Kevin Weight

From: marilyn milum <marilynmilum@yahoo.com>
Sent: Wednesday, December 6, 2023 7:03 AM
To: Kevin Weight; Helana Ruter
Subject: Fw: 333 N 7th Ave.

Hi Kevin,
The letter below is from one of our brokers we have been using for the last few years representing the property at 333 N 7th Ave.
Please include this for our file concerning the hardship meeting. Thank you.
Sincerely,
Marilyn Milum

Sent from Yahoo Mail for iPhone [mail.onelink.me]

Begin forwarded message:

On Tuesday, December 5, 2023, 1:25 PM, Justin Horwitz <justin.horwitz@svn.com> wrote:

> Craig/Marilyn,
> Please let this email serve as my insight on the value of the property and particularly how the value has been impacted by the existing structures over the course of 3+ years of attempting to sell your property. Generally speaking, the majority of developers that are willing to pay market pricing for development property are not structured for nor interested in pursuing sites that require historic preservation as part of a planned development. We are finding that most of the development community is interested solely in the land so that they can more freely plan a development with a clearer path to entitlements. We are currently asking $9.2mm for the 2.39 AC site. That is ±$88 PSF on land value which I believe is right in line with the market and I do believe the site would have sold long ago if it weren't for the complexities created by the push for historic preservation. It's hard to specifically gauge how much loss in value will occur if a developer is to incorporate these structures, but at this moment and certainly for the foreseeable future, we are finding that there is not any interested parties at any price.
>
> **Justin Horwitz, SIOR** | Senior Advisor
> **SVN Desert Commercial Advisors | AZ O/I CRE Sales Team**
> 5343 N. 16th St., Suite 100 | Phoenix, AZ 85016
> Phone 480.425.5518 | Mobile 480.220.2674
> justin.horwitz@svn.com | www.svndesertcommercial.com [svndesertcommercial.com]
> AZ O/I LinkedIn [linkedin.com]
>
>

Kevin Weight

From: marilyn milum <marilynmilum@yahoo.com>
Sent: Thursday, December 7, 2023 10:30 AM
To: Kevin Weight; Helana Ruter
Subject: Another break-in

The police were there again this morning.
Homeless people sleeping in the building.
More wasted resources of Phoenix PD
The police have to clear the property each time and make sure no one is inside, that is a big job. And a dangerous job.
Swat units, canine units and the use of many officers was not meant to be used in this way.
Marilyn

Sent from Yahoo Mail for iPhone [mail.onelink.me]

Kevin Weight

From: marilyn milum <marilynmilum@yahoo.com>
Sent: Wednesday, December 6, 2023 11:14 PM
To: Kevin Weight; Helana Ruter
Subject: Fw: 333 N 7th Ave.

Hi Kevin,
Please add this letter of opinion from one of the primary brokers who has had it listed since 2019.
Than you,
Marilyn Milum

Sent from Yahoo Mail for iPhone [mail.onelink.me]

Begin forwarded message:

On Wednesday, December 6, 2023, 9:35 PM, Paul Borgesen <paul.borgesen@transwestern.com> wrote:

Marilyn,

It is my opinion that potential HP restrictions have kept multiple groups from making an offer on the property as it is not financially feasible to bring the current structure up to code as well as incorporate it into a new development. Most developers are not willing to take on the city or HP try and deal with this potential hurdle. Most groups hear that there may be an interest in the property from HP and that is the end of the conversation about the project. The property is zoned to allow apartments and is surrounded by new apartment development and this in my opinion would be the highest and best use for the land this would also bring you as the seller the highest value.

Paul Borgesen, SIOR
Senior Vice President

Capital Markets | Investment Sales

TRANSWESTERN
2501 E. Camelback Rd, Suite 1

Phoenix, Arizona 85016

Direct: 602.296.6377

Cell: 602.214.9033

transwestern.com [transwestern.com]

From: marilyn milum <marilynmilum@yahoo.com>
Sent: Tuesday, December 5, 2023 1:44 PM
To: Paul Borgesen <paul.borgesen@transwestern.com>
Subject: Fw: 333 N 7th Ave.

Hi Paul ,

Please write us a similar letter and also state we missed that window of opportunities where Justin also told me earlier there may have well been multiple bidders , bidding war if HP buildings did not need to stay and interests rates and building rates were lower , etc

Thank you 🙏

P S this is being used in our hardship hearing and they wanted a statement of this sort for

An argument in addition to what you had provided previously.

Sent from Yahoo Mail for iPhone [mail.onelink.me]

Begin forwarded message:

On Tuesday, December 5, 2023, 1:25 PM, Justin Horwitz <justin.horwitz@svn.com> wrote:

> Craig/Marilyn,
> Please let this email serve as my insight on the value of the property and particularly how the value has been impacted by the existing structures over the course of 3+ years of attempting to sell your property. Generally speaking, the majority of developers that are willing to pay market pricing for development property are not structured for nor interested in pursuing sites that require historic preservation as part of a planned development. We are finding that most of the development community is interested solely in the land so that they can more freely plan a development with a clearer path to entitlements. We are currently asking $9.2mm for the 2.39 AC site. That is ±$88 PSF on land value which I believe is right in line with the market and I do believe the site would have sold long ago if it weren't for the complexities created by the push for historic preservation. It's hard to specifically gauge how much loss in value will occur if a developer is to incorporate these structures, but at this moment and certainly for the foreseeable future, we are finding that there is not any interested parties at any price.
>
> **Justin Horwitz, SIOR** | Senior Advisor
> **SVN Desert Commercial Advisors | AZ O/I CRE Sales Team**

5343 N. 16th St., Suite 100 | Phoenix, AZ 85016
Phone 480.425.5518 | Mobile 480.220.2674
justin.horwitz@svn.com | www.svndesertcommercial.com [svndesertcommercial.com]
AZ O/I LinkedIn [linkedin.com]

All SVN® Offices Independently Owned and Operated.

Kevin Weight

From: marilyn milum <marilynmilum@yahoo.com>
Sent: Thursday, December 7, 2023 1:26 AM
To: Kevin Weight; Helana Ruter
Subject: 333 N 7th ave

Kevin,
You may wonder why two different brokers letters.
The two brokers have been working since 2019 on trying to sell our property on &th ave.
Justin is still at SVN and Paul has chosen to change companies but they are still co-listing since the two had it listed at the one compant when they were associates.
You are possibly wondering why I am up so late, my husband just left to check on the property on 7th since we are have had tresspassers coming in at night sleepng, and making messes,very hazadous.
After multiple breakends we secured the building further and he needs to check if the barriers we used are working or weather they are down, meaning they got in again.
Marilyn

Kevin Weight

From: marilyn milum <marilynmilum@yahoo.com>
Sent: Thursday, December 7, 2023 9:08 PM
To: Kevin Weight; Helana Ruter; marilyn milum
Subject: Invoice for one year

Please note that this is just for one year in which we extended it it for as long as we were under contract with the developer which was in the purchase agreement.
We have a different carrier now and at this moment I cannot locate our invoice.

Kevin Weight

From: marilyn milum <marilynmilum@yahoo.com>
Sent: Thursday, December 7, 2023 9:15 PM
To: Kevin Weight; Helana Ruter
Subject: insurance and taxes

I have been trying to download our tax amounts we have paid for the last two years.
The site has been down.
It is public knowledge so I will say when I looked up a few days ago it was a little over $40,000.00 and has been that amout approx., for the last two years.

Burns & Wilcox

150 Burns & Wilcox Center
14631 N. Scottsdale Road
Scottsdale, AZ 85254

Insurance Quote

Date:	Monday, June 13, 2022
Agency:	NEATE DUPEY INSURANCE GROUP
Attn:	ANDY DUPEY
Insured:	MILUM TEXTILE SERVICES, INC
Application / Policy:	APP80562253

We are pleased to submit our **QUOTE** for the above captioned insured. Please review this **QUOTE** carefully as coverage offered may be **DIFFERENT** than the coverage requested.

Proposed Policy Period:	6/14/2022 - 6/14/2023
Insurance Carrier:	MT VERNON SPECIALTY INSURANCE COMPANY
Line of Business:	PACKAGE

Price Breakout:	
Premium:	$ 16,687.00
Carrier Policy Fee:	
Carrier Inspection Fee:	
Brokerage Fee:	$ 1,700.00
State Tax:	$ 551.61
Stamping Fee:	$ 36.77
Total Due:	**$ 18,975.38**

Agency Commission: 15.00%

Additional Subjectivities Required for Binding:

**FEES ARE FULLY EARNED

*BROKER FEE WILL BE ADDED TO ANY A/P ENDORSEMENT OR AUDIT

We appreciate the opportunity and look forward from hearing from you. Please call or e-mail us if you have any questions.

Melinda Lampson
Burns & Wilcox

Sent from Yahoo Mail for iPhone [mail.onelink.me]

Kevin Weight

From: marilyn milum <marilynmilum@yahoo.com>
Sent: Thursday, December 7, 2023 11:11 PM
To: Kevin Weight; Helana Ruter
Subject: comments about 333N 7th ave

To:marilyn milum
Thu, Dec 7 at 11:06 PM
Kevin,

Please include this in the files. Thank you.

In case you are wondering why there are two different companies with our brokers, Justin and Paul were associates at the same firm before Paul went to work for a different firm. Both of these gentlemen have worked very hard to represent us and are still working on the listing. They have reported to us during the last several years their obstacles in selling our property that have been mainly the "Historical Preservation" ("HP") problem we have with the City that prevents successful sales efforts. Non one wants to buy such a property, which has been confirmed repeatedly by our brokers' many sales contacts.

Both have told us repeatedly that buyers are not interested in dealing with HP. We have also have had extensive feedback that it would be cost prohibitive to even try to save these structures.

We can no longer maintain them. It has caused a huge burden financially on us not to mention what is has done to us mentally and physically and our quality of life. We are septuagenarians that want to retire and the property is our retirement fund. My husband is ill and this is not equitable for us to bear the burden and expense of this property. It has been debilitating. We can no longer deal with these costs after four years of determined sales efforts. To impose such a mandate on two individuals is criminal or at least unconstitutional. We feel like someone has stolen our property and we have to bear the burden of paying a ransom for it as well as in the interim maintaining the property for the thieves.

Property taxes, Insurance, utilities, and to maintain such as broken windows, kicked in doors, trash, feces, graffiti, and our precious time.

Prop 207 was a clear indication that the citizens in Arizona do not want this abuse by government officials.

I hate to be so blunt, but that is now how we are feeling . We have earnestly tried to work with the City, we are in the fifth year of this tyrany and we are tired of all the red tape and emotional, physical, financial abuse we have been dealt by the city and it is truly time for the City to release this terrible burden. We feel the City has gone too far.

We are asking for fairness and justice. We also think there are political schemes behind this to stop more contemporary development rather than just to save a "priceless" building. There is no significant historic value to preserve, it is simply a manipulation and political effort by primarily a very small number of people who want to limit the density.

We have been damaged. These are dilapidated buildings that have outlived their use.

We believe this mandate has enough severe impact to our rights that it warrants compensation. The whole idea of "historic" is so subjective. The City should bear the cost and pay for it if they want a museum.
Instead the City wants to give rich developers, taxpayers money at their whim and when the taxpayer will probably never see the inside of these buildings they want to keep. I s that fair and equitable?
The City is on record telling us over and over do not pursue a demo permit , it will be turned down and told us they would not let the buildings go.

These are decaying buildings that need to be torn down for useful housing.

Since it has gotten cold now, the homeless are trespassing causing the SWAT teams, the canine teams and multiple officers (a dozen or more, yesterday), more today. Every time a break in occurs, we call the police they have to search the property and clear it. What a horrible use of our police resources. This is inviting criminal activity downtown. These officers could lose their lives going into the dilapidated buildings to search nooks and corners, closets, all room by room. These intruders are scared inside the building and could react with violence towards our City's finest.

Our freedom has been taken from us.

All of this has occurred because a very small number of people have a whim for saving these junky, old buildings with no modern times commercial, viable use.

Please help resolve these serious matters in the near future well before October by when these issues would be five years with out resolution.

A solution will also help our efforts to sell the property which has been substantially slowed by other substantially more complex matters than HP considerations for a building that does not seem to meet any realistic HP concerns compared to other HP properties.

We have reviewed the check lists requested and feel like most of these requests i.e., getting itemized construction costs to restore the 100 year old property are burdensome and are not applicable to the site. We never plan on using the property for another commercial laundry and to get an itemized costs would be so expensive and unrealistic it assumed these request would be for much smaller projects. To do what you are requesting would be a hardship and speaking with a contractor undoable.

It would be 10's of thousands of dollars and a waste of the contractors time and ours.

The contractors would not take us seriously.

Thank you.

Sincerely,

Marilyn Milum

Kevin Weight

From: marilyn milum <marilynmilum@yahoo.com>
Sent: Friday, December 8, 2023 8:50 AM
To: Kevin Weight; Helana Ruter
Subject: Property Taxes, Utilities, maintanence , insurance

Good morning Kevin,

TO add to file please
WE have calclated between $ in excess of 100,000 a year saving the property for PHOENIX

Multiple insurance companies turned us down for insuranc

Insuring an empty building is risky and to keeping this place up is simply unsastainable for us

In the last couple of weeks we have turned off utilities

Aps we beleive has left one meter on by mistake.

We need to call them to turn off the last meter

METROWEST DAILY NEWS

NEWS

Historic riding ring collapses in Ashland

Rob Haneisen/Daily News staff

Published 11:01 p.m. ET Jan. 29, 2011 | **Updated 1:50 a.m. ET Jan. 30, 2011**

A massive outdoor riding ring, one of only four of its kind in the country and a local historic landmark, collapsed yesterday afternoon after years of decay and weighed down by several feet of recent snow.

The building off Olive Street was brought to the site in 1975 by Bill Sibson, 59, who disassembled the 60- by 120-foot building at the old Waseeka Farm on Chestnut Street with the help of family and friends. In 1979, he put it back together at his mother's Gleanmoura Farm, which means Mary's Glen in Gaelic.

The building had rare German lamella roof architecture, which gave the appearance of criss-crossed arches 25 feet above the riding floor. That structure held the roof up without needing any poles or beams in the center of the floor, which made it a perfect riding ring for horse lessons.

The building was first constructed around 1920 as a birthday gift for a daughter in the Powers family at Waseeka Farm, Sibson said.

Elegant in appearance at the height of its use, what remained yesterday was a pancaked heap of timbers and boards.

"I was walking my dog, and I heard a loud crack, and I saw it collapse," said Rory Warren, who lives on Clinton Street in Hopkinton and was one of the people who helped Sibson assemble the ring decades ago. "It's in seven sections, and it just came down like dominoes."

Warren and Sibson said snow stacked on the roof was definitely the reason for yesterday's collapse around 2:15 p.m., although the structure was in rough shape and had already started to lean before this winter.

Ashland Fire Lt. David Iarussi said neighbors heard the collapse and called police and fire departments. No one was in or near the building when it fell, and a huge cloud of dust flew up.

"It's the loss of a historic structure," Iarussi said.

Warren recalled the intricacy of the diamond-patterned roof and the simplicity of its white pine-board design, which allowed for interchangeable parts.

"Now it's gone - just a pile of wood on the ground," Warren said.

When the family disassembled the old ring in 1975, every bolt, nut and shingle, plus the lamella planks, were stored in garages and barns - trucked over from Chestnut Street in the family station wagon - until they could be painstakingly put back together.

"We had to cat's-paw every nail out of it," Sibson said.

Sibson said he thinks the other three lamella buildings in the country were made into aircraft hangars.

"I knew that it was going to go ... but I didn't think it would crush so flat," Sibson said.

Sibson said he hopes the town will let him salvage some of the lamella boards this spring so he can one day build a small cabin with the historic pieces.

(Rob Haneisen can be reached at rhaneis@cnc.com or 508-626-3882.)

Kevin Weight

From: marilyn milum <marilynmilum@yahoo.com>
Sent: Thursday, December 21, 2023 12:30 AM
To: Helana Ruter; Kevin Weight
Subject: A little more complicated Lamella

https://www.google.com/gasearch?q=lamella%20roof%20collapses&tbm=&shem=rime&source=sh/x/gs/m2/5#fpstate=ive&vld=cid:2426b60c,vid:YsJqJKtrwlk,st:0 [google.com]

Sent from Yahoo Mail for iPhone [mail.onelink.me]

Kevin Weight

From: marilyn milum <marilynmilum@yahoo.com>
Sent: Thursday, December 21, 2023 12:40 AM
To: Helana Ruter; Kevin Weight
Subject: Complicated

Politically I'm not sure the Lamella enthusiast
Would be as supportive if they knew Zollinger was part of the Nazi party . Is the public going to be accepting of the Nazi link with the Nazi example of superior engineering…?
https://www.youtube.com/watch?v=YsJqJKtrwlk [youtube.com]

Sent from Yahoo Mail for iPhone [mail.onelink.me]

Kevin Weight

From: marilyn milum <marilynmilum@yahoo.com>
Sent: Thursday, December 28, 2023 3:48 PM
To: Helana Ruter; Kevin Weight
Subject: Roof collapse

Not sure if I sent this one

ancy, so likely not too critical unless a whole series of these are breaking.

Is this in snow country? Maybe some unbalanced load caused flex failures.

LaminatedTimber (Materials) 22 Nov 19 16:07

Wooden lamella roofs were known for not handling unbalanced roof loadings and there were many, many failures and collapses. Some lamella roofs are doing fine. I know of at least five in Wisconsin that have been performing fine for 80 or so years. A school gym was built in Fargo, ND in the 1960s with solid wooden lamella and it collapse within months of completion. The guy who sat at my desk before me bid it as a glued laminated timber radial rib dome and when told it would go to lamella he "warned" the general contractor about problems. Hate to say "I told you so" but that's what happened. Luckily there were no injuries in the collapse.

I cannot help with your design and repair method.

Lamella is a real groovy looking type of material. The historical and iconic Brown Derby in LA has a lamella roof.

Andreas

McSEpllc (Structural) 24 Dec 19 00:18

The lamella roof was developed and patented by Friedrich Zollinger after WWI as a way to address the housing shortage (it uses about 46% of the lumber compared to the previous wood construction techniques used in Germany.

Sent from Yahoo Mail for iPhone [mail.onelink.me]

Justin Horwitz - SVN
Paul Borgesen - Transwestern
5343 N. 16th St. #100
Phoenix, AZ 85016

Helena Ruter
City of Phoenix Historic Preservation Officer
200 W. Washington St.
Phoenix, AZ 85003

Dear Ms. Ruter,

On behalf of Paul Borgesen, Senior Vice President with Transwestern, and myself, Justin Horwitz, Senior Advisor with SVN, please accept this letter in relation to the Milum Textile property located at 333 N 7th Ave, Phoenix, AZ 85007.

Paul and I are commercial real estate agents with substantial experience selling development properties particularly in Downtown Phoenix. In April 2020, we began actively listing the subject property for sale and to this point, we have been unsuccessful in solidifying a buyer for the property. Throughout the course of our listing, the subject property has received good interest from prospective buyers. However, following initial conversation with various zoning attorneys, the overwhelming majority of prospective buyers do not pursue the purchase of the property due to concerns over multiple City of Phoenix interests in historical preservation of several major structures. This has presented a number of challenges, but a few of the main issues are as follows:

1. The process is relatively more complex. Incorporating historical structures on any site adds multiple layers of processes to the design, planning, and zoning stages that eliminates a number of quality developers. The majority of developers we have presented the site to ultimately are not equipped to handle an abnormal development process or do not have an interest in taking on the risk given the amount of unpredictable expenses in the pre-development and construction phases. Simply put, our experience has been that most developers want a “cookie cutter” site that allows them to repeat their typical planning, zoning, design, and construction processes. This site does not allow for that with historical structures in place.
2. Historical structures in their current location dramatically hinder design capabilities and limit a developers ability to maximize density in its planned development. This directly impacts the ultimate price they are willing to pay for the property.
3. Retaining the structures creates liability that adds significant costs to a project making it infeasible. The existing structures are quite old and have had years of industrial wear and tear placed on them. Again placing more unpredictability and liability into a project than any prospective buyer has been willing to take on.
4. Items 1-3 listed above are primarily addressing the items of contention solely from a redevelopment perspective. We have also spent countless hours over these last few years attempting to identify end users that have an interest in retaining and using the existing structures. While we have had groups acknowledge the unique elements of the structures and have a vision for an end use, the estimated costs of renovations steer groups away from pursuing a purchase of the property. To be more specific, we had a licensed general contractor walk the property and while we could not get a specific bid, we were provided with a rough estimate upwards of $10MM to simply bring the building up to code. This was purely contemplating the

costs to bring the building up to current code (i.e. remove and replace the existing complex utility system, replace the electrical system, treat any asbestos due to the age of the structure, sure up the roof system that requires significant inspection to even understand its current condition, redesign and replace the entire HVAC system, and address general ADA items just to name a few). Again, this is only to bring the building to code in a “vanilla shell” condition and does not include the cost to customize the interior layout for an end user.

The main purpose of this letter is to attempt to identify how much the property is worth as raw land with all structures demolished as opposed to its value with various structures historically preserved. This proves to be a rather difficult task. While we have contemplated comparable sales for land sites in the immediate area (please see Exhibit “A” - Comparable Sales enclosed), it’s virtually impossible to identify a value for the property with structures in place. As mentioned above, in over three years of tireless efforts to find a buyer, we have come up empty handed. One could argue that there is no buyer in the foreseeable future for this property at any price given the significant cost of improvements due to the issues listed above. Alternatively, as it pertains to the potential value of the land with all structures demolished, we have identified seven comparable sites based on location, land size, and/or intended use for the property. The sales comparables range from $111 PSF to $316 PSF on land value only. The average of the seven comparable sales is $201 PSF. Relative to the subject property, one could argue that without any historically preserved structures, the land’s value is upwards of $21MM for the 2.39 AC of land. Our current asking price for the property is $9.2MM with no qualified parties pursuing at this price. We do however have a number of groups that have indicated a high level of interest in the property if the owner of the property can deliver the property with either a demo permit for the entirety of the site or with all structures fully demolished.

In closing and as mentioned above, without any prospective buyers to currently reference, it is difficult for Paul or I to determine the value of the property with historically preserved structures in place. However, it is safe to assume that the loss in value to the property would be significant relative to the comparable sales in the area.

Please feel free to reach out should you have any questions.

Sincerely,

Justin Horwitz

Paul Borgesen

Exhibit "A" - Comparable Sales

Site	**Land Size**	**Sale Price/ Land PSF**	**Sale Date**	**Notes**
520 S. 5th St. Phoenix, AZ 85004	2.56 AC	$17,300,000 $155 PSF	12/8/23	Existing parking lots; Covered land purchase.
840 N. Central Ave. Phoenix, AZ 85004	1.11 AC	$10,500,000 $217 PSF	12/8/23	Part of assemblage.
343 E. Lincoln St. Phoenix, AZ 85004	1.00 AC	$8,643,000 $198 PSF	10/2/23	Future use for Phoenix Suns/Mercury.
114 E. Portland St. Phoenix, AZ 85004	0.64 AC	$8,820,000 $316 PSF	2/2023	Future development site.
510 E. Lincoln St. Phoenix, AZ 85004	1.60 AC	$9,500,000 $136 PSF	1/5/23	Future development site.
601 N. Central Ave. Phoenix, AZ 85004	1.83 AC	$22,000,000 $275 PSF	3/2/22	Future development site.
362 N. 3rd Ave. Phoenix, AZ 85003	0.76 AC	$3,700,000 $111 PSF	12/29/21	Future development site
AVERAGES		**$201 PSF**		

Kevin Weight

From: marilyn milum <marilynmilum@yahoo.com>
Sent: Monday, January 8, 2024 2:22 PM
To: Kevin Weight; Helana Ruter
Subject: Important information

Please add this to our HP file and please make available to HP commission and city council members.

We feel like the city of Phoenix has not done their due diligence in insisting on keeping structures when they know virtually nothing about their safety.

This is very risky.
Sincerely,
Marilyn Milum

Sent from Yahoo Mail for iPhone [mail.onelink.me]

Kevin Weight

From: marilyn milum <marilynmilum@yahoo.com>
Sent: Monday, January 8, 2024 2:17 PM
To: Kevin Weight; Helana Ruter; Roger Strassburg
Subject: Sensitivity analysis of Kiewitt-Lamella reticulated domes due to member loss - ScienceDirect

https://urldefense.com/v3/__https://www.sciencedirect.com/science/article/abs/pii/S0143974X21004983__;!!LkjWUF49MRd51_ry!YS_y5Q2hnymJZQY8-OEQ-SbJlQ36tP5gb5x5whpMlF5Upyv_9NY1x9eMw_Z-NMfaAnWPo1FVyLmapJpS4ssrj66u9Lqs-Q$

Sent from my iPhone

Journal of Constructional Steel Research
Volume 188, January 2022, 107016

Sensitivity analysis of Kiewitt-Lamella reticulated domes due to member loss

Zubin Zhang, Ruiyi Gu, Haiqin Wang

https://doi.org/10.1016/j.jcsr.2021.107016

Abstract

In this paper, the sensitivity analysis of Kiewitt-Lamella (K-L) reticulated domes with different parameters is carried out. The sensitivity of the dome due to gradual and sudden member loss is analyzed in both static and dynamic aspects, which will clarify the distribution rule of the member sensitivity and provide a reference for future study on the K-L reticulated dome. The results show that the member sensitivity of the K-L reticulated dome with different design parameters has similar regularities. For the members in the same ring, the sensitivity of the latitudinal members is larger than that of the diagonal members. For the members in different rings, the sensitivity of the inner ring members is larger than that of the outer ring members. In addition, the static analysis shows that the latitudinal members closer to the radial members are more sensitive than those apart from the radial members, and the diagonal members paralleling to the radial members are more sensitive than the unparallel ones. The dynamic analysis shows that the K-L reticulated dome will experience a local internal force redistribution after a member's sudden loss and finally reach a stable equilibrium state on the new load transfer path without overall progressive collapse. According to the research results, a better scheme for strengthening the structure is proposed: increasing the cross-section of sensitive members is more effective in improving the structural stability than important components.

Introduction

The single-layer reticulated dome is usually used as the supporting structure for the roof of large cylindrical storage tanks in the petrochemical industry. With the development of the storage tank roof to a large span, the single-form reticulated dome used in realistic projects has been restricted. For example, a great many members of the Lamella reticulated dome are gathered at the apex, and the structure of the node is complicated, so some members must be properly removed, which changes the force transfer path and then adversely affects the overall structural strength. In addition, for the Kiewitt reticulated dome, the number of nodes in the outermost ring increases as the span increases, and the difficulty of construction also increases. Combining these two types of reticulated domes to form a Kiewitt-

Lamella (K-L for short) composite single-layer reticulated dome can effectively solve the above-mentioned problem for the large-span single reticulated dome [1,2].

At present, scholars worldwide have conducted many kinds of research on Kiewitt reticulated domes and Lamella reticulated domes, and there are also many studies on structure sensitivity. Gao *et al.* [3] discussed the problems of redundancy related to the Alternate path method, and the sensitivity of the Kiewitt single-layer reticulated dome was explored. Han *et al.* [4] evaluated the redundancy and progressive collapse performance of the large-span Lamella single-layer and double-layer domes based on the ultimate bearing capacities in both the original and damaged status. Sebastian [5] and Chen *et al.* [6] proposed the sensitivity index based on the internal force responses of members to identify sensitive members, which plays an important role in evaluating structural safety and reliability. However, the research on K-L reticulated domes needs to be strengthened, especially the sensitivity analysis of them. It plays an important role in determining the context of the system, optimizing algorithms, reliability evaluation of system performance, and structural redundancy research [7,8]. In fact, sensitivity analysis is a major prerequisite in the establishment of structural optimization, reliability evaluation, and parameter identification [9]. However, there are many members in single-layer reticulated shells, and the effects of different members on the elastoplastic stability of the structure are often different, and it has been proven that the failure of some critical members may lead to the progressive collapse of the space structure [[10], [11], [12]]. Therefore, the elastoplastic stability of the K-L reticulated dome on the member sensitivity is worth studying.

In realistic construction, collapse accidents of space structures have occurred around the world. For example, in 2004, due to the perforation of the ceiling in the terminal of the Charles de Lego Airport, the critical metal connecting members could not continue to bear the weight, and eventually collapsed. In 2014, South Korea continued to snow for many days, and the final snow load reached 0.9kN/m^2, which far exceeded the design load value. A space structure that does not consider this effect may collapse suddenly due to partial damage caused by the failure of a member without significant deformation in advance. If a member loses stability, it will inevitably affect other members connected to it. Therefore, the stability of a specific member cannot be analyzed in isolation, and the interaction of other members should be comprehensively considered and determined from the overall structural analysis [13]. Pandey et al. [8] proposed a redundancy assessment method based on sensitivity analysis. In this method, the response of the structure under design load is used as the research object, the member loss is used as the analysis parameter, and the member sensitivity and the structural redundancy are quantified theoretically with a numerical method. Subsequently, on this basis, the Japanese Society of Steel Construction considered the buckling of a single member, and made this redundancy assessment method further suitable for large-span space structures [14]. In recent years, Shekasheband et al. [15] divided the member loss into gradual and sudden loss, and carried out a numerical investigation into the static and dynamic response of tensegrity systems in the event of gradual and sudden member loss.

Therefore, in this paper, the sensitivity analysis of large-span reticulated dome due to member loss refers to the above method. One member is removed each time, and the static and dynamic response of the domes in the event of gradual or sudden member loss is investigated. The response and characteristics of the studied structures include the load-deflection response in static analysis and displacement-time history of the structures in the dynamic analyses. In addition, an effective measure for improving structural stability is discussed, which will provide a reference scheme for the designers.

Section snippets

Analysis model

Take one of the K-L reticulated domes as an example to illustrate the analysis model. As shown in Fig. 1(a), the span is 60m, the rise-to-span ratio is 1/4, the symmetrical sectors are 8, and the frequencies are 12 (Kiewitt: Lamella is 9:3).

For rings from the inside to the outside, they are marked as the first to the twelfth ring. Since the members are directly in contact with the top skin and need to bear the bending moment, it is appropriate to use I-beams but not steel circular pipes [16]. …

Sensitivity analyses of the K-L reticulated dome due to gradual member loss

A unique K-L reticulated dome can be determined when the span, the rise-to-span ratio, the number of rings, the symmetrical sectors, and the frequency ratio are determined. Currently, most of the large-span K-L reticulated domes are 12 rings. Therefore, the sensitivity analysis of the K-L reticulated dome with 12 rings is carried out, and both geometric and material nonlinearities analyses are performed to obtain the ultimate bearing capacity. Considering the influence of latitudinal members…

Sensitivity analyses of the K-L reticulated dome due to sudden member loss

The previous part discussed the static load-bearing capacity of the dome in the event of gradual member loss. Practically, when losing a member in the structure which is under load, energy stored in this member is released, and this induces a state of transient vibration in the structure. In order to compare the response of the damaged dome caused by the sudden member loss, this section introduces the results of the dynamic analysis. The K-L reticulated dome, which with 60m spans, 1/4…

Distribution and influence of sensitive members and important members

According to the previous analysis, the sensitivity of the members in different areas is different. In this paper, the sensitive member is defined as the member with a sensitivity larger than 5%, and the important member is defined as the member with a negative sensitivity. The important member loss can contain or block continuous structural damage. The sensitive members and the important members are shown in red and blue, respectively, as shown in Fig. 18.

It verifies that the sensitive members …

Conclusion and discussion

In this paper, a numerical investigation into the static and dynamic response of the K-L reticulated domes in the event of gradual and sudden member loss is carried out. The results of this study are used to obtain certain conclusions regarding the sensitivity of the K-L reticulated domes to member loss. In addition, the distribution of sensitive members and important members is distinguished, and a more economical structural reinforcement scheme is proposed and verified according to this rule, …

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.…

Recommended articles

References (22)

Y. Chen *et al.*
Effective insights into the geometric stability of symmetric skeletal structures under symmetric variations
Int. J. Solids Struct. (2015)

F. Piroglu *et al.*
Partial collapses experienced for a steel space truss roof structure induced by ice ponds
Eng. Fail. Anal. (2016)

B. Shekastehband *et al.*
Sensitivity analysis of tensegrity systems due to member loss
J. Constr. Steel Res. (2011)

W. Li *et al.*
Static stability analysis of a reticulated shell with a roofing system
Eng. Struct. (2019)

L.M. Tian *et al.*
Progressive collapse resistance of single-layer latticed domes subjected to non-uniform snow loads
J. Constr. Steel Res. (2021)

C.L. Zhang *et al.*
Effect of unsymmetrical loading distribution to the stability of single-layer latticed domes
J. Chongqing Jianzhu Univ. (2014)

D.C. Li
Static Stability and Local Failure Sensitivity Analysis of Kiewitt-Lamella Single Layer Reticulated Shells
(2019)

J. Cai *et al.*
Static stability analysis of Kiewitt-Lamella single-layer reticulated shells

F. Gao *et al.*
Sensitivity analysis on load carrying capacity of K6 single-layer reticulated domes to member failure
Architect. Struct. Design (2009)

Q.H. Han *et al.*
Progressive collapse analysis of large-span reticulated domes
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Fire Prevention & Protection

Reading A Building: More Roof Size-Up

When reading a building, do you include the roof in your size-up, and if so, what are you thinking about? To assist with this question, let's consider some important factors that are worthy of your consideration.

10.4.2004

By John W. Mittendorf

When reading a building, do you include the roof in your size-up, and if so, what are you thinking about? To assist with this question, let's consider some important factors that are worthy of your consideration. Obviously, some factors will be dependent on the type of roof construction in your particular area, however, West Coast roofs and East Coast roofs have a lot in common in both construction methods and styles.

Open Web Bar Joist

Open web bar joist (or metal deck) roofs are the commercial roof of choice in the Midwest and Eastern portions of the country and are primarily steel truss construction underneath a metal decking (Q decking). The metal decking is covered by built-up layers of insulation material, tar, and composition. As steel loses it's strength around 1,000 degrees, such roofs have a quick failure rate with minimal warning, and suppression personnel should be aware of these hazards. However, another more subtle hazard is that fire can propagate between

the metal base and the composition covering, enhancing the spread of fire with minimal visible warning signs.

Older Truss Roofs

These roofs are found anywhere in the country and on various types and sizes of commercial buildings primarily constructed during the 1800s until the 1950s – until the introduction of the flat roof with its numerous variations. The older truss roofs were normally constructed with a "large" size of wooden truss members, 1 x 6-inch sheathing as a roof base/covering, and can be found in numerous styles as follows:

Bridge Truss: This type is recognizable by it's characteristic sloping sides, ends, and flat top.

Gable Truss: This type is also identified by it's gable or peaked roof design.
Parallel Chord Truss: This roof looks similar to other types of flat roofs but can be found on older buildings and is constructed from a "large" size of truss members (compared to newer lightweight truss members).

Lamella: Although this roof can be similar in external appearance to other types of arch roofs, it is significantly different as it was constructed in an egg crate – geometric or diamond-patterned – design. This roof can be found on gymnasiums, recreational buildings, large supermarkets, etc.

Tied Truss: This arched roof uses metal tie rods to give lateral support to the walls of the building. Tie rods with turnbuckles are used below each arch member (as there is no bottom chord) to ensure that the arches do not push the exterior walls outward. With this mind, it is easy to see if fire exposes metal tie rods in this type of roof, a collapse of the building is more than a possibility. Hint: If you are ever inside a building and observe this type of roof construction, make a mental note for future reference as it may save your life!

Bowstring Truss: Most firefighters are familiar with the "bowstring truss" roof as numerous fire service writers have appropriately written on the hazards of this common roof. Interestingly, whether you are a firefighter on the East or West coast (or anywhere in between), you will likely have this roof in your municipality. It is constructed of "large-size" wooden members (Note: most wooden members used in these older truss roofs were "rough-cut" or full size lumber and used steel plates and bolts for connectors) with 1 x 6-inch sheathing roof decking. Multiple firefighter deaths attributed to this specific roof have cautioned firefighters to assume a defensive position if a working fire is encountered.

John W. Mittendorf joined the Los Angeles City (CA) Fire Department (LAFD) in 1963, rising to the rank of captain II, task force commander. In 1981, he was promoted to battalion chief and in the year following became the commander of the In-Service Training Section. In 1993, he retired from LAFD after 30 years of service. Mittendorf has been a member of the National Fire Protection Research Foundation on Engineered Lightweight Construction Technical Advisory Committee. He has provided training programs for the National Fire

Academy in Emmitsburg, Maryland; the University of California at Los Angeles; and the British Fire Academy at Morton-in-Marsh, England. He is a member of the editorial advisory board of Fire Engineering *and author of the books* Truck Company Operations *(Fire Engineering, 1998) and* Facing the Promotional Interview *(Fire Engineering, 2003).*

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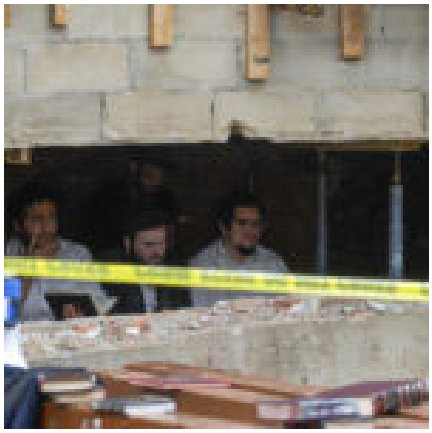

NYC Officials: Illegal Tunnel Under Synagogue Destabilized Nearby Buildings

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A lot of the integrity is no longer there, not up to US safety standards.

roofs [1]. In 1925, the idea spread to America as well [3].

1.2 Previous Roof Failures

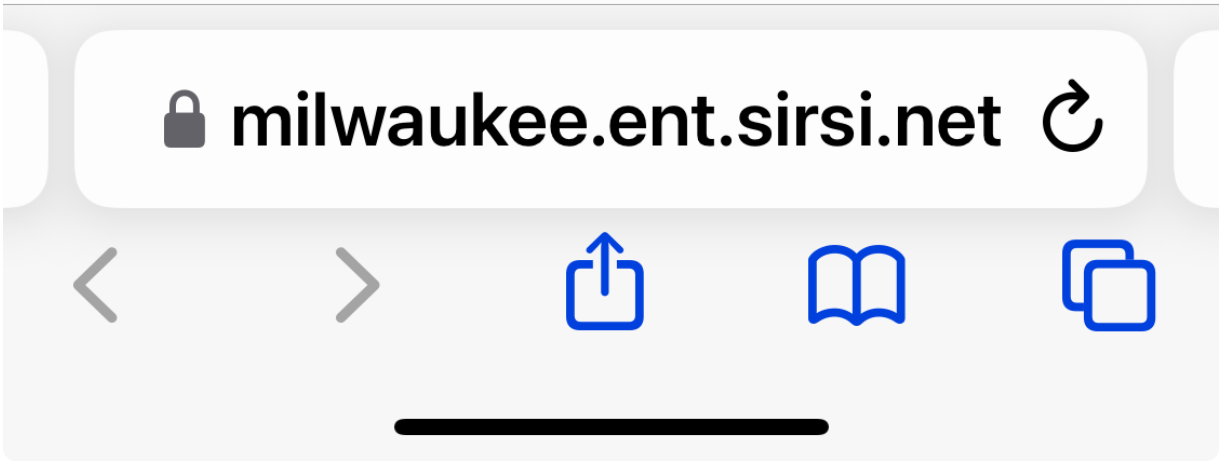
Due to the curve of the lamella roof, these structures are susceptible to failure from high wind loads. In 1926, hurricane winds caused the destruction of two lamella buildings in

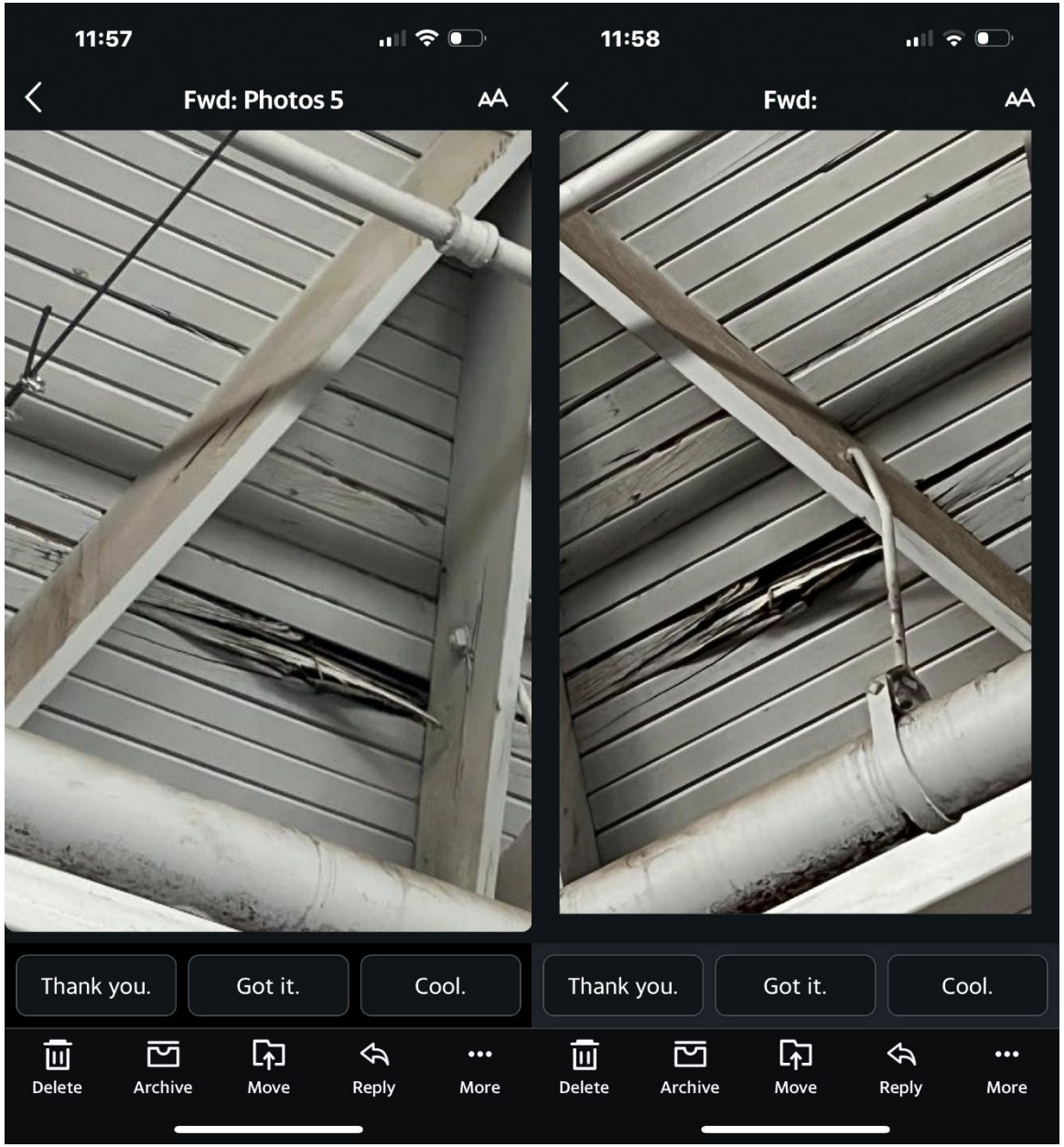
Florida with one roof being torn off completely and deposited upside-down a few hundred feet away [1, 7].

Lamella roof construction was principally in use from its introduction by Zollinger up until the 1940s, with construction mostly halted because of wind failures. Engineers at the time used a wind load of 10 psf on the vertical projection for normal wind areas and 37.5 psf for high-wind regions. The latter wind pressure correlated with a 130 mph wind speed, the highest measured in that era [1].

In modern times, the wind loads on a curved roof are better known thanks to modern wind tunnel testing and computer simulations. It is now known that wind flowing over a curved roof creates uplift (similar to an aircraft wing), not simply a uniform horizontal

curved roof creates uplift (similar to an aircraft wing), not simply a uniform horizontal load on the vertical projection. This creates a very different loading condition than the horizontal load which could potentially explain the failures of some lamella roofs in the first half of the 1900s.

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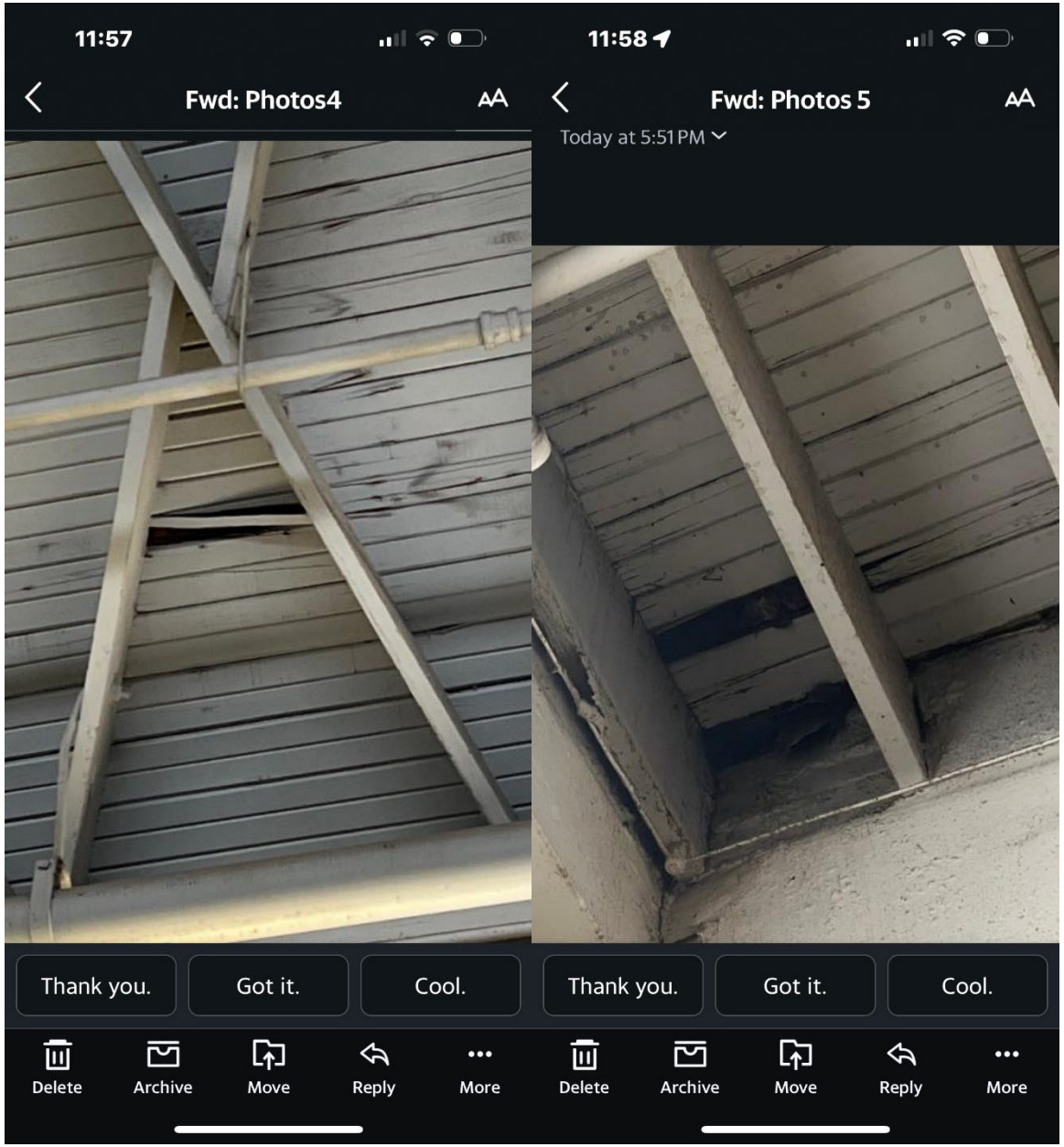
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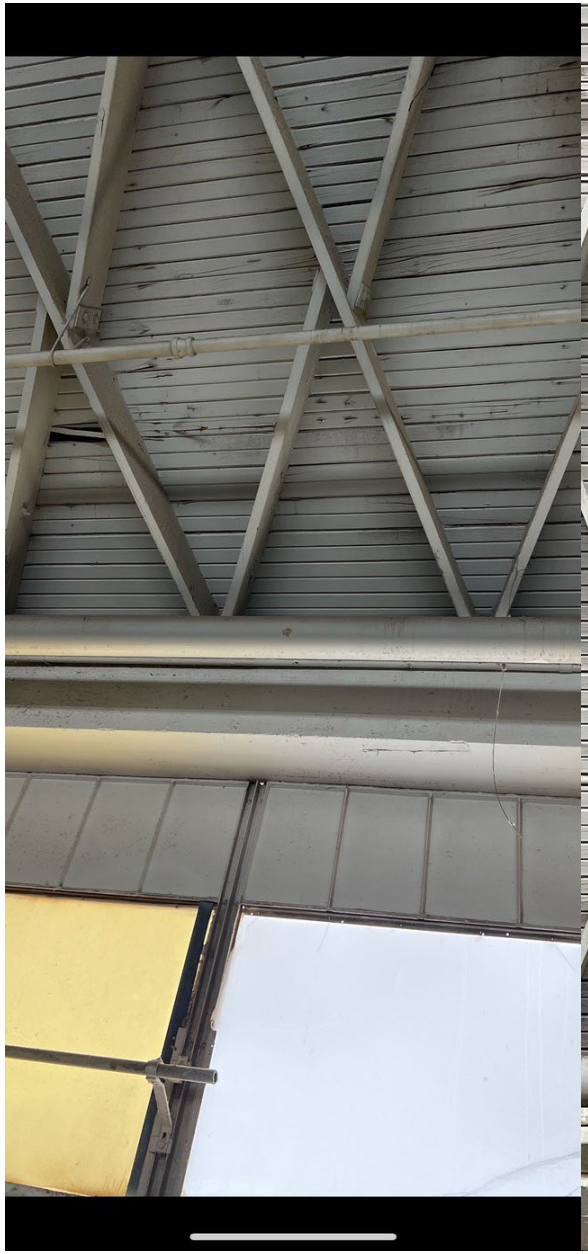

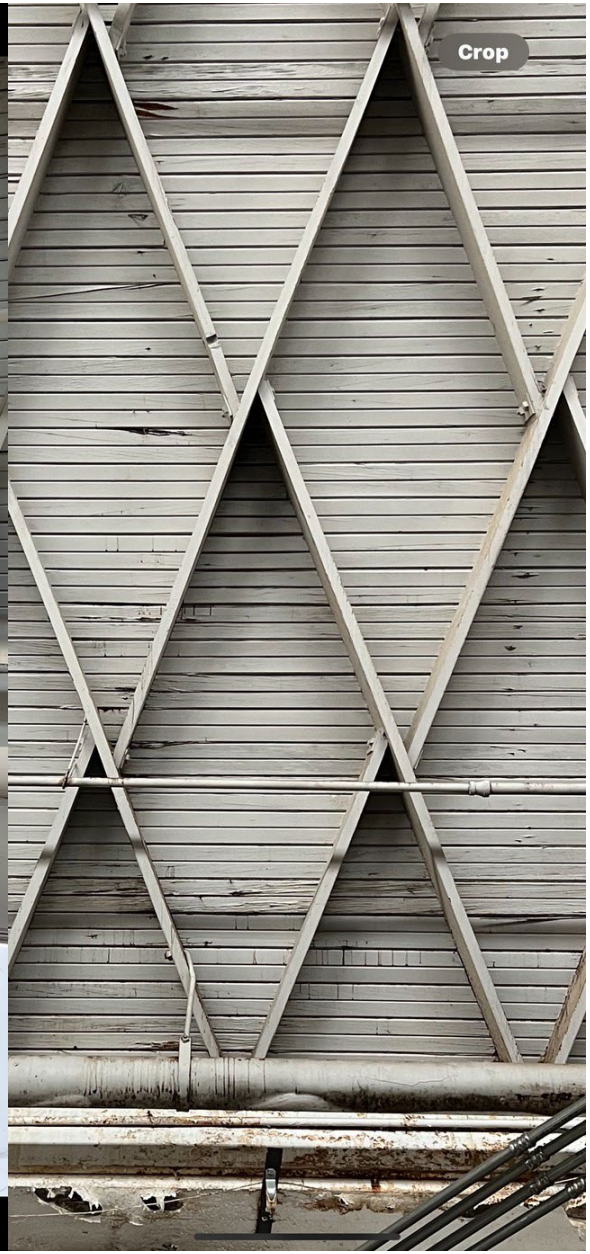
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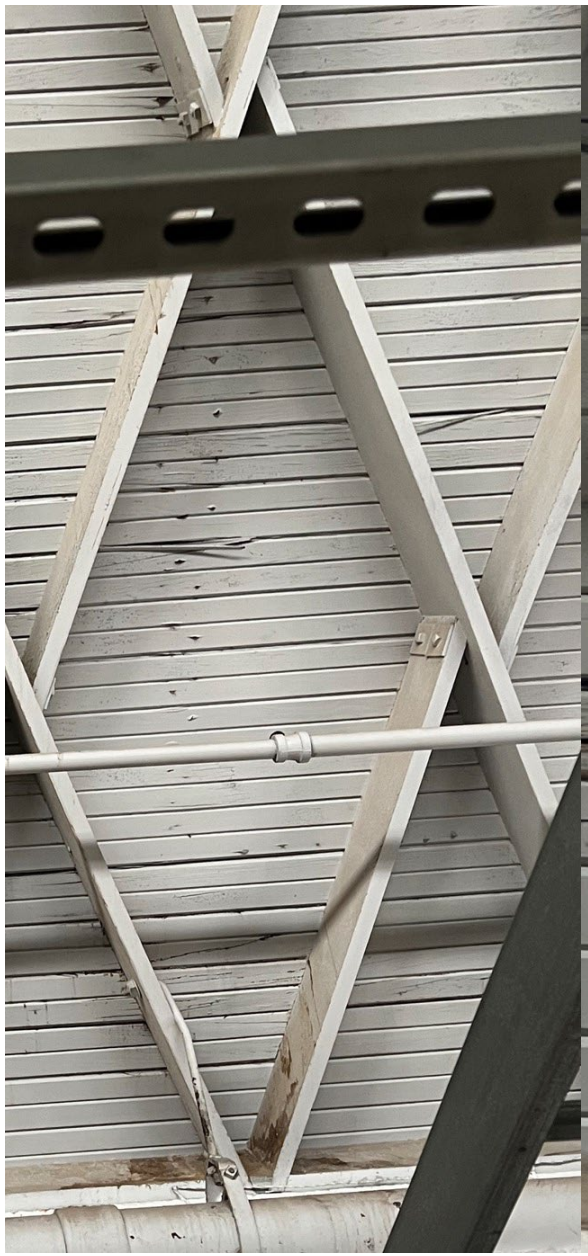

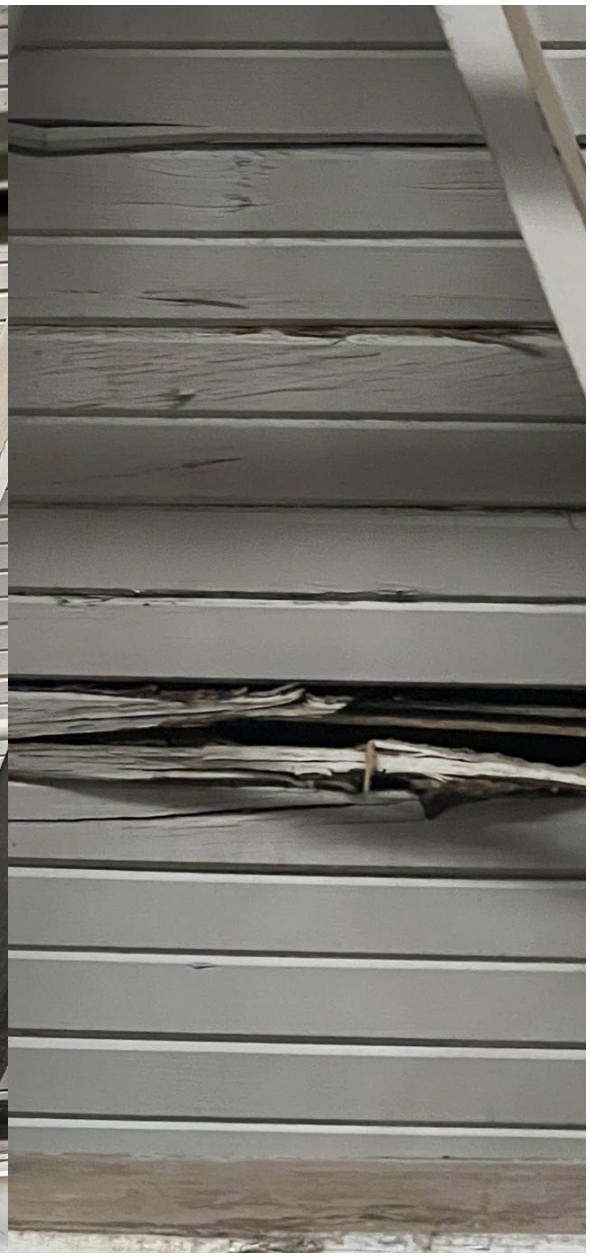

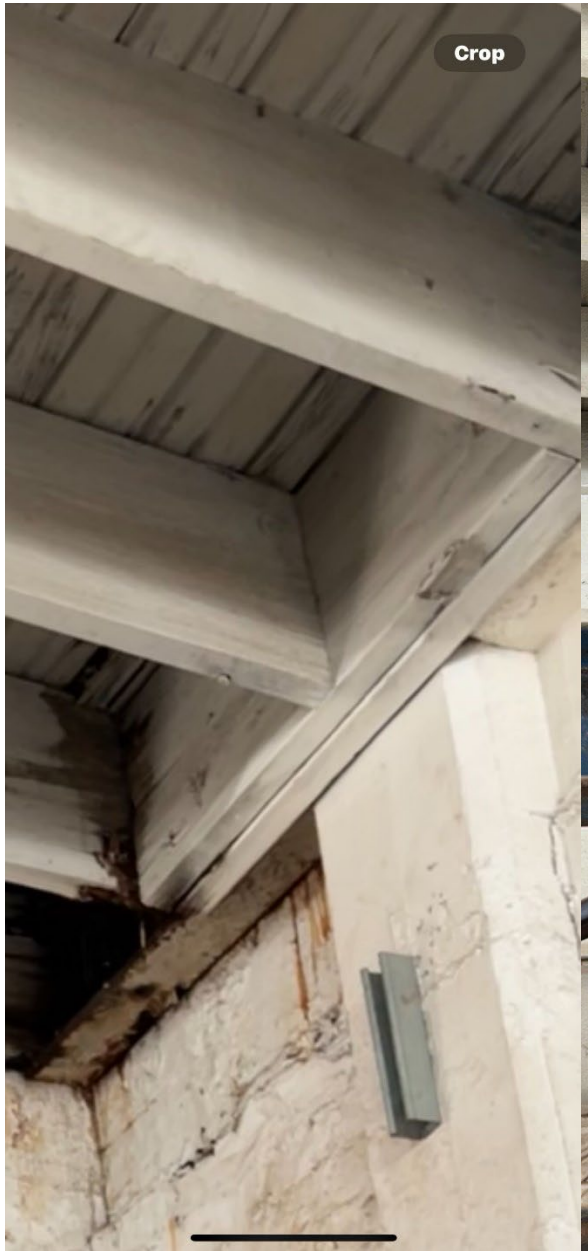
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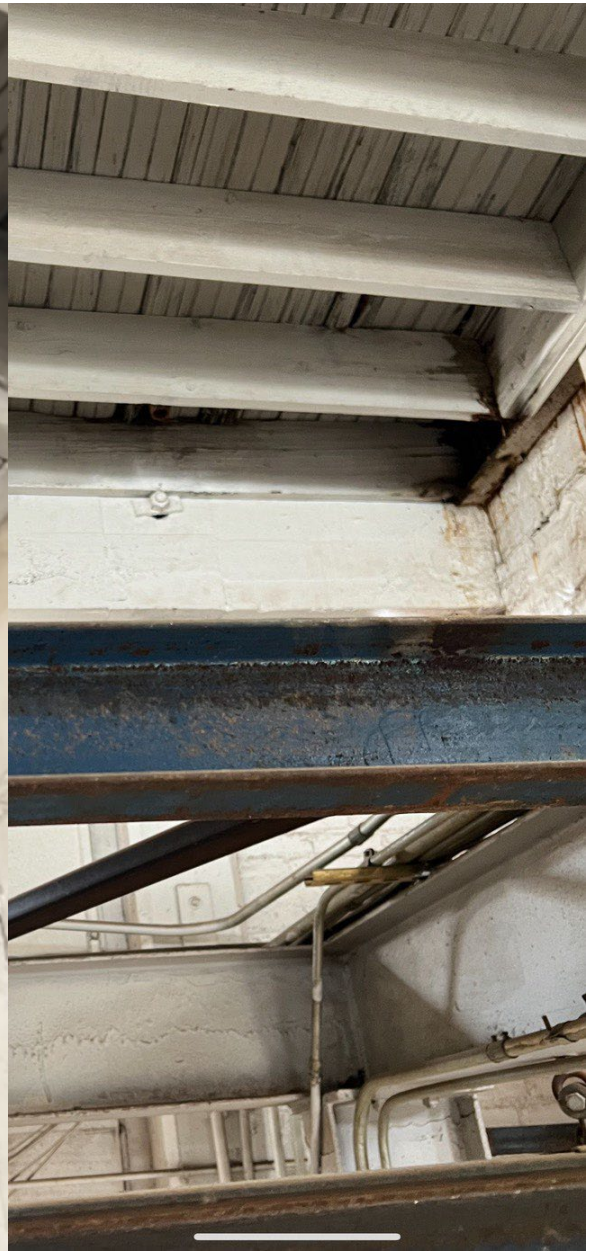

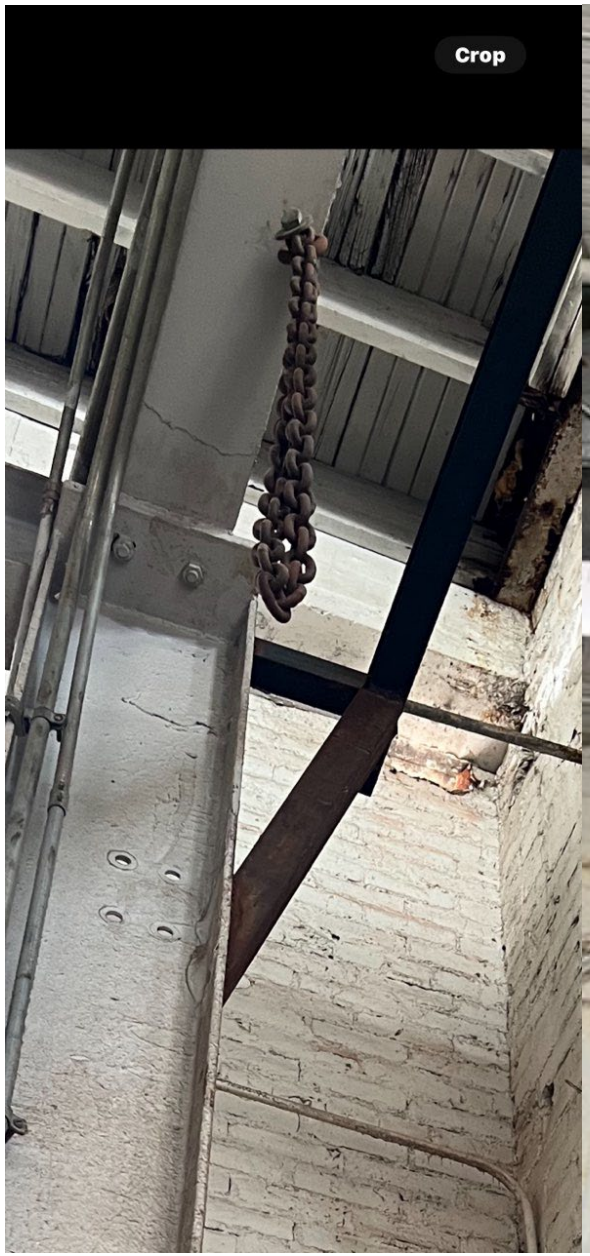
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