September 28, 2017

Mr. Steve Scruggs
Lakeland Economic Development Council

226 N. Kentucky Avenue
Lakeland, FL 33801

Telephone: 863-687-3788
Email: sscruggs@lakelandedc.com

Subject: Limited Visual Structural Evaluation – Hurricane Irma

Catapult 2.0

Cash Feed Building Renovation
502 E Main Street, Lakeland, FL

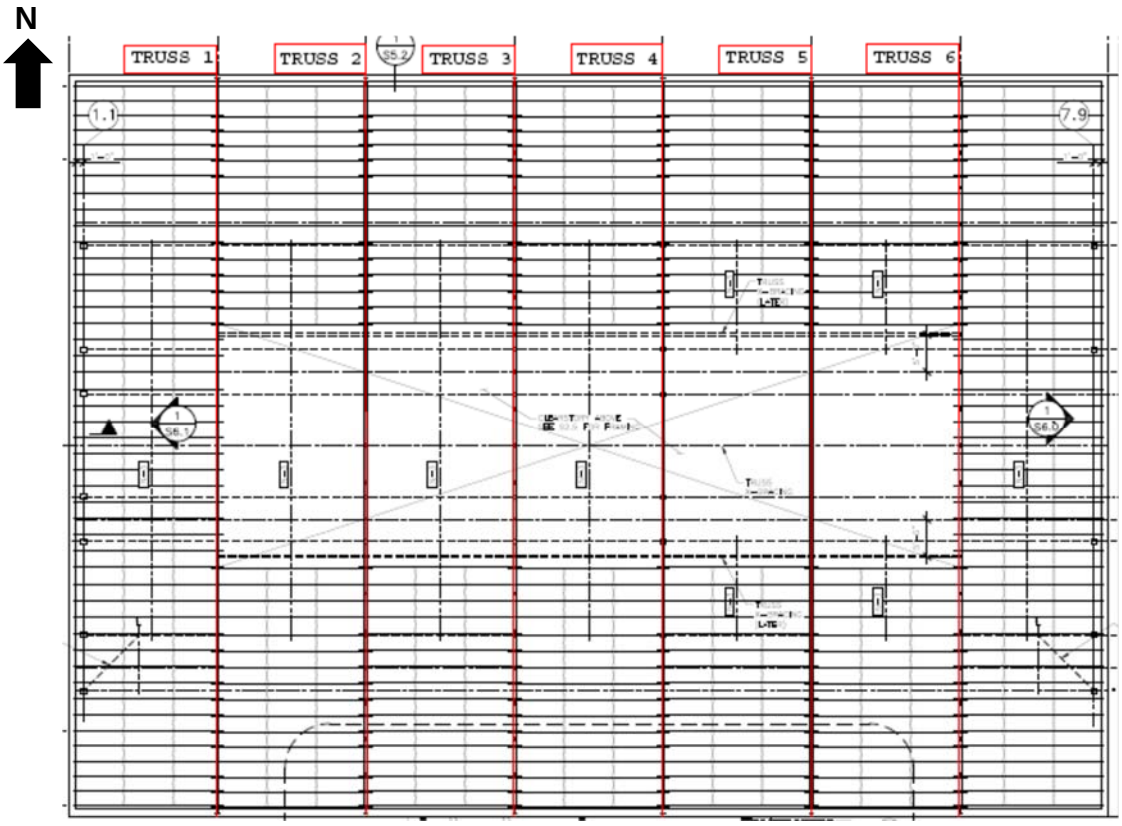
Dear Mr. Scruggs:

Robert J. Reinhart, PE, SI, of Biller Reinhart Engineering Group, Inc. (BillerReinhart) performed a requested limited visual structural assessment at the subject facility on Monday September 25, 2017, due to reported prominent visible displacements of existing main roof trusses and window dislodgement. These observed issues developed into a cause for concern after Hurricane Irma (Category 2 hurricane high wind event) occurred September 10 & 11, 2017, and significantly impacted the City of Lakeland.

The assessment consisted of a visual survey to view accessible/discernible the main roof trusses from the existing second floor and mezzanine along the north end of the building.

The structure is currently unoccupied as construction has only recently commenced to implement City of Lakeland permitted construction documents for renovations, modifications, additions and strengthening scope of work.

For the purposes of this letter, the main roof trusses spanning between the north and south main building walls are designated as TRUSSES 1 through 6 from the west end. See *ROOF REFERENCE PLAN* below.



ROOF REFERENCE PLAN: MAIN ROOF TRUSS DESIGNATIONS

Photographic documentation is included in *Appendix A* and *Appendix B* included with this letter.

Building Description

According to records from the Polk County Property Appraiser's Office, aspects of the building include:

Area:	24,164 SF (Total Under Roof)
Year Built:	1925
Wall Structure:	Concrete
Stories:	1
Wall Height:	24 feet

The main building structure appears to be constructed of cast-in-place concrete foundations and floor slab on grade, hollow building tile (clay/terra cotta block) with some clay brick and concrete masonry unit (CMU) for the exterior walls, and steel girder roof trusses supporting timber rafters and timber plank decking. The main top chords of the steel girder trusses are sloped downward from central peak ridges and also support a central clearstory assembly (primary vertical steel framing, timber rafters and timber plank decking). The steel girder roof trusses are supported at their north and south bearings with steel columns embedded within the walls. The second floor is constructed of various steel framing and timber decking. A mezzanine is constructed along the north end of the building and is comprised of various steel framing and timber decking. The exterior wall surfaces are primarily finished with stucco and paint.

Observations of Main Roof Trusses from September/October 2015

Steel girder roof trusses spanning approximately 100 feet in the north-south direction support timber rafters and timber plank decking. The steel girder roof trusses appear to exhibit surface corrosion, but no significant section loss of elements was observed from accessible vantage points on the mezzanines. Some of the steel girder trusses exhibit bottom chord lateral displacement (horizontal bowing). This condition is most prominent for the west truss. No apparent structural distress was observed from accessible vantage points on the mezzanines at the roof truss north and south bearings and/or attachments. Even though bottom chord lateral displacement was observed on some of the steel roof trusses, no apparent structural distress was observed, i.e., buckling of truss elements, from accessible vantage points on the mezzanines. The lateral displacement of the bottom chords of some of the steel roof trusses is a concern to be addressed. As the building was constructed circa 1925, the steel of the roof trusses is likely ASTM A7 with a minimum specific yield stress of 33 KSI. No lateral bracing and/or cross bracing of the trusses is present. A single steel beam spans east-west across the top chords of the trusses and bears on east and west walls.

Refer to *Appendix A* for photographic documentation.

Previous currently pertinent observations made were as follows (with references to *Appendix A*):

1. Steel girder trusses of main roof framing. Refer to *Figure 1*.
2. West steel girder truss (first truss from west end) exhibited visible lateral displacement. Refer to *Figure 2*, *Figure 3* and *Figure 4*.
3. Second truss from west end exhibited minimal lateral displacement. Refer to *Figure 5*.
4. Third, fourth and fifth trusses from west end exhibited slight lateral displacement. Refer to *Figure 6*.
5. West wall exhibited inward bowing. Roof rafters exhibited some discernible movement relative to the west wall. Refer to *Figure 7*.

6. Steel girder trusses viewed with little visible discernible lateral displacement as of July 25, 2017. See *Figure 8*.

The construction that recently commenced to implement City of Lakeland permitted construction documents for renovations, modifications, additions and strengthening scope of work included lateral bracing systems for both the west and east end walls to alleviate the existing roof trusses from sustaining lateral wind load distribution. The east and west walls were to be braced with steel framing systems tied to a new steel framed core addition to act as a substantial part of the main wind-force resisting system and contribute to the overall stability of the building.

Observations of Main Roof Trusses from September 25, 2017

Portions of the structure were visually observed on September 25, 2017. "Previous observations" refer to observations before Hurricane Irma event. Observations made are as follows (with references to *Appendix B*):

1. The single steel beam spanning east-west across the top chords of the trusses was observed to still bear on east and west walls. Some minor displacement may have occurred. See *Figure 1*.
2. The west steel girder truss (first truss from west end) exhibited significant visible lateral displacement and lateral-torsional displacement (twisting of bottom truss chord). The lateral displacement appeared to be greater than previous observations. The later-torsional displacement was not exhibited in previous observations. Refer to *Figure 2*, *Figure 3* and *Figure 4.*
3. The second steel girder truss from the west end exhibited visible lateral displacement and lateral-torsional displacement (twisting). The lateral displacement appeared to be greater than previous observations. The later-torsional displacement was not exhibited in previous observations. Refer to *Figure 5*.
4. The third steel girder truss from west end exhibited significant visible lateral displacement and lateral-torsional displacement (twisting of bottom truss chord). The lateral displacement appeared to be greater than previous observations. The later-torsional displacement was not exhibited in previous observations. Refer to *Figure 6*, *Figure 7* and *Figure 8.*
5. The fourth steel girder truss from the west end exhibited visible lateral displacement and lateral-torsional displacement (twisting). The lateral displacement appeared to be greater than previous observations. The later-torsional displacement was not exhibited in previous observations. Refer to *Figure 9* and *Figure 10*.
6. The fifth steel girder truss from the west end exhibited visible lateral displacement and minor lateral-torsional displacement (twisting). The lateral displacement appeared to be greater than previous observations. The later-torsional displacement was not exhibited in previous observations. Refer to *Figure 11*.

7. The sixth steel girder truss from the west end exhibited visible lateral displacement and minimal lateral-torsional displacement (twisting). The lateral displacement appeared to be greater than previous observations. The later-torsional displacement was not exhibited in previous observations. Refer to *Figure 12*.
8. The west window on the south building elevation has been dislodged. Refer to *Figure 12.*
9. The main roof was accessed during the site visit. The items noted may be related to the condition of the steel girder trusses.
    a. The east end of the clearstory appeared to be bowing outward toward the west. Roof system exhibited minor buckling. Refer to *Figure 13.*
    b. The east wall parapet exhibited displacement toward the west. Refer to *Figure 14*.
    c. The west end of the clearstory appeared to be displaced – differential movement between top eave and bottom interface with main roof. Roof system exhibited minor buckling. Refer to *Figure 15* and *Figure 16.*
10. Timber roof rafters bearing on the west wall appear to have been displaced. Some of the displacement was exhibited in previous observations. Some minor additional displacement may have occurred. See *Figure 17*.
11. Anchorages and window frame failed at the west window on the south building elevation. See *Figure 18.* This occurrence now elevates the concern that all existing windows and window and door openings are compromised from the storm event.

Conclusion/Recommendations

Based on the visual observations made before Hurricane Irma event compared to those after, BillerReinhart believes the structural capacity of the main steel roof truss girders have been substantially compromised, particularly considering the increased degree of lateral displacement and the introduction of lateral-torsional (twisting) displacement.

BillerReinhart believes the significant wind event of Hurricane Irma was the primary cause of the increased degree of lateral displacement and the introduction of lateral-torsional (twisting) displacement of the main steel roof truss girders. Wind forces (lateral, suction and pressures) act simultaneously on all wall, main roof, parapet and clearstory surfaces. This wind event is considered to be a cause for the window dislodgement.

Even though the east and west walls were planned to be braced with steel framing systems tied to a new steel framed core addition to act as a substantial part of the main wind-force resisting system and contribute to the overall stability of the building, the main steel roof truss girders would still be required to support the gravity loads from the timber roof system and the clearstory assembly. The exhibited lateral displacement and lateral-torsional displacement are indications that the elastic properties of the steel elements comprising the trusses have been exceeded.

The general stress-strain properties of structural steel include:

1. Elastic Range: linear stress-strain behavior, loading and unloading results in no permanent deformation. The service load unit stress in steel design is intended to be within the Elastic Range.
2. Plastic Range: non-linear stress-strain behavior, steel loading and unloading results in permanent deformation.

The overstressing of the main steel roof truss girders results in an unpredictable structural performance. Compromised lateral stability has now escalated into a life safety concern and a dangerous condition.

As defined in the Florida Building Code 5th Edition (2014) Existing Building – Section 202, *Dangerous* is defined as follows:

> *Any building, structure or portion thereof that meets any of the conditions described below shall be deemed dangerous:*
>
> 1. *The building or structure has collapsed, partially collapsed, moved off its foundation or lacks the support of ground necessary to support it.*
> 2. *There exists a significant risk of collapse, detachment or dislodgment of any portion, member, appurtenance or ornamentation of the building or structure under service loads.*

The current state of the main steel roof truss girders is considered to be a significant risk of collapse. Potential dislodgment of windows is also a dangerous condition.

Considering the totality of observed conditions and the resulting unpredictable performance of the main steel roof truss girders under gravity and wind loads, BillerReinhart does not believe that the structure should be occupied. BillerReinhart believes that the structure should be vacated until proper repairs are made to the structure or other options, such as demolition and/or partial demolition with subsequent rebuild, are implemented at the owner's discretion.

In addition to gravity loads, a wind event that would impose loads on all wall, main roof, parapet and clearstory surfaces presents a significant risk of further roof truss lateral displacements and lateral-torsional displacements eventually leading to probable partial or full collapse of the roof structure and east and west walls with subsequent additional damage to other parts of the structure.

Any remedial efforts would likely be an iterative process and include, but not be limited to:

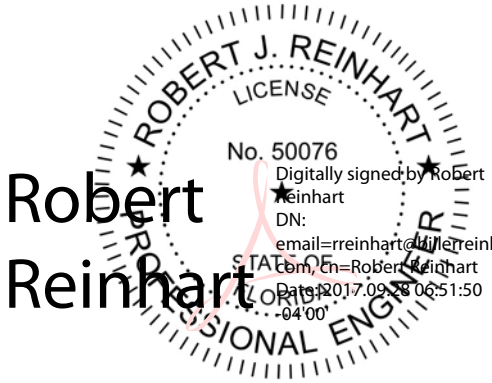
1. A significant shoring effort to un-load the roof trusses. The existing second floor system would need to be considered and factored into the shoring system.

2. Likely complete removal of the timber roof rafters and deck.
3. Installation of new steel girder roof trusses to each side of the existing trusses should they be desired to remain. Permanent supporting structure for the new trusses would be required, i.e., foundations, steel columns and/or integral concrete wall columns and lateral support for the existing trusses should they be desired to remain.
4. Integral wall concrete bond beams to supplement wall stability.
5. New roof deck framing and decking.
6. Clearstory modifications.
7. Chemical grouting process currently required will need to be implemented, perhaps beyond the present scope.
8. Window and door openings (sills, headers, jambs) fully evaluated and supplemented with integral grouting as required. Develop window and door fastening protocol.
9. Consultation with a contractor for construction for logistics and means and methods.
10. Consultation with a contractor for construction estimates as economic feasibility would be a great concern.

The property owner or owner representative shall forward this letter to the county code enforcement officer having jurisdiction. Please contact our office if you have any questions regarding this information.

Respectfully Submitted,

Biller Reinhart Engineering Group, Inc.
State of Florida Certificate of Authorization No. 9149



This item has been electronically signed and sealed by Robert J. Reinhart, PE, on September 28, 2017, using a Digital Signature.

Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.

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Robert J. Reinhart, PE, SI
Vice President / Principal Structural Engineer
Florida P.E. No. 50076

Electronic Distribution: (1) – Addressee
(1) – File

Appendix A

Photographic Documentation – Roof Trusses Prior to 09-11-2017

Figure 1: Roof Trusses 09-14-2015

Figure 2: First Truss from West End 09-14-2015

Figure 3: First Truss from West End 10-27-2015

Figure 4: First Truss from West End 09-14-2015

Figure 5: Second Truss from West End 09-14-2015

Figure 6: Third, Fourth & Fifth Truss from West End Looking N 09-14-2015

Figure 7: West Wall 10-27-2015

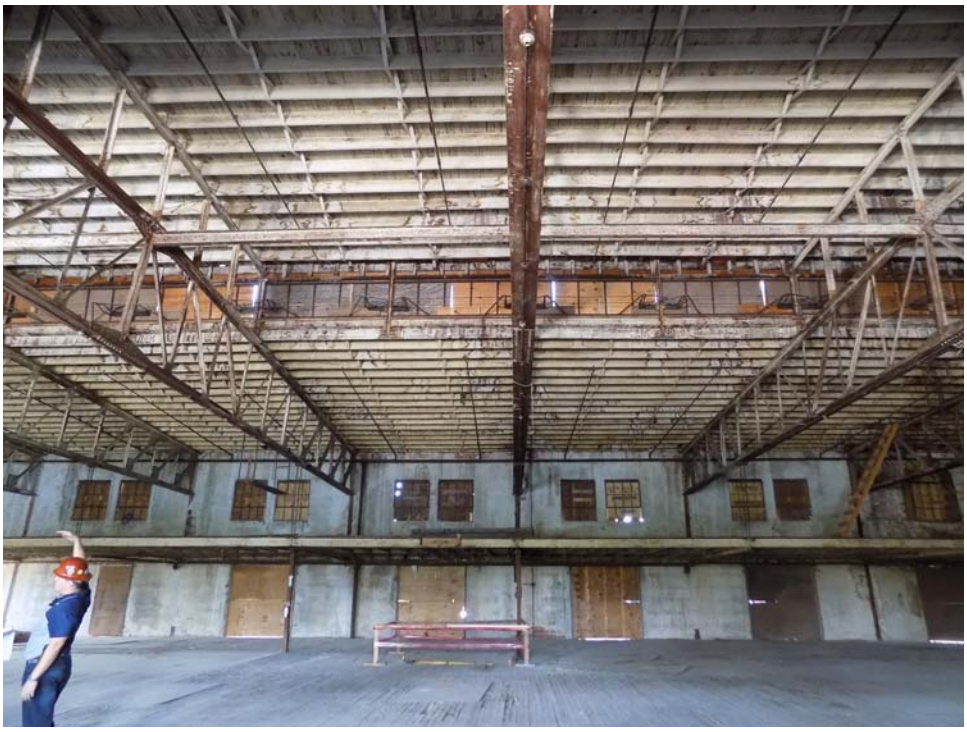

Figure 8: Second, Third, Fourth, Fifth and Sixth Roof Trusses from West End Looking North 07-25-2017

Appendix B

Photographic Documentation – Roof Trusses
09-25-2017

Figure 1: West Wall interface at single top chord truss brace 09-25-2017

Figure 2: First Truss from West End 09-25-2017

Figure 3: First Truss from West End 09-25-2017

Figure 4: First Truss from West End 09-25-2017

Figure 5: Second Truss from West End 09-25-2017

Figure 6: Third Truss from West End 09-25-2017

Figure 7: Third Truss from West End 09-25-2017

Figure 8: Third Truss from West End 09-25-2017

Figure 9: Fourth Truss from West End 09-25-2017

Figure 10: Fourth Truss from West End 09-25-2017

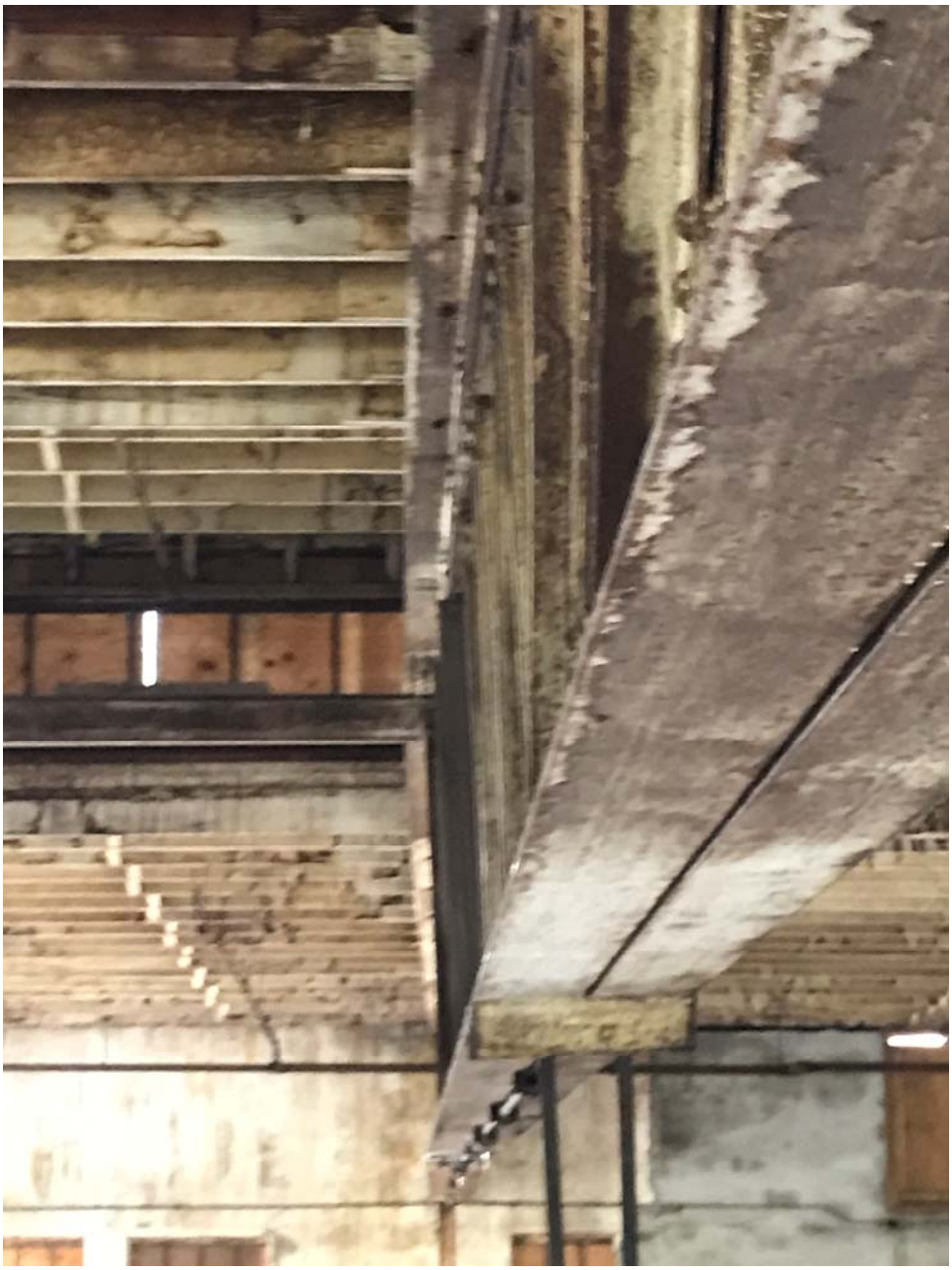

Figure 11: Fifth Truss from West End 09-25-2017

Figure 12: Sixth Truss from West End and dislodged window 09-25-2017

Figure 13: East end of Clearstory 09-25-2017

Figure 14: East Parapet 09-25-2017

Figure 15: West end of Clearstory 09-25-2017

Figure 16: West end of Clearstory – roof system buckling 09-25-2017

Figure 17: Timber roof rafter bearing at West Wall 09-25-2017

Figure 18: Sill and jamb of dislodged window