

# GILLIGAN CREEK ROAD SLIDE REPAIR AT INTAKE

SEDRO-WOOLLEY, SKAGIT COUNTY, WA

CO: 5085

PN: 3817

ISSUED FOR BIDDING

JUNE 28, 2022

**PROJECT  
LOCATION**

# Skagit PUD

**PUBLIC UTILITY DISTRICT**

**NO. 1 OF SKAGIT COUNTY**

## DISTRICT OFFICIALS

|                   |                |
|-------------------|----------------|
| JOE LINDQUIST     | PRESIDENT      |
| GERMAINE KORNEGAY | VICE PRESIDENT |
| ANDREW MILLER     | SECRETARY      |

|                        |                     |
|------------------------|---------------------|
| GEORGE SIDHU, P.E.     | GENERAL MANAGER     |
| MARK C. HANDZLIK, P.E. | ENGINEERING MANAGER |
| MICHAEL FOX            | OPERATIONS MANAGER  |

## UTILITY CONTACTS

**CASCADE NATURAL GAS**  
1520 SOUTH 2nd STREET  
MOUNT VERNON, WA 98273  
CONTACT: JAMES HOBBS  
TEL: (360) 336-3876

**FRONTIER COMMUNICATION**  
595 PEASE ROAD  
BURLINGTON, WA 98233  
CONTACT: BRET MURDOCK  
TEL: (360) 707-0641

**COMCAST XFINITY**  
400 SEQUOIA DRIVE  
BELLINGHAM, WA 98226  
CONTACT: CASEY JONES  
TEL: (360) 527-8243

**ATT FIBER OPTICS**  
C/O SIENA ENGINEERING GROUP, INC.  
11241 WILLOW RD NE, SUITE 130  
REDMOND, WA 98052  
CONTACT: LOUIE VAN HOLLEBEKE  
TEL: (425) 896-9850

**PUGET SOUND ENERGY**  
PO BOX 90868 - MAIL STOP BOT01G  
BELLEVUE, WA 98009-0868  
CONTACT: CUSTOMER CONSTRUCTION SERVICES  
TEL: (888) 321-7779

## DRAWING INDEX

1. COVER
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11. HARDWARE MANUFACTURER AND ROCK DOWEL DETAILS
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13. SPECIFICATIONS



| SUMMARY OF QUANTITY ESTIMATES |           |
|-------------------------------|-----------|
| PROJECT ELEMENT               | UNITS     |
| MOBILIZATION                  | LS        |
| ANCHOR MESH                   | 600 SQ FT |
| GABION BASKET                 | 79 CU YD  |
| SHIP LADDER                   | LS        |
| TOTAL NO. OF ANCHORS          | 21        |
| NO. OF 25 FT ANCHORS          | 7         |
| NO. OF 20 FT ANCHORS          | 7         |
| NO. OF 15 FT ANCHORS          | 7         |
| PERMEABLE BALLAST             | 106 CU YD |
| TESC                          | LS        |
| CLEARING AND GRUBBING         | LS        |
| ROCK EXCAVATION               | LS        |
| FINISH GRADING                | LS        |

**PROJECT  
LOCATION**

## VICINITY MAP

NOT TO SCALE



| ISSUE | REVISIONS  | BY  | DATE    |
|-------|--|-----|---------|
| 1     | ISSUE FOR BIDDING                                      | AJH | 5-19-22 |
| 2     | UPDATED GABION BACKFILL SPECIFICATION TO QUARRY SPALLS | AJH | 6-28-22 |
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| DATUM:<br>HOR: NAD 83<br>VERT: NAVD 88 | DSGN BY: AWS<br>DWN BY: HCM<br>APPVD BY: AJC |
| DATE PRINTED:<br>4/29/2022             | SEC: 02<br>TWP: 34 N<br>RGE: 5 E             |



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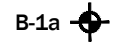










COVER










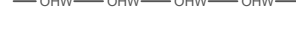

SCALE: NONE    JOB ID : CPXXXX    SHEET: 1 OF 13







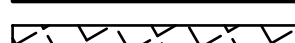
**EXISTING SYMBOL LEGEND**

-  BORING BY GEOENGINEERS, INC., COMPLETED NOVEMBER 2021
-  EXISTING HUB AND TACK
-  EXISTING SPIKE
-  EXISTING GATE VALVE
-  EXISTING STREET SIGN
-  SPOT ELEVATION ON EXISTING GROUND
-  EXISTING CONCRETE SURFACING
-  EXISTING GRAVEL SURFACING
-  EXISTING ANCHORED ROCK MESH

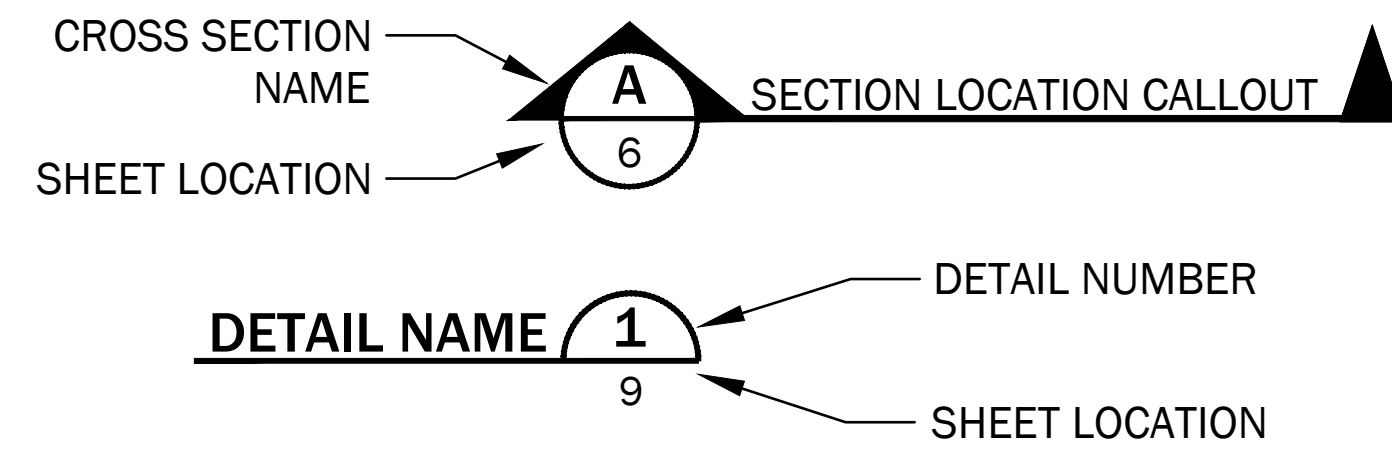
**EXISTING LINE LEGEND**

-  EXISTING CONCRETE PAD
-  EXISTING EDGE OF GRAVEL ROAD
-  RECORD WATER LINE
-  EXISTING GROUND ABOVE GROUND CONDUIT LINE
-  EXISTING TOP OF SLOPE LINE
-  EXISTING TOE OF SLOPE LINE
-  EXISTING GRADE INDEX CONTOUR 120
-  EXISTING GRADE INTERNAL CONTOUR 118
-  EXISTING FLOW LINE
-  EDGE OF WATER AS SURVEYED 11/9/21
-  EXISTING ORDINARY HIGH WATER LINE


**PROPOSED LEGEND**

-  PROPOSED SPIKE PLATE
-  PROPOSED STEEL PLATE
-  PROPOSED ROCK ANCHOR
-  PROPOSED GABION BASKET
-  PROPOSED TECCO MESH


**PLAN SYMBOL LEGEND**



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APPVD BY: AJC

DATE PRINTED: 4/29/2022

SEC: 02  
TWP: 34 N  
RGE: 5 E



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PUBLIC UTILITY DISTRICT

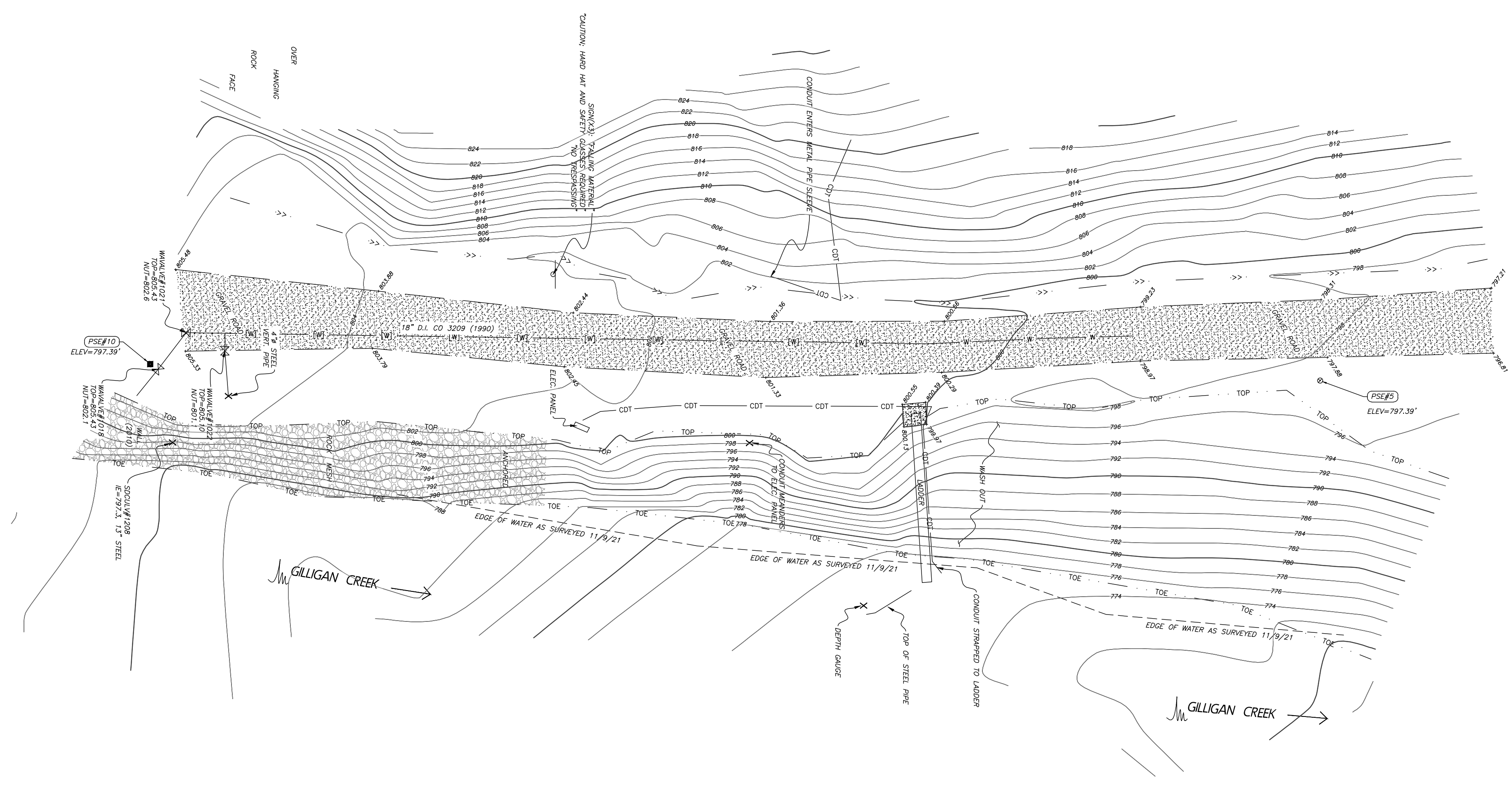
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LEGEND

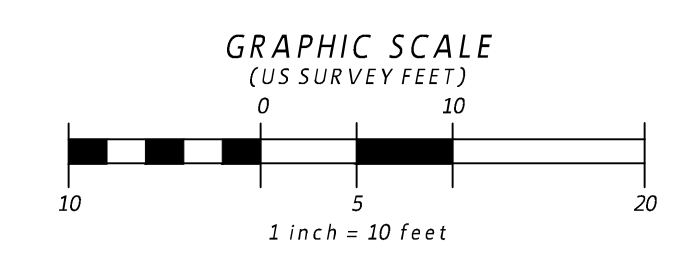
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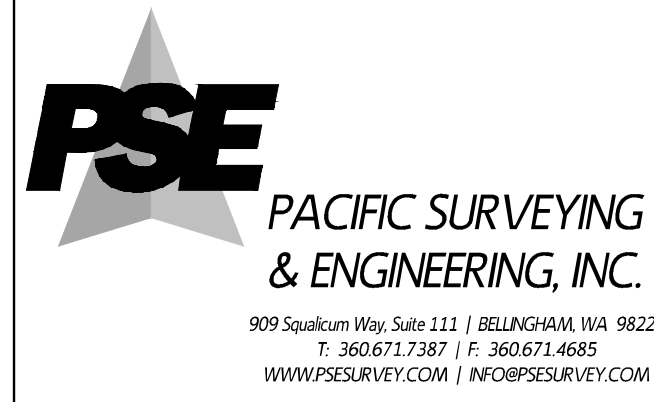
SHEET:  
2 OF 13



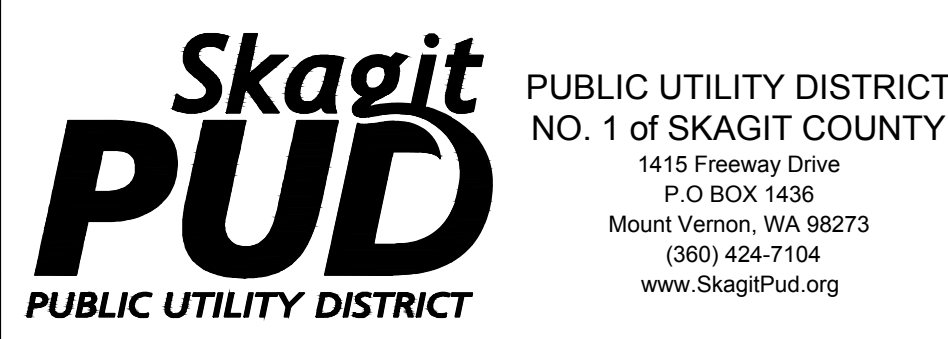
| PRIMARY SURVEY CONTROL TABLE |             |              |           |                |
|------------------------------|-------------|--------------|-----------|----------------|
| POINT NO.                    | NORTHING    | EASTING      | ELEVATION | DESCRIPTION    |
| 4                            | 538708.2009 | 1326802.3166 | 793.49    | FND. RR SPIKE  |
| 5                            | 538582.7407 | 1326849.3290 | 797.39    | FND. RR SPIKE  |
| 10                           | 538432.7285 | 1326847.1906 | 805.42    | SET HUB & TACK |



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|-------|--------------------|-----|---------|
| 1     | 60% DESIGN REVIEW  | JML | 3-14-22 |
| 2     | ISSUED FOR BIDDING | JML | 5-19-22 |
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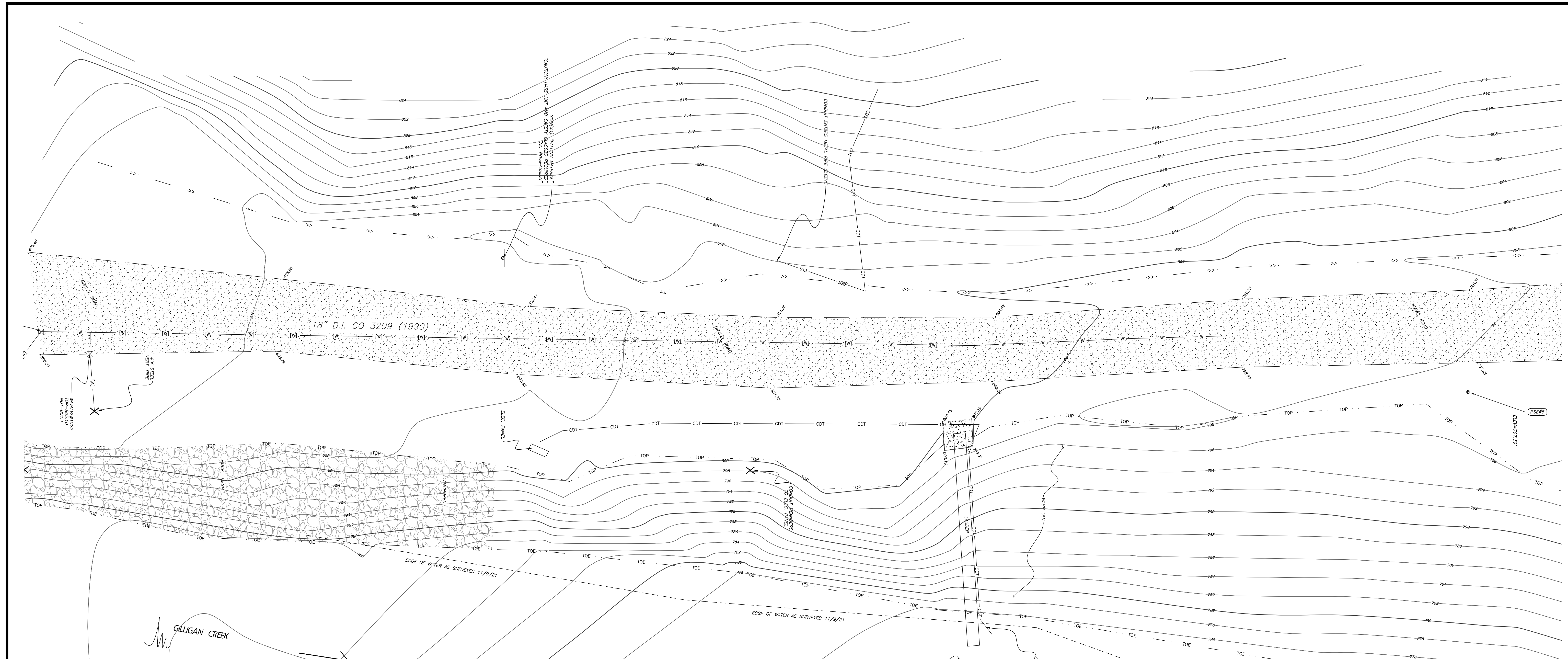


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| DATE PRINTED:<br>5/16/2022             | SEC: 02<br>TWP: 34 N<br>RGE: 5 E         |



|                     |                      |
|---------------------|----------------------|
| SURVEY CONTROL PLAN |                      |
| SCALE: 1"=10'       | CO: 5085<br>PN: 3817 |
| SHEET:<br>3 OF 13   | 05-18-2022           |





**TOPO NOTES:**

- THIS TOPOGRAPHIC SURVEY WAS PERFORMED AND PREPARED IN ACCORDANCE WITH WAC 332-130-145.
- DATA FOR THIS SURVEY WAS GATHERED BY FIELD TRAVERSE UTILIZING ELECTRONIC DATA COLLECTION IN NOVEMBER 2021.
- EQUIPMENT USED: THEOMAT 00'01.5" EDM: ± 2 PPM, ± 3 MM
- HORIZONTAL DATUM: LOCAL/ASSUMED
- VERTICAL DATUM: LOCAL/ASSUMED  
- PRIMARY BENCHMARK: SKAGIT COUNTY PUD CONTROL PT#5. ELEVATION = 797.39 (AS SHOWN)  
- TEMPORARY BENCH MARK: PSE CONTROL ON-SITE, AS SHOWN
- CONTOURS DEPICTED HEREON MEET OR EXCEED NATIONAL MAPPING STANDARDS FOR 2-FOOT ACCURACY TOPOGRAPHIC SURVEYS AND HAVE BEEN COMPUTER GENERATED FROM GROUND FIELD TOPOGRAPHY GATHERED FOR THIS SURVEY UTILIZING ELECTRONIC DATA COLLECTION.
- CONDUCTIBLE UNDERGROUND UTILITY LOCATES SERVICES WERE REQUESTED BY OTHERS AND FAINTLY PAINTED ONSITE. PSE FIELD CREWS SURVEYED VISIBLE UTILITIES IN NOVEMBER 2021. UTILITIES ARE KNOWN TO EXIST WITHIN THE LIMITS OF THIS SURVEY THAT WERE UNDETECTABLE. ADDITIONAL UTILITY VERIFICATION MAY BE WARRANTED IN AREAS CONSIDERED FOR CONSTRUCTION.
- THIS MAP IS NOT INTENDED TO REPRESENT A FORMAL BOUNDARY SURVEY, NOR DOES IT REFLECT ELEMENTS THAT A BOUNDARY SURVEY MAY DISCLOSE. NO BOUNDARY LINES, RIGHTS OF WAY, OR EASEMENTS OF RECORD ARE DEPICTED.
- A CURRENT TITLE REPORT WAS NOT PROVIDED FOR THIS SURVEY. EASEMENTS AND/OR TITLE ENCUMBRANCES MAY EXIST THAT ARE NOT SHOWN HEREON.

**EXISTING SYMBOL LEGEND:**

- = SET HUB AND TACK
- ⊙ = EXISTING SPIKE
- ⊗ = EXISTING GATE VALVE
- = EXISTING STREET SIGN
- = SPOT ELEVATION ON EXISTING GROUND
- ▭ = EXISTING CONCRETE SURFACING
- ▭ = EXISTING GRAVEL SURFACING

**EXISTING LINE LEGEND:**

- = EXISTING CONCRETE PAD
- = EXISTING EDGE OF GRAVEL ROAD
- W = EXISTING WATER LINE
- [W] = RECORD WATER LINE
- CDT = EXISTING ABOVE GROUND CONDUIT LINE
- TOP = EXISTING TOP OF SLOPE LINE
- TOE = EXISTING TOE OF SLOPE LINE
- 120 = EXISTING GRADE INDEX CONTOUR
- 118 = EXISTING GRADE INTERVAL CONTOUR
- >> = EXISTING FLOW LINE
- - - = EDGE OF WATER AS SURVEYED 11/9/21

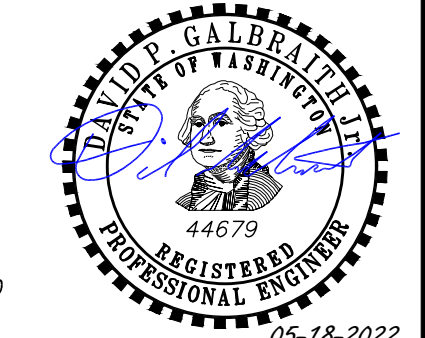
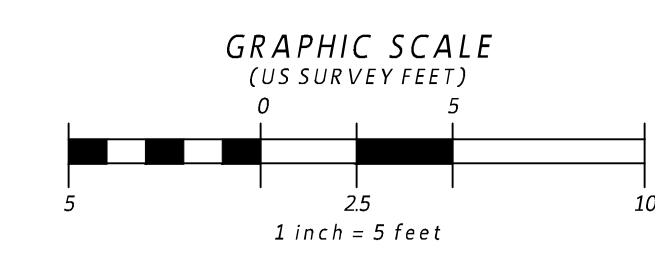
| ISSUE | REVISIONS          | BY  | DATE    |
|-------|--------------------|-----|---------|
| 1     | 80% DESIGN REVIEW  | JML | 3-14-22 |
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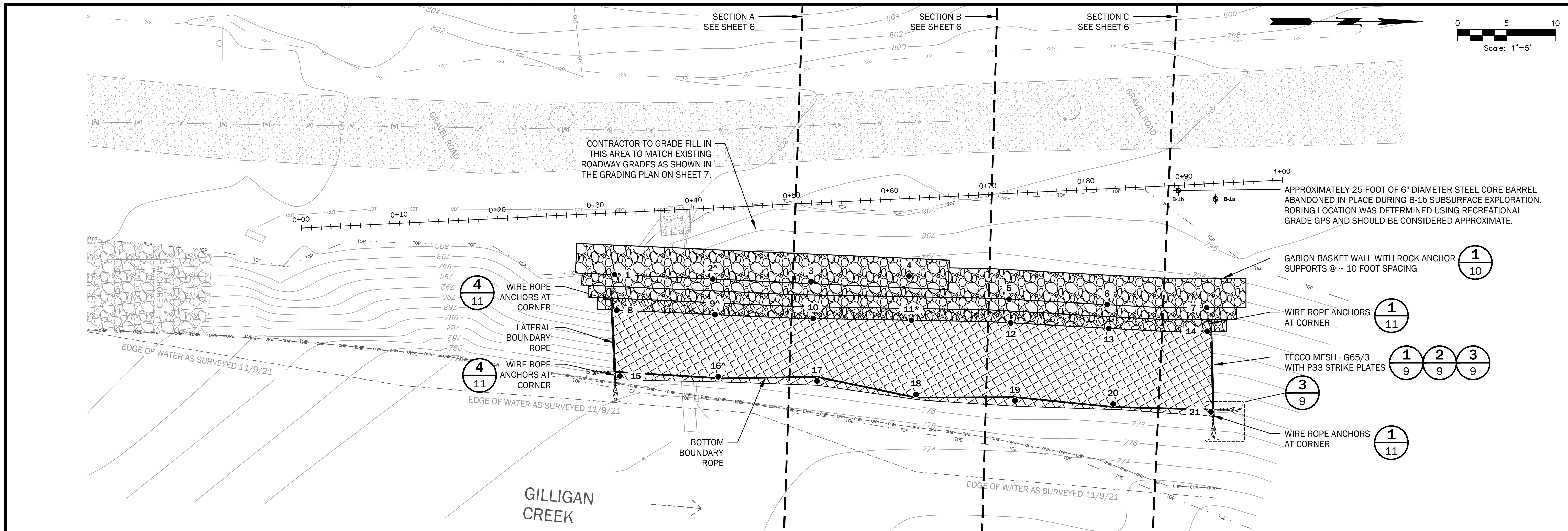


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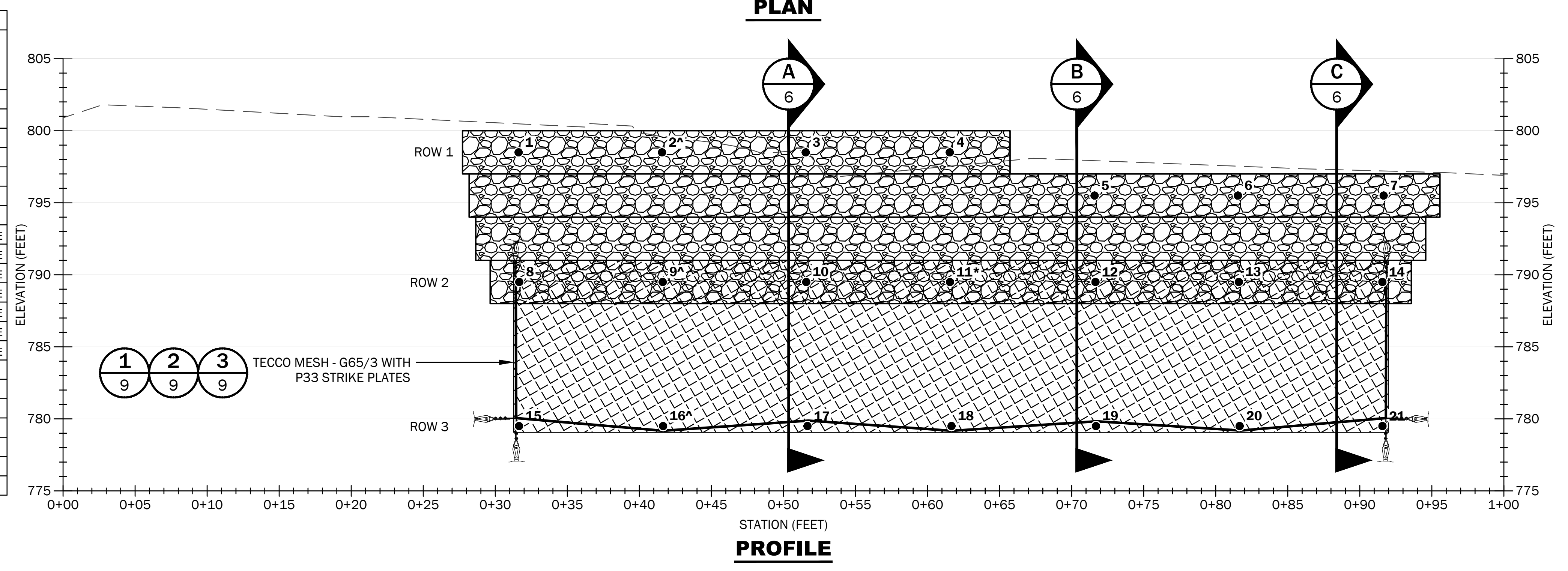
|                     |                      |
|---------------------|----------------------|
| EXISTING CONDITIONS |                      |
| SCALE: 1"=5'        | CO: 5085<br>PW: 3817 |
| SHEET: 4 OF 13      | 05-18-2022           |





| ROCK ANCHOR SCHEDULE |                   |                               |                              |                 |
|----------------------|-------------------|-------------------------------|------------------------------|-----------------|
| ANCHOR NUMBER        | TOTAL LENGTH (FT) | MIN ALLOWABLE CAPACITY (KIPS) | BAR SIZE GRADE 75 ALL-THREAD | PLATE TYPE      |
| 1                    | 25                | 30                            | 28mm                         | STEEL           |
| 2^                   | 25                | 35                            | 32mm                         | STEEL           |
| 3                    | 25                | 30                            | 28mm                         | STEEL           |
| 4                    | 25                | 30                            | 28mm                         | STEEL           |
| 5                    | 25                | 30                            | 28mm                         | STEEL           |
| 6                    | 25                | 30                            | 28mm                         | STEEL           |
| 7                    | 25                | 30                            | 28mm                         | STEEL           |
| 8                    | 20                | 30                            | 28mm                         | STEEL AND SPIKE |
| 9                    | 20                | 35                            | 32mm                         | STEEL AND SPIKE |
| 10                   | 20                | 30                            | 28mm                         | STEEL AND SPIKE |
| 11*                  | 20                | 30                            | 28mm                         | STEEL AND SPIKE |
| 12                   | 20                | 30                            | 28mm                         | STEEL AND SPIKE |
| 13                   | 20                | 30                            | 28mm                         | STEEL AND SPIKE |
| 14                   | 20                | 30                            | 28mm                         | STEEL AND SPIKE |
| 15                   | 15                | 25                            | 28mm                         | SPIKE           |
| 16                   | 15                | 30                            | 32mm                         | SPIKE           |
| 17                   | 15                | 25                            | 28mm                         | SPIKE           |
| 18                   | 15                | 25                            | 28mm                         | SPIKE           |
| 19                   | 15                | 25                            | 28mm                         | SPIKE           |
| 20                   | 15                | 25                            | 28mm                         | SPIKE           |
| 21                   | 15                | 25                            | 28mm                         | SPIKE           |

GROUT STRENGTH = 3,000 PSI  
 \*REFER TO SPECIFICATIONS ON SHEET 12 FOR VERIFICATION TESTING REQUIREMENTS.  
 ^ ANCHOR CAPACITY AND BAR SIZE INCREASED TO ACCOMMODATE LOADING FROM SHIPS LADDER.



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PLAN AND PROFILE

SCALE: 1"=5'

JOB ID: CPXXXX

SHEET: 5 OF 13

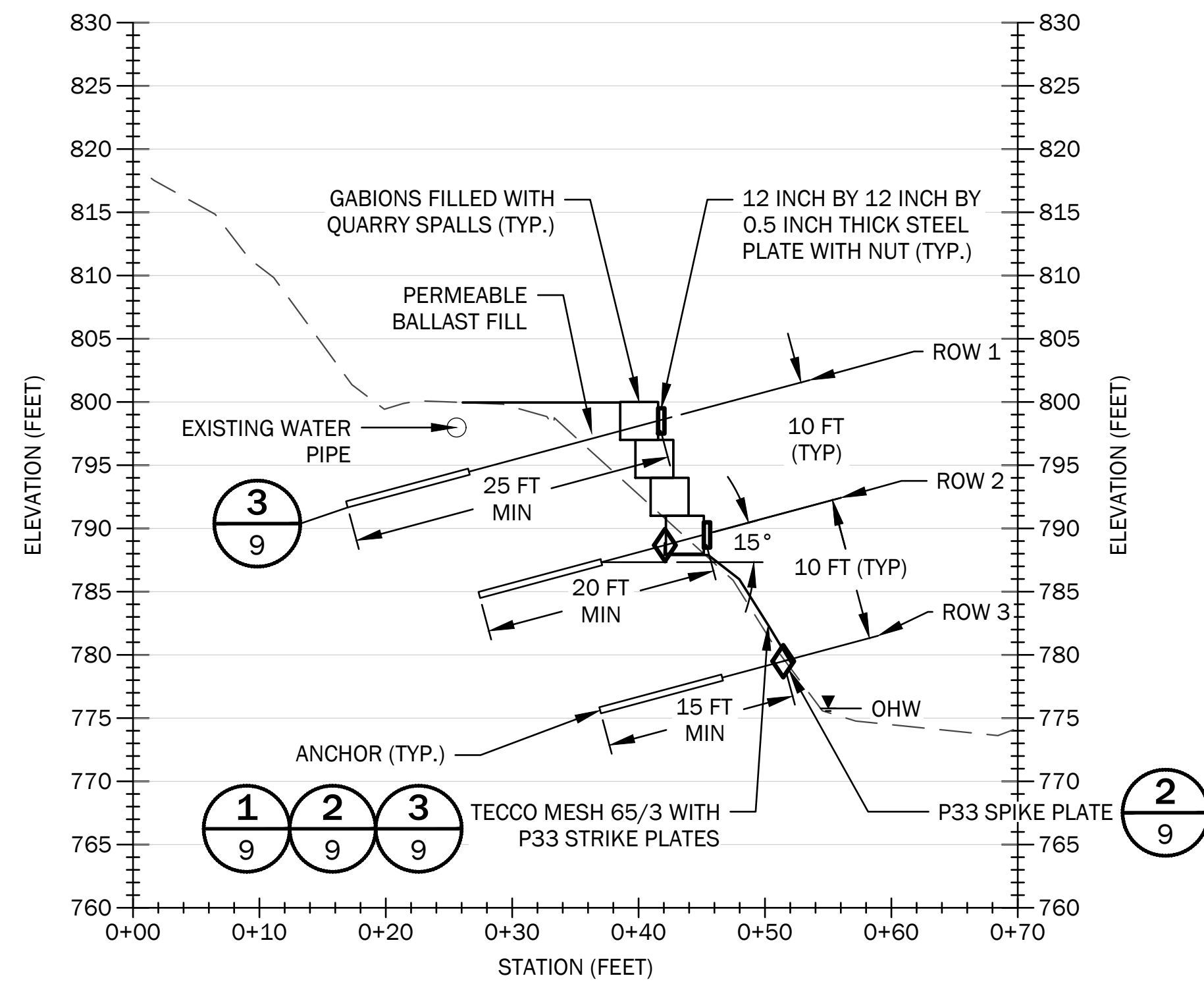
DATUM: HOR: NAD 83 VERT: NAVD 88

DSGN BY: AWS  
DWN BY: HCM  
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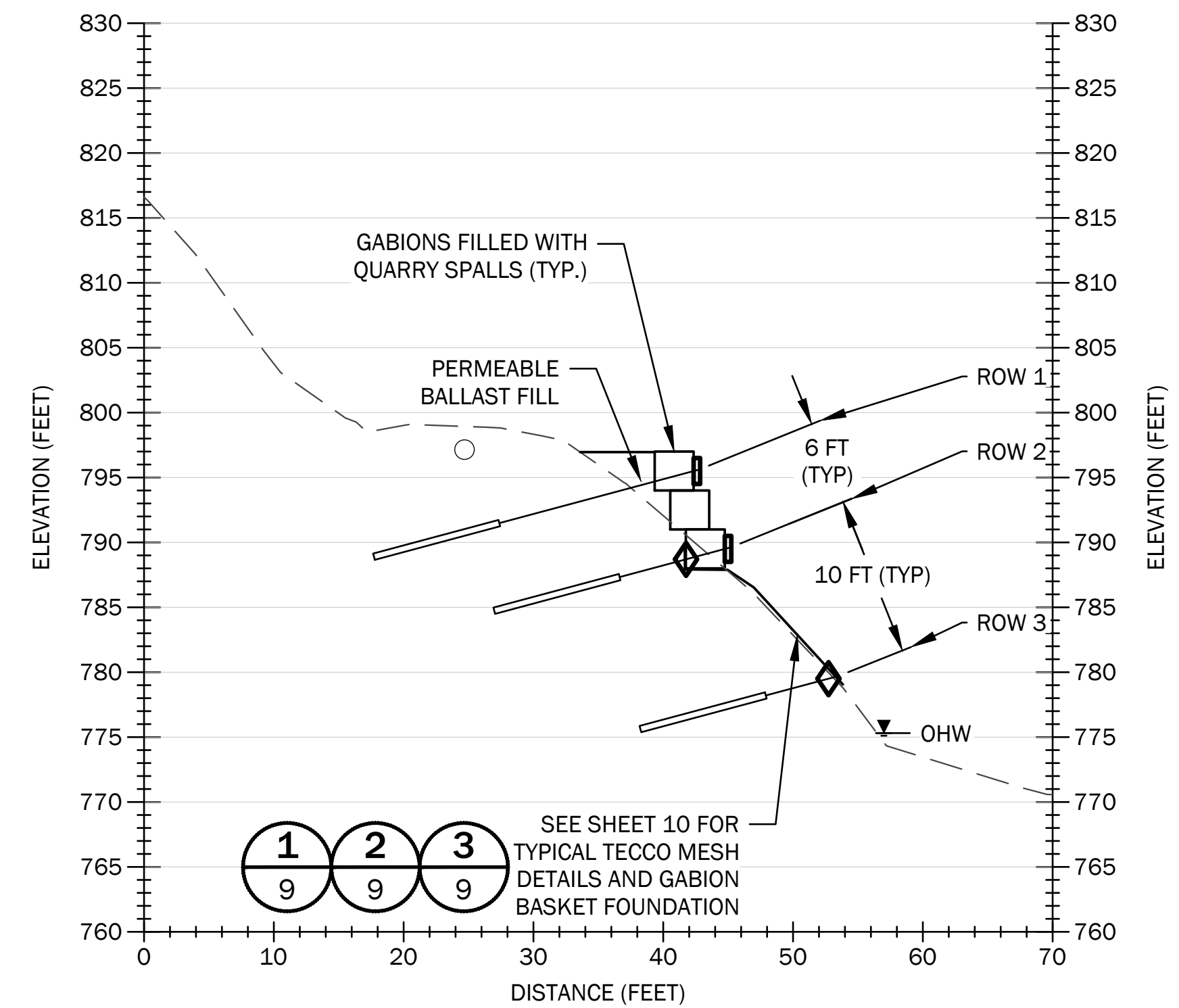
DATE PRINTED: 4/29/2022

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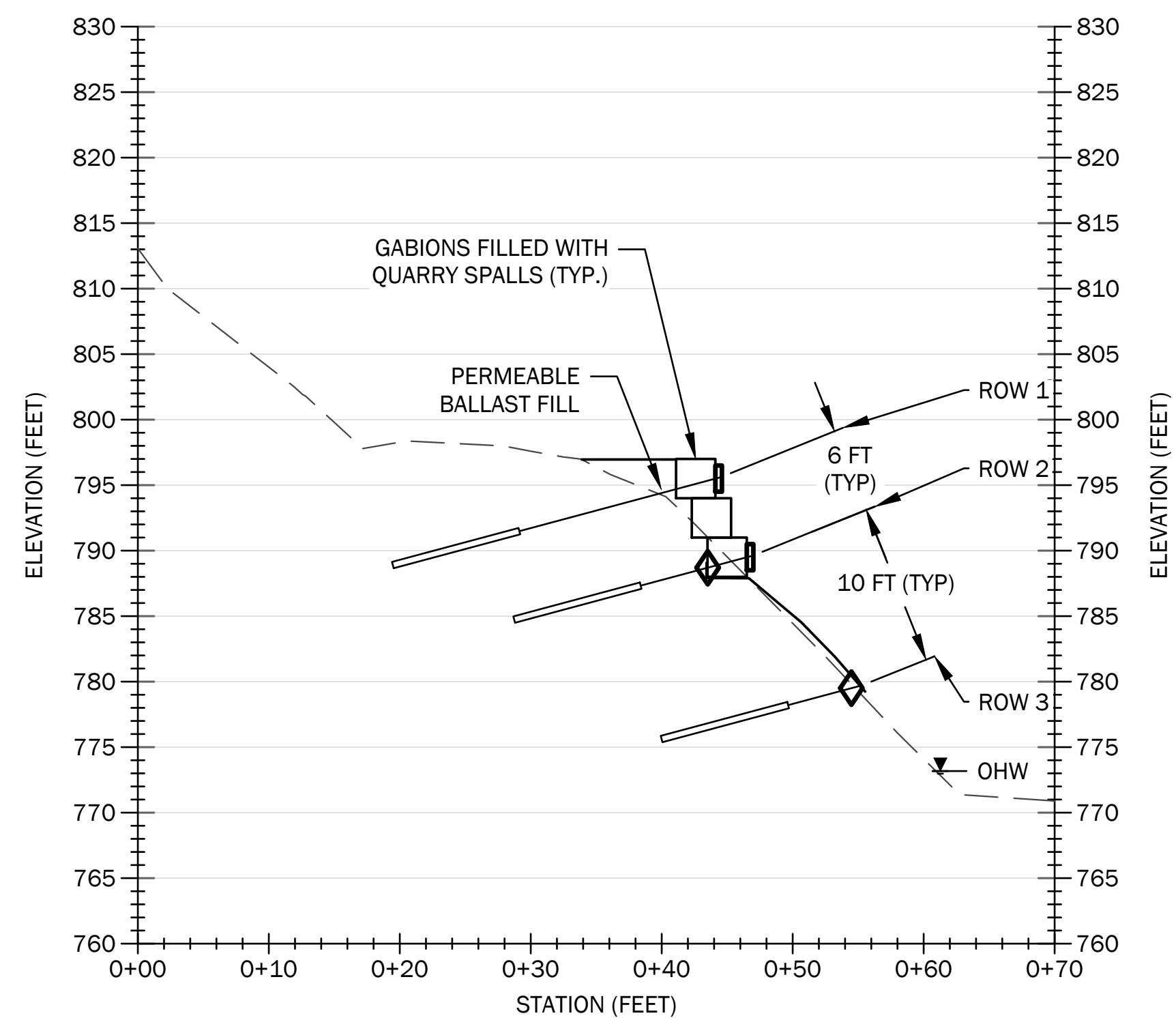




**TYPICAL CROSS SECTION A**  
SCALE: 1"=10'



**TYPICAL CROSS SECTION B**  
SCALE: 1"=10'



**TYPICAL CROSS SECTION C**  
SCALE: 1"=10'



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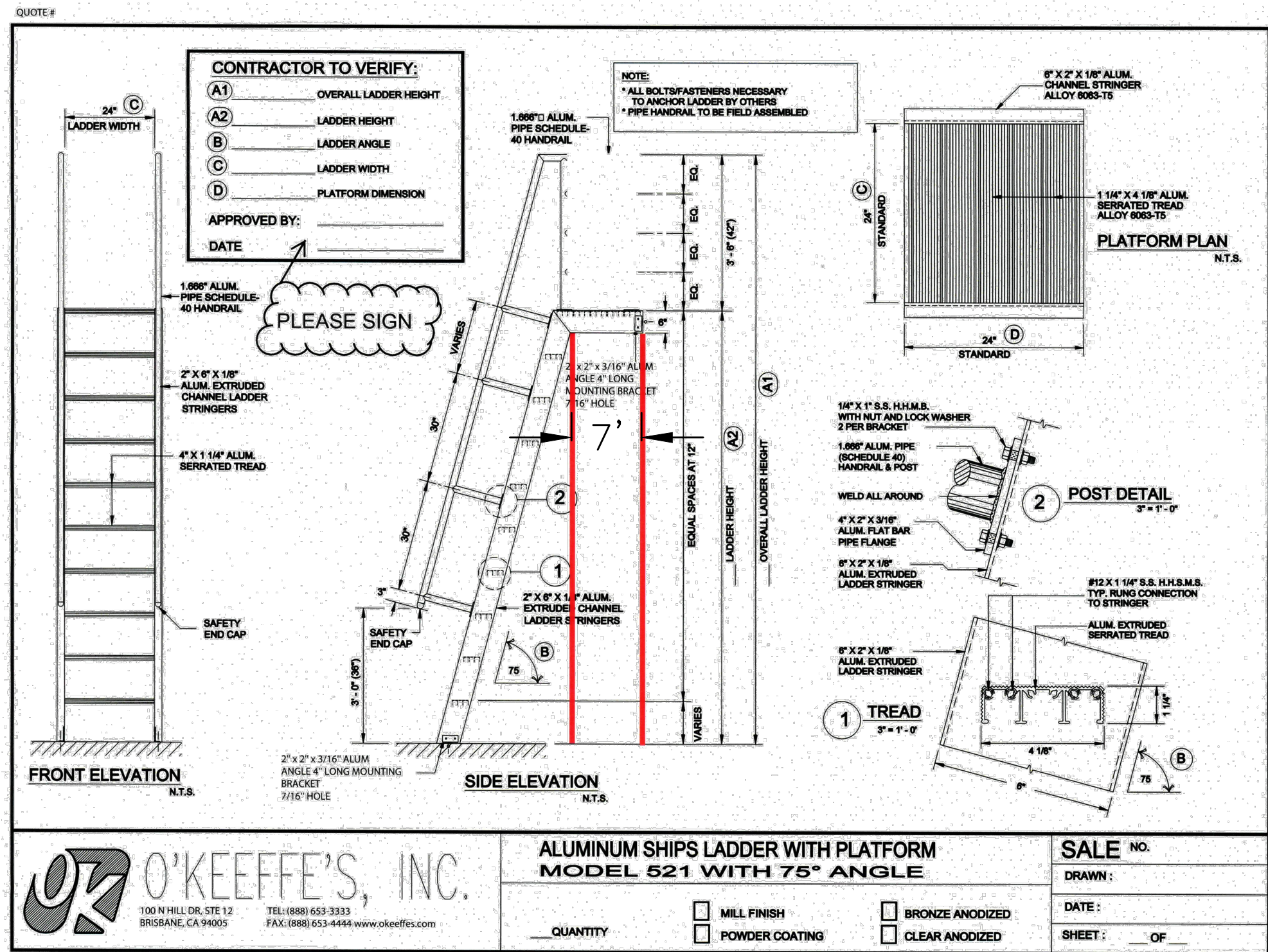


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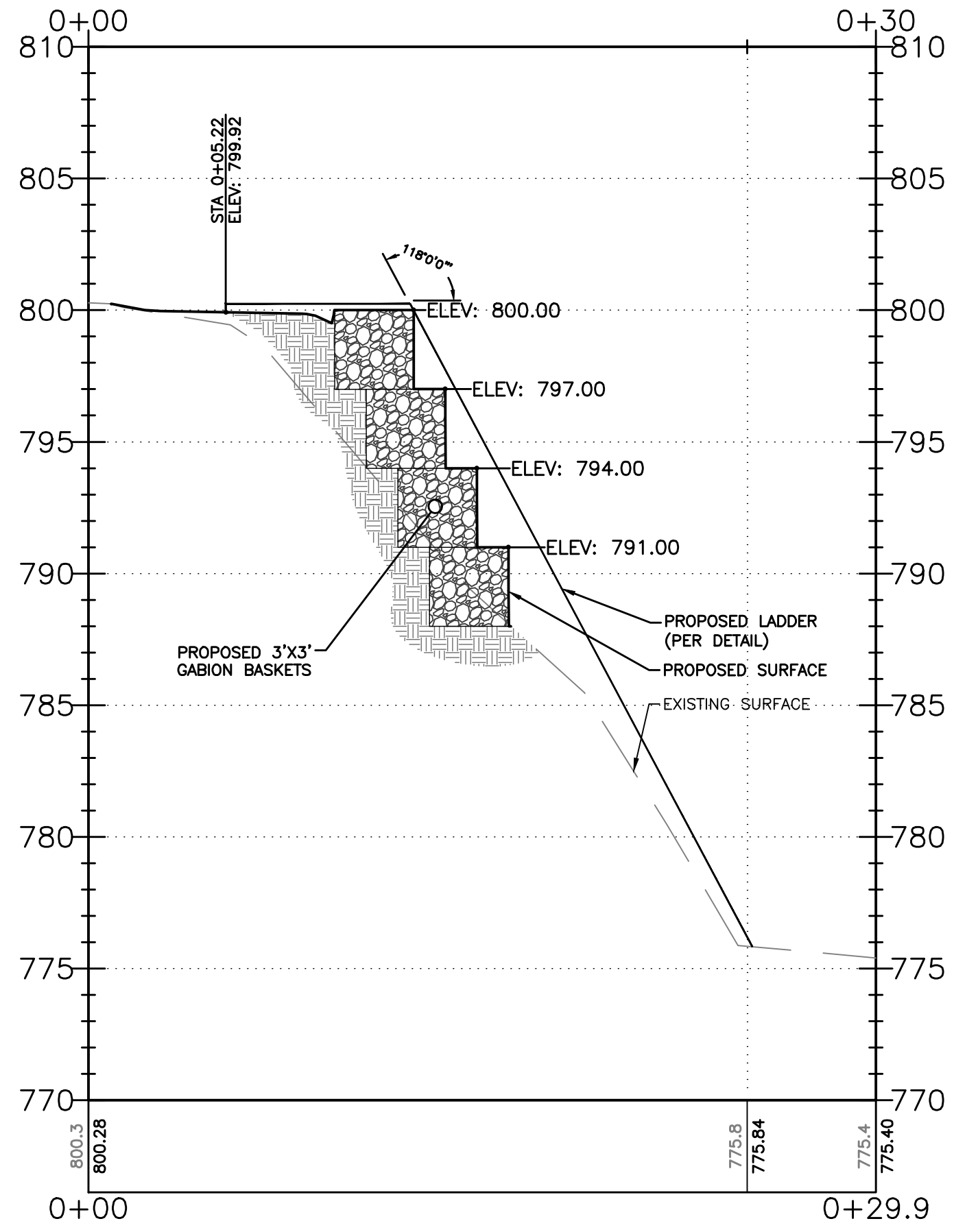
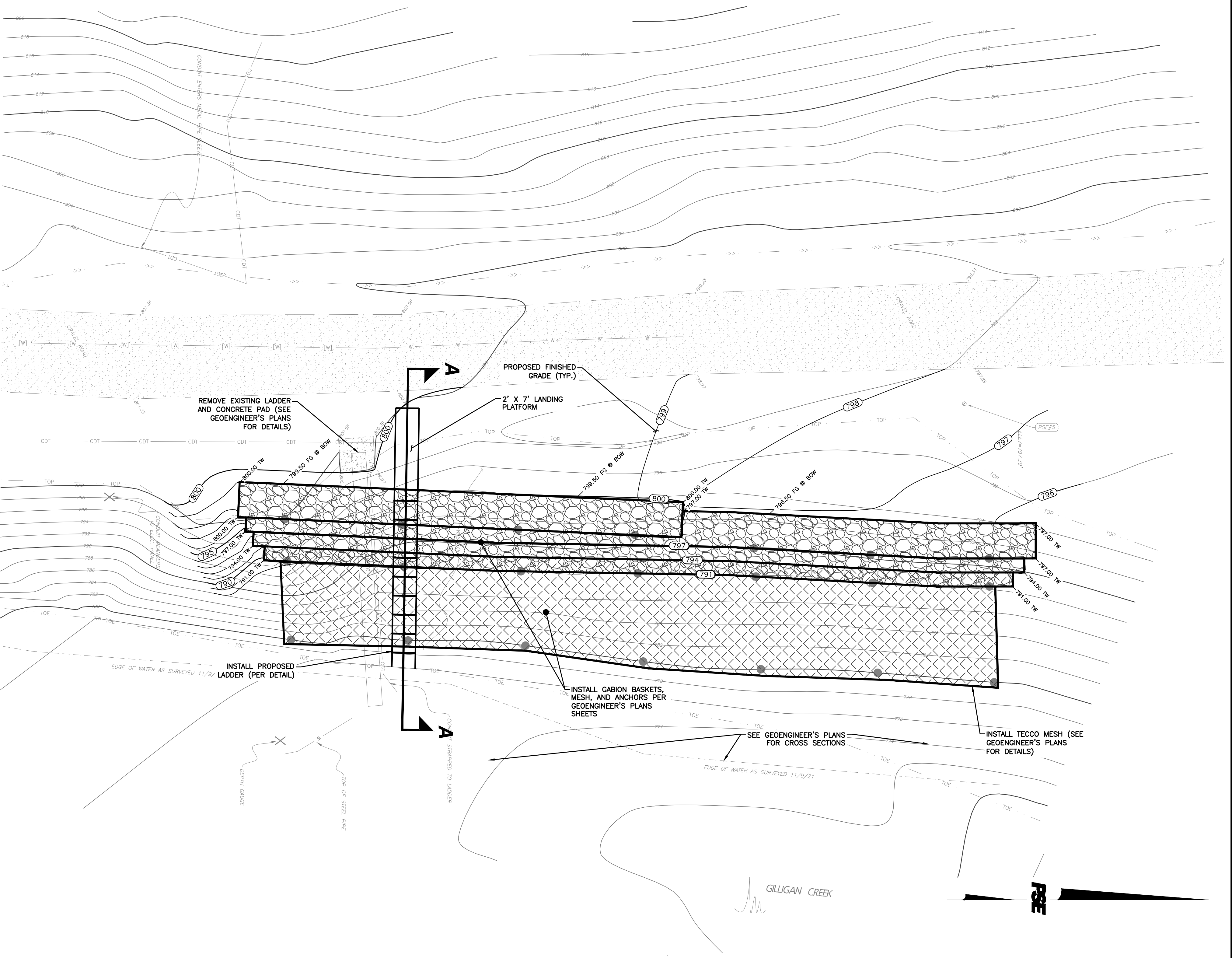




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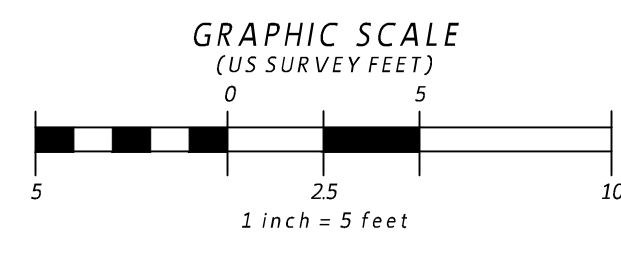
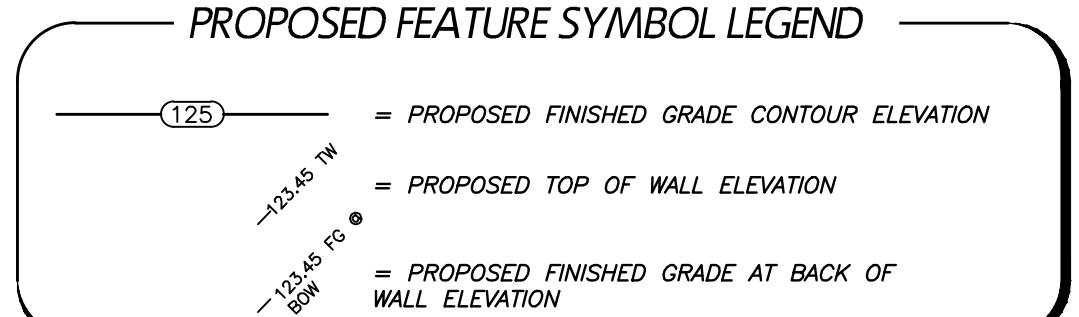
**ALUMINUM SHIPS LADDER WITH PLATFORM MODEL 521 WITH 75° ANGLE**

|          |   |  |
|----------|---|--|
| QUANTITY | <input type="checkbox"/> MILL FINISH    | <input type="checkbox"/> BRONZE ANODIZED |
|          | <input type="checkbox"/> POWDER COATING | <input type="checkbox"/> CLEAR ANODIZED  |



**APPROXIMATE CUT/FILL & GABION BASKET VOLUME**

CUT VOLUME: 20 CY  
FILL VOLUME: 185 CY  
(INCLUDING 79 CY OF GABION BASKETS)



| ISSUE | REVISIONS          | BY  | DATE    |
|-------|--------------------|-----|---------|
| 1     | 80% DESIGN REVIEW  | JML | 3-14-22 |
| 2     | ISSUED FOR BIDDING | JML | 5-19-22 |
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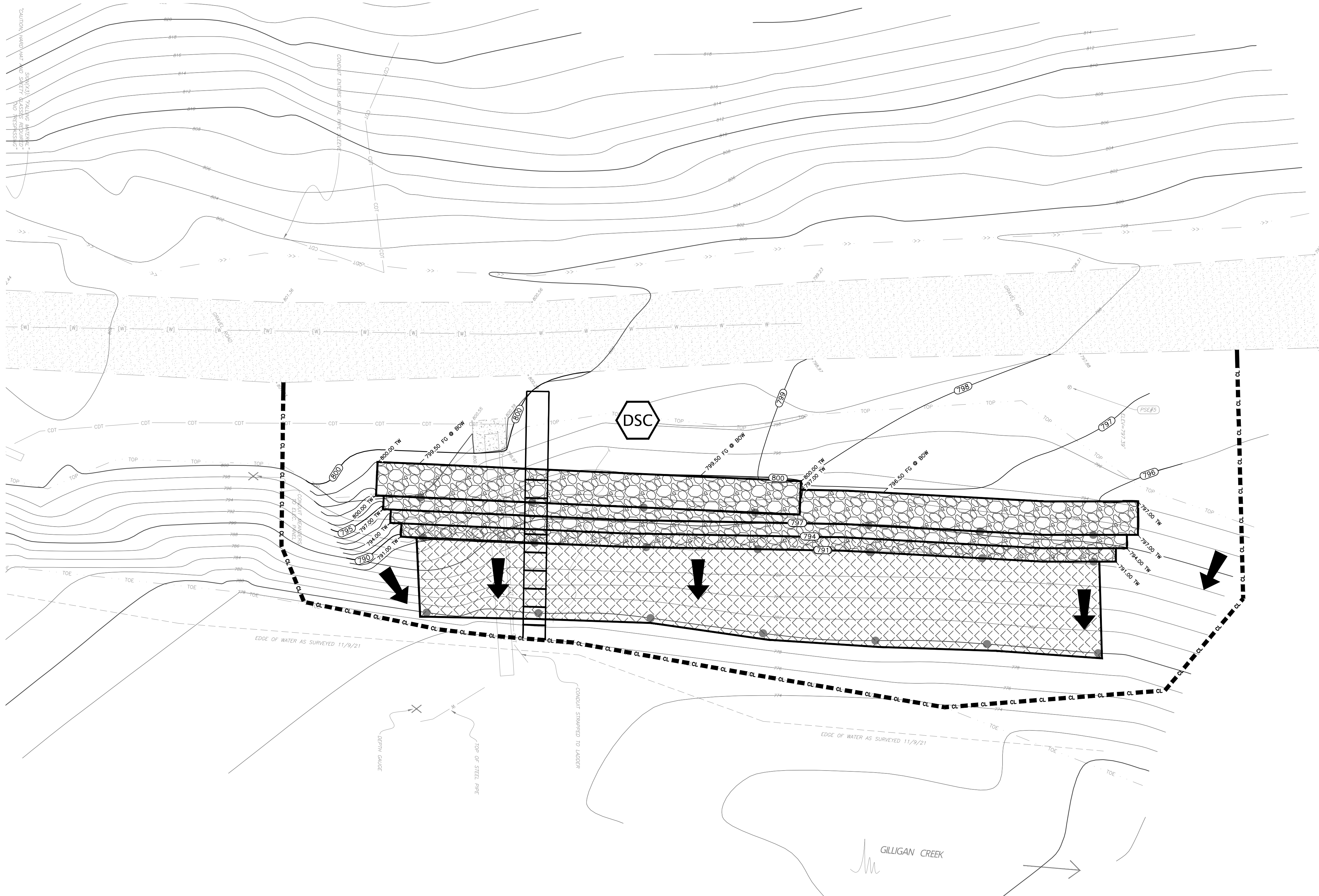
**GRADING PLAN**

SCALE: 1"=5'

CO: 5085  
PW: 3817

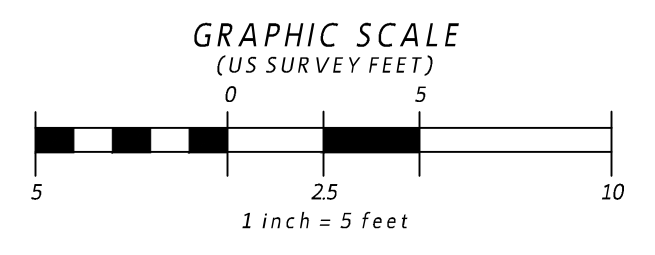
SHEET: 7 OF 13





**EROSION CONTROL LEGEND**

- PROPOSED CLEARING/GRUBBING LIMITS
- DRAINAGE FLOW DIRECTION ARROWS (SHEET FLOW OR SHALLOW CHANNEL FLOW)
- WSDE BMP C153 MATERIAL DELIVERY, STORAGE AND CONTAINMENT
- WSDE BMP C151 CONCRETE HANDLING



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WWW.PSE.SURVEY.COM | INFO@PSE.SURVEY.COM

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| DATUM:<br>HOR: NAD 83<br>VERT: NAVD 88 | DSGN BY:<br>DWN BY: JML<br>APPVD BY: DPG |
| DATE PRINTED:<br>5/16/2022             | SEC: 02<br>TWP: 34 N<br>RGE: 5 E         |

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PUBLIC UTILITY DISTRICT

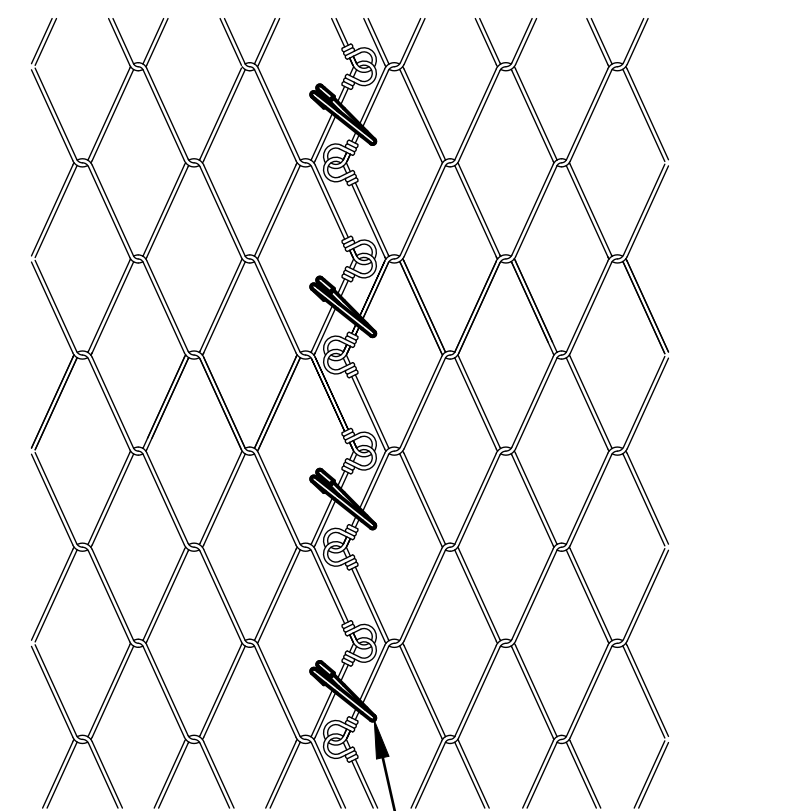
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TEMPORARY EROSION AND SEDIMENT  
CONTROL PLAN

SCALE: 1"=5'  
CO: 5085  
PN: 3817  
SHEET:  
8 OF 13



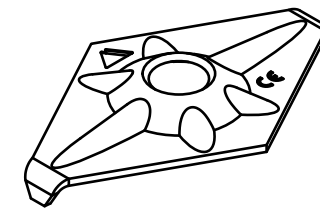
TECCO® MESH CONNECTION VERTICAL  
NORMALLY WITHOUT OVERLAP



CONNECTION CLIP T3  
(1 CLIP PER MESH)

**TECCO MESH DETAIL** 1  
SCALE: NOT TO SCALE 9

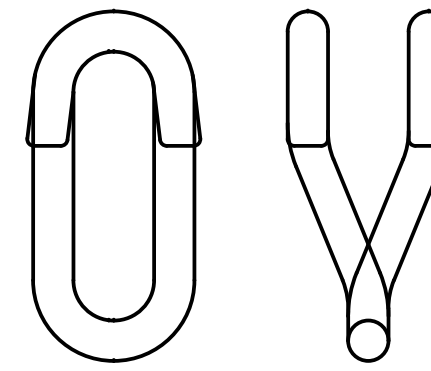
TECCO  
SYSTEM SPIKE PLATE P33



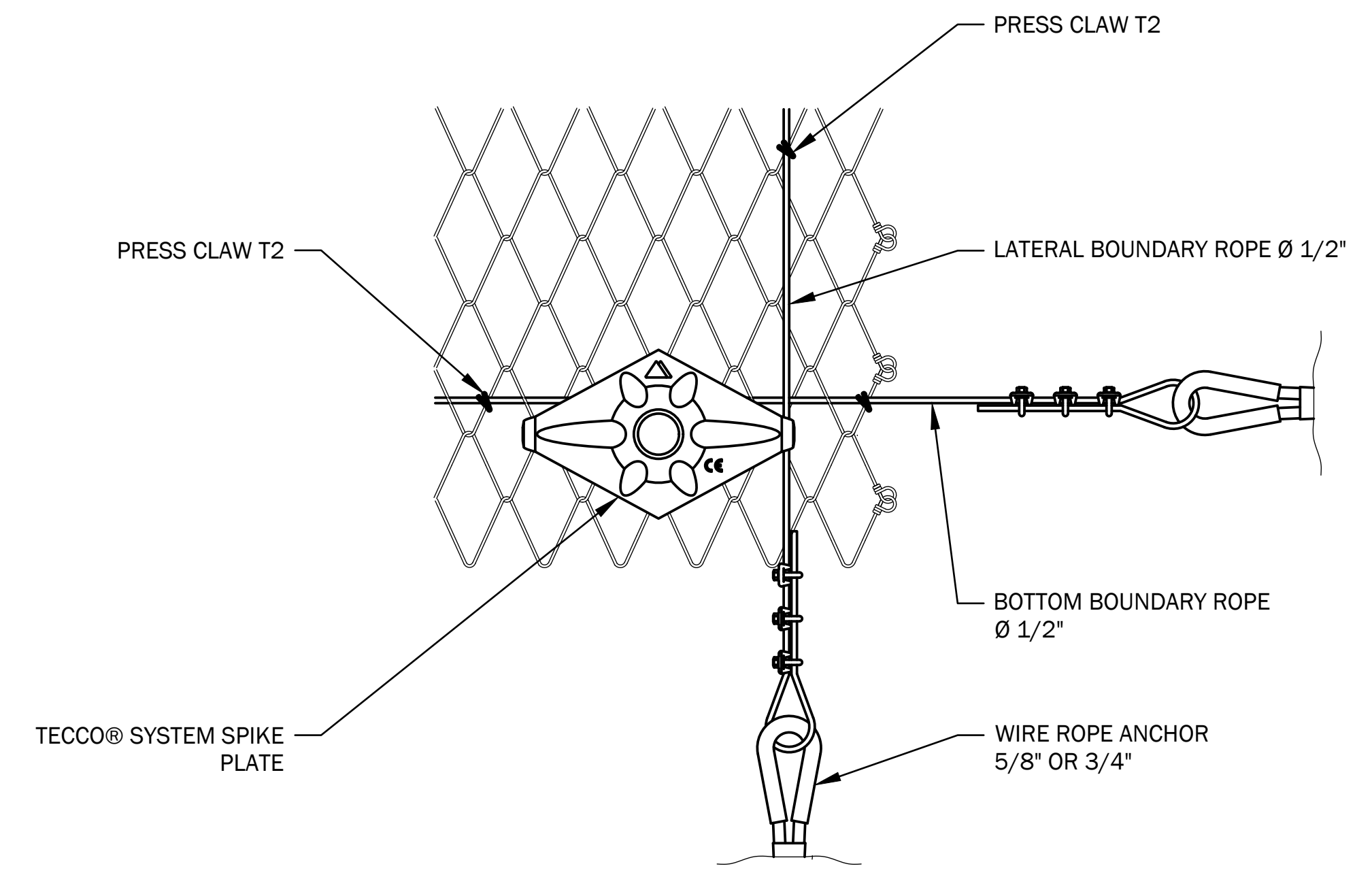
CONNECTION CLIP T3



PRESS CLAW T2



**TECCO MESH DETAIL** 2  
SCALE: NOT TO SCALE 9



**TECCO MESH DETAIL** 3  
SCALE: NOT TO SCALE 9

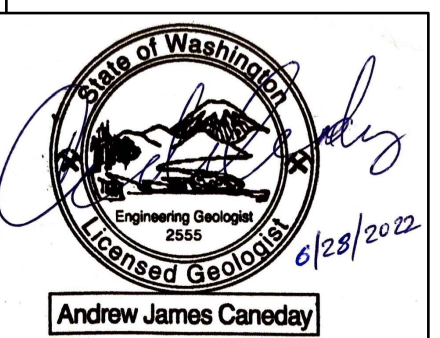
| ISSUE | REVISIONS  | BY  | DATE    |
|-------|--|-----|---------|
| 1     | ISSUE FOR BIDDING                                      | AJH | 5-19-22 |
| 2     | UPDATED GABION BACKFILL SPECIFICATION TO QUARRY SPALLS | AJH | 6-28-22 |
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| DATE PRINTED:<br>4/29/2022             | SEC: 02<br>TWP: 34 N<br>RGE: 5 E             |

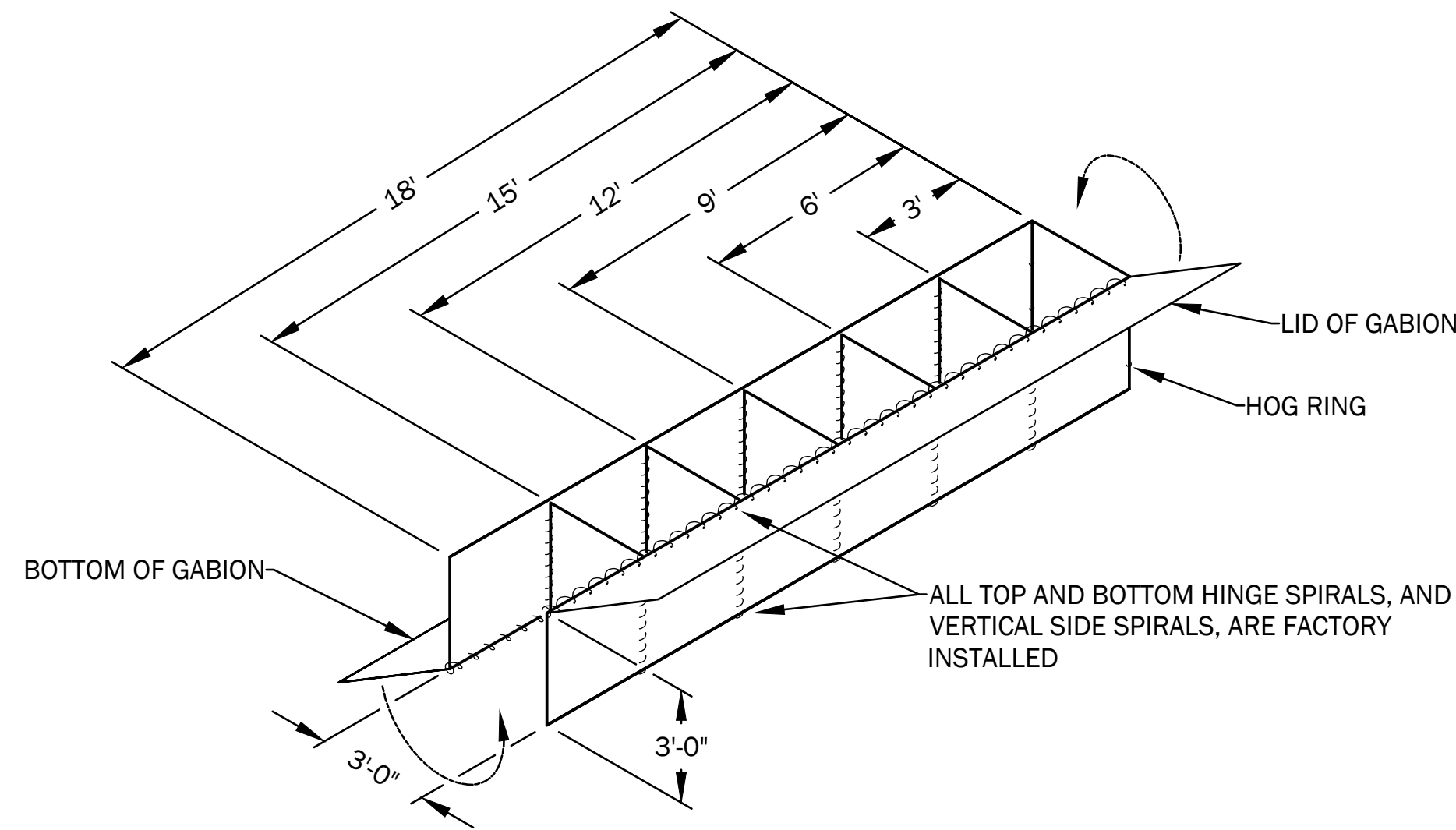


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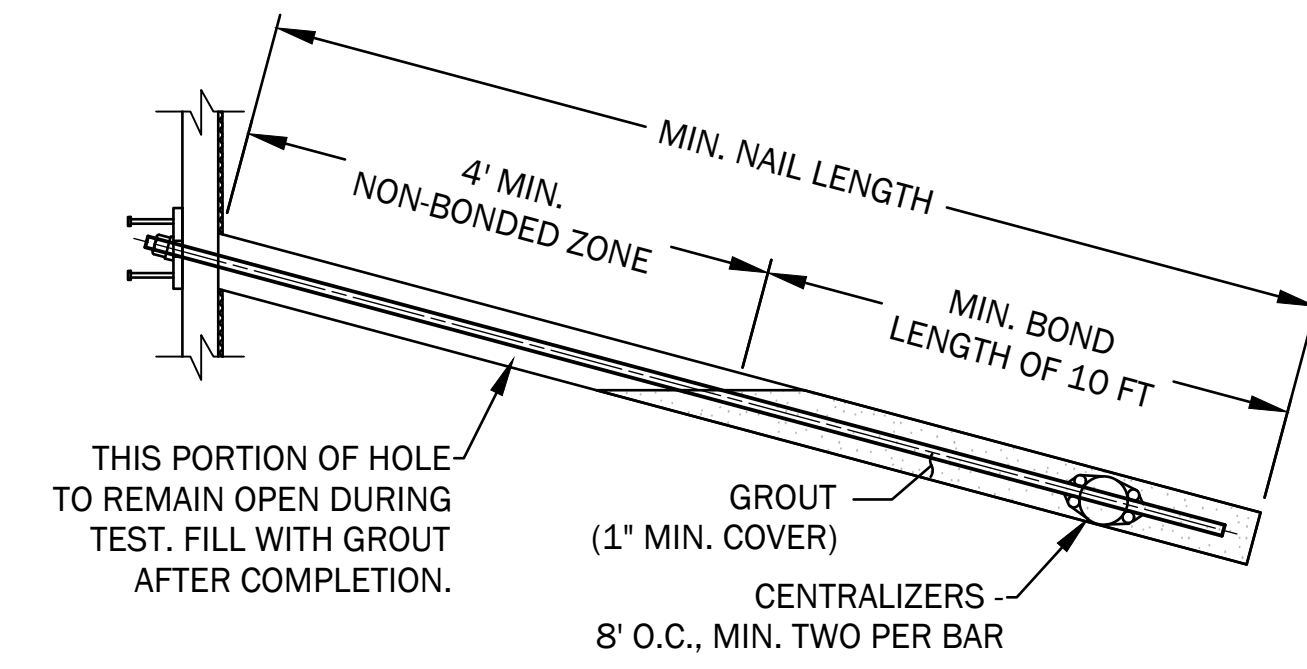


HARDWARE MANUFACTURER AND  
ROCK DOWEL DETAILS



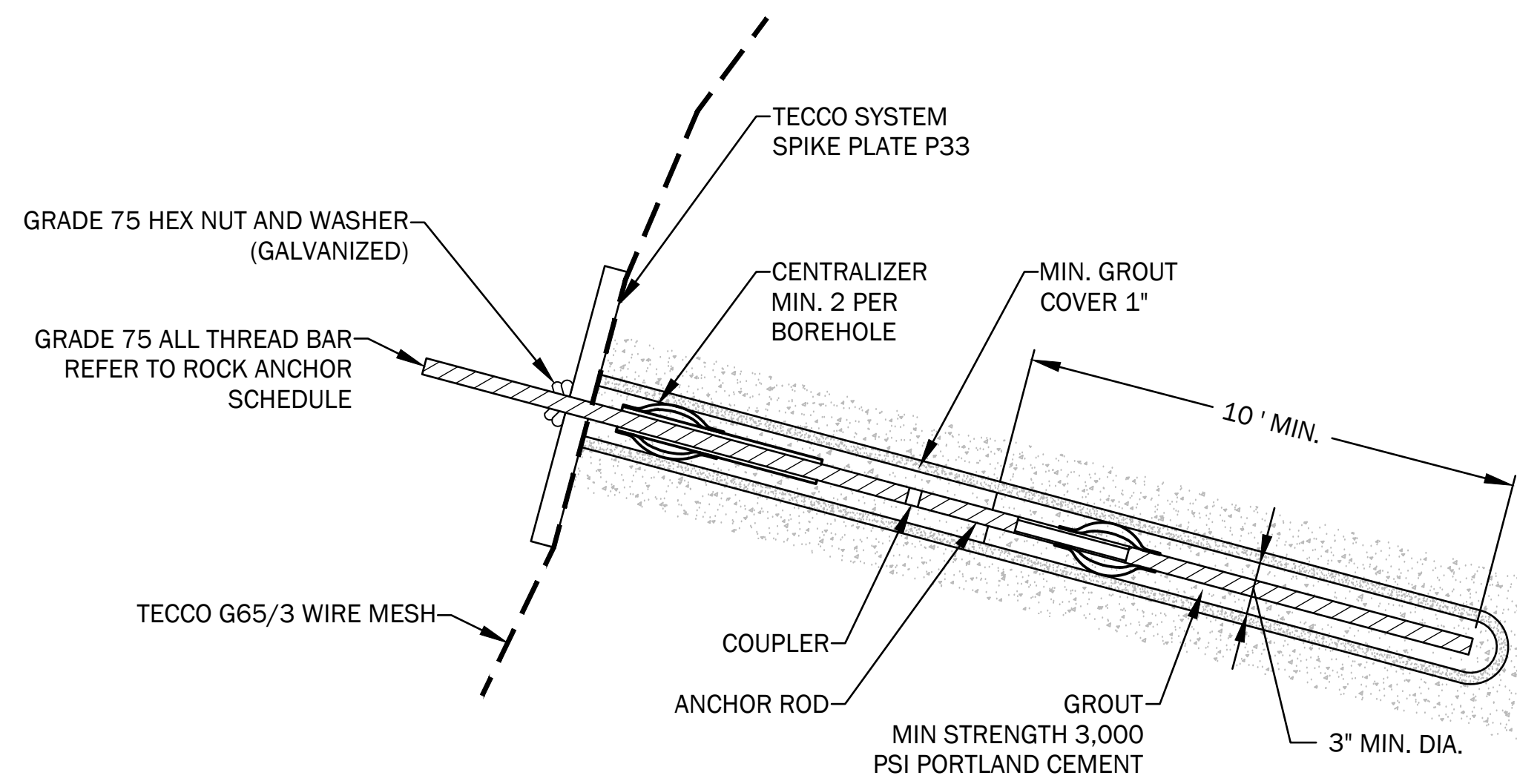


**TYPICAL GABION** 1  
SCALE: NOT TO SCALE 10

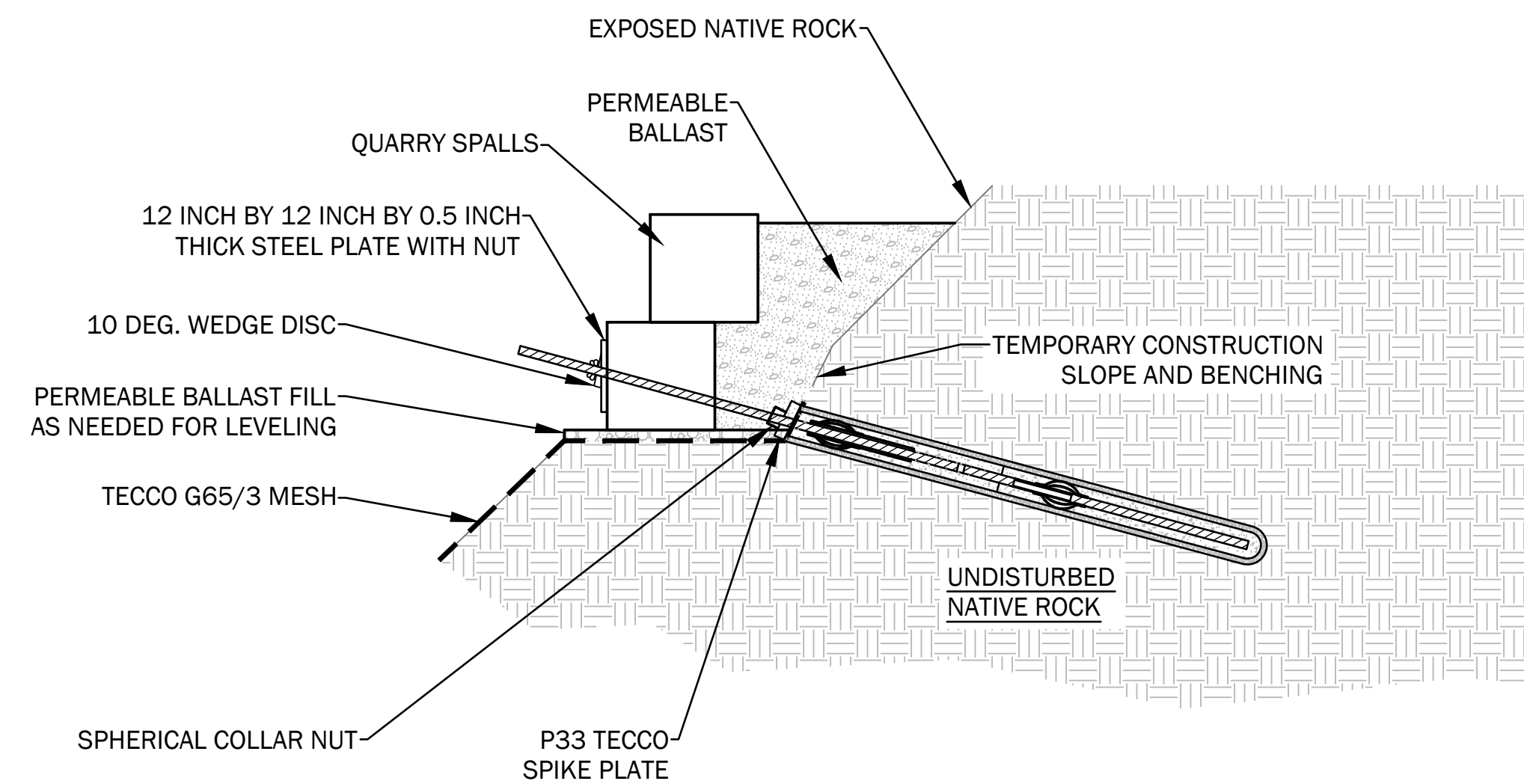


TL = TEST LOAD = (BOND LENGTH, BL) X (DESIGN LOAD TRANSFER)

**TEST NAIL DETAIL** 2  
SCALE: NOT TO SCALE 10



**ANCHOR DETAIL WITHOUT GABION BASKET FACING** 3  
SCALE: NOT TO SCALE 10



**ANCHOR DETAIL WITH GABION BASKET FACING** 4  
SCALE: NOT TO SCALE 10

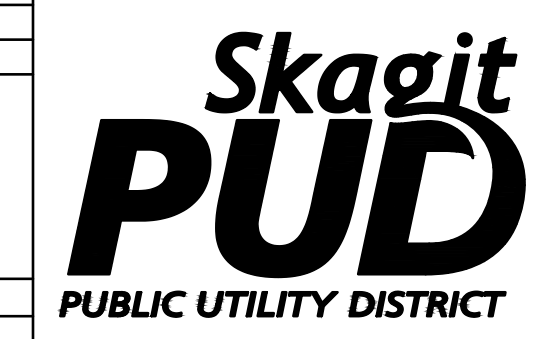
| ISSUE | REVISIONS  | BY  | DATE    |
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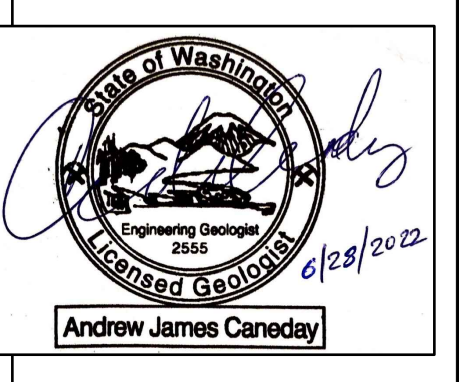
DATUM:  
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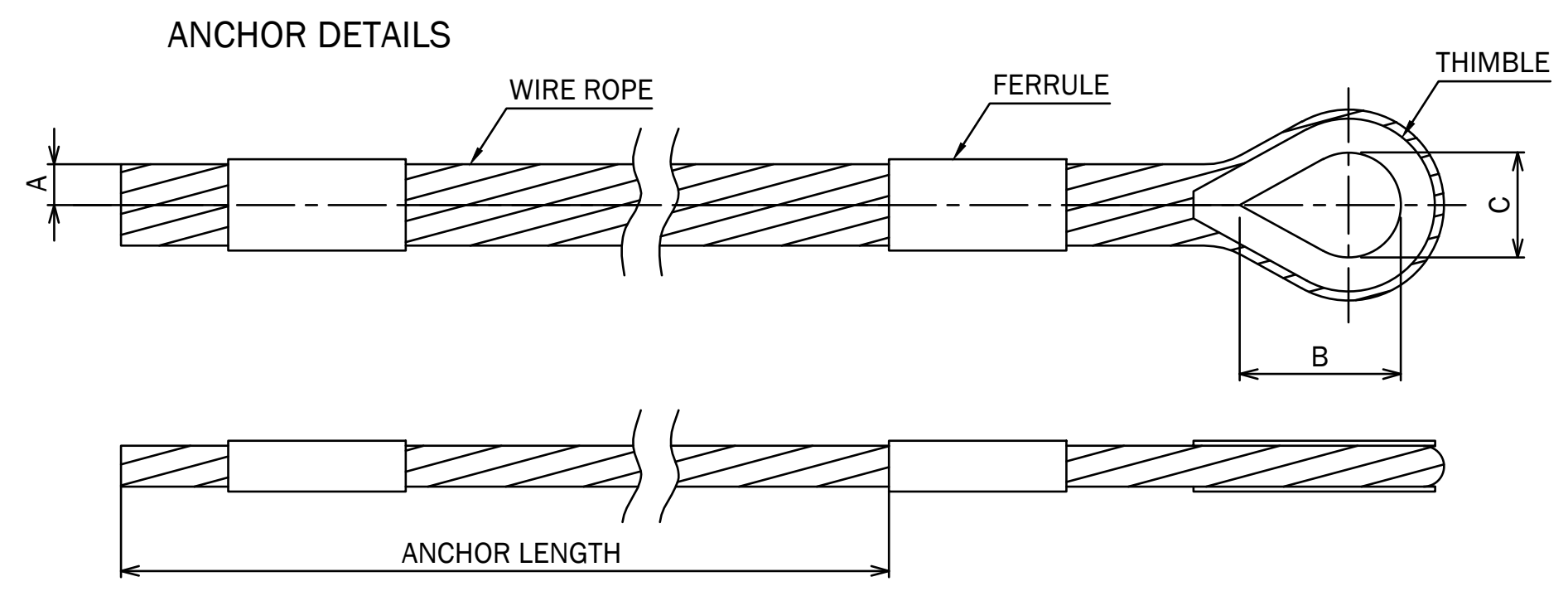
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HARDWARE MANUFACTURER AND ROCK DOWEL DETAILS

SCALE: 1"=10'    JOB ID : CPXXXX    SHEET: 10 OF 13

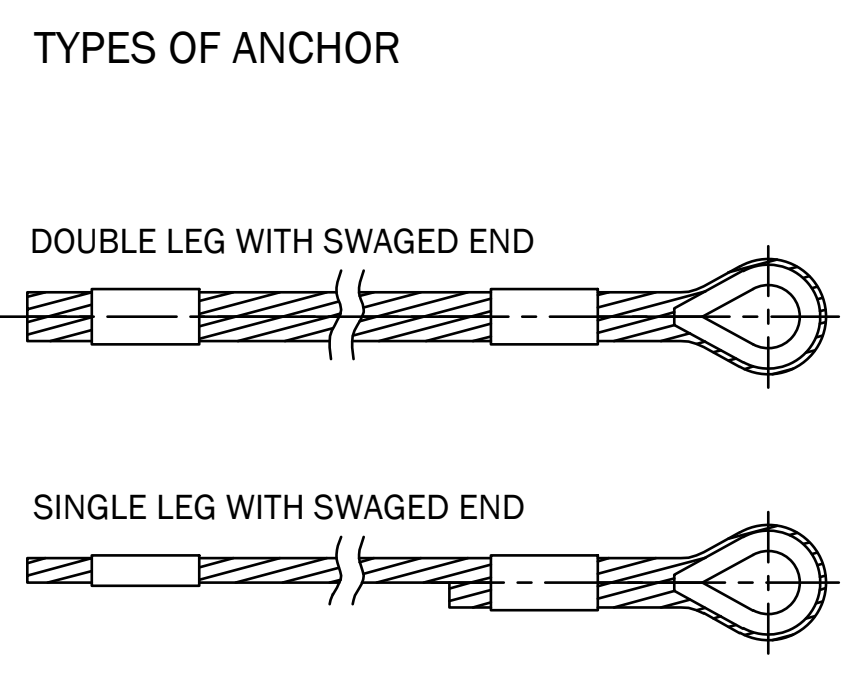
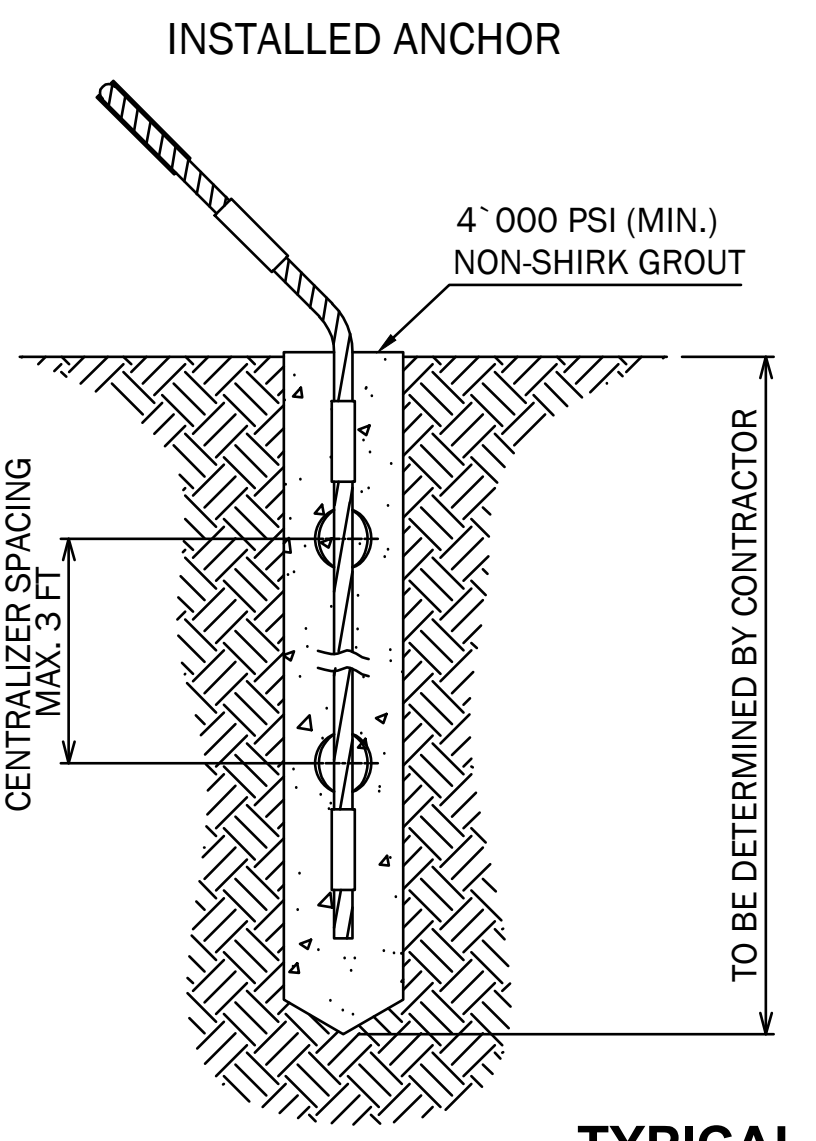




| ANCHOR SIZE | DIMENSIONS (IN) |       |       | WL (KIPS) |        |
|-------------|-----------------|-------|-------|-----------|--------|
|             | A               | B     | C     | DOUBLE    | SINGLE |
| 3/4         | 3-3/4           | 2     | 58.8  | 29.4      |        |
| 7/8         | 4-1/4           | 2-1/4 | 79.6  | 39.8      |        |
| 1           | 4-1/2           | 2-1/2 | 103.4 | 51.7      |        |
| 1-1/8       | 5-1/8           | 2-7/8 | 112.5 | 56.25     |        |

(1 KN = 0.2248 KIPS)

NOTES:  
 - DRILL ANCHOR HOLES TO A DIAMETER AND DEPTH (D) DETERMINED BY THE CONTRACTOR TO ACHIEVE REQUIRED PULLOUT STRENGTH.  
 - ANCHOR HOLE DIAMETER SHALL BE EQUAL TO THE ROPE(S) DIA PLUS 1" (MINIMUM).  
 - WIRE ROPE 6X19 IWRC OR EQUIVALENT, EIPS PER ASTM A1023  
 - AND FEDERAL SPECIFICATION RR-W-410.  
 - WL = WORKING LOAD (1/2 BREAKING STRENGTH OF THE WIRE ROPE).  
 - THIMBLES PER FEDERAL SPECIFICATION FF-T-276B / ASTM A153.  
 - SWAGES ALUMINUM OVAL SLEEVES.



**TYPICAL WIRE ROPE DETAILS** 1  
 SCALE: NOT TO SCALE 11



| ISSUE | REVISIONS  | BY  | DATE    |
|-------|--|-----|---------|
| 1     | ISSUE FOR BIDDING                                      | AJH | 5-19-22 |
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HARDWARE MANUFACTURER AND  
 ROCK DOWEL DETAILS



## GENERAL NOTES

THE CONTRACTOR AND SUBCONTRACTORS ARE RESPONSIBLE FOR THE CONSTRUCTION PROCESS AND THE SAFETY OF THE WORKERS. THIS INCLUDES BUT IS NOT LIMITED TO, THE CONSTRUCTION SEQUENCE, INTERIM HANDRAILS, SITE ACCESS, BARRIERS, AND ON SLOPE SAFETY.

### REFERENCE DATA:

SURVEY AND CIVIL BASE CAD DRAWINGS PROVIDED BY PACIFIC SURVEY AND ENGINEERING, INC.

### BUILDING CODES, DESIGN MANUALS, AND SPECIFICATIONS:

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION (WSDOT), 2021, "STANDARD SPECIFICATIONS FOR ROAD, BRIDGE, AND MUNICIPAL CONSTRUCTION".

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION (WSDOT), MAY 2019, "GEOTECHNICAL DESIGN MANUAL".

### SUBSURFACE DESIGN PARAMETERS:

THE SUBSURFACE CHARACTERIZATION USED FOR ROCK DOWEL DESIGN ARE PROVIDED BELOW:

| SOIL UNIT    | UNIT WEIGHT (PCF) | ROCK INTERFACE FRICTION (DEG) | ROCK INTERFACE COHESION (PSF) | ULTIMATE BOND STRESS (PSI) | DESIGN PULLOUT RESISTANCE (K/FT) |
|--------------|-------------------|-------------------------------|-------------------------------|----------------------------|----------------------------------|
| GREEN SCHIST | 183               | 36                            | 0                             | 85                         | 3.5                              |

FOR THE PURPOSES OF DESIGN OF THE ROCK DOWEL DESIGN, IT IS ASSUMED THAT THE WATER TABLE IS BELOW THE TOE OF THE SLOPE. LOCALIZED AREAS OF PERCHED GROUNDWATER SHOULD BE ANTICIPATED. THE CONTRACTOR SHALL CONTACT THE ENGINEER IF GROUNDWATER OCCURS DURING DRILLING OF THE EXPOSED FACE.

## SPECIFICATIONS

### PART 1 - GENERAL

#### 1.1 DESCRIPTION

A. THE WORK SHALL CONSIST OF CONSTRUCTION OF SLOPE MITIGATION AS SPECIFIED HEREIN AND AS SHOWN ON THE PLANS. THE WORK SHALL INCLUDE DRILLING ROCK DOWEL HOLES, IN BOTH SOIL AND ROCK, TO THE SPECIFIED LENGTH AND INCLINATION INDICATED ON THE PLANS; PROVIDING, INSTALLING AND GROUTING THE ROCK DOWELS IN THE DRILLED HOLES; PROVIDING AND INSTALLING MESH REINFORCEMENT. THE WORK SHALL ALSO INCLUDE FURNISHING, ASSEMBLING, AND INSTALLING ROCK FILLED WIRE MESH GABION BASKETS AND FURNISHING ASSEMBLING, AND INSTALLING A SHIP'S STAIRCASE. THE CONTRACTOR SHALL FURNISH ALL LABOR, MATERIALS AND EQUIPMENT FOR COMPLETING THE WORK.

B. THE CONTRACTOR AND SPECIALTY SUBCONTRACTORS (HEREAFTER REFERRED TO COLLECTIVELY AS THE CONTRACTOR UNLESS INDICATED OTHERWISE) ARE RESPONSIBLE FOR THE CONSTRUCTION MEANS AND METHODS AND CONTROL OF THE PROCESS OF THE WORK. THIS INCLUDES THE CONSTRUCTION SEQUENCE, THE SAFETY OF THE WORKERS, TEMPORARY HANDRAIL SITE AND SLOPE ACCESS, BARRIERS, LIFTING OF MATERIALS AND CONSTRUCTION EQUIPMENT ALONG THE SLOPE AND OTHER METHODS, TECHNIQUES, SEQUENCES OR PROCEDURES REQUIRED TO PERFORM THE WORK.

#### 1.2 PRECONSTRUCTION MEETING

A. A PRECONSTRUCTION MEETING SHALL BE HELD PRIOR TO THE START OF THE WORK AND SHALL BE ATTENDED BY THE OWNER'S REPRESENTATIVES, THE GEOTECHNICAL ENGINEER, AND THE PRIME CONTRACTOR. THE PRECONSTRUCTION MEETING SHALL BE CONDUCTED TO CLARIFY THE CONSTRUCTION REQUIREMENTS FOR THE WORK, TO COORDINATE THE CONSTRUCTION ACTIVITIES, AND TO IDENTIFY CONTRACTUAL RELATIONSHIPS AND RESPONSIBILITIES.

#### 1.3 EXISTING SITE CONDITIONS AND UTILITIES

A. THE CONTRACTOR SHALL VISIT THE SITE PRIOR TO ANY CONSTRUCTION ACTIVITIES FOR THE PURPOSE OF OBSERVING AND DOCUMENTING THE PRECONSTRUCTION CONDITION OF ALL STRUCTURES, INFRASTRUCTURE, SIDEWALKS, AND ALL OTHER FACILITIES ADJACENT TO THE SITE. DURING CONSTRUCTION, THE CONTRACTOR SHALL OBSERVE THE CONDITIONS ABOVE THE SLOPE MITIGATION ON A DAILY BASIS FOR SIGNS OF GROUND OR ROADWAY MOVEMENTS. THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE OWNER'S REPRESENTATIVE AND THE ENGINEER IF SIGNS OF MOVEMENT ARE OBSERVED. THE CONTRACTOR SHALL PROVIDE THE ENGINEER WRITTEN DOCUMENTATION OF THE OBSERVED CONDITIONS WITHIN 24 HOURS OF INITIAL OBSERVATION.

B. GABION BASKET AND ROCK DOWEL LAYOUT AND ELEVATIONS ARE BASED ON TOPOGRAPHIC AND OTHER PROJECT INFORMATION PRESENTED IN THE PROJECT PLANS AND SPECIFICATIONS. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS, CONDITIONS AND ELEVATIONS BEFORE PROCEEDING. ANY DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER.

C. THE CONTRACTOR SHALL VERIFY THE LOCATION OF ANY AND ALL EXISTING AND PROPOSED UTILITIES. ANY CONFLICTS BETWEEN UTILITY LOCATIONS AND ROCK DOWEL OR GABION BASKET WALL LOCATIONS WILL BE RESOLVED AS DIRECTED BY THE ENGINEER. THE CONTRACTOR SHALL SEEK APPROVAL OF THE ENGINEER TO SHIFT ROCK DOWEL LOCATIONS TO AVOID CONFLICTS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY REPAIR/REPLACEMENT TO DAMAGED UTILITY LINES DURING CONSTRUCTION.

D. THE CONTRACTOR IS RESPONSIBLE FOR ANY REMOVAL OF ABANDONED UTILITIES OR OTHER UNDERGROUND OBSTRUCTIONS THAT INTERFERE WITH THE SLOPE MITIGATION.

#### 1.4 SPECIAL INSPECTION

A. SPECIAL INSPECTION SHALL BE PROVIDED BY THE OWNER FOR ALL MATERIALS TESTING. SUCH INSPECTION SHALL INCLUDE OBSERVATION AND TESTING REINFORCING STEEL AND GROUT.

B. GEOENGINEERS SHALL BE THE OWNER'S REPRESENTATIVE PROVIDING THE SPECIAL INSPECTION (HEREIN REFERRED TO AS ENGINEER OR GEOTECHNICAL SPECIAL INSPECTOR) MONITORING SLOPE STABILIZATION AND GABION WALL CONSTRUCTION. ACCURATE RECORDS DOCUMENTING THE SLOPE STABILIZATION CONSTRUCTION SHALL BE MAINTAINED BY THE OWNER'S REPRESENTATIVE. THE CONTRACTOR SHALL ASSIST THE OWNER'S REPRESENTATIVE AS NECESSARY TO OBTAIN THE AS-BUILT GABION BASKET AND ROCK DOWEL LOCATIONS, AND ALL OTHER INFORMATION AS REQUIRED BY THE OWNER AND ENGINEER.

#### 1.5 QUALITY ASSURANCE

A. THE CONTRACTOR SHALL SUBMIT A REFERENCE LIST INDICATING THE SUCCESSFUL COMPLETION OF AT LEAST FIVE ROCK DOWELS OR GROUND ANCHOR PROJECTS COMPLETED DURING THE LAST 3 YEARS. A BRIEF DESCRIPTION OF EACH PROJECT WITH THE OWNER'S NAME AND CURRENT PHONE NUMBER SHALL BE INCLUDED.

B. THE CONTRACTOR'S SUPERINTENDENT SHALL HAVE A MINIMUM OF 3 YEARS EXPERIENCE GROUND ANCHOR WORK AND THE DRILL OPERATORS AND ON-SITE SUPERVISORS SHALL HAVE A MINIMUM OF 1 YEAR EXPERIENCE INSTALLING ROCK DOWELS OR GROUND ANCHORS. PRIOR TO STARTING THE WORK, THE CONTRACTOR SHALL SUBMIT A LIST IDENTIFYING THE SUPERINTENDENT, DRILL RIG OPERATORS, AND ON-SITE SUPERVISORS ASSIGNED TO THE PROJECT. THE LIST SHALL CONTAIN A SUMMARY OF EACH INDIVIDUAL'S EXPERIENCE AND SHALL BE SUFFICIENTLY COMPLETE FOR THE ENGINEER TO EVALUATE THE INDIVIDUAL'S QUALIFICATIONS. WORK SHALL NOT BE STARTED UNTIL WRITTEN APPROVAL OF THE CONTRACTOR'S QUALIFICATIONS IS GIVEN.

C. THE OWNER'S REPRESENTATIVE MAY SUSPEND THE WORK IF THE CONTRACTOR SUBSTITUTES NON-APPROVED PERSONNEL FOR APPROVED PERSONNEL.

#### 1.6 SUBMITTALS

##### 1.6.1 GENERAL

A. SUBMITTALS SHALL BE PROVIDED BY THE CONTRACTOR FOR THE ENGINEER'S REVIEW AND APPROVAL. THE CONTRACTOR WILL NOT BE ALLOWED TO BEGIN CONSTRUCTION OF THE SLOPE REPAIR UNTIL ALL SUBMITTAL REQUIREMENTS ARE SATISFIED AND FOUND ACCEPTABLE TO THE ENGINEER. ALL SUBMITTALS SHALL BE PROVIDED AT LEAST 15 DAYS PRIOR TO INITIATING WORK.

##### 1.6.2 SHOP DRAWINGS

- A DETAILED CONSTRUCTION SEQUENCE AND PLANNED START OF WORK DATE.
- DRILLING METHODS AND EQUIPMENT INCLUDING PROPOSED DRILL HOLE DIAMETER TO ACHIEVE THE SPECIFIED PULLOUT RESISTANCE AND ANY VARIATION OF THESE ALONG THE ALIGNMENT.
- ROCK DOWEL GROUT MIX DESIGNS, PLACEMENT PROCEDURES AND EQUIPMENT GROUT MIX DESIGN SHALL INCLUDE BRAND AND TYPE OF PORTLAND CEMENT, SOURCE, GRADATION, AND QUALITY OF AGGREGATES; MIX PROPORTIONS BY WEIGHT; PROPOSED ADMIXTURES AND THEIR MANUFACTURER, DOSAGE, AND TECHNICAL LITERATURE; AND COMPRESSIVE STRENGTH TEST RESULTS FROM THE SUPPLIER NO OLDER THAN 6 MONTHS VERIFYING THE MINIMUM 3-DAY AND 28-DAY COMPRESSIVE STRENGTHS.
- ONCE AVAILABLE, CERTIFIED MILL TEST RESULTS FOR ROCK DOWELS FROM EACH HEAT SPECIFYING THE ULTIMATE STRENGTH, YIELD STRENGTH, ELONGATION AND COMPOSITION.
- MANUFACTURER CERTIFICATIONS FOR THE ROCK DOWEL CENTRALIZERS AND ROCK DOWEL BAR COUPLERS.

#### 1.7 DELIVERY, HANDLING, STORAGE

- CEMENT SHALL BE ADEQUATELY STORED TO PREVENT MOISTURE DEGRADATION AND PARTIAL HYDRATION. CEMENT THAT HAS BECOME CAKED SHALL NOT BE USED.

B. ALL STEEL REINFORCEMENT SHALL BE CAREFULLY HANDLED AND SHALL BE STORED ON SUPPORTS TO KEEP THE STEEL FROM CONTACT WITH THE GROUND. STEEL BARS SHALL BE PICKED UP IN SUCH A WAY AS TO PREVENT OVERSTRESSING. DAMAGE TO THE ROCK DOWEL STEEL AS A RESULT OF OVERSTRESSING, ABRASION, CUTS, NICKS, WELDS, AND WELD SPLATTER SHALL BE CAUSE FOR REJECTION BY THE OWNER'S REPRESENTATIVE. GROUNDING OF WELDING LEADS TO THE ROCK DOWEL STEEL SHALL NOT BE ALLOWED.

C. ROCK DOWEL STEEL SHALL BE PROTECTED FROM AND SUFFICIENTLY FREE OF DIRT, RUST, AND OTHER DELETERIOUS SUBSTANCES PRIOR TO INSTALLATION. HEAVY CORROSION OR PITTING OF ROCK DOWELS SHALL BE CAUSE FOR REJECTION BY THE OWNER'S REPRESENTATIVE. LIGHT RUST THAT HAS NOT RESULTED IN PITTING IS ACCEPTABLE.

### PART 2 - MATERIALS

#### 2.1 GABION BASKET MATERIALS

A. GABIONS SHALL BE OF A SINGLE UNIT CONSTRUCTION. THE BASE, ENDS, SIDES, AND LID SHALL BE EITHER WELDED INTO A SINGLE UNIT OR SHALL BE CONNECTED IN SUCH A MANNER THAT STRENGTH AND FLEXIBILITY AT THE CONNECTION ARE AT LEAST EQUAL TO THAT OF THE WIRE MESH. THE GABIONS SHALL BE FABRICATED IN SUCH A MANNER THAT THEY CAN BE ASSEMBLED AT THE CONSTRUCTION SITE WITH SPIRAL BINDERS AND PRE-FORMED STIFFENERS INTO RECTANGULAR BASKETS OF THE SPECIFIED SIZE. THE HEIGHT, LENGTH, AND WIDTH OF THE GABIONS SHALL NOT VARY MORE THAN 5 PERCENT FROM THE DIMENSIONS SHOWN ON THE PLANS. GABIONS SHALL BE DIVIDED INTO CELLS OF EQUAL LENGTH, NOT MORE THAN 3 FEET LONG, BY DIAPHRAGMS MADE OF THE SAME WIRE MESH AS USED FOR THE GABION BODY. EACH GABION SHALL BE FABRICATED WITH THE NECESSARY DIAPHRAGM OR DIAPHRAGMS SECURED IN PROPER POSITION ON THE BASE IN SUCH A MANNER THAT NO ADDITIONAL TYING AT THE BASE WILL BE NECESSARY.

WIRE FOR THE MANUFACTURE AND ASSEMBLY OF GABIONS SHALL MEET OR EXCEED ANY COMBINATION OF THE FOLLOWING REQUIREMENTS:

| DESCRIPTION   | REQUIREMENT       |
|---|-------------------|
| 3" X 3", 11 GA. WELDED WIRE FABRIC                                | ASTM, A1064, A370 |
| GALVANIZATION: (9 GA. 0.9 OZ/SF)                                  | ASTM A641, A90    |
| 9 GA. GALVANIZED PRE-FORMED STIFFENER                             |                   |
| 9 GA. GALVANIZED SPIRAL BINDER - MIN. 0.144 IN. (3.66 mm)         | ASTM A641, A90    |
| 13.5 GA. TIE WIRE - MIN. 0.086 IN. (2.2 MM) GALVANIZED 0.70 OZ/SF | ASTM A641, A90    |

B. ROCK FOR FILLING THE GABIONS SHALL BE QUARRY SPALLS PER WSDOT STANDARD SPECIFICATION 9-13.1(5).

#### 2.2 ANCHORED MESH MATERIALS

##### A. ROCK DOWELS

A.A. ROCK NAILS SHALL BE CONTINUOUS NO. 9 AND NO. 10, GRADE 75 STEEL THREADBAR, UNTENSIONED, CEMENT GROUTED FULL-LENGTH IN ROCK, WITH ANCHORAGE HARDWARE AS DESCRIBED IN THESE SPECIFICATIONS, SHOWN ON THE DRAWINGS, OR AS DIRECTED BY THE DESIGN ENGINEER.

A.B. ROCK NAILS SHALL BE EPOXY COATED OR HOT-DIP GALVANIZED IN ACCORDANCE WITH ASTM A153

B. SLOPE MESH ANCHOR PLATES  
B.A. SLOPE MESH ANCHOR PLATES SHALL BE GEOBRUGG TECCO® SYSTEM SPIKE PLATE P33 WITH HOLE DIAMETER OF 40 MM. THE PLATE SHALL BE DIAMOND SHAPED WITH A WIDTH OF 7.5 INCHES AND A LENGTH OF 13 INCHES WITH "TABS" ON EACH END TO "CATCH" THE MESH. THE PLATE SHALL BE MADE FROM 10 MILLIMETER-THICK STEEL.

B.B. STEEL BEARING PLATES FOR ANCHORING GABION BASKETS SHALL CONFORM TO ASTM A36 AND SHALL MEET LOAD AND DEFLECTION CRITERIA OF ASTM F432. BEARING PLATES SHALL BE MINIMUM 1/2-INCH-THICK FLAT STEEL, SQUARE IN SHAPE, PROVIDING A MINIMUM 144 SQUARE-INCH AREA AND WITH A HOLE DRILLED AND SIZED TO ALLOW AT LEAST A 15-DEGREE SKEW FROM NORMAL TO THE PLATE IN ALL DIRECTIONS.

B.C. PLATES SHALL BE HOT-DIP GALVANIZED IN ACCORDANCE WITH ASTM A153 WITH A MINIMUM LAYER THICKNESS EQUAL TO 85 M.

C. WASHERS  
C.A. SPHERICAL WASHERS MUST ENSURE THAT THERE IS CONTINUOUS LOAD TRANSFER BETWEEN THE TIGHTENED HEX NUT AND THE ANCHOR PLATE. SPHERICAL WASHERS MUST BE STEEL OR MALLEABLE IRON AND MUST BE HOT-DIP GALVANIZED.

C.B. FLAT WASHERS MUST BE HARDENED STEEL AND MUST BE HOT-DIP GALVANIZED IN ACCORDANCE WITH ASTM A123. ONE SPHERICAL WASHER AND ONE FLAT WASHER MUST BE PROVIDED WITH EACH GROUND ANCHOR.

D. HEX NUTS  
D.A. HEX NUTS USED ON THREADED PORTIONS OF GROUND ANCHORS MUST BE COMPATIBLE WITH THE ROCK NAIL BARS AND OF THE HEAVY-DUTY TYPE, WITH HEXAGONAL HEADS. NUTS MUST DEVELOP AN ULTIMATE STRENGTH OF NOT LESS THAN 25 PERCENT OF THE MINIMUM YIELD STRENGTH OF THE ROCK NAIL BARS.

D.B. HEX NUTS MUST BE HOT-DIP GALVANIZED IN ACCORDANCE WITH ASTM A123.

D.C. INSIDE DIAMETER OF HEX NUT MUST BE OVERSIZED TO ACCOMMODATE THE HOT-DIP GALVANIZING WITHOUT DAMAGING THE COATING DURING INSTALLATION.

E. CENTRALIZERS  
E.A. CENTRALIZERS MUST BE PLASTIC OR OTHER APPROVED MATERIAL WHICH IS NON-DETRIMENTAL TO THE ROCK NAIL BARS. WOOD SHALL NOT BE USED.

E.B. THE CENTRALIZER MUST BE ABLE TO SUPPORT THE GROUND ANCHOR IN THE DRILL HOLE AND POSITION THE ROCK NAIL BAR SO A MINIMUM OF 0.5 INCH OF GROUT COVER IS PROVIDED.

E.C. CENTRALIZERS MUST PERMIT GROUT TO FREELY FLOW UP THE DRILL HOLE.

E.D. EACH GROUND ANCHOR SHALL INCLUDE AT LEAST TWO CENTRALIZERS PLACED NO MORE THAN 10 FEET APART WITH ONE CENTRALIZER PLACED WITHIN THE LOWER 1 FOOT OF THE THREAD BAR. IF HOLLOW BARS ARE USED, THE NUMBER OF CENTRALIZERS CAN BE REDUCED TO ONE. THE CENTRALIZER SHALL BE INSTALLED WITHIN 1 TO 2 FEET OF THE FACE OF THE ROCK SLOPE AFTER THE NAIL HOLE IS DRILLED.

F. GROUT  
F.A. CEMENT GROUT MIXTURE PROPORTIONS SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR. GROUT SHALL CONSIST OF A HOMOGENOUS, PUMPABLE, STABLE MIXTURE OF PORTLAND CEMENT AND WATER. THE WATER CONTENT MUST BE THE MINIMUM NECESSARY FOR PROPER PLACEMENT, BUT THE WATER-CEMENT RATIO MUST NOT EXCEED 0.45 BY WEIGHT. FINAL PROPORTIONS OF MATERIALS SHALL BE BASED ON RESULTS OF TESTS MADE ON SAMPLE MIXTURES OF GROUT.

F.B. THE MINIMUM COMPRESSIVE STRENGTH OF 2-INCH CUBES, MOLDED, CURED, AND TESTED IN ACCORDANCE WITH ASTM C109 MUST BE 3,500 PSI AT 7 DAYS AND 6,000 PSI AT 28 DAYS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR SAMPLING, CURING, AND BREAKING OF GROUT TEST CUBES FOR DETERMINING MIX DESIGN, AND ALL GROUT TESTING MUST BE DONE BY AN INDEPENDENT LABORATORY APPROVED BY THE ENGINEER.

F.C. PORTLAND CEMENT MUST BE ASTM C150, TYPE I, II, OR III.

G. WATER  
G.A. WATER TEMPERATURE PRIOR TO MIXING MUST BE BETWEEN 50- AND 70-DEGREES FAHRENHEIT DURING PERIODS OF COLD OR HOT TEMPERATURES. WATER MUST BE HEATED OR COOLED BEFORE MIXING GROUT.

H. ADMIXTURES  
H.A. ADMIXTURES, WHICH CONTROL BLEED, IMPROVE FLOWABILITY, REDUCE WATER CONTENT AND RETARD SET, MAY BE USED IN THE GROUT SUBJECT TO THE APPROVAL OF THE ENGINEER.

H.B. ANY ADMIXTURES USED MUST BE COMPATIBLE WITH THE STEEL ROCK NAILS AND SHALL BE MIXED IN

ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.

- GROUT TUBES  
I.A. GROUT TUBES SHALL BE POLYETHYLENE TUBING OR AS RECOMMENDED BY THE GROUND ANCHOR MANUFACTURER/SUPPLIER.  
I.B. INSIDE DIAMETER OF GROUT TUBES SHALL BE ADEQUATE FOR THE PROPOSED GROUT MIX.  
I.C. TUBES MUST BE ABLE TO WITHSTAND THE EXPECTED GROUTING PRESSURE.
- GROUT SOCKS  
J.A. GROUT SOCKS SHALL BE PROVIDED IF GROUT LOSS OCCURS. GROUT SOCKS SHALL CONSIST OF CARRIFF TYPE "A" CIRCULAR-KNITTED DRAIN-SLEEVE OR APPROVED EQUAL.  
K. SLOPE MESH  
K.A. SLOPE MESH MUST BE HIGH TENSILE STRENGTH STEEL WIRE TECCO® G65/3 MESH MANUFACTURED BY GEOBRUGG NA, LLC OR APPROVED EQUAL.  
K.B. WIRE MUST BE 3-MILLIMETER DIAMETER CARBON STEEL WITH A MINIMUM ULTIMATE TENSILE STRENGTH OF 239 KSI (1650 N/MM2). MESH MUST BE DIAMOND SHAPED, NOMINAL 83 MM BY 143 MM (±3%).
- MESH CONNECTORS  
L.A. SPIKE PLATE SHALL BE HIGH TENSILE STRENGTH STEEL TECCO® P33 MANUFACTURED BY GEOBRUGG AG OR APPROVED EQUAL.  
L.B. MESH CONNECTORS SHALL BE GEOBRUGG TECCO® T3 CLIPS OR APPROVED EQUAL. MESH CONNECTORS SHALL BE HOT DIPPED GALVANIZED.
- BOUNDARY ROPES  
M.A. BOUNDARY ROPES MUST BE THE HEAVY TYPE AS DESCRIBED IN THE GEOBRUGG TECCO® SLOPE STABILIZATION SYSTEM PRODUCT MANUAL 1/2-INCH DIAMETER STEEL WIRE ROPE.  
M.B. BOUNDARY ROPES MUST BE HOT DIPPED GALVANIZED.
- WIRE ROPE ACCESSORIES  
N.A. WIRE ROPE CLIPS MUST BE IN ACCORDANCE WITH FEDERAL SPECIFICATION FF-C-450, TYPE 2.  
N.B. WIRE ROPE CLIPS MUST BE HOT DIPPED GALVANIZED.

O. BOUNDARY ROPE CONNECTORS  
O.A. BOUNDARY ROPE CONNECTORS MUST BE TYPE 2 PRESS CLAWS, 6-MM THICKNESS, AS SUPPLIED BY GEOBRUGG OR APPROVED EQUAL.

O.B. BOUNDARY ROPE CONNECTORS MUST BE HOT DIPPED GALVANIZED.

P. WIRE ROPE ANCHORS  
P.A. WIRE ROPE ANCHORS SHALL CONSIST OF 3/4-INCH DIAMETER CABLE AS SHOWN ON THE PLANS WITH A LOAD CAPACITY OF 22.5 KIPS.

P.B. ALL COMPONENTS SHALL HAVE A MINIMUM TENSILE CAPACITY EQUAL TO THE ULTIMATE CAPACITY OF THE ANCHOR.

P.C. WIRE ROPE ANCHORS SHALL HAVE A PRE-FORMED FERRULE LOOP OR A MANUFACTURED FLEXIBLE HEAD.

PART 3 - EQUIPMENT  
3.1 DRILLING EQUIPMENT  
A. HOLES MAY BE ADVANCED BY ROTARY, PERCUSSION, ROTARY/PERCUSSION, DOWN-HOLE HAMMER, OR USING OTHER DRILLING METHOD SUITABLE FOR ADVANCING DRILL TOOLS OF THE REQUIRED DIAMETER TO THE DEPTHS SPECIFIED.

B. DRILLING EQUIPMENT SHALL BE CAPABLE OF DRILLING AT THE INCLINATIONS REQUIRED, AS SHOWN ON THE DRAWINGS.

C. IF DRILLING EQUIPMENT WILL BE SUSPENDED, CONSIDERATION SHALL BE GIVEN TO REDUCED REACTION FORCE.

3.2 GROUTING EQUIPMENT  
A. GROUT MIXER: THE GROUT MIXER SHALL BE A HIGH-SPEED, HIGH-SHEAR, COLLOIDAL TYPE GROUT MIXER CAPABLE OF CONTINUOUS MECHANICAL MIXING THAT WILL PRODUCE UNIFORM AND THOROUGHLY MIXED GROUT WHICH IS FREE OF LUMPS AND UNDISPERSED CEMENT.

B. MEASURING DEVICES: CONTRACTOR SHALL PROVIDE DEVICES CAPABLE OF MEASURING THE RELATIVE PROPORTIONS OF GROUT INGREDIENTS SUCH THAT EACH BATCH OF GROUT IS CONSISTENT WITH THE APPROVED MIX DESIGN.

C. GROUT PUMP: THE GROUT PUMP SHALL BE OF THE POSITIVE DISPLACEMENT TYPE. IT SHALL BE CAPABLE OF PUMPING AT ALL FLOW RATES BELOW 20 GALLONS PER MINUTE AND SHALL BE CAPABLE OF PUMPING AT A PRESSURE OF AT LEAST 50 PSI AT ZERO FLOW RATE. THE PUMPING EQUIPMENT SHALL HAVE A PRESSURE GAGE CAPABLE OF MEASURING PRESSURES OF AT LEAST 150 PSI.

D. MATERIAL SAFETY: PORTLAND CEMENT AND PREPACKAGED GROUT CONTAINING PORTLAND CEMENT IS A RESPIRATORY AND SKIN IRRITANT. CONTRACTOR SHALL ADHERE TO SECTION NO. 6 OF EM 385-1-1 AND WORKERS SHALL BE EQUIPPED WITH RESPIRATORS AND SKIN PROTECTION WHILE HANDLING DRY CEMENT. THE MANUFACTURER'S RECOMMENDED SAFETY EQUIPMENT AND INSTRUCTIONS SHALL BE USED.

3.3 TESTING EQUIPMENT  
A. THE CONTRACTOR SHALL SUPPLY THE FOLLOWING TESTING EQUIPMENT:

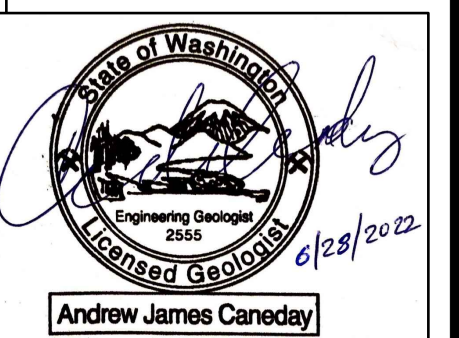
B. A HYDRAULIC JACK AND PUMP OF THE TYPE TYPICALLY USED FOR TESTING ROCK DOWELS WITH A RATED CAPACITY GREATER THAN THE MAXIMUM TEST LOAD. PROVIDE A HYDRAULIC JACK WITH A STROKE LENGTH AT LEAST 1 INCH GREATER THAN THE THEORETICAL ELASTIC ELONGATION OF THE TENDON STEEL AT THE MAXIMUM TEST LOAD, BUT NOT LESS THAN 6 INCHES.

C. ONE PRESSURE GAGE TO MEASURE THE PRESSURE IN THE HYDRAULIC JACK. GAGE SHALL HAVE GRADUATIONS OF 50 PSI OR SMALLER. THE PUMP, HYDRAULIC JACK, AND THE PRESSURE GAGE HAVE BEEN CALIBRATED AS A UNIT WITHIN 60 DAYS OF THE BEGINNING OF ROCK DOWEL TESTING. CALIBRATION SHALL BE TRACEABLE TO THE NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST).

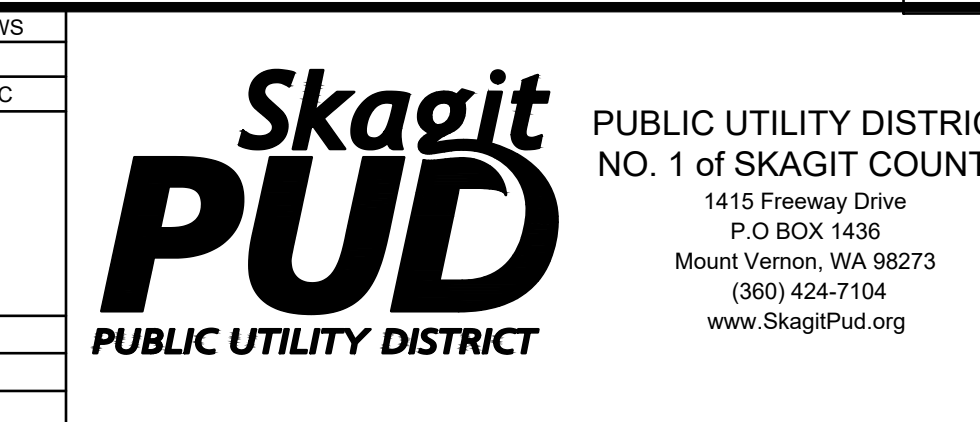
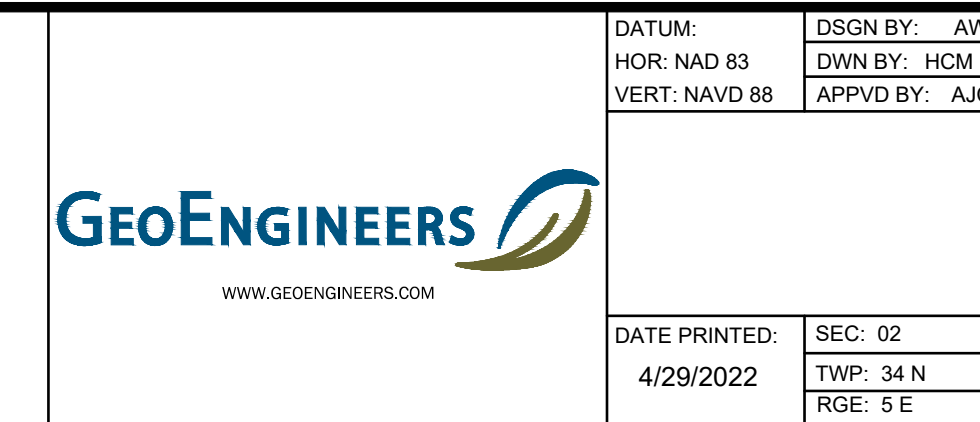
D. TWO DISPLACEMENT GAGES THAT CAN MEASURE MOVEMENT IN INCREMENTS OF 0.001 INCH OR LESS WITH A MINIMUM 4-INCH RANGE OF TRAVEL. IF THE ELASTIC ELONGATION OF THE TENDON STEEL AT THE MAXIMUM TEST LOAD WILL EXCEED 4.0 INCHES, PROVIDE DISPLACEMENT GAGES WITH A SUFFICIENT RANGE OF TRAVEL, OR PROVIDE MULTIPLE DISPLACEMENT GAGES THAT CAN BE ARRANGED IN SERIES TO ALLOW THE CONTINUOUS MEASUREMENT OF THE DISPLACEMENT OF THE ANCHOR HEAD.

E. A JACK CHAIR THAT CAN TRANSFER 166 PERCENT OF THE DESIGN LOAD.

F. RECALIBRATION OF THE TESTING EQUIPMENT IS REQUIRED AT SIX-MONTH INTERVALS THROUGHOUT THE PERIOD OF USE, AFTER ROUGH HANDLING, OR AFTER DAMAGE TO AND/OR REPAIR OR REPLACEMENT OF ANY COMPONENT, OR AS REQUESTED BY THE ENGINEER.



| ISSUE | REVISIONS  | BY  | DATE    |
|-------|--|-----|---------|
| 1     | ISSUE FOR BIDDING                                      | AJH | 5-19-22 |
| 2     | UPDATED GABION BACKFILL SPECIFICATION TO QUARRY SPALLS | AJH | 6-28-22 |
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| SPECIFICATIONS |                 |
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| SCALE: NONE    | JOB ID : CPXXXX |
|                | SHEET: 12 OF 13 |

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| DATUM:<br>HOR: NAD 83<br>VERT: NAVD 88 | DSGN BY: AWS<br>DWN BY: HCM<br>APPVD BY: AJC |
| DATE PRINTED:<br>4/29/2022             | SEC: 02<br>TWP: 34 N<br>RGE: 5 E             |

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# SPECIFICATIONS

## PART 4 - EXECUTION

### 4.1 GENERAL

A. THE CONSTRUCTION SEQUENCE SHALL BE IN ACCORDANCE WITH THE METHODS APPROVED IN THE PRE-CONSTRUCTION MEETING AND SUBMITTALS.

### 4.2 GABION BASKET CONSTRUCTION

A. GABIONS SHALL FIRST BE ASSEMBLED INDIVIDUALLY AS EMPTY UNITS. EACH GABION SHALL BE MANUFACTURED WITH THE NECESSARY PANELS, PROPERLY SPACED AND SECURED, SO THEY CAN BE ROTATED INTO POSITION AT THE CONSTRUCTION SITE WITH NO ADDITIONAL TYING OF THE ROTATION JOINT. THE PANELS AND DIAPHRAGMS SHALL BE ROTATED INTO POSITION AND JOINED ALONG VERTICAL EDGES.

WHEN 13.5-GAUGE TIE WIRE IS USED AS THE JOINT MATERIAL, ALL VERTICAL EDGES OF EACH GABION PANEL SHALL FIRST BE CONSTRUCTED TO FORM INDIVIDUAL EMPTY GABIONS. SIMPLE SPIRALING (LOOPING WITHOUT LOCKING) OF 13.5-GAUGE TIE WIRE IS NOT PERMITTED. FOR WELDED-MESH, THE JOINT SHALL BE CONSTRUCTED USING ALTERNATING SINGLE AND DOUBLE HALF HITCHES (LOCKED LOOPS) IN EVERY MESH OPENING ALONG THE JOINT.

WHEN 9-GAUGE SPIRAL BINDERS ARE USED, THE SPIRAL SHALL BE SCREWED INTO POSITION SUCH THAT IT PASSES THROUGH EACH MESH OPENING ALONG THE JOINT. BOTH ENDS OF ALL 9-GAUGE SPIRAL BINDERS SHALL BE CRIMPED TO SECURE THE SPIRAL IN PLACE. TEMPORARY FASTENERS MAY BE USED TO HOLD PANELS WHEREVER GABIONS-TO-GABION JOINTS WILL BE CONSTRUCTED. TEMPORARY FASTENERS MAY REMAIN IN PLACE.

ASSEMBLY OF SUCCESSIVE GABIONS (GABION-TO-GABION JOINTS) EMPTY GABIONS SHALL BE SET IN PLACE. INDIVIDUALLY CONSTRUCTED EMPTY GABIONS SHALL BE JOINED SUCCESSIVELY TO THE NEXT EMPTY GABION WITH 13.5-GAUGE TIE WIRE OR 9-GAUGE SPIRALS. BEFORE FILLING WITH ROCK BEGINS, THE 13.5-GAUGE TIE WIRE OR 9-GAUGE SPIRAL BINDERS SHALL SECURE, IN ONE PASS, ALL SELVAGE OR END WIRES OF PANELS OF ALL THE ADJACENT GABIONS ALONG THE JOINT.

B. ASSEMBLY OF MULTIPLE LAYERED GABIONS MULTI-LAYERED GABION CONFIGURATIONS CAN BE STEPPED AND STAGGERED AS SHOWN ON THE PLANS OR AS DIRECTED BY THE ENGINEER. WHEN CONSTRUCTING MULTI-LAYERED GABION CONFIGURATIONS, EACH LAYER OF GABIONS CAN BE JOINED TO THE UNDERLYING LAYER ALONG THE FRONT AND ENDS, OR AS SHOWN ON THE PLANS.

C. ASSEMBLY OF SINGLE-LAYERED GABIONS SINGLE-LAYERED GABION CONFIGURATIONS SHALL BE BUTTED AND JOINED ALONG THE FRONT, BACK, AND ENDS AS SHOWN ON THE PLANS, INCLUDING TOPS AND BOTTOMS OF ADJACENT GABIONS.

D. ASSEMBLY OF SHEAR KEY GABIONS SHEAR KEY GABIONS (ALSO CALLED "COUNTERFORTS") SHALL BE SPACED AS SHOWN ON THE PLANS. SHEAR KEY GABIONS SHALL BE TIED TO ADJACENT GABIONS IN THE MANNER SPECIFIED FOR "ASSEMBLY OF SUCCESSIVE GABIONS."

E. MODIFIED GEOMETRY TO MATCH THE GEOMETRY OF THE PLANNED GABION CONFIGURATION, OR TO MEET SPECIFIC CONDITIONS PANELS SHALL BE FOLDED, CUT, AND/OR RE-TIED TO DIMENSIONS SHOWN ON THE PLANS OR AS APPROVED BY THE ENGINEER.

F. FILLING WITH ROCK ROCK SHALL BE PLACED IN GABIONS TO INSURE PROPER ALIGNMENT, AVOID BULGES, AND PROVIDE A MINIMUM OF VOIDS. ALL EXPOSED ROCK SURFACES SHALL HAVE A SMOOTH AND NEAT APPEARANCE. NO SHARP EDGES SHALL PROJECT THROUGH THE WIRE MESH.

WHEN CONSTRUCTING WITH 1.5-FOOT HIGH OR 3-FOOT HIGH GABIONS, PRE-FORMED STIFFENERS SHALL BE USED TO PRODUCE A FLAT, SMOOTH EXTERNAL SURFACE. PRE-FORMED STIFFENERS SHALL BE INSTALLED ON THE EXPOSED FACE OF THE GABION PRIOR TO ROCK PLACEMENT, TWO ROWS AT 1/3 POINTS ON 3' HIGH GABIONS, ONE ROW AT 1/2 POINT IN 1.5' HIGH GABIONS.

WHEN FILLING 3-FOOT HIGH GABIONS, ROCK SHALL BE PLACED IN 3 NOMINAL 12-INCH LAYERS; WHEN FILLING 1.5-FOOT HIGH GABIONS, ROCK SHALL BE PLACED IN TWO 9-INCH LAYERS.

THE LAST LAYER OF ROCK SHALL SLIGHTLY OVERFILL THE GABIONS SUCH THAT THE LID WILL REST ON ROCK WHEN IT IS CLOSED.

### G. CLOSURE OF LIDS

LIDS SHALL BE TIED ALONG THE FRONT, ENDS, AND DIAPHRAGMS OF INDIVIDUAL GABIONS AND TO SUCCESSIVE GABIONS WITH 9-GAUGE SPIRAL BINDERS IN THE SAME MANNER AS SPECIFIED ELSEWHERE IN THIS SPECIFICATION

### 4.3 ANCHORED MESH SYSTEM INSTALLATION

#### A. GENERAL

A.A. ALL THE EQUIPMENT USED IN HANDLING AND PLACING THE GROUND ANCHORS MUST BE SUCH THAT IT DOES NOT DAMAGE THE THREADBARE OR GALVANIZED COATING.

A.B. INSERTION OF GROUND ANCHORS MUST BE IN ACCORDANCE WITH POST TENSIONING INSTITUTE (PTI) RECOMMENDATIONS.

A.C. GROUTING THE HOLE MAY CAUSE THE SOIL TO FRACTURE TO THE POINT THAT THE GROUT INTENDED TO ENCAPSULATE THE GROUND ANCHOR MIGRATES INTO THE SOIL MASS RATHER THAN FILLING THE HOLE. IF THIS OCCURS, THE CONTRACTOR MUST NOTIFY THE ENGINEER AND BE PREPARED TO INSTALL GROUT SOCKS AROUND THE GROUND ANCHORS. THE CONTRACTOR MUST ASSUME THAT 25 PERCENT OF THE GROUND ANCHORS TO BE INSTALLED WILL REQUIRE GROUT SOCKS.

#### A.D. SEQUENCE OF INSTALLATION

A.D.A. EXISTING ROCK BOLTS AT THE SITE ARE CONSIDERED ABANDONED AND SHALL BE CUT FLUSH WITH THE ROCK SURFACE PRIOR TO INSTALLATION OF THE WIRE MESH AND ROCK NAILS.

A.D.B. GROUND ANCHORS MUST BE INSTALLED AND TESTED IN ACCORDANCE WITH THE PROVISIONS OF THIS SECTION BEFORE INSTALLING SLOPE MESH AND BOUNDARY ROPES.

#### B. DRILLING

B.A. JUST PRIOR TO DRILLING HOLES FOR GROUND ANCHORS, THE AREA MUST BE INSPECTED AND GRADED AS REQUIRED TO ASSURE SAFETY AND TO PROVIDE ADEQUATE FACES TO SEAT THE MESH ANCHOR PLATE.

B.B. HOLES MUST BE DRILLED AT THE LOCATIONS, DEPTHS AND INCLINATIONS SHOWN IN THE DRAWINGS OR AS DIRECTED BY THE ENGINEER. THE LOCATIONS OF THE HOLES MAY BE CHANGED TO AVOID CONFLICTS WITH EXISTING ABANDONED NAILS OR DUE TO SITE CONDITIONS, ONLY AS APPROVED BY THE ENGINEER. IT IS THE CONTRACTOR'S RESPONSIBILITY TO LOCATE AND AVOID EXISTING STRUCTURES AND UTILITIES.

B.C. THE MINIMUM HOLE DIAMETER SHALL BE 3 INCHES.

B.D. NO HOLES MUST BE DRILLED WITHIN 3 FEET (HORIZONTAL AND VERTICAL) OF A GROUTED HOLE UNTIL THE GROUT HAS SET AT LEAST 24 HOURS.

B.E. CARE MUST BE TAKEN WHILE DRILLING TO AVOID DAMAGE OF ANY KIND TO THE EXISTING STRUCTURES.

B.F. DRILLED HOLES MUST BE BLOWN CLEAR WITH COMPRESSED AIR INTRODUCED AT THE BACK OF THE HOLE TO REMOVE ALL DRILL CUTTINGS, SLUDGE, AND DEBRIS IMMEDIATELY BEFORE INSTALLATION OF THE GROUND ANCHOR ASSEMBLY.

B.G. THE CONTRACTOR MUST BE RESPONSIBLE FOR EACH DRILLED HOLE UNTIL THE ROCK NAIL HAS BEEN INSTALLED, GROUTED, AND ACCEPTED.

#### C. INSTALLATION OF ROCK NAILS

C.A. ROCK NAILS MUST BE INSTALLED IN ACCORDANCE WITH THE RECOMMENDATIONS OF THE MANUFACTURER AND PTI RECOMMENDATIONS.

C.B. ROCK NAILS MUST BE INSTALLED IMMEDIATELY AFTER THE HOLE IS DRILLED. THE CONTRACTOR MUST NOT DRILL A SERIES OF HOLES BEFORE ATTEMPTING TO INSTALL ROCK NAILS.

C.C. CONTRACTOR MUST NOT INSTALL ROCK NAILS IN HOLES THAT HAVE NOT BEEN DRILLED (OR WHICH DO

NOT REMAIN OPEN) TO THE FULL DESIGN DEPTH.

#### D. CEMENT GROUTING

D.A. ALL GROUND ANCHORS SHALL USE SINGLE-STAGE GROUTING FROM THE BOTTOM OF THE HOLE IN A MANNER THAT WILL PREVENT AIR VOIDS. TOP OFF HOLES AS NECESSARY TO MAINTAIN THE GROUT LEVEL EQUAL WITH THE COLLAR OF THE HOLE UNTIL IT ACHIEVES AN INITIAL SET. IF GROUT LEVEL CANNOT BE MAINTAINED, USE GROUT SOCKS.

D.B. ACI 305R-10 RECOMMENDATIONS SHALL BE FOLLOWED WHEN THE AMBIENT AIR TEMPERATURE IS 75 DEGREES FAHRENHEIT OR ABOVE.

D.C. ACI 305R-10 RECOMMENDATIONS SHALL BE FOLLOWED WHEN THE AMBIENT AIR TEMPERATURE IS 40 DEGREES FAHRENHEIT OR BELOW.

D.D. THE "BIRDS-BEAK" VOID MUST BE COMPLETELY FILLED WITH DRY-PACK MORTAR. DRY PACK MORTAR MUST BE PLACED IN 6-INCH LIFTS BEGINNING AT THE BACK OF THE HOLE, WITH EACH LIFT COMPACTED BY RODDING. USE CARE NOT TO DAMAGE THE GROUND ANCHOR OR GALVANIZED COATING WHEN RODDING.

D.E. FOR GROUND ANCHORS THAT WILL BE PROOF TESTED, DRY PACK MORTAR MUST NOT BE PLACED UNTIL TESTING HAS BEEN COMPLETED.

D.F. FOR ALL OTHER ANCHORS, PLACEMENT OF DRY PACK MORTAR MUST OCCUR ONLY AFTER THE CEMENT GROUT HAS ACHIEVED AN INITIAL SET.

#### E. ROCK DOWEL TESTING

##### E.A. GENERAL

E.A.A. PROVISION SHALL BE MADE BY THE CONTRACTOR FOR CONDUCTING A MINIMUM OF 1 VERIFICATION TEST AND 2 PROOF TESTS ON THE ROCK NAILS INSTALLED. ANCHORS TO BE TESTED WILL BE SELECTED AND OBSERVED BY THE ENGINEER.

E.A.B. PROOF AND VERIFICATION TEST LOCATIONS WILL BE DETERMINED BY THE ENGINEER. TESTS WILL BE EVENLY DISTRIBUTED THROUGHOUT THE ANCHOR MESH INSTALLATION AREA.

E.A.C. CEMENT GROUTED GROUND ANCHORS MUST BE TESTED FOLLOWING A PERIOD NOT LESS THAN 7 DAYS AFTER THE INSTALLATION HAS BEEN COMPLETED. MINIMUM COMPRESSIVE STRENGTH OF THE CEMENT GROUT AT TIME OF TESTING MUST BE 4,000 PSI.

E.A.D. THE MAXIMUM TEST LOAD MUST NOT EXCEED 80 PERCENT OF THE YIELD STRENGTH OF THE ROCK NAIL BAR.

E.A.E. A HYDRAULIC JACK AND HAND PUMP OF THE TYPE TYPICALLY USED FOR TESTING GROUND ANCHORS MUST BE USED TO APPLY THE TEST LOAD. THE JACK AND PRESSURE GAUGE MUST BE CALIBRATED AS A UNIT BY AN INDEPENDENT FIRM. THE PRESSURE GAUGE MUST BE GRADUATED IN 100-PSI (OR LESS) INCREMENTS. THE PRESSURE GAUGE MUST BE USED TO MEASURE THE APPLIED LOAD. THE RAM TRAVEL OF THE JACK MUST NOT BE LESS THAN TEN TIMES THE THEORETICAL ELASTIC ELONGATION OF THE TOTAL DOWEL LENGTH AT THE MAXIMUM LOAD.

E.A.F. GROUND ANCHOR MOVEMENTS MUST BE MEASURED FROM THE ALIGNMENT LOAD AND RECORDED TO THE NEAREST 0.001 INCHES WITH RESPECT TO AN INDEPENDENT FIXED REFERENCE POINT AT EACH INCREMENT OF LOAD. THE ALIGNMENT LOAD IS A NOMINAL LOAD MAINTAINED ON THE ANCHOR TO KEEP THE TESTING EQUIPMENT IN POSITION. THE TEST LOAD MUST BE MONITORED WITH THE PRESSURE GAUGE. THE ALIGNMENT LOAD MUST BE DETERMINED DURING TESTING BUT MUST BE SUFFICIENT TO SEAT THE BEARING PLATE PRIOR TO PROCEEDING WITH THE PROOF AND VERIFICATION TESTS.

E.A.G. THE ALIGNMENT LOAD MUST NOT EXCEED 0.05 TIMES THE DESIGN LOAD (DL). RESET DIAL GAUGE TO ZERO AFTER THE ALIGNMENT LOAD HAS BEEN APPLIED.

##### E.B. PROOF AND VERIFICATION TESTS

E.B.A. THE PROOF AND VERIFICATION TESTS SHALL BE PERFORMED BY INCREMENTALLY LOADING THE ROCK NAIL IN ACCORDANCE WITH THE FOLLOWING SCHEDULE. THE ANCHOR MOVEMENTS SHALL BE MEASURED FROM THE ALIGNMENT LOAD AND RECORDED TO THE NEAREST 0.001 INCHES WITH RESPECT TO AN INDEPENDENT FIXED REFERENCE POINT AT EACH INCREMENT OF LOAD. THE ALIGNMENT LOAD IS A NOMINAL LOAD MAINTAINED ON THE ANCHOR TO KEEP THE TESTING EQUIPMENT IN POSITION. THE TEST LOAD SHALL BE MONITORED WITH THE PRODUCTION GAUGE. AT LOAD INCREMENTS OTHER THAN THE MAXIMUM TEST LOAD, THE LOAD SHALL BE HELD JUST LONG ENOUGH TO OBTAIN THE MOVEMENT READING. THE ALIGNMENT LOAD SHALL BE DETERMINED DURING TESTING BUT SHALL BE SUFFICIENT TO SEAT THE BEARING PLATE PRIOR TO PROCEEDING WITH THE PROOF AND PERFORMANCE TESTS.

E.B.B. ANCHORAGE TEST SCHEDULE (WHERE AL IS THE ALIGNMENT LOAD AND DL IS THE DESIGN LOAD):

| VERIFICATION TESTING                |                 | PROOF TESTING                       |                 |
|-------------------------------------|-----------------|-------------------------------------|-----------------|
| PERCENT OF DESIGN LOAD <sub>1</sub> | HOLD TIME (MIN) | PERCENT OF DESIGN LOAD <sub>1</sub> | HOLD TIME (MIN) |
| AL <sub>2</sub>                     | -               | % DL                                | -               |
| 100% DL                             | 1               | % DL                                | 1               |
| 125% DL                             | 1               | % DL                                | 1               |
| 150% DL                             | 1               | 150% DL                             | 1               |
|                                     | 1               |                                     | 1               |
|                                     | 1               |                                     | 1               |
|                                     | 0               |                                     | 0               |
|                                     | 1               |                                     | 1               |
|                                     | 2               |                                     | 2               |
|                                     | 3               |                                     | 3               |
|                                     | 5               |                                     | 5               |
|                                     | 6               |                                     | 6               |
|                                     | 10              |                                     | 10              |
| 20                                  | 20 <sub>3</sub> |                                     |                 |
| 30                                  | 30 <sub>3</sub> |                                     |                 |
| 50                                  | 50 <sub>3</sub> |                                     |                 |
| 60                                  | 60 <sub>3</sub> |                                     |                 |

| VERIFICATION TESTING                |                 | PROOF TESTING                       |                 |
|-------------------------------------|-----------------|-------------------------------------|-----------------|
| PERCENT OF DESIGN LOAD <sub>1</sub> | HOLD TIME (MIN) | PERCENT OF DESIGN LOAD <sub>1</sub> | HOLD TIME (MIN) |
| 175% DL                             | 5               | 100% DL                             | 1               |
| 200% DL                             | 5               | 50% DL                              | 1               |
| 150% DL                             | 1               | AL                                  | 1               |
| 100% DL                             | 1               | AL                                  | 1               |
| 50% DL                              | 1               |                                     |                 |
| AL                                  | 1               |                                     |                 |

#### NOTES:

- DESIGN LOAD OF 25 -35 KIPS SHOULD BE USED FOR TESTING. TEST DOWELS SHALL HAVE A MINIMUM BOND LENGTH OF 10 FEET. THE ALLOWABLE BAR LOAD DURING TESTING SHALL NOT EXCEED 80 PERCENT OF THE ULTIMATE STRESS.
- THE ALIGNMENT LOAD SHALL NOT EXCEED 10 PERCENT OF THE DESIGN LOAD.
- PROOF TESTS ONLY REQUIRE A 10-MINUTE HOLD TIME, UNLESS THE 10-MINUTE CREEP CRITERIA IS NOT MET. IN THAT INSTANCE THE PROOF TEST SHALL BE HELD FOR 60 MINUTES.

E.B.C. TEST RECORDS FOR EACH ANCHORAGE TEST SHALL BE SUBMITTED TO THE ENGINEER.

#### F. ACCEPTANCE OF ROCK NAILS

F.A. ACCEPTANCE OF ROCK NAILS SHALL BE DETERMINED BY THE ENGINEER, BASED ON THE FOLLOWING:  
F.A.A. THE ROCK NAIL IS CONSTRUCTED IN GENERAL ACCORDANCE WITH THESE SPECIFICATIONS.

F.A.B. THE ROCK NAIL HOLDS THE MAXIMUM TEST LOAD AND IT MEETS THE ACCEPTANCE CRITERIA FOR CREEP MOVEMENT AND APPARENT FREE LENGTH DURING TESTING.

#### F.B. CREEP MOVEMENT

F.B.A. CREEP MOVEMENT OF AN ANCHOR IS THE DISPLACEMENT OF THE ANCHOR HEAD UNDER A RELATIVELY CONSTANT LOAD DURING THE HOLD PERIOD OF THE TEST. HOWEVER, IT DOES NOT INCLUDE THE CREEP DISPLACEMENT OF THE TENDON ITSELF.

F.B.B. FOR VERIFICATION DOWELS, THE DOWELS ARE CONSIDERED ACCEPTABLE IF THE TOTAL CREEP MOVEMENT IS LESS THAN 0.08 INCHES PER LOG CYCLE OF TIME BETWEEN THE 6- AND 60-MINUTE READING AND THE RATE IS LINEAR OR DECREASING THROUGHOUT THE CREEP TEST. FOR PROOF TESTS, THE DOWEL IS CONSIDERED ACCEPTABLE IF THE MOVEMENT IS LESS THAN 0.04 INCHES PER LOG CYCLE OF TIME BETWEEN THE 1- AND 10-MINUTE READINGS OR IF THE TOTAL CREEP MOVEMENT IS LESS THAN 0.08 INCHES PER LOG CYCLE OF TIME BETWEEN THE 6- AND 60-MINUTE READING AND THE RATE IS LINEAR OR DECREASING THROUGHOUT THE CREEP TEST. ROCK NAILS OR ROCK DOWELS WHICH DO MEET THIS CRITERION SHALL BE REJECTED AND REPLACED.

#### F.C. APPARENT FREE LENGTH

F.C.A. THE APPARENT FREE LENGTH OF AN ANCHOR IS THE EQUIVALENT LENGTH OF THE TENDON STEEL THAT HAS THE SAME ELONGATION AS THE MEASURED ELASTIC MOVEMENT UNDER THE SAME NET LOAD (THE TEST LOAD MINUS THE ALIGNMENT LOAD). CALCULATE THE APPARENT FREE LENGTH AT THE MAXIMUM TEST LOAD IN A PROOF TEST AND AT THE MAXIMUM TEST LOAD IN EACH LOAD CYCLE IN A PERFORMANCE TEST OR EXTENDED CREEP TEST. USE THE FOLLOWING EQUATION TO CALCULATE THE APPARENT FREE LENGTH.

$$\text{APPARENT FREE LENGTH} = (A \times E \times D) / (TL - AL)$$

WHERE:

A = CROSS-SECTION AREA OF THE TENDON STEEL

E = MODULUS OF ELASTICITY OF THE TENDON STEEL

D = ELASTIC MOVEMENT (DISPLACEMENT READING AT THE TEST LOAD MINUS THE SUBSEQUENT

DISPLACEMENT READING AT THE ALIGNMENT LOAD)

TL = TEST LOAD

AL = ALIGNMENT LOAD

F.C.B. THE ACCEPTANCE CRITERION FOR THE APPARENT FREE LENGTH IS AT LEAST 80 PERCENT OF THE UNBONDED LENGTH OF THE ROCK NAIL (AND EXTENSION BAR, IF USED) PLUS THE JACK LENGTH.

F.C.C. IF A ROCK NAIL DOES NOT MEET THIS ACCEPTANCE CRITERION, BUT IT CAN HOLD THE MAXIMUM TEST LOAD AND IT MEETS THE ACCEPTANCE CRITERIA FOR CREEP MOVEMENT, THEN REPEAT THE TEST LOAD CYCLE. REDUCE THE TEST LOAD TO THE ALIGNMENT LOAD AND THEN INCREMENTALLY INCREASE THE TEST LOAD TO THE MAXIMUM TEST LOAD ACCORDING TO THE PROOF TEST SCHEDULE. IF THE ROCK NAIL FAILS TO MEET THE APPARENT FREE LENGTH ACCEPTANCE CRITERIA ON THE SECOND ATTEMPT, REPEAT THE TEST LOAD CYCLE A THIRD TIME. IF AFTER THREE ATTEMPTS THE ROCK NAIL STILL FAILS TO MEET THE APPARENT FREE LENGTH ACCEPTANCE CRITERIA, THEN REPLACE THE ROCK NAIL.

F.D. ROCK NAILS WHICH DO NOT PASS THE PROOF AND VERIFICATION TEST SHALL BE CUT OFF FLUSH WITH THE GROUND SURFACE AND THE HOLE SHALL BE SEALED WITH A MINIMUM 3-INCH-THICK MORTAR PATCH. FAILED ROCK NAILS SHALL BE REPLACED AT NO ADDITIONAL COST TO THE OWNER.

#### G. INSTALLATION OF SLOPE MESH AND BOUNDARY ROPES

##### G.A. GENERAL

G.A.A. SLOPE MESH MUST NOT BE INSTALLED UNTIL THE CEMENT GROUT HAS ATTAINED A MINIMUM COMPRESSIVE STRENGTH OF 4,000 PSI.

G.A.A. CONTRACTOR MUST USE CARE IN HANDLING AND INSTALLING SLOPE MESH, BOUNDARY ROPES, AND APPURTENANCES. MATERIALS DAMAGED BY THE CONTRACTOR'S OPERATIONS MUST BE REPLACED AT THE CONTRACTOR'S SOLE EXPENSE.

##### G.B. SLOPE MESH

G.B.A. INSTALL SLOPE MESH IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS AS DESCRIBED IN THE TECCO® SLOPE STABILIZATION SYSTEM PRODUCT MANUAL AND THIS SECTION, OR AS DIRECTED BY THE ENGINEER AND/OR THE MANUFACTURER'S ON-SITE REPRESENTATIVE.

G.B.B. CUTTING OR TRIMMING OF SLOPE MESH ROLLS MUST BE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDED PROCEDURE.

G.B.C. OVERLAP OF ADJACENT PANELS OF SLOPE MESH MUST BE IN ACCORDANCE WITH THE DRAWINGS AND THE MANUFACTURER'S RECOMMENDATIONS.

G.B.D. CONNECT ADJACENT MESH PANELS USING MESH CONNECTORS. USE ONE CLIP FOR EACH DIAMOND SHAPED MESH OPENING, HORIZONTALLY AND VERTICALLY.

##### G.C. BOUNDARY ROPES

G.C.A. BOUNDARY ROPES MUST BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS AS DESCRIBED IN THE TECCO® SLOPE STABILIZATION SYSTEM PRODUCT MANUAL, THE DRAWINGS, THIS SECTION, AND/OR AS DIRECTED BY THE ENGINEER AND/OR THE MANUFACTURER'S ON-SITE REPRESENTATIVE.

G.C.B. TOP EDGE BOUNDARY ROPES MUST BE PLACED ABOVE THE UPPERMOST ROW OF GROUND ANCHORS AND HELD IN PLACE BY THE SPIKE PLATES.

G.C.C. BOTTOM EDGE BOUNDARY ROPES MUST RUN ALTERNATING ONCE ABOVE AND ONCE BELOW THE LOWERMOST ROW OF ANCHORS AND HELD IN PLACE BY THE SPIKE PLATES. SIDE EDGE BOUNDARY ROPES MUST BE PLACED OUTSIDE THE PERIMETER GROUND ANCHORS AND HELD IN PLACE BY THE SPIKE PLATES.

G.C.D. SIDE EDGE BOUNDARY ROPES MUST BE PLACED OUTSIDE THE PERIMETER GROUND ANCHORS AND

HELD IN PLACE BY THE SPIKE PLATES.

G.C.E. ALL BOUNDARY ROPES MUST BE FASTENED TO THE SLOPE MESH USING BOUNDARY ROPE PRESS CLAW TYPE 2 CONNECTION CLIPS. CONNECTION CLIPS MUST BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS AS DESCRIBED IN THE TECCO® SLOPE STABILIZATION PRODUCT MANUAL.

G.C.F. BOUNDARY ROPE SEGMENTS MUST BE TERMINATED WITH EYE SPLICES, CONSISTING OF A WIRE ROPE THIMBLE AND AT LEAST FOUR WIRE ROPE CLIPS. EYE SPLICES MUST BE AS SHOWN IN THE DRAWINGS.

G.C.G. INSTALL THE FIRST WIRE ROPE CLIP AT THE END OF THE SPLICE FARTHEST FROM THE EYE.

G.C.H. INSTALL THE THIMBLE, AND THEN INSTALL THE WIRE ROPE CLIP CLOSEST TO THE THIMBLE, THEN INSTALL THE MIDDLE WIRE ROPE CLIPS.

G.C.I. FOR ALL WIRE ROPE CLIPS, THE U-BOLT MUST GO AROUND THE DEAD END OF THE CABLE AND THE SADDLE MUST GO AROUND THE LIVE PORTION OF THE CABLE.

G.C.J. THE SPACING OF THE WIRE ROPE CLIPS MUST BE AS SHOWN IN THE DRAWINGS OR AS RECOMMENDED BY GEOBRUGG.

G.C.K. EYE SPLICES MUST BE FASTENED TO GROUND ANCHORS AND HELD IN PLACE WITH A FLAT WASHER AND HEX NUT. ONE TERMINAL EYE SPLICE MUST BE MADE WHEN THE BOUNDARY ROPE IS SLACK, AND THE SECOND EYE SPLICE MUST BE COMPLETED ONCE THE BOUNDARY ROPE HAS BEEN TENSIONED.

G.C.L. BOUNDARY ROPE TENSION MUST BE AS RECOMMENDED BY THE SLOPE MESH MANUFACTURER'S ON SITE REPRESENTATIVE. THE CONTRACTOR MAY ASSUME THAT A 4-TON MANUAL CABLE TENSIONING DEVICE ("COME ALONG") WILL BE ADEQUATE FOR TENSIONING THE BOUNDARY ROPES.

##### G.D. SPIKE PLATES AND ANCHORAGE HARDWARE

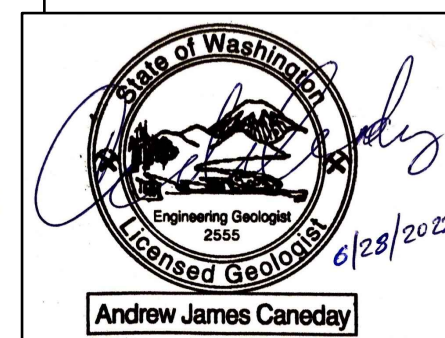
G.D.A. INSTALL SPIKE PLATE WITH THE LONG AXIS ORIENTED HORIZONTALLY. SPIKE PLATE CLAWS MUST BE POSITIONED SUCH THAT THEY PENETRATE A COMPLETE DIAMOND-SHAPED MESH OPENING (I.E., SPIKE PLATE CLAWS MAY NOT BE LOCATED OUTSIDE A HALF DIAMOND AT THE EDGE OF THE MESH).

G.D.B. INSTALL SPHERICAL WASHER, FLAT WASHER, AND HEX NUT ON NAIL BAR.

G.D.C. USING CALIBRATED TORQUE WRENCH, TIGHTEN HEX NUTS ONTO SPIKE PLATES TO A TORQUE OF 320 FOOT POUNDS, PLUS OR MINUS 10 FOOT-POUNDS, OR AS RECOMMENDED BY GEOBRUGG.

G.D.D. USING CALIBRATED TORQUE WRENCH, TIGHTEN HEX NUTS ONTO BOUNDARY ROPE EYE SPLICES TO A TORQUE OF 100 FOOT-POUNDS, PLUS OR MINUS 10 FOOT-POUNDS.

G.D.E. EXPOSED ENDS (I.E., TAILS) OF GROUND ANCHORS MUST BE CUT OFF AFTER HEX NUTS HAVE BEEN TIGHTENED TO THE REQUIRED TORQUE. CUT ENDS MUST BE PATCHED WITH A GALVANIZING REPAIR COMPOUND MEETING THE REQUIREMENTS OF MIL-P-21035B.



| ISSUE | REVISIONS  | BY  | DATE    |
|-------|--|-----|---------|
| 1     | ISSUE FOR BIDDING                                      | AJH | 5-19-22 |
| 2     | UPDATED GABION BACKFILL SPECIFICATION TO QUARRY SPALLS | AJH | 6-28-22 |
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| DATUM:<br>HOR: NAD 83<br>VERT: NAVD 88 | DSGN BY: AWS<br>DWN BY: HCM<br>APPVD BY: AJC |
| DATE PRINTED:<br>4/29/2022             | SEC: 02<br>TWP: 34 N<br>RGE: 5 E             |



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| SPECIFICATIONS |                    |
| SCALE: NONE    | JOB ID : CPXXXX    |
|                | SHEET:<br>13 OF 13 |