

NOTES

GENERAL NOTES:

1. THIS BRIDGE HAS BEEN DESIGNED FOR GENERAL SITE CONDITIONS. THE PROJECT ENGINEER SHALL BE RESPONSIBLE FOR THE STRUCTURE'S SUITABILITY TO THE EXISTING SITE CONDITIONS AND FOR THE HYDRAULIC EVALUATION – INCLUDING SCOUR AND CONFIRMATION OF SOIL CONDITIONS.
2. PRIOR TO CONSTRUCTION, CONTRACTOR MUST VERIFY ALL ELEVATIONS SHOWN THROUGH THE ENGINEER.
3. ONLY CONTECH BRIDGE SOLUTIONS INC. THE BEBO® APPROVED PRECASTER IN NORTH CAROLINA MAY PROVIDE THE STRUCTURE DESIGNED IN ACCORDANCE WITH THESE PLANS.
4. THE USE OF ANOTHER PRECAST STRUCTURE WITH THE DESIGN ASSUMPTIONS USED FOR THE BEBO® STRUCTURE MAY LEAD TO SERIOUS DESIGN ERRORS. USE OF ANY OTHER PRECAST STRUCTURE WITH THIS DESIGN AND DRAWINGS VOIDS ANY CERTIFICATION OF THIS DESIGN AND WARRANTY. CONTECH BRIDGE SOLUTIONS INC. ASSUMES NO LIABILITY FOR DESIGN OF ANY ALTERNATE OR SIMILAR TYPE STRUCTURES.
5. ALTERNATE STRUCTURES MAY BE CONSIDERED, PROVIDED THAT SIGNED AND SEALED DESIGN DRAWINGS (AND CALCULATIONS) ARE SUBMITTED TO THE ENGINEER 2 WEEKS PRIOR TO THE BID DATE FOR REVIEW AND APPROVAL.
6. PROPOSED ALTERNATES TO A BEBO® BRIDGE SYSTEM MUST SUBMIT AT LEAST TWO (2) INDEPENDENTLY VERIFIED FULL SCALE LOAD TESTS THAT CONFIRM THE PROPOSED DESIGN METHODOLOGY OF THE THREE SIDED/ARCH STRUCTURE(S). THE PROPOSED ALTERNATE, UPON SATISFACTORY CONFIRMATION OF DESIGN METHODOLOGY, MAY BE CONSIDERED AN ACCEPTABLE ALTERNATE.

DESIGN DATA

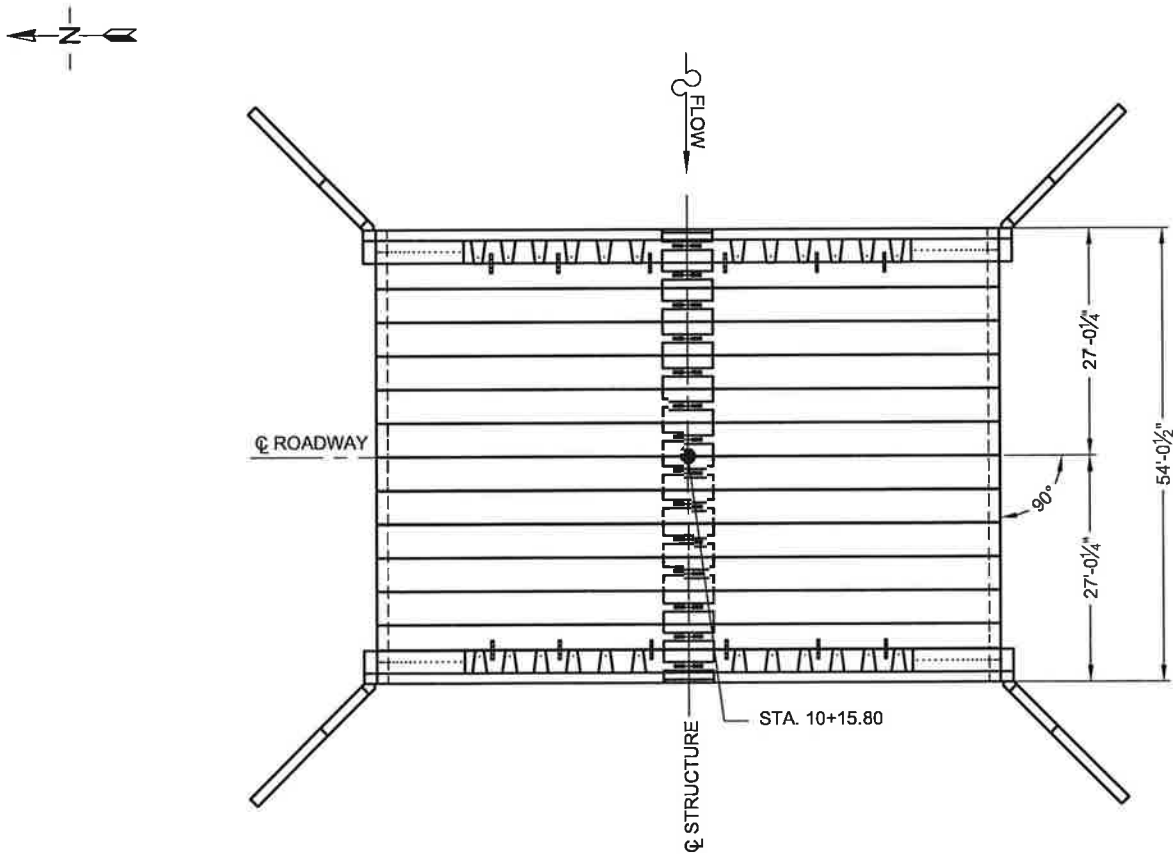
DESIGN LOADING:  
BRIDGE UNITS: HL-93  
HEADWALLS: EARTH PRESSURE ONLY  
WINGWALLS: EARTH PRESSURE ONLY  
DESIGN FILL HEIGHT: 1'-6" MIN. TO 4'-0" MAX.  
FROM TOP OF CROWN TO TOP OF PAVEMENT.  
DESIGN METHOD: LOAD RESISTANCE FACTOR DESIGN  
PER AASHTO LRFD SPECIFICATION  
FACTORED BEARING RESISTANCE: 10000 PSF \*

\*FOUNDATION EXCAVATION AND SUBGRADE PREPARATION SHALL BE IN ACCORDANCE WITH THE GEOTECHNICAL REPORT FOR THIS PROJECT PREPARED BY NCDOT DATED: 7/18/2011

MATERIALS

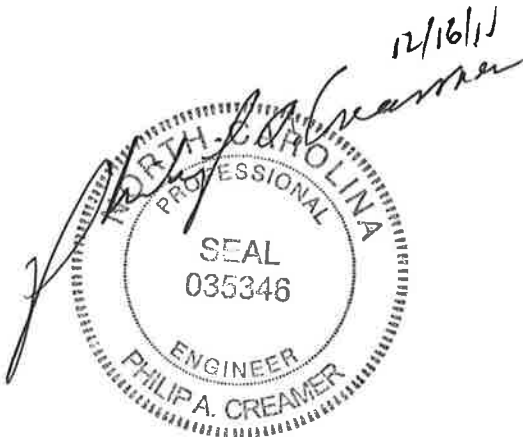
PRECAST UNITS SHALL BE CONSTRUCTED AND INSTALLED IN ACCORDANCE WITH BEBO® SPECIFICATIONS.  
CONCRETE FOR FOOTINGS SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 4000 PSI. REINFORCING STEEL FOR FOOTINGS SHALL CONFORM TO ASTM A615 OR A996-GRADE 60.

NCDOT STOKES COUNTY  
BRIDGE REPLACEMENT  
WALNUT COVE, NORTH CAROLINA



LOCATION PLAN

NOT TO SCALE



CONTECH ARCH ENGINEERING, PROFESSIONAL CORPORATION  
FIRM LICENSE NUMBER: C-3034

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

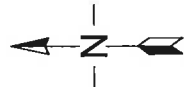


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BRIDGE REPLACEMENT  
WALNUT COVE, NORTH CAROLINA

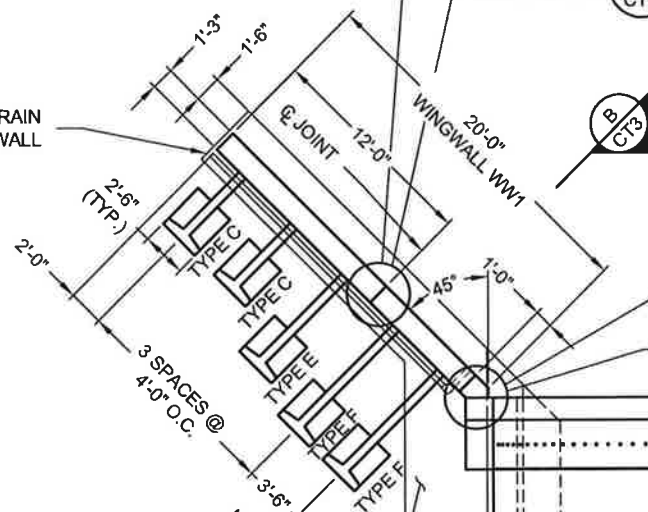
PROJECT No.: 445919	SEQ. No.: 001	DATE: 12/16/2011
DESIGNED: MRP	DRAWN: EWM	
CHECKED: JDR	APPROVED: PAC	
SHEET NO.: CT1	OF CT11	



COVER ALL WINGWALL JOINTS WITH  
2'-0" WIDE STRIP OF FILTER FABRIC

DETAIL 3  
CT6

4"Ø PERFORATED BACKFILL DRAIN  
SUPPLIED WITH WINGWALL

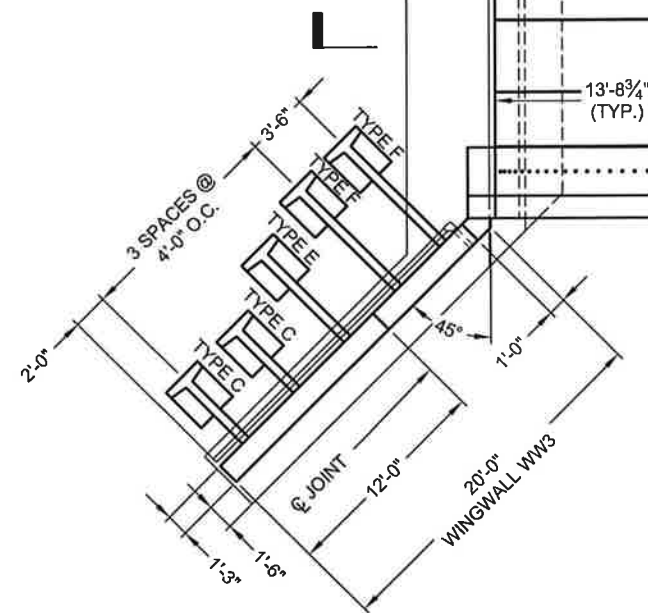


DETAIL 5  
CT7

COVER ALL CORNERS WITH  
2'-0" WIDE STRIP OF FILTER FABRIC

DETAIL 2  
CT6

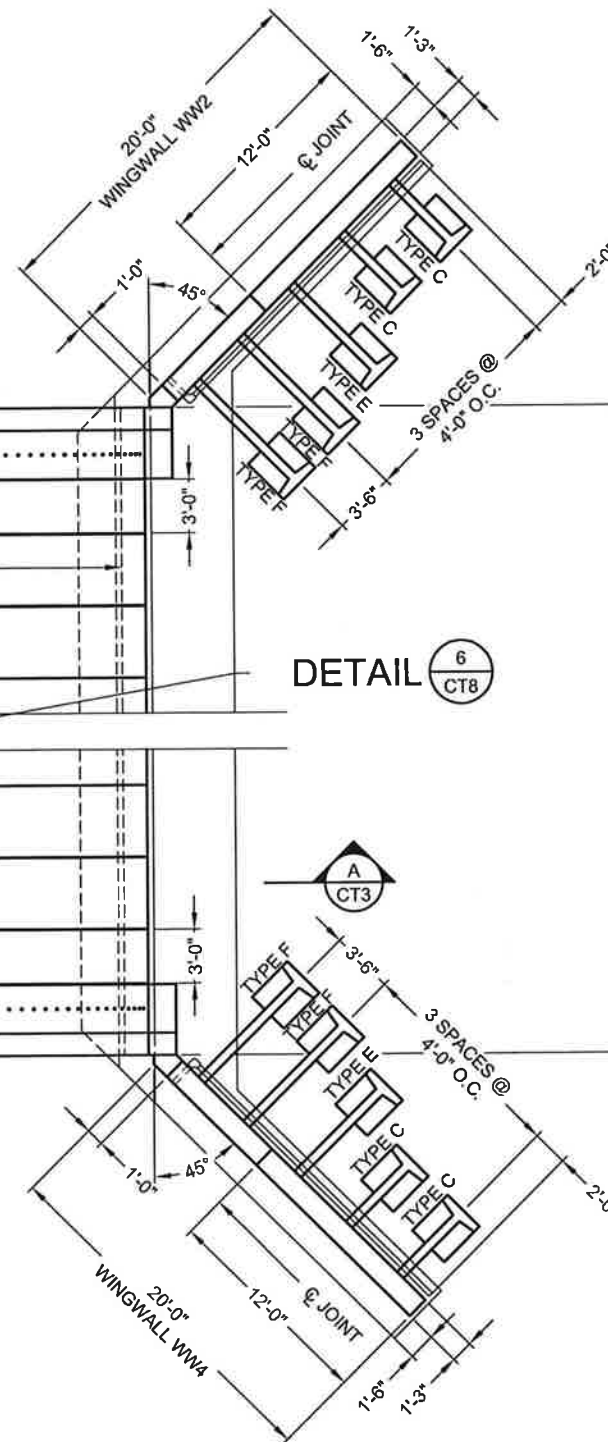
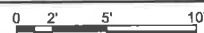
WINGWALL ANCHOR MAY REQUIRE 8" DEEP  
BLOCKOUT IN BRIDGE FOUNDATION DEPENDENT  
UPON FINAL DESIGN WIDTH.  
CONFIRM WITH CONTECH PRIOR TO FOUNDATION  
CONSTRUCTION. (TYP. ALL WALLS)



DETAIL 4  
CT6

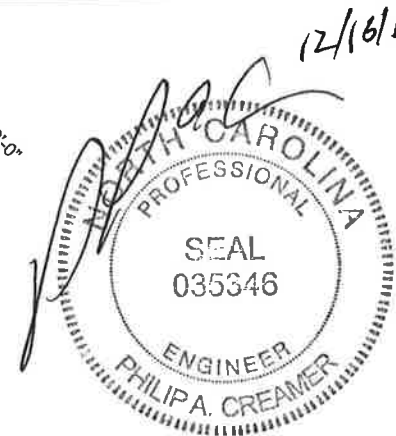
NOTE:  
ARCH FOUNDATION TO BE  
DESIGNED BY OTHERS

BRIDGE PLAN



DETAIL 6  
CT8

12 - 71'-9 1/2" SPAN x 20'-0" RISE x 3'11 1/2" LONG  
2 - 71'-9 1/2" SPAN x 20'-0" RISE x 3'-0" LONG  
PRECAST CONCRETE BRIDGE UNITS  
PLUS 13 JOINTS @ 1/2" PER JOINT



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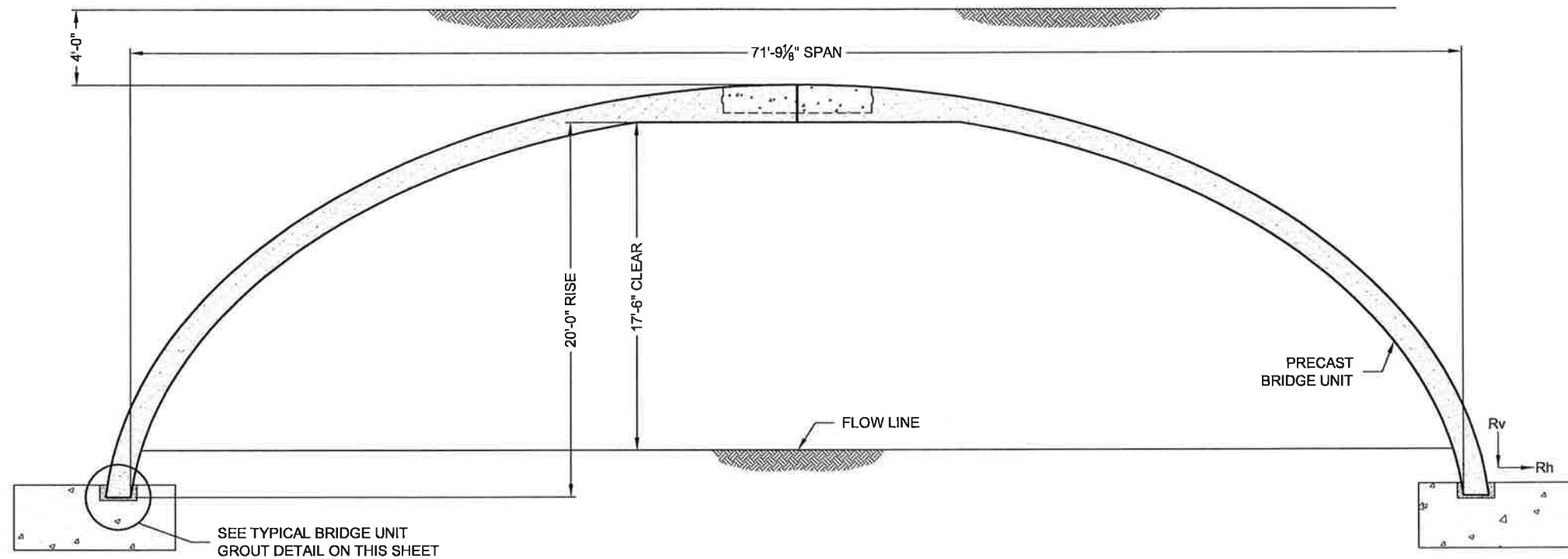
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WALNUT COVE, NORTH CAROLINA

PROJECT No.: 445919	SEQ. No.: 001	DATE: 12/16/2011
DESIGNED: MRP	DRAWN: EWM	
CHECKED: JDR	APPROVED: PAC	
SHEET NO.: CT2 OF CT11		



SEE TYPICAL BRIDGE UNIT  
GROUT DETAIL ON THIS SHEET

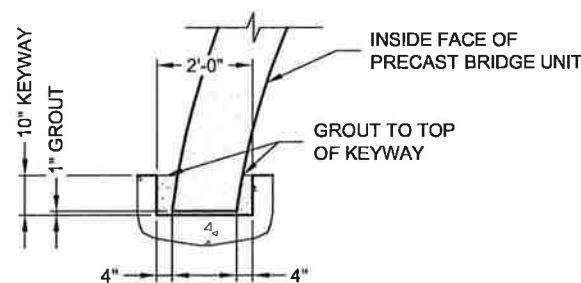
### SECTION A

CT1

BEBO UNIT REACTIONS	
SERVICE LOADS	
Rv (DL) = 56.5 K/FT	
Rv (DL + LL) = 62.8 K/FT	
Rh (DL) = 22.4 K/FT	
Rh (DL + LL) = 25.7 K/FT	

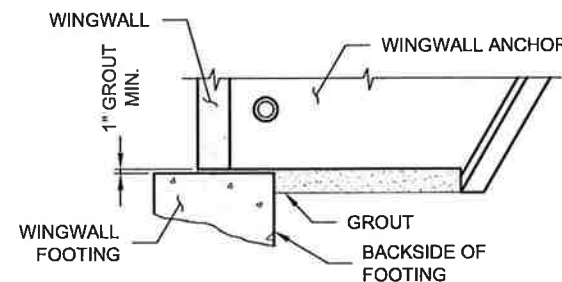
NOTE:  
ARCH FOUNDATION TO BE  
DESIGNED BY OTHERS

NOTE:  
LAP (3'-0") #6 LONGITUDINAL BARS OR  
PROVIDE DOWEL BAR SPLICERS TO  
MAKE IN WINGWALL AND BRIDGE  
FOOTINGS CONTINUOUS



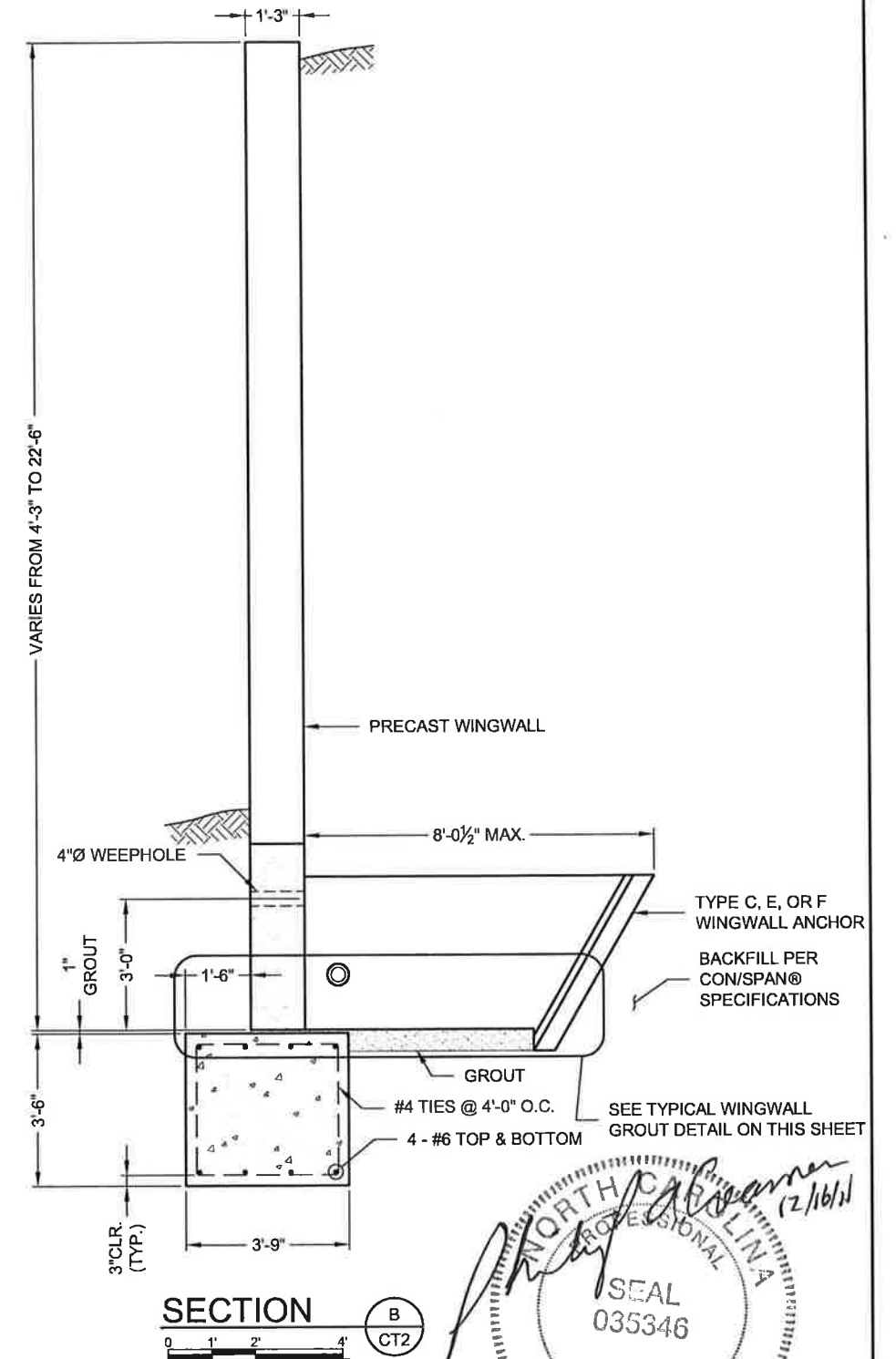
NOTE:  
FILL ENTIRE KEYWAY INCLUDING  
NOMINAL 1" VOID BETWEEN BOTTOM OF  
KEYWAY AND BOTTOM OF PRECAST  
BRIDGE UNIT LEG WITH GROUT.

**TYPICAL BRIDGE UNIT GROUT DETAIL**  
NOT TO SCALE



- NOTES:
- MINIMUM 1" GROUT UNDER WINGWALL LEG & ANCHOR STEM.
  - AREA BETWEEN WINGWALL FOOTING AND WINGWALL ANCHOR SHALL BE GROUTED SOLID BEFORE BACKFILL.
  - FORM BACKSIDE OF FOOTING TO DIMENSIONS SHOWN ON FOUNDATION PLAN.

**TYPICAL WINGWALL GROUT DETAIL**  
NOT TO SCALE

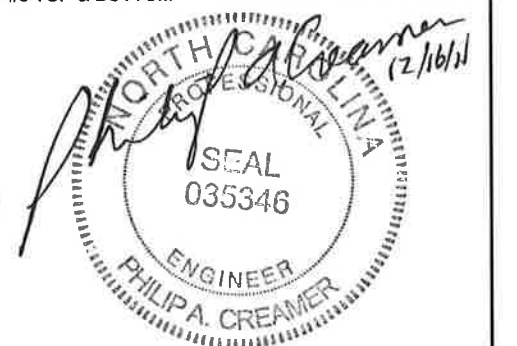


TYPE C, E, OR F  
WINGWALL ANCHOR  
BACKFILL PER  
CON/SPAN@  
SPECIFICATIONS

SEE TYPICAL WINGWALL  
GROUT DETAIL ON THIS SHEET

### SECTION B

CT2



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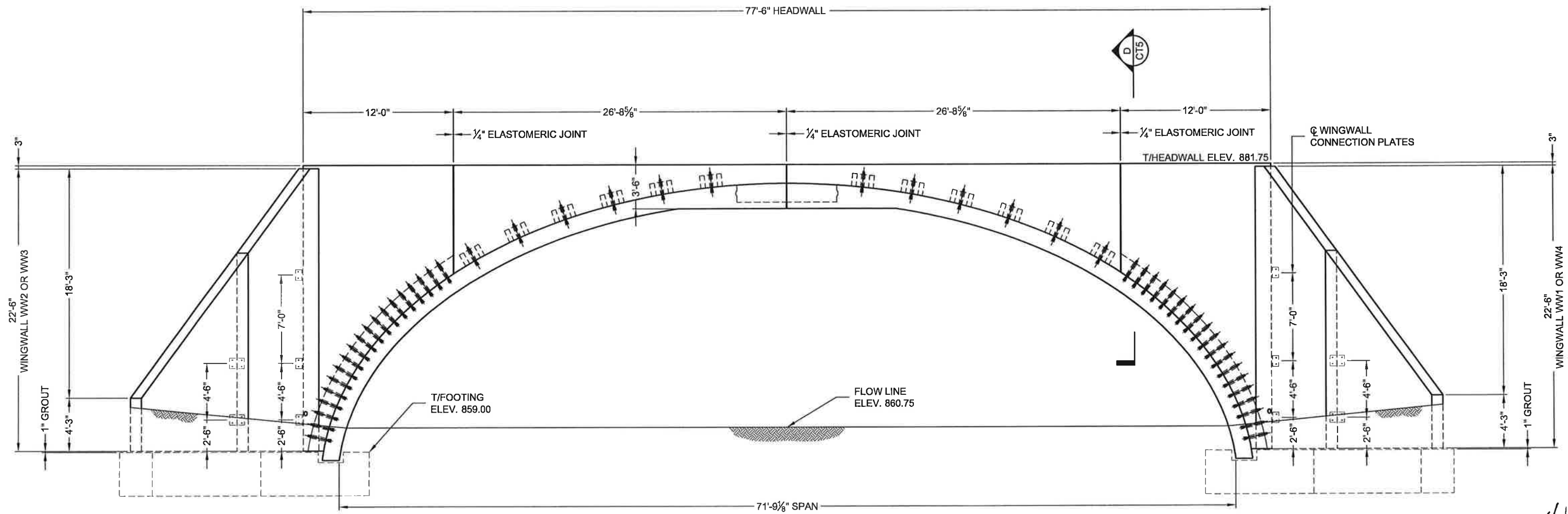
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PROJECT No.: 445919	SEQ. No.: 001	DATE: 12/16/2011
DESIGNED: MRP	DRAWN: EWM	
CHECKED: JDR	APPROVED: PAC	
SHEET NO.:	CT3 OF CT11	



TYPICAL END ELEVATION



NOTE:  
ARCH FOUNDATION TO BE  
DESIGNED BY OTHERS

*Philip A. Creamer*  
12/16/11  
SEAL  
035346  
ENGINEER  
PHILIP A. CREAMER

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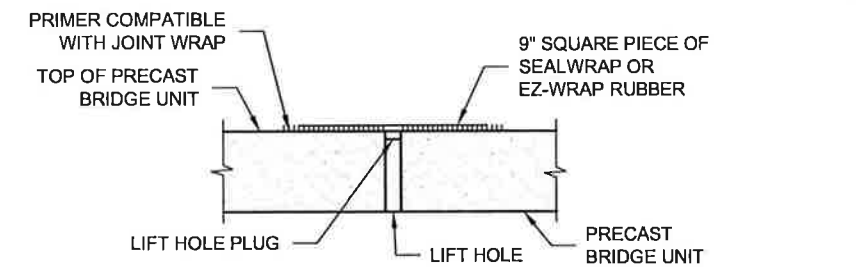
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DESIGNED: MRP	DRAWN: EWM	
CHECKED: JDR	APPROVED: PAC	
SHEET NO.:	CT4	OF CT11



PRIMER COMPATIBLE WITH JOINT WRAP

TOP OF PRECAST BRIDGE UNIT

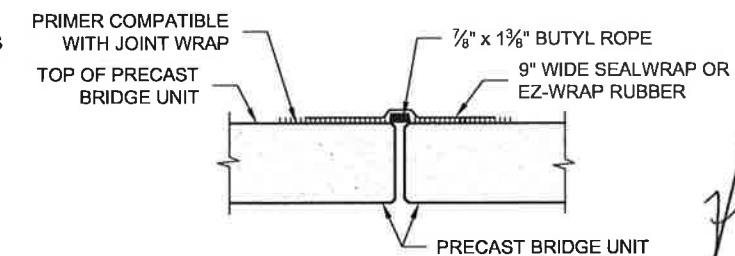
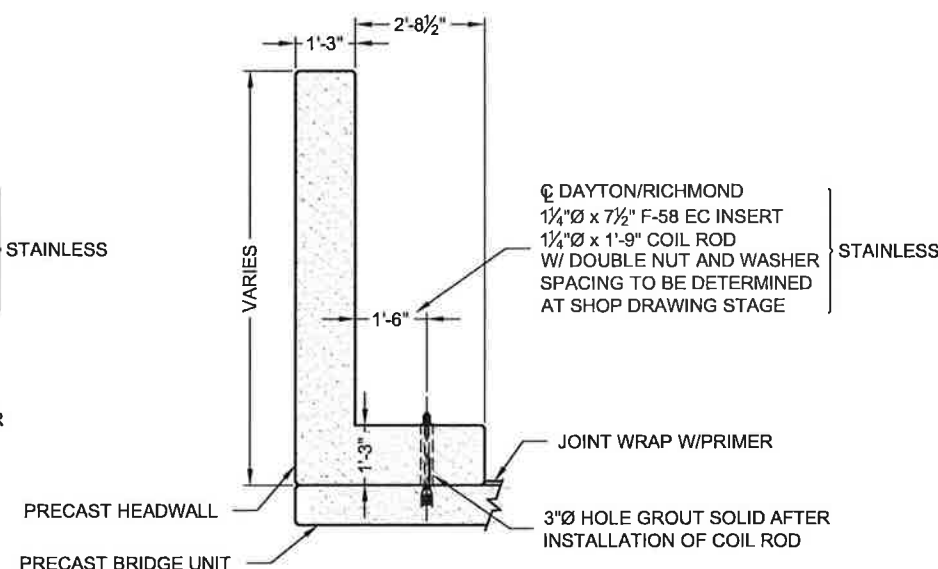
FILL LIFTING INSERT POCKET WITH GROUT, FINISHING FLUSH

9" SQUARE PIECE OF SEAL/WRAP OR EZ-WRAP RUBBER

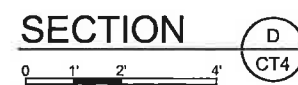
LIFTING INSERT

PRECAST BRIDGE UNIT, HEADWALL OR WINGWALL

NOT TO SCALE



NOT TO SCALE



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DESIGNED: <b>MRP</b>	DRAWN: <b>EWM</b>	
CHECKED: <b>JDR</b>	APPROVED: <b>PAC</b>	
SHEET NO.: <b>CT5 OF CT11</b>		

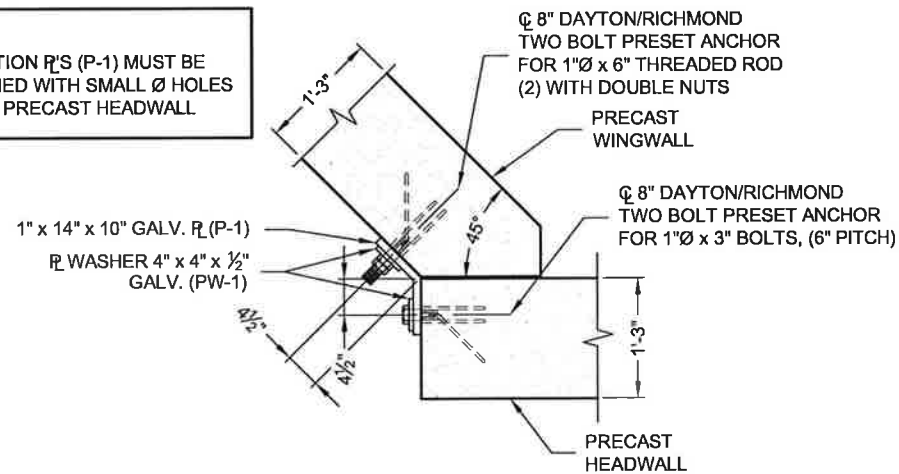
12/16/11

AP OR  
ER

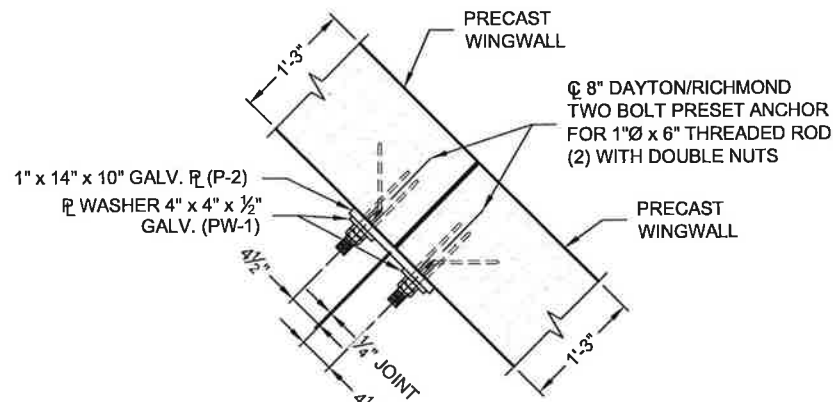
*Philip Creamer*

NORTH CAROLINA  
PROFESSIONAL  
SEAL  
035346  
ENGINEER  
PHILIP A. CREAMER

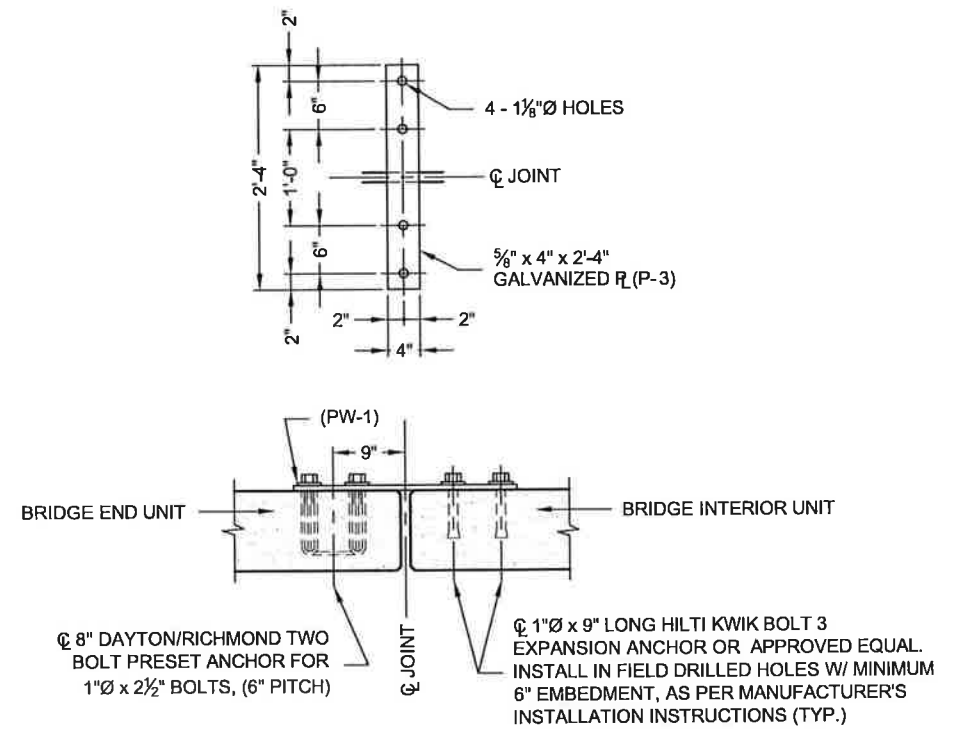
NOTE:  
CONNECTION R'S (P-1) MUST BE  
POSITIONED WITH SMALL Ø HOLES  
TOWARD PRECAST HEADWALL



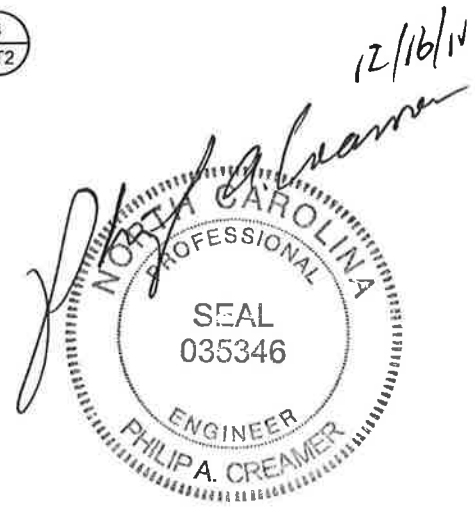
DETAIL @ HEADWALL 2 CT2



DETAIL 3 CT2



DETAIL NOT TO SCALE 4 CT2



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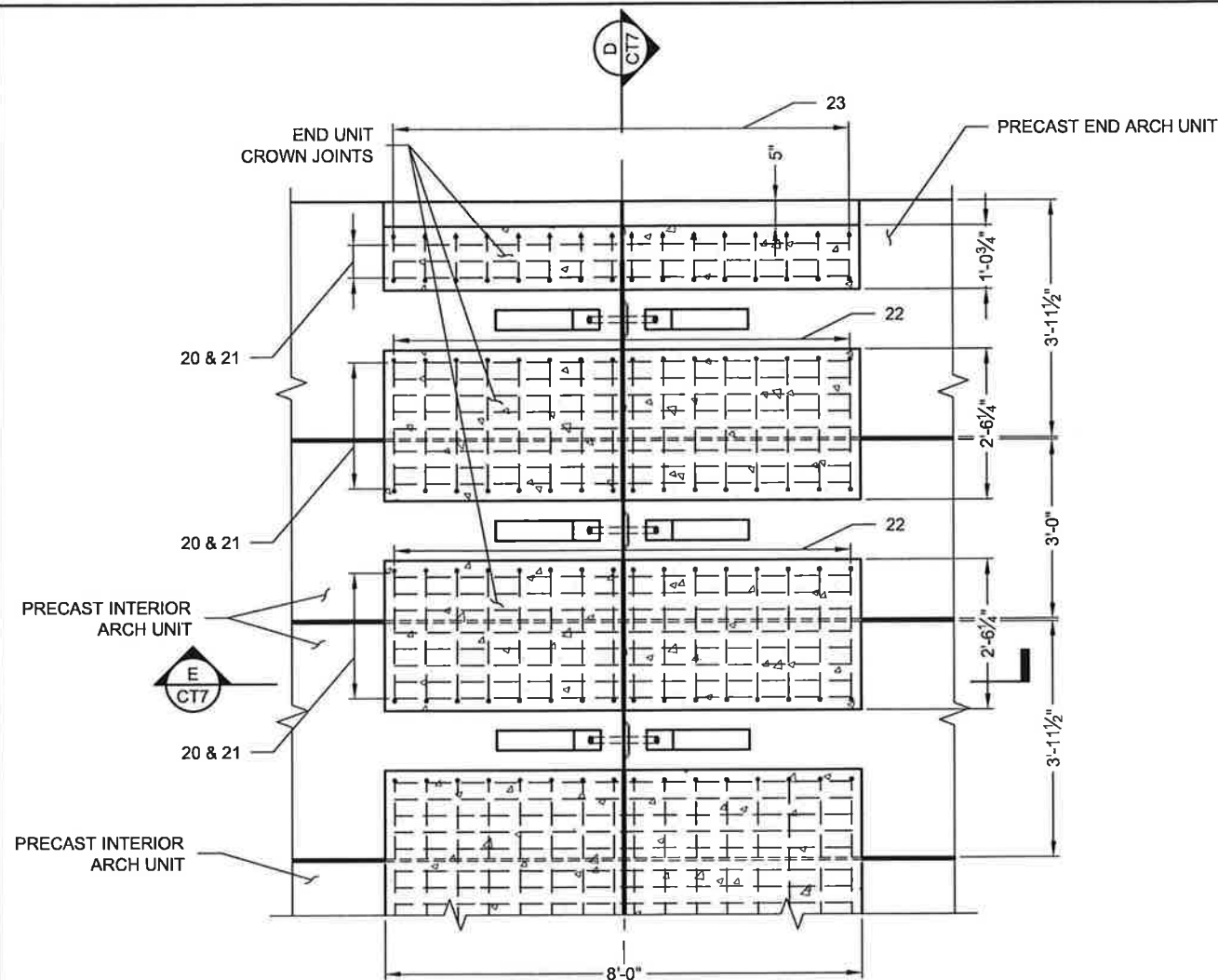
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BRIDGE REPLACEMENT  
WALNUT COVE, NORTH CAROLINA

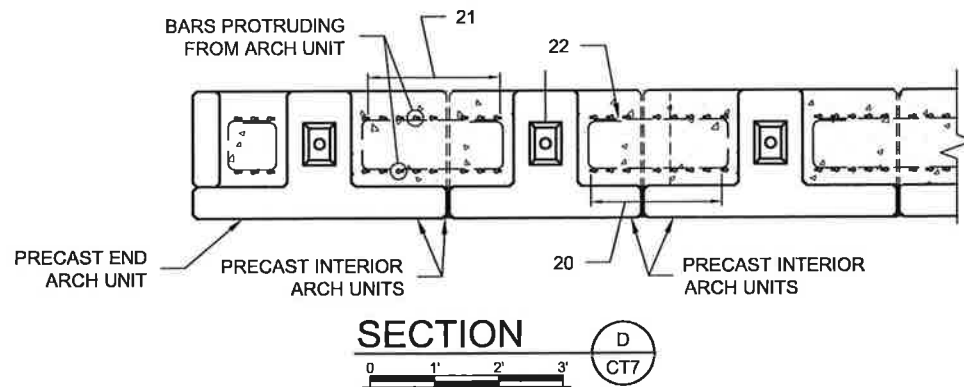
PROJECT No.: 445919	SEQ. No.: 001	DATE: 12/16/2011
DESIGNED: MRP	DRAWN: EWM	
CHECKED: JDR	APPROVED: PAC	
SHEET NO.: CT6	OF CT11	



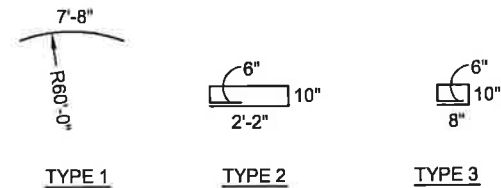
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DETAIL 5 CT2



SECTION D CT7

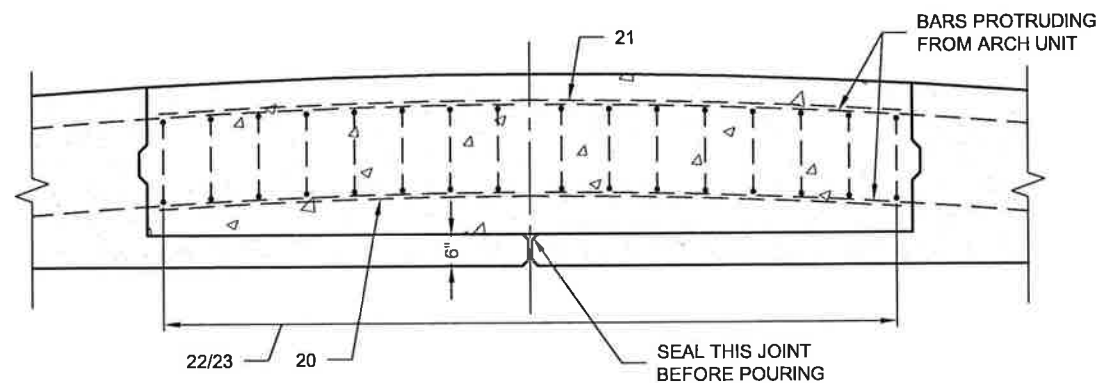


## REINFORCING BAR LIST - E72T

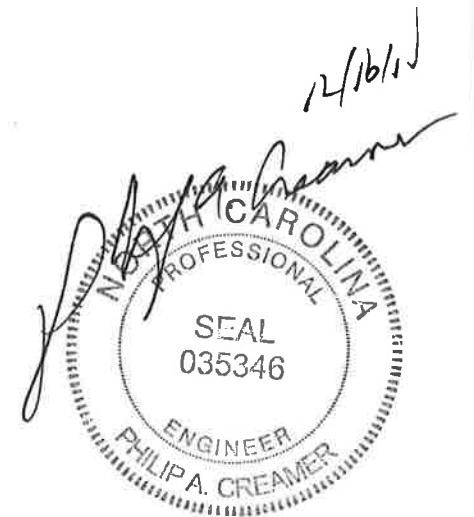
MARK	SIZE	NO.	LENGTH	TYPE	fy = 60 ksi
20	#6	76	7'-8"	1	SPACED @ 3 1/8" ± O.C.
21	#8	76	7'-8"	1	SPACED @ 3 1/8" ± O.C.
22	#3	64	6'-6"	2	SPACED @ 6" O.C.
23	#3	32	3'-6"	3	SPACED @ 6" ± O.C.

### NOTE:

- SELECT APPROPRIATE SPACERS (NOT INDICATED ON DRAWING).
- CROWN JOINT TO BE CAST-IN-PLACE 6000 PSI CONCRETE.
- CONCRETE AND REINFORCEMENT SUPPLIED BY CONTRACTOR EXCEPT WHERE NOTED.



SECTION E CT7



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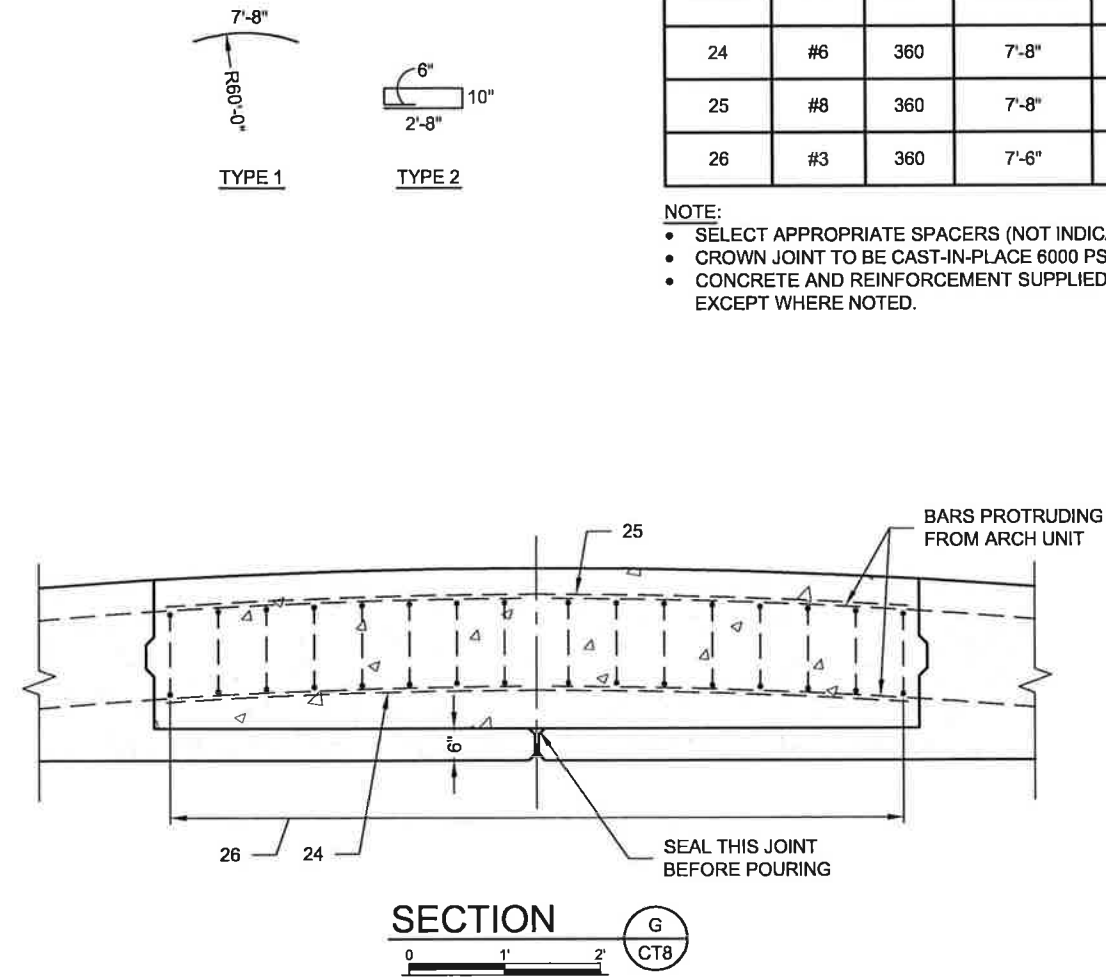
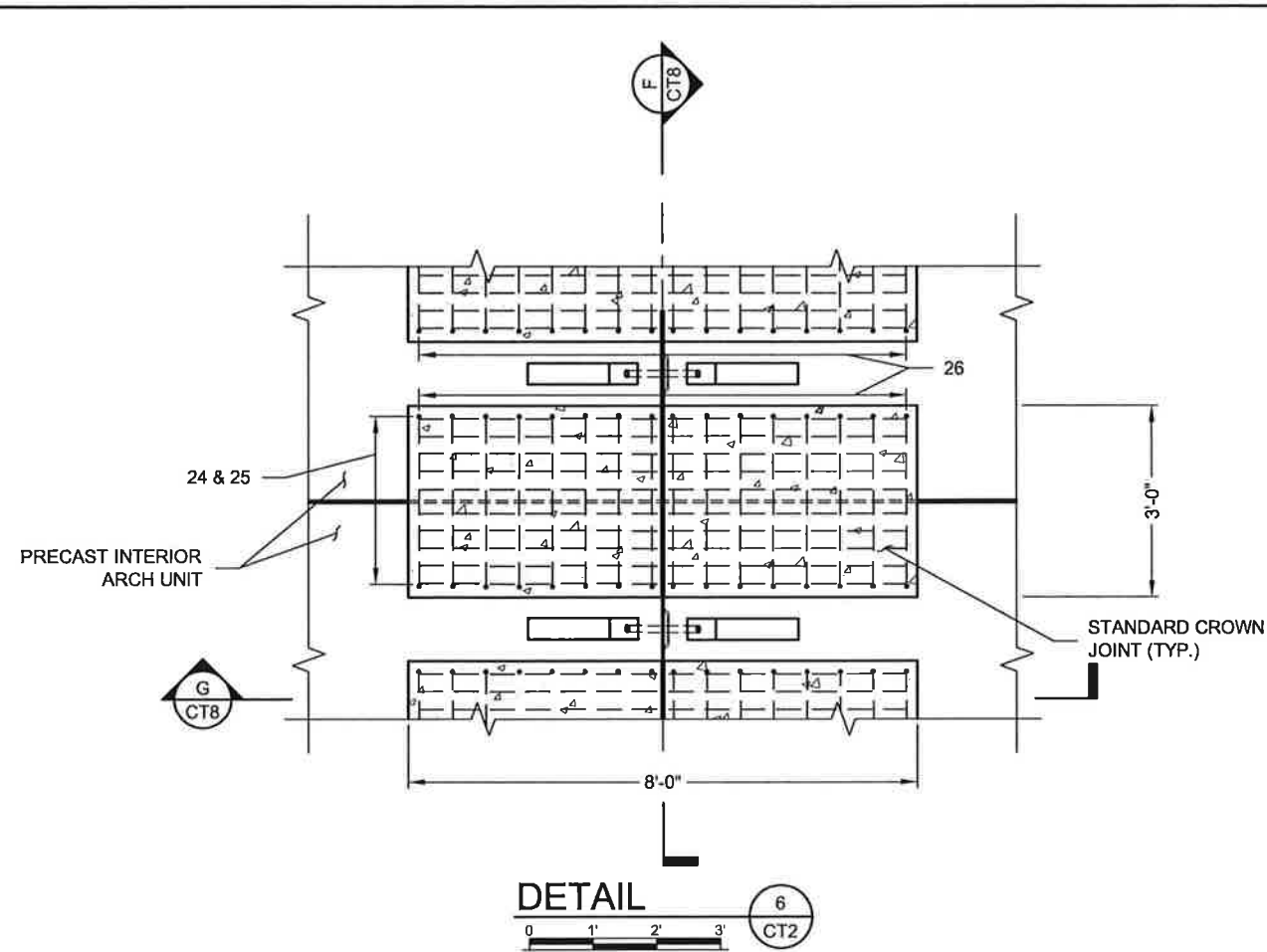
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PROJECT No.: 445919	SEQ. No.: 001	DATE: 12/16/2011
DESIGNED: MRP	DRAWN: EWM	
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SHEET NO.: CT7 OF CT11		

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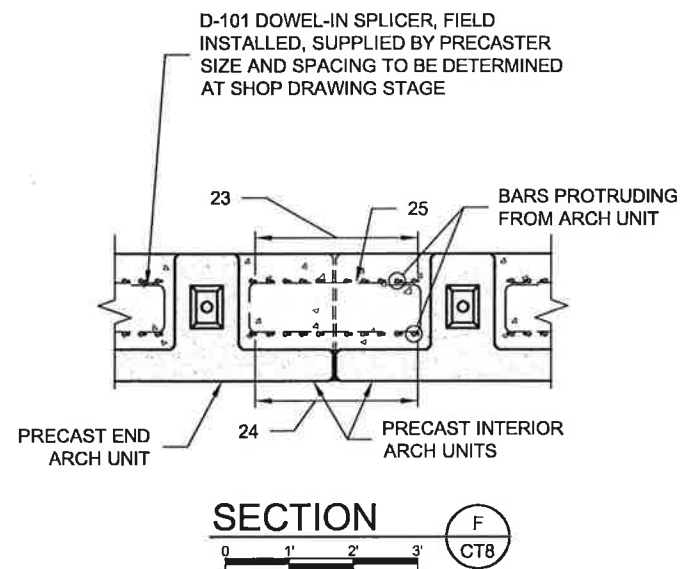


## REINFORCING BAR LIST - E72T

MARK	SIZE	NO.	LENGTH	TYPE	fy = 60 ksi
24	#6	360	7'-8"	1	SPACED @ 3 1/8" ± O.C.
25	#8	360	7'-8"	1	SPACED @ 3 1/8" ± O.C.
26	#3	360	7'-6"	2	SPACED @ 6" O.C.

### NOTE:

- SELECT APPROPRIATE SPACERS (NOT INDICATED ON DRAWING).
- CROWN JOINT TO BE CAST-IN-PLACE 6000 PSI CONCRETE.
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CHECKED: JDR	APPROVED: PAC	
SHEET NO.: CT8	OF CT11	





SPECIFICATIONS FOR MANUFACTURE AND INSTALLATION OF BEBO® ARCH SYSTEMS (CONTINUED)

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. A COPY OF THE REPORT SHALL BE SUBMITTED TO CONTECH® BRIDGE SOLUTIONS PRIOR TO SHIPMENT OF PRECAST CONCRETE ELEMENTS.

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 WITHOUT WRITTEN APPROVAL FROM CONTECH® BRIDGE SOLUTIONS.

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 LAID OUT IN THE PROJECT'S PRE-CONSTRUCTION NOTES.

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® BRIDGE 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® BRIDGE SOLUTIONS.

13.1.2.1. IN THE IMMEDIATE AREA OF THE BRIDGE UNIT, 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 INCHES 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 FEET, 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 MASONITE OR STEEL SHIMS 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.

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".

IT IS IMPERATIVE THAT ANY LATERAL SPREADING OF THE BRIDGE ELEMENTS BE AVOIDED DURING AND AFTER THEIR PLACEMENT. THEREFORE, A SUFFICIENT QUANTITY OF HARDWOOD WEDGES MUST BE AVAILABLE AND ON SITE. THE HARDWOOD WEDGES ARE PLACED IN THE KEY AND SMALLER SHIMS AND WEDGES ADDED BEFORE COMPLETE RELEASE OF THE PRECAST CONCRETE BRIDGE ELEMENT FROM THE CRANE. ALSO, A SUPPLY OF 1/4", 1/2" AND 3/4" THICK STEEL OR MASONITE SHIMS FOR VARIOUS SHIMMING PURPOSES SHOULD BE ON SITE, PER SECTION 13.2.

13.3.1. BEBO PRECAST CONCRETE TWIN-LEAF ARCH UNITS ARE TRANSPORTED AND LIFTED/ROTATED IN A SIMILAR MANNER AS THE SINGLE-LEAF ELEMENTS. TWO DOUBLE-DRUM CRANES (OR ONE CRANE AND DISPLACEABLE SCAFFOLDING) ARE REQUIRED FOR THE ERECTION OF THE PRECAST CONCRETE ARCH UNITS.

13.3.2. IDEALLY, ONE CRANE SHALL BE LOCATED ON EACH (OUTER) SIDE OF THE FOUNDATIONS TO INDEPENDENTLY LIFT HALF-ARCH UNITS FROM THE DELIVERY TRUCKS AND INTO POSITION. THE TWO TWIN PRECAST CONCRETE UNITS ARE LIFTED AND POSITIONED SIMULTANEOUSLY.

13.3.3. ALTERNATIVELY, IF CRANES ARE TO BE POSITIONED ON THE SAME SIDE OF THE FOUNDATIONS OR WITHIN THE ARCH SPAN, THEY SHOULD BE LOCATED SO THAT THE FINAL JOINTING MOVEMENT OF THE UNITS AT THE CROWN CAN BE EFFECTED WITHOUT DAMAGE TO THE INTERLOCKING JOINT KEY.

13.3.4. BEFORE RELEASING THE LOAD OF EACH PRECAST CONCRETE ARCH HALF UNIT FROM THE CRANE, BOTH ELEMENTS MUST BE BLOCKED AT THE FOUNDATION KEY IN THE CORRECT POSITION AND THE CURVED TIE ROD MUST BE INSERTED AND FIXED IN THE BLOCKOUTS AT THE CROWN JOINT.

13.3.5. CHECK THE SPAN WIDTH AT REGULAR INTERVALS TO MINIMIZE THE SPREADING.

13.3.6. ONCE CORRECTLY POSITIONED AND ALIGNED, THE PRECAST CONCRETE TWIN-LEAF UNITS ARE JOINTED AT THE CROWN WITH CAST-IN-PLACE CONCRETE AS SHOWN IN THE DRAWINGS.

13.4. PLACEMENT OF WINGWALLS & HEADWALLS - THE WINGWALLS AND HEADWALLS SHALL BE PLACED AS SHOWN ON THE PLAN DRAWINGS. SPECIAL CARE SHALL BE TAKEN IN SETTING THE ELEMENTS TO THE TRUE LINE AND GRADE.

13.5. WATERPROOFING/ JOINT PROTECTION AND SUBSURFACE DRAINAGE.

13.5.1. EXTERNAL PROTECTION OF JOINTS - THE BUTT JOINT MADE BY TWO ADJOINING BRIDGE UNITS SHALL BE COVERED WITH A 7/8" 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 NINE INCHES ON EACH SIDE OF THE JOINT. THE EXTERNAL WRAP SHALL BE EITHER 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.

13.5.2. 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.

13.5.3. CROWN JOINT WATERPROOFING MEMBRANE - THE CAST-IN-PLACE CROWN JOINTS CONNECTING TWO ARCH LEAFS SHALL BE COVERED WITH WATERPROOFING MEMBRANE. THE MEMBRANE SHALL BE A MINIMUM OF 3'-0" WIDE AND OVERLAPPED AS REQUIRED PER THE MEMBRANE MANUFACTURER'S RECOMMENDATIONS TO PROVIDE CONTINUOUS COVERAGE OF THE ARCH CROWN. THE SURFACE SHALL BE FREE OF DIRT BEFORE APPLYING THE MEMBRANE. A PRIMER COMPATIBLE WITH THE MEMBRANE TO BE USED SHALL BE APPLIED. THE MEMBRANE SHALL BE BITUTHENE 3000 BY W.R. GRACE OR APPROVED EQUAL. THE CROWN JOINT SHALL BE CONTINUOUSLY COVERED PLUS 3'-0" MINIMUM BEYOND THE C.I.P. CONCRETE. ANY SPLICES THAT RESULT IN THE MEMBRANE SHALL HAVE A MINIMUM OF A 6" LONG LAP AND WITH THE OVERLAP RUNNING DOWNHILL. A LIQUID MEMBRANE TERMINATION SHALL BE APPLIED TO THE PERIMETER OF THE MEMBRANE. CROWN JOINT WATERPROOFING IS NOT REQUIRED IF FULL ARCH MEMBRANE WATERPROOFING IS REQUIRED.

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

13.5.5. SUBSOIL DRAINAGE SHALL BE AS DIRECTED BY THE

ENGINEER.

13.6. GROUTING

13.6.1. GROUTING SHALL NOT BE PERFORMED WHEN TEMPERATURES ARE EXPECTED TO GO BELOW 35° FOR A PERIOD OF 72 HOURS.

13.6.2. 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 FOR SPANS ≤ 48 FEET, 5000 PSI FOR SPANS > 48 FEET, UNLESS OTHERWISE INDICATED ON THE INSTALLATION DRAWINGS. VIBRATE AS REQUIRED TO ENSURE THAT THE ENTIRE KEY AROUND THE BRIDGE ELEMENT IS COMPLETELY FILLED.

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

13.6.4. LIFTING AND ERECTION ANCHOR RECESSES SHALL BE FILLED WITH GROUT.

13.7. CROWN JOINT

13.7.1. THE CROWN JOINT AREAS MUST BE CLEAN AND FREE OF DEBRIS BEFORE POURING OF CONCRETE.

13.7.2. THE JOINTS BETWEEN ARCH UNITS SURROUNDING THE CROWN JOINTS MUST BE FILLED SO AS TO NOT ALLOW WET CONCRETE TO SEEP THROUGH JOINTS WHILE THE CROWN JOINT IS BEING POURED.

13.7.3. CONCRETE USED FOR THE CROWN JOINT CLOSURE POUR MUST HAVE A MINIMUM COMPRESSIVE STRENGTH AS SPECIFIED ON THE DRAWINGS.

13.7.4. THE CONCRETE FOR THE CROWN JOINT 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-ENTRAINING ADMIXTURE SHALL CONFORM TO AASHTO M154.

13.7.4.1. THE PORTLAND CEMENT SHALL CONFORM TO THE REQUIREMENTS OF ASTM SPECIFICATIONS C150-TYPE I, TYPE II, OR TYPE III CEMENT.

13.7.4.2. THE COARSE AGGREGATE SHALL CONSIST OF STONE HAVING A MAXIMUM SIZE OF 1 INCH. AGGREGATE SHALL MEET REQUIREMENTS FOR ASTM C33.

13.7.4.3. THE CONTRACTOR MAY SUBMIT, FOR APPROVAL BY THE ENGINEER, A WATER-REDUCING ADMIXTURE FOR THE PURPOSE OF INCREASING WORKABILITY AND REDUCING THE WATER REQUIREMENT FOR THE CROWN JOINT CONCRETE.

13.7.4.4. THE ADDITION OF CALCIUM CHLORIDE OR ADMIXTURES CONTAINING CALCIUM CHLORIDE WILL NOT BE PERMITTED.

13.7.4.5. THE AGGREGATES, CEMENT, AND WATER SHALL BE PROPORTIONED AND MIXED TO PRODUCE A HOMOGENEOUS CONCRETE MEETING THE STRENGTH REQUIREMENTS OF THE DESIGN.

13.7.5. ALL REINFORCING BARS USED IN THE CROWN JOINT SHALL BE DEFORMED BARS (ASTM A615) GRADE 60.

13.7.5.1. BAR REINFORCEMENT SHALL BE CUT AND BENT TO THE SHAPES SHOWN ON THE PLANS. ALL BARS SHALL BE BENT COLD, UNLESS OTHERWISE PERMITTED.

13.7.5.2. BAR REINFORCEMENT SHALL BE ACCURATELY PLACED AS SHOWN ON THE PLANS AND FIRMLY HELD IN POSITION DURING THE PLACING AND SETTING OF THE CROWN JOINT CONCRETE. TACK WELDING OF THE REINFORCEMENT WILL NOT BE PERMITTED FOR ASSEMBLY OF REINFORCEMENT.

13.7.6. LEGS OF ARCHES TO BE FULLY GROUTED IN FOUNDATION KEYWAY BEFORE POURING THE CROWN JOINT. KEYWAY GROUT TO ATTAIN 75% OF ITS DESIGN STRENGTH (3750 PSI) BEFORE CROWN JOINT CAN BE POURED.

13.7.7. CONCRETE IN CROWN JOINT MUST ATTAIN 75% OF ITS DESIGN STRENGTH BEFORE HEADWALL PANELS CAN BE SET ON THE ARCH UNITS.

13.7.8. CONCRETE IN CROWN JOINT MUST ATTAIN 100% OF ITS DESIGN STRENGTH BEFORE BACKFILLING OPERATIONS CAN BEGIN.

13.7.9. DO NOT POUR CONCRETE FOR THE CROWN JOINT WHEN TEMPERATURES ARE EXPECTED TO GO BELOW 35 DEGREES FAHRENHEIT FOR A PERIOD OF 72 HOURS.

13.7.10. NO WATERPROOFING SEALANT OR SEALER SHALL BE APPLIED WITHIN THE CROWN JOINT AREA. SHOULD ANY AREAS WITHIN THE CROWN JOINT BE COVERED WITH SEALANT OR SEALER, THE AREAS SHOULD BE SANDBLASTED TO REMOVE THE SEALANT OR SEALER.

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

13.8.6. PLACING AND COMPACTING BACKFILL - DUMPING FOR BACKFILLING IS NOT ALLOWED ANY NEARER THAN 3'-0" TO A VERTICAL PLANE THROUGH THE BRIDGE KEY.

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 STANDARD PROCTOR AS REQUIRED BY AASHTO T-99.

SOIL WITHIN 1'-0" OF CONCRETE SURFACES SHOULD BE HAND-COMPACTED. ELSEWHERE, USE OF ROLLERS IS ACCEPTABLE. IF VIBRATING ROLLER-COMPACTORS ARE USED, THEY SHOULD 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 SHOULD 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'-0", NO BACKFILLING MAY BEGIN UNTIL A BACKFILL COMPACTION TESTING PLAN HAS BEEN COORDINATED WITH AND APPROVED BY CONTECH® BRIDGE SOLUTIONS. COST OF THE BACKFILL COMPACTION TESTING SHALL BE INCLUDED IN THE COST OF THE PRECAST UNITS. THIS INCLUDED COST APPLIES ONLY TO PROJECTS WITH FILL HEIGHTS OVER 12'-0" (AS MEASURED FROM TOP CROWN OF BRIDGE TO FINISHED GRADE).

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

13.9. 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 ROW 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.

THE MAXIMUM DIFFERENCE IN VERTICAL DISPLACEMENTS 'V' SHOULD NOT EXCEED 1" ALONG THE LENGTH OF ONE FOUNDATION.

CONTECH ARCH ENGINEERING, PROFESSIONAL CORPORATION  
FIRM LICENSE NUMBER: C-3034

PROJECT No.: 445919  
SEQ. No.: 001  
DATE: 12/16/2011

DESIGNED: MRP  
DRAWN: EWM

CHECKED: JDR  
APPROVED: PAC

SHEET NO.: CT10 OF CT11

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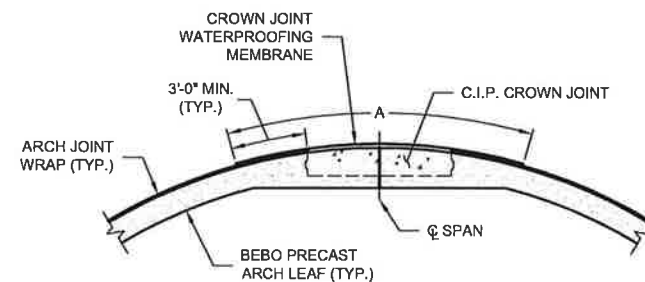
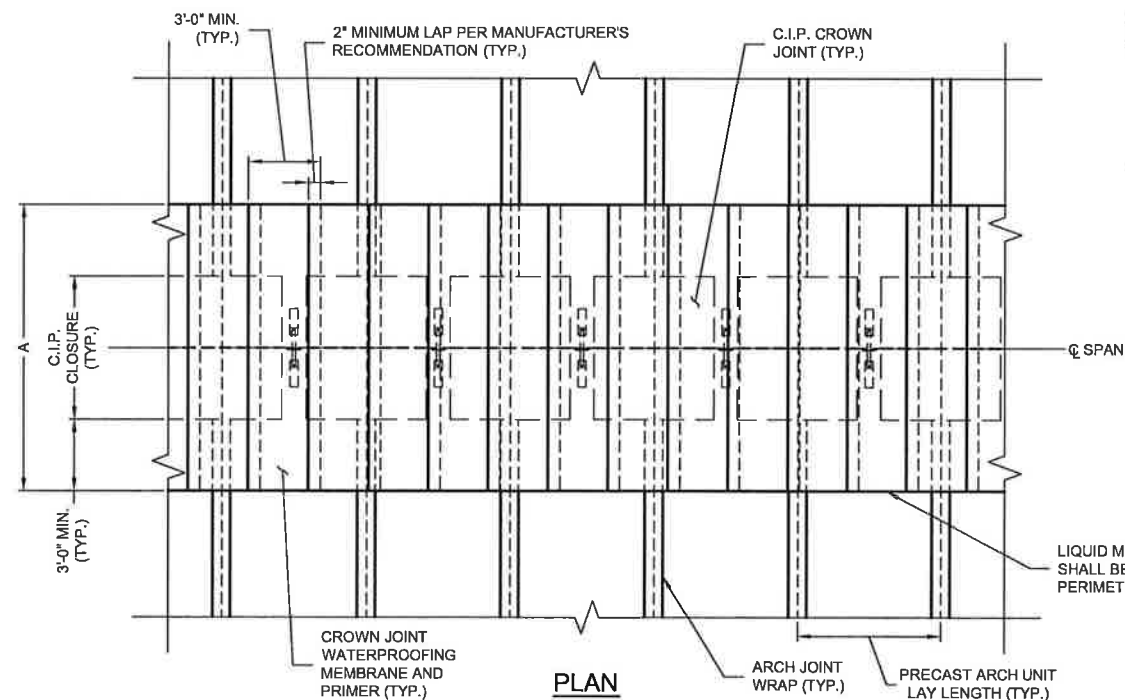
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NCDOT STOKES COUNTY  
BRIDGE REPLACEMENT  
WALNUT COVE, NORTH CAROLINA

## SPECIFICATIONS FOR MANUFACTURE AND INSTALLATION OF BEBO® ARCH SYSTEMS (CONTINUED)

### 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	LIQUID LIMIT	PLASTICITY INDEX	
GW, GP, SP	A1	A-1A	50 MAX	30 MAX	15 MAX		6 MAX	LARGELY GRAVEL BUT CAN INCLUDE SAND AND FINES GRAVELLY SAND OR GRADED SAND, MAY INCLUDE FINES
GM, SW, SP, SM		A-1B		50 MAX	25 MAX		6 MAX	
GM, SM, ML, SP, GP	A2	A-2-4			35 MAX	40 MAX	10 MAX	SANDS, GRAVELS WITH LOW- PLASTICITY SILT FINES SANDS, GRAVELS WITH PLASTIC SILT FINES
SC, GC, GM		A-2-5			35 MAX	41 MIN	10 MAX	
SP, SM, SW	A3			51 MIN	10 MAX		NON- PLASTIC	FINE SANDS
ML, SM, SC	A4				36 MIN	40 MAX	10 MAX	LOW-COMPRESSIBLTY SILTS

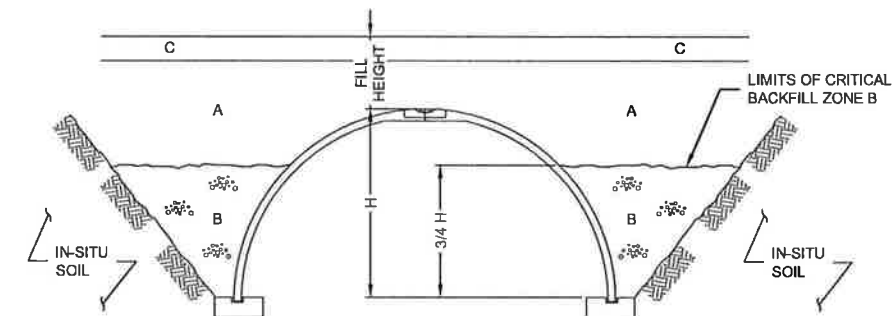
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### CROWN JOINT SEALING DETAILS

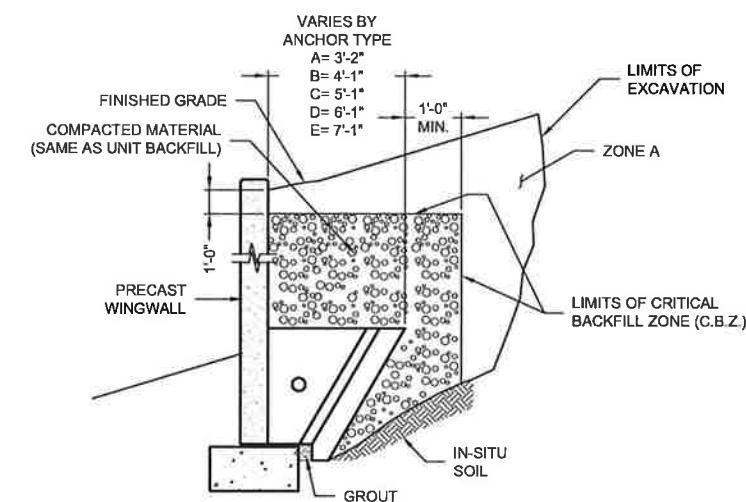
FORM/SPAN	A *
C30T - C54T	12'-6"
E54T - E66T	12'-6"
E72T - E84T	14'-6"
T64 - T82	14'-6"
T84 - T102	16'-6"

**NOTE: LENGTHS ARE ALONG THE ARCH SURFACE**

## CROWN JOINT WATERPROOFING MEMBRANE CHART



### BACKFILL REQUIREMENTS



### WALL BACKFILL REQUIREMENTS



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CONTECH  
**CONTRACT**  
DRAWING

NCDOT STOKES COUNTY  
BRIDGE REPLACEMENT  
WALNUT COVE, NORTH CAROLINA

PROJECT No.: <b>445919</b>	SEQ. No.: <b>001</b>	DATE: <b>12/16/2011</b>
DESIGNED: <b>MRP</b>	DRAWN: <b>EWM</b>	
CHECKED: <b>JDR</b>	APPROVED: <b>PAC</b>	
SHEET NO.: <b>GT11 OF GT11</b>		





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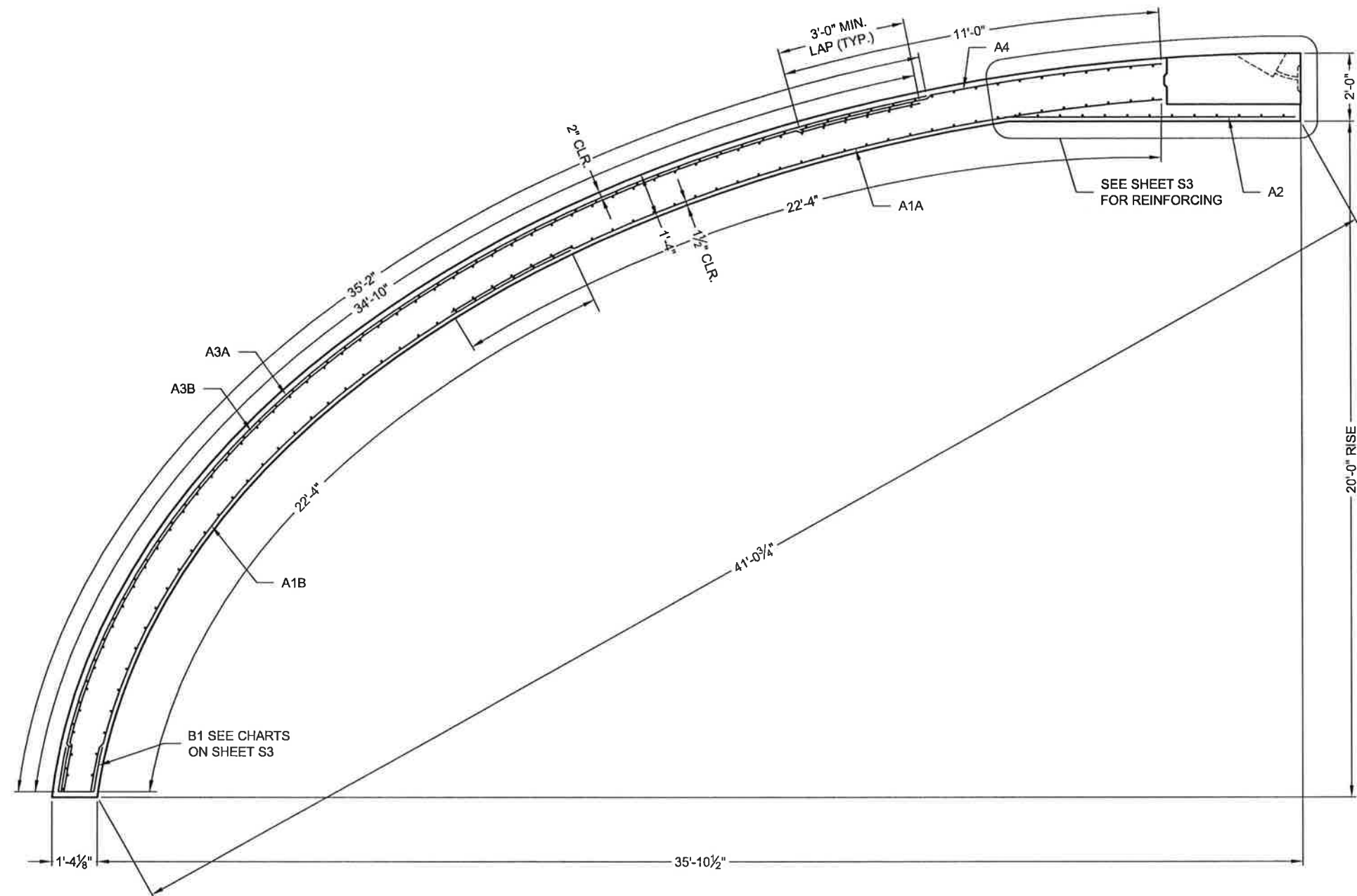


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PROJECT No.: <b>445919</b>	SEQ. No.: <b>001</b>	DATE: <b>12/15/2011</b>
DESIGNED: <b>MRP</b>	DRAWN: <b>JCH</b>	
CHECKED: <b>RKL</b>	APPROVED: <b>PAC</b>	
SHEET NO.: <b>S1</b> OF <b>S23</b>		



- NOTES:
1. MINIMUM 28-DAY CONCRETE COMPRESSIVE STRENGTH SHALL BE 6000 PSI.
  2. OVERLAP LENGTH SHALL BE MEASURED FROM LAST CROSSWIRE.
  3. DIMENSIONS SHOWN ARE FOR FORM SYSTEM "E72T".
  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 OR A3).
  6. ALL EDGES OF PRECAST TO HAVE A  $\frac{3}{4}$ " CHAMFER.
  7. SPACING OF LONGITUDINAL REINFORCEMENT MUST BE A MAXIMUM OF 8" O.C. FOR MULTIPLE LAYERS OF MESH, ONLY THE OUTER MOST LAYER MUST BE A MAXIMUM OF 8" O.C.

## PRECAST UNIT MESH REINFORCEMENT

WEIGHT OF REQUIRED MESH REINFORCEMENT = 373 LBS/FT

SHEET NO.	CIRCUMFERENTIAL AREA REQ'D (IN²/FT)	LONGITUDINAL AREA REQ'D (IN²/FT)	MESH SIZE	LENTGH (FT)	CIRCUMFERENTIAL AREA REQ'D (IN²/FT)	LONGITUDINAL AREA REQ'D (IN²/FT)
1	A1A = 0.72	0.13		22'-4"		
2	A1B = 0.42	0.13		22'-4"		
3	A2 = 0.72	0.13		8'-8"		
4	A3A = 0.72	0.13		35'-2"		
5	A3B = 0.60	0.13		34'-10"		
6	A4 = 0.36	0.13		11'-0"		

COVER = 1'-6" MIN. \ 4'-0" MAX.

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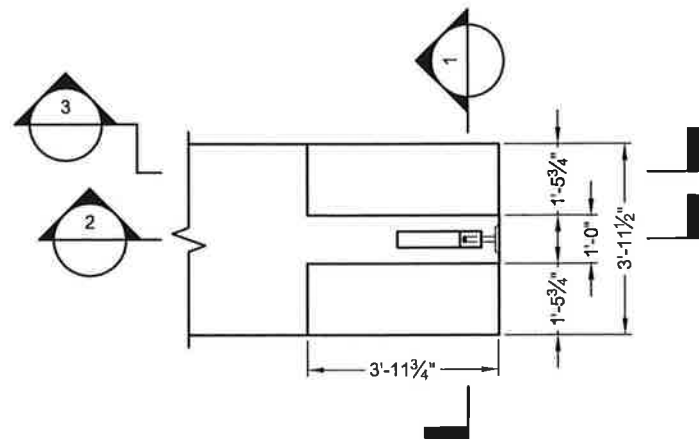
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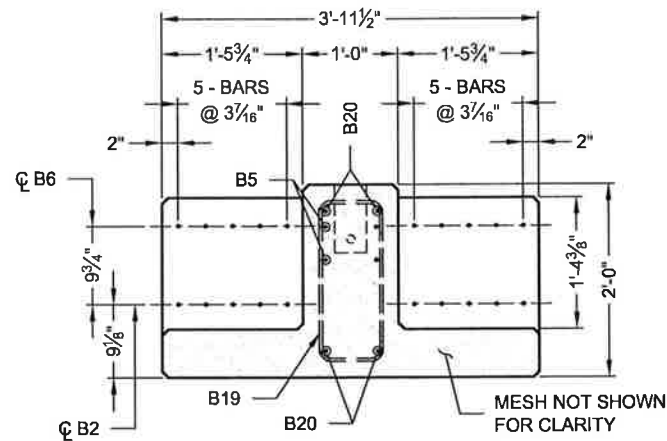
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FIRM LICENSE NUMBER: C-3034

PROJECT No.: 445919	SEQ. No.: 001	DATE: 12/15/201
DESIGNED: MRP	DRAWN: JCH	
CHECKED: RKL	APPROVED: PAC	
SHEET NO.: S2 OF S23		

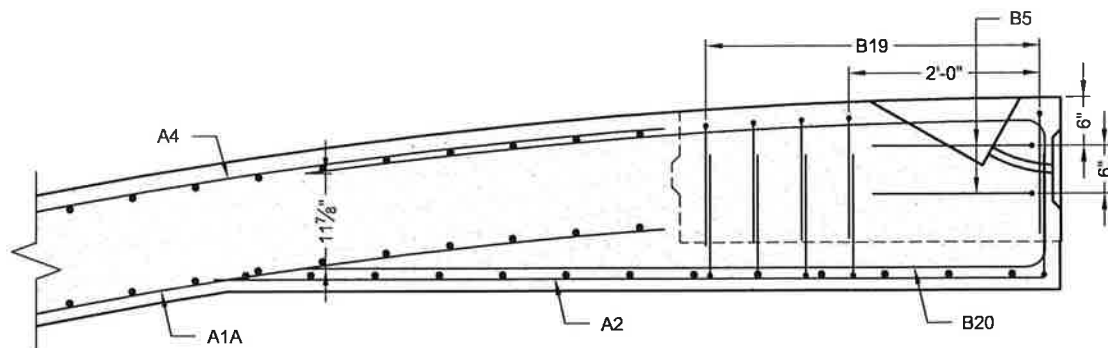
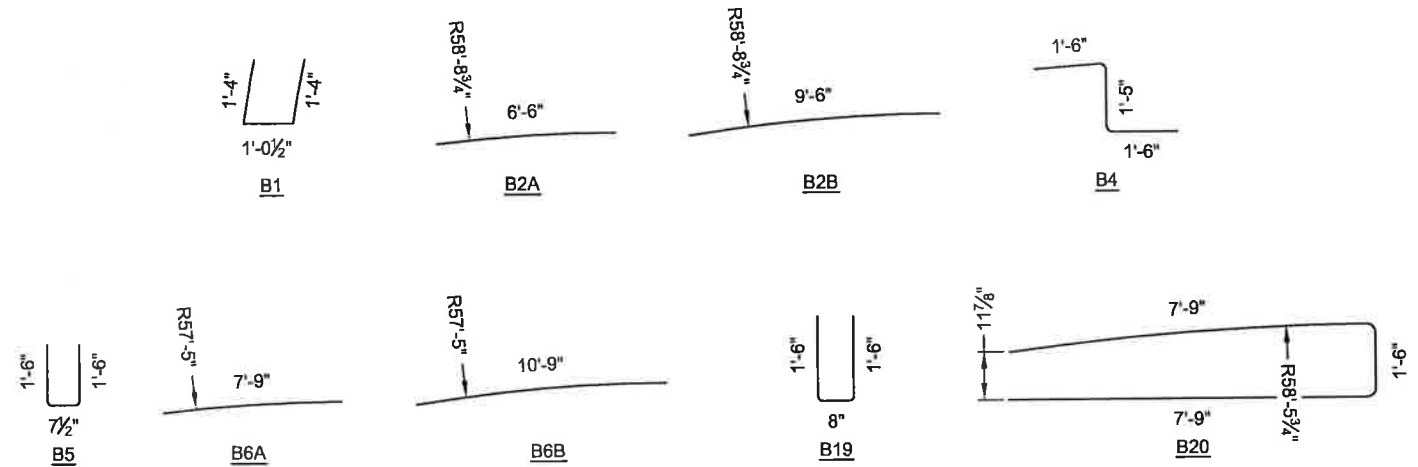


INTERIOR UNIT - PLAN



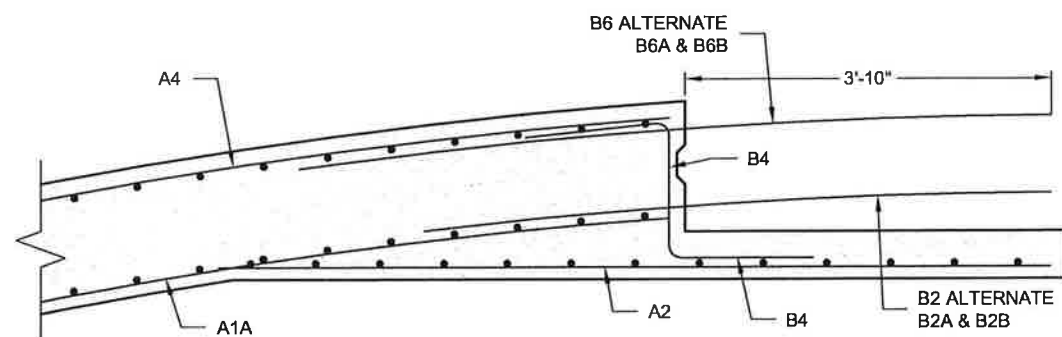
SECTION 1

INTERIOR UNIT



SECTION 2

INTERIOR UNIT

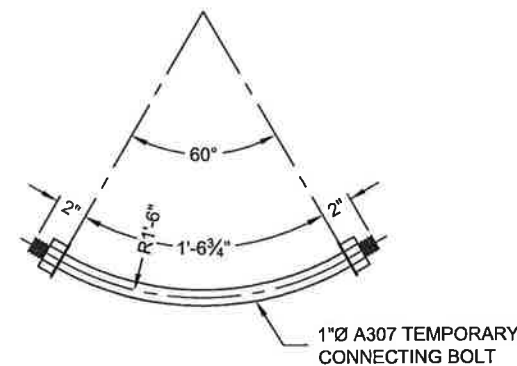


SECTION 3

INTERIOR UNIT

WEIGHT OF REQUIRED BAR REINFORCEMENT = 487.93 LBS/UNIT

UNIT - REINFORCING BAR LIST					
MARK	SIZE	NO.	LENGTH	TYPE	Fy = 60 KSI
B1	#5	6	3'-8 1/2"	BENT	SPACED @ 9" O.C.
B2A	#6	5	6'-6"	BENT	SPACE AS SHOWN
B2B	#6	5	9'-6"	BENT	SPACE AS SHOWN
B4	#4	10	4'-5"	BENT	SPACED @ 4" O.C.
B5	#3	2	3'-7 1/2"	BENT	SPACE AS SHOWN
B6A	#8	5	7'-9"	BENT	SPACE AS SHOWN
B6B	#8	5	10'-9"	BENT	SPACE AS SHOWN
B19	#3	10	3'-8"	BENT	SPACED @ 6" O.C. (UNLESS NOTED)
B20	#6	2	17'-2"	BENT	SPACED @ 6 1/2" O.C.



TEMPORARY CONNECTING BOLT DETAIL

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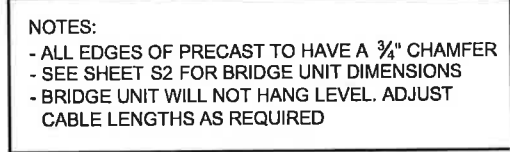
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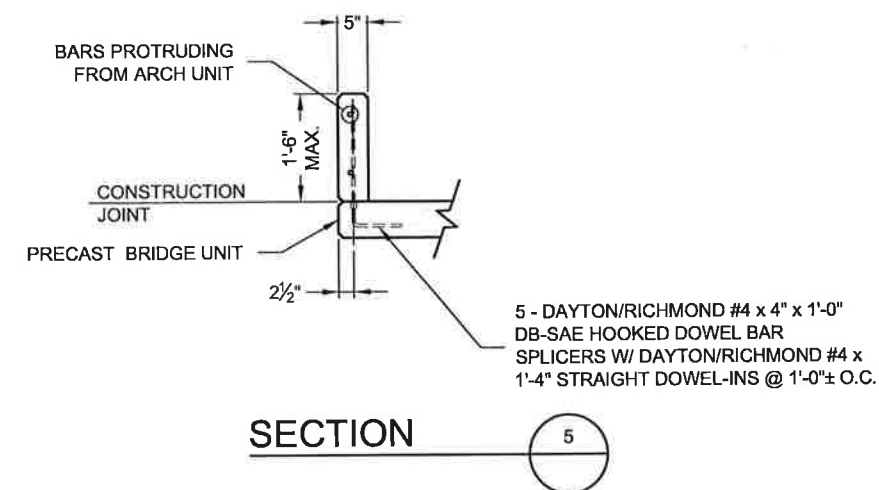
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SHEET NO.: S3 OF S23		





UNIT WEIGHT = 18.0 TONS  
CROWN JOINT WALL WEIGHT = 0.2 TONS  
TOTAL WEIGHT = 18.2 TONS



ELEVATION 4

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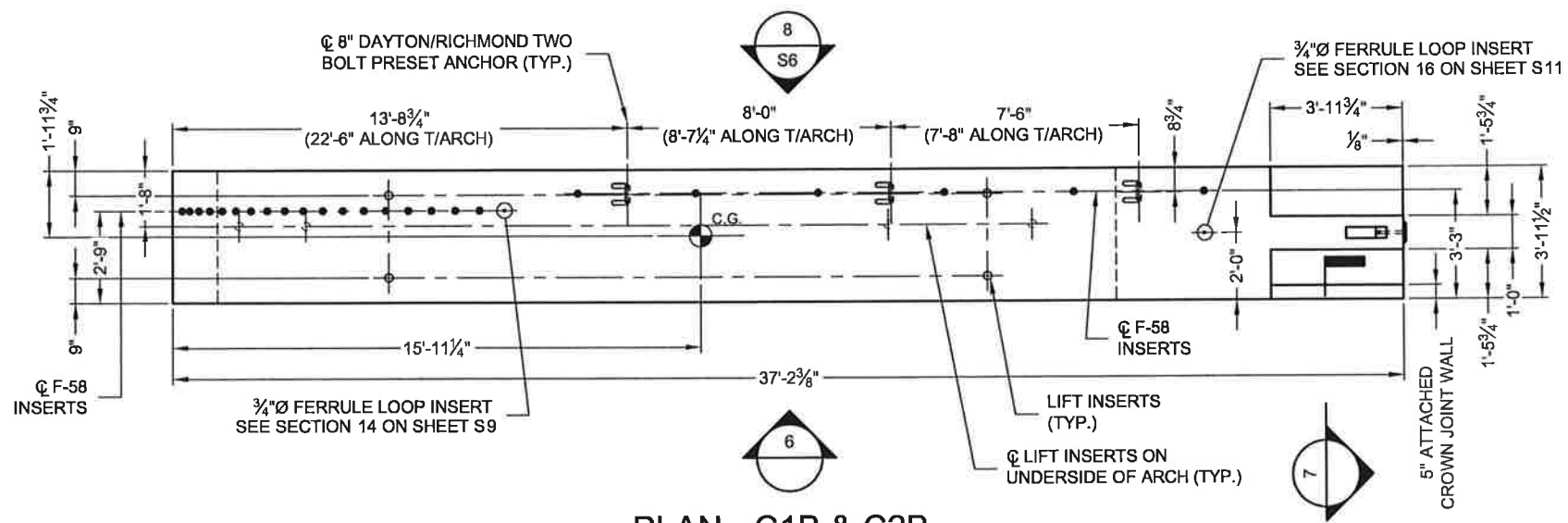
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DESIGNED: <b>MRP</b>		DRAWN: <b>JCH</b>
CHECKED: <b>RKL</b>		APPROVED: <b>PAC</b>
SHEET NO.: <b>S4</b> OF <b>S23</b>		

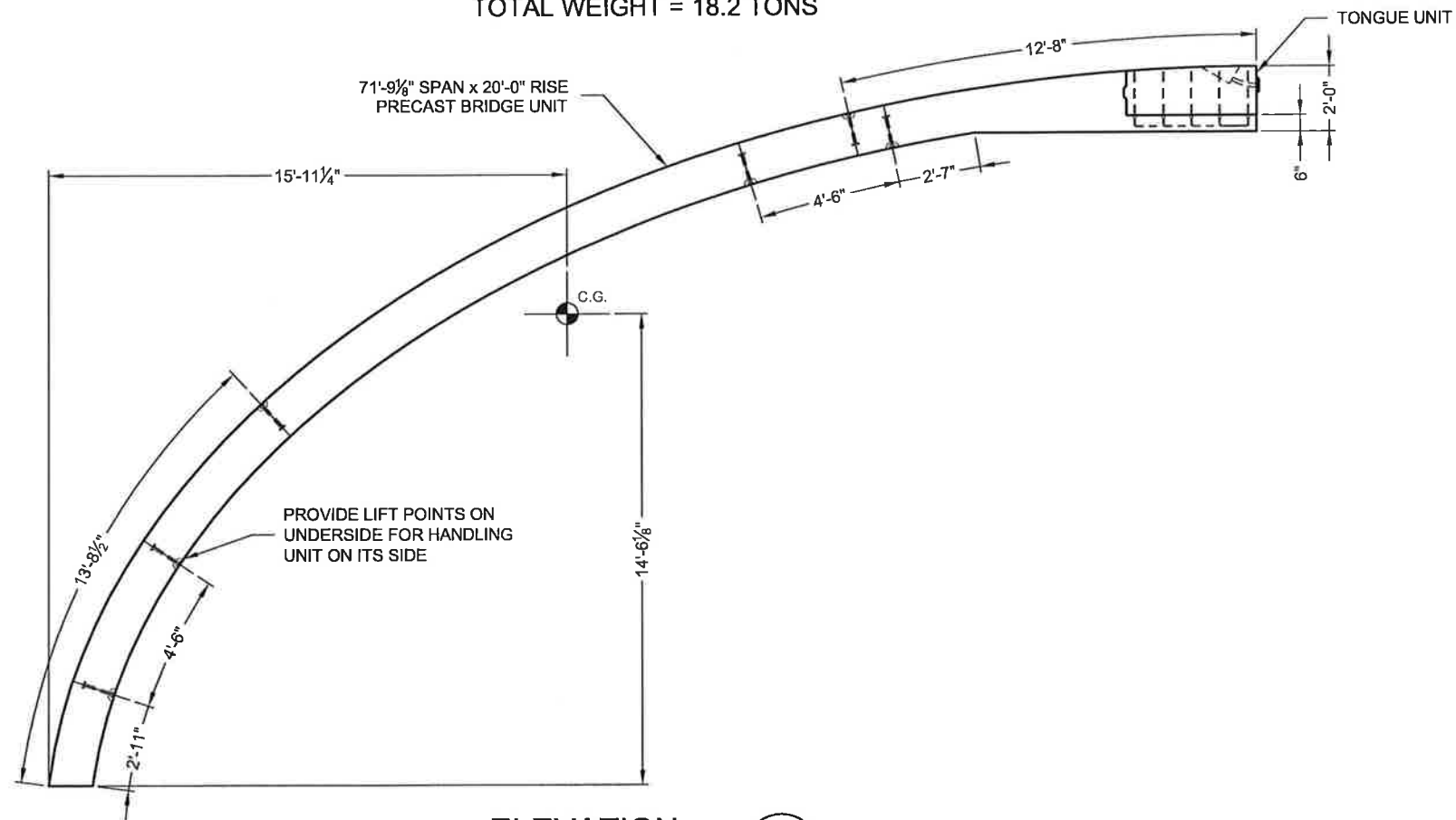
NOTES:

- ALL EDGES OF PRECAST TO HAVE A  $\frac{3}{4}$ " CHAMFER
- SEE SHEET S2 FOR BRIDGE UNIT DIMENSIONS
- BRIDGE UNIT WILL NOT HANG LEVEL. ADJUST CABLE LENGTHS AS REQUIRED



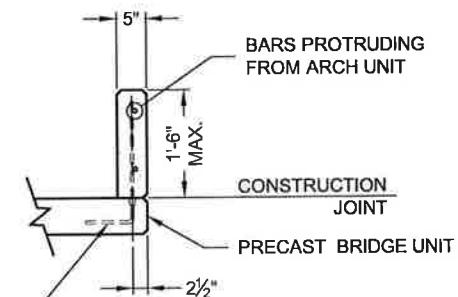
## PLAN - C1B & C2B

UNIT WEIGHT = 18.0 TONS  
CROWN JOINT WALL WEIGHT = 0.2 TONS  
TOTAL WEIGHT = 18.2 TONS



## ELEVATION

C.G. &amp; LIFT POINTS ONLY



5 - DAYTON/RICHMOND #4 x 4" x 1'-0"  
DB-SAE HOOKED DOWEL BAR  
SPLICERS W/ DAYTON/RICHMOND #4 x  
1'-4" STRAIGHT DOWEL-INS @ 1'-0"± O.C.

## SECTION

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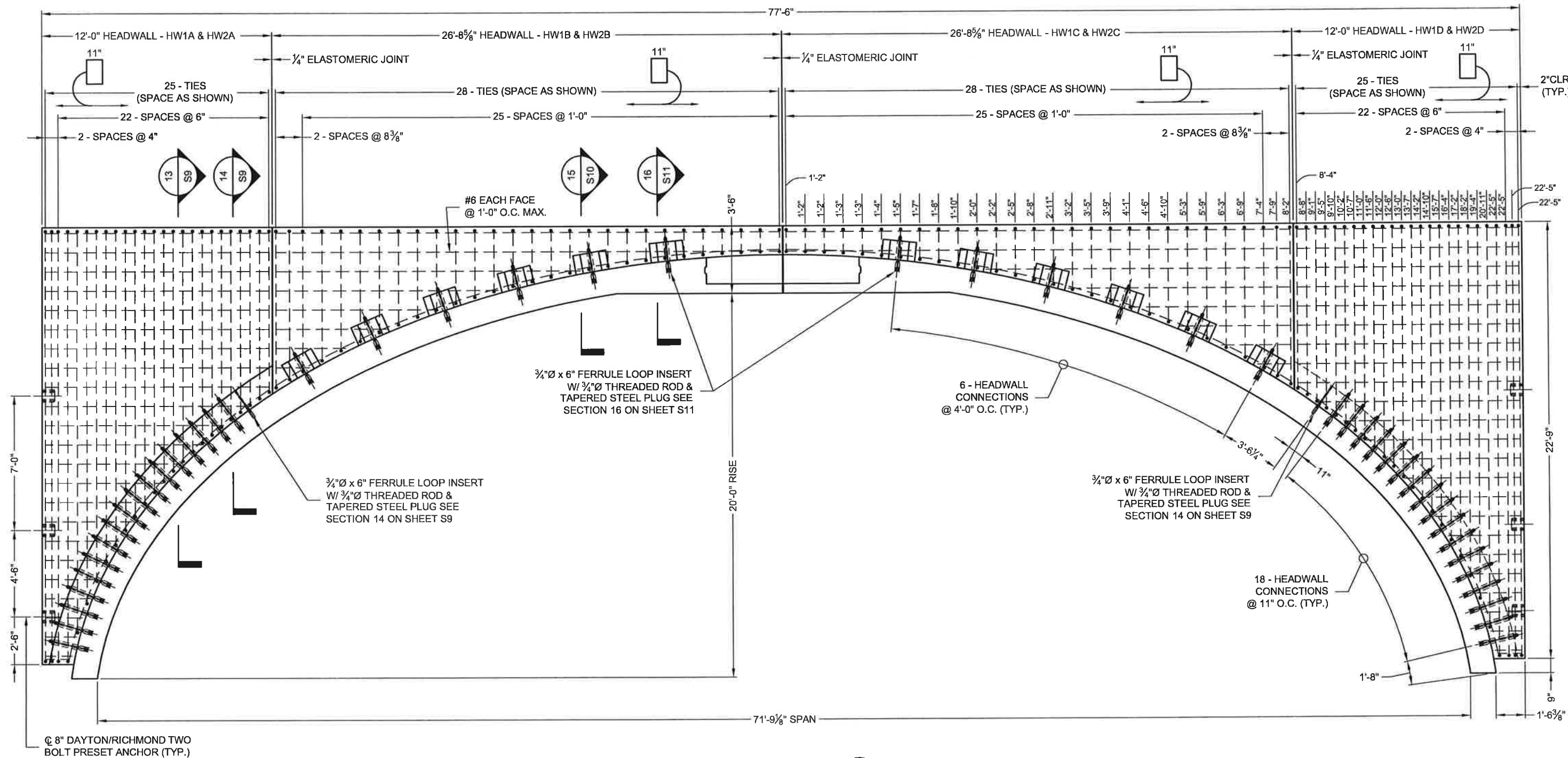
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CHECKED: RKL	APPROVED: PAC	
SHEET NO.: S5 OF S23		

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ELEVATION 8 S4,S5

- NOTES:
- ALL EDGES OF PRECAST TO HAVE A 3/4" CHAMFER
  - ELEVATION IS LOOKING AT BACK FACE OF HEADWALL
  - SEE SHEET S4 & S5 FOR BRIDGE UNIT C.G. & LIFT POINTS
  - SEE SHEET S7 & S8 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

HEADWALL		ARCH UNIT		
CONCRETE	REINF. STEEL	CONCRETE	REINF. STEEL	WWF
28-DAY: 5000 PSI	60,000 PSI UNCOATED	28-DAY: 6000 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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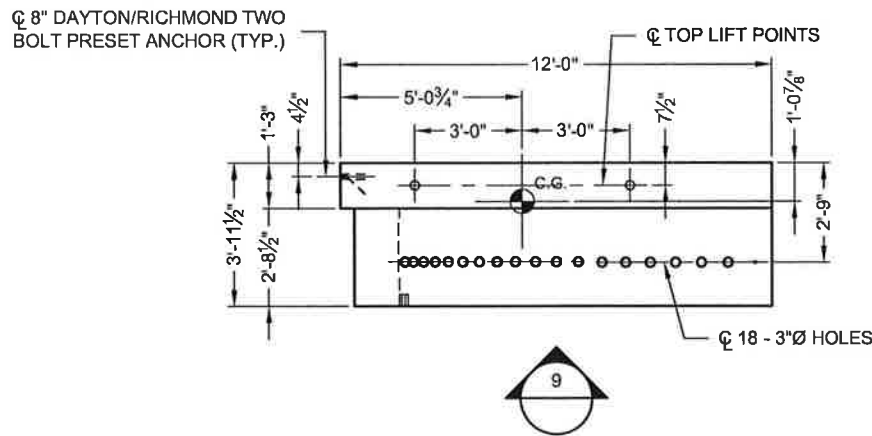
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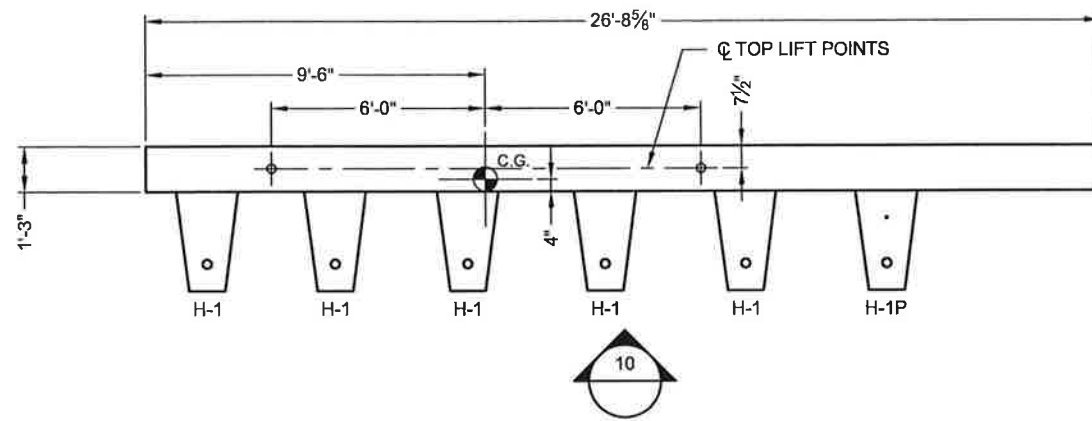
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RKL	PAC	
SHEET NO:	S6 OF S23	

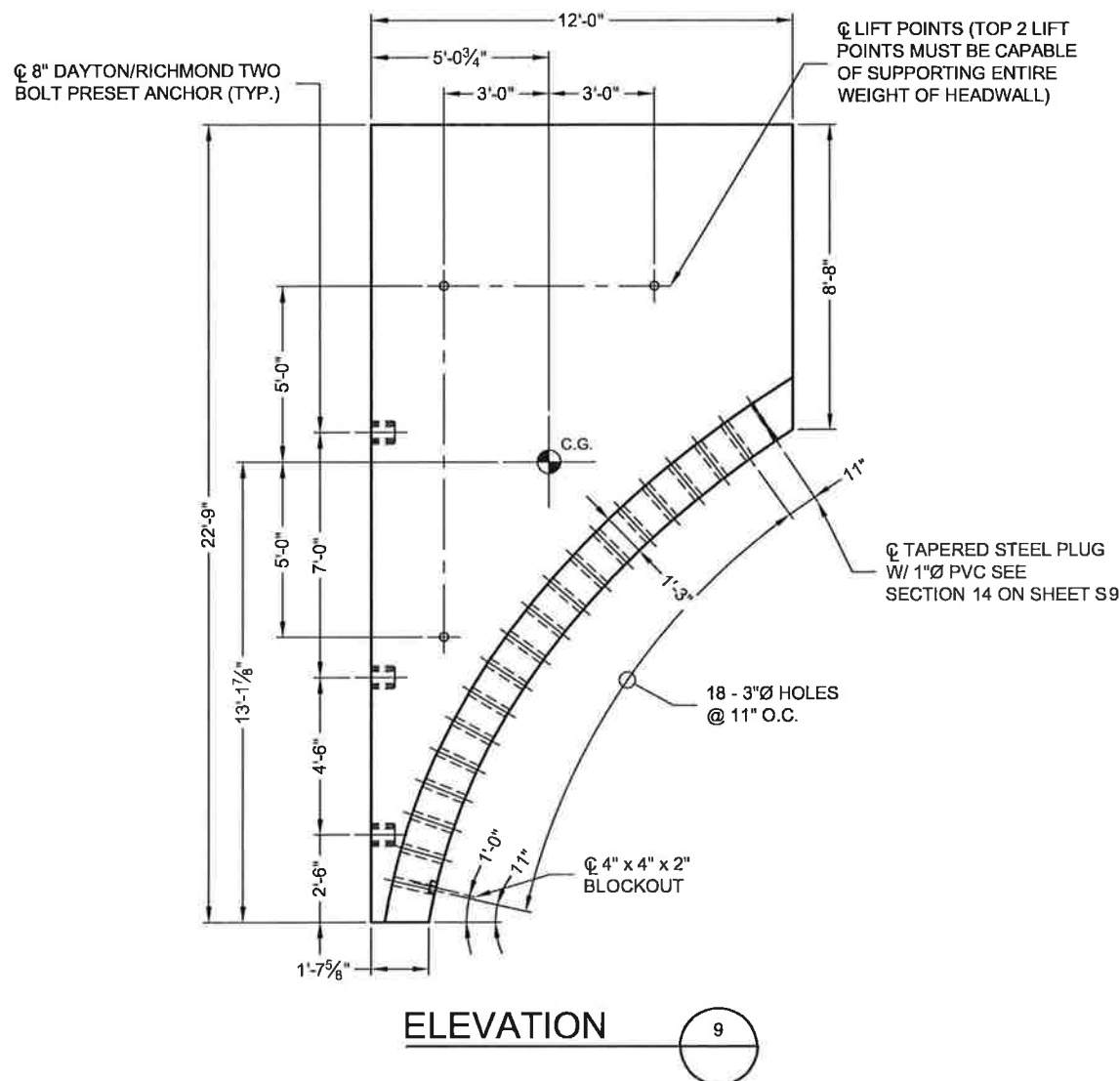


PLAN - HW1A & HW2A  
TOTAL WEIGHT = 21.6 TONS

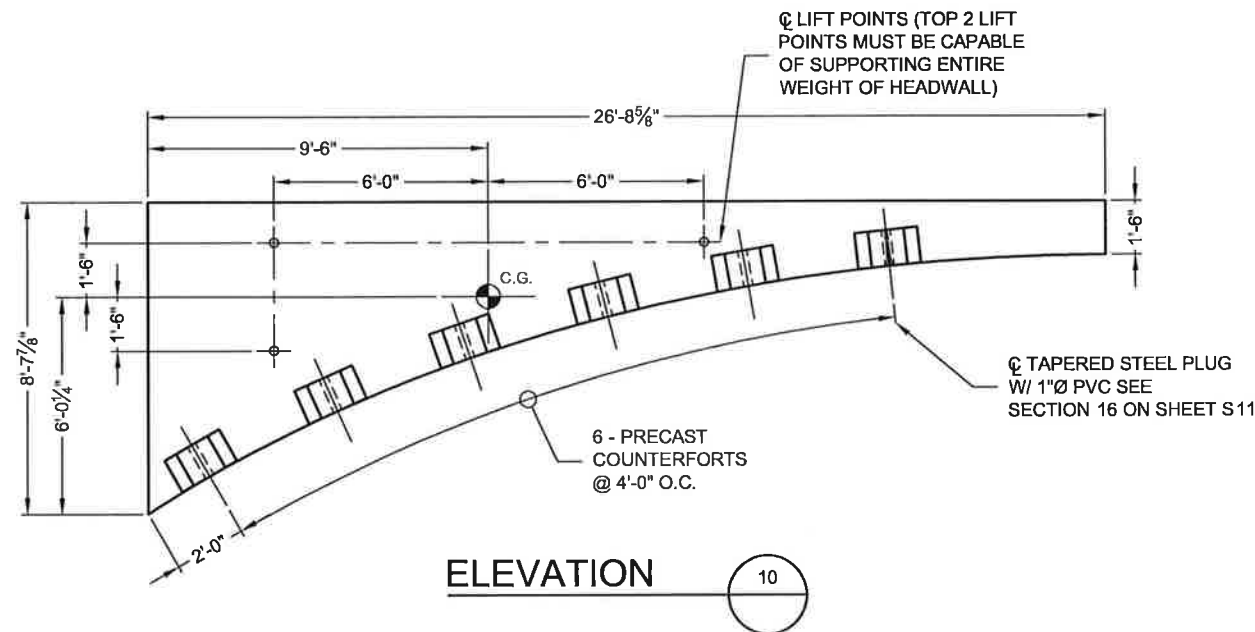


PLAN - HW1B & HW2B  
TOTAL WEIGHT = 11.0 TONS

- NOTES:
- ALL EDGES OF PRECAST TO HAVE A 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



ELEVATION 9



ELEVATION 10

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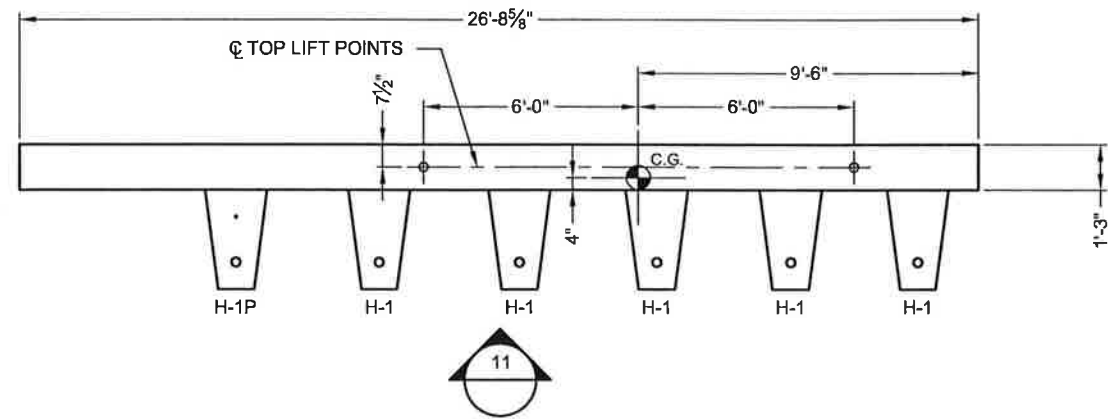
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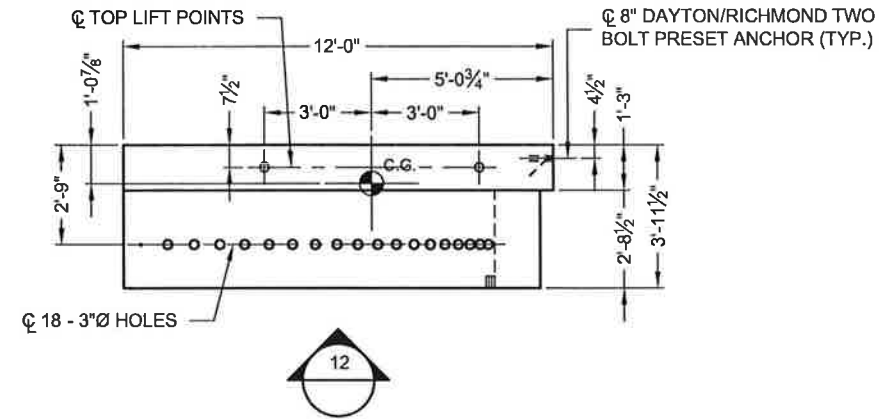
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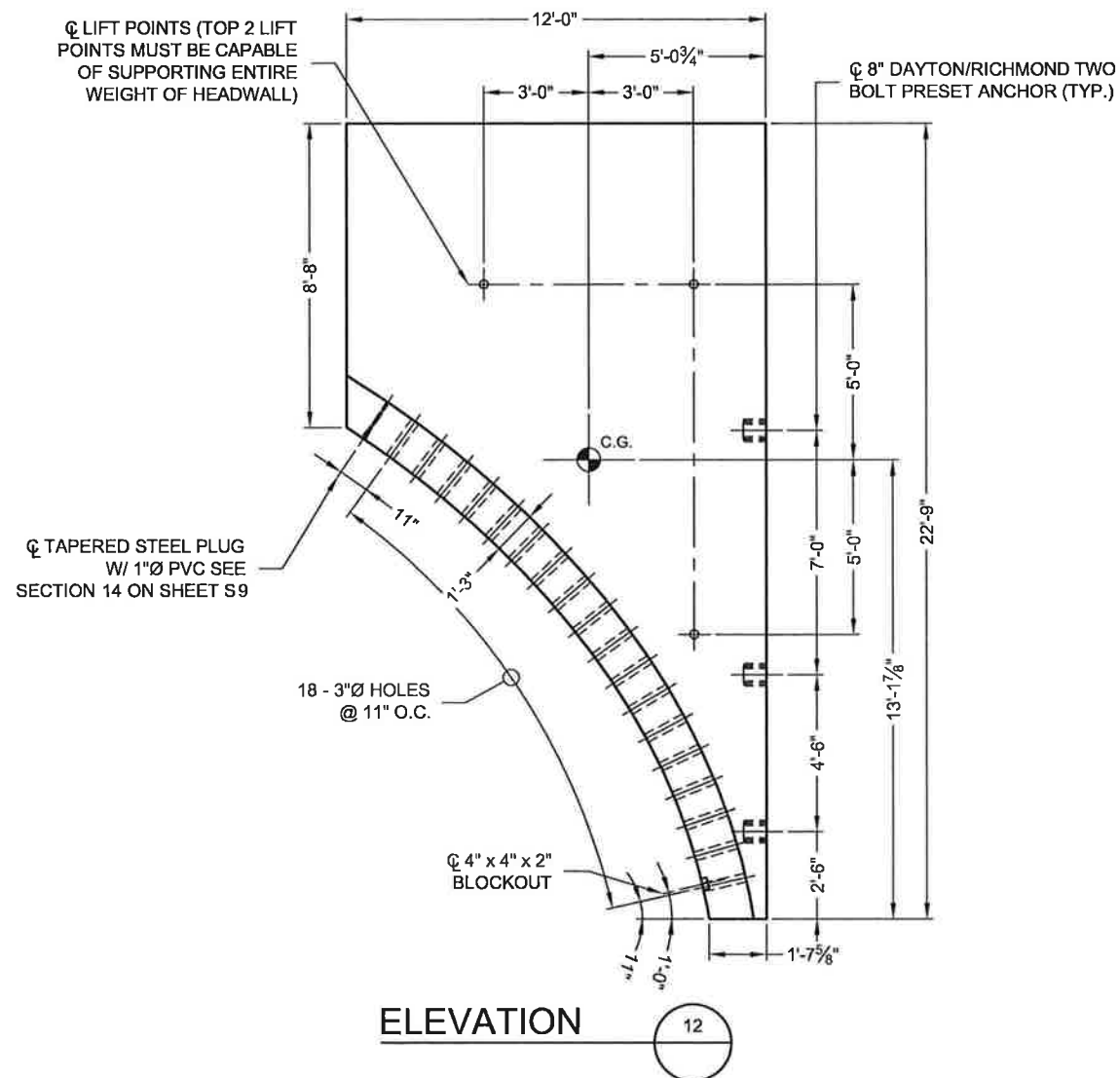
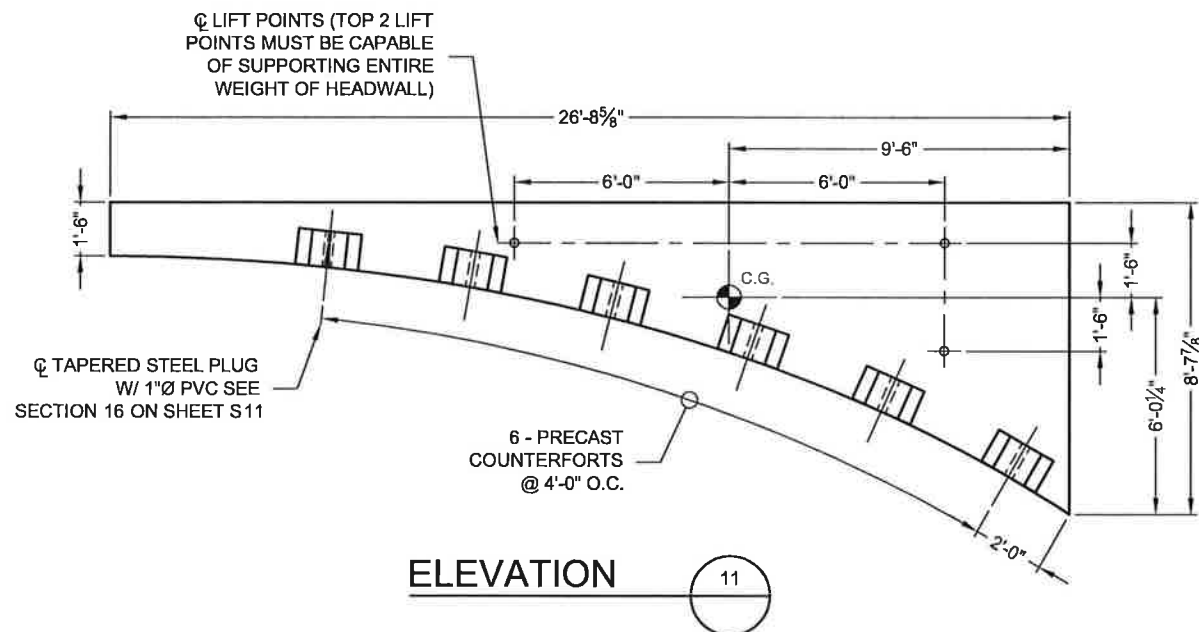
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SHEET NO.: S7	OF S23	



PLAN - HW1C & HW2C  
TOTAL WEIGHT = 11.0 TONS



PLAN - HW1D & HW2D  
TOTAL WEIGHT = 21.6 TONS



- NOTES:
- ALL EDGES OF PRECAST TO HAVE A 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

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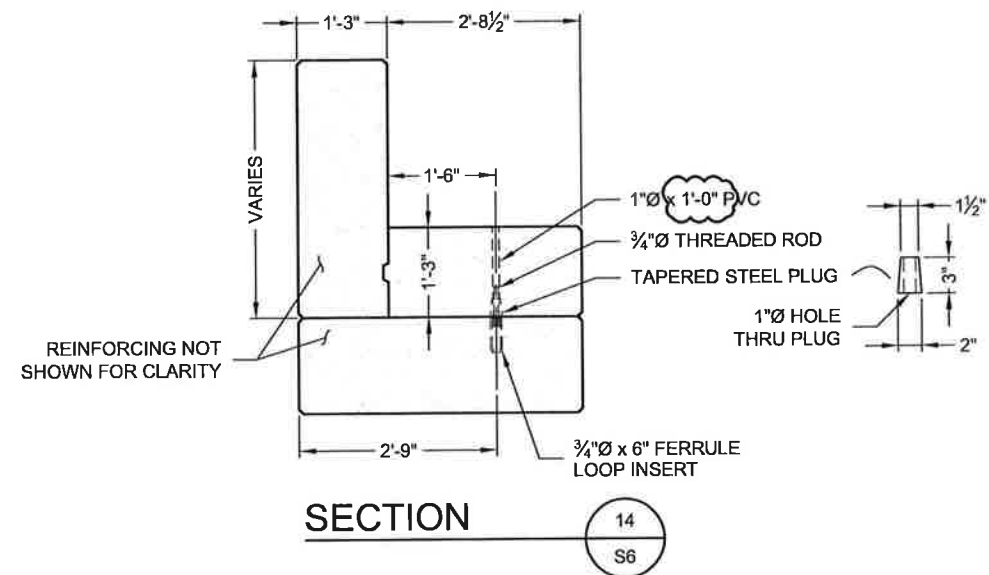
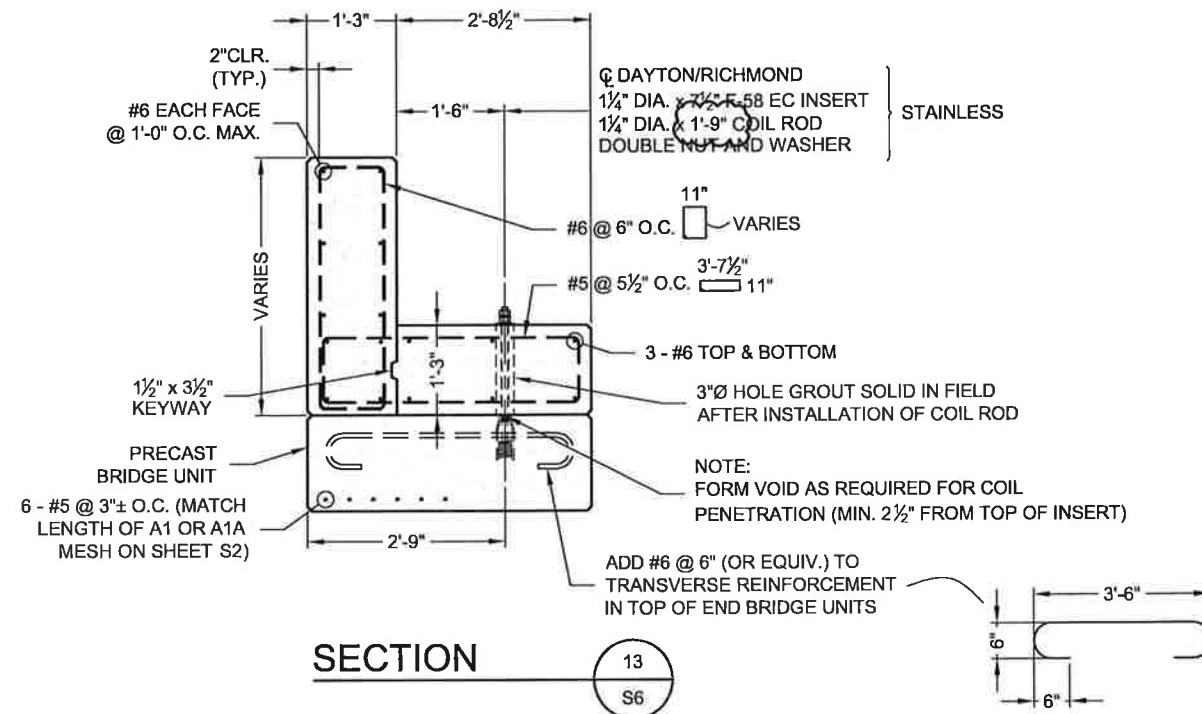
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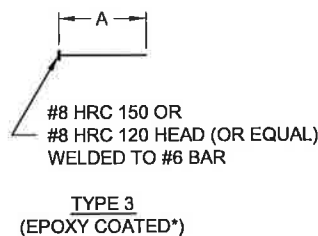
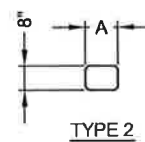
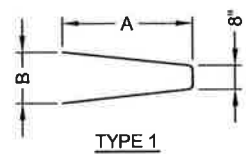
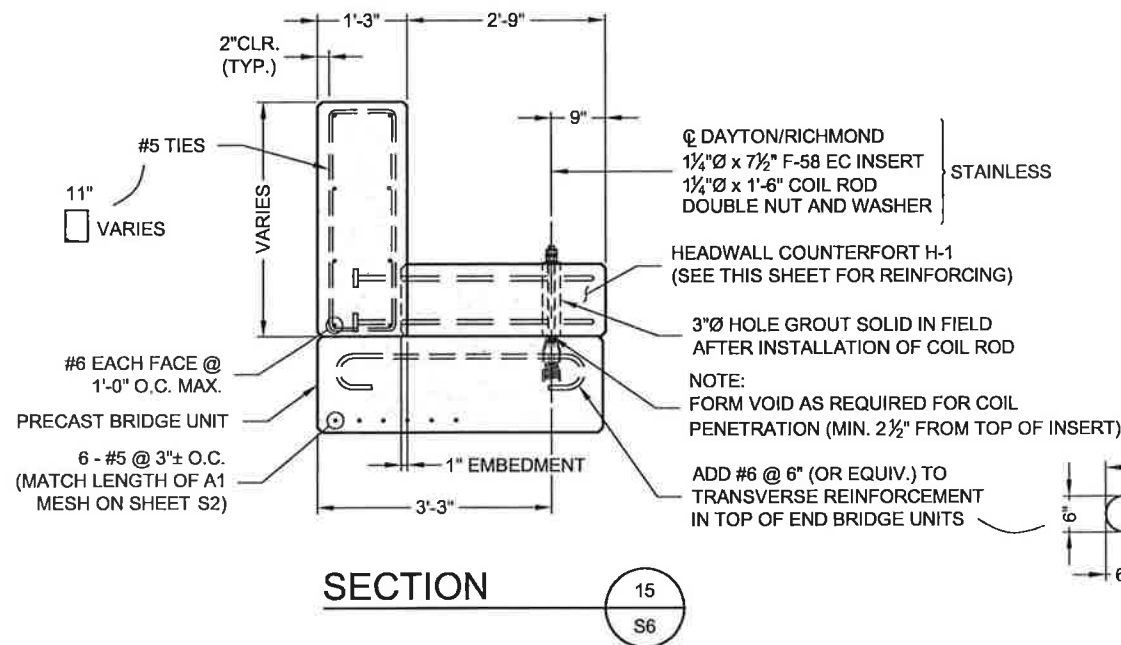
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PROJECT No.: 445919	SEQ. No.: 001	DATE: 12/15/2011
DESIGNED: MRP	DRAWN: JCH	
CHECKED: RKL	APPROVED: PAC	
SHEET NO.: S9 OF S23		

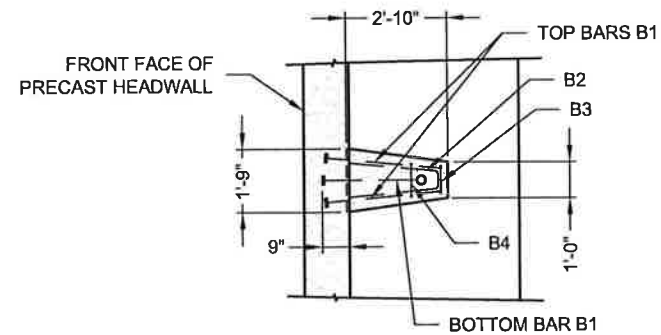


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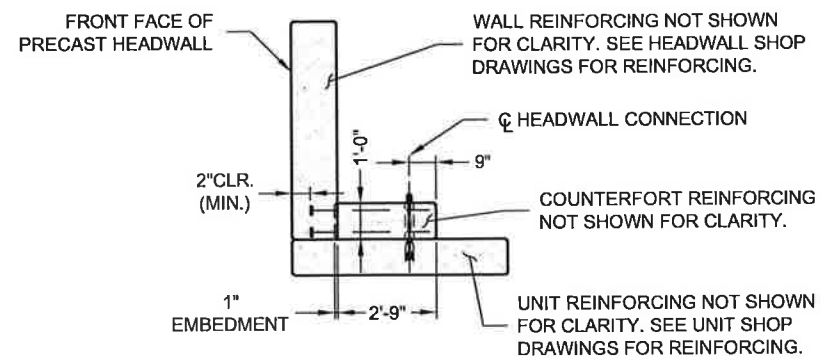


\*NOTE: EPOXY COATING IS NOT REQUIRED ON HEADED ENDS OF TYPE 3 BARS, BUT WILL NOT BE DETRIMENTAL IF PROVIDED.

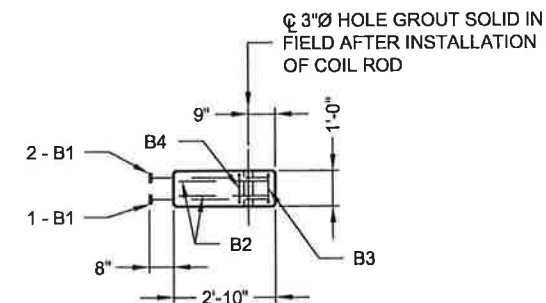
\*NOTE: HRC HEADS PROVIDED BY HEADED REINFORCEMENT CORP.



PLAN - TYPE H-1



SECTION - TYPE H-1



PRECAST COUNTERFORT  
TYPE H-1

TOTAL WEIGHT = .284 TONS

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"

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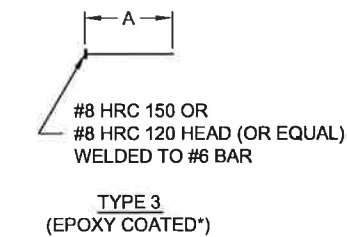
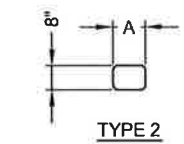
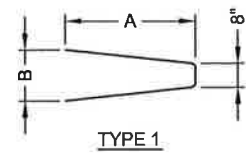
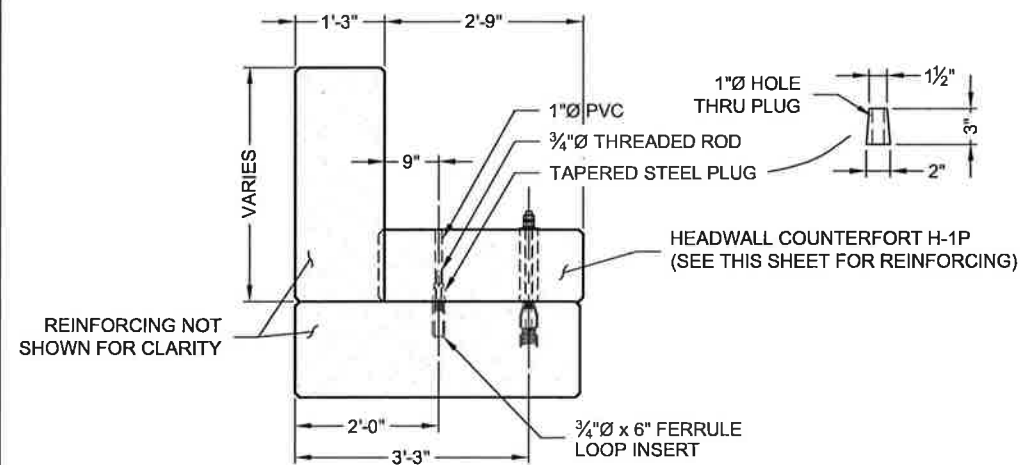
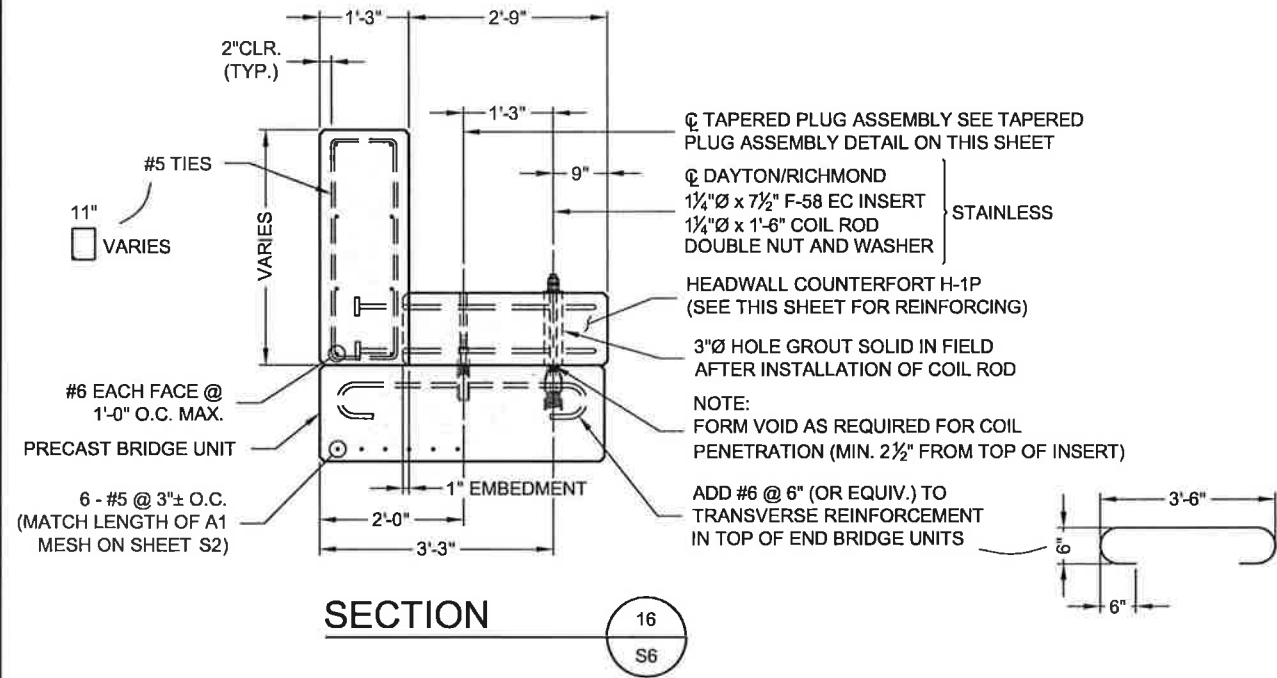
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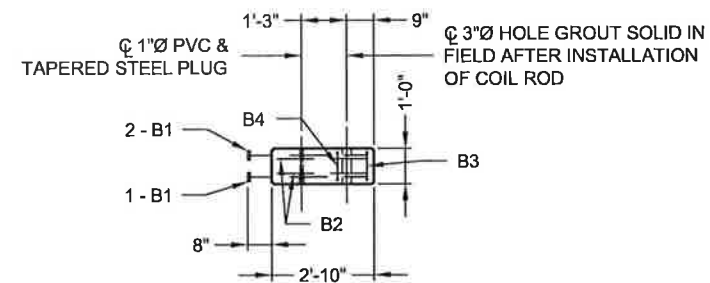
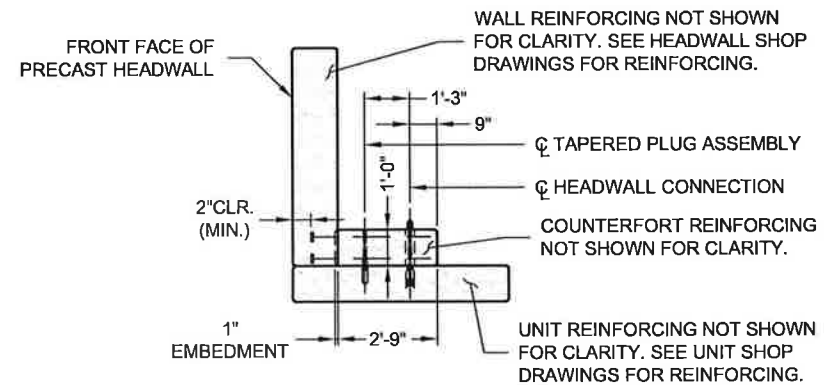
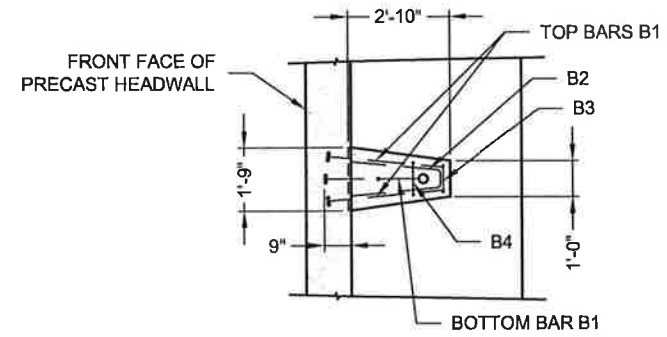
NCDOT STOKES COUNTY  
BRIDGE REPLACEMENT  
WALNUT COVE, NORTH CAROLINA

PROJECT No.:	SEQ. No.:	DATE:
445919	001	12/15/2011
DESIGNED:	DRAWN:	
MRP	JCH	
CHECKED:	APPROVED:	
RKL	PAC	
SHEET NO.:		
S10 OF S23		



\*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.



## PRECAST COUNTERFORT TYPE H-1P

TOTAL WEIGHT = .284 TONS

## 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"

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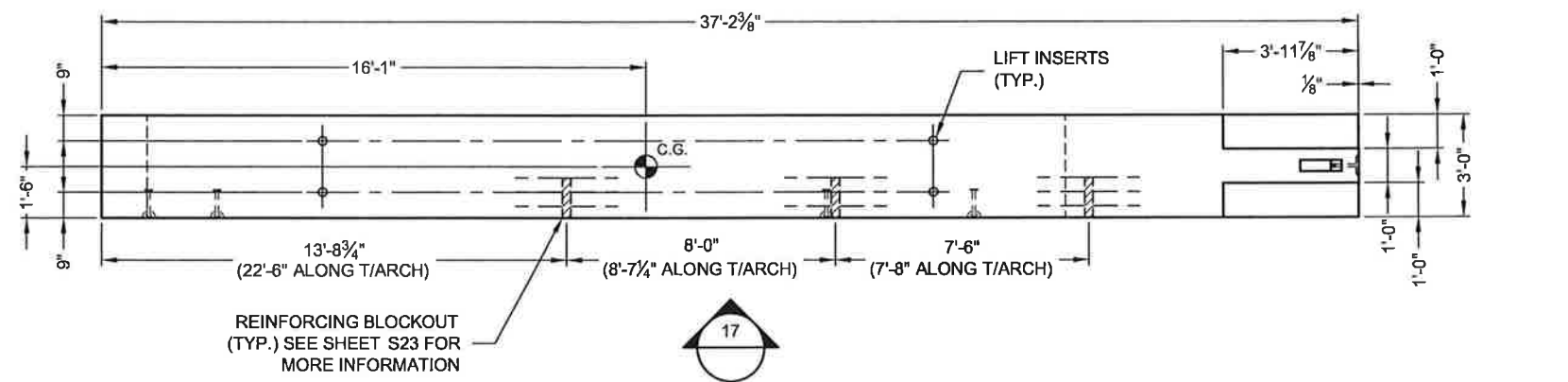
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WALNUT COVE, NORTH CAROLINA

PROJECT No.: 445919	SEQ. No.: 001	DATE: 12/15/2011
DESIGNED: MRP	DRAWN: JCH	
CHECKED: RKL	APPROVED: PAC	
SHEET NO.:	S11	OF S23

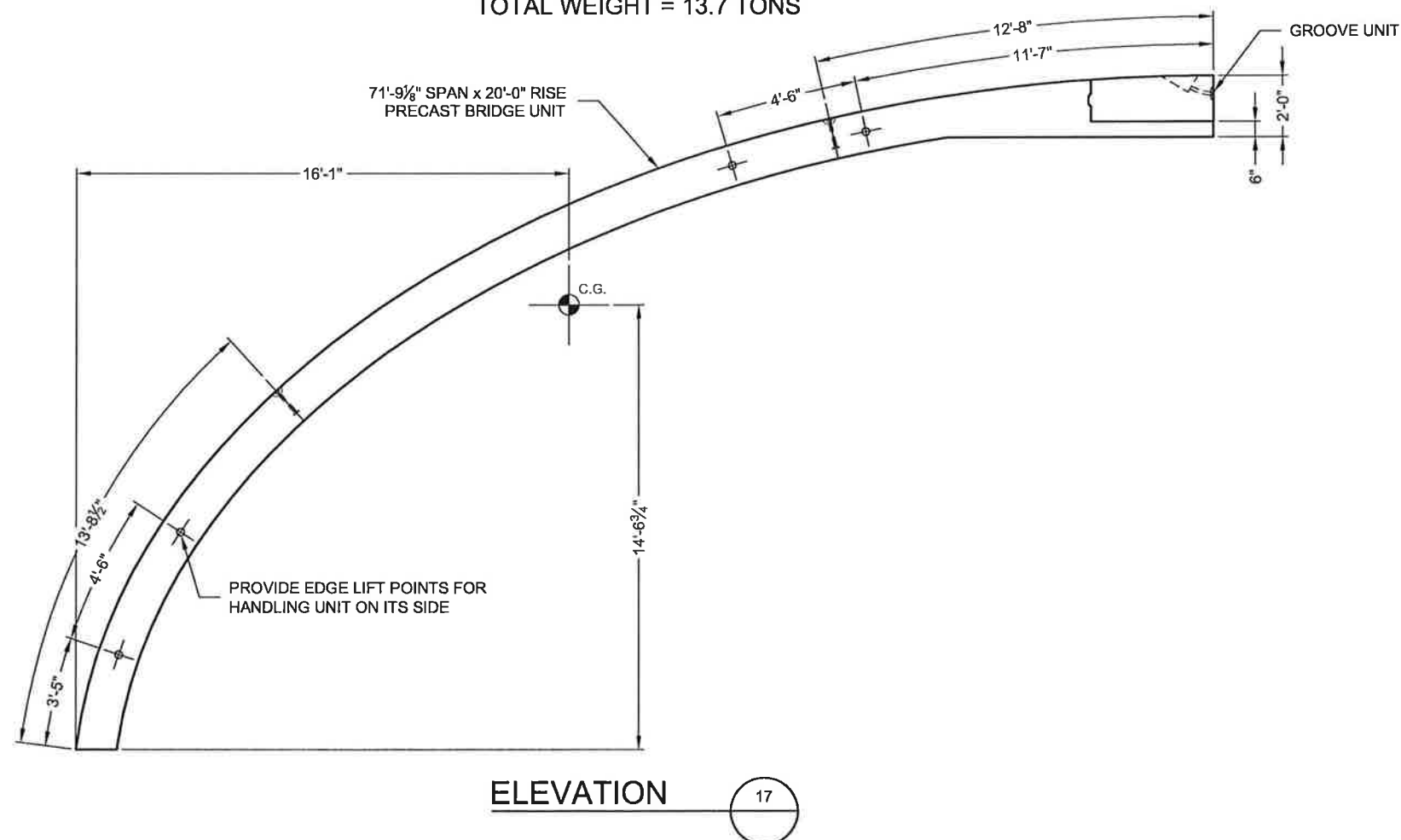
- ALL EDGES OF PRECAST TO HAVE A 3/4" CHAMFER
- SEE SHEET S2 FOR BRIDGE UNIT DIMENSIONS
- BRIDGE UNIT WILL NOT HANG LEVEL. ADJUST CABLE LENGTHS AS REQUIRED
- MANUFACTURER SHALL MARK END OF UNIT C3A WITH REINFORCING BLOCKOUT PRIOR TO SHIPPING.

ARCH UNIT		
CONCRETE	REINF. STEEL	WWF
28-DAY: 6000 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 - C3A  
TOTAL WEIGHT = 13.7 TONS



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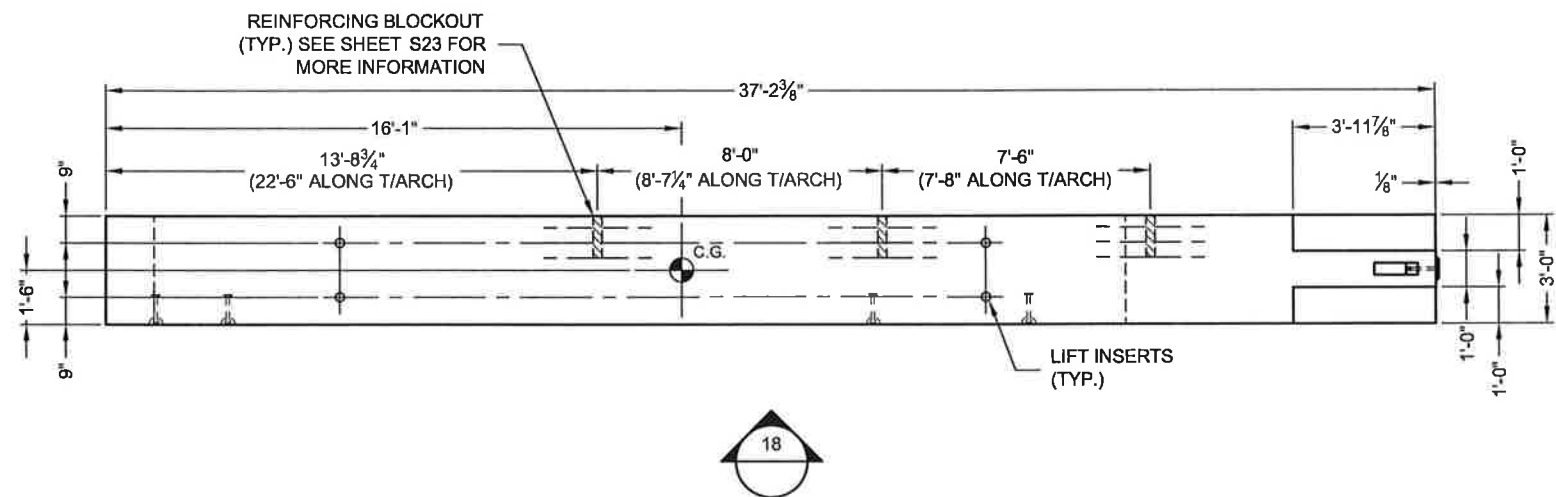
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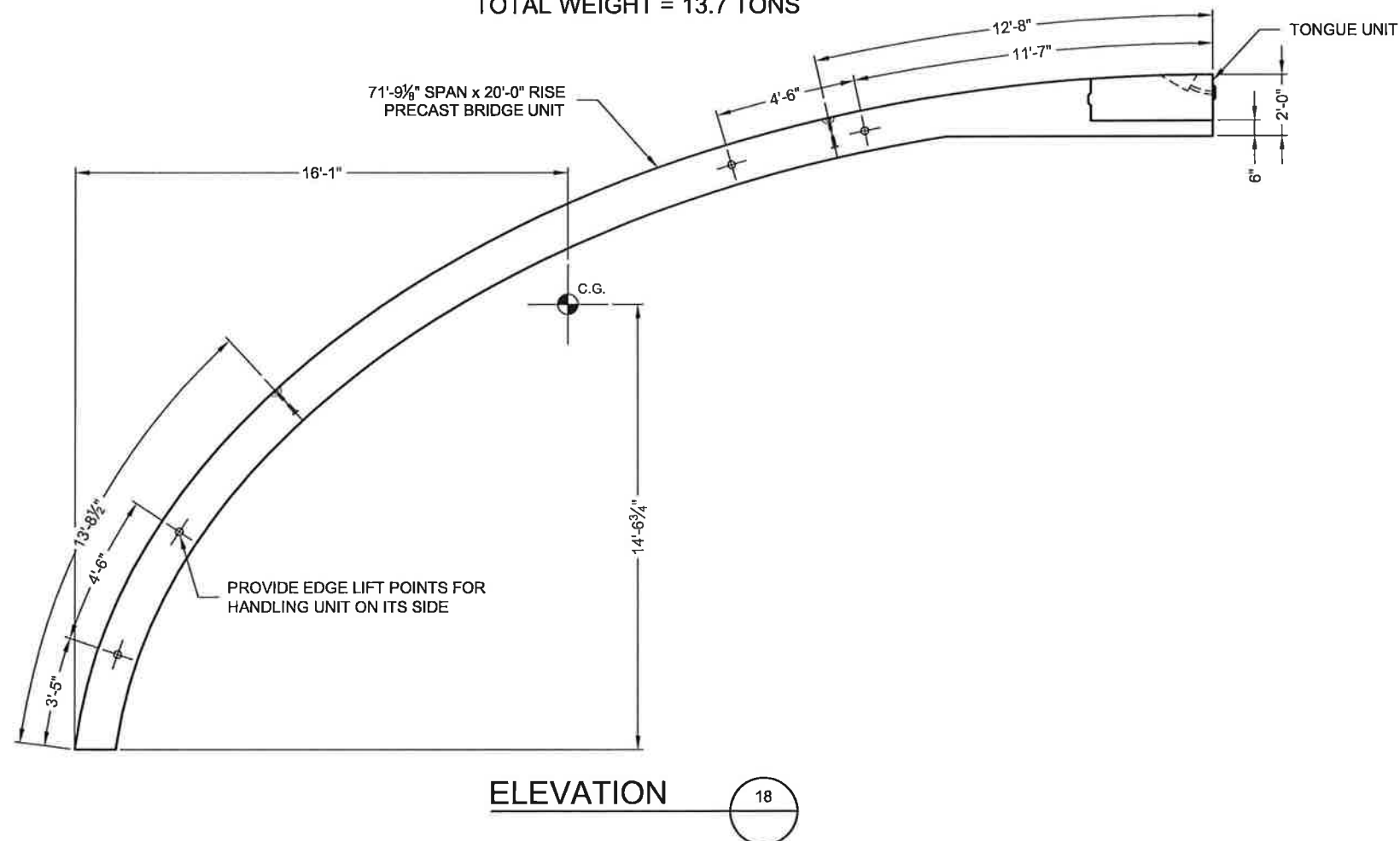
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BRIDGE REPLACEMENT  
WALNUT COVE, NORTH CAROLINA

PROJECT No:	SEQ. No.:	DATE:
445919	001	12/15/2011
DESIGNED:	DRAWN:	
MRP	JCH	
CHECKED:	APPROVED:	
RKL	PAC	
SHEET NO:		
S12 OF S23		



**PLAN - C3B**  
TOTAL WEIGHT = 13.7 TONS



- NOTES:
- ALL EDGES OF PRECAST TO HAVE A  $\frac{3}{4}$ " CHAMFER
  - SEE SHEET S2 FOR BRIDGE UNIT DIMENSIONS
  - BRIDGE UNIT WILL NOT HANG LEVEL. ADJUST CABLE LENGTHS AS REQUIRED
  - MANUFACTURER SHALL MARK END OF UNIT C3B WITH REINFORCING BLOCKOUT PRIOR TO SHIPPING.

ARCH UNIT		
CONCRETE	REINF. STEEL	WWF
28-DAY: 6000 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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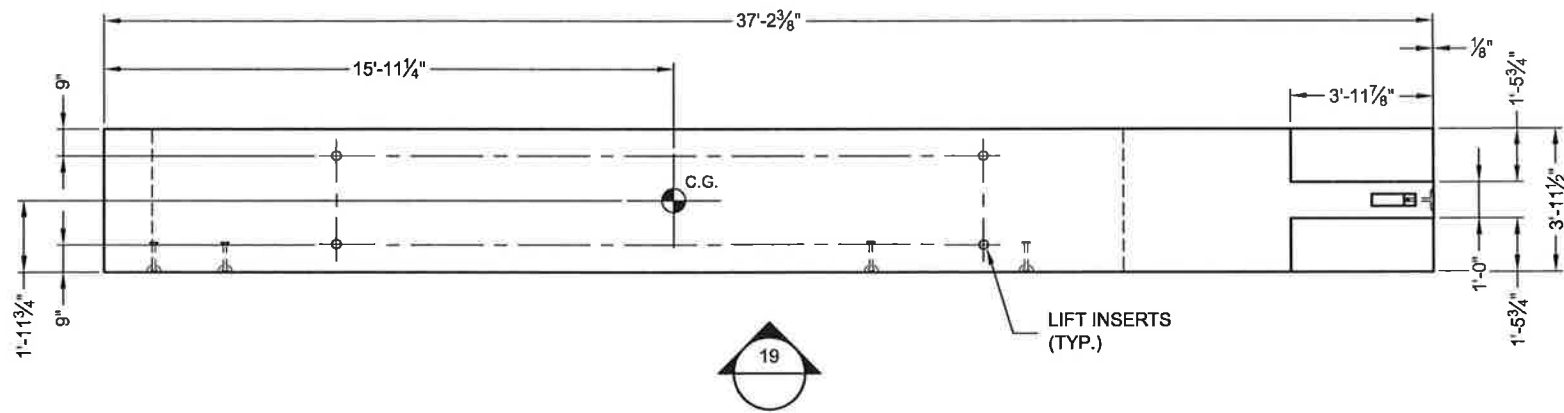
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WALNUT COVE, NORTH CAROLINA

PROJECT No.: 445919	SEQ. No.: 001	DATE: 12/15/2011
DESIGNED: MRP	DRAWN: JCH	
CHECKED: RKL	APPROVED: PAC	
SHEET NO.: S13 OF S23		

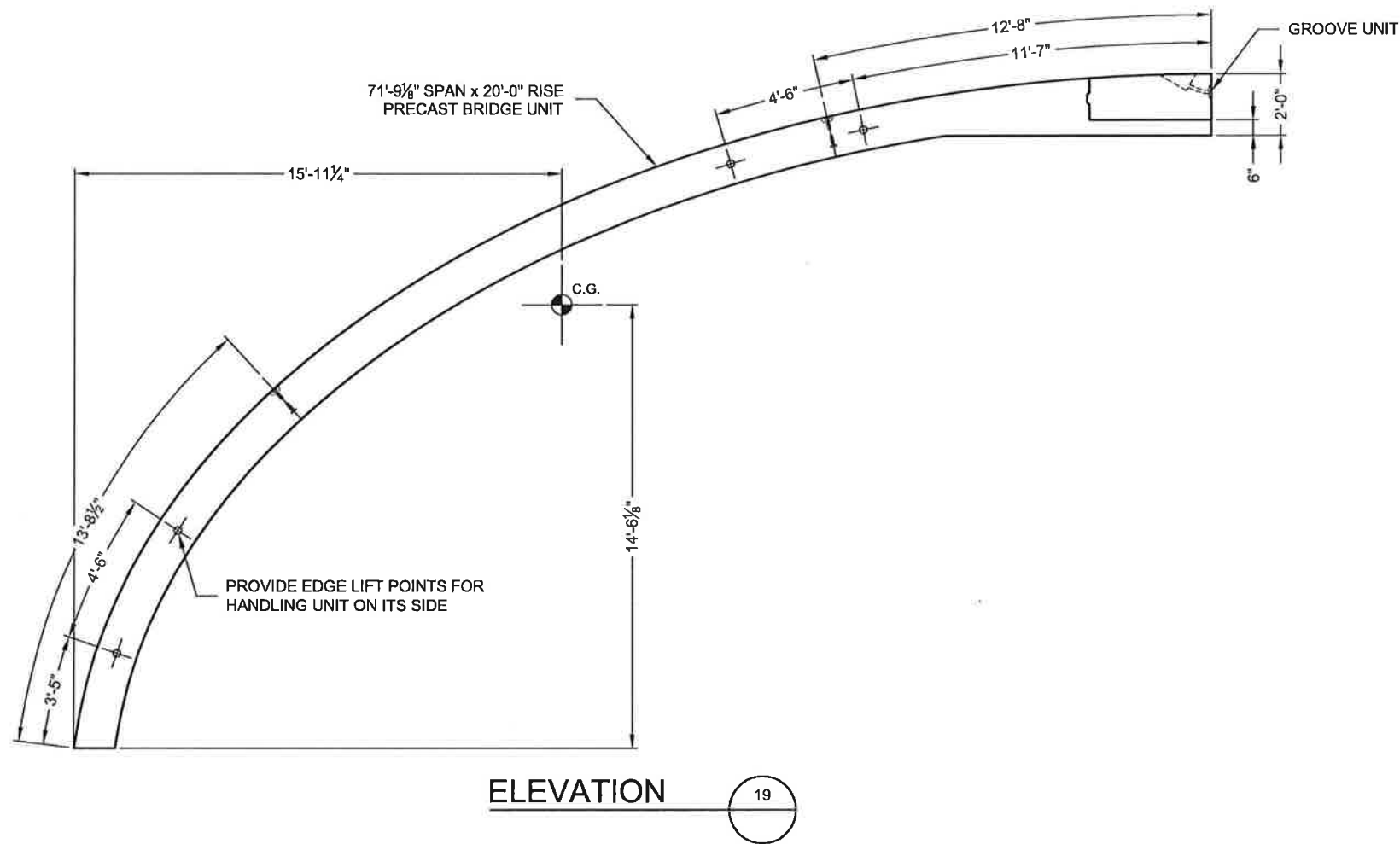
- NOTES:
- ALL EDGES OF PRECAST TO HAVE A 3/4" CHAMFER
  - SEE SHEET S2 FOR BRIDGE UNIT DIMENSIONS
  - BRIDGE UNIT WILL NOT HANG LEVEL. ADJUST CABLE LENGTHS AS REQUIRED

ARCH UNIT		
CONCRETE	REINF. STEEL	WWF
28-DAY: 6000 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 - C4A  
TOTAL WEIGHT = 18.0 TONS



ELEVATION  
19

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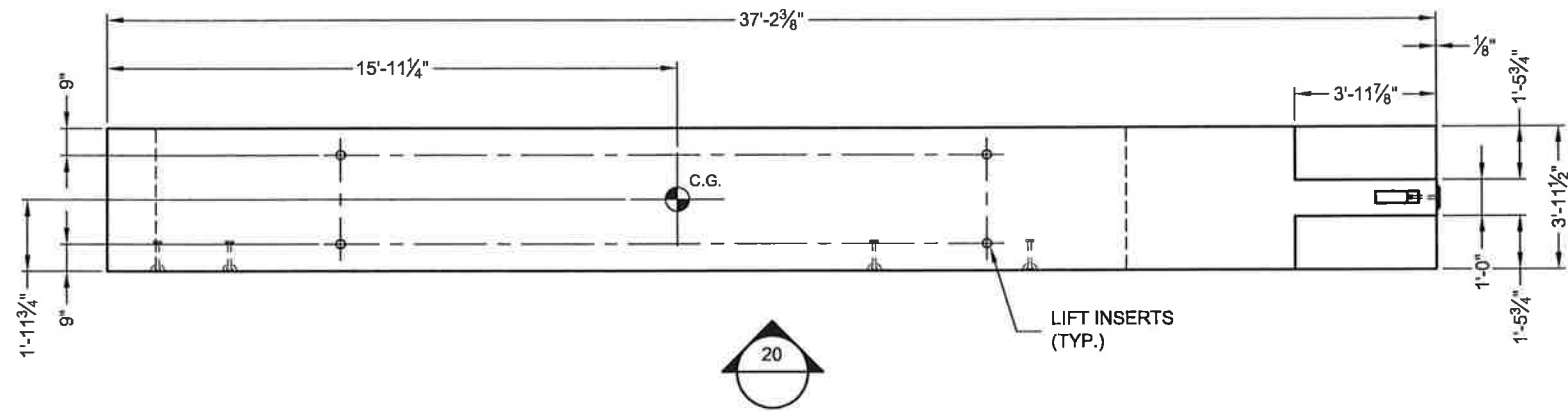
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PROJECT No.: 445919	SEQ. No.: 001	DATE: 12/15/2011
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CHECKED: RKL	APPROVED: PAC	
SHEET NO.: S14 OF S23		

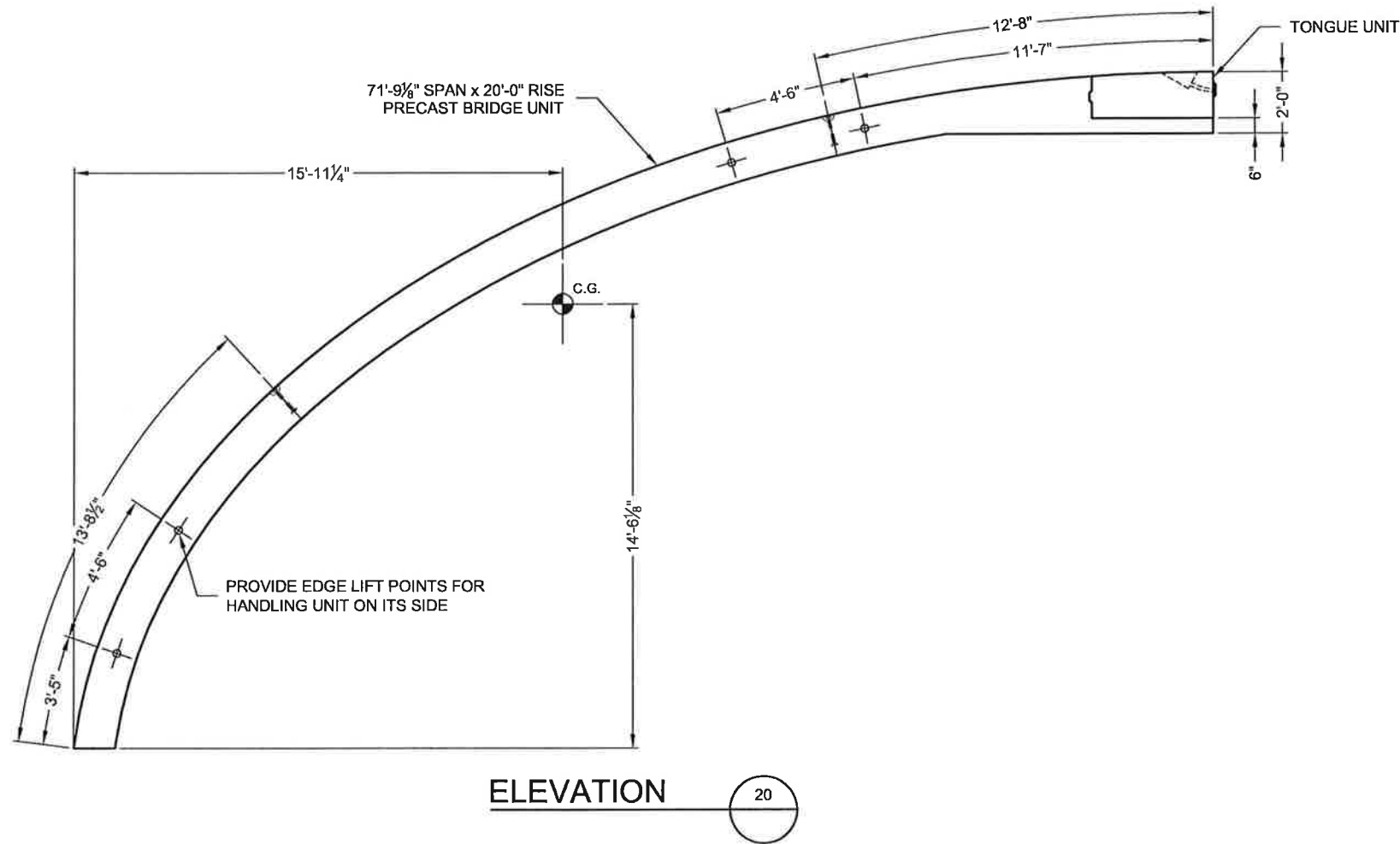
- NOTES:
- ALL EDGES OF PRECAST TO HAVE A 3/4" CHAMFER
  - SEE SHEET S2 FOR BRIDGE UNIT DIMENSIONS
  - BRIDGE UNIT WILL NOT HANG LEVEL. ADJUST CABLE LENGTHS AS REQUIRED

ARCH UNIT		
CONCRETE	REINF. STEEL	WWF
28-DAY: 6000 PSI	60,000 PSI UNCOATED	65,000 PSI UNCOATED

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PLAN - C4B  
TOTAL WEIGHT = 18.0 TONS



ELEVATION  
20

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PROJECT No.: 445919	SEQ. No.: 001	DATE: 12/15/2011
DESIGNED: MRP	DRAWN: JCH	
CHECKED: RKL	APPROVED: PAC	
SHEET NO.: S15 OF S23		



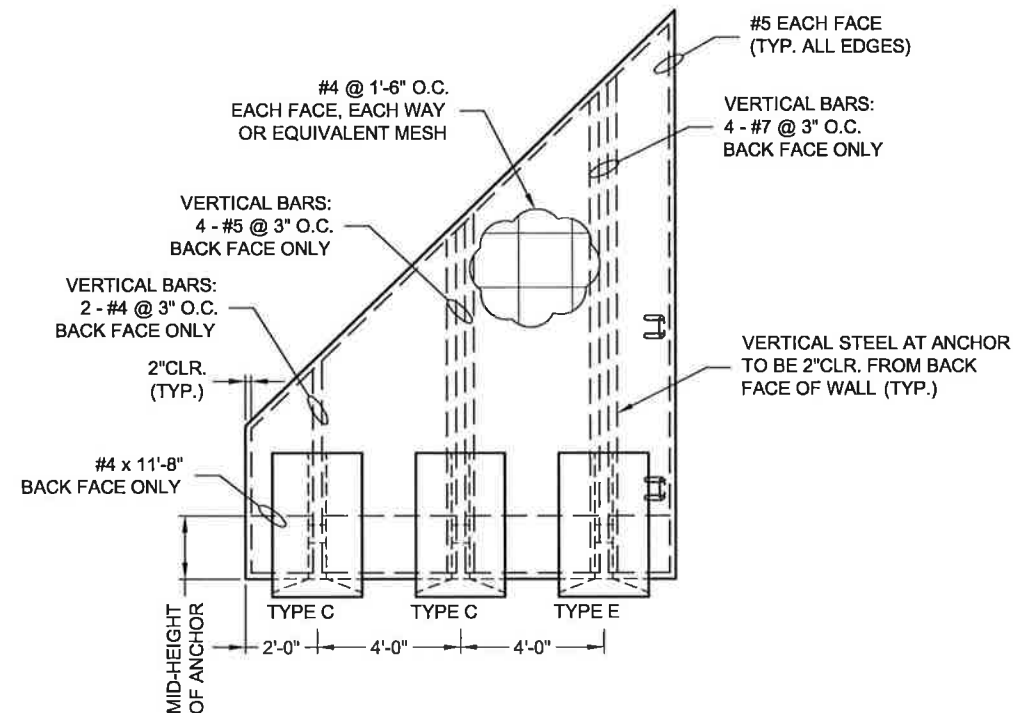
- ALL EDGES OF PRECAST TO HAVE A 3/4" CHAMFER
- ELEVATION IS LOOKING AT BACK FACE OF WINGWALL
- BACK FACE DENOTES ANCHOR SIDE OF WINGWALL
- WINGWALL WILL NOT HANG LEVEL. ADJUST CABLE LENGTHS AS REQUIRED

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

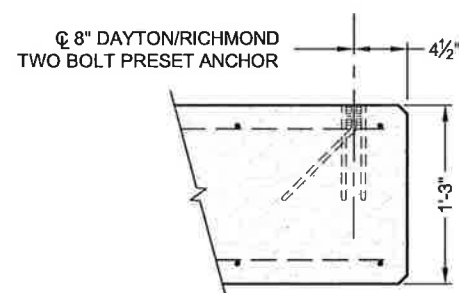
Technical drawing of a wingwall cross-section. The drawing includes the following dimensions and features:

- Overall Dimensions:**
  - Top width: 12'-0"
  - Right height: 15'-9 3/8"
- Internal Dimensions and Spacing:**
  - Top right horizontal offset: 5'-0 1/8"
  - Horizontal spacing between vertical lines: 3'-0", 3'-0", 1'-6"
  - Vertical spacing on the right: 4 1/2", 4'-6", 2'-6"
  - Bottom horizontal spacing: 2'-0", 4'-0", 4'-0"
  - Vertical dimensions on the left: 4'-3", 4'-9 1/8", 2'-0", 2'-0"
- Structural Features:**
  - Three rectangular sections labeled TYPE C, TYPE C, and TYPE E.
  - A center of gravity (C.G.) point marked with a circle and a dot.
  - A lift point indicated by a circle with a dot and a line pointing to it.
  - A wall anchor indicated by a circle with a dot and a line pointing to it.
- Notes:**
  - ☉ LIFT POINTS (TOP 2 LIFT POINTS MUST BE CAPABLE OF SUPPORTING ENTIRE WEIGHT OF WINGWALL)
  - ☉ WALL ANCHOR
- Orientation:** A circular symbol with the number 21 inside, indicating a specific orientation or view.

TOTAL WEIGHT = 14.2 TONS



(FOR ANCHOR REINFORCING SEE SHEET S20)



21

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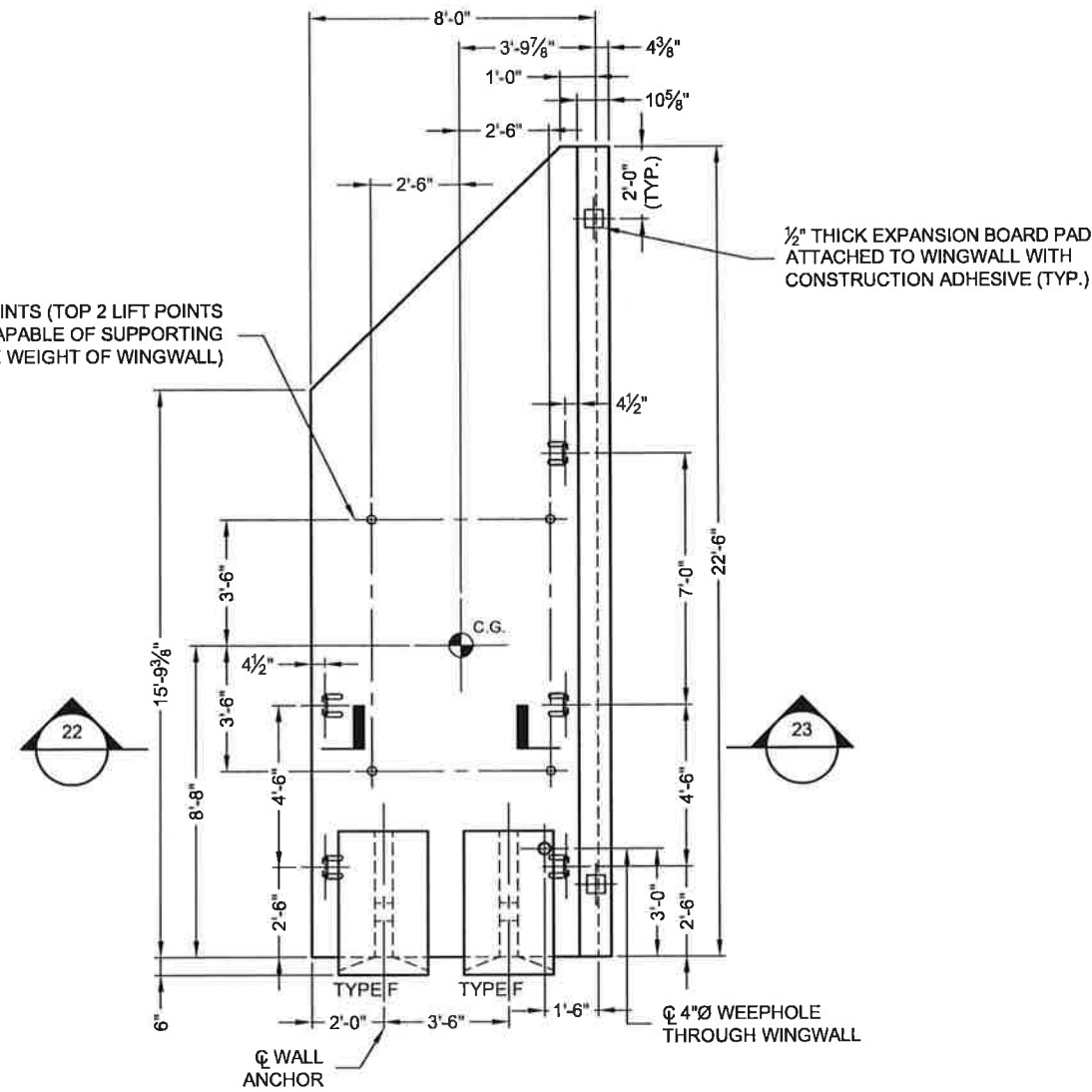
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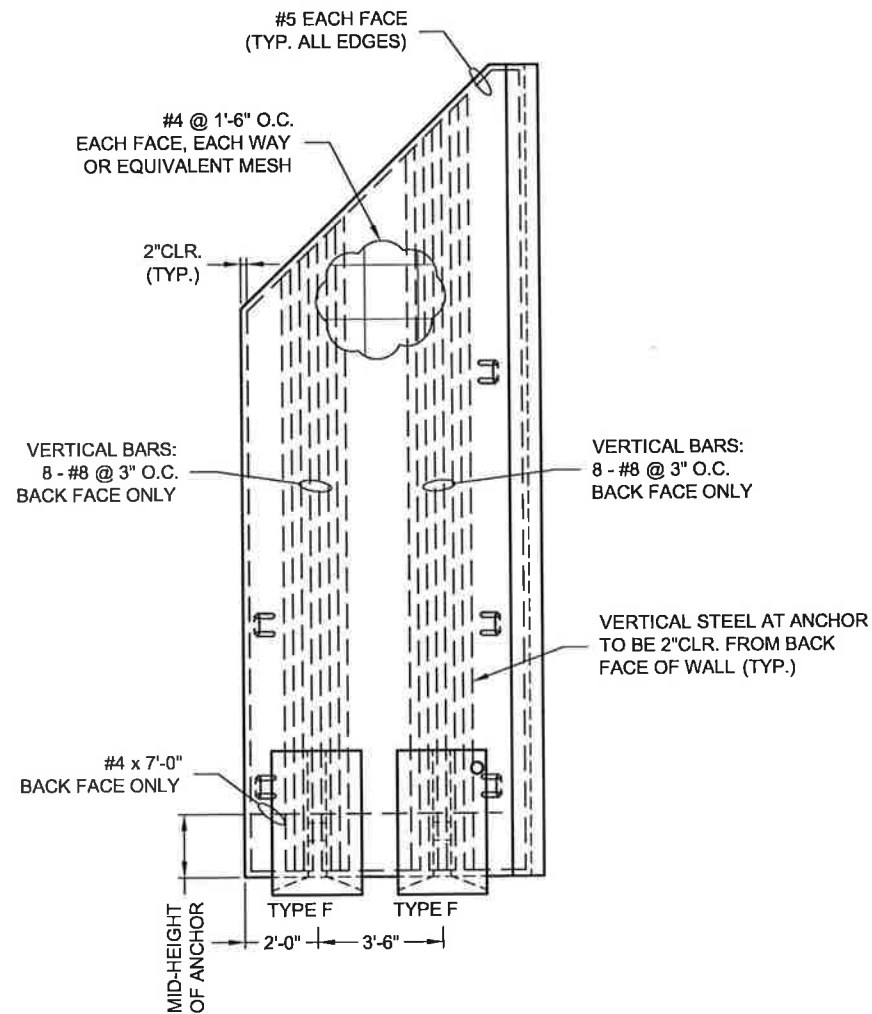
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WALNUT COVE, NORTH CAROLINA

PROJECT No:	SEQ. No.:	DATE:
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DESIGNED:	DRAWN:	
MRP	JCH	
CHECKED:	APPROVED:	
RKL	PAC	
SHEET NO.:		
S16 OF S23		



**WINGWALL - WW1B & WW4B**  
TOTAL WEIGHT = 17.3 TONS

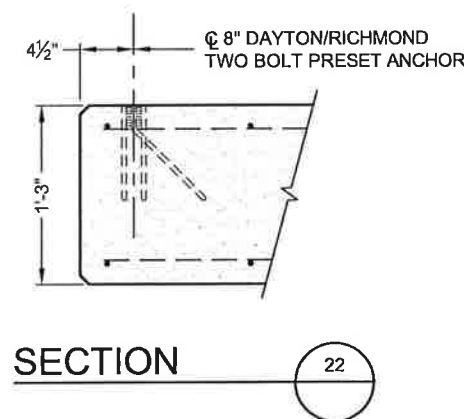


**REINFORCING DETAIL - WW1B & WW4B**  
(FOR ANCHOR REINFORCING SEE SHEET S21)

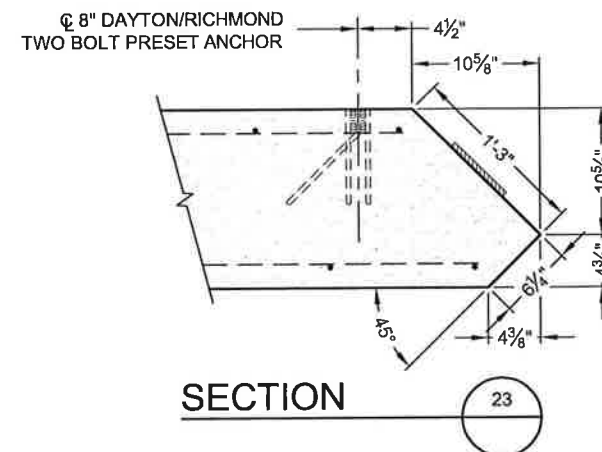
- NOTES:**
- ALL EDGES OF PRECAST TO HAVE A 3/4" CHAMFER
  - ELEVATION IS LOOKING AT BACK FACE OF WINGWALL
  - BACK FACE DENOTES ANCHOR SIDE OF WINGWALL
  - WINGWALL WILL NOT HANG LEVEL. ADJUST CABLE LENGTHS AS REQUIRED

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.



**SECTION**



**SECTION**

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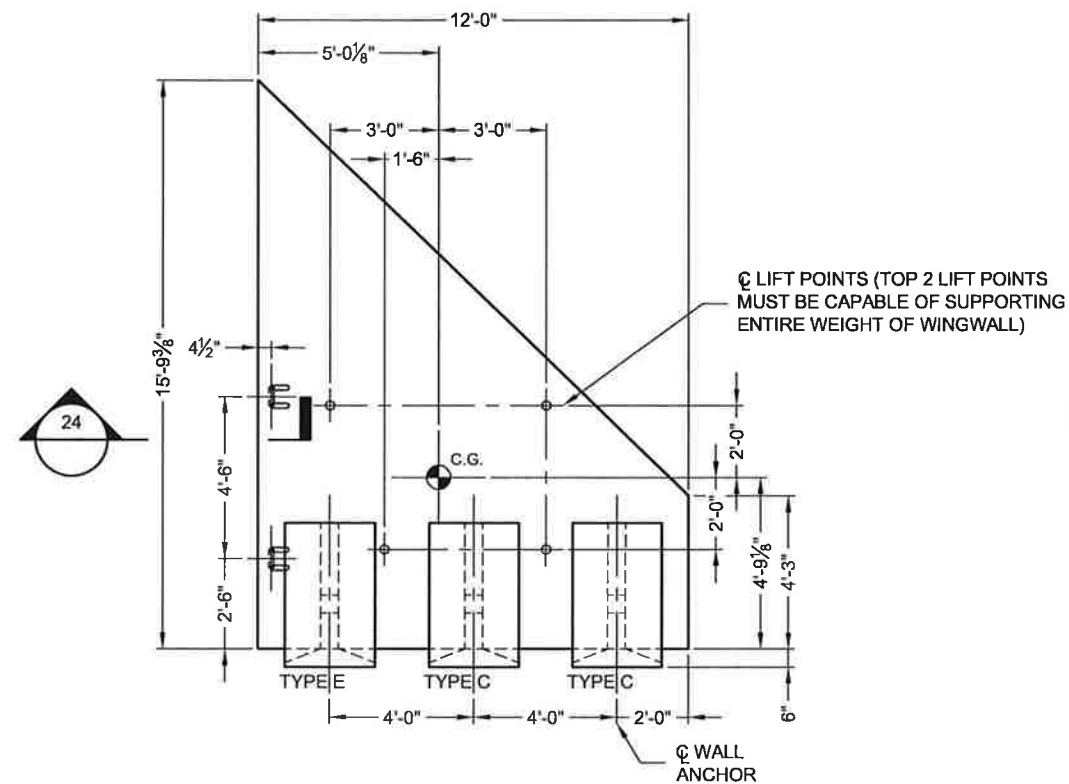
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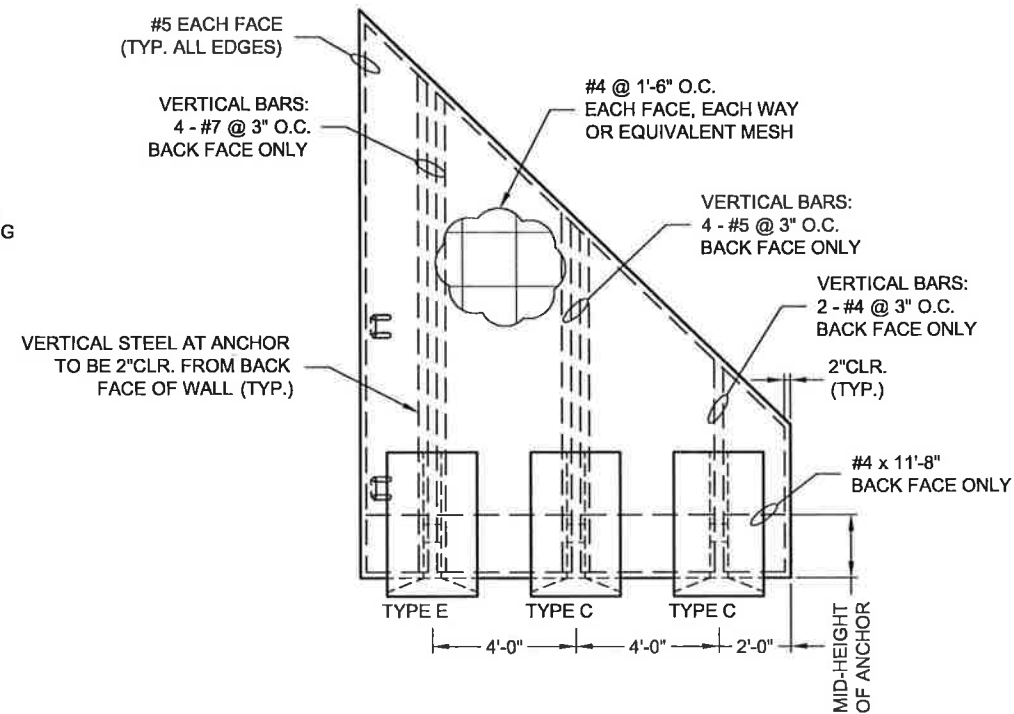
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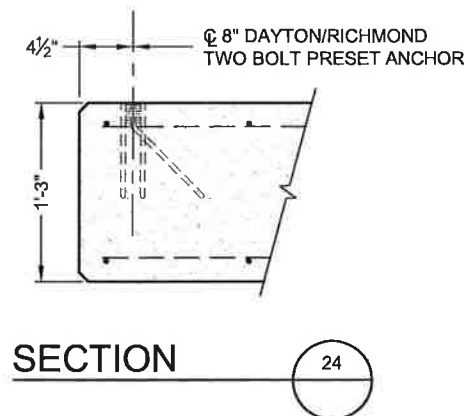
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DESIGNED: MRP	DRAWN: JCH	
CHECKED: RKL	APPROVED: PAC	
SHEET NO.: S17 OF S23		



**WINGWALL - WW2A & WW3A**  
TOTAL WEIGHT = 14.2 TONS



**REINFORCING DETAIL - WW2A & WW3A**  
(FOR ANCHOR REINFORCING SEE SHEET S20)



- 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.

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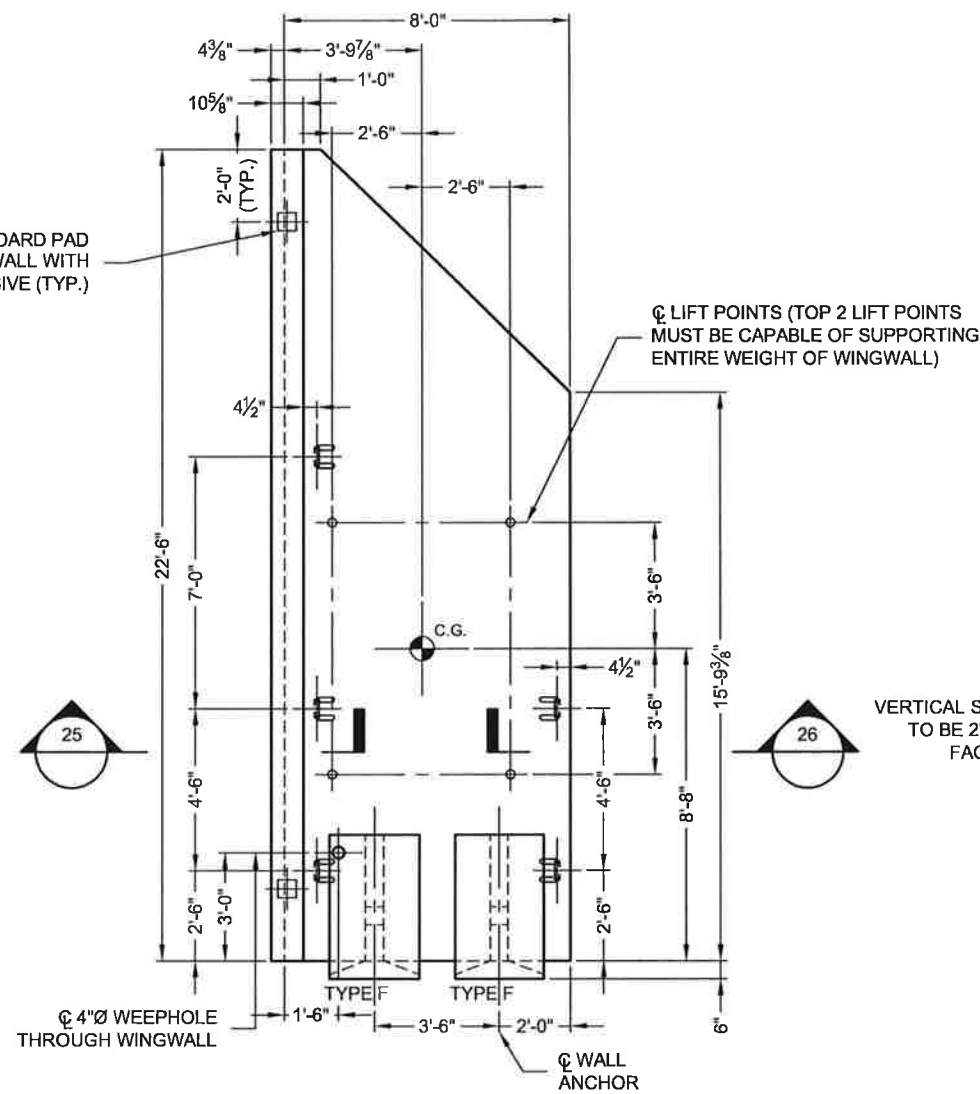
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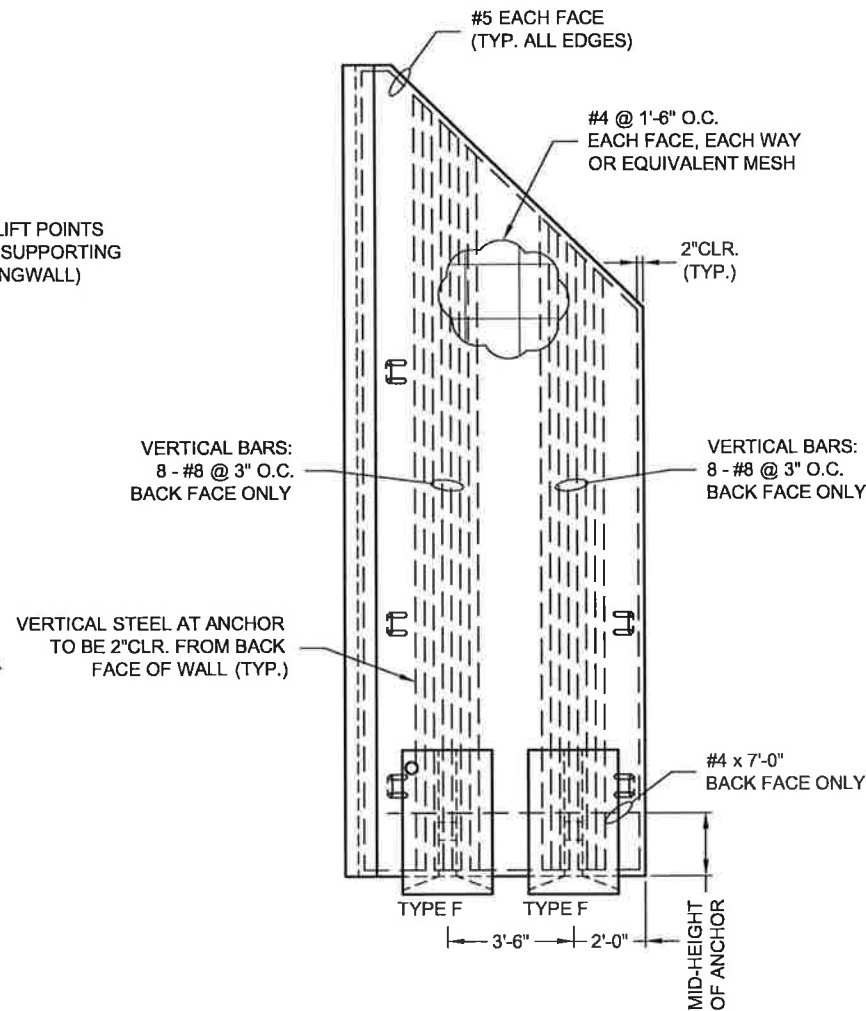
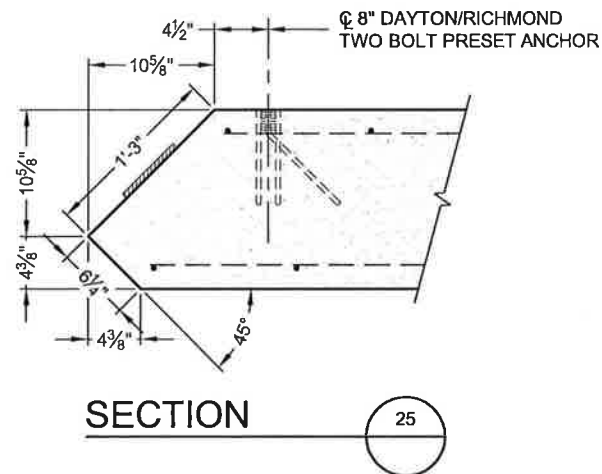
PROJECT No.: 445919	SEQ. No.: 001	DATE: 12/15/2011
DESIGNED: MRP	DRAWN: JCH	
CHECKED: RKL	APPROVED: PAC	
SHEET NO.: S18 OF S23		

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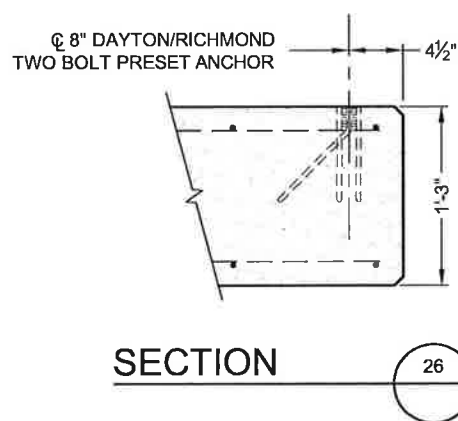
### WINGWALL - WW2B & WW3B

TOTAL WEIGHT = 17.3 TONS



### REINFORCING DETAIL - WW2B & WW3B

(FOR ANCHOR REINFORCING SEE SHEET S21)



- 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.

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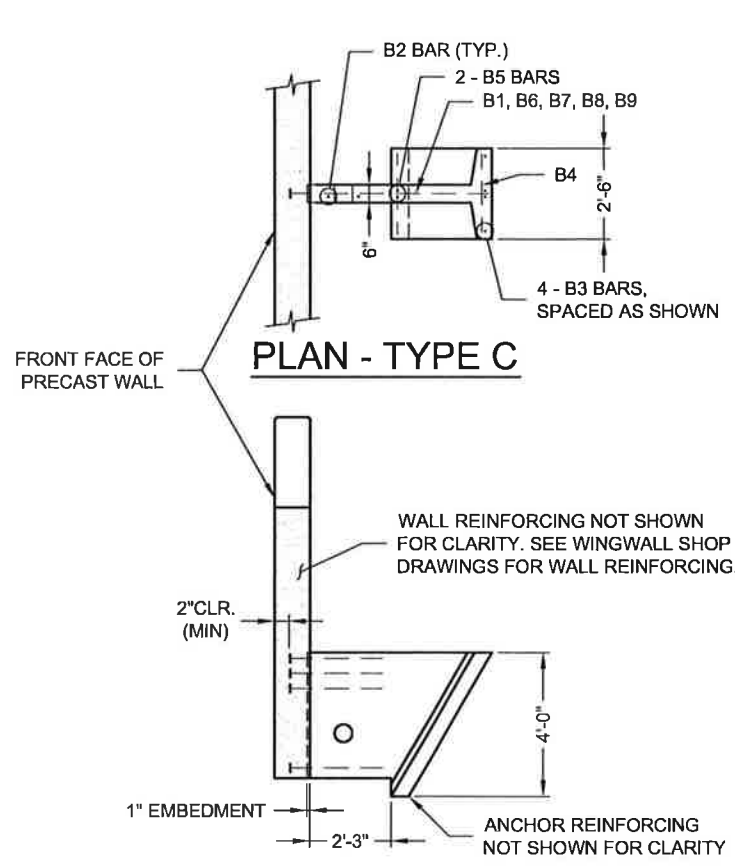
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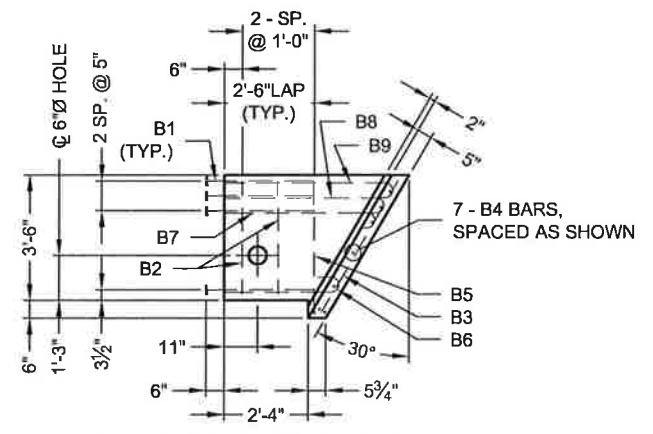
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CHECKED: RKL	APPROVED: PAC	
SHEET NO.: S19 OF S23		

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SECTION - TYPE C

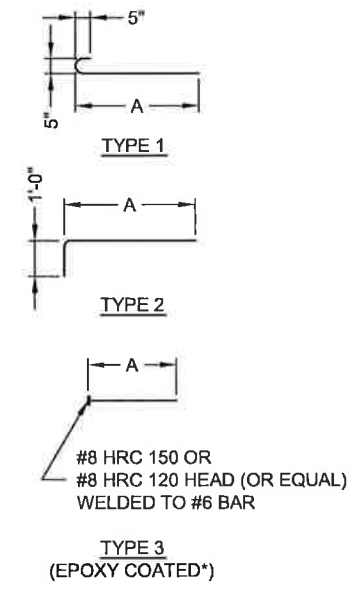


PRECAST ANCHOR  
TYPE C

TOTAL WEIGHT = .896 TONS

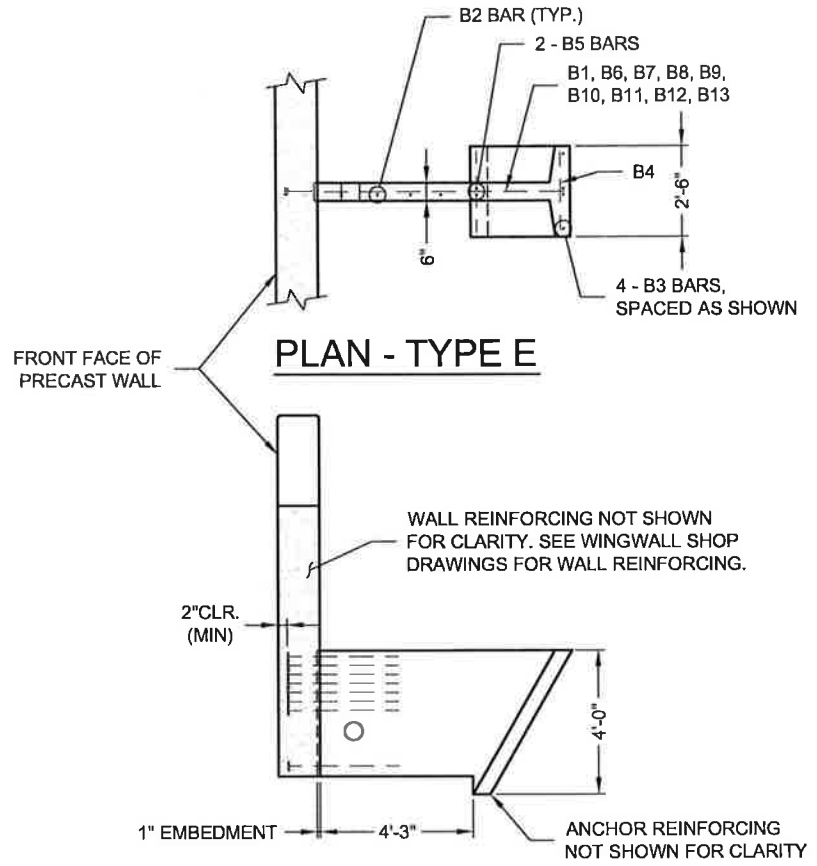
BAR LIST - TYPE C						
MARK	QTY.	SIZE	A	TYPE	LENGTH	FINISH
B1	4	#6	3'-0"	3	---	EPOXY*
B2	2	#5	---	STR.	3'-2"	BLACK
B3	4	#5	---	STR.	4'-3"	BLACK
B4	7	#5	---	STR.	2'-2"	BLACK
B5	2	#5	3'-8"	2	---	BLACK
B6	1	#5	3'-2"	1	---	BLACK
B7	1	#5	4'-2"	1	---	BLACK
B8	1	#5	4'-5"	1	---	BLACK
B9	1	#5	4'-8"	1	---	BLACK

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

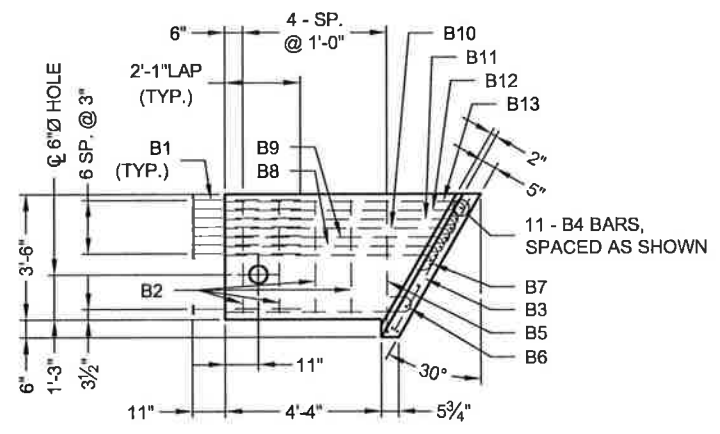


\*NOTE: EPOXY COATING IS NOT REQUIRED ON HEADED ENDS OF TYPE 3 BARS, BUT WILL NOT BE DETRIMENTAL IF PROVIDED.

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



SECTION - TYPE E



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"

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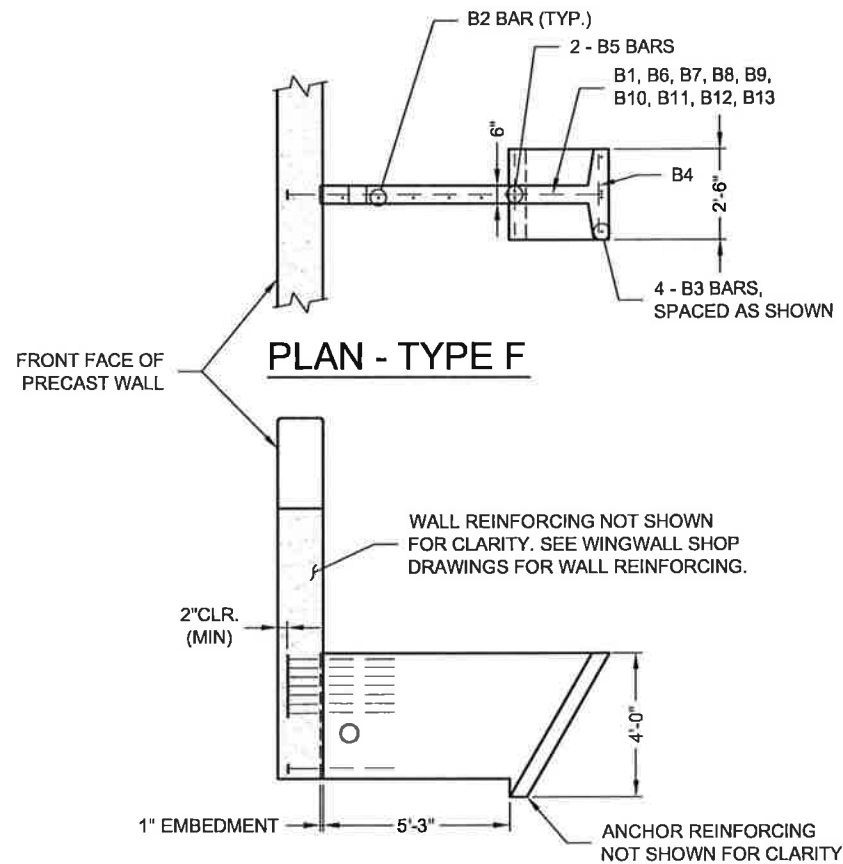
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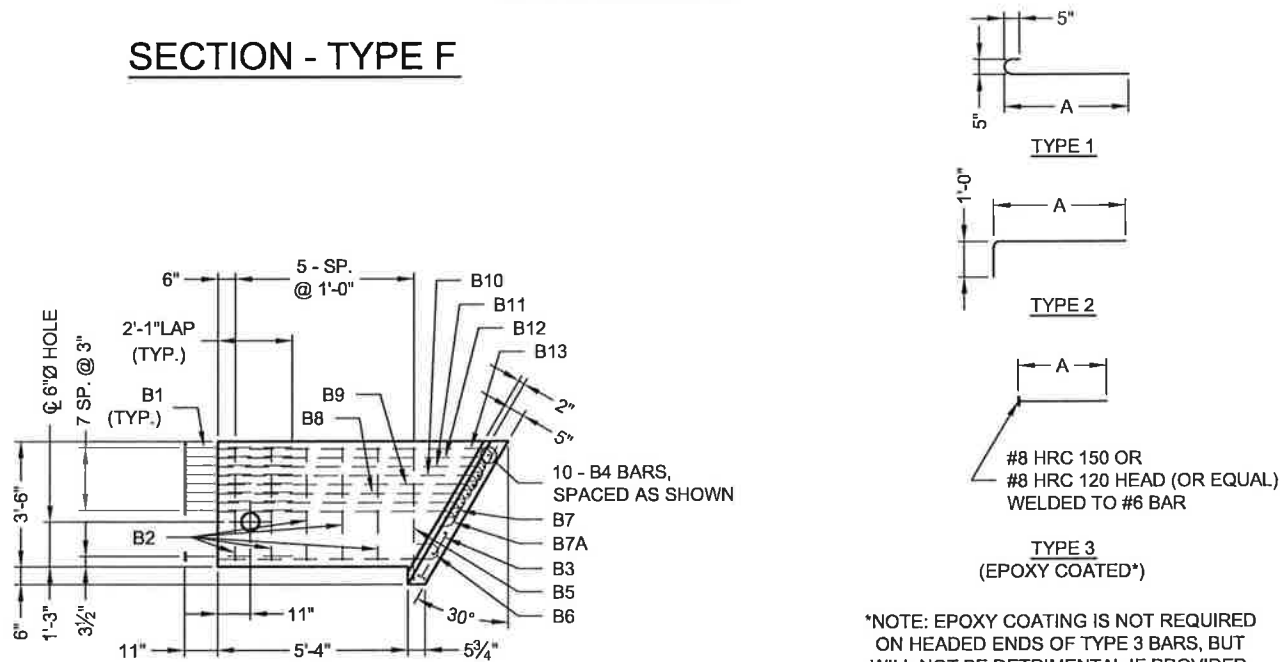
PROJECT No:	SEQ. No.:	DATE:
445919	001	12/15/2011
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RKL	PAC	
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BAR LIST - TYPE F						
MARK	QTY.	SIZE	A	TYPE	LENGTH	FINISH
B1	8	#6	3'-0"	3	---	EPOXY*
B2	5	#5	---	STR.	3'-2"	BLACK
B3	4	#5	---	STR.	4'-3"	BLACK
B4	10	#5	---	STR.	2'-2"	BLACK
B5	2	#5	3'-8"	2	---	BLACK
B6	1	#5	6'-2"	1	---	BLACK
B7	1	#5	6'-9"	1	---	BLACK
B7A	1	#5	6'-7"	1	---	BLACK
B8	1	#5	6'-11"	1	---	BLACK
B9	1	#5	7'-1"	1	---	BLACK
B10	1	#5	7'-3"	1	---	BLACK
B11	1	#5	7'-5"	1	---	BLACK
B12	1	#5	7'-6"	1	---	BLACK
B13	1	#5	7'-8"	1	---	BLACK

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



### PRECAST ANCHOR TYPE F

TOTAL WEIGHT = 1.290 TONS

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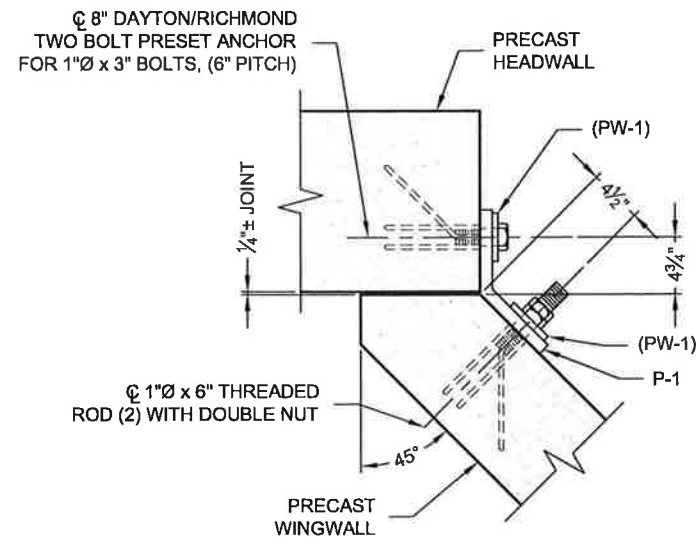


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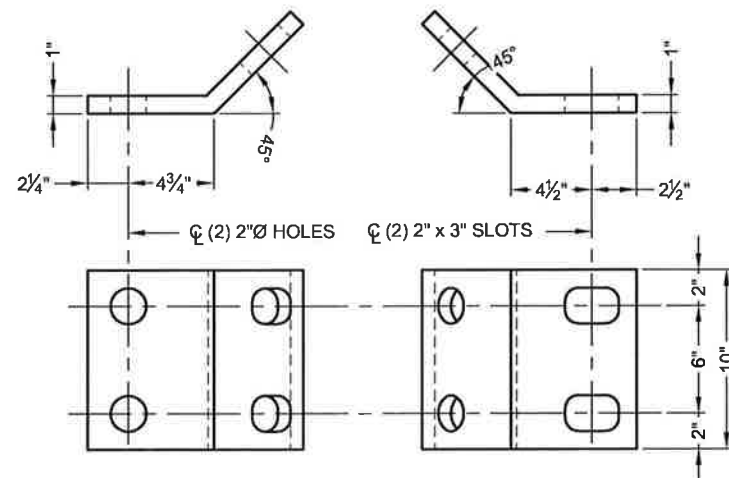
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PLAN VIEW

## TYPICAL CONNECTION DETAIL - P-1



HEADWALL LEG

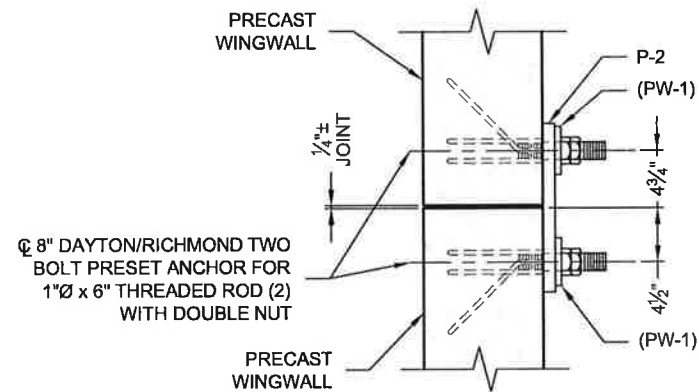
WINGWALL LEG

P-1

(PL 1" x 14" x 10")  
(GALVANIZED AS PER ASTM A153)

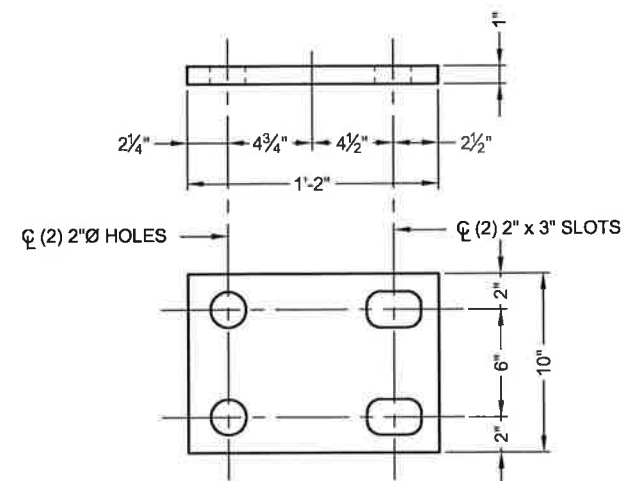
PLATE P-1

TOTAL REQUIRED = 12  
(4) PW-1 REQ'D. PER PLATE



PLAN VIEW

## TYPICAL CONNECTION DETAIL - P-2

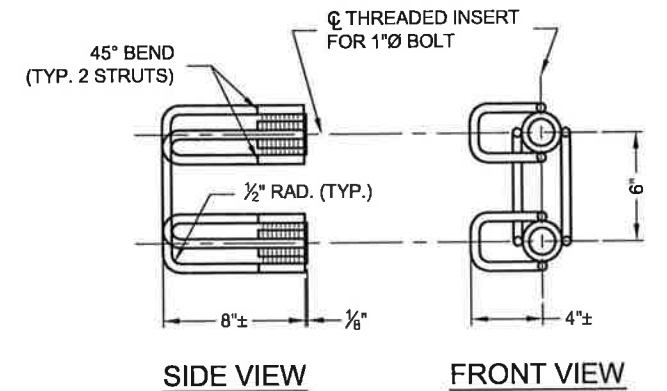


P-2

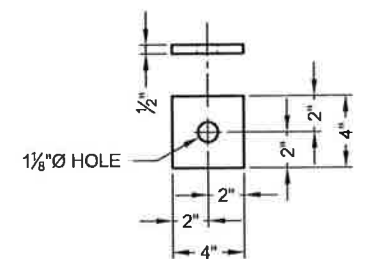
(PL 1" x 14" x 10")  
(GALVANIZED AS PER ASTM A153)

PLATE P-2

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



## DAYTON/RICHMOND TWO BOLT PRESET ANCHOR



PW-1

(PL WASHER, 1/2" x 4" x 4")  
(GALVANIZED AS PER ASTM A153)

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MRP	JCH	
CHECKED:	APPROVED:	
RKL	PAC	
SHEET NO:	S22 OF S23	

