VERSA-LOK®
Square Foot Unit
A VERSA-LOK RETAINING WALL SYSTEM

ST. LOUIS COUNTY MASTERPLAN

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APPLICATION

The Versa-lok Square Foot retaining wall system is a reinforced soil structure combining an architecturally attractive concrete facing block with geogrid reinforcement. The geogrid reinforcement interlocks with the Versa-lok Square Foot block units and fill soil to create a stable gravity retaining wall. Design of these reinforced soil structures uses well established guidelines that are readily available. The following specifications and details provide a design to incorporate geogrid reinforcement into the soil for the purposes of constructing retaining walls. Consult Kirchner Block and Brick for additional details regarding design, appearance, and aesthetic considerations.

STANDARD DESIGN PROCEDURE

The following design tables established for the construction of soil reinforced walls are based upon generally accepted soil parameters in the St. Louis County, Missouri area. An engineer shall review the site conditions and the soil present at the proposed location of the soil reinforced walls to determine if the actual conditions match the assumed parameters. All soil parameters assumed in the design are well drained, long term strength conditions. High plastic silts, and clays should be avoided without specific design recommendations from local geotechnical engineers. Frost heave and settlement need to be addressed if warranted by conditions. Also, special precautions are necessary for walls constantly in contact with water, i.e. near or at rivers, lakes, and ponds.

Three typical geometric cases were selected for these tables. The first case is a typical retaining wall with horizontal backfill, the second case is a 3:1 sloping backfill, and the third case is a tiered wall. The horizontal backfill layout is designed with 100 lb per sf surcharge. The following is a summary of the design parameters used and the minimum factors of safety which the tables are based on.

<table>
<thead>
<tr>
<th>SOIL PROPERTIES:</th>
<th>MINIMUM FACTORS OF SAFETY CALCULATED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Friction Angle</td>
<td>Reinforcement Pullout = 1.5</td>
</tr>
<tr>
<td>(degrees)</td>
<td>Reinforcement Rupture = 1.5</td>
</tr>
<tr>
<td>Unit Weight</td>
<td>External Sliding = 1.5</td>
</tr>
<tr>
<td>(#/cf)</td>
<td>Overturning = 2.0</td>
</tr>
<tr>
<td>Cohesion</td>
<td>Overall for Unknowns = 1.5</td>
</tr>
<tr>
<td>(#/sf)</td>
<td>Bearing Capacity = 2000 psf</td>
</tr>
<tr>
<td>Wall fill</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td></td>
</tr>
<tr>
<td>120</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Retained Backfill</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td></td>
</tr>
<tr>
<td>120</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Foundation Soil</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td></td>
</tr>
<tr>
<td>120</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

Friction Angle - degrees
Unit Weight - lbs per cf
Cohesion - lbs per sf
Drainage rock shall be directly behind the wall units a minimum 12" thick.

**Geogrid Reinforcing**

The geogrids shall be cut to design lengths and placed between the blocks at the elevations shown on the plans. The geogrid's primary strength direction will be directed perpendicular to the wall face (into the fill.) The geogrids placed outside a plus or minus 4" zone of the geogrid design elevation will not be accepted. The geogrid shall be placed horizontally and lay flat on the reinforced fill soil. The geogrid shall be placed so that a minimum of 8" of grid is between the block layers. Slack in the geogrid shall be removed prior to placing additional backfill.

**Wall Backfill**

Wall backfill material shall be placed in maximum 8" loose lifts and compacted to at least 95% of the material's maximum dry density as determined by the standard Proctor method. Backfill shall be placed, spread, and compacted in such a manner that minimizes wrinkles and movement of the geogrid. Field density testing shall be conducted by a qualified soils technician to verify that at least the minimum degree of compaction is being obtained.

Place 12" of drainage rock behind units. Separate drainage rock and soil with the filter fabric.

During backfill placement the 3 foot zone directly behind the wall shall be limited to the use of hand operated compaction equipment only.

**Construction equipment shall not be operated directly on the geogrid.**

**Protection of Work**

The surface of the wall backfill shall be graded at the end of each day of work to provide positive surface drainage away from the wall. Grading shall include proper contouring of fills in adjacent areas to prevent the flow of surface water into the reinforced earth zone.

The design of the walls are based on conditions and loads imposed on the wall at completion of the project. Prior to project completion, the wall is vulnerable to damages caused by construction activity adjacent to the wall. Of particular concern is the of grading and pavement construction equipment on the retained backfill at the top of the wall. Only equipment with a weight not exceeding one ton can be used in the 3 foot zone directly behind the back of the wall face.

The soil in front of the walls shall be protected from future erosion.

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**VERSALOK**

**Square Foot Unit**

<table>
<thead>
<tr>
<th>Kirchner Block and Brick</th>
</tr>
</thead>
<tbody>
<tr>
<td>12901 St. Charles Rock Rd</td>
</tr>
<tr>
<td>Bridgeton, MO 63044</td>
</tr>
<tr>
<td>314/291-3200</td>
</tr>
<tr>
<td>314/291-0265 fax</td>
</tr>
</tbody>
</table>

**SPECIFICATIONS**

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Date: May 2008
FENCE DETAIL
NOT TO SCALE

PIN HOLES FOR
1" SETBACK

STRAIGHT SPLIT FACE

FENCE POST
OR HANDRAIL POST

30" MIN.

CONCRETE BASE
USE CONCRETE TUBE FORM

DRAINAGE AGGREGATE
FILTER FABRIC

EXISTING STRUCTURE

SEE NOTE

NOTE:
1. AT ABUTMENT, ALTERNATE FULL UNIT WITH HALF UNIT EVERY OTHER COURSE
2. START AT FIXED POINTS AND WORK INTO MIDDLE PART OF WALL
3. DO NOT ATTACH VERSA-LOK S.F. UNITS TO OTHER STRUCTURES.

ABUTMENT DETAIL
NOT TO SCALE

VERSATUFF PIN
2 PER UNIT

PINHOLE

VERSATUFF PIN
2 PER UNIT

1.0" SETBACK

RECEIVING SLOT

BLOCK DETAIL
NOT TO SCALE

VERSATUFF PIN
2 PER UNIT

VERSALOK
Square Foot Unit

Kirchner Block and Brick
12901 St. Charles Rock Rd
Bridgeton, MO 63044
314/291-3200
314/291-0265 fax

DETAILS
Sheet 4 of 10
Date: May 2008
**COMPACTED SOIL IN REINFORCED EARTH ZONE**

**EXCAVATE TO A SAFE AND STABLE CONDITION**

**GEOSYNTHETIC REINFORCEMENTS – SEE TABLES FOR LENGTH AND LOCATIONS**

**FILTER FABRIC**

**6” LIFT OF DRAINAGE ROCK EXTEND TO ENDS OF GEOGRIDS**

**4” DRAINAGE PIPE AT BASE OF FIRST UNIT DAYLIGHT AT LOW POINT IN THE WALL**

**6” x 18” CRUSHED ROCK LEVELING PAD**

**TYPICAL SECTION – WITH REINFORCEMENT**

**NOT TO SCALE**

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**NOTE:** SURCHARGE LOADS OTHER THAN PARKING LOT LOADS MUST BE LOCATED A MINIMUM 8’ BEHIND THE WALL FACE.

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**TYPICAL SECTION – WITHOUT REINFORCEMENT**

**NOT TO SCALE**

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**VERSA-LOK**

Square Foot Unit

Kirchner Block and Brick
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**TYPICAL SECTIONS**

Sheet 5 of 10
Date: May 2008
LEVELING PAD DETAIL

NOT TO SCALE

LEVELING PAD MADE FROM CRUSHED ROCK OR CONCRETE MINIMUM SIZE 6" X 18"

NATIVE SOIL

6" MINIMUM COMPACTED GRANULAR BASE

REINFORCEMENT LENGTH

11" MINIMUM

PULL OUT SLACK IN REINFORCEMENT

CONNECTION DETAIL

NOT TO SCALE

VERSALOK

Square Foot Unit

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DETAILS

Sheet 7 of 10
Date: May 2008
NOTES:
1. GEOGRID LENGTH MEASURED FROM FACE OF WALL.
2. GEOGRIDS ARE MIRAGRID 2XT OR 3XT OR STRATAGRID SG150 OR SG200.
3. WALL HEIGHT MEASURED FROM TOP OF LEVELING PAD.
4. SEE TYPICAL SECTION DETAIL FOR BACKFILL REQUIREMENTS AND CONSTRUCTION NOTES.

TYPICAL SECTION – DRIVEWAY SURCHARGE
NOT TO SCALE

VERSALOK
Square Foot Unit

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HORIZONTAL GRADE
Sheet 8 of 10
Date: May 2008
NOTES:
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2. GEOGRIDS ARE MIRAGRID 2XT OR 3XT OR STRATAGR 150 OR SG200.
3. WALL HEIGHT MEASURED FROM TOP OF LEVELING PAD.
4. SEE TYPICAL SECTION DETAIL FOR BACKFILL REQUIREMENTS AND CONSTRUCTION NOTES.

Typical Section — SLOPING FILL

NOT TO SCALE

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Square Foot Unit

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SLOPING GRADE
Sheet 9 of 10
Date: May 2008
NOTES:
1. GEOGRID LENGTH MEASURED FROM FACE OF WALL.
2. GEOGRIDS ARE MIRAGRID 2XT OR 3XT OR STRATAGRID SG150 OR SG200.
3. WALL HEIGHT MEASURED FROM TOP OF LEVELING PAD.
4. SEE TYPICAL SECTION DETAIL FOR BACKFILL REQUIREMENTS AND CONSTRUCTION NOTES.

2’ TIERED WALLS

3’ TIERED WALLS

4’ TIERED WALLS

COMPACTED ROCK BACKFILL REQUIRED ON BOTTOM WALL TO ENDS OF GEOGRIDS TO REDUCE SETTLEMENTS OF UPPER WALL

TYPICAL SECTION – TIERED WALLS

NOT TO SCALE