

**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: 135 pcf  
 Internal Friction Angle: 36°  
 Cohesion = 0 psf  
 Retained Backfill:  
 Unit Weight: 115 pcf  
 Internal Friction Angle: 33°  
 Cohesion = 0 psf  
 Foundation Soils:  
 Unit Weight: 115 pcf  
 Friction Angle for Sliding: 33°  
 Cohesion = 0 psf  
  
 Traffic Surcharge (LL) = 250 psf

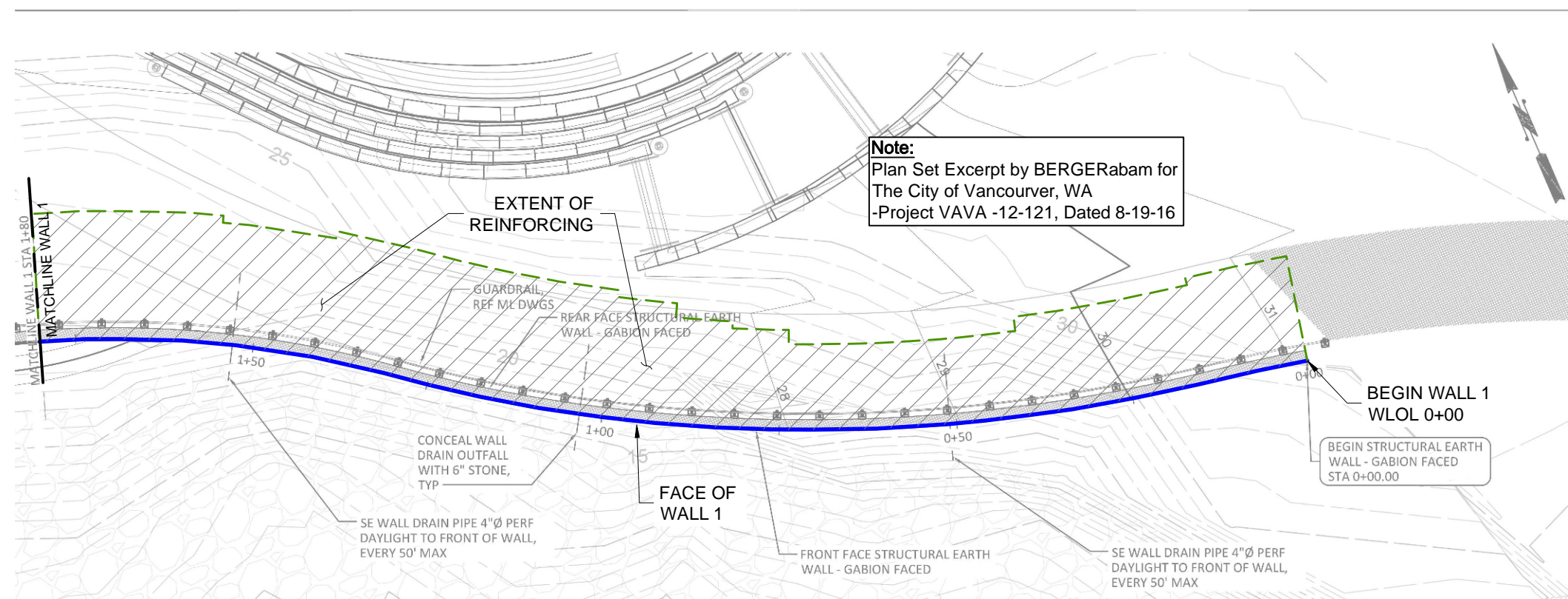
**Worst Case Applied Bearing Pressure by MSE Wall - @ 19.5' Height - 3200 psf.**

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. Field verification of existing ground elevations and bottom of wall elevations should be completed prior to preparation. The applicable Hilfiker construction guide and specifications are an integral part of this submittal.  
  
 This design is intended to be responsible for the internal stability of the retaining wall only, and not for global stability or foundation bearing capacity. CES & Hilfiker Retaining Walls are not responsible for job site drainage, safety and fall protection provisions including compliance with OSHA regulations, nor the Competent Person designated for daily inspection.

| ESTIMATED QUANTITY |      |        |        |        |        |        |        |                |          |
|--------------------|------|--------|--------|--------|--------|--------|--------|----------------|----------|
| SIZE LxWxH         | CY   | WALL 1 | WALL 2 | WALL 5 | WALL 6 | WALL 7 | WALL 8 | TOTAL QUANTITY | TOTAL CY |
| 6x2.25x1.5         | 0.75 | 0      | 33     | 0      | 0      | 0      | 0      | 33             | 24.75 CY |
| 6x1.5x2.0          | 0.66 | 5      | 0      | 0      | 0      | 0      | 0      | 5              | 3.30 CY  |
| 6x1.5x1.5          | 0.50 | 479    | 76     | 8      | 10     | 11     | 18     | 602            | 301 CY   |
| 3x1.5x1.5          | 0.25 | 13     | 2      | 0      | 0      | 0      | 0      | 15             | 3.75 CY  |
| TOTALS             |      |        |        |        |        |        |        |                | 332.8 CY |



**Note:**  
 Plan Set Excerpt by BERGERabam for  
 The City of Vancouver, WA  
 -Project VAVA -12-121, Dated 8-19-16

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

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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| 3-       | 16-17 | KLC | Revised per Plan Check Comments (3-6-17) |
| 6-       | 08-17 | KLC | Revised per Plan Check Comments (5-4-17) |

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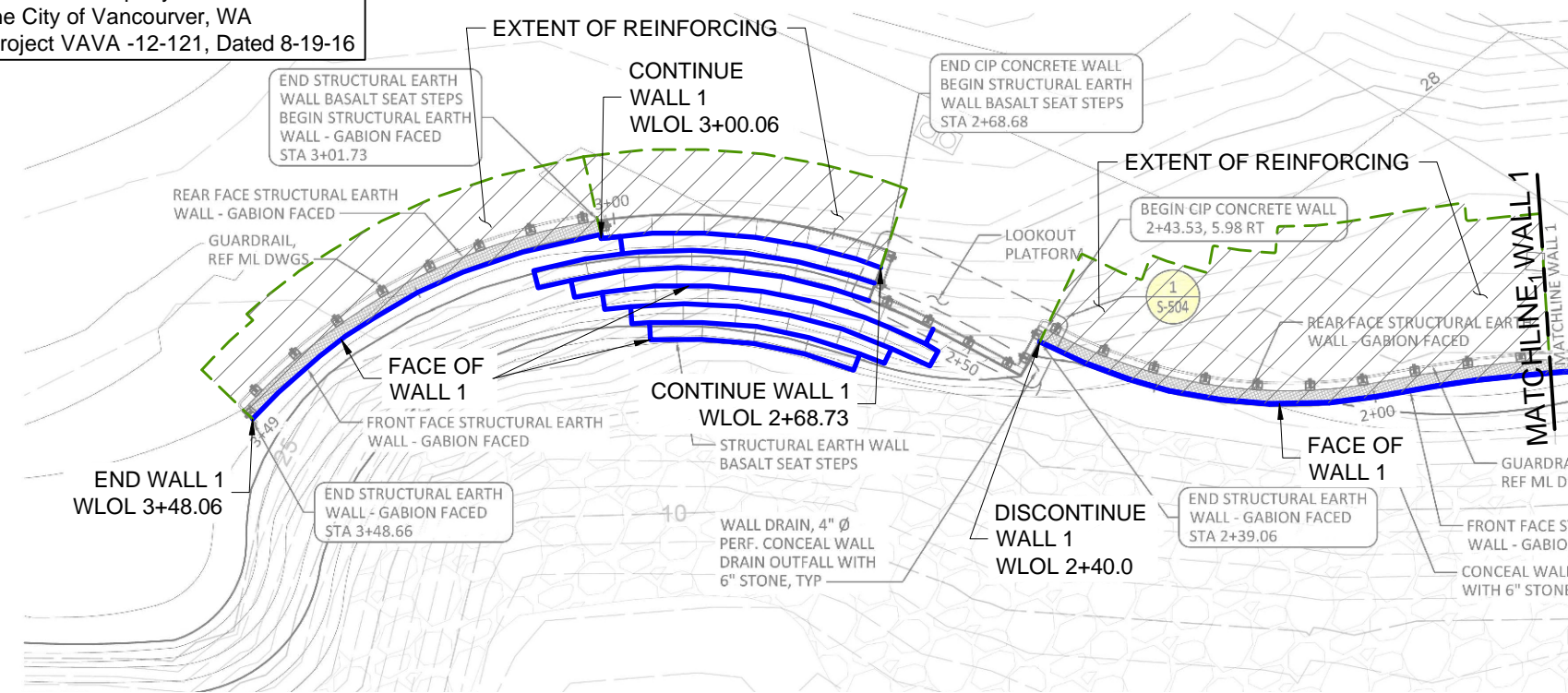
Waterfront Park Grant Street Pier  
**SEW - WALL 1 PLAN VIEW & GENERAL NOTES**

HW 160421AW

|         |         |
|---------|---------|
| PROJECT | 17-004  |
| DATE    | 2-13-17 |
| DESIGN  | KLC     |
| DRAWN   | KLC     |

SHT **1** of 15

**Note:**  
 Plan Set Excerpt by BERGERabam for  
 The City of Vancouver, WA  
 -Project VAVA -12-121, Dated 8-19-16



**PLAN VIEW - WALL 1 (CONT'D)**  
 SCALE: 1" = 20'

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Waterfront Park Grant Street Pier

**SEW - WALL 1 PLAN VIEW (CONT'D)**

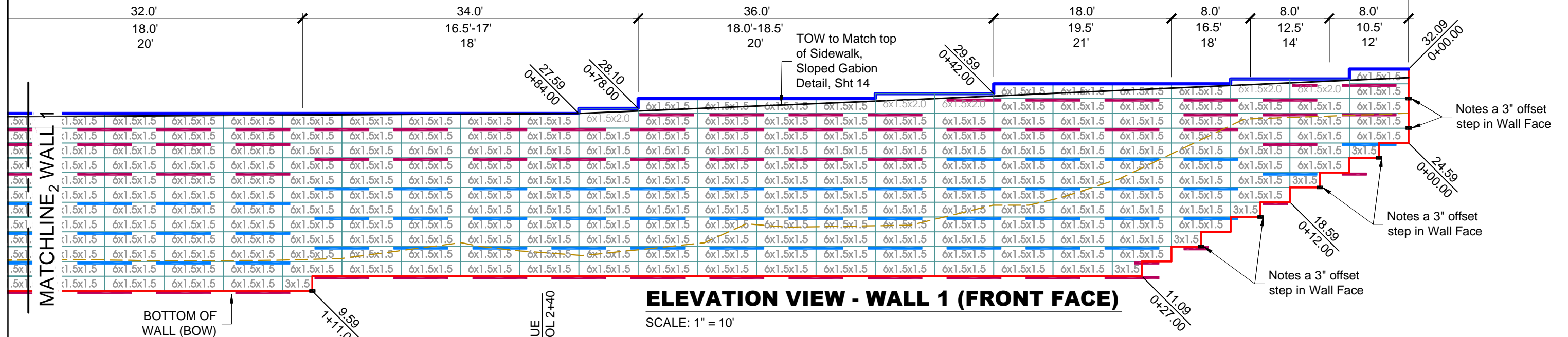
HW 160421AW

|         |         |
|---------|---------|
| PROJECT | 17-004  |
| DATE    | 2-13-17 |
| DESIGN  | KLC     |
| DRAWN   | KLC     |

SHT **2** of 15

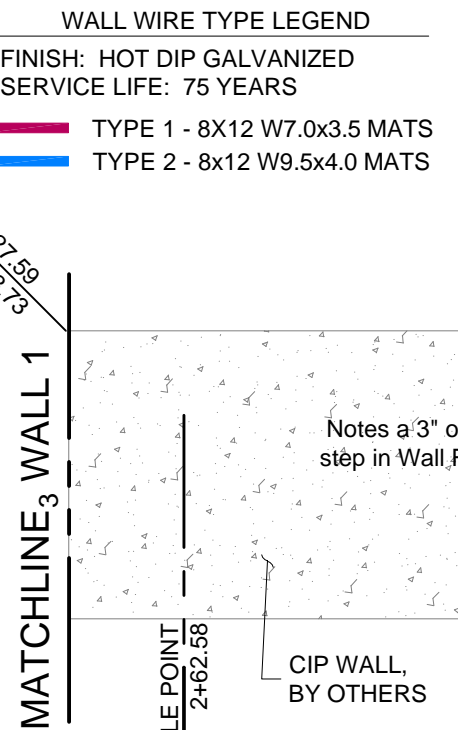
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240' OF WELDED WIRE REINFORCED WALL



| Height of Wall (H) ft | Base Length of Mats (B) ft |
|-----------------------|----------------------------|
| <7.5'                 | 10'                        |
| 9.0'                  | 11'                        |
| 10.5'                 | 12'                        |
| 12.0'                 | 14'                        |
| 13.5'                 | 15'                        |
| 15.0'                 | 17'                        |
| 16.5'-17'             | 18'                        |
| 18'-18.5'             | 20'                        |
| 19.5'                 | 21'                        |

Reinforcing Mats are:  
8x12 W7.0x3.5 WWR (Type 1)  
8x12 W9.5x4.0 WWR (Type 2)  
Finish: HOT DIP Galvanized  
75 Year Service Life



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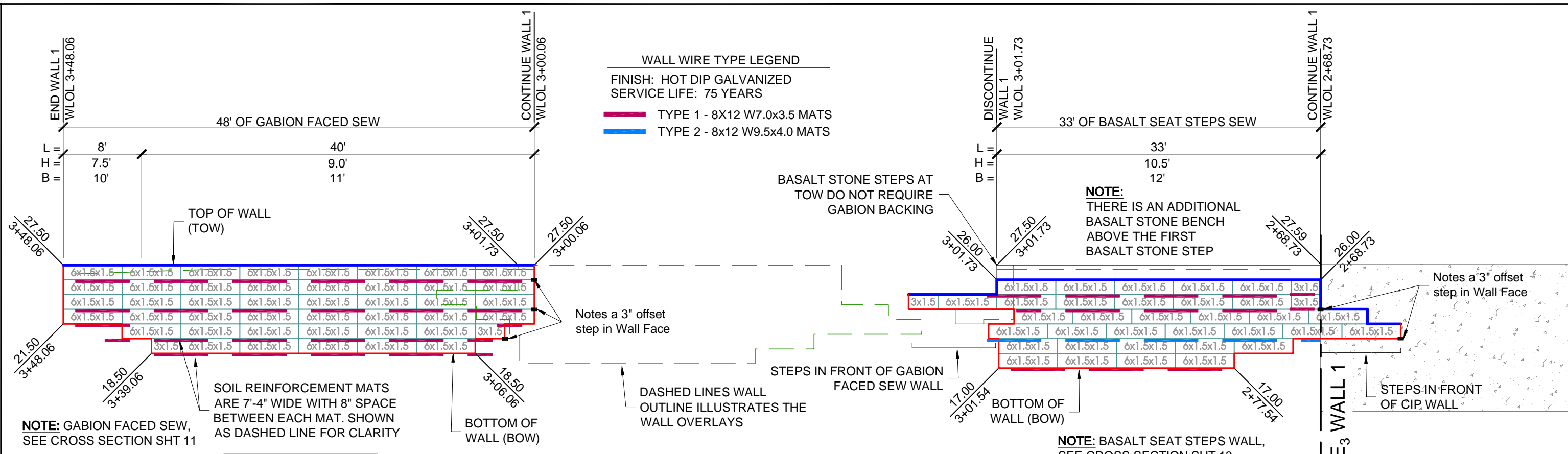
Waterfront Park Grant Street Pier

**GABION FACED SEW - WALL 1**  
ELEVATION VIEW

PROJECT 17-004  
DATE 2-13-17  
DESIGN KLC  
DRAWN KLC

HW 160421AW

SHT 3 of 15

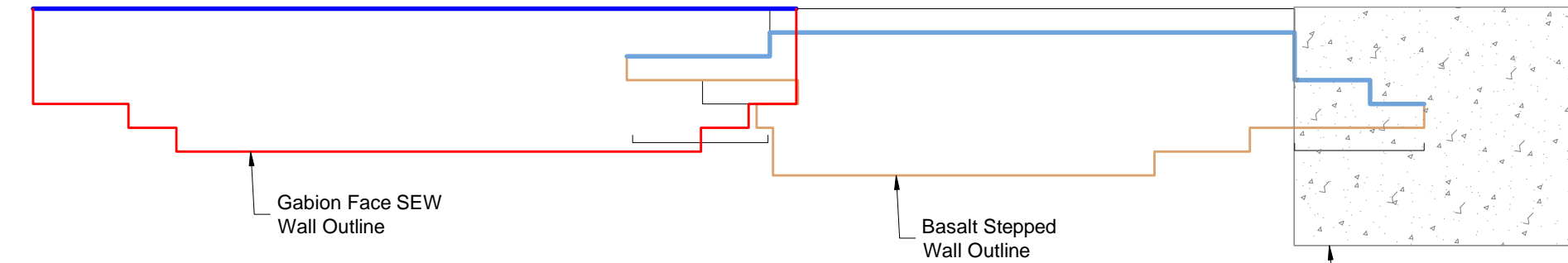


**ELEVATION VIEW - WALL 1 (FRONT FACE) CONT'D**

SCALE: 1" = 10'

| REINFORCING MAT PARAMETERS |                            |
|----------------------------|----------------------------|
| Height of Wall (H) ft      | Base Length of Mats (B) ft |
| ≤7.5'                      | 10'                        |
| 9.0'                       | 11'                        |
| 10.5'                      | 12'                        |
| 12.0'                      | 14'                        |
| 13.5'                      | 15'                        |
| 15.0'                      | 17'                        |
| 16.5'-17'                  | 18'                        |
| 18'-18.5'                  | 20'                        |
| 19.5'                      | 21'                        |

Reinforcing Mats are:  
 8x12 W7.0x3.5 WWR (Type 1)  
 8x12 W9.5x4.0 WWR (Type 2)  
 Finish: HOT DIP Galvanized  
 75 Year Service Life



**ELEVATION VIEW - WALL 1 (STA 2+68 to 3+48)**

SCALE: 1" = 10'

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Waterfront Park Grant Street Pier

**BASALT & GABION SEAT STEP SEW - WALL 1 ELEVATION VIEW (CONT'D)**

HW 160421AW

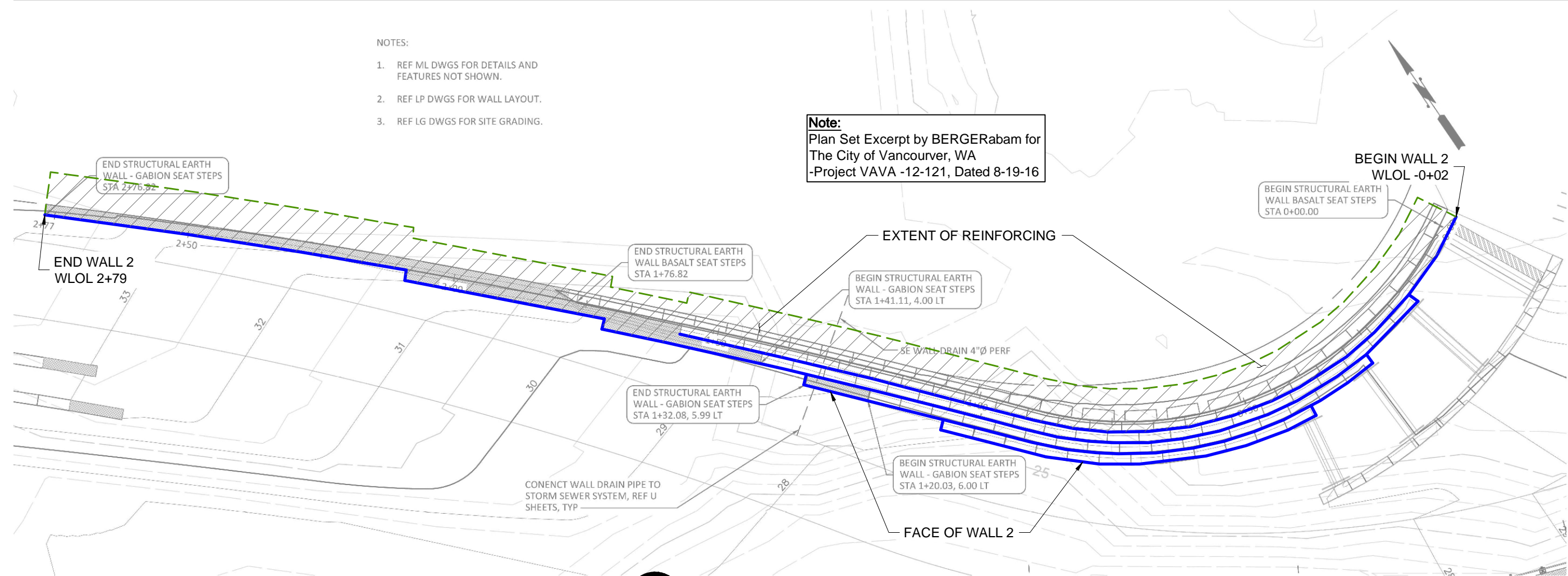
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| PROJECT | 17-004  |
| DATE    | 2-13-17 |
| DESIGN  | KLC     |
| DRAWN   | KLC     |

SHT **4** of 15

NOTES:

1. REF ML DWGS FOR DETAILS AND FEATURES NOT SHOWN.
2. REF LP DWGS FOR WALL LAYOUT.
3. REF LG DWGS FOR SITE GRADING.

**Note:**  
 Plan Set Excerpt by BERGERabam for  
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**PLAN VIEW - WALL 2**

SCALE: 1" = 20'

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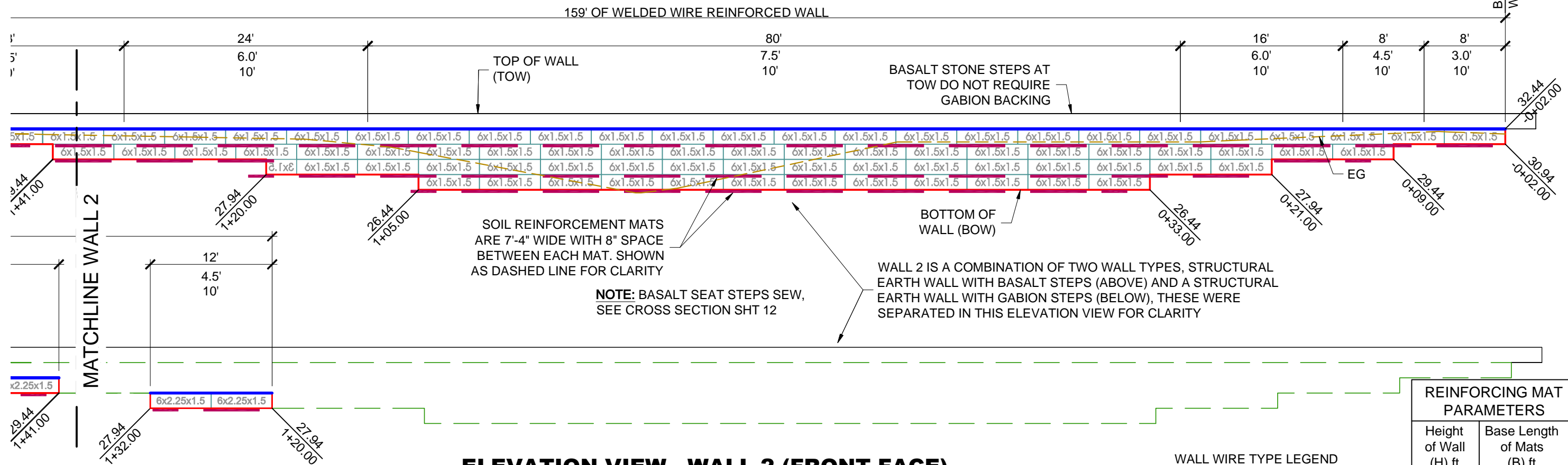
Waterfront Park Grant Street Pier  
 MSE WALL 2 PLAN VIEW

HW 160421AW

|         |          |
|---------|----------|
| PROJECT | 17-004   |
| DATE    | 2- 13-17 |
| DESIGN  | KLC      |
| DRAWN   | KLC      |

SHT 5 of 15

**NOTE:**  
THERE IS AN ADDITIONAL BASALT STONE BENCH ABOVE THE FIRST BASALT STONE STEP



**ELEVATION VIEW - WALL 2 (FRONT FACE)**  
SCALE: 1" = 10'

WALL 2 IS A COMBINATION OF TWO WALL TYPES, STRUCTURAL EARTH WALL WITH BASALT STEPS (ABOVE) AND A STRUCTURAL EARTH WALL WITH GABION STEPS (BELOW), THESE WERE SEPARATED IN THIS ELEVATION VIEW FOR CLARITY

SOIL REINFORCEMENT MATS ARE 7'-4" WIDE WITH 8" SPACE BETWEEN EACH MAT. SHOWN AS DASHED LINE FOR CLARITY

**NOTE:** BASALT SEAT STEPS SEW, SEE CROSS SECTION SHT 12

**WALL WIRE TYPE LEGEND**

FINISH: HOT DIP GALVANIZED  
SERVICE LIFE: 75 YEARS

|                                     |                             |
|-------------------------------------|-----------------------------|
| <span style="color: red;">█</span>  | TYPE 1 - 8x12 W7.0x3.5 MATS |
| <span style="color: blue;">█</span> | TYPE 2 - 8x12 W9.5x4.0 MATS |

| REINFORCING MAT PARAMETERS |                            |
|----------------------------|----------------------------|
| Height of Wall (H) ft      | Base Length of Mats (B) ft |
| ≤7.5'                      | 10'                        |
| 9.0'                       | 11'                        |
| 10.5'                      | 12'                        |
| 12.0'                      | 14'                        |
| 13.5'                      | 15'                        |
| 15.0'                      | 17'                        |
| 16.5'-17'                  | 18'                        |
| 18'-18.5'                  | 20'                        |
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Reinforcing Mats are:  
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Finish: HOT DIP Galvanized  
75 Year Service Life  
HW 160421AW

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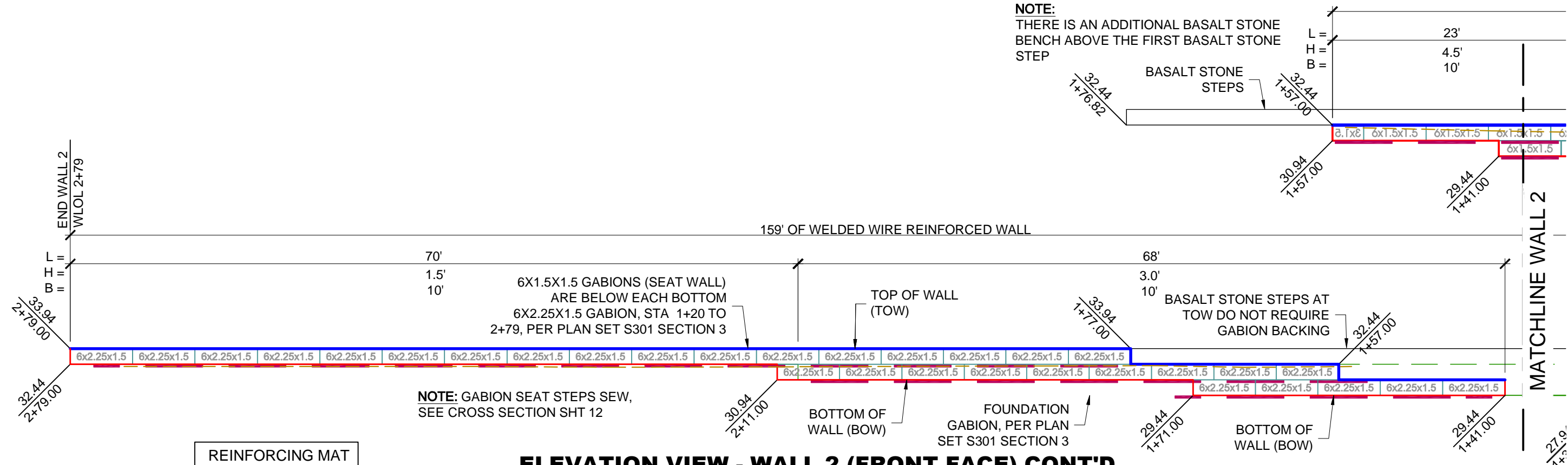
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Waterfront Park Grant Street Pier

**BASALT SEAT STEP SEW - WALL 2**  
ELEVATION VIEW

|         |         |
|---------|---------|
| PROJECT | 17-004  |
| DATE    | 2-13-17 |
| DESIGN  | KLC     |
| DRAWN   | KLC     |
| SHT     | 6 of 15 |

**NOTE:**  
THERE IS AN ADDITIONAL BASALT STONE BENCH ABOVE THE FIRST BASALT STONE STEP



**ELEVATION VIEW - WALL 2 (FRONT FACE) CONT'D**

SCALE: 1" = 10'

| REINFORCING MAT PARAMETERS |                            |
|----------------------------|----------------------------|
| Height of Wall (H) ft      | Base Length of Mats (B) ft |
| <7.5'                      | 10'                        |
| 9.0'                       | 11'                        |
| 10.5'                      | 12'                        |
| 12.0'                      | 14'                        |
| 13.5'                      | 15'                        |
| 15.0'                      | 17'                        |
| 16.5'-17'                  | 18'                        |
| 18'-18.5'                  | 20'                        |
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Reinforcing Mats are:  
8x12 W7.0x3.5 WWR (Type 1)  
8x12 W9.5x4.0 WWR (Type 2)  
Finish: HOT DIP Galvanized  
75 Year Service Life

**WALL WIRE TYPE LEGEND**  
FINISH: HOT DIP GALVANIZED  
SERVICE LIFE: 75 YEARS  
TYPE 1 - 8X12 W7.0x3.5 MATS  
TYPE 2 - 8X12 W9.5x4.0 MATS

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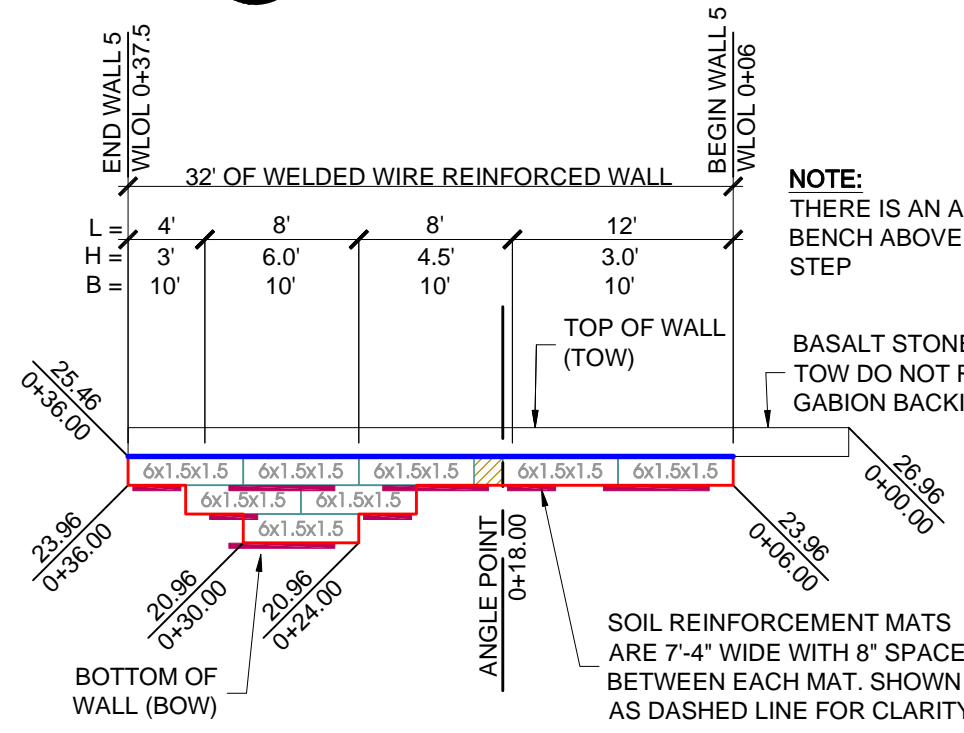
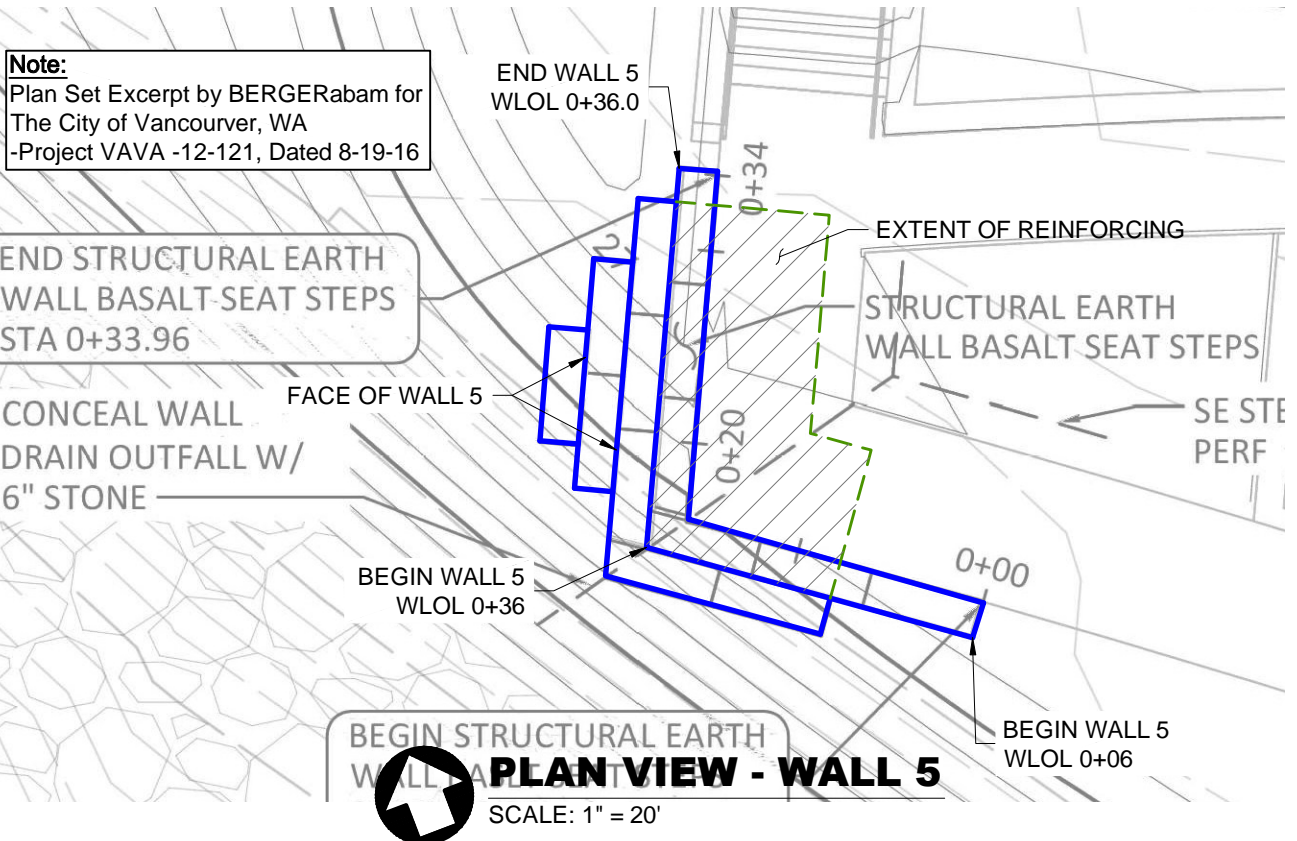
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Waterfront Park Grant Street Pier  
**GABION SEAT STEP SEW - WALL 2**  
 ELEVATION VIEW (CONT'D)

HW 160421AW

|         |         |
|---------|---------|
| PROJECT | 17-004  |
| DATE    | 2-13-17 |
| DESIGN  | KLC     |
| DRAWN   | KLC     |
| SHT     | 7 of 15 |



**ELEVATION VIEW - WALL 5 (FRONT FACE)**  
SCALE: 1" = 10'

**WALL WIRE TYPE LEGEND**  
FINISH: HOT DIP GALVANIZED  
SERVICE LIFE: 75 YEARS

TYPE 1 - 8X12 W7.0x3.5 MATS  
TYPE 2 - 8x12 W9.5x4.0 MATS

| REINFORCING MAT PARAMETERS |                            |
|----------------------------|----------------------------|
| Height of Wall (H) ft      | Base Length of Mats (B) ft |
| ≤7.5'                      | 10'                        |
| 9.0'                       | 11'                        |
| 10.5'                      | 12'                        |
| 12.0'                      | 14'                        |
| 13.5'                      | 15'                        |
| 15.0'                      | 17'                        |
| 16.5'-17'                  | 18'                        |
| 18'-18.5'                  | 20'                        |
| 19.5'                      | 21'                        |

Reinforcing Mats are:  
8x12 W7.0x3.5 WWR (Type 1)  
8x12 W9.5x4.0 WWR (Type 2)  
Finish: HOT DIP Galvanized  
75 Year Service Life

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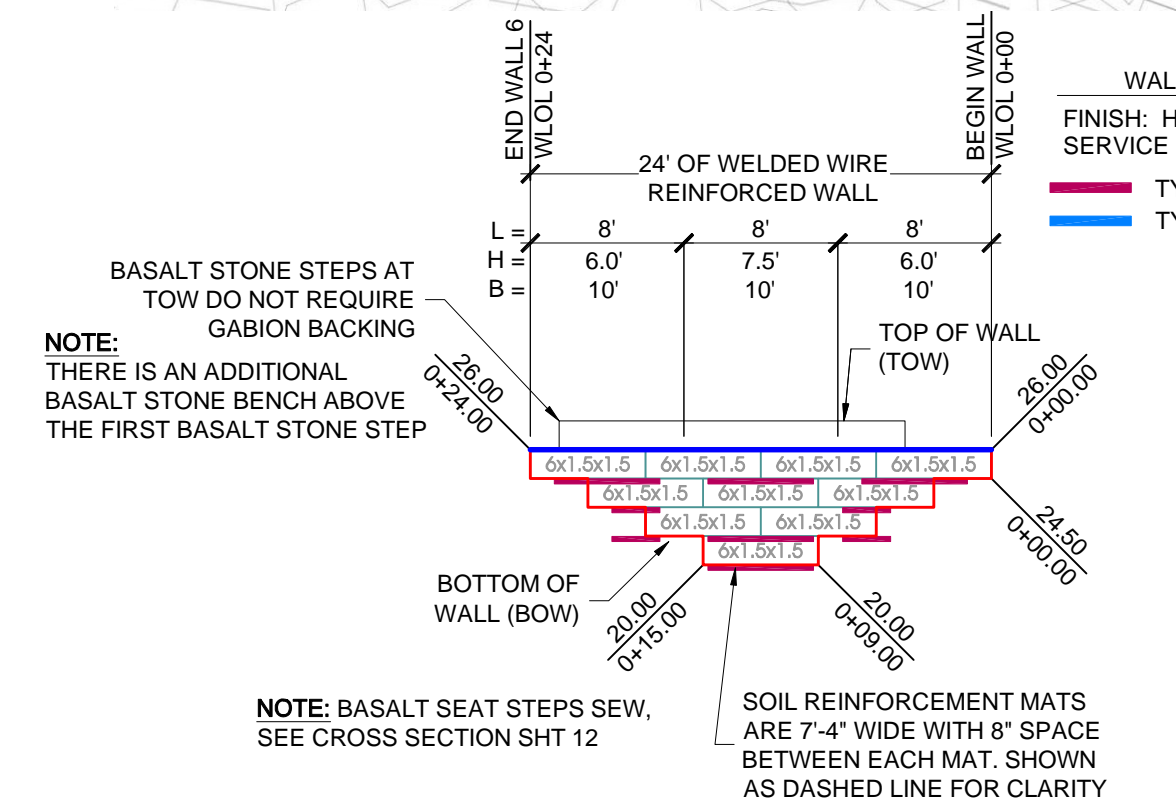
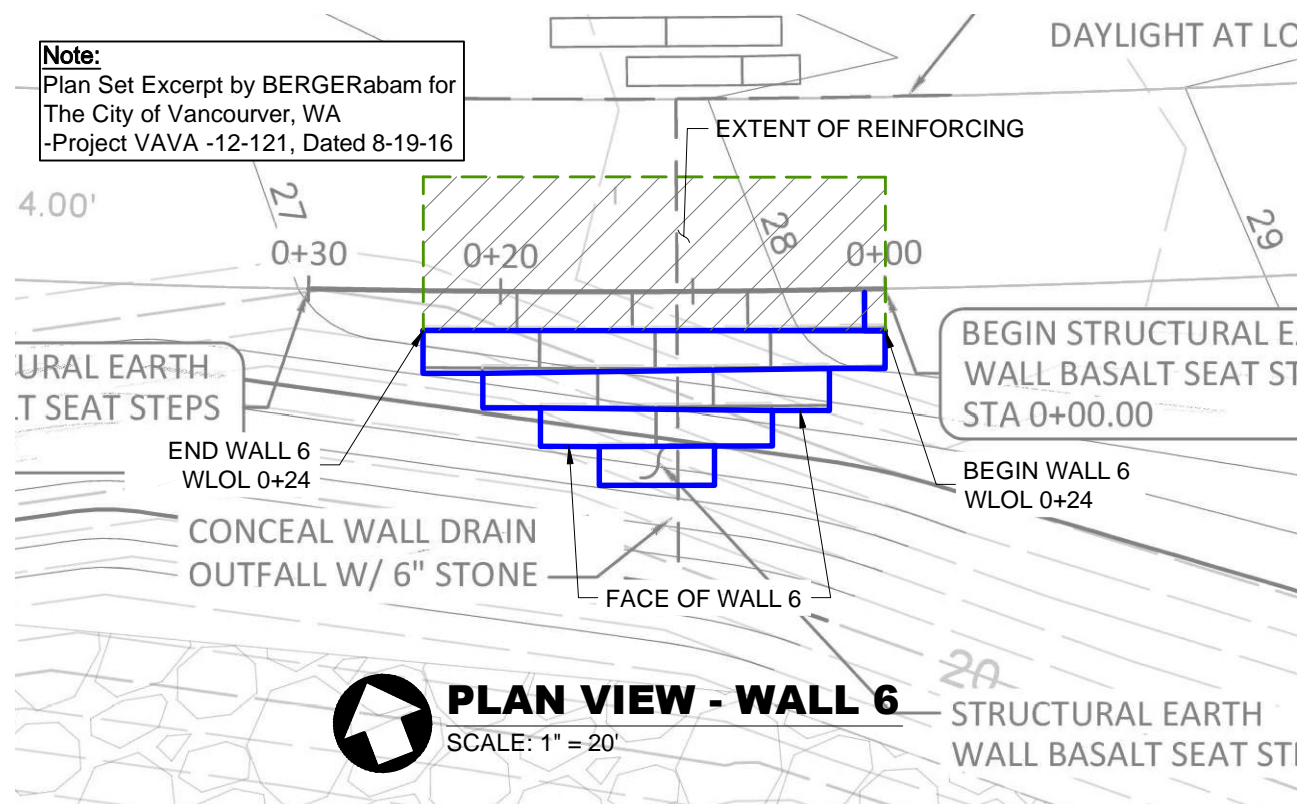
Waterfront Park Grant Street Pier

**BASALT SEAT STEP SEW - WALL 5  
ELEVATION VIEW**

HW 160421AW

|         |         |
|---------|---------|
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| DATE    | 2-13-17 |
| DESIGN  | KLC     |
| DRAWN   | KLC     |
| SHT     | 8 of 15 |





**ELEVATION VIEW - WALL 6 (FRONT FACE)**  
SCALE: 1" = 10'

| REINFORCING MAT PARAMETERS |                            |
|----------------------------|----------------------------|
| Height of Wall (H) ft      | Base Length of Mats (B) ft |
| <7.5'                      | 10'                        |
| 9.0'                       | 11'                        |
| 10.5'                      | 12'                        |
| 12.0'                      | 14'                        |
| 13.5'                      | 15'                        |
| 15.0'                      | 17'                        |
| 16.5'-17'                  | 18'                        |
| 18'-18.5'                  | 20'                        |
| 19.5'                      | 21'                        |

Reinforcing Mats are:  
8x12 W7.0x3.5 WWR (Type 1)  
8x12 W9.5x4.0 WWR (Type 2)  
Finish: HOT DIP Galvanized  
75 Year Service Life

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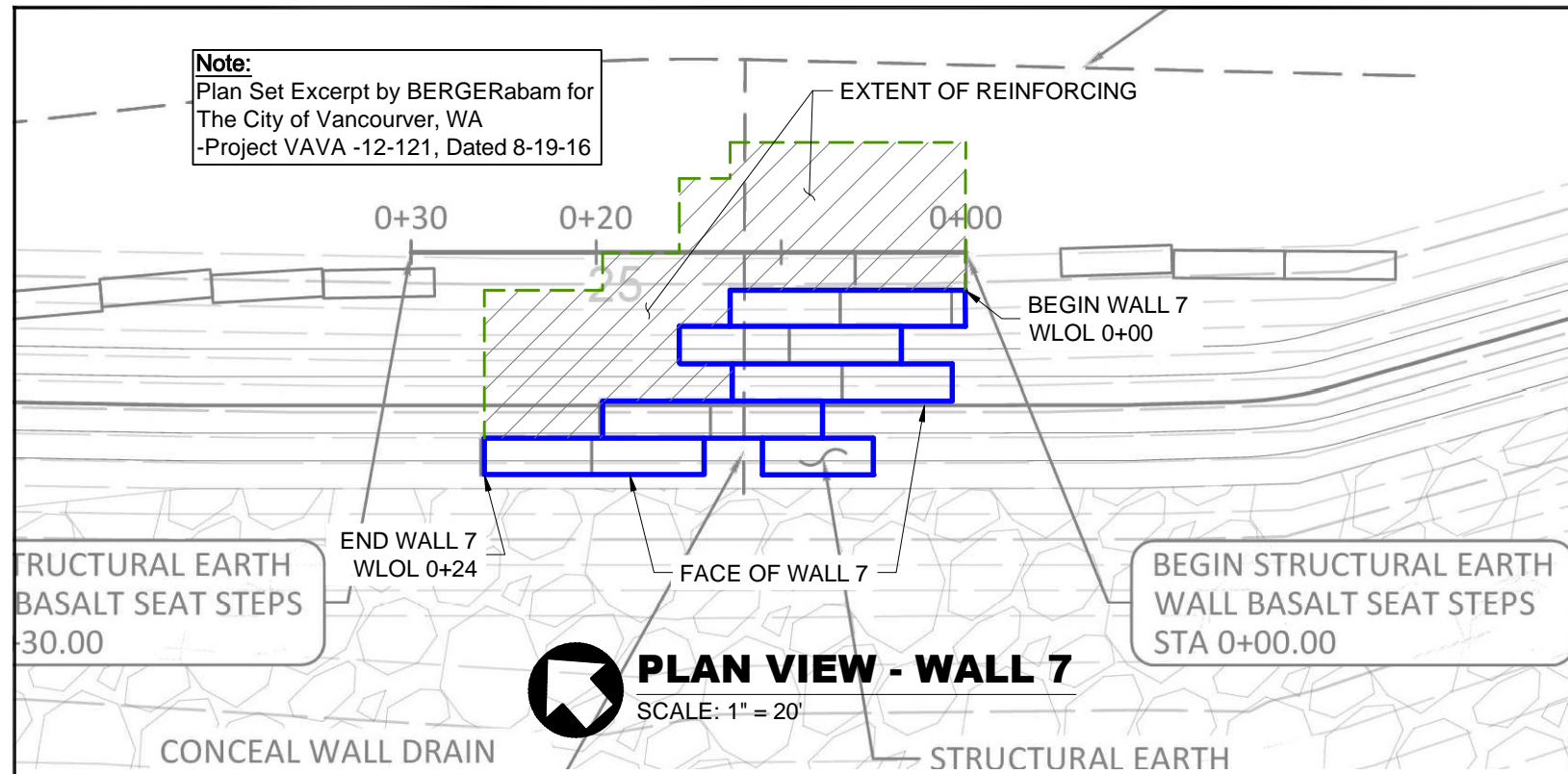
Waterfront Park Grant Street Pier

**BASALT SEAT STEP SEW - WALL 6  
ELEVATION VIEW**

HW 160421AW

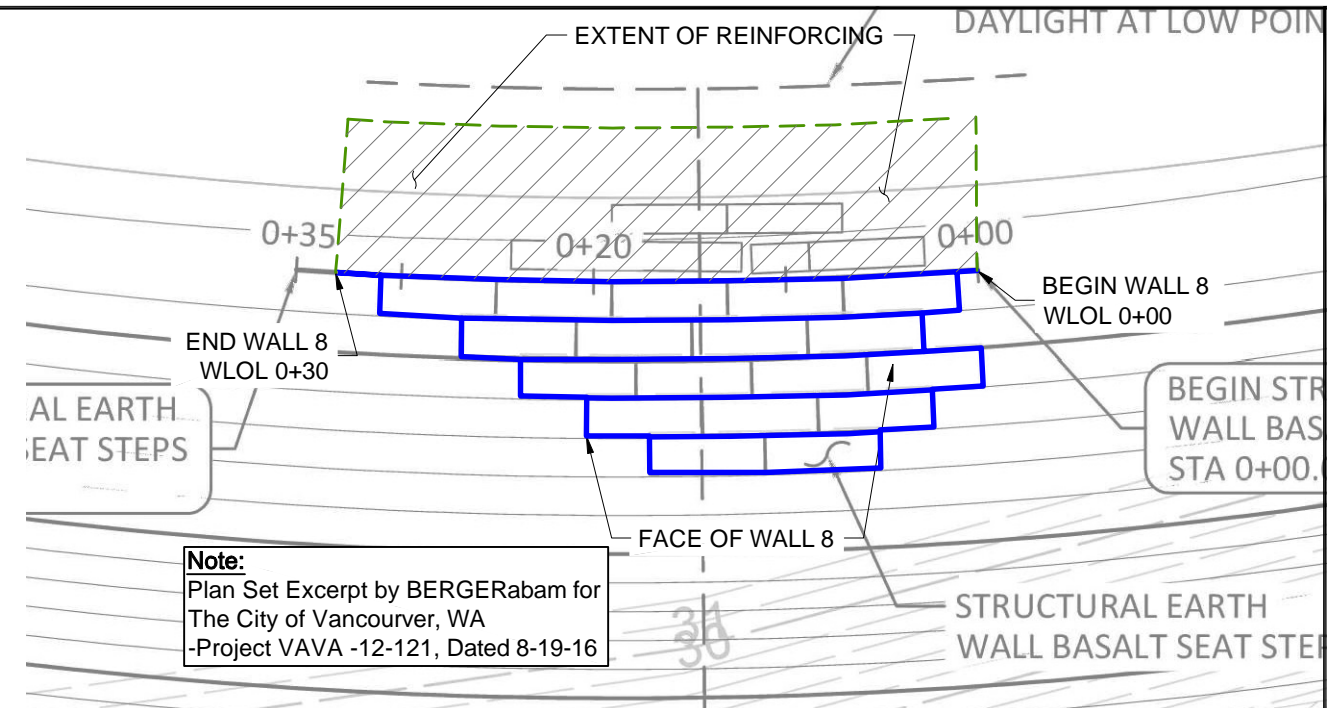
|         |         |
|---------|---------|
| PROJECT | 17-004  |
| DATE    | 2-13-17 |
| DESIGN  | KLC     |
| DRAWN   | KLC     |
| SHT     | 9 of 15 |

**Note:**  
Plan Set Excerpt by BERGERabam for  
The City of Vancouver, WA  
-Project VAVA -12-121, Dated 8-19-16



**PLAN VIEW - WALL 7**

SCALE: 1" = 20'



**PLAN VIEW - WALL 8**

SCALE: 1" = 20'

**WALL WIRE TYPE LEGEND**

FINISH: HOT DIP GALVANIZED  
SERVICE LIFE: 75 YEARS

- TYPE 1 - 8X12 W7.0x3.5 MATS
- TYPE 2 - 8X12 W9.5x4.0 MATS

**NOTE:**  
THERE IS AN ADDITIONAL  
BASALT STONE BENCH ABOVE  
THE FIRST BASALT STONE STEP

BASALT STONE STEPS AT  
TOW DO NOT REQUIRE  
GABION BACKING

**NOTE:** BASALT SEAT STEPS SEW,  
SEE CROSS SECTION SHT 12

SOIL REINFORCEMENT MATS  
ARE 7'-4" WIDE WITH 8" SPACE  
BETWEEN EACH MAT. SHOWN  
AS DASHED LINE FOR CLARITY

**REINFORCING MAT PARAMETERS**

| Height of Wall (H) ft | Base Length of Mats (B) ft |
|-----------------------|----------------------------|
| ≤7.5'                 | 10'                        |
| 9.0'                  | 11'                        |
| 10.5'                 | 12'                        |
| 12.0'                 | 14'                        |
| 13.5'                 | 15'                        |
| 15.0'                 | 17'                        |
| 16.5'-17'             | 18'                        |
| 18'-18.5'             | 20'                        |
| 19.5'                 | 21'                        |

Reinforcing Mats are:  
8x12 W7.0x3.5 WWR (Type 1)  
8x12 W9.5x4.0 WWR (Type 2)  
Finish: HOT DIP Galvanized  
75 Year Service Life

**NOTE:**  
THERE IS AN ADDITIONAL  
BASALT STONE BENCH ABOVE  
THE FIRST BASALT STONE STEP

**NOTE:** BASALT SEAT STEPS SEW,  
SEE CROSS SECTION SHT 12

SOIL REINFORCEMENT MATS  
ARE 7'-4" WIDE WITH 8" SPACE  
BETWEEN EACH MAT. SHOWN  
AS DASHED LINE FOR CLARITY

BASALT STONE STEPS AT  
TOW DO NOT REQUIRE  
GABION BACKING

**ELEVATION VIEW - WALL 7 (FRONT FACE)**

SCALE: 1" = 10'

**ELEVATION VIEW - WALL 8 (FRONT FACE)**

SCALE: 1" = 10'

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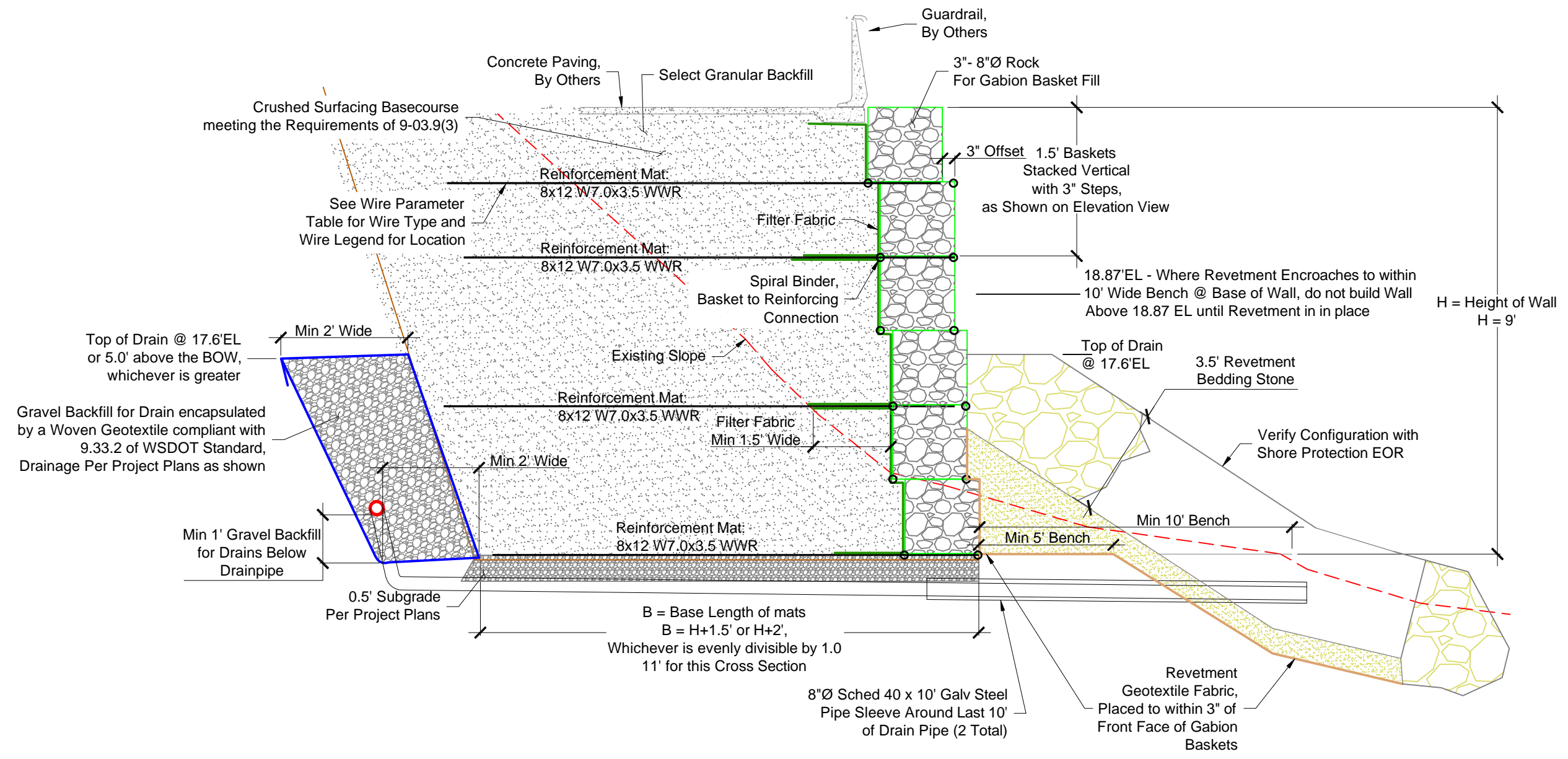
Waterfront Park Grant Street Pier

**BASALT SEAT STEP SEW- WALLS 7 & 8 - PLAN & ELEVATION VIEW**

HW 160421AW

|         |         |
|---------|---------|
| PROJECT | 17-004  |
| DATE    | 2-13-17 |
| DESIGN  | KLC     |
| DRAWN   | KLC     |

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**TYPICAL GABION FACED SEW CROSS SECTION (H=9')**

SCALE: 1" = 2.4'

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|          | 6-08-17 | KLC | Revised per Plan Check Comments (5-4-17)  |

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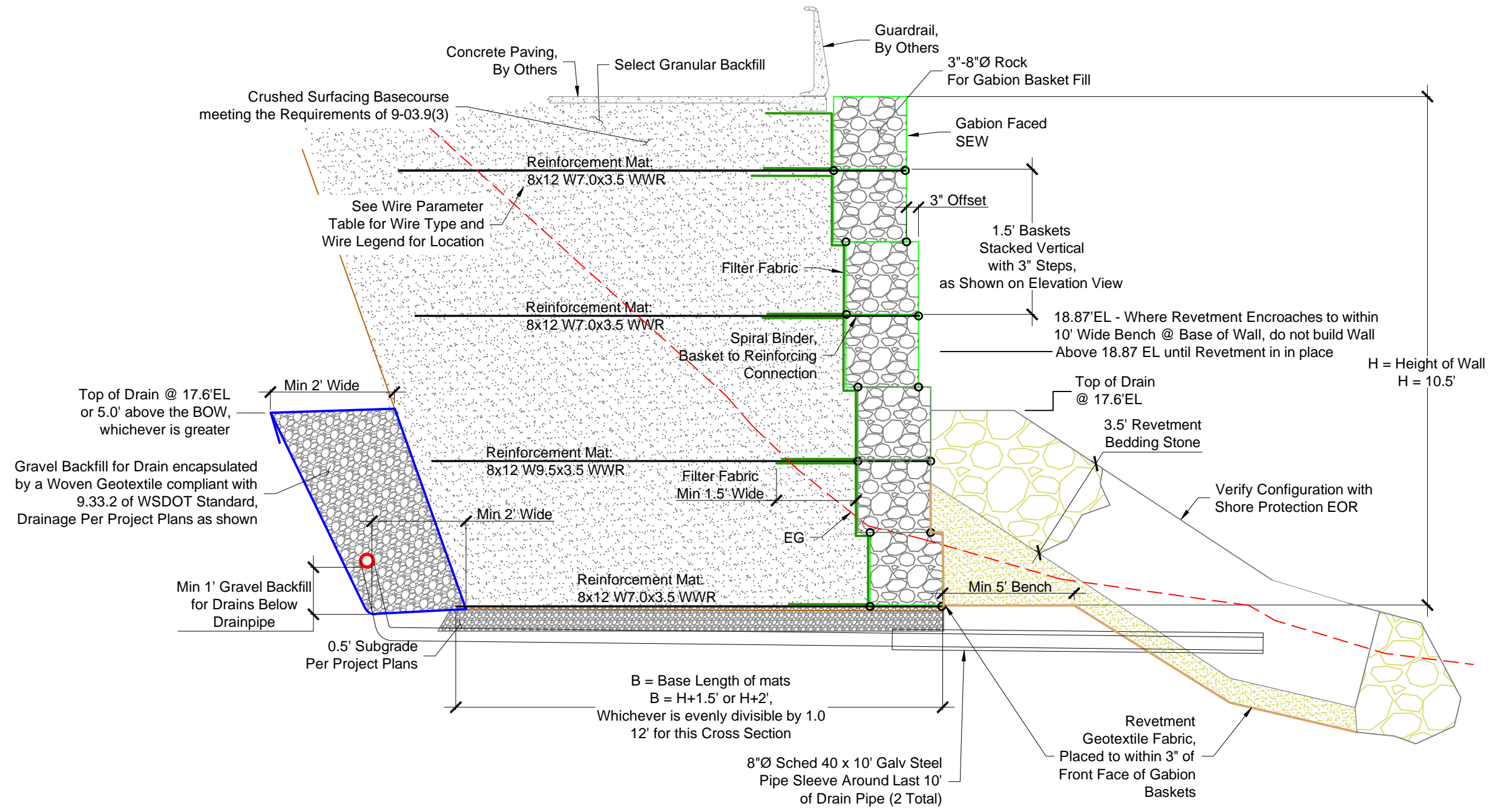
Waterfront Park Grant Street Pier

**GABION FACE STRUCTURAL EARTH WALL (SEW) CROSS SECTIONS**

HW 160421AW

|         |         |
|---------|---------|
| PROJECT | 17-004  |
| DATE    | 2-13-17 |
| DESIGN  | KLC     |
| DRAWN   | KLC     |

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**TYPICAL GABION FACED SEW CROSS SECTION (H=10.5')**

SCALE: 1" = 2.4'

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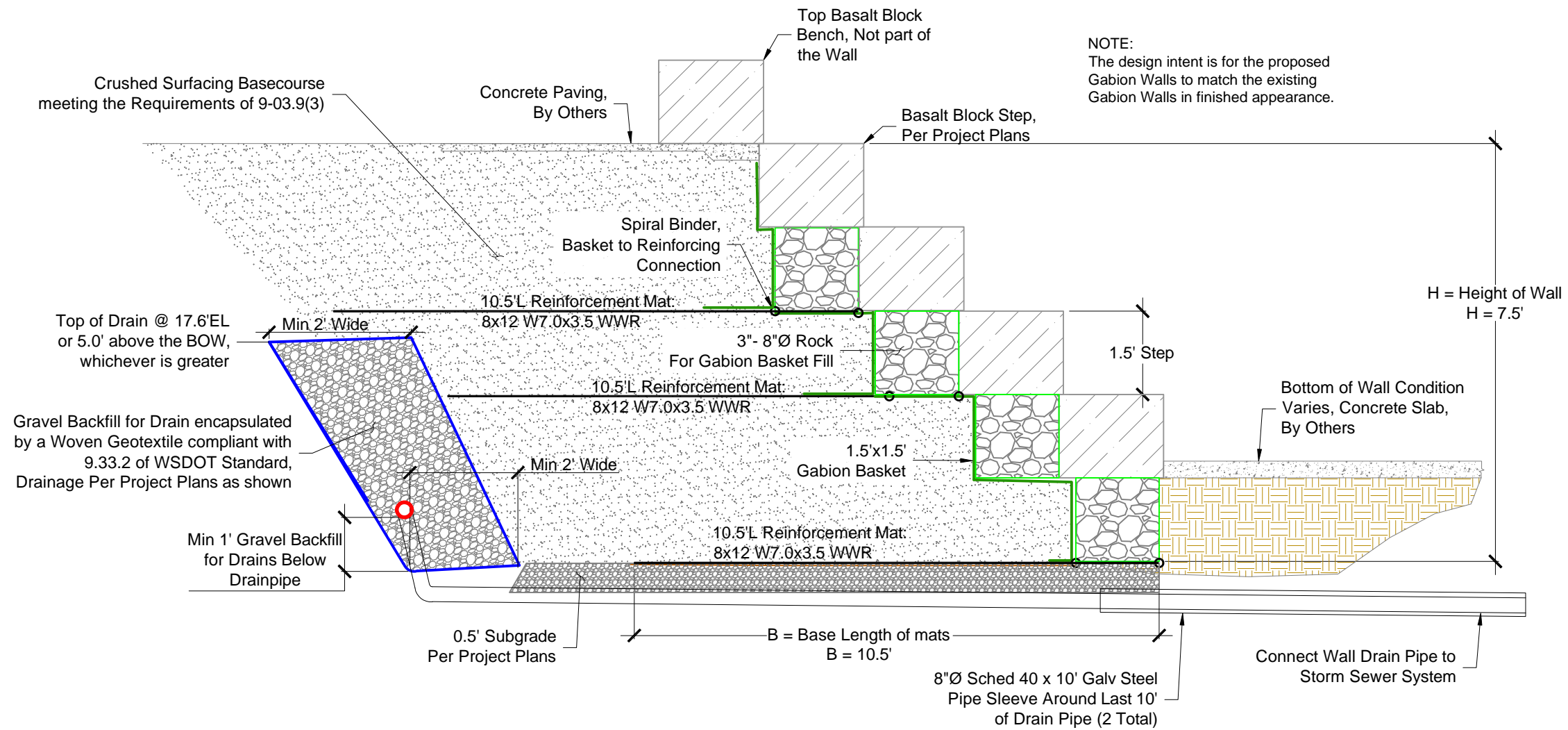
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**GABION FACE STRUCTURAL EARTH WALL (SEW) CROSS SECTIONS**

HW 160421AW

|         |         |
|---------|---------|
| PROJECT | 17-004  |
| DATE    | 2-13-17 |
| DESIGN  | KLC     |
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### TYPICAL BASALT SEAT STEPS SEW CROSS SECTION (H=7.5')

SCALE: 1" = 2.4'

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Waterfront Park Grant Street Pier  
**BASALT SEAT STEPS STRUCTURAL  
EARTH WALL (SEW) CROSS  
SECTION**

HW 160421AW

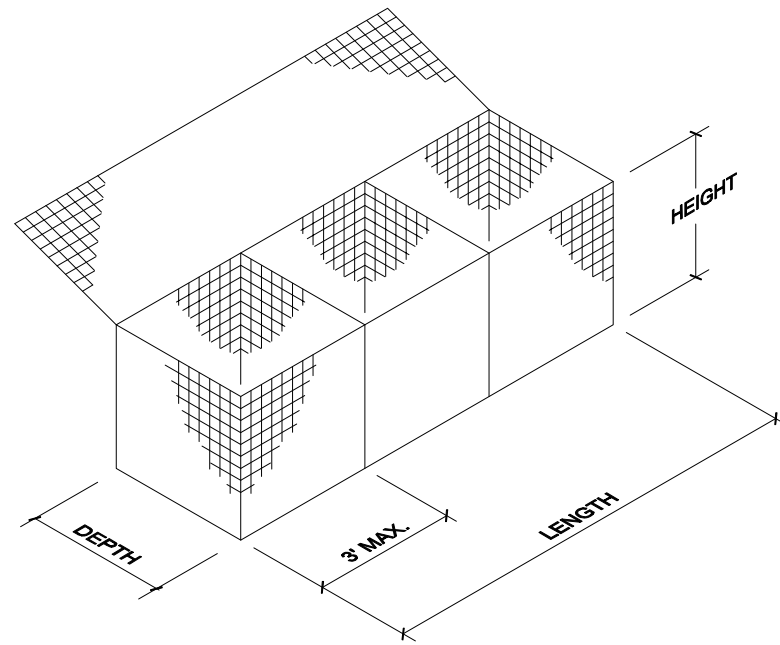
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| PROJECT | 17-004  |
| DATE    | 2-13-17 |
| DESIGN  | KLC     |
| DRAWN   | KLC     |

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**STEP 1**

1. PLACE SOIL REINFORCEMENT MATS ON PREPARED FOUNDATION.
2. PLACE THE FIRST LIFT OF GABIONS AND PERMANENTLY CONNECT THE FRONT EDGE TO THE SOIL REINFORCEMENT MATS WITH A SPIRAL BINDER.
3. INSTALL FILTER FABRIC, IF REQUIRED.
4. PLACE AND COMPACT THE FIRST COURSE OF BACKFILL ON THE SOIL REINFORCEMENT MATS. BACKFILL TO BE OF SUFFICIENT DEPTH TO PROTECT SOIL REINFORCEMENT MATS FROM DAMAGE OR MOVEMENT BY EQUIPMENT DURING DELIVERY OF ROCK TO THE GABIONS.
5. FILL THE GABIONS WITH SUITABLE ROCK.
6. CLOSE LID AND SECURE WITH SPIRAL BINDERS.

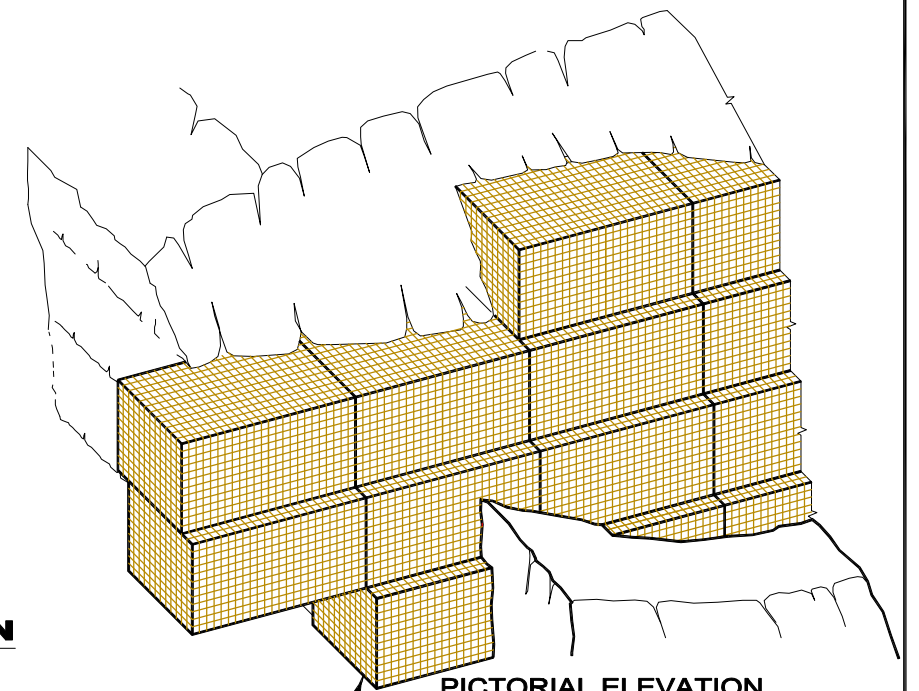


**TYPICAL GABION**

NOT TO SCALE  
 GABIONS ARE MANUFACTURED OF 3"x3" WELDED WIRE MESH, 9 GA. WITH 0.9 OZ/SF ZINC COATING.

**TYPICAL ASSEMBLED GABION**

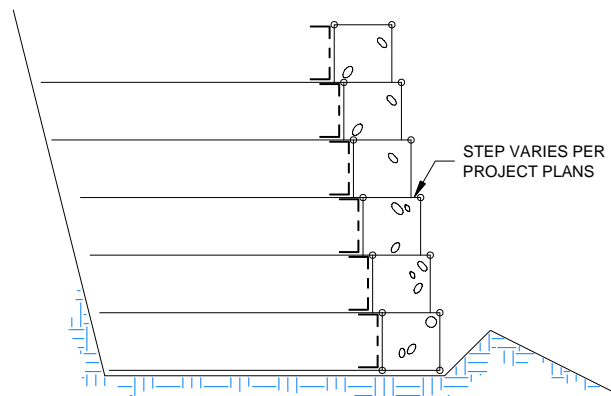
NOT TO SCALE



**PICTORIAL ELEVATION**  
 NOT TO SCALE

**STEP 2**

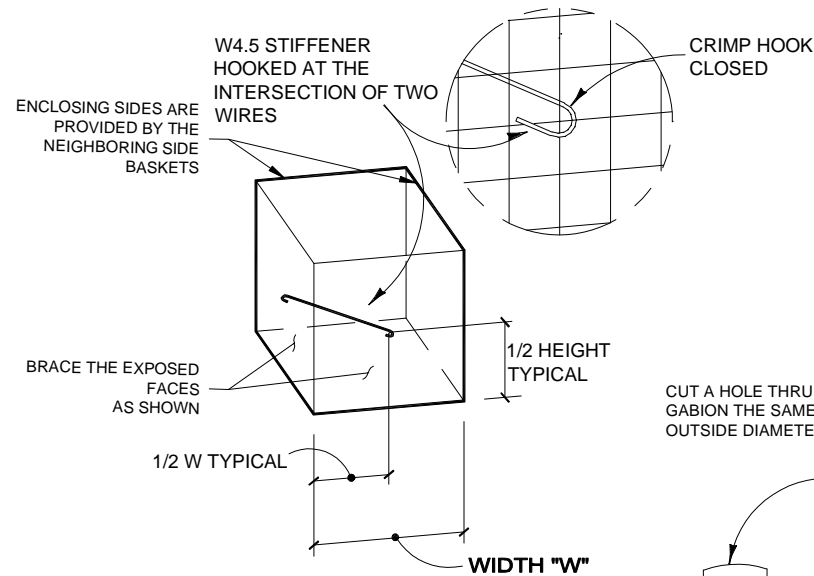
1. PLACE AND COMPACT THE REMAINING BACKFILL IN UNIFORM LIFTS OVER THE SOIL REINFORCING MAT.
2. PLACE SOIL REINFORCEMENT MATS ON THE BACKFILL AND THE TOP OF THE GABION.
3. PLACE THE SECOND LIFT OF GABIONS OVER THE FIRST LIFT AND CONNECT THE GABIONS AND THE SOIL REINFORCEMENT MATS TOGETHER PERMANENTLY WITH SPIRAL BINDERS.
4. PLACE AND COMPACT BACKFILL AT THE TOE OF THE WALL PER YOUR PROJECT PLANS.



**STEP 3**

1. REPEAT STEP 2 TO THE TOP LIFT OF GABIONS.
2. PLACE THE FINAL LIFT OF BACKFILL PER PROJECT PLANS.

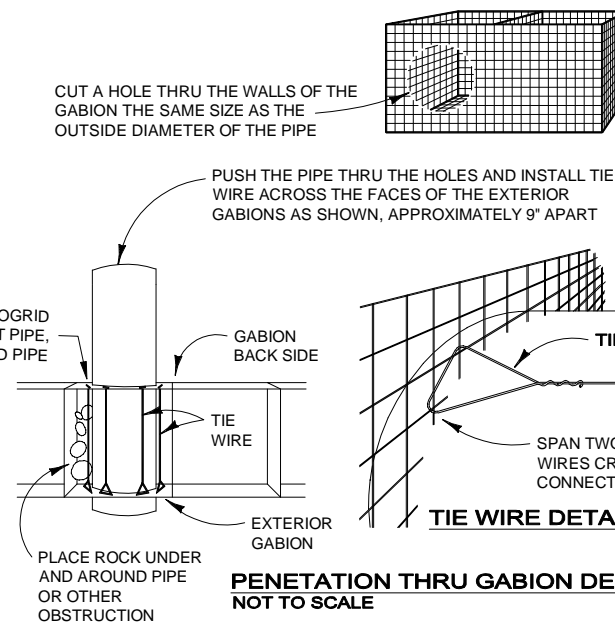
**CONSTRUCTION SEQUENCE**  
 NOT TO SCALE



**CORNER (ANGLE POINT) BASKET DETAILS**

NOT TO SCALE

CUT GEOGRID VERTICALLY TO FIT PIPE, WRAP FIT AROUND PIPE



CONNECT SPIRALBINDER TO REINFORCING MAT & GABION BASKET REAR

SPIRAL BINDER

SPIRALS ARE INSTALLED WHEN UPPER AND LOWER GABIONS ARE JOINED TOGETHER. ONE SPIRAL WILL JOIN THE MATS AND THE GABIONS TOGETHER AT ONE TIME.

**ISOMETRIC OF WALL COMPONENTS**  
 NOT TO SCALE

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Waterfront Park Grant Street Pier  
**MSE WALL PLAN VIEW & GENERAL NOTES**

HW 160421AW

|         |         |
|---------|---------|
| PROJECT | 17-004  |
| DATE    | 2-13-17 |
| DESIGN  | KLC     |
| DRAWN   | KLC     |

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