CLA Engineers, Inc.
Civil • Structural • Survey

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September 16, 2011

Mr. Alan Bergren
City Manager
City of Norwich
100 Broadway, 2nd Floor
Norwich, CT 06360

Re: Limited Structural Condition Assessment
The Reid and Hughes Building
193-201 Main Street
Norwich, CT
CL-11-4857

Dear Alan:

As requested, we have visited the above referenced structure to review its general structural condition. Our structural condition assessment is limited to our opinions of the structural condition of the building based upon limited visual observations of accessible areas. In some areas, the presence of finish materials limited our ability to directly observe structural elements, but many of the structural elements are exposed and available to view. No material tests or physical probes were performed. CLA Engineers is not responsible for evaluation for the presence of hazardous materials, evaluation for the presence of mold, evaluation for the presence of wood destroying insects, or any other discipline outside of structural engineering for the subject structure.

No construction drawings or other documentation for the subject building were available at the time of the survey. According to the City Assessor's records, the structure was constructed in 1880.

Structural work recommended in this report is not intended to be a specification for construction. Additional structural design work and the preparation of detailed framing plans, details, and specifications would be required to properly address the scope of structural repairs for any structural rehabilitation of the structure. Any changes to the existing building configuration will require reevaluation of recommendations contained in this report.

GENERAL DESCRIPTION:

The building is located on the south side of Main Street (which generally runs east-west in this area). The building has been vacant for an extended period of time (perhaps 25 to 30 years). The building is generally comprised of two main portions.

The east portion of the building, historically referred to as the Reid and Hughes Building, is approximately 36 feet by 100 feet, with the long dimension perpendicular to Main Street. The Reid and Hughes Building was reportedly built in 1898. The Reid & Hughes has four floor levels with a partial fifth floor mezzanine level located at the north side of the building (approximately 36 feet by 23 feet).

The adjoining building directly to the west of the Reid and Hughes Building, originally named the Williams and Chester Building, is approximately 22 feet by 100 feet, with the long dimension perpendicular to Main Street. The Williams and Chester Building was reportedly built in 1869. At the Williams & Chester Building, the second and third floors are of smaller size than the first floor (approximately 22 feet by 34 feet, located toward the north side of the building). The Williams and Chester Building abuts the Shannon Building which is located to the west. The east side of the Reid & Hughes Building abuts the building formerly known as the Strand. The adjoining buildings are open to each other and function as one building. A key plan is appended to this report.

The load bearing walls of the original structure consists of unreinforced brick masonry walls of varying thickness. Near the base, the walls are approximately 16-20" thick with lime/sand mortar joints. Just below the roof level at the Reid and Hughes building, the brick masonry is 12" thick. The parapets above the roof level are 8" thick. The brick masonry wall at the 4th floor of the northwest portion of the Reid and Hughes Building is supported by steel beams at the 3rd floor level. The brick masonry walls at the east and west sides of each building support the joist framing that generally spans east-west.

The floor framing systems for the each of the four floor levels of the original building follow the same structural pattern. The wood joists run in the east-west direction parallel to Main St. The floor decks in the building consist of tongue and groove ¾" boards. Ceilings are lathe and plaster, with several areas containing additional ceiling systems of gypsum, tin and/or hung acoustical tile. All of the interior finish systems have failed.

First Floor Framing:

The first floor framing consists of 3"x11¼" wood floor joists spaced 16" on center. The joists have clear spans ranging from 17'-10" to 20'-6". Floor joists bear on an

interior stone masonry wall and a double 15" deep steel channel carrying beam with steel angles fastened to each side of the channels to support the joists. A significant area of the Williams and Chester Building's first floor structural system has suffered from fire damage.

Second Floor Framing:

The second floor framing consists of 2½"x12" and 3"x10½" wood floor joists spaced 16" on center. The joists have clear spans similar to the floor below and are supported by two lines of carrying beams. The carrying beam at the Reid and Hughes Building consists of 8½"x11½" wood beams supported by cast iron fluted columns. The carrying beam at the east side of the Williams and Chester Building consists of double 18" deep steel "S" shapes which support the loads from the second floor joist framing.

A secondary floor system exists above the main floor framing and floor deck. Presumably this system was installed to mitigate deflections in the original floor framing. The secondary system generally consists of 2x4 sleepers at approximately 16" on center with a ¾" tongue and groove wood deck. Where the secondary system was observed, it appeared to be correcting approximately 3" of floor deflection.

At the rear (south) of the Williams and Chester Building, a ceiling framing system above the first floor supports portions of the roof above.

Third Floor Framing:

The third floor framing consists of 2-7/8"x13" and 2½"x12" wood floor joists spaced 16" on center. The joists have clear spans similar to the floors below. At the Reid and Hughes Building, the joists are supported by a double timber carrying beam (one beam on top the other) running the depth of the building. At the east side of the Williams and Chester Building toward the north end of the building, the floor joists are supported by two 18" deep steel "S" Shapes with 6" wide flanges. These steel beams also support the brick masonry wall above the 3rd floor. Each of the carrying beams is supported by cast iron interior columns. Safety concerns regarding excessive bird droppings from pigeons prevented detailed visual observations at the north end of the Williams and Chester Building.

A secondary floor system exists above the main floor framing and floor deck. Presumably this system was installed to mitigate deflections in the original floor framing. The secondary system generally consists of 2x4 sleepers at approximately 16" on center with a ¾" tongue and groove wood deck. Where the secondary system was observed, it appeared to be correcting approximately 3" of floor deflection.

Fourth Floor Framing:

The fourth floor framing consists of 2¼"x9¼" wood floor joists spaced 16" on center. The joists have clear spans of approximately 18 feet. Down the middle of the fourth floor framing, the joists are supported by double 8" deep steel "S" shapes with an 8"x10" wood beam on top of the steel beams.

A secondary floor system exists above the main floor framing and floor deck. Presumably this system was installed to mitigate deflections in the original floor framing. The secondary system generally consists of 2x4 sleepers at approximately 16" on center with a ¾" tongue and groove wood deck. Where the secondary system was observed, it appeared to be correcting up to 6" of floor deflection.

Partial Fifth Floor Mezzanine Framing:

The partial fifth floor framing located at the north end of the Reid and Hughes building consists of 5½" x 11½" wood floor joists spaced 48" on center. In between these joists there are 2"x6" joists framed to 4"x6" cross joists (perpendicular to the 2x6 joists).

Roof Framing:

Over the main Reid & Hughes building, the roof framing system consists of 3" x 9%" wood rafters spaced 24" on center. Plywood sheathing has been installed over portions of the roof. This appears to have been installed when this main roof covering was replaced at the Reid and Hughes, perhaps 15 years ago. The main roof over the Reid and Hughes building is supported at the east and west sides of the building by the exterior unreinforced brick masonry walls. Down the middle of the building, the rafters are supported on a sloped wood roof truss which has been attempted to be strengthened with steel angle and tension rods in the past. The roof truss is in poor structural condition and has failed in several locations along its length. A portion of the wood truss has been temporarily shored off the fourth floor to address a roof truss failure in 2001.

Safety concerns regarding excessive bird droppings from pigeons prevented detailed visual observations at the roof at the north end of the Williams and Chester Building. The roof coverings at the Williams and Chester Building have failed and do very little to impede water entry into the building.

OBSERVATIONS AND DISCUSSION:

Water Infiltration:

The building has been subject to water infiltration for a very long period of time. The roof covering systems at the Williams and Chester Building have entirely failed, causing large amounts of water to enter the building. The water then cascades through the building and into the basement. This water collects in the basement and causes the relative humidity inside the building to be constantly high. The water from the Williams and Chester Building also enters the Reid and Hughes Building, especially at the first floor where water saturates the rear of the building during rain events.

The water infiltration and the high humidity inside the building cause excessive moisture levels in the wood framing. This high moisture content leads to the biodeterioration of the wood framing. Advanced levels of biodeterioration of the wood framing is observed in many areas of the Reid and Hughes building, but is most obvious at the basement level (first floor framing) and the second floor framing, where the advanced fungal decay is evidenced by white colored fruit bodies and by a strong unpleasant odor.

As a result of the extensive water infiltration, biodeterioration of the wood framing is found throughout the Williams and Chester Building, and was observed at some portions of the first and second floor framing at the Reid and Hughes Building.

While the roof covering system at the Reid and Hughes appears to be currently intact, evidence of past water infiltration and subsequent water damage was observed. It appears that water infiltration has caused damage to the structure in the vicinity of the elevator toward the south end of the Reid and Hughes Building. It appears that water damage to the structure as a result of this has extends from the roof level through the second floor framing.

Water damage to the structure was also observed near the center of the Reid and Hughes building approximately 30 feet from the north façade. Shoring was installed in this area at the 4th floor in 2001 to repair damaged structure. It appears that water damage to the structure in this vicinity also extends from the roof level through the second floor framing.

The Williams and Chester Building:

The Williams and Chester Building has suffered from years, perhaps decades, of exposure to excessive moisture. Evidence of structural deterioration is observed throughout the building, especially at the wood framing. Rehabilitation of the existing

structural systems at the Williams and Chester building will essentially require reconstruction of each of the existing structural systems, as the structural damage to the building is in most cases beyond repair. The roof framing systems at the Williams and Chester Building are in danger of collapse.

Basement Level / First Floor Framing:

Our personnel made very limited observations at the basement area due to safety concerns. Excessive moisture infiltration and long term saturation of the majority of the first floor framing has caused biodeterioration at much of the first floor framing. The biodeterioration is evidenced by white colored fruit bodies and/or mold that covers large portions of the wood framing and some finishes at both the Reid and Hughes Building and the Williams and Chester Building. Some fire damage to the first floor wood framing was observed at the Williams and Chester Building.

Even near the north end of the first floor of the Reid and Hughes Building, far removed from areas that appear to be currently subject to water infiltration, there is evidence of water damage. Near the front entry to the building, the first floor deck can be observed to be severely weakened as a result of prolonged exposure to moisture. This may be a result of long term exposure to moisture at the underside of the first floor framing due to water infiltration from the south and west portions of the building or from previous water infiltration.

The steel framing that supports the first floor appears to be in good structural condition, with some surface rust present.

While our observations were limited, it appears that the vast majority of the wood framing at the first floor is structurally inadequate due to moisture damage to the wood framed joists and deck.

An under sidewalk vault was observed below the sidewalk to the north of the main portion of the building. Structural systems varied in this area. Barrel vaulted brick masonry was used to support the sidewalk in one area, and what appeared to be structural steel beams supporting a reinforced concrete slab in another area. We did not make detailed observations here due to safety concerns. While we did not observe any glaring structural failures to the sidewalk vault framing system, some deterioration of the steel beams and the steel reinforcement at the concrete slab was observed. We recommend that these systems be more closely inspected with proper safety gear and that the Fire Department be informed not to access the sidewalk with emergency vehicles.

Second Floor Framing:

There are numerous structural failures at the second floor framing. Water damage has as contributed to failure of the main north-south girder near the stair opening toward the southwest comer of the Reid and Hughes building. Finishes limited our observations in some areas, but it appears that there could also be a failure of this beam at the second span fi-om the north end of the building. Shear failures at the connection between the joist framing and the main north-south girder at the Reid and Hughes Building were also observed. The shear connection consists of a mortise and tenon connection that severely limits the shear strength of the joists.

A secondary floor system has been installed above the original second floor framing to correct deflections in the floor. This system has done nothing to address the underlying cause of floor deflections, and in fact exacerbates the problem by adding additional dead load to the floor framing system. The floor appears to have experienced additional deflections after the installation of the secondary system. The cause of the floor deflections may be due to structural inadequacies of the girder framing, foundation settlement, differential shrinkage between the wood framing and the brick masonry, or some combination thereof.

Some severe deflections are present at the second floor. Some of the deflections appear to be the result of floor framing failures near the center of the building and/or failures of the shear connection between the joists and the main girder. It also appears that a previous opening in the floor (perhaps from a previous set of stairs that was removed) was infilled near the northwest portion of the Reid and Hughes Building. It appears that the opening framing may be inadequate, causing additional floor deflections in this area of the building.

The ceiling framing near the second floor level at the Williams and Chester Building supports portions of the roof above in addition to supporting the ceiling finishes (that have failed). The water damage in this area of the building is severe and the rear portions of the Williams and Chester building are in danger of collapse.

Third Floor Framing:

The third floor framing is similar to the second floor framing in terms of layout. It appears to be in better condition than the second floor. This is likely due to the fact that the main girders at the third floor are larger and stronger than those at the second floor. The shear strength of the joist-girder connection is similar to the connection on the second floor and is considered inadequate.

The third floor has a secondary system similar to the second floor. While this level does not appear to have any failures of the joists or girders, there are deflections to the floor framing that appear to have occurred after the installation of the secondary system. The secondary system appears to correct approximately 3" of deflection.

Similar to the second floor framing, previous water infiltration at the Reid and Hughes building appears to have damaged portions of the third floor framing.

Safety concerns prevented us from entering the Williams and Chester Building on this level. The third floor at the Williams and Chester Building is covered with pigeon droppings, which tends to exacerbate moisture problems. The droppings tend to hold onto moisture and accelerate damage to wood framing in the presence of available moisture sources. We would expect that the floor framing at the Williams and Chester Building at this level to be in poor structural condition.

Fourth Floor Framinq:

The condition and configuration of the fourth floor is similar to the third floor, except that the secondary structural system at the fourth floor appears to correct approximately 6" of differential floor settlement near the center of the Reid and Hughes Building. In addition, the main girder at the Reid and Hughes at this level is comprised of two (2) 8" deep steel beams. The steel beams appear in good condition. The Williams and Chester Building does not have a fourth floor.

Partial Fifth Floor Mezzanine Framinq:

The fifth floor mezzanine framing is in good structural condition. This framing does not appear to be original to the building. The framing layout chosen provides an inadequate live load capacity for almost any modern use. It appears that it may also be a liability in terms of egress and in terms of architecture. The fifth level offers limited headroom. It appears that the removal of this level would be beneficial.

Roof Framing:

Portions of the main roof framing at the Reid and Hughes building, especially toward the rear of the building, are damaged by exposure to moisture. The roof did not appear to be actively leaking during our time on site. Portions of the plywood sheathing have been replaced, presumably during the roof replacement project that took place approximately 15 years ago. Toward the rear of the building, water damaged deck boards were observed that will require replacement. We would also expect some of the joist framing to have latent water damage. The elevator penthouse was not available for observation.

The main girder at the roof level of the Reid and Hughes Building has largely failed and should be replaced. Shoring supports portions of the roof girder toward the north end of the building. It is recommended to remove the existing girder/truss system in this location and install a new girder and column supports.

The roof coverings at the Williams and Chester Building have long ago failed. The roof framing at the Williams and Chester Building is in very poor condition and in danger of collapse.

Exterior Steel Fire Escape:

The exterior steel framed fire escape at the west side of the fourth floor of the Reid and Hughes Building is in very poor condition and has failed in several places. It should be considered and safe and it is recommended that it be removed from service.

Brick Masonry Walls:

The brick masonry walls at the building require improvement. The brick masonry has been covered with a coating system. Coating systems often trap moisture in this type of brick masonry wall unless they are water vapor permeable. Based upon the age and appearance of this coating system, we do not believe it to be vapor permeable. Trapped moisture within the brick masonry walls appears to have weakened the mortar, caused damage to some individual brick units throughout the brick masonry systems, and caused the coating system to fail. Removal of the coating along with repointing and selective replacement of damaged brick units is recommended.

Poor condition of the mortar joints was also observed on the interior side of the wall in areas where they were available to view. Mortar loss was observed at the upper levels of the Reid and Hughes Building. Partial collapse of an interior wythe of brick masonry was also observed. The extent of the poor condition of the mortar cannot be well estimated due to the presence of finishes, but appeared prevalent in the areas available to view.

The copings at the brick masonry parapets at the building are not functioning or have failed. Several of the clay tile copings have been dislodged and have fallen onto the roof. In the areas where the clay tile copings are in place, the joints in between the coping units is open, allowing moisture penetration into the brick masonry.

At the rear of the building, several brick failures have recently occurred over window openings. Some have been repaired. The openings in the brick masonry walls are supported by shallow brick arches and do not have lintels. The condition of the mortar is poor and this has caused several of the shallow brick arches to fail. Several of

the arches appear in danger of failure and some existing failures of the interior wythes of the brick masonry wall can be seen from the building interior. Some of the brick openings are being supported only by the wood framed window units.

Throughout the building, there is no positive attachment between the joist framing and the brick masonry walls. The joists are only pocketed into the brick masonry. Improvements to this condition are recommended.

Elevator Shaft:

The elevator shaft is supported by a steel frame with structural clay tile infill. The structural clay tile is in poor condition and of poor structural quality for this type of use. The steel frame appeared in good condition. Replacement of the structural clay tile system with concrete masonry or a light gauge steel shaft wall system is recommended. Replacement of the elevator car may require additional steel supports to support the vertical rails of a new elevator system.

SUMMARY / RECOMMENDATIONS:

The Williams and Chester Building has extensive damage and the roof framing systems are in danger of collapse. Rehabilitation of the Williams and Chester Building will likely require reconstruction of the buildings structural systems.

While the Reid and Hughes Building is clearly in better condition than the Williams and Chester Building, it has significant structural distress and structural deficiencies at nearly each and every structural system throughout the building. Structural failures and other problems that will require structural intervention exist at the wood floor framing at each level of the building. Unusual deflection of the floor framing systems at the upper floors is prevalent. Secondary systems have been installed on top of the original floor framing that add additional load to the floor framing systems and exacerbate the problem. The steel framing systems, while in good condition, are unacceptably weak in some areas. The load bearing masonry exterior walls will require extensive work to restore to an acceptable structural condition in a good state of maintenance.

The structural deficiencies that require corrective action are summarized below. It is believed that due to the extensive structural damage that exists, any proposed project would require conforming to current building code requirements for new structures unless a waiver modification is obtained based upon the buildings reported status on the historic register. Conforming to current structural provisions of the code, if required, will prove challenging due to the limitations of unreinforced masonry and the lack of any substantial lateral load resisting system in the east-west direction at the current building, especially

toward the north end of the building. While we have visually observed many of the structural deficiencies at the existing building, there appears to be a good likelihood that additional latent (hidden) structural defects are present. Removal of debris and finishes could provide more detailed structural information, if desired.

In summary, our structural recommendations for preliminary budgeting purposes are as follows:

1. Williams and Chester Building:
   a. For budgeting purposes, presume that any structural work at the Williams and Chester Building will require reconstruction of the currently installed systems.

2. Reid and Hughes Building:
   a. 1st Floor Framing:
      i. Demolish all existing finishes.
      ii. Carry a budget for replacement of the first floor framing in its entirety.
   b. 2nd Floor Framing:
      i. Demolish all existing finishes.
      ii. Demolish the secondary floor system.
      iii. Investigate and remediate the cause of deflections near the center of the building.
      iv. Jack existing structural framing as necessary to restore the floor framing to a level and plumb condition.
      v. Provide structural improvements to the mortise and tenon connections between the joists and the girder near the center of the building using joist hangers or other means as appropriate.
      vi. Replace the existing 9x12 timber beam near the center of the building with a properly sized LVL girder or other suitable system.
      vii. Carry a budget for replacement of 15% of the existing floor joists due to latent water damage.
      viii. Carry a budget for replacement of 100% of the existing tongue and groove deck with ¾" plywood subfloor.
   c. 3rd Floor Framing:
      i. Demolish all existing finishes.
      ii. Demolish the secondary floor system.
      iii. Investigate and remediate the cause of deflections near the center of the building.
      iv. Jack existing structural framing as necessary to restore the floor framing to a level and plumb condition.

v. Provide structural improvements to the mortise and tenon connections between the joists and the girder near the center of the building using joist hangers or other means as appropriate.
vi. Carry a budget for structural strengthening of the girder located near the center of the building.
vii. Carry a budget for replacement of 20% of the existing floor joists due to latent water damage.
viii. Carry a budget for replacement of 100% of the existing tongue and groove deck with ¾" plywood subfloor.
ix. Carry a budget for structural strengthening for the 18" deep steel beams that support the brick masonry walls above the third floor.

d. 4th Floor Framing:
i. Demolish all existing finishes.
ii. Demolish the secondary floor system.
iii. Investigate and remediate the cause of deflections near the center of the building.
iv. Jack existing structural framing as necessary to restore the floor framing to a level and plumb condition.
v. Provide structural improvements to the mortise and tenon connections between the joists and the girder near the center of the building using joist hangers or other means as appropriate.
vi. Carry a budget for replacement of 25% of the existing floor joists due to latent water damage.
vii. Carry a budget for replacement of 100% of the existing tongue and groove deck with ¾" plywood subfloor.

e. Mezzanine framing (5th level):
i. This floor framing appears to be in good structural condition, but has limited structural capacity. It appears likely that it may be desirable to demolish this mezzanine area for Architectural reasons. Headroom and egress are limited.

f. Roof Framing:
i. Replace existing damaged timber truss (spanning north-south at the center of the building) with a new LVL girder, temporary shoring as required. 5¼" x 11-7/8" LVL for spans up to 12'-0". 5¼" x 16" LVL for spans up to 18 feet; 5¼" x 18" for spans up to 21'-9";
ii. Replace or add new columns at the 4th floor level to facilitate above work. Approximately six (6) new 5% x 5% LSL columns.
iii. Carry a budget for replacement of 5% of the existing roof rafters due to latent water damage.
iv. Identify and replace previously water damaged roof deck areas, replacing roof coverings as required (assume approximately 1,500 square feet).

v. Replace coping at parapet.

g. Elevator Shaft:
   i. Demolish the Structural Clay Tile system at the elevator shaft and replace with masonry or a light gauge steel shaft wall system as appropriate and as required by fire code.
   ii. Budget for reconstruction of the elevator penthouse.
   iii. Budget for structural improvements to support new vertical steel rail supports at the elevator shaft.

h. Brick masonry and faqade:
   i. Carry a budget for reconstruction of the existing brick masonry parapet.
   ii. Reconstruction of the shallow brick arches over the windows and replacement with galvanized steel lintels.
   iii. 100% repointing of the exterior brick masonry.
   iv. Selectively replace damaged brick units at the building exterior.
   v. Evaluate brick masonry exterior coating and remove and/or replace as required.
   vi. Identify extent of mortar damage at interior side of brick masonry walls and repoint and/or reconstruct as necessary.
   vii. Consider structural improvement of attachments between joists and brick masonry at joist pockets (no positive attachment currently exists).
   viii. Perform a more detailed investigation of the condition of the faqade structural elements and finish materials (requires lift equipment), including the front and rear cornice at the roof level to determine the scope of necessary repairs.

i. Exterior Steel Fire Escape
   i. Demolish the steel fire escape in its entirety.
   ii. Budget for the installation of alternative means of egress as may be required by code – likely in the form of an interior egress stair.

j. Under sidewalk vault:
   i. Perform a detailed evaluation of the sidewalk vault and structural steel framing that supports the public sidewalk. Alternatively, the vault may be filled based upon a proper structural design.
   ii. Notify the local Fire Department that the sidewalk should not be accessed by emergency vehicle wheel traffic.

k. General:
   i. Engage a licensed exterminator to determine if there is an active insect presence within the building and if treatment is necessary.

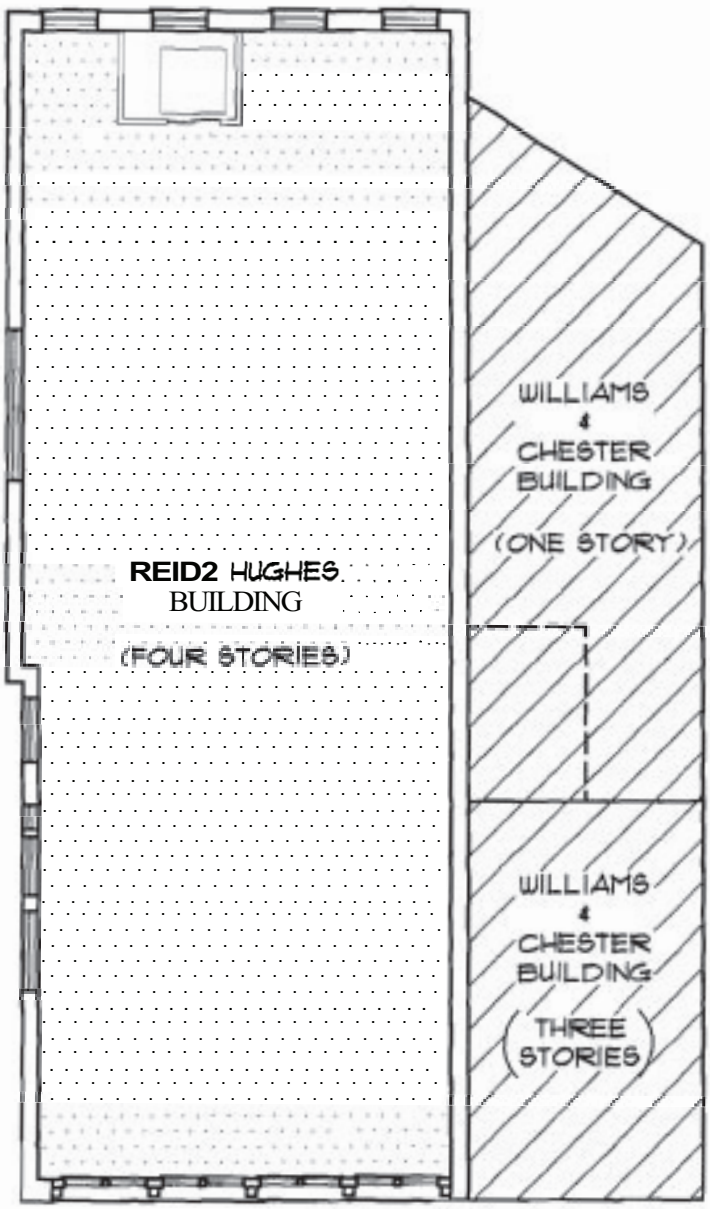
CLA Engineers, Inc. stands behind the accuracy of statements and observations contained in this report, however, this report is not intended to be considered as any guarantee or warranty (expressed or implied) of the present or future structural condition of the building. This report represents our professional opinion based on visible and readily accessible primary structural building components observed during the above structural assessment. This report has been prepared for specific application to the subject project and is not intended as a specification for construction.

In the event that any changes in the nature, design and location of structures is planned, the conclusions and recommendations contained in this report should not be considered valid unless the changes are reviewed and conclusions of this report modified or verified in writing.

Thank you for choosing CLA Engineers. Please call if you need anything further.

Very Truly Yours,
CLA Engineers, Inc.

Garry T. Ferrari, P.E.
Associate



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KEY PLAN

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REID & HUGHES

NORWICH, CT

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Project No.	CL-11-4857
Proj. Engineer:	G.T.F.
Date:	9/16/11
Sheet No.	1