4580 MEMORIAL DRIVE,
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RUGGLES ENGINEERING SERVICES INC.

CRITICAL DESIGN CALCULATIONS
TEMPORARY BRIDGE ABUTMENTS

December 2, 2014

CORINTH
BRO 1447(29)

THESE ABUTMENTS ARE FOR A MABEY TEMPORARY BRIDGE. DESIGN OF THE MABEY BRIDGE IS PROVIDED BY MABEY, INC.

PREPARED FOR:

AUSTIN CONSTRUCTION, INC.
1149 MAIN STREET
CONCORD, VT 05428

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STATE OF VERMONT
TIMOTHY J. RUGGLES
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REGISTERED PROFESSIONAL ENGINEER

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Analysis Sheet

Date: 12-1-14
By: TJR
Project: AUSTIN CONSTRUCTION-CORINTH Sheet 1 of 5

DESIGN FOOTINGS/ABUTMENTS FOR MABEY TEMPORARY BRIDGE

- USE ACI DESIGN HANDBOOK ACI 340.1 R-91

A) GIVEN:

- DESIGN LOADS (FROM MABEY BRIDGE)
  - CORNER REACTIONS = 90 KIPS (MAX)
- CONTRACTOR HAS PRECAST SLABS THAT ARE 4'X10'X12" THICK; CONCRETE CLASS B WITH 2 MATS OF #5 REBAR @ 12" O.C. E.W. (2" CLEAR) (GRADE 60)
- ASSUMED SOIL BEARING CAPACITY = 4 K/FT² (GOOD FILL)
- CONTRACTOR HAS 3'X6'X18" THICK WASTE CONCRETE BLOCKS TO STACK AND USE FOR BACKWALLS. (UNREINFORCED)

B) CHECK FOOTINGS:

- SOIL BEARING:

$$90K \div 4' \times 10' = 2.25 K/FT^2$$

$$2.25 < 4 K/FT^2 \therefore \text{SOIL BEARING OK}$$

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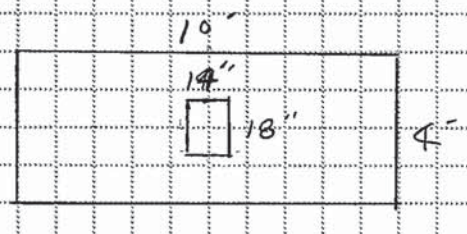
c) CHECK CONCRETE (CHECK THICKNESS): (ACI)

1) $q_s = 2.25\ K/ft^2$

2) COMPUTE MIN. DEPTH FOR ONE-WAY (BEAM SHEAR)

a) FIND LARGER OVERHANG DISTANCE
- BASE PLATE @ 18" x 14" (SMALLEST FOOTPRINT)



$a_{f_1} = [(10' \times 12) - 14] / 2 = 53"$

$a_{f_2} = [(4' \times 12) - 18] / 2 = 15"$

b) FIND K_{v_1} FOR $f'_c = 3000$ PSI & $q_s = 2.25$ KSF

(FROM FOOTINGS 1) $K_{v_1} = 0.14$

CALCULATE $d = 0.14 \times 53" = 7.42"$

THICKNESS $= 7.42 + 2.31 = 9.73" < 12"$
(REBAR + COVER) ∴ OK

3) CHECK MINIMUM DEPTH FOR TWO-WAY (PERIMETER SHEAR) ACTION:

a) ADJUST q_s FOR COLUMN ASPECT RATIO

FOR $\beta_c = \frac{18}{14} = 1.29$, READ K_{v6} FROM FOOTINGS 2

$K_{v6} = 1.0$ SO USE $q_s = 2.25$

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Analysis Sheet

Date: 12-1-14
By: TR
Project: AUSTIN CONSTRUCTION - CORINTH Sheet 3 of 5

b) COMPUTE A_F/A_C; FIND d/h_C

$A_F/A_C = (10' \times 4')/(1.5' \times 1.17') = 31.2$

FROM FOOTINGS 2-1 $d/h_C \cong 0.4$

c) COMPUTE h_C $h_C \cong \sqrt{A_C}$

$h_C = \sqrt{18'' \times 12''} = 14.70$

d COMPUTE $d = (d/h_C) \times h_C = 0.4 \times 14.70$

$d = 5.88''$

$+ \underline{2 + .31}$ (COVER + REBAR

$= 8.19'' < 12''$ ∴ O/K ✓

FOR 2-WAY SHEAR

D) CHECK REBAR IN FOOTING (#5 @ 12" O.C EACH WAY)

$d = 10''$

$d_{f_1} = 53''$

$F_y = 60$ KSI

FROM FOOTINGS 3-2, $A_{s_{REQ'D}} \cong 0.20 \text{ IN}^2/\text{FT}$

#5 @ 12" O.C. $= 0.31 \text{ IN}^2/\text{FT} > 0.20 \text{ IN}^2$

SO EXISTING REINFORCING IS O.K. ✓

E) EXISTING SLABS ARE O.K. FOR THIS APPLICATION ✓

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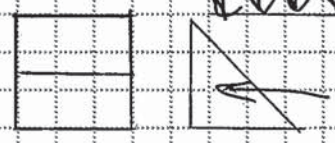
Analysis Sheet

Date: 12-1-14
By: T-12
Project: AUSTIN CONSTRUCTION - CORINTH Sheet 4 of 5

F) CHECK USE OF STACKED WASTE BLOCKS FOR BACKWALL:

↓↓↓↓ - SURCHARGE = 200 PSF (TRAFFIC LOAD)

$h = 3'$



SOIL $\gamma = 140\ lb/ft^3$
$\phi = 35° \therefore K_a = 0.271$

$$R_{SOIL} = (\gamma h^2/2) \times K_a = \frac{140 \times 3^2}{2} \times .271$$
$$= 170\ lb/ft = 0.170\ K/ft$$

$$R_{SURCHARGE} = 200 \times 3' \times 0.271 = 162.6\ lb/ft$$

SO

LOADS

← 163 lb/ft (TRAFFIC)
← 170 lb/ft (SOIL

CHECK FOR SLIDING:

BLOCKS ARE $1' \times 3' \times 3' \times 150\ lb/ft^3 = 1350\ lb = N$

USE FRICTION FACTOR $= 0.4 = \mu$

SO $F = \mu \times N = 0.4 \times 1350 = 540\ lb$

$$F.S._{SLIDING} = \frac{F}{(R_{SOIL} + R_{SURCH})} = \frac{540}{(170+163)} = 1.62 \checkmark$$

BLOCKS OK FOR SLIDING ✓

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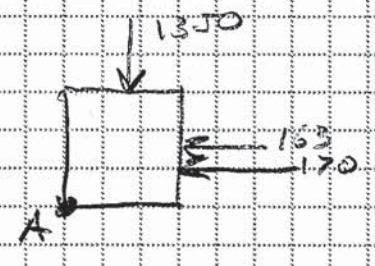
Analysis Sheet

Date: 12-1-14
By: T.R
Project: AUSTIN CONSTRUCTION - CORINTH Sheet 5 of 5

CHECK BLOCKS FOR ROTATION:



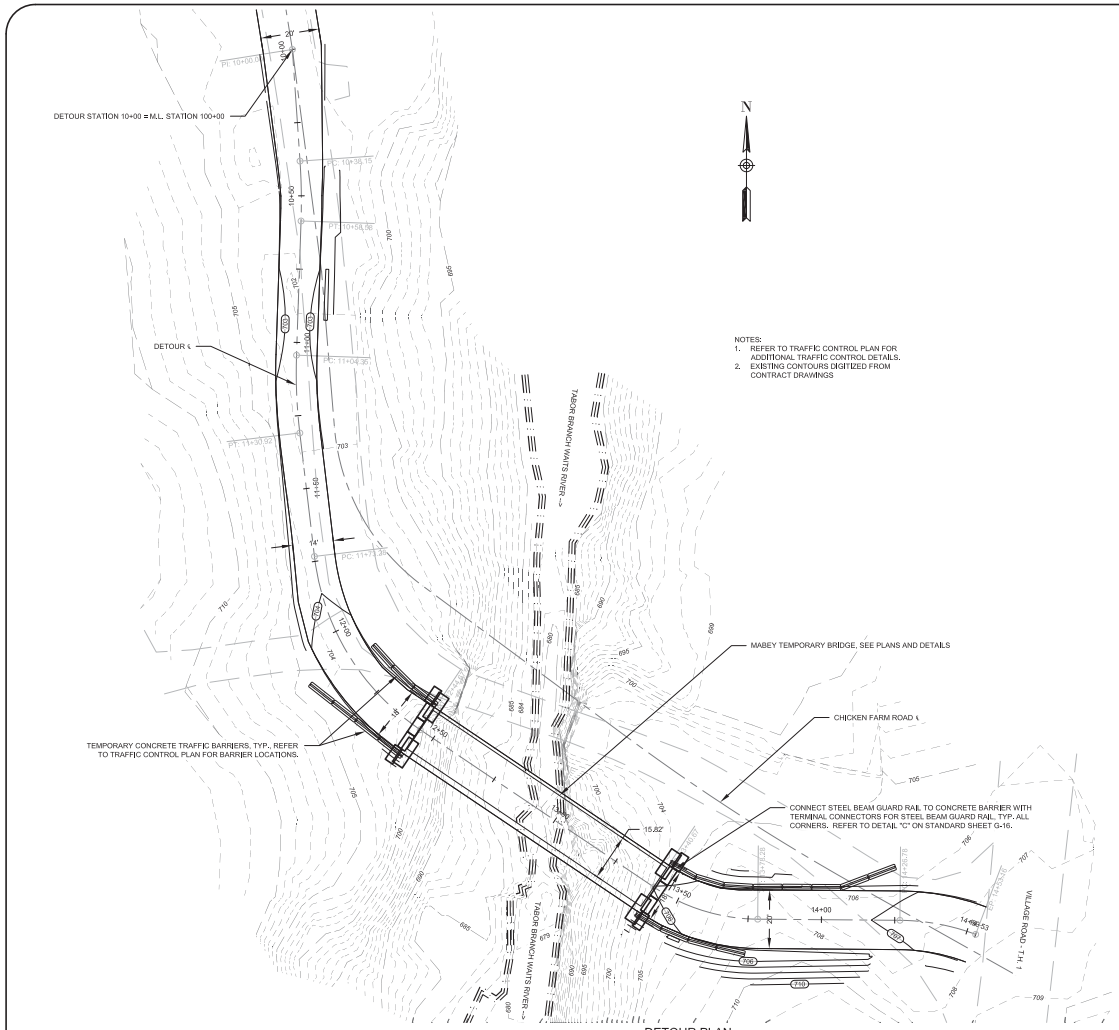
Σ MOMENTS @ A

$$F.S._{ROTATION} = \frac{(1350 \times 1.5)}{(170 \times 1) + (163 \times 1.5)} = \frac{2025}{(170 + 245)}$$

$$F.S._{ROTATION} = 4.88 \checkmark$$

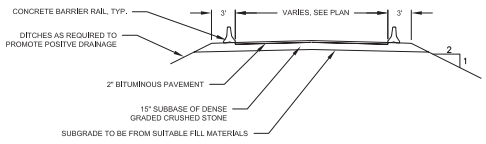
BLOCKS ARE O.K. FOR ROTATION.

- OK TO USE STACKED BLOCKS FOR BACK WALL

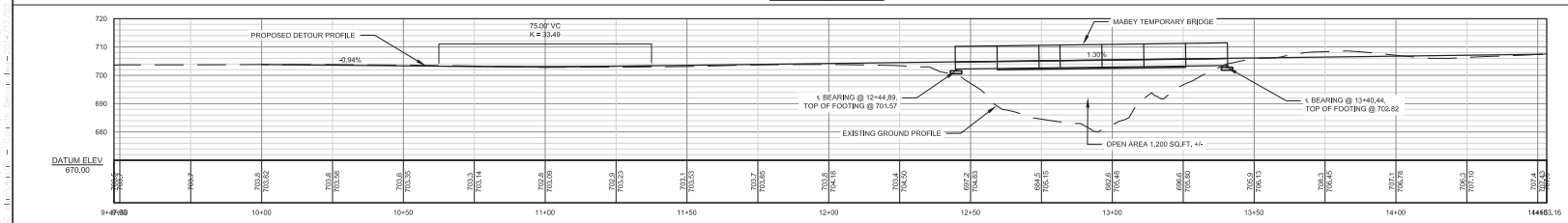


NOTES:
1. REFER TO TRAFFIC CONTROL PLAN FOR ADDITIONAL TRAFFIC CONTROL DETAILS.
2. EXISTING CONTOURS DIGITIZED FROM CONTRACT DRAWINGS

DETOUR PLAN
1" = 20'



DETOUR TYPICAL SECTION
N.T.S.



DETOUR PROFILE
1" = 20'

RUGGLES ENGINEERING SERVICES, INC.
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PREPARED FOR:
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1149 MAIN STREET, CONCORD, VT
Address

DETOUR PLAN AND PROFILE
CORINTH BRO 1447(29)

REVISIONS

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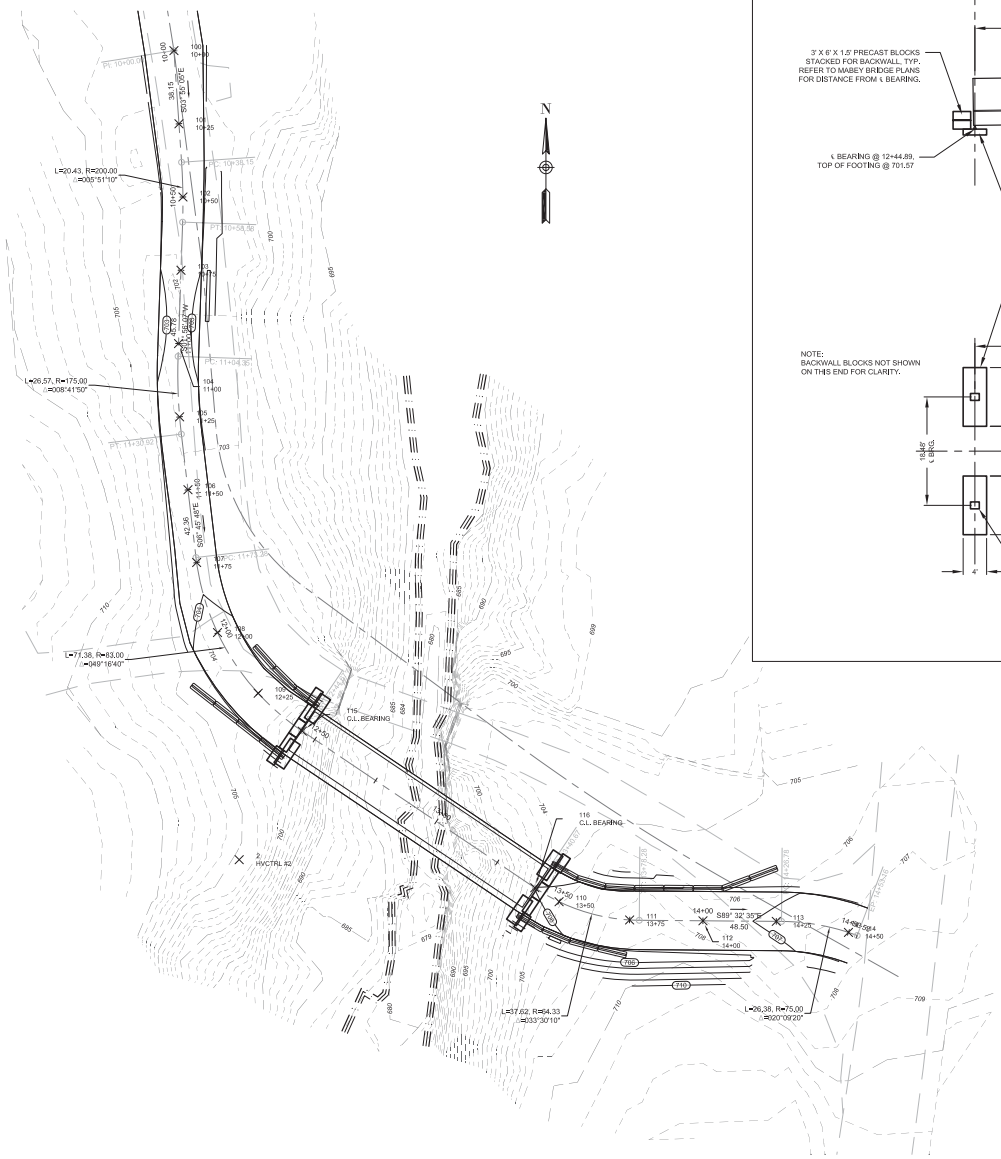
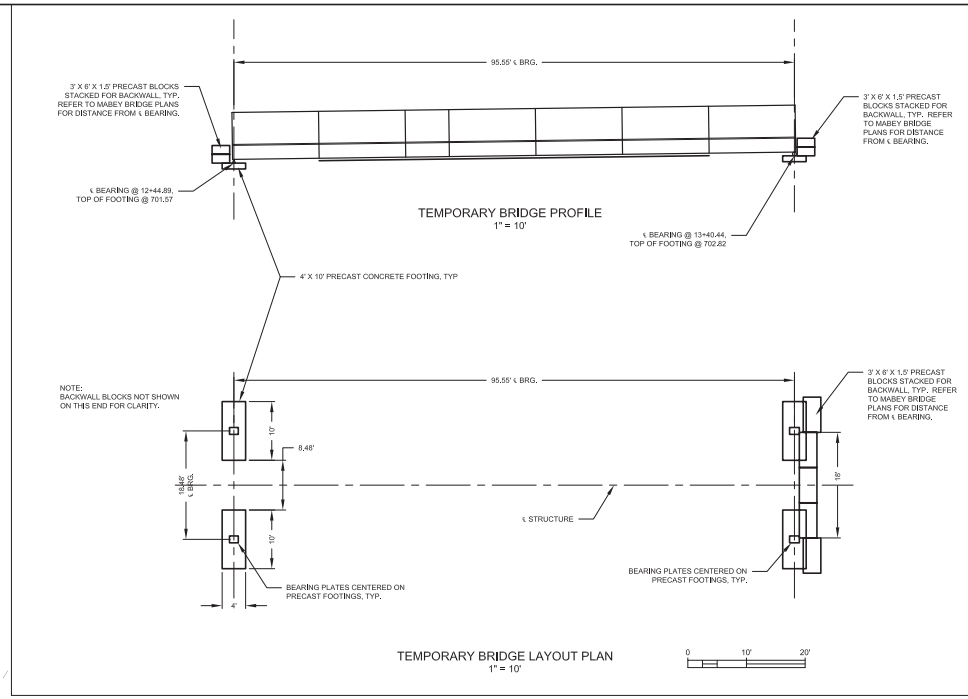
-	-	-

Designed: T.R.
Drawn: -
Checked: -
DATE: 12/02/14

1
Sheet of 2



DETOUR LAYOUT PLAN
1" = 20'



Point Table				
Point #	Description	Elevation	Northing	Easting
1	HVCTRL #1	711.400	570700.9600	1713106.1000
2	HVCTRL #2	704.660	570210.1300	1713235.1500
100	10+00	703.820	570485.9460	1713212.8995
101	10+25	703.585	570461.0045	1713214.6078
102	10+50	703.350	570436.0458	1713215.9651
103	10+75	703.138	570411.0565	1713215.3047
104	11+00	703.090	570386.0708	1713214.4605
105	11+25	703.228	570361.0918	1713214.8338
106	11+50	703.530	570336.2551	1713217.6784
107	11+75	703.855	570311.4313	1713220.6402
108	12+00	704.180	570287.5608	1713227.7457
109	12+25	704.504	570266.8730	1713241.6131
110	13+50	706.129	570195.8038	1713344.1941
111	13+75	706.454	570189.5777	1713368.2442
112	14+00	706.779	570189.2946	1713393.2414
113	14+25	707.104	570189.0952	1713418.2406
114	14+50	707.429	570185.3329	1713442.8421
115	C.L. BEARING	700.570	570253.9406	1713256.6635
116	C.L. BEARING	701.820	570200.5647	1713335.9151

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DETOUR AND ABUTMENT LAYOUT PLANS
CORINTH BRO 1447(29)

REVISIONS

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

Designed: T.R.
Drawn: -
Checked: -
DATE: 12/02/14

Sheet 2 of 2