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STEP 1: DESIGN AND LAYOUT

The starting point of any project is the preliminary design drawing. The drawing should include an overview of the project (site plan) and one or more cross sections through the wall (profiles), and should be done on graph paper to a convenient scale so that it is easy to read and estimate quantities from.

POINTER: Remember to incorporate the layout of the drainage system, specifically the outlet(s), in the design.

NOTE: The Ontario Building Code requires that a building permit be obtained for walls in excess of 1 metre that are adjacent to:

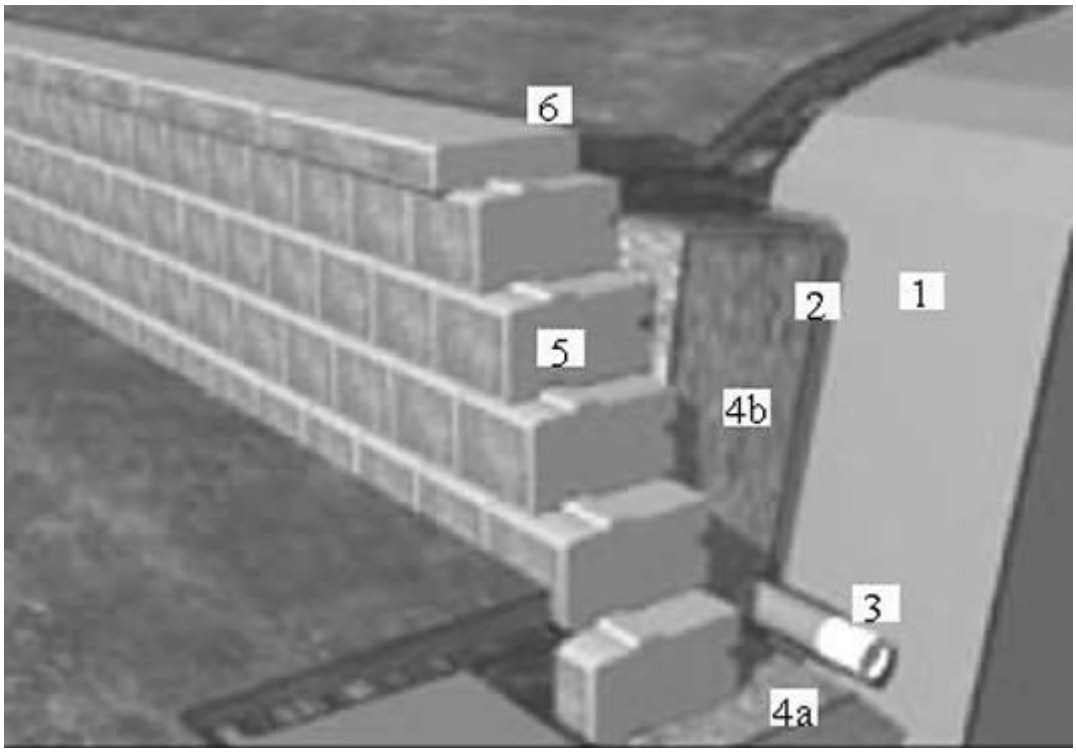
(A) public property;
(B) access to a building; or
(C) private property to which the public is admitted.

To assist with building permit applications, typical cross sections for most wall types (and at various different heights) are available for reference, or arrangements can be made for a complete engineered design to be conducted.

It is further recommended that an engineered design be prepared for walls (irrispective of height) that:

1. include geogrid;
2. are being installed on questionable soil;
3. have steep slopes at the top and/or bottom;
4. are waterfront applications; or,
5. include railings / barriers.

STEP 2: ESTIMATE QUANTITIES



Items to be estimated:

1. Volume of excavation.
2. Area of geotextile.
3. Length of drain pipe.
4. Volume of granular.
5. Number of wall units.
6. Number of coping units.

Optional items:

1. Area of geogrid.
2. Amount of adhesive.

Volume of Excavation

The key factors in the total volume are the depth and width of the base trench, and the angle of repose of the native soils. These items are discussed below.

Area of Geotextile

Geotextile should line the entire drainage layer behind the wall from top to bottom. Ensure there is adequate extra material at the top of the slope to be able to fold the geotextile back towards the wall once all the drainage material is in place. Also remember to purchase extra material to account for the overlap of

lengths (the minimum recommended overlap is 150 mm (6") between lengths).

Length of Drain Pipe

A drain pipe is required behind all retaining walls to provide a route for water to escape. The drain pipe should run the full length of the wall. Remember to purchase whatever fittings are required for the drain pipe outlet.

Volume of Granular

Granular fill is required for the granular base (4a) and the drainage layer behind the retaining wall (4b). The granular base material should be well-graded, free draining material suitable for the given application (e.g. Granular A). The drainage material should be clear stone (no sharps) or pea gravel. To calculate the respective volumes, measure the cross sectional area of each of the materials from each of the cross sectional drawings, and multiply these by the length of the applicable wall lengths.

POINTER: If the native soil is a compactable material, it may be possible to use it for part of the backfill behind the retaining wall (clear stone or pea gravel would still be required for at a minimum a 300 mm (12") thick drainage layer directly behind the wall); however, verify the acceptability of the native soil for said application with a civil engineer before proceeding to do so. The geotextile would then be placed between the replaced native material and the drainage layer.

Number of Wall Units

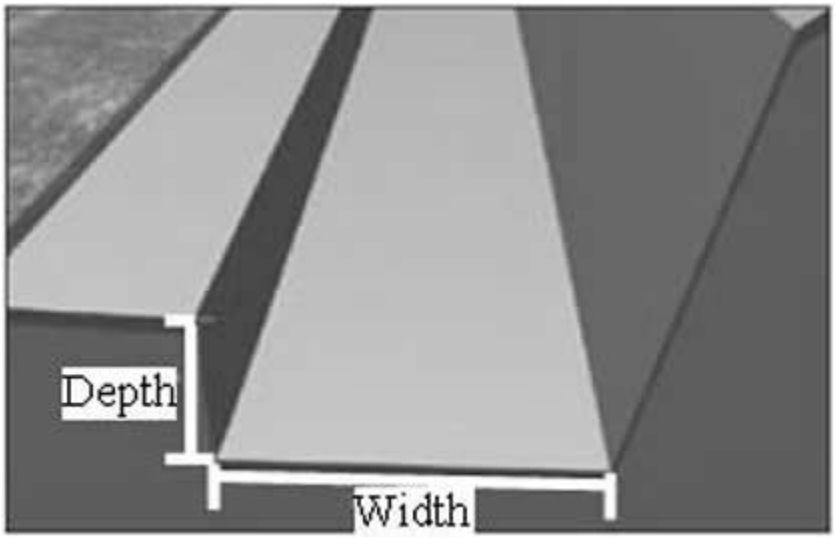
Remember to provide enough wall units for the exposed and buried portions of the wall. The rule of thumb is to at a minimum fully bury one course (row) or 10% of the total wall height, whichever is greater. Calculate the total surface area of the wall by multiplying the wall length by the wall unit height (total wall height less the height of the coping units). The total number of wall units required can then be calculated using the “Pieces per sq. ft.” number for the respective wall.

Number of Coping (Wall Cap) Units

Divide the wall length by the average length of the coping unit to get the number of units required. Remember to provide some extras if there are corners or curves in the wall where coping units may need to be cut.

STEP 3: EXCAVATION

POINTER: Remember to complete your locates prior to starting the work.



The excavation depth is the sum of the height of the buried course(s) plus a minimum of 150 mm (6”) for the granular base. For example, a Pisa II wall (unit height of 150 mm) with 2 burried courses and 200 mm of granular base would require an excavation depth of 500 mm.

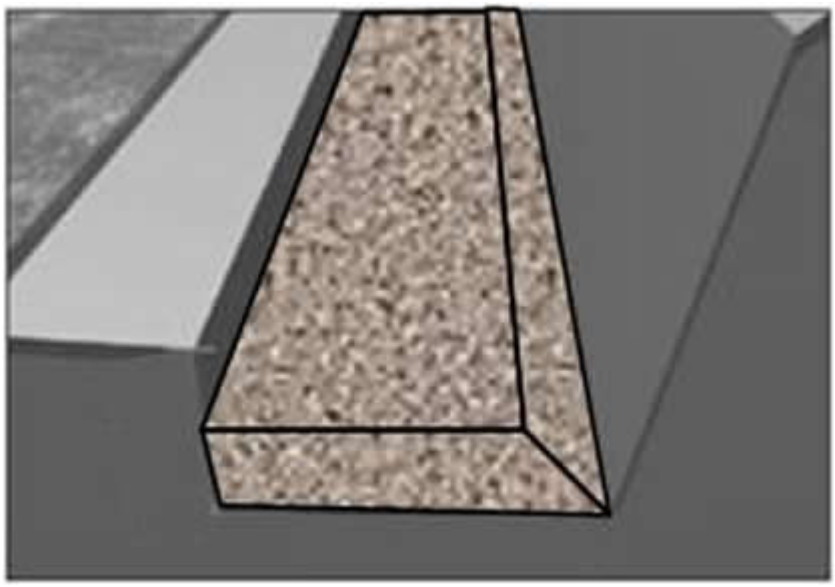
The offset between the front of the excavation and the front of the wall is typically 100 mm (4") for low walls (<27”) and 150 mm (6”) for higher walls, which is the minimum width that can be easily compacted using standard tools of the trade. The offset between the back of the wall and the back of the excavation is at a minimum 150 mm (6”) for low walls and 300 mm (12”) for higher walls. The total width of the excavation is the sum of the front offset, the depth of the unit, and the back offset. For example, a Pisa II wall (unit depth of 300 mm) with 150 mm front offset and 300 mm back offset would require an excavation width of 750 mm.

The angle of repose for the native soils is the angle (from the horizontal) at which the soil can be left without collapsing. This can range from near vertical (vertical being 90 degrees from the horizontal) for dense clay as an example to 27degrees from the horizontal for loose sand as an example. The higher the angle, the smaller the associated excavation.

When completed, the base of the excavation should be slightly sloped towards the Drain Pipe discharge point(s), and should be free of debris such as large stones, roots, etc. Run a compactor over the base to level it out and to evaluate the stability of the native material.

STEP 4: PREPARE FOUNDATION

POINTER: A solid and flat base will simplify the remainder of the installation process. Take the time to make sure this step is done correctly.

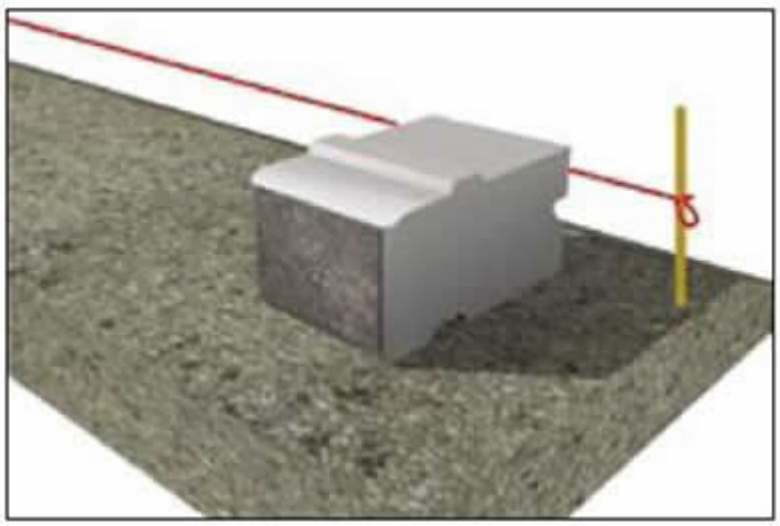


Backfill base of trench in 75mm (3") lifts to desired grade, compacting the material to at a minimum 98% Standard Proctor density. Leave a v-notch at the back of the excavation for the drain pipe. Set string level to verify final grade. Ensure base is level front to back and side to side as this will minimize the leveling of individual blocks and will ensure straight lines and smooth arcs. As an option, a skim coat (2" thick layer) of unreinforced concrete can be used to create a durable leveling surface.

Lay the geotextile starting just under the back of the wall and up the back slope of the trench. Remember to leave adequate material at the top of the slope for the fold back, and to overlap the separate pieces a minimum of 150 mm (6"). Use sand bags or similar to keep the geotextile in place as required.

Place the drain pipe in the v-notch at the back of the foundation, and surround with drain rock.

STEP 5: LAYING FIRST COURSE



Select the starting point for the wall. If the base of the wall is stepped up, start at the lowest point and work up; remember to adjust for the natural batter in the wall between steps. If

there is an outside corner, start with the corner unit (to avoid potentially having to cut stones later on to fit in the same location).

Set a string level to mark the back of the first course. Use a level to ensure blocks are level front to back and side to side.

POINTER: For a non-battered wall, level the blocks from side to side, but tilt the back slightly down (approximately 2%) so that the entire wall, when constructed leans slightly toward the soil being retained.
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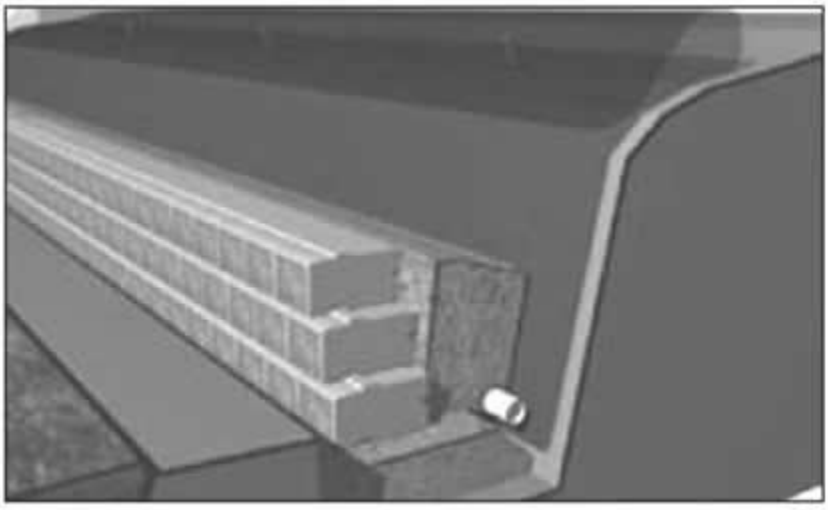
Backfill on both sides of the wall simultaneously to prevent the blocks from moving. Place material in 3" lifts and compact to 95% Std Proctor Density. Compacted backfill to be level with back of the course.

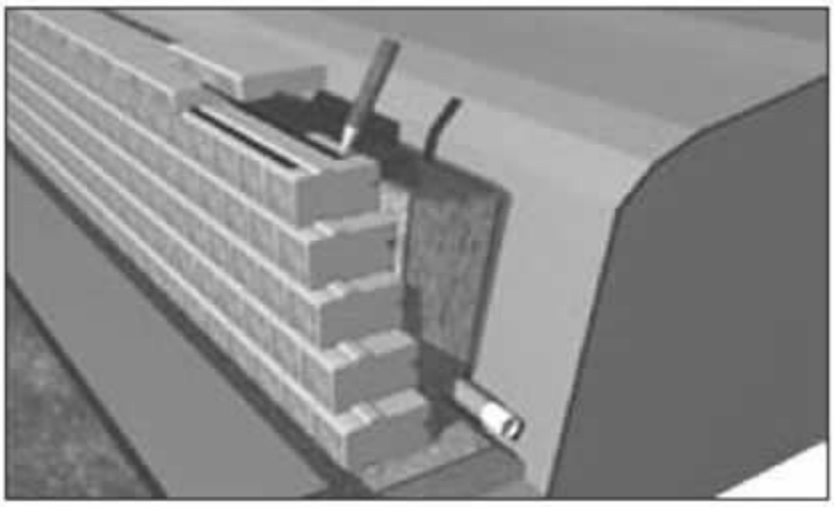
STEP 6: REMAINING COURSES

Sweep the top of each course prior to proceeding. Place the next course of units in a running bond pattern so that the middle of the uni NEVER ALIGN the wall to the sa



POINTER: Ens compaction but r each layer of bac required and dec wall).

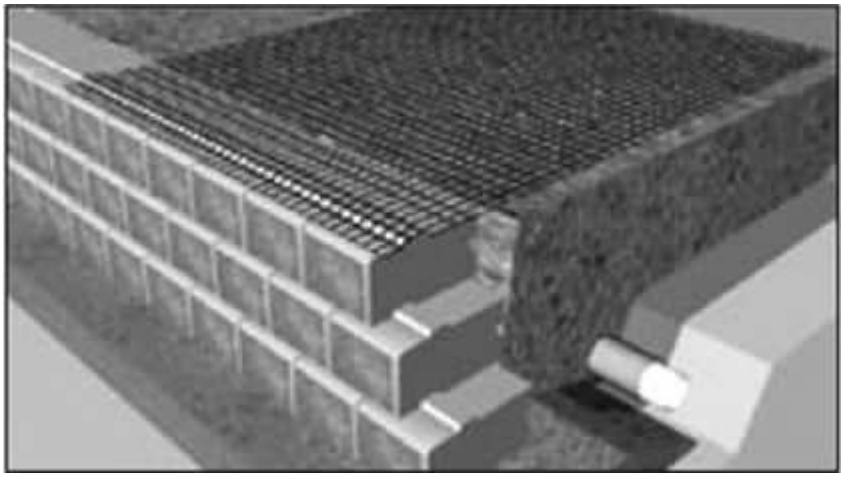
STEP 7: COPING AND GRADING



Where coping is required, sweep the top of the underlying course prior to proceeding. Place a line of butyl tape or Bond Loc adhesive on both sides of the tongue. Place the coping unit on top and apply some pressure to secure.

Prior to backfilling behind the coping and last wall unit, pull filter cloth towards back of wall and tuck in place. Fill to final grade to suit desired conditions; ensure final slopes allow for proper drainage away from the wall.

ADDITIONAL TIPS: GEOGRID REINFORCED WALLS



In simplest terms, a retaining wall uses its total weight to hold back the soil located behind it. With a gravity wall, the total weight is the sum of the blocks being used. With a reinforced wall, the total weight is the sum of the blocks and the backfill within which the geogrid is located.

For geogrid walls, the following changes are made to the installation instructions:

Step 2- The offset between the front of the wall and the back of the excavation equals the specified length of the geogrid. For example, if 2000 mm of geogrid is specified for a Pisa II wall, and the front offset is 150 mm, the total width of the excavation needs to be 2150 mm.

Step 6– Precut the geogrid from the roll to the specified length and perpendicular to the direction of primary strength. Continue wall and backfill placement as outlined above up to the elevation of the first layer of geogrid. The compacted backfill material should be level with the back of the wall unit to allow the geogrid to be laid out flat. Lay the geogrid starting within 25mm (1") of the face. Lay the next row of wall units to secure the geogrid in place. Pull the geogrid taught to its full length and stake in place at back to maintain tension. Backfill and compact next lift.

ADDITIONAL INFORMATION

Additional information for the installation of the following specific retaining wall features can be found on the respective product summary page:

- Curves using Pisa II, Roman Pisa & Pisa Light
- 90 Degree Corners using Pisa II, Roman Pisa & Pisa Light
- Steps using Pisa II & Roman Pisa
- Coping using Revers-A-Cap, 9" Cap Stone & 12" Cap Stone
- Full circle planter boxes using Tri-face
- Full circles, curves or steps using Wedgestone or Wedgestone Classic
- Lamp posts using Classic Dimensional Wall