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May 16, 2016

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Project Engineer  
City of Duluth  
411 West First Street, Rm 211  
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## **Minnesota Slip Bridge Drive Machinery Replacement Proposal**

We appreciate the opportunity to prepare this proposal to assist the City with design and plan preparation services for retrofit modifications for replacement of the drive machinery and related upgrades to the Minnesota Slip Pedestrian Bridge. To complete this work and to provide specific moveable bridge retrofit expertise we have included the services of Hardesty and Hanover. As you are aware we have previously included Hardesty and Hanover's services on Aerial Lift Bridge projects which we have completed, including the year 2000 rehabilitation project and have the commitment for the same personnel to assist us with this project. Proposal worksheets detailing LHB and Hardesty and Hanover's specific worktasks, hours and associated fee are attached. A general work description and proposed work schedule is as follows.

### **Description & Purpose:**

To retrofit the existing double leaf (Dutch Style) bascule bridge, to create a safe and reliable operating structure. The existing structure has been operating with a rope driven system since its inception circa 1990, and experiences operating problems in certain wind conditions, as well as controlling the leaves during interlocking of the chord pins. The rope drive system is 'one directional' in operation, and relies on the span heavy characteristics of the bridge to lower or close. In addition, the mating of the two bascule leaves is achieved by "chord pinning", which is the action of meshing a pin and receiver at the upper and lower chords of the truss. This action is dependent on the span drive positioning system, and the rope driven system is inherently inaccurate due to rope stretch and rope position on the winch drum and sheaves.

For this proposal the drive machinery retrofit will incorporate a pivoting rack drive system which will be developed and designed to a final bid set for construction.

## Scope of Work:

General: It is anticipated that the rope driven operating system will be removed in its entirety and replaced with a pivoting rack drive system. This proposal includes preliminary design, final design, plan preparation and development of construction specifications.

A projected milestone schedule is included, assuming the construction work will take place March and April of 2017.

### Task 1.0: Project Coordination:

Task 1.1: Project Management: This task will include all correspondence, staff management and invoicing.

Task 1.2: Project Meetings: It is anticipated that five (5) progress meetings will be held. One will include H&H representatives in person and 4 via teleconference.

### Task 2.0 Preliminary Design Phase:

Task 2.1: Document Review: LHB has provided Hardesty and Hanover with the original contract drawings, the repair contract drawings (prepared by Krech Ojard) and the previous study report (prepared by HNTB) which will initiate the basis for the retrofit design of this project. Due application of loads to the structure and other factors inherent to the current structure the pivoting rack option will be advanced for the retrofit.

Task 2.2: Cost Estimate & Lead Times for Fabrication: Budgetary costs will be developed based on the machinery components required for the new operating system. Machinery components will be selected based on the availability of components in coordination with the construction schedule outlined. Construction cost estimates for installation will also be provided with an appropriate contingency for the level of design to this point.

Task 2.3: Load Calculations & Structural Element Analysis: Prior to any development of plans or cost estimating, the operating resistance calculations, and load application to the structure will be performed. It is assumed that since the machinery location and load application is similar to the existing, the proposed system will work as outlined. The main difference from the existing system is the compressive load in the rack and resulting force in the tower. As part of this task, the operating resistances calculated will be compared to the code requirements of AASHTO. Since this bridge was designed circa 1990's, the 1988 AASHTO design manual will be used, rather than the more stringent 2008 code for machinery.

Task 2.4: Preliminary Design & City Review & Evaluation Meeting: Preliminary design drawings will be submitted to the City for review. This will consist of the following drawings:

G1: General Elevation of Structure

M1: General Elevation of Machinery

M2: General Plan of Machinery

Deliverables:

- Preliminary design drawings
- Construction cost estimate
- Lead time for component delivery
- Operating resistances and load calculations

It is anticipated that the preliminary design evaluation meeting will include Hardesty and Hanover via teleconference and is intended to answer any questions in the preliminary design, and to serve as the coordination meeting for the Site Visit task.

### Task 3.0: Final Design Phase

Task 3.1: Site Visit: After the preliminary design review meeting, the design team will visit the bridge site to develop the details to interface the new drive system. It is anticipated that three field days will be required, and operations of the bascule span necessary to identify potential interference points with the proposed system. It is also noted at this time, the tension link members between the balance beam and span and the span chord interlock members will be evaluated for replacement. Also, the structural interface points will be evaluated and analyzed for use with the new machinery components. Lastly, the electrical control system will be evaluated for implementation with the new selected drive system.

Task 3.2: Final Design & Review: The preferred option will be detailed to the 90% level, and will be essentially complete, and ready for review with minor coordination edits remaining. The anticipated Drawing List is as follows:

G1: Title Sheet & Location of Work

G2: General Elevation and Identification of Removals & New Work

G3: Pedestrian/ Area Access Control

S1: Tower Modifications at Pivot Connection

S2: Counterweight Modifications & Clearance Points

S3: Machinery Supports

S4: Machinery Support Details

S5- S6: Repainting Elevation and Details

M1: New Rack Operating Arms

M2: New Pivot Connection Details

M3: New Operating Machinery Plan

M4: New Operating Machinery – Rack Carrier Assembly

M5: Locking Pin Repairs

M6: Tension Link Repairs

E1 – E10: Electrical Control Interface

- It is noted that the electrical system will remain, but is currently 20 years old, and anticipated to require some replacement & upgrades. This cannot be determined until the Site Visit task.
- The updated cost estimate and schedule will be submitted
- The special provisions for work will be submitted

Task 3.3: Bid Set Preparation & Bid Assistance: The Final Design will be progressed to a full bid set of Plans, Specifications, and Estimate to the City for use in bidding to select a contractor including the list of drawings above, and the following:

- Signed and sealed drawings
- Fully integrated specifications with City format
- Construction estimate
- Construction schedule in Gantt format
- Checked calculations

In addition, the design team will provide assistance in answering technical questions asked by the Contractor during the bid phase.

### Anticipated Schedule:

Preliminary Design:	June 2016
City Review:	June 27 – July 1, 2016
Site Visit:	July 11 – July 15, 2016
Final Design:	July 18 – September 23, 2016
Bid Set Submission:	October 7, 2016
Contract Award:	November 15, 2016
Shop Drawing Preparation & Review:	November 16 – December 31, 2016
Fabrication & Delivery of Machinery:	January – March 2017
Machinery Installation:	March – April 2017
Testing and Acceptance:	May 1 – May 10, 2017

MN Slip Pedestrian Bridge  
Drive Machinery Study and Replacement  
May 16, 2016

We appreciate the consideration to provide services for this project. Upon review of our proposal please do not hesitate to contact us with any questions or comments.

LHB



**JOSEPH D. LITMAN, P.E. PROJECT MANAGER**

**Encl.**



# COST PROPOSAL

Project Name **Minnesota Slip Bridge  
Retrofit Design**  
Client **City of Duluth**  
Preparer **JDL**

Project Number:  
Date **May 16, 2016**

Work Plan Task	Description	Project Principal	Project Manager	Project Engineer	Lead Technician	Asst. Technician	Landscape Architect	Land Surveyor	Surv/ Const Tech	Admin Asst.	Total Labor Costs (\$)
		Joe Litman	Lisa Karlgaard	Kyle Marynik	Gary Vonasek	Josh Mayfield					
		\$ 160	\$ 128	\$ 92	\$ 107	\$ 70	\$ 100	\$ 150	\$ 76	\$ 62	
1	Project Management	32	0	24	0	0	0	0	0	0	\$ 7,328
	Meetings with City/ DECC	16		8							\$ 3,296
	Consultation with H&H	16		16							\$ 4,032
											\$ -
2	Field Measurement and Review	26	0	56	0	0	0	0	0	0	\$ 9,312
	Field Assessment	16		16							\$ 4,032
	Existing Drawing Verification	4		20							\$ 2,480
	Documentation	6		20							\$ 2,800
											\$ -
3	Structural System Review	14	0	32	16	0	0	0	0	0	\$ 6,896
	Truss Pinning Review	4		8							\$ 1,376
	Detailing/ Detail Review	10		24	16						\$ 5,520
											\$ -
4	Design Coordination	48	0	16	0	0	0	0	0	0	\$ 9,152
	Drawing Review	32		16							\$ 6,592
	Review Coord with City	8									\$ 1,280
	Review Coord with H&H	8									\$ 1,280
											\$ -
5	Retrofit Plans	8	0	28	58	0	0	0	0	0	\$ 10,062
	Title Sheet				2						\$ 214
	Est Quantities, Const Notes	2		8	8						\$ 1,912
	Painting Elevations, Details (2 Shts)	4		16	36						\$ 5,964
	Traffic/ Pedestrian Control	2		4	12						\$ 1,972
											\$ -
6	Special Provisions, Estimate, Submittal	20	0	8	0	0	0	0	0	4	\$ 4,184
	Division SP	6		4						2	\$ 1,452
	Division SB	8		4						2	\$ 1,772
	Final Estimate	6									\$ 960
											\$ -
7	Bidding Assistance	9	0	7	0	0	0	0	0	0	\$ 2,084
	Pre-bid Meeting	3		3							\$ 756
	Bidder Questions/ Addenda	6		4							\$ 1,328
											\$ -
TOTALS		157	0	171	74	0	0	0	0	4	\$ 49,018
OTHER DIRECT COSTS (ODC)										SUMMARY	
Description	Cost									LHB Labor Cost	\$ 49,018
Travel/ Insp vehicle										Other Direct Costs	\$ -
Mail / Delivery										Total LHB Est Cost	\$ 49,018
Printing											
Supplies										Subconsultant Costs	\$ 280,450
Survey Equipmeent										(Hardesty & Hanover)	
Total ODC	\$ -									Total Est Costs	\$ 329,468

