Condition Assessment Report

Newton Fire Station

35 South Main Street
Newton, NH 03858

Prepared For:
Town of Newton, NH
2 Town Hall Road
Newton, NH 03858

Prepared By:
Summit Engineering, PLLC

SUMMIT ENGINEERING

January 26, 2016

Newton Fire Station Building Committee
Town of Newton
2 Town Hall Road
Newton, NH

Re: Condition Assessment
Newton Fire Station
35 South Main Street
Newton, NH 03858

Dear Committee:

As requested, **Summit Engineering, PLLC (Summit)** conducted a limited, visual non-destructive assessment of the Newton Fire Station on South Main Street in Newton, NH on January 8, 2016**.** Present with us was Mr. John Waitt of Design Day Mechanicals to perform a mechanical systems inspection. On January 21, 2016 Mr. Kelly Davis, AIA (architect) of Port One Architects and Mr. Robert Greene (electrical) of Engineered Building Systems visited the station to perform architectural and electrical inspections. Following is a summary of each disciplines findings.

Executive Summary

Based on the information provided to date and Summit's investigation of the referenced location, the following conclusions are provided:

The building as currently occupied is serving its intended purpose, however there are concerns related to the structural framing, mechanical/electrical systems and architectural/life safety components. The building serves as an essential facility intended to remain in use after a design environmental (wind, earthquake or snow) event. It is our opinion that this structure would not meet current code requirements to survive such event. Although a renovation of the building is possible, it is likely not cost effective to upgrade the structure, mechanical/electrical systems or other life safety components to meet current code requirements.

Description of Structure and Background information:

The subject property is a two story wood framed building with sloped roof. The first floor is a concrete slab on grade and the exterior walls are covered with vinyl siding. It is our understanding that the original fire station was constructed in/about 1956, with an apparatus bay addition added in 1977. The first floor has a footprint of approximately 2600 square feet (65' x 40 +/-). There is a 1200 +/- square foot (30'x40') partial second floor at the front of the building. There are five apparatus bays on the first floor level, and support spaces (offices, assembly area and kitchen) on the second floor.

For the purposes of this report, the front of the building faces South Main Street (south orientation).

Evaluation Activities

We performed the following tasks to investigate and evaluate the electrical and mechanical systems, life safety requirements and structural framing:

- Conducted visual observations of the structure to document, photograph, and evaluate the existing conditions. Some of these photographs are included with this report; all of the photographs taken at the site have been retained in the project file in accordance with Summit's document/file retention policies;
- Conducted a brief interview with you and the fire chief to develop an understanding of the primary concerns and background information.
- Prepared this report that summarizes the results of the field investigation along with an evaluation and conclusions.

Summary of Site Observations

At the time of the January 8, 2016 site visit, during our visual non-destructive observations of the referenced location, the following was documented:

- The site is generally flat. The structure consists of a two-story wood framed building with access from South Main Street. The main structure has a sloped roof. There is a shed and fuel tank at the rear of the building, and a generator on the left side. A mostly uncovered wood framed exterior stair on the right side of the building provides a second means of egress from the second floor (**Photographs 1-4**).
- The first floor houses five vehicles (ambulance, rescue, SUV, engine 1 & tanker) as well as a bathroom, closet and mechanical room. There is a mop sink behind engine 1 and gear/storage is located along perimeter walls and above the bath/mechanical rooms. (**Photographs 5-14**).
- A fuel storage tank and transfer switch is located behind the tanker in the rear apparatus bay (**Photographs 15-16**).
- A wall opening between engine 1 and the tanker allows access to each side from the interior of the building. The concrete curb wall has been chipped down, but is not flush with the adjacent floor surfaces creating a tripping hazard (**Photograph 17**).
- Primary access to the second floor is by means of an internal stair. This stair has a dangerously low head height approximately half way up the stairs (**Photograph 18**).
- The second floor serves as an assembly area, kitchen, storage, dispatch and office functions. Exterior air conditioners were noted between interior spaces (**Photographs 19-24**).
- The roof surface is covered with what appears to be a corrugated asphaltic material over at least one layer of asphalt composition shingles. Roof framing over the rear apparatus bays (tanker & engine 1) consists of open web, metal plate

connected wooden roof trusses. The roof framing over the second floor could not be verified (**Photographs 25-26**).

- The second floor framing consists of 2x8 floor joists supported on wood and steel beams. The beams are supported on steel pipe and wide flange steel columns. Minor checks and cracks were observed in the floor joists (**Photographs 27-30**).

Section #1 Structural:

The structural framing for this building is generally comprised of wood framed floor joists and roof rafters/trusses supported on exterior wood framed walls. The floor framing includes steel beam girders and steel columns. It appears that original wooden floor beams have been reinforced after the initial building construction. The floor joists visible from within the dropped ceiling area over the front apparatus bays revealed minor checks and cracking in isolated members. Some of these cracks can likely be attributed to normal shrinkage, although it appears some may be due to overloading at one or more times after initial construction. The floor joists span approximately 11' between girders and would not be adequate for an assembly live load (100 psf) on the second floor. The lateral load resisting system (loads for wind or earthquake) although not clearly identifiable, is made up of wood framed shear walls.

This building is classified as an essential facility (category 4) in accordance with the New Hampshire State Building Code (IBC 2009 edition). Essential facilities are intended to remain operational in the event of extreme environmental loadings. Although a complete structural analysis of this structure is beyond the scope of this report, it is our opinion that this building would not withstand a design wind or seismic event. Although not up to current code requirements, the building is in generally acceptable structural condition and does not appear to be a life/safety concern at this time. Any attempt to bring the existing structure up to current code requirements would require extensive work (additional floor, roof and wall elements would likely be required).

Section #2 Mechanical (by Design Day Mechanicals):

The building is currently heated with an oil-fired forced hot air furnace. There is one furnace for both floors of the building and this unit is controlled by one thermostat. Until this year the thermostat was located on a metal column in the parking bays. The setting for this was 55 deg. F. The space needed a heat source to maintain a required temperature for the ambulance. The upstairs then received only convective or conductive heat during the times when the furnace was not being called on by the thermostat downstairs. Since there is only one furnace for both spaces, the return air from the bays is recirculated throughout the entire building, including the upstairs occupied areas bringing vehicle exhaust and oil and gas fumes into the working areas. The International Mechanical Code 2009 (IMC) outlines ventilation (fresh outside air and mixed outside and return air) requirements for all types of occupied and unoccupied spaces. Section 403 deals with mechanical ventilation and dos and don'ts. Section 403.2.1 exception 1 notes that ventilation air shall not be recirculated to another or dissimilar occupancies. Parking garages and office/ meeting

spaces needless to say are very dissimilar. Section 404 which outlines occupied spaces accessory to garages. Though it says "public" (spaces where people in the office have no control of what is happening in the building, but are affected by what happens to that building) the common sense application of this is to prevent exhaust fumes from being drawn into working or living areas through infiltration. Here we have a directly ducted system that takes all of its return from parking areas and spreads these fumes throughout the building. The nature of this problem can be seen in the dirt and grime staining the walls around the supply diffusers throughout the building.

SECTION 403

MECHANICAL VENTILATION

403.1 Ventilation system. Mechanical ventilation shall be provided by a method of supply air and return or exhaust air. The amount of supply air shall be approximately equal to the amount of return and exhaust air. The system shall not be prohibited from producing negative or positive pressure. The system to convey ventilation air shall be designed and installed in accordance with Chapter 6.

403.2 Outdoor air required. The minimum outdoor airflow rate shall be determined in accordance with Section 403.3.

Ventilation supply systems shall be designed to deliver the required rate of outdoor airflow to the breathing zone within each occupiable space.

Exception: Where the registered design professional demonstrates that an engineered ventilation system design will prevent the maximum concentration of contaminants from exceeding that obtainable by the rate of outdoor air ventilation determined in accordance with Section 403.3, the minimum required rate of outdoor air shall be reduced in accordance with such engineered system design.

403.2.1 Recirculation of air. The outdoor air required by Section 403.3 shall not be recirculated. Air in excess of that required by Section 403.3 shall not be prohibited from being recirculated as a component of supply air to building spaces, except that:

1. Ventilation air shall not be recirculated from one dwelling to **another or to dissimilar occupancies**.

SECTION 404

ENCLOSED PARKING GARAGES

404.1 Enclosed parking garages. Mechanical ventilation systems for enclosed parking garages shall be permitted to operate intermittently where the system is arranged to

operate automatically upon detection of vehicle operation or the presence of occupants by *approved* automatic detection devices.

404.2 Minimum ventilation. Automatic operation of the system shall not reduce the ventilation airflow rate below 0.05 cfm per square foot (0.00025 m3/s· m2) of the floor area and the system shall be capable of producing a ventilation airflow rate of 0.75 cfm per square foot (0.0076 m3/s .m2) of floor area.

404.3 Occupied spaces accessory to public garages. Connecting offices, waiting rooms, ticket booths and similar uses that are accessory to a public garage shall be maintained at a positive pressure and shall be provided with ventilation in accordance with Section 403.3.

The existing oil furnace is rated at 1.3 GPH. This works out to be about 180,000 btu/ h. The oil tank for this system is in the rear parking bay and is tightly installed near the wall and sticks out into the bay, making the placement of the truck currently parked there very tight. Care is needed when parking this truck to prevent the truck from backing into the tank and causing damage. Speaking from a practical frame of mind, this is a potentially hazardous situation.

The above section addresses the heating system in the building. As for air conditioning, there are through-window units in the offices and meeting area. In the bays downstairs there is no attempt to, nor need to, air condition the space used for parking the vehicles.

If the current building is to be renovated, it will be necessary to separate the parking bay area heat and the upstairs heat. The current oil furnace can be used for the parking bays, as long as the ductwork supplying the upstairs is disconnected and capped off.

To provide an efficient and cost effective HVAC system for heating and cooling for the upstairs using an electric heat pump system should be considered. New high efficiency heat pumps work down to -13 deg F and can provide up to eight heating/ cooling zones. A three to four ton heat pump system would adequately provide all the heating and cooling needs for this space.

There is also propane currently on site (used for the generator) and this could allow for the changeover to a high efficiency propane furnace for downstairs and allow for the removal of the oil tank and allow for more space in the parking bays.

If the current building is to be used, then I would first consider making the building's envelope as tight as possible. That is the best way of saving energy and lowering operational cost. Next it is a health issue that makes it imperative that the main floor and second floor are heated by two completely separate systems. When a new system is selected, the cost and stability of electric heat pumps for the second floor make the most economic sense and based on current incentive programs moneys might available to help with installation cost. Using heat pumps will also allow you to install solar panels and lower your operational cost while providing excess to the grid, either to bank in the town's

account for use later or for sale to the grid. The programs for this are numerous and changing quite frequently.

Section #3 Architectural (by Port One Architects):

This report section identifies, in a general way, building code deficiencies. NH state building codes that regulate any construction are the IBC 2009, the IECC 2009, NFPA Life Safety 101 code, NFPA 1 Uniform Fire Code, and the ADA Accessibility code.

Egress

There are two means of egress from the second floor: an interior stair that has second floor framing spanning over the stair at a dangerously low level; and a second means of egress is an exterior open wood stair. This exterior stair is mostly not covered with a roof as required. Both stairs are dimensionally correct regarding risers and treads.

Sprinkler System

A fire station is considered an essential building and is required to have a fire suppression system as per NFPA 1. The station is not equipped with a sprinkler system.

Energy Conservation

The building does not meet the current energy code. Roof and exterior walls have minimal insulation. Additional layers would be needed to achieve the code-minimum R values. Windows appear older, with non-insulated glass.

Apparatus Bays

As evidenced, the Apparatus Bays are extremely tight for space, circulation between walls and apparatus is limited and challenging for first responders. There is no required carbon monoxide building exhaust ventilation or a vehicle exhaust extraction system. The overhead doors are undersized for today's larger fire trucks.

ADA Accessibility

Handicap access to the first floor is through the main front entry door. There is no accessibility compliance to the second floor, which would require the installation of an elevator. There are no ADA-compliant bathrooms, locker rooms or kitchen.

Interior Environment

The second floor headroom is below code required minimum. Fire separation materials and fire caulking of penetrations between first and second floors is inadequate.

It's possible to bring any building up to current codes if there is the budget to do that. The usefulness of the existing station is low because of code issues and the fact that it does not contain program spaces common in current fire station design.

The space program elements are:

- Adequately sized apparatus bays for equipment
- Gear storage racks and decontamination washing machine
- Vehicle exhaust system and building CO ventilation with alarms
- Training and fitness rooms, or combination of those uses
- Specific spaces for heating equipment, electrical panels and server/telephone equipment
- Kitchen with equipment exhaust and Day Room
- Adequate storage for medical supplies, breathing apparatus and supplies
- Men and women handicap accessible bathrooms and locker rooms
- Public lobby and restroom

Section #4 Electrical (by Engineered Building Systems):

Building AC Electrical Power Distribution System

Building electrical power emanates from a pole mounted distribution transformer located on pole #106 located across the street from 35 South Main Street. The distribution transformer appears to be rated for 25 KVA with an input voltage of 5 KV delta and an output voltage of 120/240 volts single phase. The main distribution panel is rated for 150 ampere @ 120/240 volts, single phase, four wire and is located in the building main entrance and egress stair. The service capacity for this building is not adequate to handle present and future building electrical needs.

Metering Arrangement

All building electrical loads are single point secondary metered by the utility company meter. The building electrical meter is on the outside of the building.

Emergency/Standby Distribution Systems

The building is equipped with an emergency/standby electrical distribution system. The prime mover for the emergency/standby distribution system consists of a 25 KW, 31.25 KVA diesel fired exterior generator located on the side of the building. This emergency/standby generator has an output rating of 104 amperes, at 120/240volts, single phase, three wire, 60 hertz. Automatic transfer switch #1 is rated for 150 amperes at 120/240 volts, single phase, three wire. The generator and transfer switch appear to be in fair condition. Upon loss of utility power, the emergency/standby generator automatically starts and illuminates all loads throughout the building, including non-life safety loads.

Fire Alarm System

The building is presently equipped with an addressable, low voltage fire alarm system Silent Knights. The existing Fire Alarm System consists of a main control panel located in the truck bay and remote system indicating and initiating devices including manual pull stations located at egress points throughout the building. Audio visual horn/strobe units are also strategically located throughout the complex and smoke or heat detectors are located in corridors and open areas of the building. The building is presently not equipped with a fire suppression system.

Elevator Recall and Control

Not applicable to this building as it is not equipped with an elevator.

Americans with Disabilities Act Compliance

It appears that most of the buildings electrical controls and fire alarm devices are not in compliance with the height and access requirements of the Americans with Disabilities Act and the State of New Hampshire Architectural Access Barrier Board requirements.
Interior lighting the fluorescent lighting fixtures are past their useful. Most are equipped with T12 lamps and magnetic ballasts.

Automatic Lighting Controls

We did not observe any automatic lighting controls as required by the 2009 Edition of the International Energy Conservation Code, Section 505. All interior lighting systems appear to be manually controlled.

Exterior Lighting

LED & H.I.D., lensed, wall mounted floodlight luminaires illuminate the exterior entry and exit canopies as well as the front and side parking areas. As we performed our inspection during the daylight hours, we cannot comment on the adequacy of the exterior lighting levels. The existing fixtures appear to be in fair to good condition and there does not appear to be enough luminaires to provide adequate security lighting.

Emergency and Exit Lighting System

The building is not equipped with an emergency lighting and exit lighting system as required by NFPA Life Safety Code 101, and the International Building Code/BOCA in effect at the time of construction. For the most part, there appears to be an adequate number of normal/emergency lighting fixtures located throughout the egress paths and they are in good to fair condition. There are also an adequate number of exit signs to indicate the paths of egress, and they appear to be in good condition.

Lightning Protection System

The building is not equipped with a lightning protection system. The National Fire Protection Association (NFPA) and the Lightning Protection Institute (LPI) recommend that all buildings be protected against loss by lightning. However, the installation of a lightning protection system is not required by the National Electrical Code. The risk assessment index would classify this building as a moderate risk, taking into account the site conditions and the height of the structure.

Grounding Electrode and Equipment Grounding Systems

We could not visually inspect the main grounding electrode system because it was not readily apparent during our visual inspection. This main grounding electrode system should be tested every five years to ensure that the proper resistance levels are maintained.

Surge Protective Devices

The communications systems and the emergency distribution system did not appear to be equipped with surge protective devices leaving them vulnerable to an external or internal electrical spike or surge.

Critical Operations Power Systems

Article 708 of the National Electrical Code requires that critical operations areas, such as fire stations, be equipped with electrical distribution systems designed as critical operations power systems. This facility's electrical distribution system is not in compliance with N.E.C. article 708.

Conclusion

An inadequate power distribution system, a non-compliant critical operations power distribution system, non ADA compliant fire alarm system, lack of automatic lighting controls, insufficient exit and emergency lighting, outdated and non-efficient lighting systems, as well as a lack of critical systems surge protection devices are sufficient reasons why the electrical systems in this facility should be totally replaced or a new facility should be constructed to replace this existing fire station.

Limitations

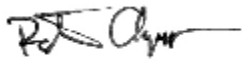
The contents of this report were intended for the use of the **Town of Newton, NH** and its designated representatives or clients and are not intended for any other purpose. Summit assumes no liability for the misuse of this information by others. The observations, comments, conclusions, analysis and opinions expressed herein are based upon the results and interpretations of the testing and/or data collection activities performed at the site, and the best information provided to us at the time of this document's preparation. The

evaluation performed on the above date was a limited visual assessment. Areas hidden from view, such as within walls, floors, or otherwise not accessible, were not examined. Summit reserves the right to update/revise the observations, comments and/or the recommendations to this report should conditions change or additional information become available.

Summit appreciates this opportunity to have assisted the **Town of Newton, NH** with this investigation. If we can be of further assistance, please do not hesitate to contact us.

Sincerely,

Summit Engineering, PLLC



Robert R. Champagne, P.E.

Summit Engineering, PLLC

Attachments: Photographs 1 through 30

Existing Conditions Floor Plan EX1

Photograph 1 - Front of building, faces South Main Street (south orientation)	
Photograph 2 - Right side of building, (west orientation).	

Photograph 3 - Rear of building (north orientation)	
Photograph 4 - Left side of building (east orientation)	

Photograph 5 - Interior view of apparatus bay at front O/H doors	
Photograph 6 - Interior view of apparatus bay looking from front to back	

Photograph 7 - Interior view at rear of apparatus bay (engine 1) looking towards right side O/H door	

Photograph 8 - Interior view of apparatus bay (engine 1 on right side of photo) looking towards right side O/H door	

Photograph 9 - Interior view of tanker	
Photograph 10 - Interior view of apparatus bay (left side) looking from front to back, bathroom door on right side of	

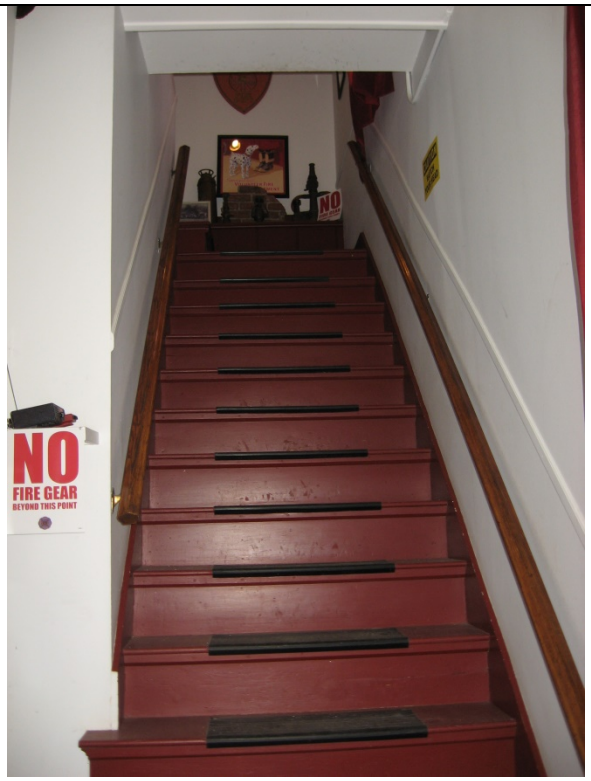
Photograph 11 - Interior view of wall/storage between tanker and engine 1 (engine 1 on left side)	
Photograph 12 - Bathroom in apparatus bay. Only restroom in facility located in apparatus bay.	

Photograph 13 - Mechanical room beyond	

Photograph 14 - Mop sink and storage area behind engine 1(tanker located on opposite side of window wall	

Photograph 15 - Fuel storage tank behind tanker	
Photograph 16 - Transfer switch behind tanker	

Photograph 17 - Uneven surface/threshold at door between tanker and engine 1	

Photograph 18 - Stairs up to second floor	

Photograph 19 - Interior view of second floor (South Main Street) on left side of photograph. Exterior egress door beyond	
Photograph 20 - Kitchen area	

Photograph 21 - Storage room at top of stairs, second floor	
Photograph 22 - Second floor office	

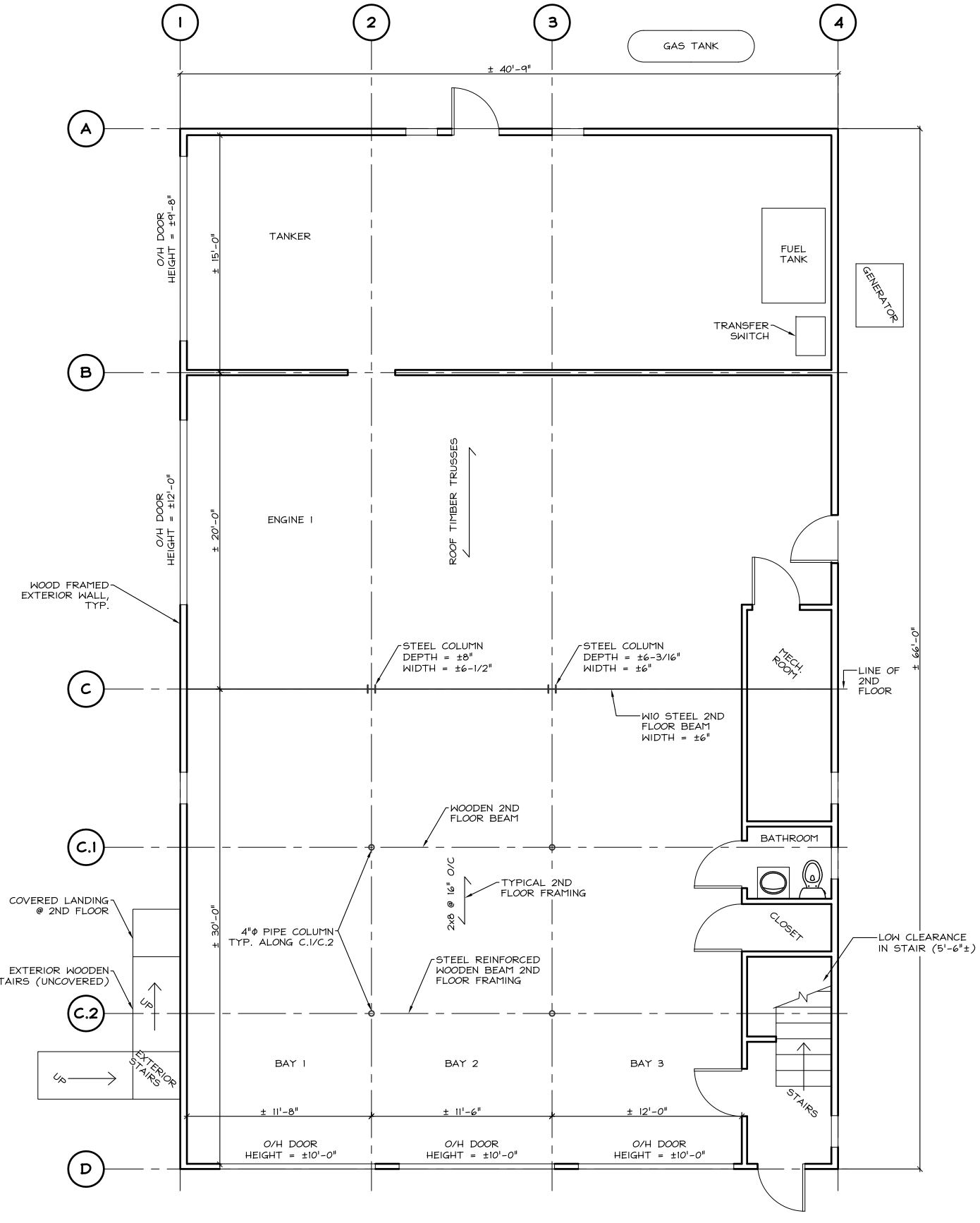
Photograph 23 - Second floor office	

Photograph 24 - Second floor office	

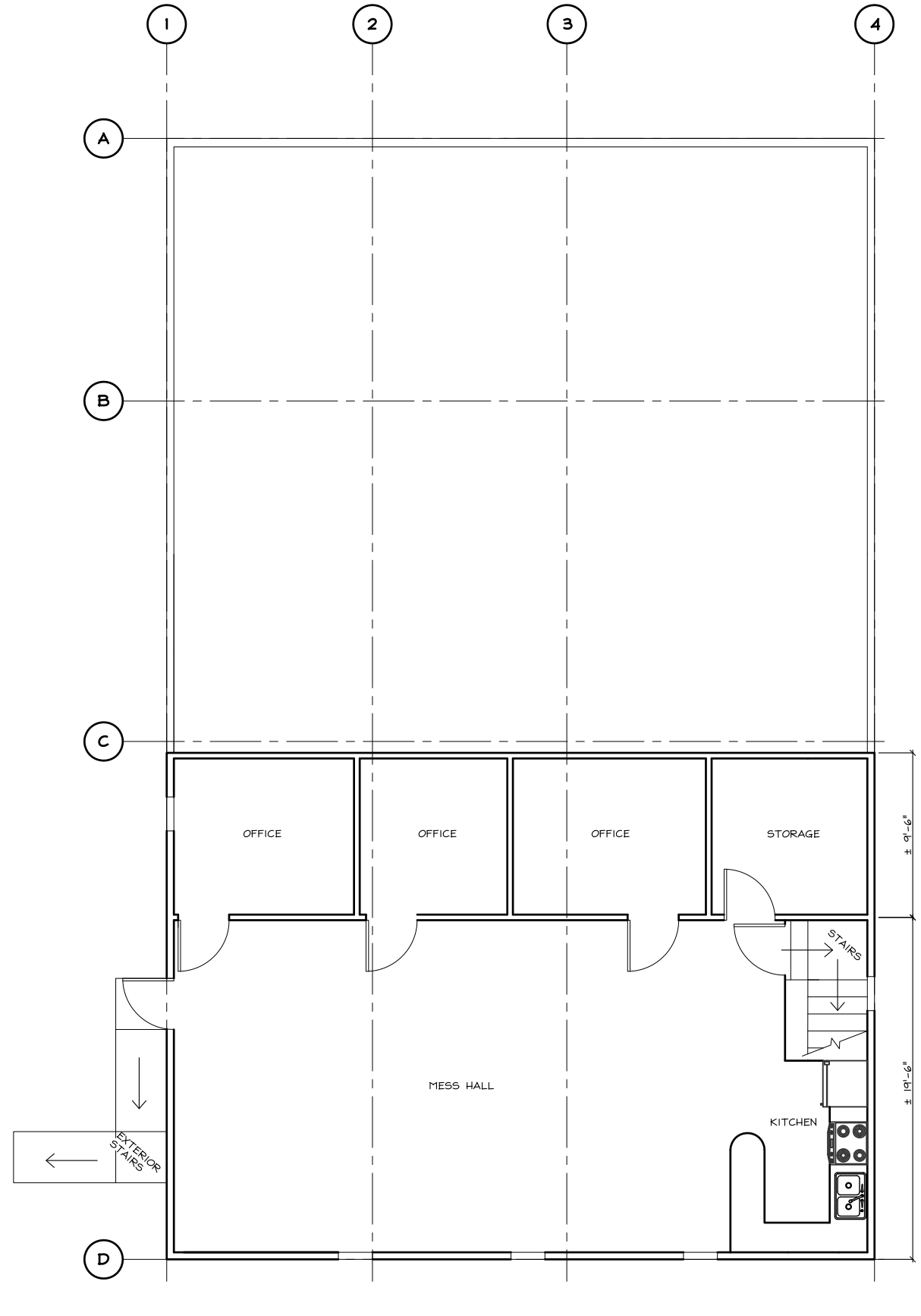
Photograph 25 - Rear side roof edge. Corrugated roofing over asphalt shingles	
Photograph 26 - View of attic space over engine 1. Metal plate connected wooden trusses	

Photograph 27 - Steel plate reinforced wooden second floor beam in apparatus bay	
Photograph 28 - 2x8 second floor joists bearing on steel beam at location of steel columns along engine 1	

Photograph 29 - 2x8 second floor joists	
Photograph 30 - 2x8 second floor joists looking from rear of building towards front in apparatus bay. Note minor crack at bottom of joist	



1 EXI **1ST FLOOR PLAN**
SCALE: 1/4"=1'-0"



2 EXI **2ND FLOOR PLAN**
SCALE: 1/4"=1'-0"

SUMMIT ENGINEERING
111 MAPLEWOOD AVE PORTSMOUTH, NH 03801
T. 603.319.1817 F. 877.808.1817
WWW.SUMMITENGINEERINGINC.COM

PREPARED FOR:

TOWN OF NEWTON NEW HAMPSHIRE Incorporated Dec 1749

2 TOWN HALL ROAD
NEWTON, NH
03858

PROJECT:

NEWTON FIRE DEPT.
35 S MAIN STREET
NEWTON, NH
03858

SEAL:

REVISIONS:

DRAWN BY: GA
DATE: 01/25/16
JOB NUMBER: 160104

TITLE:
FIRST AND SECOND FLOOR EXISTING CONDITIONS PLAN

SHEET NUMBER:
EX1

COMMENTS: