Municipality of East Ferris

Information Report to Council

Report No.: CAO-2020-01 Date: January 14, 2020

Originator: Jason H. Trottier, CAO/Treasurer

Subject: Structural Engineering Report – Arena Roof

RECOMMENDATION

No recommendation at this time – for information purposes only.

BACKGROUND

On August 14, 2019 Bry-Co Engineering Ltd. completed a cursory visual review of the roof structure of the main arena section at the East Ferris Community Centre. Attached to this report is the Arena Roof Structural Assessment Report provided by the consultant on December 12th, 2019. The report notes repairs that should be completed within the next year to prolong the life of the structure, but the consultant is recommending replacement of the roof structure.

Since receiving the report, staff have contacted a contractor to inquire as to the cost of replacing the roof structure. A quote has not yet been received. This information will be made available to Council at a later date for a decision. For the recommended repairs noted in the report, staff will be including them in the 2020 capital budget. At this time, the cost of the repairs is unknown.

Structural assessments of the roof structure were completed in 2011 and 2016.

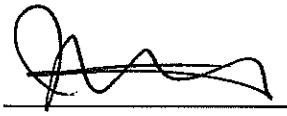
FINANCIAL IMPLICATIONS

Information not available at this time.

CONCLUSION

Not applicable.

Respectfully submitted,



Jason H. Trottier, BBA, CPA, CMA
CAO/Treasurer

BRY-CO
ENGINEERING LTD.

TOWNSHIP OF EAST FERRIS

EAST FERRIS COMMUNITY CENTRE

ASTORVILLE, ONTARIO

ARENA ROOF

STRUCTURAL ASSESSMENT REPORT

{Date of Site Inspection - August 14, 2019}

PROJECT NO: 19-104

December 12, 2019

705-724-3822 / bry-co@bry-co.ca *368 LINDQUIST LINE, POWASSAN* *ONTARIO, CANADA P0H 1Z0*

INTRODUCTION

The Township of East Ferris has retained BRY-CO Engineering Limited (BRY-CO) to complete a cursory visual review of the existing roof structure of the main Arena section at the East Ferris Community Centre, located at 1267 Village Road, in Astorville, ON.

The main Ice Rink section of the East Ferris Community Centre was reviewed on August 14, 2019 by William J. Bryant, P.Eng. with the assistance of Patrick Rochefort, EIT. Present during parts of our investigation was Tom Slack, Arena/Recreation Foreman for the Township of East Ferris.

The building is comprised of five sections:

- Arena (ice surface area, spectator stands, east end utility rooms, offices, and dressing rooms);
- West End Lobby;
- Dressing Rooms and Community Hall;
- Curling Rink and Club Space;
- Leased Area, which currently houses the Post Office and a Hair Salon.

Previous inspections were conducted and reported on by this firm, most recently in 2016, 2011 and 2004. As part of our 2016 report, we recommended that the main Arena roof structure be reviewed again in 2019 and the remaining sections of the building in 2021, following the completion of the repairs outlined in the 2016 report.

This review was limited to the Arena roof structure over the ice surface and spectator stands only. The purpose of this investigation was to visually review the existing truss members (top and bottom chords plus the web members), roof purlins (four locations), decking underside (four locations), and support timber posts for signs of new and/or continued deterioration, and recommend repairs for any observed deficiencies.

DISCUSSION AND OBSERVATIONS

The arena structure consists of two types of construction, one housing the ice surface plus spectator stands, and the other the south and east side utility rooms, offices, and dressing rooms.

Ice Surface Roof Structure:

The ice surface structure consists of eleven bowstring trusses supported by timber and/or steel posts at each end. The exterior walls consist of infill masonry. The roof structure over the trusses is timber purlins spanning between the top chords of the bowstring trusses. The top side of these purlins are covered with roof sheathing and a roofing membrane. The underside of the purlins is covered with a reflective insulation membrane.

Trusses

In general, the visual investigation revealed several areas of concern with the bowstring trusses.

The top and bottom chords are comprised of multi-ply glue laminated timber sections, laminated along their weak axis'. Delimitation of the plies was observed, at several locations, meaning the plies are separating from each other. As a result, the plies may begin to carry loading as individual members, no longer forming a solid member, and therefore reducing the member's strength. Longitudinal checking was also observed at multiple locations on multiple trusses.

Multiple web members showed signs of medium to severe checking and splitting, on multiple trusses. In some instances, previously banded compression web members showed signs of continued significant checking.

Recommended repairs are outlined in a subsequent section of this report.

Timber Posts

In general, multiple timber posts supporting the truss structure showed signs of checking. The posts near the players benches and penalty box area (#4S, #5S and #6S) showed indications of impact damage and it is suspected that this was due to damage incurred by the players hockey sticks and skates . The location of the posts can be found on Drawing SK-1.

Purlins and Roof Sheathing

The reflective insulation membrane was opened at four locations (See Drawing SK-1) to allow for visual inspection of the purlins and underside of the roof sheathing. The visual investigation of the roof purlins and roof sheathing revealed no indication of structural deterioration at the examined areas.

CONCLUSION AND RECOMMENDATIONS

The Arena roof structure above the ice surface section has been showing increasing signs of deterioration over the past several years. As previously mentioned in our 2016 assessment report and reiterated herein, plans for the full replacement of the roof structure should be seriously considered. At this time, implementing reinforcement methods will only minimally prolong the life of the structure.

The top and bottom chords of the trusses are showing signs of delaminating as well as checking, and require remedial action. Although this was not previously discovered during our other past assessments, it is evident that the delamination has been present for multiple years. A different method of investigation was implemented during this assessment that allowed us to discover this ongoing deterioration.

Several web members also require remedial action. These are in addition to the web members that have already been repaired subsequent to previous inspections. Most of these previous repairs appear to be adequately supporting the web member and have reduced the rate of further checking, although six members were identified to have substantial deterioration and warrant immediate replacement.

Checked members have a reduced resistance to shear and tension/compression loads and require reinforcement to assist the member to bear its load and reduce the rate of further deterioration. Banding is performed to reinforce compression members, and plating of tension members removes the tension from the wood member and transfers it to the steel plate.

Full replacement of the roof structure is again recommended. Reinforcement methods for the weakened members may be implemented to further prolong the life of the trusses and provide time for the municipality to develop a replacement and funding strategy. Details pertaining to the reinforcement methods can be found on Drawings SK-1 plus SK-2 and details of the required repairs are outlined in Table 1.

It is recommended that the above noted repairs be completed within the next year.

With respect to the posts supporting the trusses we did not review any post deterioration or damage that would warrant the posts being changed at this time. A number of posts have been replaced since the 2016 inspection and it is proposed that the balance of the posts be changed with a number of the most severely checked and damaged ones being done each year.

The current preventive maintenance regime should continue as it will help to identify and initiate corrective actions to impede further deterioration.

Inspection frequency should be increased from three years to every two years. As the building continues to age, the rate of deterioration may increase, and repairs will need to be executed. It is recommended that the next review be completed in 2021. This review may be completed during the next scheduled full building assessment in 2021.

Our opinions are based on the information made available to us and on our visual investigation. The visual investigation performed could not include the inaccessible areas of the structure. We request that should any new information pertaining to this matter becomes available that we be advised immediately in order that this new information can be evaluated in conjunction with the above commentary in the event that our present opinion may be affected.

Prepared by:

Patrick Rochefort, EIT, Structural EIT, and
William J. Bryant, P.Eng., Structural Engineer

Approved by:

REGISTERED PROFESSIONAL ENGINEER
W. J. BRYANT
PROVINCE OF ONTARIO

William J. Bryant, P.Eng. Structural Engineer

Attachments: - Drawing No. SK-1 & SK-2
- Table 1 – Repair Schedule for Trusses

TABLE 1

There are two different repairs (banding or plating) recommended for the truss web members dependent on whether the member is in tension or compression. Details for the fabrication of the bands and plates can be found in Drawing SK-1 and SK-2.

Truss #	Web #	Side	Repair
1	3-4	West	P
1	7-8	East	P
1	15-16	n/a	B
1	TOP & BOTTOM CHORD TO BE BANDED		
2	5-6	East	P
2	7-8	West	P
2	10-11	n/a	B
2	13-14	n/a	B
2	14-15	West	P
2	15-16	n/a	Replace
2	16-17	East	P
2	TOP & BOTTOM CHORD TO BE BANDED		
3	5-6	East	P
3	16-17	East	P
3	TOP & BOTTOM CHORD TO BE BANDED		
4	4-5	n/a	B
4	5-6	East	P
4	6-7	n/a	B
4	7-8	East	P
4	15-16	n/a	B
4	TOP & BOTTOM CHORD TO BE BANDED		
5	5-6	East	P
5	16-17	Both	P
5	TOP & BOTTOM CHORD TO BE BANDED		
6	5-6	East	P
6	9-10	n/a	B
6	10-11	n/a	Replace
6	11-12	n/a	Replace
6	13-14	n/a	B
6	16-17	East & West	P
6	TOP & BOTTOM CHORD TO BE BANDED		

7	16-17	East & West	P
7	TOP & BOTTOM CHORD TO BE BANDED		
8	11-12	n/a	B
8	16-17	East	P
8	TOP & BOTTOM CHORD TO BE BANDED		
9	5-6	East	P
9	9-10	n/a	B
9	14-15	West	P
9	16-17	West	P
9	TOP & BOTTOM CHORD TO BE BANDED		
10	7-8	West	P
10	8-9	n/a	B
10	12-13	West	P
10	13-14	n/a	Replace
10	14-15	West	P
10	TOP & BOTTOM CHORD TO BE BANDED		
11	6-7	n/a	Replace
11	8-9	n/a	Replace
11	10-11	n/a	B
11	11-12	n/a	B
11	13-14	East	P
11	14-15	East	P
11	15-16	n/a	B
11	TOP & BOTTOM CHORD TO BE BANDED		

***NOTE:* Brace at Joint 'F' between '7' and '8' to be Replaced**

Repair Details:

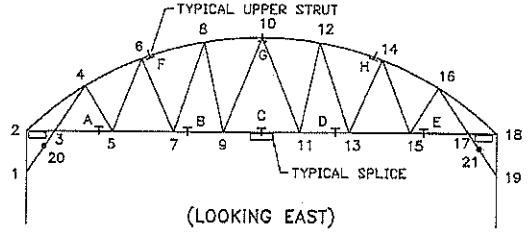
P – This web member requires reinforcement with a 5 1/2" x 3/16" thick Galvanized Steel plate the length of the tension web member. Site measurements will be required. This plate is to be secured at the ends using the existing web-chord securement bolts (threads not intercepted) and at the ¼ points with 3/8" dia. Galvanized Steel Bolts complete with oversized washers. Refer to drawing SK-1 for fabrication details of the plate. If the existing web-chord steel bolts are not reusable they are to be replaced with matching galvanized bolts, nuts and washers.

B – This compression web member requires reinforcements with 2" x 3/16" thick Galvanized Steel Bands. Refer to Drawing SK-1 for fabrication details plus spacing and orientation requirements of the bands.

Replace – This web member requires replacement with a matching Douglas Fir – No:1 Grade member. Temporary shoring of the truss for the replacement operation is to be designed by a Professional Structural Engineer.

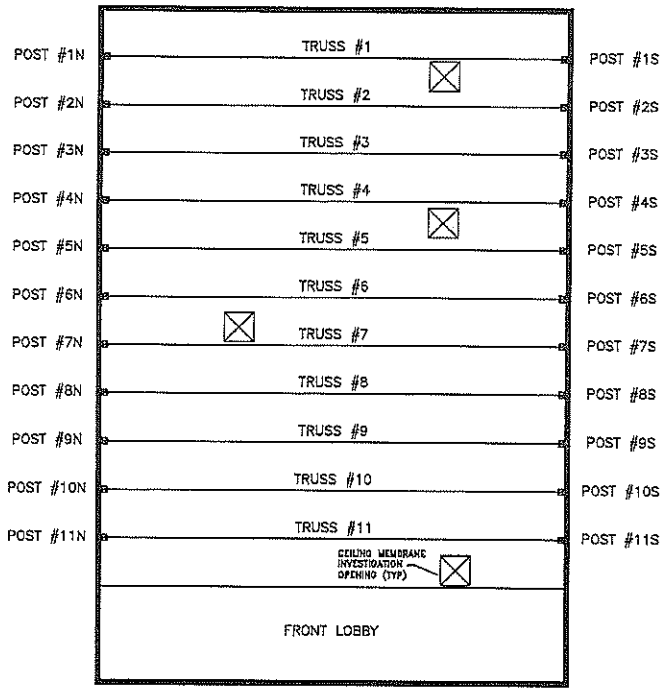
DRAWINGS

DATE	REVISION	No.

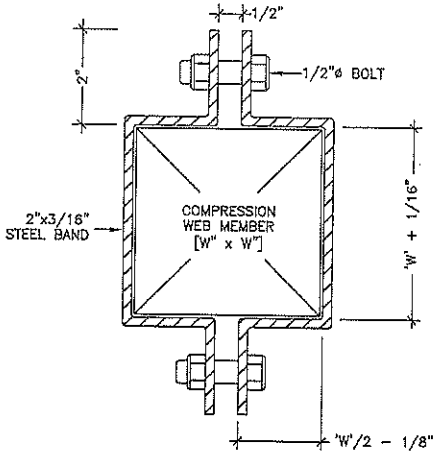


(LOOKING EAST)

TRUSS ELEVATION

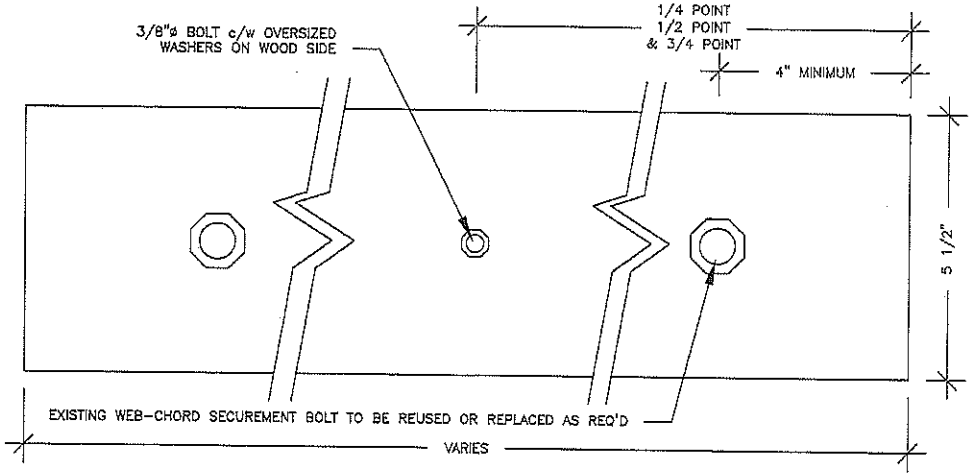


ARENA PLAN



{BAND SPACING @ 30"oc & 90° ALTERNATE ORIENTATION}

BAND DETAIL



3/8" PLATE DETAIL

BRY-CO
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POWASSAN, ONTARIO

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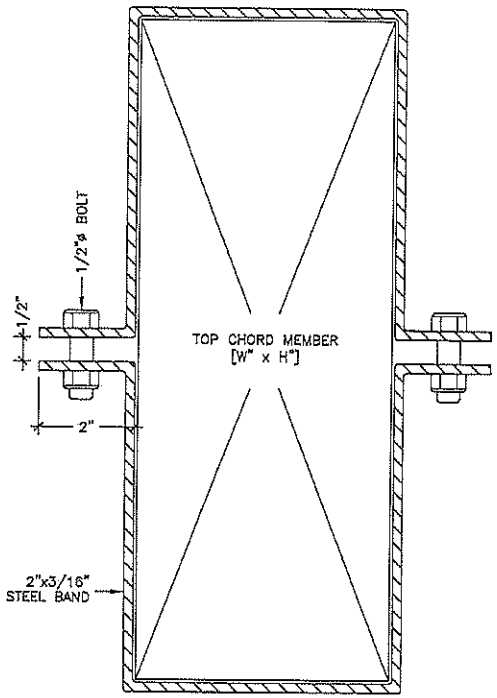
EAST FERRIS COMMUNITY CENTRE

PLAN, ELEVATION AND DETAILS

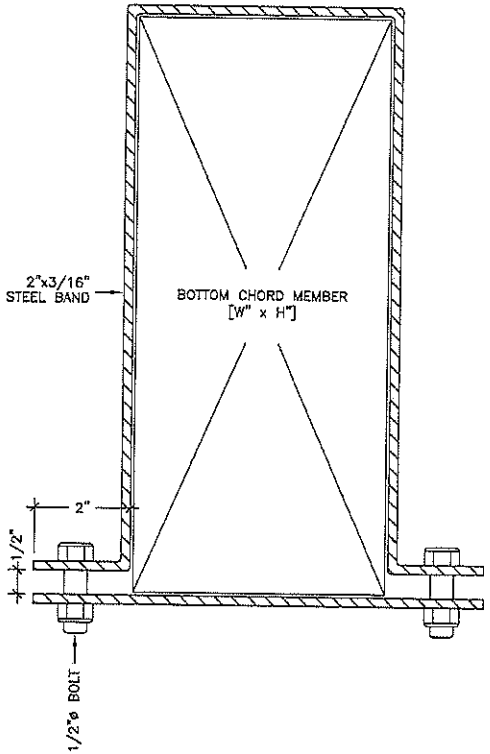
DWG. No.	PROJ. No.
SK-1	19-104
DWG. BY	DATE
W.J.B.	JUL /19
CHK. BY	FILE No.
W.J.B.	19-104ALL
SCALE	PLOT DATE
AS NOTED	DEC 11/19

DATE	REVISION	No.



{BAND SPACING @ 30"oc}

TOP CHORD BAND DETAIL



{BAND SPACING @ 30"oc}

BOTTOM CHORD BAND DETAIL

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TOP & BOTTOM CHORD BAND DETAILS

DWG. No.	PROJ. No.
SK-2	19-104
DWG. BY: W.J.B.	DATE: JUL /19
CHK. BY: W.J.B.	FILE No.: 19-104ALL
SCALE: AS NOTED	PLOT DATE: DEC 11/19