



# INSTALLATION GUIDE

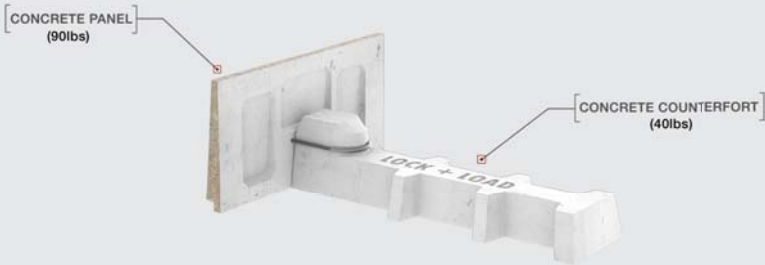


# CONTENTS

Introduction .....	3
Foundation .....	4
Drainage and Backfill .....	6
Compaction .....	7
Subsequent Rows .....	8
Special Considerations .....	10
Tool Lists .....	12



## CANTILEVER UNIT



**This manual presents the steps necessary in the construction of LOCK+LOAD retaining walls.**

### “Modular Cantilevered Walls”

Each LOCK+LOAD Cantilever Unit is comprised of a panel and a counterfort. Shipped as units, they are easily assembled at the construction site as shown in the picture above.

LOCK+LOAD has several unique aspects that require procedures different and at times in direct contravention of procedures commonly used in the building of other “Hand Placed” retaining walls.

First and most importantly, LOCK+LOAD is designed specifically for the large forces needed to achieve specified compaction throughout the backfill.

Second, each Cantilever Unit is independently stable within the soil. LOCK+LOAD concrete parts do not stack on one another, as they are supported by the surrounding soil. This flexibility allows any inclination, any configuration or any alignment desired.

Utilizing LOCK+LOAD to achieve consistent specified compaction, results in a stable monolithic mass of reinforced soil protected by an attractive, independent, 5500psi (42 Mpa), cast, reinforced, concrete armor plating. A LOCK+LOAD Retaining Wall.

Third, LOCK+LOAD allows placement of the soil reinforcement (geo-grid) at the half height of the Cantilever Unit. This ensures the geo-grid’s connection with LOCK+LOAD is identical to the geo-grid reinforcement connection throughout the wall.

## INTRODUCTION





## FOUNDATION

**Consult Engineer:** Locate survey control points and confirm with the engineer that foundation soils have adequate bearing capacity for the wall height. Once foundation condition and materials are approved, wall construction can begin.

**Excavate for the foundation pad:** Excavate a 3-foot (1 M) wide foundation allowing for 6" (15cm) min depth of footing gravel. Remove surface vegetation and organic soils as required. If there are elevation steps in the foundation cut each step 16" (4cm) higher than the next lower level.

The foundation width must accommodate the LOCK+LOAD cantilevers and any drainage requirements. Drain system design, is site and soil specific and must be constructed in accordance with the plan.

**Compact foundation pad:** Place ¾" (20mm) Minus stone required for grade to a min. 6" (15cm) deep and compact to 95% Modified Proctor (a typical - minimum of 4 passes with a 750lb or larger plate compactor). When the base pad is complete, layout and assemble LOCK+LOAD.

Except for special circumstances always begin the building of the wall from the lowest break point of the alignment. Ensuring work is always drained.

The Cantilever Units have a unique installation technique. However, as with any modular construction, becomes a natural and efficient operation. Like "Bricks and Mortar" the Cantilever Units are positioned and held in the wall by the backfill.



**Place Cantilever Units.** Setout pallets and place the panels face down side-by-side along the wall edge. With the counterforts, assemble the cantilever unit and position along the wall edge. Tilt outwards by placing wedge under Cantilever Units base. The Unit is now placed.

After the LOCK+LOAD Cantilever Units have been assembled and placed, establish a string line for the alignment of the top inside edge of the panel. Set one Cantilever Unit at each end of the section to be constructed as described below. At these locations secure a string line for alignment of the top inside edge of the Cantilever Unit. Several stakes may be added to eliminate sag and double check alignment.

Placing LOCK+LOAD on a grade or a curve are accomplished with appropriate alignment verifications.

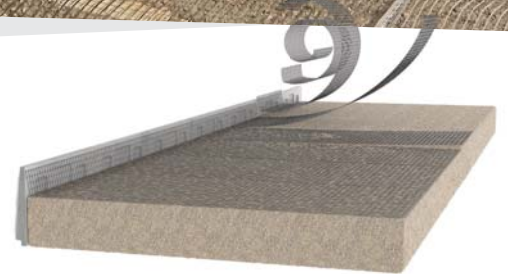
**Setting LOCK+LOAD:** Taking a few minutes to be accurate with alignment will ensure the quality of the installation.

- 1) LOCK the parts together. Using a wedge or similar create a rigid single Cantilever Unit.
- 2) Plumb the back of the LOCK+LOAD by adjusting the grade under the base.
- 3) Then level and align the Cantilever Unit with similar grading methods and minor elevation adjustments by sledge blows to wood blocking on the top.

Low Cantilever Units can be raised by tipping them forward and adding gravel under the panel and counterfort to raise the Cantilever Unit elevation.

After some practice this process becomes quick and efficient, a sign of quality work. Accurate alignment and proper compaction result in excellent wall installations something to be proud of for a long time.





## DRAINAGE & BACKFILL

**Drainage** is always site specific. On shorter walls with LOCK+LOAD only, the drain pipe will be located at the rear of the Cantilever Unit, at foundation pad elevation. On taller walls the drain goes at the back of the soil reinforcement if possible. Check the plans!

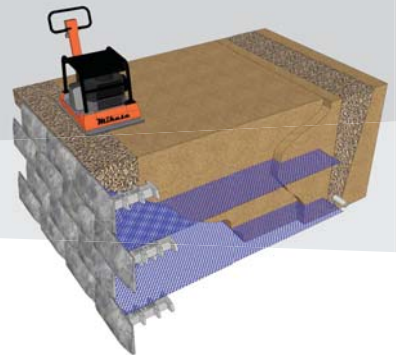
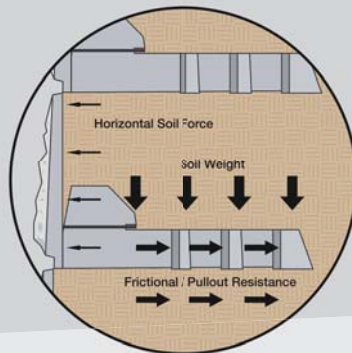
**Facing Gravel** is required at the LOCK+LOAD panel to ensure consistent vertical support maintaining wall alignment and appearance.

Select 3/4" (20mm) clear crushed rock material, a minimum of 6" (15cm) wide at the top of the Cantilever Unit, spilling on an angle down over the base. This is required on each row. Other non-plastic soils such as coarse sand etc. are feasible facing soils.

Backfill thickness at wall face, is 12" (30cm) tapering down to 8" (20cm) for rest of the fill. This allows adequate compaction of the backfill near the face. Soil compacts to near mid panel height without disturbing the Cantilever Units.

As designed, soil reinforcement is placed, at the mid height, to the back of the panel section and up 3" (75mm), ensuring 100% lap connection. Next lift of backfill should be almost 2" (5cm) above the top and then compacted flush with the top edge of the panel. Ready for the next row.

**Leveling:** Using a flat nose shovel grade the first 5" (15cm) of backfill level with the top of previous Cantilever in preparation for the subsequent row.



## COMPACTION

Compaction operations and soil density tests are completed in the backfilled reinforced soil zone. This is to confirm that what was designed was built.

A performance specification for compaction in LOCK+LOAD area would be: Backfill as specified and compact with a minimum of four passes, over 100% of the backfill in the zone, with a compactor of a minimum of 800lbs. Two complete compaction operations are required per row of LOCK+LOAD. Compaction to 95% Modified Proctor is typically required and should be checked and verified.

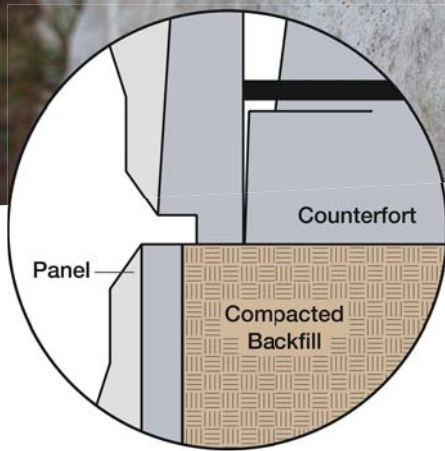
All compaction activity, **always** begins over the back of the Cantilever Unit first – “LOCKING IT” with gravel prior to moving towards the wall face.

Compact along the horizontal distance of the wall. Using a large plate compactor at the face and larger roller compactors in the reinforced soil zone

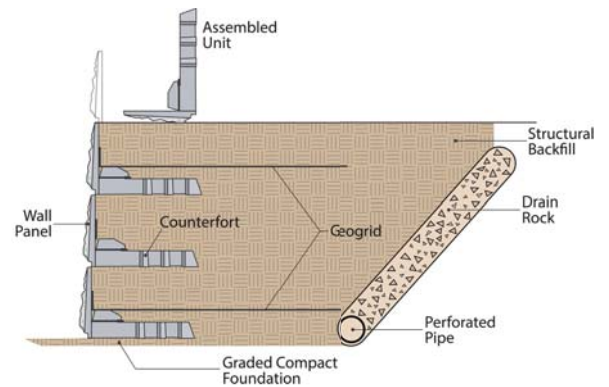
LOCK+LOAD’s Cantilever Units have solved the compaction problems that most “Hand Placed” retaining walls had in the past.

Consistent compaction throughout the reinforced soil zone, specifically in the face area, to a uniform specified amount is a requirement for optimal Reinforced Soil Wall behavior.





Assembly detail



## SUBSEQUENT ROWS

**Note: THE CONCRETE PARTS DO NOT STACK!!! EACH CANTILEVER UNIT IS COMPLETELY INDEPENDENT.**

Repeat the procedures for placing and setting Cantilever Units on page 5 for constructing the next rows. Location, alignment and elevation need to be checked.

Soil reinforcement, where required, is commonly installed near the mid height of the panel as the first lift of backfill is finished. The specified reinforcement can be rolled up and have an end trapped at the wall face with facing gravel. Then, as required unroll the reinforcement and cover with backfill. Grading and compacting the backfill in preparation for the placement of the next row of LOCK+LOAD.

Check the plans to confirm the grade, as well as the elevation and length of soil reinforcement, matches the original specifications. The LOCK+LOAD Cantilever Units are capable of creating walls up to four units high by themselves, with the inclusion of other soil reinforcement LOCK+LOAD becomes a part of a larger structure for walls over 60 feet high.

When the backfill is completed the compaction should be checked and approved before construction proceeds. Once approved, this construction sequence repeats for the next and subsequent rows until the wall is completed.





It should be noted that like all reinforced soil structures, LOCK+LOAD will consolidate at the same rate as the backfill soils maintaining a stress-free wall. Soil below the structure can also consolidate without adding wall stress. Overall compacted backfill soil will compress about 0.8% under its own weight, though minor these compressions should be considered in establishing foundation elevation. The individual stability of each LOCK+LOAD Cantilever Unit makes almost any configuration option a possibility. LOCK+LOAD can be installed vertically or near vertical.





## SPECIAL CONSIDERATIONS

**Curved:** Alignments can be accomplished in several ways depending on the requirements. Set the first Cantilever Unit and then skip a couple. Then set another LOCK+LOAD, checking offset and elevation. Returning to set other Cantilever Units afterwards to suit. For tight curves use half wide Units and construct in the same manner.

**Corners:** Corners should be wired to adjacent Cantilever Units for support during the compaction process.

**Trimming:** LOCK+LOAD does not need to be built "on bond" but if it is required, for aesthetic reasons, the Cantilever Units can be trimmed for inside corners and maintaining bond on outside corners or abutting structures.

Trimming LOCK+LOAD using a diamond blade on a powered cut off saw with a water attachment is ideal. Aesthetically it is better to spread trimming to several Cantilever Units rather than making a large adjustment to just one.

Cuts can be made to maintain bond, smooth height transition, change grade of installation, abutting an existing structure, accommodate installation around a culvert etc.









## TOOL LISTS

### Required Tools

1. String Line
2. Flat pry bar, (12" wonder nail pulling bar)
3. 36" round steel concrete stakes
4. Flat point shovel
5. 4-16 Lb. Hammer
6. 2 ft. Builders Level
7. String line level (minimum), Rotating Laser level and string line preferred.
8. Plate Compactor; with 16 in. backfill lift capability (minimum). For example: Wacker BPU 2440 or Equivalent 24 Kn or 5400 lb, centrifugal force or larger, the best results with fewer passes. Note: a smaller compactor is only acceptable on walls 4 ft or less where access for a larger compactor may be difficult and Lifts must be reduced to 8 in maximum with multiple passes.
9. Scrap lumber, (2 x 4's).
10. Always work safely, Safety Glasses, Ear Protection, Hard Hat, Leather Gloves, Leather Work Boots.

### Recommended Tools

1. *Material Handling Equipment:* Front End Loader (skid steer, wheel loader, backhoe) and or Excavator with grading bucket, Dozer etc. for excavation, placement and leveling of backfill.
2. *Ride on Vibratory Roller:* Pad-foot recommended for clay and cohesive soils. Smooth drum for granular material. Geo-tech can aid in your selection for soil type and geographic location.
3. *Laser Level:* Speeds up leveling process and insures accuracy.
4. *Utility Knife:* Used to cut geo-grid in taller wall designs.
5. 12" or 14" Diamond concrete blade on a *Cut Off Saw* with water.



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