INTRODUCTION

Engineering Design Associates, Inc. (EDA) was retained by Reinhardt Associates, Inc. to provide a Structural Conditions Assessment of the existing structure. The purpose of the Assessment is to provide a structural evaluation of the in place structural systems. As part of this Assessment, EDA conducted a site inspection and assessment of the existing single story steel framed structure. The initial walk through was conducted on the 9th of September 2014 and its purpose was to evaluate the exposed to view existing conditions. There were no structural drawings available or review and for study purposes.

METHODOLOGY

As part of the structural conditions assessment, specific site and building related deficiencies were identified, categorized by type, and grouped into one of eight major structural building elements. Subsequently, all deficiencies were prioritized to assign a relative level of importance and assist in determining an appropriate level of annual funding across each building. For the assessment, the following priority definitions were used:

- Priority One: Mission Critical Concerns (Current) – Deficiencies or conditions that directly affect the facility's ability to remain operational.
- Priority Two: Issues that directly impact the operation of the facility (8-12 months) – Items assessed that, if not addressed in the near term, may progress to a priority one item.
- Priority Three: Short Term Conditions (1-2 Years) – These items are needs that are necessary to the function of the facility, but may not require immediate attention.
- Priority Four: Long Term Requirements (2-4 Years) – Items or systems observed which are likely to require attention within the next five years, or would be considered an enhancement to the facility.
- Priority Five: Aesthetic Enhancements (3-4 Years) - Items that are considered a functional enhancement or aesthetic improvement to the facility.

A Structural Conditions Assessment (SCA) can be used for:

- Identification of Immediate facilities needs or mission critical facility items;
- Prioritization of short and long term needs across a range of facility types;
- Justification for major renovations and in some cases building replacement;
- Determination of capital renewal or replacement needs for structural systems that are projected to reach the end of their useful life in the next ten years; and
- Supporting capital planning and annual budgets.

Photographs were taken to document and record the general condition as well as the distressed areas. All descriptions of the site conditions present herein accurately reflect EDA's observations as of the latest date of its on-site visit(s).

DESCRIPTION

The Project consists of a conditions assessment of an existing two story structure. The original building located at 85 Main Street in South Hadley was a single story structure built circa 1926. A second story was later added in 1941. The attached single story garage was added in 1968. The present day structure has an approximate footprint of 17,440 square feet.

EXISTING CONDITIONS

The two story office building has membrane roof with brick parapets around the four sides. The roof has two roof drains and there is evidence that at some point in time there has been an issue with ponding. The drain on the west side must have been clogged or was not functioning properly. Each drain should be cleaned and inspected to avoid the additional loading from ponding.

The exterior wall assembly of the office building is a multi wythe brick masonry. The walls are load-bearing and therefore transfer the roof and floor loads to the foundation. On both the east and west walls there are a series of vertical cracks and sections need repair and re-pointing. The steel lintels above the windows appear to be in generally fair condition.

The roof structure is comprised of wood beams that either bear upon the exterior masonry walls or a series of steel beams that run down the middle of the building in the north-south direction. The roof deck consists of wood tongue & groove decking. The majority of the wood beams have some degree of checking and cracking running through them. This is not uncommon for wood members of this size. None of the cracks translated through the entire width of the beam. There are significant step cracks in the brick wall. The cracks translate from the bearing end of the wood beams. The cracks only appear to be in the interior most wythe of the wall. The repair for this condition will need to be addressed on a beam by beam basis and addition investigation may be required. The load from the interior line of steel beams is transferred to the foundation through a series of steel columns. All of the steel appeared to be in good general condition. When the two HVAC units were placed on the roof, additional steel beams were added to the roof structure in order to properly support the steel dunnage on the roof.

The present day Second Floor framing system is actually the original roof structure. In 1941 the original roof structure was supplemented with a series of structural steel beams in order to achieve the higher live load required for offices. The original roof framing was constructed similar to the roof with steel beams for the primary and wood joists for the secondary infill members. The exterior brick wall provides support for the beams at the perimeter and a line of steel beams and columns support the framing at the approximate midspan of the building.

The First Floor framing consists of wood beams as the primary members with wood joists that frame over the top of the beams. The floor system is finished off with diagonally laid wood decking. The primary beams either bear upon the foundation wall or isolated columns and piers. Overall the framing appears to be in good general condition with only minor modifications over the years.

The foundation of the Office Building is a masonry block wall that bears upon what is assumed to be a cast in place concrete spread footing. Around the perimeter of the building, the masonry terminates at the underside of the floor joists at which point the wall transitions to a multi-wythe brick wall. Over the course of time, a number of new interior columns were added to reduce the overall span of the wood beams thereby remedying some of the more noticeable pitches in the floor. The foundation wall appeared to be in good general condition. There were a few minor cracks observed but none appeared to translate through the interior face of the masonry unit. The basement floor consisted of a concrete slab.

The garage structure is a low sloped pre-engineered metal building, circa 1968, with metal wall panels. The foundation wall for the main structure is cast in place concrete. On the north side there is a pre-engineered lean-to frame that ties into the main frames of the garage and on the opposing side the frame columns bear upon the seawall that parallels the river. The garage bay has a raised loading dock on the north side and (5) double wide truck bays on the south side. The concrete slabs appear to be in good general condition. The original metal roof has been covered with a membrane roof. On the north and south side of the main garage there is a significant roof overhang, approximately 6-feet, with a gutter and downspouts. On the north side of the garage, the eave/ soffit are exposed to the weather. As a result, the exposed frame members, purlins, and roof decking are exhibiting varying degrees of deterioration caused by rust. Entering the garage, the main frames consist of tapered columns and beams as the primary framing members with ZEE purlins as the secondary infill members. The main frames appeared to be in good general condition, however, a number of the ZEE purlins have rolled. This condition is typically a result of an unbalanced snow load and/or sliding snow. A number of the bridging rods are no longer engaged and many are bent. At some time, the original skylights were removed, the openings decked over, and new roofing was installed. On the whole, the siding is worn and rusted in many areas.

To the west of the garage area there is a parts/storage area which is part of the pre-engineered metal building. It too has metal wall panels. The foundation wall is cast in place concrete as is the slab on grade. Unlike the main garage, the storage area does not have the same 6-foot roof overhang. The main frames have tapered columns and beams with ZEE purlins as the secondary infill members. There is an underslung castellated hoist beam attached to the main frames. Both the main frames and purlins appear to be in good general condition, however, the exterior siding is worn and rusted in many areas.

RECOMMENDATIONS

Prior to the beginning of the 2014-2015 snow season, the two roof drains on the roof of the two story office building should be cleaned and inspected. Maintenance of this type will prevent ponding and the addition load it would impose upon the existing roof structure.

The cracks in the exterior wall assembly on the west side of the office building should be repaired and the deteriorated joints should be re-pointed. On east wall the series of vertical cracks should be repaired as should the crack in the foundation wall. The joints in the brick should be inspected and re-pointed as required. All of the steel lintels above the windows should be cleaned and inspected. If deemed acceptable, the lintels should then be painted. Any deteriorated lintels should be repaired and/or replaced.

On the Second Floor, the step cracks that occur at the exterior bearing walls should be repaired and damaged brick should be replaced. The wood roof beams should be periodically inspected to verify the checks do not translate through the entire width of the member and that the cracks do not elongate and span more than 1/4 of the beam's length. If either condition presents itself, a thorough investigation should be conducted by a Structural Engineer.

To prevent water infiltration into the basement, the few cracks that occur in the masonry block foundation wall should be repaired with an appropriate cementitious or epoxy material. .

The only **Mission Critical** concern that has to be address is with the purlins framing the main garage roof. Since it is a low sloped pre-engineered metal building that is more apt to hold snow and ice, the condition of these purlins should be further investigated before snowfall this year. It is not an exact science as to when the purlins will rotate enough to render them incapable to carry the imposed roof loads. One possible remedy that would stabilize and prevent further rotation of the purlins, involves the installation of solid blocking between the purlins. There are other options, including additional rod bracing, diagonal bracing, and the installation of supplemental purlins. Further analysis would be required to determine the most efficient and economical approach.

On the north side of the garage, the exposed framing at the eave/ soffit should be cleaned, inspected, repaired as required, and painted. The soffit should also be protected from the elements (Refer to the Architectural section).

If a new roof is slated for the pre-engineered metal building, a series of design-check calculations will need to be conducted to determine whether or not the existing frames, purlins, and metal roof decking can adequately support the new roofing as well as any increased snow loads.

Around the entire perimeter of the pre-engineered metal building, the deteriorating/ rusted sections of the metal wall panels should be cleaned, inspected, repaired, and painted to prevent further damage from the weather, or replaced in their entirety.

Cross Tab of Current Deficiencies

The following chart summarizes the current deficiencies for this site in a cross tab that shows the building systems down the left and the priority of the deficiency across the top. This listing consists of current deficiencies including deferred maintenance, functional deficiencies, and code compliance.

	Priority					
Structural System	**1**	**2**	**3**	**4**	**5**	**Remarks**
Foundation Elements (Office)			■			Crack Repair in the Exterior Wall to Prevent any Water Infiltration
Exterior Wall Elements (Office)			■			Clean, Inspect, Repair, and Paint Lintels
Exterior Wall Assembly (Office East & West Walls)		■				Repointing and Crack Repairs in the Exterior Brickwork
Exterior Wall Assembly (Office at Main Entry Door)		■				Repointing and Repair the Exterior Brickwork
Foundation Element (Main Garage)			■			Crack Repair on North Side to Prevent Water Infiltration
Roof Purlins and Bridging System (Main Garage)	■					This should be addressed prior to the 2014-15 snow season.
Roof Framing System (Office)		■				Clean and Inspect Roof Drains prior to the 2014-15 snow season
Roof Framing System (Office Second Floor Interior)		■				Repair cracks in exterior wall assembly. Typical at most beam locations

PHOTOGRAPHS

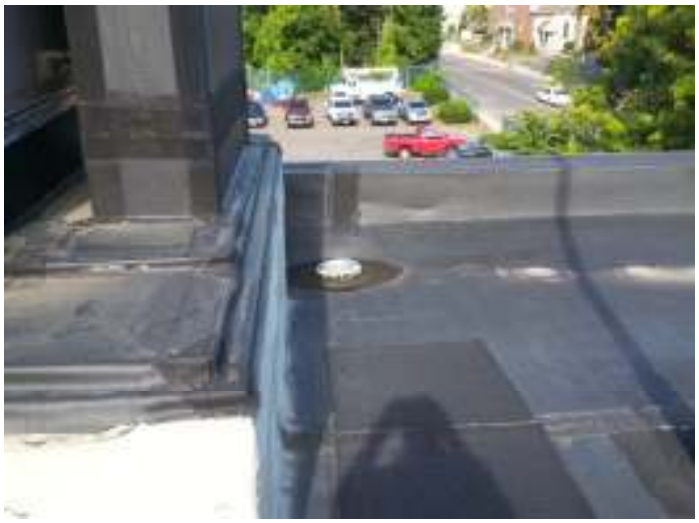


Photo 1 - Roof Parapet and Drain

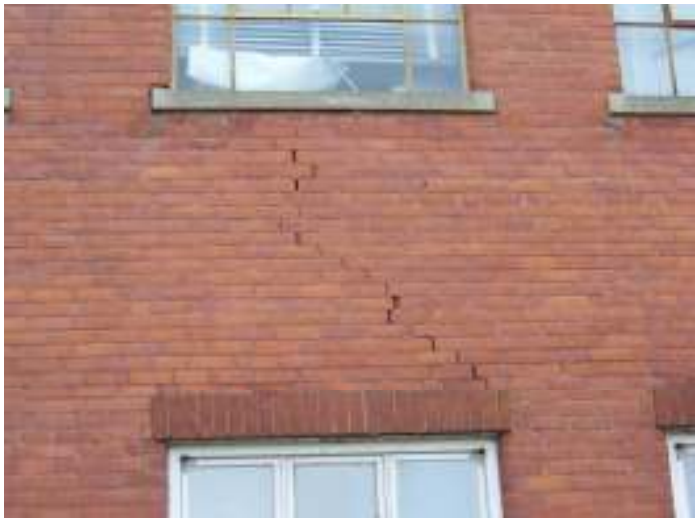


Photo 2 – Stepped Cracks in Brick (West Elevation)

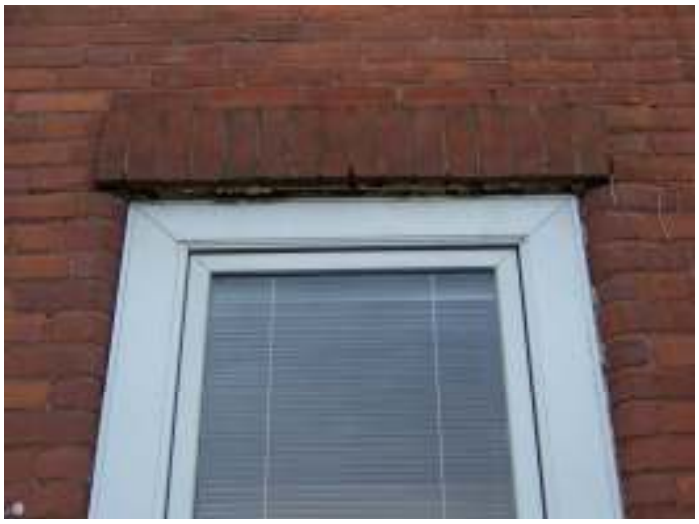
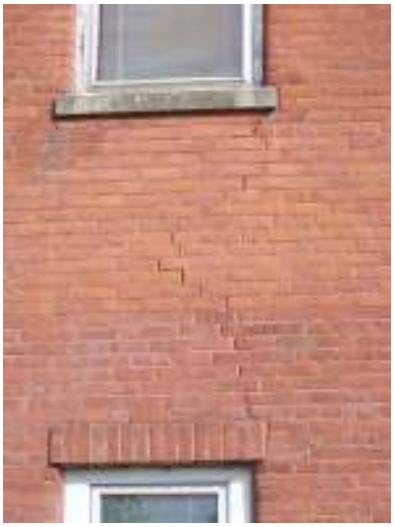


Photo 3 – Deteriorating Steel Lintels (West Elevation)

Photo 4 – Brickwork Requiring Repointing (West Elevation)



Photos 5 & 6 - Stepped Cracks in Brick (East Elevation)

Photo 7 – Foundation Crack (East Elevation)

Photo 8 - Brickwork Requiring Repointing/Repair (South Elevation)

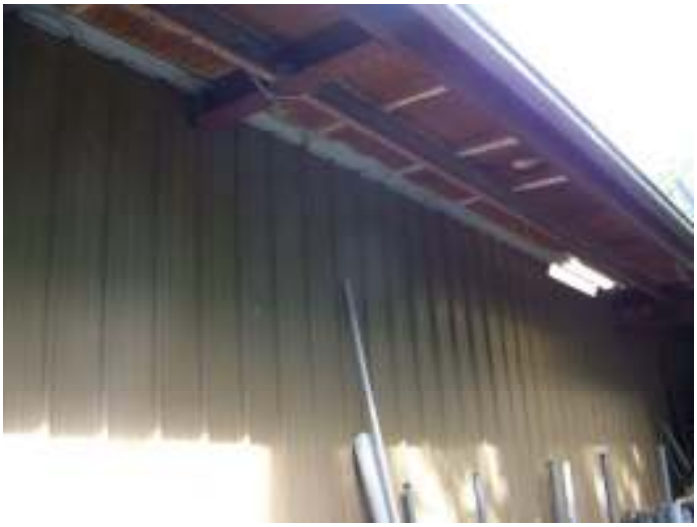


Photo 9 – Exposed Framing at PEMB Eave (North Elevation)

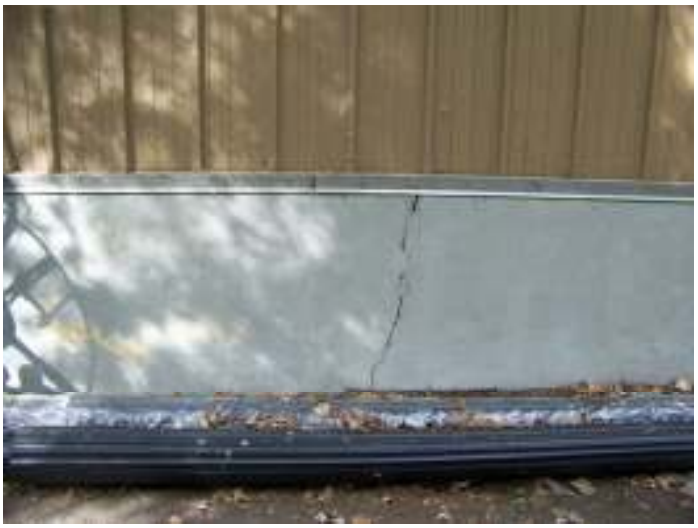


Photo 10 – Crack in Foundation Wall (North Elevation)

Photo 11 – PEMB Lean To at Storage Area (North Side)

Photo 12 – Gable End Wall of Garage (East Elevation)

Photo 13 – Overhead Doors at Main Garage (South Elevation)

Photo 14 – Tapered PEMB Frames at Elevated Dock (Main Garage)

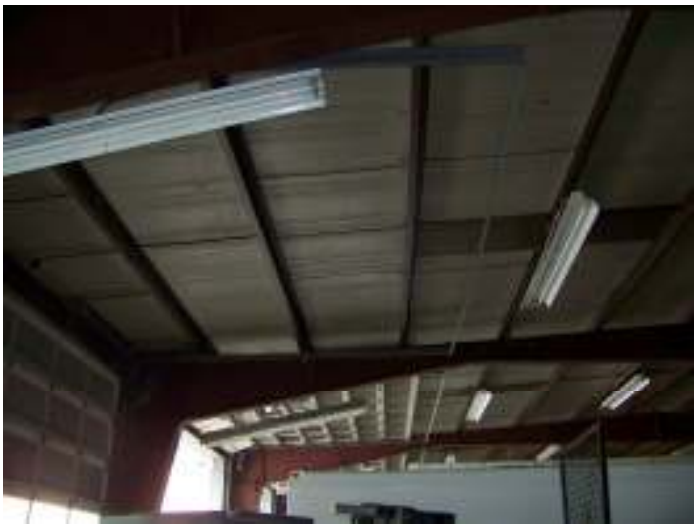
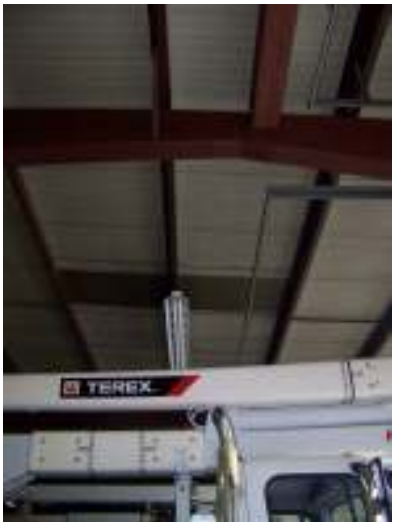
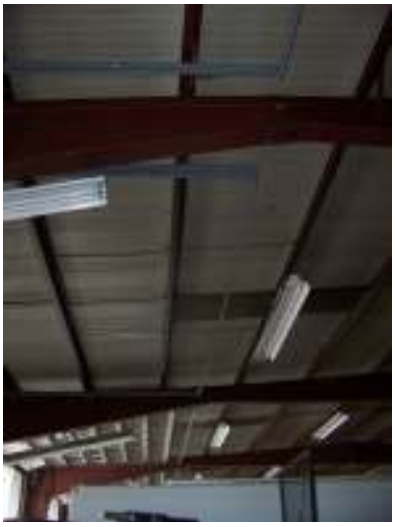


Photo 15 – Tapered PEMB Frames and Purlins (Main Garage)





Photos 16 & 17 – Close Ups of Tapered PEMB Frames and Purlins (Main Garage)

Photo 18 – Close Ups of Tapered PEMB Frames and Purlins (Main Garage)

QUALIFICATIONS

The statements of this report reflect the professional opinions of RAI and EDA and are based on visual impressions of the conditions that existed at the time of the site visit and of areas that were reasonable accessible and the exposed to view structural members. The observations and report are not intended to be technically exhaustive, or to imply that every structural component was inspected, or that every possible defect was discovered. No disassembly of equipment, opening of walls, moving of furniture, appliances or stored items, or excavation was performed. All components and conditions, which by the nature of their location are concealed, camouflaged or difficult to inspect, are excluded from the report. No physical testing was performed and no design-check calculations have been made to determine the adequacy of the Building and structural systems.

The systems and conditions that are not within the scope of the assessment include, but are not limited to the following: formaldehyde, lead paint, asbestos, toxic or flammable materials, water quality and other environmental hazards; pest infestation, efficiency measurement of insulation or heating and cooling equipment, internal or underground drainage or plumbing, any systems which are shut down or otherwise secured. Any general comments about these systems and conditions are informational only and do not represent an inspection.

The conclusions presented, represent RAI and EDA's professional judgment based on information obtained during the course of this assignment. RAI and EDA's evaluations, analyses, and opinions are not representations regarding the design, integrity, structural soundness, or actual value of the property. Factual information regarding operations, conditions, and test data provided by the Client has been assumed to be correct and accurate and complete. The conclusions presented within the report are based on data provided; observations made, and condition that exist specifically on the date of the assessment.