



# Landscapes & Hardscape

DESIGN-BUILD

FROM CONCEPT TO COMPLETION

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Anchor Wall Systems.



# Calculating Materials

Proper planning and estimating is essential for project success

*by Tim Huinker*

**A**s a contractor, I have been estimating and building residential retaining walls for over 20 years. In that time, I have had some bidding successes and some failures. (Thankfully, I've had far more successes.) I have found I am not alone in the challenges of planning and estimating. You will notice I didn't say bidding and estimating.

For residential projects, most contractors will employ planning and estimating to meet the needs of their clients. The estimate/proposal presents your own ideas for the particular project and will be different from another company's plan. This is important in the estimating process, because you are responsible for the plan and its implementation.

The measuring process is the most important step to getting an accurate materials estimate, and the initial site evaluation is where many

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*The right planning and estimating can help make your projects look as nice as this one.*

## Calculating Materials

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estimating mistakes can start. If you are dealing with smaller slopes, you can easily use a tape measure and get a pretty good idea about the size of the walls. If you are dealing with a larger project, it can be more difficult. It then becomes even more critical to be as accurate as possible in your measuring. Length is easy. You can lay out a garden hose or paint some lines on the ground to measure the length. Be aware of slopes that will change the height of the wall along its length. These changes are important to note and can create stations in your estimate.

You now have to figure the heights. Most residential walls will be built on existing grades for the toe of the wall. This works to your advantage, because you can measure up from existing grade. One simple method to establish the height is to use a stake and string line with a line level. Put the stake in the ground at a spot that is about the height of the top of the planned wall. Take a string and pull it from the stake to the location of the planned wall. Take a line level and place it on top of the string. When the line level's bubble is centered, measure from the string to the ground. This will be your wall height. It's important to do this several times along the wall length to establish the stations mentioned earlier.

Another effective way to calculate wall height is to take a long 2x4 and place the end of it at a spot on the ground that is even with the top of where the planned wall will be. Holding the beam parallel to the ground, place a level on top of it and adjust the beam until the bubble on the level is centered. Measure the distance from the beam to the ground to calculate the wall height for that location.

If you have access to one, both of these processes can be achieved with a transit and laser level, which can be more time-effective and leave less room for error. Take many notes, and be sure to include benchmark locations, which are points on the site where elevation will not change during construction. Examples include the home's foundation, driveways, sidewalks or large trees. These are important to note because they can affect how tall a wall can be built.

For example, say you are building a wall parallel to a home 20 feet from its foundation. You put a stake in the ground at a spot that is about the height of the top of the planned wall and pull the string line to level and determine the wall needs to be 4 feet high. That would make the ground between the home and the top of the wall flat. We know we need drainage away from the home, so now would be the time to figure that into the wall's height. You can figure how much slope you would like and subtract it from that 4-foot wall.



*Use a transit and a laser level to calculate wall height.*



*If cap units are not lying neatly next to each other, "butter cut" them until they touch smoothly.*



*Mark caps to show where cuts will be made.*

Now that the measurements are complete and your notes written, it's time to make calculations to determine product quantities. There are four materials you will need to estimate on every wall, and two materials you may or may not have to deal with, depending on the wall. The four absolutes are the wall block, leveling pad gravel, drainage zone gravel and the drainage pipe behind the wall.

Additional items that need to be included in most wall estimates are cap units and soil. Soil is the wild card. You may be removing soil from a site or adding soil, depending on the wall location and site conditions. You will need to figure some soil work into your estimate, because whether you need to excavate soil or haul it in, you will have labor and equipment involved that you need to account for.

Let's look at each component individually. The leveling pad has specific dimensions recommended by the National Concrete and Masonry Association (NCMA), which recommends it be a minimum of 6 inches deep after compaction and 12 inches wider than the block you are using. A tip to save on labor is to make the trench wide enough to fit the compactor you are using. You may spend a little extra on gravel, but you will be saving time compacting with a machine rather than by hand. If you have a 24-inch-wide leveling pad, an easy formula you can use to estimate material is the length in feet/27 x 1.25 = cubic yards of gravel. This will account for compaction of the materials.

The number of retaining wall units can be calculated with the basic formula of length multiplied by height to get the square footage. Of course, not all walls are perfect rectangles. This is where the stations we talked about earlier come in. We need to break the wall into a series of perfect rectangles to get an accurate quantity.

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# Calculating Materials

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Using our earlier example of the wall paralleling the home, assume the grade at the bottom of the wall is climbing along the length of the wall. The height measurements showed the grade changes by 6 inches every 20 feet. Each station would be 20 feet long times the height you measured. This allows you to do several simple calculations and add them together. Another thing to remember is that your measurements are from grade, so to this point your calculations are all above grade. Following NCMA recommendations, you will need a minimum of 6 inches below grade for your base course. Don't forget this, or you will definitely be short of block.

Now that you have your total square footage, you need to refer to the manufacturer's literature to figure how many blocks you need to cover the area. Remember that if you are using a multiple-size product, you may only be using one size for the base course and multiple sizes to construct the wall.

The drainage zone is the next component, and it consists of .75 to 1-inch clear angular stone as a backfill. The stone backfill needs to be a minimum depth of 12 inches behind the wall units. The equation for this volume is simply length in feet x height in feet x 1.25/27 = cubic yards of gravel. This zone of rock has several uses. It is a compaction zone directly behind the wall and serves as a drainage area to relieve some surcharge on the wall, as well as acts as a freeze-thaw buffer in colder climates. Along with the drainage rock is the drainage pipe. Make sure you have enough drainpipe to cover the length of the wall and allow for extra to make daylight extensions through the wall.

One additional item that I feel is not truly an option when aesthetics are involved is the cap. Capping is a great way to finish the top of your walls. Each wall system has a cap unit so you should refer to the manufacturer's specifications for details in estimating cap materials. There are two things



Using a 2x4 and a level to calculate wall height.

to remember when dealing with caps: one is you have to cut on curves, and, two, you typically need to glue each one down. The cutting associated with curves is important because you want to remember to add about 10 percent extra materials. You also need to make sure you have plenty of glue in your bid for capping.

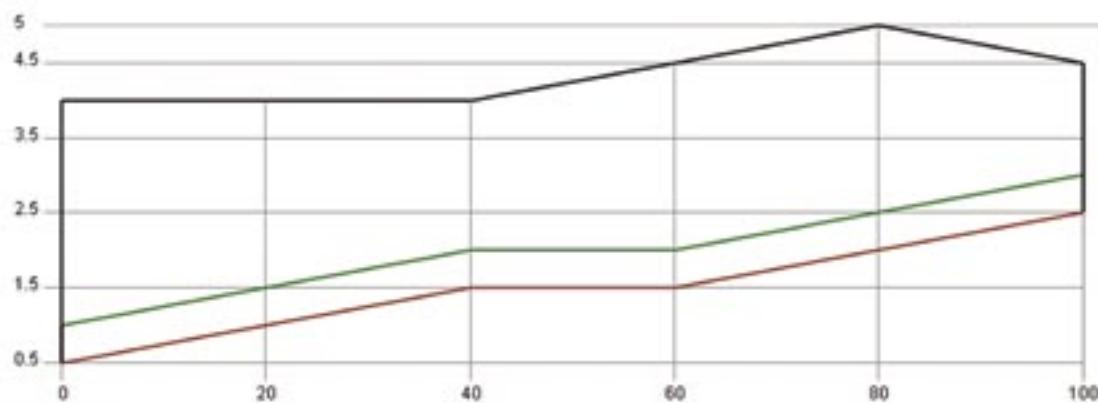
The final item is soil. If you are building a wall that requires importing a soil backfill, you want to remember to add a compaction factor for the soil. If you figure your volume of soil and forget to add soil for compaction, you could be short by 30 to 40 percent. Once you get your soil volume, you want to multiply that number by 1.35 to account for the compaction the soil will go through during construction. The opposite is also true for excavation. If you are trying to determine how many truckloads of soil you are going to haul away, remember to add that same 30 to 40 percent. As air enters the soil it will fluff up, and this could mean the difference of several truckloads of soil, and therefore cost several hundred dollars in extra hauling charges.

I hope these estimating tips help in your future projects. I only touched on materials today, but your estimate is not complete until you have added labor, overhead, equipment costs and, of course, profit. Various suppliers, manufacturers and trade shows offer training classes throughout the year, and I highly encourage you to attend one or several of them. The one thing I hope you take away from an estimating class is that there is no right price or wrong price. Each estimate is produced based on your company's efficiencies. I do know this: if you understand your costs, your estimates will become more accurate, and you will be able to close more profitable jobs. ■

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## Elevation View



## Stations

Number	Distance	Top of Wall	Finished Grade	Embedment	Base of Wall	Total Height
1	0	4	1	0.5	0.5	3.5
2	20	4	1.5	0.5	1	3
3	40	4	2	0.5	1.5	2.5
4	60	4.5	2	0.5	1.5	3
5	80	5	2.5	0.5	2	3
6	100	4.5	3	0.5	2.5	2

An example of an estimate for a retaining wall with stations created in the Anchor Materials Estimator on [www.anchorwall.com](http://www.anchorwall.com).