

BRIDGE DETAILS

- Vertical Lift Bridge over Rideau Canal, Ottawa
- Originally Built in 1915 / Rehabilitated 1980s
- Approximately 13' Lift Height



OVERVIEW

Review Recent Rehabilitation Stemming from 2004 Inspection Including:

- Inspection Findings
- Machinery Analysis
- Rehabilitation Efforts

MACHINERY INSPECTION

Component

Condition

Motors

Current ∆ at motors imbalance



MACHINERY INSPECTION

Component

- Motors
- Reducers

Condition

Current ∆ at motors imbalance

No issues



MACHINERY INSPECTION

Component

- Motors
- Reducers
- Open Gears

Condition

Current ∆ at motors imbalance

No issues

Light corrosion Inadequate lube



MACHINERY INSPECTION

Component

- Motors
- Reducers
- Open Gears
- ShaftBearings

Condition

Current ∆ at motors imbalance

No issues

Light corrosion inadequate lube

Fair condition



MACHINERY INSPECTION

Component

- Motors
- Reducers
- Open Gears
- ShaftBearings
- Couplings

Condition

Current ∆ at motors imbalance

No issues

Light corrosion inadequate lube

Fair condition

No issues



Component

MACHINERY INSPECTION Condition

Brakes

Minimal torque
No hand release
No limit switches
No cover
Defunct
manufacturer



Component

MACHINERY INSPECTION Condition

Brakes

Wire Ropes

Defunct manufacturer

Minimal torque
No hand release
No limit switches
No cover

Minor corrosion



MACHINERY INSPECTION

Component

Condition

Brakes

Defunct manufacturer
Minimal torque
No hand release
No limit switches
No cover

Wire Ropes

Minor corrosion

Guides

Frozen rollers



Component

MACHINERY INSPECTION Condition

Brakes

- Wire Ropes
- Guides
- **Span Locks**

Defunct manufacturer

Minimal torque No hand release No limit switches No cover

Minor corrosion

Frozen rollers

Inoperable



MACHINERY ANALYSIS REFERENCED CODES

- Section 13 of the Canadian Highway Bridge Design Code CAN/CSA-S6-00
- AASHTO LRFD Movable Highway Bridge Design Specification First Edition 2000

MACHINERY ANALYSIS POWER REQUIREMENTS

- Determined per Section 13.8.5 of the Canadian Highway Bridge Design Code – Similar to AASHTO with Consideration of Wind Loads, Ice Loads, Friction, Imbalance, and Inertia
- 19.4 Total hp Required Total, 30 hp Provided
- Required Brakes Based on 10 second Stop Using Motor Brakes. Check Total Brakes to Hold Span Under Specified Wind and Ice.
- Required Motor Brake 16 lbft Each Motor Brake
- Required Combined Braking 26 lbft for Each End
- Existing Brake Settings 88 to 144 lbft Per Brake
- 7 to 11 Times Required Capacity

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MACHINERY ANALYSIS GOVERNING LOADS

- Canadian Code and AASHTO 150% FLT of Motor
- Neither Code Clear on Handling of Synchro-tie Motor
- AASHTO Allows 50% Increase in Allowable for Braking Canadian Code Does not Clearly Define
- Evaluated for Total Braking with 150% of Allowables in Accordance with AASHTO

MACHINERY ANALYSIS - CAPACITY

Component

Calculated Load

Allowable Load

Percent Over Allowable

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•	Pinion Shaft	18,707 psi (shear)	10,500 psi (shear)	78

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•	Primary Speed Reducer	88 ft-lb	77 ft-lb	14

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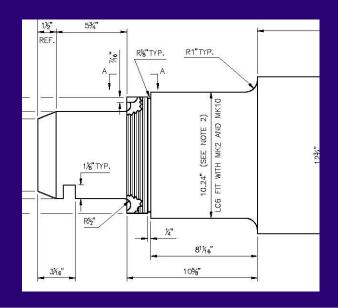
MACHINERY ANALYSIS - CAPACITY

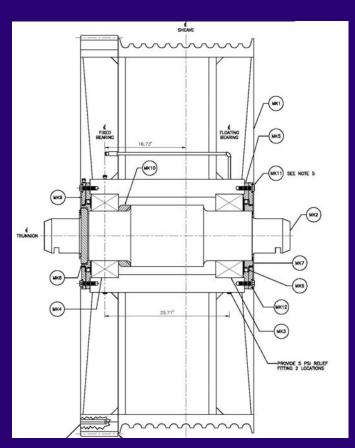
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•	Primary Speed Reducer	88 ft-lb	77 ft-lb	14
Secondary Speed Reducer		201,200 in-lb	148,537 in-lb	35

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REHABILITATION SCOPE – STAGE 1

Trunnion & SheaveAssembly Replacement





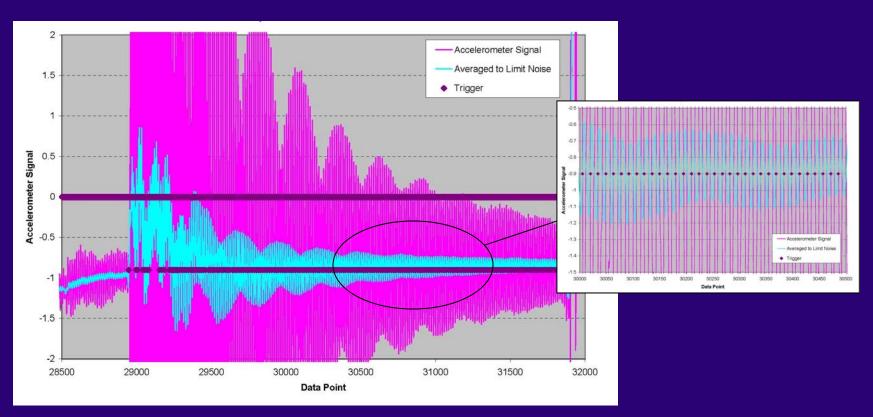
- Trunnion & sheave assembly replacement
- Counterweight rope replacement

ROPE TENSION MEASUREMENTS



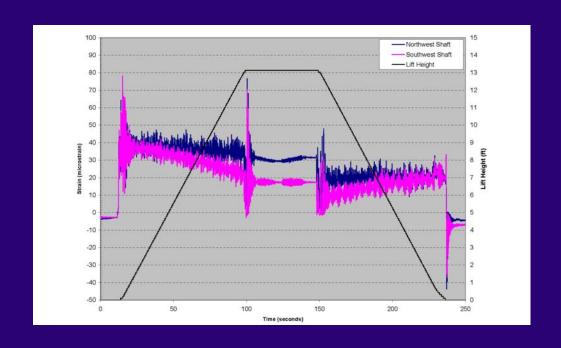
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ROPE TENSION MEASUREMENTS



STRAIN GAGE BALANCE MEASUREMENTS

- Trunnion & sheave assembly replacement
- Counterweight rope replacement
- Balance measurement and adjustment



- Span drive brakes
- Span guides
- Span locks
- Traffic gates



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