Associated Engineering | GLOBAL PERSPECTIVE. LOCAL FOCUS.

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Ms. Karen Furlong
Yukon Government
Assessments and Abandoned Mines
Energy, Mines and Resources
Box 2703, K-419
Whitehorse, YT
Y1A 2C6

Re: FARO MINE MILL BUILDING: BI-ANNUAL ROOF INSPECTION - OCTOBER 2012

Dear Ms. Furlong:

1 BACKGROUND

Associated Engineering (AE) carried out an Inspection in October 2011, to inspect the repair works at the roof that was carried out during September 2011. Subsequently, a letter report was prepared by AE recommending monitoring the condition of the roof structure on a bi-annual basis and as required for specific points of concern that may arise.

As part of the bi-annual inspection, **Richard Annett, M.Sc., C.Eng., MIStructE, MICE**, made a visit to the site on October 17, 2012, to inspect the condition of the metal deck roof and supporting beams and trusses.

2 OBSERVATIONS

A walkover was done through the building, and a visual inspection carried out from the ground or from elevated walkways. In no places were we able to touch or probe the decking or beams at the valley locations. We refer you to the key plan in the enclosures, and the building references noted. Our comments are as follows:

Lower Mill Building Roof Repair

The lower mill roof that was re-waterproofed was inspected mainly from the inside of the structure. From the Ore Silo Building, we were able to see over the roof of the mill. There were no defects noted, as it was covered in snow. The area of the valley that was used to form an intrusive inspection was largely dry at the time of the visit, noting the roof was covered in ice and mostly frozen over. The adjacent corroded decking to the NE of the inspection, which was sagging, was dry. From the roof this area was surrounded with safety bollards to demarcate it. No changes in condition from the previous visit were observed.

Rusting of the decking and support steelwork appeared dry. This suggests that the degradation of the roof has largely slowed down.

In general, the roof repairs appear to be good in condition, and no observation was made of any decking failure at supports or any sign of distress of the supporting steelwork. Areas away from gutters on the valley lines appeared in generally good condition. Closer to the gutters, the decking in some places is rusting, as well as the supporting steelwork; however, there were other flaws noted below.

- The corner flashings were still missing to the SE gable. This may lead to water ingress and, when mixed with lime powder / dust, may cause corrosion and other related problems.

- Some of the asbestos downpipes from the roof drain are blocked as evidenced by wet looking and brown staining of the pipe and junctions, and a major down pipe in the NE corner as it penetrates the ground floor slab is completely broken away; the surrounding slab was saturated. This will form a slip hazard in the winter and may lead to corrosion of steelwork as water penetrates the floor slab.

3 STRUCTURAL INSPECTION

A visual inspection of the roof structure, which was not repaired, was undertaken from the underside of the roof to monitor the condition. Photographs were taken and, while it is difficult to assess the change in dilapidation from previous visits, there were no serviceability issues of the decking or support steelwork. Again, we repeat that it is advised that the roof should not be walked on since some ribs of the decking may, at the down pipe locations, have gone beyond the point of being able to support concentrated loads (see attached). We noted that there were items on the roof, (bolts, sheet plate, sledge hammers), which could lead to damages in the roof finishes if they have not already done so.

The Ore Silo Roof is leaking in a few bays to both valleys. In some areas, the rust was quite bad, but no failures in the ribs of the decking or support steelwork were observed.

The roof to the Mill Area 3 was also wet along the valleys, which has led to heavy rusting of the support purlin, cross bracing and decking. No deck or support steelwork failures were noted. Continued inspections are advised.

The SE gable of the Upper Mill hall roof, against the wall of the Mill Area 3, was showing signs of water ingress with heavy rust staining of the walls. However, this was dry during the inspection, but it is noted that this area of the roof was frozen.

The roof over the clarifiers also had rusting along the valleys close to outlet points. No deck or support steelwork failures were noted.

The area of the Upper Mill roof that formed a secondary expansion to the plant (NW end), was largely in good condition.

4 OTHER ISSUES

Again, an inspection of the floor adjacent to the lime silo showed no widening to the cracking in the slab, as it was mainly covered with a dried slurry mix on the ground. It was previously reported that during the summer months, water was seen to rise up through the floor slab; there was no evidence of this during our visit, but we will continue to monitor this.

Through the foundations to one of the clarifiers there has been significant leaching of water causing dark orange staining from what appears to be iron, which could potentially be reinforcement. While not critical at this time, this should be monitored.

Other locations within the building show evidence of water ingress. In particular, at the lower basement level of the Upper Mill roof area, a continuous flow of water exits through a pipe entry point in the retaining wall. This is local and is not posing any risk to the structure. There was a significant amount of standing water in this basement area to the south of the retaining wall. This should not pose a problem. Both areas are slip hazards and in winter should be cordoned off. If the area with the standing water can be explored for drain points, then it would be preferable to clean these.

The area on the junction of the Ore silo roof and the Upper Mill roof shows much water ingress. In places this has iced over, and should be cordoned off in the winter as it is a slip hazard. From the quantity of water it appears to be coming from broken rain water pipes and not through the roof.

Both vertical and eave flashings are missing in places and on the SE gable of the Mill Roof 3 and the NW gable of the ore silo building. Some of the side cladding has also come off. We are not sure if this was due to storm damage or due to the age of the cladding fixings.

In the small substation building to the SE of the mill buildings, we understood there was an incident with a machine bearing overheating. The roof is substantially rusted and one bay is sagging.

In walking through the building, these areas that are noted as leaking are beyond our current scope of review. These areas may not be an immediate issue but could have consequential effects in time. They should be monitored periodically.

5 CONCLUSIONS AND RECOMMENDATIONS

5.1 REPAIRS

a. If rain water cannot be prevented from ingress into the building, then we would recommend all new electrical work be installed as if it were rated for external conditions. We noted new lighting being installed during our visit.

b. We would urge that the rain water pipes be repaired when a budget can be allocated.

c. If a budget can be found, we would recommend the relining of just the gutters and rain water pipe off take points to the remaining roofs, where it is obvious that the supporting steels are rusting below. This may have to be balanced with an understanding of what sort of residual design life is needed from the buildings and their proposed occupancy by the C&M Contractor.

d. We were told by the C&M worker that accompanied us on the inspection that some light fittings had fallen. We are unsure as to whether these areas were cordoned off. While it was not part of our brief, it was noted that the galvanized trunking and fixings running along the valley lines were in places completely corroded. We bring this to the client's attention.

e. The missing vertical and eave flashings should be reinstalled, as well as the missing vertical sheeting.

5.2 MONITORING

a. Generally, the C & M Contractor should undertake regular visual inspections as new dangers might arise. The key issue is not to allow access to parts of the building if there is any risk to employees being injured.

b. All the mentioned issues in this report should be visually monitored by the C&M contractor on a monthly basis and AE should be informed should any further degradation of the cladding or drainage occur.

c. There is a fire damaged section of roof in the Lower Mill Building. Some repairs were made, but the decking which has gone well past its serviceability limit state, has unknown capacity. Continued visual monitoring is advised. See also 5.3(c). If the decking does give way, it may 'fly' outside the cordoned-off areas.

d. We recommend that AE continues to monitor the condition, and to verify on a bi-annual basis as required for specific point of concerns that may arise. In addition, we would recommend the scope to be increased such that we can visit the sub-station to inspect that roof.

5.3 ACCESS

a. If there is a need to go on the roof, we would recommend pushing 18 mm ply along the slope near the valleys in order to distribute foot loading over the valleys and keep to walking along the roofs close to the ridge where the decking below looks in reasonable condition.

b. Where rain water pipes and junctions are broken and water is ingressing and soaking the floors and elevated access platforms, they should be cordoned off in winter as they are significant slip hazards.

c. We recommend the area below the fire damaged section of roof in the Lower Mill Building is cordoned off as a safety measure. We cannot say what kind of snow loading capacity this sheeting has.

d. Areas where cladding is coming off the building, such as on the SE wall of the Mill Roof 3 Building and on the underside of the conveyors feeding the Mill Building, these should be cordoned off as best as possible. Cold working of loose sheeting and fixings will eventually lead to a failure.

e. On many of the walkways, stairs and corridors there is a significant amount of debris and objects that make it a hazard using them. We recommend that they are all cleared up to make it safe for inspections and maintenance by the C&M Contractor and ourselves.

f. Where heavily rusted cable ducts and light fittings exist (generally found near to valleys), and where the light fittings have already fallen then access to walkways below should be cordoned off for safety if it has not already been done.

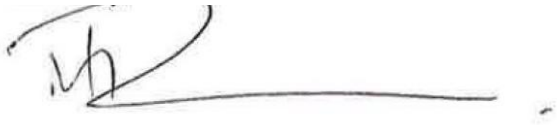
If you have any questions, please call either Mark Porter or me.

Yours truly,

Prepared by:

Richard Annett, M.Sc., C.Eng., MIStructE, MICE
Senior Structural Engineer

Reviewed by:



Mark Porter, FIStructE, P.Eng., Struct.Eng., LEED AP
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Enclosures: Photos