

PROJECT:

BON FGE

SUBJECT:

Concrete Alternative

COMPUTED BY:

CMA

CHECKED BY:

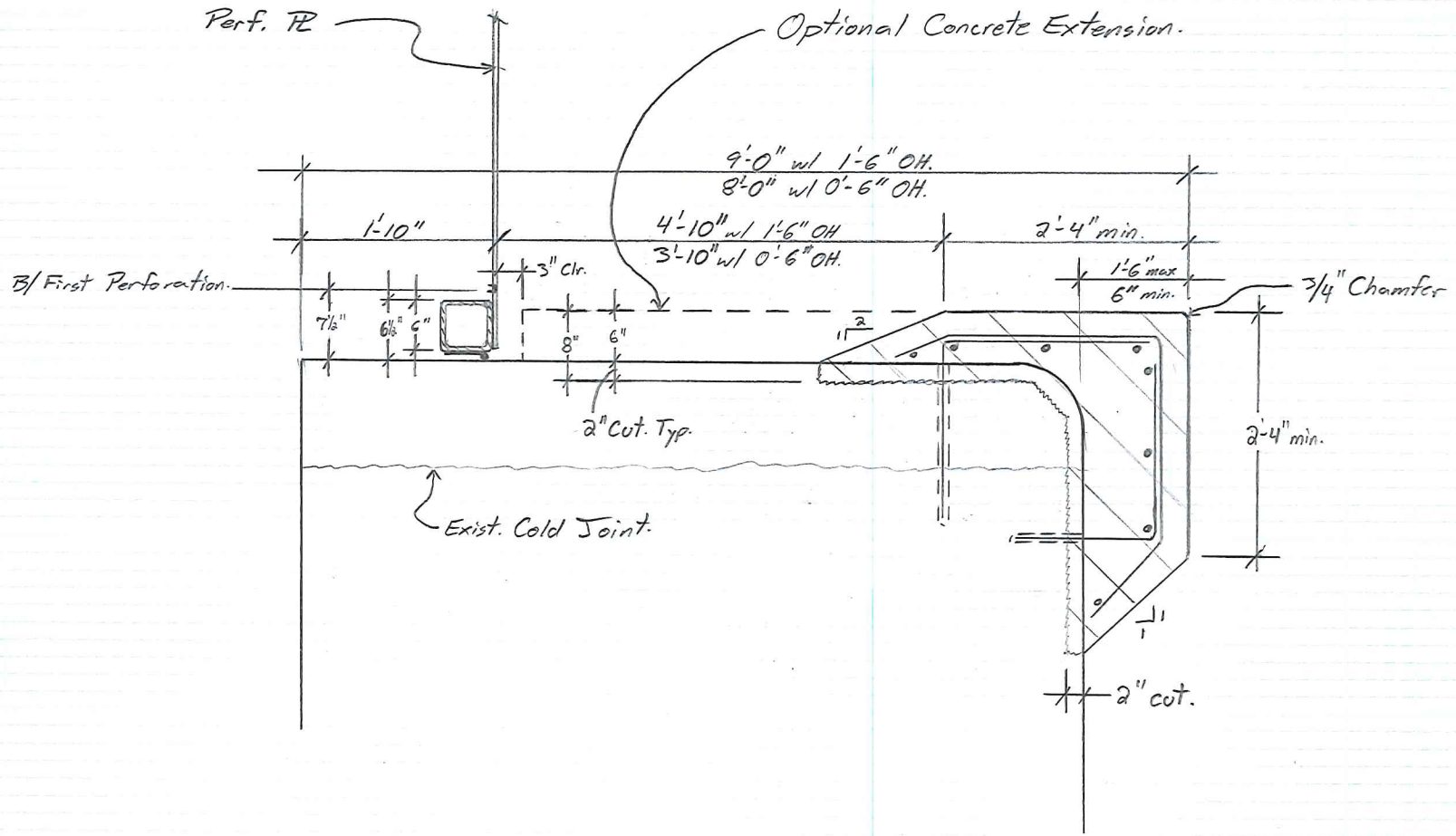
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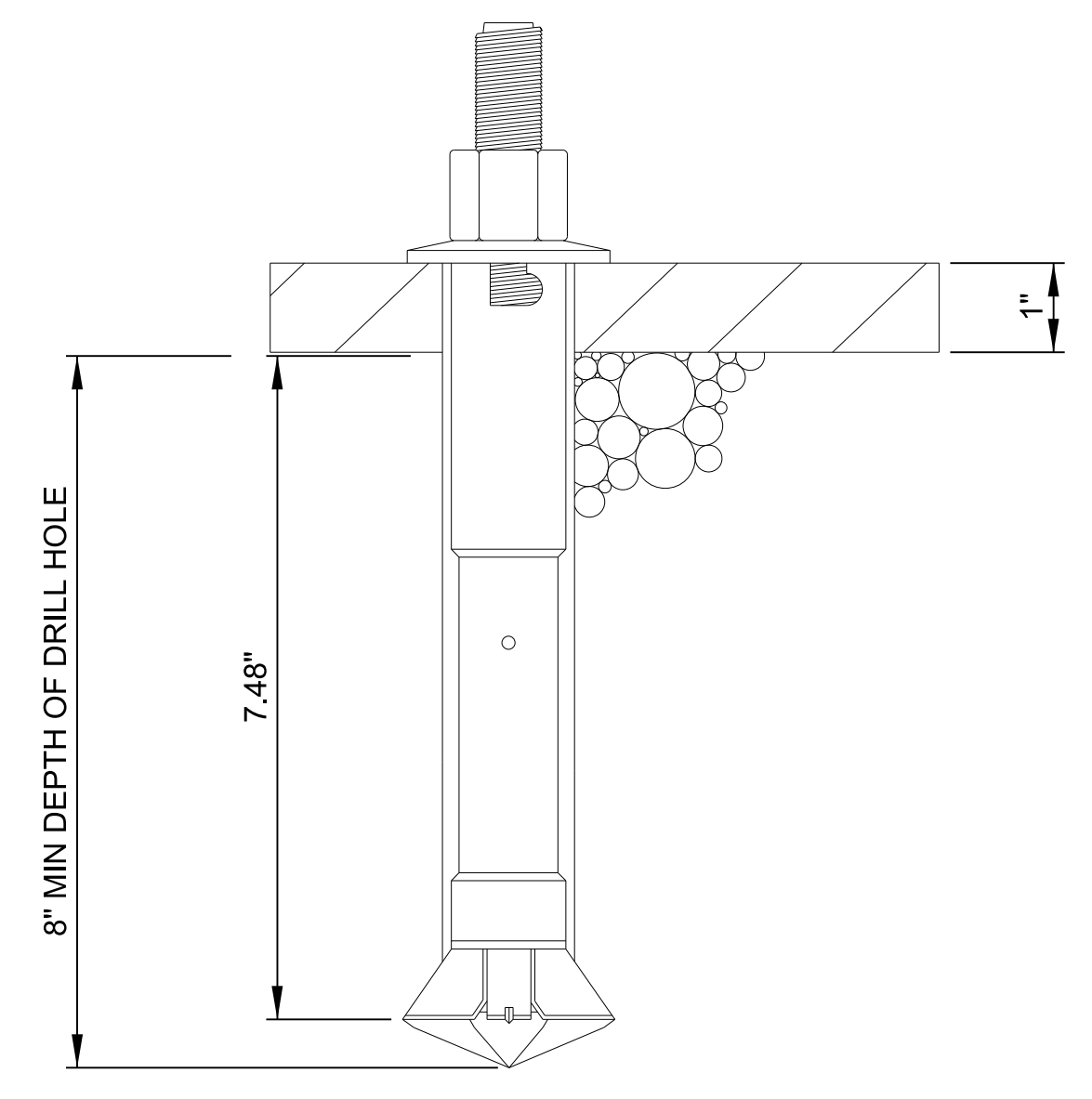
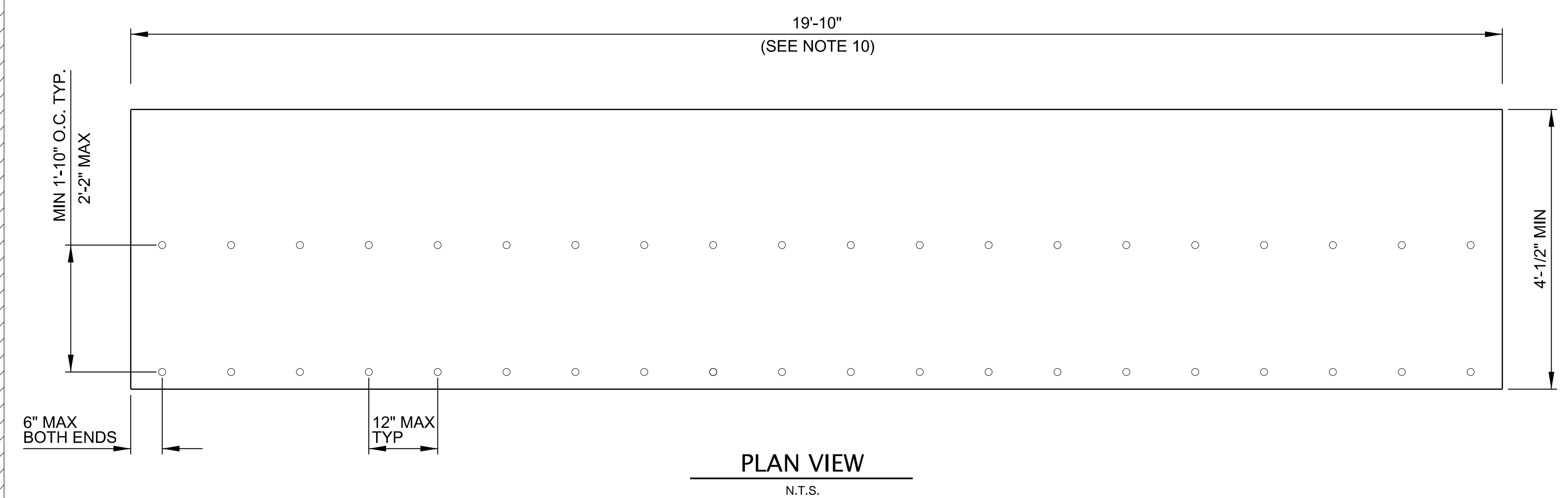
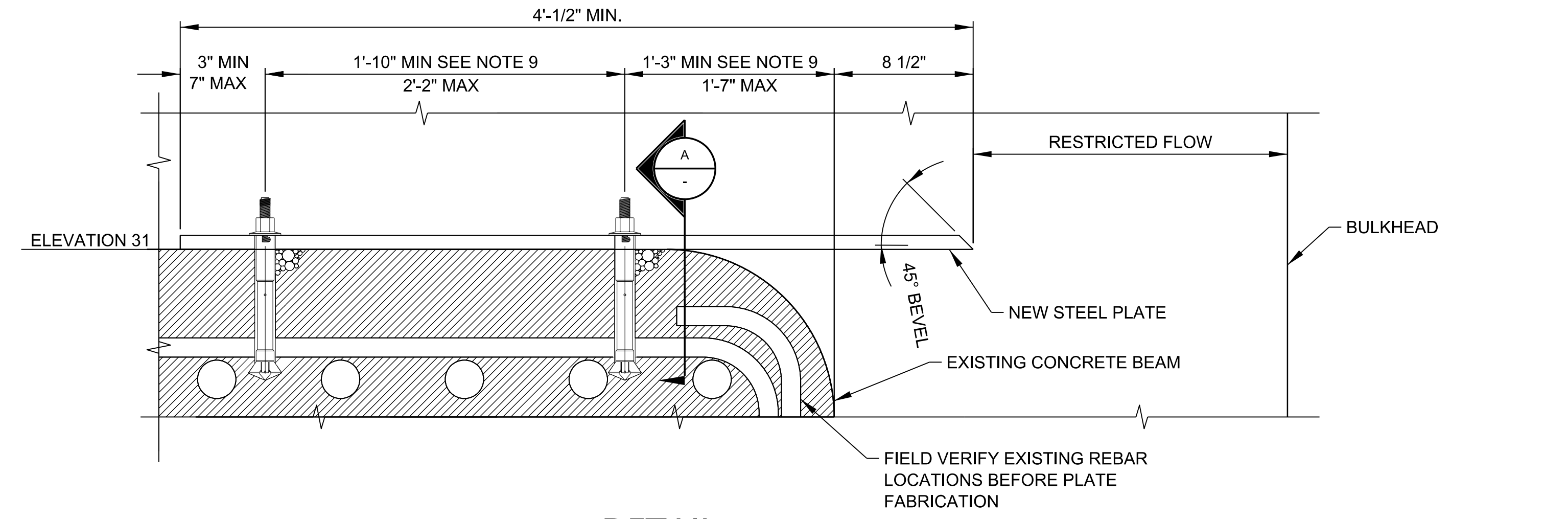
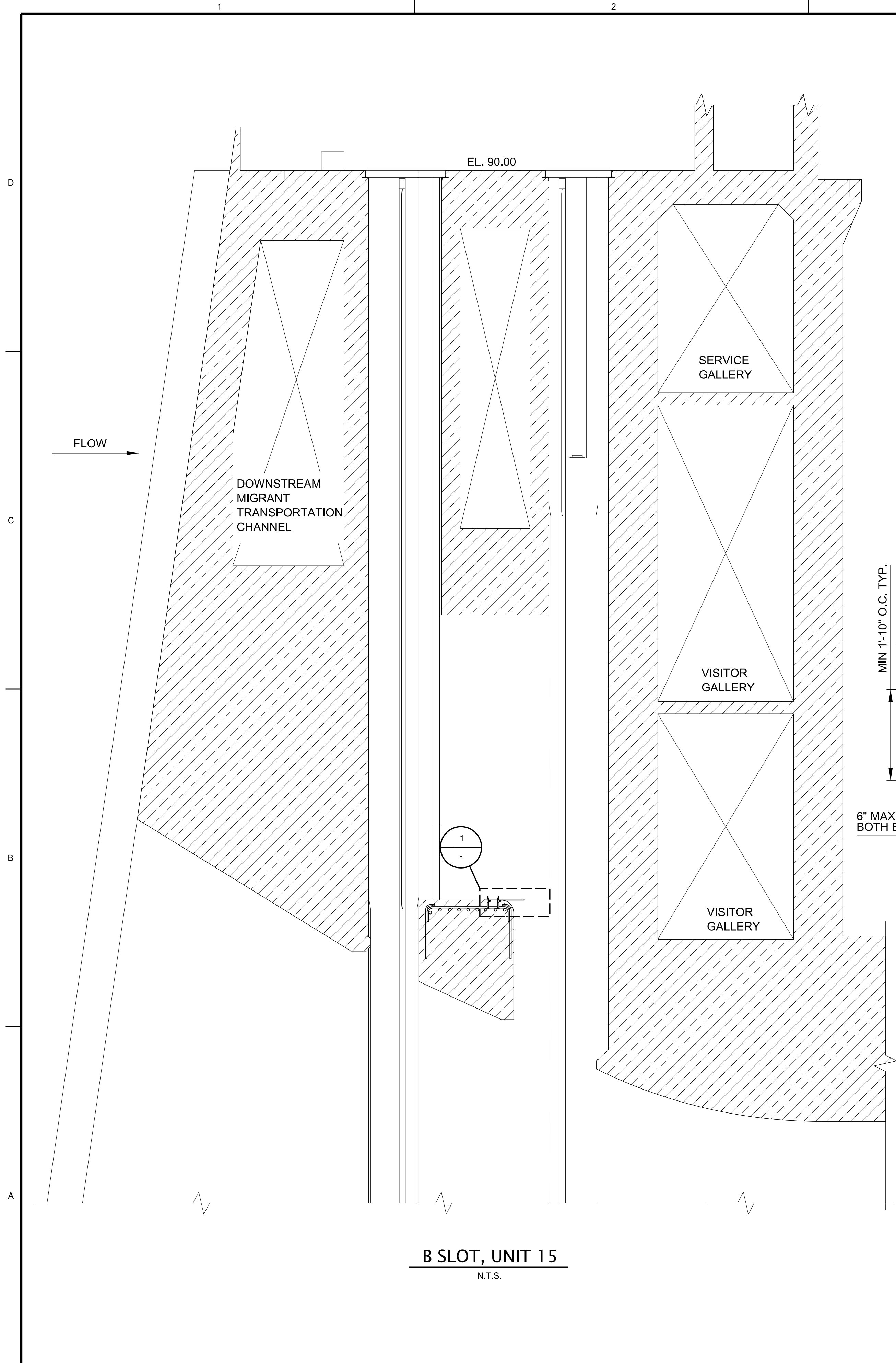
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PART:

Note:

#5 bars Class B Case 1 24" Splice.





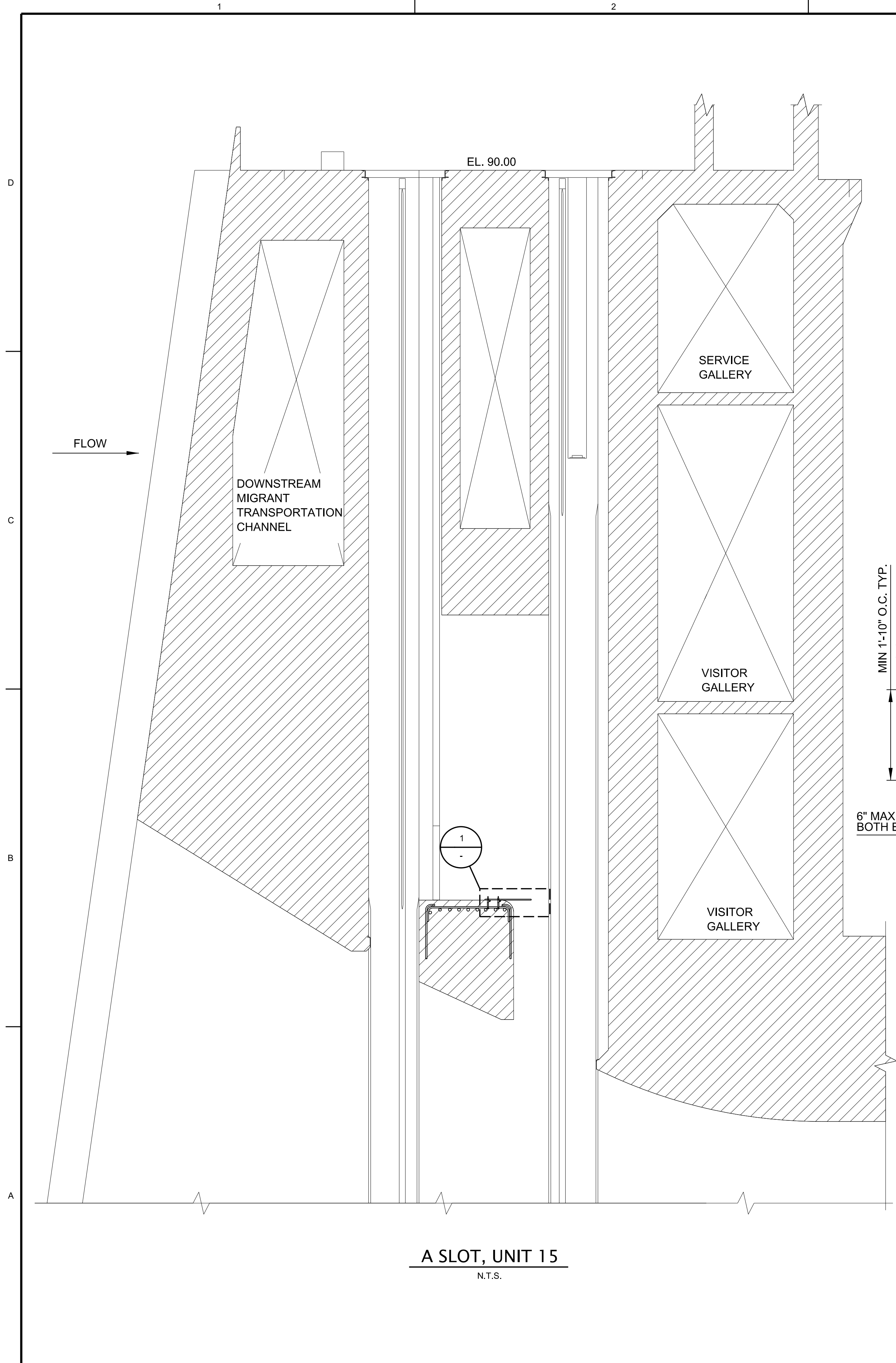
- NOTES:**
1. FIELD VERIFY DIMENSIONS BEFORE PLATE FABRICATION
 2. ALL PLATES SHALL BE STAINLESS STEEL AND CONFORM TO ASTM A240, TYPE 304.
 3. ALL ANCHOR BOLTS SHALL BE STAINLESS STEEL HILTI HDA-TR 30 M16X190/40 OR APPROVED EQUAL.
 4. ANCHOR BOLTS SHALL BE INSPECTED, TESTED, AND INSTALLED PER MANUFACTURER'S RECOMMENDATIONS.
 5. NOMINAL PLATE HOLE DIMENSIONS FOR EACH ANCHOR BOLT SHALL BE 1 1/4" INCH + 1/16" -0.0
 6. REFERENCE EXISTING REBAR ON DWG BDF-2-60/04 SEE INFORMATIONAL DRAWING (FIO)
 7. ANCHOR BOLTS MINIMUM EMBEDMENT DEPTH IS 8 INCHES.
 8. THE CONTRACTOR SHALL MAP EXISTING EMBEDDED REBAR LOCATIONS AT PLATE INSTALLATION AND SUBMIT A REPORT TO THE CONSTRUCTION OFFICE BEFORE FABRICATION AND INSTALLATION OF PLATE AND ANCHOR BOLTS.
 9. THE CONTRACTOR SHALL LOCATE THE EXISTING REBAR AND ADJUST PLATE HOLES AND ANCHOR BOLT LOCATIONS TO AVOID EXISTING REBAR BEFORE PLATE FABRICATION AND DRILLING FOR THE ANCHOR BOLTS.
 10. THE CONTRACTOR SHALL HAVE THE OPTION OF FABRICATING THE 19'-10" LONG PLATE IN SMALLER SECTIONS AND FIELD BUTT THE SECTIONS FOR A TOTAL DIMENSION AT 19'-10".
 11. THE CONTRACTOR SHALL DESIGN AND INSTALL PERMANENT FEATURES THAT ALLOW INSTALLATION OF TEMPORARY LIFTING EYES SIZED APPROPRIATELY FOR THE PLATE SECTION.
 12. THE CONTRACTOR SHALL USE ROTARY IMPACT HAMMER DRILLS FOR THE ANCHOR BOLTS.
 13. TOTAL PLATE WEIGHT IS APPROXIMATELY 3,300 LBS.
 14. ANCHOR BOLT INSTALLATION TORQUE SHALL BE 88 FT-LB

DATE	DESCRIPTION	MARK	APPR.

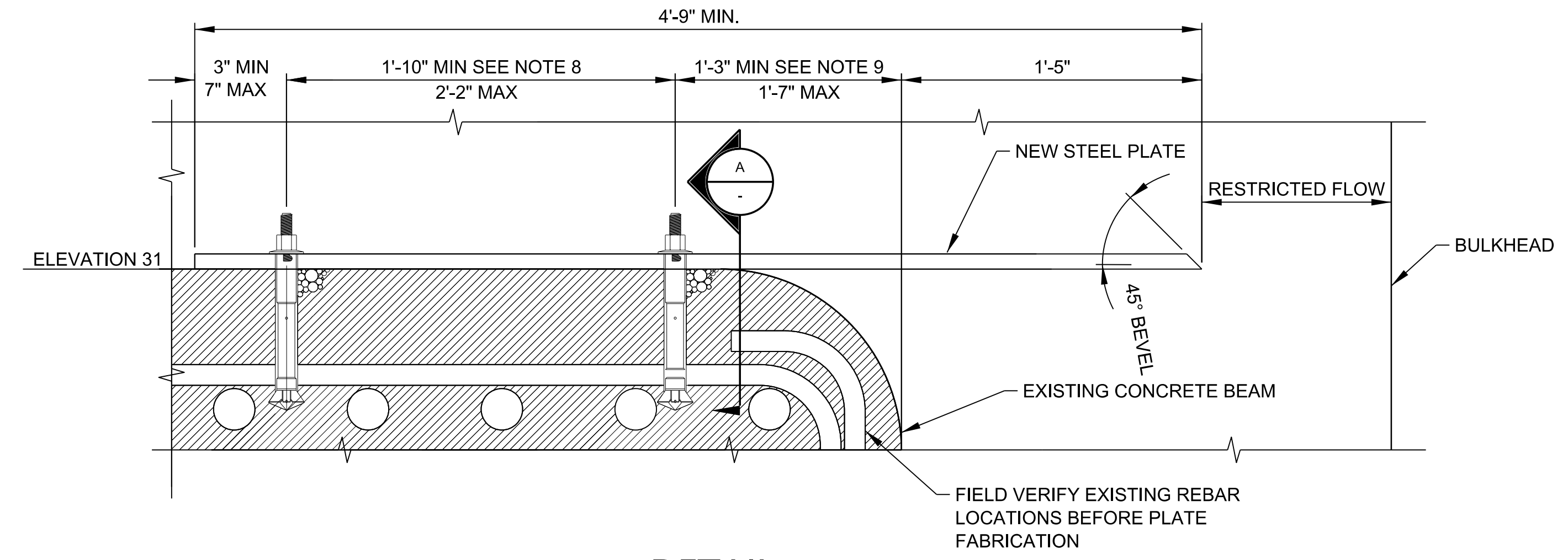
DESIGNED BY: GREGORACW	DATE: 4/22/2016	CONTRACT NO. / PLOT NO. / DRAWING NUMBER: W9127N-15-R-050 / W9127N-15-C-035 / 1-1
DESIGNED BY: GREGORACW	DATE: 8/11/2016	CONTRACT NO. / PLOT NO. / DRAWING NUMBER: W9127N-15-R-050 / W9127N-15-C-035 / 1-1
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BONNEVILLE LOCK AND DAM
SECOND POWERHOUSE
FISH GUIDANCE EFFICIENCY
FOLLOW ON
TURBINE INTAKE
FLOW CONTROL PLATE
B SLOT

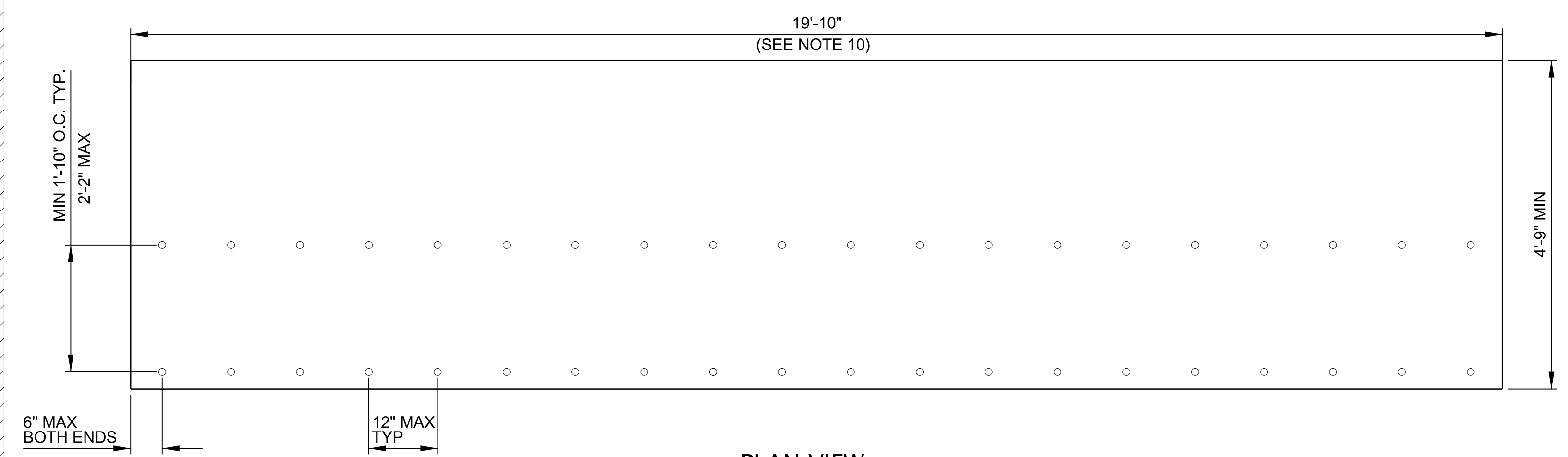
SHEET IDENTIFICATION
S-502
SHEET 0 OF 0



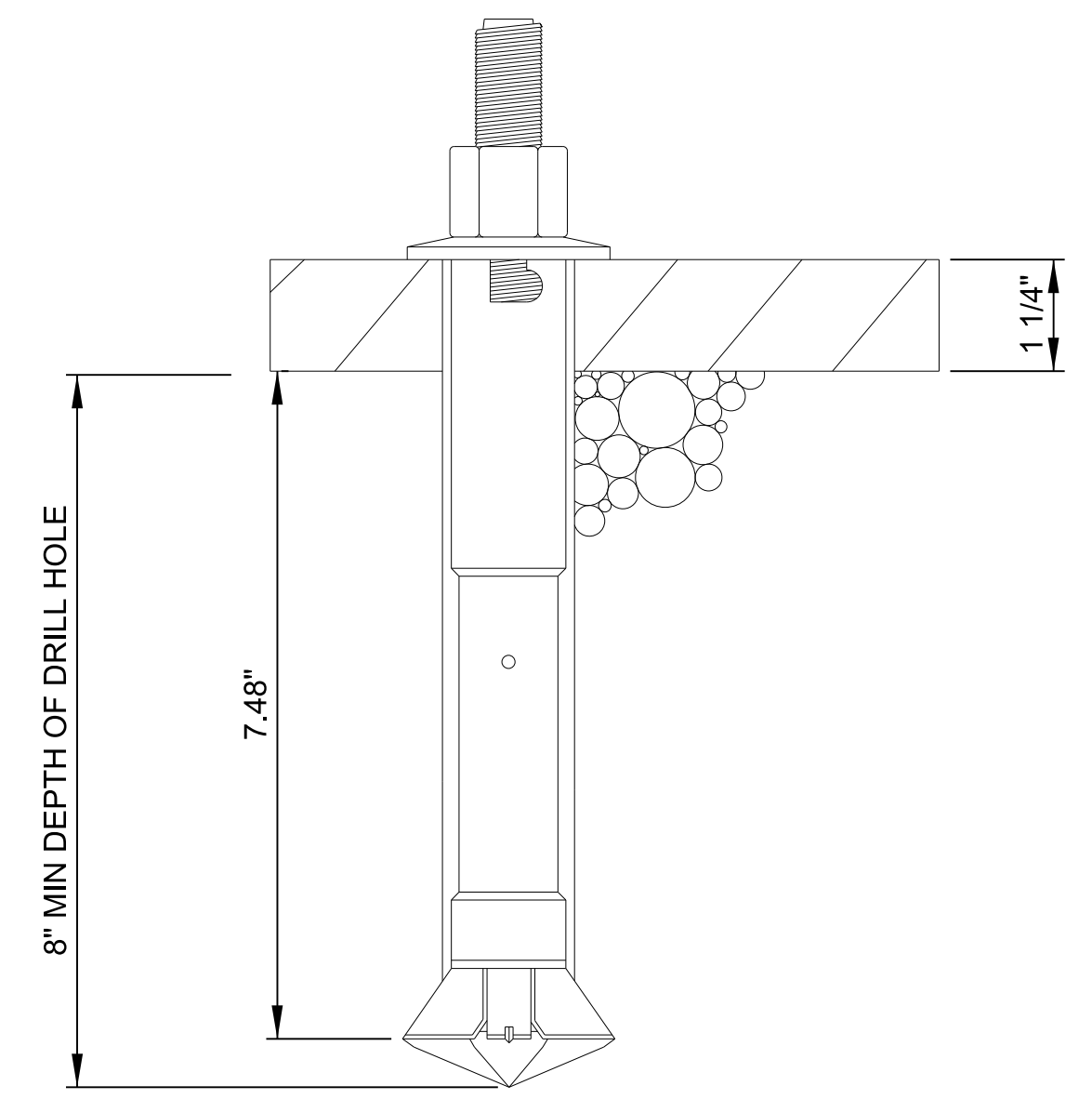
A SLOT, UNIT 15
N.T.S.



1 DETAIL
N.T.S.



PLAN VIEW
N.T.S.



A SECTION
N.T.S.

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 12. THE CONTRACTOR SHALL USE ROTARY IMPACT HAMMER DRILLS FOR THE ANCHOR BOLTS.
 13. TOTAL PLATE WEIGHT IS APPROXIMATELY 4,850 LBS.
 14. ANCHOR BOLT INSTALLATION TORQUE SHALL BE 88 FT-LB

DATE	DESCRIPTION	MARK	APPR.

DESIGNED BY: G2ECDACW	CHECKED BY: G2ECDACW	DATE: 4/22/2016
U.S. ARMY CORPS OF ENGINEERS PORTLAND DISTRICT PORTLAND, OREGON	CONTRACT NO.: W9127N-15-C-0035	U.S. PROJECT NUMBER: W9127N-15-R-0050
AE / CONTRACTOR NAME: AE / CONTRACTOR ADDRESS: AE / CONTRACTOR (CITY, STATE)	AE / CONTRACTOR ID: AE / CONTRACTOR ID	CONTRACTOR NUMBER: DRAWING NUMBER: PLOT DATE: 8/11/2016

BONNEVILLE LOCK AND DAM
SECOND POWERHOUSE
FISH GUIDANCE EFFICIENCY
FOLLOW ON
TURBINE INTAKE
FLOW CONTROL PLATE
A SLOT

SHEET IDENTIFICATION
S-503
SHEET 0 OF 0

Summary

The construction cost estimate for the three alternatives for Bonneville Powerhouse 2 Fish Guidance Efficiency long term solution was performed by ENC-C. The construction cost estimate for all 8 Powerhouse 2 units for a comparison of the three alternatives are below:

Alternative 1, Concrete, with concrete removal: \$4,960,000

Alternative 2, Concrete, without concrete removal: \$2,800,000

Alternative 3, Built-up steel: \$3,200,000

Bonneville Project prefers the concrete alternatives based on the O&M time and cost.

Alternative 2 would likely be a preferred alternative, with lower cost and less unit outage time. Alternative 1 would be next preferred alternative if alternative 2 is not acceptable.

Bonneville FGE – Cost Estimate

June 21st, 2018

	Alternative 1	Alternative 2	Alternative 3	
MOB/DEMOB	\$25,000	\$25,000	\$25,000	\$25,000
Concrete Removal and Disposal	\$85,000	\$0	\$0	\$0
Concrete Placement	\$75,000	\$75,000	\$0	\$0
Crane and Rescue Team	\$125,000	\$75,000	\$75,000	\$75,000
Plate Acquisition	\$0	\$0	\$0	\$60,000
Plate Reenforcement	\$0	\$0	\$0	\$40,000
Total Cost per Slot	\$310,000	\$175,000	\$200,000	
Time per Slot	12 Days	6 Days	6 Days	

General Notes:

A large cost to the project is the requirement to have a crane crew on site at all times and a rescue crew. These are not avoidable because of the location of the plates. The major cost for construction is labor. This is why changes in material quantity doesn't have as much of an impact on overall cost as you may think it would. For example it will take a days' worth of labor just to lower and install scaffolding to allow the workers to access the vertical portions to install plates or formwork and an additional day to remove them.

The cost difference between Slot A and Slot B is negligible. As such only the worst case is shown here (Slot A).

Duration Breakdown:

Alternative 1:

Day 1: Erect scaffolding and install fall protection Day 2-7: Break up concrete and remove from slot. Extra time given due to the fact that the basket connected to the crane will have to be loaded by hand within a confined space. The concrete will need to be broken into small manageable pieces based on the weight (1 cubic yard of concrete weights 150 lbs.) Day 8: Place formwork Day 9: Place concrete Day 11: Remove formwork Day 12: Remove scaffolding and fall protection anchors.

Alternative 2:

Day 1: Erect scaffolding and install fall protection Day 2: Place formwork Day 3: Place concrete Day 5: Remove formwork Day 6: Remove scaffolding and fall protection anchors.

Alternative 3:

Day 1: Erect scaffolding and install fall protection Day 2: Enlarge existing holes for anchors Day 3: Locate and drill new holes for anchors Day 4: Install new plates Day 5: Reinstall existing plates Day 6: Remove scaffolding and fall protection anchors.