RETAINING WALLS WITH SLOPING BACKFILL

BUILDING DIVISION

Construction of retaining walls, except those less than 3 feet in height and not supporting surcharge, requires a permit and is regulated by the current *California Building Code* (CBC) as amended and adopted by the County of San Diego. This form outlines the County's minimum requirements. The companion form PDS #084 provides information on retaining walls with level backfill. For site retaining walls proposed to be constructed in a public way or associated with Department of Public Works grading, County of San Diego Regional Standards shall be used. All wall designs are for fully grouted walls.

I. INSPECTIONS

Please call for inspections at the following times:

1. When the footing excavations have been completed, the reinforcing steel has been securely tied into final position, and **before** the placement of concrete.

2. When the block has been laid and the reinforcing steel is in position, but before any grout has been placed. Steel is to be securely fastened in place to prevent movement during grouting. Lifts are not to exceed 6 feet high and blocks are not to be laid higher than the grout pour.

3. After grouting is completed and after rock or rubble wall drains are in place, but before backfill is placed.

4. When all work has been completed.

II. WALL HEIGHT

Wall height is measured from the top of the footing to the top of the wall. Walls that are not specifically shown in this form must be designed by a California licensed architect, civil engineer, or structural engineer. No building foundation, driveway, parking or other loading on the upper level is allowed within a distance equal to the height of the wall. Walls with such loading must be designed by a California licensed architect, civil or structural engineer.

III. BLOCK

All concrete masonry unit blocks must be type "N" grouted solid with f'_m = 1500 psi.

IV. CONCRETE MIX DESIGN

The concrete mix for footings must meet a minimum compressive strength of f'_c = 2500 psi.

V. MORTAR MIX DESIGN

The mortar mix for block placement must meet a minimum compressive strength of 1800 psi. Mortar shall conform to ASTM C 270 and Articles 2.1 and 2.6 A of TMS 602/ACI 530.1/ASCE 6.
NOTE: The use of plastic cement is not permitted for mortar

VI. GROUT MIX DESIGN

Walls are to be fully grouted. Grout used for filling block cells must meet a minimum compressive strength of 2,000 psi and shall conform to CBC 2103.3. Rod or vibrate grout immediately. Re-rod or re-vibrate grout about 10 minutes after pouring to ensure solid consolidation. Stop grout 2 inches from top of masonry units when an additional grout lift is required.
NOTE: The use of plastic cement is not permitted for grout

VII. MORTAR KEY

To insure proper bonding between the footing and the first course of block, a mortar key must be formed by embedding a flat 2 x 4 flush with and at the top of the freshly poured footing. It should be removed after the concrete has started to harden (about one hour). A mortar key may be omitted if the first course of block is set into fresh concrete when the footing is poured and a good bond is obtained.

VIII. WALL DRAINS

Wall drains, four inches diameter, must be placed at 6 feet intervals along the length of the wall and located at the level of the bottom course of block. The drains may be formed by placing a block on its side at 6 feet intervals or by leaving out the mortar in the vertical spaces between all the blocks (head joint) in the first course. Backfill behind wall drains or open head joints must be gravel with a minimum thickness of 12 inches. Alternative drainage systems may be allowed, if approved by the plan check group of the County of San Diego, Planning & Development Services.

IX. SOILS

All footings must extend at least 12 inches into undisturbed natural soil or compacted fill which has been compacted to at least 90% density. Soil should be dampened prior to placing concrete footings. A soils report, compiled by a licensed engineer, may be required. Footing sizes given in this handout are based on 1000 psf maximum soil bearing value; use of different bearing values will require design by a licensed architect, civil engineer, or structural engineer specifically for the existing conditions and may also require a soils report.

X. REINFORCING STEEL

Reinforcing steel must be deformed and comply with ASTM specification A615, Grade 40 or 60. When one continuous bar cannot be used, a lap or splice of 40 bar diameters is required. Two #3 bars, minimum, must be placed longitudinally in the footing as shown. For 6-inch and 8-inch blocks, one #3 bar must be placed longitudinally in the center of the wall in a mortar joint every 16 inches as blocks are laid up. For 12-inch blocks, one #4 bar must be placed longitudinally in the center of the wall in a bond beam block course every 16 inches as blocks are laid up.

XI. USE OF TABLES - *EXAMPLE*

Specify the height of the wall required for site conditions and the slope of the retained earth. Using Table A for appropriate wall height and slope of retained earth, determine T, R, K, and W designations.

Example:

Given: Wall height = 5’-0”
Slope of earth retained = 3 horizontal to 1 vertical

From Table A:
T = Type B wall
R = Group 5 reinforcing steel
K = Use E key
W = 2'-9”

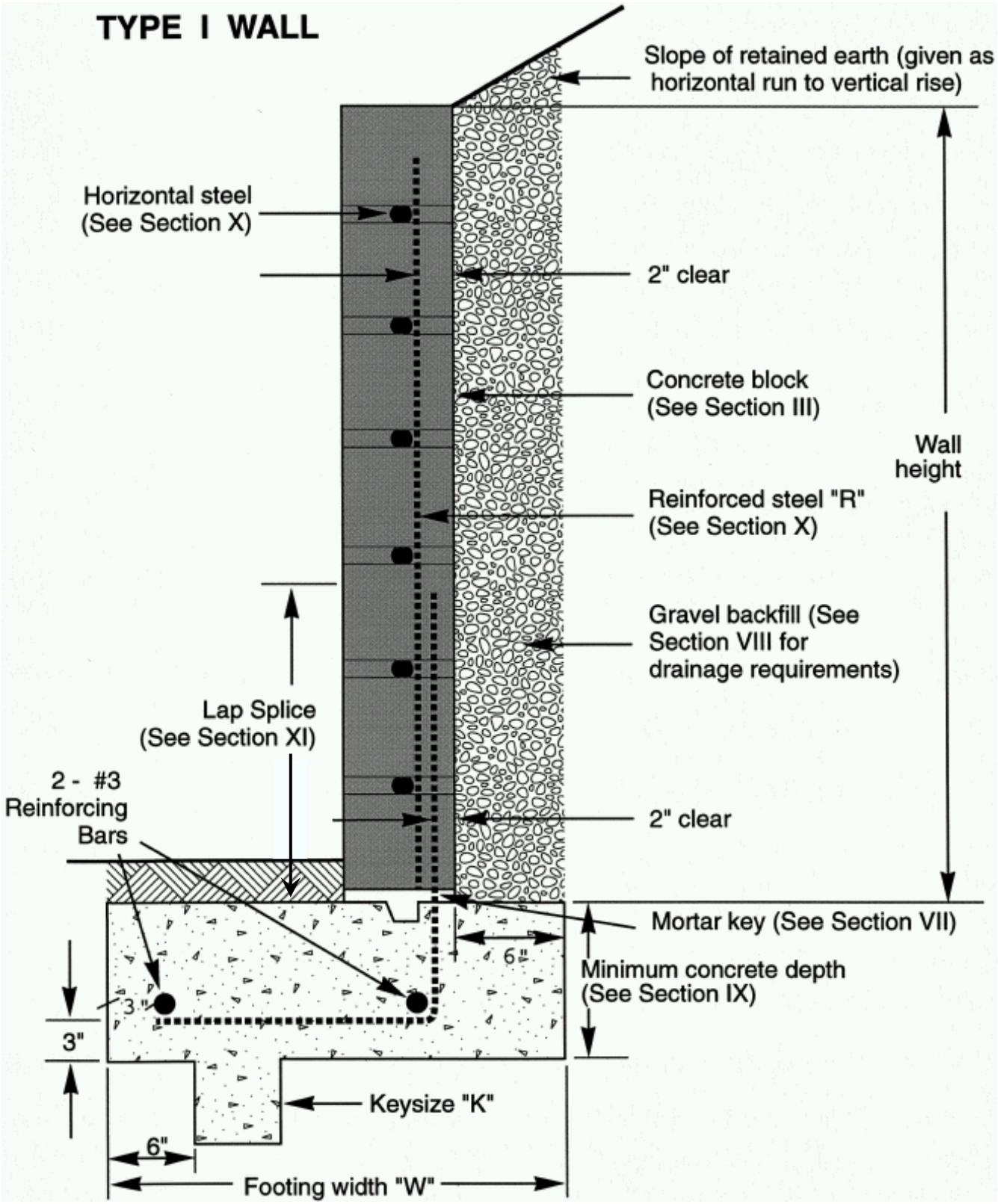
From Table B:
Type B wall = Type I wall with 8” concrete block
Group 5 reinforcing steel = #4 bars @ 16” o.c.
Type E key = 8” wide x 8” deep key
Width of footing = 2’-9”

TABLE A

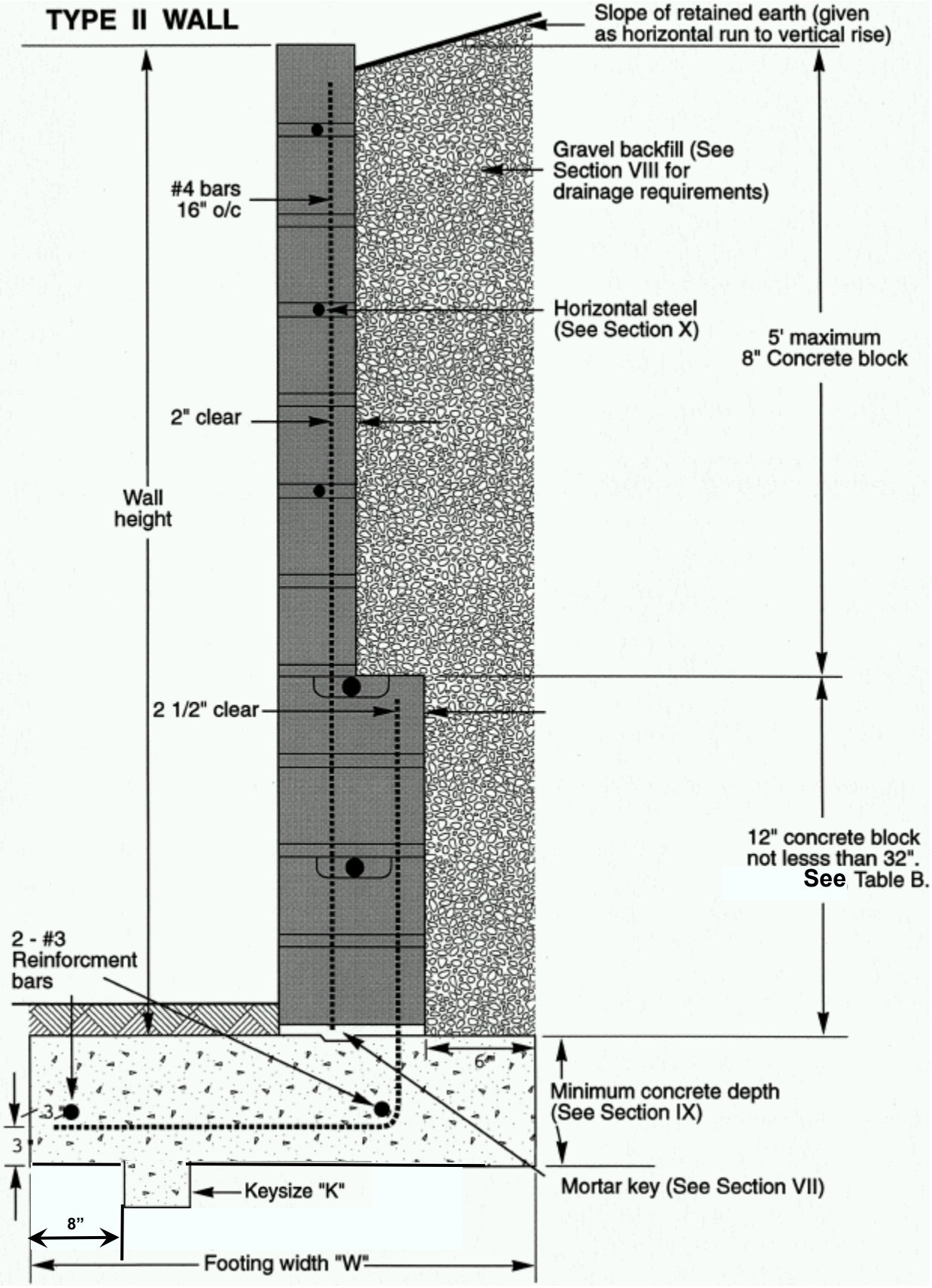
Wall Height (feet)	Slope of Retained Earth (Horizontal Run to Vertical Rise)																			
	Level				3 to 1				2 to 1				1.5 to 1				1 to 1			
	T	R	K	W	T	R	K	W	T	R	K	W	T	R	K	W	T	R	K	W
1.5'	A	1	N	1'-4"	A	1	N	1'-4"	A	1	N	1'-4"	A	1	N	1'-6"	A	1	N	1'-7"
2.0'	A	1	N	1'-4"	A	1	N	1'-4"	A	1	N	1'-4"	A	1	D	1'-8"	A	1	D	1'-10"
2.5'	A	1	N	1'-7"	A	1	N	1'-7"	A	1	N	1'-7"	A	1	D	1'-10"	A	1	E	2'-2"
3.0'	A	1	N	2'-0"	A	1	N	2'-0"	A	1	D	2'-0"	A	1	E	2'-2"	B	1	F	2'-5"
3.5'	A	1	N	2'-1"	A	3	D	2'-1"	A	3	D	2'-1"	B	1	E	2'-4"	B	4	F	3'-4"
4.0'	B	1	N	2'-4"	B	1	D	2'-4"	B	1	D	2'-4"	B	4	F	2'-5"	B	6	G	3'-4"
4.5'	B	1	N	2'-6"	B	2	D	2'-6"	B	4	E	2'-6"	B	6	F	3'-1"	C	5	G	3'-9"
5.0'	B	4	D	2'-9"	B	5	E	2'-9"	B	6	F	2'-9"	C	5	G	3'-5"				
5.5'	B	5	D	3'-0"	B	6	E	3'-0"	C	5	F	3'-2"	C	5	G	3'-9"				
6.0'	C	5	E	3'-3"	C	5	E	3'-4"	C	5	F	3'-6"	C	6	G	4'-2"				
7.0'	C	5	E	3'-10"	C	6	G	3'-11"	C	7	G	4'-1"								
8.0'	C	5	G	4'-6"																

TABLE B

T Wall Type*	R Reinforcing Steel	K Key Size (Width x Depth)
A – Type I, 6" block	1 - #3 Bars @ 24" o.c.	D – 6" x 6"
B – Type I, 8" block	2 - #4 Bars @ 32" o.c.	E – 8" x 8"
C – Type II, first 32" of block	3 - #3 Bars @ 16" o.c.	F – 12" x 12"
must be 12" wide masonry,	4 - #4 Bars @ 24" o.c.	G – 12" x 18"
regardless of wall height (see	5 - #4 Bars @ 16" o.c.	N – None
sketch), 8" block for remainder	6 - #5 Bars @ 16" o.c.	
**See pages 4 & 5 for wall types*	7 - #6 Bars @ 16" o.c.	



NOTE: The bottom leading edge of all retaining wall footings shall be 7'-0" minimum from FACE of slopes where the ground slopes away from the wall.



NOTE: The bottom leading edge of all retaining wall footings shall be 7'-0" minimum from FACE of slopes where the ground slopes away from the wall.