MAPLEWOOD HOUSE

3701 Ponderosa St.

BUILDING SURVEY, July 2015

INTRODUCTION

Before completing a building survey I met with Chris Campbell, Executive Director of the Boone County Museum & Galleries and Rachel Bacon, Planner-Transportation of the City of Columbia, Community Development Department to garner an understanding of the long and short term goals and objectives for the sustainability of Maplewood House. Secondly I met with Parks & Recreation staff to learn about the existing maintenance program, structural repairs completed within the past five years and deferred maintenance items.

This report is focused on the rehabilitation of the building's structure, building assemblies and systems (HVAC, electrical, plumbing and alarm systems). The scope of this report is as follows:

- Identify and recommend methods for the repair / replacement of defective, deteriorated or damaged structural building components and building structural assemblies.
- Identify and recommend methods for the repair, replacement or modernization of the building systems.
- Identify and recommend methods for the repair of deferred maintenance items.
- Identify needed routine maintenance.

Following is a listing of observed deficiencies by category.

Foundation:

The building sits on a brick foundation which appears to be the same brick the above grade exterior walls are constructed. A parge coat of mortar covers the foundation brick. The parging extends below grade and I assume terminates at the foundation footing. The above grade foundation parging is damaged / deteriorated in several locations. Due to the weathering effect of the soil and moisture, and the likely movement of the foundation it is credible the below grade parging is in poorer condition explaining basement ground water infiltration and excessive crawl space moisture.

Parging is a thin coat of a cementitious or (contemporarily) polymeric mortar applied to concrete or masonry for refinement of the surface. Parging is typically applied with a trowel and pressed into the existing surface. The intent is to create a contiguous surface by filling surface air voids and bugholes, to level a surface with extreme rugosity, providing a smooth and finished appearance, and to provide a foundation water / moisture barrier. In modern construction parging is sometimes used to prep masonry units providing a smooth and bondable surface for a high-performance protective coating.

Brick Chimneys:

There are four brick chimneys, three are nonfunctional, one is used as a metalbestos furnace flu chase. All four brick chimneys need repointing, and portions of three chimneys needed to be re built above the roof line. All sheet metal chimney caps are not properly secured and sealed.

As a general rule conditions which require repointing include: (1) mortar erosion equal to or greater than one quarter (1/4) inch (2) crumbling mortar, (3) hairline cracks in the mortar, and (4) cracks between the brick and mortar. As shown in the attached photos (BrickChimeny1-7) portions of the Maplewood House chimneys' mortar deterioration exceeds the above guidelines warranting a partial rebuild.

Site Drainage:

There are several low spots adjacent to the foundation where surface water runs toward the foundation and in some locations ponds during heavy rain. Additionally a landscaped and mulched area on the west side of the building adjacent to the foundation inhibits surface water drainage. The dimensional lumber edging that separates mulch from the lawn impedes the flow of surface water.

Structural:

I completed a visual inspection of the building's accessible wood structural members.

The down stair bathroom, the adjoining utility room and the adjoining hall way floor assemblies have failed. These floors are out of level three quarters of an inch (3/4") in three (3) feet meaning a 2% slope. The down stair bathtub is falling through the subflooring. These conditions are due to improperly support floor joists and beams, rotting/damaged floor joists and rotting subflooring. Defective conditions include improper bearing and support, termite damage and dry/wood rot due to excessive moisture.

Basement:

The basement is wet and damp with a musty mildew aroma. It is apparent water infiltration is a long term problem, causing a dank and muddy basement environment. Excessive moisture in the basement has caused damage to wood framing and one of the HVAC air handling unit. A variety of methods to correct the water infiltration have been attempted. Most recently a shallow pump pit with a submersible pump and discharge line has been installed. The pump discharges standing water after it infiltrates the basement, but cannot affect the excessive moisture in this area.

Crawl Space:

The crawl space is improperly ventilated. Ventilation of at least two square feet per 25 lineal feet of wall or one square foot for every 500 square feet of crawl space should exist under buildings

Attic:

1. There are no attic vents. The minimum recommended net free ventilating area is 1/150 of the area of the vented space.

2. The walking way and platform for accessing and servicing the attic horizontal air handling unit is inadequate. Presently the walking and work platform is constructed of dimensional lumber. This material is not securely fastened; it is dimensionally inadequate and is partially covered by insulation.

3. Attic insulation consists of loose insulation filling the ceiling joist cavities with an additional two layers of stacked six inch (6") nominal batt insulation. I estimate the R-Value to be approximately R-38. It appears when the above described HVAC walking way and platform were construction the batt insulation in this area was removed and stacked on the adjacent insulation. This excess insulation could be better utilized if laid over the attic HVAC duct runs.

Asbestos:

There is evidence the Maplewood house was heated by a steam boiler, supply and return piping and radiators. I am unable to determine when that heating system was installed or removed. There is a remaining supply circulation line in a closet located in what I call the living room. This room is located on front southeast corner of the structure. This line is wrapped with what I believe to be asbestos insulation. I believe the material is asbestos based upon its appearance and the common use of asbestos insulation for many decades.

Electrical:

The electrical service is adequate for the structure's electrical load. Following is a partial list of observed electrical deficiencies requiring repair or replacement work:

1. Pinched wire in basement light.
2. Improperly supported / secured non-metallic cable in basement and crawl space.
3. Coils of non-metallic cable in basement improperly terminated.
4. Eliminate use of extension cord in basement.
5. Exposed electrical wires and open j-boxes.
6. Electrical surface raceways improperly strapped / secured.

7. Exterior AC disconnect box not secured to the structure.

HVAC:

The HVAC system consists of a horizontal gas fired air handling unit in the attic, a vertical gas fired air handling unit in the basement and two exterior air conditioning condensing units. As best I can determine the gas valve, limit switches, fan motor compressors etc. are original equipment in excess of twenty years old. Due the equipment's' age and condition a system or component failure is likely. I question the benefit of maintaining outdated and inefficient equipment, and more importantly this equipment is incapable of creating and regulating an interior climate needed for the preservation of historical items and materials.

1. The first floor air handling unit (furnace) located in the basement is dated, inefficient and possibly unsafe. Due to basement ground water infiltration the furnace is rust damaged. Of greatest concern is the integrity of the heat exchanger, and the real possibility the heat exchanger rust has caused pitting and the potential release of carbon monoxide. The manufactures equipment plate is illegible so I am unable to determine the manufacturing date and the unit's designed efficiency based upon BTU input and output. In looking at the furnace cabinet, the gas value, limit switch etc.; I estimate this unit was manufactured in the late seventies or early eighties at best. For equipment of this age the designed thermo-efficiency is typically around 76% under optimum conditions.

2. The two air conditioning units are at least 20 years old. Equipment of this age typically has a SEER Rating (BTUs of Cooling per watt) of 10. All equipment becomes less efficient with time, and Water & Light Energy Services staff estimates the unit's efficiency to be 7-8 SEER. The current model energy code specifies a minimum SEER rating of 13.

3. Uncontrolled moisture is the most prevalent cause of deterioration in older and historic buildings. It leads to erosion, corrosion, rot, and ultimately the destruction of materials, finishes, and eventually structural components. Ever-present in the environment, moisture can be controlled to provide the differing levels of moisture necessary for human comfort as well as the longevity of historic building materials, furnishings, and museum collections.

4. The thermostat controls are dated analog bimetallic strip controls, and probably out of calibration. These controls are inefficient, they require manual temperature setting and regulation providing minimal operational control and information such as humidity levels, when it's time to change filters and alerts when there are problems with the system.

Plumbing:

There are no working plumbing fixtures in the structure. The abandoned plumbing piping is unsanitary. There are four DWV unprotected openings meaning sewer gas can pass into the structure.

Fire Alarm System:

The fire detection / alarm system is a residential system. By code classification the Maplewood House is an assembly occupancy meaning the system lacks numerous needed features. I am unable to determine its fire detection system's age, but what I have learned is the system is tested annual but no other routine maintenance is completed such as cleaning. Routine maintenance such as cleaning helps insure the detectors sensitivity is not diminished due to dust accumulation or material degradation.

Detection and alarm deficiencies are as follows:

1. The control panel has a single network line for communication and monitoring.

2. The audible alarms are built into the smoke detectors which is indicative of a residential fire detection system. Fire notification should include an indoor siren and visual strobe notification.

3. There are no manual fire alarm pull stations.

4. There is no detector in the attic monitoring the attic HVAC system.

5. The detectors in furnace locations should be both heat and smoke devices.

5. The telephone demarcation point equipment is old, I am guessing circa 1950s. For an unknown reason some of the on premise fire detector wiring is switched meaning a portion of the fire protection system can be manually switched off. See Photo "Alarm Wiring"

General Maintenance:

1. There are a few exterior masonry wall locations where repointing is needed.

2. Window wells are filling with debris and some plant growth.

3. There are several exterior locations where the paint is bubbling or peeling.

4. Several window shutter metal hinges are experiencing surface rust.

5. The guttering down spout horizontal piping is not properly connected and need cleaning.

6. A brick landing/walkway on the southwest corner of the structure is in bad repair. The bricks have settled causing storm water accumulation. Several of the bricks are damaged in addition to the settlement creating an irregular walking surface and a trip hazard.

7. There are several unsealed exterior penetrations such as the air conditioning condensing unit's set line penetrations.

8. There are several locations were the wood finish butt and mitered joints are gapped and need caulking.

9. There is a one (1") inch gap between the bottom of the kitchen's exterior door leaf and the threshold flooring. Obviously this condition allows for air infiltration and exfiltration and the entry of insects and vermin.

RECOMMENDATIONS:

1. Waterproof / Damp-Proof Foundation / Site Drainage

The brick foundation certainly bares the weight of the aboveground structure so maintaining its structural integrity cannot be over stated. A primary source for foundation damage is lateral pressure from over-saturated soil causing significant cracking in the wall, mortar joint and brick degradation and ground water infiltration and excessive moisture due to numerous mortar joints and natural porosity of bricks.

It is my experience the most effective method for waterproofing / damp-proofing a foundation is done on the exterior. The process begins by excavating along the wall, all the way down to the footings. Dirt, loose mortar, brick dust and parging are removed from the foundation wall and a "parge" coat of mortar is applied over the entire wall that provides a more uniform and above grade decorative surface.

Once the parge coat has cured, an exterior waterproofing membrane consisting of asphalt-modified polyurethane is applied to the below grade wall. Next install a foundation drain tile system with a sump pump. The excavated trench is filled to within two feet of the final grade with a granular backfill such as 1" clean rock. The remaining portion of the ditch is backfilled with clean soil and graded causing positive surface water drainage away from the foundation.

2. Rebuild / Repoint Brick Chimneys

The occasional repair of the mortar joints is expected over the life of the brick masonry. Unfortunately the occasional repair of the brick chimneys' mortar joints has not occurred. That is why portions of the chimneys are deteriorated to the point warranting a partial rebuild.

An imperative reason for repointing brick masonry is to improve water penetration resistance and maintain structural integrity. Repointing mortar joints is one of the most effective and permanent ways of decreasing water entry into brickwork. This is because the most common means of water entry into brick masonry is through deboned, cracked or deteriorated mortar joints.

It is important to note, and as previously stated, to avoid irreparable brick damage; the compressive strength of the repointing mortar should be similar to or weaker than the compressive strength of the original mortar. Under load, a stronger repointing mortar will deform less than a weaker original mortar, causing the load to be concentrated on the thin strip of stronger repointing mortar. This stress concentration can lead to spalling of the brick face.

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3. Structural Repairs

The observed structural deficiencies are limited to the kitchen, the adjacent hallway, first floor bathroom and the utility room floor assemblies (beams, beam supports, floor joist and subflooring). The majority of this area is above a crawl space which I was unable enter. My assessment is based upon visual observations from the basement, an access opening in the basement to the adjoining crawl space and the finished spaces above. Though I did not inspect every framing member for material damage, fatigue, bending, bearing, etc., I did note conditions such as floor slope and specific deficiencies such as wood decay and improper support to warrant my recommending a compressive structural analysis of these areas and subsequent repairs.

For deriving a cost estimate I had to make one fundamental assumption, that being the percentage of floor assembly area that requires reconstruction. At this point estimating the number of floor joist that need replacement, the support and modification of beams and so forth is impractical and potentially mistaken. Rather I have liberally estimated a professional services fee and 50% of the hallway, bathroom and utility room for assemblies will be completely reconstructed. The kitchen floor assembly damage is limited to replacement of three floor joist and floor joist supports, all of which is easily accomplished.

It is important to note the majority of this area is above a crawl space. It is probable this work can best, from a cost perspective, be accomplished from above meaning the removal of finish and subflooring materials. I do not know by its appearance or through the knowledge of others if the tile floor in the down stairs bathroom is historically significant. My estimate therefore includes the demolition and salvage of finished floor materials but not their reinstallation. I have also assumed damaged structural subflooring can be replaced with contemporary materials.

3. Install Adequate Crawl Space Ventilation

The improperly ventilated crawl space is causing a moisture problem that has contributed to structural damage, created an environment that attracts insect populations and has created conditions conducive to mold growth, mildew and wood decay. Generally, adding passive foundation ventilation to a crawl space is an easy fix. Due to the historical significance of the Maplewood House I presume consideration must be given to ventilation devices appearance, the location of the vent opening and their size while preserving the structures historical appearance.

The building code allows mechanical exhaust ventilation system instead of fixed ventilation openings through the foundation walls. To comply, a mechanically vented system, the crawl space must be continuously sealed, vapor-retarding ground cover, have no fixed ventilation openings to the outdoors, and be supplied with a continuously operating exhaust fan.

In general a continuously operating exhaust fan pulls house air down through air pathway openings circulating through the crawl space and then exhausted to the exterior requiring the following work.

1. Removal of debris: clean the under-floor grade of all construction materials, vegetation, and organic material.

2. An insulated crawlspace.

3. Installing a continuous vapor retarder that is a Class I vapor retarder with less than 1.0 presence.

4. Fan sized to provide a minimum of 1 cfm per 50 sq. ft. of crawl space area.

5. Supply-air pathways allowing house air to be drawn, under slight negative pressure, into the crawlspace.

Based upon the above listed requirements it is probable a mechanical ventilation system is impractical and cost prohibitive.

4. Install Attic Ventilation:

Attic vents in the winter, allow a natural flow of outdoor air to help keep the attic space cold, which reduces the potential for ice damming (snow that melts off a roof from an attic that is too warm and then re-freezes at the gutters, causing an ice dam that can damage the roof). In the summer, natural air flow in a well-vented attic moves super-heated air out of the attic, protecting roof sheathing and shingles and removes moisture.

Because the second story is heated and cooled by an air handling equipment in the attic, keeping the attic space properly ventilated will significantly enhance this mechanical system's cooling efficiency. Additionally, it is important to note the building was reroofed this past spring with asphalt shingles. Attics must be ventilated to comply with the terms of the asphalt shingle manufacturer's warranty.

Like the crawl space ventilation devices, attic vents will impact the buildings historical aesthetic.

5. Abate Asbestos Insulation

Due to its age and appearance it is prudent the abandoned insulated boiler piping be tested for asbestos and abated based upon the reports finding. The City has a Term and Supply Contract with ARSI for asbestos testing and abatement. Due to the nature of this possible hazard I recommend the City go forward with the testing and possible abatement of this material as soon as possible.

6. Electrical

The electrical system is a potential fire hazard in any structure if the integrity of the system's electrical service, distributions panels, controls, wiring, fixtures, equipment, devices and appurtenances are not properly maintained. There are a number of conditions, which I have previously listed, which qualify for classification as unsafe or hazardous. A thorough inspection and testing by a licensed electrician of the structures electrical system is needed. The inspection and testing should include:

1. Continuity
2. Bonding Conductors Continuity
3. Polarity
4. Earth Electrode Resistance
5. Wiring Methods
6. Boxes and Conduit Bodies
7. Cabinets and Cutout Boxes
8. Switches, Receptacles and Fixtures
9. Replace circuit breakers AFCI breakers

The cost estimate is based upon labor and materials cost as proved through the Term and Supply Contract with Mid Missouri Electric. At this point it is impossible to derive an exact materials list. Therefore I have doubled the labor estimate which I believe easily covers anticipated material costs.

HVAC Equipment Replacement:

I am recommending the replacement of the first floor air handling unit and the two air conditioning condensing units with high efficiency equipment with humidifying capabilities and smart Wi-Fi thermostats. The existing HVAC equipment and controls are inefficient and lack the capability of creating and regulating the needed interior climate.

I estimate replacing this equipment based upon equipment efficiency will reduce energy consumption within a range of 25 to 30 percent annually. Tabulated two years of electric and natural gas billing is attached. Of equal importance to the equipment's energy efficiency is the capacity to monitor and regulate the structure's interior climate. This is best accomplished through sophisticated thermostatic controls.

Wi-Fi thermostats will require a Wi-Fi hot spot in or near to the Maplewood House. The cost for equipping and providing the house with Wi-Fi is not included in this report.

Upgrade Alarm System:

Certainly determining if the existing system meets local code requirements for the occupancy type was my first consideration. Possibly the most important question to ask, does the existing system meet and perform up to its intended and needed function? Because the Maplewood House is infrequently occupied, and due to its remote location, meaning the structure is not readily observable from the right of way or adjoining properties, in the case of a fire event it is unlikely smoke or fire will be initially observed or identified. Due to the lack of human presence the sophistication and functionality of the detection and notification system becomes more critical.

I lack the expertise, testing equipment, comprehensive knowledge of industry standards and equipment compatibility for me to categorically state the system can be upgraded or should be replaced. To drive a budget number I have assumed a total replacement of the existing system with the following features.

1. Contemporary control panel
2. Wireless receiver
3. Landline and cellular communicator
4. Wireless synchronized smoke detectors
5. Wireless motion sensors
6. Wireless door sensor
7. Indoor siren
8. Visual (strobe) alarm
9. Smoke and heat detectors in furnace locations
10. Manual alarm pull station

Routine Maintenance:

The below maintenance items are not included in the following cost estimate. I presume these items can be completed by maintenance staff and costs can be covered by departmental maintenance budget.

1. Repoint exterior masonry walls as needed. Repointing needs should be based upon the following; mortar erosion equal to or greater than one quarter (1/4) inch, crumbling mortar, hairline cracks in the mortar, and cracks between the brick and mortar.

2. Clean and remove debris and plant life from the window wells.

3. Scrap, prime and repaint bubbling or peeling exterior paint.

4. Wire brush, coat with a rust inhibitor and finish paint rusting window shutter hinges.

5. Cleaning and securely connect guttering down spout horizontal piping.
6. Rebuild the brick landing/walkway on the southwest corner of the structure.

7. Seal all exterior penetrations.

8. Caulk and paint all wood finish gapped butt and mitered joints.

9. Though not historically correct in the short term install an aluminum door threshold at the kitchen exterior door.

10. Demolished abandoned plumbing piping. The main stack should remain capping openings and one protected (trapped) opening to receive condensate water from the A-Coils.

11. Comprehensive cleaning of the basement including the demolition rotted framed walls, removal of abandoned electrical conductions and plumbing pipes.

12. Construct a twenty (20') inch wide and secured walking starting at the attic access opening and thirty by thirty (30"x 30") inch work platform.

13. Place the batt insulation removed to build the walking way and platform and place over duct runs and furnace supply plenum.

COST ESTIMATE:

Damp-proof / Waterproof / Parge Coat / Ventilate Foundation/ Surface Drainage…....$45,000.00

Chimney Repair……..…$5,000

Rebuild Floor Assemblies……$25,000.00

Attic Ventilation……..$1,500

Asbestos Testing / Abatement……$2,500

Electrical Testing / Repair……..$5,000

Update HVAC……..$20,000

Fire /Alarm System……..…$6,000

Routine Maintenance by Maintenance Staff..... $0

Professional Services……....$5,000

Contingency……..…… $5000

Total Estimate.....…...$120,000

Foundation Parging

Foundation Parging

Brick Chimney

Brick Chimney

Unlevel Floor

Structural

Structural

Structural

Structural

Structural

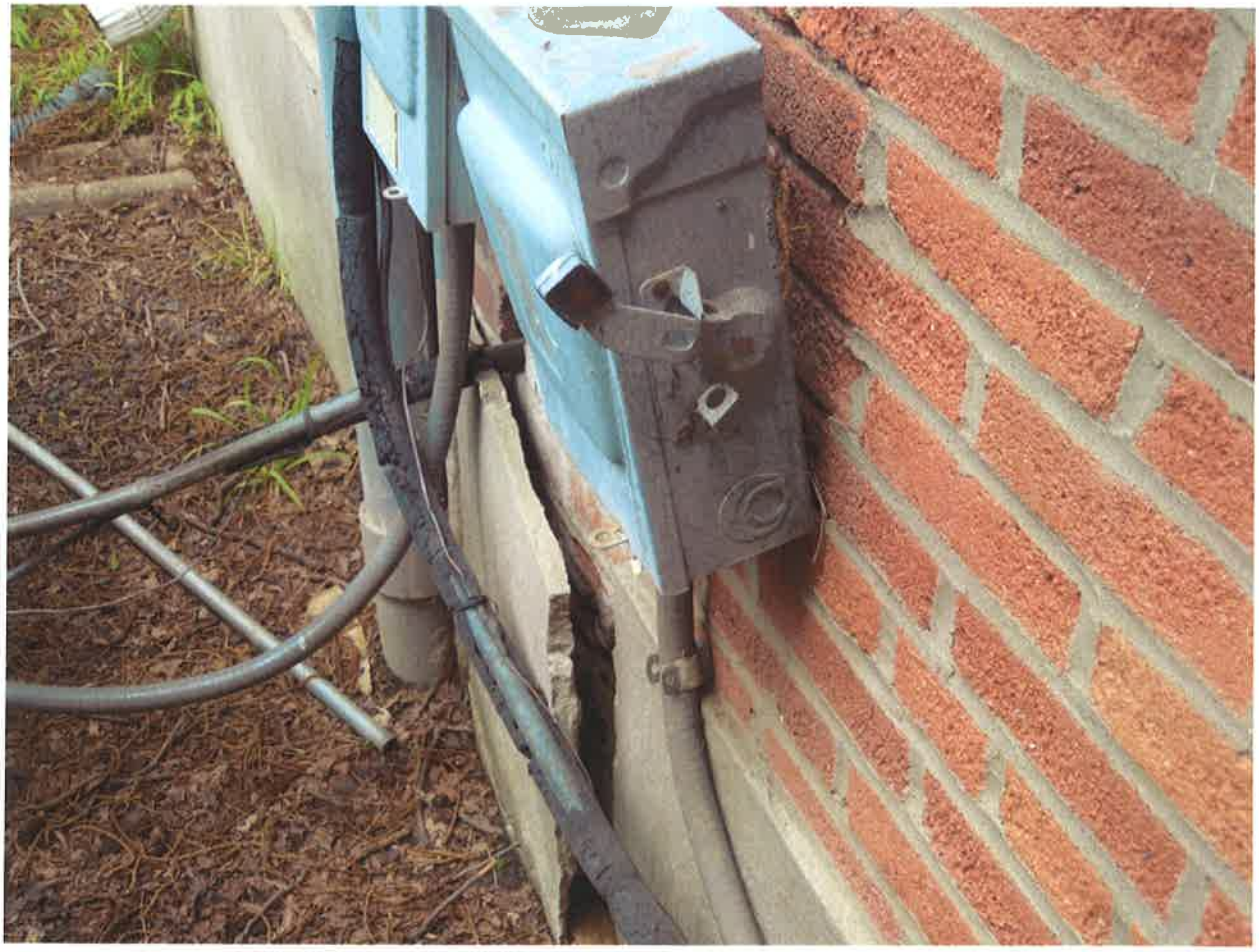
Structural

Asbestos

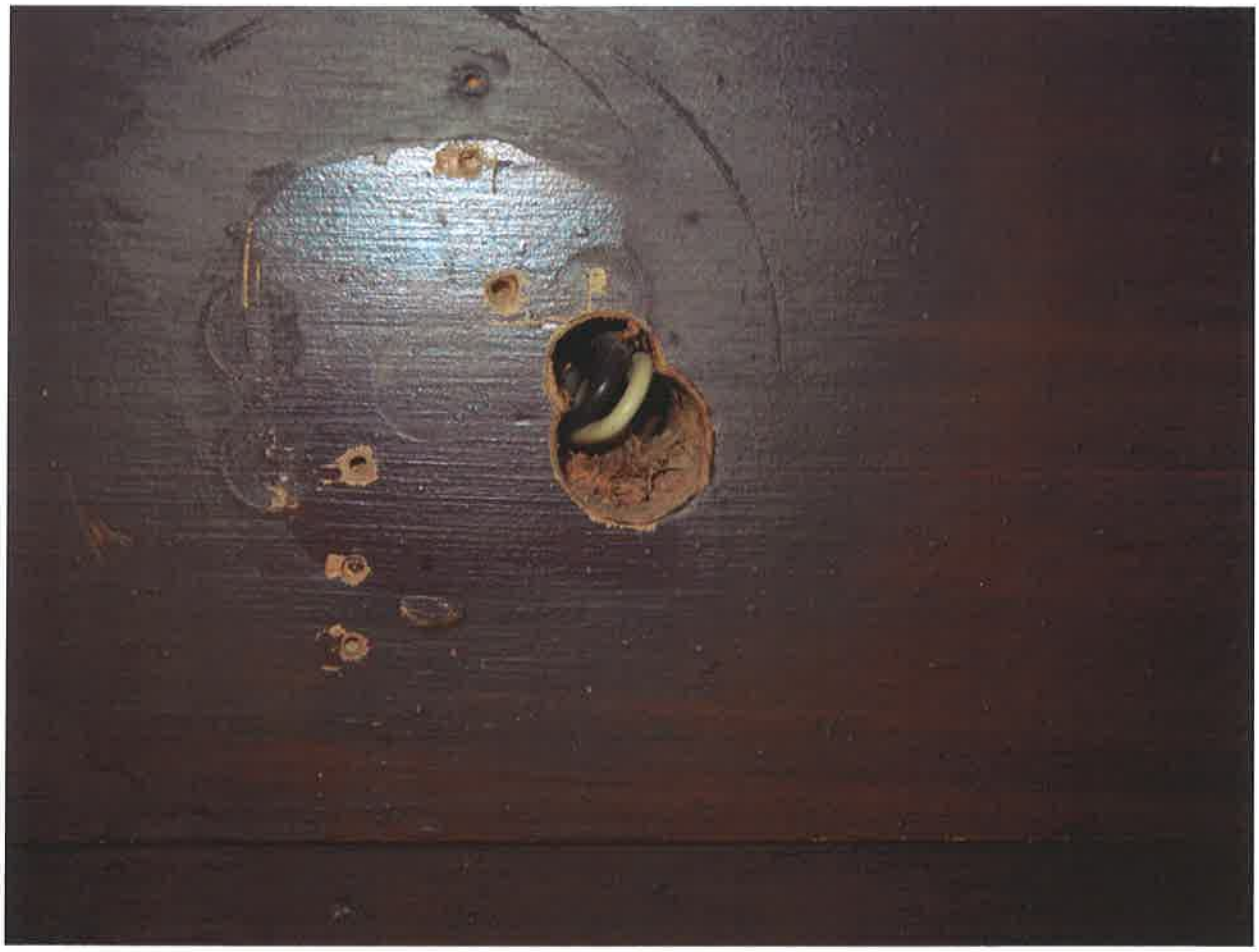
Electrical

Electrical

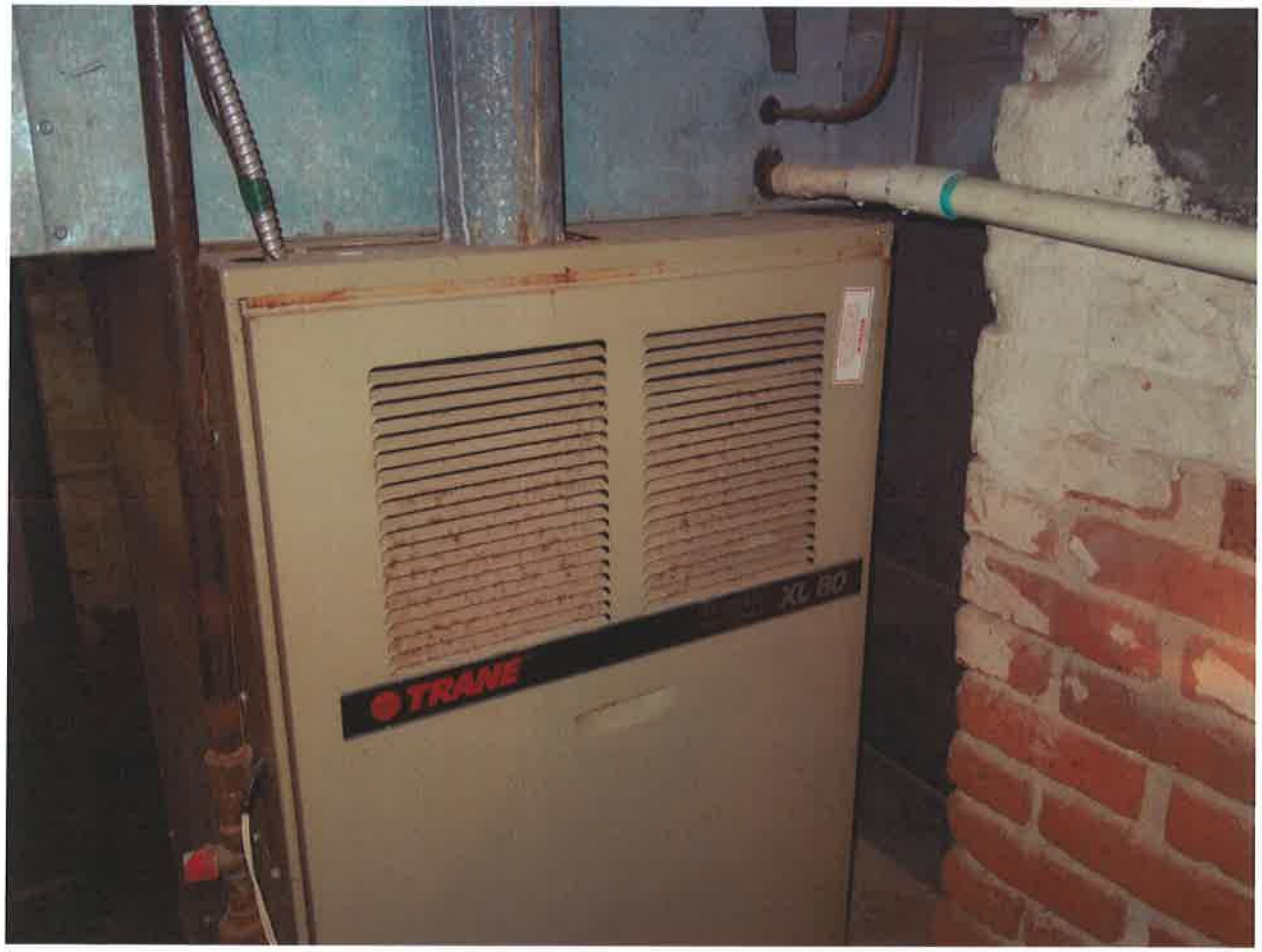
Electrical



Electrical



HVAC



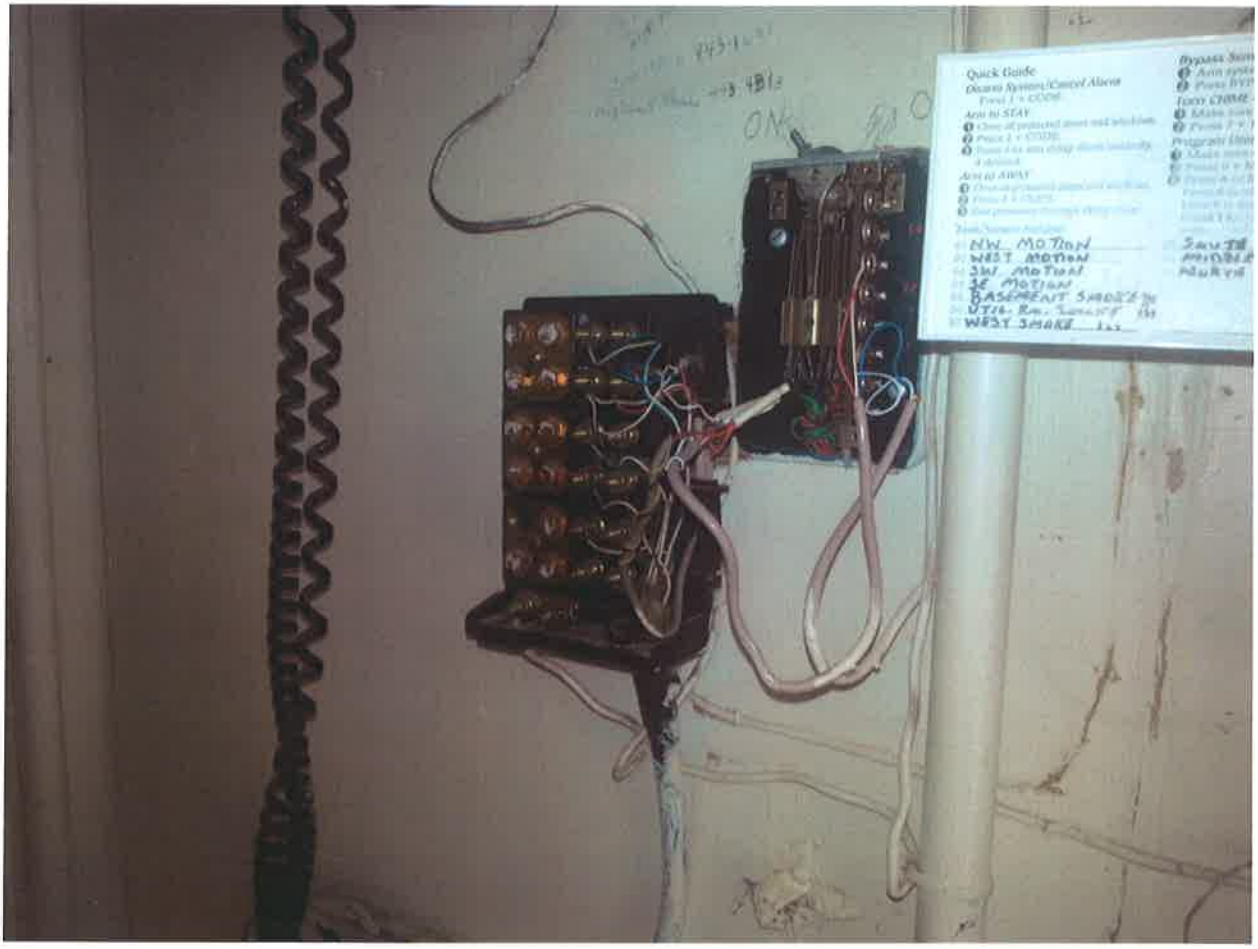
HVAC

HVAC

Plumbing

Plumbing

Alarm Wiring Phone Dmarc



Maintenance

Maintenance

Maintenance

Maintenance