

**TECHNICAL SPECIFICATION FOR
MECHANICALLY STABILIZED LOCK+LOAD RETAINING WALLS**

PART 1: - GENERAL

- 1.01 It is recommended that field observations be provided during construction. This includes the review of the bearing stratum, that the design soil parameters are met, verification of the specified soil compaction in the reinforcing zone, during construction and the review and verification that the geogrid and drainage system were installed per plan.
- 1.02 The design of these walls was prepared for the exclusive use of the Owner. The use of these plans by any others shall be approved in writing by The Engineer prior to construction.
- 1.03 The construction of LOCK+LOAD retaining walls shall be performed by either a Contractor that has been approved as knowledgeable and experienced in the construction of MSE retaining walls by LOCK+LOAD or a Representative of a LOCK+LOAD licensee shall be present at the beginning of construction until it has been determined by them that the Contractor is capable of constructing this type of wall system.
- 1.04 The design of LOCK+LOAD Mechanically Stabilized Earth Retaining Walls is based on the U.S. Department of Transportation Federal Highway Administration's publication No. FHWA-NHI-00-043 "Mechanically Stabilized Earth Walls and Reinforced Soil Slopes Design and Construction Guidelines" which has been adopted by the latest American Association of Highway and Transportation Officials (AASHTO).
- 1.05 Design compliance is made with reference to that stated in the Design Summary Table
- 1.06 Design Compliance is made with the following Factors of Safety:
- | | |
|--------------------|-----------------------|
| Sliding | FS > 1.5 |
| Bearing Capacity | FS > 2.0 |
| Overturning | FS > 2.0 |
| Internal Stability | FS > 1.5 |
| Seismic Stability | FS > 75% of Static FS |
- 1.07 The work described and shown involves the supply and installation of reinforced soil retaining walls. The concrete wall panel and counterfort create a LOCK+LOAD Retaining Module. Counterfort and Geo-grid are the types of soil reinforcement. The work includes but is not limited to:
- a. excavation to the lines and grades shown on the drawing; (or as required by the Geotechnical Engineer, to obtain adequate bearing capacities) excavation to be coordinated with the General Contractor.
 - b. supply and installation of geogrid reinforcement;
 - c. supply and installation of drainage fill and piping;
 - d. supply and installation of segmental LOCK+LOAD Modules
 - e. supply and installation of reinforced soil fill.
 - f. removal of all deleterious materials to the satisfaction of the Engineer.
- 1.08 The walls will be constructed on a compacted sub-grade consisting of 6" of dense graded material (road base) or ¾" crushed rock.
- 1.09 The Contractor shall confirm the locations and conditions of all man-made elements which may be affected or damaged by the Work. Elements which may be affected or damaged by the Work must be reported to the Engineer in advance of the work beginning. The Engineer may modify the design or approve of changes to installation techniques proposed by the Contractor to preclude damage or conflict with existing elements.
- 1.10 The Contractor shall verify all dimensions and report discrepancies to the Engineer.

PART 2 - MATERIALS

- 2.01 Concrete Panels and Counterforts are locked together to form a "Retaining Module". The retaining walls have been designed on the basis of Lock+Load retaining wall "Modules". Modules are to be purchased from a licensed LOCK+LOAD manufacturer. The LOCK+LOAD trademark on each pallet identifies LOCK+LOAD products.

Information on the purchase of LOCK+LOAD and a complete list of components can be Obtained through:

Lock & Load Retaining Walls Ltd.
Tel. (877) 901-9990 Website www.lock-load.com

- 2.02 Geogrid - The retaining walls have been designed to be erected as shown on the Plans. Other geogrid materials may be considered suitable provided that they meet the specification and requirements of the design and are approved in advance by the Engineer.
- 2.03 Modular Fill – The fill immediately behind the LOCK+LOAD panel and surrounding the counterfort shall be "dense graded" select free draining material (less than 5% passing a #200 sieve). Other structurally equivalent materials may be used as specified by a project controlling authority (DOT's).
- 2.04 Drainage Fill. Drainage fill placed around and above the perforated drainage pipe shall be granular aggregate composed of inert, clean, tough, durable particles of crushed rock capable of with standing the deleterious effects of exposure to water, freeze-thaw, handling, spreading and compacting. The aggregate particles shall be uniform in quality and free from an excess of flat or elongated pieces. The drainage fill shall consist of round or angular rock between 3/4 inch and 1 inch.
- 2.05 Reinforced Backfill. As shown on the Plans or as approved by the Design Engineer. The Reinforced backfill shall have an angle of internal friction as stated in the Design Summary Table and compacted as stated within.

PART 3 – EXECUTION

- 3.01 The Contractor shall excavate to the lines and grades shown on the construction drawings. The excavation shall be reviewed and the foundation approved prior to the placement of the levelling pad or retaining modules.
- 3.02 Over-excavation of deleterious soil or rock shall be replaced with Reinforced and Retained Backfill meeting the specifications of Section 2.04 above, and compacted to that stated in the Design Summary Table within 2% of the optimum moisture content of the soil.
- 3.03 The first course of concrete Lock+Load Modules shall be placed on the level compacted foundation and the alignment and level checked.
- 3.04 Modules shall be placed with the top of the panel level and parallel to the wall face. The counterfort base installs horizontal and perpendicular to the face of the retaining wall.
- 3.05 Geogrid shall be oriented with the highest strength axis perpendicular to the wall alignment.
- 3.06 Geogrid reinforcement shall be placed at the elevations and to the extent shown on the Plans beginning at the back of the LOCK+LOAD panels and the top of the counterfort. The geogrid soil reinforcement shall be placed so that a minimum of 3 inches remains vertical and in contact with the panel after backfill is placed and compacted.
- 3.07 The geogrid shall be laid horizontally in the direction perpendicular to the face of the retaining wall and parallel to the alignment of the "Modules". The geogrid shall be pulled taut, free of wrinkles and anchored prior to backfill placement on the geogrid.
- 3.08 The geogrid reinforcement shall be continuous throughout their embedment lengths. Spliced connections between shorter pieces of geogrid are not permitted.
- 3.09 The drainage pipe discharge points shall be free and clear to allow drainage from the pipes.

- 3.10 Reinforced and Retained backfill shall be placed, spread and compacted in such a manner that minimizes the development of slack in the geogrid.
- 3.11 Connection, Reinforced and Retained backfill shall be placed and compacted in lifts not to exceed 8 inches where light compaction equipment (less than 1000Lb vibrating plate) is used and not more than 16 inches where heavy compaction equipment is used. **First** – compact over tail of counterfort then to the panel back and finally away from the retaining wall structure toward the end of the geogrid.
- 3.12 All backfill shall be compacted to that stated in the Design Summary Table or equivalent. The moisture content of the backfill material prior to and during compaction shall be uniformly distributed throughout each layer and shall be within 2 percent of the optimum moisture content.

The free draining “densely graded” module fill (5/8”->3/4” crushed rock, typical) placed in the first 24” behind the wall panel and over the counterforts shall be deemed compacted when eight passes (4 in each direction) with a minimum 750 Lb vibrating plate compactor have been completed.

Reinforced backfill shall be free of debris and meet the following gradation tested in accordance with ASTM D-422:

<u>Sieve Size (Percent Passing)</u>	2 inch (100%) 3/4 inch (75%) No. 40 (60%) No. 200 (15%)**
<u>Plasticity Index</u>	(PI) <15
<u>Liquid Limit</u>	<40 per ASTM D-4318.

** Soils having more than 15% passing a 200 sieve must be approved by the project Design Engineer and have an engineered drainage system to insure that a hydrostatic pressure is not built up behind the reinforced soil zone.

The maximum aggregate size shall be limited to 3/4 inch unless field tests have been performed to evaluate potential strength reductions to the geogrid design due to damage during construction.

Material can be site excavated soils where the above requirements can be met. Unsuitable soils for backfill (high plastic clays or organic soils) shall not be used in the backfill or in the reinforced soil mass.

- 3.13 Tracked construction equipment shall not be operated directly upon the geogrid reinforcement. A minimum fill thickness of 6 inches is required prior to operation of tracked vehicles over the geogrid. Tracked vehicles should not turn while on the geogrid to prevent tracks from displacing the fill and geogrid and damage or slack to result in the geogrid.
- 3.14 Rubber tired equipment may pass over the geogrid reinforcement at slow speeds less than 5 mph. Sudden braking and sharp turning shall be avoided.
- 3.15 Final grading in front of and behind the wall shall be achieved such that surface water is directed away from the structure and the reinforcement zone.
- 3.16 At the end of each day of operation, the Contractor shall slope the last lift of reinforced backfill away from the wall units to direct runoff away from the wall face. The Contractor shall not allow surface runoff from adjacent areas to enter the wall construction site.