

### **STANDARD LIMITATIONS**

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## 1.0 LIFT STATION INFORMATION

**Station Name:** Syndicate Lift Station

**Location of Station:** back lane between Metcalfe Ave and Lyndale Drive; at river

**Date of Inspection:** January 26, 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

Metcalfe Lift Station is a conventional lift station with a main floor at ground level and three (3) 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 floor below grade is an access room, the second floor below ground level is a motor room containing the pump motors, and the third 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 a lifting beam spanning 2700mm along the entire width of the room. It is a W-Beam (175mm high by 93mm wide) and has a sliding hook attached to it. The wall connections are not visible on either side of wall due to insulation.

The pump room located three floors below ground has two (2) eye-shaped lifting hooks, fabricated of 19.4mm diameter steel rod, embedded into the underside of the motor room cast-in-place concrete floor slab. There are also two (2) U-shaped lifting hooks that are welded to steel plates anchored in the underside of the motor room cast-in-place concrete floor slab with anchor bolts.

The motor room located two floors below ground also has two (2) eye-shaped lifting hooks, fabricated of 19.4mm diameter steel rod, embedded into the underside of the access room cast-in-place concrete floor slab.

### 3.0 ANALYSIS AND LOAD RATING

The W-beam on the main floor was analyzed for moment resistance in the beam and the shear resistance of an assumed bolted connection. The shear resistance was found to be the governing factor at 3.0 tons. This was reduced by a factor of safety of 3.0 to yield a **load rating of 1.0 ton**

The eye-shaped lifting hooks were analyzed for pullout resistance of the embedment and the tension resistance of the hooks. The thickness of the concrete slabs was 200mm and an embedment length of 150mm was used. The governing factor in the hooks was the pullout resistance, which was calculated to be 3.5 tons. It was then applied a factor of safety of 3.5 to yield a **load rating of 1.0 ton**.

The analysis of the U-shaped lifting hooks welded to steel plates determined a rating of 1.1 tons due to the bending of the plates. A factor of safety of 2.0 was applied to yield a **load rating of 0.5 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
W-Beam	1	Main Floor	3.0 tons	3.0	<b>1.0 ton</b>
Eye-shaped Lifting Hooks	4	Underside of First and Second Cast-In-Place Concrete Floors	3.5 tons	3.5	<b>1.0 ton</b>
U-shaped Lifting Hooks	2	Underside of Second Cast-In-Place Concrete Floor	1.1 ton	2	<b>0.5 ton</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 lifting hooks in pump room to prevent further corrosion	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 our analysis it was found that the main floor W-beam is to be **load rated at 1.0 ton**, and the eye-shaped lifting hooks **load rated at 1.0 ton** as well. The U-shaped lifting hooks were **load rated at 0.5 ton**.

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

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**Photograph No. 1**

Various lifting hooks located in the pump room



**Photograph No. 2**

Lifting beam located on the main floor