



CITY OF VERSAILLES

Existing Police Department Building
110 Court St., Versailles, KY 40383

STRUCTURAL EVALUATION - REPORT



GRW Project No. 4702-01
20 June 2018

Purpose:

GRW, Inc. was engaged to provide Structural Engineering services in the form of inspection, evaluation and report services for the existing buildings at 110 Court Street, Versailles, KY 40383 which currently house the Versailles Police Department. The intent of the associated Structural evaluation will be to determine future allowable use characteristics that the property as a whole or in parts may be used for without activating the full extent of the 2018 Kentucky Building Code that would require the buildings to be brought fully up to code upon enacting any renovation initiatives to the existing buildings and for the express purpose of minimally impacting the existing structural elements for any strengthening measures required by code.

Investigation:

Jon R. Marcum, SE, and Cody Lyvers, EIT arrived on site at 8:00 AM Friday June 15, 2018 to investigate the existing exterior masonry and interior wood and structural steel conditions. Exterior dimensions defining the openings in the load bearing and non-load bearing masonry walls were taken. Interior structural members that were accessible to view were documented and measured to determine the sizes of members. Locations of interior load bearing walls, piers and beams were noted to document main zones of structural support for documentation of load paths to the foundation from floors above. Roof pitches were measured for rooves accessible to measurement.

The following information was noted during the site visit:

- The exterior brick walls were in good working condition.
- Cracks in the exterior masonry were minimal, and no out of plane movement in the masonry systems were noted or noticed that would be cause for wall movement concerns structurally.
- Foundation bearing stratum is assumed to be soils for the 70's addition, and rock for the 1800's original structure and the later additions.
- The original structure and the north east addition were load bearing clay masonry construction with wood joists spanning from wall to wall at the first second and roof elevations.
- The south east addition was fully constructed of light framed wood construction.
- The south west addition was constructed of load bearing CMU walls from foundation to first floor supporting load bearing wood stud walls supporting prefabricated wood trusses.
- All four buildings were currently housing the Versailles police department.
- Each building section seemed to have previously installed ceilings above the current drop ceiling. One section in the current training room had a total of three ceilings that could be seen.
- Measurements of the exterior openings and out to out dimensions were taken to review some of the existing structural conditions of the masonry systems and determine overall span conditions of floors.

Structural Evaluation for Future Use of Existing Buildings:

Structural evaluations of existing building systems just as the design of new building systems focus on several specific areas of concern for the service life of the building. The materials used for construction need to be checked for the following design characteristics: strength of materials, serviceability of materials, compatibility of materials, connect ability of materials, and constructability of systems. The basis of any structural system that has been designed well will meet all five of these criteria and produce a structure that has the required strength to support the intended loads of the building while not deflecting vertically or horizontally such as would create serviceability issues in internal or external finishes, while being mindful that certain materials may not be compatible in terms of having material connection issues, or construction issues.

The 2018 Kentucky Building Code reference the 2015 International Existing Building Code for the governance of existing buildings and their repair or renovation. The following is a summary of 2015 IEBC code sections that address the repair, alteration, change of occupancy, addition and relocation of existing buildings regardless of occupancy and apply to this project:

- “Chapter 1, Part 1, Section 101.4.2 **Buildings previously occupied** – The legal occupancy of any building existing on the date of adoption of this code shall be permitted to continue without change, except as is specifically covered in this code, the International Fire Code, or the International Property Maintenance Code, or as is deemed necessary by the code official for the general safety and welfare of the occupants and the public.”
- “Chapter 1, Part 1, Section 101.7 **Correction of violations of other codes** – Repairs or alterations mandated by any property, housing, fire safety maintenance code or mandated by any licensing rule or ordinance adopted pursuant to law shall conform only to the requirements of that code, rule ordinance and shall not be required to conform to this code unless the code requiring such repair or alteration so provides.”
- “Chapter 1, Part 2, Section 115.1 **Conditions** – Buildings, structures or equipment that are or hereafter become unsafe, shall be taken down, removed or made safe as the code official deems necessary and as provided for in this code.”
- “Chapter 1, Part 2, Section 115.5 **Restoration** – The building or equipment determined to be unsafe by the code official is permitted to be restored to a safe condition. To the extent that repairs, alterations, or additions made or a change or occupancy occurs during the restoration of the building, such repairs, alteration, additions, or change of occupancy shall comply with the requirements of this code.”
- “Chapter 2, Section 202 **General Definitions**”
 - “**ADDITION**. An extension or increase in floor area, number of stories, or height of a building or structure.”
 - “**ALTERATION**. Any construction or renovation to an existing structure other than a repair or addition. Alterations are classified as Level 1, Level 2 and Level 3.”
 - “**CHANGE OF OCCUPANCY**. A change in the use of the building or a portion of a building. A change of occupancy shall include any change of occupancy classification, any change from one group to another group within an occupancy classification or any change in use within a group for a specific occupancy classification.”
 - “**REPAIR**. The reconstruction or renewal of any part of an existing building for the purpose of its maintenance or to correct damage.”
- “Chapter 3 **PROVISIONS FOR ALL COMPLIANCE METHODS**”

- Chapter 3, Section 301.1.1 **Prescriptive compliance methods** – This method requires compliance with Chapter 4 of the 2015 IEBC for buildings that comply with the International Fire Code. Since these buildings may or may not fully comply with the latest fire code, this method will be avoided during our evaluation.
- Chapter 3, Section 301.1.2 **Work area compliance method** – This method requires compliance with Chapters 5 through 13 of the 2015 IEBC.
- Chapter 3, Section 301.1.3 **Performance compliance method** – This method requires compliance with Chapter 14 of the 2015 IEBC.
- Chapter 3, Section 301.1.4 **Seismic evaluation and design procedures** – This section requires compliance with either 100% or a reduced level of the current seismic portion of the code.

With any of the compliance methods for repair, alteration, change of occupancy, addition or relocation of all existing buildings for this project, Chapter 3, Section 301.1.4 would be required that would require a seismic evaluation. Typically unreinforced masonry structures similar to the ones present on this project site have not been designed for seismic forces as those forces were not part of the building code until the mid to late 80's. Therefore, for any of the compliance methods we would need some level of structural upgrade the structural components to comply with the applicable seismic requirements.

Structurally we would want to start with ASCE 41 per chapter 3 of the 2015 IEBC, since these provisions are typically less stringent. When we utilize ASCE 41 to preform our seismic evaluation we find via a Tier 1 evaluation that the existing structures do not comply with the Tier 1 evaluation since the wood joists in the diaphragm are typically not connected to the clay masonry with metal clips that would keep the joists from pulling away from the clay masonry wall. If we also check a Tier 3 evaluation, we also find that the existing buildings do not meet that level of evaluation either. Therefore, we would conclude that the masonry walls would need to be brought up to full code compliance. This is very difficult to perform and includes adding either carbon fiber strips to the interior and exterior of the building's unreinforced load bearing masonry wall system, or structural steel framing in structurally strategic locations. Neither option being necessarily less expensive, and both specifically dependent upon the load shared at the location installed.

Conclusions:

Since the existing structures are not currently in compliance with the Tier 1 and 3 evaluations that would have required lower lateral forces to comply with the seismic requirements, the existing structures would need to comply with 100% of the seismic loads of the current 2018 Kentucky Building Code if and when the structures undergo a repair, alteration, change of occupancy, addition or relocation.

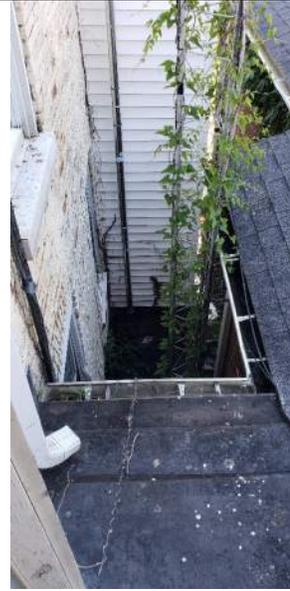
Recommendations:

Since the existing buildings would need to be brought up to code for full structural compliance under the actions of any repair, alteration, change of occupancy, addition or relocation, it is our recommendation that the structures either remain in their current Risk Category and Use group as they currently are so that the requirements of the 2015 IEBC code are not activated, or incorporate into the existing building

structures new framing that would be designed to resist the full 100% of the seismic forces required by the 2018 KBC, and utilize the existing masonry elements as a “façade only” element. Please note to do this would take great coordination by the contractor and field time for the engineer when issues arise that may not be as designed due to unforeseen conditions. Both additional times for the engineer and contractor will have additional costs to the owner when these conditions arise.



Photograph 1: South East Addition looking south.



Photograph 2: South East Addition looking south.



Photograph 3: North West Structure looking west.



Photograph 4: North West Structure looking north.



Photograph 5: North east structure looking east.



Photograph 6: North east structure looking east.



Photograph 7: North east structure looking east.



Photograph 8: North east structure looking east.



Photograph 9: North east structure looking south.



Photograph 10: North east structure looking east.



Photograph 11: South east structure looking west



Photograph 12: South east structure looking west



Photograph 13: South east structure looking west



Photograph 14: South east structure looking west



Photograph 15: North east structure looking west



Photograph 16: North east structure looking west



Photograph 17: North Building face looking south.



Photograph 18: West building face looking east.



Photograph 19: West building face looking east.



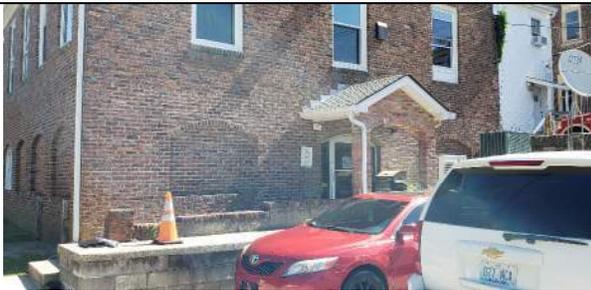
Photograph 20: West building face looking east.



Photograph 21: West building face looking east.



Photograph 22: South building face looking north.



Photograph 23: South building face looking north.



Photograph 24: South addition looking west.