a consequence of needed mechanical and electrical work, most ceilings will have to be removed and asbestos abatement carried out. Floor tiles throughout the building contain asbestos, as does the mastic in which they are set. Although this material poses no threat until it is disturbed, it must be removed and replaced as part of any meaningful renovation program. Many interior fire-rated doors and the exterior insulated doors contain asbestos cores and, again, should be replaced as part of a comprehensive program of renovations. Most other finished areas will be disturbed by necessary work to address issues of barrier-free access or by replanning spaces for more effective and efficient use by evolving educational and support programs.

Barrier-free Access Issues

Issues of barrier-free access are pervasive. Some doors and all door hardware do not meet present requirements, nor do stairs, handrails and the elevator. Toilet, locker and shower rooms were not designed with the maneuvering room and clearance for wheelchairs that present codes require. Drinking fountains are not accessible to wheelchair bound students or staff and there are also many projections into the corridor creating hazards to unsighted people. In general, casework pieces such as Library shelving, catalogue and checkout desks, the main office reception counter and science lab benches, are not designed to meet present access codes.

Space Concerns

As the science curriculum has expanded, many labs have been retrofitted into spaces originally designed for other programs such as business. These spaces are not optimal for a contemporary science curriculum that combines bench work in a continuum with board work. Ideally to do this requires a two-part teaching station, with a lecture area and tablet-arm chairs within the same room but separate from the lab bench area. Also, the present number of labs, like the number of standard classrooms, is not sufficient to contain the academic program envisioned as developing over the next decade. Music and Art find themselves in the same situation, needing additional teaching stations, larger teaching stations and more support space. Throughout the building there is a lack of staff space, storage and student gathering and activity space, as well as space for the variety of community uses which the facility hosts. A narrative description of architectural work included in the Master Plan can be found in **Section 3** and **Section 8** of this Report.

Heating, Ventilating and Air Conditioning Systems
Virtually all components of the building's mechanical and electrical systems need attention. They are all, with minor exceptions, original equipment and have exceeded their design life expectancy. The boilers are oil-fired steam, feeding roof mounted air handling units directly and supplying hot water via converters to unit ventilators on the periphery of the building. Steam systems are difficult to control and to maintain in optimal working order. RDK's strong recommendation is to replace the present boilers with hot water units with dual-fuel capability. Steam piping and controls will also need to be replaced. As the boilers are changed out the steam fed rooftop units must be replaced also. These units are very, very near the end of their lives and may, in fact, need replacement prior to the main part of the project going forward. Another deficiency to be corrected by the mechanical system upgrade is the amount of fresh air available to building occupants. New rooftop units will have a higher intake and distribution capacity to meet present codes. Review of existing conditions indicates the need for new unit ventilators, also supplying increased outside air volume. New air distribution equipment for the Pool and Fieldhouse is also indicated. It will be appropriate to replace the Pool system with a specifically designed, high efficiency "Pool-pak" system combining heating, dehumidification and heat recovery. A new filtration system for the pool is also needed.

Plumbing System
Required plumbing system work within the existing building, per RDK's investigation and analysis, includes new, water efficient fixtures, barrier-free compliance and replanning of toilet and shower room fixture layouts, and kitchen upgrades. The domestic hot water system will be replaced in its entirety. The present science labs do not have an acid neutralization system and one must be provided for the proposed new labs.

Fire Protection System
The original design of Belmont High School met the building codes then in place in all respects. Today, codes are more stringent. One of the most glaring differences is in the fire protection system. The facility has no passive or active system to assist fire fighters in controlling an event. While the building itself would, no doubt, be difficult, probably impossible, to burn, its contents and equipment would not. Today, any building approaching the size, use and construction characteristics of the High School would be required to be completely sprinklered and provided with fire department standpipes at assembly areas and on the stage. A renovation project whose cost is more than 30% of the building's assessed valuation will automatically trigger this requirement. Even if this work were not mandated, it would be very shortsighted to avoid it.

Electrical Systems

The building's electrical and lighting systems are also original equipment, with the exception of some upgrades to the tel/data network made necessary by changing technologies. RDK has determined that to provide a level of amenity, usefulness and efficiency comparable to new construction and thus provide a second 35 to 50-year "useful life-span", all of these systems should be changed out. New lighting, standard and emergency power distribution, data, communications and alarm systems are included in the recommended renovation project. Like the rooftop HVAC units noted above, the fire alarm system is a candidate for accelerated replacement due to its present condition and the difficulty of finding parts that are no longer manufactured or stocked.

A narrative description of the mechanical and electrical work included in the Master Plan can be found in **Section 4** of this Report.

IV. Educational Specifications and Program of Spaces

To create an educational specification (a listing of courses with projected student participation in each) DPC spoke at length with each Curriculum Director concerning their specialty subject area. Questions were asked concerning new curriculum directions and new teaching methodologies looking forward to the next decade. The Curriculum Directors each filled out a standard School Building Assistance Bureau (SBA) form 645, listing the courses they envisioned being offered and their considered opinion of the student participation level in each. This material was then converted by DPC using an accepted formula ("the Castaldi Method") into the number of teaching spaces needed by each department. The subject and course description dictated whether the course required a standard classroom, a science laboratory, a computer laboratory, an art studio or some other specialty space. From this exercise DPC derived a space program for the academic needs of the facility projected 10 years out. To these spaces were added core facilities and specialized teaching, administrative and other spaces based on SBA formulas and guidelines for high school programs. In addition, program space specific to Belmont High School - e.g. METCO and LABBB Collaborative areas, was added. The resulting educational specification was presented to the Belmont School Committee initially on July 21 and finally on September 7, 2004, and approved as a reasonable program on which to base the feasibility study. The approved educational specifications may be found in **Section 7** of the Report.

V. Conceptual Design

Analysis of the space requirements against the space available illustrates a need for additional teaching and support space that cannot be accommodated within the existing building envelope. Critical issues addressed by the Master Plan design include new and larger science labs, as well as an increase of 2 labs. In the 10-year plan all other academic departments require additional teaching stations as well. In addition to the science labs, the existing complement of teaching stations is projected to increase by 10 standard classrooms, 2 computer labs, 1 art studio and 1 performing arts venue. Faculty support areas consisting of faculty offices, conference rooms, tutorial rooms and storage rooms are now seriously undersized; the Master Plan increases this use by approximately 50%. The Master Plan design substantially increases the amount of support space for the music and performing arts programs, including a larger band room, dressing rooms, storage and office space. There are also increased opportunities for student gathering, student activities, display of student art and other work and informal teaching and learning. Public meeting space is also enlarged.

It is appropriate to inquire why the original Belmont High School space program is no longer adequate and why new space is needed. While the new space program presented by this Report is based on 1250 pupils, not including the needs of the LABBB Collaborative and METCO, in its earlier days Belmont High School housed well in excess of this number and, by all accounts, provided the same high quality educational experience as it does today. The answer lies in the expansion of both elective and mandated programs, the shifting emphasis toward science and technology and the changes in best-practice teaching and learning models. More specific information can be found in **Section 7** of this Report.

Fitting total program space in an efficient manner and with proper adjacencies within the existing building, it was determined that additional space needs could best be met by new construction in two main zones. The first is an area adjacent to the stage house to contain the aforementioned music and drama support. The second is a new science wing that will provide completely state-of-the-art labs and support spaces of the proper dimensions for an optimal teaching/learning environment. (This strategy also allows the present lab space to be reused more appropriately for additional standard classrooms and other teaching stations.) Other new space increments are planned to infill the present atrium – to enlarge the administration and guidance suites, create new student gathering places and an art gallery and improve circulation in that area of the building – and to add space and amenity to the cafeteria. Total new space created by the final Master Plan program is 34,825 square feet, bringing the total area of the facility to 291,945 square feet.

Of several possible design directions, two emerged as the most sensible. Both continued the departmental organization within the present building. However, each also provided the opportunity to change this structure in the future and to establish an organization of smaller "houses" or "academies" within the overall educational and physical framework. From the outset, it was considered an important goal to conserve and employ as much of the existing building as possible and, in fact, the final Master Plan design is realized without moving basic use areas or even many existing walls. The major difference between the two finalist options is the location of the new science wing. When placed behind Building Unit 2, roughly in the area now used by the portables, the new construction is as close as possible to existing academic areas and does not displace any site use not already scheduled for removal. The second solution locates the new wing in front of the building, lying along the present south wall of the Pool House. Here it is slightly further from the rest of the school and displaces the parking lot now in this location. However, here it is buffered from the noise and vibration of the rail line immediately behind the building and, rather than hidden from view, it affords a public and present architectural statement of the school's new, cutting-edge educational environment. Considering the drawbacks and opportunities of each alternative, the Advisory Committee approved the second solution.

VI. Phasing Plans and Project Schedule

Any project to upgrade and modernize Belmont High School must be accomplished while present school activities and programs are maintained. Relocation of students off site or to temporary classrooms has been considered and rejected as too disruptive to the learning and social environments. One of the most challenging aspects of the feasibility study, therefore, has been to devise a series of project steps, or phases that permits this strategy. There are several interrelated requirements that must be met to achieve this goal.

- First, the count of teaching spaces cannot be allowed to drop below that needed by the program. It was concluded by the Advisory Committee that the present number of standard classrooms, science laboratories and computer labs is a minimum functional number. Consequently, this count is maintained during the first three phases of the construction process and increased thereafter.
- Second, core facilities like the Cafeteria and Library must be maintained in operation. To insure this, there are two possibilities – summer/vacation work and temporary relocation (within the existing building envelope). Both are employed at one point or another of the proposed phasing.
- Third, safe and efficient paths of access and egress must be maintained at all times. Contractor work areas cannot restrict student and staff passage from one area of the school to another and cannot block paths of convenient entrance and safe egress to and from all areas of the building and exterior.
- Fourth, contractor work areas must be limited, clearly demarcated and separated from school use areas. They cannot be scattered in multiple, small pockets here and there throughout the building.
- Fifth, the sequence of mechanical and electrical work is constrained by the location and design of the building's present systems. As an example, the present Boiler Room and Electrical Service Room are located adjacent to the Fieldhouse, at the west end of the building (Unit 1). Replacement and renovation of these systems should start here and progress incrementally eastwards, culminating in work on the Auditorium and Music/Art areas at the building's east end (Unit 4).

In order to make the phasing plan possible, it is necessary to create some "swing space" where school uses can be housed outside the existing building, thereby freeing up areas within the building for contractor work. Of course, portable classrooms can provide temporary space, but the Committee considered this solution a last resort. Fortunately, and intentionally, for the Master Plan project, there are major pieces of new construction – the science wing and the art/music support area – scheduled to be built in Phase I. These are then be used to house teaching and support spaces, vacating areas of the existing building for contractor work. Phasing plans, Steps I through V, are included in **Section 9** of this Report, as is a synopsis of the work to be accomplished in each phase and the proposed project construction schedule. The schedule foresees a construction start in the spring of 2008, with work continuing through three and one-half academic years and the intervening summers. The project would be completed by February break in 2012.

VII. Project Cost Estimates

Design Partnership has based our Project Cost Estimates on analysis of existing conditions encountered plus new work necessary to fulfill identified program requirements. The remediation of existing deficiencies is the goal of our first-cut estimate, based on field observations by our staff and that of our consultants. The premise is the building should be refreshed to a condition approaching new, contemporary construction to provide a further useful life span of 35 to 50 years without another, similar major renovation effort required. This is termed the "Base Renovation Cost" and provides a foundation for all estimates to follow. When the conceptual design has been completed and accepted, we then look at the further work involved – renovation and reconfiguration within the existing building envelope, and new construction – and add this scope and cost to our base. Our consultants employ essentially the same methodology.

For this project, once the conceptual design was agreed upon, DPC was requested by the Committee to estimate costs based on two construction scenarios. The first would have all work of the Master Plan done under a single contract in a linear, uninterrupted stream spanning approximately 3 ½ years. The second presumes that the work would be done in segments at intervals of 2 years. Each segment would be independent, with a separate contract and potentially a different contractor. This would stretch the overall duration of the complete project to close to 10 years and naturally add considerably to the overall project cost. Finally, as a comparison, we were asked to assess the project cost associated with a mostly new building (the Fieldhouse and the Pool would be retained and renovated). Not surprisingly, the cost totals tracked from lowest to highest in the order discussed above. For a single project following the Master Plan the cost estimate is $62,328,010. For the multiple contracts strategy, spread over a decade, the estimate is $73,963,945 to accomplish the same work scope. A new building added to the renovated Fieldhouse and Pool is estimated to have a total project cost of $88,569,844. A more detailed discussion of costs may be found in **Section 10** of this Report with supporting data in **Appendix D.**

VIII. Conclusions

Design Partnership believes the following conclusions are sustained by the results of our Master Plan and Feasibility Study.

- The existing facility is well designed and well constructed – without question it should be retained and, with renovations, will continue to provide good service to the Town for many more decades.
- Renovations to the building and building systems are clearly necessary; in many cases, long overdue.
- Changes, upgrades and a modest expansion of the High School's educational program and support functions dictate some increase in overall space via new construction and some reconfiguration of existing space within the building.
- The renovation process can be phased and designed to minimize impact on the educational and social life of the School.
- The most efficient and cost effective, also the least disruptive, construction strategy is a single contractor/single project scenario.

Tab 2

SECTION 2

Master Plan and Feasibility Study for Renovations to Belmont High School

BACKGROUND AND HISTORICAL INFORMATION

In early March of 2004, The Town of Belmont, Belmont Public Schools, acting through its Superintendent's Advisory Committee, published a Request for Proposals (RFP) for qualified architectural firms to address a Master Plan for Renovations to Belmont High School. The following information, describing the parameters of the requested study and the background of the process leading to it, is excerpted from that RFP. The complete RFP is attached as **Appendix A**.

I. General Information

Belmont High School is located at 221 Concord Avenue in Belmont. It presently houses 1,220 students in grades 9 - 12. This total includes 1,187 regular-day students, including 60 students from surrounding communities through the Massachusetts School Choice program and 36 students from Boston through the Massachusetts Racial Imbalance Program (METCO), and 33 special education students in a separate program run by the LABBB Collaborative. Enrollments have increased steadily from 765 students in 1993-94. While enrollment projections by the New England School Development Council (NESDEC) indicate this growth will level off, these projections do not factor in probable housing stock growth on two major sites in the Town – The McLean Hospital property and the Alewife development area.

The High School was constructed as a new building on the present 33-acre site and opened in 1970. It consists of approximately 250,000 square feet of space, with classroom wings on two floors, and an auditorium, cafeteria, field house and pool on one floor. The library is also a one floor, two-story space that opens onto a second floor mezzanine. The roof of the entire building was replaced with membrane roofs in phases from 1996 to 2000. No other major renovations have been done to the building since it opened, and there have been no additions. All of the electrical, plumbing, and heating and ventilating infrastructure is original equipment.

II. Previous Studies

A. Facilities Audit

In 1999, the Belmont School Committee contracted with the architectural/engineering firm of ARCADD, Incorporated of West Newton, MA to perform a facilities audit of all six Belmont School buildings, plus the administration building. Included in this audit was a "Full Scope Audit plus Summary Space Analysis" of Belmont High School. Within the Executive Summary of their report of November 1999, ARCADD, Inc. states:

> "The Belmont High School is the largest of all the buildings and will require the largest effort and financial commitment on the part of the Town of Belmont. Its physical structure is solid and made to last, yet its envelope does not meet today's energy and air quality standards. Its doors are original and lack compliance with current handicap standards. Its auditorium, cafeteria and art spaces are in need of major upgrades. The science laboratories and classrooms are outdated and their fittings are old. The athletic facilities, including lockers, gymnasium spaces, and pool area are in need of redesign to suit current teaching and academic standards..."

B. Library Feasibility Study

Also in 1999, the Belmont School Committee contracted with the architectural firm of Tappe Associates, Incorporated of Boston, MA to study and propose a renovation plan for the Belmont High School Media Center. The October 1999 Tappe report recommended a renovation and expansion of the Library and Media Center from the current 12,500 square feet to a proposed 16,470 square feet at an estimated construction cost of $1.5 Million.

C. New England Association of Schools and Colleges (NEASC) Report

In April 2002, a Visiting Committee from the New England Association of Schools and Colleges (NEASC) conducted a certification review of Belmont High School. As part of the report of the Visiting Committee, conclusions were noted on the facility. The relevant pages from the NEASC Report are attached as **Appendix B**.

III. Current Efforts

A. Superintendent's Advisory Council on the Future of Belmont High School

In 2001, the Superintendent of Schools formed the Advisory Council on the Future of the High School. The Superintendent's Advisory Council consisted of the High School Principal, two School Committee members, the Director of Finance, two Curriculum Directors, a teacher, a High School student, a representative of the Town's Permanent Building Committee, and two parents. The goal of the Advisory Council was to analyze both the programmatic and the building infrastructure needs of the High School, and to develop a plan of action leading to a comprehensive renovation project to be completed by the end of the 2009 - 2010 school year. In projecting 2010 as a target date for complete renovation, the Advisory Council was recognizing that Belmont has a significant list of capital investment projects to address. Attempting to prioritize and develop a sequence and financing plan, Town officials have formed a "Mega Committee" consisting of all members of the Board of Selectmen, the Permanent Building Committee, the Warrant (Finance) Committee and the Capital Budget Committee. While acknowledging the needs of the High School, the Mega Committee has struggled with the competing demands for resources to meet the following identified needs:

- replace the existing three fire stations with two new stations,
- construct a new senior center
- replace the Wellington Elementary School with a new school building on the same site
- expand or replace the Town's main library
- renovate or replace the Town's DPW facilities
- upgrade the water and sewer systems
- develop a plan for improved parking in Belmont Center
- renovate the Police Station
- renovate or replace the skating rink and adjacent field house
- study the needs of the Underwood pool.

In August 2003, the Advisory Council met with the Town's Permanent Building Committee to seek advice about the next steps in this project. The following summary of the work and findings of the Advisory Council so far was reviewed at that meeting:

1. High School Feasibility Study (Advisory Council)

- Established by the Superintendent to begin the process of identifying and meeting the building needs, both program and infrastructure, of the 30+ year old High School
- Met regularly from February to December 2001, and again in June 2002
- Examined the needs of the building by reviewing the ARCADD report, determining current usage, touring the facility, and seeking input from staff, parents, and students
- Toured other recently renovated High Schools

2. Goal: To Implement Major Renovation by 2010

- November 1999 ARCADD report identified approximately $30 million of needed renovations, which would require an estimated $40 million project cost, incorporating design fees, other owner costs, and some inflation factor
- In addition, some new construction may be needed to meet current and projected program requirements
- Uncertainty about the status of the state School Building Assistance Program raises questions about state participation in funding
- Need to develop Master Plan that can be accomplished (and perhaps funded) in incremental steps while the building is occupied

3. Areas for Further Engineering Study

a. HVAC

- Review existing oil burners and boilers
- Analysis of most efficient, cost effective energy source, including possible conversion of burners to dual fuel capability for oil and natural gas
- Replacement of original (thirty two year old) heating pipes
- Replacement of all original univents
- Replacement of original pneumatic controls with electronic system and computerized controls
- Replacement of all rooftop HVAC units

b. Energy

- Need to perform energy audit
- Establishment of a hot water supply, separate from the heating system, for kitchen, rest rooms, locker rooms and pool -- investigate most efficient energy source (natural gas, solar, other?)
- Replacement of all fluorescent lighting
- Conversion of all kitchen appliances from electric to natural gas and upgrade ventilation

c. Program Issues

- Need to increase library space
- Need to renovate and expand Performing Arts area due to growing student enrollment and participation
- Science laboratories need complete renovation to address size, safety, and accessibility issues -- need to determine feasibility of meeting the requirements of the science program within the existing space
- Stadium seating in lecture halls in English, Social Studies and science areas and the Little Theater does not meet current educational needs
- Auditorium needs new seating and lighting
- Pool area requires new pool filtration system, replacement of translucent panels, and upgrades to ventilation and locker rooms
- Analysis of the adequacy of office space and staff/program support spaces (conference/workroom/copy center/etc.)
- Need to plan to support expanded technology presence
- Future of special education space to support LABBB Collaborative programs needs to be explored

d. ADA Compliance

- Existing single elevator is small and does not meet current code
- Possible need for a second elevator at opposite end of the building
- Replacement of all door hardware and non-compliant plumbing fixtures
- Ensure access code compliance for all building entrances, stage, etc.
- Upgrade fire alarm system to meet current code

e. Building Envelope and Site Issues

- Re-pointing of all exterior brickwork

- Replacement of windows to double-glazed to establish efficient thermal envelope
- Examination of ground water infiltration in Little Theater
- Improve entrance vestibule
- Repaving driveways and parking lots -- improve parking at the site
- Rewiring and re-lamping all exterior lighting

f. Life Safety and Security Issues

- Fire alarm requires code upgrade
- Burglar alarm needs upgrade or replacement
- Clock, bell, and intercom system needs replacement
- Telephone system is inadequate and needs replacement
- Review fire protection system in cafeteria kitchen

B. Energy Services Company Project

In January 2004 the Town initiated an RFP for an Energy Services Company (ESCo) performance contracting project to identify potential energy savings in town and school buildings and implement infrastructure upgrades, recouping costs from the savings. The High School is by far the largest building to be evaluated in this project. In September 2004, NORESCO Company from Westborough, MA was selected and is now in consultation with representatives of Design Partnership and the R.D.Kimball Company, Inc., the engineering design firm retained for this Master Plan Feasibility Study, concerning effective short- and long-term upgrades and how these may be integrated into the project as a whole.

IV. Alternatives to a Single Phase Comprehensive Renovation

It may not be possible to accomplish a single phase renovation of Belmont High School by 2010, because of the long list of competing projects on the Town's agenda and limited resources. If the single phase renovation must be pushed off beyond 2010, it will be important to determine what needs to be done more urgently to keep the building functional and avoid a major breakdown of the existing infrastructure.

The School Committee has cited the following problems with delaying the renovations to some point beyond 2010:

- Potential degradation of the Town's largest asset
- Continued heating and ventilation problems
- Delay in meeting ADA requirements
- Delay in meeting NEASC certification requirements
- Continued waste of money in energy inefficiency
- Cost of patchwork repairs as infrastructure breaks down
- Possible loss of school time for major unplanned repairs (as occurred in the fall of 2003)

Because of the financial constraints and extended time frame, the School Committee and the Advisory Council see the need to explore the phasing of several smaller projects as an alternative to one comprehensive renovation. We would like to understand the cost effectiveness, including potential for state funding, and the logistical implications of phasing discrete projects, allowing us to address the most urgent needs, prevent infrastructure break downs, and increase energy efficiency, as well as accomplish the most urgent upgrades to support program needs in an acceptable time frame.

With the support of the Permanent Building Committee, the School Committee requested and received approval at a Special Town Meeting on November 17, 2003 to fund design services to develop a Master Plan to identify immediate concerns and lay out a sequence for complete renovation.

Tab 3

SECTION 3

Master Plan and Feasibility Study for Renovations to Belmont High School

EXISTING CONDITIONS REVIEW – ARCHITECTURAL SYSTEMS AND PLANNING ISSUES

I. Overview of Architectural Systems

To establish the basis for the renovation work scope required for Belmont High School and the resulting estimated cost to remediate these issues, Design Partnership (DPC) visited the facility on several occasions, observing the condition of the various building components and transferring field notes to prints of the original architectural plan and elevations drawings for the building. Photographs were also taken to augment our documentation process. Although the survey was not performed on a room-by-room basis, all specialized areas were closely viewed and typical areas like classrooms were checked to assure our surveyors that they were indeed typical. Many issues are pervasive and repetitive and so can be quickly stated, even though the extent of the effort and cost to remedy them may be relatively large.

This Section notes areas of general present deficiency and remediation requirements. Reproductions of the original building plans appear here as do photographs illustrating many of the bulleted items that follow. In **Section 8 - Conceptual Design**, all work proposed by the Master Plan – both renovation and new construction - is specified in detail, divided by floor and by Unit. Here also appear floor plans of the building depicting the final Master Plan buildout. Review of **Section 8,** in conjunction with this Section, will provide a full picture of the existing architectural conditions encountered and DPC's recommended correction of deficiencies.

Architectural Deficiencies and Remediation

- Abate asbestos spray-on fireproofing, fire doors, caulking, "transite" panels, pipe insulation, etc.
- Remove all ceilings to access asbestos, pipe and electrical runs, etc. and replace with new.
- Remove all vinyl-asbestos floor tiles and replace with new.
- Replace "Kalwall" panels in Fieldhouse and Pool House exterior walls.
- Replace all windows.
- Replace all exterior doors.
- Replace some interior doors that are damaged and fire doors with asbestos cores.
- Replace all door hardware for barrier-free access.
- Repaint all interior surfaces.
- Replace all athletic and student corridor lockers.

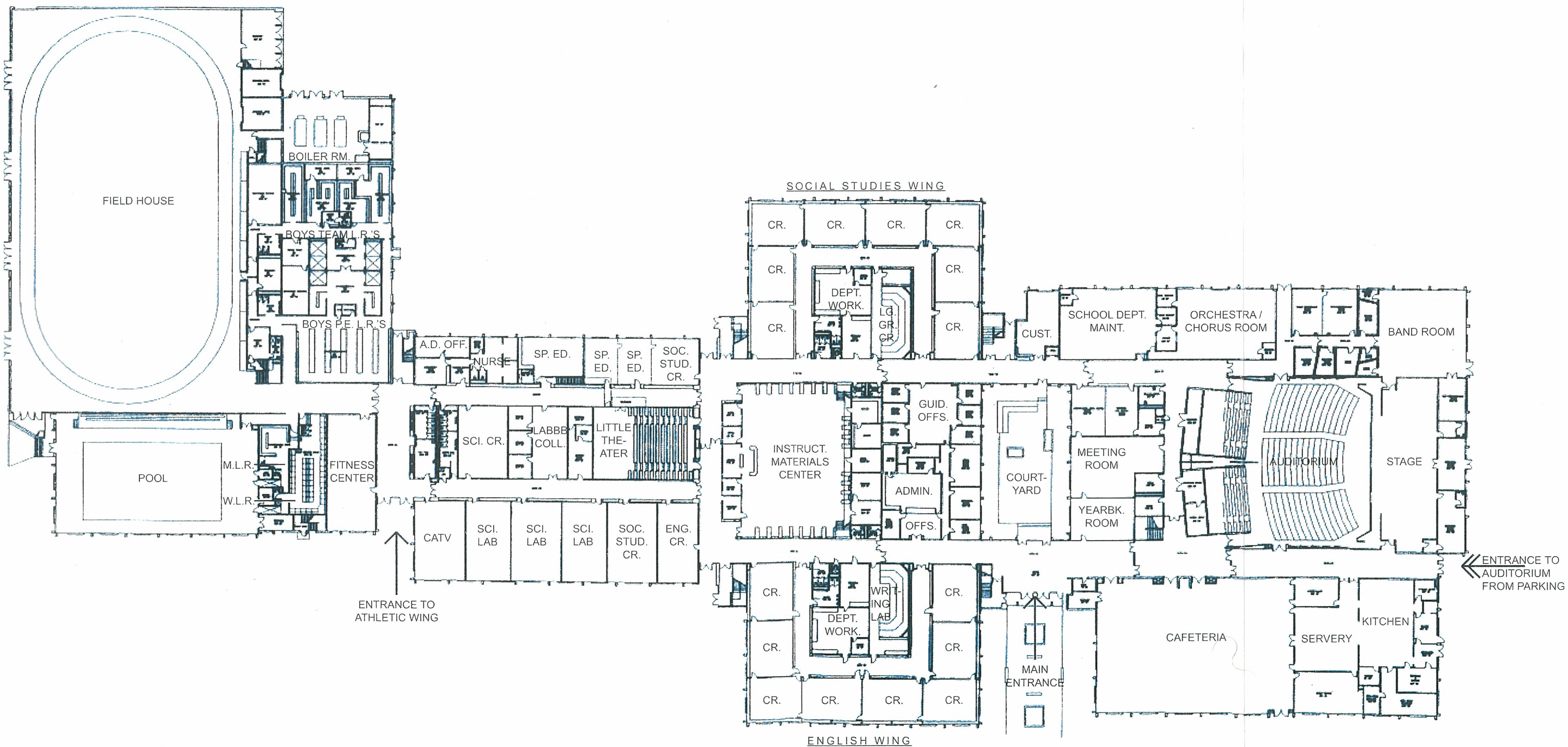
- Provide new athletic floor for Fieldhouse with cushioned wood basketball competition court.
- Provide new or reworked bleachers to allow barrier-free access.

- For all stairs, balconies and mezzanines, replace or add to existing railings to conform to present life-safety and barrier-free access codes.
- Add new riser covers to all stairs.
- Add a new elevator in the Locker Room – Fieldhouse area to provide barrier-free access from the Second Floor Locker Rooms to the Fieldhouse floor. Locate to serve the general building in this zone.
- At Owner's option, add to length of pool tank to provide MIAA compliant 25 meter pool.
- Provide lift to allow handicapped use of pool.
- Provide lift to allow barrier-free access to spectators' seating area in Pool House.
- Replan all Locker Rooms for barrier-free access.
- Replan and enlarge all Toilet rooms for barrier-free access.
- Provide casework – counters, science lab benches, art room work surfaces, library shelving, etc. – meeting current access requirements.
- Replan and re-equip all Science Labs and Art Studios.
- Cure water infiltration into lower level of "Little Theater"; equip this space for use by Drama Department.
- Redesign "Little Theater" and add lift for barrier-free access.
- Replace all carpet throughout building.
- In the Main Auditorium, remove ceiling as noted above and replace with acoustically tuned "clouds".
- Replace Stage rigging and curtains.
- Replace Auditorium seating.
- Provide barrier-free access from cross-aisle level of audience chamber and also from lower level to Stage.
- Replace existing elevator with new, larger shaft and cab to meet barrier-free access and fire department regulations.
- Repair missing and worn areas of metal roof and siding on Stagehouse.

II. Overview of Planning Issues

- Present Science Labs are generally smaller than current standards, all equipment original, over 30 years old.
- Predicted curriculum requires 2 additional Labs.
- Entrances from front and rear of building to Athletic Complex lobby should be more prominent and should provide covered exterior waiting and conversation areas.
- LABBB program requires increased space.

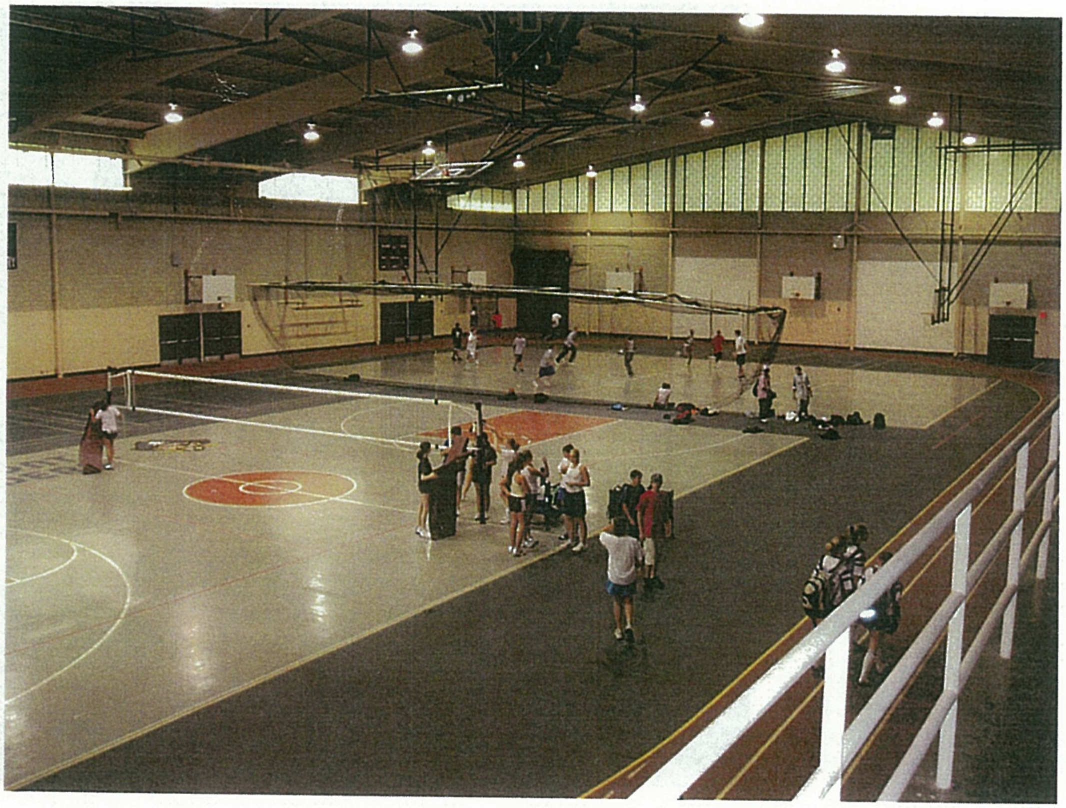
- All academic departments predict the need for more teaching stations over the next decade, a total of 10 standard classrooms in addition to the 34 now in use.
- Special Education requires increased space and a reconfiguration to provide more small spaces, ideally adjacent to one another.
- Guidance would benefit from increased space.
- Central Administration would benefit from increased space.
- The art curriculum requires 1 additional Studio.
- The Music Department requires an enlarged Band Room and additional Practice Rooms.
- The Drama program would benefit from a Dance Studio and also the aforementioned "Little Theater".
- Music and Drama both require greatly increased storage and "back-of-house" space.
- The Cafeteria should be enlarged somewhat.
- The Kitchen should be replanned and converted from electric to gas.
- There is a strong request for more student gathering space where socializing, peer and faculty dialogue, mentoring and casual study can occur. Such spaces are desirable both inside and outside the building.
- There is a strong request for more opportunities to display student artwork and other student achievements.
- The Main Entrance should be more prominent, provide better heat retention in the building and provide a sheltered exterior area for waiting and meeting.
- The Auditorium Lobby and the Corridor leading to it, spaces of frequent and significant community use, should be enlarged, enhanced and provided with a Ticket and/or Coat Room and direct access to food service opportunities.
- The entrance from the parking lot leading to the Auditorium should similarly be visually and functionally upgraded in view of its heavy use.



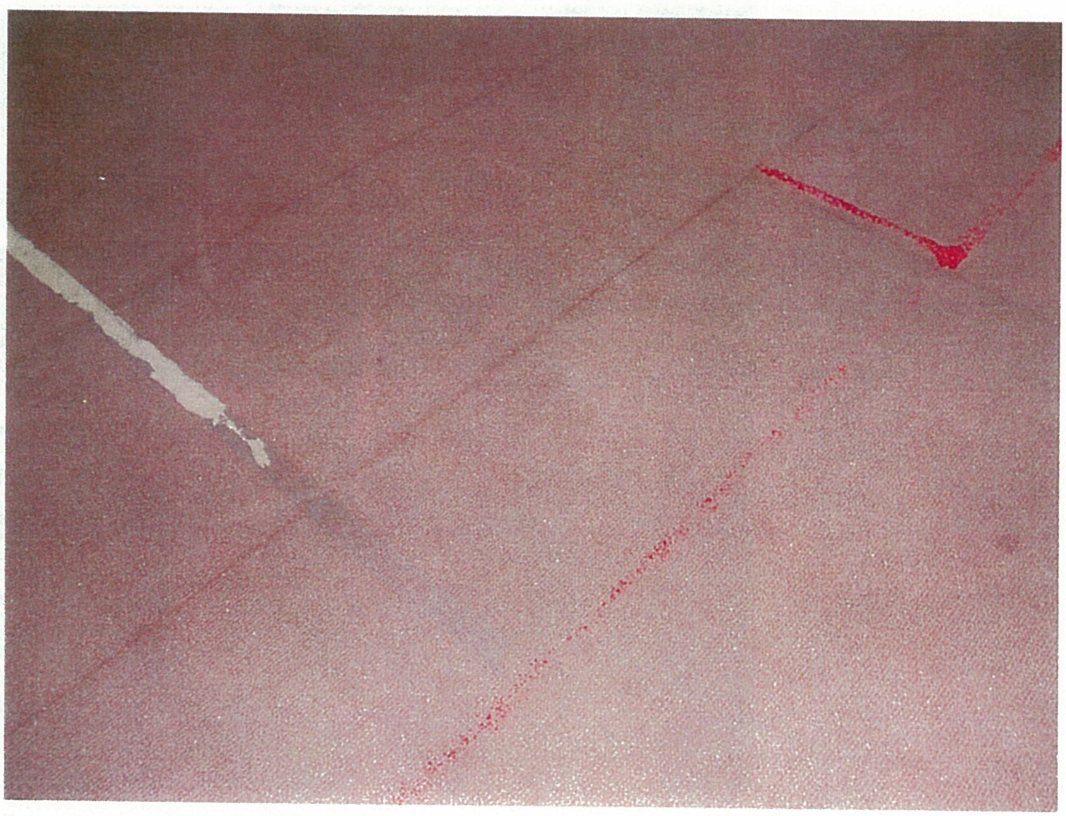
Belmont High School - Existing Plan

1st Floor

Design partnership OF CAMBRIDGE

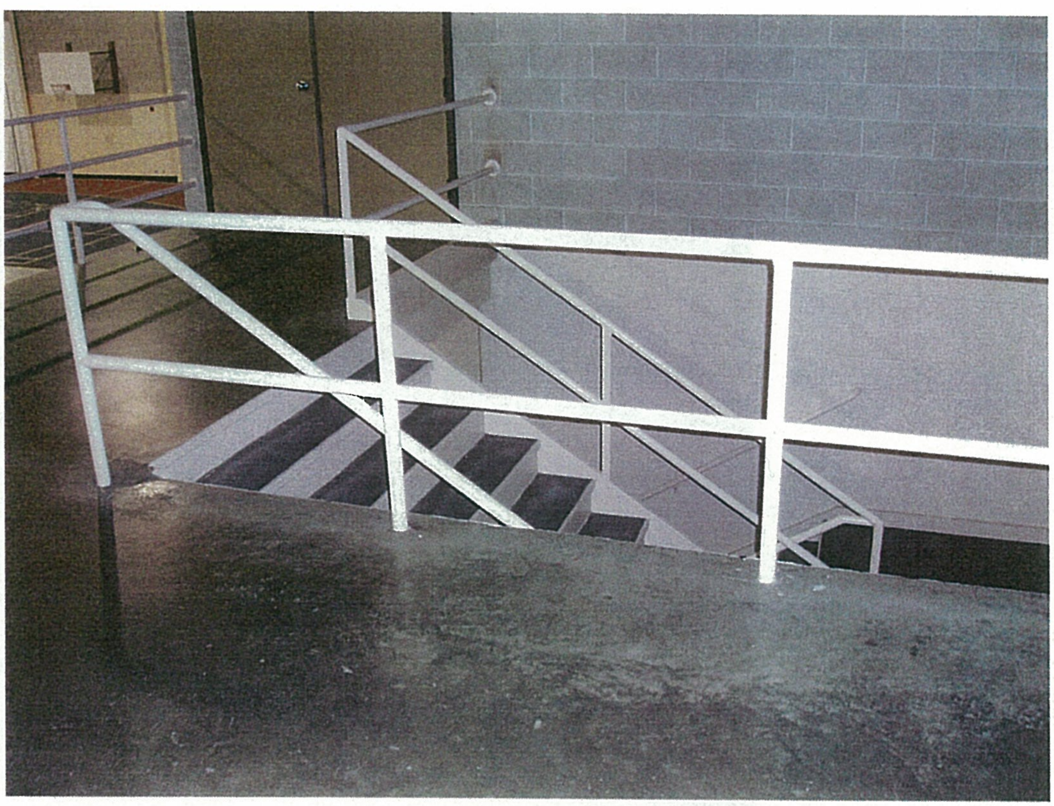


FIELD HOUSE FROM BALCONY



FIELD HOUSE FLOOR

FIELD HOUSE COMPETION COURT



STAIRS FROM FIELD HOUSE BALCONY

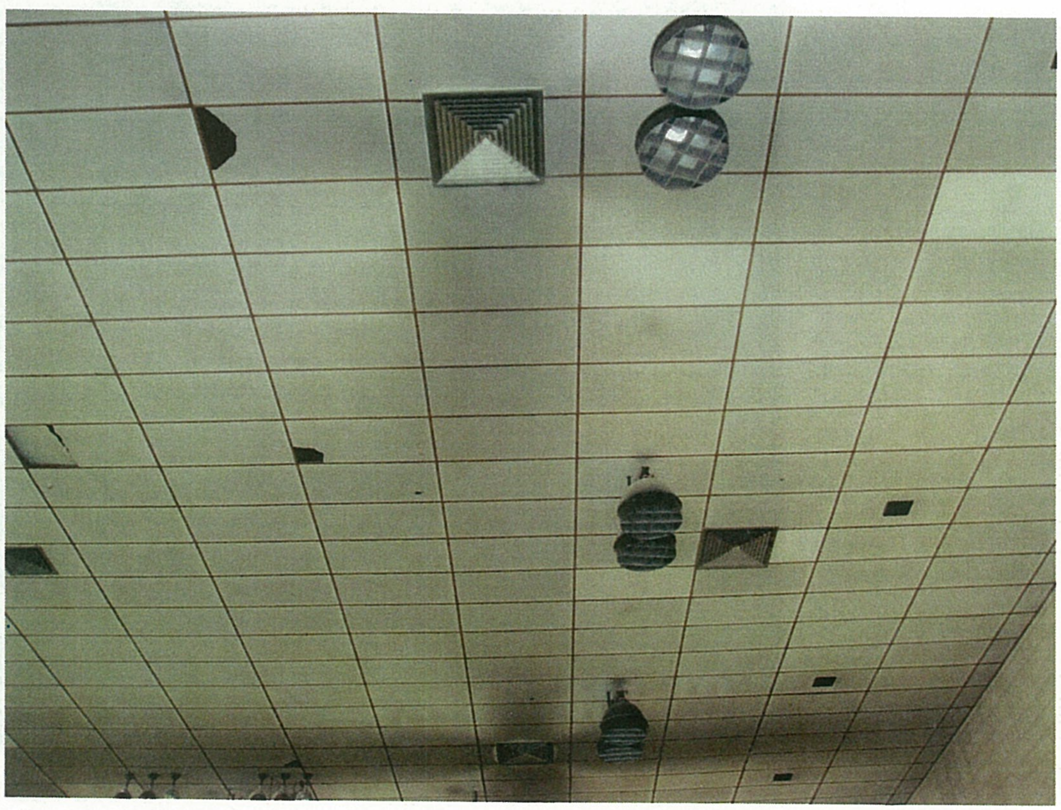
"SMALL GYMNASIUM"

LOCKER ROOM TOILETS

TEAM LOCKER ROOM

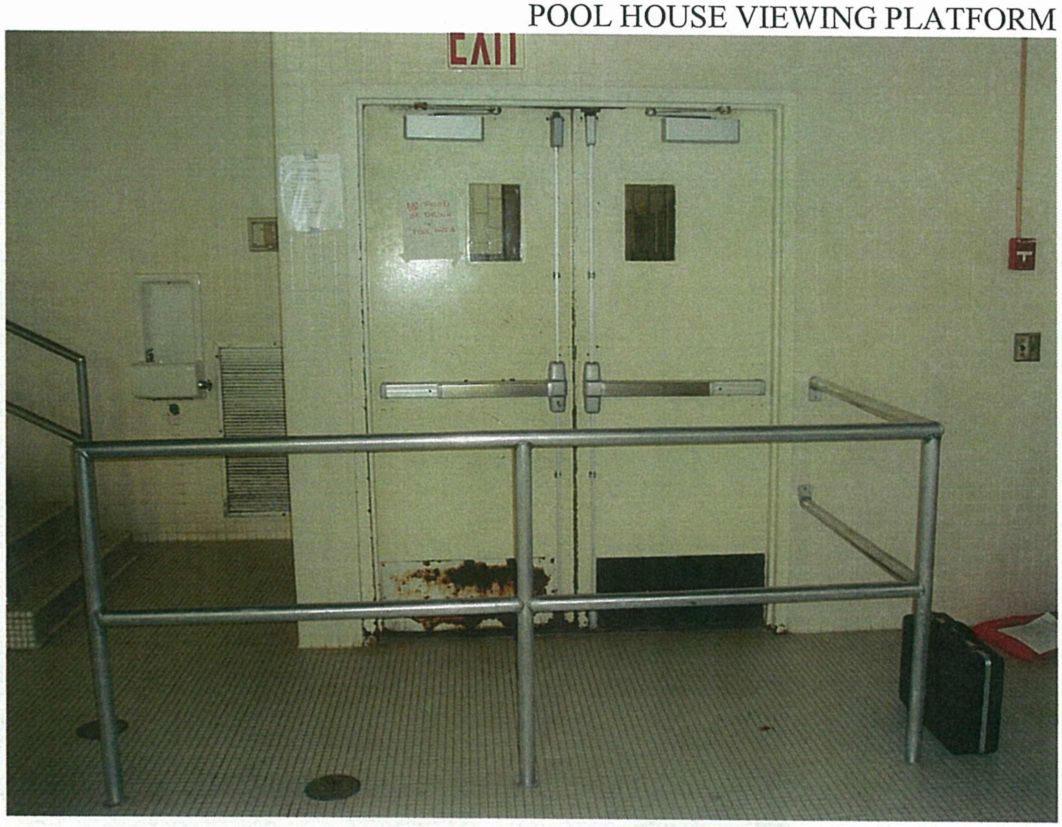
NON-ACCESSABLE DRINKING FOUNTAIN

POOL HOUSE

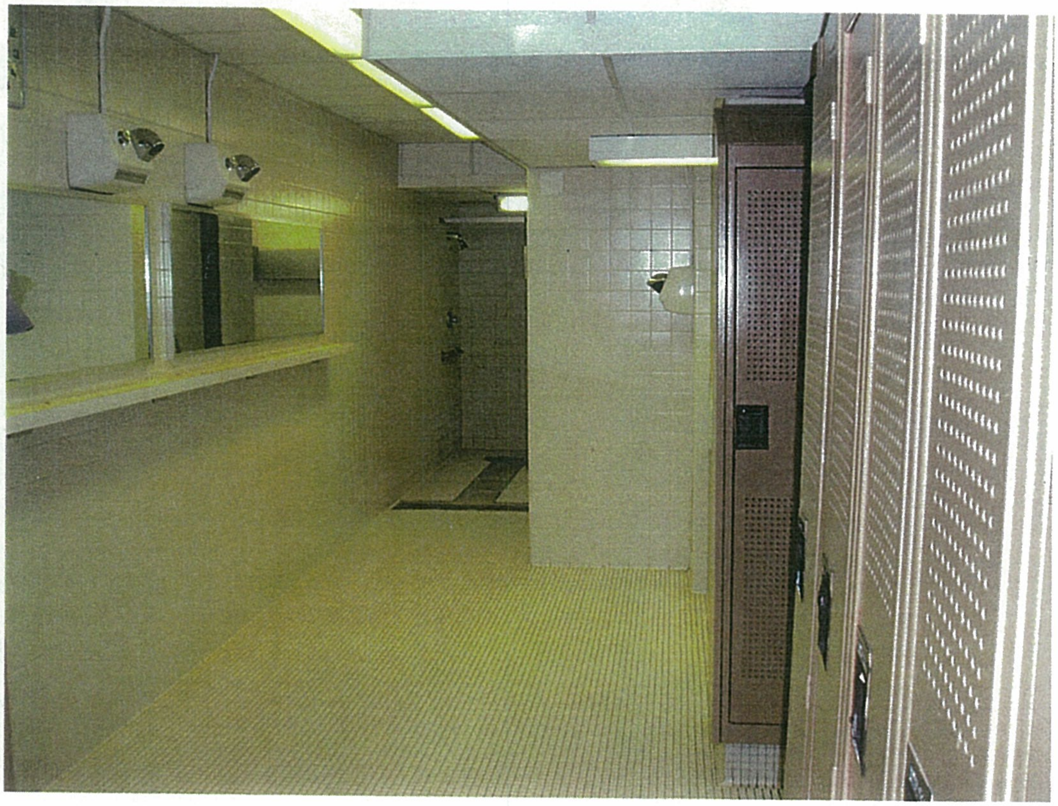


POOL HOUSE CEILING

POOL HOUSE VIEWING PLATFORM



POOL HOUSE ENTRANCE / EXIT



POOL LOCKER ROOM

POOL SHOWER ROOM

SCIENCE LABORATORY

SCIENCE LECTURE SEATING

TYPICAL STAIR

TYPICAL CORRIDOR

TYPICAL CLASSROOM

LIBRARY READING ROOM

LIBRARY COMPUTER RESEARCH CARRELS

LIBRARY STAIRS LEADING TO MEZZANINE

ELEVATOR ENTRANCE

FIRE DOOR

BAND ROOM

INSTRUMENT STORAGE

AUDITORIUM

ACCESS TO STAGE

UNIFORM STORAGE BEHIND STAGE

RAMP TO EXTERIOR FROM MUSIC CORRIDOR

AUDITORIUM ENTRANCE CORRIDOR

CORRIDOR FLOOR

CAFETERIA

COURTYARD

MAIN ENTRANCE

MAIN ENTRANCE VIEWED FROM DRIVE

ENTRANCE TO AUDITORIUM FROM PARKING AREA

REAR ENTRANCE TO FIELD HOUSE LOBBY

TYPICAL EXTERIOR WALL

STAGEHOUSE METAL SIDING

"KALWALL" PANELS
AT FIELD HOUSE

"TRANSITE" PANELS

Tab 4

SECTION 4

Master Plan and Feasibility Study for Renovations to Belmont High School

EXISTING CONDITIONS REVIEW AND RECOMMENDATIONS – MECHANICAL AND ELECTRICAL SYSTEMS

I. Introduction

To provide design and cost estimating services for the heating, ventilating and air conditioning (HVAC) systems; the plumbing system; the fire protection system and the electrical systems, Design Partnership selected **Richard D. Kimball Company, Inc.,** 200 Brickstone Square, Andover, MA. Kimball's findings and conclusions follow. Cost information is included in the Conceptual Project Cost Estimate material in **Section 10** and **Appendix D** of this Report.

RDK
NGINEERS

Belmont High School Feasibility Study And Master Plan

Submitted to:

Design Partnership of Cambridge, Inc.

Hood Business Park
500 Rutherford Avenue
Charlestown, MA 02129

By:

Richard D. Kimball Company, Inc.

200 Brickstone Square
Andover, MA 01810-1488

September 2004

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ergy Conservation

ogram Management

mmissioning

cilities Support

RDK Offices: Andover, MA Boston, MA

RDK
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Table of Contents

RDK
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SECTION 1

INTRODUCTION

OVERVIEW

INTRODUCTION

RDK Engineers has been contracted by Design Partnership to perform a Mechanical, Electrical, Plumbing and Fire Protection systems evaluation and conceptual Master Plan for the Belmont High School located in Belmont, MA. Below we have provided a summary of existing conditions from a survey we performed in June.

OVERVIEW

The Belmont High School is located on a 33-acre site off of Concord Avenue in Belmont. The two-story building was built in 1970. The building is approximately 250,000 SF and is divided into four areas, known as Unit 1, Unit 2, Unit 3, and Unit 4. Unit 1 houses the pool, fieldhouse, and locker room on the first floor; locker rooms and the upper gym on the second floor. The fieldhouse and the pool are both two-story spaces. The main boiler room is also on the first floor, on the north end of the building. Unit 2 consists of two floors of classrooms. Unit 3 houses the library (2-story space), computer lab and classrooms. The auditorium (2-story space), cafeteria and some classrooms are located in Unit 4. The entire roof of the building was replaced in phases from 1996-2000; however, no other major renovations or additions have been done since the building opened. The plumbing, electrical, and heating and ventilation equipment in the building is original equipment.

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SECTION 2

EXISTING CONDITIONS

- FIRE PROTECTION
- PLUMBING
- HVAC
- ELECTRICAL

EXISTING CONDITIONS

FIRE PROTECTION

A fire protection system in the form of sprinklers, standpipes, hose cabinets, etc. does not currently exist at the High School.

A portion of the kitchen hood does have an Ansul system installed. This system was installed when a griddle was added to the kitchen. The Ansul system does not protect the entire hood. It only protects the area where the griddle was added.

PLUMBING

Cold Water Distribution

The domestic water system is supplied by a 6" copper line which enters Room #143 at the first floor of Unit 1 (see photograph #1). As the 6" line enters the building it is reduced down to a 4" prior to the water meter to serve all plumbing fixtures within the building. In a discussion with a custodian during the site visit, it was determined that water service meets the current requirements of the building.

Plumbing Fixtures

Water closets throughout the building for the most part are wall mounted flush valve type (see photograph #2). The majority of the water closets appear not to be of the low flow type, 1.6 gallons per flush, which is now a code requirement.

Lavatories are wall hung with separate hot water and cold water metering/push handles. Although the faucets are metering type, they do not have a temperature limiting device (see photograph #3).

Toilet rooms are located on all levels of the school. Although some ADA water closets have been installed in the larger toilet rooms the other fixtures that exist in the toilet rooms are not meeting ADA requirements. The lavatories appear not to meet clearance requirements and the faucets are two handle type. Since the toilet rooms in the building are considered public the faucets are required to be metering type. The Men's toilet rooms do not have an ADA urinal in place.

Domestic Hot Water Generation and Distribution

A portion of the domestic hot water system consists of two electric water heaters in Unit 3 to serve this section of the building only. These water heaters are located in janitor closets, Rooms #612 and #634, both on the second floor of Unit 3. Both of these heaters appear to be feeding plumbing fixtures more than 100' from the heaters, but do not have a recirculating line which is required by the Massachusetts State Plumbing Code. Both water heaters are original to the building and appear to be past their life expectancy.

The larger areas of the building are fed from two separate Patterson-Kelly steam fired water heaters. One heater is located in Room #206 on the second floor of Unit 1 (see photograph #4). This heater feeds all plumbing fixtures requiring hot water in Units 1 & 2. These areas include the pool area locker rooms, as well as the boys and girls locker rooms. This heater is also serving the toilet rooms in the area, but the locker rooms are the largest load. This water heater is storing hot water at 150° and appears not to have a mixing valve at the discharge of the tank. Therefore, 150° hot water is being delivered to all fixtures in Units 1 & 2.

The second steam fired heater is located in Room #726 on the first floor of Unit 4. This heater feeds the plumbing fixtures in Unit 4 only, which includes the kitchen and all toilet rooms within Unit 4. This water heater is storing hot water at 140°. A mixing valve is installed to reduce the water temperature to the toilet rooms. A 140° line bypasses the valve to feed the kitchen.

Both water heaters are in locations that make them very difficult to maintain. Walls have been built around the units. Both of these water heaters have been provided with hot water recirculation systems. These systems utilize a small return line with an in-line pump to circulate hot water throughout the main distribution piping, thereby minimizing the time it takes for hot water to get to fixtures.

There is an existing electric water heater located within the kitchen that is no longer in use (see photograph #5). According to the school personnel, this water heater was used during the summer months for kitchen use when the boilers were shut down. Now that the school is used during the summer months for various programs, the kitchen water heater is not used. The boilers, which serve the large water heaters, are now fired all year and feed the kitchen during the summer months.

All water heaters are original to the building and are past their life expectancy.

Insulation

Cold water and hot water piping are in fair condition. The pipe insulation appears to be fiberglass. In many locations the insulation is either hanging off the piping or has been completely removed from portions of the piping. Overall, where insulation exists, it is in only fair condition. Due to the age of the building, it can be reasonably be assumed that the insulation contains asbestos.

Sanitary and Vent System

The original plans indicate the sanitary system is a gravity system. There are several locations throughout the building where the sanitary lines exit to manholes.

The sanitary piping is hub and spigot cast iron. We observed areas where it appeared new piping had been installed. The existing piping appeared to be in fair condition.

Hose Bibbs and Wall Hydrants

Hose bibbs are required in toilet rooms in the building with two or more water closets or urinals. The toilet rooms that were observed did not have hose bibbs installed.

There were three exterior wall hydrants located around the building. The wall hydrants did not have a code required integral vacuum breakers. The Massachusetts State Plumbing Code requires outside hose bibbs to be at the exterior of the building no more than 100 feet apart. The building does not appear to be meeting this requirement.

Cross Connection Control

Currently cross connection control in the form of vacuum breakers for the protection of the domestic water system is not in place. As stated above, the exterior wall hydrants do not have integral vacuum breakers.

Storm Drainage

The building storm drainage consists of external gutter and downspout system. All downspouts drop to grade and into a cast iron boot, which goes below grade (see photographs #19 & #20). The storm system appears to be adequate for the facility at present.

Boys' and Girls' & Pool Locker Rooms/Shower Areas

The Boys' Locker Room is in fair condition. The showers are controlled by means of four master control mixing valves, behind recessed cabinets, outside of the shower area (see photograph #6). The shower areas themselves are a series of separate gang showers (see photograph #7). The number of showerheads within each gang shower varies, but each showerhead can be individually turned on. The showers within each gang shower are the Symmons Hyda-Pipe system. It could not be determined if the showerheads were a code compliant 2.5 GPM head. Within each gang shower there is a single floor drain. This does not meet the current codes. The Massachusetts State Sanitary Code does not allow the water from one shower to cross into another shower area.

The Girls' Locker Room is in fair condition. The showers are controlled by means of a series of master control valves. Each valve controls one bay of showers (see photograph #8). The mixing valves are exposed outside each shower bay. The shower units are separated into individual shower areas. Each shower area is controlled by a single Symmons Hyda-Pipe shower valve and head (see photograph #9). Floor drains are located between each shower area. The shower water never passes from one shower area to the next. It could not be determined if the showerheads were a code compliant 2.5 GPM head.

The pool showers are set up similar to the boys locker room showers. There are two separate shower areas. Each shower area is controlled by a master mixing valve, which is located in the coaches room between each shower (see photograph #10). Each shower area has a single floor drain with multiple shower heads (see photograph #11). This does not meet current sanitary codes.

The areas did not meet current ADA requirements or code required low flow fixtures and metering faucets at the lavatories.

Natural Gas System

The gas service to the building enters into the Mechanical Room #104 in Unit 1 (see photograph #12). At the service entrance, the gas splits into two separate lines. There is a 4" line, which is a dedicated service to the emergency generator, located in Room #139 just outside of the Mechanical Room #104, and a 3" line, which feeds the gas pilot to the boilers as well as the gas requirements in the science wing. It was noted by the facilities personnel that the gas to the science wing has been turned off. The gas piping itself is in fair condition.

Kitchen

The kitchen is currently an all electric kitchen. No equipment is fed from the existing gas service.

The triple compartment sink is connected to a code required grease interceptor (see photograph #13). The interceptor is mounted on the floor below the triple compartment sink. The grease interceptor appears to be maintained properly.

The existing dishwasher is a conveyor type with an electric booster. 140° hot water is being delivered to the washer and the booster is raising the temperature to 180° (see photograph #14). The washer also has a grease interceptor installed on the waste line exiting the washer (see photograph #15). Current engineering practice is to not install the grease interceptor due to the water exiting the dishwasher being 140°. Any grease would simply flow through the grease interceptor.

Science Wing

Plumbing services to the science wing are in fair condition. Currently the waste from the science wing is completely separate from the standard sanitary system, but does not have an acid neutralization system, which is in code violation. The waste piping that could be observed was glass pipe (see photograph #16). There are also drum traps installed at all sinks, which is not acceptable by current code. The acid waste system exits the building separately and the existing plans show the acid waste line connecting to the standard waste outside the building. The acid vent system is also separated from the standard venting system. The acid vent penetrates the roof separately from the standard venting system.

The domestic hot and cold water to all lab faucets is connected to the same system as the rest of the building. There is not a separate non-potable water system. The system is protected by vacuum breakers on each faucet, which is an acceptable method of backflow prevention (see photograph #17). The faucets are in fair condition, but there were locations where some faucets were damaged.

Each science room is provided with an emergency shower, however, each shower is fed by cold water, and is located away from the entry door (see photograph #18). Currently code requires emergency showers to be fed with tempered water and to be located adjacent to the entry door.

As stated previously, the gas piping to the labs has been shut off. The school personnel have indicated a gas shut off valve is located in the ceiling of the corridor. Code requires a shut off valve be located within a cabinet at the exit door of each lab.

The labs are also fed with a compressed air system, which has also been shutoff to the labs.

HVAC

The basic HVAC systems in the Belmont High School consist of unit ventilators providing heat and outdoor air to most spaces that border an exterior wall and rooftop air handling units providing heat, outdoor air, and cooling in some interior spaces. According to the original design drawings, the classroom unit ventilators were intended to be 2-pipe heating / cooling units, but were never utilized as such. To support this system, a chiller and cooling tower were shown on the drawings as an alternate that was never implemented. In addition, some of the rooftop air handlers were provided with DX coils for cooling, but they were never used. The rooftop exhaust fans (64) were replaced about two years ago; however, the unit ventilators and the rooftop units are original to the building (over 30 years old) and are close to failing.

Boiler Room

The building is heated by three boilers, which burn #4 oil to produce steam. The boilers were manufactured by Kewanee/ American Standard and are rated at 8369 MBH each for a total of 25,107 MBH (100 BTU/SF). The boilers were re-tubed in the summer of 2003, and are fed water treatment chemicals from plastic drums that pump the chemicals to each boiler individually. The burner is an oil burner only, with a gas pilot. Oil is brought into the building from an underground tank by double-containment piping to duplex oil pumps feeding the boiler. The underground oil tank holds 20,000 gallons and was replaced in 1998. A unit ventilator, rated for 8,500 CFM, provides outdoor air into the space.

Steam is piped throughout the building to the rooftop air handlers and some unit ventilators. Steam is also converted to hot water, which is fed to the classroom unit ventilators. The control system is pneumatic, and according to the maintenance staff, has major leaks. Control valves have been replaced as necessary, but the system is in poor condition overall. The tubing cannot be readily repaired because it is located in areas with spray-on asbestos fireproofing on the structural steel. A 4" gas service runs near the boiler room, but only serves the science wing and the emergency generator.

Fieldhouse / Gymnasiums

The fieldhouse is served by four unit ventilators that provide heat and outdoor air to the space. These units are rated for 10,000 CFM with 50% outside air. According to the Massachusetts State Building Code, which references the 1993 BOCA National Mechanical Code, educational facilities must provide 20 CFM of outdoor air per person in gymnasiums. These units bring in enough outdoor air to seat 1,000 people, by code. There are also exhaust fans on either side of the building in the eave space to help draw the heat out of the fieldhouse. The upper gymnasium is fed from two unit ventilators, each rated for 4,500 CFM with 50% outside air. These units bring in enough outdoor air to support 225 people in the space, per code. There are no exhaust fans serving this space. The unit ventilators are quickly approaching the end of their useful lives. According to maintenance personnel, the heating coils in the unit ventilators are starting to fail and will require replacement soon.

Pool

The pool is used year round by both the school and the town. The pool area is heated and ventilated by two unit ventilators, rated for 5200 CFM with 50% outside air, and three exhaust fans. There is no dehumidification system, and the space is often cold in the non-summer months. During our visit, we noted that the pool area was under a severe negative pressure, meaning that more air was being sucked out of the area than was being supplied.

Locker Rooms

The locker rooms and team rooms have unit ventilators and exhaust fans heating and providing outdoor air to the spaces. According to the code, 0.5 CFM / SF of outdoor air is required for all locker rooms. All of these units are original equipment and starting to fail as well.

Library / Computer Lab

The library and the computer lab areas are heated, cooled, and ventilated by rooftop air handling units (RTU-E, RTU-E-1). Libraries require 20 CFM / person of outdoor air for ventilation. The computer lab, in its current configuration, requires additional cooling. Window air conditioners have been installed as a temporary measure to make the spaces comfortable, but a more permanent solution needs to be found.

Auditorium

The auditorium and stage area are heated and ventilated with four rooftop air handlers and multiple exhaust fans. One air handler serves the stage area (RTU-L), and another serves the lower half of the auditorium (RTU-K). The back half of the auditorium is split in half- one air handler serves the left (RTU-J) and another serves the right (RTU-I). There is no air conditioning capability in any of these units. Per the code, 15 CFM / person of outdoor air is required for ventilation in auditoriums. The current configuration provides 12,570 CFM, or enough for 838 people. The auditorium has seating capacity for 900 people, in addition to the performers on stage, so additional outdoor air is needed.

Classrooms and Laboratories

The classrooms that are along exterior walls are heated and ventilated by unit ventilators, fan coils, and cabinet exhaust fans. The wall louvers, from which outdoor air enters the unit ventilators, are in poor condition. Exhaust from each of the classrooms is ducted together to rooftop exhaust fans. Each of the laboratory hoods is ducted to individual rooftop exhaust fans. All of this equipment is original to the building and in need of replacement. The interior spaces are heated and ventilated by rooftop air handling units. Rooftop units (RTU-A, RTU-B, RTU-C) serve the interior classrooms and offices in Unit 2. Rooftop units (RTU-F, RTU-G, RTU-H) serve the interior classrooms and offices in Unit 3. The air handlers are also original to the building and beginning to fail. In addition, laboratories in educational facilities require 20 CFM of outdoor air per person, and classrooms require 15 CFM of outdoor air per person, according to the code.

Cafeteria

The cafeteria seating area is served by two air handling units (RTU-M, RTU-N). Together, the units provide 5,320 CFM of outdoor air, or enough to allow an occupancy of 266 people according to present code requirements.

Kitchen / Serving / Staff Dining

The kitchen is served by a 7,000 CFM heating and ventilating unit on the roof (HV-P). An exhaust hood is located over the cooking equipment. The hood was recently updated to include an Ansul fire protection system, due to the addition of a griddle in the cooking line. All of the equipment in the kitchen is electric.

A rooftop air handling unit (RTU-O) serves the staff dining and serving areas. Per the code, 15 CFM / person of outdoor air is required in dining rooms.

Additional exhaust or cooling is needed in this area due to the heat produced from the multiple vending machines in the serving area and in the cafeteria.

Corridors

Corridors are heated by recessed unit heaters and fan coils in the ceiling. There is currently no outdoor air being supplied to the corridors, although 0.1 CFM / SF is required by code.

Toilet Rooms

The toilet rooms are exhausted up to roof top exhaust fans. They appear to be adequately ventilated. Per the Massachusetts State Building Code, 75 CFM of exhaust air per fixture is required within bathroom areas.

ELECTRICAL

Main Electric Service and Power Distribution

The electrical service to the building is provided from a utility company pad-mounted transformer located outside the main electrical room, in Unit 1, to a main switchboard rated at 3000A, 480/277V, three phase, four wire with secondary utility company metering. Manufacturer is General Electric Company and the distribution sections utilize circuit breaker type overcurrent protection devices. Integral to the switchboard is a 208/120V, three phase, four wire unit substation rated at 500A. The 480V section of the switchboard houses feeder breakers which serve power and lighting panelboards throughout the entire school complex with an emphasis on serving the Unit 1 and Unit 2 areas. The 208V section of the switchboard houses feeder breakers which serve power and lighting panelboards in unit 1 and 2 areas only. Overall switchboard and associated remote panelboards are serving typical educational facility loads such as classrooms, labs, library, gymnasium, auditorium, pool, mechanical equipment, etc. The switchboard, feeder breakers and metering devices are all original.

It was noted that there is not adequate workspace clearance between the front of the switchboard and the panelboards located on the opposite wall. The national electrical code (NEC) Article 110 requires a 48-inch separation for this particular application, as opposed to the 36-inch present separation..

A second 500 KVA, 1600A, 208/120V unit substation is located on the opposite end of the complex in an electric room adjacent to the Unit 4 main corridor. The equipment manufacturer is General Electric Company and the distribution section is configured to utilize circuit breaker type overcurrent protection devices. The integral switchboard houses feeder breakers, which serve power and lighting panelboards in Unit 1 and 2 areas. The unit substation and all associated components are original.

It was noted that there is not adequate workspace clearance between the front of the unit substation distribution section (switchboard) and the panelboards located on the opposite wall. The national electrical code (NEC) Article 110 requires a 36-inch separation for this particular application, as opposed to the 29-inch present separation. A large domestic hot water tank is located in a room adjacent to the electrical room. This room is approximately 18 inches higher than the electric room which will allow water to flow onto the electric room floor and around the unit substation if the tank should ever fail to retain the water.

Power and lighting panelboards located throughout the facility are of the same manufacturer, General Electric Company, and utilize circuit breaker type protective devices. All equipment is original with the exception of the auditorium distribution panel associated with the lighting system (installed in 2000) and two power panels located in the kitchen (installed in 2001). Although In-house maintenance personnel have not experienced significant problems with the power distribution system, the 30 plus years of age places the system beyond its expected useful life. In addition to an increased frequency of component failures, replacement parts are becoming more scarce with time.

Emergency Power Distribution System

The existing emergency power distribution system is derived from a 140kW, 480/277V, diesel-fired, skid-mounted emergency generator with sub-base fuel tank located in a separate fire-rated room adjacent to the main electric room. A 300A, 480V, emergency distribution panel (EDP), located in the generator room, houses feeder breakers serving remote emergency panelboards located throughout the facility. The generator serves panel EDP via an automatic transfer switch also located in the generator room. Emergency loads consist primarily of egress and exit lighting, boilers, boiler pumps, kitchen cooler and freezer.

The generator is original to the building and is tested on a weekly basis. The 400A automatic transfer switch and 400A emergency distribution panel were installed late in 2003 due to a catastrophic failure and subsequent destruction of the original equipment. The generator was overhauled, as a precautionary measure, following the event. Panelboards serving remote loads throughout the facility are also original. Many of these panels are located in electric rooms and spaces, which also house normal power distribution equipment. It was noted that there is no 2-hour fire rated separation between normal and emergency panelboards as required by Massachusetts Electric Code, Article700-9. In addition, the feeders serving these panelboards are not 2-hour fire rated as required by Massachusetts's Electric code, Article 700.

Lighting System

The lighting system throughout the building consists mainly of a combination of recessed/surface/pendant mounted fixtures. The lamp type is predominately T-12 linear fluorescent with most others being incandescent followed by a scattering of line and low voltage halogen and quartz serving unique areas.

The corridor lighting system consists of 2x4 acrylic lens fluorescent fixtures with (6)-F3T12 lamps and high power factor ballasts. The fixtures are spaced approximately 14'-0" on center and ,in general provide a somewhat adequate level of light, however, many areas are noticeably lacking in sufficient levels of light. Key switches located at major intersections control the corridor lighting system. Lighting levels appear to be adequate.

The classroom lighting system consists of both recessed and surface mounted 4-foot fixtures with acrylic lens and (2)-F40T12 lamps and high power factor ballasts. The foot-candle level in the classrooms appears to be adequate. Lighting is controlled by switches located near the main entrance door. Lighting levels appear to be adequate.

The gymnasium lighting system consists of pendant mounted HID highbay fixtures with aluminum reflectors above the activity area and 8 foot tandem connected fluorescent fixtures with opened louvers and (2) F96 PG17 lamps above the spectator areas. It was noted that no wireguards have been provided to protect the lamps from damage due to impact from foreign objects such as a basketball. Switching of the gymnasium lighting system is achieved by switches located adjacent to stairway entry points. Lighting levels appear to be adequate. As a note, the high bay lighting fixtures were installed approximately 15 years ago (1989) to replace the original 8-foot fluorescent fixtures, which were not as practical for the application. All HID fixtures are re-lamped every 2 years.

The auditorium lighting system is comprised of recessed incandescent downlights located in the seating area and direct/indirect wall sconces mounted on the perimeter walls. The theatrical stage lighting system consists of multiple horizontally mounted pipe battens with multiple incandescent and halogen flood and spot lights. A combination of fluorescent strip fixtures and HID lowbay fixtures provide work lighting at the back stage areas. An elaborate multi zone dimming system located to the right of the stage controls the theatrical lighting system. The system includes an enclosure housing multiple control relay units and an enclosure housing multiple dimming modules. The system is manufactured by Strand Lighting Company and was installed in 2000. The system is operated on a regular basis and appears to be functioning properly for the application.

Emergency egress lighting has been provided throughout corridors, mechanical rooms and public spaces with the exception of toilet rooms. LED type exit signs have been installed along all paths of egress throughout the building. These fixtures are served by the emergency panelboards, which are connected to the generator. Additional emergency egress light fixtures should be incorporated at all major interior and exterior building exit points. Additional exit light fixtures should be strategically placed throughout the facility to better guide individuals out of the building.

In general, the lighting fixtures and associated lamps are old, inefficient and should be replaced with higher efficiency fixtures providing better distribution characteristic and higher quality light.

The control system utilizes outdated line voltage relay technology requiring multiple control points for a single location. In addition, the system has no capability to automatically shut down any fixture location. The control system should be replaced with a modernized electronic relay control system allowing greater local control flexibility, customized timed control and single point manual override control.

Fire Alarm System

The existing fire alarm system is a class B, non-supervised, multi-zone system. The master control panel is located in the Unit 1 main electrical room. An annunciator is located at the main entrance to the Unit 3 area and serves to identify system alarms, faults, trouble and their respective locations identified by specific zones (areas) of the facility. A master box, located on the building exterior of the Unit 3 entrance area is utilized to transmit a fire alarm signal directly to the local fire department via a dedicated telephone cable.

Fire detection throughout the facility is achieved with the use of smoke and heat detection devices placed in corridors, assembly areas, kitchen, storage rooms, mechanical spaces and other non-classroom use areas. Audible and visual annunciation is achieved with the use of wall mounted horn and strobe units respectively. The facility is segmented into multiple detection and audible/visual "zones" of protection. Each zone represents a single circuit connected to all devices in that zone. Each floor of each Unit has a dedicated zone of protection (i.e. 8 primary zones).

The fire alarm system has been maintained by Simplex Fire Alarm Systems Company who upgraded the master control panel approximately 15 years ago. Simplex replaces defective devices and conducts functional system testing on 50% of all devices twice per year. The master control panel appears to be functioning properly and currently has physical space available to accommodate additional detection type plug-in modules as well as audible and visual annunciation type modules. All device wiring throughout the facility is original. Most detection, audible and visual devices are also original with the exception of devices replaced due to prior failure.

The overall system is antiquated and utilizes older outdated technology and is increasingly more prone to faults and failure with time. Replacement parts are increasingly more difficult to obtain. Wiring techniques, device ratings and device placement are deficient with respect to today's national and state fire alarm codes as well as ADA compliance requirements.

Master Clock System

The existing master clock system was manufactured by Simplex and is original to the building. The system architecture is very basic in nature and consists of multiple surface mounted clocks located throughout the entire facility with a common connection back to a master control panel. The master control panel is centrally located in Unit 3 clerical room 530. The system appears to be maintaining the correct time and no concerns or complaints were indicated during discussions with in-house personnel. Each classroom is equipped with a 10" square clock mounted to an architectural millwork panel at the entry door. A combination of 10" square and 12" round clocks have been installed at various locations and intervals throughout the facility.

Intercommunications System:

The existing intercommunication system is original to the building. The system architecture is very basic in nature and consists of multiple speakers mounted throughout the entire facility with a common connection back to a master control panel. The master control panel is centrally located in Unit 3 clerical room 530. The system appears to be functioning properly and no concerns or complaints were indicated during discussions with in-house personnel. Each classroom is equipped with a 12" square speaker surface mounted to an architectural millwork panel at the entry door. Both wall and ceiling mounted type speakers have been used.

The auditorium is equipped with a separate sound system, which is controlled from a remote console located behind the stage. This system has been upgraded to include new speakers on the upper walls to the left and right of the stage facing the audience. In addition, multiple microphone-input jacks have been installed in front of and to the side of the stage area. The system is presently functioning properly.

Security/Intrusion Detection System:

The security/intrusion detection system is original to the building and primitive in nature. Basic door contacts have been installed on exterior doors at locations considered most likely to be intruded upon (cafeteria, locker rooms, field house and locations to the rear of the building). The system is monitored by a master control panel, which is centrally located in Unit 3 clerical room 530.

Audio/Visual Voice/Data System

The existing antiquated "TV" system has been upgraded throughout the school during the past several years. A fiber optic "backbone" cabling system has been run throughout the building to strategic locations terminating in a fiber optic breakout panel. The fiber cable originates at a communications server with multiple rack-mounted processing equipment. The processing equipment is located on the second floor of Unit 3 audio/visual storage room 620 on the second floor adjacent to the computer lab.

Category 5 communications cable is extended from each nearby fiber optic breakout panel to workstations in the computer lab, classrooms, offices, etc. The town has recently installed a town-wide fiber optic communications loop such that each facility can have direct and immediate access to a town-wide database. This communications loop originates at a central serving station located at the public library. Internet access is provided via the central servers and town loop.

RDK ENGINEERS

SECTION 3

ISSUES & RECOMMENDATIONS

ISSUES & RECOMMENDATIONS

In order to accommodate the master planning requirements of the Belmont High School, a phased Master Plan has been developed in conjunction with Design Partnership. The plan would be implemented as follows:

Phase I: 6/20/Yr 1 – 9/1/Yr 2

The first phase of the Master Plan is to update the systems in Unit 1 area of the building. Abatement in the Unit 1 area will be completed and ready for occupation in the fall of Year 1. The major comments of new construction will be built-in Phase I. The Science Wing, 2 floors totaling 26,700 sf and the 5400 sf addition to rear of the present Stagehouse for Art and Music Support. The steam to hot water conversion for the heating system will begin with the replacement of one of the steam boilers with a new hot water boiler of the next largest size, during the summer of Year 1. A second boiler will be brought on-line during the summer of Year 2. The boilers will be up-sized to accommodate the increased outdoor air to the building, as well as future additions. The corridor ceiling will be taken down, and the new hot water piping loop with glycol, new conduit, etc. will be started, from the boiler room in Unit 1 to the beginning of Unit 2. The existing steam unit ventilators serving the gymnasiums will be replaced with new hot water units and sized for required amount of outdoor air. A new HVAC system for the pool will also be installed.

The existing electrical service has sufficient reserve capacity to support the proposed cooling loads as well as the additional loads associated with the renovated and added facilities throughout the school. Although the existing service contains the required capacity to accommodate the demands of the renovations, the system is original to the building and has been in service for over 32 years. With consideration to age and added loads, it is recommended that the entire service and primary distribution equipment be replaced.

A direct replacement of equipment, in it's present location, will not be possible due to the extensive downtime that would occur during construction. An alternate electrical room will need to be allocated for housing the replacement service equipment. Ideally the alternate electrical room would be placed at the north wall within the adjacent emergency generator room. This location will allow the best use of the existing high voltage service already in place as well as minimize the necessary connections to the emergency generator distribution equipment. The proposed emergency generator will be located outside the electrical room.

New mechanical equipment distribution panels will need to be strategically placed throughout the building to accommodate the necessary branch circuit wiring to the upgraded HVAC equipment. In addition, power and lighting panelboards will also be introduced to best serve the specific needs of the classroom, administration and library improvements.

Due to the overall length of the school, a second distribution switchboard, similar to that which exists today, will be introduced to minimize power losses and costs associated with long equipment feeder lengths. a new space will need to be assigned to house the proposed switchboard, for reasons similar to those associated with the main switchboard replacement. The recommended location for this equipment is in the space adjacent to the room, which now houses the original switchboard serving the area. The existing steam-fired domestic water heater will be scheduled for removal during the renovations. Major components of new construction will be built during Phase I. A portion of this new construction will be utilized to house the new domestic water heater.

During this phase, all electrical distribution equipment spaces will be procured and made ready to accept the equipment as stated above. Raceways will be installed between each remote distribution, power and lighting panel board and their respective distribution switchboard to the extent possible within this phase. All proposed equipment will be installed with raceways connected to establish a continuous and unobstructed raceway system. Wiring will not be installed during this phase.

A new utility transformer concrete pad will be installed adjacent to the new main electrical room. Underground service conduit will be installed between the pad and the main service switchboard

A flexible open-type cable tray wire management system will be installed above the ceiling of the corridor ceiling of all corridors within this phase. This system will be used exclusively for future low voltage communication and signaling systems. These systems will include telephone, master clock, data, intercom, video, security and fire alarm.

Phase II: 6/20/Yr 2 – 2/20/Yr 3

New unit ventilators will be installed to support the spaces that were abated in the first phase and are being renovated during this phase, including the locker rooms, small gym, and pool locker room. In addition, abatement and new work in the classrooms of Unit 2 will commence. This work includes replacing the unit ventilators and the three rooftop air handling units, as well as running new conduit and sprinkler piping. The new hot water supply & return piping loop will be extended to the end of Unit 2. Restroom renovations in the Unit 2 area are also included in this phase, as is the abatement and renovation of the kitchen. The new gas line serving the kitchen will be brought in and the new heating and ventilation unit serving the kitchen will be installed.

Feeder wiring will be installed for all electrical distribution equipment introduced in Units 1 and 2 during Phase I. Utility transformer will be installed and new service will be energized. All remote panel boards will be energized. Branch circuit wiring will be installed to all rooftop HVAC equipment and classroom unit ventilators in Units 1 and 2.

Phase III : 2/15/Yr 3 – 1/2/Yr 4

The abatement and renovations of the north and south areas of Unit 3 will be accounted for in this phase. To support these renovations, new classroom unit ventilators and two new rooftop air handlers will be installed. The new hot water supply & return piping loop will be extended to the beginning of Unit 4. Restroom renovations in this area will be completed, and new sprinkler heads will be located.

Renovations and enclosing of the courtyard and entrance lobby also occur in this phase. New MEPFP systems will be installed to support these renovations. Final renovations to the pool locker rooms, including new unit ventilators, will also be completed.

Power and lighting branch circuits will be installed to receptacles and upgraded lighting fixtures in all renovated and newly constructed spaces. Circuits will originate from panels installed during Phase II, ensuring sufficient capacity and reliability necessary to meet the demands of today's sophisticated apparatus.

Low voltage system devices and associated wiring will be installed utilizing the flexible cable tray wire management system installed during Phase I.

Existing power, lighting and low voltage system devices and associated wiring will be selectively removed upon the completion and commissioning of the upgraded system.

The complete removal of the main service distribution switchboard and supplementary switchboard (on opposite end of the building) will take place as equipment served become de-commissioned.

Phase IV: 12/20/Yr 3 – 9/1/Yr 4

The abatement and renovations of the Library, Guidance area, and Media Center will be accounted for in this phase. To support these renovations, three new rooftop air handlers and a new boiler will be installed. Restroom renovations in this area will be completed, and new sprinkler heads will be located. The new Café addition, supported by new MEPFP systems, and the abatement of the Auditorium are also included in the scope for this phase.

Phase V: 6/20/Yr 4 – 2/20/Yr 5

The abatement and renovations of the Music and Art Wing and Cafeteria, in addition to the completion of renovations in the Auditorium will be accounted for in this phase. To support these renovations, new unit ventilators in the classrooms, two new rooftop air handlers for the Cafeteria, one new rooftop unit with DX cooling coils for Staff Dining, and four new rooftop air handlers with DX cooling coils for the Auditorium will be installed. The new hot water supply & return piping loop will be completed. Restroom renovations in this area will be completed, and new sprinkler heads will be located.

Other Phased Work

Other work needs to be completed to bring the Belmont High School up to the latest revision of the Massachusetts State Building Code. This work is completed in phases, depending on the area being renovated. The scope of this work is detailed below:

Fire Protection System

A major renovation to Belmont High will require, a complete sprinkler system installation per the Massachusetts State Building Code, Chapter 34. The Fire Protection system would be designed to meet the requirements of NFPA 13 – Installation of Sprinkler Systems, NFPA 24 – Private Fire Service Mains, NFPA 25 - Water-Based Fire Protection Systems and Chapter 9 – Fire Protection Systems of the Massachusetts State Building Code – 780-CMR.

A dedicated 8" sprinkler service will need to be extended from the existing water mains outside the building. The exact entrance location will need to be coordinated with the Architect. As the sprinkler service enters the building a Massachusetts approved double check valve assembly complete with O.S.&Y. valves on the inlet and outlet will be required.

The alarm check valve for the sprinkler system will be installed on the riser after the double check valve assembly in the water service entrance room. The alarm check valve will be complete with a standard trim package including pressure gauges, retard chamber, 2" main drain, water flow indicator and supervisory switches.

The main feeds out to the system from the alarm check valve will extend out to the building through the first floor ceiling space. The piping will then extend to all areas of the building so that each section of the building and each floor can be divided into separate zones.

Due to the building being only 2 stories the Massachusetts State Building Code does not require a standpipe system throughout the School. However, regulations governing Auditoriums and Stages will require standpipes at each side of the backstage area.

The sprinkler system risers will feed the sprinkler system at each floor level. Each floor will be a separate zone. The floor control assembly off of the standpipe which feeds each floor will contain a flow switch and tamper switch. An inspector's test connection will be installed on the most remote location of the system. Due to the capacity of the Auditorium being greater than 500, standpipes would be required on each side of the Auditorium in each tier and in each tier of dressing room.

Sprinkler heads throughout the facility where gypsum or suspended ceiling are installed will be glass bulb, quick response, chrome plated semi-recessed type. In areas where no ceilings are installed brass upright sprinklers will be installed. Where upright sprinklers are subject to potential damage, such as in storage rooms, protective cages will be installed. In areas where it is not possible to run piping above the ceiling the use of sidewall sprinkler heads would be recommended.

Sprinkler piping for the system will be as follows. Piping 2" and smaller will be schedule 40 black steel with cast iron fittings with threaded joints. Piping 2 ½" and larger will be Schedule 10 black steel with malleable iron fittings with rolled grooved joints.

All tamper and flow switches installed on the sprinkler system will be connected to the buildings fire alarm system. Each tamper and flow switch will be a dedicated point on the fire alarm system.

The siamese connection for the sprinkler system will be a flush type mounted on the exterior of the building within 100' of a fire hydrant. Final location of the siamese connection will be coordinated with the Belmont Fire Department. An additional fire hydrant may need to be added on the site to be within the required distance of the siamese connection.

The hydraulic requirements for the building will be as follows: All offices, corridors and the auditorium are considered light hazard and the sprinkler system will provide .1 GPM per square foot over the most remote 1500 square feet. All storage rooms and mechanical rooms are considered ordinary hazard Group 1 and the system will provide .15 GPM per square foot over the most remote 1500 square feet. The stage area would be classified as Ordinary Hazard

Group II. The sprinkler system in this area would be required to deliver .2 GPM per square foot over the most remote 1500 square feet.

Cold Water Distribution

The 6" water line that enters the building is the original service to the building. Although the 6" line which feeds the domestic water service appears to be adequate to meet the current building water requirements, this would be a good time to bring in a new 6" dedicated domestic water service since a new 8" service would be brought in to feed the proposed sprinkler system. The installation of a water meter on the new service would also be recommended.

Plumbing Fixtures

The majority of water closets, urinals and lavatories in the building are old and not current water conserving type. Removal of all fixtures is recommended as the major renovation proceeds. The water closets should be replaced with new 1.6 GPF flush valve units. The urinals should be replaced with 1 GPF units. The lavatories should be replaced and new metering type faucets with temperature limit stops which will deliver 0.5 GPM water with maximum temperature of 110 degrees, should be installed. ADA requirements will also need to be met during a renovation to the toilet rooms.

The Massachusetts Gas and Plumbing Code, 248 CMR 2.10, dictates the number of plumbing fixtures required in a building. This building is considered by the Plumbing Code to be Use group E – Educational (Secondary). Refer to the following "Required Plumbing Fixture" matrix for minimum plumbing fixture requirements.

RDK would recommend that the required fixtures be provided as indicated on the matrix.

Required Plumbing Fixtures

This review is based on CMR 248, Massachusetts State Plumbing Code 2.10(19) Table 1,

E – Educational, Secondary.

The possible Plumbing scope of a renovation to Belmont High School would be a complete demolition of the existing toilet facilities throughout the building. The Massachusetts State Plumbing Code Section 2.10(19)(h), (i) (m), (n) and (p) are used for guidance in determining the number of fixtures required for this space.

For this report, the anticipated occupancy count has been divided equally by sex. Total number of fixtures required may be determined from this count.

Preliminary occupancy loads for the school are a maximum of 1290 students and a maximum staff load of 130. Per section 2.10(19)(h) separate toilet facilities are required for students and staff. An Educational Occupancy also has a fixture count requirement for an Auditorium.

Auditorium Occupancy (900 Total, 450 male/ 450 female)						
USE	FIXTURE	WOMEN	MEN	OCCUPANCY	REQUIRED FIXTURES	
					women	men
	Water Closet	1 per 200	1 per 600	450 of ea. Sex 900 Total	3	1
	Lavatory	1 per 200	1 per 600	450 of ea. sex 900 Total	3	1
	Urinal		1 per 200	450	-	3

Staff Occupancy (94 Total, 47 male/ 47 female)						
USE	FIXTURE	WOMEN	MEN	OCCUPANCY	REQUIRED FIXTURES	
					women	men
	Water Closet	1 per 20	1 per 25	47 of ea. Sex 94 Total	3	2
	Lavatory	1 per 40	1 per 40	47 of ea. Sex 94Total	2	2
	Urinal		33%	2	-	N/A

Student Count (1184 Total, 592 male/ 592 female)						
USE	FIXTURE	WOMEN	MEN	OCCUPANCY	REQUIRED FIXTURES	
					women	men
	Water Closet	1 per 30	1 per 90	592 of ea. sex 1184 Total	20	14
	Lavatory	1 per 90	1 per 90	592 of ea. sex 1184 Total	7	7
	Urinal	N/A	1 per 90	592	NA	7
	Drinking Fountain		1 per 75 (total)	16	-	-

Required Plumbing Fixtures:

Based on 248 CMR 2.10 Massachusetts Fuel Gas and Plumbing Code (19) Table 1.

Educational

Use Group E

Notes: 2.10 (19)(h) (i) (m) (n) and (p)

<u>Explanations:</u>

(h) Educational
Each toilet room shall have at least one lavatory except as provided by 248 CMR 2.10(19)(h)2.

Separate facilities for teachers shall be in addition to the requirements set forth in 248 CMR 2.10(19) Table 1 for this type occupancy.

(i) Employee Facilities (Non-Industrial)

In each establishment where people are employed there shall be separate rest rooms for each sex, located in each establishment and shall be plainly so designated.

Facilities in establishments referred to in 248 CMR 2.10(19) (j)1.within two branch levels shall be acceptable (every other floor).

Unisex toilet rooms are allowed if they meet the requirements of 248 CMR 2.10(19)(m).

Where core facilities are allowed and in compliance with the code, additional designated toilet rooms shall be allowed within the establishment. These fixtures shall not be credited to the requirements of 248 CMR 2.10(19): Table 1.

Unisex toilet rooms are allowed if they meet the requirements of 248 CMR 2.10(19)(m).

(m) Handicap facility requirements: Facility for the physically handicapped person:

Fixtures shall be installed in conformance with 521 CMR 3.30.0 Public Toilets (for fixtures dimension requirements only).

When public rest rooms are installed, handicap fixtures shall be installed to comply with the requirements of 248 CMR 2.10(19)(m).

Unisex handicap facilities are allowed when approved by the Board through a variance process as indicated in 248 CMR 2.01 (l).

a. A variance is not required if the fixtures in an existing or proposed men's and women's room and the fixtures in a unisex handicapped toilet room meet the minimum fixture requirements in 249 CMR 2.10(19): Table 1. A unisex toilet may be counted only once toward the total minimum fixture requirements.
b. These facilities shall be kept clear of obstructions at all times in accordance with 105 CMR (the sanitary code).
Wherever drinking fountains are provided, at least one drinking fountain shall be accessible to and usable by person in a wheel chair.

Hi-low handicapped fixtures are considered (1) one fixture not (2).

(n) Restrooms General

Toilet rooms accessible to the public which have two or more water closets or urinals, or two or more thereof in combination, shall have a floor drain and a valved hose bibb connection equipped with an approved backflow preventer for the purpose of flushing and/or sanitary hosing.

Floor drains shall be of an approved design and shall be installed in the vicinity of the urinal(s) and at a grade to permit floor drainage to it from all directions.

Water closets for public use shall be of the elongated type and seat shall be solid plastic, non-porous of the open front type. Refer to 2.10(6)(a) through (f).

When a urinal(s) is provided, floor area to one foot in front of the urinal lip and one foot on each side of the urinal and the wall areas to four feet above the floor, shall be furnished so as to be non-absorbent. Wood and fiber boards are prohibited in these areas. Refer to 248 CMR 2.10(7)(c).

In a room with more than one water closet, or with a water closet and a urinal, each water closet shall be enclosed. Each urinal shall be side shielded for privacy.

When two or more urinals are required a shield shall be provided between urinals.

(p) Urinals

Urinals may be substituted for water closets where indicated in 248 CMR 2.10(19) Table 1 are listed by percentage.

Urinals listed for elementary, secondary, post secondary and industrial factory/warehouse are in addition to the water closets required.

When urinals are used at least one shall be set for handicapped use.

<u>Additional Comments:</u>

Reasonable distance: 248 CMR 2.10 (19) (c) (4) minimum facilities allows toilet rooms/drinking fountains on same floor if within 300 ft. for reasonable access.

AAB and 248 CMR require one water closet, one lavatory and one urinal to be handicapped accessible at each location where plumbing fixtures are required.

<u>Additional Fixtures</u>

New toilet rooms will be provided with floor drains and hose bibbs.

1 service sink per floor shall be provided

Domestic Hot Water Generation and Distribution

The existing steam water heaters serving the larger portions of the building are original to the building and have passed their useful life expectancy. Also with the use of these steam water heaters the boilers are required to fire during the summer months to allow hot water to be created for the building. RDK recommends the installation of gas fired storage type water heaters in the same locations as the existing. Demolition of the walls surrounding the current water heaters would be required to remove the existing water heaters as well as to install the new. RDK also recommends that two water heaters be located at each location. Each would be sized at approximately 65% of the load. This will allow the system to at least partially operate if one of the water heaters were to need service. The water heaters will be sized to serve the existing fixtures as well as the additions to the building which will be added.

The existing electric domestic water heaters serving Unit 3 are original to the building and have passed its useful life expectancy. These should be replaced with new electric water heaters of similar size.

The hot water for the new water heaters would be stored at 140 degrees F, and then enter a master mixing valve to drop the temperature. Metering/mixing faucets will be provided on the lavatories. These faucets will have a temperature-limiting feature to meet the code temperature limit of 110 degrees.

Insulation

The insulation that currently exists will be tested to determine the extent of asbestos. The insulation should be removed and replaced with new fiberglass insulation with an all service jacket. Piping which is not currently insulated should have new insulation installed.

Insulation will also need to be provided on waste piping and water piping below handicapped lavatories and sinks.

Sanitary and Vent System

The sanitary system in the existing building is in good condition but replacement will be required as a consequence of the fixture count change and probable relocation of fixtures in the renovation plan. It would be less expensive to remove the existing piping in areas where renovation work is done than try to reuse the existing piping. The new piping will connect to the existing waste and vent piping at a convenient point to be determined by further investigation.

Hose Bibbs and Wall Hydrants

When a major renovation is done to the building, the existing hose bibbs in the toilet rooms will be removed and new wall mounted hose bibbs with an integral vacuum breaker and removable tee handle installed.

Currently there are not a sufficient number of wall hydrants on the exterior of the building and the wall hydrants that exist do not have integral vacuum breakers. Additional non-freeze wall hydrants with integral vacuum breakers will be added during the renovation. The existing wall hydrants will be removed and replaced with non-freezing wall hydrants with integral vacuum breakers.

Cross Connection Control

As stated above the existing hose bibbs and wall hydrants do not have backflow prevention devices. Backflow devices will be integral to all new hose bibbs and wall hydrants installed during the renovation.

All service sink faucets installed during a renovation will also have integral vacuum breakers.

Storm Drainage

The existing building roof drainage appears to be in good condition and no replacement is required. The roof has been replaced within the last 7 years and no leaking around the roof drains themselves has been reported.

Boys, Girls and Pool Locker Room/Shower Areas

All locker room/shower areas will be completely re-planned and renovated. Floor drains within the new shower stalls will be arranged so that the water from one shower does not enter into the adjacent shower area. New shower valves will be installed with code compliant 2.5 GPM shower heads. Master mixing valves will be installed at each shower location.

All plumbing fixtures will be replaced as discussed in the "Plumbing Fixture" section of this report.

Natural Gas System

Currently the gas service is adequate to meet the school's demand requirements. If the water heaters and kitchen equipment are changed to gas, the existing service will need to be reviewed for adequacy. Due to the existing water heater in Unit 4 and the kitchen being so far from the existing service, a new gas service from the street to Unit 4 should be investigated. The service could also provide gas for heating units serving the new Art/Music Support Wing.

Science Wing

The existing science wing is scheduled to be converted to a standard classroom wing. Therefore, all gas piping, compressed air piping, hot and cold water piping and acid waste and vent piping will be removed in its entirety. All acid waste piping which penetrates the slab will be capped below the finished floor. Any acid vents through the roof will be capped at the roof level.

The new science wing will be provided with the same services that are in the existing wing. This will include acid waste and vent, gas and compressed air. The gas system at each lab will have a master shut off valve at the entrance to the room. The new wing design will also include a central neutralization tank that will handle all science sinks.

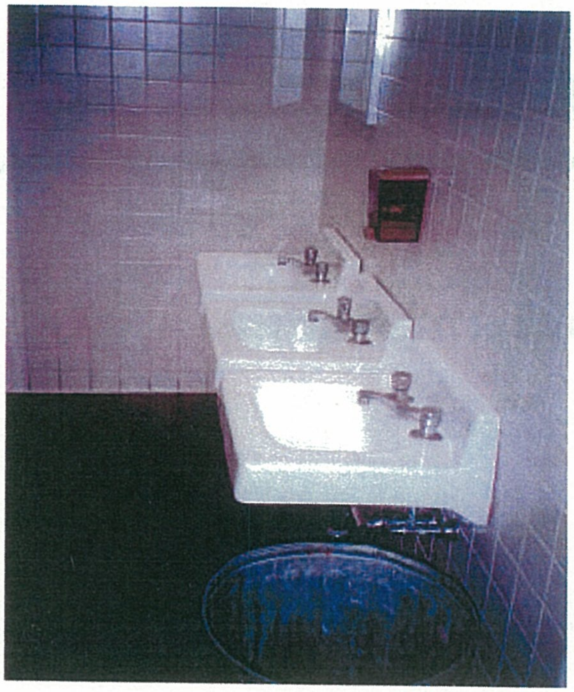
Miscellaneous

It was discussed by school personnel during the site visit that there are plans to demolish the existing pool filtration system and replace it with a new system. This is outside the scope of this report. RDK verified in the field there is not an emergency shower/eyewash in the pool filter room as required by current code.

RDK ENGINEERS

SECTION 4

PHOTOGRAPHS



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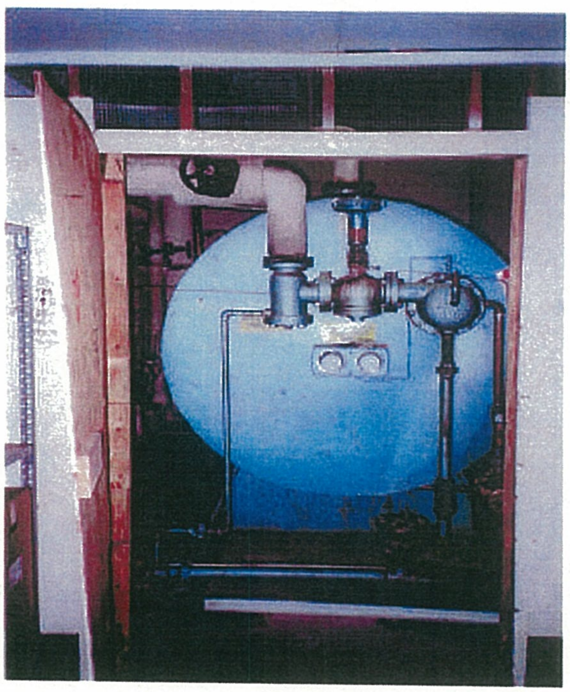

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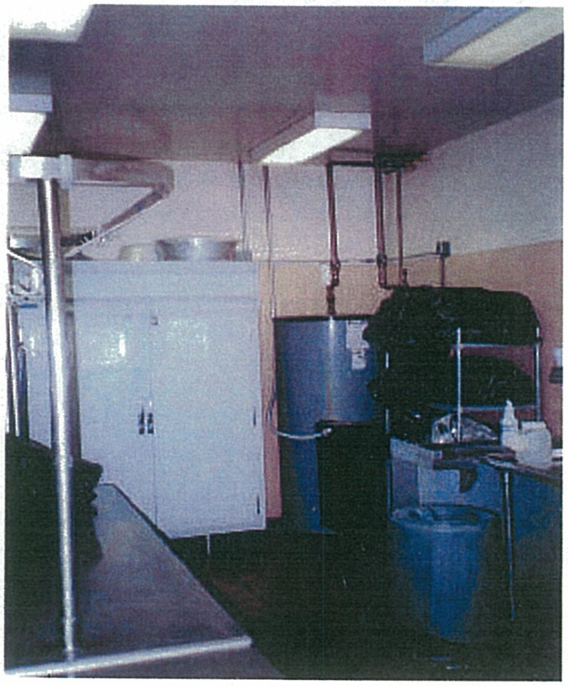
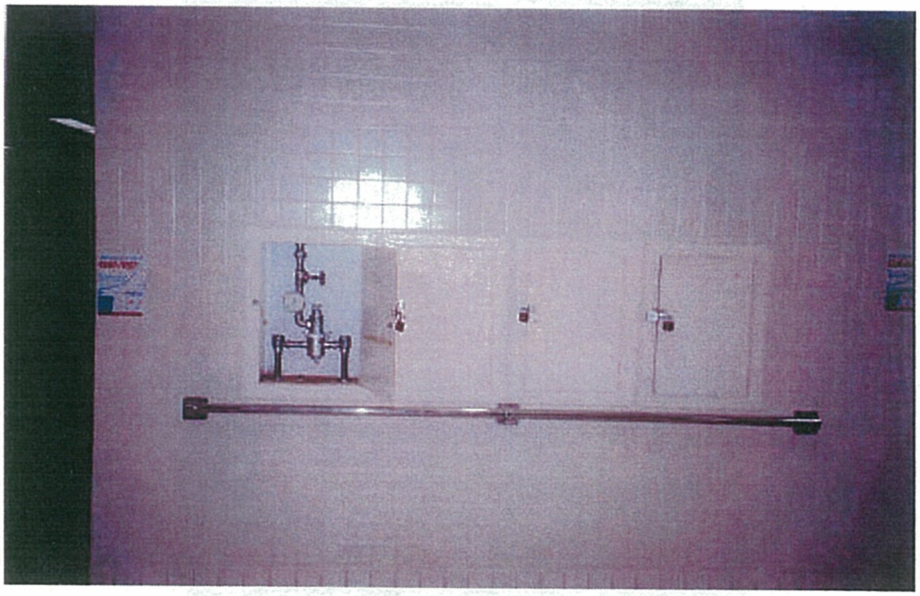


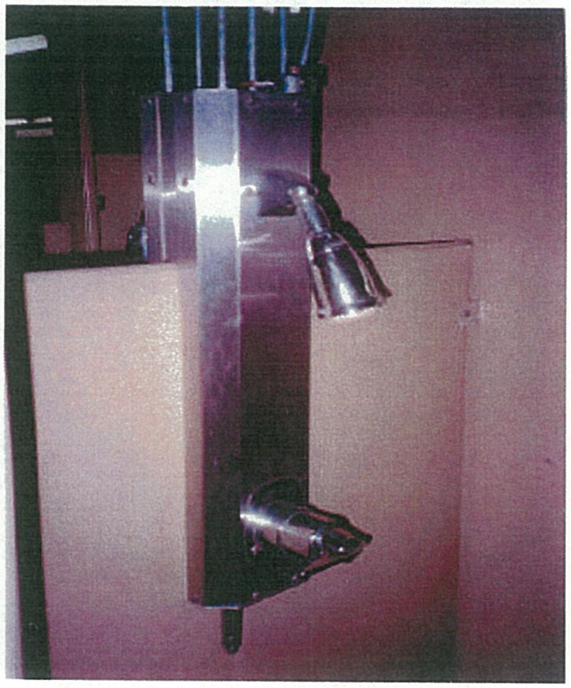
Picture 5



Picture 6

Picture 7

Picture 8



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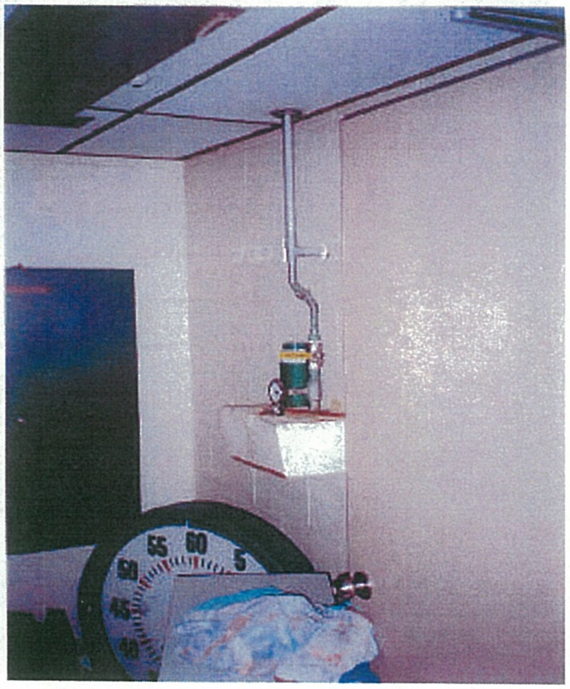

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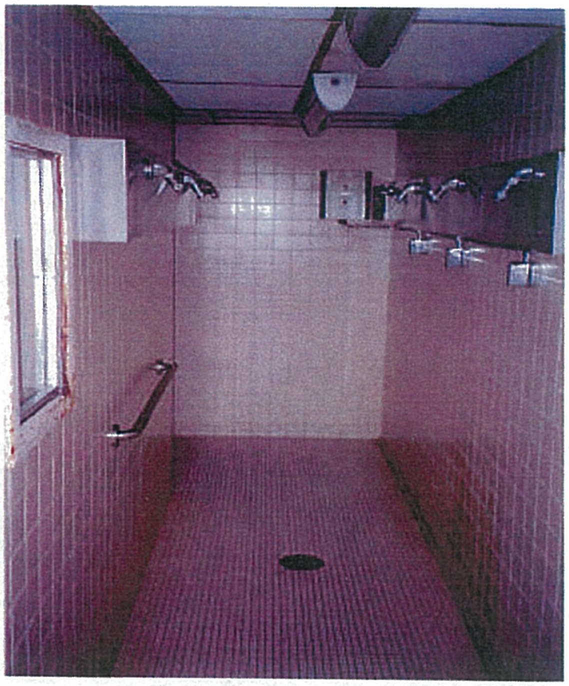


Picture 11

Picture 12

Picture 13

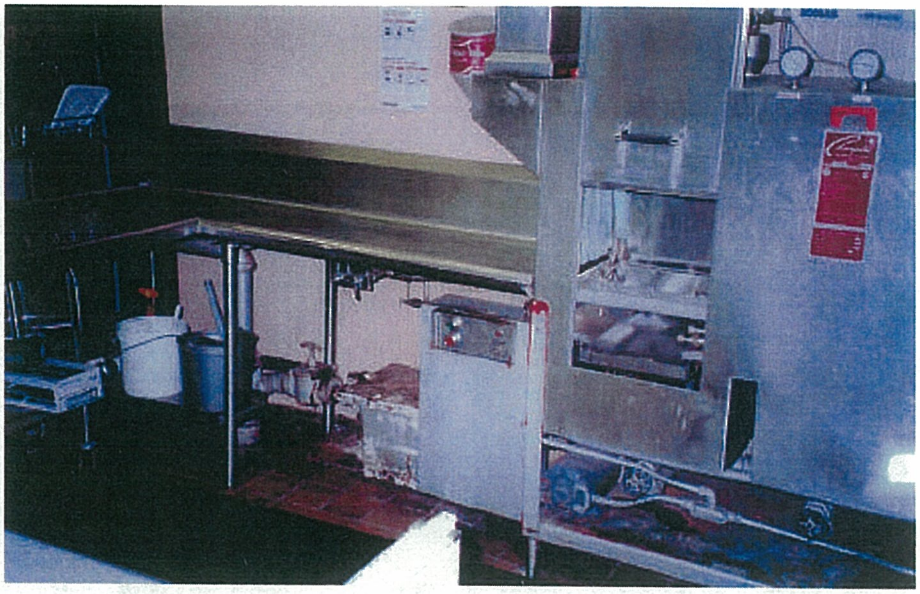
Picture 14

Picture 1

Picture 2

Picture 1

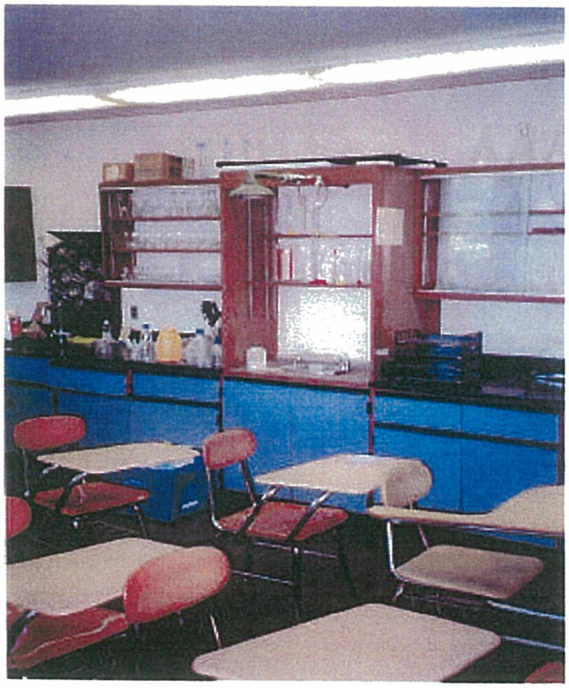
Picture 2



Picture 15

Picture 16

Picture 17



Picture 18

Tab 5

SECTION 5

Master Plan and Feasibility Study for Renovations to Belmont High School

EXISTING CONDITIONS REVIEW AND RECOMMENDATIONS - HARZARDOUS MATERIALS ABATEMENT

I. Introduction

To provide existing conditions review, recommendations for remediation design, and cost estimating services for hazardous materials abatement for this portion of the Master Plan Study, Design partnership selected **Universal Environmental Consultants**, 1151 Worcester Road, Framingham, MA. Universal's findings, conclusions and cost data follow and are also found in **Section 10** of this Report.

REPORT
FOR
HAZARDOUS MATERIALS IDENTIFICATION SURVEY
AT THE
BELMONT HIGH SCHOOL
BELMONT, MASSACHUSETTS

For

The Design Partnership of Cambridge
500 Rutherford Avenue
Charlestown, MA 02129

PROJECT NO: 24111.00

SURVEY DATES:
August 30-September 1, 2004

SURVEY CONDUCTED BY:

UNIVERSAL ENVIRONMENTAL CONSULTANTS

UEC

October 8, 2004

Mr. Bob Vogel
The Design Partnership of Cambridge
500 Rutherford Avenue
Charlestown, MA 02129

Reference: Report for Hazardous Materials Inspection and Laboratory Services at the Belmont High School, Belmont, MA

Dear Mr. Vogel:

Thank you for the opportunity for Universal Environmental Consultants (UEC) to provide professional services.

Enclosed please find the report for the Identification Survey for accessible asbestos containing materials and other hazardous materials at the Belmont High School.

The inspection was performed by a Massachusetts licensed asbestos inspector Mr. Leonard J. Busa (AI 50865).

Please do not hesitate to call should you have any questions.

Very truly yours,

Universal Environmental Consultants

Ammar M. Dieb
President

UEC:\24111\REPORT.DOC

Enclosure

Universal Environmental Consultants
1151 Worcester Rd
Framingham, MA 01701
Tel: (508) 628-5486
Fax: (508) 628-5488

1.0 INTRODUCTION:

Universal Environmental Consultants (UEC) was contracted by The Design Partnership of Cambridge to conduct a determination survey for accessible Asbestos Containing Materials (ACM) and for underground oil tanks at the Belmont High School, Belmont, MA.

The scope of work included the inspection of accessible ACM, collection of bulk samples from materials suspected to contain asbestos, determination of types of ACM found and cost estimates for remediation.

Bulk samples analyses for asbestos were performed using the standard Polarized Light Microscopy (PLM) in accordance with EPA standard. The bulk samples were collected by a Massachusetts licensed asbestos inspector Mr. Leonard J. Busa (AI 50865) and analyzed by a Massachusetts licensed laboratory AmeriSci, Weymouth, MA.

Samples results can be found in Appendix A.

2.0 FINDINGS:

The regulations for asbestos inspection are based on representative sampling. It would be impractical and costly to sample all materials in all areas. Therefore, representative samples of each homogenous area were collected and analyzed or assumed.

All suspect materials were grouped into homogenous areas. By definition a homogenous area is one in which the materials are evenly mixed and similar in appearance and texture throughout. A homogeneous area shall be determined to contain asbestos based on findings that the results of at least one sample collected from that area shows that asbestos is present in an amount greater than 1 percent.

A. Number of Samples Collected

Thirty-eight (38) bulk samples were collected from the following materials suspected of containing asbestos:

- 12"x 12" Dark brown vinyl floor tile at stairwell by classroom 130
- Glue for 12"x 12" dark brown vinyl floor tile at stairwell by classroom 130
- 12"x 12" Light brown vinyl floor tile at classroom 112A
- Glue for 12"x 12" light brown vinyl floor tile at classroom 112A
- Linoleum floor covering at faculty lounge
- Insulation inside wood fire door at kitchen
- Insulation inside wood fire door at classroom 247
- Insulation inside wood fire door at classroom 142
- Hard joint insulation off fiberglass insulated pipe at main corridor
- Hard joint insulation off fiberglass insulated pipe at boiler room
- Ceiling plaster at boiler room
- Soft ceiling plaster at little theater
- Soft ceiling plaster at little theater
- Soft ceiling plaster at auditorium
- Soft ceiling plaster at auditorium
- Pressed wood material under hardwood floor at wood shop
- Pressed wood material under hardwood floor at wood shop
- 1'x1' Acoustical wall tile at music area
- Glue daub for 1'x1' acoustical wall tile at music area
- 1'x1' Acoustical ceiling tile at library
- 1'x1' Acoustical ceiling tile at classroom 217
- Soft black window glazing sealant
- Soft black window glazing sealant
- Soft black window glazing sealant
- 2'x 2' Suspended acoustical ceiling tile at main corridor

- 2'x 2' Suspended acoustical ceiling tile at main corridor
- 2'x 4' Suspended acoustical ceiling tile at wood shop
- 2'x 4' Suspended acoustical ceiling tile at room 111
- 2'x 4' Suspended acoustical ceiling tile at classroom 140
- Interior window caulking at library
- Interior window caulking in door assembly at main corridor
- Hard ceiling plaster at stairwell by classroom 112
- Wall plaster at music area
- Wall plaster at classroom 247
- Wall plaster at main corridor by lockers
- Fireproofing above ceiling tile at classroom 140
- Fireproofing as debris in pipe chase
- Transite window sill at cafeteria

The following suspect materials were assumed or previously found to contain asbestos:

- Blackboard and glue
- Pipe insulation
- Stage curtain
- Insulation inside boilers
- Duct insulation

B. Sample Results

The following suspect materials were found to contain asbestos, including:

Location/ Type of Material	Sample Result
12"x 12" Dark brown vinyl floor tile at stairwell by classroom 130	8% Asbestos
Glue for 12"x 12" dark brown vinyl floor tile at stairwell by classroom 130	15 % Asbestos
12"x 12" Light brown vinyl floor tile at classroom 112A	Not Analyzed
Glue for 12"x 12" light brown vinyl floor tile at classroom 112A	Not Analyzed
Linoleum floor covering at faculty lounge	25% Asbestos
Insulation inside wood fire door at kitchen	30% Asbestos
Insulation inside wood fire door at classroom 247	Not Analyzed
Insulation inside wood fire door at classroom 142	Not Analyzed
Hard joint insulation off fiberglass insulated pipe at boiler room	10% Asbestos
Soft ceiling plaster at little theater	5% Asbestos
Soft ceiling plaster at little theater	Not Analyzed
Soft ceiling plaster at auditorium	4% Asbestos
Soft ceiling plaster at auditorium	Not Analyzed
Soft black window glazing sealant	15% Asbestos
Soft black window glazing sealant	Not Analyzed
Soft black window glazing sealant	Not Analyzed
Interior window caulking at library	15% Asbestos
Interior window caulking in door assembly at main corridor	5% Asbestos
Fireproofing above ceiling tile at classroom 140	15% Asbestos
Fireproofing as debris in pipe chase	15% Asbestos
Transite window sill at cafeteria	20% Asbestos

Some samples were not analyzed. The Environmental Protection Agency regulations states that should one sample from a homogenous area was found to be greater than 1 percent of asbestos, then the material must be considered asbestos containing.