MIDDLETOWN SPRINGS FIREHOUSE STUDY

ARCHITECTURAL SERVICES - FEASIBILITY STUDY
BY:
CENTERLINE ARCHITECTS & PLANNERS, P.C.
RUSSELL CONSTRUCTION SERVICES, INC.
DECEMBER 2020

TABLE OF CONTENTS

EXECUTIVE SUMMARY..... 4

PROGRAMMING..... 6

THERMAL INTEGRITY..... 8

ACCESSIBILITY 10

CODE VIOLATIONS 12

MECHANICAL, ELECTRICAL, PLUMBING..... 14

GENERAL REPAIR 16

APPENDIX 19

CONCEPTUAL DRAWINGS 20

COST ESTIMATE 22

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EXECUTIVE SUMMARY

Centerline Architects and Russell Construction were invited by trustees of the Middletown Springs fire department in the fall of 2020 to review their existing firehouse facility. The trustees noted that the existing building was no longer an adequate fire house to serve the community. A preliminary architectural study was conducted in 2018, one that examined the prospect of a new building on the existing firehouse site. The new building's design was a insulated metal panel building. The new firehouse plans, along with two other town buildings were submitted to a town vote for approval. All new building votes were defeated. The town asked the trustees to examine the costs for renovating the existing building. The following assessment is a review of the existing facility, and what is required to make the existing building a contemporary fire house to service the people of Middletown Springs for years to come.

EXISTING FACILITY

The existing firehouse is a 'mash-up' of different additions from different ages. The first firehouse, built in the 1950's was a two bay concrete masonry block structure. Overtime the building was added upon. A major addition occurred in the early 1984. The addition was primarily designed as a bingo parlor, and dance hall. Over time, the parlor became a dedicated firehouse.

Since 1980, minor modifications have been added such as increasing the size of the overhead doors and creating small addition for the ladder truck. A portion of the building has remnants of its bingo hall past, with a stage, and small proscenium. No formal code review for a change of use has occurred. The building remains a space designed for assembly purposes not a firehouse.

BUILDING PROGRAM

The current facility no longer fits the needs of the modern fire house. The building lacks the room to fit the town's existing truck fleet. A ladder truck, in fact, is located off site. There are no formal offices, no room for equipment, no proper storage, no laundry facilities, and not enough space to properly service the trucks. The building does not fulfill the needs of its users.

BUILDING DESIGN APPROACH

The overall design approach is to transform the existing building into a firehouse. The town's current fleet of trucks, including a ladder truck, are to fit into the building. For this to occur, the building's footprint is to be expanded and roof is to be removed and rebuilt. The stage and gable end walls will need to be reconfigured to allow for the new roof, set higher to accommodate the town's taller trucks.

In addition to a reconfigured apparatus bay, full accessibility of the facility will require a single floor level. A single level will require that the 1950's building truck bays become repurposed to office or conference rooms. Windows, doors, electrical outlets will be required to be reset at the new floor height. An additional restroom

will be required to be added to the building.

In order to modernize the entire building, extensive renovations of the existing facility will need to occur.

ENVIRONMENTAL SYSTEMS DESIGN

Due to the age of the existing mechanical, electrical, and plumbing systems will need to be renovated and updated to contemporary codes. A fire alarm system will be required to be added. A sprinkler system should be considered.

Per Chapter 43 of Vermont's Building Code, if more than 50% of a building is to be renovated, it is considered a reconstruction, and therefore all of the building will need to be brought up to current code. The building will require a new thermal envelope, and new mechanical, electrical, plumbing, and fire protection infrastructure.

COSTS

The overall costs for the reconstruction of the building, includes a combination of renovated and new space, the combination of which totals to about $1.8M. The total project costs are estimated to be $2.1M. It should be noted, that these costs include 15% construction contingency along with a 5% owner's contingency, which together equal to about $300K. At the stage of design, this level of contingency is appropriate. The overall average square foot cost for the entire building is averages $175/square foot.

CONCLUSION

The renovation of this building will be a relatively costly endeavor. Since this is a major reconstruction, the entire building will need to be brought up to current code; all elements of the building will need to be updated. It should be noted that although reconstruction of the existing building will prolong the building's lifespan, the underlying foundation and structure, are aged and will not be replaced. With this reconstruction you certainly will be extending the life of this building, but maybe it's lifespan is not as long as it would be if it were a new building.

A new building lifespan will be considerably longer than this renovation and it is assured that all building components and systems will be contemporary. A new building's design, one can reconsider the orientation of the building to the street, an item especially important when responding to a fire. Considering the amount of space on the current site, you could consider this orientation change. The costs for a new building could potentially be less depending upon size and the exact program, although a full architectural study would be recommended to confirm this conclusion.

IDENTIFIED ISSUE - PROGRAMMING

According to the building's users, the current size of the building is too small to accommodate an ever expanding truck and equipment sizes. The current fire truck sizes have grown, in their length, width, and height since the building was first conceived in 1950. No longer do the entire fleet of trucks fit into the apparatus bay. Equipment is also put on racks within the apparatus bay.

There are two portions of the existing building, one built in 1950 and the second build in 1984. There are two bays in the 1950 portion, however only one bay currently houses a truck. The modern truck size in the 1950's portion is too large for proper access around the vehicle, and impedes proper egress from the building in case of emergency.

There are currently no offices, conference rooms, or dedicated training space within the current facility. Any gathering takes place in the apparatus bay. In modern firehouse facilities, offices and training rooms are provided in separate spaces.

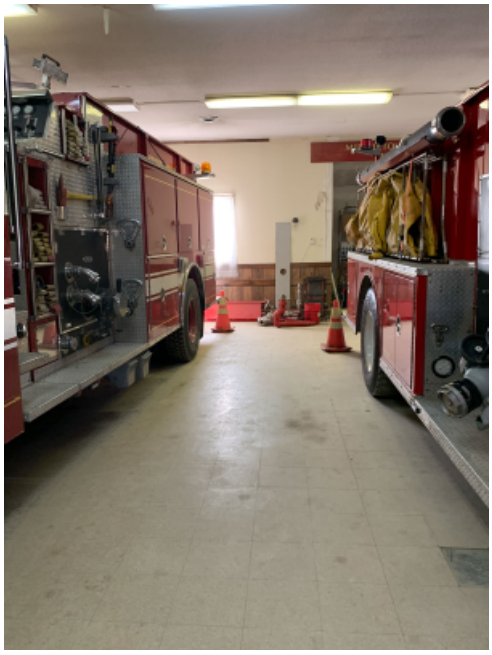
POTENTIAL SOLUTION- PROGRAMMING

In order to accommodate the current fleet of fire trucks, the building's footprint must be expanded. The current length of the apparatus bay is adequate for the current fleet, however the building width is too short to fit the current trucks length. A ladder truck, currently parked off site, for it to be incorporated again into the building will require additional building width. It is planned to provide a single apparatus bay, pulling the equipment and trucks from the 1950's section into the expanded apparatus bay. Six bays are planned for regular trucks, with a seventh bay for the ladder truck. In order to maximize the square footage of the current footprint, the stage is to be removed and the space devoted to becoming a new bay.

Currently apparatus bay sizes is not standard. It is important to standardize the bay size and standardize the bay doors to allow for the future growth of truck sizes.

The current roof above the existing apparatus bay is to be removed and replaced. The clear span height between the floor and current ceiling is too low for the town's fleet of trucks. A new roof, raised so that the clear space is to be about 15' is recommended. A new roof will mean new trusses and exterior bearing walls.

The 1950's section will be renovated and dedicated towards offices, conference room, kitchen, restrooms, laundry, and storage.



TRUCK SIZE VERSUS APPARATUS BAY SIZE: The fleet of fire trucks do not fit into the apparatus bay. The bay shown in this photo was designed as a bingo parlor and not as a garage. The trucks height barely fit the facility. The facility floor is vinyl tile and not a proper bay surface. No floor drain is present. Snow and water from trucks accumulates on the floor, creating a moisture and cleanliness issue.

TRUCK SIZE VERSUS APPARATUS BAY SIZE: The fleet of fire trucks do not fit into the apparatus bay. The photo shown illustrates the 1950's bay that houses a single truck. There is no room to access the truck or it's equipment.

TRUCK SIZE VERSUS APPARATUS BAY SIZE: The fleet of fire trucks do not fit into the apparatus bay. The following bay expansion, attempted to alleviate the bay size constraint, but the layout was determined to be inadequate. There is not adequate storage for equipment, thus it is placed on the bay floor.

OFFICES: There are no space for offices in the building. The only office or meeting room occurs in the apparatus bay.

IDENTIFIED ISSUE - THERMAL INTEGRITY

The existing facility, since it will be considered by code a reconstruction, will therefore need to be brought up to contemporary thermal enclosure standards. Currently the exterior walls, are either without insulation, or have batt insulation that has settled, creating gaps in the thermal envelope. The result of this incongruous barrier is the advent of condensation at the warm side of the interior wall. This condensation invites mold growth. .

The ceiling above the apparatus bay contains batt insulation. However, since the roof is leaking, the batt insulation is wet. Wet batt insulation, especially paper faced, provides minimal thermal protection.

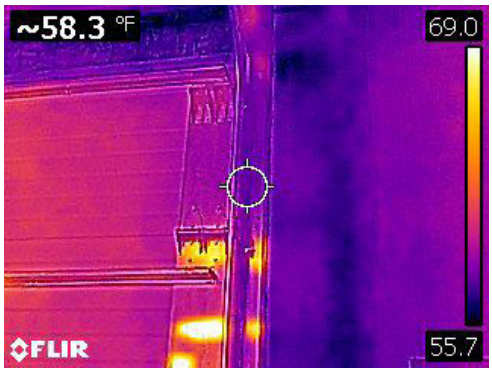
Per the images on Page 9, subsurface insulation barrier under the apparatus slab edge is not present. It was reported by the owner, that ice under the overhead doors will often accumulate and remain throughout the winter months. Ice is a failure of not only the bottom overhead door seal failing but also with a lack of sub-slab insulation.

The energy usage of this building is significant. There is no thermal separation between the apparatus bays, and the kitchen/restroom. When the overhead doors are opened, the conditioned air escapes the building. The owner reports that it takes significant time, especially in the winter months, for the bays to be re-heated. The furnace is therefore constantly attempting to replace the escaped conditioned air. The result is excessive propane use.

POTENTIAL SOLUTION- THERMAL INTEGRITY

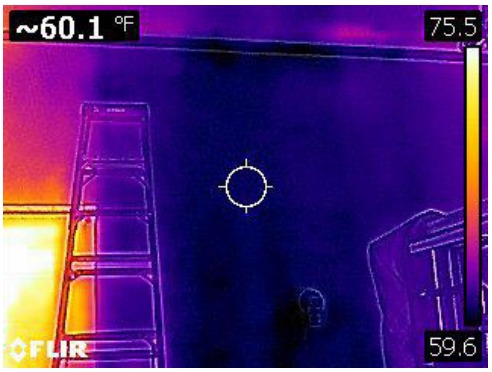
Any reconstruction will require a continuous thermal barrier. The barrier will need to be set from the bottom of the footing to the tip of the roof's ridge. At the proposed apparatus bay additions, underslab rigid insulation will be set under the concrete floor. Both the new and existing foundation walls are to have rigid insulation barrier. All exterior walls will be fully insulated on the exterior face of the wall, and along the roof.

The revised layout will have only one apparatus bay, whereas you now have two. The new apparatus bay is to be thermally sealed from the offices and will be a separate thermal zone.

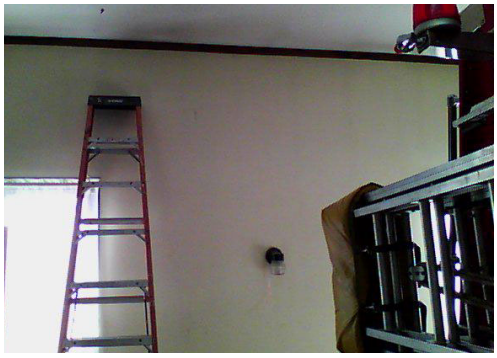


THERMAL SCAN AT APPARATUS BAY WALL: As is illustrated in this thermal scan, the darker portions of the photo illustrate the cold sections of the walls. In this photo there are portions of the wall that are completely uninsulated and therefore are subject to moisture due to condensation.

THERMAL SCAN- IDENTIFIED PHOTO - This photo is the normal photo of the thermal scan shown on the left hand margin.



THERMAL SCAN AT APPARATUS BAY WALL #2: Here is another example of an exterior wall not insulated. The result is moisture and eventually mold within the wall cavity.



THERMAL SCAN- IDENTIFIED PHOTO #2- The following wall is not properly insulated. Therefore this section of wall is subject to thermal conductivity.

THERMAL SCAN AT APPARATUS BAY WALL #3: The floor at the door again illustrates the lack of insulation. In addition, the concrete sub-floor is cold inside the building. In the winter, as has been noted, that ice forms at inside portions of the building especially at the overhead doors and entrances. Under the floor tile, the slab is wet and prone to mold.

THERMAL SCAN- IDENTIFIED PHOTO #3- The floor tile telegraphs the joints between tile, indicated possible moisture at the concrete sub-floor.

IDENTIFIED ISSUE - ACCESSIBILITY

The current facility is not accessible. Floor levels throughout the building are only accessed via steps, and as such, not all portions of the building are accessible.

The restroom is not accessible; the fixtures are not the correct height, the grab bars and mirror are not set correctly, and the sink are not a correct fixture.

Doors are not accessible as they are without the correct lever hardware. The countertops in the kitchen are not set at the correct height.

Accessible parking into the building is not provided. A dedicated accessible parking space is required, as well as a accessible path. The current pathway or ramp to inside the building is not correctly designed for proper accessibility.

POTENTIAL SOLUTION- ACCESSIBILITY

Per ADA Standard for Accessible Design, 2010, any alternations to a building are to be made fully accessible. Since the building is to undergo a full reconstruction, all components of the building are to be redesigned to allow for full accessibility. Therefore, all floors are to be constructed on a single level, unless a lifts or internal ramps are to be added to the building. The 1950's floor is to be raised to be level with the apparatus bay. All restrooms are to be properly laid out to accommodate the correct fixtures and clearances. All handles, whether on doors, sinks, or hardware are to be accessible. Doors are to be reset to correct doorway approaches. There is to be dedicated van parking, along with a loading zone and accessible pathway to the building's entry. The current ramp's slope is to be redesigned, with proper landings, and rails added.

RESTROOM: The bathroom is not accessible. The plumbing fixtures are not accessible. The toilet grab bars are missing, and the one that is present is not to code. An additional bar is required. The existing bar is to be replaced and set at the correct height. The faucet levers are not to code, and need to be replaced with levers. The mirror is not to code, and needs to be replaced. Under counter piping insulation is required.

RAMP : The entrance ramp is not accessible. The ramp requires an accessible rail along the path of travel. The ramp itself is required to have rails at the side of the ramp. A intermediate landing is required at 12' of run. The rails at the stairs are not to code. The railing returns at the top and bottom run are not to code.

ACCESSIBLE BUILDING ACCESS: In order for a building to be accessible, designated accessible parking is required, near the building. An accessible pathway is then required to the main accessible entrance. Both elements are missing and are required.

ROOM ENTRANCE : The middle portion of the 1950's section is raised from the apparatus bays. The raised floor is to allow for a crawlspace piping chase. The result however is that not all rooms are accessible, including storage rooms, kitchen, apparatus bays, and stage. This raised portion needs to be removed and all floors are to be on the same plane.

IDENTIFIED ISSUE - BUILDING CODE VIOLATIONS

Beyond the thermal and accessible code infractions discussed earlier, there are a number of basic building code issues. The 1950's apparatus bay configuration does not have a clear means of egress. Exit from this portion of the building is impeded by a fire truck. The 1950's exit door to the outside is not a code compliant means of egress, there is no emergency lighting, the door hardware is lacking, there is a step at the threshold.

In case of a event, a person is required to exit from the 1950's section into a potentially more dangerous portion of the building, namely the 1980's apparatus bay. Once inside the apparatus bay, there is only one proper exit door. All in all, it appears that there is only one means of egress from the entire building without issue.

As discussed, there are numerous step transitions from one room to another, often in the path of egress that do not have a rail, whose steps are over seven inches in height, or are at a door threshold. For instance, the second means of egress from the apparatus bay has a step at the threshold.

In general, egress pathways throughout the building are not defined or properly lighted, or are blocked by equipment, or trucks.

In the kitchen, the exhaust hood is not code compliant. The hood is a residential hood, and is without a proper hood or fire suppression system.

A two hour wall partition separation between the apparatus bay and other portions of the building is required. Currently, no separation exists.

There are no evidence of fire or smoke detection within the building.

POTENTIAL SOLUTION- BUILDING CODE VIOLATIONS

Egressing safely from the building takes priority. Therefore doors, door hardware, egress path widths and floor heights are to be thoroughly reviewed for code compliance; the priority being the creation of a compliant floor level, stairs, or ramps.

MEANS OF EGRESS: The following photo is the only code compliant means of egress in the building. The other exit doors are either missing exit hardware, have a step, are not clearly identified as means of egress, or the pathway to that egress door is not clearly defined.

KITCHEN EXHAUST: The kitchen exhaust shown is a residential hood and is not allowed per the mechanical code. The propane stove is a commercial stove, which is allowed, however the exhaust hood is required to have a ansul system, fire alarm, make up air, as well as to be enlarged to over the stove's footprint.

MEANS OF EGRESS: The following photo is an example of an obstructed means of egress from the building. The photo illustrates how the truck blocks the means of egress. The steps at the door are also not allowed per the NFPA 101, and present a clear and present danger for those exiting the building during a fire or smoke event.

MEANS OF EGRESS: The following photo is an example of an obstructed means of egress from the building. The photo illustrates how a truck is blocking the means of escape from the building in case of a fire. The door illustrated here does not have proper egress hardware, and opens upon a portion of the ramp.

IDENTIFIED ISSUE - MEP + FP

Mechanical

The existing mechanical system is outdated. It is a propane fed forced hot air system. There is no energy recovery, nor does there appear to be dedicated ventilation system. The building is a single zone, the building and apparatus bay are heated equally, however during a emergency call, the overhead doors are opened and heat escapes from the building. The entire building will heat according to status of the apparatus bay. It takes a significant amount of time and energy to heat the building to comfortable levels.

There is no active ventilation system in the building. When the trucks are started up, the vehicle exhaust is dissipated throughout the building and then passively released outside. The bay smells of exhaust.

Plumbing

The existing plumbing fixtures are inefficient and outdated. As mentioned earlier, they do not comply to accessible code. An additional restroom is required by code. There are no floor drains, or oil water separator in the apparatus bay. All items are required of a modern fire house.

Electrical

The existing electrical infrastructure is outdated. There is three phase single service provided from South Street. There are two-sub panels in the building. There is no emergency generator. This infrastructure and distribution are outdated, and are not adequate for servicing modern fire trucks and equipment.

Fire Protection

There is no fire or smoke detection infrastructure present in the building. Fire and smoke alarms, and panel infrastructure are recommended throughout.

POTENTIAL SOLUTION- MEP + FP

All of the building's infrastructure systems are to be upgraded to current code. There is to multiple heating, and cooling zones within the building. As discussed earlier, the apparatus bay is to be thermally separated from the rest of the building. The separate zones will help control the lost of heat energy within the building. Energy recovery should be added to the building. The ventilation is required by code, and includes ventilation fans from the apparatus bay as well as the kitchen exhaust system.

As noted, a apparatus floor drains and new efficient plumbing fixtures will be required.

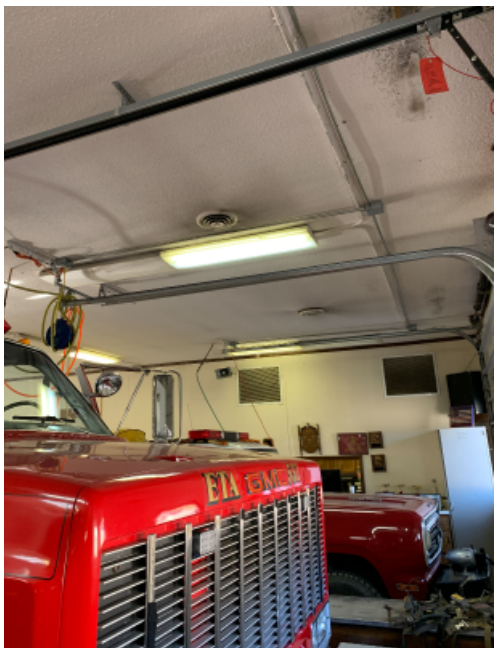
Modern contemporary electrical infrastructure will be required throughout the building. New efficient fixtures will be required to minimize energy usage.

Smoke and fire alarms are recommended throughout the building. The owner will need to decide if a sprinkler coverage will be added to the building.

ELECTRICAL SERVICE: There is adequate power that runs from the road, however the distribution at the building is antiquated and should be redistributed. It was noted by the Owner that 3-Phase is available from the street. Three phase is used for the siren. No other items, appear to require 3 phase power.

MECHANICAL VENTILATION: As noted previously, the kitchen ventilation is limited to this hood. The hood is required to be an commercial hood. Makeup air would need to be part of the system.

MECHANICAL SYSTEM: The current heating system is forced hot air. There is no active make up air, no energy recovery units. There is a furnace which supplies heated air to the building. The furnace is inefficient and outdated.



VENTILATION SYSTEM: The passive ventilation system shown by the two wall vents. The system is not appropriate for this building's use. Vehicles exhaust in a enclosed space is potentially dangerous to occupants. Walking through the space, one can smell the diesel fumes.

IDENTIFIED ISSUE - GENERAL REPAIR

THERMAL CONTINUITY
The exterior walls have been hit by firemen parking trucks. Two to three areas in the building remain unfixed, and are without insulation or areas of damaged insulation.

SITE DRAINAGE
The apron to the building slopes towards the overhead doors. Therefore during rain events, water tends to flow into the building. In combination with the thermal issues at the slab, there is ice build up at the overhead door entrance.

WEATHER TIGHTNESS
The roof is a simple metal panel sheathing. These panels are at the end of their normal lifespan and fail to keep water out of the building. The owner notes that there are distinct portions of the roof that are leaking.

STRUCTURAL CONTINUITY
At the 1950's portion of the building, there is evidence of cracking at the cmu blocks that comprise the exterior walls. Considering the age of the building, one can assume that the foundation walls have settled.

POTENTIAL SOLUTION- GENERAL REPAIR

The above items are not on the overall critical path for renovating the building. All of these items will be addressed during the reconstruction of the entire building.

AREAS OF REPAIR: There are areas of the building that have been patched due to trucks hitting the building. These areas are places where there are thermal breaks. To reestablish the thermal barrier, insulation and drywall patching are to take place.

ROOF SHEATHING: A new roof is suggested. The current roof metal panel system currently leaks. It appears that the service life of the building's roof is coming to an end.

BUILDING APRON: The apron to the building has been washed away by the neighboring sand pile, belonging to the town. The apron no longer pitches away from the building, and therefore during sizable rain events, the apparatus bay, especially in front of the overhead doors receives water.

STRUCTURAL MOVEMENT: The following cracking in the drywall is an indication of structural elements that have moved within the building. Proper expansion joints are required in order to account for movement between elements.

APPENDIX

CONCEPTUAL DRAWINGS

COST ESTIMATE

APPENDIX

CONCEPTUAL DRAWINGS

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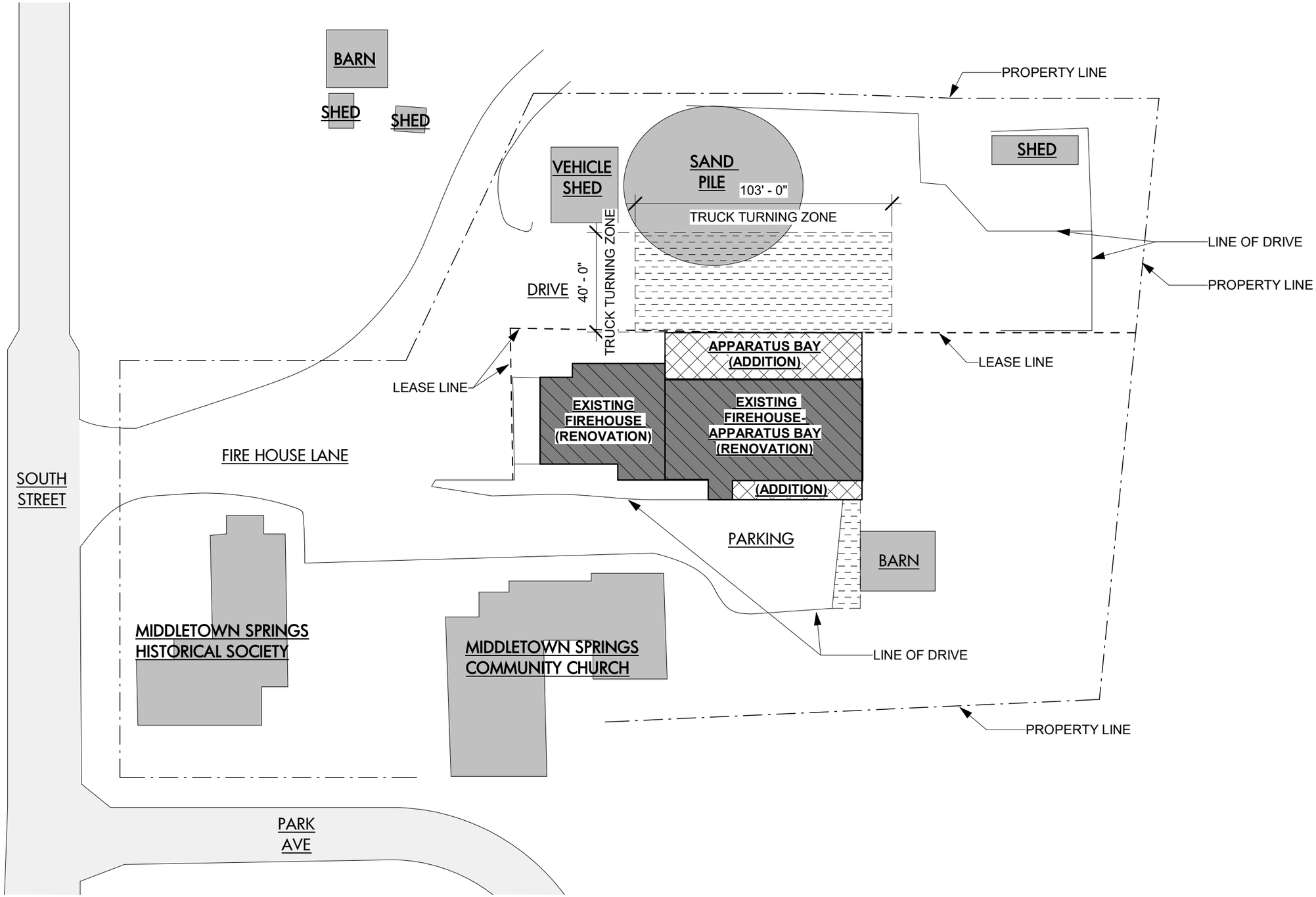
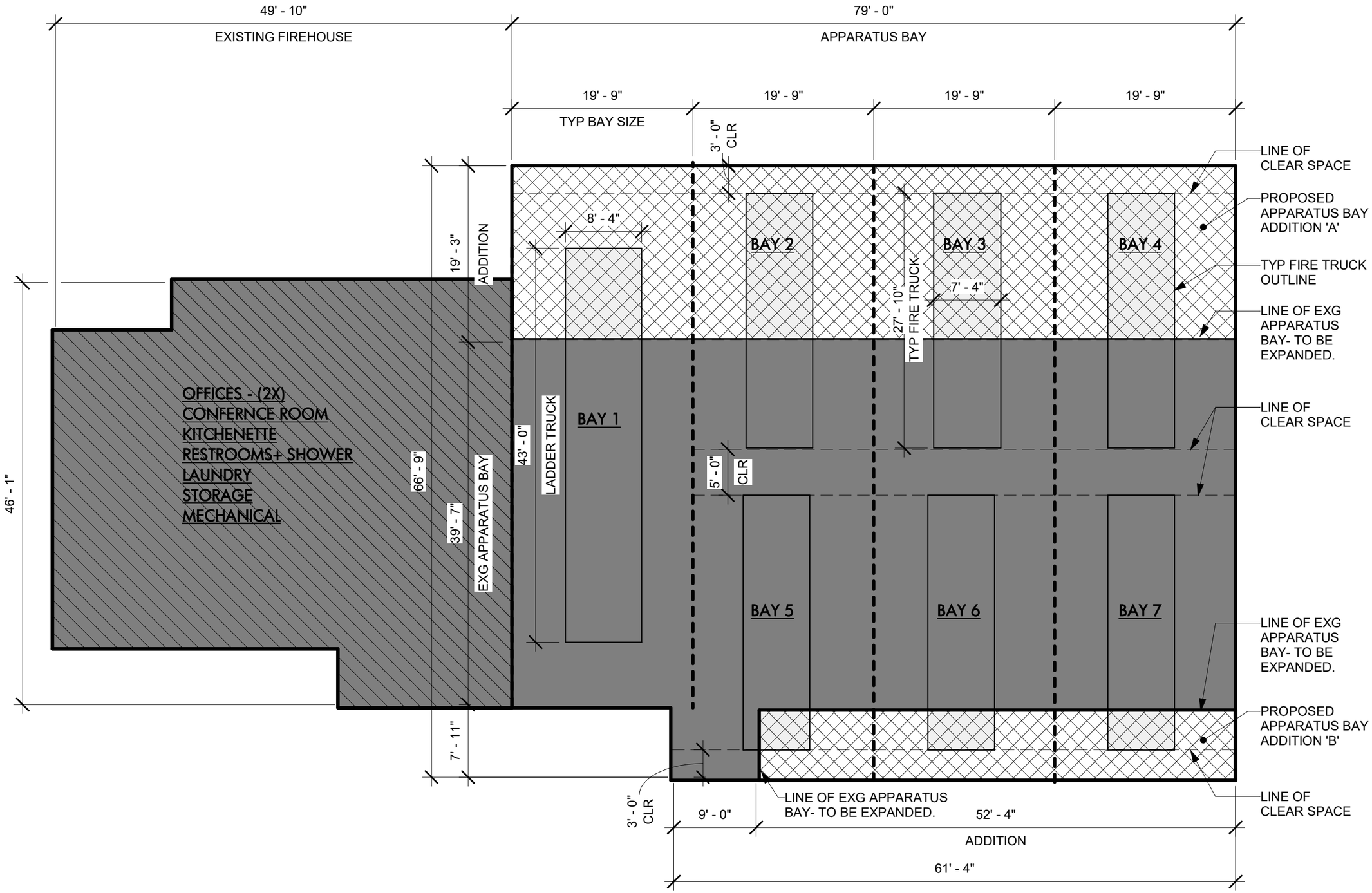


1 PROPOSED FIREHOUSE + SITE
1" = 40'-0"

01. 05. 2021

FIREHOUSE RENOVATION , MIDDLETOWN SPRINGS VERMONT

CENTERLINE ARCHITECTS



BUILDING AREA (SQUARE FEET)

EXISTING AREA
RENOVATION

• OFFICE AREA	= 2,073
• APPARATUS BAY	= 3,269
SUB-TOTAL	= 5,336
EXG BUILDING	

ADDITION

• ADDITION 'A'	=1,493
• ADDITION 'B'	= 398
SUB-TOTAL	=1,891
TOTAL	**=**7,227

1 PROPOSED FOOTPRINT
3/32" = 1'-0"

01. 05. 2021

FIREHOUSE RENOVATION , MIDDLETOWN SPRINGS VERMONT

CENTERLINE
ARCHITECTS

APPENDIX

COST ESTIMATE

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MIDDLETOWN SPRINGS FIRE DEPARTMENT

2021 Conceptual Estimate

CENTERLINE ARCHITECTS

DIVISION TYPE:	DESCRIPTION:	CONSTRUCTION TYPE/GENERAL COMMENTS:	AMOUNT (SF unless noted):	SQUARE FOOT COSTS (SF unless notes):	SPECIAL AMOUNTS		TOTAL COST
Demolition and Remediation							
	Building Demolition	Assumes hazardous materials, Clean Site			$35,000		$35,000
						demo subtotal=	$35,000
Site Work and Earthworks							
	Gravel and Fill	General Fill, 12" deep	4,120.00	$15.00	Cubic Yard		$61,800
	Street Lamps	Concrete Base, Pole, Lamp	1.00	$3,500.00	$3500/Light Pole		$3,500
						site subtotal=	$65,300
Building							
	Existing Office Renovation		2,072.00	$125.00	Assumes a $125/SF Renovation Cost		$259,000
	Existing Apparatus Bay Renovation		3,269.00	$150.00	Assumes a $150/SF Renovation Cost		$490,350
	New Apparatus Bay Addition		1,891.00	$275.00	Assumes a $275/SF New Construction Cost		$520,025
		subtotal=	7,232.00	AVG S/F= $183.33		**Building Subtotal:**	**$1,269,375**
		Site Costs/SF (includes Demo)=	$13.87			**Site + Demo Subtotal:**	**$100,300**
						Building + Site Subtotal:	**$1,369,675.00**
Constractor Fees							
	General Requirements				10% of Building Subtotal		$136,968
	Overhead + Profit				10% of Building Subtotal		$68,484
						GC Requirements and Fees	**$205,451**
						P&P Bond	**$20,545**
						Contingency 15%	**$205,451**
						Sub-total=	**$431,448**
COST/SF	$175.52					TOTAL CONSTRUCTION BUDGET:	$1,801,123
Professional Fees: (Not Included In Construction Budget)							
	Architectural Services and Engineering Services				10% of Construction Subtotal		$180,112
						Professional Fees Subtotal:	**$180,112**
Owners Cost: (Not Included in Construction Budget)							
	Building Permit Fees						$14,409
	Owners Contingency (5%)						$90,056
	Furnishings						$0
	Act 250 Permit Application Fee						$8,555
	Builders Risk Insurance						$5,000
	City Permits						$0
	Signage						$500
	Testing(Soils, Concrete)						$5,000
						Owner's Cost Subtotal	**$123,520**
						Construction Budget	$1,801,123
						Professional Fees	$180,112
						Owner's Cost	$123,520
						TOTAL PROJECT BUDGET =	**$2,104,755**