



Retaining Wall – Level and Sloping Backfill

Minimum Requirements

Construction of retaining walls, except those less than four (4) feet high, measured from the bottom of the footing to the top of the wall and not supporting surcharge, require a building permit and is regulated by the City of Vista.

This information bulletin outlines the City's requirements for retaining walls with level backfill. A grading permit is also required if the general drainage pattern is altered or the flow concentrated. Please contact the City's Land Development Division with questions regarding grading permits.

A site plan showing the height and length of the retaining wall is required. The site plan will show the location and width of all dedicated easements. If there is no easement, provide a note on the site plan with the signature of the owner, designer, or contractor which states: "I have verified the subject property's grant deed and title report and have found no easements in the area of construction. I acknowledge that I am responsible and accountable for not constructing any improvements in the easements."

Type of Block

All retaining walls must either be constructed using decorative block or must be finished (e.g., with stucco) to match the main structure.

Inspections

Inspections must be performed during several phases of construction. Please call (760) 639-6106 to schedule inspections at the following construction stages:

1. A footing inspection is needed when the footing has been dug with the steel tied securely in its final position and the site is ready for the concrete to be placed.
2. 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.
 - a. If cleanout holes are used, block may be laid to the full height at the grout pour before calling for pre-grout inspection. Grout shall be placed in a continuous pour in grout lifts not exceeding six (6) feet.
 - b. 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 five (5) feet in height.
3. A backfill/drainage inspection is needed after grouting is completed and rock or rubble wall drains are in place, but before earth backfill is placed.
4. Call for a final inspection when all work has been completed.

Wall Height for Table A and B

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

Walls not shown in Tables A and B must be designed specifically for the existing soil conditions.

The walls shown here are designed to retain earth banks with level backfill. No building foundation, driveway, or other loading on the upper level is allowed within a distance equal to the height of the wall.

Block

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

Mix Requirements

Note: The use of plastic cement is not permitted in retaining walls.

1. The concrete mix for footings must meet a compressive strength of $f'_c=2,500$ psi minimum.
2. 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
 - 3½ parts sand
 - ¼ part hydrated lime or lime putty
3. 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. Re-rod or re-vibrate grout about 10 minutes after pouring to ensure solid consolidation. Stop grout two (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.**

Mortar Key

To ensure 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 placed footing. It should be removed after the concrete has started to harden (about one (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.

Wall Drains

Wall drains (four (4)-inch-diameter) must be placed at six (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 six (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 or by any other acceptable equivalent method. Backfill behind wall drains or open head joints must be loose rubble or gravel twelve (12) inches wide and extending from the top of the wall to the top of the footing.

Soil

Wall design, footing sizes, and reinforcing steel are all based on an active earth pressure with an equivalent fluid weight of 30 pounds per cubic foot. All footings must extend at least twelve (12) inches into undisturbed natural soil or compacted fill which has been compacted to at least 90 percent density. Soil should be dampened prior to placing concrete in footings. A soils report, compiled by a licensed civil engineer, may be required.

A minimum of seven (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.

Footing sizes given in Table A are based on a 1,000 psf maximum soil bearing value; use of a larger bearing value will require design by a licensed architect or civil engineer specifically for the existing conditions. A soils report, compiled by a licensed civil engineer, may be required.

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 24" is required.

Two #3 bars must be placed longitudinally in the footing as shown in Figure 1 and 2.

For six (6)-inch or eight (8)-inch blocks, one #3 reinforcing bar must be placed longitudinally in the center of the wall in a bond beam block every 16 inches as the blocks are laid up.

FOR LEVEL BACKFILL

Table A/Requirements for Various Wall Heights 1,2,3

Wall Height (H)	Wall Type	Toe Dimension (L)	Footing Width (W)	Key Size (K)	"A" Bars	"B" Bars
1'-4"	III	2"	1'-3"	None	#3s @ 24" o.c.	None
2'-0"	III	2"	1'-6"	None	#3s @ 24" o.c.	None
2'-8"	III	3"	1'-10"	None	#3s @ 24" o.c.	#3s @ 48" o.c.
3'-4"	III	4"	2'-1"	None	#3s @ 24" o.c.	#3s @ 48" o.c.
4'-0"	IV	6"	2'-6"	None	#4s @ 24" o.c.	#3s @ 32" o.c.
4'-8"	IV	11"	2'-11"	None	#4s @ 24" o.c.	#4s @ 24" o.c.
5'-4"	IV	12"	3'-2"	6"x6"	#4s @ 16" o.c.	#4s @ 24" o.c.

Footnotes

1. Footing sizes are based on 1,000 psf maximum soil bearing value. The resultant is within the middle third of the footing.
2. Wall not shown in Table A above must be designed specifically for the actual condition.
3. All construction must comply with the specifications shown in this information bulletin.

FOR SLOPING BACKFILL

Determine height of 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, note T, R, K, and W designations. Proceed to Table B.

Example: Wall height of 5 feet; slope of retained earth 3 horizontal to 1 vertical

From Table A: T=B, R=5, K=E and W=2'-9"

From Table B: B=Type I, 8" concrete block
 5=#4 reinforcing bars @ 16" on center
 E=Key size of 8" wide by 8" deep

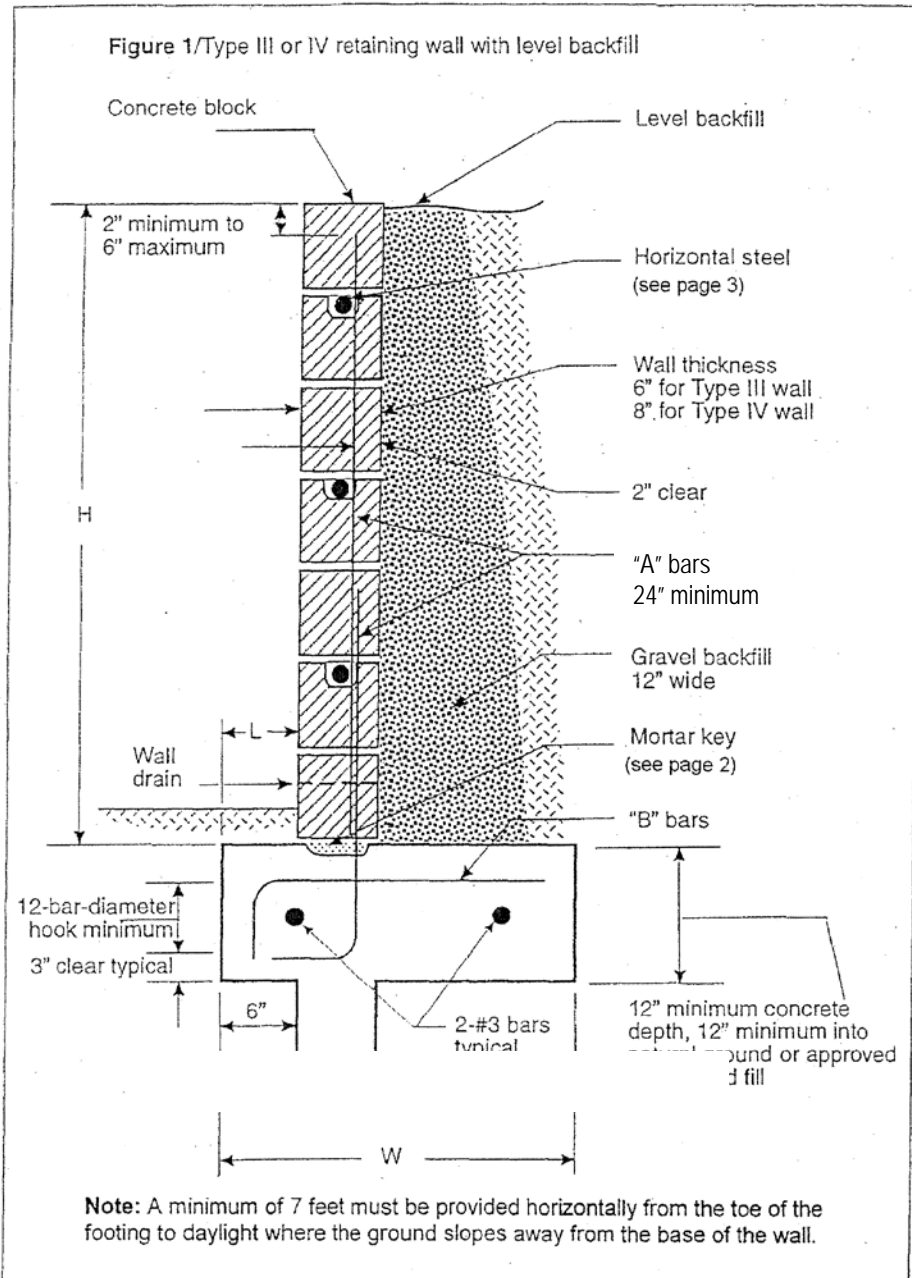
Wall Ht.	Level				5 to 1				4 to 1				3 to 1				2 to 1			
	T	R	K	W	T	R	K	W	T	R	K	W	T	R	K	W	T	R	K	W
1'-6"	A	1	N	1'-4"	A	1	N	1'-4"	A	1	N	1'-4"	A	1	N	1'-4"	A	1	N	1'-4"
2'-0"	A	1	N	1'-4"	A	1	N	1'-4"	A	1	N	1'-4"	A	1	N	1'-4"	A	1	N	1'-4"
2'-6"	A	1	N	1'-7"	A	1	N	1'-7"	A	1	N	1'-7"	A	1	N	1'-7"	A	1	N	1'-7"
3'-0"	A	1	N	2'-0"	A	1	N	2'-0"	A	1	N	2'-0"	A	1	N	2'-0"	A	1	D	2'-0"
3'-6"	A	1	N	2'-1"	A	1	N	2'-1"	A	1	N	2'-1"	A	3	D	2'-1"	A	3	D	2'-1"
4'-0"	B	1	N	2'-4"	B	1	N	2'-4"	B	1	N	2'-4"	B	1	D	2'-4"	B	1	D	2'-4"
4'-6"	B	1	N	2'-6"	B	2	D	2'-6"	B	2	D	2'-6"	B	2	D	2'-6"	B	4	E	2'-6"
5'-0"	B	4	D	2'-9"	B	4	D	2'-9"	B	5	E	2'-9"	B	5	E	2'-9"	B	6	F	2'-9"
5'-6"	B	5	D	3'-0"	B	6	D	3'-0"	B	6	E	3'-0"	B	6	E	3'-0"	Not allowed			

Wall Type and Thickness, T	Reinforcing Steel, R	Key Size, K (Width by Depth)
A - 6" block	1 - #3 bars @24" o.c.	D - 6" X 6"
B - 8" block	2 - #4 bars @ 32" o.c.	E - 8" X 8"
	3 - #3 bars @ 16" o.c.	F - 12" X 12"
	4 - #4 bars @ 24" o.c.	N - None
	5 - #4 bars @ 16" o.c.	
	6 - #5 bars @ 16" o.c.	

FOOTNOTES

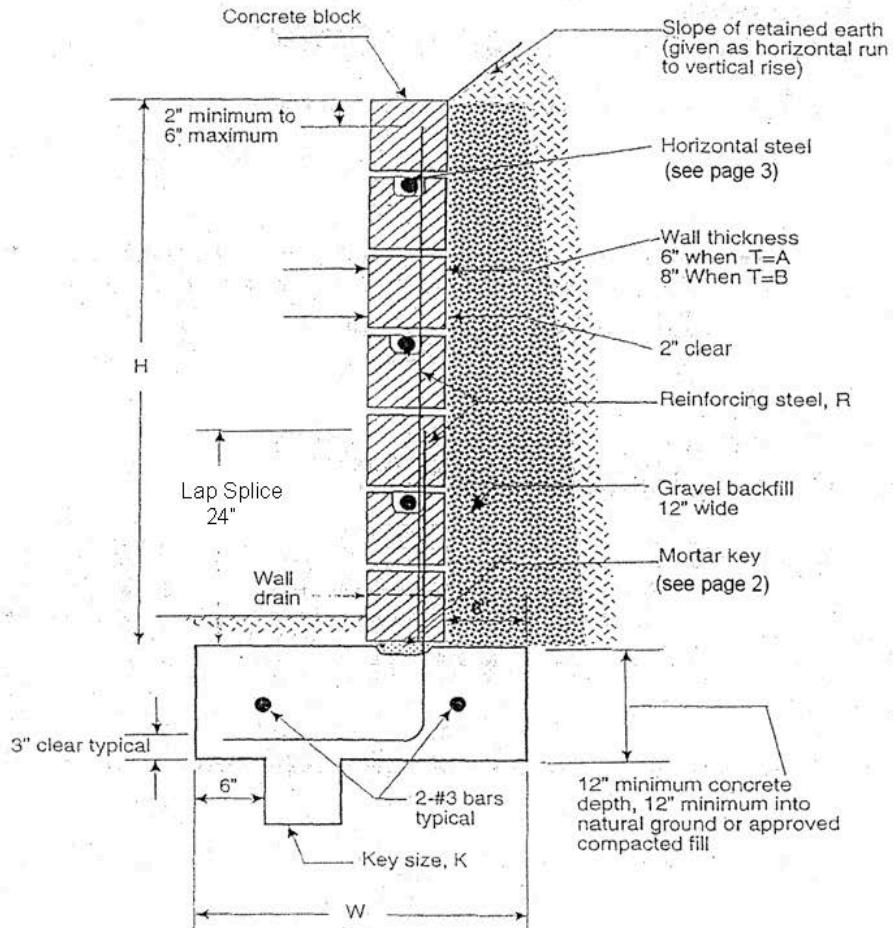
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3. All construction must comply with the specifications shown in this information bulletin
4. All blocks must be grade "N" grouted solid with and f'm=1,500 psi

LEVEL BACKFILL



SLOPING BACKFILL

Figure 2 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.