



# Chappaqua Fire Department New Castle Fire District #1

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## Why Your Fire Station Needs to be Fixed



# Experience

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- 40+ years designing buildings
- 28 years designing fire stations
- More than 184 public safety projects addressing over 321 facilities
- 63 fire station renovation projects
- Full time staff dedicated solely to Fire Station & Emergency Facilities Design
- National Lecturer on Fire Station Design
- Member of NFPA 1550 Committee – Firefighter Service Occupational Safety



# Building History

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# Intended Addition

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# Prior Studies

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- **2003 – Mitchell Space Needs Study**
- **2008 – Relf Architects Station Expansion Study**
- **2013 – Emergency Vehicle Response (EVR) Apparatus Fleet & Equipment Review**
- **2014 – EVR Fire Station, Staffing & Water Supply Review**
- **2015 – Mitchell Program & Schematic Design**



# Prior Study Recommendations

EVR – Emergency Vehicle Response

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## Recommendations From EVR Report:

**The overall fire station design should incorporate all of the presently required fire protection and building code requirements .**

**The building should be set back from the roadway to provide for adequate ramp space to safely park all department apparatus.**



# Prior Study Recommendations

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## Recommendations From EVR Report:

- **Build for the future**
- **Additional bay space to accommodate future needs**
- **Drive through bays**
- **Accommodate seven or eight vehicles**
- **Adequate storage**
- **Decon capability**
- **Bunking for up to 10**





**Handicapped Access**

Hose couplings, hoses, lockout and tag-out gear (for locking and labeling circuit breaker terminals or main water valves in a building; this prevents tampering during an accident), power tool case, cords, air hose, jackhammer, wrench, pneumatic tools, jaws of life, purple K extinguisher.



**Handicapped Access**  
Couplings, nozzles, valve, concrete saw, gear bag, power tool box.

**Handicapped Access**  
SCBA tank and harness, ABC extinguisher, water can, smoke fan, gear bag, shovel, extension cords.

**Handicapped Access**  
Respirator mask, fireman's axe, fireman's mallet and hook, power tool box, bolt cutters, sledgehammer.

**Warning Signs**

Upper level lights, like the light bar on the cab roof, are for long distance warning. Lower level lights on the sides, fenders, and bumpers are for close proximity warning.



**Master stream**  
An engine-mounted master stream is capable of delivering huge amounts of water over long distances.

Various diameters and lengths of hoses are stored throughout the apparatus.

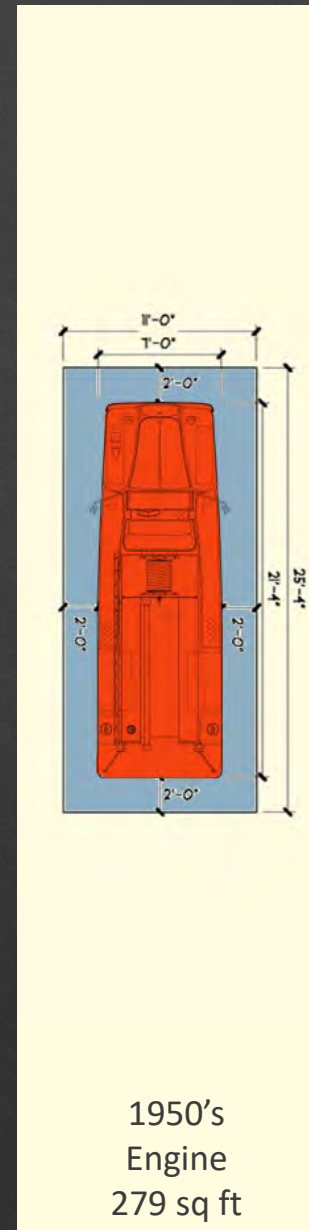
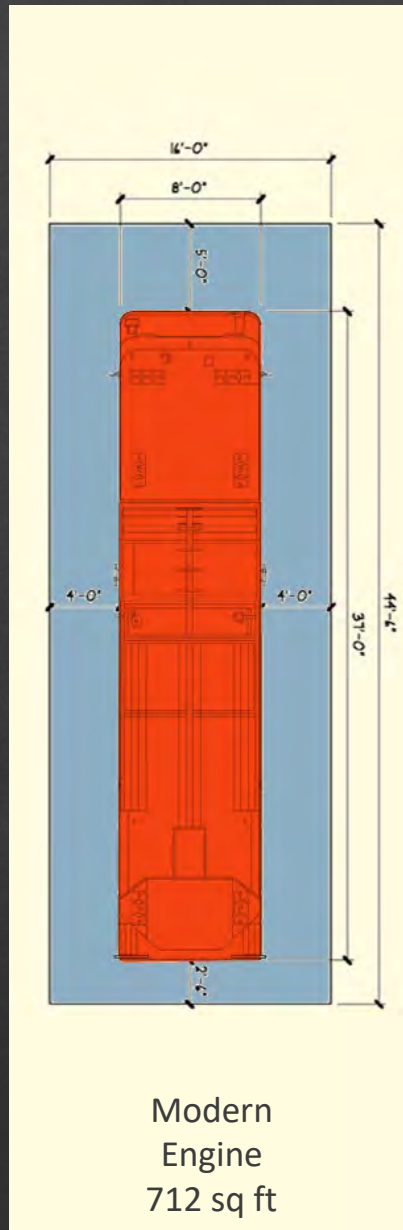
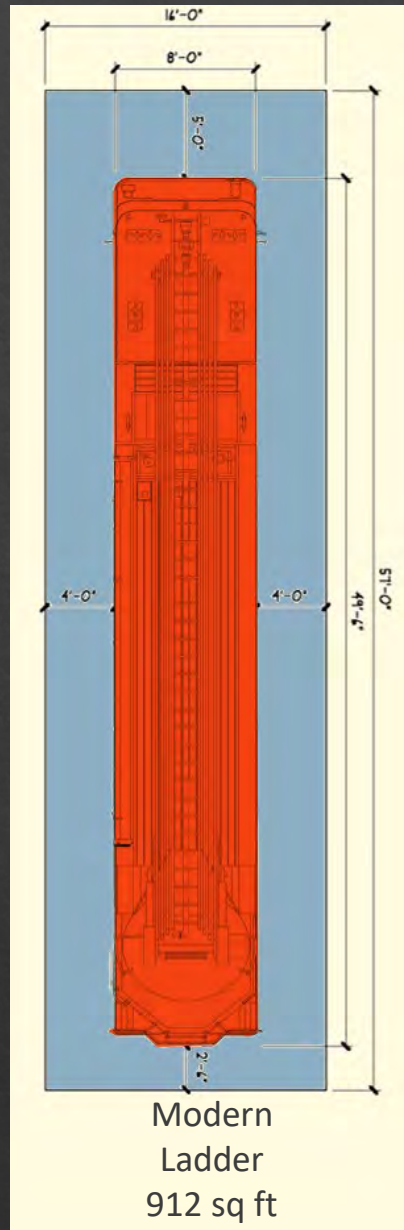
**Handicapped Access**  
The apparatus has ample storage space for essential firefighting tools and implements.

**Pump**  
The pump is powered by the diesel engine through the drive shaft.

**Handicapped Access**  
Retroreflective paint stripes on the sides and chevron markings at the rear are required by regulation. Retroreflective materials reflect light back to the source for high visibility.

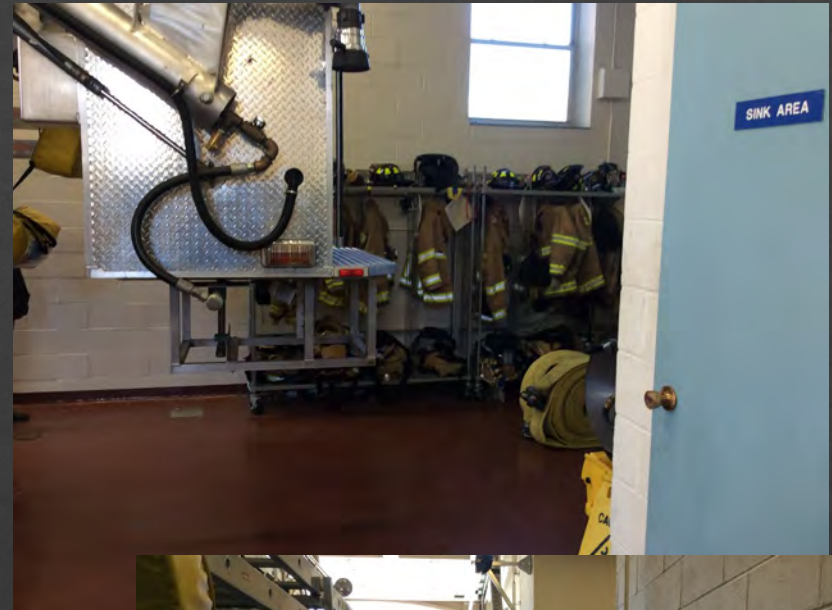
**Handicapped Access**  
A pre-connected hose reduces preparation steps at the scene.

**Handicapped Access**  
Air horns use compressed air to create a loud warning sound.





# Safe Apparatus Bay



# Obligations - OSHA

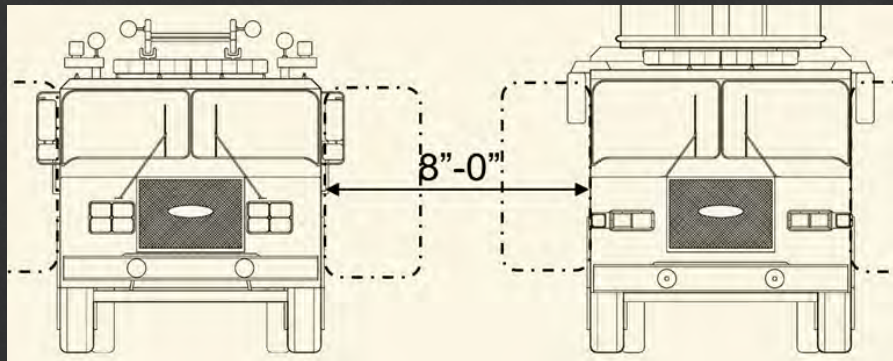
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## OSHA Consensus Standards and the General Duty Clause

Each employer shall furnish a place of employment which is free from recognized hazards that are causing or are likely to cause death or serious physical harm



# Safe, Efficient Apparatus Bay



# Firefighter Health & Safety

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- Cancer
- Injuries
- Long term impact of sleep deprivation
- Exposure to pathogens
- Unaddressed stress
- Noise
- PTSD
- Suicide



# Cancer Risk



## Types of Occupational Exposures International Agency for Research on Cancer (IARC)

Sources: <http://monographs.iarc.fr/ENG/Monographs/vol98/mono98-7.pdf>

Carbon monoxide (CO)

Hydrogen cyanide (HCN)

Hydrogen sulfide

Ammonia (NH<sub>3</sub>)

Asbestos

Nitric oxide (NO)

Methyl isocyanates

Benzene

Hydrogen chloride (HCl)

Sulfur dioxide

Chloroform

Nitrogen dioxide (NO<sub>2</sub>)

Cadmium

Phosgene (COCl<sub>2</sub>)

Perfluoroisobutylene (PFIB)

Soot

Polychlorinated Dibenzofurans PCDFs)

Trichloroethylene

Toluene diisocyanate

Oxides of nitrogen (NO<sub>x</sub>)

Chlorine

Hydrogen bromide (HBr)

Tetrachloroethylene

Formaldehyde

Polychlorinated dibenzo-*p*-dioxins (PCDDs)

Sulphur dioxide (SO<sub>2</sub>)

Acrolein

Polycyclic aromatic hydrocarbons (PAHs)

Hydrogen fluoride (HF)

Arsenic

Hydrochloric acid

Carbon dioxide (CO<sub>2</sub>)

Styrene



## **USFA, NIOSH Release Findings from Firefighter Cancer Study**

*Mortality patterns and cancer incidence among over 29,000 career firefighters examined*

*USFA Published Wednesday, November 6, 2013*

A U.S. Fire Administration (USFA) and National Institute for Occupational Safety and Health (NIOSH) research project to clarify the relationship between firefighter occupational exposures and cancer.

After examining mortality patterns and cancer incidence among a group of 29,993 U.S. career firefighters employed between 1950–2009 in the cities of San Francisco, Chicago and Philadelphia, the researchers found that:

**Cancers of the respiratory, digestive, and urinary systems accounted mostly for the higher rates of cancer seen in the study population. The higher rates suggest that firefighters are more likely to develop those cancers.**

**The population of firefighters in the study had a rate of mesothelioma two times greater than the rate in the U.S. population as a whole.**



# Biological Risks



## MRSA in the Fire Station — A Striking Possibility

By Richard Barlette & Mitchell Associates Architects

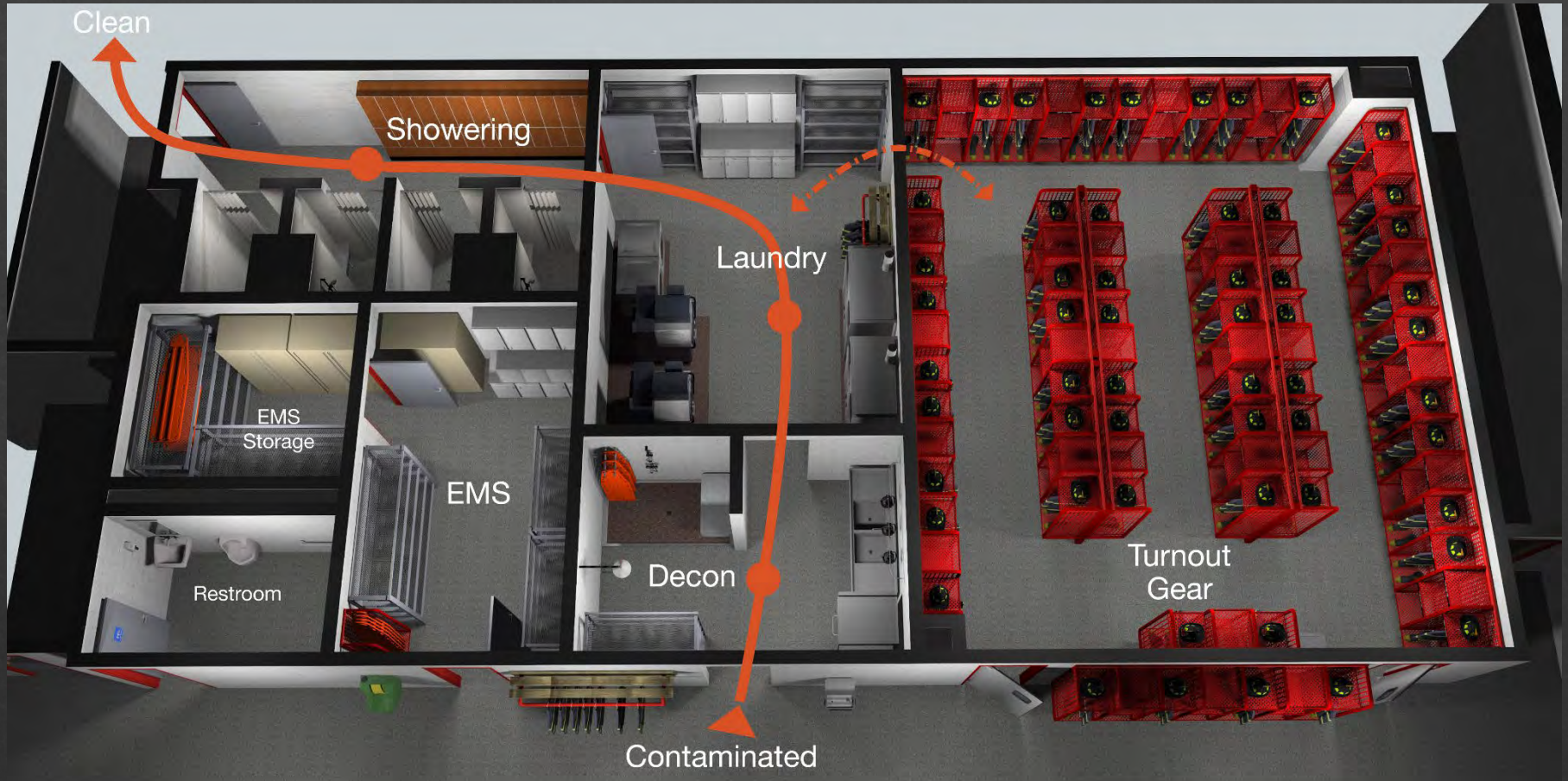
**MRSA, what is it, what is the impact if infected, why does it like to live in and around firefighters, and what can we do to control its spread?**

**What is MRSA:** *Methicillin-resistant Staphylococcus aureus* is commonly referred simply as MRSA. It is a potentially dangerous type of staph bacteria that is resistant to certain antibiotics and can survive on hard surfaces for several days to several weeks. MRSA tends to appear first as a pimple, spider bite or boil that may be red, swollen and painful, and generally accompanied by pus or other drainage and fever. If undiagnosed, or left untreated, it can rapidly progress into widespread systemic infection. It can spread along soft tissue in as little as 2-3 days and can enter the bloodstream where it becomes difficult to treat. In 2010, MRSA infections resulted in 19,000 deaths a year in the United States.

**Where it is found:** Since firefighters and emergency medical providers live and move about the community freely, treating patients and frequenting hospitals and health care facilities, they can be exposed to both strains of MRSA, community acquired (CA) and hospital acquired (HA). MRSA can be passed from person to person and contracted from unclean, contaminated surfaces such as tables, chairs, couches, computer key boards, door handles, countertops, sinks and faucets. Because firefighters and emergency medical providers are working out among the community and are in frequent contact with high risk populations, they can easily transport infectious microbes back to the fire station on their hands, clothing, PPE and even apparatus. Fire stations, because of their operational make-up and communal living, can easily become a haven for MRSA.



# Decontamination



Hot zone separation and designated cleaning areas are required under 2020 NFPA 1500





# Decontamination

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# Decon – Gear Washing

Current Chappaqua



NFPA and/or FEMA Compliant



***NFPA 1500 §10.1.2*** – Fire Departments shall provide facilities for disinfecting, cleaning, and storage in accordance with NFPA 1581

***NFPA 1851 §7.3.5*** – Where the use of machine cleaning is specified for ensembles or ensemble elements, advanced cleaning shall be conducted using a washer/extractor

***NFPA 1851 §7.3.10.1 (2)*** – Ensembles and ensemble elements shall be dried by a drying cabinet



# Turnout Gear



**TOTAL COST: \$15,950**

TOOLS  
\$350

GLOVES  
\$125

PANTS  
\$1,100

HELMET  
\$600

COAT  
\$1,600

THERMAL IMAGING CAMERA  
\$6,000

SELF-CONTAINED BREATHING APPARATUS  
\$5,700

BOOTS  
\$475



# Turnout Gear

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Current Chappaqua



Proper Method



***NFPA 1550\* §12.5.4***– PPE stored in a firehouse when not in use shall be stored in an enclosed and ventilated area.

\*Forthcoming Standard in 2024.



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# Turnout Gear

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# Breathing Air

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# Breathing Air

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Current Chappaqua



Proper Method



# Breathing Air Decon

Historical Design / Existing Station



NFPA and/or FEMA Compliant



**NFPA 1852 §6.1.1 – The external surfaces of the SCBA shall be cleaned and disinfected according to manufacturer’s instructions using only those agents indicated by the manufacturer.**





# Mission Control

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Current Chappaqua



Proper Method



# Training

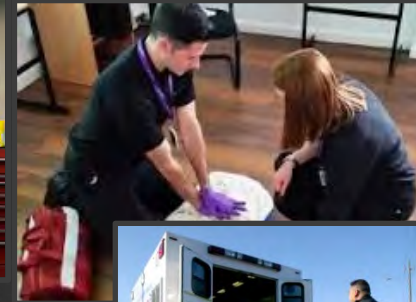
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**You Don't Train Until You Get it Right;  
You Train Until You Can't Get it Wrong!**



# INCREASING IMPORTANCE OF TRAINING

Requires more frequent and more intense training to support the ever more complex missions



# Maintenance Tasks

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Current Chappaqua



Proper Method



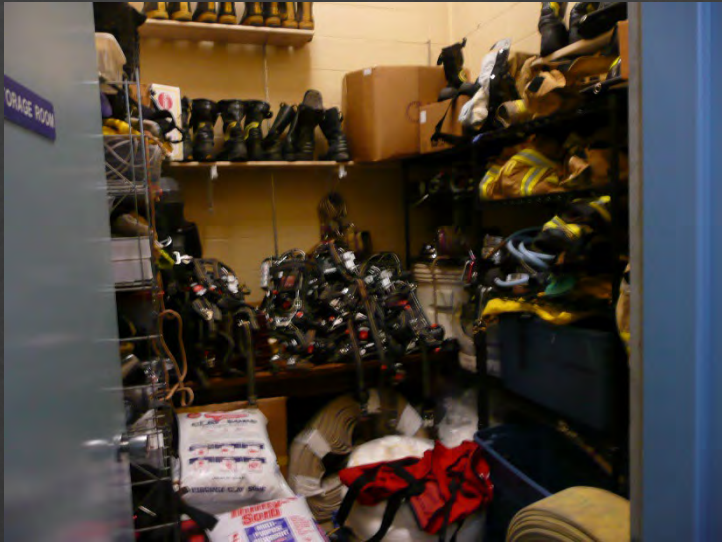
# Vehicle Repair

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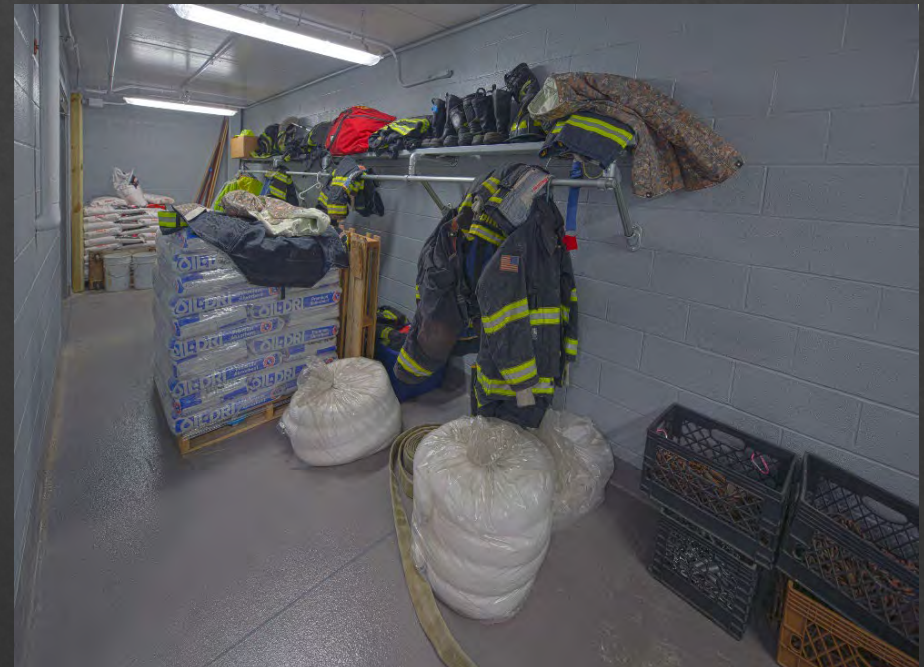
# Storage

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# Storage

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# Hose Storage

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Current Chappaqua



Proper Method





# Bunking

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Purchase Live-In Program



***FEMA Safety & health Considerations for the Design of Fire Stations –  
“Minimum of 60 square feet of space per bed.”***



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# Offices

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Current Chappaqua



Proper Design



# Basis of Design

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## Priorities

- **Efficient Operation**
- **Dirty/Clean Separation**
- **Decon/Laundry**
- **SCBA**
- **Proper Bathrooms**
- **Gender Flexibility**
- **ADA Compliance**
- **On-Site Training**



# Recruitment & Retention

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An April 2019 article in *Governing* magazine revealed,

“The number of volunteer firefighters has **declined from 300,000 in the 1970s to 38,000 in 2018**, according to the Pennsylvania Fire and Emergency Services Institute.”

North Carolina noted a **22% decline in volunteers in the past two years alone**, according to FEMA.



# Cost of Paid Firefighters

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**Salaries and Benefits = \$90 to 100,000**

**Annual Cost to Amortize \$2,000,000  
at 3.5% for 30 Years = \$ 108,742**

**Support active programs to maintain  
interest in volunteering, including in  
the college student community**



# Obligations

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## A Fire Station is an *Essential Facility*

- **Under the *International Building Code* it is considered Risk Category IV (the highest category),** which is defined as essential facilities such as hospitals, fire and police stations, rescue and other emergency service facilities, power stations, water supply facilities, aviation facilities, and other buildings critical for the national and civil defense. The risk category serves as a threshold for a variety of code provisions related to earthquake, flood, snow, wind loads and includes the magnitude of special inspections.



# Obligations - OSHA

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## OSHA Consensus Standards and the General Duty Clause

- Each employer shall furnish to each of his employees, employment and a place of employment which **are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employee.**



# Obligations - NFPA 1500

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## NFPA 1500 - Standard on Fire Department Occupational Safety and Health Program

- The fire department shall provide for the **cleaning of protective clothing** and station/work uniforms by a fire department facility that is equipped to handle contaminated clothing.
- Fire departments shall provide facilities for **disinfecting, cleaning, and storage** in accordance with NFPA 1581, Standard on Fire Department Infection Control Program.





# Obligations - NFPA 1581

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## NFPA 1581 - Standard on Fire Department Infection Control Program

- To provide minimum criteria for **infection control** in the fire station.
- The standard outlines the recommended facilities for infection control within the department. These recommendations also comply with CDC and OSHA regulations. The fire department should be equipped with **facilities for disinfection, cleaning, and storage.**



# Obligations - NFPA 1581

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- A **designated cleaning area** shall be provided in each fire station for the cleaning of personal protective equipment, portable equipment, and other clothing. The cleaning area shall have proper ventilation, lighting, and drainage connected to a sanitary sewer system or septic system. Under no circumstances should contaminated equipment or clothing be taken home for cleaning.
- **Infection control measures should be applied** to bathrooms, kitchens, sleeping areas, laundry facilities, equipment storage areas, cleaning areas, disinfection facilities, and disposal areas.



# Obligations - NFPA 1581

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- **The apparatus bay contains carcinogenic byproducts of combustion and blood borne pathogens, excrement, and vomit.** To comply with NFPA 1581 it is necessary to have a bathroom that can be accessed without passing from the chemically and biologically “hot” area of the apparatus bay to the “cold” area of the offices.
- The fire department should set aside an area in each fire station for the **storage, cleaning, and disinfecting of emergency medical equipment.** The room should be physically separated by four walls from other fire station areas, properly lighted, vented to the outside environment, and fitted with floor drains connected to a sanitary sewer system.



# Obligations - NFPA 1581

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- Each fire department must have **procedures for the decontamination of specific items of clothing and equipment.** OSHA has published recommendations for these procedures in their *Bloodborne Pathogens Standard*. Cleaning, disinfecting, and disposal criteria are included in this OSHA standard as well as in NFPA 1581, *Standard on Fire Department Infection Control Program*, which is required to be utilized by NFPA 1500.



# Obligations – OSHA re. Training

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- The **employer must provide training and education** for all fire brigade members that is "commensurate with those duties and functions that fire brigade members are expected to perform."
- **The general duty obligations include the requirement to provide adequate training. This in turn requires adequate space that is available for the required training.**
- The volunteer fire department is required to maintain training records for all of its volunteers.
- **OSHA requires that firefighters be physically fit to perform their duties. It follows that the Department must provide means for this training.**



# Obligations – NFPA re. Training

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- **The fire department shall establish and maintain a training and education program with a goal of preventing occupational deaths, injuries, and illnesses.**
- The fire department shall provide training and education for all department members commensurate with the duties and functions that they are expected to perform.
- The fire department shall establish training and education programs that provide new members initial training, proficiency opportunities, and a method of skill and knowledge evaluation for duties assigned to the member prior to engaging in emergency operations.



# Obligations – NFPA re. Fitness

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- Requirements for the development, implementation, and management of a health-related fitness program (HRFP) for members of the fire department involved in emergency operations. **Firefighting is among the most physically demanding occupations. Performing demanding physical work in high temperatures in heavy protective gear that maintains a near saturation interior humidity. Long work shifts, and the need to ramp up to full speed on a moment's notice all contribute to the potential for injury. NFPA 1583 serves as an outline for the department's command staff in response to this.**
- One of the core requirements is an exercise training program that is available to all members.



# Obligations – Gender Equality

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- **Title VII of the Federal Civil Rights Act of 1964 makes it unlawful to discriminate on the basis of sex** with regard to the terms, conditions, or privileges of employment and prohibits an employer from depriving any individual of employment opportunities or otherwise adversely affecting his status as an employee on the basis of sex.
- It was amended to require similar obligations with regard to pregnancy.





# Obligations - Accessibility

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- All fire stations must comply with ADA or might be subject to punitive damages associated with not following the law.



# Obligations - Exiting

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- **NFPA, IBC & OSHA all require every building or structure, new or old, designed for human occupancy have exits sufficient to permit the prompt escape of occupants in case of fire or other emergency.**



# Mental Health Daily Headlines

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- **Dead Baby Found in Duffel Bag at Station**
- **House Fire Kills Four, Including Two Children**
- **Firefighter Hurt After Falling Through Stairs**
- **Medic Pepper-Sprayed During COVID Call**
- **Mental Bandwidth Overload Must be Addressed**
- **EMS Providers Draw the Line re: Mandated Reporting When Abuse or Neglect is Suspected**
- **MI Firefighter Killed at Accident Scene**
- **This Fire Will Live With Them Forever**



# Liability

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- **Injured NY Firefighter Initiates Lawsuit**
- **Fallen Firefighters' Loved Ones File Lawsuit**
- **Lawsuit Claims FFs Could Have Saved FL Man**
- **Chicago to pay \$3.8 million as part of Fire Department gender bias case**
- **Ill. Supreme Court kills rule protecting fire, police, EMS from lawsuits**
- **As cancer deaths among firefighters soar, their families fight for compensation**



# Litigation - Training

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- **Lawsuit Claims FFs Could Have Saved FL Man**
- **NY Fire Department Sued for Negligence in Fatal Fire**
- **Massive Claims in WA Intubation Scandal**
- **Family of Fallen Firefighter Files Wrongful Death Suit Against City of Hartford**
- **Family of Man Who Drowned Sues Alameda**
- **Family of Fallen CT Firefighter Settles Lawsuit**



# Mental Health

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- **Widow, TN Firefighter's Converge on Capitol for PTSD Benefits**
- **A Tucson firefighter was awarded a \$3.8 million settlement last year in a 2014 lawsuit accusing that city's fire department of discrimination and retaliation after she asked for an area to pump milk and was denied.**



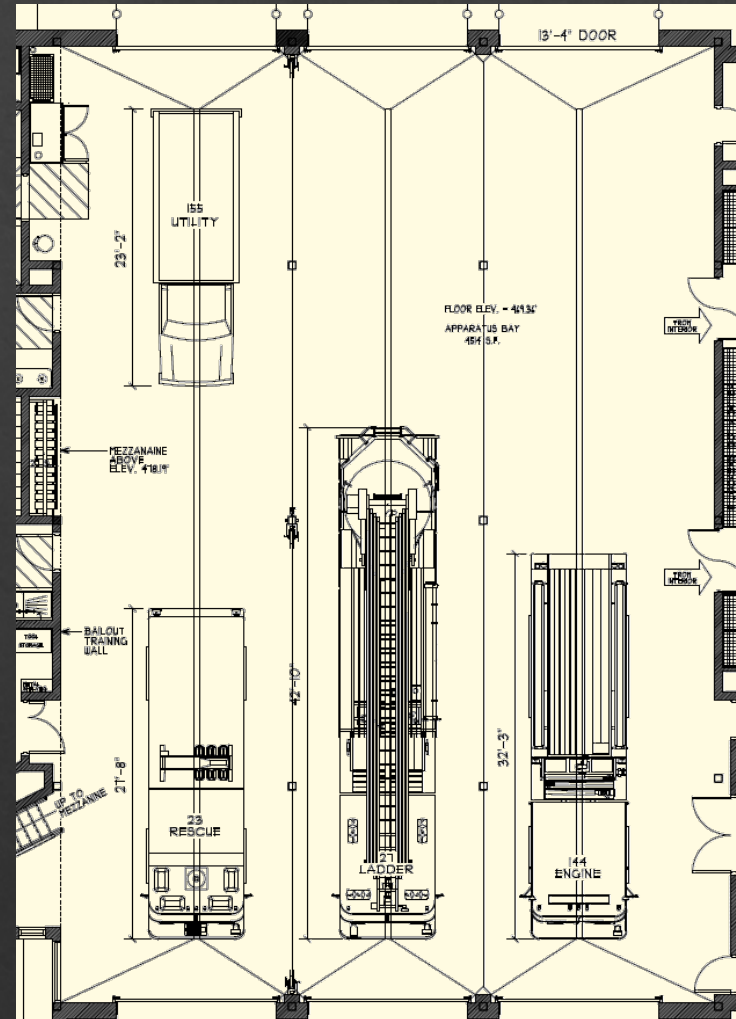
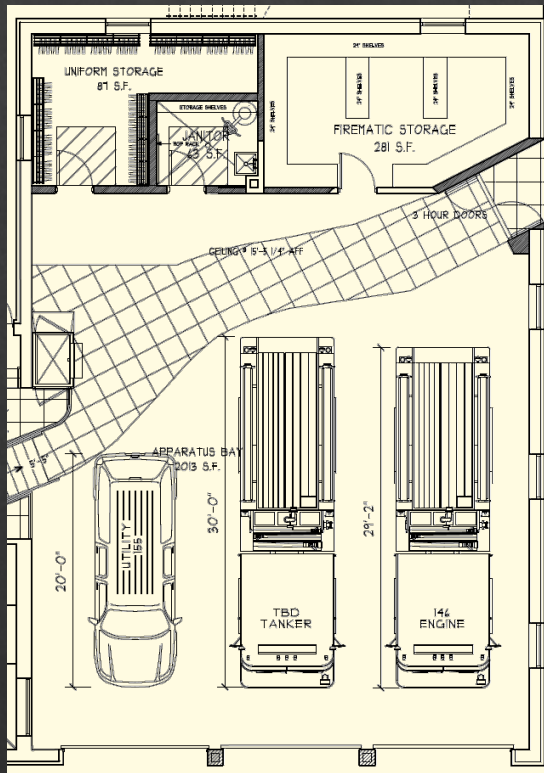
# Compare New vs. Reno Costs

<b>Reno</b>	<b>11,172</b>	<b>\$ 198</b>	<b>\$ 2,211,162</b>
<b>New</b>	<b>16,927</b>	<b>\$ 651</b>	<b>\$ 11,027,263</b>
<b>Total</b>	<b>28,099</b>	<b>\$ 471</b>	<b>\$ 13,238,426</b>
<b>Reduce size by 15% and build all new</b>			
<b>Size</b>	<b>23,884</b>	<b>\$ 651</b>	<b>\$ 15,559,568</b>
<b>Demolition</b>			<b>\$ 150,000</b>
<b>Temporary Operations</b>			<b>\$ 500,000</b>
		<b>Total Cost</b>	<b>\$ 16,209,568</b>
<b>Savings by Renovation &gt;&gt;</b>			<b>\$ 2,971,143</b>



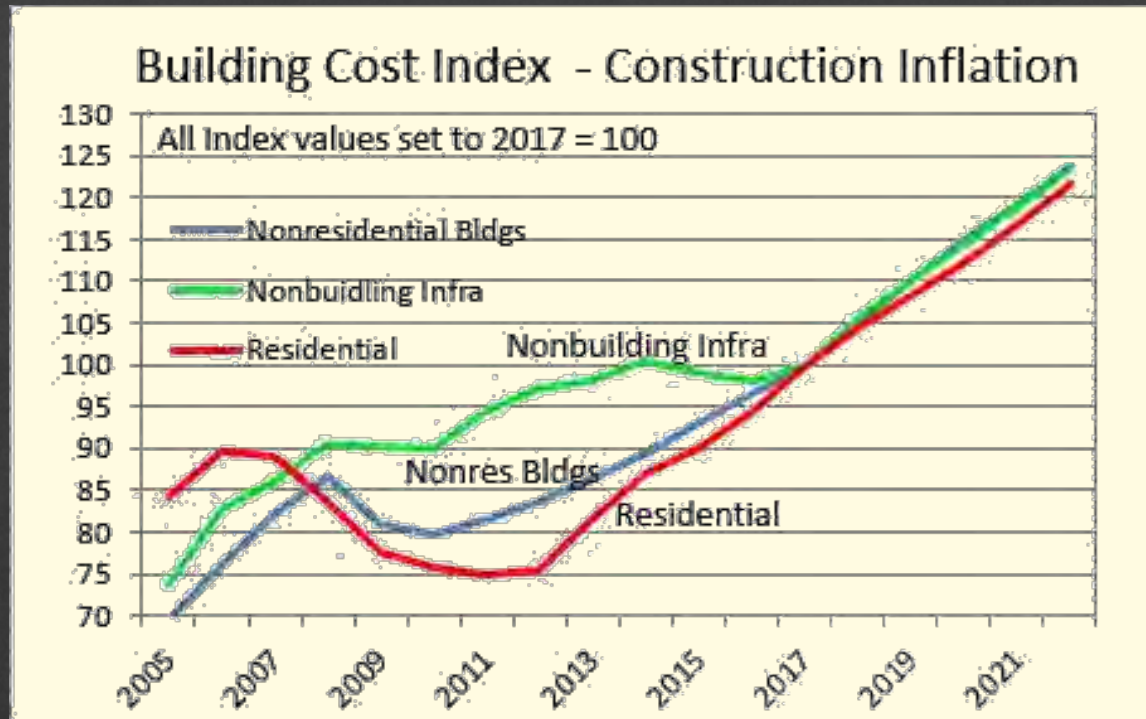
# Bays & Apparatus

The bays are sized for existing plus modest growth





# The Cost of Delay



Construction Cost Escalation Between  
2015 & 2021 averaged 4.1%

**Cost Has More Than Doubled Since  
Initial 2003 Study**



# The Cost of Delay

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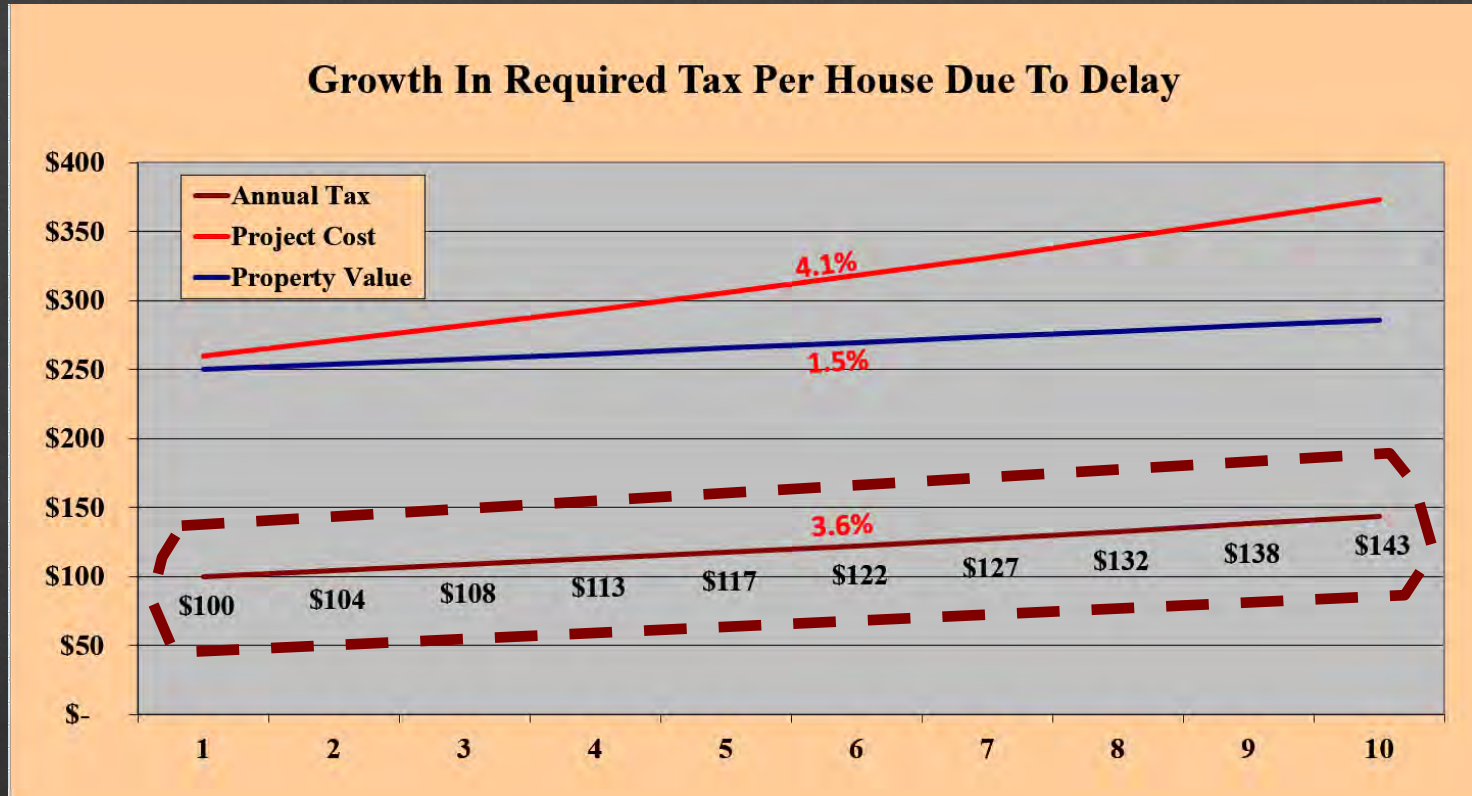
**From 2016 to 2022 New Construction Cost Increased  
About 34%**

**By Reducing the Renovation of the Existing  
Building, the Project Construction Cost Increase is  
20%**

**Current Budget is Based on Spring 2022  
Groundbreaking. Analysis is Needed to Account for  
Spring 2023 Groundbreaking**



# Don't Delay



**The Sooner The Better**



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# Mitchell Associates Architects, PLLC

## Emergency Services Facilities

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Mitchell Associates Architects