TYPICAL DURA-HOLD II SINGLE CRIB WALL SAMPLE CALCULATIONS

Note: Calculations shown below are short form preliminary design analysis for the typical DURA-HOLD II single crib wall section shown on Plate No. DHII-6. Calculations are performed using the Coulomb Analysis Method for retaining wall design.

Given:

H	=	10'-0"
i	=	26.56° (Backfill at 1:2 slope)
H_a	=	10'-0" + 2'-6" = 12'-6"
h	=	3'-0"
b	=	6'-0"
γwall	=	145 pcf
q	=	No surcharge
f	=	0.6
ϕ	=	30°
α	=	7.13° (Wall at natural 8:1 batter)
β	=	82.87°
δ	=	2/3 ϕ = 20°
γsoil	=	130 pcf (saturated)
γstone	=	135 pcf (compacted)

1. Determine forces acting on wall:

a. Find K_a and K_p:

$$K_a = \left[\frac{\text{cosec } \beta \sin (\beta - \phi)}{\sqrt{\sin (\beta + \delta)} + \sqrt{\frac{\sin (\delta + \phi) \sin (\phi - i)}{\sin (\beta - i)}}} \right]^2$$

$$= \left[\frac{\frac{\sin (82.87 - 30)}{\sin 82.87}}{\sqrt{\sin (82.87 + 20)} + \sqrt{\frac{\sin (20 + 30) \sin (30 - 26.56)}{\sin (82.87 - 26.56)}}} \right]^2$$

K_a = .43

$$K_p = \left[\frac{\text{cosec } \beta \sin (\beta + \phi)}{\sqrt{\sin (\beta - \delta)} \cdot \sqrt{\frac{\sin (\delta + \phi) \sin (\phi + i)}{\sin \beta - i}}} \right]^2$$

$K_p = 1.72$

b. Find P_a, P_s and P_p:

$P_a = 1/2\ K_a\ \gamma\ H_a^2$

$= (.5)\ (.43)(130)(12.5)^2$

$= 4367.19$ lbs.

$P_s = K_a\ q\ H_a$

$= .43\ (0)\ (7.75)$

$= 0$ lbs. (No surcharge)

$P_p = 1/2\ K_p\ \gamma\ h^2$

$= (.5)(1.72)(130)(3)^2$

$= 1006.2$ lbs

Note: Passive resistance will be used in this example. The contractor is directed to backfill footing and first two courses prior to continuing wall erection.

2. Determine stability against sliding along the base:

a. Find F_s, F_r and FS_s

$F_s = (\Sigma$ Horizontal sliding forces)

$= P_a \cos (\delta + \beta - 90) + P_s \cos (\delta + \beta - 90)$

$= 4367.19(.97) + 0(.97)$

$= 4236.17$ lbs

F_r = (Σ Vertical forces) x f

Type	W_x	d_x	M_x
Front Wall	1450.00 lbs	1.13	1638.50
Rear Wall	1160.00 lbs	6.00	6960.00
Tie Backs	162.40 lbs	3.50	568.40
Stone	4017.60 lbs	3.50	14061.60
Footing	1015.00 lbs	----	-----
Backfill	2112.50 lbs	5.68	11999.00
	ΣW_x= 9,917.50 lbs		**ΣM_x=35,227.50**

$F_r = [P_a \sin(\delta + \beta - 90) + P_s \sin(\delta + \beta - 90) + \Sigma W_x](f) + P_p$

$= [4367.19 (.22) + 0 + 9917.50] (.60) + 1006.2$

$= 7533.17$

$FS_s = \frac{F_r}{F_s} = \frac{7533.17}{4236.17} = 1.8 \geq 1.5$ **O.K.**

3. Determine stability against overturning about the toe:

a. Find M_o , M_r and FS_o:

$M_o = [P_a \cos(\delta + \beta - 90)] (H_a/3) + [P_s \cos(\delta + \beta - 90)] (H_a/2)$

$= 4367.19 (.97) (4.17) + 0$

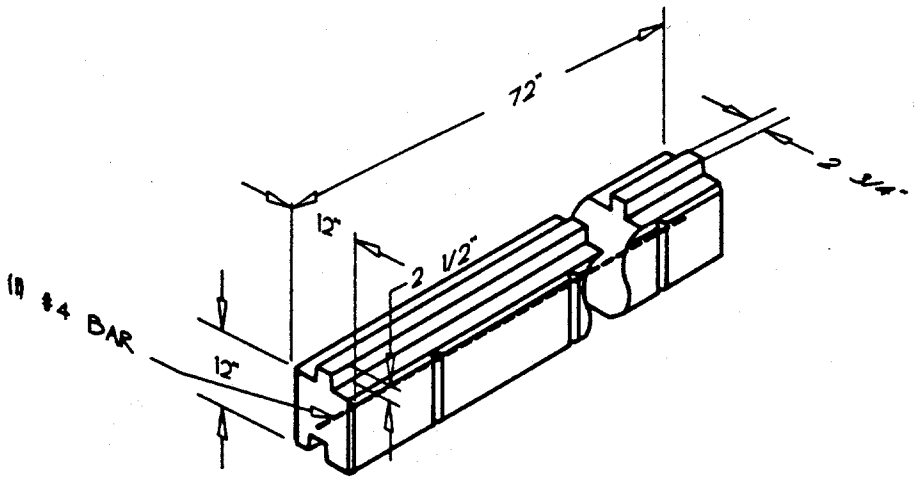
$= 17,664.85$ ft. lbs.

$M_r = (W_x) (d_x) + [P_a \sin(\delta + \beta - 90)] (d_a) + P_p (d_p)$

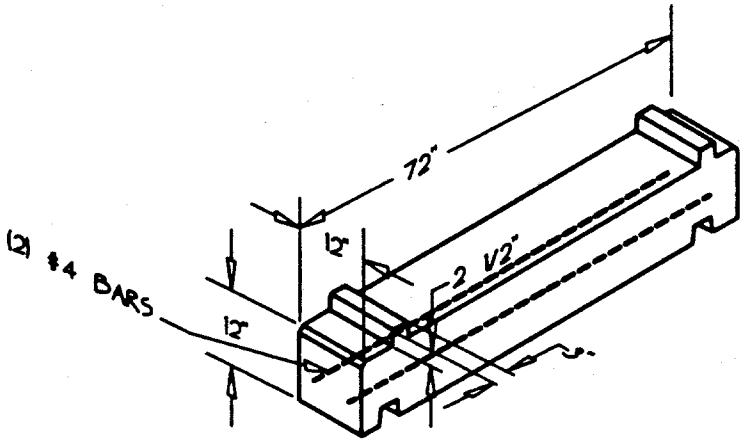
$= 35227.5 + 4367.19 (.22) 6.52 + 1006.22$

$= 42498.02$ ft. lbs.

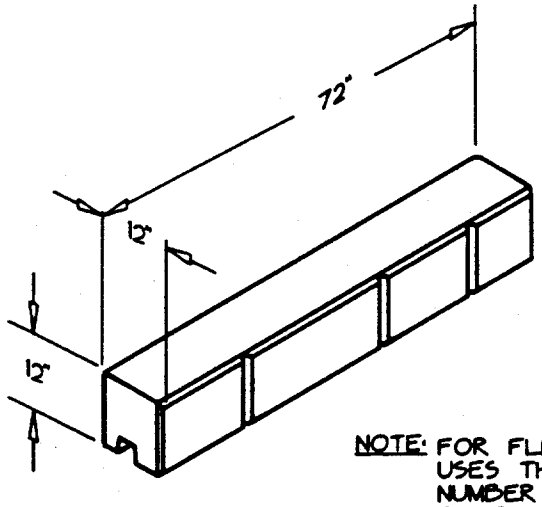
$FS_o = \frac{M_r}{M_o} = \frac{42498.02}{17664.85} = 2.4 \geq 2.0$ **O.K.**



STANDARD UNIT



TIE-BACK UNIT

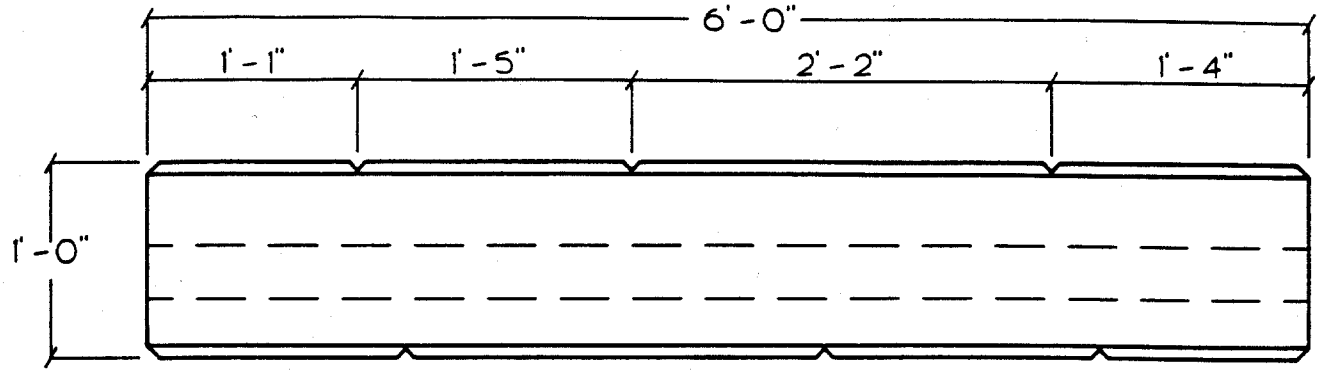


COPING UNIT

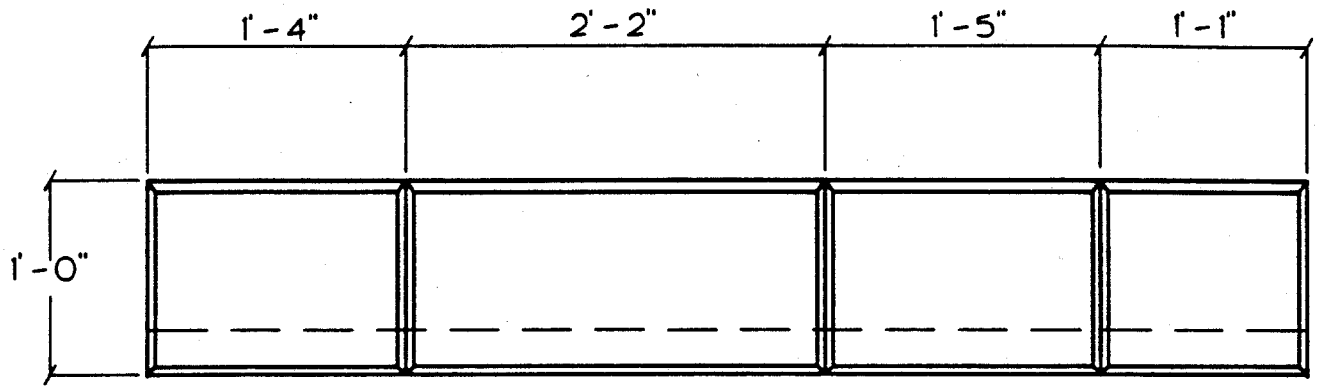
NOTE: FOR FLEXIBILITY IN CONSTRUCTION USES THE SIZE, LOCATION AND NUMBER OF REINFORCING BARS MAY BE DESIGNED BASED UPON SPECIFIC PROJECT REQUIREMENTS.

SHOP DRAWING FOR DURA-HOLD II
TYPICAL UNITS

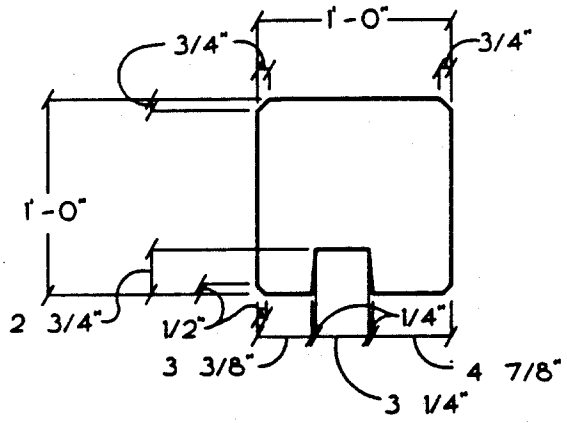
Scale: 3/8"=1'-0"		Plate No. DHII-1



PLAN



ELEVATION

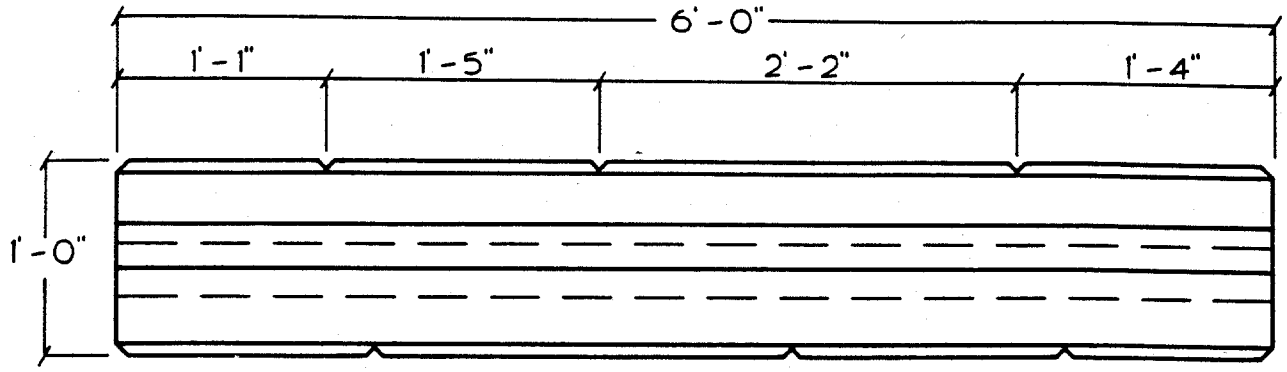


SECTION

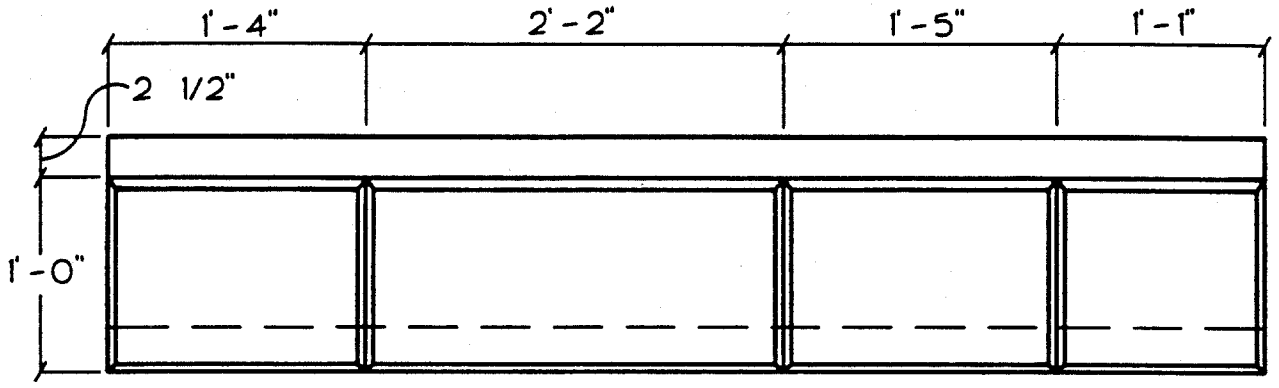
SHOP DRAWING FOR DURA-HOLD II
TYPICAL COPING UNIT

Scale: 1"=1' - 0"

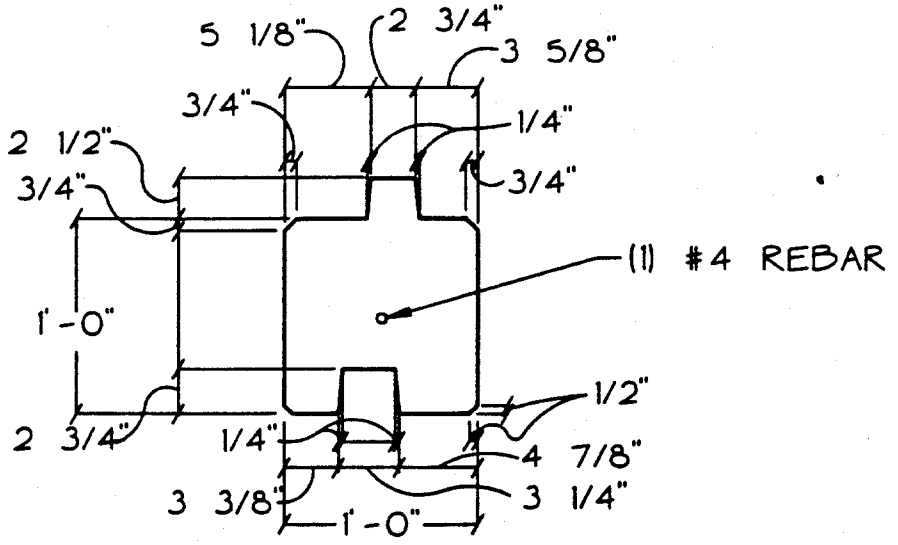
Plate No. DHII-3



PLAN



ELEVATION



SECTION

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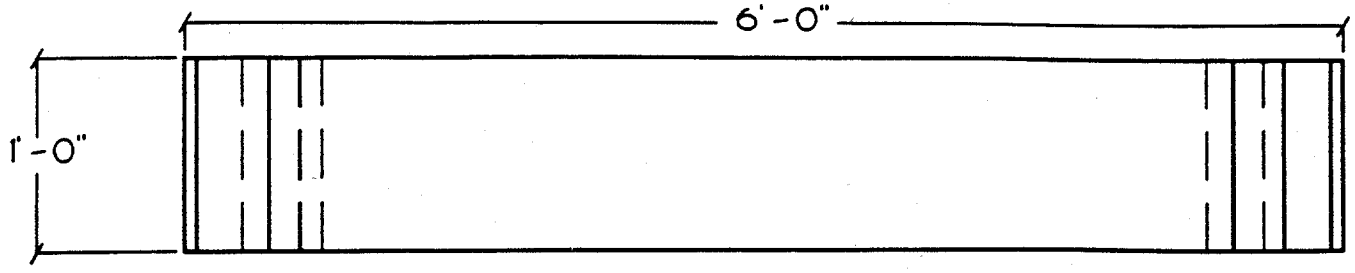
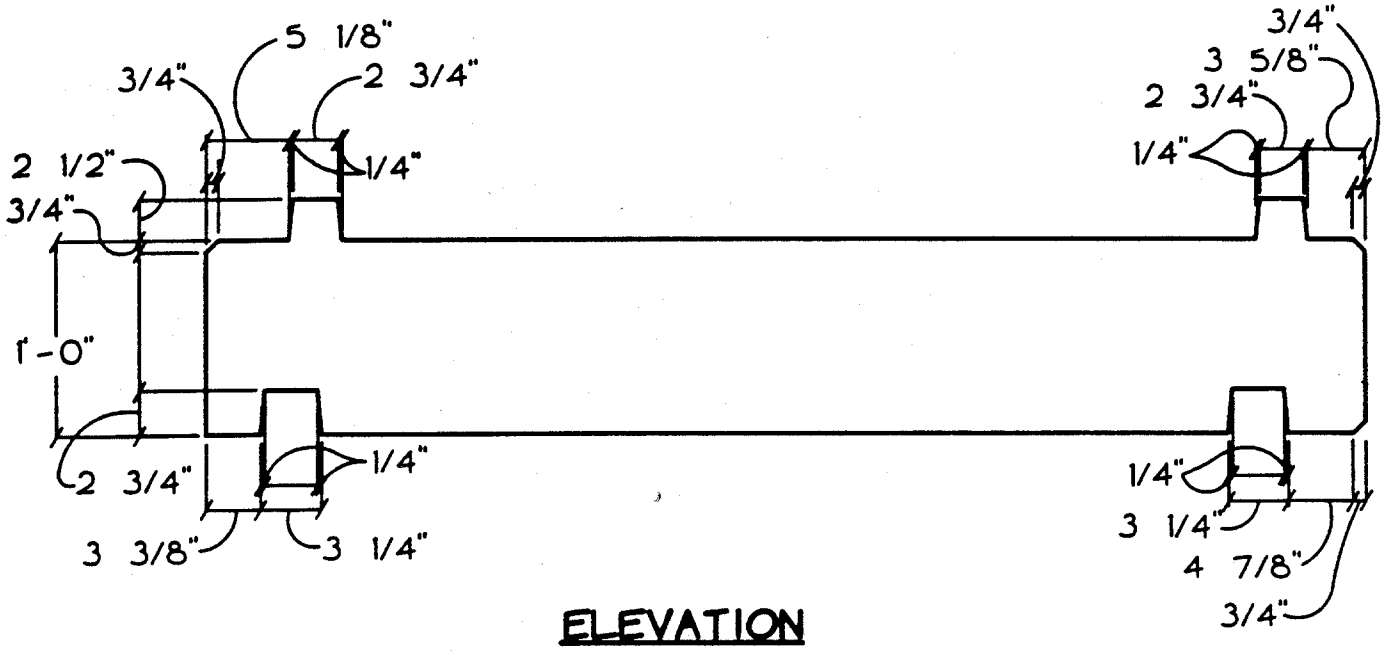
SHOP DRAWING FOR DURA-HOLD II TYPICAL STANDARD UNIT

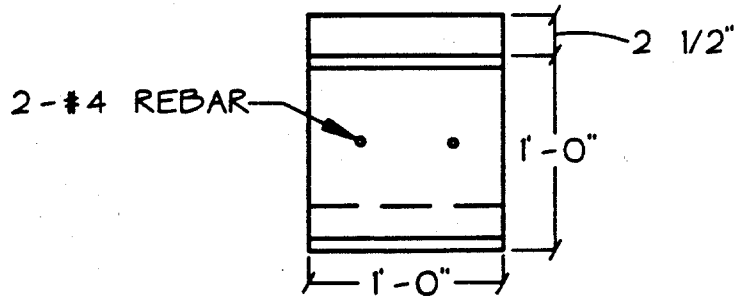
Scale: 1"=1'-0"		Plate No. DHII-4



PLAN



ELEVATION



SECTION

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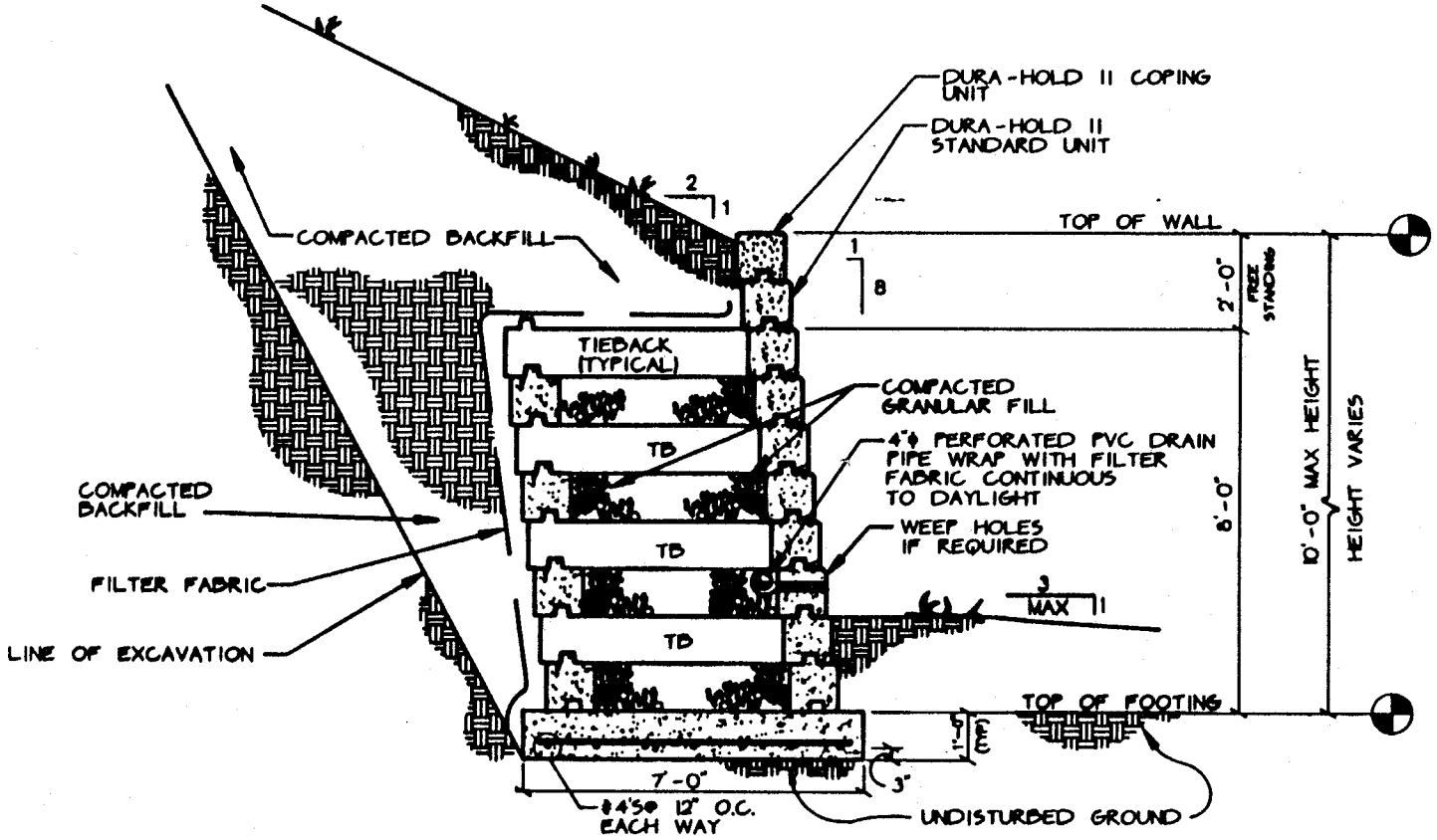
SHOP DRAWING FOR DURA-HOLD II
TYPICAL TIEBACK UNIT

Scale: 1"=1'-0"		Plate No. DHII-5

SHOP DRAWING FOR TYPICAL DURA-HOLD II SINGLE CRIB WALL

Plate No. D48-6

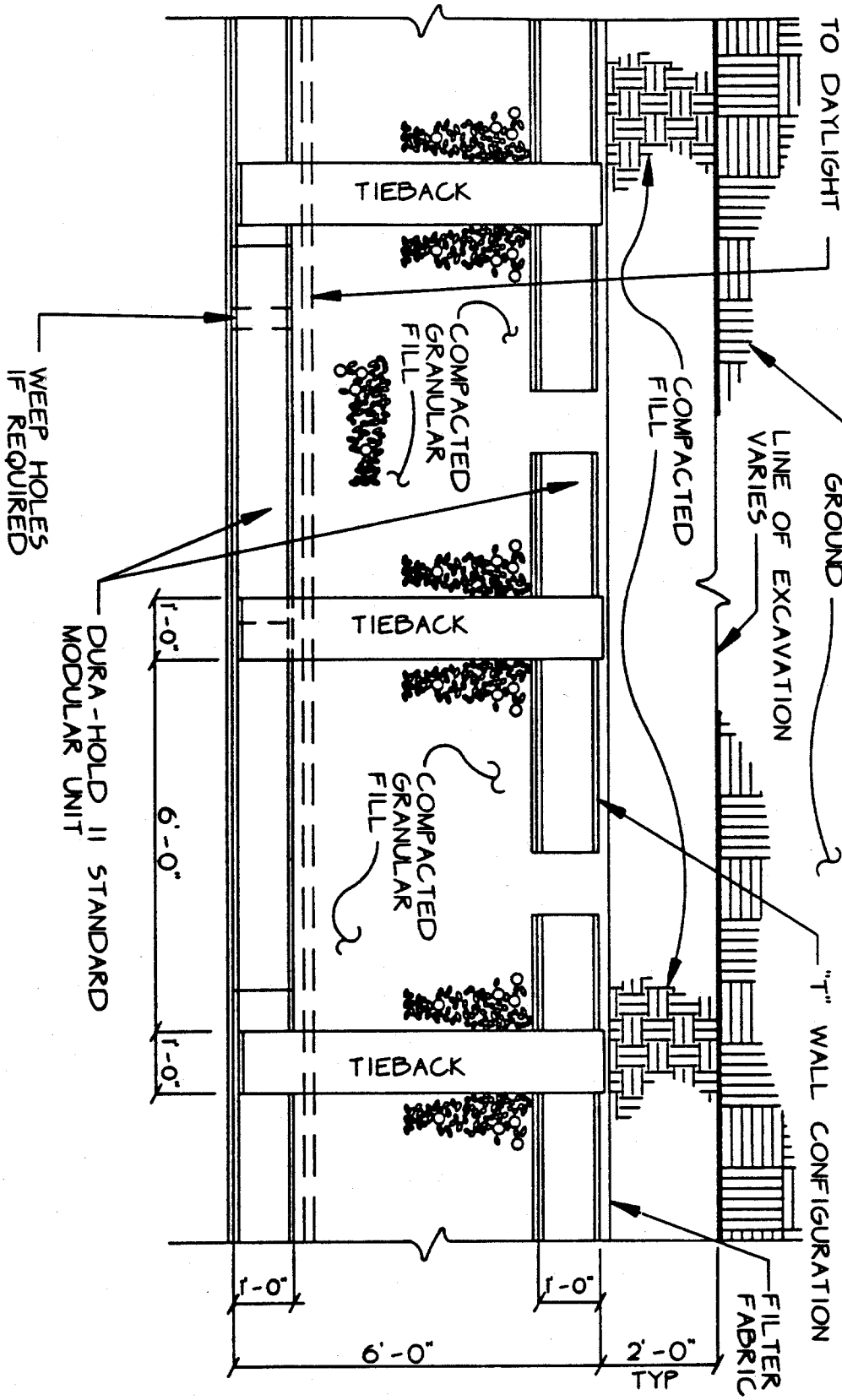
Scale: 1/4"=1'-0"



WALL SECTION

SCALE: 1/4"=1'-0"

NOTE DEPTH OF EMBEDMENT, FOOTING TYPE, SIZE AND REINFORCING DEPENDS UPON CONDITIONS.



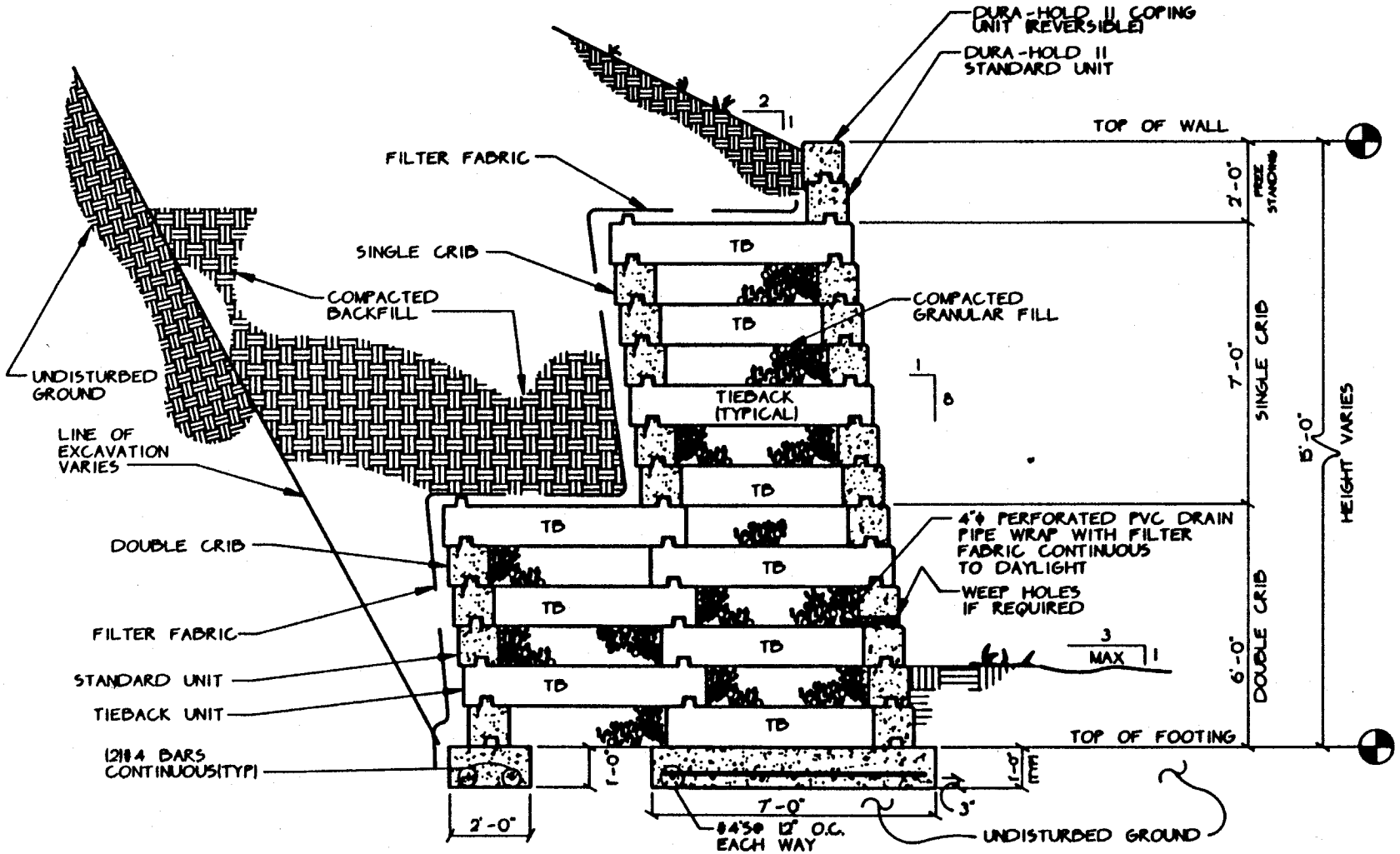
SINGLE CRIB "T WALL" PLAN

SCALE: 3/8"-1'-0"

SHOP DRAWING FOR DURA-HOLD II SINGLE CRIB "T" WALL PLAN

Scale: 3/8"-1'-0"

Plate No. DHII-7



SECTION

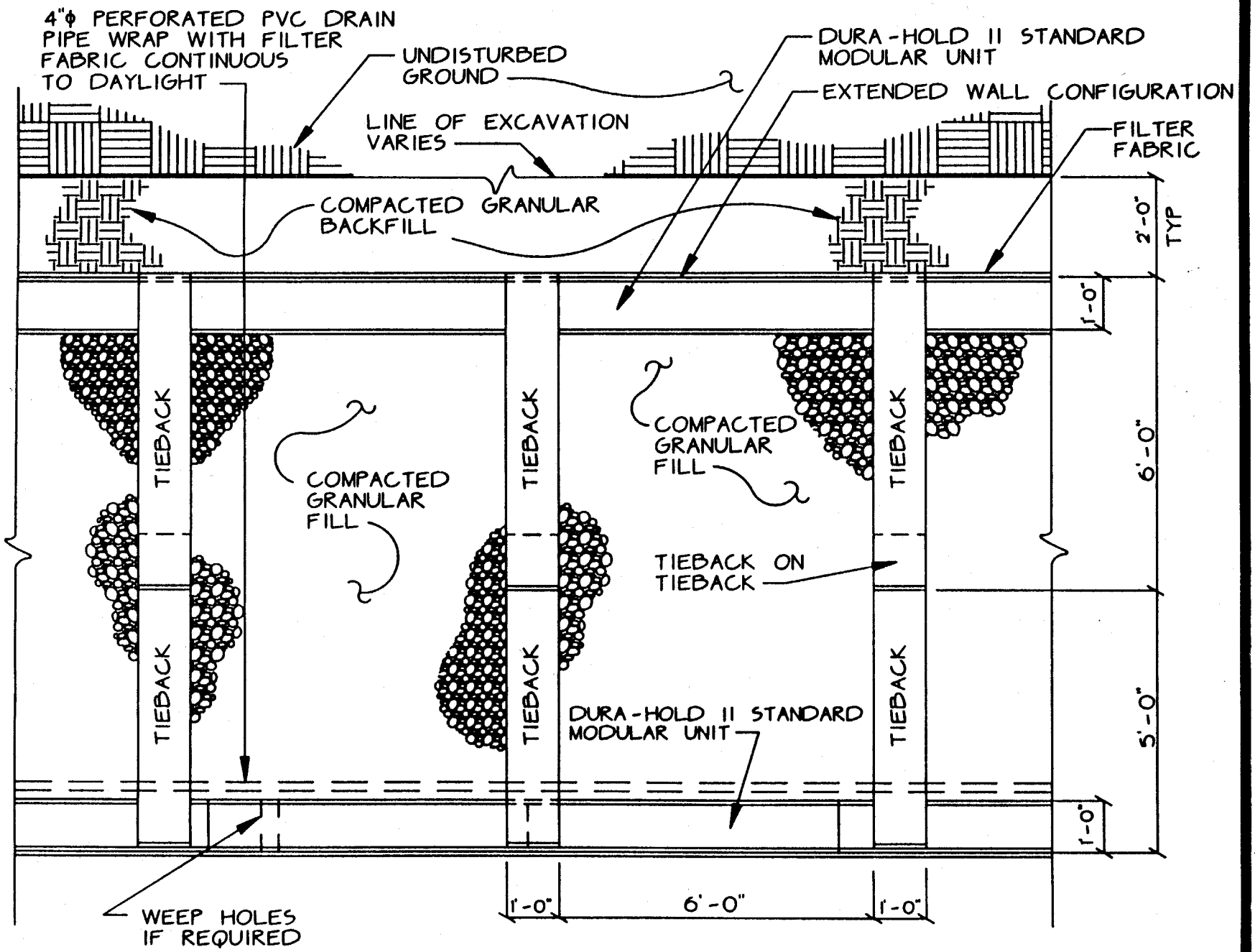
SCALE: 1/4"=1'-0"

NOTE DEPTH OF EMBEDMENT, FOOTING TYPE, SIZE AND REINFORCING DEPENDS UPON CONDITIONS.

SHOP DRAWING FOR TYPICAL DURA-HOLD II DOUBLE CRIB WALL

Plate No. DHII-10

Scale: 1/4"=1'-0"



DOUBLE CRIB "TIEBACK ON TIEBACK" EXTENDED WALL PLAN

SCALE: 3/8"=1'-0"

SHOP DRAWING FOR TYPICAL DURA-HOLD II DOUBLE CRIB TIEBACK ON TIEBACK EXTENDED WALL PLAN

Plate No. DHII-11

Scale: 3/8"=1'-0"