Mechanical, Electrical, Plumbing Report

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NEEDHAM TOWN HALL
EXISTING CONDITIONS REPORT
MECHANICAL, ELECTRICAL & PLUMBING SYSTEMS
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The Needham Town hall was built in 1902-1903, at a total cost including furnishing of approximately $57,500, based on the book, The History of Needham, Massachusetts 1711-1911, by George Kuhn Clarke. A lot has changed since 1902.

FIRE PROTECTION:

The building is fully sprinklered by a dry sprinkler system. The sprinkler head spacing is for ordinary hazard in accordance with NFPA-13. The service to the building is a 4" line and appears to be of adequate capacity. The system is protected with a back flow preventer and the system compressor is in good condition.

MECHANICAL SYSTEMS:

The HVAC systems serving the town hall consist of a steam oil fired boiler as well as variety of small independent systems which serve various areas of the building. The systems range from grade mounted cooling only air conditioning units, wall mounted ductless split system AC units, dehumidifiers and exhaust fans for toilet exhaust. The boiler was installed in 1971 when the HVAC system for the building was converted from a warm air heating furnace to the existing system. There is still evidence of the old system at the lower level of the building where there is existing abandoned ductwork which still remains. There is also a large convector in the old coal room behind the boiler room which has also been abandoned.

HEATING:

The oil fired steam boiler is a cast iron boiler manufactured by Weil-McLain. The boiler has a capacity of 1,694 MBH heating input capacity with an output capacity of 1,355 MBH. The flu from the boiler is a galvanized metal flue which runs 10 feet to a masonry chimney. The metal flue appears to be in good condition and has no signs of corrosion. The masonry chimney did not have good access for inspection however, it is likely not a lined chimney given the age. The steam heat is distributed to the building via the steam piping and runs to cast iron radiators which serve the spaces in the building. The condensate from the radiators is separately piped from the radiators and runs back to the boiler room. The condensate is collected in a boiler feed tank which consists of a tank for the collection of the condensate and pumps the condensate back to the boiler. The boiler feed pump is located in a swallow pit in the boiler room. The boiler feed pump is in good condition.

In addition to the steam heat for the building, there is a steam to hot water heat exchanger which was installed this past summer. This heat exchanger transfers the heat from the steam to a hot water medium for heating. The heating hot water is pumped to base board radiation which serves the existing computer room and associated offices at the ground level of the building. There are three zones associated with the hot water system and each zone has a thermostat which when calling for heat turns on the respective pump to provide flow to the zone calling for heat.

The oil tank is a 2000 gallon tank which is buried underground in the parking lot of the building. The piping from the tank is a copper line which is run inside a larger pipe to protect the pipe from exposure to the soil. The oil is fed by gravity to the boiler so there are no pumps associated with this oil system. There was no anti-siphon valve connected to the oil piping which would prevent the oil from draining into the boiler room in the event of a pipe break in the system. The original steel tank was removed in 1992 and replaced with a new double-walled fiberglass tank as part of a larger tank replacement project in which the oil tanks of all schools and the town hall were replaced.

The steam and condensate piping serving the radiators distribute from the boiler room to the ground floor and serve risers at the exterior walls. The piping is insulated with fiberglass insulation in the boiler room however, once the piping exits the boiler room there is no insulation on the pipes. The piping to the first and second floors rises from the ground floor and run exposed in the various spaces. These pipes also do not have insulation.

The radiators in the building are of the old style cast iron radiators. The controls for these radiators consist of either thermostatic type controls valves or a shut-off valve. The thermostatic control valves are the dial type which are adjustable by turning the dial at the valve mounted to the steam piping to the radiator. The radiators with only a shut-off valve do not have thermostatic control.

COOLING:

The cooling for the building consists of multiple window type air conditioning units. The only central system in the building is the units serving the computer room. These units are commercial packaged grade mounted air conditioning units which have side discharge duct connections for the supply and return ductwork. The capacities of the units are 2.5 tons for the office area adjacent to the computer room and a 3 ton unit serving the computer room itself. The units are manufactured by Carrier and are cooling only units. The units appear to be in fair condition and are estimated to be 5-8 years old.

The supply and return ductwork from these runs exposed outside from the unit and through the wall to the ceiling space of the computer room. The ductwork outside is not externally insulated however there is likely internal lining on the ducts which is the insulating material for the ductwork. The lining on the ductwork does not provide

complete coverage however and is evident as a result of condensation forming on the ductwork which was observed during our inspection.

The office at the west end of the building on the second floor is served by a ductless split system air conditioning unit. The evaporator is mounted in the office on the wall. The piping for the unit runs to an air cooled condensing unit which is mounted on the small roof of the Chapel street entry portico.

VENTILATION:

The building ventilation is virtually non-existent. There is no introduction of outside air into the building other than operable windows which does not conform to the current building code requirements. The toilet rooms in the building are not consistently exhausted. There are some rooms that have mechanical exhaust some that have a vent to the outside, relying on natural ventilation and others do not have any exhaust at all.
Other rooms, such as the copier room have exhaust fans which are ducted to the attic to dissipate the heat from the space.

MISCELLANIOUS:

There are a number of portable de-humidifiers located throughout the building which have been implemented to reduce the humidity of the spaces which they occupy. The units are located mainly on the ground level and are located in the vaults and in the training room.

The heating system for the building is reaching its expected life of 40 years per 2007 ASHRAE HVAC application handbook. The system is an outdated system and is not very energy efficient. The control to fire the boiler consists of a single thermostat located on the first floor in the main corridor. This thermostat signals the boiler to fire or not fire based solely on the temperature of this thermostat. The result of this is that areas of the building are overly warm while other areas are cold.

There are also a number of components in the building that due not comply with the current code regulations. The main item is that there is no ventilation serving the building. Proper ventilation to the space will likely reduce the necessity of the dehumidifiers that are currently used throughout the building. The majority of the toilet rooms do not have mechanical exhaust. Other items are the lack of combustion air for the boiler in the mechanical room. The oil system needs to be updated to provide the required devices to meet code such as the require safety devices.

PLUMBING SYSTEMS:

The building is served by a 1-1/4" diameter water service. The existing toilets observed, are the "tank" type toilets requiring the minimal pipe size. The men's room at the ground floor had both urinals and toilets.

The sanitary for the building is connected to the toilets throughout the building. There are a men's room and women's room located and the ground floor. There is also a small kitchenette in the computer room office which has a small sink. The first floor has a handicapped toilet at the east end of the building and the second floor has a men's room at the west and a women's room at the east end of the building. There is also a small sink in the lounge on the east end of the second floor.

The domestic hot water for the toilets is served by electric water heaters. The water heater at the ground floor serves the toilet rooms and the service sink. The heater is 9 years old and is located in the boiler room. The domestic hot water serving the toilets on the first floor and the second floors is also electric. The heater is located in the lounge area at the second floor. The heater is 4 years old.

The roof drainage for the building consisted of gutters and down spouts.

ELECTRICAL SYSTEMS:

OVERALL CONDITION

The overall condition of the electrical systems at the Needham Town hall is fair. Each component of the electrical systems will be discusses in greater detail with in section below.

POWER:

The building is currently fed from a small pad mounted NSTAR owned transformer located on the Chapel Street side of the rear parking lot. The service is rated at 120/208V three phase, four wire. There is one, four inch conduit that enters the building underground. The conductors terminate in a Square D 400A fused disconnect. There are three 300A Gould Shawmut Tri-onic Dual element time delay fuses within the fused switch. Within the fused switch, the #6 AWG CU ground wire is not properly identified as a ground, it is white not green as required by code . Also where the ground wire from the water service enters the fused disconnect, the knockout has come loose and slid down the wire. The loose knockout is resting just above the live terminal on the back of the fuse switch. The switch is making a rather load humming noise which may be cause by a loose connection or the knockout vibration against the fused disconnect. Power would need to be turned off by NSTAR at the transformer to properly inspect the fused

disconnect. There is one set of four Aluminum cloth covered conductors running from the transformer to the fused switch. We could not determine the size of these conductors. From the fused switch, two sets of 3/0 CU conductors run through two 200A meter sockets. One phase of one of these sets has been splice to extend its length about one foot. From these two meter sockets, one set of four 3/0 AWG CU conductors run to each of two separate three phase 200A panelboards. One of the 200A panelboards is a Bryant brand panelboard that appears, based on the date written on the panelboard cover, to have been added in 1984. The other 200A feed appears to feed a 200A Square D panelboard. It is very difficult to determine what circuit breaker feeds what loads because few circuit breakers are labeled. It appears that a second 200A Square D panelboard is fed from the first Square D panelboard. Due to multiple splicing of cables it was impossible to determine how the left hand Square D panel is fed. All three panelboard are close to or over the maximum height for a circuit breaker which is six feet, seven inches, (section 240.24). See attached photographs. This setup results in the town hall actually having two 200A three phase electrical services.

There three electrical panels located on the main mechanical room, two electrical panels located out in the basement corridor outside the cable TV access room. One panel is a 120/208V single phase 200 A main lug only Cutler Hammer brand panel in good shape. There is a #6 CU green ground wiring running back to the water service from this panel. This panel should be grounded at the main electrical service only. The other panel in the basement corridor is a 100A Square D panel in good shape. There is a small two pole Square D panel located with the Cable TV access room feeding the security system and outlet.

One the first floor there is one very old Federal brand fused electrical panel. This panel has 10 circuits is rated at 50A single phase. This panel appears to be close to, if not one of the original panels to the building. It feed hall lights and baseboard receptacles. On the second floor there are two electrical panels. The first panel is located in the Park and Recreation office. This panel is a Cutler Hammer 120/208V single phase 200A panel, with a 100A main circuit breaker. It appears that this panel feeds primarily receptacle and lighting loads. Based on the date within the panelboard, it appears that this panel was added in 1986. In the Vet's office there is a newer Murry brand 200A single phase panelboard with a 200A main circuit breaker. None of the main panels are capable of supporting a 200A branch circuit breaker. It is our belief that power for this panel is tapped off of the main feeders running from a meter socket to a Square D panel in the main mechanical room. This tap is not protected according to code. This panel was opened up to look for quality of installation and code violation. We found several National Electric Code (NEC) code violations: In pole positions 18 and 20 there are two single pole circuit breakers tied together with a sheet rock screw to feed the AC in room 21. The NEC does not permit sheet rock screws to be used to tie to single phase circuit breakers together to form a two pole circuit breaker. A factory made two pole circuit breaker needs to be used to feed a two pole (208V) load. The overall quality of the workmanship within the panel was fair. The wiring within the panel was not neatly

dresses. In several location white conductors where used at hot wires instead of neutrals. In one instance the conductor was not marked at all, in two other cases the marking is not permanent as required by code (section 200.7). The neutral and ground busses are tied together which is not allowed by code except at the service entrance. Several branch circuits where installed utilizing type NM (Romex) cabling. Romex, under current code is not allowed above a dropped ceiling. Since the panel is located on the second floor which has a dropped ceiling, we can assume Romex should not be installed. Romex can also not be used in a place of assembly; therefore if it desired some time in the future to reuse the great hall, the use of Romex would need to be addressed.

In general the electrical system is not labeled at all. It is full of splices and taps, most of them not to code. Several of the splices appear to have gotten warm enough to cause the glue on the tape to form small puddles of black adhesive under some splices. See attached photographs.

We could not determine why the town hall has two, 200A services. Both are rated at 200A three phase, four wire. Both have close to the same demand, the left meter is at 32.5 kW and the right meter is at 33.5 kW. We have no way of knowing when these peaks reading occurred. If we assume they occurred at the same time, then the load on the town hall is in the range of 184A. This is well within the service capacity of the building. Due to age of the panels we did not remove all of the covers, however from what we did observe there are several panels still being fed with cloth covered wiring that is over 40 years old. Any renovations to the building will require a though examination of all the existing wiring.
We spot check using a plug in circuit tester approximately 12 receptacles located throughout the building for proper wiring and grounding and found no problems.

LIGHTING:

Lighting is supplied throughout the building by fluorescent lamps. Many of the fixtures are old and not very efficient. Many fixtures have milky white diffusers. Several fixtures appear to be in odd locations due to new wall being installed but the fixtures not being relocated. Any reuse of the building should include all new lighting fixtures (luminaires). Light switches are located in each office although some are located behind movable partitions.

FIRE ALARM:

The fire alarm system is an old 8 zone conventional panel. It appears that six zones are in use. They are labeled, Computer room, Sprinkler, basement, first floor, second floor and penthouse. Under the Sixth Edition of the Mass Building Code, Chapter Nine, Fire Protection, smoke detectors are not required under Use Group A-3 or B. .

Under the same chapter of the building code, if the building is in Use Group B, horn strobes, pull-stations, etc are not required. If the building falls under Use Group A-3, then a signaling system as defined under chapter 9, section 917 is require.

In either Use Group, since the building is sprinkler, an audio visual alarm is required to indicate water flow. This is most easily accomplished by using a fire alarm panel to monitor the sprinkler flow switch

There are smoke detectors in most hallways, but they are missing from the tops and bottom of stairwells and along most other paths of egress.

We noted a general lack of audio/visual devices through the building. There appears to be on horn strobe located in the center of each main corridor on each of the three floors. There are manual fire alarm pull-stations located at each of the three main exits on the first floor. There is one pull-station located on the basement level at the Youth Services exit. However, pull-stations are required at the exit from each floor level. The second floor has one pull-station located in the center of the corridor.

If a fire alarm system is installed, it has to meet all required codes and based on this there are audio/visual devices lacking though out the space. By code they need to be in all conference rooms, public toilets, along corridors and as required to ensure a clearly heard signal throughout the building. There appears to be one audio/visual device per floor located in the center of each corridor. The arrangement doe not meet code. None of the fire alarm conduit system is color coded as required by code. The junction boxes are not painted red. The requirement to color code the fire alarm wiring system aids in determining which conduits and wiring are dedicated to the fire alarm system and should not be removed.

The existing fire alarm system does not meet current codes and should be replaced with a new addressable system. An addressable fire alarm system, unlike a convention system, which has a very limited number of zones or addressees, can have hundreds of individual device addresses. In the case of the Needham Town Hall, the existing fire alarm panel only provides for six zones thought-out the building? In the addressable system, each device, smoke detector, heat detector water flow switch, etc is given a unique numeric address that will provide a plain English text of where the alarm is. This allows the fire department to quickly determine where the source of the alarm is located.
The building currently has a master box connected to the Needham Fire Department. Currently the town still uses a hard wired master box system it is our understanding that some time in the future the town will be converting to a radio master box system. If a new fire alarm system is designed, provision for a radio master box should be considered based up upon timing.

LIFE SAFETY: This section deals with emergency lighting and exit signs.

Emergency lighting:

There is a limited number of emergency battery units (EBU's) located throughout the building. One the ground level there is one EBU located in the center of the corridor, this unit is non-functioning and should be inspected by a qualified person to determine if the battery need to be replaced or the whole unit.
On the first floor, there are two EBU's, one located in the center of the corridor and one by the Chapel Street exit. The unit in the center is functioning; the Chapel Street unit is not.
On the second floor, there are three units; all of them are in working order. One unit is located by the Chapel Street exit, one is in the center of the corridor and the third unit is located on the first landing of the staircase to the first floor.

EBU's are missing entirely from the upper penthouse floor level, from all the toilet rooms, from the stairways in general, from the Highland Avenue first floor exit, from the lower level at the Youth Services exit, from the mechanical room exit, from at the FACP, and outside each exit to a public way as required by code. EBUS are also required along all paths of egress, which can be taken to be any space a person has to pass through to get out of a building. This means when ever a person has to pass though another office to get to the main egress path, these offices will also require emergency lighting.

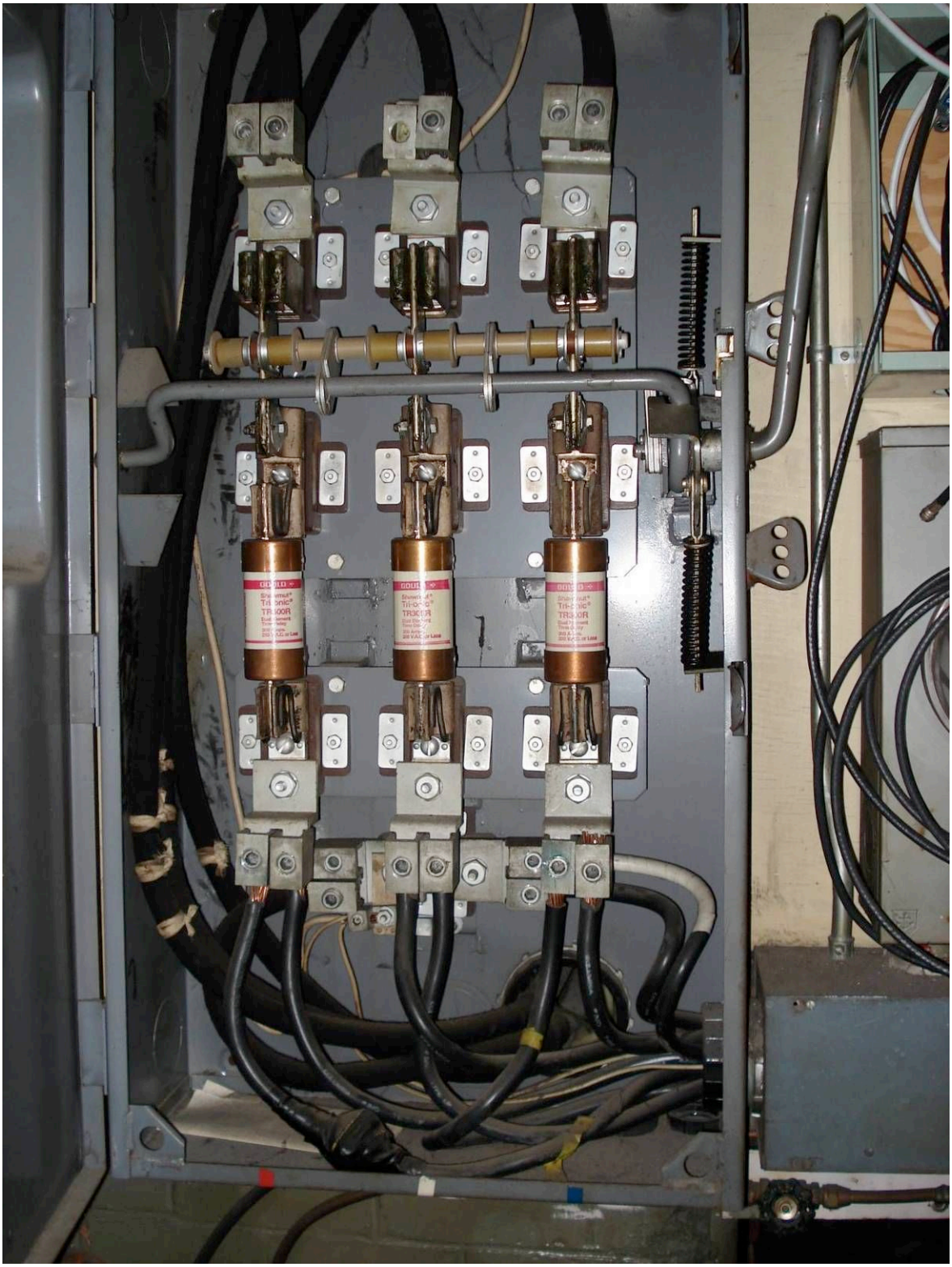
New EBU's with remotes heads need to be installed as soon as possible to provide the proper level of emergency egress lighting.

Exit Signs:

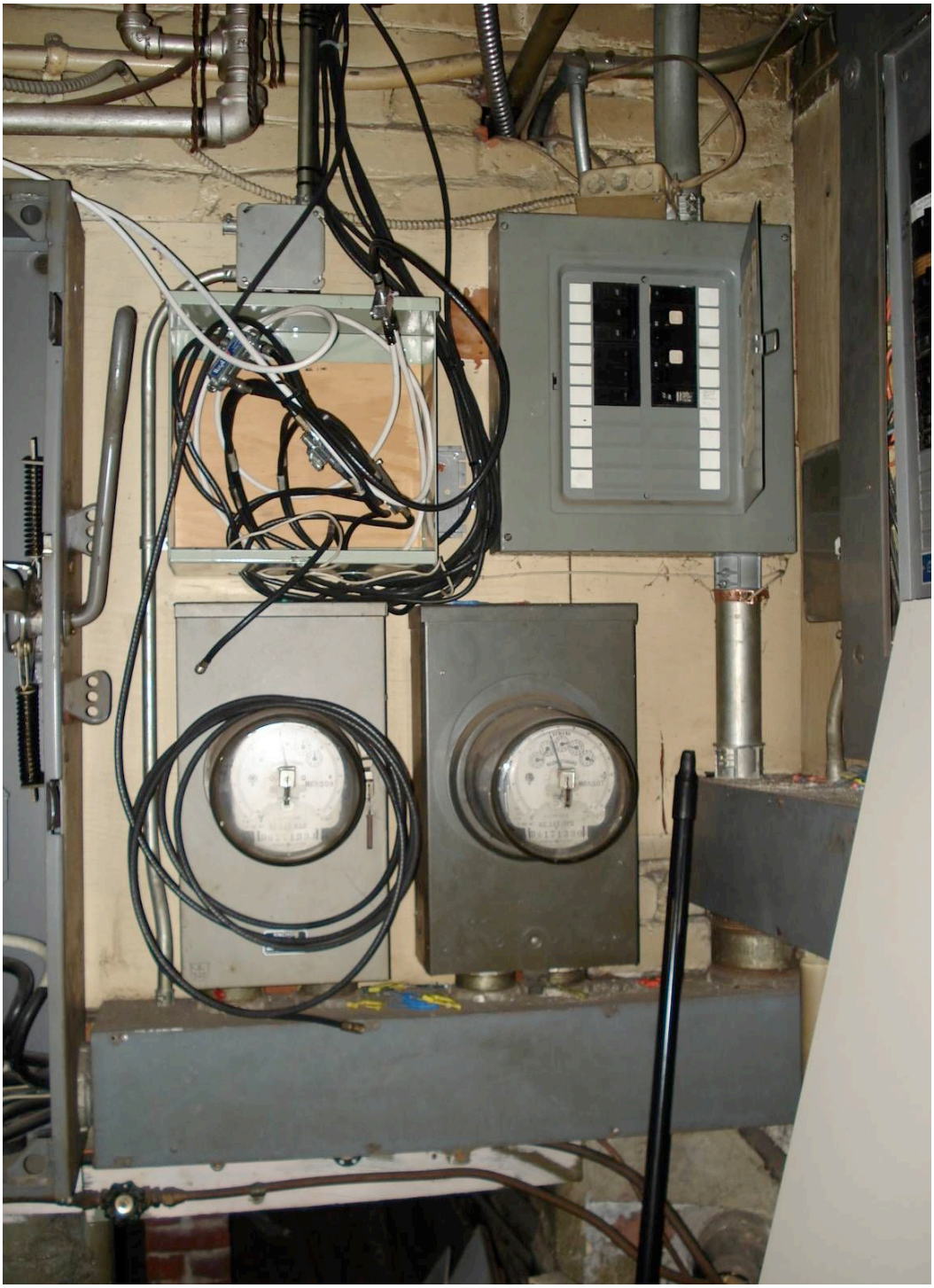
Exit signs are located at most major exits from each floor and from the building. Some of these signs are not lit as required by code. Exit signs are also required when a room has more than one exit from it. Over time, many new rooms have been created throughout the building. None of the new rooms have the proper exit signage. New exit signs are needed throughout the building to meet code.

Lightning Protection:

No lightning protection system was observed.



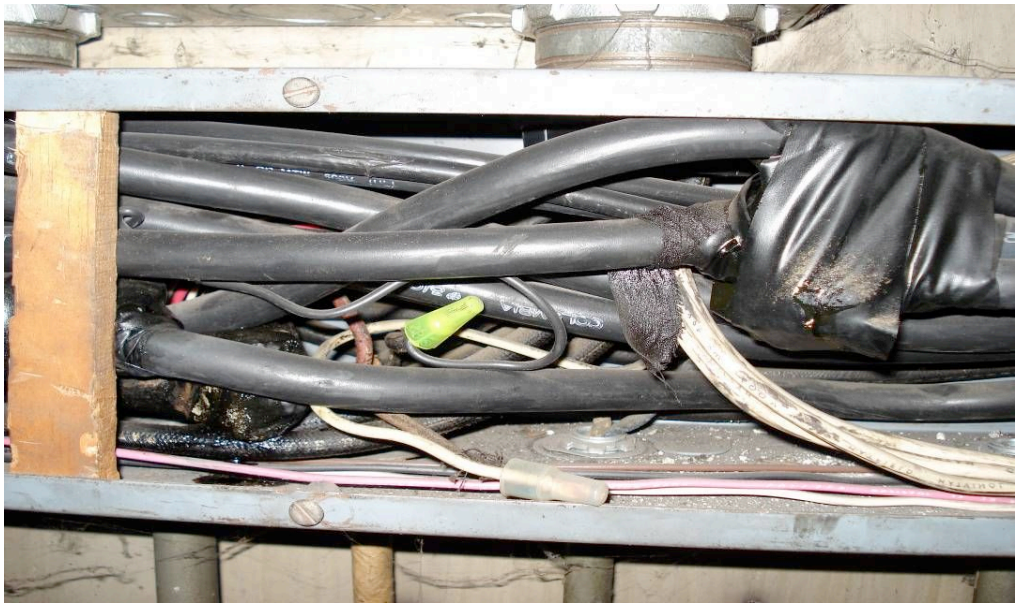
400A FUSED MAIN DISCONNECT



TWO ELECTRIC METER AND BRYANT 200A PANEL FOR 1ST SERVICE

TWO 200A SQ-D PANELS FOR 2ND SERVICE

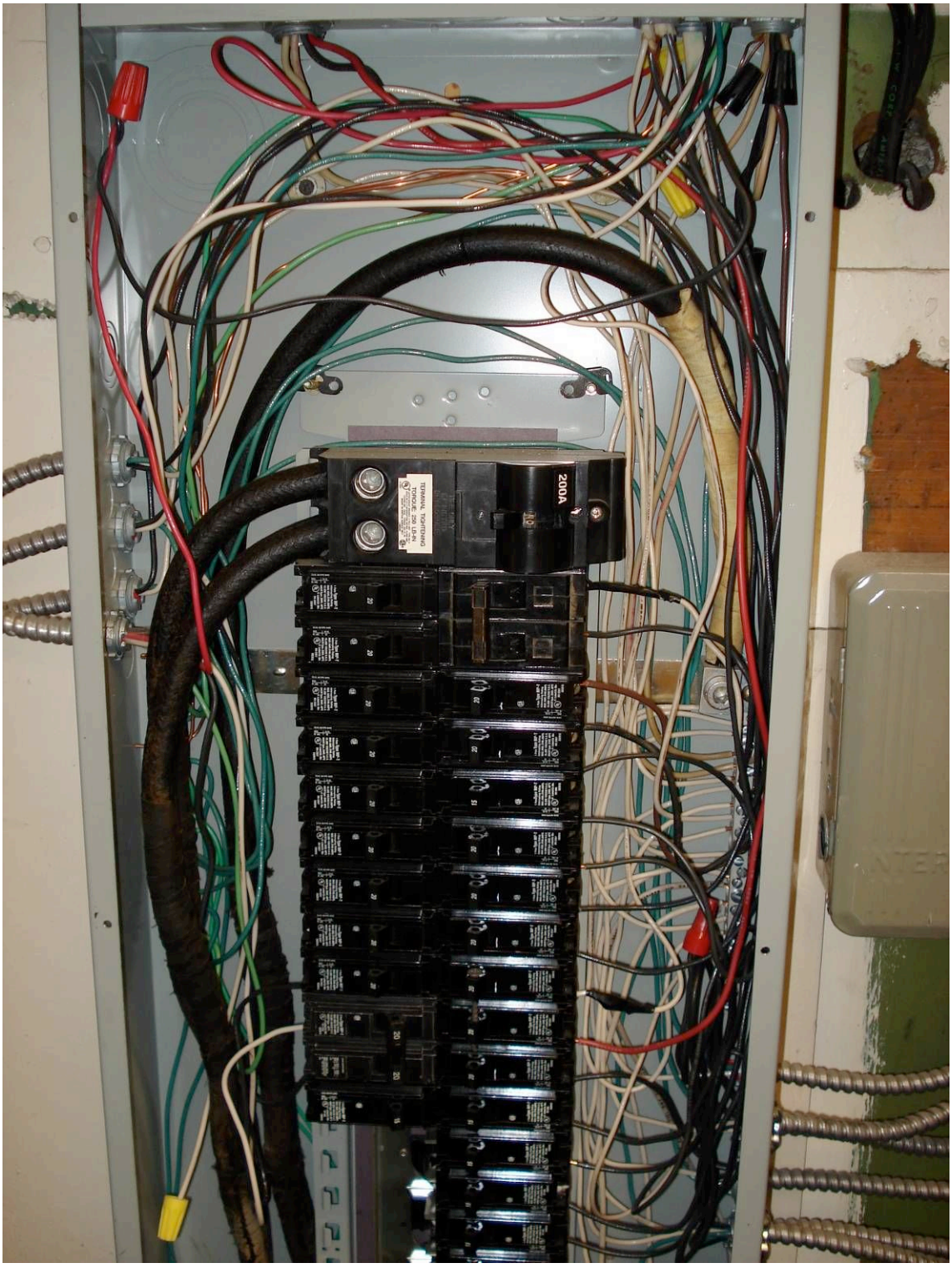
WIREWAY UNDER MAIN PANELBOARDS



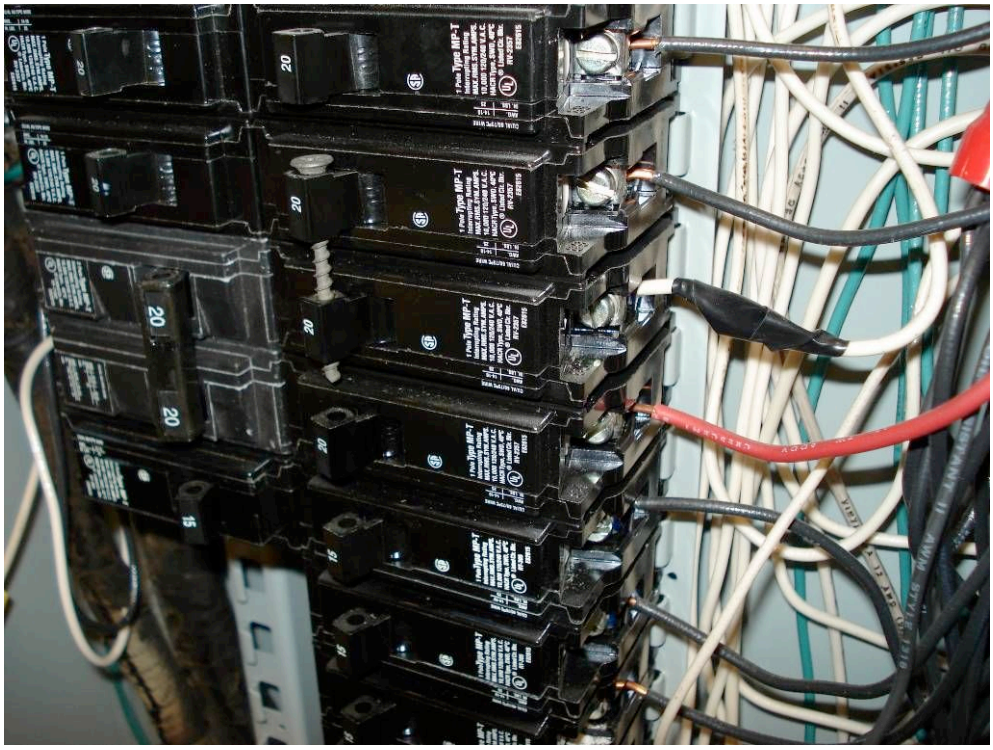
WIREWAY UNDER MAIN PANELBOARDS

FIRST FLOOR FUSE PANEL

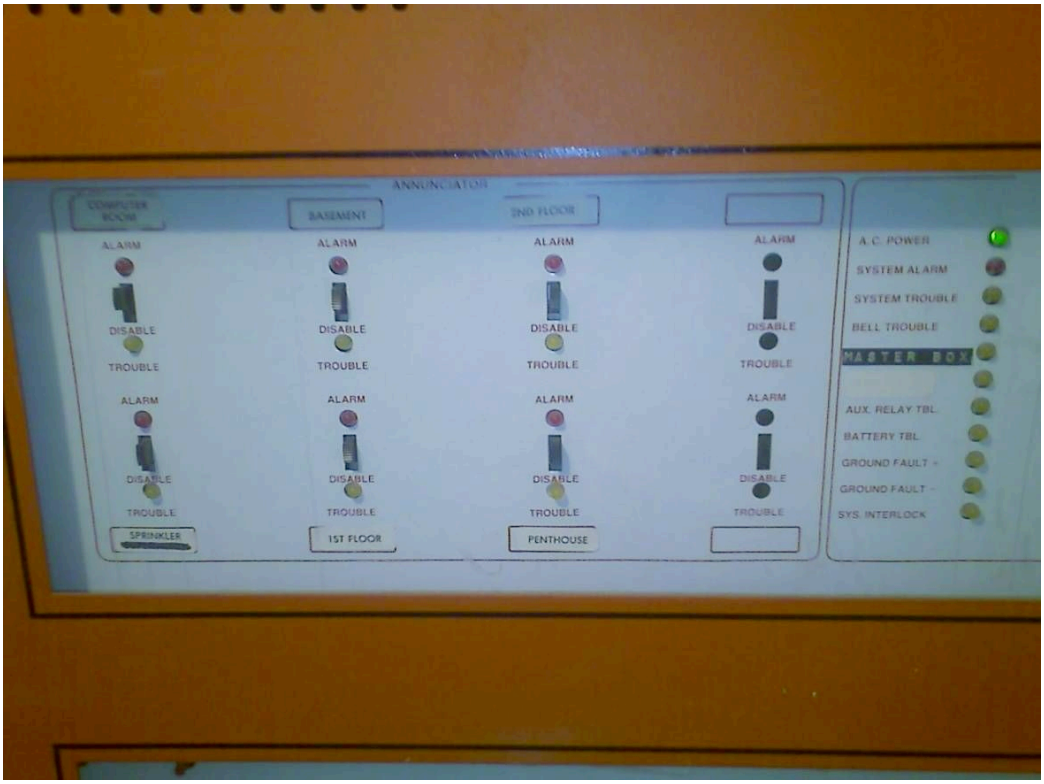
SECOND FLOOR CORRIDOR



ELECTRICAL PANEL IN VETS OFFICE



ELECTRICAL PANEL VETS OFFICE W/ SHEET ROCK SCREW



FIRE ALARM PANEL