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# DOVER HIGH SCHOOL AND CAREER TECHNICAL CENTER

## Site & Building Assesment Report

Dover, New Hampshire

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**Volume I of II**


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## Acknowledgements

We wish to thank the following individuals for their assistance and their contributions to this feasibility study:

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| Jason Gagnon | City Councilor |
| Amanda Russell | School Board Representative |
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| Karen Taylor | Business Administrator |
| Peter Driscoll | Dover High School (DHS)Principal |
| Louise Paradis | Career Technical Center (CTC) Director |
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# Acknowledgements

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## Evaluation of Existing Conditions

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Image courtesy Google Maps

Aerial View of Dover High School & Career Technical Center

The following information was gathered from various site visits by HMFH and Consultants, existing condition drawings, and documents provided by Jeffrey White for Dover High School & Regional Career Technical Center (DHS-CTC) over the past two months.

## Overview

The Dover High School & Regional Career Technical Center (DHS-CTC) is located at 25 Alumni Drive, in Dover New Hampshire. The campus is approximately 44 acres, with several play and practice fields for baseball, softball, football, track, field hockey, lacrosse, and other athletic programs. The original high school a brick and curtain wall three story structure was designed by Dirsha & Lampron Architects & Engineers, and built in 1967. In 1989, Lavallee / Brensinger Architects were hired to design the new two story Career Tech Center addition attached to the east side of the school. The addition utilized a similar tone of brick, and created a CTC entrance to the school. In 2002 McHenry Architecture was hired to design a World Language Classroom addition, once commonly referred to as the "Freshman Academy". This two storty addtion was added ot the South East corner of the building adjacent to the existing auditorium. The current school is approximately 250,000 square feet and has approximately 1300 full time Dover High School students, and 75 Career Technical Center students, from other regional schools. The building has been well maintained throughout the years; however most of finishes and systems, many of which are original to the school have exceeded their useful life, and will require replacement with any renovation.

The following are Capital Projects and School Upgrades that have been undertaken in addition to the major construction projects mentioned above.

- 1970 addition of tin storage shed added to the grounds
- 1991 part of the girls locker room was converted to a weight room
- 1999 the administration and art rooms were renovated,
- 2000 an accessible ramp was constructed to connect the main entry to the first floor level
- 2002 a boiler replacement project was undertaken
- 2007 new bleachers were installed in the gymnasium,
- 2008 the roof was replaced
- 2009 a new barn was built for the Animal Science Career Tech Program
- 2010 new flashing was installed on the Freshman Academy
- 2014 the home side gym bleachers were replaced.

A range of issues were identified during the investigation that will impact the renovation potential of the building. An overview of the key issues are as follows:

- In general the Mechancial, Electrical, Plumbing, and Fire Protection Systems are all past their useful life and full replacement is recommended with the exception of the boiler plant

View of  Roof with snow cover


View of Entrance Canopy

Flaking Plaster at Entrance Canopy

Exterior Wall System 1 - Brick Veneer

Stained Brick

Visible Efflorescence

Rusted Lintels

Cracked Sealant

update in 2002, and some plumbing upgrades over the years from the various new additions. Further cost benefit analysis is needed to be to determine the cost benefit of salvaging portions of existing systems with any renovation options. (Reference Appendix B for full Reports)

- The existing floor to floor heights for the 2nd and 3rd are low, making it difficult to retrofit new HVAC system that will meet the ventilization requirments of today's building code.
- The existing 1967 building predates lateral load design requirements, and a renovation of the building would most likely trigger the need for a retrofit lateral load structural upgrade. (See Appendix A for full report)
- The majority of interior walls are 4" CMU, which do not meet the current accoustical separation standards between classrooms and other spaces.
- Nearly 50% of the classrooms, the Library, and Guidance Offices are interior rooms with no access to exterior views or daylight.
- The paths of travel throughout the school has significant accessibility issues and only a small portion of the existing bathrooms in the school would meet the current accessibility code or comply with the American's with Disabilities Act.
- The school only has access to one passenger elevator, and it is located in the classroom portion of the building, which favors one side of the school. Schools of this size typically have a minimum of 2 elevators.

## Exterior Systems

### Roof Systems

In 2008, a new white Thermoplastic Polyolefin (TPO) roof was installed over the entire (DHS –CTC) addition. These roofs generally carry a 20 year prorated warranty, so the roof is 7 years old. When walking the site, the roof was covered in 3" to 4" of snow. When viewing the roof in this condition, the melting pattern of the snow on the roof indicated areas where heat was escaping due to the thermal breaks at the roof fasteners. This melting pattern might imply the installation of the mechanical fasteners was directly connected to the metal deck. Further investigation into this melting pattern is recommended should the building be renovated.

### Entrance Canopy

At the main entrance a large double barrel vaulted canopy covers the walk-way as you approach the school from two directions. The canopy is held up by painted concrete columns, and the roof structure is concrete with painted plaster. The structure itself is sound, however the plaster is continuously flaking, requiring yearly maintenance repairs.

Exterior Wall System 2 - Curtain Wall with Kalwall Infill

Stained Brick Under Curtain Wall System

CTC Entrance & Brick in Disrepair

2002 Addition with Visible Efflorescence

Roll Up Garage Doors

Windows Located at Grade

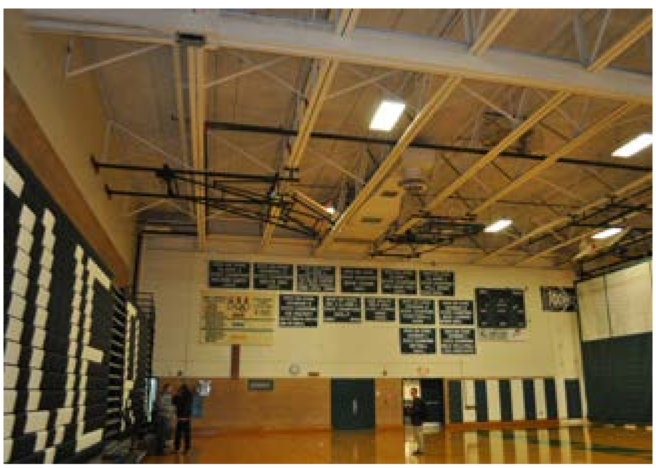
**Exterior Wall Systems**

There are two main exterior wall systems used in the construction of the 1967 portion of Dover High School. The first is a brick veneer attached to a 10" concrete masonry unit backup system, and 1" rigid poly-urethane insulation. The second is an aluminum curtain wall system attached to the steel super structure. The curtain wall frame is in filled with Kalwall panels and windows. Neither of the exterior wall systems meets the insulation requirements of today's International Energy Conservation Code (IECC 2009). The current code also requires a continuous Air Barrier, which is not indicated to be present in the 1967 construction documents for the school; however it is assumed a mastic weather-barrier was installed, as it was a common construction practice at the time. Without selective demolition, it is difficult to confirm the continuity of the mastic barrier and how well it was tied into with the windows systems. In addition, the Kalwall panels have been tested by Kalwall to have approximately a 50 year expected life, which will be reached in 2 years in 2017 for the 1967 portion of Dover High School. With any renovation, replacement of the Kalwall Panels is recommended. The masonry portions of the 1967 building have held up well over the years, with minimal cracking in the brick. Efflorescence is visible in the masonry in some areas of the building which indicates areas of water flowing out of the brick, and possible issues with the air space and drainage cavity behind the brick. Staining of the brick occurs where water weeps from the Kalwall panels. The sealant around windows, doors, and control joints is showing signs of cracking, and some of the visible loose lintels are rusting with decay. There are various corners around the building where brick has been damaged and requires replacement. Although the masonry wall system does not meet today's code, The overall condition appears to be good, and with minimal work, new sealant, selective repointing, selective brick replacement, and a thorough cleaning, further investigation to its reuse should the building be renovated is recommended.

Both the addition added in 1989 & 2002 utilize a similar brick veneer wall system with a CMU back up wall and 2" of rigid poly-urethane insulation. This wall construction would meet today's IECC 2009, using an alternate compliance method. Over all the brick veneer is in good shape, with small areas of visible staining at window sills, and the 2002 addition has visible efflorescence stains. Further investigation regarding the efflorescent stains is recommended, to ensure there is not a larger problem with the drainage cavity and weeps of the wall system, that can lead to larger failures of the wall system over time.

Auditorium

Fixed Seating and Operable Partition



Gymnasium

Drinking Fountain, Aged Base Board & Cracking CMU

Boy's Locker Rooms

Weight Rooms

**Windows & Exterior Doors**
The windows at the 1967 building are original to the building. They are aluminum with a single pane 1/4" tempered glass. There are a variety of fixed and operating windows. The windows are still functioning, but have exceeded their useful life and complete replacement is recommended if a renovation option is selected. As noted in the summary, many of the interior spaces do not have any windows; in fact 21 out of 52 classrooms are interior with no views to the exterior. The current configurations of windows would not qualify for the prerequisite access to views or the day lighting credits for LEED, which is one rating system for high performance buildings. The 2002 addition have aluminum frame windows with double glazing. These windows are near their life expectancy, but appear to be functioning. The exterior doors are constructed of aluminum with aluminum frames and have ¼" tempered glass similar to the windows. There are just under 10 roll up garage doors, all functioning but beyond their useful life. The windows on the lower level of the north side are located almost at grade, and have to be shoveled out when it snows, creating a maintenance nightmare, and increase risk for leaking.

## Interior Conditions - Spaces

**Auditorium**
The Auditorium is a double height space with original fixed metal seating. The slope of the Auditorium floor is too steep to meet ADA and no wheelchair locations with companion seat are currently provided. There is no accessible access to the seating that rises up at the back to the second floor. These areas of seating that rise up to the second floor were also originally designed to be separated from the main auditorium space with large movable partitions which no longer work. The operable partitions are beyond their useful life, and the school has found that parts are no longer made for these partitions. The seating throughout the auditorium is damaged uncomfortable and well beyond its useful life. Also, the auditorium stage is not accessible from the seating area. A wheelchair lift or ramp system would need to be installed to correct this problem. There are no assisted listening devices currently provided. One would need to be installed. Given the large size of the Auditorium it may be cost effective to renovate this portion of the existing school.

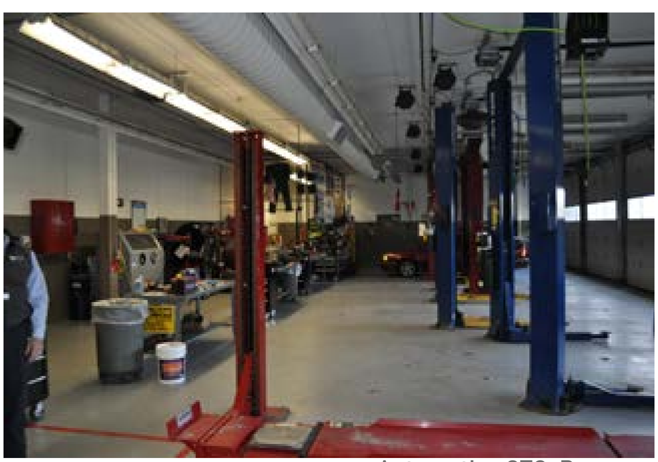
**Gymnasium**
The Gymnasium is approximately 13,690 square feet allowing for two full size gym stations, with a divider curtain separating the two courts. A main basketball court can be created by pulling out the retractable bleachers

Cafetorium

Kitchen Rubber Floor

Library, No Natural Daylight

Interior Aluminum Wall System & Aged Bookshelves



Automotive CTC  Program

Electrical Technology CTC Program

on either end. The visitor bleachers were replaced in 2002, and then the home side bleacher were replaced in 2014. The athletic equipment such as basket ball backstops and nets are past the useful life. There is a climbing wall on the Southwest wall that appears to be in good shape. The wood floors have been well maintained, but are beyond their useful life. The lower third of the gym wall is exposed brick, with portions covered with aged wall padding for safety, and the upper two thirds of the wall is painted CMU. There is a settlement cracking pattern in the CMU that would require further investigation should the space be renovated. The base around the gym is wood and projects out about 4" from the wall. This wood is in poor condition and should be replaced. The drinking fountains are in poor conditions and have visible rust and have stained the brick around them. The bathrooms and locker rooms adjacent to the gym are large but are in poor condition and are well beyond their useful life. The lighting is poor in the locker rooms, and cracked ceramic tile on the walls has been replaced over the years with various colors not matching the original. The boy's locker room showers are not used for showering and a portion of them is now used for overflow gym storage. Part of the original Girl's Locker Room has been converted to a weight room. The weight room was only sized to accommodate lifting weights and will not accommodate cardio equipment.

**Cafeteria and Kitchen**

The existing Cafeteria and Kitchen are located in the lowest level of the building adjacent to the original loading dock. The large trucks that service the school cannot make the turn into the original loading dock so it has been abandoned. Currently trucks use a loading dock at the opposite end of the school near the CTC addition and the goods for the kitchen are transported a significant distance through the corridors. This is not the most efficient layout for deliveries but the school has made it work. Both Cafeteria and kitchen are adequate in size, but the kitchen equipment is out of date and past its useful life. The floor of the kitchen has been replaced to a rubber floor due to heaving and cracking issues of the quarry tile.

**Library**

The Library is located central to the school on the main level. There are no exterior windows or natural light, and the interior lighting is poor. This interior space is furnished with aged tables, chairs and book shelves. The wall paper is original to the school, and well beyond its useful life with visible tears and repairs with duct tape. The space requires a complete renovation, and would benefit greatly from natural light.

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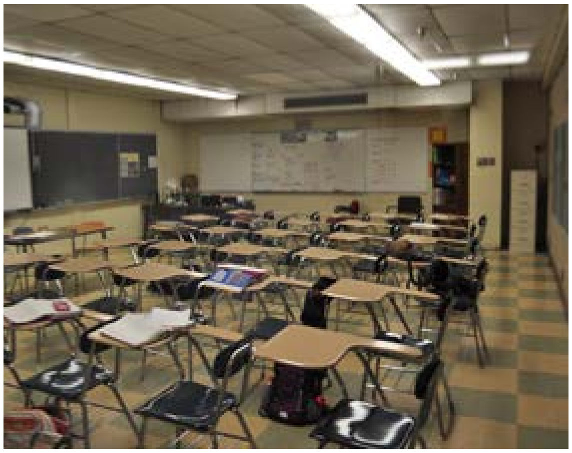
CMU  Wall


Typical Corridor


Typical Classroom - Asbestos Tile Floor


Base in Disrepair


Cracked Tile Floor


Cracked Tile Floor


Classroom to Corridor Transition


Missing Expansion Joint at 2002 Addition

**Career Technical Spaces**

The majority of the Career Technical Spaces are overall in good condition; however the configuration of many of the spaces does not meet the programmatic needs of the different departments. The current spaces do not adequately separate noise and smells from that adjacent hallways and classrooms above. Every Thursday the washing of dogs in the Animal Science Program permeates through the school, at near unbearable levels. The Automotive Center's gas and oil smells also travel through the school, and complaints about the smells are constant. The equipment for the various departments is varies in age, much of which is beyond its useful life. The overall structure and finishes in the space are in good condition.

## Interior Conditions - Materials

**Interior Partitions**

The typical interior partitions between through the school are concrete masonry units (CMU). The overall condition of the interior walls appears to be in fair condition, with minor cracking throughout as to be expected with CMU and plaster. The permanent nature of CMU does not lend itself well for renovations as it is very difficult to move walls, reuse, and run new conduit, piping and ductwork for building technology and systems upgrades. There are large interior classrooms spaces that utilize movable partitions to break the large classroom into smaller classrooms, these partitions are beyond their useful life, and do not provide the needed acoustical separation between classrooms spaces to be in agreement with today's acoustical standards. The bathroom walls are full height ceramic tile and base.

**Floors**

The 1966 portion of DHS has a variety of floor types throughout the school. The corridors, kitchen, bathrooms, and lockers rooms are ceramic tile, the classrooms and cafeteria are Vinyl Coated Tile (VCT), the auditorium, library, computer room, administration areas and select other spaces have carpet, the gymnasium is athletic wood flooring. All of the flooring in the 1966 portion of the school is beyond its useful life and would require full replacement. The 2012 AHERA report as attached in the appendix, indicates that all of the flooring listed above with the exception of the gym floor is assumed to have asbestos containing material, and would need full remediation prior with any renovation , demolition or addition.

The 1989 CTC addition also has a variety of floor types throughout, including exposed concrete in the shop areas, VCT in the classroom areas, and ceramic tiles in the corridors. Overall the exposed concrete areas have

Typical Corridor Ceiling in Disrepair

Typical Interior Classroom Ceiling


Typical, Painted Ceiling Tiles

Chipped Blue Stone Treads

Ramp Near Main Entry

Counter Tops in Disrepair

Original Chemical Shower

Typical Science Classroom Casework

slight cracking as to be expected. Both the VCT and Ceramic Tile flooring is beyond its useful life and too is listed in the AHERA report requiring full abatement.

The 2002 World Languages addition primarily has VCT in the corridors and classrooms. The overall condition of this VCT is fair condition and is 13 years old nearing its life expectancy of 15-20 years. Given that these floors were installed in 2002, the likely hood that asbestos containing materials were used is rare, and the 2012 AHERA report does not list these spaces. However, if a renovation option is selected, it would be recommended to replace these floors.

**Ceilings**

Acoustic Ceiling Tile (ACT) is installed throughout the school, and is in complete disrepair. Much of the ceiling tile and grid is warped, stained, or painted. None of the existing ceiling tile and grid is salvageable and will require full replacement with any renovation.

**Ramps, Stairs & Elevator**

There is one permanent ramp in the school located approximately 140 feet from the main entrance. The ramp is approximately 60 feet long and connects the main entry level to the first floor. The ramp is constructed of painted steel stringers, guardrails and handrails. In the 1967 building there are 4 main stairs that connect all three levels. The stairs are constructed of painted steel stringers and risers, with slate treads, and stainless steel hand rails. The handrails are 36" high and require a guardrail up to 42" high to be compliant with today's code. The vertical supports are spaced approximately every 3 ft, and do not have any infill pickets. The maximum opening between pickets to meet today's code is 4". Any renovation would require full replacement of the handrail and guardrails. The treads are made of blue Stone and chipping throughout. The 1989 CTC addition added one stair and a new entrance to the CTC building. The entrance is equipped with a vertical platform lift for accessibility. The 2002 World Language Addition also added a stair, which is equipped with a stair lift for accessibility. There is one elevator located in the Northeast corner of the 1967 building, and was constructed with the original school. Replacement of the elevator is recommended with any new renovation, and would be required to be brought up to current elevator and ADA codes.

**Interior Built-in Furnishings**

All of the interior built in furnishing are original to the school, and beyond

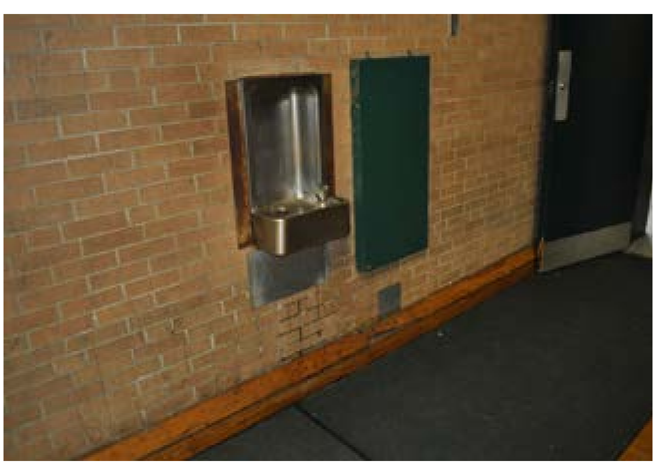
Multiple Levels

Rails and Guards

Inaccessible Toilet Stalls

Hardware Issues

Lift at CTC Entrance



Inaccessible Water Fountain

Remotely Located Elevator

their useful life. The majority of built in casework is located in the science classrooms and labs. Full replacement is recommended with any renovation.

## Accessibility

### Americans with Disability Act

A renovation of the Dover High School and Regional Career Technical Center would require the renovation be brought up to full compliance with ADA. The current building code regulations requires full compliance for any public building undergoing renovation work that is worth more than 30% of the assessed value of the building. Maintenance related work is exempt from the calculation, but only if the value of the work is below $500,000. Public school buildings are also required to meet full ADA regulations. Any significant renovation to Dover High School would trigger the ADA upgrade requirement. The notable challenges to bring the current school into compliance and non compliant ADA issues observed at the Dover High School and Regional Career Technical Center (DHS-CTC) are as follows:

- There are multiple level transitions, and limited accessible routes, which makes it difficult for someone with a disability to navigate the school in a timely efficient manner.
- The school only has access to one passenger elevator, and it is located in the classroom portion of the building, which favors one side of the school. Schools of this size typically have a minimum of 2 elevators.
- Handrails at existing stairs do not meet a number of ADA regulations. It would be necessary to install new handrails to meet these requirements.
- There is only a couple of accessible toilets that meet the current ADA standards for students and staff. These would need to be provided at each floor for both students and staff.
- Currently the drinking fountains lack appropriate clear floor space and height requirements ADA.
- Many of the doors do not provide the required push/ pull clearances and must be replaced or relocated to meet the ADA requirements. This condition occurs throughout the building including several of the classroom entrances, and secondary egress doors.
- Door hardware must be upgraded or replaced to meet ADA regulations including, but not limited to, door handles, closers and panic devices, as previously noted
- Signage throughout the building must be replaced to meet ADA requirements.
- Egress Lighting and Exit signs will need to be added at various locations
- All replacement materials must comply with Code. Existing to remain can stay as is.

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**Structural Summary**
**(See full report by Foley Buhl & Roberts in appendix)**

Foley Buhl Roberts & Associates, Inc. (FBRA) is collaborating with HMFH Architects, Inc. (HMFH) in the review and evaluation of planning alternatives for Dover High School and Career Technical Center (CTC), in Dover, New Hampshire. The purpose of this report is to identify and describe the structural systems of the various sections of the school and to comment on the structural issues/conditions observed. General comments relating to potential renovations, alterations and additions to the building (governed by the International Existing Building Code (IEBC; 2009 edition) are presented as well. The evaluation of specific renovation and/or renovation/addition schemes will be addressed in a separate, future structural narrative. Dover High School is located at 25 Alumni Drive in Dover, New Hampshire. The facility consists of a single building, comprised of three generations of construction. The largest, original portion of the building was built in 1966. The original school is three stories and comprises approximately 208,000 gross square feet. (In this report, "first floor" refers to the lowest floor level of the original building. The school's main entry is at the second floor level.) There have been two additions to the original school. The two-story 1989 Career Technical Center (CTC) addition is located at the east end of the school. This addition is 1-1/2 stories and comprises approximately 25,800 gross square feet, plus an attached greenhouse of approximately 1600 square feet. The 2002 addition, known originally as the "Freshman Academy", is now referred to as the "World Language Wing" (and is hereinafter referred to as "The 2002 addition"). This is a two-story classroom addition off the southwest corner of the original school, comprising approximately 10,600 gross square feet. The school's main entry and drop-off are on the south side of the original 1966 building. This main entry lobby is on the second floor level and it provides direct access to the auditorium and to the school's main office and central corridors. The grading around the building slopes downhill to the north such that the first floor (or "basement" level) is partially below grade along most of the south elevation, but is at grade along the north elevation. The floors of the 1989 CTC addition are aligned with the first and second floor levels of the original building. The CTC addition has its own separate entry, also located on the south side of the building, providing direct access to the bus drop-off lane. The upper level (second floor) of this addition is dedicated to the culinary arts program, with the balance of the technical arts programs located on the first floor. The primary access to the 2002 addition is from the school's main entry lobby. This addition is comprised of eight (8) classrooms and associated support and circulation space, with four classrooms on each floor level. The floor levels of the 2002 addition align with the second and third floors of the original school.

**Electrical Summary**
**(See full report from Garcia Galuska DeSouza in appendix)**
In general, the electrical systems have reached their life expectancy and are in poor condition with the exception of the world language addition. Life safety lighting and exit signs are battery type and not served from a backup generator. The electrical service was replaced during last addition but is not sufficient in size for present standards. The fire alarm system is in fair condition and will require replacement due to voice evacuation requirements of present code. Lighting systems in general have been upgraded with lamps and ballasts to conserve energy. T8 lamps have been installed in most spaces. Light fixtures however are in poor/fair condition in the majority of the building. The fixtures are original to respective addition construction period in most locations and should be upgraded. The power for the facility is in poor/fair condition, a new power distribution system should be provided at 277/480 volt distribution. The communications system wiring infrastructure for tel/data has been upgraded to accommodate desired use. A classroom intercom/paging system head end has been upgraded but is not up to present standards. The central clock system is not operational. There is a dedicated head end room and remote IDF closets with a fiber optic back bone that is in fair condition but lacks physical space.

**Fire Protection Summary**
**(See full report from Garcia Galuska DeSouza in appendix)**
The building is protected by automatic sprinkler systems. The building is served by two separate fire water services. There is one service located in the original 1967 Building which supplies the original building and the 2003 building addition. The other service is located in the 1989 Building mechanical room and supplies the 1989 building addition. The majority of the equipment and systems installed appear to have been well maintained and are generally in fair to good condition.

**HVAC – Heating, Ventilation and Air Conditioning Summary**
**(See full report from Garcia Galuska DeSouza in appendix)**
The existing High School and Addition building are heated by a gas-fired, standard efficiency boiler plant. A second gas-fired, standard efficiency boiler plant provides heating to the CTC building. The building is ventilated by a combination of indoor air handling units, packaged rooftop units, unit ventilators and fan coil units. Exhaust air ventilation is provided by a combination of roof mounted and inline exhaust air fans. The buildings do not have a central air conditioning plant. Air conditioning is provided to

several areas of the building by a combination of ductless and ducted type, split system AC units and window air conditioning units.

The majority of the building's heating and ventilation systems and equipment are originally installed equipment and have exceeded their expected useful service life. The majority of the High School building systems, with the Boiler Plant as a notable exception, were installed circa 1966. Therefore, the majority of the equipment and systems are approximately 48 years old. The High School boiler plant was installed in 2002, and the boilers and pumps appear to be in good condition. The majority of the CTC Building HVAC systems were installed circa 1989, are approximately 25 years old and are nearing or have exceeded their expected useful service life. The High School Language Arts Addition building HVAC systems were installed in 2003, are approximately 11 years old and appear to be in fair condition.

The existing HVAC systems appear to have been well maintained throughout recent years. However, even with proper system maintenance, equipment efficiencies and operation will gradually degrade over time due to factors such as equipment wear and scaling build-up on piping distribution systems. Therefore, it is our recommendation that the majority of building HVAC systems be replaced and upgraded. The existing High School boiler plant could remain as it has not exceeded the midway point of its expected service life. However the CTC building boilers should be removed and/or replaced. The CTC building wing could potentially be connected to the High School boiler plant, however new cross connecting piping and pumps would need to be provided, and a complete building heating load analysis would need to be provided in order to make that determination. In general, due to the HVAC piping and ductwork distribution systems age, we would recommend that piping and ductwork distribution systems are replaced. However, if any existing hot water piping and ductwork were to be re-used as part of a renovation project we recommend that all existing to remain piping and ductwork be internally cleaned prior to re-use.

For improved energy efficiency we would recommend the following HVAC system improvements. New ventilation systems, equipped with energy recovery should be installed to replace existing ventilation systems that have exceeded their useful service life. New mechanical ventilation systems should be provided for exterior classrooms that currently utilize operable windows for ventilation. New outside air ventilation units should be provided for the Locker Rooms, which are currently provided with ventilation air through the use of transferred air form the gymnasium. New high efficiency air conditioning systems should be provided to replace existing window AC units and older split system AC units and ductless AC units. All new fans and pumps should be equipped with VFD drives. A new building energy management and direct digital control system should be installed to control all building HVAC systems.

**Plumbing Summary**
**(See full report from Garcia Galuska DeSouza in appendix)**
Presently, the Plumbing Systems serving the building are cold water, hot water, sanitary, waste and vent system, special waste and vent system, storm drain system, and natural gas. Municipal sewer and municipal water service the Building. The majority of the plumbing systems are original to the building and its additions. Portions of the system have been updated as part of building renovation and upgrade projects. The plumbing fixtures are generally in fair condition. The plumbing fixtures in the 2003 building are in good condition. In general, the fixtures in the original and 1987 building appear to have served their useful life. Current Access Code requires accessible fixtures wherever plumbing is provided. In terms of the water conservation fixtures, their use is governed by the provisions of the Plumbing and Building Code. Essentially, the code does not require these fixtures to be upgraded, but where new fixtures are installed, as may be required by other codes or concerns, the new fixtures need to be water conserving type fixtures. All new fixtures are recommended in the original and 1987 building. Cast iron is used for sanitary and storm drainage. Rainwater from flat roof areas is collected by interior rain leaders which appear to discharge to a below grade drainage system. Where visible, the cast iron pipe appears to be in fair condition. Smaller pipe sizes appear to be copper or PVC. In general, the drainage piping can be reused where adequately sized for the intended new use.

**Civil Summary**
**(See full report from Nobis Engineering in appendix)**
In general, the existing bituminous asphalt pavement, curbing, and walkways/sidewalks are in poor condition and have reached or surpassed their life expectancy. The asphalt surfaces appear to have been overlain several times and as a result the asphalt surface is severely cracked from underlying deficiencies. The exception to this assessment is the site conditions of the Dover Alternate Program at 50 Alumni Drive. The conditions of the asphalt at the Dover Alternate Program are in good condition.

The condition of the landscaping appears to well established and

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healthy. The existence of an irrigation system could not be determined from visual inspection. Building access and accessibility is generally not in conformance with current American with Disabilities Act (ADA) design standards. The non-conformance includes but is not limited to total number of accessible parking spaces in each parking lot, signage, and access aisle striping and accessibility.

The existence of the utilities servicing the building/campus were observed including municipal water and sewer, natural gas, electrical power, site lighting, and a closed drainage system. The condition of the services cannot be noted from visual inspection however the structures appeared to be in good condition (manhole covers, hydrants, valves, meters, etc.). The majority of the drainage runoff from the impervious surfaces on-site appears to sheet flow to a closed drainage system. The closed drainage system is believed to discharge to the seasonal brook east of the campus and the seasonal brook south of the Senior Lot. DHS also has a foundation drain and roof drains that tie into the closed drainage system.

**Hazardous Materials Survey**
**(See full report from Universal Environmental Consultants in appendix)**
The HAZMAT survey is starting on January 16, 2015, and will require 3 to 5 visits from our consultant. After the site visits and testing, a final report will be issued and included in the appendix of the final existing conditions report.

**Environmental Phase I - Initial Site Investigation**
**(See full report from McPhail Associates in appendix)**
The Environmental Phase I investigation is currently underway, and will be completed by the end of January 2015. This report will be added in the appendix of the final existing conditions report.

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# Appendix A

## Structural Report

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**DOVER HIGH SCHOOL**
Dover, New Hampshire

**Existing Conditions Structural Report**
January 14, 2015 **Draft**

## I. INTRODUCTION and GENERAL DESCRIPTION

*Foley Buhl Roberts & Associates, Inc. (FBRA)* is collaborating with *HMFH Architects, Inc. (HMFH)* in the review and evaluation of planning alternatives for Dover High School and Career Technical Center (CTC), in Dover, New Hampshire. The purpose of this report is to identify and describe the structural systems of the various sections of the school and to comment on the structural issues/conditions observed. General comments relating to potential renovations, alterations and additions to the building (governed by the International Existing Building Code (IEBC; 2009 edition) are presented as well. The evaluation of specific renovation and/or renovation/addition schemes will be addressed in a separate, future structural narrative.

Dover High School is located at 25 Alumni Drive in Dover, New Hampshire. The facility consists of a single building, comprised of three generations of construction. The largest, original portion of the building was built in 1966. The original school is three stories and comprises approximately 208,000 gross square feet. (In this report, “first floor” refers to the lowest floor level of the original building. The school’s main entry is at the second floor level.)

There have been two additions to the original school. The two-story 1989 Career Technical Center (CTC) addition is located at the east end of the school. This addition is 1-1/2 stories and comprises approximately 25,800 gross square feet, plus an attached greenhouse of approximately 1600 square feet.

The 2002 addition, known originally as the “Freshman Academy”, is now referred to as the “World Language Wing” (and is hereinafter referred to as “The 2002 addition”). This is a two-story classroom addition off the southwest corner of the original school, comprising approximately 10,600 gross square feet.

The school’s main entry and drop-off are on the south side of the original 1966 building. This main entry lobby is on the second floor level and it provides direct access to the auditorium and to the school’s main office and central corridors. The grading around the building slopes downhill to the north such that the first floor (or “basement” level) is partially below grade along most of the south elevation, but is at grade along the north elevation.

The floors of the 1989 CTC addition are aligned with the first and second floor levels of the original building. The CTC addition has its own separate entry, also located on the south side of the building, providing direct access to the bus drop-off lane. The upper level (second floor) of this addition is dedicated to the culinary arts program, with the balance of the technical arts programs located on the first floor.

The primary access to the 2002 addition is from the school’s main entry lobby. This addition is comprised of eight (8) classrooms and associated support and circulation space, with four classrooms on each floor level. The floor levels of the 2002 addition align with the second and third floors of the original school.

The original school is irregular in plan. The core of the original facility is a rectangular, three-story classroom wing, measuring approximately 260' x 190'. This core includes all of the original classrooms as well as the office, library and cafeteria areas. The first floor level includes the original tech education classrooms. The cafeteria, located on the first floor, is the only two-story space within this core area.

At the west end of the classroom wing is an irregularly shaped, two-story section of the building that includes the gymnasium, the auditorium, locker rooms, training rooms, music rooms, the boiler room and the majority of the main entry lobby. This two-story area aligns with the second and third floors of the classroom wing and is structurally integrated (i.e.; connected) with the core classroom wing.

Structural conditions at the school were reviewed on site on December 4, 2014. Our review of the existing structure was limited, as most areas were concealed by finishes.

The following documents were reviewed in the preparation of this *Existing Conditions Structural Report:*

***Original (1966) School:***

- Structural Drawings S-1 through S-4, Architectural drawings A-1, A-3 through A-10, A12 through A23, all of the above by Dirsa and Lampron, Architects and Engineers, Manchester, NH. November 1965 through March 1966.
- 3-7-66 Borings (Boring Logs and boring location plan) by C. L. Guild Drilling & Boring Co., Inc.
- 3-28-66 "Revised Foundation Drawing" (re-issue of drawing S-1 for pile foundation).
- 3-29-66 "Topo Plan" (Plot Plan) Test pit locations. By Dirsa and Lampron, Harvey Construction.
- "Misc Foundation Piles Plan" partial foundation plan, no date, no author listed, depicts additional piles under grade beams.

***1989 CTC Addition:***

- Architectural Drawings A2 through A17, prepared by Lavallee Brensinger Professional Association (Architects), Manchester, NH, May 1988.
- Structural Drawings S1 through S4, prepared by Peter H. Steffensen, P.E., Manchester, NH, May 1988.

***2002 Addition:***

- Architectural Drawings A1.1 through A5.1 (10 drawings total), prepared by McHenry Architecture, Portsmouth, New Hampshire, and Witcher Builders, Strafford, New Hampshire, December 11, 2002.
- Structural Drawings F1, F2, S1 through S11, prepared by Civil Consultants, South Berwick, Maine, November 12, 2002.

- "New Addition Site Plan", prepared by Civil Consultants, South Berwick, Maine, October 4, 2002.

- "Report of Geotechnical Investigation for Proposed Addition to Dover High School" by R. W. Gillespie & Associates, Inc., April 5, 2002.

No exploratory demolition or structural materials testing was performed in conjunction with this review**.** Subsurface soils data associated with the original building and the 2002 addition was been reviewed for this report, however no additional geotechnical investigations have been conducted.

## II. STRUCTURAL SYSTEMS DESCRIPTION

### 1966 Construction

***General Description:*** The three-story core classroom wing of the original 1966 building has a structural steel primary frame comprised of wide flange ("WF") rolled steel beams and girders supported on square and rectangular structural steel columns of varying sizes. The columns are typically protected by an outer fire-resistant shell, with a gypsum fill between the outer shell and the inner structural core.

The primary steel frame is infilled with "H" series open web steel joists, typically spaced at 2'-0" for support of the framed floors and 3'-0" on centers for the support of the roof deck. Typical joist spans in the three-story classroom core range from 12'-0" at corridors to 36'-0" over the perimeter classrooms. Joist depths in the classroom wing range from 8" to 18".

The gymnasium roof utilizes 56" deep open web joists spaced at 5'-0" on centers, while the auditorium roof includes a range of joist sizes up to 48" deep, typically spaced at 4'-0" on centers. The joists in the gymnasium and the auditorium are typically supported on load-bearing concrete masonry walls.

***Story Heights (core classroom wing):***

| | |
|---|---|
| First Floor to Second Floor: | 15.00' +/- |
| Second Floor to Third Floor: | 11.25' +/- |
| Third Floor to Roof: | 11.30' +/- |
| Roof to top of parapet: | 1.5' +/- |

***Structural Materials:***

| | |
|---|---|
| Concrete - Foundations: | 3000 psi 28 day compressive strength |
| Concrete – Framed floors: | 3,750 psi 28 day compressive strength |
| Steel Reinforcing : | 20 ksi allowable stress |
| Structural Steel: | Not specified, presumed to be ASTM A36; Fy = 36 ksi on the basis of the construction date. |
| Open web steel joists: | "H" and "J" series, per May 1961 SJI standards. |
| Load-bearing Masonry: | Not specified. |

***Design Loads:***

| | |
|---|---|
| Floors: | Not specified. |
| Roof: | Not specified. |
| Wind: | Not specified |
| Seismic: | Not specified (predates seismic design requirements) |

***Upper Floor Construction:***

The design live load capacity of the floors is not enumerated on the original construction drawings.

The floor decks are comprised of cast-in-place concrete supported on draped, steel-reinforced fiber forms ("SteelTex" system). Steeltex is an archaic building product intended to serve as both a concrete form and to provide reinforcement for the floor slab. These slabs are 4" minimum thickness at the second floor and 2.5" minimum thickness at the third floor. The open web steel floor joists that support the floor decks are spaced typically at 2'-0" on centers. Product literature on the load capacity of the Steeltex floor system could not be located for this study, however it is likely that the load capacity of these slabs is not the limiting factor in the floor load capacity.

Open web steel joist sizes and spans were reviewed for this study. The joist sizes, span conditions and arrangements are similar on both the second and third floors, despite the thicker floor slab used at the second floor level (4" minimum thickness, vs. 2.5"). This evaluation indicates that typical classroom floor live load capacities ranged from 40 to 55 pounds per square foot for the commonly used 18H6 and 18H7 joist sizes used on 35' and 36' spans, respectively.

The main corridors on both floor levels utilize 8H2 joists, with the most prevalent span condition being 12 feet. However there are two locations on each floor where those joists span 16 feet. Corridor live loads were therefore rated at 96 psf for the typical 12' span condition, but only 30 psf for the 16' maximum span conditions on the second floor level.

***Roof Construction:*** The roof deck is typically a 4" cement fiber deck similar to "Tectum", although the actual manufacturer is unknown. Typically these panels span 3'-0" between steel joists in the core classroom wing, but longer spans (4'-0" to 5'-0" on centers) are utilized in the auditorium and gymnasium areas. The cement fiber roof deck is augmented with steel bulb tees in those areas where the longer roof deck spans are utilized and at roof overhangs. All areas of the building have flat roofs.

***Expansion Joints***: The original building has no expansion joints.

***Lowest Level Floors:*** The lowest-level floor slabs are grade supported, cast-in-place concrete slabs with welded wire fabric reinforcing. These slabs are typically 4" thick in the corridors and academic areas, with 6" slabs used in the tech ed and shop areas.

***Exterior Wall Construction:*** The north, south and east exterior elevations of the core classroom wing are predominately curtain wall assemblies comprised of strip windows (glass), translucent Kalwal panels and vertical aluminum mullions. The mullions are restrained at each floor level.

The auditorium and gymnasium area exterior walls are comprised primarily of load-bearing concrete masonry (CMU) with an 4" exterior brick veneer. The CMU has a nominal thickness of 8" in the multi-story areas and 12" in the high bay areas. The cavity between the brick veneer and the CMU is less than 1" wide and is uninsulated.

***Subsurface Soils:*** Eight borings were conducted in February and March of 1966. The depth of these borings ranged from 5 feet to 35 feet below the original ground surface. All of these borings encountered strata described as "soft grey clay", ranging in thickness from 2 to 12 feet, with Standard Penetration Test values as low as 2.

***Foundations:*** Two versions of the original foundation plan (drawing S-1) exist. The original release, dated 11-26-1965, depicts a shallow, spread and strip footing foundation. The notes on that plan indicate that the footings were designed for a bearing pressure of 2 tons per square foot.

However a revised issue of this drawing stamped and dated 3-26-1966 was revised to depict a pile foundation for the three-story core classroom area. This revised drawing is likely the result of the geotechnical borings performed in February and March of 1966. It appears that the foundation design was revised in response to the relatively weak clay soil layers that underlie the building site. The piles depicted in the 3-26-66 plan set are concrete-filled steel pipe piles, ranging in diameter from 10.75" to 12.75". Design loads documented on the plan range from 35 to 90 tons per pile.

It appears that the revised pile foundation was implemented for the three-story classroom wing, but not for the two-story westerly portions of the building. The revised foundation plan shows the auditorium, music and the westerly side of the gymnasium on spread footing foundations. The foundations are not accessible for visual examination and accordingly the extents of this change foundation type could not be fully determined for this assessment.

***Lateral Load Resistance:*** The 1966 construction predates the inclusion of seismic design criteria into the model building codes. The building does not comply with current design standards for wind or seismic loads. The building does not have a defined lateral load-resisting system.

For the classroom wing, it is likely that considerable lateral load resistance is provided by the non load-bearing interior CMU walls that extend from the foundation to the underside of the second floor structural steel.

For the gym, music and auditorium areas, the load-bearing exterior wall masonry would function to attract lateral loads and convey them to the building foundations.

***Drop-off Canopy:*** The main entry canopy extends along the bus drop-off roadway. This canopy is comprised of precast concrete barrel vault elements supported on precast concrete columns.

***Drainage:*** The presence of a perimeter and/or underslab drainage system is not known; however, no drainage is indicated on the available drawings.

**1989 CTC Wing Construction**

***General Description:*** The Career Technical Center (CTC) has a rectangular footprint measuring approximately 195' x 100', with one long side immediately adjacent to the east end of the original 1966 classroom wing. The main floor of the CTC is a grade-supported slab, aligned with the first floor of the original 1966 building. The CTC has a partial upper floor of approximately 8100 gsf, occupying the southerly portion of building footprint. The elevation of the upper floor aligns with the second floor of the original 1966 building. The low roof area occupies the northerly portion of the building footprint and extends across approximately 70% of the interface line where the CTC meets the original building.

The CTC has a structural steel primary frame comprised of wide flange ("WF") rolled steel beams and girders supported on square HSS structural steel tube columns ranging in size from 4"X4" to 7"X7".

The primary steel frame is infilled with "K" series open web steel joists, typically spaced at 1'-7" to 4'-1" for support of the framed floors and 2'-0" to 4'-6" on centers for the support of the roof deck. The joist spans are variable, ranging from 10'-4" to 35'-0". Joist depths range from 10" to 26".

***Story Heights:*** The floor elevations in the CTC addition match the first and second floor elevations of the original building (11.25'). The story height from the highest floor elevation to the top of the roof steel is variable; the roof steel is sloped to achieve drainage pitch.

***Structural Materials:***

| | |
|---|---|
| Concrete | 3000 psi 28 day compressive strength |
| Steel Reinforcing: | Grade 60 bars. |
| Structural Steel: | Beams and girders: ASTM A36; Fy = 36 ksi<br>HSS columns: Fy = 46 ksi. |
| Open web steel joists: | "K" series, per SJI standards. |
| Roof Deck: | 1.5" deep cold-formed steel deck, 22 gauge, Type B. |
| Floor Forms: | 9/16" deep, 28 gauge corrugated steel deck. |
| Load Bearing Masonry: | ASTM C90 concrete block, grade N, type 1, with<br>Type "S" mortar and 3000 psi grout, reinforced. |

***Design Loads:***

| | |
|---|---|
| Flat Roof Snow Load (min.): | 40 psf |
| Floor Live Load – Slabs on Grade: | 100 psf |
| Floor Live Load, framed floors, Corridors: | 80 psf |
| Floor Live Load, Framed floors, Classrooms: | 40 psf |
| Floor Live Load, Storage Areas: | 125 psf |
| Wind Load: | 20 psf |
| Seismic Loads: | Not specified. |

***Upper Floor Construction:*** Cast-in-place concrete slabs on 9/16" deep, 28 gauge form deck, with 6"x6" welded wire fabric reinforcing. Typical slab thickness is 3 inches, except as noted below.

The floor slab in the Food Trades area is atypical and varies in thickness from 3.5" to 5.5" in order to provide a pitch to the floor drains.

The floor slab in the food storage area is atypical and is 8" thick.

***Roof Construction:*** 1.5" deep, 22 gauge, cold formed steel roof deck, Type "B".

***Expansion Joints***: There are no expansion joints within the CTC wing. The CTC wing is separated (i.e., structurally isolated) from the original 1966 construction by a 1" wide expansion joint.

***Lowest Level Floors:*** Grade-supported 5" thick concrete slabs with welded wire mesh reinforcement (Note: the original structural drawings contain ambiguous or contradictory information on the slab thickness and on the gauge of the welded wire fabric.).

***Exterior Wall Construction:*** The main level (second floor level) are predominately 8" concrete masonry walls with a 4" brick veneer. There is a 2" cavity between the brick and the CMU. The window openings are punched openings, with loose steel angle lintels.

Perimeter exterior walls at the upper level (third floor) are predominately comprised of 6" cold-formed steel stud backup with a 4" brick masonry veneer.

The exterior walls at the upper level (third floor; over low roof areas) are predominately composed of metal panels on light gauge steel framing.

***Subsurface Soils:*** No soils descriptions, subsurface explorations or geotechnical report are on record for this addition.

***Foundations:*** Shallow, spread footing and strip footing foundations at frost depth (i.e., 4'-0" minimum below grade). Notes on the structural drawings indicate that the foundations were designed for a soil bearing capacity of 1.0 ton per square foot.

***Lateral Load Resistance:*** East-west lateral load resistance is provided for by structural steel moment-resisting frames. The design loads for the connections in these frames is specified on the structural drawings, however, the source of these design loads (wind or seismic) is not identified.

North-south lateral load resistance is provided for by moment frame action, achieved by attachment of extended joist bottom chords to the columns (i.e., "tie joists). No design loads are specified for the tie joist connections.

***Drainage:*** Not specified.

**2002 World Languages/Freshman Academy Wing**

***General Description:*** The two-story 2002 addition has a rectangular footprint measuring approximatey 68' x 88', with the northeast side of this addition immediately adjacent to the main entry lobby and auditorium of the original school. The floors of this addition is are aligned with the second floor (main floor) and third floor (upper level) of the original school. The 2002 addition is accessed by corridors on both floor levels that connect to the auditorium/main entry lobby and the balcony lobby (upper level). This addition has 8 classrooms, four on each floor level.

The lower floor of the 2002 addition is a grade-supported 5" thick cast-in-place concrete slab. The upper floor construction includes both cast-in-place and precast concrete decks, with the former supported on open web steel joists. The cold-formed steel roof deck is also supported on open web steel joists.

The majority of the floor and roof framing is supported on interior and exterior load-bearing masonry walls. The exception to this is a single line of structural steel beams and columns, located immediately adjacent to the original 1966 building.

***Story Heights:*** The floor elevations of the 2002 addition align with the second and third floors of the original building.

***Structural Materials:***

| | |
|---|---|
| Concrete | 4000 psi 28 day compressive strength, normal weight |
| Steel Reinforcing: | ASTM A615, Grade 60 bars. |

| | |
|---|---|
| Structural Steel: | Rolled shapes: ASTM A992 Grade 50.<br>Plates and angles ASTM A36; Fy = 36 ksi.<br>HSS columns: ASTM A500, Fy = 46 ksi. |
| Open web steel joists: | "K" series, per SJI standards. |
| Roof Deck: | 1.5" deep cold-formed steel deck, gauge unknown. |
| Floor Forms: | 1.5" deep, 22 gauge cold-formed steel deck. |
| Precast floor deck: | 6" deep hollow core precast prestressed plank, f'c=5000 psi. |
| Load Bearing Masonry: | ASTM C90 concrete block.<br>Type "S" mortar.<br>Grout: ASTM C476.<br>f'm = 2000 psi |
| Masonry Vertical reinforcement and bond beams: | ASTM A615 bars, #4, 48" maximum spacing. |
| Horizontal joint reinforcement: | 9 gauge, galvanized, ladder type. |

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***Design Loads:***

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|---|---|
| Flat Roof Snow Load (min.): | 66 psf |
| Maximum snow drift load: | 153 psf |
| Floor Live Load, framed floors, Corridors: | 105 psf |
| Floor Live Load, Framed floors, Classrooms: | 45 psf |
| Wind Load: | unknown |
| Seismic Loads: | per 2000 International Building Code,<br>Seismic Design Category "C"<br>Seismic Use Group II,<br>Site Class "E". |

***Upper Floor Construction:***

Classrooms: 4" cast-in-place concrete slab on 1.5" deep, 20 gauge cold-formed steel deck, supported by "K" series open web steel joists spaced at 24" on centers. Joists in the classroom areas are typically 24" deep and have a maximum span of 34'-8". Floor joists are typically supported on 8" concrete masonry interior bearing walls (corridor walls) and on the exterior masonry walls.

Corridors: 6" hollow core precast prestressed concrete plank with a 2" cast-in-place concrete topping. Typical spans are 9'-4" to 9'-8". Planks are supported on the interior masonry corridor walls and on the structural steel frame line adjacent to the original building.

***Roof Construction:*** Cold-formed, galvanized steel roof deck, 1.5" deep, supported on open web steel joists spaced at 36" to 48" on centers. Joist sizes range from 10" deep over the corridors to 24" deep over the classrooms.

***Expansion Joints***: There are no internal expansion joints internal to the 2002 addition. The upper floor and roof of the 2002 addition are separated from the original building by a 1" expansion joint.

***Lowest Level Floors:*** The lower floor of this addition is a 5" concrete slab on grade. The structural drawings call for either welded wire fabric or synthetic fiber reinforcement; it is not known which of these options was utilized.

***Exterior Wall Construction:*** The exterior walls of the building are typically 12" thick concrete masonry. The construction is variable, with some areas utilizing a single 12" wythe, while other areas are comprised of an 8" inner wythe and an exterior 4" wythe, with the outer wythe typically consisting of a contrasting color CMU. The exterior walls are load-bearing and are reinforced with #4@48" typical vertical reinforcement and with bond beams and joint reinforcement horizontally. The punched window openings range in width from 4'-4" to 8'-4". The shorter openings utilize single span, double angle loose lintels. The longer windows typically occur in pairs, utilizing two-span, WT loose lintels.

***Subsurface Soils:*** Subsurface borings and a geotechnical report were completed for the 2002 addition. This work was completed by R.W. Gillespie & Associates, Inc. (RWGA) and is summarized in their 4/5/2002 report. That report notes the presence of a soft, silty clay layer beneath the addition footprint. The borings indicate that the clay layer ranges from 3 to 53 feet in thickness. The RWGA report recommended that the building be founded on shallow spread and strip footings designed for a bearing pressure of 1.0 ton per square foot. That report also recommends a preload surcharge of the building site in order to pre-compress the silty clay layers that underlie the site. It is not known if the preload recommendation was implemented. Foundation drawing F2 included notes pertaining to the design soil bearing pressure, but unfortunately those drawing notes are no longer legible.

***Foundations:*** The foundations for the 2002 addition are comprised of shallow spread and strip footings, bearing on pre-compressed native soils.

***Lateral Load Resistance:*** The drawing notes indicate that the building was designed for seismic loads, in accordance with the 2000 International Building Code. No information on design wind loads is included in the contract drawings. Lateral load resistance is provided by reinforced masonry shear walls, including the exterior walls and the corridor walls.

***Drainage:*** A perimeter foundation drainage system consisting of 4" perforated PVC pipes laid in a coarse gravel bed was specified on the construction drawings. This system is consistent with the recommendations included in the RWGA geotechnical report.

## III. STRUCTURAL CONDITION/COMMENTS

Structural Conditions at Dover High School were reviewed at the site (to the extent possible) on December 4, 2014. Generally speaking, floor and roof construction appears to be in satisfactory condition (where visible); there is no evidence of structural distress that would indicate significantly overstressed, deteriorated or failed structural members.

Foundations generally appear to be performing adequately. Typically, there are no signs of excessive total or differential settlements.

Floors and roofs appear to have been constructed in general accordance with the available, original framing drawings.

Specific areas of structural concern are discussed further below.

**Floor live load capacity:** Live load capacities were reviewed for this report, either as tabulated on the original plans, or by analysis of the framing sizes shown on the original plans. With one exception, the live load capacities were found to meet or exceed current IBC/ASCE-7 design standards, which are as follows:

Minimum uniform live load capacities (ASCE 7-05):

| | |
|---|---|
| Classrooms | 40 psf |
| First floor corridors | 100 psf |
| Corridors above the first floor: | 80 psf |

The exception was certain areas of the second and third floor corridors in the original 1966 building. Typically, those corridors are framed with 8H2 joists spanning 12 feet. However there are specific bays where that same joist size is used on a 16' span. The corresponding floor live load capacity for those 16' spans is approximately 30 pounds per square foot. If the framing sizes shown on the original plans are correct, then this represents a significant live load deficiency in those areas. That framing was concealed from view at the time of our site visit. Field verification of the framing sizes in these bays is recommended.

**Lateral Load Resisting Systems:** The construction drawings for the 2002 addition contain specific information on seismic design loads and the masonry shear walls that are intended to resist those loads. However no information on the design wind loads was included in that drawing package. Given the type of construction used for that addition, it is likely that the seismic loads specified on the plans were the governing factor in design.

The plans for the 1989 addition included connection design forces for the structural steel moment frames used to resist lateral loads. A design wind load of 20 pounds per square foot is specified on those plans, however no seismic design criteria are included in the drawing notes. The BOCA model building code widely used in New Hampshire at that time did require consideration of seismic loads, but it is not clear if the connection design forces shown on the plans are the result of wind forces or seismic forces. Design of this addition may have predated formal adoption of the BOCA code by either the State or the City.

The original 1966 construction predates any code-mandated seismic design requirements. This portion of the building lacks a defined, dedicated lateral load-resisting system. Lateral loads are likely resisted by the masonry walls acting as shear walls. In the case of the auditorium and gymnasium areas, the masonry walls are typically load-bearing perimeter walls that have relatively few windows or other penetrations. In the case of the classroom wing, the masonry walls are, for the most part, interior to the building and non-load bearing, typically consisting of an infill of the primary steel building frame. In both cases, reinforcement of these walls is limited and accordingly their performance as seismic-resisting elements is therefore of questionable value.

**Concrete Main Entry Canopy:** The main entry and bus drop-off canopy has reportedly been a continuing maintenance issue. This canopy is comprised of precast concrete vaulted roof components, bearing on precast concrete columns. The resulting shape apparently traps snow within the structure, resulting in water penetration and paint system failure. This canopy is massive and laterally unrestrained and accordingly it may represent a seismic hazard. If this structure is to be maintained, FBRA recommends that an analysis be conducted to evaluate the expected performance of this canopy under seismic loads.

**Foundations:** The documentation on file indicates that the 1966 building was originally designed with a spread footing foundation, but that subsurface borings performed immediately prior to the start of construction resulted in a change to a pile foundation for the 3-story classroom wing. However the change to a pile foundation was apparently not implemented for the auditorium and gymnasium areas.

The 1989 addition was designed with a spread footing foundation, using a low design soil bearing pressure (1.0 ton per square foot). There is no indication that any additional site preparation work was conducted to address the site soil conditions in this area.

For the 2002 addition, the existing documentation indicates that the building site was surcharged in order to consolidate the compressible clay strata that underlie the building footprint. The addition was then constructed with spread footing foundations, also designed for the relatively low bearing pressure of 1.0 ton per square foot.

In summary, the foundation types and elevations used for each of the three eras of construction are substantially different. In addition, the original 1966 construction apparently utilizes two dissimilar foundation types. See further comments below under “Isolation Joints”.

**Grading:** Exterior grade elevations along the south side of the 1966 classroom wing result in snow depths that frequently are above the window sill level. This condition has reportedly resulted in continuing maintenance and snow removal issues.

**Expansion Joints and Isolation Joints:** The 1989 and 2002 additions are both separated from the original building by 1” isolation joints, thereby making the additions structurally independent of the original building. The isolation joint separating the 1989 addition from the original building appears to be of insufficient width to address lateral drift under seismic loadings.

There are no internal expansion joints within the original 1966 building, however the plan arrangement of the two-story auditorium /gymnasium represents a geometric irregularity with respect to the 3 story classroom wing. In addition to this plan irregularity, the foundations in each of these areas are of different types (shallow strip footings vs. piles), the elevation of the lowest level differs by one story, and the structural systems used in these two areas are dissimilar. No isolation joint was included to separate these distinct areas. A crack has formed in the main entry lobby floor slab and the interior lobby wall, apparently as a result of these discontinuities and the reentrant corner near the main entry doors. This crack is apparently the result of the geometric irregularities and the two distinct structural systems used within this building.

**Partition Walls:** The framed floors throughout the entire school utilize open web joists to support the floor decks. Joists were specifically “doubled up” (i.e., two joists in close proximity) where masonry partition walls were anticipated. As a result, the relocation of interior masonry partitions supported on joist-supported floor decks would likely require augmentation of the existing floor framing beneath the new partitions.

**Cement Fiber Roof Deck**: Cement fiber roof decks were utilized throughout the original 1966 building. Although similar products remain on the market, this type of deck is generally considered to be an archaic building product. The deck can be directly observed in the gymnasium. Typically, this deck performs satisfactorily under gravity loads, provided that it is kept dry. This type of deck has a poor performance history when subjected to wet conditions. No evidence of deteriorated roof deck was observed in the gymnasium area.

**Snow Drift:** The original building predates building code requirements for consideration of snow drift loads occurring on low roofs that are adjacent to taller sections of the building. Potential snow drift conditions exist on the one-story low roof areas at the northwest corner of the building, over the locker rooms.

## IV. RENOVATIONS AND ADDITIONS – BUILDING CODE REQUIREMENTS

General comments relating to potential renovations, alterations and additions to Dover High School are presented in this section. Renovations, alterations, repairs and additions to existing buildings in New Hampshire governed by the provisions of the 2009 International Existing Building Code (IEBC).

The IEBC defines three (3) compliance methods for the repair, alteration, change of occupancy, addition or relocation of an existing building. The method of compliance is chosen by the Design Team (based on the project scope and cost considerations) and cannot be combined with other methods.

The *Prescriptive Compliance Method* (IEBC Chapter 3) duplicates Sections 3403 through 3411 of Chapter 34 in the *2009 International Building Code* (IBC) and prescribes specific minimum requirements for construction related to additions, alterations, repairs, fire escapes, glass replacement, change of occupancy, historic buildings, moved buildings and accessibility. If the impact of the proposed alterations and additions to structural elements carrying gravity loads and lateral loads is minimal (less than 5% and 10% respectively), seismic upgrades to an existing building are generally not required.. Renovations and alterations must be conducted in a manner such that the level of compliance of the existing building is not diminished.

The *Work Area Compliance Method* (IEBC Chapters 4 through 12) is based on a proportional approach to compliance, where upgrades to an existing building are triggered by the type and extent of work. The Work Area Compliance Method includes requirements for three levels of alterations, in addition to requirements for repairs, changes in occupancy, additions, historic buildings or moved buildings. A complete seismic evaluation of the existing building is required for the following: Level 2 alterations where the demand to capacity ratio of lateral load resisting elements has been increased by more than 10%, all Level 3 alterations, a change in occupancy to a higher category (not applicable in this case) and where structurally attached additions (vertical or horizontal) are planned. A full renovation of Dover High School (involving more than 50% of the space reconfigured) would be classified as a Level 3 alteration.

The Work Area Compliance Method will likely be applicable to this project.

The *Performance Compliance Method* (IEBC Chapter13) duplicates Section 3412 of Chapter 34 in the IBC and provides an alternative means for evaluating a building based on fire safety, means of egress and general safety (19 parameters total). This method allows for the evaluation of the existing building to demonstrate that proposed alterations, while not meeting new construction requirements, will maintain existing conditions at their current levels (at a minimum) or improve conditions, as required. A structural investigation and analysis of the existing building is required to determine the adequacy of the structural systems for the proposed alteration, addition or change of occupancy. A report of the investigation and evaluation, along with proposed compliance alternatives must be submitted to the Code official for approval.

Regardless of the compliance method chosen, an assessment of masonry shear stresses, wall slenderness, parapets, wall anchorage, diaphragm anchorage, etc. is required, and the existing building must be capable of resisting at least 75% of the seismic loading required by the Code for new construction. In addition, the auditorium and gymnasium areas of the original building include masonry load-bearing walls that would be classified as “unreinforced” (although these walls do include horizontally reinforced bond beams). Given the geotechnical Site Class “E” classification determined for the 2002 addition, in combination with an Occupancy Category III classification (per IBC table 1604.5; secondary school with occupancy greater than 250 people), the resulting Seismic Design Category for this building is “D”. Accordingly, a Level 3 alteration of this area of the building would require a seismic retrofit designed for the earthquake loads applicable to new construction. (Reference: IEBC Appendix A1, paragraph A102.2). Although compliance with this requirement may be technically feasible, the cost associated with complying with these requirements may render a seismic retrofit an impractical alternative.

**Future Additions – General Comments:**

The design and construction of any proposed future addition to Dover High School would be conducted in accordance with the Code for new construction. Significant, horizontal additions should be structurally separated from the existing building by an expansion (seismic) joint, to avoid an increase in gravity loads or lateral loads to existing structural elements. The roof structure and foundations of the existing building were not designed to accommodate a vertical addition.

**Further Study**

One major factor contributing to the seismic design requirements associated with renovating this school is the Seismic Site Class. Although a classification of "E" was utilized for the 2002 addition, further geotechnical testing is warranted to confirm this Site Classification. Shear wave velocity testing conducted in accordance with Chapter 20 of ASCE/SEI 7-05 may result in an improved Site Class determination, thereby easing the required retrofit design criteria.

The original architectural and structural plans for the 1966 construction do not indicate that the masonry load-bearing walls of the auditorium and gymnasium area contain vertical steel reinforcement. In the absence of vertical reinforcement, these walls must be classified as "unreinforced". As noted in this report, unreinforced masonry load-bearing walls would require seismic retrofit upgrades to comply with the requirements of IEBC Appendix A1. FBRA recommends that these walls be scanned with a pacometer (or other non-destructive scanning methodology) to confirm the absence of vertical reinforcement.

As noted previously, the floor joist sizes used in the longer bays of the corridors of the 1966 building should be field verified.

FBRA recommends that the existing main entry canopy be reviewed with regard to its stability under lateral loads.

**Renovations/Alterations – General Comments:**

Where proposed alterations to existing structural elements carrying gravity loads result in a stress increase of over 5%, the affected element will need to be reinforced or replaced to comply with the Code for new construction.

Alterations to existing structural elements carrying lateral load (the interior and perimeter, unreinforced masonry walls of the of the building) and/or increases in building mass which combine to result in an increase in the demand-capacity ratio of over 10% should be avoided, if possible.

As discussed above, For the 1966 three-story classroom wing, the 1989 addition and the 2002 addition, compliance with the reduced seismic forces (50% of those required by the Code for new construction) will be necessary. An even more stringent requirement is triggered if the building undergoes a *Substantial Structural Alteration*, defined as structural alterations to more than 30% of the total floor and roof areas of the building. In this case, compliance with reduced seismic forces equal to 75% of those required by the Code for new construction will be necessary.

Following the development of proposed, specific renovation/alteration schemes for the building, the anticipated scope of structural/structurally related work required will be addressed in a separate narrative.

**V. PHOTOGRAPHS**


1. Bus drop-off and main entry canopy, 1966 classroom wing at left.

2. 1966 Classroom wing: South side window sill elevation near grade.

3. 1989 CTC Addition: Main entry

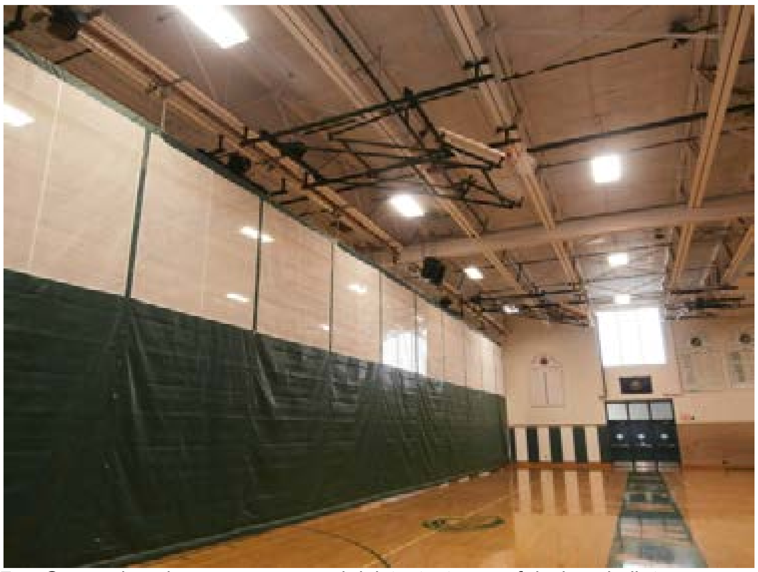
4. Low roof area, north side of 1989 addition, adjacent to three-story 1966 classroom wing.

5. North side of 1966 building – low roof locker room wing.

6. Masonry chimney – note step crack near upper roof line.

# DRAFT





7. Gymnasium, long span open web joists, tectum roof deck on bulb tees.

8. West elevation: 2002 addition (right) meeting auditorium wall.

9. 1966 Classroom Wing – corner column at corridor intersection.

10. High and low roof areas of the 2002 CTC addition, looking NE from the third floor of the 1966 classroom wing.

***End of Existing Conditions Structural Report***

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## MEP-FP Existing Conditions Report

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**HVAC**

***Executive Summary:***

The existing High School and Addition building are heated by a gas-fired, standard efficiency boiler plant. A second gas-fired, standard efficiency boiler plant provides heating to the CTC building. The building is ventilated by a combination of indoor air handling units, packaged rooftop units, unit ventilators and fan coil units. Exhaust air ventilation is provided by a combination of roof mounted and inline exhaust air fans. The buildings do not have a central air conditioning plant. Air conditioning is provided to several areas of the building by a combination of ductless and ducted type, split system AC units and window air conditioning units.

The majority of the building's heating and ventilation systems and equipment are originally installed equipment and have exceeded their expected useful service life. The majority of the High School building systems, with the Boiler Plant as a notable exception, were installed circa 1966. Therefore, the majority of the equipment and systems are approximately 48 years old. The High School boiler plant was installed in 2002, and the boilers and pumps appear to be in good condition. The majority of the CTC Building HVAC systems were installed circa 1989, are approximately 25 years old and are nearing or have exceeded their expected useful service life. The High School Language Arts Addition building HVAC systems were installed in 2003, are approximately 11 years old and appear to be in fair condition.

The existing HVAC systems appear to have been well maintained throughout recent years. However, even with proper system maintenance, equipment efficiencies and operation will gradually degrade over time due to factors such as equipment wear and scaling build-up on piping distribution systems.

Therefore, it is our recommendation that the majority of building HVAC systems be replaced and upgraded. The existing High School boiler plant could remain as it has not exceeded the midway point of its expected service life. However the CTC building boilers should be removed and/or replaced. The CTC building wing could potentially be connected to the High School boiler plant, however new cross connecting piping and pumps would need to be provided, and a complete building heating load analysis would need to be provided in order to make that determination. In general, due to the HVAC piping and ductwork distribution systems age, we would recommend that piping and ductwork distribution systems are replaced. However, if any existing hot water piping and ductwork were to be re-used as part of a renovation project we recommend that all existing to remain piping and ductwork be internally cleaned prior to re-use.

For improved energy efficiency we would recommend the following HVAC system improvements. New ventilation systems, equipped with energy recovery should be installed to replace existing ventilation systems that have exceeded their useful service life. New mechanical ventilation systems should be provided for exterior classrooms that currently utilize operable windows for ventilation. New outside air ventilation units should be provided for the Locker Rooms, which are currently provided with ventilation air through the use of transferred air form the gymnasium. New high efficiency air conditioning systems should be provided to replace existing window AC units and older split system AC units and ductless AC units. All new fans and pumps should be equipped with VFD drives. A new building energy management and direct digital control system should be installed to control all building HVAC systems.

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***High School Heating Plant:***

The building is primarily heated by gas fired hot water boiler plant. There are three (3) gas-fired hot water boilers located in the lower level boiler room. The boilers were manufactured by Cleaver Brooks (Model CBLE-700 240 125, Serial Nos. 0L102065, 0L102066, 0L102067) with 9,900 MBH gas input. The boilers are equipped with CB Hawk boiler controls. The boilers were installed circa 2002 and are approximately 12 years old. The boilers appear to be in good physical condition.

*Existing Boilers*

The boilers are vented by a common manifold double wall steel breeching system that terminates through a masonry chimney to the outdoors. There are some visible cracks at the top of the chimney. The condition of the interior liner was not inspected during the site visit.

*Boiler Chimney*

*Steel Breeching (top left)*

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*Combustion Air Fan*


*Combustion Air Fan*

*Combustion Air Perforated Supply Diffuser*

Combustion air for the boilers is provided by two (2) inline combustion air fan systems. Combustion air is distributed to the boilers via galvanized sheetmetal ductwork and perforated supply diffusers that are located between the boilers. The perforated supply diffusers were observed to be dirty and clogged.

Hot water is distributed from the boilers to terminal heating equipment located throughout the High School and Addition are of the building by two (2) in-line base mounted pumps. The pumps appear to have been installed in 2002. In general, the pumps appear to be in fair condition. The pumps are equipped with variable speed drives.

*Existing Hot Water Pumps*

*Existing HW Pump VFDs (left) and Expansion Tanks (right)*

There are three (3) hot water expansion tanks that appear to be in good condition.

In general, the majority of the main hot water supply and return piping distribution system and associated valving located within the boiler room appear to be have been installed circa 2002. In general the hot water piping and insulation appears to be in good condition. The majority of the hot water piping located outside of the boiler room in the high school is believed to have been installed in 1966.

There is a steam boiler system installed in the mechanical room. The steam boiler is a Fulton Edge boiler. The steam boiler provides steam for the Kitchen dishwasher and steam cooking kettles. The steam boiler appears to be in good condition.


*Steam Boiler*

***CTC Heating Plant:***

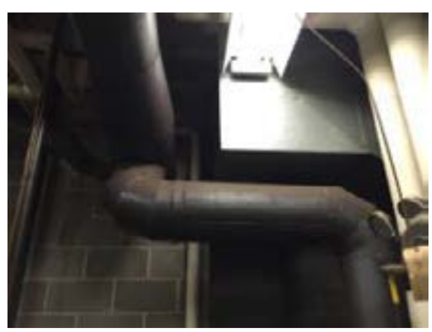
The CTC building is primarily heated by a gas fired hot water boiler plant. There are two gas-fired cast iron sectional hot water boilers located in the boiler room. The boilers were manufactured by Cleaver Brooks. One boiler is equipped with a S.T. Johnson Co, burner and the other boiler has a Cleaver Brooks burner. The boiler equipped with Johnson burner has an input capacity of 2,520 MBH. The boiler equipped with a Cleaver Brooks Burner (Model I-506 Series 200, Serial No. CI-1296) has a capacity of 2,237 MBH gas input and 1,786 MBH output (I=B=R). The boilers were installed circa 1988 and are approximately 26 years old and nearing the end of their useful service life. The boilers appear to be in fair physical condition. One boiler has recently had a damaged control board replaced.

*Existing Boiler (Johnson Burner)*

*Existing Boiler (CB Burner)*

The boilers are vented by a common steel breeching system that terminates through the roof to the outdoors. The steel breeching is uninsulated, and the exterior breeching shows visible signs of rust and corrosion.

*Exterior Boiler Breeching Stack*



*Interior Boiler Breeching*

*Combustion Air Louver*

Hot water is distributed from the Boilers to terminal heating equipment located throughout the building by six (6) inline zone circulator pumps. The pumps appear to have been installed in 1988. In general, the pumps appear to range from fair to poor physical condition. Much of the adjacent piping insulation is damaged. There is a hot water expansion tank which appears to be in good condition.

*Existing Hot Water Pumps*

*Existing Expansion Tank (back)*

In general, the majority of the piping distribution system and associated valving located in the CTC building appears to be have been installed circa 1988. In general, the hot water piping appears to be in fair condition. The condition of piping insulation appears to range from fair to poor condition.

***Automatic Temperature Controls:***

The building HVAC automatic temperature control system is a combination pneumatic and direct digital control (DDC) system. The DDC system appears to be an older generation DDC system that was manufactured by Powers/Landis&Gyr. The DDC system was updated in recent years with Siemens DDC controls and front end workstation.

There is a pneumatic air compressor, equipped with air dryer system, located in the each of the Boiler rooms.

*Existing CTC Building ATC System Pneumatic Compressor and Control Panel*

*Existing CTC Building ATC DDC Control Panel*

*Existing High School Boiler Room ATC DDC Control Panel*

***Ventilation Systems:***

The High School and CTC areas of the building are mechanically ventilated by a combination of indoor air handling units, rooftop units and unit ventilator and fan coil units with outdoor air connections.

The majority of High School classrooms located on exterior walls are not ventilated by mechanical ventilation systems. These Classrooms are ventilated by natural ventilation through the use of operable windows.

Ventilation air is exhausted from the majority of areas of the building by a combination of inline, propeller and roof mounted exhaust air fans. The majority of exhaust fans appear to be originally installed equipment, however some exhaust fans have been replaced within recent years.

*Exhaust Air Fan*

*Unit Ventilator Intake Louver*

*Roof Intake and Exhaust Air Hoods and Fans*

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***Air Conditioning Systems:***

The majority of the building is not air conditioned. Some areas of the building are air conditioned by window AC units, split-system and ductless cooling type air conditioning systems. There are several roof mounted and grade mounted air-cooled condensing (ACC) units that are connected to ductless split system AC units located throughout the building. The Administration area, Copy room, Computer Classroom and Main Server room are air conditioned by split system AC units. The teacher Dining Room, Custodian's office and various Classrooms are air conditioned by Window AC units. In general the majority of these units appear to have been installed within the past 5-10 years and in fair to good physical condition. There was one older condensing unit observed that appeared to be of an older vintage and in need of replacement.

*CTC Dining Room Ceiling Ductless AC Unit (typical of 2)*

*Window AC Units*

*Grade Mounted Air cooled Condensing Units*

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*Ductless Cooling Unit – Operations Office*

*Ductless Cooling Unit – IT Server and Office*


*Administration Area ACC Unit*

*Ductless AC Unit ACC Units*

*Roof ACC Unit*

*Roof ACC Unit*

***Library/Media Center:***

The Library/Media Center is heated and ventilated by indoor ceiling suspended heating and ventilation unit ventilators. The units were installed circa 1966, and are approximately 48 years old and past their expected service life. The Library/Media Center is also heated by supplemental fin tube radiation that is located along the perimeter exterior walls.

*Library Heating & Ventilation Unit*

***Auditorium:***

The Auditorium is heated and ventilated by two indoor air-handling units (AHU-8 & 9) that deliver supply air to the space via a galvanized sheetmetal distribution system and ceiling mounted diffusers. Return air is primarily removed from the space by return registers located under the stage. The air handling units and ductwork distribution system was installed circa 1966, and is approximately 48 years old and past its expected service life. The Lecture Hall rooms are heated and ventilated by an indoor air-handling unit (AHU-10) that delivers supply air to the space via a galvanized sheetmetal distribution system and ceiling mounted diffusers. There are return air grilles located in each of the stair risers in the adjacent Lecture Hall rooms.

*Auditorium - Ceiling Supply Diffusers*

*Auditorium - Return Register*

***Music Classrooms:***

The Music classrooms are heated and ventilated by horizontal type classroom unit ventilators, and are exhausted by exhaust air fan systems. The unit ventilators and ductwork distribution systems appear to be originally installed equipment, installed circa 1966, and past their expected service life. Some Music classrooms also have supplemental hot water fin tube radiation installed; the fin tube radiation also appear to be originally installed equipment.

*Music Classroom – Unit Ventilator*

*Music Classroom – Fin tube Radiation*

***Cafeteria:***

The Cafeteria is heated and ventilated by an indoor hot water air-handling unit (AHU-6) that delivers supply air to the space via a galvanized sheetmetal distribution system and ceiling mounted diffusers. Return air is primarily removed from the space by low wall return registers. The air handling unit and ductwork distribution system was installed circa 1966, and is approximately 48 years old and past its expected service life.

*Cafeteria – Ceiling Diffusers*

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***<u>High School Kitchen:</u>***

The Kitchen has a stainless steel exhaust hood that is exhausted by a centrifugal utility set exhaust fan located in the Penthouse Mechanical room. The kitchen exhaust ductwork riser does not appear to meet all current NFPA 96 code requirements as the riser is not located in a 2-hr fire rated enclosure. The Kitchen is heated by supplemental hot water unit heaters and supply air registers that are connected to a make-up heating and ventilation air-handling unit (AHU-7). There is a wall mounted propeller fan that is utilized to provide airflow movement within the space. The dishwasher is exhausted by stainless steel ductwork that is connected to an exhaust air fan. The Kitchen service corridor is heated by a unit heater.

*Supply Diffusers (left) and Prop Fan (right)*

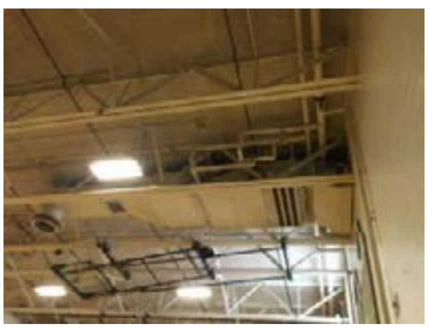
*Dishwasher Exhaust Ductwork*

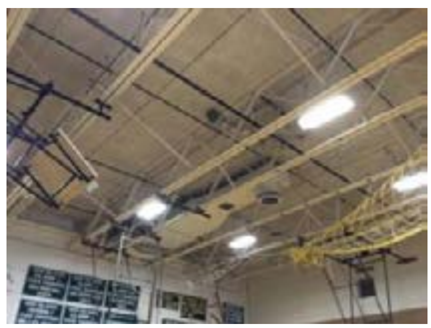
*Kitchen – Unit Heater*

*Kitchen Exhaust Duct Riser in Storage Closet*

***Gymnasium:***

The Gymnasium is heated and ventilated by four (4) indoor, ceiling suspended, hot water heating and ventilation units (AHU-1, 2, 3 & 4). The units appear to have been installed circa 1966 and are in poor physical condition and have exceeded their expected service life. Exhaust air is removed from the gymnasium via ceiling exhaust grilles that are connected to roof exhaust fans. There are (4) four roof exhaust fans.





*Gym Heating & Ventilation Units*

*Gym Exhaust Grille*

***Fitness Room:***

The Fitness Room is heated by a ceiling suspended hot water unit ventilator. It appears that the unit ventilator is originally installed equipment circa 1966. The heating and ventilation system appears to be in poor condition and past its expected service life.


*Fitness Room Unit Ventilator*

***Locker and Team Rooms:***

The Locker Rooms are heated by a combination of suspended hot water unit ventilators and hot water fin tube radiation heating equipment. The Girls locker room has a ducted exhaust air system that is served by two (2) inline exhaust air fans. The Boy's Locker room is exhaust by rooftop exhaust air fans. It appears that the heating and ventilation system appears to be originally installed equipment, in poor physical condition and past its expected service life. Sections of the fin tube radiation and several of the air distribution devices appear to be rusted and soiled.

The majority of the make-up ventilation air for the Boys and Girls Locker Rooms are provided from the adjacent Gymnasium instead of being provided directly from the outdoors. Therefore it does not appear that the original design would be fully code compliant per today's mechanical code's ventilation air requirements.

*Locker Room Unit Ventilator*

*Locker Room Fin tube Radiation*

The Team Rooms are heated by a combination of an indoor hot water air handling unit (AHU-5) and hot water fin tube radiation heating equipment. The heating and ventilation system appears to be originally installed equipment, in poor physical condition and past its expected service life. Sections of the fin tube radiation and several of the air distribution devices appear to be rusted and soiled. The Team rooms are exhausted by roof mounted exhaust air fans.

There are approximately five (5) exhaust fans serving the Boys locker room and Team rooms. Three (3) of the exhaust air fans have been replaced within the recent years.

***Administration:***

The Administration offices are heated primarily by wall mounted fin tube radiation. The Main Administration area is air conditioned and ventilated by a ceiling suspended indoor split AC unit that is located in the kitchenette area. The fin tube radiation appears to be originally installed equipment. It is our understanding that the AC system and associated ductwork was installed approximately 7-8 years ago.

*Administration Air Handling Unit*

*Administration Office – Fin tube Radiation Heating*

The Operations office is air conditioned by a ductless AC unit.

*Administration Ductless AC Unit*

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***Classrooms:***

The majority of interior classrooms are heated and ventilated by horizontal type classroom unit ventilators. The exterior classrooms are typically heated by hot water fin tube radiation and ventilated through the use of operable windows. Roof mounted exhaust air fans and associated exhaust ductwork distribution systems provide exhaust air for the majority of classrooms. The unit ventilators, exhaust fans and ductwork distribution systems appear to be originally installed equipment, installed circa 1966, and past their expected service life.

*Classroom – Fin tube Radiation*

*Classroom –Exhaust Grille*

***Science Classrooms:***

*Science Classroom Fume Hoods*

*Science Classroom Sidewall Exhaust Fan*

Some of the Science Classrooms have fume hoods and associated exhaust air fan systems. Some of the Science classrooms also have a sidewall exhaust air fan. It has been reported that the fume hood operation interferes with the heating and ventilations system's ability to properly heat the space, as warm air is exhausted through the fume hood and sidewall exhaust air fan while they are in operation. Tempered mechanical make-up air ventilation should be provided in these Classrooms.

***Classrooms – Addition Building:***

The World Language Arts Classrooms are heated and ventilated by hot water fan coil units which are located above the ceilings in the corridor. There are four (4) fan coil units that serve eight (8) classrooms and asscoaiated teacher offices. The fan coil units were installed circa 2003. Therefore the units are approximayely 12 years old. The fan coil units are ducted to supply air and return air distribution devices.

The adjacent stairwell and entry way are heated by hot water cabinet unit heaters.

The HVAC systems in the addition area of the building appear to be in fair condition.

***CTC Kitchen and Dining:***

The CTC Kitchen has a main stainless steel kitchen exhaust hood and associated roof mounted exhaust air fan. There is also a stainless steel canopy dishwasher hood. There are hot water ceiling suspended unit heaters that provide heating to the kitchen. Make up air ventilation is provided by a roof top make-up air unit. The exhaust, make-up air and heating systems appears to have been installed circa 1989 and appear to be in fair to poor condition.

*Kitchen Exhaust Hood*

*Dishwasher Exhaust Hood*

The CTC Dining room is heated and air conditioned by a ductless AC split system heat pump system. There is also perimeter hot water fin tube radiation heating. It has been reported that the heat pump AC system and hot water fin tube radiation heating operate simultaneously at certain times of the year, resulting in both excess energy usage and temperature control complaints. The ductless cassette type AC heat pump system has its own stand-alone thermostat controls which are not fully integrated into the building control system.

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*CTC Dining Room - Cassette Type AC Unit (left)*

*CTC Dining - Thermostats*

***CTC Auto Shop:***

The Auto Shop is primarily heated and ventilated by a central indoor air handling unit and duct mounted hot water heating coils. Supplemental heating is provided by hot water unit heaters. There are general exhaust air, welding booth and under-slab exhaust air systems installed. The air handling unit, unit heaters, general exhaust and under slab exhaust were installed circa 1989 and are generally in poor physical condition. The welding booth exhaust and ventilation ductwork appear to be in fair condition.

*Auto Shop Unit Heater*

*Auto Shop Under Slab Exhaust*

*Auto Shop Welding Exhaust System*

***CTC Auto Body Shop***

The Auto Body Shop is primarily heated and ventilated by a central indoor air handling unit and duct mounted hot water heating coils. Supplemental heating is provided by hot water unit heaters. There are general exhaust air, and paint booth exhaust welding booth systems installed. The air handling unit, unit heaters and general exhaust systems were installed circa 1989 and are generally in poor physical condition. The paint booth make-up ventilation air is provided from a rooftop unit and exhaust air is provided by an associated exhaust fan. The paint booth appears to be in fair condition.

*Paint Booth*

*Paint Booth Ductwork and Unit Heater*

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***CTC Trades Shop***

The Trades Shop is primarily heated and ventilated by a central indoor air-handling unit and duct mounted hot water heating coils, and supplemental heating is provided by ceiling suspended propeller type unit heaters. The unit heaters appear to be in good condition. There is a re-circulating filtered type dust collector installed. The dust collector appears to be in good condition.

*Unit Heaters*

*Dust Collector*

***CTC Wood Shop***

The Wood Shop is primarily heated and ventilated by a hot water unit ventilator, and supplemental ventilation air is provided by a central station air handling unit. There is an outdoor grade mounted dust collector installed that is ducted to wood-working saws and equipment via galvanized sheetmetal ductwork. The unit ventilator, dust collector and associated ductwork appears to be in poor condition.

*Wood Shop - Ventilation Ductwork*

*Wood Shop - Dust Collector*

*Wood Shop Unit Ventilator*

*Wood Shop Dust Collector Exhaust Ductwork*

***CTC CADD ClassRoom/Shop***

The CADD Classroom and Shop is primarily heated and ventilated by a central indoor air handling unit and duct mounted hot water heating coils. There are general exhaust air and hose-reel exhaust air systems installed. The air handling unit, general exhaust fan and hose-reel exhaust systems were installed circa 1989 and are generally in poor physical condition. The exhaust and ventilation ductwork appear to be in fair condition.

*CADD Shop Heating Coil and Ventilation Ductwork*

*Hose-Reel Exhaust*

***IT Server Room and Office:***

The IT Server and Office room is air conditioned by a ductless AC unit. It was reported that the room is consistently warm and experiences inadequate airflow and temperature control.

*IT Room - Ductless AC Unit*

***Entryways, Stairwells, and Corridors:***

Entryways, stairwells, and corridors are typically heated by cabinet unit heaters. There are also locations where hot water fin tube radiation is installed. In general, the heating equipment is originally installed equipment, approximately 25 to 48 years old dependent upon its location and date of installation.

*Existing Cabinet Unit Heater*

*Existing Cabinet Unit Heater*

*Existing Cabinet Unit Heater – World Arts Wing*

***Restrooms:***

The majority of restrooms are exhausted by via a galvanized sheetmetal distribution system, typically through sidewall exhaust air grilles to roof mounted exhaust air fans. The exhaust air systems appear to be originally installed systems, circa 1989 or 1966, dependent upon location. The majority of restroom exhaust air systems have exceeded their expected service life.

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Dover, NH
Electrical Existing Conditions Systems Report
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**ELECTRICAL**

***Executive Summary***

In general, the electrical systems have reached their life expectancy and are in poor condition with the exception of the world language addition. Life safety lighting and exit signs are battery type and not served from a backup generator. The electrical service was replaced during last addition but is not sufficient in size for present standards.

The fire alarm system is in fair condition and will require replacement due to voice evacuation requirements of present code.

Lighting systems in general have been upgraded with lamps and ballasts to conserve energy. T8 lamps have been installed in most spaces. Light fixtures however are in poor/fair condition in the majority of the building. The fixtures are original to respective addition construction period in most locations and should be upgraded.

The power for the facility is in poor/fair condition, a new power distribution system should be provided at 277/480 volt distribution.

The communications system wiring infrastructure for tel/data has been upgraded to accommodate desired use. A classroom intercom/paging system head end has been upgraded but is not up to present standards. The central clock system is not operational. There is a dedicated headend room and remote IDF closets with a fiber optic back bone that is in fair condition but lacks physical space.

***Electrical Distribution System***

The service voltage is 120/208V rated at 2000 amps. The switch is in fair condition and within its 40 year useful life. The main switchboard does not have space for future expansion. The main switchboard is manufactured by Square D.


The parking lot lighting has a step up transformer for 480 volt branch circuits.

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There is a dedicated utility company pad mounted transformer for the facility. The service is underground from the transformer to main electrical room. The service was upgraded as part of last addition.

A motor control center is present in gym to serve backstop motors.

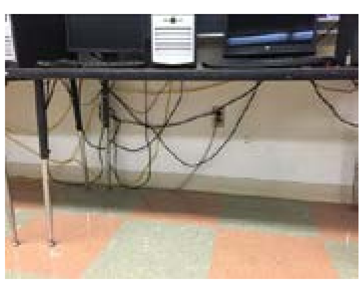
There are sub-panels located throughout the facility and they are generally in closets and are circuit breaker type and are in poor condition where original. Panels have been with each addition and are in fair condition.

Motor starter panels are used for Roof exhaust fans.

***Branch Circuits/Wiring Devices***

This quantity of receptacles appears minimal in most spaces. Additional receptacles for computers have been added in classrooms typically done using surface wiremold.

Kitchen and Science Lab receptacles are not on GFCI circuits to meet present code. Science labs do not have EPO's installed.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***Interior Lighting System***

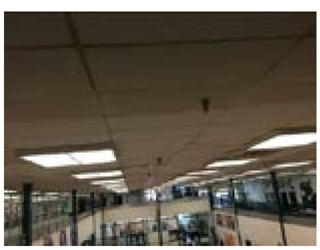
Lighting in corridor varies but is generally surface 1'x4' acrylic fluorescent fixtures.

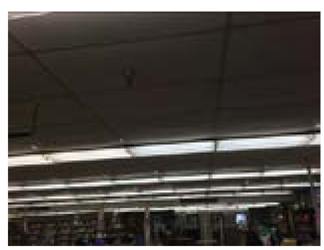
Classroom lighting typically consists of surface 1'x4' acrylic fluorescent fixtures. The lighting system should be upgraded in all classrooms. The fixtures are controlled by manual wall switches.

Lighting in shop/mechanical spaces consists of fluorescent industrial fixtures. Woodshop has vapor tight fixtures present.

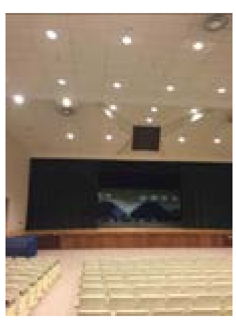
Cafeteria lighting consists of surface fluorescent fixtures forming a 4'x4' square.

Kitchen lighting consists of 2'x4' recessed fluorescent fixtures. The fixtures have lenses and are in fair condition.





Lighting in auditorium is recessed fluorescent downlighting. The fixtures replaced original incandescent fixtures.



Site lighting consists of pole fixtures with period type heads and are in poor condition.

Theatrical spot lights are in good condition. The system dimming rack has been updated within the last ten years or so. The dimming rack is manufactured by EDI and has 54 dimmers.

Gym lighting consists of high bay fluorescent fixtures. The fixtures were replaced approximately within the last ten years. The fixtures are equipped with T5 lamps.

Media center lighting typically consists of surface fluorescent wraparound fixtures similar to classroom.

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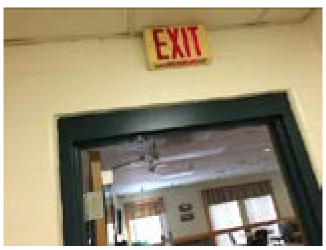
***Emergency Lighting System***

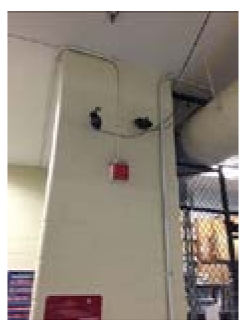
The existing emergency lighting and exit signs are battery type. There is an inverter present for the original building. The system is in poor condition and should be replaced with an emergency generator for backup power.

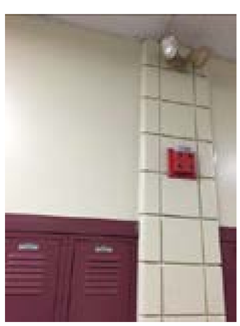



Emergency lighting is normally "off". There were no area protection relays observed.

***Fire Alarm System***

The fire alarm panel is manufactured by EST. The system is an addressable type. The fire alarm notification alarms are not code compliant in accordance with present code. There are door holders in corridors as required by code. The world language addition has strobes in the classrooms.





There is smoke detection in Corridors.

The fire alarm annunciator is located in the main entrance.

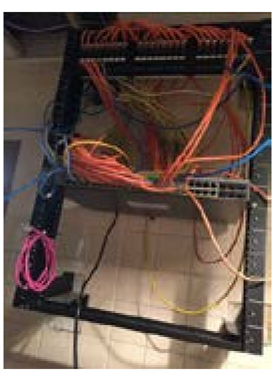
***<u>Data/Telephone/Classroom Intercom/Clock System/Security System</u>***

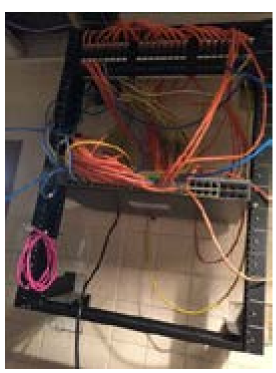
The master clock system is operational but beyond its life expectancy. Classroom clocks have been replaced with battery type where system clocks have failed.

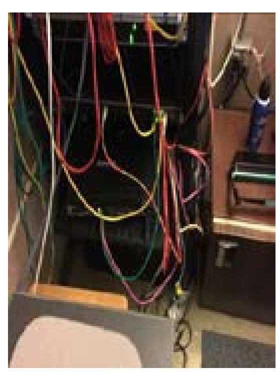
There are smartboards present in each classroom. There is a classroom amplification system manufactured by Light-speed Model Redcat.

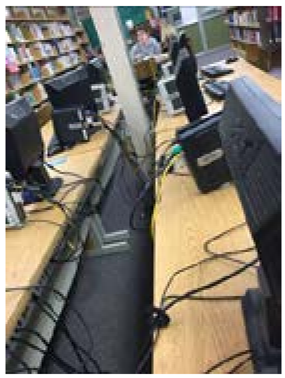

There is a local sound system in Auditorium.

In the classrooms there are two data drops for teacher computers. All data wiring is CAT 5. The voice/data infrastructure should be updated to present standards. The CAT 5 is installed in Wiremold. The location of data outlets appears fine.









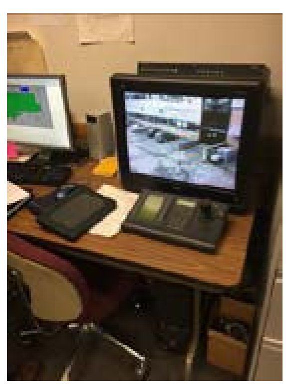
There are dedicated data closets. There is a wall mounted patch panel in one classroom.

There is a Netgear wireless data network presently being installed throughout the facility. Netgear switches are installed with gigabit backbone and POE.

The classroom intercom system is manufactured Bogan. A Multicom 2000 headend has replaced the original Dukane intercom system.

There are paging speakers throughout the facility connected through the Bogen intercom system.

A closed circuit TV system is present.  The coverage in the building covers corridors and entrance locations. Exterior perimeter has building dome camera. The cameras are analog type. Exterior camera DVR is manufactured by Bosch.



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**PLUMBING**

***Executive Summary:***

Presently, the Plumbing Systems serving the building are cold water, hot water, sanitary, waste and vent system, special waste and vent system, storm drain system, and natural gas. Municipal sewer and municipal water service the Building. The majority of the plumbing systems are original to the building and its additions. Portions of the system have been updated as part of building renovation and upgrade projects.

The plumbing fixtures are generally in fair condition. The plumbing fixtures in the 2003 building are in good condition. In general, the fixtures in the original and 1987 building appear to have served their useful life. Current Access Code requires accessible fixtures wherever plumbing is provided. In terms of the water conservation fixtures, their use is governed by the provisions of the Plumbing and Building Code. Essentially, the code does not require these fixtures to be upgraded, but where new fixtures are installed, as may be required by other codes or concerns, the new fixtures need to be water conserving type fixtures. All new fixtures are recommended in the original and 1987 building.

Cast iron is used for sanitary and storm drainage. Rainwater from flat roof areas is collected by interior rain leaders which appear to discharge to a below grade drainage system. Where visible, the cast iron pipe appears to be in fair condition. Smaller pipe sizes appear to be copper or PVC. In general, the drainage piping can be reused where adequately sized for the intended new use.

***Fixtures:***

The water closets are predominately floor mounted vitreous china with manually operated flush valves.

Urinals are pedestal type, vitreous china with manually operated flush valves.

Lavatories are generally wall hung vitreous china. The lavatories have a variety of faucet types with hot and cold water supplies.

Drinking fountains consist of either wall mounted stainless steel and vitreous china single bowl fountains.

Electric water coolers are wall hung, non accessible.

Janitor's sink are generally trap standard mounted, enameled cast iron sinks. Faucets are typically not equipped with vacuum breakers.

Science classroom sinks are resin type with deck mounted faucets. Faucets are not equipped with vacuum breakers. Classrooms contain an antiquated emergency shower fixture fed by the cold water system only. Sinks are not piped to an acid neutralization system.

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Shop/Tech labs have a wash fountain fixture.

Shop/Tech labs contain either a combination emergency shower/eye wash or just an eyewash fixture. The emergency fixtures are fed by cold water system only; water is not tepid.

The main Kitchen area and Culinary Arts Kitchen fixtures are in fair to good condition. The pot washing sinks are fitted with grease interceptors.

*Typical bathroom fixtures*

*Stainless steel drinking fountain*

*China drinking fountain*

*Electric water cooler*

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*Service sink*


*Shop sink*


*Emergency fixture*

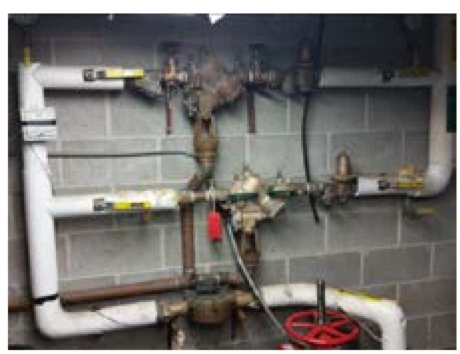
***Water Systems:***

The building has two separate domestic water services, one in the original building and one in the 1987 building addition.

In the original building there is a dedicated 4" domestic water service which enters the mechanical room. There is a 4" domestic water meter and two 2" reduced pressure backflow preventers with pressure reducing valves located in parallel. There is also two 1-1/2" pressure reducing valves piped in parallel configuration. The distribution main is 4" in size.

In the 1987 building there is a combined 8" water service which enters the lower level mechanical room. Off of this service there is a 2-1/2" domestic water supply with 2" water meter and two 1-1/2" reduced pressure backflow preventers with 1-1/2" pressure reducing valves located in parallel. The outlet water pressure is 70 PSI.


*Original building water service & meter*


*1987 Building water meter*

Piping, where exposed, appears to be copper with sweat joints.

Domestic hot water in original building is generated through three natural gas fired storage type water heaters. Water heaters are PVI model 750N-400A, with a natural gas input of 600,000 BTUH and 400 gallon storage capacity. The water heaters are in fair condition. The hot water systems are recirculated. There are two thermostatic mixing valves on the systems to prevent scalding, Lawler model 805 and Lawler model 802.

Domestic hot water in 1987 building is generated through a gas fired storage type water heater. Water heater are PVI model 375P-225, with a natural gas input of 300,000 BTUH and 225 gallon storage capacity. The water heater is in fair condition. The hot water system is recirculated. There are two thermostatic mixing valves on the systems to prevent scalding, both are Symmons model 5-900.

*Original building water heaters*


*1987 water heater*

***Gas:***

The building has two gas services; one at the original building and on at the 1987 building.

The gas service at the 1987 Building is elevated pressure and it supplies the heating boilers, domestic water heater, and the Culinary Arts kitchen cooking equipment. Culinary Arts kitchen supply is equipped with an automatic shutoff valve. Hood contains a fire suppression system.

The gas service at the original Building is elevated pressure and it supplies the heating boilers, domestic water heater, Science classroom, and the main kitchen cooking equipment. The main kitchen supply is equipped with an automatic shutoff valve. Hood contains a fire suppression system.

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Gas piping is black steel with a combination of screwed and welded joints and fittings depending on the time of installation.

Science Classrooms are equipped with a master emergency shutoff valve located in the teacher's bench.

*Original building gas service & meter*

*1987 building gas service & meter*

*Original building gas piping*


*1987 building gas piping*

*Science room gas valve*

***Drainage Systems:***

Cast iron is used for sanitary and storm drainage. Where visible, the cast iron pipe appears to be in fair condition. Smaller pipe sizes appear to be copper or PVC.

Tech shops are equipped with trench drains. There is no evidence that trench drains are piped through an oil/sand separator.

In general, the cast iron drainage piping can be reused even in a major renovation where adequately sized for the intended new use.

Acid waste and vent piping is hub and spigot dur-iron. The systems is not piped to an acid neutralization system

*Cast iron drainage piping*

*Science waste piping*

***Compressed Air System:***

The technical shops are provided with compressed air. There are various pipe drops in each shop supplied from the piping distribution system. Typical outlets include a filter and pressure regulator.

The compressed air is provided by a single 15 h.p. motor located on a horizontal receiver. Compressor is located in the 1987 Building mechanical room. The air compressor is in good condition.

*Air compressor*

*Typical air outlet station*

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**FIRE PROTECTION**

***Executive Summary***

The building is protected by automatic sprinkler systems. The building is served by two separate fire water services. There is one service located in the original 1967 Building which supplies the original building and the 2003 building addition. The other service is located in the 1989 Building mechanical room and supplies the 1989 building addition. The majority of the equipment and systems installed appear to have been well maintained and are generally in fair to good condition.

***1967 Building***

There is dedicated 6" fire water service which enters the lower level storage room adjacent to the mechanical room. There is a 4" double check valve assembly (Febco Model 805) with a 4" wet alarm valve and fire distribution main.

Fire service is controlled by an exterior Post Indicating Valve.

Fire department connection is a 4" x 2-1/2" x 2-1/2" Siamese.

Piping is black steel with coupling or threaded fittings, depending on pipe size.

All shutoff valves are monitored by the fire alarm system.

Sprinkler heads in general are standard response type heads. Pendent type in ceiling areas and upright type in non-ceiling areas.

Standpipes are not provided in the Stage.

Incoming water pressure is in excess of 100 PSI.

*Fire service riser*


*Double check valve assembly*

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*Post Indicating valve*


*Siamese Fire Department connection*


*Typical pendent sprinkler*

***1989 Building***

There is a combined 8" water service which enters the lower level mechanical room. Off of this service there is a 6" double check valve assembly (Febco Model 805). There is a 6" wet alarm valve and fire distribution main.

Fire service is controlled by an exterior Post Indicating Valve.

Fire department connection is a 4" x 2-1/2" x 2-1/2" Siamese.

Piping is black steel with coupling or threaded fittings, depending on pipe size.

All shutoff valves are monitored by the fire alarm system.

Sprinkler heads in general are standard response type heads. Pendent type in ceiling areas and upright type in non-ceiling areas.

Incoming water pressure is in excess of 100 PSI.


*Combined water service - FP riser*


*Siamese Fire Department connection*

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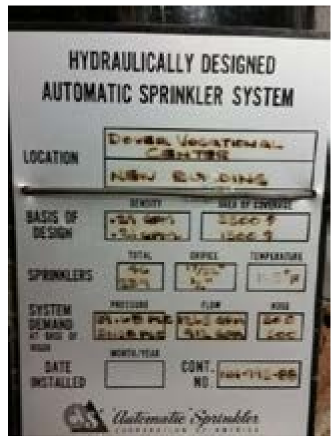
*Post indicating valve*




*Hydraulic data card*

# Appendix C

## Civil Existing Conditions Report

Engineering a Sustainable Future

# MEMORANDUM

| | |
|---|---|
| **To:** | HMFH Architects, Inc. |
| **From:** | Nobis Engineering, Inc. |
| **Subject:** | Dover High School and Regional Career Technical Center - Site Assessment Report |
| **Date:** | January 13, 2015 |

## SITE ASSESSMENT

On December 4 and December 30, 2014, Nobis Engineering, Inc. performed visual site assessments of the 44 acre Dover High School & Regional Career Technical Center campus at 25 Alumni Drive.

The site assessment conducted by Nobis was limited to visually inspecting the condition of surficial site features. The inspection included, but was not limited to, pavement, driveways, parking spaces, curb, sidewalks, landscaping, and building access and accessibility. Once an ALTA survey is completed Nobis can make additional assessments on grading and subsurface features including utilities and drainage. Detailed below are the findings and recommendations of the site assessment.

### Executive Summary

In general, the existing bituminous asphalt pavement, curbing, and walkways/sidewalks are in poor condition and have reached or surpassed their life expectancy. The asphalt surfaces appear to have been overlain several times and as a result the asphalt surface is severely cracked from underlying deficiencies. The exception to this assessment is the site conditions of the Dover Alternate Program at 50 Alumni Drive. The conditions of the asphalt at the Dover Alternate Program are in good condition.

The condition of the landscaping appears to well established and healthy. The existence of an irrigation system could not be determined from visual inspection.

Building access and accessibility is generally not in conformance with current American with Disabilities Act (ADA) design standards. The non-conformance includes but is not limited to total number of accessible parking spaces in each parking lot, signage, and access aisle striping and accessibility.

The existence of the utilities servicing the building/campus were observed including municipal water and sewer, natural gas, electrical power, site lighting, and a closed drainage system. The condition of the services cannot be noted from visual inspection however the structures



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appeared to be in good condition (manhole covers, hydrants, valves, meters, etc.). The majority of the drainage runoff from the impervious surfaces on-site appears to sheet flow to a closed drainage system. The closed drainage system is believed to discharge to the seasonal brook east of the campus and the seasonal brook south of the Senior Lot. DHS also has a foundation drain and roof drains that tie into the closed drainage system.

**Pavement/Driveway Assessment**

Upon inspection of the campus parking lots and driveways Nobis noted the following:

**A Lot & Bus Drop-off**

- Upon visual inspection the condition of the existing pavement is generally less than satisfactory. Numerous cracks (longitudinal, traverse, alligator) were observed in both the bus-drop off loop and the A Lot. Few of the cracks observed in the pavement have been sealed using asphalt crack sealant while the majority of the cracks have been left untreated.
- Some patch work and pavement overlays have been done over the years presumably to address the worst sections of pavement.
- Some raveling and aging (pavement surface deterioration/loss of aggregate) of the pavement is evident throughout but is the worst in the visitor parking spaces.
- The pavement overlays at the entrance and exit from Alumni Drive are in good condition.

**B Lot**

- Upon visual inspection the condition of the existing pavement is generally poor. Numerous cracks (longitudinal, traverse, alligator) were observed in both the B lot and the portion of the lot associated with the 2002 addition. Few of the cracks observed in the pavement have been sealed using asphalt crack sealant while the majority of the cracks have been left untreated.
- Some patch work and pavement overlays have been done over the years presumably to address the worst sections of pavement.
- Some raveling and aging (pavement surface deterioration/loss of aggregate) of the pavement is evident throughout.

- The pavement overlay at the entrance and exit from Alumni Drive is in good condition.
- The entrance and exit from Alumni Drive to the parking spaces associated with the 2002 addition is in less than satisfactory condition.

**C Lot**

- Upon visual inspection the condition of the existing pavement is generally very poor. Numerous cracks (longitudinal, traverse, alligator) were observed in the C lot. Few of the cracks observed in the pavement have been sealed using asphalt crack sealant while the majority of the cracks have been left untreated.
- Some patch work and pavement overlays have been done over the years presumably to address the worst sections of pavement.
- Serious raveling and aging (pavement surface deterioration/loss of aggregate) of the pavement is evident throughout sections of the C lot. This likely results in surface ponding during/following rain events.
- The entrance and exit from Alumni Drive to the parking spaces associated with the 2002 addition is in less than satisfactory condition.

**Senior Lot**

- Upon visual inspection the condition of the existing pavement is generally in satisfactory to less than satisfactory condition. Longitudinal and traverse cracking is low to medium in severity while alligator cracking is minimal. None of the cracks observed in the pavement have been sealed using asphalt crack sealant.
- Raveling and aging (pavement surface deterioration/loss of aggregate) of the pavement is not evident.

**Dover Alternate Program Parking Lot (50 Alumni Drive)**

- Upon visual inspection the condition of the existing pavement is generally in good condition.
- No cracking, raveling and aging (pavement surface deterioration/loss of aggregate) of the pavement is evident.
- A couple of minor puddles were observed in the parking lot.

**Pavement East of 1989 CTC Addition (Including the access road from Alumni Drive)**

- Upon visual inspection the condition of the existing pavement is generally satisfactory to less than satisfactory. Numerous cracks (longitudinal, traverse, alligator) were observed in the pavement. None of the cracks observed in the pavement have been sealed using asphalt crack sealant.

- There is minor raveling and aging (pavement surface deterioration/loss of aggregate) of the pavement evident throughout the area.
- The pavement overlay at the entrance and exit from Alumni Drive is in good condition.

**Curb Assessment**

Upon inspection of the campus parking lots and driveways Nobis observed multiple types of curbing. Refer below for Nobis' findings at locations around the campus:

**A Lot & Bus Drop-off**

- The A Lot and Bus Drop-off driveway are surrounded by bituminous concrete curb (BCC) except along the face of the concrete sidewalk entering the main entrance to the building.
- Based on visual inspection most of the BCC is nearing the end of its life cycle however it still appears to be functioning as designed. The BCC is cracked into several small 1 to 2 foot sections and is deformed in areas. BCC is a cost-effective curb, however, the harsh New England winters and snow plows shorten its useful life.
- The height of BCC is generally desired to be about 4-5 inches above finished grade. Nobis observed sections of BCC less than 3 inches (likely due to pavement overlays over the years).
- Recommend replacing BCC with vertical granite curb (VGC) along sidewalk for pedestrian safety.

**B Lot**

- No curb

**C Lot**

- No curb

**Senior Lot**

- No curb except around the landscape island abutting Alumni Drive. The landscape island has BCC along both sides of the island and VGC around the radial ends.
- The condition of the VGC is satisfactory while the condition of the BCC is nearing the end of its useful life. The BCC is cracked into several small 1 to 2 foot sections but has not begun to lose its alignment.

**Dover Alternate Program Parking Lot (50 Alumni Drive)**

- No curb except around the southeast corner of the building.  The curb around the edge of the parking lot surrounding the southeast corner of the building is sloped granite curb (SGC).  The SGC is in satisfactory condition.

**Pavement East of 1989 CTC Addition (East Side of DHS)**

- SGC around portions of the asphalt perimeter along the east side of the CTC building. The SGC is in satisfactory condition.

**Sidewalk/Walkway Assessment**

Upon inspection of the campus sidewalks and walkways Nobis noted the following:

**Observations**

- The concrete sidewalk along the main entrance at the front of the school is in satisfactory condition.  There is some cracking along the sidewalk and minimal chipping. The concrete steps to the main entrance have some chipped concrete at the edges.
- The asphalt sidewalk that loops from Alumni Drive along the front of the school is in less than satisfactory condition.  Numerous cracks (longitudinal, traverse) were observed along the sidewalk.  Some of the cracks have been treated with asphalt crack sealant

but the majority of the cracks have been left untreated. Appeared that the sidewalk has been overlain in the past.

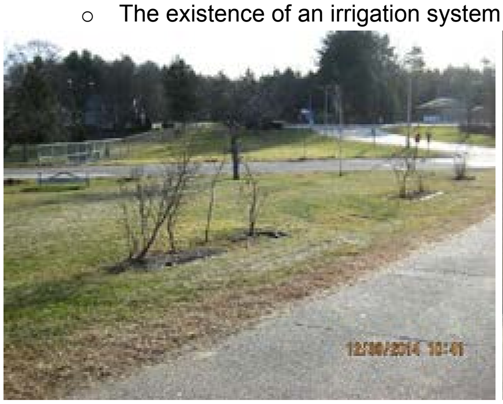
- The sidewalk along the edge of Alumni Drive is in poor condition. Numerous cracks (longitudinal, traverse, alligator) were observed in the asphalt. Raveling and aging (pavement surface deterioration/loss of aggregate) of the asphalt was also observed, most notably at the sidewalk edges. Appeared that the sidewalk has been overlain in the past.
- The walkways to the building at 50 Alumni Drive are in good condition.
- The walkway from the B Lot to the ball fields was in good condition.
- The walkway from the B Lot to the doors at the front of the 2002 addition (Door #3 & Door #4) are in good condition.
- The concrete sidewalk leading to Door 28 at the east side of the CTC building is in poor condition. The concrete has deteriorated next to the accessible parking space.




**Landscaping Assessment**

Upon inspection of the campus landscaping Nobis noted the following:

- **Observations**
  - Landscape inspection included the inspection of the trees and shrubs around the perimeter of the buildings and parking lots. The inspection did not include the landscaping and vegetation of the ball fields.
  - The trees and shrubs planted around the buildings and parking lots appeared to be well established and healthy.
  - The majority of the planted tree and shrubs are along the front face of the buildings and along the western edge of the driveway from Alumni Drive heading towards the C lot and middle school.
  - Visible inspection of the grass appeared to be well established throughout the campus.
  - The existence of an irrigation system could not be determined during the inspection.



**Building Access and Accessibility Assessment**

Upon inspection of the campus building access and accessibility Nobis noted the following:

**A Lot & Bus Drop-off**

- Upon visual inspection there are two accessible parking spaces in the A lot and one accessible ramp into the main entrance of the building. There are approximately 87 parking spaces in the A Lot. According to state and federal ADA design standards there should be a minimum of 4 accessible parking spaces. In addition to having less than the minimum number of accessible spaces required, the access aisle striping and parking space signage are out of compliance. Also the head of the accessible aisles does not lead to an accessible path of travel as required by ADA.

**B Lot**

- Upon visual inspection of the building exterior it appears that Door 3, 4, 5, and 12 are accessible building entrances. There are approximately 90 parking spaces in the B Lot. According to ADA design standards there should be a minimum of 4 accessible parking spaces for which 4 accessible parking spaces are provided in the B Lot.
- Although the number of accessible spaces provided for Door 3 and 4 (one each) are adequate, one of the spaces should be designated as a van accessible space with an 8 foot wide access aisle.
- There are two accessible parking spaces designated in the shortest accessible route to Door 5. Although the number of spaces is adequate one of the spaces should be designated as van accessible and the accessible spaces are not properly striped with an access aisle.
- There is a long concrete ramp leading to the Door 5 entrance. This ramp should have a handrail and a level landing per the ADA standards.
- No accessible parking spaces are provided to access Door 12. If this is an accessible building entrance a minimum of one van designated accessible space should be provided.

**C Lot**

- Upon visual inspection of the building exterior it is unclear whether any of the building entrances are intended to be accessible.

- Based on the total number of parking spaces provided in the C Lot (approximately 65) three accessible parking spaces would be required per ADA design standards if any of the building entrances in the C Lot are accessible.

**Senior Lot**

- Upon visual inspection there are no accessible spaces in the Senior Lot. According to the ADA design standards the amount of accessible parking spaces that must be provided is based on the total number of spaces in each parking lot. Nobis interprets this to mean that the Senior Lot should have accessible parking spaces given that it is parking lot that is used by seniors to access various accessible entrances on the campus. A minimum of 6 accessible parking spaces is required based on a total of approximately 186 parking spaces in the lot.

**Dover Alternate Program Parking Lot (50 Alumni Drive)**

- Upon visual inspection there are three accessible parking spaces in the parking lot and there appears to be one accessible entrance at the front of the building. There are approximately 76 parking spaces in the parking lot.
- Two accessible parking spaces are properly located closest to the accessible entrance although one of the spaces should be designated as van accessible. The other accessible space is located closest to the walkway to one of the ball fields. To be in accordance with ADA design standards this accessible space should be designated as van accessible and have an 8 foot wide access aisle to the right of the space.
- Based on the 76 parking spaces in the parking lot per ADA design standards 4 accessible parking spaces are required and only 3 accessible parking spaces are provided.

**Career Technical Center Building**

- Upon visual inspection there is one accessible entrance (Door 28) to the CTC building. There is a small 4 parking space lot accessible to this entrance. One of the four parking spaces is accessible which meets ADA design standards. However, this accessible parking space should be designated as van accessible and have an 8 foot wide access aisle to the right of the space.

- **Nobis could not determine if the accessible path from the parking spaces to the accessible building entrance meets the ADA design standards for running slope or cross slope. A detailed topographic survey will be necessary to make this determination.**
- **All building accessibility assessments have been based off of visual inspection of the building exterior. If programmatic needs or building entrance accessibility changes or the assumptions made above are incorrect the accessible parking spaces and accessible paths will need to be addressed accordingly.**

## Existing Utility Assessment

Upon inspection of the Dover High School campus and blueprints Nobis noted the following regarding the existing utilities on-site:

**Water:** The building is serviced by municipal water supply. It appears that the water supply enters the building in two locations. The two locations are between the B Lot and C Lot behind the building and at the east side of the building for the 1989 CTC addition.

**Sewer:** The building is serviced by municipal sewer. It appears that the municipal sewer exits the building in two locations. The two locations are between the B Lot and C Lot behind the building and at the north side of the building for the 1989 CTC addition.

**Gas:** The building is serviced by natural gas. It appears that the natural gas enters the building between the B Lot and C Lot behind the building as evidenced by the gas meter. It is unclear from visual inspection if the natural gas line enters the building in any other locations.

**Electric:** The building appears to receive its electric service from the transformer off of Alumni Drive in front of the 2002 building addition.

**Site Lighting:** The site has several site lighting posts throughout the campus. Based upon the number and spacing of the site light poles the lighting seems adequate. There are several light poles along the driveway from Alumni Drive to the middle school that have been abandoned for reasons unknown to Nobis.

**Drainage:** The majority of the drainage runoff from the impervious surfaces on-site appears to sheet flow to a closed drainage system. The closed drainage system is believed to discharge to the seasonal brook east of the campus and the seasonal brook south of the Senior Lot. DHS also has a foundation drain and roof drains that tie into the closed drainage system.

# HAZARDOUS MATERIALS REPORT

DRAFT

# Appendix E

## Environmental Phase I - Site Evaluation