

DESIGN NOTES

- Design is based on the assumption that backfill within the reinforced soil mass, methods of construction and quality of materials conform to the requirements of Hilfiker Retaining Walls.
- Assumed Soil Characteristics:
 Wall Backfill:
 Unit Weight: 130 pcf
 Internal Friction Angle: 36°
 Cohesion = 0 psf
 Bond Strength (@ Depth) = 20 psi
 Retained Backfill:
 Unit Weight: 130 pcf
 Internal Friction Angle: 36°
 Cohesion = 0 psf
 Foundation Soils:
 Unit Weight: 125 pcf
 Friction Angle for Sliding: 33°
 Cohesion = 0 psf

Assumed Loading - Live Load = 500psf
 Dead Loading = 130pcf Soil Density
 150 pcf Concrete Density

Worst Case Applied Bearing Pressure: 4600 psf at the 17' MSE Wall Height.

If actual characteristics, grades or dimensions of soil materials differ from those listed above or shown on the plans, Hilfiker Retaining walls shall be notified to evaluate the need to redesign.

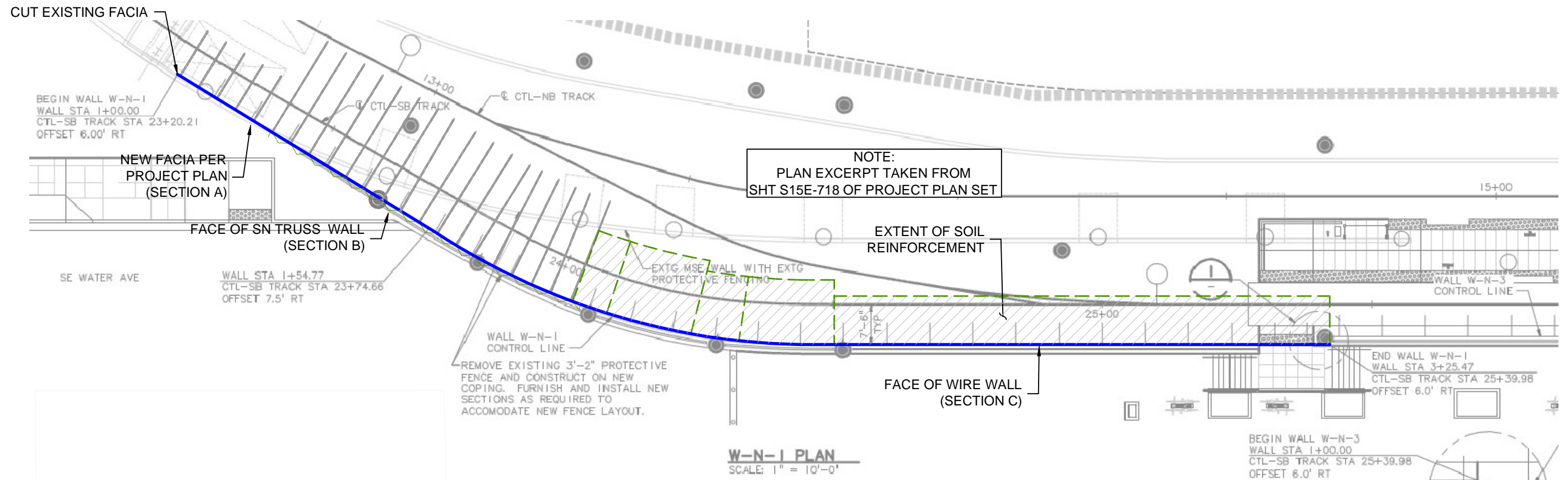
- If during construction, the wall location, structure location or loads are different than that proposed in this plan set and calculation package, HRW shall be notified to evaluate the need for a redesign.
- The design requires a non-saturated backfill. Surface and sub-surface drainage control may be required to prevent saturation of the backfill or relieve hydrostatic pressures.

Drainage control shall be as specified in the project plans and specifications or as directed by the engineer.

- Design Procedure:
 Mechanically Stabilized Earth walls and Reinforced Soil Slopes, FHWA report No. FHWA-NHI-00-043.
 - All information hereon is derived from the reference drawings, and is subject to geometric and geotechnical confirmation. The applicable Hilfiker construction guide and specifications are an integral part of this submittal.
- Reference drawings:
Project Plans by TriMet 'Portland To Milwauke LRT East Segment' Dated May 14, 2012.
- Hilfiker Retaining Walls shall be responsible only for the internal stability of the retaining wall, and not for global stability or foundation bearing capacity. The owner/contractor shall be responsible for all job site drainage, safety and fall protection provisions for workers in compliance with OSHA and any other applicable requirements.



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WALL 1 - PLAN VIEW
 SCALE: 1" = 20'

SUPPLIED QUANTITIES:

WALL - N-1 Section A:	23 - 10' SN's
WALL - N-1 Section B:	34 - 25' SN's
TRUSS Wall System:	1,208 SQ. FT
WALL - N-1 MSE Section C:	1,536 SQ. FT

THE DESIGN CONTAINED ON THESE DRAWINGS IS BASED ON INFORMATION PROVIDED BY THE OWNER. ON THE BASIS OF THIS INFORMATION, THE HILFIKER COMPANY HAS DESIGNED, AND IS RESPONSIBLE FOR THE INTERNAL STABILITY OF THE STRUCTURE ONLY. EXTERNAL STABILITY, INCLUDING FOUNDATION AND SLOPE STABILITY, IS THE RESPONSIBILITY OF THE OWNER.

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TRIMET PORTLAND-MILWAUKIE LIGHT RAIL - EAST SEGMENT

W-N-1 PLAN VIEW

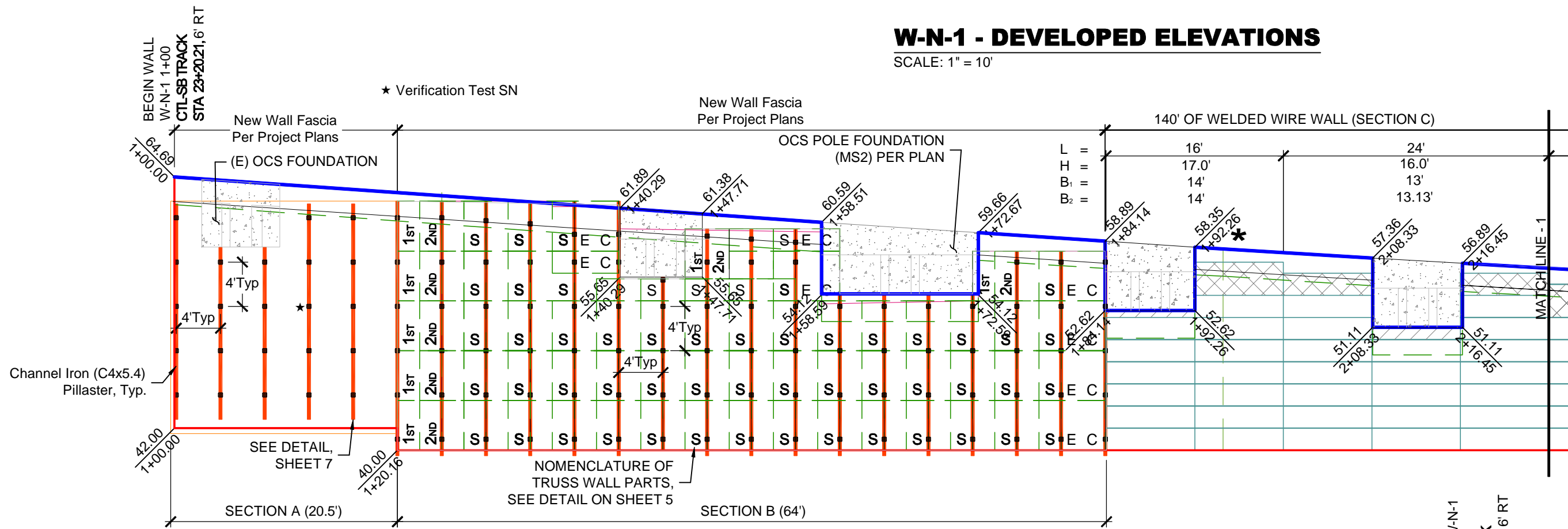
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SHT 1 OF 8

W-N-1 - DEVELOPED ELEVATIONS

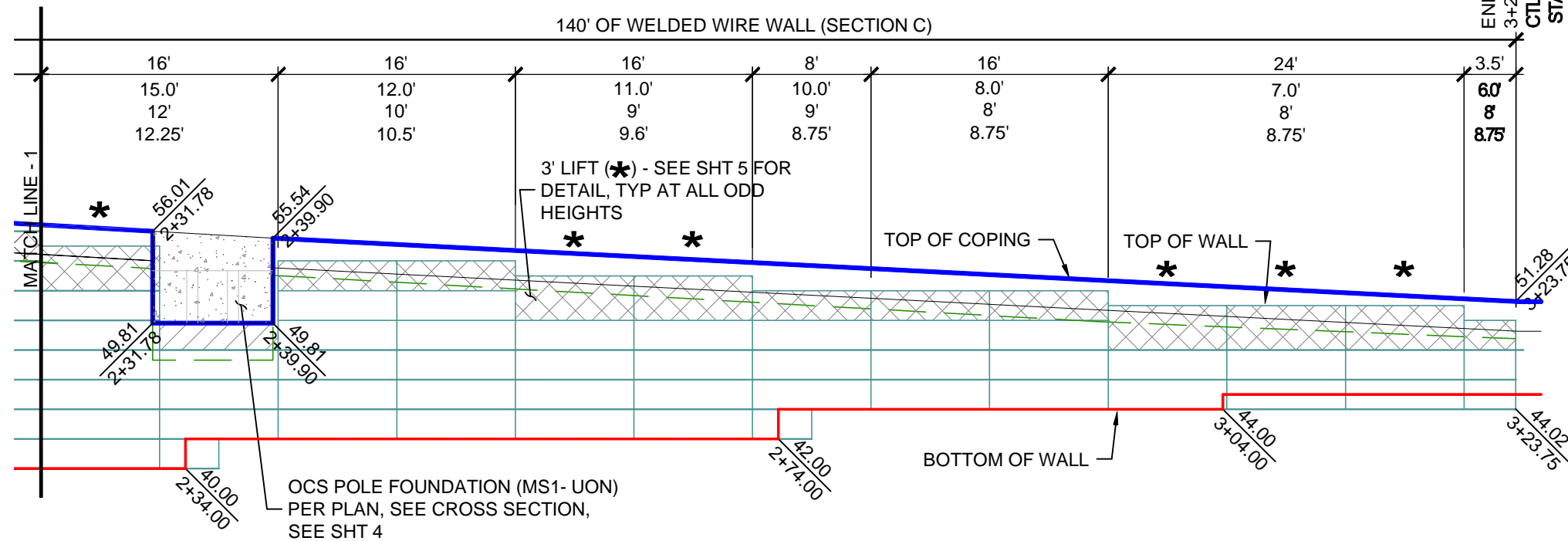
SCALE: 1" = 10'



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WALL WIRE TYPE LEGEND

- FINISH: HOT DIP GALVANIZED
SERVICE LIFE: 75 YEARS
- TYPE 1 - 8x12 W7.0x3.5 MATS
 - TYPE 2 - 8x10.5 W7.0x4.0 MATS
 - TYPE 3 - 8x12 W7.0x3.5 MATS CAP MAT ONLY



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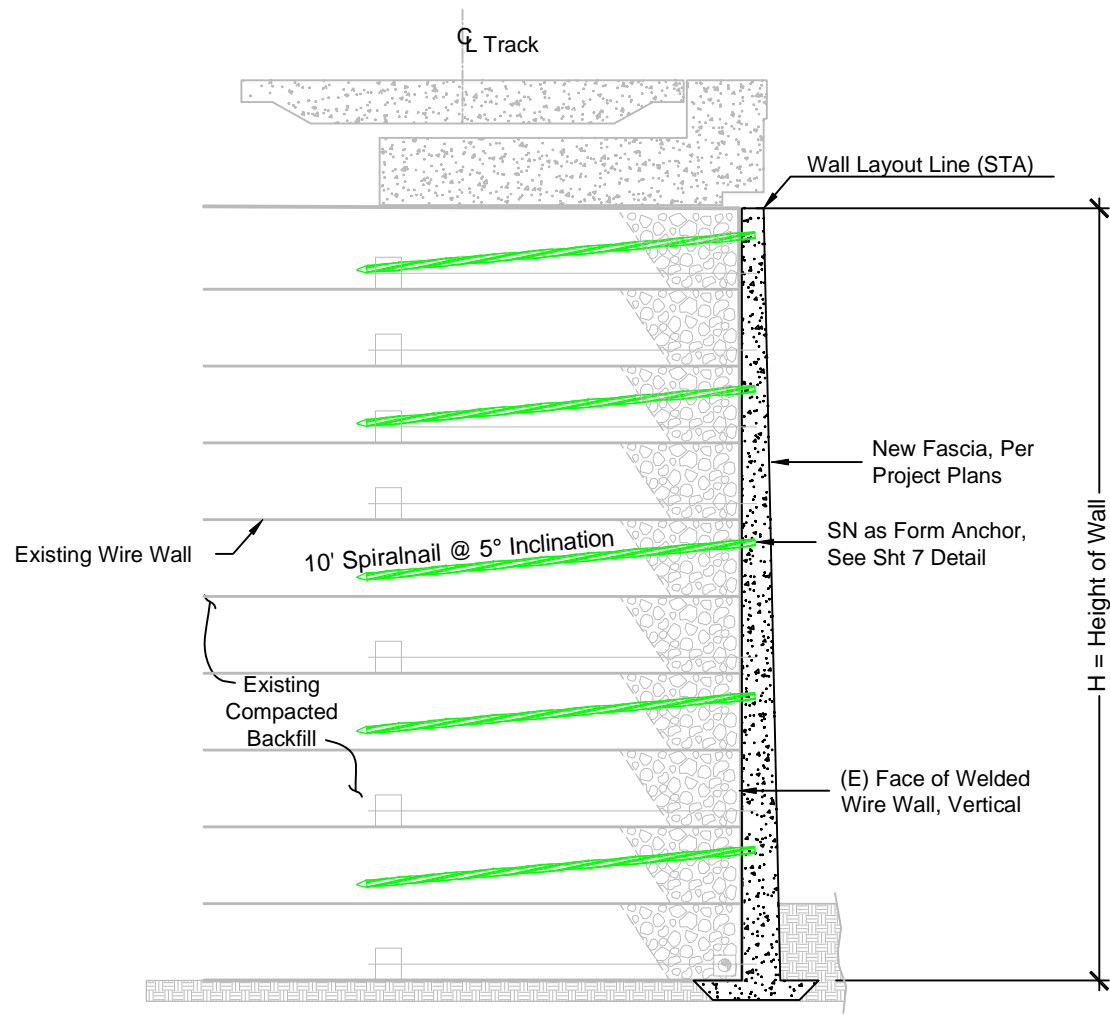
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TRIMET PORTLAND-MILWAUKIE LIGHT RAIL - EAST SEGMENT
W-N-1 ELEVATION VIEW

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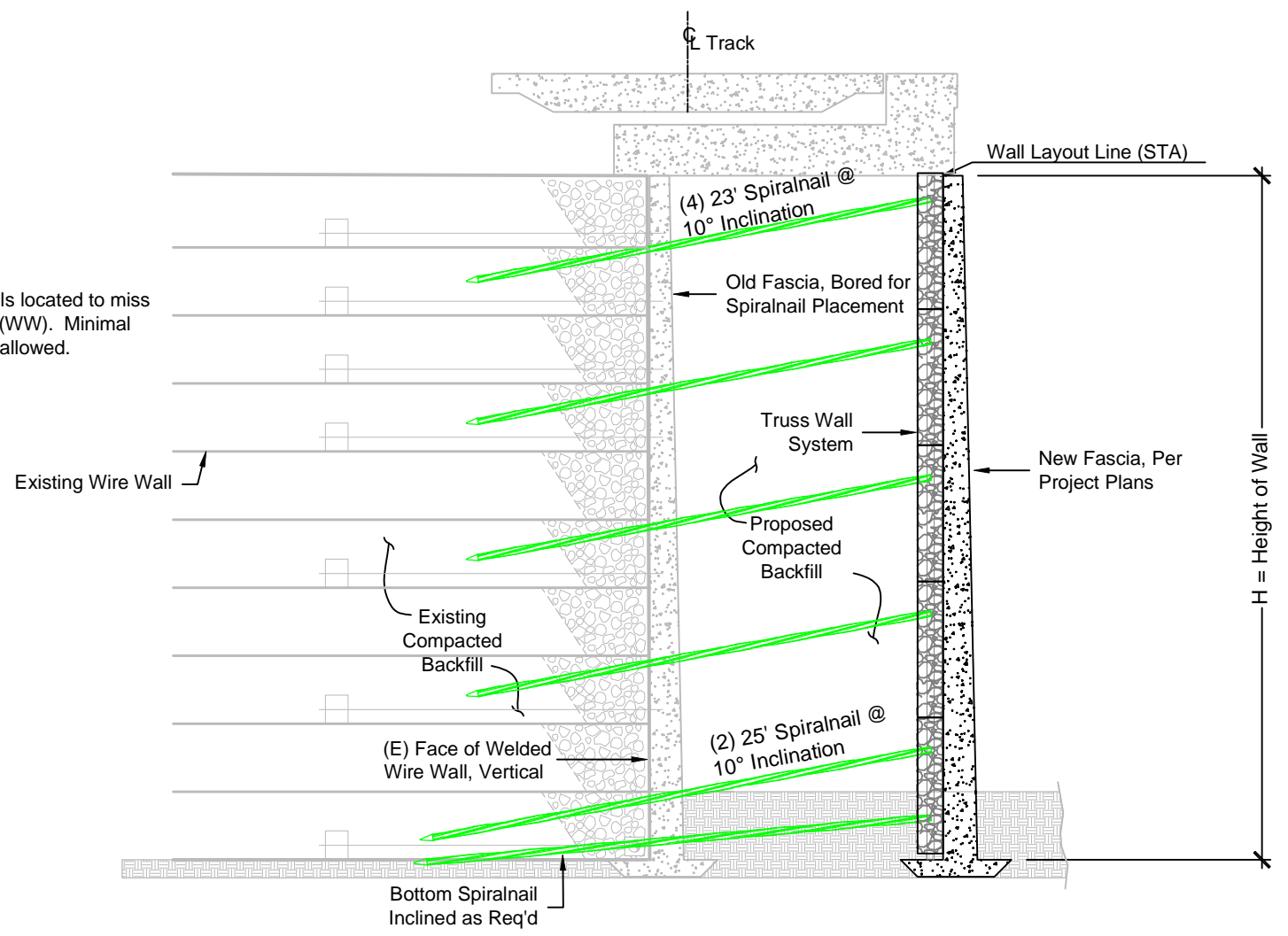
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TYPICAL WALL SECTION (A)

SCALE: 1" = 5'

NOTE:
Proposed Spiralnails located to miss Existing Wire Wall (WW). Minimal WW displacement allowed.



TYPICAL WALL SECTION B

SCALE: 1" = 5'

SN FORM ANCHOR CAPACITY	
Distance From Top of Wall to bottom of anchor(ft)	Anchor Capacity (lbs)
1	9,000
5	12000 max allowed

SPIRALNAIL LENGTH & INCLINATION ANGLE	
Wall Section	Spiralnail Quantity- Length & Inclination Angle (Top to Bottom)
SECTION A - Wall Height 23' Max	(5) - 10' @ 5° (4' o.c.)
SECTION B - Wall Height 21' Max	(4) - 23' @ 10° (4' o.c.) (2) - 25' @ 10° (4' o.c.)

NOTE:
If within a section there are less nails required (shorter than the max allowed height), nails may be eliminated from the bottom up.



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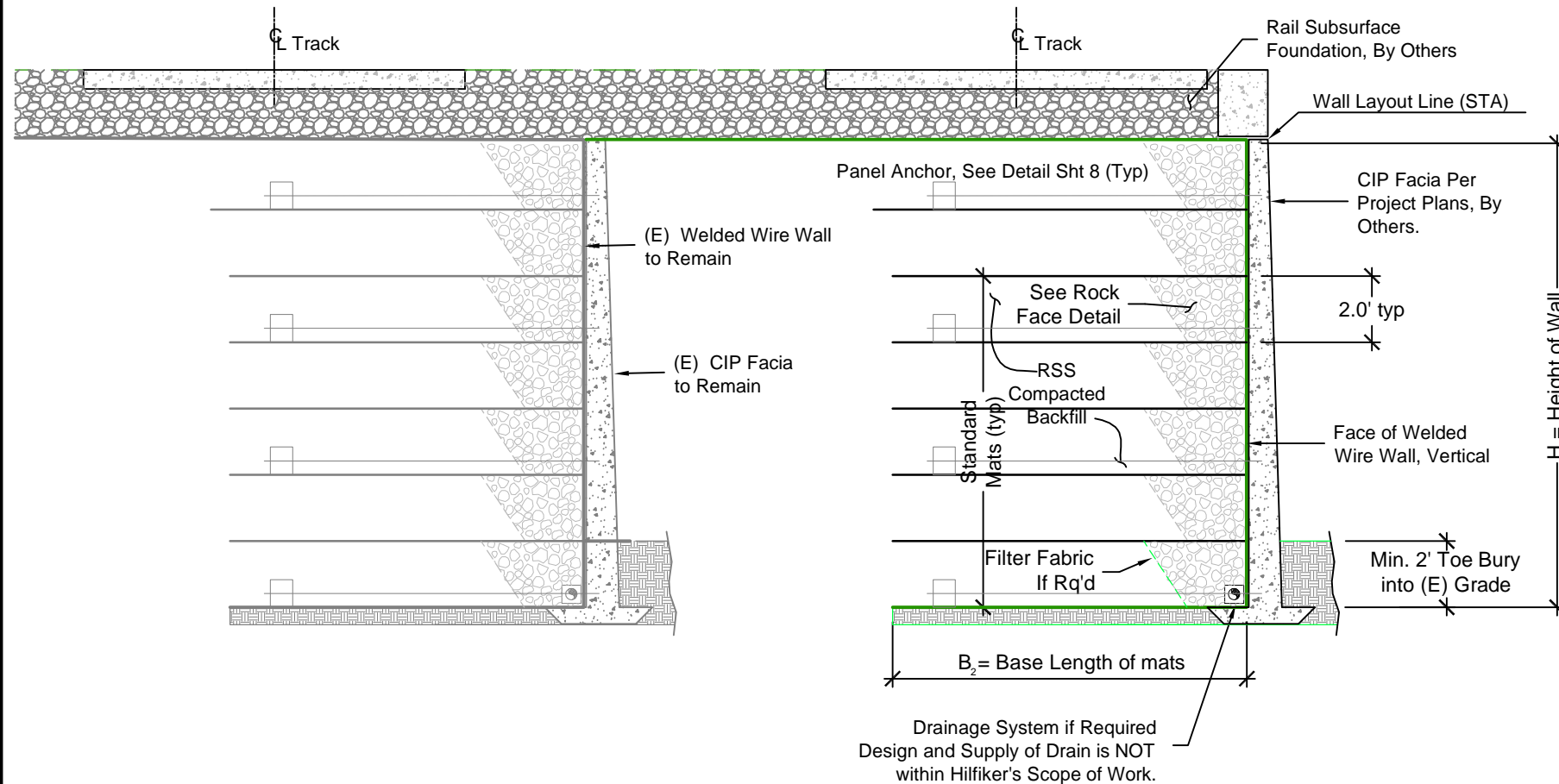
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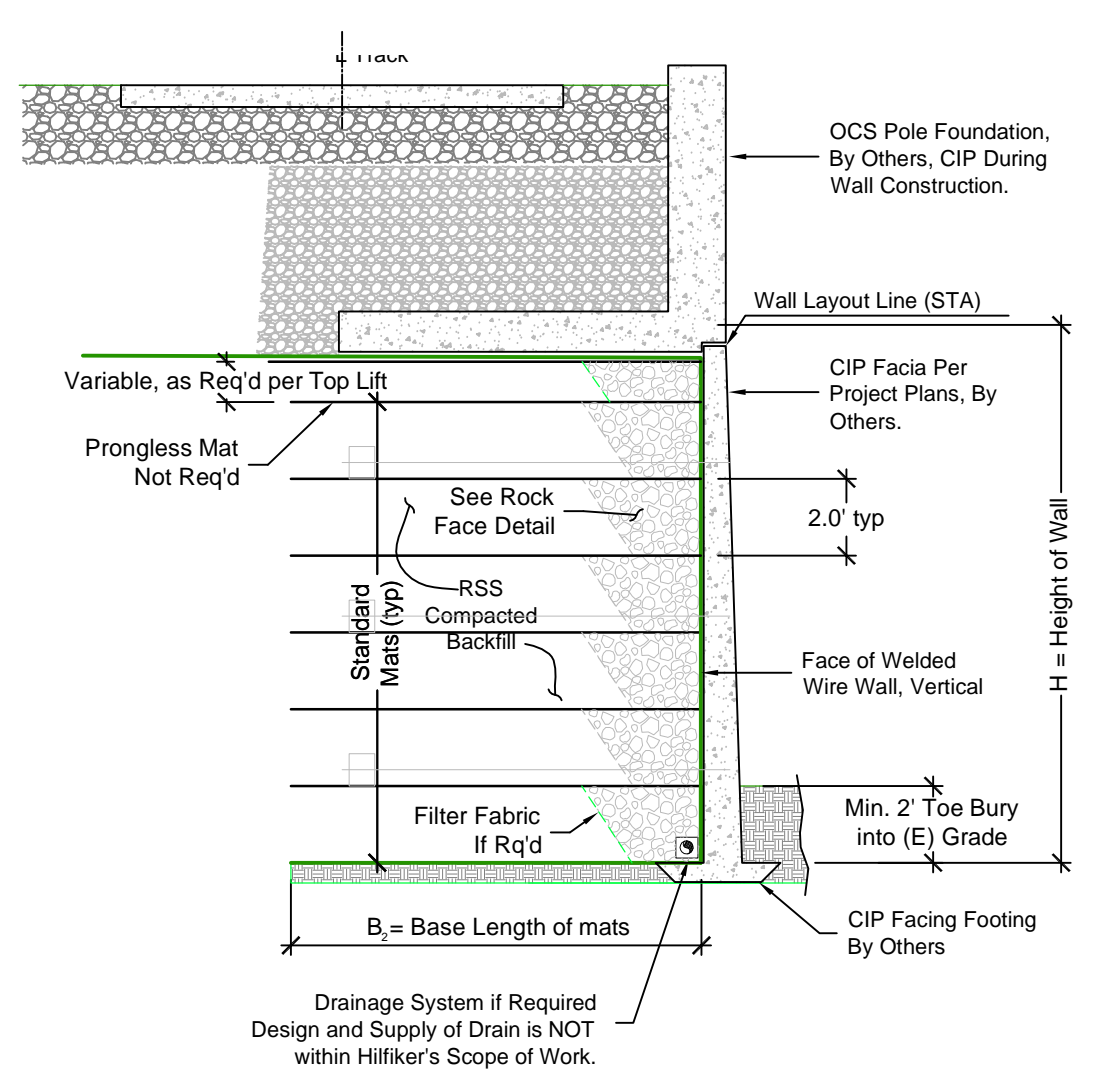
W-N-1 CROSS SECTIONS

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SHT 3 OF 8	

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TYPICAL WALL SECTION (C)
SCALE: 1" = 5'



WALL SECTION @ OCS POLE
SCALE: 1" = 5'

**WELDED WIRE WALL PARAMETERS,
UNLESS OTHERWISE NOTED
UNIQUELY LOADED CONDITIONS EXIST**

Height of Wall (H) ft	Length of Cap & Prongless Mats (B1) ft, where Req'd	Base Length of Mats (B2) ft
≤8	8	8.75
≤10	9	8.75
≤11	9	9.6
≤12	10	10.5
≤15	12	12.25
≤16	13	13.13
≤17	14	14

Cap & Top Mats (B1) are 8x12 W7.0x3.5 WWR (Type 1)
Standard Mats (B2) are 8x10.5 W7.0x4.0 WWR (Type 2),
Unless Otherwise Noted Finish: Hot Dip Galvanized - 75 Year Life



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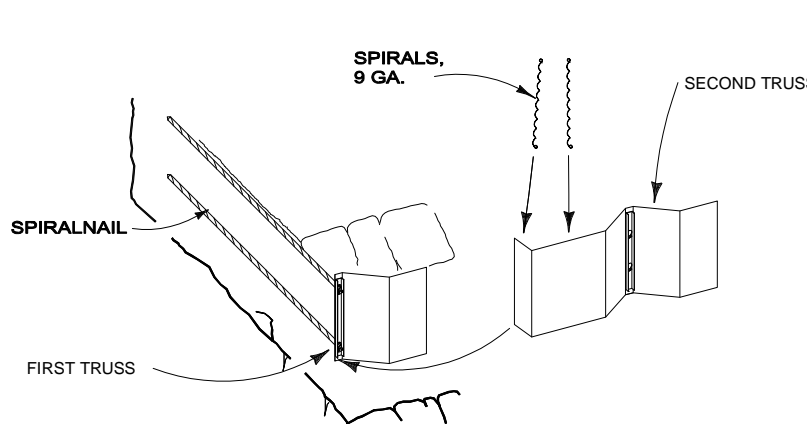
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TRIMET PORTLAND-MILWAUKIE LIGHT RAIL - EAST SEGMENT

W-N-1 CROSS SECTIONS

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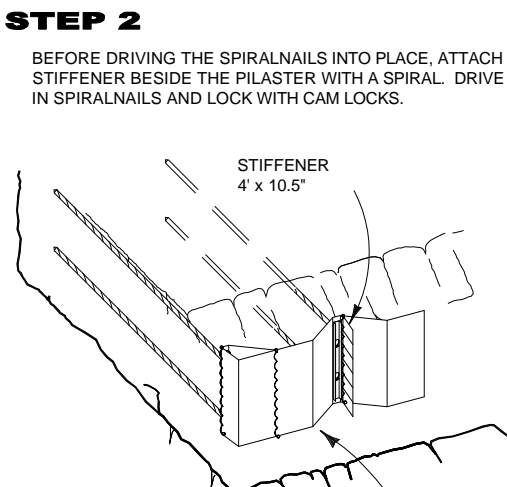


STEP 1

PLACE FIRST TRUSS AGAINST PREPARED SLOPE.

PLACE THE PILASTER CHANNEL AGAINST THE EDGE OF THE TRUSS AND DRIVE SPIRALNAILS THROUGH THE PILASTER INTO THE SOIL. PLACE CAM LOCK ON EACH SPIRALNAIL AND TIGHTEN TO TORQUE SPECIFICATIONS

PLACE THE SECOND TRUSS OVER THE FIRST TRUSS USING SPIRALS TO CONNECT THE MATS AS SHOWN.

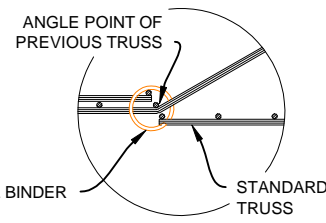
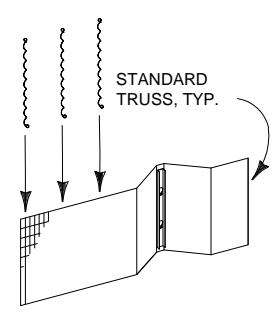


STEP 2

BEFORE DRIVING THE SPIRALNAILS INTO PLACE, ATTACH STIFFENER BESIDE THE PILASTER WITH A SPIRAL. DRIVE IN SPIRALNAILS AND LOCK WITH CAM LOCKS.

STEP 3

PLACE STANDARD TRUSS AGAINST ANGLE POINT OF THE PREVIOUS TRUSS AND SPIRAL THE SECOND VERTICAL WIRE OF THE STANDARD TRUSS TO ALL VERTICAL WIRES AT THAT POINT. SEE DETAILS.

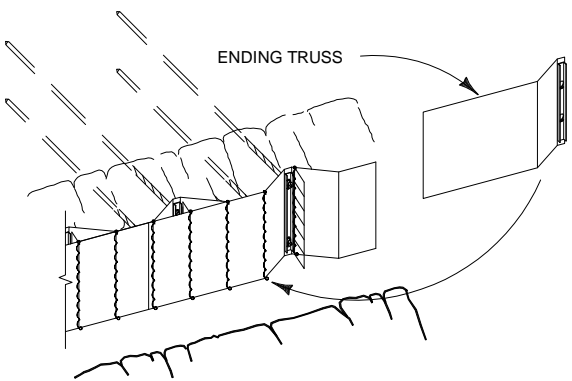
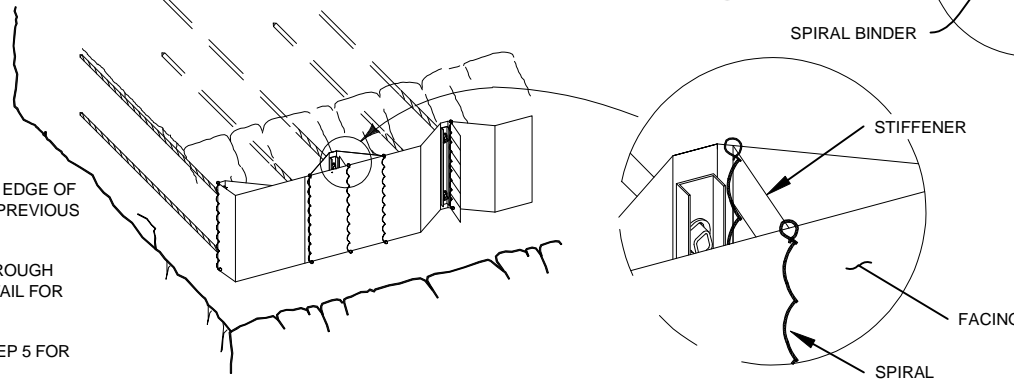


STEP 4

CONTINUE SPIRALING STANDARD TRUSS TO FRONT EDGE OF STIFFENER AND TO THE LAST ANGLE POINT IN THE PREVIOUS TRUSS. EACH SPIRAL WILL BE ABOUT ±2' APART.

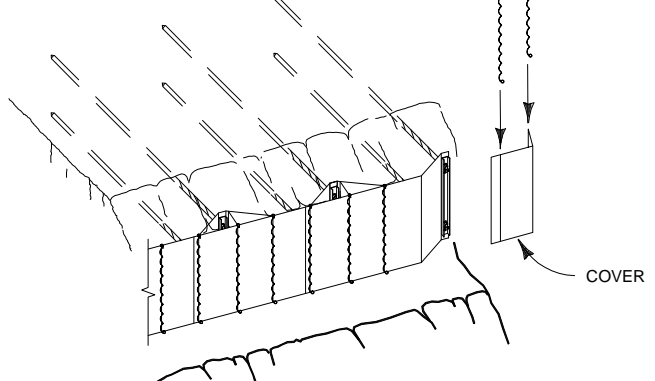
PLACE PILASTER CHANNEL, DRIVE SPIRALNAILS THROUGH PILASTERS, ADD CAM LOCK AND TIGHTEN. SEE DETAIL FOR JOINING STIFFENER TO THE TRUSS.

REPEAT STEPS 3 & 4 UNTIL ENDING TRUSS. SEE STEP 5 FOR ENDING TRUSS PLACEMENT.



STEP 5

PLACE ENDING TRUSS AGAINST ANGLE POINT OF FINAL STANDARD TRUSS AND SPIRAL SECOND TRANSVERSE WIRE TO JOIN. DRIVE SPIRALNAILS AND ADD CAM LOCKS, TIGHTEN. CAM LOCK DETAIL, SEE SHT 7.

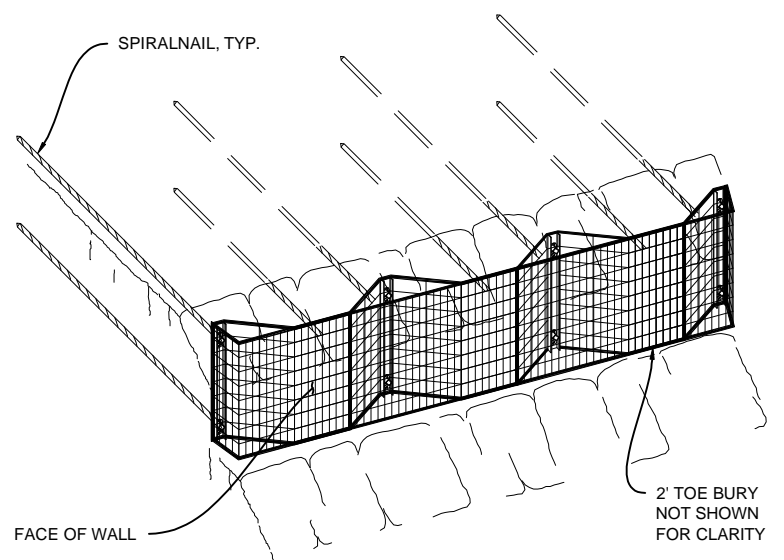
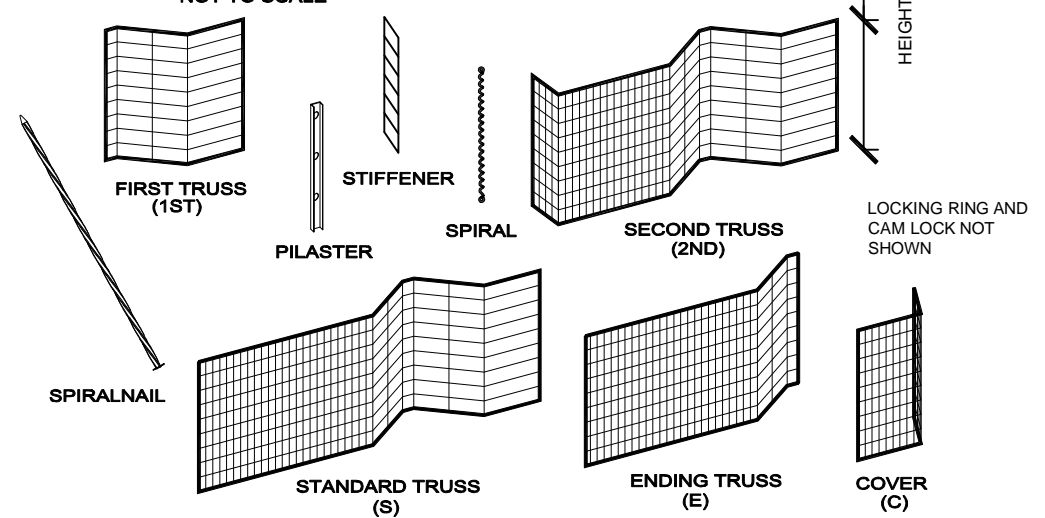


STEP 6

SPIRAL COVER AT SECOND TRANSVERSE WIRE TO JOIN PREVIOUS TRUSS. SPIRAL END OF COVER TO END OF PREVIOUS TRUSS

CONSTRUCTION SEQUENCE

TRUSS WALL COMPONENTS
NOT TO SCALE



ISOMETRIC VIEW
NOT TO SCALE



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TRIMET PORTLAND-MILWAUKIE LIGHT RAIL - EAST SEGMENT

W-N-1 TRUSSWALL DETAILS

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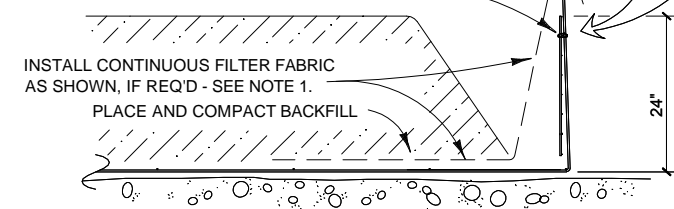
STEP 1

PLACE THE FIRST COURSE OF SOIL REINFORCEMENT MATS ON PREPARED FOUNDATION



STEP 2

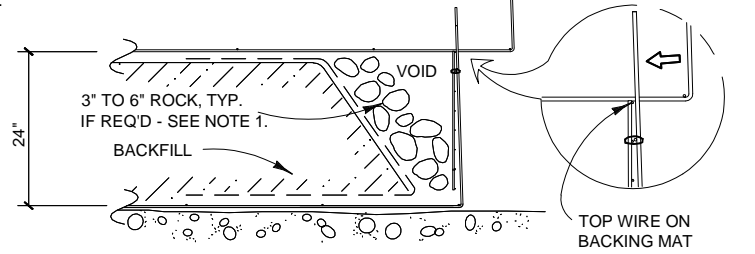
PLACE THE BACKING MAT AGAINST THE INSIDE FACE OF THE SOIL REINFORCEMENT MAT. CLIP THE SECOND-TO-TOP TRANSVERSE WIRE ON THE BACKING MAT TO THE TOP TRANSVERSE WIRE ON THE SOIL REINFORCEMENT MAT.



STEP 3

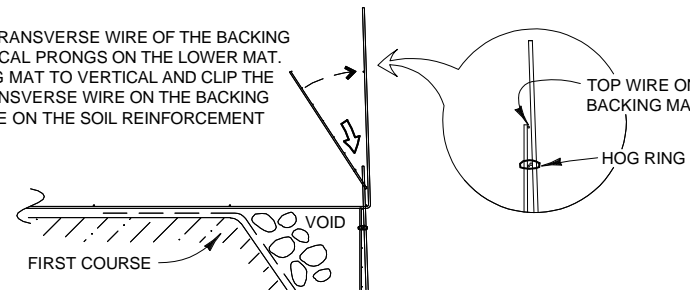
BRING THE FILTER FABRIC OVER THE FRONT AND TOP OF THE BACKFILL AS SHOWN. PLACE THE ROCK IN THE FACE OF THE WALL. LEAVE A VOID AS SHOWN.

PLACE THE SECOND COURSE OF SOIL REINFORCEMENT MATS WITH THE BASE LONGITUDINAL WIRES RESTING ON THE TOP TRANSVERSE WIRE OF THE BACKING MAT BELOW. SLIDE THE SOIL REINFORCEMENT MAT INTO ALIGNMENT.



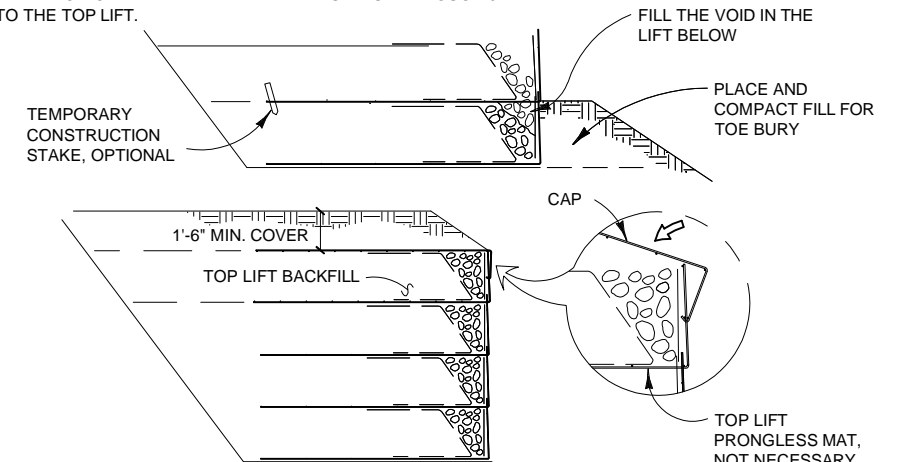
STEP 4

HOOK THE BOTTOM TRANSVERSE WIRE OF THE BACKING MAT OVER THE VERTICAL PRONGS ON THE LOWER MAT. ROTATE THE BACKING MAT TO VERTICAL AND CLIP THE SECOND-TO-TOP TRANSVERSE WIRE ON THE BACKING MAT TO THE TOP WIRE ON THE SOIL REINFORCEMENT MAT.



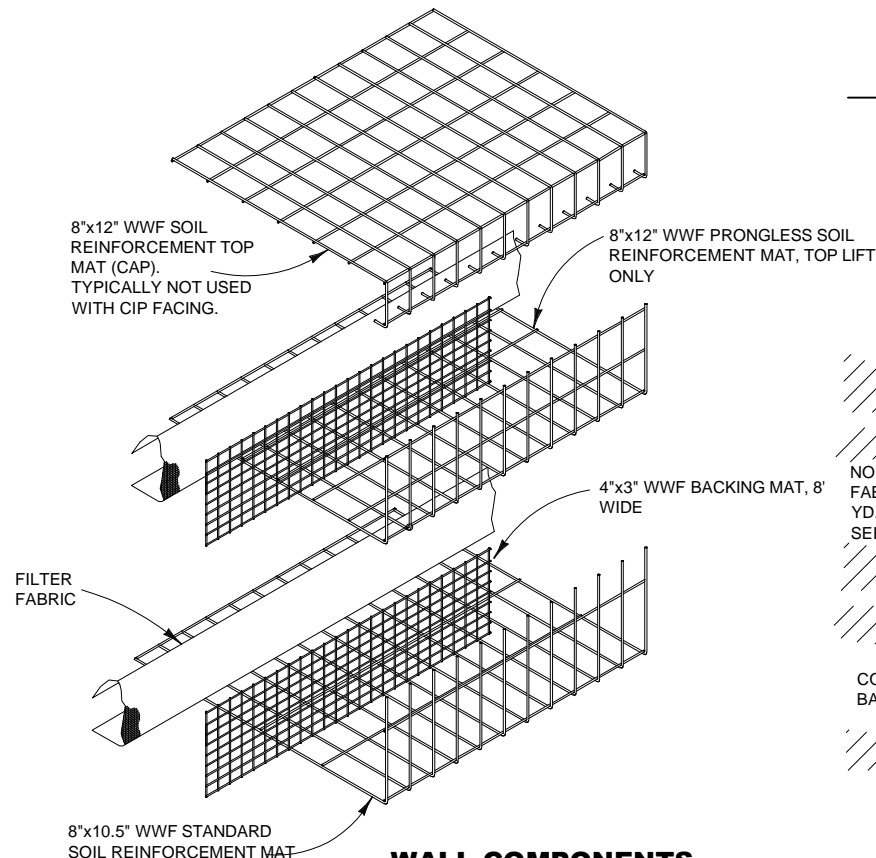
STEP 5

INSTALL THE FILTER FABRIC AS IN STEPS 2 AND 3 AND INSTALL CONTINUOUS HARDWARE CLOTH BEHIND THE BACKING MAT. PLACE AND COMPACT THE BACKFILL AND ROCK TO THE BASE ELEVATION OF THE NEXT MAT. REPEAT STEPS 2 THROUGH 5 TO THE TOP LIFT.



STEP 6: TOP LIFT, VARIES WITH CIP FACING (SEE SHT8)

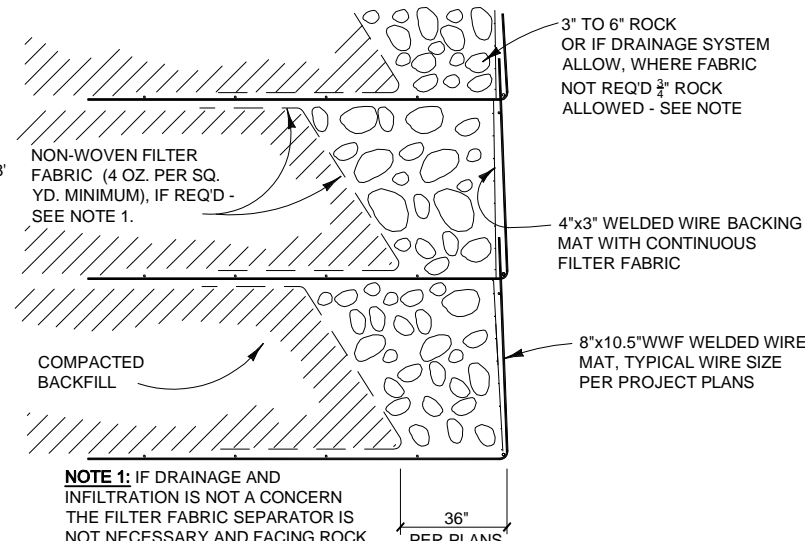
PLACE THE TOP LIFT PRONGLESS MAT, BACKING MAT AND FILTER FABRIC. PLACE AND COMPACT BACKFILL AND ROCK IN THE TOP LIFT. HOOK THE CAP OVER THE MIDDLE TRANSVERSE WIRE ON THE PRONGLESS MAT, AND ROTATE INTO PLACE. PLACE AND COMPACT COVER OVER TOP MAT TO 1'-6" MINIMUM DEPTH.



WALL COMPONENTS
NOT TO SCALE

CONSTRUCTION SEQUENCE

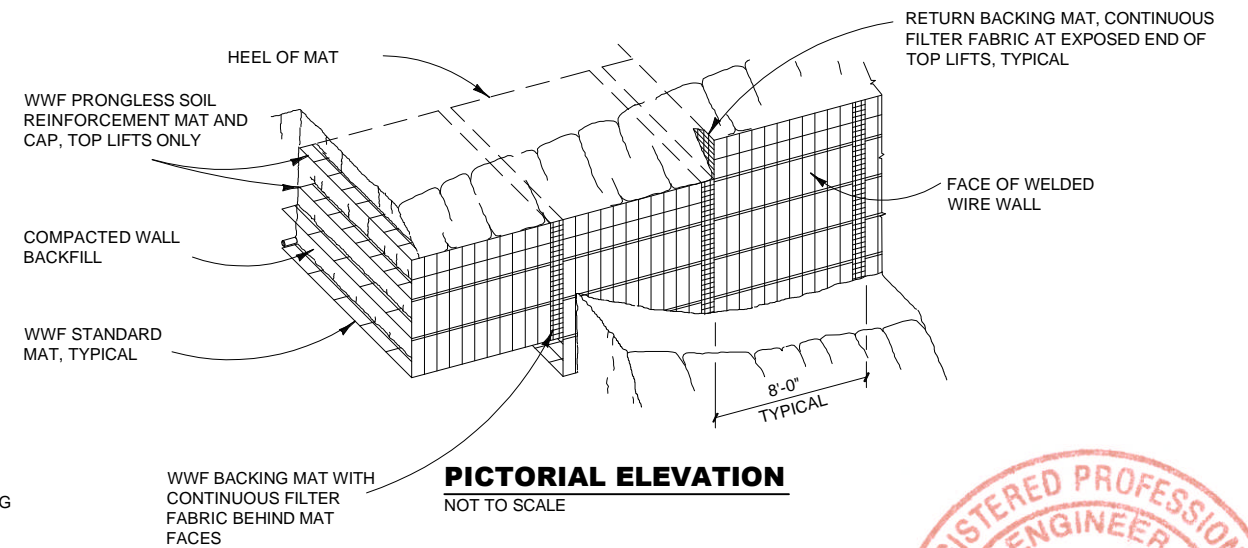
NOT TO SCALE



NOTE 1: IF DRAINAGE AND INFILTRATION IS NOT A CONCERN THE FILTER FABRIC SEPARATOR IS NOT NECESSARY AND FACING ROCK CAN BE 3/4" TYP.

ROCK-FACE DETAIL

NOT TO SCALE



PICTORIAL ELEVATION
NOT TO SCALE



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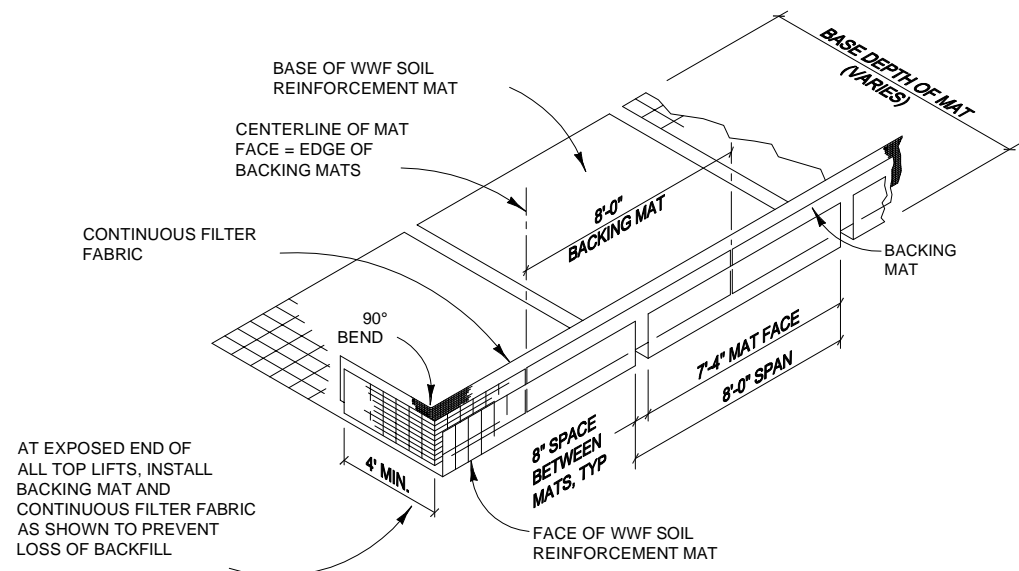
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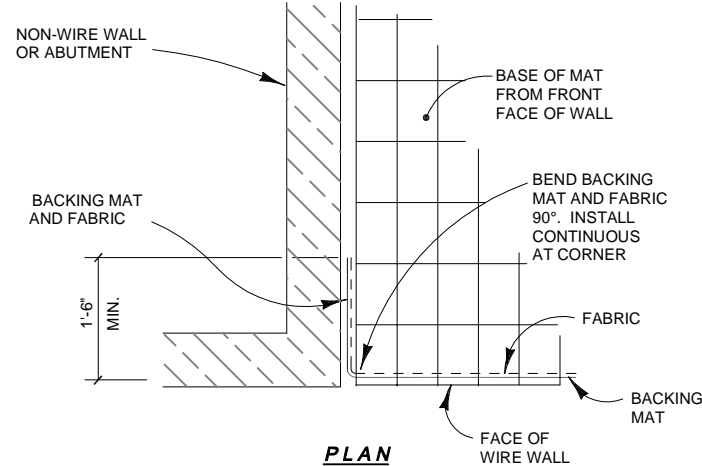
W-N-1 WIRE WALL DETAILS

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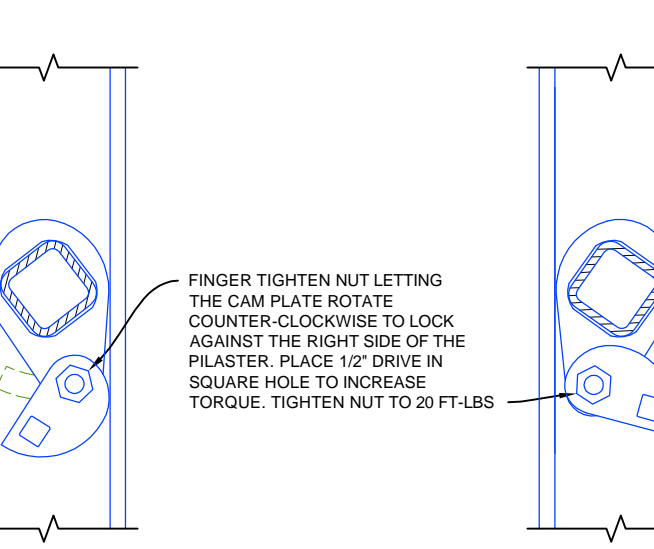
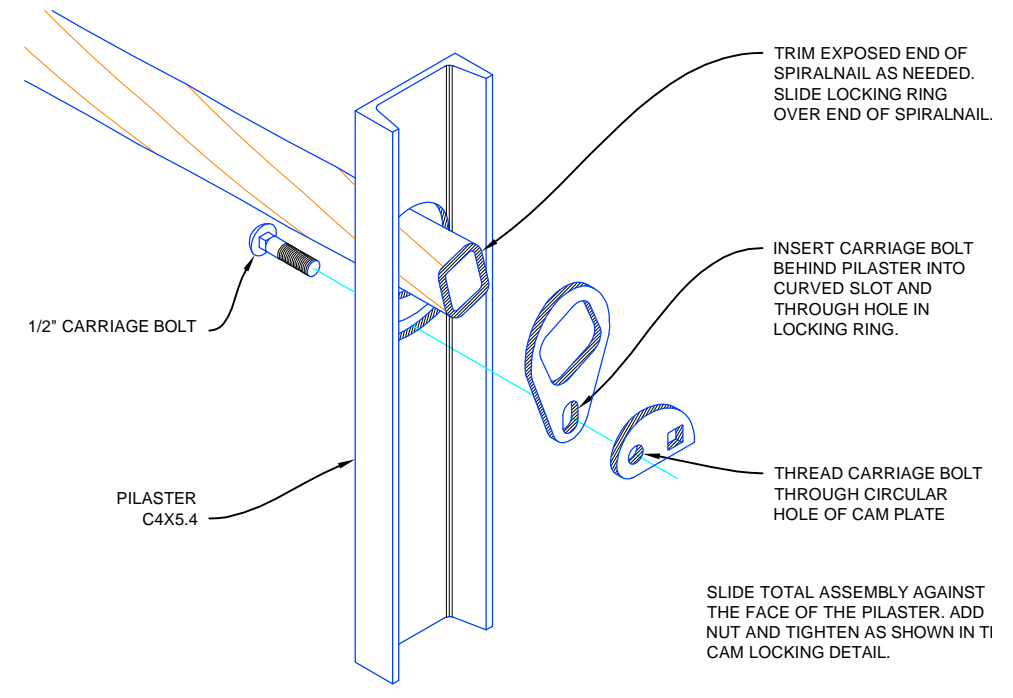
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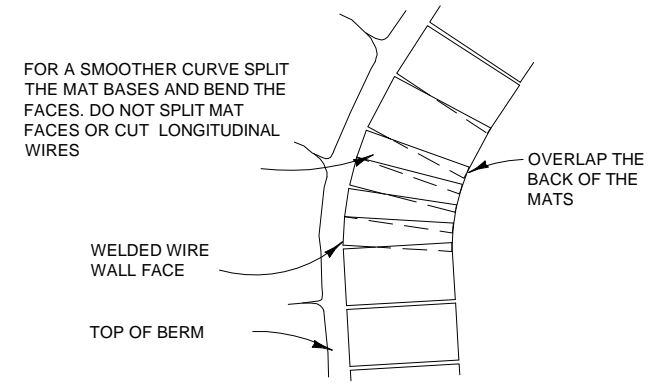
ISOMETRIC VIEW
WELDED WIRE WALL COMPONENTS WITH RETURN MAT
 NOT TO SCALE



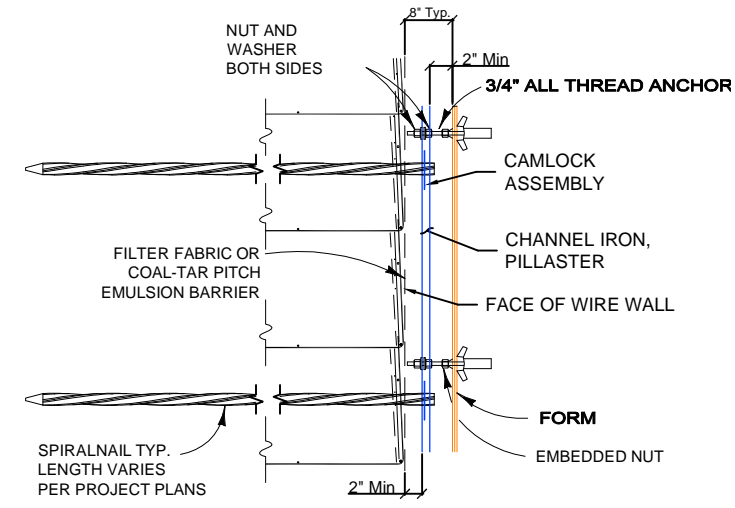
PLAN
WIRE WALL ABUTTING CONCRETE WALL



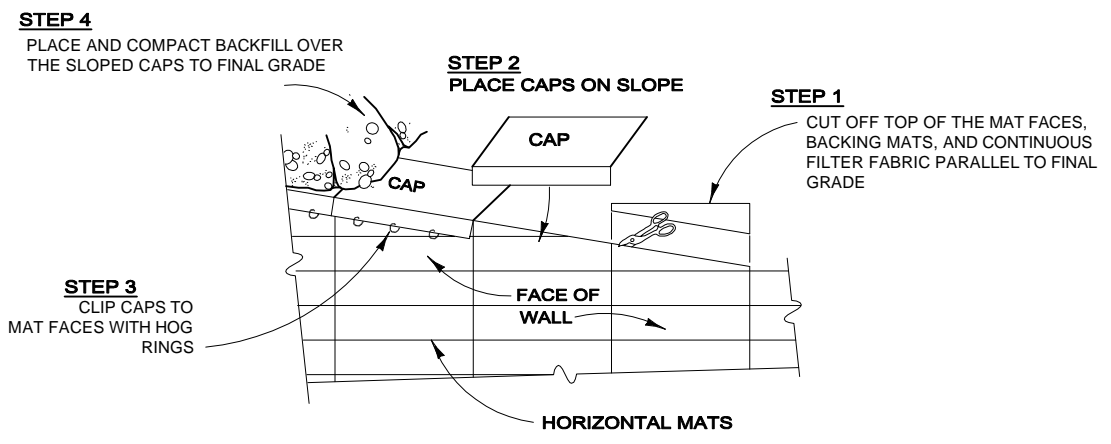
CAM LOCK LOCKING DETAIL
 NOT TO SCALE



PLAN VIEW
CONVEX CURVE
 NOT TO SCALE



SECTION
FORM ANCHOR DETAIL
 NOT TO SCALE



PICTORIAL ELEVATION
SLOPED CAP MAT DETAIL
 NOT TO SCALE



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TRIMET PORTLAND-MILWAUKIE LIGHT RAIL - EAST SEGMENT
 W-N-1 WIRE WALL & SN DETAILS

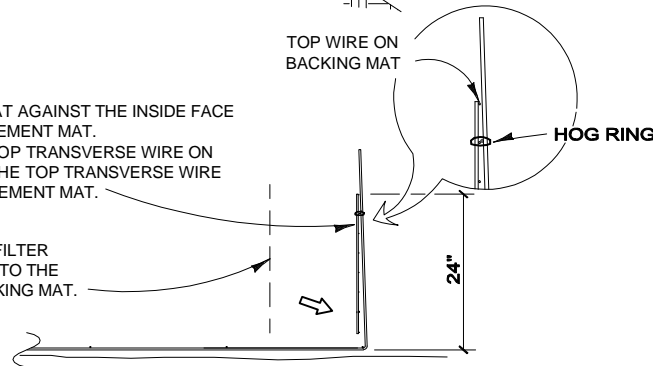
FOUNDATION

1. PLACE THE FIRST COURSE OF SOIL REINFORCEMENT MATS ON PREPARED FOUNDATION.



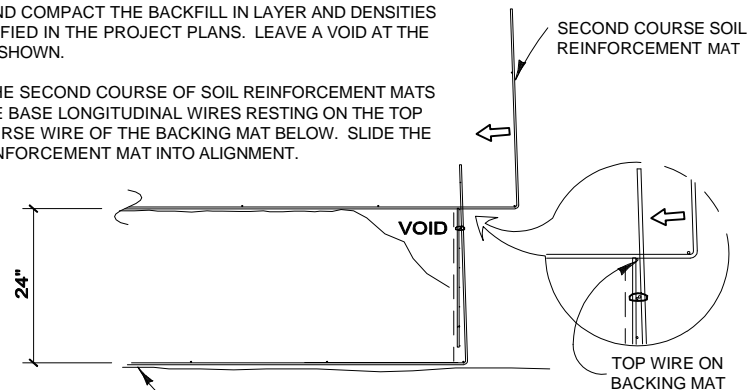
BOTTOM MAT

1. PLACE THE BACKING MAT AGAINST THE INSIDE FACE OF THE SOIL REINFORCEMENT MAT. CLIP THE SECOND-TO-TOP TRANSVERSE WIRE ON THE BACKING MAT TO THE TOP TRANSVERSE WIRE ON THE SOIL REINFORCEMENT MAT.
2. INSTALL CONTINUOUS FILTER FABRIC AND HOG-RING TO THE TOP WIRE ON THE BACKING MAT.



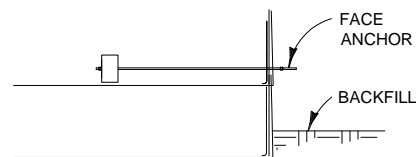
SECOND LIFT

1. PLACE AND COMPACT THE BACKFILL IN LAYER AND DENSITIES AS SPECIFIED IN THE PROJECT PLANS. LEAVE A VOID AT THE FACE AS SHOWN.
2. PLACE THE SECOND COURSE OF SOIL REINFORCEMENT MATS WITH THE BASE LONGITUDINAL WIRES RESTING ON THE TOP TRANSVERSE WIRE OF THE BACKING MAT BELOW. SLIDE THE SOIL REINFORCEMENT MAT INTO ALIGNMENT.



SECOND LEVEL CONT'D

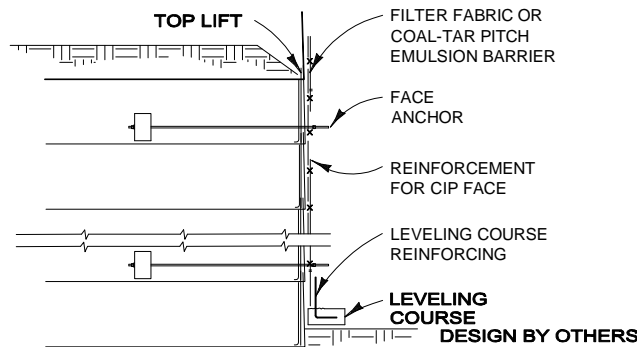
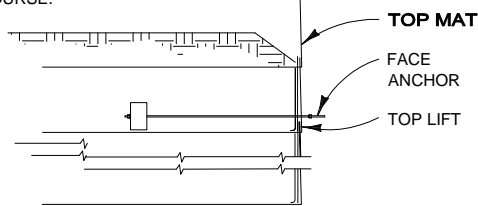
1. PUT AN 8" LAYER OF FILL IN THE BOTTOM OF LIFT AND COMPACT ACCORDING TO PLANS.
2. INSTALL THE FACE ANCHORS TO THE SPACING SHOWN IN THE PROJECT PLANS.
3. CAREFULLY BACKFILL AND COMPACT SECOND 8" LAYER OF FILL AROUND FACE ANCHORS BEING CAREFUL NOT TO BREAK OR BEND THE ANCHOR ROD.
4. BACKFILL TOE OF WALL TO ELEVATION OF BOTTOM OF LEVELING COURSE.
5. FINISH FILLING AND COMPACTING SECOND LEVEL AS REQUIRED. CONTINUE ADDING COURSES UNTIL THE TOP LIFT.



CONSTRUCTION SEQUENCE FOR CAST IN PLACE FACING PREPARATION
NOT TO SCALE

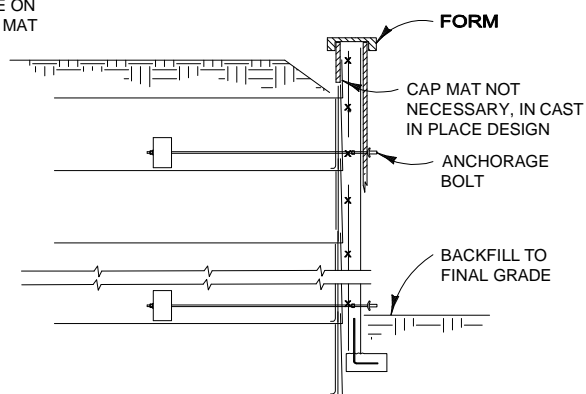
TOP LIFT

1. INSTALL THE FACE ANCHORS TO THE SPACING SHOWN IN THE PROJECT PLANS.
2. INSTALL TOP MAT. THERE IS NO BACKING MAT INSIDE THE FACE OF THE TOP LIFT.
3. BACKFILL TO ANCHOR THE TOP MAT.
4. BACKFILL TOE OF WALL TO ELEVATION OF BOTTOM OF LEVELING COURSE.



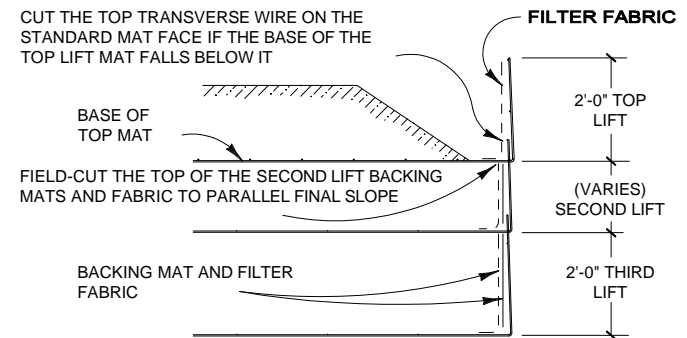
LEVELING COURSE, REINFORCING

1. INSTALL FILTER FABRIC OR COAL-TAR PITCH EMULSION BARRIER.
2. POUR LEVELING COURSE TO ELEVATION SHOWN IN THE PROJECT PLANS.
3. INSTALL REINFORCING FOR CAST-IN-PLACE FACE.

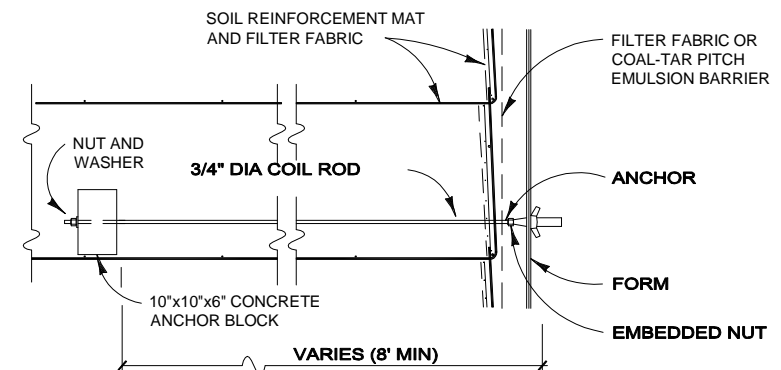


CASTING THE FACE

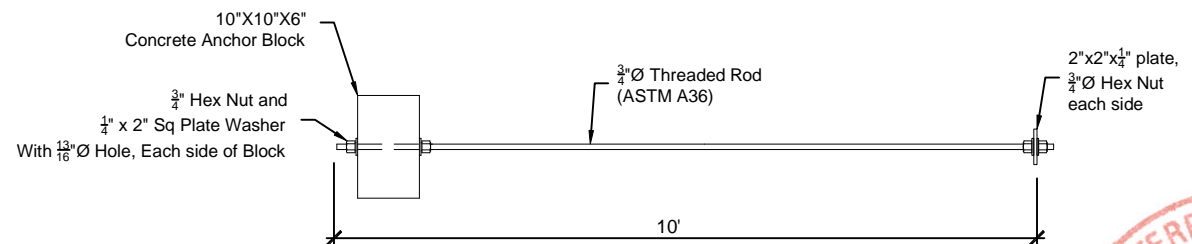
1. ATTACH THE FORMS TO THE FACE ANCHOR BOLTS.
2. CAST CONCRETE AS SHOWN IN PROJECT PLANS.
3. STRIP FORMS AND BACKFILL AT TOE TO FINAL GRADE.
4. FINISH TOP OF WALL PER PROJECT PLANS.



ERS TOP LIFT SECTION
NOT TO SCALE



FACE ANCHOR DETAIL
NOT TO SCALE



PANEL ANCHORAGE COMPONENTS

NTS

PANEL ANCHOR CAPACITY	
Distance From Top of Wall to bottom of anchor(ft)	Anchor Capacity (lbs)
2	3000
6	11700
10	12000 max allowed

NOTE:

Standard Anchors shown @ 4' o.c. Vertical and Horizontal spacing Concrete Pour rates are determined by anchor capacity and anchor spacing



EXPIRATION DATE: 12/31/13

HRW 120416AN

P:\12-050-HRW - Trimet-Portland Milwaukie Light Rail (PMLP)-HRW - Trimet-Portland Milwaukie LR(10-25-12).dwg - Last Saved: 1/3/2013 9:18 AM

REV.NO.	DATE	BY	DESCRIPTION
	10/23/12	KLC	INITIAL .PDF RELEASE
	11/20/12	KLC	RESPONSE TO PLAN CHECK COMMENTS

HILFIKER RETAINING WALLS

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TRIMET PORTLAND-MILWAUKIE LIGHT RAIL - EAST SEGMENT
W-N-1 CONSTRUCTION SEQUENCE
PANEL ANCHORS W/ DETAILS

PROJECT	12-050
DATE	10-23-12
DESIGN	KLC
DRAWN	KLC