4580 MEMORIAL DRIVE,
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RES

RUGGLES ENGINEERING SERVICES INC.

CRITICAL DESIGN CALCULATIONS
TEMPORARY BRIDGE
October 16, 2014

JOHNSON
BRF 030-2(26)

PREVIOUSLY DESIGNED FOR:
MIDDLESEX BRF 024(132)
AND USED FOR
CORNWALL BRS0172 (6) AND
HYDE PARK STP CULV (26)

THIS TEMPORARY BRIDGE IS THE END (70') SPAN OF A THREE SPAN STRUCTURE THAT HAS BEEN SUCCESFULLY USED ON THE ABOVE PROJECTS. THE CALCULATIONS ENCLOSED HAVE BEEN MODIFIED TO REFLECT THE PROPOSED USE ON THIS PROJECT.

PREPARED FOR:

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

Timothy J. Ruggles PE

Digitally signed by Timothy J. Ruggles PE
DN: cn=Timothy J. Ruggles PE, o=Ruggles Engineering Services, ou, email=RES@myfairpoint.net, c=US
Date: 2014.10.16 16:13:12 -04'00'

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STATE OF VERMONT
TIMOTHY J. RUGGLES
NO. 6149
REGISTERED
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RUGGLES ENGINEERING SERVICES INC.

Analysis Sheet

Date: 04/01/09
By: T.R
Project: A.L. STONGE - MIDDLESEX - TEMP. BRIDGE Sheet 1 of 6

REVISED 10/16/14 FOR JOHNSON BRF 030-2(26)

CRITICAL DESIGN CALCULATIONS FOR TWO-WAY, ONE TR ~~THREE~~ SPAN TEMPORARY BRIDGE, GIVEN:

1) ~~TWO~~ SPANS @ 70', USED W 33X 201 GIRDERS (5)
- $S_x = 684 \text{ in}^3$

~~2) MIDDLE SPAN @ 80', USED W 36X 245 GIRDERS (5)~~
- $S_x = 895 \text{ in}^3$

3) DECK TO BE 27' PRECAST CONCRETE, 8" THICK + 2" PAVEMENT USE 0.85' THICK (PREVIOUSLY DESIGNED AND BUILT)

4) BRIDGE TO BE 24' RAIL TO RAIL

~~5) PIERS TO BE PILE BENTS, FB, HP, W X 73~~

BEAMS @ 5' O.C.

ANALYZE BEAMS FOR WORTCASE, ONE WHEEL LOAD DIRECTLY OVER ONE BEAM
DEAD LOAD DISTRIBUTED OVER 5 BEAMS

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Analysis Sheet

Date: 04/01/09
By: T.R
Project: A.L. ST. ONGE – MIDDLESEX TEMP. BRIDGE Sheet 2 of 6

1) ~~END~~ SPANS: (70' LONG)

A) DEAD LOADS (ALL PER GIRDER)

- DECK: 27' × 1' × .83' × 150 lb/FT³ ÷ 5 = 0.67 K/FT
- BEAMS 201 lb/FT × 1.1 (DIAPHRAMS ETC = 0.22 K/FT
- GUARD RAIL 2 × 200 lb/FT ÷ 5 = 0.08 K/FT

TOTAL DL = 0.97 K/FT

So $M_{DL} = \frac{wl^2}{8} = \frac{(0.97) \times (70)^2}{8} = 594$ K-FT.

B) LIVE LOAD

4728

(AASHTO APP A) LANE LOAD = 985.6 (HS-20) × 1.25 TO HS25 = 1232 K-FT

So 1/2 LANE LOAD ON GIRDER = 616 K-FT

$I = \frac{50}{L+125} = \frac{50}{70+125} = 0.26$

DIST FACTOR $= \frac{S}{5.5} = \frac{5}{5.5} = 0.91 = (D.F)$

So $M_{LL} = 616 \times 1.26 \times 0.91 = 706.3$ K-FT
(I) (DF)

C) $M_{TOTAL} = \underset{M_{DL}}{594.0} + \underset{M_{LL}}{706.3} = 1300.3$ K-FT

D) $S_{x(REQD)} = \frac{M_{MAX}}{F_b} = \frac{1300.3 \times 12 \text{ IN/FT}}{24 \text{ K/IN}^2} = 650.1 \text{ IN}^3$

E) S_x W 33×201 = 684 IN³ > 650.1 IN³ ∴ O.K. ✓

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By: T.R
Project:

2) MIDDLE SPAN: (80' LONG)

A) DEAD LOADS (ALL PER GIRDER (SAME HS ENDS)

- DECK 0.67 K/FT
- BEAMS 0.22 K/FT
- GUARDRAIL 0.08 K/FT

TOTAL 0.97 K/FT

So $M_{DL} = \frac{0.97 \times (80)^2}{8} = 776$ K-FT

B) LIVE LOAD:

(AASHTO APP A) LANE LOAD = 1164.9 (HS-20) × 1.25 (TO HS-25) = 1456.1 K-FT/LANE

So 1/2 LANE LOAD = 728.1 K-FT

USE I = 0.26 ; DF = 0.91

So $M_{LL} = 728.1 \times 1.26 \times 0.91 = 834.8$

C) $M_{TOTAL} = \underset{M_D}{776} + \underset{M_{LL}}{834.8} = 1610.8$ K-FT

D) $S_{x\,REQ'D} = \frac{M_{max}}{F_b} = \frac{1610.8 \text{ K-FT} \times 12 \text{ IN/FT}}{24 \text{ K/IN}^2} = 805.4 \text{ IN}^3$

E) W 36×201 $S_x = 895 \text{ IN}^3 > 805.4 \text{ IN}^3$ ∴ OK

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Project:

3) CALCULATE END REACTIONS:

A) ~~END~~ SPANS: 70'

AASHTO APP A - REACTION = 62.4 X 1.25/LANE X 2 LANE = 156 K

D.L. = 0.97 K/FT X 70' X 5 BEAMS / 2 = 170 K

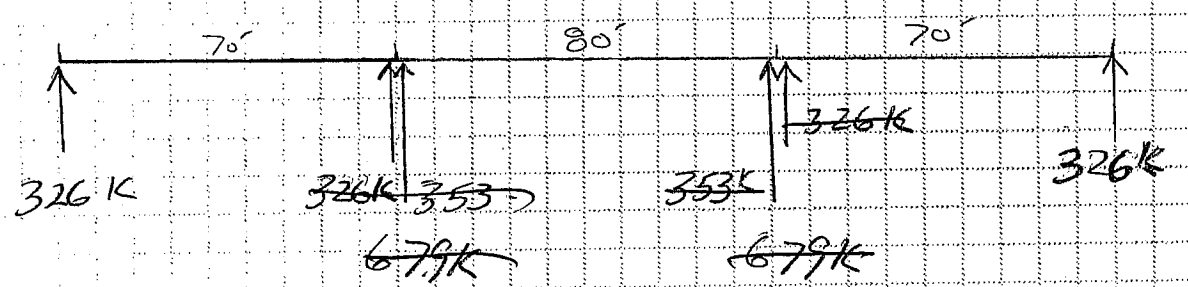
326 K EACH END ✓

~~B) MID SPAN = 80'~~

~~AASHTO APP. A - REACTION = 63.6 X 1.25/LANE X 2 LANE = 159 K~~

~~D.L. = 0.97 K/FT X 80' X 5 BEAMS / 2 = 194 K~~

~~353 K EACH END.~~



~~SO PILE BENTS MUST SUPPORT 679 K~~

ABUTMENTS MUST SUPPORT 326 K ✓

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Analysis Sheet

Date: 04/01/09
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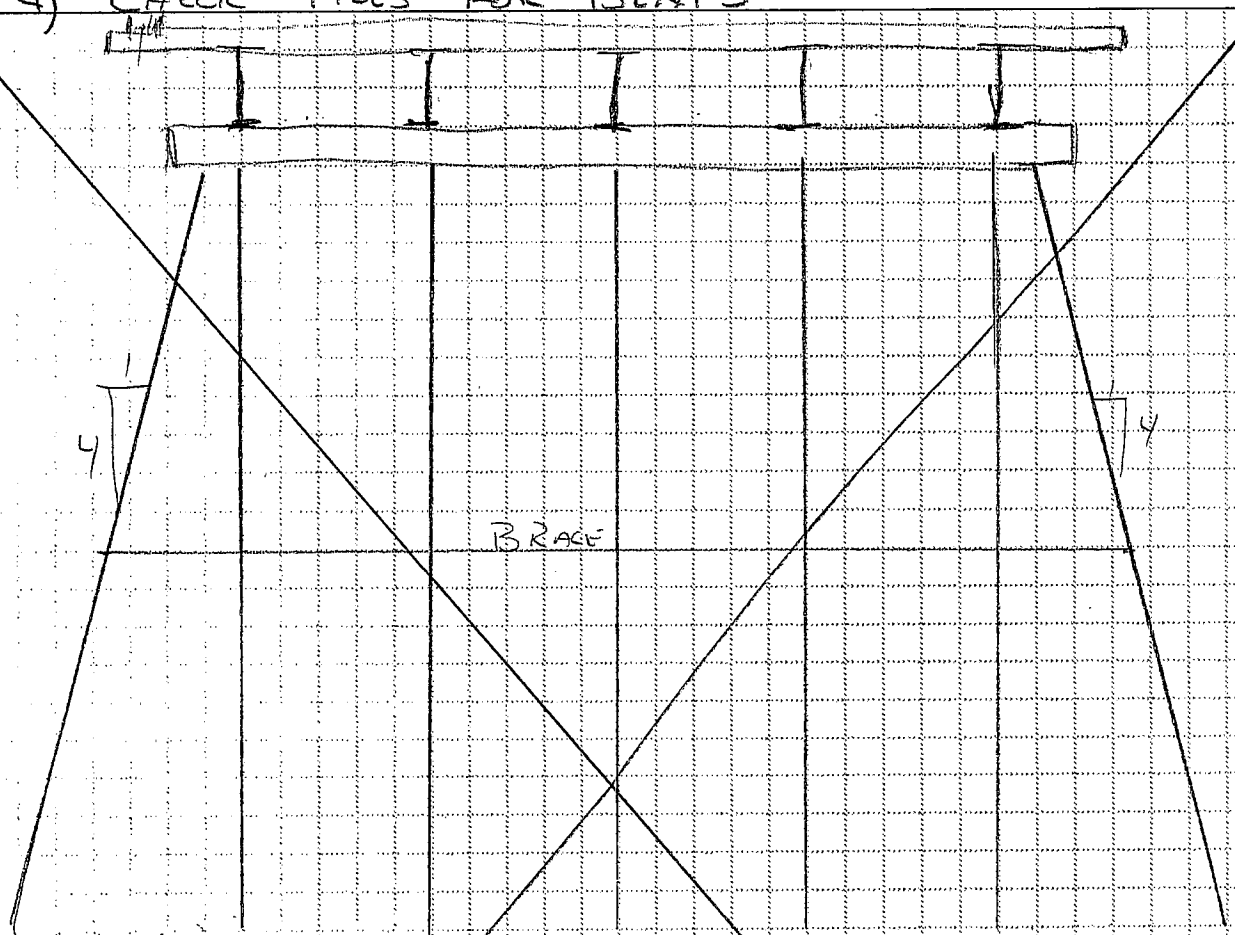
Project:

4) CHECK PILES FOR BENTS



PLACE PILES DIRECTLY BELOW GIRDERS
SAY LOAD IS DISTRIBUTED OVER 5 PILES

∴ $LOAD_{PILE} = 679\,K/5 = 135.8\,K$ - SAY 150 K

SAY EACH COLUMN ≈ 25' LONG SO

USE $K = 1.2$ $r = 3.49$ $A_s = 21.4\,in^2$ $C_c = 126.1$
$\ell = 300''$

$K\ell/r = 103.2$

$$F_a = \frac{[1-(K\ell/r)^2/2C_c^2]F_y}{FS}$$

103.2 126.1 36 K 1.91

$F_a = 12.54\,K/in^2$

SO ALLOWABLE LOAD = 21.4 × 12.54 = 268.3 K > 150 K ∴ OK

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Analysis Sheet

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By: T.R
Project:

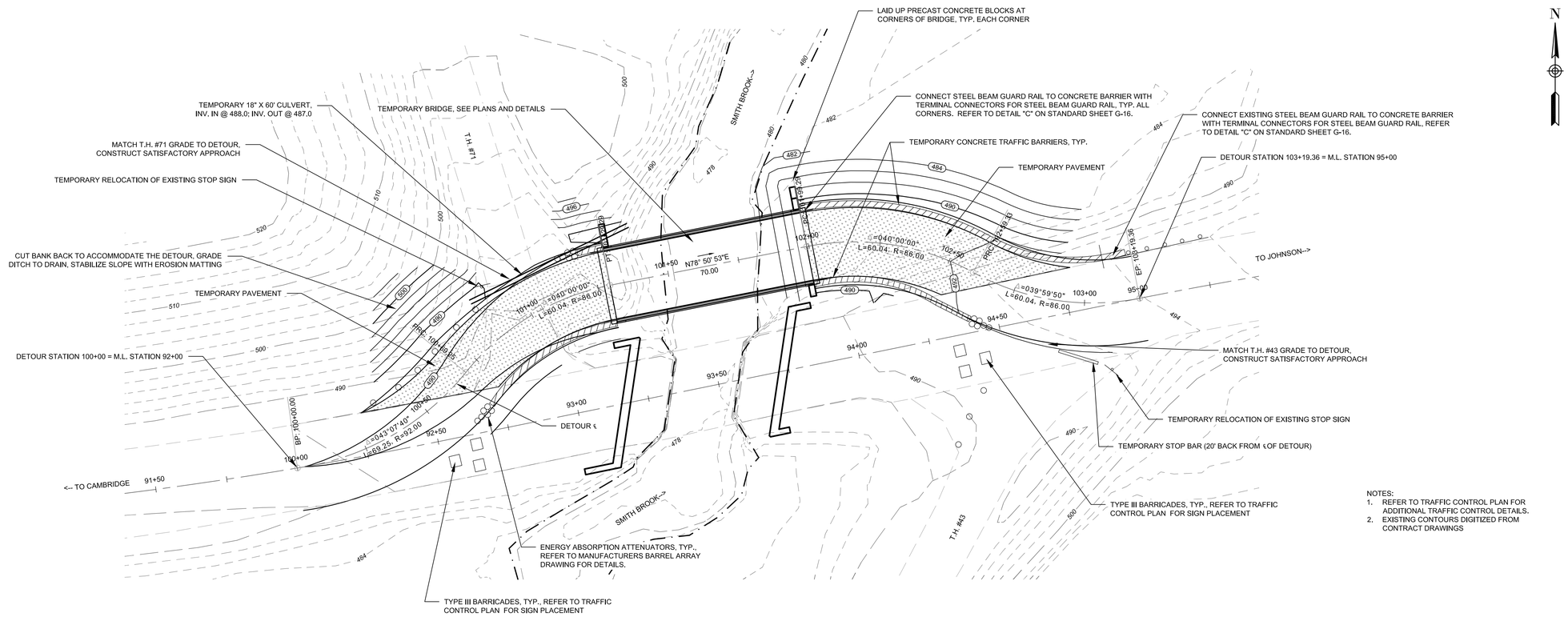
5) CHECK ABUTMENT END LOAD CONDITIONS

- LOAD ON ABUTMENT ENDS = 326 K ✓
- USE A 5' x 27' x 8" THICK PRECAST DECK SECTION UNDER THE GIRDERS
- TOTAL AREA = 5 x 27 = 135 sq ft
- LOAD = $\frac{326\,K}{135\,ft^2}$ = 2.4 K/ft² SAY 2.5 K/ft²
- USING STRUCTURAL FILL, SO 2.5 K/ft² IS REASONABLE FOR TEMPORARY USE.
- USE 2.5 K/ft² SURCHARGE LOAD WHEN DESIGNING SHEETING FOR ABUTMENTS -IF REQUIRED- T.R.

6) NOTE:

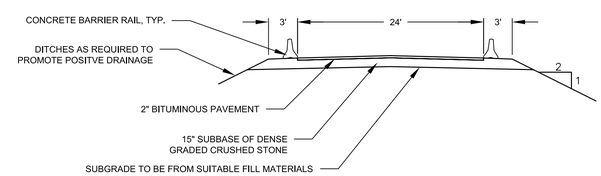
PRECAST BRIDGE DECK PANELS HAVE BEEN DESIGNED PREVIOUSLY BY OTHERS, AND HAVE BEEN USED SUCCESSFULLY ON OTHER PROJECTS
- NO ANALYSIS PERFORMED -

7) NOTE THE H-PICE GUARDRAIL CONFIGURATION HAS BEEN DESIGNED PREVIOUSLY BY OTHERS, AND HAS BEEN USED SUCCESSFULLY ON OTHER PROJECTS
- NO ANALYSIS PERFORMED -

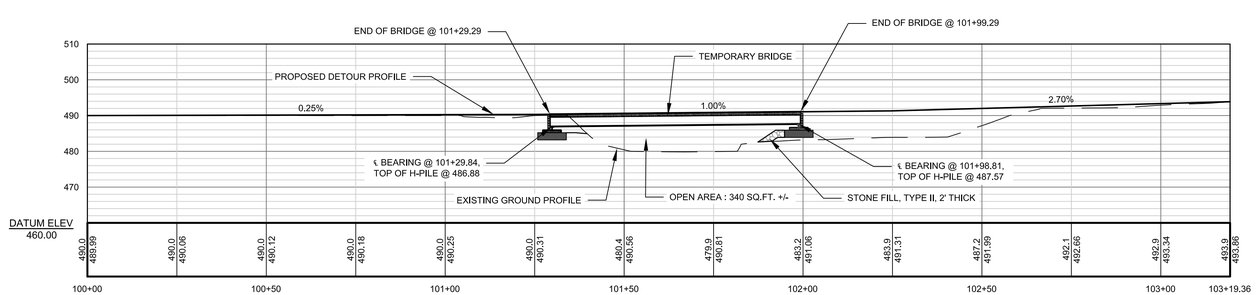


NOTES:
1. REFER TO TRAFFIC CONTROL PLAN FOR ADDITIONAL TRAFFIC CONTROL DETAILS.
2. EXISTING CONTOURS DIGITIZED FROM CONTRACT DRAWINGS

DETOUR LAYOUT PLAN
1" = 20'
0 20' 40'



DETOUR TYPICAL SECTION
N.T.S.



DETOUR PROFILE
1" = 20'
0 20' 40'

RUGGLES ENGINEERING SERVICES, INC.
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Civil Engineering-Site Development
Septic System Design-Soils Analysis
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STATE OF VERMONT
TIMOTHY J. RUGGLES
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PREPARED FOR:
A.L. ST. ONGE CONTRACTORS, INC.
P.O. BOX 65 MONTGOMERY, VT 05470
Address

DETOUR PLAN AND PROFILE
JOHNSON BRF 030-2(26)

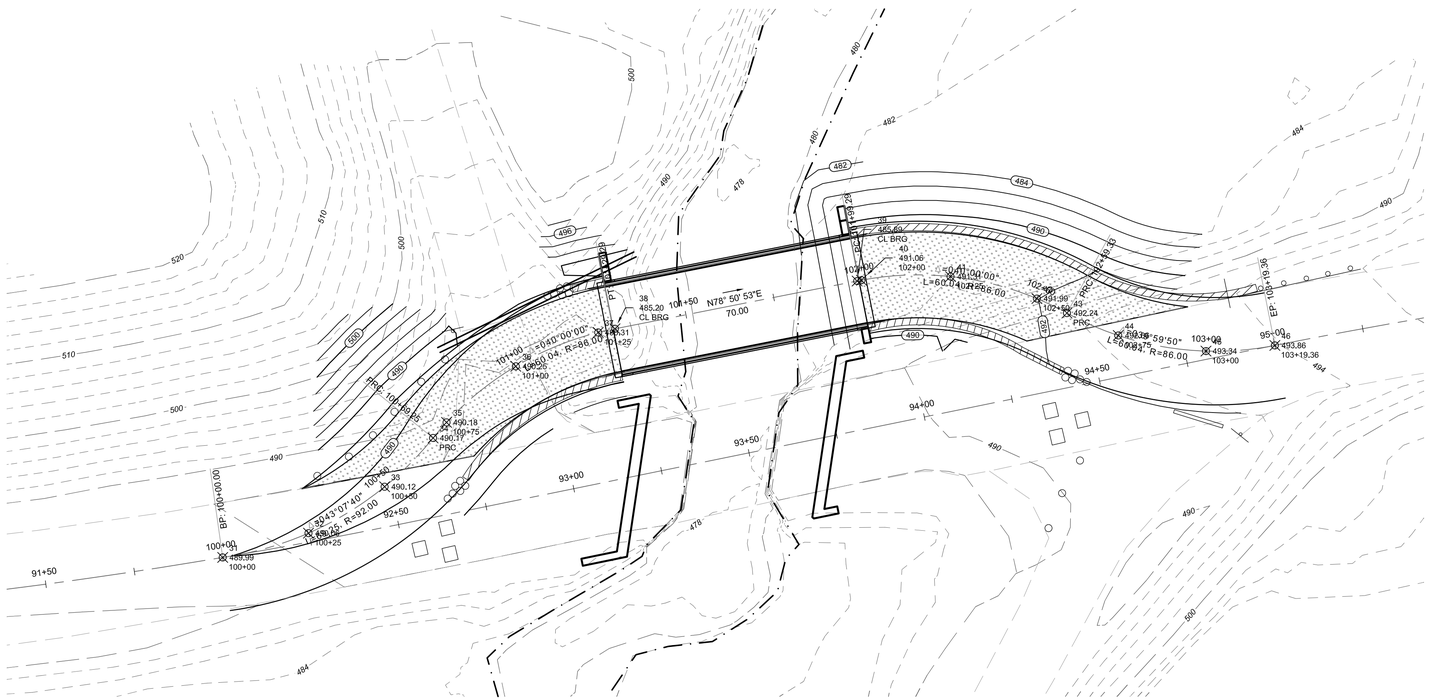
REVISIONS

No.	Description	Date
-	-	-
-	-	-
-	-	-
-	-	-

Designed: T.R.
Drawn: -
Checked: -
DATE: 10/16/14

DTR 1

Sheet of



DETOUR LAYOUT PLAN
1" = 20'
0 20' 40'

Point Table				
Point #	Raw Description	Elevation	Northing	Easting
31	100+00	489.99	780892.893	1582582.640
32	100+25	490.06	780899.683	1582606.620
33	100+50	490.12	780912.661	1582627.898
34	PRC	490.17	780926.284	1582641.446
35	100+75	490.18	780930.640	1582645.201
36	101+00	490.25	780946.315	1582664.563
37	101+25	490.31	780955.782	1582687.606
38	CL BRG	485.20	780956.815	1582692.290
39	CL BRG	485.89	780970.157	1582759.970
40	102+00	491.06	780970.390	1582761.168
41	102+25	491.31	780971.411	1582786.059
42	102+50	491.99	780965.255	1582810.199
43	PRC	492.24	780961.207	1582818.596
44	102+75	492.66	780954.934	1582832.935
45	103+00	493.34	780950.574	1582857.463
46	103+19.36	493.86	780952.155	1582876.710

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DETOUR LAYOUT PLAN
JOHNSON BRF 030-2(26)

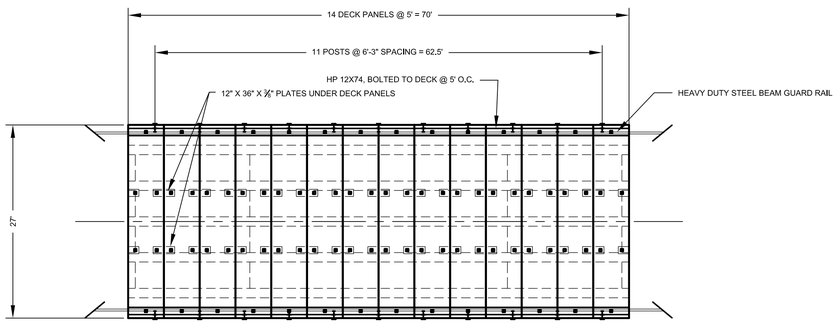
REVISIONS

No.	Description	Date

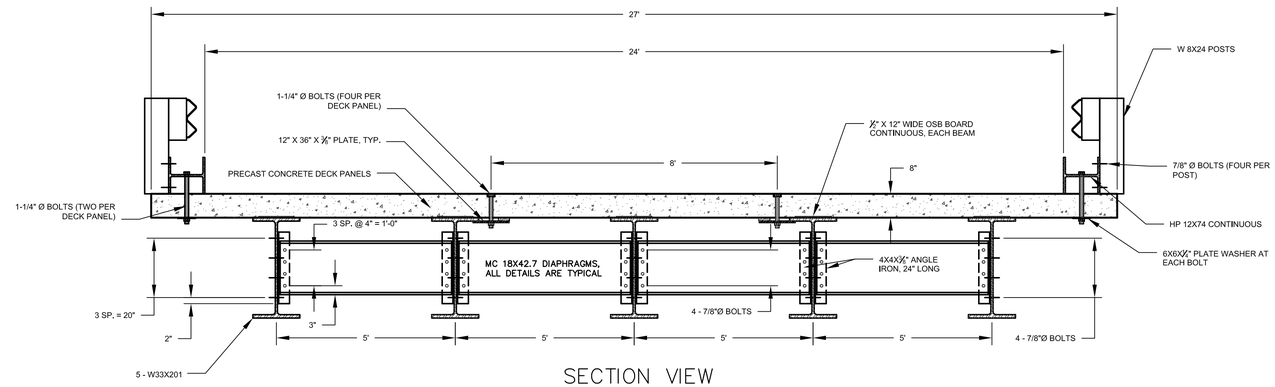
Designed: T.R.
Drawn: -
Checked: -
DATE: 10/16/14

DTR 2

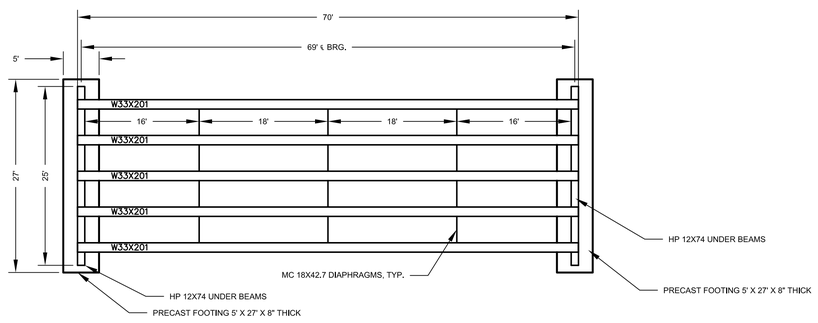
Sheet of



BRIDGE DECK PLAN
1" = 10'



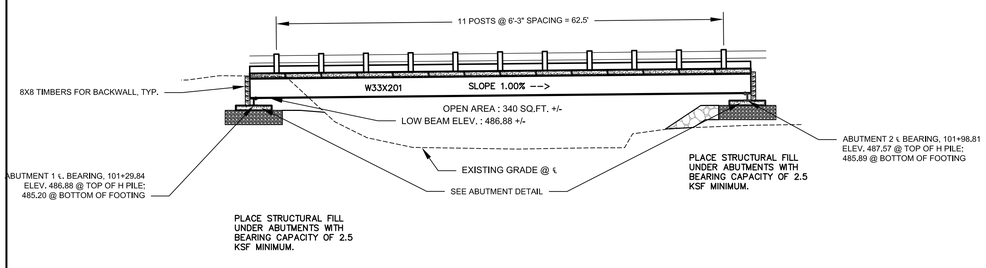
SECTION VIEW
1" = 2'



BRIDGE FRAMING PLAN
1" = 10'

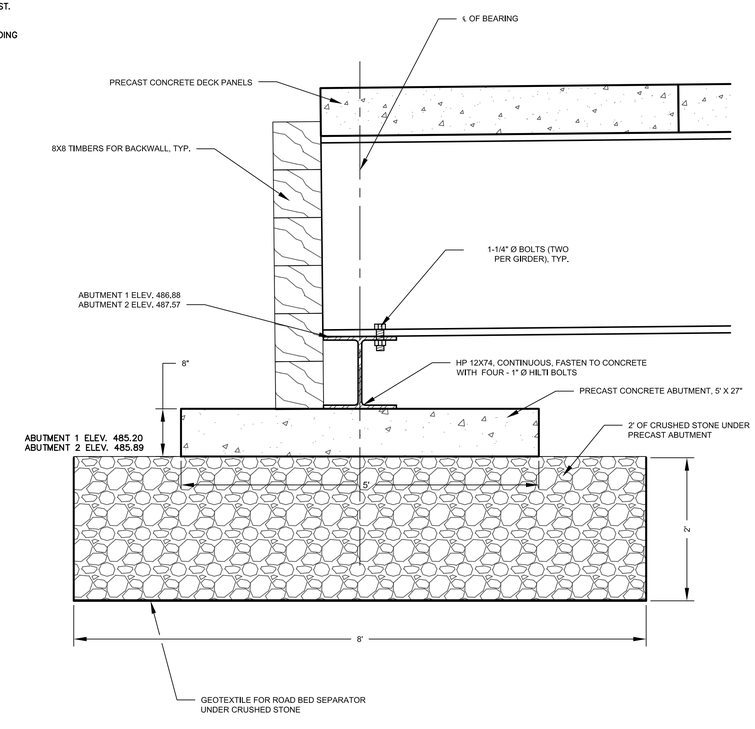
NOTES:

1. ALL BEAMS ARE TO BE IN GOOD CONDITION WITH A MINIMUM YIELD STRENGTH OF 36 KSI.
2. STEEL FOR BRACING SHALL BE NEW OR IN LIKE NEW CONDITION AND ASTM A36 OR STRONGER.
3. BOLTS AND NUTS FOR CONNECTIONS SHALL BE H.S. A-325 WITH ALL HOLES DRILLED. ALL BOLTED CONNECTIONS TO HAVE A FLAT WASHER ON EACH END.
4. CONCRETE FOR PRECAST PANELS SHALL BE CLASS A.
5. REINFORCING STEEL SHALL BE GRADE 60.
6. BRIDGE IS DESIGNED FOR TWO-WAY TRAFFIC, HS-25 LOADING. DESIGN BASED ON CONTRACT DOCUMENTS AND TEMPORARY STRUCTURE CONSIDERATIONS.
7. PRECAST DECK PANELS TO HAVE A 8" NOMINAL DEPTH. PREVIOUSLY DESIGNED BY A.L. ST. ONGE FOR HS-25 LOADING.
8. ALL WELDING TO BE PERFORMED BY QUALIFIED WELDERS USING E70XX OR STRONGER WELDING ELECTRODE.



BRIDGE ELEVATION
1" = 10'

0 10' 20'



DETAIL @ ABUTMENTS
1" = 1'

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TEMPORARY BRIDGE DETAILS
JOHNSON BRF 030-2(26)

REVISIONS		
No.	Description	Date

Designed: T.R.
Drawn: -
Checked: -
DATE: 10/16/14

BR 1

Sheet of

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