

## **APPENDIX B – AUBREY PUMPING STATION HOIST DEVICES AND LIFTING CAPACITIES REPORT**

### **STANDARD LIMITATIONS**

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## 1.0 LIFT STATION INFORMATION

**Station Name:** Aubrey Lift Station

**Location of Station:** 1016 Palmerston Avenue (at Aubrey Street)

**Date of Inspection:** February 17, 2010

**Inspected By:** Damir Muhurdarevic, EIT

**Inspecting Firm:** MMM Group Limited (MMM)

**Client:** City of Winnipeg – Water and Waste Department

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## 2.0 OBSERVATIONS

### 2.1 General

Aubrey Lift Station is a conventional lift station with a main floor at ground level and four (4) floors below ground level. The lift station is constructed of cast-in-place concrete below ground level and masonry and wood framing above ground level. The main floor contains typical lift station components and controls, the first and second floors below ground level are a combined chamber room, the third floor below ground level is a motor room containing wastewater/land drainage pump motors, and the fourth floor below ground level is a pump room containing wastewater/land drainage pumps. The condition and operation of the pumps and motors was not observed.

### 2.2 Lifting Devices

The main floor has two (2) steel lifting beams are beam approximately 2400mm above the top of main floor spanning approximately 3120mm. One (1) lifting beam is an S150x19 steel beam. A sliding steel beam clamp is bolted onto the bottom flange of the lifting beam. The other lifting beam is a W150x22 steel beam. Sliding steel beam clamps are bolted onto the bottom flange of the reference lifting beams. The lifting beam support connections were unable to be observed due to wall insulation.

The third floor motor room and the fourth floor pump room each contain three (3) eye-shaped hooks. The hooks are fabricated of 19.4mm diameter steel rod and are embedded underside of the cast-in-place concrete floors above. The pump room also contains one (1) smaller eye-shaped hook, fabricated of 13.6mm diameter steel rod and embedded into the cast-in-place concrete floor above, and one (1) U-shaped hook fabricated of 13mm diameter steel rod welded to a 7mm thick steel plate bolted to the cast-in-place concrete floor above. Surface corrosion was observed on the U-shaped hook plate. However, no significant loss of sectional area was observed. The motor room also contains one (1) bracket hook fabricated of a 19mm diameter steel rod ring welded to a bracket fabricated of 13mm x 50mm bar steel bolted into the underside of the cast-in-place concrete floor and adjacent concrete wall. Mild surface corrosion was observed on the bracket hook. However, no significant loss of sectional area was observed.



### 3.0 ANALYSIS AND LOAD RATING

Both beams on the main floor were analyzed for bending resistance. Bending resistance in the S-beam was determined to be 3.0 tons, and the W-Beam was determined to be 4.8 tons. This capacity was reduced by factors of 3.0 and 3.2 respectively, due to unknown wall connections to yield a **load rating of 1.0 tons for the S150x19 beam and 1.5 tons for the W150x22 beam.**

The six (6) eye-shaped hooks, located in the third floor motor room and the fourth floor pump room, were analyzed for pullout resistance of the embedment and tension resistance of the hook. A thickness of 200mm for the cast-in-place concrete floor and an embedment length of 150mm were used. The pullout resistance was the governing factor in the hooks, which was calculated to be 3.5 tons per hook. However, it is recommended that an additional factor of safety of 3.5 be applied to the hooks, to yield a **load rating of 1.0 ton.**

The analysis of the U-shaped hook, located in the fourth floor pump room, determined a capacity of 1.0 tons due to the bending of the plates. However due to the surface corrosion of the steel, a factor of safety of 2 must be applied, to yield a **load rating of 0.5 tons.**

The bracket hook, located in the third floor motor room, was analyzed for tensile resistance of the hook, pullout of the floor anchor bolts, shear resistance of the wall anchor bolts, and the shear resistance of the bracket. The pullout resistance was the governing factor in the hook, which was calculated to be 3.3 tons. However, due to the surface corrosion and the unconventional bracket design, a factor of safety of 3.3 was applied, to yield a **load rating of 1.0 ton.**

Table 3.1 below is a summary table of lifting device load ratings:

Table 3.1 Load Rating Summary

Type	Quantity	Location	Calculated Resistance	Safety Factor	Load Rating
W150x22 Lifting Beam	1	Main Floor	4.8 tons	3.2	<b>1.5 tons</b>
S150x19 Lifting Beam	1	Main Floor	3.0 tons	3.0	<b>1.0 ton</b>
Eye-Shaped Lifting Hooks	6	Underside of Cast-In-Place Concrete Floors	3.5 tons	3.5	<b>1.0 ton</b>
U-Shaped Hook	1	Underside of Second Cast-In-Place Concrete Floor	1.0 ton	2.0	<b>0.5 tons</b>
Bracket Hook	1	Underside of Second Cast-In-Place Concrete Floor	3.3 tons	3.3	<b>1.0 tons</b>

## 4.0 CONCLUSIONS AND RECOMMENDATIONS

Below is a summary of deficiencies and items requiring further attention.

*Table 4.1 Deficiencies*

Ref.	Description	Priority
4.1	Paint U-shaped hooks to prevent further rusting.	B

Items denoted as Priority A are Must Do Work items and should be addressed immediately.

Items denoted as Priority B are One (1) Year Deferrable items and should be addressed as soon as possible within one (1) year.

Items denoted as Priority C are Three (3) Year Deferrable items and should be addressed within three (3) years.

MMM, through this inspection, does not warrant the lifting devices installation or warrant that the design complies with current codes or standards. As per MMM's analysis it was found that the eye hooks should be rated at 1.0 tons, and the U-shaped hooks at 0.5 tons. The main floor W-beam is to be rated at 1.5 tons and the S-beam at 1.0 tons.

This lift station inspection is limited to a visual inspection lifting members and connections. The inspection pertains to surface material condition only.

Prepared by:

**MMM Group Limited**

Damir Muhurdarevic, EIT  
Inspector

Reviewed by:

**MMM Group Limited**

Jim Lukashenko, P.Eng.  
Manager, Structures  
Associate

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**Photograph No. 1**

Various hooks in the pump room



**Photograph No. 2**

Cast-in-place concrete deteriorated near one of the eye-shaped hooks

**Photograph No. 3**

Motor room bracket hook



**Photograph No.4**

Side by side lifting beams on the main floor