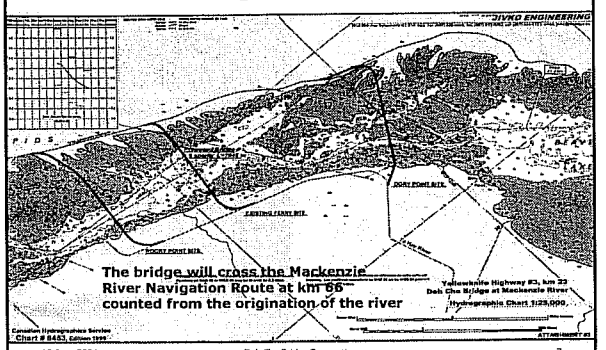
Deh Cho Bridge Corporation Ltd.

Proposed Deh Cho Bridge
Yellowknife HWY #3, km 23

Bridge Location



Design Parameters

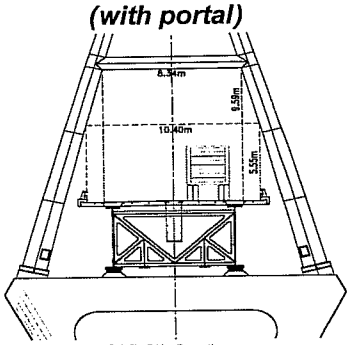
- The proposed bridge is 1,045 m long structure configured as simple main span supported on the cantilevered ends of two opposing continuous 4 span approaches
- The superstructure is composite construction of two steel trusses with pre-cast concrete deck panels. The trusses are 4.5 m deep with 7.3 m horizontal distance between
- The superstructure is supported on 8 piers constructed in the watercourse and 2 abutments constructed on the approach berms

Superstructures Parameters

- The main span, including the cantilevers, is 190 m long with a vertical clearance of 22.56 m at H.W.L. Under the main span there is a navigation channel used by large tug-barges configurations
- The main span is flanked by three 112.5 m spans and one at 90.0 m end span
- In order to reduce the depth of the trusses on the main span the design contemplates a system of portal and stays installed on the piers on both sides of the main span

Superstructure cross-section

(with portal)

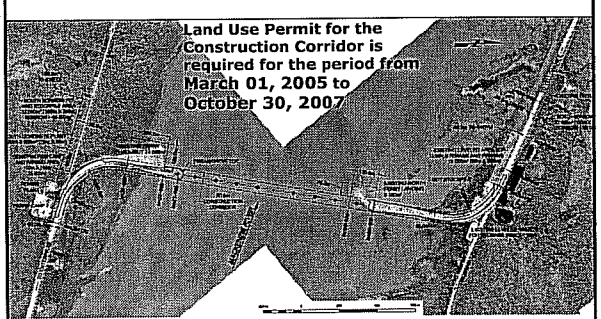


Design Load

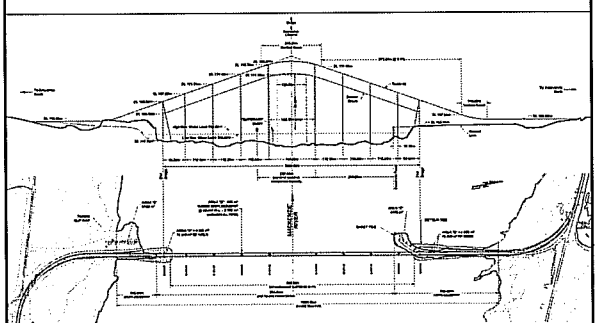
- **The Design Live Load for the bridge is CL-750 (GVW of 750 kN) in accordance with the CSA-S6-00**
- **There is a 40% dynamic allowance and additional 60% safety factor incorporated in the design**
- **Additionally, the design allows for special, overload truck configurations as shown on the drawings**

Construction Corridor

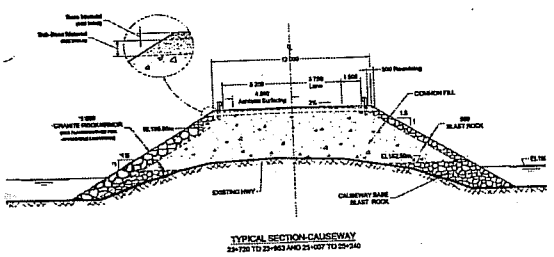
Extends from km 23+120 to km 25+840 of Yellowknife HWY #3.
It is 2,720 m long, 60 m wide (30 m on each side of HWY centre line)



Bridge Approaches



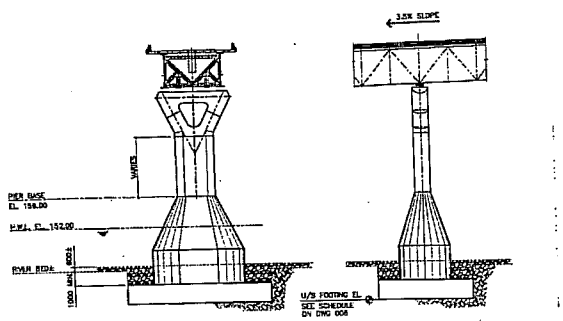
Approach Cross-Section



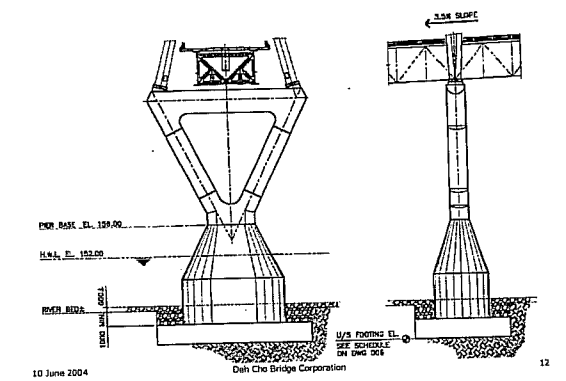
Earthwork Volumes

- 40,000 cu m limestone rock - placed "in-water" for base of road embankment, detour on the north and armouring the embankment shoulders
- 91,000 cu m placed for common embankment fill on both sides
- 11,600 cu m gravel for sub-base and base of the roadway
- 7,200 cu m limestone rock for scour control around the piers
- 6,000 cu m granite for dressing the head-slopes of the approaches and their upstream shoulders exposed to ice action
- 1,000 cu m stone chips for chip-sealing of 1,600 m approach road

Approach Pier



Main Pier



Construction of piers involves:

- Installation of 850,000 kg steel for sheet pile cofferdams
- Excavation of 7,000 cu m riverbed material from the cofferdams
- Placing 900 cu m tremie concrete mud slabs
- Pumping 15,000 cu m water from the cofferdams into the river
- Placing 10,300 cu m concrete and 850,000 kg rebar for pier footings and pedestals
- Fabrication and installation of 315,000 kg structural steel for pier shafts

Abutments

- The abutments are cast in place reinforced concrete structure consisting of pile cap, back wall, and wing walls at 45 degree to the centre line of the bridge
- Each abutment is supported 16 @ 12.0 m long HP-350 piles (173 kg/m), predrilled and driven to refusal into the underlying till
- Abutment construction involves installation of 70,000 kg steel piles, 560 cu m cast in place concrete and 40,000 kg rebar

Steel Superstructure Fabrication and Delivery

- 4,750,000 kg steel for trusses, portals and stays will be fabricated in sections by qualified fabricator in Southern Canada and will be delivered on site by road
- The delivery will involve 180 truckloads, the largest section being 37 m in length, 4.5 m in width and 40,000 kg in weight

Steel Superstructure Installation

- The trusses for the 4 end spans will be fully preassembled on the approaches on both sides of the river and will be launched towards the center
- For better deflection control during launching a 50 m long "launching nose" will be attached on the leading end of the truss
- The main span will be preassembled on a large barge in the Hay River shipyard, will be sailed to site and lifted into position with winches mounted on the cantilevered sections of the launched end spans

Concrete Deck

- The deck consists of 418 pre-cast concrete panels, 11.5 m long, 2.5 m wide and 0.3 m thick and of 22,500 kg weight
- The panels are pre-stressed transversely during fabrication, and post-tensioned longitudinally after installation
- The deck is built of 4,520 cu m (11,300,000 kg) concrete; 40 Mpa strength
- The panels are fabricated in a specialised plant in southern Canada and delivered with specially configured trucks

Concrete Deck Installation

- Installation of the deck panels will proceed simultaneously from each end of the bridge towards the centre, using mobile crane deployed on previously installed panels
- After installation, the panels will be post tensioned with specialized hydraulic jacks and will be grouted to the steel trusses
- Concrete curbs, handrails and bridge lights will be installed on both sides of the installed panels

Temporary Concrete Plants

- 13,000 cu m concrete required for the bridge construction will be produced in Concrete Plants set in the vicinity of the bridge site
- Each plant will be able to produce in excess of 50 cu m concrete per hour and to maintain this rate of production for a period of not less than 15 hours

Construction Camp

- 30 men Construction Camp will be set in the vicinity of the bridge site
- For the 10 months operation the camp will:
  - Provide 8,100 man day accommodation
  - Generate 1,800 man day local employment
  - Consume 420,000 l fresh water
  - Generate 15,000 solid wastes, etc...
- The impact on the municipal services (fresh water plant, sewage lagoon and garbage dump) from the operation of the camp would equivalent to an increase of the Ft Providence population by less than 5% for the duration of 10 months

Reclamation of Lands

- After completion of bridge the Construction Corridor including the ROW will be cleaned and landscaped according to current HWY Standards
- Granular materials and Rock for the bridge construction will be obtained from 7 different quarries with distances to the bridge ranging from 0.5 km to 205 km. After completion of construction the quarries will be cleaned and landscaped according to the conditions of the land use permits

Reclamation of Existing Ferry Infrastructure

- The infrastructure related to the ferry operation will not be needed after completion of the bridge. As owner, the GNWT is responsible for its removal and reclamation of the corresponding lands
- In agreement with the GNWT the DCBC accepted to participate in the reclamation only of the facilities affecting the construction of the bridge, namely the extension of the North Ferry Landing and the Ferry Haul-out on the south side

Material Removed from the Reclamation Areas

North Ferry Landing:

4,300 sq m reclaimed riverbed

- 20,000 cu m granular backfill for embankment
- 500 cu m blasted rock for rip rap
- 80 cu m concrete for landing pad
- 30,000 kg structural steel for sheet-pile wall

South Ferry Haul-out:

9,500 sq m reclaimed riverbed

- 11,000 cu m granular backfill
- 90 cu m structural timber

Construction Schedule

- **October 2004**: Granular sources development: brushing, grubbing
- **March 2005**: Camp and concrete plant installation; rock production,
- **June – October 2005**: Construction of piers, abutments, earthworks
- **March – October 2006**: Installation of superstructure, completion of earthworks
- **October 2006**: Opening bridge for traffic
- **July – August 2007**: Reclamations, paving, landscaping...

Design Team

- **The bridge design, cost estimating and logistics research is done by:**
- **JR Spronken & Associates**
  - **Calgary, AB**
- **Jivko Engineering**
  - **Yellowknife, NT**

Other Consultants

- **Golder Associates of Edmonton, AB – Environmental impact assessment with emphasis on the aquatic life**
- **EBA Engineering Consultants of Yellowknife, NT – Geotechnical evaluation of the bridge site and of the quarries for concrete aggregates, rock and granular sources**
- **Trillium Engineering of Edmonton, AB – River Engineering including ice action, scour, etc...**
- **Davenport Engineering Group from the University of Western Ontario, London, ON – Wind tunnel testing of the bridge model**
- **BPTech Engineering of Edmonton, AB retained by the GNWT to assemble team of consulting engineering firms to carryout detailed design review**

Construction contractors providing input in logistics, scheduling & estimating

- **RTL Robinsons of Yellowknife, NT – earth works, road construction and concrete supply**
- **NTCL of Hay River, NT – Barge/tug access to the river for construction in open water season**
- **Supreme Steel and Empire Iron both of Edmonton, AB – Steel fabrication an installation**
- **North American and AGRA, both of Edmonton, AB – pier an abutment foundations**
- **Lafarge of Edmonton, AB - Fabrication and delivery of pre-cast concrete panels for deck**

Questions?