

STANDARD LIMITATIONS

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1.0 LIFT STATION INFORMATION

Station Name:	<u>Jessie Lift Station</u>
Location of Station:	<u>1 Mulvey Avenue East</u>
Date of Inspection:	<u>January 28, 2010</u>
Inspected By:	<u>Damir Muhurdarevic, EIT</u>
Inspecting Firm:	<u>MMM Group Limited (MMM)</u>
Client:	<u>City of Winnipeg – Water and Waste Department</u>

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2.0 OBSERVATIONS

2.1 General

Jessie 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 grade are a combined chamber room, the third floor below ground level is a motor room containing the 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 an S150x19 lifting beam that spans approximately 2900mm with an attached sliding plate hook. The end support connections were unable to be observed due to Styrofoam wall insulation. Slight corrosion was observed on the lifting beam. However, no significant loss of sectional area was observed on the lifting beam.

The second floor chamber room has two (2) eye-shaped hooks, fabricated of 25.4mm diameter steel rod embedded into the underside of the cast-in-place concrete floor above. One of the motor room eye-shaped hooks is bent and cracked. The back room on the same floor contains one (1) additional eye hook that is currently not in use. Corrosion on the steel hook and deterioration of the surrounding concrete was observed.

The third floor motor room and the fourth floor pump room each contain three (3) eye-shaped hooks fabricated of 19.4mm diameter steel rod embedded into the underside of the cast-in-place concrete floors above.

The pump and motor rooms each have one (1) round hook fabricated of 13mm diameter steel rod, welded to a plate anchored into the underside of the cast-in-place concrete floor above. Both round hooks were observed to have three (3) out of four (4) potential anchors installed.

The pump room also contains a U-shaped hook fabricated of 25mm diameter steel rod welded to a plate anchored into the underside of the cast-in-place concrete floor above. Surface corrosion was observed on the U-shaped hook. However, no significant loss of sectional area was observed.

3.0 ANALYSIS AND LOAD RATING

The main floor S-beam system was analyzed for bending resistance of the beam and shear resistance of the assumed wall connection. Bending resistance governed which was calculated to be 3.4 tons. Due to wall connection assumptions, it is recommended a safety factor of 3.4 be applied to yield a **load rating of 1.0 ton.**

The eye hooks were analyzed for pullout resistance of the embedment and the tension resistance of the hook. A concrete thickness of 200mm and an embedment 150mm were used. The governing factor in the hooks was the pullout resistance, which was calculated to be 3.5 tons for the 19.4mm diameter hooks and 3.6 tons for the 25.4mm diameter hooks. 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 bent and cracked eye-hook in the motor room and the rusted eye-hook with damaged concrete are deemed unsafe and should not be used.**

The round hooks were analyzed for tension and pullout resistance of two (2) of the possible four (4) anchors, weld, shear, and tension resistance of the hook, and bending resistance of the steel plate. Bending in the steel plate governed which was calculated to be 1.2 tons. It is recommended a safety factor of 2.4 be applied to yield a **load rating of 0.5 ton.**

The analysis of the U-shaped hook welded to a plate bolted in the ceiling was calculated to have a resistance of 1.2 tons due to the bending of the plates. However, it is recommended a safety factor of 2.4 be 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
S150x19 Lifting Beam	1	Main Floor	3.4 tons	3.4	1.0 ton
Eye-Shaped Lifting Hooks	6	Underside of Cast-In-Place Concrete Floors	3.5 tons (19.4mm) 3.6 tons (25.4mm)	3.5	1.0 ton
Round Hook	2	Underside of Cast-In-Place Concrete Floors	1.2 tons	2.4	0.5 ton
U-Shaped Hook with Plate	1	Underside of Third Cast-In-Place Concrete Floor	1.2 tons	2.4	0.5 ton

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	Remove motor room cracked eye hook and second floor corroded eye hook, replace as required.	A

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-shaped hooks should be rated at 1.0 tons, and the U-shaped hooks welded to steel plates bolted to the ceiling at ½ tons. The main floor beam is rated at 1.0 ton. It is also imperative that the 1 bent/cracked and the 1 rusted eye hook not be used further and be replaced.

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 and motor rooms
(eye-shaped hook bent and cracked in the motor room)



Photograph No. 2

Eye-shaped lifting hook located in the back room on the 2nd floor down
(corroded hook and deteriorating concrete)



Photograph No. 3

Thick eye-shaped lifting hooks located on the 2nd floor down, embedded into concrete beams



Photograph No. 4

Lifting beam located on the main floor