February 6, 2007

Ms. Sheelah J. Moyer
Senior Development Specialist
City of Dayton
Office of Economic Development
101 W 3rd Street
P. O. Box 22
Dayton, Ohio 45401

Re: Structural Evaluation Report of
Gem City Ice Cream Building
1005 West Third Street
Dayton, Ohio
SMA #06.400.271

Dear Ms. Moyer,

In response to our agreement and your authorization to proceed, Shell and Meyer Inc. has visited the above referenced site. Our site visits occurred on 7/24, 7/26, 7/31, 8/22, 9/3, 9/14 and 10/6/2006. During these visits, field dimensions of the three buildings that are included in this project were obtained. Photographs were also taken to document the conditions observed and are included with this report. We have also included copies of reports from Ground Penetrating Radar and Bowser Morner Inc. The information and photographs obtained during our site visits, combined with the reports provided by Bowser Morner and Ground Penetrating Radar Systems, form the basis of our observations, recommendations, analysis and conclusions.

Please advise if you require additional information.

Sincerely,

SHELL AND MEYER ASSOCIATES, INC.

Kenneth E. Isham, PE

KEI:lm

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INTRODUCTION

Shell and Meyer Associates, Inc., entered into a professional services agreement on July 27, 2006, with the City of Dayton, Ohio. The purpose of the agreement is to provide a structural evaluation report of the existing structures located at 1005 W. Third Street, Dayton, Ohio.

The evaluation is to include field observations, assessment of the building's structural condition and recommendations for reinforcing. Recommendations are to include the suitability of the structure to be reinforced to allow use for residential, office or educational purposes.

OBSERVATIONS

OBSERVATION-ORIGINAL BUILDING

The original structure is a 2 story wood framed building with both interior and exterior brick masonry bearing walls. The estimated date of construction is mid to late 1800's.

The floor framing consists of rough sawn 2x12 floor joist @ 16" on center. The joist span is approximately 20'-0" from the exterior masonry wall to an interior centrally located masonry bearing wall.

The joists supporting the ground level floor are damp and are showing signs of deterioration. It was also observed that some joist and sub-floor areas have already failed. The floor joists have been shored using a system of steel jack post and beams. The shoring is quite rusty indicating a high moisture content in the basement.

The basement foundation walls appear to be a rubble stone. The walls were generally damp indicating moisture penetration is ongoing. It was also observed that the northeast and southeast corners were very damp indicating the location of the main source of moisture. Along with moisture penetration, the mortar has deteriorated.

The second floor level framing and roof framing were generally not visible. However, I was able to observe that the roof has a downward slope toward the north, while the ceiling is level. This indicates that there are separate framing levels. The east wall also has brick vents located just below the roof line. These vents typically provided ventilation into the space between ceiling joist and roof rafters. Evaluation of the roof framing is not possible until the ceiling is removed. Given the deterioration that is visible, I would expect to see roof framing and ceiling joist that will require replacement. This will likely include replacing some part of the roof sheathing. Specifically, the northeast corner of the roof is not water tight. Water ponding was observed in this area, along with moisture entering the east wall resulting in deterioration of both brick and mortar. The second floor framing, specifically near the northeast corner, may require reinforcing and/or replacement. The condition and extent of any damage can be evaluated after the 1st floor ceiling material has been removed.

The exterior walls in the east and south elevations show signs of moderate to severe weathering. Again the northeast corner seems to be the main source of water intrusion into the building. The grass area adjacent to the east wall of the building does not have sufficient slope away from the building. Ponded water was observed along this wall. The grade along the east wall appears to be at or above the bearing level of the floor joist. This condition provides a pathway for any moisture intrusion to enter the ends of the floor joist. The condition commonly referred to as dry rot results from alternating wet and dry conditions. The south wall appears to have been added later, providing a uniform facade to the front of the building. The facade shows signs of weathered mortar joints. The raked mortar joints in the façade are not generally recommended for exterior use due to moisture penetration.

The west and south walls of the original building are visible from the interior only. The west wall appears to have bowed outward away from the floor framing. The 2nd floor joists and the roof girders have less than adequate bearing and will need additional support framing installed.

This concludes my observations of the original building.

OBSERVATION – 1st ADDITION

The first addition is a 2 story concrete structure located to the north of the original building. It is believed to have a construction date of early 1900's. In general the structure consists of 12"x 12" and 12"x16" concrete columns supporting a slab and beam framing system for both the 2nd floor and roof levels. The floor structure and the roof structure shows signs of deterioration with spalling concrete observed on beams, columns and slab areas. It should be noted that some areas remain covered with an insulating material and may also be deteriorated. A non-structural concrete topping has been placed on the 2nd level.

The east wall has full length window openings with the sills located at 5' to 6' above the floor. There is also one overhead door opening near the north end. The 1st level has 3 large dock door openings, along with various window and man door openings. None of the openings are secure from the elements.

The existing 1st floor slab on grade construction is extremely uneven, with sloping floors, floor drains and curbs. The north end has loading dock area. The floor in this section is approximately 2'-0" below the remaining slab on grade area.

The second level of the north wall is the same as the east wall; full length windows with the sills at 5'to 6' above the floor level. The first level has a partial height masonry and stucco wall. The foundation for this wall has failed, as evidenced by the stair step cracking from east to west. None of these openings are secure from the elements.

The roof of this addition slopes from west to east. The four leader boxes and downspouts are missing along the east wall. The parapet at the southeast corner appears to be out of line with the remaining portion of the building and will need to have new anchors installed. Additional observations will be required to determine if a problem exists.

This concludes my observation of the first addition.

OBSERVATION – 2nd ADDITION

The 2nd addition was built west of the original building and the first addition. According to the City of Dayton's plan data records this addition was built in 1914.
The construction of this building is similar to the 1st addition, consisting of a 2 story concrete frame structure. Columns are 16x16 and 18x18 supporting a concrete slab and beam structure. The floor and roof structure were observed to have concrete spalling from the columns, beams and slab elements. Some interior areas remain covered with insulation material and may also be deteriorated. A non-structural concrete topping has been placed on the 2nd level.

The roof structure also supports two penthouses. These penthouses have serious spalling of concrete along with a failed roof and walls. I also noted that the existing roof membrane is not secured along west wall.

Both levels of the west wall, like the east wall of the first addition, have full length window openings with sill heights 5' to 6' above the floor line. These openings are not secured from the elements. The west wall brick masonry infill areas are severely damaged from exposure to the elements. It appears that missing leader boxes and downspouts have allowed water to accumulate in the brick masonry resulting in separation of the brick wythes. Spalling has also occurred on the exposed concrete structure. The north wall has badly spalled brick masonry infill between the 2nd level columns. The ground level is similar to the 1st addition with partial height concrete block and stucco in fill between columns. This wall is also showing signs of possible foundation problems.

Along the west wall, there is a one story appendage that is in poor structural condition with major deterioration of the masonry walls and pre-cast concrete roof planks.

This concludes my observation of the 2nd addition.

RECOMMENDATIONS

The following recommendations are for maintaining the integrity and soundness of the buildings for future renovation.

THE ORIGINAL BUILDING

1. The original building must have the roof repaired and made water tight. This will include establishing a method of removing water from the roof and away from the foundation walls.
2. The area immediately east of the building needs to be regraded below the bearing level of the floor joists and sloped away from the building. .
3. Retain an experienced masonry consultant for the purpose establishing criteria for repair and replacement of all damaged masonry work including tuck pointing of mortar joints.
4. The existing 1st level floor framing should be reinforced or replaced where significant failures of joist or sub-flooring have occurred.
5. Observation of structural elements at both 2nd floor and roof level that have been exposed to water intrusion and are presently covered with original finish materials. Areas of the existing ceilings at the 1st and 2nd floors should to be removed to determine joist bearing lengths at each location and deterioration of wood framing members.
6. Establish adequate bearing of floor joists, roof joists, and girders.

THE 1st ADDITION

1. Establish a positive method of removing rain water from the roof by installing appropriately sized leader boxes and down spouts.
2. The existing roofing should be examined and recommendations obtained by a professional roofing consultant.
3. Remove existing brick/glass block masonry infill areas.
4. Close all openings in walls and/or roof to prevent water from entering the building.
5. Remove all existing insulation material from the interior surfaces of columns, beam and slab.
6. Remove all areas of spalled concrete and replace with appropriate epoxy patching mortar.

THE 2nd ADDITION

1. Remove existing penthouse structures completely. Provide new roof framing over openings where penthouses are located.
2. The existing roofing should be examined and recommendations obtained by a professional roofing consultant.
3. Remove existing 1 story appendage located near northwest corner.
4. Establish a positive method of removing rain water from the roof, installing appropriately sized leader boxes and down spouts.
5. Establish proper site drainage away from building line.
6. Remove existing brick/glass block masonry infill areas.

7. Close all openings in walls and/or roof to prevent water from entering the building.
8. Remove all existing insulation material from the interior surfaces of columns, beam and slab.
9. Remove all areas of spalled concrete and replace with appropriate epoxy patching mortar.

RECOMMENDATIONS – PRIORITIES

The existing buildings are approximately 100 years old. As such there is virtually no documentation of how there were constructed. This is particularly true of the original building.

ORIGINAL BUILDING

Based on our observations, it is imperative that the original building have an additional bearing wall constructed. This wall will support the west end of the floor joists (both 1st and 2nd) and the anticipated roof girder construction. Additionally, given the undocumented conditions of the roof framing and 2nd floor framing, the removal of the ceilings should be such to avoid the possibility of the ceilings becoming unstable. Once the floor 2nd floor and roof framing systems are visible, recommendations to reinforce or replace can be made. No storage of equipment, material, including debris from the ceiling removal process, should be permitted on any floor level.

Repair and/or replacement of the first floor level joist and sheathing should occur simultaneously with construction of the new bearing wall. Site grading issues must be addressed to avoid perpetuating a condition that is a major source of structural problems.

1st AND 2nd ADDITION

The building envelope should be made water tight before structural issues can be addressed.

The repair of the 1st and 2nd addition should begin with the removal of all debris. There should be no motorized equipment, such as bob cats, used on any supported floor area. Repair of building columns may begin after the existing debris is removed. Repair of the floor beams, girders and slab should follow in an orderly fashion.

STRUCTURAL ANALYSIS

According to the Office of Economic Development, it is my understanding that the buildings referred to as Gem City Ice Cream located at 1005-1007 W. Third are being treated as "Historical Buildings" and will not be required to meet the present Ohio Building Code structural requirements.

The buildings "historic" classification may permit the buildings to meet limited structural requirements compared to the latest Ohio Building Code. This office recommends that at a minimum, all gravity loads and wind loads be adequately provided for the structural system. This would include the probability of including shear walls within any potential renovation work.Variances to waive seismic load requirements will need to be filed with the local building official.

OFFCE LOADING REQUIREMENTS

The Ohio Building Code mandates a minimum live load of 50 psf with an additional 20 psf for partition loading. 2nd floor corridors are required to have a minimum live load of 80 psf. These loadings are the largest gravity loads required, for "office use". Educational and residential uses will require smaller gravity loads.

Our structural analysis is based on the following information

1. Information obtained during our site visits
2. Review of available plan data, (1914 2nd addition)
3. Information provided from Bowser Morner and Ground Penetrating Radar reports. Bowser Morner and Ground Penetrating Radar provided services that obtained:
    1. The compressive strength of the original concrete.
    2. The locations, spacing a sizes of reinforcing steel.
    3. The thickness of concrete overpours.

    The information contained in these reports are the basis from which structural analysis was made.

The following are the calculated available superimposed live loads for each of the buildings. The superimposed loads include live load, ceiling, MEP systems, and partition walls.

ORIGINAL BUILDING (1800's Wood)

	FLEXURE	
1st Floor	35 psf	Presumes joist are structurally sound
2nd Floor	25 psf	having no deterioration due to moisture or insect infestation.

1st ADDITION (1900's Concrete)

FLEXURE	SHEAR
125 psf	33 psf

2nd ADDITION (1914 Construction)

	FLEXURE	SHEAR
2nd Floor	260 psf	49 psf

The available superimposed loads listed above are based on the actual dead weight of the original structure and the non structural topping. The added weight of the non structural topping has the effect of reducing the live load capacity of the original structure.

CONCLUSION

The capacity of the concrete structures are limited by "shear". Both additions were designed and constructed prior to the full understanding of the interaction of concrete and reinforcing steel. The design methods used were varied and generally considered experimental by most local building codes. Shear reinforcing was not specifically addressed until the first national design specification was adopted in 1926.

My analysis of the three buildings indicates that they have the potential to be used as office, classroom or residential spaces with a uniform live load of 50 psf. The original structure should be limited to 25 psf, unless additional interior supporting structure is designed and installed. The additional supporting structure would consist of installing new floor girders and columns at the first floor and basement levels. This additional supporting structure will require new foundations. It is anticipated that this reinforcing can increase the live load capacity to 40 psf.

The concrete frame buildings could also be used for offices, classrooms or residential construction with uniform loads of 50 psf if adequately reinforced. Our analysis indicates a weakness in the capacity of the floor beams. This limiting condition can be remedied by installing a structural steel frame below the existing concrete frame of both buildings. I have included a partial plan to illustrate this reinforcing. New interior footings will be required. As long as the reinforcing is being installed, we recommend a minimum live load of 80 psf for maximum flexibility of future occupancy.

As noted previously, early 1900's design criteria were limited to primarily gravity loads. No consideration of lateral loads was included in any analysis. Today's codes require that lateral loads, both wind and seismic, be evaluated with the minimum design live loads. The live load requirements are code minimums based on occupancy or use of the structure. We recommend masonry shear walls should be incorporated in the final floor plan to provide stability for the structure. These walls are considered permanent.