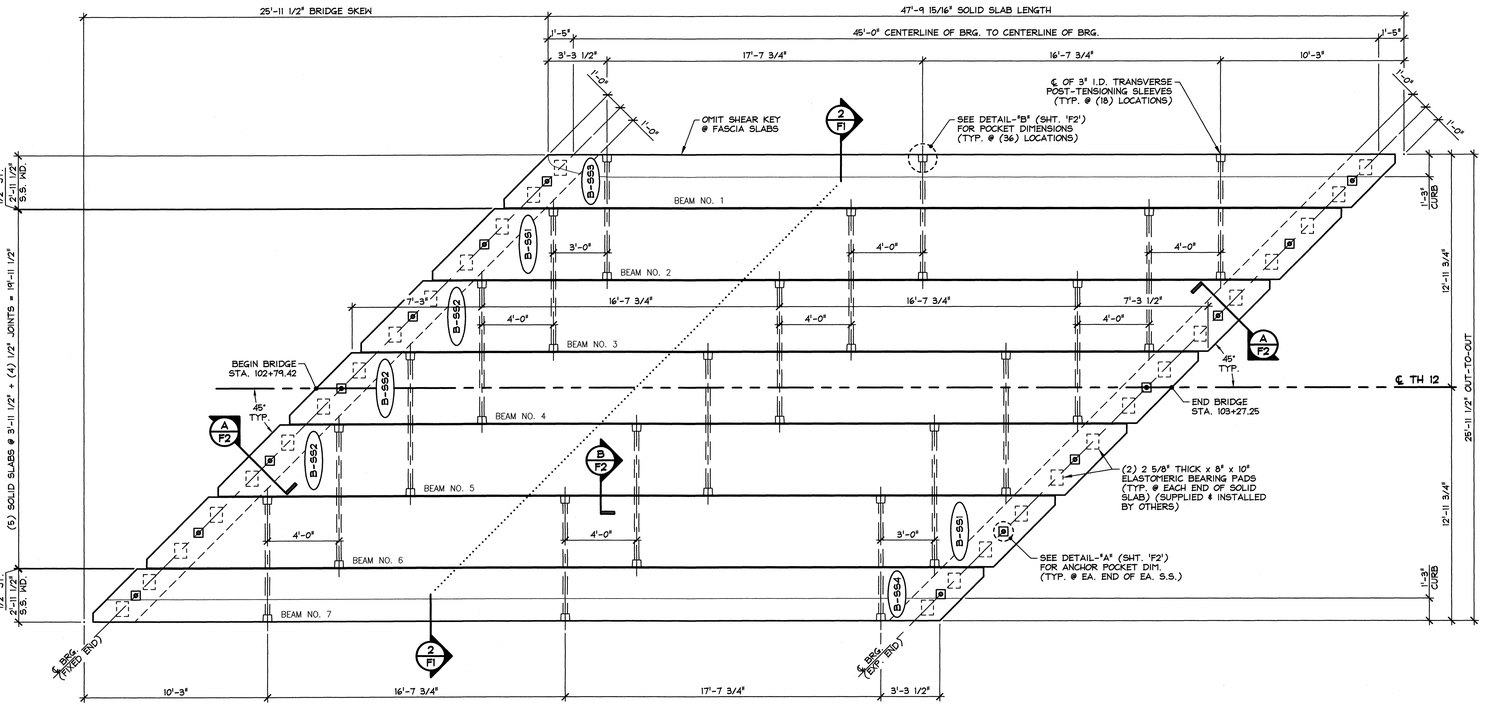
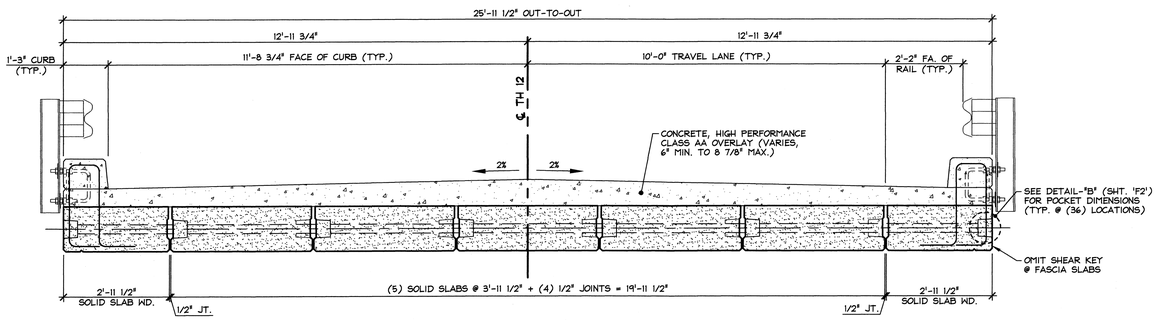


1 F1 PRECAST SOLID SLAB LAYOUT

1/4" = 1'-0"



2 F1 TRANSVERSE SECTION

1/2" = 1'-0"

CONSTRUCTION SEQUENCE

1. ERECT SLABS STARTING AT THE LOWER EXTERIOR SLAB, PLACING ONE SLAB AT A TIME:
   - A. PLACE SLABS TO FIT WITHIN THE WORKING LINES.
   - B. PRIOR TO INSTALLING INTERIOR SLABS IN EACH PHASE OF CONSTRUCTION, INSTALL ANCHORED END OF THREADED STEEL ROD WITH ENOUGH ROD TO PASS THROUGH THE NEXT SLAB TO BE PLACED IN THE FOLLOWING PHASE OF CONSTRUCTION.
   - C. AS WORK PROGRESSES, INSTALL HARDWOOD WEDGES BETWEEN ADJACENT SLABS TO MAINTAIN PROPER JOINT OPENING (A MINIMUM OF ONE WEDGE AT EACH POST-TENSIONING DUCT).
   - D. DRILL ANCHOR BOLT HOLES.
   - E. PLACE ANCHOR BOLTS.
2. INSTALL BACKER ROD: PLACE FILLER BELOW THE KEYWAY BOTTOM, AS SHOWN ON THE PLANS.
3. INSTALL THREADED STEEL RODS:
   - F. FEED THREADED STEEL RODS THROUGH DUCTS.
   - G. VERIFY THAT HARDWOOD WEDGES ARE IN PLACE AS REQUIRED TO PREVENT SLIPPAGE OF SLABS.
   - H. USING A CALIBRATED JACK, POST-TENSION THE THREADED STEEL RODS TO APPROXIMATELY 5 KIPS TO SEAT THE ANCHOR NUT.
6. GROUT SHEAR KEYS:
   - I. CLEAN JOINTS WITH AN OIL FREE AIR-BLAST IMMEDIATELY BEFORE GROUT PLACEMENT. VERIFY THAT THE BACKER ROD IS STILL IN PLACE.
   - J. FOLLOW MANUFACTURER'S RECOMMENDATIONS FOR ADDITIONAL JOINT PREPARATION AND GROUT PLACEMENT.
   - K. CAREFULLY ROD JOINTS TO ELIMINATE ANY POSSIBILITY OF VOIDS.
7. POST-TENSION THREADED STEEL RODS:
   - L. GROUT SHALL ATTAIN A MINIMUM COMPRESSIVE STRENGTH OF 1,500 PSI, BASED ON THE MANUFACTURER'S RECOMMENDATIONS, PRIOR TO STRESSING. THE GROUT NEED NOT BE CURED FOR THREE DAYS PRIOR TO THE COMMENCING OF POST-TENSIONING.
   - M. PROVIDE APPROPRIATE CUBE MOLDS AS DESCRIBED IN AASHTO T106 FOR 3 SETS OF 3 DAY CUBES, 3 SETS OF 28 DAY CUBES AND AT A MINIMUM OF 3 MORE CUBES TO TEST FOR THE 1,500 PSI MINIMUM COMPRESSIVE STRENGTH (BY OTHERS).
   - N. POST-TENSION THREADED STEEL RODS TO 47 KIPS USING A CALIBRATED JACK OPERATED BY QUALIFIED PERSONNEL.
8. FOR EACH SOLID SLAB, REPEAT THE SEQUENCE SPECIFIED IN NOTES 1-7.

GENERAL NOTES

1. MIN. CONCRETE STRENGTH AT 28 DAYS SHALL BE 6,000 PSI.
2. MIN. CONCRETE STRENGTH AT STRESS TRANSFER SHALL BE 4,800 PSI.
3. REINFORCING STEEL SHALL BE GR-60, ASTM A-615 (AASHTO M31) AND SHALL BE LEVEL II, DUAL COATED.
4. PRESTRESSING STRANDS SHALL CONFORM TO ASTM A-416 (AASHTO M203) AND SHALL CONSIST OF 0.60"ϕ x 270 KSI 7-WIRE LOW RELAXATION STRANDS.
5. PRESTRESSING STRANDS SHALL EACH BE PULLED TO HAVE A NET TENSION OF 44.0 K AFTER ACCOUNTING FOR CHUCK SLIPPAGE. TENSION SHALL BE VERIFIED BY MEASURING STRAND ELONGATION. (SEE EXAMPLE ELONGATION CALCULATION AND TENSIONING PROCEDURE, THIS SHEET.)
6. ENDS OF PRESTRESSING STRANDS SHALL BE RECESSED & GROUTED.
7. ALL EXPOSED CORNERS SHALL BE CHAMFERED 3/4".
8. THE TOP OF SLABS SHALL RECEIVE A TRANSVERSE RAKE FINISH ROUGHENED TO 1/4" AMPLITUDE.
9. SHEAR KEY SURFACES SHALL BE SAND BLASTED CLEAN.
10. SLABS SHALL BE HANDLED AND ERECTED USING THE LIFTING LOOPS ONLY. THE MINIMUM SLING ANGLE FROM THE HORIZONTAL SHALL BE 60°. **THE PINS OF THE SHACKLES SHALL BE PLACED THOUGH THE LIFTING LOOPS.** SEE DETAIL, SHEET 'F2'. SLABS SHALL BE STORED AND TRANSPORTED WITH TIMBER SUPPORTS WITHIN 2'-0" OF THE SLAB ENDS, UNLESS APPROVED BY J.P. CARRARA & SONS, INC.
11. MATERIAL SPECIFICATION AND MIX DESIGN SHALL CONFORM TO VERMONT SPEC. P510.02 AND P510.05 RESPECTIVELY.
    DESIGN MIX: J.P.C. BRIDGE MIX #4125M
12. QUALITY CONTROL PROCEDURES ARE IN ACCORDANCE WITH PCI REQUIREMENTS. J.P. CARRARA & SONS, INC. SHALL NOT BE HELD LIABLE FOR PROBLEMS ASSOCIATED WITH MOISTURE INFILTRATING GROUTED SHEAR KEYS.
13. CURING METHOD: AS SOON AS THE TOP OF SLAB IS FINISHED, A COVER OF POLY AND A LAYER OF HOMOSOTE (OR BLUE BOARD) WILL BE PLACED OVER THE SLAB. THE DESIRED CURING TEMPERATURE RANGE SHALL NOT DROP BELOW 70°F. THE TEMPERATURE SHALL BE RECORDED BY AUTOMATIC SENSOR INSTRUMENTS ON GRAPH CHARTS, SPACED NOT MORE THAN 100' APART AND WILL CONTINUE UNTIL RELEASE STRENGTH IS ACHIEVED. (NATURAL CURE WITH NO EXTERNAL HEAT APPLIED). EACH CHART SHALL BE MARKED.
14. OWNER SHALL PROVIDE APPROPRIATE WATERPROOFING TO GROUTED SHEAR KEYS. J.P. CARRARA & SONS, INC. SHALL NOT BE HELD LIABLE FOR PROBLEMS ASSOCIATED WITH MOISTURE INFILTRATING GROUTED SHEAR KEYS.

EXAMPLE PRESTRESSING STRAND ELONGATION CALC. AND TENSIONING

(NOT TO BE USED FOR CONSTRUCTION)

SIZE & GRADE: 0.60"ϕ x 270 KSI
AREA: 0.217 IN^2
TENSION: 44,000 LB. EACH STRANDS
GRIP-TO-GRIP: 192'-9 3/4" = 192.813'
Es = 28,600,000 PSI (ASSUMED FOR THESE CALCULATIONS; VALUE TO BE OBTAINED FOR STRAND SPOOL ACTUALLY USED)

EXAMPLE:

$$\Delta = \frac{PL}{AE} = \frac{(44{,}000 - 3{,}000) \times 192.813 \times 12}{0.217 \times 28{,}600{,}000} = 15.29"$$

THEREFORE: (TOLERANCES ± 5%)
△ UPPER LIMIT = 1.05 x 15.29" = 16.05" = 16 1/16"
△ LOWER LIMIT = 0.95 x 15.29" = 14.53" = 14 1/2"

EXTRA FORCE REQUIRED TO COMPENSATE FOR 1/2" CHUCK SLIPPAGE:

$$\Delta P = \frac{0.5 \times 41{,}000}{15.29} = 1{,}340 \text{ LBS.}$$

TOTAL TENSIONING FORCE = 44,000 + 1,340 = 45,340 LBS.

STRAND TENSIONING PROCEDURE:

1. PULL EACH STRAND INITIALLY TO 3,000# LBS. AND MARK STRAND.
2. THEN PULL EACH STRAND TO A TOTAL TENSION OF 45,340# LBS. AND MEASURE ELONGATION AFTER SEATING. IT MUST BE BETWEEN 14 1/2" & 16 1/16".

NOTE: FORCES READ ON STRESSING JACK GAUGES MUST BE MADE TO CORRESPOND TO ABOVE VALUES BASED ON CALIBRATION DATA FOR SPECIFIC JACK USED.

APPROVAL STAMP:

J.P. CARRARA & SONS INC.
Precast & Prestress Manufacturer
2464 CASE STR., MIDDLEBURY, VERMONT 05753 Phone:(802)388-6361 Fax:(802)388-9010

RENAUD BRO., INC.
CONTRACTOR
VERNON, VERMONT

STATE OF VERMONT AGENCY OF TRANSPORTATION
COUNTY OF WINDHAM

DATE: MAR. 24, 2014
SCALE: NOTED
CHKD: M.D. DFTM: B.L.

TOWN OF BRATTLEBORO
TH 12, CLASS III (LOCAL ROAD) OVER HALLADAY BROOK
BRIDGE NO.: 7 PROJECT NO.: BRO 1442(35)

JOB NO: 23424-014

SUPERSTRUCTURE PLAN & SECTION

DWG. NO: F1

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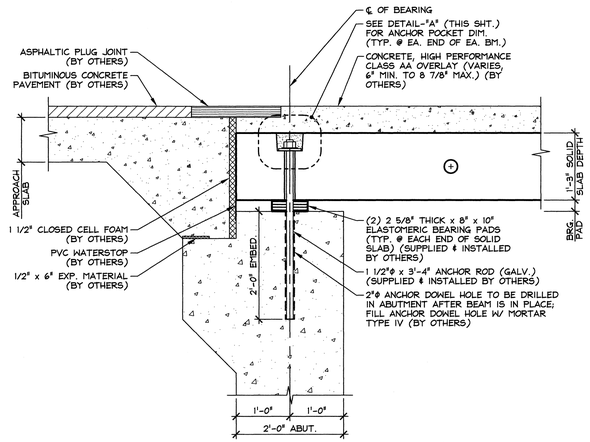
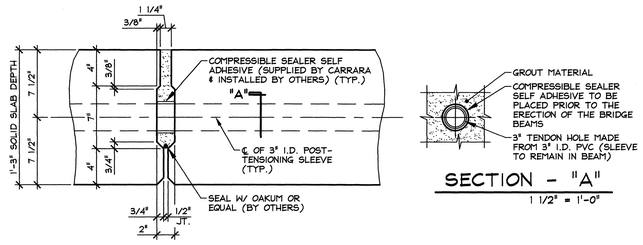


A / F2 BEARING SECTION

3/4" = 1'-0"



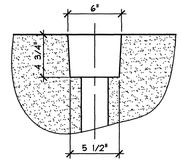
B / F2 SHEAR KEY SECTION @ P.T. SLEEVE

1 1/2" = 1'-0"

SECTION - "A"

1 1/2" = 1'-0"

PLAN @ BEAM ℄



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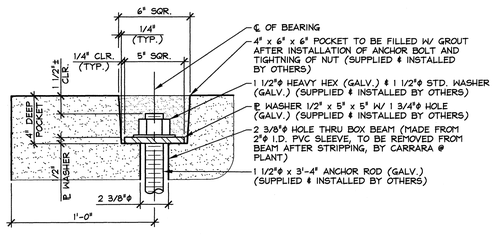
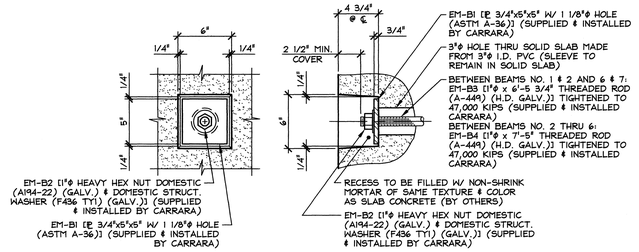


SECTION @ BEAM ℄

DETAIL - "A"

2" = 1'-0"

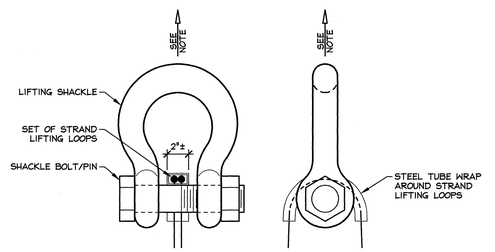


FASCIA ELEVATION

SECTION AT CENTERLINE

DETAIL - "B"

1 1/2" = 1'-0"



NOTE: SLAB SHALL BE HANDLED AND ERECTED USING THE LIFTING LOOPS ONLY. RIGGING SHALL BE CONFIGURED SUCH THAT EQUAL FORCES ARE APPLIED TO EACH SET OF LIFTING LOOPS AT EACH END OF THE SLAB. SHACKLE BOLT/PIN SHALL BE PLACED UNDER LIFT LOOPS AS SHOWN. DESIGN AND CONFIGURATION OF RIGGING BY PURCHASER.

LIFTING SHACKLE DETAILS

N.T.S.

APPROVAL STAMP:

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2444 CASE STR., MIDDLEBURY, VERMONT 05753 Phone:(802)388-6361 Fax:(802)388-9010

RENAUD BRO., INC.
CONTRACTOR
VERNON, VERMONT

STATE OF VERMONT AGENCY OF TRANSPORTATION
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DATE: MAR. 24, 2014
SCALE: NOTED

TOWN OF BRATTLEBORO
TH 12, CLASS III (LOCAL ROAD) OVER HALLADAY BROOK
BRIDGE NO.: 7 PROJECT NO.: BRO 1442(35)

CHKD: M.D. DFTM: B.L.
JOB NO: 23424-014

SUPERSTRUCTURE DETAILS

DWG. NO: F2

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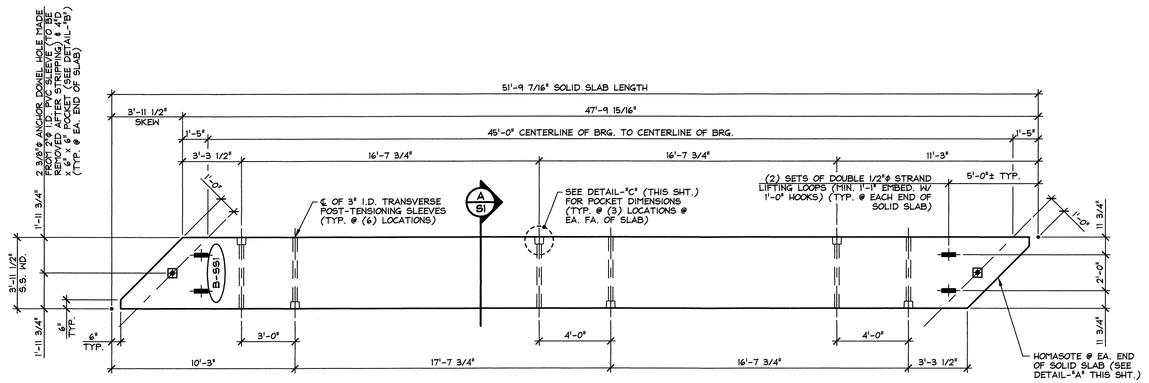
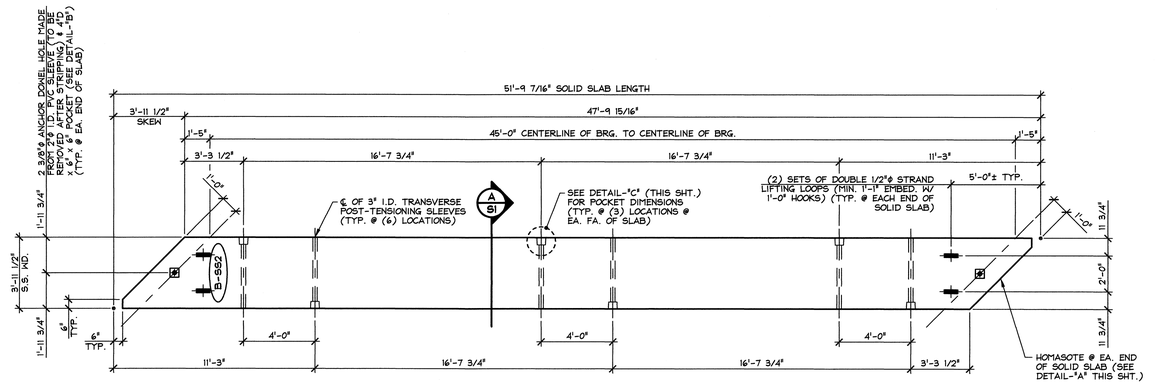
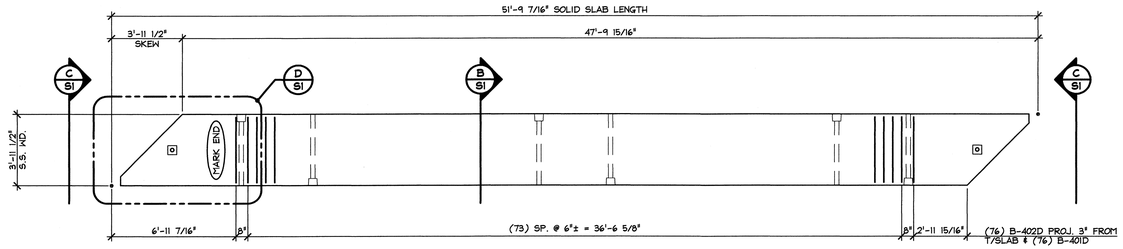


1 S1 DIMENSIONAL PLAN VIEW IN FORM
1/4" = 1'-0"

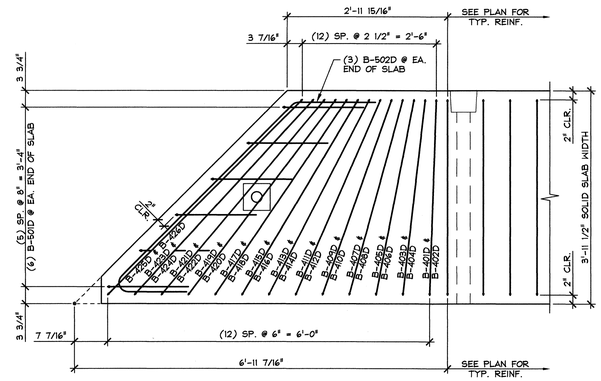


2 S1 DIMENSIONAL PLAN VIEW IN FORM
1/4" = 1'-0"

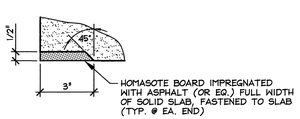


3 S1 REINFORCING PLAN VIEW IN FORM
1/4" = 1'-0"

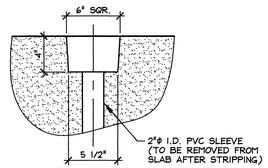
SHOP NOTE:
ADJUST REINFORCING AS REQUIRED TO CLEAR INSERTS, SLEEVES, ETC.



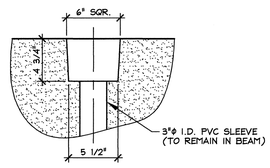
D S1 END BLOCK REINFORCING PLAN
3/4" = 1'-0"



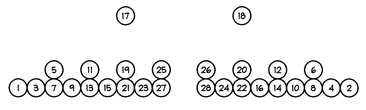
DETAIL - "A"
3" = 1'-0"



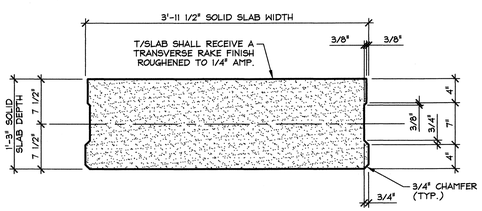
DETAIL - "B"
1 1/2" = 1'-0"



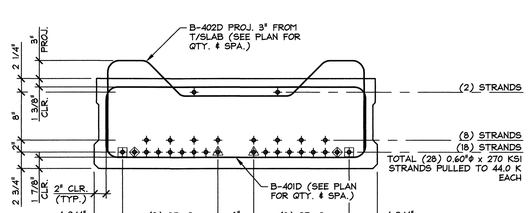
DETAIL - "C"
1 1/2" = 1'-0"



DETENSIONING SCHEDULE
N.T.S.



A S1 DIMENSIONAL SECTION
1" = 1'-0"

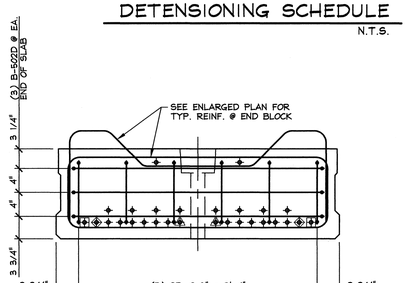


B S1 REINFORCING SECTION
1" = 1'-0"

◆ DENOTES STRAIGHT STRANDS TO BE DEBONDED 10'-0" FROM EA. END OF EA. SLAB

◈ DENOTES STRAIGHT STRANDS TO BE DEBONDED 12'-0" FROM EA. END OF EA. SLAB

⊞ DENOTES STRAIGHT STRANDS TO BE DEBONDED 14'-0" FROM EA. END OF EA. SLAB



C S1 END BLOCK REINF. SECTION
1" = 1'-0"

MARK:	B-SS1	QTY.: 2	WT.: 17.4 T	VOL.: 8.6 cy
MARK:	B-SS2	QTY.: 3	WT.: 17.4 T	VOL.: 8.6 cy

MATERIAL LIST / SOLID SLAB

ITEM	MARK	DESCRIPTION	QTY./SLAB B-SS1	QTY./SLAB B-SS2
1	B-401D	#4 BENT BAR (LEVEL II, DUAL COATED)	78	78
2	B-402D	#4 BENT BAR (LEVEL II, DUAL COATED)	78	78
3	B-403D	#4 BENT BAR (LEVEL II, DUAL COATED)	2	2
4	B-404D	#4 BENT BAR (LEVEL II, DUAL COATED)	2	2
5	B-405D	#4 BENT BAR (LEVEL II, DUAL COATED)	2	2
6	B-406D	#4 BENT BAR (LEVEL II, DUAL COATED)	2	2
7	B-407D	#4 BENT BAR (LEVEL II, DUAL COATED)	2	2
8	B-408D	#4 BENT BAR (LEVEL II, DUAL COATED)	2	2
9	B-409D	#4 BENT BAR (LEVEL II, DUAL COATED)	2	2
10	B-410D	#4 BENT BAR (LEVEL II, DUAL COATED)	2	2
11	B-411D	#4 BENT BAR (LEVEL II, DUAL COATED)	2	2
12	B-412D	#4 BENT BAR (LEVEL II, DUAL COATED)	2	2
13	B-413D	#4 BENT BAR (LEVEL II, DUAL COATED)	2	2
14	B-414D	#4 BENT BAR (LEVEL II, DUAL COATED)	2	2
15	B-415D	#4 BENT BAR (LEVEL II, DUAL COATED)	2	2
16	B-416D	#4 BENT BAR (LEVEL II, DUAL COATED)	2	2
17	B-417D	#4 BENT BAR (LEVEL II, DUAL COATED)	2	2
18	B-418D	#4 BENT BAR (LEVEL II, DUAL COATED)	2	2
19	B-419D	#4 BENT BAR (LEVEL II, DUAL COATED)	2	2
20	B-420D	#4 BENT BAR (LEVEL II, DUAL COATED)	2	2
21	B-421D	#4 BENT BAR (LEVEL II, DUAL COATED)	2	2
22	B-422D	#4 BENT BAR (LEVEL II, DUAL COATED)	2	2
23	B-423D	#4 BENT BAR (LEVEL II, DUAL COATED)	2	2
24	B-424D	#4 BENT BAR (LEVEL II, DUAL COATED)	2	2
25	B-425D	#4 BENT BAR (LEVEL II, DUAL COATED)	2	2
26	B-426D	#4 BENT BAR (LEVEL II, DUAL COATED)	2	2
27				
28	B-501D	#5 BENT BAR (LEVEL II, DUAL COATED)	12	12
29	B-502D	#5 BENT BAR (LEVEL II, DUAL COATED)	6	6
30				
31				
32		SET OF DOUBLE 1/2"ø x 270 KSI STRAND LIFTING LOOPS	4	4
33				
34				
35				

APPROVAL STAMP:

J.P. CARRARA & SONS INC.
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TOWN OF BRATTLEBORO
TH 12, CLASS III (LOCAL ROAD) OVER HALLADAY BROOK
BRIDGE NO.: 7 PROJECT NO.: BRO 1442(35)

PRESTRESSED SOLID SLAB DETAILS

DATE: MAR. 24, 2014
SCALE: NOTED
CHKD: M.D. DFTM: B.L.
JOB NO: 23424-014
DWG. NO: S1

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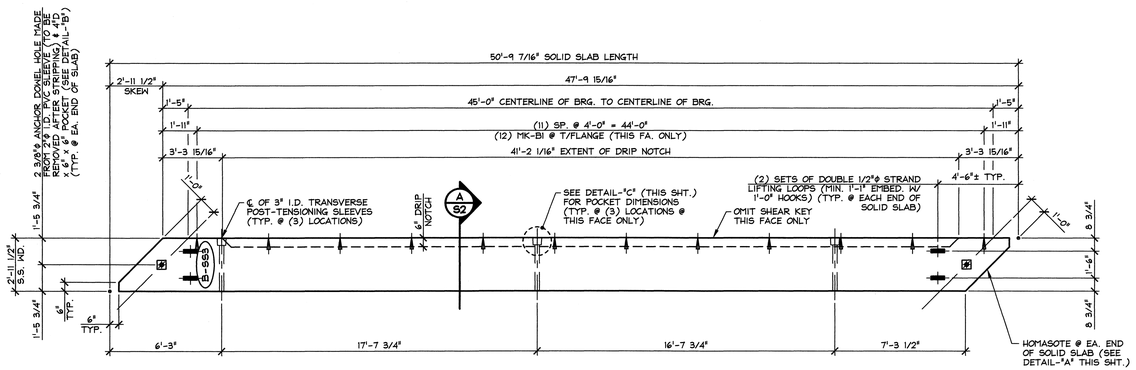
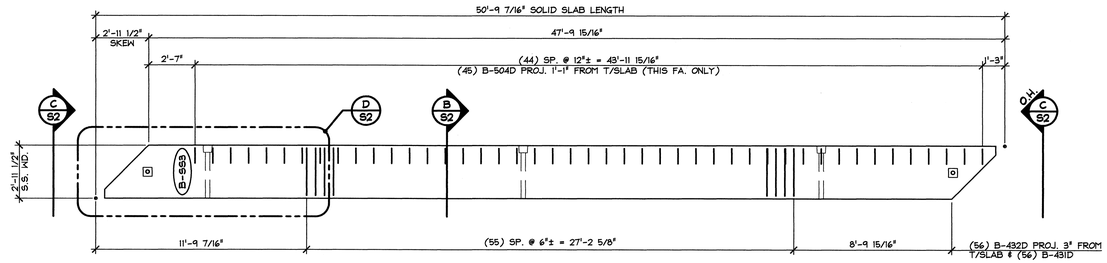


1 S2 DIMENSIONAL PLAN VIEW IN FORM

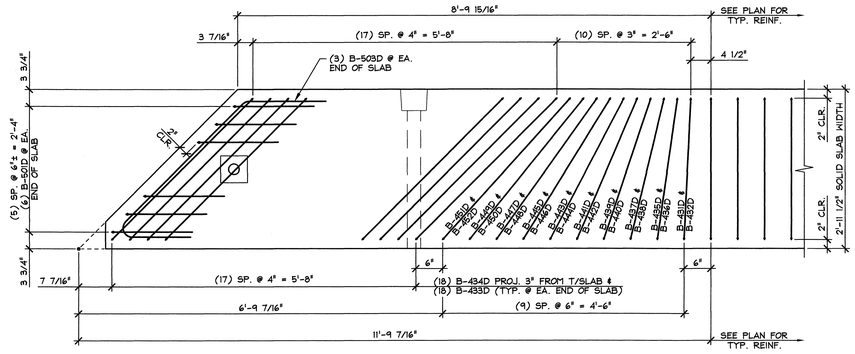
1/4" = 1'-0"



2 S2 REINFORCING PLAN VIEW IN FORM

1/4" = 1'-0"

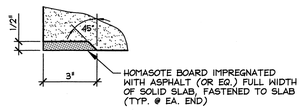
SHOP NOTE:
ADJUST REINFORCING AS REQUIRED TO CLEAR INSERTS, SLEEVES, ETC.



D S2 END BLOCK REINFORCING PLAN

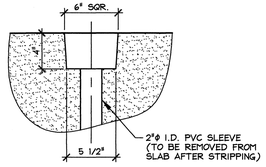
CURB REINFORCING NOT SHOWN FOR CLARITY

3/4" = 1'-0"



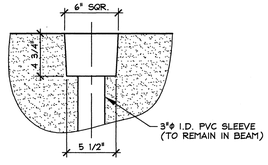
DETAIL - "A"

3" = 1'-0"



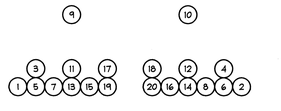
DETAIL - "B"

1 1/2" = 1'-0"



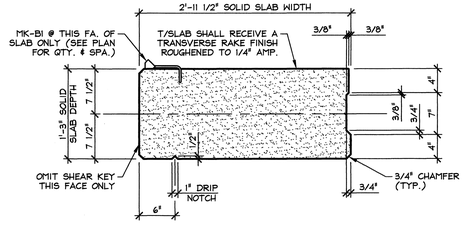
DETAIL - "C"

1 1/2" = 1'-0"



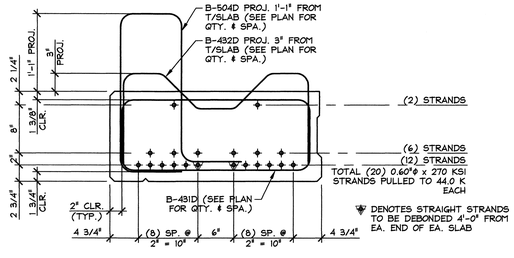
DETENSIONING SCHEDULE

N.T.S.



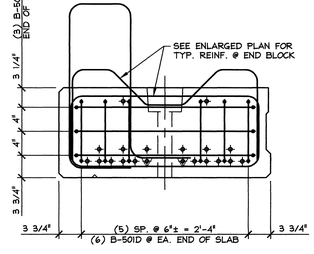
A S2 DIMENSIONAL SECTION

1" = 1'-0"



B S2 REINFORCING SECTION

1" = 1'-0"



C S2 END BLOCK REINF. SECTION

1" = 1'-0"

MARK: B-SS3	QTY.: 1	WT.: 13.1 T	VOL.: 6.5 cy
MARK: -	QTY.: -	WT.: -	VOL.: -

MATERIAL LIST / SOLID SLAB

ITEM	MARK	DESCRIPTION	QTY./SLAB B-SS3	-
1	B-431D	#4 BENT BAR (LEVEL II, DUAL COATED)	58	
2	B-432D	#4 BENT BAR (LEVEL II, DUAL COATED)	58	
3	B-433D	#4 BENT BAR (LEVEL II, DUAL COATED)	36	
4	B-434D	#4 BENT BAR (LEVEL II, DUAL COATED)	36	
5	B-435D	#4 BENT BAR (LEVEL II, DUAL COATED)	2	
6	B-436D	#4 BENT BAR (LEVEL II, DUAL COATED)	2	
7	B-437D	#4 BENT BAR (LEVEL II, DUAL COATED)	2	
8	B-438D	#4 BENT BAR (LEVEL II, DUAL COATED)	2	
9	B-439D	#4 BENT BAR (LEVEL II, DUAL COATED)	2	
10	B-440D	#4 BENT BAR (LEVEL II, DUAL COATED)	2	
11	B-441D	#4 BENT BAR (LEVEL II, DUAL COATED)	2	
12	B-442D	#4 BENT BAR (LEVEL II, DUAL COATED)	2	
13	B-443D	#4 BENT BAR (LEVEL II, DUAL COATED)	2	
14	B-444D	#4 BENT BAR (LEVEL II, DUAL COATED)	2	
15	B-445D	#4 BENT BAR (LEVEL II, DUAL COATED)	2	
16	B-446D	#4 BENT BAR (LEVEL II, DUAL COATED)	2	
17	B-447D	#4 BENT BAR (LEVEL II, DUAL COATED)	2	
18	B-448D	#4 BENT BAR (LEVEL II, DUAL COATED)	2	
19	B-449D	#4 BENT BAR (LEVEL II, DUAL COATED)	2	
20	B-450D	#4 BENT BAR (LEVEL II, DUAL COATED)	2	
21	B-451D	#4 BENT BAR (LEVEL II, DUAL COATED)	2	
22	B-452D	#4 BENT BAR (LEVEL II, DUAL COATED)	2	
23				
24	B-501D	#5 BENT BAR (LEVEL II, DUAL COATED)	12	
25	B-503D	#5 BENT BAR (LEVEL II, DUAL COATED)	6	
26	B-504D	#5 BENT BAR (LEVEL II, DUAL COATED)	45	
27				
28	MK-BI	DAYTON C-24 TYPE 4-APR DECK FORM HANGER (GALV.)	12	
29		SET OF DOUBLE 1/2"ϕ x 270 KSI STRAND LIFTING LOOPS	4	
30				

APPROVAL STAMP:

J.P. CARRARA & SONS INC.
Precast & Prestress Manufacturer
2444 OSE STR., MIDDLEBURY, VERMONT 05753 Phone:(802)388-6361 Fax:(802)388-9010

RENAUD BRO., INC.
CONTRACTOR
VERNON, VERMONT

STATE OF VERMONT AGENCY OF TRANSPORTATION
COUNTY OF WINDHAM

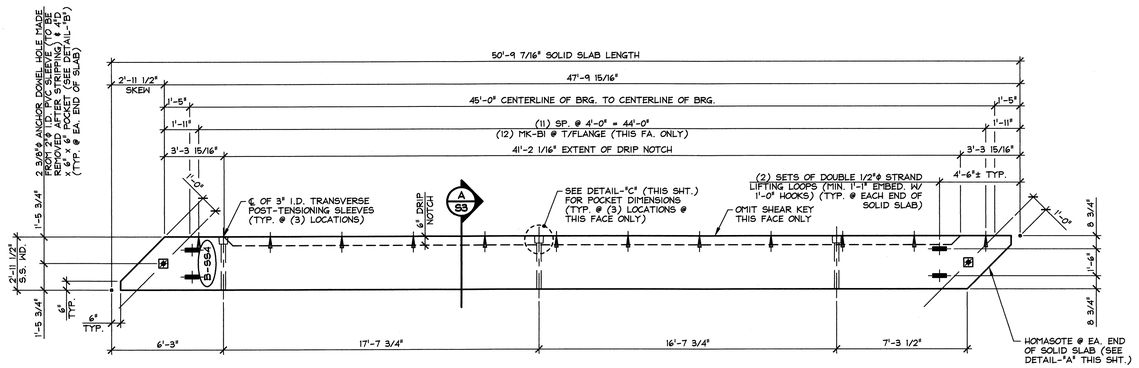
DATE: MAR. 24, 2014
SCALE: NOTED
CHKD: M.D. DFTM: B.L.
JOB NO: 23424-014

TOWN OF BRATTLEBORO
TH 12, CLASS III (LOCAL ROAD) OVER HALLADAY BROOK
BRIDGE NO.: 7 PROJECT NO.: BRO 1442(35)

PRESTRESSED SOLID SLAB DETAILS

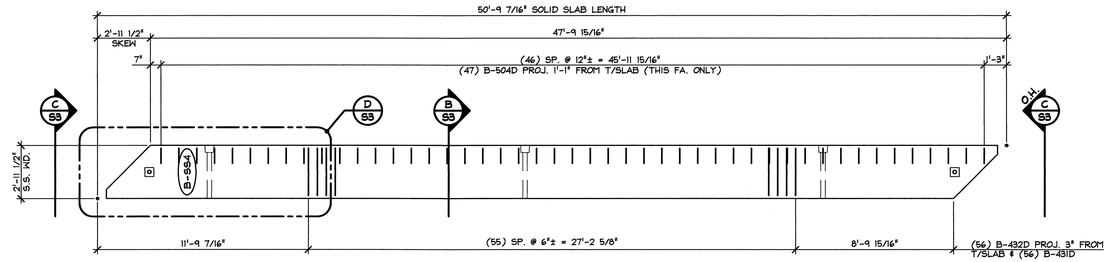
DWG. NO: S2

F:\VT-Bridges\23424-14 Brattleboro\23424-S2.dwg, 4/3/2014 10:07:37 AM



1 S3 DIMENSIONAL PLAN VIEW IN FORM

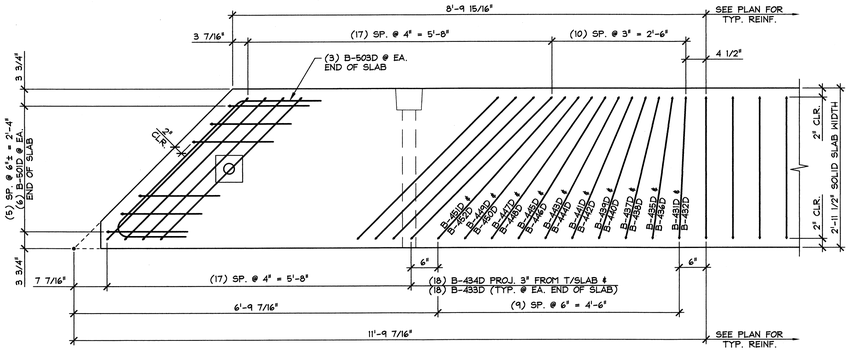
1/4" = 1'-0"



2 S3 REINFORCING PLAN VIEW IN FORM

1/4" = 1'-0"

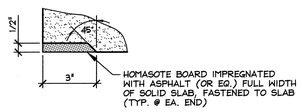
SHOP NOTE:
ADJUST REINFORCING AS REQUIRED TO CLEAR INSERTS, SLEEVES, ETC.



D S3 END BLOCK REINFORCING PLAN

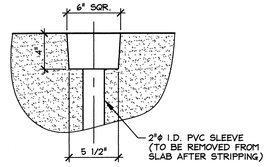
CURB REINFORCING NOT SHOWN FOR CLARITY

3/4" = 1'-0"



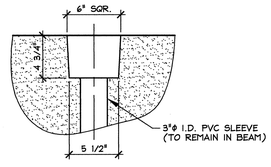
DETAIL - "A"

3" = 1'-0"



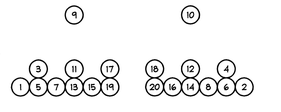
DETAIL - "B"

1 1/2" = 1'-0"



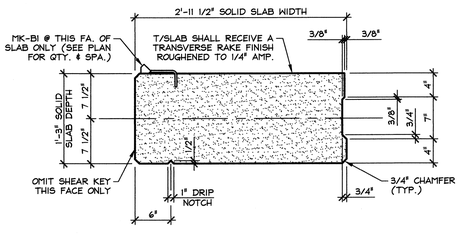
DETAIL - "C"

1 1/2" = 1'-0"



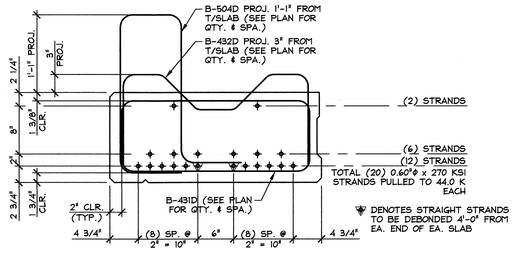
DETENSIONING SCHEDULE

N.T.S.



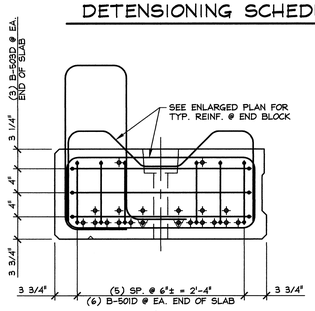
A S3 DIMENSIONAL SECTION

1" = 1'-0"



B S3 REINFORCING SECTION

1" = 1'-0"



C S3 END BLOCK REINF. SECTION

1" = 1'-0"

MARK: B-SS4	QTY.: 1	WT.: 13.1 T	VOL.: 6.5 cy
MARK: -	QTY.: -	WT.: -	VOL.: -

MATERIAL LIST / SOLID SLAB

ITEM	MARK	DESCRIPTION	QTY./SLAB B-SS4	-
1	B-431D	#4 BENT BAR (LEVEL II, DUAL COATED)	58	
2	B-432D	#4 BENT BAR (LEVEL II, DUAL COATED)	58	
3	B-433D	#4 BENT BAR (LEVEL II, DUAL COATED)	36	
4	B-434D	#4 BENT BAR (LEVEL II, DUAL COATED)	36	
5	B-435D	#4 BENT BAR (LEVEL II, DUAL COATED)	2	
6	B-436D	#4 BENT BAR (LEVEL II, DUAL COATED)	2	
7	B-437D	#4 BENT BAR (LEVEL II, DUAL COATED)	2	
8	B-438D	#4 BENT BAR (LEVEL II, DUAL COATED)	2	
9	B-439D	#4 BENT BAR (LEVEL II, DUAL COATED)	2	
10	B-440D	#4 BENT BAR (LEVEL II, DUAL COATED)	2	
11	B-441D	#4 BENT BAR (LEVEL II, DUAL COATED)	2	
12	B-442D	#4 BENT BAR (LEVEL II, DUAL COATED)	2	
13	B-443D	#4 BENT BAR (LEVEL II, DUAL COATED)	2	
14	B-444D	#4 BENT BAR (LEVEL II, DUAL COATED)	2	
15	B-445D	#4 BENT BAR (LEVEL II, DUAL COATED)	2	
16	B-446D	#4 BENT BAR (LEVEL II, DUAL COATED)	2	
17	B-447D	#4 BENT BAR (LEVEL II, DUAL COATED)	2	
18	B-448D	#4 BENT BAR (LEVEL II, DUAL COATED)	2	
19	B-449D	#4 BENT BAR (LEVEL II, DUAL COATED)	2	
20	B-450D	#4 BENT BAR (LEVEL II, DUAL COATED)	2	
21	B-451D	#4 BENT BAR (LEVEL II, DUAL COATED)	2	
22	B-452D	#4 BENT BAR (LEVEL II, DUAL COATED)	2	
23				
24	B-501D	#5 BENT BAR (LEVEL II, DUAL COATED)	12	
25	B-503D	#5 BENT BAR (LEVEL II, DUAL COATED)	6	
26	B-504D	#5 BENT BAR (LEVEL II, DUAL COATED)	47	
27				
28	MK-81	DAYTON C-24 TYPE 4-APR DECK FORM HANGER (GALV.)	12	
29		SET OF DOUBLE 1/2"ø x 270 KSI STRAND LIFTING LOOPS	4	
30				

APPROVAL STAMP:

J.P. CARRARA & SONS INC.
Precast & Prestress Manufacturer
2464 CASE STR., MIDDLEBURY, VERMONT 05753 Phone:(802)388-6361 Fax:(802)388-9010

RENAUD BRO., INC.
CONTRACTOR
VERNON, VERMONT

STATE OF VERMONT AGENCY OF TRANSPORTATION
COUNTY OF WINDHAM

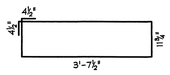
DATE: MAR. 24, 2014
SCALE: NOTED
CHKD: M.D. DFTM: B.L.
JOB NO: 23424-014

TOWN OF BRATTLEBORO
TH 12, CLASS III (LOCAL ROAD) OVER HALLADAY BROOK
BRIDGE NO.: 7 PROJECT NO.: BRO 1442(35)

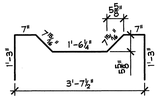
PRESTRESSED SOLID SLAB DETAILS

DWG. NO: S3

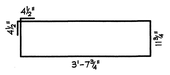
F:\VT-Bridges\23424-14 Brattleboro\23424-S3.dwg, 4/3/2014 10:09:30 AM



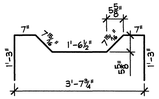
B-401D
#4 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾"ϕ (70 mm) PIN
(340) REQ'D.



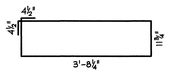
B-402D
#4 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾"ϕ (70 mm) PIN
(340) REQ'D.



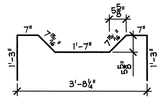
B-403D
#4 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾"ϕ (70 mm) PIN
(10) REQ'D.



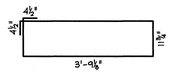
B-404D
#4 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾"ϕ (70 mm) PIN
(10) REQ'D.



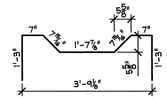
B-405D
#4 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾"ϕ (70 mm) PIN
(10) REQ'D.



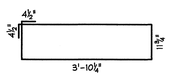
B-406D
#4 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾"ϕ (70 mm) PIN
(10) REQ'D.



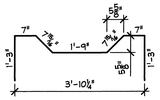
B-407D
#4 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾"ϕ (70 mm) PIN
(10) REQ'D.



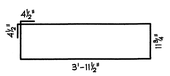
B-408D
#4 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾"ϕ (70 mm) PIN
(10) REQ'D.



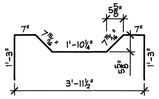
B-409D
#4 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾"ϕ (70 mm) PIN
(10) REQ'D.



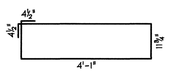
B-410D
#4 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾"ϕ (70 mm) PIN
(10) REQ'D.



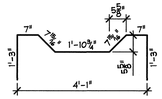
B-411D
#4 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾"ϕ (70 mm) PIN
(10) REQ'D.



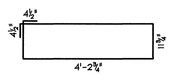
B-412D
#4 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾"ϕ (70 mm) PIN
(10) REQ'D.



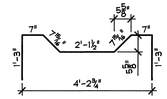
B-413D
#4 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾"ϕ (70 mm) PIN
(10) REQ'D.



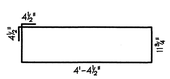
B-414D
#4 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾"ϕ (70 mm) PIN
(10) REQ'D.



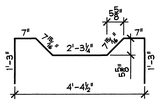
B-415D
#4 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾"ϕ (70 mm) PIN
(10) REQ'D.



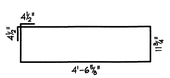
B-416D
#4 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾"ϕ (70 mm) PIN
(10) REQ'D.



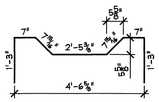
B-417D
#4 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾"ϕ (70 mm) PIN
(10) REQ'D.



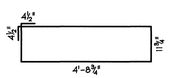
B-418D
#4 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾"ϕ (70 mm) PIN
(10) REQ'D.



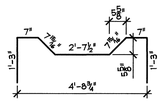
B-419D
#4 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾"ϕ (70 mm) PIN
(10) REQ'D.



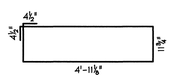
B-420D
#4 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾"ϕ (70 mm) PIN
(10) REQ'D.



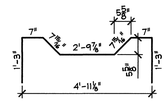
B-421D
#4 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾"ϕ (70 mm) PIN
(10) REQ'D.



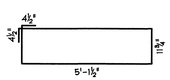
B-422D
#4 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾"ϕ (70 mm) PIN
(10) REQ'D.



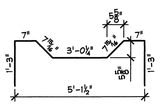
B-423D
#4 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾"ϕ (70 mm) PIN
(10) REQ'D.



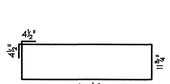
B-424D
#4 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾"ϕ (70 mm) PIN
(10) REQ'D.



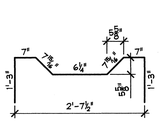
B-425D
#4 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾"ϕ (70 mm) PIN
(10) REQ'D.



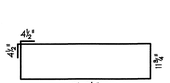
B-426D
#4 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾"ϕ (70 mm) PIN
(10) REQ'D.



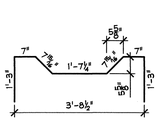
B-431D
#4 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾"ϕ (70 mm) PIN
(116) REQ'D.



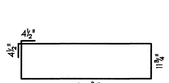
B-432D
#4 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾"ϕ (70 mm) PIN
(116) REQ'D.



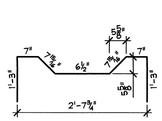
B-433D
#4 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾"ϕ (70 mm) PIN
(72) REQ'D.



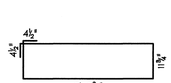
B-434D
#4 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾"ϕ (70 mm) PIN
(72) REQ'D.



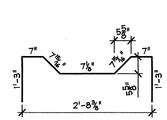
B-435D
#4 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾"ϕ (70 mm) PIN
(4) REQ'D.



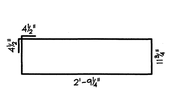
B-436D
#4 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾"ϕ (70 mm) PIN
(4) REQ'D.



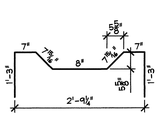
B-437D
#4 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾"ϕ (70 mm) PIN
(4) REQ'D.



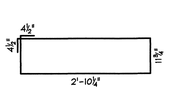
B-438D
#4 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾"ϕ (70 mm) PIN
(4) REQ'D.



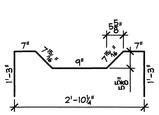
B-439D
#4 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾"ϕ (70 mm) PIN
(4) REQ'D.



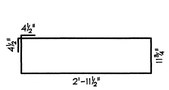
B-440D
#4 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾"ϕ (70 mm) PIN
(4) REQ'D.



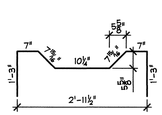
B-441D
#4 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾"ϕ (70 mm) PIN
(4) REQ'D.



B-442D
#4 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾"ϕ (70 mm) PIN
(4) REQ'D.

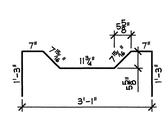


B-443D
#4 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾"ϕ (70 mm) PIN
(4) REQ'D.

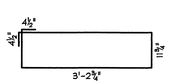


B-444D
#4 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾"ϕ (70 mm) PIN
(4) REQ'D.

B-445D
#4 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾"ϕ (70 mm) PIN
(4) REQ'D.



B-446D
#4 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾"ϕ (70 mm) PIN
(4) REQ'D.



B-447D
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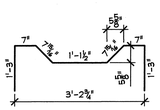
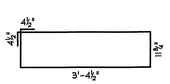
LEVEL II (DUAL COATED)
USE 2¾"ϕ (70 mm) PIN
(4) REQ'D.



B-448D
#4 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾"ϕ (70 mm) PIN
(4) REQ'D.



B-449D
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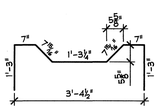
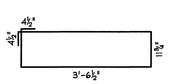
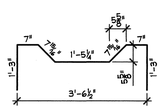
LEVEL II (DUAL COATED)
USE 2¾"ϕ (70 mm) PIN
(4) REQ'D.



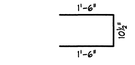
B-450D
#4 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾"ϕ (70 mm) PIN
(4) REQ'D.



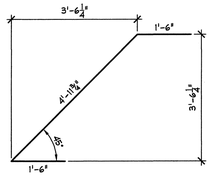
B-451D
#4 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾"ϕ (70 mm) PIN
(4) REQ'D.



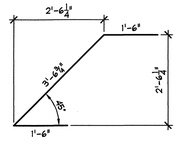
B-452D
#4 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾"ϕ (70 mm) PIN
(4) REQ'D.



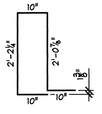
B-501D
#5 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾"ϕ (70 mm) PIN
(84) REQ'D.



B-502D
#5 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾"ϕ (70 mm) PIN
(30) REQ'D.



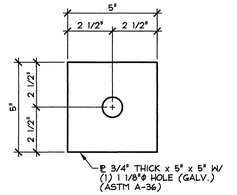
B-503D
#5 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾"ϕ (70 mm) PIN
(12) REQ'D.



B-504D
#5 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾"ϕ (70 mm) PIN
(92) REQ'D.

MISCELLANEOUS MATERIALS

ITEM	MARK	QTY.	DESCRIPTION	REMARKS
1				
2				
3				
4	EM-B1	36	℄ 3/4" x 5" x 5" W/ 1 1/8"ϕ HOLE (GALV.) (ASTM A-36)	FOR ERECTION; SEE DETAIL THIS SHEET
5	EM-B2	36	1"ϕ HEAVY HEX NUT DOMESTIC (A194-2Z) (GALV.) & DOMESTIC STRUCTURAL WASHER (F436 TY1) (GALV.)	FOR ERECTION
6	EM-B3	6	1"ϕ x 6'-5 3/4" THREADED ROD (A-449) (H.D. GALV.)	FOR ERECTION
7	EM-B4	12	1"ϕ x 7'-5" THREADED ROD (A-449) (H.D. GALV.)	FOR ERECTION
8		18	COMPRESSIBLE SEALER SELF ADHESIVE	FOR ERECTION
9				
10				
11				
12				
13				
14				
15	MK-B1	24	DAYTON C-24 TYPE 4-APR DECK FORM HANGER (GALV.)	
16		28	SET OF DOUBLE 1/2"ϕ x 270 KSI STRAND LIFTING LOOPS	
17				
18				
19				
20				



EM - B1
3" = 1'-0"

APPROVAL STAMP:

J.P. CARRARA & SONS INC.
Precast & Prestress Manufacturer
2464 CASE STR., MIDDLEBURY, VERMONT 05753 Phone:(802)388-6361 Fax:(802)388-9010

RENAUD BRO., INC.
CONTRACTOR
VERNON, VERMONT

STATE OF VERMONT AGENCY OF TRANSPORTATION
COUNTY OF WINDHAM

TOWN OF BRATTLEBORO
TH 12, CLASS III (LOCAL ROAD) OVER HALLADAY BROOK
BRIDGE NO.: 7 PROJECT NO.: BRO 1442(35)

MATERIALS LIST

DATE: MAR. 24, 2014
SCALE: NOTED
CHKD: M.D. DFTM: B.L.
JOB NO: 23424-014
DWG. NO: M1

F:\VT-Bridges\23424-14 Brattleboro\23424-M1.dwg, 4/3/2014 10:11:57 AM

TOWN OF BRATTLEBORO, VT

T.H. 12 CLASS III LOCAL ROAD

BRIDGE NO. 7

LIFTING LOOP DESIGN CALCULATIONS

(WORK THESE CALCULATIONS W/ CARRARA SHOP DWGS)

		MAX WEIGHT
15" SOLID SLAB BEAMS	× 4'-0" WIDE	17.4 TONS
	× 3'-0" WIDE	13.1 TONS

THERE ARE (4) LIFT LOOP LOCATIONS PER BEAM

LOAD / LIFT LOCATION = $17.4 \times 2/4 = 8.7$ K

ASSUME 60° MIN. SLING ANGLE WITH THE HORIZONTAL

DESIGN LOAD / LIFT LOCATION = $8.7^{K} / 0.866 = 10.$ K

FROM ATTACHED PCI LITERATURE (SECTION 5.2.8) AT C.A. LIFT POINT USE (2) ½" ϕ 270 KSI STRAND LIFTING LOOPS, MIN EMBEDMENT 13", W 1'-0" HOOKS

SWL (4:1 SF) ≈ $\left(\frac{8.5+12.5}{2}\right)$ = 10.5 K - 0.K. (BUT EMBEDMENT IS ONLY 13" INSTEAD OF 16" IN ATTACHED LITERATURE)

∴ PROVIDE ADDITIONAL EVALUATION BASED ON PCI FIG. 6.15.7A

$\phi P_c = 0.85 \times 2.67 \times (4ECC)^{0.5} (47.5)(27+13)/1000 = 299$ K

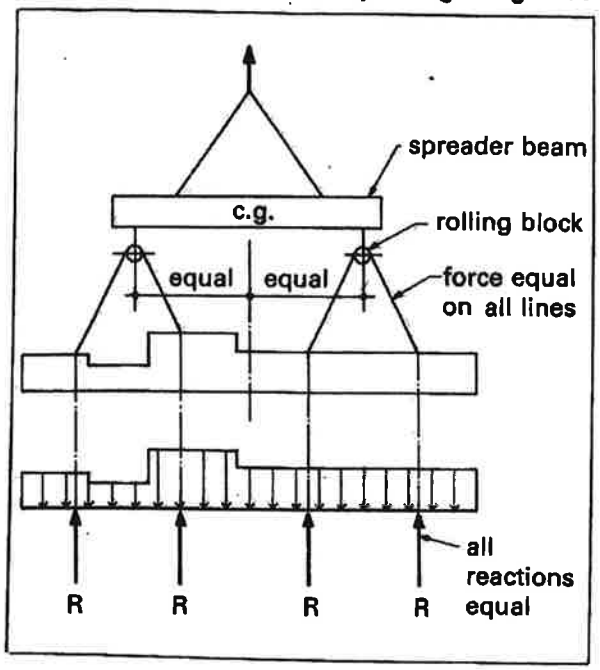
FOR S.F. = 4:1

SWL = 299/4 = 74.7 K > 10K × 2 = 20K ∴ O.K.

LIFTING LOOPS SHOWN IN SHOP DRAWINGS, OK.

TOPS 35500

Fig. 5.2.10 Arrangement for equalizing lifting loads



lines equal. The member can then be analyzed as a beam with varying load supported by equal reactions.

The force in inclined lift lines can be determined from Fig. 5.2.7.

5.2.8 Handling devices

The most common lifting devices are prestressing strand or cable loops projecting from the concrete, threaded inserts, or special proprietary devices.

Since lifting devices are subject to dynamic loads, ductility of the material is part of the design requirement. Deformed reinforcing bars should not be used since the deformations result in stress concentrations from the shackle pin. Also, reinforcing bars are often hard-grade or re-rolled rail steel with little ductility and low impact strength at cold temperatures. Smooth bars of a known steel grade may be used if adequate embedment or mechanical anchorage is provided. The diameter must be such that localized failure will not occur by bearing on the shackle pin.

Prestressing strand is often used for lifting loops. The variables involved make it almost impossible to calculate a capacity which can be used for all situations. Generally, producers will establish standard criteria for use in handling the standard products manufactured by that plant. Table 5.2.3 is an example which has been used successfully.

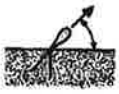
Reduced capacities for shorter embedment lengths may be suitable. In shallow products, providing a 90° bend can reduce the required embedment length significantly. Lightly rusted strand has better bond than bright strand.

The diameter of the bend of the loop should be at least 4 in. For smaller diameters, the loop capacities in Table 5.2.3 should be reduced to:

1 in. dia. — 70 %
2 in. dia. — 85 %
3 in. dia. — 90 %

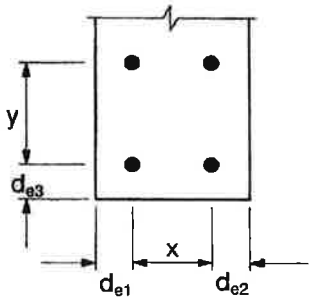
The angle of incline of lifting has little effect on the strand lifting loop capacity if the angle from the horizontal is more than about 20°. Typical handling methods are usually such that this angle is no less than 60°.

Table 5.2.3 Capacity of ½ in. diameter, 270 ksi strands used as lifting loops

Lifting angle	Embedment length (in.)	Single loop (kips)	Double loop (kips)	Triple loop (kips)
45 degrees 	16	5	8.5	11.5
	22	8	13	17.5
	28	10	18	23
	34	11	23	29
Vertical	16	7.5	12.5	16.5
	22	11.5	19	24.5
	28	15.5	25.5	33
	34	16	32.5	41

1. These values are limited by slippage rather than strand strength, with a factor of safety of 4. For other strand diameters, multiply table values by 0.75 for ⅜ in. diameter, 0.85 for 7/16 in. diameter, and 1.1 for 0.6 in. diameter.
2. Minimum f'_c = 3000 psi.
3. Multiple strand loops must be fabricated to ensure equal force on each strand.

Figure 6.15.7A (continued) Design tensile strength for $h \geq h_{min}$, ϕP_{c1}—Case 5



x and y are the overall dimensions (width and length) of the stud group.

Case 5: Free edges on three sides

$\phi P_{c1} = \phi 2.67 \lambda \sqrt{f'_c}\,(x_1)(y_1 + \ell_e)$

$\phi = 0.85$

where: x_1 and y_1 are the dimensions of the flat bottom of the part of the truncated pyramid.

For Case 5: $x_1 = x + d_{e1} + d_{e2}$ $\quad y_1 = y + d_{e3}$

Note: Table values are based on $\lambda = 1.0$ and $f'_c = 5000$ psi; for different material properties, multiply table values by $\lambda\sqrt{f'_c/5000}$

ℓ_e in.	y_1, in. \ x_1, in.	Design tensile strength, ϕP_{c1} (kips)														
		2	4	6	8	10	12	14	16	18	20	22	24	26	28	30
3	0	1	2	3	4	5	6	7	8	9	9	11	11	13	13	15
	2	1	3	5	7	8	9	11	13	15	16	17	19	21	23	24
	4	2	5	7	9	11	13	16	18	20	23	25	27	29	31	33
	6	3	6	9	11	15	17	20	23	26	29	32	35	37	41	43
	8	3	7	11	14	17	21	25	28	32	35	39	42	46	49	53
	10	4	9	13	17	21	25	29	33	37	42	46	50	54	59	63
	12	5	9	15	19	24	29	33	39	43	48	53	58	63	67	72
	14	5	11	17	22	27	33	38	43	49	55	60	65	71	76	82
	16	6	12	18	25	31	37	43	49	55	61	67	73	79	85	91
4	0	1	3	4	5	7	8	9	10	11	13	14	15	17	18	19
	2	2	4	6	8	9	11	13	15	17	19	21	23	25	27	29
	4	3	5	8	10	13	15	18	21	23	25	28	31	33	36	39
	6	3	7	9	13	16	19	23	25	29	32	35	39	42	45	48
	8	4	8	11	15	19	23	27	31	35	39	42	46	50	54	58
	10	5	9	13	18	23	27	31	36	41	45	49	54	59	63	67
	12	5	10	15	21	25	31	36	41	46	51	57	61	67	72	77
	14	6	11	17	23	29	35	41	46	52	58	63	69	75	81	87
	16	7	13	19	25	32	39	45	51	58	64	71	77	83	90	96
6	0	2	4	6	8	9	11	13	15	17	19	21	23	25	27	29
	2	3	5	8	10	13	15	18	21	23	25	28	31	33	36	39
	4	3	7	9	13	16	19	23	25	29	32	35	39	42	45	48
	6	4	8	11	15	19	23	27	31	35	39	42	46	50	54	58
	8	5	9	13	18	23	27	31	36	41	45	49	54	59	63	67
	10	5	10	15	21	25	31	36	41	46	51	57	61	67	72	77
	12	6	11	17	23	29	35	41	46	52	58	63	69	75	81	87
	14	7	13	19	25	32	39	45	51	58	64	71	77	83	90	96
	16	7	14	21	28	35	42	49	57	63	71	77	85	92	99	106
8	0	3	5	8	10	13	15	18	21	23	25	28	31	33	36	39
	2	3	7	9	13	16	19	23	25	29	32	35	39	42	45	48
	4	4	8	11	15	19	23	27	30	35	39	42	46	50	54	58
	6	5	9	13	18	23	27	31	36	41	45	49	54	59	63	67
	8	5	10	15	21	25	31	36	41	46	51	57	61	67	72	77
	10	6	11	17	23	29	35	41	46	52	58	63	69	75	81	87
	12	7	13	19	25	32	39	45	51	58	64	71	77	83	90	96
	14	7	14	21	28	35	42	49	57	63	71	77	85	92	99	106
	16	8	15	23	31	39	46	54	61	69	77	85	92	100	108	115