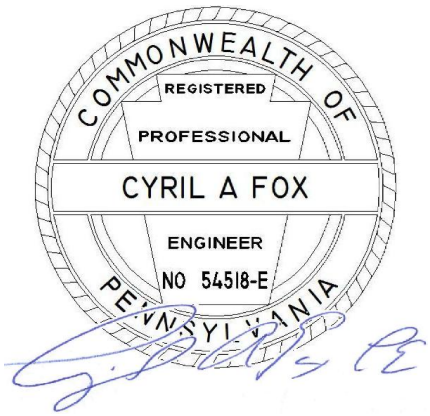
McKIM&CREED
ENGINEERS SURVEYORS PLANNERS

WILKINS TOWNSHIP MUNICIPAL BUILDING

110 Peffer Road.
Turtle Creek, PA 15145

Date: April 6, 2023



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McKim & Creed Project # 07406-0001

CONTENTS

APPENDICES

PART 1 - GENERAL

1.1 Project Description

A. Project: Wilkins Township Municipal Building
B. Owner: Wilkins Township
C. Address: 110 Peffer Road
Turtle Creek, Pennsylvania, 15145
D. Project Longitude & Latitude:40 deg, 25' 10.10": -79 deg 49' 44"
E. Project elevation:1200'
F. Occupancy: Police / Municipal Offices / Department of Public Works
G. Project Type: Renovation 2018 IEBC level 2 Alteration – No Change of Use
H. Project Description: Update building services, add elevator, DPW Garage addition.

1.2 Scope

This Document is a feasibility study of the building structural system with an opinion on the conditions and recommendations on the project approach for proposed building renovations.

The report was authored based on original documentation by Walter E Schardt Associates Architects dated April 11, 1957 and conditions observed during field visits. No invasive or material sampling was performed during this study.

This report is intended as a basis of design (BOD) for the structural approach to building renovations and additions for The Project. This report is not intended to provide technical details for Architectural, MEP system conditions. Included discussion of other systems is intended for clarity and general understanding. The BOD may be used to identify building condition and system parameters for schematic pricing. This is not intended as a construction document or direction on future work.

1.3 SUMMARY

In summary the buildings are sound and in fine condition for a 60+ existing structure. We did not observe any critical conditions at this time which will prevent the building from remaining in service.

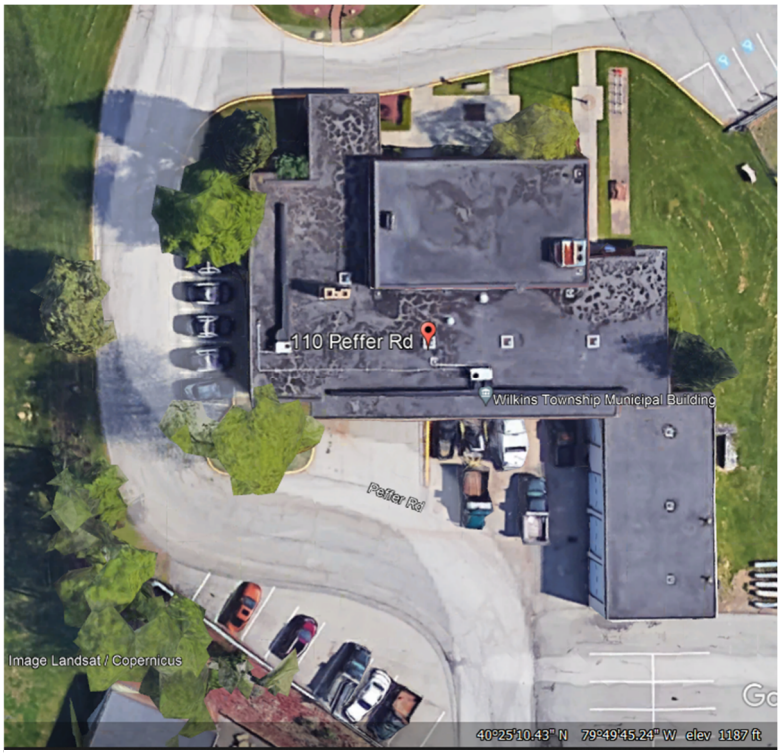
The cracks observed can be attributed to the past building settlement event. Of the cracking, we did not see any which are out of plane in the wall or have moved with concern for the building stability. Many of the cracks have been patched and these may reappear until a more aggressive repair approach can be applied.

Future renovations to the spaces will be invasive and will require the structure to be mostly unoccupied during construction. The overall size and original construction method limits phasing options and would add costs to the project while adding design concessions.

PART 2. STRUCTURAL

2.1 Building Conditions.

The building is a masonry 2 story structure with access to both levels from grade. The main level is accessed from doors on the north side with the lower-level access from the south. Another access is on the west side at the mid-level stair landing. These stairs are the only vertical circulation to the building. A 4-bay garage was added to the south for the Department of Public Works (DPW).



Google Earth Image

The township provided MKC with original building documentation which clearly identifies the construction and accurately matches the observations. The DPW addition looks to be early 1960's vintage and construction is clearly visible. While not available at this writing, we expect the original documentation is available, as the TWP has a good building records system.

Firsthand accounts reported a structural event that occurred about 20 years ago. The original building experienced a building movement event as two of the lower level garage columns failed. The failure was reported as rusting at the base from 50 years of exposure to salt and water, which compromised the column bases and resulting buckling caused the floor to settle beyond 3"+/- normal. Repairs appear to have been made by a qualified contractor and look to be of a better quality of construction.

2.2 Observations & Level of Service

1957 Township Building

Designed and built in 1957 the original building is a 13,200 square foot 2 story masonry bearing structure.

The lower level is roughly 5,200 square feet and partially below grade with the north wall retaining up to 13 feet of earth. This level is divided into 2 elevations with the lower as a 3-bay DPW garage and the police sally port, storage rooms and mechanical spaces 3 feet higher.

- Slab on Grade – The ground level is typically 4", wire reinforced, concrete slab on grade. We typically limit this construction to a superimposed live load up to 100 psf and is good for general occupancy like offices, assembly, and light duty parking. The floor in this area looks in acceptable condition with some minor cracks.
- The DPW garage area is identified as a 5" wire reinforced concrete slab on grade. This construction is recommended for general duty loading up to 200 psf. This area is currently being used for multi-axle vehicles and we noticed significant cracking and floor joint separation. It was reported that the floor drains are not functioning with water dissipating through the slab joints.

The 1st floor is 8,000 square feet office space with most of the area framed with 8" precast plank plus 1" concrete topping. The community room and front municipal offices (3,400 square feet) are slab on grade. The spaces are partitioned with concrete masonry (CMU) bearing and partition walls.

- Floor Framing – The documented floor framing uses 8" flexicore plank with 1" concrete topping. Precast plank is manufactured as a proprietary method of pre-tensioned and mild reinforcing. The documentation does not provide directions on the reinforcing installed. Using vintage and modern understanding this floor was designed for a live load capacity of 100 psf and is acceptable for occupancies from office to public assembly spaces.
- The 1st floor slab has some large cracking through the floor covering which we attribute to the building movement event. These should be addressed in future renovations.
- Slab on Grade – The existing slab on grade areas are documented as a 4", wire reinforced, concrete slab on grade. There is no issue with this material as described and is acceptable for 100 psf occupancy loading. We could not observe the slab condition through the existing floor covering.

The roof is separated into 2 levels framed with 2" lightweight concrete on metal form deck. The roof is framed with metal bar joists spanning to CMU bearing walls. The roof slabs as shown as flat having us consider the roof sloping created by tapered roof insulation. The typical floor to roof deck is 8'-10" with the ceiling attached directly to the bottom cord of the 12" roof joists resulting in a ceiling height of 7'-6" in the office spaces. The community room roof deck 16'-0" above finished floor with 18" deep bar joists for a much grander space.

- Roof Framing – The documented roof framing looks to consider general roof loading with no considerations for future construction or roof mounted mechanical equipment. We predict the roof total load is 60 psf and future roof mounted equipment will require supplemental framing.

The building gravity support, lateral load bracing and envelop are from concrete masonry unit (CMU) bearing walls. Most walls are 8" thick un-reinforced walls with the basement walls retaining soil being 12" and reinforced walls. The exterior bearing walls are running bond brick and 6" CMU separated by a 2" nominal cavity, while the non-bearing exterior walls are brick and 4" CMU and cavity.

The building interior bearing walls are supported to ground or in the case of the south office area on steel framing to posts in the lower level. Two of the original columns corroded to the point of buckling. The repairs appear to be quality work and the building was returned to an acceptable point of level.

- CMU bearing walls – The documented 6" thick CMU is thin for a bearing condition. 4" CMU back up is also thin for exterior wind loading. The original design of the building walls was more aggressive than typical buildings of this vintage, so we would not recommend inducing an increase in loading into these walls. Modern construction for an exterior brick and CMU cavity wall includes weeps and vents to control trapped water and vertical control joints to allow for the wall to expand and contract over the seasons. We did not observe any weeps, vents, or vertical control joints here.

- Many of the walls show some sign of cracking and most look to be indictive of a structure which has experienced a movement event. The DPW has done extensive work to repair cracks and return the building to a serviceable status. These cracks will likely return until a deep repair approach is implemented. We will discuss remediation actions more in the renovation section ahead.

The building walls and columns are documented as supported on shallow foundations. Footings are continuous reinforced concrete placed 3'-0" below finished grade for frost. No foundation bearing pressure was reported.

DPW Addition

The 2,400 square foot, 4-bay garage addition was built after the original building, and we estimate sometime in the mid 1960's. The floor to roof for this addition is 15'-0" to allow for larger multi-axle vehicles.

The roof is narrow rib metal roof deck on bar joists. The joists span North / South and are supported by steel girders spanning E/W spanning from exterior wall to exterior wall. This allows for a column free space and thin roof structure at the working bays.

- The roof framing appears very economical with the deck at its maximum span. It is recommended that any roof mounted equipment be placed on new roof framing and deck reinforcement.

The garage floor is a slab on grade and is significantly cracked and pitted. The slab was reported to have been installed in unacceptable conditions with topping repairs in past years.

- The floor slab is in poor condition and perhaps thinner than recommended to service heavy truck traffic. Overall floor repair is recommended but a full replacement may be less or equal value.
- One of the service bays has a service pit for maintaining vehicles without a lift. This service pit is accessed from a stair well on the north side and a framed drive aisle between the stairs and pit. The existing framing shows rusting and corrosion along with the exterior walls having deep spalling and delamination. The current direction from the Township, their insurance carrier and the proposed program is to infill this pit, so our review was a cursory review. If the program changes to retain this area, a more thorough concrete and steel repair evaluation is recommended.

The exterior walls are single wythe masonry with an unusual girder support condition. The North/East corner retains some soil as the grade slopes north. The addition has 1 interior partition wall of 4" CMU which was identified to be a painting area.

- The exterior walls were constructed without any insulation, control joints and are painted concrete masonry. CMU is not water resistant and the wall construction shows the early aging from difficult service life. The base course is deteriorating at the door jambs from salt intrusion and the upper walls have diagonal cracking from thermal and moisture expansion.

Currently we do not have documentation for an understanding of the foundations. It is assumed that the walls would be on shallow footing to match the main building.

2.3 Conditions and Remediation.

1957 Township Building

The original building is in fine shape and is structurally sound. There are some fine details and elements which would be expensive to replicate. These same features date the building and require a specific audience to fully appreciate.

The current program is identifying the building will require modifications beyond just painting and window replacement, which elevates the required design to meet or exceed the Pennsylvania Uniform Construction Code and the International Existing building code for a minimum level 2 alteration. A level 2 alteration requires a building to be brought up to current building code standards, and the American Disabilities Act level of care. As a police station, this also will require the building to resist a higher level of wind, snow and earthquake events than a typical building. Additionally, since 2018, new police stations are also required to have a FEMA storm shelter designed to survive a 250 MPH tornado, to provide a safe haven for the building occupants. Other system upgrades and services may be required depending on the Township's critical operation requirements for this building.

The building is robust and resilient as demonstrated by the settlement event which would have been more catastrophic in other construction types. We would expect the

building structure to resist the 2018 loading requirements and if located judiciously include an approximate~~ly~~ 15 person FEMA storm shelter without significant renovation.

This same robust construction of the walls, floors and roof does not allow for simple modification and changes to interior spaces and building services. Most upgrades will require demolition and construction methods which would limit adjacent occupancy.

The current program is to add an elevator from the lower level to the main level. Elevators require pit and overrun space which adds length to the vertical shaft construction. Lifts do not have the same pit and overrun demands but are limited to a single passenger and may not be ideal for police use. Construction of a new elevator shaft would be to build new 8" CMU bearing walls to the underside of the plank. Cut the plank and continue the shaft to the roof framing. With the limited floor to roof space a new elevator shaft will need to extend through the roof. ~~too~~. With some modification to the bar joists the shaft can support the roof joists and roof deck and extend to the required over run height. We have identified a construction sequence in the appendix: New Elevator Shaft Schematic Section.

The settlement event has induced cracking throughout the structure's floors and walls. Once a concrete material cracks pieces of debris lodge into the crack and wedge into place. Any future movement frees this wedge and may push it deeper into the crack and wedging the crack wider over time. To prevent cracks from propagating, the crack needs to be routed clean and repaired with a stiff bonding agent, typically called repair mortar or epoxy crack filler. This repair method is labor intensive, and the material has a high cost, making crack repair expensive but will extend the life of the building and assure occupants of structural stability.

The exterior walls have cracks on most walls in varying degrees of concern which we assessed to be from the settlement event. When the building's interior wall settled the roof and floor diaphragm pulled the walls inward causing an exterior cracking. These are typically horizontal cracks on the north and south walls, while are diagonal and vertical cracks on the east and west walls. To repair these cracks a mason or masonry restoration contractor needs to rake and repoint the walls. Some of the cracks may be from expansion and contraction, and should be addressed by the same mason by cutting vertical control joints into the brick and caulking the open joint with a high grade sealant. We recommend vertical joints to be between 7 and 15 feet from a corner and up to 25' thereafter.

We recommended remediation to the lower level DPW parking bays. The slab is undersized and at the end of its service life. The drains are in poor condition, and it is understood water infiltrates the slab through floor joints deteriorating the sub-base. Removing the existing slab, repairing the sub-base, and replacing the slab with a heavy reinforced 8" concrete slab with new trench drains appropriate for multi-axle vehicle loads will better serve the space as a garage for multi-axle vehicles.

DPW Addition

This addition was an economical addition to serve a specific use group. The building is uninsulated and has an interior and exterior utilitarian finish. The proposed project is to renovate the floor slab of this building and provide an addition to the east for a double stacked garage and locker room.

The building is in fair shape and is nearing the end of its service life. To extend the service life an extensive renovation is required and may trigger a building envelop retrofit. It has been reported that the electrical service is undersized and no air handling equipment was present. We also recommend the project consider removing the 4" CMU partition wall between bay 3 and 4. It is not structural and limits use of the spaces.

The proposed project scope includes removing the existing floor service pit construction. To infill the service pit, the construction will demolish the concrete lid and steel framing. Break apart the pit floor into 2"-3" pieces of rubble and fill the pit with compacted layers of 2A or #57 stone to sub-grade level and install a new 8" concrete slab reinforced with (2) layers of #4 rebar at 12" on center – each way.

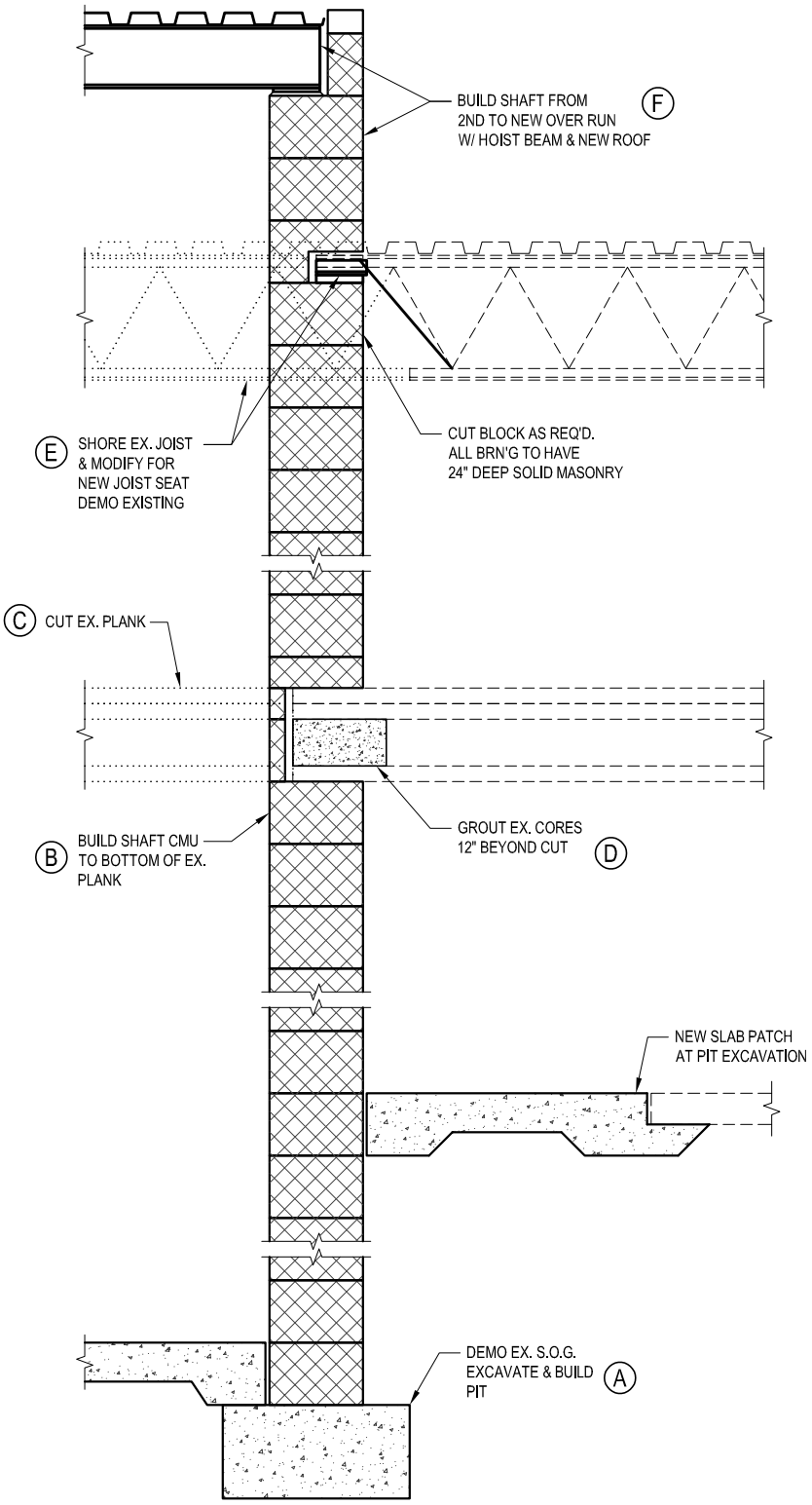
The proposed scope also includes a 40' x 67' addition to the east of the DPW garage. Because the existing garage has focused beam pockets on the existing west wall we suspect this wall is not designed to accept additional or future loading. The project would prefer to have a column free garage space and we have developed a Schematic Design with roof joists spanning east/west which bear on the new east wall and on new framing along the west wall. This allows for the new roof to be higher than the current garage and avoids impacts to the existing foundations. Roof framing will use 28" deep bar joists with steel framing and posts. The least cost envelop option would be metal stud framing ballooning to the roof deck. CMU exterior walls are also a solution, and for the added cost would add a level of robustness to the new addition. Schematic framing is shown in the appendix: New DPW Garage Addition Schematic Framing.

An alternative to renovating and building an addition could be a new metal building separate from the current building. A new building may have the same final costs while allowing for unobstructed construction and would not require phasing and downtime to the Department. A new space will provide a modern workflow and enclosure to meet modern vehicles and better energy efficacies.

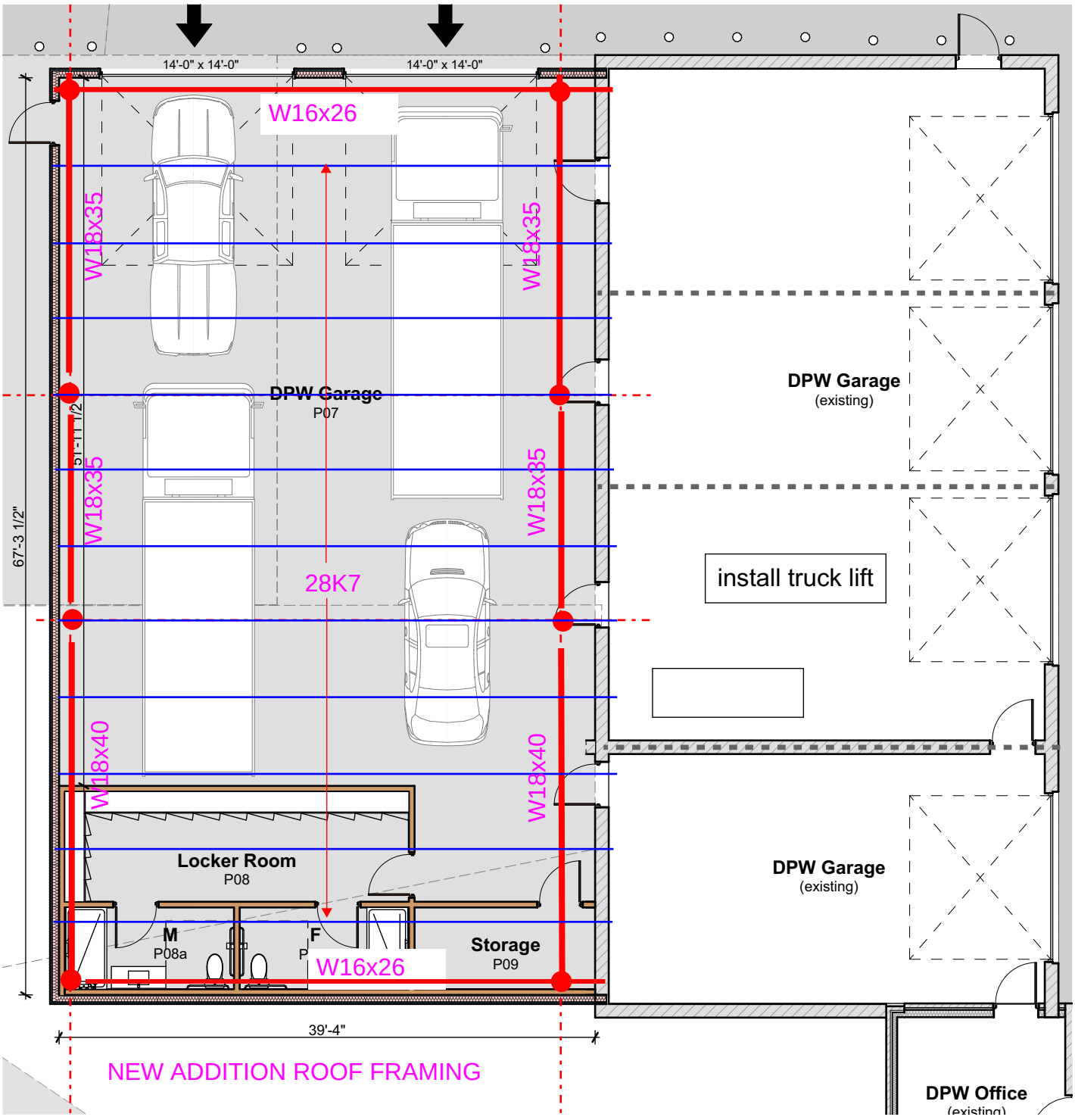
2.4 Conclusions.

The building is in fine overall shape but does require a system and space renovation. The building is sound but the obvious cracking and uneven floors do not give the occupants a level of assurance necessary in a public building.

Proposed renovations along with building remediation will extend the service life, with a full renovation extending the building's life for another 25 years or more. By comparison a new facility would be qualified for better than a 50 year life cycle with the understanding that building system renovations would be required every 20 -25 years.



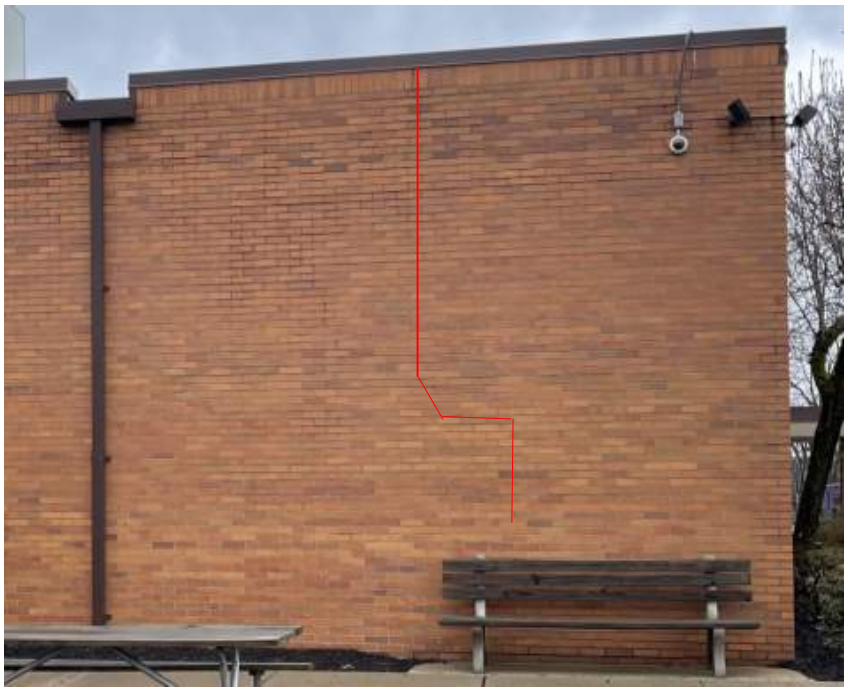
NEW ELEVATOR SHAFT IN EXISITNG PRE-CAST PLANK BUILDING


14'-0" x 14'-0"
14'-0" x 14'-0"
W16x26
W18x35
W18x35
DPW Garage
P07
DPW Garage
(existing)
51'-11 1/2"
67'-3 1/2"
W18x35
W18x35
28K7
install truck lift
W18x40
W18x40
Locker Room
P08
M
P08a
F
P
Storage
P09
W16x26
DPW Garage
(existing)
39'-4"
NEW ADDITION ROOF FRAMING
DPW Office
(existing)

1957 East wall Near Stair Entrance.

Horizontal and stepping crack (highlighted in red).
This cracking is an example of the building being dragged during settlement event

1957 West wall at NE corner and community Room.



Vertical and stepping crack (highlighted in red).
This crack likely occurred during the settlement event.

The crack now acts as an expansion control joint.

1957 First Floor - Storage room off Community room

Un-repaired Horizontal cracking.
Another example of the building walls being dragged during settlement event.

1957 First Floor -Police Chief Office door

Un-repaired floor cracking.
Crack is an occurred during settlement event.

1957 Ground Floor - DPW Garage bay at column repair