MINIMUM REQUIREMENTS FOR

Retaining Wall/Sloping Backfill

CITY OF OCEANSIDE DEVELOPMENT SERVICES
300 N COAST HWY, OCEANSIDE, CA 92054
Call (760) 435-3950 for information

INFORMATION BULLETIN
224
July 2008

Construction of retaining walls, except those less than four feet high (measured from the bottom of the footing) and not supporting surcharge, requires a permit and is regulated by City of Oceanside building codes. Information Bulletin 223 and 223a outline the City's requirements for retaining walls with level backfill. Information Bulletin 224 describes retaining walls with sloping backfill. These bulletins are intended to provide a simple alternative to designing minor retaining walls, but should be used only where appropriate (see Section VII. SOIL).

I. INSPECTIONS

Inspections must be performed during several phases of construction. Please call for inspections at the following times:

A. A footing inspection is needed when the excavation for a footing has been dug with the steel tied securely in its final position, and the site is ready for the concrete to be placed.

B. A masonry pre-grout inspection is required when the block has been laid and the steel is in place, but before the grout has been placed.

1. If cleanout holes *are* used, block may be laid to the full height at the grout pour before calling for the pre-grout inspection. Grout shall be placed in a continuous pour in grout lifts not exceeding 6 feet.
2. If cleanout holes *are not* used, a masonry pre-grout inspection is required prior to each grout pour. Block cannot be laid higher than the grout pour. Note that cleanouts are required for all grout pours over 5 feet in height.

C. After grouting is completed and rock or rubble wall drains are in place, but before earth backfill is placed, call for a backfill/drainage inspection.

D. When all work has been completed, call for a final inspection.

II. WALL HEIGHT (Table A)

Wall height is measured from the top of the footing to the top of the wall.

Walls not shown in Table A on page 2 must be designed specifically for the existing conditions. The walls shown here are designed to retain gently sloping backfill no steeper than 2 horizontal to 1 vertical (2:1). No building foundation, retaining wall, driveway, parking, fence, or other potential source of loading on the upper level is allowed within a distance equal to the height of the wall.

III. BLOCK

All block must be type "N" grouted solid with f'_m =1,500 psi.

IV. MIX REQUIREMENTS

Note: The use of plastic cement is not permitted in retaining walls located in Oceanside, Seismic Category D.

A. The concrete mix for footings must meet a compressive strength of f'_c = 2,500 psi minimum, or the following proportions by volume:

1 part Portland cement
2-1/2 parts sand
3-1/2 parts 3/4-inch maximum-size gravel
7 gallons of water maximum per sack of cement

B. The mortar mix must have a compressive strength equal to 1,800 psi minimum. One possible mix contains the following proportions by volume:

1 part Portland cement
3-1/2 parts sand
1/4 part hydrated lime or lime putty

C. Grout must have a compressive strength equal to 2,000 psi minimum. One possible mix contains the following proportions by volume:

1 part Portland cement
3 parts sand
2 parts pea gravel (3/8-inch aggregate)

Add water until pouring consistency is achieved without segregation of the grout constituents. Rod or vibrate immediately. Rerod or revibrate grout about 10 minutes after pouring to ensure solid consolidation. Stop grout 2 inches from top of masonry units when grouting of second lift is to be continued at another time.

Note: All cells must be filled solid with grout.

V. 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 2x4 flush with and at the top of the freshly placed footing. It should be removed after the concrete has started to harden (about 1 hour). A mortar key may be omitted if the first course of block is set into the fresh concrete when the footing is placed and a good bond is obtained.

VI. WALL DRAINS

Wall drains must be placed at 6-foot intervals along the length of the wall and located just above the level of the soil or paving on the front face of the wall. The drains may be formed by placing a block on its side at 6-foot intervals, by leaving out the mortar in the vertical spaces between all the blocks in the first course above the soil or paving (head joint), by installing 4-inch diameter drain line behind the wall, or by any other acceptable equivalent method. Backfill behind wall drains or open head joints must be loose rubble or gravel at least 12 inches wide and extending from the top of the wall to the top of the footing.

VII. SOIL

This bulletin is to be used only when the soils to be retained are not expansive (i.e. sandy soils). These walls' footing sizes and reinforcing steel are based upon granular, non-cohesive soil backfill utilizing an active earth pressure with an equivalent fluid weight of 30 pounds per cubic foot for an allowable bearing value of 1,500 psf. If existing soil

conditions do not meet this criterion or the conditions are unknown, walls should be designed by a registered civil engineer or a licensed architect. A soil report may be required.

Where the ground slopes away from the base of the wall, a minimum of 7 feet must be provided horizontally from the toe of the footing to the slope face (daylight). All footings must extend at least 12 inches into undisturbed natural soil or compacted fill which has been tested and certified by a registered civil engineer. Soil should be dampened prior to placing concrete in footing excavations.

VIII. REINFORCING STEEL

Reinforcing steel must be deformed and comply with ASTM specification A615-85, Grade 40 or 60. When one continuous bar cannot be used, a lap or splice of 40-bar diameters is required.

Three #4 bars must be placed longitudinally in the footing as shown in figures 1 and 2.

One #4 reinforcing bar must be placed longitudinally within the wall in a bond beam block every 16 inches as the blocks are laid up.

IX. USE OF TABLES

Determine the height of the wall to be constructed as described above and the slope of retained earth. Using Table A with the appropriate wall height and slope of retained earth, read T,R,K and W designations. Then proceed to Table B.

The following example is for a 5'4" high wall with a 2 to 1 slope:

From Table A: T = C, R = 2, K = K, W = 3'-2"
From Table B:

C = Type II, 8" and 12" block,
2 = #4 bars at 16" on center, and
K = Key size of 12" wide by 23" deep

Table A[2]/Requirements for Various Slopes of Retained Earth (Horizontal Run to Vertical Rise)

Wall	Level				2 to 1			
Height	**T**	**R**	**K**	**W**	**T**	**R**	**K**	**W**
2'-0"	A	1	N	1'-4"	A	1	N	1'-4"
2'-8"	A	1	N	1'-7"	A	1	E	1'-7"
3'-4"	A	1	D	2'-1"	A	1	F	2'-1"
4'-0"	B	1	E	2'-4"	B	1	H	2'-4"
4'-8"	B	1	F	2'-9"	B	3	J	2'-9"
5'-4"	B	2	H	3'-0"	C	2	K	3'-2"
6'-0"	C	2	I	3'-3"	C	2	L	3'-6"

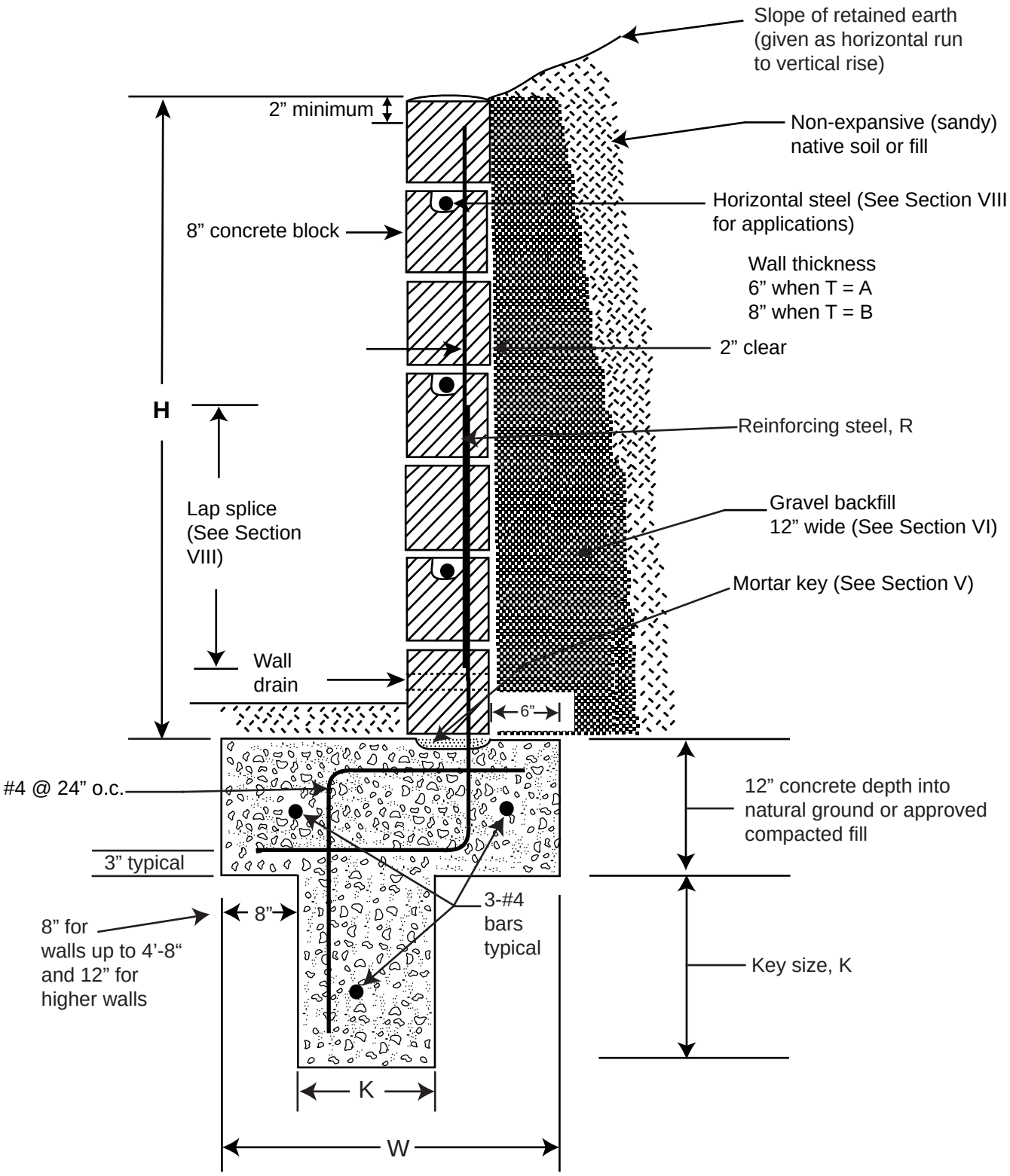
Table B[1,3,4,5]/Values for T, R, and K

Wall Type and Thickness, T	Reinforcing Steel, R	Key Size, K (Width by Depth)
A – Type I, 6" block B – Type I, 8" block C[5] – Type II, 8" and 12" block	1 - #4 bars @ 24" o.c. 2 - #4 bars @ 16" o.c. 3 - #5 bars @ 16" o.c.	D – 6" x 6" E – 8" x 8" F – 12" x 12" H – 12" x 16" I – 12" x 19" J – 12" x 20" K – 12" x 23" L – 12" x 27" N- None

Footnotes:

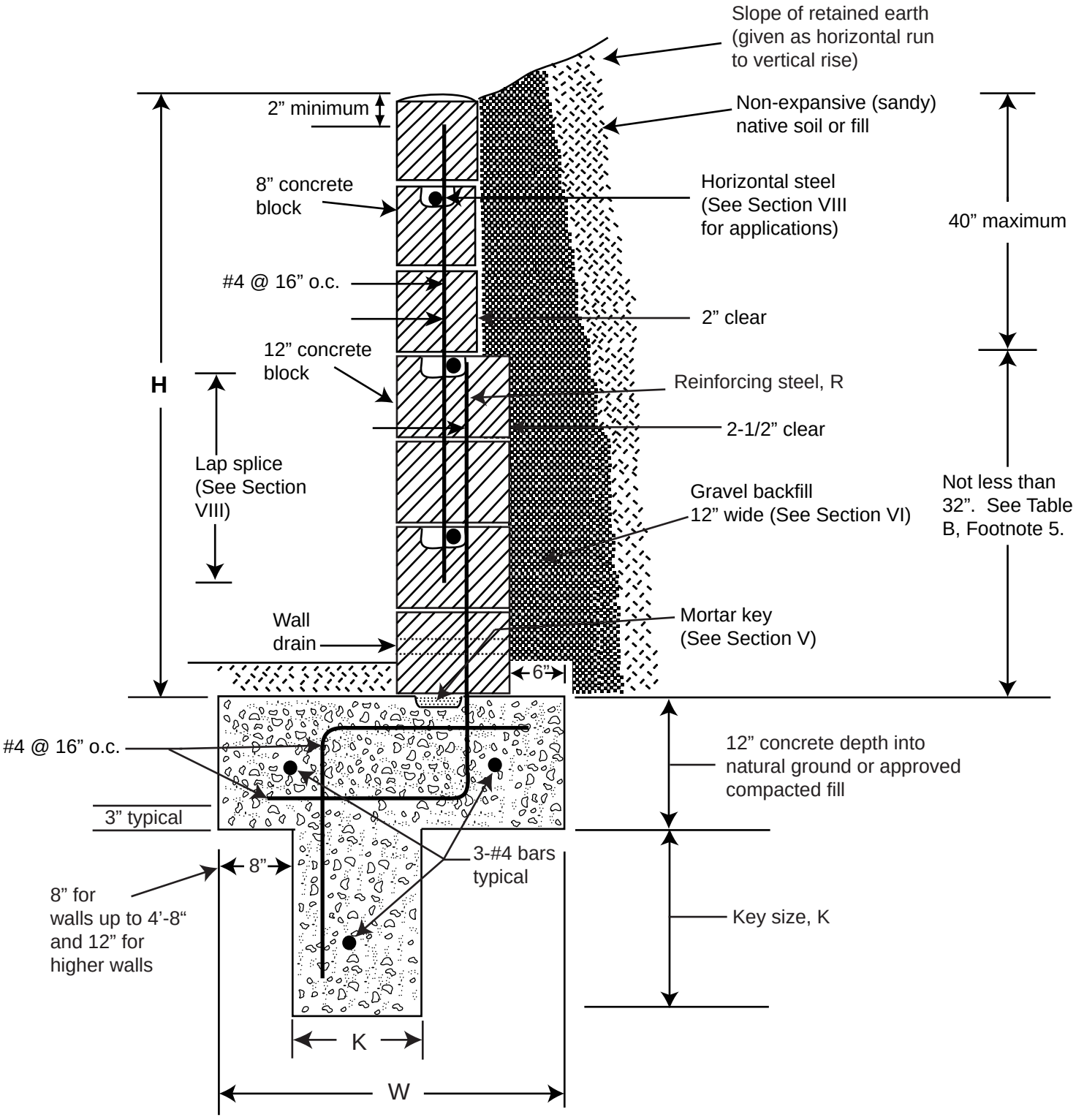
1. Footing sizes are based on 1,500 psf design soil bearing value
2. Walls not shown in Table A must be designed specifically for the actual conditions.
3. All construction must comply with the specifications shown in this information bulletin.
4. All blocks must be grade "N" grouted solid with an f'_m = 1,500 psi.
5. For wall Type II, the first 32 inches of block, regardless of wall height, must be 12-inch-wide masonry units.

Figure 1 Type I retaining wall with sloping backfill



Note: A minimum of 7 feet must be provided horizontally from the toe of the footing to daylight where the ground slopes away from the base of the wall.

Figure 2 Type II retaining wall with sloping backfill



Note: A minimum of 7 feet must be provided horizontally from the toe of the footing to daylight where the ground slopes away from the base of the wall.