Plan for Testing Phase

Overall Project Objective

Differences have been observed between the calculated strength of covered bridge floorbeams and the performance of such beams in actual bridges. The objective of this project is to correlate the actual strength of covered bridge floorbeams with the strength calculated by current analytical methods, and to, potentially, recommend changes to the analytical methods.

Project Design for Field Testing Phase

The objective of the testing work is to determine the strains experienced by the floor beams and deck boards of a typical Town Lattice covered bridge when a typical heavy vehicle of known weight and dimensions drives across the bridge.

Field testing will consist of

(a) constructing a forty-foot long section of typical Town Lattice covered bridge having 15 feet clear between truss lower chords, and with 18-ft long floorbeams at 46" spacing, and with 16-ft long floorbeams halfway between the longer ones.
(b) attaching 34 linear strain gauges to three floorbeams and several deck boards near midspan
(c) attaching one tilt gauge to each truss near the instrumented floorbeams
(d) getting the data acquisition software working and calibrating the strain gauges
(e) measuring wheelbase, track width and axle weights of a ten-ton (+/-) truck
(f) driving the truck across the bridge twice for each configuration of the deck, once at 10 mph and again at 20 mph, while recording the strains or tilts of all 36 gauges. The manner of attaching the deck to the floorbeams will be varied, and the effect of adding a second layer of decking will be investigated.
(g) returning test equipment and other equipment to their owners and site cleanup.
(h) testing the 3 floorbeams at U. of Main to correlate strains with stress and breaking strength.

Testing Equipment

The truck will be obtained by Barns and Bridges of New England (BBNE), which will also provide the truck scales and measure the truck axle dimensions. BBNE has also constructed the 40-foot covered bridge.

VS Engineering (VS) will provide leased strain gauges, connecting wires, laptop computer, software and related equipment. The equipment is being leased from Bridge Diagnostics, Inc. (BDI). There will be 34 linear strain gauges and 2 gauges to measure the rotation or "tilt" of the truss lower chords.

Testing Location

The bridge is located at Compton, New Hampshire, about 8 mile north of Plymouth, which is where the testing will take place. Mr. Tim Andrews of BBNE will provide more detailed directions.

Date and Time of Testing

The Town Lattice bridge is already in place at the testing site. The strain gauges and equipment will arrive at BBNE on July 26 or 27, 2016. The principal investigators will spend July 28 and July 29 installing the gauges on the floorbeams and deck, getting the data acquisition software working reliably, zeroing the gauges and procuring fasteners for the tests to follow.

Testing will be done on Saturday, July 30. Testing will start about 9:30 am and continue until the deck tests have been completed.

Decks to be Studied

Floorbeams, running transverse to traffic flow, are rough-sawn 4"x 12" (11.7" actual) of No. 1 structural Douglas fir at 46" c-c spacing, with shorter floorbeams halfway between. Thus, there will be a floorbeam every 23" along the deck. This is a typical spacing for Town Lattice timber trusses. The most common deck for this floorbeam configuration is a single layer of planks laid parallel with the direction of traffic. Occasionally, "runners" are added on top, consisting of two four-foot wide layers of planks, one for each wheel track. Less commonly, the space between the two runners filled in to make a nearly-full-width second layer of deck.

This study's baseline deck will be a single layer of rough-sawn 3" x 10", No. 2 and better. Eastern Hemlock planks laid parallel to traffic, with most planks being 16 feet long. This also is a common deck material in New England. Various attachment methods to the floorbeams will be tested. Then, a second layer of decking will be added to examine the effect of runners. Runners will be rough-sawn 1¾" x 10", No. 1 and better, Eastern Hemlock.

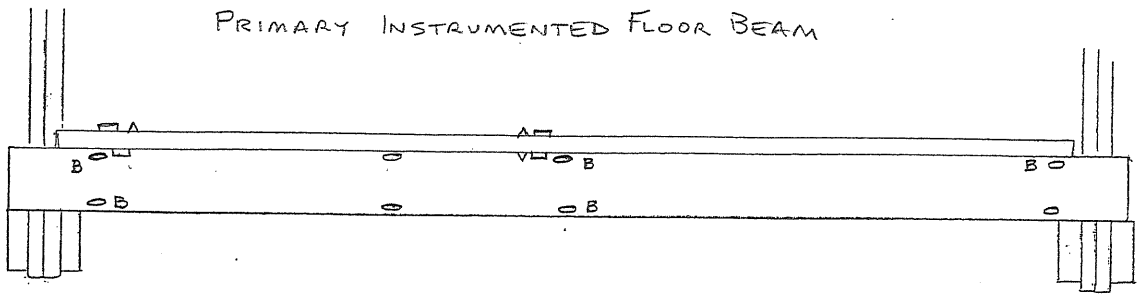
The attachment configurations to be studied -- listed in the order they will be tested -- are:

1. Boards laying in place with no attachment to floorbeams
2. Boards screwed to floorbeams with one screw per floorbeam per plank
3. Boards screwed to floorbeams with two screws per floorbeam per plank
4. Screws removed, boards flipped or sifted, one truck run-through with no fasteners
5. Boards spiked to floorbeams with one 60d nail per floorbeam per plank
6. Boards spiked to floorbeams with two 60d nails per floorbeam per plank
7. Two four-foot wide runners added lightly spiked to first deck layer
8. Space between runners filled in with boards, also lightly spiked to first layer
9. Spikes attaching top layer of deck doubled.

Gauge Locations

See attached drawings.

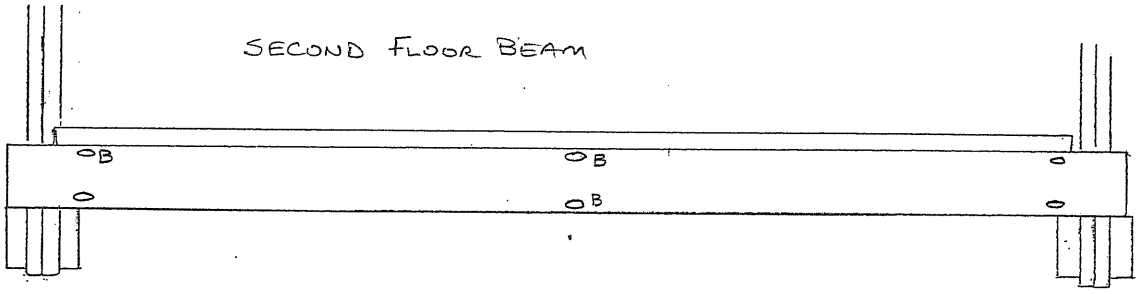
PRIMARY INSTRUMENTED FLOOR BEAM



7 ON DECK PLANKS

13 ON F.B.

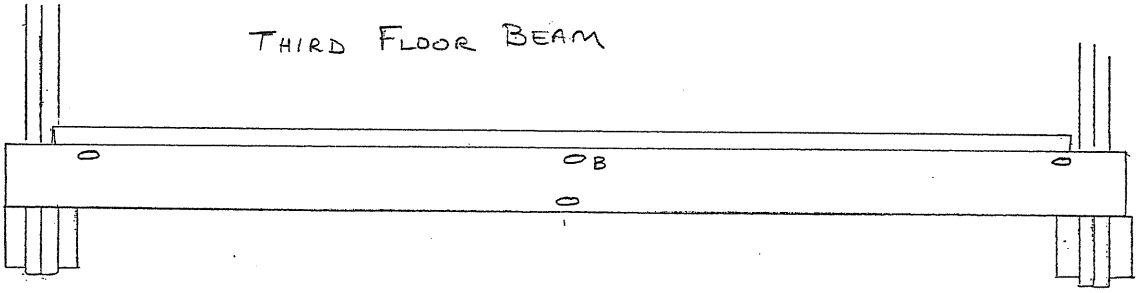
SECOND FLOOR BEAM



0 ON PLANKS

9. ON F.B.

THIRD FLOOR BEAM



0 ON PLANKS

5 ON F.B.

34 GAUGES TOTAL

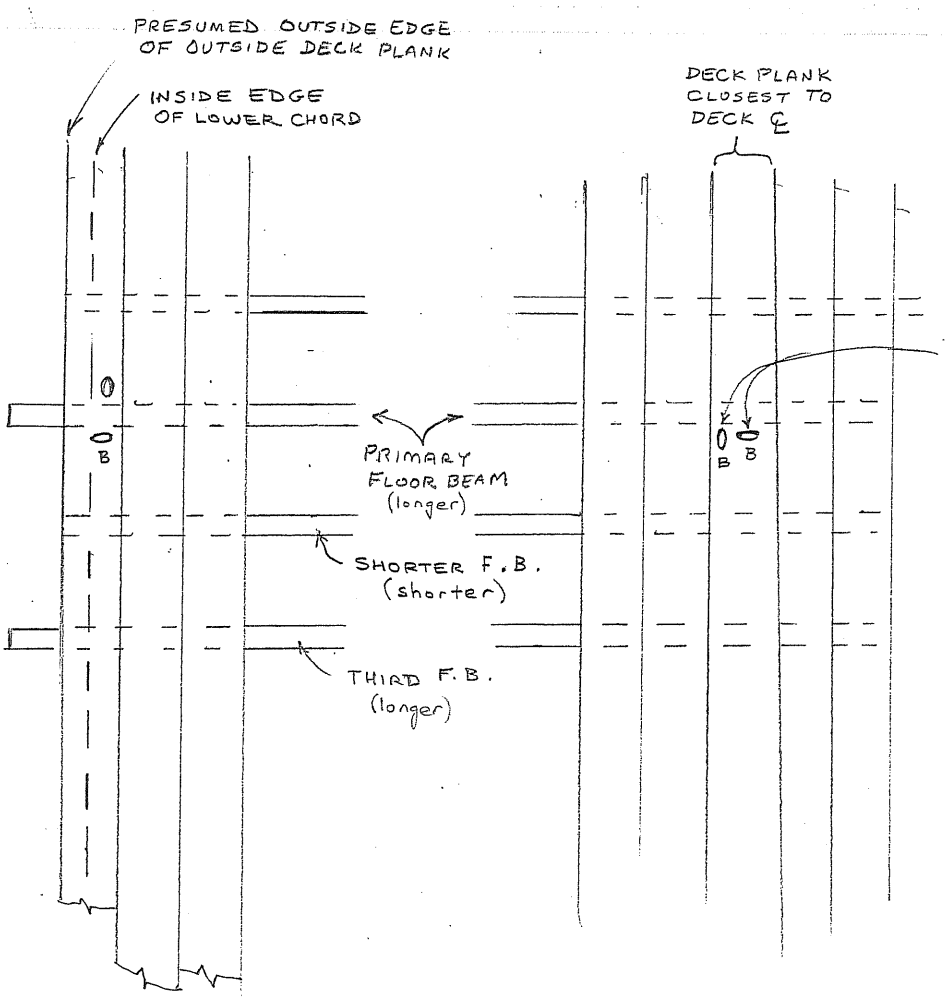
B = ON BOTH SIDES OF FLOOR BEAM
ie, denotes two gauges

+ 2 TILT GAUGES ON TRUSS LOWER CHORD (NOT SHOWN)

□ = GAUGE ON DECK MEASURING TRANSVERSE STRAIN - POINTING SAME DIRECTION AS THOSE ON F.B.

△ = GAUGE ON DECK MEASURING LONGITUDINAL STRAIN - POINTING OUT OF THE PAGE

JB
7-2011



FOR GAUGES ATTACHED TO TOP OF DECK THERE IS SLIGHT CHANCE OF TRUCK BREAKING GAUGE. BUT IF DRIVER STICKS TO APPROX. CENTER OF BRIDGE TIRES SHOULD CLEAR GAUGES AT DECK ℄.

B = ON BOTH SIDES OF DECK PLANK = 2 GAUGES

PLAN VIEW OF DECK

SHOWING MOUNTING LOCATIONS FOR GAUGES ATTACHED TO DECK

JB
7-2016