Fiberglass Composite Products

Bridge decks
  • Transverse
  • Longitudinal

Bridge superstructure
  • Largest structure to date 90m span

Rigid Span Bridges

Abutments

Wing walls

Approach slabs
140 BILLION (24%)

The U.S. Department of Transportation’s 2006 Conditions and Performance Report notes that $8.7 billion in capital investment annually is needed to maintain bridge conditions at current levels and $12.4 billion would be needed to actually improve “conditions” to a level that would help relieve congestion and reduce accidents.

According to data from the FHWA, it would cost $140 billion in 2006 dollars to immediately repair every bridge that is deficient in the country. This estimate is based upon the amount of bridge area considered deficient as of December, 2007, multiplied by the cost per square meter for bridge replacement, estimated at $1,550 per square meter.
Innovation and Technology Are Adding to Bridge Safety

To ensure the safety of the nation’s bridges, every state conducts a thorough and continual bridge inspection and rehabilitation program. Federal regulations require that, with some exceptions, bridges over 20 feet in length be inspected every 24 months by trained and qualified bridge inspectors. States often develop more detailed programs appropriate to unique circumstances.

Advances in technology such as electronic gauges are also enhancing the ability of inspectors to assess bridge conditions. New materials are now available for bridge building such as high-strength steel, high-performance concrete, rustproof components, and fiber-reinforced polymer composites.

The nation’s departments of transportation face a frustrating contradiction. They have better engineering, materials, and construction techniques than ever before, ensuring that a new generation of safe and longer-lasting bridges can be built for the future. Without a national commitment to bridge investment, however, states will face painful trade offs to keep the nation’s bridges safe and the American public moving.

Quote from page 7 of AASHTO 2008 REPORT BRIDGING THE GAP
Longitudinal Deck Systems:
Longitudinal Glulam Panel Decks

Beam Systems:
Glulam Stringer and Transverse Glulam Deck

Beam Systems:
Transverse Glulam Decks for Steel Beam Bridges
Stringer Configuration and Size - 24-ft Roadway Width

Glulam beams
37” H

Steel beams
24” H

See table below for stringer size based on bridge length.
Beam Systems:
Transverse Glulam Decks for Steel Beam Bridges

**Wood deck**
- Durability issues
- Not compositely acting
- No 2% cross slope
- More steel superstructure costs (2x more)
- Design Service Life 5 years then penalized

**Concrete deck**

**Fiberglass Composite deck**
- Durability issues
- Compositely acting
- 2% cross slope, super elevate, longitudinal slope
- Effective steel design
- Design Service Life 75 years then penalized
Concrete deck

Span 15m

Depth of Section
- Girders 610
- Deck 205
- Asphalt 55

870

70mm less

Fiberglass Composite deck

Span 15m

Depth of Section
- Girders 660
- Deck 225
- Asphalt 55

940
Bridge applications comparison...

Concrete Bridge Deck

- Design not good
- Internally reinforce

Durability and capacity

Glue Laminated Timber Bridge

- Design not good
- Externally reinforce

Durability and capacity
Diagram of Composite Beams Testing

Safety factor in service study in comparison with breaking point

- Beam #1: 5.8 (3.4) (beam #1)
- Beam #2: 8.66 (5.1) (beam #2)
- Beam #3: 9.50 (5.6) (beam #3)
- Beam #4, #5: 8.0 (4.7) (beam #4,#5)

Max Service Load:

- Beam #1: 1856 Lbs (0.844 ton)
- Beam #2: 2109 Lbs (0.959 ton)
- Beam #3: 2689 Lbs (1.222 ton)
- Beam #4: 4897 Lbs (2.227 ton)
- Beam #5: 5737 Lbs (2.608 ton)

Note:
Values in diagram are deflections of testing beams.
13m long x 3m wide x .495mm deep
Engineered Wood core

Encapsulated with Epoxy Fiberglass reinforcement

Canadian, U.S., International Patents
11.86m long x 5.5m wide x 508mm deep

92mm less than concrete rigid span
Robust & Durable
Modular Panel 40 feet long x 18 feet wide
Modular Panel 40 feet long x 18 feet wide

Panel Two

Panel One
New prefab bridge panel 50 feet long x 20 feet wide
New prefab deck
Lowest concrete bid 566,000.00
Guardian bid 294,000.00
Savings over 200,000.00
Plus dead load savings of 190,000 pounds
Plus time from concrete at 90 days reduced to 10 days on site.
Concrete deck and steel floor beams removed
Bridge painted before deck removed
And after
3 Prefabricated bridge decks delivered on one truck to site
31,00 pounds total
3 Prefabricated bridge decks
Removed by crane
Launching three bridge deck panels
Increased live load

from 4 t to 22 t

Bridge was proof loaded using Tri-axle loaded dump truck, weighed at scale with load ticket.

Pulled middle axle, loaded section by section with back two axles.

Deflection measured using digital indicators.

Result posted 22 tonne limit.
Tweed

Double lane bridge delivered in two panels

10m long x 8m wide
Centre Hastings
Callander
Double lane bridge

Prefitted at shop before shipping to site
Massie Road Bridge 9.0m span x 8.158m wide
Typical Deck to steel girder connection

- Wood core 185mm
  - Certified 35 MPa
- Steel pipe DN25 ASTM A53
  - INFUSED INTO DECK
- EPOXY GROUT
- STAGGERED BOLTS
- HOT DIP GALVANIZED BOLT A325 M22X2.5
- HOT DIP GALVANIZED WASHER
  - 60mm, THICKNESS 16mm
- FIBERGLASS OVERLAY STRIP
- OVER STAGGERED BOLTS
- EPOXY REINFORCED FIBERGLASS 5mm
  - AS PER GUARDIAN QUALITY PROCEDURE FOR PRE-STRESSING
- HOT DIP GALVANIZED NUT M22X2.5
- HOT DIP GALVANIZED WASHER
  - TO BE TIGHTENED AS PER CHBDC PROCEDURE & GUARDIAN QUALITY CONTROL FOR PRESTRESSING

GFRP LAMINATE 10.5mm

U.S. PATENT IN PROCESS, MATERIALS, APPLICATION

PATENT PENDING
Bridge
Delivered by truck
8:30am
Bridge Panel One
Rigging completed
9:00am
Bridge Panel One
Rigging completed
9:00am
Panel One
Set in place
9:09am
Panel Two

Rigged

9:19am
Panel Two
Rigged
Lifted into place
9:20am
Weight of each GFRP bridge panel 17,700 pounds
Old concrete bridge was 167,700 pounds- single lane
Reduced dead load on rehab abutments
Increases capacity and longevity.

Panel Two
Set in place
9:25am
Panel Two
Secure in place
9:43am
10 days on site from mobilization to completion

- Removed single lane bridge
- Rehab existing abutments and re-certified
- New double lane bridge
- PL1 Rails
- Approach’s Granular B & A
- Asphalt
44 meters long x 10.86 meters wide (two lanes+sidewalk)

CHBDC CL625

5 steel girders 1.7m high

10 GFRP bridge decks transverse to be field installed
Panel to Panel Connection
161 feet long x 26 feet wide

10,000 vehicles per day
83’ long x 28’ wide
221’ long x 32’ wide
182’ long x 28’ wide
241’ long x 32’ wide
125’ long x 25’ wide

10,000 vehicles per day
Port Clyde

90 m long x 5.5 m wide

CHIEF ENGINEER JIM FRANCIS
DEPARTMENT OF NOVA SCOTIA TRANSPORTATION
14 fiberglass composite panels

Prefabricated off site

Installed in weeks versus months

Compositely acting deck
Cheaper, faster, longer lasting…what’s not to like?
Innovative Approach to Port Clyde Bridge

Transportation and Public Works
May 31, 2005 15:35

Residents of the Port Clyde area on the Lighthouse Route (Route 309) will have their new bridge in place sooner than anticipated.

"The Port Clyde bridge will have an innovative decking system that will reduce construction costs and even more importantly for residents, reduce the amount of time a detour will be in place," said Ron Russell, Minister of Transportation and Public Works. "Cheaper, faster, longer lasting -- what's not to like?"

The new bridge will span the river without the need for in-water piers. This reduces environmental concerns. The bridge's fibreglass wrapped deck will provide added protection against road salt and require less maintenance than a traditional bridge. Cost of the replacement will be $2.1 million as opposed to the cost of a traditional bridge, estimated at more than $3 million.

Traditional bridge construction would require the immediate placement of the panel bridge with a permanent bridge to be built in 2006, taking five months to complete.

Mr. Russell said his department will be consulting with the local community, including organizations like the fire department, about the best time to schedule a two-month closure while the new bridge is constructed on site.
CLYDESDALE
CHIEF ENGINEER JIM FRANCIS
DEPARTMENT OF NOVA SCOTIA TRANSPORTATION

BRIDGE PANEL NUMBER ONE
27 m long x 4.75m wide
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27 m long x 4.75m wide
CLYDESDALE
CHIEF ENGINEER JIM FRANCIS
DEPARTMENT OF NOVA SCOTIA TRANSPORTATION

BRIDGE PANEL NUMBER ONE
27 m long x 4.75m wide
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DEPARTMENT OF NOVA SCOTIA TRANSPORTATION

TWO BRIDGE PANELS INSTALLED

BRIDGE 9.5M WIDE
27 m long x 9.5 m wide bridge
Delivered in two panels
Installed in weeks versus months
790K Project costs
**Guardian**

1. New bridge panels  
   A. First panel  
   B. Second Panel  
2. Semi Integral or Integral  
3. Asphalt HL3 90mm

**Concrete**

1. New concrete beams  
   A. First Beam  
   B. Second Beam  
   C. Third Beam  
   D. Fourth Beam  
2. Install forming  
3. Install Rebar  
4. Pour Concrete Deck  
5. Wait 28 days  
6. Waterproofing  
7. Asphalt HL3 90mm

5 days  

60 days
Recognize

Nancy Dewar

Joshua Dewar, Ben Dewar, Natascha Dewar

International Timber Bridge Conference Scientific Committee

International Timber Bridge Conference Planning Committee

USDA Forestry Lab

Wood Works

Canadian Highway Bridge Design Code

Canadian Wood Council Jasmine Wang Ph.D P.Eng

Blackwell – Cory Zurell Ph.D P.Eng

Delcan – Sylvain Montminy P.Eng & Patrick Mergel P.Eng

Stantec – Reed Ellis Ph.D P.Eng & Jim Francis P.Eng

ISIS Canada – Dr. Mufti, Dr. Baidar Bakht

MTO – Bala Tharmabala Ph.D P.Eng