



MINIMUM REQUIREMENTS FOR

Retaining Wall/Sloping Backfill

CITY OF SAN DIEGO DEVELOPMENT SERVICES
1222 FIRST AVENUE, MS 301 SAN DIEGO, CA 92101-4153
CALL (619) 446-5300 FOR APPOINTMENTS AND (619) 446-5000 FOR INFORMATION

INFORMATION
BULLETIN

222

JANUARY 2010

Construction of retaining walls, except those less than three feet high, measured from the top of the footing to the top of the wall and not supporting surcharge, requires a permit and is regulated by City of San Diego Municipal Code.

Information Bulletin 222 outlines the city's requirements for retaining walls with sloping backfill. Information Bulletin 221 describes retaining walls with level backfill. These bulletins are intended to provide a simple alternative to designing minor retaining walls, but should be used only where appropriate soil condition at the site. See Section VII. SOIL.

For information on how to obtain a permit for a retaining wall, see Information Bulletin 220.

I. ZONING REGULATIONS

Retaining walls heights are also regulated by the zoning laws of the city as follows: The height of a retaining wall is measured from grade on the lower side of the retaining wall to the top of the retaining wall, (Exposed height E), (SDMC 113.0270(b)(2)).

San Diego Municipal Code Chapter 14, Article 2, Division 3 regulates the location and the height of the retaining walls in the required setbacks and in the visibility area as follows:

1. Retaining walls in visibility areas shall not exceed 3 feet in height. (SDMC 142.0340(b)).
2. Two retaining walls with a maximum height of 3 feet each are permitted in the required front and street side yard if the two retaining walls are separated by a minimum horizontal distance equal to the height of the upper wall. (SDMC 142.0340(c)(1)).
3. Two retaining walls with a maximum height of 6 feet each are permitted in the required side and rear yard if the two retaining walls are separated by a minimum horizontal distance equal to the height of the upper wall. (SDMC 142.0340(d)(1)).

Note: Retaining walls higher than 5 feet may require a grading permit.

II. WALL HEIGHT

For the purpose of designing the wall in this information bulletin, wall height is measured from the top of the footing to the top of the wall. Walls not shown in Tables A and B on page 3 must be designed specifically for the existing conditions. The walls shown here are designed to retain only sloping backfill. 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. See figure 1.

Documents Referenced in this Information Bulletin

- 2007 California Building Code, (CBC)
- San Diego Municipal Code, (SDMC)
- [Information Bulletin 220](#), How to Obtain a Permit for a Retaining Wall/Fence
- [Information Bulletin 221](#), Minimum Requirements for Retaining Wall/Level Backfill

III. CAL/OSHA PERMIT/WAIVER

A CAL/OSHA construction activity permit is required for construction of trenches or excavations which are five feet or deeper and into which a person is required to descend. For more information please contact:

Cal/OSHA Enforcement Unit district office
7575 Metropolitan Drive, Ste. 207
San Diego 92108
(619) 767-2280
Fax (619) 767-2299

IV. MASONRY BLOCKS

Concrete masonry units shall be of sizes shown on drawings and conform to ASTM C90 (CBC 2103.1) Medium Weight Units with maximum linear shrinkage of 0.06%, F'm=1,500 psi grouted solid reinforced cells.

All head and bed joints shall be 3/8" thick. Bed joints of the starting course over the concrete foundation may be between 1/4" and 3/4". (ACI 530.1-05 section 3.3B)

No special inspection is required for retaining walls up to 6 feet in height.

V. SPECIFICATIONS

A. CONCRETE

Concrete for footings must have a minimum compressive strength of 2,500 psi at 28 days. (CBC 1805.4.2.1). Cement shall conform to ASTM-C150 (ACI 318-05 section 3.2).

Note: Plastic (Stucco) cement ASTM C 1328 is not permitted in retaining walls located in Seismic Design Category D.

B. MORTAR

The mortar mix must have a compressive strength equal to 1,800 psi minimum (CBC Table 2105.2.2.1.2). Mortar for use in masonry

construction shall conform to ASTM C 270 and shall conform to the proportion specifications of Table 2103.8(1) or the property specifications of Table 2103.8(2) of the CBC.

C. GROUT

Grout must have a compressive strength equal to 2,000 psi minimum. Grout shall conform to Table 2103.12 or to ASTM C 476. When grout conforms to ASTM C 476, the grout shall be specified by proportion requirements or property requirements (CBC 2103.12).

E. REINFORCING STEEL

Reinforcing steel must be deformed and comply with ASTM A 615 (CBC 2103.13.1), Grade 60. When one continuous bar cannot be used, a lap or splice of 40-bar diameters is required. All bars shall be clean of loose flaky rust, grease or other materials likely to impair bond. (ACI 318-05 Section 5.7).

Reinforcement in concrete shall be protected from corrosion and exposure to chlorides. (ACI 318-05 Section 7.7.6). Concrete protection for reinforcement shall be at least 3" to earth when the concrete is poured against the earth. (ACI 318-05 Section 7.7.1).

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. See Figure 2.

F. 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 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) on the front face of the wall, 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 DESIGN CRITERIA

This information bulletin is to be used only when the soils to be retained are **not expansive (i.e. sandy soils)**. The design of this information bulletin is based on the following criteria:

1. Soil type: granular, non-cohesive soil backfill.
2. Active earth pressure with an equivalent fluid weight of:
 - 42 pounds per cubic foot for 2 to 1 slope.
 - 60 pounds per cubic foot for 1.5 to 1 slope.
3. Passive earth pressure with an equivalent fluid weight of:
 - 200 pounds per cubic foot for 2 to 1 slope.
 - 300 pounds per cubic foot for 1.5 to 1 slope.
4. Allowable bearing value of 1,500 psf.
5. Soil friction factor 0.25.

If existing soil conditions do not meet these design criteria or the conditions are unknown, walls should be designed by a State of California licensed civil engineer or architect. A soil report may be required.

Note: Soil lateral pressure due to earthquake motion is not included.

VIII. 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 pregrout 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 pregrout 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 pregrout 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.

Table A / Requirements for Various Wall Heights 2 to 1 Slope ^{1,2,3,4,5}

Wall Type	I	II		III	
Wall Height (H) ⁶	3' - 4"	4' - 0"	4' - 8"	5' - 4"	6' - 0"
Exposed Wall Height (E) ⁷	2' - 4"	3' - 0"	3' - 8"	4' - 4"	5' - 0"
Stem Block Thickness	6"	8"	8"	8" / 12"	8" / 12"
Heel Dimension (L)	1' - 0"	1' - 0"	1' - 4"	1' - 6"	1' - 6"
Toe Dimension (T)	1' - 2"	1' - 8"	1' - 8"	1' - 9"	2' - 3"
Vert Bars (A)	#4 @ 24"	#4 @ 24"	#4 @ 24"	#4 @ 16"	#4 @ 16"
Vert Bars (B)	#4 @ 24"	#4 @ 24"	#4 @ 24"	#4 @ 16"	#4 @ 16"
Footing Width (W)	2' - 2"	2' - 8"	3' - 0"	3' - 3"	3' - 9"
Key Distance from Toe	6"	6"	6"	6"	6"
Key (W x D)	6" x 6"	6" x 6"	8" x 12"	12" x 14"	12" x 18"

Table B / Requirements for Various Wall Heights 1.5 to 1 Slope ^{1,2,3,4,5}

Wall Type	II			III	
Wall Height (H) ⁶	3' - 4"	4' - 0"	4' - 8"	5' - 4"	6' - 0"
Exposed Height (E) ⁷	2' - 4"	3' - 0"	3' - 8"	4' - 4"	5' - 0"
Stem Block Thickness	8"	8"	8" / 12" ⁵	8" / 12"	8" / 12"
Heel Dimension (L)	1' - 4"	1' - 4"	1' - 4"	1' - 6"	2' - 0"
Toe Dimension (T)	1' - 5"	2' - 0"	2' - 2"	2' - 6"	2' - 8"
Vert Bars (A)	#4 @ 24"	#4 @ 24"	#4 @ 24"	#4 @ 16"	#5 @ 16"
Vert Bars (B)	#4 @ 24"	#4 @ 24"	#4 @ 24"	#4 @ 8"	#5 @ 8"
Footing Width (W)	2' - 9"	3' - 4"	3' - 6"	4' - 0"	4' - 8"
Key Distance from Toe	6"	6"	6"	12"	12"
Key (W x D)	6" x 6"	8" x 8"	8" x 10"	12" x 15"	12" x 21"

FOOTNOTES:

¹ Tables A makes the following assumptions:

$f'_y = 60000$ psi

$F_s = 24000$

Solid grouting

Using half f'_m stress

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 Walls less than 3' 4" in height shall be constructed to meet the 3' 4" wall height design criteria.

I= 6 Inches block

II= 8 Inches block

III=12 Inches block

⁵ Footing depth shall be 24 inches below finish grade and 12 inches of compacted soil is required on top of footing to stabilize the wall.

⁶ For the purpose of the structural design, wall height shall be measured from the top of the footing to the top of the wall.

⁷ For zoning requirements fence height shall be measured from finish grade.

Figure 1 / Subcharge and Slope Setbacks

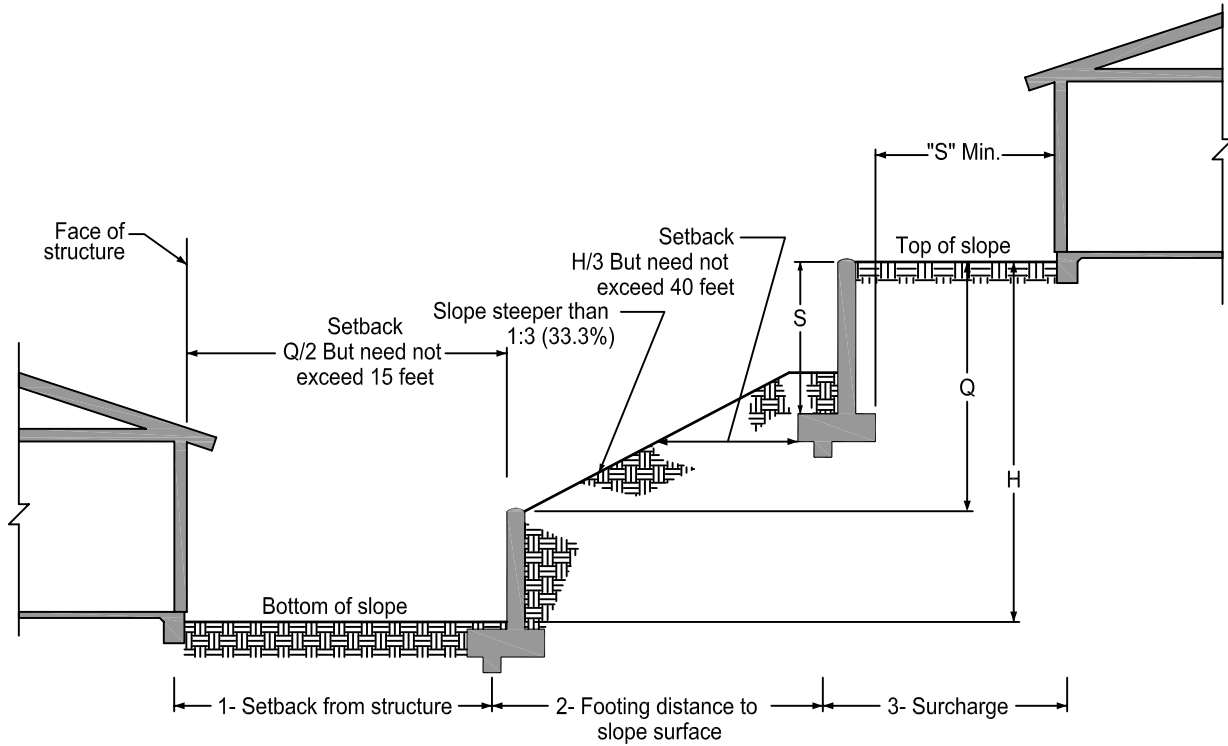
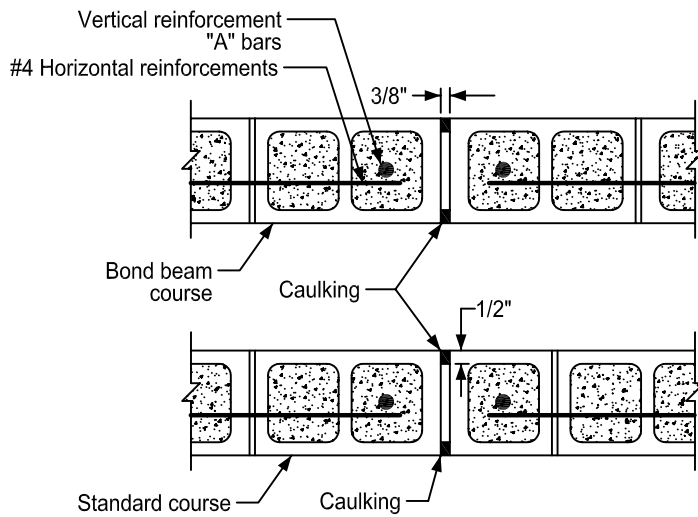


Figure 2 / Typical Control Joints



Note: Control joints shall be spaced no greater than 25 feet O.C.

Figure 3 / Type I and II Retaining Wall with Sloping Backfill

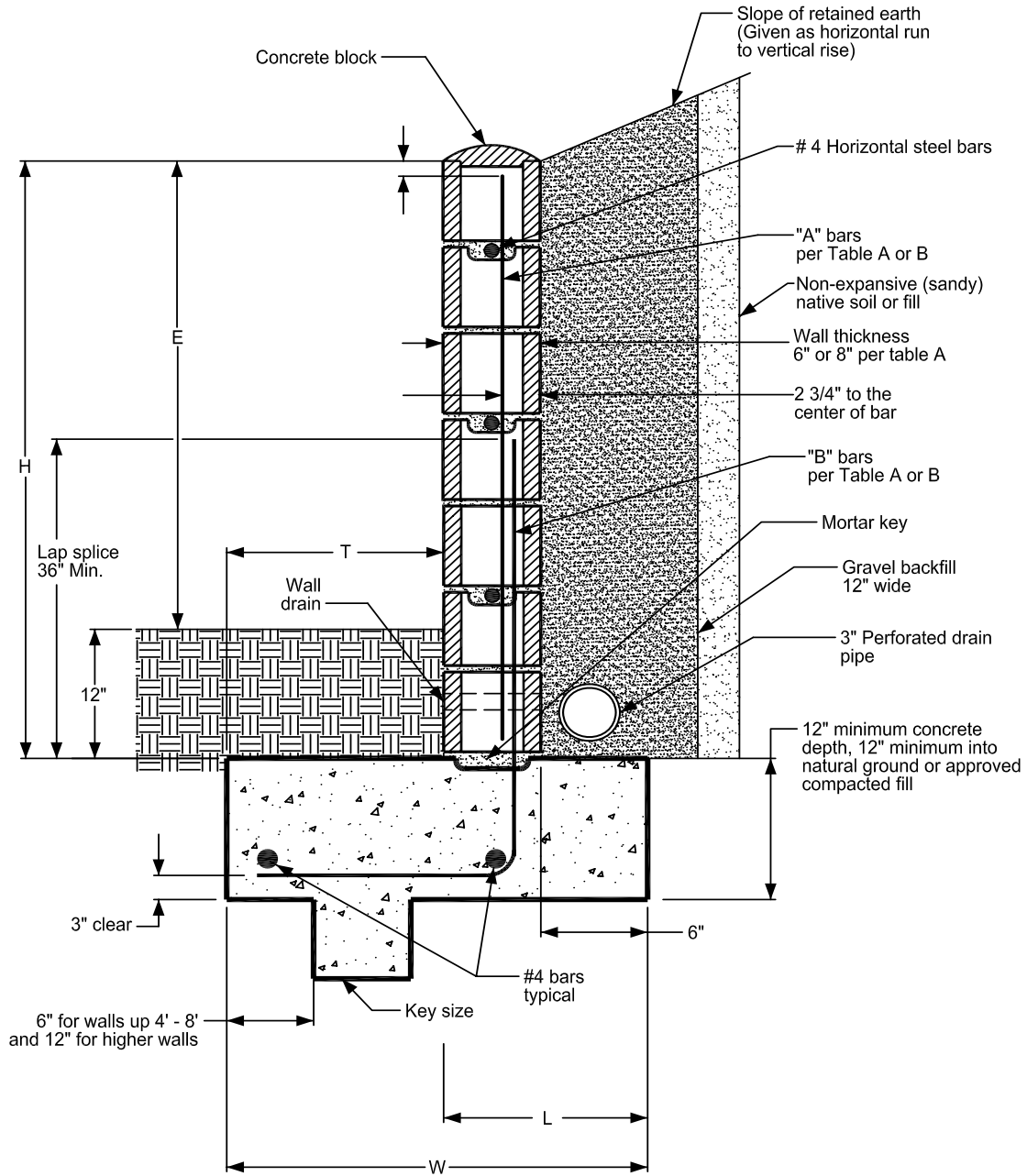


Figure 4 / Type III Retaining Wall with Sloping Backfill

