06 February 2008

Evaluation of the North and South Cores
Danvers High School

Danvers, Massachusetts

DiNisco Design Partnership Limited
architects and planners

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Part 1: INTRODUCTION

Preface

This study has been prepared for Construction Monitoring Services (CMS) on behalf of the town of Danvers with specific reference to the North and South Cores at the High School. The scope of work includes four specific tasks which are described further in PART 2 – PROBLEM STATEMENT. A general background and brief history of the issues are described below.

General

During the past twelve years there have been numerous studies of the High School and Middle school located on Cabot Road. A major consideration in these studies was whether the Middle School remain at this site or be relocated to another site. In 2002 the town decided to relocate the Middle School from the Dunn Wing (1972) to a renovated/expanded Holten-Richmond School. Following the occupancy of the Holten-Richmond School in 2005, the Dunn Wing was vacated with the intention of becoming transition space when the High School is renovated.

North and South Cores

The Working Group Report determined that upon project completion of the High School renovations, the Dunn Wing and possibly other spaces built in 1972 were to be demolished. The North and South Cores located in the courtyard adjoining the 1964 High School Wing are notable in this regard for the following reasons:

1. Exterior Wall Construction

   a. The original 1972 walls consisting of a single wythe, four inch thick brick veneer was historically a source of water penetration.

   b. In 1983 a new foundation and additional brick veneer was constructed which apparently solved the moisture problem.

   c. In January 1999 further analysis determined that both the original brick and new brick, including the steel truss supports, lacked adequate lateral bracing. The analysis and evaluation of this existing condition is identified under Task 1, Task 3 and Task 4 in PART 2 – PROBLEM STATEMENT.

2. Planning Considerations

   Although the North and South Cores have zig-zag exterior masonry and glass walls, the distance to interior corridors varies from 60 to 120 feet deep, effectively creating interior windowless spaces. The appropriate use of this space for educational purposes raises a number of questions, specifically, whether it is feasible to convert this space to educational use, and if so, for what purposes. This is identified under
   Task 2.

Part 2: PROBLEM STATEMENT

General

The scope of this study is limited to the North and South Cores located in the courtyard adjacent to the 1964 classroom wing. Other adjoining spaces or links connecting adjoining spaces will be discussed for reference purposes only.

Evaluation Tasks

The following tasks are excerpted from the CMS RFP, a complete copy of which is included in the appendix.

Task 1

Evaluate the existing buildings for structural issues. There is a concern that these two wings may require major structural repairs which could include the removal of the exterior skin.

Task 2

Provide recommendation for possible use of this space.

Task 3

Provide a list of requirements to repair and renovate this space, etc.

Task 4

Provide the value of repairs and renovation of this space verse demolition and rebuilt.

Reference Map

The map on the following page uses reference names for building components excerpted from the Working Group Report. Area calculations were prepared by DiNisco Design.

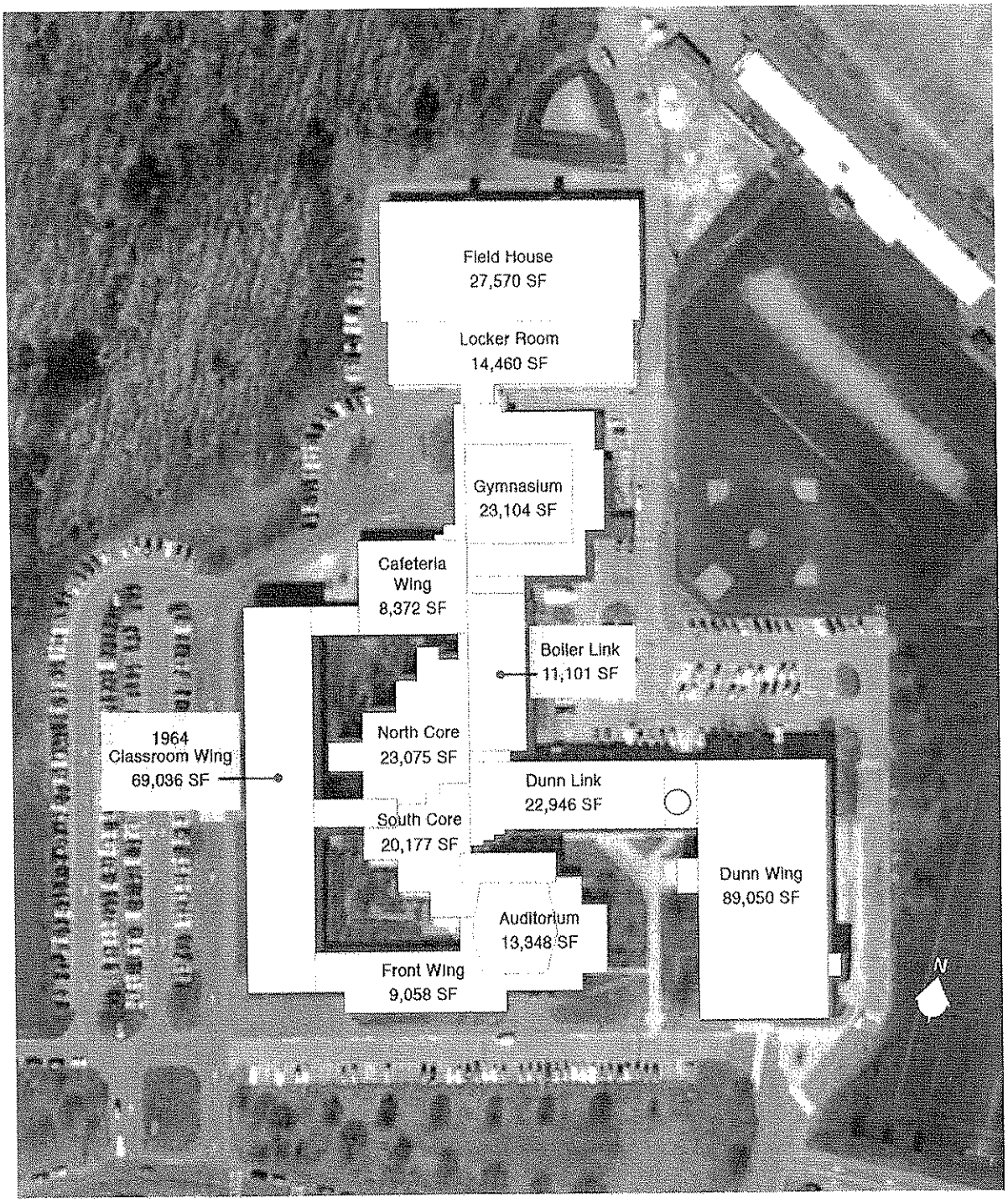


Diagram of Cabot Road Complex, Reference Name and Areas

Part 3: ASSUMPTIONS

Assumptions

1. Programmatic requirements will conform to MSBA Design Guidelines (Draft dated May 2006) with the expectation that the town is/will be eligible for State reimbursement.

2. Design calculations for enrollment projections will vary between 1,000 students and 1,200 students, to be determined in the final design phase. Allowable MSBA building areas will vary in proportion to the enrollment.

3. Estimates of probable construction costs are based upon Spring 2009 costs.

4. Assumptions stated in the Executive Summary of the Working Group Report (November 2, 2005) include (a) and (b) below. Refer to the RFP in appendix for the full Executive Summary.

    a. The Dunn Wing and Dunn Link will be used for temporary classrooms during phased construction.

    b. Areas to be demolished upon completion of the project are the Dunn Wing and Auditorium and possibly the North and South Cores.

5. Code compliance is based upon the latest Commonwealth of Massachusetts (CMR) regulations.

Part 4: EXISTING CONDITIONS

Analysis of Existing Conditions

The analysis of existing conditions is organized into four tasks as described in the RFP.

Task 1

Evaluate the existing building for structural issues. There is a concern that these two wings may require major structural repairs which could include the remove of the exterior skin.

Findings

Structural engineer, Richard Foley of Foley, Buhl, Roberts & Associates has determined the following:

1. Exterior Wall of North and South Cores.

    a. The exterior wall consisting of two wythes of brick veneer including the steel truss lacks sufficient capacity for required lateral (wind) loading on the exterior wall.

2. Framing for Entire North and South Cores

    a. The North and South Cores lateral load resisting system for wind as required by Massachusetts State Building Code Chapter 34 "Repair, Alteration, Addition and Change of Use of Existing Buildings" is **undetermined**. Structural modifications may be required to floor and roof beams for additional diagonal bracing and possibly alteration/additions to the foundation. Further analysis could not be made without destructive testing since there is insufficient detail on the drawings and the joints/beams appear to be proprietary.

3. Lastly, given the lack of available structural details, extensive exploration of structural members is required to define the full scope of any required structural modifications.

4. An independent structural peer review by Lin Associates will follow.

Task 2

Provide recommendation for possible use of this space.

Findings

1. Structural limitations

    a. The first floor concrete slab on grade of North and South Cores can be used for any educational purpose.

    b. The second floor of North Core is designed as a library with heavy loading of books. This area also has few, if any structural limitations.

    c. The second floor of South Core should be used for general academic classrooms. Avoid assembly or library usage unless structural capacity can be verified.

2. Educational Considerations

   a. The North and South Cores are centrally located to the three story 1964 classroom wing and as such are suitable for educational core activities such as library, computer graphics, T.V. Studio, SPED and other related spaces which are shared by most students.

   b. Since the depth of North and South Cores vary from 60 to 120 feet, interior (windowless) spaces are more appropriately used for larger spaces such as Library and Band and are not suitable for typical classrooms.

3. Building Code Requirements

   Large spaces with suites of rooms opening from one to another are not allowed by current building code. In order to make these large spaces usable current building code requires the addition of interior corridors.

4. Summary

   The re-use of North and South Cores must consider both structural and educational limitations with the most restrictive condition governing. For example classrooms should not be located in windowless spaces and the library should not be located on the second floor of the South Core due to structural considerations.

Task 3

Provide a list of requirements to repair and renovate this space (North and South Cores).

Structural Requirements

Q1. Must the exterior wall be rebuilt?

A1. Most likely. The exterior wall lacks lateral stability and is not designed for a 90 MPH wind (hurricane) force. The original mortar (Sarabond) began to deteriorate shortly after installation and was one of the reasons for the 1984 repairs.

Q2. Must the entire structure of the North and South Cores be rebuilt or modified?

A2. If the entire North and South Cores are renovated, the answer is "Yes", it must comply with current code.

If further testing determines that there is inadequate bracing the answer is "Yes".

If further testing determines that there is some indeterminate bracing, the answer is "Maybe".

Other Code Requirements

As a consequence of extensive structural work (CMR Chapter 34) additional code requirements[1] dictate a complete upgrade of mechanical/electrical/plumbing systems, addition of fire protection systems, new exterior walls, roofs, and corridors. This will result in a complete renovation involving substantial structural revisions to comply with current codes.

(1) Massachusetts Architectural Access Board (access), Energy Code, egress, fire alarm, etc.

Task 4

Provide the value of repairs and renovation of the space versus demolition and rebuild.

Prior to responding to this task, there are a number of issues that must be identified and discussed. There is no straight line interpolation from area calculations to cost. These issues are:

1. Enrollment Projections.
2. MSBA Draft Educational Standards & Guidelines and potential reimbursement.
3. Calculating Existing Building Areas and comparison with MSBA standards.

Enrollment Projections

The Working Group Report states that enrollment projections vary from 1,000 to 1,200 students and that a subsequent final design will address this issue. The current enrollment is approximately 1,050 students.

One of the underlying assumptions of this report is to obtain MSBA reimbursement. MSBA calculates allowable area (eligible for reimbursement) based upon the number of students times 185 SF/student (based on MSBA's Draft Educational Program Space Standards and Guidelines). The conversion from enrollment to area is as follows:

	MSBA Allowable Area
1,000 students x 185 SF/pp =	185,000 SF
1,050 students x 185 SF/pp =	194,250 SF
1,100 students x 185 SF/pp =	203,500 SF
1,200 students x 185 SF/pp =	222,000 SF

MSBA Draft Educational Standards & Guidelines

MSBA has issued a draft of educational standards and guidelines which are under review and subject to change, but which serve the purpose of this report. Excerpts of these standards pertaining to Gross Square Foot per Student and Secondary School Program Guidelines are located in the appendix for general area reference and for spaces such as Media Center/Library, Gymnasium, Auditorium, Cafeteria, etc.

Existing Building Area

A chart taken from the Working Group Report which identifies the Cabot Road Educational Complex with reference to names and area calculations (prepared by DDP) is shown on the following page.

The significance of this chart is a comparison of MSBA allowable areas and existing spaces. In most, if not all instances, individual areas and the total area of the existing building exceed MSBA standards.

Enrollment – MSBA Allowable Area

A.	1,000 Students	=	185,000 SF
B.	1,100 Students	=	203,000 SF
C.	1,200 Students	=	222,000 SF

Existing Building Areas

Field House		=	27,570 SF		
Vye Gym		=	23,104 SF		
Cafeteria Wing		=	8,372 SF		
Boiler Link		=	11,101 SF		Difference from MSBA Standards Above
1964 Classroom Wing		=	69,036 SF		
Front Wing		=	9,058 SF		A. (36,759 SF)
	Area 1			148,241 SF	B. (54,759 SF)
					C. (73,759 SF)
North Core		=	23,075 SF		
South Core		=	20,177 SF		
Auditorium		=	13,348 SF		
Dunn Link		=	22,946 SF		
	Area 2			79,546 SF	
Dunn Wing		=	89,050 SF		
	Area 3			89,050 SF	
	Total			**316,837 SF**	

A comparison of MSBA allowable areas and existing building areas reveals a broad discrepancy. Existing Area 1 above at 148,241 SF when compared to a 1,200 student enrollment @ 222,000 (using MSBA standards) has a difference of **73,759 SF** to accommodate all of the activities currently contained in North Core, South Core, Dunn Link and new auditorium. It is assumed that the Dunn Wing and existing auditorium will be demolished.

If the enrollment falls to 1,100 students, the allowable area drops to 203,500 SF and the gap between the total available area and MSBA allowable area widens.

Clearly the planning/cost options in the next section have to conceptualize ways of meeting the spirit of MSBA Standards and present viable alternatives concerning the North and South Cores which is the focus of this report.

Part 5: PLANNING / COST OPTIONS

1. Remove and Replace Exterior Wall
2. Major Renovation/Addition
3. New Construction
   (Demolish North and South Cores)

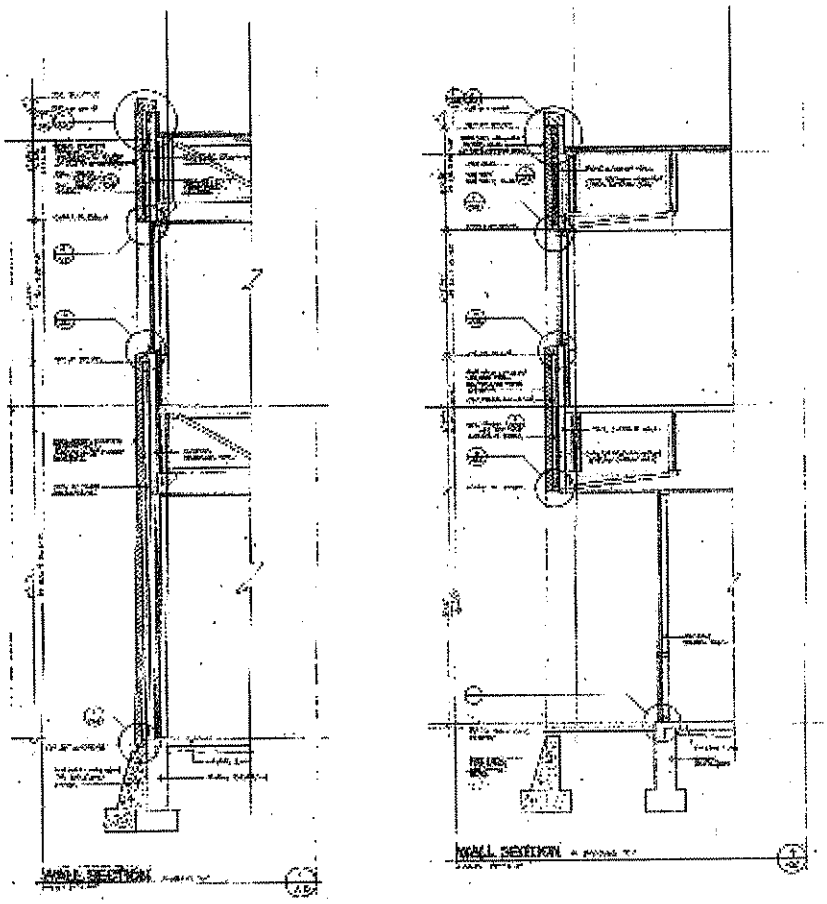
This section responds to Task 4 – North and South Cores as follows:

1. Construction Cost to remove and replace exterior wall.
2. Construction Cost of major renovation of North and South Cores.
3. Construction Cost of demolition of North and South Cores and a new addition.

Detailed costs estimates are included in the appendix.

Remove and Replace Exterior Wall

This cost option assumes that the entire exterior wall down to the foundation will be demolished and rebuilt with similar new materials that comply with current building codes. The following wall section drawings identify the area in yellow to be demolished.



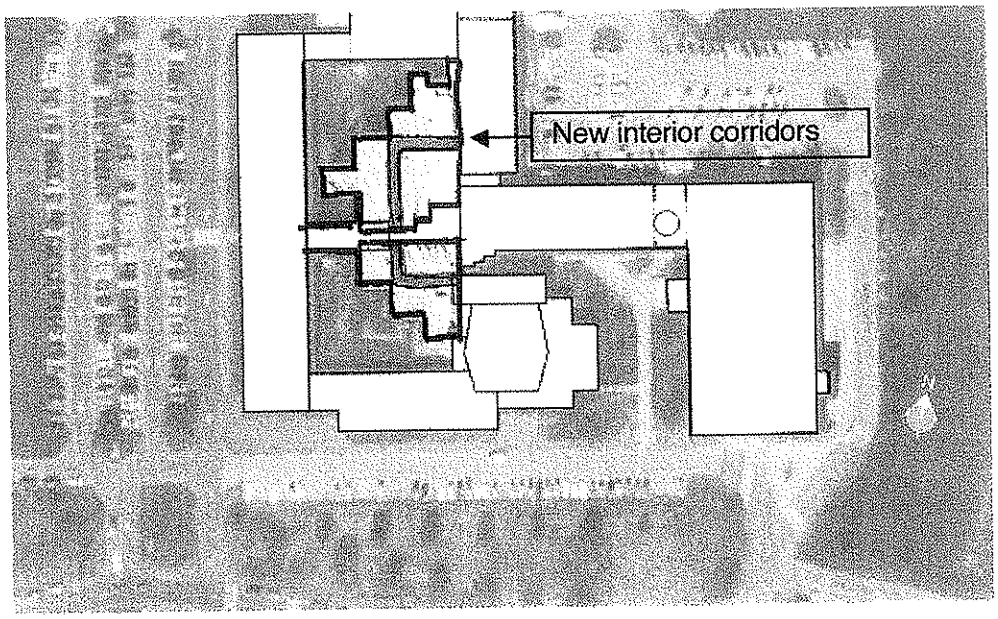
Since the exterior wall is entirely contained in a courtyard surrounded by occupied spaces with no external means of access, there is a premium cost for a crane and other temporary access to facilitate construction.

Construction Cost (2009 dollars)	=	**$3,093,193**
Estimated Renovation of Construction	=	6 Months

Major Renovation/Addition

If the North and South Cores undergo major renovations, interior corridors must be added to meet current building code. The area of corridors, service spaces, and inefficiency of renovations totals approximately 15% of the total area. What this means is that new construction is 85% more efficient than renovation.

Construction Cost (2009 dollars)	=	**$12,060,960**
Estimated Renovation of Construction	=	12-14 Months



New Construction (Demolish North and South Cores)

New construction is assumed to be 15% more efficient than renovation construction which is reflected in the following cost estimate. If the existing area of North and South Cores is 43,252 SF, then the area of new construction is 85% of that area or 36,764 SF.

Construction Cost (2009 dollars)	=	**$12,302,787**
Estimated Renovation of Construction	=	14-16 Months

Summary of Costs

Remove and Replace Exterior Wall	$	$3,093,193
Renovate North and South Cores	$	$12,060,960
New Construction (Demolish North & South Cores)	$	$12,602,787

Phased Construction

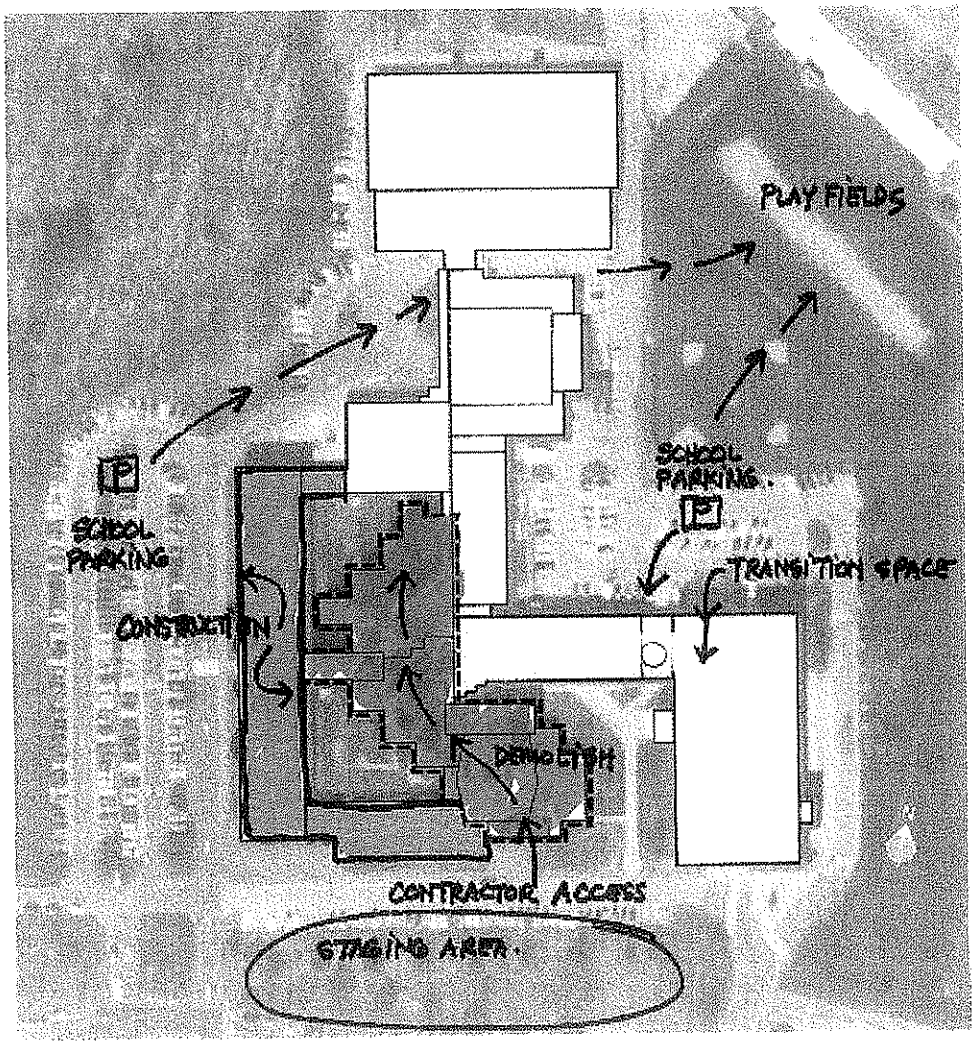
Construction while adjoining spaces are occupied raises numerous and complex issues. For the purpose of this limited discussion, issues relating to construction access and continuity/safety of educational spaces follow.

Construction Access

The contractor requires space for logistical supply, storage of materials, staging areas and worker parking. This area must be separate and protected from occupied educational spaces. For the purpose of cost estimating it is further assumed that there will be a breech into the courtyard to demolish the North and South Cores for new construction. Alternatively a breech could be accomplished through the one story Front Wing.

Occupied Spaces / Transition

It is assumed that the Dunn Wing will become a transition space for high school students while the three story 1964 classroom wing is renovated. Students require safe and separate passage to the cafeteria, gym, locker rooms as well as access to play fields, cars, buses, etc. The following drawing illustrates the viability of demolishing the North and South Cores, renovation of the 1964 addition and maintaining transitional educational spaces.



Part 6: RECOMMENDATIONS

Exterior Wall – North and South Cores

The removal and replacement of the exterior wall is not discretionary. The 1984 repairs were directed at moisture penetration and did not address lateral loading inadequacies. In a 90 MPH hurricane wind (the basis for current codes) it is most likely that the exterior wall would fail.

The cost to replace this wall (Spring 2009 costs) is in excess of $3 million, a premium cost due to difficult access to courtyard area. The cost to either fully renovate the North and South Cores or to demolish and build new is approximately $12 million.

The only benefit to replacing only the exterior wall is the assurance that it would not collapse in hurricane conditions. There is no other benefit. When compared to a fully renovated/replacement of North and South Cores with corresponding infrastructure and program improvements, the wall replacement alone makes little economic sense.

North and South Cores – Renovation or New

There is a premium cost to renovate the North and South Cores due to difficult site access and more importantly, the apparent absence of structural bracing, confirmation of which would require extensive destructive testing.

Due to the inefficiencies of a renovated building with large interior spaces, a new building uses 85% of the area to accommodate the same program as renovated space.

After considering limited site access for a renovated building plus the greater efficiency of a new building, the comparative cost between renovation versus new is very close ($12 million vs. $12.6 million).

The value added benefits of new construction (addition) makes it a clear choice. The unequivocal recommendation is to demolish North and South Cores and build new. There is no redeeming value to structurally repair and renovate the North and South Cores. Further, the renovation of 15% more space would have an adverse impact in annual operating and maintenance budgets.

MSBA Reimbursement Strategies

If the town is eligible, MSBA reimbursement could account for possibly 40% reimbursement of the project cost based upon compliance with MSBA standards. The most significant standard is the allowable building area which is directly proportional to school enrollment. This is discussed in Part 4 – EXISTING CONDITIONS. Simply stated, the area of the existing high school significantly exceeds the allowable MSBA areas. This has a potential adverse impact on reimbursement.

For example, the allowable gym area is 10,000 SF. The area of the Field House and Vye Gym combined is 50,000 SF. Similar comparisons, to a lesser extent, apply to the Library, Auditorium, etc. Space for Central Administration space (Superintendent and system-wide faculty) is ineligible and therefore discounted.

One approach to this problem is to identify the Field House as community space and deduct it from the educational program. Any improvements to the Field House would be paid for separately by the town.

Another approach is to consolidate spaces that are inefficient or ineffectively being used due to the original "open space" design concept. The entire lower level of the North Core should be examined in this context.

Ultimately, there may not be full compliance with MSBA standards due to inefficiencies of existing spaces. However, a smaller more efficient building will save the town substantial costs in lower operating and maintenance costs in the long term.

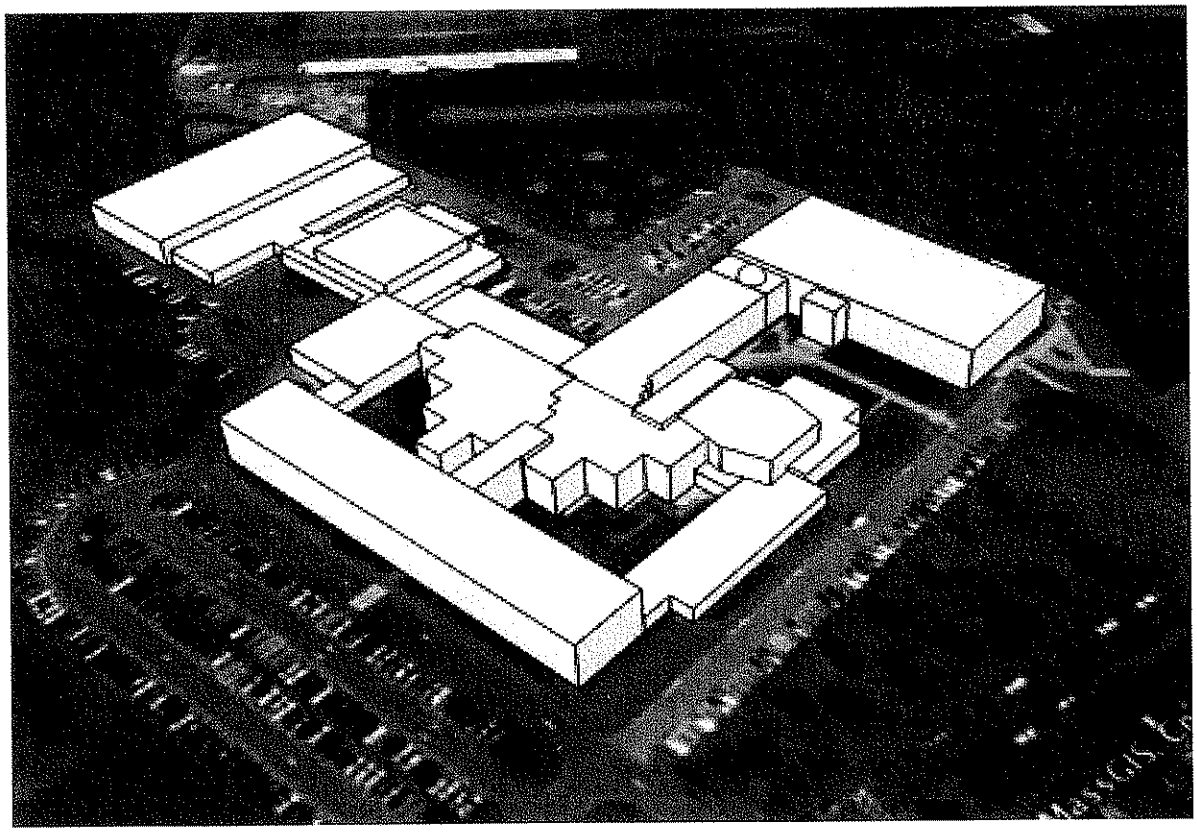
Phased Construction

For reasons of safety and efficiency the total separation of an occupied school from construction activities is essential. While there will be unavoidable interruptions, continuity of educational spaces and flow of students must be carefully planned in the same way that construction drawings are prepared. This includes continuity of corridors, toilet facilities, heating and ventilating, separation of construction space, public parking, bus drop-off, etc.

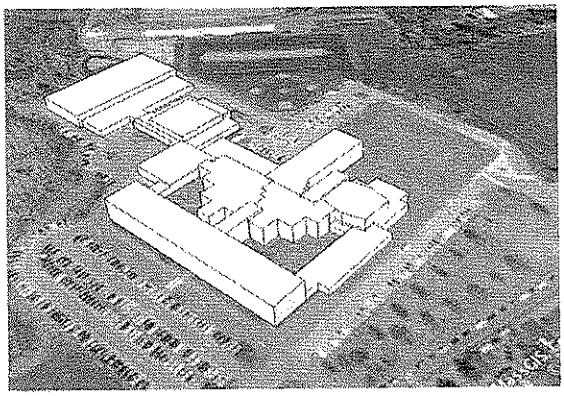
The same careful planning must be considered for the construction side of the project such as the location of a construction gate(s), delivery of materials, staging areas, storage areas, worker parking, etc.

There is a connection between efficient, safe, phased construction and the evaluation of whether or not to demolish the North and South Cores. The drawing on page 5.3 shows viable options for demolition, new construction and transition space.

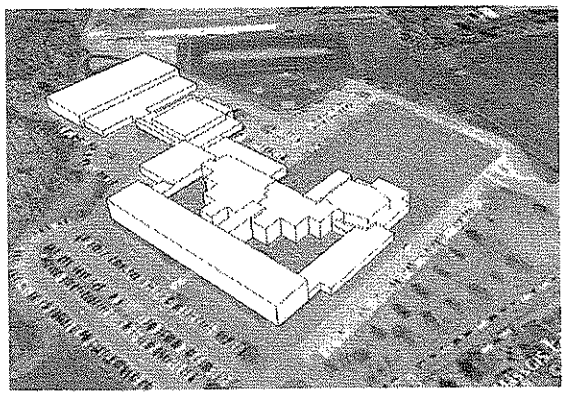
The following aerial drawing shows the existing building including the Dunn Wing and Dunn Link. The six drawings on the following page graphically show the resulting building mass with the progressive demolition of the Dunn Wing, Dunn Link, Auditorium, South Core, North Core and Front Wing. This is shown for illustrative purposes only to help visualize what the 1962 building would look like if certain wings were demolished. These drawings should not be construed as a recommendation to demolish these spaces.



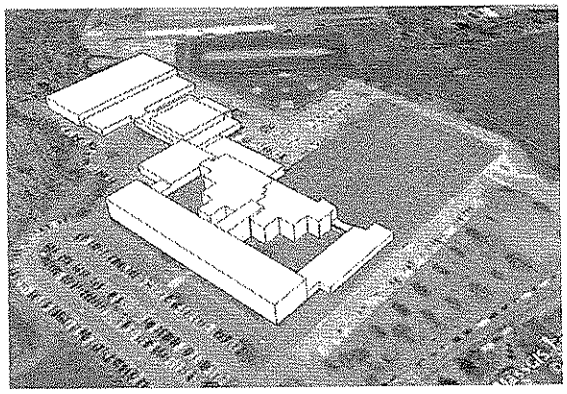
This page illustrates an aerial view with progressive wings of the building demolished.



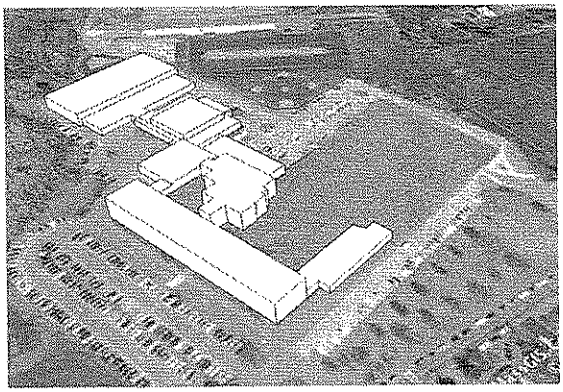
without Dunn Wing



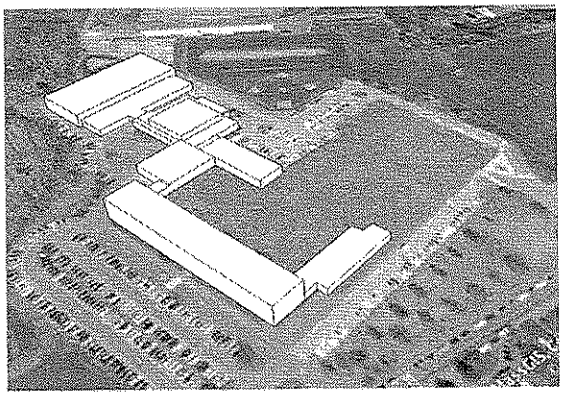
without Dunn Link



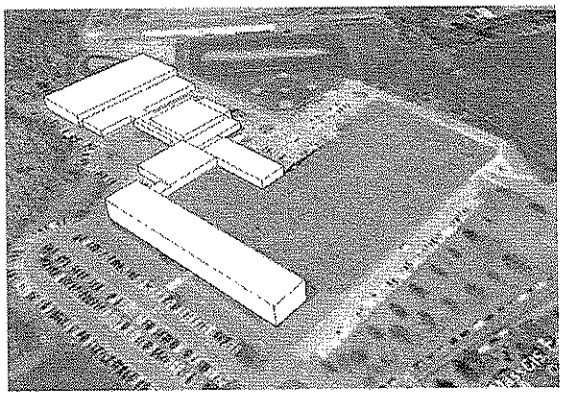
without Auditorium



without South Core



without North Core



without Front Wing

Part 7: APPENDIX

1. RFP
2. Structural Reports
3. Cost Estimate
4. MSBA DRAFT Educational Standards & Guidelines (partial)

Part 7: APPENDIX

1. RFP

Danvers High School

The Town of Danvers is proceeding to plan the renovation and addition to the High School. The High School Planning Advisory Committee has recommended that an evaluation of the North and South Core be undertaken prior to proceeding to hire the design firm for the project. This evaluation will also be used to determine the final requirement of the project to MSBA. Construction Monitoring Services (CMS) has been retained to be the Owner's Project Manager. The evaluation will be contracted through CMS under the direction of the Town Manager's Office.

Review of the North and South Core's as outlined in the "Long Term Planning Considerations" dated November 2, 2005

Task 1
Evaluate the existing buildings for structural issues. There is a concern that these two wings may require major structural repairs which could include the removal of the exterior skin.

Task 2
Provide recommendation for possible use of this space.

Task 3
Provide a list of requirements to repair and renovate this space, etc.

Task 4

Provide the value of repairs and renovation of the space verses demolition and rebuilt.

Attachments

Working Group Report page 2
High School Planning Advisory Committee Final Report page 11
Diagram of Cabot Road Complex and Reference Names.

Submission Requirements

Qualifications of the firm or firms and project team.
Project approach relating to the task above.
Time table to complete task.
Price proposal for all the task and a final report.
Proposal due date: November 15, 2007

Submitt to:

Construction Monitoring Services, Inc.
Paul V. Griffin Jr.
276 Main Street
Marlboro, MA 01752

4. It is far more costly, and not likely feasible, to accomplish the capital improvements on a piece-by-piece basis over several years. It will be necessary to implement a comprehensive, but phased, renovation and addition project.

5. The design (layout) of the proposed renovation and addition requires further study and will be part of the next Designer Services contract. However, it appears the following are known:

   5.1. The 1964 classroom wing is a strong candidate for renovation for General Purpose Classrooms.

   5.2. The Field House is a strong candidate for renovation and continued use as a Field House.

   5.3. The three-story Dunn Wing will ultimately be demolished. It is valuable as temporary space to facilitate a renovation and addition project.

   5.4. New facilities are required for at least the following:

      5.4.1. 1,000-seat auditorium

      5.4.2. Specialized classrooms such as Science Labs, Performing Arts and other programs

      5.4.3. Kitchen and food storage facilities for the High School and Elementary Schools

   5.5. It may be advantageous to demolish at least one of the North or South cores. The two cores provide more interior (no windows) space than is desirable.

   5.6. Whether the two-story Dunn Link should be demolished or renovated remains to be determined.

   5.7. The Dunn Link, North Core and South Core's exterior walls require such an extensive repair that it may not be advantageous to renovate these areas compared to replacing them with new construction.

   5.8. The size of the Field House is more than adequate for the High School's educational specifications. The Vye Gym is excess athletic space available for other uses.

   5.9. Any significant building project should include renovation of the Athletic Fields

   5.10. The existing footprint of the Cabot Road complex, excluding the Dunn Wing and the athletic facilities, is more gross square footage than required to meet the educational specifications for the High School. However, the existing complex would require extensive renovations in order to comply with the space allocations of the educational specifications.

   5.11. The project cost, as escalated from 2002, appears to have remained valid through the summer of 2005. Whether recent events, most notably the significant cost increase in fuel and steel, will cause construction cost to escalate at faster rate or gap upward remains to be seen.

   5.12. The project should be planned for an enrollment for grades 9-12 of 1,000 to 1,200 students. Since the enrollment projections have fluctuated over the past several years, the planning enrollment should be determined when the final project planning is ready to begin.

Danvers High School Planning Advisory Committee

Building Component Analysis
North Core / South Core Building

Classroom Type(s)	Band Room Curriculum Offices Library Art Room Computer Graphics Business Labs 4 general classrooms	Band Storage Area SPED rooms Television Studio Ceramics Applied Technology Conference room (100 person)
Needs Analysis		
Regulatory Mandates	ADA requirements: doorways and ramps renovations Upgrades to climate control, electric service, windows, interior wall material, floors, ceilings, lighting Fire Codes: fire protection and suppression Bathrooms Elevators Stairways	
Curriculum Requirements	Improved acoustic design in Band Room Additional storage for band equipment Technology appropriate for music / band activities Secure storage for musical instruments	
Facility Requirements	See above	
Safety and Security	Security Cameras, motion lights, buzzer access system	
Room Count/ Space Requirements	see above	
Options for Consideration	Renovate existing structure Major renovation on existing footprint New construction	
Recommendation(s)	None pending structural analysis of exterior walls; a) intact b) modified for new window and door locations	

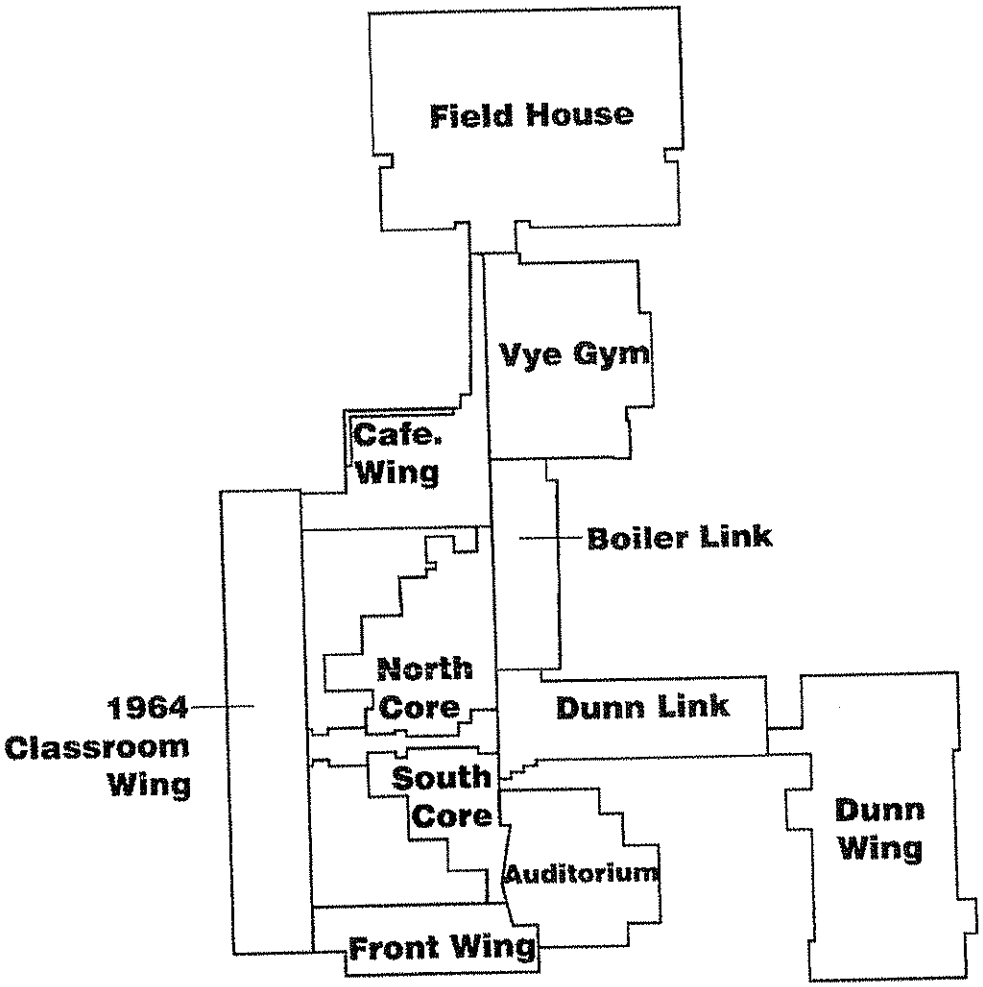


Diagram of Cabot Road Complex and Reference Names

Part 7: APPENDIX

2. Structural Reports
   - Foley & Buhl Engineering – 1998
   - Foley & Buhl Engineering – 1999
   - Foley Buhl Roberts & Associates - 2008
   - Lin Associates – 2008
   - David M. Berg Associates - 1999

FOLEY & BUHL
STRUCTURAL ENGINEERS

RECEIVED
JAN 12 1999
DINISCO DESIGN PARTNERSHIP, LIMITED
87 SUMMER ST. BOSTON, MA

PROJ. NAME DAN HS Study UPDATE
Proj. Number
☒ Cor Cons Struct
☐ Cor Cons FP
☐ Cor F & S
Contract ☐ O/A ☐ A/C ☐ O/C

January 11, 1998

Mr. Ken DiNisco
DiNisco Design Partnership Limited
87 Summer Street
Boston, MA 02110

Reference: Danvers Middle/High School

Dear Ken:

The referenced building was observed on Tuesday December 29, 1998 with Mr. Jerry Akins and Mr. Ken Herwig. Particular attention was directed to the exterior wall construction of the 1983 addition renovations. Exploration holes were made above the second and third floor "drop in" ceilings at the Academic House portion.

The wall construction was verified to be as detailed. The original wall system consisted of 4 inch brick veneer with 1 1/2" insulation glued to the interior face of the brick with a veneer plaster surface for a total thickness of approximately 6 inches.

The renovation consisted of the addition of a 4 inch brick veneer with a four inch air space for a total wall thickness of approximately 14 inches (6" original + 8" new). Additional steel truss framing and 2 inch wall insulation was located in the new air space. The new brick veneer was tied back to the original brick wall. A new ceramic tile surface was added over the existing interior plaster finish.

The adequacy of the wall in our opinion is questionable (under horizontal loading) as its strength relies on the original four inch wall and the tension capacity of "Sarabond" mortar.

We suggest that for any proposed renovation, the following options be considered:

1. Remove entire exterior wall systems and rebuild with a conventional brick veneer on steel stud back-up system with punched windows.

2. Add a steel stud back-up system to the interior of the existing wall systems with a revision to punched windows and the addition of epoxy tie anchors from the new stud wall to the original brick wall. The new wall thickness would be approximately 22 inches (14" existing + 8" new).

If you have any questions please do not hesitate to call.

Very truly yours,

Richard A. Foley

Richard A. Foley
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FOLEY & BUHL
ENGINEERING, INC.

9 GALEN ST. · SUITE 240
WATERTOWN, MA 02172
TEL (617) 926-9150
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FOLEY & BUHL
STRUCTURAL ENGINEERS

RECEIVED
JAN 20 1999
DINISCO DESIGN PARTNERSHIP, LIMITED
87 SUMMER ST. BOSTON, MA

PROJ. NAME Dan HS Study, UPDATE
Proj. Number
☒ Cor Cons Street
☐ Cor Cons FP
☐ Cor F & E
Contract ☐ O/A ☐ A/C ☐ O/C

cc: Ken

January 13, 1999

Mr. Ken DiNisco
DiNisco Design Partnership Limited
87 Summer Street
Boston, MA 02110

Reference: Danvers Middle/High School

Dear Ken:

As a follow-up to our letter of January 1999, it is our understanding upon talking with Mr. Jerry Akins that the 1983 wall additions were made due to water penetration through the original wall construction. Also, when the reinforcing of the auditorium walls was added, the exposed exterior plates were covered by a "stucco" surface, which when exposed to rain water "peeled" off the walls.

The adequacy of the wall construction is questionable under wind loads at or near the current design standards. Severe damage or outright failure of the brick and window facade could occur in any general area, but probably would occur more at the exposed corners of the classroom wing and less at the courtyard area.

If you have any questions please do not hesitate to call.

Very truly yours,

Richard A. Foley

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Foley Buhl Roberts
& ASSOCIATES INC
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2150 Washington Street
Newton MA 02462

T 617 527 9600
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Manchester NH
Atlanta GA

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January 25, 2008

Mr. Richard Rice
DiNisco Design Partnership Inc.
87 Summer Street
Boston, MA 02110

Re: **Danvers High School**
Danvers, MA
Structural Consulting Investigation

Dear Rick:

The Danvers High School was observed on Tuesday January 15, 2008. Particular attention directed at the Core area of the Dunn complex comprised of the North and South cores, the Dunn Link and the Dunn Wing.

Drawings by CRS (CAUDILL ROWLETT SCOTT) were reviewed including:
G10 thru G15, G32, G33, and G8 dated Dec 1972, S20, S21, S22, and S24 thru S35 dated Sept. 1972. Please note that the structural drawings are for the slab on grade work and assume the existence of a foundation and the steel structure above.

Drawing by HAMMER KIEFER AND TODD INC. Dated 1983 were reviewed including:
A1, A-2, A3, A9, A10, A11, A17, A18, A19, A20, A21, A25, A26, A28, A29, A30, A31, A32, A33, A34, A35, A41, A42, A44, A45, S1, S3, S5, S6, S-7, S10, S11, S12, S14, and S15.

Please note that no exploratory investigation of the existing structure was performed.

The original Core area of the 1972 addition is two stories in height. The roof construction is metal deck on steel joists and joist girders. The second floor construction is concrete slab on metal deck on steel joists and joist girders. The first floor construction is concrete slab on grade with concrete perimeter walls and footings. The Core area appears to be separated from the link area by an expansion joint. The Link area is separated from the Wing area.

The 1983 alterations to the high school addition was the structural support of the exterior walls due to deteriorating mortar problems with the existing exterior veneer. Refer to reports by Foley & Buhl Eng. Inc. dated January 11 & 13th, 1999 and David M. Berg Associates dated January 25, and February 4, 1999. Also additional roof joists were added to areas subjected to snow drifting. Refer to report by R.F Geisser & Associates Inc. Dated May 26, 1982.

No direct lateral load resisting system was determined, only the secondary effects of any column connection to joist or joist girder and any partitions extending from floor to structure above. As the steel joist and the steel girders are of a proprietary nature, no vertical load analysis can be made without more exact drawings or extensive investigation in the field, including measurements of the size and connections of all joist and girder members. No signs of distress were noted due to the present uses in the present locations. A change of use on the second floor to a higher loading could be a problem.

The Massachusetts state building code chapter 34 "Repair, Alteration, Addition, and Change of Use of Existing Buildings" has provisions that require a lateral load resisting system to resist the wind loads for exposure type A in Chapter 16, and provisions that require corrections of special earthquake hazards such as unsecured parapets and masonry walls. If the investigations do not determine a primary load resisting system the introduction of new bracing would require the coordination with new planning for the addition of floor and roof beams, diagonal bracing members and the possible alteration/addition to the foundation. The recommendation for the renovation of the exterior wall system is the removal of both the added 1983 brick veneer system and the original 1972 brick veneer system and the addition of an entirely new exterior wall system braced at the first floor, second floor and the roof. A brick veneer system would require a proper light gage steel stud backup with air space. The removal of the exterior wall would remove any unsecured parapets. Any remaining interior masonry walls would require bracing at the floor and the roof.

Any demolition could be limited to the North and South cores extending to the existing expansion joint at the Link. Some new vertical support may be required at the joint for the link portion. The expansion joint details should be verified before final plans are made.

If you have any questions please do not hesitate to call.

Very truly yours,

FOLEY BUHL ROBERTS & ASSOCIATES, INC.

Richard A. Foley

Richard A. Foley, P.E.

Danvers High School - Structural Consulting Investigation 01.25.08 rev.doc

DAVID M. BERG ASSOCIATES, INC.
CONSULTING ENGINEERS

PRINCIPALS
Peter E. Banks
David M. Berg, P.E.
Stephen K. Crockett, P.E.

ASSOCIATES
Thomas G. Heger, P.E.
Ali R. Borojerdi, P.E.

RECEIVED
JAN 26 1999
DINISCO DESIGN PARTNERSHIP, LIMITED
87 SUMMER ST. BOSTON, MA

PROJ. NAME DAN/HS Struct
Proj. Number
☐ Cor Cons Struct
☐ Cor F & E
☐ Contract ☐ O/A ☐ A/C ☐ O/C

January 25, 1999

Mr. Ken DiNisco
DiNisco Design Partnership Limited
87 Summer Street
Boston, MA 02110

RE: DANVERS MIDDLE/HIGH SCHOOL
DANVERS, MASSACHUSETTS

Dear Ken:

In accordance with our proposal to you of January 19, 1999, we have reviewed drawings of the exterior masonry walls at the above-referenced site, made available to us by Richard Foley of Foley and Buhl Engineers.

The wall structure in question consists of an original four inch (4") masonry wall built with Sarabond mortar that has been modified by tying a new four inch (4") masonry wythe to it over a four inch (4") air space. The ties used are mortared into the new wall and set into a slotted anchor bolted to the original wall. The tie spacing is on a sixteen (16) inch by twenty-four (24) inch module.

Due to the slotted connection there does not appear to be any mechanism which can transfer shear forces from the new outer wythe of masonry to the original wythe. The structural significance of this is that, at best, the two wythes share the wind load between them acting as two four (4) inch walls and not a composite tied wall.

Our calculations indicate that under the most liberal interpretation of today's building code the wall, as it exists today, is severely overstressed and in fact exceeds the allowable tensile stress of mortar by a minimum factor of one and one half (1.5).

We concur with Mr. Foley's opinion as expressed in his letters to you of January 11, and 13, 1999.

If you have any questions or comments, please do not hesitate to contact our office.

Sincerely,

DAVID M. BERG ASSOCIATES, INC.

David M. Berg, P.E.
Senior Principal

DMB/mnh
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570 HILLSIDE AVENUE NEEDHAM, MASSACHUSETTS 02494-1297
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DAVID M. BERG ASSOCIATES, INC.

CONSULTING ENGINEERS

PRINCIPALS Peter F. Banks
David M. Berg, P.E.
Stephen K. Crockett, P.E.

ASSOCIATES Thomas G. Heger, P.E.
Ali R. Borojerdi, P.E.

RECEIVED
FEB 16 1999
DINISCO DESIGN PARTNERSHIP, LIMITED
87 SUMMER ST. BOSTON, MA

PROJ. NAME DANVERS Update
Proj. Number 96-405-01
☐ Cor Cons Struct
☐ Cor Cons FP
☐ Co
☐ Co
☐ Co
☒ Co Struct. Eng.
☐ Co
☐ Cor Co
☐ Cor F & E
☐
Contract ☐ O/A ☐ AIC ☒ OTC

February 4, 1999

Mr. Kenneth F. DiNisco
DiNisco Design Partnership, Ltd.
87 Summer Street
Boston, MA 02110

RE: DANVERS HS/MS
DANVERS, MASSACHUSETTS

Subject: Update Study

Dear Ken:

In response to your letter of February 1, 1999, we are not concerned about the safety of the walls at the above noted building in the immediate future. We are out of the hurricane season, and would not expect high winds (i.e., over 50 mph) or a seismic event, within say the next six months. Note that wind forces are proportional to the square of the velocity, so that a wind of 50-60 mph would generate forces less than one half of present code required loads.

For the long range, where the building in question is municipally owned, we feel that a strong effort should be made to bring these walls into code compliance. Various schemes should be investigated:

1. Install a bracing system such as lightgauge framing on the interior face of the walls, designed to resist code required loads;

2. Investigate methods of tying the two wythes together so that they may act as a 12 inch thick composite wall:

   a. Determining a method of grouting the wythes together [not too probable];
   b. Pinning the two wythes together with 5/16 inch diameter rods on a 12 inch by 12 inch module.

If you have any questions or comments, please do not hesitate to contact our office.

Sincerely,

DAVID M. BERG ASSOCIATES, INC.

David M. Berg, P.E.
Senior Principal

DMB/mnh
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570 HILLSIDE AVENUE NEEDHAM, MASSACHUSETTS 02494-1297

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Part 7: APPENDIX

3. Cost Estimate

COST ESTIMATE

Danvers High School
Danvers, MA

Prepared For:

DiNisco Design
87 Summer Street
Boston, MA
617-426-2858

Prepared By:

A. M. Fogarty & Associates, Inc.
175 Derby Street - Suite 5
Hingham, MA 02043
(781) 749-7272
FAX: (781) 740-2652

6-Feb-08

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
REMOVE AND REPLACE EXTERIOR WALL				
Demolition of Ext wall	19,536	SF	7.50	146,520
Repair found/floor	1,628	LF	15.00	24,420
Cut back roof	1,628	LF	10.00	16,280
6" 18 ga. Metal stud	19,536	SF	7.50	146,520
Exterior Wall baracing	19,536	SF	5.00	97,680
1/2 Sheathing	19,536	SF	2.50	48,840
2" Rigid Insul	19,536	SF	3.00	58,608
Air and Vapor Barries	19,536	SF	2.50	48,840
5/8" Int Gyp	19,536	SF	3.00	58,608
Loose lintel	814	LF	26.00	21,164
Brick Veneer	14,652	SF	32.00	468,864
Alum Window - 25%	4,884	SF	60.00	293,040
Precast sill	814	LF	75.00	61,050
Misc. Interior patching	1	LS	50,000.00	50,000
Brace Interior partitions	1	LS	30,000.00	30,000
Masonry flashing	1,800	LF	7.50	13,500
Parapet cap and flashiong	793	LF	50.00	39,650
Repair roof edge	793	LF	75.00	59,475
Int Window sill	814	LF	15.00	12,210
Remove replace ACT	1,628	LF	35.00	56,980
Remove replace VCT	1,628	LF	25.00	40,700
Rework HVAC	1	LS	50,000.00	50,000
New outlets - 15' oc	110	EA	350.00	38,500
Misc. Electrical	1	LS	25,000.00	25,000
Add premium for Site Logistics	1	LS	190,645	190,645
*premium added due to difficulty of access to courtyard area				

SUBTOTAL				2,097,094
GENERAL CONDITIONS		10 %		209,709

SUBTOTAL				2,306,803
OVERHEAD & PROFIT		10 %		230,680

SUBTOTAL				2,537,484
CONTINGENCY		15 %		380,623

SUBTOTAL				2,918,106
ESCALATION (SPRING 2009)		6 %		175,086

TOTAL				3,093,193

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
GUT REHAB EXISTING BUILDING				
Replace exterior wall	1	LS	1,906,449	1,906,449
Interior Demolition	43,521	GSF	8.00	348,168
Structural upgrade	43,521	GSF	10.00	435,210
New finished	43,521	GSF	50.00	2,176,050
Fire protection/Plumbing	43,521	GSF	12.00	522,252
Hvac	43,521	GSF	25.00	1,088,025
Electrical/Teledata	43,521	GSF	22.00	957,462
Add premium for Site Logistics	1	LS	743,362	743,362
*premium added due to difficulty of access to courtyard area				

SUBTOTAL				8,176,978
GENERAL CONDITIONS		10 %		817,698

SUBTOTAL				8,994,675
OVERHEAD & PROFIT		10 %		899,468

SUBTOTAL				9,894,143
CONTINGENCY		15 %		1,484,121

SUBTOTAL				11,378,264
ESCALATION		6 %		682,696

TOTAL				12,060,960
NEW ADDITION				
Remove existing wing	43,521	GSF	8.00	348,168
New Construction	36,993	GSF	225.00	8,323,425
Construction Access	1,200	GSF	233.00	279,600

SUBTOTAL				8,951,193
GENERAL CONDITIONS		5 %		447,560

SUBTOTAL				9,398,753
OVERHEAD & PROFIT		10 %		939,875

SUBTOTAL				10,338,628
CONTINGENCY		15 %		1,550,794

SUBTOTAL				11,889,422
ESCALATION		6 %		713,365

TOTAL				12,602,787

Part 7: APPENDIX

4. MSBA DRAFT Educational Standards & Guidelines (partial)

Massachusetts School Building Authority

Educational Program Space Standards and Guidelines

DRAFT

May 2006

(17) Note specific environmental requirements such as special ventilation, natural lighting, special heating and heat control;

(18) Note specific safety and health features required such as emergency eyewash stations in shops and laboratories. Note requirements where the instructor controls gas, compressed air and water. Note where automatic shutoff to specialized equipment is required, i.e., saws, lathes, planers, grinders;

(19) Explain audio-visual, television access and public address requirements as well as computer equipment and stations;

(20) Specify equipment, furnishings and casework to be located within the activity area.

(21) Identify and describe internal areas and support spaces needed including general storage requirements of each space;

(22) Identify special colors, textures and shapes required within an area. This is of particular importance for kindergarten, special education, pre-school, and primary classrooms;

(23) Identify area needed for display of student projects and project storage, large and small.

(24) Identify and describe any other requirement that may be unique to the activity setting.

E. The Design Program should include a summary of spatial relationships. This should be illustrated through either a bubble diagram or a matrix showing the desired spatial relationships of the entire facility. This is not intended to be a scaled school design plan; it is merely intended to demonstrate the desired adjacencies among the activity settings. Consider the following factors when establishing the spatial relationships for the facility:

(1) Public vs. private spaces – Grouping public spaces together and providing direct relationships between them makes it easier to keep the private spaces private.

(2) Noisy vs. quiet spaces – Grouping of like spaces to enhance the overall effectiveness of a buildings ability to provide spaces that facilitate learning.

(3) Consolidation of like spaces – Consolidate mechanical intensive areas such as restrooms, kitchens, etc.

(4) Joint-use spaces – Consideration should be given to utilization of a space to fulfill two or more purposes.

(5) Academic discipline spatial relationships. i.e. science suites composed of classrooms, laboratories, chemical storage, specimen storage, animal rooms and a plant room; or metal shops composed of multiple task areas such as welding, forging, storage, finishing, grinding, instruction, clean-up, student project, tools, etc.

F. The Design Program shall be approved by the district school committee prior to submission to the Authority for approval and shall be in a form suitable to the Authority.

3. Space Standards

A. Based upon model educational programs for varying enrollments, the Authority has developed a variable gross square foot per student standard that is intended to accommodate the differing needs and economies

of scale in smaller and larger enrollment facilities. These standards are reflective of realistic and contemporary educational program goals and are based on the summation of square foot allocations for each itemized educational space. The gross square footage per student allowances promulgated 963 CMR 1.00 are established in the following Tables 1, 2 and 3.

Table 1: Gross Square Feet per Student – Elementary Schools

Projected Enrollment	GSF per Student
Less than 300	180
Between 300 and 309	180
Between 310 and 319	179
Between 320 and 329	178
Between 330 and 339	177
Between 340 and 349	175
Between 350 and 359	174
Between 360 and 369	173
Between 370 and 379	172
Between 380 and 389	171
Between 390 and 399	170
Between 400 and 409	168
Between 410 and 419	167
Between 420 and 429	166
Between 430 and 439	165
Between 440 and 449	164

Projected Enrollment	GSF per Student
Between 450 and 459	163
Between 460 and 469	161
Between 470 and 479	160
Between 480 and 489	159
Between 490 and 499	158
Between 500 and 509	157
Between 510 and 519	156
Between 520 and 529	154
Between 530 and 539	153
Between 540 and 549	152
Between 550 and 559	151
Between 560 and 569	150
Between 570 and 579	149
Between 580 and 589	147
Between 590 and 599	146
600 and greater	145

Table 2: Gross Square Feet per Student – Middle and Junior High Schools

Projected Enrollment	GSF per Student
Less than 400	190
Between 400 and 409	190
Between 410 and 419	189
Between 420 and 429	188
Between 430 and 439	187
Between 440 and 449	187
Between 450 and 459	186
Between 460 and 469	185
Between 470 and 479	184
Between 480 and 489	183
Between 490 and 499	182
Between 500 and 509	181
Between 510 and 519	181
Between 520 and 529	180
Between 530 and 539	179
Between 540 and 549	178
Between 550 and 559	177
Between 560 and 569	176
Between 570 and 579	175

Projected Enrollment	GSF per Student
Between 580 and 589	175
Between 590 and 599	174
Between 600 and 609	173
Between 610 and 619	172
Between 620 and 629	171
Between 630 and 639	170
Between 640 and 649	169
Between 650 and 659	169
Between 660 and 669	168
Between 670 and 679	167
Between 680 and 689	166
Between 690 and 699	165
Between 700 and 709	164
Between 710 and 719	163
Between 720 and 729	163
Between 730 and 739	162
Between 740 and 749	161
750 and greater	160

Table 3: Gross Square Feet per Student – Academic High Schools

Projected Enrollment	GSF per Student
Less than 600	205
Between 600 and 609	205
Between 610 and 619	205
Between 620 and 629	204
Between 630 and 639	204
Between 640 and 649	203
Between 650 and 659	203
Between 660 and 669	202
Between 670 and 679	202
Between 680 and 689	201
Between 690 and 699	201
Between 700 and 709	200
Between 710 and 719	200
Between 720 and 729	199
Between 730 and 739	199
Between 740 and 749	198
Between 750 and 759	198
Between 760 and 769	197
Between 770 and 779	197
Between 780 and 789	196
Between 790 and 799	196

Projected Enrollment	GSF per Student
Between 800 and 809	195
Between 810 and 819	195
Between 820 and 829	194
Between 830 and 839	194
Between 840 and 849	193
Between 850 and 859	193
Between 860 and 869	192
Between 870 and 879	192
Between 880 and 889	191
Between 890 and 899	191
Between 900 and 909	190
Between 910 and 919	190
Between 920 and 929	189
Between 930 and 939	189
Between 940 and 949	188
Between 950 and 959	188
Between 960 and 969	187
Between 970 and 979	187
Between 980 and 989	186
Between 990 and 999	186
1000 and greater	185

B. The Authority will not provide funding for that portion of an Approved Project that exceeds the limitations established in Tables 1, 2 and 3 for gross square footage per student, except as expressly authorized in 963 CMR 1.00 and which exceptions the Authority shall determine according to the method of computation defined in "MSBA Educational Space Program Standards and Guidelines".

C. Vocational Technical Schools and the Vocational Educational Space components of Comprehensive High schools shall not exceed 225 gross square feet per pupil and any additional programmatic requirements may be considered on a case-by-case basis by the Authority in conformity with M.G.L. c.74 requirements and a comparison of existing school facilities with similar vocational program requirements.

D. Special Education Spaces: Spaces for special education classes/programs will receive special consideration at the discretion of the Authority. The gross square feet per student defined Tables 1, 2 and 3 includes a baseline assumption that 8% of the total planned enrollment will be enrolled in separated special education programs. Notwithstanding the gross square footage maximum standards established herein, additional space consideration may be given, at the sole discretion of the Authority, if the Eligible Applicant documents and certifies a greater need.

4. Space Allowance by Program Activity:

A. The approved "Design and Educational Program" shall be determined utilizing Tables 4, 5, and 6. The tables are guidelines only and the Eligible Applicant may make reasonable departures from the guidelines when the Authority determines, at their sole discretion, that such departures are consistent with the intent of M.G.L. c.70B and 963 CMR 1.00 to provide adequate, safe, cost effective and programmatically sound school facilities projects.

Table 6: Secondary School Program Guidelines

	600 Students	1000 Students
Core Classrooms	950sf ea.	950sf ea.
Science Laboratory	1200sf ea	1200sf ea
Art (including storage and workroom)	1350sf	2700sf
Music (including practice and ensemble)	2125sf	2275sf
Tech Classroom (e.g. drafting, business)	2400sf	4800sf
Tech Shop (e.g. consumer, wood)	4000sf	8000sf
Self-contained SPED Classroom (including toilet)	950sf ea.	950sf ea.
SPED Small Group/Resource Room	500sf ea.	500sf ea.
Media Center/Library	3650sf	6150sf
Gymnasium	10,000sf	10,000sf
Ancillary PE Space (including PE alternatives, storage, offices, locker rooms, etc.)	7,000sf	10,300sf
Food Prep/Kitchen	1900sf	2300sf
Cafeteria	15sf/student accommodating 1/3 planned enrollment	15sf/student accommodating 1/3 planned enrollment
Staff Lunch Room	400sf	500sf
Auditorium	2/3 enrollment at 10sf per student 750 seats maximum	2/3 enrollment at 10sf per student 750 seats maximum
Stage Auditorium Storage, dressing Rooms, controls, etc.	2800sf	2800sf
General Office	2020sf	2270sf
Nurse's Office/Health	710sf	910sf
Guidance	1050sf	1500sf
Teachers Workroom/Lounge (including toilet)	300sf	450sf
Custodian/Maintenance	1475sf	1575sf
General Storage (Books)	400sf	600sf

DRAFT

5. Space Computations

A. Gross and net square footage and perimeter measurements shall be reported with all preliminary, revised, and final drawings submitted for approval, and shall be computed according to the following methods:

B. Gross Square Footage. The gross area of a building is the sum of all areas of the several floors, including mezzanines, stairwells, and basements having a floor slab and 7'-6" or more headroom. All horizontal measurements shall be taken from the exterior face of enclosing walls, at the plane of the floor. The following shall not be included in gross area computation: basements having no floor slab or less than 7'-6" headroom; pipe trenches; retaining walls; roof overhangs; exterior terraces; and courts open to the sky.

C. Net Square Footage. The net area of individual spaces shown on approved educational specifications and included in the plans shall be measured from the inside face of enclosing walls and partitions. Wall thickness shall be excluded.

(1) Basic Instructional Spaces (classrooms) shall include the net area of all non-specialized and special subject teaching areas, including directly-related preparation and equipment storage rooms and directly-related toilet rooms. Do not include the area of such spaces as wardrobes and teachers' supply closets.

(2) Educational Support Space shall include the net area of miscellaneous specified or required educational space, such as gymnasium locker rooms, cafeteria dining areas, kitchens, administration offices, health service unit, guidance quarters, teacher workrooms, storage, community rooms and serving rooms.

(3) Other square footage is determined by subtracting "Basic Instructional "and "Miscellaneous Educational" spaces, determined as above, from the calculated gross area. Thus, "Other" will include wall thickness; corridors, stairways, and other circulation space; general storage areas; custodians' closets and receiving areas; toilets; and heating and mechanical spaces.

DRAFT