The Waller County Commissioners Court is evaluating the viability of renovations and adding on to the existing Waller County Courthouse in Hempstead, possibly relocating to the former hospital or outlet mall in Hempstead or demolishing and replacing the courthouse.

The purpose of this report is to document the existing conditions of the mechanical, electrical, and plumbing systems and to identify deficiencies to determine the order of magnitude to design and install a functioning and energy efficient MEP systems.

The report identifies several areas where the MEP system is deficient and does not meet current codes. Most equipment has served past its anticipated life and the HVAC system approach (2 Pipe system) is no longer used because of its comfort issues and inability to heat and cool the building. The plumbing system is not compliant to current ADA/TAS or water efficiency requirements with the sanitary piping leaking. The electrical system does not meet current safety standards and is limited in additional capacity to support current technology. The grounding system may be adequate for electrical safety, but does not have the isolation and low impedance characteristics required by technology systems.

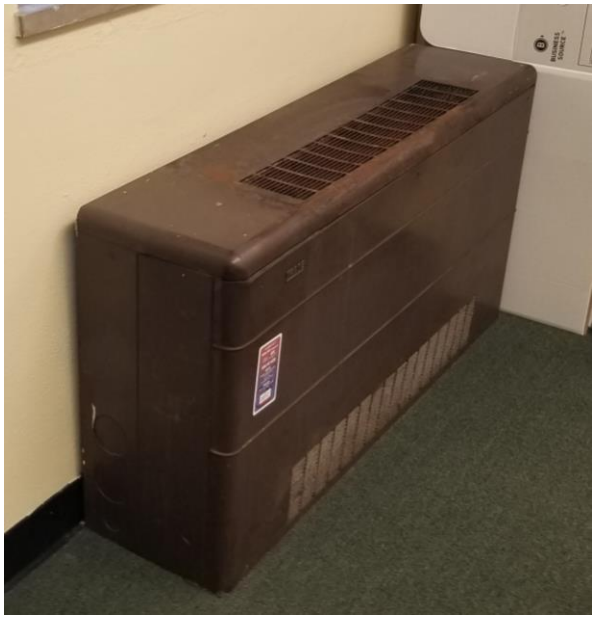
MD Engineering's recommendation if the building were renovated would be to replace the entire mechanical, electrical, and plumbing systems to meet current codes and serve the needs of the County. This would include **all** equipment, piping, ductwork, controls, wiring, lighting, switchboards and panels. MD Engineering is not aware of abatement issues however that should be addressed regardless of the decision for renovation or demolition.

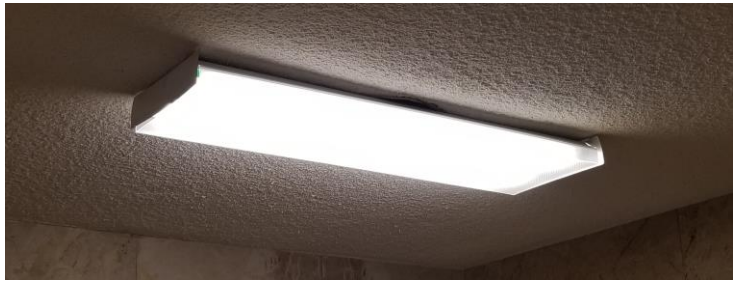
WALLER COUNTY COURTHOUSE MEP SYSTEM DESCRIPTION

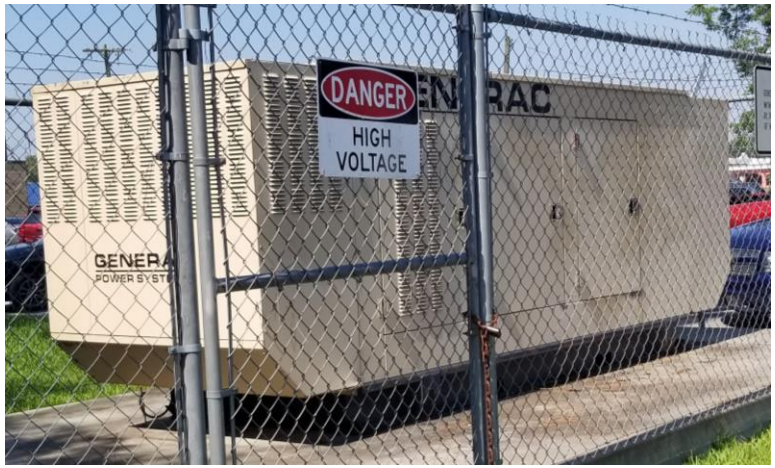
The existing Waller County Courthouse was designed in the mid 1950's and is still used for County functions including Commissioners Court, County Clerk, County Treasurer, County Fire Marshall, County Auditor, Records and other County departments.

The mechanical system is based on a 2 pipe chilled water/hot water system that serves air handlers that distribute the air through a ducted air distribution system. There are eleven (11) air handling systems. The system also has several wall mounted convectors to provide heat.

The original chilled water system was a water cooled centrifugal chiller with a cooling tower located on the roof. The hydronic boiler is located in the same equipment room, which is a boiler code violation. The centrifugal chiller was decommissioned, but is still in the equipment room on the 4th floor. To replace the air cooled chiller was installed in 2008/2009 (based on the manufacturer's serial number. The hydronic boiler was replaced in 2021. The air handling equipment which consists of a fan, motor, and coil appear to be the original equipment from the 1950's.







The plumbing system consists of cast iron sanitary waste lines. The domestic water piping material appears to be galvanized steel which is consistent with the installation date of the systems.

The current size of the bathrooms are small with most not complying with ADA and the fixtures are all dated and do not meet current flow requirements per EPAct 1992. This act required all water closets to use no more than 1.6 gallons of water per flush.

The roof has an internal roof drain system to drain the water from the roof.

The electrical service to the courthouse consists of three 50 kVA pole mounted transformers, providing 520 amps at 208Y/120 volts, 3 phase, 4 wire. This system, in most cases, consists of original panelboards, wiring and receptacles. Some single-phase load-centers have been added to extend the capacity of original panelboards.

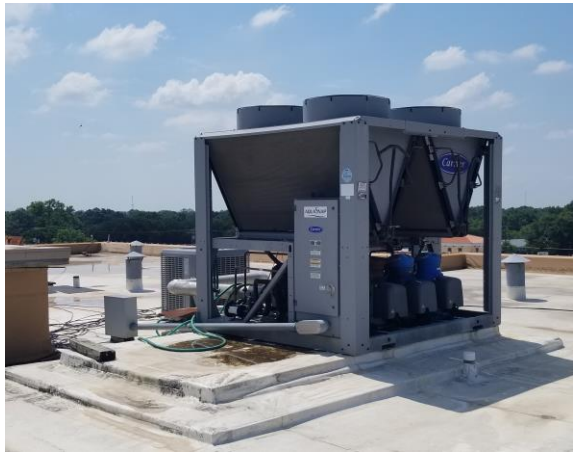
The source of elevator power does not meet current elevator code requirements.

The building does not have a lightning protection system.

Seasonal outdoor lighting appears to be fed from an extension cord laying on the roof.

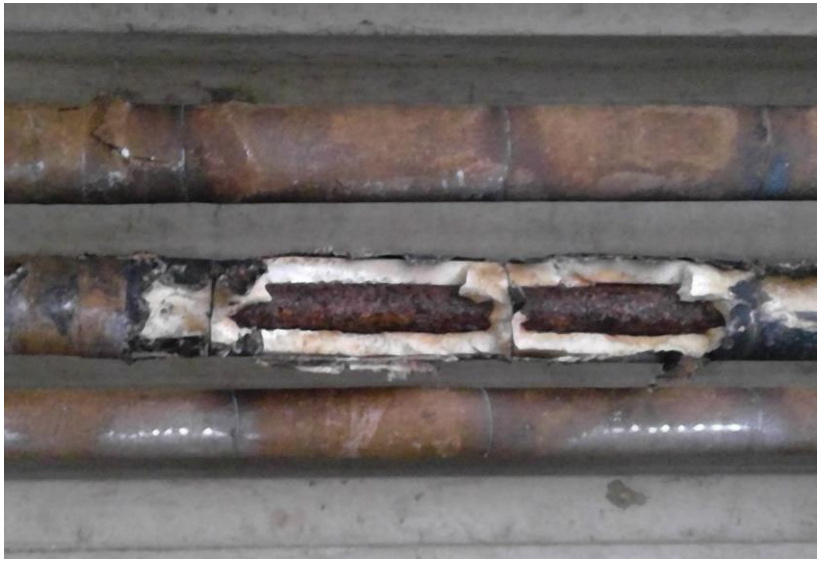
The lighting system consists of fluorescent lamps and surface mounted 2x4 lights in most of the spaces in the courthouse. This lighting is inefficient, non-uniform and provides poor visual comfort.

WALLER COUNTY COURTHOUSE MEP SYSTEM ASSESSMENT



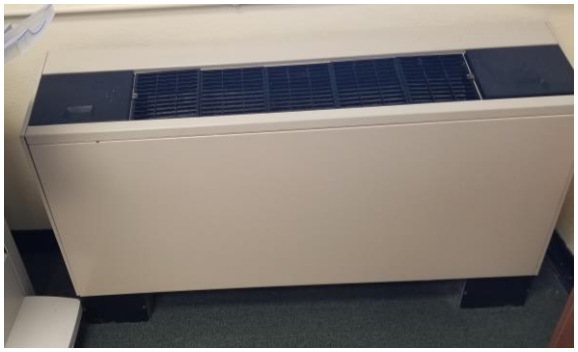
To determine the recommendations, our experience with similar systems and the ASHRAE median service life tables were utilized. Estimated equipment service life, according to the 2015 American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) Handbook, is defined as the economic life of a system or component, or the amount of time it remains in its original service application. The remaining service life values reported in this document are based off the ASHRAE Equipment Life Expectancy Chart, as well as the ASHRAE Preventative Maintenance Guidebook, which use median years to provide an indication of expected equipment service life. Many factors effect equipment service life and with any average, some systems may have lifetimes far from average. However, these median lifetimes provide a reasonable basis for establishing the remaining useful life of existing systems.

MECHANICAL



The two pipe system shares a common supply and return pipe for chilled water or heating. The system is in either heating or cooling and must be switched between modes often with a delay in switching between heating and cooling because the water temperate had to cool down or warm up. This design was popular during the era the courthouse was designed, especially in climates where buildings often go the entire year in one mode of operation. This system reduced the amount of piping compared to a four pipe system saving initial cost and installation time.

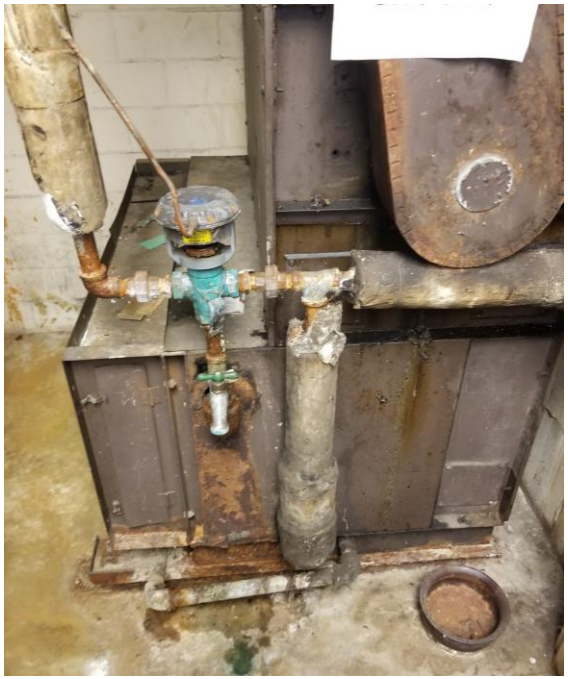
The hydronic piping system is in bad shape from age and several other factors like open insulation which allows pipes to condense on the outside, interruptions in chemical treatment to preserve the interior of the pipe and valves that no longer seal the system to allow for repairs. Given the integrity of the pipe or lack of integrity it is difficult to know where to stop the replacement of new piping creating a difficult costing issue.



It was observed that several doors from the office space to the corridor have transfer grilles installed which violate current code pertaining to return air through the corridor(2015 IMC, §601.2.)

While the air handling units and many of the wall ventilators are original, a few of the wall ventilators have been replaced.

The original systems are not efficient and are not designed to allow for ventilation as required by the current mechanical code. To allow for current code ventilation the system capacity would need to be increased and potentially lead to equipment changes, either more or larger air handling units.



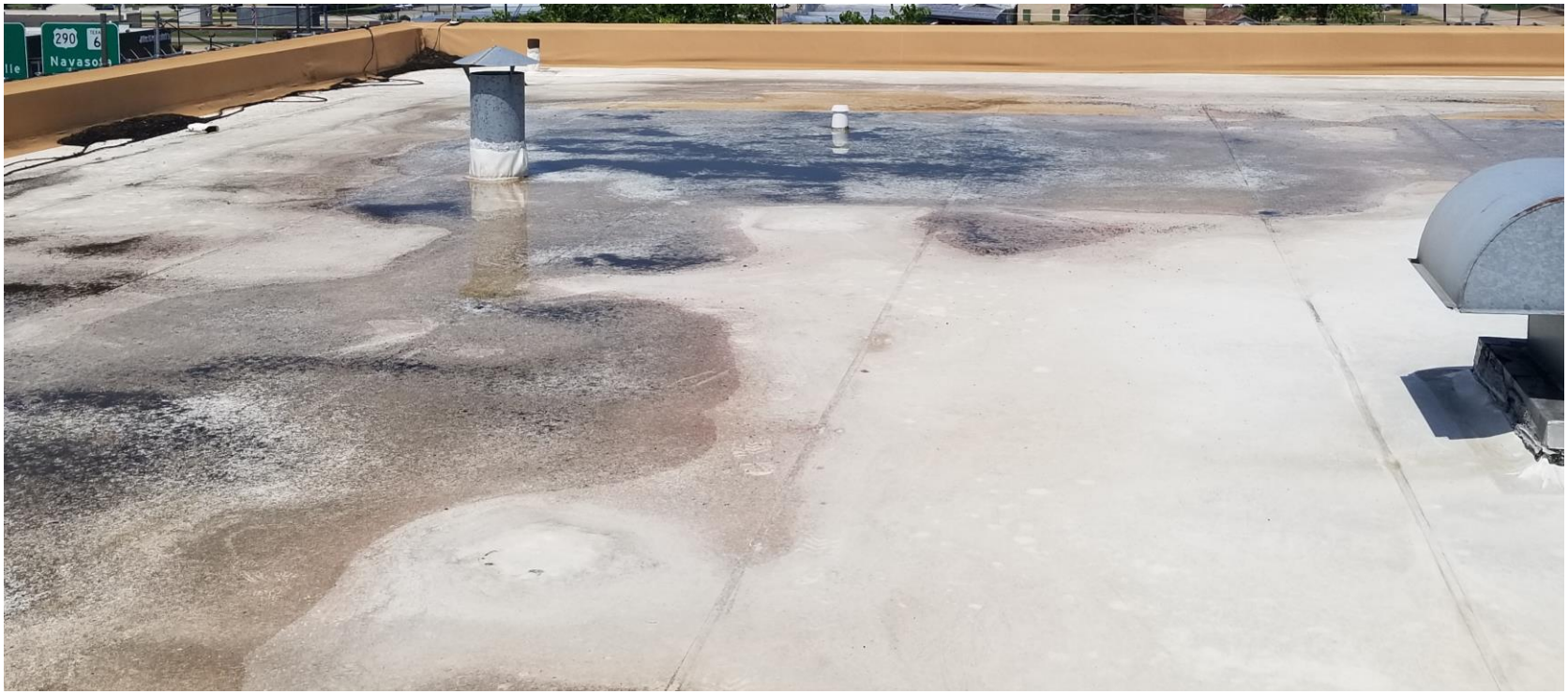
The control system needs to be upgraded from a pneumatic system to a direct digital control system to allow for better control of the HVAC system and allow Waller County to schedule the HVAC systems at the courthouse.

Based on the ASHRAE Equipment Life Expectancy Chart the most of the equipment is in the final stages of is anticipated life or has exceed its anticipated life.

- Package Chiller – 20 years. The installed chiller is 13 years old.
- Ductwork – 30 years. The installed system is over 60 years old.
- Fans – 20 years. The installed fans in the air handling units are over 60 years old.
- Water Coils – 20 years. The installed coils in the air handling units are over 60 years old.
- Pumps (Chilled Water) – 10 years. The installed pump date is unknown.
- Pumps (Hot Water) – 10 years. The installed pump is approximately 3 years old
- Controls – 20 years.
- Valve Actuators – 20 years. Appear to be original installation

The two exceptions are the hydronic boiler and hydronic pumps which were installed within the past two years.

PLUMBING

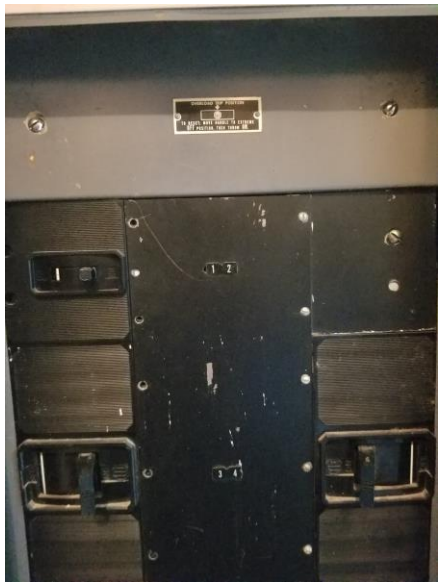


The plumbing system piping is leaking and needs to be repaired. The most recent example of this has caused extensive damage when a urinal overflowed.

The fixtures controls (faucets and flush valves) need to be replaced to allow for ADA/TAS compliance. When these are changed and meet the new low flow requirements, the fixtures (water closets and urinals) will need to be replaced.

The roof had standing water in several places and was not draining to the roof drains to allow for the water to be removed from the roof. While the roof drain system appeared to be functioning, either the roof needs to be sloped to the drains or more roof drains added.

ELECTRICAL

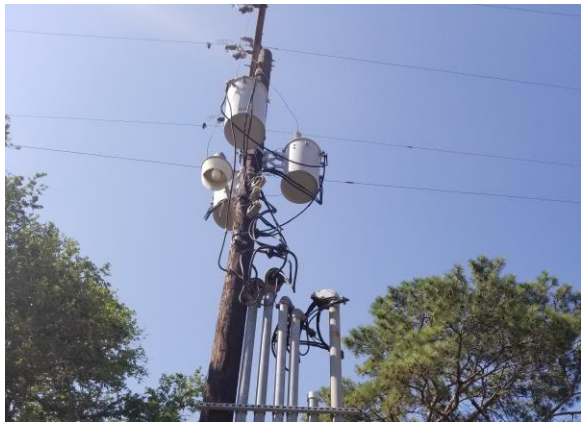


The electrical service to the building is pole mounted which is vulnerable to storm damage. The natural gas generator and exterior automatic transfer switch which were added later, provide emergency backup power during an outage. It appears that the normal power and emergency power are all located at the pole, which means if the pole was damaged the courthouse would be without power.

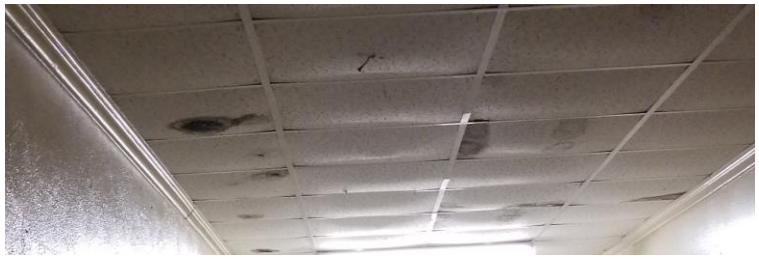
Most of the panelboards utilize molded case circuit breakers. These breakers are sealed at the factory and cannot be maintained. They have internal lubricating products that help the breaker open promptly in response to a circuit problem. Over time, the lubricant within these breakers becomes dry and no longer performs the intended function. As a result, the breaker will open more slowly or not at all due to the dry condition. Circuit breakers have a life expectancy of approximately 35 years.

Based on the ASHRAE Equipment Life Expectancy Chart the most of the equipment is in the final stages of is anticipated life or has exceed its anticipated life.

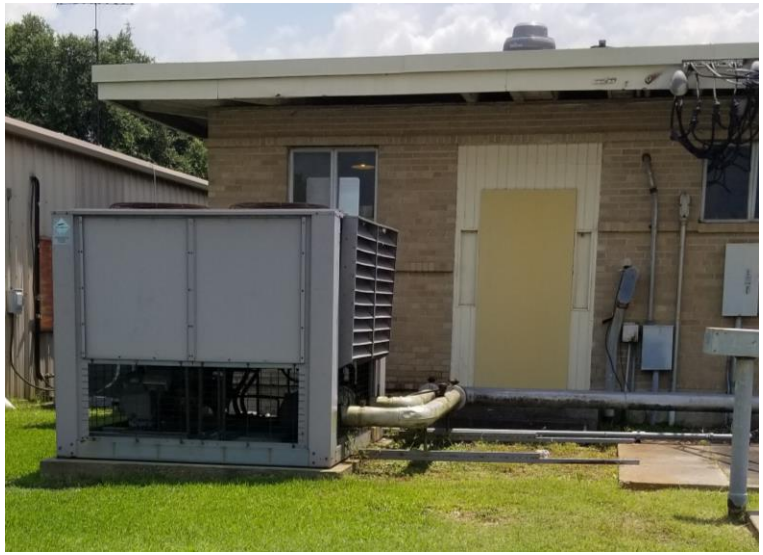
- Motor Starters– 17 years. Appear to be original installation



WALLER COUNTY HOSPITAL MEP SYSTEM ASSESSMENT

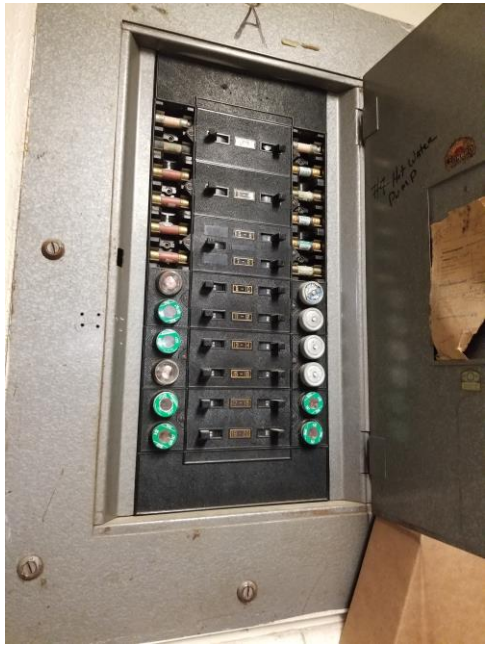


The existing Waller County Hospital was designed in the mid 1950's and is still used for County functions including Environmental and Maintenance. The building shows evidence of moisture in the building observed by the cupping of the tiles. This could be from several factors including envelope issues allowing warm humid air into the space, the HVAC system being off while the building was unoccupied, or the HVAC system not adequately conditioning the space due to age, improper functioning or inadequate sizing.



The original mechanical system consisted of two systems: one was a self-contained air conditioning unit with a condenser loop and the second system was a chilled water system with steam heat coils. The original chilled water system was a centrifugal chiller with a cooling tower located on the ground adjacent to the chiller room. The system now consists of an air cooled chiller system to condition the building. It appears the wall mounted convectors were added in the corridor after the original construction. Because of storage the mechanical equipment rooms were not observed.

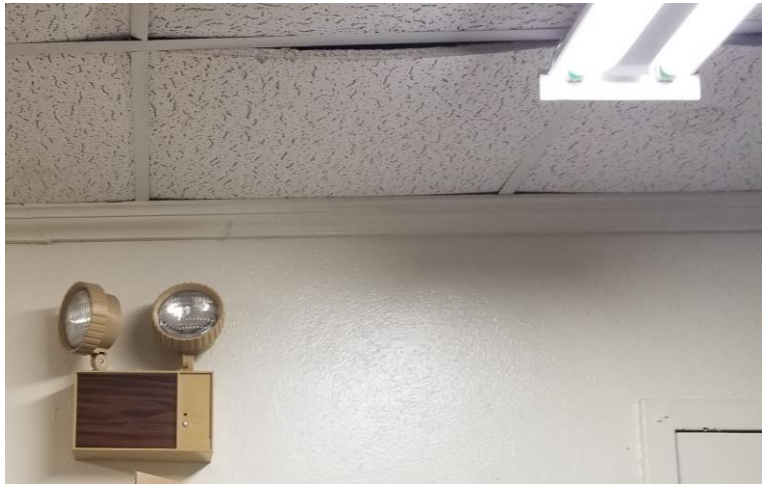
The plumbing system appears to be cast iron sanitary waste lines which is consistent with the installation date of the systems. The original plans call for Orangeburg Pipe on the exterior, which is the predecessor to PVC pipe. Orangeburg pipe has a useful life of about 50 years and is no longer an acceptable material for most building codes. The domestic water piping material appears to be copper and galvanized steel which is consistent with the installation date of the systems. There appears to be a catch basin installed outside the building to collect the drains from the original kitchen and boiler room based on manholes found on the site. The bathrooms were not observed because of storage.

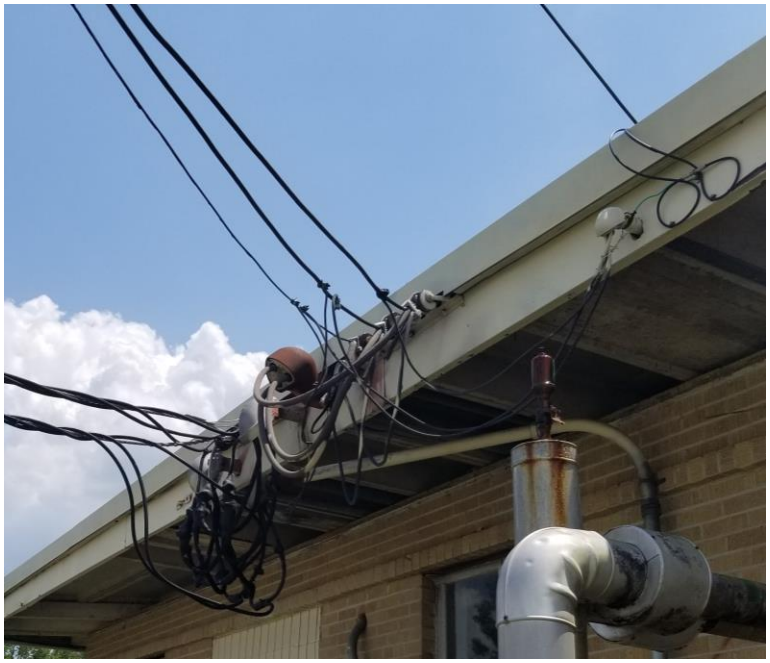


The building is served by three, overhead services at 120/240 volts, 1 phase, 3 wire. The electrical system, in most cases, consists of original panelboards, wiring and receptacles. Several panels utilize Edison base fuses and disconnect switches.

The lighting system consists of fluorescent lamps and surface mounted 2x4 lights in most of the spaces that were observed. The emergency light fixtures were battery powered “bug eye” fixtures located throughout the building. Batteries for these light fixtures should be checked or replaced every two years.

Based on the ASHRAE Equipment Life Expectancy Chart, most of the equipment has exceeded its anticipated life and would need to be replaced.





WALLER COUNTY OUTLET MALL MEP SYSTEM ASSESSMENT

This building is currently vacant. During the site observation it was observed to have mold in parts of the building. There were no existing plans provided for this building. All comments and assessments are based on visual observations.

This building is conditioned through roof mounted package units to heat and cool the space. The HVAC system would have to be reviewed against any floor plans programmed because relocating the RTU's may be difficult with the structure. The electrical service appears to be adequate to repurpose this building for several courtrooms and county staff. The plumbing appears to be adequate to repurpose this building for several courtrooms and County staff.

The building is served at 480Y/277 volts, 3 phase, 4 wire. The electrical distribution panels are fusible switch type and appear to be in good condition. Mall lighting consists of industrial low bay metal halide fixtures. If a momentary power outage occurs and is then restored, these fixtures would be off while they cool down for several minutes before they would re-strike and resume providing light.