Facility Evaluation for Fire Dept. Transport Study

City of Traverse City

April 25, 2022

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APPENDIX

EXECUTIVE SUMMARY

C2AE was contracted to; *1)* perform building and site evaluations of both fire stations for the City of Traverse City to determine their general condition, areas of immediate need, code compliance with the Americans with Disabilities Act (ADA) and Michigan Barrier-Free code (MI-BF), feasibility and ability to accommodate Advanced Life Support (ALS) with cost estimates, all to be contained in a written report; and; *2)* prepare bid documents for the installation of new fire suppression systems at both buildings.

Building Facility Evaluations

Fire Station 1 was built in 1975 and is well maintained, but in fair physical condition overall. The exterior walls are exhibiting a fair amount of deterioration (cracking, spalling, mortar joints) from age, water intrusion, and movement, in the masonry (all sides), particularly at all the sloped brick window sills and at the angled brick projections over the apparatus doors (both north and south), and training tower. Spalling of the facebrick is occurring at the patio walls from water intrusion and freeze/thaw cycles and the lack of a cavity within the wall. The chimney needs tuck-pointing on all faces as well. The windows and doors are mostly original and of minimal thermal performance value. The apparatus bay overhead doors are newer insulated units to help reduce utility costs. The building's interior décor is dated (except for the fitness room) and finishes/materials are largely original 1975 vintage.

Fire Station 2 was built in 1968 and is in good physical condition overall. The exterior masonry walls are in very good condition with minor damage existing. The exposed steel jambs and column exhibit some damage with corrosion at the ground from salts and moisture. There are newer windows and insulated apparatus bay overhead sectional doors in good condition, however, like Station 1, the thermal efficiency of the building is minimal. Station 2 benefited from a 2007 'make-over' of the west Day Room (kitchen and office) and redecorating of the east sleeping quarters, restroom, and fitness room making the occupied areas more comfortable with more current decor.

Common Building Issues

Modern fire stations are designed with wider bays (20' minimum), larger bay doors (14'x14' minimum), abundant storage rooms (fire rated), single occupancy sleeping quarters and restroom/showers, designing with best practices for all building systems, not to mention ADA and local barrier free design standards. Both fire stations were designed prior ADA and MI-BF codes, so many non-compliant conditions exist, however, fire stations are exempt from these requirements (Michigan Building Code 2015 – Section 1103.2.15 Military, Fire Service and Police Facilities states: *"housing, bathing, toilet, training, and storage areas intended for use and occupancy exclusively by military, fire service,*

police, or security personnel required to be physically agile are not required to be accessible."), except for any publicly accessible areas, therefore, any desire to upgrade the entire facility to be MI-BF and ADA would be driven by a City of Traverse City mandate.

The buildings were designed prior to energy efficiency regulations and codes and, therefore, have minimal insulation, except for roof insulation added when roofing was replaced and new insulated windows (at Station 2 only). The exterior masonry walls have minimal block core insulation and the lack of a drainage cavity allows moisture to penetrate the facebrick and experience freeze/thaw cycles the cause the damage witnessed. The roof design and large overhangs on Station 2 have helped preserve the masonry walls over time vs. the parapet walls, low-slope (flat) roof design, and cut-in flashings, all which fail over time, on Station 1. Therefore, both buildings will consume energy at a higher rate due to the relatively low thermal efficiency of the building envelopes.

The buildings weren't originally designed with cooling (air conditioning) systems and would be costly to incorporate a new ducted air system. Station 1 does have an under floor ducted system from the basement supplying the fitness room and sleeping quarters for heat only, however, the ducts aren't sized for cooling (need to be larger to be effective).

The Men's only sleeping quarters and multi-occupancy restroom exclude women from employment in the department. The latest design trends for sleeping and restroom accommodations in fire stations is single occupancy bedrooms and restrooms with shower (gender neutral/non-gender specific).

It should be noted that when renovation costs exceed two thirds (2/3) the cost of new construction, it is often better to replace the building rather than renovate/upgrade.

Site Expansion Capabilities

Station 1 can only expand to the east towards Kids Creek which is in a Flood Overlay District with a 50' wide setback from the high water mark (595' +/-?) to any physical obstruction (i.e., a building). This may prove detrimental to any reasonable expansion if the 50' setback extends closer than 20' to the current east exterior wall face. A new ambulance transport bay is not needed, however, if a 20' wide addition is allowed, an addition for the bedrooms, storage and circulation is all that is required. The single occupancy restrooms (3-4), EMS office and equipment/supplies storage can be designed to fit within the existing building.

Station 2 has a reasonably sizeable east side yard along Fair Street which was a separate residential parcel originally. Since Station 2 is on a corner lot, current zoning may require front-yard setbacks from each street (25'?) limiting any expansion to 33' wide along Fair Street. The setback along Eighth Street is 45' to the property line. The new cold storage building is within 15' of the Fair Street property line. Station 2 requires a new ambulance bay be added, along with EMS office, EMS equipment/supplies storage, possibly some new bedrooms, and a new potential mechanical room for HVAC and Electrical equipment if deemed necessary. The vacated spaces can be converted to new single occupancy restrooms (2-3) along with an expanded (widened) fitness room.

STATION 1

Architectural Assessment

Building Description

Station 1 was designed and built in 1974/75 and reflects the building techniques of the era, before energy and accessibility (MI-BF and ADA) codes and is largely unchanged today (9500 sq. ft. +/-). The building is facebrick on concrete block bearing back-up walls with minimal (core) insulation and no cavity/drainage plane. The architectural style is contemporary with brown facebrick with dark bronze anodized aluminum window and door framing. The low slope (flat) roof structure (Figure A1.1) is comprised of 1-1/2" steel deck on open web steel joists bearing on the concrete block walls (interior and exterior) at various elevations above the finish floor. The floor plan reflects the typical 1960's/70's fire station layout with office/work and living functions separated by the apparatus bays. There is a 3-story training/hose drying tower along the north façade. The building has a small basement (1600 sq. ft. +/-) for storage, utilities, and mechanical/boiler room under the current day room at the northeast corner of the building which also connects to the training tower to the north. There is a low height storage mezzanine over the apparatus bay support spaces on the east side (12' wide x 56' long – 672 sq. ft.) and accessed from the south end (Figure A1.2). There is a small outdoor patio off the day room to the east that has concrete stairs accessing the east yard and the lower basement access/exit doors.

The building was expanded in the 1978/79 with a contiguous 2-story city (split-level design) police station on the west side, which is now occupied by the Grand Traverse County Commission on Aging (GTC-CoA) and MSU Extension office (MSU-EO). The former physical connector (original west entry) has been closed with stud partition walls (non-fire rated), however, the west side fire station offices are cooled from the HVAC system in the addition which is problematic and inconvenient.

Site Description

Fire Station 1 is located at 500 W. Front Street just west of the historic downtown area bounded by W. Front St. to the south, N. Oak St. and Kids Creek to the east, an alley access and Kids Creek to the north, and the 1979 addition (GTC-CoA/MSU-EO) to the west on roughly 0.93 acres of land (245' x 165') measured to the west facade of the original fire station. The addition occupies the remainder of the original city site of roughly 0.59 acres (155' x 165'). The fire station parking is limited along the north alley to 4 spaces. Kids Creek (Figures A1.3-A1.5), to the east, is approximately 13' below the fire station apparatus bay floor normally, and hasn't been known to flood the side yard or north alley during extreme rain events. The east yard and alley are used for over flow parking (more than 4 vehicles) (Figure A1.6), vehicle rescue training, and snow storage.

The fire station apparatus bay aprons are 6" reinforced concrete slabs the width of the bays and extend to the roadway curbs and are cracking badly (Figures A1.7 and A1.8). There is a fire hydrant at the north side of the training tower at the alley connected by a 6" buried water main. The building is serviced by a 2" water connection off the main and there is a 2 ½" service (unmetered) to the training tower. Other services (power, gas, sanitary sewer) are provided from utilities in the north alley. Storm (and roof) water appears to be piped to city storm sewers.

Systems Conditions and Evaluations

Building Envelope

Roof

The roof consists of a white single ply membrane over rigid insulation of unknown depth and R-value, but appears in good condition with no visible problems, other than removing moss and debris buildup in low pockets (Figure A1.9) and at roof drains. Several of the cast iron drain strainers are broken/cracked and should be replaced. We were informed (from the RFP) that the roof is older and portions of the roof were replaced in 1993; typically roof warranties are 20 years. Minor roof leaks have stained the suspended ceiling tiles that appear to be localized along walls, pointing to wall and cap flashing issues. We would recommend taking cores to evaluate the roof insulation condition and R-value. We also recommend getting thermal scan of the roof to see there is wet insulation present. The metal wall copings are in good condition, however, the section joints need new caulking and several cut coping panels (Figures A1.10-A1.12) should be replaced with new to prevent cutting the membrane and provide a complete cover of the tops of the parapet walls. The soffits appear to be cement plaster, or direct applied stucco, on exterior gypsum board that are exhibiting some wear (Figures A1.13 and A1.14) and deterioration at several locations, especially over the apparatus bay doors.

Masonry and Brick Walls

The all-masonry building is in fairly good condition, however, several cracks have appeared over the years around the building. The cracks (Figures A1.15-A1.17) have been repaired with both mortar and caulk that appear to be from water freeze-thaw cycles when water finds its way into the joint between the facebrick veneer and concrete block backup walls. There are areas on the chimney that need tuck-pointing, primarily at the top perimeter (Figures A1.18 and A1.19). Another concern (Figure A1.20) is the rusting steel lintels at the door openings and over the apparatus bay doors. The brick on some piers and at the base of the patio stair wall (Figure A1.21) exhibit face shells spalling off with more face shell cracking evident directly above. All the sloped brick window sills have facebrick/mortar joint failure (Figures A1.22-A4.24) allowing water to migrate behind and push/lift the lower courses out and crack the brick.

Windows and Doors

The exterior windows (Figures A1.25 and A1.26) are dark bronze anodized aluminum frames with ½" insulated glass and appear to be original to the building. A newer (1980's?) entry door (Figure A1.27) with side-lites and wire glass was installed to make a public entry at the south west corner (in the former equipment storage room) with a newer card reader security lock and doorbell. The rear man-door is equipped with stand-alone push button security lock and doorbell. The top-most training tower window opening is painted plywood and the middle window does not close completely. See Figures A1.29-A1.31 for tower window problems. The patio sliding door has no security devices and is in good condition. There are three (3) painted hollow metal doors and frames at the training tower (1) and basement level access (2), all are equipped with round knob (spherical) handles with integral standard key locks without any security devices or alarms. The (5) 14' w x 12' h apparatus bay overhead doors (Figure A1.28) are newer power operated insulated sectional panel doors with small vision windows. The north bay door power operators and controls were recently replaced with Raynor 'Power Hoist' units (Figure A1.32). The south (3) doors still have older (original?) power operators and are replaced when they fail (not serviced any longer) (Figure A1.33). The overall height of the apparatus bay doors will limit the height of new equipment and will require the city to mandate maximum equipment heights as part of any purchases which may limit vehicle options and/or increase vehicle purchase price.

Patio

The patio structure is in fair condition and showing its age at the facebrick perimeter walls where water damage (freeze/thaw) in visible, primarily at the lower east wall north of the gate and at limestone wall cap joints (Figure A1.34). The concrete floor slab is in good condition with minimal cracking and 'sheet' drains via the concrete steps (good condition), however, the joints at the perimeter walls are heavily caulked (Figure A1.35) to prevent water damage to the brick walls. The steel gate door and posts are in good condition, but settling unevenly (Figure A1.36)

Ingress and Egress

Stairs

The stairs that access the training tower and basement are original and will be reviewed with both the 2015 Michigan Building Code and 2015 Michigan Rehabilitation Code for Existing Buildings which 'grandfather' older buildings to continue to be used unless the areas (stair) are remodeled or replaced. The stair is close to current code compliance with risers under the 7" maximum (6.6"), but the tread depth at only 10" (11" minimum code).

The exterior cast in-place concrete patio and basement access steps are similar with shorter treads than current code, but less than the minimum riser height. The patio access from the day room has a 4" step down at the sliding glass doors.

ADA Compliance

Since the building was constructed in 1974/75, prior to any barrier free and ADA code requirements for accessibility, the building is 'grandfathered' under the 2015 Michigan Rehabilitation Code for Existing Buildings to operate as-is until any improvements (remodeling) occurs. Any remodeling or alternations must meet current codes, however, if the remodeling encompasses 50%, or greater, of the total floor area, the entire facility is required to meet those codes. However, with that said, fire stations are exempt from Michigan Barrier Free and ADA codes since staff must be ambulatory (physically able) to do their jobs, however, any publicly accessible areas (entry lobbies, available restrooms, circulation, meeting rooms, etc.) must meet these code requirements.

All man-doors are 36" wide (compliant), however, push side/pull side clearances at many of the doors are not compliant to current codes. The floor elevations from the east office and west living areas are 6" above the apparatus bay floor, creating a step down at all the access doors. In addition, door knobs should be replaced w/ accessible lever hardware.

Toilet, Lavatory, and Shower Rooms

The current Men's only restroom (Figure A1.37) has 2 water closets, 2 floor mounted urinals, 2 shower stalls and 3 lavatories. The overall condition is good, however, the wing wall has broken/missing ceramic tile (Figure A1.38) on the top surface corner and is non-compliant to ADA and MI-BF requirements, though, not necessary to be for a fire station use. The toilet partitions are the original ceiling and wall hung painted metal pieces that appear to be in good shape, but painted several times.

There is a single occupancy restroom in the west (office) portion of the facility that is non-compliant as well (too small), but available to the general public currently.

The main restroom can be upgraded to meet current ADA/MI-BF requirements, however, current fire station design is moving away from gang restroom/shower facilities to single occupancy non-gender specific bathrooms (1 per 2 beds). The west single occupancy restroom should be remodeled to be ADA/ MI-BF compliant as the likelihood of public visitors in the future is not unrealistic. Any remodeled restrooms would require new plumbing fixtures to low water consumption units (water closets, lavatories, and showers).

Interior

Walls

Most of the interior walls are painted 8" concrete block, or facebrick veneer over 4" or 8" concrete block. A drywall partition was built when the SE public entry lobby/office was added (remodeled equipment/storage room). Ceramic wall tile wainscots are in the east restroom and shower stalls.

Doors and Frames

All the interior doors and frames are painted hollow metal (3'-0" x 7'-0") and in fair condition. The doors/frames are painted with several colors, some different colors on opposite sides. The hardware is newer locking lever handles at offices and restrooms, and push plates/pull handles at the day areas. The door hardware in the SE lobby have integral manual security locks to control access to the offices.

Ceilings

Suspended 2x4 acoustic tile ceiling systems are prevalent throughout the facility including the apparatus bay. The tiles are sagging due to age and moisture absorption (Figure A1.41) over the years with water stains in several rooms (Figures A1.39 and A1.40) from roof leaks. Following the repair of any roof leaks, it si recommended to replace the ceiling tile and grid as it will improve the overall appearance of the spaces. The workout room (former locker room) now has painted exposed roof structure (black). The bottom side of any exposed precast concrete floor panel is painted on the main floor and unpainted in the basement.

Flooring

Terrazzo flooring and base is in most of the east and west portions of the facility with former work and storage spaces receiving carpet and epoxy finished. The dormitory restroom has ceramic floor tile and base. The central apparatus bays and basement are natural concrete with an applied sealer.

Storage

Not surprisingly, there is a shortage of storage in the facility. Most storage is in cabinets or systems furniture. The several small closets that are scattered through the facility along with the basement are the only dedicated storage rooms and are full. The former apparatus bay equipment storage room was converted to entry lobby and 'front' office which removed over 350 sq. ft. of storage capacity. The former basement generator room was repurposed to general storage and added 115 sq. ft. back, but is 'cold' storage.

Kitchen

The kitchen and dining area are open to each other and to the day room in general (one large room). The kitchen is essentially the original layout (Figure A1.42) and cabinetry, except for refinished doors and drawer faces done several years ago. The refrigerator and range/oven are newer and an under-counter dishwasher was installed to the right of the existing double basin sink. The range/oven is a small commercial unit (48" wide) with a commercial type exhaust hood with fire suppression. There is a newer free-standing (on casters) (Figure A1.43) coffee counter/storage unit that supports a Bunn single urn coffee maker, 2 additional hot-pots, coffee bean grinder and condiments. The countertops are plastic laminate on plywood substrate and is worn and cracked in several places along the edging (Figure A1.44). The plastic laminate backsplash is old (original?) with many sealant-filled holes from removed wall mounted devices. The sink does have a newer faucet assembly. There is minimal work surface to prepare food as the countertop holds a microwave and toaster ovens, and other cooking equipment and utensils.


Figure A1.1


Figure A1.2


Figure A1.3


Figure A1.4

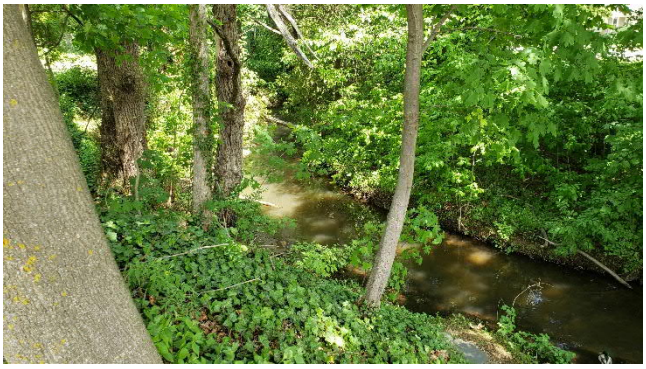
Figure A1.5


Figure A1.6


Figure A1.7

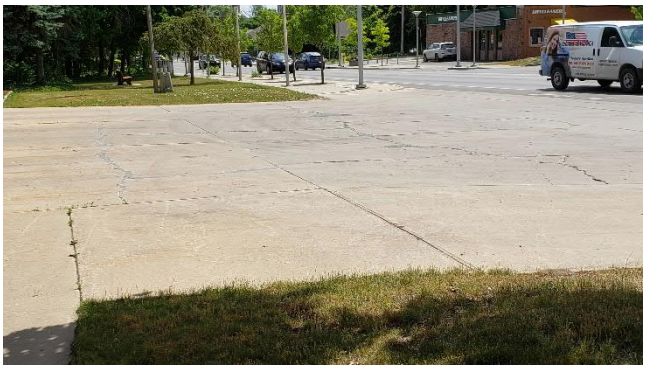
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Figure A1.9


Figure A1.10


Figure A1.11


Figure A1.12

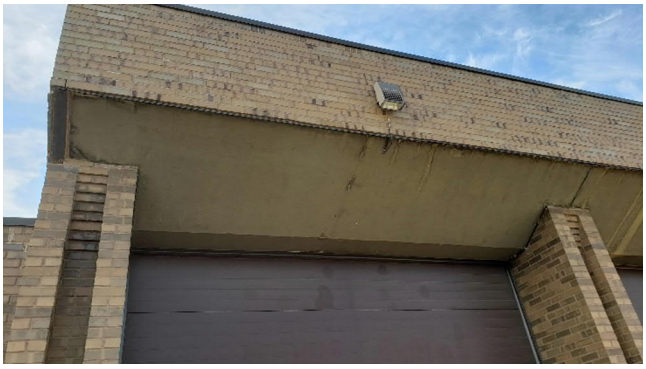


Figure A1.13


Figure A1.14


Figure A1.15

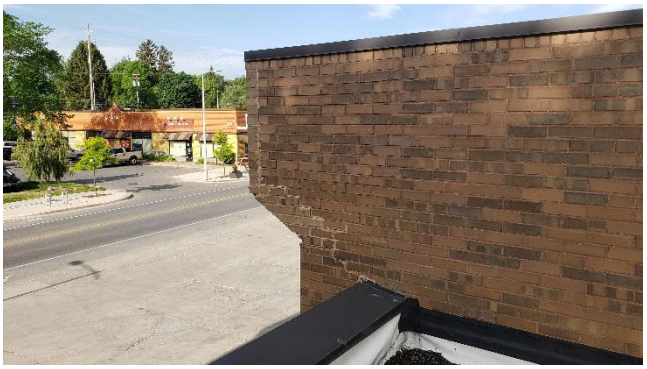


Figure A1.16

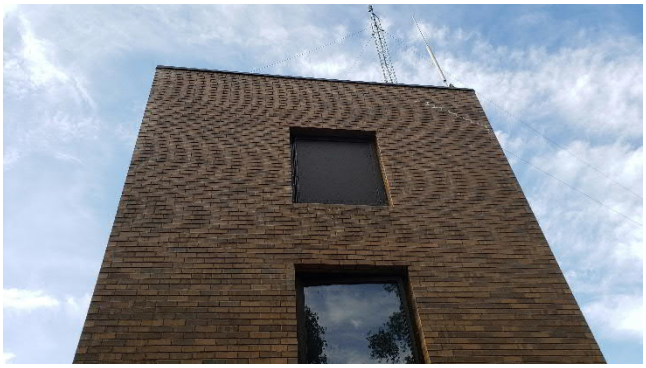


Figure A1.17


Figure A1.18


Figure A1.19


Figure A1.20


Figure A1.21


Figure A1.22


Figure A1.23


Figure A1.24


Figure A1.25


Figure A1.26


Figure A1.27


Figure A1.28


Figure A1.29

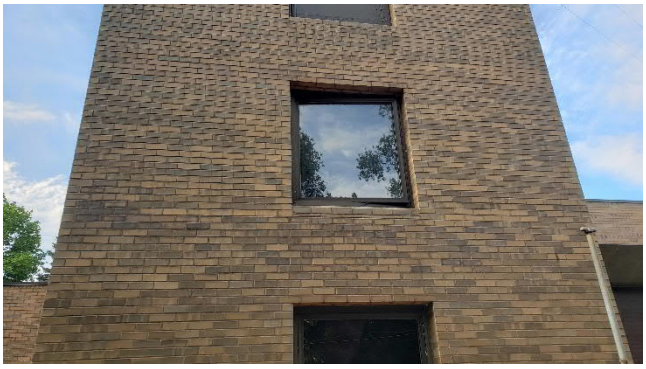


Figure A1.30


Figure A1.31

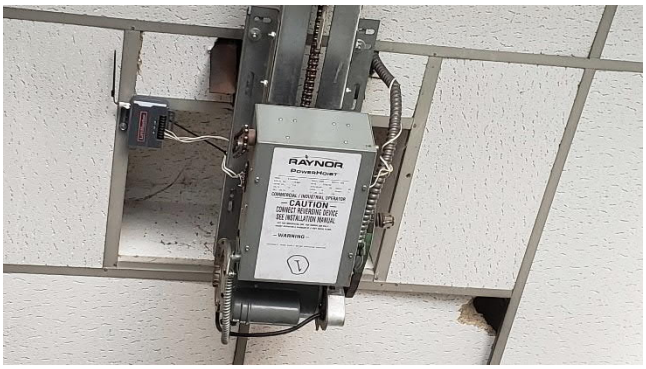


Figure A1.32


Figure A1.33


Figure A1.34


Figure A1.35


Figure A1.36

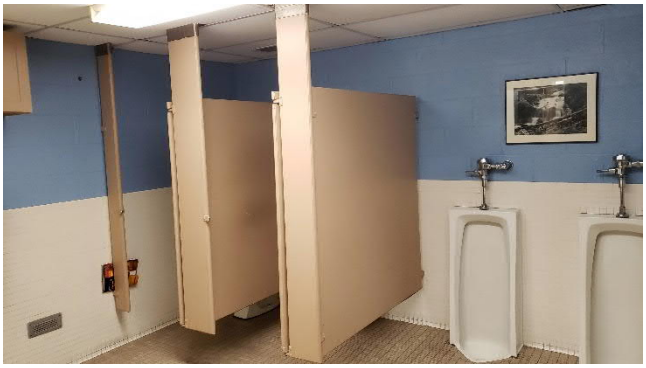


Figure A1.37


Figure A1.38


Figure A1.39


Figure A1.40

Figure A1.41

Figure A1.42

Figure A1.43

Figure A1.44

Electrical Assessment

Electrical Service and Power

Electrical service to the Traverse City Fire Station #1 is via an underground feed from Traverse City Light & Power near the northeast corner of the building. A 35kW emergency diesel generator is located outside near the service entrance and supplies emergency loads for the building through an automatic transfer switch (ATS). It is fueled from an underground tank. This unit was built in 2003 and appears to be in fair condition. The main service and emergency panels are both rated 120/240V, single phase, 3 wire. The main panel is 200A and emergency is 150A. Each panel appears to be original to the building and have exceeded the manufacturer's recommended service life.

It is believed that the primary electrical service panels were installed in the mid-1970s. Manufacturer's typically recommend a service life anywhere from 20 – 40 years depending on maintenance, installation location, among other various factors. Electrical panels that are approximately 45-50 years old are well beyond the manufacturer's recommended service life. These should be replaced as soon as possible. Replacement parts for these panels are obsolete and/or not available. Further, it is understood that air conditioning for the building is desired. This upgrade will need to be coordinated with the utility company as it will require a larger service and corresponding electrical panel(s).

Electrical Lighting

The existing light fixtures in most of the offices, corridors, kitchen, dormitory etc. are generally 2x4 flat panel and surface mounted troffers. The apparatus bay also contains surface mounted troffers. The vast majority of lighting in the building is either fluorescent or incandescent. These should all be replaced with high efficiency LED fixtures. Additionally, the lighting controls observed are manual. These should also be replaced with updated modern occupancy and vacancy sensors that meet the current energy requirements. It was noted that the exterior wall pack fixtures appear to be LED. A plan to bring all lights and controls up to the most recent ASHRAE requirements should be developed and integrated with any other program modifications.

Fire Alarm System

Currently there is not an existing fire alarm system in the building. Consideration should be given to installing a system that includes visual and audio notification devices throughout the building and pull stations at each exit.

Communication and Miscellaneous Systems

- The main server for the data throughout the building is located in a room with medical supplies and does not appear to be very easily accessible. However, it is understood that data service to the building is through the county, who operates and maintains the system. No revisions to this system are anticipated at this time.
- No security cameras are installed in the interior or exterior of the building. However, several doors are equipped with key pad access to secure the building. A security system that includes cameras and alarms is recommended for safety of fire fighters and anyone who visits the building.
- A new speaker system was installed approximately 2 years ago and is in good working order.
- The existing phone system is through was upgraded approximately 10 years ago. Presently, there are no issues or concerns with this system.
- Garage door controls are original to the building and should be replaced with a current model.


Figure E1.1 Incoming Service Equipment


Figure E1.2 Emergency Generator

Figure E1.3 Automatic Transfer Switch (ATS)

Mechanical Assessment

Heating

The existing heating system is for the most part original. However, the original cast iron sectional boiler was replaced in 2013 by a high-efficiency Lochinvar Knight condensing boiler with a nominal output rating of 710,000 Btuh at 95% rated efficiency. Concurrent with the boiler replacement project, the original hydronic distribution system was converted from multiple zone distribution pumps to a single system pump with zone control valves. The existing Lochinvar boiler is 8 years old and has an anticipated life expectancy of 15-20 years. Future heating system upgrades should include a second boiler to provide redundancy in the event one boiler fails.


Figure M1.1 Existing Lochinvar Boiler (in basement)


Figure M1.2 Apparatus Bay Unit Heater (typical of 4)

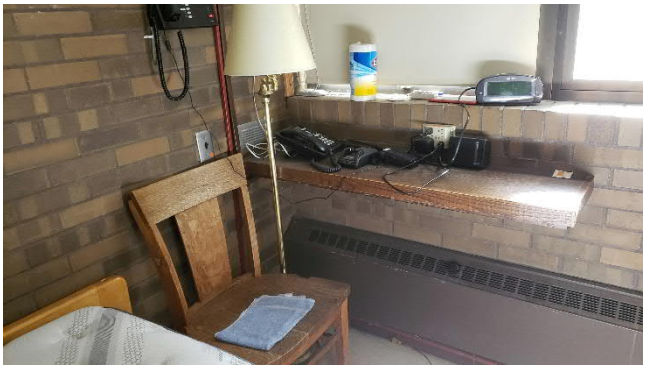


Figure M1.3 Typical Perimeter Heating Unit


Figure M1.4 Training Room Unit Heater

Heat transfer equipment is combination of baseboard finned tube convectors located on the exterior walls of the occupied spaces, ceiling-mounted vertical hot water unit heaters in the Apparatus Bay and Training Room, and a heating-only air handling unit with serves the dormitory and fitness room. Although all of these terminal heating units are functional, they are old and should be replaced in the near future. Newer heating units will provide for improved occupant comfort, controllability and energy efficiency.

Cooling / Air-Conditioning

The building's cooling system consist of four unitary DX units which serve dedicated occupancy areas. A split system unit (Mitsubishi) with wall mounted indoor evaporator and companion ground-mounted compressor/condenser which serves the Day Room (nominal 2 ton). The dormitory is served by a residential type thru-the-wall AC unit.


Figure M1.5 Mini-Split A/C Unit (outdoor condenser)


Figure M1.6 Dormitory Window A/C Unit


Figure M1.7 Mini-Split A/C Unit (indoor evaporator)


Figure M1.8 Thru-Wall A/C Unit

General Ventilation / Indoor Air Quality

Natural ventilation is the building's primary means of ventilation via a combination of operable windows and doors. The Dormitory is the only area served by a ducted fan-powered heating and ventilation air handling unit (AHU).

Figure M1.9 Heating & Ventilation AHU (in basement)


Figure M1.10 Fresh Air Intake Louver for AHU

The split system cooling indoor unit is capable of recirculation ventilation operation independent of cooling function.

Mechanical exhaust equipment is comprised of single-space exhaust fans serving office toilet rooms and the Workshop/Repair, a ducted central exhaust system serving the Toilet/ Fitness areas, and. The kitchen is equipped with a range hood side-wall exhaust fan.


Figure M1.11 Rooftop Exhaust Fan


Figure M1.12 Kitchen Hood Exhaust Fan

Some of the offices on the building's west side are served by an air system associated with the adjacent former Police Building. These offices should be provided with new ventilation system independent of the adjacent building unit, as well and the limited heating supply and return piping.

Apparatus Bay Gas Detection / Exhaust

The Apparatus Bay currently has no vehicle exhaust detection and ventilation system. For the safety of building occupants, it is recommended that a new vehicle exhaust detection system be installed to monitor for unsafe levels of carbon monoxide and nitrogen dioxide. The system would include alarm devices as well as an exhaust fan to purge the bay with fresh air. It is also recommended that some form of exhaust capture equipment by added to the Apparatus Bay to minimize the accumulation of exhaust gases. Common capture systems include AirVac911 suspended units or PlymoVent snorkel units.

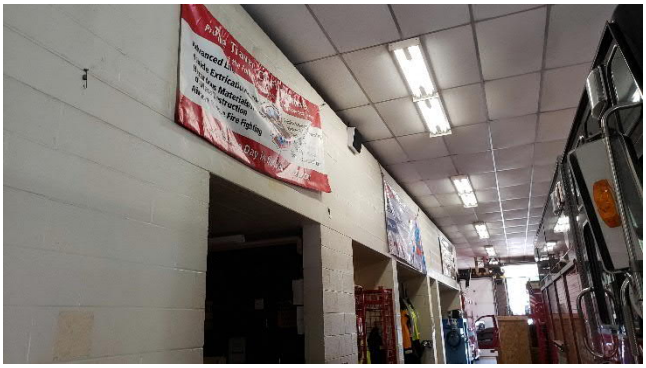


Figure M1.13 Apparatus Bay (no gas detection or exhaust system)

Figure M1.14 Apparatus Bay (no vehicle exhaust capture)

Temperature Controls

The temperature controls for the Station are primarily the original pneumatic (compressed air) devices. Each space has a thermostat which controls modulating heating valves for the heating units. Each A/C unit includes a separate temperature sensor for cooling set points. An air compressor in the basement provides the pneumatic air supply for the thermostats and control valves. These legacy pneumatic controls have far exceeded their life expectancy and provide very limited controllability. It is recommended that the temperature controls for the Station be completely upgraded to programmable direct-digital control (DDC) devices with a central building automation system.

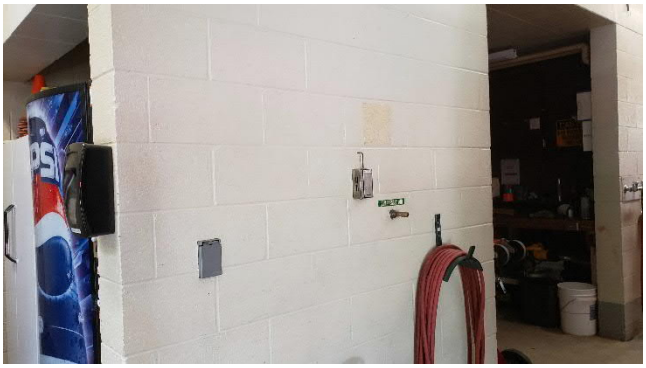


Figure M1.15 Typical Pneumatic Thermostat

Figure M1.16 Air Compressor for Temperature Controls

The boiler and heating system pumps are set up to operate continuously whenever there is call for heat from the domestic hot water storage tank; or whenever the outdoor air temperature falls below a specific set point value. The Apparatus Bay unit heaters are continuously circulated and their fans cycle on a call for heat from their respective wall-mounted thermostats. Wall-mounted electronic thermostats interface with either distribution zone valves or, in the case of the unit heaters, with the fan operation.

Plumbing Systems

City domestic water is supplied to the tower standpipe and the hose bibbs located in the Apparatus Bay by a 2-1/2" unmetered service which enters at the building's north side near the training tower. There is also a metered 2" domestic water service at the NE corner of the basement.

A storage type indirect heater provides hot water to building lavatories, sinks and showers. Heat is sourced from the heating boiler and the unit is rated for first hour output of 358 gallons with 82-gallon storage. The hot water distribution system includes a return water circulation pump.


Figure M1.17 Unmetered Domestic Water Service (2.5")


Figure M1.18 Metered Domestic Water Service (2" with BFP)


Figure M1. 19Domestic HW Storage Tank


Figure M1.20 Domestic HW Recirculation Pump

Fire Protection System

Other than the small chemical fire suppression tank/nozzles serving the kitchen hood, Station 1 is not provided with any building wet- or dry-pipe fire protection system. A future project to add a wet-piped fire protection system to serve the entire building is pending.

Recommendations

1. Replace all non-lever door hardware with lever style hardware to improve building accessibility.
2. Repaint walls to update appearance.
3. After any above ceiling or roof work is complete, replace ceiling tiles and ceiling grid to update appearance and eliminate stained tiles.
4. Replace front door with new thermal broken unit to improve thermal performance. At the same time adjust the swing in the direction of egress.
5. Repair exterior brick by tuckpointing mortar joints and reconstruct severely damaged areas. After completion, apply a sealer recommended for facebrick to the complete exterior to reduce water penetration into the wall
6. Replace all roofing and roof insulation. Install a single ply system such as EPDM or TPO and new insulation to meet current ASHRAE recommendations.
7. Replace windows with new to improve thermal performance and allow for better occupant use. New glazing system should be thermally broken frame with 1" insulated glass. The glass should have a low emissivity coating and ideally should be clear glass to maximize daylight into the building and also to allow passersby to see activity within the station.
8. Remove the existing cracked truck aprons and replace with new, thicker reinforced concrete aprons on compacted sand fill.
9. Replace electrical switchgear with new throughout the building and increase service size to accommodate cooling electrical loads.
10. Replace all interior and exterior lighting with LED and update lighting controls to include occupancy and vacancy sensors.
11. Until new dorm areas can be constructed, in the short term install smoke detectors and carbon monoxide detectors in sleeping quarters.
12. Install NFPA compliant fire alarm system.
13. Replace overhead door controls.
14. Install a CCTV system.
15. Clean and paint exposed steel lintels to extend lifespan.

16. Add vehicle exhaust detection and ventilation system for Apparatus Bay. For the safety of building occupants, it is recommended that a new vehicle exhaust detection system be installed to monitor for unsafe levels of carbon monoxide and nitrogen dioxide. The system would include alarm devices as well as an exhaust fan to purge the bay with fresh air for meet current code requirements.
17. Add general exhaust fan for Apparatus Bay and pressure sensors to maintain proper pressure relationship between Apparatus Bay and occupied living areas.
18. Add some form of exhaust capture equipment by added to the Apparatus Bay to minimize the accumulation of exhaust gases. Common capture systems include AirVac911 suspended units or PlymoVent snorkel units.
19. Upgrade temperature controls to programmable direct-digital control (DDC) devices with a central building automation system. This will allow for constant space parameter monitoring as well as overall energy management and conservation.
20. Upgrade boiler heating system to include two parallel boilers for redundancy in the event one boiler fails.
21. Replace aging terminal heating units, they are old and should be replaced in the near future. Newer heating units will provide for improved occupant comfort, controllability and energy efficiency.
22. Remove existing air handing unit and small A/C units and provide a central ventilation and air-conditioning system to serve all occupied and living areas sized to meet current ventilation and indoor air quality standards.
23. Remove and replace heating supply and return piping.
24. Replace plumbing fixtures and flush valves for improved performance and water conservation.

Additional commentary

- Station #1's current Energy Use Intensity (EUI) is estimated at 106.0 kBtu/ft^2 per year. The national median for buildings of this type and age is approximately 91.8 kBtu/ft^2 per year (per *Energy Start Portfolio Manager* target finder). As a benchmark, Station #1's energy performance is 15.5% worse than the median.
    - Annual Energy Cost = $11,883 (2020 utility bills)
    - Energy Types: Electric (17.7%) and Natural Gas (82.3%)
- The last half of 2021 and the first months of 2022 have presented challenges for the construction market. Supply chain issues of material and shipping have increased the cost of some products. In addition, a skilled labor shortage has also led to an increased cost of construction. A factor to address this market volatility has been included in the cost estimate. The forecast is that material costs may stabilize but will not retreat.

STATION 2

Architectural Assessment

Building Description

Station 2 was designed and built in 1967/68 and reflects the 'California' style (Figure A2.1) with cathedral (low pitch) open ceilings with glu-laminated beams and tongue and groove wood roof decking and echoes the building techniques of the era, before energy and accessibility (MI-BF and ADA) codes, and is largely unchanged today. The building has approximately 4400 sq. ft. of gross floor area (including exterior walls). When originally constricted, the 'California' style design was modified for the Michigan climate with the incorporation of suspended 2x4 acoustic tile ceiling systems throughout with lay-in fiberglass batt insulation loose laid above. The exterior walls are load bearing with face-brick on 8" concrete unit masonry (cmu) without air cavity space or insulation. The drawings describe 'insulated cores' in the cmu block, but was not confirmed as to type and existence. The interior apparatus bay walls are also load-bearing for the roof structure. The layout mimics Station 1 with the central apparatus bays separating front office, day room and mechanical/electrical rooms from the sleeping quarters, restrooms, and fitness room. There is no basement or training/hose drying tower at this facility.

In 2007 the day room, kitchen, and front office was remodeled on HGTV's 'Carter Can' reality show (Figures A2.2 and 2.3) along with the boiler being replaced. The sleeping quarters, fitness room, and restrooms were refinished later (2014?) and, similar to the 'Carter Can' remodeling, removed the 2x4 suspended grid ceilings to expose the sloped wood deck roofing above. The roof was replaced with new single ply roof membrane over new rigid insulation (4" total?) to maintain the R-value of the removed ceiling batt insulation (8"?). Newer (in 2007?) 1" insulated glass in dark anodized aluminum frame windows replaced the original units with operable (sliding) sashes for natural ventilation. New passive attic vents (2) (Figure A2.4) were added at both the north and south gable walls over the apparatus bay doors to ventilate the attic more effectively. It appears the apparatus bay is the only space remaining that has an insulated suspended ceiling system in the building.

Site Description

Fire Station 2 is located at 1313 E. Eighth Street in a neighborhood of mixed commercial and residential properties bounded by E. Eighth Street on the south, Fair Street on the east, and alley on the north, and a commercial business on the west. The site is roughly 175' x 175' (0.70 acres) with the building 58' from the east property line (along Fair Street) and 45' from the front property line (E. Eighth Street - from old site plan drawing).

The fire station apparatus bay aprons are 6" reinforced concrete slabs (Figures A2.5 and A2.6) the width of the bays and extend to the roadway and curbs along Eighth St. and 25' +/- from the north bay door, then transitions to asphalt paving to the alley. There is a fire hydrant at the north side of the building connected by a 6" buried water main from Fair Street. The building is serviced by a 1-1/2" water connection off the main and there is a 1-1/2" service (unmetered) to the apparatus bay. Other services are provided from utilities in the north alley (power and sanitary sewer) and Fair Street (gas). Storm (and roof) water appear to flow overland to city storm sewers in the streets (east and south). There is a newer back-up generator (2004) in the west side yard and a small storm water detention basin (no inlet/outlet pipes) at the west side of the north drive at the alley to alleviate ponding during heavy rain events.

Parking for firefighters is along the north side of the building on either side of the apparatus bay door for 6 vehicles on pavement. There is gravel drive access to a new 20'x35' (+/-) cold storage building (Figure A2.7) recently constructed at the northeast corner of the property (appears to be built the same location and size as the old wood framed garage it replaced). The east side-yard is used to store fire department trailers (Figure A2.8) and equipment open air. The front yard along Eighth Street has an old wheeled water pump and the original steel tube flag pole that is rusty and in poor condition (Figure A2.9).

Systems Conditions and Evaluations

Building Envelope

Roof

The 2-1/2:12 pitch roof consists of a white single ply membrane over rigid insulation of unknown depth and R-value, but appears to be older with the scrim (reinforcing mesh) reading through the membrane and along most of seams (Figure A2.10). The flashings around roof penetrations look to be in good condition with no known leaking problems. There was a build-up of pine needles along the west roof eave caused by the raised metal roof edges that make a 1" high dam (Figure A2.11). There are no gutters and downspouts to control water runoff, so rain sheet drains over the edges. We would recommend taking roof cores to evaluate the roof insulation condition and R-value (unless known) and replacing the roof membrane.

The metal eave and rake edges are in good condition and cover the top half of the wood eave and rake boards, however, the boards are cupping (Figure A2.12) and showing signs of wear and age. The exposed painted glu-laminated beam extensions and tongue and groove roof deck boards soffits appear to be in good condition.

Masonry and Brick Walls

The all-masonry building is in good condition with no observed settlement cracks and some minor brick deterioration. The only concerns are the bases of the steel composite columns (Figure A2.13) at the apparatus bay overhead doors (all opening jambs and center column at south doors) show signs of rusting that need to be inspected and repaired. There are several original wall vents/louvers on the east and west walls that have been blocked and sealed from the inside.

Windows and Doors

The exterior windows are dark bronze anodized aluminum frames with 1" insulated glass that were installed in 2007(?) except for the front entry/office door, which appears to be the original clear anodized aluminum (Figure A2.14). This door swings into the office, so is not code compliant and should swing out for proper emergency egress travel. The front door does not have either a security locking device or a doorbell. The rear (north) painted hollow metal (door and frame) man-door is equipped with stand-alone push button security lock (no doorbell). The west insulated glass patio sliding door (2007) has no security devices and is in good condition. There are 3 painted hollow metal doors and frames at the mechanical room and west storage room and are equipped with knob handles (spherical) with integral standard key locks without any security devices or alarms. The 14'w x 12'h (3) apparatus bay overhead doors (Figure A2.15) are newer power operated insulated sectional panel doors with small vision windows. The north bay door power operator and controls were recently replaced with a 'Lift Master' wall mount unit (Figures A2.16 and A2.17). The south (2) doors still have their older (original?) power operators and will be replaced when they fail (not serviced any longer). The overall height of the apparatus bay doors will limit the height of new equipment and will require the city to mandate maximum equipment heights as part of any purchases which may limit vehicle options and/or increase vehicle purchase price.

Patio

The patio (4" concrete slab) is in good condition and has a bolt-down gas grill on the north end. There is a 2' wide concrete walkway around the perimeter of the building under the roof overhangs on the east and west sides that connect to the front and rear driveways.

Ingress and Egress

Stairs – Not Applicable (none on site)

ADA Compliance

Since the building was constructed in 1967/68, prior to any barrier free and ADA code requirements for accessibility, the building is 'grandfathered' under the 2015 Michigan Rehabilitation Code for Existing Buildings to operate as-is until any improvements (alterations or remodeling) occurs. Any remodeling or alternations must meet current codes, however, if the remodeling encompasses 50%, or greater, of the total floor area, the entire facility is required to meet those codes. Fire stations are exempt from Michigan Barrier Free and ADA codes since staff must be ambulatory (physically able) to perform their jobs, however, any publicly accessible areas (entry lobbies, available restrooms, circulation, meeting rooms, etc.) must meet these code requirements.

All man-doors are 36" wide (compliant), however, push side/pull side clearances at many of the doors are not compliant to current codes. The floor elevations from the west office/day room core and east sleeping/fitness core are 6" above the apparatus bay floor (Figure A2.18), creating a step down at all adjoining doors.

Toilet, Lavatory, and Shower Rooms

The current Men's only restroom has 2 water closets, 2 floor mounted urinals, 2 shower stalls and 2 lavatories (Figures A2.19 and A2.20). The overall condition is good and recently redecorated, however, is non-compliant to ADA and MI-BF requirements, though, not necessary to be for a fire station use. The painted metal toilet partitions are floor supported and are in fair condition. There is no restroom provided in the west portion of the facility.

The main restroom can be upgraded to meet current ADA/MI-BF requirements, however, current fire station design is moving away from gang restroom/shower facilities to single occupancy non-gender specific bathrooms (1 per 2 beds). The remodeled restrooms would require new plumbing fixtures that are low water consumption units (water closets, lavatories, and showers).

Interior

Walls

All the interior walls are painted 8" concrete block in good condition. Ceramic wall tile is in the shower stalls and in good condition.

Doors and Frames

All the interior doors and frames are painted hollow metal (3'-0" x 7'-0") and in fair condition. The hardware is a combination of original locking round knob handles (spherical) (Figure A2.21) at utility and service rooms and push plates/pull handles at the day room, office and sleeping areas.

Ceilings

Suspended 2x4 acoustic tile ceiling systems are only in the apparatus bay, office and newer 2x2 in the kitchen area of the day room. The 2x4 tiles are sagging (Figures A2.22 and A2.23) due to age and moisture absorption over the years. The rest of the building is open to the wood roof deck and in good condition. The remainder of the ceilings are exposed tongue and groove stained wood deck.

Flooring

Luxury vinyl tile (wood look) flooring and rubber wall base is in the west office and day room area and east sleeping quarters of the facility. The restrooms and fitness room has an epoxy coating with broadcast multi-colored chips. The showers have a ceramic tile floor. The central apparatus bays and utility/support rooms are natural concrete with an applied sealer. All flooring is in good condition.

Storage

Most storage is in cabinets or systems furniture. Several small closets/rooms along the apparatus bays providing a total of 140 sq. ft. The new cold storage garage does offer more remote capacity (no net gain), but is inconvenient for quick access and meant for larger fire department equipment (vehicles, boat, and trailers).

Kitchen

The kitchen, dining area and day room are open to each other as one large common room. The entire space, along with the entry office, was remodeled on the HGTV reality show "Carter Can" in 2007 with all new cabinetry, countertops, and appliances installed and the finishes (flooring, walls, and ceiling) upgraded. The kitchen has a work island with a concrete countertop with the TCFD logo inset (Figures 2.24 and 2.25). The remodeled spaces show minimal wear and are in very good condition. Despite the condition, there is minimal food prep area except for the island.


Figure A2.1


Figure A2.2


Figure A2.3


Figure A2.4


Figure A2.5

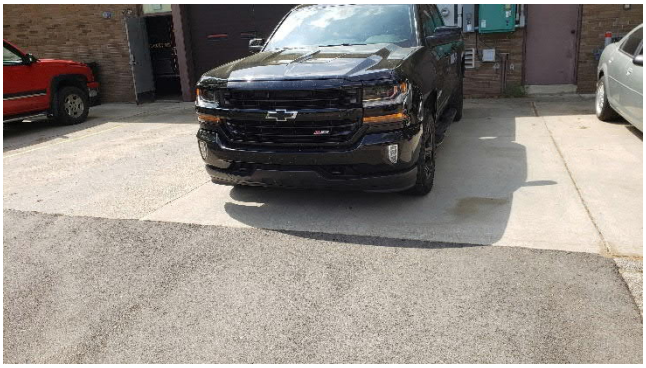


Figure A2.6


Figure A2.7


Figure A2.8


Figure A2.9


Figure A2.10


Figure A2.11


Figure A2.12


Figure A2.13


Figure A2.14


Figure A2.15

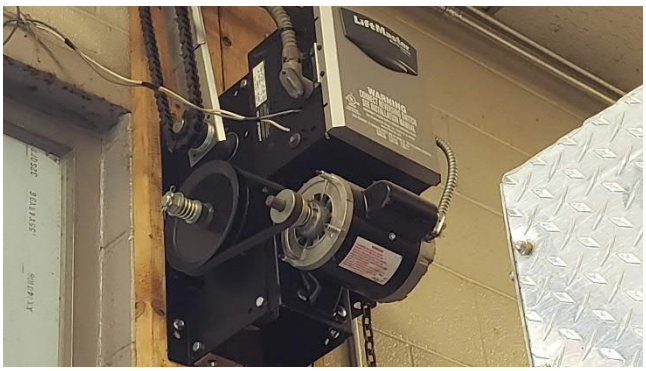


Figure A2.16

Figure A2.17

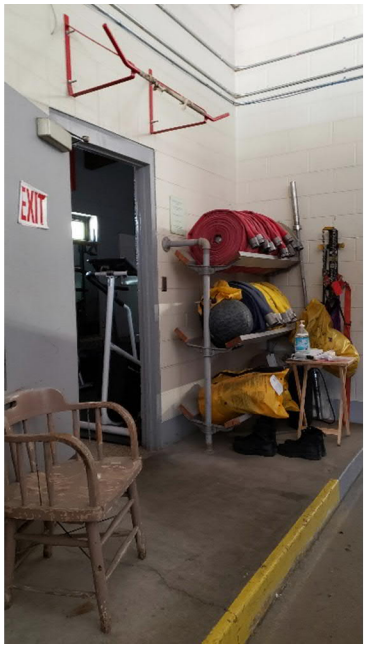


Figure A2.18


Figure A2.19

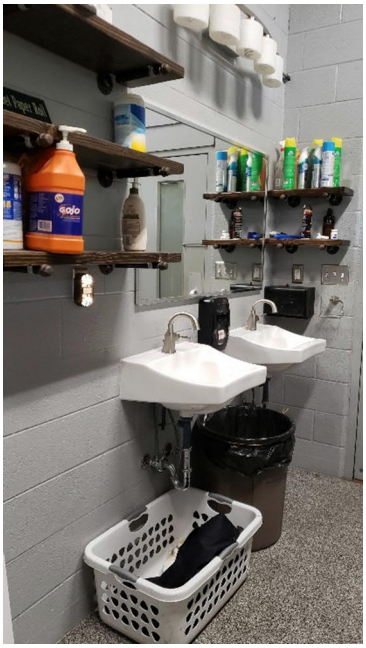


Figure A2.20


Figure A2.21

Figure A2.22

Figure A2.23

Figure A2.24

Figure A2.25

Electrical Assessment

Electrical Service and Power

Electrical service to the Traverse City Fire Station #2 is from a nearby pole mounted transformer that runs down the pole and underground to the Traverse City Light & Power meter on the north side of the building. A 35kW emergency diesel generator is located outside, west of the service entrance and supplies emergency loads for the building through an exterior automatic transfer switch (ATS). This unit was built in 2003 and appears to be in good condition. The main service and emergency panels are both rated 120/240V, single phase, 3 wire. The main panel and emergency are each 200A. Each panel is dated 2014 and appear to be in good working order.

It is understood that air conditioning for the building is desired. The current electrical service does not have sufficient capacity to serve a load this large. If air conditioning is added, a larger service and corresponding electrical panel(s) will be required. This modification will need to be coordinated with the utility company.

Electrical Lighting

The existing light fixtures in most of the offices, corridors, dormitory, exercise room, etc. are generally surface mounted troffers. The track lighting in kitchen, dayroom, front office appears to provide insufficient light. Consideration should be given to add or enhance the existing fixtures. The apparatus bay also contains surface mounted fixtures. The vast majority of lighting in the building is either fluorescent or incandescent. These should all be replaced with high efficiency LED fixtures or bulbs. Additionally, the lighting controls observed were manual. These should also be replaced with updated modern occupancy and vacancy sensors that meet the current energy requirements. It was noted that the exterior wall pack fixtures appear to be LED. A plan to bring all lights and controls up to the most recent ASHRAE requirements should be developed and integrated with any other program modifications.

Fire Alarm System

Currently there is not an existing fire alarm system in the building. Consideration should be given to installing a system that includes visual and audio notification devices throughout the building and pull stations at each exit.

Communication and Miscellaneous Systems

- Data service for Station 2 is run through the county. No issues or concerns have been reported with the existing system and no revisions are anticipated.

- No security cameras are installed in the interior or exterior of the building. However, several doors are equipped with key pad access to secure the building. A security system that includes cameras and alarms is recommended for safety of fire fighters and anyone who visits the building.
- A new speaker system was installed approximately 2 years ago and is in good working order.
- The existing phone system is through was upgraded approximately 10 years ago. Presently, there are no issues or concerns with this system.
- It was observed that one (1) new garage operator was installed. However, the other door controls are original to the building and should be replaced.

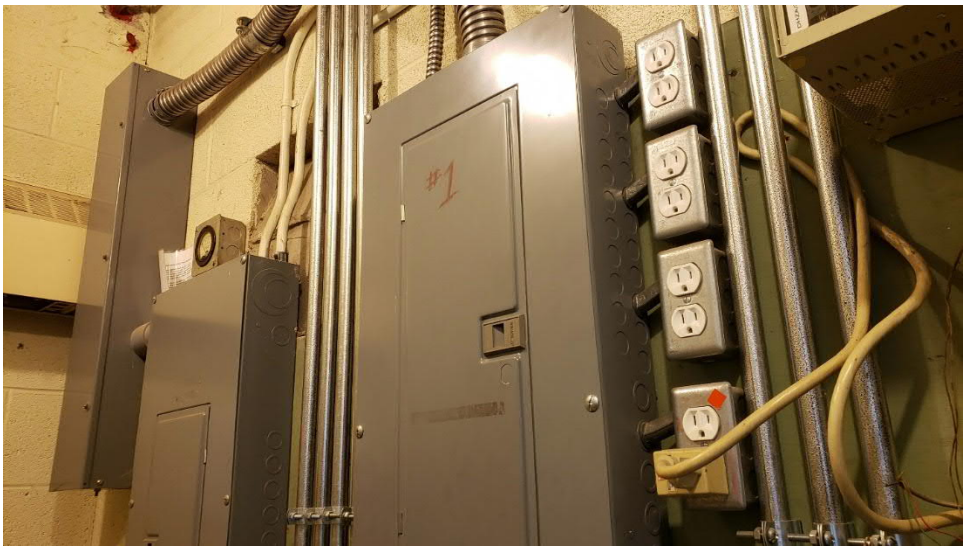


Figure E2.1 Main Panels


Figure E2.2 Emergency Generator

Figure E2.3 Automatic Transfer Switch (ATS) & Incoming Service Equipment

Mechanical Assessment

Heating

The existing heating system is that which was designed and installed as part of the building's original construction. The hydronic heating system is based on an atmospheric natural gas combustion, cast iron sectional boiler (the original unit was replaced in 2007) with a nominal output rating of 410,000 Btuh at 82% rated efficiency; providing heating hot water via pumped circulation hydronic distribution piping loops. Heat transfer equipment is primarily baseboard finned tube convectors located on the exterior walls of the occupied spaces, and ceiling-mounted vertical hot water unit heaters in the apparatus bay. A majority of the heating supply and return piping are located in pipe tunnels or below slab.

Figure M2.1 Existing Boiler

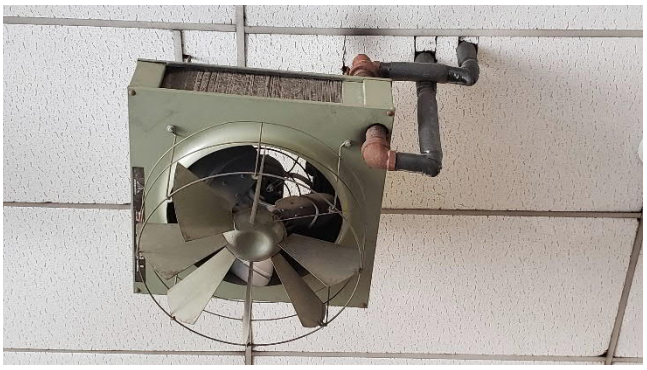


Figure M2.2 Apparatus Bay Unit Heater (typical of 2)


Figure M2.3 Typical Perimeter Heating Unit


Figure M2.4 Heater System Zone Pumps

Cooling

The building's cooling system consist of four unitary DX units which serve dedicated occupancy areas. Two of the units are split systems (LG) with wall mounted indoor evaporators and companion ground-mounted compressor/condensers and serve the Day Room (nominal 1-1/2 ton) and Dispatch (nominal ¾ ton) respectively. The dormitory is served by a residential type thru-the-wall AC unit. The fitness room has a portable air conditioning unit with a thru-the-window flex duct connection for heat rejection.

Figure M2.5 Mini-Split A/C Unit (outdoor condenser)


Figure M2.6 Dormitory Window A/C Unit


Figure M2.7 Mini-Split A/C Unit (indoor evaporator)

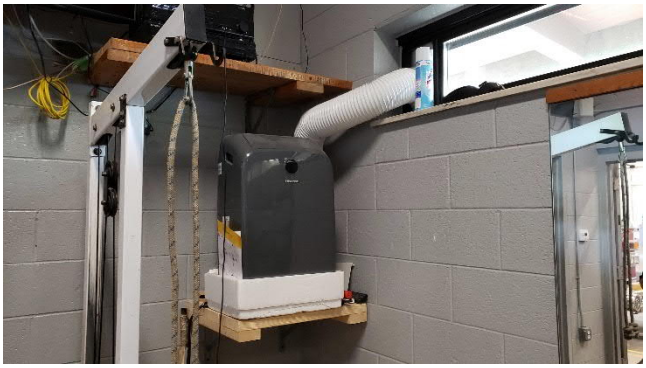


Figure M2.8 Fitness Room Portable A/C Unit

General Ventilation / Indoor Air Quality

Natural ventilation is the building's primary means of ventilation via a combination of operable windows and doors. Mechanical exhaust is limited to a single exhaust fan serving the shower adjacent to the Washdown/Storage & Laundry area. The kitchen is equipped with a range hood. The unitary cooling indoor equipment items are capable of recirculation ventilation operation independent of cooling function.


Figure M2.9 Rooftop Exhaust Fan


Figure M2.10 Kitchen Range Exhaust Hood

Apparatus Bay Gas Detection / Exhaust

The Apparatus Bay currently has no vehicle exhaust detection and ventilation system. For the safety of building occupants, it is recommended that a new vehicle exhaust detection system be installed to monitor for unsafe levels of carbon monoxide and nitrogen dioxide. The system would include alarm devices as well as an exhaust fan to purge the bay with fresh air. It is also recommended that some form of exhaust capture equipment by added to the Apparatus Bay to minimize the accumulation of exhaust gases. Common capture systems include AirVac911 suspended units or PlymoVent snorkel units.


Figure M2.11 Apparatus Bay (no gas detection or exhaust system)


Figure M2.12 Apparatus Bay (no vehicle exhaust capture)

Temperature Controls

The temperature controls for the Station are primarily the original low-voltage thermostats and relays. Each space has a thermostat which controls modulating heating valves for the heating units. Each A/C unit includes a separate temperature sensor for cooling set points. These legacy temperature control devices have far exceeded their life expectancy and provide very limited controllability. It is recommended that the temperature controls for the Station be completely upgraded to programmable direct-digital control (DDC) devices with a central building automation system.

Controls configuration divides the building into 3 zones, each associated with one of the hydronic circulating pumps as follows:

- Pump 1 – West zone (Day Room/Kitchen/Watch Area)
- Pump 2 – Center zone (Washdown/Storage & Laundry Area and Apparatus Bay)
- Pump 3 – East zone (Dormitory and Locker Area)

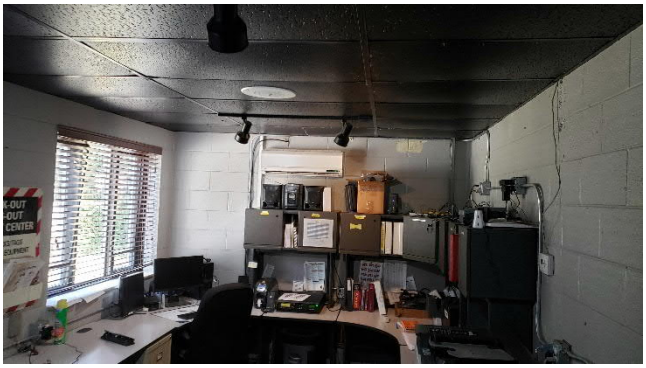


Figure M2.13 Typical Low-Voltage Thermostat

Figure M2.14 Typical Stand-Alone Control Device

The west and east zones are divided into subzones with thermostat-controlled two-position motorized valves. Pump 2 is set up to operate continuously based on sensed outdoor air temperature. Pumps 1 and 2 cycle on a call for heat from any one of their respective sub-zone space thermostats. The Apparatus Bay unit heaters are continuously circulated whenever Pump 2 is operating and their fans cycle on a call for heat from their respective wall-mounted thermostats.

The boiler is enabled to operate continuously based on sensed outdoor air temperature and cycles as required to maintain the system water temperature in accordance with an inverse reset schedule relative to sensed outdoor air temperature.

Plumbing Systems

Water is supplied by a 1-1/2" metered service which enters at the building's northwest corner. A storage type atmospheric vent gas fired storage type domestic water heater provides hot water to building lavatories, sinks and showers; unit is rated at 199,999 input Btuh with 91-gallon storage volume. The heater is equipped with an automatic flue damper and the hot water distribution system includes an aquastat-controlled return water circulation pump.

Figure M2.15 Domestic Water Heater

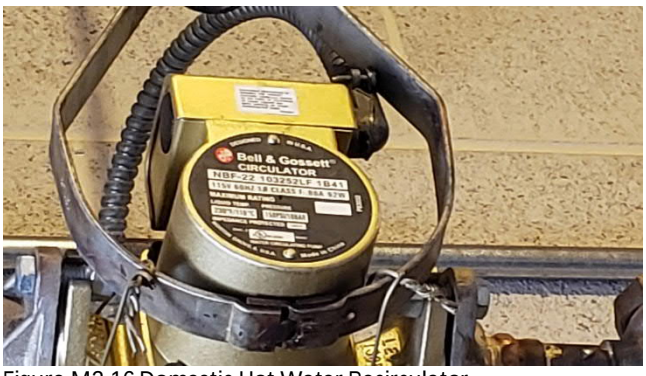


Figure M2.16 Domestic Hot Water Recirculator

Fire Protection System

Station 2 as designed did not include a fire protection system. A future project to add a wet-piped fire protection system to serve the entire building is pending.

Recommendations

1. Replace all non-lever door hardware with lever style hardware to improve building accessibility.
2. Repaint walls to update appearance.
3. After any above ceiling or roof work is complete, replace ceiling tiles and ceiling grid to update appearance and eliminate stained tiles.
4. Replace front door with new thermal broken unit to improve thermal performance. At the same time adjust the swing in the direction of egress.
5. Remove the existing cracked truck aprons and replace with new, thicker reinforced concrete aprons on compacted sand fill.
6. Replace all interior and exterior lighting with LED and update lighting controls to include occupancy and vacancy sensors.
7. Until new dorm areas can be constructed, in the short term install smoke detectors and carbon monoxide detectors in sleeping quarters.
8. Replace overhead door controls.
9. Install NFPA compliant fire alarm system.
10. Install a CCTV system.
11. Install an exterior doorbell in case a baby is dropped off in accordance with Safe Delivery law.
12. Add vehicle exhaust detection and ventilation system for Apparatus Bay. For the safety of building occupants, it is recommended that a new vehicle exhaust detection system be installed to monitor for unsafe levels of carbon monoxide and nitrogen dioxide. The system would include alarm devices as well as an exhaust fan to purge the bay with fresh air for meet current code requirements.
13. Add general exhaust fan for Apparatus Bay and pressure sensors to maintain proper pressure relationship between Apparatus Bay and occupied living areas.
14. It is also recommended that some form of exhaust capture equipment by added to the Apparatus Bay to minimize the accumulation of exhaust gases. Common capture systems include AirVac911 suspended units or PlymoVent snorkel units.

15. Upgrade temperature controls to programmable direct-digital control (DDC) devices with a central building automation system. This will allow for constant space parameter monitoring as well as overall energy management and conservation.
16. Remove existing small A/C units and provide a central ventilation and air-conditioning system to serve all occupied and living areas sized to meet current ventilation and indoor air quality standards.
17. Replace existing boiler with two equal sized condensing type units equipped with manufacturer based sequencing controls to provide improved thermal efficiency and system redundancy.
18. Replace aging terminal heating units, they are old and should be replaced in the near future. Newer heating units will provide for improved occupant comfort, controllability and energy efficiency.
19. Remove and replace heating supply and return piping.
20. The existing gas-fired water heater should be upgraded to a heat pump unit for improved energy efficiency and alignment with EPA water heating equipment standards.
21. Replace plumbing fixtures and flush valves for improved performance and water conservation.

Additional commentary

- Station #2's current Energy Use Intensity (EUI) is estimated at 118.2 kBtu/ft^2 per year. The national median for buildings of this type and age is approximately 91.1 kBtu/ft^2 per year (per *Energy Start Portfolio Manager* target finder). As a benchmark, Station #2's energy performance is 29.8% worse than the median.
    - Annual Energy Cost = $6,230 (2020 utility bills)
    - Energy Types: Electric (18.3%) and Natural Gas (81.7%)
- The last half of 2021 and the first months of 2022 have presented challenges for the construction market. Supply chain issues of material and shipping have increased the cost of some products. In addition, a skilled labor shortage has also led to an increased cost of construction. A factor to address this market volatility has been included in the cost estimate. The forecast is that material costs may stabilize but will not retreat.

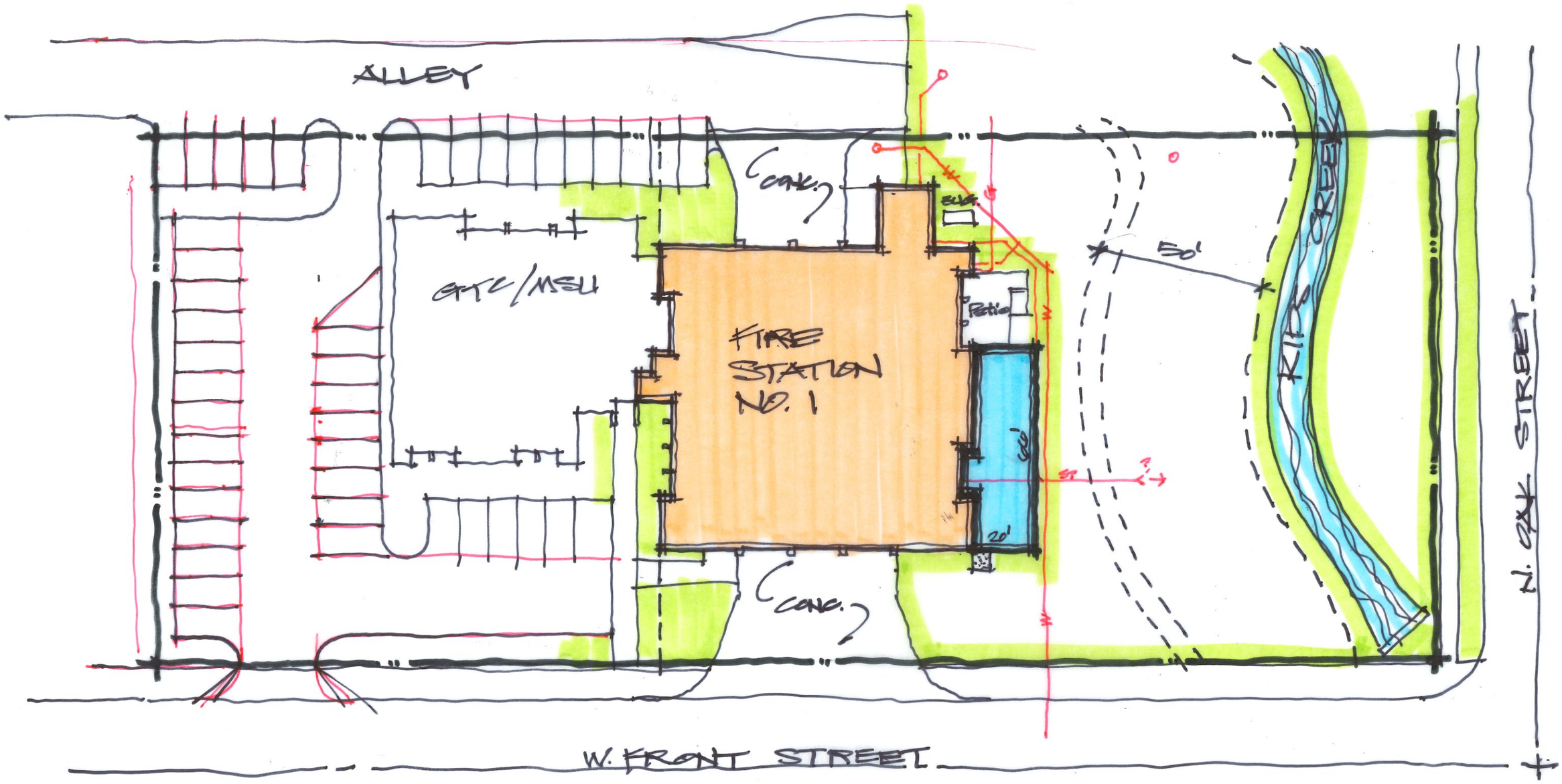
OVERALL ADDITIONAL TESTING RECOMMENDATIONS

1. The various buildings materials used within both buildings should be tested and, if hazardous materials such as lead paint or ACBM are found, properly abated. Once the design direction is determined (new building vs. addition(s)), the city should retain an Industrial Hygienist to perform the testing and the prepare bid documents to properly abate any hazardous materials that are found through testing. The hygienist should also provide estimates for cost of abatement.
2. Prior to any roofing replacement, roof core samples should be taken of the existing roofing to determine the number of roof systems present, the type of roof systems, the type of insulation, etc. At the same time, a thermal scan of the roof should be performed to determine if existing insulation is wet and needs replacement. Many roofing companies can provide these services and many design professionals also have access to similar services.
3. Any existing mechanical systems to remain should get recommissioned including a test and balance to ensure flows are being provided as originally designed.
4. A geotechnical investigation will be required for any additions to determine the bearing capacity of the soils for new foundations. For the additions, we recommend four borings performed to a depth of 30 feet. If the proposed design solution includes complete replacement of the building, we recommend doubling the number of borings to eight. The geotechnical investigation should also include testing of the soils of the percolation rate for storm water infiltration and pavement designs for parking and drive areas.
5. A topographic and boundary survey will need to be completed for any building additions to complete building design and also to be used for site plan approval if required by the city. The survey should include any adjacent city owned property which in the case of Station 1 would include the parklike area located on the east side of the building and the former police station located west of the station.
6. Due to the proximity to Fish Creek, a wetlands delineation should be completed for the station 1 site. Any markers delineating wetland can then be picked up by the surveyor and placed on the topographic survey.

CONCEPTUAL

FLOOR PLAN

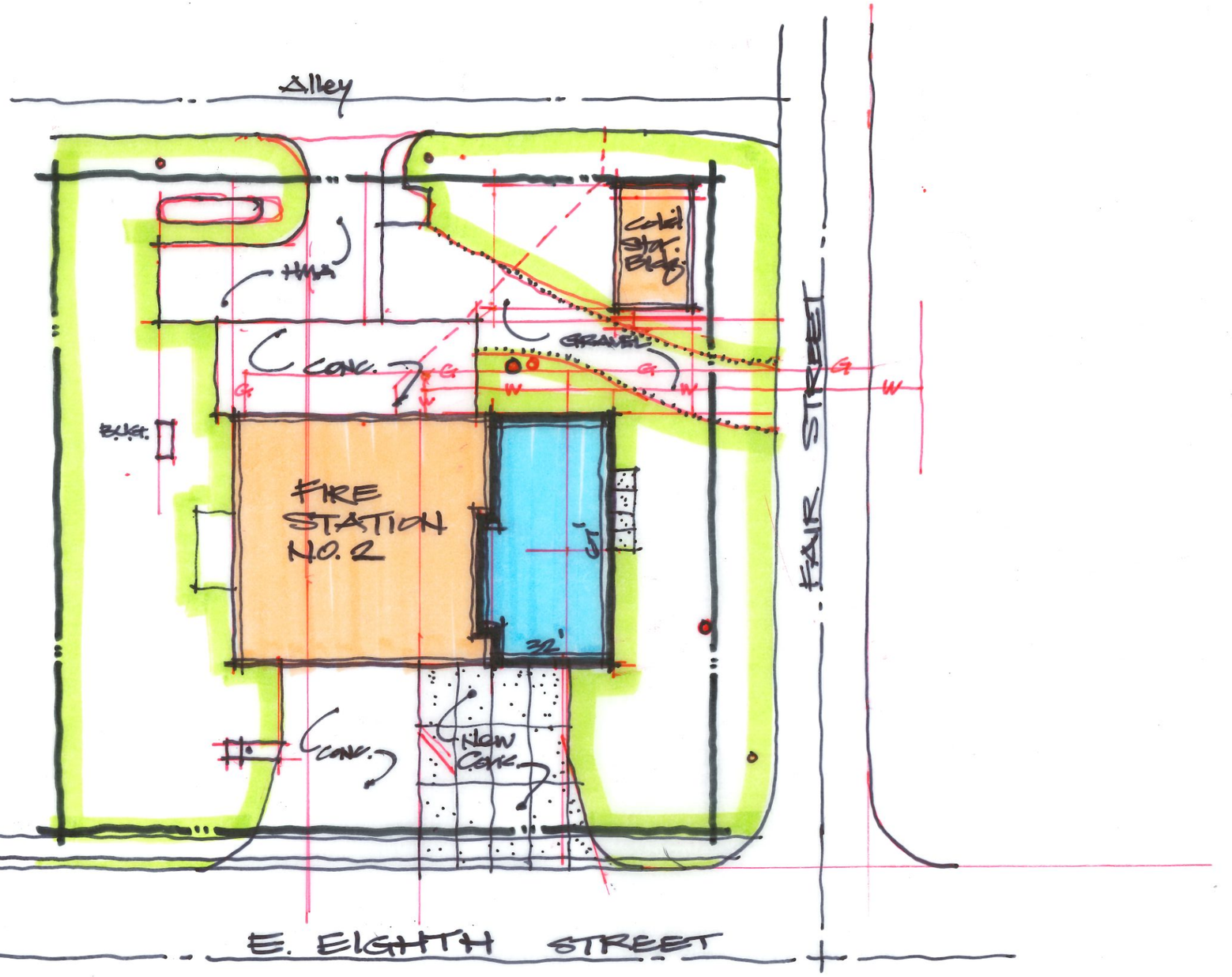
STATION NO. 1



CONCEPTUAL

SITE PLAN

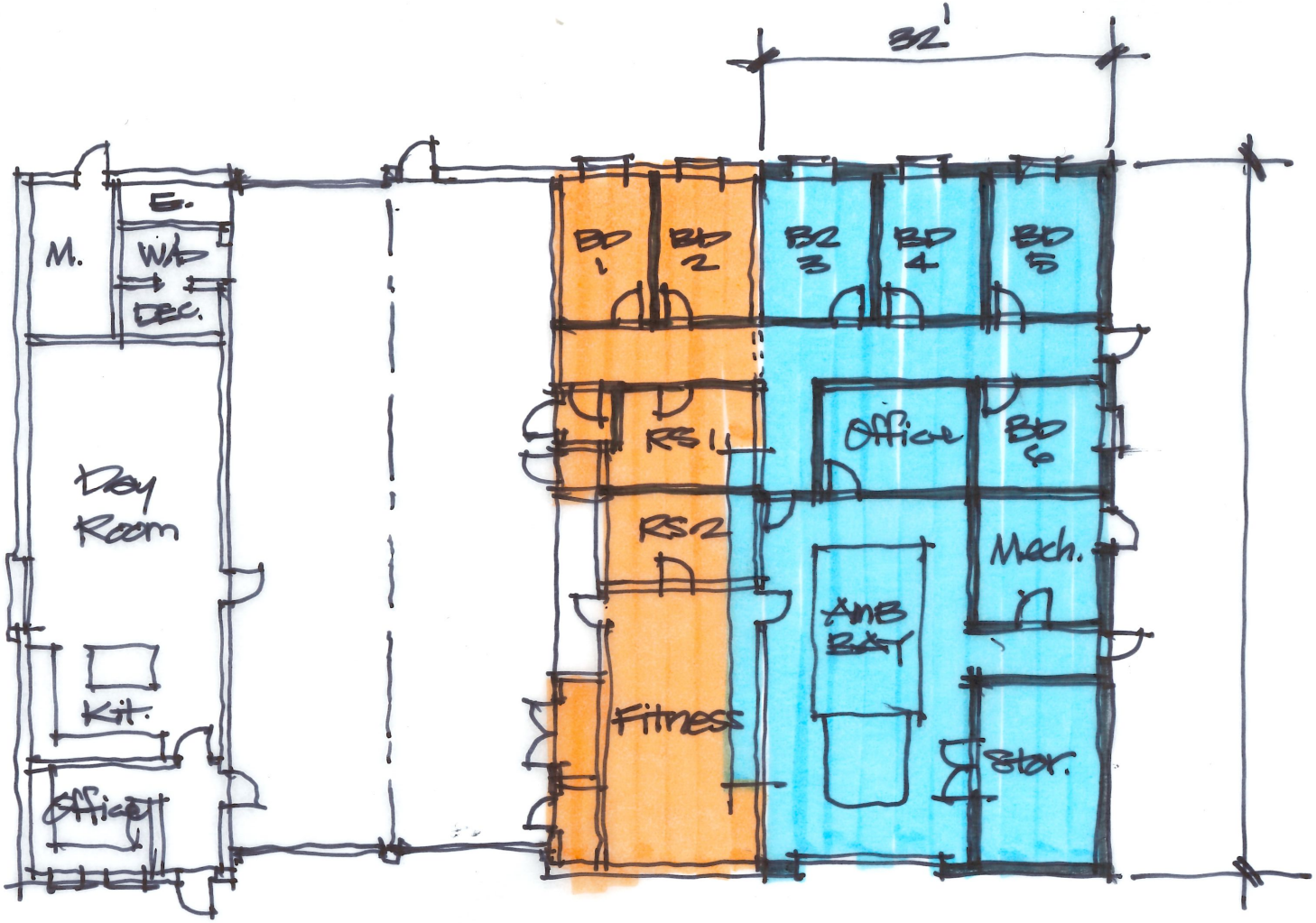
07.09.2021



CONCEPTUAL

SITE PLAN

07.09.2021



CONCEPTUAL

FLOOR PLAN

07.09.2021

STATION NO. 2

Traverse City Fire Station 1
Preliminary Opinion of Probable Construction Cost

Addition & Remodeling to Station 1

		Addition/ Maintenance/ Upgrade	1st Phase/ 2nd Phase	Green
Excavation - New Addition	22,300	A	2nd	
Demolition - Bldg. Exterior	12,700	A	2nd	
Demolition - Bldg. Interior	38,200	U	2nd	
Concrete	-			
Strip Footings	13,400	A	2nd	
Spread Footings	12,700	A	2nd	
Piers	11,900	A	2nd	
Foundation Walls	35,600	A	2nd	
Floor Slab	13,400	A	2nd	
Ex. Floor Slab w/Cutting	12,700	A	2nd	
New Steel Roof Structure	55,700	A	2nd	
Misc. Ex. Roof Structural Reinf.	3,200	A	2nd	
Ex. Roof Structure Repairs	6,400	M	1st	
New Roofing & Insulation (Station)	349,800	A	2nd	G
Exterior Facebrick/CMU Walls	293,800	A	2nd	G
Exterior Masonry Repair	31,800	M	1st	
Brick Sealer	19,100	M	1st	
Exterior Windows	23,900	A	2nd	G
Exterior Windows - Existing	23,900	U	2nd	G
Exterior Doors & Hardware	25,400	A	2nd	G
New Prefin. Metal Wall Caps	118,800	A	2nd	
Interior CMU Walls	85,900	A	2nd	
Restroom Hardware & Acc.	23,900	A	2nd	
Interior Doors & Hardware	54,100	A	2nd	
Lever Door Hardware Repl.	23,900	M	1st	
Overhead Door Controls	3,200	M	1st	
Interior Glass	20,700	A	2nd	
Flooring	57,200	A	2nd	
Paint	35,000	A	2nd	
New Ceilings	57,200	A	2nd	
Millwork	14,300	A	2nd	
Interior Signage	1,000	A	2nd	
HVAC	787,100	A	2nd	G
Plumbing	78,700	A	2nd	G
Roof Drains	22,300	A	2nd	
Fire Protection	87,500	U	2nd	
Electrical - Power & Data	402,300	U	2nd	
LED Lighting	209,900	M	1st	G
New Fire Alarm System	78,700	U	2nd	
Building Security System	87,500	U	2nd	
Building Remodeling Subtotal	3,255,100			

Traverse City Fire Station 1
Preliminary Opinion of Probable Construction Cost

Site Work (Parking & Courtyard)				
Site Demolition	3,200	A	2nd	
Regrading	3,200	A	2nd	
New HD HMA (Alley)	8,000	A	2nd	
New 8" Concrete Aprons	76,300	A	2nd	
New Concrete Curb & Gutter	4,000	A	2nd	
Storm Water Control	55,700	A	2nd	G
Landscaping	3,200	A	2nd	G
Site Amenities	8,000	A	2nd	
Dumpser Enclosure	39,800	A	2nd	
LED Parking Lot Lighting	15,900	U	2nd	G
Site Work Subtotal	217,300			
15% Contingency				
15% General Conditions				
7.5% 2022 Market Volatility				
Construction Total	3,472,400			
Other Project Costs (by Owner)				
5% Misc. Owner Costs				
A/E Fee to Complete				
FF&E	112,100			
Technology	22,400			
Total Owner Costs	134,500			
Total Project Costs	$3,606,900			
Total Project Costs Related to Addtion	2,444,100			
Total Project Costs Related to Maintenance	294,300			
Total Project Costs Related to Upgrades	734,000			
Total Project Costs in First Phase	294,300			
Total Project Costs in Second Phase	3,178,100			
Total Project Costs for "Green" Initatives	1,867,300			
New 11,000 Sq. Ft. Fire Station	$4,675,000			
Proposed Project vs. New Construction Costs	77.2%			

1 Estimates are based on 2022 construction. Assume 3% escalation factor per year for construction years 2023 and beyond

2 In providing opinions of probable construction cost, the Client understands that the Architect has no control over the cost or availability of labor, equipment or materials, or over market conditions or the Contractor's method of pricing, and that the Architect's opinions of probable construction costs are made on the basis of the Architect's professional judgment and experience. The Architect makes no warranty, express or implied, that the bids or the negotiated cost of the Work will not vary from the Architect's opinion of probable construction cost.

3 Where renovation costs exceed 2/3 of replacement costs, building new should be considered.

4 Demoltion costs assume no signficant amounts of ACBM present.

5 New fire station costs do not include site acquisition or relocating/space rental costs if new building is to be constructed on existing site after existing building demolition.

Traverse City Fire Station 2
Preliminary Opinion of Probable Construction Cost

Addition & Remodeling to Station 2

		Addition/ Maintenance/ Upgrade	1st Phase/ 2nd Phase	Green
Excavation - New Addition	36,600	A	2nd	
Demolition - Bldg. Exterior	6,400	A	2nd	
Demolition - Bldg. Interior	23,900	U	2nd	
Concrete	-			
Strip Footings	15,700	A	2nd	
Spread Footings	15,900	A	2nd	
Piers	8,000	A	2nd	
Foundation Walls	42,000	A	2nd	
Floor Slab	21,900	A	2nd	
Ex. Floor Slab w/Cutting	6,400	A	2nd	
New Glu-Lam Roof Structure	128,000	A	2nd	G
Misc. Ex. Roof Structural Reinf.	4,800	U	2nd	
Ex. Roof Structure Repairs	9,500	M	1st	
New Roofing & Insulation	267,100	U	2nd	G
Exterior Facebrick/CMU Walls	346,300	A	2nd	G
Exterior Windows	23,900	A	2nd	G
Exterior Windows - Existing	11,900	U	2nd	G
Exterior Doors & Hardware	25,400	A	2nd	G
Exterior 14' x 12' OHD	25,400	A	2nd	G
Prefin. Metal Soffits and Fascia	23,900	A	2nd	
New Prefin. Metal Roof Edges	28,600	A	2nd	
Interior CMU Walls	80,100	A	2nd	
Restroom Hardware & Acc.	8,000	A	2nd	
Interior Doors & Hardware	44,500	A	2nd	
Lever Door Hardware Repl.	6,000	M	1st	
New Overhead Door Controls	2,400	M	1st	
Interior Glass	10,300	A	2nd	
Flooring	63,000	A	2nd	
Paint	21,300	A	2nd	
New Ceilings	47,700	A	2nd	
Millwork	9,500	A	2nd	
Interior Signage	1,100	A	2nd	
HVAC	479,400	A	2nd	G
Plumbing	42,900	A	2nd	G
Domestic Water Heater	31,800	M	1st	G
Roof Gutters & Downspouts	14,300	A	2nd	
Fire Protection	53,300	U	2nd	
Electrical - Power & Data	213,100	U	2nd	
LED Lighting	127,800	M	1st	G
Safe Haven Doorbell	800	M	1st	
New Fire Alarm System	48,000	U	2nd	

Building Security System	53,300	U	2nd	
Building Remodeling Subtotal	2,430,200			
Site Work (Parking & Courtyard)				
Site Demolition	2,400	A	2nd	
Regrading	3,700	A	2nd	
New HMA (Parking)	19,100	A	2nd	
New 8" Concrete Aprons	65,000	A	2nd	
New Concrete Curb & Gutter	4,000	A	2nd	
Storm Water Control	91,500	A	2nd	G
Landscaping	3,200	A	2nd	G
Site Amenities	8,000	A	2nd	
Dumpser Enclosure	39,800	A	2nd	
LED Parking Lot Lighting	15,900	U	2nd	G
Site Work Subtotal	252,600			
15% Contingency				
15% General Conditions				
7.5% 2022 Market Volatility				
Construction Total	$2,682,800			
Other Project Costs (by Owner)				
5% Misc. Owner Costs				
A/E Fee to Complete				
FF&E	123,300			
Technology	24,700			
Total Owner Costs	148,000			
Total Project Costs	2,830,800			
Total Project Costs Related to Addition	1,813,200			
Total Project Costs Related to Maintenance	178,300			
Total Project Costs Related to Upgrades	691,300			
Total Project Costs in First Phase	178,300			
Total Project Costs in Second Phase	2,504,500			
Total Project Costs for "Green" Initatives	1,620,500			
New 6,700 Sq. Ft. Fire Station	$3,015,000			
Proposed Project vs. New Construction Costs	93.9%			

1 Estimates are based on 2022 construction. Assume 3% escalation factor per year for construction years 2023 and beyond

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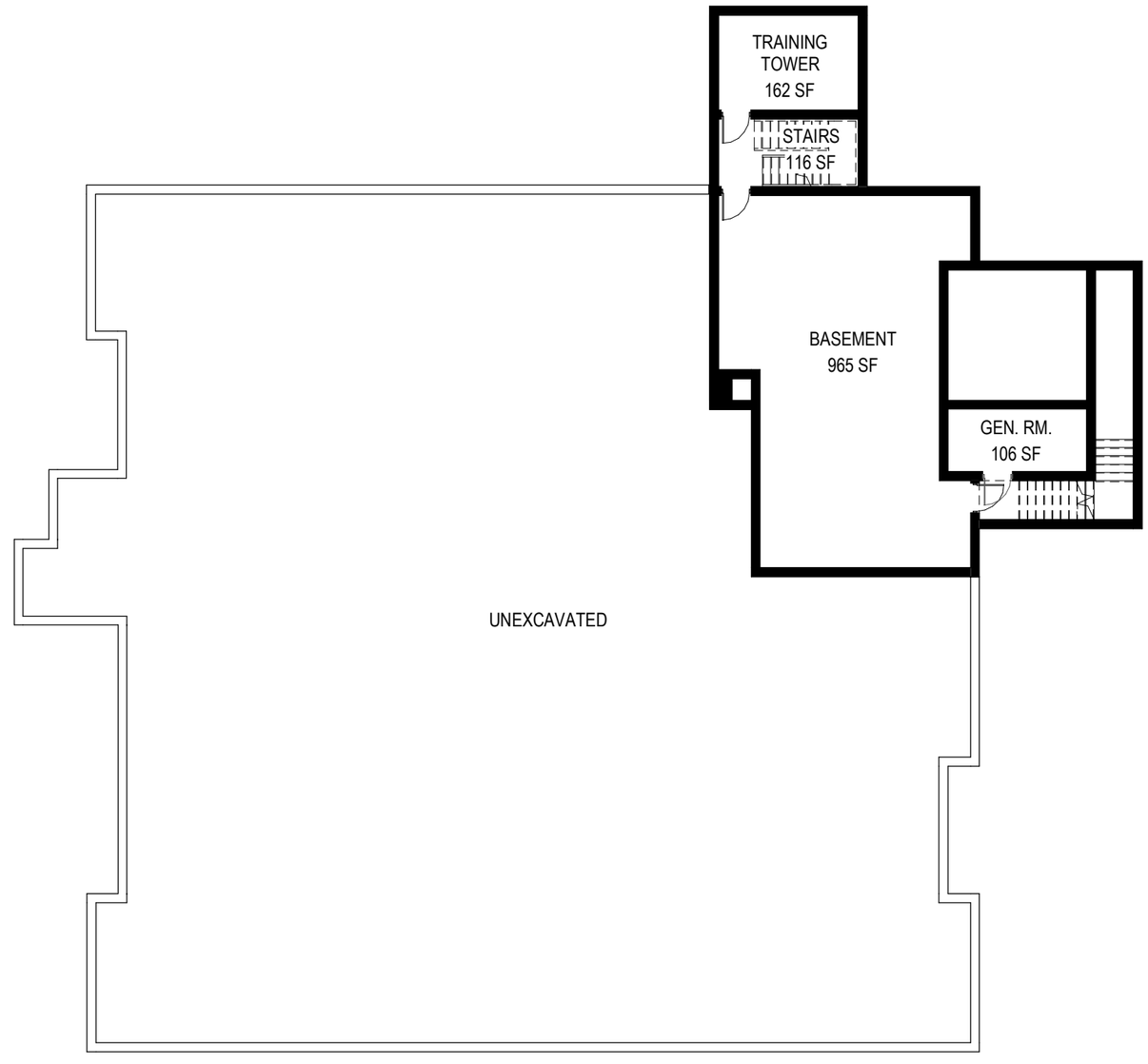
Appendix 4 - Fire Station Example



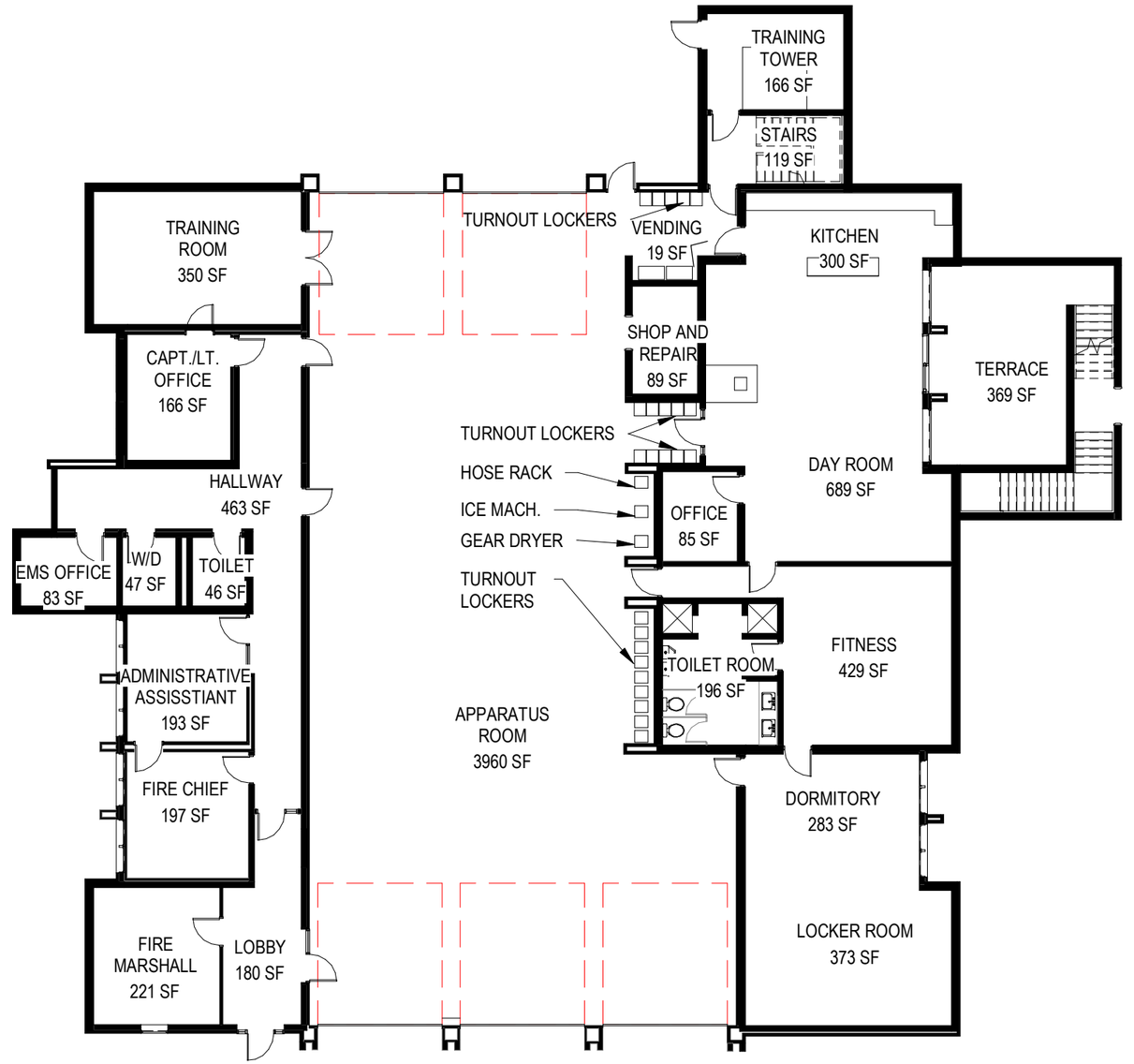
LOWER LEVEL FLOOR PLAN

1/16" = 1'-0"

FIRE STATION NO.1 BASEMENT PLAN

TRAVERSE CITY FIRE DEPARTMENT

c2ae architecture • engineering



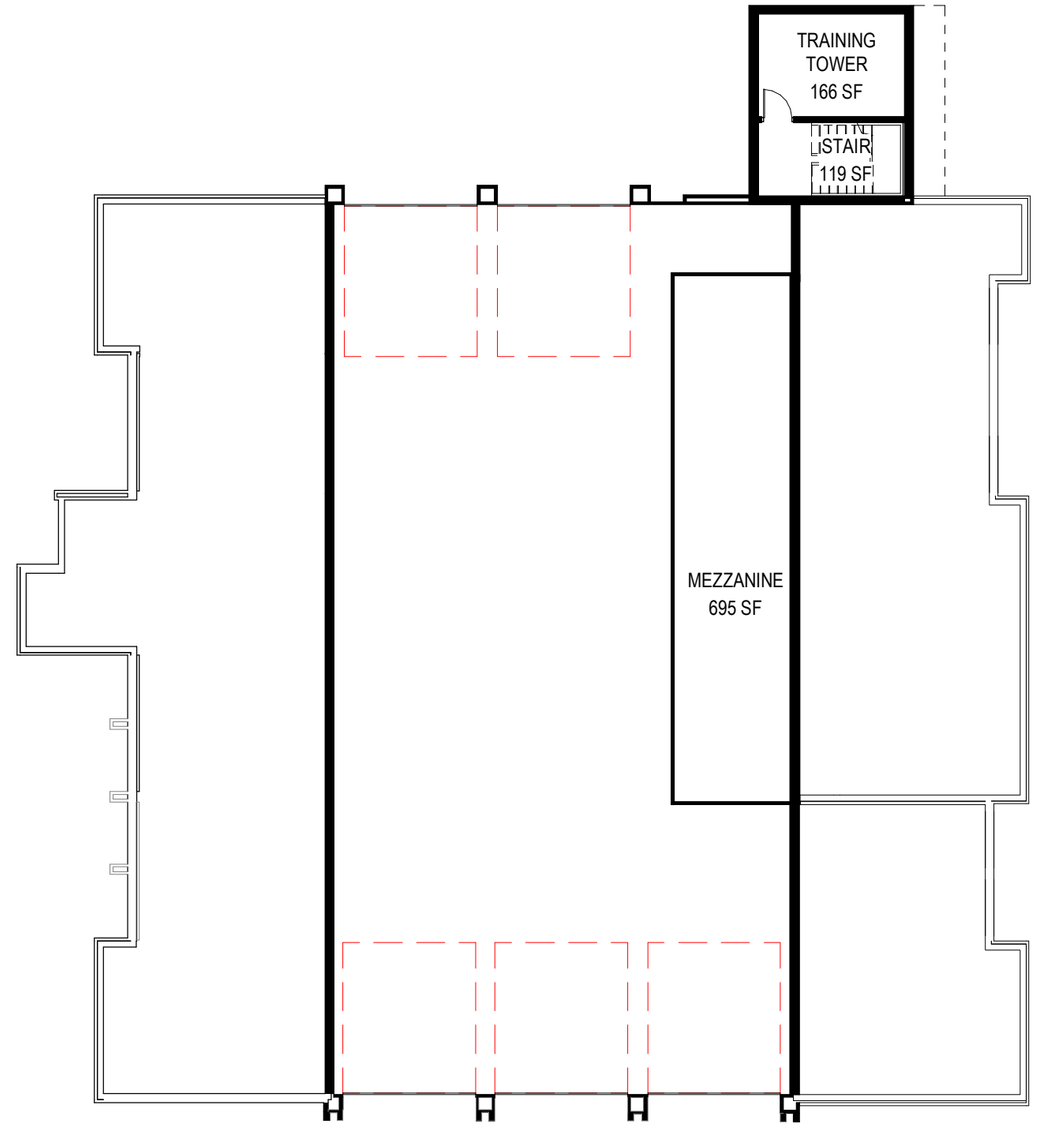
FIRST FLOOR PLAN

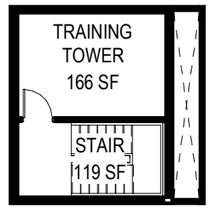
1/16" = 1'-0"

FIRE STATION NO.1 FLOOR PLAN

TRAVERSE CITY FIRE DEPARTMENT

c2ae architecture • engineering





THIRD FLOOR PLAN

1/16" = 1'-0"

MEZZANINE FLOOR PLAN

1/16" = 1'-0"

FIRE STATION NO. 1 MEZZANINE FLOOR PLAN

TRAVERSE CITY FIRE DEPARTMENT

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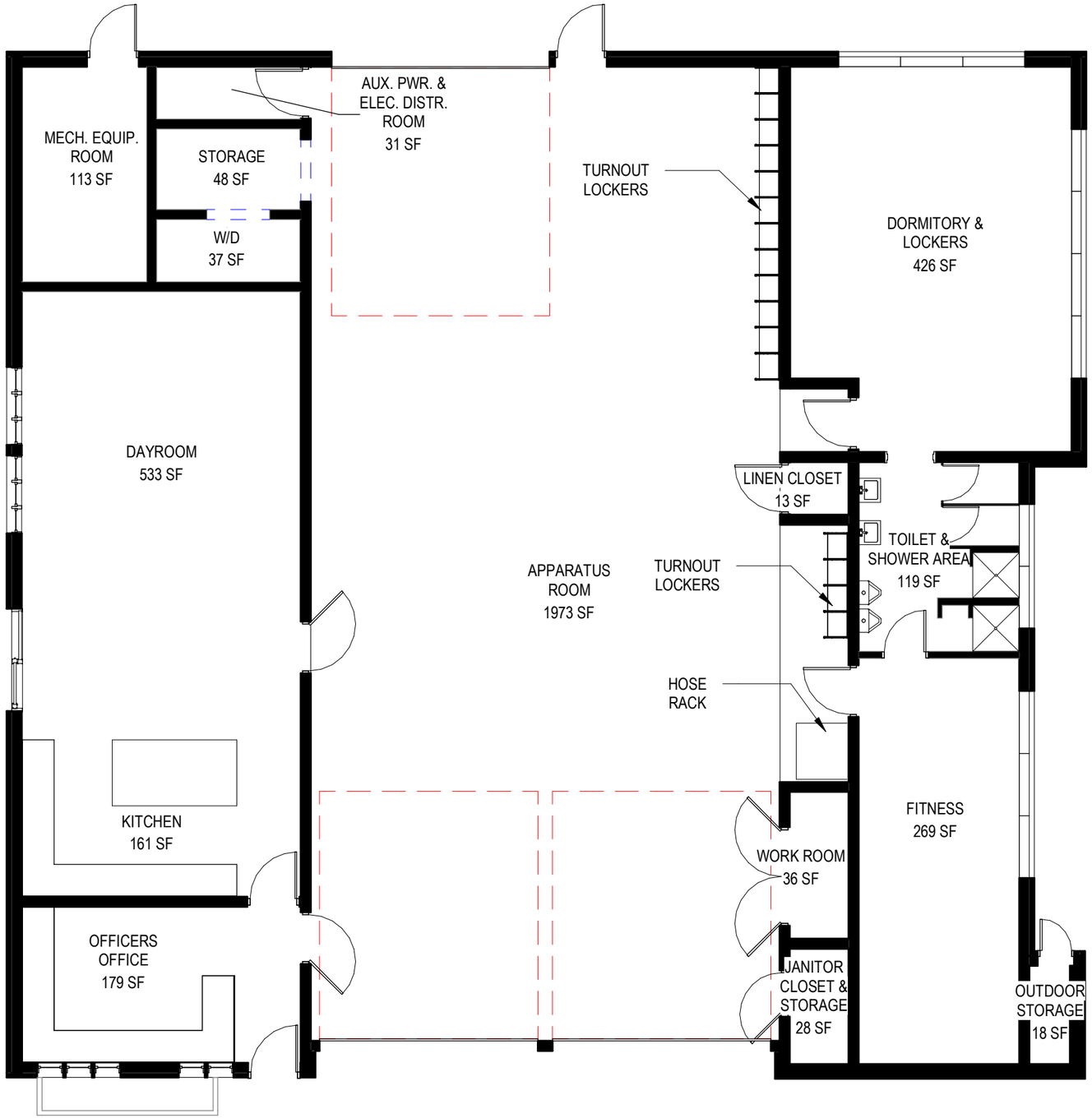

FIRST FLOOR PLAN

1/8" = 1'-0"

FIRE STATION NO.2 FLOOR PLAN

TRAVERSE CITY FIRE DEPARTMENT

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