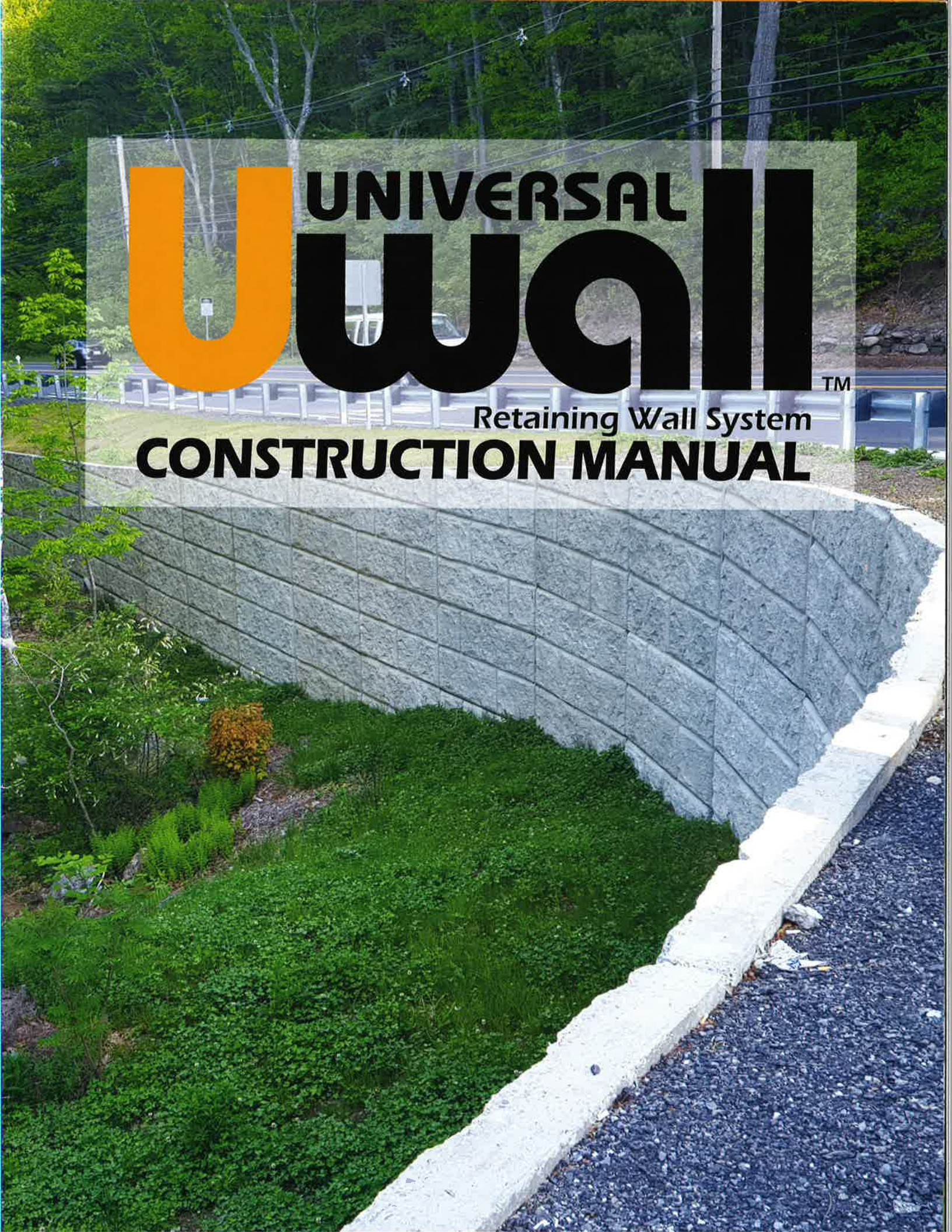


The background of the cover is a photograph of a retaining wall system. The wall is constructed from large, grey, rectangular concrete blocks stacked in a staggered pattern. At the base of the wall, there is a concrete curb, and beyond that, a gravel area. The area behind the wall is covered with green vegetation. In the background, there are trees and a road with a guardrail.

U **UNIVERSAL** **wall** TM

Retaining Wall System
CONSTRUCTION MANUAL

President's Letter

CSI is a leader in its industry supplying precast infrastructure products throughout New England and beyond since 1972, developing engineered solutions for prefabricated bridges, segmental tunnel lining rings, retaining wall systems and more. Our in-house capabilities to provide design and engineering services coupled with our 3 modern manufacturing plants allow us to expedite many large, complex, and fast-track projects.

After 44 years of continued innovation in precast concrete manufacturing, CSI is pleased to offer a new and exciting Precast Retaining Wall System - Uwall™. The Uwall™ Retaining Wall System was jointly developed by CSI, CLECO Manufacturing (a CSI subsidiary), and the late Ray O'Neill (designer of the STA-WAL and T-WALL retaining wall systems). We are proud to offer an engineered wall system that is easy to manufacture and offers fast installation. Uwall's unique capabilities will allow you and your client to realize a substantial time and money savings when compared to other wall systems.

Uwall™ design benefits include:

- Fully engineered steel reinforced wall system
- Ship 352 sf of wall on each load (savings in freight and time unloading)
- Extremely lightweight for a larger wall unit
- Ease and speed of installation - substantially less sections to set/ installs rapidly in comparison to other modular block wall systems

We are extremely excited about the acceptance and feedback we are receiving from specifiers, contractors, and project owners. Uwall™ offers a fast, economical, and attractive solution for any retaining wall application. Call us today to learn more about saving time and money on your next project.

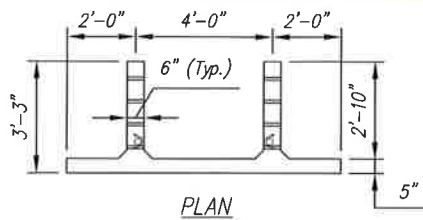
Michael

Michael R. Worden
President
Concrete Systems, Inc./Universal Wall Systems

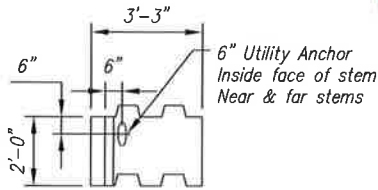
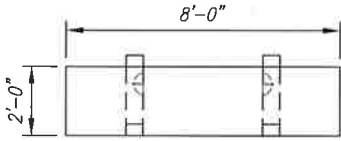
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 Preconstruction**
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- 6 The First Row of Blocks:
 Fill Placement, Drainage and Compaction**
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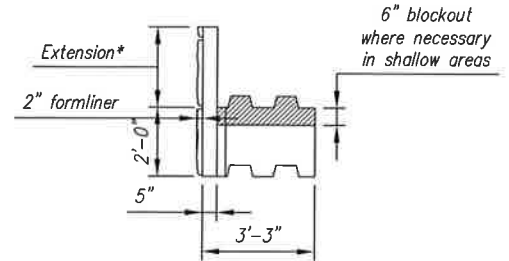
Block Details



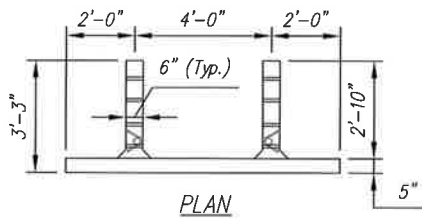
Standard 2' high unit weight
without extension is:
weight: 1.14 tons



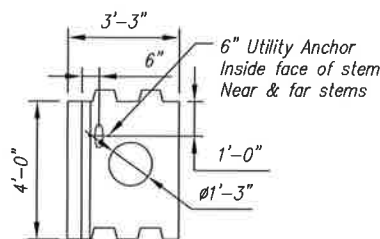
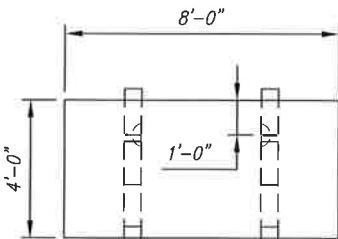
*NOTE: Extension height varies in 6" increments to 2'-6" max.



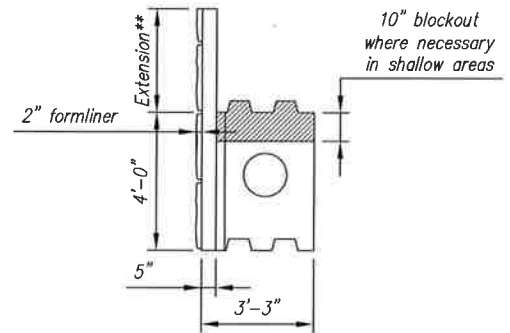
Standard 2ft Unit Details



Standard 4' high unit weight
without extension is:
weight: 2.11 tons

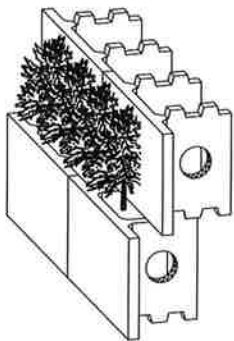


**NOTE: Extension height varies in 6" increments to 3'-0" max.

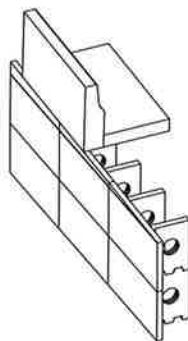


Standard 4ft Unit Details

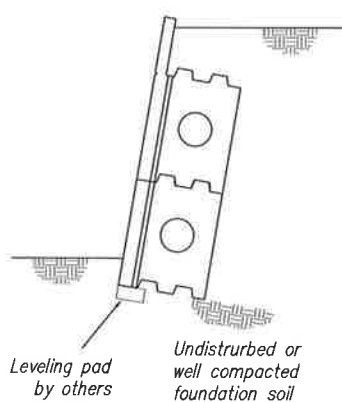
Wall Options



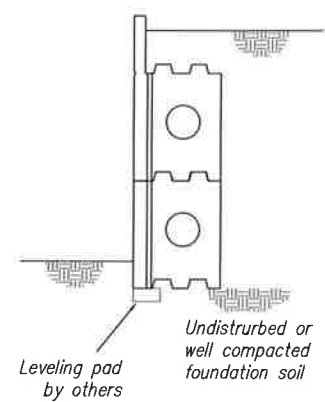
**Offset
Planter
Wall**



**Wall With
Traffic
Barrier**



Battered Wall



Vertical Wall

General information

The owner or owner's representative is responsible for reviewing and verifying that the actual site conditions are as described prior to and during construction.

All plan specifications and dimensions must be verified by the contractor. The project engineer must be notified of any discrepancies before the contractor begins work.

Precautions must be taken where other building work, service trenches, garden beds, etc., may be excavated in front of the wall.

Note: Some projects require the wall design engineer's certification for the wall construction. Be sure to make arrangements prior to starting construction should your project need this item.



Preconstruction



Prior to starting the wall construction it is recommended that the installation team:

- Read the specifications and become familiar with the material requirements, compaction requirements, construction procedures, etc.
- Review the plans to determine the construction sequence, drainage requirements and identify any utility or structures that may be in the wall zone.
- Review the material requirements including all aggregate for the base leveling pad and backfill, reinforcement specifications (if required) and drainage features.
- Inspect the site and site access to assure delivery trucks will not have problems, locate a level and efficient off loading/staging area.

Earthwork

Foundation - The foundation should be inspected and approved by the owner's engineer before the leveling pad is poured.

Backfill Gradation - Gradation tests must be performed to ensure the backfill meets the specifications. Specifications are on the Uwall installation drawings.

Geogrid Placement - Geogrid must be installed per the Uwall installation drawings.

Layers that are not locked between stems must be staked just behind the wall face.

Geogrid is then pulled taught and staked at the opposite end to keep taught during backfill operations.

Compaction - Each lift must be compacted to not less than 95% of the maximum dry density for standard compaction in accordance with ASTM D698.



Typical Construction Sequence

Erection Of The Wall

A. Site Preparation/Leveling Pad:

Proper preparation of the excavated area and leveling pad are critical to the successful installation of the U Wall System.

Compaction shall be according to the plan specification with the subgrade a minimum of 95% standard proctor. Soil not meeting the minimum strength should be excavated and replaced with acceptable materials.

A concrete leveling pad is usually 12"W x 6"D with a surface tolerance of no more than 1/4" per 10 feet. It should be a minimum of 3,000psi, cure for a minimum of 24 hours and be inspected for correct line, grade and tolerances before block placement begins.

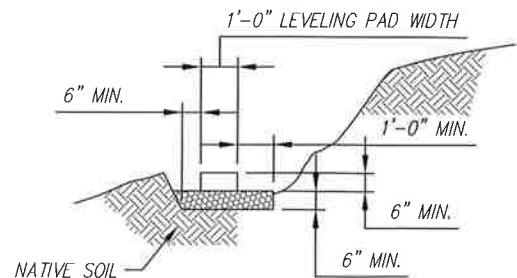
The leveling pad may be specified to be built with aggregate. Aggregate leveling pad must be built to the plan specifications for compaction.

If there are steps in the leveling pad be sure to overexcavate 6" to 8" beyond the last block of the lower level.



STEP 1:

- EXCAVATE TRENCH FOR LEVEL BASE.
- REMOVE ALL TOPSOIL/SUBSOIL/FOREST MAT FROM BELOW LEVELING PAD AND ROADWAY. PRIOR TO PLACING FILL OR LEVELING COURSE, PROOF-COMPACT THE SUBGRADE WITH AT LEAST 8 PASSES OF A WALK BEHIND VIBRATORY ROLLER OR 4 PASSES OF A 10,000 POUND (STATIC WEIGHT) VIBRATORY ROLLER OR TRACKED EXCAVATOR.
- PROVIDE LEVEL BASE FOR LEVELING PAD AND WALL.



B. The First Row of Blocks:

Proper setting of the bottom row is the key to a successful project. Make every effort to ensure it is properly aligned and level. This course is the template for the rest of the wall installation and if set properly, will make subsequent courses simple and fast to place.

Uwall blocks are lifted with 1 embedded hook in each stem. Both hooks must be used for proper lifting. When lifted the blocks pitch forward slightly making it easier to line the front face up with either adjacent or the block below.

If there is an existing structure or other fixed point start at this point and proceed to the open end of the wall. Otherwise always start at the lowest point of the wall.

Using offsets, a chalk line or other reference to assure the base course blocks are placed with proper alignment will help with project efficiency.

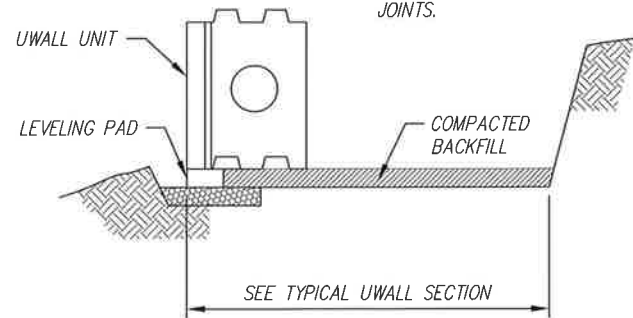
The elevation of the block stems should be adjusted as necessary to assure the stems and top of block are level and the faces plumb.

As you progress with the base course be sure to continually verify that the blocks are aligned and level.



STEP 2:

- CHECK LEVEL OF BASE COURSE, LAY FIRST ROW OF UWALL UNITS.
- CHECK ALL LINE, GRADE, AND CURVES.
- PLACE 24" WIDE FILTER FABRIC AT VERTICAL JOINTS.



C. Fill Placement, Drainage and Compaction:

Be sure to follow the plan and specifications for this and all phases of the wall construction and consult the project engineer before making any deviations or substitutions.

Consistent fill placement and compaction are key to good wall performance.

Before initiating any backfill two steps need to occur:

- 1.) A 12" wide filter fabric with a length as tall as the wall is placed covering the vertical seams of the block
- 2.) Be sure any reinforcement being used (geogrid or Paraweb strap) is placed according to the plan specifications.

It will make the job go faster if these items are precut before block placement starts.

Refer to the wall plans to identify and properly install drain pipe at the correct elevation and with adequate outlets. If field conditions require drainage pipe location different than shown on the plan, the wall engineer should be consulted before installing.

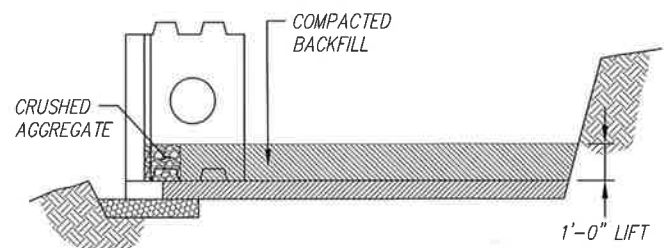
To assure proper drainage, provide a drainage layer of clean crushed stone with a minimum width of 12" placed directly behind the face.

All fill required behind the wall should be placed from the back of the face to the back of the cut to assure no block movement occurs during this step.

Place backfill in lifts as specified but not greater than 12" lift. After placing each lift be sure compaction is checked for specified density. For compaction within 3 feet of the block faces only small walk behind vibratory compactors should be used.

STEP 3:

- PLACE 12" WIDE DRAINAGE LAYER (CRUSHED AGGREGATE) IN THE ZONE IMMEDIATELY BEHIND FACE OF WALL.
- PLACE AND COMPACT 12" LIFT OF BACKFILL, ENSURING BACKFILL IS LEVEL AND UNIFORM.
- COMPACT TO 95% OF MAXIMUM DRY DENSITY.
- REPEAT STEP 3 UNTIL REINFORCEMENT IS REQUIRED.



D. Placement of Reinforcement (Geogrid and/or Strap)

Geogrid and Paraweb strap should be installed in strict compliance with spacing and length requirements as shown on the plans.

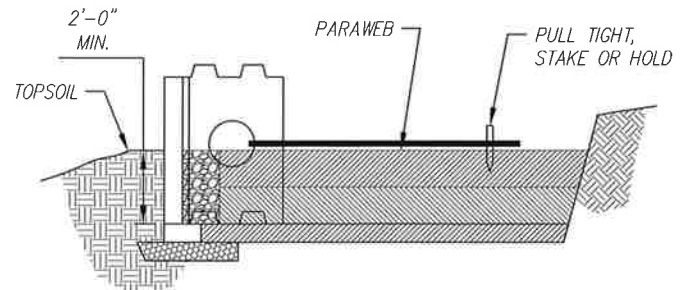
If grid or straps overlap due to corners or curves in the wall each layer need to be separated by a minimum of 3" of the specified fill per the plans and specifications.

Always pull the grid or straps taught before placing backfill and compacting. Staking is usually a good method to assure proper placement.



STEP 4 (SKIP STEP 4 IF GEOGRID IS NOT REQUIRED):

- PLACE GEOGRID AT PROPER ELEVATION, ENSURING TO CUT TO THE CORRECT LENGTH (SEE TYPICAL UWALL SECTION).
- AT UWALL MID-HEIGHT LEVELS INSTALL PARAWEB 30 IF REQUIRED BY PLAN. OTHERWISE USE GEOGRID.
- INSTALL GEOGRID WITH THE ROLL DIRECTION (PRIMARY STRENGTH) PERPENDICULAR TO THE WALL FACE.
- GEOGRID SHOULD BE EXTENDED TO THE BACK FACE OF THE UWALL.



- PULL GEOGRID TIGHT, KEEP TENSION APPLIED UNTIL BACKFILL IS PLACED. ADDITIONAL STAKES MAY BE USED TO MAINTAIN TENSION.
- PLACE THE NEXT LIFT.
- ADJACENT ROLLS OF GEOGRID SHOULD BE OVERLAPPED A MINIMUM OF 4\"/>

E. Subsequent levels:



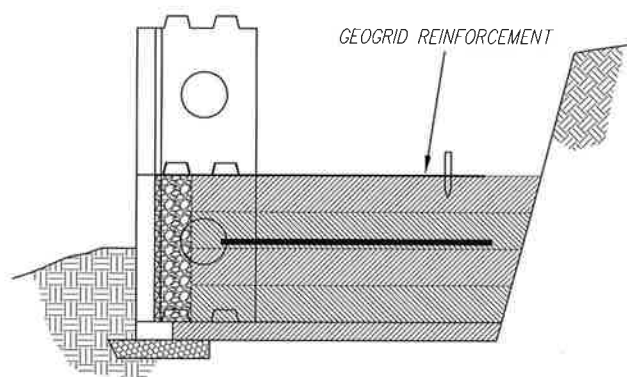
Be sure to maintain horizontal and vertical alignment throughout the wall installation.

If the wall is reinforced with Geogrid, setting the next level will lock the grid into the keyways of the block stems.

Bearing pads are used between courses to assure proper block alignment.

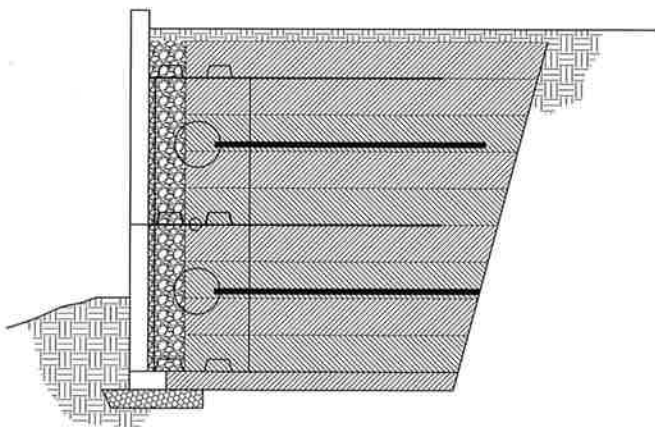
STEP 5:

- CONTINUE WALL CONSTRUCTION.
- PLACE ADDITIONAL UWALL UNITS & LIFTS BY REPEATING STEP 3.
- PLACE GEOGRID OVER TOP OF STEM AND PINCH BETWEEN KEYS OF NEXT LEVEL WHEN GEOGRID IS REQUIRED.



STEP 6:

- REPEAT STEPS 3 THRU 5, UNTIL WALL IS AT REQUIRED HEIGHT.



NOTE:

AT THE END OF EACH DAYS OPERATION, THE CONTRACTOR SHALL SLOPE THE LAST LAYER OF SELECT FILL AWAY FROM THE WALL FACING TO RAPIDLY DIRECT RUNOFF AWAY FROM THE WALL FACE. IN ADDITION, THE CONTRACTOR SHALL NOT ALLOW SURFACE RUNOFF FROM ADJACENT AREAS TO ENTER THE WALL CONSTRUCTION SITE.







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