

November 15, 2017

Mr. John Erickson
DSGW Architects
2 West First Street, Suite 201
Duluth, MN 55802

Sent by Email to: jerickson@dsgw.com

**Re: Grand Rapids IRA Civic Center – West Venue Roof – Truss Web Member Repair
NCE Job No. 17-665**

Dear John,

This report is intended to follow up on our previous reports dated 11-06-17 and 11-09-17 and our discussions discussions with Matt Wegworth (City Engineer) and Travis Cole (City Building Official) yesterday. Also included is a requested detail for properly replacing the failed truss member discussed in our 11-09-17 report.

The Original report summarizing our analysis of the roof structure dated 11-06-17 stated that the existing roof design capacity of the west venue wood roof structure was determined to be approximately 20 psf based on member sizes and like new condition of the members. We stated that we consider this condition to be dangerous and should be corrected as soon as possible. Since the roof has adequately performed for over 50 years, we recommended that the snow load be controlled to less than 1 foot, that consideration be given to posting notice of the diminished capacity and to cancel events during a significant snow event.

The follow up report dated 11-09-17 discussed the issue regarding the failure of a significant truss web member under minimal loading. The failure apparently occurred between 10-24-17 and 11-08-17 with no large snow event and only approximately 3 inches of snow on the roof when we visited. In this letter, we concluded that the failure could potentially be a result of the wood being somewhat weakened by long term moisture changes in the material and that our confidence in the calculated capacity is diminished by the partial failure. This letter recommended that the truss be shored, and that the facility not be used unless and until the building official and the building ownership can agree to stringent maintenance procedures to adequately protect the public. In other words, we did not further prescribe these further procedures but leave this to the building official and the management to work out knowing the potentially very weak condition.

Based on our discussions and further review of the failure. We determined that the new web failure did occur in the same truss as a previous failure and repair in 2001. We also noted that the previous failure was in an adjacent web member. Since it is possible that the diminished capacity of the member could also be due to incorrect procedures in the previous repair, we informed the building official and staff of this possibility. This information along with their internal discussions and planning has apparently led them to instruct NCE to provide a repair detail for the broken web member.

Attached to this letter, please find our repair detail for the failed member. In our opinion, it is possible that this failure is partially due to improper repair in the past, but it is also possible that the failure under light loading is partially or completely due to reduced capacity due to long term moisture changes. Therefore, as we discussed, in our professional opinion:

1. The public should be informed and protected from snow loading on the roof as determined by the building official and the ownership with the knowledge that a partial failure has occurred with less than 6" of snow on the roof. The procedures for doing so are to be determined by the ownership and building official. Note: unbalanced loading (loading on one side of the roof only) is of particular concern as it causes members designed for tension to be placed into compression.
2. The repair of this member, if properly installed per the drawing, meets or exceeds the capacity of the original member, but does not improve upon the overall capacity of the truss or overall roof structure.
3. The venue should be closed during a significant snow event, with the understanding that a partial failure has occurred with less than 6" of snow on the roof.

Sincerely,



Jon E. Aamodt, PE
Principal Partner

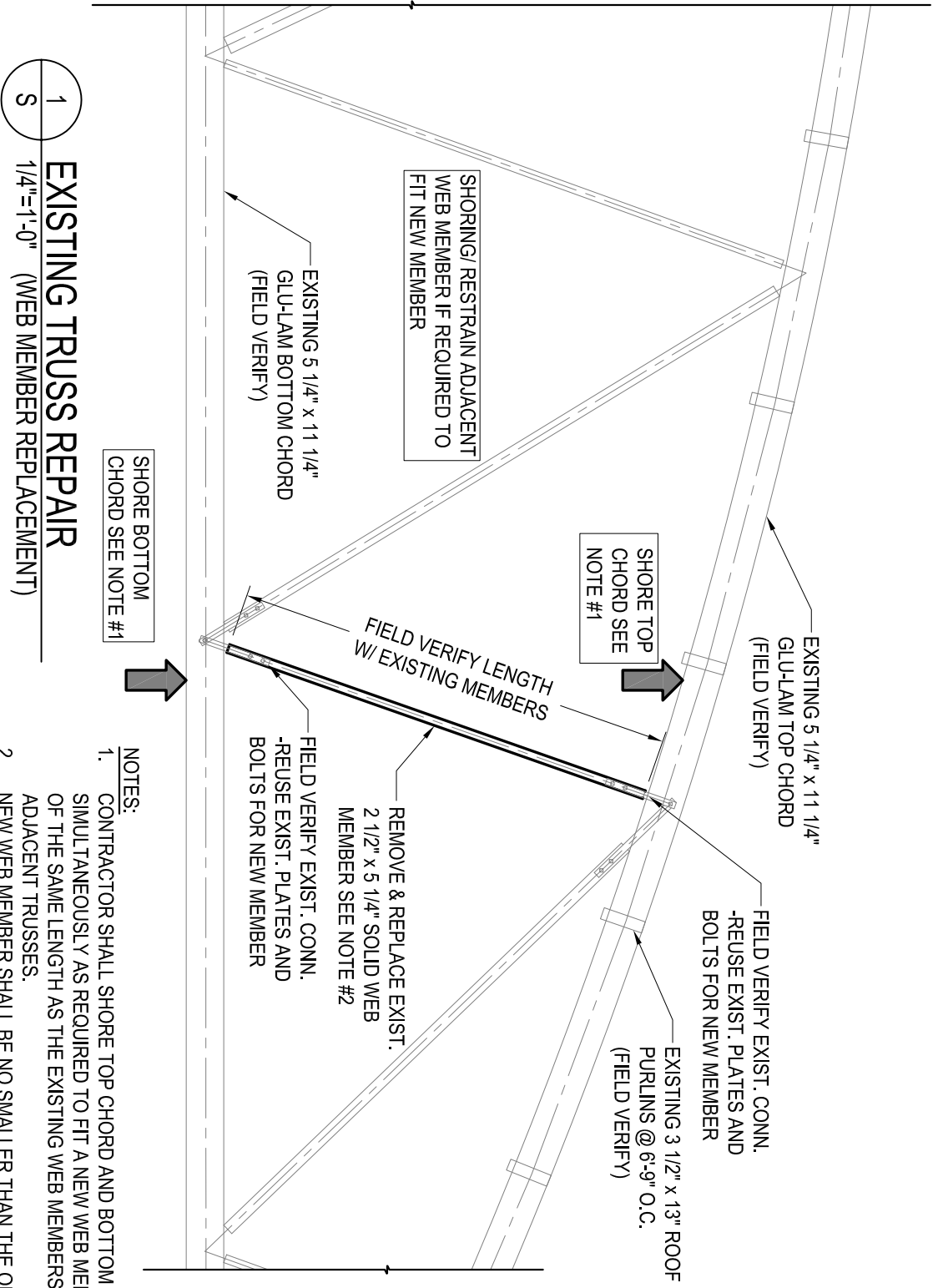
Professional Certification:

I hereby certify that this plan, specification or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.



Jon E. Aamodt, P.E.
MN Reg. No. 24838

Date 11-15-17



1
EXISTING TRUSS REPAIR
 1/4"=1'-0" (WEB MEMBER REPLACEMENT)

SHORE BOTTOM
 CHORD SEE NOTE #1

SHORE TOP
 CHORD SEE
 NOTE #1

- NOTES:**
- CONTRACTOR SHALL SHORE TOP CHORD AND BOTTOM CHORD SIMULTANEOUSLY AS REQUIRED TO FIT A NEW WEB MEMBER OF THE SAME LENGTH AS THE EXISTING WEB MEMBERS IN ADJACENT TRUSSES.
 - NEW WEB MEMBER SHALL BE NO SMALLER THAN THE ORIGINAL MEMBER AND SHALL BE D.F. #1 OR BETTER. ROSBORO X-BEAM GLU-LAM OF SIMILAR DIMENSIONS MAY BE USED.