

**State of Vermont  
PDD/Structures Design Section**

Danny R. Landry  
One National Life Drive  
Montpelier, VT 05633-5001  
[www.aot.state.vt.us](http://www.aot.state.vt.us)

Structures Project Manager  
[phone] 802-828-3639  
[fax] 802-828-3566

*Agency of Transportation*

February 18, 2016

Eric Boyden  
PO Box 132  
Lyndon Center, Vermont 05850

**Project Name: Lunenburg NH CULV(27)**

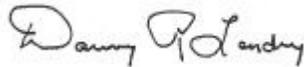
**Structure Identification: Bridge No. 126 Replacement**

Dear Mr. Boyden:

The precast concrete fabrication drawings associated with Items 540.10 Precast Concrete Structure (7'-0" X 20' - 0" X 110' - 0" Arch) and (Wingwalls) has been reviewed and is approved as noted.

Please incorporate all review comments.

Sincerely,



Danny R Landry  
Structures Project Manager

# US ROUTE 2 BRIDGE NO. 126 TOWN OF LUNENBURG ESSEX COUNTY, VERMONT

REVIEWED

By Jim Wild at 2:37 pm, Apr 22, 2016

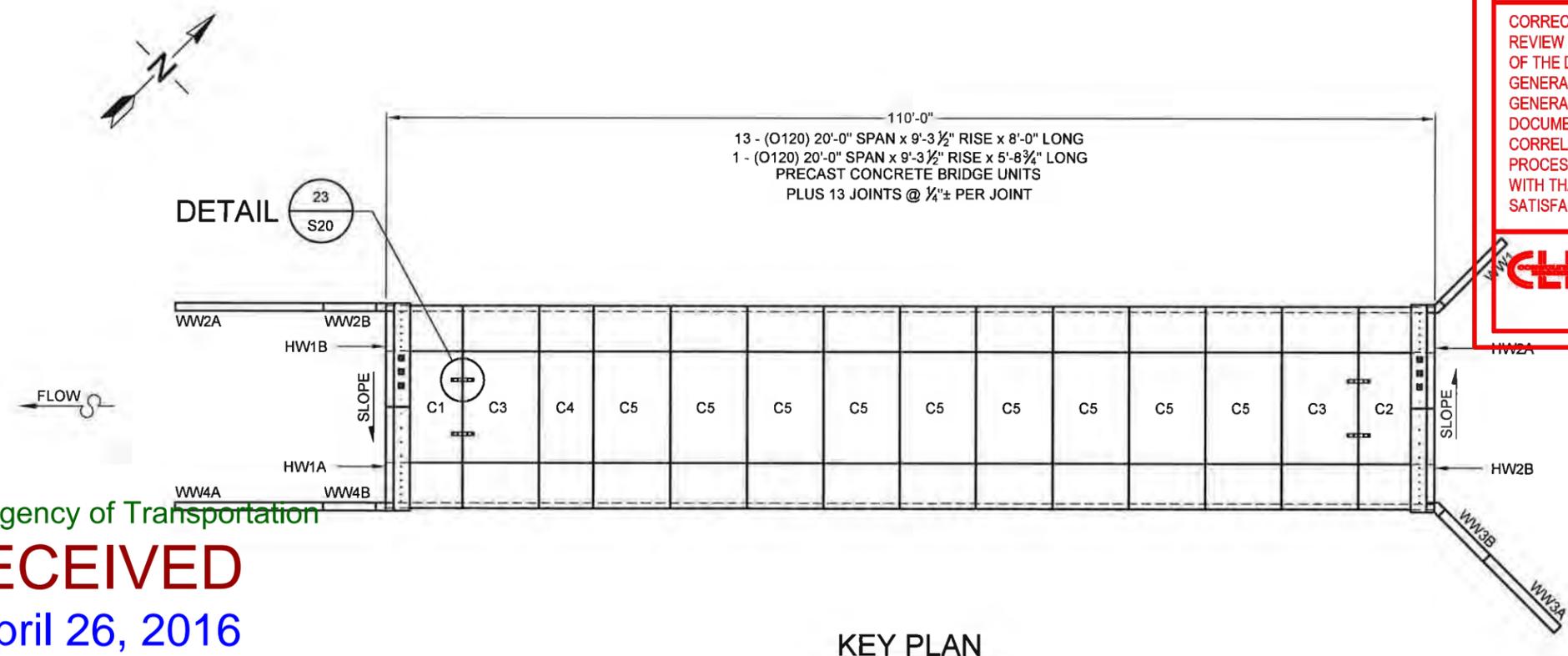
## SHOP DRAWING REVIEW

- REVIEWED AS REQUIRED BY THE CONSTRUCTION CONTRACT DOCUMENTS AND APPROVED, BUT ONLY FOR CONFORMANCE TO THE DESIGN CONCEPT OF THE WORK, AND SUBJECT TO FURTHER LIMITATIONS AND REQUIREMENTS CONTAINED IN THE CONSTRUCTION CONTRACT DOCUMENTS.
- REJECTED       REVISE AND RESUBMIT       APPROVED AS NOTED

CORRECTIONS OR COMMENTS MADE ON THE SHOP DRAWINGS DURING THIS REVIEW DID NOT RELIEVE CONTRACTOR FROM COMPLIANCE WITH REQUIREMENTS OF THE DRAWINGS AND SPECIFICATIONS. THIS CHECK IS ONLY FOR REVIEW OF GENERAL CONFORMANCE WITH THE DESIGN CONCEPT OF THE PROJECT AND GENERAL COMPLIANCE WITH THE INFORMATION GIVEN IN THE CONTRACT DOCUMENTS. THE CONTRACTOR IS RESPONSIBLE FOR: CONFIRMING AND CORRELATING ALL QUANTITIES AND DIMENSIONS; SELECTING FABRICATION PROCESSES AND TECHNIQUES OF CONSTRUCTION; COORDINATING THEIR WORK WITH THAT OF ALL OTHER TRADES; AND PERFORMING THEIR WORK IN A SAFE AND SATISFACTORY MANNER.

CLD Consulting Engineers  
 540 Commercial Street  
 Manchester, NH 03101  
 603-668-8223

Job Number: 120106  
 Reviewed by: NDC  
 Date: 4/22/16



Vermont Agency of Transportation

RECEIVED

ON: April 26, 2016

and Checked for

CONFORMANCE

BY: Danny Landry DATE: 04/26/16



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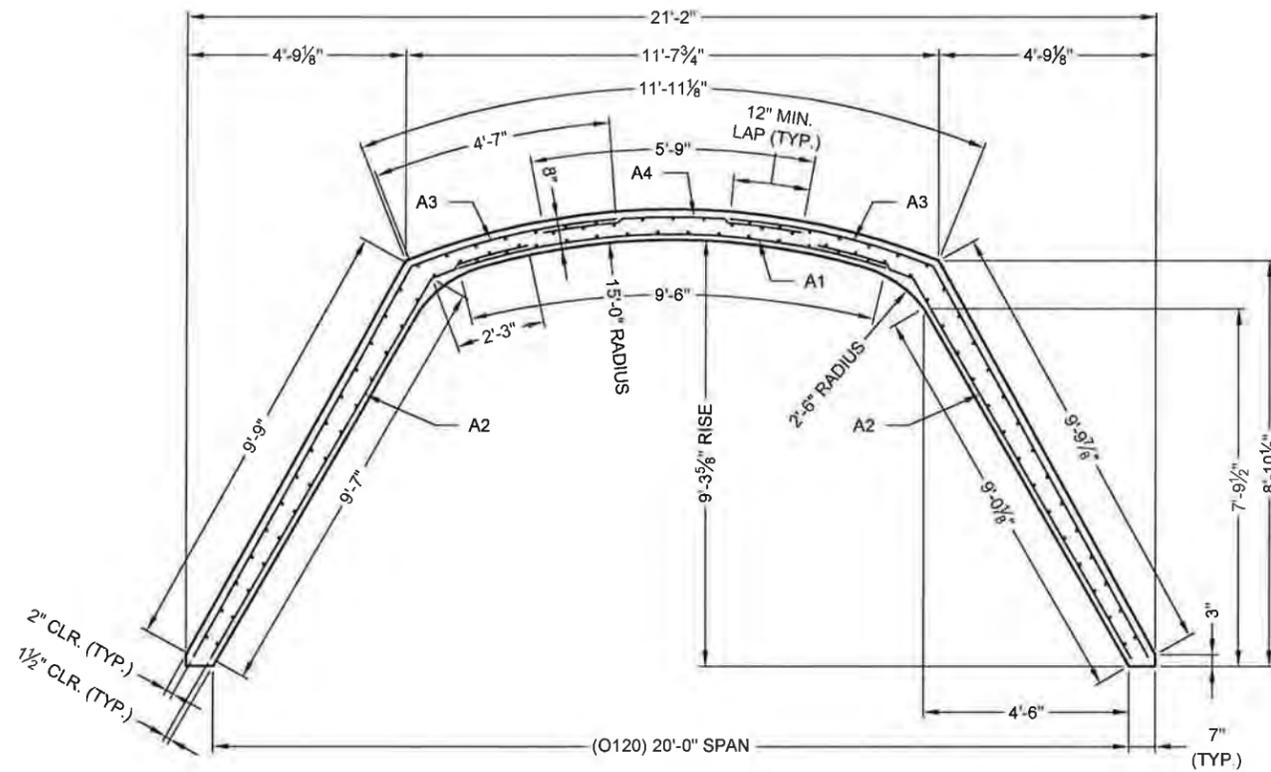
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2	4/14/2016	REVIEW COMMENTS	JDR
1	3/16/2016	NO CHANGES THIS SHEET	KDK

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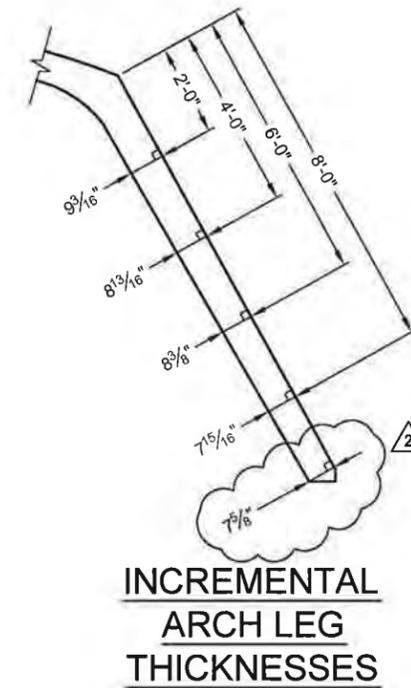
US ROUTE 2  
BRIDGE NO. 126  
TOWN OF LUNENBURG  
ESSEX COUNTY, VERMONT

PROJECT No.: 468920	SEQ. No.: 010	DATE: 12/8/2015
DESIGNED: KDK	DRAWN: TRL	
CHECKED: JDR	APPROVED: PAC	
SHEET NO.: S1 OF S22		

- NOTES:
1. MINIMUM 28-DAY CONCRETE COMPRESSIVE STRENGTH SHALL BE 5000 PSI
  2. OVERLAP LENGTH SHALL BE MEASURED FROM LAST CROSSWIRE
  3. DIMENSIONS SHOWN ARE FOR FORM SYSTEM O-100 SERIES.
  4. MINIMUM YIELD STRENGTH FOR WELDED WIRE FABRIC SHALL BE 65,000 PSI
  5. REINFORCING SHALL BE LIMITED TO A MAXIMUM OF THREE LAYERS OF REINFORCING (WWF OR BARS) PER AREA (A1, A2, A3 OR A4)
  6. ALL EDGES OF PRECAST TO HAVE A 3/4" CHAMFER
  7. SPACING OF LONGITUDINAL REINFORCEMENT MUST BE A MAXIMUM OF 8" O C FOR MULTIPLE LAYERS OF MESH, ONLY THE OUTER MOST LAYER (A1A OR A3A) MUST BE A MAXIMUM OF 8" O C.
  8. SPACING OF A2 & A4 CIRCUMFERENTIAL REINFORCEMENT SHALL BE 2" MIN TO 4" MAX SPACING OF A1 & A3 CIRCUMFERENTIAL REINFORCEMENT SHALL BE 2"



**PRECAST UNIT REINFORCEMENT**



WEIGHT OF REQUIRED REINFORCEMENT = 118 0 LBS/FT

SHEET NO.	CIRCUMFERENTIAL AREA REQ'D (IN <sup>2</sup> /FT)	LONGITUDINAL AREA REQ'D (IN <sup>2</sup> /FT)	MESH SIZE	LENGTH (FT)	CIRCUMFERENTIAL AREA SUPL'D (IN <sup>2</sup> /FT)	LONGITUDINAL AREA SUPL'D (IN <sup>2</sup> /FT)
1	A1 = 0.30	0.13		9'-6"		
2	A2 = 0.48	0.13		11'-10"		
3	A3 = 0.36	0.13		14'-4"		
4	A4 = 0.24	0.13		5'-9"		
5						

DESIGN LOADING: HL-93

COVER = 2'-0" MIN. \ 13'-0" MAX.

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1	3/16/2016	NO CHANGES THIS SHEET	KDK

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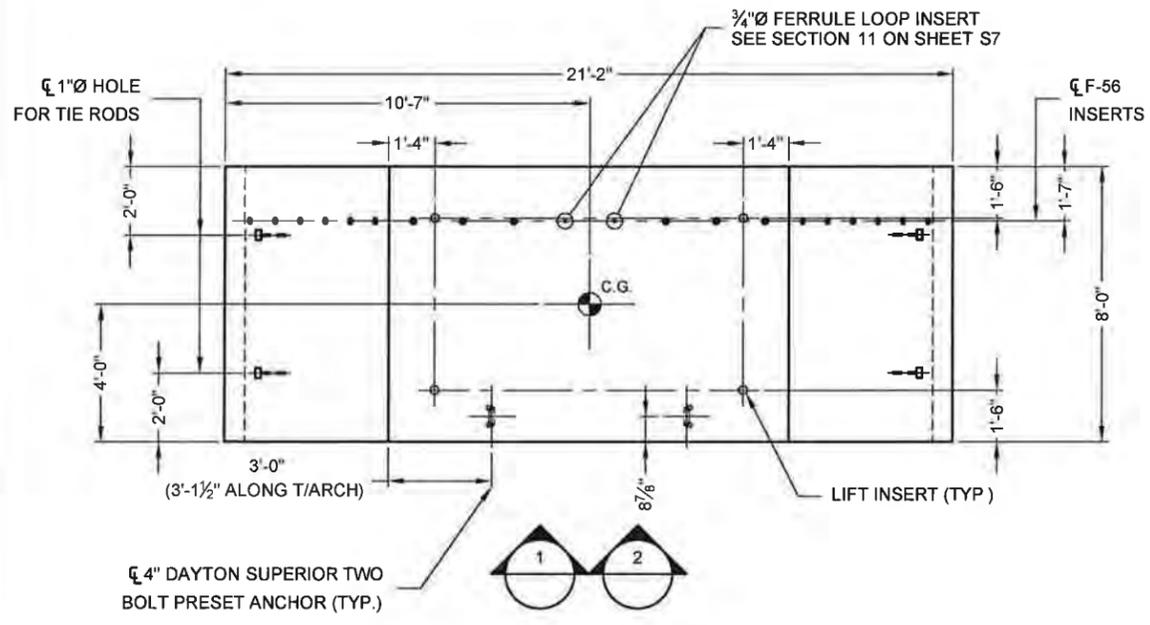
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BRIDGE NO. 126  
TOWN OF LUNENBURG  
ESSEX COUNTY, VERMONT



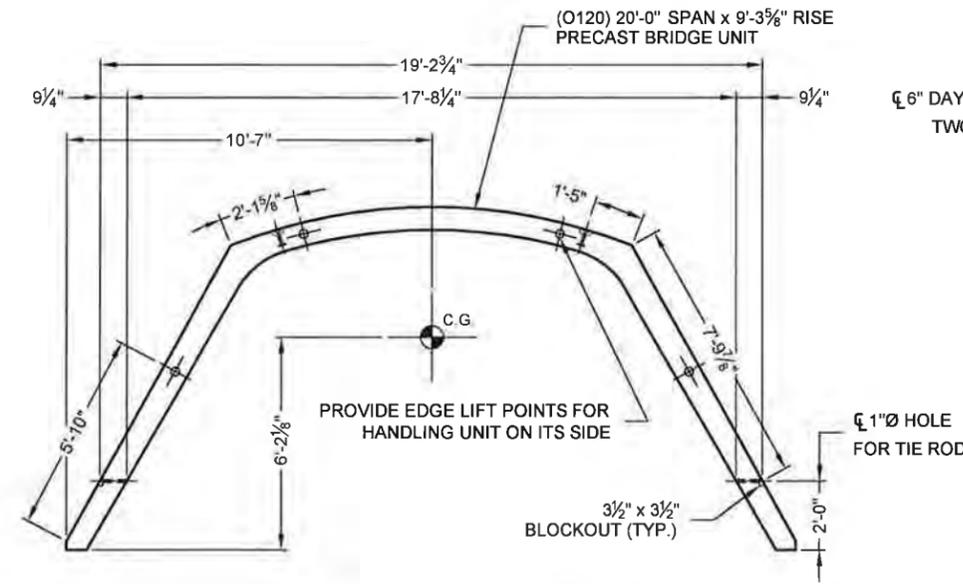
SHOP DRAWING REVIEW	
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<input type="checkbox"/>	REJECTED
<input type="checkbox"/>	REVISE AND RESUBMIT
<input type="checkbox"/>	APPROVED AS NOTED
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CLD Consulting Engineers 540 Commercial Street Manchester, NH 03101 603-468-5223	Job Number: 12-0106 Reviewed by: NDC Date: 04/22/16

PROJECT No.	SEQ No.	DATE
468920	010	12/8/2015
DESIGNED:	DRAWN:	
KDK	TRL	
CHECKED:	APPROVED:	
JDR	PAC	
SHEET NO.:	S2 OF S22	

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**PLAN - C1**  
TOTAL WEIGHT = 13.1 TONS

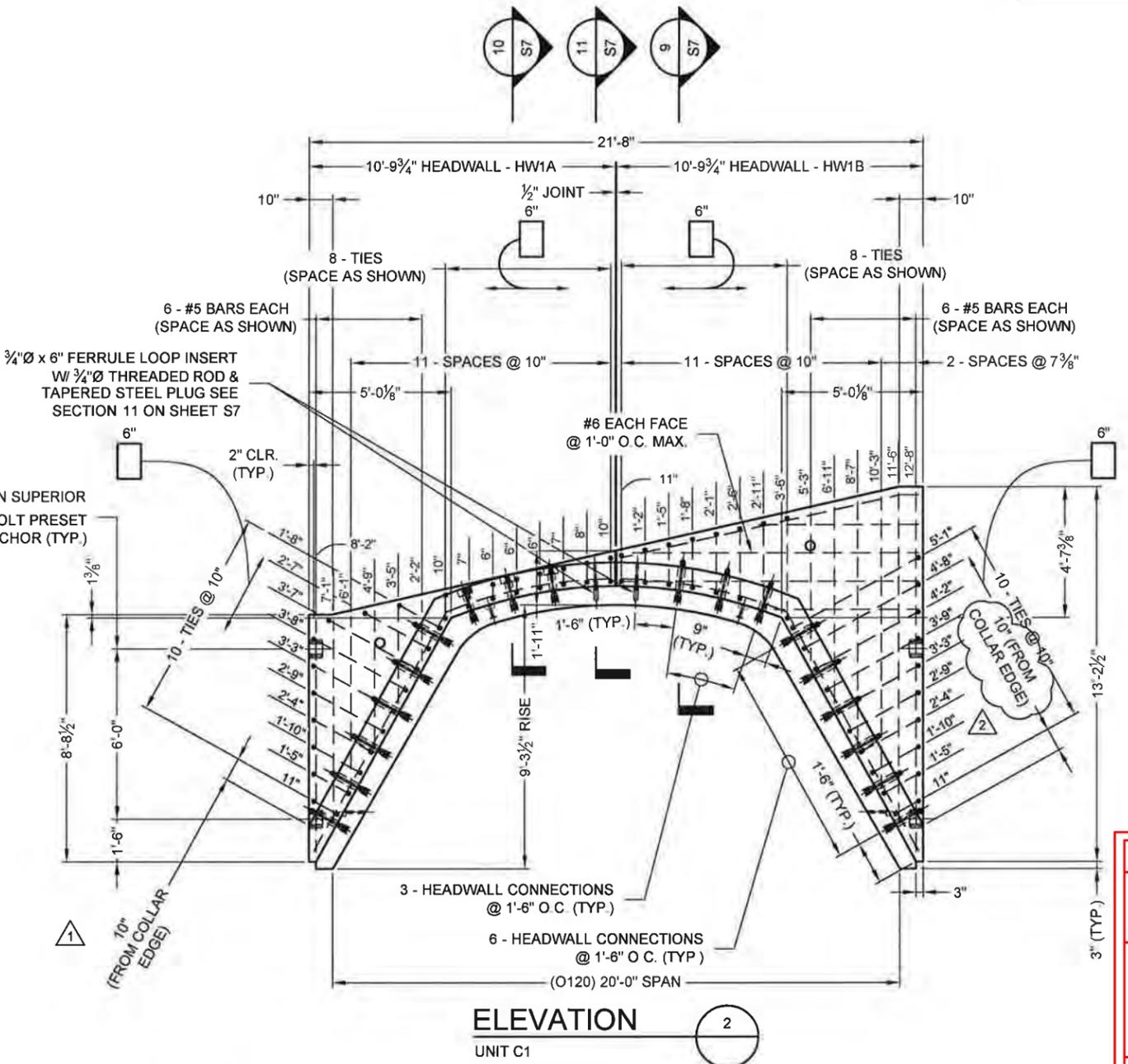


**ELEVATION**

HEADWALL		ARCH UNIT		
CONCRETE	REINF STEEL	CONCRETE	REINF STEEL	WWF
28-DAY: 5000 PSI	60,000 PSI UNCOATED	28-DAY: 5000 PSI	60,000 PSI UNCOATED	65,000 PSI UNCOATED

WHEREVER THE REINFORCING IS CUT FOR THE PLACEMENT OF LIFT HOLES OR OTHER BLOCKOUTS, REINFORCING BARS OR WIRES OF EQUIVALENT CROSS-SECTIONAL AREA SHALL BE PLACED SYMMETRICALLY AROUND THE HOLE. AT LEAST ONE BAR MUST BE ON EACH SIDE OF THE HOLE, AND THE DEVELOPMENT LENGTH OF THE BAR MUST BE ACHIEVED ON EITHER SIDE OF THE CUT.

- NOTES:**
- ALL EDGES OF PRECAST TO HAVE A 3/4" CHAMFER
  - ELEVATION IS LOOKING AT BACK FACE OF HEADWALL
  - SEE SHEET S4 FOR HEADWALL C G & LIFT POINTS
  - HEADWALL TO BE CAST AGAINST BRIDGE UNIT
  - BRIDGE UNITS MUST BE GROUTED OR BRACED WHEN SETTING PRECAST HEADWALLS
  - SEE SHEET S2 FOR BRIDGE UNIT DIMENSIONS
  - INSTALL TIE RODS BEFORE UNIT IS SET UPRIGHT & LEAVE IN PLACE UNTIL UNIT IS GROUTED INTO FINAL POSITION



**ELEVATION**  
UNIT C1

**SHOP DRAWING REVIEW**

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Manchester, NH 03101  
603-688-5225

Job Number: 12-0106  
Reviewed by: NDC  
Date: 04/22/16

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1	3/16/2016	REVISIONS PER REVIEW COMMENTS	KDK

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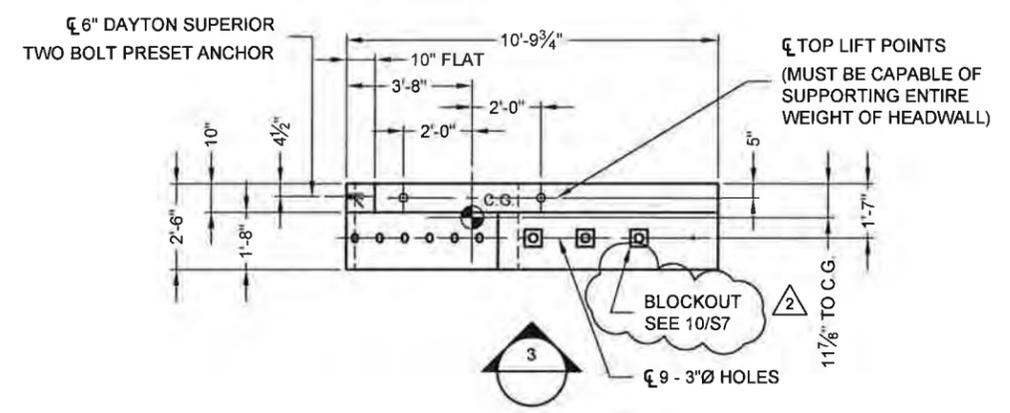
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FABRICATION  
DRAWING

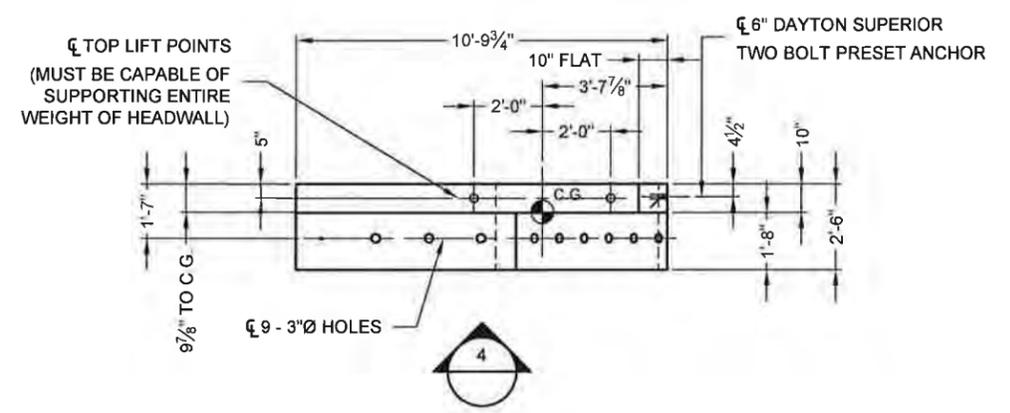
US ROUTE 2  
BRIDGE NO. 126  
TOWN OF LUNENBURG  
ESSEX COUNTY, VERMONT

PROJECT NO:	SEQ NO:	DATE:
468920	010	12/8/2015
DESIGNED:	DRAWN:	
KDK	TRL	
CHECKED:	APPROVED:	
JDR	PAC	
SHEET NO:	S3 OF S22	

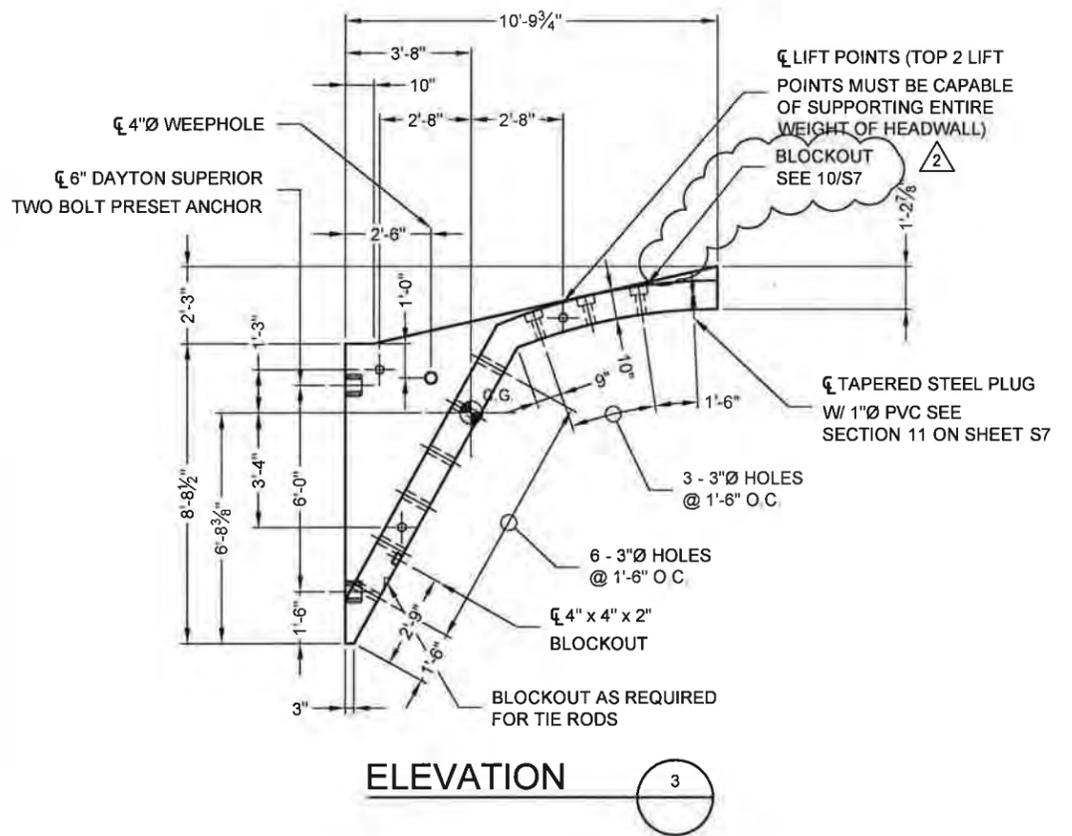
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 - ELEVATION IS LOOKING AT BACK FACE OF HEADWALL  
 - HEADWALL TO BE CAST AGAINST BRIDGE UNIT  
 - BRIDGE UNITS MUST BE GROUTED OR BRACED WHEN SETTING PRECAST HEADWALLS  
 - HEADWALL WILL NOT HANG LEVEL ADJUST CABLE LENGTHS AS REQUIRED



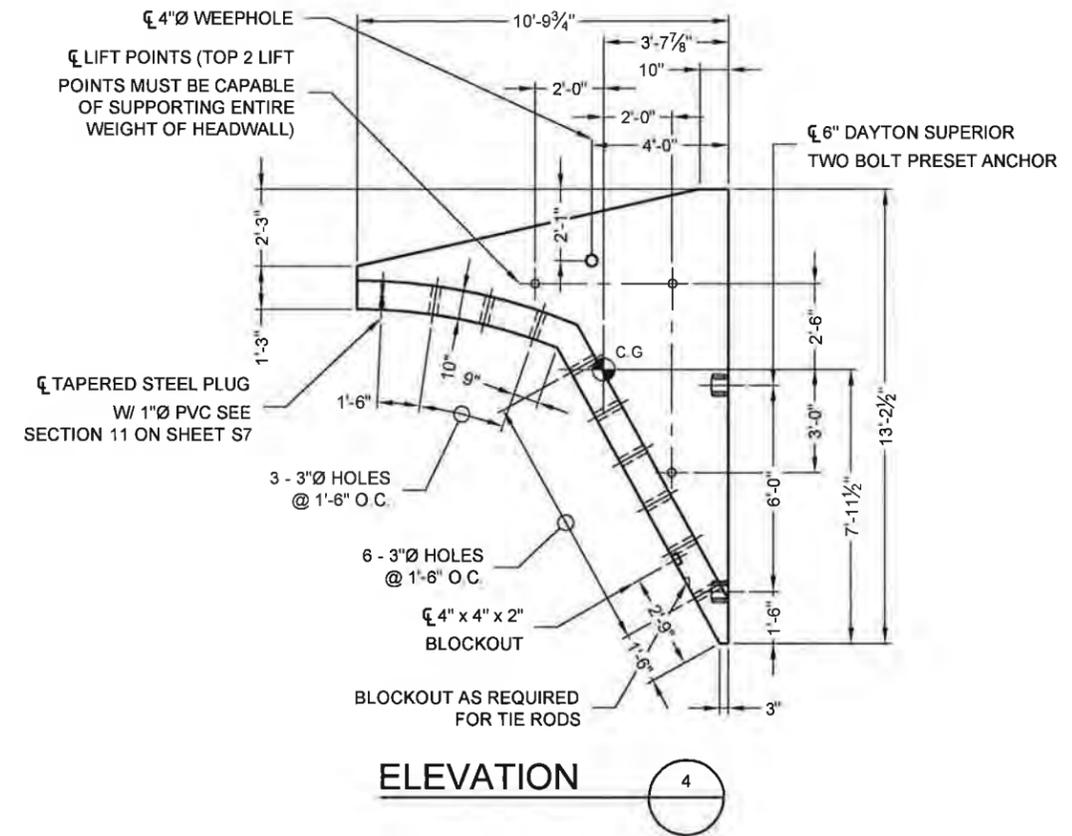
**PLAN - HW1A**  
 TOTAL WEIGHT = 3.6 TONS



**PLAN - HW1B**  
 TOTAL WEIGHT = 5.2 TONS



**ELEVATION** 3



**ELEVATION** 4

**SHOP DRAWING REVIEW**

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 603-688-8223

Job Number: 12-0106  
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 Date: 04/22/16

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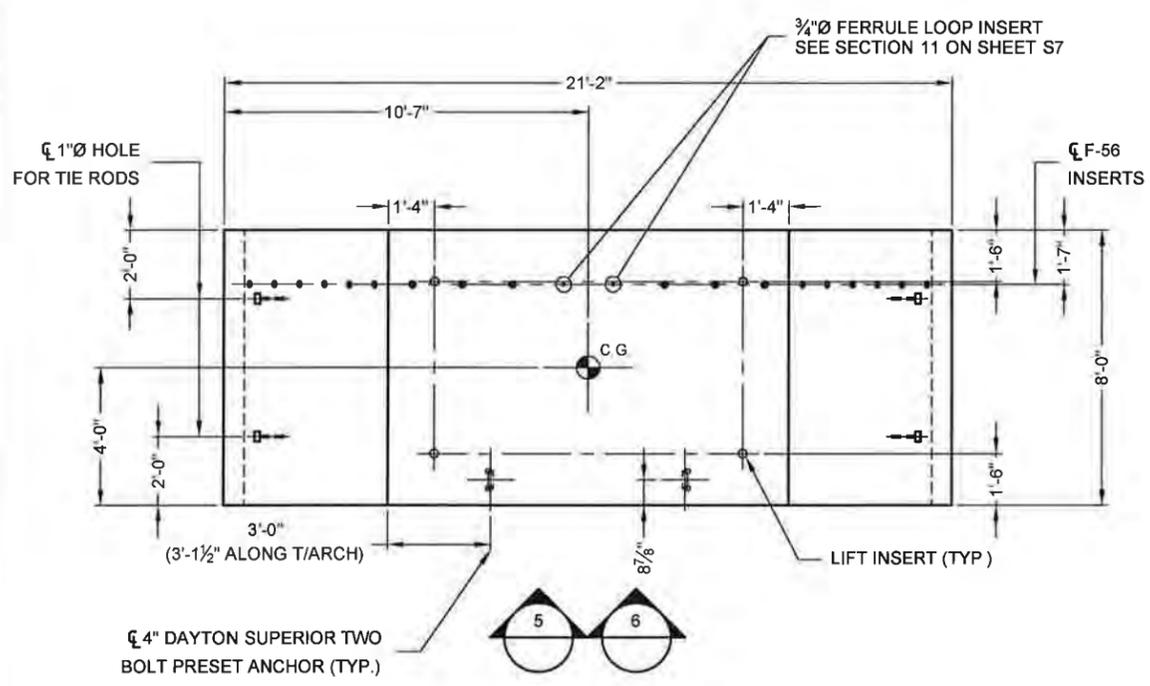
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1	3/16/2016	NO CHANGES THIS SHEET	KDK

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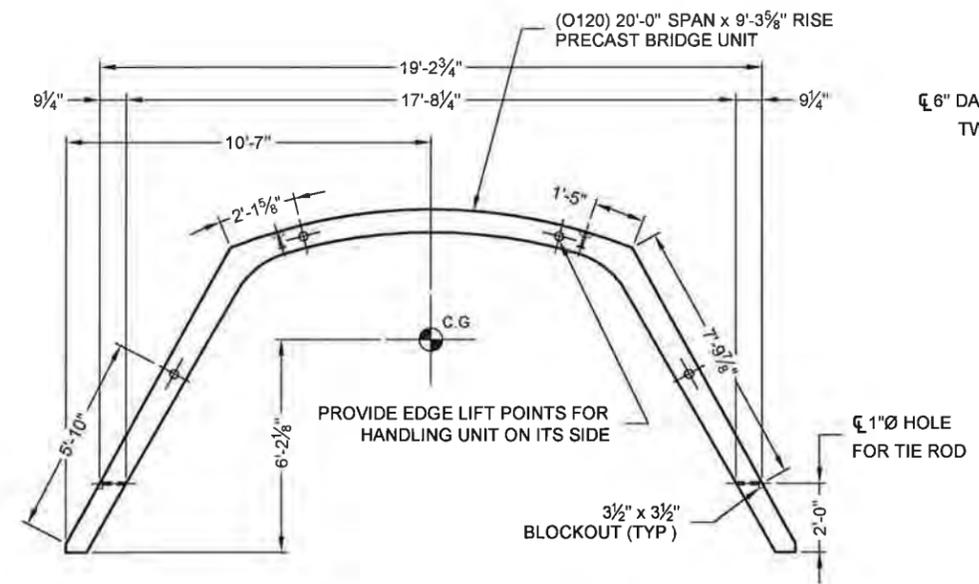
**CONSPAN**  
 -SERIES  
 FABRICATION  
 DRAWING

US ROUTE 2  
 BRIDGE NO. 126  
 TOWN OF LUNENBURG  
 ESSEX COUNTY, VERMONT

PROJECT No:	SEQ No:	DATE:
468920	010	12/8/2015
DESIGNED:	DRAWN:	
KDK	TRL	
CHECKED:	APPROVED:	
JDR	PAC	
SHEET No:	S4 OF S22	



**PLAN - C2**  
TOTAL WEIGHT = 13.1 TONS

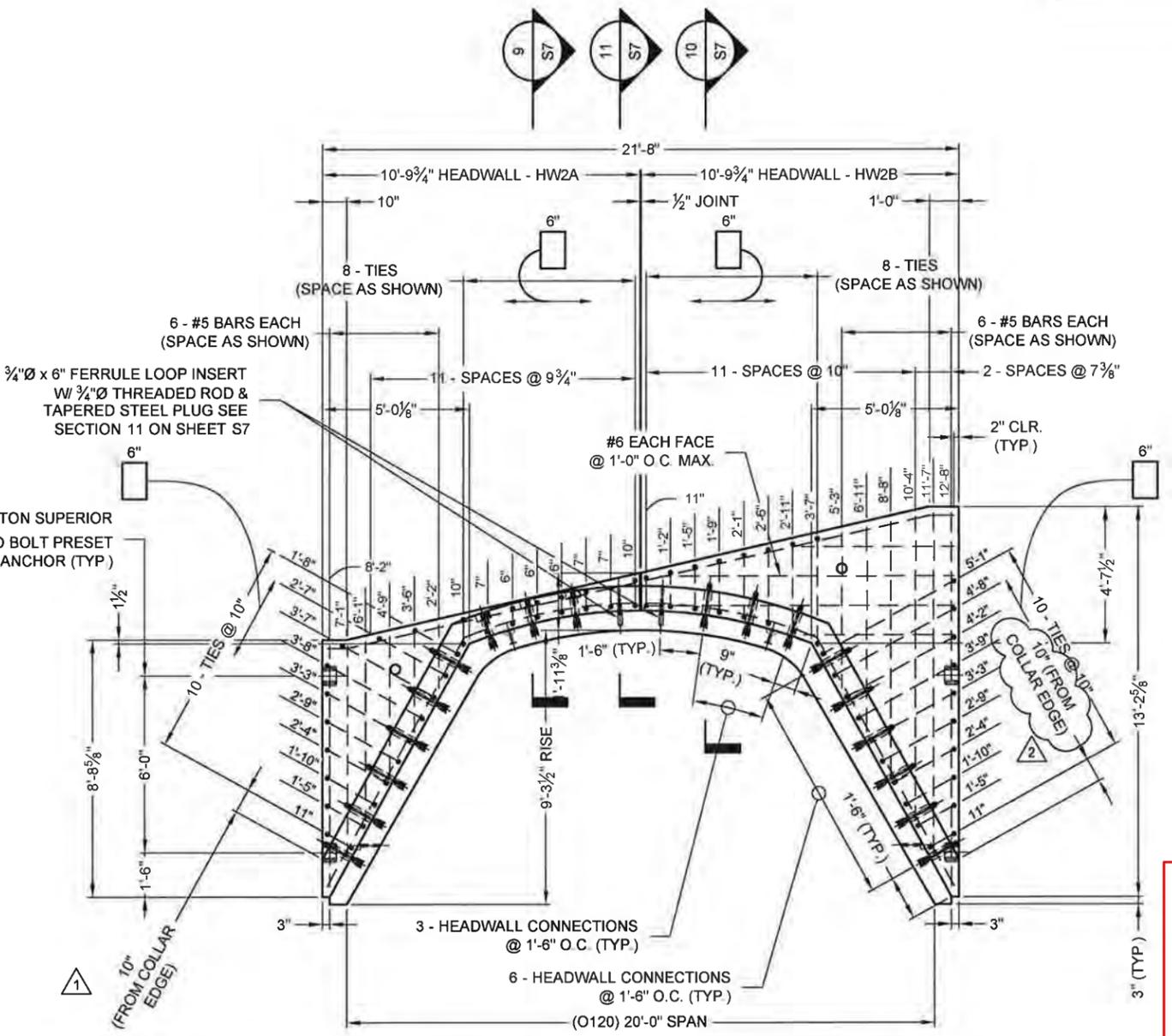


**ELEVATION**

HEADWALL		ARCH UNIT		
CONCRETE	REINF STEEL	CONCRETE	REINF STEEL	WWF
28-DAY: 5000 PSI	60,000 PSI UNCOATED	28-DAY: 5000 PSI	60,000 PSI UNCOATED	65,000 PSI UNCOATED

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- NOTES:**
- ALL EDGES OF PRECAST TO HAVE A 3/4" CHAMFER
  - ELEVATION IS LOOKING AT BACK FACE OF HEADWALL
  - SEE SHEET S6 FOR HEADWALL C.G. & LIFT POINTS
  - HEADWALL TO BE CAST AGAINST BRIDGE UNIT
  - BRIDGE UNITS MUST BE GROUTED OR BRACED WHEN SETTING PRECAST HEADWALLS
  - SEE SHEET S2 FOR BRIDGE UNIT DIMENSIONS
  - INSTALL TIE RODS BEFORE UNIT IS SET UPRIGHT & LEAVE IN PLACE UNTIL UNIT IS GROUTED INTO FINAL POSITION



**ELEVATION**  
UNIT C2

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603-888-5223

Job Number: 12-0106  
Reviewed by: NDC  
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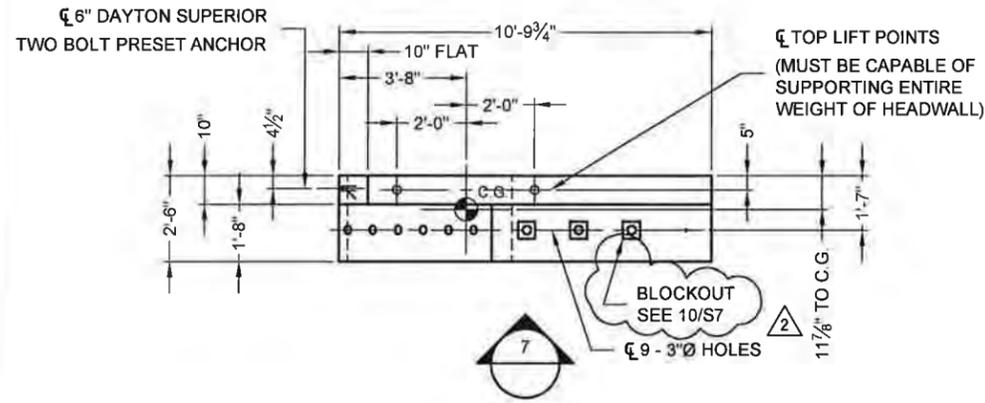
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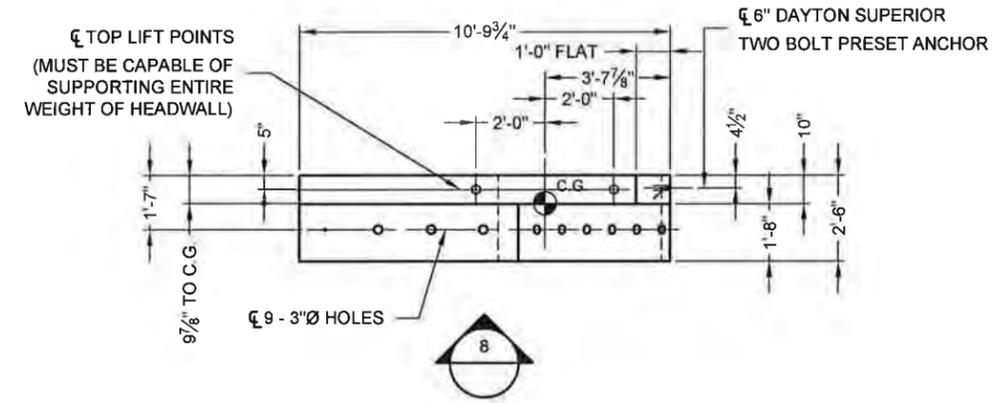
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JDR	PAC	
SHEET No:	S5 OF S22	

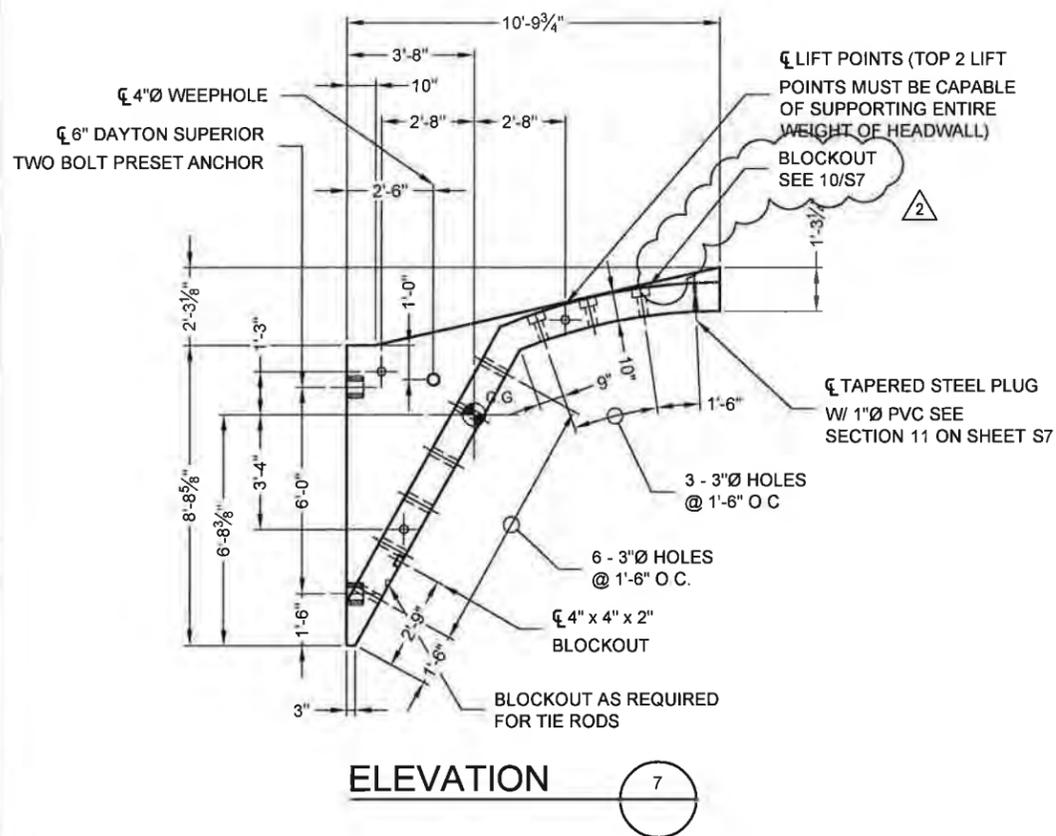
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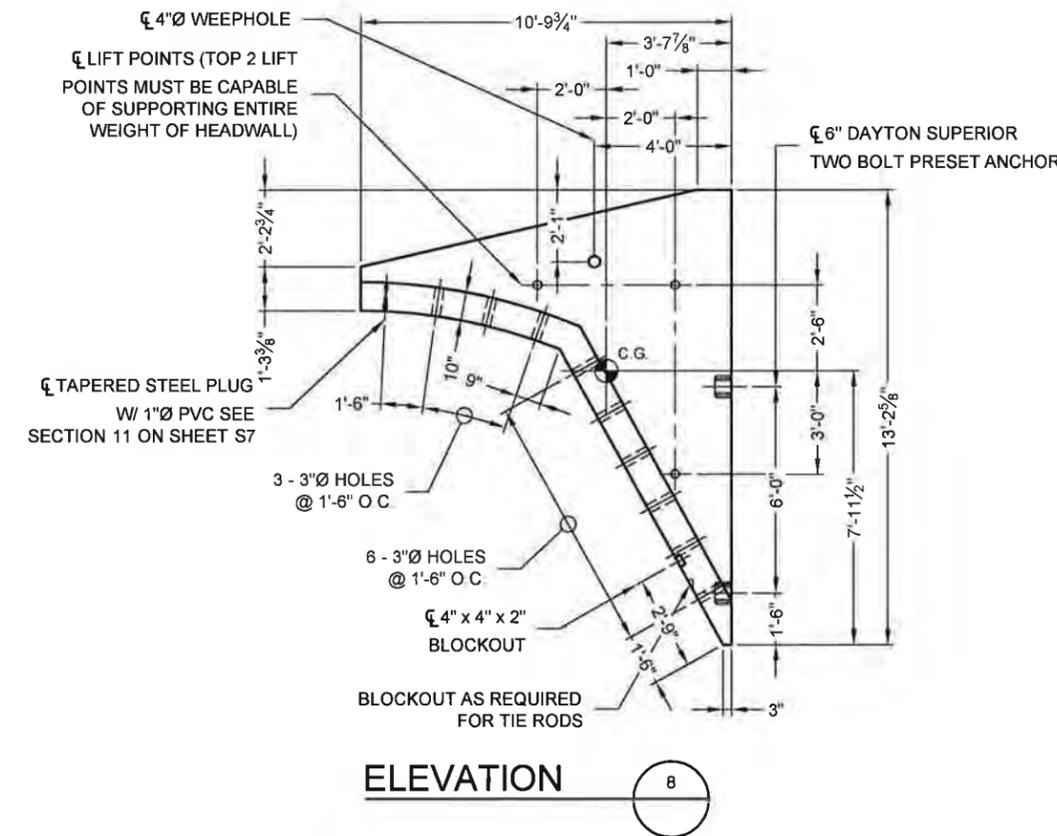
**PLAN - HW2A**  
 TOTAL WEIGHT = 3.6 TONS



**PLAN - HW2B**  
 TOTAL WEIGHT = 5.2 TONS



**ELEVATION 7**



**ELEVATION 8**

**SHOP DRAWING REVIEW**

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1	3/16/2016	NO CHANGES THIS SHEET	KDK

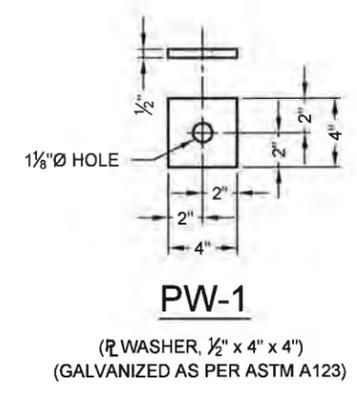
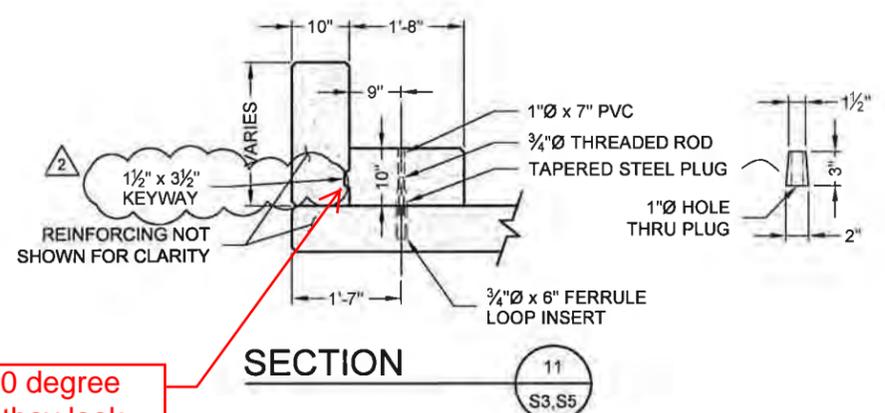
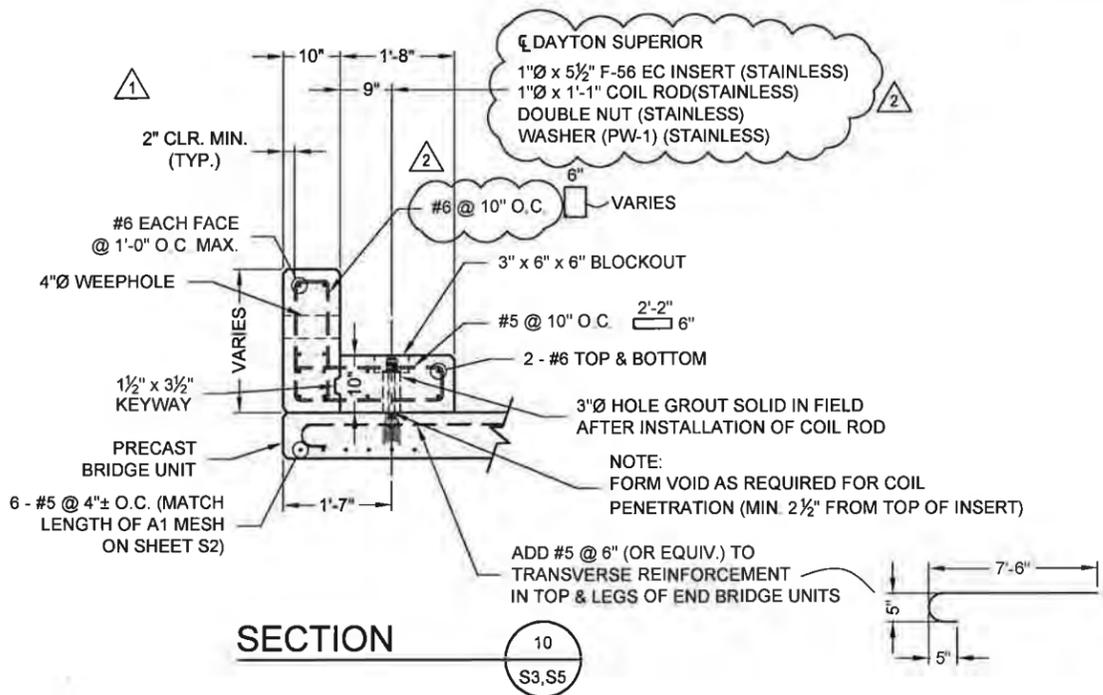
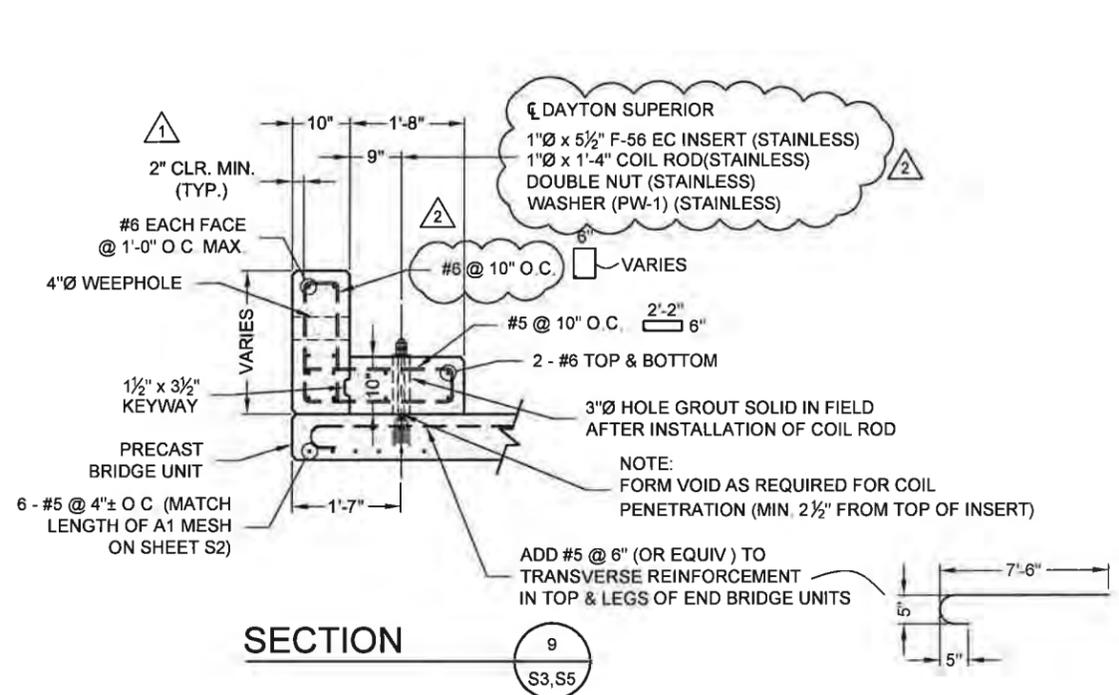
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 ENGINEERED SOLUTIONS LLC  
 www.ContechES.com  
 9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069  
 800-338-1122    513-645-7000    513-645-7993 FAX

**CONSPAN**  
 -SERIES  
 FABRICATION  
 DRAWING

US ROUTE 2  
 BRIDGE NO. 126  
 TOWN OF LUNENBURG  
 ESSEX COUNTY, VERMONT

PROJECT No.	SEQ. No.	DATE
468920	010	12/8/2015
DESIGNED:	DRAWN:	
KDK	TRL	
CHECKED:	APPROVED:	
JDR	PAC	
SHEET NO.: S6 OF S22		

NOTES:  
 - ALL EDGES OF PRECAST TO HAVE A 3/4" CHAMFER  
 - HEADWALL TO BE CAST AGAINST BRIDGE UNIT  
 - BRIDGE UNITS MUST BE GROUTED OR BRACED WHEN SETTING PRECAST HEADWALLS



is this 90 degree sides? they look angled so would need both top and bottom widths.

**SHOP DRAWING REVIEW**

REVIEWED AS REQUIRED BY THE CONSTRUCTION CONTRACT DOCUMENTS AND APPROVED, BUT ONLY FOR CONFORMANCE TO THE DESIGN CONCEPT OF THE WORK, AND SUBJECT TO FURTHER LIMITATIONS AND REQUIREMENTS CONTAINED IN THE CONSTRUCTION CONTRACT DOCUMENTS.

REJECTED  REVISE AND RESUBMIT  APPROVED AS NOTED

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**CLD** CLD Consulting Engineers  
 540 Commercial Street  
 Manchester, NH 03101  
 603-898-8223

Job Number: 12-0106  
 Reviewed by: NDC  
 Date: 04/22/16

I:\MERLIN\PROJECTS\ACTIVE\VEVE\68900\68920\10-CON\_SPAN\_0\_SERIES\DRAWINGS\FABRICATION\PRE-468920-010-CC-FAB-D.DWG 4/14/2016 11:20 AM

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MARK	DATE	REVISION DESCRIPTION	BY
2	4/14/2016	REVIEW COMMENTS	JDR
1	3/16/2016	REVISIONS PER REVIEW COMMENTS	KDK

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 800-338-1122 513-645-7000 513-645-7993 FAX

**CONSPAN**  
 -SERIES  
 FABRICATION DRAWING

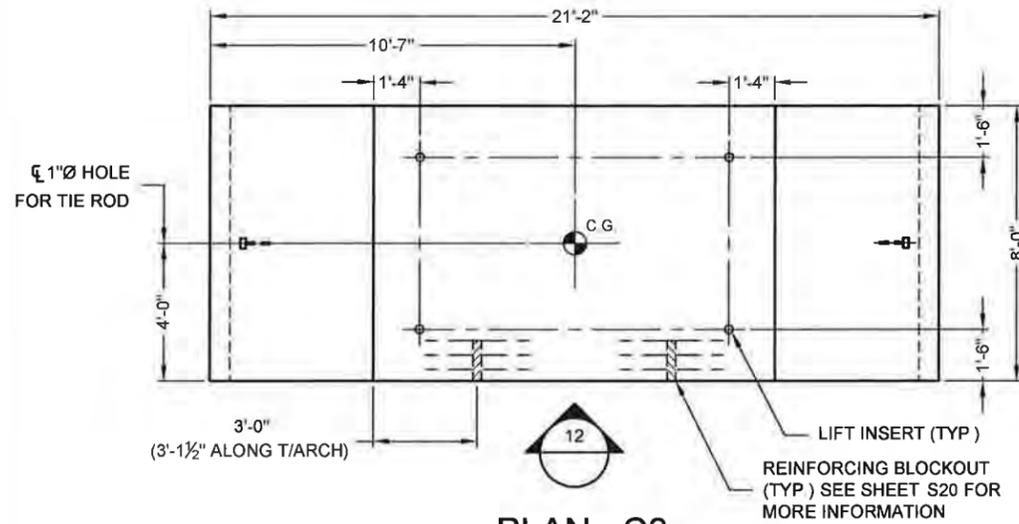
US ROUTE 2  
 BRIDGE NO. 126  
 TOWN OF LUNENBURG  
 ESSEX COUNTY, VERMONT

PROJECT No:	468920	SEQ. No:	010	DATE:	12/8/2015
DESIGNED:	KDK	DRAWN:	TRL		
CHECKED:	JDR	APPROVED:	PAC		
SHEET NO.:	S7 OF S22				

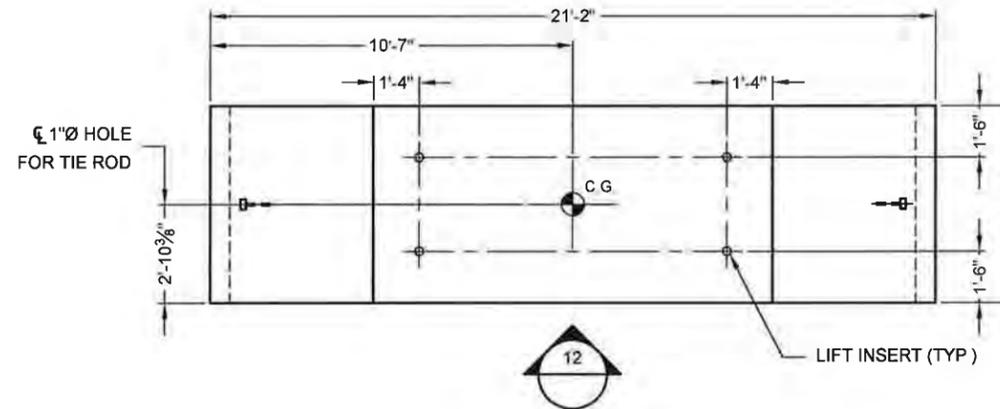
**NOTES:**  
 - ALL EDGES OF PRECAST TO HAVE A 3/4" CHAMFER  
 - SEE SHEET S2 FOR BRIDGE UNIT DIMENSIONS  
 - INSTALL TIE RODS BEFORE UNIT IS SET UPRIGHT & LEAVE IN PLACE UNTIL UNIT IS GROUTED INTO FINAL POSITION  
 - MANUFACTURER SHALL MARK END OF UNIT C3 WITH REINFORCING BLOCKOUT PRIOR TO SHIPPING.

ARCH UNIT		
CONCRETE	REINF. STEEL	WWF
28-DAY: 5000 PSI	60,000 PSI UNCOATED	65,000 PSI UNCOATED

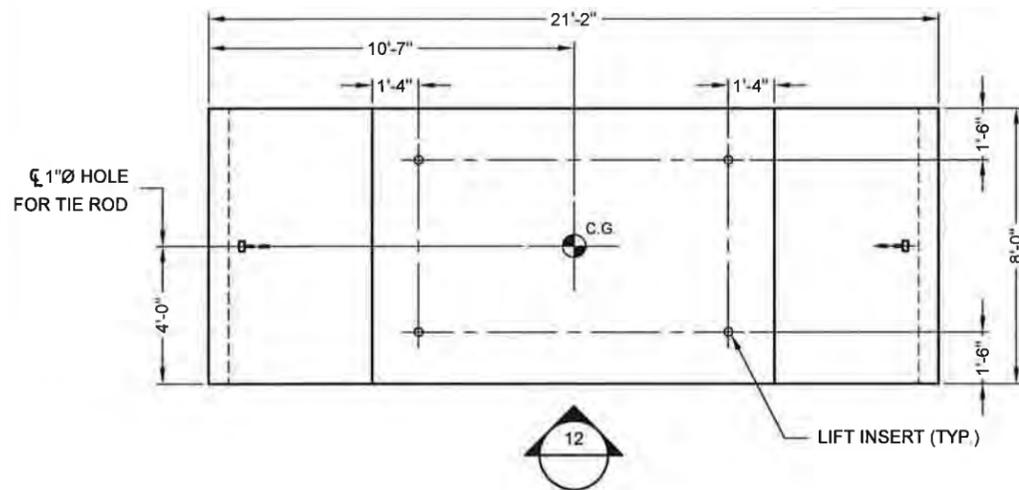
WHEREVER THE REINFORCING IS CUT FOR THE PLACEMENT OF LIFT HOLES OR OTHER BLOCKOUTS, REINFORCING BARS OR WIRES OF EQUIVALENT CROSS-SECTIONAL AREA SHALL BE PLACED SYMMETRICALLY AROUND THE HOLE. AT LEAST ONE BAR MUST BE ON EACH SIDE OF THE HOLE, AND THE DEVELOPMENT LENGTH OF THE BAR MUST BE ACHIEVED ON EITHER SIDE OF THE CUT



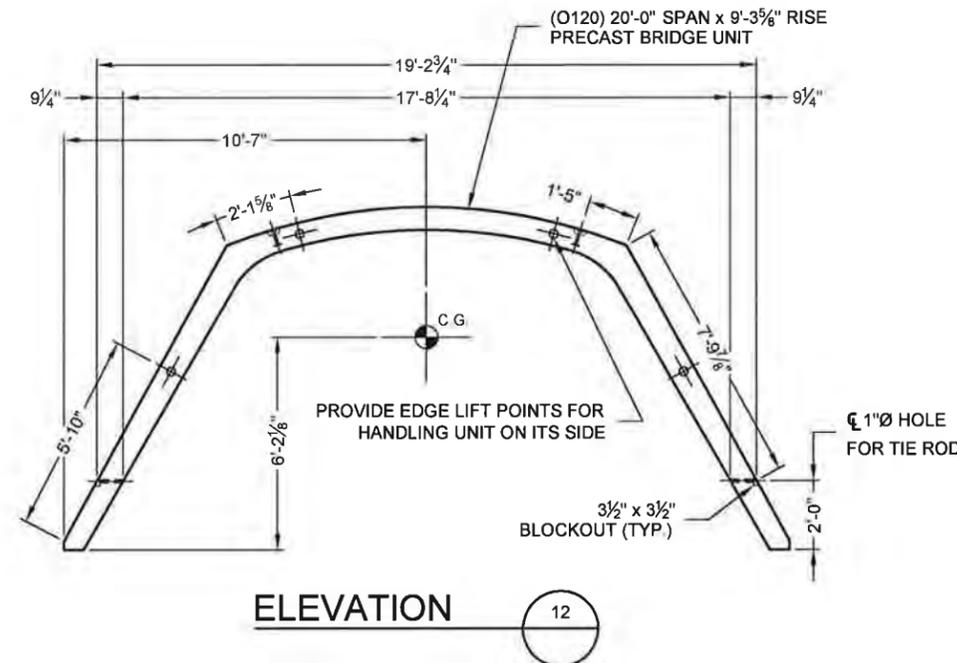
**PLAN - C3**  
 TOTAL WEIGHT = 13.1 TONS



**PLAN - C4**  
 TOTAL WEIGHT = 9.4 TONS



**PLAN - C5**  
 TOTAL WEIGHT = 13.1 TONS



**ELEVATION**  
 12

SHOP DRAWING REVIEW	
<input checked="" type="checkbox"/>	REVIEWED AS REQUIRED BY THE CONSTRUCTION CONTRACT DOCUMENTS AND APPROVED, BUT ONLY FOR CONFORMANCE TO THE DESIGN CONCEPT OF THE WORK, AND SUBJECT TO FURTHER LIMITATIONS AND REQUIREMENTS CONTAINED IN THE CONSTRUCTION CONTRACT DOCUMENTS.
<input type="checkbox"/>	REJECTED
<input type="checkbox"/>	REVISE AND RESUBMIT
<input type="checkbox"/>	APPROVED AS NOTED
CORRECTIONS OR COMMENTS MADE ON THE SHOP DRAWINGS DURING THIS REVIEW DID NOT RELIEVE CONTRACTOR FROM COMPLIANCE WITH REQUIREMENTS OF THE DRAWINGS AND SPECIFICATIONS. THIS CHECK IS ONLY FOR REVIEW OF GENERAL CONFORMANCE WITH THE DESIGN CONCEPT OF THE PROJECT AND GENERAL COMPLIANCE WITH THE INFORMATION GIVEN IN THE CONTRACT DOCUMENTS. THE CONTRACTOR IS RESPONSIBLE FOR CONFIRMING AND CORRELATING ALL QUANTITIES AND DIMENSIONS; SELECTING FABRICATION PROCESSES AND TECHNIQUES OF CONSTRUCTION; COORDINATING THEIR WORK WITH THAT OF ALL OTHER TRADES; AND PERFORMING THEIR WORK IN A SAFE AND SATISFACTORY MANNER.	
CLD Consulting Engineers 540 Commercial Street Manchester, NH 03101 603-688-8223	Job Number: 12-0106 Reviewed by: NDC Date: 04/22/16

I:\MWERLIN\PROJECT\ACTIVELY\68900468920-10-CON\_SPAN\_O\_SERIES\DRAWINGS\FABRICATION\PRE-468920-010-CC-FAB-D.DWG 4/14/2016 11:20 AM

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MARK	DATE	REVISION DESCRIPTION	BY
2	4/14/2016	REVIEW COMMENTS	JDR
1	3/16/2016	NO CHANGES THIS SHEET	KDK

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**CONSPAN**  
 -SERIES  
 FABRICATION  
 DRAWING

US ROUTE 2  
 BRIDGE NO. 126  
 TOWN OF LUNENBURG  
 ESSEX COUNTY, VERMONT

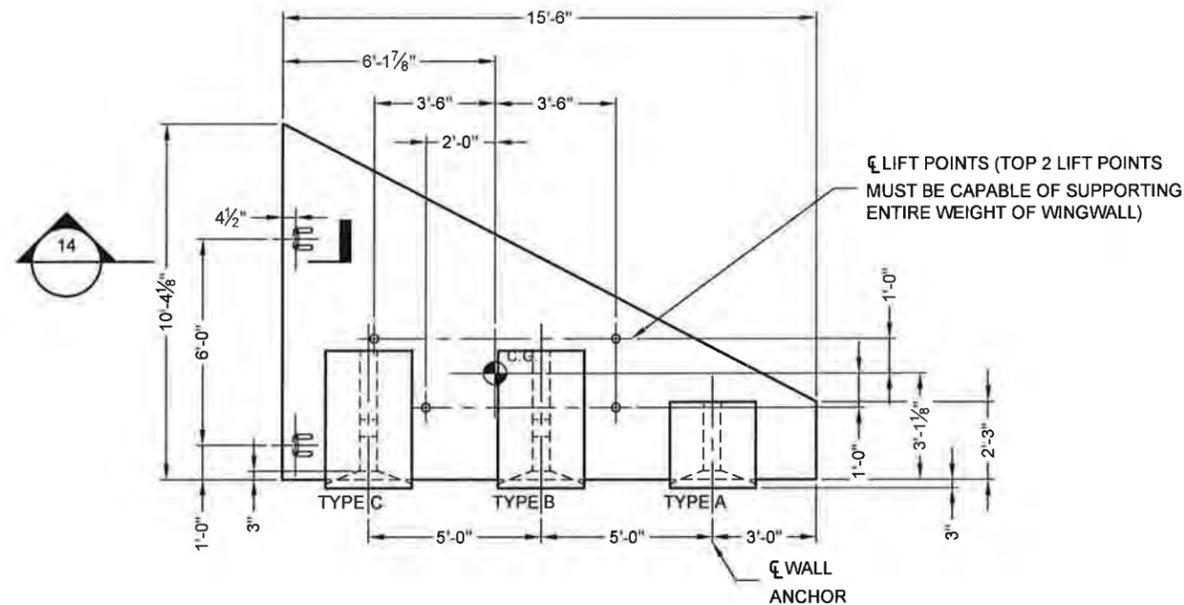
PROJECT No.	SEQ. No.	DATE
468920	010	12/8/2015
DESIGNED:	DRAWN:	
KDK	TRL	
CHECKED:	APPROVED:	
JDR	PAC	
SHEET NO: S8 OF S22		



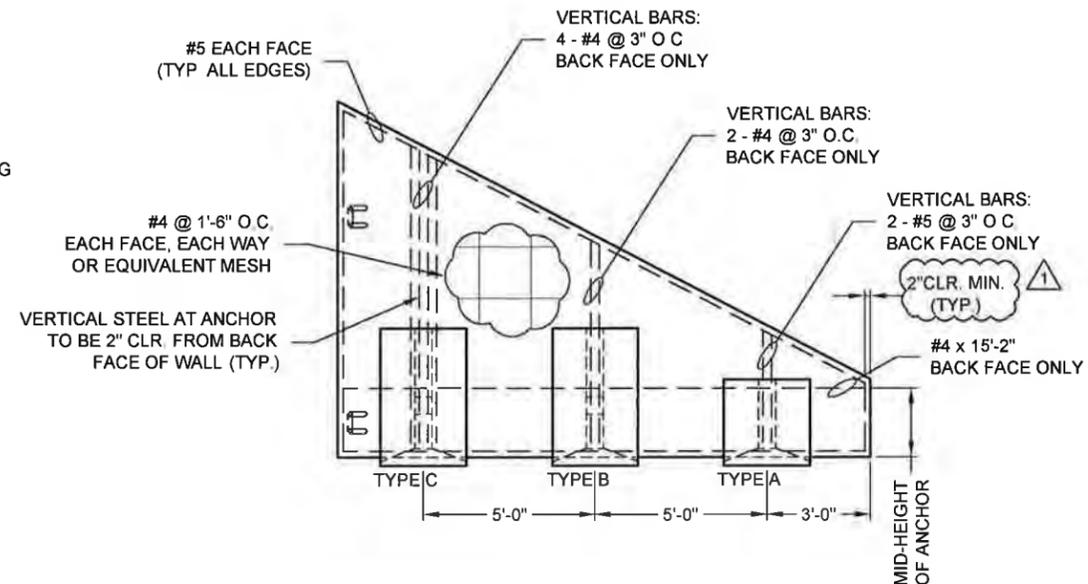
**NOTES:**  
 - ALL EDGES OF PRECAST TO HAVE A 3/8" CHAMFER  
 - ELEVATION IS LOOKING AT BACK FACE OF WINGWALL  
 - BACK FACE DENOTES ANCHOR SIDE OF WINGWALL  
 - WINGWALL WILL NOT HANG LEVEL. ADJUST CABLE LENGTHS AS REQUIRED

WINGWALL		
CONCRETE	REINF. STEEL	WWF
28-DAY: 5000 PSI	60,000 PSI UNCOATED	65,000 PSI UNCOATED

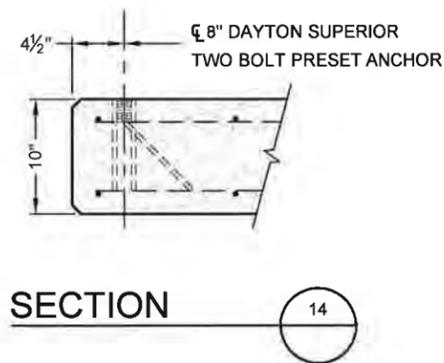
WHEREVER THE REINFORCING IS CUT FOR THE PLACEMENT OF LIFT HOLES OR OTHER BLOCKOUTS, REINFORCING BARS OR WIRES OF EQUIVALENT CROSS-SECTIONAL AREA SHALL BE PLACED SYMMETRICALLY AROUND THE HOLE. AT LEAST ONE BAR MUST BE ON EACH SIDE OF THE HOLE, AND THE DEVELOPMENT LENGTH OF THE BAR MUST BE ACHIEVED ON EITHER SIDE OF THE CUT



**WINGWALL - WW2A**  
 TOTAL WEIGHT = 8.2 TONS



**REINFORCING DETAIL - WW2A**  
 (FOR ANCHOR REINFORCING SEE SHEET S16 & S17)



**SHOP DRAWING REVIEW**

REVIEWED AS REQUIRED BY THE CONSTRUCTION CONTRACT DOCUMENTS AND APPROVED, BUT ONLY FOR CONFORMANCE TO THE DESIGN CONCEPT OF THE WORK, AND SUBJECT TO FURTHER LIMITATIONS AND REQUIREMENTS CONTAINED IN THE CONSTRUCTION CONTRACT DOCUMENTS.

REJECTED     REVISE AND RESUBMIT     APPROVED AS NOTED

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CLD Consulting Engineers  
 540 Commercial Street  
 Manchester, NH 03101  
 603-688-8223

Job Number: 12-0106  
 Reviewed by: NDC  
 Date: 04/22/16

I:\MERLIN\PROJECT\ACTIVE\468920-10-CON\_SPAN\_O\_SERIES\DRAWINGS\FABRICATION\PRE-468920-010-CC-FAB-D.DWG 4/14/2016 11:20 AM

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MARK	DATE	REVISION DESCRIPTION	BY
2	4/14/2016	REVIEW COMMENTS	JDR
1	3/16/2016	REVISIONS PER REVIEW COMMENTS	KDK

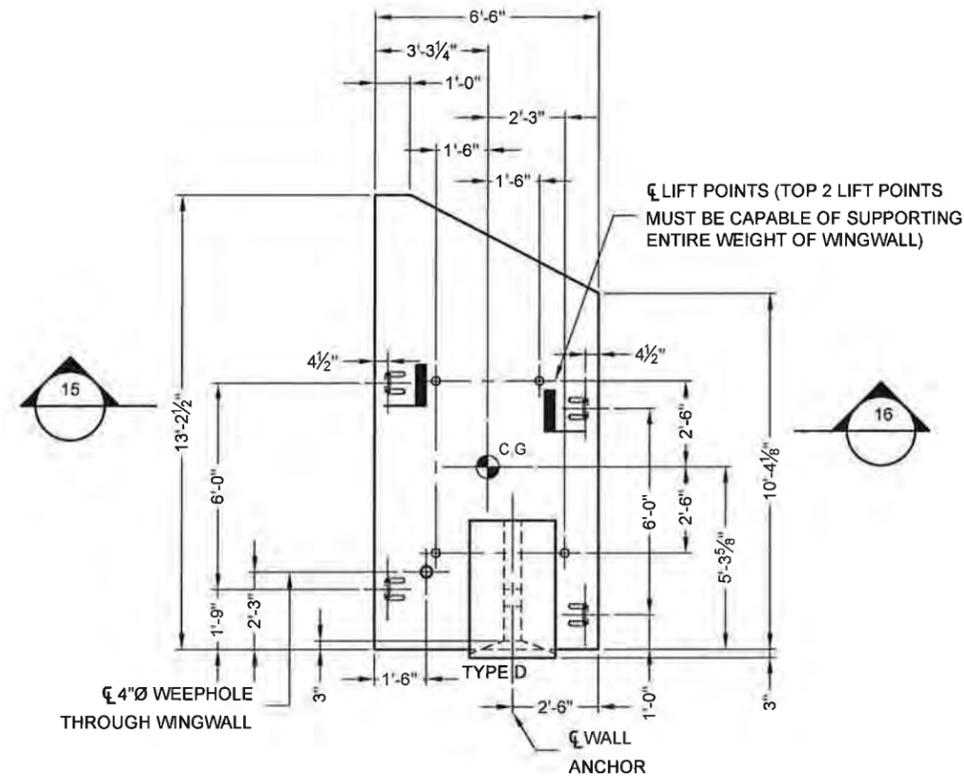
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**CONSPAN**  
 -SERIES  
 FABRICATION DRAWING

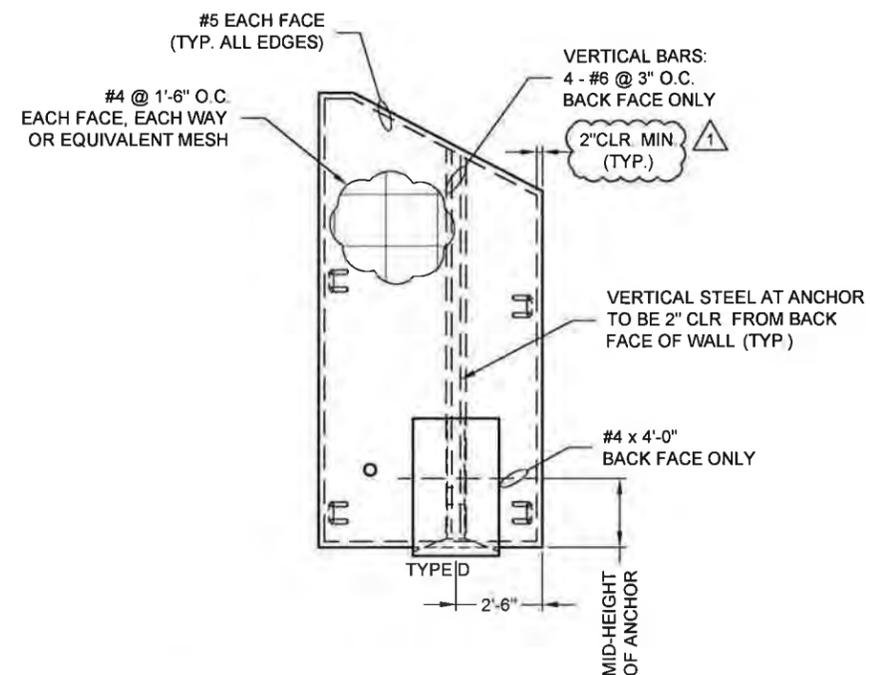
US ROUTE 2  
 BRIDGE NO. 126  
 TOWN OF LUNENBURG  
 ESSEX COUNTY, VERMONT

PROJECT No:	SEQ. No:	DATE:
468920	010	12/8/2015
DESIGNED:	DRAWN:	
KDK	TRL	
CHECKED:	APPROVED:	
JDR	PAC	
SHEET NO: S10 OF S22		

NOTES:  
 - ALL EDGES OF PRECAST TO HAVE A 3/4" CHAMFER  
 - ELEVATION IS LOOKING AT BACK FACE OF WINGWALL  
 - BACK FACE DENOTES ANCHOR SIDE OF WINGWALL  
 - WINGWALL WILL NOT HANG LEVEL. ADJUST CABLE LENGTHS AS REQUIRED



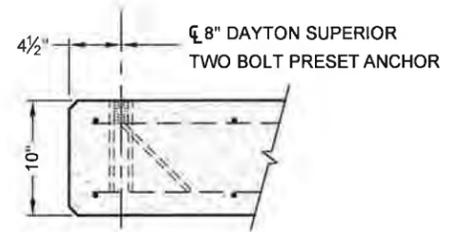
**WINGWALL - WW2B**  
 TOTAL WEIGHT = 5.9 TONS



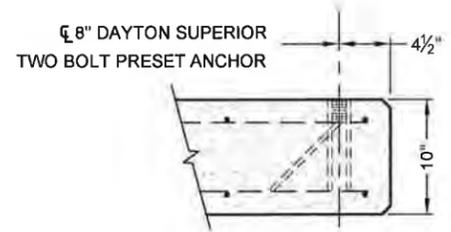
**REINFORCING DETAIL - WW2B**  
 (FOR ANCHOR REINFORCING SEE SHEET S17)

WINGWALL		
CONCRETE	REINF STEEL	WWF
28-DAY: 5000 PSI	60,000 PSI UNCOATED	65,000 PSI UNCOATED

WHEREVER THE REINFORCING IS CUT FOR THE PLACEMENT OF LIFT HOLES OR OTHER BLOCKOUTS, REINFORCING BARS OR WIRES OF EQUIVALENT CROSS-SECTIONAL AREA SHALL BE PLACED SYMMETRICALLY AROUND THE HOLE. AT LEAST ONE BAR MUST BE ON EACH SIDE OF THE HOLE, AND THE DEVELOPMENT LENGTH OF THE BAR MUST BE ACHIEVED ON EITHER SIDE OF THE CUT.



**SECTION 15**



**SECTION 16**

**SHOP DRAWING REVIEW**

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CLD Consulting Engineers  
 240 Commercial Street  
 Manchester, NH 03101  
 603-888-8223

Job Number: 12-0106  
 Reviewed by: NDC  
 Date: 04/22/16

I:\MERLIN\PROJECTS\ACTIVELY\468920-10-CONSPAN\_SERIES\DRAWINGS\FABRICATION\PRE-468920-01\CCO-FAB-D DWG 4/14/2016 11:20 AM

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MARK	DATE	REVISION DESCRIPTION	BY
2	4/14/2016	REVIEW COMMENTS	JDR
1	3/16/2016	REVISIONS PER REVIEW COMMENTS	KDK

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 800-338-1122    513-645-7000    513-645-7993 FAX

**CONSPAN**  
 SERIES  
 FABRICATION  
 DRAWING

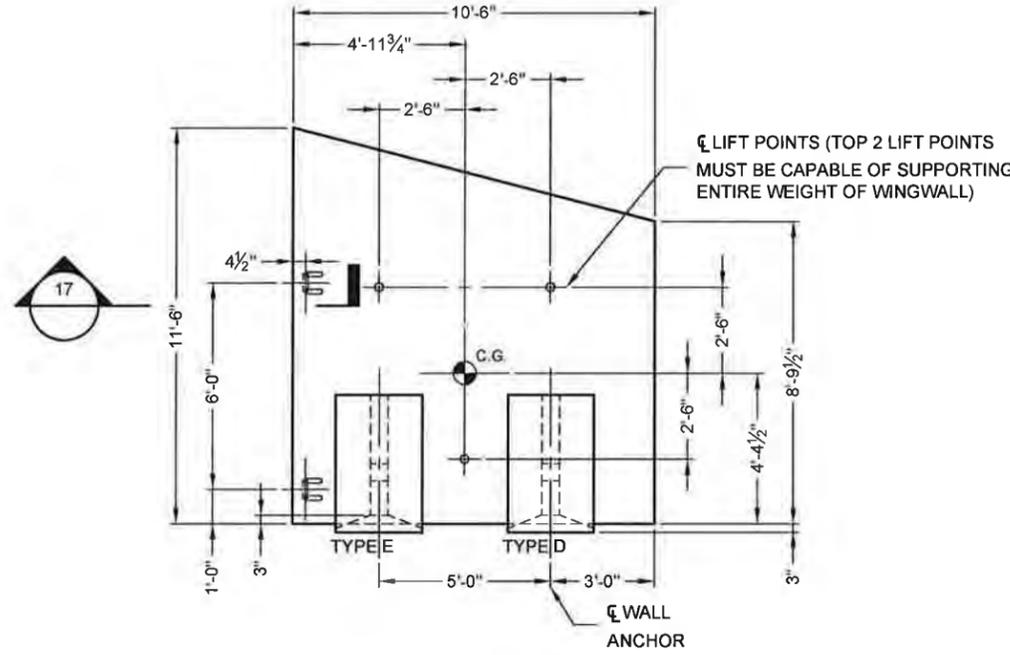
US ROUTE 2  
 BRIDGE NO. 126  
 TOWN OF LUNENBURG  
 ESSEX COUNTY, VERMONT

PROJECT No:	SEQ. No.:	DATE:
468920	010	12/8/2015
DESIGNED:	DRAWN:	
KDK	TRL	
CHECKED:	APPROVED:	
JDR	PAC	
SHEET NO.:	S11 OF S22	

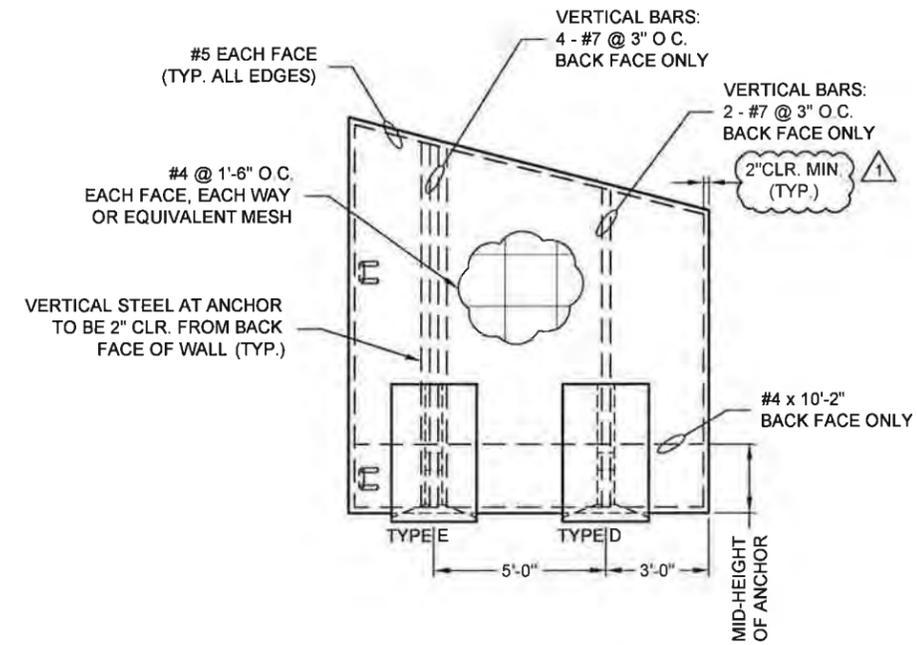
**NOTES:**  
 - ALL EDGES OF PRECAST TO HAVE A 3/4" CHAMFER  
 - ELEVATION IS LOOKING AT BACK FACE OF WINGWALL  
 - BACK FACE DENOTES ANCHOR SIDE OF WINGWALL  
 - WINGWALL WILL NOT HANG LEVEL. ADJUST CABLE LENGTHS AS REQUIRED

WINGWALL		
CONCRETE	REINF. STEEL	WWF
28-DAY: 5000 PSI	60,000 PSI UNCOATED	65,000 PSI UNCOATED

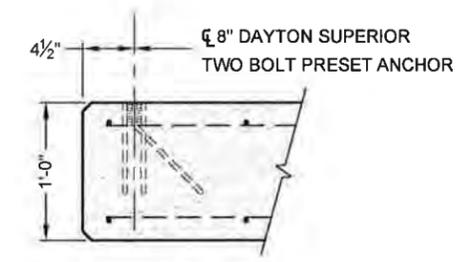
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**WINGWALL - WW3A**  
 TOTAL WEIGHT = 10.2 TONS



**REINFORCING DETAIL - WW3A**  
 (FOR ANCHOR REINFORCING SEE SHEET S18)



**SECTION** 17

**SHOP DRAWING REVIEW**

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**CED** C.E.D. Consulting Engineers  
 540 Commercial Street  
 Manchester, NH 03101  
 603-668-8223

Job Number: 12-0106  
 Reviewed by: NDC  
 Date: 04/22/16

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MARK	DATE	REVISION DESCRIPTION	BY
2	4/14/2016	REVIEW COMMENTS	JDR
1	3/16/2016	REVISIONS PER REVIEW COMMENTS	KDK

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 800-338-1122    513-645-7000    513-645-7993 FAX

**CONSPAN**  
 SERIES  
 FABRICATION  
 DRAWING

US ROUTE 2  
 BRIDGE NO. 126  
 TOWN OF LUNENBURG  
 ESSEX COUNTY, VERMONT

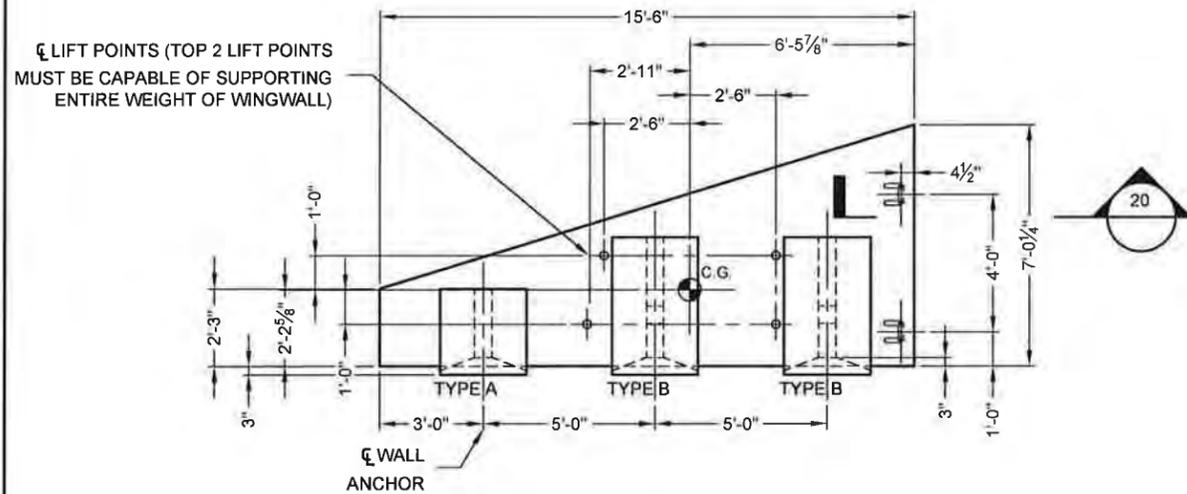
PROJECT No: 468920	SEQ. No: 010	DATE: 12/8/2015
DESIGNED: KDK	DRAWN: TRL	
CHECKED: JDR	APPROVED: PAC	
SHEET NO.: S12 OF S22		



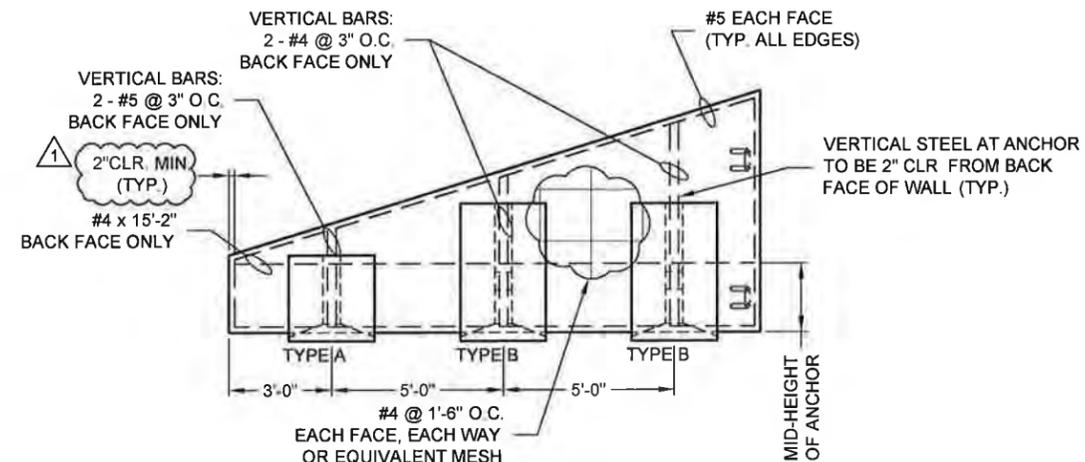
NOTES:  
 - ALL EDGES OF PRECAST TO HAVE A 3/4" CHAMFER  
 - ELEVATION IS LOOKING AT BACK FACE OF WINGWALL  
 - BACK FACE DENOTES ANCHOR SIDE OF WINGWALL  
 - WINGWALL WILL NOT HANG LEVEL. ADJUST CABLE LENGTHS AS REQUIRED

WINGWALL		
CONCRETE	REINF STEEL	WWF
28-DAY: 5000 PSI	60,000 PSI UNCOATED	65,000 PSI UNCOATED

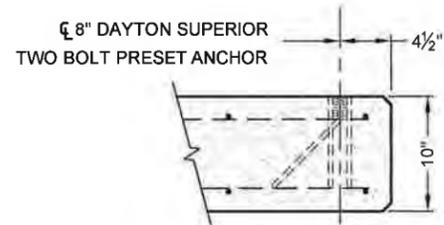
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**WINGWALL - WW4A**  
 TOTAL WEIGHT = 6.5 TONS



**REINFORCING DETAIL - WW4A**  
 (FOR ANCHOR REINFORCING SEE SHEET S16)



**SECTION** 20

**SHOP DRAWING REVIEW**

REVIEWED AS REQUIRED BY THE CONSTRUCTION CONTRACT DOCUMENTS AND APPROVED, BUT ONLY FOR CONFORMANCE TO THE DESIGN CONCEPT OF THE WORK, AND SUBJECT TO FURTHER LIMITATIONS AND REQUIREMENTS CONTAINED IN THE CONSTRUCTION CONTRACT DOCUMENTS.

REJECTED     REVISE AND RESUBMIT     APPROVED AS NOTED

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 CLD Consulting Engineers  
 540 Commercial Street  
 Manchester, NH 03101  
 603-698-8223

Job Number: 12-0106  
 Reviewed by: NDC  
 Date: 04/22/16

I:\MERLIN\PROJECTS\ACTIVE\VEH\468920\SPAN\_0\_SERIES\DRAWINGS\FABRICATION\PRE-468920-010-CC-FAB-D.DWG 4/14/2016 11:20 AM

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MARK	DATE	REVISION DESCRIPTION	BY
2	4/14/2016	REVIEW COMMENTS	JDR
1	3/16/2016	REVISIONS PER REVIEW COMMENTS	KDK

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 800-338-1122 513-645-7000 513-645-7993 FAX

**CONSPAN**  
 -SERIES  
 FABRICATION  
 DRAWING

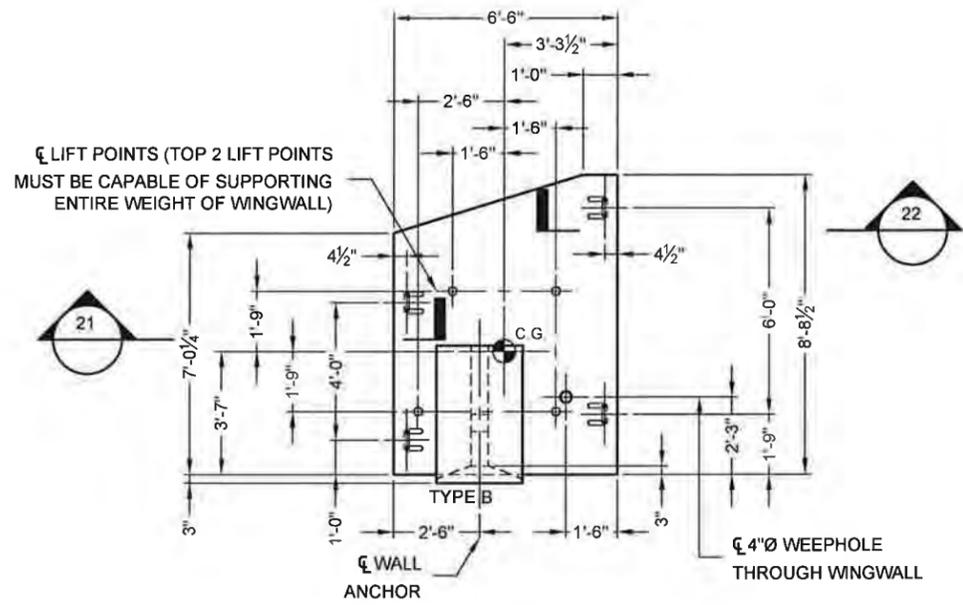
US ROUTE 2  
 BRIDGE NO. 126  
 TOWN OF LUNENBURG  
 ESSEX COUNTY, VERMONT

PROJECT No:	468920	SEQ No:	010	DATE:	12/8/2015
DESIGNED:	KDK	DRAWN:	TRL		
CHECKED:	JDR	APPROVED:	PAC		
SHEET NO:	S14 OF S22				

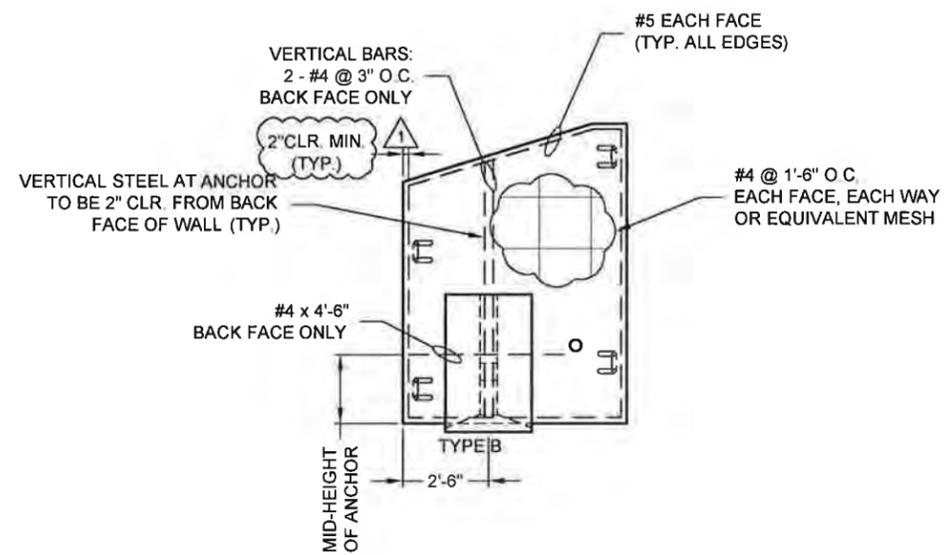
NOTES:  
 - ALL EDGES OF PRECAST TO HAVE A 3/4" CHAMFER  
 - ELEVATION IS LOOKING AT BACK FACE OF WINGWALL  
 - BACK FACE DENOTES ANCHOR SIDE OF WINGWALL  
 - WINGWALL WILL NOT HANG LEVEL. ADJUST CABLE LENGTHS AS REQUIRED

WINGWALL		
CONCRETE	REINF STEEL	WWF
28-DAY: 5000 PSI	60,000 PSI UNCOATED	65,000 PSI UNCOATED

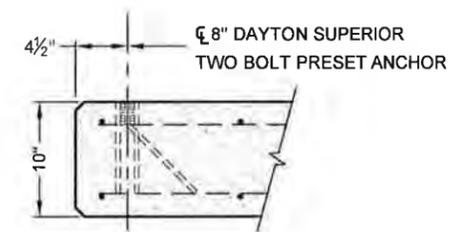
WHEREVER THE REINFORCING IS CUT FOR THE PLACEMENT OF LIFT HOLES OR OTHER BLOCKOUTS, REINFORCING BARS OR WIRES OF EQUIVALENT CROSS-SECTIONAL AREA SHALL BE PLACED SYMMETRICALLY AROUND THE HOLE. AT LEAST ONE BAR MUST BE ON EACH SIDE OF THE HOLE, AND THE DEVELOPMENT LENGTH OF THE BAR MUST BE ACHIEVED ON EITHER SIDE OF THE CUT



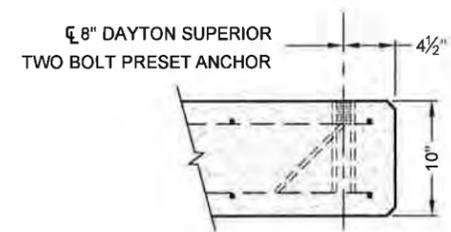
**WINGWALL - WW4B**  
 TOTAL WEIGHT = 4.0 TONS



**REINFORCING DETAIL - WW4B**  
 (FOR ANCHOR REINFORCING SEE SHEET S16)



**SECTION 21**



**SECTION 22**

**SHOP DRAWING REVIEW**

REVIEWED AS REQUIRED BY THE CONSTRUCTION CONTRACT DOCUMENTS AND APPROVED, BUT ONLY FOR CONFORMANCE TO THE DESIGN CONCEPT OF THE WORK, AND SUBJECT TO FURTHER LIMITATIONS AND REQUIREMENTS CONTAINED IN THE CONSTRUCTION CONTRACT DOCUMENTS.

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CLD Consulting Engineers  
 340 Commercial Street  
 Manchester, NH 03101  
 603-668-6223

Job Number: 12-0106  
 Reviewed by: NDC  
 Date: 04/22/16

I:\MERLIN\PROJECTS\VE\VE\468920\10-CON\_SPAN\_O\_SERIES\DRAWINGS\FABRICATION\PRE-468920-010-CC-FAB-D.DWG 4/14/2016 11:20 AM

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1	3/16/2016	REVISIONS PER REVIEW COMMENTS	KDK

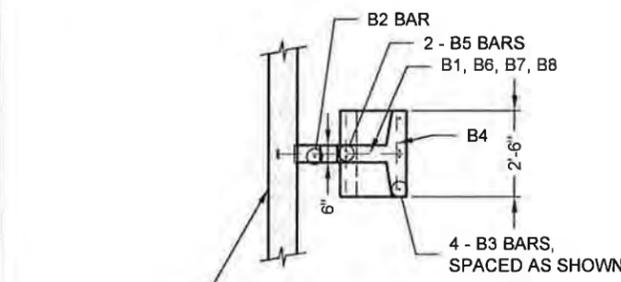
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**CONSPAN**  
 -SERIES  
 FABRICATION  
 DRAWING

US ROUTE 2  
 BRIDGE NO. 126  
 TOWN OF LUNENBURG  
 ESSEX COUNTY, VERMONT

PROJECT No:	468920	SEQ No:	010	DATE:	12/8/2015
DESIGNED:	KDK	DRAWN:	TRL		
CHECKED:	JDR	APPROVED:	PAC		
SHEET NO:		S15 OF S22			

I:\MERLIN\PROJECTS\VE\468900\468920\10-CON\_SPAN\_O\_SERIES\DRAWINGS\FABRICATION\PRE-468920-01-CCO-FAB-D.DWG 4/14/2016 11:20 AM

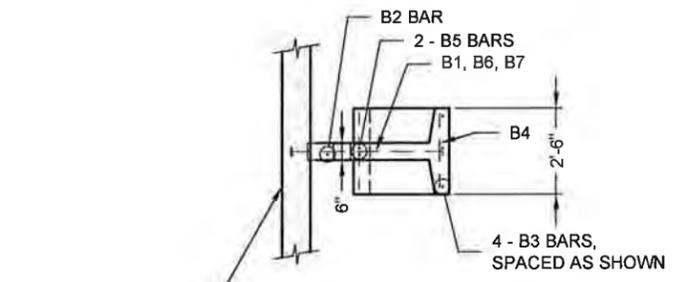


**PLAN - TYPE A**

FRONT FACE OF PRECAST WALL

BAR LIST - TYPE A						
MARK	QTY	SIZE	A	TYPE	LENGTH	FINISH
B1	3	#6	3'-0"	3	---	EPOXY*
B2	1	#5	---	STR.	1'-8"	BLACK
B3	4	#5	---	STR.	2'-6"	BLACK
B4	6	#5	---	STR.	2'-2"	BLACK
B5	2	#5	2'-2"	2	---	BLACK
B6	1	#5	2'-2"	1	---	BLACK
B7	1	#5	2'-6"	1	---	BLACK
B8	1	#5	2'-9"	1	---	BLACK

NOTE: "STR." DENOTES STRAIGHT BAR. STANDARD CLEARANCE = 2"

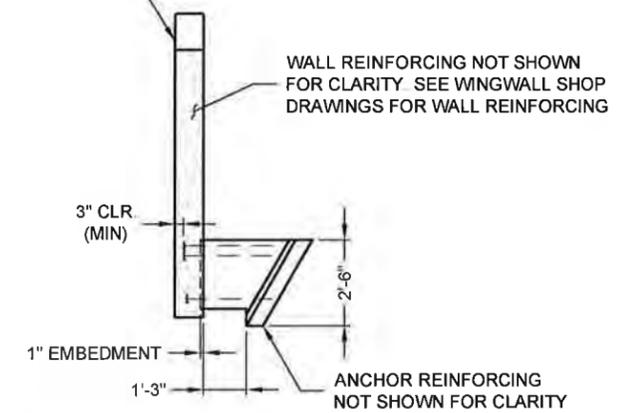


**PLAN - TYPE B**

FRONT FACE OF PRECAST WALL

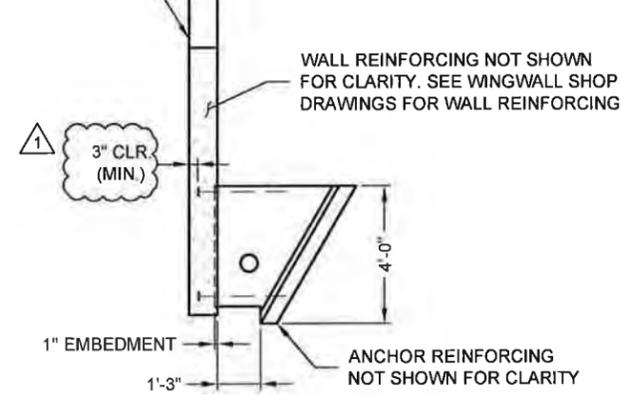
BAR LIST - TYPE B						
MARK	QTY	SIZE	A	TYPE	LENGTH	FINISH
B1	2	#6	3'-0"	3	---	EPOXY*
B2	1	#5	---	STR.	3'-2"	BLACK
B3	4	#5	---	STR.	4'-3"	BLACK
B4	7	#5	---	STR.	2'-2"	BLACK
B5	2	#5	3'-8"	2	---	BLACK
B6	1	#5	2'-2"	1	---	BLACK
B7	1	#5	3'-7"	1	---	BLACK

NOTE: "STR." DENOTES STRAIGHT BAR. STANDARD CLEARANCE = 2"



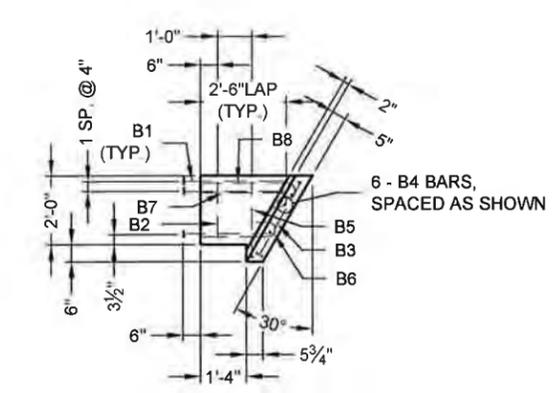
**SECTION - TYPE A**

10" THICK WINGWALL



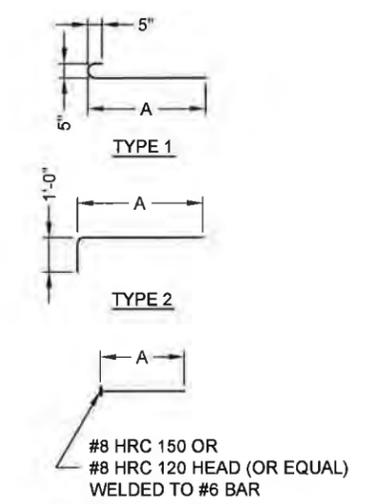
**SECTION - TYPE B**

10" THICK WINGWALL



**PRECAST ANCHOR TYPE A**

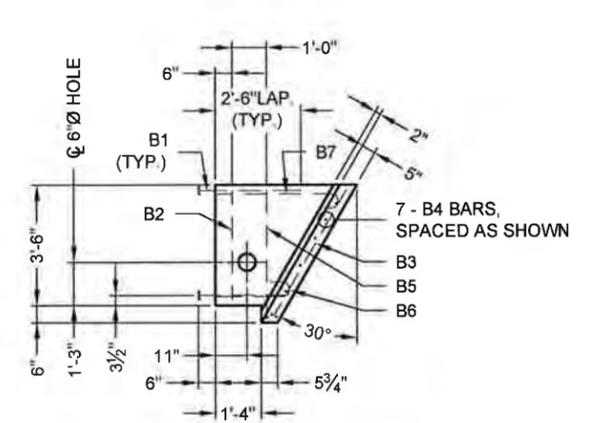
TOTAL WEIGHT = .428 TONS



#8 HRC 150 OR #8 HRC 120 HEAD (OR EQUAL) WELDED TO #6 BAR

**TYPE 3 (EPOXY COATED\*)**

\*NOTE: HRC HEADS PROVIDED BY HEADED REINFORCEMENT CORP.



**PRECAST ANCHOR TYPE B**

TOTAL WEIGHT = .765 TONS

SHOP DRAWING REVIEW

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CLD Consulting Engineers 540 Commercial Street Manchester, NH 03101 603-498-8225	Job Number: 12-0106 Reviewed by: NDC Date: 04/22/16
---	---

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1	3/16/2016	REVISIONS PER REVIEW COMMENTS	KDK

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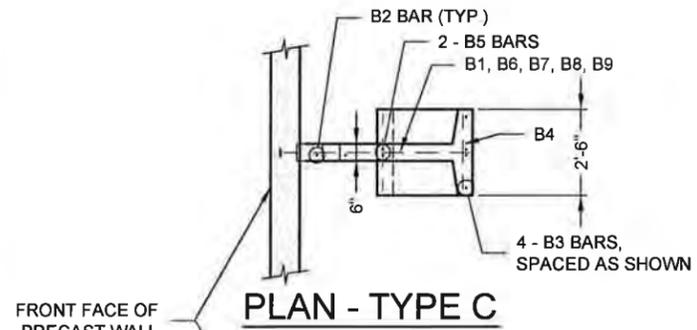
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**CONSPAN**  
-SERIES-

FABRICATION  
DRAWING

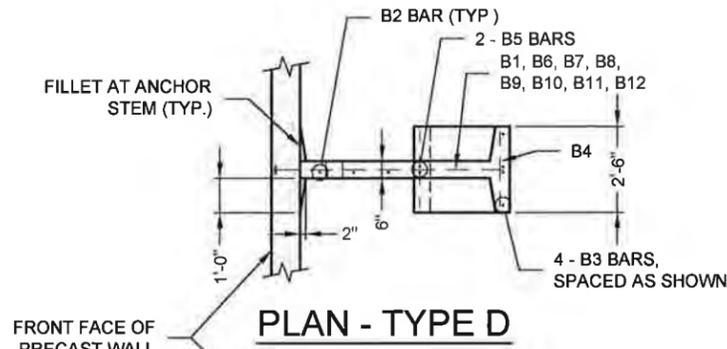
US ROUTE 2  
BRIDGE NO. 126  
TOWN OF LUNENBURG  
ESSEX COUNTY, VERMONT

PROJECT No.	SEQ. No.	DATE:
468920	010	12/8/2015
DESIGNED:	DRAWN:	
KDK	TRL	
CHECKED:	APPROVED:	
JDR	PAC	
SHEET NO.:	S16 OF S22	



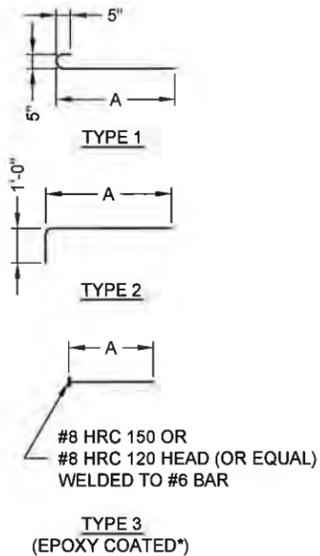
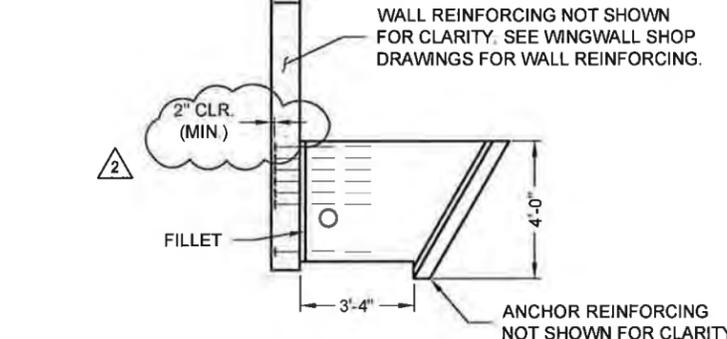
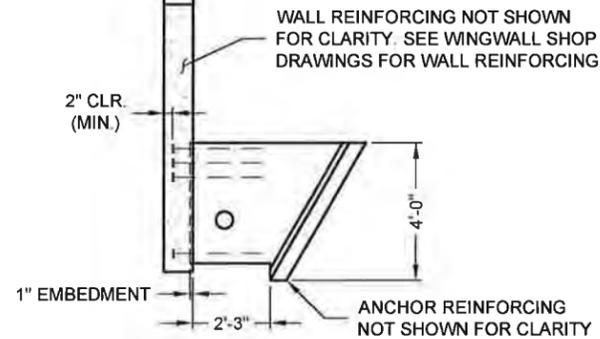
BAR LIST - TYPE C						
MARK	QTY	SIZE	A	TYPE	LENGTH	FINISH
B1	4	#6	3'-0"	3	---	EPOXY*
B2	2	#5	---	STR.	3'-2"	BLACK
B3	4	#5	---	STR.	4'-3"	BLACK
B4	7	#5	---	STR.	2'-2"	BLACK
B5	2	#5	3'-8"	2	---	BLACK
B6	1	#5	3'-2"	1	---	BLACK
B7	1	#5	4'-2"	1	---	BLACK
B8	1	#5	4'-5"	1	---	BLACK
B9	1	#5	4'-8"	1	---	BLACK

NOTE: "STR." DENOTES STRAIGHT BAR. STANDARD CLEARANCE = 2"

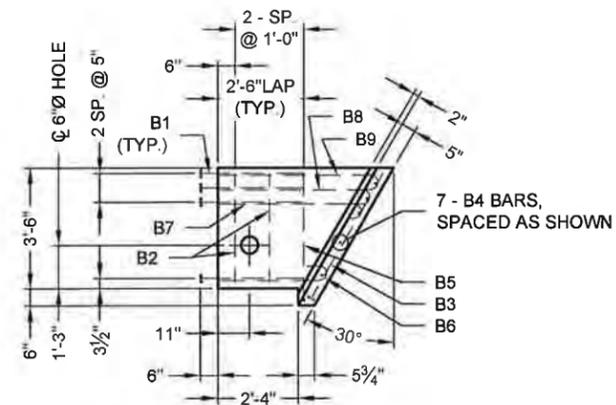


BAR LIST - TYPE D						
MARK	QTY	SIZE	A	TYPE	LENGTH	FINISH
B1	7	#6	3'-0"	3	---	EPOXY*
B2	3	#5	---	STR.	3'-2"	BLACK
B3	4	#5	---	STR.	4'-3"	BLACK
B4	9	#5	---	STR.	2'-2"	BLACK
B5	2	#5	3'-8"	2	---	BLACK
B6	1	#5	4'-2"	1	---	BLACK
B7	1	#5	4'-8"	1	---	BLACK
B8	1	#5	4'-10"	1	---	BLACK
B9	1	#5	5'-1"	1	---	BLACK
B10	1	#5	5'-3"	1	---	BLACK
B11	1	#5	5'-5"	1	---	BLACK
B12	1	#5	5'-8"	1	---	BLACK

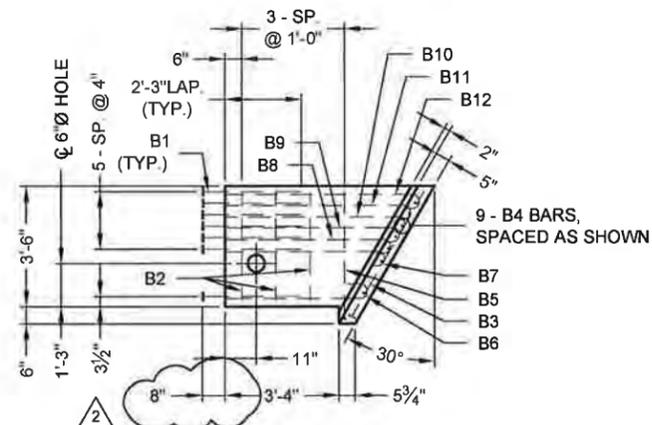
NOTE: "STR." DENOTES STRAIGHT BAR. STANDARD CLEARANCE = 2"



\*NOTE: HRC HEADS PROVIDED BY HEADED REINFORCEMENT CORP.



PRECAST ANCHOR TYPE C  
TOTAL WEIGHT = .896 TONS



PRECAST ANCHOR TYPE D  
TOTAL WEIGHT = 1.028 TONS

SHOP DRAWING REVIEW	
<input checked="" type="checkbox"/>	REVIEWED AS REQUIRED BY THE CONSTRUCTION CONTRACT DOCUMENTS AND APPROVED, BUT ONLY FOR CONFORMANCE TO THE DESIGN CONCEPT OF THE WORK, AND SUBJECT TO FURTHER LIMITATIONS AND REQUIREMENTS CONTAINED IN THE CONSTRUCTION CONTRACT DOCUMENTS.
<input type="checkbox"/>	REJECTED
<input type="checkbox"/>	REVISE AND RESUBMIT
<input type="checkbox"/>	APPROVED AS NOTED
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CLD Consulting Engineers 540 Commercial Street Manchester, NH 03101 603-668-8223	Job Number: 12-0106 Reviewed by: NDC Date: 04/22/16

I:\MERLIN\PROJECTS\VEI\468920\468920-10-CON\_SPAN\_C\_SERIES\DRAWINGS\FABRICATION\PRE-468920-010-CC-FAB-D.DWG 4/14/2016 11:21 AM

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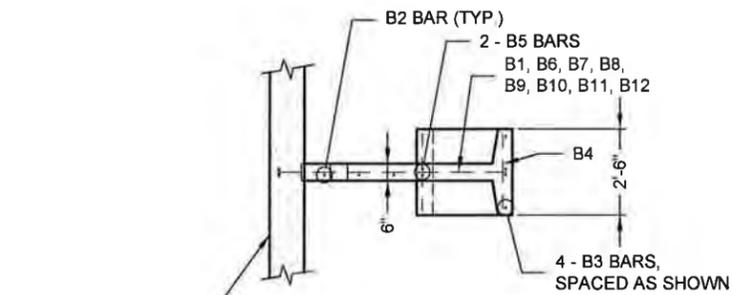
MARK	DATE	REVISION DESCRIPTION	BY
2	4/14/2016	REVIEW COMMENTS	JDR
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**CONSPAN**  
-SERIES  
FABRICATION  
DRAWING

US ROUTE 2  
BRIDGE NO. 126  
TOWN OF LUNENBURG  
ESSEX COUNTY, VERMONT

PROJECT No:	SEQ. No:	DATE:
468920	010	12/8/2015
DESIGNED:	DRAWN:	
KDK	TRL	
CHECKED:	APPROVED:	
JDR	PAC	
SHEET NO.:	S17 OF S22	



**PLAN - TYPE D**

FRONT FACE OF PRECAST WALL

WALL REINFORCING NOT SHOWN FOR CLARITY SEE WINGWALL SHOP DRAWINGS FOR WALL REINFORCING.

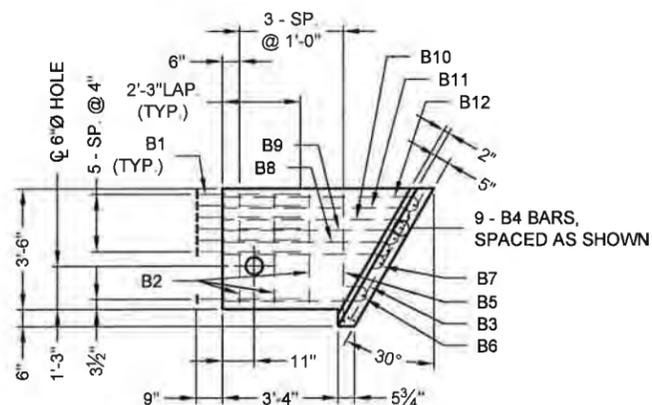
2" CLR. (MIN.)

1" EMBEDMENT

ANCHOR REINFORCING NOT SHOWN FOR CLARITY

**SECTION - TYPE D**

12" THICK WINGWALL WW3A

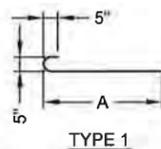


**PRECAST ANCHOR TYPE D**

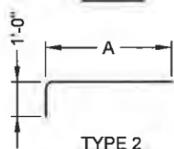
TOTAL WEIGHT = 1.028 TONS

BAR LIST - TYPE D						
MARK	QTY.	SIZE	A	TYPE	LENGTH	FINISH
B1	7	#6	3'-0"	3	---	EPOXY*
B2	3	#5	---	STR.	3'-2"	BLACK
B3	4	#5	---	STR.	4'-3"	BLACK
B4	9	#5	---	STR.	2'-2"	BLACK
B5	2	#5	3'-8"	2	---	BLACK
B6	1	#5	4'-2"	1	---	BLACK
B7	1	#5	4'-8"	1	---	BLACK
B8	1	#5	4'-10"	1	---	BLACK
B9	1	#5	5'-1"	1	---	BLACK
B10	1	#5	5'-3"	1	---	BLACK
B11	1	#5	5'-5"	1	---	BLACK
B12	1	#5	5'-8"	1	---	BLACK

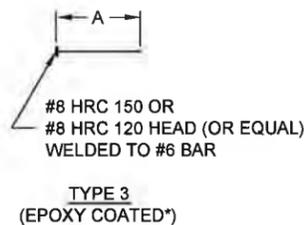
NOTE: "STR." DENOTES STRAIGHT BAR. STANDARD CLEARANCE = 2"



TYPE 1

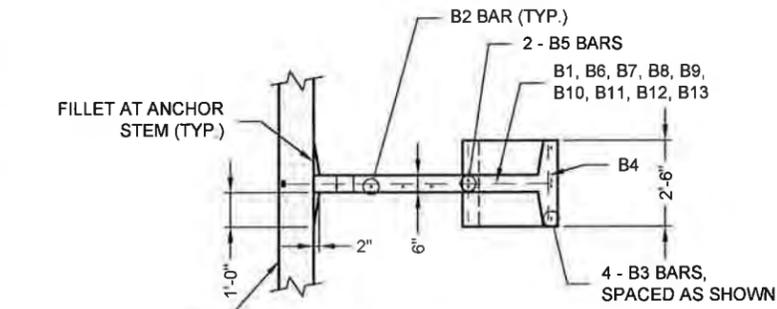


TYPE 2



TYPE 3 (EPOXY COATED\*)

\*NOTE: HRC HEADS PROVIDED BY HEADED REINFORCEMENT CORP.



**PLAN - TYPE E**

FRONT FACE OF PRECAST WALL

WALL REINFORCING NOT SHOWN FOR CLARITY SEE WINGWALL SHOP DRAWINGS FOR WALL REINFORCING.

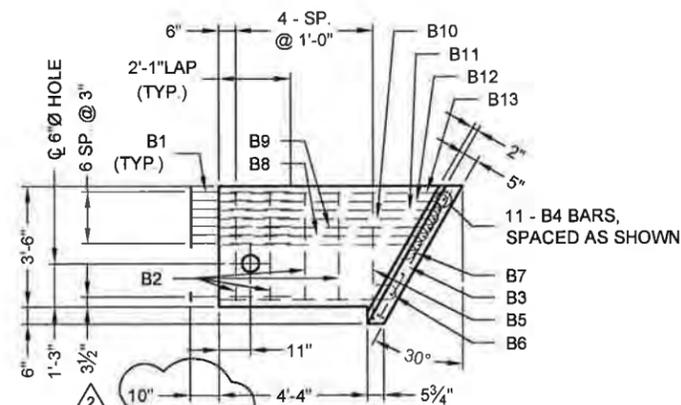
2" CLR. (MIN.)

FILLET

ANCHOR REINFORCING NOT SHOWN FOR CLARITY

**SECTION - TYPE E**

12" THICK WINGWALL



**PRECAST ANCHOR TYPE E**

TOTAL WEIGHT = 1.159 TONS

BAR LIST - TYPE E						
MARK	QTY.	SIZE	A	TYPE	LENGTH	FINISH
B1	8	#6	3'-0"	3	---	EPOXY*
B2	4	#5	---	STR.	3'-2"	BLACK
B3	4	#5	---	STR.	4'-3"	BLACK
B4	11	#5	---	STR.	2'-2"	BLACK
B5	2	#5	3'-8"	2	---	BLACK
B6	1	#5	5'-2"	1	---	BLACK
B7	1	#5	5'-9"	1	---	BLACK
B8	1	#5	5'-11"	1	---	BLACK
B9	1	#5	6'-1"	1	---	BLACK
B10	1	#5	6'-3"	1	---	BLACK
B11	1	#5	6'-5"	1	---	BLACK
B12	1	#5	6'-6"	1	---	BLACK
B13	1	#5	6'-8"	1	---	BLACK

NOTE: "STR." DENOTES STRAIGHT BAR. STANDARD CLEARANCE = 2"

**SHOP DRAWING REVIEW**

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540 Commercial Street  
Manchester, NH 03101  
603-668-8223

Job Number: 12-0106  
Reviewed by: NDC  
Date: 04/22/16

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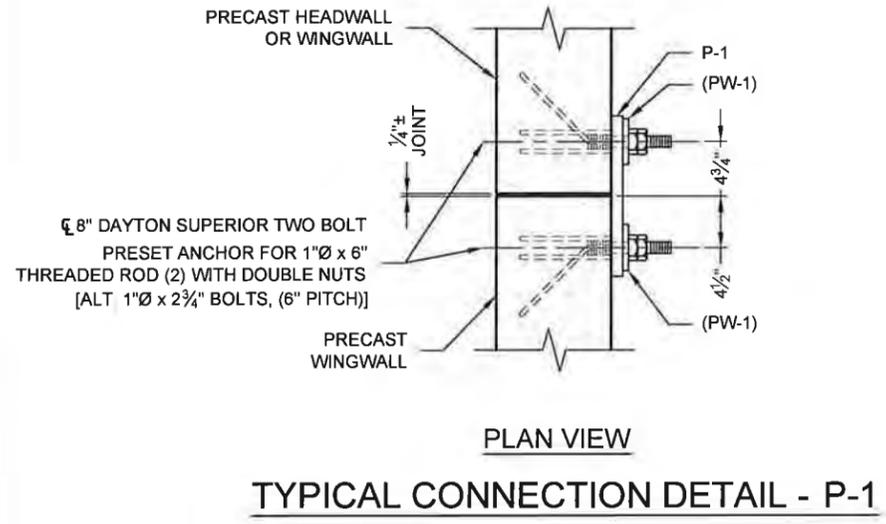
MARK	DATE	REVISION DESCRIPTION	BY
2	4/14/2016	REVIEW COMMENTS	JDR
1	3/16/2016	REVISIONS PER REVIEW COMMENTS	KDK

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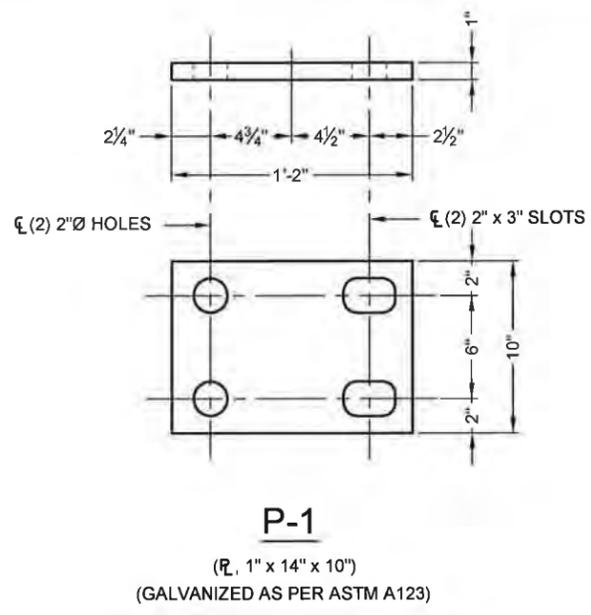
**CONSPAN**  
-SERIES  
FABRICATION DRAWING

US ROUTE 2  
BRIDGE NO. 126  
TOWN OF LUNENBURG  
ESSEX COUNTY, VERMONT

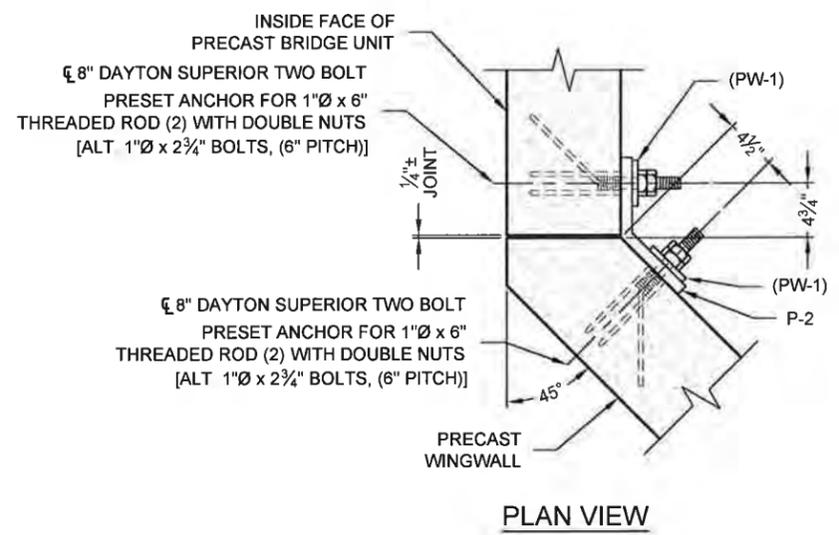
PROJECT No:	SEQ. No:	DATE:
468920	010	12/8/2015
DESIGNED:	DRAWN:	
KDK	TRL	
CHECKED:	APPROVED:	
JDR	PAC	
SHEET NO: S18 OF S22		



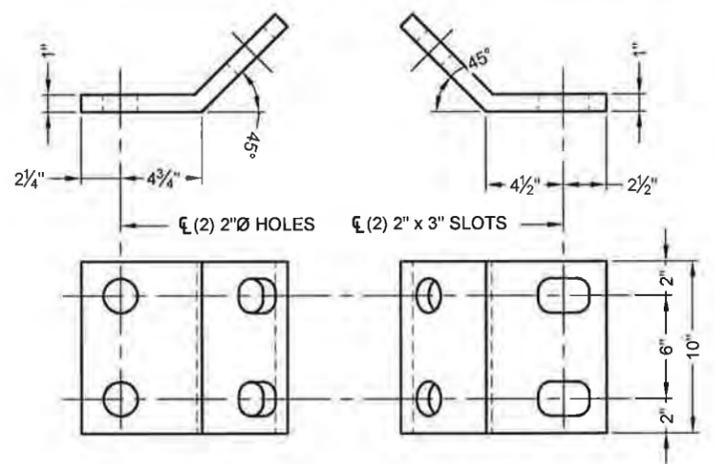
**PLAN VIEW**  
**TYPICAL CONNECTION DETAIL - P-1**



**PLATE P-1**  
TOTAL REQUIRED = 10  
(4) PW-1 REQ'D. PER PLATE

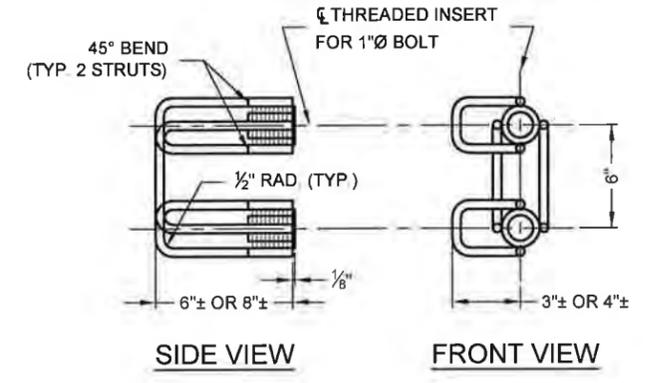


**PLAN VIEW**  
**TYPICAL CONNECTION DETAIL - P-2**

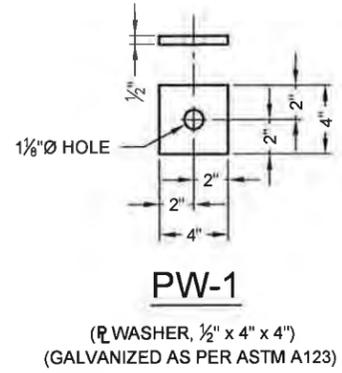


**UNIT LEG** **P-2** **WINGWALL LEG**  
(R, 1" x 14" x 10")  
(GALVANIZED AS PER ASTM A123)

**PLATE P-2**  
TOTAL REQUIRED = 4  
(4) PW-1 REQ'D. PER PLATE



**DAYTON SUPERIOR TWO BOLT PRESET ANCHOR**



**PW-1**  
(R WASHER, 1/2" x 4" x 4")  
(GALVANIZED AS PER ASTM A123)

SHOP DRAWING REVIEW	
<input checked="" type="checkbox"/>	REVIEWED AS REQUIRED BY THE CONSTRUCTION CONTRACT DOCUMENTS AND APPROVED, BUT ONLY FOR CONFORMANCE TO THE DESIGN CONCEPT OF THE WORK, AND SUBJECT TO FURTHER LIMITATIONS AND REQUIREMENTS CONTAINED IN THE CONSTRUCTION CONTRACT DOCUMENTS.
<input type="checkbox"/>	REJECTED
<input type="checkbox"/>	REVISE AND RESUBMIT
<input type="checkbox"/>	APPROVED AS NOTED
CORRECTIONS OR COMMENTS MADE ON THE SHOP DRAWINGS DURING THIS REVIEW DID NOT RELIEVE CONTRACTOR FROM COMPLIANCE WITH REQUIREMENTS OF THE DRAWINGS AND SPECIFICATIONS. THIS CHECK IS ONLY FOR REVIEW OF GENERAL COMPLIANCE WITH THE DESIGN CONCEPT OF THE PROJECT AND GENERAL COMPLIANCE WITH THE INFORMATION GIVEN IN THE CONTRACT DOCUMENTS. THE CONTRACTOR IS RESPONSIBLE FOR CONFIRMING AND CORRELATING ALL QUANTITIES AND DIMENSIONS; SELECTING FABRICATION PROCESSES AND TECHNIQUES OF CONSTRUCTION; COORDINATING THEIR WORK WITH THAT OF ALL OTHER TRADES; AND PERFORMING THEIR WORK IN A SAFE AND SATISFACTORY MANNER.	
CLD Consulting Engineers 540 Commercial Street Manchester, NH 03101 603-688-6223	Job Number: 12-0106 Reviewed by: NDC Date: 04/22/16

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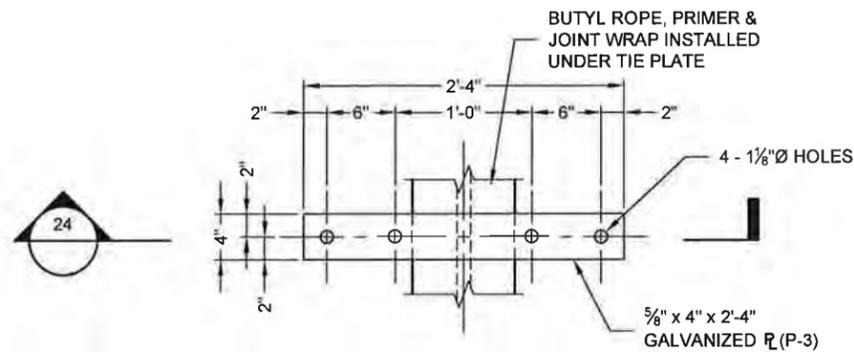
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1	3/16/2016	NO CHANGES THIS SHEET	KDK

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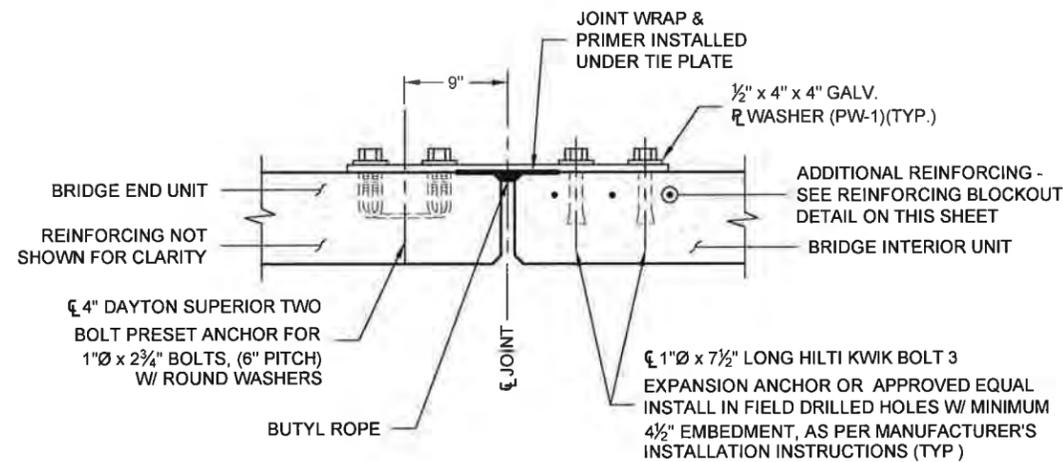
**CONSPAN**  
-SERIES  
FABRICATION  
DRAWING

US ROUTE 2  
BRIDGE NO. 126  
TOWN OF LUNENBURG  
ESSEX COUNTY, VERMONT

PROJECT No.: 468920	SEQ No.: 010	DATE: 12/8/2015
DESIGNED: KDK	DRAWN: TRL	
CHECKED: JDR	APPROVED: PAC	
SHEET NO: S19		OF S22

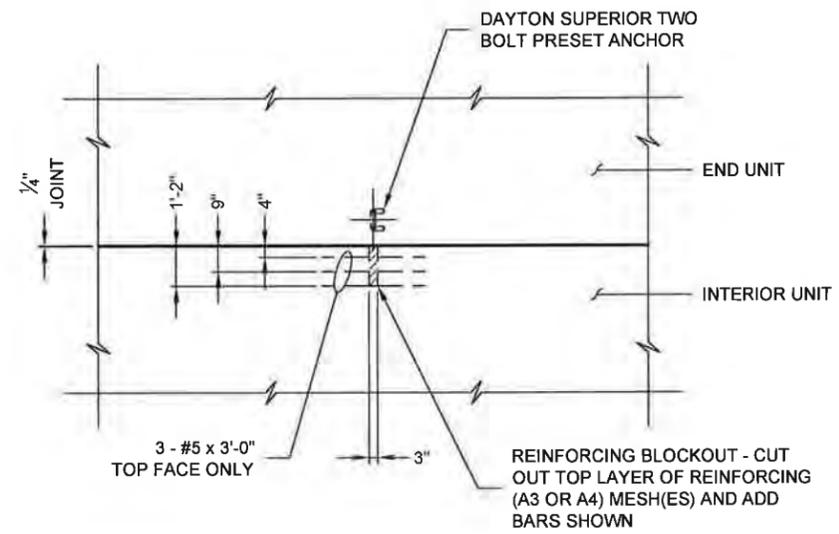


**DETAIL** 23  
S1

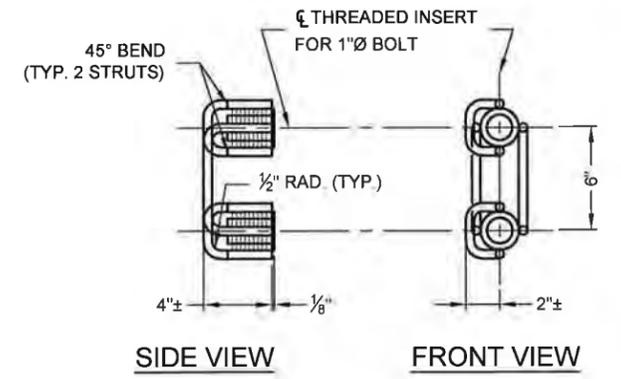


**SECTION** 24

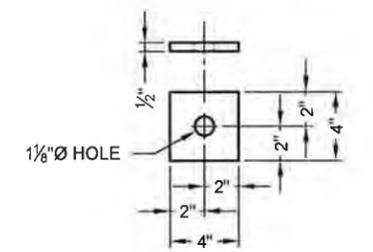
**PLATE P-3**  
TOTAL REQUIRED = 4  
(4) PW-1 REQ'D. PER PLATE



**REINFORCING BLOCKOUT DETAIL**



**DAYTON SUPERIOR TWO BOLT PRESET ANCHOR**



**PW-1**  
(PLATE WASHER, 1/2" x 4" x 4")  
(GALVANIZED AS PER ASTM A123)

SHOP DRAWING REVIEW	
<input checked="" type="checkbox"/>	REVIEWED AS REQUIRED BY THE CONSTRUCTION CONTRACT DOCUMENTS AND APPROVED, BUT ONLY FOR CONFORMANCE TO THE DESIGN CONCEPT OF THE WORK, AND SUBJECT TO FURTHER LIMITATIONS AND REQUIREMENTS CONTAINED IN THE CONSTRUCTION CONTRACT DOCUMENTS.
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CLD Consulting Engineers 540 Commercial Street Manchester, NH 03101 603-668-8223	Job Number: 12-0106 Reviewed by: NDC Date: 04/22/16

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**CONSPAN**  
-SERIES-

FABRICATION  
DRAWING

US ROUTE 2  
BRIDGE NO. 126  
TOWN OF LUNENBURG  
ESSEX COUNTY, VERMONT

PROJECT No: 468920	SEQ No: 010	DATE: 12/8/2015
DESIGNED: KDK	DRAWN: TRL	
CHECKED: JDR	APPROVED: PAC	
SHEET No: S20		OF S22

note that curing compound will be removed from all surfaces that will receive a water proofing application such as silane.

# FACTURE AND INSTALLATION OF CON/SPAN® O-SERIES BRIDGE SYSTEMS

**1. DESCRIPTION**  
 1.1. TYPE - THIS WORK SHALL CONSIST OF FURNISHING AND CONSTRUCTING A CON/SPAN® O-SERIES BRIDGE SYSTEM IN ACCORDANCE WITH THESE SPECIFICATIONS AND THE VERMONT AGENCY OF TRANSPORTATION SPECIFICATIONS AND IN REASONABLY CLOSE CONFORMITY WITH THE LINES, GRADES, DESIGN AND DIMENSIONS SHOWN ON THE PLANS OR AS ESTABLISHED BY THE ENGINEER. IN SITUATIONS WHERE TWO OR MORE SPECIFICATIONS APPLY TO THIS WORK, THE MOST STRINGENT REQUIREMENTS SHALL GOVERN.  
 1.2. DESIGNATION - PRECAST REINFORCED CONCRETE CON/SPAN® O-SERIES BRIDGE UNITS MANUFACTURED IN ACCORDANCE WITH THIS SPECIFICATION SHALL BE DESIGNATED BY SPAN AND RISE. PRECAST REINFORCED CONCRETE WINGWALLS AND HEADWALLS MANUFACTURED IN ACCORDANCE WITH THIS SPECIFICATION SHALL BE DESIGNATED BY LENGTH, HEIGHT, AND DEFLECTION ANGLE. PRECAST REINFORCED CONCRETE EXPRESS™ FOUNDATION UNITS MANUFACTURED IN ACCORDANCE WITH THIS SPECIFICATION SHALL BE DESIGNATED BY LENGTH, HEIGHT AND WIDTH.

**2. DESIGN**  
 2.1. SPECIFICATIONS - THE PRECAST ELEMENTS ARE DESIGNED IN ACCORDANCE WITH THE "AASHTO LRFD BRIDGE SPECIFICATION" 6TH EDITION, ADOPTED BY THE AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS, 2012. A MINIMUM OF ONE FOOT OF COVER ABOVE THE CROWN OF THE BRIDGE UNITS IS REQUIRED IN THE INSTALLED CONDITION. (UNLESS NOTED OTHERWISE ON THE SHOP DRAWINGS AND DESIGNED ACCORDINGLY.)

**3. MATERIALS**  
 3.1. CONCRETE - THE CONCRETE FOR THE PRECAST ELEMENTS SHALL BE AIR-ENTRAINED WHEN INSTALLED IN AREAS SUBJECT TO FREEZE-THAW CONDITIONS, COMPOSED OF PORTLAND CEMENT, FINE AND COARSE AGGREGATES, ADMIXTURES AND WATER. AIR-ENTRAINED CONCRETE SHALL CONTAIN 6 ± 2 PERCENT AIR. THE AIR-ENTRAINED ADMIXTURE SHALL CONFORM TO AASHTO M154. THE MINIMUM CONCRETE COMPRESSIVE STRENGTH SHALL BE AS SHOWN ON THE SHOP DRAWINGS.  
 3.1.1. PORTLAND CEMENT - SHALL CONFORM TO THE REQUIREMENTS OF ASTM SPECIFICATIONS C150-TYPE I, TYPE II, OR TYPE III CEMENT.  
 3.1.2. COARSE AGGREGATE - SHALL CONSIST OF STONE HAVING A MAXIMUM SIZE OF 1 INCH. AGGREGATE SHALL MEET REQUIREMENTS FOR ASTM C33.  
 3.1.3. WATER REDUCING ADMIXTURE - THE MANUFACTURER MAY SUBMIT, FOR APPROVAL BY THE ENGINEER, A WATER-REDUCING ADMIXTURE FOR THE PURPOSE OF INCREASING WORKABILITY AND REDUCING THE WATER REQUIREMENT FOR THE CONCRETE.  
 3.1.4. CALCIUM CHLORIDE - THE ADDITION TO THE MIX OF CALCIUM CHLORIDE OR ADMIXTURES CONTAINING CALCIUM CHLORIDE WILL NOT BE PERMITTED.  
 3.1.5. MIXTURE - THE AGGREGATES, CEMENT AND WATER SHALL BE PROPORTIONED AND MIXED IN A BATCH MIXER TO PRODUCE A HOMOGENEOUS CONCRETE MEETING THE STRENGTH REQUIREMENTS OF THIS SPECIFICATION. THE PROPORTION OF PORTLAND CEMENT IN THE MIXTURE SHALL NOT BE LESS THAN 564 POUNDS (6 SACKS) PER CUBIC YARD OF CONCRETE.  
 3.2. STEEL REINFORCEMENT  
 3.2.1. THE MINIMUM STEEL YIELD STRENGTH SHALL BE 80,000 PSI, UNLESS OTHERWISE NOTED ON THE SHOP DRAWINGS.  
 3.2.2. ALL REINFORCING STEEL FOR THE PRECAST ELEMENTS SHALL BE FABRICATED AND PLACED IN ACCORDANCE WITH THE DETAILED SHOP DRAWINGS SUBMITTED BY THE MANUFACTURER.  
 3.2.3. REINFORCEMENT SHALL CONSIST OF WELDED WIRE REINFORCING CONFORMING TO ASTM SPECIFICATION A 1064, OR DEFORMED BILLET STEEL BARS CONFORMING TO ASTM SPECIFICATION A 615, GRADE 60. LONGITUDINAL DISTRIBUTION REINFORCEMENT MAY CONSIST OF WELDED WIRE FABRIC OR DEFORMED BILLET-STEEL BARS.  
 3.3. STEEL HARDWARE  
 3.3.1. BOLTS AND THREADED RODS FOR WINGWALL CONNECTIONS SHALL CONFORM TO ASTM A 307. NUTS SHALL CONFORM TO AASHTO M292 (ASTM A194) GRADE 2H. ALL BOLTS, THREADED RODS AND NUTS USED IN WINGWALL CONNECTIONS SHALL BE MECHANICALLY ZINC COATED IN ACCORDANCE WITH ASTM B695 CLASS 50.  
 3.3.2. STRUCTURAL STEEL FOR WINGWALL CONNECTION PLATES AND PLATE WASHERS SHALL CONFORM TO AASHTO M 270 (ASTM A 709) GRADE 36 AND SHALL BE HOT DIP GALVANIZED AS PER AASHTO M111 (ASTM A123).  
 3.3.3. INSERTS FOR WINGWALLS SHALL BE 1" DIAMETER TWO-BOLT PRESET WINGWALL ANCHORS AS MANUFACTURED BY DAYTON SUPERIOR CONCRETE ACCESSORIES, MIAMISBURG, OHIO, (800) 745-3700 AND SHALL BE MECHANICALLY ZINC COATED IN ACCORDANCE WITH ASTM B695 CLASS 50.  
 3.3.4. FERRULE LOOP INSERTS SHALL BE F-64 FERRULE LOOP INSERTS AS MANUFACTURED BY DAYTON SUPERIOR CONCRETE ACCESSORIES, MIAMISBURG, OHIO, (800) 745-3700.  
 3.3.5. HOOK BOLTS USED IN ATTACHED HEADWALL CONNECTIONS SHALL BE ASTM A307.  
 3.3.6. INSERTS FOR DETACHED HEADWALL CONNECTIONS SHALL BE AISI TYPE 304 STAINLESS STEEL, EXPANDED COIL INSERTS AS MANUFACTURED BY DAYTON SUPERIOR

CONCRETE ACCESSORIES, MIAMISBURG, OHIO, (800) 745-3700. COIL RODS AND NUTS USED IN HEADWALL CONNECTIONS SHALL BE AISI TYPE 304 STAINLESS STEEL WASHERS USED IN HEADWALL CONNECTIONS SHALL BE EITHER AISI TYPE 304 STAINLESS STEEL PLATE WASHERS OR AASHTO M270 (ASTM A709) GRADE 36 PLATE WASHERS. HOT DIP GALVANIZED AS PER AASHTO M111 (ASTM A123).  
 3.3.7. MECHANICAL SPLICES OF REINFORCING BARS SHALL BE MADE USING THE DOWEL BAR SPLICER SYSTEM AS MANUFACTURED BY DAYTON SUPERIOR CONCRETE ACCESSORIES, MIAMISBURG, OHIO, (800) 745-3700, AND SHALL CONSIST OF THE DOWEL BAR SPLICER (DB-SAE) AND DOWEL-IN (DI).

**4. MANUFACTURE OF PRECAST ELEMENTS - SUBJECT TO THE PROVISIONS OF SECTION 5, BELOW, THE PRECAST ELEMENT DIMENSION AND REINFORCEMENT DETAILS SHALL BE AS PRESCRIBED IN THE PLAN AND SHOP DRAWINGS PROVIDED BY THE MANUFACTURER.**  
 4.1. FORMS - THE FORMS USED IN MANUFACTURE SHALL BE SUFFICIENTLY RIGID AND ACCURATE TO MAINTAIN THE REQUIRED PRECAST ELEMENT DIMENSIONS WITHIN THE PERMISSIBLE VARIATIONS GIVEN IN SECTION 5 OF THESE SPECIFICATIONS. ALL CASTING SURFACES SHALL BE OF A SMOOTH MATERIAL.  
 4.2. PLACEMENT OF REINFORCEMENT  
 4.2.1. PLACEMENT OF REINFORCEMENT IN PRECAST BRIDGE UNITS - THE COVER OF CONCRETE OVER THE OUTSIDE CIRCUMFERENTIAL REINFORCEMENT SHALL BE 2" MINIMUM. THE COVER OF CONCRETE OVER THE INSIDE CIRCUMFERENTIAL REINFORCEMENT SHALL BE 1 1/2" MINIMUM, UNLESS OTHERWISE NOTED ON THE SHOP DRAWINGS. THE CLEAR DISTANCE OF THE END CIRCUMFERENTIAL WIRES SHALL NOT BE LESS THAN 1" NOR MORE THAN 2" FROM THE ENDS OF EACH SECTION. REINFORCEMENT SHALL BE ASSEMBLED UTILIZING SINGLE OR MULTIPLE LAYERS OF WELDED WIRE FABRIC (NOT TO EXCEED 3 LAYERS), SUPPLEMENTED WITH A SINGLE LAYER OF DEFORMED BILLET-STEEL BARS, WHEN NECESSARY. WELDED WIRE FABRIC SHALL BE COMPOSED OF CIRCUMFERENTIAL AND LONGITUDINAL WIRES MEETING THE SPACING REQUIREMENTS OF 4.3, BELOW, AND SHALL CONTAIN SUFFICIENT LONGITUDINAL WIRES EXTENDING THROUGH THE BRIDGE UNIT TO MAINTAIN THE SHAPE AND POSITION OF THE REINFORCEMENT. LONGITUDINAL DISTRIBUTION REINFORCEMENT MAY BE WELDED WIRE FABRIC OR DEFORMED BILLET-STEEL BARS AND SHALL MEET THE SPACING REQUIREMENTS OF 4.3, BELOW. THE ENDS OF THE LONGITUDINAL DISTRIBUTION REINFORCEMENT SHALL BE NOT MORE THAN 3" AND NOT LESS THAN 1 1/2" FROM THE ENDS OF THE BRIDGE UNIT.  
 4.2.2. BENDING OF REINFORCEMENT FOR PRECAST BRIDGE UNITS - THE OUTSIDE AND INSIDE CIRCUMFERENTIAL REINFORCING STEEL FOR THE CORNERS OF THE BRIDGE SHALL BE BENT TO SUCH AN ANGLE THAT IS APPROXIMATELY EQUAL TO THE CONFIGURATION OF THE BRIDGE'S OUTSIDE CORNER.  
 4.2.3. PLACEMENT OF REINFORCEMENT FOR PRECAST WINGWALLS AND HEADWALLS - THE COVER OF CONCRETE OVER THE LONGITUDINAL AND TRANSVERSE REINFORCEMENT SHALL BE 2" MINIMUM. THE CLEAR DISTANCE FROM THE END OF EACH PRECAST ELEMENT TO THE END OF REINFORCING STEEL SHALL NOT BE LESS THAN 1 1/2" NOR MORE THAN 3". REINFORCEMENT SHALL BE ASSEMBLED UTILIZING A SINGLE LAYER OF WELDED WIRE FABRIC, OR A SINGLE LAYER OF DEFORMED BILLET-STEEL BARS. WELDED WIRE FABRIC SHALL BE COMPOSED OF TRANSVERSE AND LONGITUDINAL WIRES MEETING THE SPACING REQUIREMENTS OF 4.3, BELOW, AND SHALL CONTAIN SUFFICIENT LONGITUDINAL WIRES EXTENDING THROUGH THE ELEMENT TO MAINTAIN THE SHAPE AND POSITION OF THE REINFORCEMENT. LONGITUDINAL REINFORCEMENT MAY BE WELDED WIRE FABRIC OR DEFORMED BILLET-STEEL BARS AND SHALL MEET THE SPACING REQUIREMENTS OF 4.3, BELOW.  
 4.2.4. PLACEMENT OF REINFORCEMENT FOR PRECAST FOUNDATION UNITS - THE COVER OF CONCRETE OVER THE BOTTOM REINFORCEMENT SHALL BE 3 INCHES MINIMUM. THE COVER OF CONCRETE FOR ALL OTHER REINFORCEMENT SHALL BE 2 INCHES MINIMUM. THE CLEAR DISTANCE FROM THE END OF EACH PRECAST ELEMENT TO THE END OF REINFORCING STEEL SHALL NOT BE LESS THAN 2 INCHES NOR MORE THAN 3 INCHES. REINFORCEMENT SHALL BE ASSEMBLED UTILIZING A SINGLE LAYER OF WELDED WIRE FABRIC OR A SINGLE LAYER OF DEFORMED BILLET-STEEL BARS. WELDED WIRE FABRIC SHALL BE COMPOSED OF TRANSVERSE AND LONGITUDINAL WIRES MEETING THE SPACING REQUIREMENTS OF 4.3, BELOW, AND SHALL CONTAIN SUFFICIENT LONGITUDINAL WIRES EXTENDING THROUGH THE ELEMENT TO MAINTAIN THE SHAPE AND POSITION OF THE REINFORCEMENT. LONGITUDINAL REINFORCEMENT MAY BE WELDED WIRE FABRIC OR DEFORMED BILLET-STEEL BARS AND SHALL MEET THE SPACING REQUIREMENTS OF 4.3, BELOW.  
 4.3. LAPS, WELDS, AND SPACING  
 4.3.1. LAPS, WELDS, AND SPACING FOR PRECAST BRIDGE UNITS - TENSION SPLICES IN THE CIRCUMFERENTIAL REINFORCEMENT SHALL BE MADE BY LAPPING. LAPS MAY BE TACK WELDED TOGETHER FOR ASSEMBLY PURPOSES. FOR SMOOTH WELDED WIRE FABRIC, THE

OVERLAP SHALL MEET THE REQUIREMENTS OF AASHTO 5 11 2.5.2 AND 5 11 6.2 FOR DEFORMED WELDED WIRE FABRIC. THE OVERLAP SHALL MEET THE REQUIREMENTS OF AASHTO 5 11 2.5.1 AND 5 11 6.1. THE OVERLAP OF WELDED WIRE FABRIC SHALL BE MEASURED BETWEEN THE OUTER-MOST LONGITUDINAL WIRES OF EACH FABRIC SHEET. FOR DEFORMED BILLET-STEEL BARS, THE OVERLAP SHALL MEET THE REQUIREMENTS OF AASHTO 5 11 2.1 FOR SPLICES OTHER THAN TENSION SPLICES, THE OVERLAP SHALL BE A MINIMUM OF 1'-0" FOR WELDED WIRE FABRIC OR DEFORMED BILLET-STEEL BARS. THE SPACING CENTER TO CENTER OF THE CIRCUMFERENTIAL WIRES IN A WIRE FABRIC SHEET SHALL BE NOT LESS THAN 2" NOR MORE THAN 4". THE SPACING CENTER TO CENTER OF THE LONGITUDINAL WIRES SHALL NOT BE MORE THAN 8". THE SPACING CENTER TO CENTER OF THE LONGITUDINAL DISTRIBUTION STEEL FOR EITHER LINE OF REINFORCING IN THE TOP SLAB SHALL BE NOT MORE THAN 1'-4".  
 4.3.2. LAPS, WELDS, AND SPACING FOR PRECAST WINGWALLS, HEADWALLS AND FOUNDATIONS - SPLICES IN THE REINFORCEMENT SHALL BE MADE BY LAPPING. LAPS MAY BE TACK WELDED TOGETHER FOR ASSEMBLY PURPOSES. FOR SMOOTH WELDED WIRE FABRIC, THE OVERLAP SHALL MEET THE REQUIREMENTS OF AASHTO 5 11 2.5.2 AND 5 11 6.2. FOR DEFORMED WELDED WIRE FABRIC, THE OVERLAP SHALL MEET THE REQUIREMENTS OF AASHTO 5 11 2.5.1 AND 5 11 6.1. THE SPACING CENTER-TO-CENTER OF THE WIRES IN A WIRE FABRIC SHEET SHALL BE NOT LESS THAN 2" NOR MORE THAN 8".  
 4.4. CURING - THE PRECAST CONCRETE ELEMENTS SHALL BE CURED FOR A SUFFICIENT LENGTH OF TIME SO THAT THE CONCRETE WILL DEVELOP THE SPECIFIED COMPRESSIVE STRENGTH IN 28 DAYS OR LESS. ANY ONE OF THE FOLLOWING METHODS OF CURING OR COMBINATIONS THERE OF SHALL BE USED:  
 4.4.1. STEAM CURING - THE PRECAST ELEMENTS MAY BE LOW-PRESSURE STEAM CURED BY A SYSTEM THAT WILL MAINTAIN A MOIST ATMOSPHERE.  
 4.4.2. WATER CURING - THE PRECAST ELEMENTS MAY BE WATER CURED BY ANY METHOD THAT WILL KEEP THE SECTIONS MOIST.  
 4.4.3. MEMBRANE CURING - A SEALING MEMBRANE CONFORMING TO THE REQUIREMENTS OF ASTM SPECIFICATION C309 MAY BE APPLIED AND SHALL BE LEFT INTACT UNTIL THE REQUIRED CONCRETE COMPRESSIVE STRENGTH IS ATTAINED. THE CONCRETE TEMPERATURE AT THE TIME OF APPLICATION SHALL BE WITHIN +/- 10 DEGREES F OF THE ATMOSPHERIC TEMPERATURE. ALL SURFACES SHALL BE KEPT MOIST PRIOR TO THE APPLICATION OF THE COMPOUNDS AND SHALL BE DAMP WHEN THE COMPOUND IS APPLIED.  
 4.5. STORAGE, HANDLING & DELIVERY  
 4.5.1. STORAGE - PRECAST CONCRETE BRIDGE ELEMENTS SHALL BE LIFTED AND STORED IN "AS-CAST" POSITION. PRECAST CONCRETE HEADWALL AND WINGWALL UNITS ARE CAST, STORED AND SHIPPED IN A FLAT POSITION. THE PRECAST ELEMENTS SHALL BE STORED IN SUCH A MANNER TO PREVENT CRACKING OR DAMAGE. STORE ELEMENTS USING TIMBER SUPPORTS AS APPROPRIATE. THE UNITS SHALL NOT BE MOVED UNTIL THE CONCRETE COMPRESSIVE STRENGTH HAS REACHED A MINIMUM OF 2500 PSI, AND THEY SHALL NOT BE STORED IN AN UPRIGHT POSITION.  
 4.5.2. HANDLING - HANDLING DEVICES SHALL BE PERMITTED IN EACH PRECAST ELEMENT FOR THE PURPOSE OF HANDLING AND SETTING. SPREADER BEAMS MAY BE REQUIRED FOR THE LIFTING OF PRECAST CONCRETE BRIDGE ELEMENTS TO PRECLUDE DAMAGE FROM BENDING OR TORSION FORCES.  
 4.5.3. DELIVERY - PRECAST CONCRETE ELEMENTS MUST NOT BE SHIPPED UNTIL THE CONCRETE HAS ATTAINED THE SPECIFIED DESIGN COMPRESSIVE STRENGTH, OR AS DIRECTED BY THE DESIGN ENGINEER. PRECAST CONCRETE ELEMENTS MAY BE UNLOADED AND PLACED ON THE GROUND AT THE SITE UNTIL INSTALLED. STORE ELEMENTS USING TIMBER SUPPORTS AS APPROPRIATE.  
 4.6. QUALITY ASSURANCE - THE PRECASTER SHALL DEMONSTRATE ADHERENCE TO THE STANDARDS SET FORTH IN THE NPCA QUALITY CONTROL MANUAL. THE PRECASTER SHALL MEET EITHER SECTION 4.6.1 OR 4.6.2.  
 4.6.1. CERTIFICATION - THE PRECASTER SHALL BE CERTIFIED BY THE PRECAST/PRESTRESSED CONCRETE INSTITUTE PLANT CERTIFICATION PROGRAM OR THE NATIONAL PRECAST CONCRETE ASSOCIATION'S PLANT CERTIFICATION PROGRAM PRIOR TO AND DURING PRODUCTION OF THE PRODUCTS COVERED BY THIS SPECIFICATION.  
 4.6.2. QUALIFICATIONS, TESTING AND INSPECTION  
 4.6.2.1. THE PRECASTER SHALL HAVE BEEN IN THE BUSINESS OF PRODUCING PRECAST CONCRETE PRODUCTS SIMILAR TO THOSE SPECIFIED FOR A MINIMUM OF THREE YEARS. HE SHALL MAINTAIN A PERMANENT QUALITY CONTROL DEPARTMENT OR RETAIN AN INDEPENDENT TESTING AGENCY ON A CONTINUING BASIS. THE AGENCY SHALL ISSUE A REPORT, CERTIFIED BY A LICENSED ENGINEER, DETAILING THE ABILITY OF THE PRECASTER TO PRODUCE QUALITY PRODUCTS CONSISTENT WITH INDUSTRY STANDARDS.  
 4.6.2.2. THE PRECASTER SHALL SHOW THAT THE FOLLOWING TESTS ARE PERFORMED IN ACCORDANCE WITH THE ASTM STANDARDS INDICATED. TESTS SHALL BE PERFORMED AS

INDICATED IN SECTION 6 OF THESE SPECIFICATIONS.  
 4.6.2.2.1. AIR CONTENT: C231 OR C173  
 4.6.2.2.2. COMPRESSIVE STRENGTH: C31, C39, C497  
 4.6.2.3. THE PRECASTER SHALL PROVIDE DOCUMENTATION DEMONSTRATING COMPLIANCE WITH THIS SECTION TO CONTECH® ENGINEERED SOLUTIONS AT REGULAR INTERVALS OR UPON REQUEST.  
 4.6.2.4. THE OWNER MAY PLACE AN INSPECTOR IN THE PLANT WHEN THE PRODUCTS COVERED BY THIS SPECIFICATION ARE BEING MANUFACTURED.  
 4.6.3. DOCUMENTATION - THE PRECASTER SHALL SUBMIT PRECAST PRODUCTION REPORTS TO CONTECH® ENGINEERED SOLUTIONS AS REQUIRED.

**5. PERMISSIBLE VARIATIONS**  
 5.1. BRIDGE UNITS  
 5.1.1. INTERNAL DIMENSIONS - THE INTERNAL DIMENSION SHALL VARY NOT MORE THAN 1% FROM THE DESIGN DIMENSIONS NOR MORE THAN 1/2", WHICHEVER IS LESS.  
 5.1.2. SLAB AND WALL THICKNESS - THE SLAB AND WALL THICKNESS SHALL NOT BE LESS THAN THAT SHOWN IN THE DESIGN BY MORE THAN 1/4". A THICKNESS MORE THAN THAT REQUIRED IN THE DESIGN SHALL NOT BE CAUSE FOR REJECTION.  
 5.1.3. LENGTH OF OPPOSITE SURFACES - VARIATIONS IN LAYING LENGTHS OF TWO OPPOSITE SURFACES OF THE BRIDGE UNIT SHALL NOT BE MORE THAN 1/2" IN ANY SECTION, EXCEPT WHERE BEVELED ENDS FOR LAYING OF CURVES ARE SPECIFIED BY THE PURCHASER.  
 5.1.4. LENGTH OF SECTION - THE UNDERRUN IN LENGTH OF A SECTION SHALL NOT BE MORE THAN 1/2" IN ANY BRIDGE UNIT.  
 5.1.5. POSITION OF REINFORCEMENT - THE MAXIMUM VARIATION IN POSITION OF THE REINFORCEMENT SHALL BE ± 1/2" IN NO CASE SHALL THE COVER OVER THE REINFORCEMENT BE LESS THAN 1 1/2" FOR THE OUTSIDE CIRCUMFERENTIAL STEEL OR BE LESS THAN 1" FOR THE INSIDE CIRCUMFERENTIAL STEEL AS MEASURED TO THE EXTERNAL OR INTERNAL SURFACE OF THE BRIDGE. THESE TOLERANCES OR COVER REQUIREMENTS DO NOT APPLY TO MATING SURFACES OF THE JOINTS.  
 5.1.6. AREA OF REINFORCEMENT - THE AREAS OF STEEL REINFORCEMENT SHALL BE THE DESIGN STEEL AREAS AS SHOWN IN THE MANUFACTURER'S SHOP DRAWINGS. STEEL AREAS GREATER THAN THOSE REQUIRED SHALL NOT BE CAUSE FOR REJECTION. THE PERMISSIBLE VARIATION IN DIAMETER OF ANY REINFORCEMENT SHALL CONFORM TO THE TOLERANCES PRESCRIBED IN THE ASTM SPECIFICATION FOR THAT TYPE OF REINFORCEMENT.  
 5.2. WINGWALLS & HEADWALLS  
 5.2.1. WALL THICKNESS - THE WALL THICKNESS SHALL NOT VARY FROM THAT SHOWN IN THE DESIGN BY MORE THAN 1/2".  
 5.2.2. LENGTH/HEIGHT OF WALL SECTIONS - THE LENGTH AND HEIGHT OF THE WALL SHALL NOT VARY FROM THAT SHOWN IN THE DESIGN BY MORE THAN 1/2".  
 5.2.3. POSITION OF REINFORCEMENT - THE MAXIMUM VARIATION IN THE POSITION OF THE REINFORCEMENT SHALL BE ± 1/2" IN NO CASE SHALL THE COVER OVER THE REINFORCEMENT BE LESS THAN 1 1/2".  
 5.2.4. SIZE OF REINFORCEMENT - THE PERMISSIBLE VARIATION IN DIAMETER OF ANY REINFORCING SHALL CONFORM TO THE TOLERANCES PRESCRIBED IN THE ASTM SPECIFICATION FOR THAT TYPE OF REINFORCING STEEL AREA GREATER THAN THAT REQUIRED SHALL NOT BE CAUSE FOR REJECTION.  
 5.3. FOUNDATION UNITS  
 5.3.1. WALL THICKNESS - THE WALL THICKNESS SHALL NOT VARY FROM THAT SHOWN IN THE DESIGN BY MORE THAN 1/2".  
 5.3.2. LENGTH/HEIGHT/WIDTH OF FOUNDATION SECTIONS - THE LENGTH, HEIGHT AND WIDTH OF THE FOUNDATION UNITS SHALL NOT VARY FROM THAT SHOWN IN THE DESIGN BY MORE THAN 1/2".  
 5.3.3. POSITION OF REINFORCEMENT - THE MAXIMUM VARIATION IN THE POSITION OF THE REINFORCEMENT SHALL BE ± 1/2" IN NO CASE SHALL THE COVER OVER THE REINFORCEMENT BE LESS THAN 1 1/2".  
 5.3.4. SIZE OF REINFORCEMENT - THE PERMISSIBLE VARIATION IN DIAMETER OF ANY REINFORCING SHALL CONFORM TO THE TOLERANCES PRESCRIBED IN THE ASTM SPECIFICATION FOR THAT TYPE OF REINFORCING STEEL AREA GREATER THAN THAT REQUIRED SHALL NOT BE CAUSE FOR REJECTION.

**6. TESTING/INSPECTION**  
 6.1. TESTING  
 6.1.1. TYPE OF TEST SPECIMEN - CONCRETE COMPRESSIVE STRENGTH SHALL BE DETERMINED FROM COMPRESSION TESTS MADE ON CYLINDERS OR CORES. FOR CYLINDER TESTING, A MINIMUM OF 4 CYLINDERS SHALL BE TAKEN FOR EACH BRIDGE ELEMENT. EACH ELEMENT SHALL BE CONSIDERED SEPARATELY FOR THE PURPOSE OF TESTING AND ACCEPTANCE.  
 6.1.2. COMPRESSION TESTING - CYLINDERS SHALL BE MADE AND TESTED AS PRESCRIBED BY THE ASTM C39 SPECIFICATION. CYLINDERS SHALL BE CURED IN THE SAME ENVIRONMENT AS THE BRIDGE ELEMENTS. CORES SHALL BE OBTAINED AND TESTED FOR COMPRESSIVE STRENGTH IN ACCORDANCE WITH THE PROVISIONS OF THE ASTM C42 SPECIFICATION.  
 6.1.3. ACCEPTABILITY OF CYLINDER TESTS - WHEN THE AVERAGE COMPRESSIVE STRENGTH OF ALL CYLINDERS TESTED IS EQUAL TO OR GREATER THAN THE DESIGN COMPRESSIVE

STRENGTH, AND NOT MORE THAN 10% OF THE CYLINDERS TESTED HAVE A COMPRESSIVE STRENGTH LESS THAN THE DESIGN CONCRETE STRENGTH, AND NO CYLINDER TESTED HAS A COMPRESSIVE STRENGTH LESS THAN 80% OF THE DESIGN COMPRESSIVE STRENGTH, THEN THE ELEMENT SHALL BE ACCEPTED. WHEN THE COMPRESSIVE STRENGTH OF THE CYLINDERS TESTED DOES NOT CONFORM TO THESE ACCEPTANCE CRITERIA, THE ACCEPTABILITY OF THE ELEMENT MAY BE DETERMINED AS DESCRIBED IN SECTION 6.1.4, BELOW.  
 6.1.4. ACCEPTABILITY OF CORE TESTS - THE COMPRESSIVE STRENGTH OF THE CONCRETE IN A BRIDGE ELEMENT IS ACCEPTABLE WHEN THE AVERAGE CORE TEST STRENGTH IS EQUAL TO OR GREATER THAN THE DESIGN CONCRETE STRENGTH. WHEN THE COMPRESSIVE STRENGTH OF A CORE TESTED IS LESS THAN THE DESIGN CONCRETE STRENGTH, THE PRECAST ELEMENT FROM WHICH THAT CORE WAS TAKEN MAY BE RE-CORED. WHEN THE COMPRESSIVE STRENGTH OF THE RE-CORE IS EQUAL TO OR GREATER THAN THE DESIGN CONCRETE STRENGTH, THE COMPRESSIVE STRENGTH OF THE CONCRETE IN THAT BRIDGE ELEMENT IS ACCEPTABLE.  
 6.1.4.1. WHEN THE COMPRESSIVE STRENGTH OF ANY RECORE IS LESS THAN THE DESIGN CONCRETE STRENGTH, THE PRECAST ELEMENT FROM WHICH THAT CORE WAS TAKEN SHALL BE REJECTED.  
 6.1.4.2. PLUGGING CORE HOLES - THE CORE HOLES SHALL BE PLUGGED AND SEALED BY THE MANUFACTURER IN A MANNER SUCH THAT THE ELEMENTS WILL MEET ALL OF THE TEST REQUIREMENTS OF THIS SPECIFICATION. PRECAST ELEMENTS SO SEALED SHALL BE CONSIDERED SATISFACTORY FOR USE.  
 6.1.4.3. TEST EQUIPMENT - EVERY MANUFACTURER FURNISHING PRECAST ELEMENTS UNDER THIS SPECIFICATION SHALL FURNISH ALL FACILITIES AND PERSONNEL NECESSARY TO CARRY OUT THE TEST REQUIRED.  
 6.2. INSPECTION - THE QUALITY OF MATERIALS, THE PROCESS OF MANUFACTURE, AND THE FINISHED PRECAST ELEMENTS SHALL BE SUBJECT TO INSPECTION BY THE PURCHASER.  
 7. JOINTS  
 THE BRIDGE UNITS SHALL BE PRODUCED WITH FLAT BUTT ENDS. THE ENDS OF THE BRIDGE UNITS SHALL BE SUCH THAT WHEN THE SECTIONS ARE LAID TOGETHER THEY WILL MAKE A CONTINUOUS LINE WITH A SMOOTH INTERIOR FREE OF APPRECIABLE IRREGULARITIES, ALL COMPATIBLE WITH THE PERMISSIBLE VARIATIONS IN SECTION 5, ABOVE. THE JOINT WIDTH BETWEEN ADJACENT PRECAST UNITS SHALL NOT EXCEED 3/4".  
 8. WORKMANSHIP/FINISH  
 THE BRIDGE UNITS, WINGWALLS, HEADWALLS AND FOUNDATION UNITS SHALL BE SUBSTANTIALLY FREE OF FRACTURES. THE ENDS OF THE BRIDGE UNITS SHALL BE NORMAL TO THE WALLS AND CENTERLINE OF THE BRIDGE SECTION, WITHIN THE LIMITS OF THE VARIATIONS GIVEN IN SECTION 5, ABOVE, EXCEPT WHERE BEVELED ENDS ARE SPECIFIED. THE FACES OF THE WINGWALLS AND HEADWALLS SHALL BE PARALLEL TO EACH OTHER, WITHIN THE LIMITS OF VARIATIONS GIVEN IN SECTION 5, ABOVE. THE SURFACE OF THE PRECAST ELEMENTS SHALL BE A SMOOTH STEEL FORM OR TROWELED SURFACE. TRAPPED AIR POCKETS CAUSING SURFACE DEFECTS SHALL BE CONSIDERED AS PART OF A SMOOTH, STEEL FORM FINISH.  
 9. REPAIRS  
 PRECAST ELEMENTS MAY BE REPAIRED, IF NECESSARY, BECAUSE OF IMPERFECTIONS IN MANUFACTURE OR HANDLING DAMAGE AND WILL BE ACCEPTABLE IF, IN THE OPINION OF THE PURCHASER, THE REPAIRS ARE SOUND, PROPERLY FINISHED AND CURED, AND THE REPAIRED SECTION CONFORMS TO THE REQUIREMENTS OF THIS SPECIFICATION.  
 10. REJECTION  
 THE PRECAST ELEMENTS SHALL BE SUBJECT TO REJECTION ON ACCOUNT OF ANY OF THE SPECIFICATION REQUIREMENTS. INDIVIDUAL PRECAST ELEMENTS MAY BE REJECTED BECAUSE OF ANY OF THE FOLLOWING:  
 10.1. FRACTURES OR CRACKS PASSING THROUGH THE WALL, EXCEPT FOR A SINGLE END CRACK THAT DOES NOT EXCEED ONE HALF THE THICKNESS OF THE WALL.  
 10.2. DEFECTS THAT INDICATE PROPORTIONING, MIXING, AND MOLDING NOT IN COMPLIANCE WITH SECTION 4 OF THESE SPECIFICATIONS.  
 10.3. HONEYCOMBED OR OPEN TEXTURE.  
 10.4. DAMAGED ENDS, WHERE SUCH DAMAGE WOULD PREVENT MAKING A SATISFACTORY JOINT.

**SHOP DRAWING REVIEW**

REVIEWED AS REQUIRED BY THE CONSTRUCTION CONTRACT DOCUMENTS AND APPROVED, BUT ONLY FOR CONFORMANCE TO THE DESIGN CONCEPT OF THE WORK, AND SUBJECT TO FURTHER LIMITATIONS AND REQUIREMENTS CONTAINED IN THE CONSTRUCTION CONTRACT DOCUMENTS.

REJECTED  REVISE AND RESUBMIT  APPROVED AS NOTED

CORRECTIONS OR COMMENTS MADE ON THE SHOP DRAWINGS DURING THIS REVIEW DID NOT RELIEVE CONTRACTOR FROM COMPLIANCE WITH REQUIREMENTS OF THE DRAWINGS AND SPECIFICATIONS. THIS CHECK IS ONLY FOR REVIEW OF GENERAL CONFORMANCE WITH THE DESIGN CONCEPT OF THE PROJECT AND GENERAL COMPLIANCE WITH THE INFORMATION GIVEN IN THE CONTRACT DOCUMENTS. THE CONTRACTOR IS RESPONSIBLE FOR CONFIRMING AND CORRELATING ALL QUANTITIES AND DIMENSIONS; SELECTING FABRICATION PROCESSES AND TECHNIQUES OF CONSTRUCTION; COORDINATING THEIR WORK WITH THAT OF ALL OTHER TRADES; AND PERFORMING THEIR WORK IN A SAFE AND SATISFACTORY MANNER.

CLD Consulting Engineers  
 540 Commercial Street  
 Manchester, NH 03101  
 603-689-6225

Job Number: 12-0106  
 Reviewed by: NDC  
 Date: 04/22/16

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MARK	DATE	REVISION DESCRIPTION
2	4/14/2016	REVIEW COMMENTS
1	3/16/2016	REVISIONS PER REVIEW COM

how is the precaster to know where to put the supports for storage and shipping? Designer should show positioning of them.



US ROUTE 2  
 BRIDGE NO. 126  
 TOWN OF LUNENBURG  
 ESSEX COUNTY, VERMONT

PROJECT No.	SEQ. No.	DATE
468920	010	12/8/2015
DESIGNED:	DRAWN:	
KDK	TRL	
CHECKED:	APPROVED:	
JDR	PAC	
SHEET No.:	S21 OF S22	

# SPECIFICATIONS FOR MANUFACTURE AND INSTALLATION OF CON/SPAN® O-SERIES BRIDGE SYSTEMS (CONT'D)

**11. MARKING**  
EACH BRIDGE UNIT SHALL BE CLEARLY MARKED BY WATERPROOF PAINT THE FOLLOWING SHALL BE SHOWN ON THE INSIDE OF THE VERTICAL LEG OF THE BRIDGE SECTION:  
BRIDGE SPAN x BRIDGE RISE  
DATE OF MANUFACTURE  
NAME OR TRADEMARK OF THE MANUFACTURER

**12. INSTALLATION PREPARATION**  
TO ENSURE CORRECT INSTALLATION OF THE PRECAST CONCRETE BRIDGE SYSTEM, CARE AND CAUTION MUST BE EXERCISED IN FORMING THE SUPPORT AREAS FOR BRIDGE UNITS, HEADWALL, AND WINGWALL ELEMENTS. EXERCISING SPECIAL CARE WILL FACILITATE THE RAPID INSTALLATION OF THE PRECAST COMPONENTS

**12.1. FOOTINGS**  
DO NOT OVER EXCAVATE FOUNDATIONS UNLESS DIRECTED BY SITE SOIL ENGINEER TO REMOVE UNSUITABLE SOIL

THE SITE SOILS ENGINEER SHALL CERTIFY THAT THE BEARING CAPACITY MEETS OR EXCEEDS THE FOOTING DESIGN REQUIREMENTS, PRIOR TO THE CONTRACTOR POURING OF THE FOOTINGS

THE BRIDGE UNITS AND WINGWALLS SHALL BE INSTALLED ON EITHER PRECAST OR CAST-IN-PLACE CONCRETE FOOTINGS. THE SIZE AND ELEVATION OF THE FOOTINGS SHALL BE AS DESIGNED BY THE ENGINEER. A KEYWAY SHALL BE FORMED IN THE TOP SURFACE OF THE BRIDGE FOOTING AS SPECIFIED ON THE PLANS. NO KEYWAY IS REQUIRED IN THE WINGWALL FOOTINGS, UNLESS OTHERWISE SPECIFIED ON THE PLANS

THE FOOTINGS SHALL BE GIVEN A SMOOTH FLOAT FINISH AND SHALL REACH A COMPRESSIVE STRENGTH OF 2,000 PSI BEFORE PLACEMENT OF THE BRIDGE AND WINGWALL ELEMENTS. BACKFILLING SHALL NOT BEGIN UNTIL THE FOOTING HAS REACHED THE FULL DESIGN COMPRESSIVE STRENGTH

THE FOOTING SURFACE SHALL BE CONSTRUCTED IN ACCORDANCE WITH GRADES SHOWN ON THE PLANS. WHEN TESTED WITH A 10'-0" STRAIGHT EDGE, THE SURFACE SHALL NOT VARY MORE THAN 1/4" IN 10'-0"

IF A PRECAST CONCRETE FOOTING IS USED, THE CONTRACTOR SHALL PREPARE A 4" THICK BASE LAYER OF COMPACTED GRANULAR MATERIAL THE FULL WIDTH OF THE FOOTING PRIOR TO PLACING THE PRECAST FOOTING

THE FOUNDATIONS FOR PRECAST CONCRETE BRIDGE ELEMENTS AND WINGWALLS MUST BE CONNECTED BY REINFORCEMENT TO FORM ONE MONOLITHIC BODY. EXPANSION JOINTS SHALL NOT BE USED

THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE CONSTRUCTION OF THE FOUNDATIONS PER THE PLANS AND SPECIFICATIONS

**13. INSTALLATION**  
**13.1. GENERAL** - THE INSTALLATION OF THE PRECAST CONCRETE ELEMENTS SHALL BE AS EXPLAINED IN THE PUBLICATION CON/SPAN BRIDGE SYSTEMS INSTALLATION HANDBOOK

**13.1.1. LIFTING** - IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO ENSURE THAT A CRANE OF THE CORRECT LIFTING CAPACITY IS AVAILABLE TO HANDLE THE PRECAST CONCRETE UNITS. THIS CAN BE ACCOMPLISHED BY USING THE WEIGHTS GIVEN FOR THE PRECAST CONCRETE COMPONENTS AND BY DETERMINING THE LIFTING REACH FOR EACH CRANE UNIT. SITE CONDITIONS MUST BE CHECKED WELL IN ADVANCE OF SHIPPING TO ENSURE PROPER CRANE LOCATION AND TO AVOID ANY LIFTING RESTRICTIONS. THE LIFT ANCHORS OR HOLES PROVIDED IN EACH UNIT ARE THE ONLY MEANS TO BE USED TO LIFT THE ELEMENTS. THE PRECAST CONCRETE ELEMENTS MUST NOT BE SUPPORTED OR RAISED BY OTHER MEANS THAN THOSE GIVEN IN THE MANUALS AND DRAWINGS WITHOUT WRITTEN APPROVAL FROM CONTECH® ENGINEERED SOLUTIONS

**13.1.2. CONSTRUCTION EQUIPMENT WEIGHT RESTRICTIONS** - IN NO CASE SHALL EQUIPMENT OPERATING IN EXCESS OF THE DESIGN LOAD (HL-93) BE PERMITTED OVER THE BRIDGE UNITS UNLESS APPROVED BY CONTECH® ENGINEERED SOLUTIONS

**13.1.2.1. IN THE IMMEDIATE AREA OF THE BRIDGE UNITS, THE FOLLOWING RESTRICTIONS FOR THE USE OF HEAVY CONSTRUCTION MACHINERY DURING BACKFILLING OPERATIONS APPLY:**

- NO CONSTRUCTION EQUIPMENT SHALL CROSS THE BARE PRECAST CONCRETE BRIDGE UNIT
- AFTER THE COMPACTED FILL LEVEL HAS REACHED A MINIMUM OF 4" OVER THE CROWN OF THE BRIDGE, CONSTRUCTION EQUIPMENT WITH A WEIGHT OF LESS THAN 10 TONS MAY CROSS THE BRIDGE
- AFTER THE COMPACTED FILL LEVEL HAS REACHED A MINIMUM OF 1'-0" OVER THE CROWN OF THE BRIDGE, CONSTRUCTION EQUIPMENT WITH A WEIGHT OF LESS THAN 30 TONS MAY CROSS THE BRIDGE
- AFTER THE COMPACTED FILL LEVEL HAS REACHED THE DESIGN COVER, OR 2'-0" MINIMUM, OVER THE CROWN OF THE PRECAST CONCRETE BRIDGE, CONSTRUCTION EQUIPMENT WITHIN THE DESIGN LOAD LIMITS FOR THE ROAD MAY CROSS THE PRECAST CONCRETE BRIDGE

**13.2. LEVELING PADS/SHIMS** - THE BRIDGE UNITS AND WINGWALLS SHALL BE SET ON HARDBOARD SHIMS CONFORMING TO ASTM D1037 OR PLASTIC SHIMS (DAYTON SUPERIOR P-80, P-81 OR APPROVED EQUAL) MEASURING 5" x 5", MINIMUM, UNLESS SHOWN OTHERWISE ON THE PLANS. A MINIMUM GAP OF 1/2" SHALL BE PROVIDED BETWEEN THE FOOTING AND THE BOTTOM OF THE BRIDGE'S

VERTICAL LEGS OR THE BOTTOM OF THE WINGWALL. ALSO, A SUPPLY OF 1/4", 1/2" AND 3/4" THICK HARDBOARD OR PLASTIC SHIMS FOR VARIOUS SHIMMING PURPOSES SHALL BE ON SITE

**13.3.** PLACEMENT OF BRIDGE UNITS - THE BRIDGE UNITS SHALL BE PLACED AS SHOWN ON THE ENGINEER'S PLAN DRAWINGS. SPECIAL CARE SHALL BE TAKEN IN SETTING THE ELEMENTS TO THE TRUE LINE AND GRADE. THE JOINT WIDTH BETWEEN ADJACENT PRECAST UNITS SHALL NOT EXCEED 3/4"

**13.4.** IT IS THE CONTRACTOR'S RESPONSIBILITY TO MAINTAIN THE STRUCTURE SPAN DURING ALL PHASES OF INSTALLATION. DUE TO THE ARCH SHAPE, BRIDGE ELEMENTS WILL TEND TO SPREAD UNDER SELF-WEIGHT. IT IS IMPERATIVE THAT ANY LATERAL SPREADING OF THE BRIDGE ELEMENTS BE AVOIDED DURING AND AFTER THEIR PLACEMENT. GENERALLY, HORIZONTAL CABLE TIES OR TIE RODS ARE SHIPPED IN THE LARGER BRIDGE ELEMENTS TO ASSIST IN PREVENTING THIS SPREADING. CABLE TIES/TIE RODS SHALL NOT BE REMOVED UNTIL BRIDGE UNITS ARE GROUTED AND GROUT HAS CURED. IT IS RECOMMENDED THAT TEMPORARY HARDWOOD BLOCKS BE USED IN CONJUNCTION WITH THE CABLE TIES/TIE RODS TO MAINTAIN SPAN. IF, HOWEVER, DUE TO SITE RESTRICTIONS, THESE CABLE TIES/TIE RODS MUST BE REMOVED PRIOR TO PLACEMENT OF THE BRIDGE ELEMENTS, THE CONTRACTOR MUST NOTIFY CONTECH (MANUFACTURER) AND REQUEST A SUGGESTED INSTALLATION PROCEDURE

IN ADDITION, IF THE CABLE TIES/TIE RODS MUST BE REMOVED PRIOR TO SETTING ARCH UNITS, THE FOLLOWING QUALITY CONTROL PROCEDURE MUST BE FOLLOWED:

- 1) FIND "MEASURED SPAN" UPON ARCH UNITS DELIVERY TO SITE, PRIOR TO LIFTING FROM TRUCK AND REMOVING CABLE TIES/TIE RODS. "MEASURED SPAN" SHALL BE THE AVERAGE OF (3) SPAN MEASUREMENTS ALONG THE LAY LENGTH OF THE ARCH UNIT
- 2) AFTER SETTING OF BRIDGE UNIT ON THE FOUNDATION, VERIFY THE SPAN. THIS "INSTALLED SPAN MEASUREMENT" SHALL NOT EXCEED THE MAXIMUM OF:
  - A) THE NOMINAL SPAN + 1/2" OR
  - B) THE "MEASURED SPAN"

IF THE "INSTALLED SPAN MEASUREMENT" EXCEEDS THIS AMOUNT, THE ARCH UNIT SHALL BE LIFTED AND RE-SET UNTIL THE "INSTALLED SPAN MEASUREMENT" MEETS THE LIMITS

**13.5.** PLACEMENT OF WINGWALLS, HEADWALLS AND FOUNDATION UNITS - THE WINGWALLS, HEADWALLS AND FOUNDATIONS SHALL BE PLACED AS SHOWN ON THE PLAN DRAWINGS. SPECIAL CARE SHALL BE TAKEN IN SETTING THE ELEMENTS TO THE TRUE LINE AND GRADE

**13.6.** WATERPROOFING/JOINT PROTECTION AND SUBSURFACE DRAINAGE

**13.6.1.** EXTERNAL PROTECTION OF JOINTS - THE BUTT JOINT MADE BY TWO ADJOINING BRIDGE UNITS SHALL BE COVERED WITH A 1/4" x 1 1/2" PREFORMED BITUMINOUS JOINT SEALANT AND A MINIMUM OF A 9" WIDE JOINT WRAP. THE SURFACE SHALL BE FREE OF DIRT BEFORE APPLYING THE JOINT MATERIAL. A PRIMER COMPATIBLE WITH THE JOINT WRAP TO BE USED SHALL BE APPLIED FOR A MINIMUM WIDTH OF 9" ON EACH SIDE OF THE JOINT. THE EXTERNAL WRAP SHALL BE CS212 BY CONCRETE SEALANTS INC., EZ-WRAP RUBBER BY PRESS-SEAL GASKET CORPORATION, SEAL WRAP BY MAR MAC MANUFACTURING CO. INC. OR APPROVED EQUAL. THE JOINT SHALL BE COVERED CONTINUOUSLY FROM THE BOTTOM OF ONE BRIDGE SECTION LEG, ACROSS THE TOP OF THE BRIDGE AND TO THE OPPOSITE BRIDGE SECTION LEG. ANY LAPS THAT RESULT IN THE JOINT WRAP SHALL BE A MINIMUM OF 6" LONG WITH THE OVERLAP RUNNING DOWNHILL

**13.6.2.** IN ADDITION TO THE JOINTS BETWEEN BRIDGE UNITS, THE JOINT BETWEEN THE END BRIDGE UNIT AND THE HEADWALL SHALL ALSO BE SEALED AS DESCRIBED ABOVE. IF PRECAST WINGWALLS ARE USED, THE JOINT BETWEEN THE END BRIDGE UNIT AND THE WINGWALL SHALL BE SEALED WITH A 2'-0" STRIP OF FILTER FABRIC. ALSO, IF LIFT HOLES ARE FORMED IN THE BRIDGE UNITS, THEY SHALL BE PRIMED AND COVERED WITH A 9" x 9" SQUARE OF JOINT WRAP

**13.6.3.** DURING THE BACKFILLING OPERATION, CARE SHALL BE TAKEN TO KEEP THE JOINT WRAP IN ITS PROPER LOCATION OVER THE JOINT

**13.6.4.** SUBSOIL DRAINAGE SHALL BE AS DIRECTED BY THE ENGINEER

**13.7. GROUTING**

**13.7.1.** GROUTING SHALL NOT BE PERFORMED WHEN TEMPERATURES ARE EXPECTED TO GO BELOW 35° FOR A PERIOD OF 72 HOURS. FILL THE BRIDGE-FOUNDATION KEYWAY WITH CEMENT GROUT (PORTLAND CEMENT AND WATER OR CEMENT MORTAR COMPOSED OF PORTLAND CEMENT, SAND AND WATER) WITH A MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 3000 PSI. VIBRATE AS REQUIRED TO ENSURE THAT THE ENTIRE KEY AROUND THE BRIDGE ELEMENT IS COMPLETELY FILLED. IF BRIDGE ELEMENTS HAVE BEEN SET WITH TEMPORARY TIES (CABLES, BARS, ETC.) GROUT MUST ATTAIN A MINIMUM COMPRESSIVE STRENGTH OF 1500 PSI BEFORE TIES MAY BE REMOVED

**13.7.2.** ALL GROUT SHALL HAVE A MAXIMUM AGGREGATE SIZE OF 1/4"

**13.7.3.** LIFTING AND ERECTION ANCHOR RECESSES SHALL BE FILLED WITH GROUT

**13.7.4.** AFTER GROUT HAS REACHED ITS DESIGN STRENGTH THE TEMPORARY HARDWOOD WEDGES SHALL BE REMOVED AND THEIR HOLES FILLED WITH GROUT

**13.8. BACKFILL**

**13.8.1.** DO NOT PERFORM BACKFILLING DURING WET OR FREEZING WEATHER.

**13.8.2.** NO BACKFILL SHALL BE PLACED AGAINST ANY STRUCTURAL ELEMENTS UNTIL THEY HAVE BEEN APPROVED BY THE ENGINEER

**13.8.3.** BACKFILL SHALL BE CONSIDERED AS ALL REPLACED EXCAVATION AND NEW EMBANKMENT ADJACENT TO THE PRECAST CONCRETE ELEMENTS. THE PROJECT CONSTRUCTION AND MATERIAL SPECIFICATIONS, WHICH INCLUDE THE SPECIFICATIONS FOR EXCAVATION FOR STRUCTURES AND ROADWAY EXCAVATION AND EMBANKMENT CONSTRUCTION, SHALL APPLY EXCEPT AS MODIFIED IN THIS SECTION

**13.8.4.** BACKFILL ZONES:  
• IN-SITU SOIL  
• ZONE A: CONSTRUCTED EMBANKMENT OR OVERFILL  
• ZONE B: FILL THAT IS DIRECTLY ASSOCIATED WITH PRECAST CONCRETE BRIDGE INSTALLATION  
• ZONE C: ROAD STRUCTURE

**13.8.5.** REQUIRED BACKFILL PROPERTIES

**13.8.5.1.** IN-SITU SOIL - NATURAL GROUND IS TO BE SUFFICIENTLY STABLE TO ALLOW EFFECTIVE SUPPORT TO THE PRECAST CONCRETE BRIDGE UNITS. AS A GUIDE, THE EXISTING NATURAL GROUND SHOULD BE OF SIMILAR QUALITY AND DENSITY TO ZONE B MATERIAL FOR MINIMUM LATERAL DIMENSION OF ONE BRIDGE SPAN OUTSIDE OF THE BRIDGE FOOTING

**13.8.5.2.** ZONE A - ZONE A REQUIRES FILL MATERIAL WITH SPECIFICATIONS AND COMPACTING PROCEDURES EQUAL TO THAT FOR NORMAL ROAD EMBANKMENTS

**13.8.5.3.** ZONE B - GENERALLY, SOILS SHALL BE REASONABLY FREE OF ORGANIC MATTER, AND, NEAR CONCRETE SURFACES, FREE OF STONES LARGER THAN 3" IN DIAMETER. SEE CHARTS FOR DETAILED DESCRIPTIONS OF ACCEPTABLE SOILS

**13.8.5.4.** ZONE C - ZONE C IS THE ROAD SECTION OF GRAVEL, ASPHALT OR CONCRETE BUILT IN COMPLIANCE WITH LOCAL ENGINEERING PRACTICES

**13.8.5.5.** GEOTECHNICAL ENGINEER SHALL REVIEW GRADATIONS OF ALL INTERFACING MATERIALS AND, IF NECESSARY, RECOMMEND GEOTEXTILE FILTER FABRIC (PROVIDED BY CONTRACTOR)

**13.8.6.** PLACING AND COMPACTING BACKFILL DUMPING FOR BACKFILLING IS NOT ALLOWED ANY NEARER THAN 3'-0" FROM THE BRIDGE LEG

THE FILL MUST BE PLACED AND COMPACTED IN LAYERS NOT EXCEEDING 8" THE MAXIMUM DIFFERENCE IN THE SURFACE LEVELS OF THE FILL ON OPPOSITE SIDES OF THE BRIDGE MUST NOT EXCEED 2'-0"

THE FILL BEHIND WINGWALLS MUST BE PLACED AT THE SAME TIME AS THAT OF THE BRIDGE FILL. IT MUST BE PLACED IN PROGRESSIVELY PLACED HORIZONTAL LAYERS NOT EXCEEDING 8" PER LAYER

THE BACKFILL OF ZONE B SHALL BE COMPACTED TO A MINIMUM DENSITY OF 95% OF THE STANDARD PROCTOR, AS REQUIRED BY AASHTO T-99

SOIL WITHIN 1'-0" OF CONCRETE SURFACES SHALL BE HAND-COMPACTED ELSEWHERE, USE OF ROLLERS IS ACCEPTABLE. IF VIBRATING ROLLER-COMPACTORS ARE USED, THEY SHALL NOT BE STARTED OR STOPPED WITHIN ZONE B AND THE VIBRATION FREQUENCY SHOULD BE AT LEAST 30 REVOLUTIONS PER SECOND

THE BACKFILL MATERIAL AND COMPACTING BEHIND WINGWALLS SHALL SATISFY THE CRITERIA FOR THE BRIDGE BACKFILL, ZONE B

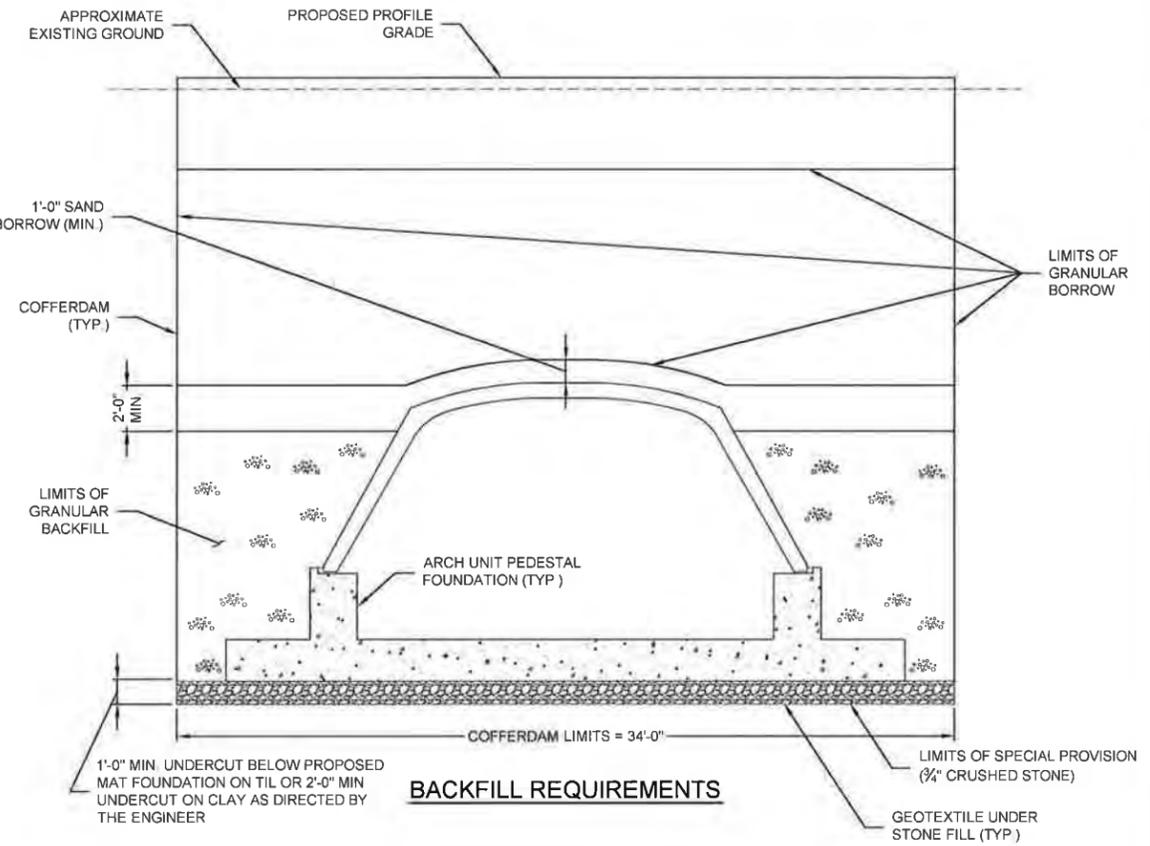
BACKFILL AGAINST A WATERPROOFED SURFACE SHALL BE PLACED CAREFULLY TO AVOID DAMAGE TO THE WATERPROOFING MATERIAL

**13.8.7.** BRIDGE UNITS FOR FILL HEIGHTS OVER 12 FEET (AS MEASURED FROM TOP CROWN OF BRIDGE TO FINISHED GRADE), NO BACKFILLING MAY BEGIN UNTIL A BACKFILL COMPACTION TESTING PLAN HAS BEEN COORDINATED WITH AND APPROVED BY CONTECH® ENGINEERED SOLUTIONS

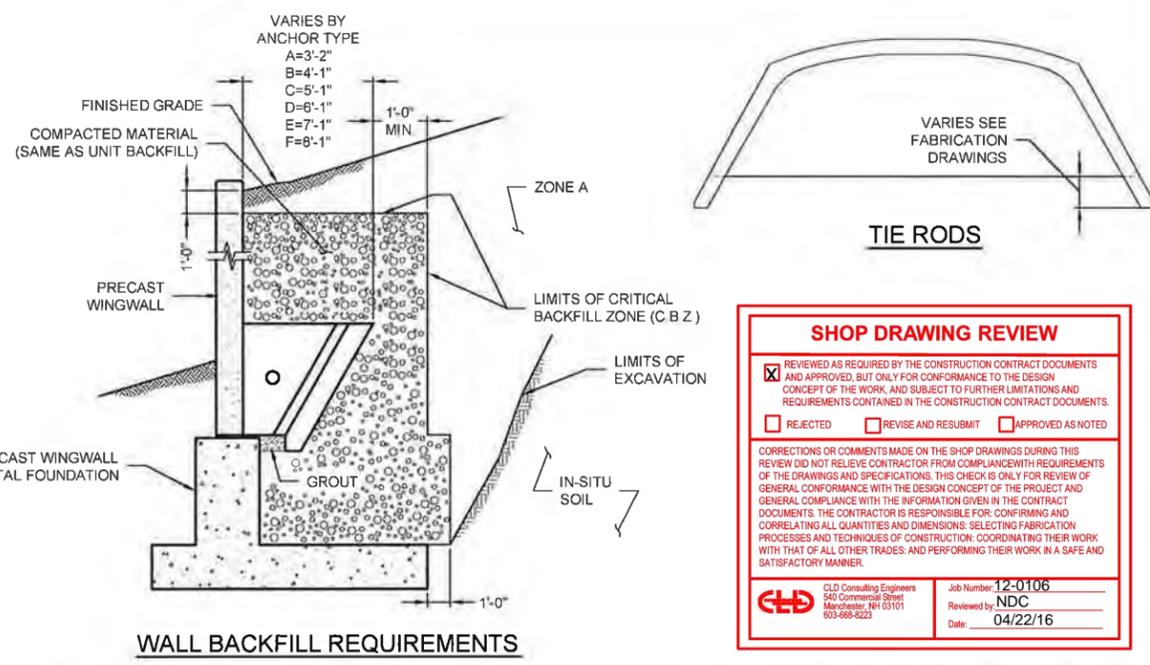
**13.8.8.** WINGWALLS BACKFILL IN FRONT OF WINGWALLS SHALL BE CARRIED TO GROUND LINES SHOWN IN THE PLANS

**13.8.9.** MONITORING THE CONTRACTOR SHALL CHECK SETTLEMENTS AND HORIZONTAL DISPLACEMENT OF FOUNDATION TO ENSURE THAT THEY ARE WITHIN THE ALLOWABLE LIMIT PROVIDED BY THE ENGINEER. THESE MEASUREMENTS SHOULD GIVE AN INDICATION OF THE SETTLEMENTS AND DEFORMATIONS ALONG THE LENGTH OF THE FOUNDATIONS

THE FIRST MEASUREMENT SHOULD TAKE PLACE AFTER THE ERECTION OF ALL PRECAST BRIDGE SYSTEM ELEMENTS, A SECOND AFTER COMPLETION OF BACKFILLING, AND A THIRD BEFORE OPENING OF THE BRIDGE TO TRAFFIC. FURTHER MEASUREMENTS MAY BE MADE ACCORDING TO LOCAL CONDITIONS



**TYPICAL ARCH EARTH WORK SECTION**  
(PER SHEET 7 OF 74 OF BID DOCUMENTS)



**WALL BACKFILL REQUIREMENTS**

SHOP DRAWING REVIEW

REVIEWED AS REQUIRED BY THE CONSTRUCTION CONTRACT DOCUMENTS AND APPROVED, BUT ONLY FOR CONFORMANCE TO THE DESIGN CONCEPT OF THE WORK, AND SUBJECT TO FURTHER LIMITATIONS AND REQUIREMENTS CONTAINED IN THE CONSTRUCTION CONTRACT DOCUMENTS.

REJECTED     REVISE AND RESUBMIT     APPROVED AS NOTED

CORRECTIONS OR COMMENTS MADE ON THE SHOP DRAWINGS DURING THIS REVIEW DID NOT RELIEVE CONTRACTOR FROM COMPLIANCE WITH REQUIREMENTS OF THE DRAWINGS AND SPECIFICATIONS. THIS CHECK IS ONLY FOR REVIEW OF GENERAL CONFORMANCE WITH THE DESIGN CONCEPT OF THE PROJECT AND GENERAL COMPLIANCE WITH THE INFORMATION GIVEN IN THE CONTRACT DOCUMENTS. THE CONTRACTOR IS RESPONSIBLE FOR CONFIRMING AND CORRELATING ALL QUANTITIES AND DIMENSIONS; SELECTING FABRICATION PROCESSES AND TECHNIQUES OF CONSTRUCTION; COORDINATING THEIR WORK WITH THAT OF ALL OTHER TRADES; AND PERFORMING THEIR WORK IN A SAFE AND SATISFACTORY MANNER.

CLD Consulting Engineers  
 640 Commercial Street  
 Manchester, NH 03101  
 603-668-0223

Job Number: 12-0106  
 NDC  
 Reviewed by: \_\_\_\_\_  
 Date: 04/22/16

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MARK	DATE	REVISION DESCRIPTION	BY
2	4/14/2016	REVIEW COMMENTS	JDR
1	3/16/2016	NO CHANGES THIS SHEET	KDK

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**CONSPAN**  
O-SERIES

FABRICATION  
DRAWING

**US ROUTE 2**  
**BRIDGE NO. 126**  
**TOWN OF LUNENBURG**  
**ESSEX COUNTY, VERMONT**

PROJECT No:	SEQ No:	DATE:
468920	010	12/8/2015
DESIGNED:	DRAWN:	
KDK	TRL	
CHECKED:	APPROVED:	
JDR	PAC	
SHEET NO.:	S22 OF S22	