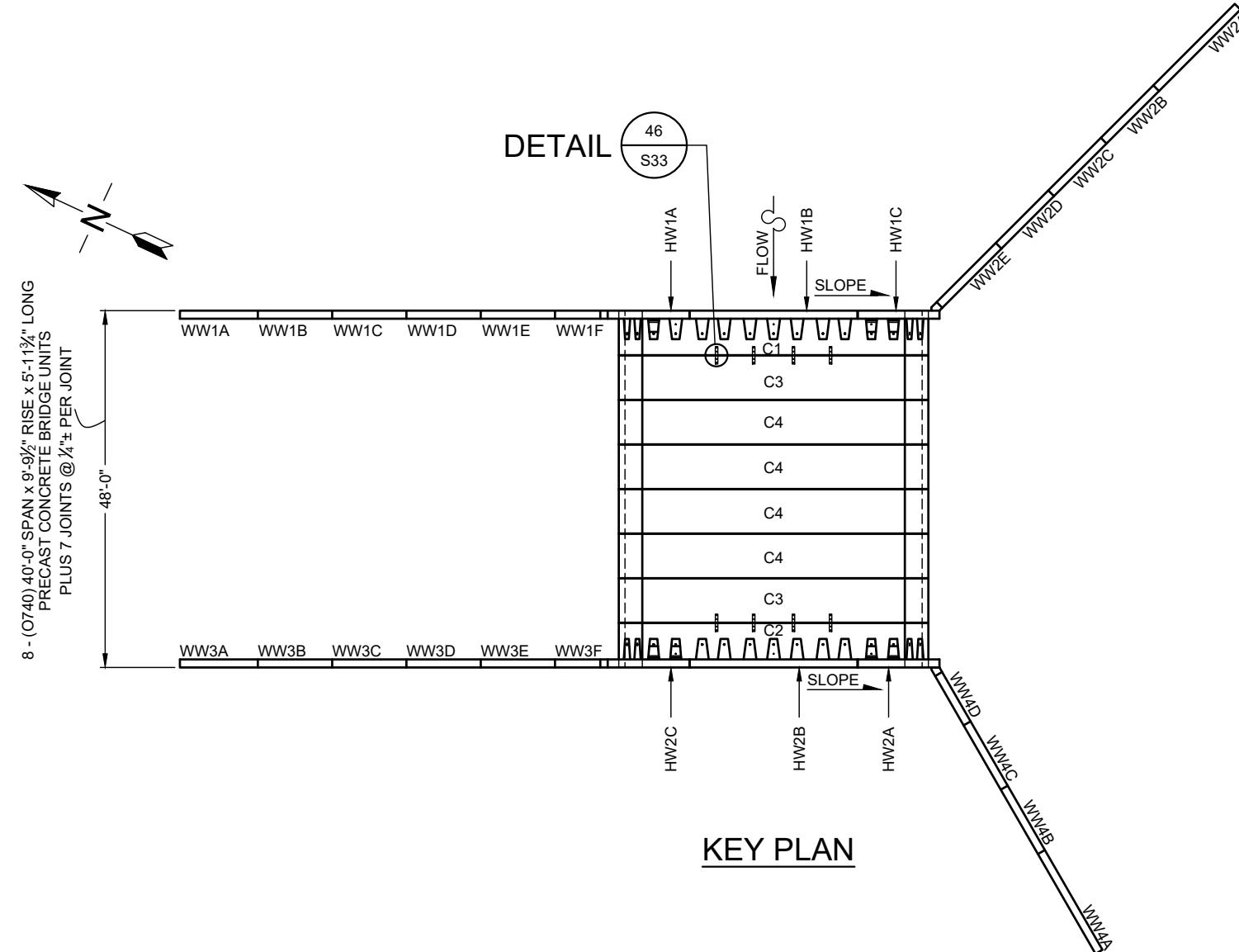


# CAMPUS EXPANSION

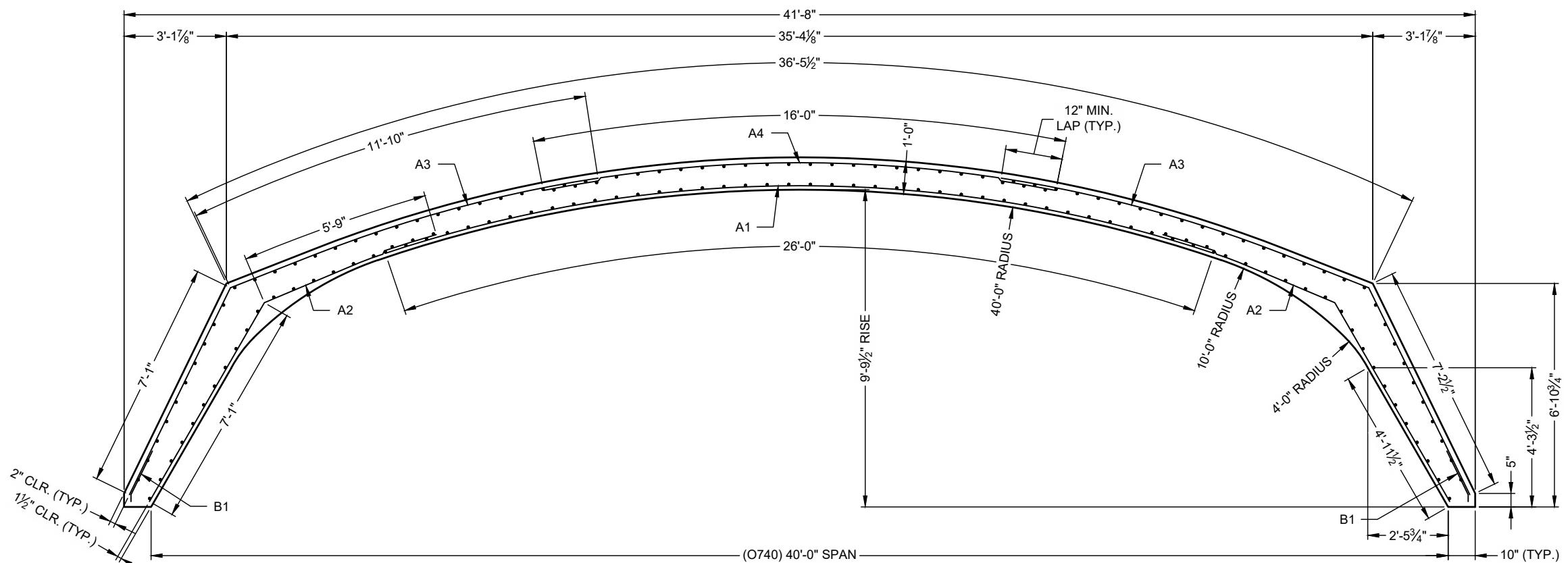
## RAYBURN ELECTRIC CORP.

### ROCKWALL, TEXAS



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-700 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  $\frac{3}{8}$ " 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 CIRCUMFERNENTIAL REINFORCEMENT SHALL BE 2" MIN. TO 4" MAX. SPACING OF A1 & A3 CIRCUMFERNENTIAL REINFORCEMENT SHALL BE 2".



## PRECAST UNIT REINFORCEMENT

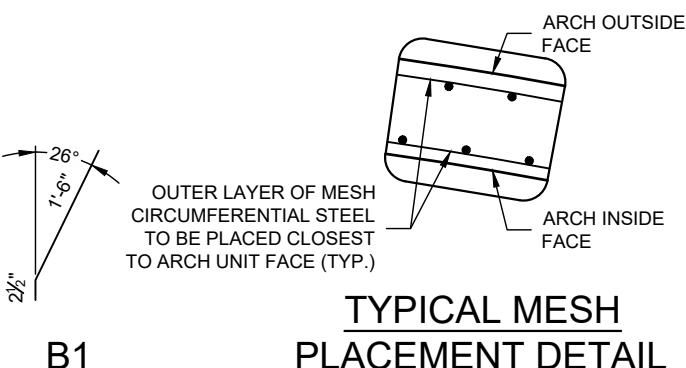
WEIGHT OF REQUIRED REINFORCEMENT = 285.8 LBS/FT

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 SUP'L'D (IN <sup>2</sup> /FT)	LONGITUDINAL AREA SUP'L'D (IN <sup>2</sup> /FT)
1	A1 = 0.90	0.13		26'-0"		
2	A2 = 0.36	0.13		12'-10"		
3	A3 = 0.84	0.13		18'-11"		
4	A4 = 0.36	0.13		16'-0"		
5						
5						

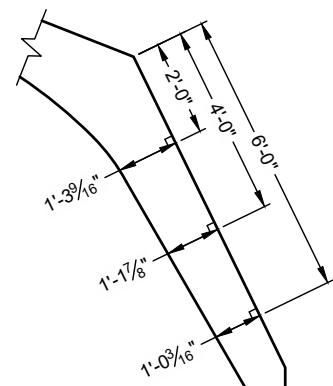
DESIGN LOADING: HL-93 TRUCK, HL-93 TANDEM & MOBILE SUBSTATION

COVER = 2'-0" MIN. \ 3'-6" MAX.

MARK	SIZE	NO	LENGTH	TYPE	Fy = 60 KSI
B1	#4	24	1'-8 1/2"	BENT	SPACED @ 6" O.C.



TYPICAL MESH PLACEMENT DETAIL



INCREMENTAL ARCH LEG THICKNESSES

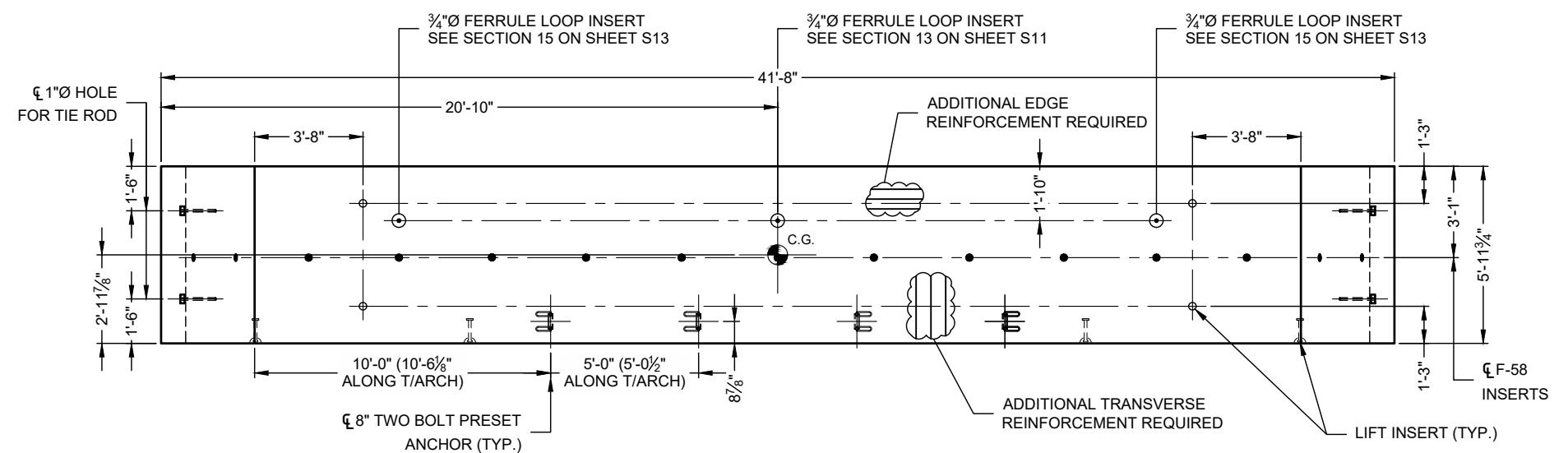
PROJECT NO.:	SEQ. NO.:	DATE:
736881	130	7/26/2024
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JAL	PJW	
CHECKED:	APPROVED:	
DM	PAC	
SHEET NO.:		
S2	OF	S35

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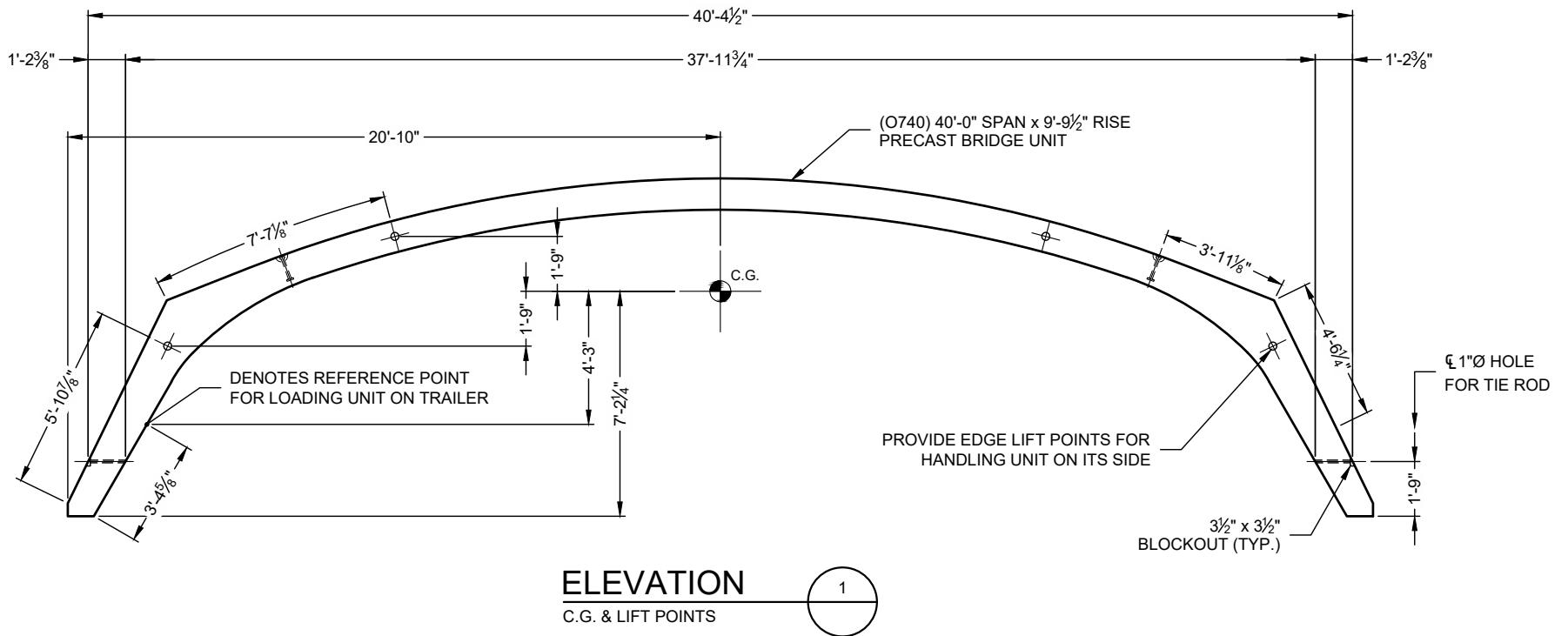
**CON-SPAN**  
**C-SERIES**  
FABRICATION  
DRAWING

CAMPUS EXPANSION  
RAYBURN ELECTRIC CORP.  
ROCKWALL, TEXAS



PLAN - C1 &amp; C2

TOTAL WEIGHT = 24.4 TONS



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

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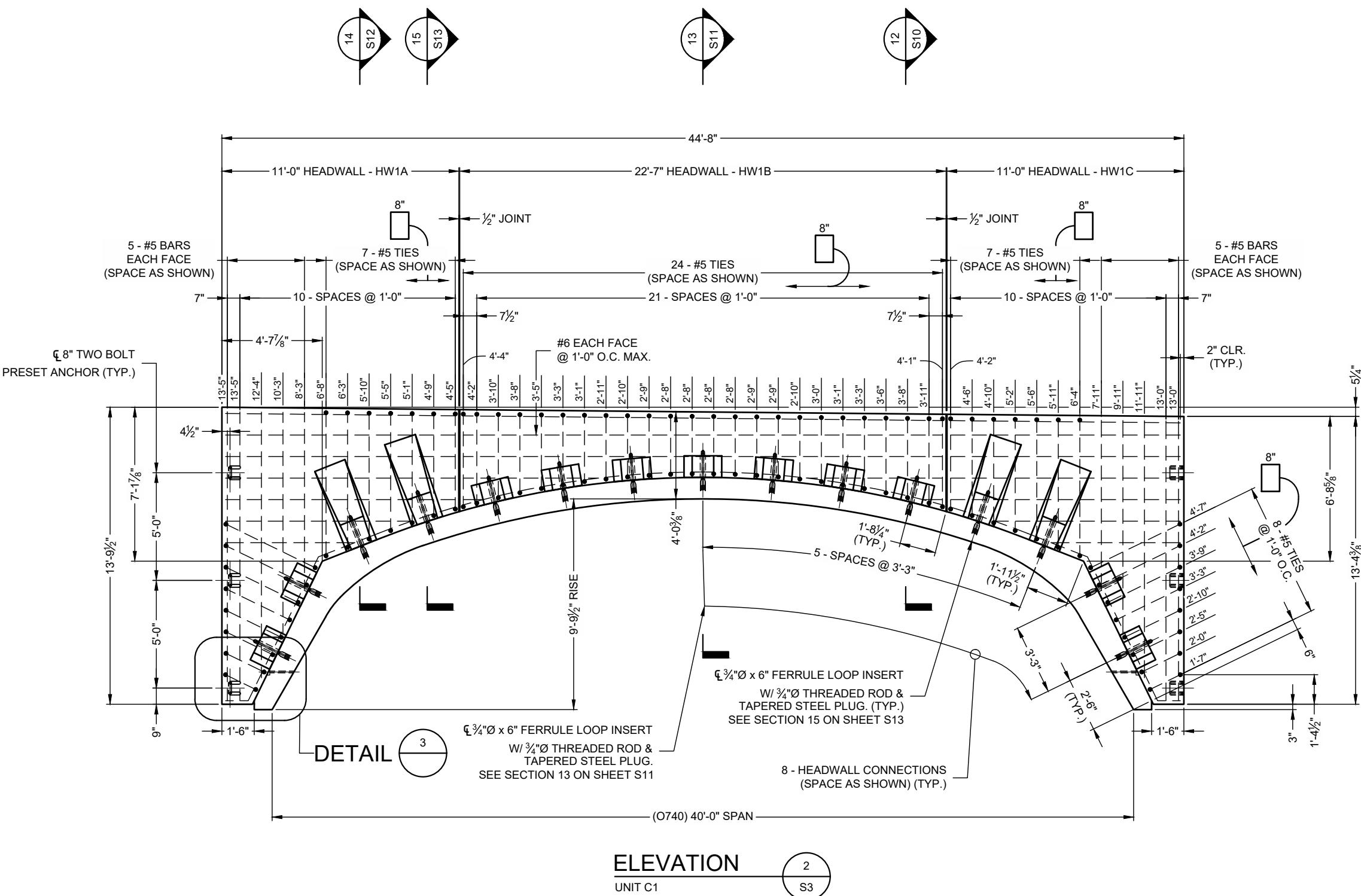
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CAMPUS EXPANSION  
RAYBURN ELECTRIC CORP.  
ROCKWALL, TEXAS

FIRM NAME - CONTECH ENGINEERED SOLUTIONS LLC  
REGISTRATION # F-14755

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736881	130	7/26/2024
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S3		OF S35



**DETAIL**

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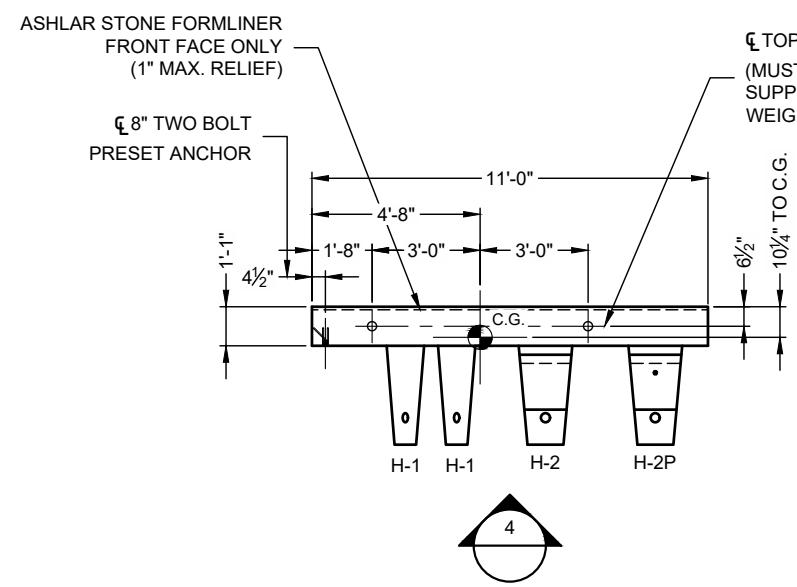
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**S-SERIES**  
FABRICATION  
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CAMPUS EXPANSION  
RAYBURN ELECTRIC CORP.  
ROCKWALL, TEXAS

PROJECT NO.: 736881 SEQ. NO.: 130 DATE: 7/26/2024  
DESIGNED: JAL DRAWN: PJW  
CHECKED: DM APPROVED: PAC  
SHEET NO.: S4 OF S35



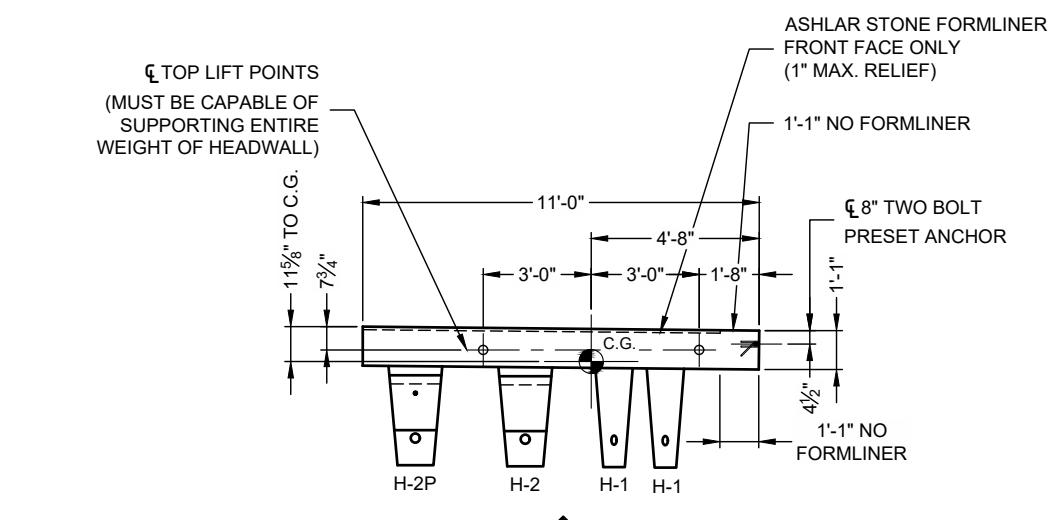
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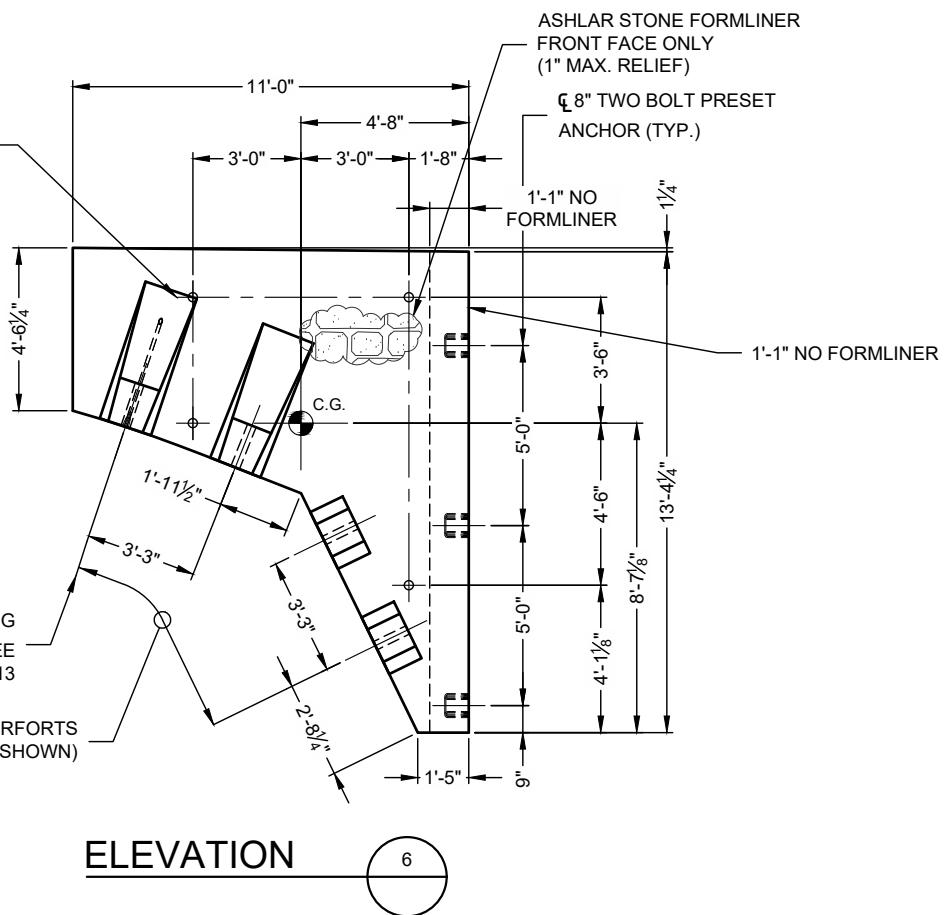
**CON-SPAN**  
**C-SERIES**  
FABRICATION  
DRAWING



**PLAN - HW1C**  
TOTAL WEIGHT = 8.8 TONS

**NOTES:**

- ALL EDGES OF PRECAST TO HAVE A  $\frac{3}{4}$ " CHAMFER
- 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
- SEE SHEET S10 FOR H-1 COUNTERFORT DETAILS
- SEE SHEET S12 FOR H-2 COUNTERFORT DETAILS
- SEE SHEET S13 FOR H-2P COUNTERFORT DETAILS

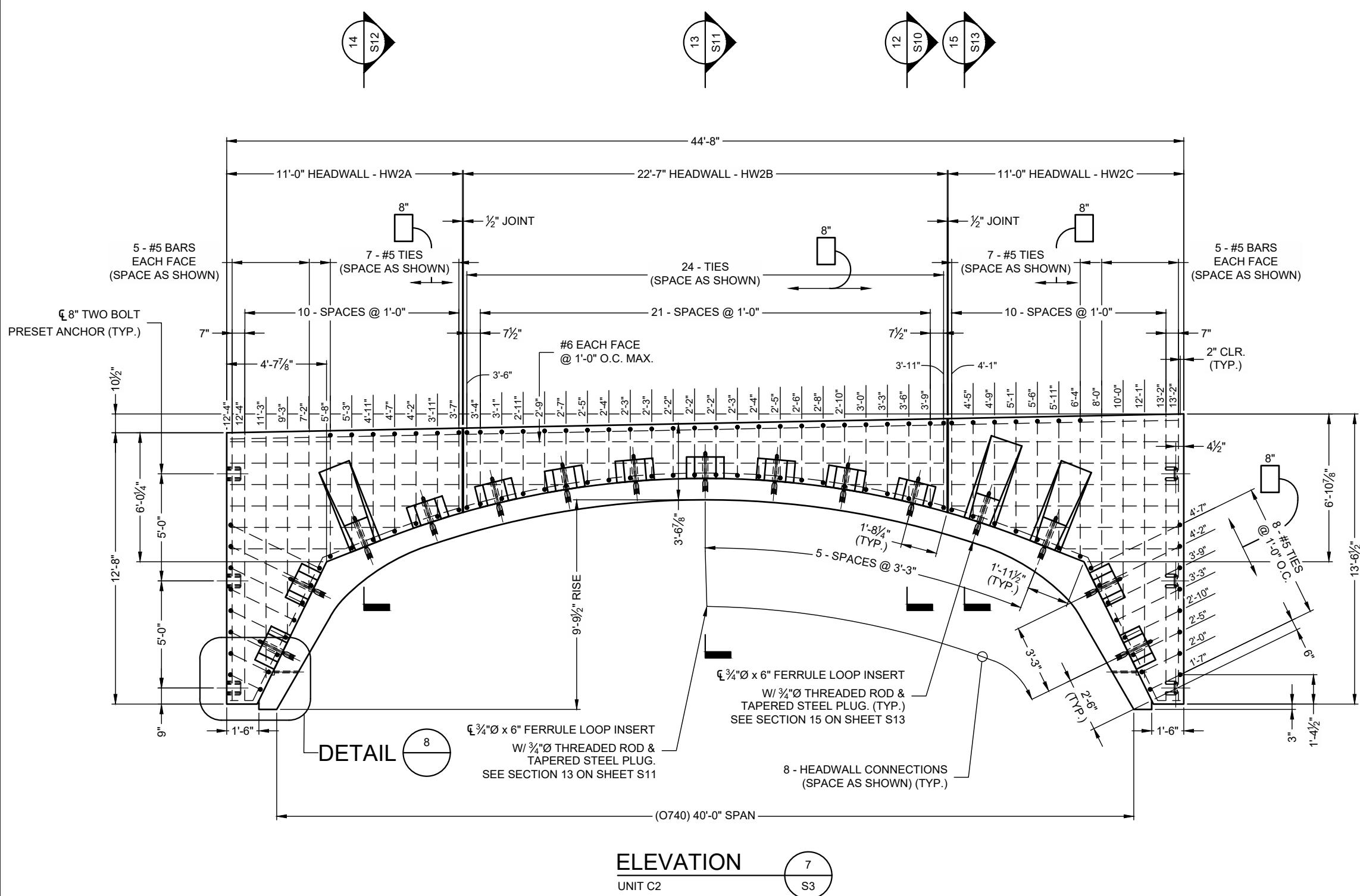


**ELEVATION**

FIRM NAME - CONTECH ENGINEERED SOLUTIONS LLC  
REGISTRATION # F-14755

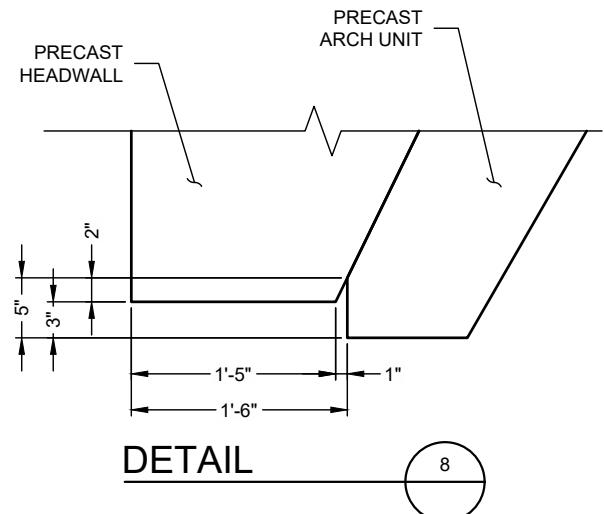
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RAYBURN ELECTRIC CORP.  
ROCKWALL, TEXAS

PROJECT NO.:	SEQ. NO.:	DATE:
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DM	PAC	
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HEADWALL		ARCH UNIT		
CONCRETE	REINF. STEEL	CONCRETE	REINF. STEEL	WWF
28-DAY: 4000 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.



## ELEVATION

UNIT C2

S3

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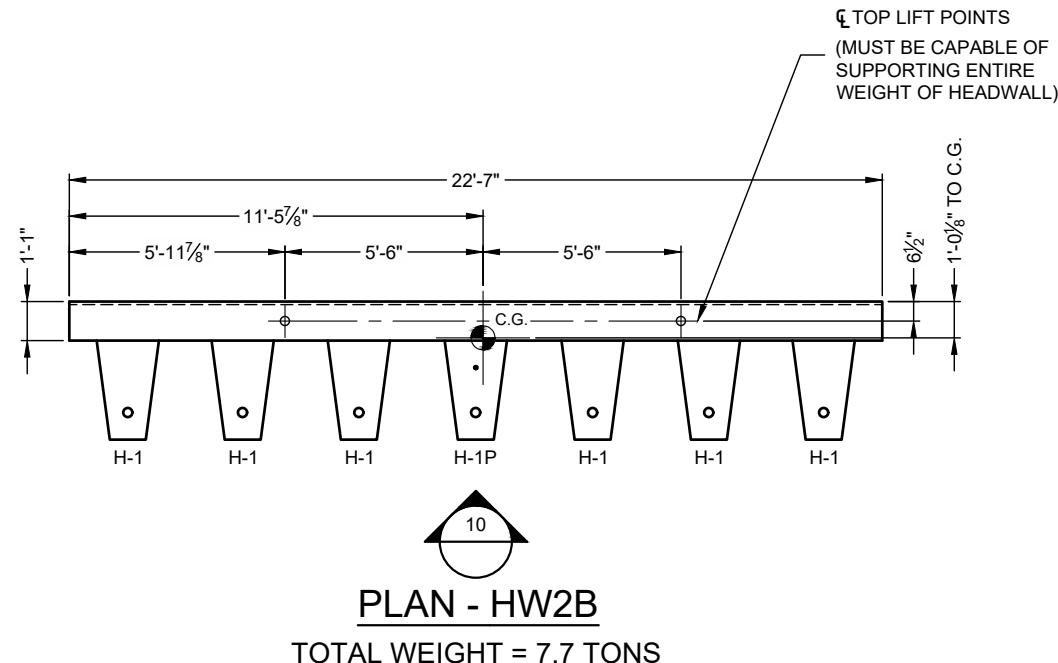
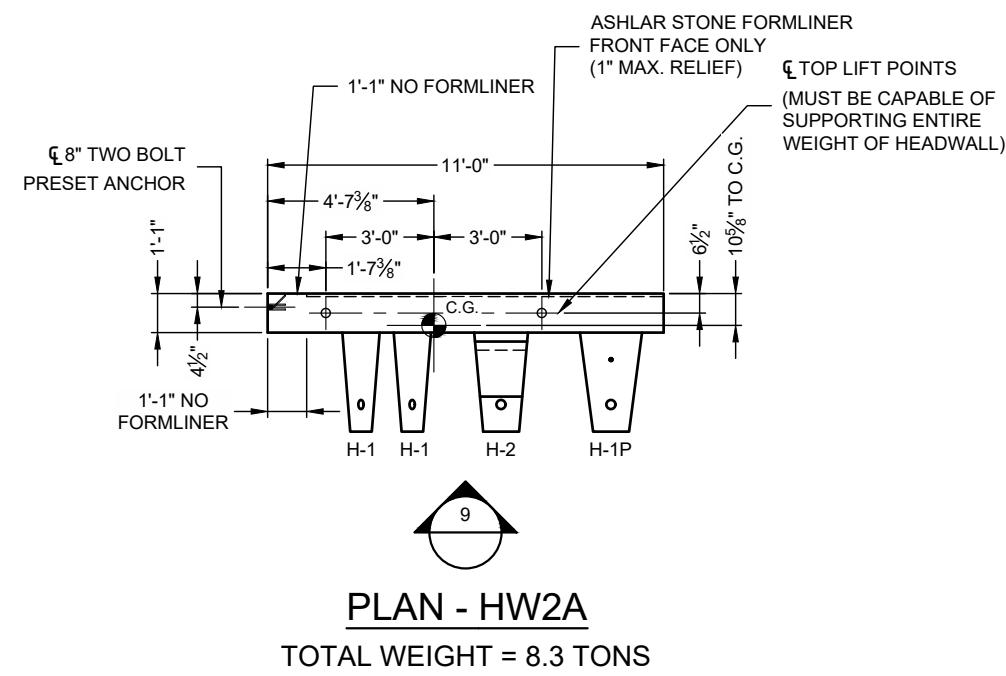
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**S-SERIES**  
FABRICATION  
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CAMPUS EXPANSION  
RAYBURN ELECTRIC CORP.

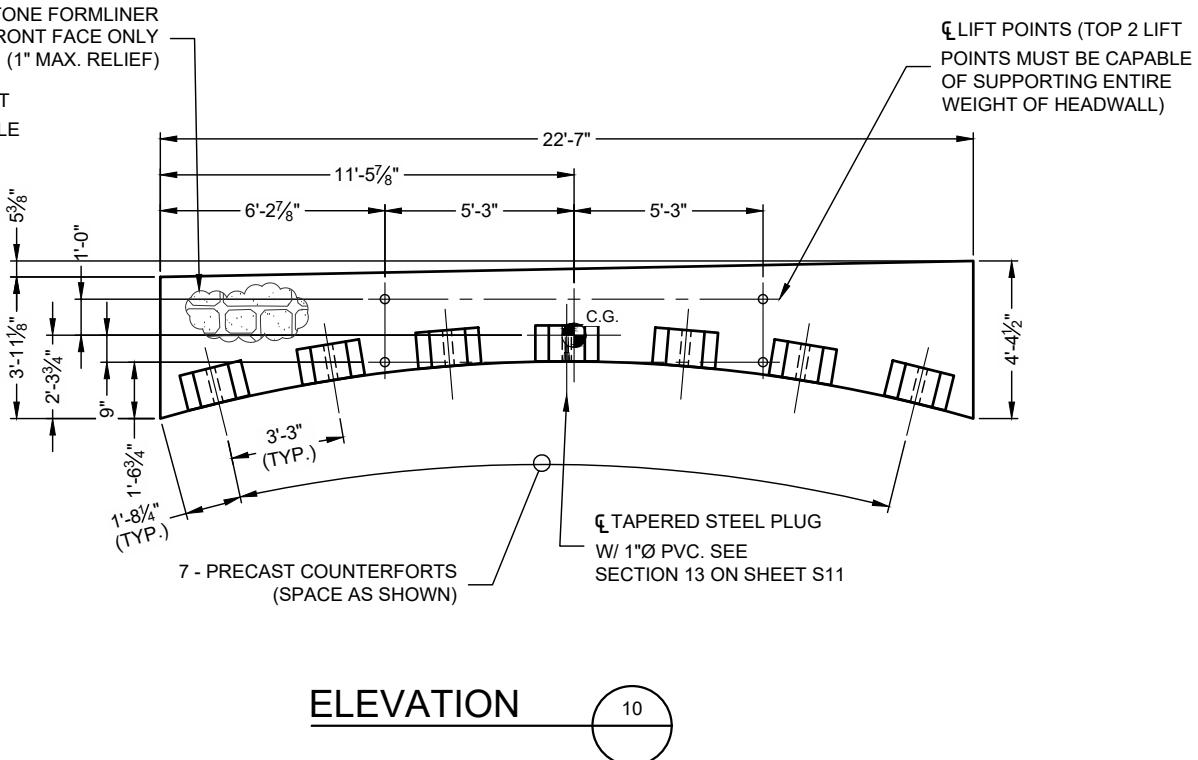
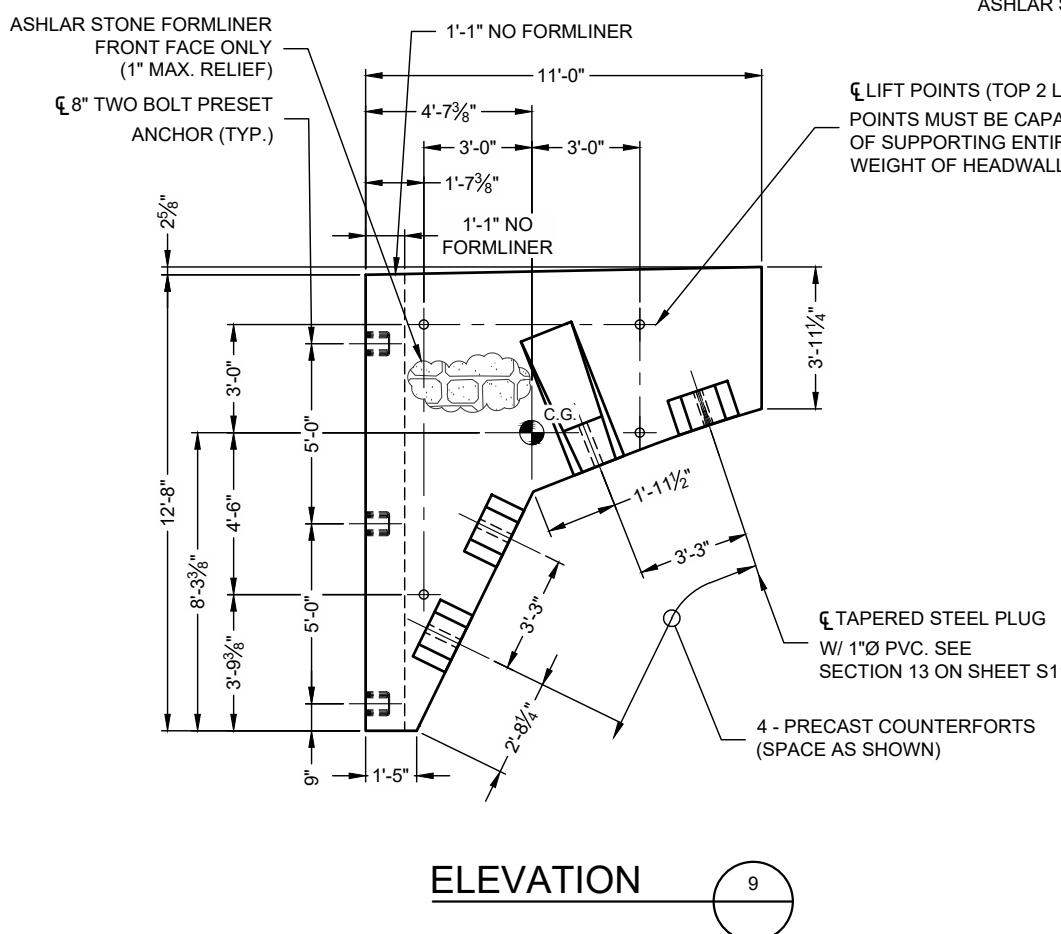
ROCKWALL, TEXAS

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SHEET NO.:		
S7		OF S35



NOTES:

- ALL EDGES OF PRECAST TO HAVE A  $\frac{3}{4}$ " CHAMFER
- 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
- SEE SHEET S10 FOR H-1 COUNTERFORT DETAILS
- SEE SHEET S11 FOR H-1P COUNTERFORT DETAILS
- SEE SHEET S12 FOR H-2 COUNTERFORT DETAILS
- SEE SHEET S13 FOR H-2P COUNTERFORT DETAILS



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**CON-SPAN**  
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CAMPUS EXPANSION  
RAYBURN ELECTRIC CORP.  
ROCKWALL, TEXAS

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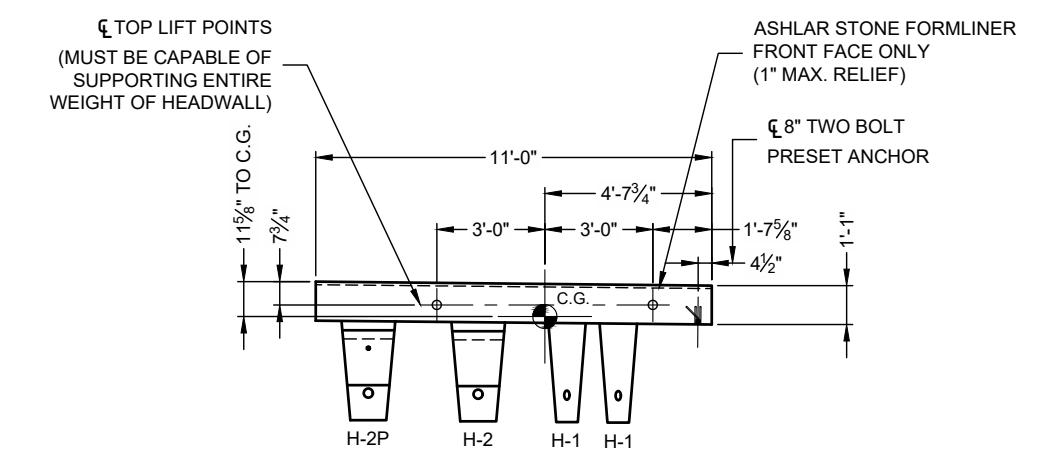
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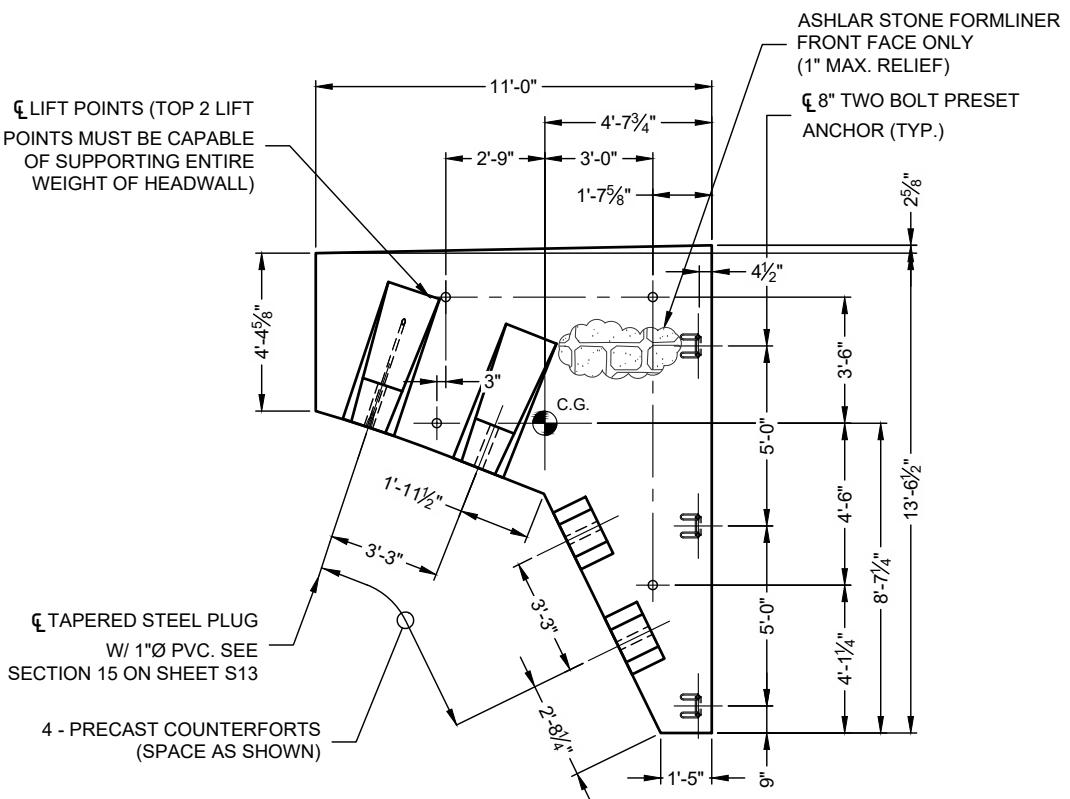


FABRICATION  
DRAWING



## PLAN - HW2C

TOTAL WEIGHT = 8.9 TONS



## ELEVATION

**NOTES:**

- ALL EDGES OF PRECAST TO HAVE A  $\frac{3}{4}$ " CHAMFER
- 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
- SEE SHEET S10 FOR H-1 COUNTERFORT DETAILS
- SEE SHEET S12 FOR H-2 COUNTERFORT DETAILS
- SEE SHEET S13 FOR H-2P COUNTERFORT DETAILS

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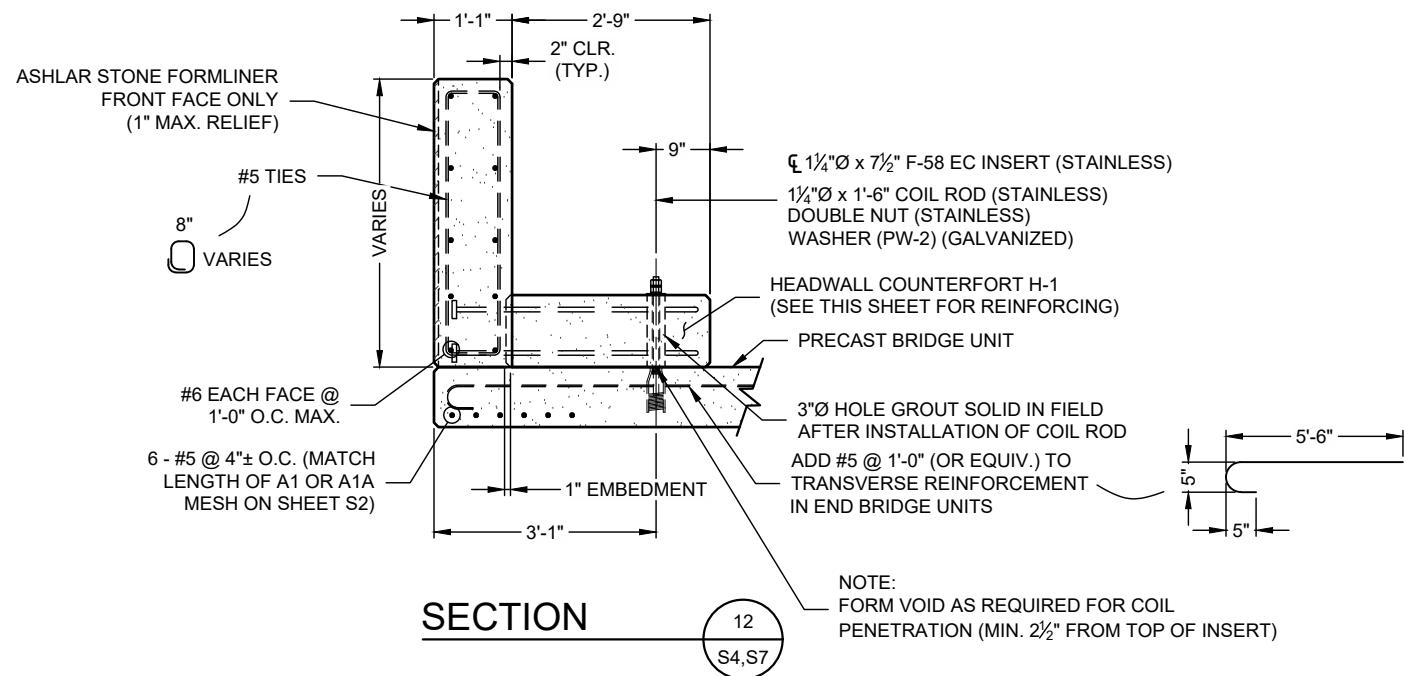
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ROCKWALL, TEXAS

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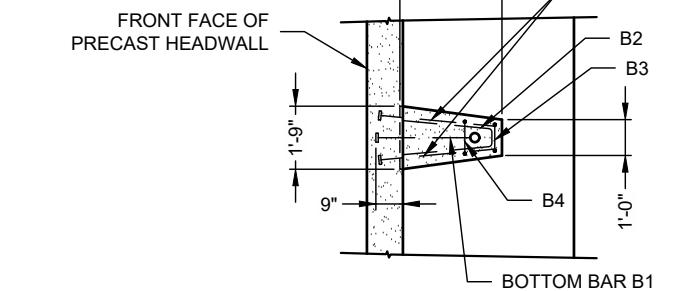
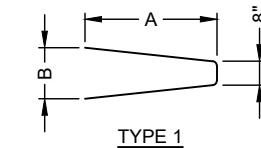
## COUNTERFORT H-1

EC INSERT = F-58  
TOTAL REQUIRED = 20

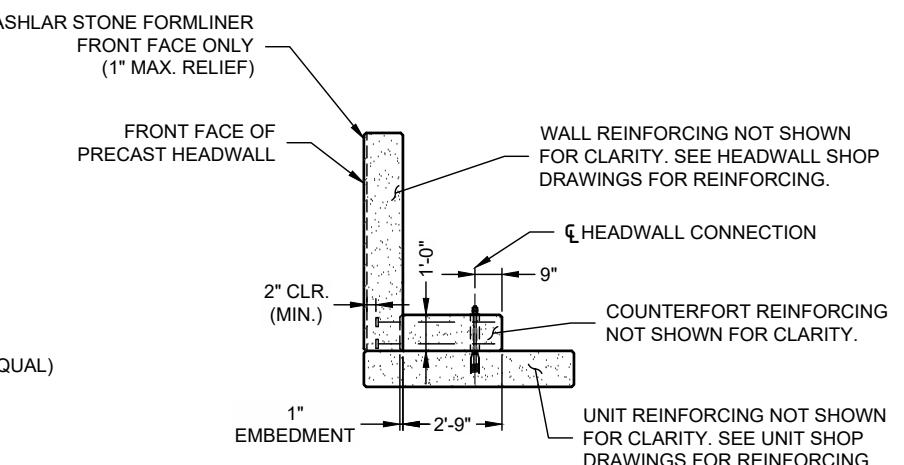
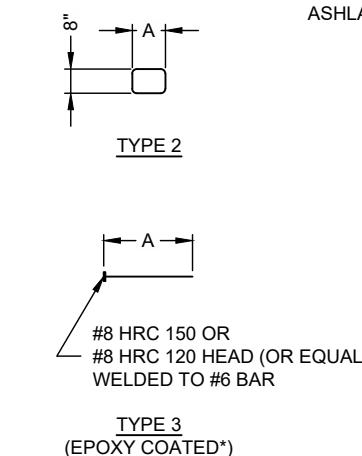


## SECTION

12  
S4,S7



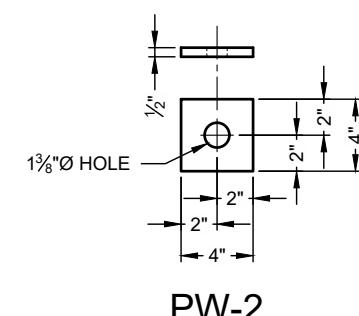
## PLAN - TYPE H-1



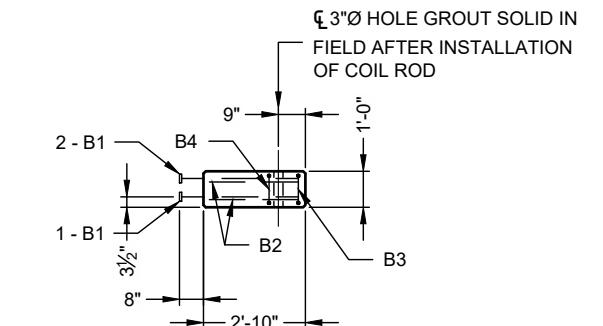
## SECTION - TYPE H-1

BAR LIST - TYPE H-1							
MARK	QTY.	SIZE	A	B	TYPE	LENGTH	FINISH
B1	3	#6	3'-0"	-	3	3'-0"	EPOXY*
B2	2	#5	2'-6"	1'-5"	1	5'-8"	BLACK
B3	1	#3	8"	-	2	2'-8"	BLACK
B4	1	#3	11"	-	2	3'-2"	BLACK

STANDARD CLEARANCE = 2"



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

PRECAST COUNTERFORT  
TYPE H-1

TOTAL WEIGHT = .284 TONS

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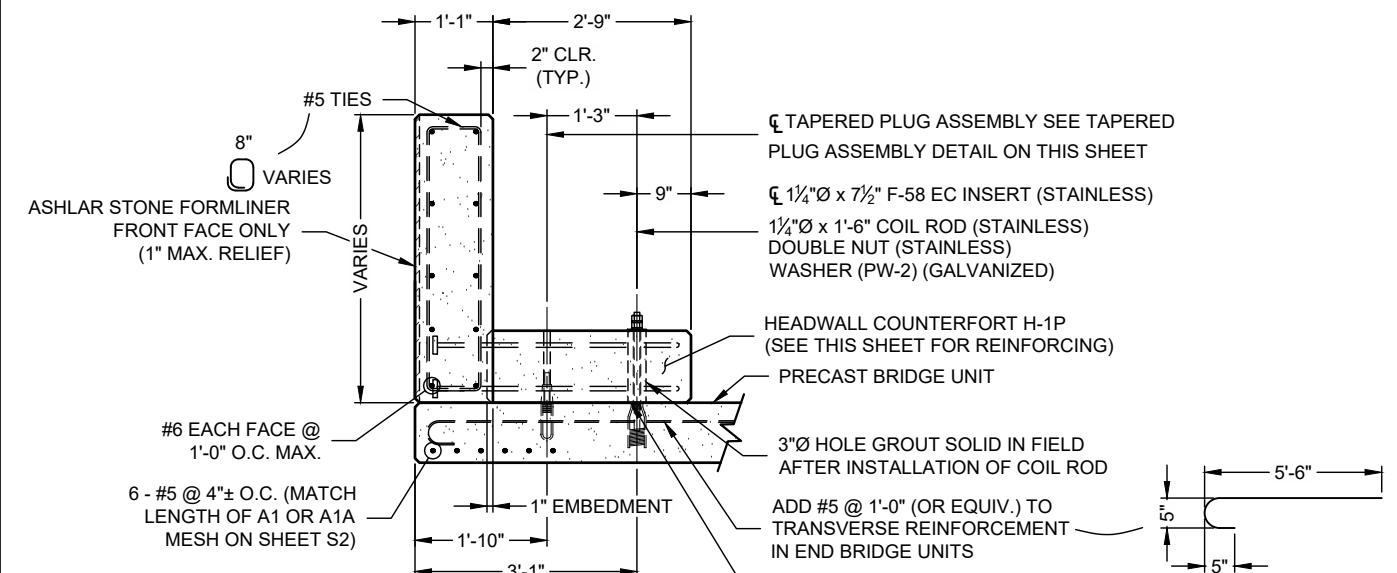
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CAMPUS EXPANSION  
RAYBURN ELECTRIC CORP.  
ROCKWALL, TEXAS

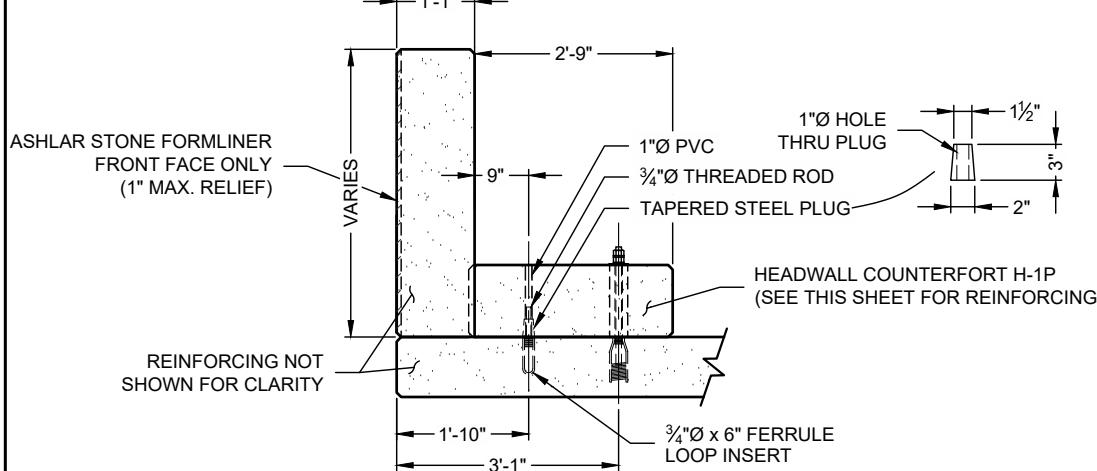
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## COUNTERFORT H-1P

EC INSERT = F-58  
TOTAL REQUIRED = 3



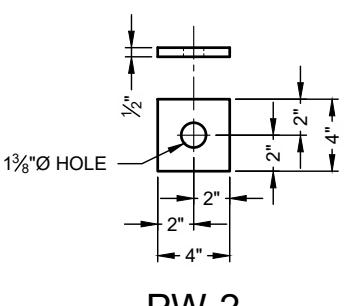
## SECTION



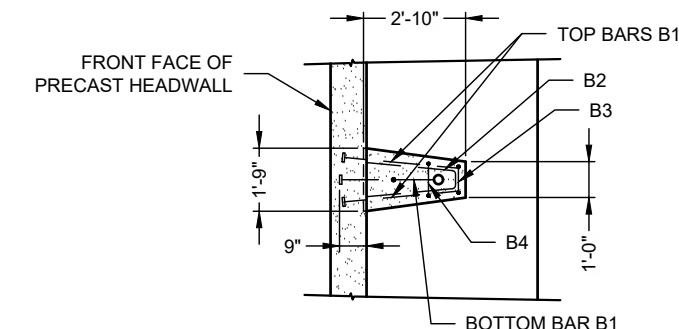
## TAPERED PLUG ASSEMBLY DETAIL

BAR LIST - TYPE H-1P							
MARK	QTY.	SIZE	A	B	TYPE	LENGTH	FINISH
B1	3	#6	3'-0"	-	3	3'-0"	EPOXY*
B2	2	#5	2'-6"	1'-5"	1	5'-8"	BLACK
B3	1	#3	8"	-	2	2'-8"	BLACK
B4	1	#3	11"	-	2	3'-2"	BLACK

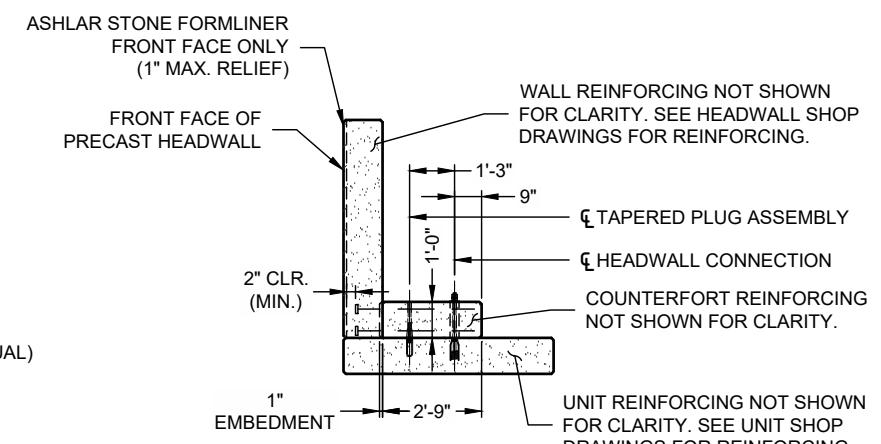
STANDARD CLEARANCE = 2"



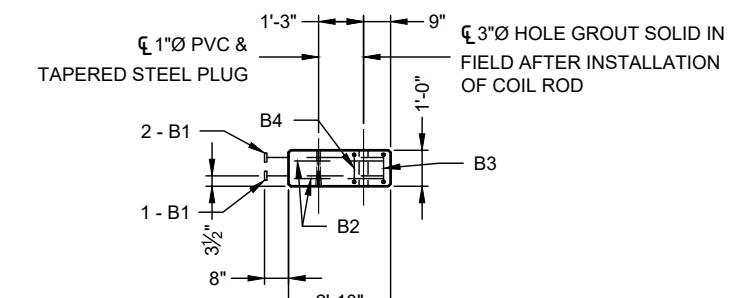
(WASHER, 1/2" x 4" x 4")  
(GALVANIZED AS PER ASTM A123)



## PLAN - TYPE H-1P



## SECTION - TYPE H-1P

PRECAST COUNTERFORT  
TYPE H-1P

TOTAL WEIGHT = .284 TONS

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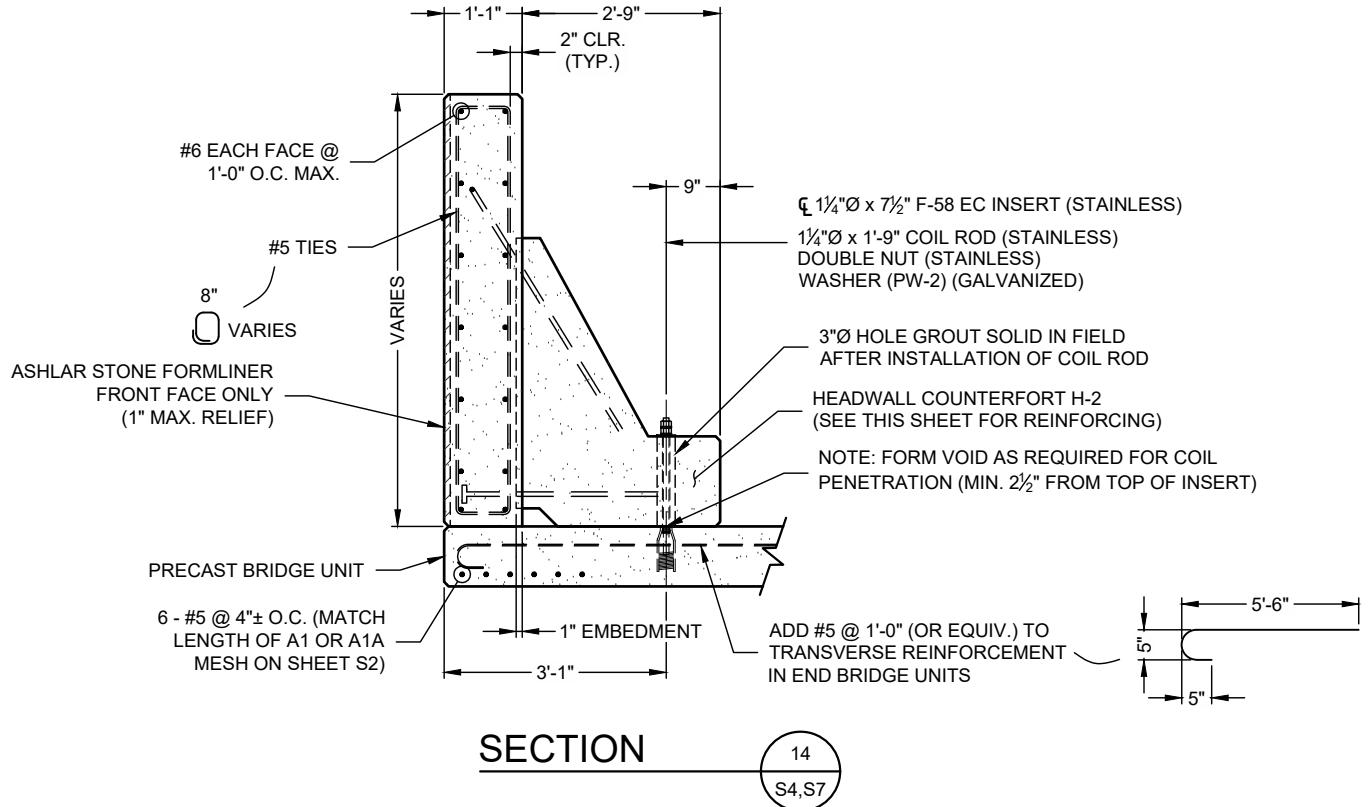
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**CONSPAN**  
**S-SERIES**  
FABRICATION  
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CAMPUS EXPANSION  
RAYBURN ELECTRIC CORP.

ROCKWALL, TEXAS

PROJECT NO.:	SEQ. NO.:	DATE:
736881	130	7/26/2024
DESIGNED:	DRAWN:	
JAL	PJW	
CHECKED:	APPROVED:	
DM	PAC	
SHEET NO.:		
S11		OF S35



BAR LIST - TYPE H-2							
RK	QTY.	SIZE	A	B	TYPE	LENGTH	FINISH
1	1	#6	3'-0"	-	3	3'-0"	EPOXY*
2	1	#5	4'-3"	1'-2"	1	9'-6"	BLACK
3	2	#3	2'-6"	1'-2"	1	5'-8"	BLACK
4	2	#6	3'-11"	-	4	4'-11"	EPOXY
5	1	#3	8"	-	2	3'-2"	BLACK
6	1	#3	10"	-	2	3'-6"	BLACK

STANDARD CLEARANCE = 2

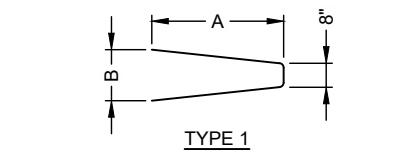


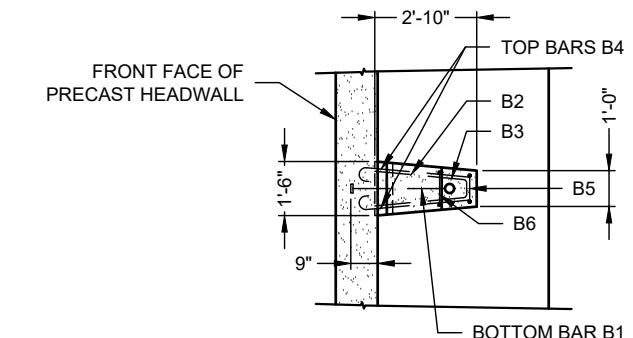
Diagram of a Type 2 fixture with a height of 11 inches. The fixture is shown with a horizontal base and a vertical support arm extending upwards. A horizontal line at the top is labeled 'A' with an arrow pointing to it. A vertical dimension line on the left indicates a height of 11 inches from the base to the top line. The fixture is labeled 'TYPE 2' at the bottom.

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

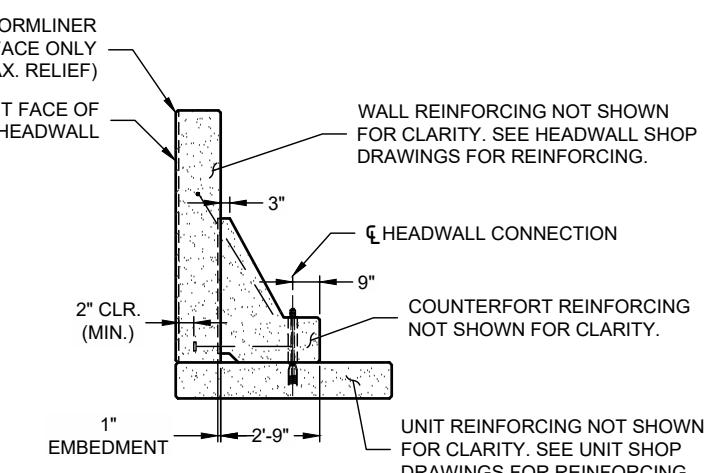
TYPE 3  
 (EPOXY COATED\*)

\*NOTE: EPOXY COATING IS NOT REQUIRED ON HEADED ENDS OF TYPE 3 BARS, BUT WILL NOT BE DETRIMENTAL IF PROVIDED.

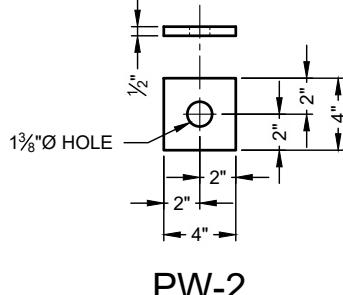
\*NOTE: HRC HEADS PROVIDED BY  
HEADED REINFORCEMENT CORP.



## PLAN - TYPE H-2



## SECTION - TYPE H-2



(**L** WASHER,  $\frac{1}{2}$ " x 4" x 4")  
(GALVANIZED AS PER ASTM A123)

## PRECAST COUNTERFORT TYPE H-2

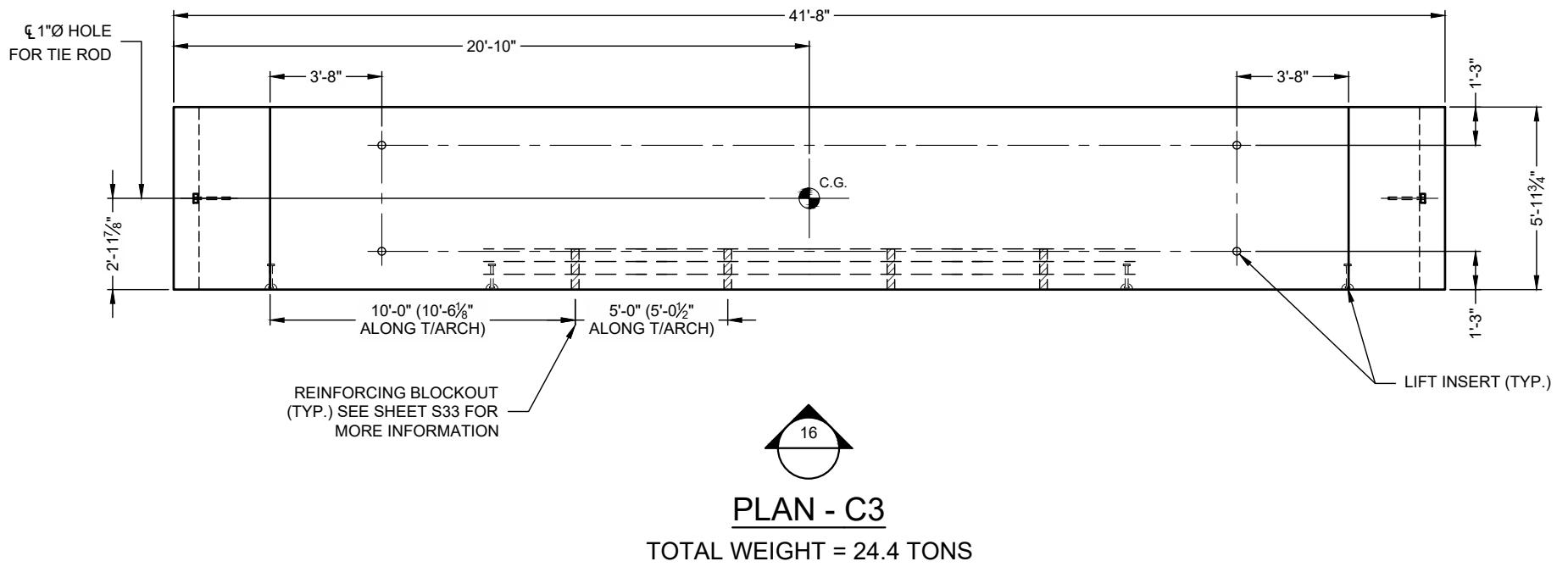
TOTAL WEIGHT = .597 TONS

FIRM NAME - CONTECH ENGINEERED SOLUTIONS LLC  
REGISTRATION # F-14755

## CAMPUS EXPANSION RAYBURN ELECTRIC CORP.

## ROCKWALL, TEXAS



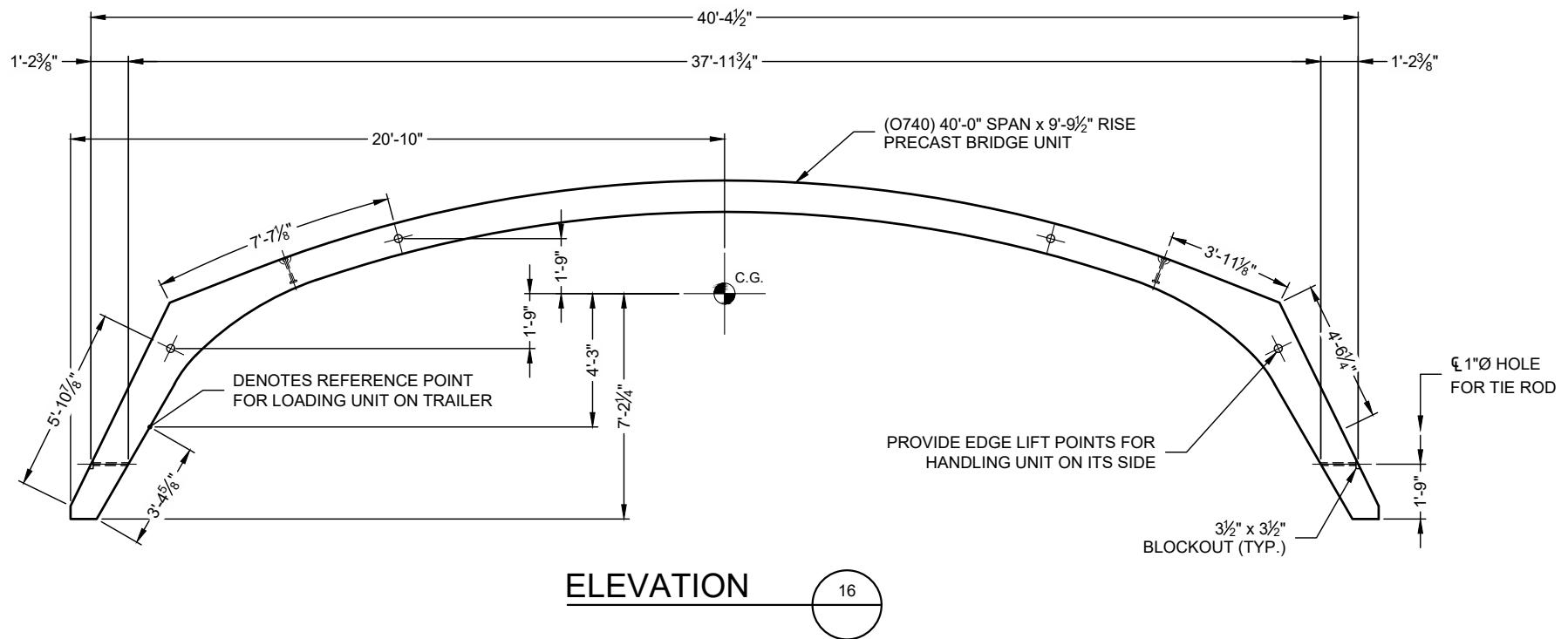


NOTES:

- ALL EDGES OF PRECAST TO HAVE A  $\frac{3}{4}$ " 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 UNCOATED	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.



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MARK	DATE	REVISION DESCRIPTION	BY

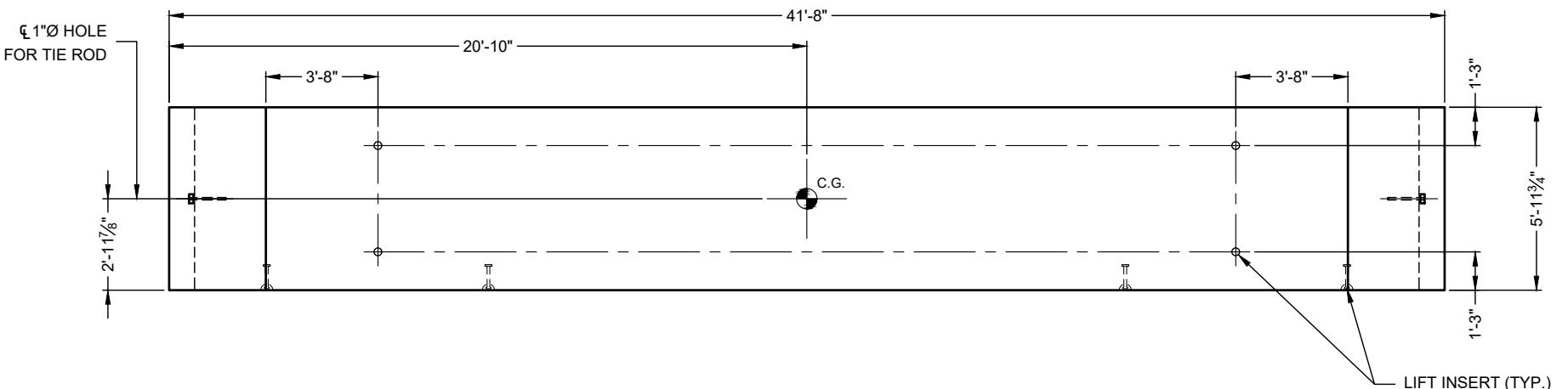
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**CON-SPAN**  
**C-SERIES**  
FABRICATION  
DRAWING

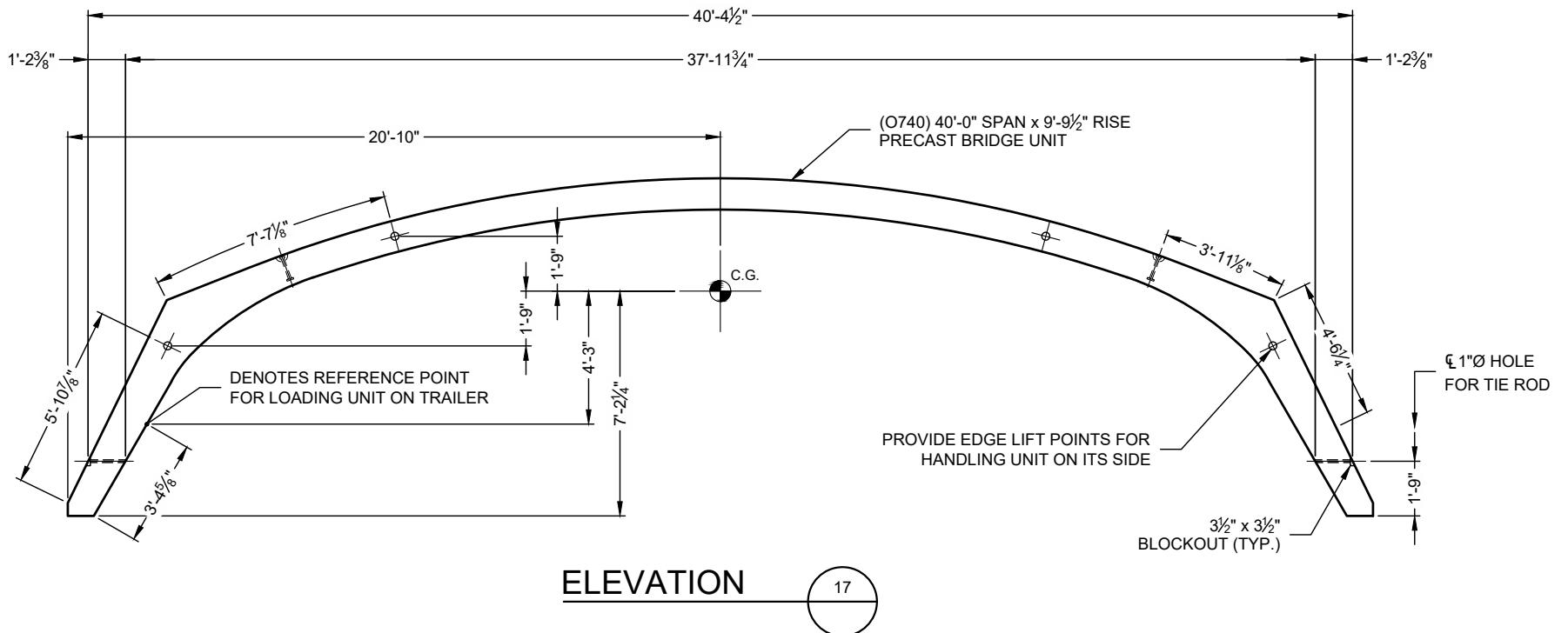
CAMPUS EXPANSION  
RAYBURN ELECTRIC CORP.  
ROCKWALL, TEXAS

PROJECT NO.:	SEQ. NO.:	DATE:
736881	130	7/26/2024
DESIGNED:	DRAWN:	
JAL	PJW	
CHECKED:	APPROVED:	
DM	PAC	
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S14	OF	S35



## PLAN - C4

**TOTAL WEIGHT = 24.4 TONS**



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REGISTRATION # F-14755

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DM	PAC	
SHEET NO.:		
S15 OF S35		

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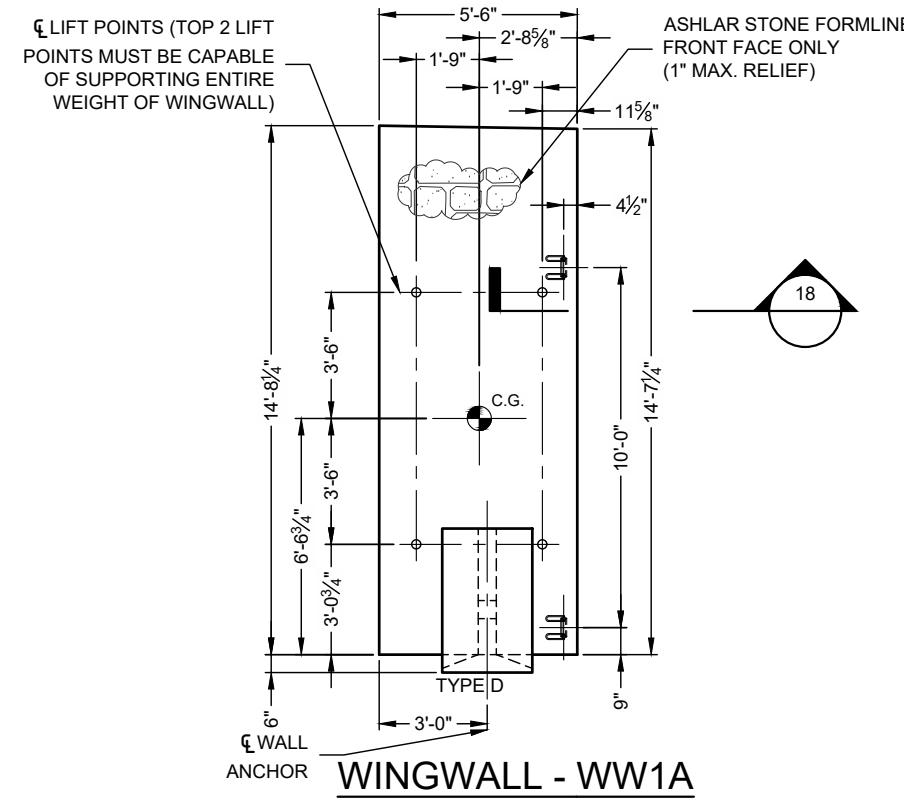
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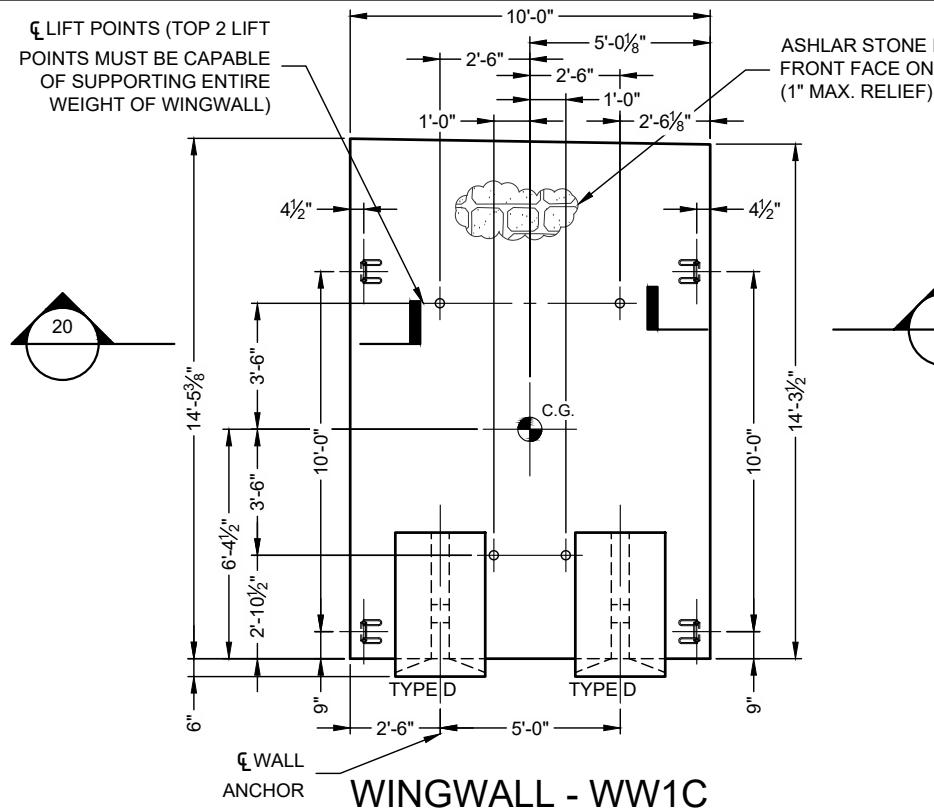
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CAMPUS EXPANSION  
RAYBURN ELECTRIC CORP.

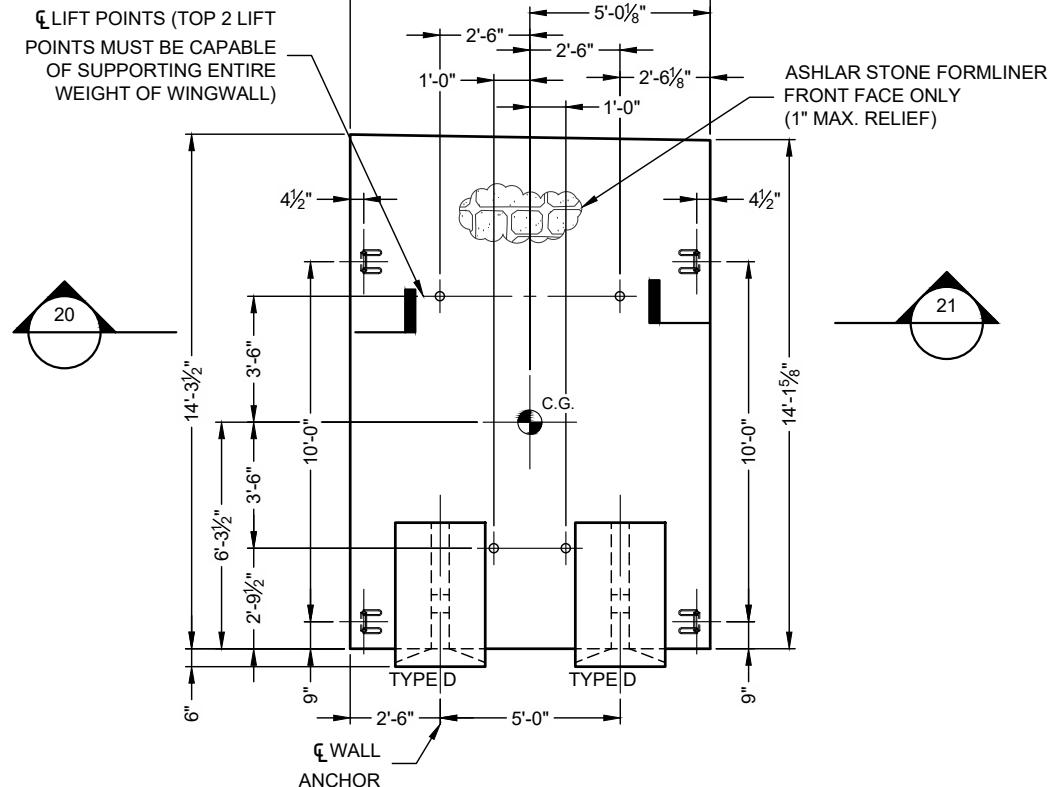
## ROCKWALL, TEXAS





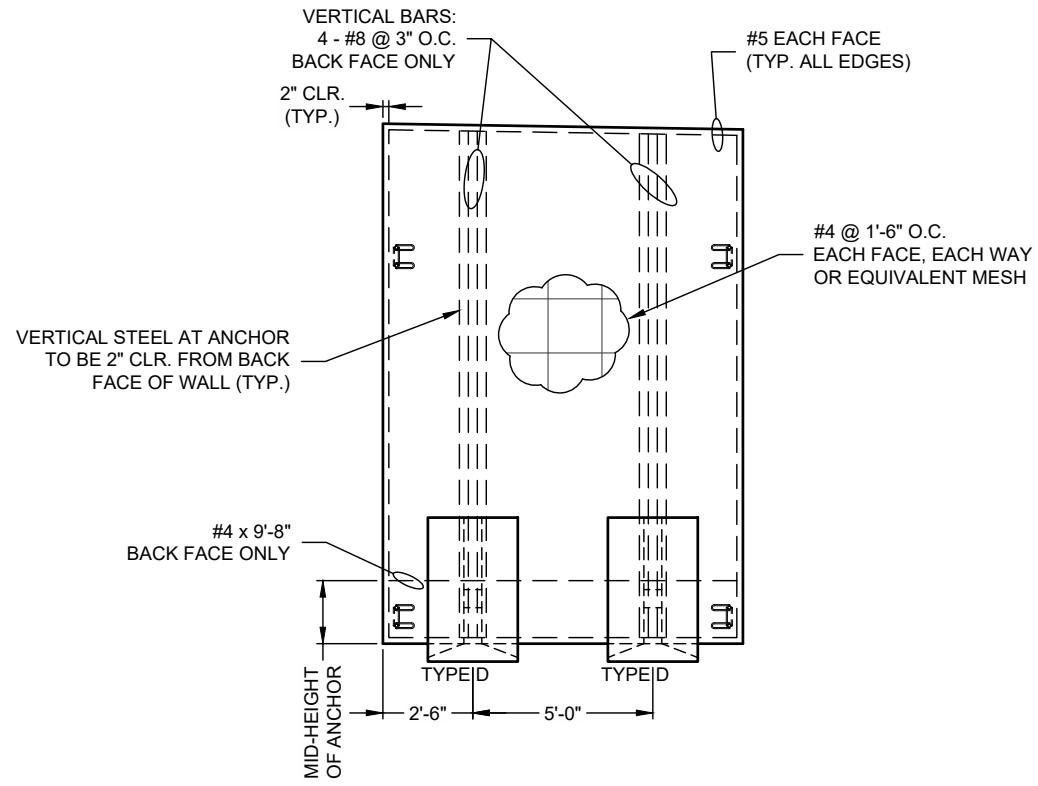
WINGWALL - WW1C

TOTAL WEIGHT = 13.7 TONS



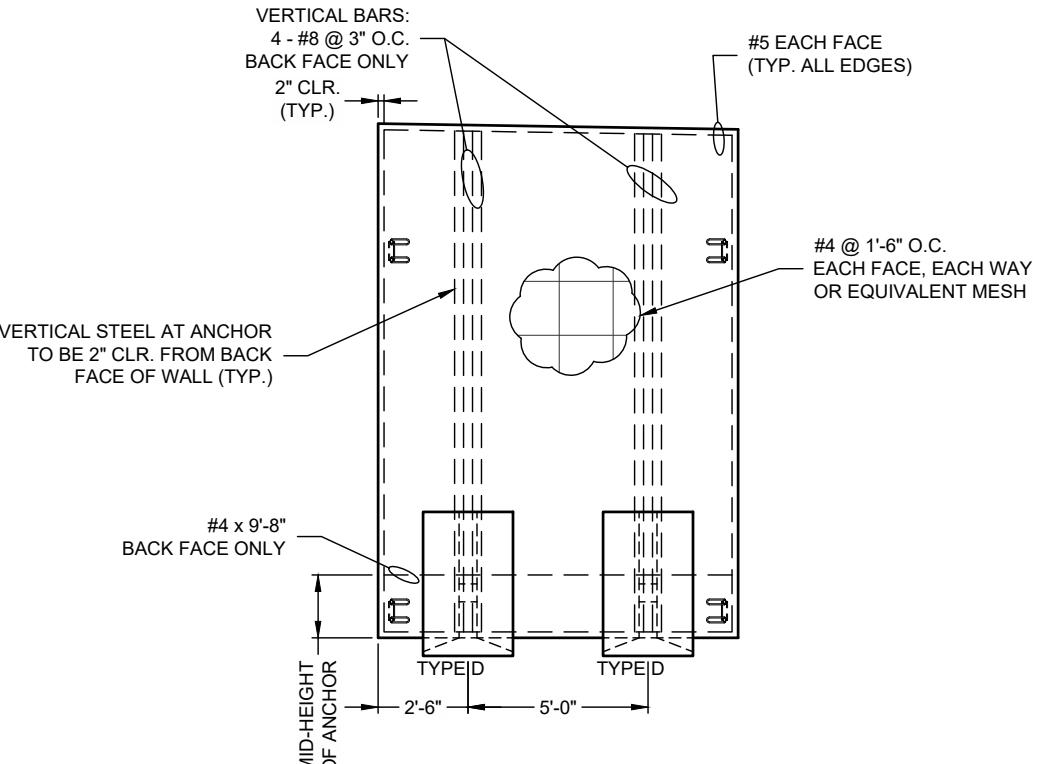
WINGWALL - WW1D

TOTAL WEIGHT = 13.6 TONS



REINFORCING DETAIL - WW1C

(FOR ANCHOR REINFORCING SEE SHEET S30)



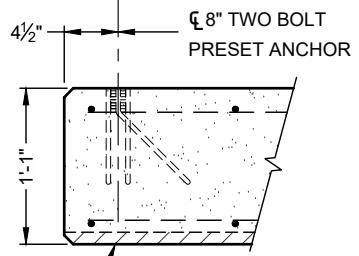
REINFORCING DETAIL - WW1D

(FOR ANCHOR REINFORCING SEE SHEET S30)

NOTES:  
- ALL EDGES OF PRECAST TO HAVE A  $\frac{3}{4}$ " 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

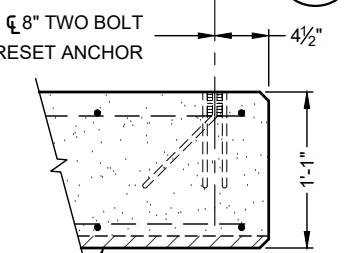
WINGWALL		
CONCRETE	REINF. STEEL	WWF
28-DAY: 4000 PSI	60,000 PSI UNCOATED	65,000 PSI UNCOATED

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.



ASHLAR STONE FORMLINER  
FRONT FACE ONLY  
(1" MAX. RELIEF)

SECTION



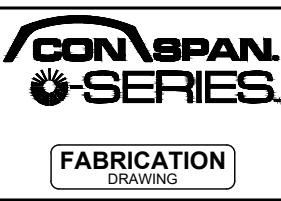
ASHLAR STONE FORMLINER  
FRONT FACE ONLY  
(1" MAX. RELIEF)

SECTION

MARK	DATE	REVISION DESCRIPTION	BY

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DRAWING

CAMPUS EXPANSION  
RAYBURN ELECTRIC CORP.

ROCKWALL, TEXAS

PROJECT NO.:	SEQ. NO.:	DATE:
736881	130	7/26/2024
DESIGNED:	JAL	DRAWN:
CHECKED:	DM	APPROVED:
SHEET NO.:	S17	OF S35

LIFT POINTS (TOP 2 LIFT POINTS MUST BE CAPABLE OF SUPPORTING ENTIRE WEIGHT OF WINGWALL)

22

C.G.

TYPE D

TYPE D

WALL ANCHOR

WINGWALL - WW1E

TOTAL WEIGHT = 13.5 TONS

TOTAL WEIGHT = 15.7 TONS

**TOTAL WEIGHT = 15.7 TONS**

Technical diagram of a concrete wall section showing reinforcement details. The wall is 5'-0" wide and 9'-0" high. It features vertical bars on the back face and a mesh reinforcement on the front face. The diagram includes labels for vertical bars, mesh reinforcement, anchor height, and clearances.

VERTICAL BARS:  
4 - #8 @ 3" O.C.  
BACK FACE ONLY

2" CLR.  
(TYP.)

#5 EACH FACE  
(TYP. ALL EDGES)

VERTICAL STEEL AT ANCHOR  
TO BE 2" CLR. FROM BACK  
FACE OF WALL (TYP.)

#4 @ 1'-6" O.C.  
EACH FACE, EACH WAY  
OR EQUIVALENT MESH

#4 x 9'-0"  
BACK FACE ONLY

ANCHOR HEIGHT

TYPE D

TYPE D

2'-6" 5'-0"

## REINFORCING DETAIL - WW1E

(FOR ANCHOR REINFORCING SEE SHEET S30)

Technical drawing of a concrete wall section showing reinforcement details. The wall is 5'-0" wide and 9'-0" high. It features vertical bars at the top, vertical steel at the anchor, and horizontal reinforcement at the bottom. The drawing includes callouts for reinforcement specifications and dimensions.

VERTICAL BARS:  
4 - #8 @ 3" O.C.  
BACK FACE ONLY

2" CLR.  
(TYP.)

VERTICAL STEEL AT ANCHOR  
TO BE 2" CLR. FROM BACK  
FACE OF WALL (TYP.)

#5 EACH FACE  
(TYP. ALL EDGES)

#4 @ 1'-6" O.C.  
EACH FACE, EACH WAY  
OR EQUIVALENT MESH

#4 x 9'-0"  
BACK FACE ONLY

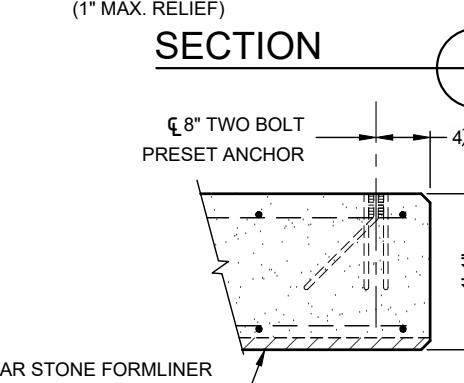
MID-HEIGHT  
OF ANCHOR

TYPE D

TYPE D

2'-6" 5'-0"

## SECTION



ASHLAR STONE FORMLINER  
FRONT FACE ONLY  
(1" MAX. RELIEF)

**SECTION**

**ASHLAR STONE FORMLINER  
FRONT FACE ONLY  
(1" MAX. RELIEF)**

**SECTION**

22

22

## SECTION

## REINFORCING DETAIL - WW1F

(FOR ANCHOR REINFORCING SEE SHEET S30)

FIRM NAME - CONTECH ENGINEERED SOLUTIONS LLC  
REGISTRATION # F-14755

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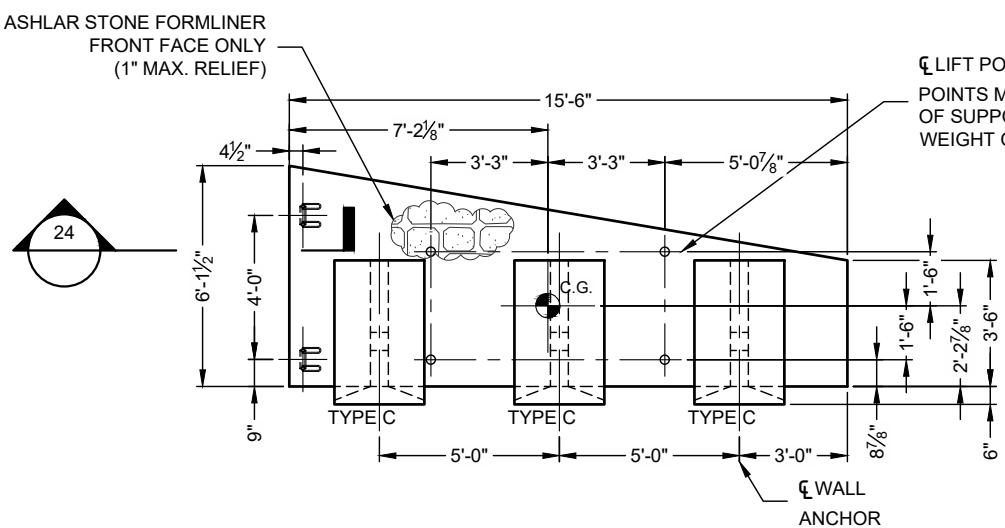
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# CONSPAN -SERIES

CAMPUS EXPANSION  
RAYBURN ELECTRIC CORP.  
ROCKWALL, TEXAS

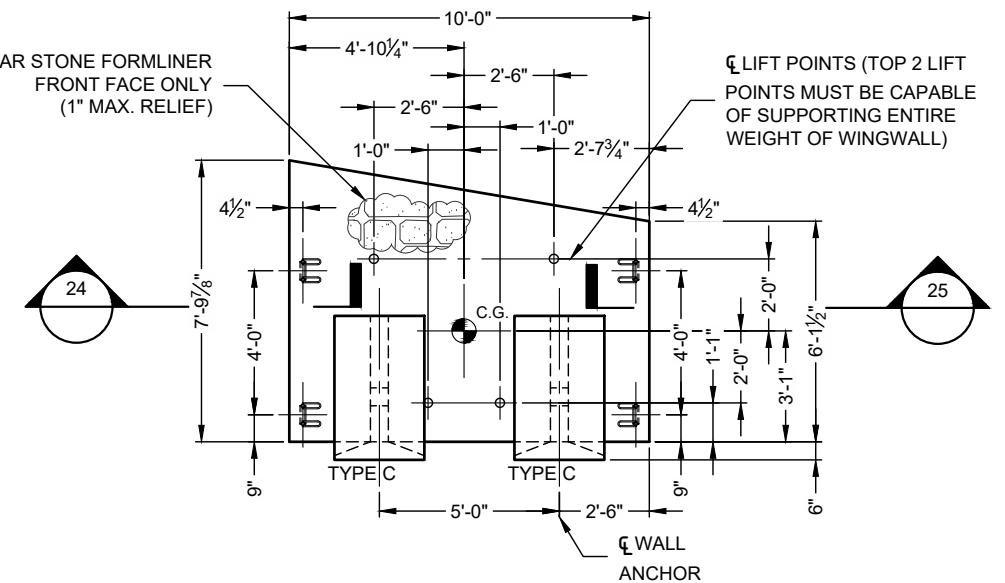
PROJECT No.:	SEQ. No.:	DATE:
736881	130	7/26/2024
DESIGNED:	DRAWN:	
JAL	PJW	
CHECKED:	APPROVED:	
DM	PAC	
SHEET NO.:		
S18 OF S35		

I:\MERLIN\PROJECT\ACTIVE\7368800\73688\173688-1-130-CON\_SPAN\_O-SERIES\DRAWINGS\MANUFACTURING\PRE-73688-1-130-CO-FAB-A.DWG 7/26/2024 9:12 AM



## WINGWALL - WW2A

**TOTAL WEIGHT = 8.8 TONS**



## WINGWALL - WW2B

**TOTAL WEIGHT = 7.5 TONS**

FT  
BLE  
E  
)

#5 EACH FACE  
(TYP. ALL EDGES)

VERTICAL STEEL AT ANCHOR  
TO BE 2" CLR. FROM BACK  
FACE OF WALL (TYP.)

VERTICAL BARS:  
2 - #4 @ 3" O.C.  
BACK FACE ONLY

2" CLR.  
(TYP.)

#4 @ 1'-6" O.C.  
EACH FACE, EACH WAY  
OR EQUIVALENT MESH

#4 x 15'-2"  
BACK FACE ONLY

TYPE C

TYPE C

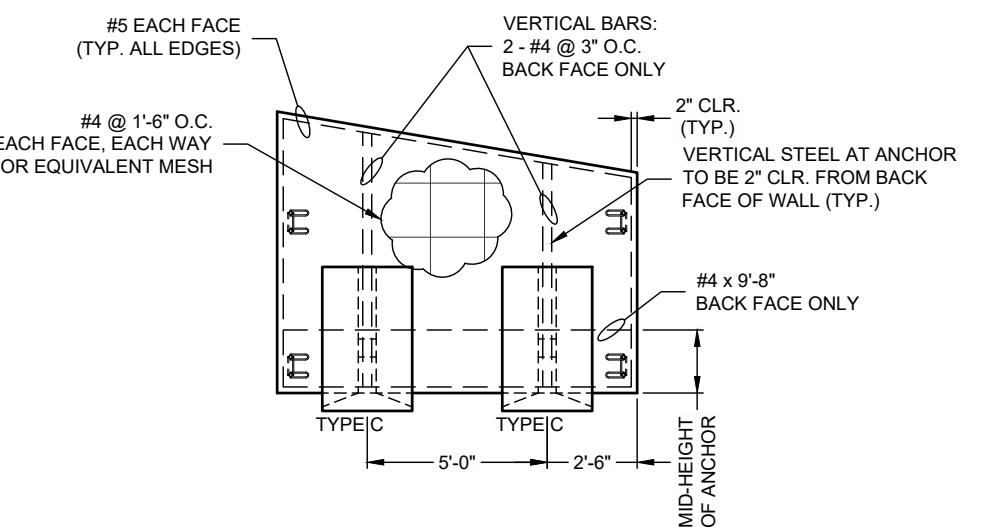
TYPE C

5'-0" 5'-0" 3'-0"

MID-HEIGHT  
OF ANCHOR

## REINFORCING DETAIL - WW2A

(FOR ANCHOR REINFORCING SEE SHEET S30)



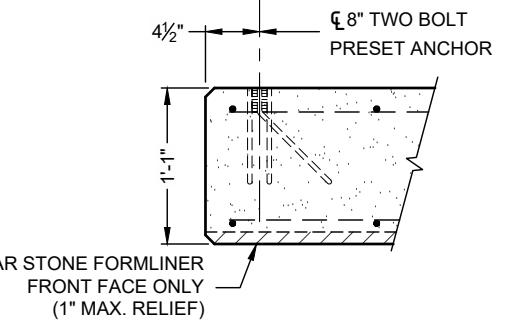
## REINFORCING DETAIL - WW2B

(FOR ANCHOR REINFORCING SEE SHEET S30)

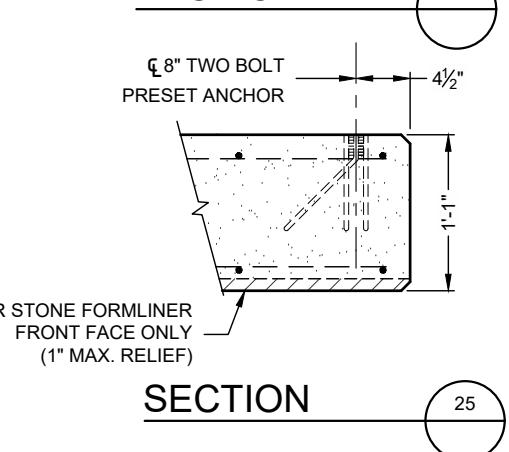
OTES:  
LL EDGES OF PRECAST TO HAVE A  $\frac{3}{4}$ " CHAMFER  
LEVATION IS LOOKING AT BACK FACE OF WINGWALL  
ACK FACE DENOTES ANCHOR SIDE OF WINGWALL  
WINGWALL WILL NOT HANG LEVEL. ADJUST  
ABLE LENGTHS AS REQUIRED

WINGWALL		
CONCRETE	REINF. STEEL	WWF
28-DAY: 4000 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



## SECTION

FIRM NAME - CONTECH ENGINEERED SOLUTIONS LLC  
REGISTRATION # F-14755

PROJECT No.:	SEQ. No.:	DATE:
736881	130	7/26/2024
DESIGNED:	DRAWN:	
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DM	PAC	
SHEET NO.:		
S19 OF S35		

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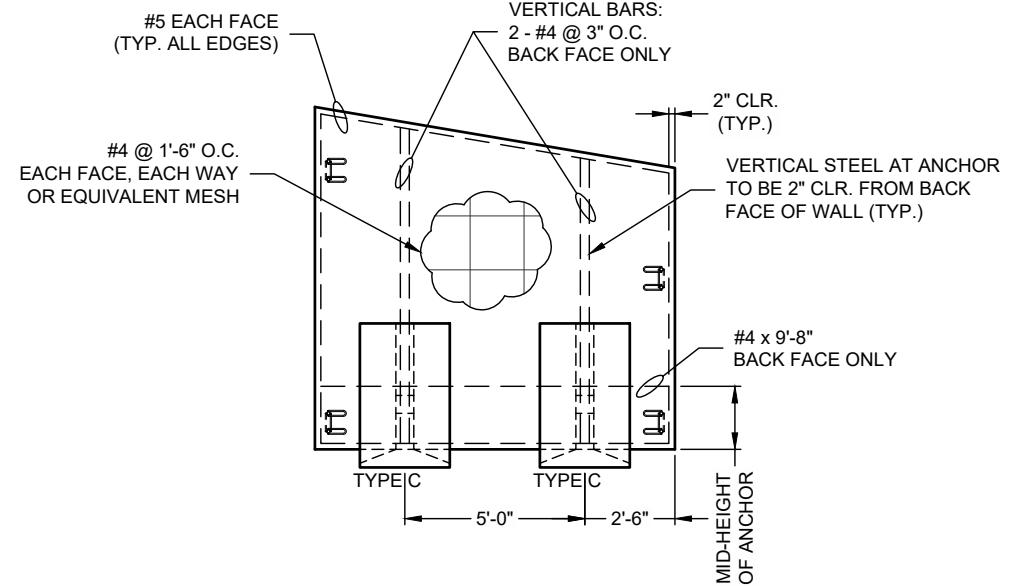
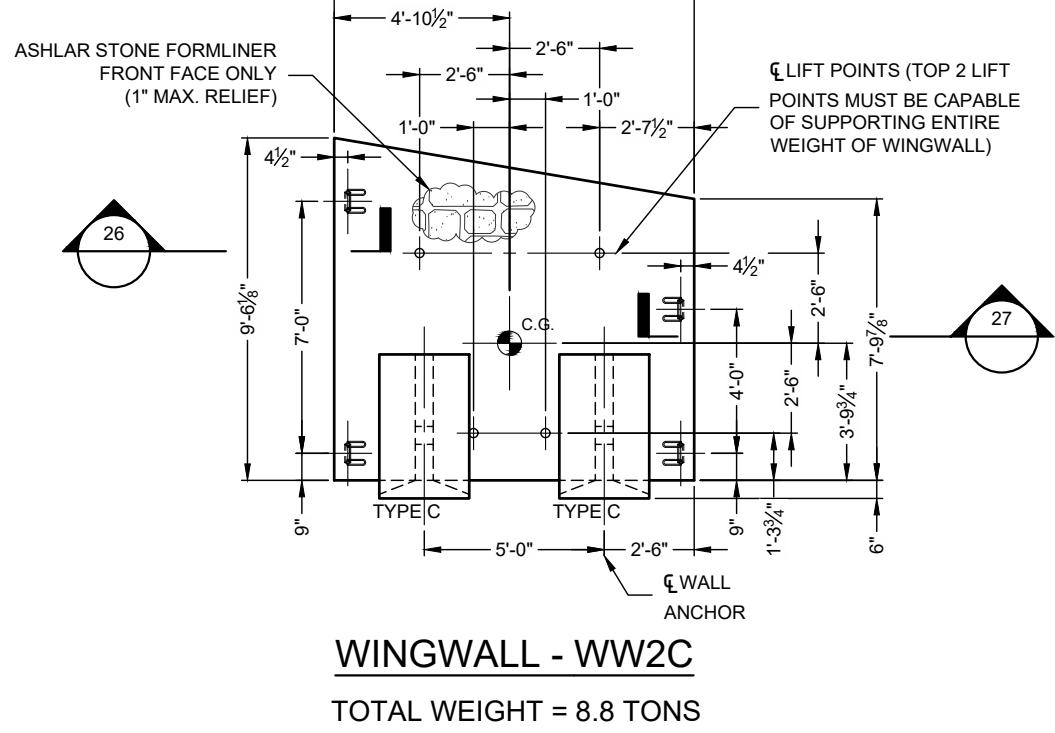
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The logo for CONSPAN O-SERIES. It features the word 'CONSPAN' in a bold, sans-serif font with a horizontal line above it. Below it is 'O-SERIES' in a similar font. To the left of 'O-SERIES' is a stylized 'O' symbol consisting of a central circle with radiating lines. Below the main text is a rectangular box with a black border containing the words 'FABRICATION' on top and 'DRAWING' on the line below. The entire logo is in black and white.

CAMPUS EXPANSION  
RAYBURN ELECTRIC CORP.

## ROCKWALL, TEXAS

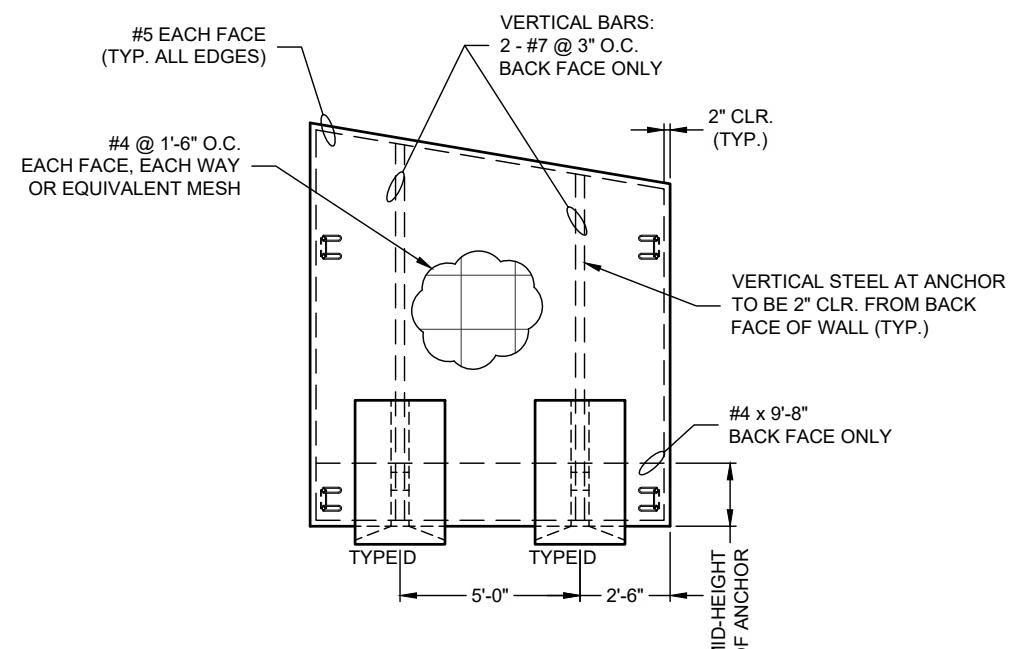
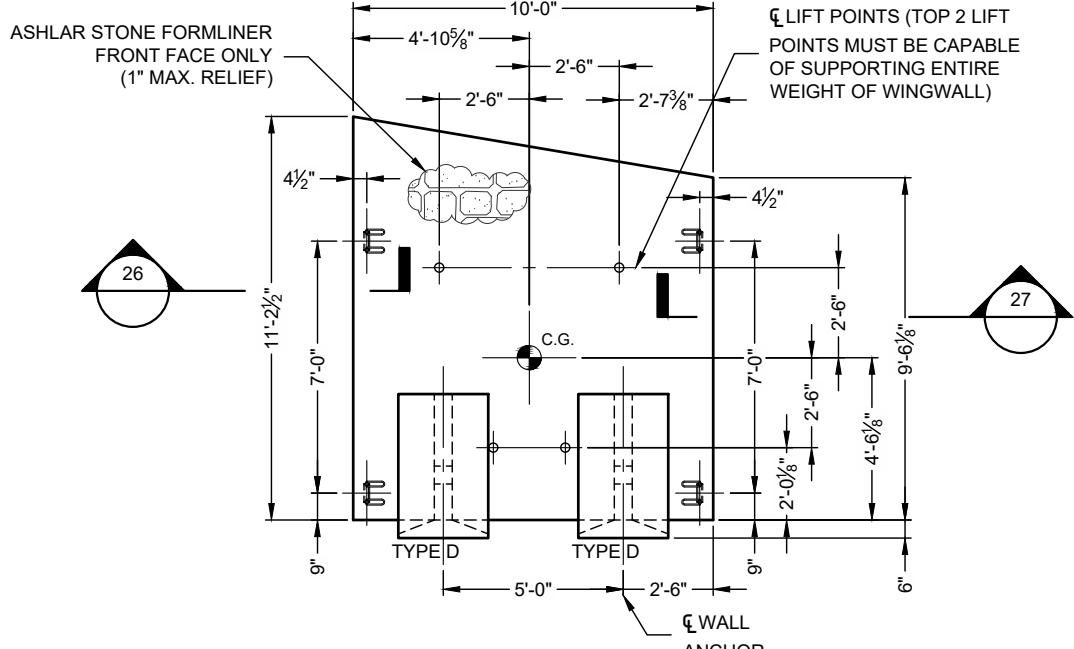
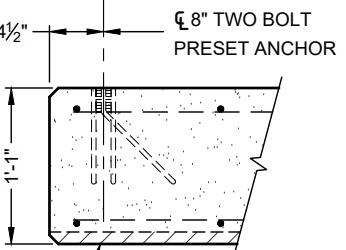


NOTES:

- ALL EDGES OF PRECAST TO HAVE A  $\frac{3}{4}$ " 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: 4000 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.



FIRM NAME - CONTECH ENGINEERED SOLUTIONS LLC  
REGISTRATION # F-14755

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JAL	PJW	
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SHEET NO.:		
S20	OF	S35

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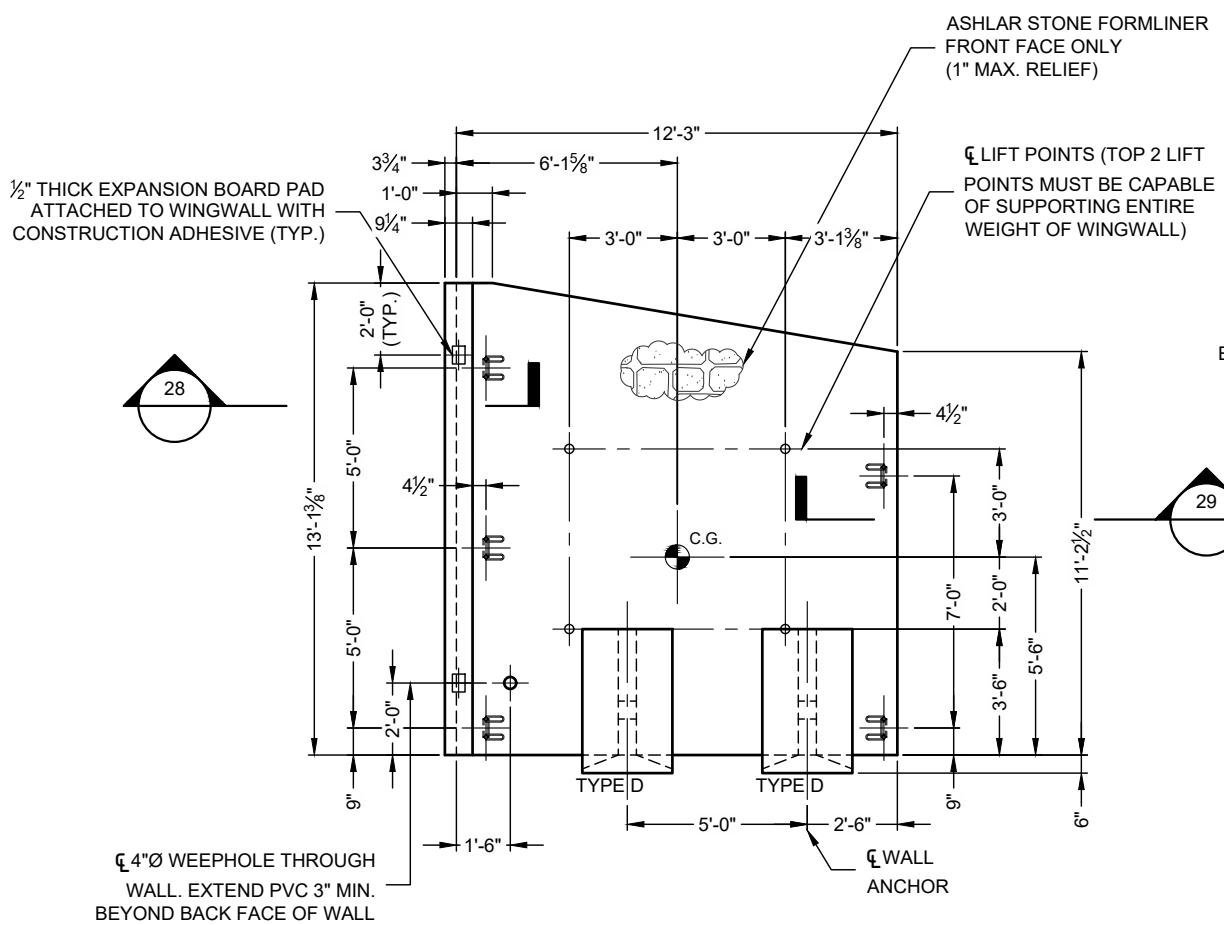
MARK DATE REVISION DESCRIPTION BY

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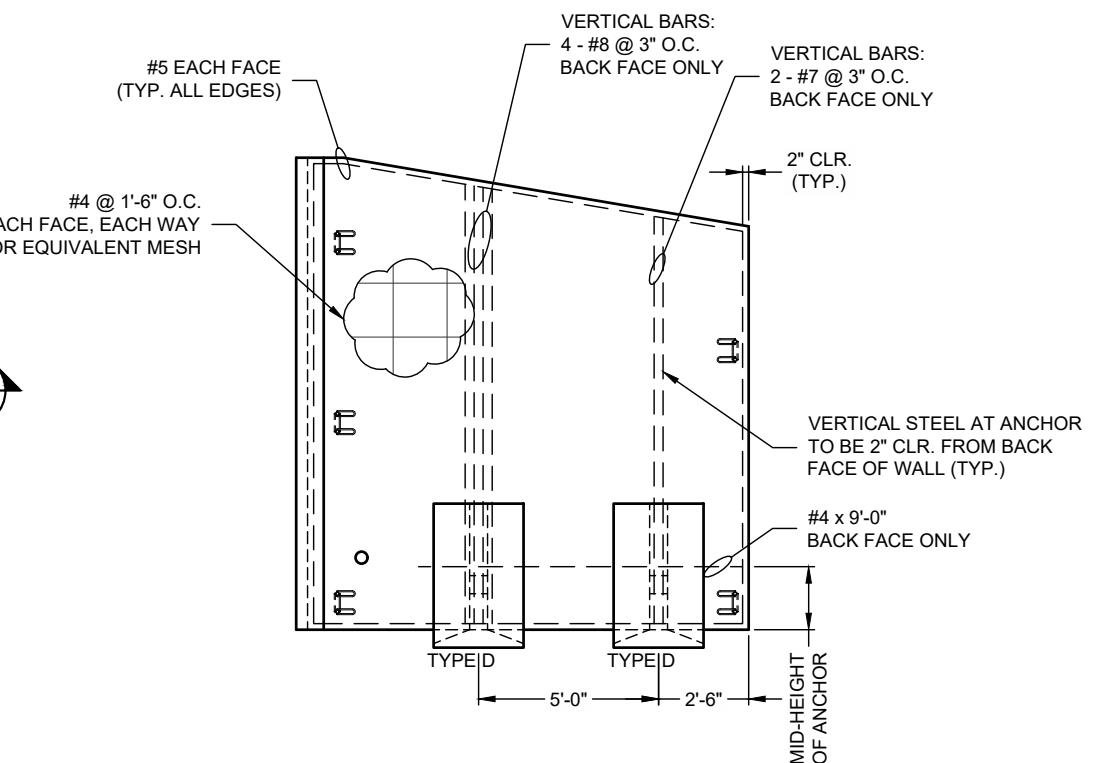
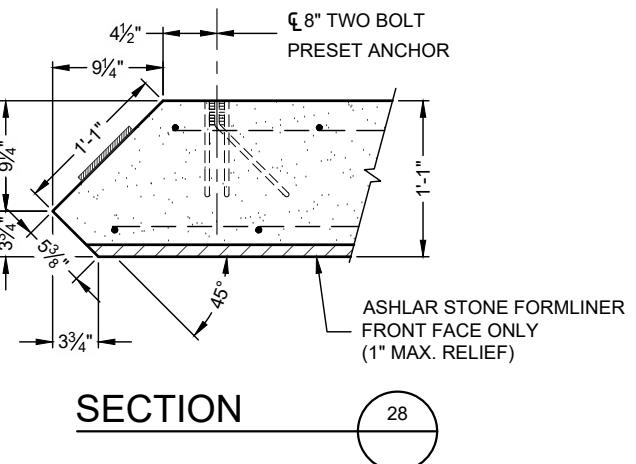
**CON-SPAN**  
**S-SERIES**  
FABRICATION DRAWING

CAMPUS EXPANSION  
RAYBURN ELECTRIC CORP.  
ROCKWALL, TEXAS



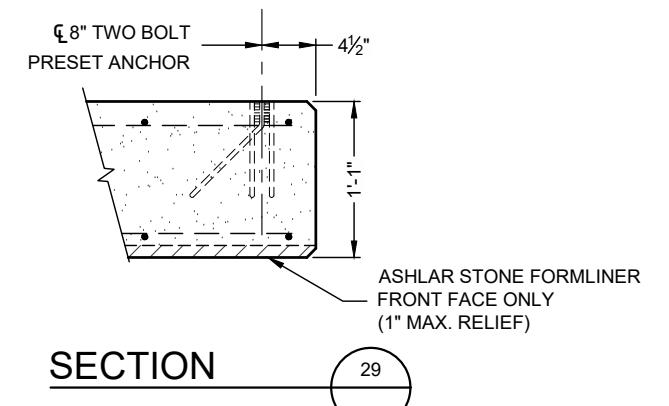
### WINGWALL - WW2E

TOTAL WEIGHT = 14.2 TONS



### REINFORCING DETAIL - WW2E

(FOR ANCHOR REINFORCING SEE SHEET S30)



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: 4000 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.

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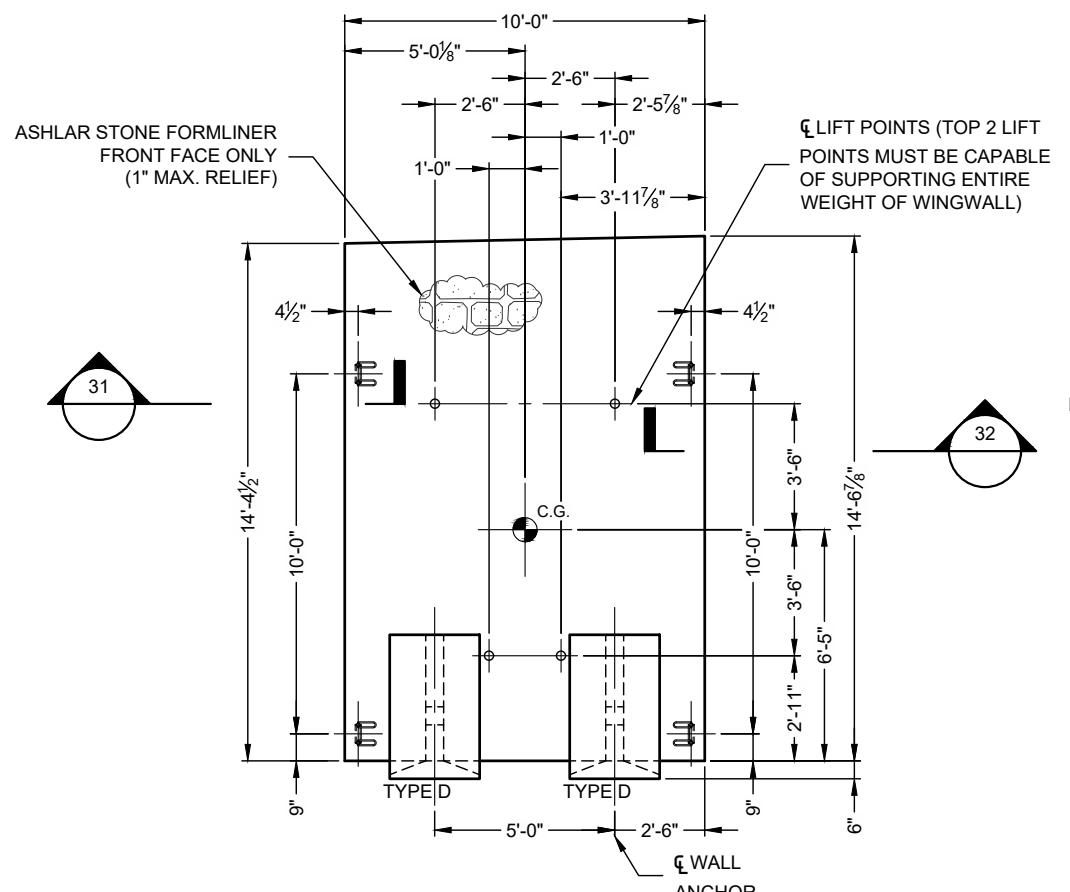
**CONSPAN**  
**S-SERIES**  
FABRICATION DRAWING

CAMPUS EXPANSION  
RAYBURN ELECTRIC CORP.

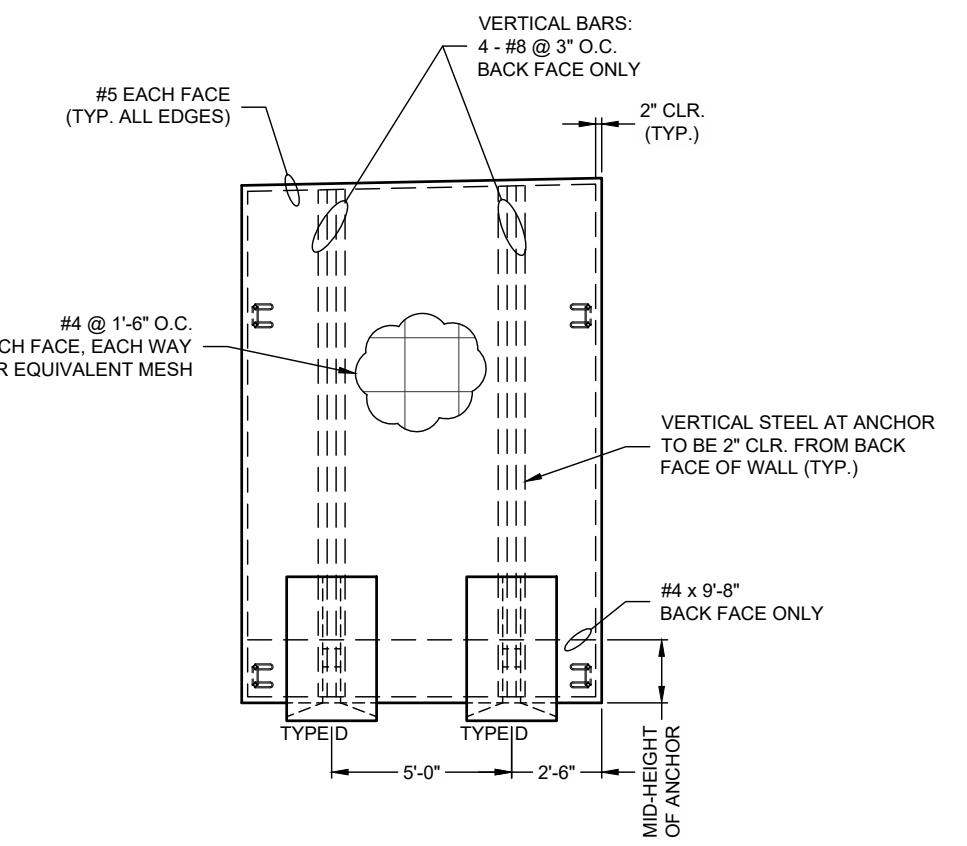
ROCKWALL, TEXAS

PROJECT NO.:	SEQ. NO.:	DATE:
736881	130	7/26/2024
DESIGNED:	DRAWN:	
JAL	PJW	
CHECKED:	APPROVED:	
DM	PAC	
SHEET NO.:		
S21	OF	S35

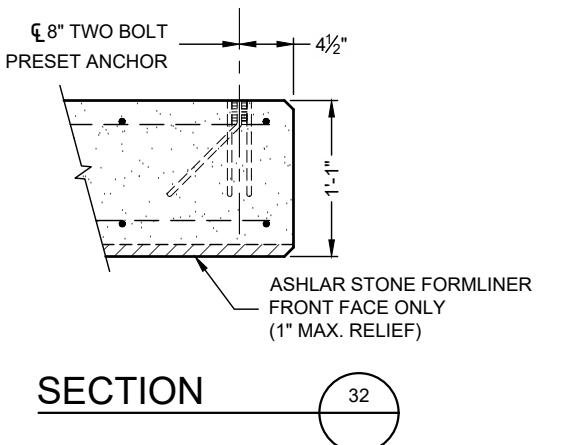
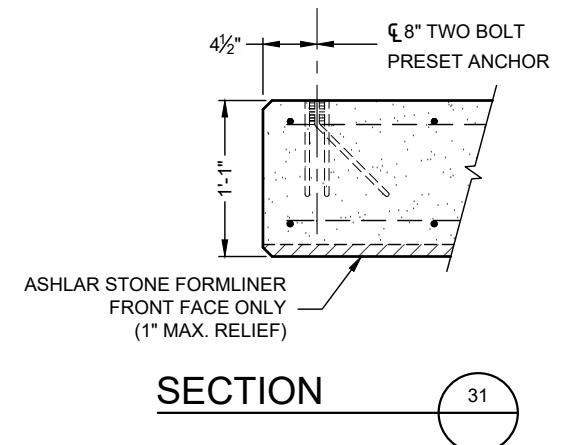




**WINGWALL - WW3B**  
TOTAL WEIGHT = 13.8 TONS



**REINFORCING DETAIL - WW3B**  
(FOR ANCHOR REINFORCING SEE SHEET S30)



NOTES:

- ALL EDGES OF PRECAST TO HAVE A  $\frac{3}{4}$ " 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: 4000 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.

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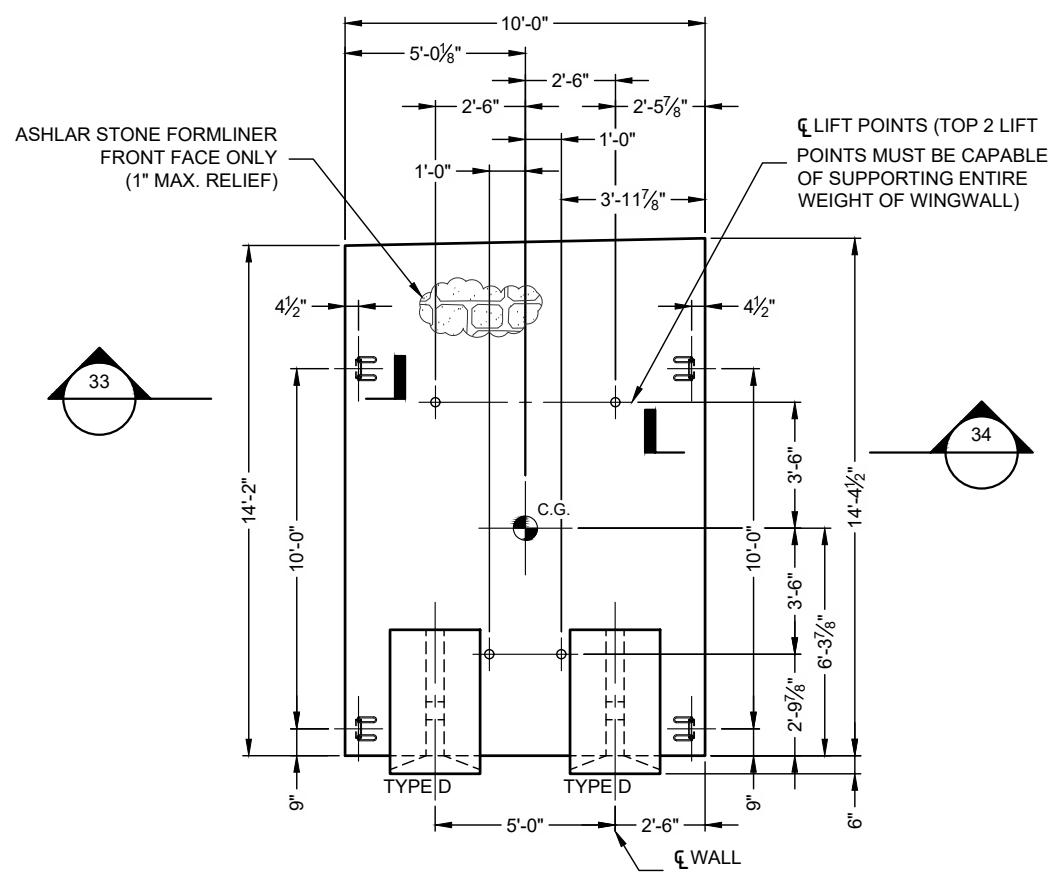
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**CON-SPAN**  
**C-SERIES**  
FABRICATION DRAWING

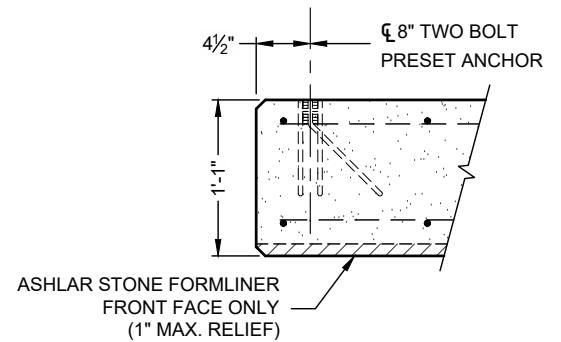
CAMPUS EXPANSION  
RAYBURN ELECTRIC CORP.  
ROCKWALL, TEXAS

FIRM NAME - CONTECH ENGINEERED SOLUTIONS LLC  
REGISTRATION # F-14755

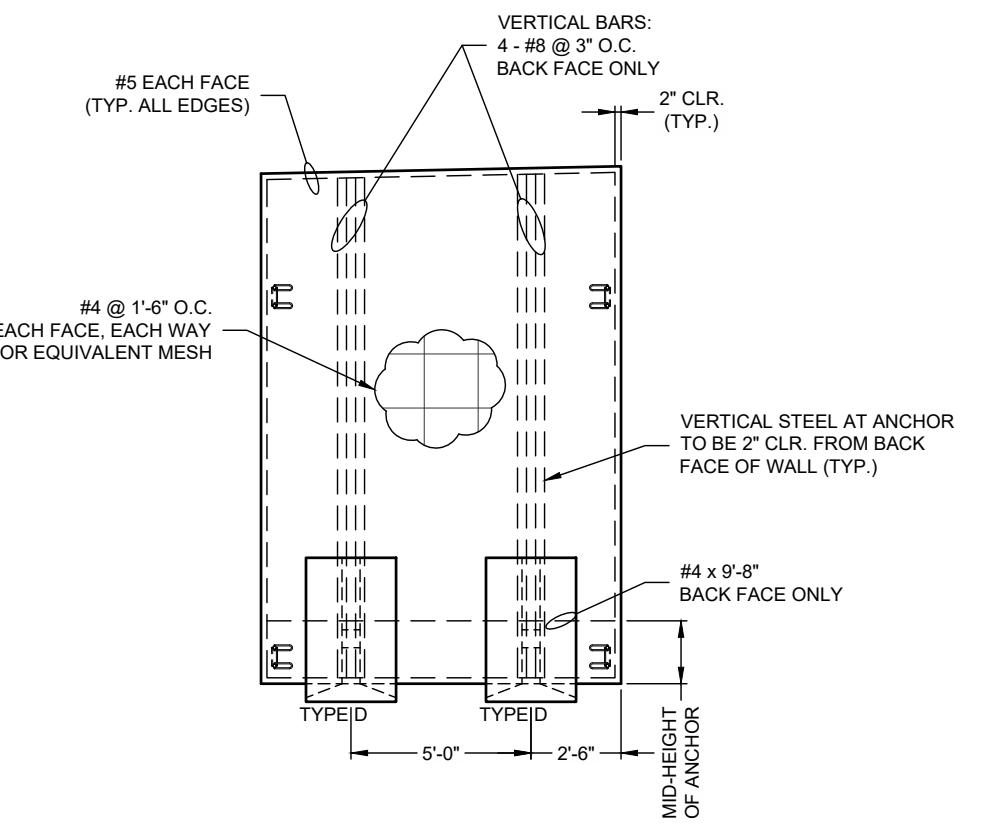
PROJECT NO.:	SEQ. NO.:	DATE:
736881	130	7/26/2024
DESIGNED:	DRAWN:	
JAL	PJW	
CHECKED:	APPROVED:	
DM	PAC	
SHEET NO.:		
S23		OF S35



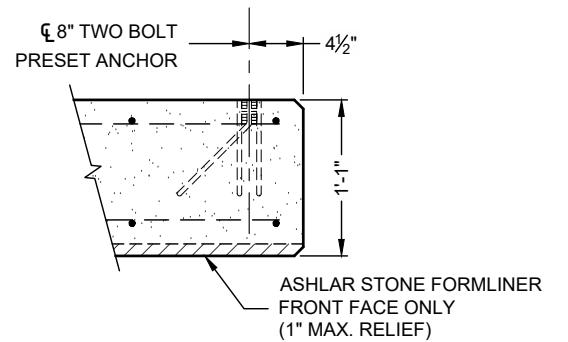
**WINGWALL - WW3C**  
TOTAL WEIGHT = 13.7 TONS



**SECTION**



**REINFORCING DETAIL - WW3C**  
(FOR ANCHOR REINFORCING SEE SHEET S30)



**SECTION**

**NOTES:**

- ALL EDGES OF PRECAST TO HAVE A  $\frac{3}{4}$ " 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: 4000 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.

MARK	DATE	REVISION DESCRIPTION	BY

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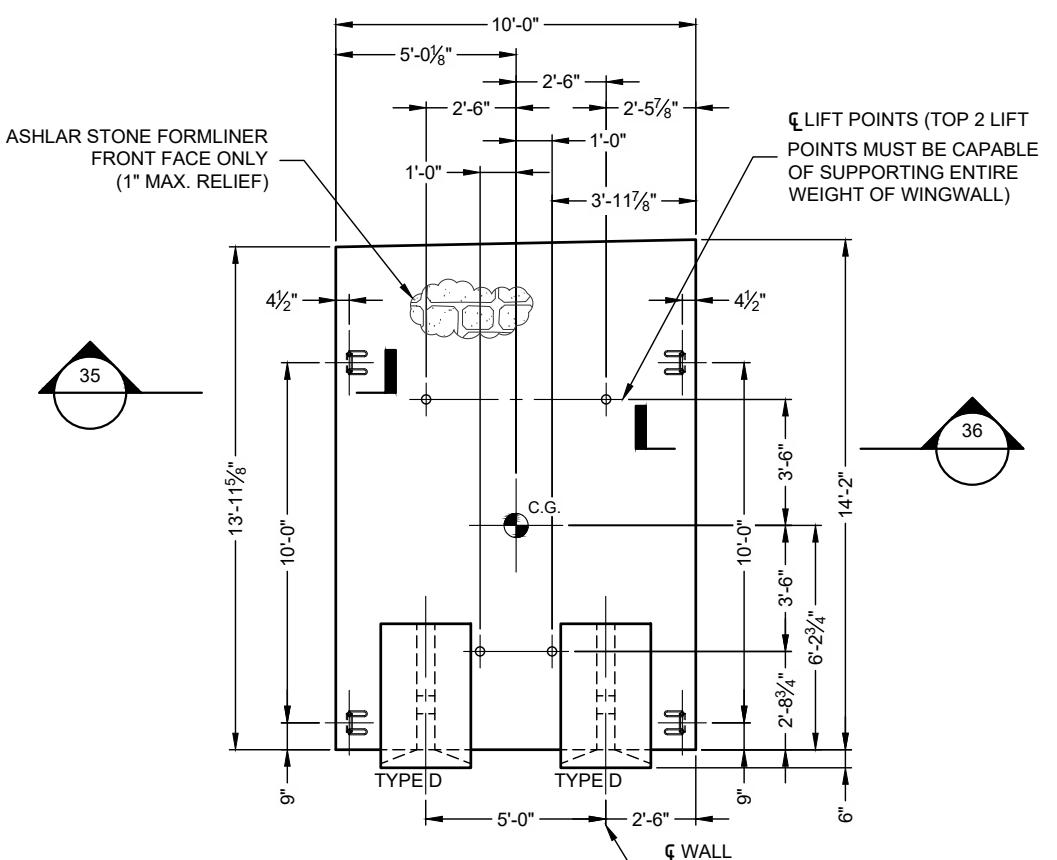
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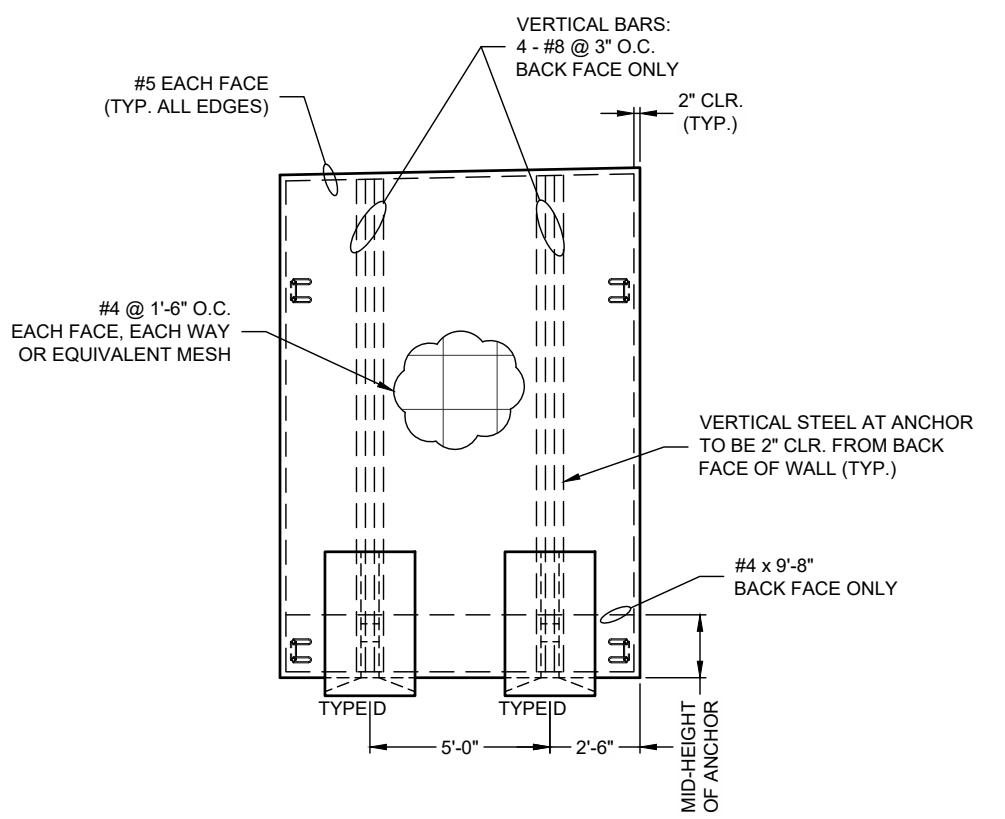
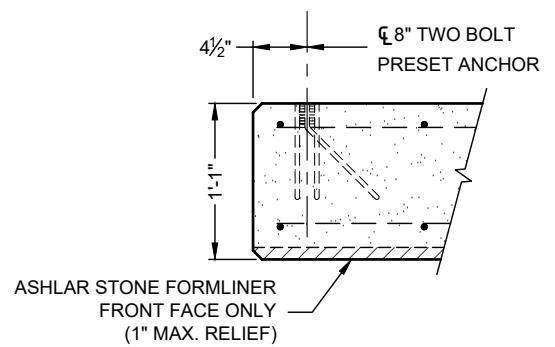
**CON-SPAN**  
**O-SERIES**  
FABRICATION  
DRAWING

CAMPUS EXPANSION  
RAYBURN ELECTRIC CORP.  
ROCKWALL, TEXAS

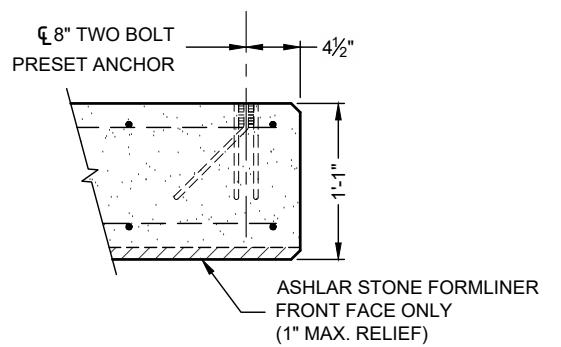
PROJECT NO.:	SEQ. NO.:	DATE:
736881	130	7/26/2024
DESIGNED:	DRAWN:	
JAL	PJW	
CHECKED:	APPROVED:	
DM	PAC	
SHEET NO.:		
S24	OF	S35



**WINGWALL - WW3D**  
TOTAL WEIGHT = 13.5 TONS



**REINFORCING DETAIL - WW3D**  
(FOR ANCHOR REINFORCING SEE SHEET S30)



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: 4000 PSI	60,000 PSI UNCOATED	65,000 PSI UNCOATED

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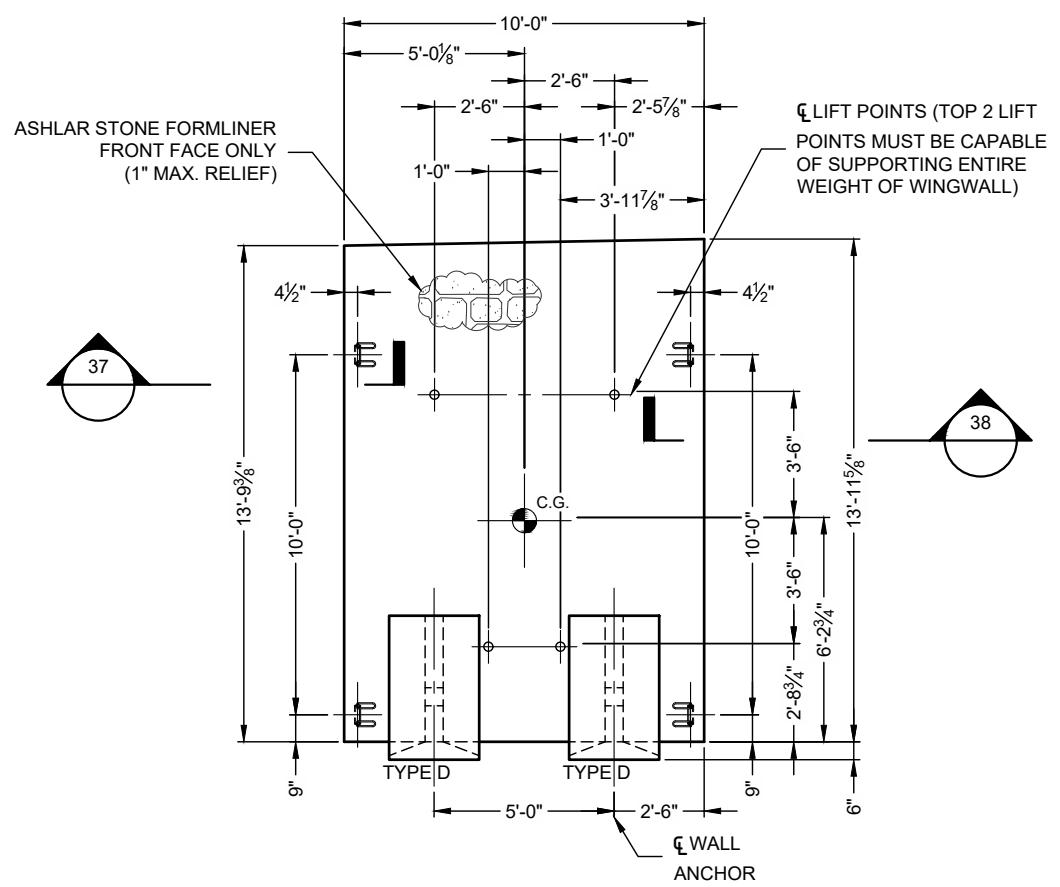
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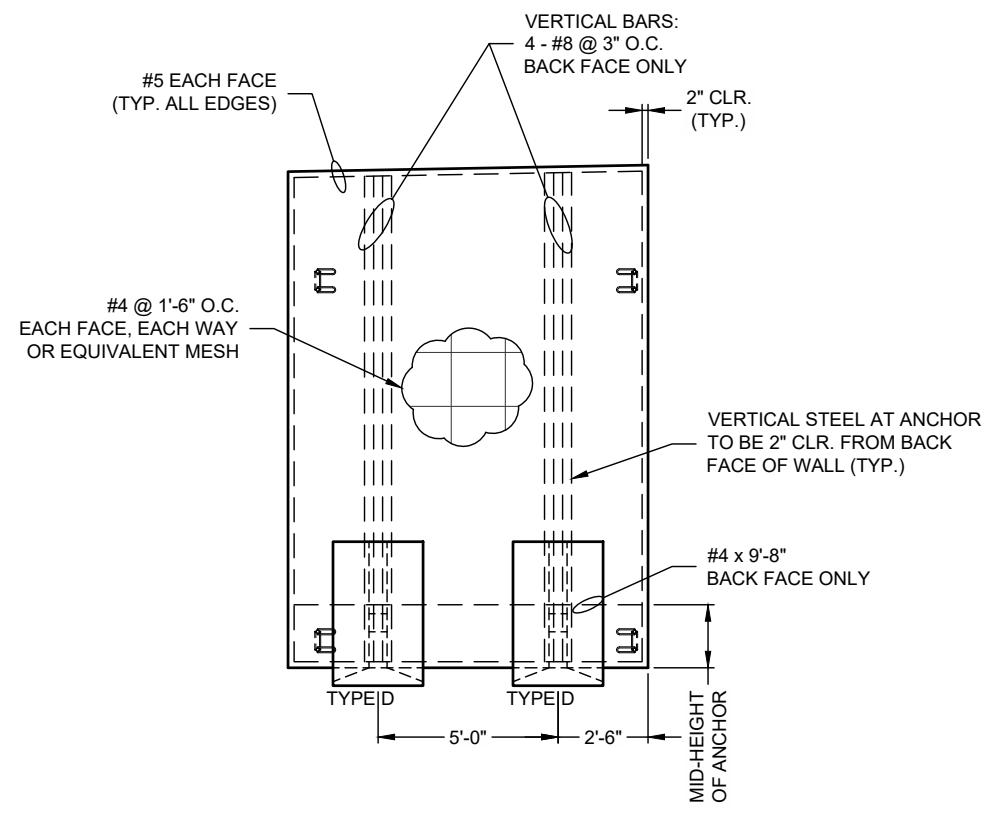
**CONSPAN**  
**S-SERIES**  
FABRICATION DRAWING

CAMPUS EXPANSION  
RAYBURN ELECTRIC CORP.  
ROCKWALL, TEXAS

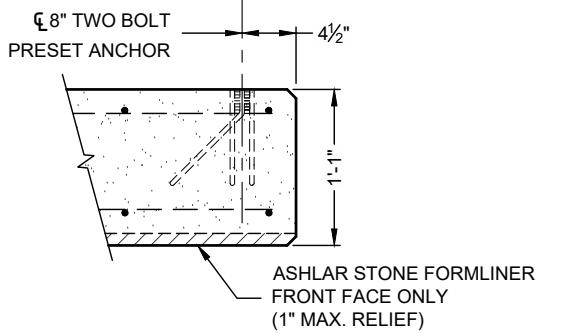
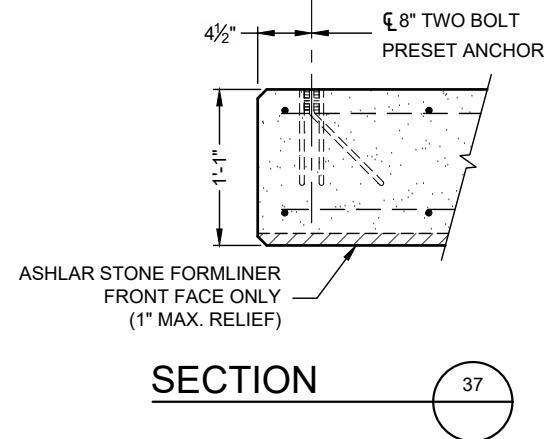
PROJECT NO.:	SEQ. NO.:	DATE:
736881	130	7/26/2024
DESIGNED:	DRAWN:	
JAL	PJW	
CHECKED:	APPROVED:	
DM	PAC	
SHEET NO.:		
S25	OF	S35



**WINGWALL - WW3E**  
TOTAL WEIGHT = 13.3 TONS



**REINFORCING DETAIL - WW3E**  
(FOR ANCHOR REINFORCING SEE SHEET S30)



**SECTION**

**SECTION**

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MARK

DATE

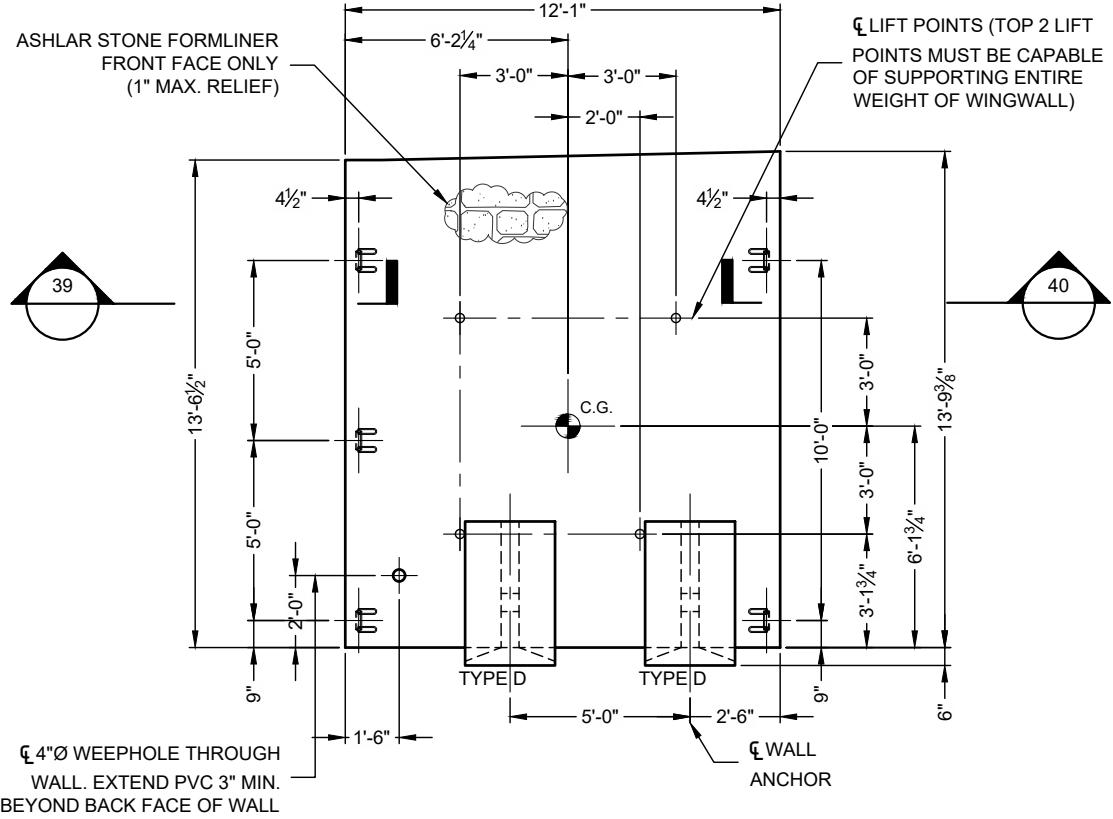
REVISION DESCRIPTION

BY

NOTES:  
- ALL EDGES OF PRECAST TO HAVE A  $\frac{3}{4}$ " 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

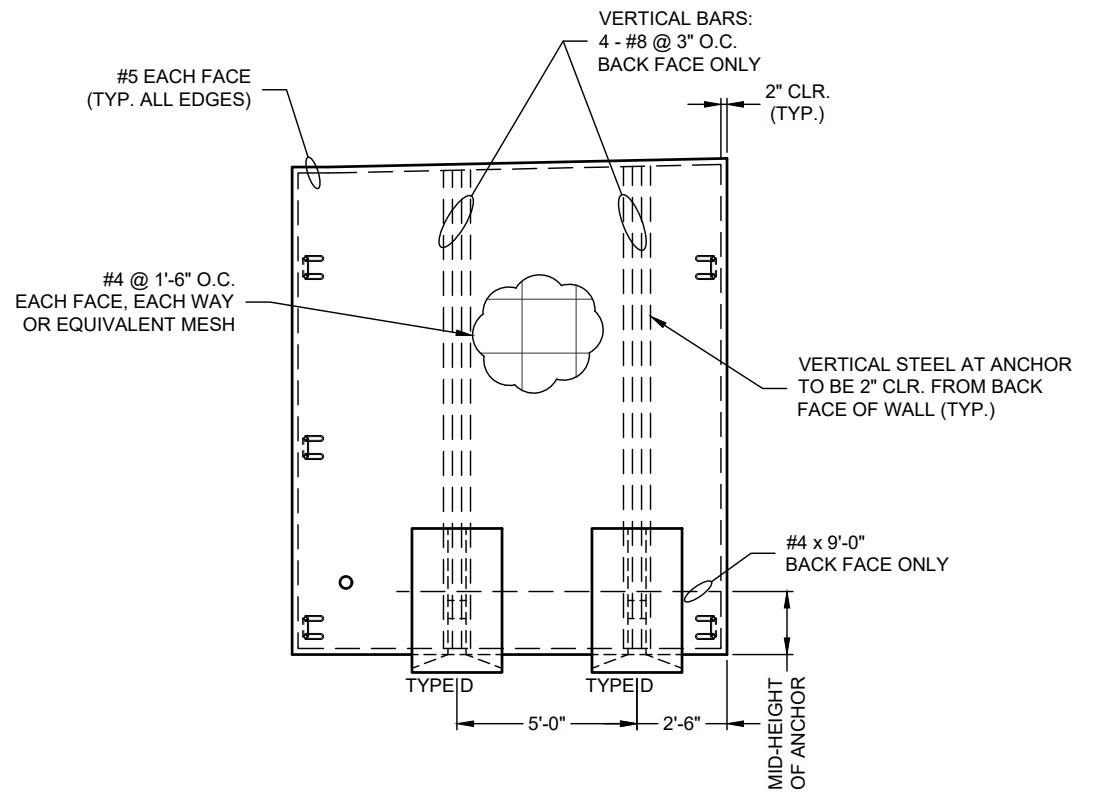
WINGWALL		
CONCRETE	REINF. STEEL	WWF
28-DAY: 4000 PSI	60,000 PSI UNCOATED	65,000 PSI UNCOATED

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### WINGWALL - WW3F

TOTAL WEIGHT = 15.5 TONS

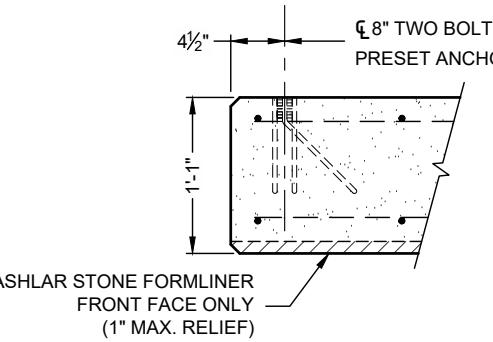


NOTES:

- ALL EDGES OF PRECAST TO HAVE A  $\frac{3}{4}$ " 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

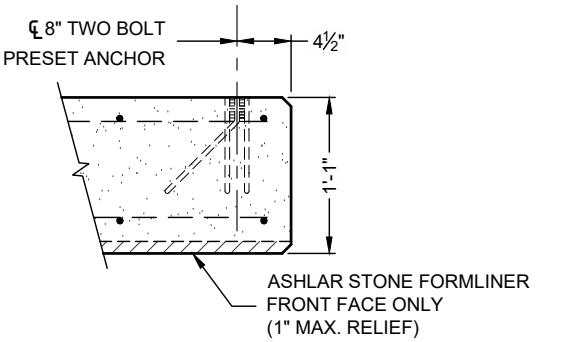
WINGWALL		
CONCRETE	REINF. STEEL	WWF
28-DAY: 4000 PSI	60,000 PSI UNCOATED	65,000 PSI UNCOATED

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

39



SECTION

40

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REGISTRATION # F-14755

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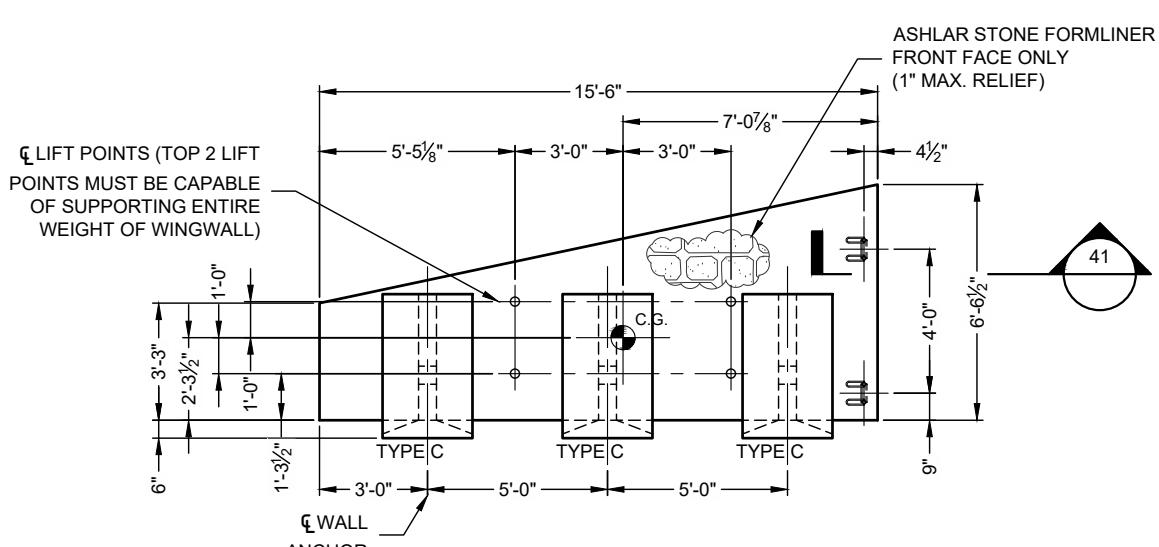
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**CON-SPAN**  
**S-SERIES**  
FABRICATION  
DRAWING

CAMPUS EXPANSION  
RAYBURN ELECTRIC CORP.

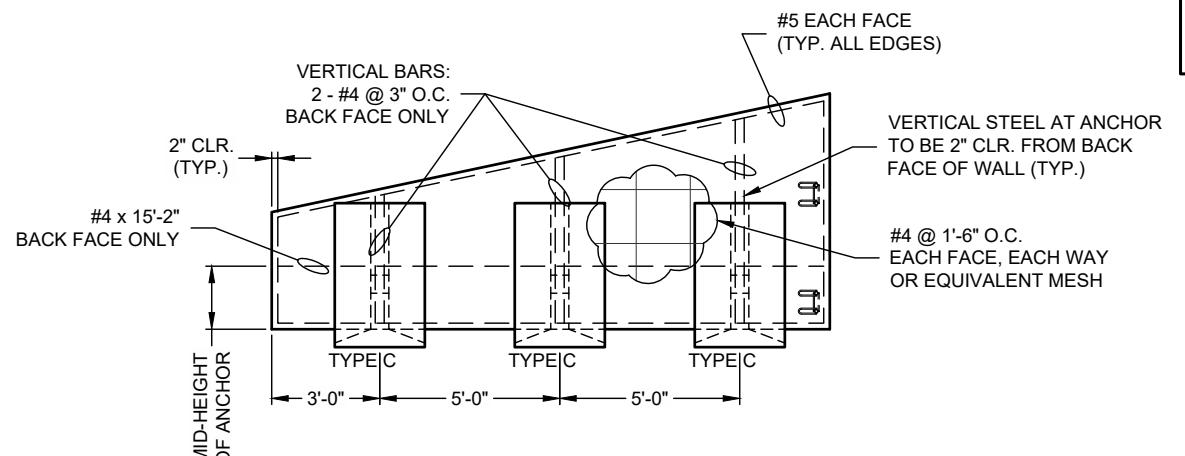
ROCKWALL, TEXAS

PROJECT NO.:	SEQ. NO.:	DATE:
736881	130	7/26/2024
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SHEET NO.:		
S27	OF	S35



WINGWALL - WW4A

TOTAL WEIGHT = 8.9 TONS



REINFORCING DETAIL - WW4A

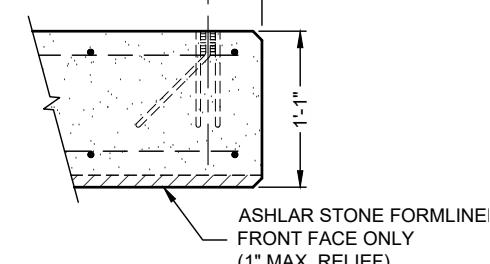
(FOR ANCHOR REINFORCING SEE SHEET S30)

NOTES:  
 - ALL EDGES OF PRECAST TO HAVE A  $\frac{1}{8}$ " 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

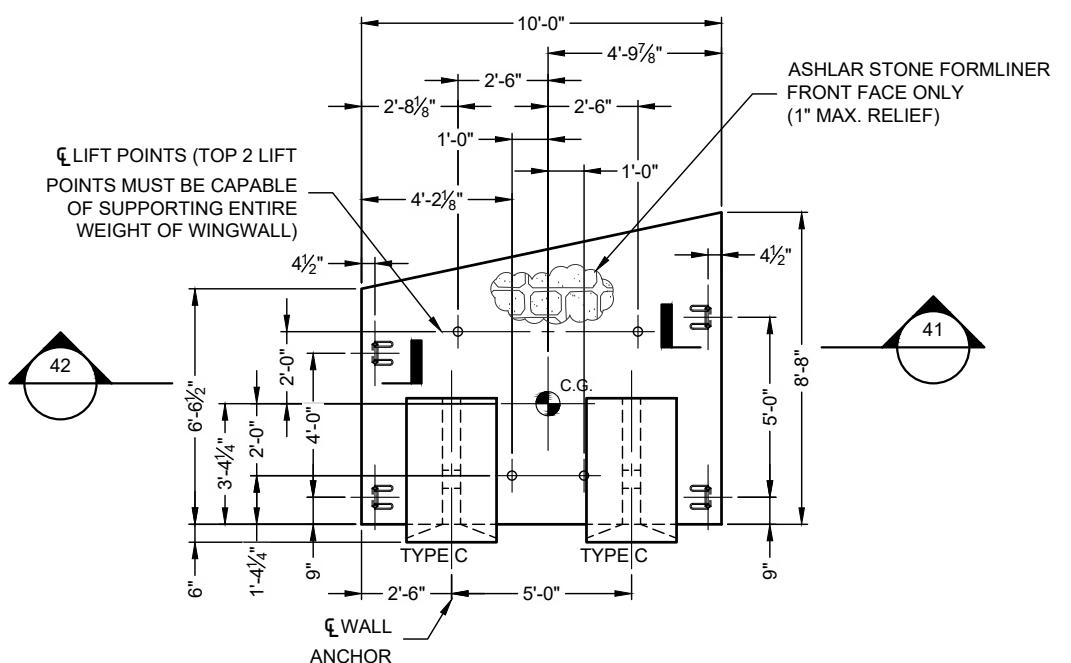
WINGWALL		
CONCRETE	REINF. STEEL	WWF
28-DAY: 4000 PSI	60,000 PSI UNCOATED	65,000 PSI UNCOATED

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.

4 1/2" TWO BOLT  
PRESET ANCHOR

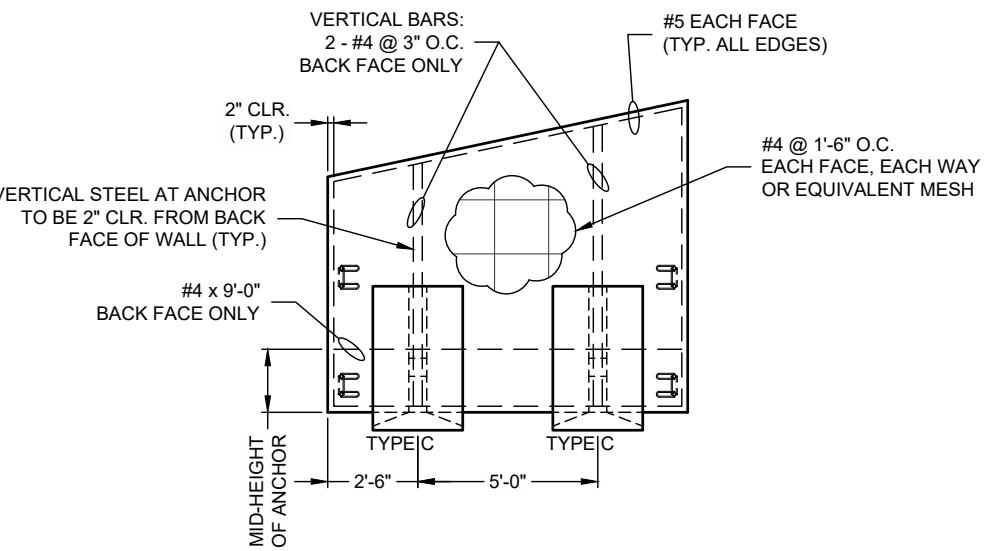


SECTION



WINGWALL - WW4B

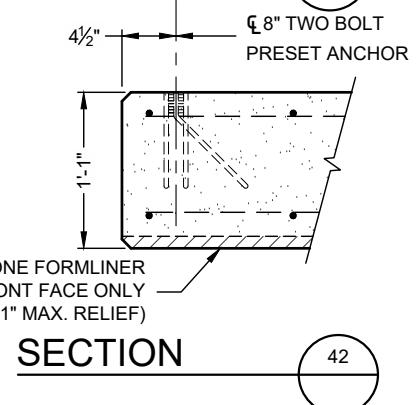
TOTAL WEIGHT = 8.0 TONS



REINFORCING DETAIL - WW4B

(FOR ANCHOR REINFORCING SEE SHEET S30)

SECTION



SECTION

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**CON-SPAN**  
**S-SERIES**  
FABRICATION  
DRAWING

CAMPUS EXPANSION  
RAYBURN ELECTRIC CORP.

ROCKWALL, TEXAS

FIRM NAME - CONTECH ENGINEERED SOLUTIONS LLC  
REGISTRATION # F-14755

PROJECT NO.:	SEQ. NO.:	DATE:
736881	130	7/26/2024
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JAL	PJW	
CHECKED:	APPROVED:	
DM	PAC	
SHEET NO.:		
S28		OF S35

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Technical drawing showing the dimensions and lift points for a wingwall anchor system. The drawing includes two anchor points labeled 43 and 44, and two anchor types labeled TYPE D. Key dimensions include:

- ANCHOR 43: Total height 8'-8", height from base to top 4'-2 3/4", height from base to top of anchor 2'-6", height from base to top of anchor 5'-0".
- ANCHOR 44: Total height 10'-9 1/2", height from base to top 5'-0", height from base to top of anchor 9".
- WALL: Total height 5'-0", height from base to top of anchor 2'-6", height from base to top of anchor 5'-0".
- ANCHOR 43 LIFT POINTS: Top lift point at 2'-7 5/8", bottom lift point at 1'-8 3/4".
- ANCHOR 44 LIFT POINTS: Top lift point at 2'-6", bottom lift point at 1'-0".
- ANCHOR 43 RELIEF: Maximum relief of 1" at the front face.
- ANCHOR 44 RELIEF: Maximum relief of 1" at the front face.
- ANCHOR 43 C.G.: Center of gravity at 4 1/2" from the base.
- ANCHOR 44 C.G.: Center of gravity at 4 1/2" from the base.
- ANCHOR 43 ANCHOR: Type D anchor.
- ANCHOR 44 ANCHOR: Type D anchor.

**WINGWALL - WW4C**

VERTICAL BARS:  
2 - #7 @ 3" O.C.  
BACK FACE ONLY

VERTICAL BARS:  
4 - #8 @ 3" O.C.  
BACK FACE ONLY

#5 EACH FACE  
(TYP. ALL EDGES)

2" CLR.  
(TYP.)

VERTICAL STEEL AT ANCHOR  
TO BE 2" CLR. FROM BACK  
FACE OF WALL (TYP.)

#4 @ 1'-6" O.C.  
EACH FACE, EACH W  
OR EQUIVALENT ME

#4 x 9'-8"  
BACK FACE ONLY

TYPE ID

TYPE ID

MID-HEIGHT  
OF ANCHOR

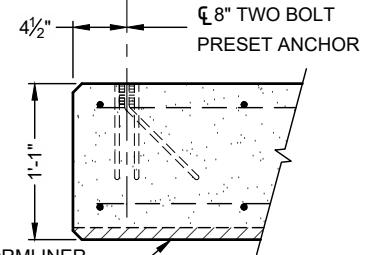
2'-6" 5'-0"

NOTES:

- ALL EDGES OF PRECAST TO HAVE A  $\frac{3}{4}$ " 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: 4000 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.



ASHLAR STONE FORMLINER  
FRONT FACE ONLY  
(1" MAX RELIEF)

**REINFORCING DETAIL - WW4C**  
(FOR ANCHOR REINFORCING SEE SHEET S30)

VERTICAL BARS:  
4 - #8 @ 3" O.C.  
BACK FACE ONLY

VERTICAL BARS:  
2 - #7 @ 3" O.C.  
BACK FACE ONLY

2" CLR.  
(TYP.)

VERTICAL STEEL AT ANCHOR  
TO BE 2" CLR. FROM BACK  
FACE OF WALL (TYP.)

#4 @ 8'-0"  
BACK FACE ONLY

MID-HEIGHT  
OF ANCHOR

TYPE D

TYPE D

2'-6" 4'-0"

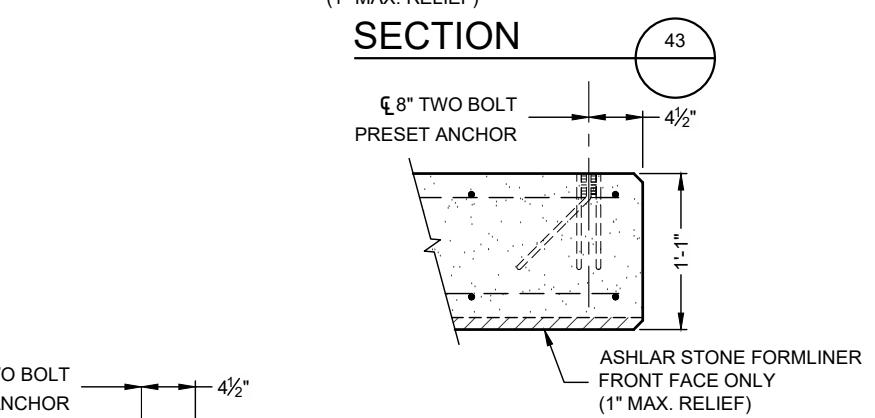
#5 EACH FACE  
(TYP. ALL EDGES)

#4 @ 1'-6" O.C.  
EACH FACE, EACH WAY  
OR EQUIVALENT MESH

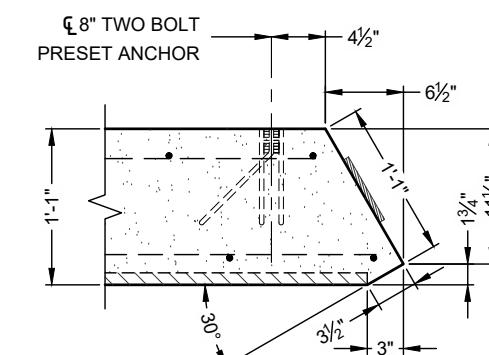
1'-1"

PRE

SECTION



## SECTION



## SECTION

**WINGWALL - WW4D**

**REINFORCING DETAIL - WW4D**  
(FOR ANCHOR REINFORCING SEE SHEET S30)

FIRM NAME - CONTECH ENGINEERED SOLUTIONS LLC  
REGISTRATION # F-14755

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provided or by or this ed or ent of k and ty for				
which entered ported tech lete or				
MARK	DATE	REVISION DESCRIPTION	BY	

# CONTECH<sup>®</sup>

ENGINEERED SOLUTIONS LLC

www.ConechES.com  
100 Centre Pointe Dr., Suite 400, West Chester, OH 45069  
800-800-1122 513-945-7000 513-945-7000 FAX

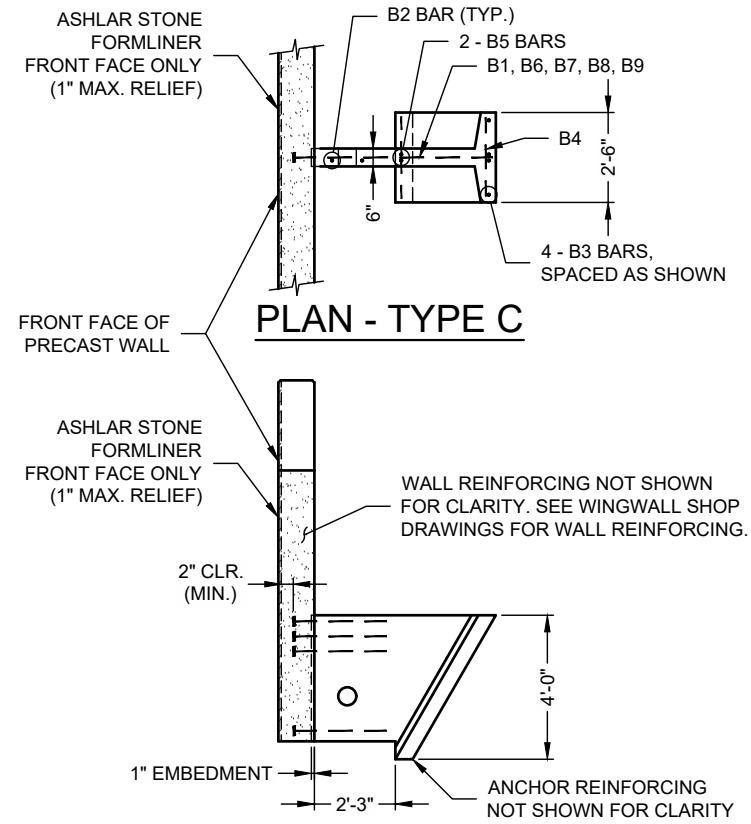
The logo for Con-Span O-Series. It features the word "CONSPAN" in a bold, sans-serif font. A thick, curved line starts from the top left, dips down to the left of the letter "O", and then curves back up to the right of the letter "N". Below "CONSPAN", the word "O-SERIES" is written in a smaller, bold, sans-serif font. To the left of the "O" in "O-SERIES" is a circular icon containing a stylized sunburst or flame design.

**FABRICATION  
DRAWING**

## CAMPUS EXPANSION RAYBURN ELECTRIC CORP.

## ROCKWALL, TEXAS

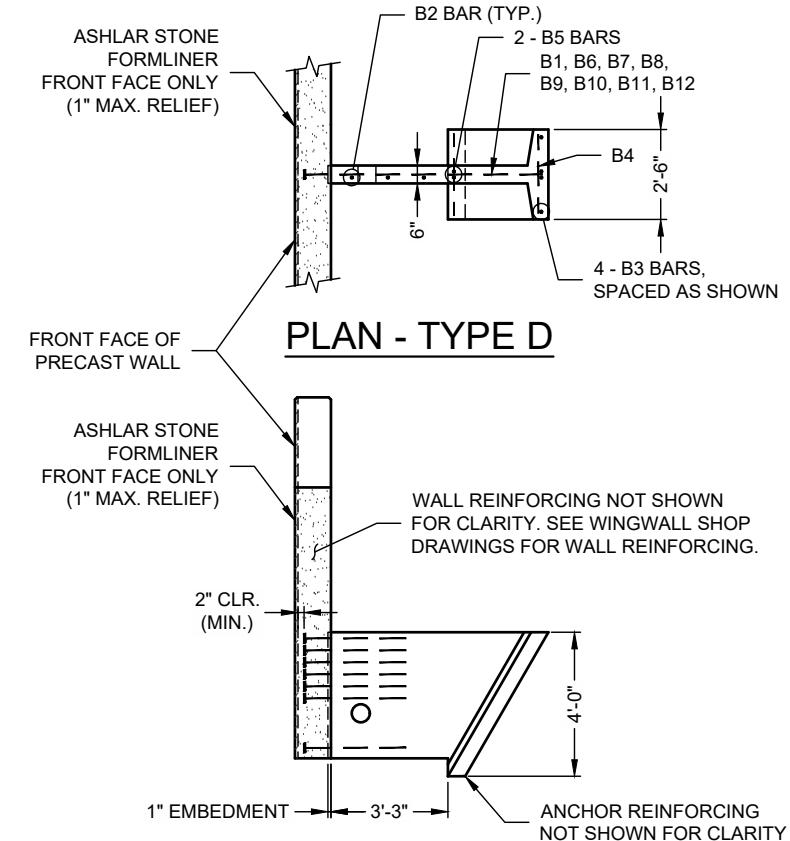
PROJECT NO.:	SEQ. NO.:	DATE:
736881	130	7/26/2024
DESIGNED:	DRAWN:	
JAL	PJW	
CHECKED:	APPROVED:	
DM	PAC	
SHEET NO.:		
S29 OF S35		



PLAN - TYPE C

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

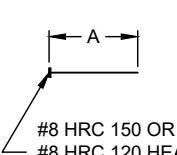
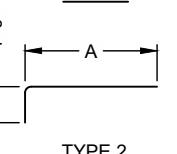
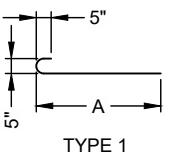
NOTE: "STR." DENOTES STRAIGHT BAR. STANDARD CLEARANCE = 2"



PLAN - TYPE D

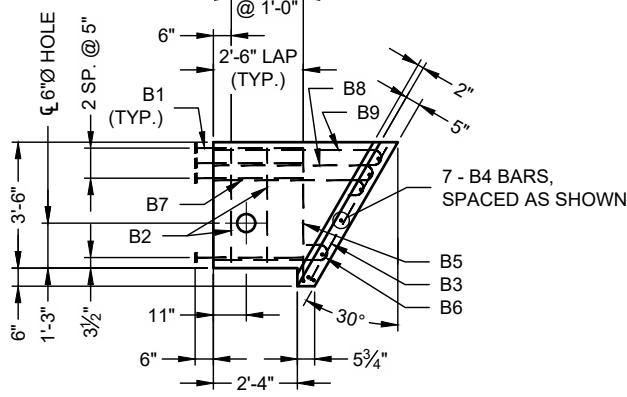
BAR LIST - TYPE D						
MARK	QTY	SIZE	A	TYPE	LENGTH	FINISH
B1	7	#6	3'-0"	3	—	EPOXY*
B2	3	#5	—	STR.	3'-2"	BLACK
B3	4	#5	—	STR.	4'-3"	BLACK
B4	9	#5	—	STR.	2'-2"	BLACK
B5	2	#5	3'-8"	2	—	BLACK
B6	1	#5	4'-2"	1	—	BLACK
B7	1	#5	4'-8"	1	—	BLACK
B8	1	#5	4'-10"	1	—	BLACK
B9	1	#5	5'-1"	1	—	BLACK
B10	1	#5	5'-3"	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: EPOXY COATING IS NOT REQUIRED ON HEADED ENDS OF TYPE 3 BARS, BUT WILL NOT BE DEDIMENTAL IF PROVIDED.

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



PRECAST ANCHOR  
TYPE C

TOTAL WEIGHT = .896 TONS

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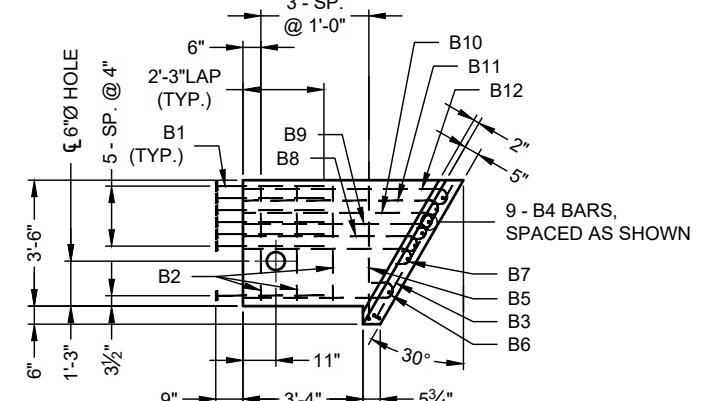
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800-338-1122 513-645-7000 513-645-7993 FAX

**CON-SPAN**  
S-SERIES  
FABRICATION  
DRAWING



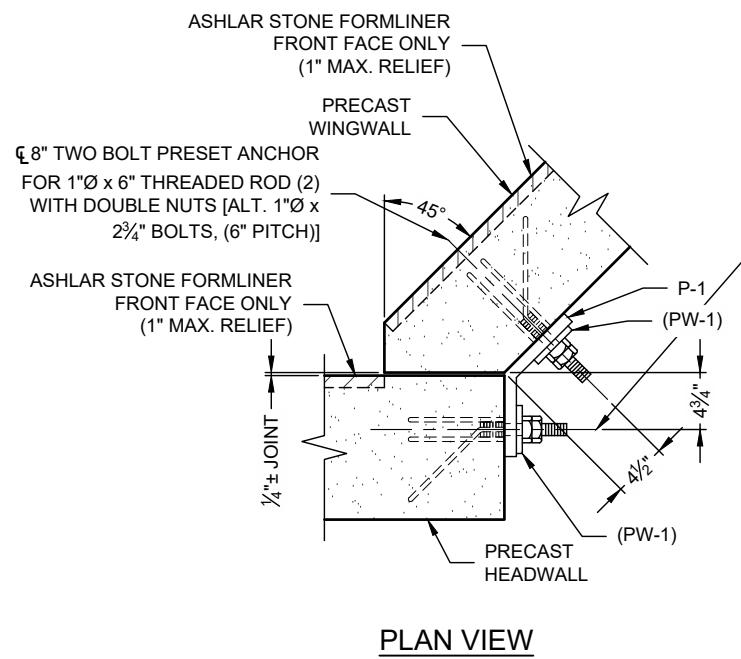
PRECAST ANCHOR  
TYPE D

TOTAL WEIGHT = 1.028 TONS

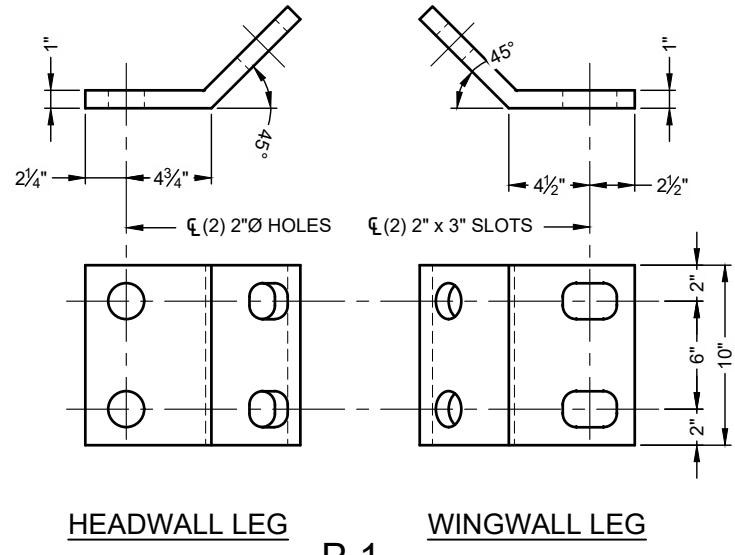
FIRM NAME - CONTECH ENGINEERED SOLUTIONS LLC  
REGISTRATION # F-14755

PROJECT NO.:	SEQ. NO.:	DATE:
736881	130	7/26/2024
DESIGNED:	DRAWN:	
JAL	PJW	
CHECKED:	APPROVED:	
DM	PAC	
SHEET NO.:		
S30	OF	S35

CAMPUS EXPANSION  
RAYBURN ELECTRIC CORP.  
ROCKWALL, TEXAS

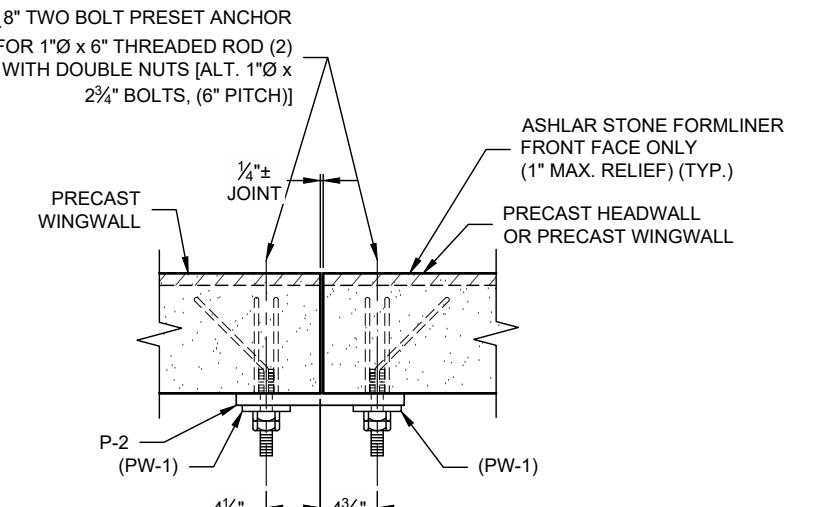


TYPICAL CONNECTION DETAIL - P-1

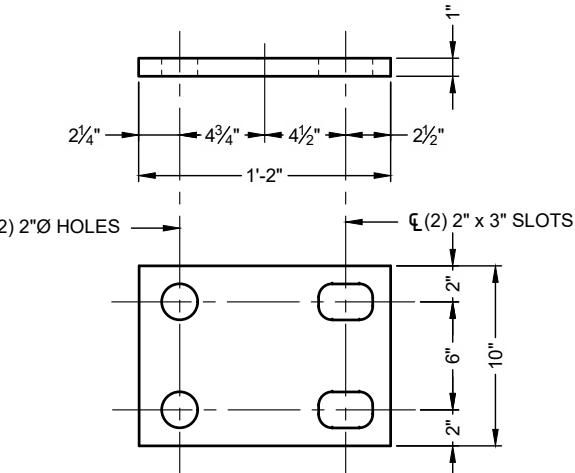


(P, 1" x 14" x 10")  
(GALVANIZED AS PER ASTM A123)

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

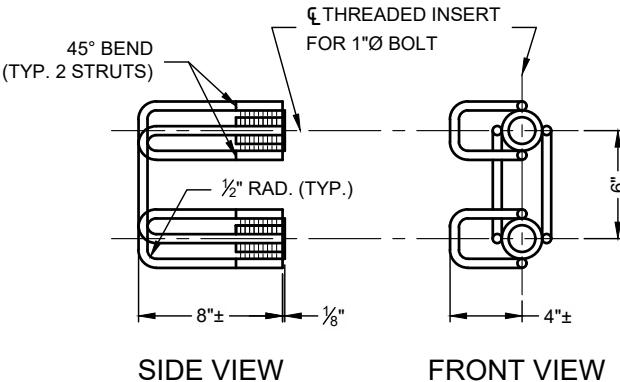


TYPICAL CONNECTION DETAIL - P-2

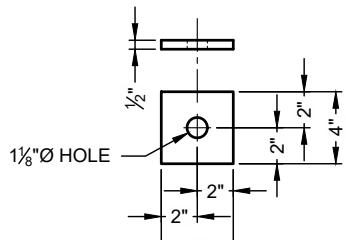


(P, 1" x 14" x 10")  
(GALVANIZED AS PER ASTM A123)

PLATE	P-2
TOTAL REQUIRED =	40 (4) PW-1 REQ'D PER PLATE



TWO BOLT PRESET ANCHOR



PW-1

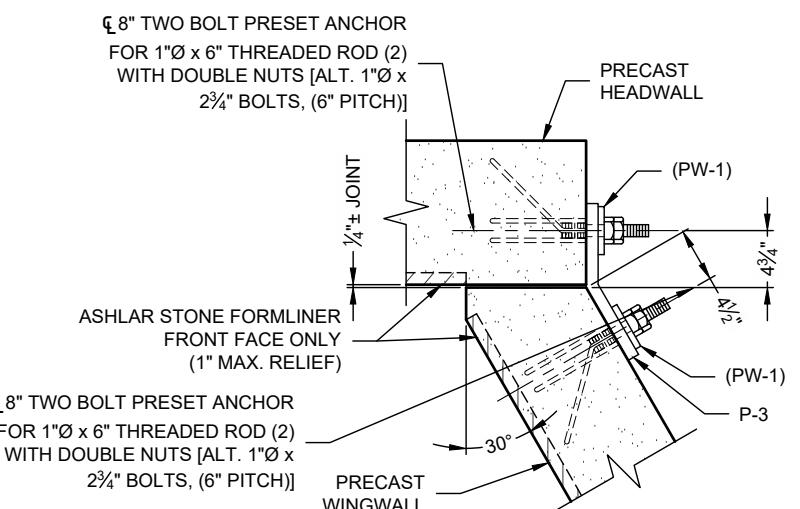
(P, WASHER, 1/2" x 4" x 4")  
(GALVANIZED AS PER ASTM A123)

FIRM NAME - CONTECH ENGINEERED SOLUTIONS LLC  
REGISTRATION # F-14755

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PLAN VIEW  
TYPICAL CONNECTION DETAIL - P-3

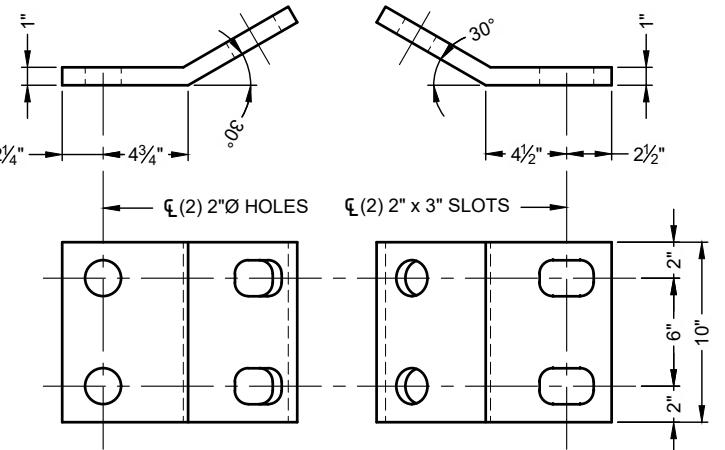
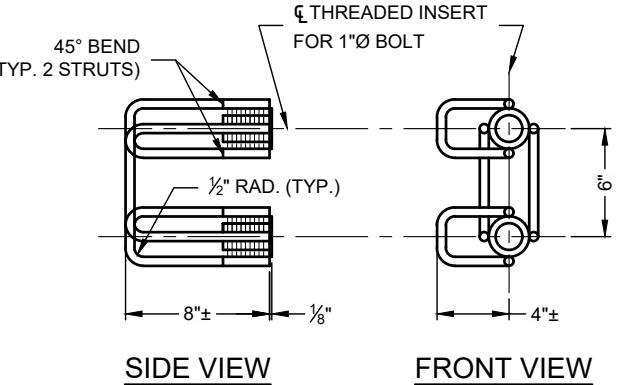
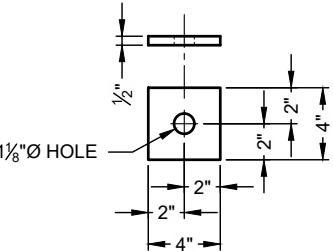


PLATE P-3
TOTAL REQUIRED = 3 (4) PW-1 REQ'D PER PLATE



TWO BOLT PRESET ANCHOR

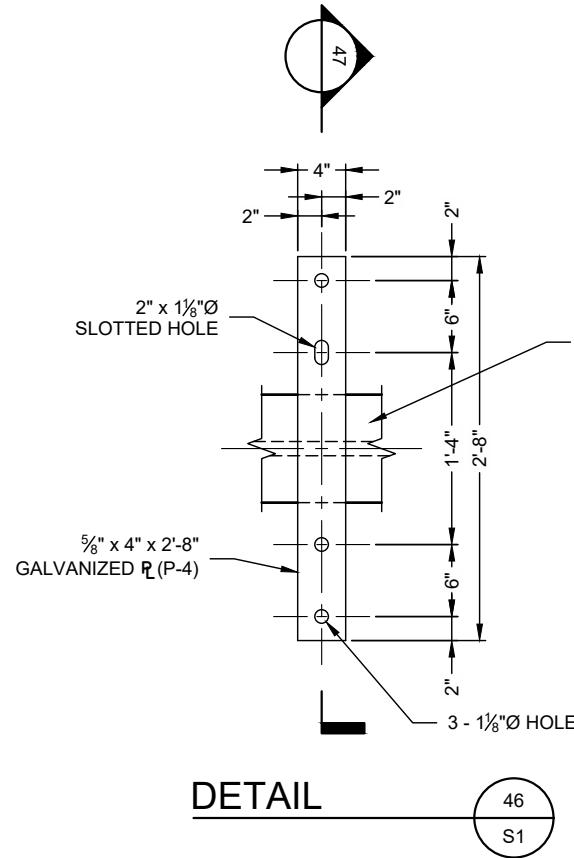


PW-1

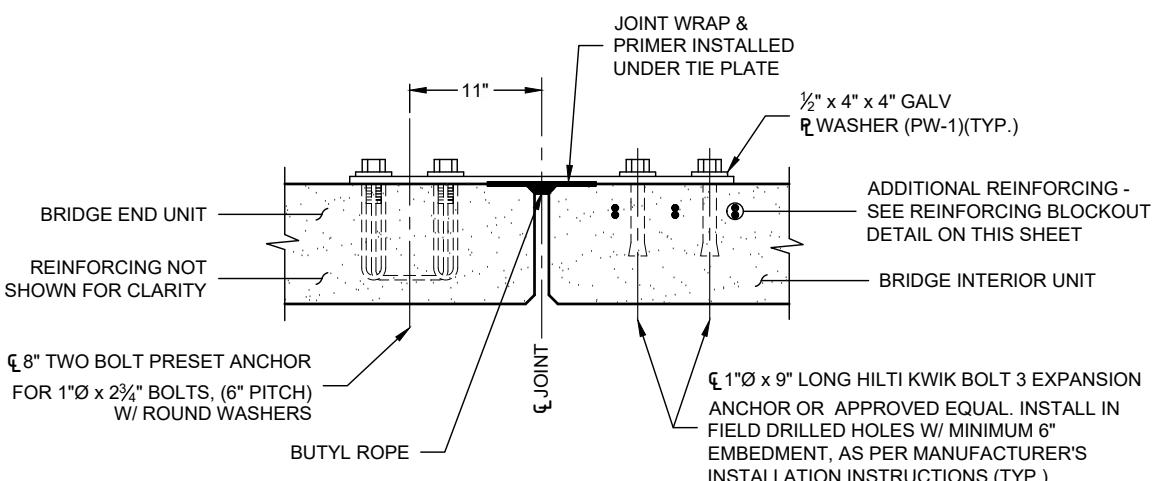
(P WASHER, 1/2" x 4" x 4")  
(GALVANIZED AS PER ASTM A123)

FIRM NAME - CONTECH ENGINEERED SOLUTIONS LLC  
REGISTRATION # F-14755

L:\MERLIN\PROJECT\ACTIVE\736881\736881-130-CON_SPAN-C-SERIES\DRAWINGS\FABRICATION\PR-E736881-130-CO-FABA.DWG			
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MARK	DATE	REVISION DESCRIPTION	BY



DETAIL



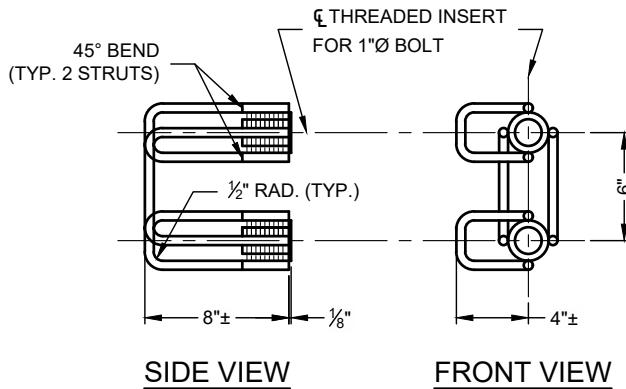
SECTION

PLATE P-4
TOTAL REQUIRED = 8 (4) PW-1 REQ'D PER PLATE

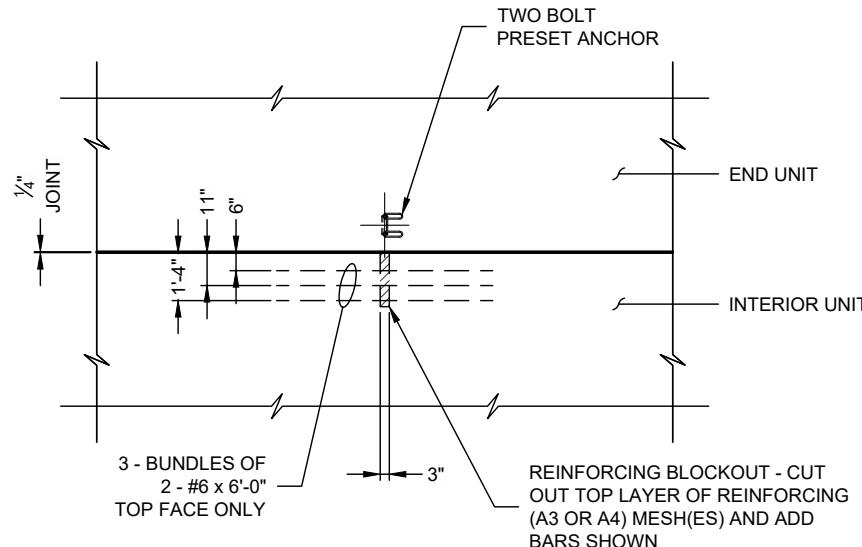
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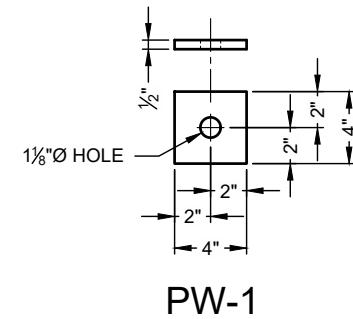
MARK	DATE	REVISION DESCRIPTION	BY



TWO BOLT PRESET ANCHOR



REINFORCING BLOCKOUT DETAIL



PW-1

(P WASHER, 1/2" x 4" x 4")  
(GALVANIZED AS PER ASTM A123)

# SPECIFICATIONS FOR MANUFACTURE 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 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 DESIGN SPECIFICATIONS" 9TH EDITION, ADOPTED BY THE AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS, 2020. 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  $6 \pm 2$  PERCENT AIR. THE AIR-ENTRAINING 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, TYPE III CEMENT.

3.1.2. 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 60,000 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 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 ELECTRO GALVANIZED IN ACCORDANCE WITH ASTM B633 SC-1.

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 AND SHALL BE ELECTRO GALVANIZED.

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 DBDI SPLICE SYSTEM (DOWEL BAR SPlicer AND DOWEL-IN), OR AS MANUFACTURED BY BARSPLICE PRODUCTS INC, DAYTON, OHIO, (937)-275-8700, AND SHALL CONSIST OF BARSPLICER XP TYPE 2 SYSTEM.

**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  $1\frac{1}{2}$ " 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  $1\frac{1}{2}$ " 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  $1\frac{1}{2}$ " 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.

4.2.5. 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, 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 5.10.8.2.5B AND 5.10.8.5.2. FOR DEFORMED WELDED WIRE FABRIC, THE OVERLAP SHALL MEET THE REQUIREMENTS OF AASHTO 5.10.8.2.5A AND 5.10.8.5.1. 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 5.10.8.2.1 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 NOT BE 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 5.10.8.2.5B AND 5.10.8.5.2. FOR DEFORMED WELDED WIRE FABRIC, THE OVERLAP SHALL MEET THE REQUIREMENTS OF AASHTO 5.10.8.2.5A AND 5.10.8.5.1. FOR DEFORMED BILLET-STEEL BARS, THE OVERLAP SHALL MEET THE REQUIREMENTS OF AASHTO 5.10.8.2.1. 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 THEREOF 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 (3000 PSI FOR SPANS  $>48$  FEET), 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  $\frac{1}{8}$ " 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  $\frac{1}{8}$ ". 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  $\frac{1}{8}$ " 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  $\frac{1}{8}$ " IN ANY BRIDGE UNIT.

5.1.5. POSITION OF REINFORCEMENT - THE MAXIMUM VARIATION IN POSITION OF THE REINFORCEMENT SHALL BE  $\pm \frac{1}{8}$ ". IN NO CASE SHALL THE COVER OVER THE REINFORCEMENT BE LESS THAN  $\frac{1}{2}$ " FOR THE OUTSIDE CIRCUMFERENTIAL STEEL OR 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  $\frac{1}{8}$ ".

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  $\frac{1}{8}$ ".

5.2.3. POSITION OF REINFORCEMENT - THE MAXIMUM VARIATION IN THE POSITION OF THE REINFORCEMENT SHALL BE  $\pm \frac{1}{8}$ ". IN NO CASE SHALL THE COVER OVER THE REINFORCEMENT BE LESS THAN  $\frac{1}{2}$ ".

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  $\frac{1}{8}$ ".

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  $\frac{1}{8}$ ".

# 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  $\frac{1}{8}$ " IN 10'-0".

IF A PRECAST CONCRETE FOOTING IS USED, THE CONTRACTOR SHALL PREPARE A 4" THICK BASE LAYER OF COMPAKTED 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 PAD/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  $\frac{1}{8}$ " 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  $\frac{1}{8}$ ",  $\frac{1}{4}$ " AND  $\frac{3}{8}$ " 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  $\frac{1}{4}$ ".

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 IS CURED. IT IS RECOMMENDED THAT TEMPORARY HARDBOARD 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 UNIT'S 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 +  $\frac{1}{8}$ " 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. 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  $\frac{1}{8}$ " x  $\frac{1}{2}$ " 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. GROUTING SHOULD BE COMPLETED AS SOON AS PRACTICAL AFTER PRECAST ARCHES HAVE BEEN INSTALLED. 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  $\frac{1}{4}$ ".

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 HARDBOARD 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 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 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 HOLE-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

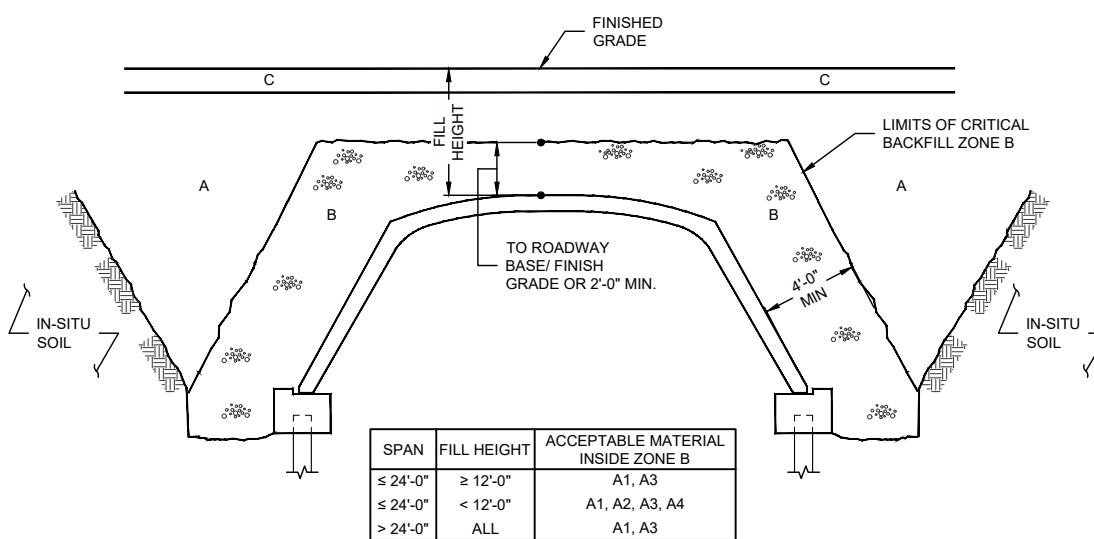
THE CONTRACTOR SHALL CHECK SETTLEMENTS AND HORIZONTAL DISPLACEMENT OF FOUNDATION TO ENSURE THAT THEY ARE WITHIN THE ALLOWABLE LIMIT PROVIDED BY THE ENGINEER. THESE MEASUREMENTS SHOULD GIVE AN INDICATION OF THE SETTLEMENTS AND DEFORMATIONS ALONG THE LENGTH OF THE FOUNDATIONS.

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.

13.8.10. DO NOT PERFORM BACKFILLING DURING WET OR FREEZING

## ACCEPTABLE SOILS FOR USE IN ZONE B BACKFILL

TYPICAL USCS MATERIALS	AASHTO GROUP	AASHTO SUBGROUP	PERCENT PASSING US SIEVE NO.			CHARACTER OF FRACTION PASSING NO. 40 SIEVE	SOIL DESCRIPTION
			#10	#40	#200		
GW, GP, SP GM, SW, SP, SM	A1	A-1a	50 MAX	30 MAX	15 MAX	6 MAX	LARGELY GRAVEL BUT CAN INCLUDE SAND AND FINES
		A-1b		50 MAX	25 MAX	6 MAX	GRAVELY SAND OR GRADED SAND, MAY INCLUDE FINES
GM, SM, ML, SP, GP SC, GC, GM	A2	A-2-4		35 MAX	40 MAX	10 MAX	SANDS, GRAVELS WITH LOW-PLASTICITY SILT FINES
		A-2-5		35 MAX	41 MIN	10 MAX	SANDS, GRAVELS WITH PLASTIC SILT FINES
SP, SM, SW	A3			51 MIN	10 MAX		NON-PLASTIC
				36 MIN	40 MAX	10 MAX	LOW-COMPRESSIBILITY SILTS



## BACKFILL REQUIREMENTS

