

4580 MEMORIAL DRIVE,
ST. JOHNSBURY, VT 05819
P 802-748-5898
RES@MYFAIRPOINT.NET



RUGGLES ENGINEERING SERVICES INC.

MIDDLESEX
BRF 024-1(37)

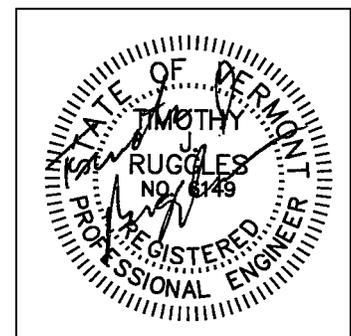
TWO-WAY TEMPORARY BRIDGE
PRECAST DECK PANELS
CRITICAL DESIGN CALCULATIONS
July 22, 2015

PREPARED FOR:

A.L. ST. ONGE CONTRACTOR, INC.
P.O. BOX 65
MONTGOMERY, VT 05470

ANALYSIS SHEETS
CUT SHEET OF DECK PANELS

1-3/3
1/1



Analysis Sheet

Date: 7/22/15

By: T.R.

Project: A.L. ST. ONGE

Sheet 1 of 3

PRECAST DECK PANELS

- CHECK ADEQUACY OF EXISTING PRECAST BRIDGE DECK PANELS, GIVEN

- PANELS ARE 5' X 27' X 8" THICK

- REINFORCED WITH #5 @ 6" O.C. - LONG

#5 @ 12" O.C. - SHORT

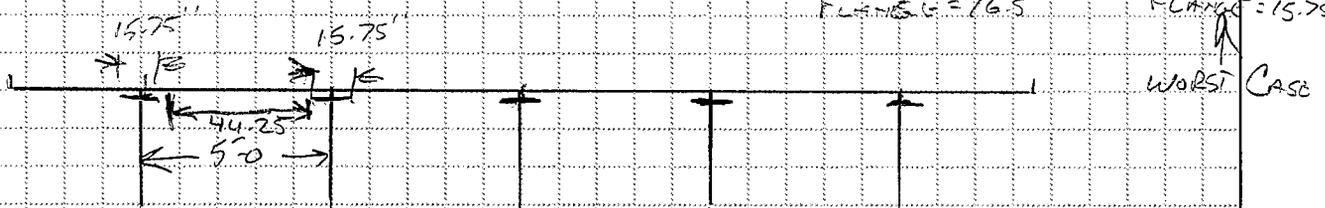
- PANELS ARE SUPPORTED ON BEAMS

SPACED @ 5' O.C.

- PANELS MAY BE USED WITH W36X245 OR W33X201

FLANGE = 16.5"

FLANGE = 15.75"



CALCULATE EFFECTIVE SPAN

$$S = F \text{ TO } F + \frac{b_f}{2} = 44.25 + \frac{15.75}{2} = 52.125'$$

(AASHTO 3.24.1.2 (b)) - SAY 53' (4.42')

- CONSIDER 1' WIDE SECTION OF DECK PANEL

$$W_{DL} = (0.67') \times 1' \times 150 \text{ lb/ft}^3 = 100 \text{ lb/ft}$$

$$M_{DL} (\text{MAX}^+) = (0.0703)(100)(4.42^2) = 137.3 \text{ FT-LB}$$

$$M_{DL} (\text{MAX}^-) = (0.125)(100)(4.42^2) = 244.2 \text{ FT-LB}$$

- USE $M_{DL} = 0.244 \text{ K-FT}$

Analysis Sheet

Date: 7/22/15

By: F.R.

Project: A.L. ST. OUGE

Sheet 2 of 3

PRECAST DECK PANELS

CALCULATE M_{LL} - AASHTO 3-24.3.1 - CASE A

$$S = \text{EFFECTIVE SPAN} = 4.42'$$

$$P_{25} = P_{20} \times 1.25 = 16,000 \times 1.25 = 20,000 \text{ lb}$$

$$I = .30 \text{ ; USE CONTINUITY FACTOR OF } 0.8 \text{ (CONTINUOUS OVER 3 OR MORE SUPPORTS)}$$

$$\text{SO } M_{LL} = \left(\frac{S+Z}{32} \right) \times P \times I \times C$$

$$M_{LL} = \left(\frac{4.42+2}{32} \right) \times 20\text{K} \times 13 \times 0.8 = 4.173\text{K-FT}$$

SO:

$$M_{\text{TOTAL}} = \overset{M_{LL}}{4.173} + \overset{M_{DC}}{0.244} = 4.417\text{K-FT}$$

SEE SHEET 3 FOR ANALYSIS SPREADSHEET

- SUMMARY OF RESULTS

- EXISTING PANELS, AS SHOWN ON DETAIL

BY DAVID RING, P.E. ARE ADEQUATE ✓

- DECK IS CAPABLE OF A 6.68K-FT MOMENT



SIMPLE DESIGN OF CONCRETE SLAB WITH THE FOLLOWING ASSUMPTIONS:
DESIGN IS FOR A 12" WIDE SECTION OF SLAB
DESIGN FOR LIVE LOAD MOMENT GIVEN

Date: 7/22/2015

Given Information:

Design LLM (k-ft)	Effective Span (ft.)	Slab Thickness (in)	Steel cover (in)	Bar size	Bar Dia. (in)	Concrete design strength f'_c (psi)	Rebar allowable load f_s (psi)
4.417	4.42	8	1.5	5	0.625	3,500	24,000

Formulas used:

$$A_s = M_T / (f_s * j * d)$$

$$n = E_s / E_c$$

$$j = 1 - (k/3)$$

$$k = n / (n + r)$$

$$r = f_s / f_c$$

$$f_c = 0.45 * f'_c$$

$$E_s = 29,000,000$$

$$E_c = 57,000 * f'_c^{.5}$$

Calculate:

$$WT_{ft} = 100 \text{ lb/ft}$$

$$M_{DL} = \text{k-ft (included in LLM above)}$$

$$M_T = 4.42 \text{ k-ft} = 53040 \text{ lb-in (to make units work)}$$

$$d = 6.19 \text{ in}$$

$$n = 8.600$$

$$f_c = 1575 \text{ lb/in}^2$$

$$r = 15.238$$

$$k = 0.361$$

$$j = 0.880$$

$$A_{s(\text{req'd})} = \underline{0.41} \text{ in}^2$$

$$\# \text{ bars req'd} = 1.32 \text{ (minimum required to provide } A_{s(\text{req'd})})$$

$$\text{Required spacing} = 9 \text{ inches (maximum spacing allowed)}$$

Use:

$$\# \text{ bars} = 2$$

$$\text{Actual Spacing} = 6 \text{ inches}$$

$$A_{s(\text{provided})} = \underline{0.61} \text{ O.K.}$$

$$M_{T(\text{allowable})} = 80161 \text{ lb-in}$$

$$6.68 \text{ k-ft}$$

$$\text{Distribution steel percentage required (AASHTO 3.24.10.2)} = 67\%$$

$$\text{Distribution steel } A_{s(\text{req'd})} = 0.27 \text{ in}^2$$

Bar size	Bar Dia. (in)
5	0.625

Use:

$$\# \text{ bars/ft} = 1$$

$$\text{Actual Spacing} = 12 \text{ inches}$$

$$A_{s(\text{provided})} = \underline{0.31} \text{ O.K.}$$

NO PAVEMENT ON BRIDGE DECK

TOP VIEW

SCALE $\frac{3}{8}'' = 1'$

M C 6 X 12 0 WITH ONE
EDGE CUT BOLTED
WITH $1\frac{1}{4}''$ BOLT THROUGH
DECK PANELS UNDER
BEAM FLANG TO THE
DECK PANELS

W 33" X 15 $\frac{3}{4}''$
200 $\frac{16}{17}$

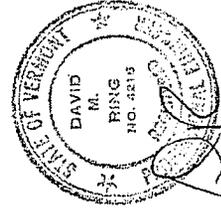
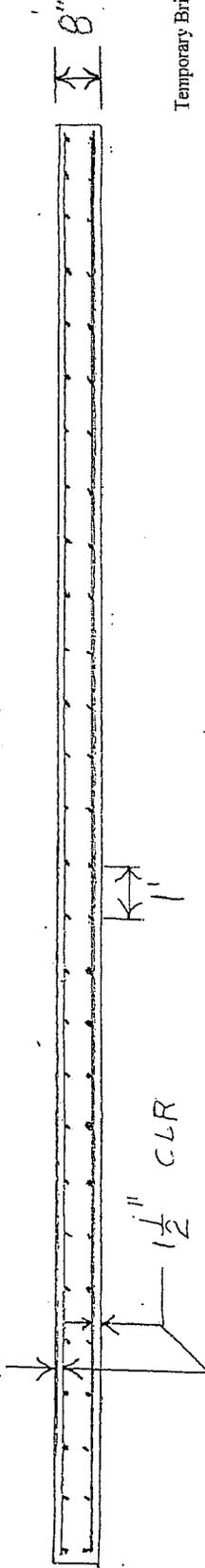
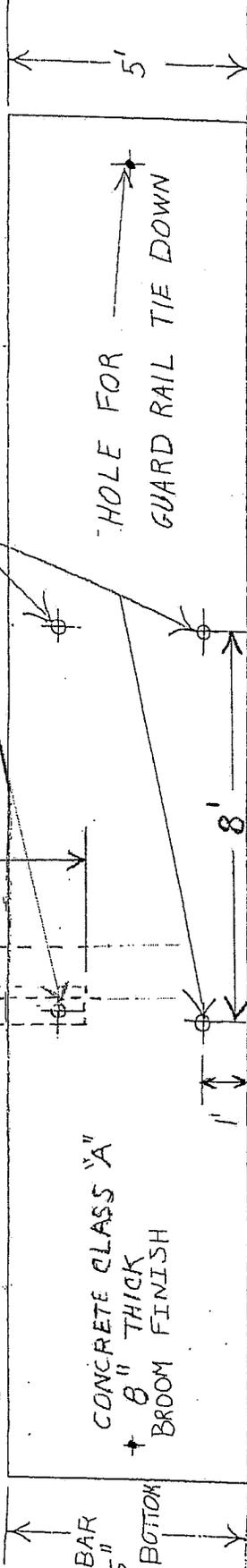
$1\frac{1}{4}''$ BOLTS
FOR TIE DOWN

CONCRETE CLASS "A"
+ 8" THICK
BROOM FINISH

#5 BAR
@ 6"
TOP & BOTTOM

#5 BAR @ 12"
TOP & BOTTOM
27'

HOLE FOR
GUARD RAIL TIE DOWN



Temporary Bridge Plan

Town of & Project No:
Johnson BRP 030-2(17S)

Highway No:

Rte 15

Prime Contractor:

A.L. St. Onge Contractor, Inc.

Detailer:

Randy St. Onge

Sheet Number 5 of 6

CUT SHEET OF PRECAST DECK
PROVIDED BY A.L. ST. ONGE

07/23/2015
SHEET 1/1