

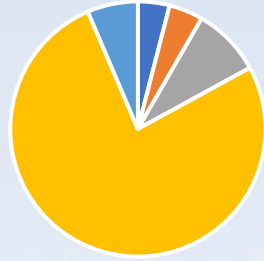
Minuteman Regional Vocational High School

Lexington, Massachusetts



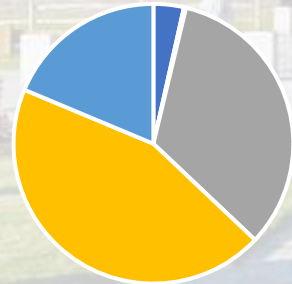


Race and Ethnicity



- African American
- Asian
- Hispanic
- White
- Multirace, Non-Hispanic

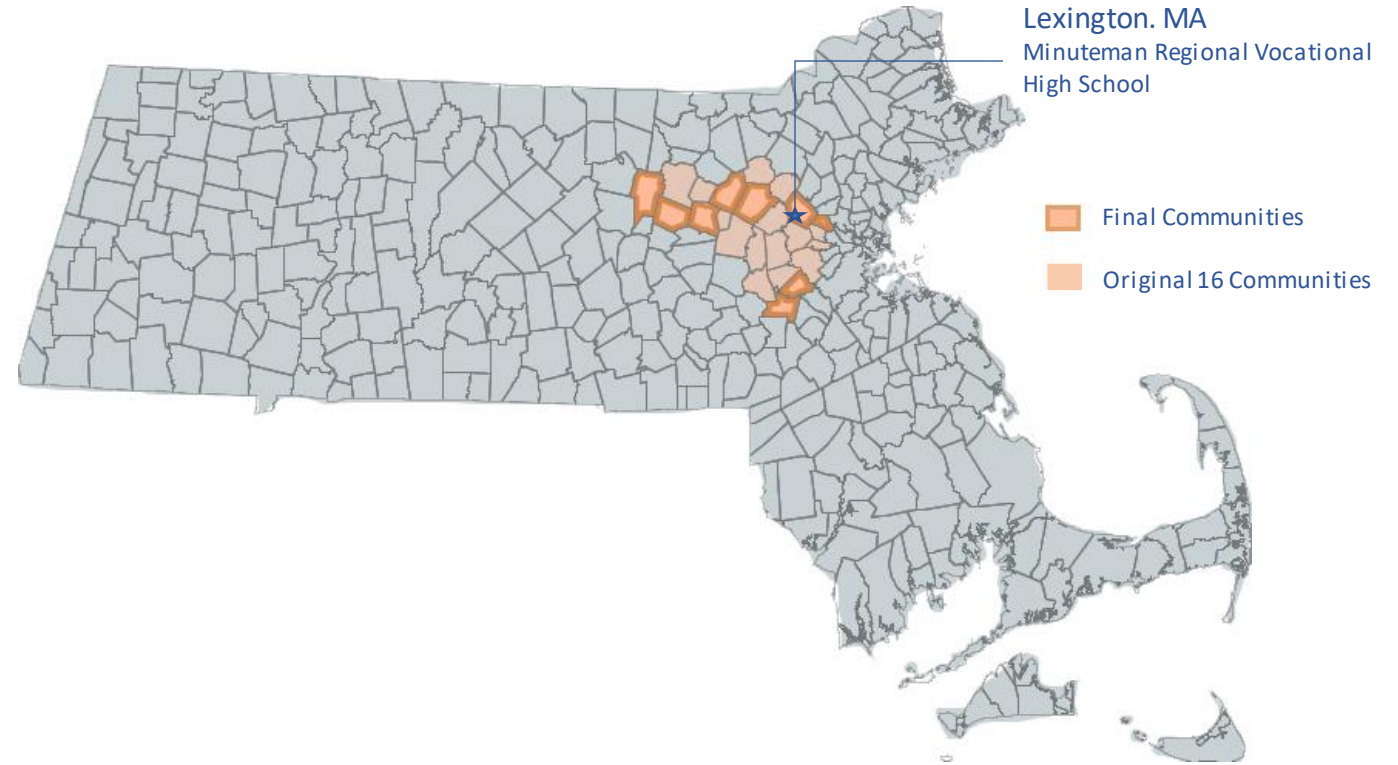
Selected Populations



- First Language Not English
- English Language Learner
- Students with Disabilities
- High Needs
- Low Income

Community Environment

A Vocational School For Many Communities



Minuteman Mission

“Minuteman collaborates with parents, communities, and business leaders to serve a diverse student body with multiple learning styles. Through a challenging, integrated curriculum our students develop the academic, vocational, and technical skills necessary to be productive members of a global community. We value life-long learning that fosters personal and professional development in a safe and respectful environment. Minuteman is committed to preparing all students for success.”

Existing Environment

Setting the Stage for Change



Classroom wing of old vocational regional high school building with oversized outdated elements masked the innovative STEM technology students studied inside.



A mismatched façade and outdated materials gave the wrong impression of the previous vocational building's purpose.



An ill-defined entry of old school building made it difficult for the community to interact with program elements the school offered.

Understanding The Existing Conditions

In 2008, Minuteman had reached a critical point in its history. Student enrollment was declining to record low levels, the building's original infrastructure had begun to fail, and the district's financial outlook was challenging. When compared to the sending communities' traditional schools, Minuteman was clearly lacking in capital improvements. Combined, the sending communities had invested almost one billion dollars on capital improvements since the inception of Minuteman. Minuteman had spent zero outside of their normal operating budget. This was identified as one of the primary factors that led to the lack of interest among potential students.

When new, the original Minuteman building was celebrated as a modern educational environment geared to the future of education. The building was a mix of traditional and open classrooms surrounding an open core with trades library / media, a mall, dining, and fitness facilities. In concept, this design promoted many of the ideas still desired in current designs. In practice, however, the teaching models and spaces had never aligned, leading to once open spaces to be closed off in a haphazard manner. These modifications not only took away from the original design intent but also led to improper heating, cooling and ventilation. Lack of natural light and views in many spaces kept students and staff from any connection to the exterior for long portions of the day. Ultimately, this building was difficult and costly to align to the current educational program despite having the gross area to potentially do so.

Minuteman submitted a statement of interest to the Massachusetts School Building Authority (MSBA) for a capital project. Once admitted to the program, Minuteman went through a rigorous process which evaluates existing facilities, student enrollment and demographics, educational programs, as well as many other factors. Although it was already clear to the school that a new facility was needed, Minuteman went through the due diligence with the state and ultimately agreed to support and assist with funding a project.

Planning Process

A Career and Technical High School for the Future

History of Career and Technical Education at Minuteman

The story of the planning process for Minuteman High School is over a decade in the making, and involved hundreds of individuals including district leaders, sending district community members, students, staff, parents, and business partners in the planning and execution of the project.

Planning for a Career and Technical High School serving many communities proved to be more than just a facilities challenge. Since the 1917 Smith-Hughes National Vocational Education Act, federal investments have been made to provide funding to individual states. Expansion with the Vocational Education Act of 1963, allowed for the funding of such schools to be authorized by population rather than program which allowed for the creation of vocational high schools shared by multiple communities. Since 1984, the Carl D. Perkins Act has served to provide accountability, academic integration, and business partnerships. In the 1990s, there was a shift in focus from vocational job-specific training towards Career and Technical Education which is skills-based career education.

Minuteman Education Task Force

When the original 16 Communities attending Minuteman began planning changes to their facility, the primary points of discussion for planning were the targeted enrollment, and the programs that would be offered. Minuteman developed an education plan task force to dive into the issues.

The Minuteman Education Plan Task Force was comprised of the school committee, administrators, and educators from all the sending communities. The goal of this group was to review the plan factors. The existing plan factors: employment outlook, wages, student interest, emerging occupations, other training alternatives, and industry partners were reviewed. Additionally, the group reviewed several other factors which included job placement history, gender balance, and program synergy. The group found that three primary factors including employment outlook, occupational wages, and student interest were the most valuable to determining program relevancy in the new facility.

The Task Force then engaged an outside third-party consultant from NESDEC (New England School Development Council) to update the 2006 employment and wage data contained in the previous plan.

To assess student interest, the administration assembled enrollment data and student vocational program preference data, sorted by vocational program and by member versus non-member town. In looking at enrollments, primary focus was on member-town enrollment, not total enrollment.

The administration prepared an initial set of recommendations for a vocational program mix for a 435-student school and an 800-student school. The task force discussed the recommendations and made several modifications thereto.



Planning Process

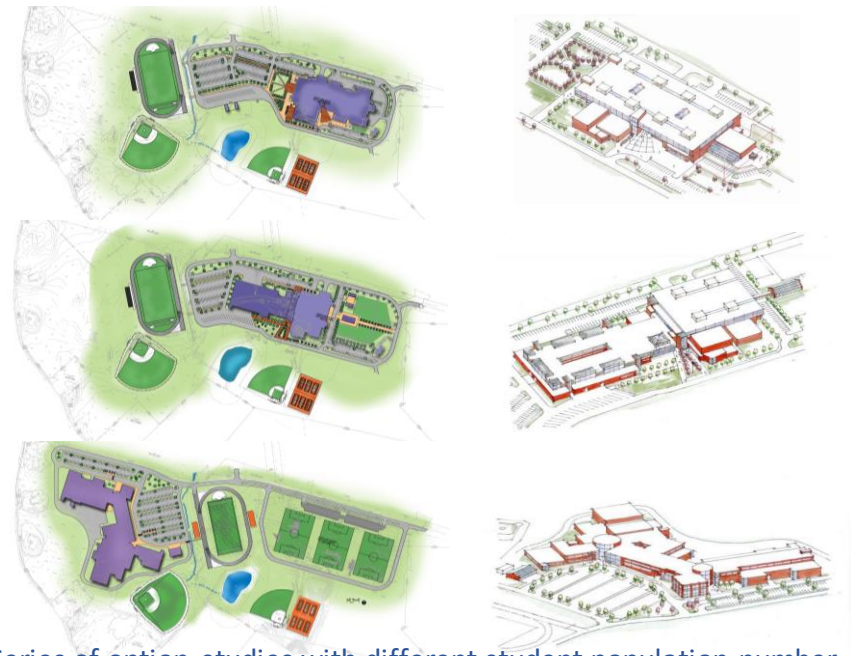
A Career and Technical High School for the Future

What is the right population for Minuteman?

As part of discussions with the state, the enrollment is a primary statistic which informs many funding mechanisms and building size and scope. During the beginning of the planning process, studies were completed to evaluate a building that would support 453, 628, or 800 students.

Operating under the assumption that there will be 40 students enrolled in each vocational program, the total population ranges from 13-20 total programs, determining the total enrollment became the first challenge.

As a non-traditional district serving many different communities, running a single high school as its own district presents operational challenges. If the costs to operate a facility remain constant, a larger population clearly reduces the per pupil expenditure. Armed with information, and community feedback, the School Committee voted to move forward with a project serving 628 students in July 2014. This enrollment accounted for seven of the member communities choosing to leave the district and send students as out of district students or seek alternative districts to enroll their Career and Technical student in. The driving factor in these decisions were financial. The project anticipated these withdrawals but also anticipated that a new facility coupled with changing socioeconomic factors would lead to an enrollment expansion that was not currently supported. The planning therefore included options for future expansion to reach an enrollment of 800 with a series of small projects within the campus.



Series of option studies with different student population number

Planning Process

A Career and Technical High School for the Future



Task Force tours



MIT Lincoln Labs

Programs for a Changing Economy

The taskforce used the primary factors (employment outlook, occupational wages, and student interest) to weigh validate the programs to support the 628 student population. Several months of discussions with community and business leaders led to first-hand data regarding the job and labor market which led to direct changes at the school. Programs with limited student interest and low market wages were discontinued as others were shown to have a greater need in the direct community.

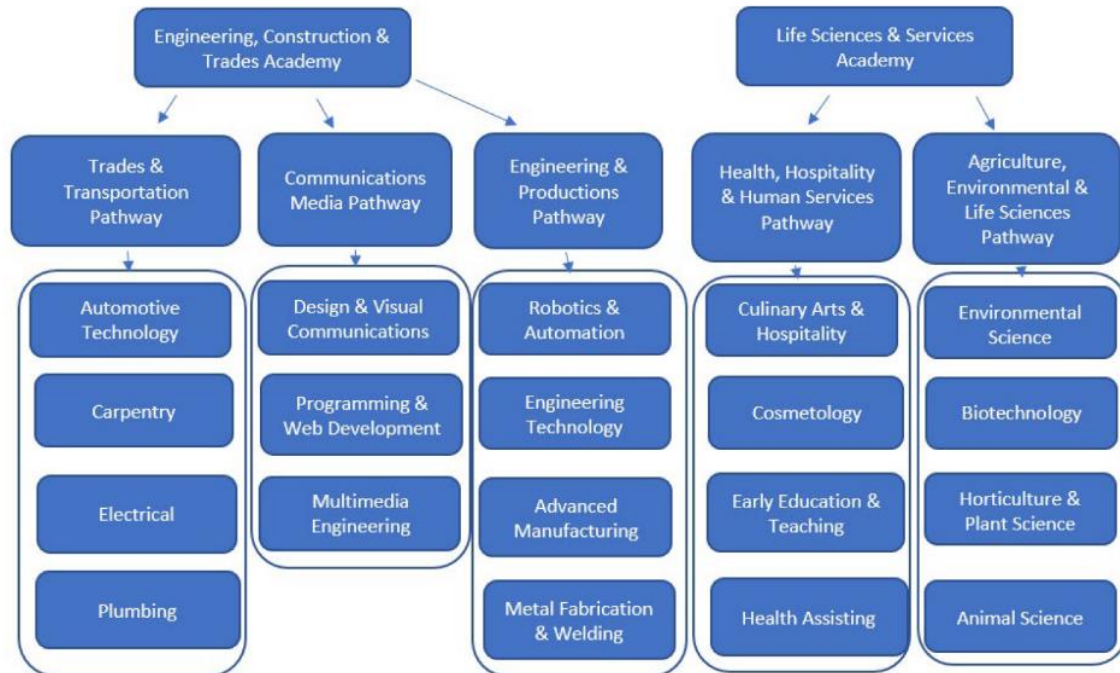
Business and Community Leaders also helped contribute to the determination of programs to be included in the project. Minuteman worked with Labor Market Works founder, Robert Vinson, to review labor market information and provide a comprehensive overview of job outlook projections related to real world occupations.

Concurrent to the programing process, Minuteman started to rethink their traditional delivery methods. Originally separated by department, educational delivery was siloed not only between traditional academics and career and technical areas but also between subject. Instead, the school began to organize into an academy model while the design and construction of the new facility was under construction. Among other benefits, this allowed for students to interact with the same group of teacher throughout their time at Minuteman. Starting this process prior to entering the new facility was critical to success for the faculty and staff. Allowing adjustments to be made before dealing with the learning curve associated with a new facility.

Minuteman educators, parents, students, leaders, and the design team embarked on a mini-bus school tour which brought them all over new England. They took the opportunity to visit not only other high school educational facilities but higher education and authentic work environments as well. Of note, were MIT's Lincoln Labs, MIT's Slone School, New England Studios, Devens Sound Stage, and regional educational and industry leaders' facilities.

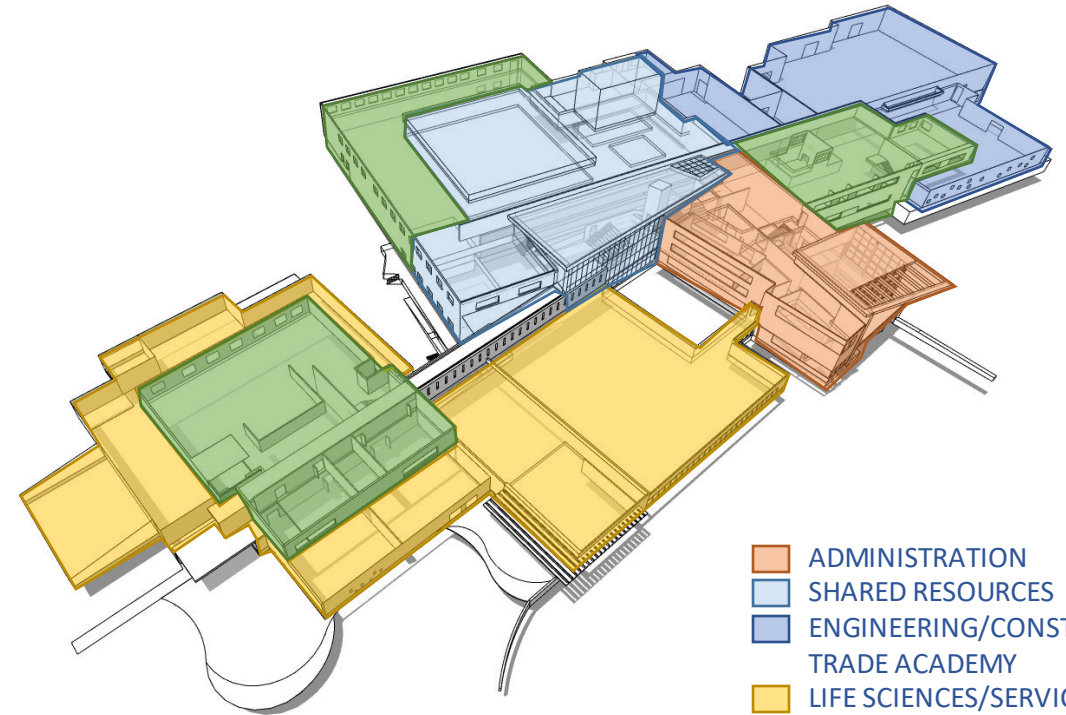
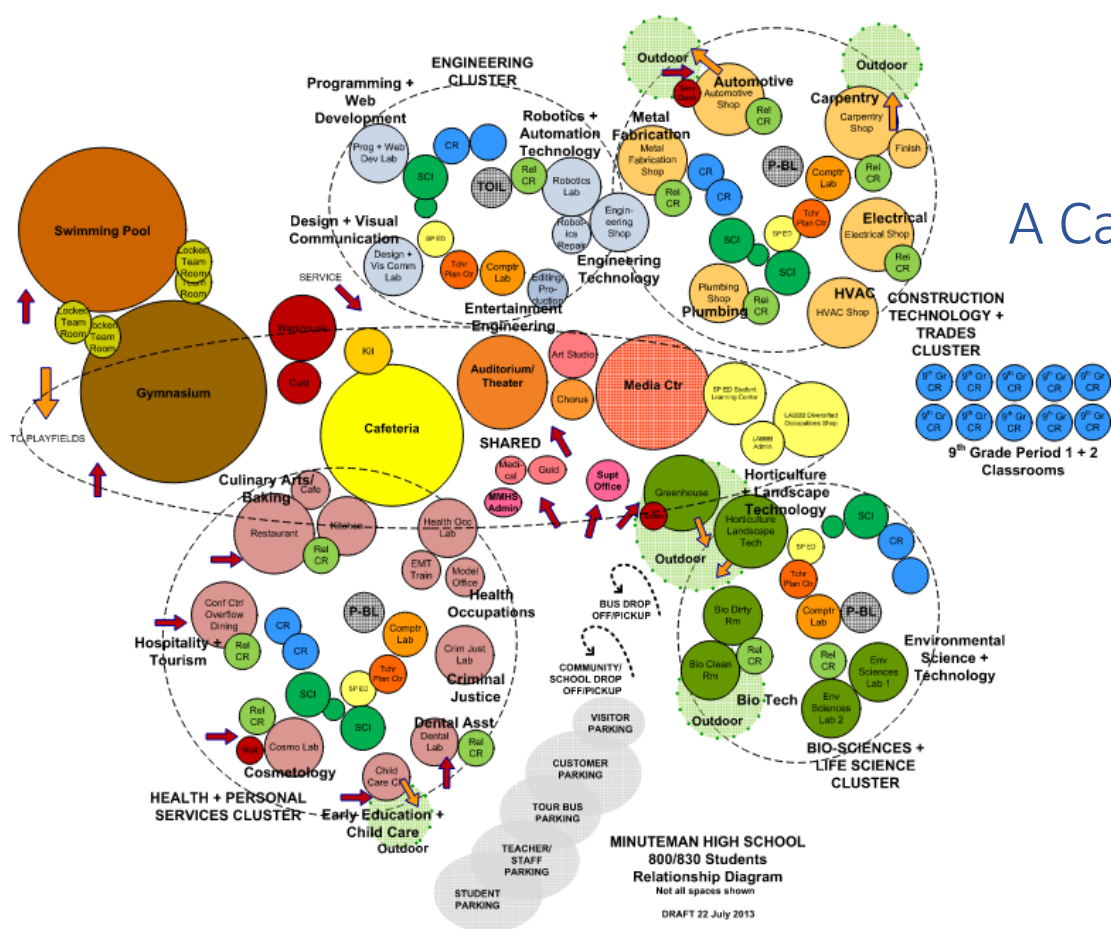
Ultimately, the final programs that were chosen to be included in the design of the new school were organized into two small learning academies: Engineering, Construction & Trades Academy, and the Life Science & Services Academy as shown in the organizational diagram. These programs were designed to be as authentic to college and career as possible. Where appropriate, the design would take from the inspirations that had seen been in the mini-bus tour.

New Vocational Learning Model



Planning Process

A Career and Technical High School for the Future



- ADMINISTRATION
- SHARED RESOURCES
- ENGINEERING/CONSTRUCTION TRADE ACADEMY
- LIFE SCIENCES/SERVICE ACADEMY
- GENERAL CLASSROOMS

Re-Imagining CTE

With the programs selected, the focus shifted towards thoughtful organization of programs. Educational Planners worked with staff, students, and parents to develop relationship diagrams. Further, there was a large emphasis on the relationships between traditional academic and vocational courses. Minuteman wanted to think about how this could be improved from the general approach to vocational curriculum. It was determined that there was a desire to create a looping model, not just with the vocational educators, but with the academic educators as well. This model, in which an educator stays with a student throughout their years at a school, would allow a teacher to be paired with students for 4 years rather than just a single semester as is more traditional. This relationship helps support the social emotional needs of the students in a much deeper capacity, as they get to know students and establish a bond throughout their formative years.

Building Form Responds to CTE

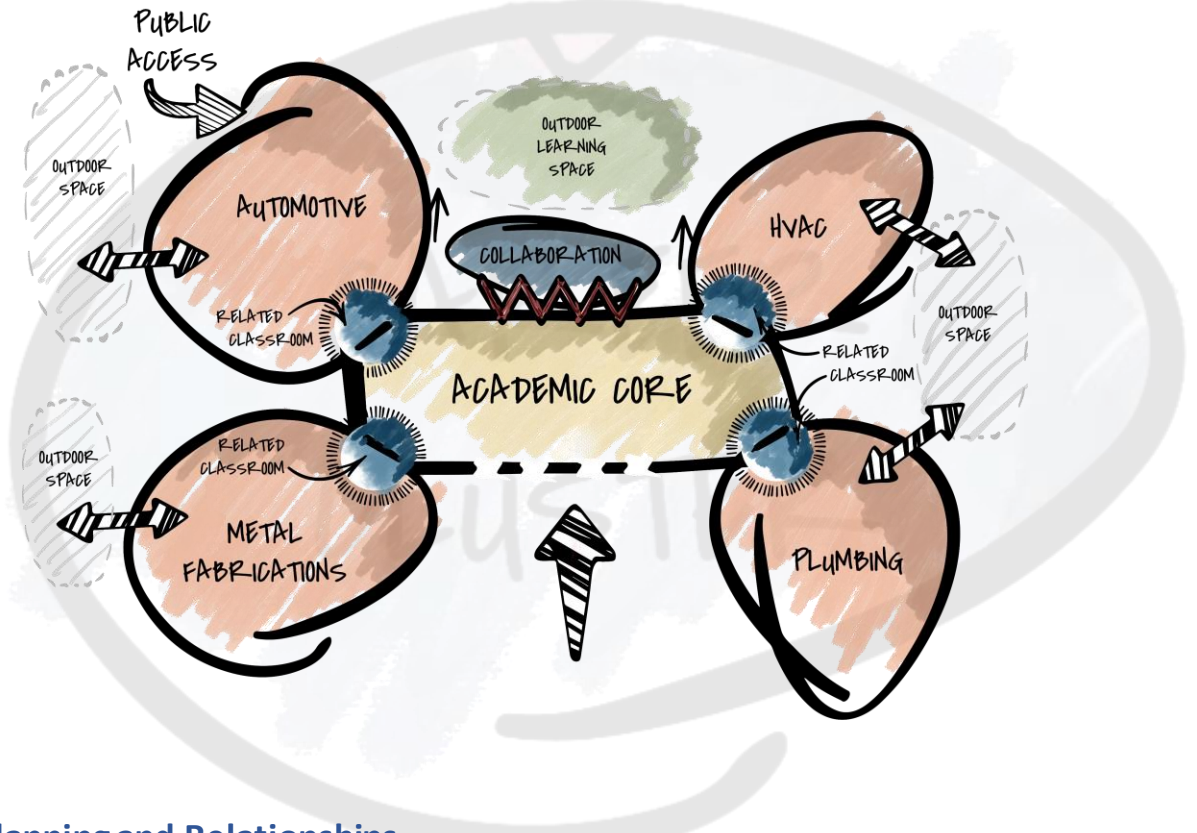
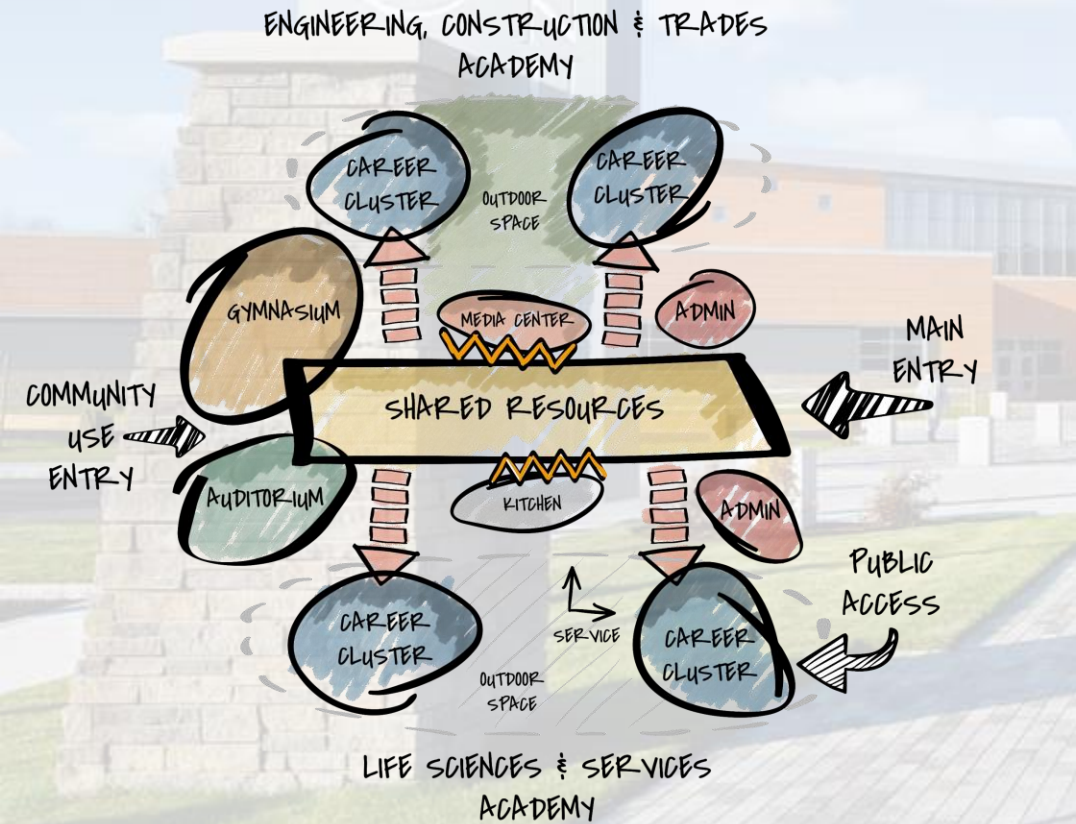
By arranging three sections of the building (South: Life Science & Services CVTE programs, Middle: Shared Resources, North: Engineering & Construction Trades CVTE programs) on the site in a north-to-south orientation, the building can utilize the sloped site by stepping each section down the slope. This allows the best use of the site and minimizes site modifications for fill and cutting near the sensitive wetland areas at the lower south elevation of the site. The center section (cafeteria), as a transition between wings, creates opportunities for open spaces and views between floors and expand to the outside via courtyard and skylights.

Planning Process

A Career and Technical High School for the Future

Overall Facility Planning Diagram

Career Cluster Planning Diagram



Planning and Relationships

The diagram on the left is a simplified relationship study of how the basic portions of the building and Engineering, Construction & Trades Academy could be organized to create connections to the major spaces.

On the right, the diagram shows how the Career cluster is broken down and the individual vocational programs and academic spaces.

Planning Process

A School for its Students

JEDI

Although the terminology had yet to be created, the Minuteman design team did consider many ideas which fall under the JEDI umbrella.

The concepts of justice, equity, diversity, and inclusion were considered as driving factors in many elements of program selection, facility design, and professional staffing. The sending towns that serve the Minuteman Community vary significantly. By nature of having a diverse set of communities, it lends to a diverse student body.

During the process of selecting programs, gender access and equity was very important to balance the facility. While more technical programming was done to understand the nuts and bolts of what happens within the shops, there was a conscious move away from the historical model of shops with locker rooms. In addition, in common areas such as the student commons, multiple seating and gathering zones were provided. This allows for students to seek out the area that fits best with their social and emotional needs.

To fully support the idea of providing gender equity, Minuteman employs a balance of male and female administrators. This balance allows female students to have a support system and not be steered into programs based on historical gender stereotypes.

Students as Decision Makers

The student voice was included throughout the entire planning and design process. The students were able to weigh in on the decisions of what Career and Tech programs that were included in the project. Students and program educators also worked with the educational planning team to understand how to organize the shops.

Groups of students also met with the design team to participate in discussions on the building's "look and feel", as well as problem solving on planning and design issues.

Programming Outside of School Hours

In a new school facility, learning can happen anywhere and at any time. As part of the programming for the building, it was clear that there was a desire to run an adult learning program through the Districts "Minuteman Technical Institute". This program allows community members to attend courses to learn professional trades in the evenings.



Planning Process

Design Principles

Authentic / Relevant / Real-World Spaces

Small Learning Communities – Academy Model

Flexible and High-Tech Space

Connect Programs to the Outside Community

**Facility to be an Expression of its Site and
Minuteman Sending Communities**

Educators and Student-Informed Design



Throughout the visioning and programming phases of the project, these guiding design principles became the ideas that the design team referenced in all the decision making and design choices. On the following pages, we will show how these principles were manifested in the learning environments.

Existing Site Challenges

The Minuteman campus is located within two towns and has many significant site issues that the design team needed to react to, including significant wetland areas that required protection and restoration. In addition, the site abuts the Minuteman National Historical Park that preserves and interprets the sites, structures, and landscapes that became the field of battle during the first armed conflict of the American Revolution.

Based on the enrollment and program needs, and studies of options/costs, it was determined to be less expensive to construct a new building on the existing site and then demolish the existing to create new playing field. This allowed minimal disruption to the student learning while the construction project was completed.

Physical Environment Site Design

New Site Resolutions



Existing Site Analysis

Physical connection from the student commons into the protected courtyard allows students the opportunity to connect to the site safely during school hours. After hours, this space is directly connected to the hospitality areas which serve community groups.



Physical Environment

Forming the Building

Applying the Diagram

Once the diagrammatic and programming relationships were understood, the design team was challenged with forming a building which reflected that diagram.

By arranging three sections of the building (South: Life Science & Services CVTE programs, Middle: Shared Resources, North: Engineering & Construction & Trades CVTE programs) on the site in a north-to-south orientation, the building can utilize the sloped site by stepping each section down the slope. This allows the best use of the site and minimizes site modifications for fill and cutting near the sensitive wetland areas at the lower southern elevation of the site.

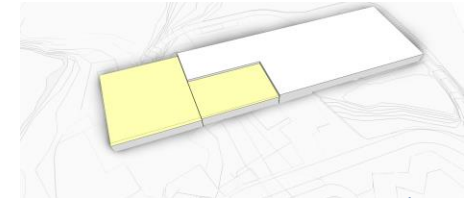
The center section (cafeteria), as a transition between wings, creates opportunities for open spaces and views between floors and expand to the outside via courtyard and skylights.



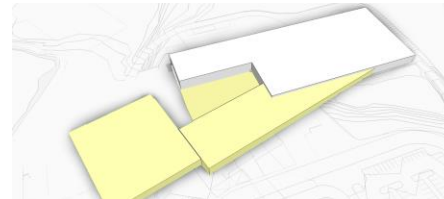
STEP 01: Simple box



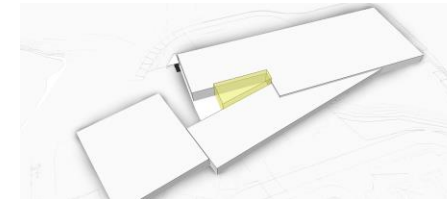
STEP 02: Place onto the site



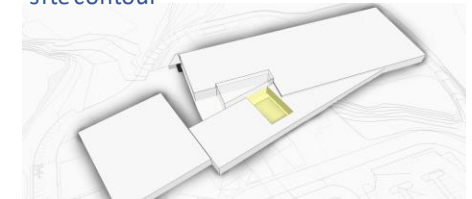
STEP 03: Drop portions to respect the site contour



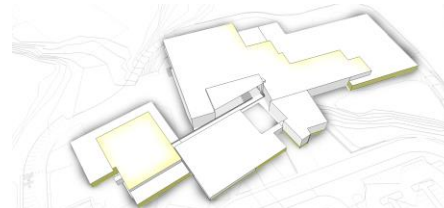
STEP 04: Change axis to avoid wetland



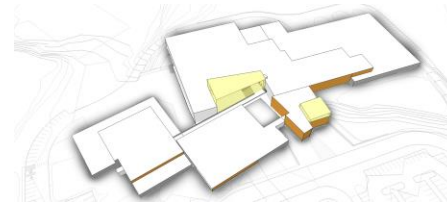
STEP 05: Insert a glass box (cafeteria)



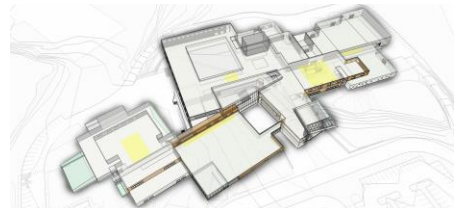
STEP 06: Notch to create courtyard



STEP 07: Shaped per programs and add stone base



STEP 08: Wood tone metal panel cladding/ café and media center being raised

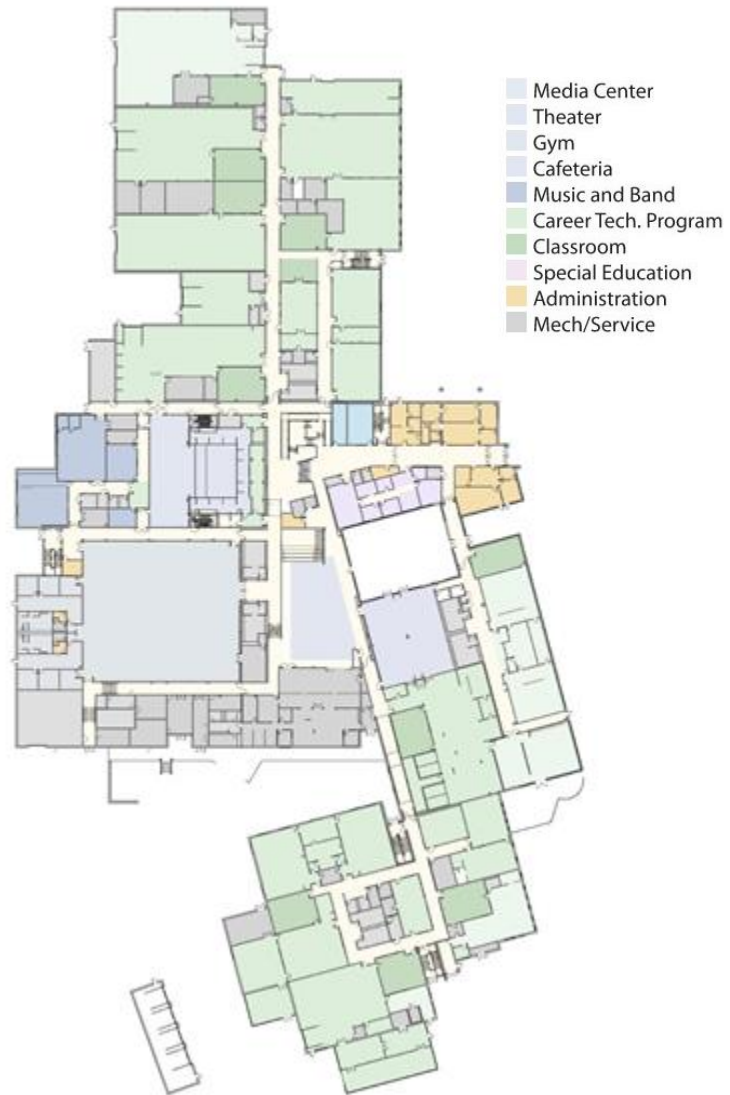


STEP 09: Insert points of interests at corridors and break-out



Physical Environment

Floor Plans



Main Level Floor Plan



Upper Level Floor Plan

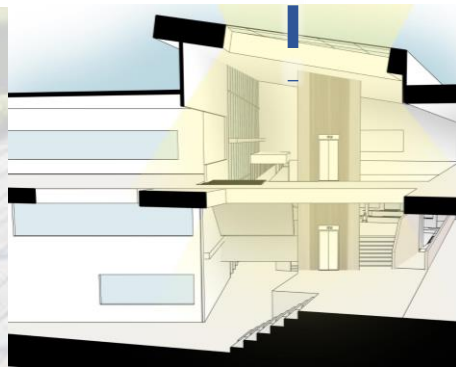
Physical Environment

Spatial Connections



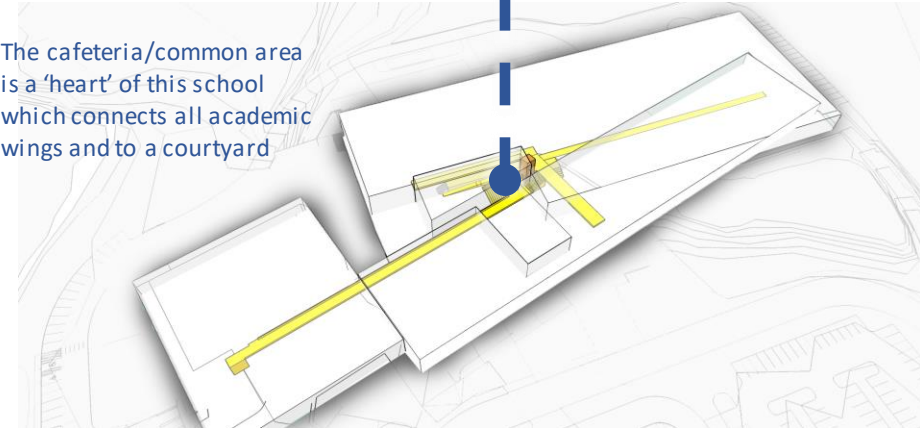
Vertical Linkage

The lower floor opens to the upper floor and spaces are filled with day light through the skylight. Friends are talking at the lower-level break-out area.



Horizontal Linkage

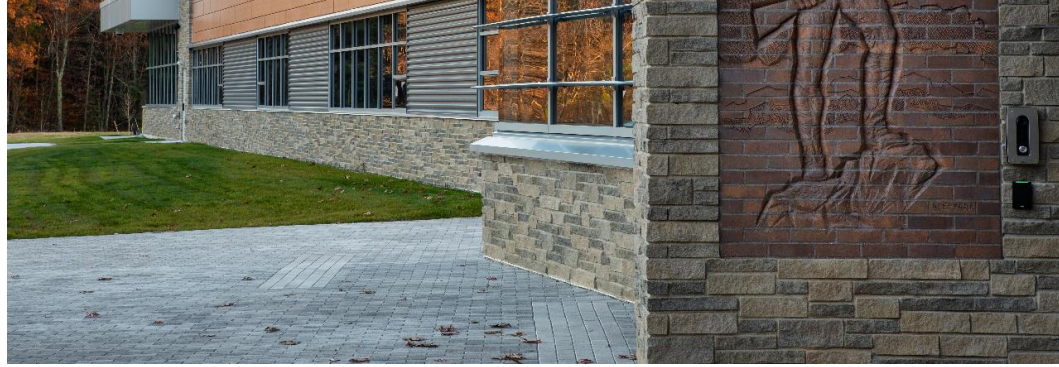
The cafeteria/common area is a 'heart' of this school which connects all academic wings and to a courtyard.





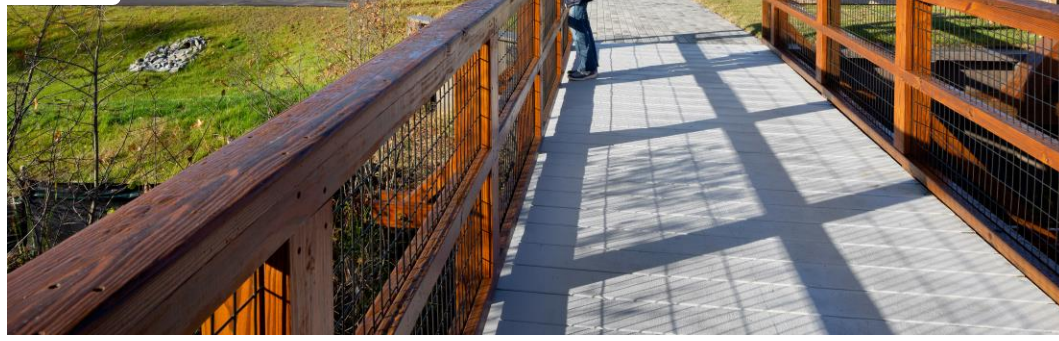
The site is nestled into a wooded slope, west of the existing school building and across from National Historical Park.

The building materials and colors were selected to resemble natural beauty of the site and harmonized in the context.



Physical Environment

Contextual Details



Physical Environment Sustainable Design

School as a Teaching Tool

Imperative to the sustainable design process was the implementation of sustainable features that were mission aligned and educationally beneficial. The campus was designed as a working lab for the schools. These features include a rooftop photovoltaic system, that is integrated into the science and electrical trades curriculums. A rainwater harvesting for the greenhouse system that engages students from the science, horticulture environmental programs. Working within the existing sites, wetland challenges created an opportunity to create a living lab for the environmental and horticulture programs. The building provided numerous other sustainable design features and is anticipated to achieve a LEED silver rating.

Goals

- Additional 2% MSBA Reimbursement
- LEED Silver Certification
- Incorporate PV

Challenges

- Large Exhaust Air Requirements
- Multiple Large Openings
- Building Orientation

Strategies

- LED Lighting & Controls
- Air Source Heat Pumps (Administration Areas)
- Energy Recovery
- Photovoltaic (PV)
- Recirculating Welding Exhaust Capture



Water



Transportation

Indoor Environment



Energy

Site



Innovation



Food



Educational Environment

Academic Spaces



The academic spaces were designed for maximum flexibility. Classroom furniture is lightweight and easily moveable so that classrooms can be re-arranged and transformed. Even the hexagonal desk spaces allow students to easily work in groups. In the science labs, shared lab tables on castors were included so that the space can transform from a more traditional lecture-based style to easily wheel over to the perimeter casework and lab stations for project work. Drop down electrical in the ceilings allow for the space to be configured in many ways. Large wooden tables in the art rooms allow for students to work on larger scale projects individually or in groups.



Educational Environment

Spaces to Gather



Library Media Center



Learning Lounge



Break Out Space

Throughout the building, gathering spaces were incorporated to create a variety of options for students. Designers understood that students are drawn to different types of space depending on their preference, activity, or personal learning style.

In the student commons, a learning stair and balcony seating areas create options for students. In the media center, different types of seating from soft seating and tables for group work were included. In the learning lounges and break-out spaces, options allow students to work with each other adjacent to learning areas.

Educational Environment

Thinking Beyond the Box



A Teaching Theater

Massachusetts has a thriving connection to the professional performing arts community where many film companies have set up shop for Hollywood level productions. Minuteman saw the incorporation of an auditorium as an opportunity to connect to this community.

When you walk into Minuteman's auditorium it looks very different than a traditional high school space. Any good theatre in an academic environment must be both a good teaching space and a good performance space. The Minuteman project is unusual because it is designed to teach theatre and video production technologies, so performances in the space are intended to support that technical education rather than the other way around. It expresses design decisions that would make no sense in a conventional high school theatre: highly advanced, even redundant theatre technology, a full-height proscenium stagehouse virtually unique for a space with such an intimate seating capacity in a secondary-school setting.

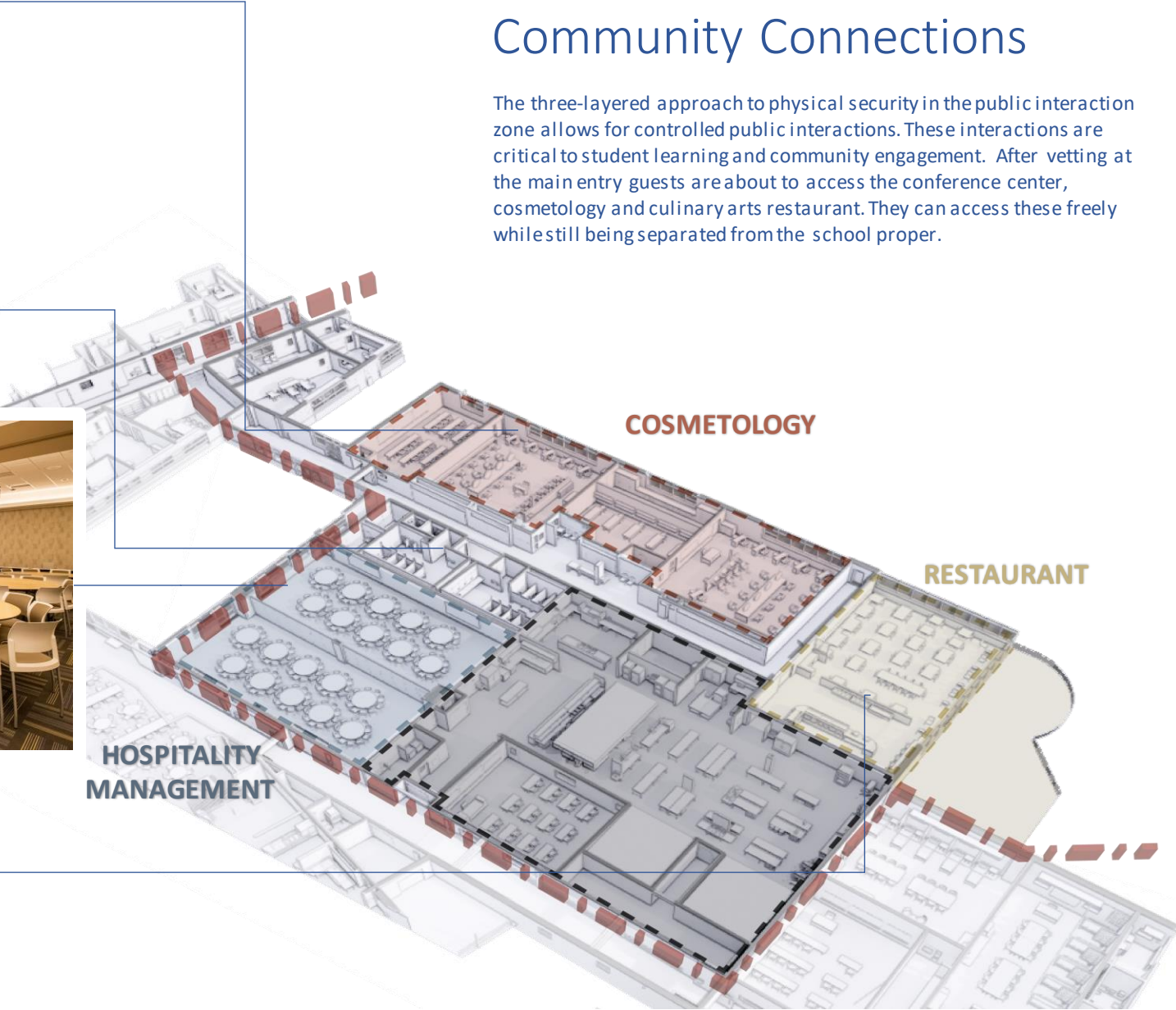
The design had to solve the problem of creating a single space that could function both as a state-of-the-art theatre and as a sound stage for video production and broadcast technology. A room that could support musical theatre with Broadway-level production support one week, had to work as live television production studio the next and a film sound stage the week after. That meant that the entire auditorium had to be convertible not only to a wide range of seating configurations, but also to a flat floor, and that the means of making those conversions were themselves teachable moments.

At Minuteman, the form of the space is truly about its complex functions – it's a room designed to prepare students for careers in the ever-evolving world of performing arts technology, where flexibility is not merely useful but is at the heart of the creative endeavors the theatre is meant to teach.

Educational Environment

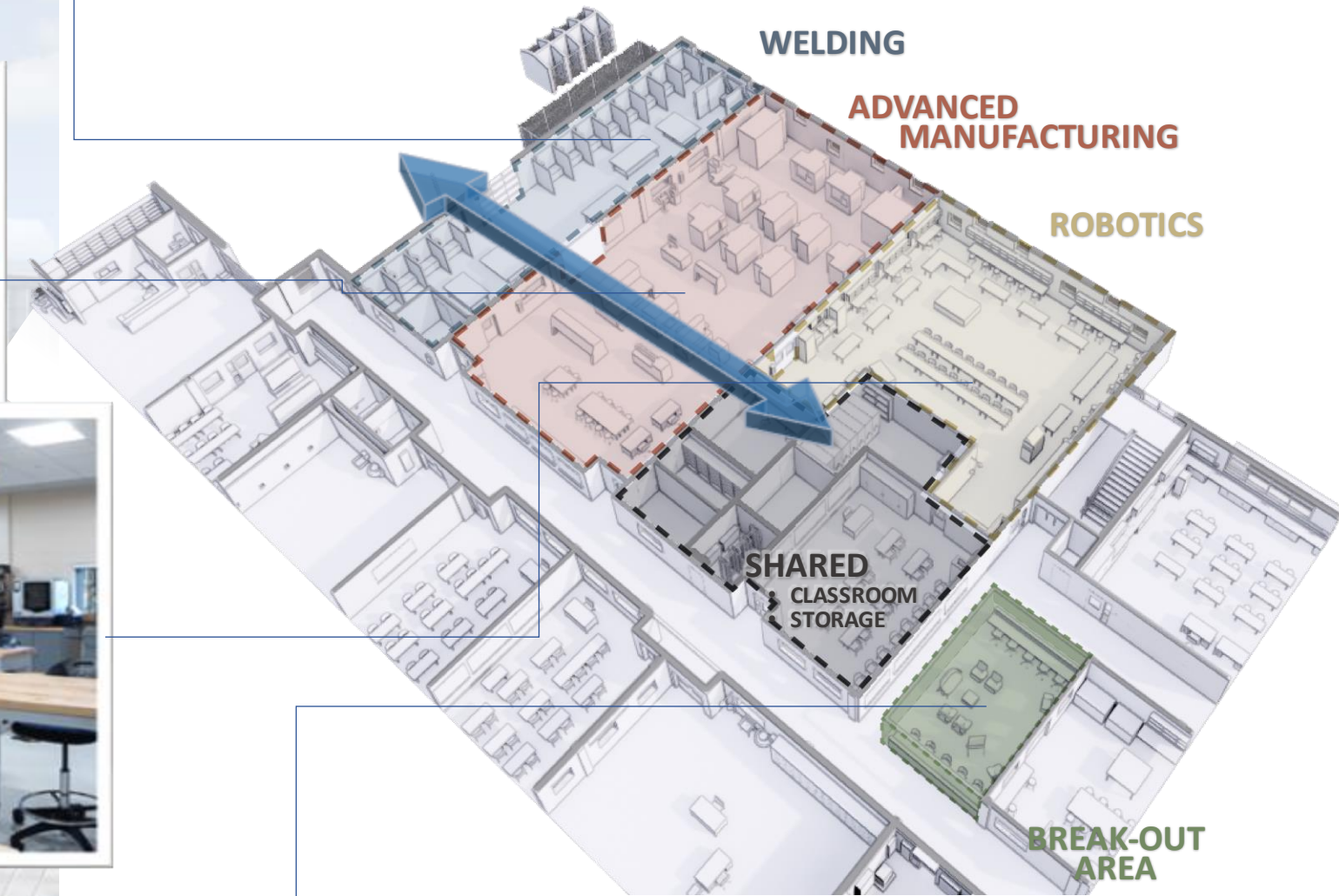
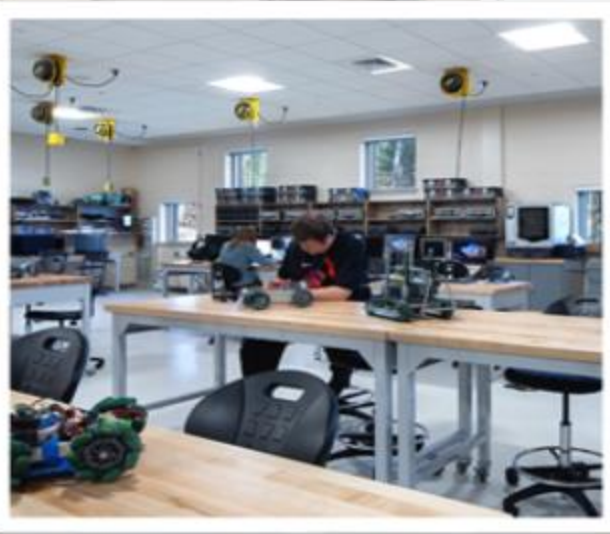
Community Connections

The three-layered approach to physical security in the public interaction zone allows for controlled public interactions. These interactions are critical to student learning and community engagement. After vetting at the main entry guests are about to access the conference center, cosmetology and culinary arts restaurant. They can access these freely while still being separated from the school proper.



Educational Environment

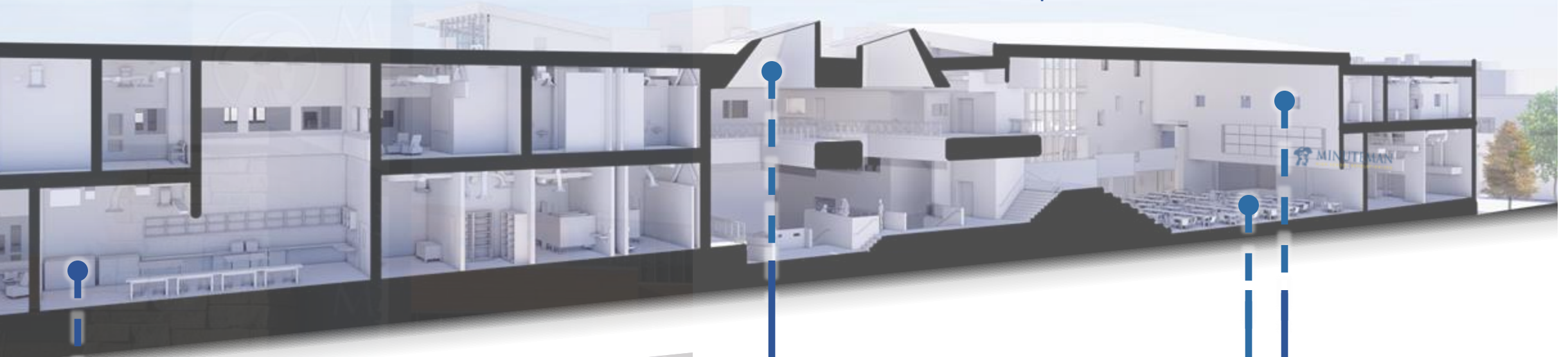
Vocational Adjacencies and Relationships



Creating a physical connection between Robotics, Welding, and Advanced Manufacturing allows for curriculum and program flexibility. Students can work on projects that crossover each of the programs and moves from design concept (in the classroom spaces), to creating prototypes within the physical shop spaces.

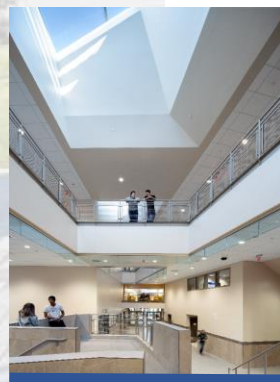
Educational Environment

Spaces for Skills of the Future



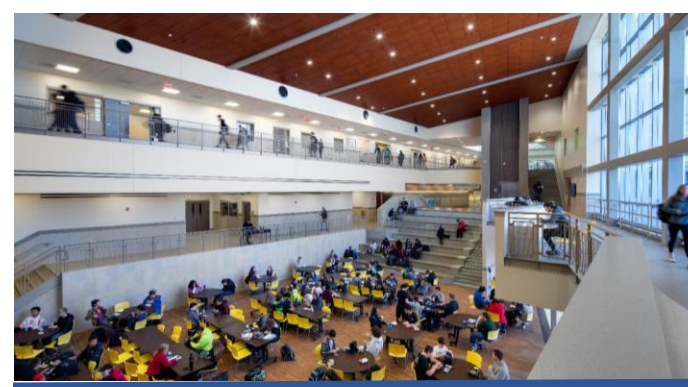
Collaborative Learning Space:

STEM lab allows collaborative learning activities and developing critical thinking skill



Transparency:

Building connects all various learning spaces and extends to the nature



Community:

Multi-purpose learning spaces spur synergetic learning activities



Creativity:

Visual connection between DVC shop and student common, digital display panels between spaces will increase creativity

Beyond the Ribbon Cutting

In 2019, Minuteman Regional Vocational High School opened. Students, staff, families, community members, members of the Massachusetts School Building Authority attended the ribbon cutting.

Seemingly right after the opening of the school, Covid-19 caused most schools across the world to close. Major challenges in delivering career and technical education virtually meant that students in their vocational week would attend courses in person at the school. In order to be in person, social distancing was required. While many schools struggled to find the space to do this, Minuteman was able to utilize their flexible spaces and appropriately sized shops and classrooms.

With the end of Covid in sight, leaders expect to see a greater connection to the community as local residents can begin to fully interact with the programs that serve them.

There is also a waiting list to attend Minuteman Regional Vocational High School which shows leaders evidence of the success of the project.

Students has seen improved statistics and test scores and the expectation is that this will continue as students get back to "life as usual" in their new facility.

Since the Class of 2021 graduated...

- **98%** of graduates secured positive placement in post secondary education or employment
- **67%** enrolled in a 2 or 4 year college or university
- **23%** were hired for a job in their trade of study



Revolutions in Learning

The New Minuteman High School

"It's almost every emotion you can imagine here other than sadness – it's joyful, it's exciting, I get emotional. We finished a year ahead of schedule, and slightly under budget. We're going to spend all the money on the kids though – so it's been an amazing experience."

*Dr. Ed Bouquillon, Superintendent of Schools
Minuteman Regional Vocational Technical School District*



Submitting Firm :	Kaestle Boos Associates Inc.
Project Role	Architect
Project Contact	Gregory Joynt, AIA
Title	Associate Principal
Address	16 Chestnut Street, Suite 301
City, State or Province, Country	Foxborough, MA 02035
Phone	508.549.9906

Joint Partner Firm:	Skanska USA
Project Role	Owners Project Manager
Project Contact	Mary Ann Williams
Title	Program Executive
Address	101 Seaport Boulevard, Suite 200
City, State or Province, Country	Boston, MA 02210
Phone	1 617 293 6869

Planner on Record:	Frank Locker Educational Planning
Name	Frank Locker, PhD
Address	306c Dover Point Rd
City, State or Province, Country	Dover, NH, 03820
Phone	617.412.7444
Email	fl@franklocker.com

Construction Firm:	Gilbane Building Company
Project Role	Construction Manager at Risk
Project Contact	Walter Kincaid
Title	Senior Project Executive
Address	10 Channel Center Street, Suite 100
City, State or Province, Country	Boston, MA 02210
Phone	617-438-4538

Project Name	Minuteman Regional Technical Vocational High School	
City	Lexington	
State	Massachusetts	
District Name	Minuteman Regional Vocational Technical School District	
Supt/President	Edward A. Bouquillon, PhD	
Occupancy Date	September 1, 2019	
Grades Housed	9-12, Post Secondary Night Programs	
Capacity(Students)	628	
Site Size (acres)	59.6 Project Boundary	
Gross Area (sq. ft.)	257,745	
Per Occupant(pupil)	410	
gross/net please indicate	1.5	
Design and Build?	Yes	
If yes, Total Cost:	\$148M	
Includes:	Total costs including Design and Construction, FF&E	
Project Costs		
If no,		
Site Development:		
Building Construction:		
Fixed Equipment:		
Other:		
Total:	\$148M	