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Header 1

List View

- General Information**
- Contact
- Default Values
- Discount
- Document Information
- Clarification Request

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Legal Name: Manns Woodward Studios, Inc

Alias/DBA:

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Comm Code	Manufacturer	Specification	Model #
81101508			

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Extended Description:

Provide professional architectural and engineering design services per the attached documentation.



CEOI 0603 ADJ2600000005
FIRE DEPARTMENT FACILITY DESIGN -
CAMP DAWSON TRAINING CENTER

Submitted March 17, 2026

MW Studios
8098 Sandpiper Circle, Suite H
Baltimore, Maryland 21236

TABLE OF CONTENTS

TAB 1 FIRM HISTORY & BACKGROUND

MW Studios Firm History & Background.....	1
Recent Public Safety Experience	2
Firm Size and Commitment	3
Geographic Location and Response.....	4
Codes and Standards	4
Utilization of Virtual Reality.....	5
Support Capabilities.....	6
Recent Awards for Excellence in Public Safety Designs	7

TAB 2 STAFF QUALIFICATIONS

Team Organizational Chart	9
David Woodward, AIA	10
Robert Manns, AIA	11
Evan Gray, AIA.....	12
Erasmio Rizo.....	13
Jason Pauley.....	14
Scott Frenck	15
Danny Wyatt.....	16
Kevin Merriman	17
Josh Telenko.....	18
Robert Moss	19

TAB 3 QUALIFICATIONS, EXPERIENCE & REFERENCES

References	21
Kingwood Volunteer Fire Department.....	25
Berkeley County Public Safety Building.....	26
Joint Base Andrews Crash Rescue Station	27
King George Fire Department Station 2	28
Arundel Volunteer fire Department.....	29
9th & Marion Fire Station.....	30
9th & Marion Fire Station.....	31
N. Providence Public Safety Complex.....	32
Spring Garden Fire Station 892	33
Cumru Fire Department	34
Ocean City Fire Station #3.....	35
Ocean City Fire Station #3.....	36
Upperco Fire Company.....	38
White Marsh Fire Department.....	40
Aberdeen Fire/EMS Department.....	42
Mechanicsville Fire Department	44
Crownsville Fire Department.....	46

TAB 4 PROJECT APPROACH

General Design Philosophy	48
Our Proposed Plan and Approach	49
Quality Control / Quality Assurance Program	54
Coordination Methodology	56
Quality Assurance During Design	56
Maintaining The Design Schedule.....	58



TABLE OF CONTENTS

TAB 5 FIRE STATION UNDERSTANDING

Fire Station Understanding.....	61
Research, Development & Reputation for Excellence.....	61
Understanding History...What Makes A Good Fire/EMS Station?	62
Site Conditions for Fire/EMS Station Design	63
Structural and Life Safety Importance	65
Sprinkler Protection and Detectors	65
Organizational Considerations Within the Station	66
First Responder Health : The Invisible Killers.....	67
Single Story VS. Multi-Story Stations.....	68
More Bays Now or Later?.....	71
Programming - Balancing Wants, Needs, and Budget	72
Hot Zone Design Approach.....	73
Vehicle Exhaust and Air Quality.....	74
A Case Study for Response, Return, and Decon Control.....	77
Decon Control.....	79
Kitchen, Culture and Hoods.....	80
Bunk, Shower, and Toilet Accommodations	82
Sample Bunk Room Styles.....	83
ADA Accessibility	83
Existing Operations.....	83
Open Bunkroom	85
Semi-private Bunkrooms	85
Private Bunkroom	86
Factors to Decide Upon.....	86
Locker and Shower Facilities.....	89
Infrastructure and Resiliency	91
Force Protection.....	92
Apparatus Bay System Details and Technologies	92
Natural and Artificial Light.....	94
Bay Air Control	97
Bay Heating	98
Bay General Exhaust.....	99
Apparatus Vehicle Exhaust	99
Apparatus Bay Door Operations	100
Rainwater Collection Systems.....	100
Training Elements and Props	101
Utilization of Mezzanines	102
Fitness Facilities	103
Project Understanding Closing	104



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Principal Architect

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SUBCONSULTANTS NAMES & ADDRESSES

CIVIL & ENVIRONMENTAL CONSULTANTS

Civil Engineering

120 Genesis Boulevard, Bridgeport, WV 26330

DEDC ENGINEERING

MEP Engineering

315 S Chapel Street, Newark, DE 19711

CARROLL ENGINEERING

Structural Engineering

215 Schilling Circle, #102, Hunt Valley, MD 21031

ECS MID-ATLANTIC

Geotechnical Engineering

449 Fortress Boulevard, #2403, Morgantown, WV 26508

YA GROUP

Cost Estimating

347 W 36th Street, Suite 1101, New York, NY 10018





March 17, 2026

David Pauline
2019 Washington Street
East Charleston, WV 25305

RE: FIRE DEPARTMENT FACILITY DESIGN - CAMP DAWSON TRAINING CENTER

Mr. Pauline,

We are pleased to submit our expression of interest and qualifications for the architectural and engineering design services of the Fire Department Facility at Camp Dawson. At MW Studios (MWS), Public Safety work is the cornerstone of our practice - it is our passion and our purpose. As a Maryland-based architectural firm with nationally recognized, award-winning experience in the design of fire facilities and complex public safety training centers, we bring a deep understanding of the operational demands and mission-critical nature of these environments.

Our team has deep roots in public safety architecture; we recognize the importance of this project and the meaningful impact it will have on the readiness and effectiveness of the military personnel who rely on this facility. Designing for those who serve requires more technical experience; it requires an understanding of the operational realities first responders face every day and a commitment to creating facilities that support their safety, readiness, and long-term success.

In recent years, our team has been directly responsible for the study and design of numerous fire station projects throughout the region, including the Kingwood Volunteer Fire Department, Berkeley County, WV Joint Public Safety Building, the Bridgeport Police Department, the Crash Rescue Station at Joint Base Andrews, and fire stations for the Reading, Mechanicsville, Upperco, Earleigh Heights, New Brunswick, Aberdeen, Ocean City, White Marsh, Crownsville, and Lutherville Fire Departments. These projects demonstrate our ability to deliver high-performing facilities tailored to the unique operational needs of each department and community.

As a firm dedicated to public safety design, we are highly experienced in navigating the complex state and federal codes, regulations, and performance standards that govern these facilities. Our goal is not simply to meet requirements, but to deliver facilities that exceed expectations while supporting operational efficiency, safety, and long-term durability.

MWS is led by nationally recognized public safety architects whose collective experience exceeds 100 years, dedicated exclusively to the planning and design of first responder facilities. We understand that fire stations and training facilities represent significant long-term investments for communities and agencies. Our responsibility to ensure these facilities provide resilient, efficient, and adaptable environments that will support generations of firefighters and emergency personnel.

We believe our team offers the experience, expertise, and commitment necessary to successfully partner with the state of West Virginia and West Virginia National Guard to deliver this important project. Our involvement will help ensure that the department is equipped with a facility that enhances operational readiness and supports the safety of the personnel who protect their community.

Should you have any questions, please do not hesitate to contact me directly. I welcome the opportunity to discuss our qualifications and approach in greater detail.

Respectfully Submitted.

Robert Manns
Principal Architect
E: rmanns@mwsarch.com
P: 410-917-5158
O: 410-344-1460

DESIGNATED CONTACT: Vendor appoints the individual identified in this Section as the Contract Administrator and the initial point of contact for matters relating to this Contract.

(Printed Name and Title) Evan Gray, Principal

(Address) 8098 Sandpiper Cir, H, Baltimore, MD 21236

(Phone Number) / (Fax Number) 410-344-1460

(email address) egray@mwsarch.com

CERTIFICATION AND SIGNATURE: By signing below, or submitting documentation through wvOASIS, I certify that: I have reviewed this Solicitation/Contract in its entirety; that I understand the requirements, terms and conditions, and other information contained herein; that this bid, offer or proposal constitutes an offer to the State that cannot be unilaterally withdrawn; that the product or service proposed meets the mandatory requirements contained in the Solicitation/Contract for that product or service, unless otherwise stated herein; that the Vendor accepts the terms and conditions contained in the Solicitation, unless otherwise stated herein; that I am submitting this bid, offer or proposal for review and consideration; that this bid or offer was made without prior understanding, agreement, or connection with any entity submitting a bid or offer for the same material, supplies, equipment or services; that this bid or offer is in all respects fair and without collusion or fraud; that this Contract is accepted or entered into without any prior understanding, agreement, or connection to any other entity that could be considered a violation of law; that I am authorized by the Vendor to execute and submit this bid, offer, or proposal, or any documents related thereto on Vendor's behalf; that I am authorized to bind the vendor in a contractual relationship; and that to the best of my knowledge, the vendor has properly registered with any State agency that may require registration.

By signing below, I further certify that I understand this Contract is subject to the provisions of West Virginia Code § 5A-3-62, which automatically voids certain contract clauses that violate State law; and that pursuant to W. Va. Code 5A-3-63, the entity entering into this contract is prohibited from engaging in a boycott against Israel.

Manns Woodward Studios, Inc.

(Company)

Evan Gray

(Signature of Authorized Representative)

Evan Gray, Principal - 3/17/2026

(Printed Name and Title of Authorized Representative) (Date)

410-344-1460

(Phone Number) (Fax Number)

egray@mwsarch.com

(Email Address)

TAB 1
FIRM HISTORY &
BACKGROUND



MW STUDIOS FIRM HISTORY & BACKGROUND



READING 9TH & MARION FIRE STATION

Design of a new 16,000 SF 2-story fire station. The station was constructed on a lot adjacent from the existing station. The urban-infill project provides 3 apparatus bays, administrative office space, day room, lockers, kitchen, patio, fitness area, study, and mezzanine storage.

MW Studios (MWS) is a Maryland based architectural firm founded in 2006 that passionately specializes in the design of public safety facilities.

Public safety architecture is the cornerstone of our practice. For more than a decade, the firm has been directly responsible for the successful design of over 150 Fire Stations, Police Stations, Emergency Operations Centers, 911 Call Centers, Training Centers, and other Emergency Services and Mission Critical Facilities.

MWS' leadership in public safety design has been recognized on a national level, time-and-time again. The senior leadership of the firm has been involved in the development of best practice standards, spoken at national conferences on the design of fire station and other public safety facilities, and has received numerous project design awards for finished work. Through experience, our team has gained unprecedented insight as to how departments from across the country are solving the many unique challenges associated with designing fire stations.

In today's era, public safety is increasingly more critical. The ability to respond to events ranging from a regional natural disaster to a single motor vehicle collision is essential to ensure the safety of our communities. The design of a fire/EMS station requires a high level of expertise to develop an enduring building that optimizes preparedness, ensures responder safety, and promotes operational efficiency. The world around us is ever-changing, and as architects and responders, we must continually educate ourselves and enhance our facilities to protect the health, safety, and wellbeing of our communities.

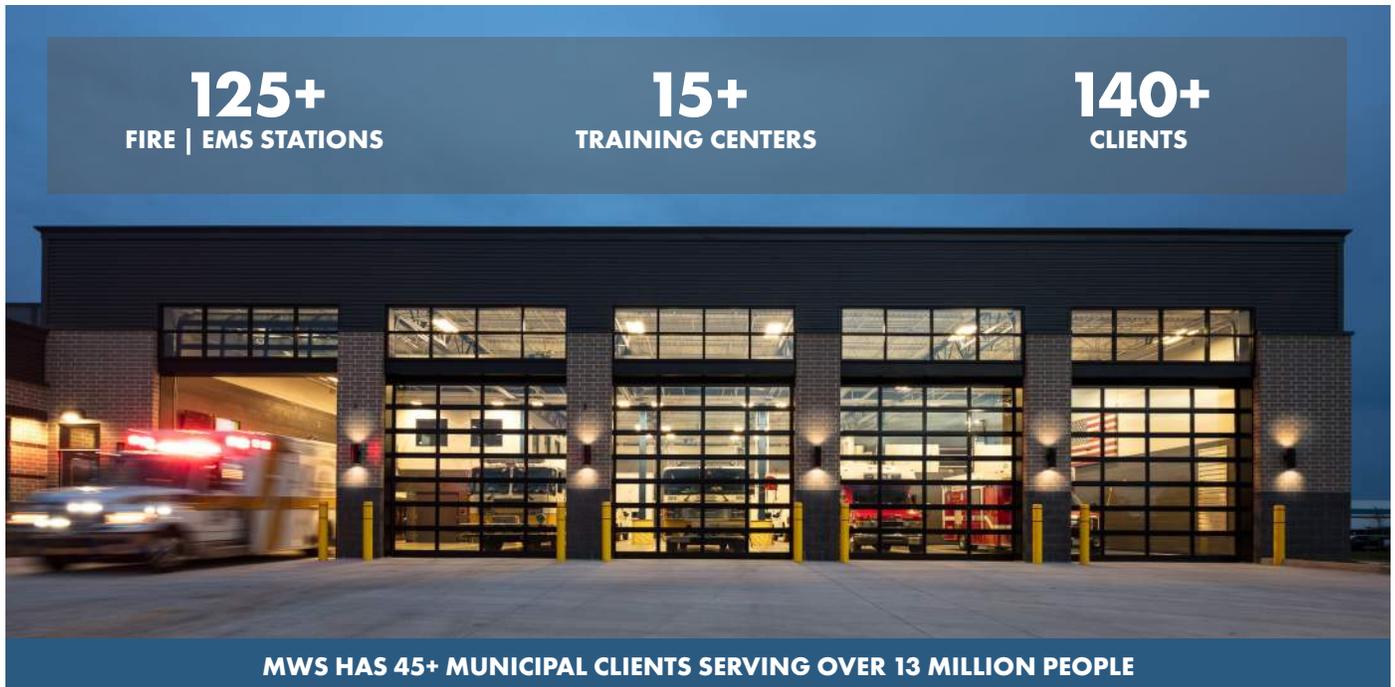
Our team will leverage our experience in the design of fire/EMS buildings to tailor this project to meet the needs of the users and the community it serves. As such, the site, along with the architecture and interior design, will be purposefully designed to accommodate the needs of a modern fire department.

We possess a solid understanding of spatial relationships and safety standards associated with fire/EMS department building operations. We know how to program and design these unique facilities to maintain functionality throughout the life of the building.



RECENT PUBLIC SAFETY EXPERIENCE

MW Studios is a specialty firm that partners with communities to plan, design, and construction of public safety facilities. We bring years of experience in successfully designing public safety training centers, fire stations, police stations, and other public facilities that are unique and special for each community.



125+
FIRE | EMS STATIONS

15+
TRAINING CENTERS

140+
CLIENTS

MWS HAS 45+ MUNICIPAL CLIENTS SERVING OVER 13 MILLION PEOPLE

FIRE / EMS STATIONS

10th District Volunteer Fire Company • Aberdeen Volunteer Fire Company – House 1 • Aberdeen Volunteer Fire Company – House 2 • Aberdeen Volunteer Fire Company – House 3 • Allentown Fire Department Study • Arcadia Volunteer Fire Company • Baltimore Co. Fire Dept. – Essex • Baltimore Co. Fire Dept. – Golden Ring • Baltimore Co. Fire Dept. – Randallstown • Baltimore Co. Fire Dept. – Texas Station • Cambridge Fire Department • Christiana Volunteer Fire Company • Church Hill Volunteer Fire Company • Colora Paramedic Station • East Dover Fire Department • Earleigh Heights Fire Department • Glen Echo Volunteer Fire Company • Glyndon Volunteer Fire Company • Grasonville Volunteer Fire Company • Hamilton Township Fire Department • Hampstead Volunteer Fire Company • Harford County EOC • Hollywood Volunteer Rescue Squad • Kensington Rescue Squad • Kingsville Volunteer Fire Company • Kitty Hawk Fire Department • Laytonsville District Volunteer Fire Company • Liberty Road Volunteer Fire Department • Lisbon Volunteer Fire Department • Lutherville Volunteer Fire Company • Laurel Volunteer Rescue Squad • Mechanicsville Volunteer Fire Company • Middleboro Volunteer Fire Company • Middle River Volunteer Fire Company • New Brunswick Fire Headquarters • Odenton Volunteer Fire Company • North Providence Fire Department • Odessa Paramedic Station • Pikesville Volunteer Fire Company • Queen Anne’s EMS Station 2 • Savage Fire Department • Second District Volunteer Fire Company • Sykesville Freedom District Fire Department • Toms River Fire Department • Tri-towns EMS • West Friendship Volunteer Fire Department • West Windsor Fire and EMS • White Marsh Volunteer Fire Company • Woodland Beach Fire Department • Upperco Volunteer Fire Company

PUBLIC SAFETY TRAINING CENTERS

Baltimore City Burn Building • Bucks County Burn Building • Carroll County Public Safety Training Center • Chester County 911 Backup Center • Chester County Tactical Village • Chester County Transit Security Firing Range • Harford County 911 / EOC • Howard County PSTC • Luzerne County Public Safety Training Center • New Castle County Public Safety Training Center • Montgomery County Public Training Safety Center • Mt. Pleasant, South Carolina • Philadelphia Fire Academy • Sidney Ohio Public Safety Center • Ventura Public Safety Complex

FIRM SIZE AND COMMITMENT

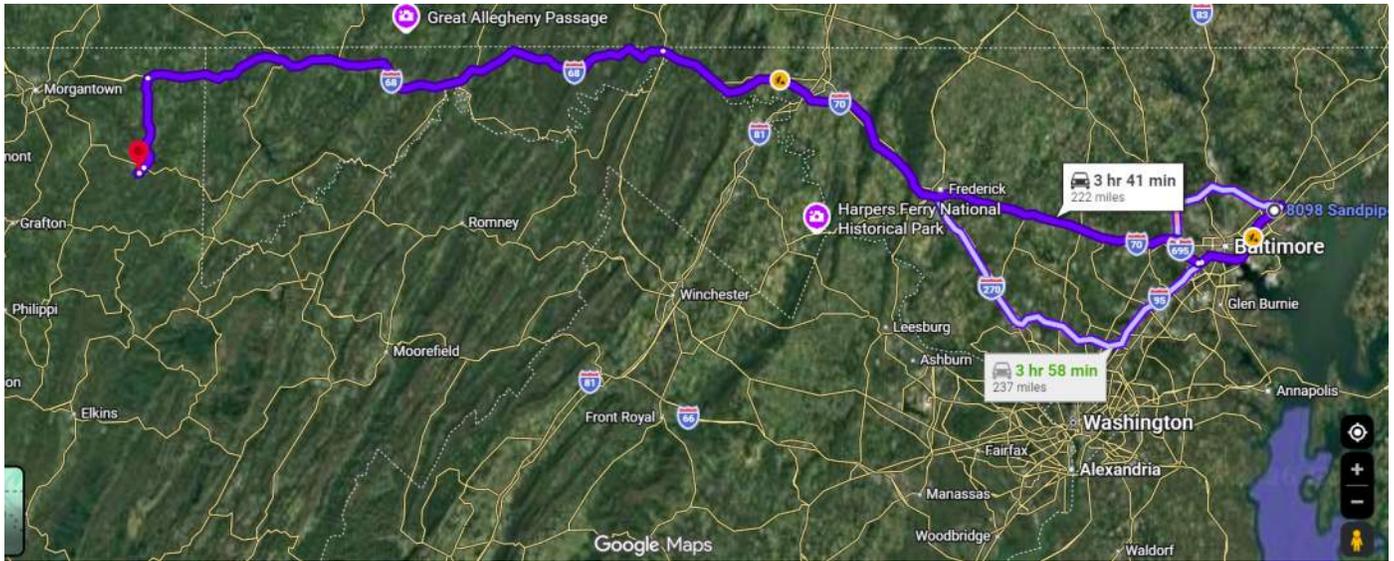


MW Studios consists of fifty-four total staff including four principal architects, thirty-three project architects and designers, five interior designers, six administrative personnel and five construction administrators.

We have 10 licensed architects, plus LEED AP and LEED GA accredited professionals among our staff. Our veteran team will bring forth lessons learned and best practices fire department and public safety agencies from across the country are implementing on their projects. The principals, project managers, and project architects of the firm will be directly involved with and responsible for every aspect of the design and production of work.



GEOGRAPHIC LOCATION AND RESPONSE



MW Studios operates from our main office located in Baltimore, Maryland, **approximately 3 hours and 40 minutes from the project site on Hockett Road**. Our base of operations houses state of the art workstations, Building Information Modeling (BIM) software, large format scanners, laser plotters, internet and teleconferencing communications hardware, 3D printers, and drone camera technology.

We have successfully worked with groups upwards of 8 hours away as the prime consultant. Our experiences lie within West Virginia, Pennsylvania, Maryland, Virginia, North Carolina, New Jersey, and Delaware. We have established procedures to allow principal personnel to quickly respond to the project site in the event their attention is immediately needed.

Our team is familiar with the design guidelines, review process and jurisdictional approvals necessary to successfully execute the project with regards to West Virginia Code and any other applicable Department of Defense, Force Protection, and Army Regulations.

As part of our standard process we meet with zoning, planning, permitting and other approval agencies early and often through the design phases. This interaction allows for both the design team and agencies to identify and address any issues that may arise prior to final submission.

Additionally, Principal Architect Rob Manns is a licensed private pilot with immediate access to aircraft, allowing a representative from MWS to be on-site within 60-minutes should an issue arise.

CODES AND STANDARDS

We are experts in the design of public safety facilities. Our experience tells us that fire/EMS stations are far more complex than the typical commercial or institutional building when it comes to code and operational constraints.

Homeland security guidelines, NFPA operational requirements and HIPA protocols are only a few of the additional standards to which these facilities are held to. Facilities utilizing grant funding can also often be subjected to specific requirements that must be incorporated into the management process or design itself.

In addition to the local codes, The Series of International Building Codes, Accessibility Codes, and NFPA Life Safety Codes, we are also well versed with the procedural manuals listed to the side. If desired or required, we will design facilities that conform to their prescribed protocols in order to minimize a client's risk exposure to personnel injury and infectious disease.

LIST OF POTENTIAL APPLICABLE STANDARDS THAT MAY APPLY

- NFPA 1500 – Fire Department Occupational Safety & Health Program
- NFPA 1581 – Fire Department Infection Control Program
- NFPA 1710 – Standard for the Organization and Deployment of Fire Suppression, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments
- NFPA 1720 NFPA 1710 – Standard for the Organization and Deployment of Fire Suppression, Emergency Medical Operations, and Special Operations to the Public by Volunteer Fire Departments
- UFC 4-730-10 – Department of Defense Design Criteria for Fire and Emergency Service Programs
- IBC 2016 – International Building Code; specifically seismic, snow, and wind resistance requirements
- NFPA 1 – Fire Code; specifically the requirement for fire stations to be protected by an automatic sprinkler system

UTILIZATION OF VIRTUAL REALITY

For centuries the tools utilized by architects and designers to communicate the intent of the design relied on a series of coordinated flat two-dimensional drawings. Alone, each drawing only told a portion of the story. Together, only under the interpretation of a trained eye, they began to paint the entire picture. In the early 90's computer technology evolved to a point that enabled designers to communicate their design in the form of computer generated 3D images. Then, with the advent of more advanced computer hardware and Building Information Modeling (BIM), designers were able to communicate the design of a building in real-time by creating accurate construction models.

Today, MW Studios maintains its commitment and focus on utilizing cutting edge technology to improve the process and communication of design. Our team regularly integrates the latest immersive virtual reality systems into the design, coordination, and construction process. Making use of advanced hardware inclusive of a back-pack style-high-performance computer work station, high resolution virtual reality headset with controls, room sensors, and immersion software our team has the capabilities to place clients, stakeholders, facilities personnel, and contractors in a high-detailed virtual world that enables one to experience the BIM model.

Users take control and have the ability to interact with the model and physically walk through a building, lean over railings, peer into cabinets, and test the ergonomics of desks. Visualization tools allow realtime 3D markups, commentary and layering control to simulate what the project will look like during and after construction. The ability to control layers allows facilities personnel to isolate mechanical elements to understand the routing of conduits, ductwork, etc. Clients can select finishes and lighting schemes to experiment with how such decisions can affect the appearance and mood of a space.



Client using VR - PM Lindsey Kiefer explaining what he's walking through



Client using VR



Clients using VR

In short, this technology revolutionizes the design process. It demystifies the complexity of the built environment and enables anyone, regardless of their background, to understand the implications of design in clear terms. We look forward to demonstrating this technology throughout this project to not only explain the solutions but to achieve overall project buy-in from those responsible for financial buy-in.

What Clients & Contractors Say...

"I think the VR experience helps bring concepts and ideas from a drawing to a real life understanding of what you are designing, which helps you make more informed decisions"

Kevin Palmer, President
White Marsh Volunteer Fire Department

"I am a HUGE fan of the VR experience. For a company like Rockwell Collins, where the stakeholders and decision makers aren't necessarily facilities/real estate/construction personnel, the VR experience has proven crucial to obtaining buy in. The VR has brought life to our plans so everyone is able to better envision the look and feel of our project"

Karen Murphy, Senior Manager, Facilities Services / Technology Services & Operations
Rockwell Collins

"The VR experience was a huge asset to our team. It provided the opportunity for our stakeholders to see first hand what our space could look like. It answered a lot of questions around the look and feel of the finished space."

Chris Nahas, Director, Technology Services & Operations Information Management
Rockwell Collins

SUPPORT CAPABILITIES

Since our inception, MWS has maintained a commitment towards investing in progressive design software and technology. The firm regularly integrates technological solutions that promote design quality, improve our ability to communicate the design intent, and better mitigate the project risks. From the outset in 2006, the firm began servicing clients utilizing Building Information Modeling (BIM). BIM is a digital tool that enables the team to design and coordinate nearly every element of the building in three dimensions before construction begins. Today, we are now at the leading forefront of integrating virtual reality software into the design process. For the first time in history, clients can experience the design of their building throughout the entire design process.

MWS's commitment to technology allows our firm to maintain low overhead and design and manage projects efficiently without sacrificing design quality. It enables our clients and end-users to step inside of the building before shovels strike the ground, thus reducing the financial risk that can stem from costly change orders.

SOFTWARE

- Autodesk Revit
- Autodesk AutoCAD
- Autodesk Navis Works
- Sketchup
- Adobe Creative Suite
- Blue Beam
- Plan Grid (Web Based PM Software)
- Submittal Exchange (Web Based PM Software)
- Go-To-Meeting Subscription
- Doodle Poll Corporate Subscription
- Microsoft Office

- Microsoft Teams
- Ecotect
- Zoom

HARDWARE

- Cutting Edge Mobility Work Stations w/ Dual Monitors
- Full-Size Laser Plotting
- Laser Printing
- 3D Printing
- Laser Cutter
- Mavic Pro Digital Drone
- Virtual Reality



TECHNOLOGY ASYNCHRONOUS COLLABORATION

Our team leverages virtual asynchronous collaboration technology that significantly improves information sharing, obtaining, and maintaining consensus. Early in the process, we shall establish a "Virtual White Board" utilizing Miro, a cloud-based technology. Miro is a virtual collaboration board allowing designers and project stakeholders to share real-time ideas, images, concerns, and comments. Users can import pictures, issue comments, and create virtual sketches and markups. Users can share their thoughts through real-time virtual or in-person collaboration or visit the board at leisure to share ideas or seek clarification on a proposed design solution. The technology also serves as an excellent resource for recalling the history and rationale for design decisions. In addition to meeting minutes, Miro is a visual reference to the design process and an excellent tool that reminds users why certain decisions were made. As a result, back-tracking on progress is significantly reduced.



RECENT AWARDS FOR EXCELLENCE IN PUBLIC SAFETY DESIGNS

READING FIRE DEPARTMENT - FIERO - Honor



UPPERCO FIRE/EMS DEPARTMENT - Firehouse Station Design Awards - Bronze; FIERO - Merit; ABC - Diamond Excellence



WHITE MARSH FIRE/EMS COMPANY - Firehouse Station Design Awards - Gold



MECHANICSVILLE FIRE/EMS DEPARTMENT - Firehouse Station Design Awards - Gold / FIERO - Honors



ABERDEEN FIRE/EMS DEPARTMENT - Firehouse Station Design Awards - Bronze



TAB 2
STAFF QUALIFICATIONS



TEAM ORGANIZATIONAL CHART

MW Studios makes it a policy to retain only the best and most qualified consultants capable of meeting our clients' specific needs. Understanding the nature of this project, we have assembled an outstanding and highly qualified team that has experience in fire station design, and the capacity to deliver and meet the expectations of the project. The key personnel associated with the architects and engineers on this team are the same individuals responsible for designing and completing many similar projects.



DAVID WOODWARD, AIA
Principal Architect



David is a founding Principal of MW Studios and serves as the managing director of the firm. He carries over two decades of experience in the practice of institutional and construction management with a primary focus on public safety and government projects.

While maintaining leadership over projects, David oversees and performs the vast majority of design, contract documentation, and administration. He is also responsible for ensuring the firm's quality control of all institutional projects. David specializes in providing owners with the invaluable insight on the construction of and government of these highly specialized facilities. His expertise and skills in contract administration and negotiations have saved both owners and contractors from unnecessary and costly change orders.

POSITION / ROLE	YEARS AT MWS	YEARS OF EXPERIENCE	EDUCATION	REGISTRATION
Quality Control / Quality Assurance	20	29	Bachelor of Architecture Drexel University	WV - 5476 NCARB

HIGHLIGHTED PROJECTS



**MECHANICSVILLE FIRE DEPARTMENT
ST. MARY'S COUNTY, MARYLAND**

Principal Architect for the design and construction for a new 29K SF single story fire station. The station provides 6 full-depth drive thru apparatus bays, and 1 half-depth back-in bay. Additional apparatus support, engineers office, quarter master's storage, and dedicated turnout gear storage round out the apparatus bay. Operational functions include a kitchen and dining area, game room, fitness center, and large training room.



**WHITE MARSH FIRE DEPARTMENT
BALTIMORE COUNTY, MARYLAND**

Principal Architect for the design and construction of a new 18,000 SF fire station. The new facility provides 5 apparatus bays, wet training tower, various apparatus support spaces, and an efficiently organized operations and living area that improves response time. The operations and living areas are supported by 7 bunk rooms, study, day room, kitchen, showers, and outdoor patio.



**ABERDEEN FIRE & EMS DEPARTMENT
HARFORD COUNTY, MARYLAND**

Principal Architect for the design and construction for the renovation/addition to an existing fire station. The existing 10,800 SF apparatus bay was modernized with new doors, lighting, flooring, alerting, and mechanical upgrades. A new 4-story drill tower flanks the end of the bays to provide training opportunities. A 20,500 SF addition was tied into the existing portion to complete the station and include living and operations spaces.

ROBERT MANN, AIA
Principal Architect



Robert Mann, AIA is a founding principal of the firm. He carries over 20 years of experience and specializes in the design of public safety facilities such as fire stations, EMS stations, police stations, public safety training centers, and mission critical structures. He has a proven track record for providing meaningful, budget conscious and quality driven design solutions that meet the specific needs of first responders.

Rob is dedicated to the creation, coordination, and implementation of design solutions that improve the quality of life for first responders and their surrounding community. Rob's has had work and research published numerous times and regularly spoken at conferences on the topics surrounding public safety design at, FIERO, Firehouse, APCO, and IACP. Over the past decade, Rob's been instrumental in advancing the design of public safety buildings to mitigate first responder exposure to carcinogens and hazardous materials. As a result, his work, and the work of the firm have generated numerous national awards for design and construction excellence of public safety facilities.

POSITION / ROLE	YEARS AT MWS	YEARS OF EXPERIENCE	EDUCATION	REGISTRATION
Principal Architect	20	28	Master of Architecture Catholic University of America	Licensed Architect NCARB

HIGHLIGHTED PROJECTS



**JBA CRASH RESCUE STATION
JOINT BASE ANDREWS, MARYLAND**

Principal Architect for the design and construction of a new 35,882 SF firefighting facility located on Joint Base Andrews. The single-story facility will provide a modern, highly functional environment that enhances emergency response and operational readiness.

The station will feature spacious apparatus bays to accommodate today's advanced firefighting apparatus, dedicated training room, full kitchen, residential dormitories, and administrative offices. A mezzanine level will provide additional capacity for equipment storage and building systems.



**OCEAN CITY FIRE DEPARTMENT
OCEAN CITY, MARYLAND**

Project Manager for the design and construction of a new 2-story 18,706 SF fire station. The station provides 4 double-deep apparatus bays, independently ventilated turnout gear storage, and multi-tier decontamination area and fire gear storage. Three independent mezzanines provide auxiliary storage, host in-station high angle training exercises, and fully enclosed fitness area. The second floor provides a kitchen, day room, study, administrative space, and bunk rooms for fire department employees and volunteers. The station sits 1 street away from the ocean, requiring the design to meet category IV standards, heightened strength requirements for both wind speed and airborne debris impact.



**CROWNSVILLE FIRE STATION
CROWNSVILLE, MARYLAND**

Principal Architect for the design and construction of a new 22,400 SF fire station. The new state-of-the-art station is designed to achieve LEED Silver with healthy and sustainable materials, low energy fixtures/appliances, daylighting, among other items. The design optimizes response times from anywhere in the station while providing de-stressing features including a gym, kitchen/dayroom, shared and private bunk spaces, exterior patio, sound proofing, and top of the line alerting system.

Four double-deep apparatus bays provide state-of-the-art housing including proper electrical/plumbing systems, vehicle exhaust, flooring finishes, and sloping/drainage designed to sustain the lifetime of the vehicles.

EVAN GRAY, AIA
Principal Architect



Mr. Gray serves as one of the lead designers and project architects for public safety facilities within the firm. Over the course of his career with the firm, he has been directly involved in the design of more than 30 fire stations, police stations, and emergency operations centers. His architectural experience is further complemented by his 15 years' experience in the construction industry.

As one of the firm's leading technical experts, Evan is responsible for quality assurance and control, design production, construction document standards, and implementing innovative strategies in the design of public safety buildings. He regularly engages in technically challenging and specialty projects such as firing ranges, communications centers, laboratories, and storm hardened structures. Evan also possesses direct FEMA experience where he worked to secure project funding to harden and replace public safety facilities compromised by Hurricane Sandy. He possesses immense knowledge regarding the nuisances associated with the renovation and construction of public safety facilities and, specifically, challenging sites.

POSITION / ROLE	YEARS AT MWS	YEARS OF EXPERIENCE	EDUCATION	REGISTRATION
Principal Architect	15	15	Master of Architecture Savannah College of Art & Design	Licensed Architect NCARB

HIGHLIGHTED PROJECTS



**JBA CRASH RESCUE STATION
JOINT BASE ANDREWS, MARYLAND**

Project Manager for the design and construction of a new 35,882 SF firefighting facility located on Joint Base Andrews. The single-story facility will provide a modern, highly functional environment that enhances emergency response and operational readiness.

The station will feature spacious apparatus bays to accommodate today's advanced firefighting apparatus, dedicated training room, full kitchen, residential dormitories, and administrative offices. A mezzanine level will provide additional capacity for equipment storage and building systems.



**BERKELEY PUBLIC SAFETY COMPLEX
BERKELEY COUNTY, WEST VIRGINIA**

Principal for the design of a new joint-use facility that combines the County's fire department, volunteer fire department, EMS, and Sheriff's Office under one roof. The facility is planned to be 44,600 SF and organized to clearly separate public, secure, and operational zones while maintaining operational efficiency.

Fire & EMS operations are supported by seven drive-thru double-deep apparatus bays, decontamination facilities, turnout gear and equipment storage, and specialized support spaces. Living quarters accommodate 24-hour operations with kitchen and dining areas, dayrooms, fitness facility, locker and laundry facilities, and a combination of individual and open bunk rooms.



**READING FIRE DEPARTMENT
READING, PENNSYLVANIA**

Project Manager for the design and construction of a new 2-story 15,900 SF fire station located on a dense urban street. A mezzanine overlooks the apparatus bay which also provides auxiliary storage and can also host various in-station high angle training exercises. The second floor provides a kitchen, day room, fitness area, administrative space, and bunk rooms for fire fighters. Special focus was given to the layout and efficiency of vertical circulation, ensuring that fire fighters have a direct and efficient travel path from the second floor into the apparatus bay. The ground floor has 3 back-in bays, watch office, day room, storage lockers, and additional storage.

Erasmio Rizo

Principal



21 YEARS OF EXPERIENCE

EDUCATION

B.S., Civil Engineering Technology, West Virginia Institute of Technology, 2005

CERTIFICATIONS

10-hour Construction Safety, Occupational Safety & Health Administration

Nuclear Gauge, Troxler Electronic Laboratories, Inc.

Certified Wastewater Treatment Plant Operator Class II, State of West Virginia

Adult and Pediatric First Aid/CPR/AED, Red Cross

SafeLand USA - Basic Orientation, PEC Safety

Mr. Rizo has 19 years of experience in urban land, transportation engineering, oil and gas, and public utilities. He has performed site layout, profiles, cross sections, grading, earthwork analysis, drainage, water lines, hydraulic analysis, and erosion and sediment control for numerous projects. Mr. Rizo's project experience for the Oil and Gas industry includes design and quality assurance of pipelines, well pads and associated pits & impoundments, and ASTs. He has permitting experience for Army Corp of Engineers, state DOH and environmental permits. His water and wastewater project experience includes emergency action plan review, HEC-RAS modeling, stormwater detention and retention modeling and analysis, dam observation and inspections. Mr. Rizo has also directed a sanitary sewer department which include the wastewater treatment plant, the collections system for sanitary sewer and stormwater, and the maintenance section. Mr. Rizo also served in the Army National Guard as a part of the maintenance and recovery section. He held first-line leader responsibilities, and served in Operation Iraqi Freedom II.

PROJECT EXPERIENCE

Public Sector

Swisher Street Culvert Replacement, The City*

Design, Permitting, and construction management of the relocation of an existing eight-inch Sewer to control elevation for the replacement of the Swisher Street Culvert. Relocated 380 Linear feet of existing vitrified clay line with 8" SDR-35 PVC pipe. Installed a 60 inch HDPE Corrugated culvert and associated traffic rated decking, reinforced grouted rip rap wing walls and aprons.

Brushy Fork Road Sewer Extension, Various*

Design, permitting, and Right of Way acquisition of 2,500 Linear feet of eight- inch SDR 35 PVC pipe, three-Jack and bore locations, all manholes and apparatus, and associated creek crossings to serve 45 new sewer customers.

Wood Street Sewer Upgrade, The City*

Design, permitting, and construction management of 1,800 Linear feet of various size SDR 35 PVC pipe. The Sanitary Sewer main upgrade and associated collection system was constructed while maintaining service to 40 customers.

Boggs Street Sewer and Stormwater Project*

Design, permitting, and construction management of 300 Linear feet of eight inch SDR 35 PVC pipe, to address old and badly configured existing clay system. Installation of new 300 Linear feet of 12 inch HDPE corrugated pipe to provide stormwater relief in a low lying area. This project allowed the removal of downspouts from the sewer system from homes along project limits.

Civil & Site Development Engineering



Civil & Environmental Consultants, Inc.

Jason M. Pauley, P.E.

Senior Project Manager



15 YEARS OF EXPERIENCE

EDUCATION

B.S., Civil and Environmental Engineering, West Virginia University, 2009

EXPERTISE

Water Transfer Operations and Hydraulic Modeling

REGISTRATIONS

Professional Engineer
• WV 22205

Mr. Pauley is a professional engineer with 15 years of experience in civil and environmental engineering. He is experienced in several aspects of civil engineering including potable and fresh water system design, hydraulic modeling, freshwater intake design, pump selection and piping systems. The majority of his experience is in permanent and temporary water systems for the energy industry as well as some municipal clients. He has designed and permitted over 500 miles of temporary and permanent water transfer lines from 16" to 30" in diameter for Oil and Gas Clients and designed and permitted 12 fresh water intake pump stations.

Mr. Pauley has prepared and received approval for numerous environmental permits to include West Virginia Bureau for Public Health Permits for municipal water and wastewater projects, West Virginia Department of Environmental Protection Stormwater Construction Permits, United States Army Corps Permits, WV National Pollutant Discharge Elimination System (NPDES) and West Virginia Department of Highways Road Crossing and Encroachment Permits.

Mr. Pauley also has over 20 years of experience in the United States Army Reserve operating fuel transfer and storage systems such as the Inland Pipeline Distribution System (IPDS), Fuel System Supply Point (FSSP) and the Advanced Aviation Forward Aircraft Refueling System (AAFARES) in different environments and terrain. The construction and operation of these systems are extremely similar to the water systems Mr. Pauley currently designs for the natural gas industry.

PROJECT EXPERIENCE

Fresh Water Intake and Water Distribution System, Chevron AMBU, Moundsville Marshall, WV*

Project Engineer. Jason was responsible for assisting in the design of a fresh water intake capable of delivering up to 4 million gallons per day of fresh water to Marcellus well pads in and around the area of Moundsville. He also assisted in the design and reviewing of the permanent water distribution system attached to the intake to include water line sizing, booster pump location selection, booster pump selection and pipe line classification requirements. Jason also provided the client with a set of operating Piping and Instrumentation Diagrams for each pumping scenario identifying operating pressures at key points along the water line as well as pump operating speeds.

Ohio River to Pioneer Impoundment Buried Water Line, Antero Resources, Tyler County, WV

Role: Project Manager

Jason provided the client with project management in addition to engineering design for the construction of a 10.1 mile 30" HDPE Buried Water Line network to replace their existing infrastructure. This water line and intake were designed to be capable of delivering over 10 million gallons of water per day to support Antero's operations in Tyler County. In addition to project management and design, Jason also prepared the bid packages, assisted with environmental permitting and DOH permitting,



Civil & Environmental Consultants, Inc.

**Scott A. Frenck,
P.E., LEED AP**

MANAGING DIRECTOR



Scott has over 20 years of experience in Project Management as well as in engineering and designing mechanical systems for educational, commercial, and industrial projects.

As a Managing Director, Scott is responsible for managing and coordinating all engineering aspects of the project, from design conception to construction completion. He is responsible for understanding the requirements of the project and translating them into mechanical and electrical drawings and specifications for bidding and construction. As the Engineering Project Leader, Scott will manage the entire mechanical and electrical engineering team and lead all interactions with the larger project team. As the Lead Mechanical Engineer, Scott will lead the mechanical engineering and design effort for the project. As a LEED professional, Scott always considers sustainability in his work.

Scott's technical skills combined with his unique ability to understand, simplify, resolve and effectively communicate complex engineering problems makes him an asset in the project process.

EDUCATION

Bachelors of Mechanical Engineering - University of Delaware

REGISTRATION

Registered Professional Engineer

*PROJECT
EXPERIENCE*

Mechanicsville Volunteer Fire Department - Addition and Renovations
White Marsh Volunteer Fire Company – New Fire Station
Kingsville Volunteer Fire Company – Addition and Renovations
Aberdeen Fire Department – House One Renovation and Addition
Odenton Volunteer Fire Department - Bunk Area Renovation and Upgrade
Hampstead Volunteer Fire Department - New Facility
New Brunswick Volunteer Fire Department - New Facility
Perryville Police Station - Renovations and Upgrades
The George School - LEED Field House and Natatorium
Penn State University - Health and Human Development Building
Millbrook School - Girls Dormitory
Friends Select School - Lower Level Renovations
Sisters of St. Joseph - Convent Historic Renovations
Widener Partnership Charter School - School Addition
Vassar College Swift Hall - History Department Building Historic Renovations
Alstom - LEED-CI Silver Certified Fit Out of a Commercial Warehouse
St. Andrews School
- Sippelle LEED Gold Field House Building
- Founders Hall Historic Renovations
- Joan D. and Jonathan B. O'Brien Fine Arts Building

Danny Wyatt

SR. ELECTRICAL DESIGNER



Danny has over 10 years of experience in electrical engineering and design of medical, institutional, hospitality, commercial and industrial facilities. His experience includes both building renovation and new construction projects.

As a Sr. Electrical Designer, Danny is responsible for reviewing electrical codes (NEC, IECC, NFPA, Life Safety and Fire Alarm Codes), performing field surveys, calculating electrical loads, developing a basis of design and preparing construction documents. For lighting projects, Danny is often asked to prepare detailed photometric analysis and lighting control options. Danny contributes in a lead role as well as in a support role depending on the size of the project.

Danny enjoys the construction phase of a project and is very experienced providing electrical engineering support for projects during construction. One of Danny's strengths is his communication skills which make him an asset on each project he is involved. He is able to effectively communicate to DEDC's internal project team, the customer and the construction team.

EDUCATION

Associates Degree, Architectural Engineering - Delaware Technical & Community College

PROJECT EXPERIENCE

Mechanicsville Volunteer Fire Department - Addition and Renovations
White Marsh Volunteer Fire Company – New Fire Station
Kingsville Volunteer Fire Company – Addition and Renovations
Aberdeen Fire Department – House One Renovation and Addition
Odenton Volunteer Fire Department - Bunk Area Renovation and Upgrade
Hampstead Volunteer Fire Department - New Facility
New Brunswick Volunteer Fire Department - New Facility
Perryville Police Station - Renovations and Upgrades
Port of Wilmington - Overhead to Underground Utility Relocation
University of Delaware - Morris Library Reading Room Renovations
University of Delaware - McKinley Building Sound Lab
St. Thomas Parish – Building Addition
W.L. Gore - Fair Hill Office Renovation
Milford Wellness Center - Pediatric Care
Milford Wellness Center - Dental Clinic
Christiana Hospital - Pellaport Renovation
University of Delaware - Maintenance off Renovation
University of Delaware - Perkins Student Center O&M Communication Upgrade
University of Delaware - DuPont Hall Labs 020, 021 and 022 Renovation
University of Delaware - Penny Hall Rooms 011 and 012 Lab Modifications



KEVIN MERRIMAN, PE Vice President || Structural Principal

Mr. Merriman has served as Vice President of Carroll Engineering for nearly 20 years. As head of the structural department, he is involved in all project phases, from early schematic planning and design through construction administration. He provides design insights on new construction, renovation, and design-build projects, and he is well-versed in a variety of structural systems. Throughout the process, Mr. Merriman communicates with the client to develop efficient, lasting designs. With 30 years in the industry, he has completed structural services for a number of public safety projects, including police stations, training academies, fire stations, and emergency response facilities.

Relevant Projects

Anne Arundel County Police Training Academy; Davidsonville, MD

Completed structural designs for the construction of 20,000 SF of new tactical, training, and office facilities at the public safety complex, including a new Administration Building and a new Fitness Building. Included steel moment framing for single-story buildings; light-gauge steel exterior walls, shallow spread footing foundations, and reinforced concrete wall footings.

MSU Public Safety Building; Baltimore, MD

Completed structural designs for new police building providing 24-hour dispatch, administrative, and crisis management functions on the campus. Included designs for 3-story, 18,000-SF steel-framed structure founded on shallow spread foundations with office and training spaces. Analyzed seismic loading requirements and provided designs for interior reinforced concrete shear walls.

Philadelphia Police Department District 15; Philadelphia, PA

Completed designs to renovate this 20,000-SF, 2-story station. Included upgrades to envelope, windows, and roof. Prepared designs for masonry, steel, and concrete framing, ADA upgrades, and interior renovations to locker rooms, offices, and prisoner processing areas. Security and separation of populations was accomplished through structural walls and hard materials. LEED Silver.

65th Street Fire Station; Ocean City, MD

Completed structural designs for the construction of a new, 2-story fire station totaling approximately 20,000 SF. Included design of masonry walls and steel framing founded on timber pile deep foundations. Included plans for four drive-through vehicle bays with overhead doors, a decontamination area, interior mezzanines for increased storage, and second-floor kitchen, bunk rooms, and offices. Designs met criteria for Risk Category IV structure.

Bel Air Police Department Renovation & Addition; Harford County, MD

Completed structural designs for a 20,000-SF addition and renovations to the existing 12,300-SF building. Included interior demolition and renovation designs to existing spaces, addition for police and administrative areas, new roofing and load analysis for RTU equipment. Also prepared plans for new entrance canopy, connections, and new openings and closures in walls and floors.



Education

*BSCE | Structures | 1989
University of Maryland College
Park*

Registration

WV | PE | 016229 | 2004

Professional Experience

*1995 – Present
Carroll Engineering*

Professional Associations

*ASCE
Post-Tensioning Institute*

CEI || Resumes

Key Staff

Joshua Telenko Senior Vice President

Background

With over 20 years of experience in the construction industry, Josh brings a well-rounded and insightful perspective to the R.L. Young, LLC d/b/a/ YA Group team. His career reflects a rare balance of field and office experience, allowing him to understand how decisions at each phase of a project impact all stakeholders—from owners and design teams to contractors and end users.

Josh began his career in the field as a Laborer, gaining firsthand experience on a variety of projects throughout Pennsylvania and West Virginia. He later pursued both a Bachelor's and Master's degree at Indiana University of Pennsylvania, further strengthening his academic and technical foundation. After a brief tenure with FedEx, Josh returned to the construction industry.

Since then, Josh has expanded his role to include Owner's Representation, Construction Management Services, and broader Consulting Services. His thoughtful, process-driven approach is informed by his diverse professional background and has made him a trusted advisor on projects with complex phasing and logistical challenges.

Education

- *Indiana University of Pennsylvania*
B.S. – Business Management
M.B.A.

Project Experience

- City of Fort Lauderdale – Fire Stations 13 and 88
- Friendship Ambulance Fire Station
- Garden City Park Water / Fire District – New Fire Station
- Howard County – Waterloo Fire Station Gear Lockers Expansion
- King George Fire Station – New Station
- Port Ewen Fire District – New Fire Station
- Randallstown Fire Station 18 – Kitchen Renovation
- Spring Garden Township – New Fire Station 892
- Ticonderoga Fire Department – New Fire Station
- West Athens – Limestone Fire Station

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KNOWLEDGE • INTEGRITY • PROFESSIONALISM

RESUME: PAUL AGUTTER, PE

PRINCIPAL ENGINEER / VICE PRESIDENT



PROFESSIONAL CREDENTIALS

Professional Engineer: DC, MD,
VA, WV

Prince William County Special
Inspections - Approved Engineer

SKILLS

Roadways

Utility Systems

Retaining Systems

Dams

Low and High Rise Structures

Stormwater Management Ponds

EDUCATION

Bachelor of Science, 1997,
Civil Engineering, State University of
New York at Buffalo, NY

Associate of Science, 1994,
Engineering Science, Broome
Community College, Binghamton, NY

PROFESSIONAL PROFILE

Mr. Agutter is a Principal Engineer. He manages geotechnical projects, provides Principal review of geotechnical reports, oversight for construction materials testing related to the design and construction of low- and high-rise structures, roadways, utility systems, bridges, industrial structures, retaining systems, stormwater management ponds, dams, and other types of structures.

Mr. Agutter has extensive project experience throughout the Commonwealth of Virginia and adjacent states and in a wide variety of geologic conditions, including the Coastal Plain, Piedmont, Triassic Basin, and Ridge and Valley Physiographic Provinces. He provides services for both private and public sector clients, including local, county, and state agencies. Mr. Agutter has been approved by the Fairfax, and Prince William County Critical/Complex Structures Divisions to serve as Special Inspections Engineer-of-Record and serves in this capacity (reference IBC 2018) for projects.

PROJECT EXPERIENCE

- Fairfax County Fire and Rescue Training Academy Expansion/Renovation Phase II, Fairfax, VA
- Herndon Fire Station Temporary Facility, Herndon, VA
- Bailey's Crossroads Fire Station, Falls Church, VA
- City of Fairfax Shooting Range, Fairfax, VA
- Jefferson Fire Station Temporary Facility, Falls Church, VA
- Reston Fire Station Temporary Facility, Reston, VA
- Vienna Police Station, Vienna, VA
- Fairfax County Park Authority, Open-End Contract, Geotechnical Engineering, Fairfax County, VA
- Fairfax County DPW&ES Geotechnical / CMT Services Contract, Fairfax County, VA
- Brookfield Dam Rehabilitation, Fairfax County, VA
- Fairfax County Public Safety Headquarters, Fairfax County, VA
- Fairfax County Pump Station Rehabilitation, Great Falls, VA
- 301 West Broad Street – Mixed Use, Falls Church, VA
- Fairfax County Public Schools, Fairfax County, VA
- Fort Belvoir Museum Support Center, Fort Belvoir, VA
- GMU Science Center, Belmont Bay, Woodbridge, VA
- GMU Sub II Pedestrian Path, Fairfax, VA
- Longhorn Steakhouse Restaurant, Falls Church, VA
- Merrill House Apartments, Falls Church, VA

TAB 3
QUALIFICATIONS,
EXPERIENCE & REFERENCES



REFERENCES

Upperco Fire Department



Contact - Scott Warner
Phone - 410-404-3585
Email - swarner@absolutefp.com
Completed - 2023

Crownsville Fire Department



Contact - Rajan Nigam
Phone - 410-222-8325
Email - pwinga01@aacounty.org
Completed - On-going

Reading Fire Department



Contact - James Stoudt
Phone - 610-655-6137
Email - james.stoudt@readingpa.gov
Completed - 2024

Saint Leonard Fire Department



Contact - Stephen (CJ) Jones
Phone - 443-684-8657
Email - stephenjones@calvertcountymd.gov
Completed - On-going

Ocean City Fire Department



Contact - Ryan Whittington
Phone - 410-251-1253
Email - rwhittington@oceancitymd.gov
Completed - 2024

Cumru Fire Department



Contact - Jeanne Johnston
Phone - 610-777-1343
Email - jjohnston@cumrutownship.org
Completed - On-going

Harford County EMS Department



Contact - Ed Hopkins
Phone - 443-752-2357
Email - ehopkins@harfordpublicsafety.org
Completed - 2023

New Brunswick Fire Department



Contact - Robert Rawls
Phone - 732-745-5254
Email - rrawls@cityofnewbrunswick.org
Completed - On-going

White Marsh Fire Department



Contact - Kevin Palmer
Phone - 443-534-0401
Email - president@wmvfc.org
Completed - 2018



JAMES G. STOUDT, JR.
FIRE CHIEF

CITY OF READING, PENNSYLVANIA

DEPARTMENT OF FIRE & RESCUE SERVICES
OFFICE OF THE FIRE CHIEF
815 WASHINGTON ST
READING, PA 19601-3690
PHONE 610-655-6137

MW Studios
8098 Sandpiper Circle Suite H
Nottingham, MD 21236

October 14, 2024

Attention Jessica Spencer,

I am writing to provide my highest recommendation for MW Studios, who served as the architectural and interior design firm for 9th and Marion Fire Station. Throughout the entire process, from initial concept to project completion, their team demonstrated an exceptional level of professionalism, creativity, and commitment to delivering a high-quality facility that meets the needs of our community.

MW Studios has extensive experience in public safety building design, and their knowledge was evident at every stage of the project. Their thoughtful approach ensured that we not only achieved a beautiful design but also one that is highly functional, cost-effective, and future proof. Their ability to listen to our concerns, anticipate challenges, and offer innovative solutions was invaluable to the success of this project.

In particular, MW Studios excelled at:

- **Collaborative Design Process:** They took the time to truly understand our vision, incorporating our feedback into every phase of design while providing expert guidance to ensure the final product aligned with our goals.
- **Attention to Detail:** From initial concepts through construction documents, MW Studios maintained an unwavering focus on detail. Their comprehensive approach to quality control and design coordination ensured that the project was executed smoothly and met all regulatory requirements.
- **Commitment to Client Satisfaction:** MW Studios fostered a strong relationship with our team and were always available to address any questions or concerns. They maintained open lines of communication, and we consistently felt that our needs were their top priority.
- **Going Above and Beyond:** When the City faced challenges with an underperforming General Contractor, MW Studios time and time again rallied to support the City and



FAX: (610) 655-6395 TDD: (610) 655-6442

Department through transparency, fairness, firmness, and sound advice. As a result of MW Studios' efforts and collaborative approach, our first responders are now operating out of a state-of-the-art facility tailored to support health, safety, wellness, and operational efficiency.

Our completed station has exceeded our expectations, both aesthetically and operationally. The spaces they designed have significantly improved our ability to serve the community, and we continue to receive positive feedback from staff and visitors alike.

I would highly recommend MW Studios for any future projects, especially those requiring the expertise in public safety, creativity, and dedication that MW Studios consistently delivers.

Sincerely,

A handwritten signature in black ink, appearing to read "James G. Stoudt Jr.", written in a cursive style.

James G. Stoudt Jr
Fire Chief



February 8, 2024

To Whom It May Concern:

I am writing on behalf of the Fire Industry Education and Resource Organization (F.I.E.R.O.). Rob Manns has been an active participant in the F.I.E.R.O. Fire Station Design Symposium for the past 10 years, both as a presenter and an advisor. I am consistently impressed by his expertise, dedication, and innovative approach to public safety facility design.

Rob stands out as a true subject matter expert in his field. His presentations at the Symposium have always been insightful and engaging, showcasing his deep understanding of current trends, challenges, and best practices in fire station and public safety facility design. Rob's commitment to first responder health and safety shines through in every project he undertakes, consistently prioritizing solutions that optimize response times, minimize risks, and promote firefighter well-being.

Furthermore, Rob possesses a remarkable talent for innovative thinking. He consistently brings fresh perspectives and creative solutions to both his presentations and real-world projects. This is evident in his numerous awards received through the rigorous F.I.E.R.O. Fire Station Design Awards program, where his designs are judged by a panel of specialized architects within the fire industry. These awards stand as a testament to his ability to deliver not only functional but also groundbreaking facilities that push the boundaries of design for the better.

In addition to his technical expertise and design flair, Rob is an excellent communicator and collaborator. He fosters open dialogue with stakeholders, ensuring projects align with their needs and vision. His dedication to collaboration ensures positive outcomes for both clients and the communities served by these critical facilities. His designs not only address the department's current needs but also adaptively anticipate and accommodate future needs to help ensure his facilities will be sustainable and functional for 50 years or more. This future-proofing approach helps agencies ensure long-term investment value and avoid costly renovations or rebuilds due to unforeseen changes.

Without a doubt, Rob Manns is a highly skilled and dedicated architect who makes a significant contribution to the field of public safety facility design. His passion for firefighter well-being, combined with his innovative approach, long-term vision, and proven track record of success, make him an invaluable asset to any project or organization.

Sincerely,

Jessica Pickett
Executive Director, F.I.E.R.O.
Fire Lieutenant, Fairfax County Fire & Rescue (ret.)



CONTACT

Ethan Rouzee
304-329-0101

PROJECT COMPLETED: 2023

ROLE: Architect of Record

PROJECT BRIEF

Nestled in the serene landscapes of rural West Virginia, the Kingwood Volunteer Fire department is exploring three different options to bolster the communities public safety through the design of a modern fire department. Spanning two stories, this facility is planned to optimize functionality and efficiency. The ground floor hosts essential operational spaces including a spacious training room for skill enhancement, a organized gear room ensuring swift response to emergencies, and dedicated operational offices facilitating seamless coordination. Ascending to the second floor reveals the living areas of the department, featuring strategically positioned bunk rooms ensuring rapid deployment of firefighters, a well-equipped kitchen and dining area fostering community and camaraderie, and a welcoming dayroom providing respite between duties.

BERKELEY COUNTY PUBLIC SAFETY BUILDING

Berkeley County, West Virginia

DESIGN OF NEW JOINT-USE BUILDING



CONTACT

Gary Wine
304-264-1923
gwine@berkeleywv.org

PROJECT COMPLETED: Est. 2028

ROLE: Architect of Record

SIZE: 44,600 SF

PROJECT BRIEF

The proposed Berkeley County Public Safety Complex is a centralized, joint-use facility designed to support coordinated operations between the County's Fire Department, Volunteer Fire Department, Emergency Medical Services, and Sheriff's Office.

The approximately 44,600 SF facility is organized to clearly separate public, secure, and operational zones while promoting collaboration among agencies. Shared public spaces include a centrally located community hall with seating for approximately 130 occupants, supported by a commercial kitchen and storage areas for public meetings, training, and emergency coordination. Secure circulation connects administrative and operational areas, allowing each department to function independently while maintaining close proximity for joint response.

Fire and EMS operations are supported by seven double-deep apparatus bays with front and rear access, decontamination facilities, turnout gear and equipment storage, and specialized support spaces. Living quarters accommodate 24-hour operations with kitchen and dining areas, dayrooms, fitness spaces, locker and laundry facilities, and a combination of individual and open bunk rooms. The Sheriff's Office includes administrative offices, interview and processing rooms, holding cells, and a secure sally port, establishing a flexible and scalable framework that supports both daily operations and emergency response.

JOINT BASE ANDREWS CRASH RESCUE STATION

Joint Base Andrews, Maryland

DESIGN OF NEW CRASH RESCUE STATION



CONTACT

Chief Dorian Dillon
301-981-4986
dorian.dillon.1@us.af.mil

PROJECT COMPLETED: Est. 2028

ROLE: Architect of Record

SIZE: 35,882 SF

PROJECT BRIEF

This project envisions a state-of-the-art Aircraft Rescue and Firefighting (ARFF) Station at Joint Base Andrews, designed to support both structural and aircraft firefighting operations. The single-story facility will encompass approximately 35,882 square feet, providing a modern, highly functional environment that enhances emergency response and operational readiness.

The station will feature spacious apparatus bays to accommodate today's advanced firefighting vehicles, a dedicated training room to support ongoing skill development, a full kitchen, residential dormitories, and administrative offices. A mezzanine level will provide additional capacity for equipment storage and building systems.

Constructed with durable, non-combustible Type IIB materials and equipped with a full sprinkler system, the facility prioritizes safety, resilience, and long-term performance. Delivered through a Design-Build delivery method, the project unites operational, residential, and training functions under one roof to strengthen mission preparedness and ensure rapid, coordinated emergency response for the base and surrounding community.

KING GEORGE FIRE DEPARTMENT STATION 2

King George, Virginia

DESIGN OF NEW FIRE STATION



CONTACT

David Moody, Fire Chief
540-775-8910
dmoody@co.kinggeorge.state.va.us

PROJECT COMPLETED: TBD

ROLE: Architect of Record

SIZE: 15,900 SF

PROJECT BRIEF

The King George Fire Department Station 2 project includes the planning and design of a new 15,900 SF station. The station will be designed to risk category 4 and will provide 4 drive-thru apparatus bays, administrative offices, living areas, bunk rooms, fitness center, open kitchen and day-room, and storage and support space for fire department operations.



CONTACT

James Richmond
301-261-0060

PROJECT COMPLETED: 2025

ROLE: Architect of Record

SIZE: 29,500 SF

PROJECT BRIEF

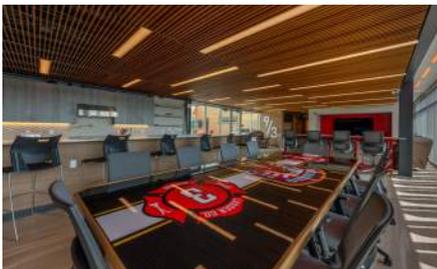
MW Studios was hired by the Arundel Volunteer Fire Department to conduct a needs assessment and feasibility study for the replacement of their existing Station 7 facility in Gambrills, Maryland. The study evaluated the operational needs of the department, assessed the limitations of the existing station, and developed a program for a modern fire station capable of supporting current and future service demands. Originally constructed decades ago, the existing facility has become significantly undersized and lacks many features required for contemporary fire service operations, including adequate turnout gear storage, decontamination areas, and sufficient space for personnel and apparatus. Through stakeholder interviews, facility assessments, and programming workshops with the department’s building committee, MW Studios established the operational requirements necessary to support a modern, code compliant station.

The feasibility study resulted in a recommended program for a new approximately 29,500 square foot fire station featuring eight apparatus bays along with the operational, administrative, training, and residential spaces required to support the department’s growing service area. The study also included evaluation of the existing station site and adjacent parcels, development of multiple site test fits, and selection of a preferred site plan that allows the existing station to remain operational during construction. The proposed facility includes apparatus support spaces, decontamination areas, bunk rooms and living quarters, administrative offices, training and fitness spaces, and public support areas designed to improve firefighter health, safety, and operational efficiency while supporting the department’s service to the surrounding community for decades to come.

9TH & MARION FIRE STATION

Reading, Pennsylvania

DESIGN OF NEW FIRE HEADQUARTERS



CONTACT

James Stoudt, Fire Chief
610-655-6137
james.stoudt@readingpa.gov

PROJECT COMPLETED: Aug. 2024

ROLE: Architect of Record

PROJECT PARAMETERS

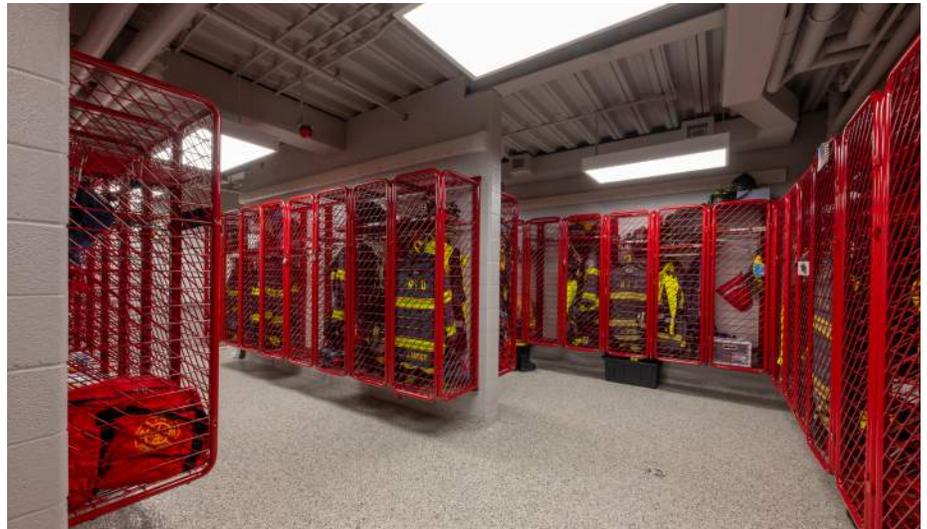
-  15,900 SF New Construction
-  3 Apparatus Bays
-  Full Kitchen & Day Room
-  7 Bunk Rooms
-  Fitness Area

PROJECT BRIEF

The 9th & Marion fire station is a 15,900 SF two-story station and the latest project in the City of Reading's effort to modernize its fire service. It will replace the existing firehouse, located one block south of the project site and infill the previously vacant urban lot. The first floor includes a three-lane apparatus bay, independently ventilated turnout gear storage, a multi-tier decontamination area and fire gear storage. A mezzanine level overlooks the apparatus bay which provides auxiliary storage and can host various in-station high angle training exercises.

The second floor of the facility provides a kitchen, day room, study, fitness area, administrative space, and bunk rooms for fire department employees. The entirety of the second floor surrounds an exterior, second-floor courtyard that introduces natural light into the core of the floor plate, while simultaneously providing a central outdoor gathering space and grilling space for fire department personnel.

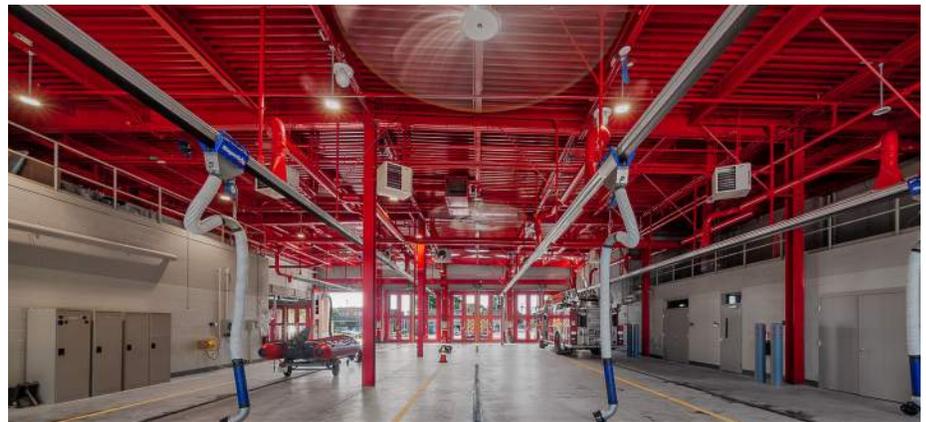
Special focus was given to the layout and efficiency of vertical circulation, ensuring that fire fighters have a direct and efficient travel path from the second floor into the apparatus bay. To address this requirement, three separate pole drops supplement three flanking stair towers.



N. PROVIDENCE PUBLIC SAFETY COMPLEX

N. Providence, Rhode Island

DESIGN & CONSTRUCTION OF NEW JOINT-USE BUILDING



CONTACT

Andrew Romero
401-272-1730
aromero@rgb.net

PROJECT COMPLETED: 2019

ROLE: Associate Architect

PROJECT PARAMETERS

 60,000 SF New Construction

 5 Apparatus Bays

 Full Kitchen & Day Room

 Fitness Area

PROJECT BRIEF

MWS Served as the design architect and public safety design consultant in association with Robinson Green Beretta (RGB), a local Rhode Island architect, and was responsible for providing programming and planning services for a new 60,000 SF public safety building for North Providence. The project is a joint-use public safety complex and provides dedicated space for fire, police, EOC, municipal court, and PSAP functions. The complex functions as a “one-stop-shop” for all public safety and municipal court needs.

The two-story building is tailored to fit a tight urban site in the city of North Providence. It has one shared secure two-story lobby that welcomes the public to and directs them to the different agencies that have their own dedicated program space. The structure has “21st-century building systems” and is designed with materials and assemblies intended to last 50 to 100 years with proper maintenance. Shared areas include the lobby, communication center, fitness center, and public bathrooms.

The building was designed as a hardened and secure structure that exemplifies the principles of layered security and user group access control. Police vehicles cruisers are located at the back of the site in a secure staff parking area, which is shrouded by the building itself. A significant site concept incorporated into the back of the site allows for a dedicated pull-through zone and apron. This approach provides Fire and Police Command Apparatus to loop around the back of the site to access multiple drive-through apparatus bays.

SPRING GARDEN FIRE STATION 892

Spring Garden, Pennsylvania

DESIGN OF NEW FIRE STATION



CONTACT

Luther Wike
717-848-2858
lwike@sgtwp.org

PROJECT COMPLETED: TBD

ROLE: Architect of Record

PROJECT PARAMETERS



15,000 SF New Construction



3 Apparatus Bays



Full Kitchen & Day Room



9 Bunk Rooms



Fitness Area

PROJECT BRIEF

The Spring Garden Township Fire Station 892 is a new 15,000 SF building that will provide 3 apparatus bays, 9 bunk rooms, study/office, fitness area, EMS office, watch office, EMS supply storage, as well as tiered decon spaces.



CONTACT

Jeanne Johnston, Township Manager
610-777-1343
jjohnston@cumrutownship.org

PROJECT COMPLETED: Dec. 2025

ROLE: Architect of Record

PROJECT PARAMETERS

 24,800 SF New Construction

 6 Apparatus Bays

 Full Kitchen & Day Room

 7 Bunk Rooms

 Fitness Area



Cumru Fire Station Under Construction

PROJECT BRIEF

The proposed fire station for the Cumru Fire Department is a 24,800 SF facility situated in rural Berks County Pennsylvania. MWS was tasked with providing a new centralized station, large enough for the fire department to consolidate their apparatus fleet, which was previously scattered across multiple substations due to nonuniform unplanned growth. Apart from making sure enough space was afforded for the consolidated apparatus fleet, a heavy emphasis on turnout gear storage, ventilation, and the promotion of appropriate decontamination protocol is emphasized in the building program and floor plan layout. Adequate provisions were applied to the living program, with an open kitchen/dayroom layout, fitness room, and seven live-in style bunk rooms.

Additionally, five offices, conference room, study, and 60-person meeting room block out the backbone of the stations operational and administrative needs. In partner with building program the single-story structure utilizes a mixture of steel and exposed heavy timber construction, paying homage to the regional steel industry and surrounding rural land scape.

OCEAN CITY FIRE STATION #3

Ocean City, Maryland

DESIGN OF NEW FIRE STATION



CONTACT

Ryan Whittington
410-251-1253
rwhittington@oceancitymd.gov

PROJECT COMPLETED: Nov. 2024

ROLE: Architect of Record

PROJECT PARAMETERS



18,700SF New Construction



4 Apparatus Bays



Full Kitchen & Day Room



9 Bunk Rooms



Fitness Area

PROJECT BRIEF

Ocean City Station 3 is a 18,706 SF two-story station and the latest project in the City's effort to invest in the career plus volunteer fire service model. It is slated to replace the existing Station 3, taking advantage of the now City owned parking lot on 65th street. The first floor includes four double deep, drive through apparatus bays, independently ventilated turnout gear storage, and a multi-tier decontamination area and fire gear storage. Three independent mezzanines provide auxiliary storage, host various in-station high angle training exercises, and a dedicated fully enclosed fitness area. The second floor of the facility provides a kitchen, day room, study, administrative space, and bunk rooms for fire department employees and volunteers.

All habitable second floor rooms have access to natural lighting, further reinforced by the large terrace that acts as outdoor extension of the Kitchen and Dining area. Focus was given to the coastal environment, to ensure the building can withstand whatever inclement weather is thrown at it. In addition to being design as a Risk Category IV structure, heightened strength requirements for both wind speed and airborne debris impact was assigned to the station, ensuring the building truly can be a "a last building standing" structure.

OCEAN CITY FIRE STATION #3

Ocean City, Maryland



UPPERCO FIRE COMPANY
Baltimore County, Maryland



CONTACT

Scott Warner
410-404-3585
swarner@absolutefp.com

PROJECT COMPLETED: Feb. 2023

ROLE: Architect of Record

PROJECT PARAMETERS

 20,000 SQ. FT.

 5 Apparatus Bays

 Full Kitchen & Day Room

 Sleeping Areas

 Fitness Area

PROJECT BRIEF

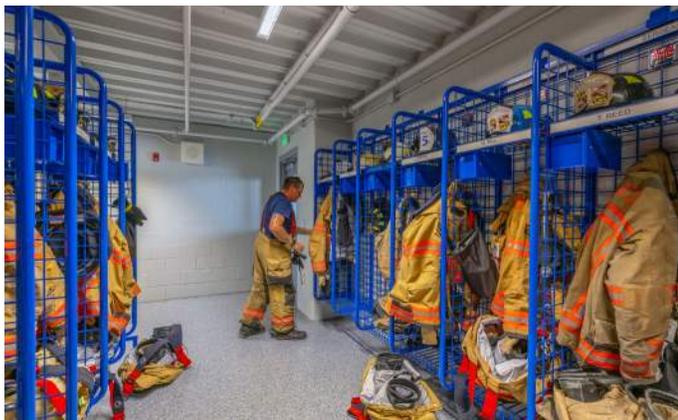
The Arcadia and Boring fire companies merged in 2017 to create the Upperco Volunteer Fire Company. The merger allowed for the consolidation of resources and personnel and a new site was selected that will increase the coverage areas and decrease the response times within the first due area. The new 6.5 acre site is situated directly off of the main response artery while still allowing for safe and easy access for the response apparatus. After extensive programming sessions, an overall building program of 20,000 gsf was determined to meet all of the operational needs of the new company.

The new station provides the department with five double deep drive-thru apparatus bays, apparatus support spaces, turnout gear storage and dedicated decontamination areas for both the first responders and their gear. The apparatus bay is adjacent to the administrative office spaces, living areas, and bunks. The spaces are configured to allow for quick response from anywhere within the building to the apparatus bay. Additionally, there is a training/meeting room sized for 50 people that will accommodate fire training classes and be used as a community meeting space.

The completed project has been recognized and awarded from ABC, Firehouse Station Design, and F.I.E.R.O. Station Design Symposium.

NEW CONSTRUCTION OF FIRE STATION

UPPERCO FIRE COMPANY
Baltimore County, Maryland



WHITE MARSH FIRE COMPANY
Baltimore County, Maryland



CONTACT

Kevin Palmer
443-534-0401
president@wmvfc.org

PROJECT COMPLETED: Oct. 2018

ROLE: Architect of Record

PROJECT PARAMETERS

-  18,000 SQ. FT.
-  5 Drive-Thru Apparatus Bays
-  Full Kitchen & Day Room
-  10 Bunk Rooms
-  Fitness Area
-  Wet-training Tower

PROJECT BRIEF

The White Marsh Fire Company is a new 18,000 programmable SF station located on a major thoroughfare just off interstate 95 in Baltimore, County. The department relocated from an aging nearby facility that suffered from significant and unpredictable response delays that results from a major CSX freight rail line located adjacent to the existing building. The new station was constructed on land generously donated to the department by General Motors after being jointly approached by the department and the design team.

The new facility provides the department with five apparatus bays, a wet training tower, various apparatus support spaces and an efficiently organized operations and living area that improves response time. The operations and living areas of the station are supported by seven separated double bunk rooms, three live-in bunks, kitchen, day room, study, fitness area, game room, outdoor patio, showers, and various operations and administrative offices.

The station encourages a stronger relationship with the community not only through welcoming overall design, but also by increasing the visibility of response and training activities and including a large training room ready to host a variety of neighborhood functions.

WHITE MARSH FIRE DEPARTMENT
Baltimore County, Maryland





CONTACT

John Bender
443-876-8801
jfbender1@gmail.com

PROJECT COMPLETED: May 2021

ROLE: Architect of Record

PROJECT PARAMETERS



31,300 SQ. FT.



8 Apparatus Bays



Full Kitchen & Day Room



Sleeping Areas



Fitness Area



Wet-training Tower

PROJECT BRIEF

Completed in 2021, the central station for the Aberdeen Fire/EMS Department underwent extensive construction to modernize the aging station. The design focused on improving response time, mitigating exposure to carcinogens, supporting responder health and wellness, expanding community engagement, and enhancing training. The old station had served the community for nearly 50 years and now stands ready for 50 more.

The 10,800 GSF existing apparatus bays received a complete modernization consisting of the door, lighting, flooring, alerting, and mechanical upgrades. The station's previous, dilapidated living and operations portion was demolished to accommodate 20,500 GSF of new construction.

Features within the addition include a new 100+ person multi-purpose training room, individual bunk rooms, fitness center, an inviting kitchen, and offices. Serving as the central station for Aberdeen, the lobby is home to historic apparatus and memorabilia that celebrates the department's 100-year-old history.

The design provides first responders with safe and efficient access to their gear and equipment. The apparatus bays are separated, both physically and mechanically, from living areas of the station to mitigate the risk of exposure to contaminants. Clearly delineated "one-way" response paths lead responders directly to apparatus from the rooms that are most frequently occupied – while innovative transitional decontamination space with sinks, showers, and walk-off mats creates a natural flow for responders to re-enter the clean zones of the station and return to service.

ABERDEEN FIRE/EMS DEPARTMENT
Harford County, Maryland



MECHANICSVILLE VOLUNTEER FIRE DEPARTMENT

St. Mary's County, Maryland



CONTACT

Bill Smith
301-247-3060
wsmith@mvfd.com

PROJECT COMPLETED: May 2021

ROLE: Architect of Record

PROJECT PARAMETERS



29,00 SQ. FT.



6 Apparatus Bays



Full Kitchen & Day Room



Sleeping Areas



Fitness Area



Wet-training Tower

PROJECT BRIEF

Design of a new 29,000 SF station to replace the existing aging facility at the department's current location.

The apparatus floor provides six full depth drive thru apparatus bays and one half depth back in bay. Additional apparatus support includes a shop, engineers office, SCBA shop, quarter master's storage, decon room and dedicated turn out gear storage.

Provisions for an integral training tower have also been made which will allow the department to practice basic exercises all from the comfort of their own station. Skill props include laddering, ceiling breaching, door breaching, rappelling, making stand pipe connections, and high line exercises. Sleeping provisions at the station include ten separate two-man dorm rooms and one larger open bunk capable of sleeping 16 individuals.

The bunk rooms are located immediately adjacent to the apparatus bays as to improve response times. Operational functions include a kitchen and dining area capable of feeding upwards of twenty personnel at once, a day room, a game room, a fitness center and a media/study center. A large training room also provides room for classes and department meetings. Administrative provisions include offices for the president, vice president, treasurer, secretary, chief, deputy chief, and line officers. File storage, a copy area, and a conference room are also provided.

NEW CONSTRUCTION OF FIRE STATION

MECHANICSVILLE FIRE DEPARTMENT
St. Mary's County, Maryland



CROWNSVILLE FIRE DEPARTMENT

Anne Arundel County, Maryland



CONTACT

Ross Dinkel
410-222-8325
fddinkel@aacounty.org

PROJECT COMPLETED: Dec. 2025

ROLE: Architect of Record

PROJECT PARAMETERS



22,400 SQ. FT.



4 Drive-Thru Apparatus
Bays



Full Kitchen & Day Room



10 Bunk Rooms



Fitness Area

PROJECT BRIEF

The Crownsville Fire Station is a 22,400 SF new facility for the Anne Arundel County Fire Department located on an 8 acre site at the corner of General’s Hwy and Sun Rise Beach Road. The new state of the art fire/EMS station is designed to work with the local residential area’s characteristics. The project is aiming for LEED Silver Certification using healthy and sustainable materials, low energy fixtures/appliances, daylighting, etc. The systems are designed to provide a healthy environment for the first responders which include decontamination areas, exhaust collection systems, and living/working areas separated from carcinogens/hazardous environments. The living spaces provide de-stressing aspects for the first responders by providing access to a gym, kitchen/dayroom, shared but private bunk spaces, exterior patio, sound proofing, and top of the line alerting system.

The design optimizes the response time and efficiencies by using direct paths for responding from anywhere in the station, proper door hardware, lighting systems to address “night-blindness”, radio room with views to apparatus, the station-wide modern alerting system, and proper direct site egress. The bays provide state-of-the-art apparatus housing which includes proper electrical/plumbing systems, vehicle exhaust, flooring finishes and sloping/drainage designed to sustain the lifetime of the vehicles, etc. There are training Services via mezzanine training props for laddering and a training conference room with views of the apparatus. The station also includes a community room for public use.

CROWNSVILLE FIRE DEPARTMENT

Anne Arundel County, Maryland



TAB 4

PROJECT APPROACH



GENERAL DESIGN PHILOSOPHY

We take tremendous pride in knowing that lives will be saved once a client takes full ownership and occupancy of a facility that our firm had the privilege to design.

Before describing and detailing the efforts related to specific projects, it's important to communicate the general philosophies and principals that we hold toward public safety and architecture in general. The responsibilities of being the Designer and Architect for any project are extraordinary. The way a project is designed and executed greatly impacts the lives of many people.

MW Studios approaches every public safety project we design with a profound appreciation for the design responsibilities that have been entrusted to us. The decisions we collectively make have far reaching effects and the community depends on our ability to execute architecture in a functional, contextual and meaningful way.

We strive, on every project to strike a strong balance between owner needs, sustainability, budget, life cycle, quality of space, and context for community. To summarize our general philosophy...



GIVE EQUAL ATTENTION TO SITE DESIGN

Every site has unique characteristics and features that should be brought into play. Every building should be carefully married to the land to maximize design potential and minimize environmental impact. This is of critical importance in Space Study and Plannings design where vehicle and apparatus movements must be carefully considered.



BALANCE FORM, FUNCTION & AESTHETICS

Spaces should be tailored towards the people and community that use them; thus every design should be a unique reflection of the firefighters that use the building and their culture. It should meet all of their needs, invite growth and development and function efficiently for its intended use.



CONSIDER THE ENVIRONMENT

Great design does not have to come at the expense of the environment or compromise a budget. By properly employing even the simplest sustainable design solutions we can successfully reduce a building's energy consumption and contribute to reducing society's reliance upon fossil fuels. Considering simple solutions like harvesting rainwater to fill engines and tankers with can reduce both operational and site development and stormwater costs.



RESPECT & EMBRACE BUDGETS

Every project has a vision, needs, wants and a limited amount of funds to accomplish the goal. We believe that budgets must be established early and respected throughout the entire process. It is our goal to contribute to the value of a project by assisting you in understanding the impacts of every design decision, to ensure you get the most out of your money.



INVOLVE THE CLIENT

You should be an active participant in bringing a design to life. Meaningful design is better facilitated by engaging in a process driven by an interactive relationship between clients and design professionals. After all, it is your building.

OUR PROPOSED PLAN AND APPROACH

For each project we undertake, we create a tailored and specialized work plan that lays the pathway for how we will complete the project, from kickoff, to closeout. The work plan summarized below and on the following pages is an example of our process we take for any project, and will be our guide on completing the design of the Camp Dawson Fire Facility. Our team looks forward to working with the Department to adapt and refine this plan to meet the project needs.

Phase	Schematic Design	Design Development	Construction Documents	Bidding	Construction Administration
Effort	15%	20%	35%	5%	25%
Focus	Concepts	Specifics	Construction Details	Procurement	Execution & Quality Control

PHASE 1 - SCHEMATIC DESIGN PHASE OBJECTIVES

The Schematic Design phase intends to accomplish three specific goals. Early in this phase, our team will lead you through needs assessment and conceptual design efforts in order to begin to resolve the following objectives:

PHASE GOALS:

1. The first is defining the Department and all stakeholders' expectations for each project.
2. The second is to determine the functional, aesthetic, and financial parameters.
3. The third objective is to establish a clear understanding of the performance and design characteristics, which will be achieved by exploring a variety of options

During the schematic design phase, our team will define functional relationships, room and space sizes, and configurations, equipment and furnishing requirements, building image, primary building systems, and anticipated costs.

SCHEMATIC DESIGN WORK PLAN:

Given the complex nature of designing, building, and commissioning modern-day fire stations, our team proposes a phased design process that will first complete a quick yet thorough needs assessment, site study, and preliminary design. We trust that this proven process, which we have utilized on countless similar facilities, will help obtain rapid and confident stakeholder consensus on designing and developing a Facility that will serve the County and community for decades to come.



OUR PROPOSED PLAN AND APPROACH

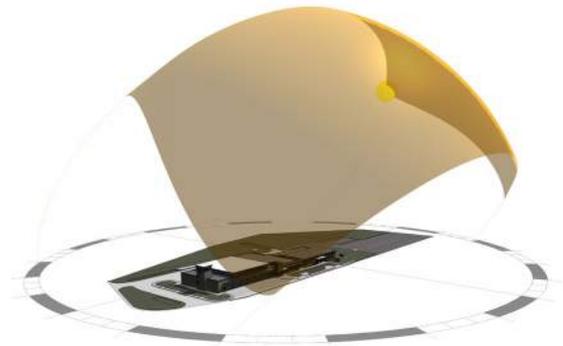
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Given the complex nature of designing, building, and commissioning modern-day facilities, our team proposes a phased design process that will first complete a quick yet thorough needs assessment, site study, and preliminary design. We trust that this proven process, which we have utilized on countless similar facilities, will help obtain rapid and confident stakeholder consensus on designing and developing a Facility that will serve the department and community for decades to come.

- Kickoff Meetings
- Programming and Focus Group Meetings
- Cost Control
- Preliminary Site Investigations & Surveys
- Preliminary Architectural Site Diagrams
- Architectural Site Diagram Refinement & Presentation
- Preliminary Concept Planning
- Stakeholder and Community Engagement
- Schematic LEED/ Sustainability Workshop with designated LEED AP
- Comparing Performance, Cost, and Value
- Internal Building and Concept Plan Refinement
- Initial Schematic Plan Cost Estimate
- Perspective Renderings
- Geotechnical, Testing Studies, & Reports
- Establish Project Narrative and Report
- Provide Schematic Design Deliverables



Carroll County Public Safety Center
Project Initiation / Kick-off



Mechanicsville Fire Company
Solar Orientation Study



Lutherville Fire Department
Concept Floor Plan

OUR PROPOSED PLAN AND APPROACH

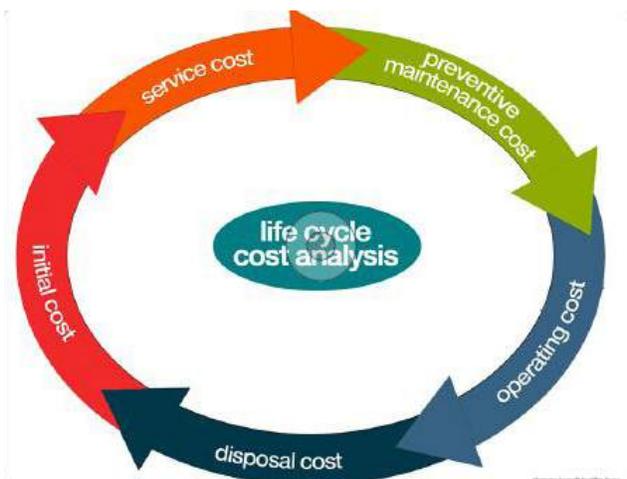
PHASE II - DESIGN DEVELOPMENT OBJECTIVES:

Design development will consist of further refinement of the selected design option. Throughout this phase, we conduct regular progress coordination meetings with all design team members and continue to develop the project utilizing Building Information Modeling (BIM). The BIM model will be hosted on a cloud service to ensure the entire team works on a live and current version of the design.

This real-time design and coordination approach allows the management team to review progress, identify tasks to be accomplished, update cost estimates, and coordinate the major design elements. We have four primary goals during this process:

PHASE GOALS:

1. The first is to dive deeper into each component of the project and refine the coordination amongst all significant disciplines such as structural, mechanical, electrical and plumbing systems.
2. The second primary objective is to engage and accelerate the site design team fully. Once a schematic solution has been agreed upon our team will begin to develop more detailed site development design documents, make initial submissions, and engage in appropriate hearings and meetings. Completing the site design and obtaining final site plan approvals will prove to be the critical path for the project. As such, it is of vital importance to fully engage the site design team early and manage the schedules and synchronize it with building design efforts.
3. The third is to gain a shared understanding or preliminary approval from the agency and authority having jurisdiction for all of the components that have gone into the design of the project. Achieving an early consensus will require our team to prepare for and attend various hearings and life safety review meetings.
4. The final is to monitor how design decisions impact cost as this phase is the best time to ensure that the project has been designed for maximum value.



Wicomico Public Safety Building
Interior BIM Model



OUR PROPOSED PLAN AND APPROACH

DESIGN DEVELOPMENT WORK PLAN:

The following is a summary of critical efforts to occur during the design development phase:

- Present schematic design to Stakeholder and Community for Engagement
- Design refinement and Geometric Coordination
- Site Design, Development, Meetings & Hearings
- Evaluations of Building Systems, Equipment Selections, and Device Coordination
- Utilize Virtual Reality and Provide Initial Video Tours
- Outline Preliminary Specifications
- Progress Meetings and System Refinement Workshop
- Regular Cross-Discipline Coordination Meetings & BIM 360
- Commissioning Plan Development
- Life Safety & Building Code Initial Regulatory Review
- In-House Charettes and Peer Review
- Cost Estimating
- Provide Design Development Deliverables



PHASE III - CONSTRUCTION DOCUMENT PHASE

We take pride in our track record for completed projects with minimal change orders, as it is a testament to the quality of our work. The construction documentation phase revolves around developing the detailed instruments of service that will serve as the contractual agreement between the County and the General Contractor. The importance of developing coordinated and accurate drawings and specifications during this phase cannot be understated.

Our team will methodically develop your set of detailed drawings and specifications throughout the construction documentation phase, including the contractual documents required for bidding and construction. Our review process places great emphasis on coordination with our consultants, leveraging a detailed quality assurance program across all disciplines to minimize unexpected issues in the field. All work, including specifications, are completed utilizing BIM technology. Our documents' quality has been complimented time and time again by field superintendents and construction project managers for completeness and accuracy.

- Construction Document Work Plan
- Final Detailed Coordination and Contract Documents
- Envelope Study & Analysis
- Project Manual & Specifications
- Internal Quality Control Review Procedures
- 75% and 95% Page Turn Meetings
- Building and Site Permits
- Preparation for Bidding
- Refinement of Cost Estimating
- Provide Construction Document Deliverables

OUR PROPOSED PLAN AND APPROACH

PHASE IV - BIDDING PHASE

Our team will assist you with the bid and award process by processing drawing set requests, participating in pre-bid meetings, responding to requests for information, issuing addenda (if necessary). Once bids are received, our team will assist you in evaluating the accuracy and responsiveness of the results to ensure a successful award is made.

Our design team is familiar and comfortable with traditional design-bid-build and construction management agreements. During the pre-bid meeting, we will walk the prospective contractors through the BIM model to help them gain an immediate understanding of the project scope. The majority of the bids received for our projects have fallen within a 5% spread. This “tight” grouping of numbers is a testament to the quality of documentation and coordination we provide to our clients during the construction documentation phase.

BIDDING DELIVERABLES:

- 100% Complete Coordinated Contract Drawings for all Disciplines
- 100% Complete and Coordinated Project Manual & Specifications
- Applicable Permits
- Updated Cost Estimate
- Exported CAD Files of Drawings & Word Perfect 5.1 Compatible Specification

PHASE V - CONSTRUCTION ADMINISTRATION

Successfully executing the design and construction administration is crucial in maintaining project quality and client expectations. One factor in our success is based on the fact that the Construction Administration is performed by the same design team that successfully led the programming and design phases. We do not hand off the project to an “Administration” team during construction. The principals who are familiar with the critical design issues remain involved throughout the entire process. The benefit is that if any activity in construction warrants additional consideration, such as a change to the design or proposed substitution, we will be in the position to revisit the design issue in a timely and knowledgeable fashion.

We also endeavor to establish a positive working relationship with the contractor because we recognize the expertise they bring to the table. Throughout the entire construction process, we listen to everyone’s concerns about the progress of the building. When issues arise, the design team consults with everyone involved to explore, discuss, develop, and implement a viable and cost-effective solution that is in your best interest. Utilizing BIM and other state-of-the-art-construction administration software technology, we electronically log and track all construction data such as submittals, requests for information, and change order requests. This enables us to monitor the status of all issues efficiently and share timely information with the Owner, Construction Manager, Contractor, and Commissioning Agent.

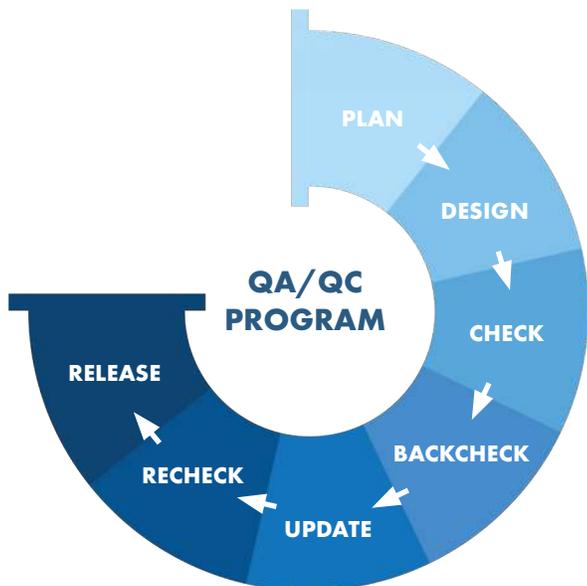
Our commitment to you and the contractor is to respond to the requests and submittals immediately upon receiving them. When more time is required for research, we will notify all of the parties as to when they can expect our response. This prioritized review process enhances our working relationship with the contractor and helps them stay on schedule.

- Regular Site Visits
- Record Keeping
- Enhance Construction Administration & Owner Representation
- Seeing the Project Through Full Completion



QUALITY CONTROL / QUALITY ASSURANCE PROGRAM

We recognize that the methodologies we employ in our daily operations directly shape the caliber of our deliverables. This extends to how we structure our tasks, communicate with both colleagues and clients, and navigate challenges. Each team member bears the responsibility of upholding stringent quality control standards in their work and actively seeking avenues to enhance precision and effectiveness.



LONG TERM PROJECT SUCCESS

Ensuring sufficient time and budget allocation for the completion of Quality Assurance and Quality Control (QAQC) steps is paramount for our firm. While the percentage of time required for QAQC may fluctuate based on project specifics, it typically falls within the range of 25% to 40%. Despite the seemingly significant allocation, it is imperative when weighed against potential alternatives.

The often overlooked yet crucial Backcheck, Update, and Recheck steps play a pivotal role in closing the loop of the QAQC process. Their implementation significantly minimizes the risk of oversight and ensures that necessary updates do not go unnoticed.

Recognizing the indispensable role of the QAQC process in long-term project success, we emphasize its importance at MW Studios. Neglecting this critical aspect is not an option. We are dedicated to refining our QAQC process continuously, aiming to deliver solutions that will stand the test of time and benefit communities for generations.

- **PLAN** for adequate time and budget to complete the QA/QC Process.
- **DESIGN** and detail for completeness and accuracy in accordance with MW Studios standards and client requirements.
- **CHECK** for accuracy, compliance, completeness, and risk mitigation. Provide comments and mark-ups.
- **BACKCHECK** designer confirms suggested changes.
- **UPDATE** documents are changed to incorporate comments.
- **RECHECK** revised plans are rechecked to ensure changes were made correctly.
- **RELEASE** documents for formal use upon completion of the recheck process.



QUALITY CONTROL / QUALITY ASSURANCE PROGRAM

QUALITY CONTROL VS. QUALITY ASSURANCE

Within our firms, Quality Assurance (QA) signifies a formalized review system conducted before submission within a specific timeframe. Its purpose is to capture and rectify any last-minute issues. Conversely, Quality Control (QC) is an ongoing process throughout the project's life cycle, addressing challenges as they emerge.

QUALITY CONTROL	QUALITY ASSURANCE
<ul style="list-style-type: none"> Provides 100% Check of Documents, Plans, and Details Detailed Process for Each Submittal with Multiple Steps <ul style="list-style-type: none"> Individual Checks Their Own Work Supervisor Checks Work Occurs Throughout Life of Project Review Occurs on All Project Submittals 	<ul style="list-style-type: none"> Planned System of Review and Spot-Check by Experienced Senior Staff One-Step Review Process Before Each Submittal Occurs After QC Complete, But Before Submission Review Frequency is Per the Project Work Plan

QUALITY CONTROL (QC)

QC constitutes a set of regular technical activities aimed at assessing and managing the quality of a product during its development. The QC process is structured to deliver consistent and routine examinations of design and plan details, facilitating the identification and resolution of errors and omissions. Roles within Quality Control encompass:

DESIGNER	CHECKER	BACK-CHECKER	UPDATER	RE-CHECKER
Document Developer	Independent Document Checker	Confirms/denies checker corrections prior to updating	Updates Documents to agreed-to revision	Verifies document corrections have been made

QUALITY ASSURANCE (QA)

QA activities involve a systematic plan of review procedures carried out by individuals who are not directly engaged in the design compilation or development process. Roles within Quality Assurance encompass:

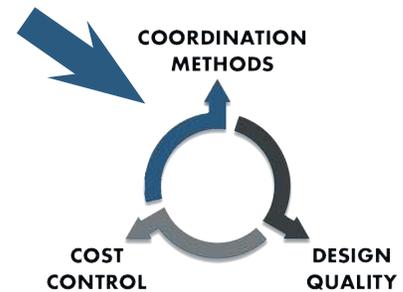
QUALITY FACILITATOR	PROJECT MANAGER	QUALITY CONTROL REVIEWER
Advocates for the quality program at the group level.	Responsible for quality control of their assigned projects.	Senior-level person who reviews the milestone submittal prior to sending it to the client.

COORDINATION METHODOLOGY

At MW Studios we take tremendous pride in our ability to coordinate our work. The principal staff and project managers from both firms take direct responsibility for ensuring all elements of building and site design have been thoroughly coordinated. Increasingly, and far too often, architectural firms throughout the country have been pinning the responsibility of coordination on the General Contractor. While the contractor should hold some degree of responsibility to ensure that sequencing and fabrication are done appropriately, they should not be expected to redesign and coordinate the elements of design—at a cost ultimately absorbed by the owner. Traditionally, and as it should be, coordination is the architect’s responsibility, and it’s something both our firms fully embrace.

To remove the burden of coordination from the General Contractor and better protect the owner from change orders, our team has developed and utilizes a comprehensive and thorough approach to building coordination. As lead designers, MW Studios take firm control of the process and incorporate both traditional and technologically advanced methods of coordination management. Our two firms have developed a detailed quality control program that is outlined below. These measures are applied to every project, regardless of size, complexity, or budget. This level of discipline has proven to result in quality documents, which afford unprecedented levels of protection to owners from error-initiated change orders.

We implement a tailored coordination and quality control plan for every project our firms manage. These plans are customized to account for unique site conditions, specialized building systems, sustainability features, and other project-specific parameters. We cannot stress enough that, in addition to the items and processes outlined below, the design and cost control practices we implement play an equally important role in successful coordination.



Elements of a Successful Project
Importance of Good Coordination

QUALITY ASSURANCE DURING DESIGN

BUILDING INFORMATION MODELING COORDINATION (BIM)

Our coordination process revolves heavily around the use of Building Information Modeling (BIM) Technology, which is utilized by our entire team. We consider ourselves to be one of the industry’s leading experts in BIM technology and know the benefits it brings to a project. Principal Robert Manns has written educational course work on the technology and has assisted engineers, contractors, and other architects in successfully implementing the process in their practices to largely eliminate major errors and omissions.

While most firms have just recently started using BIM technology, our principal staff has been successfully delivering projects with BIM software since 2003. As a result, we are able to share an abundance of information with both our client and their contractor that can often save both parties a substantial amount of time and money. Utilizing Revit and Navisworks we enable the client, end user and contractor to see a fully constructed and detailed digital building before the first shovel strikes the ground.

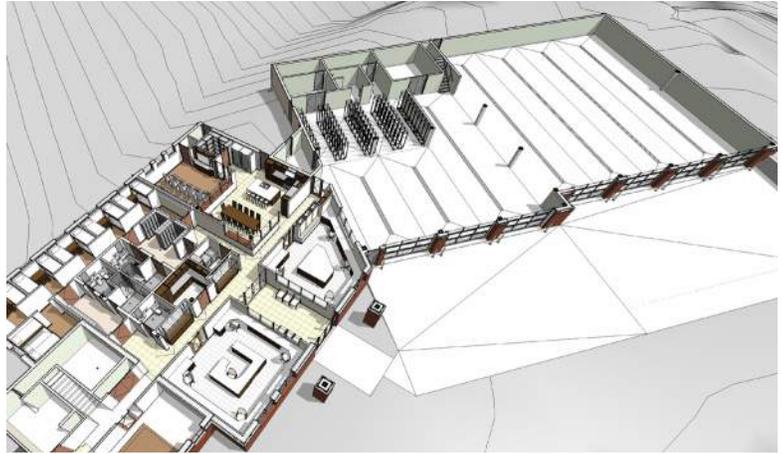
Our experience, efficiency and flexibility with the software enables the design team to maximize time spent on design and coordination rather than processing repetitive drafting tasks. As such, we are capable of delivering better construction documents in a timelier manner and at a cheaper cost. By digitally constructing the building in full detail, we eliminate the vast majority of costly coordination issues and enable others to truly visualize the project.

Statistically, the majority of change orders in construction are a result of contractor misinterpretation and misaligned expectations. Our highly detailed and coordinated documents result in a better understanding of the scope of work and intent of the design. This results in our ability to give the contractor a better understanding of what is expected of them and more accurate construction bids.

QUALITY ASSURANCE DURING DESIGN

Benefits of Our BIM Expertise:

- Design Accurately and in Three Dimensions
- Quickly Explore Different Design Options
- Better Visual Understanding of the Design
- More Effective Cost Control
- Better Coordination / Fewer Change Orders
- Faster Turn Around Times
- Fewer Delays From Contractor Questions
- Quick Material Quantifications / Better Cost Control
- Energy Analysis / Life Cycle Costing
- Contractors Better Understand The Design Intent



Coordinated BIM Model
Kingsville Volunteer Fire Company
Coordinated Cut-Away Plan

At a minimum the following elements are ALWAYS three dimensionally digitally modeled in full detail and coordinated through a series of clash detections prior to issue of bid documents. Elements are linked to the drawings specifications and product data as required.

Structural Slabs	Windows	Furniture
Structural Steel	Ceilings	Toilet Partitions
Structural Foundations	Architectural Equipment	Grades / Earthwork
Structural Walls	Casework	Lighting
Structural Footings	Storefronts	Electrical Conduits & Raceways Greater Than 1.5"
Roofs, Drains, Gutters, Downspouts	Curtainwalls	Mechanical Equipment
Architectural Walls & Partitions	Ramps	Sheet Metal Fabricated Duct work
Finished Floors & Trims	Stairs	Plumbing Fixtures
Doors	Handrails & Guard Rails	Plumbing Lines Greater Than 1.5"

What Clients & Contractors Say...

"The level and sophistication of the model can't be compared to anything I've ever seen. Frankly, it makes our task as contractor easier, and the interaction with the Architect more enjoyable."

Ken Wingate, President
North Point Builder

"What they do with this [software] is incredible! To see the site issues in 3D really helped us understand the challenges we faced and what we needed to do to overcome them."

Mike Berna, Captain
Baltimore County Fire Department



Coordinated BIM Model
Carroll County Public Safety Training Center

COST CONTROL

Effective cost control is a central component of our project delivery approach. We have teamed with YA Group, formerly Trophy Point, a trusted third-party cost estimating partner with whom we have extensive experience to provide independent, detailed cost modeling at key milestones throughout the design process. Their involvement ensures accurate, data-driven insights that align with current market conditions with the project's scope and quality expectations.

Working collaboratively with the design team, YA Group will support real-time budget validation, identify potential cost risks early, and recommend value-driven alternatives where appropriate. This proactive and transparent approach allows the team to make informed decisions, maintain alignment with the project budget, and minimize the need for cost redesign or scope reductions later in the process.

MAINTAINING THE DESIGN SCHEDULE

MWS uses both Microsoft Project and Excel to develop and manage design project schedules. Schedules are developed with the input of our clients and consultants at the beginning of the project in order to derive the most realistic expectations for project delivery. A Master architectural schedule and individually tailored consultant schedules are developed and distributed to every team member. These schedules are monitored, updated and distributed to the team on a regular basis. By providing both master and consultant schedules to the team, each key player is able to better understand our expectations and how others will depend on their ability to perform in a timely manner.

In addition to the conventional process of maintaining schedules we require that our core consultants upload their BIM model along with a brief progress report on a biweekly basis. This practice allows us to keep a solid pulse on the project and ensure that work is progressing in a logical, smooth and orderly manner. The uploaded consultant models are then integrated into the master model and tested for clashes. Any clashes are immediately logged and reported to the team. This method effectively mitigates the risk of delay by increasing the communication and quality of coordination between consultants — creating a honed system of checks and balances.

MWS and our consultants are committed to meeting any reasonable schedule that is mutually agreed upon with the city. Minimizing the amount of time spent in the design process is often achieved by making educated decisions in a timely manner. Utilizing our vast experience in community building design we will be able to immediately answer questions relating to standards and design which undoubtedly afford the town a head start in this process.

TAB 5
FIRE STATION
UNDERSTANDING



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FIRE STATION UNDERSTANDING

Fire/EMS stations and public safety facilities, in general, are expensive, long-term investments that ensure the well being of our citizens and communities. They must be flexible enough to meet the demands of future standards and durable enough to withstand some of the most extreme abuse. The design of fire/EMS stations should ultimately provide the comforts of home during a long shift, as well as convey the core values of the communities they serve.

Unique when compared to standard forms of municipal construction, fire/EMS stations must be tailored to meet national, regional, and local standards, and the specific needs of first responders. What works for one department may not be the right solution for another as the demands for service and the cultural identity of the department are likely to vary. For this reason, it is critical for the architect to work directly with the responders, staff, and community leaders to gain a clear insight into the specific needs and procedures of the department.

Our experienced and award-winning fire/EMS station design team will provide design solutions that not only incorporates the unique requirements of the Department, but also satisfy the local code requirements, and captures the culture of the community. A successful fire station design should provide first responders with a secure, safe, and healthy building that establishes a fast and efficient route to the apparatus and turn-out gear. With the understanding that every second counts, our team has developed a wide range of design strategies, standards, and details that significantly improve response time and station safety.

Additionally, a fire/EMS station must accommodate an incredibly diverse set of functions, including housing, recreation, administration, training, community education and general apparatus maintenance. These elements require careful organization and detailing to conform with building codes while simultaneously

creating an efficient, inviting and home-like environment for responders who spend extended periods within the building.

Finally, the design of these critical buildings should consider the future demands for service. It will be crucial to establish a strategy that allows the needs of the first responders to be addressed and adapted over time. This is achievable by implementing a comprehensive and well-thought-out plan that can adapt to accommodate a wide range of potential future needs that can not be reasonably forecast today.

By adhering and expanding upon these basic principles, our team will ensure that Reading's first responders are living and operating in a first-class facility that is attractive, affordable, durable, and safe — all while meeting your specific needs.

The following pages outline our specific experience and items for consideration relating to Fire/EMA Station facilities.

RESEARCH, DEVELOPMENT & REPUTATION FOR EXCELLENCE

Over the years, our team has developed concrete skills and understanding related to the design and functionality of fire/EMS station design. Through extensive research and practice, we have come to appreciate the fine details that set these buildings apart from any other. The content within this section is only a small sampling of our knowledge base and expertise. We believe that it conveys our qualifications for this project and hope that it will provide you with some assistance when it comes to planning your project.

The principals of our firm regularly speak at local and national design conferences, such as Station Style and FIERO, to share their knowledge and experience with other architects and first responders from across the country. Our firm regularly works with the Maryland State Fireman's Association (MSFA) and the Maryland Fire Chief's Association to promote best practices when it comes to facility planning. The research performed by MWS leadership has been published on numerous occasions by reputable sources such as Firehouse Magazine, and the firm has received multiple national design awards that are specific to public safety projects.

SPEAKING & PUBLICATIONS

- **Fire Stations 101** - Introduction to Fire Station Design - MSFA Annual Convention, Firehouse World
- **Anatomy of the Apparatus Bay** - Details of Apparatus Bay Design - Firehouse SDC, FIERO, Firehouse Magazine
- **Real-World Challenges** - Case Study for Chester County Public Safety Training Center - FIERO, Firehouse SDC
- **Anatomy of the Living Space** - Details of Effective Kitchen & Bunk Room Spaces - FIERO
- **Common Sense Design Solutions** - Basic & Cost-Effective Solutions for Safe Fire Stations
- **Mental Health & Design** - The Relationship Between PTSD & Building Design - FIERO
- **Hell or High Water** - Storm Hardening & Blast Resistance for Public Safety Buildings - FIERO
- **Combination Facilities** - Effective Combinations of Fire, Police, & Training Facilities - FIERO
- **Gender Neutrality** - Bunk Room & Station Design Solutions for Diverse Fire Departments - FIERO, Firehouse SDC
- **Facility Hardening** - A White Paper Guide to Facility Hardening Requirements - FIERO
- **FEMA Safety & Health Considerations for Fire & Emergency Medical Services Stations** - Contributing Author

UNDERSTANDING HISTORY...WHAT MAKES A GOOD FIRE/EMS STATION?



To best understand what makes a “good” fire/EMS station, one must first understand their history, origin, and purpose within a community.

Arguably, fire/EMS stations are the last remaining type of building that is instantly recognizable. While churches may have spires, today’s era of worship is more likely to take place within an industrial complex or gymnasium at a recreational center. Fire stations on the other hand, continue to identify themselves to the surrounding community with the magnificence of tall towers and repetition of large openings that showcase a department’s readiness to serve the community during times of need. Towers that once were homes to crews looking out over their cities for signs of distress transformed into drying towers, and have since evolved into state-of-the-art training features that keep the skills of those who live and work there honed.

The profession of firefighting has been in existence since the days of Roman Emperor Augustus when the Watchman of the City (“Vigiles Urbani”) battled fires within the City of Rome utilizing buckets and horse-drawn pumps. This technology was lost to humanity during the dark ages and would not reemerge until the mid-17th century in Nuremberg when the Renaissance era pump technology found its way onto the back of horse-drawn carriages. The

subsequent advent of leather hoses required drying to prevent rot, thus leading to the development of the hose drying tower and the image of fire stations as we now know it today.

The Second Industrial Revolution sparked rapid changes in both building and firefighting technology. The availability of structural steel and the implementation of modern building materials enabled architects and engineers to design buildings that were taller and larger. With that came innovations in firefighting technology and equipment, such as longer ladders and apparatus with larger suppression capacities. These advancements in technology continue to make fire engines bigger and ultimately render older facilities obsolete.

The fire/EMS stations of today share common ground with their predecessors in that functionality always takes precedence over aesthetics. Modern-day fire/EMS stations are host to a unique blend of residential, office, municipal, and communal duties. They serve the common good of communities and thus carry a symbolic presence rooted in functionality and tradition. A fire/EMS station is not merely a garage for fire trucks or a house for firefighters – Instead, they are civic buildings that embody our values as a society.

So, what is it that makes for a “good” fire/EMS station? By understanding century’s worth of precedent and tradition, coupled with the findings of modern-day science, one can resolve this subjective question with confidence.

- A “good” fire/EMS station will ensure that the deployable resources and apparatus are as close as possible to the living and working quarters of first responders to provide the briefest, most effective, and safest route.
- A “good” fire/EMS station is designed in a manner that promotes the physical and mental wellness of those that put their lives on the line for their community during routine responses and the darkest of hours.
- A “good” fire/EMS station will be inviting and warm for both first responders and the community they serve, yet durable enough to withstand decades of demanding service.
- A “good” fire/EMS station will stand out as a reassuring beacon, provide a recognizable entrance and instill a sensation of trust and security across its service area, thus building and improving upon the value of community.
- A “good” fire/EMS station will be both environmentally and fiscally sustainable and will protect the resources of the community.
- A “good” fire/EMS station will honor the traditions of the past while looking into the future.

SITE CONDITIONS FOR FIRE/EMS STATION DESIGN



Fire/EMS stations require the design team to account for unique site planning design requirements. All construction projects must account for issues such as stormwater management, grading, zoning, setbacks, and environmental concerns. Fire/EMS station sites, however, must be designed to address these fundamental concerns along with a series of mission-critical design parameters that ensure operational preparedness. Our team understands that to successfully create a functional fire station the following site parameters will need to be properly addressed.

1. **Response Times:** Organize the plan and site to provide the safest and quickest response to the main road. This requirement may require the development of specific access points, signalization control, and sight-line analysis.
2. **Visibility:** Site design conditions should mitigate the risks associated with blind corners and excessive vegetation that might hinder the visibility of both the apparatus driver and oncoming traffic.
3. **Apparatus Maneuvering Considerations:** The site should be designed to support safe and efficient traffic movement from the department’s entire fleet of emergency apparatus. The design should ensure that the largest pieces of equipment, such as tower and aerial units have enough space for turning and pulling into the station without risk of hitting other vehicles, curbs, or the building itself.
4. **Grading:** Site grading should be evaluated against Apparatus Break-over and Departure Angles to ensure that apparatus won’t bottom out or scrape against site features.
5. **Safety of Apparatus Response and Return:** The ideal configuration of a site should ensure that pedestrian or non-essential personnel vehicle traffic does not cross the apron or path of apparatus response.
6. **Designated Parking Zones:** Marked and convenient areas for parking that correspond to the specific functions of the building should be provided.
 - Public Parking (Near Station Entrance)
 - Event Parking (Near Community Room Entrance, If Applicable)
 - Home Response Parking (Near Turn-out Gear, If Applicable)
 - Firefighter Parking (Near Bunk Room / Back of Station)

SITE CONDITIONS FOR FIRE/EMS STATION DESIGN

7. Apron Dimensions and Clearances

- Aprons should be of reinforced concrete and capable of withstanding heavy point loads that might be developed by the outriggers of a piece of apparatus.
- Ideally, it is recommended that the apron be at least 10' - 0" longer than the longest piece of apparatus. This allows for the staging of equipment and simplified cleaning of the bays.
- Ideally, avoid pedestrian traffic and general vehicle traffic across these areas. Pedestrian traffic should be controlled within 20' of the face of the bays.

8. Utilities & Infrastructure: Attempt to site the building in a location that has adequate water, sewer, natural gas, power, and telecommunications. If possible, identify redundant power and communication feeds to improve mission-critical reliability. Identify if stormwater management features can be utilized for drafting purposes on rural sites; or a rescue training feature.

9. Fueling Stations: If applicable, fueling stations should be located such that a fueling truck does not block vehicular traffic. Tanks should be protected from terroristic type attacks and separated from the building structure.

10. Paving: Invest in heavy-duty paving where apparatus will drive.

11. Flood Plains: When utilizing federal funding, FEMA prohibits stations from being constructed within the 100-year flood plain unless they have been flood-proofed. Flood Proofing requires that all occupied spaces and equipment be located two feet above the design flood elevation flood line; and that appropriate measures have been implemented to allow the building to withstand tidal surges.



Woodland Beach Volunteer Fire Department Site Plan

STRUCTURAL AND LIFE SAFETY IMPORTANCE



Public safety buildings serve as the backbones of our communities. So much so, that the building codes have recognized their importance amongst their peers. Since fire stations house specially trained personnel and equipment tasked with serving their community under the most trying of conditions, they are held to a higher standard when compared to many other building types. Per commonly adopted building codes, fire stations are considered essential structures. This classification often triggers the requirement for the design of the station to be a “last building standing” in the event of a regional disaster.

Buildings across the region are subject to natural disasters such as flooding, tornados, hurricanes, blizzards, and even earthquakes. Fundamentally, the essential facilities classification requires a station to be more structurally sound or “hardened” than an office building, retail store, or other common building types.

The spirit of the building codes ensures that “Essential Facilities,” such as EMS stations, police stations, 911 call centers, hospitals,

and FIRE stations, are capable of withstanding extreme conditions so that first responder may continue to protect and serve even during the most trying of times.

The code defines “Essential Facilities” as buildings that must remain operational during and after an extreme environmental event, such as a hurricane or snowstorm. Chapter 16 of the International Building Code specifies that public safety facilities must:

1. Withstand a 15% greater wind loads than that of a non-essential facility.
2. Withstand a 20% greater snow loads than that of a non-essential facility.
3. Withstand a 50% greater seismic loads than that of a non-essential facility.

Such measures require careful and thoughtful design to ensure resiliency is achieved and project costs are controlled.

SPRINKLER PROTECTION AND DETECTORS



Mineral City Fire Department suffers complete collapse from tornado leaving department unable to assist their surrounding community. No fatalities.

A study conducted in 2001 by the US Fire Administration concluded that more than 37% of all emergency service facilities structural fires originate from the departments’ apparatus. It is the leading cause of approximately 150 reported structures within fire stations. Other notable reasons have originated from old faulty wiring, cooking equipment, and arson.

Sprinkler systems have proven to be one of the most valuable tools in the preservation of life and property. Most departments across the country encourage and promote the use of automatic sprinkler systems within their communities. So, when it comes to the design of emergency service facilities, it is required to practice. NFPA 1 – Uniform Fire Code establishes the requirement that all “New buildings housing emergency fire, rescue, or ambulance services be protected throughout by an approved automatic sprinkler system.” NFPA also requires that both new and existing fire stations be equipped with smoke detectors in work, sleeping, and general storage areas.

These provisions exist without exception and are a fundamental requirement of stations regardless of size, or building construction type.

ORGANIZATIONAL CONSIDERATIONS WITHIN THE STATION

The amount of time it takes a first responder to get out of the station can be the difference between life and death for a person in need. For their safety, responders should not be making up the time lost in the station on the road. As such, the response path is one of the most sacred functional considerations in the design process. Sound planning strategies should ensure:

- Corridors provide a clear and efficient response to the bays with minimal, turns, jogs and corners
- Most frequently occupied spaces are located the closest to the bays
- Traffic leads to turnout gear ready zones where responders can safely dress without risk of being struck by moving apparatus.
- Doors from high occupant load zones swing in the direction of the apparatus bays. Doors should be nested into alcoves to prevent them from freely swinging into corridors where other responding personnel might be struck.
- Public access is limited and controlled.
- Turnout gear isolated from exhaust & UV
- Fitness center visible for the safety of personnel working out. Ideally, duress alarms should be provided within these spaces that would allow a first responder that might be experiencing a cardiac event to alert the department.
- Acoustical “buffers” should be provided between sleeping areas and other high noise environments to promote better sleeping habits for first responders, thus mitigating cardiac health risks.
- The station should be free of unnecessary and unexpected steps and tripping hazards.



FIRST RESPONDER HEALTH : THE INVISIBLE KILLERS

Most first responders enter the profession to serve their community and help others during a time of need. Inherently, they recognize the hazards associated with the job. The most commonly perceived risks are those found on the fire grounds – burns from fire, falls from heights, and the collapse of a structure are just a few of the dangers commonly associated with the profession. Unfortunately, it is not the hazards on the fire grounds that have proven most dangerous to first responders:

CANCER

After combating the tangible risks on the fire grounds, most responders are shocked to discover that as a result of prolonged exposure to contaminated materials, they are 2.2 times more likely to be diagnosed with cancer than the average person. Responsible station design can mitigate these risks by implementing functional circulation and contamination containment strategies.

CARDIAC ARREST

Furthermore, sudden cardiac arrest is the number one cause of line of duty death for first responders. Statistically, more than 59% of all first responder deaths are attributed to cardiac arrest. Such deaths have been scientifically linked to overexertion, lack of physical fitness, and sleep deprivation. Responsible station design can mitigate these risks by providing better bunking accommodations, state of the art alerting systems, and fitness rooms.

POST TRAUMATIC STRESS

First responders experience a steady exposure to trauma and intense human emotion. Burning buildings, mangled car accidents, suicide attempts, gunshot wounds, and loss of a fellow first responder are events one might expect to experience throughout their career. Such tragic events come with the territory of being a first responder. Scientists and mental health experts are intensely studying the effects of such trauma on the psychology of first responders, but research conducted to date reveals that the results are similar to that of a military service member who has experienced intense and regular exposure to combat.

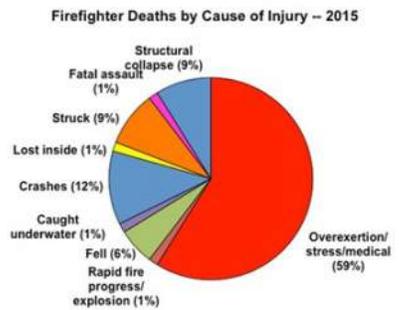
While some first responders cope well, others do not. Different events may trigger different responses from individuals. Responsible station design can promote mental wellness and mitigate the risks of first responders developing acute PTSD by creating welcoming environments with an abundance of natural light. Careful selection of materials and intentionally defining spaces for a gathering can induce calming sensations and create opportunities for first responders to open up and seek assistance from their peers.



Firefighters don their turnout gear in clean zones, carrying those same contaminants with them. Education and cultural changes need to occur in parallel with responsible design practice.

2.2

Times more likely a firefighter will develop cancer compared to the general population.



“I wish I could forget what my eyes have seen.”

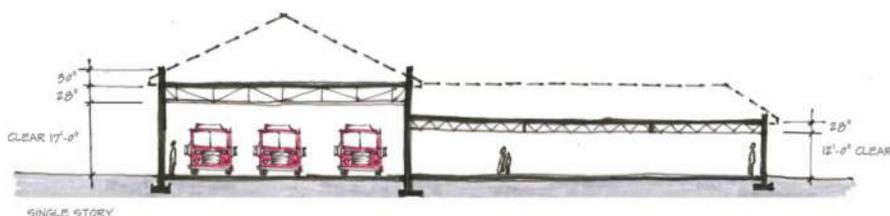
- PTSD Study Subject



Firefighters attack a structure fire; contaminants from the contents of the fire saturate their PPE turnout gear.

SINGLE STORY VS. MULTI-STORY STATIONS

Fire stations can be classified into three basic organizational typologies: single-story, multi-story (stacked), and hybrid. Each typology offers unique advantages and disadvantages. Regardless, the difference in response times for a well-designed single story or multi-story station should be negligible.



Single Story: Provided that there is sufficient room on the site, and the topography is favorable, a single-story station will usually provide the most cost-effective and functional model for design. Single-story solutions do not require vertical circulation elements such as stairs or elevators. They also often offer ample frontage for apparatus bay connectivity to other living spaces.

Advantages & Highlights:

- The most efficient use of space as stairs, elevators, and elevated mechanical areas are often not required.
- Construction costs for the building itself are usually less than that of a multi-story solution since fire ratings are simplified, and apparatus bay walls need only support a roof structure.

Challenges:

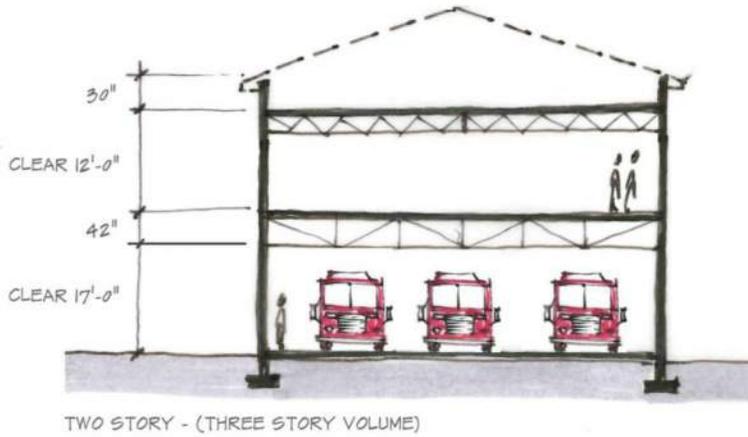
- Single Story stations usually require the most site development.
- For large stations (25,000+ GSF), response times may become hindered from some areas as spaces may be more remotely located from the bays.

Multi-Story: Multi-story stations are commonly utilized on small parcels, urban environments or on sites with particularly challenging environmental or topographic features. In principle, multi-story stations usually have occupied space above the apparatus bay. They typically require multiple means of egress as well as elevators to comply with life safety and accessibility codes.

Advantages & Highlights:

- Compact footprint.

SINGLE STORY VS. MULTI-STORY STATIONS

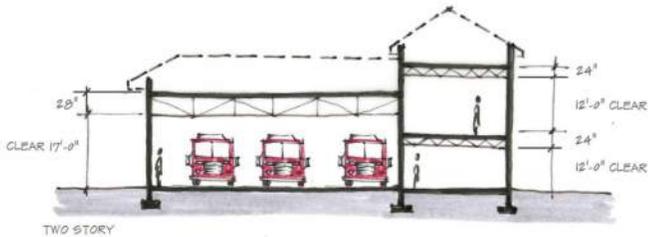


- For larger stations (25,000+ GSF), response times can be reduced by allowing personnel to vertically “spill out” into a rapid response ready area within or immediately adjacent to the apparatus.
- Site development costs may be less than that of single-story construction.
- If necessary, it is usually the easiest typology to achieve Flood Resistance Compliance with FEMA.

Challenges:

- Fire ratings are often required between floors.
- It generally requires more overall square footage to accommodate stairs and elevators.
- Structural isolation of fitness room is vital to prevent vibration of dropping weights.
- The Structural design of walls and frames become more complicated than single-story solutions due to the fact that a two-story station is essentially a three-story volume.

SINGLE STORY VS. MULTI-STORY STATIONS



- Clear spanning apparatus bays can be difficult or costly since the structure must support the floor load above.
- If the station is utilizing overhead sectional doors, the motors should be isolated, to prevent disruptive vibrations during door operation.

It is usually most cost-effective to build a station where the upper floor and ground floor areas are balanced and allow for the design to be “stacked” economically. Achieving an appropriate balance in the program can sometimes be challenging

Hybrid: Hybrid stations usually consist of a single-story apparatus bay adjoined by a multi-story occupied structure. They can provide a cost-effective balanced approach to sites with spatial, environmental, or topographical limitations. Hybrid stations are often excellent candidates for sites with a significant cross slope as one might enter from the upper level to then access the bays below.

Pros:

- Generally, more cost-effective than a multi-story station since the structure of the high apparatus bays does not need to support loads of floors above.
- Moderately compact footprint.
- Fire ratings between floors are generally not required.

Cons:

- It generally requires more overall square footage to accommodate stairs and elevators.
- The program associated with the occupied portions of the station tends to become fragmented which results in inefficiency.
- Prioritizing which portions of the operational program will have quick access to the bays can prove to be challenging.
- Similar to multi-story stations, the program for the occupied portions of the station should be balanced to achieve economic viability.

MORE BAYS NOW OR LATER?

When determining the number of bays to be integrated into the design of a fire station, the project team should carefully consider the short and long-term needs of the community and department. What types of apparatus will be housed at the station upon completion? Is there anticipated community growth within the near future that would necessitate more equipment? If an additional bay was needed, would it be in the near or distant future? Would another station located elsewhere better serve the community instead of an expansion? What is the likelihood of actually needing the extra space? These are all questions that must be answered to determine the appropriate project requirements.

In any case, the construction of a fire station is a generational investment for taxpayers. The determination of the quantity of bays ultimately comes down to value and budget, and the apparatus bays usually constitute the most significant chunks of square footage associated with the project. It is a common mistake for some to look at the total project cost and uniformly distribute it across the area of the building to determine a cost per square foot. As such, due to their size, apparatus bays often become the unfortunate target of budget cuts due to the perceived cost.



However, it is important to note that all square footage is not created equal. For example, the square footage costs associated with the kitchen of a fire station are exponentially higher than that of a storage room. When it comes to the apparatus bay, generally speaking, the two end bays are the most costly to construct as they function as the “bookends” for the space. As such, the perimeter end walls consist of the most materials when compared to that of a central bay. Central bays on the other hand, are often simple modules by nature which can be replicated with ease at a significantly lesser cost than that of the rest of the station.

While possible, adding the bays in the future typically requires more substantial construction efforts when compared to that of expanding the internal array of bays at the time of original construction. As such, the cost for such efforts is usually at a premium due to the required construction of another “bookend” perimeter wall, site development, integration to existing roofing systems, expanded utilities, disruption to current operations, and more.

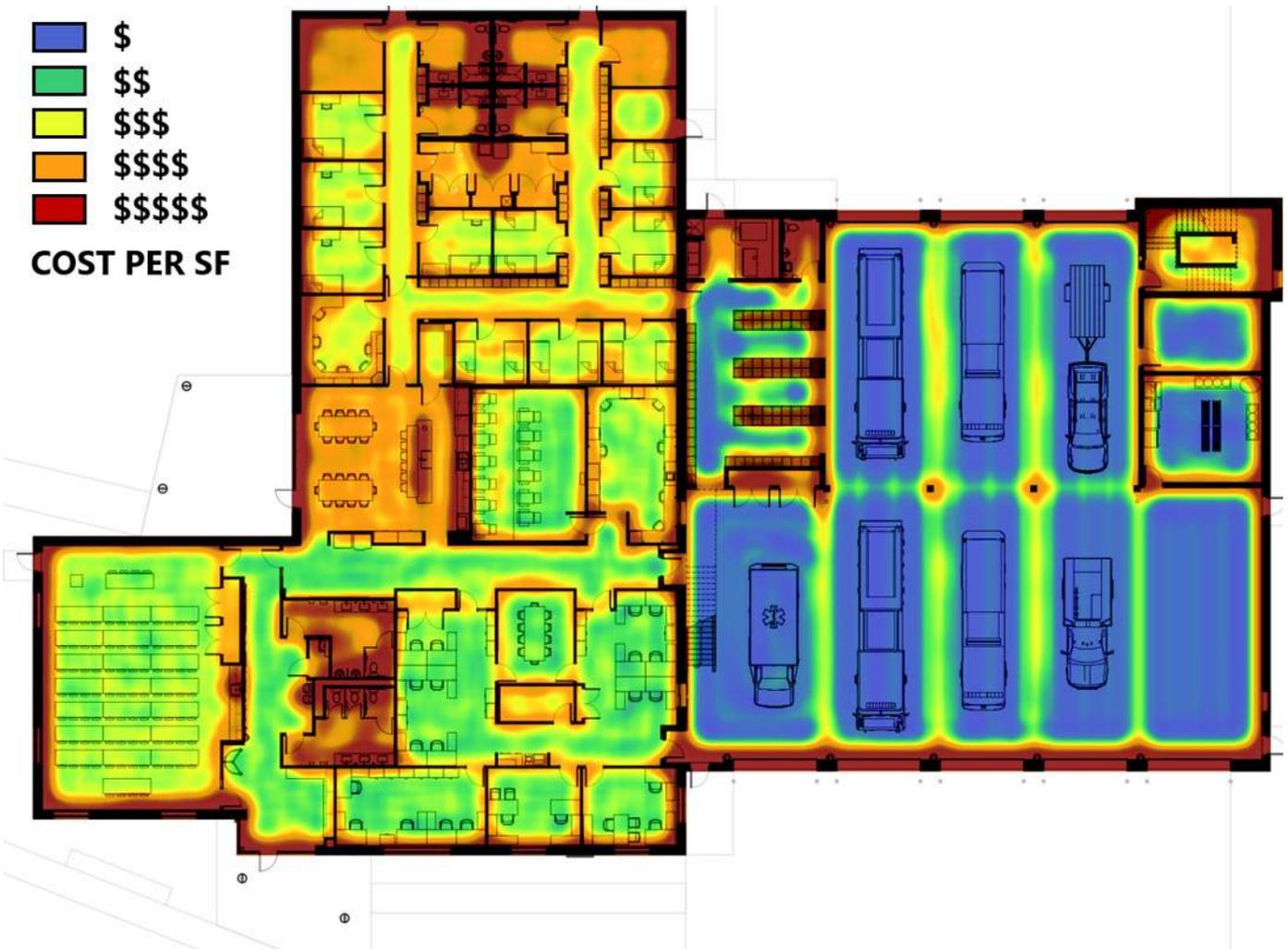
It is recommended that comparative cost models be performed to determine the probable cost of including the bays during construction vs. the cost of adding them sometime in the future. It is particularly important to factor in economic inflation during the analysis as an apparatus bay may cost \$180,000 to include today, but \$1,800,000 five years from now. If additional bays can be justified, and the funding is there, it is usually most advantageous to address including space at the time of original construction.

Regardless of the perceived need, our team would suggest planning the building to allow for future expansion to both the apparatus bays and sleeping quarter areas. Without a crystal ball, one never truly knows what the future may hold and to plan for maximum flexibility will ensure the station is viable for decades to come.

PROGRAMMING - BALANCING WANTS, NEEDS, AND BUDGET

The process of managing a program in Fire/EMS Station design can often be complicated by the fact that the building serves the community in many different roles. As part of our process of cost control, we work carefully with Town and Firefighter personnel to evaluate specific needs and wants as they relate to probable construction costs. Through our experience, we understand that a department's needs can be met in a multitude of ways; each providing distinct advantages and disadvantages. It would be our responsibility as your architect to educate you about the possibilities by presenting you with all of the viable programming options that exist.

Further, our team understands that all square footage is not created equal. On more than one occasion, our team has been required to defend the design solution and programmatic needs of the project before fiscal authorities and watch groups. The most natural reaction of these individuals is to call for a reduction in scope. This call for cost reduction commonly manifests itself in scrutinizing the sizes and quantities of the apparatus bays. With more than a dozen stations constructed within the region, and an unmatched depth of national public safety experience, our team stands educated and at the ready to justify the demands and costs associated with the project – with the capability of demonstrating value in ways that are easy to understand.



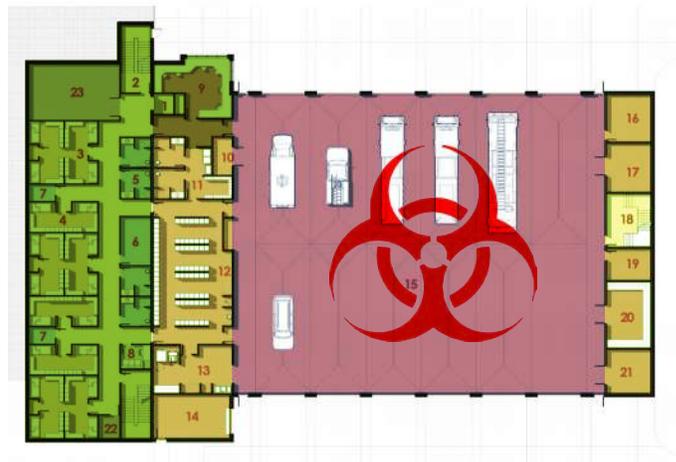
HOT ZONE DESIGN APPROACH

Mitigating the risk of cancer and exposure to bloodborne pathogens within the first responder service requires a well thought out design approach and perhaps a change in culture. First responders are routinely exposed to bloodborne pathogens such as hepatitis, MRSA, and HIV that originate from the wounds and other bodily fluids of the people they are serving. Exposure to carcinogens and toxic contaminants regularly occur on the fire ground. A small structure fire from a building constructed in the '60s might expose firefighters to arsenic, asbestos, and many other toxic compounds created from off-gassing materials within the building. These contaminants and pathogens ultimately return to the station via the PPE gear, tools, and equipment used at the scene.

A well-designed station will ensure equipment and gear can be quickly and safely decontaminated at the station and without allowing the contaminants to migrate through the building. By employing design strategies and technological equipment, the station design itself can mitigate the risk of these contaminants and pathogens entering the living spaces of the building. While many organizational hierarchies present challenges to the design of a successful station, the establishment of exposure zones is most crucial.

Organizing and classifying the station into three primary hazard zones is a proven strategy that can mitigate first responder exposure. Fundamentally, the apparatus bays and associated spaces should be classified as the **HOT ZONE**. This zone classification should always be assumed to be a contaminated environment. Conversely, the living areas of the station such as bunks, offices, kitchen, etc. should function as **CLEAN ZONES**. In practice, personnel returning from a call should never have the ability to transfer from a Hot Zone to a Clean Zone without having first had the capability to decontaminate themselves and their gear. HVAC systems and flooring materials should be selected and detailed to mitigate the risk of cross exposure from one environment into another.

Commonly, **DECONTAMINATION ZONES / WARM ZONES** serve as a transitional buffer between Clean Zones and Hot Zones and provide spaces for decontamination to occur. Areas usually classified as Warm Zones include turnout gear rooms, decontamination rooms, airlocks, and gear extrication rooms. These spaces must be adequately ventilated, and equipment for personnel sanitation should be strategically located to promote good hygiene and sanitation practices.



CLEAN ZONE

- Living Areas
- Sleeping Quarters
- Food Preparation
- Office Areas
- Shower / Hygiene Areas

NO PPE GEAR ALLOWED

WARM ZONE

- Hand Sanitizers
- Decon Showers
- Gear Extractors
- Gear Dryers
- Toilet Room
- Personnel Showers
- Eye Wash
- Easy To Clean

HOT ZONE

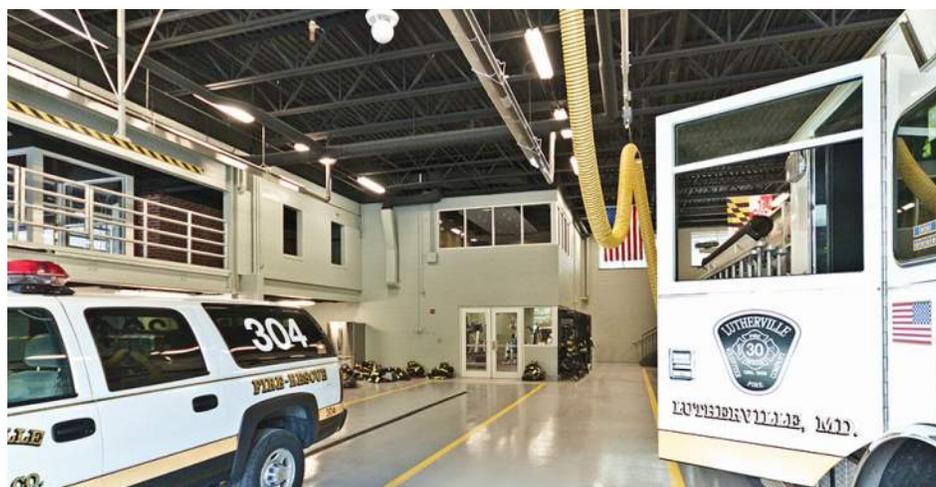
- Apparatus Bays
- Asbestos
- Oils
- Diesel Exhaust Fumes
- Blood Borne Pathogens
- Off Gassing Equipment

VEHICLE EXHAUST AND AIR QUALITY

Studies have shown that particulates emitted from diesel combustion engines, such as fire apparatus, are known carcinogens. In fact, NFPA requires all fire stations to “address” vehicle exhaust. In addition to vehicle exhaust, first responders should be protected from off-gassing that may come from equipment and gear found in the bays and turnout gear areas. As such, vehicle exhaust removal is only one of the many components necessary to ensure the proper decontamination and isolation of environmental risks that first responders face.

Maintaining indoor air quality of the apparatus bay and living areas of the station is essential to the safety and wellbeing of first responders. It is necessary to ensure that their exposure to diesel exhaust and other forms of air contamination are mitigated by developing a well-thought-out design solution. Protecting the occupants of the station is usually achieved by employing a four-stage protection approach to the design of mechanical systems. These stages consist of 1.) Source Capture/Treatment; 2.) Environmental Monitoring; 3.) Environmental Purging, and 4.) Fail-Safe Cross-Contamination Prevention.

Stage 1: Source Capture & Treatment: Fundamentally, there are three typologies of vehicle exhaust removal systems. It is important to note that despite what manufacturers and vendors promote, no one method is perfect and completely eliminates the risk associated with exposure. Regardless, each system type has demonstrated its ability to comply with NFPA 1581 and has its merit, based upon operational requirements. The selection of a system should be carefully coordinated with the building design goals and departmental policies to ensure maximum effectiveness. The following is a summary of each primary system type:



Direct Source Capture: Direct source capture commonly consists of a flexible exhaust hose that attaches directly to a proprietary fitting attached directly to the exhaust system of the apparatus. The system utilizes an independent exhaust fan assembly to pull the apparatus exhaust directly from the source and purge it from the building. The flexible hose is mounted to a traveler rail, usually attached to the ceiling, which allows the hose to move with the apparatus as it leaves the station. When the apparatus reaches a pre-determined point the hose will then disconnect from the fitting and swing freely. As the apparatus returns, the hose should ideally be reconnected prior to the apparatus fully entering the building.

Pros:

- Direct source capture eliminates the vast majority of diesel particulates provided that the department is using the system properly.
- Energy-efficient as the system does not exchange the actual air within the apparatus bay.
- Eliminates CO gas directly emitted by the apparatus.

Cons:

- The exhaust location on the apparatus should be consistent across the entire fleet of apparatus as the rails need to be set for either passenger or driver side. The exhaust system is rendered useless if a piece of equipment has an exhaust system in an incompatible location or is not equipped with the proprietary fitting. This issue is particularly troublesome when fill-in or mutual aid departments utilize apparatus that does not rely on direct source capture systems.

VEHICLE EXHAUST AND AIR QUALITY

- The mechanical or magnetic connection can sometimes fail to release, causing the hose to disconnect from the ceiling and trail the apparatus as it leaves the station.
- The hoses should be manually connected upon apparatus return to be fully effective. This practice requires a firefighter to leave the apparatus and connect the hose to a running engine. As such, the firefighter is then directly exposed to exhaust and put at risk of being accidentally struck by a moving vehicle.
- Traveling rails and their hanging hoses must be carefully coordinated with lighting, sprinkler systems, heaters, and other infrastructure



to ensure proper functionality.

- Does not remove other airborne pollutants, VOC's or gaseous contaminants.

Filtration Systems: Stand-alone filtration systems usually consist of multiple standalone "air scrubbers" strategically suspended from the ceiling above the apparatus. These air purifiers are designed to run air through multi-stage filtration systems at high volumes to collect a wide arrange of pollutants.

Pros:

- Clutter-free and open ceiling environment.
- Energy-efficient as the system does not exchange the actual air within the apparatus bay.
- Universally compatible with all types of apparatus regardless of vehicle exhaust configuration.
- The system treats a wide range of airborne pollutants, including VOC's or gaseous contaminants.

Cons:

- The system does not capture exhaust at the source. As such, first responders may receive limited direct exposure.
- While contaminants are treated, gasses such as CO are not eliminated from the environment. As such, a centralized mechanical exhaust is required if elevated levels are detected.
- The system requires periodic filter replacement.

Vehicle Mounted Source Filtration: Several manufacturers offer "after-market" equipment that mounts directly to the apparatus itself that consists of a catalytic compound filter to capture hazardous particulates.

Pros:

- Direct source capture eliminates the vast majority of diesel particulates.
- Energy-efficient as the system does not exchange the actual air within the apparatus bay.
- It does not require mechanical systems integrated into the building.

VEHICLE EXHAUST AND AIR QUALITY



- It can be utilized on-scene to mitigate exposure outside of the station.

Cons:

- While contaminants are treated, gasses such as CO are not eliminated from the environment. As such, a centralized mechanical exhaust is required if elevated levels are detected.
- The system requires periodic filter replacement, which can be costly.
- The station is left unprotected from fill-in or mutual aid apparatus that does not utilize the same system.

Stage 2: Environmental Monitoring: As described above, no source capture or treatment system is without vulnerabilities. Therefore, per mechanical codes, it is important to monitor air quality within the bays to ensure levels are safe. Detectors that monitor for hundreds of harmful compounds and gasses should be strategically located around the station to sample air continuously. The monitors are then integrated with environmental purge systems to evacuate the air within the bays well before it becomes harmful to the occupants of the building.

Stage 3: Environmental Purge Systems: If indoor air quality within the bays reach unacceptable levels, an automated air exchange system will activate to quickly replace the air within the bays with fresh outdoor air. Under such conditions, remotely located purge exhaust fans will engage and dampers on louvers will open allowing fresh air to be brought in. This system is also commonly equipped with a manual switch allowing for personnel to purge and circulate the air on hot days.

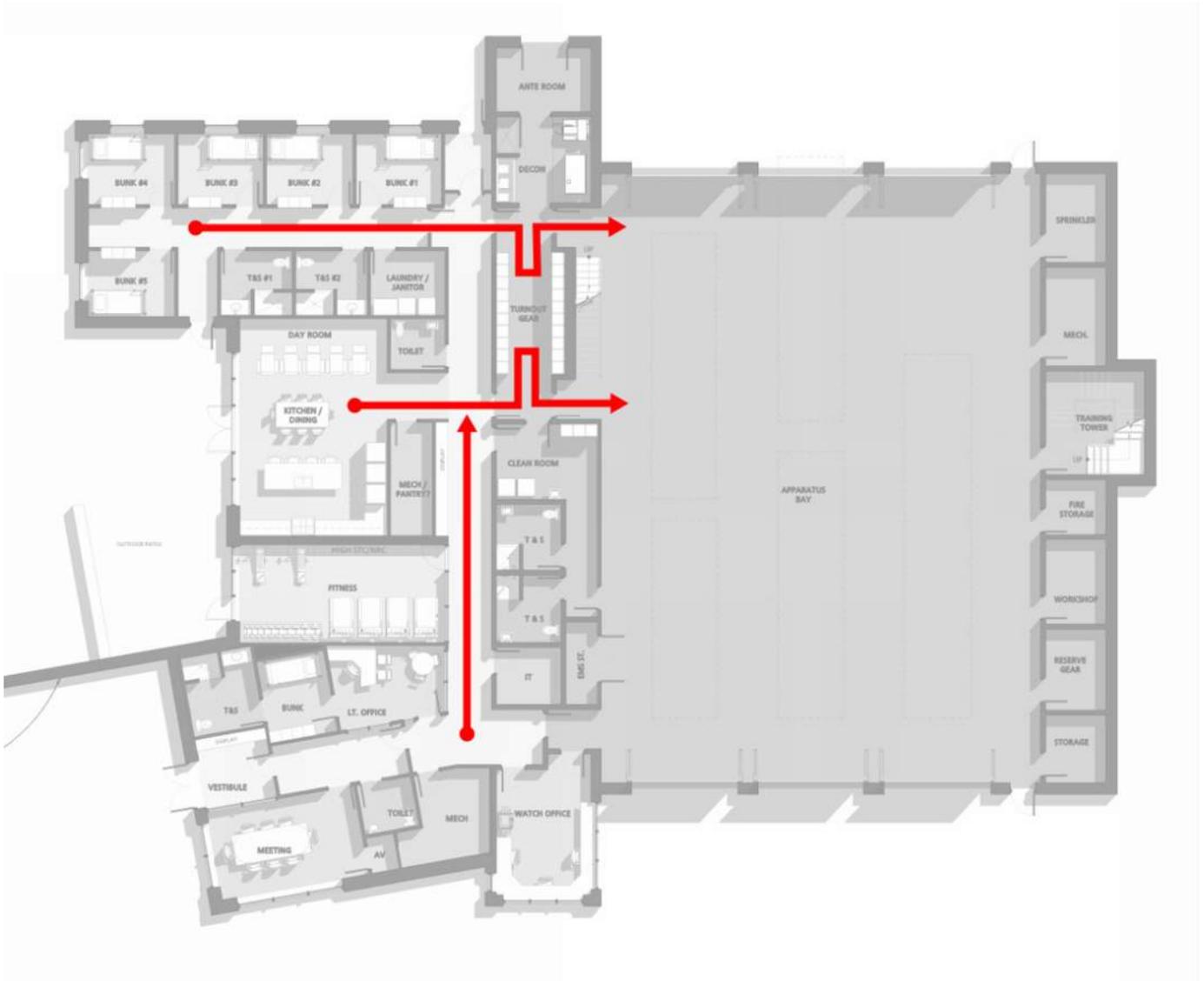
Stage 4: Fail-Safe Cross-Contamination Prevention: The “last line of defense” to protect first responders is achieved by carefully designing and balancing the remaining portions of the mechanical systems. Occupied portions of the building should remain under positive pressure to prevent contaminants from being “back drafted” from the bays into the living spaces. Turnout gear areas, decon rooms, and other areas that function as a buffer between the bays and living spaces should be designed exhausted under negative pressure to further mitigate the risk associated with off-gassing gear and equipment.

A CASE STUDY FOR RESPONSE, RETURN, AND DECON CONTROL

The principal staff has been researching and developing design solutions that support first responder health and hygiene since 2008. Our team considers this a continually evolving challenge and we strive to advance our design solutions each time scientific research emerges from agencies such as the Fire Fighter Cancer Foundation, NIOSH, and OSHA. Further, as a firm with deep experience in the design of fire stations, we endeavor to study the results of our work and the work of our peers, to apply the lessons learned.

MWS had been retained by the Town of Sidney, Ohio to design a new 11,500 SF substation for their growing community. The department, lead by a progressive fire chief, partnered with MWS to develop a solution that might serve as a failsafe solution that optimized response times, mitigated health risks, and improved fiscal responsibility. The chief dismissed all preconceived notions as to how a station should function and encouraged the design team to demonstrate proof-of-concept in the final solution. With this, MWS recognized that the design solution would likely challenge the cultural norms of any fire department.

The design solution ultimately accepted by the department yielded a plan that established a “one way out, one way in” decontamination and deployment zone for the department. During activation, all responding personnel funnel into a large turn-out gear room where they prepare for the call by putting on their turn-out gear. Once geared up, responders leave the ready area and enter the bays behind the first line apparatus – thus mitigating the risk of being struck by a moving piece of equipment.



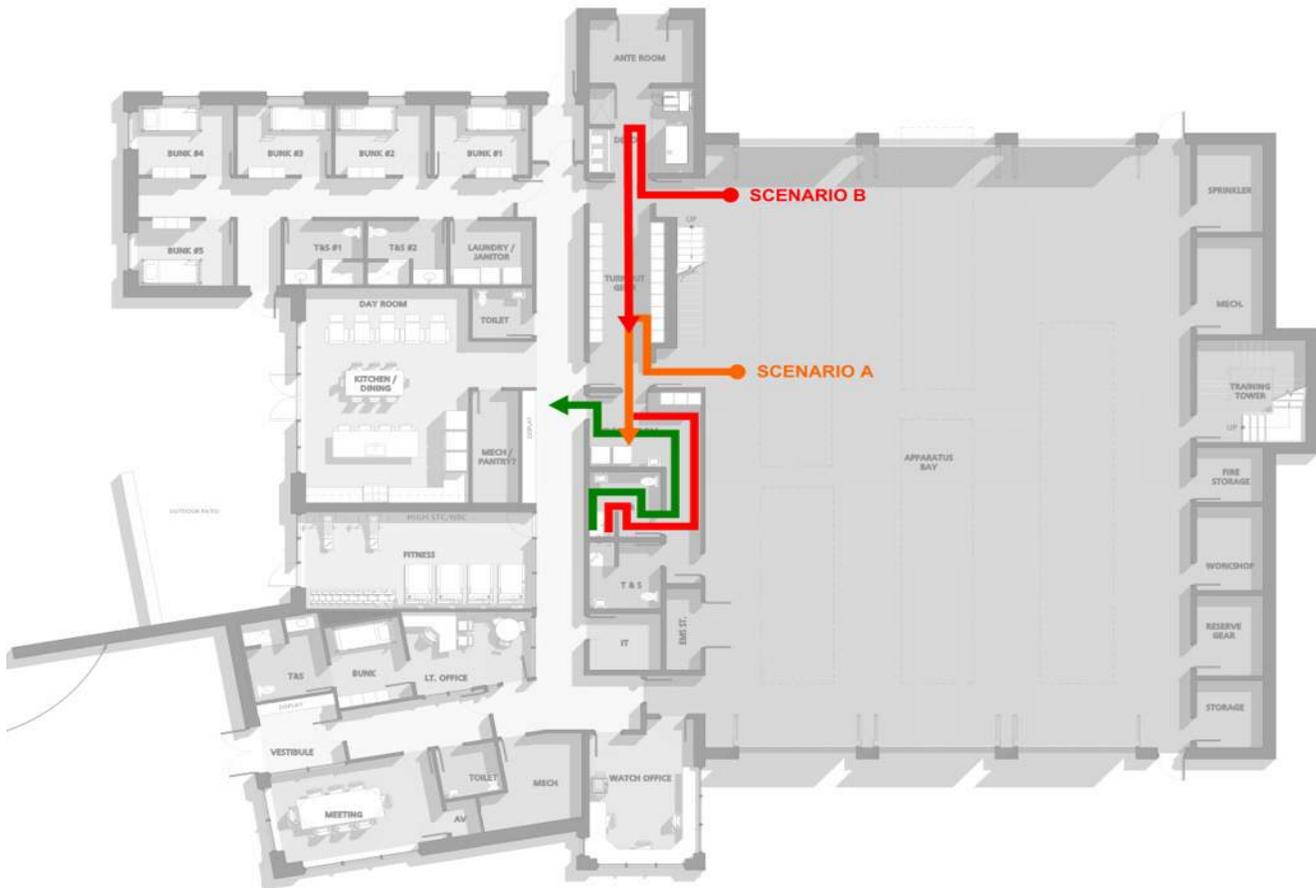
A CASE STUDY FOR RESPONSE, RETURN, AND DECON CONTROL

Upon returning from the call, responders are presented with natural return paths back into the occupied portions of the station, depending on the scenario.

SCENARIO A: Minor Call (I.E. Fire Alarm Check) – In this scenario, it is assumed that the responder has not received any exposure to contaminants while on the scene, but that residual contaminants may be within the bay. As such, the responder returns to the station, returns gear to their locker in Turnout Gear Room, then enters the Clean Room to wash their hands. After cleaning their hands, they would then enter the station through the Clean Room.

SCENARIO B: Common Fire Scene Exposure (Structure Fire) – In this scenario, it is assumed that the responder has been exposed to smoke from a structure fire. As such, it is assumed that their skin and undergarments have been exposed to contaminants. Under this premise, the responder returns to the station then utilizes the Decontamination room to clean their gear with the provided NFPA compliant sinks, gear extractors, and dryers. While the gear is in the extractor, the responder would enter the Clean Room to retrieve temporary gym style clothing stored within cubbies. The responder then utilizes the shower rooms connected to the Clean Room to de-robe, place contaminated clothing in a garment bag, and shower.

The shower is thermostatically controlled to prevent water temperatures from exceeding 60 degrees. While miserably uncomfortable, this temperature setting mitigates the risk of the responder’s skin pores from opening further where contaminants may embed into deeper into



A CASE STUDY FOR RESPONSE, RETURN, AND DECON CONTROL

the body. After taking a decontamination shower, the responder places exposed clothes into a commercial washer within the Clean Room specifically dedicated to exposed undergarments. The responder then re-enters the station through the Clean Room, where they may go to their locker to change into their standard duty uniform or take a warmer shower.

LESSONS LEARNED & NOTIONS DISMISSED:

- Turnout Gear room isolates gear from UV light, thus extending the life of the gear.
- Concerns regarding delayed response times resulting from gear being placed in a ready room were proven to be inconsequential. Strategically locating lockers based upon shift assignment, providing adequate spaces between lockers, and utilization of larger size lockers provided response time results nearly identical to that of gear being placed on the floor next to apparatus.
- Bunker Gear located within the Turnout Gear Room protected the gear from diesel exhaust exposure.
- Turnout Gear Room ventilation system better controls residual off-gassing from Bunker Gear.
- Elimination of "Pull Side" or "Return Side" door hardware at turnout gear rooms, and Watch Office forces personnel to traverse through the Clean Room, thus improving personnel hygiene and decontamination practices.
- The Ante Room provides an area where a contaminated medic unit can back up to the decontamination room for cleaning purposes without jeopardizing an already sanitized apparatus bay.
- The Turnout Gear Room serves as a dual function "airlock" preventing cross migration of air from higher hazard zones into the Clean Zone

DECON CONTROL

The equipment decontamination space is perhaps one of the most crucial support spaces to the apparatus bay. Full of equipment and fixtures, the utilitarian space must be properly designed to meet the functional demands of a fire station and protect the longterm health and wellbeing of first responders. MWS fully understands the design requirements associated with the equipment and detailing of these spaces to ensure compliance with NFPA 1581 (Infectious Disease Protocol) and NFPA 1851 (Gear Maintenance).

Functionally, the decontamination space should be assumed to be the most hazardous space within the building. It houses heavy-duty gear extractors designed to clean PPE gear, gear drying cabinets, emergency wash down areas, and areas to safely store garments exposed to have been exposed to hazardous materials. The space should be outfit with floor drains, trench drains, and hose bibs for easy cleanup. Similar to the bays, finishes should be selected to mitigate the risk construction materials being permeated with hazardous fluids. The HVAC system should also be isolated to prevent the risk of cross-contamination to other areas within the building.



KITCHEN, CULTURE AND HOODS

Arguably, the dayroom and the kitchen form the sacred heart of the station. They are the spaces that differentiate a fire station from a firehouse. They are the spaces where mentorship occurs, trust is formed, stories are told, and unbreakable bonds forged. As such, kitchens and day rooms should be flexible in their function, welcoming in their feel, and durable in their performance. Through the lens of flexibility, it is crucial to recognize that each shift may have its own unique culture, which is likely to change over time as personnel is reassigned or retires.

Kitchens should ideally be located along the exterior with access to an outdoor area that might provide a grill and/or eating and gathering area. Kitchen and dining areas should be functional, bright, and inviting, yet offer durability and functionality in its ability to create and provide meals.

Dayrooms fulfill a wide range of purposes. After a stressful series of calls, they may serve as an alternative quiet and dark place to rest and decompress. Moments later, they may function as a gathering area for a crew to watch competitive sports or serve as a center stage to lively competitive video games. That evening, the very same space might be used to teach a life-saving RIT (Rapid Intervention Team) Seminar.



While kitchens are essential to the culture of the department, they must still be technically sound to comply with applicable code standards and meet the unique operational demands of the project. Unique to any other building type, fire department kitchens float in the realm of ambiguity when it comes to their classification. Are they commercial, domestic, or both? – and does either classification make a difference in the project design requirements? What are the risks of an improperly designed kitchen and are there ways to make the space safe for first responder operation? Ultimately, the answer to these questions relies on the interpretation of the authority having jurisdiction (AHJ).

Three critical design parameters usually influence a technical requirement of a fire station kitchen. The first critical parameter that must be established is to determine the classification of the exhaust hood. Fundamentally, fire station kitchens are domestic by nature unless they are to prepare and serve food to the public. However, often the AHJ has determined that this classification does not create an exception to the criteria established by the International Mechanical Code (IMC), which requires that equipment that produces grease-laden vapor be placed under a UL Listed Type I hood (Ansul system). The second parameter, which is usually driven by budget and client preference, is determining the type of range equipment. Generally, cooking equipment is classified as commercial or domestic. This simple form of classification is often misleading to departments, as they might initially assume that the term “commercial” infers that the product is of greater quality and durability. This assumption is not always accurate, thus, equipment selections should be carefully vetted to ensure functionality and technical compliance.

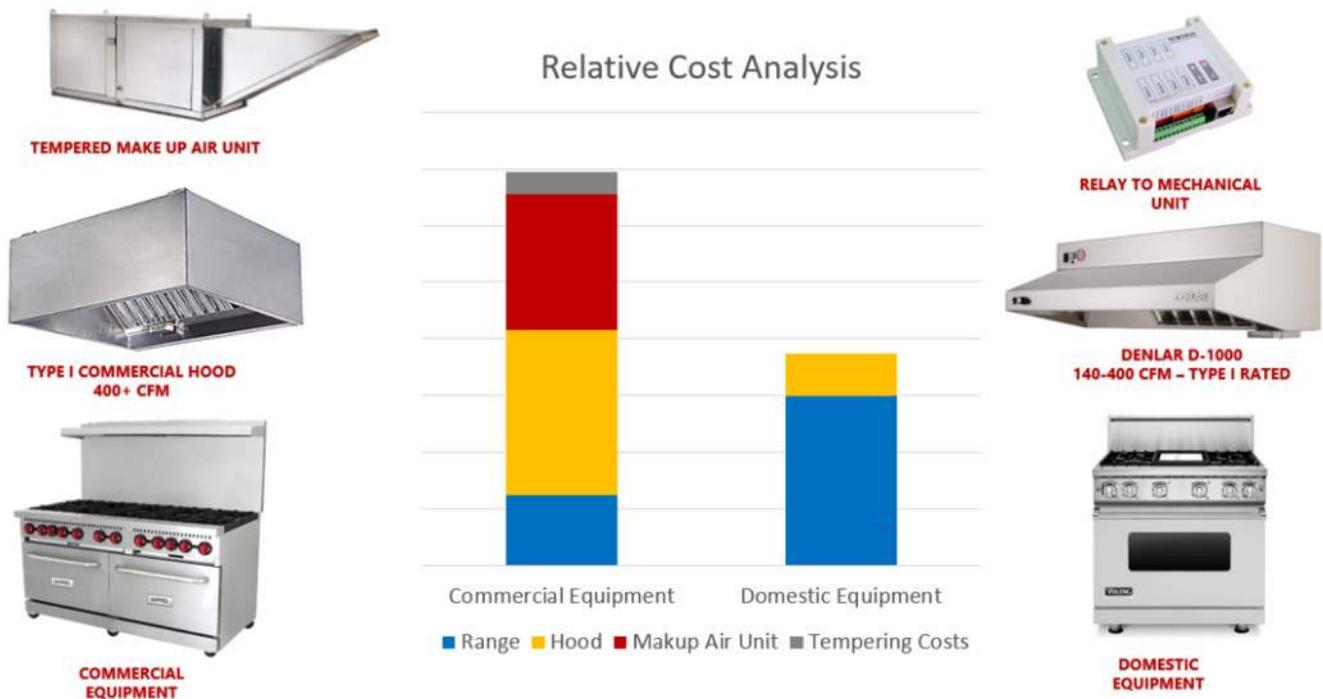
KITCHEN, CULTURE AND HOODS

The third variable, which directly relates to equipment selection and hood size, is determining whether or not a makeup air unit is required. When a kitchen hood is activated, the ventilation system will begin purging air from the occupied space. When the amount of air exhausted is nominal, this air is principally recovered from alternative sources such as excess supply and outside air delivered by voids common to the building envelope. However, when the rate of exhaust exceeds 400 CFM a makeup air unit (MAU) must be provided. Without an MAU the building will experience negative pressurization that may extinguish mechanical system pilot lights, or draw "contaminated air" into the building through the apparatus bay. The MAU is commonly a dedicated unit that delivers tempered air to the kitchen at the same rate at which the hood is exhausting it to ensure a balanced condition. As a general rule of thumb, 1 CFM is required for every 100 BTU of equipment output.

Domestic equipment is typically smaller in nature, yields less BTU in total output, does not require a pilot light and is usually insulated to allow minimal combustibility clearances. Commercial equipment is generally available in a broader range of sizes, may require a pilot light, exceeds 40,000 BTU in output, and contain uninsulated side and rear panels. The omission of insulation in the panels requires that equipment clearances be maintained from combustible materials. Usually, commercial equipment without insulation is economically incentivizing for commercial establishments that might establish an array of tightly spaced equipment under a shared hood. Another factor that is often initially incentivizing to departments is the initial cost of equipment. Usually, decent commercial equipment can be purchased at a lower cost when compared to high-quality domestic equipment.

Understanding these basic principles can aid a department in making critical decisions that will affect the long term flexibility and functionality of their station. One or two high-quality 40,000 BTU domestic ranges equipped with dedicated 400 CFM pre-packaged recirculating UL listed Type I hoods, and no required MAU might yield an attractive, flexible and cost-effective solution for a department. Whereas an inexpensive commercial range, custom UL listed type I hood and dedicated MAU might quickly add up to more than \$60,000 in cost and result in an institutional space.

Regardless of approach, the technical design requirements of the station kitchen should be designed to meet the specific needs of the department. As a matter of safety, the range system should always be integrated with the station alerting system to ensure responders don't accidentally leave cooking unattended when responding to an emergency.



BUNK, SHOWER, AND TOILET ACCOMMODATIONS

Generally speaking, the design and organization of bunk rooms and sleeping facilities play a significant role in the culture and effectiveness of a department. The configuration and design of bunking facilities also directly correlates to health and wellness, and response times. There are seemingly endless ways to configure bunks to achieve project goals, but generally, they are categorized into three basic typologies: Open, Semi-Private, and Private. Each typology offers distinct advantages and disadvantages as they relate to privacy, wellness, square footage requirements, cost, and response times.

With an increase in female first responders joining the profession, there has been a consistent demand to reconsider the living and sleeping environments within the station. Many departments recognize that their demographics are consistently changing and that what is planned for today may not satisfy the needs of tomorrow. Case law surrounding equality issues have continued to rise throughout the public safety legal landscape for the past 20 years and is now only further compounded by the most current issues regarding gender-neutral accommodations. Currently, there are no nationally adopted building codes requiring such accommodation.

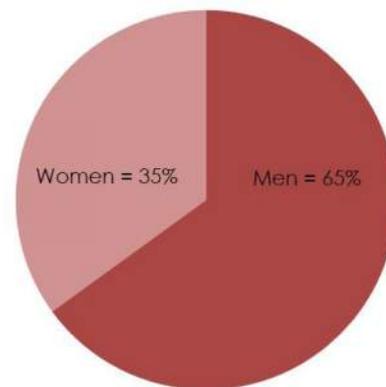
While the diversity and the cultural identity of a department may serve as influencer's on bunk-room accommodations, so too should responder health, wellness, and response. Recent scientific and medical research are further influencing the design challenges associated with bunk-room designs. Studies have shown that nearly twice the amount of injuries occur on calls between midnight and 6 am when compared to other times of the day. Many of these injuries are directly attributed to sleep deprivation. Sleep deprivation is directly linked to decreased mental performance, depression, cardiovascular disease, obesity, cancer and immune system deficiency – all of which are health risks to first responder personnel.

Yet the debate over individual dorms, gender-specific dorms, and co-ed dorms rages on. Each solution presents inherent advantages and disadvantages as they relate to culture, wellness, and cost. Private and small group bunk rooms are proven to afford first responders a better night's sleep due to the lack of disruption from others. Snoring, coughing, cell phone noises, and door slamming is typically contained to an isolated environment. Alerting systems can be equipped with a selector switch to ensure only crew members to be dispatched for a call are alerted. Beyond the functional benefits associated with separate rooms, large departments have also reported less sick time amongst crew members as communicable diseases such as the flu and colds are far less likely to affect an entire department or shift.

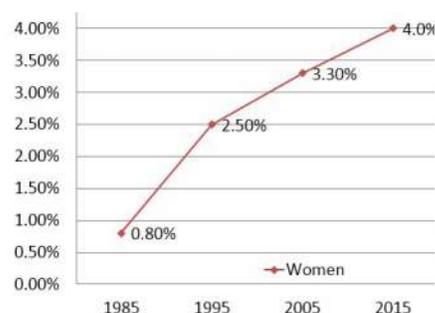
One obvious concern that many raise about private bunk rooms is the impact that they might have on the culture and camaraderie within the station. Worries over a responder sleeping through an alarm might be another issue. Cultural concerns revolving around isolationism can be overcome by limiting the opportunity for televisions within the rooms, implementing good departmental policies on bunk-room use, and providing quality community spaces in areas such as the kitchen and day room to encourage social activities better.

Similar to the challenges associated with sleeping quarters, toilet room and locker facilities face similar challenges. The design of dedicated male and female locker facilities may necessitate a commitment to the fixtures and equipment assigned to each area based upon an assumed trend. Knowing that a station is designed to accommodate a maximum complement of first responders, if the assumed distribution is wrong, resources are likely to be inappropriately assigned. For example, if the station is designed for 80% male and 20% female; and the actual compliment becomes 95% male and 5% female there is likely to be a shortage of resources for men while there is an excess in facilities for women that can not be utilized by men because of gender.

One potential solution to this problem is to develop flexible single-occupant toilet rooms that are accessible from a corridor lined with personnel lockers. Single occupant toilet rooms allow personnel to retrieve their personal belongings from their locker and enter a private shower and toilet facility to shower and change. Lockers that line the surrounding shower and bunk room corridors take advantage of circulation space already required by other programmatic areas. This approach can yield a significant reduction in project square footage. Overall, this approach ensures that the toilet and shower facilities are designed to satisfy the programmatic mission of providing locker and shower facilities for all personnel in a cost-effective and flexible manner.



Women in the EMS Service, 2015



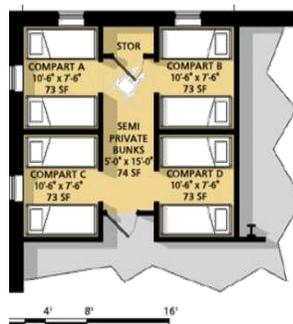
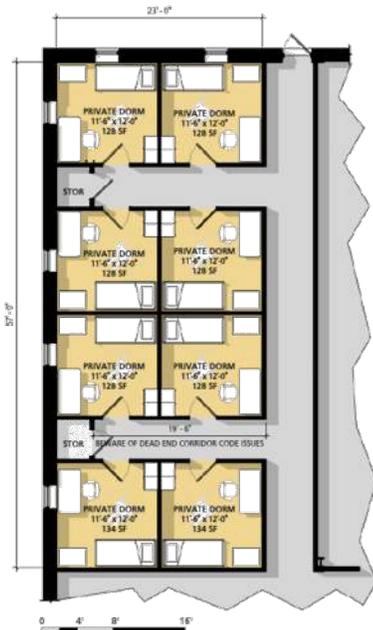
Women in the Fire Service, 2015
Trending at a 1% increase every 5-10 year

BUNK, SHOWER AND TOILET ACCOMMODATIONS

In any case, departments and architects are now faced with the challenge of how to best prepare for the future while looking at mitigating the risks associated with first responder health and gender equality. Our team stands prepared, with experience, to present a variety of solutions that can satisfy the cultural needs of the Reading Fire Department and its responders.

Below and on the following pages, you will find a sample study we have developed for bunk rooms and toilet facilities. The studies and others like it have proven to be extremely helpful to many of our clients when trying to balance program and budget early in the process.

SAMPLE BUNK ROOM STYLES

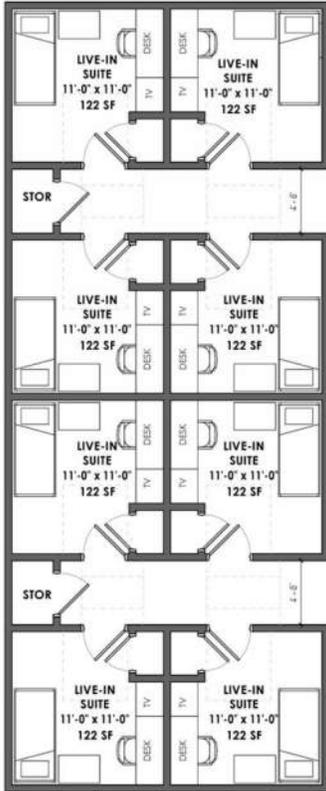


ADA ACCESSIBILITY

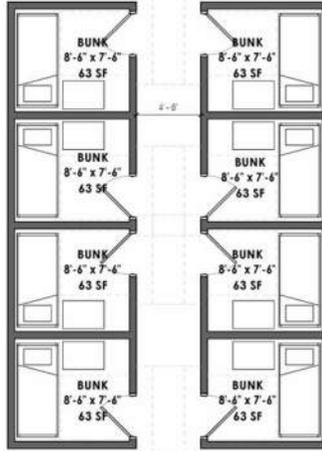
Our team understands that fire stations are considered public buildings and that the entire station, in accordance with Federal Laws, must be 100% accessible. Over the years numerous departments have requested that we explore exception to this requirement under the premise that firefighters are able bodied personnel and must be so to perform their duties. As such, we have made numerous inquires to the United States Department of Justice to obtain an official interpretation. In all cases the Department of Justice has ruled that fire stations must meet accessibility requirements.

EXISTING OPERATIONS

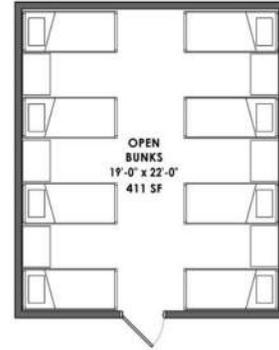
Our team carries a significant depth of experience in designing stations to ensure existing operations can be sustained during construction. We have a very clear understanding of the impacts new construction can have on an existing and occupied facility. It is of the utmost importance that any proposed design be tailored to ensure fire-rescue operations are not hampered during the construction process.



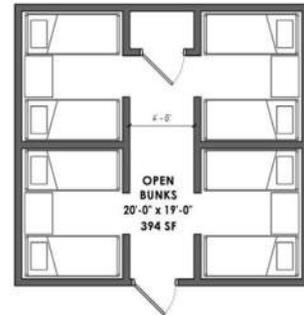
OPTION 1: LIVE IN DORMS



OPTION 2: PRIVATE BUNKS



OPTION 3: OPEN BUNKS

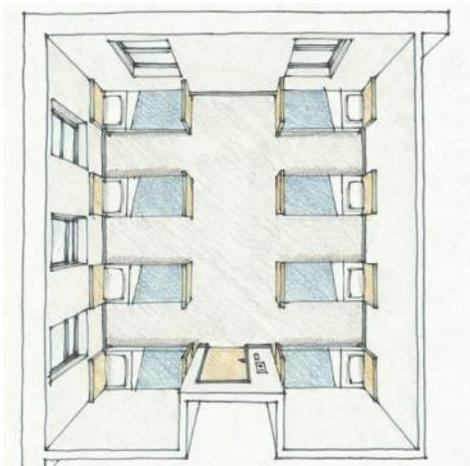


OPTION 4: SEMI-PRIVATE BUNKS

- **Option 1: Live-In Dorms**
 - 18 Doors
 - 976 Net SF / 1,351 Gross
 - 12 Light Fixtures
 - 10 Diffusers
 - 8 Alerting Speakers
 - 396 LF of walls
 - Cost @ \$200/SF = \$270,200
- **Option 2: Private Bunks**
 - 8 Doors
 - 504 Net SF / 763 Gross
 - 11 Light Fixtures
 - 10 Diffusers
 - 8 Alerting Speakers
 - 250 LF of walls
 - Cost @ \$200/SF = \$152,600
- **Option 3: Open Bunks**
 - 1 Doors
 - 418 Net SF / 449 Gross
 - 6 Light Fixtures
 - 6 Diffusers
 - 1 Alerting Speakers
 - 85 LF of walls
 - Cost @ \$200/SF = \$89,800
- **Option 4: Semi-Private**
 - 2 Doors
 - 393 Net SF / 440 Gross
 - 4 Light Fixtures
 - 4 Diffusers
 - 2 Alerting Speakers
 - 125 LF of walls
 - Cost @ \$200/SF = \$88,000

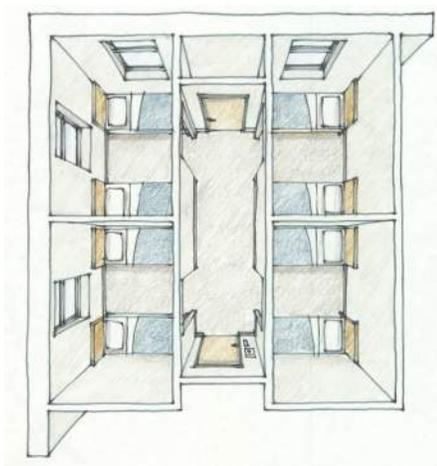
OPEN BUNKROOM

Perhaps the most traditional methodology, open bunk rooms, consist of large rooms designed to accommodate multiple beds. In some instances, the sleeping positions may be separated by partial height walls or screening devices, while continuing to share the same lighting, alerting, and mechanical systems. Even with partial height partitions, Beds are often spaced apart. Thus, these areas require a moderate amount of square footage. An open style configuration is usually the least costly to build but comes at the expense of the first responder wellness and privacy.



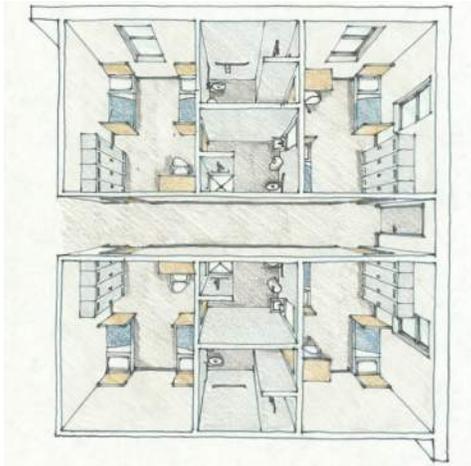
SEMI-PRIVATE BUNKROOMS

Semi-private bunkrooms usually consist of beds or bunks open and accessible to a common access aisleway but separated by full-height partitions. Semi-private style configurations strike a balance between open and private bunk rooms as they afford some privacy, yet still often share lighting, mechanical, and alerting systems. The utilization of full-height partitions also allows for beds to be placed immediately adjacent to the wall on both sides. This approach often yields the most compact footprint.



PRIVATE BUNKROOM

Private bunks are usually classified as individual dormitory-style rooms with a capacity of one or two occupants. In certain instances, where staffing is assigned to a specific apparatus, these rooms may be larger to accommodate the entire apparatus crew. Private bunk rooms typically require the most space and infrastructure but provide the highest degree of privacy and best mitigate against risks to first responder health and wellness. Cardiovascular disease has been directly linked to sleep deprivation, and in the current pandemic, the ability to isolation and/or quarantine has never been more important. Individualized sleeping quarters have long been proven to mitigate the spread of viruses and bacteria, as well as afford a better quality of sleep.



FACTORS TO DECIDE UPON

Rendering a decision about which bunkroom configuration is right for the County of Pasquotank will require the stakeholders to consider many factors. Below are just a few to consider:

Privacy & Gender Neutrality: In the past, the conversation on gender neutrality mostly revolved around the culture and context of the fire service. Today, the ever-changing landscape of law surrounding gender and discrimination requires departments to strive to achieve a “one-size-fits-all” solution that is inclusive, allows for privacy, and mitigates the risk of litigation.

Gender equality continues to remain a focal point in the design of fire stations as more women continue to enter emergency services. To ensure appropriate quarters, shower, and locker facilities are provided for all staff, a careful analysis of short and long-term staffing needs should be performed.

The traditional gender-specific dorm strategy of one communal bunk area, one locker room, and one bathroom for each sex is usually not the most flexible or cost-effective solution for a department. When multiple shifts of varying demographic composition are operating from the same station, this often results in high inefficiency.

Case Study Example: A Department operates (4) shifts, with each shift staffing (4) firefighters and (2) EMT’s. The gender composition of each shift varies as follows:

Shift	Male	Female	Utilization
A Shift	 3M/3F	 3M/3F	3M/3F
B Shift	 4M/2F	 4M/2F	4M/2F
C Shift	 2M/4F	 2M/4F	2M/4F
D Shift	 5M/1F	 5M/1F	5M/1F
	Occupied Bed		
	Vacant Bed		

FACTORS TO DECIDE UPON

In the-referenced scenario on the previous page, the maximum occupancy for any given shift of each sex is (5) males and (4) females. As such, to accommodate "C Shift," a female bunk room of (4) beds would be required. To provide for "D Shift," a male bunk room of (5) beds would be required. In a traditional segregated configuration, the station would need to provide a minimum of (9) sleeping positions to accommodate only (6) first responders. This scenario suggests that at any given time, beds are being left empty. This vacancy, in turn, means that valuable square-footage and resources are going unutilized on multiple duty days. Conversely, if the demographics shift beyond the pre-determined maximum occupant loads (I.E., 5 Females), there will likely be a shortage of sleeping positions for one gender.

Rather than design large traditional dormitories that can address all possible scenarios, a department should consider providing flexible solutions that optimize preparedness and operational efficiency. In many instances, the utilization of private bunkrooms, or coed semi-private sleeping quarters will generate flexible and practical solutions that address the privacy needs of all first responders regardless of gender or sexual orientation.

Culture: "Old Salt" first responders have often cited the bunkroom area as the heart of the station. Traditionally, it is where countless stories are told, and pranks are pulled. This begs the question, were the bonds and memories formed in these spaces a result of design or adaptation? Had there been a more appropriate space in their career, would those same bonds have been formed there instead? Today, should sleeping facilities be prioritized and looked at as purposely designed spaces that support the health and wellness of a first responder? Can we carry on 200 hundred years of tradition elsewhere in the building in a more appropriate way? It is said that a firefighter's career both begins and ends at the kitchen table. Perhaps it is the kitchen that is, in fact, the heart of a station.

Health & Wellness: The health and wellness of first-responders have become an increasingly more important topic in the design of fire and EMS stations. Studies continue to identify cancer, cardiovascular disease, and mental health as challenges within the service. The integration and design of fitness areas, decontamination zones, and bunk rooms can play a significant role in addressing these issues. Below are but a few designs parameters to consider:

Natural Daylight: The inclusion of natural daylight into sleeping facilities is of the utmost importance. For first responders, sleep deprivation is often linked to circadian rhythm disorder, which can cause stress, weight gain, and heart disease. Providing first responders with ample natural daylight allows for their body to more naturally biologically link with the time of day. When sleeping during daylight hours must occur, light dissipating and total blackout shades can be integrated into the window shades to allow for full light control and flexibility.

Alerting Systems: Integrating modern alerting system technology into the design of the bunk areas is essential to support the goal of promoting first responder wellness. Older style claxon alarms have been proven to startle sleeping personnel, which over time, can cause stress and cardiac health issues. Contemporary alerting systems often gradually increase lighting and sound to awaken a first responder and have proven to be equally, if not more effective.

If sleeping facilities are separated from one another, an assignment selector switch can be integrated into the design of each room. This approach ensures that only the appropriate crew is signaled for dispatch, allowing the remaining occupants of the building to remain asleep.

Sufficient Space: Allowing for sufficient space within each sleeping area provides both mental and physical benefits. Ensuring that the response floor area is free of tripping hazards is essential. NFPA 1581 Standard recommends/requires 60 NSF of open floor area for each bed. Today, given the Covid-19 pandemic, one might consider even more space if multiple beds are sharing a room.

Mechanical Isolation: When designed appropriately, private bunkrooms are superior to other strategies when it comes to isolating contagions that may be transmitted amongst coworkers. In addition to the physical separation, the integration of Ultraviolet (UV) light sterilization and HEPA filtration within the mechanical systems can further mitigate the risk of exposure to airborne viruses and bacteria. Even outside of the current Covid-19 pandemic, the integration of such solutions often results in fewer sick days and transmission of communicable disease amongst first responders. When comparing the capital construction costs against the human resource costs of paying for medical expenses and overtime, the decision on whether or not to implement these technologies is usually a clear and wise investment.

Sleep Quality: Four key factors that play a role in improving first responder sleep quality; acoustics, thermal comfort, lighting, and personal comfort. Acoustically, the design team should consider how to mitigate sounds originating from CPAP machines, cell phones, snoring, outside traffic, and perhaps even overhead door motors. Thermal comfort can be accomplished by providing each sleeping area with programmable thermostats that allow the user to work within a pre-determined range of setpoints.

FACTORS TO DECIDE UPON

Lighting controls should provide maximum flexibility and consideration should be given to including low-level floor lighting that gently illuminates paths of travel during evening hours. This strategy allows for first responders to navigate the station in the middle of the night without completely dilating their eyes should they need to use the restroom or get a drink. Finally, personal comfort revolves around selecting quality beds, mattresses, and ensuring there is sufficient storage space for personal effects such as pillows, sheets, and blankets.

Private Bunk Rooms & Response Times: Two common critiques of private bunk rooms are 1.) What happens if someone sleeps through a call? And 2.) What happens if someone has a heart attack? Both of these concerns can be resolved through technological innovation. Heartrate mattress monitors can be integrated into alarm and signaling systems. For example, the system, detecting a sleeping first responder may relay to a small red light outside of the door. A responding crew passing by may then take more aggressive measures to awaken that individual should they sleep through the alarm. Similarly, newer technology can now activate a duress alarm if cardiac arrest is suspected of having occurred.

Bed Bugs & Vector-Borne Disease: While bed bugs rarely transmit disease, they are at best, an annoyance to anyone who must experience living with them. Their presence is not determined by the level of cleanliness of a station. They have been found at meticulously maintained five-star hotels and resorts.

Bed bug infestations usually occur around or near areas where people sleep. Their bites cause itching and discomfort, and in exceptionally rare instances, may transmit diseases. They tend to hide during the day in places such as the seams of a mattress, box spring, bed frame, or construction cracks and crevices.

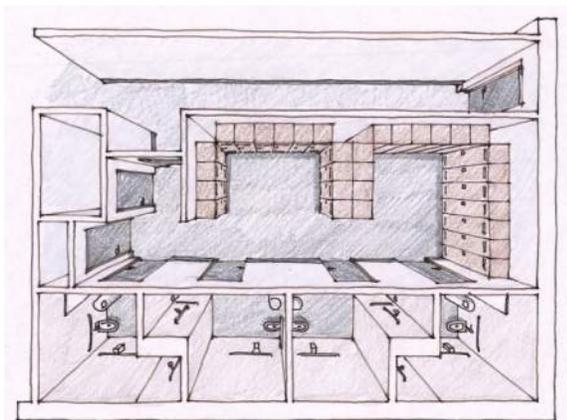
Good design and quality craftsmanship can mitigate the risk of infestation provided that the department maintains well thought out standard operating procedures. Some methods to mitigate the risk of infestation include:

- The project team should carefully select furniture with minimal voids and crevices.
- The department cover mattresses with protective covers.
- All gaps, joints, and voids within locker and sleeping areas should be sealed with expandable foams or continuous sealants.
- First responders should keep all linens and clothing within sealed totes or bins. The project team should then carefully consider storage solutions to accommodate those bins.
- Clothing, cardboard, and other materials should never be left on the floor. The design team should consider how and where dirty laundry will be stored.
- Should infestation occur, bed bugs are commonly exterminated by heating a space to above 115 degrees. It is recommended that all bunk, locker, and shower areas be isolated from one another with frame and sill seals. Further, ductwork serving these areas be equipped with accessible manual dampers. This cost-effective practice allows for the department to isolate specific areas of the building, bring in a remote heater, and treat that area without having to shut down the entire station.

Trends & Conclusion: While there is no right or wrong strategy for bunkroom design, there has been a consistent trend towards providing first responders with private facilities. The emotional and fiscal tolls that cancer and cardiovascular disease impose on the municipality, the first responders, and their families, is immeasurable. Departments and municipalities generally appear to be more willing to make this investment as they continue to become more aware of the health and wellness benefits that private facilities provide.

LOCKER AND SHOWER FACILITIES

The same issues which surround the design of sleeping facilities directly correlate to that of shower and locker facilities. Resource utilization, privacy, spatial requirements, and flexibility all are but a few of the common threads that impact both spaces. Generally, personnel storage lockers and shower facilities are classified in one of three manners:



Traditional Locker Rooms & Shower Facilities: The creation of actual locker rooms has been a traditional staple of fire station design for decades. However, over the course of the past two decades, they have given way to more effective solutions.

Conventional locker rooms usually consist of two variations; Co-Ed, and Gender-Specific. Co-Ed locker rooms will provide space for all personnel locker units and immediate access to individualized uni-sex toilet and shower rooms. Staff is expected to take their personal effects with them into the individual shower rooms to change. On the other hand, Gender-Specific shower rooms may have "gang" shower and toilet combinations or individual rooms, but afford the option for personnel to get changed within the locker room itself.

Gender-specific locker rooms present specific space and flexibility challenges, similar to that of the case study previously presented on bed utilization. Without over-designing the number of lockers required for a fully staffed station, gender-specific locker rooms will often result in vacant lockers being available in one area, and a shortage in another. The effectiveness of gender-specific locker rooms is further diminished when accounting for the legal and privacy needs that are associated with providing equal accommodations for LGBT personnel.

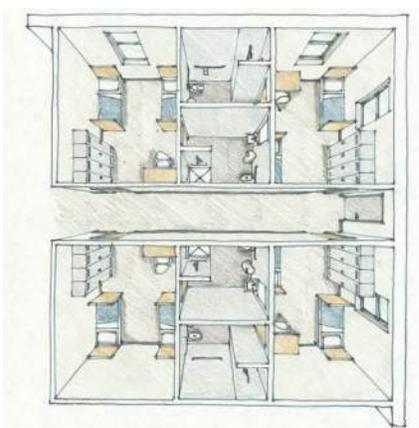
Finally, both variations of traditional lockers rooms tend to utilize significantly more square footage than alternative solutions. Lockers placed in a dedicated locker room require aisles and circulation space to access each unit. Establishing even the most compact circulation routes to locker areas usually consumes a considerable amount of square footage. Alternative configurations of locker areas typically allow for the design team to take advantage of access corridors that are naturally present within the design.

LOCKER AND SHOWER FACILITIES

In-Corridor & Private Shower: Locating locker rooms within natural circulation paths within the bunk and shower room areas is a common practice that provides the highest degree of flexibility with the least impact on building size and cost. In this configuration, lockers are nested within corridor walls, usually just outside of bunkroom and shower room areas. This approach ensures that the facility provides a precise quantity of lockers for the station which can be equitably assigned to staff regardless of gender, race, or creed.

Staff is expected to collect their personal belonging from their locker and utilize an individual shower/toilet room to shower and change. Once complete, space should be cleaned and made available for the next person. Perhaps the only disadvantage that accompanies this solution is the inconvenience of carrying personnel effects back-and-forth regularly.

When compared to an In-Bunk approach, this solution also allows for less disruption to personnel that may be sleeping or otherwise occupying the bunkroom itself – which may be particularly prevalent during shift change. A department will usually evaluate the inconvenience of carrying items vs. disadvantage disrupting someone’s sleep when deciding what approach is best for them.



In-Bunk Lockers & Private Showers: Locating lockers within the bunkroom itself is usually only feasible for departments that utilize a shift structure where first responders are regularly assigned specific rooms. This approach allows personnel to get changed within the privacy of their bunk area and, depending on the configuration of shower facilities, complete hygiene routines at remotely located individual toilet/shower rooms. This solution also has the highest potential for flexibility and privacy, especially if the toilet and shower rooms are connected to the bunk rooms in a jack-and-jill configuration. It should be noted that depending on the number of bunk rooms, a jack-and-jill configuration may result in a design with more toilet and shower facilities than otherwise required by code.

The disadvantage that accompanies this locker design approach is the risk of sleep disruption. Usually, across all shifts, multiple personnel will share a bunkroom. When an individual has completed a particularly hard day, they may choose to sleep at the station a little longer rather than risk falling asleep while driving home. As the next shift arrives for duty, they risk disrupting an individual’s sleep as they gain access to their locker.

Finally, hybrid solutions are always available. In the past, some departments have utilized pass-thru lockers in an attempt to achieve the best that both solutions have to offer. When considering this approach, the design team should carefully select lockers to maintain fire ratings and acoustical separation.

Design Considerations: The design of locker and shower facilities should be organized to maximize flexibility, improve operational efficiency while controlling project costs. Regardless of which approach is taken the project team should ensure lockers are of sufficient size to house boots, uniforms, linens, and other large items that first responders will utilize. When selecting a locker system, one should also consider how noisy they are when closing, how they are ventilated, and how they will be properly secured. Finally, the project team should consider whether or not to include charging ports and whether or not night lighting should be integrated with the toe-kicks.

INFRASTRUCTURE AND RESILIENCY

The nature of emergency services require that a fire station be operationally prepared to respond to the surrounding community immediately following, and sometimes during, natural disasters. As such, first responders must be able to rely on the essential systems that serve their facility. Stand-by emergency backup generators should ideally be installed for the project with a reliable fuel capacity to meet operational demands for a minimal operation time of 72 hours. Since generators require a start-up time period, an uninterruptable power supply (UPS) battery system should be provided for mission-critical systems such as computers, servers, communications equipment, access control systems, etc. The UPS will ensure continuity of operation and prevent loss of service during the brief period in which the facility is without power while the generator comes online.

The proposed site is located less than 1 mile from the Atlantic Ocean. In 2012, Hurricane Sandy produced heavy volumes of rain and winds in excess of 90 miles per hour. Further north, the States of New Jersey, New York, and Connecticut, amongst others, suffered debilitating damage as the storm stalled over the region. As a mission-critical facility, this station should be designed to withstand the genuine risk of facing similar events. Ensuring that the station remains functional, personnel is safe, and equipment prepared to serve the community is of the utmost importance. Our team suggests that the City and Department consider adopting standards such as FEMA 543 for this project.

In addition to the above-referenced risk, this facility may require “N+1” systems redundancy to ensure uninterrupted continuity of system infrastructure during power outages and storms. The City and Department may wish to consider dual service feeds to improve systems reliability. Our team may also suggest enclosing critical outdoor equipment such as chillers and generators. In this instance, equipment may be placed within ventilated storm hardened cages that will protect them from being damaged, and taken offline, by windborne debris.



FORCE PROTECTION

Conventional building codes, such as IBC and NFPA, are requirements that set the minimum standard of care regarding the protection of the life, safety, and wellbeing of the occupants of all types of buildings. When jurisdictions adopt these standards via legislative measures, they become law and establish the design protocols for what can be considered a minimum acceptable risk. These standards of care address a wide variety of building and construction types. And, while the umbrella of these codes certainly addresses the general use and occupancies of a fire station, they do not address the many unique risks to public safety facilities.

Standards such as Crime Prevention Through Environmental Design (CPTED), UFC Anti-Terrorism and Force Protection Design Guidelines are authored by panels of experts with significant experience in the design, construction, and operations of similar facilities that are at an elevated risk of being attacked. Given that the design and development of a public safety facility is an infrequent occurrence, it is uncommon for legislative bodies to adopt such standards when establishing building code requirements. These standards exist for specific reasons as there is a long history in this country of fire station and public safety facilities that have faced attack. These guidelines establish a standard of care protecting the occupants of public safety facilities from low-frequency high-risk events.

Beyond the structural requirements established by IBC, conventional practices in certain communities now strongly encourage careful consideration of ballistic protection from outside threats. Beyond the minimally mandated measures, a careful and thoughtful design must take place to ensure resiliency while controlling project costs. Additional and more stringent standards that may apply to public safety facilities include but are not necessarily limited to FEMA 543, NEC 708, UFC 04-012-23. Compliance with these codes and standards often drive project costs beyond what one might expect with a traditional building typology.



Varying Types of Ballistic Glazing

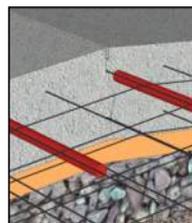
In short, the term “Hardening” can mean many different things depending upon which standards are applicable. Blast resistant, floodproofing, progressive collapse prevention and numerous other criteria are all further defined within each of these standards. Often funding sources will dictate which standards apply to a project. Where multiple standards are applicable, the most stringent standards apply. Our team will assist the Department in determining what requirements this project must subscribe to and which ones are elective best practices.

APPARATUS BAY SYSTEM DETAILS AND TECHNOLOGIES

Our team has designed stations utilizing a wide array of mechanical systems that are tailored to fit the project requirements and the owner’s budget. We possess a clear understanding that a fire station carries many unique requirements when compared to other building types. We understand that oftentimes the building systems (mechanical, electrical, plumbing) require careful integration with one another in order to optimize their performance. Below you will find a demonstration of some of the specific technologies that we have mastered within the realm of the apparatus bay.

BAY SLAB CONDITIONS

The structural slab must support the load of the fire apparatus and is largely dependent upon the soil conditions of the site. Be sure to conduct geotechnical engineering analysis early in the design process to ensure soils are capable of supporting loads of the apparatus, foundation, etc. In-floor radiant heat requires careful coordination with structural elements, slopes, and drains. Slabs should be sloped to optimize water drainage.

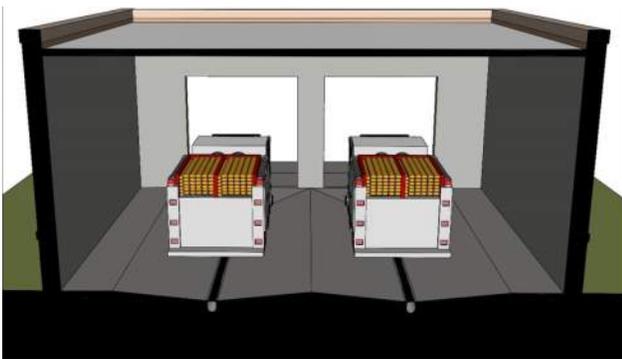
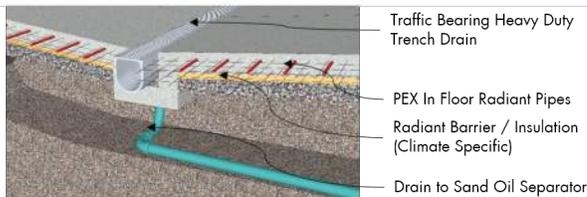
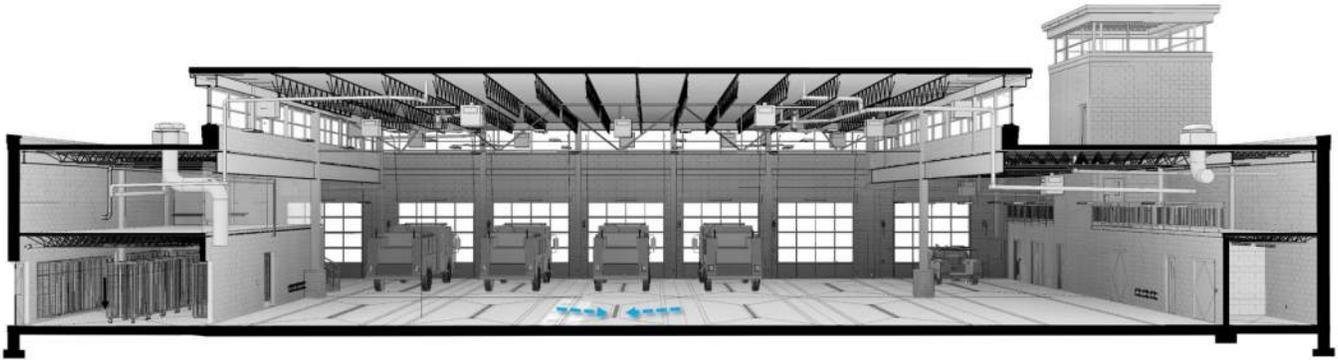


Slab Control Joint

APPARATUS BAY SYSTEM DETAILS AND TECHNOLOGIES

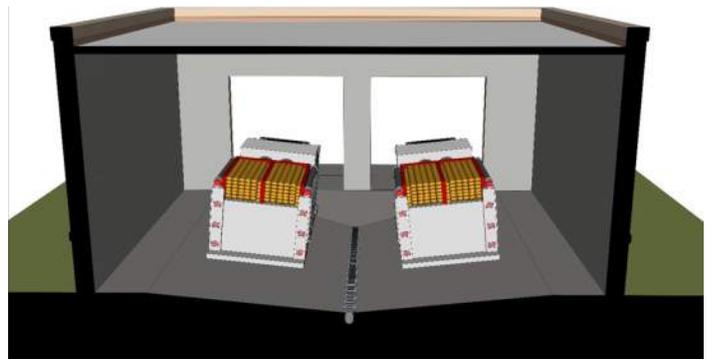
BAY TRENCH DRAIN SYSTEMS

Trench drains collect water and snow runoff from the apparatus. Ideally, they should slope to the center of the door line to ensure water drains away from walking paths, and that apparatus is parked with all wheel points at the same elevation. Trench drains should then typically connect to a sand and oil separator to prevent environmental contamination.



Slab Slopes to Center of Door Line

- Water slopes away from walking paths
- Wheel points at same elevation
- Vehicles not in contact with drains



Slab Slopes to Center of Piers or Columns

- Water slopes towards walking paths
- Wheel points at different elevations
- Stress on suspension
- Vehicles not in contact with drains

NATURAL AND ARTIFICIAL LIGHT

Both natural and artificial lighting plays a large role in sustainability and first responder health and wellness. As referenced in the narrative on bunkroom design, cardiovascular disease can be directly linked to sleeping and circadian rhythm disorders. As first responders tend to work long shifts throughout their entire careers, it is easy for their body to lose the natural sleep-wake cycle. Ensuring that occupied portions of the station have plentiful access to natural daylight is a significant measure the project team can take to help regulate first responder circadian rhythm.

Natural light is often provided to the interior of a station through windows, clerestory assemblies, skylights, and/or courtyards. Studies have also demonstrated that access to natural light improves morale and productivity. As such, the benefits of natural light cannot be overstated when it comes to combatting first responder mental health. First responders are regularly exposed to traumatic incidents that can take their toll on an individual's mental health and wellbeing. Statistics have shown that a department is four times more likely to experience a suicide-related death than a line of duty death. We must continue to stress the benefits of good design as public safety entities become increasingly more aware and vocal about mental health and PTSD.

In addition to the physical benefits, natural light also contributes to a station's energy efficiency and sustainability. Properly designed overhangs can provide the station with natural passive-solar heating and allow the building to capture solar radiation during the winter when the sun is lower in the sky. During the summer months, when the sun is high, overhangs shade the building to mitigate heat gain. Further, the implementation of natural light can reduce energy use associated with artificial lighting. Spaces equipped with photocells or light monitors can be designed to automatically scale back or turn off artificial lighting when natural light fills a space.

The selection of artificial light fixtures and controls plays an equally important role in sustainability and wellness. Technology now exists that allows the color temperature of artificial lights to replicate real-time outdoor conditions. During the daytime, light fixtures will produce a bright white (5000–6500 K) color. As day turns to evening, the fixtures will gradually adjust to a more relaxing soft or warm white (2700-3000k). The utilization of this technology has proven to be beneficial to health and wellness in the healthcare industry as it aids in balancing the circadian rhythm of medical professionals.

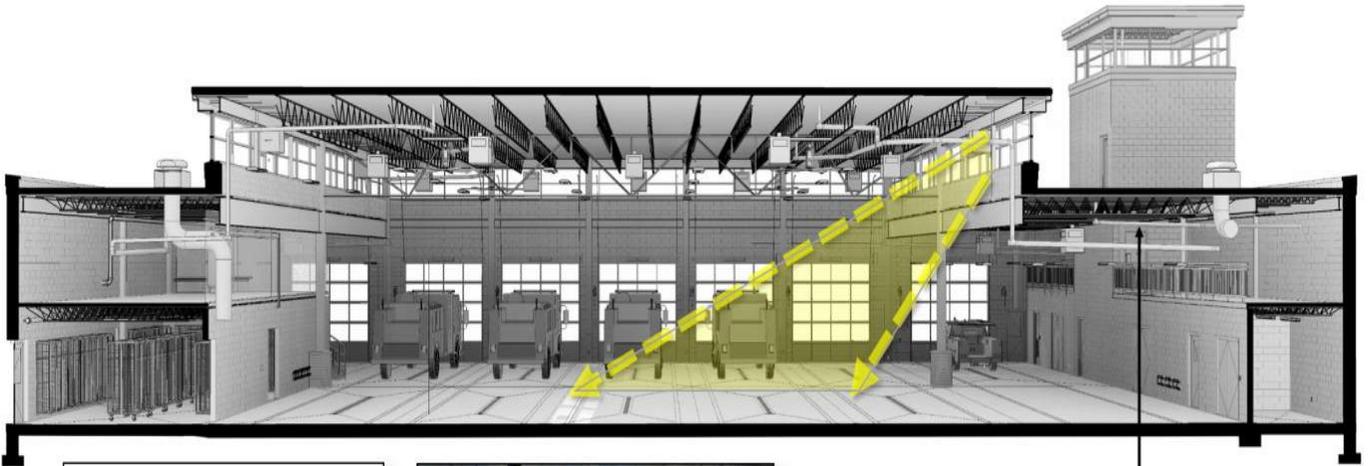
Additional strategies for sustainability include but are not necessarily limited to:

- Utilize LED light fixtures throughout the entire station.
- Ensure all occupied portions of the station receive access to natural daylight.
- Shield southern exposures from direct sunlight utilizing canopies, overhangs, or sun louvers.
- Integrate artificial lighting with daylight monitoring controls that automatically dims perimeter zone lighting when sufficient natural daylighting is available.
- Fire Stations are 24/7/365 facilities that regularly utilize hot water. Consider integrating solar hot water heaters into the design of the station.
- Consider collecting rainwater from the roof for irrigation, apparatus washing, and fire suppression water.
- Consider photovoltaic solar panels after carefully evaluating costs, funding sources, and the return on investment.
- If geothermal is being considered, be sure to carefully analyze the demand for the station. As a 24/7/365 facility, fire stations often require significantly larger geothermal well fields to recover and properly perform.
- Consider utilizing Variable Refrigerant Flow (VRF) mechanical systems which can provide a quasi-redundancy and energy-efficient solution capable of simultaneously heating and cooling different areas of the building.

NATURAL AND ARTIFICIAL LIGHT

NATURAL DAYLIGHTING

Clerestory windows and skylights can be utilized to flood the apparatus bay with natural light, significantly reducing the costs associated with providing artificial light. Light fixtures can be wired to dimmers and control devices that monitor the amount of natural daylight entering the space. When sufficient natural light is available the lights will be dimmed or turned off. Such a system can be zoned to address darker areas of the bay.



Light Monitors Can Adjust to Provide Varying Degrees of Artificial Illumination in Darker Zones



NATURAL AND ARTIFICIAL LIGHT

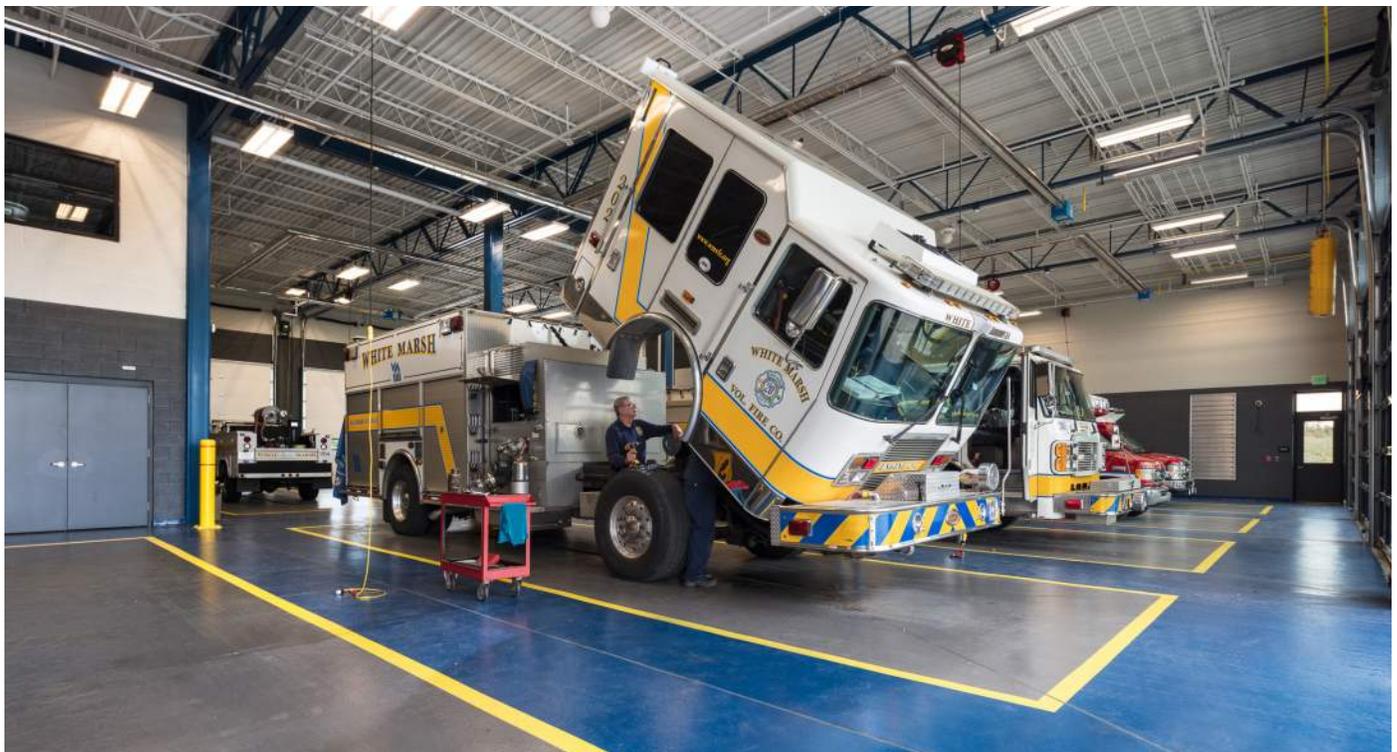
ARTIFICIAL LIGHTING

Artificial lighting has made tremendous strides in the past 10 years. Studies have proven that LED fixtures provide a short term return on investment and are capable of instantly illuminating. Lights should be carefully located between apparatus to ensure the parked apparatus does not cast shadows on walking surfaces. If the project requires overhead infrared radiant heaters, the design will require careful coordination to keep the fixtures away from the heater combustibility zone.

Further, the lighting control systems within the building can be integrated into the alerting system so that lights are automatically turned on when a call is received.



Are you washing apparatus inside?
Check to make sure fixtures are damp proof of waterproof.



BAY AIR CONTROL

BAY INDUSTRIAL FANS

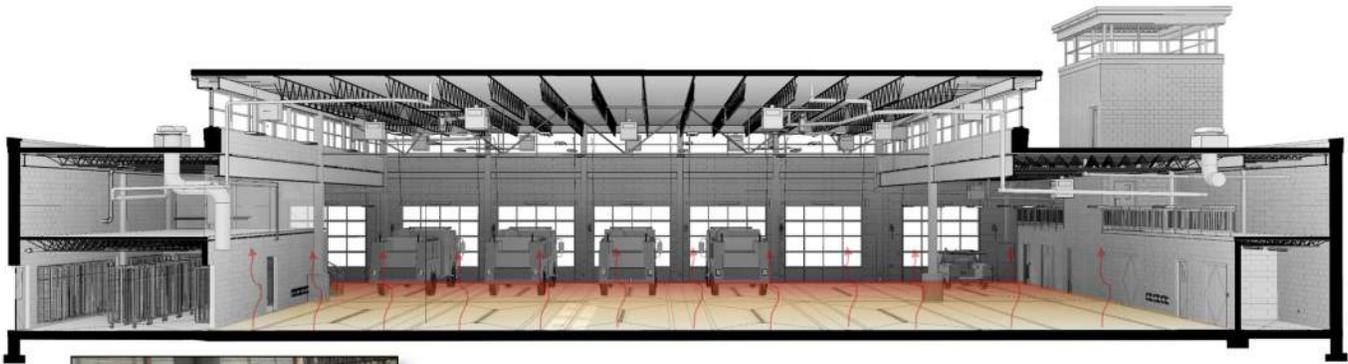
Large industrial fans can be utilized during both the heating and cooling season to achieve occupant comfort in the bays. High bay structures such as apparatus bay tend to experience air stratification. Low speed, high volume fans help to de-stratify the air and improve air quality and overall comfort. During the winter months, the fans can work to mix high temperatures found at the ceiling with the lower temperatures on the floor, rendering the heating system more efficient.



Make sure the air foils (blades) of the fans are free and clear of objects such as equipment hangers, air, and electric drops. Don't place fans above area where overhead sectional doors will be in the raised position.

BAY HEATING

Heating the apparatus bay is crucially important to maintain occupant comfort and equipment functionality. Radiant heat is ideal for all instances as it allows the building to efficiently recover from the cold air that may rush in from an open bay door. Radiant energy is stored in objects or “thermal mass” (concrete slab), which then “radiates” heat into the surrounding space, thus warming the environment. The energy is stored in the slab, not in the air and may be generated from in-floor radiant heat systems or overhead gas fire infrared heaters.



In Floor Radiant Heat Being Installed



Infrared Radiant Heater

Radiant PEX tubing must be carefully coordinated during construction with control joint cuts to ensure damage does not occur during construction. Tubing must have appropriate concrete coverage.



IN FLOOR RADIANT HEAT

Advantages

- Does not bake apparatus
- Quick recovery time
- Low operating costs
- No impact on ceiling coordination
- No exhaust requirements
- Long life span
- Can be extended to apron for snow melt

Disadvantages

- Initial costs
- Damage are costly to repair

INFRARED RADIANT HEAT

Advantages

- Most cost effective
- Quick recovery time

Disadvantages

- Required careful ceiling coordination to avoid other equipment being within combustible clearances. In some circumstances wider spaces between doors may be necessary, increasing overall building size. Building structure may also need to be taller.
- Requires exhaust and intake pipes
- Requires propane or gas to operate

FORCED AIR HEAT

Advantages

- None, just don't do it. Please...

Disadvantages

- Expensive to recover heat
- Does not heat objects
- Expensive to operate

BAY GENERAL EXHAUST

In many circumstances, regardless of vehicle exhaust systems, building codes require that apparatus bays be ventilated with fresh air. Advanced and cost-effective sensors can detect a wide range of unhealthy gases, inclusive of carbon monoxide. When quantities reach unsafe levels fresh air intake and exhaust fans are activated to “exchange” the volume of air in the building with fresh air. Intake fans or motor operated louvers provide fresh air at lower elevations and are then exhausted high to achieve a complete cycle. The system can also be manually activated to assist with air circulation on hot days.

Consider monitoring air quality and exhausting turn-out gear rooms to address gear “off gassing”

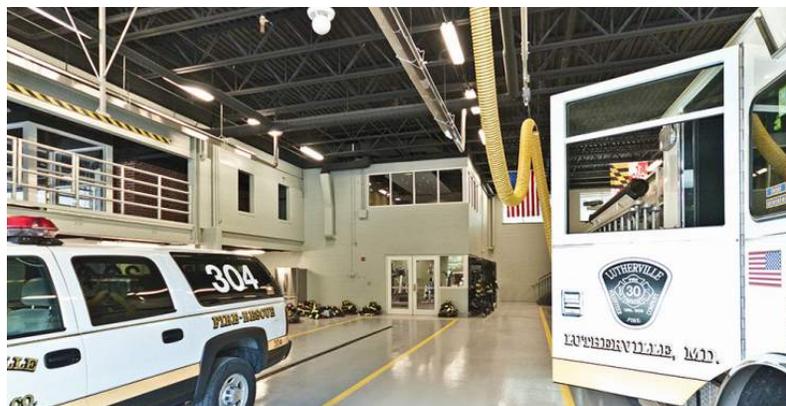
Example of ducted exhaust system

Gas Monitors

Carbon monoxide detectors should be located both high and low to ensure air quality is being monitored. Monitors should be connected to relays that activate intake and exhaust features.

APPARATUS VEHICLE EXHAUST

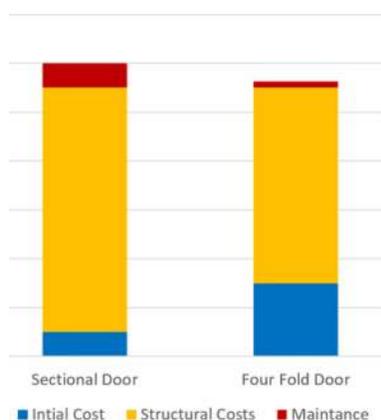
In addition to general bay exhaust, NFPA standards require that personnel be protected from exposure to vehicle exhaust particulates. Specifically, NFPA 1500 9.1.6 states “The fire department shall prevent exposure to firefighters and contamination of living and sleeping areas to exhaust emissions.” Compliance with such standards usually comes in one of three forms. A.) Vehicle-mounted exhaust equipment such a that manufactured by Ward Diesel; B.) Integration of Direct Source Capture Systems such as that manufactured by Plymovent, MagneGrip, and Nederman; C.) High-Grade Multi-Stage Hepa Filtration Systems such as that manufactured by AirVac and Airmation.



APPARATUS BAY DOOR OPERATIONS

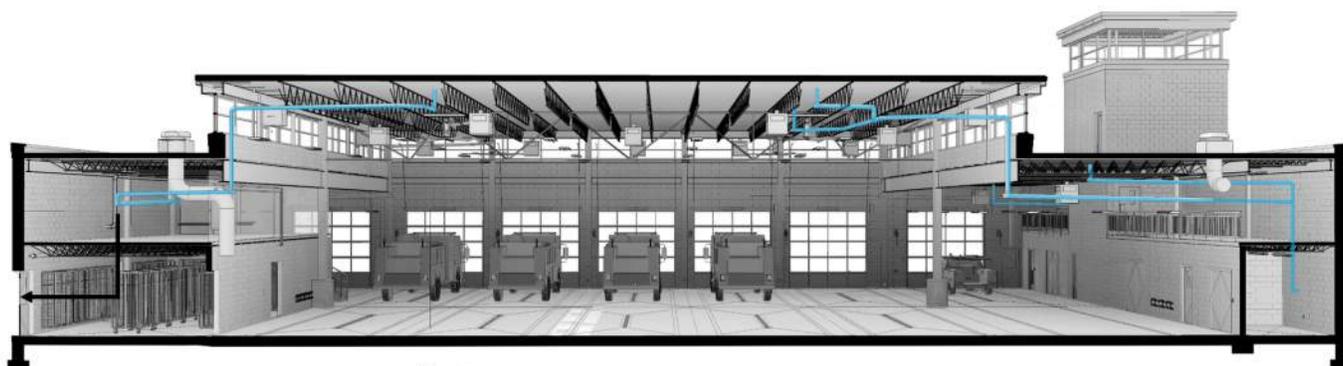
Apparatus bay doors play a significant role in the functionality, aesthetics and thermal performance of the building. As a mission-critical component of the structure, they must be designed to function with reliability and stand up to storms and abuse. Sectional doors, coiling doors, and four-fold are all viable options, each possessing their own qualities and challenges. While sectional doors generally provide a lower initial cost they are typically lacking in thermal performance, have a reduced life span and require a taller structure to operate correctly when compared to a four-fold system. Four-fold systems have a higher initial cost but operate faster, generally have a significantly longer life span, and can be a good candidate for lower structural clearances. Four-fold doors also provide better thermal performance and can be designed to be hurricane resistant. Our team will work with the City and Department to determine the best value for this project.

Relative Cost Analysis



RAINWATER COLLECTION SYSTEMS

Most municipalities require construction projects to manage stormwater. Consider capturing rainwater from the roof and storing it in cisterns of reuse. Some municipalities may provide a stormwater a “credit” for this approach, thus reducing site development costs associated with stormwater management facilities. Collected rainwater can be utilized for Filling Apparatus, Washing Apparatus, and Non-Potable Water Functions such as irrigation, toilets, etc.



Roof Drains



Storage Tank



Water Pump

TRAINING ELEMENTS AND PROPS

In many instances, regional training centers require reservations months in advance and will take units out of service for extended periods. The integration of training elements within the design of fire stations is something that can and should be incorporated into the design of all modern stations, if for no other reason than to reduce the wear and tear on expensive fire apparatus and to take units out of service less frequently. The inclusion of physical training props within a station allows departments to hone life-saving skills and showcase their role in the community all while maintaining operational readiness.

When appropriately planned, training props, towers, and mezzanines can be incorporated into the natural design of a station where the cost is so marginal that it would be detrimental to omit them. For example, a training tower that also functions as a required means of egress from a storage mezzanine or an upper level would be a wise investment with insignificant cost implications.

Most recently, our design team developed a stand-alone training tower that was to be added to a station as part of an extensive 10,000 SF renovation and 28,000 SF addition. The tower was classified as what is known as an add alternate to the contractor bid price. The cost to include this comprehensive training system, inclusive of a simulated elevator shaft, was \$83,520.00. The City found a significant economic benefit to this approach when comparing the cost of this element to that of annual training expenses for rudimentary skills.

In new construction, the project team should strive to identify common architectural and structural elements within the building that may also double for training opportunities. If planned correctly from the start, the cost of integrated training solutions should be marginal at best. Below is a sampling of considerations that you may wish to consider for the design of your station:

- Utilize Mezzanine structures to simulate parapet walls and window openings that will allow first responders to practice laddering, rappelling, and bailout techniques during all weather conditions.
- Consider utilizing manholes and other forms of covers through mezzanine floors to practice technical rescue skills such as confined space training.
- If the exterior of the building is being utilized for laddering and rappelling, be sure to design a robust parapet and roofing system that will prevent first responders from accidentally damaging essential waterproofing systems.
- If exercises are occurring on the interior of the bays, be sure to consider the finishes of walls and floors to mitigate footprints on walls and marring that may occur from ladders.
- Strategically place NFPA compliant anchor points on the outside of the building and inside of the apparatus bays to allow for laddering and rappelling exercises. Be sure to include ladder tie-offs.
- Consider placing exit stairs near apparatus aprons so that they can be used for training purposes. Be sure to provide sufficient staging area for apparatus that is clear of electrified utilities.
 - Contemplate designing the stairs so that the first responder can flow water and manipulate hose lines without damaging the interior finish spaces of the building.
 - Consider integrating a vertical standpipe that can be charged by apparatus from the exterior.
 - Consider integrating piping that can distribute water-based artificial smoke from a centralized smoke machine. Further, be sure to include signage that alerts the public to training exercises that are in progress so that they don't think your station is burning down.
 - The exterior training towers should be finished with durable materials to allow for ladders to be thrown against the building.
- If the station consists of two or more remote mezzanine structures, consider setting up high-line rescue training opportunities.
- Consider providing robust frames that allow for the construction of temporary wall and floor assemblies that firefighters can use for roof ventilation and forced entry training.
- Provide sufficient storage for standalone props such as forced entry door systems, and homemade entanglement systems.
- For areas that present elevator rescue challenges, consider developing an elevator shaft prop that can simulate an elevator cab struck between floors.
- Consider including a workshop complete with a table saw and similar tools that allow instructors and other departmental personnel to fabricate temporary and sacrificial/consumable elements.
- Consider incorporating a "sprinkler lab" into the design of the station that will allow firefighters to train on how to shut off various types of sprinkler heads.
- Consider providing a remote dedicated pad where vehicle extrication training can occur. Be sure to locate the pad in an area where debris will not impact regular station operations.

UTILIZATION OF MEZZANINES

Apparatus bays by default are high volume spaces that require tall doors capable of accommodating emergency vehicles. These bays are commonly served by a wide range of lower volume spaces that support the operations of the fleet. Such spaces may include but are not necessarily limited to Turnout Gear Storage, Decontamination Areas, Grounds Storage, SCBA and Compressor Rooms, and Workshops. Generally, the area above these support spaces are ideally supported for mezzanines.

Mezzanines can be a cost-effective way to provide for a wide range of departmental functions. They can be utilized for storage, training, mechanical equipment, and in some cases, general occupancy. Regardless of function, a good mezzanine design will usually offer some form of training, acting as a secondary benefit. Some concepts for consideration regarding the design for mezzanines are as follows:

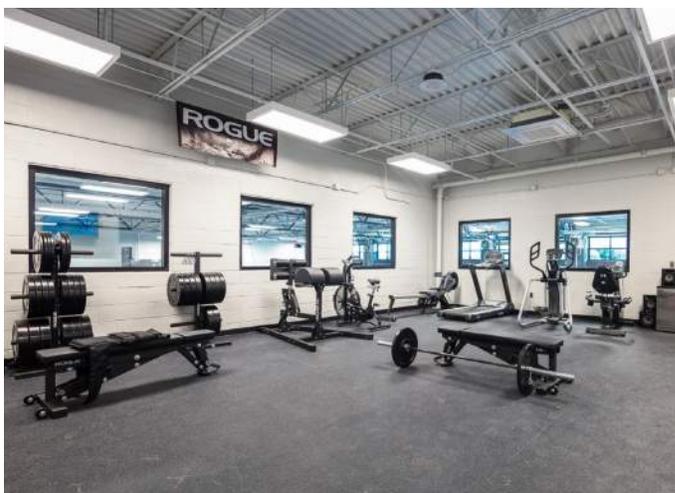
- Carefully consider placing mission-critical infrastructure such as generators and air-handling within ventilated mezzanine environments. This approach may prove to be a cost-effective way to protect these features from a natural disaster or terrorist-like activities. Hardening of facilities has become increasingly more important, especially as public safety agencies continue to become more of an at-risk target.
- As previously mentioned, consider integrating training elements into the design of storage areas that allow for all-weather training.
- Utilize mezzanine space for storage of less frequently accessed supplies and materials. Be sure to consider how materials and pallets of supplies will be stocked and unloaded from the mezzanine.
- Consider integrating a small gantry crane into the design of the structure that allows for department personnel to transport large loads to higher elevations safely.
- Where possible, avoid locating habitable spaces above mezzanines as it becomes challenging to maintain both visual oversight and acceptable air quality.
- If utilizing back-in-bays, consider integrating an elevated loading dock leveler which allows personnel to unload and load hose from engines with ease.
- Consider providing an “out of service” storage area where all tools and equipment from a piece of apparatus may be temporarily stored when a unit must leave the station for outside mechanical service.



FITNESS FACILITIES

As previously mentioned, Cardiovascular disease presents a significantly higher risk to the first responder community when compared to other occupations. The inclusion of fitness facilities is equally essential to providing bunk facilities that promote quality sleep. Often the physical skills performed by first responders are unique to the job. As such, the workout routines and equipment utilized within the space may slightly differ from what might be found in a typical weight room. The design of workout facilities for first responders should be coordinated with a departmental fit-for-duty program. The following principles should be incorporated into the design of first responder fitness facilities where possible:

- Consider incorporating an overhead door or operable wall that allows the fitness room to directly open to the exterior of the station where first responders may workout in an outdoor setting.
- Fitness rooms should be located in high-visibility / high-traffic areas with windows that allow other occupants of the building to monitor individuals who are exercising. Locating fitness rooms in remote locations, such as above mezzanines, is ill advised as a person suffering from a heart attack may go unnoticed for a considerable period of time.
- All fitness rooms should be equipped with a defibrillator and a duress alarm that can be pressed to alert the station should there be a medical emergency.
- Fitness facilities should be sized to provide sufficient clearances for both equipment and floor exercises.
- Ceiling heights should be of sufficient height to accommodate stair-climbing machines.
- Fitness facilities should be acoustically isolated from sleeping and dayroom areas to mitigate the risk of disrupting individuals that may be sleeping.
- As private on-demand classes increase in accessibility and popularity, consider including sufficient A/V equipment that allows for content to be displayed.
- Provide sufficient power connections for cardio equipment and electronic timers.
- Fitness facilities should have an independent mechanical zone that allows the space to maintain a cooler temperature than the rest of the facility.
- The floor structure should be isolated from the rest of the building to mitigate vibrations from resonating throughout the rest of the building when weights are dropped. Isolation is particularly important, considering some occupants may be sleeping.
- Carefully select equipment that best aligns with the physical demands of the occupation. For example, Cybex and Life Fitness manufacturer equipment tailored explicitly to lifting and carry maneuvers performed by firefighters.
- Select a resilient flooring material capable of withstanding impact loads, mitigating vibration, and deadening sound. Further, ensure all materials are non-organic and antimicrobial to aid in cleaning and mitigate the risk of mold growth.
- Consider all of the minor details. For example, plan and locate wipe and disposal stations at the time of design.



PROJECT UNDERSTANDING CLOSING

As leading public safety architects, our team carries tremendous experience in designing these types of facilities. It is our desire to be your partner through the life of the modernization of your department and see the project through completion. Through experience, we understand that this means our team will be required to get in the trenches with you to justify funding, explore cost effective design alternatives, and deliver a solid well thought out solution. We look forward to the opportunity of meeting with you to further discuss our ideas in the near future.



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