NEW CASTLE COUNTY
VOCATIONAL-TECHNICAL SCHOOL DISTRICT

1417 NEWPORT ROAD, WILMINGTON, DELAWARE 19804
(302) 995-8050

YVETTE SANTIAGO
President
Board of Education

JOSEPH JONES, Ed.D.
Superintendent

MADELINE BOLDEN JOHNSON
Vice President
Board of Education

Questions and Answers

Bid 2204 – Architects – New Hodgson High School

Q1) **Pages 37 Proposal Reply Section (and subsequent pages 38-42 as described below): Under "Attachments" on this page, it says "The following attachments are required to be included in the final submission package." The next 3 pages – pages 38-40 – include Appendix A, a written description of the Scope of Services. The 2 pages that follow – pages 41 and 42 – include Attachment 1, a written description of the Proposal Requirements.**

- **Since these two items are descriptions of both the project, and the proposal submission requirements, do we need to include copies of these pages in the response in the same way that the remaining attachments (fillable forms) are included?**
- **Or can we include for Appendix A, a statement of our understanding of the scope of work, and for Attachment 1, a statement that the response format and layout adheres to the list of required items on pages 41 and 42?**

A1) Neither Appendix A nor Attachment 1 need to be resubmitted as part of the proposal. However, to be clear, everything listed in Attachment 1 must be submitted.

Q2) **Would you please send the application for the Certificate of Necessity**

A2) A copy of the application for certificate of necessity will be posted to mymarketplace.de.gov.

Q3) **Is a cost proposal expected to be provided with the RFP response? The below referenced sections allude to this, but a cost proposal is not noted as a requirement under Attachment 1 Proposal Requirements.**

- **Section number: III.H. DISCOUNT**
  Paragraph number: 1
  Page number: 6
  Text of passage being questioned: Vendors are invited to offer in their proposal value added discounts (i.e. speed to pay discounts for specific payment terms). Cash or separate discounts should be computed and incorporated into unit bid price(s).
- **Section number: III.N. PROPOSAL EXPIRATION DATE**
  Paragraph number: 1
  Page number: 7
  Text of passage being questioned: Prices quoted in the proposal shall remain fixed and binding on the bidder at least through one year.
- **Section number: IV.B.1.c. RESPONSIVENESS AND RESPONSIBILITY OF VENDOR**
  Paragraph number: 1
  Page number: 12

Text of passage being questioned: A proposal may be rejected for 1 or more of the following reasons: … The proposed price is unreasonable.

A3) A cost proposal is not to be included with the proposal. The proposals that are received will be ranked based on the interviews of the shortlisted firms and the established evaluation criteria. The District will negotiate a price with the top-ranked firm. If a reasonable fee cannot be achieved, the District will negotiate with the 2nd highest ranked firm.

Q4) Confirm that the District will hire an asbestos remediation consultant outside of this contract and that the A/E will coordinate with that consultant.

- **Section number: Appendix A. Scope of Services**
  Paragraph number: 3
  Page number: 38
  Text of passage being questioned: The District recognizes that some asbestos abatement will need to be performed on the existing building, so the architect/engineer will need to be cognizant of these services being performed prior to demolition.

A4) The District will hire an asbestos remediation consultant outside of this contract and the A/E firm will coordinate with that consultant.

Q5) In terms of our response, does a double sided page count as one page or two pages?

A5) A double sided page counts as two pages.

Q6) Is it acceptable that the electronic copy be submitted on a flash drive, in lieu of a CD/DVD??

A6) Yes, flash drives are fine.

Q7) Is there a project schedule or expected completion date for the project?

A7) At this point the project schedule has not been developed. It is important that the submittals show a tight schedule so that it can be incorporated into the CM's schedule once they are hired.

Q8) Can a site plan with the property line shown be provided??

A8) A site plan is shown within the Application for Certificate of Necessity which is also posted to mymarketplace.de.gov.

Q9) Please confirm the anticipated project schedule. Based upon available your funding schedule, we understand the following:

A9) We will rely on the expertise of your firm to develop a reasonable project schedule that your firm can accommodate. A Construction Manager is being hired simultaneously and once they are hired, will confirm that your proposed schedule will fit within the parameters of the CM's schedule.

Q10) Has any project-specific programming information been developed to date, and can this be made available to candidate firms?

A10) No programming information has been developed at this time.

Q11) Please clarify what the scope expectations are for stakeholder engagement and input as part of the programming and design processes.

A11) The District would like to hear the firm's suggested expectations and methodologies for stakeholder engagement and input based on the firm's past experiences and expertise.

Q12) Please clarify the scope expectations for community engagement and communications.

A12) The District would like to hear the firm's suggested expectations and methodologies for Community engagement and communications based on the firm's past experiences and expertise.

Q13) Please confirm the intended student occupancy / capacity.

A13) The New Hodgson Vocational Technical High School will be a 275,000 s.f. facility with an expected capacity of between 1,250 and 1,500 students.

Replacement for

HODGSON VOCATIONAL TECHNICAL HIGH SCHOOL

Certificate of Necessity

DRAFT

JULY 26, 2021

ABHA | BSA+A

NEW CASTLE COUNTY VOCATIONAL-TECHNICAL SCHOOL DISTRICT

1417 NEWPORT ROAD, WILMINGTON, DELAWARE 19804
(302) 995-8050

YVETTE SANTIAGO
President
Board of Education

JOSEPH JONES, Ed.D.
Superintendent

MADELINE BOLDEN JOHNSON
Vice President
Board of Education

August 31, 2021

Ms. Cathy Wolfe
Education Associate District State Funds, Federal Funds/LEA Indirect Costs
Delaware Department of Education Finance Office
John G. Townsend Building
401 Federal Street, Suite 2
Dover, DE 19901

Re: Certificate of Necessity
NEW Projects for
New Castle County Vocational Technical School District

Dear Ms. Wolfe:

Please find enclosed our request for major capital investment for *New and Reconstructed* projects in the New Castle County Vocational Technical School District. Within this document you will find the documentation and recommendations that provide a rationale for the Certificate of Necessity forms, provided under a separate cover. This booklet also is complementary to our separate submission for our renovation projects, that together, address both our ongoing maintenance needs for the foreseeable future for two of our aging buildings.

This submission reflects the need for a new Hodgson Vocational Technical High School.

NCCVT continues to provide outstanding career and technical education to over 4500 students throughout New Castle County. Over the last few years, Hodgson Vo-Tech has expanded to over 1000 students to accommodate the growing demand for superior CTE instruction. The challenge is that Hodgson was designed and created to be a shared time high school offering only vocational classes. Today, it functions as full comprehensive high school offering both vocational and academic classes.

Currently, due to the building aging and its original design to serve half-day students creates a less than optimal learning environment for students. This ranges from small spaces, such as the cafeteria to students needing to walk through one classroom to access another. Fortunately, our preventive maintenance, using minor capital funding, has allowed us to keep Hodgson existing in very good condition, but it does not negate the fact that the building itself is simply not designed to accommodate students in the 21st Century. Our Certificate of Necessity request booklet illustrates the needs of Hodgson and how a newly constructed building could not only offer existing students a better learning environment, but it could accommodate up to 500 additional students, which would better meet the demand for superior CTE instruction and support the demand in our county for specialized skilled trades and allied health workers.

Although we are also submitting an application for Certificate of Necessity to renovate Hodgson, we believe this is a much inferior methodology to building a new Hodgson. Just to take care of Hodgson's immediate needs, the estimated cost is over 50% to build a new building. Even with the renovations, the school would still have inadequacies such as: undersized kitchen/cafeteria, extremely narrow maze-like hallways, and extremely small classrooms with no natural light. So, while the renovations is a list of stopgap projects to keep the building running, the students and staff of Hodgson need a building designed for full time comprehensive instruction.

We firmly believe this approach for a new Hodgson Vo-Tech is an effective and economical solution to the unique challenges we face.

Thank you for your thoughtful consideration of this request.

Respectfully submitted,

Joseph M. Jones, Ed.D.
Superintendent
New Castle County Vocational Technical School District

TABLE OF CONTENTS

Executive Summary

Paul M. Hodgson Vocational Technical High School is a public school dedicated to providing each student the opportunity to reach his or her potential as a productive and successful member of the community. This is accomplished by offering students an innovative curriculum, which combines academic instruction, career training, and structured work experiences designed to bridge the gap between classroom learning and workplace skills. Graduates of the programs are uniquely prepared to meet both the demands of today's competitive job market and the challenges of tomorrow's workplace.

The building was constructed in 1973 and was originally designed as a temporary part-time shared facility for the Glasgow/Bear area. The facility continued as a part time educational facility for a number of years before its change to a full time facility.

As such, much of the building support spaces are grossly inadequate for a comprehensive high school and have been added to or modified over the years. The original facility did not house many functions including a kitchen or cafeteria. As a result, interior classrooms were converted into the kitchen, serving and cafeteria spaces. In addition, the original building did not house a library, gymnasium, lockers or program areas such as science labs and culinary arts. While the building was not originally intended to support full time use, it is currently used as a full time educational, career and technical facility. With a student population of roughly 1,200+ students within 305,000 square feet, the building does not meet the State of Delaware's educational standards to support the existing student capacity in a number of required areas.

With high student retention, while 2,100 students apply, there are only 1,200 seats available. With the enrollment demand growing in New Castle County's southern region, area schools are expanding. Increasing capacity with a replacement school will help alleviate the burden on other districts. The new school would accommodate an increased capacity of 1,500 students.

The building envelope and classroom sizes are not adequate to meet educational daylighting and size requirements. The building requires extensive renovation to address the building and program deficiencies, including much needed reprogramming such as, additional classroom space, and additional kitchen, serving and cafeteria space to meet student capacity requirements. In addition, compliance with current code requirements are required , as well as, improving and updating all existing mechanical, electrical, plumbing, life safety, ADA, security and fire suppression systems associated with the new work.

To continue to properly serve Hodgson Vo-tech's students today as well into the future, this study will identify and address the much needed improvements. A component of this directive will be the professional recommendations from the architecture team ABHA/BSA+A and their consultant team, as well as, other the input of other local, state, and federal agencies.

A comprehensive analysis was undertaken of the existing site, facility and configuration in an effort to identify major issues and propose remedies. The intent of the study was to determine the feasibility and associated costs to repair and renovate the existing facility to accommodate the growing needs of the school compared to building a new facility. Cost estimates are included to properly gauge financial implications for consideration through the various funding sources available to the NCCVT. The report is to be utilized to request a Certificate of Necessity from the Delaware Department of Education for inclusion in an upcoming bond bill as the primary source of funding for steps required to address the needs of Hodgson Vocational Technical High School to properly support and educate its students.

The study identifies the current building conditions of all areas and systems, with a full analysis of required repair and upgrade needs. It identifies potential constraints and limitations, as well as the suitability and/or constraints of current site elements and configuration. The analysis addresses current requirements per applicable building codes and includes construction cost estimate data for all recommended facility and site improvements for comparison purposes to the cost of new construction. Considerations for utilization of the existing facility are included, however, based on the magnitude of instructional, life safety and security deficiencies, the cost to remediate the building is within 15% of the cost to build a replacement school. The benefit of gaining appropriate instructional space and increased capacity in a secure and energy efficient building with a more positive impact on students, presents a far more cost effective long term and a more structurally sound choice to construct a new facility.

As a result of significant population growth in the southern region, the replacement school allows for expanded capacity to address current overcrowding and capacity issues as well as to help offset the overburdening on surrounding districts.

DDOE Forms

Delaware Department of Education

Certificate of Necessity Application – New Construction

1. **Project Name: New Castle County Vocational Technical School District Paul M. Hodgson Vocational Technical High School**

   Project Description: State funding is requested for the planning, construction and equipping of a new technical high school on District owned property as a replacement for the current undersized and underperforming facility.
   Grade levels served: 9th - through - 12th

Facility Data

Proposed Facility:

Address	*2575 Glasgow Ave, Newark, DE 19702*
Gross # square feet	275,000
Estimated start time of project	2022
Estimated completion date	2025
Estimated date of occupancy	2025
Capacity	1,500

Capital Request Funding

FISCAL YEAR	***AMOUNT***
FY 2023	$19,329,000
FY 2024	$33,825,750
FY 2025	$54,121,200
FY 2026	$27,060,600
FY 20__	
TOTALS:	$134,336,550

1

Cost Breakdown/Phase Out

	FY2023	***FY2024***	***FY2025***	***FY2026***	***FY20__***	***TOTAL***
Construction Expenses						
Planning/Design	$500,000	$500,000	$0	$0		$1,000,000
Architect/Engineering	$3,500,000	$2,000,000	$2,000,000	$350,517		$7,850,517
Audit Fees	$0	$250,000	$100,000	$100,000		$450,000
Site Development Costs	In Below	In Below	In Below	In Below		$0
Construction Costs	$14,125,183	$27,290,639	$44,783,823	$19,143,576		$105,343,221
Construction Contingency	$1,203,817	$2,174,361	$3,160,177	$1,352,907		$7,891,262
*Other (*Provide Description*)*						
Non-Construction Expenses						
Technology	$0	$0	$1,500,000	$1,525,000		$3,025,000
Furniture and Equipment	$0	$0	$0	$3,300,000		$3,300,000
Escalation Costs	$0	$1,610,750	$2,577,200	$1,288,600		$5,476,550
*Other (*Provide Description*)*						
TOTALS	**$19,329,000**	**$33,825,750**	**$54,121,200**	**$27,060,600**		**$134,336,550**

2. Project Details:

a. The DOE decision-making process is based on a priority legend, with the priorities being the following:
   - Capacity and future enrollment
   - Project corrects facility life, health or safety issues
   - Building aesthetics and programming

b. **New Construction:**
   i. Why is a new school needed? **The current building lacks sufficient academic and support spaces necessary to support a 1,200 student high school. Major life safety and code deficiencies are present and the building is in such poor condition it is in need of a complete replacement.** What will be the grade configuration? **The grade configuration will be from ninth to twelfth grades.**
   ii. Provide details of overcrowding issues. **The current building houses 1,200 students, yet the calculated capacity is 900 students. A replacement school will address the need for additional capacity as well as addressing the current conditions of the facility.** Which schools? What are the relief/redistribution plans? **District student placement is based upon program specific offerings at each school, therefore enrollment is set based on capacity of each school. With the current 1,400 seats available, increasing capacity will help to alleviate burdens of other districts.** What are the patterns of population and student growth in the district? **Given the significant student growth in the southern region of the county, the increased**

2

capacity will help alleviate the burden on neighboring districts. With high student retention, while 2,100 students apply for only 1,200 seats. Are there any other ways for this to happen? **No, not aside from proceeding with renovations and additions to the current facility rather than constructing a replacement school. However, the cost to renovate is within 15% of constructing a new facility and will not address all issues. In fact, cost of renovating in this case would be higher.**

iii. Is the building square footage as per DOE formula (School Construction Technical Assistance Manual, section 3 "School Construction Formula")? ☒ Yes; ☐ No
If over the threshold, justification must be given. *Note: any square footage over and above the DOE formula must be supported by 100% local funds.* Indicate how these local funds will be acquired.

iv. Explain how this project aligns with the priority legend. **Refer to section 2, item a of this form; first and second priority categories apply.**

v. Has the school district obtained district Board of Education approval to submit this CN request? ☒ Yes; ☐ No

Please address the urgency of each project or your request in general. **Due to the current limitations, constraints and deficiencies of the building, there is an immediate need to address the building program, academic and space needs and provide additional capacity**
What would happen if the CN is not approved this year? **The sever limitations of the academic and support spaces for students will continue and the overcrowding of the cafeteria, serving, etc. will require The District would immediately re-submit this project in a future CN request.**
In what priority order would you classify your request(s) if not all requests were granted? **The conditions and levels of deterioration of Paul M. Hodgson Vocational Technical High School and the ability to support the continued pattern of growth in the southern region of New Castle County justify this project being of the highest priority to NCCVT. Therefore it is requested to classify this submission as a Priority 1 project.**

3. Request Deadline:

Complete Board approved capital requests, accompanied by all completed submission documentation must be submitted to DOE by no later than August 31st of each State fiscal year for the next year's capital budget submission to the attention of:

Education Associate, Capital Project Management
Delaware Department of Education
401 Federal Street, Suite 2
Dover, DE 19901

4. Recommendations:

It is strongly recommended that districts notify DOE of any potential capital budget requests as early as possible in order to ensure a thorough review by DOE and to allow time for additional exchange of information, as applicable.

5. Attachments:

☒ District Board approved minutes (draft is acceptable)
☒ Building Professional (i.e. Architectural/Engineering firm) supporting documentation
☐ Office of State Planning Coordination approval letter (if applicable)

Project Name:	New Castle County Vocational Technical School District - Paul M. Hodgson High School

Type of School	High School
Proposed Capacity	*** See Attached Documents
$ per Square Foot	$ 448.54
Square Foot Allowance	275,000
State Share (%)	62%
Local Share (%)	38%
Authorized Formula Amount	$ 123,348,500.00

Extraordinary Site Conditions	See below

Extraordinary Site Condition 1 Amount	$4,361,500	Demolish Existing Building
Extraordinary Site Condition 2 Amount	$400,000	Hazardous Material Abatement
Extraordinary Site Condition 3 Amount	$500,000	Unsatisfactory Soil Remediation
Extraordinary Site Condition 4 Amount	$250,000	Transportation to Remote Athletic Fields
Extraordinary Site Condition Total	$ 5,511,500.00	

Funding Request By Fiscal Year						
Fiscal Year	2023	2024	2025	2026	20__	Total
Total State Amount	$ 11,471,410.50	$ 19,119,017.50	$ 30,590,428.00	$ 15,295,214.00	$ -	$ 76,476,070.00
Total State Escalation	$ -	$ 955,950.88	$ 1,529,521.40	$ 764,760.70	$ -	$ 3,250,232.98
TOTAL STATE	***$ 11,471,410.50***	***$ 20,074,968.38***	***$ 32,119,949.40***	***$ 16,059,974.70***	***$ -***	***$ 79,726,302.98***
Total Local Amount	$ 7,030,864.50	$ 11,718,107.50	$ 18,748,972.00	$ 9,374,486.00	$ -	$ 46,872,430.00
Total Local Escalation	$ -	$ 585,905.38	$ 937,448.60	$ 468,724.30	$ -	$ 1,992,078.28
TOTAL LOCAL	***$ 7,030,864.50***	***$ 12,304,012.88***	***$ 19,686,420.60***	***$ 9,843,210.30***	***$ -***	***$ 48,864,508.28***
Extraordinary Site Conditions	$ 826,725.00	$ 1,377,875.00	$ 2,204,600.00	$ 1,102,300.00	$ -	$ 5,511,500.00
Extraordinary Site Conditions Escalation	$ -	$ 68,893.75	$ 110,230.00	$ 55,115.00	$ -	$ 234,238.75
TOTAL EXTRAORDINARY SITE CONDITIONS	***$ 826,725.00***	***$ 1,446,768.75***	***$ 2,314,830.00***	***$ 1,157,415.00***	***$ -***	***$ 5,745,738.75***
Total State, Local, & ESC Amount	$ 19,329,000.00	$ 32,215,000.00	$ 51,544,000.00	$ 25,772,000.00	$ -	$ 128,860,000.00
Total State, Local, and ESC Escalation	$ -	$ 1,610,750.00	$ 2,577,200.00	$ 1,288,600.00	$ -	$ 5,476,550.00
TOTAL STATE, LOCAL, & ESC	***$ 19,329,000.00***	***$ 33,825,750.00***	***$ 54,121,200.00***	***$ 27,060,600.00***	***$ -***	***$ 134,336,550.00***

State Share ($)	$ 76,476,070.00
State Escalation ($)	$ 3,250,232.98
Local Share ($)	$ 46,872,430.00
Local Escalation ($)	$ 1,992,078.28
Extraordinary Site Conditions ($)	$ 5,511,500.00
Extraordinary Site Conditions Escalation ($)	$ 234,238.75
Other Funding ($)	$ -
Total Funding Request	***$ 134,336,550.00***

HS STUDENT ENROLLMENT AND PROJECTIONS

	Actual								Projected				
Delcastle	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**Current Fiscal Year**	**2020**	**2021**	**2022**	**2023**
9th Grade	403	404	420	423	420	416	416	416	419	417	418	419	416
10th Grade	400	395	393	409	405	408	402	406	408	409	407	408	408
11th Grade	348	386	375	369	388	386	395	388	401	398	403	402	396
12th Grade	360	357	391	378	391	383	384	405	405	400	393	394	390
Total Enrollment	**1,511**	**1,542**	**1,579**	**1,579**	**1,604**	**1,593**	**1,597**	**1,615**	**1,633**	**1,624**	**1,621**	**1,623**	**1,610**
Capacity	1,764	1,764	1,764	1,764	1,764	1,764	1,764	1,764	1,764	1,764	1,764	1,764	1,764

	Actual								Projected				
Hodgson	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**Current Fiscal Year**	**2020**	**2021**	**2022**	**2023**
9th Grade	271	279	277	307	299	289	294	299	287	295	291	294	290
10th Grade	281	263	260	267	296	290	281	282	289	278	286	282	285
11th Grade	248	270	247	246	257	286	276	268	261	278	267	275	271
12th Grade	246	245	264	238	238	254	274	270	262	255	272	261	269
Total Enrollment	**1,046**	**1,057**	**1,048**	**1,058**	**1,090**	**1,119**	**1,125**	**1,119**	**1,099**	**1,106**	**1,116**	**1,112**	**1,115**
Capacity	1,629	1,629	1,629	1,629	1,629	1,629	1,629	1,629	1,629	1,629	1,629	1,629	1,629

	Actual								Projected				
Howard	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**Current Fiscal Year**	**2020**	**2021**	**2022**	**2023**
9th Grade	283	250	268	284	237	203	233	244	241	252	256	250	255
10th Grade	224	236	239	238	262	223	194	223	230	233	239	243	239
11th Grade	186	200	205	231	218	234	208	180	211	219	217	221	234
12th Grade	202	165	187	187	218	200	213	187	168	199	202	202	210
Total Enrollment	**895**	**851**	**899**	**940**	**935**	**860**	**848**	**834**	**850**	**903**	**914**	**916**	**938**
Capacity	1,145	1,145	1,145	1,145	1,145	1,145	1,145	1,145	1,145	1,145	1,145	1,145	1,145

	Actual								Projected				
St Georges	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**Current Fiscal Year**	**2020**	**2021**	**2022**	**2023**
9th Grade	259	260	263	293	292	318	280	280	290	295	294	296	295
10th Grade	272	254	255	261	286	281	313	269	270	279	284	283	285
11th Grade	262	268	244	247	249	278	279	305	265	264	273	278	277
12th Grade	250	255	260	242	242	243	274	272	302	261	260	269	274
Total Enrollment	**1,043**	**1,037**	**1,022**	**1,043**	**1,069**	**1,120**	**1,146**	**1,126**	**1,127**	**1,099**	**1,111**	**1,126**	**1,131**
Capacity	1,368	1,368	1,368	1,368	1,368	1,368	1,368	1,368	1,368	1,368	1,368	1,368	1,368

Total HS	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**Current Fiscal Year**	**2020**	**2021**	**2022**	**2023**
9th Grade	1,216	1,193	1,228	1,307	1,248	1,226	1,223	1,239	1,237	1,259	1,259	1,259	1,256
10th Grade	1,177	1,148	1,147	1,175	1,249	1,202	1,190	1,180	1,197	1,199	1,216	1,216	1,217
11th Grade	1,044	1,124	1,071	1,093	1,112	1,184	1,158	1,141	1,138	1,159	1,160	1,176	1,178
12th Grade	1,058	1,022	1,102	1,045	1,089	1,080	1,145	1,134	1,137	1,115	1,127	1,126	1,143
Total Enrollment	**4,495**	**4,487**	**4,548**	**4,620**	**4,698**	**4,692**	**4,716**	**4,694**	**4,709**	**4,732**	**4,762**	**4,777**	**4,794**
Capacity	5,906	5,906	5,906	5,906	5,906	5,906	5,906	5,906	5,906	5,906	5,906	5,906	5,906

Statement of Purpose

Introduction

The Paul M. Hodgson Vocational Technical High School of the New Castle County Vocational Technical School District, was originally designed as a part time shared facility. As a result, the building is in need of a major systemic renovations to address the needed program space and building deficiencies. In addition, the facility requires an improvement to the interior environmental quality by bringing in more natural light and ventilation and updating the building envelope in terms of current standards and energy efficiency.

The Districts' mission is to offer a variety of educational experiences for students integrating academic courses with practical vocational-technical problem solving. Math and English teachings are reinforced in the student's career program which compliments the real life applications of career area instruction and training at Hodgson. In order to continue to offer its students this unique interplay of education and real life experience the building and program deficiencies need to be addressed. Due to the current building configuration and constraints, this presents a difficult and costly challenge to address the needed changes. With a high demand for skilled trades, and a decreasing skilled workforce, the current industry needs are a driving force behind technical high school instruction.

To identify and address these issues, school staff and administrators put together a strategic planning committee including Architects, Engineers and Construction Managers. They held meetings to discuss various factors, which contributed to the development of this report. The plan was developed to consider alternative solutions in order to identify the most cost effective solution to address a building with numerous functional, programmatic and life safety deficiencies. As outlined the major factors include the following:

Architectural

- Building Envelope
- Circulation
- Internal Accessibility
- Interior/Program
- Life Safety and Security
- Technology

MPE

- Mechanical
- Plumbing
- Fire Protection
- Electrical
- Life Safety, Fire Alarm and Security
- Technology

Site

- Parking and Vehicular/Bus Circulation
- Athletic Fields
- Storm Water Management

SUMMARY COMMENTS:

Upon assessment of the building, the following deficiencies were noted and require attention:

- Classroom size and distribution inadequate to support program use and does not meet State requirements.
- Inadequate critical support spaces including cafeteria, kitchen, gymnasium and lacking auditorium or large assembly space.
- Bus entrance, pedestrian and vehicular traffic requires reconfiguration.
- Kitchen, serving area and cafeteria seating area require expansion to accommodate the student capacity.
- Current cafeteria seating capacity cannot support or accommodate the current student population. Expansion of existing cafeteria is required to meet the capacity of a 1200 student school with 3 seatings of 400 students.
  - Existing Area available: 3051 SF
  - Required Area per State requirements: 6300 SF
- Life Safety and Security deficiencies throughout
- Mechanical, Electrical & Plumbing System upgrades are required
- ADA Code Compliance
- Based on energy audit of the building envelope, existing windows and metal panel require replacement
- Lobby and 'mall' area require redesign for security, visibility and control.
- Culinary arts area requires additional space to address program needs and code compliance.
- Technology upgrades to Classrooms and Media Center are required.
- Natural light is lacking throughout the building and in classrooms.
- Nurse's suite and Wellness require additional space to operate adequately.
- Door and hardware upgrades are required throughout.
- Interior air quality is extremely poor throughout. (refer to MPE report)
- Resurface track and add (2) new fields.
- Interior air quality is extremely poor throughout. (refer to MPE report)
- Resurface track and add (2) new fields.

RECOMMENDATIONS

1. Build a new 275,000 SF facility with expanded student capacity.
2. Utilize the existing high school as swing space while the new facility is constructed on the location of the existing athletic fields. Relocate athletics off-site for duration of construction.
3. Demolish the existing 305,000 SF Hodgson Vo-Tech High School.
4. Create new athletic fields in place of existing building.

Process / Investigation

Commencing in January of 2016 with subsequent facility evaluation updates in 2017, 2018 and again in 2019, the project team, consisting of district representatives including administrators, board members and community stakeholders as well as licensed and registered professional architects, engineers and cost estimators performed both independent and coordinated on-site observations and investigations of the existing building, grounds and site. In support of these efforts, the New Castle Vocational Technical School District provided all available scaled construction drawings and reports, energy usage, building data and maintenance records for coordination and review by the team.

The culmination of this effort was a Certificate of Necessity submission in July of 2016 and subsequent submissions in 2017 and 2018. As the requested funds were not approved each time, the team has prepared an update to the report for this subsequent submission.

In regard to operational performance, a comprehensive evaluation was undertaken, and various facility-based and programmatic-driven shortcomings were identified. The team walked the building and grounds with school and District administration and staff. Meetings and workshops with school representatives were held to extract specific program deficiencies as observed by these school district personnel.

The design team performed a preliminary code review of the facility to ensure compliance with current and local building codes, accessibility regulations, building, fire and life safety requirements, and the actual condition of the building at Paul M. Hodgson Vocational Technical High School. The interior components, building systems and exterior envelope of the facility was evaluated with regard to general condition, compliance and ability to efficiently and safely educate students.

In conjunction with district facilities staff, Mechanical, Plumbing and Electrical engineers examined the facility and generated a report documenting systematic inefficiencies, such as the condition of heating and cooling, plumbing, lighting, electrical systems, as well as ventilation and air quality. All of this was carefully examined in an attempt to improve existing conditions, increase energy efficiency and reduce the overall cost impact to the district.

Using the Delaware Department of Education Certificate of Necessity form, required for funding for potential improvements, as a template the team recorded observable deficiencies in a tabular fashion. This documentation was provided to a cost estimator experienced in secondary school building construction and operation for preparation of a conceptual design cost estimate.

The cost estimate data was to target measures necessary to remedy the deficiencies in an effort to bring the site and facility to a required level of code compliance and provide a reasonable level of improvements to functionality through infrastructure upgrades. This evaluation and estimating exercise was compared to and analyzed against the cost to construct a new replacement school on site using State of Delaware's mandated construction values and associated square footage required for a 1,500-student comprehensive technical high school in lieu of renovation.

Findings & Recommendations
ARCHITECTURAL

After thorough investigation of the site, building and grounds, as well as review of associated drawings and records yielded evidence of a number of building system, infrastructure, and code deficiencies as well as program capacity deficiencies exhibited in the existing facility. These deficiencies adversely impact student operations for specific educational functions and limits provision for continued growth and flexibility. Our team performed a due diligence evaluation of the issues, assigned an index rating (see explanation below) and documented the issues in order to establish the costs required to remedy the issues.

Index Rating Explanation:

As a comprehensive team we have established an Index Rating Chart to help better communicate the level of deficiency among the building systems and Architectural components. We have assessed each system and component's condition and have given it a rating of 1 through 5, 1 being the best condition and 5 being the worst condition. The chart below helps define this process & description of work required:

Index Rating	Rating Description	% Work Required	Description of Work Required
5	Very Poor	100%	Complete Repair or Replacement Required
4	Poor	80%	Large amount of repair or replacement work required
3	Fair	60%	Moderate amount of repair or replacement work required
2	Good	40%	Little to no repair or work required
1	Very Good	20%	No repair Work Required at time of site visit

Index Rating Summary:

Collectively through the assessment of the facility we have determined, as a whole, that the buildings systems and components of construction are mostly all rated as a 4, (Poor) – Requiring 80% or more replacement or renovation necessary; OR a 5, (very Poor) – Requiring 100% repair or replacement necessary to allow the system or construction component to perform properly to ensure safety and efficiency to the facility.

OVERALL ASSESSMENT

Based on a thorough assessment it has been determined that this facility does not meet the requirements to operate as a full time technical and career high school facility and that major renovations to the existing building would rival the cost of new construction due to complexities in the overall condition of the building and systems. In addition, a renovation of the existing facility would not provide the same level of instructional capacity or program delivery method and energy efficiency. The facility lacks efficient, functional building systems, appropriate educational spaces, natural daylighting, adequate ventilation, and appropriate crucial supporting spaces such as cafeteria, kitchen and auditorium space. The original building was not intended to be a full time instructional facility and therefore systems are not adequate to support such programs. In order to meet the Life Safety and ADA code requirements, address structural, mechanical, electrical, fire protection, plumbing, technology and general program issues, it is our recommendation the existing school be demolished and a new replacement building be constructed.

Figure 1.1
Aerial campus view

A. Envelope – Index Rating: 5

- Based on an energy audit, the existing school envelope is inefficient and requires a complete upgrade.
- Existing metal panel in poor condition and requires replacement throughout the entire building exterior.
- Replace all existing windows for improved efficiency.

Figure 1.2
Building exterior (typical)

B. Circulation – Index Rating: 4

- Corridors are circuitous and of excessive lengths in terms of travel distance.
- Several corridors have “dead -end” egress conditions that are not code compliant.

Figure 1.3
Non-Code Compliant Issues Throughout

C. Internal Accessibility – Index Rating: 5

- Hardware upgrades are necessary throughout
- Toilet Rooms need to be upgraded to meet ADA code compliance and required fixture counts.

Figure 1.4
Non-Code Compliant Issues Throughout

D. Interior and Program – Index Rating: 5

The original building was not intended to be a full time instructional facility and therefore a number of program support places are inadequate.

- Program spaces and classroom sizes do not meet current state requirements.
- Lack of appropriate distribution of classroom spaces.
- Lack of essential program facilities including kitchen and serving area. Number of serving lines are inadequate without appropriate queuing space available. Expansion is not feasible in its current location within the building as it is essentially land locked.
- Kitchen equipment does not meet code and needs replacement.
- Gymnasium and supporting locker rooms and toilet facilities are insufficient.
- Bus entrance, vehicular and pedestrian traffic requires reconfiguration. A dedicated bus lot is preferred.
- Facility does not currently offer an auditorium or large assembly area.
- Entry Lobby and 'mall' area require redesign for security, visibility and control.
- Culinary arts area requires expansion to address program needs, the lack of instructional lab space, code compliance, and access to the program area independent of the teachers' lounge and kitchen. Being landlocked as it is currently, expansion of the program to meet its needs is not feasible.
- Current cafeteria is grossly undersized by roughly 50%; current seating capacity cannot support or accommodate the student population. Expansion of existing cafeteria is required to meet the current capacity of a 1200 student school with 3 seatings of 400 students, and preferably 3 seatings of 500 students to support 1,500 students. Expansion in current location is not feasible.
  - Existing Area available: 3051 SF
  - Required Area per State requirements: 6300 SF for 1,200 students and 7,000 SF for 1,500 students
- Technology upgrades to Classrooms and Media Center are required.
- Natural light is lacking throughout the building and in classrooms.
- Nurses suite and Wellness require additional space to operate adequately.
- Door and hardware upgrades are required throughout.
- New Furniture is required
- Many of the interior finishes have exceeded their useful life and require update.
- Asbestos abatement required in limited areas.

Figure 1.5
Classroom crowding: Extreme overcrowding: classrooms are not the correct size to meet state requirements. Lack of natural daylight in more than 70% of classroom spaces.

Figure 1.6
Lack of instructional space for culinary

Figure 1.7
Cafeteria Seating

E. Life Safety and Security – Index Rating: 3

- Emergency lighting does not meet code – refer to MPE report for additional information.
- Limited security camera coverage; at exterior and interior areas.

F. Technology – Index Rating: 4

- Existing cabling and equipment is outdated and requires updating to meet the State of Delaware's standards.

ARCHITECTURAL RECOMMENDATIONS

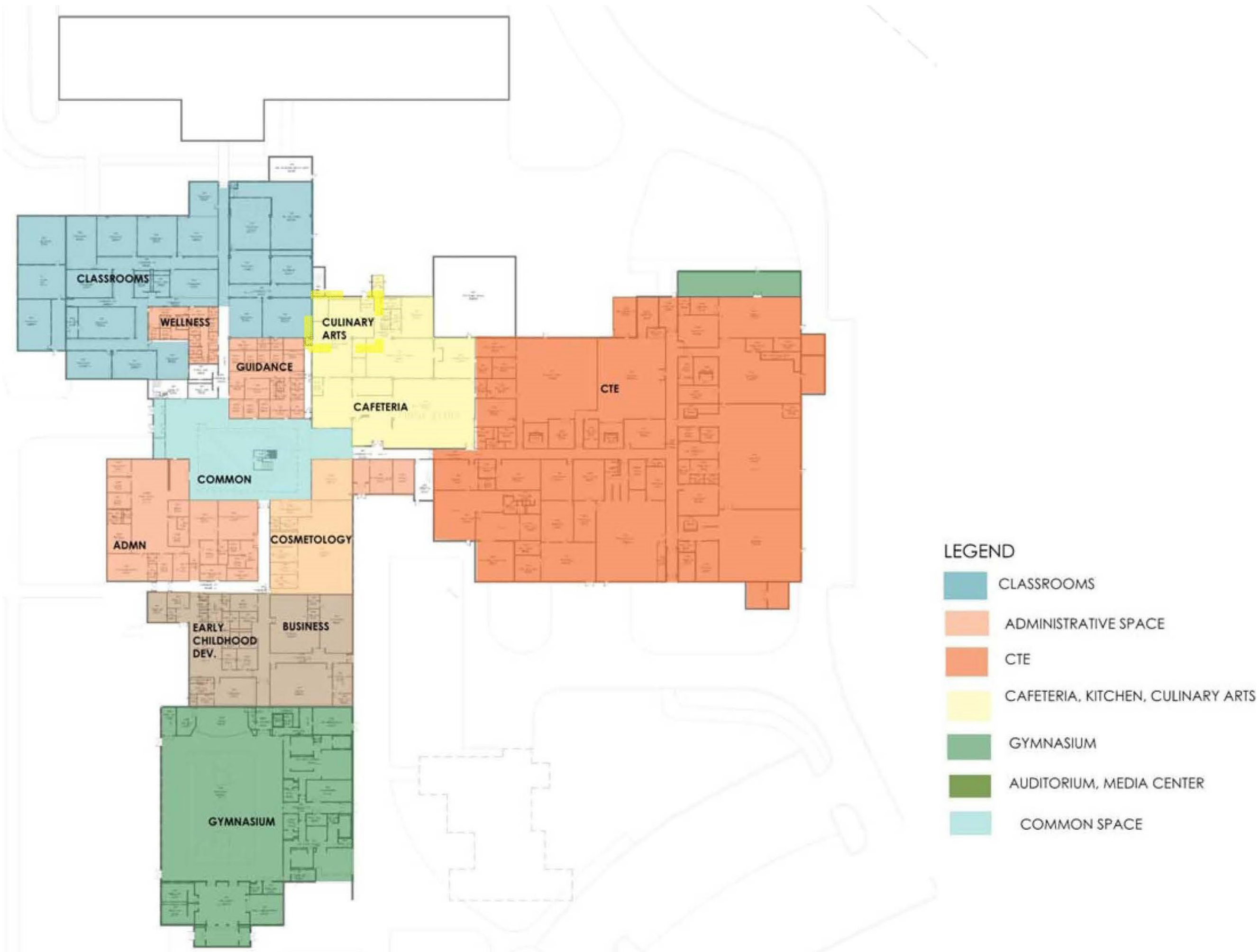
As noted previously in our evaluation of the existing building, the result of the part time faculty having been renovated and added to over the past 30 years as a full time facility to address building and program needs has impacted the overall building footprint and effective function of the building. It is not beneficial or effective to continue to renovate and expand the facility since the basic configuration is not functional in its current use.

However, in consideration of overall costs, our team performed the due diligence task to evaluate what could be done with the existing facility to maximize its function and efficiency. The following diagrams identify how the existing facility could be renovated and expanded to address such needs. The following outlines the brief suggestions:

- Construct a new addition to house an appropriately sized cafeteria, kitchen, serving, and culinary arts areas.
- Expand classroom area into vacated kitchen/ cafeteria/ culinary arts areas to accommodate new classroom reconfiguration and redistribution.
- Incorporate additional toilet rooms for code compliance.
- Renovate and reconfigure classroom wing for more adequate classrooms with improved circulation.
- Expand gymnasium, locker rooms and toilet rooms to support a 1200 student facility. (This does not address additional capacity)
- Construct new auditorium.
- Renovate remaining surrounding spaces including science labs, media center, nurse, wellness and guidance as required.
- Existing high bay CTE shops would remain largely intact.

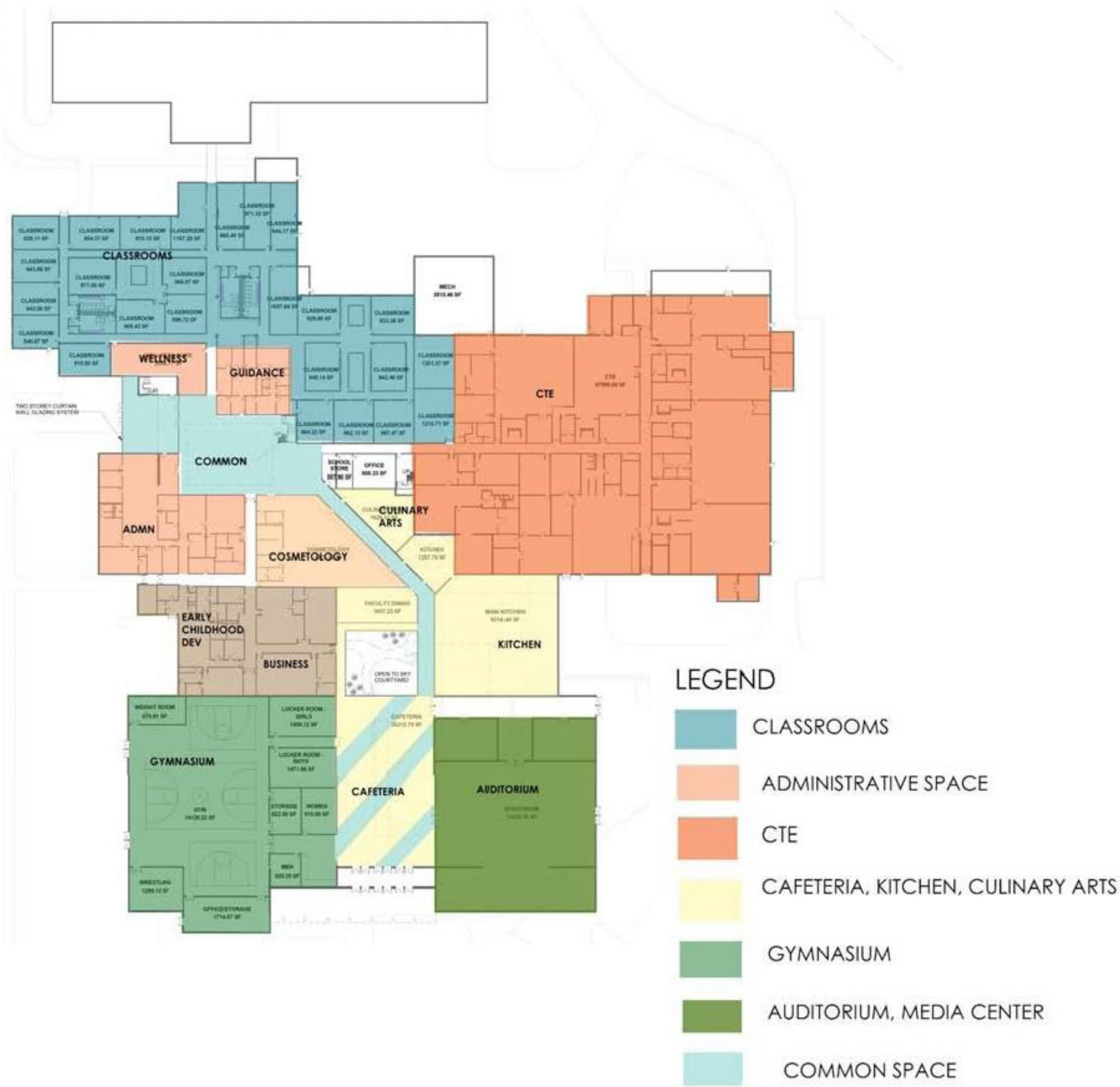
However, with the suggested modifications and additions completed, the building still does not address all needs for appropriate classroom size or daylighting adequacy or ideal circulation throughout. In addition, with complete MPE system upgrades the renovations do not fully address the overall building efficiency. In order to address such major renovations and additions, a complex phasing schedule is required and relies on multiple trailers for students for a duration of 3-4 years, negatively impacting the overall instruction of students. The cost comparison of the renovations and additions to new construction is an increase of roughly 15% for new construction. However, as stated, the final result of renovations and additions does not fully address all needs and has a greater negative impact on students. Therefore, it is our recommendation to construct a new replacement school.

A. EXISTING PLAN



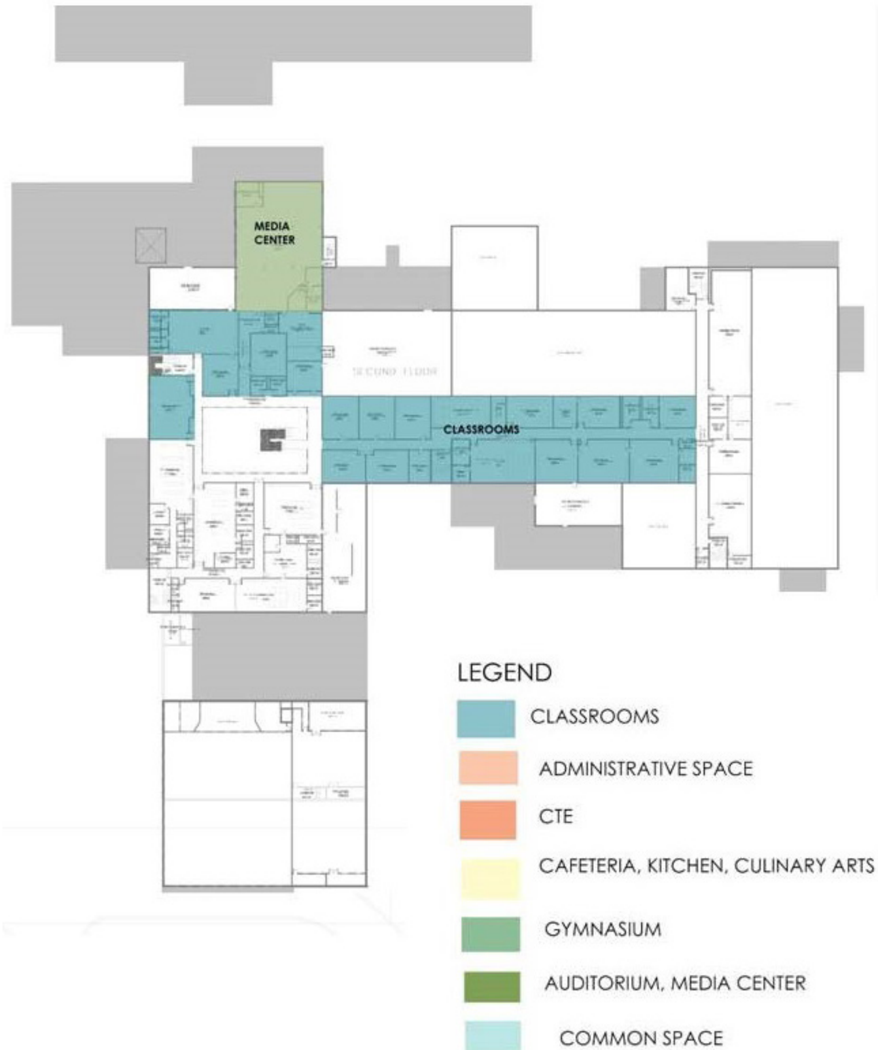
EXISTING FIRST FLOOR PLAN

B. PROPOSED RENOVATION AND ADDITION PLAN



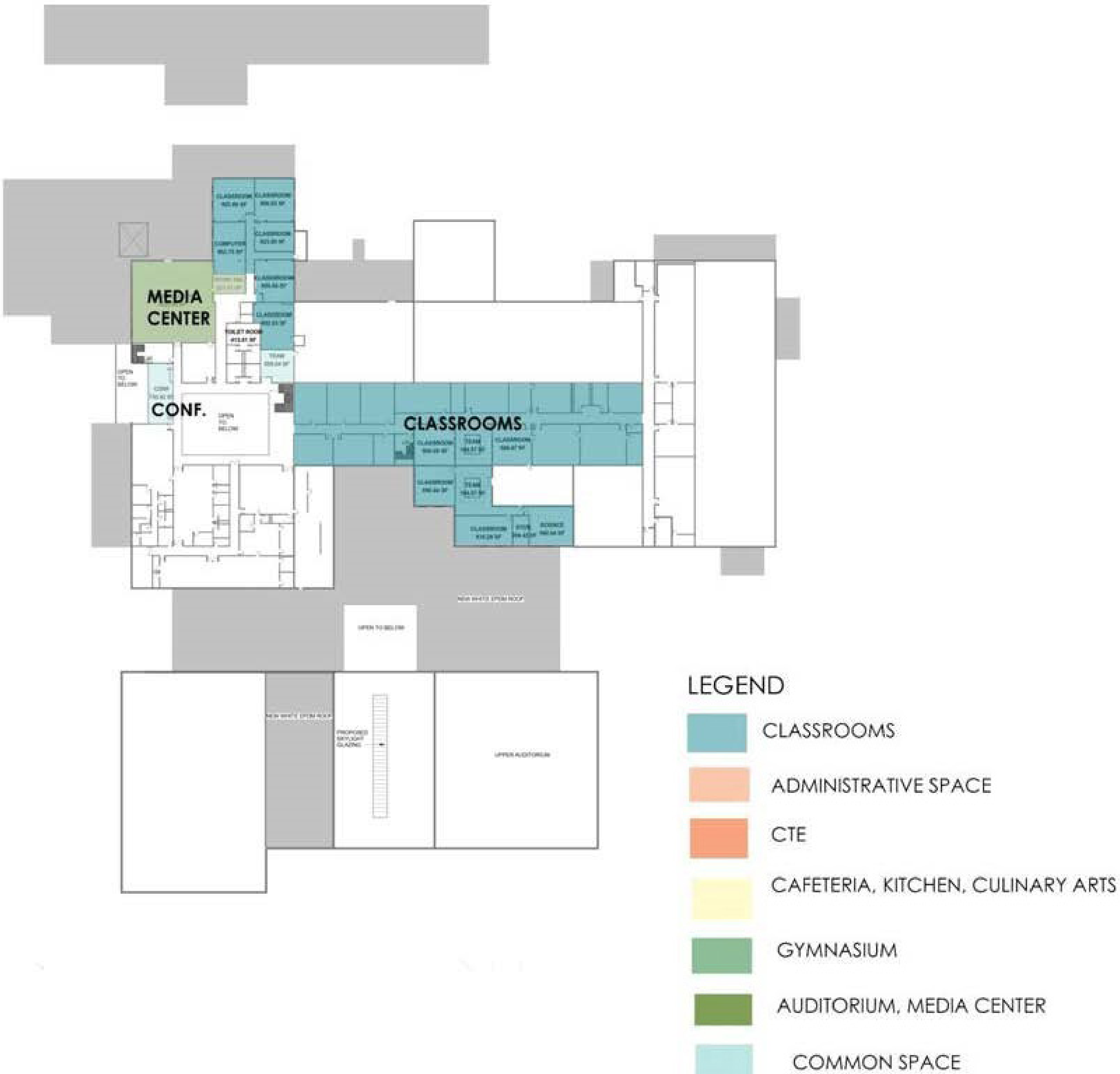
PROPOSED FIRST FLOOR PLAN

C. EXISTING PLAN



EXISTING SECOND FLOOR PLAN

D. PROPOSED RENOVATION PLAN



PROPOSED SECOND FLOOR PLAN

E. EXISTING CLASSROOM ASSESSMENT – CLASSROOM SIZE

- Existing classrooms meeting the state size requirements shown in **Green**.
- Undersized existing classrooms shown in **Orange**.

EXISTING FIRST AND SECOND FLOOR PLANS

F. PROPOSED CLASSROOM ASSESSMENT – CLASSROOM SIZE

- Proposed redesign - classrooms meeting the state size requirements shown in **Green**.
- Undersized existing classrooms shown in **Orange**.
- Flex space shown in **Blue**.

PROPOSED FIRST AND SECOND FLOOR PLANS

G. EXISTING CLASSROOM ASSESSMENT - DAYLIGHTING

- Existing classrooms meeting the state size requirements shown in **Yellow**.
- Existing classrooms with no daylight shown in **Purple**.

EXISTING FIRST AND SECOND FLOOR PLANS

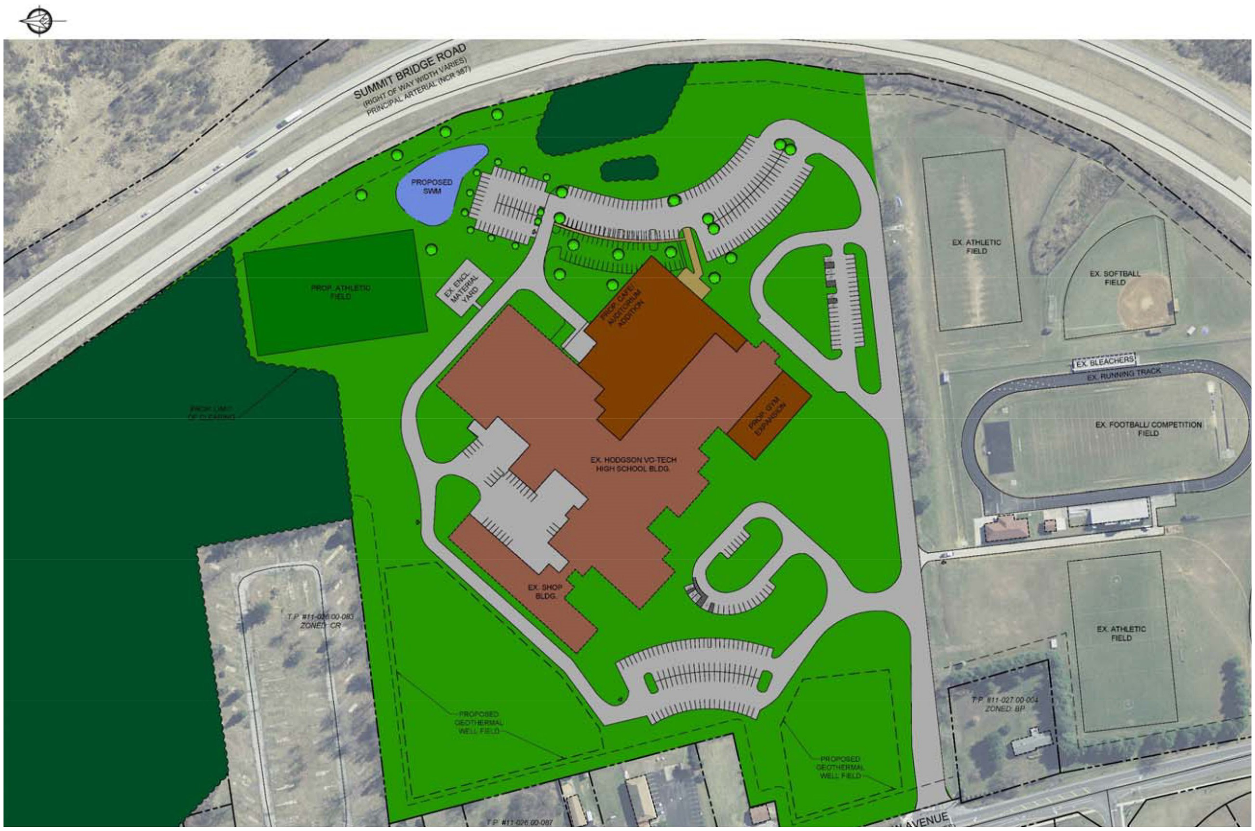
H. PROPOSED CLASSROOM ASSESSMENT - DAYLIGHTING

- Proposed classrooms with access to natural daylight and views shown in **Yellow**.
- Proposed classrooms with access to natural light shown in **Green**.
- Existing classrooms with no daylight shown in **Purple**.

PROPOSED FIRST AND SECOND FLOOR PLANS

I. EXISTING SITE PLAN

J. PROPOSED SITE PLAN FOR EXISTING BUILDING



K. PROPOSED PLAN – REPLACEMENT SCHOOL

PROPOSED LOCATION
OF NEW ATHLETIC FIELDS

PROPOSED LOCATION OF NEW
250, 000 SF FACILITY

HODGSON VOCATIONAL TECHNICAL HIGH SCHOOL – PROPOSED ALTERNATE – NEW FACILITY

PROPOSED ALTERNATE - AERIAL VIEW

L. PROPOSED SITE PLAN FOR REPLACEMENT SCHOOL

HODGSON VOCATIONAL TECHNICAL HIGH SCHOOL – PROPOSED SITE PLAN – NEW FACILITY

PROPOSED SITE PLAN - NEW FACILITY

Findings & Recommendations
MECHANICAL, PLUMBING, FIRE PROTECTION & ELECTRICAL

Paul M. Hodgson Vocational Technical High School

Newark, DE 19702

HVAC Building Assessment

PERFORMED FOR:

New Castle County Vo-Tech School District

10.21.2020

315 SOUTH CHAPEL STREET / NEWARK, DE 19711
ONE LIBERTY PLACE / 1650 MARKET STREET / 36TH FLOOR / PHILADELPHIA, PA 19103
T 302.738.7172 / F 302.738.7175 / WWW.DEDC-ENG.COM

DEDC
ENGINEERING | DESIGN | CONSULTING

DEDC
ENGINEERING | DESIGN | CONSULTING
WWW.DEDC-ENG.COM

0.0 **TABLE OF CONTENTS**

DEDC
ENGINEERING | DESIGN | CONSULTING
WWW.DEDC-ENG.COM

1.0 COMMONLY USED ACRONYMS AND ABBREVIATIONS

A	Amp
AFF	Above Finish Floor
AHU	Air Handling Unit
ATC	Automatic Temperature Control
BAS	Building Automation System
BOD	Bottom of Duct
CFH	Cubic Feet per Hour
CFM	Cubic Feet per Minute
CFS	Cubic Feet per Second
CHWS&R	Chilled Water Supply & Return
CV	Constant Volume
CVE	Constant Volume Exhaust Box
DDC	Direct Digital Control
DWDI	Double Width Double Inlet
EF	Exhaust Fan
FPM	Feet per Minute
GPM	Gallons per Minute
GSF	Gross Square Feet
HRC	Heat Recovery Coil
HWS&R	Hot water Supply & Return
ISM	Industrial Sheet Metal (Manufacturer)
KV	Kilovolt
KVA	Kilovolt Amp
KW	Kilowatt
LBS/HR	Pounds per Hour
LFD	Laminar Flow Diffuser
MCC	Motor Control Center
MEP	Mechanical, Electrical, Plumbing
MCFH	Thousand Cubic Feet per Hour
NBS	Nation Bureau of Standards
NFPA	National Fire Protection Association
OA	Outside Air
PM	Preventive Maintenance
PSI	Pounds per Square Inch
PSIG	Pounds per Square Inch Gauge
SD	Smoke Detector
SP	Static Pressure
UG	Underground
VAV	Variable Air Volume Supply Box
VEV	Variable Air Volume Exhaust Box
VFD	Variable Frequency Drive
WG	Water Gauge (Inches)
W/SF	Watts per Square Foot

DEDC
ENGINEERING | DESIGN | CONSULTING
WWW.DEDC-ENG.COM

2.0 INTRODUCTION

This report section will overview the existing cooling and heating systems at the Paul M. Hodgson Vocational Technical School. The sections will include the building cooling plant, building heating plant, automatic temperature controls system, and air handling systems. The system replacement recommendation(s) follow each equipment's existing conditions description. To determine the recommendations, our experience with similar systems and the ASHRAE median service life tables were utilized. Estimated equipment service life, according to the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) Handbook, is defined as the economic life of a system or component, or the amount of time it remains in its original service application. The remaining service life values reported in this document are based off the ASHRAE Equipment Life Expectancy Chart (see Appendix A) which uses median years to provide an indication of expected equipment service life. Many factors effect equipment service life and with any average, some systems may have lifetimes far from average. However, these median lifetimes provide a reasonable basis for establishing the remaining useful life of existing systems.

3.0 EXECUTIVE SUMMARY

A general site survey of the facilities was performed to review the existing HVAC systems. Record drawings were used to review systems serving rooms and calculate required ventilation rates.

The building cooling plant chillers, cooling tower and associated pumps are nearing the end of their useful lives and should be scheduled to be replaced.

The building heating plant boilers, domestic water heat exchangers and associated pumps are nearing the end of their useful lives and should be scheduled to be replaced.

The building pneumatic automatic temperature control system should be replaced and updated to direct digital controls.

Most of the air handling units and terminal heating units have exceeded their ASHRAE life expectancy and should be replaced. Approximately half of the classrooms do not have the International Mechanical Code / ASHRAE required outside air ventilation rates for students. Air handling units should be installed with higher outside air percentages than the existing units to correct this issue.

DEDC
ENGINEERING | DESIGN | CONSULTING
WWW.DEDC-ENG.COM

4.0 EXISTING CONDITIONS DISCUSSION AND RECOMMENDATIONS

4.1 Building Cooling Plant

Space cooling is provided by one (1) chilled water plant, located in the main building mechanical / electrical room. The plant has two (2) 1997 "Carrier" electric, water-cooled, centrifugal chillers rated for 480 nominal tons each. The chillers used R-134A refrigerant. The chilled water system operates utilizing a chilled water loop. The loop supplies constant volume to the chillers via two (2) constant speed chilled water pumps. Chilled water loop temperature is varied by either cooling it with the chillers and towers or by bypassing water through a bypass pipe. The primary pumps are each rated for 60 HP, 132 ft. of head, and 1068 GPM. These two (2) pumps were installed in 1997.

Figure 1: Chillers

Heat rejection for the chillers is provided by Baltimore Air Coil twin cell, induced draft, cross flow cooling tower located on a steel platform west of the main mechanical room. The cooling tower is equipped with two (2) tower fans, each rated for 30 HP. Condenser water is circulated by two condenser water pumps installed in 1997. These pumps are constant speed and are rated for 1440 gpm at 50 ft. of head. During the survey, green tower water was observed in the tower basins. The tower water chemistry should be reviewed as this quality water will affect tower performance.

DEDC
ENGINEERING | DESIGN | CONSULTING
WWW.DEDC-ENG.COM

Figure 2: Cooling Tower and Basin (showing green water)

The ASHRAE median service life for centrifugal chillers such as those described above is 23 years (see Appendix A). Given the age of the chillers, it is recommended to replace them within the 6 to10-year timeframe.

The ASHRAE median service life for cooling towers such as those described above is 20 years. Given the age of the chillers, it is recommended to replace them within the 6 to10-year timeframe.

The ASHRAE median service life for base mounted pumps such as those described above is 25 years. Given the age of the chilled water and condenser water pumps, it is recommended to replace them within the 6 to 10-year timeframe.

Priority 1: Code/Life Safety Issues

1. None

Priority 2: Critical Repairs, Use and Operating Cost Issues

1. None

Priority 3: Non-Critical Repairs

1. Replace chillers in the next 6-10 years
2. Replace chilled water pumps in the next 6-10 years. The chilled water pumps are constant volume. Pumping energy can be saved if VFDs were installed the system control methodology was changed to variable primary flow.
3. Replace cooling tower in the next 6-10 years
4. Replace condenser pumps in the next 6-10 years
5. Review condenser water chemistry and adjust.

DEDC
ENGINEERING | DESIGN | CONSULTING
WWW.DEDC-ENG.COM

6. Pneumatic control systems should be replaced and updated to direct digital controls.

4.2 Building Heating Plant

Space heating is provided by one (1) heating water plant, located in the main building mechanical / electrical room. The plant has two (2) 1974 "Kewanee" hot water boilers rated for 300 boiler horsepower each. Each boiler has a Superior Boiler gas/Oil burner for dual fuel capability. The heating water system operates utilizing a heating water loop. The loop supplies constant volume to the building via two (2) constant speed primary heating water pumps. The system pumps are each rated for 30 HP, 40 ft. of head, and 1730 GPM and were replaced in 1990. The boilers inject water into the loop via (2) boiler pumps. The boiler pumps are each rated for 10 HP, 30 ft. of head, and 1000 GPM and were replaced in 1990

Figure 3: Boilers

DEDC
ENGINEERING | DESIGN | CONSULTING
WWW.DEDC-ENG.COM

Domestic hot water is made with indirect storage tanks. Heating hot water is pumped through heat exchangers in the tanks and warms the domestic water. In summer, a small 199MBH Lochinvar condensing boiler heats the domestic water so that the boilers can be taken off-line.

Figure 4: Domestic Hot Water System

The ASHRAE median service life for boilers such as those described above is 35 years (see Appendix A). Given the age of the boilers, it is recommended to replace them within the 6 to10-year timeframe.

The ASHRAE median service life for base mounted pumps such as those described above is 25 years. Given the age of the primary and secondary pumps, it is recommended to replace them within the 6 to 10-year timeframe.

The ASHRAE median service life for shell and tube heat exchangers such as those used to make domestic hot water is 24 years. Given the age of the heat exchangers, it is recommended to replace them within the 6 to 10-year timeframe.

DEDC
ENGINEERING | DESIGN | CONSULTING
WWW.DEDC-ENG.COM

Priority 1: Code/Life Safety Issues

1. None

Priority 2: Critical Repairs, Use and Operating Cost Issues

1. None

Priority 3: Non-Critical Repairs

1. Replace boilers in the next 6-10 years. Consider replacing with high efficiency condensing boilers for energy savings
2. Replace the system and boiler pumps in the next 6-10 years
3. Replace the domestic hot water heat exchangers in the next 6-10 years
4. Pneumatic control systems should be replaced and updated to direct digital controls.

4.3 Automatic Temperature Controls

Pneumatic controls are currently used throughout the building. Air compressors in the main mechanical room are used to provide pressurized air via pneumatic piping to control valves and actuators. Pneumatic controls are accurate when maintained but doing so is time consuming. Leaks in pneumatic tubing are also difficult to isolate and repair.

Figure 5: Pneumatic Controls Compressors, Dryers and Representative Panel

The ASHRAE median service life for pneumatic controls and actuators such as those described above is 20 years (see Appendix A). Given the age of the pneumatics, and advances in digital controls, it is recommended to replace them as soon as possible

Priority 1: Code/Life Safety Issues

1. None

Priority 2: Critical Repairs, Use and Operating Cost Issues

1. Pneumatic controls need frequent adjustment. Replacing the controls system will allow for better control which will lead to lower overall operating costs at the school.

Priority 3: Non-Critical Repairs

1. None

4.4 Air Handling Systems

Almost all the air handling units and return fans in the school are the original units installed in 1974. Constant volume units that provide heating, ventilation and air conditioning to classrooms, offices, the library, conference rooms and the cafeteria introduce approximately 20% of their total airflow as ventilation air from the outside. The air is delivered to the rooms through terminal reheat boxes with hot water coils. Thermostats in the rooms are used to control the terminal reheats.

Constant volume units that provide heating and ventilation air to the gym provide 50% of their airflow from the outside. Constant volume units that provide heating and ventilation air to shops can provide 100% of their airflow from the outside. Temperatures for these are controlled at the unit with no local thermostats.

Figure 6: Typical Return Fan

Figure 7: Typical Air Handling Unit

Pneumatic controls are used in the air handling systems as follows:

- Pneumatic actuators on dampers to open and close depending on space occupancy
- Pneumatic thermostats coupled with valve actuators vary the amount of chilled and heating water to coils

As students and teachers return to schools during the COVID-19 pandemic, understanding the heating, ventilating and air conditioning system's role in airborne pathogen prevention is extremely important. Ventilation, filtration and air distribution technologies have the potential to limit airborne pathogen transmission. Limiting airborne pathogen transmission can help break the chain of infection transmission. Methods and procedures to address airborne transmission include 1) source control, 2) source removal, and 3) dilution ventilation. Source control includes the tools we are all aware of, such as wearing face coverings and social distancing. Source removal includes using tools such as increased filtering of room air or utilizing air purification technology. Dilution ventilation involves increasing the outdoor airflow to the HVAC system and increasing the air change rate within a space.

The American Society of Heating, Refrigerating and Air-conditioning Engineers (ASHRAE) has developed a measurement scale to report the effectiveness of air filters. Minimum Efficiency Reporting Value, commonly known as MERV. MERV ratings are on a scale of 1 to 20 depending on the minimum size of the particles a filter can capture. For example, a filter with a MERV rating of 1 to 4 captures particles greater than 10 microns. Typical code-compliant commercial buildings utilize MERV 4 or MERV 7 filtration. ASHRAE has indicated that a minimum filtration level of MERV 13 or MERV 14 to help reduce the spread of airborne pathogens. The existing units were designed to use a maximum MERV-8 filtration. The existing fans and motors most likely cannot handle the increased static pressure across MERV-13/14 filters. This increased pressure drop across the filters will also result in lower airflow to the spaces which is not recommended as this will lower the amount of ventilation air to rooms.

Additionally, the use of Ultraviolet Germicidal Irradiation (UVGI) has been found to inactivate microorganisms by damaging the structure of nucleic acids and proteins. UVGI in HVAC systems is accomplished with the use of UV-C lights installed in the air handling unit or ductwork. UV-C lights could be added to the existing units, but they work best when used in combination with MERV-13/14 level filtration.

Ensuring the proper amount of code required ventilation air from outdoors dilutes the concentration of airborne pathogens in the space. The 2015 International Mechanical Code requires the following amount of ventilation air to be supplied to high occupancy rooms at the school:

Room	Ventilation Air per Person (cfm/person)	Ventilation Air per Square Foot of Floor Area (cfm/SF)
Classrooms	10 cfm/person	0.12 cfm/SF
Gym (playing area)	20 cfm/person	0.18 cfm/SF
Gym (spectator area)	7.5 cfm/person	0.06 cfm/SF
Weight Rooms	20 cfm/person	0.06 cfm/SF
Libraries	5 cfm/person	0.12 cfm/SF
Multi-Use Assembly	7.5 cfm/person	0.06 cfm/SF
Science Laboratories	10 cfm/person	0.18 cfm/SF

Dilution ventilation would require introducing the above rates or more of the required outside air. Out of the one hundred rooms reviewed, forty-three (43) of

DEDC
ENGINEERING | DESIGN | CONSULTING
WWW.DEDC-ENG.COM

them did not have the required ventilation (see Appendix B). Due to the design of the air handling units serving these spaces (fans, motors, coil sizing) it is not possible to increase the ventilation air to the required levels.

The ASHRAE median service life for the HVAC units and return fans such as those described above is 20 years for coils and 25 years for fans (see Appendix A). Given the age of these units it is recommended to replace them as soon as possible. When the units are replaced, they can be sized for MERV-13/14 filtration, have UV-C lights pre-installed and have coils sized to allow increased ventilation to rooms.

The ASHRAE median service life for pneumatic controls and actuators is 20 years. Given the age of the control system it is recommended to replace it as soon as possible.

Priority 1: Code/Life Safety Issues

1. IMC required ventilation rates are not met in several classrooms. Replacing air handling systems serving these spaces should be a top priority.

Priority 2: Critical Repairs, Use and Operating Cost Issues

1. Pneumatic controls need frequent adjustment. Replacing the controls system will allow for better control which will lead to lower overall operating costs at the school.

Priority 3: Non-Critical Repairs

1. None

5.0 APPENDICES

5.1 Appendix A: ASHRAE Equipment Life Expectancy Chart

5.2 Appendix B: Existing Building Ventilation Calculations

ASHRAE Equipment Life Expectancy chart

ASHRAE is the industry organization that sets the standards and guidelines for most all HVAC-R equipment.
For additional info about ASHRAE the website is www.ashrae.org .

Equipment Item	Median Years
Air conditioners	
Window unit	10
Residential single or Split Package	15
Commercial through-the wall	15
Water-cooled package	15
Heat Pumps	
Residential air-to-air	15
Commercial air-to-air	15
Commercial water-to-air	19
Roof-top air conditioners	
Single-zone	15
Multi-zone	15
Boilers, hot water (steam)	
Steel water-tube	24 (30)
Steel fire-tube	25 (25)
Cast iron	35 (30)
Electric	15
Burners	21
Furnaces	
Gas- or oil-fired	18
Unit heaters	
Gas or electric	13
Hot water or steam	20
Radiant Heaters	
Electric	10
Hot water or steam	25

Equipment Item	Median Years
Air terminals	
Diffusers, grilles, and registers	27
Induction and fan coil units	20
VAV and double-duct boxes	20
Air washers	17
Ductwork	30
Dampers	20
Fans	
Centrifugal	25
Axial	20
Propeller	15
Ventilating roof-mounted	20
Coils	
DX, water, or steam	20
Electric	15
Heat Exchangers	
Shell-and-tube	24
Reciprocating compressors	20
Packaged chillers	
Reciprocating	20
Centrifugal	23
Absorption	23
Cooling towers	
Galvanized metal	20
Wood	20
Ceramic	34

Equipment Item	Median Years
Air-cooled condensers	20
Evaporative condensers	20
Insulation	
Molded	20
Blanket	24
Pumps	
Base-mounted	20
Pipe-mounted	10
Sump and well	10
Condensate 15	
Reciprocating engines	20
Steam turbines	30
Electric motors	18
Motor starters	17
Electric transformers	30
Controls	
Pneumatic	20
Electric	16
Electronic	15
Valve actuators	
Hydraulic	15
Pneumatic	20
Self-contained	10

Appendix B: Hodgson Vocational Technical High School
Existing Building Ventilation Calculations

AHU #	Floor	Rm. No.	Room Name	IMC Occupancy Classification	Base Area (SF)	Assigned Capacity from District	Default IMC Occupancy/ 1000SF (if Assigned Capacity not provided)	Occupancy for Ventilation Calculation	Required Ventilation Rate per Person Rp (cfm/person)	Required Ventilation Rate by Area Ra (cfm/SF)	**IMC Code Required Ventilation to Room (cfm)**	AHU OA Percentage (Original Design)	HVAC to Room from AHU (cfm)	Current Ventilation to Room (cfm)	Enough ASHRAE 62.1 Ventilation?
AH3	GYM	93	WRESTLING ROOM	Gym, sports arena (play area)	5087		7	36	20	0.18	1628	50	7500	3750	YES
AH12	1	101	EARLY CHILDHOOD	Classrooms (ages 5–8)	1305	21	-	21	10	0.12	367	20	2250	450	YES
AH12	1	101G	CLASSROOM	Classrooms (age 9 plus)	541	15	-	15	10	0.12	215	20	1400	280	YES
AH12	1	103	BUSINESS LAB	Wood/metal shop	1324	21	-	21	10	0.18	448	100	1000	1000	YES
AH12	1	104	TYPING ROOM	Classrooms (age 9 plus)	1288	30	-	30	10	0.12	455	20	2600	520	YES
AH12	1	105	ACCOUNTING	Classrooms (age 9 plus)	998	24	-	24	10	0.12	360	20	1600	320	NO
AH13	1	106	COSMETOLOGY	Classrooms (age 9 plus)	2716	21	-	21	10	0.12	536	20	4200	840	YES
AH13	1	106E	CLASSROOM	Classrooms (age 9 plus)	890	21	-	21	10	0.12	317	20	1500	300	NO
AH15	1	108	COMPUTER ROOM	Classrooms (age 9 plus)	600	17	-	17	10	0.12	242	20	430	86	NO
?	1	112	DRAFTING	Classrooms (age 9 plus)	1426	21	-	21	10	0.12	381	20	?	?	?
?	1	112B	DRAFTING	Classrooms (age 9 plus)	636	21	-	21	10	0.12	286	20	?	?	?
?	1	112C	CLASSROOM	Classrooms (age 9 plus)	650	19	-	19	10	0.12	268	20	?	?	?
AH28	1	113	CULINARY ARTS	Classrooms (age 9 plus)	1489	21	-	21	10	0.12	389	100	5650	5650	YES
AH1	1	113B	FACULTY DINING	Cafeteria/fast-food dining	822		100	82	7.5	0.18	764	20	1580	316	NO
Unit Vent	1	113C	CLASSROOM	Classrooms (age 9 plus)	665	19	-	19	10	0.12	270	20	?	?	?
AH10	1	114	CLASSROOM	Classrooms (age 9 plus)	672	19	-	19	10	0.12	271	20	1200	240	NO
AH31,32	1	115	MACHINE SHOP	Wood/metal shop	3563	21	-	21	10	0.18	851	100	19000	19000	YES
?	1	115B	CLASSROOM	Classrooms (age 9 plus)	618	17	-	17	10	0.12	244	20	?	?	?
AH31/32	1	115D	INSPECTION	Wood/metal shop	266		20	5	10	0.18	101	100	1000	1000	YES
AH31/32	1	115E	HEAT TREAT	Wood/metal shop	413		20	8	10	0.18	157	100	1000	1000	YES
AH10	1	116	CLASSROOM	Classrooms (age 9 plus)	674	19	-	19	10	0.12	271	20	1200	240	NO
AH10	1	116A	CLASSROOM	Classrooms (age 9 plus)	709	20	-	20	10	0.12	285	20	820	164	NO
AH8	1	117	CLASSROOM	Classrooms (age 9 plus)	619	17	-	17	10	0.12	244	20	1200	240	NO
AH42	1	118	ELECTRONICS	Wood/metal shop	1133	21	-	21	10	0.18	414	20	4600	920	YES
AH33,34	1	119	MILLWRIGHT	Wood/metal shop	3222	21	-	21	10	0.18	790	100	24000	24000	YES
AH42	1	120	ELECTRICAL TRADE	Wood/metal shop	3080	21	-	21	10	0.18	764	20	4600	920	YES
AH10	1	120A	CLASSROOM	Classrooms (age 9 plus)	478		35	17	10	0.12	225	20	820	164	NO
AH10	1	120B	MOTOR CONT.	Wood/metal shop	680	21	-	21	10	0.18	332	20	1200	240	NO
?	1	120E	CLASSROOM	Classrooms (age 9 plus)	341		35	12	10	0.12	160	20	?	?	?
AH40,41	1	122	MASONRY	Wood/metal shop	3407	21	-	21	10	0.18	823	20	6400	1280	YES
AH10	1	122B	CLASSROOM	Classrooms (age 9 plus)	474		35	17	10	0.12	223	20	300	60	NO
AH10	1	124	CLASSROOM	Classrooms (age 9 plus)	652	19	-	19	10	0.12	268	20	1200	240	NO
AH3	1	125	CLASSROOM	Classrooms (age 9 plus)	699	20	-	20	10	0.12	284	20	1900	380	YES
AH37,39	1	126	CARPENTRY	Wood/metal shop	4714	21	-	21	10	0.18	1059	60	6400	3840	YES
AH38	1	126E	FINISH ROOM	Wood/metal shop	353		20	7	10	0.18	134	100	10000	10000	YES
AH3	1	127	CLASSROOM	Classrooms (age 9 plus)	660	19	-	19	10	0.12	269	20	650	130	NO
AH36	1	128	PLUMBING	Wood/metal shop	2408	21	-	21	10	0.18	643	100	3200	3200	YES

Appendix B: Hodgson Vocational Technical High School
Existing Building Ventilation Calculations

AHU #	Floor	Rm. No.	Room Name	IMC Occupancy Classification	Base Area (SF)	Assigned Capacity from District	Default IMC Occupancy/ 1000SF (if Assigned Capacity not provided)	Occupancy for Ventilation Calculation	Required Ventilation Rate per Person Rp (cfm/person)	Required Ventilation Rate by Area Ra (cfm/SF)	**IMC Code Required Ventilation to Room (cfm)**	AHU OA Percentage (Original Design)	HVAC to Room from AHU (cfm)	Current Ventilation to Room (cfm)	Enough ASHRAE 62.1 Ventilation?
?	1	128B	CLASSROOM	Classrooms (age 9 plus)	381		35	13	10	0.12	179	20	?	?	?
AH3	1	129	CLASSROOM	Classrooms (age 9 plus)	654	19	-	19	10	0.12	268	20	750	150	NO
AH35	1	130	HVAC	Wood/metal shop	1775	21	-	21	10	0.18	530	100	3200	3200	YES
AH11	1	130B	CLASSROOM	Classrooms (age 9 plus)	670	19	-	19	10	0.12	270	20	1200	240	NO
AH3	1	131	CLASSROOM	Classrooms (age 9 plus)	944	22	-	22	10	0.12	333	20	1500	300	NO
AH1	1	132	CLASSROOM	Classrooms (age 9 plus)	709	20	-	20	10	0.12	285	20	1000	200	NO
AH1	1	134	CLASSROOM	Classrooms (age 9 plus)	838	21	-	21	10	0.12	311	20	1100	220	NO
AH1	1	136	CLASSROOM	Classrooms (age 9 plus)	821	21	-	21	10	0.12	309	20	800	160	NO
AH1	1	138	CLASSROOM	Classrooms (age 9 plus)	831	21	-	21	10	0.12	310	20	500	100	NO
AH1	1	140	CLASSROOM	Classrooms (age 9 plus)	822	21	-	21	10	0.12	309	20	500	100	NO
AH1	1	142	CLASSROOM	Classrooms (age 9 plus)	672	19	-	19	10	0.12	271	20	1000	200	NO
AH22,23,24	SHOP	146	AUTO MECHANICS	Wood/metal shop	4993	21	-	21	10	0.18	1109	100	7050	7050	YES
AH18	SHOP	146A	CLASSROOM	Classrooms (age 9 plus)	669	19	-	19	10	0.12	270	20	1040	208	NO
AH24	SHOP	146E	DYNO ROOM	Wood/metal shop	487		20	10	10	0.18	185	100	2300	2300	YES
AH18	SHOP	148	CLASSROOM	Classrooms (age 9 plus)	640	18	-	18	10	0.12	257	20	1040	208	NO
AH19,20,21	SHOP	149	AUTO BODY	Wood/metal shop	4883	21	-	21	10	0.18	1089	100	16500	16500	YES
AH18	SHOP	149C	CLASSROOM	Classrooms (age 9 plus)	669	19	-	19	10	0.12	270	20	1040	208	NO
AHLIB	1	150	CLASSROOM	Classrooms (age 9 plus)	702	20	-	20	10	0.12	284	30	860	258	NO
AHLIB	1	151	CLASSROOM	Classrooms (age 9 plus)	1052	26	-	26	10	0.12	386	30	1200	360	NO
AHLIB	1	152	CLASSROOM	Classrooms (age 9 plus)	602	17	-	17	10	0.12	242	30	800	240	NO
AHLIB	1	153	CLASSROOM	Classrooms (age 9 plus)	731	21	-	21	10	0.12	298	30	900	270	NO
AHLIB	1	154	CLASSROOM	Classrooms (age 9 plus)	1077	27	-	27	10	0.12	399	30	1400	420	YES
?	1	155	CLASSROOM	Classrooms (age 9 plus)	520	14	-	14	10	0.12	202	20	?	?	?
AHDX1	1	156	CLASSROOM	Classrooms (age 9 plus)	906	21	-	21	10	0.12	319	23	1600	368	YES
AHDX2	1	157	CLASSROOM	Classrooms (age 9 plus)	869	21	-	21	10	0.12	314	25	1600	400	YES
AH5	1	166	COMMONS AREA	Multiuse assembly	6777	30	-	30	7.5	0.06	632	20	11000	2200	YES
AH6	1	171	CAFETERIA	Cafeteria/fast-food dining	3051		100	305	7.5	0.18	2837	100	5750	5750	YES
AH25/26	SHOP	179	MAINTENANCE SHOP	Wood/metal shop	4081		20	82	10	0.18	1551	100	4700	4700	YES
AH1	1	181	WEIGHT ROOM	Health club/weight rooms	1219		10	12	20	0.06	317	20	1000	200	NO
AH4	GYM	196	WEIGHT ROOM	Health club/weight rooms	533		10	5	20	0.06	139	50	750	375	YES
AH6	GYM	198	LOBBY	Lobbies	997		150	150	5	0.06	808	50	2800	1400	YES
AH1/2	GYM	199	GYMNASIUM	Gym, sports arena (play area)	7141	42	-	42	20	0.18	2125	50	11040	5520	YES
AH1/2	GYM	199	BLEACHERS	Spectator areas	2500		150	375	7.5	0.06	2963	50	11040	5520	YES
AH16	2	200	DENTAL LAB	Classrooms (age 9 plus)	1413	21	-	21	10	0.12	380	20	2200	440	YES
AH16	2	201	CLASSROOM	Classrooms (age 9 plus)	1240	30	-	30	10	0.12	449	20	2200	440	NO
AH16	2	202	DENTAL LAB	Classrooms (age 9 plus)	1268	21	-	21	10	0.12	362	20	1890	378	YES
AH16	2	202D	CASTING	Classrooms (age 9 plus)	145		35	5	10	0.12	68	20	350	70	YES

Page 2 of 3

Appendix B: Hodgson Vocational Technical High School
Existing Building Ventilation Calculations

AHU #	Floor	Rm. No.	Room Name	IMC Occupancy Classification	Base Area (SF)	Assigned Capacity from District	Default IMC Occupancy/ 1000SF (if Assigned Capacity not provided)	Occupancy for Ventilation Calculation	Required Ventilation Rate per Person Rp (cfm/person)	Required Ventilation Rate by Area Ra (cfm/SF)	**IMC Code Required Ventilation to Room (cfm)**	AHU OA Percentage (Original Design)	HVAC to Room from AHU (cfm)	Current Ventilation to Room (cfm)	Enough ASHRAE 62.1 Ventilation?
AH28	2	203	NURSE TECH	Classrooms (age 9 plus)	1367	21	-	21	10	0.12	374	20	3000	600	YES
AH28	2	203A	CLASSROOM	Classrooms (age 9 plus)	653	19	-	19	10	0.12	268	20	1200	240	NO
AH15	2	204	CLASSROOM	Classrooms (age 9 plus)	808	21	-	21	10	0.12	307	20	1800	360	YES
AHLIB	2	205	CLASSROOM	Classrooms (age 9 plus)	750	21	-	21	10	0.12	300	20	1200	240	NO
AH15	2	206	SCIENCE LAB	Science laboratories	912	21	-	21	10	0.18	374	20	2200	440	YES
AH7	2	207	CLASSROOM	Classrooms (age 9 plus)	736	21	-	21	10	0.12	298	20	1400	280	NO
AHLIB	2	208	CLASSROOM	Classrooms (age 9 plus)	737	21	-	21	10	0.12	298	20	1200	240	NO
AH7	2	209	CLASSROOM	Classrooms (age 9 plus)	734	21	-	21	10	0.12	298	20	1400	280	NO
AH13	2	210	SCIENCE LAB	Science laboratories	1123	21	-	21	10	0.18	412	20	2200	440	YES
AH7	2	211	CLASSROOM	Classrooms (age 9 plus)	674	19	-	19	10	0.12	271	20	1000	200	NO
AH7	2	212	CLASSROOM	Classrooms (age 9 plus)	622	18	-	18	10	0.12	255	20	1300	260	YES
AH7	2	213	SCIENCE LAB	Science laboratories	785	21	-	21	10	0.18	351	20	900	180	NO
AH7	2	214	CLASSROOM	Classrooms (age 9 plus)	626	18	-	18	10	0.12	255	20	1300	260	YES
AH9	2	215	CLASSROOM	Classrooms (age 9 plus)	694	20	-	20	10	0.12	283	20	1600	320	YES
AH9	2	218	SCIENCE LAB	Science laboratories	1097	21	-	21	10	0.18	407	20	3000	600	YES
AH9	2	219	CLASSROOM	Classrooms (age 9 plus)	630	18	-	18	10	0.12	256	20	1200	240	NO
AH9	2	220	CLASSROOM	Classrooms (age 9 plus)	784	21	-	21	10	0.12	304	20	1000	200	NO
AH9	2	221	CLASSROOM	Classrooms (age 9 plus)	556	15	-	15	10	0.12	217	20	2300	460	YES
AH9	2	222	CLASSROOM	Classrooms (age 9 plus)	899	21	-	21	10	0.12	318	20	2700	540	YES
AH9	2	223	CLASSROOM	Classrooms (age 9 plus)	893	21	-	21	10	0.12	317	20	2200	440	YES
AH11	2	224	SCIENCE CLASSROOM	Classrooms (age 9 plus)	1317	21	-	21	10	0.12	368	20	800	160	NO
AH11	2	226	CLASSROOM	Classrooms (age 9 plus)	682	20	-	20	10	0.12	282	20	1600	320	YES
?	2	227	CLASSROOM	Classrooms (age 9 plus)	441		35	15	10	0.12	207	20	?	?	?
AH11	2	228	DRAFTING LAB	Classrooms (age 9 plus)	2408	21	-	21	10	0.12	499	20	2400	480	NO
?	2	230	CLASSROOM	Classrooms (age 9 plus)	506	14	-	14	10	0.12	201	20	?	?	?
AHLIB	2	237	LIBRARY	Libraries	4571		10	46	5	0.12	777	30	2050	615	NO
AHLIB	2	237D	COMP ROOM	Classrooms (age 9 plus)	648		35	23	10	0.12	305	30	1600	480	YES

Page 3 of 3

FINDINGS

A. Mechanical Equipment & Systems Index Rating 5

The existing HVAC systems were originally designed to support a part time facility. Once the facility was expanded to become a full time instructional facility with reconfiguration of classroom and supporting spaces to accommodate the full-time students, the building systems were and remain inadequate to support the current student capacity.

The existing Hodgson Vocational Technical High School consists of 189,000 ft2 of fully conditioned (heated and cooled) spaces and 116,000 ft2 of technical career training labs and gymnasium that are only heated and ventilated. The original school was constructed in 1973 with M/E/P renovations/additions in 1996 and 1997. Furthermore, a gym addition was constructed in 1990 with its own central heating plant.

The existing heating, ventilating and air conditioning systems serving Hodgson Vo-Tech consists of the following equipment/components:

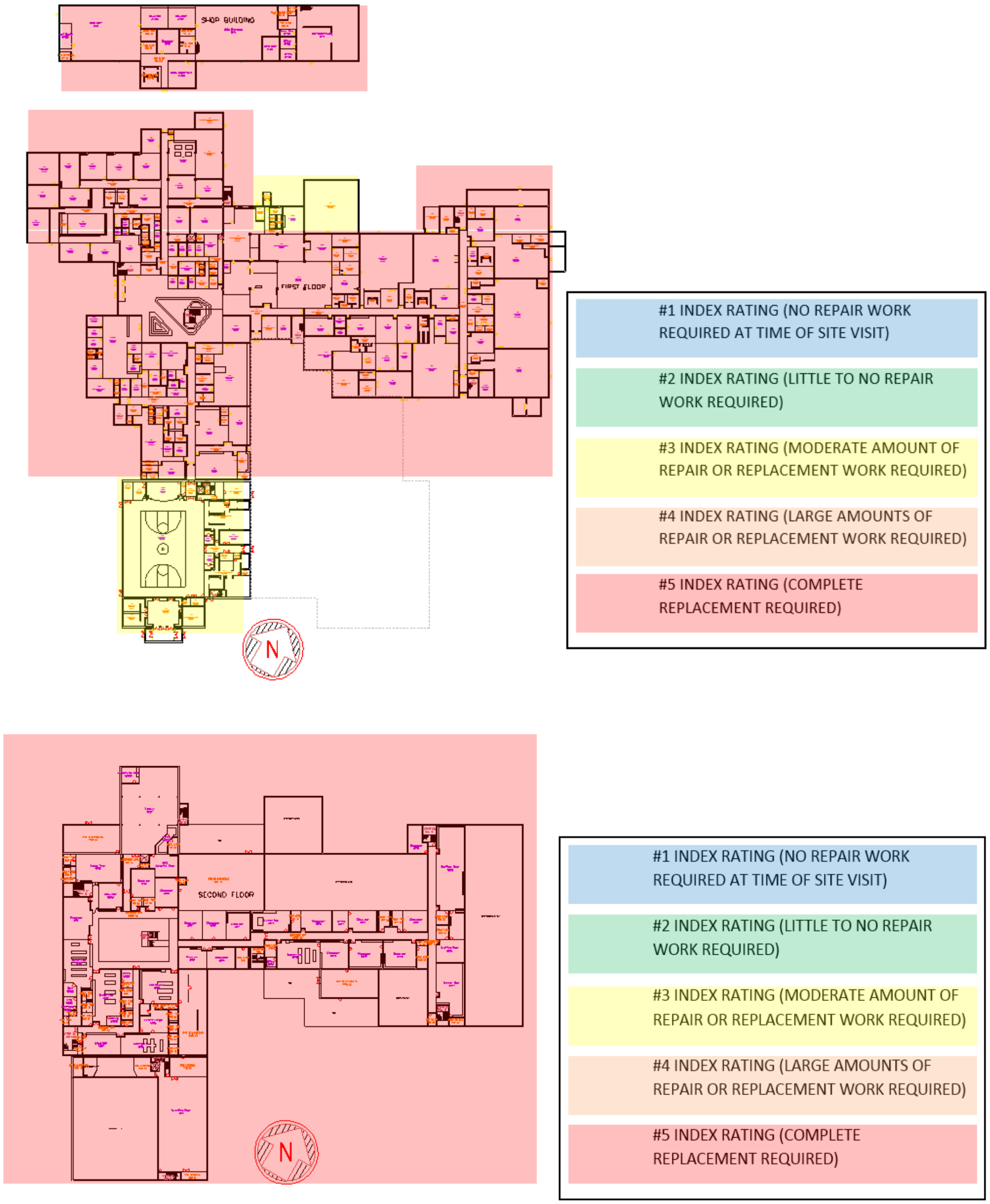
Main School

1. Four (4) pipe hydronic heating/cooling systems.
2. Two (2) dual fuel type L3-300-05 Kewaunee fire tube boilers. Capacity = 10,043 mbh each. (Where 1 mbh = 1,000 btu/hr)
3. Two (2) water-cooled Carrier chillers model 19XR-46-56903. Capacity = 480 tons each. (Where 1 ton = 12,000 btu/hr)
4. One (1) air-cooled chiller that serves library and first floor spaces below the library. York model YCAZ33TD3. Capacity = 30 tons
5. Two (2) Baltimore air-cooled cooling towers, model 3485-2WR. Capacity = 500 tons each.
6. Forty-five (45) central station air handling Units.
7. Thirty-three (33) pumps and circulators.
8. Forty-five (45) power roof ventilator exhaust fans.
9. Seventy-one (71) miscellaneous exhaust fans of various types.
10. Three (3) duct mounted hot water coils.
11. Approximately two hundred thirty-eight (238) hydronic terminal re-heat units.
12. Eighteen (18) return air fans.
13. Sixteen (16) hot water cabinet unit heaters.
14. Twenty-two (22) hot water propeller unit heaters
15. Five (5) compression type expansion tanks.
16. Ten Thousand (10,000) gallon underground fuel oil storage tank.

Gymnasium

1. Heating-only hydronic plant constructed in 1990 (No Mechanical Air Conditioning).
2. Two (2) cast iron sectional Weil McLain hot water boilers. Model 994 Capacity = 2,300,000 btu/hr each.
3. Six (6) heating water pumps, two (2) of the pump serve a domestic hot water generator.
4. Two (2) hot water expansion tanks.
5. Six (6) central station heating and ventilating units.
6. Ten (10) hydronic cabinet unit heaters
7. Eleven (11) exhaust fans.

Due to the age and condition of the existing HVAC systems the index rating for the majority of the school is an Index #5. Index #5 requires a complete replacement of the existing systems. ***Mechanical Figure #1*** illustrates the areas of the building and the associated index description.



Mechanical Figure #1 – HVAC Index – Hodgson High School

HVAC Index Rating Summary:

Based on our assessment of the facility, we have determined that the majority of the building's HVAC systems and components of construction have an HVAC Index Rating of #5, (Extremely Poor) – Requiring 100% replacement necessary to allow the systems to function properly, meet code, operate efficiently, and provide code required ventilation airflow. The exceptions, which we rated as an HVAC index rating of #3 were the chillers located in the boiler room and the HVAC gym equipment located in the gym addition.

The next portion of the report will review the HVAC system findings in detail. We will separate the HVAC portion into the Main School (Originally built in 1973) and the gym addition (Originally built in 1990).

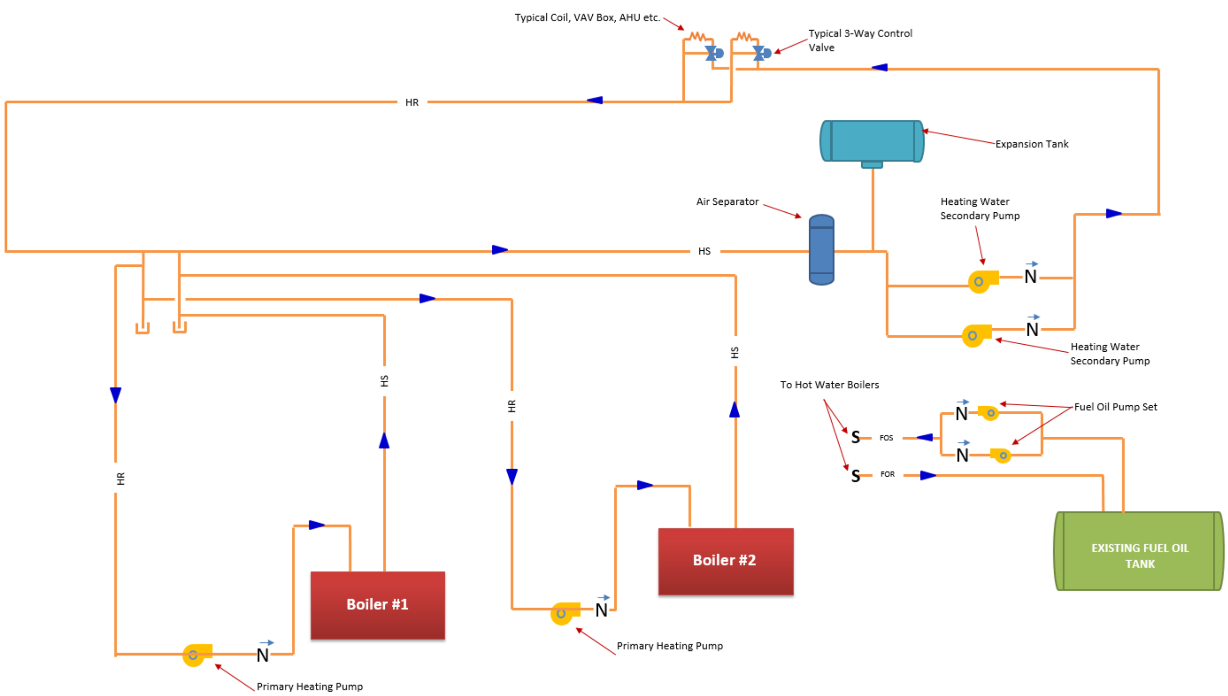
Main School

The main central hot water boilers can be seen in ***Mechanical Photographs #1A and #1B***.

Mechanical Photograph #1A
Main School Boiler

Mechanical Photograph #1B
Main School Boiler

The existing boilers are Kewaunee fire tube boilers with a nominal capacity rating of 10,043 MBH (MBH = 1,000 Btuhs). The boilers are approximately 43 years old and although very well maintained, the boilers are at the end of their useful service life and should be replaced. Based on the age of the equipment, the boilers are operating at approximately 60% to 70% efficiency, which is very poor compared to current standards. The boilers are currently served by natural gas and No. 2 Fuel Oil. The hot water plant provides hot water to a variety of air handling units, unit heaters, VAV boxes, terminal re-heat boxes, and duct coils. ***Mechanical Figure #2*** shows the existing hot water system serving the Main School Building. As indicated, the heating water pumps are arranged in a primary/secondary arrangement with a lead/lag redundant pump on the secondary loop.

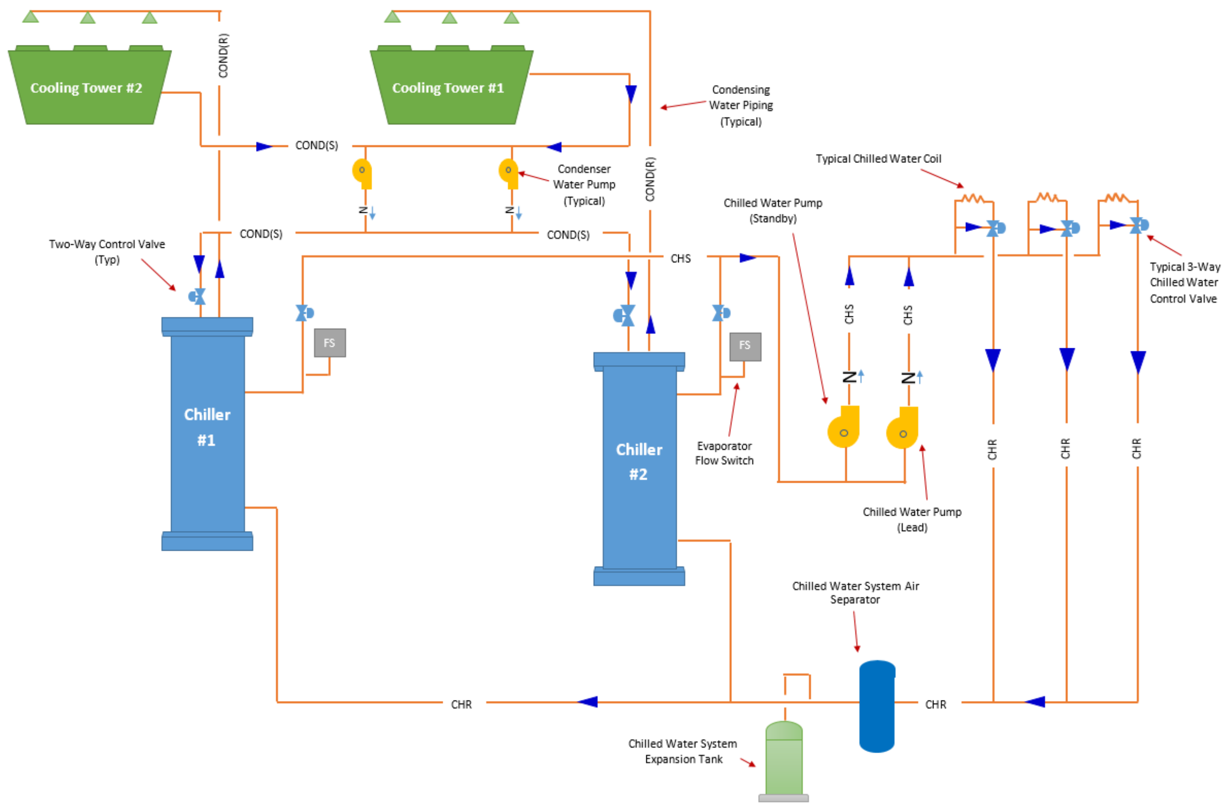


Mechanical Figure #2– Main School Central Hot Water Heating System

The existing cooling plant consists of two (2) water cooled Carrier chillers coupled to two (2) Baltimore air coil cooling towers as shown in ***Mechanical Photograph #2*** and ***Mechanical Photograph #3***. The chillers have a nominal capacity of 480 tons each. The cooling towers have a nominal capacity of 500 tons each. Both the chillers and the cooling towers along with the central chilled water piping/pumps in the main mechanical room were replaced in 1997. Therefore, the central chilled water cooling plant is approximately 19 years old. The central chilled water plant is in good condition and has been well maintained. While we rated these chillers a HVAC Index of #3, the proposed replacement HVAC systems are likely to move toward a distributed geothermal system making the chilled water plant obsolete. The existing chiller plant is arranged in a constant primary flow system with parallel base mounted evaporator and condenser pumps as shown in ***Mechanical Figure #3*** on the following page.

Mechanical Photograph #2
Water Cooled Chiller

Mechanical Photograph #3
Cooling Tower



Mechanical Figure #3 – Main School Central Chilled Water Plant

The chilled water and condenser water pumps have full back-up "lag" pumps for redundancy. Also, the existing mechanical room houses both boilers and chillers and would require a refrigerant monitoring system to de-energize the boilers and initiate the ventilation system should a refrigerant leak occur. The existing school does not contain any type of refrigerant monitoring systems. According to the Owner the chiller plant only needs to operate one (1) chiller to meet the school's peak cooling load on a design day.

In addition to the central chilled water system a small air cooled chiller plant was installed in 1991 to serve the library and the spaces below the library. This chilled water plant was installed after the gym addition was constructed in 1990. This 30-ton chilled water plant consists of a single air cooled chiller, constant speed pump, controls, VAV boxes, and air handling unit to serve the 1990 renovated library area.

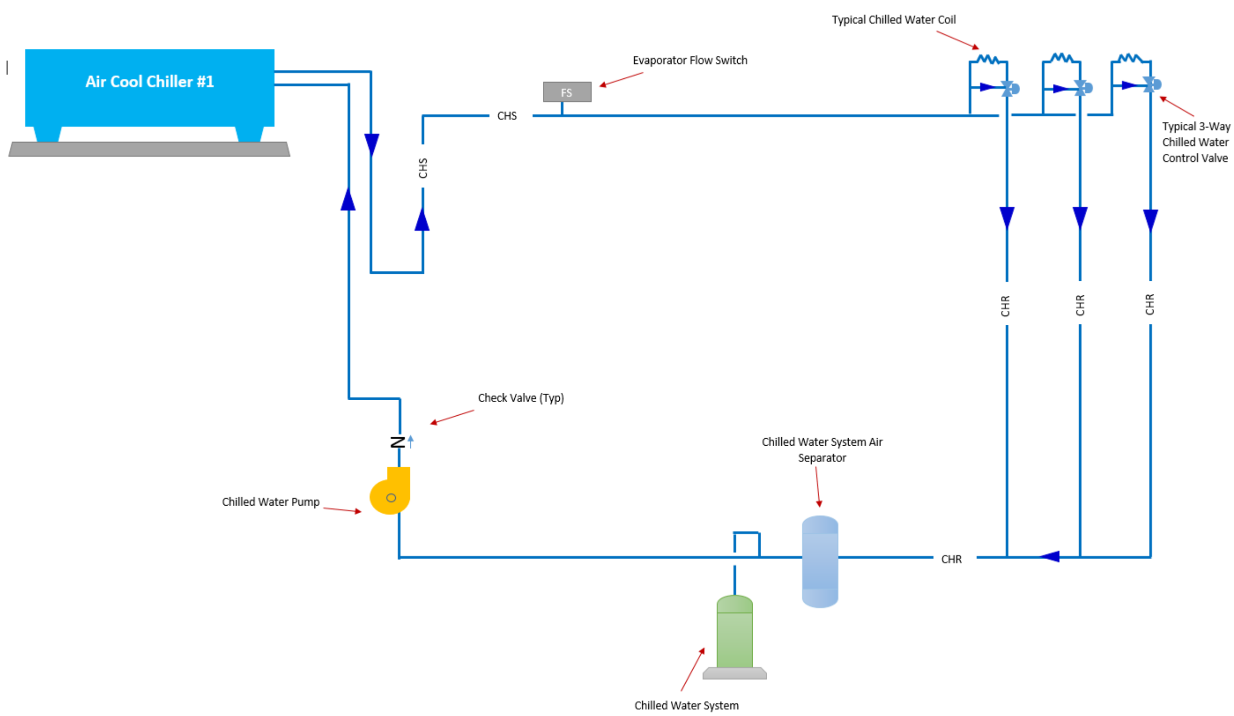
Mechanical Photograph #4 shows the existing air cooled chiller outside of the storage room that houses the air handling unit and pump.

Photograph #4
Air Cooled Chiller

This chilled water system also includes antifreeze to prevent freezing in the winter months. ***Mechanical Photograph #5*** shows the changeover valves that integrate this chilled water system into the existing large central plant. During summer operation, the large central plant provides chilled water to the small air cooled chiller plant. When the central chilled water plant is "off" the small air cooled chiller plant provides chilled water to the library and first floor spaces directly below. Please refer to ***Mechanical Figure #4*** which illustrates a flow diagram of the small air cooled chiller plant. All of the existing hot water and chilled water plants included chemical feed tanks for water treatment. This feature allows proper fluid chemistry to be maintained, prolonging the life of the piping systems.

One final observation that should be noted, is the fact that none of the existing heating water, chilled water, or condenser water systems utilize variable speed pumping. The lack of variable flow hydronic systems contributes to excessive operating costs.

Photograph #5
Air Cooled Chiller Changeover Valves



Mechanical Figure #4 – Air Cooled Chiller Plant Serving the Library

The existing Automatic Temperature Control (ATC) system is an outdated Johnson Controls pneumatic system utilizing an air compressor and refrigerated air dryer to serve the valves and dampers utilized for temperature control. The ATC system is beyond its useful service life and we would recommend replacement with a digital-web based automatic temperature control system for monitoring, scheduling, energy conservation, and set-point adjustment.

The majority of the school's air handling units are central station air handling units with chilled water coils, return air fans, economizer controls, duct detectors, 3-way controls valves, and freeze protection pumps, as shown in ***Mechanical Photograph #6***. A very nice feature of the original design is the fact that the majority of the air handling units, return air fans, and exhaust air fans are located in mechanical penthouses. This feature of housing equipment inside is superb and should be continued if possible. We believe the condition and useful life of the existing systems was extended by many years by locating equipment inside and not outside on a roof!

Mechanical Photograph #6
Typical Air Handling Units

Next, we will review the HVAC components in the 1990 Gym Addition.

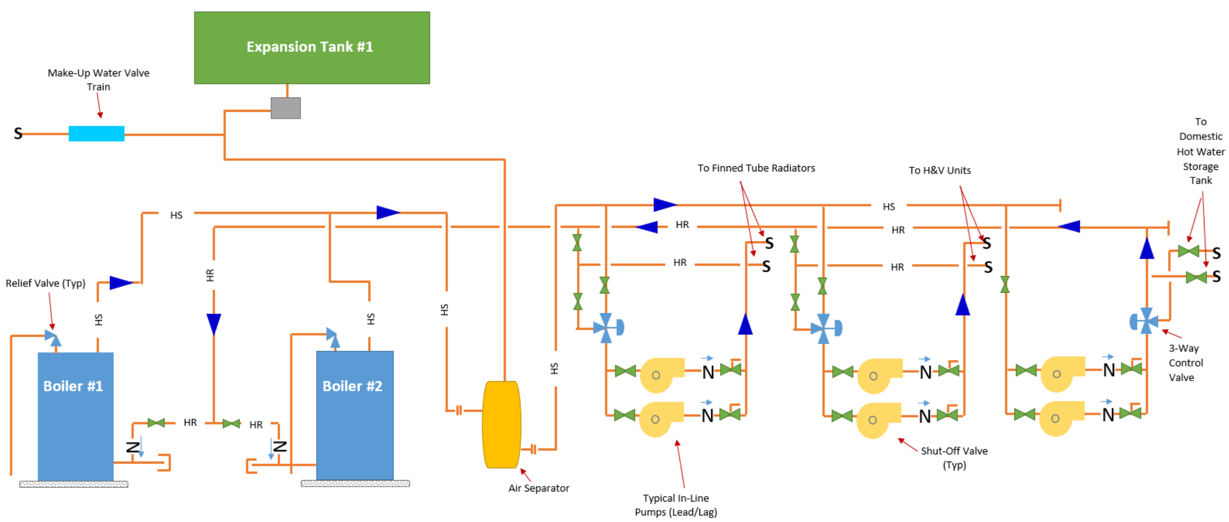
Gym Addition

In 1990 a gym addition was constructed to better serve the student body attending the Hodgson High School. The gym addition included a stand-alone heating plant that is completely separate from the main school heating plant. The central hot water boilers can be seen in the ***Mechanical Photograph #7***.

Mechanical Photograph #7
Gym Hot Water Boilers

The existing heating plant utilizes two (2) Weil McLain cast iron sectional boilers with a capacity of 2,300,000 btu/hr each. These boilers are approximately 26 years old and are in good condition. Therefore we have given these systems a HVAC Index Rating of #3. ***Mechanical Figure #5*** illustrates the major components and arrangement of the pumps, boilers, etc. in the gym heating plant.

The gym heating plant provides hot water for central station heating and ventilating units, cabinet unit heaters, finned tube radiators, and a domestic hot water generator. Subsequent to the original installation, a separate domestic hot water heater has been added to allow the boilers to be shut-off in the summer months and still provide domestic hot water. The gym is currently not mechanically cooled.



Mechanical Figure #5 – Gym Hot Water Heating Plant

Special Systems

In addition to the General HVAC Systems, the Hodgson High School also includes a few special HVAC system applications that are worth noting as follows:

- Office Administration Split System
- Kitchen Ventilation/Make-up Air System
- Laboratory Fume Hood Exhaust/Make-up Air System

Office/Administration Split System

The office/administration area is served by a direct expansion (DX) split system that allows these areas to be cooled in the summer without operating the entire central chilled water plant. This approach is suitable for a large central chilled water plant in a school and we feel that provisions for accomplishing the same goal in the renovations should be considered. The office/administration area DX unit is in fair condition, but due to its age should be replaced.

Mechanical Photograph #8
Kitchen Hood Exhaust Fan

Kitchen Ventilation/Make-up Air Systems

The kitchen hood exhaust air is provided by a large utility set type exhaust fan located in the Penthouse as shown in ***Mechanical Photograph #8***.

As indicated in Mechanical Photograph #8, the kitchen hood exhaust ductwork is wrapped with a U.L. Listed fire wrap. The kitchen make-up air is provided by a 100% outside air heating and ventilating unit. The kitchen make-up air unit is served by a heat exchanger that separates the central heating plant water from the antifreeze in the hot water fluid that serves the kitchen make-up air unit. The expansion tank for the kitchen make-up air unit glycol loop is shown in ***Mechanical Photograph #9***.

Mechanical Photograph #9
Kitchen Make-up Air Unit Glycol Expansion Tank

The kitchen hood exhaust and make-up air fans are all constant speed fans which should be replaced with variable air volume fans to allow energy reductions during part load conditions.

Laboratory Fume Hood Exhaust/Make-Up Air Systems

The science laboratory is ventilated with a chemical fume hood that includes a supply plenum on the front for make-up air. The chemical fume hood is shown in ***Mechanical Photograph #10*** and as indicated the fume hood is in very poor condition and in need of replacement. The make-up air is provided by a heating and ventilating unit located in the mechanical penthouse above the Science Lab. All of the laboratory ventilation equipment has served its useful life and should be replaced.

In summary, the majority of the existing HVAC equipment is well beyond its expected useful life. The Equipment/ Systems are inefficient and not compliant with current codes. We would recommend that the HVAC systems/ equipment be replaced with systems/equipment that are appropriate for current educational facilities.

The next portion of our report will focus on the existing plumbing and fire protection systems serving the Hodgson.

Mechanical Photograph #10
Chemical Fume Hood

B. Fire Protection Equipment & Systems Findings: Index Rating 4

Fire Protection:

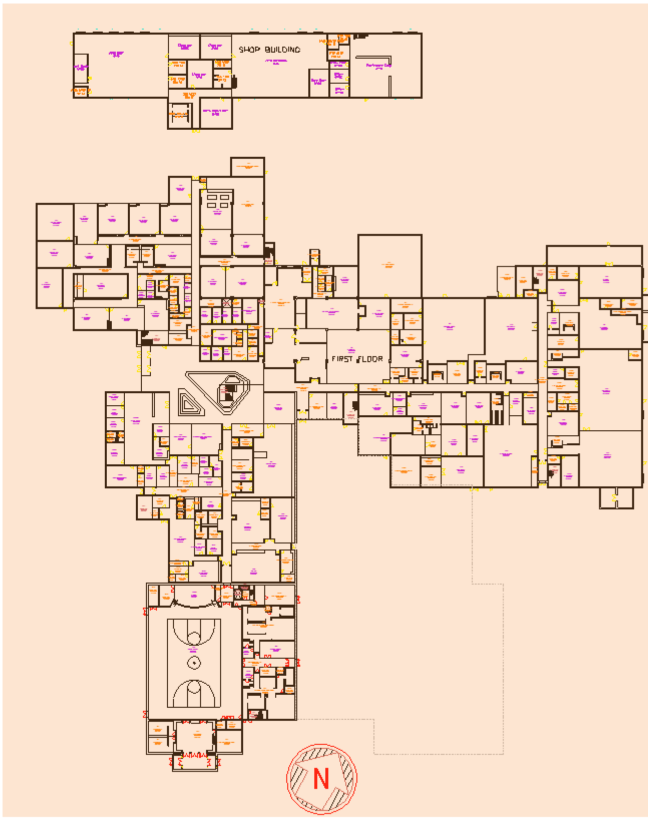
The existing school is fully protected by an automatic fire suppression system. A wet pipe riser located in the Automotive Lab and Main Boiler Room serves the main school. A separate independent wet pipe riser is located in the Gym Mechanical Room.

Due to the age and condition of the existing fire protection standpipe system the Index Rating is #4. Index #4 requires a major replacement/upgrade of existing systems. ***Mechanical Figure #6*** indicates the areas of the building and the associated fire protection index description.

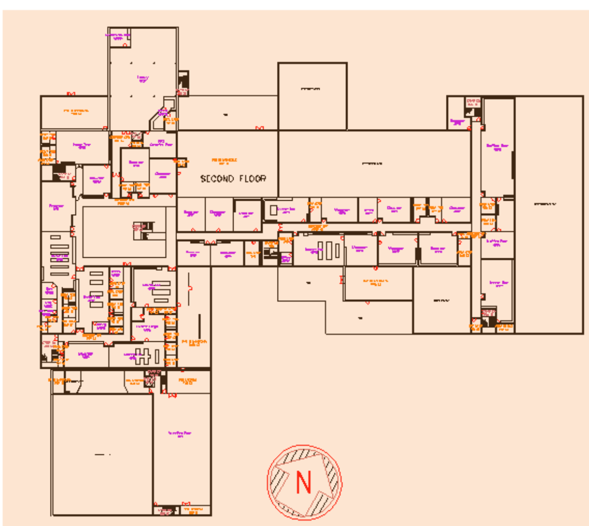
Fire Protection Index Rating Summary:

Based on our assessment of the facility, we have determined, as a whole, that the buildings Fire Protection systems and components of construction are all rated as a 4, (Poor) – Requiring 95% replacement necessary to allow the systems to function properly and provide proper life safety protection of the occupants and the facility.

The next portion of the report will review the Fire Protection system findings in detail.



- #1 INDEX RATING (NO REPAIR WORK REQUIRED AT TIME OF SITE VISIT)
- #2 INDEX RATING (LITTLE TO NO REPAIR WORK REQUIRED)
- #3 INDEX RATING (MODERATE AMOUNT OF REPAIR OR REPLACEMENT WORK REQUIRED)
- #4 INDEX RATING (LARGE AMOUNTS OF REPAIR OR REPLACEMENT WORK REQUIRED)
- #5 INDEX RATING (COMPLETE REPLACEMENT REQUIRED)



- #1 INDEX RATING (NO REPAIR WORK REQUIRED AT TIME OF SITE VISIT)
- #2 INDEX RATING (LITTLE TO NO REPAIR WORK REQUIRED)
- #3 INDEX RATING (MODERATE AMOUNT OF REPAIR OR REPLACEMENT WORK REQUIRED)
- #4 INDEX RATING (LARGE AMOUNTS OF REPAIR OR REPLACEMENT WORK REQUIRED)
- #5 INDEX RATING (COMPLETE REPLACEMENT REQUIRED)

Mechanical Figure #6 – Fire Protection Index – Hodgson High School

Fire Protection System Findings

The fire protection risers all consist of alarm check valves, drain risers, fire department connections, gauges, and alarm devices. ***Mechanical Photograph #11*** shows a typical wet pipe riser that is located within the main boiler room.

The condition or operability of the wet pipe systems could not be determined from our field survey. However, the systems are annually tested and maintained by an independent fire protection vendor. New standpipes would be required to serve the school based on the Delaware State Fire Prevention Regulations and State Fire Marshal.

A flow test will be required to determine if a fire pump is required for the facility. This will be further discussed in our recommendations section of the report. However, assuming the need for standpipes we would expect this building to require a fire pump and fire pump controller with automatic transfer switch. The use of a fire pump will allow all of the wet pipe risers to be consolidated and served by a single fire pump. This fire pump and associated controller, jockey pump, jockey pump controller, risers, and backflow preventer should be located in a dedicated, fire rated room.

Next we will review the plumbing systems.

Mechanical Photograph #11
Wet Pipe Riser in Main Mechanical Room

C. Plumbing Equipment and Systems: Index Rating 3 and 5

The existing plumbing systems consist of the following equipment/components:

1. Two (2) domestic hot water storage tanks with integral water to water shell/tube heat exchangers. Capacity = Approximately 4,000 gallons each
2. A gas fired water heater in the main school boiler room (Capacity = 250,000 btuh with 100 gallon storage).
3. A gas fired water heater in the gym boiler room (Capacity = 125,000 btu/hr with 100 gallon storage).
4. Vertical domestic hot water storage tank in the Gym Boiler Room. Capacity = Approximately 4,000 gallons
5. Lab compressed air systems with air compressors/refrigerated air dryers.
6. Domestic recirculating pumps.
7. Institutional grade plumbing fixtures.
8. The domestic cold water, hot water, and hot water recirculating main piping are original to the building. The existing branch piping to fixtures and equipment is approximately 43 years old for the main school and 26 years old for the gym and is in need of replacement. All new plumbing fixtures would require new piping insulation and supports.

Existing plumbing fixtures serving the facility include the following:

- Water Closets (Floor Mounted Flush Valves)
- Urinals (Wall Mounted Flush Valves) (Shown in ***Mechanical Photograph #12***)
- Lavatories (Wall Mounted – Mechanical Faucets)
- Mop Sinks
- Lavatory Stations (Stainless Steel)
- Emergency Eyewashes (Lab Areas)

Mechanical Photograph #12
Typical Urinal

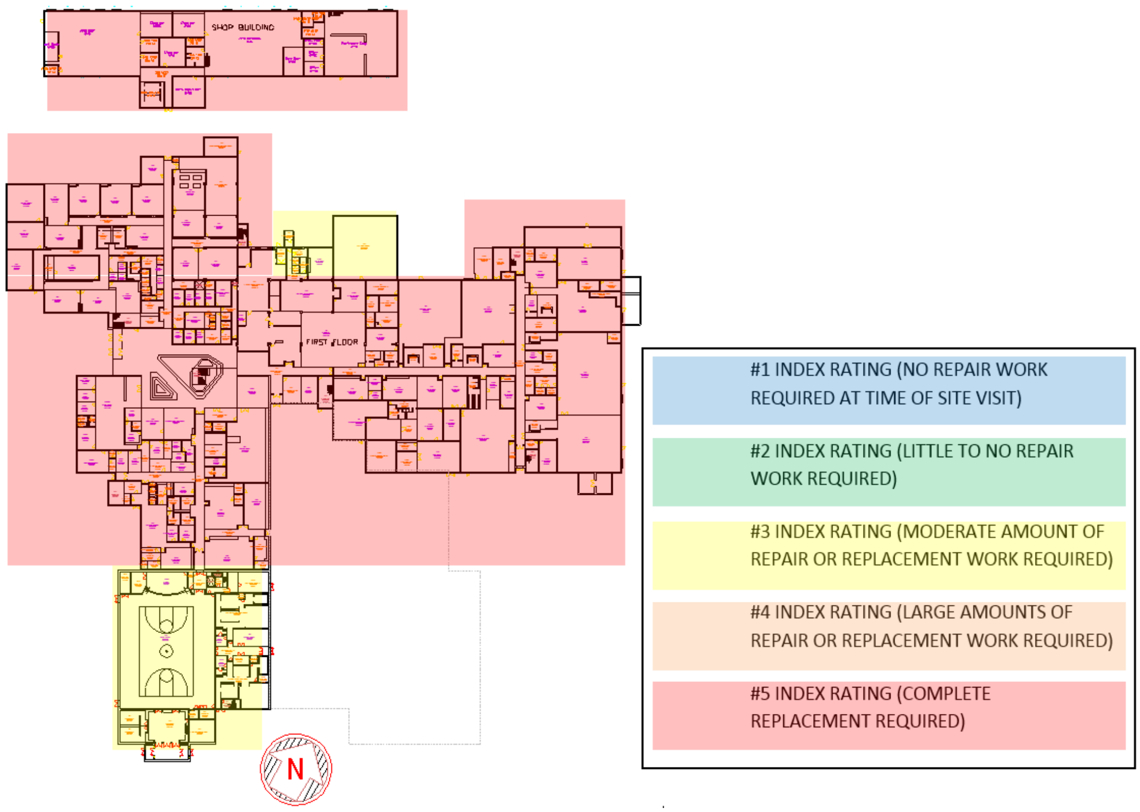
Plumbing Index Rating Summary:

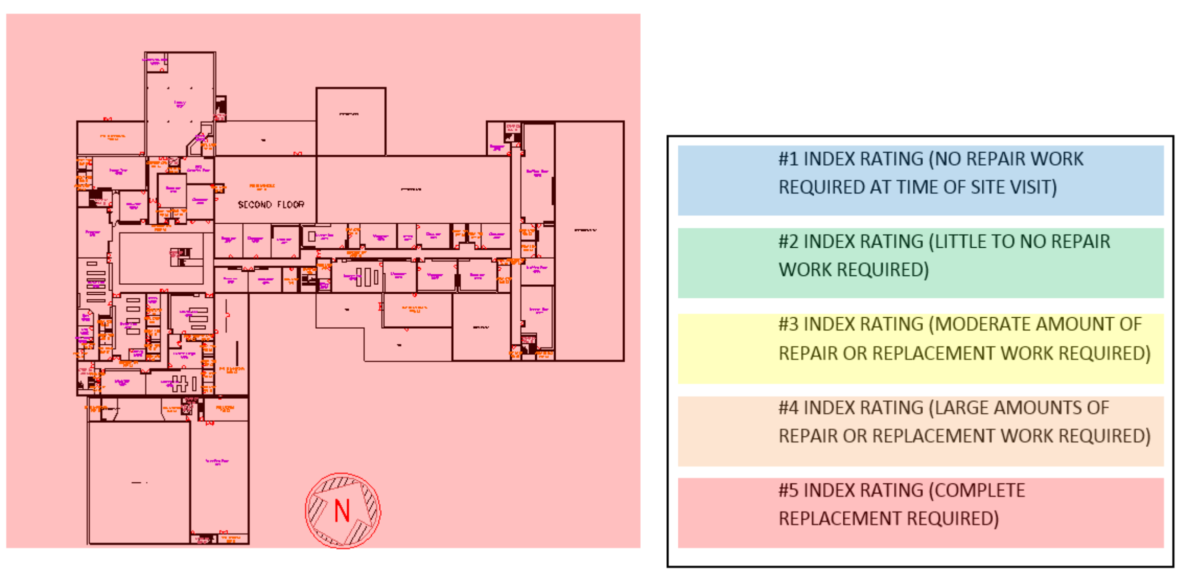
The existing plumbing system Index Ratings are as follows:

Central Domestic Hot Water Heaters - #3 Index Rating (Existing domestic hot water heaters located in main boiler and gym mechanical room can be re-utilized/expanded for the building renovations).

All other plumbing fixtures, equipment, piping and systems - #5 Index Rating (The existing plumbing fixtures, equipment, piping and systems due to age, water consumption, parts availability, and condition of the same should be replaced in their entirety).

The next portion of the report will review the Plumbing system findings in detail.





Mechanical Figure #7 – Plumbing Index – Hodgson High School

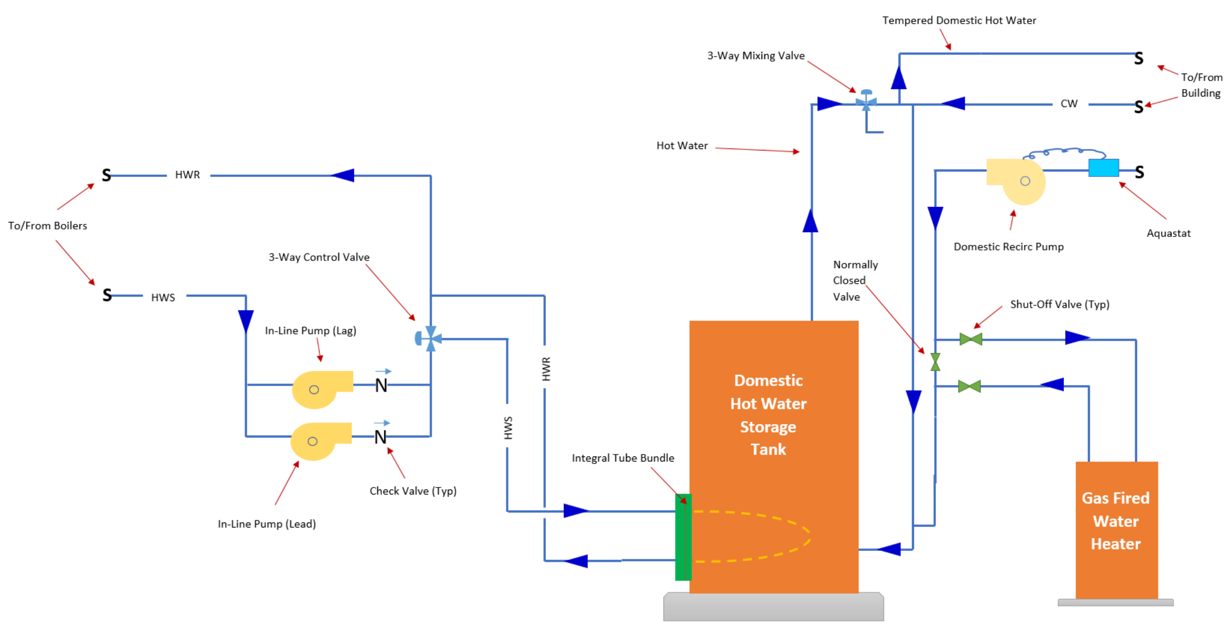
Plumbing System/Equipment Findings

The entire plumbing system with the exception of the plumbing systems serving the gym was installed in 1973. The gym plumbing systems were installed in 1990. Except for the age of the equipment and piping, the plumbing systems in the main school and gymnasium are very similar.

Hot water for both the main school and gymnasium were originally produced by the boilers. Large storage tanks with shell/tube heat exchangers were provided with hot water via the boilers and dedicated pumps as shown in the ***Mechanical Photograph #13***.

The problem with this approach is the fact that the boilers must operate all year round to provide domestic hot water. The Owner addressed this limitation by adding gas fired water heaters that are piped into the recirculating pipes at each existing storage tank as shown in the ***Mechanical Figure#8***.

Mechanical Photograph #13
Domestic Water Storage Tank



Mechanical Figure #8 – Gym Domestic Hot Water System with Supplemental Gas Water Heater

The water heaters are gas fired water heaters with sealed combustion as shown in ***Mechanical Photograph #14***.

The tanks, piping, recirculating pumps, and controls have served their useful life and should be replaced. The gas fired domestic hot water heaters could be re-used, but due to phasing considerations would likely be removed and re-used at another project.

Plumbing Fixtures

We have the following comments regarding the existing plumbing fixtures:

- Thermostatic mixing valves would be required on all lavatories and kitchen hand sinks to meet the Plumbing Code.
- The existing plumbing fixtures may not meet current ADA guidelines.
- All ADA sinks require below fixture insulation kits.
- All plumbing fixtures that are replaced shall be replaced with low water consumption type fixtures. We would recommend replacement of all plumbing fixtures.
- All public lavatories shall be provided with thermostatic mixing valves to prevent scalding water temperatures (>110 degrees Fahrenheit).
- All branch piping, insulation, fittings, and valves should be replaced due to their age and condition.
- Domestic hot water piping would need to be located as close as possible to the faucets to minimize the time it takes for hot water to be produced especially with water conserving fixtures. This will require close coordination between the Architect and Engineer for chase space.

The main sanitary and vent piping within the building is greater than 43 years old and should be replaced. We would recommend replacement of both above slab piping and below slab piping to a point 5 feet outside the building.

The existing roof drains and roof drain piping also appear to be greater than 43 years old and should be replaced. It is also important to note that since the existing roofs are surrounded by parapets it is critical that scuppers are provided/maintained to serve as the overflow drainage system.

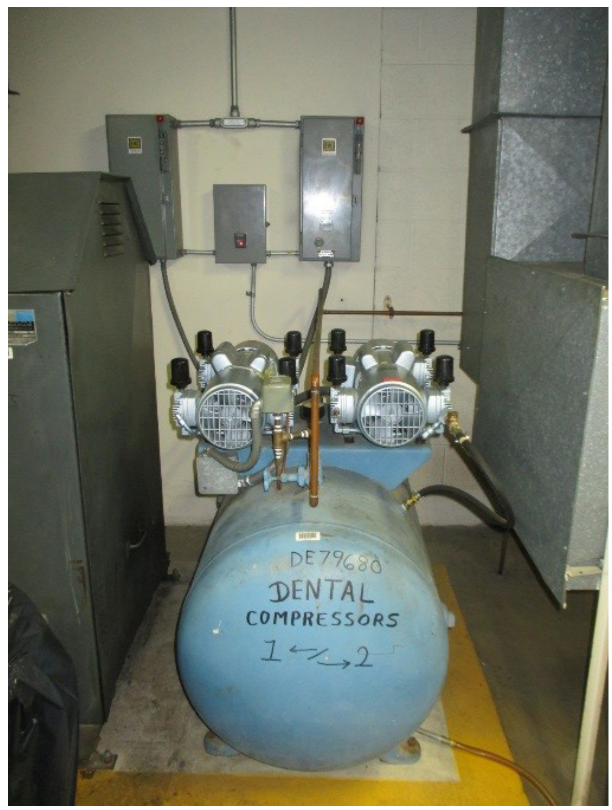
Mechanical Photograph #14
Domestic Hot Water Heater

In addition to the domestic plumbing systems there are a few compressed air systems that serve the existing pneumatic ATC control system, lab, and maintenance tool outlets. The existing air compressors serving the pneumatic ATC control system and labs can be seen in ***Mechanical Photograph #15.***

Due to the compressors age and condition we would recommend conversion to direct digital controls. The compressed air requirements for the labs/maintenance areas should be reviewed during the new system design to determine the requirements of the same. Existing air compressors could be utilized where feasible.

Furthermore, the school contains dental equipment as shown in ***Mechanical Photograph #16***. The dental equipment is in good condition.

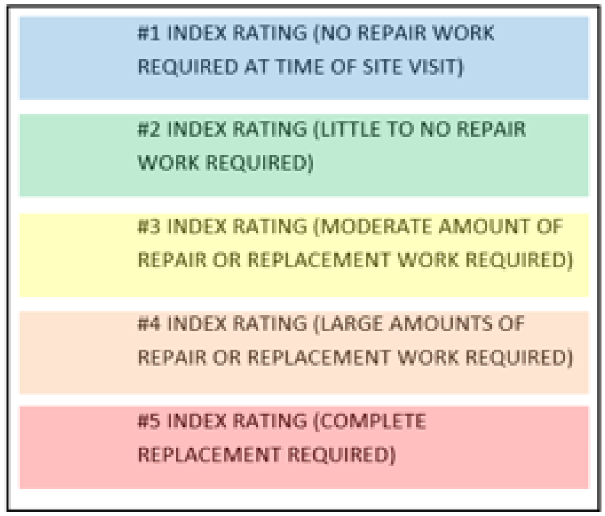
Mechanical Photograph #15
Existing Air Compressors



Mechanical Photograph #16
Dental Equipment

In summary, the majority of the existing plumbing systems/equipment are well beyond the expected useful life. The plumbing equipment/systems are inefficient, not compliant with current codes and should be replaced with equipment/systems appropriate for current educational facilities.

The next section of this report will assess the existing electrical systems in the building. Each system will be assigned an index rating based on the index rating chart shown in ***Electrical Figure #1***. Color coded floor plans are not included as the index ratings may not be applicable building wide since system components have been upgraded and/or replaced. Specific items of work for each system, e.g. selective replacement of panelboards, are detailed under each respective section.



#1 INDEX RATING (NO REPAIR WORK REQUIRED AT TIME OF SITE VISIT)

#2 INDEX RATING (LITTLE TO NO REPAIR WORK REQUIRED)

#3 INDEX RATING (MODERATE AMOUNT OF REPAIR OR REPLACEMENT WORK REQUIRED)

#4 INDEX RATING (LARGE AMOUNTS OF REPAIR OR REPLACEMENT WORK REQUIRED)

#5 INDEX RATING (COMPLETE REPLACEMENT REQUIRED)

Electrical Figure #1
Index Rating System Descriptions

D. Electrical Distribution System Existing Conditions: Index Rating 5

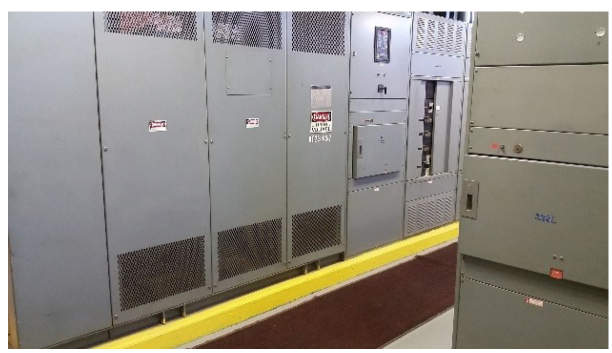
The school has a 13,800-volt primary switchgear line up in the Boiler Room consisting of (1) main switch, (1) primary metering compartment, and (2) 600A switches fused at 125A located next to the incoming primary metering compartment shown in ***Electrical Photograph #1***. One 600A switch fused at 125A feeds a three phase 2000kVA, 12470V to 480Y/277V transformer that serves a switchboard with a 3,200A main circuit breaker as shown in ***Electrical Photograph #2***.

The second 600A switch fused at 125A feeds a three phase, 1500kVA, 12,470V to 480Y/277V transformer that serves a switchboard with a 2,000A main circuit breaker as shown in ***Electrical Photograph #3***. The utility has installed an electricity meter on the exterior of the building on the outside wall of all the incoming electric service so that the meter can be read without entering the school.

The electrical system is configured as a three-phase, four-wire system. All other panelboards and power devices located throughout the school are served from these two switchboards. There are several 480V to 208Y/120V step down transformers located throughout the building to provide power for computers, appliances and other equipment requiring 120 volts. Some of the breakers in the existing switchboards have been replaced in the last 10-15 years but several breakers are the original breakers installed in 1973. The switchboards, distribution panelboards, branch-circuit panelboards, dry-type step down transformers, main circuit breakers, and branch-circuit breakers installed were manufactured by Square D Company. The 3,200A circuit breaker is tied via Kirk Key interlock to a 2000A circuit breaker that is served by the generator. Five (5) motor control centers labeled as "D-I", located in the mezzanines throughout the school, have normal and emergency breakers located in the 3,200A switchboard. Both the normal and emer-

Electrical Photograph #1
Incoming Primary Metering Compartment and Primary Switches

Electrical Photograph #2
2000kVA Transformer and Switchboard



Electrical Photograph #3
1500kVA Transformer and Switchboard

gency circuit breakers have Kirk Key interlocks so that the motor control centers can be manually switched to generator power when utility power is lost.

We have rated Electrical Distribution System as an Index #5 Rating due to the age/condition of the electrical distribution system, the entire system shall be replaced and sized appropriately to handle the new loads.

Electrical Photograph #4
Kohler Generator

Generator:

The existing high school has a 400kW, 480/277V, 3 phase, 4 wire generator as shown in ***Electrical Photograph #4***. This generator provides back-up power to select lighting fixtures throughout the building. The generator also backs-up life safety loads and various standby loads. The generator feeds a 600A, 480V, distribution panel that has breakers to back up the motor control centers in each mechanical mezzanine and a breaker to serve a 150kVA step down transformer to serve the 120 volt circuits that are connected to the generator. This step down transformer serves a 120/208V, 400A, distribution panelboard that has breakers that serve emergency lighting panels in the various mechanical mezzanines throughout the school. There is an automatic transfer switch that is located between the 480V, distribution panel and the 150kVA step down transformer. The emergency loads are served by one transfer switch and there is no separation of life safety and standby loads. The generator and transfer switch appear to be in fair condition based on visual observations, but we did not review any inspection logs or test the same.

We have given the Generator a #5 Index Rating due to the age/condition. We recommend the generator and associated transfer switches, conduits and wiring be replaced.

General Building Power:

Beyond the distribution system, the majority of the electrical branch-circuit infrastructure appears to be a mixture of original panelboards, upgrades, add-ons, and replacements depending on the location in the building. The typical power layout observed during the survey showed that the majority of the receptacles in the classrooms appear to be original to the building as shown in ***Electrical Photograph #5***. Since the receptacles and panelboards serving the school appear to be original to the building we would assume that the branch-circuit wiring is original to the school as well. The majority of the mechanical equipment is served from motor starters/disconnects located in various motor control centers located throughout the school. The majority of the motor control centers and their associated branch-circuit wiring appear to be original to the school as shown in ***Electrical Photograph #6***. The shops located throughout the school have dedicated panelboards to the shops and the majority of these panelboards appear to be original to the building as well.

We have rated the general building power system as an Index Rating #5 due to the age/condition. The equipment, panelboards, conduit and wiring should be replaced.

Electrical Photograph #5
Typical Receptacle

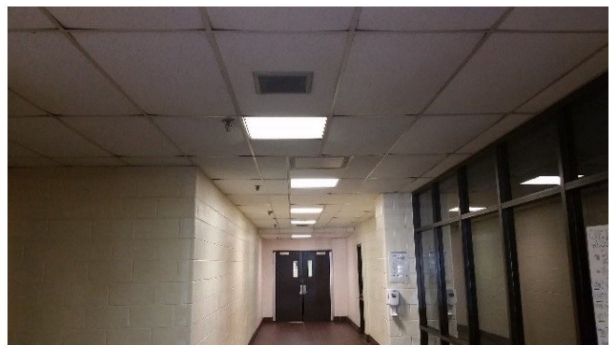
Electrical Photograph #6
Typical Motor Control Center

Interior Lighting:

The interior lighting in the classrooms consists of 2'x4' recessed acrylic lens fluorescent fixtures, and the lighting in the hallways of the school is 2'x2' recessed acrylic lens fluorescent fixtures as shown in ***Electrical Photographs #7 and #8***. The acrylic lenses for the 2'x 4' and 2' x 2' lighting fixtures are exhibiting signs of aging, including but not limited to yellowing, cracks, etc.

The mechanical mezzanines do not have lay-in ceiling grids and have 1'x4' fluorescent strip lights suspended from the ceiling/structure above. The boiler room has 1'x4' fluorescent suspended fixtures with acrylic lenses. The typical lighting fixtures utilize 34 watt T12 linear fluorescent lamps as shown in ***Electrical Photograph #9***, which Federal energy legislation such as The Energy Policy Act (EPACT) mandated be phased out of manufacturing starting in July 2012. This is due to the fact that T12 lamps have a lower efficacy and efficiency compared to modern counterparts, i.e. T8/T5 fluorescent lamps and LED technologies. Efficacy is the measure of how well a light source produces visible light, also commonly referred to as "lumens per watt", whereas efficiency is the ratio based on total energy (wattage) consumed versus useful energy out as light. The following Electrical Table compares the efficacy and efficiency of T12 lamps to other common light sources.

Electrical Photograph #7
Typical 2'x4' Acrylic Lens Fluorescent Fixtures



Electrical Photograph #8
Typical 2'x2' Acrylic Lens Fluorescent Fixtures

Electrical Photograph #9
Typical T-12 Fluorescent Lamp

Electrical Table #1: Efficacy of Common Light Sources		
Light Source	**Luminous Efficacy (lumens/watt)**	**Luminous Efficiency (percent)**
Incandescent	5-12.6	0.7-1.8%
T12 Fluorescent	60	9%
T8 Fluorescent	80-100	12-15%
T5 Fluorescent	70-104	10-16%
LED	Up to 150	Up to 22%

As a result of the lower efficacy/efficiency values, the existing school has significantly more lighting fixtures and lamps than a modern school would in order to achieve similar illumination levels. For example, some existing classrooms have approximately twelve (12) lighting fixtures, each with four (4) T12 linear fluorescent lamps. For all intents and purposes, we will assume that the original electromagnetic ballasts have been replaced with electronic ballasts upon failure. We can estimate that each classroom lighting fixture consumes approximately 140 watts, based on manufacturer's published product data for electronic ballasts. So, for a typical classroom with twelve (12) fixtures with electronic ballasts, we have a total energy consumption of 1680 watts. A typical modern classroom this size would have twelve (12) lighting fixtures, each consuming approximately 47 watts, for a classroom energy consumption of 564 watts, which is a sixty-six (66) percent decrease from the existing classrooms at the Hodgson High School.

In addition, the State of Delaware now requires that all new construction and major renovation projects comply with the requirements of ASHRAE 90.1-2010. One of those requirements involves the installed interior lighting power, which is commonly referred to as Lighting Power Density (LDP) or more commonly as watts per square foot. ASHRAE 90.1 restricts the lighting power density for a school to 0.99 watts/square foot.

If the average existing classroom is 877 square feet, the existing lighting layout results in lighting power density of 1.92 watts/square foot. These levels greatly exceed the levels allowed by ASHRAE 90.1-2010 and would need to be amended.

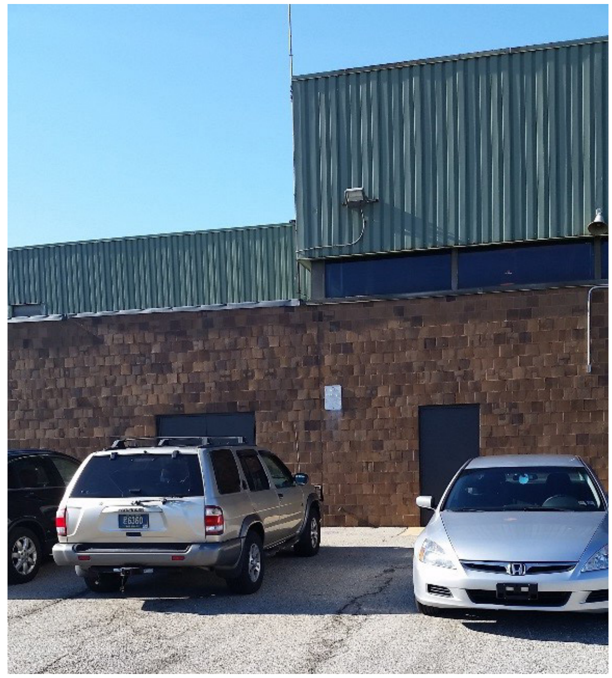
The lighting in the shop areas and gymnasium are provided by suspended high bay metal halide fixtures, which also you inefficient technology. Lighting levels in these spaces are inadequate based on today's recommended illumination levels. The Illuminating Engineering Society of North America (IESNA) recommends a range of fifty (50) to one-hundred (100) foot-candles, depending on the difficulty of the inspection/work being performed in these spaces. Our recommendation would be seventy (70) foot-candles average, which is not possible with the existing lighting fixtures. We would recommend new lighting fixtures in order to increase illumination levels, while ensuring that lighting power densities do not exceed levels allowed by ASHRAE 90.1.

The Interior lighting has been rated as an Index #5 Rating. Due to the lower efficacy/efficiency values of the interior lighting and that T-12 lamps have stopped being manufactured, the interior lighting should be replaced.

Exterior Lighting:

The exterior lighting fixtures on the original portion of the school are wall mounted metal halide flood lights. These fixtures are not full cut-off as shown in ***Electrical Photograph #10*** and do not have provisions to reduce light trespass. The gymnasium, which was built in 1990, also has metal halide wall packs without full cut off and an external photocell mounted on selected fixtures as shown in ***Electrical Photograph #11*** to control when lights are on or off.

Metal-halide fixtures have been an industry standard for exterior lighting, until the relatively recent development of LED light sources. LED light sources offer several benefits over traditional high intensity discharge (HID) light sources, which we will review in further detail in the recommendations portion of this report.



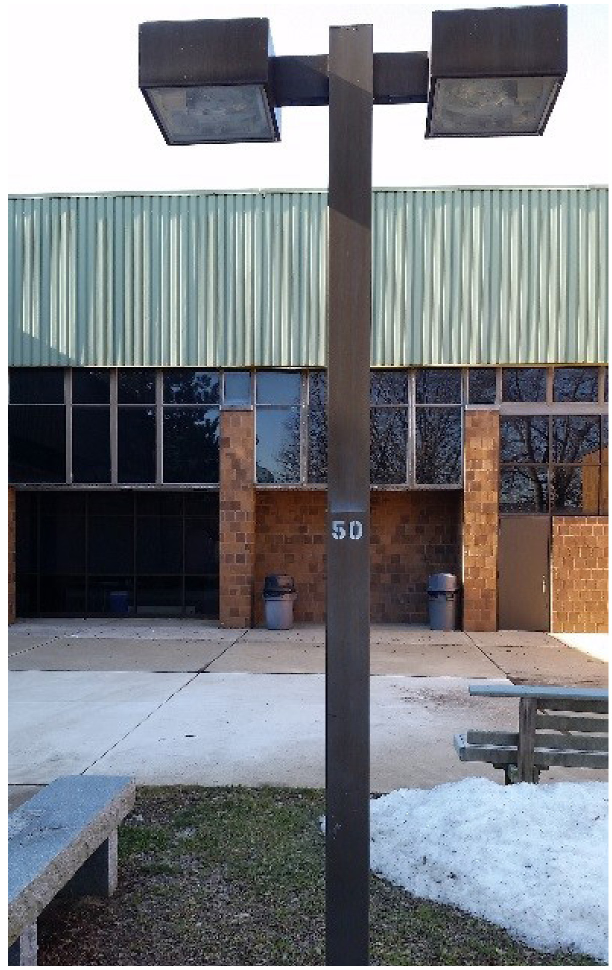
Electrical Photograph #10
Exterior Lighting Fixtures

Electrical Photograph #11
Exterior light with photocell at 1990 Gym Addition

The school has pole mounted metal halide site lighting fixtures in the parking lot and in the courtyards around the school. The parking lot fixtures are single head fixtures mounted on 20-25 foot high poles around as shown in ***Electrical Photograph #12***. The fixtures in the court yard are two-headed fixtures mounted on 10-12 foot poles as shown in ***Electrical Photograph #13***. These fixtures are exhibiting signs of aging and weathering, including but not limited to peeling paint and rust, and should be replaced.

The exterior lighting has been given a #5 Index Rating, due to the age/condition of the exterior lighting, the inefficient light source, and should be replaced.

Electrical Photograph #12
Exterior Lighting Fixtures – Parking Lot



Electrical Photograph #13
Exterior Lighting Fixtures - Sidewalk

Lighting Controls:

The Hodgson Vo-Tech School does not appear to have any occupancy sensors or programmable lighting control panels in the building. The classroom lights are currently controlled by toggle switches located on the wall as part of the classroom utility panel as shown in ***Electrical Photograph #14.*** The corridor lighting is currently controlled by keyed switches on the wall as shown in ***Electrical Photograph #15***. ASHRAE 90.1 requires that all interior lighting shall be controlled by an automatic means of turning off the lights after a certain period of space vacancy and/or between nighttime hours. Automatic shut-off reduces energy consumption, resulting in a lower electricity bill, and can also extend the life of lamps and ballasts and reduce maintenance costs. Relying solely on the occupant to cut the lights off manually can allow for the lights to be left on accidentally and therefore result in a waste of energy if no one is in the space. The lighting throughout the rest of the school, including storage, shops, library, restrooms, and mezzanines are controlled by toggle switches on the wall. ASHRAE 90.1 requires that the interior lighting in each space be controlled so as to provide at least one intermediate step in lighting power in addition to full "on" and full "off".

We rated Lighting Controls as an Index #5 due to the lack of code required lighting controls. The lighting controls should be replaced with code compliant devices.

Electrical Photograph #14
Classroom Utility Panel

Electrical Photograph #15
Existing Keyed Lighting Switches

E. Life Safety Systems – Index Rating 5

The life safety systems at a school consist of the emergency egress lighting, exit signs and the fire alarm system. For this report we will address the fire alarm separately in the next section. As mentioned earlier under the emergency generator section, the emergency egress lighting is accomplished by selected fixtures throughout the school being backed-up by the generator. Power was not removed during our survey of the school so we were not able to verify which lights in the building are backed-up by the generator to confirm if egress lighting levels are adequate. The emergency lighting throughout the building is provided by the generator once power to the entire building has been lost. NFPA 101: Life Safety Code requires emergency lighting in a space to activate upon loss of power to normal lighting in that space. Therefore, if a breaker is accidently turned off or trips the emergency lights should activate. This will not happen at Hodgson High School unless the entire building loses power. There are currently exit signs throughout the school, but there are a couple of different styles of fixtures/colors of exit signs throughout the building. It appears some of the original exit signs may have been upgraded over the years but do not match the original fixtures as shown in ***Electrical Photograph #16***. The condition of the exit signs range from fair to good depending if the exit sign has been replaced or not.

The Life Safety Systems are a #5 Index Rating due to the age, condition and the fact that the current egress lighting does not meet the NFPA 101 Life Safety Code for the egress lighting and exit signs.

Electrical Photograph #16
Mis-Matched Exit Signs

F. Fire Alarm: Index Rating 4

The fire alarm control panel presently serving the school is a Simplex Grinnell model 4100 fire alarm control panel located in the boiler room as shown in ***Electrical Photograph #17***. The existing fire notification devices are a combination of addressable and non-addressable.

The hallways through most of the school have been upgraded to addressable devices mounted in the ceiling tiles but in each classroom there are classroom utility panels which contain non-addressable devices as shown in ***Electrical Photographs #18 and #19***.

Electrical Photograph #18
Upgraded Addressable Devices

Electrical Photograph #17
Simplex Grinnell Fire Alarm Control Panel

Electrical Photograph #19
Classroom Utility Panel with
Non-Addressable Devices

When the Gym Addition was built in 1990, a Simplex Grinnell model 4100 fire alarm control panel with voice evacuation was installed in the lobby leading to the gym as shown in ***Electrical Photograph #20***. The gym and associated locker rooms and area above have speaker notification appliances throughout, but these are the only parts of the building that have speakers associated with the fire alarm system. There are fire alarm pull stations located at various locations through the school including all exit doors and throughout the hallways. At the exit doors, the pull stations have covers to deter the students from pulling the alarms.

The Fire Alarm System has been rated as a #4 Index Rating. Some of the notification devices have been upgraded recently and may be able to be reused but the overall system should be replaced.

Electrical Photograph #20
Simplex Grinnell Model 4100 Fire Alarm Control Panel with Voice Evacuation

G. Security System: Index Rating 4

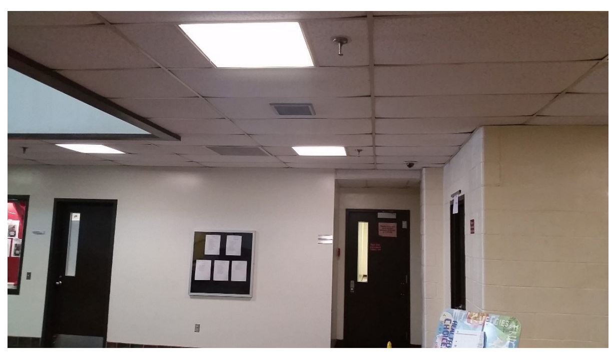
The school has an existing ADT security system with the main alarm control panel and associated power supplies located in the lounge off of the main office as shown in ***Electrical Photographs #21 and #22***. Based on our survey it appears that the school doesn't have any exterior keypads, intercom stations or other access control means. The exterior doors are just locked and unlocked via keys.

There is limited video surveillance throughout the school hallways via ceiling mounted cameras. The cameras, shown in ***Electrical Photograph #23*** appear to be relatively new, but Gipe Associates Inc. did not test the same.

The Security System has been rated as an Index #4 Rating due to the lack of access control and video surveillance inside and outside the building. Our recommendation for the security system would be to replace the system with a new system with full building coverage. The existing video cameras that are in good condition could potentially be reused.

Electrical Photograph #21
ADT Security System Control Panel

Electrical Photograph #22
ADT Security System Power Supply Panels



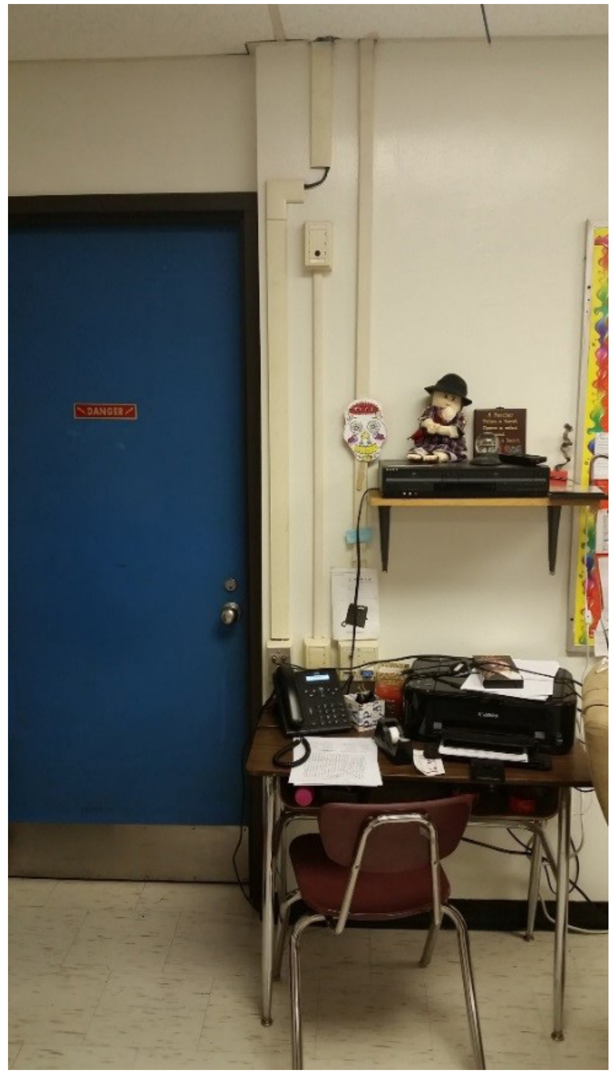
Electrical Photograph #23
Upgraded Security Cameras

H. Information Technology and Media: Index Rating 5

The school's information technology system is distributed through the school via 4 telecommunications/equipment locations. The main distribution frame (MDF) room is located on the first floor in the room labeled as 107D Mech/LAN on the architectural floor plan. There are two other intermediate distribution frame (IDF) rooms on the first floor and one IDF room located on the second floor. The existing telecom rooms are not up to the state of Delaware's standards. These rooms are not rooms dedicated for communication equipment with dedicated HVAC units as required by Delaware Department of Technology & Information (DTI) Standards. The data network consists of a mixture of Category 5 and Category 6 cabling system, which has been installed and upgraded over the years as building renovations have occurred. A Category 5 data network is capable of bandwidths up to 100 MHz and transmission rates up to 1000BASE-T, or one (1) gigabit per second. Modern Category 6 data networks are capable of bandwidths up to 250 MHz and transmission rates up to10GBASE-T, or ten (10) gigabits per second. Based on this information, Category 6 networks are significantly faster than Category 5 networks, and are capable of transmitting significantly more information across the network. This is becoming increasingly necessary in today's schools which utilize streaming media applications, such as video distribution. The existing telecom rooms are not up to the State of Delaware's standards. Each classroom has a cable television outlet mounted on the classroom utility panel located in each classroom.

The majority of the data devices were added over the years using surface mounted raceway as shown in ***Electrical Photograph #24***. The classrooms utilize overhead projectors, whiteboards, and a speaker to present information to the students in the classroom as shown in ***Electrical Photograph #25***. There are limited wireless access points located throughout the school to provide internet access to laptops and tablets. There is an existing 700-800 MHZ system that the state of Delaware provided so that first responders can communicate within the building is located on the second floor mezzanine and shall be retained for reinstallation after renovation. The head end equipment for the paging/intercom and clock systems are located in the lounge located inside of the main office.

The Information Technology and Media systems have been given a #5 Index Rating. Due to the lack of Category 6 cabling throughout the building and no dedicated HVAC units for each IDF room, the information technology and media systems should be replaced.



Electrical Photograph #24
Surface-Mounted Communication Raceways

Electrical Photograph #25
Overhead Projector and Speaker

M/E/P RECOMMENDATIONS

Mechanical Equipment and Systems:

The existing heating, ventilating and air conditioning (HVAC) systems serving the Main School and Gym are inefficient, not Code compliant, and are nearing or beyond their useful service life. We would recommend replacement of the HVAC systems with modern energy efficient HVAC systems that provide the following for the Main School and Gym.

- Heat, cooling and ventilation for all areas requiring the same.
- Heat and ventilation only for areas that do not require cooling such as lab spaces, mechanical rooms, electrical rooms, etc.
- Code required exhaust and ventilation airflow for all areas based on occupancy and function. Incorporation of energy recovery technologies and demand controlled ventilation should be implemented where feasible.
- Digital web based automatic temperature control system.
- Adequate zones of temperature control to provide building users with flexibility and ease of temperature adjustment.
- High energy efficiency equipment/ components that utilize energy recovery where feasible.
- An HVAC system that will allow equipment to be housed inside the building.
- Variable speed pumping strategies to reduce operating costs and maintenance.
- Decoupled ventilation to allow separation of ventilation loads from space loads.
- Appropriate redundancy for select components without complexity.
- Scalability to allow the existing systems to remain in service while the school is renovated.

Before we can evaluate the HVAC system options it is critical to establish the Heating, Cooling and Ventilation loads for the facility.

Heating/Cooling/Ventilation Load Calculations:

The existing wall and roof U-values for the building are based on the existing architectural documents and our field survey are as follows.

- Typical Masonry Wall U-Value = .202 BTU/hr/ F/ft2 (approximate R-value of R-4.94)
- Membrane Roof U-Value = .060 BTU/hr/ F/ft2 (approximate R-value of R-16.5)

We utilized the following U-Value and shading coefficient for the windows in our load calculations:

- Window U-Value = .683 BTU/hr/ F/ft2
- Shading Coefficient = .645

The existing walls, roof and windows should all be evaluated for replacement to improve the insulating value to reduce heating and cooling loads. Adding insulation to an existing building can be very challenging due to the difficulty of installing the same. Refer to the Architectural recommendations section of the report for additional information.

We calculated the required heating and cooling capacity for the Hodgson High School based on the following assumptions and ambient outside air conditions/interior conditions for the summer and winter months.

Summer:

1. Summer Interior Design Conditions = 75 F Dry Bulb (+8 F and -5 F accuracy), and 50% (+/- 20%) Relative Humidity.
2. Summer Ambient Design Conditions = 93 F Dry Bulb and 78 F Wet Bulb.

Winter:

1. Winter Interior Design Conditions = 70 F Dry Bulb (+8 F and -5 F accuracy), and >30% Relative Humidity.
2. Winter Ambient Design Conditions = 10 F Dry Bulb.

We have summarized the block heating and cooling loads from the hourly analysis program in Mechanical Table #1. The detailed load calculations are included in the Appendix M1 of this report.

Mechanical Table #1 – Hodgson High School Heating and Cooling Load Summary						
Area	**Total Building Cooling Load (Btuh)**	**Total Ventilation Cooling Load (Btuh)**	**Building and Ventilation Total Tons of Cooling**	**Total Building Heating Load (Btuh)**	**Total Ventilation Heating Load (Btuh)**	**Square Footage**
Main High School	3,347,525	4,269,876	634	1,556,740	2,381,422	188,835 Square Feet (Approximate)
Lab Areas	1,464,671	1,645,704	259	881,825	692,928	94,062 Square Feet (Approximate)
Gym	507,686	230,183	61.5	294,215	96,919	22,312 Square Feet (Approximate)
Totals	**5,319,882**	**6,145,763**	**954.5**	**2,732,780**	**3,171,269**	**305,209 Square Feet -(Approximate)**
Grand Total Cooling Load Including Ventilation Airflow = 11,454,000 Btuh (954.5 tons) **Grand Total Heating Load Including Ventilation Airflow = 5,904,049 Btuh**						
Notes: 1. Ventilation heating and cooling loads are based on the use of an enthalpy wheel for pre-treatment of outside air. Kitchen exhaust make up air is cooled/dehumidified and no pretreatment is utilized. 2. 1-Ton of Cooling = 12,000 Btuh (Btuh = British thermal unit per hour). 3. Assumes shops are cooled. If this is not the case in the future the cooling load can be eliminated for the same.						

The ventilation heating and cooling loads were based on the calculated ventilation airflow rates stated in Mechanical Table #2.

Mechanical Table #2 – Minimum Ventilation Airflow	
Area	**Outside Air in Cubic Feet per Minute (CFM)**
Main High School	70,251 CFM
Lab Areas	32,080 CFM
Gym	4,487 CFM
Totals	**5,319,882**

*Ventilation airflow calculations are based on utilizing a decoupled ventilation system. Per ASHRAE Standard 62-2010 – Ventilation for Acceptable Indoor Air Quality: Ez=Zone Air Distribution Effectiveness = 1.0 for ceiling supply of cool air. And Ev=System ventilation efficiency = 1.0 for dedicated/decoupled outdoor air system.

** Main School Ventilation Airflow includes 20,000 CFM of outside airflow for kitchen ventilation/make up air systems.

The minimum ventilation airflow rates were calculated using ASHRAE Standard 62-2010, Ventilation for Acceptable Indoor Air Quality. Preliminary detailed ventilation calculations are included in the Appendix M1 of the Report.

The next portion of our report will review the Life Cycle Cost Analysis calculations.

Life Cycle Cost Analysis:

There are several potential new HVAC systems, but to be of maximum benefit any new system must meet the following criteria:

1. High energy efficiency.
2. Must be easy to maintain.
3. Must provide code required amount of ventilation airflow for people and spaces.
4. Have the capability to maintain temperature and humidity levels in the space required for comfort and maintain good indoor air quality.
5. Minimize the required alterations to the existing architecture and structure.
6. Work in concert with the historic nature of the building.
7. Should be familiar to maintenance staff.

We have evaluated three (3) HVAC systems based on the following criteria:

- Availability of cooling/heating energy sources
- Required mechanical room/ceiling space.
- Installation costs (first costs).
- Service and maintenance costs.
- Annual operating costs.
- Maintenance involvement.
- Utility costs.

A brief summary of the three (3) proposed HVAC systems are as follows:

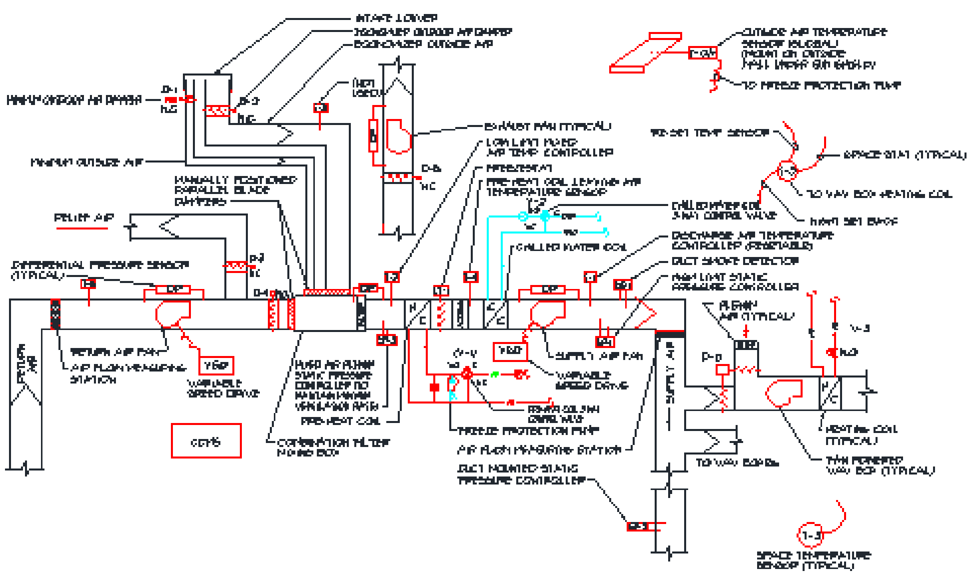
System #1(Conventional Variable Air Volume):

Conventional HVAC system using chillers for cooling, boilers for heating, and variable air volume air handling units for air distribution. The Conventional System consists of four-pipe heating water, chilled water system serving a combination of Variable Air Volume and Constant Volume air handling units. A typical control diagram for a variable air volume air handling unit can be seen in ***Mechanical Figure #9***.

The chilled water system utilizes multiple chillers and primary-secondary pumping system that operates at standard supply water (44°F) and return water (54°F) temperatures. Likewise, air-handling systems operate at standard 55°F supply temperatures. New boilers and a chillers would be used in this system approach where applicable.

Ventilation airflow is provided directly through the air handling units.

Domestic hot water heating is provided by existing gas fired water heater. An additional redundant water heater is recommended.



Mechanical Figure #9 – Typical VAV AHU

Advantages:

1. The system is simple, reliable, and proven over thousands of installations. High efficiency chillers minimizes refrigeration systems and components.
2. Chillers are remotely located in a Mechanical equipment space which can be easily serviced and maintained, while generated noise is not adjacent to learning areas.
3. Central Air Handling Systems, zoned based on function, can be easily maintained without disturbing occupied areas.
4. Air Handling Systems can utilize energy conserving control strategies such as outside air economizer cycles.
5. Modulating controls for air handling units and terminal units (VAV boxes) provides close space temperature and humidity control.
6. Glycol piping is limited to piping serving air handling unit-cooling coils and is minimized over occupied areas.
7. Condensate drains are limited to Air Handling Units.
8. Energy-conserving variable speed drives can be applied to chilled water, heating water, and fan systems.
9. Flexibility exists to meet cooling load requirements.
10. No impact to building façade.

Disadvantages:

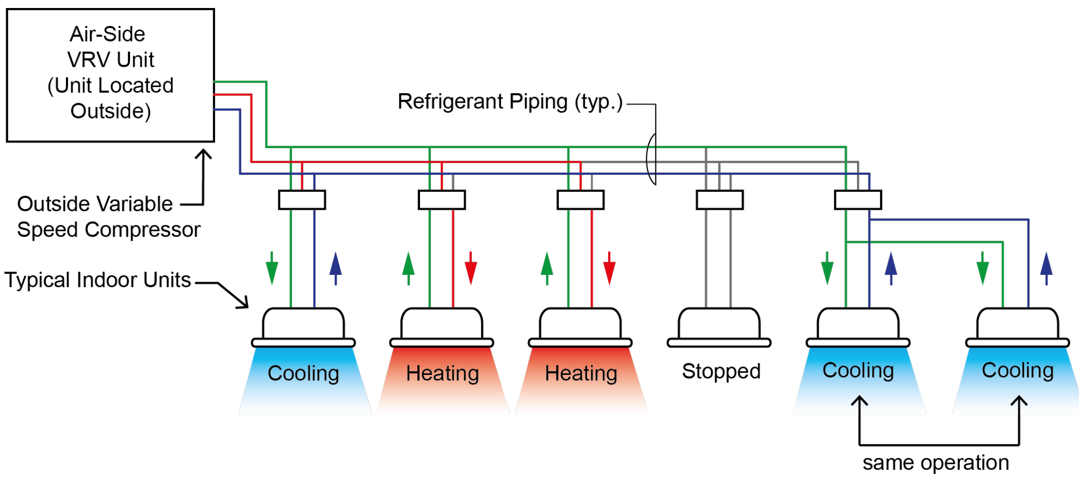
1. Large ductwork distribution systems.
2. Large air handling units and associated roof structure required.
3. Mechanical Equipment Room is needed for boilers, pumps and piping.
4. Exterior equipment space is required for exterior chillers.
5. Direct Expansion Systems are required for 12-month occupancy areas.
6. Larger starters, disconnects, fans, pumps, etc., when compared to de-centralized HVAC systems.
7. High first costs when compared to System #2 and System #3.
8. Exhaust air energy recovery is not utilized.
9. Service contracts are required for the Boilers and Chillers.
10. Required outdoor equipment is exposed to weather conditions.
11. Boilers will require annual maintenance.
12.

System #2 (Air Side Variable Refrigerant Volume Systems and Energy Recovery Ventilators):

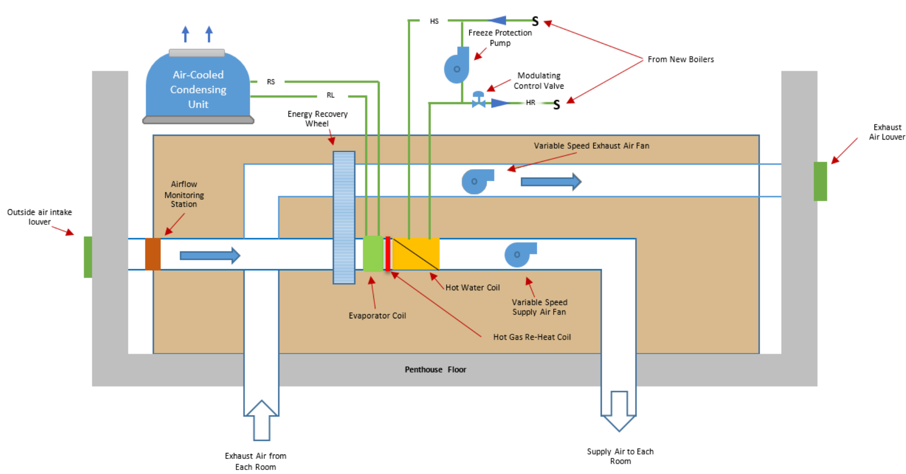
Air side Variable refrigerant volume (VRV) system (heat pumps) and 100% Outside Air Direct Expansion (DX) with hot water heat energy recovery ventilators (air-cooled) to provide cooling/heating and code amount of ventilation, respectively. The outside air energy recovery ventilator will be either a packaged air-cooled unit or split system units with an enthalpy wheel and hot water coil. The variable refrigerant volume system allows simultaneous heating and cooling throughout the zones by utilizing individual ductless heat pump units. Digital scroll compressors are utilized in both the VRV heat pump compressor units and the energy recovery ventilator.

The basic layout of the VRV system is indicated below in ***Mechanical Figure #10***.

For this system the energy recovery ventilators shall utilize direct expansion cooling with digital scroll compressors. Heating will be provided by unit mounted hot water coils with freeze protection pumps as shown in ***Mechanical Figure #11***.



Mechanical Figure #10 – VRV Heat Pump System



Mechanical Figure #11 – Typical DX Energy Recovery Ventilator with Hot Water Heat

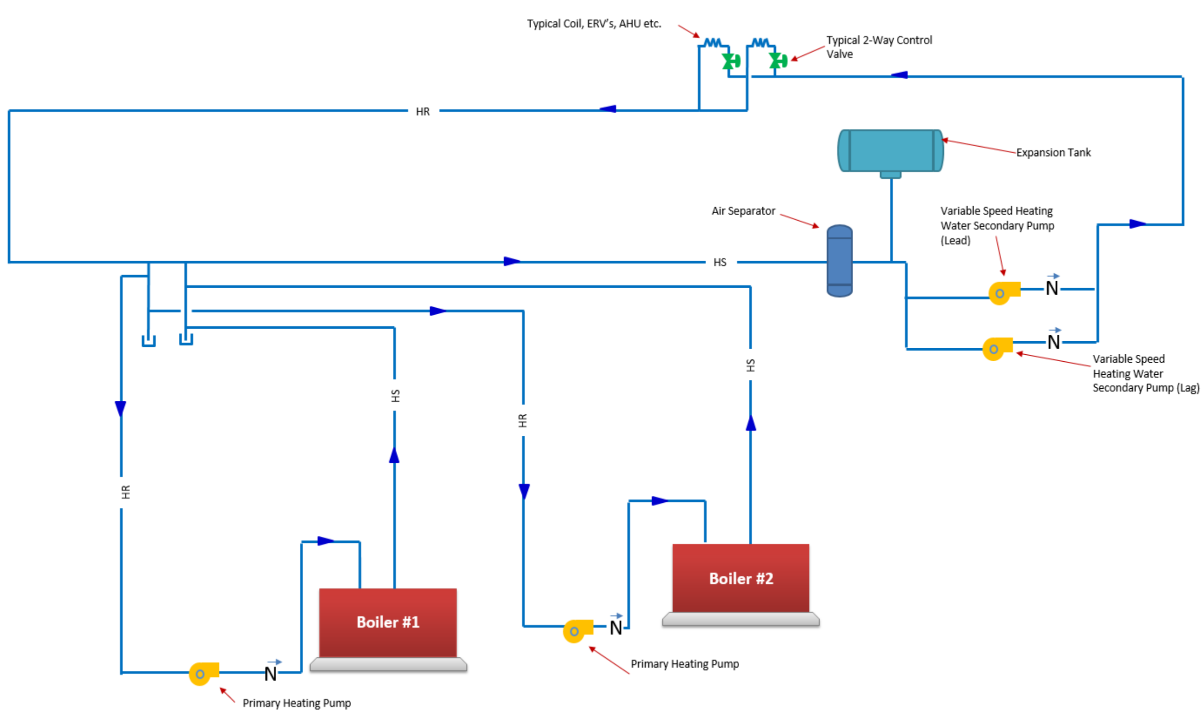
The energy recovery ventilators will be provided with variable frequency drives and demand controlled ventilation. The ventilation system will monitor the carbon dioxide levels and allow the energy recovery ventilator to reduce air flow rates when the occupancy and carbon dioxide levels are low.

For dehumidification each ERV unit shall include a hot gas re-heat coil that will provide "free" refrigerant re-heat for precise temperature and humidity control based on both a discharge air temperature sensor and a space mounted humidity sensor.

Heating for System #2 shall be provided by new natural gas fired boilers as shown in ***Mechanical Figure #12***.

The Cafeteria and similar high occupancy assembly spaces will be provided with a single zone variable air volume packaged rooftop unit that will provide heating, cooling, dehumidification, and ventilation airflow.

Domestic hot water heating will be provided by gas fired water heaters. An additional redundant water heater is recommended.



Mechanical Figure #12 – Hot Water Heating Plant

Advantages:

1. Familiar to maintenance staff (similar to Howard High School 1927 Building Systems).
2. Multiple units such that failure of one does not impact remainder of building.
3. Digital Scroll technology provides reduced operating power at part load.
4. Very Small Refrigerant piping utilized for heating/cooling distribution.
5. Inherent energy recovery.
6. Easy to operate and understand.
7. Decoupled ventilation air for excellent humidity control and energy efficiency.
8. Smaller ductwork distribution due to de-coupled outside air.
9. Units are remotely located outside and air-cooled, which can be easily serviced and maintained.
10. Flexibility exists to meet cooling/heating load requirements.
11. Lower first cost when compared to System #1 and #3.
12. No impact to building façade.
13. Smaller interior mechanical space required when compared to System #1.
14. Utilizes exhaust air energy recovery.
15. Very low noise levels.
16. Due to hot water heat – no defrost is needed in the winter for the ERV units.

Disadvantages:

1. Boilers will require annual maintenance.
2. Exterior noise from air-cooled condensing unit fans.
3. Condensate piping from all ductless equipment.
4. Space for the new boilers must be constructed.
5.

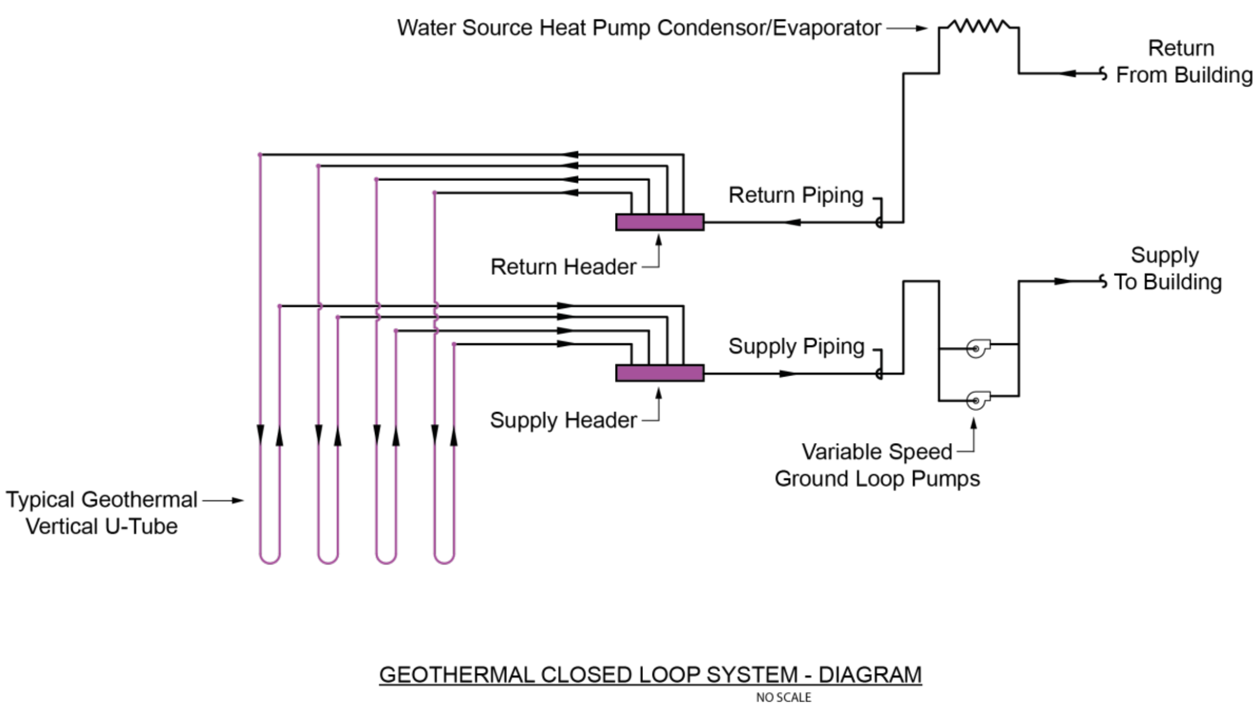
System #3 (Geothermal Variable Refrigerant Volume Systems and Energy Recovery Ventilators):

Ground coupled heat pumps are water source heat pumps which operate at extended water temperature ranges. Ground coupled heat pumps do not require heat rejection and generation equipment, such as cooling towers and supplemental boilers associated with standard water source heat pumps.

The earth is used as the heat sink for both heat rejection and heat absorption accomplished by circulating fluid through piping loops installed in vertical wells or horizontal trenches.

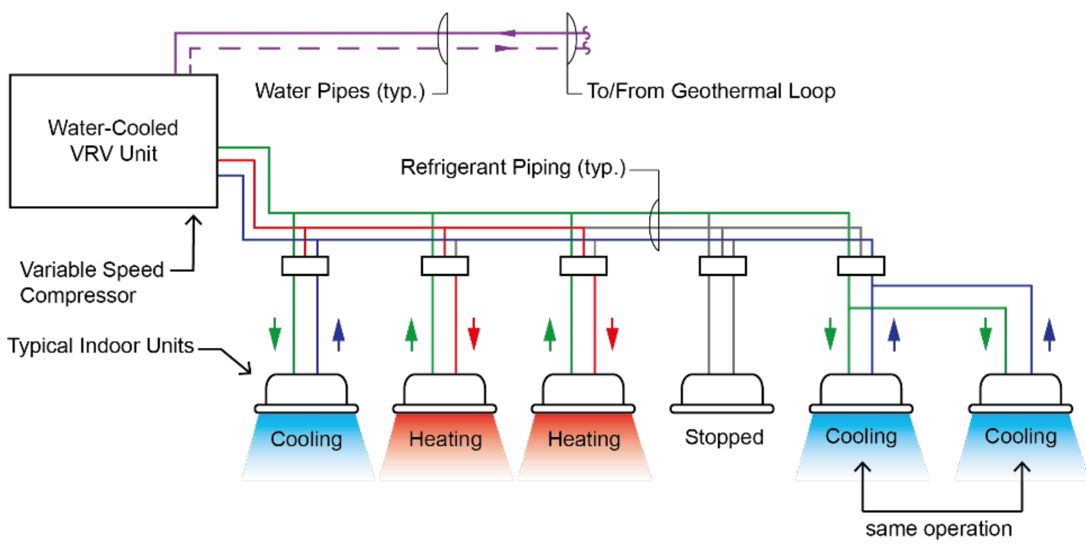
Variable speed distribution pumps are required for circulation of the heat transfer fluid as indicated in ***Mechanical Figure #13***.

Horizontal indoor units consist of the same components as most water source heat pumps. The complete refrigeration system, including compressor, water-cooled condenser, direct expansion cooling coil, expansion device, and refrigeration controls are housed in each unit. Additionally, a supply fan and filters are also components of the unit. A reversing valve located in the refrigeration circuit allows the unit to provide heating or cooling, but not both simultaneously unless an optional hot gas reheat coil is added for dehumidification control. This allows full dehumidification with re-heat energy being provided by waste heat not an external fuel source.



Mechanical Figure #13 - Typical Closed-Loop Geothermal System

The majority of the school shall be heated and cooled utilizing a heat recovery variable refrigerant flow system. Multiple ductless units shall be connected to branch selector boxes via refrigerant piping. The branch selector boxes shall be connected to compressor units that will be coupled to the geothermal piping system as shown in ***Mechanical Figure #14***. The ductless units shall be variable speed and the water cooled compressors shall be variable speed.



Mechanical Figure #14 – Variable Refrigerant Volume System

Compressor units would be provided for various portions of the school. These units would be connected to the water source heat pump loop. Two 2-way, two 2-position ATC valves shall be utilized to reduce system flow when a unit is de-energized by the control system. To prevent over pressurization of the loop a differential pressure sensor and flow measuring station shall modulate the speed of the central distribution pumps. The Geothermal pumps shall be designed to be turned “off” during unoccupied periods.

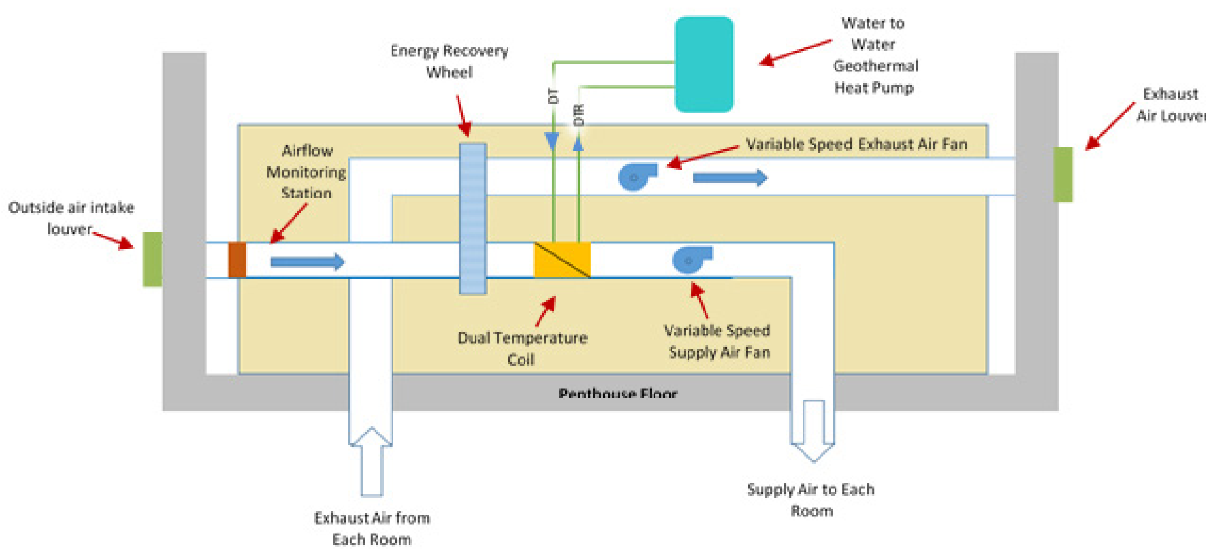
The VRV indoor units primarily constructed to be the re-circulating air type do not have sufficient capabilities to condition the ventilation requirements associated with the spaces. Therefore, separate Energy Recovery Ventilators with heat wheels designed specifically for the conditioning of outside air will need to be provided. These units, operating at 100% outside air, will be ducted directly to each space to comply with current ventilation requirements. The Energy Recovery Ventilators will be provided with chilled and heated water from a dual temperature system as indicated in ***Mechanical Figure #15***. The dual temperature system will consist of centrally located water to water geothermal heat pumps creating chilled and heated water. The dual temperature system will utilize individual pumps on each water to water heat pump.

The energy recovery ventilators will be provided with variable frequency drives and demand controlled ventilation. The ventilation system will monitor the carbon dioxide levels and allow the ventilation system to reduce airflow rates when the occupancy and carbon dioxide levels allow. Unlike conventional water source heat pumps, the circulating fluid can be very cold; and due to these extended temperatures, all piping must be insulated. No central boilers, chillers or cooling towers are required for this system.

All ERV units shall include air flow monitoring stations to monitor building ventilation rates.

The Central Distribution Room (CDR) Room or Main I.T. Room shall be conditioned with a unit served by the geothermal system and a separate air cooled unit to allow growth and redundancy.

The following are the advantages/disadvantages of System #3:



Mechanical Figure #15 – Typical Dual Temperature Energy Recovery Ventilator

Advantages:

1. Increased number of zones (temperature control) versus System #1.
2. Minimal central plant equipment to maintain.
3. Lowest operating cost.
4. Digital scroll technology provides reduced operating power at part load.
5. Inherent energy recovery.
6. ERVs maintain constant ventilation of the occupied spaces.
7. Decoupled outside air from terminal equipment resulting in excellent humidity control, excellent energy efficiency, and smaller ductwork distribution.
8. Excellent Indoor Air Quality.
9. Very favorable from an aesthetic point of view since "central plant" is the earth.
10. Longer useful service life.
11. Equipment efficiency remains more consistent for life of system versus air cooled systems.
12. Reduced outside airflow required since airflow is decoupled from heating/cooling units.
13. No need for electrical heat for back up heat.
14. No need for electric heat for defrost. Units do not need defrost cycle.

Disadvantages:

1. Highest initial cost when compared to System #2.
2. Large area needed for geothermal bore holes.

Mechanical Table #3, summarizes the life cycle costs based on hour by hour energy modeling of each system.

Mechanical Table #3 Life Cycle Cost Analysis Summary Table			
	System #1 (Conventional VAV)	**System #2 (Air-Cooled VRV & ERV)**	**System #3 (Geothermal VRV & ERV)**
Total Initial Cost ($)	$25,815,500	$23,556,000	$25,041,000
Total Annual Costs($)	$623,695	$564,689	$468,901

Notes:
1. Total Initial Cost does include plumbing and fire protection costs. These costs were equal in all three systems.
2. Total initial cost does not include bonds, insurance, general conditions or design contingency.
3. System #1 initial cost includes an additional $125,000 for additional architectural components above System #2 and #3.
4. System #2 initial cost includes and additional incremental cost of $60,000 for electrical components above the base system.
5. System #3 initial cost includes an additional $60,000 for electrical components above the base system.
6. Total Annual Costs include energy, service and maintenance costs.
7. Present Worth Factor utilizes an escalation rate of .05 and discount rate of .04

The ***estimated*** total 20 year life cycle cost for System #1 (Conventional VAV), System #2 (VRV and ERV) and System #3 (Geothermal VRV and ERV) are as follows:

- **System #1 (Conventional VAV)**
  20 year life cycle cost = $39,628,907
- **System #2 (Air-Cooled VRV-ERV)**
  20 year life cycle cost = $36,062,560
- **System #3 (Geothermal VRV and ERV)**
  20 year life cycle cost = $35,426,077

Over a 20 year life cycle, System #3 (Geothermal VRV and ERV) would have the lowest life cycle cost. This is due to the lower operating costs and relatively low first costs when compared to Systems #1 & 2. The detailed life cycle cost analysis is included in the Appendix M2 of the Report.

Finally, please note that the energy calculations and service costs indicated in our life cycle cost analysis cannot be utilized as a predictor for future utility costs of the facility. The energy analysis utilizes specific occupancy schedules, weather data and other numerous input variables that can vary greatly from the actual use of the building and will have a major impact on total annual utility costs. The energy analysis focuses on an "apples to apples" comparison of three separate HVAC systems utilizing the same typical meteorological data, occupancy schedules and other input variables

Plumbing and Fire Protection Equipment and Systems:

Based on our fire protection and plumbing findings presented earlier in the report we would recommend the following:

- Provide automatic fire protection system, standpipe system and stage hose valve cabinets.
- Provide a fire pump with fire pump controller and integral automatic transfer switch.
- Provide fire protection for all concealed combustible spaces. (If heat is not available system will need to be a dry pipe system.)
- Provide new incoming fire protection and domestic water service to a point 5 feet outside the building and connect to municipal water system. Provide new double check valve type backflow preventers for both the fire suppression and domestic water system.
- Provide new exterior water meter per City of Newark requirements.
- Based on the preliminary fire protection calculations a fire pump will be required to meet the demands of the sprinklers and standpipes. A dedicated fire pump room will need to be created to house the fire pump and associated equipment per NFPA-20.
- Provide new sanitary and vent piping system to serve all plumbing fixtures. Provide new sanitary piping main connection to 5 feet outside the building and connect to site sanitary system.
- Provide new roof drainage and storm water piping system to serve the facility. Provide new storm water piping main connection to 5 feet outside the building and connect to site storm water system. Provide scuppers to meet secondary roof drain requirements.
- Provide new water conservation type plumbing fixtures to reduce water consumption by 30-40% when compared to existing fixtures. Install domestic hot water piping as close to fixtures/faucet as possible to provide acceptable hot water delivery time.
- Provide ADA compliant plumbing fixtures.
- Provide new branch and main piping/insulation (where existing cannot be re-used) to serve the plumbing fixtures (domestic cold water, hot water and hot water recirculating).
- A domestic booster pump will be required to serve the new plumbing fixtures. This is mostly due to the fact that the high efficiency type flush valves have higher minimum pressure requirements than older plumbing fixtures. However, cost savings can be realized by utilizing smaller piping sizes since a booster pump is available.
- Recommend providing redundant water heater.
- Provide new gas piping to serve water heater and any heating and ventilation units.
- Provide new compressed air piping, hose reels, and outlets for shops.
- Provide emergency showers/eyewashes for lab area and shop areas. Provide thermostatic mixing valves and piping for tempered water.
- Install thermostatic mixing valves at all lavatories to comply with Code.
- Install high/low thermostatic mixing valve downstream of water heaters to meet Code.

This concludes the Mechanical (HVAC, Plumbing and Fire Protection) Recommendations Section of the report.

A summary of more detailed recommendations can be found in the Mechanical Basis of Design found in the Appendix M3.

Electrical Distribution System:

The existing electrical distribution system serving the Main School and Gym are nearing or beyond their useful service life. We would recommend that the entire electrical distribution system for the school be replaced. In place of the existing primary metering and switches located in the building, we recommend installing a new utility owned pad mounted transformer with C/T metering on the side of the transformer outside the school. This transformer would feed one (1) 5,000A, 480Y/277V, 3 phase switchboard that would serve the entire school. There would be a 2,000A circuit breaker installed in this switchboard that would serve another switchboard located in the opposite end of the school from the 5,000A switchboard. A separate feed from the new transformer would also go to the fire pump controller since a new fire pump is being provided for the building. The electrical system would be a 3 phase, 4 wire system and all the other panelboards and equipment requiring power would be fed from these switchboards. There would be several 480V to 208Y/120V step down transformers throughout the building to provide power to computers, receptacles and any other equipment requiring 120V power. Distribution and branch circuit panelboards will be located throughout the building to serve electrical loads near their location. Since the panelboards are going in a school, all efforts will be made to locate the panelboards in electrical, storage, and mechanical spaces and not in hallways where they can be accessed by the students.

a. Generator:

Due to the age/condition and size of the existing generator we would recommend that the generator located inside the existing school be replaced. We would recommend a new 1,000kW, 480Y/277V, 3 phase, diesel generator be provided outside the building near the electrical room. This new generator would have two circuit breakers mounted on the generator; one to serve the life safety load transfer switch and the second breaker to serve the standby loads transfer switch. There would need to be two programmed start automatic transfer switches sized as required to serve the building life safety loads and the standby loads as selected by the owner. The life safety transfer switch would serve lighting circuits that would contain various lighting fixtures throughout the building so that the lighting fixtures connected to these circuits would provide illumination in the event power is lost to the building. The standby transfer switch would serve access control system, video surveillance, MDF/IDF rooms, public address system, clock system. The National Electric Code (NEC) requires that the life safety loads have a dedicated transfer switch that only serves life safety loads.

b. General Building Power:

Due to the age/condition and capacity of the general building power system we would recommend that the existing general building power system be replaced. As mentioned in the electrical distribution system portion of the recommendations, the school will receive all new electrical branch circuit panelboards. All new wiring, conduit, supports ...etc. should be provided to new 20A, 120V, receptacles located throughout the building. New disconnects, wiring, and conduits would be provided for all new mechanical equipment provided. All shops where machinery or motors are used would have panelboards with shunt-trip breakers, which would be interlocked with an emergency stop button located in the shop area.

c. Interior Lighting:

Since the existing lighting fixtures are near or have exceeded their useful service life, and since T-12 lamps are no longer being manufactured and more efficient light sources are available, we would recommend that the existing interior lighting be replaced. We would recommend that all new lighting throughout the school be LED and shall be arranged to provide Illuminating Engineering Society (IES) recommended lighting levels and comply with the lighting power density requirements of ASHRAE 90.1-2010. We would recommend 2'x4' recessed volumetric LED lighting fixtures being installed in all the classrooms and 2'x4' recessed acrylic LED fixtures in the hallways. In the mechanical spaces where there are not ceilings we recommend 1'x4' LED industrial fixtures with a wire guard being installed suspended from the structure above or surface mounted. We would recommend high bay LED fixtures to be used in the shops and gymnasium areas. These LED high bay lights will provide significant energy savings over the existing metal halide fixtures and will provide instant-on capabilities instead of the 5-10-minute warm-up time for metal halide lamps.

d. Exterior Lighting:

Since the existing fixtures utilize less efficient metal halide lamps and due to lack of full cut-off fixtures, we would recommend that the existing exterior lighting be replaced. We would recommend that all new lighting on the exterior of the building and parking lots be LED and shall be arranged to provide Illuminating Engineering Society (IES) recommended lighting levels and comply with the lighting power density requirements of ASHRAE 90.1-2010. LED light sources offer the following advantages over the existing metal halide light sources.

1. LED luminaires exhibit higher efficiency than metal halide counterparts. Although metal halide light sources themselves have fairly high efficacies, they are point sources, which means the luminaires require reflectors to aim and control the light. Typical metal halide luminaires are only 60-70% efficient, which means that 30-40% of the light is trapped within the luminaire. LEDs are directional light sources, meaning they distribute light in one direction, and therefore do not rely solely on external reflectors to control light. Reflectors may, however, be used to control spill light and enhance light distribution. Typical LED luminaires are 80-90% efficient.
2. As a direct result of their increased efficiency, LED luminaires consume significantly less energy than metal halide luminaires. For example, a traditional 400W metal halide fixture operates at 460 watts. An LED fixture producing equivalent illumination levels would operate at approximately 210 watts.
3. LED luminaires have much longer life expectancies than metal halide lamps. End of useful life for light sources is commonly defined as the time at which the light source is reduced to 70 percent output. For metal halide light sources, this is usually after approximately 15,000 hours. Modern LED light sources are capable of 90% output after 100,000 hours of operation.
4. Metal halide light sources take several minutes to reach full brightness due to their inherent nature of operation by energizing atoms in gases via an electric arc. If a metal halide light source is turned off, they cannot be turned back on immediately. In fact, there is often a re-strike time delay, which is a fixed period of time before the ballast will attempt to re-strike. LED light sources are instant on, instant off, which can be effective for security lighting. This also enables light sources to be cycled on and off more frequently, resulting in energy savings.

Our design would include all exterior lighting being full cut-off fixtures to eliminate uplight and reduce light trespass onto adjacent properties.

e. Lighting Controls:

Due to the fact that the existing lighting controls do not meet current energy codes and standards we would recommend that all the existing lighting controls are replaced. In addition, ASHRAE 90.1-2010 requires that lighting controls in spaces receiving new and/or modified lighting fixtures comply with control requirements specified in ASHRAE 90.1-2010. Our design would provide occupancy sensors in all classrooms, offices, and restrooms to cut the lights off automatically if no one is in the space after 20 minutes. The classrooms would have dimmer controls to be able to adjust the lighting levels in the room based on the current activity in the room. This also allows for multi-level lighting control in compliance with ASHRAE 90.1-2010. Programmable lighting relay control panels are recommended for areas such as corridors, lobbies and stairwells. During normal business hours, as designated by the Owner, the lighting control panel would hold the lighting fixtures on serving the corridor, lobby and stair based on the internal time sequence. During non-business hours, the programmable lighting control panel would only energize specific zones based upon a control signal from one or multiple occupancy sensors in the specified zone. Once triggered, the lighting control panel would operate the designated lighting fixtures for a specific period of time before de-energizing the circuit. There would also be an override button installed at the entry doors to turn the lights on for an individual using the building after hours. A similar lighting control panel would be used as well to control the exterior building and parking lot lights based on time sequence.

Life Safety:

Due to the fact that there is no exterior emergency egress lighting and the interior egress lighting does not meet the NFPA 101 Life Safety Code, we would recommend that the existing life safety devices be replaced. New exit signs should be provided at all exit doors and throughout the hallways as required to comply with NFPA 101 Life Safety Code. Egress lighting should be provided throughout the building and outside all exterior egress doors as required to comply with NFPA 101 Life Safety Code. Exit and egress lighting would be served by new generator and would use generator transfer devices to switch from normal to emergency upon loss of normal power.

Fire Alarm:

The existing fire alarm devices are a mixture of styles, (addressable and non-addressable) and a majority of the devices have exceeded their useful service life; therefore, we would recommend that the entire fire alarm system be replaced. The new system should be completely addressable and have notification and initiation devices throughout the school as required by the latest Delaware State Fire Prevention Codes and NPFA 72. Addressable systems offer significantly more functionality over analog systems. For example, if a pull station at the main entry door was activated, an addressable system would indicate the exact device identification number and location. However, an analog system can only indicate which zone the pull is on, which means that someone has to troubleshoot the system to determine where the device is. Analog devices can commonly be replaced with digital devices while maintaining and reusing existing cabling. However, based on the amount of additional devices required and the age of the existing cabling, we recommend that all new cabling be provided.

In addition, addressable systems can offer better redundancy than analog systems, through the use of Class "A" circuitry. Traditional systems utilize Class "B" wiring, which basically daisy-chains devices on a circuit, and terminates at an end-of-line (EOL) resistor. Class "A" wiring provides a complete loop back to the control panel, which provides protection against an open circuit, which would traditionally render all devices beyond the open point useless until the circuit was repaired.

Audible/visual alarms should be provided in all regularly occupied areas of the building, with voice evacuation in select spaces as required by the Authority Having Jurisdiction.

Two independent telephone lines and an automatic dialer should be provided for central station monitoring of alarm, trouble and supervisory conditions. If a voice-over-IP (VoIP) telephone system is used, the digital alarm communicator transmitter (DACT) will need to be IP based, with a GSM communications module for a secondary communications path over the GSM network.

All new fire suppression/sprinkler system tamper switches and flow switches will need to be monitored by the fire alarm system. The generator should be interfaced with the fire alarm system to receive "generator running" and "generator trouble" supervisory signals at the fire alarm control panel and annunciator.

The new devices installed in electrical, mechanical and gymnasiums should have wire guards to protect the devices from damage. Pull stations should have hinged vandal shields with alarms to prevent false alarms.

Security System:

Due to the fact that the existing security system doesn't appear to have any access control means, we would recommend that the existing security system be replaced. All exterior doors, roof hatches, etc. should be monitored by door contacts. Card readers should be provided at exterior doors intended for regular entry as well as interior spaces requiring additional security, e.g. MDF/IDF rooms. This would allow for more secure access to the school and be able to monitor who opened what door and at what time. We would also recommend providing IP based video surveillance cameras throughout the hallways, and to monitor building entry doors, and parking lots. We would recommend adding an exterior intercom station with video at the public entrances to be able to see who is requesting entry into the school before the door is unlocked and they are inside the school. Panic buttons should also be provided at the reception desk to lock entry doors during lock-down procedures and send an alarm signal to the central monitoring station.

Information Technology and Media:

Since Category 5 cabling is still being used and the IDF rooms are not in conditioned spaces dedicated to communications equipment only, we would recommend that the existing information technology and media system be replaced. All cabling and data outlets throughout the school should be Category 6 and the information technology system should meet Delaware's Department of Technology and Information (DTI) Standards. We would recommend that dedicated IDF rooms be provided with new lighting and independent HVAC systems. Smartboards and teacher drops should be installed so that the teacher can display on the smartboard or television from their computer. Wireless access points should be located for full coverage throughout the school so that students using laptops and smart devices (e.g. tablets) could access the internet. The existing 700/800 MHZ bi-directional antenna for first responders should be reinstalled. We would recommend a new paging/intercom system and clock system be provided.

This concludes the electrical recommendations section of the report. A summary of more detailed recommendations can be found in the Electrical Basis of Design found in Appendix E1.

Findings & Recommendations
KITCHEN & CULINARY

Main Kitchen

- Life expectancy for most of equipment roughly 7 years.
- 3 compartment sink not to code. Must be stainless steel and have 20" x 28" sink bowls. Recommend replacing.
- Per IMC09, hood coverage should extend over oven (code must be 12" front and 6" on the side). A new hood or hood extension is required.
- Ansul system for main kitchen hood not present. It is undetermined if it was UL classified.
- Internal bracing and lighting are a code concern for cleaning- consider.
- Existing walls, floors and ceiling meet code.

Culinary Arts Area

- Life expectancy for most equipment roughly 7 years.
- Refrigerated drawers on 6-burner range require repair or replacement
- Existing hoods are to code and UL classified.
- Existing walls, floors and ceiling meet code.

Findings & Recommendations
SITE

A. Site – Index Rating: 4

The Paul M. Hodgson Vocational-Technical High School (Hodgson HS) is located at 2575 Glasgow Avenue in Newark, Delaware, 19702. The school is located directly to the west of Route 896 and south of Route 40 (Pulaski Highway). The existing property is tax parcel number 11-027.00-003 and it is approximately 64.16 +/- acres in size. The record reference for this property is Instrument #20131022-0067390. The property is split-zoned, with the north side zoned "S" (Suburban), and the south side "BP" (Business Park). The use is permitted in these zones.

There are several factors that go into place when deciding whether or not a school site is adequate for the surrounding community. Elements such as size, shape, topography, safety, and access are just a few of the guidelines that need to be analyzed. With that in mind, one major factor includes the total size of the high school property to make sure that there is a sufficient amount of space to operate effectively. The Department of Education (DOE) requires 30 acres for a base high school plus one acre per 100 students at final school capacity. Hodgson currently enrolls roughly 1,200 students and so the required size for this school should be approximately 42 acres in size. At 64.16 acres, the existing site is large enough to handle this amount of students, as well as the staff and faculty. (see Figure 2.1)

Figure 2.1
Existing school looking northeast from athletic fields

Another factor includes the shape and topography of the land. The Department of Education (DOE) prefers a rectangular shape with dimensional ratios at either 3:5 or 5:8. The Hodgson site is shaped like an acute trapezoid, with the south corner of the property where Glasgow Ave. and Route 896 come close in distance. The topography for the Hodgson Vocational Technical High School includes mostly grassed areas with limited woods located throughout the site. The ground is well graded, with no apparent areas of poor drainage or major elevation changes. There are no known jurisdictional wetlands areas on or around the site perimeter of the school. However, this finding would need to be confirmed with a field inspection prior to commencing with any land development design. The site is not located in a Water Resource Protection Area (WRPA). In addition, no 100 year floodplains are located on the property according to the latest February 4, 2015 Flood Insurance Rate Map (FIRM). The current site is not affected under Executive Order 41 Rising Sea Levels.

Student and public safety is an important factor when deciding a high school location. Glasgow Avenue is a low speed, low volume road, where students can safely traverse to and from school under normal conditions. Good site visibility exists entering and exiting the property. Also, there are no railroad tracks around the site and no overhead utility lines cross the high school. Overall, the site remains a good location for a high school, and its proposed expansion fits well on site, with little or no safety concerns.

The current vehicle entrance to the high school is located off Glasgow Avenue and the internal roads are designated two-way around the campus. The existing high school building is roughly 305,000 +/- GSF. The building layout is shaped like an "L" with several building entrances. There are 357 existing striped parking spaces, including 9 handicap spaces scattered around the school. Buses have a designated loop for pick-up and drop-off, located on the south side of the school where one of the main entrances can be found, however this does not operate efficiently (see figure 2.2 & 2.3). Located further to the south, are two athletic fields, one soccer field, one baseball field, a softball field, and a football/ competition field with a perimeter running track. There is a concession stand close to the football field, as well as stands on both sides of the track. There are existing 8" and 12" water mains, as well as an existing 8" sanitary sewer main that connects

Figure 2.2
Exterior Bus Access

Figure 2.3
Exterior Bus Access

to public lines running under Glasgow Avenue. Also, Hodgson has four fire hydrants distributed around the perimeter of the school.

The proposed development for the Hodgson Vocational Technical High School Replacement school, includes the demolition of the existing school, parking lots, stadium and athletic fields and replacement with a new updated, school and fields with a new site layout. A new two-story 275,000 +/- GSF building will be located on the south side of the existing entrance road, at the location of the current competition athletic stadium. A new bus loop will be located on the west side of the building, where there will be 32 bus spaces available. In addition, there will be new access roads around the site with 475 paved parking spaces and over 200 overflow lawn spaces. It is anticipated that the existing main ingress/egress driveway on-site can remain intact, with surface paving upon completion of the new school (see Figure 2.4). The existing signalized entrance location will also remain in place (see Figure 2.5), although minor upgrades for ADA compliance will be required. Student parking will be provided to the east of the new school. Staff parking will be provided north of the main building entrance. Additional event and athletic parking occurs further to the north, across the existing entrance drive. Since an entirely new layout is being proposed, grading will have to be done around the site in order to ensure proper drainage for roadways and athletic fields.

To provide additional fields necessary to support various athletics, there will be an increase in athletic fields scattered around the site. The southwest corner will include a proposed lacrosse and field hockey field as well as a new softball field close to where the existing baseball field is located. Behind the proposed school and east of the softball field, there will be six new tennis courts which gives Hodgson HS tennis courts for the first time. There will also be the addition of two new soccer fields, two practice fields, a multi-purpose competition field/ track and field facility, and a baseball field. The multi-purpose field will include a grandstand as well as a ticket booth and concession stand located close in proximity. The baseball field will also include bleachers for spectators.

The Replacement school will need to comply with the current SWM regulations. Therefore, several SWM facilities will be provided. Small SWM facilities located around the south of the new building

Figure 2.4
Main Access Road on site looking east.

Figure 2.5
Site Access from Glasgow Avenue looking south.

will be incorporated into the site design, as well as a large SWM facility east of the multi-purpose stadium. This latter SWM location east of the stadium is designed at a low spot, so converting it to a SWM facility is an effective use of the land. Two geo-thermal well fields are also proposed on both sides of the site entrance and will be designed to convert groundwater into usable heat for the new building. The proposed site layout utilizes all 64 acres of property in a much more practical way that will aid both the Hodgson HS students and faculty.

The existing 8-inch sewer main under the main access driveway is anticipated to remain, subject to an evaluation of its condition. Parts of the existing on-site water main system may be salvageable as well, pending a grading analysis. New water and sewer mains will extend off the existing mains to serve the new school and stadium facilities. Pressures and flows of the water main will need to be tested for fire flow and sprinkler service adequacy.

Proposed development of the replacement school is anticipated to occur in two distinct phases. The first phase would include the demolition of the stadium and athletic fields south of the main access driveway and the construction of the new replacement school.

The second phase would consist of the demolition of the existing high school and parking lots, and the construction of new athletic fields and Multi-purpose stadium. During the construction of the new school, athletic fields, and stadium, sanctioned athletic events would be transferred to nearby public high schools or recreation fields.

In order to obtain development approval, plans will need to be provided to agencies including, but not limited to, DelDOT, New Castle County Department of Land Use (NCCDLU), New Castle County Department of Special Services (NCCDSS), the Delaware State Fire Marshal's Office (SFMO), Artesian Water Company, and The Delaware Department of Natural Resources and Environmental Control (DNREC). Before any major submittal to review agencies, projects of this magnitude typically partake in the Preliminary Land Use Service (PLUS) process. After submittal, public PLUS meetings are held and generally occur on the fourth Wednesday of each month. PLUS provides for State agency review of any major land use change proposals prior to submission to the local governments. However, it should be noted that this project has not been submitted to the State Office of Planning for a PLUS review as of this report.

Cost Estimate Summary

New Castle County Vocational Technical School District
Major Capital Projects Cash Flow Worksheet
2021 Certificate of Necessity Request
Date: 28 June 2021

	2021 C OF N REQUEST				Grand Total
Project Name	**FY2020**	**FY2021**	**FY2022**	**FY2023**	**Bond Funding**
New 275,000 SF Hodgson High School	$19,329,000	$33,825,750	$54,121,200	$27,060,600	$134,336,550
Delcastle Renovations & Additions	$7,859,610	$20,631,476	$12,378,885	----	$40,869,971
Marshalton Renovations	$3,886,566	$10,202,234	$6,121,341	----	$20,210,141
2019 Referendum	**$31,075,175**	**$64,659,460**	**$72,621,426**	**$27,060,600**	**$195,416,661**

ALTERNATE SCHEME	2021 C OF N REQUEST				Grand Total
Project Name	**FY2020**	**FY2021**	**FY2022**	**FY2023**	**Bond Funding**
Hodgson Renovations & Additions	$14,938,746	$31,371,366	$31,371,366	----	$77,681,477
Delcastle Renovations & Additions	$7,859,610	$20,631,476	$12,378,885	----	$40,869,971
Marshalton Renovations	$3,886,566	$10,202,234	$6,121,341	----	$20,210,141
2019 Referendum	**$26,684,921**	**$62,205,076**	**$49,871,592**	**$0**	**$138,761,589**

PAUL M. HODGSON VOCATIONAL TECHNICAL HIGH SCHOOL
NEW SCHOOL BUILDING
CONCEPTUAL DESIGN ESTIMATE 1.0
DATE: 28 JUNE 2021

TOTAL PROJECT COST SUMMARY 275,000 SF		
	School Construction 3 Years	
BUILDING CONSTRUCTION COST	**Demo/New Fields 1 Year**	
NEW CONSTRUCTION		
CONSTRUCTION COST	$78,914,403	
SUBTOTAL NEW CONSTRUCTION		$78,914,403
10% CONTINGENCY	$7,891,440	
GENERAL CONDITIONS & REIMBURSABLE LABOR	$6,944,467	
CM FEE	$3,750,012	
BUILDING PERMIT FEES	$838,753	
GRAND TOTAL CONSTRUCTION COST		$98,339,076
SOFT COSTS		
AE FEE	$8,850,517	
AGENCY REVIEW FEES & IMPACT FEE	$9,833,908	
COMPUTER & TECHNOLOGY	$3,025,000	
FF&E	$3,300,000	
TOTAL SOFT COSTS		$25,009,424
SUBTOTAL PROJECT COSTS		**$123,348,500**
COST ESCALATION - CONSTRUCTION		
COST ESCALATION - CONSTRUCTION		
ESCALATION 2023-2026	$5,242,311	
Subtotal Escalation Costs		$5,242,311
EXTRAORDINARY SITE CONDITIONS		
DEMOLISH EXISTING BUILDING	$4,361,500	
HAZARDOUS MATERIALS ABATEMENT	$400,000	
UNSATISFACTORY SOIL REMEDIATION	$500,000	
TRANSPORTATION TO REMOTE ATHLETIC FIELDS	$250,000	
Subtotal Extraordinary Site Conditions		$5,511,500

Page 1 of 2

PAUL M. HODGSON VOCATIONAL TECHNICAL HIGH SCHOOL
NEW SCHOOL BUILDING
CONCEPTUAL DESIGN ESTIMATE 1.0
DATE: 28 JUNE 2021

TOTAL PROJECT COST SUMMARY 275,000 SF

COST ESCALATION - EXTRAORDINARY SITE

COST ESCALATION - CONSTRUCTION		
ESCALATION 2022-2025	$234,239	
Subtotal Escalation Costs		$234,239
FINAL GRAND TOTAL PROJECT COSTS		**$134,336,550**

Schedule

Due to extremely limited interior and site related 'swing' space, and the configuration of the facility's circulation and egress patterns, it is anticipated that with the consideration for the renovation and addition to existing facility, the construction process will require multiple year, occupied phasing over a duration of four years. Currently, the anticipated construction will occur over a 12 month period for four years including summers and is factored into the cost estimate documentation. A majority of the work is intrusive to the basic function of the school and will mandate summer or other off-session time period for work to be executed in an efficient and safe manner. Multiple student classroom trailers would be required as a result of the sequencing of renovation required, especially to existing classrooms. The space for the trailers on site is limited and not adjacent to appropriate interior functions or circulation. (Refer to figure 3.1, 3.2 and 3.3)

Figure 3.1
Existing Site Plan

Figure 3.1
Existing Site Plan

Figure 3.1
Existing Site Plan

While we have generated a proposed plan for renovations and additions, as noted previously, we feel proceeding in this direction is a more costly option and has a negative impact on students and staff for a four year duration.

As a result with increased capacity, it is recommended that the District construct a replacement school with increased capacity. The proposed new school would be on site and in the location of current athletic fields, thereby displacing athletics fields offsite for a three-year duration. This would allow students and staff to remain in the existing school throughout the two year building construction duration with minimal disruption to school functions. The additional one-year athletic field construction on site would then occur after the new facility is occupied. Overall, this eliminates the need for costly trailers for classroom space, multiple occupied phasing, increased costs and an overall shorter duration of construction. See the following proposed phasing plans for intent of execution.

- Existing school remains functional
- Athletic field use moves off site to other vocational technical schools for two-year construction duration
- Construct new 275,000 comprehensive vocational technical high school on site in location of existing athletic fields. (See Figure 3.2 & 3.3)
- At completion of the new building, transition students into new facility
- Demolish existing facility
- Construct new athletic fields and fieldhouse in place of demolished facility.

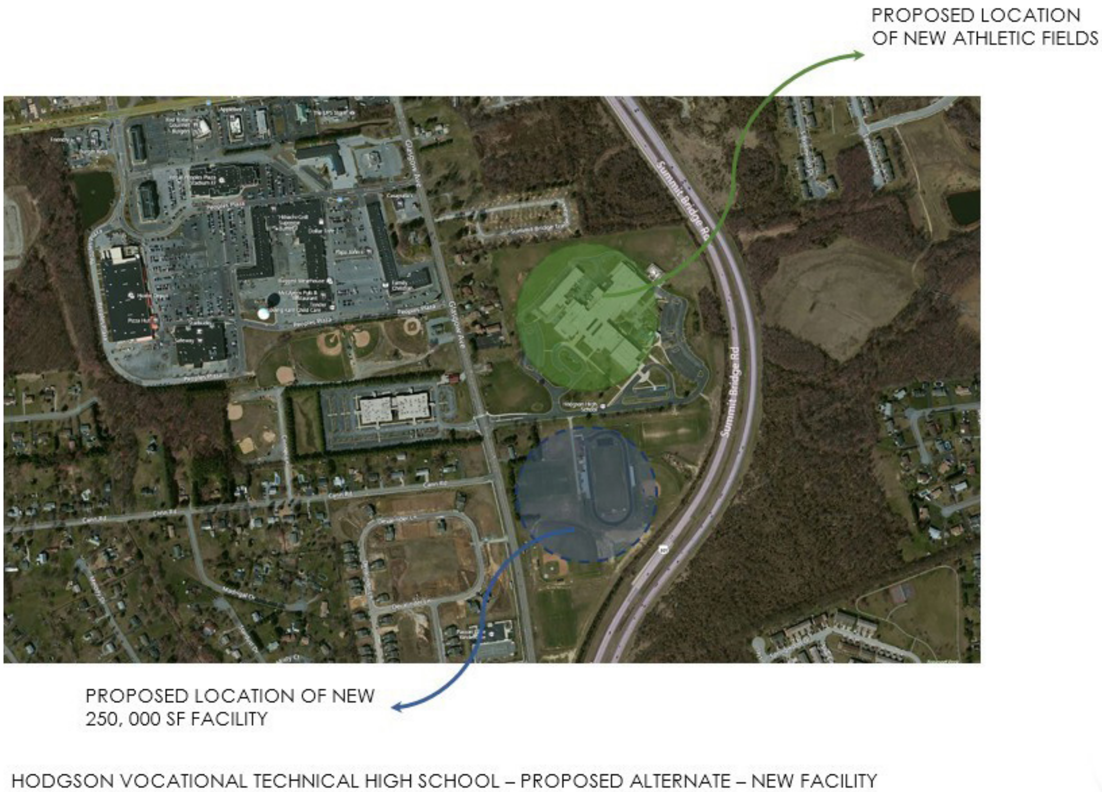


Figure 3.4
Proposed Alternate – New Facility

Figure 3.5
Proposed Site Plan – New Facility

Conclusion

As outlined in the Findings and Recommendation section of this analysis, the proposed renovation and addition work to the existing facility will not address all of the existing programmatic and educational deficiencies of the facility. In addition, to do so is a major disruption to students and school functions for a four-year period and is within 15% of constructing a new, efficient and compliant facility with additional capacity.

As this facility was not designed to be a full time educational facility, renovations to update the current systems and program spaces to align with the state requirements for a full time, career and technical high school are very difficult to achieve and more costly in the long term. Therefore, constructing a replacement school is a more cost effective and efficient use of funding within a shorter duration of a three-year period. This also allows for increased student capacity to help address the student growth in southern regions of the county and alleviate the burden on outside districts.

It is the passion of the administration, staff and community that New Castle County Vocational Technical School District moves forward as a leader in the field of public education and career and technical training. The action items in this report target tangible steps that can be taken immediately to allow the District to accommodate its need to address the building and program deficiencies at Hodgson Vocational Technical High School with the construction of a replacement school. Without funding the level of quality and performance that NCCVT and specifically Hodgson brings to its students will not be achievable.

It is the recommendation of this report that New Castle County Vocational Technical School District submit Certificate of Necessity documentation to the Department of Education to seek bond bill funding. Pursuant to the estimate documentation, the required funding must be sufficient to allow the new construction of the Paul M. Hodgson Vocational Technical High Replacement School with a budget of approximately $128,763,158 for a full facility replacement.

It is of critical importance that all available effort and resources are directed to addressing New Castle County Vocational Technical School District's notable need in order to keep the district on target as a leader in the Delaware career and technical educational system.

Appendices

New Castle County
Vocational-Technical School District
1417 Newport Road
Wilmington, DE 19804

Board of Education Meeting

TELECONFERENCE
SEPTEMBER 28, 2020
7:00 P.M.

AGENDA

PLEASE POST

THIS IS NOT AN IN PERSON MEETING

TELECONFERENCE

Join Zoom Meeting
https://zoom.us/j/91821877901?pwd=SlkrUjJDOUh2WnI2UzYzQWVIWnRTQT09

Meeting ID: 918 2187 7901
Passcode: 402564

EXAMPLE

this page will be replaced with july 26 board agenda and approval date

1. Call to Order
   a. Pledge of Allegiance
2. Report, Secretary/Superintendent
   a. Minutes of the August 24, 2020, Regular Meeting *(Action Item)*
3. Community/Public Comments
4. Recognition of Accomplishments - *None*
5. Presentation - *None*
6. Updates
   a. COVID-19 Update
7. Financial Reports *(Action Item)*
8. Bids, Quotations, and Change Orders - *None*
9. Reports, Principals/Directors/Special
10. Old Business
    a. Revised Board Policy 103 – Title IX *2nd Read (Action Item)*
11. New Business
    a. Financial Position Report *(Action Item)*
    b. Certificate of Necessity Renovations Application *(Action Item)*
    c. Certificate of Necessity New Projects Application *(Action Item)*
    d. Student Code of Conduct Revision *1st Read (Action Item)*
       i. Page 51, S. Inflammatory Actions/Harassment/Hazing
    e. Revised Board Policies 608 Acceptable Use Policy *1st Read (Action Item)*
    f. Attendance Policy *(Action Item)*
    g. Athletic Policy *(Action Item)*
    h. Personnel *(Action Item)*
12. General Information
    a. Dates to Remember

During this meeting, the NCCVT Board of Education may enter into Executive Session in order to consider matters authorized under Delaware Code, Title 29, Chapter 100, §10004 (b, c, d, h).

Approval to proceed with C of N submission on 9/28/20

The following are diagrams indicating proposed work areas and corresponding scope

Item	Title
Figure 1.1	Aerial Campus View
Figure 1.2	Building Exterior (typical)
Figure 1.3	Non-code Compliant Issues Throughout
Figure 1.4	Non-code Compliant Issues Throughout
Figure 1.5	Classroom Crowding
Figure 1.6	Lack of Instructional Space for Culinary
Figure 1.7	Cafeteria Seating
Figure 2.1	Existing School Looking Northeast from Athletic Fields
Figure 2.2	Exterior Bus Access
Figure 2.3	Exterior Bus Access
Figure 2.4	Main Access Road on Site Looking East
Figure 2.5	Site Access from Glasgow Avenue Looking South
Figure 3.1	Existing Site Plan
Figure 3.2	Proposed Site Plan – Renovated Facility – Phase 1
Figure 3.3	Proposed Site Plan – Renovated Facility – Phase 2
Figure 3.4	Proposed Alternate – New Facility
Figure 3.5	Proposed Alternate – New Facility

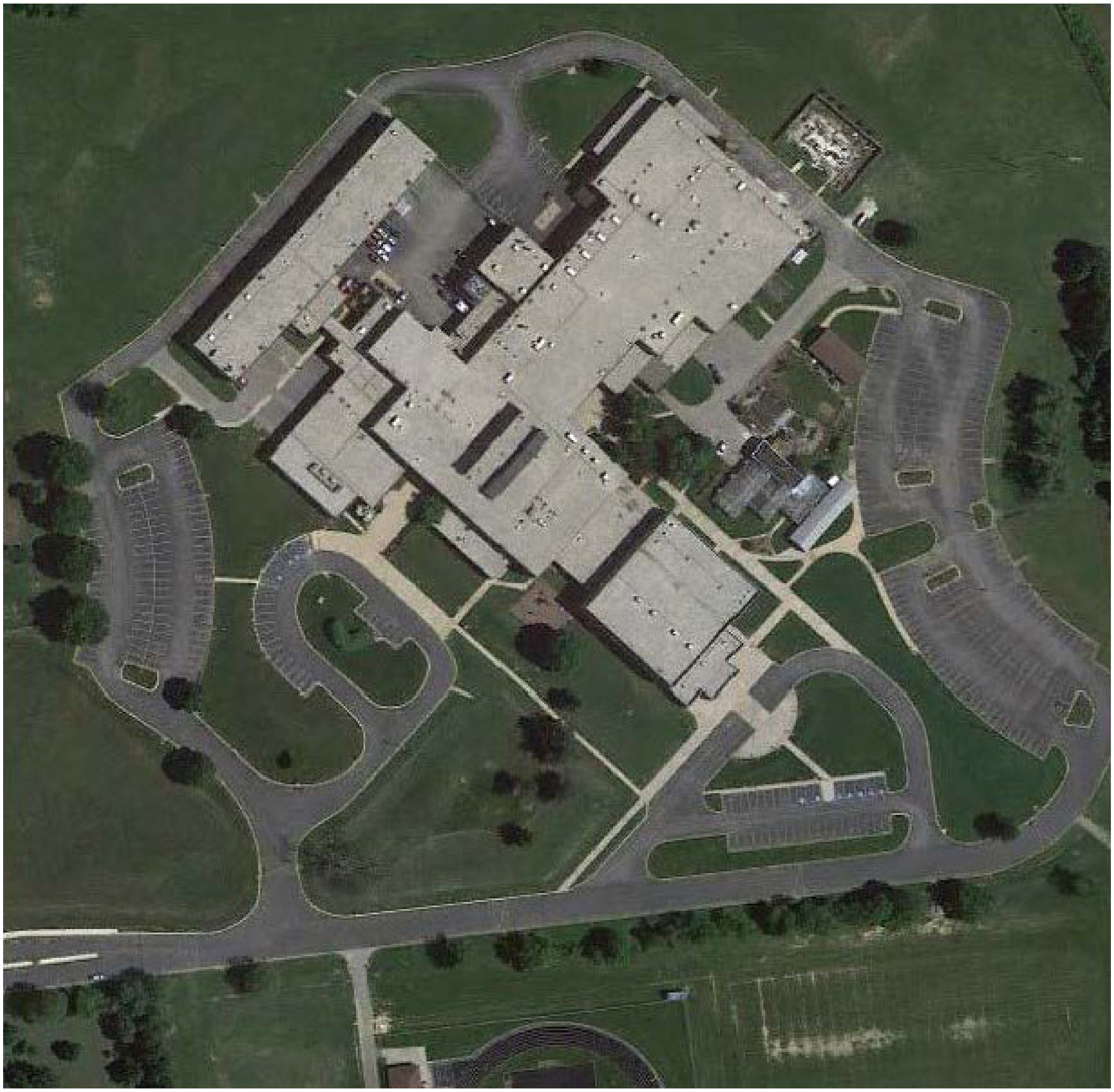


Figure 1.1
Aerial Campus View

Figure 1.2
Building Exterior (Typical)

Figure 1.3
Non-Code-Compliant Issues Throughout

Figure 1.4
Non-Code-Compliant Issues Throughout

Figure 1.5
Classroom Crowding

Figure 1.6
Lack Of Instructional Space For Culinary

Figure 1.7
Cafeteria Seating

Figure 2.1
Existing School Looking Northeast From Athletic Fields

Figure 2.2
Exterior Bus Access

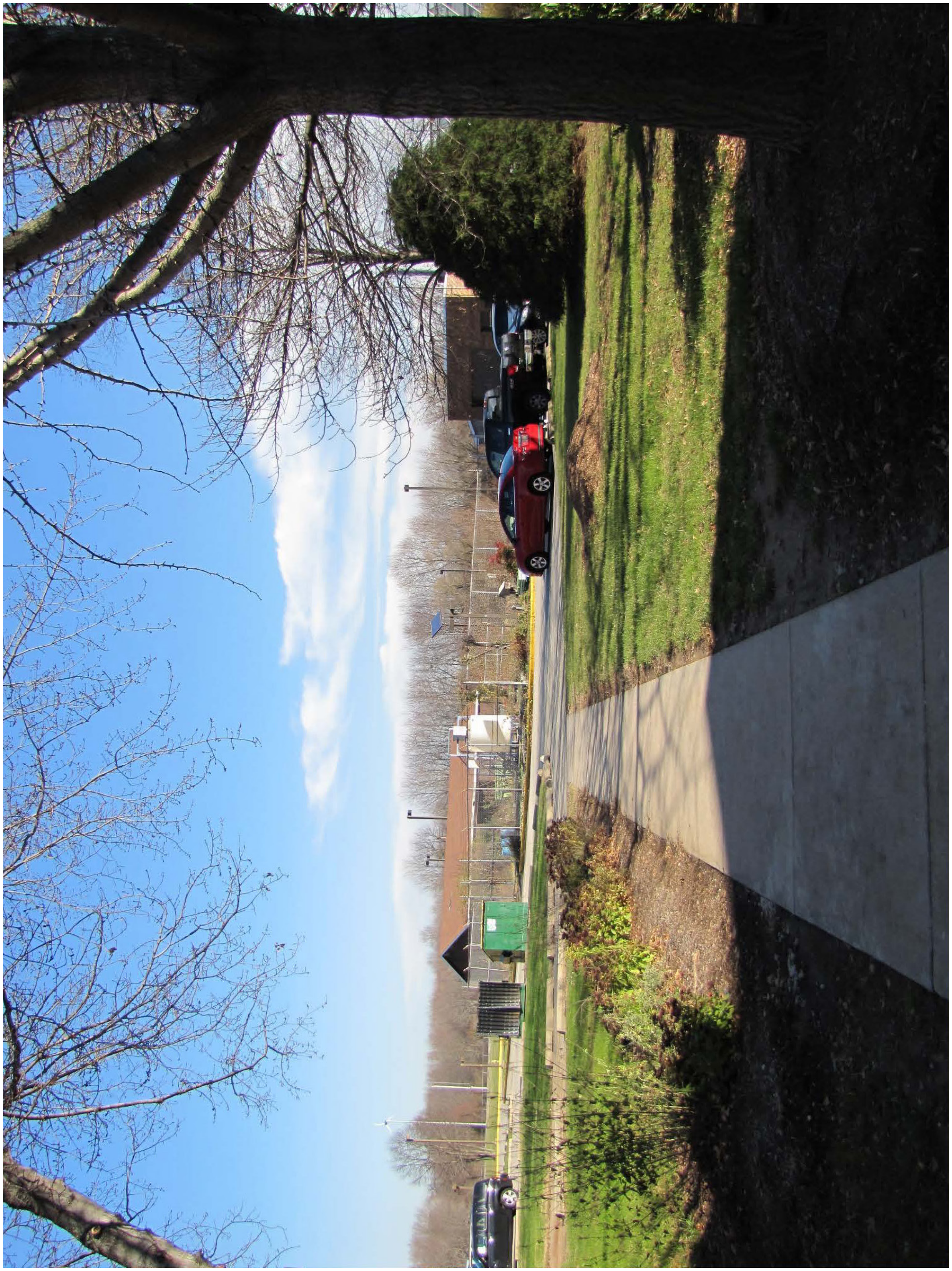


Figure 2.3
Exterior Bus Access

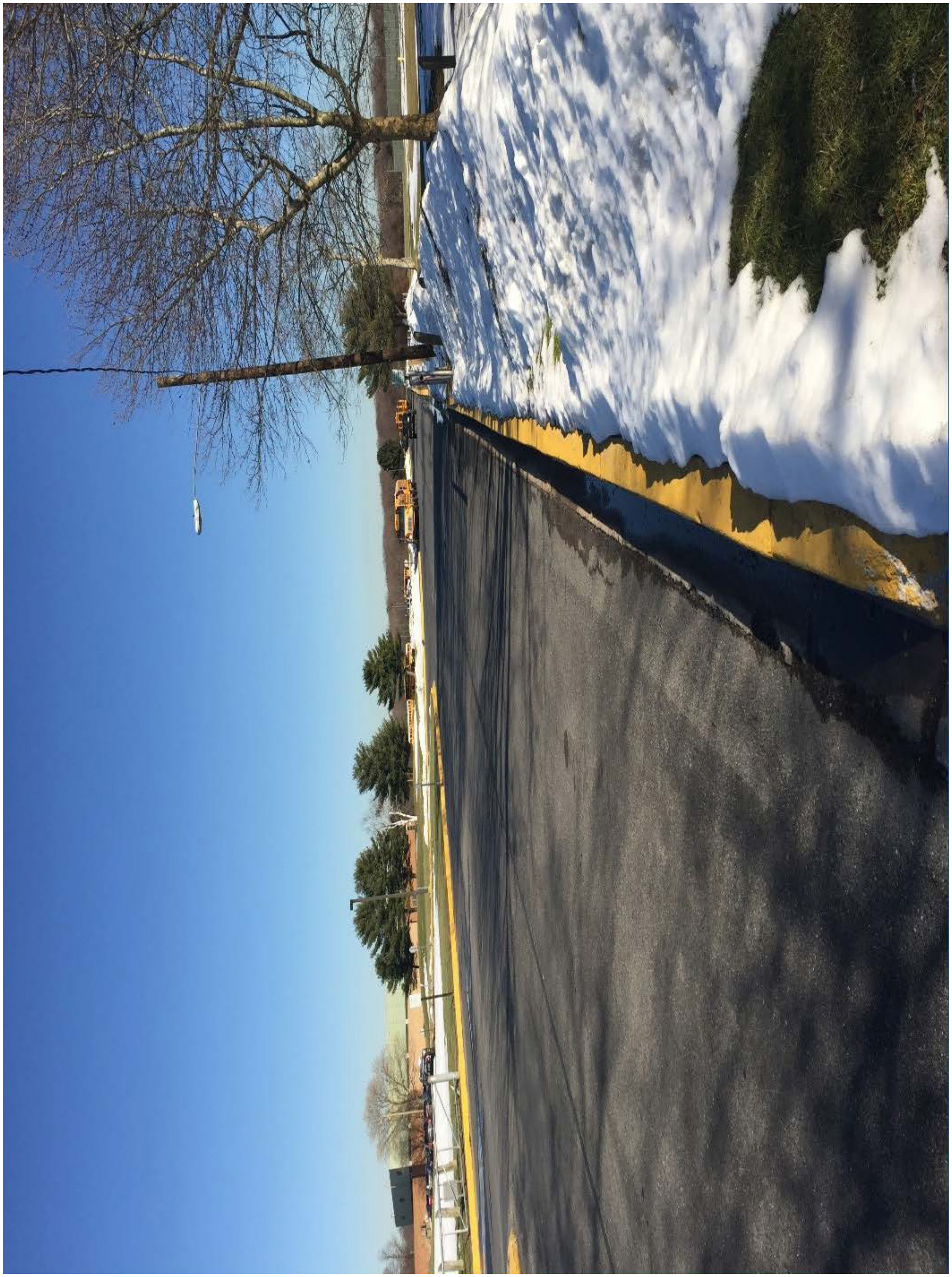


Figure 2.4
Main Access Road On Site Looking East

Figure 2.5
Site Access From Glasgow Avenue Looking South

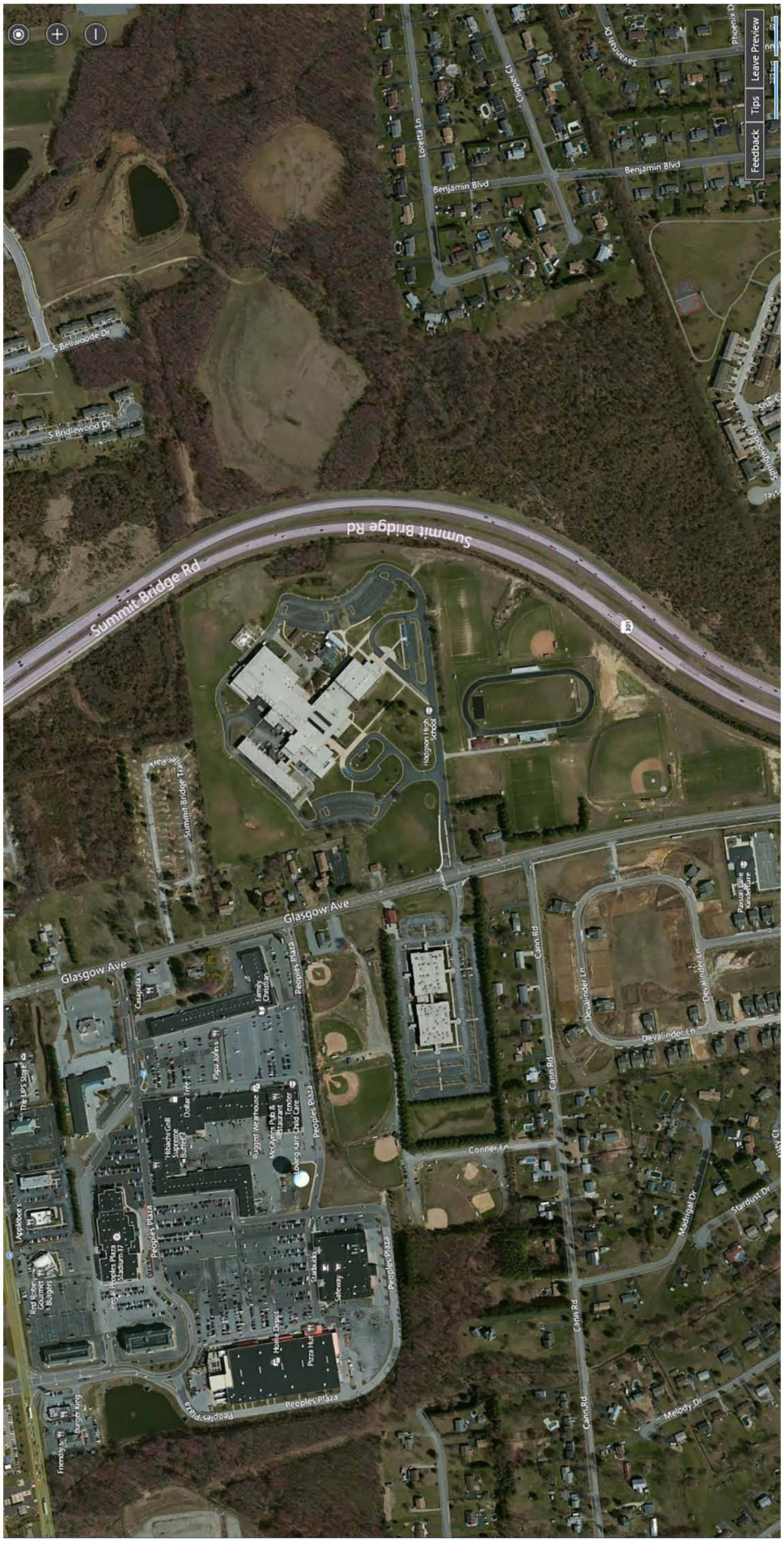


Figure 3.1
Existing Site Plan

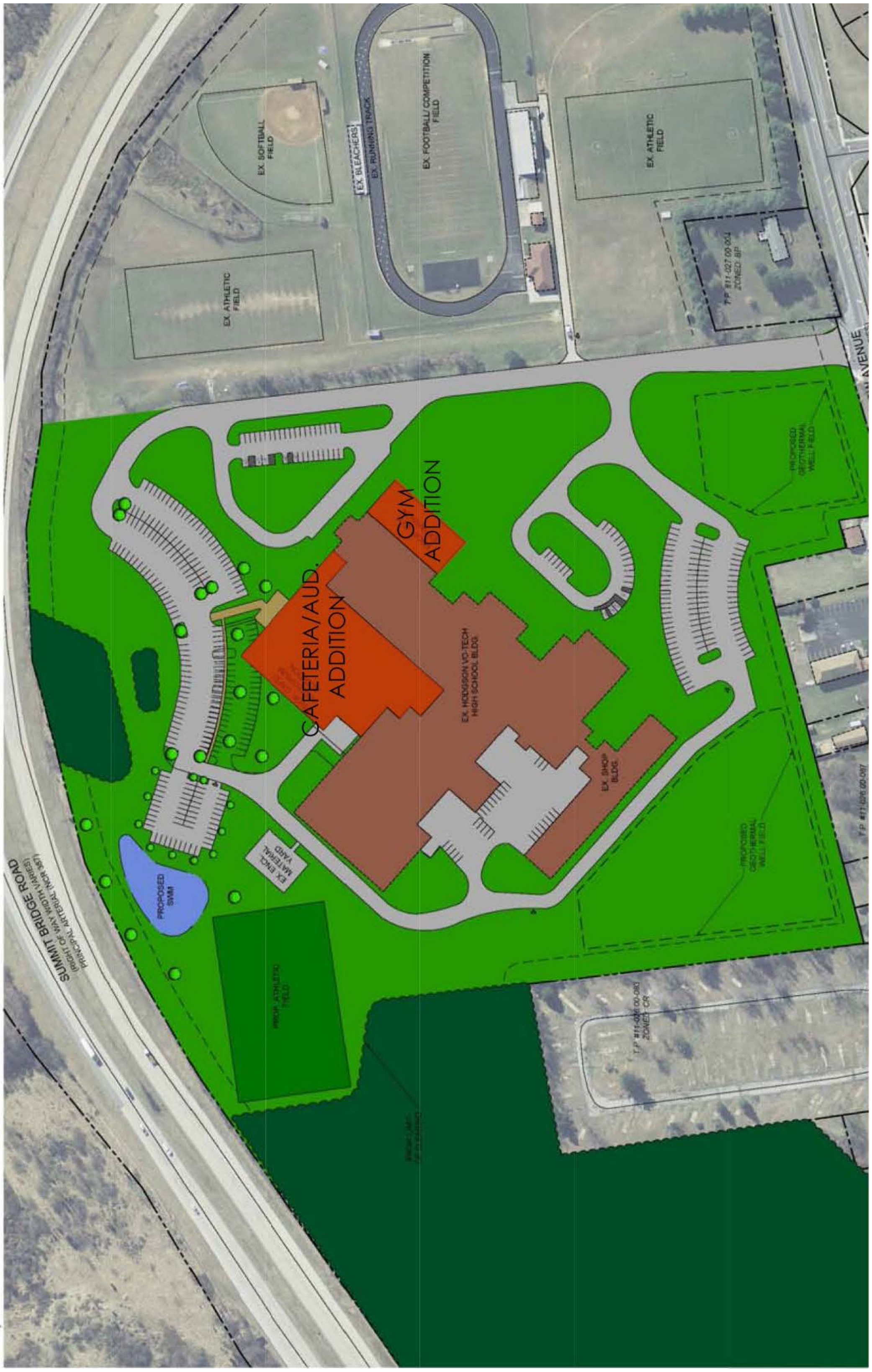


Figure 3.2
Proposed Site Plan - Renovated Facility - Phase 1

Figure 3.3
Proposed Site Plan - Renovated Facility - Phase 2

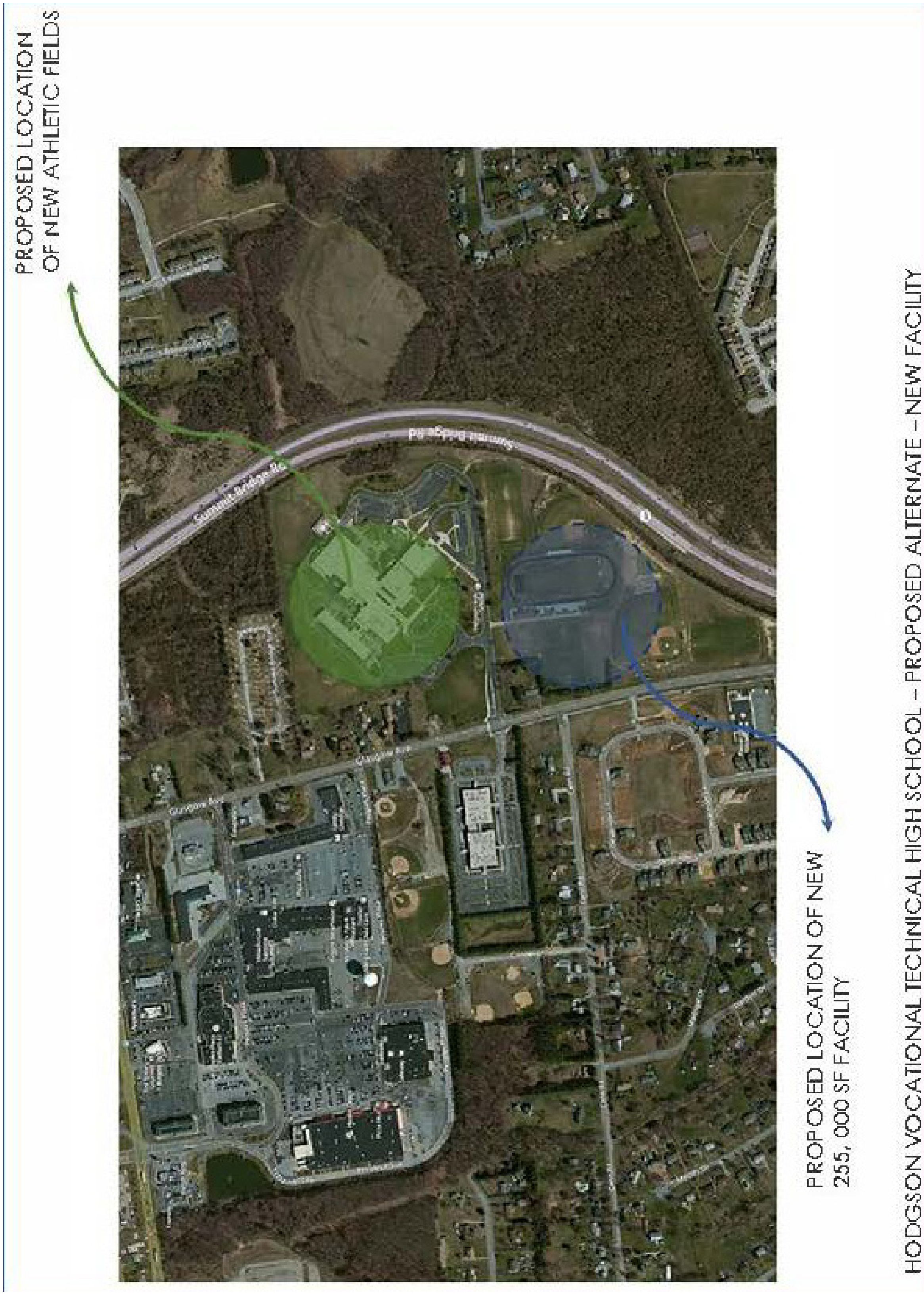


Figure 3.4
Proposed Aleternate - New Facility

Figure 3.5
Proposed Site Plan - New Facility

Replacement for
HODGSON VOCATIONAL TECHNICAL HIGH SCHOOL

Certificate of Necessity
July 26, 2021

DRAFT

ABHA | BSA+A