APPENDIX B – MONTCALM PUMPING STATION HOIST DEVICES AND LIFTING CAPACITIES REPORT

STANDARD LIMITATIONS

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1.0 LIFT STATION INFORMATION

Station Name:	Montcalm Lift Station
Location of Station:	41 Archibald St.
Date of Inspection:	January 21, 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

Linden 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. There is also a front room on the main floor. 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 en empty backroom, 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 front room on the main floor has a single beam spanning 3000mm across the entire width of the room. It is an S150x19 beam, and its wall connections are not visible, as insulation is exposed. This beam carries a sliding trolley with a ½ ton rating.

The main floor big room has a horizontal truss system with cross bracing. There are three (3) U shaped lifting hooks, fabricated of 19.4mm diameter steel rod, that are connected to an S250x38 beam spanning 2115mm, with double angles bolted on each side of the beam's web. This beam in turn is bolted to a longer beam that spans across the entire width of the room. It is a W310x39 and is 5115mm long.

The second floor below ground has one (1) U-shaped lifting hook that is attached to a plate that is anchored to a concrete floor beam and one (1) eye-shaped hook, fabricated of 19.4mm diameter steel rod .Some corrosion was observed in the steel plate, but with no loss of sectional area. The motor room on that floor contains four (4) more eye-shaped lifting hooks fabricated of 19.4mm diameter steel rod, and one (1) additional U-shaped lifting hook welded to a steel plate anchored in the concrete, as well as a beam system, which is consists of 4 parts of an S200x27 beam. The system spans throughout the entire length of the room, and is supported at the walls with shelf angles that are anchored to the bottom flange of the beam and anchored to the wall with anchor bolts. At two (2) of the three (3) connections between the four (4) parts of the beam there are welds and clamps, and the one (remaining) connection the beam is in two parts and is inserted into one another and clamped as well. Additional supports for the beam are clamps that are holding the beam up and are anchored into the cast-in-place concrete slab in the floor above. There are a total of six (6) of those clamps. The rating of the sliding trolley attached to this S-beam is posted at 2.0 tons.

The third floor below ground has a backroom that contains (1) U-shaped lifting hook that is attached to a plate that is anchored to a concrete floor beam and one (1) eye-shaped hook, fabricated of 19.4mm diameter steel rod. Corrosion was observed in the U-shaped hook with no loss of sectional area.

The bottom floor pump room contains three (3) eye-shaped hooks fabricated of 19.4mm diameter steel rod, one (1) plate lifting hook hook, and one U shaped hook welded to a plate. Both plates were anchored to the underside of the third floor cast-in-place concrete slab with 12.4mm anchor bolts. Some corrosion appears in the U-shaped hook and its anchor plate, but no loss of sectional area was observed.

3.0 ANALYSIS AND LOAD RATING

The lifting beam in the front room on the main floor was analyzed for moment resistance which was determined to be 3.0 tons. A factor of safety of 3.0 was applied to the beam to yield a **load rating of 1.0 ton.**

The horizontal beam truss system was analyzed for the tension resistance of the hooks, the moment resistance in the double angles, moment resistance in the S250x38 beam and the larger W310x39 beam. The moment resistance of the double angles governed at 3.0 tons. A factor of safety of 3.0 was applied to the beam to yield a **load rating of 1.0 ton.**

The U-shaped lifting hook on the second floor below ground was analyzed shear resistance of the bolts, and tension resistance of the hook. The shear resistance of the bolts governed at 3.2 tons. A factor of safety of 3.0 was applied to the beam to yield a **load rating of 1.0 ton.**

The S200x27 beam system on the third floor below ground was analyzed for moment resistance in the beam, tension in the bolts anchored in the concrete slab, the shear resistance and moment resistance in the wall shelf angles. The governing capacity was determined to be 1 ton, which was the moment resistance of the shelf angles, which was assigned as the load rating for the beam system. **The 1.0 ton load rating must be printed on the beam**, as the sliding trolley's posted rating of 2.0 was not accepted

The eye-shaped lifting hooks were analyzed for tension resistance of the hooks and the pullout resistance of the embedment, which was the governing factor, at 3.5 tons. A factor of safety of 3.5 was applied to the beam to yield a **load rating of 1.0 ton.**

The one (1) U-shaped hook welded to a steel place, located on the bottom floor and one (1) in the backroom on the third floor below ground were analyzed for tension resistance of the hook, tension resistance of the bolts, and bolt resistance of the embedment.. The moment resistance in the plate was also analyzed and it was determined the governing factor at 1.1 tons. A factor of safety of 2.0 was applied to the beam 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	3.0 tons	3.0	**1.0 ton**

Type	Quantity	Location	Calculated Resistance	Safety Factor	Load Rating
Horizontal Truss (U-shaped lifting hooks)	3 hooks	Main Floor	3.0 tons	3.0	**1.0 ton**
U-shaped lifting hook	1	Underside of Main Cast-In-Place Concrete Floor	3.2 tons	3.0	**1.0 ton**
U-Shaped lifting Hooks	2	Underside of Second, and Third Cast-In-Place Concrete Floors	1.1 tons	2.0	**0.5 ton**
S200x27 Lifting Beam System	1	Second Floor Below Ground	1.0 ton	1.0	**1.0 ton**
Eye-shaped Lifting Hooks	5	Underside of the second and third Cast-In-Place Concrete Floors	3.5	3.5	**1.0 ton**

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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	Replace bent and cracked eye-shaped hooks before further use Install stiffeners at shelf angles on S-Beam in the motor room to achieve higher load rating	**A**
4.2	Paint steel plates and hooks 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 all hooks are to be rated at 1.0 ton, except for two (2) U-shaped lifting hooks that are load rated at 0.5 ton. The beam system on the third floor below ground found to be only capable of supporting 1.0 ton, and in order to achieve a higher rating, stiffeners will need to be welded to both shelf angles at the wall connections. Both the main floor horizontal truss system and the single beam in the front room were load rated 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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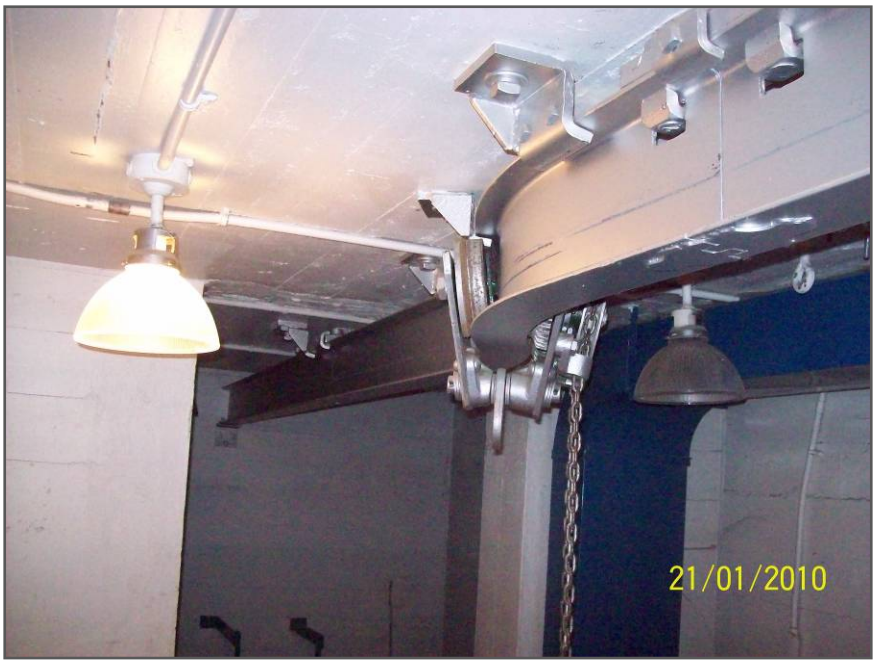
APPENDIX A – Photographs

Photograph No. 1

Various hooks located in the pump room

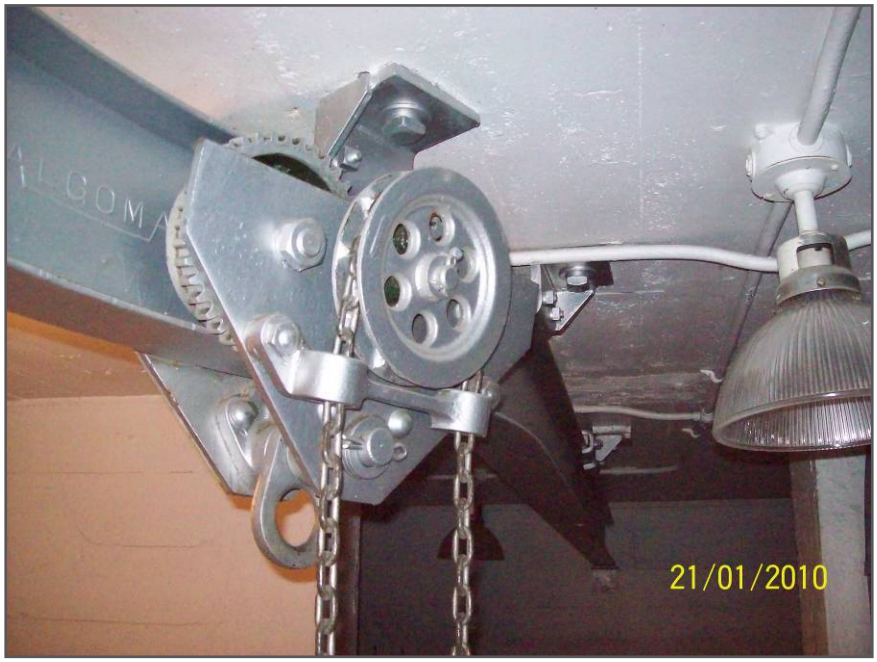
Photograph No. 2

Eye-shaped hook located in the pump room (cracked and bent)



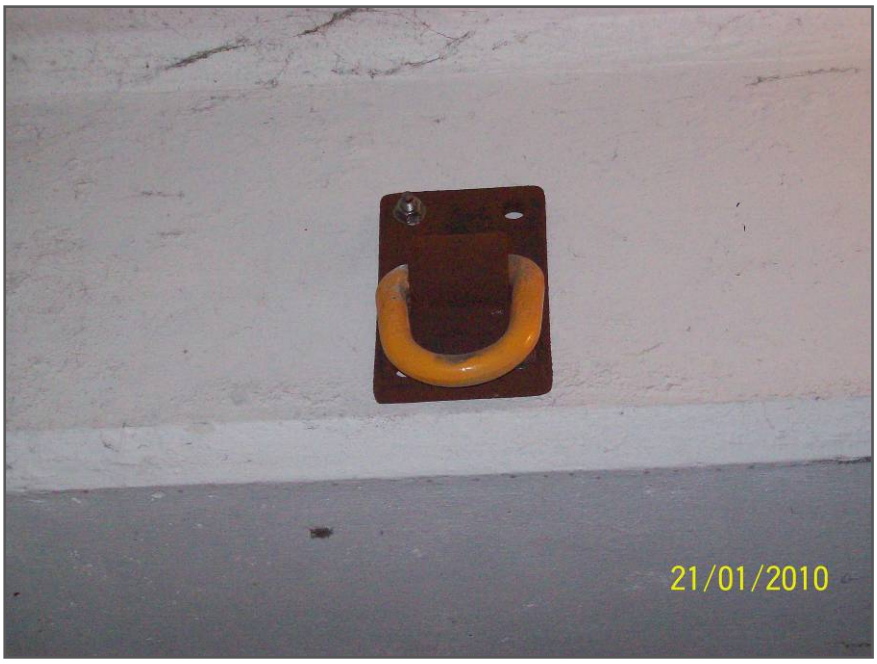
Photograph No. 3

Lifting beam located in the motor room



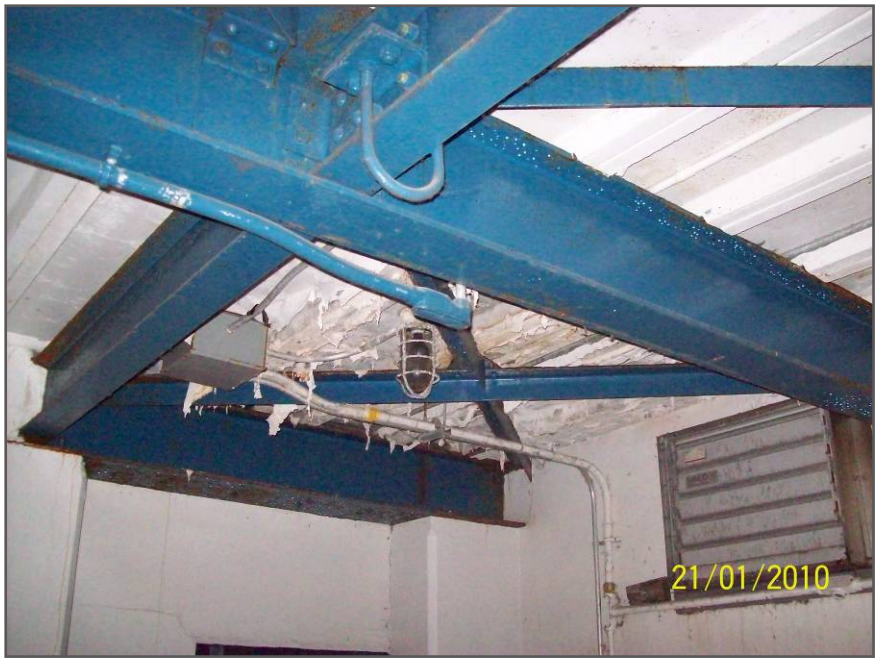
Photograph No. 1

Close-up of crane mounted on the lifting beam in Photograph 3



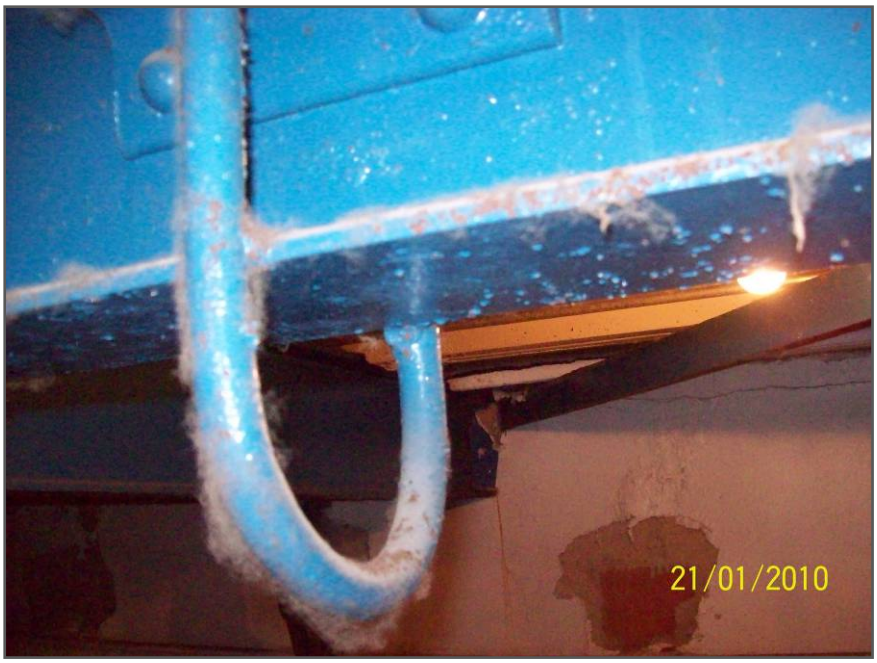
Photograph No. 5

Lifting hook on a vertical steel plate, bolted into concrete beam, located on the 2nd floor down



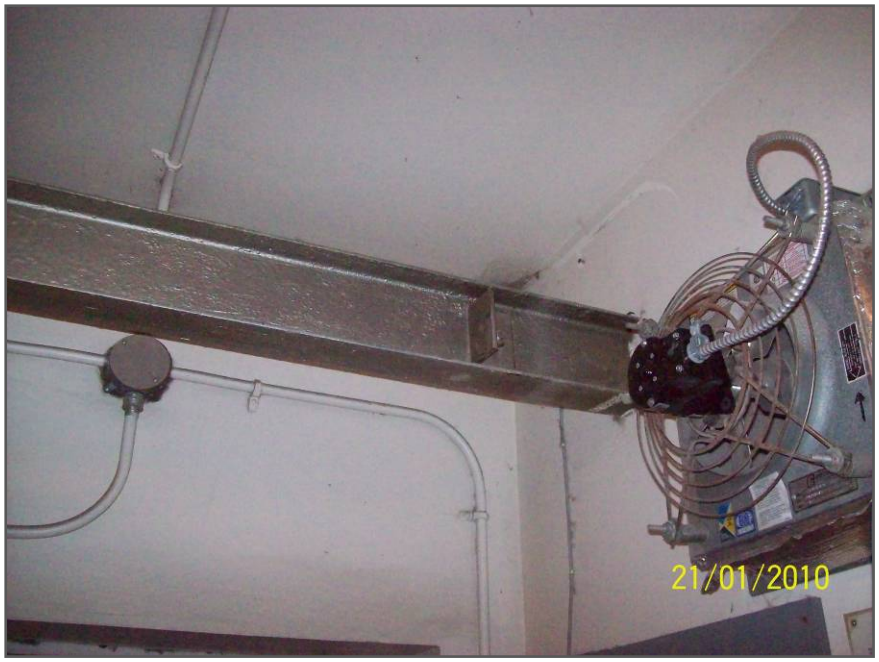
Photograph No. 6

U-shaped lifting hook bolted to the horizontal truss system located on the main floor



Photograph No.7

Close-up of U-shaped lifting hook shown in Photograph No.7



Photograph No. 8

Lifting beam located on the main floor, in the front room