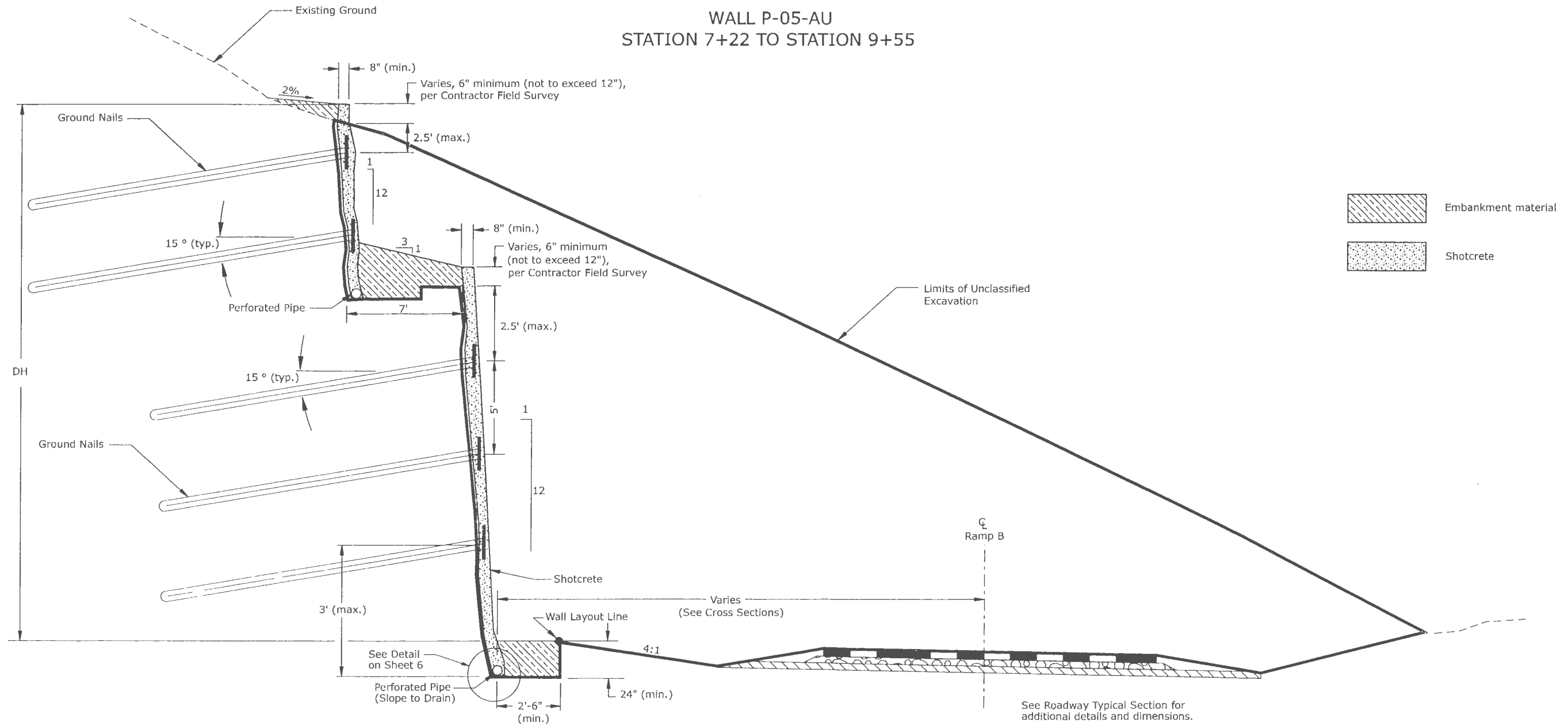


GROUND NAIL WALL TYPICAL SECTION

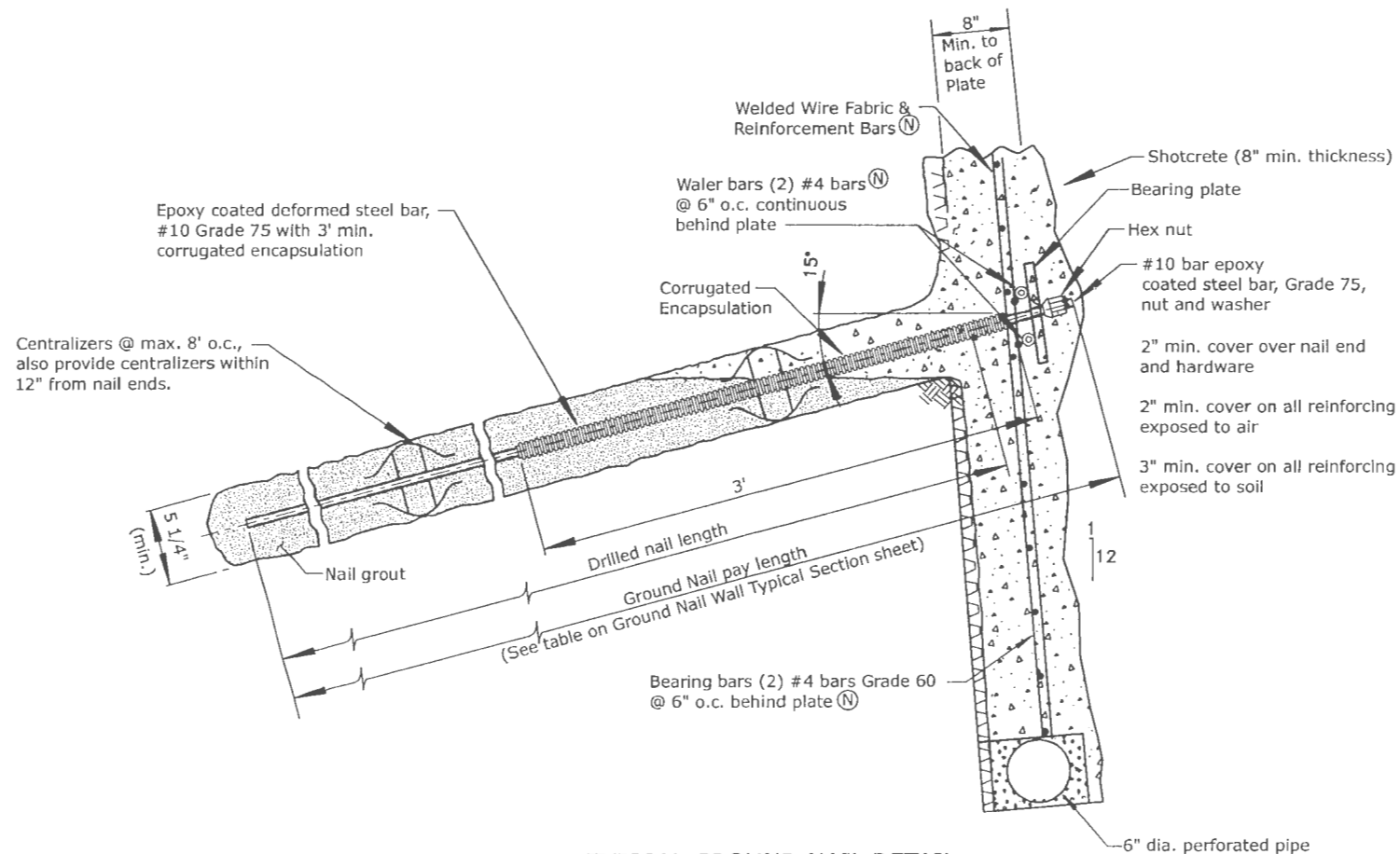
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STATION 1+25 TO STATION 2+98

WALL P-05-AU
STATION 7+22 TO STATION 9+55

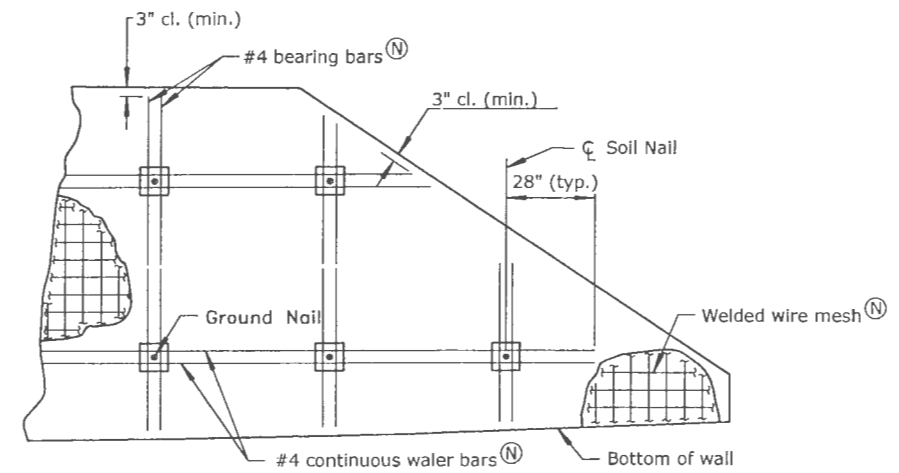


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 Terry Barron 10

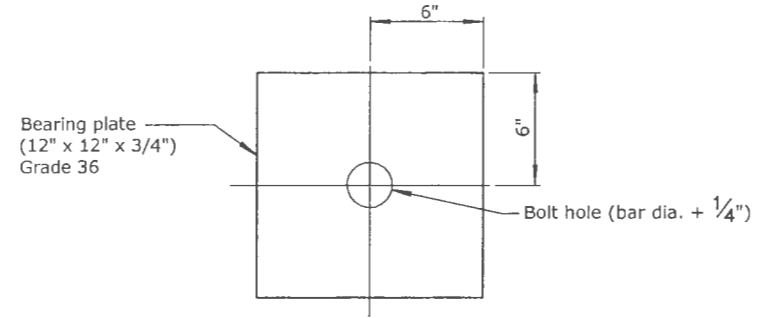
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File Name: 17269Ramp B _Typical GNW Tiered Section.dgn			No Revisions: 8/27/10					ES5 160A-010	
Horiz. Scale: 1:10 Vert. Scale: As Noted			Revised:		Designer: TLA	Structure Numbers	P-05-AU		17269
Unit Information SPC			Void:		Detailer: TLB	P-05-AW		Sheet Number	31
 Yeh and Associates, Inc. Consulting Engineers & Scientists		See Detail on Sheet 6 Perforated Pipe (Slope to Drain) 2'-6" (min.)		See Roadway Typical Section for additional details and dimensions.		Sheet Subset: WALLS Subset Sheets: 3 of 14			



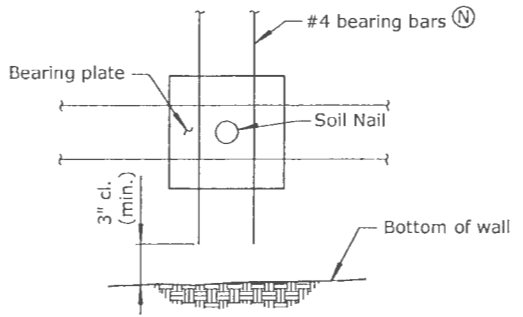
TYPICAL GROUND NAIL DETAIL
NTS



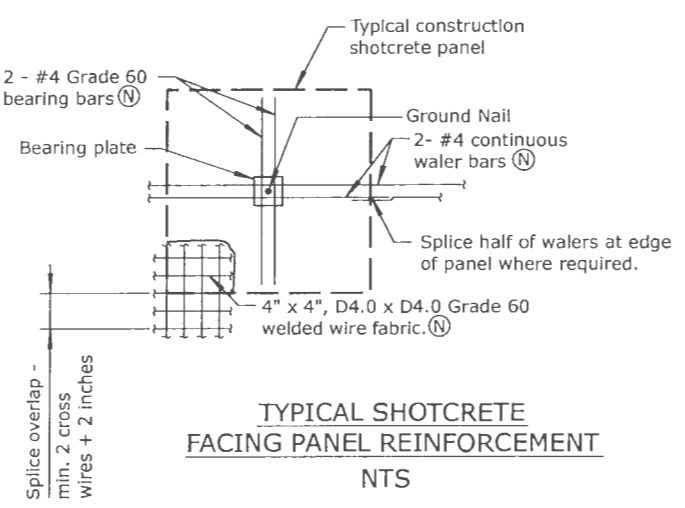
TYPICAL SHOTCRETE FACING
REINFORCEMENT - END OF WALL (NOTE 1)
NTS



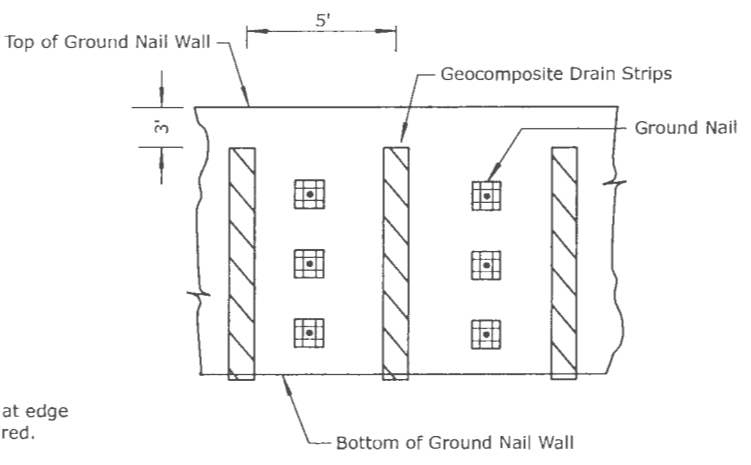
BEARING PLATE DETAIL
NTS



TYPICAL REINFORCEMENT
BOTTOM ROW OF GROUND NAILS
NTS



TYPICAL SHOTCRETE
FACING PANEL REINFORCEMENT
NTS



TYPICAL STRIP DRAIN DETAIL
NTS

- NOTES:
1. Reinforcement of the shotcrete facing shall be installed throughout the entire shotcrete facing, including the facing beyond the ground nails.
 2. The minimum splice length for #4 bars is 15 inches.
 3. The minimum shotcrete thickness is 8 inches.
 4. (N) denotes non-coated reinforcing steel.

Print Date: 5/21/2009	
File Name: 17269Ramp B_GNW Details.dgn	
Horiz. Scale: 1:100 Vert. Scale: As Noted	
Unit Information SPC	

Sheet Revisions		
Date:	Comments	Init.

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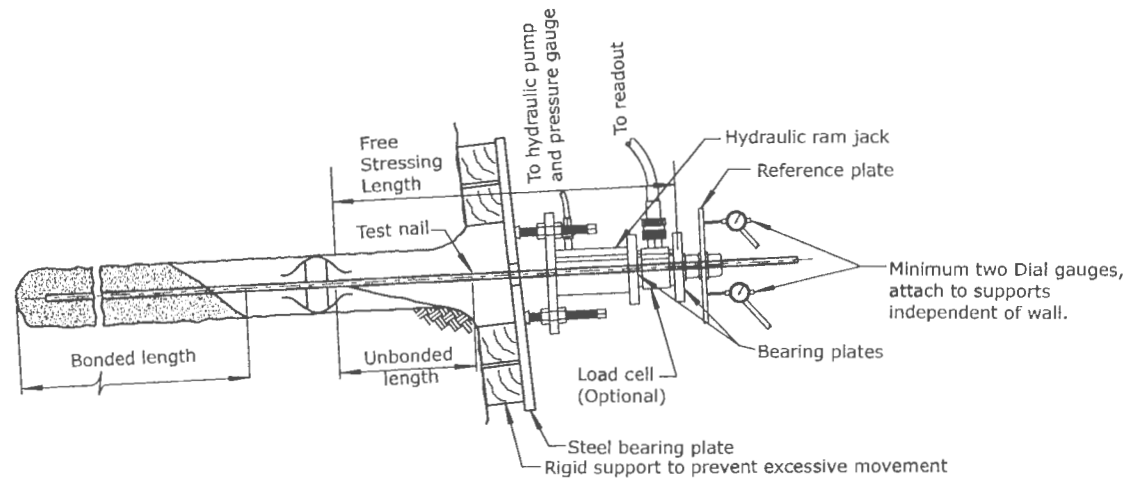
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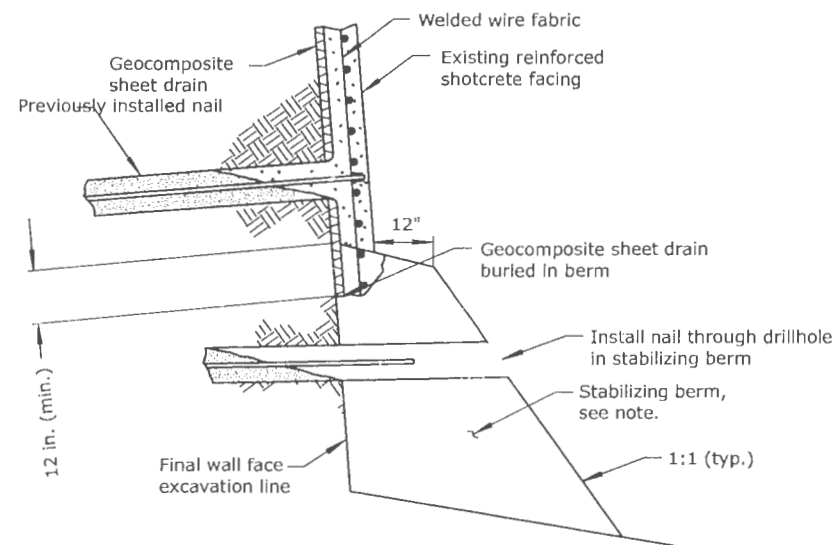
As Constructed
No Revisions: 8/22/10
Revised:
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GROUND NAIL WALL DETAILS			
Designer:	TLA	Structure Numbers:	P-05-AU
Detailer:	TLB		P-05-AW
Sheet Subset:	WALLS	Subset Sheets:	4 of 14

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	17269
Sheet Number	32



TYPICAL GROUND NAIL TEST SETUP



NAIL INSTALLATION THROUGH TEMPORARY STABILIZING BERM (USE IN CASE OF SLOUGHING GROUND)

Note: Excavate stabilizing berm to final wall face excavation line for shotcrete placement. Contractor shall carefully excavate stabilizing berm to avoid hitting ground nails buried in the berm.

TYPICAL CONSTRUCTION SEQUENCE:

1. Walls shall be built from the top-down in accordance with the contract requirements.
2. The following wall construction sequence for each excavation lift shall be completed prior to initiating work on the next excavation lift unless otherwise approved by the Engineer.
 - 2.1 Install and test pre-production verification test nails.
 - 2.2 Excavate to stage 1 rough grade.
 - 2.3 Trim to final wall face excavation line or to stabilizing berm (if used).
 - 2.4 Drill, install and grout nails. Trim stabilization berm (if used) to final wall face excavation line.
 - 2.5 Install geocomposite sheet drains and 6" Ø perforated pipe.
 - 2.6 Place reinforcing and apply shotcrete facing upon completion of the excavation lift. No part of an excavation lift shall be left unstabilized (without shotcrete) at the end of the work day unless the Engineer approves otherwise.
 - 2.7 Perform nail proof tests per specifications after shotcrete and nail grout have attained their specified strengths.

GROUND NAIL TESTING NOTES:

1. See specifications for verification and proof test nail requirements.
2. Required ground nail allowable pullout resistance,

$$Q_D = \frac{15 \text{ psi}}{2} \times 5.25 \times \pi \times 12 \text{ "/>} = 1,480 \text{ lbs/ft of bonded length}$$
3. The test support system (eg. cribbing, chairs, bearing plates etc. shall be sufficient to complete the test without excessive deflection or bearing failure.
4. A minimum of 2 verification tests are required for each soil nail wall. Additional verification tests may be required by the Engineer if ground conditions or construction methods change.
5. A minimum of 5% of the soil nails shall be proof-tested.

Print Date: 5/21/2009	
File Name: 17269Ramp B_GNW Testing and Const.dgn	
Horiz. Scale: 1:100 Vert. Scale: As Noted	
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No Revisions: 8/22/10
Revised:
Void:

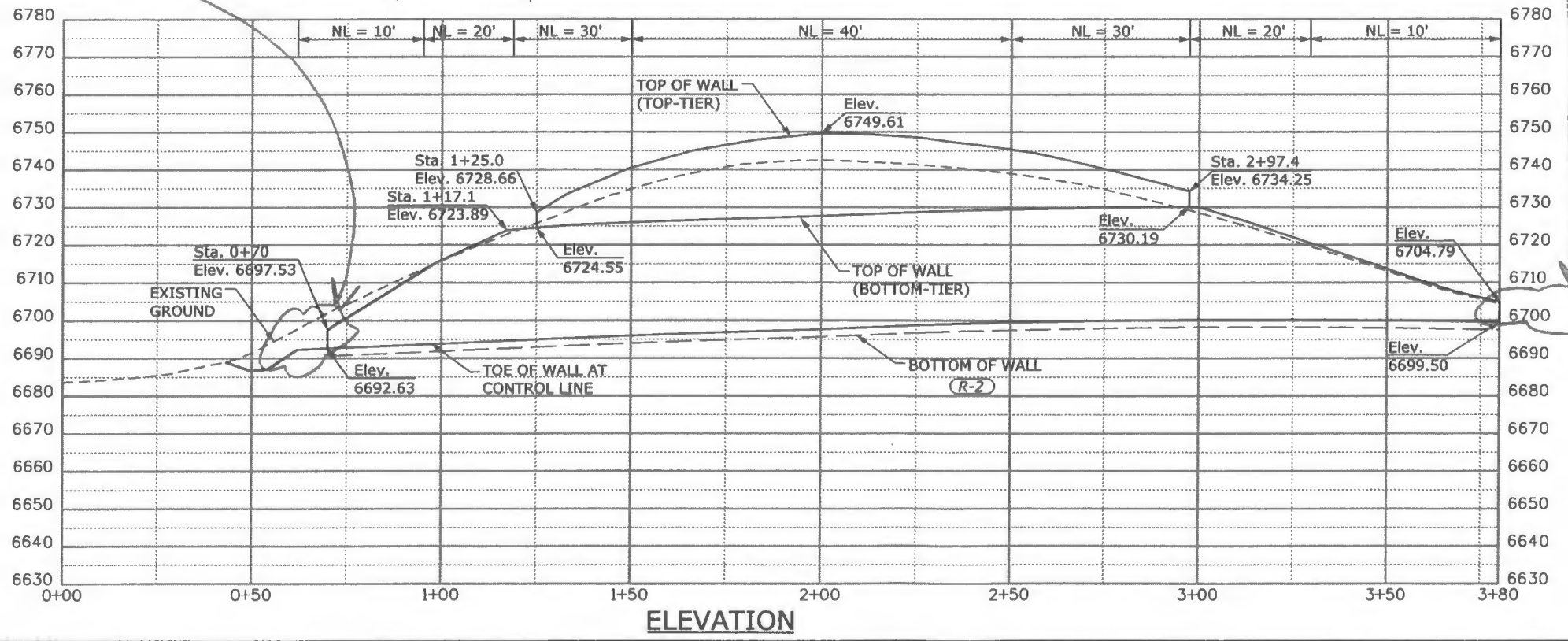
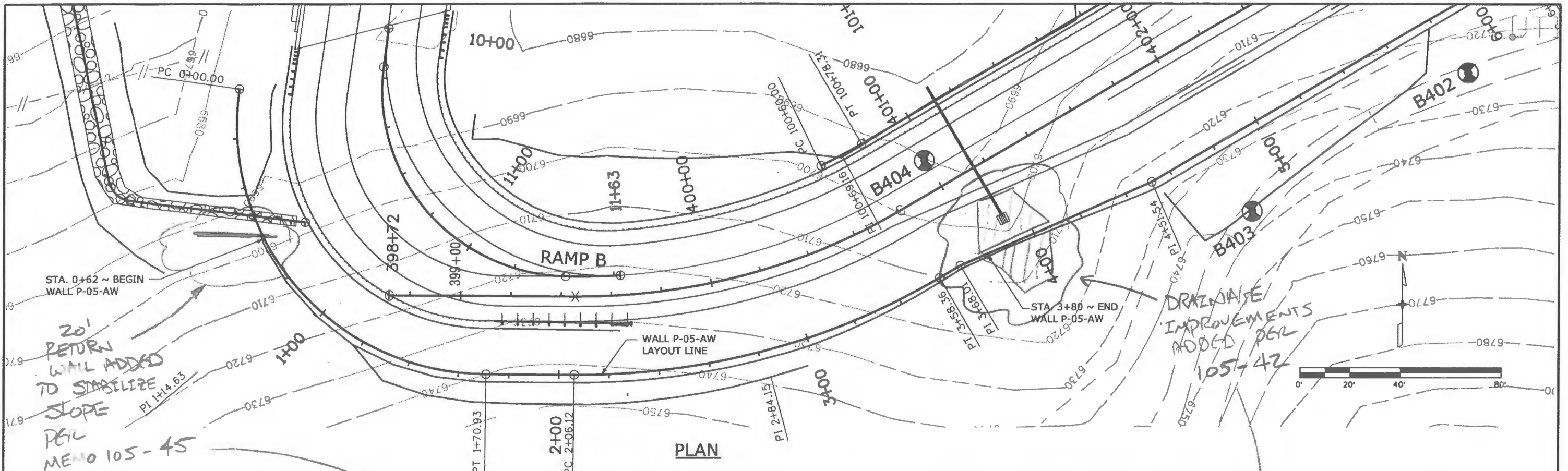
GROUND NAIL WALL TESTING AND CONSTRUCTION DETAILS			
Designer:	TLA	Structure Numbers	P-05-AU
Detailer:	TLB	Structure Numbers	P-05-AW
Sheet Subset:	WALLS	Subset Sheets:	5 of 14

Project No./Code	ES5 160A-010
17269	Sheet Number 33

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**CALL UTILITY NOTIFICATION
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CALL 2 BUSINESS DAYS (NOT INCLUDING INITIAL DAY OF CONTACT) IN ADVANCE BEFORE YOU DIG, GRADE, OR EXCAVATE FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES.

NL = MINIMUM NAIL LENGTH (PAY LENGTH)

Print Date: 7/13/2009	Project Manager: SPC
File Name: 17269 Ramp B Wall Plan P-05-AW R2.dgn	
Horiz. Scale: 1:40	Vert. Scale: As Noted
Unit Information	
Yeh and Associates, Inc. Consulting Engineers & Scientists	

Sheet Revisions		
Date	Comments	Init.
07-14-2009	Clarify bottom of wall	TLA

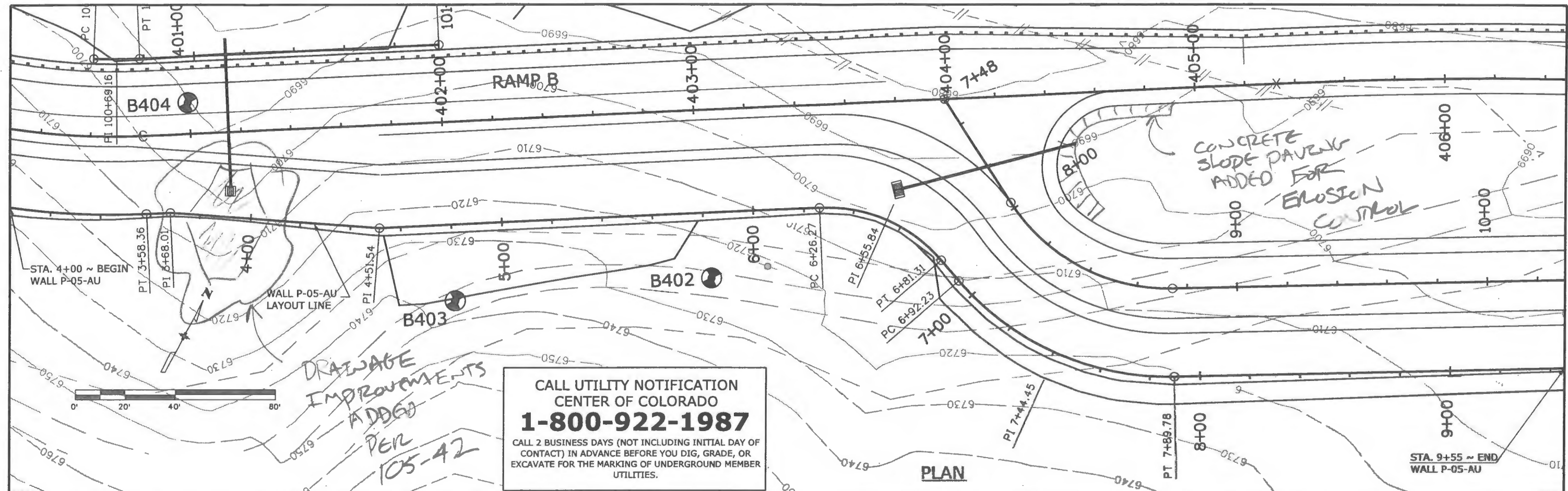
Colorado Department of Transportation
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Suite 200
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No Revisions:
Revised: 8/27/10
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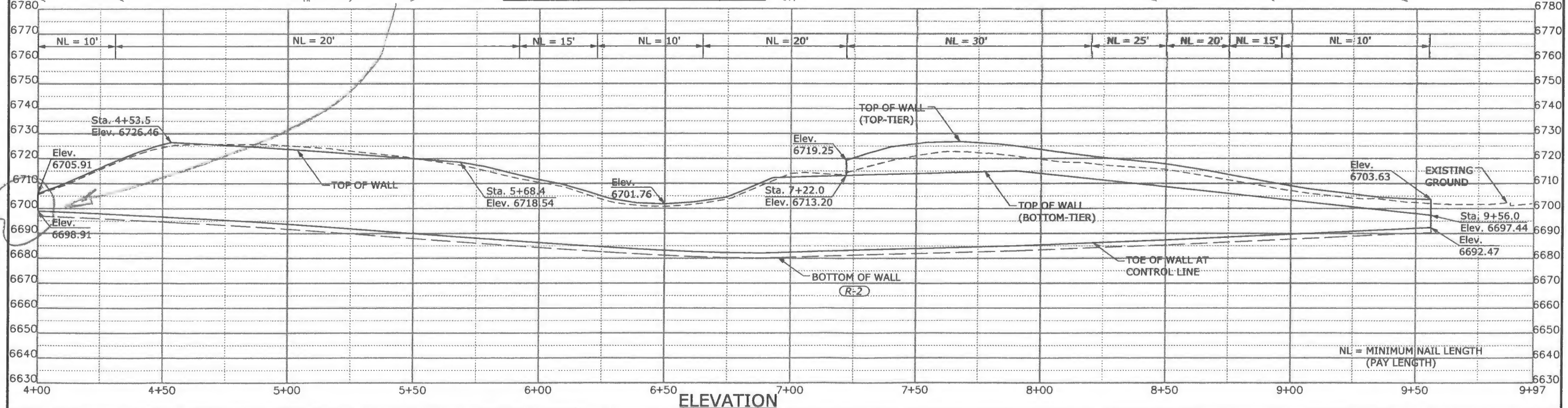
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Detailer:	SPC/TLB	Sheet Subset:	WALLS
		Subset Sheets:	6 of 14

Project No./Code	ES5 160A-010
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 UTILITIES.



Print Date: 7/13/2009 File Name: 17269 Ramp B Wall Plan P-05-AU R2.dgn Horiz. Scale: 1:40 Unit Information	Vert. Scale: As Noted Project Manager: SPC	Sheet Revisions <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Date:</th> <th>Comments</th> <th>Init.</th> </tr> </thead> <tbody> <tr> <td>07-14-2009</td> <td>Clarify bottom of wall</td> <td>TLA</td> </tr> </tbody> </table>	Date:	Comments	Init.	07-14-2009	Clarify bottom of wall	TLA	Colorado Department of Transportation 3803 North Main Avenue Suite 200 Durango, CO 81301 Phone: 970-385-1440 FAX: 970-385-8365 Region 5	As Constructed No Revisions: Revised: 8/27/10 Void:	GROUND NAIL WALL P-05-AU PLAN & ELEVATION Designer: TLA Detailer: SPC/TLB Sheet Subset: WALLS Structure Numbers: P-05-AU Subset Sheets: 7 of 14	Project No./Code ES5 160A-010 17269 Sheet Number 35
Date:	Comments	Init.										
07-14-2009	Clarify bottom of wall	TLA										

Yeh and Associates, Inc.
 Consulting Engineers & Scientists

1.0 MSE WALL GENERAL NOTES

- 1.1 EXCEPT AS SHOWN IN THE PLANS, STRUCTURE EXCAVATION AND BACKFILL SHALL BE IN ACCORDANCE WITH THE REVISION OF SECTION 504 IN THE PROJECT SPECIAL PROVISIONS.
- 1.2 STATION, ELEVATIONS AND DIMENSIONS SHOWN ON THESE PLANS ARE CALCULATED FROM A RECENT FIELD SURVEY. THE CONTRACTOR SHALL VERIFY ALL DEPENDENT DIMENSIONS IN THE FIELD BEFORE ORDERING OR FABRICATING ANY MATERIAL.
- 1.3 THE INFORMATION SHOWN ON THESE PLANS CONCERNING THE TYPE AND LOCATION OF UNDERGROUND UTILITIES IS NOT GUARANTEED TO BE ACCURATE OR ALL INCLUSIVE. THE CONTRACTOR IS RESPONSIBLE FOR MAKING HIS OWN DETERMINATION AS TO THE TYPE AND LOCATION OF UNDERGROUND UTILITIES AS MAY BE NECESSARY TO AVOID DAMAGE THERETO. THE CONTRACTOR SHALL CONTACT THE UTILITY INFORMATION CENTER OF COLORADO AT 1-800-922-1987 AT LEAST TWO (2) DAYS (NOT INCLUDING THE DAY OF NOTIFICATION) PRIOR TO ANY EXCAVATION OR OTHER EARTHWORK. CONFLICTING UTILITIES MAY REQUIRE MSE WALL REDESIGN, AT ENGINEERS DISCRETION.
- 1.4 THE SOIL REINFORCEMENT LENGTHS SHOWN ON THE PLANS ARE THE MINIMUM LENGTHS REQUIRED.
- 1.5 THE CONTRACTOR IS RESPONSIBLE FOR MAINTAINING SLOPE STABILITY ABOVE AND BELOW THE MSE WALLS DURING CONSTRUCTION.

2.0 DESIGN PARAMETERS

- 2.1 DESIGN METHODOLOGY -- AASHTO 16TH EDITION WITHOUT INTERIMS FOR INTERNAL DESIGN ONLY.
- 2.2 SOIL PROPERTIES

	EFFECTIVE FRICTION ANGLE (DEGREES)	EFFECTIVE COHESION (PSF)	MOIST UNIT WEIGHT (PCF)
STRUCTURE BACKFILL (CLASS 1)	34	0	125
NATIVE WEATHERED BEDROCK	31	0	135

2.3 DESIGN FACTORS OF SAFETY

- OVERTURNING = 1.00
- SLIDING = 1.50
- BEARING CAPACITY = 2.00
- ECCENTRICITY = L/6 (MIDDLE 1/3 OF BASE)
- WALL SUPPORTING ROADWAY = 1.30
- WALL SUPPORTING ABUTMENT = 1.50

2.4 LOADING CONDITIONS

- 2.4.1 LIVE LOAD SURCHARGE: = 250 PSF
- 2.4.2 THE GROUNDWATER TABLE IS ASSUMED TO BE SUFFICIENTLY BELOW THE LEVELING PAD AS TO NOT AFFECT MSE WALL STABILITY.
- 2.4.2 SEISMIC LOADING DOES NOT CONTROL DUE TO GEOGRAPHIC LOCATION ($a \leq 0.08g$).

3.0 MATERIAL REQUIREMENTS

- 3.1 LEVELING PAD AND COPING -- SHALL BE CONCRETE CLASS B, 4500 PSI (MINIMUM) COMPRESSIVE STRENGTH (PER CDOT SECTION 601).
- 3.2 REINFORCING STEEL -- SHALL BE BLACK, GRADE 60 (PER CDOT SECTION 602).
- 3.3 STRIP DRAINS -- SHALL BE DIMPLED CORE WRAPPED IN GEOTEXTILE PER THE CDOT APPROVED PRODUCTS LIST.
- 3.4 GEOTEXTILE -- SHALL BE CLASS B (PER CDOT TABLE 712-3).
- 3.5 DRAINAGE FILL -- SHALL BE FILTER MATERIAL CLASS B (PER CDOT SECTION 703.09 AND TABLE 703-7), TO BE INCLUDED IN ITEM NO. 206, STRUCTURE BACKFILL (CLASS 1).
- 3.6 PIPE -- SHALL BE 4" DIAMETER SOLID AND PERFORATED PVC (PER CDOT SECTIONS 605 AND 712.11) AS SHOWN ON THE PLANS.
- 3.7 SOIL REINFORCEMENT -- SHALL MEET THE REQUIREMENTS OF CDOT SPECIAL PROVISION SECTION 504.
- 3.8 REINFORCED BACKFILL - SHALL BE STRUCTURE BACKFILL (CLASS 1) (PER CDOT SECTIONS 206 AND 703.08).

3.9 MATERIAL RECEIPT AND STORAGE

- 3.9.1 ALL MSE WALL MATERIALS SHALL BE STORED IN A LEVEL, WELL-DRAINED LOCATION, AND PROTECTED FROM WEATHER PER THE MANUFACTURER'S RECOMMENDATIONS.
- 3.9.2 SOIL REINFORCEMENT AND DRAINAGE MATERIALS SHALL BE INSPECTED UPON DELIVERY TO THE SITE TO ENSURE THAT THE PROPER MATERIAL TYPE AND QUANTITY HAS BEEN RECEIVED.

4.0 CONSTRUCTION

4.1 AN APPROVED SET OF CONSTRUCTION DRAWINGS SHALL BE ON-SITE AT ALL TIMES DURING CONSTRUCTION OF THE MSE RETAINING WALLS.

4.2 EXCAVATION

- 4.2.1 PRIOR TO CONSTRUCTION OF THE MSE WALLS, THE CONTRACTOR SHALL CLEAR AND GRUB THE REINFORCED BACKFILL ZONE, REMOVING TOPSOIL, BRUSH, SOD OR OTHER ORGANIC OR DELETERIOUS MATERIALS. ANY UNSUITABLE SOILS SHALL BE OVER EXCAVATED AND REPLACED WITH STRUCTURE BACKFILL (CLASS 1).
- 4.2.2 RETAINING WALL FOUNDATION SHALL BE PROOF ROLLED BY THE CONTRACTOR PRIOR TO SURVEYING AND WALL LAYOUT. ANY UNSUITABLE AREAS REVEALED BY THE PROOF ROLLING OPERATION SHALL BE OVER-EXCAVATED AND REPLACED WITH STRUCTURE BACKFILL (CLASS 1).
- 4.2.3 THE RETAINING WALL FOUNDATION SHALL BE EVALUATED BY THE PROJECT GEOTECHNICAL ENGINEER PRIOR TO LEVELING PAD INSTALLATION TO VERIFY THAT THE FOUNDATION PROVIDES SUITABLE BEARING CAPACITY.
- 4.2.4 TEMPORARY CONSTRUCTION EXCAVATION SHALL BE MAINTAINED IN ACCORDANCE WITH OSHA, STATE AND LOCAL REGULATIONS.

4.3 SURVEY AND LAYOUT

- 4.3.1 SURVEY AND LAYOUT OF THE MSE WALLS IS THE RESPONSIBILITY OF THE CONTRACTOR. THE LAYOUT PROVIDED BY SHALL INDICATE THE FRONT FACE OF WALL. THE WALL LAYOUT SHALL BE IDENTIFIED BY THE PLACEMENT OF STAKES AT WALL ENDS AND EVERY 25 FEET (MAXIMUM) ALONG THE WALL. A PERMANENT BENCH MARK SHALL BE PROVIDED AT EACH RETAINING WALL LOCATION AT AN INTERVAL OF ONE PER EACH 300 LF OF WALL. THE CONTRACTOR SHALL SUBMIT THE "AS-STAKED" WALL PROFILE TO THE ENGINEER FOR REVIEW AND APPROVAL.

4.4 LEVELING PAD INSTALLATION

- 4.4.1 THE LEVELING PAD SHALL BE CONSTRUCTED AS SHOWN ON THE DETAILS.
- 4.4.2 IF THE BOTTOM OF THE WALL STEPS TO FOLLOW GRADE, START CONSTRUCTION OF THE LEVELING PAD AT THE LOWEST POINT ON THE RETAINING WALL.

4.5 SOIL REINFORCEMENT PLACEMENT

- 4.5.1 NO CHANGES TO THE SOIL REINFORCEMENT LAYOUT (AS SHOWN ON THE CONTRACTOR PROVIDED SHOP DRAWINGS) SUCH AS LENGTH, TYPE, OR ELEVATION, SHALL BE MADE WITHOUT CONSULTING THE RETAINING WALL DESIGN ENGINEER OF RECORD.
- 4.5.2 TRACKED CONSTRUCTION EQUIPMENT SHALL NOT BE OPERATED DIRECTLY ON THE REINFORCEMENT MATERIALS. A MINIMUM FILL THICKNESS OF SIX (6) INCHES IS REQUIRED FOR OPERATION OF TRACKED VEHICLES OVER THE REINFORCEMENT MATERIALS. TURNING OF TRACKED VEHICLES SHOULD BE KEPT TO A MINIMUM TO PREVENT TRACKS FROM DISPLACING THE FILL AND/OR THE REINFORCEMENT MATERIALS.

4.6 RETAINING WALL DRAINAGE

- 4.6.1 INTERNAL DRAINAGE SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE RETAINING WALL DETAILS. THE INTERNAL DRAINAGE SYSTEM HAS BEEN DESIGNED TO CONTROL GROUND WATER SEEPAGE INTO THE RETAINING WALL REINFORCED ZONE. THE INTERNAL DRAINAGE SYSTEM IS NOT DESIGNED TO ACCOMMODATE SURFACE WATER INFILTRATION THAT OCCURS DUE TO IMPROPER CONTROL OF SURFACE WATER DURING AND AFTER CONSTRUCTION.
- 4.6.2 EXTERNAL DRAINAGE CONTROL MEASURES MUST BE CONSTRUCTED AND MAINTAINED BY THE CONTRACTOR DURING CONSTRUCTION OF THE RETAINING WALL(S). AT THE END OF EACH WORK DAY, THE CONTRACTOR SHALL GRADE THE SURFACE OF THE LAST LIFT OF REINFORCED BACKFILL SUCH THAT SURFACE WATER IS DIRECTED AWAY FROM THE FACE OF THE WALL.
- 4.6.3 THE CONTRACTOR SHALL PROTECT THE RETAINING WALL WORK AREA FROM SURFACE WATER AT ALL TIMES BY THE USE OF BERMS, DIVERSION DITCHES, TEMPORARY DRAINS, SILT FENCING, AND ALL OTHER MEANS THAT MAY BE REQUIRED.

4.7 BACKFILL AND COMPACTION -- IN ACCORDANCE WITH THE PROJECT SPECIAL PROVISIONS, REVISION OF SECTION 504.

Print Date: 5/22/2009		Sheet Revisions		Colorado Department of Transportation 3803 North Main Avenue Suite 200 Durango, CO 81301 Phone: 970-385-1440 FAX: 970-385-8365 Region 5 EJA	As Constructed	MSE WALL GENERAL NOTES		Project No./Code	
File Name: 17269Ramp B_MSE General Notes01.dgn		Date:	Comments:		Init.	No Revisions: 8/22/10			ES5 160A-010
Horiz. Scale: 1:10 Vert. Scale: As Noted						Revised:	Designer: LSB	Structure Numbers: P-05-AT	17269
Unit Information: SPC						Void:	Detailer: TLB	P-05-AV	Sheet Number: 36
 Yeh and Associates, Inc. Consulting Engineers & Scientists					Sheet Subset: WALLS	Subset Sheets: 8 of 14			

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 Terry Barron 9:

MSE WALL GENERAL NOTES (CONTINUED)

5.0 POST CONSTRUCTION

- 5.1 LIGHT TRUCKS AND EQUIPMENT MUST BE KEPT A MINIMUM OF THREE (3) FEET FROM THE FRONT FACE OF THE RETAINING WALL.
- 5.2 HEAVY EQUIPMENT, SUCH AS DUMP TRUCKS, COMPACTION EQUIPMENT, ETC., MUST BE KEPT A MINIMUM OF FIVE (5) FEET FROM THE FRONT FACE OF THE RETAINING WALL.
- 5.3 CRANES, BACKHOES, OR OTHER TYPES OF EQUIPMENT WHICH MAY BE ECCENTRICALLY LOADED BY MOVEMENT OF THE BOOM OR BUCKET ARM MUST BE KEPT A MINIMUM OF TEN (10) FEET FROM THE FRONT FACE OF THE RETAINING WALL.
- 5.4 MATERIAL STOCKPILES MUST BE KEPT A MINIMUM OF TEN (10) FEET FROM THE FRONT FACE OF THE RETAINING WALL.
- 5.5 PROPER SURFACE WATER CONTROL AND DIVERSION OF WATER AWAY FROM THE RETAINING WALL MUST BE MAINTAINED BY THE CONTRACTOR AT ALL TIMES. ALL TOE AND CREST SLOPES SHALL BE VEGETATED AND PROTECTED AGAINST EROSION AS SOON AS POSSIBLE FOLLOWING CONSTRUCTION.

SUMMARY OF WALL QUANTITIES (AS-BUILT IN RED ABOVE)

BID ITEM	DESCRIPTION	UNIT	P-05-AT	P-05-AU	P-05-AV	P-05-AW
203	EMBANKMENT MATERIAL	CY	747	310		180
206	STRUCTURE EXCAVATION	CY	705		500	
(R-2) 206	STRUCTURE BACKFILL (CLASS 1)	CY	1355		460	
(R-2) 206	MECHANICAL REINFORCEMENT OF SOIL	CY	835		310	
(R-2) 504	PRECAST PANEL FACING	SF	1756		975	
504	GROUND NAIL (10')	EACH		127		83
504	GROUND NAIL (15')	EACH		62		
504	GROUND NAIL (20')	EACH		66		70
504	GROUND NAIL (25')	EACH		320		66
504	GROUND NAIL (30')	EACH		360		160
504	GROUND NAIL (40')	EACH		48		160
(R-2) 601	CONCRETE CLASS B (WALL)	CY	5.6		6	
(R-2) 601	STRUCTURAL CONCRETE STAIN	SY	11	1961	175	1237
(R-2) 602	REINFORCING STEEL (EPOXY COATED)	LB	260		75	1215
(R-2) 606	GUARDRAIL TYPE 7 (STYLE CAPA)	LF	150		150	

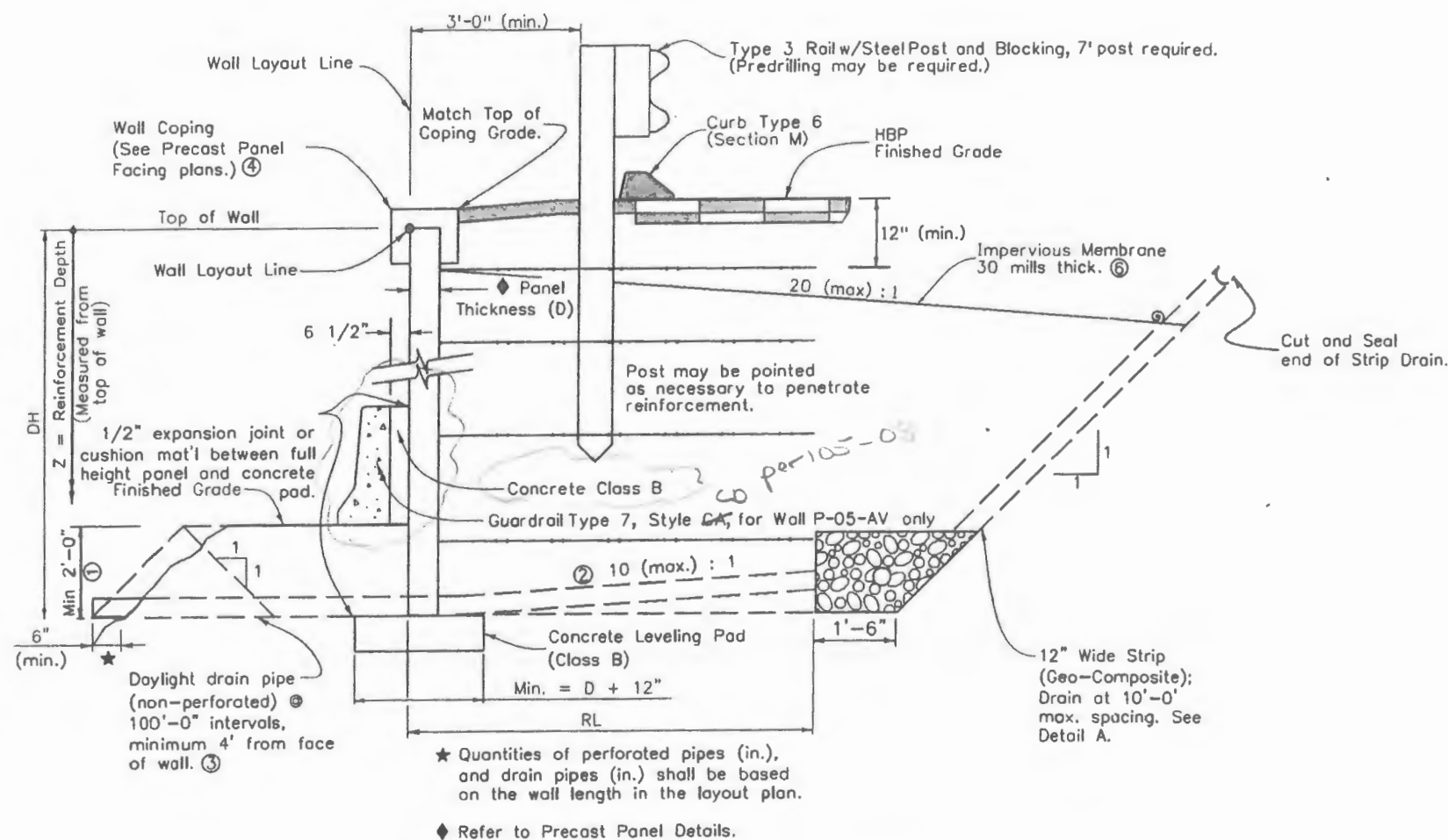
NOTE: COPING WILL NOT BE PAID FOR SEPARATELY, BUT SHALL BE INCLUDED IN PAY ITEM 504, PRECAST PANEL FACING. per 105-08

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Print Date: 7/9/2009	Sheet Revisions	Date: 07-01-2009 Comments: Added Item Init.: TLA Date: 07-14-2009 Comments: Revised Quantity Init.: LSB	Colorado Department of Transportation 3803 North Main Avenue Suite 200 Durango, CO 81301 Phone: 970-385-1440 FAX: 970-385-8365 Region 5 EJA	As Constructed No Revisions: Revised: 8/27/10 Void:	MSE WALL GENERAL NOTES (CONT.) AND SUMMARY OF WALL QUANTITIES		Project No./Code ES5 160A-010
File Name: 17269Ramp B_MSE GeneralNotes02 R2.dgn					Designer: LSB/TLA Detaller: TLB Sheet Subset: WALLS	Structure Numbers P-05-AT, P-05-AU, P-05-AV & P-05-AW Subset Sheets: 9 of 14	
Unit Information SPC	Yeh and Associates, Inc. Consulting Engineers & Scientists						

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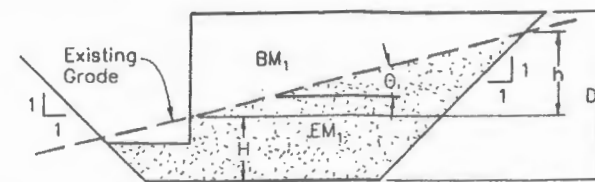
**TYPICAL SECTION
RETAINING WALLS 1 AND 3**

ABBREVIATIONS USED

- BM₁ = Quantities of Structure Backfill (Class 1) without Shoring (c.y./ft.)
- BM₂ = Quantities of Structure Backfill (Class 1) with Shoring (c.y./ft.)
- BP² = Maximum Required Allowable Bearing Pressure (ksf)
- DH = Design Height (or, Avg. ht. for qty. calculations) (ft.)
- EM₁ = Quantity of Structure Excavation without Shoring (c.y./ft.)
- EM₂ = Quantity of Structure Excavation with Shoring (c.y./ft.)
- H = Depth of Excavation at Wall Layout Line (ft.)
- LTDS = Required Long Term Design Strength (lb./in.)
- MARV = Minimum Average roll Value (lb./in.)
- RL = Reinforcement Length (ft.)
- S = Tributary reinforcement spacing (ft.)
- Total = Sum of required LTDS for all layers (lb/in)

NOTES

- ① See Plan & Elevation sheets for embedment elevations. Embedment shall be 2'-0" (min.) Structure Backfill (Class 2) for frost depth, erosion control and to conceal and protect a stepped leveling pad. The cost for this material shall be included in the cost for Structure Backfill (Class 1).
- ② Soil Reinforcement may be cut to accommodate pipe installation. The cut shall be made in a direction parallel to the pipe centerline, as seen in a plan view.
- ③ All Pipes and Connectors shall be 4" diameter PVC.
- ④ Wall coping shall not be paid for separately but shall be included in Item 504 Precast Panel Facing.
- ⑤ One side temporary forming board is required to build detail A. The filter material shall be wrapped with erosion control Class B Geotextiles.
- ⑥ Impervious membrane and pipe collector for metal or geosynthetic reinforced walls.



$$EM_1 = [(H + \frac{1}{2})(h/TAN\theta) + 0.75H + \frac{(H - 1.5 \cdot TAN\theta)(0.5H + 0.75)}{1 + TAN\theta} - 0.5(H+h)^2]/27$$

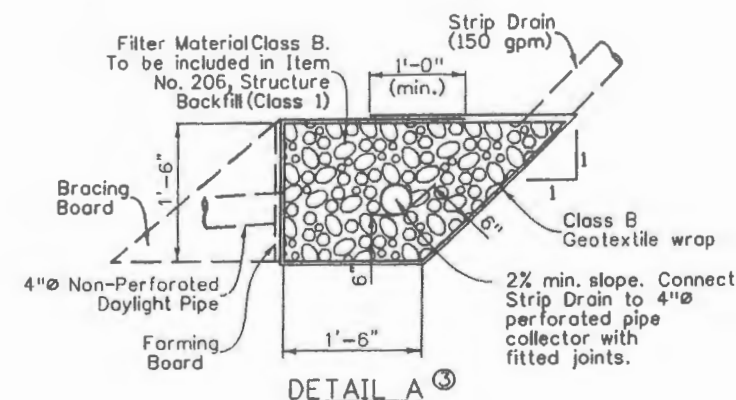
$$h = (H+RL) \frac{TAN\theta}{1 - TAN\theta}$$

$$BM_1 = [DH(RL) + 0.5(DH)^2 + 1.5(1.50)^2]/27$$

θ = Average angle of existing ground line

EARTHWORK QUANTITIES

(For wall without Shoring)



DESIGN DATA

- AASHTO, 16th EDITION without interims for internal design only
- Unit weight of γ_{conc} = 150 pcf
- Unit weight of γ_{soil} = 125 pcf is assumed.
- Allowable Bearing Capacity = 5,000 psf on bedrock.
- Internal friction angle of soil for Structure Backfill (Class 1) is assumed to be φ = 34°. K_a = 0.2827, K_o = 0.4408. for horizontal slope
- Coefficient of resistance to direct sliding $\left\{ \begin{array}{l} = 0.8 \text{ (Geogrid)} \\ = 0.6 \text{ (Geotextile)} \end{array} \right.$
- See Project Special Provisions for the relationship between LTDS and MARV of Geosynthetic soil reinforcement, and sacrificial thickness of metallic soil reinforcement.

Print Date: 6/9/2010	Sheet Revisions			Colorado Department of Transportation		As Constructed		MSE TYPICAL SECTION		Project No./Code	
File Name: 17269Ramp B_MSE Typical Section R1.dgn	Date:	Comments:	Init.	3803 North Main Avenue Suite 200 Durango, CO 81301 Phone: 970-385-1440 FAX: 970-385-8365		No Revisions:		Designer: LSB Structure Numbers: P-05-AT Detaller: TLB Structure Numbers: P-05-AV		ES5 160A-010	
Horiz. Scale: 1:2 Vert. Scale: As Noted	0/9/10	105-41				Revised: 8/27/10				Sheet Subset: WALLS	
Unit Information: SPC				Region 5		EJA				Sheet Number: 38	
Yeh and Associates, Inc. Consulting Engineers & Scientists											

GENERAL NOTES

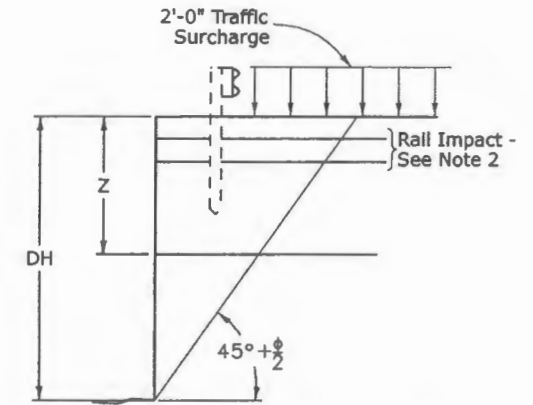
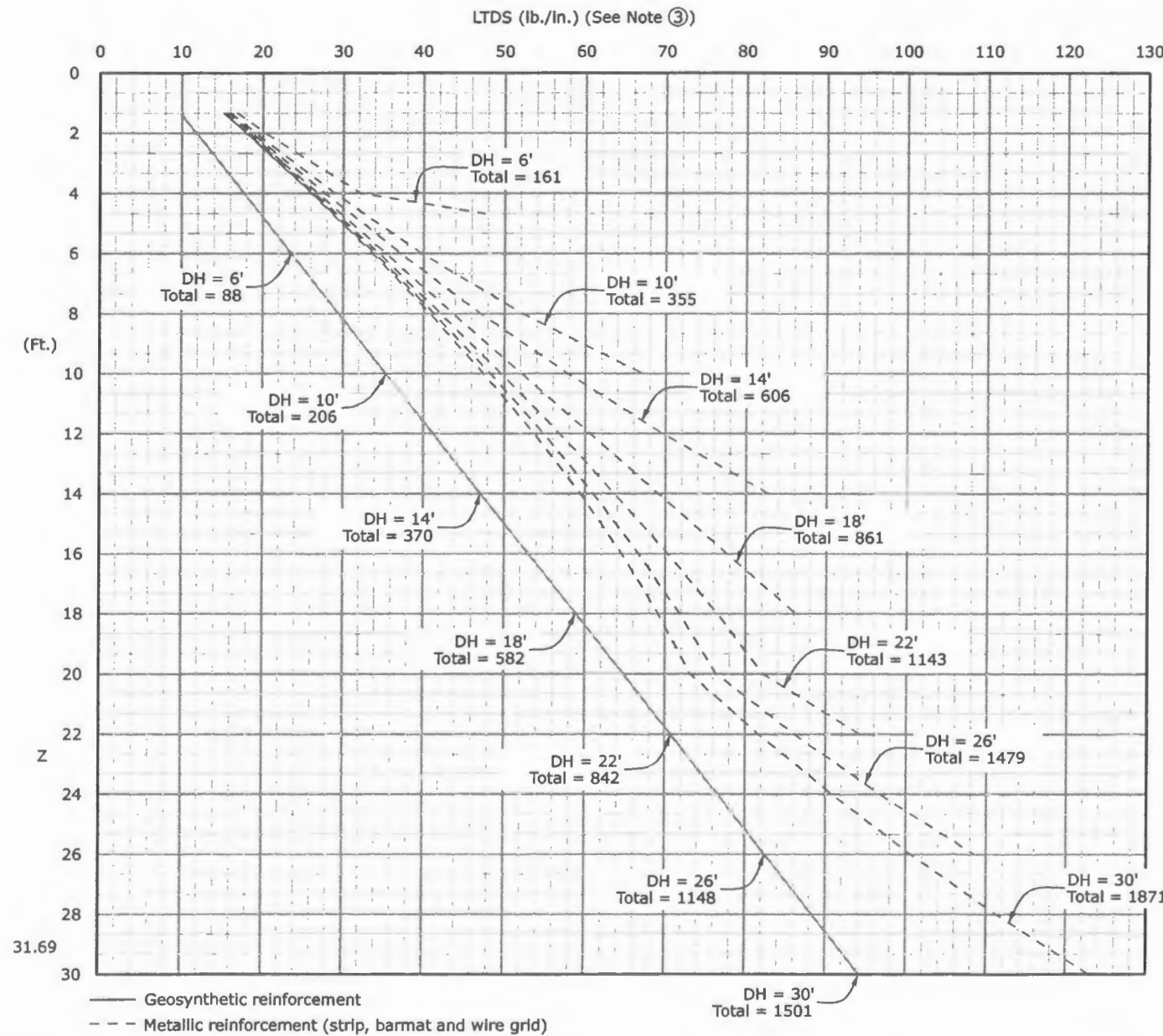
The required LTDS for different reinforcement layer depths is determined with the following equations, using the values as depicted in the Loading Diagram.

$$\sigma_v = (Z + 2) \gamma_{soil}$$

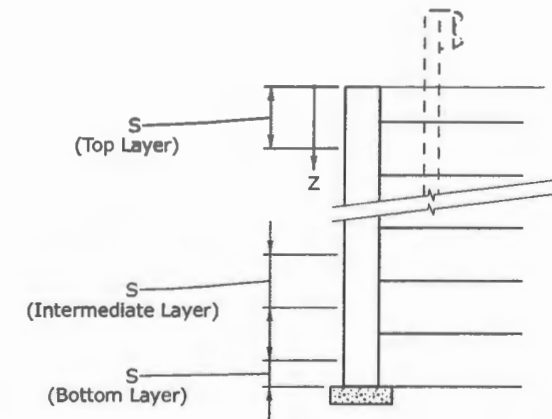
$$LTDS \geq (K) \cdot (\sigma_v) \cdot (S) / 12 + \text{Rail Impact (See note 2)}$$

Where K = K_a for Geosynthetic reinforcement or

K = K_c to K_a for metallic reinforcement - see AASHTO fig. 5.8.4.1A



LOADING DIAGRAM



REINFORCEMENT PATTERN

NOTES:

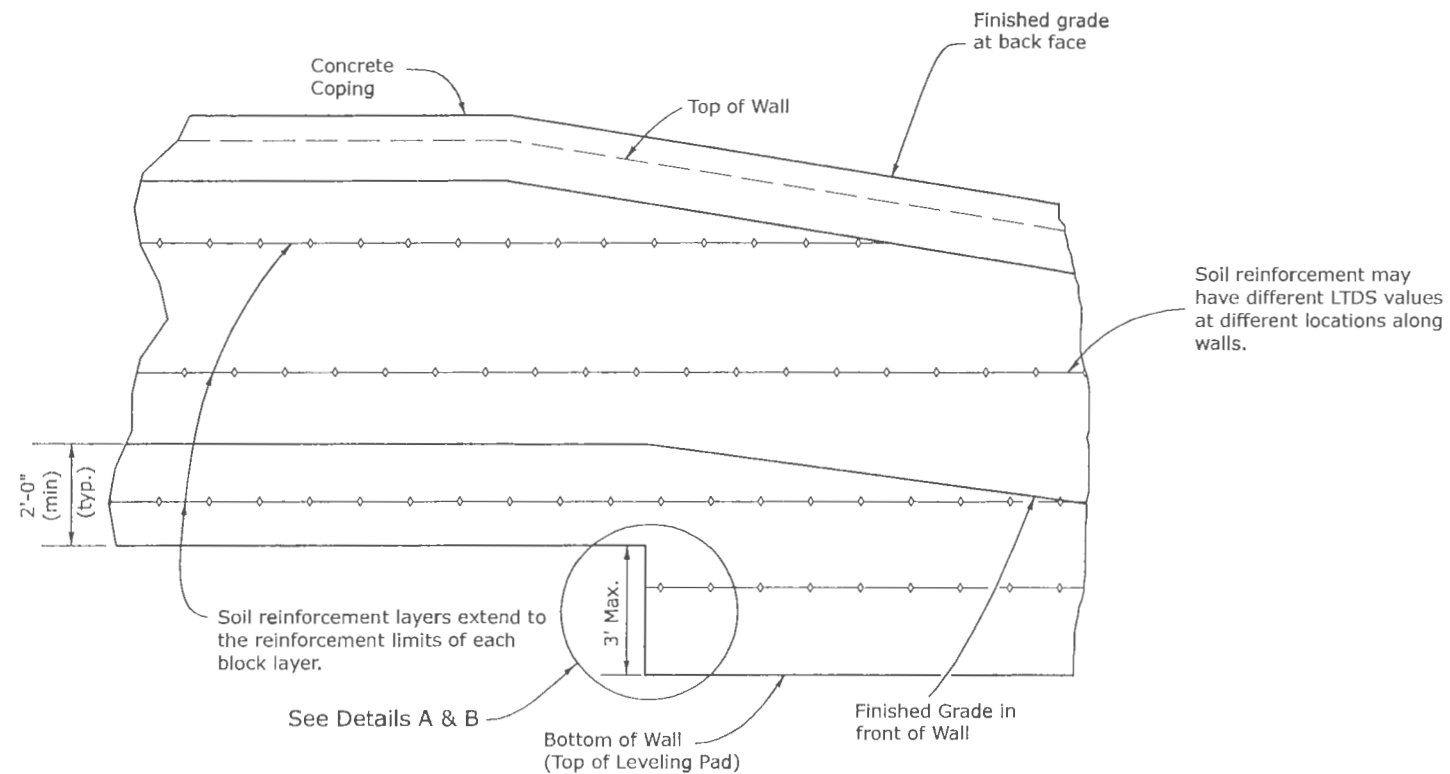
- ① For the installation of an impervious membrane, the reinforcement shall be started 2 feet from the top of roadway pavement when the wall height is greater than 10'-0".
- ② When a Type 3 rail is present, each of the top two layers shall take an additional rail impact load of 12.5 lb./in.
- ③ Graph values must be multiplied by S in feet to obtain the required LTDS.

Print Date: 5/22/2009	Sheet Revisions			Colorado Department of Transportation 3803 North Main Avenue Suite 200 Durango, CO 81301 Phone: 970-385-1440 FAX: 970-385-8365	As Constructed	PANEL FACING M.S.E. WALL WITH TYPE 3 RAIL			Project No./Code
File Name: 17269Ramp B_Sheet_B-504-B2.dgn	Date:	Comments	Init.		No Revisions: 8/27/10	Designer: LSB	Structure Numbers	P-05-AT	ES5 160A-010
Horiz. Scale: 1:1.00001 Vert. Scale: As Noted				Revised:	Detailer: TLB		P-05-AV	17269	
Unit Information SPC				Void:	Sheet Subset: WALLS	Subset Sheets:	11 of 14	Sheet Number 39	
Yeh and Associates, Inc. Consulting Engineers & Scientists	Region 5			EJA					

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Terry Barron 8/27/10

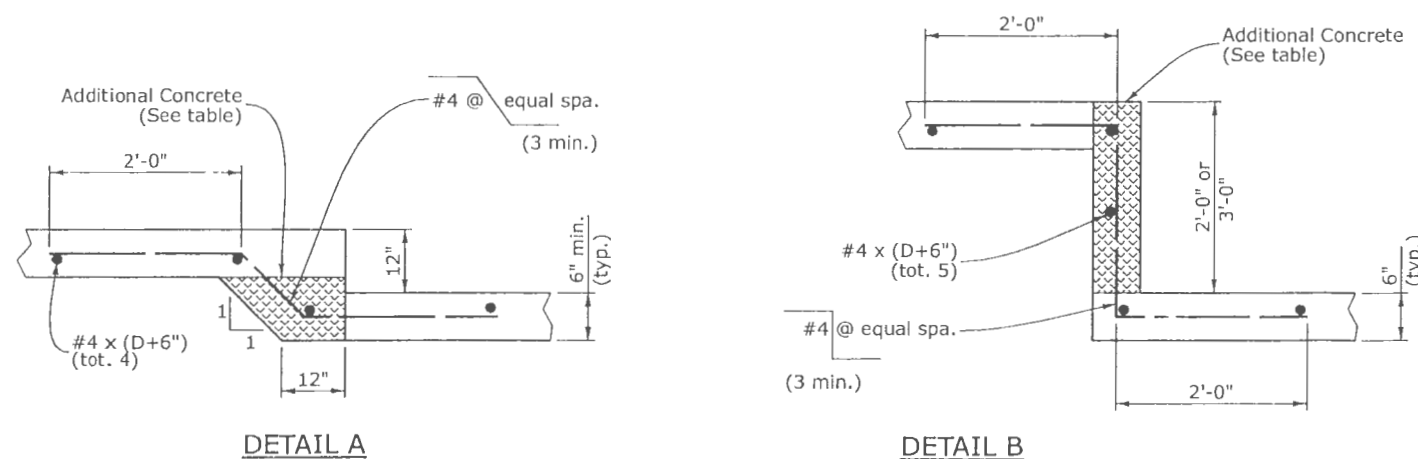


TYPICAL ELEVATION (WALL)

LEVELING PAD AND STEP QUANTITIES *
(For Information Only)

DESCRIPTIONS		UNIT	QUANTITIES
LEVELING PAD CONCRETE		c.y./ft.	0.036
1'-0" STEP	STEEL	lb/step	14.86
	ADDITIONAL CONCRETE	c.y./step	0.111
2'-0" STEP	STEEL	lb/step	17.03
	ADDITIONAL CONCRETE	c.y./step	0.075
3'-0" STEP	STEEL	lb/step	19.04
	ADDITIONAL CONCRETE	c.y./step	0.111

* Based on 1'-0" nominal panel depth (D)



DETAIL A

DETAIL B

LEVELING PAD DETAILS

Print Date: 5/22/2009	
File Name: 17269Ramp B_Sheet_B-504-B3.dgn	
Horiz. Scale: 1:1.00001 Vert. Scale: As Noted	
Unit Information SPC	
Yeh and Associates, Inc. Consulting Engineers & Scientists	

Sheet Revisions		
Date:	Comments	Init.

Colorado Department of Transportation

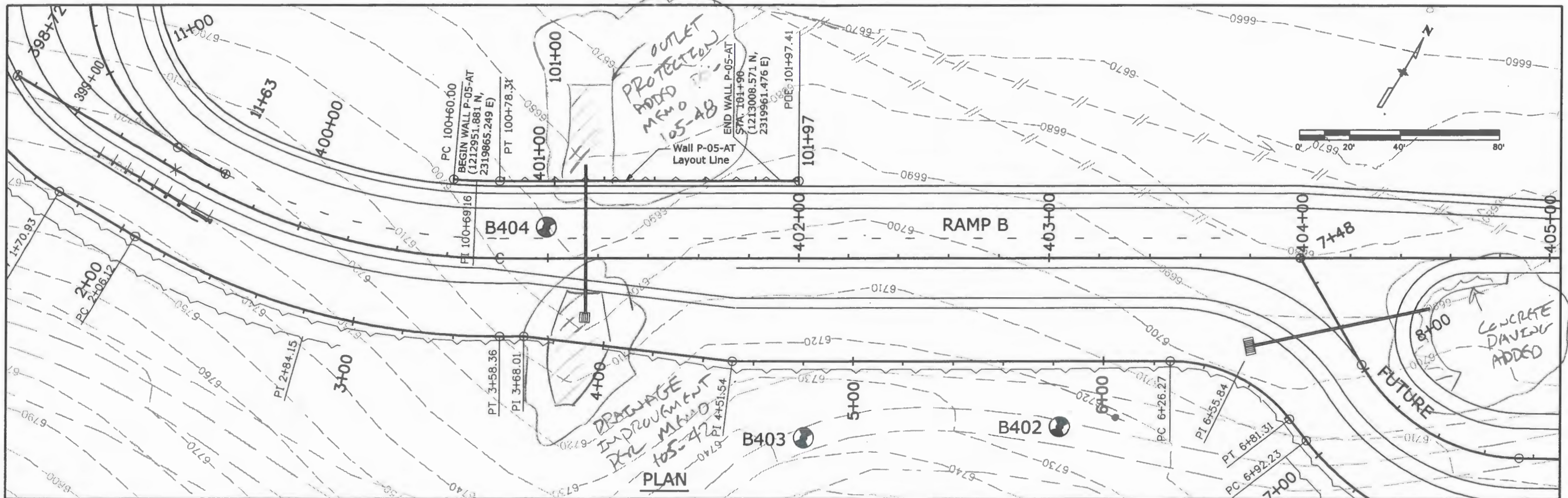
3803 North Main Avenue
 Suite 200
 Durango, CO 81301
 Phone: 970-385-1440 FAX: 970-385-8365

Region 5 EJA

As Constructed
No Revisions: 8/27/10
Revised:
Void:

PANEL FACING M.S.E WALL DETAIL WITH TYPE 3 RAIL			
Designer:	LSB	Structure Numbers	P-05-AT
Detailer:	TLB	Structure Numbers	P-05-AV
Sheet Subset:	WALLS	Subset Sheets:	12 of 14

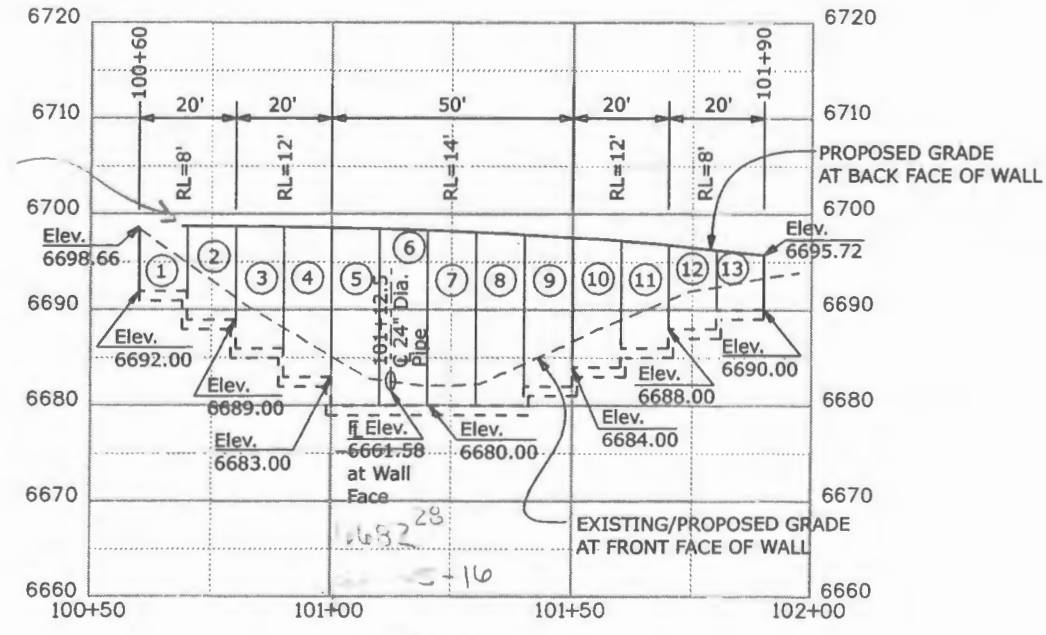
Project No./Code	ES5 160A-010
17269	Sheet Number 40



PLAN

RETAINING WALL ELEVATIONS

STATION	PANEL NO.	ELEVATION AT TOP OF LEVELING PAD (FEET)	ELEVATION AT PROPOSED GRADE (FEET)	HEIGHT (FEET)	PANEL BANNER
100+60	1	6692.00	6698.66	6.66	2
100+70	2	6689.00	6698.75	9.75	3
100+80	3	6686.00	6698.74	12.74	2
100+90	4	6683.00	6698.69	15.69	3
101+00	5	6680.00	6698.60	18.60	2
101+10	6	6680.00	6698.47	18.47	3
101+20	7	6680.00	6698.29	18.29	2
101+30	8	6680.00	6698.09	18.09	3
101+40	9	6682.00	6697.85	15.85	2
101+50	10	6684.00	6697.56	13.56	3
101+60	11	6686.00	6697.23	11.23	2
101+70	12	6688.00	6696.75	8.75	3
101+80	13	6690.00	6696.26	6.26	2
101+90	13	6690.00	6695.72	5.72	3



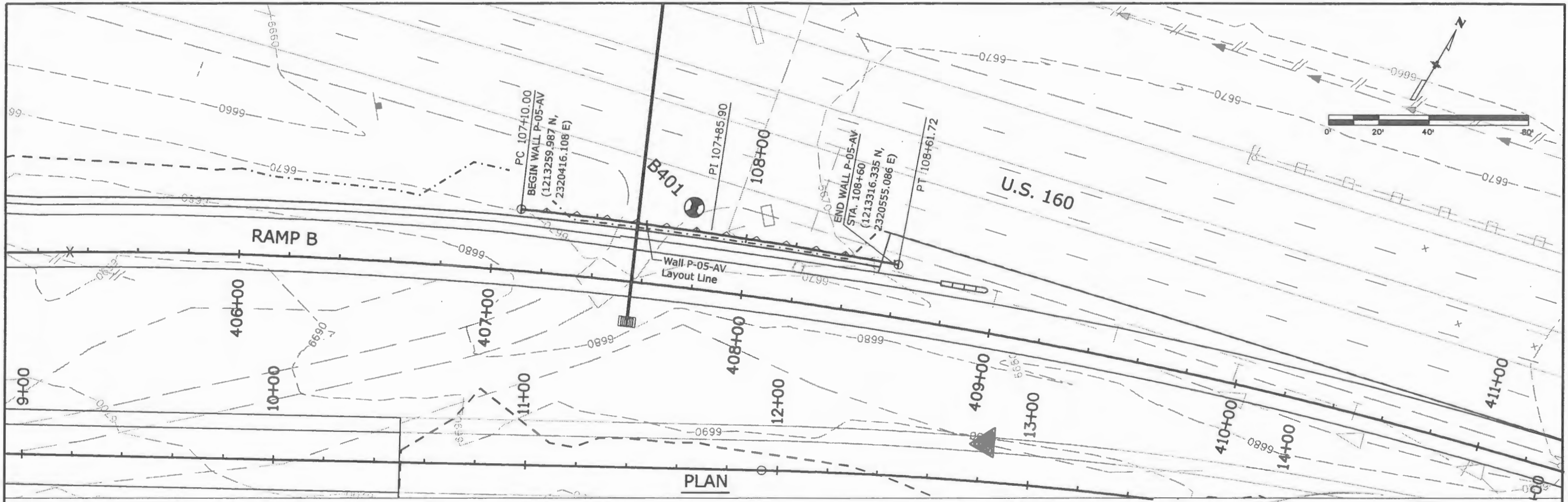
ELEVATION

NOTE: COPING DIMENSIONS CHANGED TO MATCH PROJECT #16042

CALL UTILITY NOTIFICATION CENTER OF COLORADO
1-800-922-1987
 CALL 2 BUSINESS DAYS (NOT INCLUDING INITIAL DAY OF CONTACT) IN ADVANCE BEFORE YOU DIG, GRADE, OR EXCAVATE FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES.

Print Date: 5/22/2009	Sheet Revisions		Colorado Department of Transportation		As Constructed	MSE WALL P-05-AT PLAN & ELEVATION		Project No./Code
File Name: 17269 Ramp B Wall Plan P-05-AT.dgn	Date:	Comments:	Init.:	3803 North Main Avenue Suite 200 Durango, CO 81301 Phone: 970-385-1440 FAX: 970-385-8365 Region 5 EJA	No Revisions: 8/27/10	Designer: LSB	Structure Numbers: P-05-AT	ES5 160A-010
Unit Information					Revised:			Detailer: SPC/TLB
Unit Leader Initials					Void:	Sheet Subset: WALLS	Subset Sheets: 13 of 14	Sheet Number: 41

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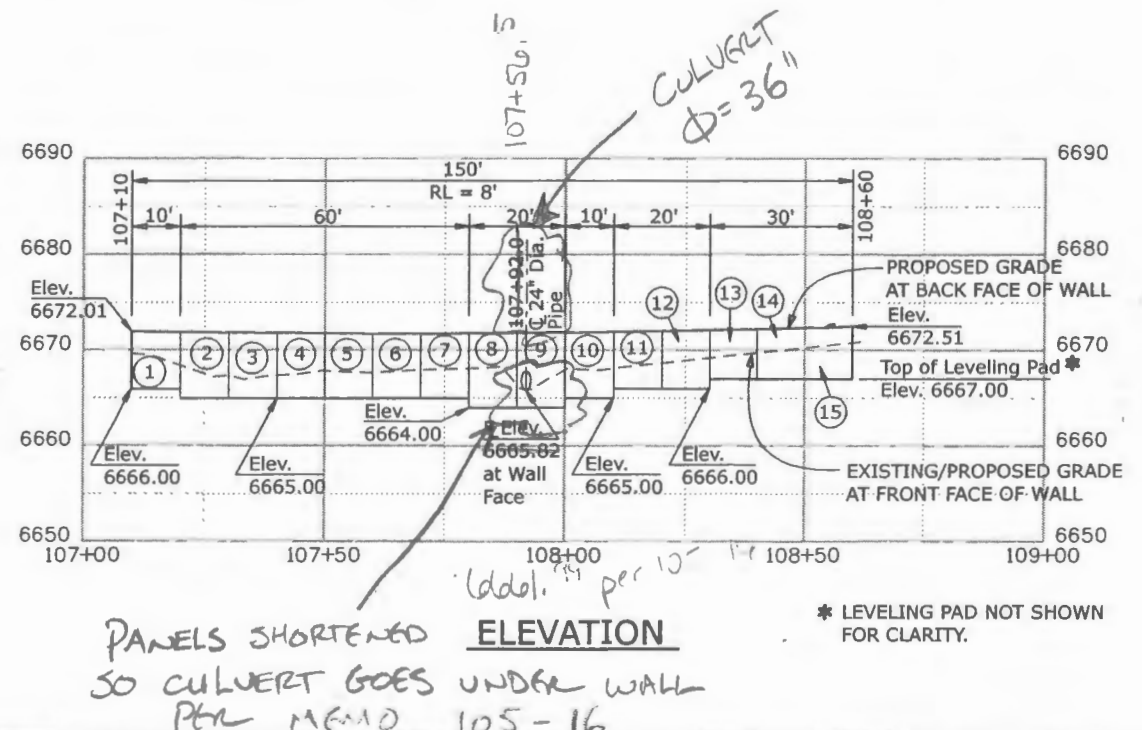


PLAN

RETAINING WALL ELEVATIONS

STATION	PANEL NO.	ELEVATION AT TOP OF LEVELING PAD (FEET)	ELEVATION AT PROPOSED GRADE (FEET)	HEIGHT (FEET)
107+10	1	6666.00	6672.01	6.01
107+20	2	6665.00	6671.94	6.94
107+30	3	6665.00	6671.87	6.87
107+40	4	6665.00	6671.84	6.84
107+50	5	6665.00	6671.80	6.80
107+60	6	6665.00	6671.78	6.78
107+70	7	6665.00	6671.78	6.78
107+80	8	6664.00	6671.80	7.80
107+90	9	6664.00	6671.83	7.83
108+00	10	6665.00	6671.88	6.88
108+10	11	6666.00	6671.94	5.94
108+20	12	6666.00	6672.01	6.01
108+30	13	6667.00	6672.11	5.11
108+40	14	6667.00	6672.22	5.22
108+50	15	6667.00	6672.35	5.35
108+60	15	6667.00	6672.51	5.51

FLUTED PANELS, NO BANNERS



GEOMETRY MODIFIED PER MEMO 105-16

PANELS SHORTENED SO CULVERT GOES UNDER WALL PER MEMO 105-16

CALL UTILITY NOTIFICATION CENTER OF COLORADO 1-800-922-1987
 CALL 2 BUSINESS DAYS (NOT INCLUDING INITIAL DAY OF CONTACT) IN ADVANCE BEFORE YOU DIG, GRADE, OR EXCAVATE FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES.

Print Date: 5/24/2009	Sheet Revisions		Colorado Department of Transportation		As Constructed		MSE WALL P-05-AV PLAN & ELEVATION		Project No./Code	
File Name: 17269 Ramp B Wall Plan P-05-AV.dgn	Date:	Comments:	Init.:	3803 North Main Avenue Suite 200 Durango, CO 81301 Phone: 970-385-1440 FAX: 970-385-8365		No Revisions: 8/27/10	Designer: LSB Structure Numbers: P-05-AV		ES5 160A-010	
Horiz. Scale: 1:40 Vert. Scale: As Noted				Region 5 EJA		Revised:	Detailer: SPC/TLB		17269	
Unit Information SPC						Void:	Sheet Subset: WALLS Subset Sheets: 14 of 14		Sheet Number 42	
Yeh and Associates, Inc. Consulting Engineers & Scientists										

GENERAL NOTES

EXCEPT AS SHOWN IN THE GROUND NAIL & MSE WALL PLANS, STRUCTURE EXCAVATION AND BACKFILL SHALL BE IN ACCORDANCE WITH M-206-1 FOR CAST-IN-PLACE RETAINING WALLS.

EXPANSION JOINT MATERIAL SHALL MEET AASHTO SPECIFICATION M213.

ALL EXPOSED CONCRETE SURFACES SHALL RECEIVE A CLASS I FINAL FINISH TO ONE FOOT BELOW THE GROUND LINE.

A COLORED STRUCTURAL CONCRETE COATING FINISH WILL BE REQUIRED, AS SHOWN ON THE PLANS, ON EXPOSED CONCRETE SURFACES. THE COLOR SHALL BE AS SHOWN ON THE PLANS, EQUIVALENT TO FEDERAL STANDARD 595B COLOR, AND IS TO BE SELECTED FROM TEST PANELS PROVIDED BY THE CONTRACTOR.

ALL STRUCTURAL STEEL NOT OTHERWISE NOTED SHALL BE PAINTED IN ACCORDANCE WITH SECTION 509 OF THE STANDARD SPECIFICATIONS. THE TEST COLOR SAMPLE SHALL BE SELECTED BY THE ENGINEER, EQUIVALENT TO FEDERAL STANDARD 595B COLOR.

THE FOLLOWING STRUCTURAL STEEL SHALL BE AASHTO M270 GRADE 36 (ASTM A-36): NAIL ANGLE STOPPERS.

ALL BOLTS SHALL BE 7/8" DIAMETER, HIGH STRENGTH, UNLESS OTHERWISE NOTED.

GRADE 60 REINFORCING STEEL IS REQUIRED.

ALL REINFORCING STEEL SHALL BE EPOXY COATED UNLESS OTHERWISE NOTED.

Ⓝ DENOTES NON COATED REINFORCING STEEL.

THE FOLLOWING TABLE GIVES THE MINIMUM LAP SPLICE LENGTH FOR EPOXY COATED REINFORCING BARS PLACED IN ACCORDANCE WITH SUBSECTION 602.06. THESE SPLICE LENGTHS SHALL BE INCREASED BY 25% FOR BARS SPACED AT LESS THAN 6" ON CENTER.

BAR SIZE	#4	#5	#6	#7	#8	#9	#10	#11
SPLICE LENGTH FOR CLASS B AND D CONCRETE	1'-3"	1'-7"	2'-5"	2'-10"	3'-8"	4'-8"	5'-11"	7'-3"

WHEN THE CONTRACTOR ELECTS TO SUBSTITUTE EPOXY COATED REINFORCEMENT FOR BLACK REINFORCING BARS, THE MINIMUM LAP SPLICE SHALL BE AS DESCRIBED ABOVE.

STRUCTURE EXCAVATION AND STRUCTURE BACKFILL (CLASS 2) SHALL BE INCLUDED IN THE WORK. REFER TO GROUND NAIL & MSE WALL PLANS FOR THE QUANTITIES.

SEEDING IS INCLUDED IN PAY ITEM 212 SEEDING (NATIVE) AND SEE ROADWAY PLANS FOR QUANTITY.

ALL WORKS AND PAY ITEMS SHOWN IN THE PRECAST PANEL FACING PLANS SHALL BE CALCULATED AND INCLUDED IN THE WALL AND ROADWAY PLANS.

DESIGN DATA

AASHTO , FOURTH EDITION LRFD WITH CURRENT INTERIMS

DESIGN METHOD: LOAD AND RESISTANCE FACTOR DESIGN

WIND LOAD: 50 psf

NOMINAL BEARING CAPACITY: 9 tsf

DIFFERENTIAL TEMPURATURE OF PANEL: 50 DEGREES

REINFORCED CONCRETE:

CLASS B CONCRETE: f'c = 4,500 psi
 CLASS D CONCRETE: f'c = 4,500 psi
 REINFORCING STEEL: fy = 60,000 psi

STRUCTURAL STEEL: AASHTO M270 (ASTM A709) GRADE 36 Fy = 36,000 psi

THE FOLLOWING TABLE GIVES THE MINIMUM LAP SPLICE LENGTH FOR BLACK REINFORCING BARS PLACED IN ACCORDANCE WITH SUBSECTION 602.06. THESE SPLICE LENGTHS SHALL BE INCREASED BY 25% FOR BARS SPACED AT LESS THAN 6" ON CENTER.

BAR SIZE	#4	#5	#6	#7	#8	#9	#10	#11
SPLICE LENGTH FOR CLASS B AND D CONCRETE	1'-1"	1'-4"	1'-7"	1'-11"	2'-6"	3'-1"	5'-11"	5'-10"

THE ABOVE SPLICE LENGTHS SHALL BE INCREASED BY 20 PERCENT FOR 3 BAR BUNDLES AND 33 PERCENT FOR 4 BAR BUNDLES.

THE ABOVE SPLICE LENGTHS MAY BE REDUCED BY 20% WHEN 3" OF CLEAR COVER EXISTS AND BAR SPACING IS 6" OR GREATER ON CENTER.

THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE STABILITY OF THE STRUCTURE DURING CONSTRUCTION.

FOR STRUCTURE NUMBER INSTALLATION, SEE STANDARD S-614-12. STRUCTURE NUMBER IS REQUIRED FOR EACH WALL.

STATIONS, ELEVATIONS, AND DIMENSIONS CONTAINED IN THESE PLANS ARE CALCULATED FROM THE "GROUND NAIL AND MSE WALL PLANS". THESE STATIONS, ELEVATIONS, AND DIMENSIONS MAY BE ADJUSTED TO MEET THE EXISTING STRUCTURE. THE CONTRACTOR SHALL VERIFY ALL DEPENDENT DIMENSIONS IN THE FIELD BEFORE ORDERING OR FABRICATING ANY MATERIAL.

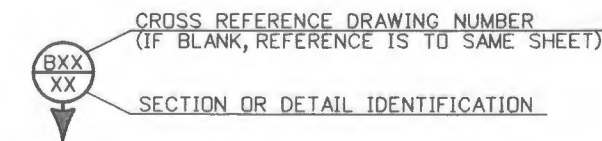
THE INFORMATION SHOWN ON THESE PLANS CONCERNING THE TYPE AND LOCATION OF UNDERGROUND UTILITIES IS NOT GUARANTEED TO BE ACCURATE OR ALL INCLUSIVE. THE CONTRACTOR IS RESPONSIBLE FOR MAKING HIS OWN DETERMINATION AS TO THE TYPE AND LOCATION OF UNDERGROUND UTILITIES AS MAY BE NECESSARY TO AVOID DAMAGE THERETO. THE CONTRACTOR SHALL CONTACT THE UTILITY NOTIFICATION CENTER OF COLORADO AT 1-800-922-1987 AT LEAST 2 DAYS (NOT INCLUDING THE DAY OF NOTIFICATION) PRIOR TO ANY EXCAVATION OR OTHER EARTHWORK.

INDEX OF DRAWINGS

- W01 GENERAL INFORMATION - SUMMARY OF QUANTITIES
- W02 GROUND NAIL WALL - PRECAST PANEL FACING DETAILS
- W03 GROUND NAIL WALL - COPING & LEVELING PAD DETAILS
- W04 MSE WALL - PRECAST PANEL FACING DETAILS
- W05 ARCHITECTURAL DETAILS (1 of 2)
- W06 ARCHITECTURAL DETAILS (2 of 2)

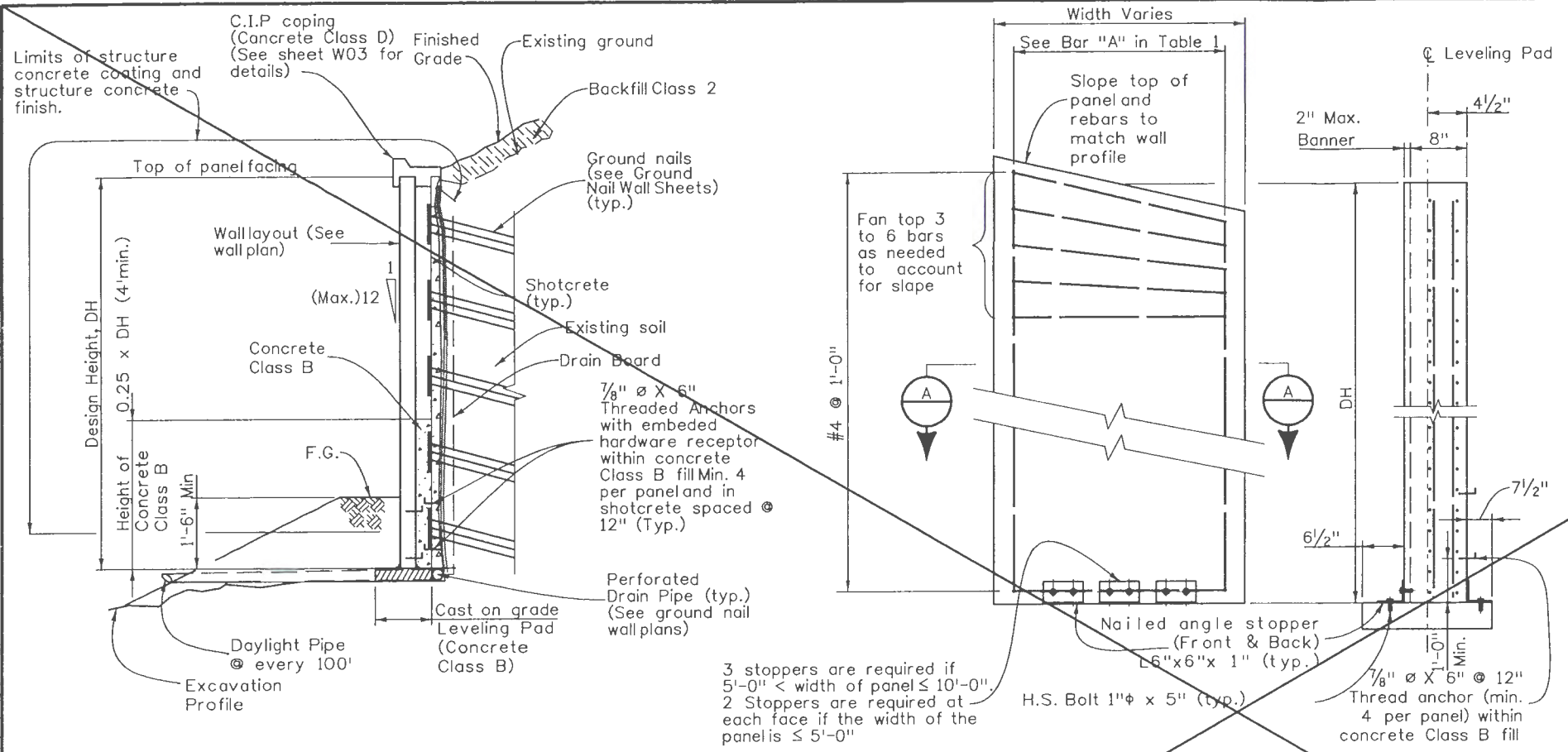
FOR BURIED UTILITY INFORMATION
THREE (3) BUSINESS DAYS
BEFORE YOU DIG
CALL 811
 (or 1-800-922-1987)
 UTILITY NOTIFICATION
 CENTER OF COLORADO (UNCC)
www.uncc.org

Design	Detail	Quantity
INITIAL	INITIAL	INITIAL
PPC	CSL	CSL
MCY	MCY	PPC
DATE	DATE	DATE
04/09	04/09	04/09
Checked By	Checked By	Checked By
Designed By	Designed By	Designed By



Print Date: 5/19/2009	Sheet Revisions	Colorado Department of Transportation	As Constructed	GENERAL INFORMATION SUMMARY OF QUANTITIES	Project No./Code
Drawing File Name: 17269_01_Gen Info SoQ.dgn	Date: Comments: Init.	4201 East Arkansas Avenue Room 330 Denver, CO 80222-3400 Phone: 303-757-9352 FAX: 303-757-9197	No Revisions: 8/27/10	Designer: P. Chomsrimake	ES5 160A-010
Horiz. Scale: 1:1 Vert. Scale: As Noted		STW	Revised:	Structure: Wall P-05-AT, AU	17269
Unit Information: 0221 Unit Leader: STW			Void:	Detailer: C. Lenway	43
				Numbers: P-05-AV & AW	
				Sheet Subset: Wall	Sheet Number
				Subset Sheets: W01 of 6	

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NOTES:

1. Panel lifting hook embedments and related hardware shall be furnished, sized, and placed by fabricator (per Contractor's design) for each individual panel.
2. Contractor may submit alternate panel width with approval of the Engineer at no cost to the project.
3. Alternate bolt and angle system at the bottom of the panel is to be designed by the Contractor with approval of the Engineer at no cost to the project.
4. The acceptable panel joint material between panels shall be proposed by the contractor with approval of the Engineer, and shall be included in the cost of Item 504 Precast Panel Facing.
5. Provide a minimum of two panel stoppers per panel during the panel installation. Each panel connection system includes bolt and angle systems at the bottom of the panel. Work to be included in Item 504 Precast Panel Facing. Contractor may submit an alternative method for restraining the panel during erection.
6. Test panel as specified in specification shall be included in cost of item 504 Precast Panel Facing provided by the contractor.
7. Facing connection system shall be in accordance with ASTM A36, Grade 36. All hardware shall be galvanized.
8. 2" clr. for rebar is typical except as noted.
9. Sawing of panels is acceptable in areas to meet existing ground profile if needed with approval of the engineer.
10. The tolerance on panel thickness shall not exceed $\pm 1/4"$.
11. Total service loads applied to any panel during construction shall not exceed 117 psf.
12. Any flexural cracks, sags, or cambers greater than 0.5" will be considered evidence of mishandling, overloading, or exceeding allowable tolerances, and may be cause for rejecting panels at the Engineer's discretion.
13. Care must be taken to ensure proper cleaning of construction debris off the tops of the panels and consolidation of concrete mortar under the edges of the panels. Water, dirt or other debris on top of the panels will inhibit the bond of the cast-in-place concrete. It is also important that adequate space (min. 1" x 2") is provided for the concrete to fill the space under the panel as the slab concrete is placed. Panel lengths and width shall be determined by the Contractor and shown on the shop plans.
14. The Contractor is responsible for the stability of the panels during shipping, delivery, inspection, and anytime during construction. Erected panels shall be uniformly supported along the length of the panel. The contractor shall provide geogrid installation, lifting and erection plan to the engineer for information only at no additional cost.
15. This work will be included if funds become available.

**GROUND NAIL WALL
TYPICAL SECTION**

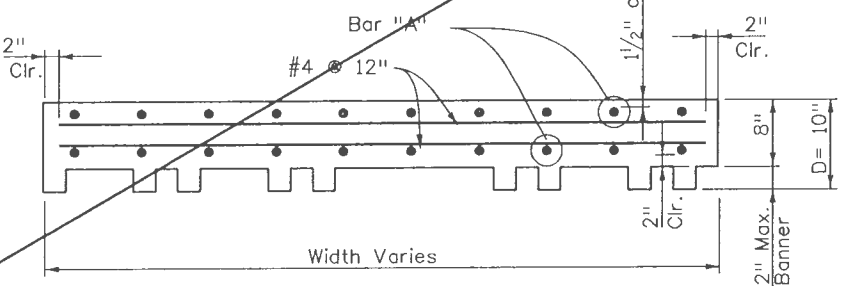
(Tube included in the cost of perforated drain pipe)

**PRESTRESSED PRECAST
PANEL ELEVATION**

**PRECAST PANEL
TYPICAL SECTION**

**TABLE 1
PRECAST PANEL FOR SOIL NAIL WALL**

DH (Ft)	Bar "A"
< 4.0	#4 @ 10"
4.0 - 8.0	#4 @ 9"
8.0 - 12.0	#4 @ 8"
12.0 - 16.0	#5 @ 10"
16.0 - 20.0	#5 @ 8"
20.0 - 24.0	#5 @ 7"
24.0 - 28.0	#5 @ 7"
28.0 - 32.0	#6 @ 8"



PRECAST PANEL FOR SOIL NAIL WALL - SECTION

NOT INCLUDED IN
THIS CONTRACT

Print Date: 5/19/2009
 File Name: 17269_02_GroundNailWall.dgn
 Horiz. Scale: 1:100 Vert. Scale: As Noted
 Unit Information: 0221 Unit Leader: STW

Sheet Revisions		
Date:	Comments	Init.

Colorado Department of Transportation
 4201 East Arkansas Avenue
 Room 107
 Denver, CO 80222
 Phone: 303-757-9352 FAX: 303-757-9197
Staff Bridge Branch STW

As Constructed
 No Revisions: *B/27/10*
 Revised:
 Void:

GROUND NAIL WALL PRECAST PANEL FACING DETAILS			
Designer:	M. Yip	Structure	Wall P-05-AU
Detailer:	C. Lenway	Numbers	Wall P-05-AW
Sheet Subset:	Wall	Subset Sheets:	W02 of 06

Project No./Code
 ES5 160A-010
 17269
 Sheet Number **44**

Set\17269_03_GroundNailWall.dgn

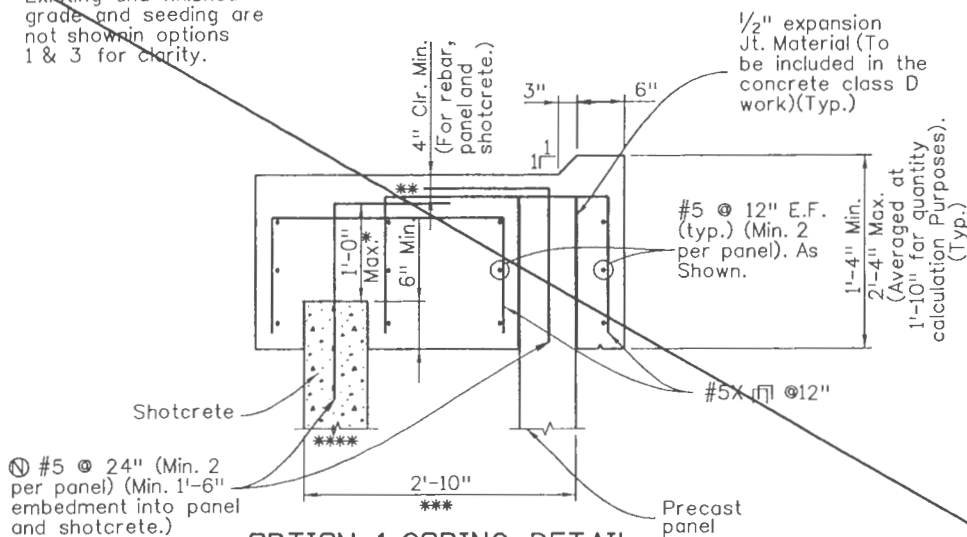
0221\Active Projects\RS\FinalDesign Projects\17269 US160 Ramp B Walls\Drawings\Advertisement P

Design

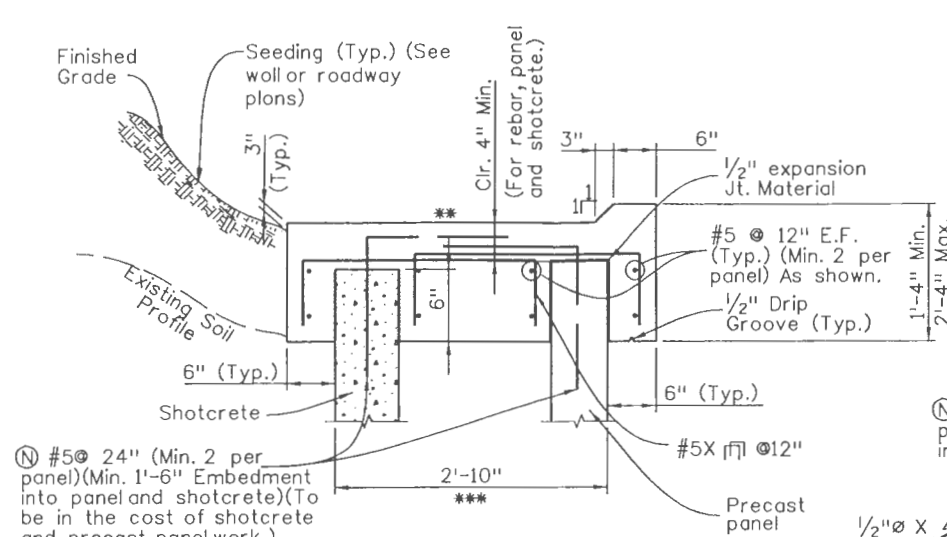
Designed By	MCY	04/09	Checked By	PPC	04/09
Checked By	MCY	04/09	Checked By	MCY	04/09

0221\Active Projects\RS\FinalDesign Projects\17269 US160 Ramp B Walls\Drawings\Advertisement P

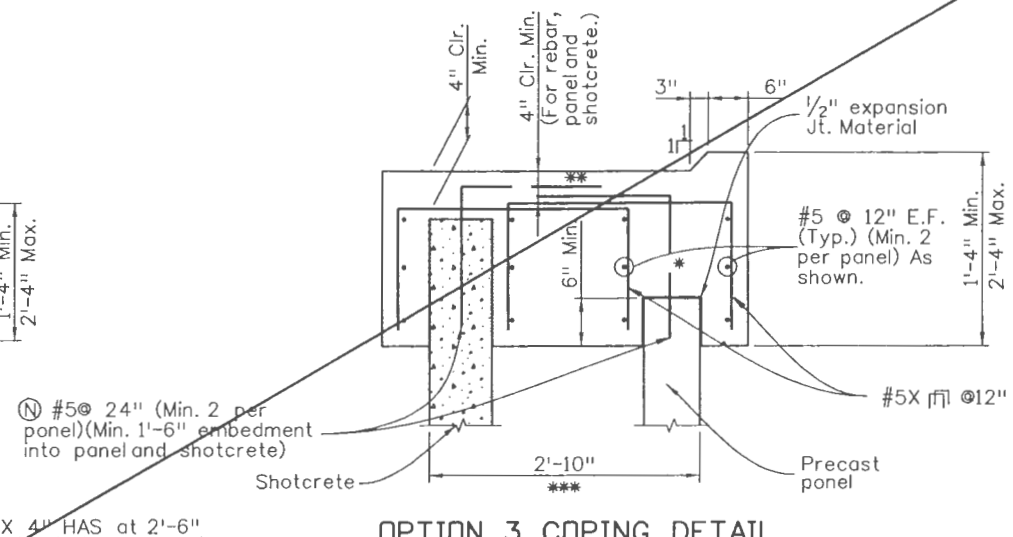
Existing and finished grade and seeding are not shown in options 1 & 3 for clarity.



OPTION 1 COPING DETAIL ALTERNATIVE

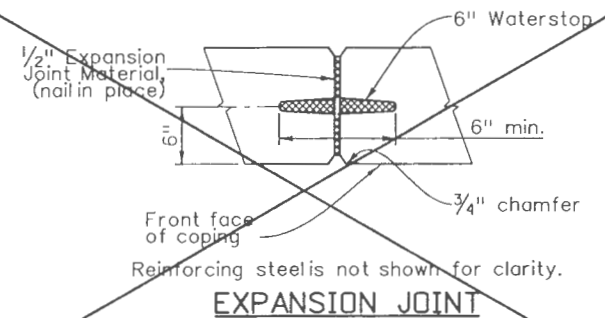


OPTION 2 C.I.P. COPING DETAIL ALTERNATIVE

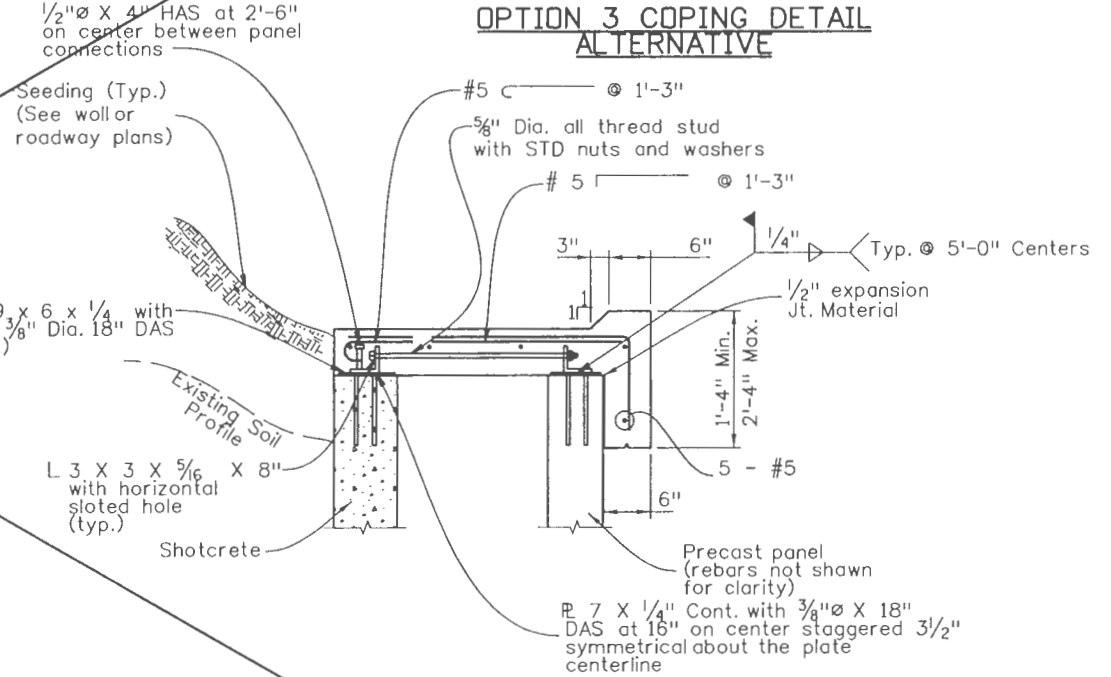


OPTION 3 COPING DETAIL ALTERNATIVE

- * Contractor shall provide bracing details for 1'-0" Max. rebars projecting from shotcrete or panel.
- ** Use mechanical connectors for Non-epoxy bars as a temporary connection during construction by contractor. (To be included in the work).
- *** Contractor to verify the dimension between front face of the panel and backface of the shotcrete. Assume 2'-10" of between the panels and shotcrete for quantity calculations. Actual dimension is varied.
- **** Assume 8" of shotcrete for quantity calculations.



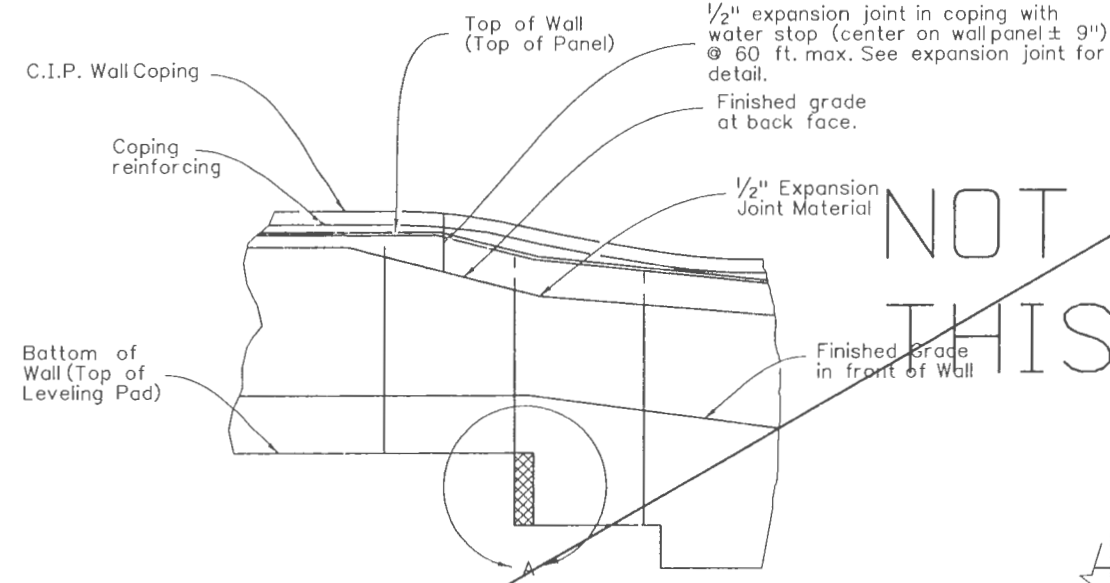
EXPANSION JOINT



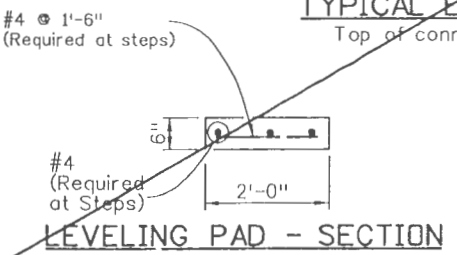
TYPICAL COPING DETAIL

Note: The contractor may submit alternate coping and connection system details of precast panels for the engineer approval.

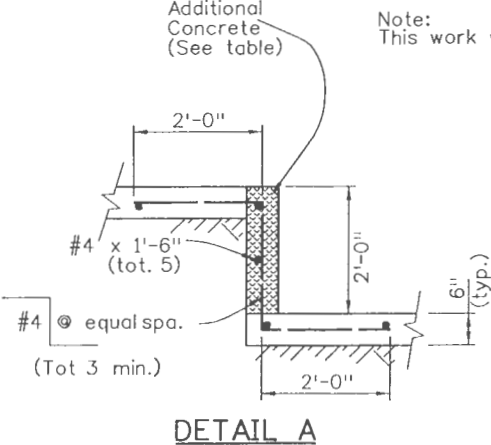
NOT INCLUDED IN THIS CONTRACT



TYPICAL ELEVATION (WALL)



LEVELING PAD - SECTION



DETAIL A

LEVELING PAD AND STEP QUANTITIES FOR PANELS

(For Information Only)

DESCRIPTIONS	UNIT	QUANTITIES
LEVELING PAD CONCRETE	c.y./ft.	0.037
STEEL	lb/ft.	0.00
24" STEP		
STEEL	lb/step	17.34
ADDITIONAL CONCRETE	c.y./step	0.074

COPING QUANTITIES FOR PANELS

OPTIONS 1, 2 & 3 (For Information Only)

DESCRIPTION	UNIT	QUANTITIES
Concrete	C.Y./ft.	0.202
Reinforcing Steel	Lb/ft.	22.868

Print Date: 5/19/2009

File Name: 17269_03_GroundNailWall.dgn

Horiz. Scale: 1:100 Vert. Scale: As Noted

Unit Information: 0221 Unit Leader: STW

Sheet Revisions		
Date:	Comments	Init.

Colorado Department of Transportation

4201 East Arkansas Avenue
Room 107
Denver, CO 80222
Phone: 303-757-9352 FAX: 303-757-9197

Staff Bridge Branch STW

As Constructed	No Revisions: 8/27/10
Revised:	
Void:	

GROUND NAIL WALL COPING & LEVELING PAD DETAILS			
Designer:	M. Yip	Structure	Wall P-05-AU
Detailer:	C. Lenway	Numbers	Wall P-05-AW
Sheet Subset:	Wall	Subset Sheets:	W03 of 06

Project No./Code	ES5 160A-010
	17269
Sheet Number	45