JOSEPH P. CARRARA & SONS, INC. LETTER OF TRANSMITTAL

2464 CASE STREET
MIDDLEBURY, VERMONT 05753

TEL (802) 388-6363
FAX (802) 388-9010

DATE: January 23, 2014	JOB NO: 23411-013
ATTENTION: Mr. Brian Emmons *bemmons@tbuckcon.net*	
RE: Sand Hill Bridge No. 13	
VT 125 over Middlebury River	
Middlebury, VT	
Project No. RS 0174 (8)	
Transmittal #8	Precast Concrete

TO: **T. Buck Construction**
249 Merrow Road
Auburn, Maine 04210

207-783-6223 x205

WE ARE SENDING YOU [x] Attached [ ] Under separate cover via **Email** the following items:

[x] Shop Drawings [ ] Prints [ ] Plans [ ] Samples [ ] Specifications

[ ] Copy of Letter [ ] Change Order [ ] Other:

COPIES	DATE	NO.	DESCRIPTION
1	1/23/14	as noted	J. P. Carrara & Sons' Precast Framing and Individual Piece Detail Drawings for NEXT 28D Beams:
			"For Approval" Framing Drawings: F1 & F1.1
			"For Approval" Piece Detail Drawings: NB1, NB1.1, NB2, NB2.1, NB3, NB3.1, NB4, NB4.1,
			NB5, NB5.1, NBM1, & NBM2
1	1/23/14	-	JPC Lifting Loop Design Calculations for NEXT 28D Beams

THESE ARE TRANSMITTED as checked below:

[x] For approval [ ] Approved as submitted [ ] Resubmit ____ copies for approval

[ ] For your use [ ] Approved as noted [ ] Submit ____ copies for distribution

[ ] As requested [ ] Returned for corrections [ ] Return ____ corrected prints

[ ] For review and comment [ ] _____

[ ] FOR BIDS DUE _____ 20 ____ [ ] PRINTS RETURNED AFTER LOAN TO US

REMARKS **Brian,**

Attached please find our framing drawings and individual piece details for the NEXT 28D Beams which are submitted for approval.

Please note the following:

1. JPC proposes the use of the shear key shown in detail A/F1.1 to match JPC's existing steel siderail form for projecting hairpin bars.

2. At curtain wall closure pours, (4) bars project from precast curtain wall on one side and only (1) on the other to otherwise avoid installation conflicts. Contract plans call for projecting bars to be alternating.

3. At the location of headed studs on bearing plates, the #6 U-shaped bars have been changed to #6 L-shaped bars, ref. C/NB1.

4. #5 x 7'4" projecting bars shall be bent and touched up in the plant prior to curtain wall fabrication, ref. A/NB1.1.

5. Please confirm the size and layout of inserts in beam SH-NB2 on drawing NB2 for waterline support and hoist inserts.

6. For fascia beams, please note JPC changed #5 @ 12" cantilever bars projecting 10" to #4 @ 8" to match railing reinforcement spacing. Railing reinforcement is hooked below bottom mat. Cantilever steel is on top of the top mat. Please confirm.

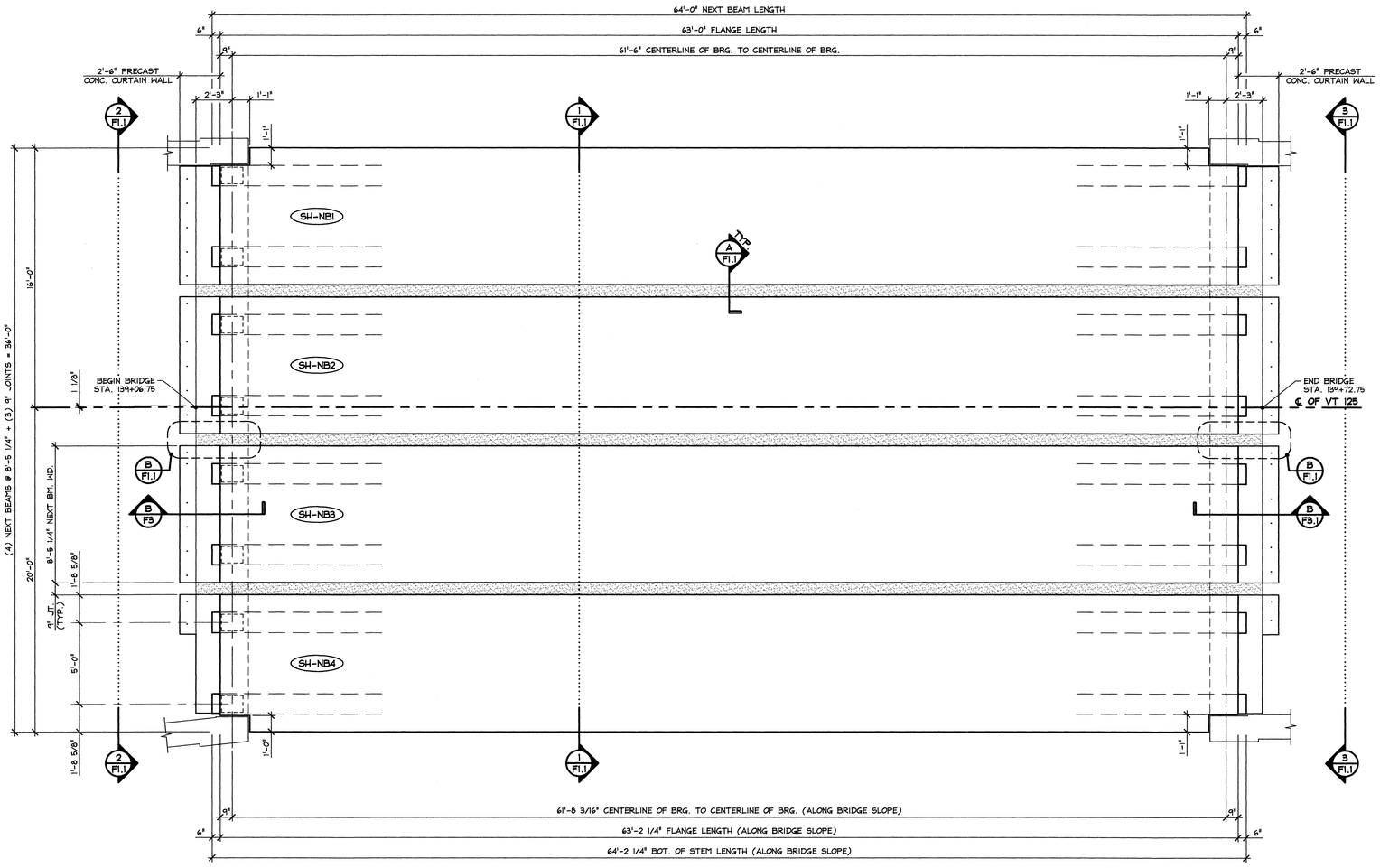
7. JPC proposes to use (3) different projecting lengths of #5 bars for CIP sidewalk to accommodate its profile which varies due to the thickness of the CIP which varies between 3 1/8" to 10 11/16" over the span of the beam, ref. drawing NB5.

Please contact us at 802-388-6363 with any questions.

COPY TO:

SIGNED: Michael Weigand

If enclosures are not as noted, please notify us at once.



1 / F1 PRESTRESSED NEXT BEAM LAYOUT

1/4" = 1'-0"

SUBMITTED
JAN 23 2014
J. P. CARRARA & SONS, INC.
MIDDLEBURY, VT 05753

APPROVAL STAMP:

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

T. BUCK CONSTRUCTION
CONTRACTOR
AUBURN, MAINE

STATE OF VERMONT AGENCY OF TRANSPORTATION
COUNTY OF ADDISON

TOWN OF MIDDLEBURY
ROUTE NO. VT 125, EAST MIDDLEBURY GORGE
BRIDGE NO.: 13 PROJECT NO.: RS 0174(8)

PRESTRESSED NEXT BEAM LAYOUT

DATE: OCT. 9, 2013
SCALE: NOTED
CHKD: DFTM: B.L.
JOB NO: 23411-013
DWG. NO: F1

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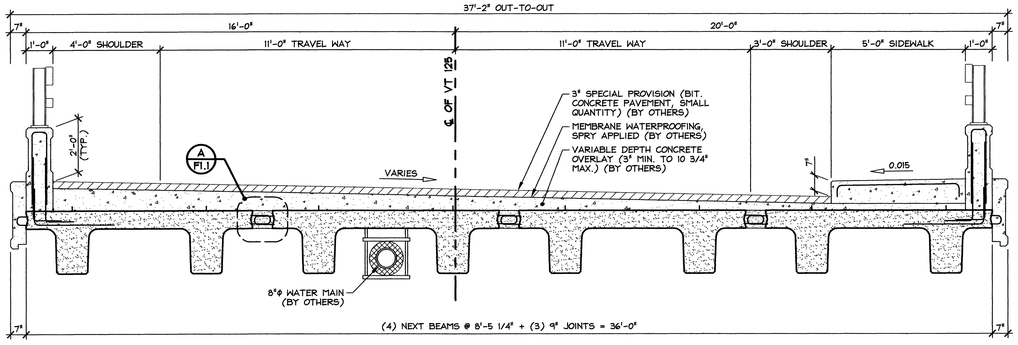
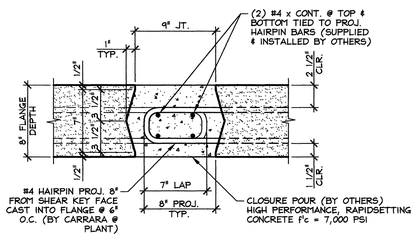


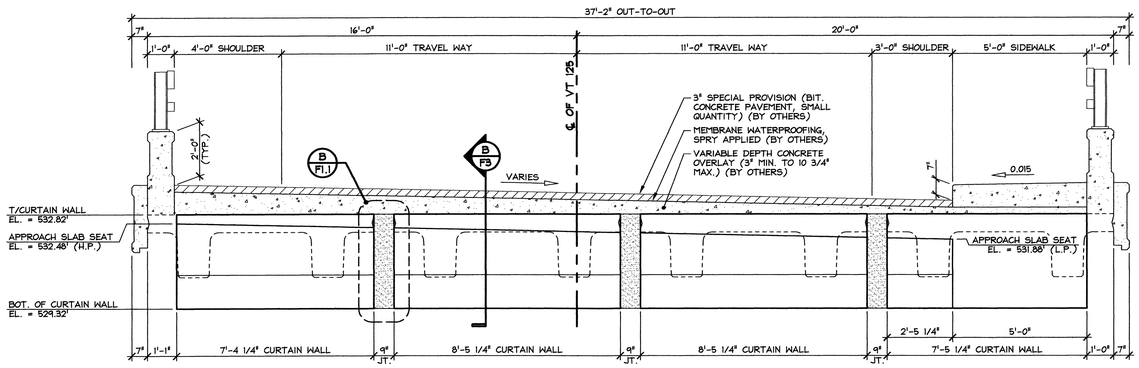
1 / F1.1 TRANSVERSE SECTION

3/8" = 1'-0"



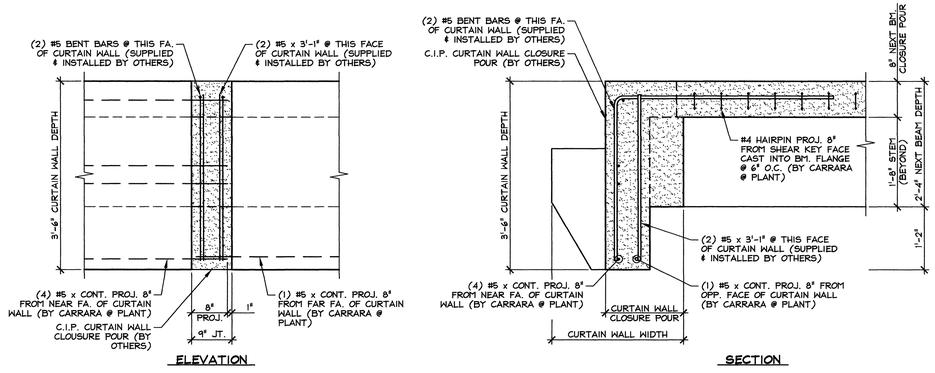
A / F1.1 NEXT BEAM CLOSURE POUR DETAIL

1 1/2" = 1'-0"



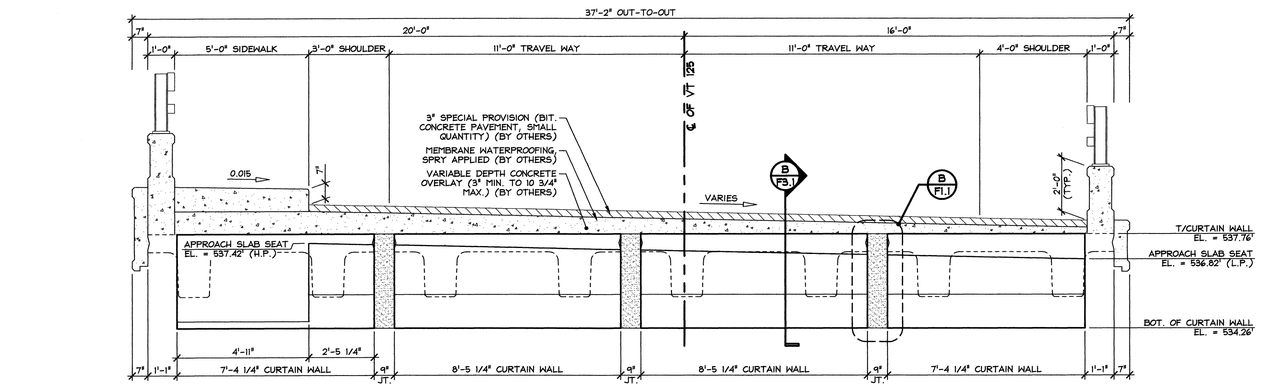
2 / F1.1 WEST ELEVATION - ABUTMENT #1

BEGIN BRIDGE STA. 139+06.75 3/8" = 1'-0"



B / F1.1 CURTAIN WALL CLOSURE POUR DETAILS

3/4" = 1'-0"



3 / F1.1 EAST ELEVATION - ABUTMENT #2

END BRIDGE STA. 139+72.75 3/8" = 1'-0"

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CONTRACTOR
AUBURN, MAINE

STATE OF VERMONT AGENCY OF TRANSPORTATION
COUNTY OF ADDISON

DATE: OCT. 9, 2013
SCALE: NOTED
CHKD: DFTM: B.L.
JOB NO: 23411-013

TOWN OF MIDDLEBURY
ROUTE NO. VT 125, EAST MIDDLEBURY GORGE
BRIDGE NO.: 13 PROJECT NO.: RS 0174(8)

PRESTRESSED NEXT BEAM SECTIONS & ELEVATIONS

DWG. NO: F1.1

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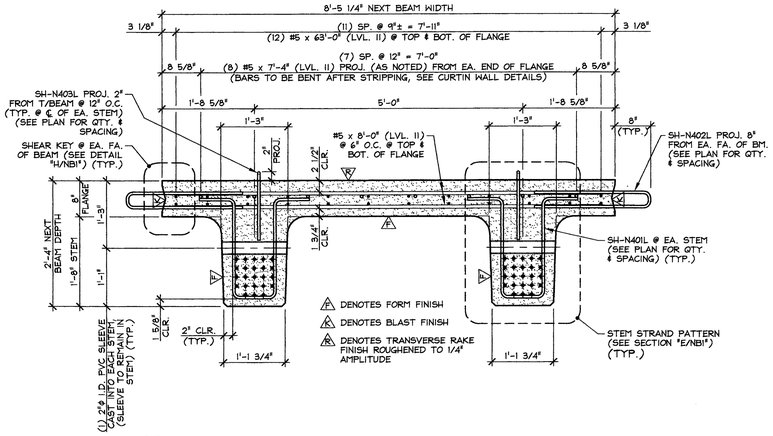
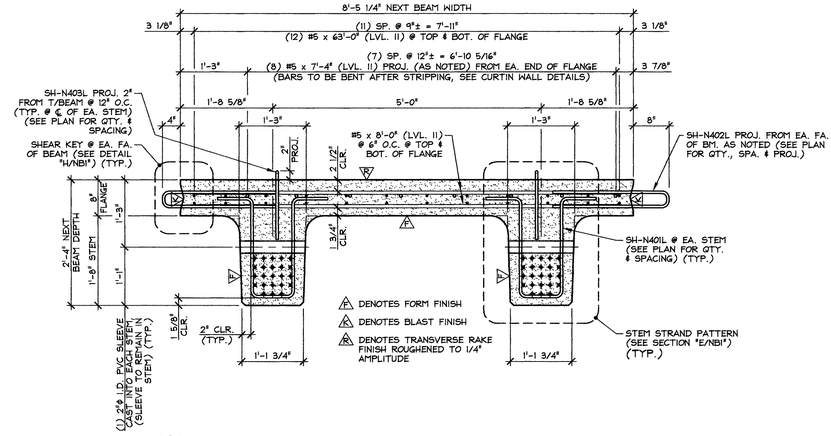


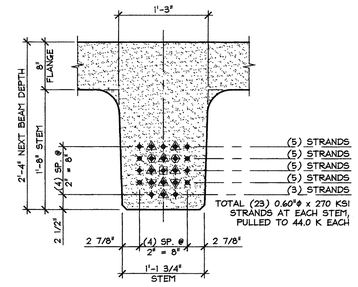
A NB1 DIMENSIONAL & REINFORCING SECTION

- BEAMS "SH-NB2" & "SH-NB3" 3/4" = 1'-0"
- SEE INDIVIDUAL BEAM DETAILS FOR WATER MAIN SUPPORT INSERTS.



B NB1 DIMENSIONAL & REINFORCING SECTION

- BEAMS "SH-NB1" & "SH-NB4" 3/4" = 1'-0"
- SEE INDIVIDUAL BEAM DETAILS FOR ADDITIONAL COMPOSITE REINFORCING PROJECTING FROM TOP OF BEAM.



PRESTRESSING NOTATIONS

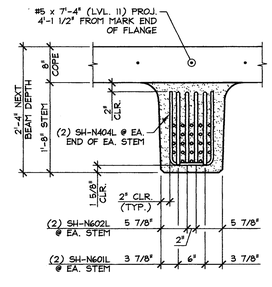
- ✦ DENOTES STRAIGHT STRANDS TO BE CUT FLUSH WITH EA. END OF EA. STEM
- ✖ DENOTES STRAIGHT STRANDS TO PROJECT 1'-6" FROM EA. END OF EA. STEM (STRANDS TO BE BENT AFTER STRIPPING SEE CURTAIN WALL DETAILS.)
- ✦ DENOTES STRAIGHT STRANDS TO BE DEBONDED 6" FROM EA. END OF EA. STEM
- ✦ DENOTES STRAIGHT STRANDS TO BE DEBONDED 4'-0" FROM EA. END OF EA. STEM
- ✦ DENOTES STRAIGHT STRANDS TO BE DEBONDED 6'-0" FROM EA. END OF EA. STEM
- ✦ DENOTES STRAIGHT STRANDS TO BE DEBONDED 12'-0" FROM EA. END OF EA. STEM

E NB1 STEM STRAND PATTERN

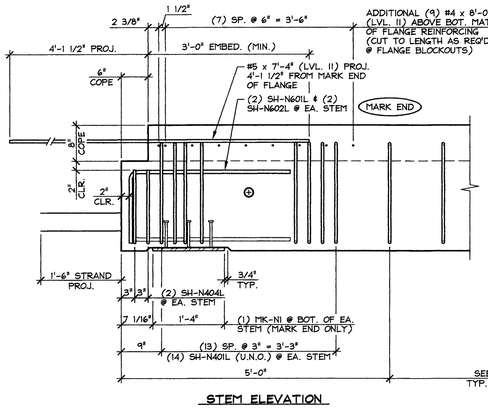
1" = 1'-0"

F NB1 DETENSIONING SCHEDULE

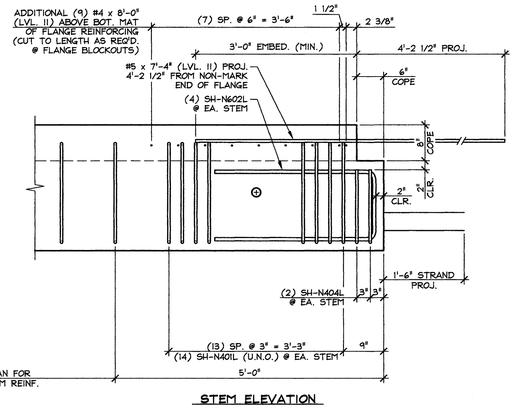
N.T.S.



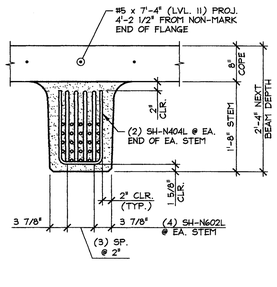
STEM SECTION



STEM ELEVATION



STEM ELEVATION



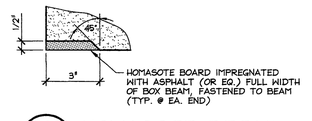
STEM SECTION

C NB1 END BLOCK STEM REINFORCING DETAILS
MARK END 3/4" = 1'-0"

- TYPICAL FLANGE REINFORCING NOT SHOWN FOR CLARITY.
- SEE CURTAIN WALL DETAILS FOR PROJECTING BAR BENDING & PROJECTING STRAND BENDING ("A/NB1.1").

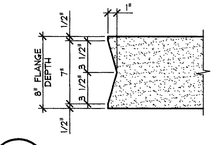
D NB1 END BLOCK STEM REINFORCING DETAILS
NON-MARK END 3/4" = 1'-0"

- TYPICAL FLANGE REINFORCING NOT SHOWN FOR CLARITY.
- SEE CURTAIN WALL DETAILS FOR PROJECTING BAR BENDING & PROJECTING STRAND BENDING ("A/NB1.1").



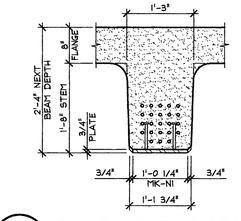
G NB1 HOMASOTE DETAIL

3" = 1'-0"



H NB1 SHEAR KEY DETAIL

1 1/2" = 1'-0"



J NB1 BEARING ℄ DETAIL

3/4" = 1'-0"

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J. P. CARRARA & SONS, INC.
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T. BUCK CONSTRUCTION
CONTRACTOR
AUBURN, MAINE

STATE OF VERMONT AGENCY OF TRANSPORTATION
COUNTY OF ADDISON

DATE: OCT. 9, 2013
SCALE: NOTED
CHKD: DFTM: B.L.
JOB NO: 23411-013

TOWN OF MIDDLEBURY
ROUTE NO. VT 125, EAST MIDDLEBURY GORGE
BRIDGE NO.: 13 PROJECT NO.: RS 0174(8)

PRESTRESSED NEXT BEAM DETAILS

DWG. NO: NB1

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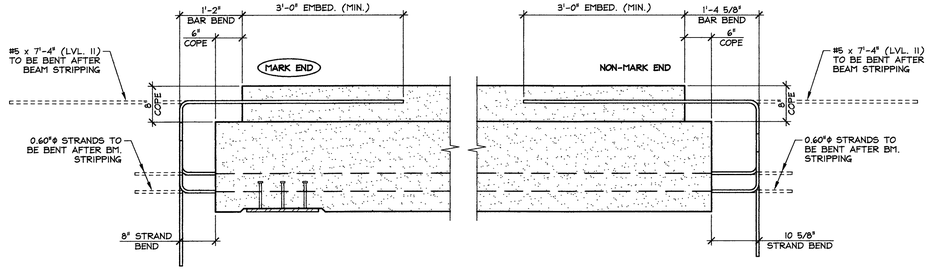
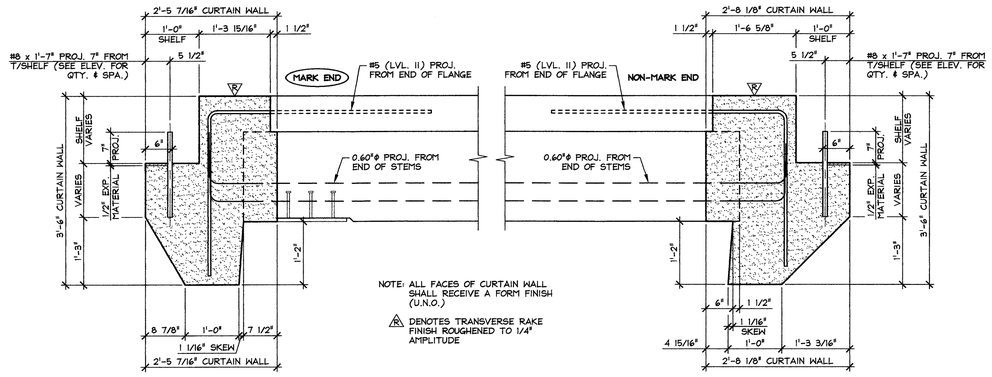


A NB1.1 PROJECTING STRAND & PROJECTING BAR BEND DETAIL

3/4" = 1'-0"

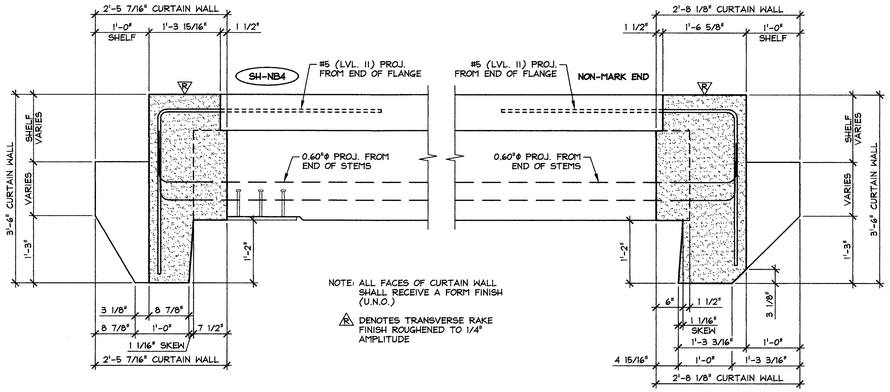


NOTE: ALL FACES OF CURTAIN WALL SHALL RECEIVE A FORM FINISH (U.N.O.)

Ⓡ DENOTES TRANSVERSE RAKE FINISH ROUGHENED TO 1/4" AMPLITUDE

B NB1.1 CURTAIN WALL DIMENSIONAL SECTIONS

3/4" = 1'-0"

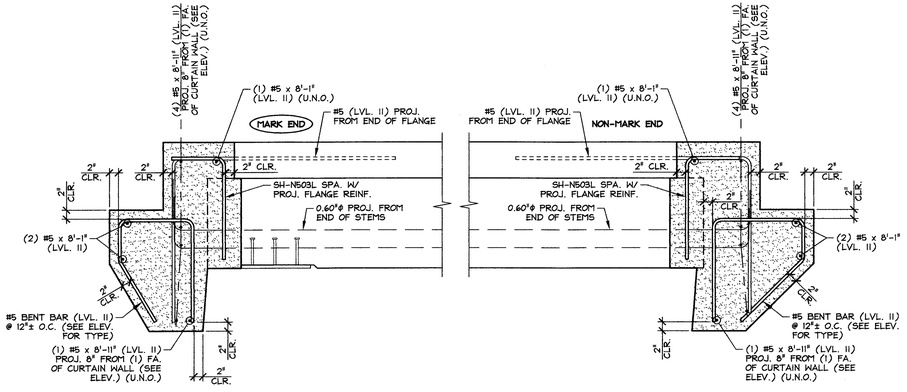


NOTE: ALL FACES OF CURTAIN WALL SHALL RECEIVE A FORM FINISH (U.N.O.)

Ⓡ DENOTES TRANSVERSE RAKE FINISH ROUGHENED TO 1/4" AMPLITUDE

D NB1.1 CURTAIN WALL DIMENSIONAL SECTIONS

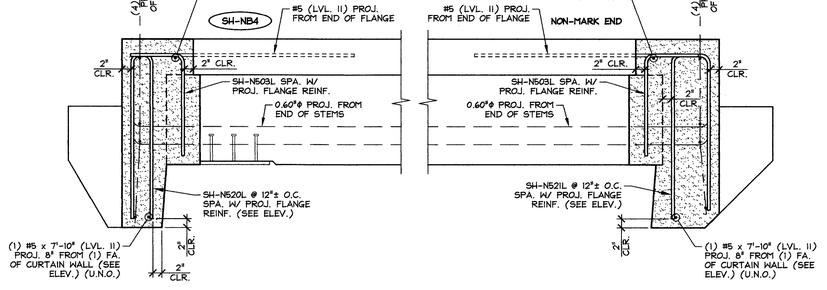
3/4" = 1'-0"



C NB1.1 CURTAIN WALL REINFORCING SECTIONS

SEE CURTAIN WALL ELEVATIONS FOR LONGITUDINAL BAR LENGTH CHANGES

3/4" = 1'-0"



E NB1.1 CURTAIN WALL REINFORCING SECTIONS

SEE CURTAIN WALL ELEVATIONS FOR LONGITUDINAL BAR LENGTH CHANGES

3/4" = 1'-0"

SUBMITTED
JAN 23 2014
J.P. CARRARA & SONS, INC.
MIDDLEBURY, VT 05753

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

T. BUCK CONSTRUCTION
CONTRACTOR
AUBURN, MAINE

STATE OF VERMONT AGENCY OF TRANSPORTATION
COUNTY OF ADDISON

DATE: OCT. 9, 2013
SCALE: NOTED
CHKD: DFTM: B.L.
JOB NO: 23411-013

TOWN OF MIDDLEBURY
ROUTE NO. VT 125, EAST MIDDLEBURY GORGE
BRIDGE NO.: 13 PROJECT NO.: RS 0174(8)

PRECAST CURTAIN WALL DETAILS

DWG. NO: NB1.1

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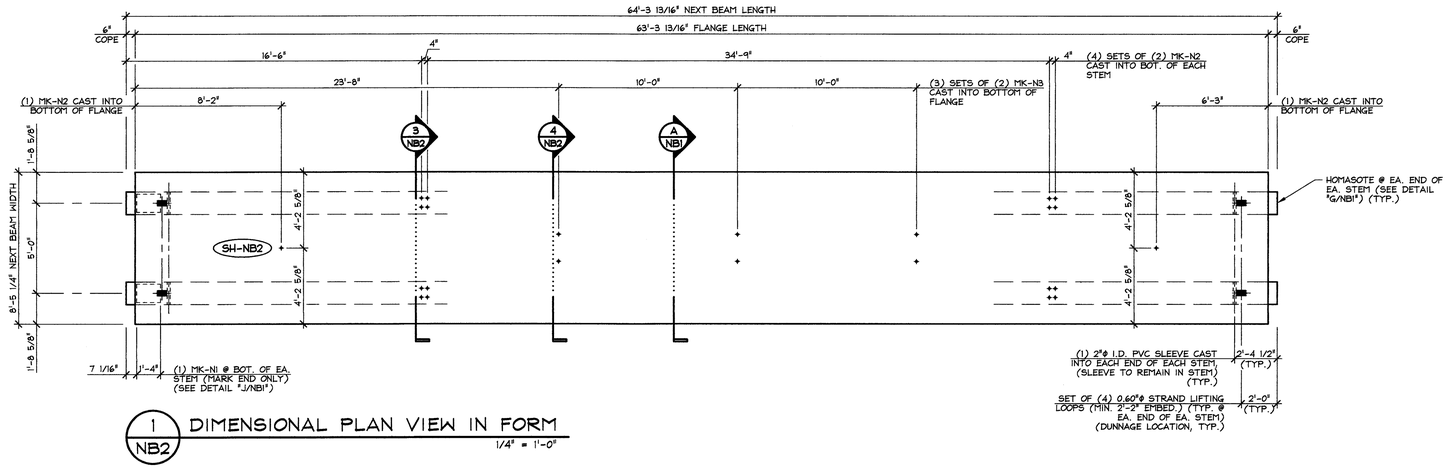
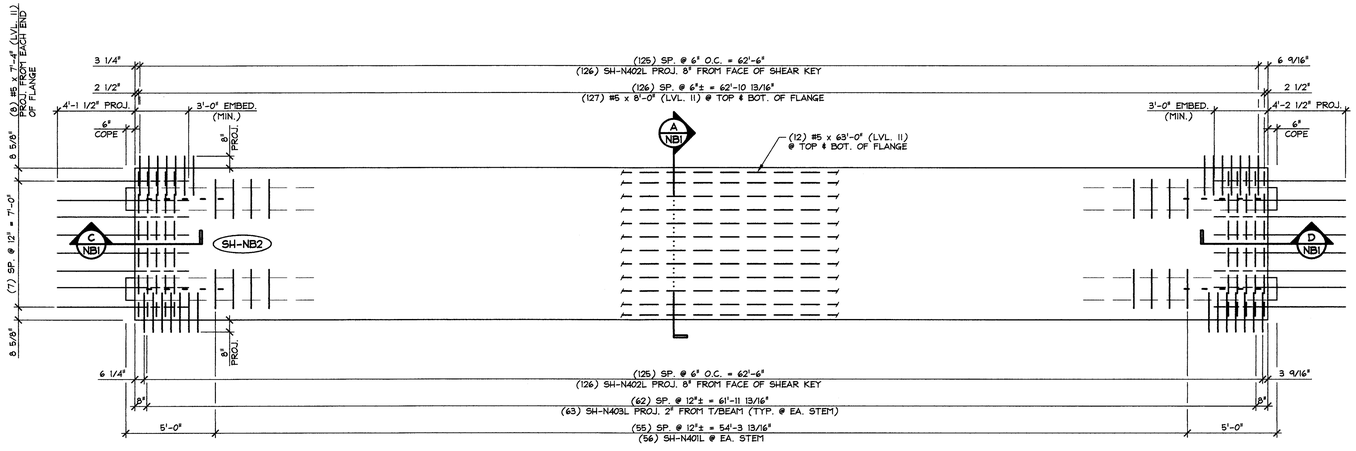
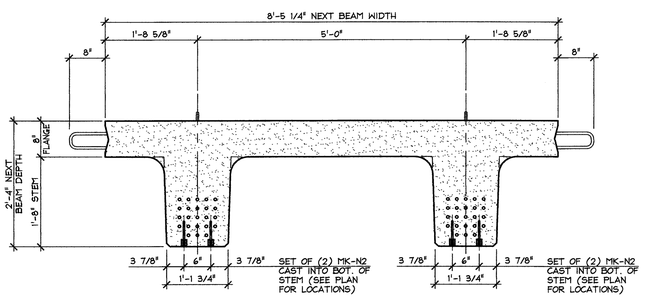


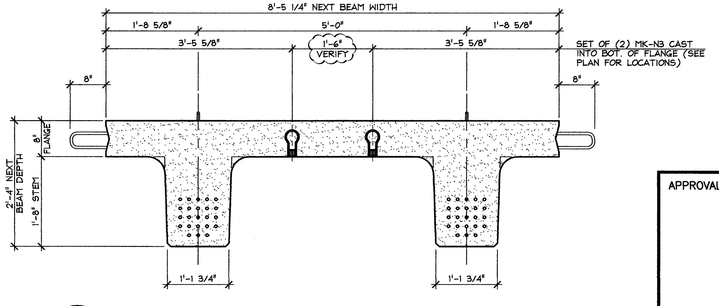
1 NB2 DIMENSIONAL PLAN VIEW IN FORM
1/4" = 1'-0"



2 NB2 REINFORCING PLAN VIEW IN FORM
SEE CURTAIN WALL DETAILS FOR PROJECTING BAR BENDING & PROJECTING STRAND BENDING
1/4" = 1'-0"



3 NB4 WATER MAIN INSERT SUPPORT SECTION
3/4" = 1'-0"



4 NB4 WATER MAIN INSERT SUPPORT SECTION
3/4" = 1'-0"

SUBMITTED
JAN 23 2014
J. P. CARRARA & SONS, INC.
MIDDLEBURY, VT 05753

MARK: SH-NB2	QTY.: 1	WT.: 46.07 T	VOL.: 22.75 cy

MATERIAL LIST / NEXT BEAM

ITEM	MARK	DESCRIPTION	QTY.
1	SH-N401L	#4 BENT BAR (LEVEL II, DUAL COATED)	168
2	SH-N402L	#4 BENT BAR (LEVEL II, DUAL COATED)	252
3	SH-N403L	#4 HAIRPIN (LEVEL II, DUAL COATED)	126
4	SH-N404L	#4 BENT BAR (LEVEL II, DUAL COATED)	8
5		#4 x 8'-0" (LVL. II, DUAL COATED)	18
6			
7		#5 x 7'-4" (LVL. II, DUAL COATED)	16
8		#5 x 8'-0" (LVL. II, DUAL COATED)	254
9		#5 x 63'-0" (W/ (1) 2'-6" STAGGERED LAP) (LVL. II, DUAL COATED)	24
10			
11	SH-N601L	#6 BENT BAR (LEVEL II, DUAL COATED)	4
12	SH-N602L	#6 BENT BAR (LEVEL II, DUAL COATED)	12
13			
14			
15			
16	MK-N1	BRG. ℄ 3/4" x 1'-0 1/4" x 1'-4" W/ ANCHORS (GALV.)	2
17	MK-N2	DAYTON 7/8"ø F-42 LOOP FERRULE INSERT (GALV.)	18
18	MK-N3	DAYTON 1"ø F-42 LOOP FERRULE INSERT (S.S.)	6
19		SET OF (4) 0.60"ø x 270 KSI STRAND LIFTING LOOPS	4
20			

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STATE OF VERMONT AGENCY OF TRANSPORTATION
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JOB NO: 23411-013

TOWN OF MIDDLEBURY
ROUTE NO. VT 125, EAST MIDDLEBURY GORGE
BRIDGE NO.: 13 PROJECT NO.: RS 0174(8)

PRESTRESSED NEXT BEAM PLANS

DWG. NO: NB2

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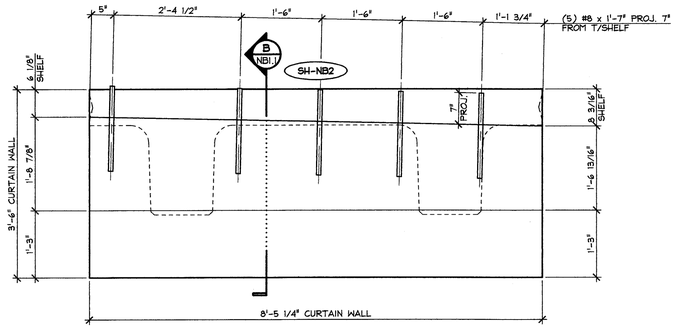
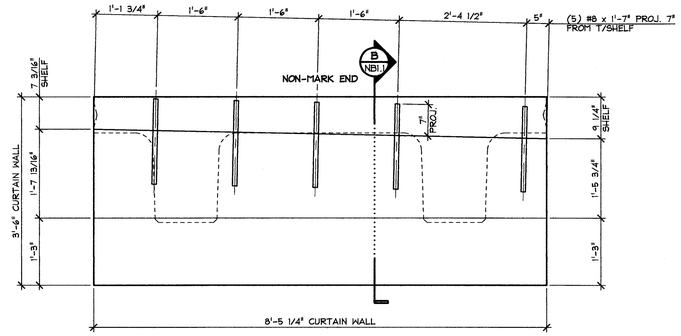


1 NB2.1 CURTAIN WALL DIMENSIONAL ELEVATION

VOL.: 1.99 cy
WT.: 4.03 T

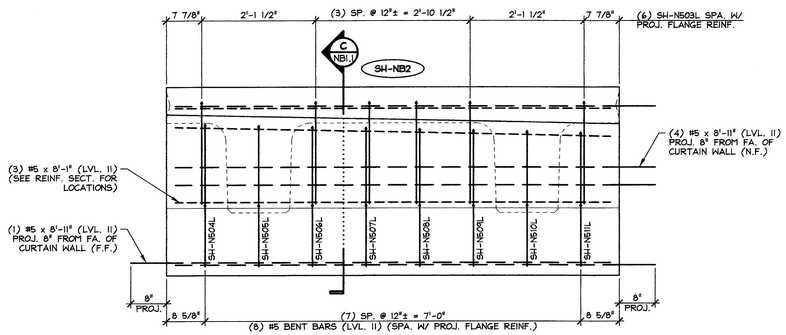
3/4" = 1'-0"



3 NB2.1 CURTAIN WALL DIMENSIONAL ELEVATION

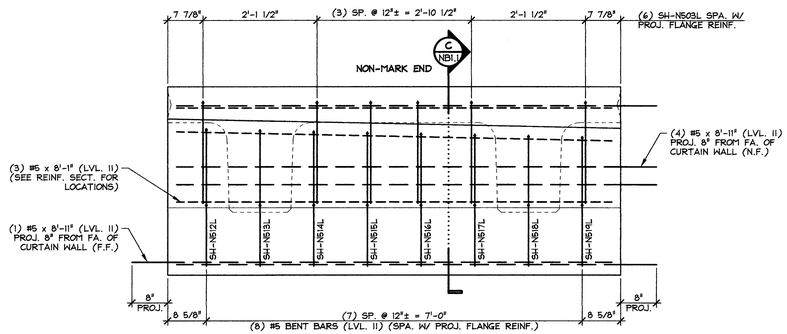
VOL.: 2.18 cy
WT.: 4.42 T

3/4" = 1'-0"



2 NB2.1 CURTAIN WALL DIMENSIONAL ELEVATION

3/4" = 1'-0"



4 NB2.1 CURTAIN WALL DIMENSIONAL ELEVATION

3/4" = 1'-0"

46.07 T = NEXT BEAM
4.03 T = CURTAIN WALL (MARK END)
4.42 T = CURTAIN WALL (NON-MARK END)
54.5 T = TOTAL BEAM WT.

SUBMITTED
JAN 23 2014
J. P. CARRARA & SONS, INC.
MIDDLEBURY, VT 05753

MARK: SH-NB2 | QTY.: 1

MATERIAL LIST / CURTAIN WALL

ITEM	MARK	DESCRIPTION	QTY./CURTAIN WALL	
			MARK END	NON-MARK END
1	SH-N503L	#5 BENT BAR (LEVEL II, DUAL COATED)	6	6
2	SH-N504L	#5 BENT BAR (LEVEL II, DUAL COATED)	1	
3	SH-N505L	#5 BENT BAR (LEVEL II, DUAL COATED)	1	
4	SH-N506L	#5 BENT BAR (LEVEL II, DUAL COATED)	1	
5	SH-N507L	#5 BENT BAR (LEVEL II, DUAL COATED)	1	
6	SH-N508L	#5 BENT BAR (LEVEL II, DUAL COATED)	1	
7	SH-N509L	#5 BENT BAR (LEVEL II, DUAL COATED)	1	
8	SH-N510L	#5 BENT BAR (LEVEL II, DUAL COATED)	1	
9	SH-N511L	#5 BENT BAR (LEVEL II, DUAL COATED)	1	
10	SH-N512L	#5 BENT BAR (LEVEL II, DUAL COATED)		1
11	SH-N513L	#5 BENT BAR (LEVEL II, DUAL COATED)		1
12	SH-N514L	#5 BENT BAR (LEVEL II, DUAL COATED)		1
13	SH-N515L	#5 BENT BAR (LEVEL II, DUAL COATED)		1
14	SH-N516L	#5 BENT BAR (LEVEL II, DUAL COATED)		1
15	SH-N517L	#5 BENT BAR (LEVEL II, DUAL COATED)		1
16	SH-N518L	#5 BENT BAR (LEVEL II, DUAL COATED)		1
17	SH-N519L	#5 BENT BAR (LEVEL II, DUAL COATED)		1
18		#5 x 8'-1" (LVL. II, DUAL COATED)	3	3
19		#5 x 8'-11" (LVL. II, DUAL COATED)	5	5
20				
21		#8 x 1'-7" (LEVEL II, DUAL COATED)	5	5
22				
23				
24				
25				

APPROVAL STAMP:

J.P. CARRARA & SONS INC.
Precast & Prestress Manufacturer
2484 CAGE STR, MIDDLEBURY, VERMONT 05753 Phone:(802)388-6361 Fax:(802)388-9010

T. BUCK CONSTRUCTION
CONTRACTOR
AUBURN, MAINE

STATE OF VERMONT AGENCY OF TRANSPORTATION
COUNTY OF ADDISON

DATE: OCT. 9, 2013
SCALE: NOTED
CHKD: DFTM: B.L.
JOB NO: 23411-013

TOWN OF MIDDLEBURY
ROUTE NO. VT 125, EAST MIDDLEBURY GORGE
BRIDGE NO.: 13 PROJECT NO.: RS 0174(8)

PRECAST CURTAIN WALL DETAILS

DWG. NO: NB2.1

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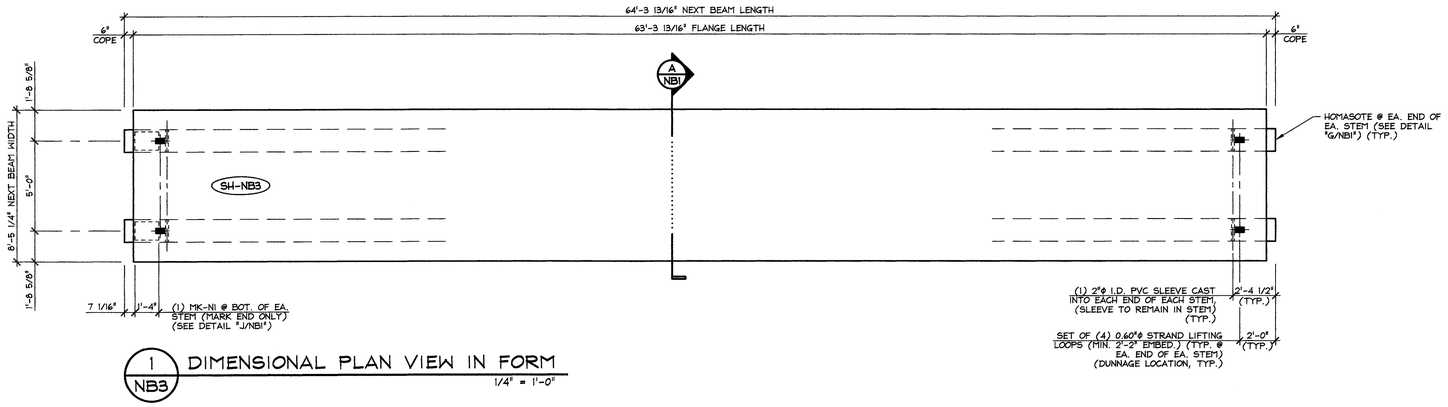
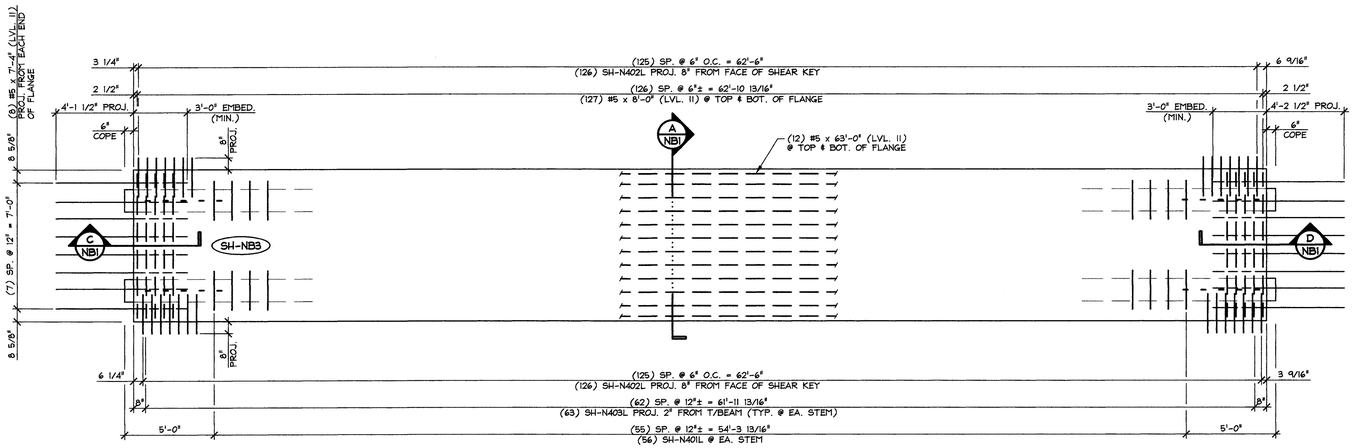


1 NB3 DIMENSIONAL PLAN VIEW IN FORM

1/4" = 1'-0"



2 NB3 REINFORCING PLAN VIEW IN FORM

SEE CURTAIN WALL DETAILS FOR PROJECTING BAR BENDING & PROJECTING STRAND BENDING

1/4" = 1'-0"

SUBMITTED
JAN 23 2014
J.P. CARRARA & SONS, INC.
MIDDLEBURY, VT 05753

MARK: SH-NB3	QTY.: 1	WT.: 46.07 T	VOL.: 22.75 cy

MATERIAL LIST / NEXT BEAM

ITEM	MARK	DESCRIPTION	QTY.
1	SH-N401L	#4 BENT BAR (LEVEL II, DUAL COATED)	168
2	SH-N402L	#4 BENT BAR (LEVEL II, DUAL COATED)	252
3	SH-N403L	#4 HAIRPIN (LEVEL II, DUAL COATED)	126
4	SH-N404L	#4 BENT BAR (LEVEL II, DUAL COATED)	8
5		#4 x 8'-0" (LVL. II, DUAL COATED)	18
6			
7		#5 x 7'-4" (LVL. II, DUAL COATED)	16
8		#5 x 8'-0" (LVL. II, DUAL COATED)	254
9		#5 x 63'-0" (W/ (1) 2'-6" STAGGERED LAP) (LVL. II, DUAL COATED)	24
10			
11	SH-N601L	#6 BENT BAR (LEVEL II, DUAL COATED)	4
12	SH-N602L	#6 BENT BAR (LEVEL II, DUAL COATED)	12
13			
14			
15			
16			
17			
18	MK-N1	BRG. ∠ 3/4" x 1'-0 1/4" x 1'-4" W/ ANCHORS (GALV.)	2
19		SET OF (4) 0.60"ø x 270 KSI STRAND LIFTING LOOPS	4
20			

APPROVAL STAMP:

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

T. BUCK CONSTRUCTION
CONTRACTOR
AUBURN, MAINE

STATE OF VERMONT AGENCY OF TRANSPORTATION
COUNTY OF ADDISON

TOWN OF MIDDLEBURY
ROUTE NO. VT 125, EAST MIDDLEBURY GORGE
BRIDGE NO.: 13 PROJECT NO.: RS 0174(8)

PRESTRESSED NEXT BEAM PLANS

DATE: OCT. 9, 2013
SCALE: NOTED
CHKD: DFTM: B.L.
JOB NO: 23411-013
DWG. NO: NB3

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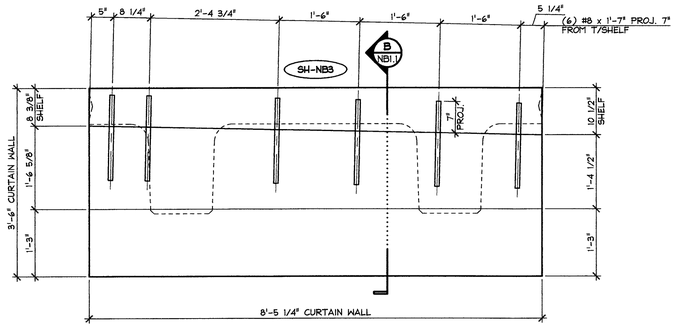
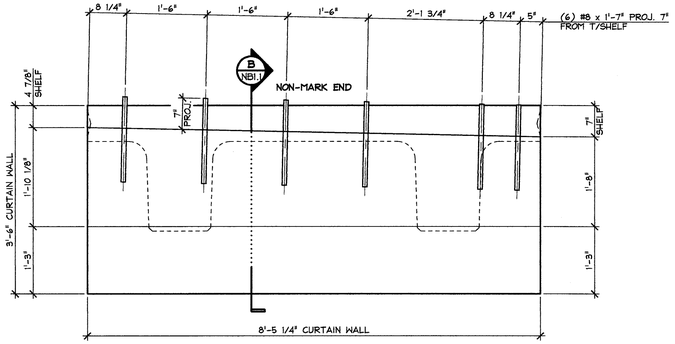


1 NB3.1 CURTAIN WALL DIMENSIONAL ELEVATION

VOL.: 1.93 cy
WT.: 3.91 T

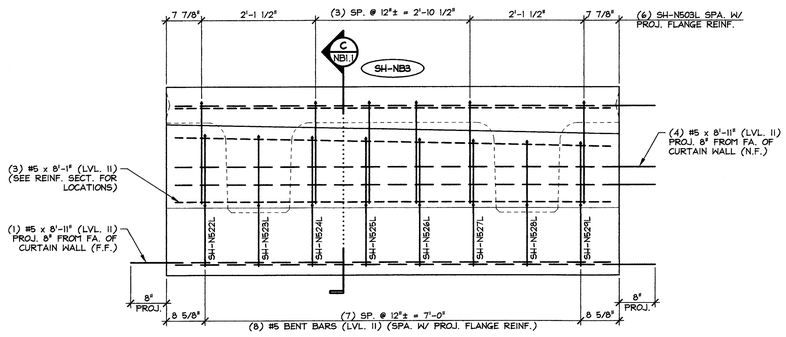
3/4" = 1'-0"



3 NB3.1 CURTAIN WALL DIMENSIONAL ELEVATION

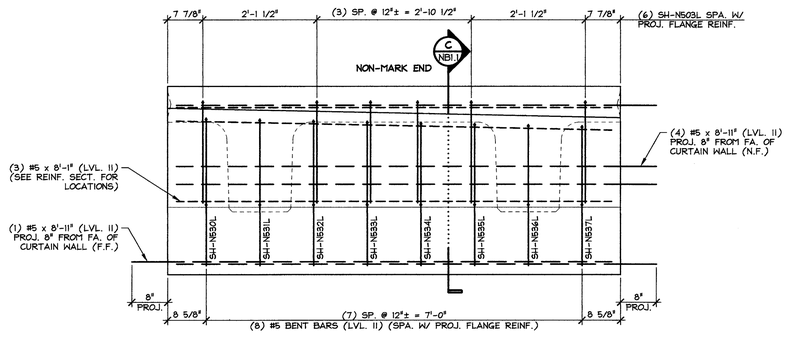
VOL.: 2.24 cy
WT.: 4.54 T

3/4" = 1'-0"



2 NB3.1 CURTAIN WALL DIMENSIONAL ELEVATION

3/4" = 1'-0"



4 NB3.1 CURTAIN WALL DIMENSIONAL ELEVATION

3/4" = 1'-0"

46.07 T = NEXT BEAM
3.91 T = CURTAIN WALL (MARK END)
4.54 T = CURTAIN WALL (NON-MARK END)
54.5 T = TOTAL BEAM WT.

SUBMITTED
JAN 23 2014
J. P. CARRARA & SONS, INC.
MIDDLEBURY, VT 05753

MARK: SH-NB3 | QTY.: 1

MATERIAL LIST / CURTAIN WALL

ITEM	MARK	DESCRIPTION	QTY./CURTAIN WALL	
			MARK END	NON-MARK END
1	SH-N503L	#5 BENT BAR (LEVEL II, DUAL COATED)	6	6
2	SH-N522L	#5 BENT BAR (LEVEL II, DUAL COATED)	1	
3	SH-N523L	#5 BENT BAR (LEVEL II, DUAL COATED)	1	
4	SH-N524L	#5 BENT BAR (LEVEL II, DUAL COATED)	1	
5	SH-N525L	#5 BENT BAR (LEVEL II, DUAL COATED)	1	
6	SH-N526L	#5 BENT BAR (LEVEL II, DUAL COATED)	1	
7	SH-N527L	#5 BENT BAR (LEVEL II, DUAL COATED)	1	
8	SH-N528L	#5 BENT BAR (LEVEL II, DUAL COATED)	1	
9	SH-N529L	#5 BENT BAR (LEVEL II, DUAL COATED)	1	
10	SH-N530L	#5 BENT BAR (LEVEL II, DUAL COATED)		1
11	SH-N531L	#5 BENT BAR (LEVEL II, DUAL COATED)		1
12	SH-N532L	#5 BENT BAR (LEVEL II, DUAL COATED)		1
13	SH-N533L	#5 BENT BAR (LEVEL II, DUAL COATED)		1
14	SH-N534L	#5 BENT BAR (LEVEL II, DUAL COATED)		1
15	SH-N535L	#5 BENT BAR (LEVEL II, DUAL COATED)		1
16	SH-N536L	#5 BENT BAR (LEVEL II, DUAL COATED)		1
17	SH-N537L	#5 BENT BAR (LEVEL II, DUAL COATED)		1
18		#5 x 8'-1" (LVL. II, DUAL COATED)	3	3
19		#5 x 8'-11" (LVL. II, DUAL COATED)	5	5
20				
21		#8 x 1'-7" (LEVEL II, DUAL COATED)	6	6
22				
23				
24				
25				

APPROVAL STAMP:

J.P. CARRARA & SONS INC.
Precast & Prestress Manufacturer
2484 CASE STR., MIDDLEBURY, VERMONT 05753 Phone:(802)388-6361 Fax:(802)388-9010

T. BUCK CONSTRUCTION
CONTRACTOR
AUBURN, MAINE

STATE OF VERMONT AGENCY OF TRANSPORTATION
COUNTY OF ADDISON

TOWN OF MIDDLEBURY
ROUTE NO. VT 125, EAST MIDDLEBURY GORGE
BRIDGE NO.: 13 PROJECT NO.: RS 0174(8)

PRECAST CURTAIN WALL DETAILS

DATE: OCT. 9, 2013
SCALE: NOTED
CHKD: DFTM: B.L.
JOB NO: 23411-013
DWG. NO: NB3.1

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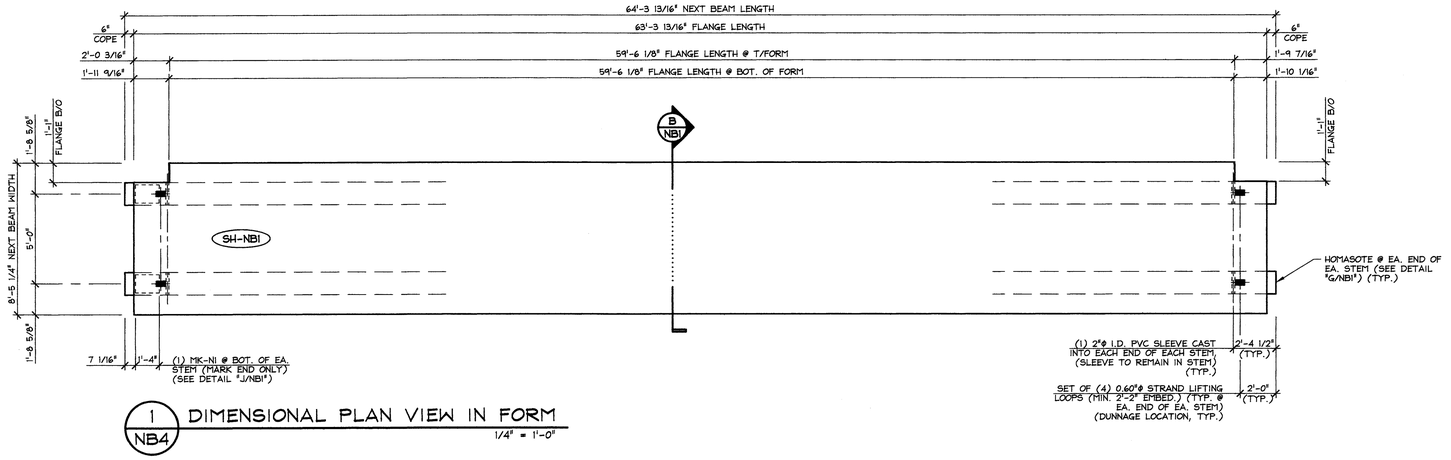
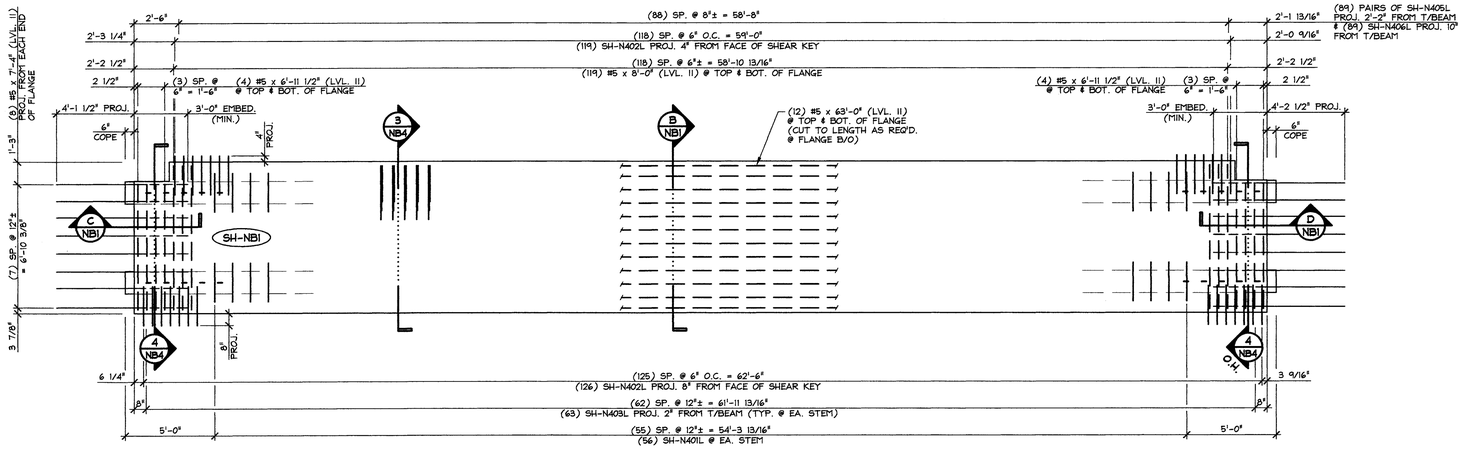
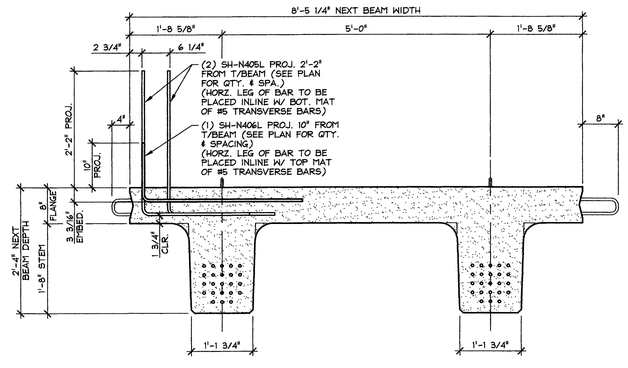


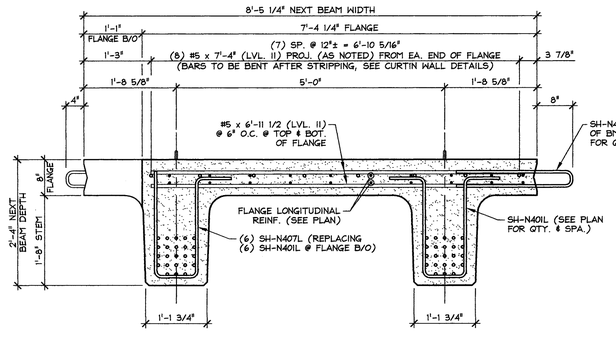
1 NB4 DIMENSIONAL PLAN VIEW IN FORM
1/4" = 1'-0"



2 NB4 REINFORCING PLAN VIEW IN FORM
SEE CURTAIN WALL DETAILS FOR PROJECTING BAR BENDING & PROJECTING STRAND BENDING
1/4" = 1'-0"



3 NB4 ADDITIONAL COMPOSITE REINFORCING SECTION
3/4" = 1'-0"



4 NB4 BEAM END REINFORCING SECTION
SEE SECTION "B/NB1" & REINFORCING PLAN FOR ADDITIONAL INFORMATION
3/4" = 1'-0"

SUBMITTED
JAN 23 2014
J.P. CARRARA & SONS, INC.
MIDDLEBURY, VT 05753

MARK: SH-NB1	QTY.: 1	WT.: 45.87 T	VOL.: 22.65 cy

MATERIAL LIST / NEXT BEAM

ITEM	MARK	DESCRIPTION	QTY.
1	SH-N401L	#4 BENT BAR (LEVEL II, DUAL COATED)	156
2	SH-N402L	#4 BENT BAR (LEVEL II, DUAL COATED)	245
3	SH-N403L	#4 HAIRPIN (LEVEL II, DUAL COATED)	126
4	SH-N404L	#4 BENT BAR (LEVEL II, DUAL COATED)	8
5	SH-N405L	#4 BENT BAR (LEVEL II, DUAL COATED)	178
6	SH-N406L	#4 BENT BAR (LEVEL II, DUAL COATED)	89
7	SH-N407L	#4 BENT BAR (LEVEL II, DUAL COATED)	12
8		#4 x 8'-0" (LVL. II, DUAL COATED)	18
9			
10		#5 x 6'-11 1/2" (LVL. II, DUAL COATED)	16
11		#5 x 7'-4" (LVL. II, DUAL COATED)	16
12		#5 x 8'-0" (LVL. II, DUAL COATED)	238
13		#5 x 63'-0" (W/ (1) 2'-6" STAGGERED LAP) (LVL. II, DUAL COATED)	24
14			
15	SH-N601L	#6 BENT BAR (LEVEL II, DUAL COATED)	4
16	SH-N602L	#6 BENT BAR (LEVEL II, DUAL COATED)	12
17			
18	MK-N1	BRG. ℄ 3/4" x 1'-0 1/4" x 1'-4" W/ ANCHORS (GALV.)	2
19		SET OF (4) 0.60"ϕ x 270 KSI STRAND LIFTING LOOPS	4
20			

APPROVAL STAMP:

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

T. BUCK CONSTRUCTION
CONTRACTOR
AUBURN, MAINE

STATE OF VERMONT AGENCY OF TRANSPORTATION
COUNTY OF ADDISON

DATE: OCT. 9, 2013
SCALE: NOTED
CHKD: DFTM: B.L.
JOB NO: 23411-013

TOWN OF MIDDLEBURY
ROUTE NO. VT 125, EAST MIDDLEBURY GORGE
BRIDGE NO.: 13 PROJECT NO.: RS 0174(8)

PRESTRESSED NEXT BEAM PLANS & SECTION

DWG. NO: NB4

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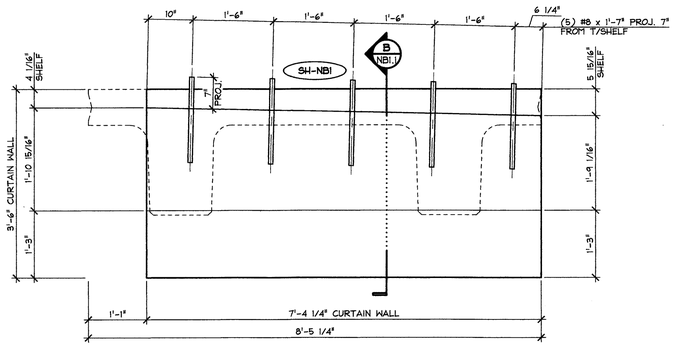
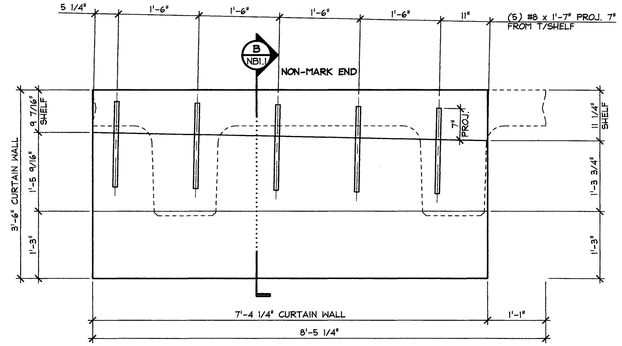


1 NB4.1 CURTAIN WALL DIMENSIONAL ELEVATION

VOL.: 1.86 cy
WT.: 3.77 T

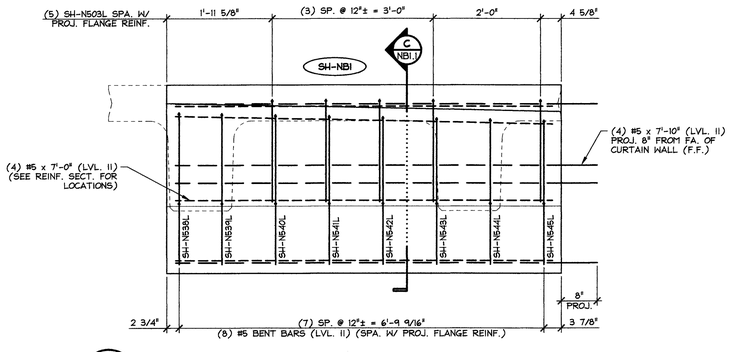
3/4" = 1'-0"



3 NB4.1 CURTAIN WALL DIMENSIONAL ELEVATION

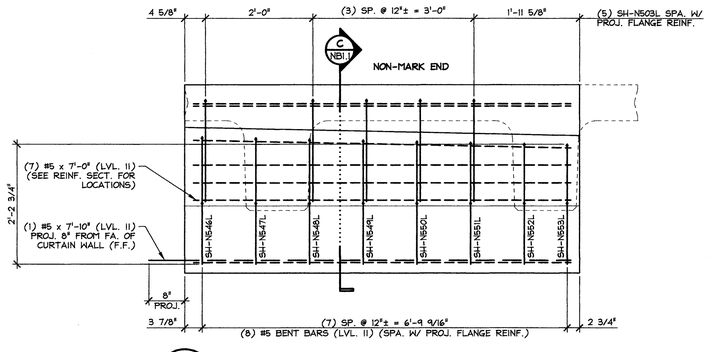
VOL.: 1.93 cy
WT.: 3.92 T

3/4" = 1'-0"



2 NB4.1 CURTAIN WALL DIMENSIONAL ELEVATION

3/4" = 1'-0"



4 NB4.1 CURTAIN WALL DIMENSIONAL ELEVATION

3/4" = 1'-0"

45.87 T = NEXT BEAM
3.77 T = CURTAIN WALL (MARK END)
3.92 T = CURTAIN WALL (NON-MARK END)
53.6 T = TOTAL BEAM WT.

SUBMITTED
JAN 23 2014
J. P. CARRARA & SONS, INC.
MIDDLEBURY, VT 05753

MARK: SH-NB1 | QTY.: 1

MATERIAL LIST / CURTAIN WALL

ITEM	MARK	DESCRIPTION	QTY./CURTAIN WALL MARK END	QTY./CURTAIN WALL NON-MARK END
1	SH-N503L	#5 BENT BAR (LEVEL II, DUAL COATED)	5	5
2	SH-N538L	#5 BENT BAR (LEVEL II, DUAL COATED)	1	
3	SH-N539L	#5 BENT BAR (LEVEL II, DUAL COATED)	1	
4	SH-N540L	#5 BENT BAR (LEVEL II, DUAL COATED)	1	
5	SH-N541L	#5 BENT BAR (LEVEL II, DUAL COATED)	1	
6	SH-N542L	#5 BENT BAR (LEVEL II, DUAL COATED)	1	
7	SH-N543L	#5 BENT BAR (LEVEL II, DUAL COATED)	1	
8	SH-N544L	#5 BENT BAR (LEVEL II, DUAL COATED)	1	
9	SH-N545L	#5 BENT BAR (LEVEL II, DUAL COATED)	1	
10	SH-N546L	#5 BENT BAR (LEVEL II, DUAL COATED)		1
11	SH-N547L	#5 BENT BAR (LEVEL II, DUAL COATED)		1
12	SH-N548L	#5 BENT BAR (LEVEL II, DUAL COATED)		1
13	SH-N549L	#5 BENT BAR (LEVEL II, DUAL COATED)		1
14	SH-N550L	#5 BENT BAR (LEVEL II, DUAL COATED)		1
15	SH-N551L	#5 BENT BAR (LEVEL II, DUAL COATED)		1
16	SH-N552L	#5 BENT BAR (LEVEL II, DUAL COATED)		1
17	SH-N553L	#5 BENT BAR (LEVEL II, DUAL COATED)		1
18		#5 x 7'-0" (LVL. II, DUAL COATED)	4	7
19		#5 x 7'-10" (LVL. II, DUAL COATED)	4	1
20				
21		#8 x 1'-7" (LEVEL II, DUAL COATED)	5	5
22				
23				
24				
25				

APPROVAL STAMP:

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

T. BUCK CONSTRUCTION
CONTRACTOR
AUBURN, MAINE

STATE OF VERMONT AGENCY OF TRANSPORTATION
COUNTY OF ADDISON

TOWN OF MIDDLEBURY
ROUTE NO. VT 125, EAST MIDDLEBURY GORGE
BRIDGE NO.: 13 PROJECT NO.: RS 0174(8)

PRECAST CURTAIN WALL DETAILS

DATE: OCT. 9, 2013
SCALE: NOTED
CHKD: DFTM: B.L.
JOB NO: 23411-013
DWG. NO: NB4.1

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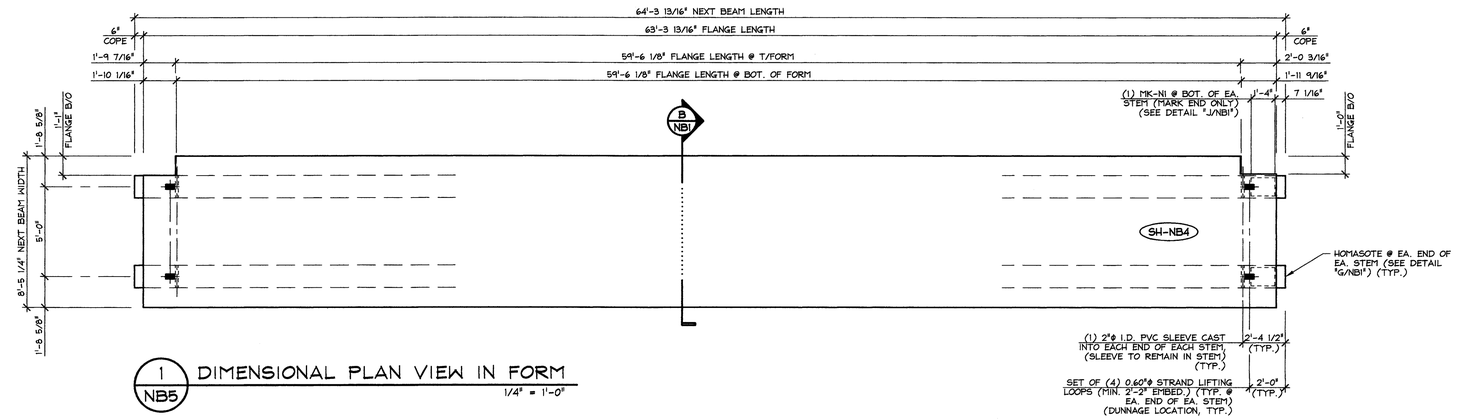
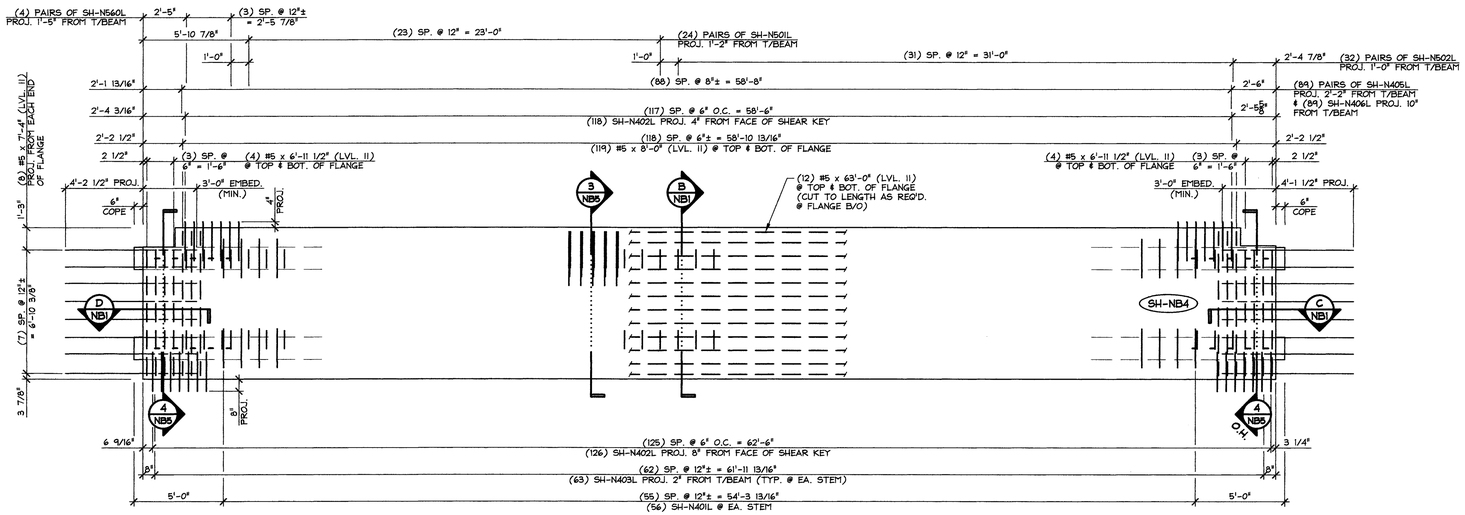


1 NB5 DIMENSIONAL PLAN VIEW IN FORM

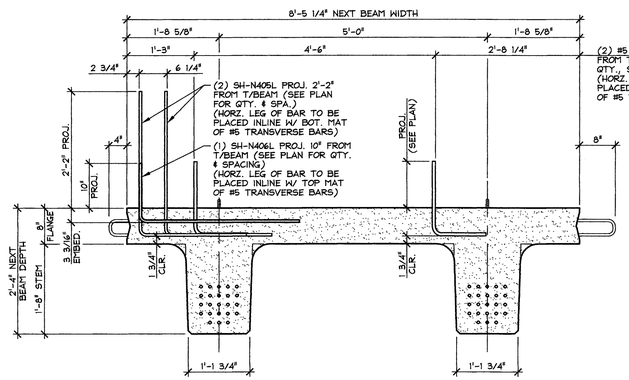
1/4" = 1'-0"



2 NB5 REINFORCING PLAN VIEW IN FORM

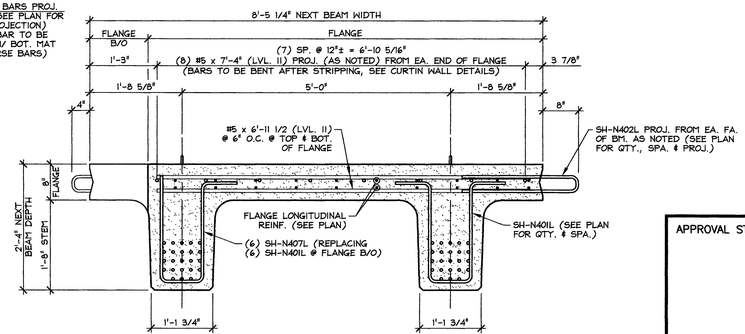
SEE CURTAIN WALL DETAILS FOR PROJECTING BAR BENDING & PROJECTING STRAND BENDING

1/4" = 1'-0"



3 NB5 ADDITIONAL COMPOSITE REINFORCING SECTION

3/4" = 1'-0"



4 NB5 BEAM END REINFORCING SECTION

SEE SECTION "B/NB1" & REINFORCING PLAN FOR ADDITIONAL INFORMATION

3/4" = 1'-0"

SUBMITTED

JAN 23 2014

J. P. CARRARA & SONS, INC.
MIDDLEBURY, VT 05753

MARK: SH-NB4	QTY.: 1	WT.: 45.87 T	VOL.: 22.65 cy

MATERIAL LIST / NEXT BEAM

ITEM	MARK	DESCRIPTION	QTY.
1	SH-N401L	#4 BENT BAR (LEVEL II, DUAL COATED)	156
2	SH-N402L	#4 BENT BAR (LEVEL II, DUAL COATED)	244
3	SH-N403L	#4 HAIRPIN (LEVEL II, DUAL COATED)	126
4	SH-N404L	#4 BENT BAR (LEVEL II, DUAL COATED)	8
5	SH-N405L	#4 BENT BAR (LEVEL II, DUAL COATED)	178
6	SH-N406L	#4 BENT BAR (LEVEL II, DUAL COATED)	89
7	SH-N407L	#4 BENT BAR (LEVEL II, DUAL COATED)	12
8		#4 x 8'-0" (LVL. II, DUAL COATED)	18
9	SH-N501L	#5 BENT BAR (LEVEL II, DUAL COATED)	48
10	SH-N502L	#5 BENT BAR (LEVEL II, DUAL COATED)	64
11	SH-N560L	#5 BENT BAR (LEVEL II, DUAL COATED)	8
12		#5 x 6'-11 1/2" (LVL. II, DUAL COATED)	16
13		#5 x 7'-4" (LVL. II, DUAL COATED)	16
14		#5 x 8'-0" (LVL. II, DUAL COATED)	238
15		#5 x 63'-0" (W/ (1) 2'-6" STAGGERED LAP) (LVL. II, DUAL COATED)	24
16	SH-N601L	#6 BENT BAR (LEVEL II, DUAL COATED)	4
17	SH-N602L	#6 BENT BAR (LEVEL II, DUAL COATED)	12
18			
19	MK-N1	BRG. PL 3/4" x 1'-0 1/4" x 1'-4" W/ ANCHORS (GALV.)	2
20		SET OF (4) 0.60"ø x 270 KSI STRAND LIFTING LOOPS	4

APPROVAL STAMP:

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

T. BUCK CONSTRUCTION
CONTRACTOR
AUBURN, MAINE

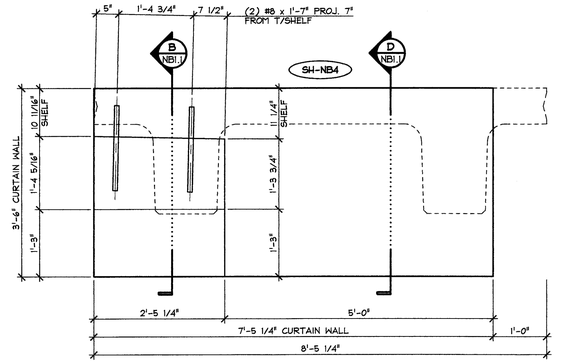
STATE OF VERMONT AGENCY OF TRANSPORTATION
COUNTY OF ADDISON

TOWN OF MIDDLEBURY
ROUTE NO. VT 125, EAST MIDDLEBURY GORGE
BRIDGE NO.: 13 PROJECT NO.: RS 0174(8)

PRESTRESSED NEXT BEAM PLANS & SECTION

DATE: OCT. 9, 2013
SCALE: NOTED
CHKD: DFTM: B.L.
JOB NO: 23411-013
DWG. NO: NB5

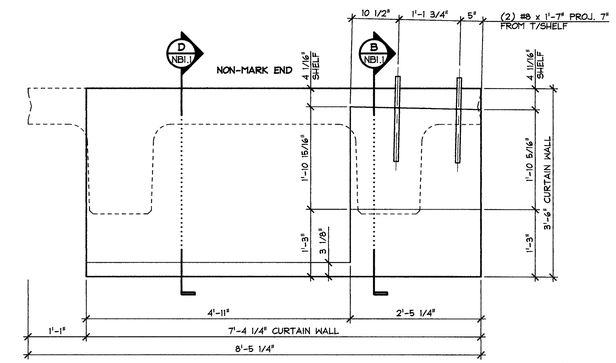
F:\VT-Bridges\East Middlebury Gorge\23411-013 NB5.dwg, 1/22/2014 3:23:00 PM



1 NB5.1 CURTAIN WALL DIMENSIONAL ELEVATION

VOL.: 1.26 cy
WT.: 2.55 T

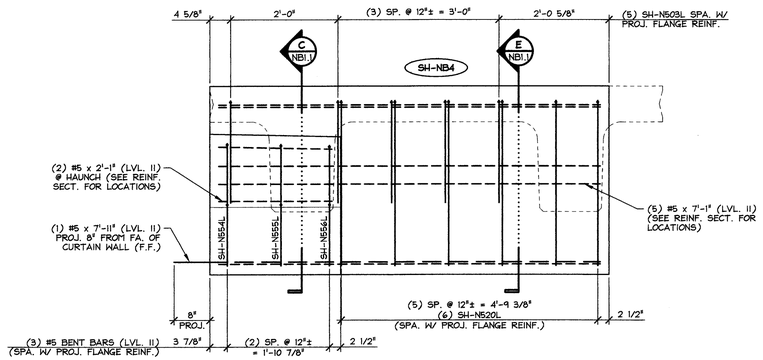
3/4" = 1'-0"



3 NB5.1 CURTAIN WALL DIMENSIONAL ELEVATION

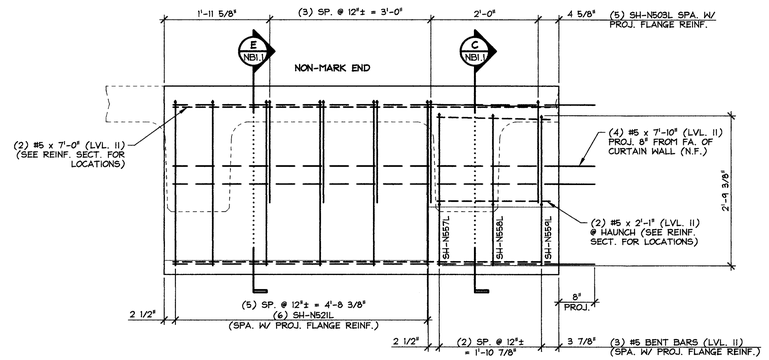
VOL.: 1.54 cy
WT.: 3.12 T

3/4" = 1'-0"



2 NB5.1 CURTAIN WALL DIMENSIONAL ELEVATION

3/4" = 1'-0"



4 NB5.1 CURTAIN WALL DIMENSIONAL ELEVATION

3/4" = 1'-0"

45.87 T = NEXT BEAM
2.55 T = CURTAIN WALL (MARK END)
3.12 T = CURTAIN WALL (NON-MARK END)
51.5 T = TOTAL BEAM WT.

SUBMITTED
JAN 23 2014
J. P. CARRARA & SONS, INC.
MIDDLEBURY, VT 05753

MARK: SH-NB4 | QTY.: 1

MATERIAL LIST / CURTAIN WALL

ITEM	MARK	DESCRIPTION	QTY./CURTAIN WALL	
			MARK END	NON-MARK END
1	SH-N503L	#5 BENT BAR (LEVEL II, DUAL COATED)	5	5
2	SH-N520L	#5 BENT BAR (LEVEL II, DUAL COATED)	6	
3	SH-N521L	#5 BENT BAR (LEVEL II, DUAL COATED)		6
4	SH-N554L	#5 BENT BAR (LEVEL II, DUAL COATED)	1	
5	SH-N555L	#5 BENT BAR (LEVEL II, DUAL COATED)	1	
6	SH-N556L	#5 BENT BAR (LEVEL II, DUAL COATED)	1	
7	SH-N557L	#5 BENT BAR (LEVEL II, DUAL COATED)		1
8	SH-N558L	#5 BENT BAR (LEVEL II, DUAL COATED)		1
9	SH-N559L	#5 BENT BAR (LEVEL II, DUAL COATED)		1
10		#5 x 2'-1" (LVL. II, DUAL COATED)	2	2
11		#5 x 7'-0" (LVL. II, DUAL COATED)		2
12		#5 x 7'-1" (LVL. II, DUAL COATED)	5	
13		#5 x 7'-10" (LVL. II, DUAL COATED)		4
14		#5 x 7'-11" (LVL. II, DUAL COATED)	1	
15				
16		#8 x 1'-7" (LEVEL II, DUAL COATED)	2	2
17				
18				
19				
20				

APPROVAL STAMP:

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

T. BUCK CONSTRUCTION
CONTRACTOR
AUBURN, MAINE

STATE OF VERMONT AGENCY OF TRANSPORTATION
COUNTY OF ADDISON

TOWN OF MIDDLEBURY
ROUTE NO. VT 125, EAST MIDDLEBURY GORGE
BRIDGE NO.: 13 PROJECT NO.: RS 0174(8)

PRECAST CURTAIN WALL DETAILS

DATE: OCT. 9, 2013
SCALE: NOTED
CHKD: DFTM: B.L.
JOB NO: 23411-013
DWG. NO: NB5.1

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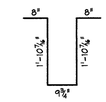
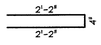
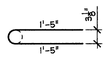


SH-N401L
#4 BENT BAR
LEVEL II (DUAL COATED)
USE 2"ϕ (50 mm) PIN
(648) REQ'D.

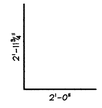


SH-N402L
#4 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾"ϕ (70 mm) PIN
(993) REQ'D.

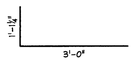


SH-N403L
#4 HAIRPIN
LEVEL II (DUAL COATED)
USE 2"ϕ (50 mm) PIN
(504) REQ'D.

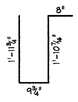
SH-N404L
#4 BENT BAR
LEVEL II (DUAL COATED)
USE 2"ϕ (50 mm) PIN
(32) REQ'D.



SH-N405L
#4 BENT BAR
LEVEL II (DUAL COATED)
USE 2"ϕ (50 mm) PIN
(356) REQ'D.



SH-N406L
#4 BENT BAR
LEVEL II (DUAL COATED)
USE 2"ϕ (50 mm) PIN
(178) REQ'D.

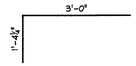


SH-N407L
#4 BENT BAR
LEVEL II (DUAL COATED)
USE 2"ϕ (50 mm) PIN
(24) REQ'D.

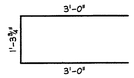
SH-N501L
#5 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾"ϕ (70 mm) PIN
(48) REQ'D.

SH-N502L
#5 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾"ϕ (70 mm) PIN
(64) REQ'D.

SH-N560L
#5 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾"ϕ (70 mm) PIN
(8) REQ'D.



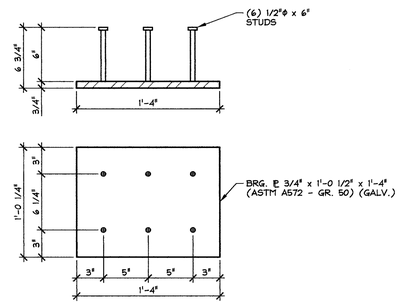
SH-N601L
#6 BENT BAR
LEVEL II (DUAL COATED)
USE 4"ϕ (100 mm) PIN
(16) REQ'D.



SH-N602L
#6 BENT BAR
LEVEL II (DUAL COATED)
USE 4"ϕ (100 mm) PIN
(48) REQ'D.

MISCELLANEOUS MATERIALS

ITEM	MARK	QTY.	DESCRIPTION	REMARKS
1		72	#4 x 8'-0" (LVL. II, DUAL COATED)	
2				
3				
4		32	#5 x 6'-11 1/2" (LVL. II, DUAL COATED)	
5		64	#5 x 7'-4" (LVL. II, DUAL COATED)	
6		984	#5 x 8'-0" (LVL. II, DUAL COATED)	
7		96	#5 x 63'-0" (W/ (1) 2'-6" STAGGERED LAP) (LVL. II, DUAL COATED)	
8				
9				
10				
11				
12	MK-N1	8	BRG. ℄ 3/4" x 1'-0 1/4" x 1'-4" W/ ANCHORS (GALV.)	SEE DETAIL, THIS SHEET
13	MK-N2	18	DAYTON 7/8"ϕ F-42 LOOP FERRULE INSERT (GALV.)	
14	MK-N3	6	DAYTON 1"ϕ F-42 LOOP FERRULE INSERT (STAINLESS STEEL)	
15		16	SET OF (4) 0.60"ϕ x 270 KSI STRAND LIFTING LOOPS	
16				
17				
18				
19				
20				



BEARING PLATE DETAIL
1 1/2" = 1'-0"

SUBMITTED
JAN 23 2014
J. P. CARRARA & SONS, INC.
MIDDLEBURY, VT 05753

APPROVAL STAMP:

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

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STATE OF VERMONT AGENCY OF TRANSPORTATION
COUNTY OF ADDISON

TOWN OF MIDDLEBURY
ROUTE NO. VT 125, EAST MIDDLEBURY GORGE
BRIDGE NO.: 13 PROJECT NO.: RS 0174(8)

NEXT BEAM MATERIALS LIST

DATE: OCT. 9, 2013
SCALE: NOTED
CHKD: DFTM: B.L.
JOB NO: 23411-013
DWG. NO: NBM1

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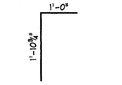
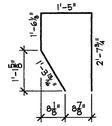
MISCELLANEOUS MATERIALS

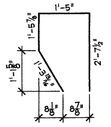
ITEM	MARK	QTY.	DESCRIPTION	REMARKS
1		4	#5 x 2'-1" (LVL. II, DUAL COATED)	
2		13	#5 x 7'-0" (LVL. II, DUAL COATED)	
3		5	#5 x 7'-1" (LVL. II, DUAL COATED)	
4		9	#5 x 7'-10" (LVL. II, DUAL COATED)	
5		1	#5 x 7'-11" (LVL. II, DUAL COATED)	
6		12	#5 x 8'-1" (LVL. II, DUAL COATED)	
7		20	#5 x 8'-11" (LVL. II, DUAL COATED)	
8				
9		36	#8 x 1'-7" (LVL. II, DUAL COATED)	
10				



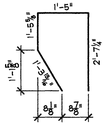
SH-N503L
#5 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾ϕ [70 mm] PIN
(44) REQ'D.



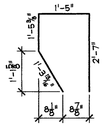
SH-N504L
#5 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾ϕ [70 mm] PIN
(1) REQ'D.



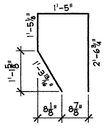
SH-N505L
#5 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾ϕ [70 mm] PIN
(1) REQ'D.



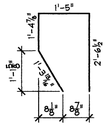
SH-N506L
#5 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾ϕ [70 mm] PIN
(1) REQ'D.



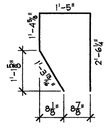
SH-N507L
#5 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾ϕ [70 mm] PIN
(1) REQ'D.



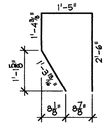
SH-N508L
#5 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾ϕ [70 mm] PIN
(1) REQ'D.



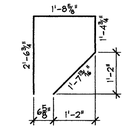
SH-N509L
#5 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾ϕ [70 mm] PIN
(1) REQ'D.



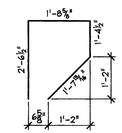
SH-N510L
#5 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾ϕ [70 mm] PIN
(1) REQ'D.



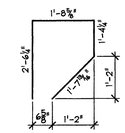
SH-N511L
#5 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾ϕ [70 mm] PIN
(1) REQ'D.



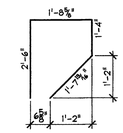
SH-N512L
#5 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾ϕ [70 mm] PIN
(1) REQ'D.



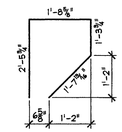
SH-N513L
#5 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾ϕ [70 mm] PIN
(1) REQ'D.



SH-N514L
#5 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾ϕ [70 mm] PIN
(1) REQ'D.



SH-N515L
#5 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾ϕ [70 mm] PIN
(1) REQ'D.



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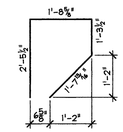
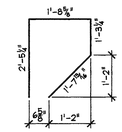
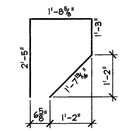
#5 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾ϕ [70 mm] PIN
(1) REQ'D.



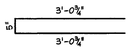
SH-N517L
#5 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾ϕ [70 mm] PIN
(1) REQ'D.



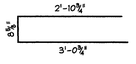
SH-N518L
#5 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾ϕ [70 mm] PIN
(1) REQ'D.



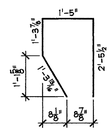
SH-N519L
#5 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾ϕ [70 mm] PIN
(1) REQ'D.



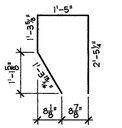
SH-N520L
#5 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾ϕ [70 mm] PIN
(6) REQ'D.



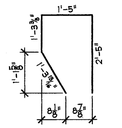
SH-N521L
#5 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾ϕ [70 mm] PIN
(6) REQ'D.



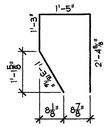
SH-N522L
#5 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾ϕ [70 mm] PIN
(1) REQ'D.



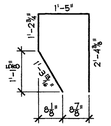
SH-N523L
#5 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾ϕ [70 mm] PIN
(1) REQ'D.



SH-N524L
#5 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾ϕ [70 mm] PIN
(1) REQ'D.



SH-N525L
#5 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾ϕ [70 mm] PIN
(1) REQ'D.



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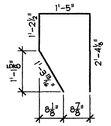
USE 2¾ϕ [70 mm] PIN
(1) REQ'D.



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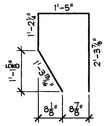
USE 2¾ϕ [70 mm] PIN
(1) REQ'D.



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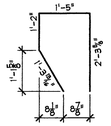

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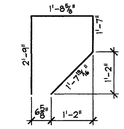

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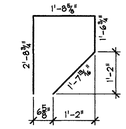

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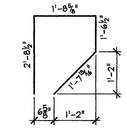
#5 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾ϕ [70 mm] PIN
(1) REQ'D.



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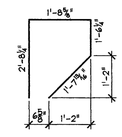
#5 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾ϕ [70 mm] PIN
(1) REQ'D.



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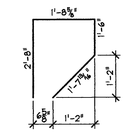

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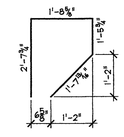

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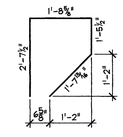

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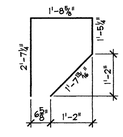

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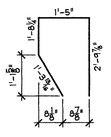

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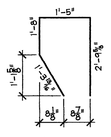

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USE 2¾ϕ [70 mm] PIN
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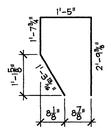

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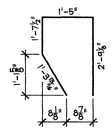
USE 2¾ϕ [70 mm] PIN
(1) REQ'D.



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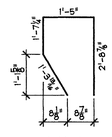

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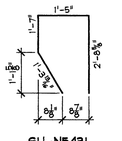

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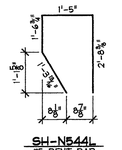

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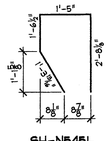

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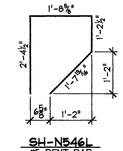

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LEVEL II (DUAL COATED)
USE 2¾ϕ [70 mm] PIN
(1) REQ'D.

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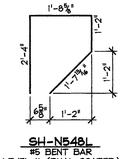
LEVEL II (DUAL COATED)
USE 2¾ϕ [70 mm] PIN
(1) REQ'D.



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LEVEL II (DUAL COATED)
USE 2¾ϕ [70 mm] PIN
(1) REQ'D.

SH-N549L
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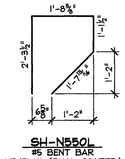
LEVEL II (DUAL COATED)
USE 2¾ϕ [70 mm] PIN
(1) REQ'D.



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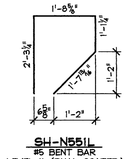

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LEVEL II (DUAL COATED)
USE 2¾ϕ [70 mm] PIN
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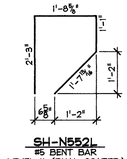

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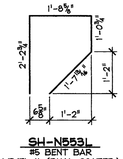

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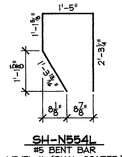

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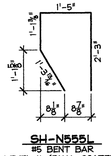
(1) REQ'D.



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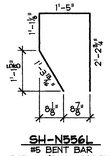

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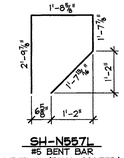

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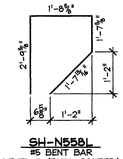

SH-N558L
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LEVEL II (DUAL COATED)
USE 2¾ϕ [70 mm] PIN
(1) REQ'D.

SH-N559L
#5 BENT BAR
LEVEL II (DUAL COATED)
USE 2¾ϕ [70 mm] PIN
(1) REQ'D.

SUBMITTED
JAN 23 2014
J. P. CARRARA & SONS, INC.
MIDDLEBURY, VT 05753

APPROVAL STAMP:

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

T. BUCK CONSTRUCTION
CONTRACTOR
AUBURN, MAINE

STATE OF VERMONT AGENCY OF TRANSPORTATION
COUNTY OF ADDISON

DATE: OCT. 9, 2013
SCALE: NOTED
CHKD: DFTM: B.L.
JOB NO: 23411-013

TOWN OF MIDDLEBURY
ROUTE NO. VT 125, EAST MIDDLEBURY GORGE
BRIDGE NO.: 13 PROJECT NO.: RS 0174(8)

CURTAIN WALL MATERIALS LIST

DWG. NO: NBM2

F:\VT-Bridges\East Middlebury Gorge\23411-013 NBM2.dwg, 1/22/2014 3:25:52 PM

J. P. CARRARA & SONS, INC.

ERNEST J. BROD
1-23-14

LIFTING LOOP DESIGN CALCULATIONS
(WORK W/ CARRARA SHOP DRAWINGS)

MIDDLEBURY BRIDGE
JPC # 23411-013

NEXT 280 BEAMS (SH-NB1, SH-NB2, SH-NB3 & SH-NB4)

WT = 108900 LB, MAX

THERE ARE (4) LIFT POINTS/BM

STRIPPING & ERECTION

LOAD/LIFT POINT = 108900/4 = 27225 LB

ASSUME 60° MIN SLING ANGLE W/ THE HORIZONTAL

DESIGN LOAD/LIFT POINT = 27225/0.866 = 31438 LB

FROM ATTACHED PCI LITERATURE

USE (4) 0.600" ϕ X270 STRAND LIFT LOOPS AT

EACH LOCATION, MIN EMBEDMENT = 2'-2"

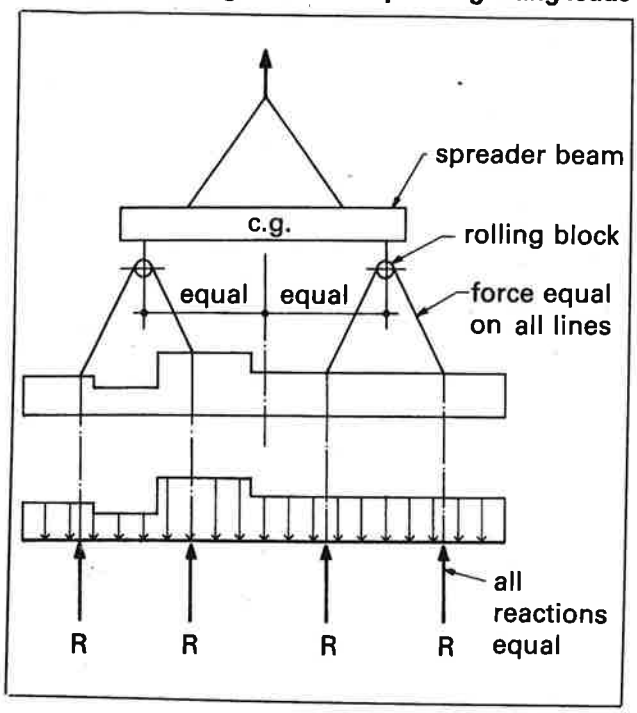
BY INTERPOLATION LWC (4.1 S.F.):

1.1 X 28.4 = 31.3^K ≈ 31.4^K, OK

STATE OF VERMONT
ERNEST J. BROD
No. 9814
REGISTERED
PROFESSIONAL ENGINEER

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.

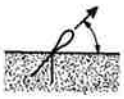
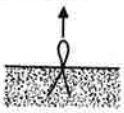
Reduced capacities for shorter embedment lengths may be suitable. In shallow products, providing a 90° bend can reduce the required embedment length significantly. Lightly rusted strand has better bond than bright strand.

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.