



*WILLIAMSTOWN FIRE DEPARTMENT
FEASIBILITY STUDY*

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**Prepared by: Maguire Group Inc.
33 Commercial Street, Suite 1
Foxborough, MA 02035**

Williamstown Fire Department Feasibility Study

Table of Contents

TABLE OF CONTENTS	i
EXECUTIVE SUMMARY	iii
I EXISTING BUILDING EVALUATION	
Introduction	I-1
Civil	I-2
Architecture	I-4
Life Safety and Code Compliance	I-5
Accessibility	I-5
Waterproofing System	I-6
Integrity of Doors, Windows and Exterior Walls	I-6
Fire Department Operational Issues	I-8
Structural	I-10
Mechanical	I-13
Electrical	I-15
Plumbing	I-17
II SPACE NEEDS PROGRAM	
Table of Contents	II-i
Staffing and Parking	II-1
Space Allocations	II-2
Apparatus and Support	II-4
Public Lobby/Dispatch	II-13
Administration	II-16
Indoor Training	II-25
Firefighters Headquarters	II-28
Building Support and Mechanical	II-35
III CONCEPTUAL LAYOUTS	
Introduction	III-1
Option A	III-4
Option B	III-5
IV COST ESTIMATE	
Construction Costs Considerations	IV-1
Construction Estimate	IV-2

V CONCEPTUAL PLANS

Option A

First Floor Plan (Not in Set)
Basement Floor Plan (Not in Set)

Option B

First Floor Plan
Second Floor Plan

VI APPENDICES

APPENDIX A – Applicable Codes

APPENDIX B – U.S. Air Force Fire Station Design Guide

APPENDIX C – Station Design Benchmarks

EXECUTIVE SUMMARY

Based on our evaluation, the current Williamstown Fire Station is in good condition and very well maintained. However, due to its original design and orientation on the site the facility has a very limited expansion capability. The facility as it relates to the Department's current needs is insufficiently sized in all three aspects of a fire station, Administrative Spaces, Apparatus Bay and Firefighters living quarters.

This depletion of spaces is not conducive to a standalone fire station and consequently it is impacting the Fire Department's operations and the internal response time to an emergency. The apparatus bay is insufficiently sized to accommodate all of the current Fire Department's vehicles, and the circulation space between the apparatus is minimal creating bottlenecks and safety hazards for responding firefighters.

When we factor in the anticipated station's growth from a volunteer department to a more traditional career department, along with the programmatic needs of the station, the facility becomes excessively undersized. Our evaluation also revealed that if the station is to be expanded, then most of the building systems would also need to be upgraded due to the age and lifecycle of these systems.

To date, this facility has adequately served the district. That said, technological advances in firefighting equipment, the expansion of the departments' services and the need to look toward additional staff in the future, the existing buildings limitations are currently, and will continue to limit the department's ability to carry out its mission. All are in conflict with the constraints of the facility.

Based on the building evaluation and the programmatic needs of the department, the station needs to be expanded or replaced. The spaces requiring the most expansion are the apparatus bay, and the administrative offices. Due to their organization within the facility and on the site, the options for expanding the existing facility are very limited.

The options available to the fire department are as follows:

Option A Expand/Rebuild at Current Site, 34 Water Street

The existing fire station site is too narrow to accommodate any possible expansion without purchasing adjacent property. In this scheme the adjacent property is utilized to construct either a new apparatus bay or a new station. The existing apparatus bay would then be either demolished or renovated into administrative and living spaces. The right-of-way would be relocated around the new addition.

Option B New Facility on New Site

In this option, a new facility would be constructed on a new site. Once the new facility is constructed, the station's operations can be shifted from the existing to the new with little disturbances. The existing station can then be sold, or re-utilized by the Town.

A "Green Building" – The Prudential Committee has given direction to look at a sustainable building. All construction whether new or renovation will be LEED certified. A LEED Silver classification would be the goal of the renovated facility, however the classification would greatly depend on what is achievable, versus readily achievable but expensive. Passive features such as skylights in the apparatus bay, as well as specialty features as geothermal energy will be evaluated and pending on their payback will be included in the project.

We have included a Preliminary Cost Estimate in Section IV of this report for cost comparisons between the two options. Keep in mind that estimates at this level of study are very preliminary and should be considered for the purpose of alternative comparison and not for budgeting purposes.

INTRODUCTION

Maguire Group Inc. was commissioned by the Williamstown Fire District to evaluate the existing Fire Department's Headquarters for the possibility of renovating and expanding the existing facility to accommodate the current and future Fire Department needs.

An on-site visual assessment of the building was performed on November 3, 2008 by professional representatives of Maguire's architectural and engineering staff. In addition to the building evaluation, Maguire personnel interviewed members of the Fire Department, investigating such issues as staffing and equipment levels, personnel flow, public spaces, staff spaces and logistical considerations in responding to an event. The end result is a comprehensive program, where each component was considered as to its security level, equipment requirements and adjacencies. The complete program is located in Section II of this report.

The building evaluation presented in this report is based on field observations, review of available construction documents, and discussions with personnel from the facility.

Building codes and pertinent guidelines, presently in force locally and federally, were used in evaluating the building and surrounding grounds. Applicable codes are included in the reference list found in Appendix "A".

CIVIL

General

The intent of the civil assessment is to review the condition of the existing site and to assess the feasibility of modifying the building from a site perspective.

Existing Conditions

Location

The existing Fire Headquarters is located on 1/3-acre lot at 34 Water Street in Williamstown on the north bank of the Green River. The site is predominantly cleared and covered by pavement, sidewalk or building. The only vegetated area is the grassed south yard and it is flat for approximately 6 feet prior to slopping down to the Green River. The steep sloped bank is left natural with some mature tree growth as well as brush undergrowth.

Layout

The property has frontage Water Street and is bordered by the Green River on the south and a right of way on the north. The north side of the building sits on the property line, offering no space for expansion. Adjacent to the property line is a legal right of way, which provides access from Water Street to the properties to the rear of the site.

The right of way is a varying-width paved roadway that provides access to the general parking for the Fire Station, ambulance Facility, as well as access to commercial properties northeast of the site. Striping for the fire department parking are worn, and there are no designated spaces for handicapped use with both pavement markings and signage. The remainder of the spaces is unmarked and can accommodate approximately six to eight vehicles. The pavement is in fair condition. No curbing is provided. There is a steep bituminous embankment separating the right of way from the fire station parking. The embankment is unprotected, offering no safety devices to prevent vehicles from driving over the edge.

The existing structure is a 4,325 square-foot one-story fire station. Vehicles access the apparatus bays via a bituminous paved driveway on Water Street. The driveway or bituminous apron is bordered by bituminous Cape Cod berm.

Utilities

Water, sewer, gas and drainage are located in Water Street. The path of the sewer and water service are from the basement mechanical room located on the south side of the building and run parallel along the building to Water Street. From the interior of the building it is apparent that there is also a storm water line, however it is not clear where it connects to or if it includes an oil/sand interceptor.

Since a topographical survey was not conducted or provided, it is difficult to determine if catch basins are located at low points on the site. However, during the site visit, it was noted that the catch basin on the parking lot discharged the water directly into the Green River. It is unclear if the drains in the apparatus bays also discharge into this system, as they appear to be connected to one of the on-site catch basins or to a storm sewer system.

Proposed Conditions**Permitting**

If a proposed fire station addition is to be considered, it will be subject to the Town of Williamstown's Zoning Bylaws. Specifically relating to the building lot coverage, square footage and building heights. Due to the limited size of the existing size, it is anticipated that a special permit with site plan review needs to be sought from the Board of Appeals.

Layout

The Space Needs Program for the Fire Station reports that 11 staff parking spaces are required. Parking spaces shall be 9'x18' and shall be 90-degree, parallel and paved. While all public parking shall be off-site, two handicapped parking spaces will be required on-site, near the entrance to the facility. Parking spaces shall either have wheel stops or be curbed to prevent vehicles from being parked or driven within required setback areas or into landscaped open space areas. The driveway and parking lots will be flexible pavement with an appropriate aggregate base. In addition to the curbs and wheel stops required for parking, curbing will be used to control drainage, where needed.

A snow storage area shall be provided to ensure the availability of all proposed parking spaces year-round. All required parking spaces, maneuvering aisles and driveways shall have an asphalt or concrete surface.

A concrete pavement apron will be provided outside of the apparatus bay door locations. Concrete pads will be provided at points of egress, as required. A concrete dumpster pad shall be located on-site and enclosed by a fence or wall at least six feet in height.

Utilities

Utilities, including water and sewer, shall be evaluated and upgraded as necessary for the expansion of the facility. Mechanical equipment shall be screened from public view.

The proposed site shall be designed such that surface waters will be disposed of by grading and drainage in such a manner that no additional surface water shall drain into a public way or onto adjacent properties. Water quality must comply with the Massachusetts Stormwater Guidelines and is subject to application to and review by the Conservation Commission.

Ideal Site for New Facility

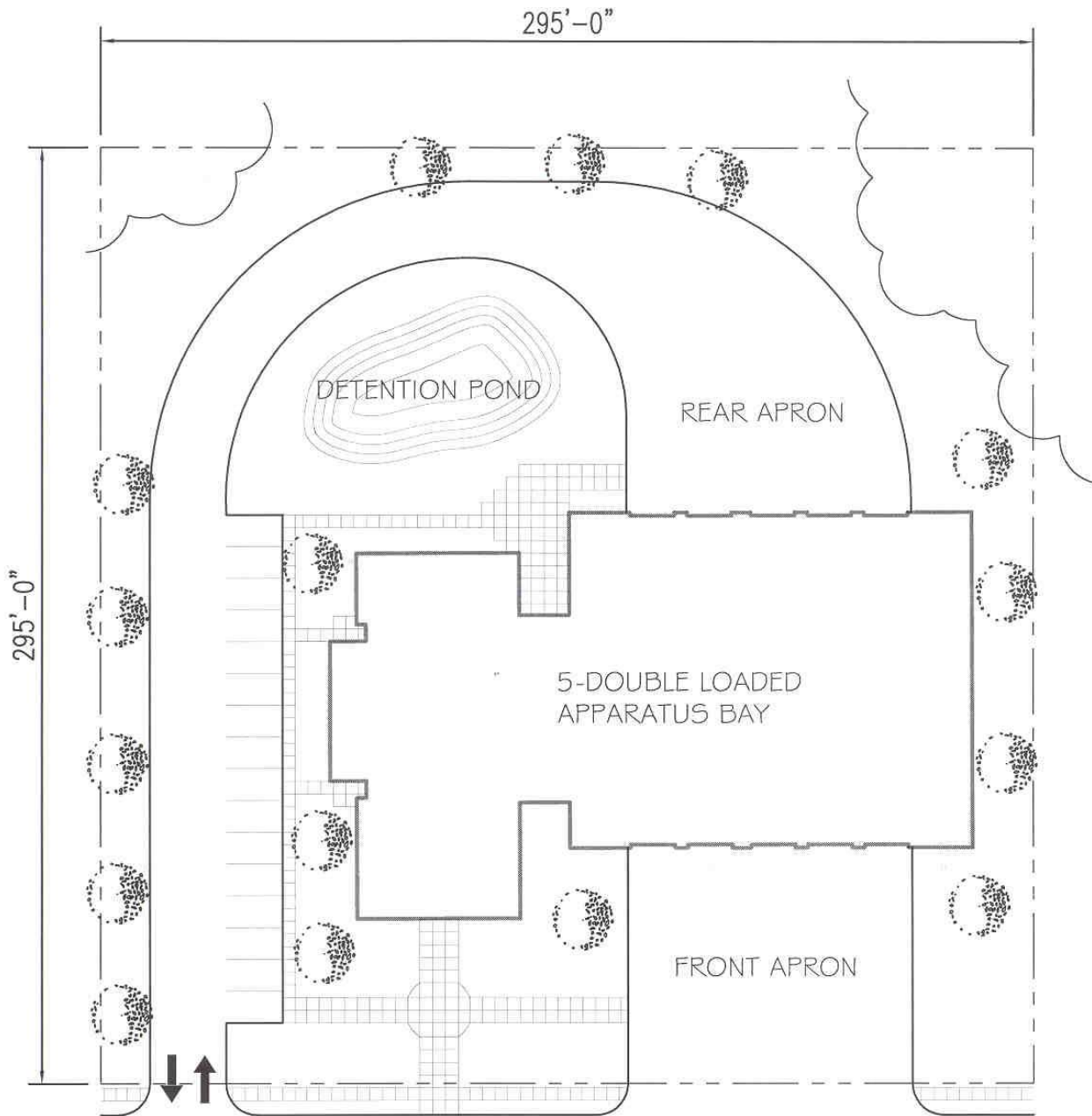
One of the options available to the Williamstown Fire District is to construct a new facility on a different site. Based on the programmatic needs of the proposed station, the required lot size to accommodate this facility would be approximately 2 acres. However it should be noted that this size is based on usable (buildable) area and not just the overall lot square footage.

Obviously, lots that are irregularly shaped, have streams, right-of-ways, setbacks, wetlands, steep slopes, are within flood plains, require detention ponds or other restricting features will need a much larger square footage to accommodate the station. Additionally the size of the usable lot will dictate whether or not the station can be configured with drive-thru apparatus bays.

Some sites may fulfill the required size requirements; however their location may negatively impact their selection. For example a site located on a dead end or vulnerable to becoming isolated due to natural

features such as on grade railroad tracks, low bridges or subjected to rush hour traffic and congestion at the apron's entrance, or in the close proximity to public schools may not be the ideal site.

Based on this information, all candidate sites will need to be evaluated to make sure that they can accommodate the stations footprint, corresponding aprons, parking, drives and ancillary spaces. Additionally, the site needs adequate road frontage to accommodate the maneuvering of emergency vehicles. The location should also not impact the current response time.



ARCHITECTURE

The Williamstown Fire Headquarters was constructed in the 1950's as a three bay, single-story building with a partial basement, in the 1980's the existing apparatus bay was expanded towards Water Street by twelve feet, and the overhead doors were modified from three at 10 foot wide to one at 10 feet and the other at 20 feet.

The entire structure has a gross square footage (GSF) of 5,060. The first floor of the facility occupies 4,325 GSF, and 736 GSF on the basement level. The building construction consists of load bearing masonry walls, with a wood framed flat roof.

Since the construction of the facility in 1950, other than the apparatus bay expansion and minor improvements and modifications, the facility has virtually remained unaltered.

Building Square Footage		
Floor	Area	Square Footage
First Floor	Apparatus Bay, and Support	2,422
First Floor	Offices, Living Quarters, Stair and Toilet Room	1,903
Basement	Storage, and Mechanical Rooms	736
Total:		5,060

Currently, the station is manned by only one full time firefighter, the fire chief. The rest of the department is on call. The primary apparatus bay consists of three single loaded bays exiting onto Water Street. Storage for firefighter's equipment and supplies is limited to those off of the apparatus bays.

The administrative portion of the facility, consisting of the Fire Chief's office, is located on the first floor adjacent to the recreation/meeting room. Firefighters living quarter's are also on the first floor and consist of only the recreation room and a kitchen. Currently there are no sleeping accommodations, locker rooms, fitness rooms or dining accommodations.

Overall, for its age, the facility is in very good condition. The following is an architectural evaluation of the station assessed in the following categories:

1. Life safety and code compliance.
2. Accessibility.
3. Waterproofing systems.
4. Integrity of doors, windows, and exterior walls.
5. Interior finishes.
6. Fire department operational issues.
7. Structural.
8. Mechanical.
9. Electrical.
10. Plumbing.

Life Safety and Code Compliance

1. The existing facility does not have a fire suppression system. While this is currently not an issue, if the decision to expand the facility is implemented then the entire facility would need to be sprinklered.
2. Exit signs are missing, mounted too high or not located properly.
3. There is no fire separation between the apparatus bays and the offices. This is true of the walls as well as the ceilings.
4. Handrails and guardrails throughout the facility are deficient in a number of ways.
 - a. The diameter and shape of the handrail are incorrect
 - b. The handrails do not have the proper extensions at platforms and landings
 - c. Guardrail and handrails are at the wrong heights
5. The stair to the basement needs to be closed off with a gate to prevent patrons from continuing down into the basement in the case of a fire.
6. The stair platform at the exterior egress door is too shallow, and does not comply with current codes.
7. There are numerous penetrations through rated walls, ceilings and floor assemblies that do not have the required fire stopping.

Accessibility

Since construction of the facility, handicapped requirements have slowly been increased. In 1990, congress passed the "Americans with Disabilities Act" (ADA), which set federal guidelines for the accessibility of buildings by individuals with disabilities. Using ADA, and the Massachusetts Architectural Access Barriers requirements, it has been determined that the Williamstown Fire Headquarters is deficient in providing barrier-free access, both in site access and to spaces within the building. Field investigations identified the following issues that need to be addressed:

1. All doors with closers need the speed and pressure adjusted.
2. The majorities of the doors do not have the proper push and pull clearances.
3. Fire extinguishers, exterior pullboxes and switches are not accessible.
4. Door hardware throughout the building does not comply with accessibility requirements.
5. Toilet room sizes, fixtures and accessories are non-compliant with accessibility requirement.
6. The stairway steps have open risers; this is not allowed by the handicap code nor is it allowed for a means of egress.

7. The exterior front door is only accessible via a step and consequently does not comply with current accessibility requirements. The rear entrance leads to the stairway making the rest of the facility inaccessible.
8. All interior building signs need to be upgraded to include Braille and mounted at the correct height.
9. The facility has multiple floor levels, and there is no elevator connecting them. This will require a variance. Since the basement (Prudential Committee Office) and sub-basement (mechanical room) are only utilized by able bodied firefighters typically a variance is granted.

Waterproofing System

Generally, the waterproofing at the Williamstown Station is in fair to good condition. Our field investigations revealed the following:

1. The existing flat roof was not evaluated, however from below there were no indications of any current roof leaks. There are indications of old water leak stains on walls and ceilings; however, it appears that these leaks are no longer active. In discussions with the Fire Chief, the existing single-ply roof membrane is approximately 10 years old (1998) and has had some repair work.
2. All sealant and caulking joints should be evaluated. It is expected that they have outlived their life expectancy and need to be replaced.
3. Ventilation in the roof joists spaces needs to be evaluated and corrected. The lack of proper ventilation, if not addressed, could lead to more serious problems such as dry rot, mold, and roofing delamination.
4. At the time of our evaluation the existing basement was dry; however it does appear that it may be prone to water infiltration. While there is no sure remedy to keep moisture out of basements in existing facilities, there are several ways to improve this situation, some more expensive than others. Since, in this case the problem does not appear to be severe, we recommend that the below grade walls and slabs be coated with a negative side water proofing. This will prevent ground moisture from seeping into the building.
5. The existing facility was constructed during the 50's, when energy conservation was not an issue. In past renovations, supplemental rigid roof insulation has been installed below the roof membrane. However, it is apparent that the existing walls were left untouched. Consequently, the facility is lacking insulation within the exterior walls; additionally there is no continuous vapor barrier or infiltration barrier as required by the Massachusetts Energy Code.

Integrity of Doors, Windows and Exterior Walls

Visually, the exterior envelope of the facility appears to be in satisfactory condition. Our field investigations revealed the following:

Doors

1. The weatherstripping at the exterior doors is either missing or in poor condition.
2. All door hardware should be evaluated and modified to comply with current codes and guidelines.
3. Overhead doors to the facility are too narrow and too low to accommodate procurement of standard-size apparatus. Additionally, the operations of the doors and operators have been problematic, requiring constant service.

Windows

1. Windows throughout the facility are in good shape and consist of double-hung vinyl replacement windows.

Exterior Walls

The existing masonry façade appears to be in good condition for its age.

1. A cursory review of the brick façade revealed that the brick has performed fairly well. There are numerous masonry cracks on the exterior of the facility as well as within the facility; however they appear to be stable and attributable to the lack of masonry control and expansion joints. The majorities of the cracks have been in filled with some type of sealant. In certain areas the sealant is clear silicone while in others the sealants have been painted over.

Typically, all of the masonry joints throughout the façade need to be raked out and repointed. This will stop any future moisture infiltration issues as well as maintain the integrity of the exterior wall.

2. The existing exterior trim and decorative molding needs to be scraped, primed and repainted.
3. Exterior conduits, metal railings and piping needs to be scraped, primed and painted.

Interior Finishes

The condition of the interior finishes within the facility generally varies with the extent of their use. The majority are in good condition. Overall, the facility has been very well-maintained.

1. Interior walls of the administrative office are in good conditions.
2. The suspended ceilings on are in good shape; however there are indications of staining from roof leaks, it is unclear if these leaks are still active or residual staining from past leaks.
3. The flooring within the facility, by its 9" x 9" size, is suspect as being asbestos floor tiles. Further testing would be required to verify if it is in fact an Asbestos Containing Material. Currently, the flooring is in fair condition and it is not friable, if this changes,

the flooring should be removed and replaced or encapsulated to prevent asbestos fibers from becoming air borne.

Fire Department Operational Issues

Currently, there is no accreditation standard for fire stations. The only guidelines available are the National Fire Prevention Association (NFPA) which determines interior response standards and the U.S. Air Force Fire Station Design Guide which is very helpful in verifying space requirements. Typically, each station is designed to suite the specific requirements established by the end users. In discussions with Fire Department personnel and utilizing the U.S. Air Force Fire Station Design Guide, (copy attached in Appendix B), the following deficiencies were identified:

1. Overhead doors to the fire apparatus room are too narrow and too low for present equipment; it impedes the department in the procurement of future apparatus and it also hinders the deployment of supplemental support from this facility.
2. The overall width and length of the apparatus bays are too narrow for present equipment to accommodate the majority of the vehicles. This congested layout impacts and interferes with the internal response time of the station.
3. The stations administrative spaces are greatly undersized and limited to the fire chief's office, and a diminutive office off of the apparatus bays office serving multiple duties.
4. Currently, there is no separate area for gear storage. Gear is stored in open lockers within the apparatus bay.
5. The only toilet rooms to the facility are off of the meeting room and are also used for storage. Consequently, due to the limited number of toilet rooms, there is no separation of use from toilets in the "dirty" portion of the station to those in the "clean" area.
6. There are no public toilet rooms.
7. Currently, the facility other than the kitchen is lacking all firefighter's living space amenities. Spaces such as dining area, day room, locker rooms, fitness room and dormitories are non existent.
8. Breathing air tanks and gear are stored and filled on the apparatus floor and not in a separate contained area.
9. The facility does not have a decontamination area. All contaminated equipment is hosed down within the apparatus bay.
10. There is no dedicated area for a washer and dryer. Additionally, the facility does not have a washer extractor to wash firefighter protective gear.
11. Current storage areas are tight, with storage overflow occupying mezzanines, mechanical room and attic spaces. Storage of building supplies is scattered throughout the facility.
12. The existing kitchen is extremely small and insufficiently sized to accommodate the current staff.

13. The station in its current configuration cannot accommodate the anticipated growth within the community and within the programmatic requirements of the fire station. For a complete program requirement, see Section II - Space Needs Program.
14. The male and female toilet/shower rooms are all original construction and are in dire need of an upgrade.
15. There is no janitor's closet.
16. There is no emergency shower.
17. The existing apparatus approach slab is bituminous concrete in lieu of concrete, consequently is sagging and it needs to be patched or replaced.
18. The interior concrete apparatus slab has several large cracks. These need to be addressed to prevent water from seeping through the slab, washing away the under slab substrate and exasperating the condition.

STRUCTURAL

Existing Conditions

This description of the building's structural system is based on the observations made during the field visit and from the available original architectural design drawings.

The Williamstown Fire Station was designed in 1950 and constructed of 3 wythe brick masonry bearing walls supporting wood-framed roofs and floors and structural concrete slab under heavily loaded areas of the ground level. The portion of the building that houses the administrative area has a partial basement and a sub-basement. The apparatus room is one story in height with a flat roof.

At the apparatus room the floor is cast-in-place concrete slab. The floor of the basement is also concrete slab-on-grade. The floor above the mechanical and electrical rooms is a cast-in-place structural concrete slab. Foundation walls are concrete. Walls and columns are supported on concrete spreadfootings, at this time it is unclear if the foundation walls are reinforced.

Most walls are brick masonry bearing walls with exposed brick at the exterior faces and interior faces. Interior partitions in the basement are concrete block.

Elevated floors are framed with dimensional lumber spanning between exterior walls and interior walls or beams. The roof is framed by dimensional lumber rafters and wood board sheathing. In the apparatus bays the lathe and plaster ceilings are secured to the bottom of the wood-framed flat roof, however, in the rest of the facility the plaster ceiling is secured to supplemental wood ceiling joists.

Observations

1. The first floor concrete slabs in the main apparatus bay have cracked extensively:
 - a. Cracking is observable from the top surface throughout the apparatus bay.
 - b. Alligator cracking of the surface can be observed throughout the apparatus room, most noticeably toward the front of the main bays.
2. There are diagonal cracks in the top of the foundation walls at many of the exterior foundation walls.
3. The steel lintels over the windows and openings are somewhat corroded.
4. Around the perimeter of the facility, there are numerous cracks within the masonry walls. These cracks have been repaired most recently with a caulking product; from a visual observation it appears to be clear silicone, not the best product for this application.

Discussion

The structural elements of the Williamstown Fire Station structure appear to be in generally sound condition. Deterioration of some elements, including rusting of lintels, some concrete cracking of foundation walls and some deterioration of mortar joints are fairly minor and appear to be related to building aging and exposure to moisture.

Proposed Work

For this evaluation, two different approaches to the building are being looked at:

- Option A, consists of expanding the existing facility, site limitations will restrict the size of the addition unless adjacent land is purchased. Refer to the Architectural portion of this report for additional information.
- Option B, which consists of constructing a new facility on a separate parcel, will not impact the existing structural system.

Structural Code Requirements

Any of the proposed work must conform to the requirements of the Massachusetts State Building Code, CMR 780, Seventh Edition, which was newly adopted in September of this year. For Option B, replacement of the entire building, any structural work will comply with the requirements for new building construction.

For Option A, Chapter 34, “Repair, Alteration, Addition and Change of Use of Existing Buildings” will be implemented and it includes the relevant requirements for an existing building that would apply to either upgrades for basic code compliance or in this case to maintain and renovate most of the existing building.

Code requirements related to the building structure are associated with the type and extent of changes that will be made and on how the Code categorizes the level of work. Due to extent of renovations in the existing building, the structural work will be categorized as no less than Level 2 Work:

- Paragraph 3408.4.3.5.A states that Level 2 Work includes structural work involving “more than 25% of the total tributary area of horizontal framing members...of any existing framed floor or roof.” Since the facility would be expanded, the existing structure would be required to be upgraded, however there is the possibility to structurally isolate the addition so it will not affect the existing structure. In this scenario the existing structure would not be disturbed and would not be required to be brought up to code.

One cannot determine if this can be utilized until the design portion of the project. For example, if the proposed addition is taller than the existing structure then even though the addition is structurally isolated from the existing structure, snow drift could accumulate on the lower roof impacting the existing structural loads requiring modifications to the existing structural framing and consequently triggering a comprehensive facility structural upgrade.

Level 2 Work for the Williamstown Fire Headquarters requires the following:

- A survey of the existing building to gather and verify existing conditions and to identify load paths for both gravity and lateral loads.
- A structural evaluation of the building, including:
 - Determination of strengths of existing materials by either testing or through any existing, available, acceptable historic records.

- Evaluation of hazardous conditions and determination of repairs.
- Determination of the total gravity load capacity, of the live load capacity and of the snow load capacity.
- An evaluation of the lateral load capacity of the building and determination of how to correct any deficiency.
- An evaluation of structural details including:
 - Connectivity of structural elements.
 - Presence, condition and strength of any anchorage between masonry walls and floor and roof decks.
 - Any unreinforced masonry parapets.
 - Adequacy of the ratio of thickness to distance between lateral supports.

Any deficiencies discovered in the process of the detailed structural evaluation will require repair or remediation.

Because of the age and construction type of the building, it can be assumed that its masonry walls are not reinforced and that there is no or insufficient anchorage between the masonry walls and roof framing. Anchors must be provided to transfer both in-plane and transverse loadings and must meet minimum strength requirements dictated by the code. Because the exterior walls are quite thick, typically 12-inches, it is not likely that additional lateral support will be required to meet the code's minimum height to thickness ratio. Parapets are not particularly high and it will not be necessary to provide parapet tie-backs.

Recommendations

Recommendations that follow are those required to restore deficiencies of the building and to comply with code requirements. They are discussed in reference to two of the potential approaches:

- Option A: Addition to the existing station and reconfiguration of interior spaces and upgrades for code compliance.
 1. Repair the apparatus room structural floor slab.
 2. Repair the masonry cracks inside and outside of the facility. Clear silicone sealant will need to be removed and replaced with appropriate cementitious products.
 3. Re-point existing masonry joints.
 4. Seal the diagonal cracks around the perimeter foundation walls.
 5. At any corroded lintels, clean to remove loose rust and paint and recoat with a high quality, corrosion-resistant paint system.

Since Option B involves constructing a new facility elsewhere, it is not relevant to the discussion of recommendations.

MECHANICAL

Existing Conditions

1. The building heat source is a Weil McClain hot water boiler which was installed approximately 20 years ago. The boiler is fired on natural gas. The hot water rating is 348 Mbh.
2. A two-pipe system distributes heat throughout the building. Two circulators serve one zone for the apparatus bay and one zone for the remainder of the building.
3. Hot water piping in the Boiler Room and the hot water pipe distribution system that is exposed throughout the building is not insulated.
4. In general, hot water heat is provided to the building by cast-iron radiators, baseboard radiation and unit heaters.
5. The Apparatus Bays are heated by two hot water unit heaters. These heaters are mounted high near the ceiling, supported from the structure.
6. The Apparatus Bays are served by a vehicle exhaust removal system, manufactured by Plymovent and consisting of three vehicle exhaust connectors ducted up through the ceiling to an exhaust fan discharging up through the roof.

Recommendations

1. The hot water heating system has been well maintained.
2. Further expansion of the facility would require more capacity than is presently available, thus a new boiler would be needed.
3. Controls are limited. More zones should be created to maximize heating efficiencies.
4. Ventilation is limited and must be increased per code.
5. All piping should be insulated.

If the building is expanded, all of the existing heating and cooling systems will need to be upgraded and replaced with new.

ELECTRICAL

Existing Conditions

1. Service/Power Distribution System – Normal: The electrical service to the building is provided by National Grid. Service originates from a pole-mounted transformers located on a riser pole on Water Street. From there the service entrance conductors are routed overhead via several poles to the building where they drop to a service weatherhead and then to a 200 ampere, 120/240 volt, single-phase, three wire main service circuit breaker in the basement. This main service breaker feeds a 200 ampere automatic transfer switch. The transfer switch then feeds the main distribution panel which is a 1950 vintage Westinghouse 200 amp, single-phase, 120/240 volt with a main circuit breaker. The only other panel is called the “Garage” panel on the first floor. The “Garage” panel was flush-mounted in an apparatus bay wall. Presently, a new style 100 amp single-phase circuit breaker panel with residential type mini-breakers has been installed in the space where the old panel interior existed and since been removed. This appears to have been done to create more circuits on the first floor.
2. Standby Power Distribution System: Standby power for building loads is provided by a standby generator located in the basement. Within this same basement room, the following services reside: Normal utility main service disconnect, main distribution panel, telephone service, water service, sewer and storm entrances as well as an air compressor. The generator is rated 33 kW at 120/240 volts, single-phase, three wire. It has output capability of 138 amperes and feeds all of the loads within the building. It should be noted that we are using the term “Stand-by” and not “Emergency” since there is no separation of stand-by and emergency loads as would be required by the latest edition of the National Electrical Code if it were deemed “Emergency.”
3. Interior Lighting: The lighting system within the facility consists of fluorescent lighting with local switching.
4. Exterior Lighting: Exterior lighting consists of HID wall-mounted lights mounted on active sides of the building.
5. Emergency Lighting: Since the existing lighting within the facility designated as "emergency lighting" is powered by the standby generator, it is not in compliance with the National Electrical Code and cannot be designated as "emergency lighting."
6. Fire Alarm System: The fire alarm system consists of a Fire-Lite main control panel located in the apparatus bay near the front personnel entrance door. At the main panel there is a manual pull station. There seems to be a limited number of heat and smoke detectors.
7. Convenience Outlets: The quantity of outlets is utilitarian reflective of anticipated needs in 1950. Over the years, outlets have been added as needed. Suffice it to say that there is need for more usable outlets.
8. Telephone/Data: Telephone enters the building from overhead via exposed cable from Water Street. Upon entering the building in the basement electric room, there is an exterior type splice can where the cable then is cut-down in an interface cabinet. This cabinet and additional telecom equipment is mounted to a telecom plywood backboard. All this equipment needs to be upgraded and rearranged for present usage.

9. Cable Television: Cable television enters the building overhead. One outlet is provided in the meeting room.
10. Communications Equipment: Dispatch for the Fire Department is handled through the dispatch room. A chimney-mounted antenna is the repeater for two-way communication.

Recommendations:

1. Service/Power Distribution System – Normal: The existing service capacity is sufficient for present day operations; however the capacity is inadequate for any additional loads.
2. Stand-by Power Distribution System: Although the existing generator has been well maintained and in good condition, its capacity is limited to the present day use. The natural gas fuel source is considered interruptible thus consideration must be given to an outdoor diesel powered package engine generator with integral double wall base tank. Also, present day codes do not allow the generator to be in the same room as electrical equipment.
3. Interior Lighting: The existing lighting is in good condition and can be retained in areas that would not require renovation. In areas undergoing major renovations, the lighting should be replaced. In addition, automatic lighting controls should be provided for all areas.
4. Exterior Lighting: The exterior lighting is adequate and efficient and need not be changed, unless new work interferes with the existing coverage. If the building is to be expanded then all of the existing electrical, lighting and low voltage systems will require to be replaced with new.
5. Emergency Lighting: To remedy the existing "emergency lighting" issue that is described in the Existing Conditions section of this report. One of three possible actions can be taken and they are as follows:
 - a. Since the existing Fire Headquarters building function and operation is essential to the Town's public safety, the Authority Having Jurisdiction (AHJ), which in this case, is the Town Building Inspector or Wiring Inspector, can deem this existing standby Power Distribution System and its loads as emergency and the "emergency lighting" fixtures can remain as is.
 - b. The next most economical solution is to disconnect the existing "emergency lighting" fixtures from the standby Distribution System and connect them to the existing Normal Power Distribution System and install new battery-powered emergency lighting units throughout the building.
 - c. The last and most expensive solution is to remove the existing natural gas-fueled standby generator and install a new diesel-powered engine generator with a new or existing modified power distribution system to provide the segregation of standby and emergency loads in the building.

PLUMBING

Existing Conditions

1. The following plumbing systems are present within the existing building:
 - Domestic water enters the basement from Water Street. There is a backflow preventer on the service. Domestic hot water is generated by a 50 gal natural gas-fired water heater; the manufacturer is A.O. Smith. The piping is copper tubing.
 - The sanitary drain system collects wastes from plumbing fixtures located in the first floor bathrooms. The drain piping is predominantly hub and spigot cast iron piping.
 - The bathrooms are equipped with mostly old style lavatories, sinks and flush valve toilets. None of the toilets are of the water saver quality as required by the current code. There are no handicapped accessible bathrooms in the building.
 - There is a corner type shower in the men's room presently not used.
 - The apparatus bay floor drains that are reportedly draining into the storm sewer. There is no oil/sand interceptor on this system. These are violations of the current code.
 - There is a natural gas system that provides the gas to the heating boiler and the hot water heater in the basement. This system also supplies gas to the emergency generator in the basement electric room.

2. The existing facility does not have a fire suppression system.

Recommendations

1. The facility should be equipped with an integrated fire suppression system.
2. All areas accessible to the handicap shall be provided with handicapped accessible plumbing fixtures.
3. The apparatus bay should be furnished with trench drains with an oil/sand interceptor for the floor drain.

SPACE NEEDS PROGRAM

Williamstown Fire Department

Williamstown Fire Headquarters

July 16, 2008

Updated September 18, 2008



**Maguire Group Inc.
33 Commercial Street, Suite 1
Foxborough, MA 02035**

TABLE OF CONTENTS

STAFFING AND PARKING	I-1
SPACE ALLOCATION	I-2
APPARATUS AND SUPPORT	
APPARATUS ROOM	I-4
HAZMAT, DISASTER SUPPLY and HOSE STORAGE	I-5
EQUIPMENT STORAGE/TOOLS AND MECHANICS ROOM	I-6
FIREFIGHTER’S TOILETS	I-7
AIR SUPPLY ROOM	I-8
TURN-OUT GEAR ROOM	I-9
“CONTAMINATED” WASHER EXTRACTOR	I-10
BIOHAZARD/DECON ROOM	I-11
READY ROOM/BATTERY CHARGING	I-12
PUBLIC LOBBY/DISPATCH	
WATCH ROOM	I-13
PUBLIC LOBBY/VESTIBULE/RECEPTION	I-14
PUBLIC TOILETS	I-15
ADMINISTRATION	
FIRE CHIEF'S OFFICE	I-16
FIRE DEPUTY’S OFFICE	I-17
FIRE PREVENTION	I-18
CONFERENCE ROOM	I-19
PRUDENTIAL COMMITTEE ROOM	I-20
ADMINISTRATIVE ASSISTANT	I-21
SUPPLY/WORK ROOM	I-22
ADMINISTRATIVE KITCHENETTE	I-23
ARCHIVES/DEAD RECORDS/SERVER ROOM	I-24
INDOOR TRAINING	
TRAINING EQUIPMENT STORAGE	I-25
TRAINING ROOM	I-26
FITNESS	I-27
FIREFIGHTER’S QUARTERS	
FIREFIGHTERS' BUNK ROOMS	I-28
MALE TOILET AND SHOWER	I-29
FEMALE TOILET AND SHOWER	I-30
MALE LOCKER ROOM	I-31
FEMALE LOCKER ROOM	I-32
DAY ROOM	I-33
KITCHEN/DINING	I-34
BUILDING SUPPORT AND SYSTEMS	
JANITOR’S CLOSET	I-35
BUILDING SUPPLIES ROOM/STORAGE	I-36
MAINTENANCE AND STORAGE	I-37
MECHANICAL ROOM	Not in Set
ELECTRICAL ROOM	Not in Set
TELEPHONE ROOM	Not in Set

Personnel, Day Shift	Present		Future (2033)	
	Per Shift	Total	Per Shift	Total
Fire Chief	1	1	1	1
Deputy Fire Chief	1	4	1	4
Shift Commander	0	0	0	0
Company Officer	0	0	0	0
Firefighters	6	13	6	24
Dispatch	0	0	0	0
Training Officer	0	0	0	0
Fire Prevention	0	0	1	1
Administrative	1	1	1	1
Administrative Assistant	0	0	1	1
Total	10	19	11	32

	Present	Future
	Parking per Shift	Parking per Shift
Staff	10	11
Public	0	0

Site Features

Provide space for dumpster, A/C condenser, and emergency generator (48-hour service for entire building).

Interior Features

- All wall clocks interwired.
- Multiple data and outlet locations in each room.

	ITEM	PROPOSED SF	Bsmt	1ST	2ND
APPARATUS AND SUPPORT					
	APPARATUS ROOM	I-4	7200		
	HAZMAT, DISASTER SUPPLY and HOSE STORAGE	I-5	168		
	EQUIPMENT STORAGE/TOOLS and MECHANICS ROOM	I-6	144		
	FIREFIGHTER'S TOILETS	I-7	181		
	AIR SUPPLY ROOM	I-8	192		
	TURN-OUT GEAR ROOM	I-9	300		
	"CONTAMINATED" WASHER EXTRACTOR	I-10	80		
	BIOHAZARD/DECON ROOM	I-11	128		
	READY ROOM/BATTERY CHARGING	I-12	48		
PUBLIC/LOBBY/DISPATCH					
	WATCH ROOM	I-13	144		
	PUBLIC LOBBY/VESTIBULE/RECEPTION	I-14	144		
	PUBLIC TOILETS	I-15	200		
ADMINISTRATION					
	FIRE CHIEF'S OFFICE	I-16	200		
	FIRE DEPUTY'S OFFICE	I-17	320		
	FIRE PREVENTION	I-18	208		
	CONFERENCE ROOM	I-19	250		
	PRUDENTIAL COMMITTEE ROOM	I-20	168		
	ADMINISTRATIVE ASSISTANT	I-21	206		
	SUPPLY/WORKROOM	I-22	100		
	ADMINISTRATIVE KITCHENETTE	I-23	24		
	ARCHIVES/DEAD RECORDS/SERVER ROOM	I-24	160		
INDOOR TRAINING					
	TRAINING EQUIPMENT STORAGE	I-25	100		
	TRAINING ROOM	I-26	1000		
	FITNESS	I-27	250		
FIREFIGHTER'S QUARTERS					
	FIREFIGHTER'S ROOMS (6)	I-28	720		
	MALE TOILET AND SHOWER	I-29	320		
	FEMALE TOILET AND SHOWER	I-30	120		
	MALE LOCKER ROOM	I-31	286		
	FEMALE LOCKER ROOM	I-32	44		
	DAY ROOM	I-33	600		
	KITCHEN/DINING	I-34	720		
BUILDING SUPPORT AND SYSTEMS					
	JANITOR'S CLOSET	I-35	72		
	BUILDING SUPPLIES ROOM/STORAGE	I-36	120		
	MAINTENANCE AND STORAGE	I-37	120		

	ITEM	PROPOSED SF	Bsmt	1ST	2ND
MECHANICAL ROOM	Not in set	300			
ELECTRICAL ROOM	Not in set	80			
TELEPHONE ROOM	Not in set	80			
SUBTOTAL		15,497			
WALLS, CIRCULATION, STAIRS, CHASES @25%		3,874			
TOTAL GROSS BASEMENT					
TOTAL GROSS FIRST FLOOR					
TOTAL GROSS SECOND FLOOR					
TOTAL BUILDING GROSS		19,371			

APPARATUS ROOM**FLOOR AREA NEEDED**

5 double-loaded bays @ 18' x 80' = 7,200 SF

ADJACENCY REQUIREMENTS

Adjacent to firefighter's quarters and to support spaces

PUBLIC ACCESS

Controlled by public lobby

SECURITY REQUIREMENTS

Moderate

FURNITURE, FIXTURES & EQUIPMENTEye wash
Area for printer and radio charging (Ready Room)**HEADQUARTERS FRONT LINE RESPONSE**3 Pumpers @ 38'
2 Brush truck @ 22'
1 Ladder @ 50'
1 Command vehicle**HEADQUARTERS FUTURE**1 Inflatable Motorboat on trailer @ 18'
1 Rescue
1 Rescue**SPECIAL NEEDS**Electric cord reel.
Overhead doors 14' x 14', overhead power, overhead water fill, compressed air.
Overhead door operations: At door jamb, at watch desk, and on apparatus vehicles.
Wide trench drains centered on apparatus bays
Mop sink
Acoustic considerations
Sand/oil separator
Heavy-duty overhead door operators
Zetron speakers**FLOOR MATERIALS AND FINISHES**

Hardener and sealer concrete slab with epoxy paint

WALL MATERIALS AND FINISHES

CMU with epoxy paint

CEILING MATERIALS AND FINISHES

Painted exposed/GWB

LIGHTING

Low-level night lighting, fluorescent rapid-response

HVAC

No A/C, provide vehicle exhaust system (possibility of re-using portions of existing system)

HAZMAT, DISASTER SUPPLY AND HOSE STORAGE

FLOOR AREA NEEDED	12' x 14' = 168 SF
ADJACENCY REQUIREMENTS	Off apparatus floor
PUBLIC ACCESS	None
SECURITY REQUIREMENTS	Moderate
FURNITURE, FIXTURES & EQUIPMENT	2'-0" deep shelves, 12" apart on 3 walls 5'-0" x 5'-0" secure metal cage within room
FLOOR MATERIALS AND FINISHES	Sealed concrete
WALL MATERIALS AND FINISHES	CMU - epoxy paint
CEILING MATERIALS AND FINISHES	Exposed Structure/GWB
LIGHTING	Fluorescent
HVAC	No A/C

EQUIPMENT STORAGE/TOOLS AND MECHANIC'S ROOM

FLOOR AREA NEEDED	12' x 12' = 144 SF
ADJACENCY REQUIREMENTS	Next to apparatus room
PUBLIC ACCESS	None
SECURITY REQUIREMENTS	Moderate
FURNITURE, FIXTURES & EQUIPMENT	Storage for hand tools, ropes, portable generator, ice sled, 2 rows of 18" deep metal mesh shelving on one wall
FLOOR MATERIALS AND FINISHES	Concrete with hardener
WALL MATERIALS AND FINISHES	CMU-epoxy paint
CEILING MATERIALS AND FINISHES	Painted exposed structure/GWB
LIGHTING	Fluorescent
HVAC	No A/C

FIREFIGHTER'S TOILETS**FLOOR AREA NEEDED**

Male @ 117 SF
Female @ 64 SF
TOTAL 181 SF

ADJACENCY REQUIREMENTS

Next to apparatus room and gear room

PUBLIC ACCESS

None

FURNITURE, FIXTURES & EQUIPMENT

Male - 1 toilet, 2 sinks, 1 urinal
Female - 1 toilet, 1 sink

SPECIAL NEEDS

Zetron speakers

FLOOR MATERIALS AND FINISHES

Ceramic tile

WALL MATERIALS AND FINISHES

CMU with ceramic tile wainscot

CEILING MATERIALS AND FINISHES

GWB

LIGHTING

Fluorescent

HVAC

A/C, good ventilation

AIR SUPPLY ROOM**FLOOR AREA NEEDED**

12' x 10' = 120 SF
Compressor room 12' x 6' = 72 SF
TOTAL = 192 SF

ADJACENCY REQUIREMENTS

Off of apparatus room
Accessible to the outside

PUBLIC ACCESS

None

SECURITY REQUIREMENTS

High

FURNITURE, FIXTURES & EQUIPMENT

Rack for storage of air tanks, 6' long workbench,
tool storage, SCBA air tank, mop sink to wash
tanks and masks
SCBA compressor 4' x 10' in a separate room
with ventilation to the outside.

SPECIAL NEEDS

Zetron speakers

FLOOR MATERIALS AND FINISHES

Concrete with hardener

WALL MATERIALS AND FINISHES

CMU

CEILING MATERIALS AND FINISHES

GWB

LIGHTING

Fluorescent

HVAC

No A/C, good ventilation

TURN-OUT GEAR ROOM

FLOOR AREA NEEDED	10 SF for each locker (30) = 300 SF
ADJACENCY REQUIREMENTS	Next to apparatus room
PUBLIC ACCESS	None
SECURITY REQUIREMENTS	Moderate
FURNITURE, FIXTURES & EQUIPMENT	30 steel mesh cubicles 24" x 24" with top and bottom shelves Zetron speakers
SPECIAL NEEDS	Zetron speakers Floor drains Electrical outlets in each cubicle
FLOOR MATERIALS AND FINISHES	Concrete with hardener/or rubber flooring
WALL MATERIALS AND FINISHES	CMU with epoxy paint
CEILING MATERIALS AND FINISHES	GWB
LIGHTING	No fluorescent light fixtures
HVAC	No A/C, very good ventilation – Maintain gear room under negative pressure

“CONTAMINATED” WASHER/DRYER

FLOOR AREA NEEDED	8' x 10' = 80 SF
ADJACENCY REQUIREMENTS	Near turn-out gear room and Decontamination Room
PUBLIC ACCESS	None
SECURITY REQUIREMENTS	None
FURNITURE, FIXTURES & EQUIPMENT	Heavy-duty, stainless steel, 45 lb. capacity washer extractor and dehydrator with shelving above
SPECIAL NEEDS	Floor drain Thickened floor slab Gravity drain from extractor with air gap
FLOOR MATERIALS AND FINISHES	Concrete with hardener/ or rubber flooring
WALL MATERIALS AND FINISHES	CMU
CEILING MATERIALS AND FINISHES	GWB
LIGHTING	Fluorescent
HVAC	No A/C, good ventilation, dryer vent

BIOHAZARD/DECON ROOM

FLOOR AREA NEEDED	8' x 16' = 128 SF
ADJACENCY REQUIREMENTS	Near deluge shower accessible from the exterior and the apparatus bay
PUBLIC ACCESS	None
SECURITY REQUIREMENTS	High
FURNITURE, FIXTURES & EQUIPMENT	3' x 4' floor sink with deluge shower, hose with spray, sink with eyewash device, wall-mounted stainless steel sink with foot controls
SPECIAL NEEDS	Zetron speakers
FLOOR MATERIALS AND FINISHES	Ceramic tile
WALL MATERIALS AND FINISHES	CMU with ceramic tile wainscot
CEILING MATERIALS AND FINISHES	GWB
LIGHTING	Fluorescent
HVAC	Good ventilation

READY ROOM/BATTERY CHARGING

FLOOR AREA NEEDED	4' x 12' = 48 SF
ADJACENCY REQUIREMENTS	Alcove adjacent to Apparatus Room
PUBLIC ACCESS	None
SECURITY REQUIREMENTS	Moderate
FURNITURE, FIXTURES & EQUIPMENT	Counter with storage cabinets and shelving
SPECIAL NEEDS	Electrical wire mold outlets and data jackets
FLOOR MATERIALS AND FINISHES	Sealed concrete.
WALL MATERIALS AND FINISHES	CMU
CEILING MATERIALS AND FINISHES	GWB
LIGHTING	Task lighting
HVAC	No A/C

WATCH ROOM

FLOOR AREA NEEDED	144 SF
ADJACENCY REQUIREMENTS	Direct view to Public/Lobby entrance, view into Apparatus Room.
PUBLIC ACCESS	None
SECURITY REQUIREMENTS	High
FURNITURE, FIXTURES & EQUIPMENT	Radio console position for one 10' work, 2 chairs, wall space for maps, counter with storage for forms under at window to Public Lobby, 20 LF shelving, white board, cable TV.
SPECIAL NEEDS	Window with pass-through and counter to Public Lobby/Reception Controls for VOC-ALARM or ZETRON. CCTV Room darkening shades.
FLOOR MATERIALS AND FINISHES	Carpet tile
WALL MATERIALS AND FINISHES	GWB
CEILING MATERIALS AND FINISHES	ACT
LIGHTING	Fluorescent with parabolic reflector, 2 level lighting, task lighting
HVAC	A/C

PUBLIC LOBBY/VESTIBULE/RECEPTION

FLOOR AREA NEEDED	12' x 12' = 144 SF
ADJACENCY REQUIREMENTS	Next to Watch Room; near Administrative area, and Training Room. Easy, but not visible access to Admin. Speak-thru and paper slot to watch room.
PUBLIC ACCESS	Full access
SECURITY REQUIREMENTS	Moderate; controlled exit from Lobby to the rest of the building. All public must check in w/watch room first.
FURNITURE, FIXTURES & EQUIPMENT	
SPECIAL NEEDS	Surveillance from watch room, automatic door operators
FLOOR MATERIALS AND FINISHES	Porcelain pavers
WALL MATERIALS AND FINISHES	GWB
CEILING MATERIALS AND FINISHES	ACT
LIGHTING	Fluorescent plus accent lighting
HVAC	A/C

PUBLIC TOILETS

FLOOR AREA NEEDED	2 @ 9'X 10' = 200 SF
ADJACENCY REQUIREMENTS	Access from Public Lobby but not visible
PUBLIC ACCESS	High
SECURITY REQUIREMENTS	Moderate
FURNITURE, FIXTURES & EQUIPMENT	Women's room 2 sinks 2 toilets Men's room 2 sinks 1 urinal 1 toilet
SPECIAL NEEDS	Handicapped accessible Floor drain
FLOOR MATERIALS AND FINISHES	Ceramic tile
WALL MATERIALS AND FINISHES	Ceramic tile wainscot
CEILING MATERIALS AND FINISHES	GWB
LIGHTING	Fluorescent
HVAC	No A/C, good exhaust tied to light switch

FIRE CHIEF'S OFFICE

CURRENT STAFF	1
FUTURE STAFF	1
FLOOR AREA NEEDED	12' x 16' plus 2' x 4' closet 200 SF TOTAL
ADJACENCY REQUIREMENTS	Near Secretary's office
PUBLIC ACCESS	Limited, controlled
FURNITURE, FIXTURES & EQUIPMENT	30" x 6' desk with return and credenza, desk chair, with 2 file lateral file drawers, seating for 4 at small conference table, TV/VCR and 30 LF bookshelves
SPECIAL NEEDS	Coat closet Zetron speakers
FLOOR MATERIALS AND FINISHES	Carpet
WALL MATERIALS AND FINISHES	GWB
CEILING MATERIALS AND FINISHES	ACT
LIGHTING	Fluorescent with parabolic reflector
HVAC	A/C

FIRE DEPUTY'S OFFICE

CURRENT STAFF	4
FUTURE STAFF	4
FLOOR AREA NEEDED	Separate room to house 4 cubicles @ 8' x 10' = 320 SF
ADJACENCY REQUIREMENTS	Near Secretary's office
PUBLIC ACCESS	Limited, controlled
FURNITURE, FIXTURES & EQUIPMENT	Each cubicle to house (1) 30" x 6' desk and return, 1 desk chair, 1 guest chair, 4 LF book shelves, (1) 3' storage cabinets, (1) 3-drawer lateral files with top
SPECIAL NEEDS	Zetron Speakers
FLOOR MATERIALS AND FINISHES	Carpet
WALL MATERIALS AND FINISHES	GWB
CEILING MATERIALS AND FINISHES	ACT
LIGHTING	Fluorescent with parabolic reflector
HVAC	A/C

FIRE PREVENTION OFFICE

CURRENT STAFF	0
FUTURE STAFF	1
FLOOR AREA NEEDED	1 cubicles @ 100 SF = 100 SF 1 closet @ 8 SF = 8 SF Work space @ 100 SF = 100 SF 208 SF TOTAL
ADJACENCY REQUIREMENTS	Near administrative staff
PUBLIC ACCESS	Limited
SECURITY REQUIREMENTS	Moderate
FURNITURE, FIXTURES & EQUIPMENT	1 desks with return and desk chair, 1 guest chairs, (1) 3-drawer lateral files, 10 LF shelving, plan review table, flat files for archived plans, roll storage for current plans Space for printer
SPECIAL NEEDS	Coat closet Zetron speakers Multiple data and outlets
FLOOR MATERIALS AND FINISHES	Carpet
WALL MATERIALS AND FINISHES	GWB
CEILING MATERIALS AND FINISHES	ACT
LIGHTING	Fluorescent with parabolic reflections
HVAC	A/C

CONFERENCE ROOM

FLOOR AREA NEEDED	10 persons at 25 SF per person = 250 SF
ADJACENCY REQUIREMENTS	Adjacent to Chief's and Deputy Fire Chief's Office
PUBLIC ACCESS	Controlled
SECURITY REQUIREMENTS	Moderate
FURNITURE, FIXTURES & EQUIPMENT	Table and chairs to accommodate 10, credenza
SPECIAL NEEDS	6' white board, tackable surface Overhead projection screen, cable, phone and electrical connections set in conference table
FLOOR MATERIALS AND FINISHES	Carpet
WALL MATERIALS AND FINISHES	GWB
CEILING MATERIALS AND FINISHES	ACT
LIGHTING	Fluorescent with parabolic reflectors, downlights
HVAC	A/C

PRUDENTIAL COMMITTEE ROOM

CURRENT STAFF	1
FUTURE STAFF	1
FLOOR AREA NEEDED	12' x 14' = 168 SF
ADJACENCY REQUIREMENTS	Adjacent to Reception area
PUBLIC ACCESS	Limited, controlled
FURNITURE, FIXTURES & EQUIPMENT	30" x 6' desk, return and credenza, desk chair, 2 guest chairs, 40 LF book shelves, 2-3' storage cabinets, 4 3-drawer lateral files with top
SPECIAL NEEDS	
FLOOR MATERIALS AND FINISHES	Carpet
WALL MATERIALS AND FINISHES	GWB
CEILING MATERIALS AND FINISHES	ACT
LIGHTING	Fluorescent with parabolic reflections
HVAC	A/C

ADMINISTRATIVE ASSISTANT

CURRENT STAFF	1
FUTURE STAFF	1
FLOOR AREA NEEDED	Office area 10' x 12' = 120 SF Waiting area 10' x 8' = 80 SF Closet 2' x 3' = 6 SF TOTAL 206 SF
ADJACENCY REQUIREMENTS	Near Chief, Deputy Chief, Public Lobby
PUBLIC ACCESS	Limited controlled
SECURITY REQUIREMENTS	High
FURNITURE, FIXTURES & EQUIPMENT	1 desk with returns, 1 desk chairs, 20 LF shelving; require 3-36" 4-drawer laterals - for active files Waiting area to have 2 chairs and a counter for filling out forms Office area to be separated from waiting area with a low wall and counter
SPECIAL NEEDS	Coat closet
FLOOR MATERIALS AND FINISHES	Carpet
WALL MATERIALS AND FINISHES	GWB
CEILING MATERIALS AND FINISHES	ACT
LIGHTING	Fluorescent with parabolic reflectors
HVAC	A/C

SUPPLY/WORK ROOM

FLOOR AREA NEEDED	10' x 10' = 100 SF
ADJACENCY REQUIREMENTS	Adjacent to Administrative Workroom
PUBLIC ACCESS	None
SECURITY REQUIREMENTS	Moderate
FURNITURE, FIXTURES & EQUIPMENT	4 rows of 24" adjustable metal shelving on two walls. Space for copier, printer and shredder. Cable and data outlets
SPECIAL NEEDS	Zetron speakers
FLOOR MATERIALS AND FINISHES	VCT
WALL MATERIALS AND FINISHES	GWB
CEILING MATERIALS AND FINISHES	ACT
LIGHTING	Fluorescent with parabolic reflections
HVAC	A/C

ADMINISTRATIVE KITCHENETTE

FLOOR AREA NEEDED	3'x 8'= 24 SF
ADJACENCY REQUIREMENTS	Near Administration toilet rooms
PUBLIC ACCESS	None
SECURITY REQUIREMENTS	Moderate
FURNITURE, FIXTURES & EQUIPMENT	Kitchenette with undercounter refrigerator, microwave, coffeemaker and sink.
SPECIAL NEEDS	Zetron speakers
FLOOR MATERIALS AND FINISHES	VCT
WALL MATERIALS AND FINISHES	GWB
CEILING MATERIALS AND FINISHES	ACT
LIGHTING	Fluorescent
HVAC	A/C

ARCHIVES/DEAD RECORDS/SERVER ROOM

FLOOR AREA NEEDED	16 SF per lateral file (16' x 10') 160 SF
ADJACENCY REQUIREMENTS	None, could be in basement
PUBLIC ACCESS	None
SECURITY REQUIREMENTS	Moderate
FURNITURE, FIXTURES & EQUIPMENT	8 – 4-drawer lateral file cabinets or mobile shelving. Server rack for buildings computer system.
FLOOR MATERIALS AND FINISHES	Sealed concrete
WALL MATERIALS AND FINISHES	GWB
CEILING MATERIALS AND FINISHES	ACT
LIGHTING	Fluorescent
HVAC	A/C

TRAINING EQUIPMENT STORAGE

FLOOR AREA NEEDED	10' x 10' = 100 SF
ADJACENCY REQUIREMENTS	Access from training room
PUBLIC ACCESS	None
SECURITY REQUIREMENTS	High
FURNITURE, FIXTURES & EQUIPMENT	Shelving, 1½' deep for the storage of training equipment; VCR, TV monitor, slide projector, training tapes, CPR training equipment such as mannequins. (Area to store tables and chairs).
FLOOR MATERIALS AND FINISHES	Carpet
WALL MATERIALS AND FINISHES	GWB
CEILING MATERIALS AND FINISHES	ACT
LIGHTING	Fluorescent
HVAC	No A/C

TRAINING ROOM

FLOOR AREA NEEDED	50 people @ 20 SF/person = 1000 SF
ADJACENCY REQUIREMENTS	Accessible from lobby and adjacent to Training Equipment Storage, adjacent to firefighters kitchen
PUBLIC ACCESS	Possibly
SECURITY REQUIREMENTS	Moderate
FURNITURE, FIXTURES & EQUIPMENT	Table and chairs to accommodate 50; podium, stand with wheels for VCR, video monitor, and video and slide projectors. White board, fabric covered tackable surfaces. Room darkening shades. Cable data outlets.
SPECIAL NEEDS	Alcove for coffee prep to include small refrigerator, microwave, sink, coffeemaker, and cabinets above. Zetron speakers Sound control to adjacent spaces Exterior access
FLOOR MATERIALS AND FINISHES	Carpet
WALL MATERIALS AND FINISHES	GWB
CEILING MATERIALS AND FINISHES	ACT
LIGHTING	Fluorescent, glare-free; dimmers, or incandescent with dimmers
HVAC	A/C with good exhaust system

FITNESS

STAFF	All
FLOOR AREA NEEDED	250 SF
ADJACENCY REQUIREMENTS	Direct access to showers
PUBLIC ACCESS	None
SECURITY REQUIREMENTS	Moderate
FURNITURE, FIXTURES & EQUIPMENT	Treadmill, stationary bicycle, universal weight, machine, step master, and free weights. Equipment will be furnished with FF&E.
SPECIAL NEEDS	Zetron speakers
FLOOR MATERIALS AND FINISHES	Clock, wall-mounted TV, cable mirrored wall. Sport flooring on concrete slab, sound insulation
WALL MATERIALS AND FINISHES	GWB
CEILING MATERIALS AND FINISHES	ACT
LIGHTING	Fluorescent
HVAC	A/C, good ventilation, separate control

FIREFIGHTER'S BUNK ROOMS

FLOOR AREA NEEDED	Double bedrooms, 6 @ 10' x 12' = 720 SF
ADJACENCY REQUIREMENTS	Good access to Apparatus Room Adjacent to toilet rooms and locker rooms
PUBLIC ACCESS	None
SECURITY REQUIREMENTS	Moderate
FURNITURE, FIXTURES & EQUIPMENT	Each room to have a chair, two extra long twin beds, small built-in desk, (8) 2' x 2' half lockers for linen. Provide 2 power, 2 data and 2 cable TV outlets on all walls. Room darkening shades.
SPECIAL NEEDS	Zetron speakers Sound attenuation in walls
FLOOR MATERIALS AND FINISHES	Carpet
WALL MATERIALS AND FINISHES	GWB
CEILING MATERIALS AND FINISHES	ACT
LIGHTING	Fluorescent, 2 light levels Task lighting
HVAC	A/C

MALE TOILET & SHOWER

FLOOR AREA NEEDED	320 SF
ADJACENCY REQUIREMENTS	Near Firefighter's Rooms Direct access to Locker Room near Sleeping Quarters
PUBLIC ACCESS	None
SECURITY REQUIREMENTS	Moderate
FURNITURE, FIXTURES & EQUIPMENT	2 sinks, 2 toilets, 2 urinals, 2 showers with drying area. Toilet room does not need to be handicap accessible.
SPECIAL NEEDS	1 full-length mirror, Zetron speakers.
FLOOR MATERIALS AND FINISHES	Ceramic tile
WALL MATERIALS AND FINISHES	GWB with ceramic wainscoting
CEILING MATERIALS AND FINISHES	GWB
LIGHTING	Fluorescent
HVAC	A/C

FEMALE TOILET & SHOWER

FLOOR AREA NEEDED	120 SF
ADJACENCY REQUIREMENTS	Near Firefighter's Rooms Direct access to Locker Room near Sleeping Quarters
PUBLIC ACCESS	None
SECURITY REQUIREMENTS	Moderate
FURNITURE, FIXTURES & EQUIPMENT	1 sink, 1 toilet, 1 shower with drying area. Toilet room does not need to be handicap accessible.
SPECIAL NEEDS	1 full-length mirror, Zetron speakers.
FLOOR MATERIALS AND FINISHES	Ceramic tile
WALL MATERIALS AND FINISHES	GWB with ceramic tile wainscoting
CEILING MATERIALS AND FINISHES	GWB
LIGHTING	Fluorescent
HVAC	A/C

MALE LOCKER ROOM

CURRENT STAFF	24
FUTURE STAFF	26
FLOOR AREA NEEDED	11 SF per locker = 286 SF
ADJACENCY REQUIREMENTS	Direct access to fitness room and showers
PUBLIC ACCESS	None
SECURITY REQUIREMENTS	Moderate
FURNITURE, FIXTURES & EQUIPMENT	One 24" x 24" locker per person, wood bench
SPECIAL NEEDS	Zetron speakers Full length mirror
FLOOR MATERIALS AND FINISHES	VCT/rubber
WALL MATERIALS AND FINISHES	GWB
CEILING MATERIALS AND FINISHES	ACT
LIGHTING	Fluorescent
HVAC	A/C, good ventilation

FEMALE LOCKER ROOM

CURRENT STAFF	1
FUTURE STAFF	4
FLOOR AREA NEEDED	11 SF per locker = 44 SF
ADJACENCY REQUIREMENTS	Direct access to Fitness Room and shower
PUBLIC ACCESS	None
SECURITY REQUIREMENTS	Moderate
FURNITURE, FIXTURES & EQUIPMENT	One 24" x 24" locker per person. Wood bench.
SPECIAL NEEDS	Zetron speakers. Full length mirror.
FLOOR MATERIALS AND FINISHES	VCT/rubber
WALL MATERIALS AND FINISHES	GWB
CEILING MATERIALS AND FINISHES	ACT
LIGHTING	Fluorescent with parabolic reflectors
HVAC	A/C, good ventilation

DAY ROOM

FLOOR AREA NEEDED	600 SF
ADJACENCY REQUIREMENTS	Good access to Apparatus Room near Kitchen/Dining
PUBLIC ACCESS	None
SECURITY REQUIREMENTS	Moderate
FURNITURE, FIXTURES & EQUIPMENT	Recliners, couch and seating for 10. Table and chairs for four. Provide power and cable TV outlets on all walls. Allow space for pool table
SPECIAL NEEDS	Zetron speakers
FLOOR MATERIALS AND FINISHES	Carpet
WALL MATERIALS AND FINISHES	GWB
CEILING MATERIALS AND FINISHES	ACT
LIGHTING	Fluorescent with parabolic reflectors, multiple TV jacks, task
HVAC	A/C

KITCHEN/DINING**FLOOR AREA NEEDED**

Kitchen 20 x 20 = 400 SF
Dining 20 SF x 16 = 320 SF
TOTAL = 720 SF

ADJACENCY REQUIREMENTS

Near Day Room
Adjacent to training room
Exterior patio with gas grille

PUBLIC ACCESS

None

SECURITY REQUIREMENTS

Moderate

FURNITURE, FIXTURES & EQUIPMENT

Commercial appliances;
6 burner range with oven and hood,
(1) 20 CF refrigerator
(1) 20 CF freezer/refrigerator
(2) wall ovens,
microwave
large deep sink
dishwasher
garbage disposal
water tap at range
solid-surface countertop or stainless steel
Dining table to accommodate entire shift (10)
plumbed coffeemaker

SPECIAL NEEDS

Ability to serve large meals in Training Room
Zetron speakers
Ansel Sprinkler system at range hood

FLOOR MATERIALS AND FINISHES

Ceramic tile, quarry tile

WALL MATERIALS AND FINISHES

GWB/CT

CEILING MATERIALS AND FINISHES

ACT

LIGHTING

Fluorescent

HVAC

A/C, range exhaust

JANITOR'S CLOSETS**FLOOR AREA NEEDED**

(2) 6' x 6' = 36 SF
72 SF TOTAL

ADJACENCY REQUIREMENTS

Centrally located
One adjacent to apparatus bay
One in fire fighters living quarters

PUBLIC ACCESS

None

SECURITY REQUIREMENTS

Moderate

FURNITURE, FIXTURES & EQUIPMENT

Floor sink, mop racks, shelving

FLOOR MATERIALS AND FINISHES

Ceramic tile

WALL MATERIALS AND FINISHES

GWB with ceramic tile wainscoting

CEILING MATERIALS AND FINISHES

GWB

LIGHTING

Fluorescent

HVAC

No A/C

BUILDING SUPPLIES ROOM/STORAGE

FLOOR AREA NEEDED	10' x 12' = 120 SF
ADJACENCY REQUIREMENTS	None
PUBLIC ACCESS	None
SECURITY REQUIREMENTS	Moderate
FURNITURE, FIXTURES & EQUIPMENT	Three rows of adjustable 24" deep shelves on two and walls and 12" deep shelves on one wall
FLOOR MATERIALS AND FINISHES	VCT
WALL MATERIALS AND FINISHES	GWB
CEILING MATERIALS AND FINISHES	ACT
LIGHTING	Fluorescent
HVAC	No A/C

MAINTENANCE & STORAGE

FLOOR AREA NEEDED	10' x 12' maintenance, 120 SF
ADJACENCY REQUIREMENTS	First floor, good access to exterior and Apparatus Room
PUBLIC ACCESS	None
SECURITY REQUIREMENTS	Moderate
FURNITURE, FIXTURES & EQUIPMENT	6' workbench with stool and tool rack above, 30 LF shelving
FLOOR MATERIALS AND FINISHES	Concrete with hardener
WALL MATERIALS AND FINISHES	CMU
CEILING MATERIALS AND FINISHES	GWB or exposed
LIGHTING	Fluorescent
HVAC	A/C, ventilation

INTRODUCTION

Based on the findings from Section I and Section II of this report, the existing Fire Station is currently undersized to meet today's Fire Departments needs. Additionally, when considering the future purchasing of new apparatus and the addition of even minimal full time or hold over (storm) staffing, the station does not have the space or facility components typical and necessary in a modern fire station.

The most telling evidence is shown by comparing the proposed space (see Summary of Space Needs Program, Page II-3) of 19,371 S.F. with the existing station at 5,060 S.F. As it currently stands, the facility is hindering the deployment of emergency respondents in an efficient manner and consequently could be jeopardizing the rescue process.

Currently, most of the station apparatus are packed within the existing bays to fit all of the available spaces. In addition to housing the vehicles, the perimeter of the apparatus bays are also cluttered with gear, storage supplies, and ancillary equipment which should be stored in separate enclosed spaces. The overcrowding of the apparatus bay creates a bottleneck when firefighters respond to a call, increasing the stations internal response time, and jeopardizing the health and safety of not only the firefighters but also that of the party seeking assistance.

Understanding that the programmatic needs of the department cannot be fulfilled on the existing facility, without constructing an addition, Maguire Group evaluated the existing site and building to determine the best possible placement for the expansion and possibly a new facility.

Expansion Towards the Front (West)

Currently the existing facility is located very close to Water Street. Expanding the apparatus bay forward toward the street will have the following negative impact to the stations operations.

1. Moving the apparatus bays closer to the road will impact on the visibility of the apparatus truck exiting the station. Additionally, shorting the apparatus apron would be problematic. The facility has previously been expanded toward the front and any further frontal expansion would reduce the front apron and will require that the engine perform multiple maneuvers to exit the facility, increasing the stations response time.

Additionally, if the expansion is too close to the Street, it will necessitate that the firefighters stop traffic when returning from an event so that the apparatus can back-up into the station.

2. Expanding the apparatus bay towards the front will also not improve on the width of the bays or the size of the apparatus doors.
3. In addition to the station operations a renovation towards the front will require that the fire department be relocated during the renovations.

Expansion Towards the Side (North)

The existing building face is the property line and consequently expansion in this direction is not possible without purchasing the adjacent lot and impacting on the existing right-of-way.

If the adjacent parcel is purchased, the existing structures can be demolished to make way for a new station or as a possibility a new apparatus bay attached to the existing station. The one problem will be that during construction access must be maintained to the rear of the site for the ambulance facility.

Expansion in this direction also offers us the benefit of a phased construction, where the new apparatus bay can be constructed in the side without impacting the current stations operation. Once the apparatus bay has been completed then the operations can be relocated from the existing apparatus bay to the new, leaving the existing bays open for renovations. Since the existing apparatus bay will no longer be utilized to house vehicles, it can be retrofitted for administrative and living quarters for the department.

Expansion Towards the Side (South)

The south side of the facility is adjacent to the Green River and the distance of the building to the river bank varies between 20 to 30 feet, and there is an approximate 20 foot drop from the apron to the river below. Consequently, due to the proximity to the river, several agencies must be petitioned prior to receiving approval to expand the facility. Even with the approvals, the size of the retaining wall and fill required to make the site buildable would be very expensive.

Assuming that a 20-foot bay addition can be added on this side, it will not improve the existing width and depth of the apparatus bay, nor would it address the width of the existing overhead doors. Additionally, money would need to be spent on replacing/repairing the existing apparatus slab.

1. The width of the apparatus bays would not improve.
2. The overhead door widths would not be addressed
3. Circulation between the apparatus is not addressed. Consequently, the pedestrian circulation around the apparatus would remain unchanged.

To complicate matters, since the apparatus addition of the facility would be greater than the 10% of the existing, and it impacts the existing bay truss framing and consequently increases the existing structural loadings, it would trigger Massachusetts State Building Code, Chapter 34 Structural Seismic upgrades requiring the entire existing building to be seismically updated.

Even if all these seismic upgrades were achievable and cost effective, the resulting apparatus layout would be problematic and ineffective.

Weighing in all of these issues, the net gained and the required expenses to make this option workable, makes the expansion of the facility in this direction not very favorable.

Expansion Towards the East

Expanding the facility to the east offers the most possibility for the administrative and living quarter expansion, however it would not address any of the existing apparatus bay shortcomings and it would also eliminate all of the existing facility parking.

Vertical Expansion

Expanding the facility vertically, adding a second floor and expanding the apparatus bay in to the current meeting room is an option. However since the facility was not designed to carry the additional floor loads it would require almost a complete structural upgrade and based on our experience it would be more cost effective to tear down the existing facility and reconstruct it as a two story facility. Even if this option is selected, it would not improve on the existing apparatus bay width issues.

Summary

Based on the building evaluation and the programmatic needs of the department, the station needs to be expanded or replaced. The space that requires the most expansion are the apparatus bay and administrative offices. While the location of the administrative spaces is flexible and can be located either on the first or second floor, the apparatus bay placement is much more restrictive, requiring access to the street, proper turning radius, front aprons and good visibility. Since the programmed apparatus bay is 5 bays wide it will require as a minimum a lot with a 90 foot frontage (not including setbacks or drive ways), consequently the existing site is too narrow.

Based on these restrictions and current site limitations the only feasible expansion for the existing apparatus bay would be toward the North and it requires the purchase of the adjacent property. However there are several issues that will need to be resolved to make this option feasible. For example there is a large grade differential between the two sites, and there is a right of way that needs to be maintained during construction or eventually relocated. Considering these restrictions it will be easier and likely less expensive to construct a new facility on a different site.

Taking into account all of the above information, there are several options for the Williamstown Fire Department:

- Option A - Construct an apparatus addition on the adjacent property.
- Option B - Construct a new facility on a different site.

Obviously each option has its pros and cons and the construction costs versus the net gain would need to be carefully evaluated prior to selecting a Town appropriate solution.

OPTION A – CONSTRUCT AN APPARATUS BAY EXPANSION USING ADJACENT PROPERTY

The main purpose of this scheme is to provide additional space while maintaining operations of the Fire Department from this site during the construction. To achieve this, a phased construction is required. The first phase would be to purchase and demolish the buildings on the adjacent property and to replace it with a five bay double loaded apparatus bay with support space at each side. Once this phase is complete, firefighters operations can move into the new construction and the existing apparatus bay can be modified as administrative offices and firefighters quarters.

By providing a physical separation (building joint) between the existing building and new construction the existing facility does not need to be updated to reflect current seismic requirements.

The existing facility would undergo a comprehensive renovation including new finishes, windows, doors, toilet rooms, electrical, mechanical, and fire protection.

Advantages

1. The existing station (or portions of) is salvaged.
2. Apparatus bay issues are resolved without incurring significant costs.
3. Less expensive to construct than new construction
4. Phased construction, Fire Department does not need to relocate off site during construction.
5. Very little demolition costs
6. The majority of the paved site (rear parking lot, front apron) will be reclaimed as landscape areas.

Disadvantages

1. Due to existing building orientations and site restrictions, not all of the programmed spaces will be accommodated.
2. Phased construction requires additional time and money to complete.
3. Some of the inherited building issues, such as windows, stair, etc. will dictate the new plan, square footages and adjacencies.
4. The fire department will need to coexist with construction through the station renovation.
5. The existing grade differential will need to be addressed in the station design.
6. The right-of-way serving the ambulance station will need to be addressed and incorporated into the design, unless the right of way can be relocated prior to construction, or the ambulance station will need to be relocated during the construction.
7. The Engineering solutions to overcome site constraints may prove to be unfeasible and/or undesirable.

OPTION B – CONSTRUCT A NEW FACILITY ON A DIFFERENT SITE

The main aspect of this scheme is to construct a new facility on a different site. This scheme would solve all of the programmatic requirements and also eliminate the majority of the project phasing.

In this scheme, the first floor would occupy the apparatus bay, support spaces and administrative offices, with the firefighter's living quarters and training room on the second floor. To minimize the building height and construction costs, the second floor would not extend over the apparatus bays.

Advantages

1. Fulfills all of the programmatic needs, including the five double loaded apparatus bays.
2. Construction is not phased
3. Operational efficient
4. Can be designed to include future expansion
5. Will serve the community for years to come

Disadvantages

1. Construction costs

IV COST ESTIMATE

To properly evaluate the construction costs for this project, we have created a matrix that provides prices for the construction and project costs for each of the options; additionally we compared them to historical data from fire stations of recent construction and with similar size.

The Construction Costs or hard costs refer to the money required to prepare the site and construct the actual building with associated construction contingencies. The Project Costs include the soft costs which are all of the money required for the design, and associated support. This includes engineering fees and design fees, furniture and equipment, owner's project management fees, testing, and associated costs, legal fees, surveying, etc.

The figures utilized in the costs per square foot were derived from historical data gathered from our past designed projects, Means Construction Cost Guides as well as for projects that Maguire Group has served as Owner's Project Management.

In addition to the construction cost, we have evaluated the square footage of proposed station to three other Communities of comparable size. In this Cost Trends Analysis we compared the community size, department size, construction costs, project costs and space allocations of the Hudson and Franklin Fire Headquarters and the Yarmouth Sub-Station. (see appendix B for Cost Trends Analysis).

From the Trends Analysis, we can see that the square footage of the spaces is compatible with that of other stations of similar population and square mileage. Additionally, the Project costs for the projects are compatible, even though the comparison is between three constructed projects versus an anticipated construction budget.

Williamstown Fire Department	Variables	Option A Addition/ Renovation	Option B New Construction
Building Square Footage			
New Construction s.f.		15,000	19,371
Existing Building Renovation s.f.		5,060	0
Existing Apparatus Bay s.f.			
Total Square Footage			
Existing building demolition (Existing Station)		0	0
Existing building selective demolition (Existing Fire Station Bay)		0	
Construction Costs			
New Building Construction Costs	\$ 300.00	\$ 4,500,000	\$ 5,811,300
Existing Building Renovation Costs	\$ 180.00	\$ 910,800	\$ -
Demolition Costs	\$ 20.00	\$ -	TBD
Selective Demolition	\$ 30.00	TBD	\$ -
Seismic Upgrades to Existing Building	\$ 10.00	\$ 50,600	\$ -
Asbestos Abatement		TBD	
	Subtotal	\$ 5,461,400	\$ 5,811,300
Phasing Premium	6%	\$ 327,684	\$ -
Station Relocation Costs (allowance)		\$ -	\$ -
	Subtotal	\$ 5,789,084	\$ 5,811,300
Construction Contingencies	10%	\$ 578,908	\$ 581,113
	Subtotal	\$ 6,367,992	\$ 6,392,430
Design Engineering Fees	8%	\$ 509,439	\$ 511,394
Owners Project Manager	4%	\$ 254,719	\$ 255,697
Furniture And Equipment Allowance		\$ 40,000	\$ 40,000
Communication Technologies Allowance		\$ 20,000	\$ 20,000
Additional Project Costs (testing, survey, geotech, etc.)	4.0%	\$ 254,719	\$ 255,697
Bond Costs	0.4%	\$ 25,471	\$ 25,569
Site Environmental Issues		TBD	TBD
Land Acquisition		TBD	TBD
Permitting and approval		TBD	TBD
	Subtotal	\$ 7,472,340	\$ 7,500,787
Construction Escalation to end of 2009	10%	\$ 747,234	\$ 750,078
GRAND TOTAL		\$ 8,219,574	\$ 8,250,865

V CONCEPTUAL PLANS

VI APPENDICES

Appendix A: Applicable Codes

ADA	Americans with Disability Act
ASME	Society of Mechanical Engineers, A.17.1 Latest Edition
ANSI	American National Standards Institute
ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
BOCA	Basic/National Building Code
BOCA	Mechanical Code
BOCA	Plumbing Code
IEEE	Institute of Electrical and Electronic Engineers
MSBC	Massachusetts State Building Code (Seventh Edition)
MSPC	Massachusetts State Plumbing Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association (NFPA) 101, Life Safety Code, 1991
NFPA	National Fire Protection Association (NFPA) 14, Standpipe and Hose Systems, 1985
NFPA	National Fire Protection Association (NFPA) 78
NFPA	National Fire Protection Association (NFPA) 70, National Electrical Code, 1990
NFPA	National Fire Protection Association (NFPA) 110, Emergency and Standby Power System, 1985
UL	Underwriters Laboratories

Appendix B: U.S. Air Force Fire Station Design Guide

Appendix C: Station Design Benchmarks
