



Engineers • Consultants • Inspectors

**INSPECTION REPORT
FOR
SARA INVESTMENT REAL ESTATE
FLOOR INSPECTION – 6409 ODANA ROAD**

Prepared by:

GENERAL ENGINEERING COMPANY

916 Silver Lake Drive

P.O. Box 340

Portage, WI 53901

Phone: (608) 742-2169

GEC No. 2-0519-243

INSPECTION REPORT

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- 1.0 BACKGROUND AND GENERAL INFORMATION**
- 2.0 INSPECTION**
- 3.0 SUMMARY AND CONCLUSIONS**

INSPECTION REPORT
For
SARA INVESTMENT REAL ESTATE
MAY 2019

1.0 BACKGROUND AND GENERAL INFORMATION

Brandon Adler of Bouril Design Studio contacted General Engineering Company to inspect a building located at 6409 Odana Road in Madison, Wisconsin. The purpose of the inspection was to determine why the floor system of the second floor of this building was sagging. The inspection was completed on May 16, 2019. Present at the inspection were Kent Fish of General Engineering Company, Steven Lueck and Jared Stinehagen of Sara Investments, and Brandon Adler of Bouril Design Studio.

The building in question is a two story multi-tenant office building. This is a two story wood framed building with a full basement.

2.0 INSPECTION

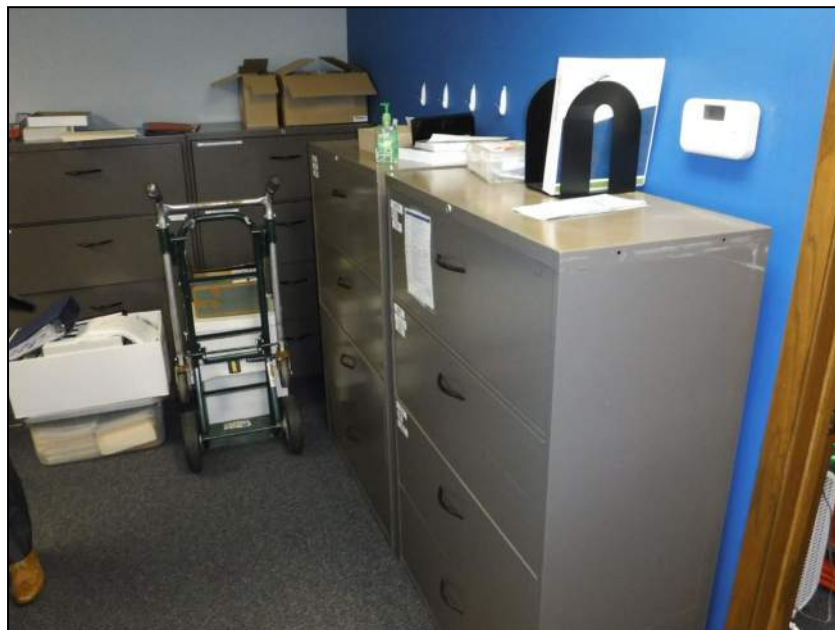
The floor system of this building has two beam lines and three truss spans. The trusses bear on the front wall, then a first intermediate beam, then a second intermediate beam, and then the back wall. The trusses are 18" deep floor trusses that span approximately 20'. The trusses are a top chord bearing truss.



A second floor tenant informed Sara Investment that there was deflection in their floor system. This deflection was mostly in the file room in the second floor of this building. When I entered this room, I found extremely large file cabinets and a shelving system which had paper storage which ran from the second floor almost to the ceiling. The current tenant had already removed some of the storage that was in this room.



The adjacent room has a tool rack that extends from the second floor to the ceiling. This tool rack is loaded on every shelf. Just outside of this room are more banks of very heavy file storage. In an effort to correct the situation, the tenants moved some of the heavy file storage over to the entryway of this facility that already has 3 additional heavy file cabinets.





All of the areas that have the heavy storage have failed the trusses below. The way that these trusses failed is they pulled the web members at the two outer ends through the gang nail plates and displaced the gang nail plates from the bottom chord of the truss. This has dramatically reduced the strength of these trusses.





Short term, I recommend having any tenants above or below this failed floor system removed immediately. Next, I recommend installing temporary supports beneath each end of each of the failed trusses at a panel point. This could be done with a single 2 x 6 stud beneath each panel point or a beam could be installed and larger columns could be installed along the way. Installation of these temporary supports will be necessary to remove the heavy contents from the floor above. Once the contents have been removed, then the trusses can be repaired.

Fortunately the trusses failed in the outer edges which means they will be easier to repair. The repair involves installing plywood gusset plates on each side of each truss with a specified nailing pattern. Please note that it is very important that the contractor nailing the trusses make sure that he hits the web members when completing the repair.

There was one other area where the truss was cut and this truss should be repaired. The truss was cut to install plumbing components.



3.0 SUMMARY AND CONCLUSIONS

The failure of the truss system appears to have been caused by excessive loads applied by a second floor tenant. The second floor storage room and tool rooms were loaded as if they were designed for a 100 lb/sq. ft. floor load. The trusses however were designed to carry 50 lb/sq. ft. which is customary for an office floor. We verified that this was the case by building a computer model of the truss and loading it to 50 psf. I will be sending a repair for the trusses early next week.

Thank you for the opportunity to work with you on this project. If you have any questions, please feel free to call.

Sincerely,



Kent E. Fish, P.E
Vice President

KEF/llf

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**INSPECTION REPORT
FOR
SARA INVESTMENT REAL ESTATE
FLOOR INSPECTION – CLOCK TOWER OFFICE
PARK**



Prepared by:

GENERAL ENGINEERING COMPANY

916 Silver Lake Drive

P.O. Box 340

Portage, WI 53901

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INSPECTION REPORT

For

SARA INVESTMENTS

JUNE 2019

1.0 BACKGROUND AND GENERAL INFORMATION

Sara Investments contacted General Engineering Company to complete an inspection on seven of their buildings located on Odana Road in Madison, Wisconsin. The name of the facility is the Clock Tower Office Park. The purpose of the inspection was to determine if there were issues with the trusses on each of these buildings. Recently one of the floor systems had a structural failure and they wanted to make sure that there were not more with this issue. The inspection was completed on June 4, 2019. Present at the inspection was Kent Fish of General Engineering Company and three members from Sara Investments.

All of the buildings in this business park with the exception of one were constructed in a very similar fashion. Each of the buildings has two floors with a full basement. Each building has three rows of floor trusses that span from the outside wall to a steel beam to another steel beam and then to the opposite outside wall. Each building also has wood framed walls, floors, and roof. The 6 buildings that are of very similar construction are 6325, 6333, 6401, 6409, 6417, and 6425. The one building that is different is 6323.

2.0 INSPECTION

•**Roof Trusses.** Six of the seven buildings have an issue with truss uplift from the roof trusses. The only building that does not have a truss uplift issue is building 6323. Truss uplift occurs when roof trusses are constructed with a ventilated attic. The bottom chord of the truss is located directly above the ceiling and is buried in the insulation therefore it is warmer. The top chord of the truss is up in the ventilated part of the attic and is in the coldest part of the roof. The differential movement of the top chord versus the bottom chord will lift the bottom chord of the truss slightly. This lifting will occur every winter and every summer the lifting will go away. Typically this makes for a large crack that occurs in the winter and the crack heals itself during the summer along any of the interior walls where they meet up with the ceiling. Because the trusses bear on the exterior walls the cracks do not typically occur at the exterior walls.

Truss uplift is a common occurrence. It is typically dealt with in 1 of 2 ways. The first way is to secure the drywall to the wall instead of the truss at the locations where the truss and wall meet. This way when the truss lifts the drywall does not lift with it therefore it does not crack. The other option is to simply cover over the crack by installing trim along the interior wall/ceiling interface.

•**Floor Trusses.** The floor trusses in these buildings are constructed from different manufacturers. Most of the floor trusses use conventional gang nail plates but two of the buildings was constructed with an older style of gang nail plate that does not work as well. The majority of the problems occur in building 6409 which has the older style gang nail plates. The other building with the older style trusses is building 6323 which has shorter spans. This building has very few truss related issues.

•**Building 6323.** This building was built with the older style truss gang nail plates and only one truss was found in this entire building that had an issue. This truss was has been cut to allow for heat duct installation. Repair for this truss will involve installation of either a gang nail plate on each side of the truss or a Simpson nail plate designed to carry this load. Repair of this truss is significantly easier than the repairs for the other trusses.

•**Building 6325.** This building was built with good truss gang nail plates and only one truss was found in this entire building that had an issue. This truss was constructed with the use of one bad wood member. Unfortunately this bad web member was the highest loaded member on the truss near the bearing point and therefore this wood member failed in tension. A repair was designed for the failed trusses in building 6409. The repair for this truss member is the same as it was for all of the other failed trusses.



•**Buildings 6333, 6401, 6417, and 6425.** These 3 buildings do not have any floor truss related issues other than some minor deflections which are within acceptable limits.

•**Building 6409.** Building 6409 is one of the two buildings that are framed with the older style truss plates. There are truss failures that have occurred in many locations in this building. Some had already been repaired prior to the purchase by Sara Investments. The majority of the truss failures however have not been repaired.



The most heavily loaded web member in a top chord bearing truss is always the first diagonal from the bearing point. This is the member that has failed in almost every case. Fortunately this also makes it such that the repair is typically easier because you don't have to try to splice the plywood gusset plates that will need to be installed. I have included a detail that shows the best way to complete these repairs on these floor trusses. Truss failures were found on both the first floor system and the second floor system.

Some of the second floor trusses have been cut. Cutting a floor truss is a very bad idea and heavily compromises the load carrying capacity of the truss. This only happens in one area on this building but it affects approximately 8 – 10 trusses. The repair for these trusses in the same repair as what was prescribed for the previous repair. Plywood gusset plates will need to be installed on both sides of the existing truss.

Some of the failed trusses in this building have been sistered with an I-joist adjacent to the floor truss. Also note that there was one second floor truss that had been cut for plumbing installation.

One thing that can be stated with certainty is that the previous owner of this building knew that there were structural issues with the floors. The fact that there were several repairs made to the floor trusses is proof of that statement.



3.0 SUMMARY AND CONCLUSIONS

All of the buildings with the exception of building 6325 have roof truss uplift issues. This appears to have been an issue for some time because most of the buildings have trim installed along the ceiling line on the second floor. This issue does not represent a structural failure and does not have to be fixed. If however you would like to deal with the aesthetic issue presented then either covering the crack with trim or securing the drywall to the wall instead of the truss at the wall/ceiling interfaces would be your methods of repair.

The majority of the floor truss issues at this facility relate to building 6409. The floor trusses were not designed properly and as a result the gang nail plates are pulling out of the wood. This is happening on both floor levels. In addition to the poor choice of gang nail plates, the contractor had an issue where some of the trusses did not fit. To remedy this situation the contractor cut the

floor trusses. All of the damaged trusses and cut floor trusses will be required to be repaired. In many cases this will involve removal and replacement of ceiling tiles and grids, wiring and ductwork. While this work is being completed, the deflections in the floors can be corrected. This will require the contractor to lift the floor trusses back to the proper levels while the repairs are being made.

The only other floor truss related issues relate to a floor truss being cut in building 6323 and a failure in a wood member in building 6325.

Please review this information and if you have any questions, please feel free to call.

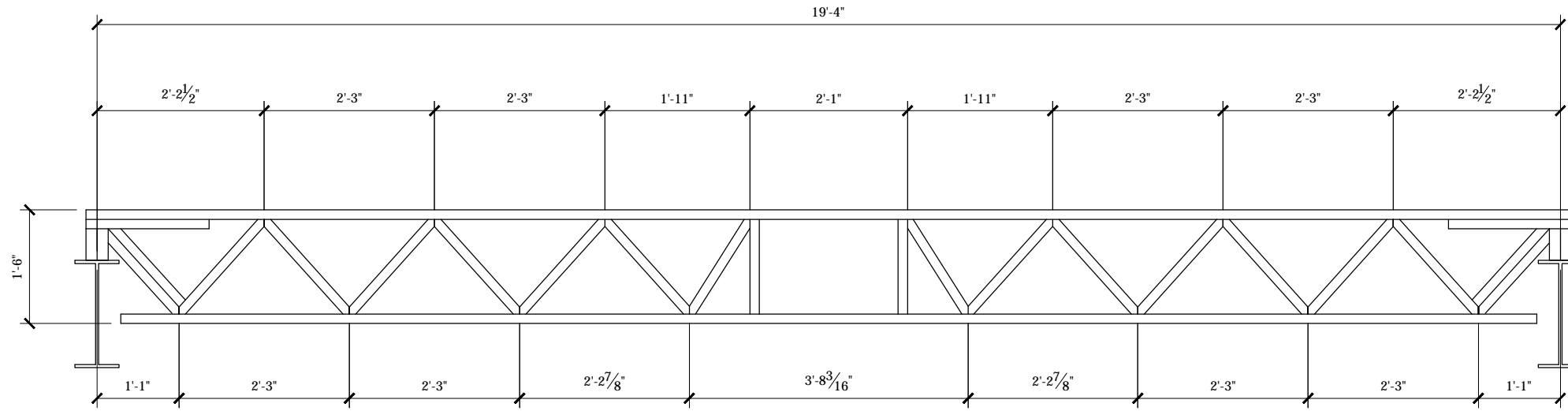
Sincerely,

A handwritten signature in black ink, appearing to read 'Kent E. Fish', written in a cursive style.

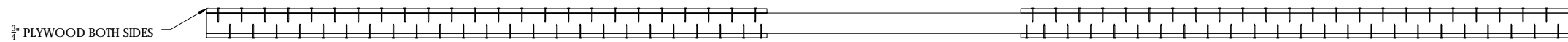
Kent E. Fish, P.E.
Vice President

KEF/llf

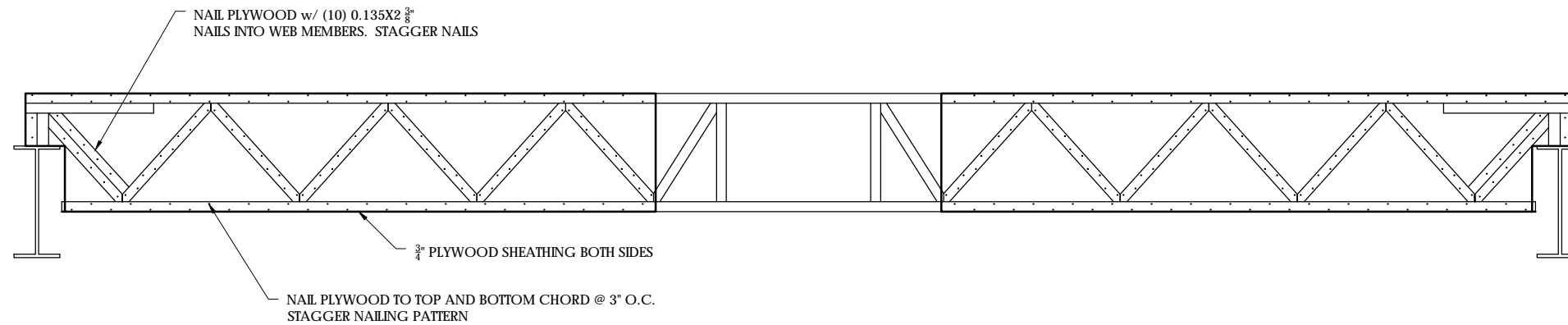
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① TRUSS ELEVATION VIEW
SCALE: 1/2" = 1' - 0"



② TRUSS REPAIR PLAN VIEW
SCALE: 1/2" = 1' - 0"



③ TRUSS REPAIR ELEVATION VIEW
SCALE: 1/2" = 1' - 0"



General Engineering Company

P.O. Box 340 • 916 Silver Lake Dr. • Portage, WI 53901
608-742-2169 (Office) • 608-742-2592 (Fax)
www.generalengineering.net

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TRUSS REPAIR PLAN
TRUSS REPAIR
SARA INVESTMENTS

CITY OF MADISON
DANE COUNTY, WI

REVISIONS	NO.	BY	DATE

SCALE

DRAWN BY	JRN
REVIEWED BY	KEF
ISSUE DATE	05/20/2019
GEC FILE NO.	2-0519-243
SHEET NO.	

STRUCTURAL CALCULATIONS

For

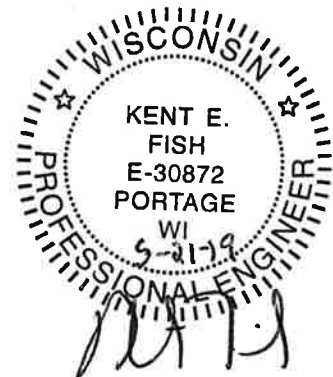
Sara Investments
(Floor Truss Repair Design)

Assumptions

- Loads Per ASCE 7-10
- Wood Design Per 2015 NDS

Table of Contents

- 1 Title Page
- 2-3 Truss Repair Design
Truss Repair Plan



Engineers • Consultants • Inspectors
916 Silver Lake Dr. • P.O. Box 340 • Portage, WI 53901
Phone: 606-742-2169 Fax: 606-742-2592
E-mail: gec@generalengineering.net

Subject:	Title Page	
Date:	5/20/2019	Engineer: JRN
Sheet:	1	File: 2-0519-243

Truss Design

ASSUMPTIONS

- MEMBER SIZE: 2x4
- MATERIAL: SPF #1
- SPAN: 19' - 6"
- TRUSS DEPTH: 18"

$$Spacing := 2 \text{ ft}$$

$$DL := 10 \text{ psf}$$

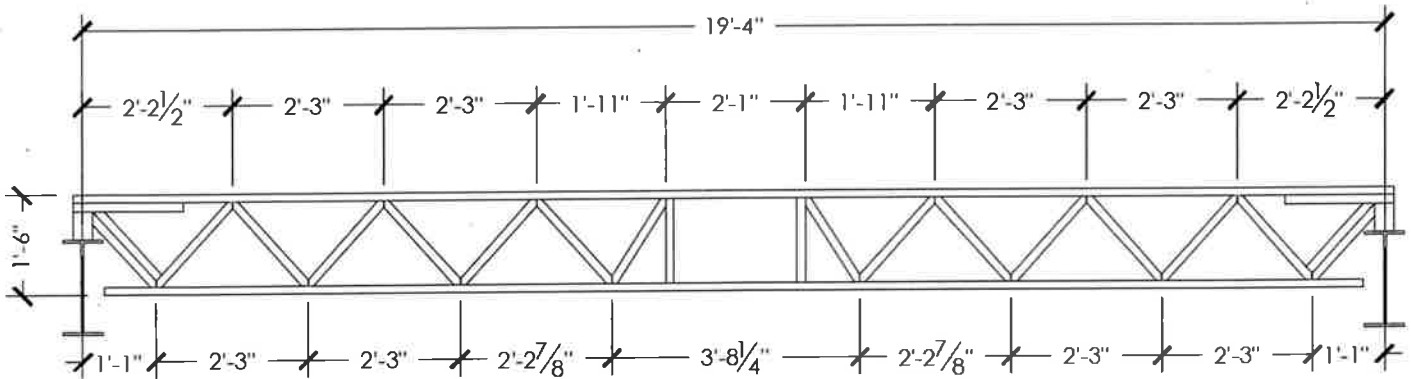
$$LL_{Design} := 50 \text{ psf}$$

$$LL_{Actual} := 150 \text{ psf}$$

$$W_{DL} := DL \cdot Spacing = 20 \text{ plf}$$

$$W_{LLD} := LL_{Design} \cdot Spacing = 100 \text{ plf}$$

$$W_{LLA} := LL_{Actual} \cdot Spacing = 300 \text{ plf}$$



*DESIGN DONE USING RAM ELEMENTS

THE ANALYSIS PROVES THAT THE DESIGN LIVE LOAD OF THE TRUSS WAS SET AT 50psf FOR OFFICE SPACES, AND NOT THE 150psf FOR FILE ROOM.



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916 Silver Lake Dr. • P.O. Box 340 • Portage, WI 53901
 Phone: 608-742-2169 Fax: 608-742-2592
 E-mail: gec@generalengineering.net

General Engineering Company	
Subject:	Truss Repair Design
Engineer:	JRN
Date:	05/20/2019
Sheet:	2
File:	2-0519-243

TRUSS REPAIR

ASSUMPTIONS

-NAIL 3/4" PLYWOOD ON BOTH SIDES OF TRUSS

-NAIL SIZE: 12D NAIL - 0.135" Ø

-SG BOTH TRUSS AND PLYWOOD: 0.42

$$T_{max} := 1.367 \text{ kip}$$

-Max Tension in Web From
RAM Analysis

$$Z := 72 \text{ lbf}$$

$$C_D := 1$$

$$Capacity := C_D \cdot Z \cdot 2 = 144 \text{ lbf}$$

-Plywood Both Sides

$$\#_{Nails} := \frac{T_{max}}{Capacity} = 9.493$$

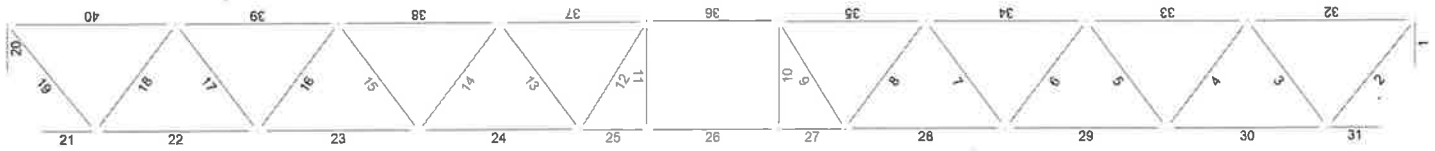
-USE 10 NAILS BOTH SIDES



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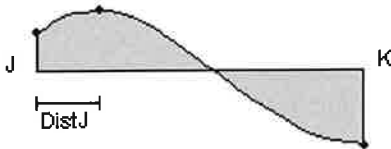
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Phone: 608-742-2169 Fax: 608-742-2592
E-mail: gec@generalengineering.net

General Engineering Company	
Subject:	Truss Repair Design
Engineer:	JRN
Date:	05/20/2019
Sheet:	3
File:	2-0519-243



Analysis result

Points of interest in members



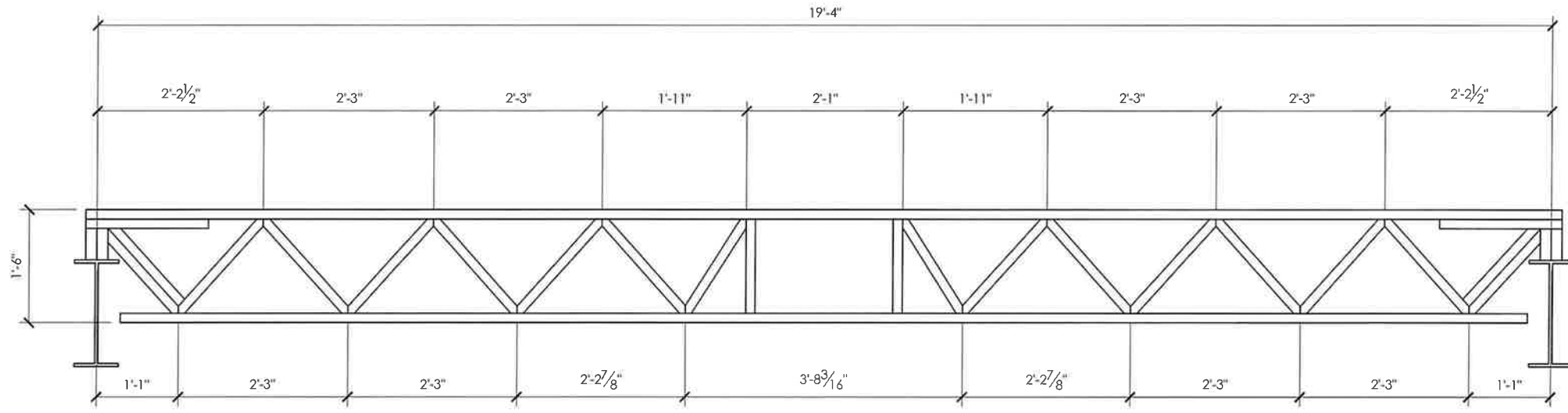
Considered points

CONDITION : D2=DL+LL

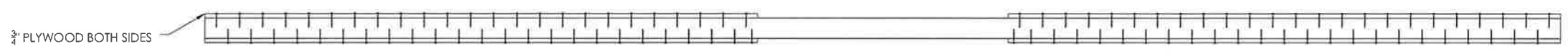
Station	Dist to J [ft]	Axial [Kip]	Plane 1-2			Plane 1-3	
			Shear V2 [Kip]	M33 [Kip*ft]	Shear V3 [Kip]	M22 [Kip*ft]	Torsion [Kip*ft]
MEMBER 1							
0%	0.000	-1.177	0.000	0.000	0.000	0.000	0.000
100%	0.667	-1.177	0.000	0.000	0.000	0.000	0.000
MEMBER 2							
0%	0.000	1.367	0.000	0.000	0.000	0.000	0.000
100%	1.939	1.367	0.000	0.000	0.000	0.000	0.000
MEMBER 3							
0%	0.000	-1.319	0.000	0.000	0.000	0.000	0.000
100%	1.875	-1.319	0.000	0.000	0.000	0.000	0.000
MEMBER 4							
0%	0.000	0.945	0.000	0.000	0.000	0.000	0.000
100%	1.875	0.945	0.000	0.000	0.000	0.000	0.000
MEMBER 5							
0%	0.000	-0.947	0.000	0.000	0.000	0.000	0.000
100%	1.875	-0.947	0.000	0.000	0.000	0.000	0.000
MEMBER 6							
0%	0.000	0.610	0.000	0.000	0.000	0.000	0.000
100%	1.875	0.610	0.000	0.000	0.000	0.000	0.000
MEMBER 7							
0%	0.000	-0.610	0.000	0.000	0.000	0.000	0.000
100%	1.875	-0.610	0.000	0.000	0.000	0.000	0.000
MEMBER 8							
0%	0.000	0.282	0.000	0.000	0.000	0.000	0.000
100%	1.870	0.282	0.000	0.000	0.000	0.000	0.000
MEMBER 9							
0%	0.000	-0.265	0.000	0.000	0.000	0.000	0.000
100%	1.762	-0.265	0.000	0.000	0.000	0.000	0.000
MEMBER 10							
0%	0.000	-0.001	0.000	0.000	0.000	0.000	0.000
100%	1.500	-0.001	0.000	0.000	0.000	0.000	0.000
MEMBER 11							
0%	0.000	-0.001	0.000	0.000	0.000	0.000	0.000
100%	1.500	-0.001	0.000	0.000	0.000	0.000	0.000
MEMBER 12							
0%	0.000	-0.265	0.000	0.000	0.000	0.000	0.000
100%	1.762	-0.265	0.000	0.000	0.000	0.000	0.000
MEMBER 13							
0%	0.000	0.282	0.000	0.000	0.000	0.000	0.000
100%	1.870	0.282	0.000	0.000	0.000	0.000	0.000

MEMBER 14							
0%	0.000	-0.610	0.000	0.000	0.000	0.000	0.000
100%	1.875	-0.610	0.000	0.000	0.000	0.000	0.000
MEMBER 15							
0%	0.000	0.610	0.000	0.000	0.000	0.000	0.000
100%	1.875	0.610	0.000	0.000	0.000	0.000	0.000
MEMBER 16							
0%	0.000	-0.947	0.000	0.000	0.000	0.000	0.000
100%	1.875	-0.947	0.000	0.000	0.000	0.000	0.000
MEMBER 17							
0%	0.000	0.945	0.000	0.000	0.000	0.000	0.000
100%	1.875	0.945	0.000	0.000	0.000	0.000	0.000
MEMBER 18							
0%	0.000	-1.319	0.000	0.000	0.000	0.000	0.000
100%	1.875	-1.319	0.000	0.000	0.000	0.000	0.000
MEMBER 19							
0%	0.000	1.367	0.000	0.000	0.000	0.000	0.000
100%	1.939	1.367	0.000	0.000	0.000	0.000	0.000
MEMBER 20							
0%	0.000	-1.177	0.000	0.000	0.000	0.000	0.000
100%	0.667	-1.177	0.000	0.000	0.000	0.000	0.000
MEMBER 21							
0%	0.000	0.000	0.000	0.000	0.000	0.000	0.000
100%	0.771	0.000	0.000	0.000	0.000	0.000	0.000
MEMBER 22							
0%	0.000	1.658	0.000	0.000	-0.002	0.000	0.000
100%	2.250	1.658	0.000	0.000	-0.002	0.005	0.000
MEMBER 23							
0%	0.000	2.793	0.000	0.000	0.000	0.005	0.000
100%	2.250	2.793	0.000	0.000	0.000	0.006	0.000
MEMBER 24							
0%	0.000	3.525	0.000	0.000	0.000	0.006	0.000
100%	2.241	3.525	0.000	0.000	0.000	0.007	0.000
MEMBER 25							
0%	0.000	3.832	0.000	0.000	-0.001	0.007	0.000
100%	0.925	3.832	0.000	0.000	-0.001	0.007	0.000
MEMBER 26							
0%	0.000	3.832	0.000	0.000	0.000	0.007	0.000
100%	1.833	3.832	0.000	0.000	0.000	0.007	0.000
MEMBER 27							
0%	0.000	3.832	0.000	0.000	0.001	0.007	0.000
100%	0.925	3.832	0.000	0.000	0.001	0.007	0.000
MEMBER 28							
0%	0.000	3.525	0.000	0.000	0.000	0.007	0.000
100%	2.241	3.525	0.000	0.000	0.000	0.006	0.000
MEMBER 29							
0%	0.000	2.793	0.000	0.000	0.000	0.006	0.000
100%	2.250	2.793	0.000	0.000	0.000	0.005	0.000
MEMBER 30							
0%	0.000	1.658	0.000	0.000	0.002	0.005	0.000
100%	2.250	1.658	0.000	0.000	0.002	0.000	0.000
MEMBER 31							
0%	0.000	0.000	0.000	0.000	0.000	0.000	0.000
100%	0.771	0.000	0.000	0.000	0.000	0.000	0.000
MEMBER 32							
0%	0.000	-0.866	0.000	0.000	-0.120	0.000	0.000
43%	1.001	-0.866	0.000	0.000	0.000	0.060	0.000
100%	2.354	-0.866	0.000	0.000	0.162	-0.050	0.000

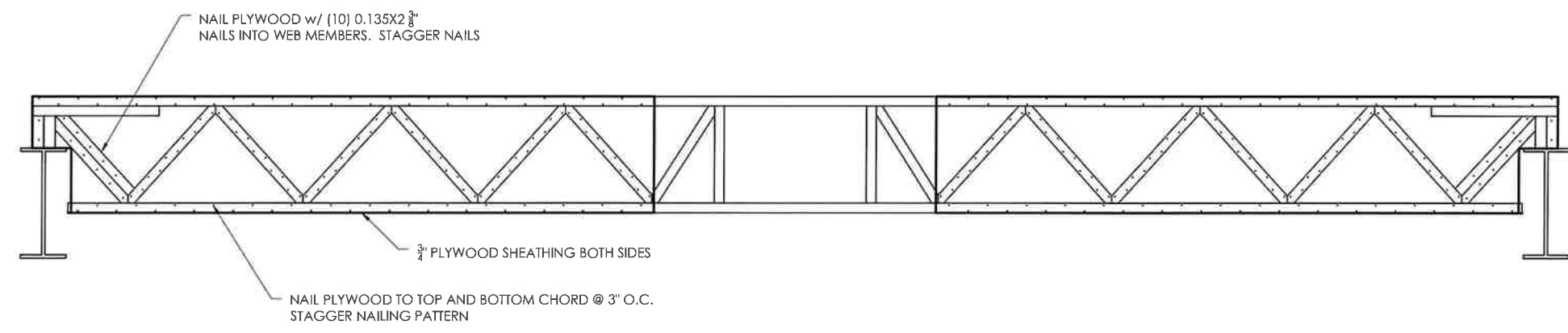
MEMBER 33							
0%	0.000	-2.225	0.000	0.000	-0.137	-0.050	0.000
50%	1.125	-2.225	0.000	0.000	-0.002	0.028	0.000
100%	2.250	-2.225	0.000	0.000	0.133	-0.046	0.000
MEMBER 34							
0%	0.000	-3.159	0.000	0.000	-0.137	-0.046	0.000
50%	1.125	-3.159	0.000	0.000	-0.002	0.033	0.000
100%	2.250	-3.159	0.000	0.000	0.133	-0.041	0.000
MEMBER 35							
0%	0.000	-3.693	0.000	0.000	-0.129	-0.041	0.000
53%	1.072	-3.693	0.000	0.000	0.000	0.028	0.000
100%	2.042	-3.693	0.000	0.000	0.116	-0.029	0.000
MEMBER 36							
0%	0.000	-3.832	0.000	0.000	-0.110	-0.029	0.000
50%	0.917	-3.832	0.000	0.000	0.000	0.022	0.000
100%	1.833	-3.832	0.000	0.000	0.110	-0.029	0.000
MEMBER 37							
0%	0.000	-3.693	0.000	0.000	-0.116	-0.029	0.000
48%	0.970	-3.693	0.000	0.000	0.000	0.028	0.000
100%	2.042	-3.693	0.000	0.000	0.129	-0.041	0.000
MEMBER 38							
0%	0.000	-3.159	0.000	0.000	-0.133	-0.041	0.000
50%	1.125	-3.159	0.000	0.000	0.002	0.033	0.000
100%	2.250	-3.159	0.000	0.000	0.137	-0.046	0.000
MEMBER 39							
0%	0.000	-2.225	0.000	0.000	-0.133	-0.046	0.000
50%	1.125	-2.225	0.000	0.000	0.002	0.028	0.000
100%	2.250	-2.225	0.000	0.000	0.137	-0.050	0.000
MEMBER 40							
0%	0.000	-0.866	0.000	0.000	-0.162	-0.050	0.000
57%	1.354	-0.866	0.000	0.000	0.000	0.060	0.000
100%	2.354	-0.866	0.000	0.000	0.120	0.000	0.000



1 TRUSS ELEVATION VIEW
SCALE: 1/2" = 1' - 0"



2 TRUSS REPAIR PLAN VIEW
SCALE: 1/2" = 1' - 0"



3 TRUSS REPAIR ELEVATION VIEW
SCALE: 1/2" = 1' - 0"



General Engineering Company
P.O. Box 340 • 916 Silver Lake Dr. • Portage, WI 53901
608-742-2169 (Office) • 608-742-2592 (Fax)
www.generalengineering.net
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TRUSS REPAIR PLAN
TRUSS REPAIR
SARA INVESTMENTS
CITY OF MADISON
DANE COUNTY, WI

REVISIONS	NO.	BY	DATE

SCALE

DRAWN BY JRN
REVIEWED BY KEF
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