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www.jpsicard.com

Submittal Data Sheet

Submittal #: 6

Submission #: 1

Date: 5/8/2015

Project Name: Barton BRO (1449) Bridge Replacement

Owner: Town of Barton, VT

Engineer: VTrans

Contractor: J.P. Sicard Inc.

Item Number(s): 540.10, 900.640

Supplier: J.P. Carrara

Description of Item: Fabrication Drawings: Pre-Cast Abutments, NEXT Beams and Approach Slabs

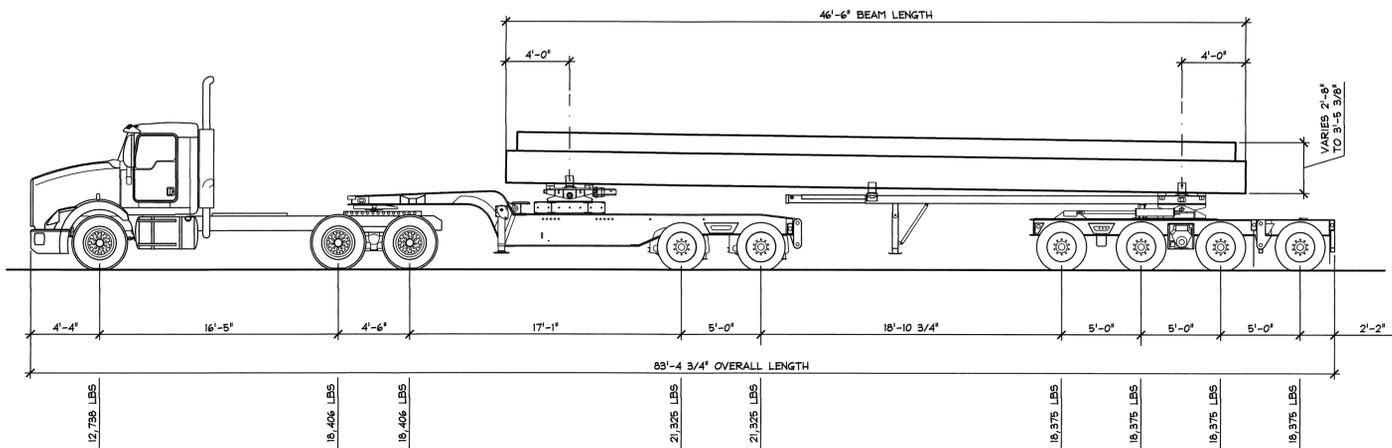
Substitution: NO

Engineers Review Comments: _____

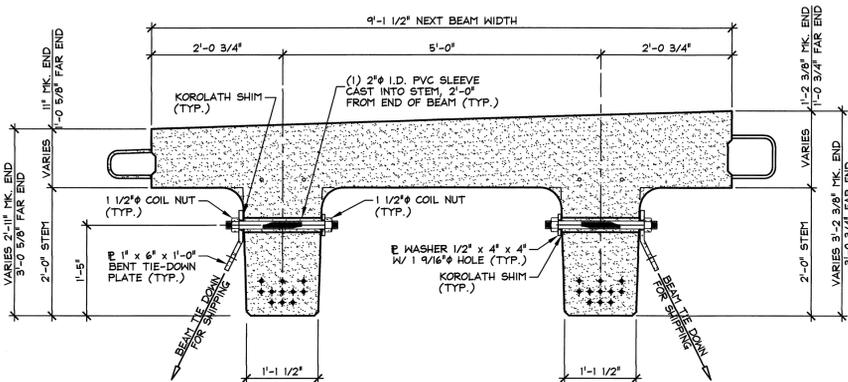
Submitted By: Brad Drake

Title: Project Manager

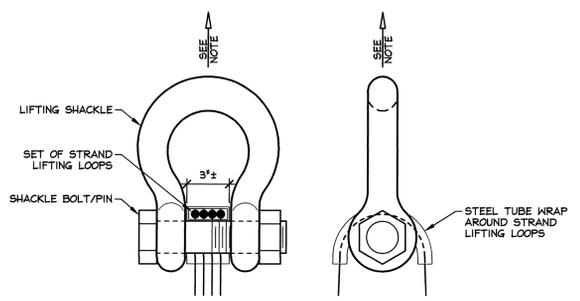
Company: JP Sicard Inc



SHIPPING ELEVATION
3/16" = 1'-0"



MODIFIED NEXT BEAM 32D HOLD-DOWN
DETAIL FOR SHIPPING
3/4" = 1'-0"



LIFTING SHACKLE DETAILS
N.T.S.

- ABUTMENT & APPROACH SLAB GENERAL NOTES**
- MIN. CONCRETE STRENGTH AT 28 DAYS SHALL BE 5,000 PSI.
 - MIN. CONCRETE STRENGTH AT STRESS TRANSFER SHALL BE 3,500 PSI (UNLESS NOTED OTHERWISE).
 - REINFORCING STEEL SHALL BE GR-60, ASTM A-615 (AASHTO M31) LEVEL I (BLACK STEEL) (UNLESS NOTED OTHERWISE).
 - THE TOP OF ABUTMENTS SHALL RECEIVE A RAKE FINISH (UNLESS NOTED OTHERWISE). THE TOP OF ABUTMENT CHEEKWALLS SHALL RECEIVE A SMOOTH FLOAT FINISH (UNLESS NOTED OTHERWISE).
 - SHEAR KEY SURFACES SHALL BE SAND BLASTED CLEAN.
 - PRECAST CONCRETE UNITS SHALL BE HANDLED AND ERECTED USING THE LIFTING INSERTS ONLY. THE MINIMUM SLING ANGLE FROM THE HORIZONTAL SHALL BE 60°. NON-PRESTRESSED UNITS SHALL BE STORED & TRANSPORTED WITH TIMBER SUPPORTS AT 5ft POINTS, UNLESS APPROVED BY J.P. CARRARA & SONS, INC.
 - MATERIAL SPECIFICATION AND MIX DESIGN SHALL CONFORM TO VERMONT SPEC. PS10.02 AND PS10.05 RESPECTIVELY.
DESIGN MIX:
APPROACH SL. : J.P.C. BRIDGE MIX #448M9CC (APPROVED 4-2-2015)
ABUTMENT : J.P.C. BRIDGE MIX #448M-NO DCI (APPROVED 3-21-2015)
 - QUALITY CONTROL PROCEDURES ARE IN ACCORDANCE WITH PCI REQUIREMENTS. J.P. CARRARA & SONS, INC. IS A PCI CERTIFIED PLANT.
 - CURING METHOD: AS SOON AS THE TOP OF PRECAST CONCRETE UNITS ARE FINISHED, A COVER OF RIGID INSULATION AND POLY WILL BE PLACED OVER THE UNIT. NATURAL CURE WITH NO EXTERNAL HEAT APPLIED.
 - POST TENSION TENDONS TO 32,000 LBS.

- NEXT BEAM GENERAL NOTES**
- MIN. CONCRETE STRENGTH AT 28 DAYS SHALL BE 6,000 PSI.
 - MIN. CONCRETE STRENGTH AT STRESS TRANSFER SHALL BE 4,000 PSI.
 - REINFORCING STEEL SHALL BE GR-60, ASTM A-615 (AASHTO M31) LEVEL II (DUAL COATED).
 - PRESTRESSING STRANDS SHALL CONFORM TO ASTM A-416 (AASHTO M208) AND SHALL CONSIST OF 0.60" x 270 KSI 7-WIRE LOW RELAXATION STRANDS.
 - 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.)
 - ENDS OF PRESTRESSING STRANDS SHALL BE CUT FLUSH WITH END OF NEXT BEAM STEMS (UNLESS NOTED OTHERWISE) AND COATED WITH TWO PART EPOXY PAINT SYSTEM.
 - ALL EXPOSED CORNERS SHALL BE CHAMFERED 3/4" (UNLESS NOTED OTHERWISE).
 - THE TOP OF BEAMS SHALL RECEIVE A SMOOTH SCREED FINISH (UNLESS NOTED OTHERWISE).
 - SHEAR KEY SURFACES SHALL BE SAND BLASTED CLEAN.
 - BEAMS SHALL BE HANDLED AND ERECTED USING THE LIFTING LOOPS ONLY. RIGGING SHALL BE CONFIGURED SUCH THAT EQUAL AND VERTICAL FORCES ARE APPLIED TO EACH OF THE TWO LIFTING LOOPS AT EACH END OF THE BEAM. THE PINS OF THE SHACKLES SHALL BE PLACED THROUGH THE LIFTING LOOPS. (SEE DETAIL, THIS SHEET). BEAMS SHALL BE STORED AND TRANSPORTED WITH TIMBER SUPPORTS WITHIN 2'-0" OF THE BEAM ENDS, UNLESS APPROVED BY J.P. CARRARA & SONS, INC.
 - MATERIAL SPECIFICATION AND MIX DESIGN SHALL CONFORM TO VERMONT SPEC. PS10.02 AND PS10.05 RESPECTIVELY.
DESIGN MIX: J.P.C. BRIDGE MIX #430M-NO DCI (SUBMITTED 3-21-2015)
 - QUALITY CONTROL PROCEDURES ARE IN ACCORDANCE WITH PCI REQUIREMENTS. J.P. CARRARA & SONS, INC. IS A PCI CERTIFIED PLANT.
 - CURING METHOD: AS SOON AS THE TOP OF BEAM IS FINISHED, A COVER OF INSULATED POLY. THE DESIRED CURING TEMPERATURE RANGE SHALL NOT DROP BELOW 70°. 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. EACH CHART SHALL BE MARKED WITH THE CASTING DATED AND LOCATION OF THE RECORDER. IF NECESSARY TO MAINTAIN CASTING BED TEMPERATURE PRIOR TO CONCRETE PLACEMENT OR TO ACCELERATE EARLY AGE STRENGTH GAIN, EXTERNAL RADIANT HEAT MAY BE EMPLOYED VIA HOT WATER DUCTS BENEATH AND WITHIN THE PERIPHERY OF THE CASTING BED. MAXIMUM CURING TEMPERATURE SHALL NOT EXCEED PCI SPECIFIED LIMITS.
 - OWNER SHALL PROVIDE APPROPRIATE WATERPROOFING TO GROUTED AND/OR EPOXIED SHEAR KEYS. J.P. CARRARA & SONS, INC. SHALL NOT BE HELD LIABLE FOR PROBLEMS ASSOCIATED WITH MOISTURE INFILTRATING GROUTED AND/OR EPOXIED SHEAR KEYS.
 - MANUFACTURING TOLERANCES SHALL COMPLY WITH PCI MNL-116. SINCE PRESTRESSED PRODUCT CAMBER IS A RESULT OF REQUIRED DESIGN LOADS AND SPAN LENGTH, CAMBER TOLERANCES SHALL NOT APPLY.

EXAMPLE PRESTRESSING STRAND ELONGATION CALC. AND TENSIONING
(NOT TO BE USED FOR CONSTRUCTION)

SIZE & GRADE: 0.60" x 270 KSI
AREA: 0.217 IN²
TENSION: 44,000 LB. EACH STRAND
GRIP-TO-GRIP: 252'-0" = 252.00'
Es = 28,600,000 PSI (ASSUMED FOR THESE CALCULATIONS; VALUE TO BE OBTAINED FOR STRAND SPOOL ACTUALLY USED)

EXAMPLE:
$$\Delta = \frac{PL}{AE} = \frac{(44,000 - 3,000) \times 252.00 \times 12}{0.217 \times 28,600,000} = 19.977'$$

THEREFORE: (TOLERANCES ± 5%)
Δ UPPER LIMIT = 1.05 x 19.977' = 20.98' = 21'
Δ LOWER LIMIT = 0.95 x 19.977' = 18.98' = 19'

EXTRA FORCE REQUIRED TO COMPENSATE FOR 1/2" CHUCK SLIPPAGE:
$$\Delta P = \frac{0.5 \times 41,000}{19.977} = 1,026 \text{ LBS.}$$

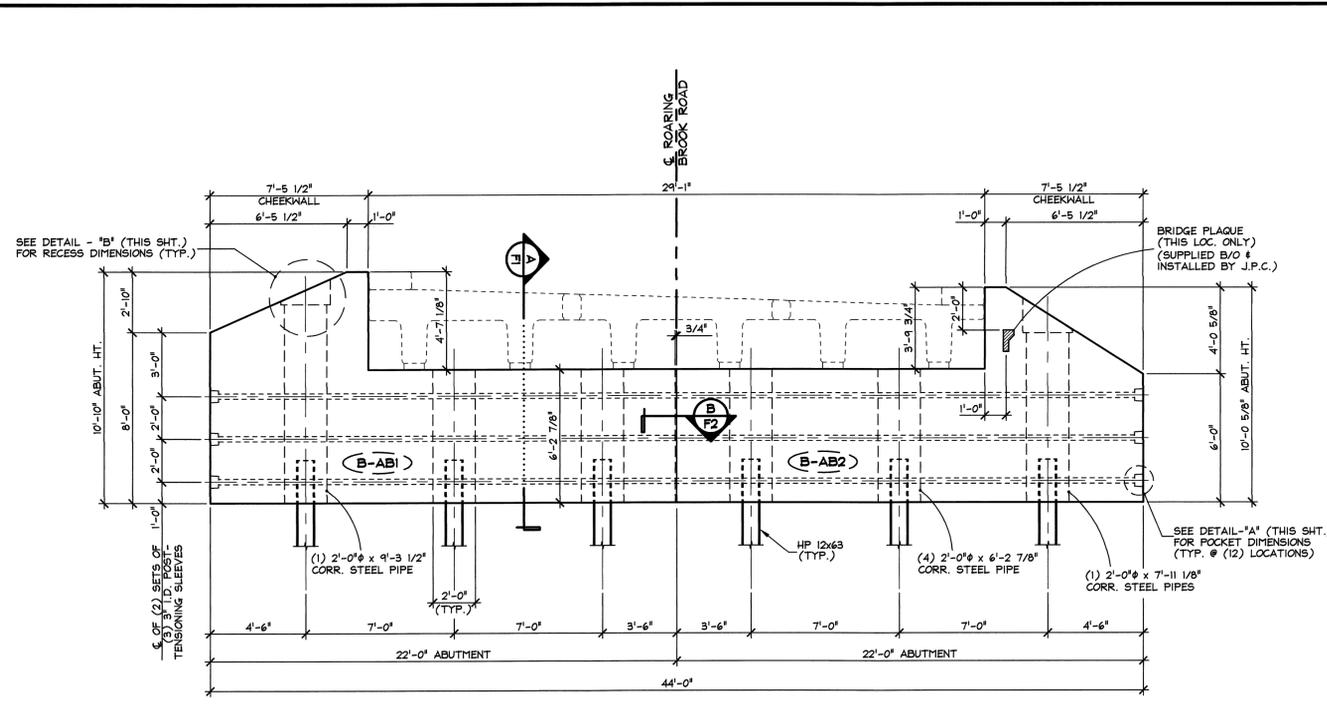
TOTAL TENSIONING FORCE = 44,000 + 1,026 = 45,026 LBS.

ADDITIONALLY, INCREASED ELONGATION AND THE CORRESPONDING FORCE DUE TO FORM SHORTENING SHALL BE ACCOUNTED FOR IN THE CALCULATIONS USED FOR CONSTRUCTION PER PROVISION PCI MNL-116 5.3.11.3.

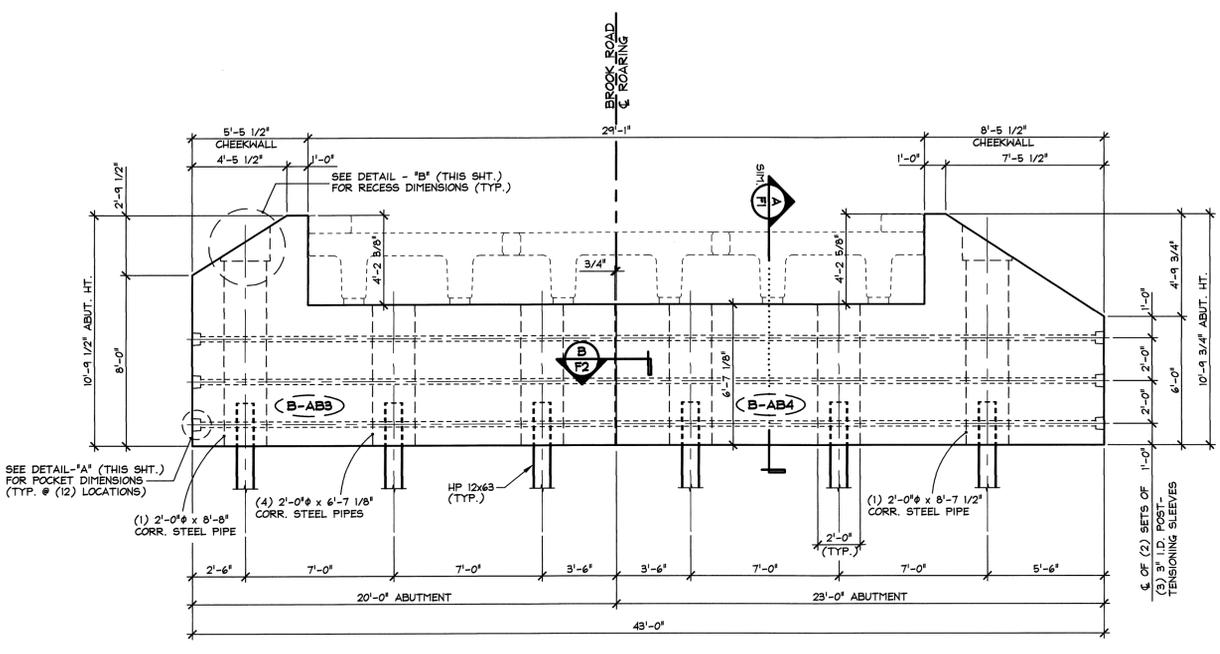
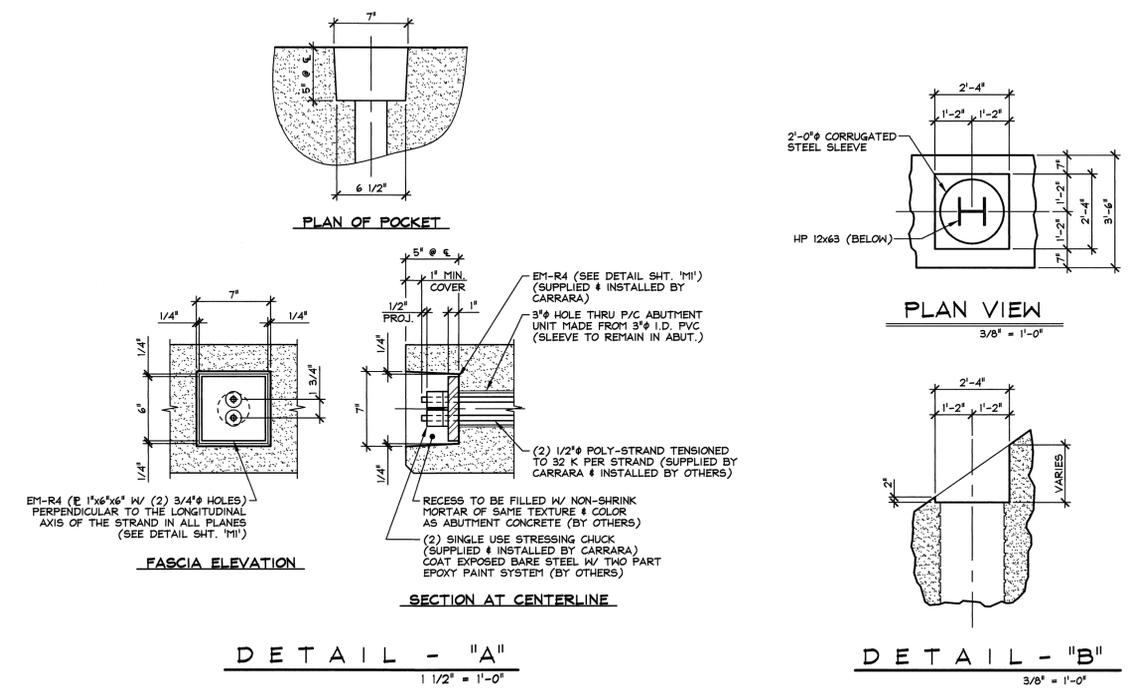
- STRAND TENSIONING PROCEDURE:**
- PULL EACH STRAND INITIALLY TO 3,000+ LBS. AND MARK STRAND.
 - THEN PULL EACH STRAND TO A TOTAL TENSION OF 45,026+ LBS. AND MEASURE ELONGATION AFTER SEATING. IT MUST BE BETWEEN 19" AND 21".
- NOTE: FORCES READ ON STRESSING JACK GAUGES MUST BE MADE TO CORRESPOND TO ABOVE VALUES BASED ON CALIBRATION DATA FOR SPECIFIC JACK USED.
- STRANDS IN BOTTOM TWO ROWS SHALL BE RE-PULLED TO VERIFY SHORTENING EFFECT OF SELF STRESSING BED. RE-PULL FORCE SHALL NOT INCLUDE OVER-PULL FOR SHORTENING.

DESIGN LIVE LOAD: HL-93

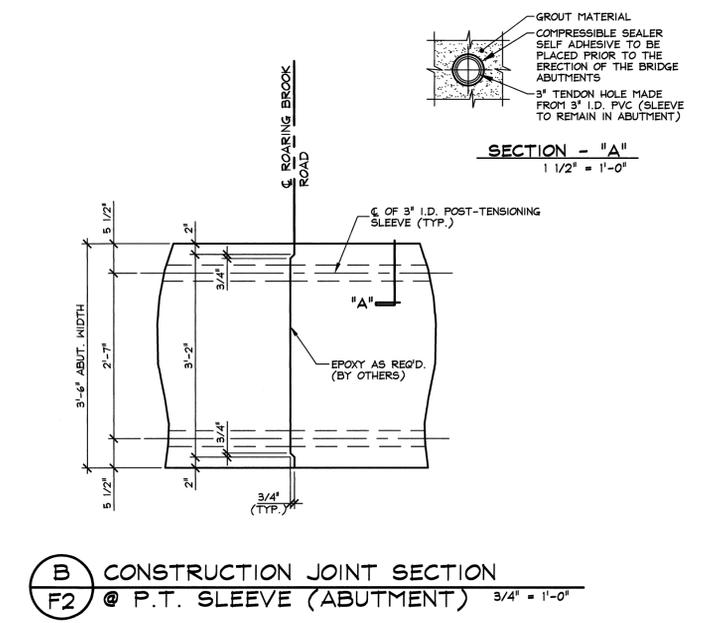
APPROVAL STAMP:	J.P. CARRARA & SONS INC. Precast & Prestress Manufacturer 2404 CASE ST., MIDDLEBURY, VERMONT 05753 Phone: (802)388-6361 Fax: (802)388-9010		J.P. Sicard CONTRACTOR BARTON, VERMONT
	STATE OF VERMONT AGENCY OF TRANSPORTATION COUNTY OF ORLEANS		DATE: FEB. 25, 2015 SCALE: NOTED
	TOWN OF BARTON ROARING BROOK ROAD TH #2, RURAL MINOR COLLECTOR BRIDGE NO.: 8 PROJECT NO.: BRO 1449(31)		CHKD: DFTM: T.D. JOB NO: 23462-015
	COVER SHEET		DWG. NO: C1



2 PRECAST ABUTMENT #1 ELEVATION
 F2 1/4" = 1'-0"

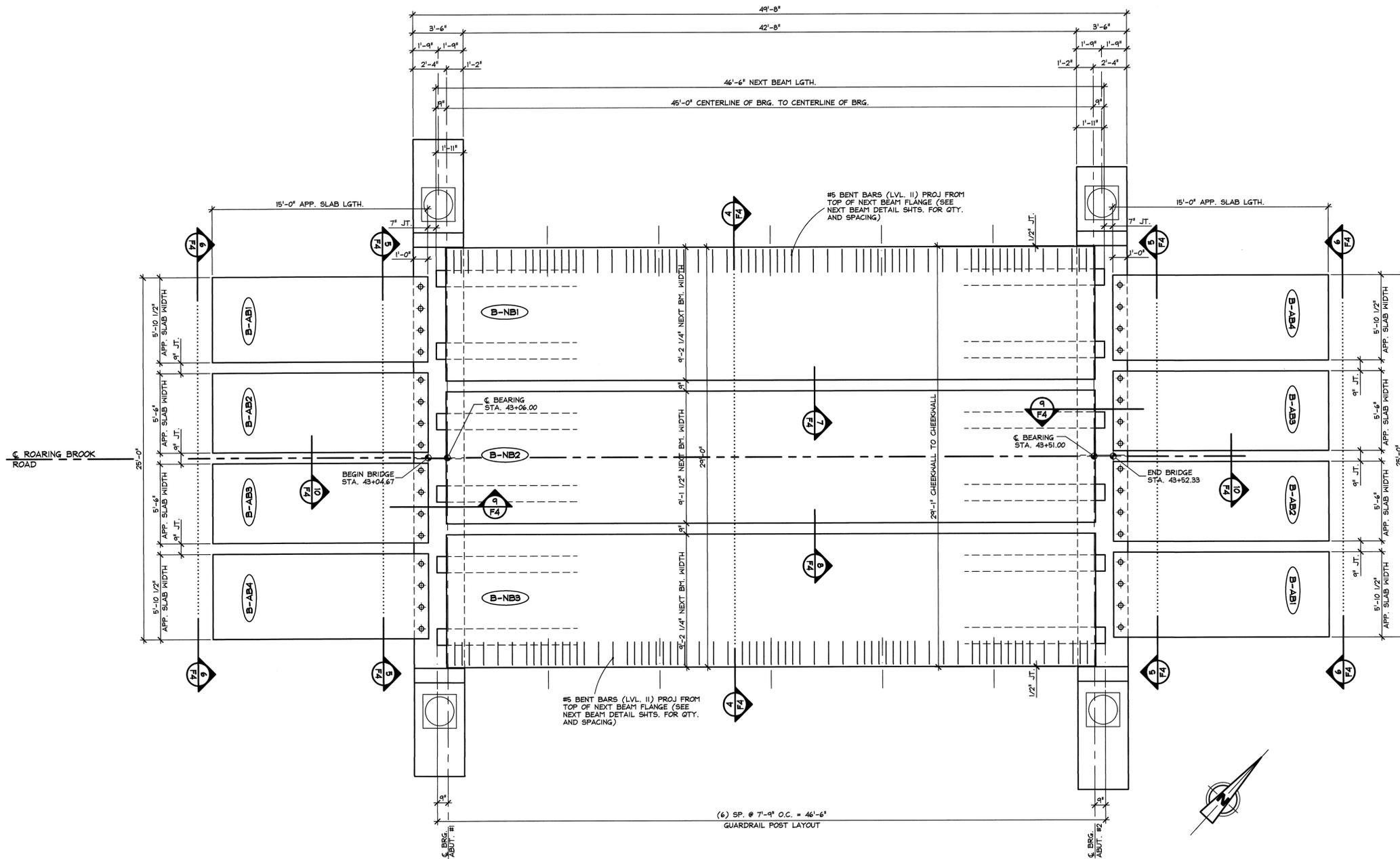


3 PRECAST ABUTMENT #2 ELEVATION
 F2 1/4" = 1'-0"



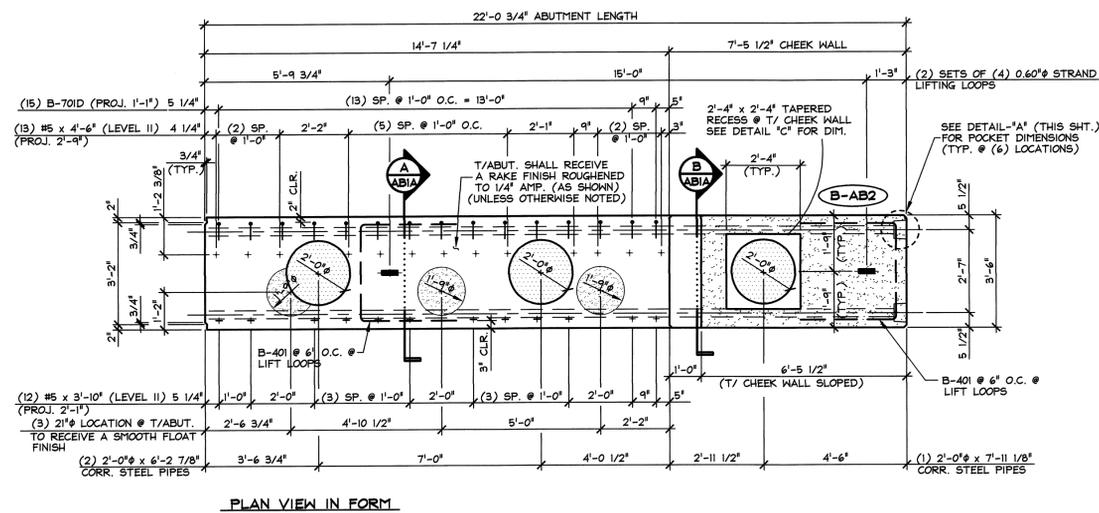
B CONSTRUCTION JOINT SECTION
 F2 @ P.T. SLEEVE (ABUTMENT) 3/4" = 1'-0"

APPROVAL STAMP:	J.P. CARRARA & SONS INC. Precast & Prestress Manufacturer 244 USE STR., MIDDLEBURY, VERMONT 05753 Phone: (802)388-6361 Fax: (802)388-9010		J.P. Sicard CONTRACTOR BARTON, VERMONT	
	STATE OF VERMONT AGENCY OF TRANSPORTATION COUNTY OF ORLEANS		DATE: FEB. 25, 2015	
	TOWN OF BARTON ROARING BROOK ROAD TH #2, RURAL MINOR COLLECTOR BRIDGE NO.: 8 PROJECT NO.: BRO 1449(31)		SCALE: NOTED	
	PRECAST ABUTMENT ELEVATIONS & DETAILS		CHKD:	DFTM: T.D.
			JOB NO: 23462-015	DWG. NO: F2

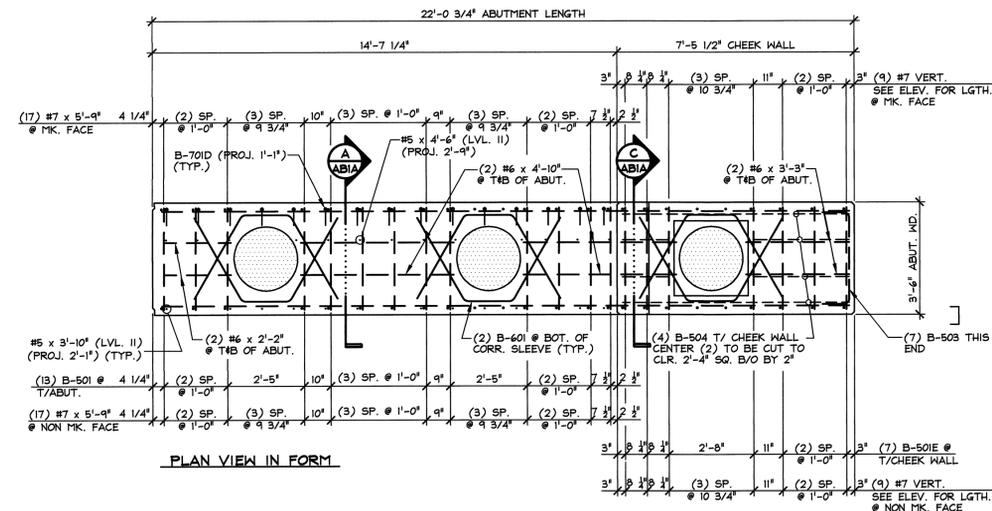


1 PRESTRESSED NEXT BEAM & APPROACH SLAB LAYOUT
 F3 1/4" = 1'-0"

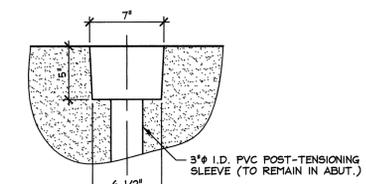
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	STATE OF VERMONT AGENCY OF TRANSPORTATION COUNTY OF ORLEANS		DATE: FEB. 25, 2015 SCALE: NOTED
	TOWN OF BARTON ROARING BROOK ROAD TH #2, RURAL MINOR COLLECTOR BRIDGE NO.: 8 PROJECT NO.: BRO 1449(31)		CHKD: DFTM: T.D. JOB NO: 23462-015
	PRECAST NEXT BEAM & APPROACH SLAB LAYOUT		DWG. NO: F3



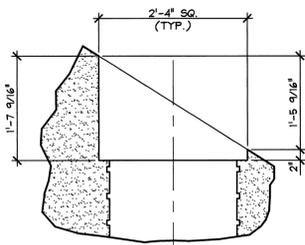
PLAN VIEW IN FORM



PLAN VIEW IN FORM

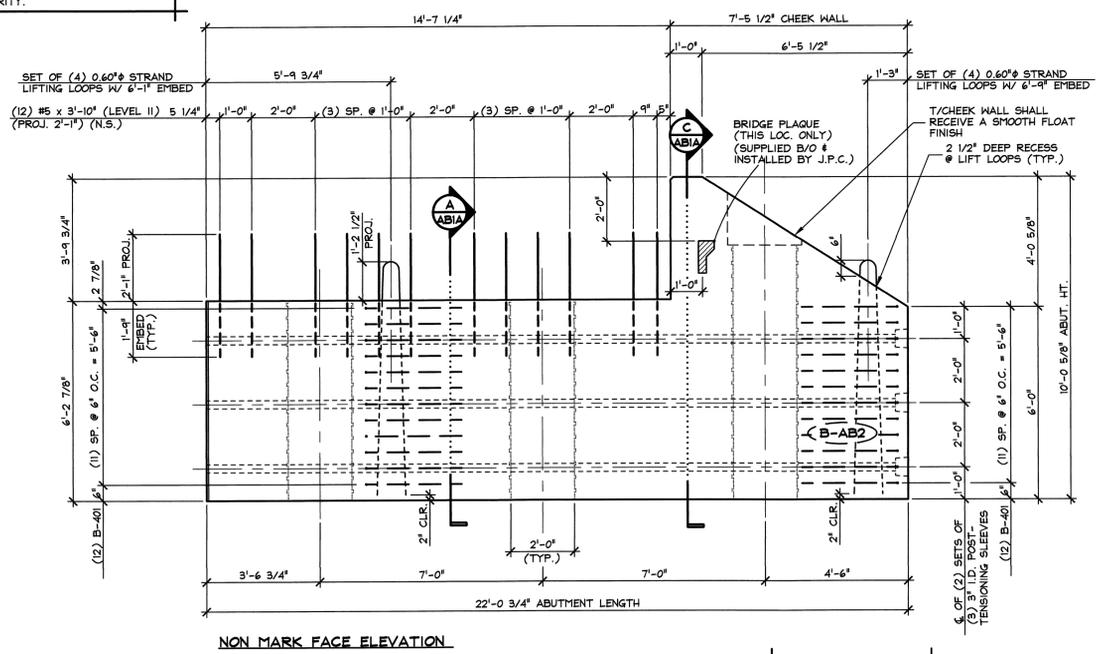


DETAIL - "A"
1 1/2" = 1'-0"

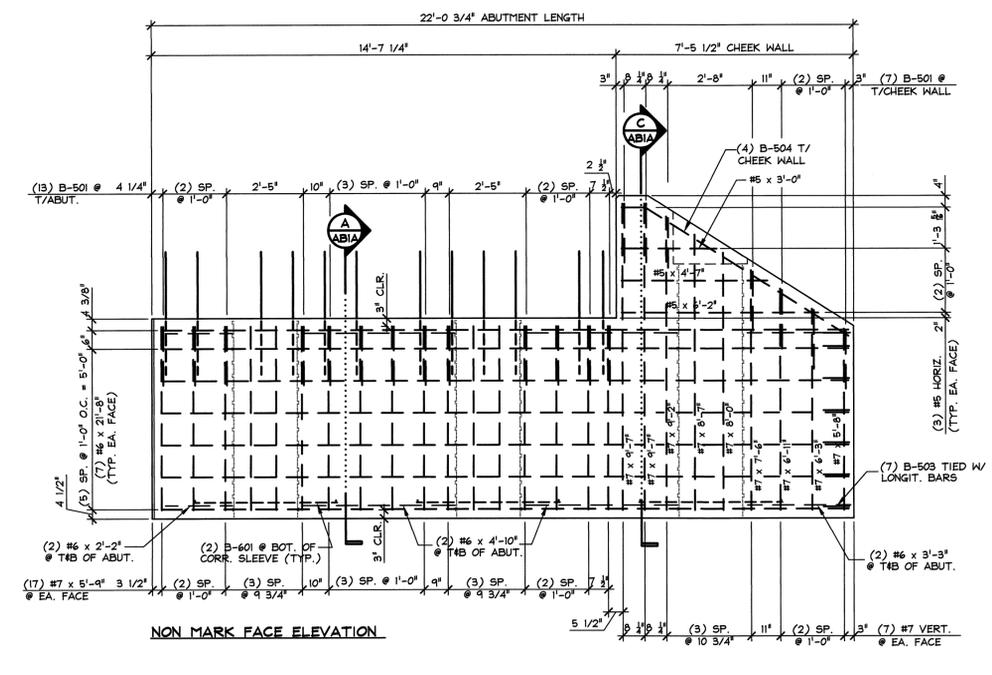


DETAIL - "C"
3/4" = 1'-0"

SHOP NOTE: B-701D & #5 PROJ. 2'-9" ON FAR SIDE NOT SHOWN ON THIS VIEW FOR CLARITY.



NON MARK FACE ELEVATION



NON MARK FACE ELEVATION

SHOP NOTE: ALL EDGES OF ABUTMENT SHALL RECEIVE A 1" CHAMFER (U.N.O.)

MATERIAL LIST / ABUTMENT			
ITEM	MARK	DESCRIPTION	QTY.
1	B-401	#4 BENT BAR (LEVEL I)	24
2	B-501	#5 BENT BAR (LEVEL I)	20
3	B-504	#5 BENT BAR (LEVEL I)	4
4	B-503	#5 BENT BAR (LEVEL I)	7
5	B-601	#6 BENT BAR (LEVEL I)	6
6	B-701D	#5 BENT BAR (LEVEL II, DUAL COATED)	15
7		#5 x 3'-10" (LEVEL II, DUAL COATED)	12
8		#5 x 4'-6" (LEVEL II, DUAL COATED)	13
9		#5 x 3'-0" (LEVEL I)	2
10		#5 x 4'-7" (LEVEL I)	2
11		#5 x 6'-2" (LEVEL I)	2
12		#6 x 2'-2" (LEVEL I)	4
13		#6 x 3'-3" (LEVEL I)	4
14		#6 x 4'-10" (LEVEL I)	8
15		#6 x 21'-6" (LEVEL I)	14
16		#7 x 5'-9" (LEVEL I)	34
17		#7 x 5'-8" (LEVEL I)	2
18		#7 x 6'-3" (LEVEL I)	2
19		#7 x 6'-11" (LEVEL I)	2
20		#7 x 7'-6" (LEVEL I)	2
21		#7 x 9'-2" (LEVEL I)	2
22		#7 x 9'-7" (LEVEL I)	4
23		#7 x 8'-7" (LEVEL I)	2
24		#7 x 8'-0" (LEVEL I)	2
25		SET OF (4) 0.60" STRAND LIFTING LOOPS	2
26		2'-0" x 6'-2 7/8" CORRUGATED STEEL PIPE (GALV.)	2
27		2'-0" x 7'-11 1/8" CORRUGATED STEEL PIPE (GALV.)	1

1 ABUTMENT DIMENSIONAL DETAILS
3/8" = 1'-0"

SHOP NOTE:
28 DAYS = 5,000 PSI
RELEASE = 5,000 PSI

MIX DESIGN:
MIX NO. 425M-NO DCI
APPROVED 3-21-2015

2 ABUTMENT REINFORCING DETAILS
3/8" = 1'-0"

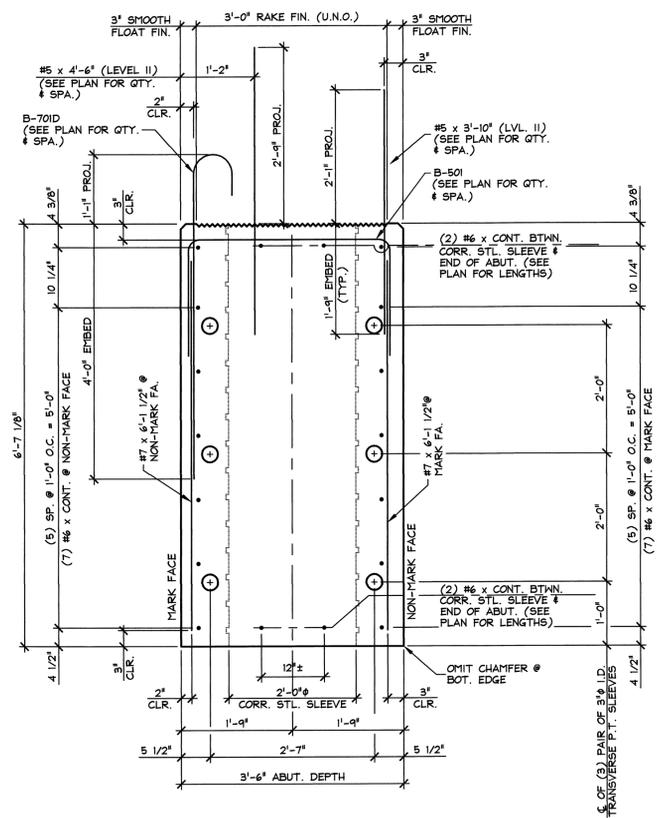
APPROVAL STAMP:

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

STATE OF VERMONT AGENCY OF TRANSPORTATION
COUNTY OF ORLEANS

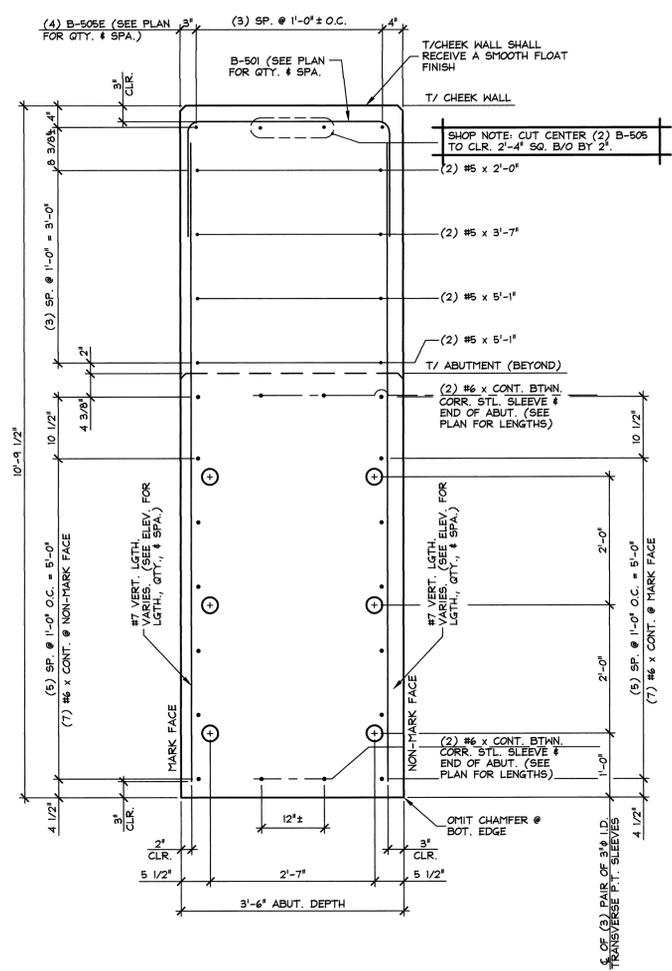
TOWN OF BARTON
ROARING BROOK ROAD TH #2, RURAL MINOR COLLECTOR
BRIDGE NO.: 8 PROJECT NO.: BRO 1449(31)

DATE: FEB. 25, 2015
SCALE: NOTED
CHKD: DFTM: T.D.
JOB NO: 23462-015
DWG. NO: AB2



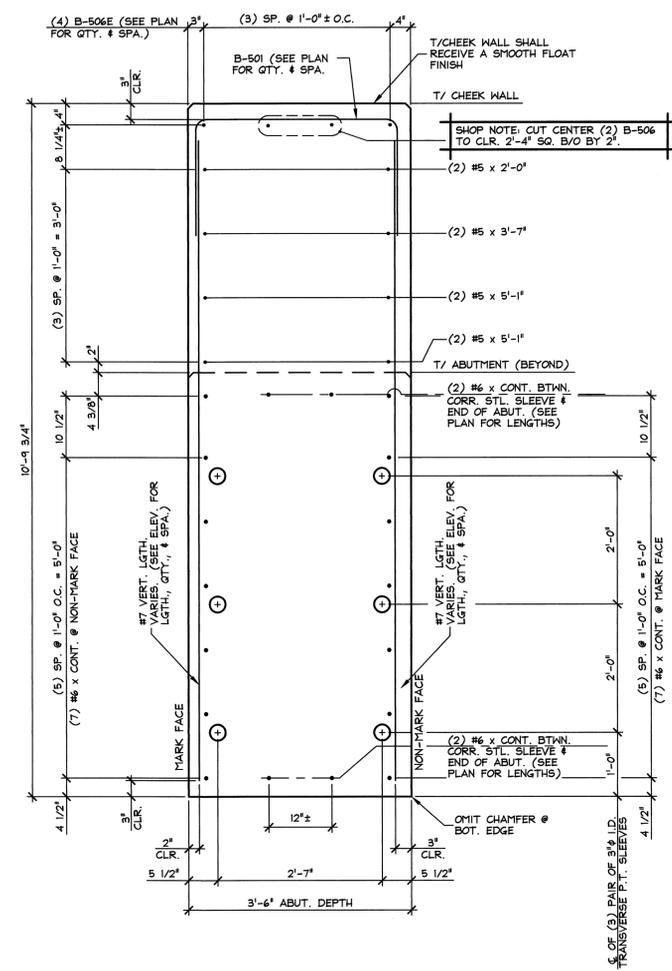
A ABUTMENT SECTION
 AB3A (B-AB3 & B-AB4) 3/4" = 1'-0"

SHOP NOTE:
 ALL EDGES OF ABUTMENT SHALL
 RECEIVE A 1" CHAMFER (U.N.O.)



B ABUTMENT SECTION
 AB3A (B-AB3) 3/4" = 1'-0"

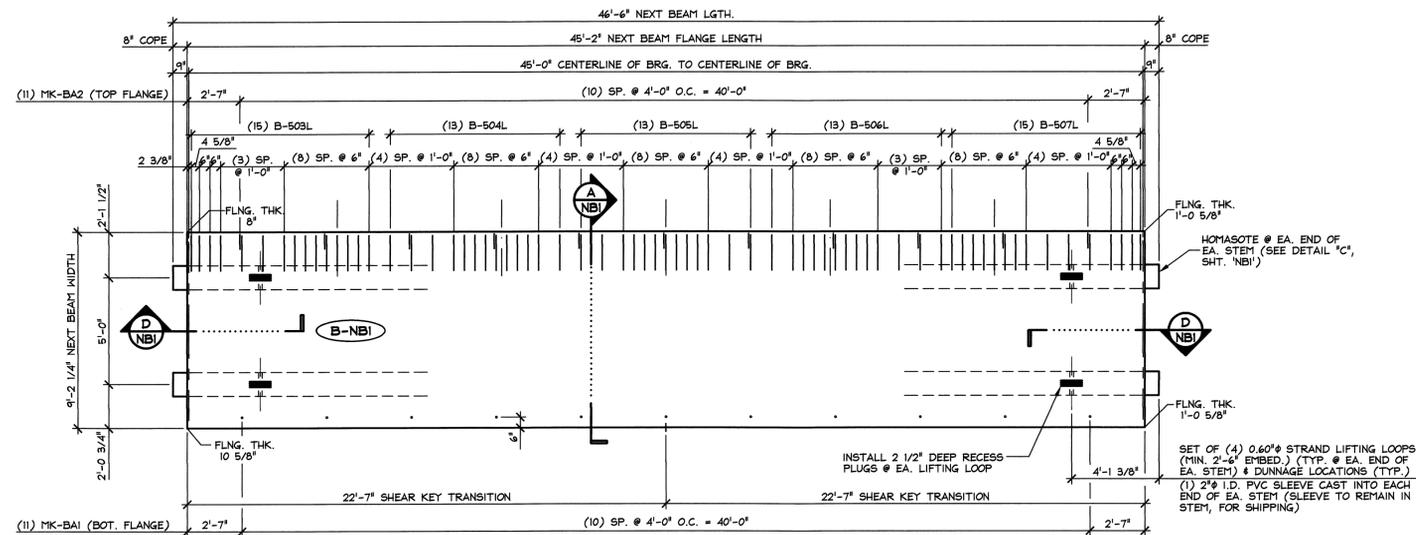
SHOP NOTE:
 ALL EDGES OF ABUTMENT SHALL
 RECEIVE A 1" CHAMFER (U.N.O.)



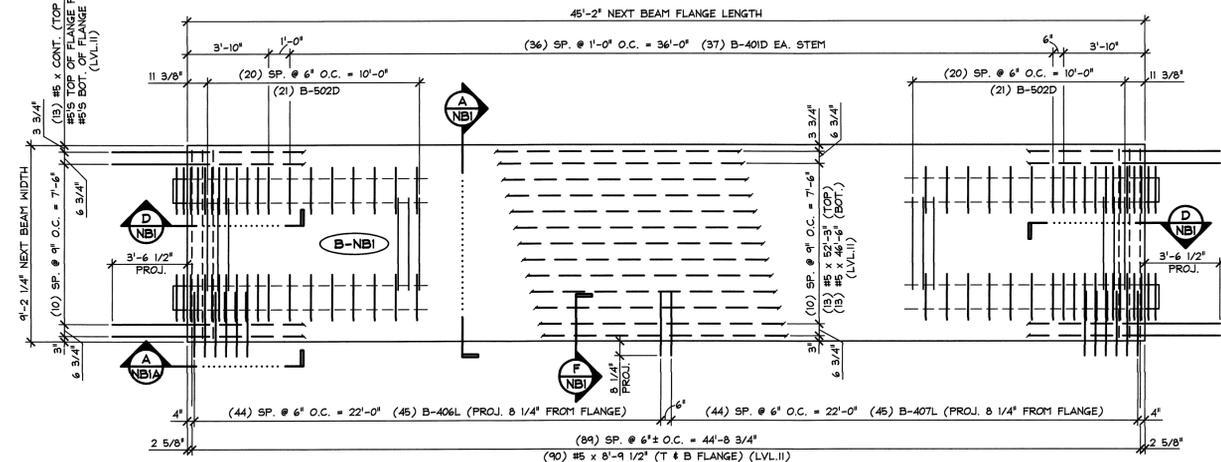
C ABUTMENT SECTION
 AB3A (B-AB4) 3/4" = 1'-0"

SHOP NOTE:
 ALL EDGES OF ABUTMENT SHALL
 RECEIVE A 1" CHAMFER (U.N.O.)

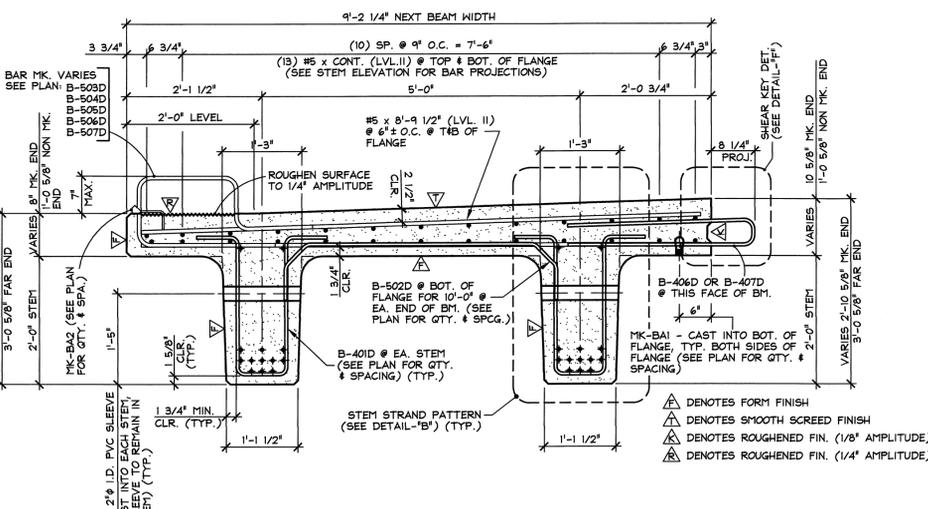
APPROVAL STAMP:	J.P. CARRARA & SONS INC. Precast & Prestress Manufacturer <small>2464 GISE STR., MIDDLEBURY, VERMONT 05753 Phone: (802)388-6361 Fax: (802)388-9010</small>	
	STATE OF VERMONT AGENCY OF TRANSPORTATION COUNTY OF ORLEANS	DATE: FEB. 25, 2015
	TOWN OF BARTON ROARING BROOK ROAD TH #2, RURAL MINOR COLLECTOR BRIDGE NO.: 8 PROJECT NO.: BRO 1449(81)	SCALE: NOTED
	PRECAST ABUTMENT SECTIONS	CHKD: DFTM: T.D. JOB NO: 23462-015 DWG. NO: AB3A



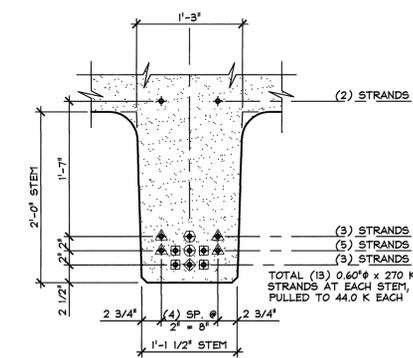
1 DIMENSIONAL PLAN VIEW IN FORM
NBI
1/4" = 1'-0"



2 REINFORCING PLAN VIEW IN FORM
NBI
1/4" = 1'-0"



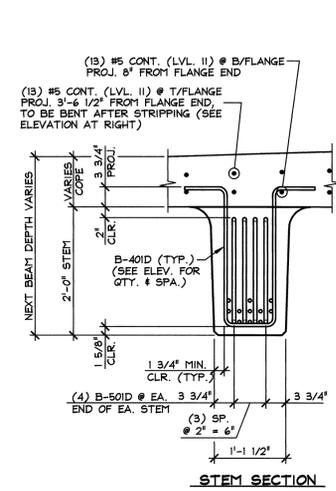
A DIMENSIONAL & REINFORCING SECTION
NBI
3/4" = 1'-0"



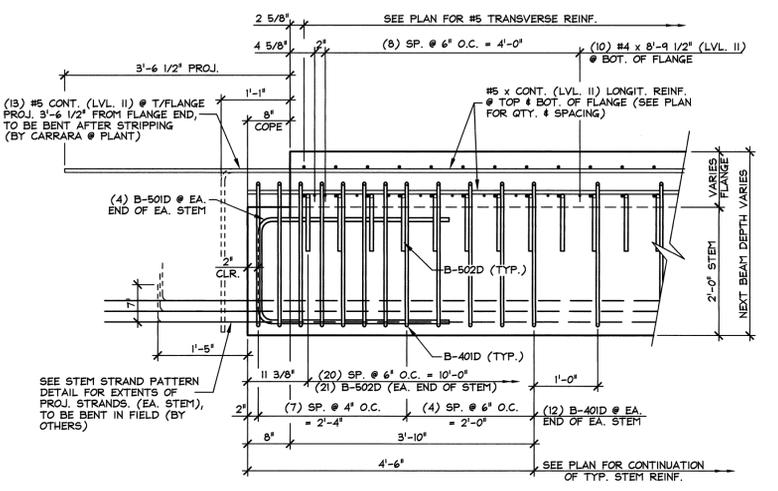
B STEM STRAND PATTERN
NBI
1" = 1'-0"



DETENSIONING SCHEDULE
N.T.S.

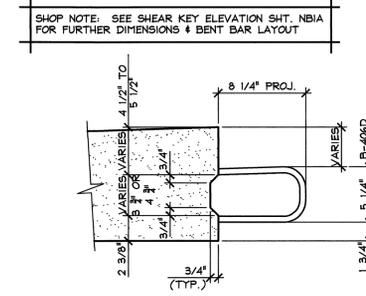


STEM SECTION

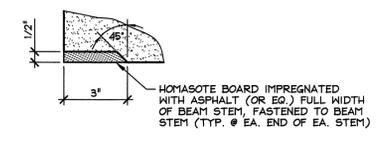


STEM ELEVATION ALONG C OF STEM

D END BLOCK STEM REINFORCING DETAILS
NBI
3/4" = 1'-0"



F SHEAR KEY DETAIL
NBI
1 1/2" = 1'-0"



C HOMASOTE DETAIL
NBI
3" = 1'-0"

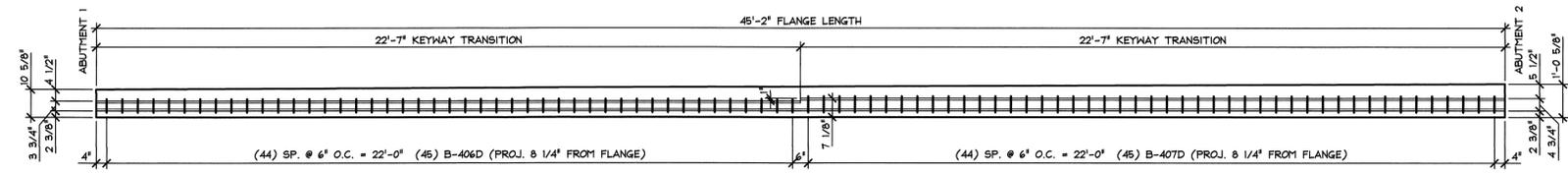
PRESTRESSING NOTATIONS

- ▲ DENOTES STRAIGHT STRANDS TO BE DEBONDED 6" FROM EA. END OF EA. STEM
- DENOTES FULLY BONDED STRAIGHT STRANDS EXTENDED 2'-0" FROM EA. END OF EA. STEM
- ◆ DENOTES STRAIGHT STRANDS TO BE DEBONDED 8'-0" FROM EA. END OF EA. STEM
- ⊙ DENOTES STRAIGHT STRANDS TO BE DEBONDED 4'-0" FROM EA. END OF EA. STEM
- ⊕ DENOTES FULLY BONDED STRAIGHT STRANDS TO BE CUT FLUSH W/ EA. END OF EA. STEM

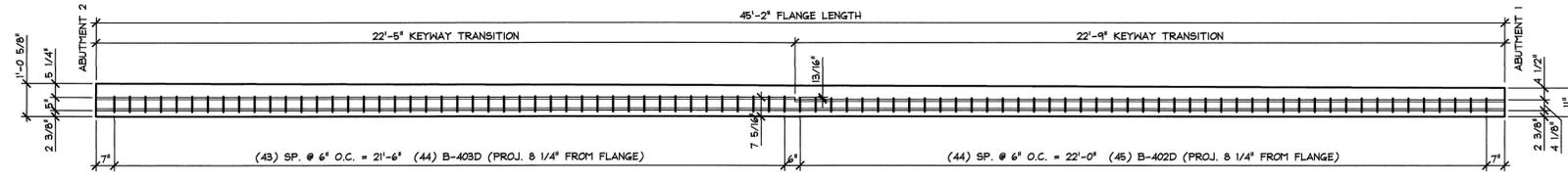
APPROVAL STAMP:

J.P. CARRARA & SONS INC. Precast & Prestress Manufacturer 2464 GSE STR., MIDDLEBURY, VERMONT 05753 Phone: (802)388-6361 Fax: (802)388-9010		J.P. Sicard CONTRACTOR BARTON, VERMONT	
STATE OF VERMONT AGENCY OF TRANSPORTATION COUNTY OF ORLEANS		DATE: FEB. 25, 2015	
TOWN OF BARTON ROARING BROOK ROAD TH #2, RURAL MINOR COLLECTOR BRIDGE NO.: 8 PROJECT NO.: BRO 1449(31)		SCALE: NOTED	
PRESTRESSED NEXT BEAM DETAILS		CHKD: - DFTM: T.D.	
		JOB NO: 23462-015	
		DWG. NO: NBI	

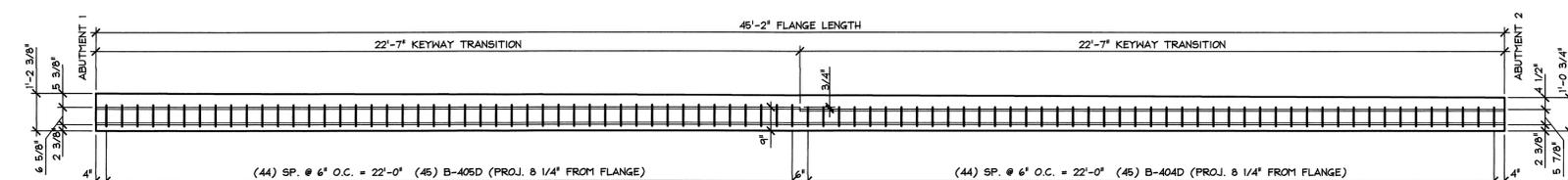
MARK:	B-NBI	QTY.:	1	WT.:	44.87 T	VOL.:	22.15 cy
MATERIAL LIST / NEXT BEAM							
ITEM	MARK	DESCRIPTION	QTY.				
1	MK-BA1	3/4" F42 FERRULE INSERT (GALV.)	11				
2	MK-BA2	DAYTON C-24 TYPE 4-PR DECK FORM HANGER (GALV.)	11				
3							
4	B-401D	#4 BENT BAR (LEVEL II, DUAL COATED)	122				
5	B-406D	#4 BENT BAR (LEVEL II, DUAL COATED)	45				
6	B-407D	#4 BENT BAR (LEVEL II, DUAL COATED)	45				
7	B-501D	#5 BENT BAR (LEVEL II, DUAL COATED)	16				
8	B-502D	#5 BENT BAR (LEVEL II, DUAL COATED)	42				
9	B-503D	#5 BENT BAR (LEVEL II, DUAL COATED)	15				
10	B-504D	#5 BENT BAR (LEVEL II, DUAL COATED)	13				
11	B-505D	#5 BENT BAR (LEVEL II, DUAL COATED)	13				
12	B-506D	#5 BENT BAR (LEVEL II, DUAL COATED)	13				
13	B-507D	#5 BENT BAR (LEVEL II, DUAL COATED)	15				
14		#4 x 8'-9 1/2" (LEVEL II, DUAL COATED)	20				
15		#5 x 8'-9 1/2" (LEVEL II, DUAL COATED)	180				
16		#5 x 46'-6" (LEVEL II, DUAL COATED)	13				
17		#5 x 52'-3" (LEVEL II, DUAL COATED)	13				
18		SET OF (4) 0.60" STRAND LIFTING LOOPS	4				



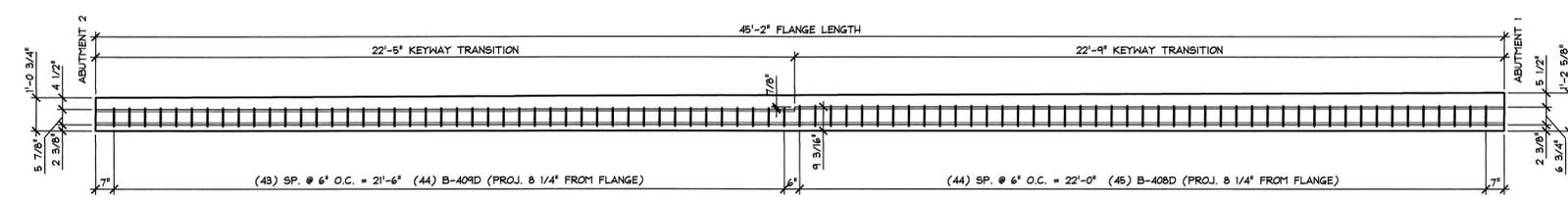
KEY ELEVATION - "A"
3/8" = 1'-0"



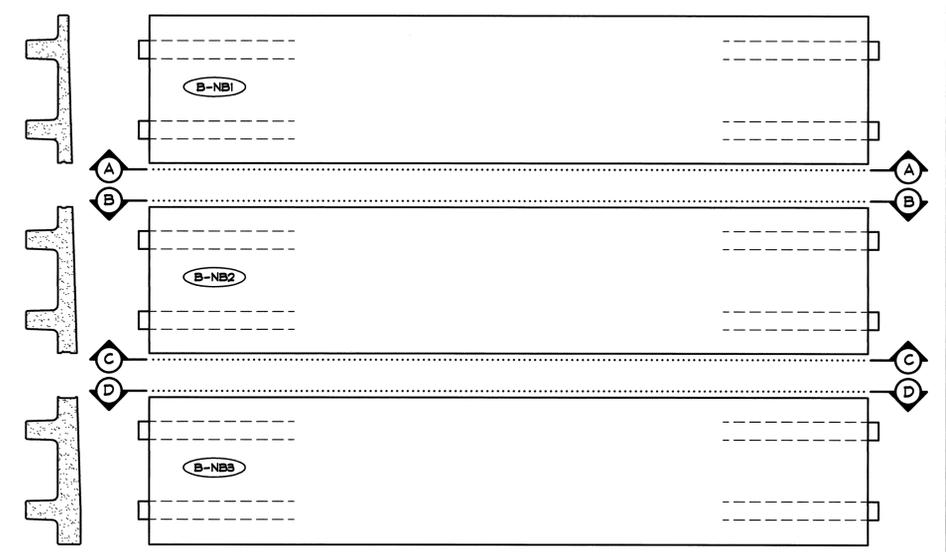
KEY ELEVATION - "B"
3/8" = 1'-0"



KEY ELEVATION - "C"
3/8" = 1'-0"

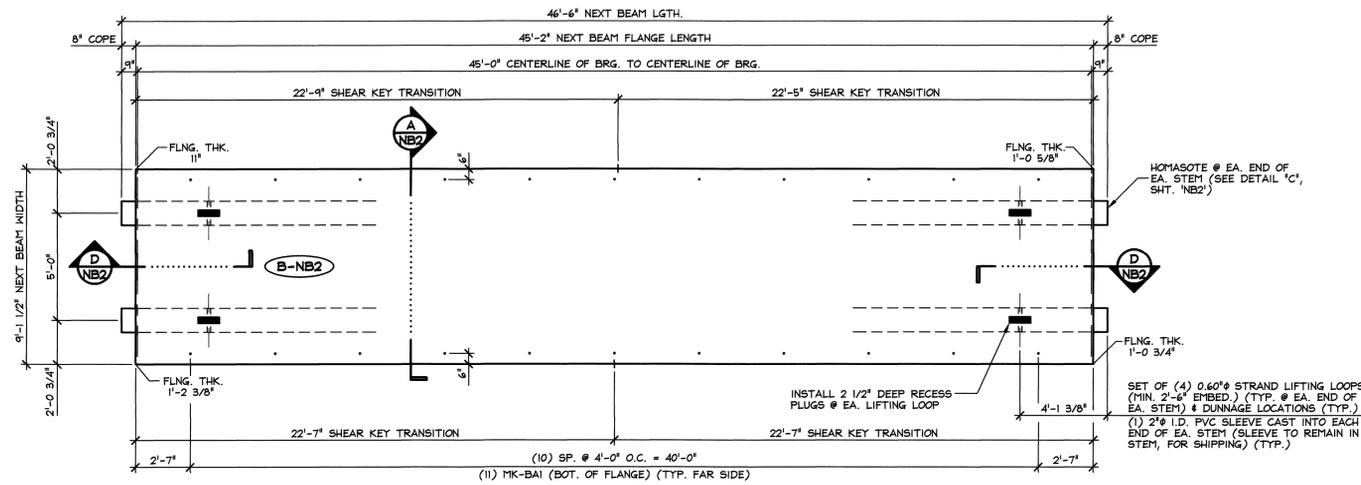


KEY ELEVATION - "D"
3/8" = 1'-0"



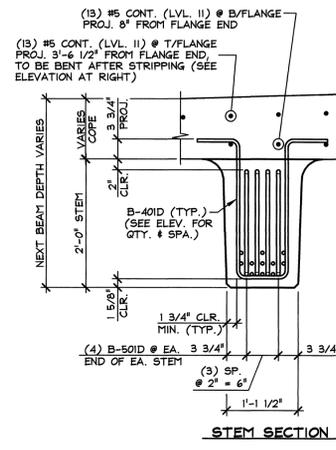
SCHMATIC PLAN VIEW OF NEXT BEAMS
N.T.S.

APPROVAL STAMP:	J.P. CARRARA & SONS INC. Precast & Prestress Manufacturer <small>2444 CASE ST., MIDDLEBURY, VERMONT 05753 Phone: (802)388-6361 Fax: (802)388-9010</small>		J.P. Sicard CONTRACTOR BARTON, VERMONT
	STATE OF VERMONT AGENCY OF TRANSPORTATION COUNTY OF ORLEANS		DATE: FEB. 25, 2015
	TOWN OF BARTON ROARING BROOK ROAD TH #2, RURAL MINOR COLLECTOR BRIDGE NO.: 8 PROJECT NO.: BRO 1449(31)		SCALE: NOTED
	SHEAR KEY ELEVATIONS		CHKD: DFTM: T.D. JOB NO: 23462-015
			DWG. NO: NB1A

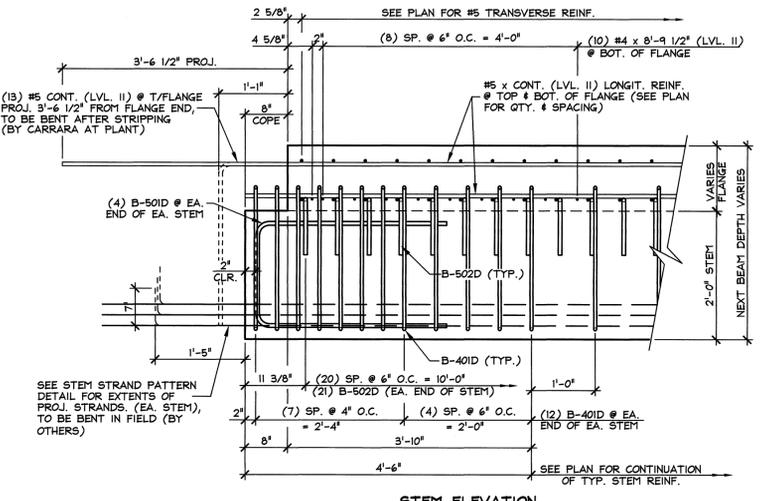


1 DIMENSIONAL PLAN VIEW IN FORM
NB2
1/4" = 1'-0"

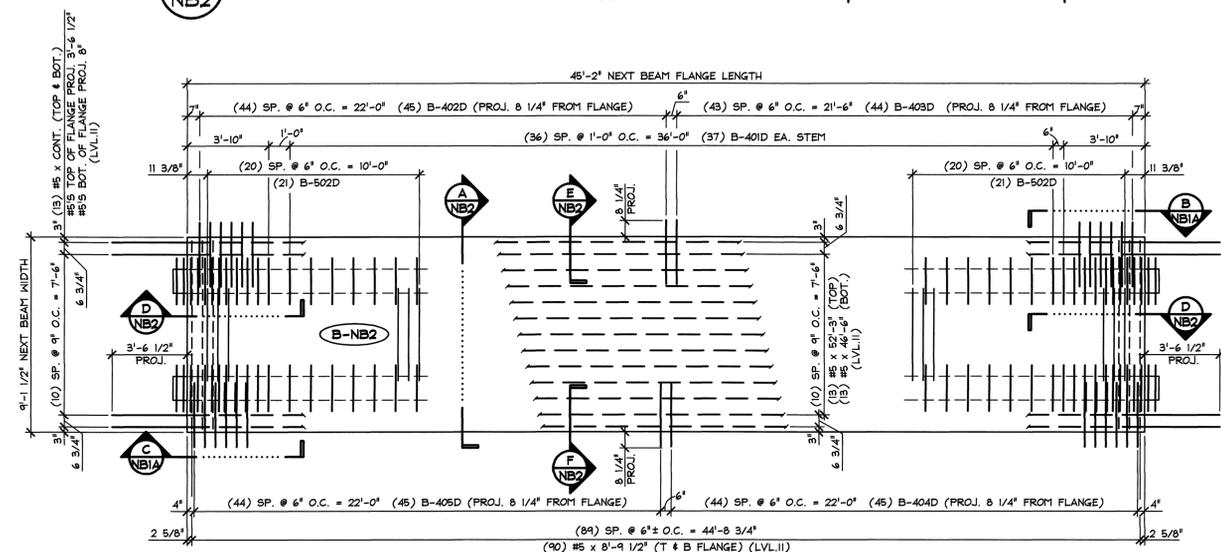
SHOP NOTE: SEE DWG. N81A FOR SHEAR KEY ELEVATIONS



STEM SECTION
NB2

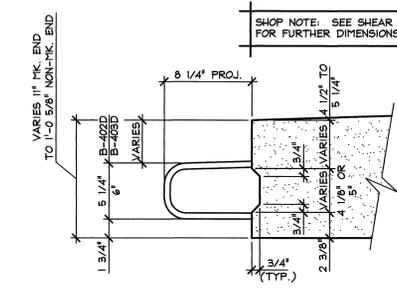


STEM ELEVATION ALONG C OF STEM
NB2

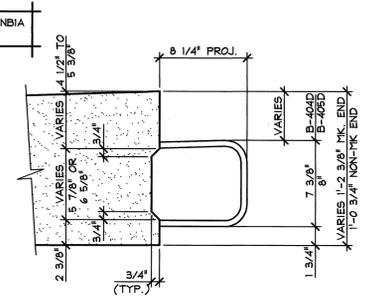


2 REINFORCING PLAN VIEW IN FORM
NB2
1/4" = 1'-0"

D END BLOCK STEM REINFORCING DETAILS
NB2
3/4" = 1'-0"



E SHEAR KEY DETAIL
NB2
1 1/2" = 1'-0"

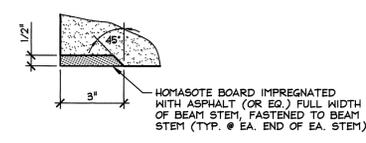


F SHEAR KEY DETAIL
NB2
1 1/2" = 1'-0"

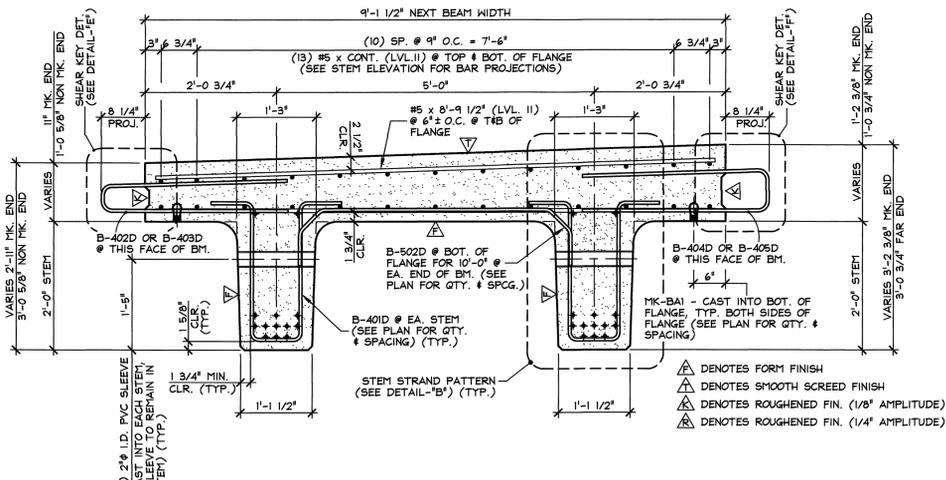
1 3 4 2

7 5 8
17 16 15 14 13
24 23 22 21

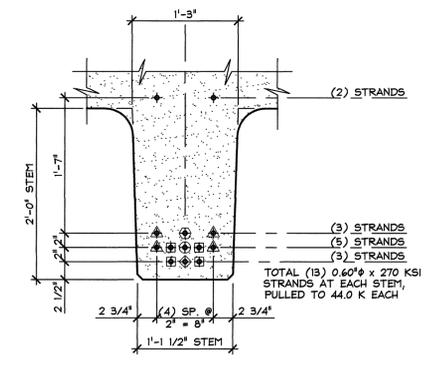
DENENSIONING SCHEDULE
N.T.S.



C HOMASOTE DETAIL
NB2
3" = 1'-0"



A DIMENSIONAL & REINFORCING SECTION
NB2
3/4" = 1'-0"



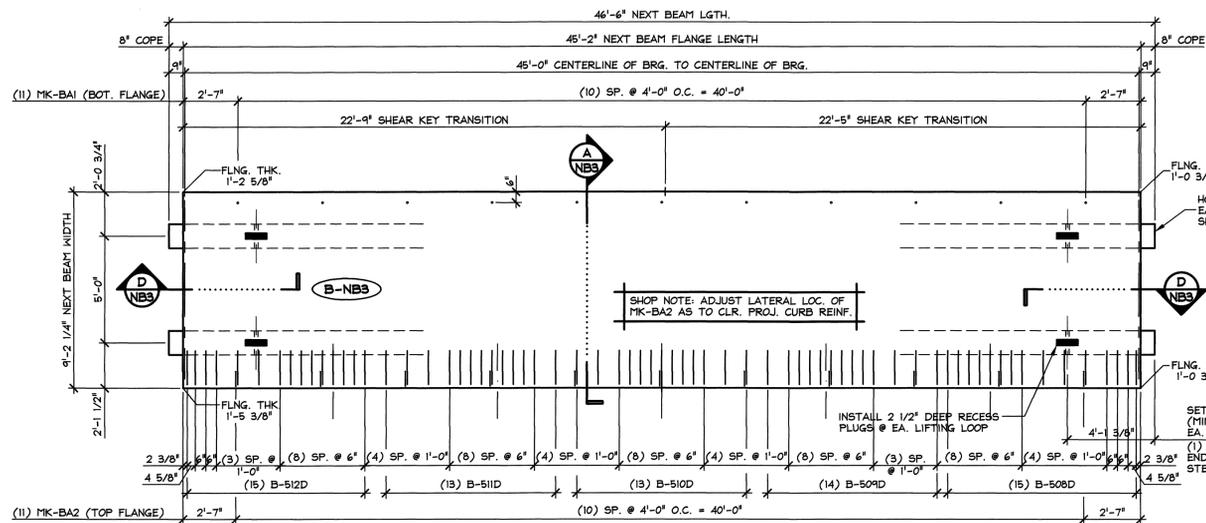
B STEM STRAND PATTERN
NB2
1" = 1'-0"

- PRESTRESSING NOTATIONS**
- ▲ DENOTES STRAIGHT STRANDS TO BE DEBONDED 6" FROM EA. END OF EA. STEM
 - ⊕ DENOTES FULLY BONDED STRAIGHT STRANDS EXTENDED 2'-0" FROM EA. END OF EA. STEM
 - ◆ DENOTES STRAIGHT STRANDS TO BE DEBONDED 8'-0" FROM EA. END OF EA. STEM
 - ⊙ DENOTES STRAIGHT STRANDS TO BE DEBONDED 4'-0" FROM EA. END OF EA. STEM
 - ⊕ DENOTES STRAIGHT STRANDS TO BE DEBONDED 2'-0" FROM EA. END OF EA. STEM
 - ⊕ DENOTES FULLY BONDED STRAIGHT STRANDS TO BE CUT FLUSH 1/4" EA. END OF EA. STEM

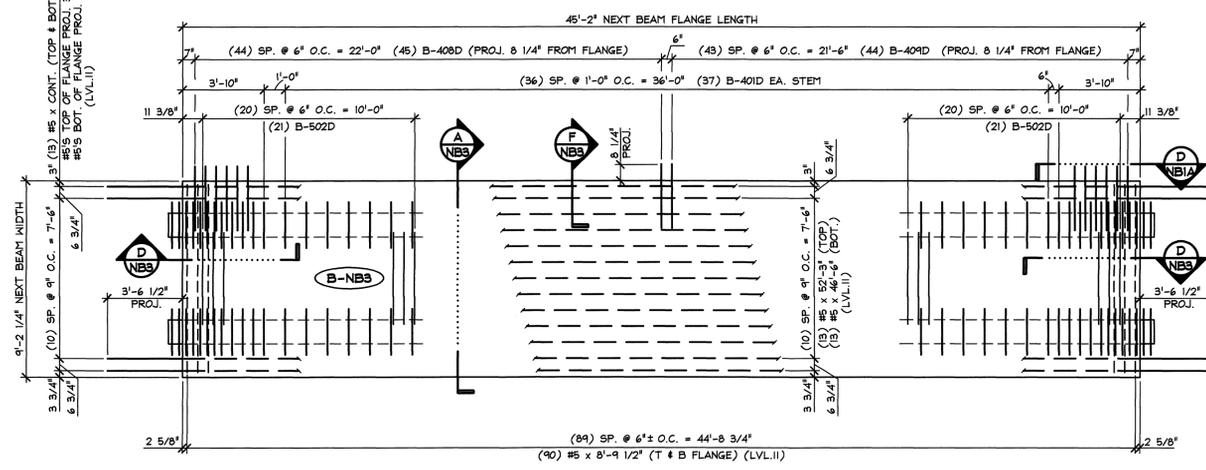
APPROVAL STAMP:

J.P. CARRARA & SONS INC. Precast & Prestress Manufacturer 2404 CASE STR., MIDDLEBURY, VERMONT 05753 Phone: (802)388-6361 Fax: (802)388-9010		J.P. Sicard CONTRACTOR BARTON, VERMONT	
STATE OF VERMONT AGENCY OF TRANSPORTATION COUNTY OF ORLEANS		DATE: FEB. 25, 2015 SCALE: NOTED	
TOWN OF BARTON ROARING BROOK ROAD TH #2, RURAL MINOR COLLECTOR BRIDGE NO.: 8 PROJECT NO.: BRO 1449(31)		CHKD: - DFTM: T.D. JOB NO: 23462-015	
PRESTRESSED NEXT BEAM DETAILS		DWG. NO: NB2	

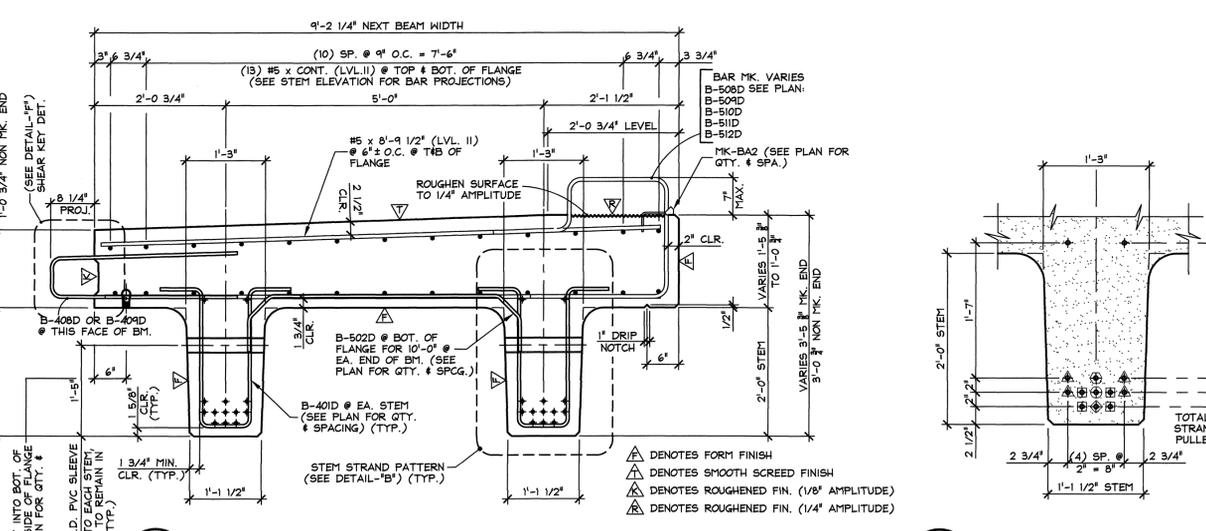
MARK: B-NB2	QTY.: 1	WT.: 49.36 T	VOL.: 24.38 cy
MATERIAL LIST / NEXT BEAM			
ITEM	MARK	DESCRIPTION	QTY.
1	MK-BAI	3/4" F42 FERRULE INSERT (GALV.)	22
2	B-401D	#4 BENT BAR (LEVEL II, DUAL COATED)	122
3	B-402D	#4 BENT BAR (LEVEL II, DUAL COATED)	45
4	B-403D	#4 BENT BAR (LEVEL II, DUAL COATED)	44
5	B-404D	#4 BENT BAR (LEVEL II, DUAL COATED)	45
6	B-405D	#4 BENT BAR (LEVEL II, DUAL COATED)	45
7	B-501D	#5 BENT BAR (LEVEL II, DUAL COATED)	16
8	B-502D	#5 BENT BAR (LEVEL II, DUAL COATED)	42
9			
10		#4 x 8'-9 1/2" (LEVEL II, DUAL COATED)	20
11		#5 x 8'-9 1/2" (LEVEL II, DUAL COATED)	180
12		#5 x 46'-6" (LEVEL II, DUAL COATED)	13
13		#5 x 52'-3" (LEVEL II, DUAL COATED)	13
14			
15		SET OF (4) 0.60" STRAND LIFTING LOOPS	4



1 DIMENSIONAL PLAN VIEW IN FORM
 NB3
 1/4" = 1'-0"
 SHOP NOTE: SEE DWG. NB3A FOR SHEAR KEY ELEVATIONS



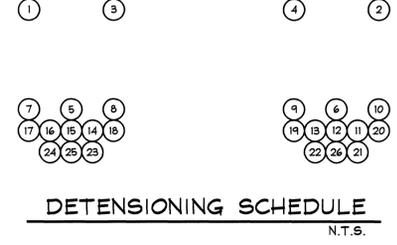
2 REINFORCING PLAN VIEW IN FORM
 NB3
 1/4" = 1'-0"



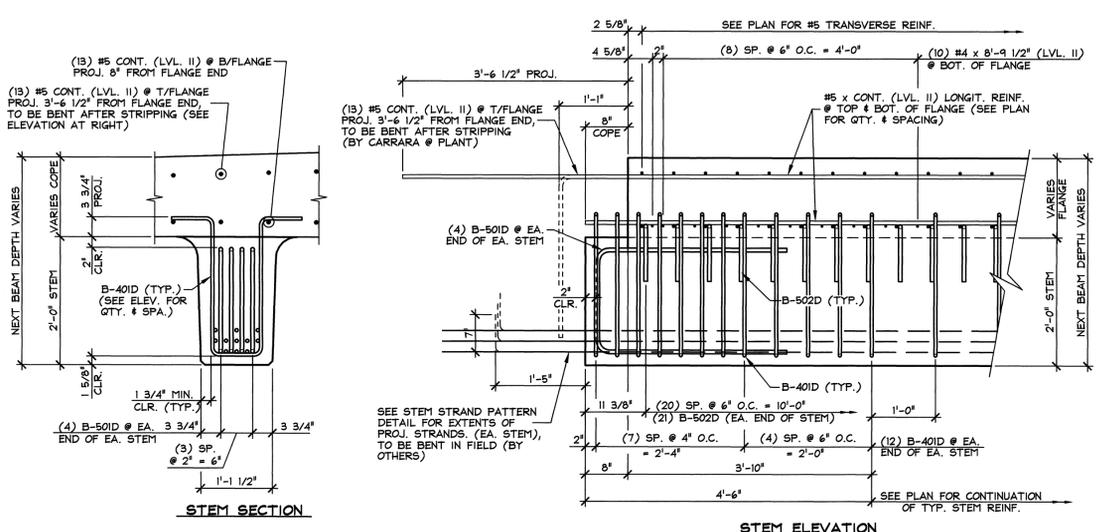
A DIMENSIONAL & REINFORCING SECTION
 NB3
 3/4" = 1'-0"



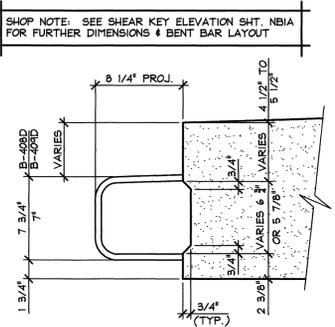
B STEM STRAND PATTERN
 NB3
 1" = 1'-0"



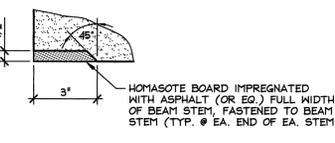
DETENSIONING SCHEDULE
 N.T.S.



D END BLOCK STEM REINFORCING DETAILS
 NB3
 3/4" = 1'-0"



F SHEAR KEY DETAIL
 NB3
 1 1/2" = 1'-0"



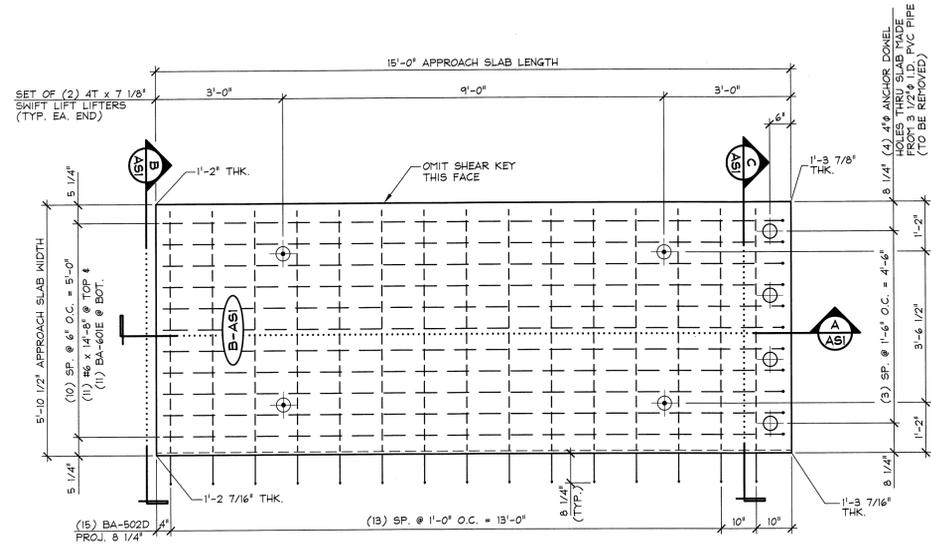
C HOMASOTE DETAIL
 NB3
 3" = 1'-0"

- PRESTRESSING NOTATIONS**
- ▲ DENOTES STRAIGHT STRANDS TO BE DEBONDED 6" FROM EA. END OF EA. STEM
 - ⊕ DENOTES FULLY BONDED STRAIGHT STRANDS EXTENDED 2'-0" FROM EA. END OF EA. STEM
 - ⊖ DENOTES STRAIGHT STRANDS TO BE DEBONDED 8'-0" FROM EA. END OF EA. STEM
 - ⊙ DENOTES STRAIGHT STRANDS TO BE DEBONDED 4'-0" FROM EA. END OF EA. STEM
 - ⊕ DENOTES STRAIGHT STRANDS TO BE DEBONDED 2'-0" FROM EA. END OF EA. STEM
 - ⊖ DENOTES FULLY BONDED STRAIGHT STRANDS TO BE CUT FLUSH W/ EA. END OF EA. STEM

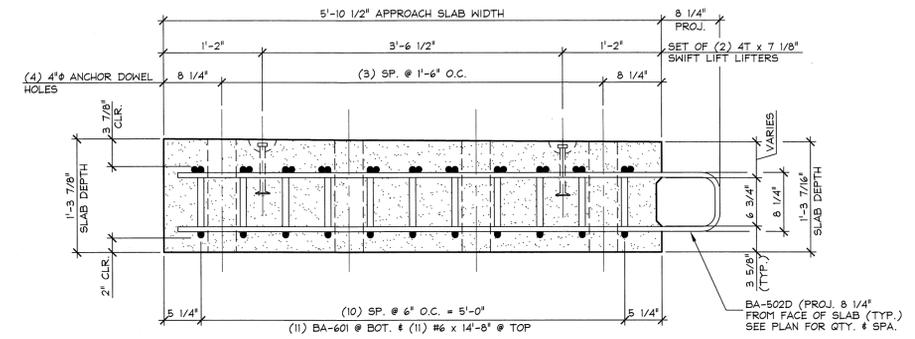
APPROVAL STAMP:

J.P. CARRARA & SONS INC. Precast & Prestress Manufacturer 2464 ORG. ST., MIDDLEBURY, VERMONT 05753 Phone: (802)388-4361 Fax: (802)388-9010		J.P. Sicard CONTRACTOR BARTON, VERMONT	
STATE OF VERMONT AGENCY OF TRANSPORTATION COUNTY OF ORLEANS		DATE: FEB. 25, 2015	
TOWN OF BARTON ROARING BROOK ROAD TH #2, RURAL MINOR COLLECTOR BRIDGE NO.: 8 PROJECT NO.: BRO 1449(31)		SCALE: NOTED	
PRESTRESSED NEXT BEAM DETAILS		CHKD: - DFTM: T.D.	
		JOB NO: 23462-015	
		DWG. NO: NB3	

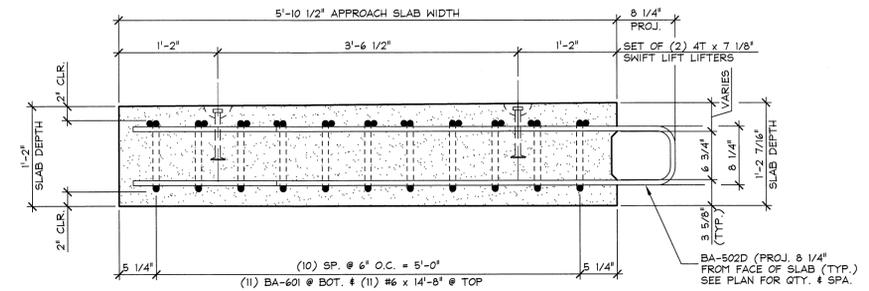
MATERIAL LIST / NEXT BEAM			
ITEM	MARK	DESCRIPTION	QTY.
1	MK-BA1	3/4" F42 FERRULE INSERT (GALV.)	11
2	MK-BA2	DAYTON C-24 TYPE 4-APR DECK FORM HANGER (GALV.)	11
3			
4	B-401D	#4 BENT BAR (LEVEL II, DUAL COATED)	122
5	B-408D	#4 BENT BAR (LEVEL II, DUAL COATED)	45
6	B-409D	#4 BENT BAR (LEVEL II, DUAL COATED)	44
7	B-501D	#5 BENT BAR (LEVEL II, DUAL COATED)	16
8	B-502D	#5 BENT BAR (LEVEL II, DUAL COATED)	42
9	B-508D	#5 BENT BAR (LEVEL II, DUAL COATED)	15
10	B-509D	#5 BENT BAR (LEVEL II, DUAL COATED)	14
11	B-510D	#5 BENT BAR (LEVEL II, DUAL COATED)	13
12	B-511D	#5 BENT BAR (LEVEL II, DUAL COATED)	13
13	B-512D	#5 BENT BAR (LEVEL II, DUAL COATED)	15
14		#4 x 8'-9 1/2" (LEVEL II, DUAL COATED)	20
15		#5 x 8'-9 1/2" (LEVEL II, DUAL COATED)	180
16		#5 x 46'-6" (LEVEL II, DUAL COATED)	13
17		#5 x 52'-3" (LEVEL II, DUAL COATED)	13
18		SET OF (4) 0.60" x 270 KSI STRAND LIFTING LOOPS	4



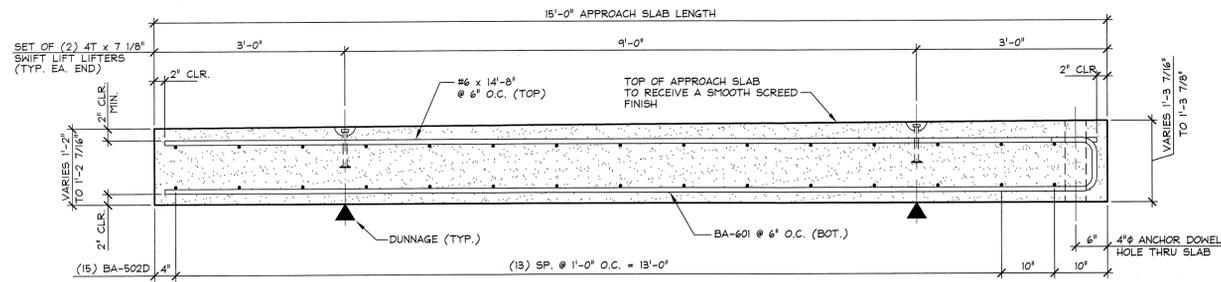
1 PLAN VIEW IN FORM
ASI
1/2" = 1'-0"



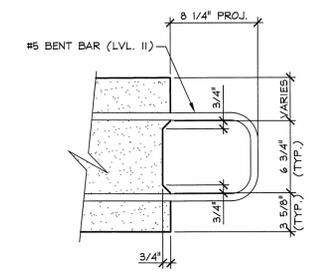
C SECTION
ASI
1" = 1'-0"



B SECTION
ASI
1" = 1'-0"



A LONGITUDINAL SECTION
ASI
3/4" = 1'-0"

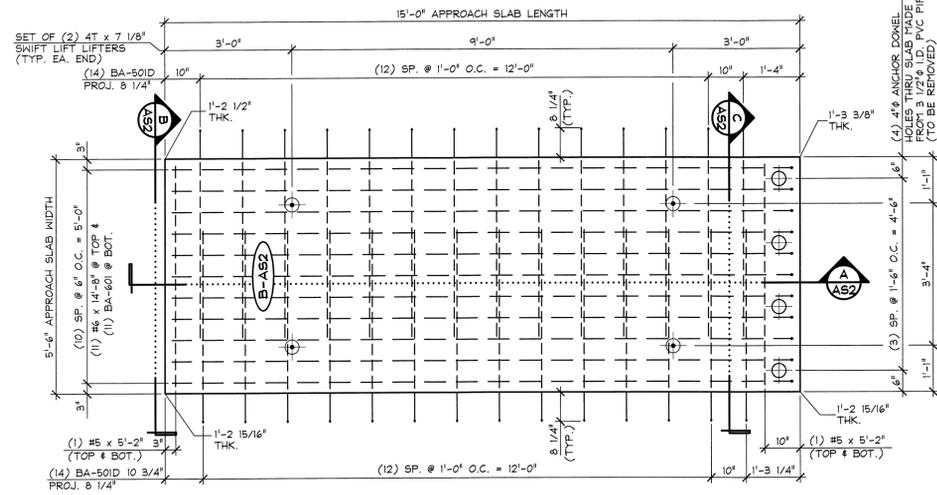


SHEAR KEY DETAIL
1 1/2" = 1'-0"

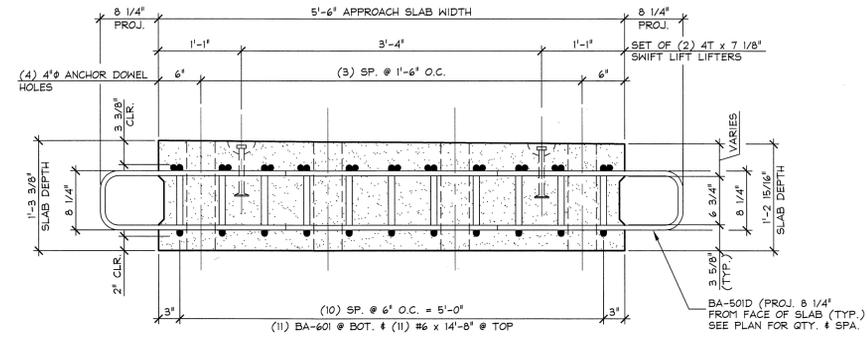
MARK: B-ASI QTY.: 2 WT.: 8.26 T VOL.: 4.08 cy

MATERIAL LIST / APPROACH SLAB			
ITEM	MARK	DESCRIPTION	QTY.
1			
2	BA-502D	#5 BENT BAR (LEVEL II, DUAL COATED)	15
3	BA-601	#6 BENT BAR (LEVEL I)	11
4			
5			
6		#6 x 14'-8" (LEVEL I)	11
7			
8			
9			
10			
11			
12			
13			
14		DAYTON 4T x 7 1/8" SWIFT LIFT	4
15			

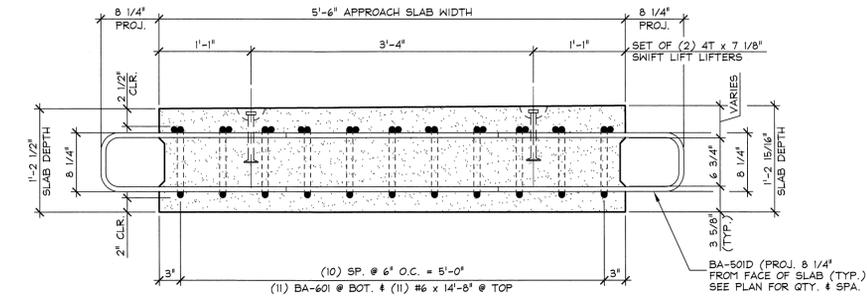
APPROVAL STAMP:	J.P. CARRARA & SONS INC. Precast & Prestress Manufacturer 2464 CASE STR., MIDDLEBURY, VERMONT 05753 Phone:(802)388-6361 Fax:(802)388-9010		J.P. Sicard CONTRACTOR BARTON, VERMONT
	STATE OF VERMONT AGENCY OF TRANSPORTATION COUNTY OF ORLEANS		DATE: FEB. 25, 2015 SCALE: NOTED
	TOWN OF BARTON ROARING BROOK ROAD TH #2, RURAL MINOR COLLECTOR BRIDGE NO.: 8 PROJECT NO.: BRO 1449(31)		CHKD: DFTM: T.D. JOB NO: 23462-015
	APPROACH SLAB DETAILS		DWG. NO: ASI



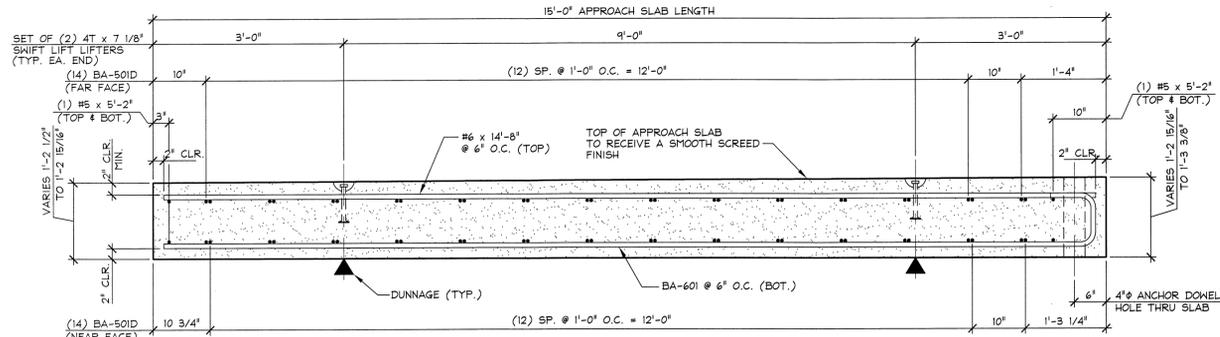
1 PLAN VIEW IN FORM
AS2 1/2" = 1'-0"



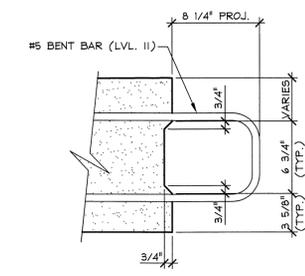
C SECTION
AS2 1" = 1'-0"



B SECTION
AS2 1" = 1'-0"



A LONGITUDINAL SECTION
AS2 3/4" = 1'-0"



SHEAR KEY DETAIL
1 1/2" = 1'-0"

MARK: B-AS2 QTY: 2 WT: 7.73 T VOL: 3.82 cy

MATERIAL LIST / APPROACH SLAB			
ITEM	MARK	DESCRIPTION	QTY.
1			
2	BA-501D	#5 BENT BAR (LEVEL II, DUAL COATED)	28
3	BA-601	#6 BENT BAR (LEVEL I)	11
4			
5			
6		#6 x 14'-8" (LEVEL I)	11
7		#5 x 5'-2" (LEVEL I)	4
8			
9			
10			
11			
12			
13			
14		DAYTON 4T x 7 1/8" SWIFT LIFT	4
15			

APPROVAL STAMP:

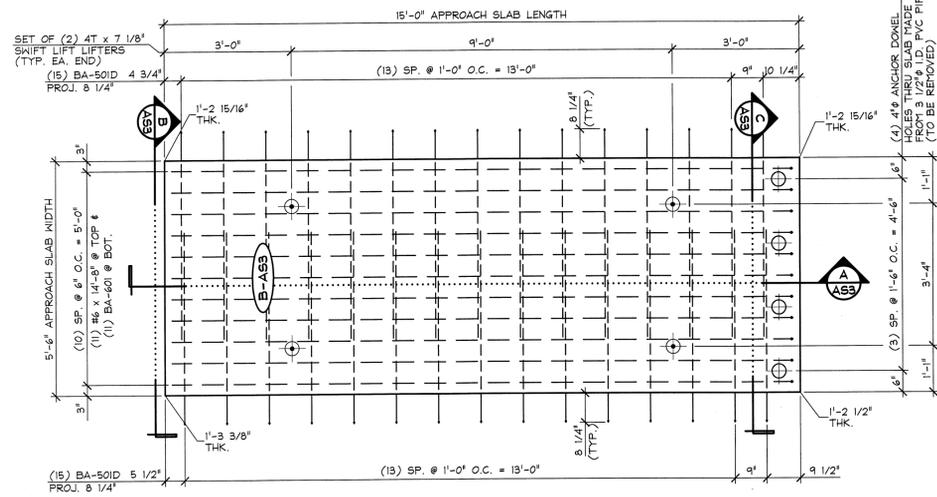
J.P. CARRARA & SONS INC.
Precast & Prestress Manufacturer
2444 CASE STR., MIDDLEBURY, VERMONT 05753 Phone: (802)388-6361 Fax: (802)388-9910

J.P. Sicard
CONTRACTOR
BARTON, VERMONT

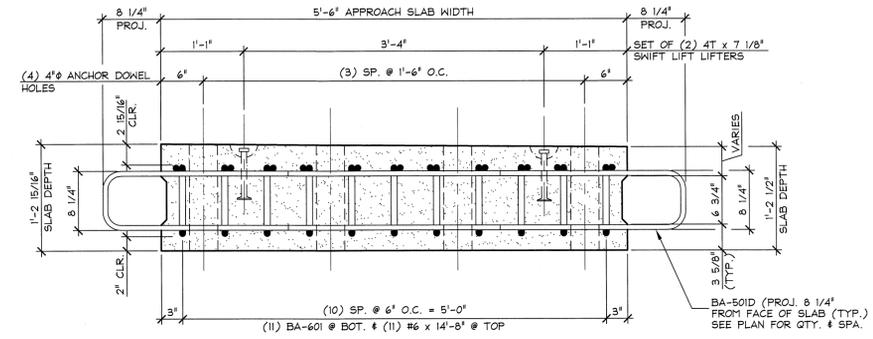
STATE OF VERMONT AGENCY OF TRANSPORTATION
COUNTY OF ORLEANS

TOWN OF BARTON
ROARING BROOK ROAD TH #2, RURAL MINOR COLLECTOR
BRIDGE NO.: 8 PROJECT NO.: BRO 1449(31)

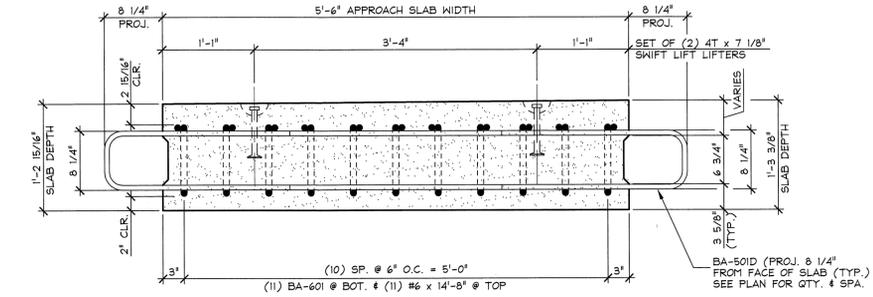
DATE: FEB. 25, 2015
SCALE: NOTED
CHKD: DFTM: T.D.
JOB NO: 23462-015
DWG. NO: AS2



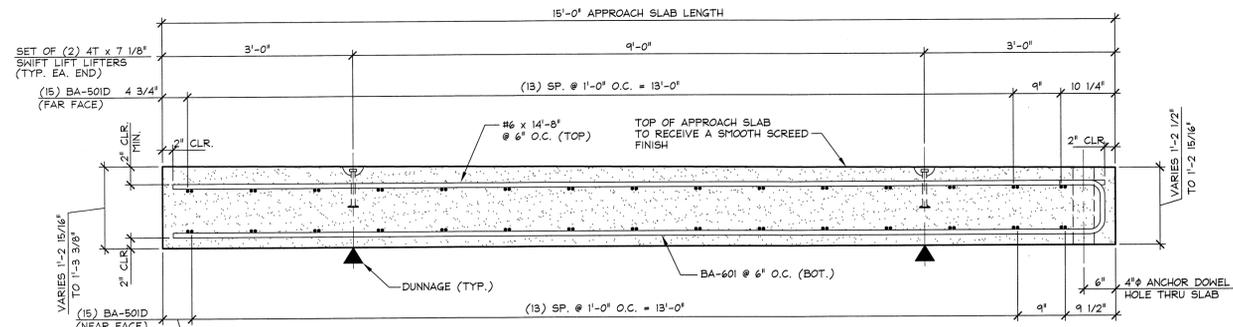
1 PLAN VIEW IN FORM
AS3
1/2" = 1'-0"



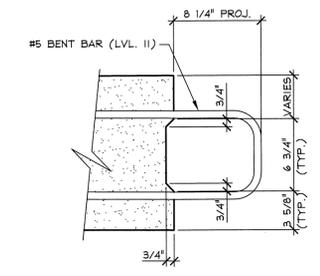
C SECTION
AS2
1" = 1'-0"



B SECTION
AS2
1" = 1'-0"



A LONGITUDINAL SECTION
AS3
3/4" = 1'-0"

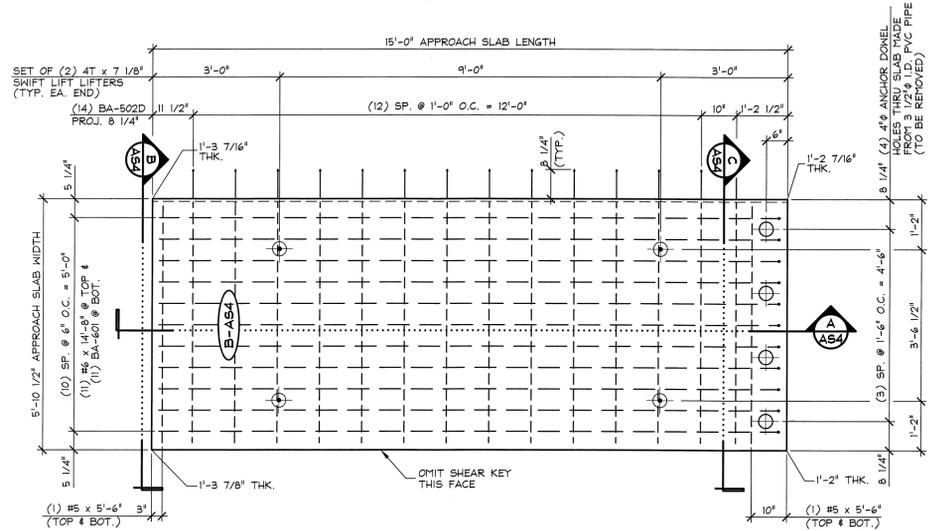


SHEAR KEY DETAIL
1 1/2" = 1'-0"

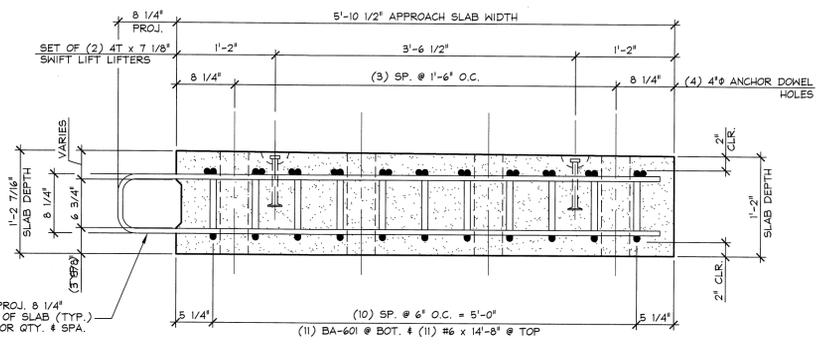
MARK: B-AS3 QTY.: 2 WT.: 7.73 T VOL.: 3.82 cy

MATERIAL LIST / APPROACH SLAB			
ITEM	MARK	DESCRIPTION	QTY.
1			
2	BA-501D	#5 BENT BAR (LEVEL II, DUAL COATED)	30
3	BA-601	#6 BENT BAR (LEVEL I)	11
4			
5			
6		#6 x 14'-8" (LEVEL I)	11
7			
8			
9			
10			
11			
12			
13			
14		DAYTON 4T x 7 1/8" SKIFT LIFT	4
15			

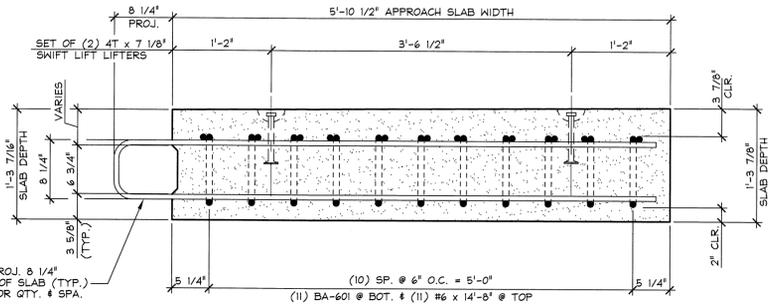
APPROVAL STAMP:	J.P. CARRARA & SONS INC. Precast & Prestress Manufacturer 2464 CASE STR., MIDDLEBURY, VERMONT 05753 Phone:(802)388-6361 Fax:(802)388-9010	J.P. Sicard CONTRACTOR BARTON, VERMONT
	STATE OF VERMONT AGENCY OF TRANSPORTATION COUNTY OF ORLEANS	DATE: FEB. 25, 2015 SCALE: NOTED
	TOWN OF BARTON ROARING BROOK ROAD TH #2, RURAL MINOR COLLECTOR BRIDGE NO.: 8 PROJECT NO.: BRO 1449(31)	CHKD: DFTM: T.D. JOB NO: 23462-015
	APPROACH SLAB DETAILS	DWG. NO: AS3



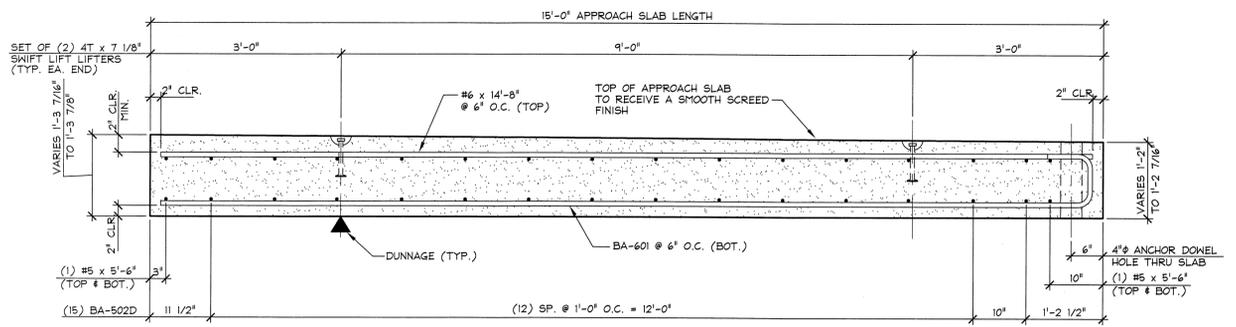
1 PLAN VIEW IN FORM
AS4
1/2" = 1'-0"



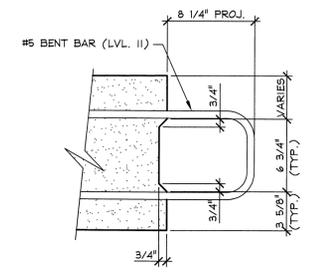
C SECTION
AS4
1" = 1'-0"



B SECTION
AS4
1" = 1'-0"



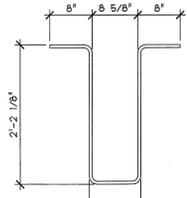
A LONGITUDINAL SECTION
AS4
3/4" = 1'-0"



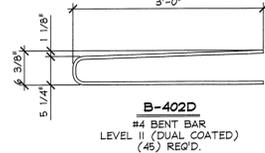
SHEAR KEY DETAIL
1 1/2" = 1'-0"

MARK: B-AS4		QTY.: 2	WT.: 8.26 T	VOL.: 4.08 cy
MATERIAL LIST / APPROACH SLAB				
ITEM	MARK	DESCRIPTION	QTY.	
1				
2	BA-502D	#5 BENT BAR (LEVEL II, DUAL COATED)	14	
3	BA-601	#6 BENT BAR (LEVEL I)	11	
4				
5				
6		#6 x 14'-8" (LEVEL I)	11	
7		#5 x 5'-6" (LEVEL I)	4	
8				
9				
10				
11				
12				
13				
14		DAYTON 4T x 7 1/8" SWIFT LIFT	4	
15				

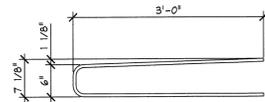
APPROVAL STAMP:	J.P. CARRARA & SONS INC. Precast & Prestress Manufacturer 2484 CASE ST., MIDDLEBURY, VERMONT 05753 Phone: (802) 388-6361 Fax: (802) 388-9010		J.P. Sicard CONTRACTOR BARTON, VERMONT	
	STATE OF VERMONT AGENCY OF TRANSPORTATION COUNTY OF ORLEANS		DATE: FEB. 25, 2015	
	TOWN OF BARTON ROARING BROOK ROAD TH #2, RURAL MINOR COLLECTOR BRIDGE NO.: 8 PROJECT NO.: BRO 1449(31)		SCALE: NOTED	
	APPROACH SLAB DETAILS		CHKD: DFTM: T.D. JOB NO: 23462-015 DWG. NO: AS4	



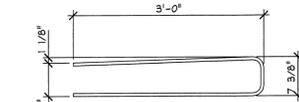
B-401D
#4 BENT BAR
LEVEL II (DUAL COATED)
(366) REQ'D.



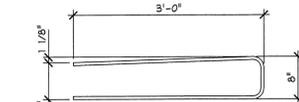
B-402D
#4 BENT BAR
LEVEL II (DUAL COATED)
(45) REQ'D.



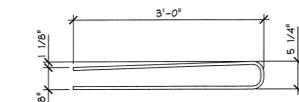
B-403D
#4 BENT BAR
LEVEL II (DUAL COATED)
(44) REQ'D.



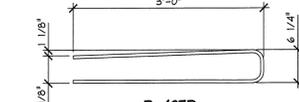
B-404D
#4 BENT BAR
LEVEL II (DUAL COATED)
(45) REQ'D.



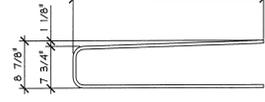
B-405D
#4 BENT BAR
LEVEL II (DUAL COATED)
(45) REQ'D.



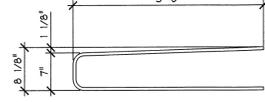
B-406D
#4 BENT BAR
LEVEL II (DUAL COATED)
(45) REQ'D.



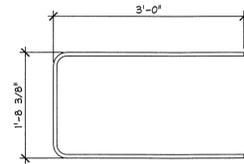
B-407D
#4 BENT BAR
LEVEL II (DUAL COATED)
(45) REQ'D.



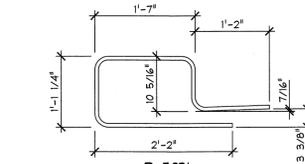
B-408D
#4 BENT BAR
LEVEL II (DUAL COATED)
(45) REQ'D.



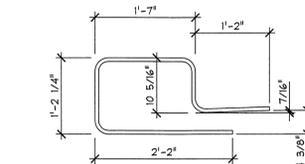
B-409D
#4 BENT BAR
LEVEL II (DUAL COATED)
(45) REQ'D.



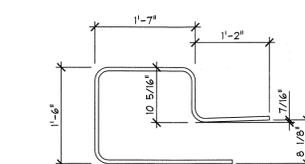
B-501D
#5 BENT BAR
LEVEL II (DUAL COATED)
(48) REQ'D.



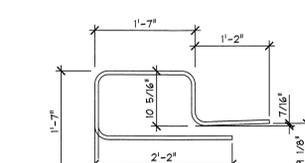
B-503L
#5 BENT BAR
LEVEL II (DUAL COATED)
(15) REQ'D.



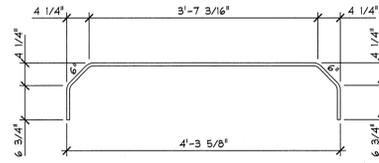
B-504L
#5 BENT BAR
LEVEL II (DUAL COATED)
(15) REQ'D.



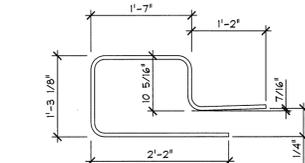
B-506D
#5 BENT BAR
LEVEL II (DUAL COATED)
(15) REQ'D.



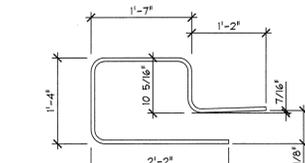
B-509D
#5 BENT BAR
LEVEL II (DUAL COATED)
(14) REQ'D.



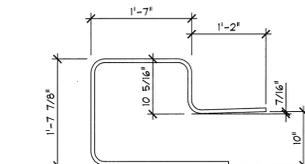
B-502D
#5 BENT BAR
LEVEL II (DUAL COATED)
(126) REQ'D.



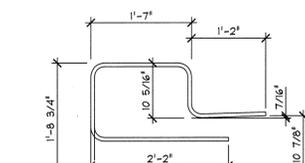
B-505L
#5 BENT BAR
LEVEL II (DUAL COATED)
(15) REQ'D.



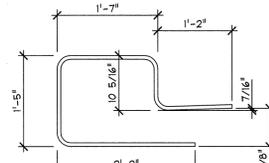
B-506L
#5 BENT BAR
LEVEL II (DUAL COATED)
(15) REQ'D.



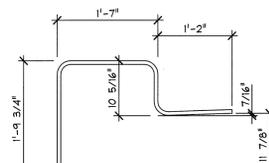
B-510D
#5 BENT BAR
LEVEL II (DUAL COATED)
(15) REQ'D.



B-511D
#5 BENT BAR
LEVEL II (DUAL COATED)
(15) REQ'D.



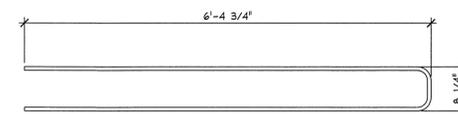
B-507L
#5 BENT BAR
LEVEL II (DUAL COATED)
(15) REQ'D.



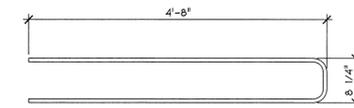
B-512D
#5 BENT BAR
LEVEL II (DUAL COATED)
(15) REQ'D.

MISCELLANEOUS MATERIALS				P/S NEXT BEAMS	
ITEM	MARK	QTY.	DESCRIPTION	REMARKS	
1	B-401D	366	#4 BENT BAR (LEVEL II, DUAL COATED)		
2	B-402D	45	#4 BENT BAR (LEVEL II, DUAL COATED)		
3	B-403D	44	#4 BENT BAR (LEVEL II, DUAL COATED)		
4	B-404D	45	#4 BENT BAR (LEVEL II, DUAL COATED)		
5	B-405D	45	#4 BENT BAR (LEVEL II, DUAL COATED)		
6	B-406D	45	#4 BENT BAR (LEVEL II, DUAL COATED)		
7	B-407D	45	#4 BENT BAR (LEVEL II, DUAL COATED)		
8	B-408D	45	#4 BENT BAR (LEVEL II, DUAL COATED)		
9	B-409D	45	#4 BENT BAR (LEVEL II, DUAL COATED)		
10	B-501D	48	#5 BENT BAR (LEVEL II, DUAL COATED)		
11	B-502D	126	#5 BENT BAR (LEVEL II, DUAL COATED)		
12	B-503D	15	#5 BENT BAR (LEVEL II, DUAL COATED)		
13	B-504D	13	#5 BENT BAR (LEVEL II, DUAL COATED)		
14	B-505D	13	#5 BENT BAR (LEVEL II, DUAL COATED)		
15	B-506D	13	#5 BENT BAR (LEVEL II, DUAL COATED)		
16	B-507D	15	#5 BENT BAR (LEVEL II, DUAL COATED)		
17	B-508D	15	#5 BENT BAR (LEVEL II, DUAL COATED)		
18	B-509D	14	#5 BENT BAR (LEVEL II, DUAL COATED)		
19	B-510D	13	#5 BENT BAR (LEVEL II, DUAL COATED)		
20	B-511D	13	#5 BENT BAR (LEVEL II, DUAL COATED)		
21	B-512D	15	#5 BENT BAR (LEVEL II, DUAL COATED)		
22					
23		60	#4 x 8'-9 1/2" (LEVEL II, DUAL COATED)		
24		540	#5 x 8'-9 1/2" (LEVEL II, DUAL COATED)		
25		39	#5 x 46'-6" (LEVEL II, DUAL COATED)		
26		39	#5 x 52'-3" (LEVEL II, DUAL COATED)		
27		12	SET OF (4) 0.60" STRAND LIFTING LOOPS		
28	MK-BA1	44	3/4" F42 FERRULE INSERT (GALV.)		
29	MK-BA2	22	DAYTON C-24 TYPE 4-APR DECK FORM HANGER (GALV.)		

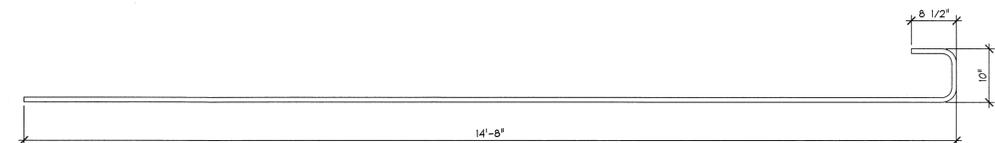
MISCELLANEOUS MATERIALS				P/C APPROACH SLABS	
ITEM	MARK	QTY.	DESCRIPTION	REMARKS	
1	BA-501D	116	#4 BENT BAR (LEVEL II, DUAL COATED)		
2	BA-502D	58	#4 BENT BAR (LEVEL II, DUAL COATED)		
3	BA-601	88	#4 BENT BAR (LEVEL I)		
4					
5					
6		88	#6 x 14'-8" (LEVEL I)		
7		8	#5 x 5'-2" (LEVEL I)		
8		8	#5 x 5'-6" (LEVEL I)		
9					
10		32	DAYTON 4T x 7 1/8" SWIFT LIFT		



BA-502D
#5 BENT BAR
LEVEL II (DUAL COATED)
(58) REQ'D.

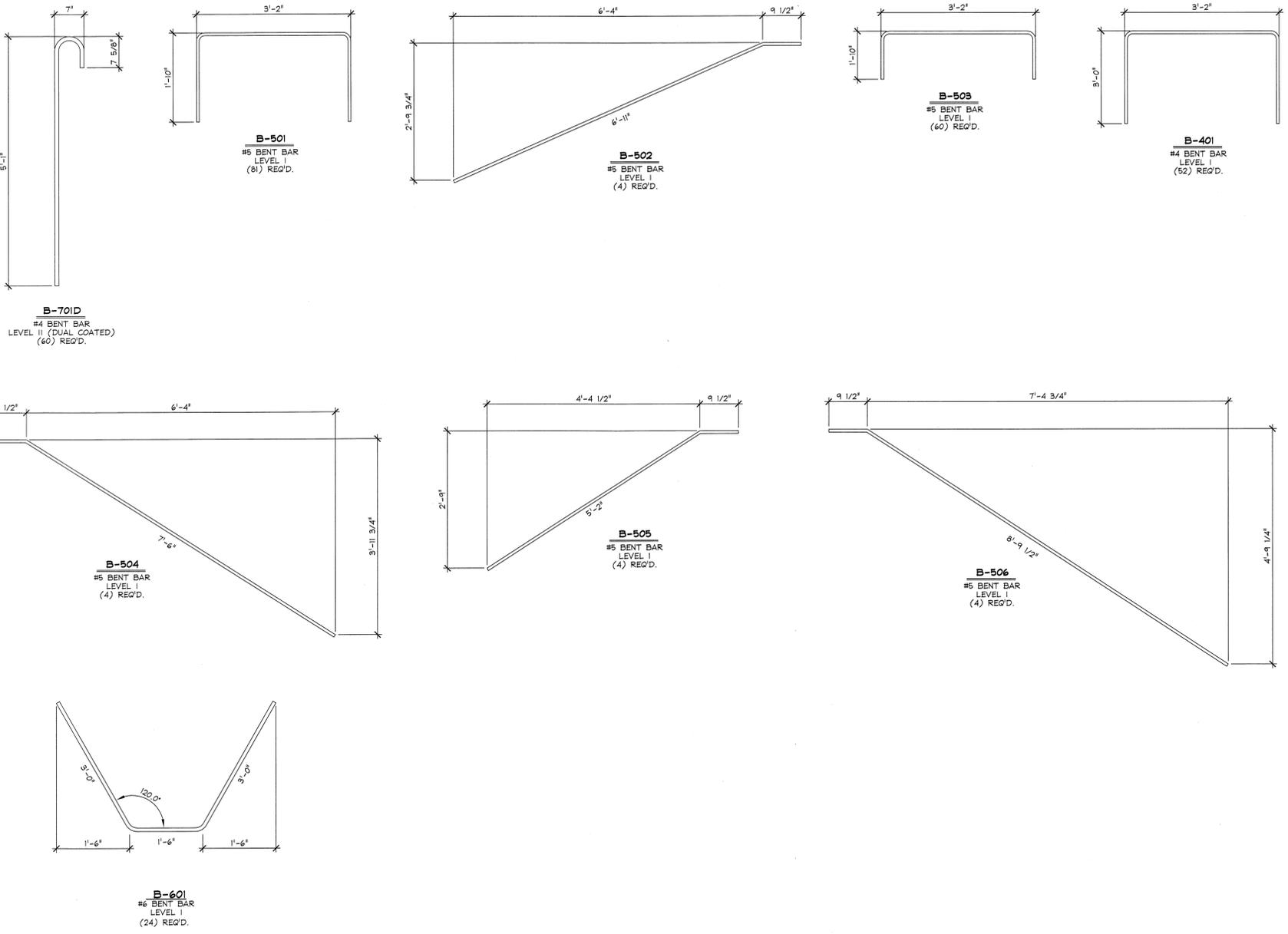


BA-501D
#5 BENT BAR
LEVEL II (DUAL COATED)
(116) REQ'D.



BA-601
#6 BENT BAR
LEVEL I
(88) REQ'D.

APPROVAL STAMP:	J.P. CARRARA & SONS INC. Precast & Prestress Manufacturer 2464 CASE STR., WOODBURY, VERMONT 05753 Phone:(802)388-6361 Fax:(802)388-9010	J.P. Sicard CONTRACTOR BARTON, VERMONT
	STATE OF VERMONT AGENCY OF TRANSPORTATION COUNTY OF ORLEANS	
	TOWN OF BARTON ROARING BROOK ROAD TH #2, RURAL MINOR COLLECTOR BRIDGE NO.: 8 PROJECT NO.: BRO 1449(31)	
	NEXT BEAM MATERIAL LIST	
	DATE: FEB. 25, 2015	
	SCALE: NOTED	
	CHKD: - DFTM: T.D.	
	JOB NO: 23462-015	
	DWG. NO: M1	



MISCELLANEOUS MATERIALS				
ITEM	MARK	QTY.	DESCRIPTION	REMARKS
1	B-401	52	#4 BENT BAR (LEVEL I)	
2	B-501	81	#5 BENT BAR (LEVEL I)	
3	B-502	4	#5 BENT BAR (LEVEL I)	
4	B-503	60	#5 BENT BAR (LEVEL I)	
5	B-504	4	#5 BENT BAR (LEVEL I)	
6	B-505	4	#5 BENT BAR (LEVEL I)	
7	B-506	4	#5 BENT BAR (LEVEL I)	
8	B-601	24	#6 BENT BAR (LEVEL I)	
9	B-701D	60	#7 BENT BAR (LEVEL II, DUAL COATED)	
10				
11		48	#5 x 3'-10" (LEVEL II, DUAL COATED)	
12		60	#5 x 4'-6" (LEVEL II, DUAL COATED)	
13				
14		4	#5 x 2'-0" (LEVEL I)	
15		4	#5 x 3'-7" (LEVEL I)	
16		2	#5 x 3'-8" (LEVEL I)	
17		2	#5 x 2'-9" (LEVEL I)	
18		2	#5 x 4'-5" (LEVEL I)	
19		6	#5 x 5'-1" (LEVEL I)	
20		2	#5 x 5'-11" (LEVEL I)	
21		2	#5 x 6'-2" (LEVEL I)	
22		2	#5 x 6'-8" (LEVEL I)	
23		4	#5 x 7'-1" (LEVEL I)	
24				
25		4	#6 x 1'-3" (LEVEL I)	
26		4	#6 x 2'-1" (LEVEL I)	
27		12	#6 x 2'-2" (LEVEL I)	
28		8	#6 x 3'-3" (LEVEL I)	
29		4	#6 x 4'-4" (LEVEL I)	
30		32	#6 x 4'-10" (LEVEL I)	
31		14	#6 x 1'-7" (LEVEL I)	
32		14	#6 x 2'-7" (LEVEL I)	
33		14	#6 x 2'-8" (LEVEL I)	
34		12	#6 x 2'-7" (LEVEL I)	
35		2	#6 x 2'-11" (LEVEL I)	
36				
37		68	#7 x 5'-9" (LEVEL I)	
38		68	#7 x 6'-1" (LEVEL I)	
39		4	#7 x 5'-8" (LEVEL I)	
40		2	#7 x 6'-3" (LEVEL I)	
41		2	#7 x 7'-8" (LEVEL I)	
42		4	#7 x 7'-7" (LEVEL I)	
43		4	#7 x 6'-11" (LEVEL I)	
44		2	#7 x 6'-4" (LEVEL I)	
45		2	#7 x 7'-6" (LEVEL I)	
46		2	#7 x 8'-2" (LEVEL I)	
47		2	#7 x 8'-3" (LEVEL I)	
48		4	#7 x 8'-0" (LEVEL I)	
49		2	#7 x 8'-6" (LEVEL I)	
50		2	#7 x 8'-7" (LEVEL I)	
51		4	#7 x 8'-9" (LEVEL I)	
52		2	#7 x 8'-10" (LEVEL I)	
53		2	#7 x 9'-3" (LEVEL I)	
54		2	#7 x 9'-2" (LEVEL I)	
55		4	#7 x 9'-4" (LEVEL I)	
56		4	#7 x 9'-7" (LEVEL I)	
57		2	#7 x 9'-8" (LEVEL I)	
58		4	#7 x 9'-11" (LEVEL I)	
59		4	#7 x 10'-3" (LEVEL I)	
60		8	#7 x 10'-4" (LEVEL I)	
61		2	#7 x 10'-0" (LEVEL I)	
62				
63				
64		4	2'-0" x 6'-2 7/8" CORRUGATED STEEL PIPE (GALV.)	
65		4	2'-0" x 6'-7 1/8" CORRUGATED STEEL PIPE (GALV.)	
25		1	2'-0" x 9'-3 1/2" CORRUGATED STEEL PIPE (GALV.)	
25		1	2'-0" x 7'-11 1/8" CORRUGATED STEEL PIPE (GALV.)	
25		1	2'-0" x 8'-8" CORRUGATED STEEL PIPE (GALV.)	
25		1	2'-0" x 8'-7 1/2" CORRUGATED STEEL PIPE (GALV.)	

APPROVAL STAMP:	J.P. CARRARA & SONS INC. Precast & Prestress Manufacturer 2464 CASE STR., MIDDLEBURY, VERMONT 05753 Phone:(802)388-6361 Fax:(802)388-9010		J.P. Sicard CONTRACTOR BARTON, VERMONT
	STATE OF VERMONT AGENCY OF TRANSPORTATION COUNTY OF ORLEANS		DATE: FEB. 25, 2015 SCALE: NOTED
	TOWN OF BARTON ROARING BROOK ROAD TH #2, RURAL MINOR COLLECTOR BRIDGE NO.: 8 PROJECT NO.: BRO 1449(31)		CHKD: - DFTM: T.D. JOB NO: 23462-015
	PRECAST ABUTMENT MATERIAL LIST		DWG. NO: M2



LIFTING LOOP/LIFTING INJECT DESIGN CALCULATIONS
(WORK W/ CARRARA SHOP DWGS)

APPROACH SLABS

$f'_c = 5000 \text{ PSI}$ $f'_{cu} = 3500 \text{ PSI}$

WT OF HEAVIEST APPROACH SLAB = $8.26^T \approx 16.52^K$

THERE ARE (4) LIFT POINTS

ASSUME 60° SLING ANGLE W/THE HORIZONTAL

DESIGN LOAD/LIFT POINT = $\frac{16.52}{4 \times 0.866} = 4.77^K$

FROM ATTACHED PRODUCT LITERATURE, P 24

USE $4^T \times 7\frac{1}{8}^"$ S.L. SWL (9:1 S.F.) = 8000 LB > 4.77^K, OK

NOTE 1 LOCATE LIFTERS APPROX $e/5$ POINTS E.W. CENTER LIFTER PATTERN ON C.C. OF SLAB

NOTE 2 MIN EDGE DISTANCE OF 20" IS APPLICABLE WHEN LIFTERS ARE USED IN SHEAR. IN THIS APPLICATION THE LIFTERS ARE PRIMARILY IN TENSION AND THE MIN EDGE DISTANCE IS APPROX = $7\frac{1}{8} + 9/16 + 1\frac{7}{8} = 8.625"$, SAY 10". SEE ATTACHED PRODUCT LITERATURE, P 24 FOR LIFTER DIM. & INSTALLATION DIM. SHEAR CODE IS SIM TO HEADER STU. SEE FIG 4.5.3 OF PCI DESIGN HANDBOOK, ATTACHED.

NEXT BEAMS

$f'_c = 6000 \text{ psi}$

$f'_{LL} = 4000 \text{ psi}$

WEIGHT OF HEAVIEST NEXT BEAM = 108780 LB (NB-3)

AND HEAVIEST VERTICAL LIFTED LOAD IS

$0.27 \times 108780 = 29371 \text{ LB}$, SEE NEXT BEAM

SUMMARY OF LOAD DISTRIBUTION / BEAM WEIGHT / ATTACH

ASSUME 60° MIN SLING ANGLE W/ THE HORIZONTAL

DESIGN LOAD / LIFTED = $\frac{29371}{0.866} = 33915 \text{ LB}$
 $= 33.9 \text{ K}$

FROM ATTACHED PCI LITERATURE TABLE 5.2.3

BY INTERPOLATION BETWEEN VERTICAL / 45° LIFT

USE (+) 2.600" ϕ X 270 KIL STRAIN LIFT LOOP, MIN

LIBRO 2'-6", SWL (4.1 S.F)
 $= \left[23 + \frac{30-28}{34-28} (29-23) + 33 + \frac{30-28}{34-28} (41-33) \right] \frac{1.1}{2}$
 $= (25 + 35.67) / 1.1 = 33.4 \text{ K} \leq 33.9 \text{ K}$, BUT OK
(W/ ACCEPT)

ALSO CHECK USING PCI REC 4.15.7A, CASE 3, ATTACH

$\phi P_n = 0.85 \times 2.67 \sqrt{4000} \left(\frac{14}{4} \right) \left(\frac{~6'' + 2 \times 36''}{1000} \right)$
 $= 135 \text{ K}$
LIFT LOOP SIZE

FOR 4.1 S.F

$SWL = \frac{135}{4} = 33.7 \text{ K} \leq 33.9 \text{ K}$, BUT OK
(W/ ACCEPT)

ABUTMENTS

$f'_c = 5000 \text{ PSI}$

~~$f'_w = 3500 \text{ PSI}$~~

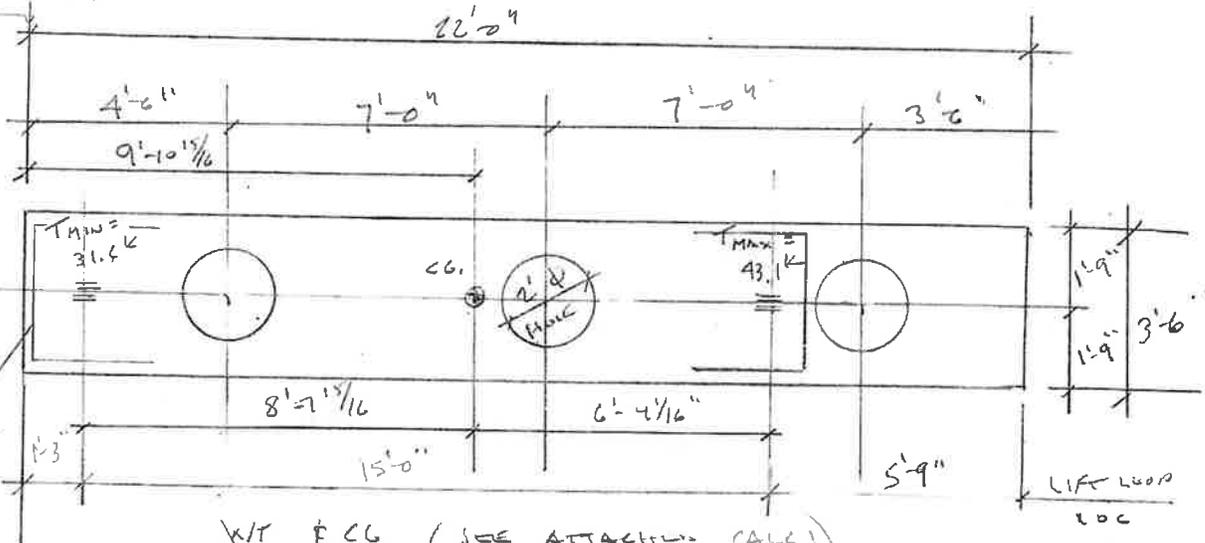
REUSE $f'_c = 5000 \text{ PSI}$

B-AB1

WT 37.33T

PLAN VIEW

CHEEK WALL
END



WT @ CG (SEE ATTACHMENT CALLS)

$WT = 37.33T = 74.66 \text{ K}$

$T_{MAX} = \frac{8'-7 \frac{1}{16}}{15'} \times 74.66 = 43.1 \text{ K}$

$T_{MIN} = 74.66 - 43.1 = 31.6 \text{ K}$

USE (4) 0.600" ϕ X 270 KSI STRAND LIFT LOOP

MIN. EMBED 6'-0" @ 43.1 K LOC ϕ

MIN EMBED TO WITHIN 2" OF B/ABUT ϕ 31.6 K LOC, SEE SKETCH ABOVE

FROM ATTACHMENT TABLE 5.2.3 OF PCI DESIGN HANDBOOK

$SWL(4:1 \text{ S.F.}) = 1.1 \times 41.0 = 45.1 \text{ K} > 43.1 \text{ K} > 31.6 \text{ K}, \text{ O.K.}$

ALSO CHECK SWL USING PCI FIG 6.15.7A (CASE C), ATTACHMENT

$\phi P_{ci} = 0.85 \times 2.6 \sqrt{3500} (42)(42) / 1000 = 237 \text{ K} \phi$

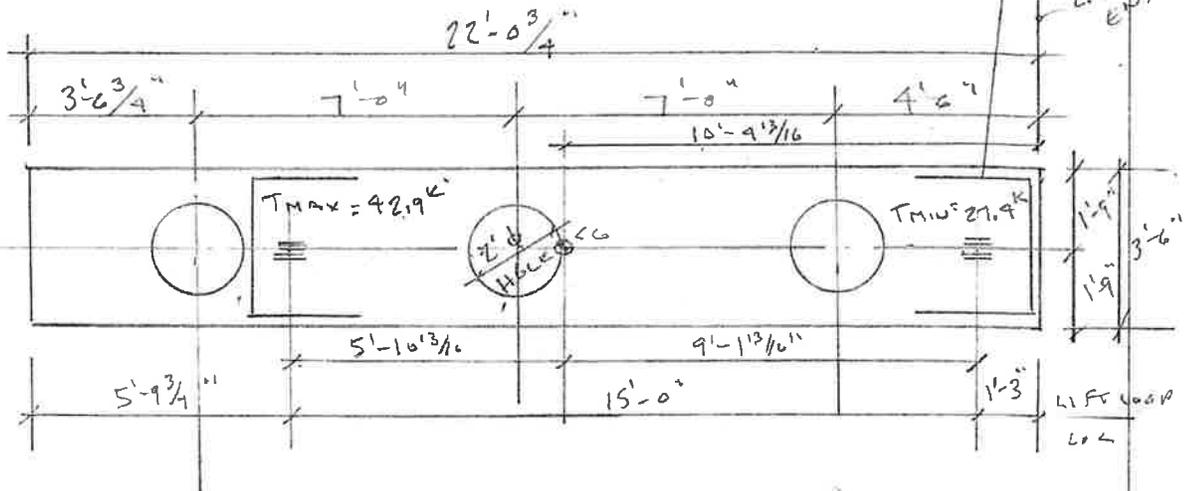
FOR S.F. = 4:1

$SWL = \frac{237}{4} = 59 \text{ K} > 43.1 \text{ K} > 31.6 \text{ K}, \text{ O.K.}$

B-ABZ
PLAN VIEW

WT 35.13^T

ADD 2" @ 6" O/C
TOP



WT @ CC (SEE ATTACHED CALLS)

$$WT = 35.13^T = 70.26^K$$

$$T_{MAX} = \frac{9'-1 \frac{13}{16}}{15'-0} \times 70.26 = 42.9^K$$

$$T_{MIN} = 70.26 - 42.9 = 27.9^K$$

USE (4) 0.600" ϕ X 270 KSI STRAND LIFT LOOP

MIN EMBEDMENT 1'-0" @ 42.9^K LOC &

MIN EMBEDMENT TO WITHIN 2" OF B/ABUT \mp @ 27.9^K LOC.

SEE SKETCH ABOVE

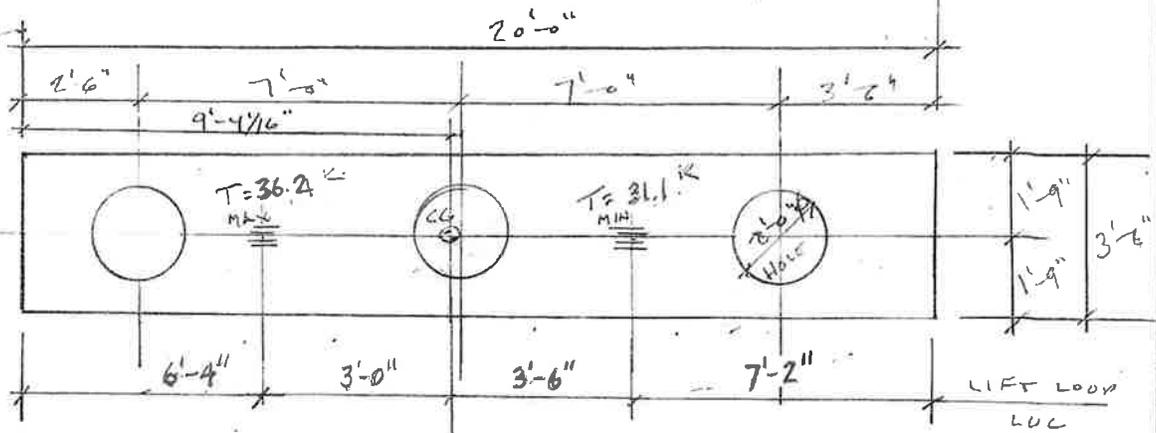
ALSO CHECK SWL USING PCI FIG 6.15.7A CASE 6, ATTACHED

O.K. BY B-AB1 SIM CALC

B-AB3
PLAN VIEW

WT 33.64^T

CHEEK WALL
END



WT & CG (SEE ATTACHED CALC)

WT & CC, (SEE ATTACHED CALC)

$$WT = 33.64^T = 47.28^k$$

$$T_{MAX} = \frac{3'-6''}{6'-6''} \times 47.28 = 36.2^k$$

$$T_{HI} = 47.28 - 36.2 = 31.1^k$$

USE (A) 0.600" 4 X 271 ksi STRAND LIFT LOOP

MIN. EMB. IS 6'-5" SEE SKETCH ABOVE

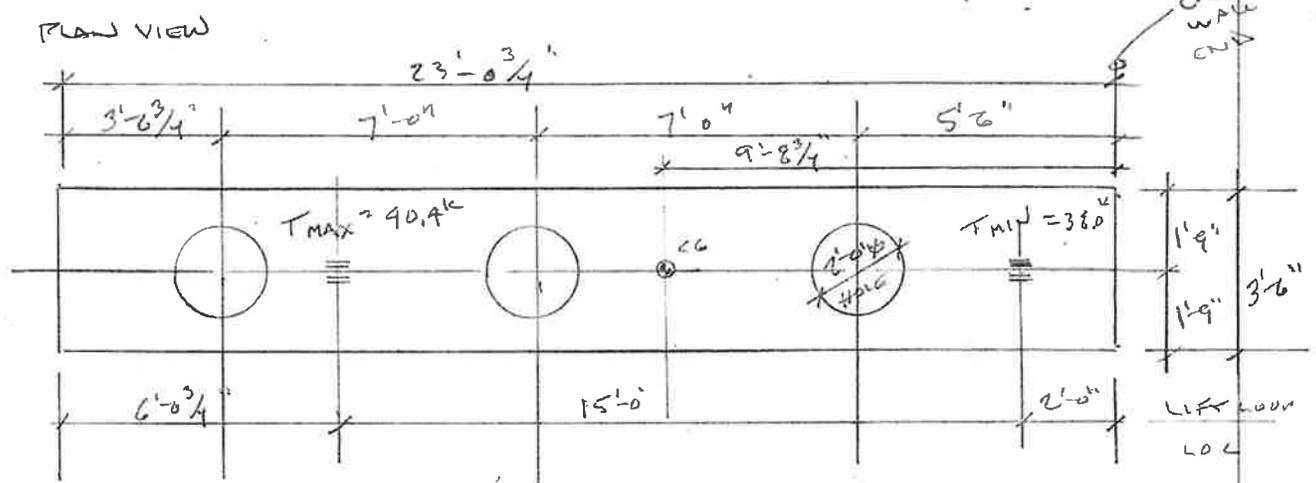
FROM ATTACHED TABLE 5.2.3 OF PCI DESIGN HANDBOOK

$$SWL(4:1 S.F.) = 1.1 \times 41.0 = 45.1^k > 36.2^k > 31.1^k, \text{ O.K.}$$

ALSO CHECK SWL USING PCI FIG 6.15.7A CASE C, 4 STRANDS

O.K. BY B-AB1 SIM CALC.

B-AB4 WT 39.22^T



WT & CG. (SEE ATTACHED CALC)

$$WT = 39.22^T = 78.44^k$$

$$T_{MAX} = \frac{7'-8\frac{3}{4}"}{15'} \times 78.44 = 40.4^k$$

$$T_{MIN} = 78.44 - 40.42 = 38.0$$

USE (4) 0.600" φ x 270 KW STRAIN LIFT LOOP

MIN EMBED 6'-5" @ 40.4^k LOC &

MIN EMBED TO WITHIN 2" OF B/ABOUT @ 38.0^k LOC

SEE SKETCH ABOVE

ALSO CHECK SWL USING PCI FIG 6.15.7A CASE 6,
ATTACHED

OK. BY B-AB1 SIM CALC

P-52 Swift Lift® Anchor Tensile and Shear Capacity

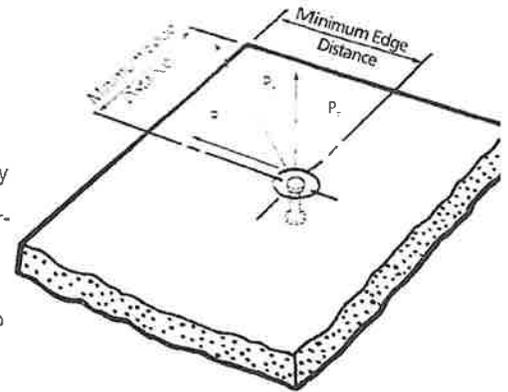
When anchors are used in the face of thin concrete elements

The following table lists the P-52 Swift Lift Anchors that are currently manufactured. Other sizes and lengths are available on special order. However, the sizes and lengths of anchors shown will handle the majority of flat precast concrete elements.

When the P-52 Swift Lift Anchor is properly embedded in normal weight concrete, the tabulated working loads are applicable for any direction of load. This applies even if the direction of load is parallel to the axis of the anchor, perpendicular to it or at any other angle.

Minimum distance between anchors is twice the minimum edge distance.

It is critical to remember that in order to obtain the safe working loads listed in the table below, the normal weight concrete must have obtained the minimum concrete strength shown, prior to initial load application.



Swift Lift Anchor Ton x Length	Safe Working Load	Minimum Concrete Strength	Minimum Edge Distance
1 ton x 2-5/8"	1,700 lbs.	3,500 psi	8"
1 ton x 3-3/8"	2,000 lbs.	2,200 psi	10"
1 ton x 4-3/8"	2,000 lbs.	1,600 psi	10"
1 ton x 8"	2,000 lbs.	1,600 psi	10"
1 ton x 9-1/2"	2,000 lbs.	1,600 psi	10"
2 ton x 2-3/4"	2,100 lbs.	3,500 psi	8"
2 ton x 3-3/8"	2,900 lbs.	3,500 psi	10"
2 ton x 5-1/2"	4,000 lbs.	1,600 psi	13"
2 ton x 6"	4,000 lbs.	1,600 psi	13"
2 ton x 6-3/4"	4,000 lbs.	1,600 psi	13"
2 ton x 11"	4,000 lbs.	1,600 psi	14"
4 ton x 3-3/4"	4,000 lbs.	3,500 psi	12"
4 ton x 4-1/4"	4,900 lbs.	3,500 psi	13"
4 ton x 4-3/4"	5,800 lbs.	3,500 psi	14"
4 ton x 5-1/2"	7,400 lbs.	3,500 psi	17"
4 ton x 5-3/4"	7,900 lbs.	3,500 psi	17"
4 ton x 7-1/8"	8,000 lbs.	1,800 psi	20"
4 ton x 9-1/2"	8,000 lbs.	1,600 psi	17"
4 ton x 14"	8,000 lbs.	1,600 psi	18"
4 ton x 19"	8,000 lbs.	1,600 psi	20"
8 ton x 4-3/4"	6,400 lbs.	3,500 psi	16"
8 ton x 6-3/4"	11,200 lbs.	3,500 psi	21"
8 ton x 10"	16,000 lbs.	3,500 psi	19"
8 ton x 13-3/8"	16,000 lbs.	1,600 psi	23"
8 ton x 26-3/4"	16,000 lbs.	1,600 psi	27"
20 ton x 10"	25,000 lbs.	3,500 psi	24"
20 ton x 19-3/4"	40,000 lbs.	3,500 psi	31"

Safe Working Loads provide a factor of safety of approximately 4 to 1 in normal weight concrete. Safe Working Load is based on anchor setback from face of concrete "X" dimension, as shown on page 26.

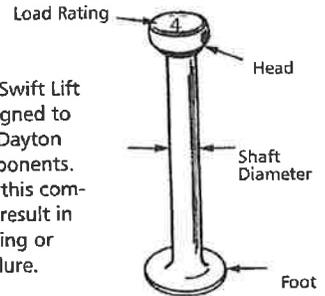
P-52 Swift Lift® Anchor

The P-52 Swift Lift Anchor is hot forged from carbon steel. The formed head provides spherical seating that the Lifting Eye engages, while a disc-shaped foot is embedded in the concrete.

Due to its being a forged part, the Swift Lift Anchor does not depend on welds or thread engagement to develop its safe working load. Forging provides maximum safety with its advantageous material structure. This allows the anchor to easily meet the OSHA requirement of a 4 to 1 factor of safety.

In addition to the carbon steel anchors, Type 304 or 316 Stainless Steel Swift Lift Anchors are available on special order. Use stainless steel anchors when maximum protection against corrosion is required.

For safety, refer to the P-52 Swift Lift Anchor Selection Chart on page 31 to determine the actual safe working load of an individual anchor. The MAXIMUM safe working load is clearly visible on the head of the anchor for easy recognition of the appropriate hardware and accessories for use with each Swift Lift Anchor.®



Caution: The Swift Lift Anchor is designed to be used with Dayton Superior components. Failure to use this combination may result in concrete spalling or premature failure.

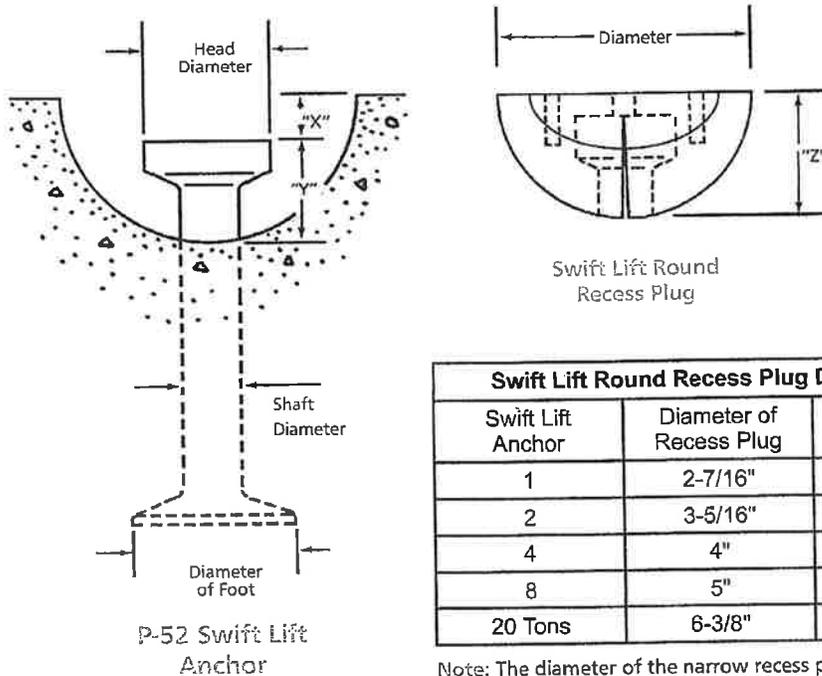
To Order:

Specify: (1) quantity, (2) name, (3) system size, (4) length

Example:

200, P-52 Swift Lift Anchors, 4 ton, 9-1/2" long

P-52 Swift Lift Anchor and Recess Plug Dimensions



Swift Lift Anchor	Diameter of Recess Plug	Dimension "Z"
1	2-7/16"	1-3/16"
2	3-5/16"	1-7/16"
4	4"	1-13/16"
8	5"	2-5/16"
20 Tons	6-3/8"	3-1/8"

Note: The diameter of the narrow recess plug is the same as the diameter of the round recess plug.

Swift Lift Anchor	Dimension "X"	Dimension "Y"	Shaft Diameter	Foot Diameter	Head Diameter
1	5/16"	7/8"	3/8"	1"	11/16"
2	7/16"	1-1/16"	9/16"	1-3/8"	1-1/32"
4	9/16"	1-5/16"	3/4"	1-7/8"	1-11/32"
8	9/16"	1-5/8"	1-3/32"	2-5/8"	1-7/8"
20 Tons	9/16"	2-5/8"	1-1/2"	3-3/4"	2-3/4"

ability of headed stud design. The design methods used here should be considered an interim step toward a final headed stud design procedure. It is recommended that this procedure be limited to headed studs with an embedment not greater than 8 in.

An important factor in the performance of headed studs when controlled by concrete capacity is the confinement of the failure area with reinforcement. In shear, design capacity is increased with such reinforcement. In tension, ductility can be provided. It is recommended that reinforcement be placed to cross failure planes around headed stud anchorages.

Welded headed studs are designed to resist direct tension, shear or a combination of the two. The design equations given below are applicable to studs which are welded to steel plates or other structural members, and embedded in unconfined concrete.

Where feasible, headed stud connections should be designed and detailed such that the connection failure is precipitated by failure (typically defined as yielding) of the stud material rather than failure of the surrounding concrete. The in-place strength should be taken as the smaller of the values based on concrete and steel.

6.5.2.1 Tension

The design tensile strength governed by concrete failure is [9]:

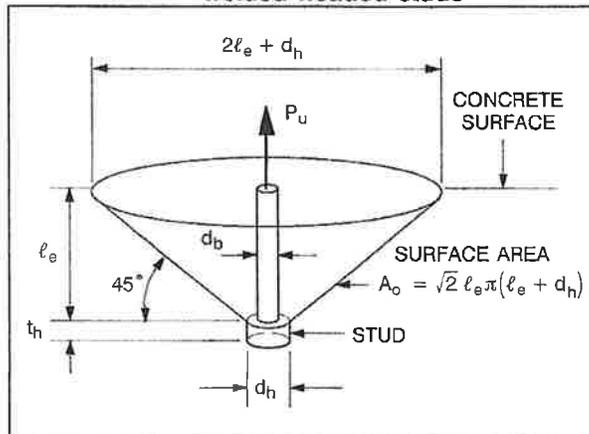
$$\phi P_c = \phi A_o (2.8\lambda \sqrt{f'_c}) \quad (\text{Eq. 6.5.2})$$

where:

$$\phi = 0.85$$

A_o = area of the assumed failure surface which, for a single stud not located near a free edge, is taken to be that of a 45° truncated cone as shown in Figure 6.5.3.

Figure 6.5.3 Shear cone development for welded headed studs



Using the 45° cone area and $\phi = 0.85$, Eq. 6.5.2 may be written as:

$$\phi P_c = 10.7 \ell_e (\ell_e + d_h) \lambda \sqrt{f'_c} \quad (\text{Eq. 6.5.3})$$

Note: The stud length is often used in place of the actual embedment length, ℓ_e , which is equal to the stud length minus the thickness of the head. This simplification is generally acceptable except in short stud. In short studs (length ≤ 4 in.), the use of actual embedment length is recommended. It should also be noted that short stud capacities are also sensitive to fabrication tolerances. Thus, use of a larger over factor of safety may be appropriate for short stud. See Sect. 6.3.

For a stud located closer to a free edge than the embedment length, ℓ_e , the design tensile strength given by Eq. 6.5.3, should be reduced by multiplying it by C_{es} :

$$C_{es} = \frac{d_e}{\ell_e} \leq 1.0 \quad (\text{Eq. 6.5.4})$$

where d_e is the distance measured from the stud axis to the free edge. If a stud is located in the corner of concrete member, Eq. 6.5.4 should be applied twice, once for each edge distance. Figure 6.15.6 lists values based on Eqs. 6.5.3 and 6.5.4.

For a group of studs, the concrete failure surface may be along a truncated pyramid rather than separate shear cones, as shown in Figure 6.5.4.

For this case, the design tensile strength is:

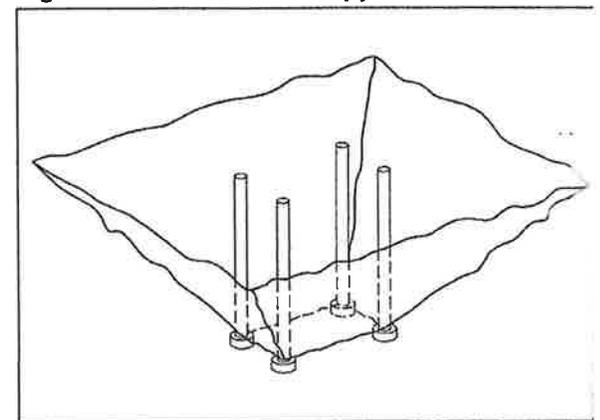
$$\phi P_c = \phi \lambda \left(\frac{2}{3} \right) \sqrt{f'_c} (2.8A_{\text{slope}} + 4A_{\text{flat}}) \quad (\text{Eq. 6.5.5})$$

where:

A_{slope} = sum of the areas of the sloping sides

A_{flat} = area of the flat bottom of the truncated pyramid

Figure 6.5.4 Truncated pyramid failure



4/17/15

BARTON

10
1/13

NEXT BEAM SUMMARY OF LOAD DISTRIBUTION/BEAM WEIGHTS

MARKED
END

• 0.23L	NB1 WT = 89,728 LB	0.26L •
• 0.24L		0.27L •

NON-MARKED
END

MARKED
END

• 0.24L	NB2 WT. = 98,719 LB	0.25L •
• 0.26L		0.25L •

NON-MARKED
END

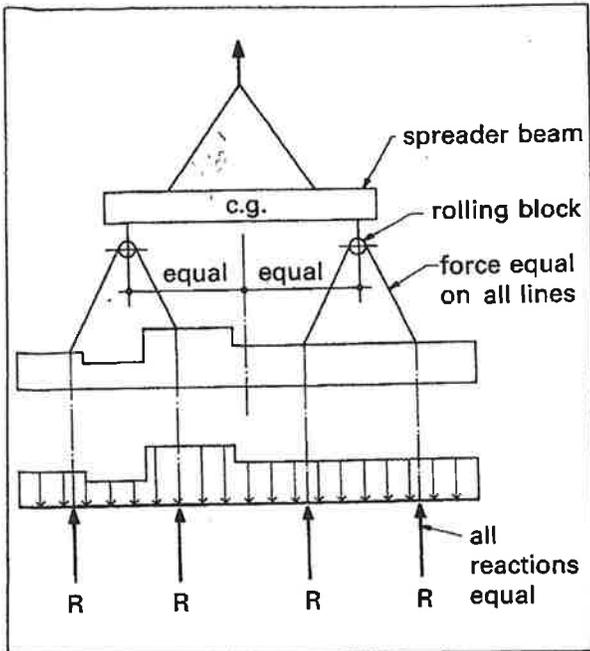
MARKED
END

• 0.25L	NB-3 WT. = 108,780 LB	0.24L •
• 0.27L		0.24L •

NON-MARKED
END

CONTRLS
DESIGN

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.

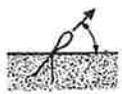
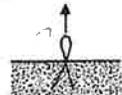
Reduced capacities for shorter embedment lengths may be suitable. In shallow products, providing a 90° bend can reduce the required embedment length significantly. Lightly rusted strand has better bond than bright strand.

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

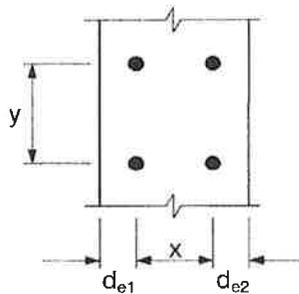
Lifting angle	Embedment length (in.)	Single loop (kips)	Double loop (kips)	Triple loop (kips)
45 degrees 	16	5	8.5	11.5
	22	8	13	17.5
	28	10	18	23
	34	11	23	29
Vertical 	16	7.5	12.5	16.5
	22	11.5	19	24.5
	28	15.5	25.5	33
	34	16	32.5	41

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 3



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

Case 3: Free edges on two opposite sides

$$\phi P_{c1} = \phi 2.67 \lambda \sqrt{f'_c} (x_1)(y_1 + 2\ell_e)$$

$$\phi = 0.85$$

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

$$\text{For Case 3: } x_1 = x + d_{e1} + d_{e2} \quad y_1 = y$$

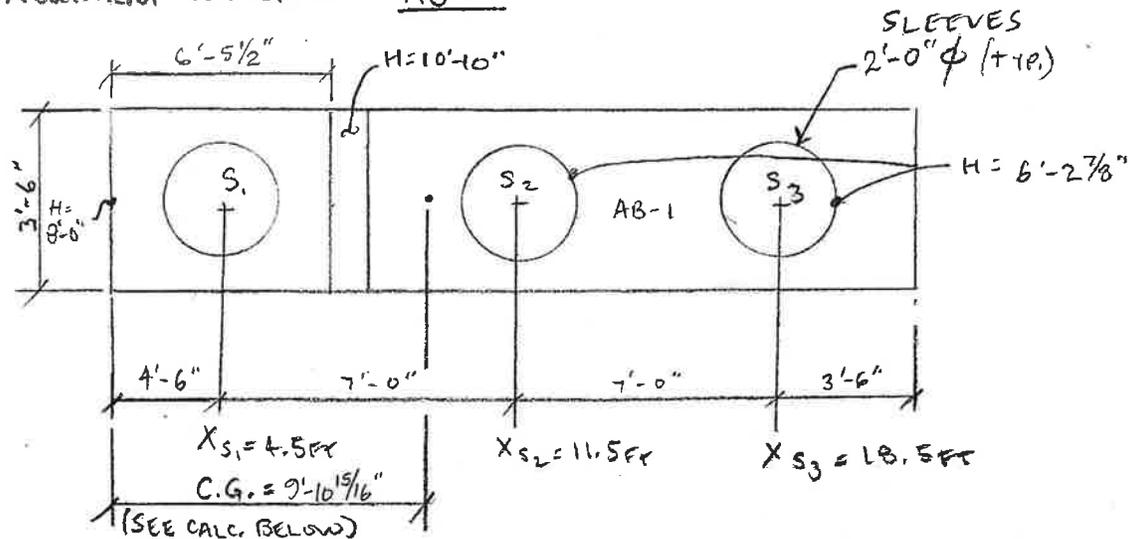
Note: Table values are based on

$$\lambda = 1.0 \text{ and } f'_c = 5000 \text{ psi;}$$

for different material properties, multiply table

values by $\lambda \sqrt{f'_c} / 5000$

ℓ_e in.	x_1, y_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	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	
4	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	31	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	
6	0	4	8	11	15	19	23	27	31	35	39	42	46	50	54	58	
	2	5	9	13	18	23	27	31	36	41	45	49	54	59	63	67	
	4	5	10	15	21	25	31	36	41	46	51	57	61	67	72	77	
	6	6	11	17	23	29	35	41	46	52	58	63	69	75	81	87	
	8	7	13	19	25	32	39	45	51	58	64	71	77	83	90	96	
	10	7	14	21	28	35	42	49	57	63	71	77	85	92	99	106	
	12	8	15	23	31	39	46	54	61	69	77	85	92	100	108	115	
	14	9	17	25	33	42	50	59	67	75	83	92	100	109	117	125	
	16	9	18	27	36	45	54	63	72	81	90	99	108	117	125	135	
8	0	5	10	15	21	25	31	36	41	46	51	57	61	67	72	77	
	2	6	11	17	23	29	35	41	46	52	58	63	69	75	81	87	
	4	7	13	19	25	32	39	45	51	58	64	71	77	83	90	96	
	6	7	14	21	28	35	42	49	57	63	71	77	85	92	99	106	
	8	8	15	23	31	39	46	54	61	69	77	85	92	100	108	115	
	10	9	17	25	33	42	50	59	67	75	83	92	100	109	117	125	
	12	9	18	27	36	45	54	63	72	81	90	99	108	117	125	135	
	14	9	19	29	39	48	58	67	77	87	96	106	115	125	135	144	
	16	10	21	31	41	51	61	72	82	92	103	113	123	133	143	154	

ABUTMENT WEIGHTS AB-1

SOLID ABUT. PROPERTIES, NOT CONSIDERING SLEEVES:

$$X_A = \text{CENTER OF GRAVITY W/O SLEEVES} = 9'-11 \frac{9}{16}''$$

$$A_A = \text{ABUT AREA IN ELEV. VIEW} = 162.383 \text{ SF}$$

} DERIVED FROM AUTOCAD

$$V_A = \text{ABUT. VOL. W/O SLEEVES CONSIDERED} = 162.383 \text{ SF} (3.5 \text{ FT}) = 568.34 \text{ CF}$$

$$W_A = 568.34 \text{ CF} \times 150 \text{ PCF} = 85,251 \text{ LB}$$

SLEEVES:

$$W_{S1} = \text{WT OF } S_1 = (8'-0" \times 4'-6" (10'-10" - 8'-0") / (6'-5 \frac{1}{2}")) (\pi (1'-0")^2) (150 \text{ PCF}) = 4700.2 \text{ LB}$$

$$W_{S2} = \text{WT OF } S_2 = (6'-2 \frac{7}{8}" (7 (1'-0")^2) (150 \text{ PCF}) = 2940.3 \text{ LB} = W_{S3}$$

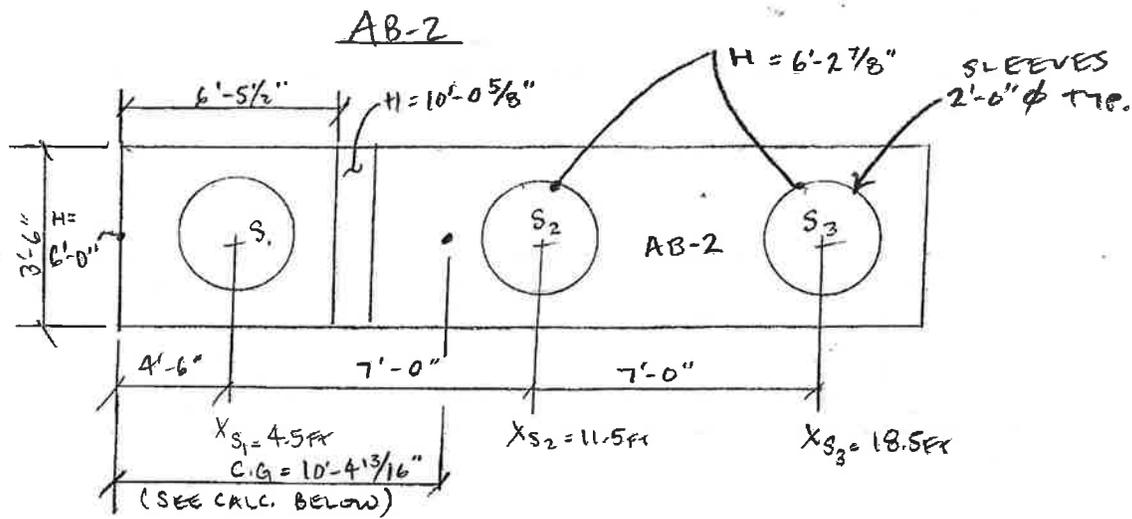
FINAL ABUT. WT / C.G.:

$$W_{A-FINAL} = 85,251 \text{ LB} - 4700.2 \text{ LB} - 2(2940.3 \text{ LB}) = \boxed{74,670.3 \text{ LB}}$$

$$\bar{X}_{A-FINAL} = \frac{(85,251 \text{ LB})(9'-11 \frac{9}{16}'' - (4700.2 \text{ LB})(4.5 \text{ FT}) - 2(2940.3 \text{ LB})(11.5 \text{ FT} + 18.5 \text{ FT}))}{74,670.3 \text{ LB}}$$

$$\bar{X}_{A-FINAL} = \text{ABUT. FINAL C.G.} = \boxed{9'-10 \frac{15}{16}''}$$

ABUTMENT WEIGHTS (CONTINUED):



SOLID ABUT. PROPERTIES, NOT CONSIDERING SLEEVES:

$$X_A = \text{CENTER OF GRAVITY w/o SLEEVES} = 10' - 5 \frac{3}{16}'' \quad \left. \begin{array}{l} \\ \end{array} \right\} \text{DERIVED FROM AUTOCAD}$$

$$A_A = \text{ABUT. AREA IN ELEV. VIEW} = 153.011 \text{ SF}$$

$$W_A = \text{ABUT. WT. w/o SLEEVES CONSIDERED} = 153.011 \text{ SF} (3.5 \text{ FT}) (150 \text{ PCF}) = 80,330.8 \text{ LB}$$

SLEEVES:

$$W_{S_1} = \text{WT. OF } S_1 = (6'-0'' + 4'-6'' (10'-0 \frac{5}{8}'' - 6'-0'') / (6'-5 \frac{1}{2}'')) (\pi (1'-0'')^2) (150 \text{ PCF}) = 4157.9 \text{ LB}$$

$$W_{S_2} = \text{WT. OF } S_2 = \text{WT. OF } S_3 = 2940.3 \text{ LB (SEE AB-1 CALC)}$$

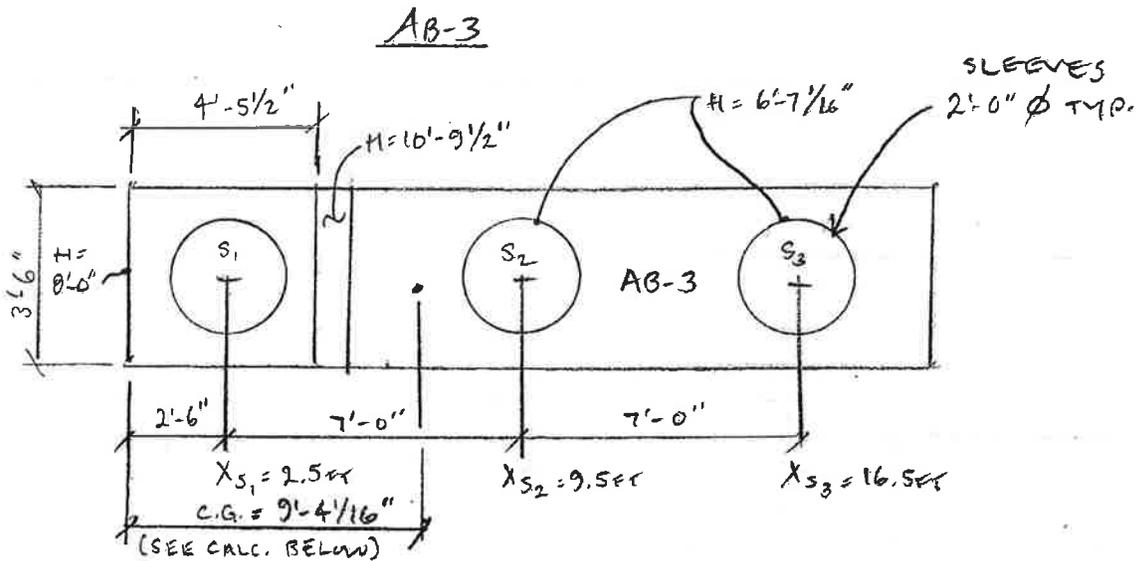
FINAL ABUT. WT / C.G.:

$$W_{A-FINAL} = 80,330.8 \text{ LB} - 4157.9 \text{ LB} - 2(2940.3 \text{ LB}) = \boxed{70,292.3 \text{ LB}}$$

$$\bar{X}_{A-FINAL} = \frac{(80,330.8 \text{ LB})(10'-5 \frac{3}{16}'') - (4157.9 \text{ LB})(4.5 \text{ FT}) - 2940.3 \text{ LB}(11.5 \text{ FT} + 18.5 \text{ FT})}{70,292.3 \text{ LB}}$$

$$\bar{X}_{A-FINAL} = \text{ABUT. FINAL C.G.} = \boxed{10'-4 \frac{13}{16}''}$$

ABUTMENT WEIGHTS (CONTINUED):



SOLID ABUT. PROPERTIES, NOT CONSIDERING SLEEVES:

$$X_A = \text{CENTER OF GRAVITY W/O SLEEVES} = 9'-2 \frac{13}{16}'' \quad \left. \begin{array}{l} \text{DERIVED FROM} \\ \text{AUTOCAD} \end{array} \right\}$$

$$A_A = \text{AREA ABUT. IN ELEV VIEW} = 148.566 \text{ SF}$$

$$W_A = \text{ABUT. WT. W/O SLEEVES CONSIDERED} = 148.566 \text{ SF} (3.5 \text{ FT}) (150 \text{ PCF}) = 77,997.2 \text{ LB}$$

SLEEVES:

$$W_{S_1} = \text{WT. OF } S_1 = (8'-0'' + 2.5 \text{ FT} (10'-9 \frac{1}{2}'' - 8'-0'') / (4'-5 \frac{1}{2}'') (\pi (1'-0'')^2) (150 \text{ PCF}) = 4507.6 \text{ LB}$$

$$W_{S_2} = \text{WT. OF } S_2 = \text{WT. OF } S_3 = (6'-7 \frac{1}{16}'') (\pi (1'-0'')^2) (150 \text{ PCF}) = 3104.8 \text{ LB}$$

FINAL ABUT. WT (C.G.):

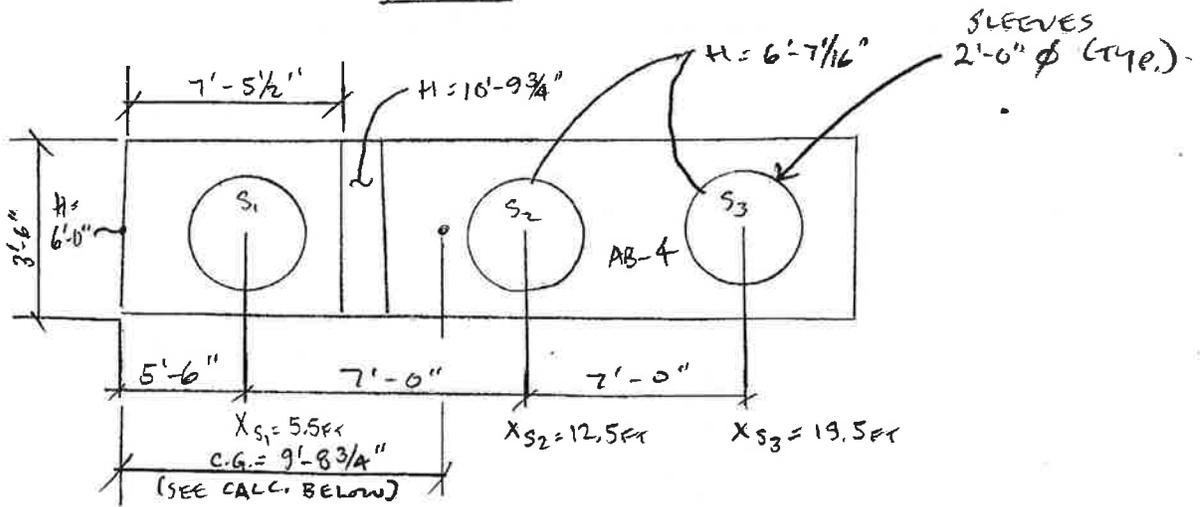
$$W_{A_FINAL} = 77,997.2 \text{ LB} - 4507.6 \text{ LB} - 2(3104.8 \text{ LB}) = \boxed{67,280 \text{ LB}}$$

$$\bar{X}_{A_FINAL} = \frac{(77,997.2 \text{ LB})(9'-2 \frac{13}{16}'') - (4507.6 \text{ LB})(2.5 \text{ FT}) - (3104.8 \text{ LB})(9.5 \text{ FT} + 16.5 \text{ FT})}{67,280 \text{ LB}}$$

$$\bar{X}_{A_FINAL} = \text{ABUT. FINAL C.G.} = \boxed{9'-4 \frac{1}{16}''}$$

ABUTMENT WEIGHTS (CONTINUED)

AB-4



SOLID ABUT. PROPERTIES, NOT CONSIDERING SLEEVES!

$$\left. \begin{aligned} X_A &= \text{CENTER OF GRAVITY W/O SLEEVES} = 9'-11\frac{7}{16}" \\ A_A &= \text{AREA ABUT. IN ELEV. VIEW} = 169.805 \text{ SF} \end{aligned} \right\} \text{DERIVED FROM AUTOCAD}$$

$$W_A = \text{ABUT. WT. W/O SLEEVES CONSIDERED} = 169.805 \text{ SF} (3.5 \text{ FT}) (150 \text{ PCF}) = 89,147.6 \text{ LB}$$

SLEEVES:

$$W_{S1} = \text{WT. OF } S_1 = (6'-0" + 5'-6" (10'-9\frac{3}{4}" - 6'-0") / (7'-5\frac{1}{2}")) \left(\frac{1'-0"}{2} \right)^2 (150 \text{ PCF}) = 4499.8 \text{ LB}$$

$$W_{S2} = \text{WT OF } S_2 = \text{WT OF } S_3 = 3104.8 \text{ LB (SEE AB-3 CALC.)}$$

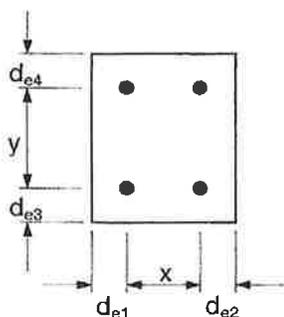
FINAL ABUT. WT/C.G.:

$$W_{A-FINAL} = 89,147.6 \text{ LB} - 4499.8 \text{ LB} - 2(3104.8 \text{ LB}) = \boxed{78,438.2 \text{ LB}}$$

$$\bar{X}_{A-FINAL} = \frac{(89,147.6 \text{ LB})(9'-11\frac{7}{16}") - (4499.8 \text{ LB})(5.5 \text{ FT}) - 3104.8 \text{ LB}(12.5 \text{ FT} + 19.5 \text{ FT})}{78,438.2 \text{ LB}}$$

$$\bar{X}_{A-FINAL} = \text{ABUT. FINAL C.G.} = \boxed{9'-8\frac{3}{4}"}$$

Figure 6.15.7A (continued) Design tensile strength for $h \geq h_{\min}$, ϕP_{c1} —Case 6



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

Case 6: Free edges on four adjacent sides

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

$$\phi = 0.85$$

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

For Case 6: $x_1 = x + d_{e1} + d_{e2}$ $y_1 = y + d_{e3} + d_{e4}$

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_o in.	x_1, y_1 in.	Design tensile strength, ϕP_{c1} (kips)													
		2	4	6	8	10	12	14	16	18	20	22	24	26	28
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2	1	1	2	3	3	4	5	5	6	7	7	8	9	9
	4	1	3	4	5	7	8	9	10	11	13	14	15	17	17
	6	2	4	6	8	9	11	13	15	17	19	21	23	25	25
	8	3	5	8	10	13	15	18	21	23	25	29	31	33	33
	10	3	7	9	13	16	19	23	25	29	32	35	39	42	42
	12	4	8	11	15	19	23	27	31	35	39	42	46	50	50
	14	5	9	13	18	23	27	31	36	41	45	49	54	59	59
16	5	10	15	21	25	31	36	41	46	51	57	61	67	67	
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2	1	1	2	3	3	4	5	5	6	7	7	8	9	9
	4	1	3	4	5	7	8	9	10	11	13	14	15	17	17
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	8	3	5	8	10	13	15	18	21	23	25	29	31	33	33
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	12	4	8	11	15	19	23	27	31	35	39	42	46	50	50
	14	5	9	13	18	23	27	31	36	41	45	49	54	59	59
16	5	10	15	21	25	31	36	41	46	51	57	61	67	67	
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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16	5	10	15	21	25	31	36	41	46	51	57	61	67	67	
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	12	4	8	11	15	19	23	27	31	35	39	42	46	50	50
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16	5	10	15	21	25	31	36	41	46	51	57	61	67	67	