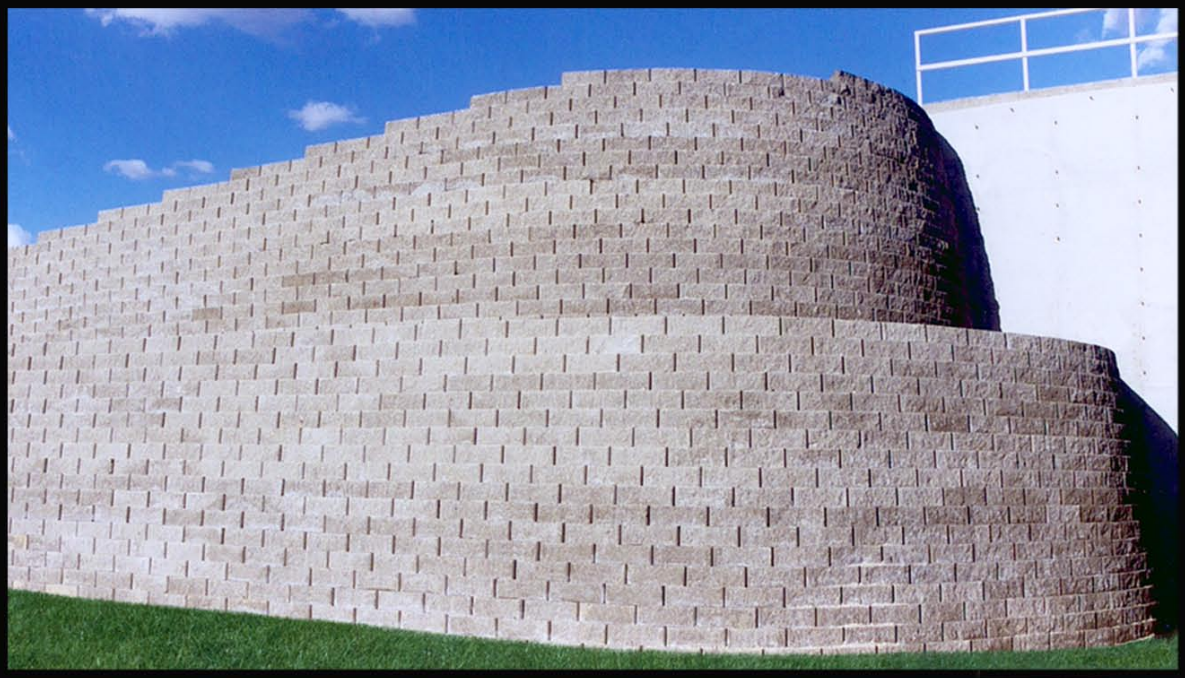
VyKing Wall Systems LLC

The King of Retaining Wall Stone



VyKing

Wall Systems LLC

www.vyking.net

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SRW Walls

Notes

SEGMENTAL RETAINING WALLS

There are two types of Segmental Retaining Walls [SRWs]. There are

1. Conventional SRWs and
2. Reinforced Earth SRWs.

Conventional SRWs resist the forces of failure such as overturning, tilting forward, or global failure (forward movement at the foot of the wall) by the weight, depth and batter of the SRW units alone.

Reinforced Earth SRWs are a composite system including 4 major components. These components are:

1. The SRW blocks (VyKing stones),
2. The horizontal layers of geosynthetic often geogrid reinforcement,
3. The select soil fill and in some installations, drainage from within this component, and
4. The drainage rock and drain tube behind SRW blocks.

The above four components comprise the retaining wall.

This multi-component system is designed as a unit to work as a single block, the wall, that will resist the forces of failure acting against the wall from the retained soil behind the block.

Notes

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SRW Engineer

Notes

Why hire a competent SRW engineer?

A competent SRW engineer familiar with the project location should evaluate all site data and provide recommendations or an assessment of the following:

Slope Stability

Slope stability analysis should include the influence of all geometry, subsoil properties, groundwater conditions, and slopes above and below the proposed retaining wall. Long term slope stability (global stability) is an important site assessment.

Settlement

The type, thickness and compressibility of the foundation soils is required. The SRW engineer should be alerted to any collapsible soils in the wall structure's vicinity which could cause distress or failure to the SRW.

Groundwater

Groundwater conditions in the vicinity of the SRW should be known and reported to the SRW engineer. This information should include:

1. Current groundwater levels,
2. Seasonal fluctuations of ground water,
3. Maximum previous groundwater elevation,
4. Regional groundwater flow,
5. Probable influence of SRW on groundwater flow and elevation, and
6. The potential for hydrostatic pressure or seepage forces on or in the select soils and retained soil zones.

Hazardous Materials

The areal extent and concentrations of hazardous materials, chemicals and/or microbiological activity at the site should be identified and provided to the SRW engineer.

SEISMIC

Horizontal and vertical acceleration should be incorporated into the SRW design if there is potential for seismic activity.

OTHER CONSIDERATIONS ARE:

- Relative location of significant structures, especially structures that could involve potential loss of life.
- Location of other engineered walls in the vicinity.
- Landfill or subsurface mines in the area of the SRW.
- The possibility of karst topography [typically from underground soluable rock that can result in sinkholes and other wall structure problems].
- Steep slopes near the SRW site.
- Are cohesive soils proposed for the select infill soil.
- Is ground water elevation above the proposed bearing pad (foundation) elevation.
- Is there potential seismic activity in the area.

Local building codes and national standards should be followed to ensure all products associated with the SRW are adequately tested to establish conformance. Inspection of the fill material's compaction should be conducted by a qualified inspector who is not employed by the contractor installing the SRW. Also, the qualified inspector should observe placement and tauntness of all geogrid layers.

An experienced SRW engineer should provide all of the necessary information stated above as part of the SRW design or report.

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Retaining Wall Primer

Notes

RETAINING WALL PRIMER

A RETAINING WALL:

- Is used to support soil which is higher than the adjacent grade.
- Resists the lateral pressure from soil and water that produce horizontal force.
- Low walls are less than 36 inches in height.

FAILURE IN RETAINING WALLS:

- Sliding failure is a result of inadequate downward weight and/or friction at the soil line.
- Overturning is the inability to resist the moment of force which wants to pivot the wall structure.
- Settlement is the inability of the soil to resist the downward, vertical, loads of the wall structure.
- Weathering is the result of frost action within or on the surfaces of the wall structure.

FORCES ON A RETAINING WALL :

Vertical, downward, forces are the weight of the wall structure plus the soil over the footing. (failure = settlement, The footing must spread loads over larger area to meet the strength of the soil.)

Horizontal, slide, forces are the weight of soil (100 #/ cu ft) plus water pressure that tend to overturn the wall or make it slide forward.

Soil contributing to the horizontal force is only that above the angle of repose of the soil. (typically assumed to be 33 degrees.)

Soil horizontal pressure acts parallel to the top plane of the wall unless it is surcharged. Surcharged walls have soil sloping upward behind the stone face of the retaining wall.

HYDROSTATIC PRESSURE :

The pressure of water held behind the face of the retaining wall. Hydrostatic pressure increases with verticle depth.

Water pressure = weight (water per cubic foot) x height

Soil Pressure = [weight (free weight of soil above the angle of repose) x height] squared then divided by 2.

MOMENT OF FORCE :

The moment of force acts as a force to pivot at the toe of the wall. Force = soil pressure x height/3.

KEY STEPS IN SRW CONSTRUCTION:

1. Plan the location of the SRW, including location and limits of the top and bottom of the wall or walls.
2. Profile the SRW dimensions, including elevations of top and bottom of the wall and, for reinforced earth walls, elevations of the reinforcement.
3. Develop cross-sectional drawings.
4. Develop drainage details for both surface and subsurface water.
5. Develop specific details of bearing pad, geogrid reinforcement, wall abutment to other structures, wall termination, and geogrid layout around utilities and other obstructions.
6. Develop specifications consistent with the SRW construction drawings.

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SRW Advantages

Notes

ADVANTAGES OF SRW WALLS

SRWs have the advantage of offering multiple shapes, sizes, colors and textures as well as proven economic, constructability and a proven design methodology.

SRWs typically cost 25 to 40 percent less than properly engineered concrete case-in-place, natural stone and masonry walls.

Treated wood walls typically have a much shorter life when compared to the 75 to 100 year design life of SRWs. Treated wood walls may be moderately cheaper at installation but the life cycle cost of treated wood walls is much higher.

SRW walls are better for the environment than treated wood walls because SRWs do not contain chemical additives such as creosote, arsenic and nickel like some timbers. Treated woods are increasingly being classified as hazardous waste, no longer accepted at many landfills. SRWs are relatively inert and are not affected by wet soils and humidity as natural wood products. SRWs do not attract insects, bugs and rodents which can be destructive to treated wood walls and the overall property.

SRWs are dry stacked and mortarless. The SRW units flex with shrink/swell cycles of the retained soil. SRWs can tolerate this movement which will crack and damage concrete and masonry walls. SRWs constructability is superior to concrete and mortar walls. SRWs can be built in winter as long as the foundation soil is not frozen. Concrete and mortar walls are typically limited to temperatures above 40 degrees Fahrenheit. Hot summer weather will also negatively affect the cure of concrete and mortar.

SRWs offer design flexibility to build graceful radiuses, 90 degree corners, stairs, columns, planter and other architectural requirements can be built into a retaining wall or built as separate side structures.

SRW design standards are established and published by the American Association of State Highway and Transportation Officials (AASHTO) and the National Concrete Masonry Association (NCMA). With stones manufactured to these standards and structures designed by competent SRW engineers and built to the specific guidelines of the engineer, the long term structural integrity of a SRW retaining wall or other structure can be assured.

Notes

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GEOGRID INFORMATION

Notes

GENERAL INFORMATION ON GEOGRID USE AND WALL CONSTRUCTION

GEOGRID IDENTIFICATION

Geogrids are manufactured to varying specifications. The original shipping of geogrids includes identification of the directional strength of the geogrid and the tensile strength. Be certain that the geogrid used is equal to or greater in strength than that specified in the engineering design.

GEOGRID STORAGE

Store geogrids in an inside environment where it will not be exposed to sunlight [ultraviolet light], strong acids or strong bases, fire or sparks and temperatures exceeding 160 degrees Fahrenheit. Do not allow the geogrid to be walked on or otherwise abused while in storage.

GEOGRID HANDLING

Lay geogrid rolls out with stress strength perpendicular to the face of the wall. Unroll the geogrid on a flat compacted stone/rock/select fill surface. Set an additional layer of VyKing stones on the geogrid and install pins to hold the front of the geogrid in place. Pull the geogrid taunt at the back of the length specified by the design engineer and stake the back of each geogrid layer. Place fill on the taunt geogrid, being certain to not damage the geogrid by driving wheel or track equipment directly on the geogrid. A 4 inch layer of fill should be in place before wheel or track equipment is used behind the stone face of the wall.

BASE MATERIAL PREPARATION FOR GEOGRID

Follow compaction guidelines of the design engineer before placing each layer of geogrid. Select soil fill shall be compacted to 95% of optimum dry per AASHTO T99. Typically, cohesive soils are compacted in six inch to eight inch lifts and granular soils in nine inch to twelve inch lifts.

GEOGRID INSTALLATION

Do not install damaged geogrid. Cuts, chemical damage and U V light exposure may alter the strength of the geogrid. Install layers of specified tensile strength geogrid as directed by the wall engineer. Orientation and depth of the specified geogrid is critical to wall stability. Do not allow geogrid to have wrinkles or be laid loosely before the next lift of backfill is placed.

All layers of geogrid are to be one continuous piece from the wall stones to the rear point of the geogrid where it is staked taunt. Geogrid may not be spliced by overlapping two pieces in the principal stress direction.

BACKFILL COMPACTION

Backfill shall be placed and spread in lifts as previously discussed. Use only hand compaction equipment within 3 feet of the back of the VyKing stones.

At the end of each day be certain that the top layer of backfill is compacted and sloped away from the VyKing stones to prevent water, should it rain, from flowing to the wall face or ponding in the fill zone.

All backfill lifts shall be compacted according to AASHTO T99 and per the design engineer's instructions.

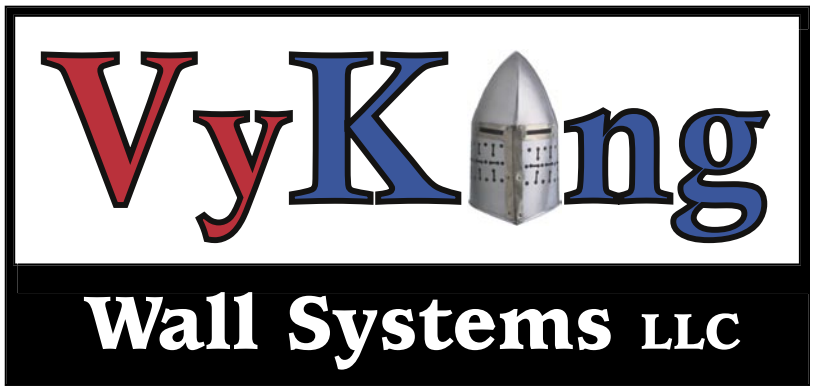
DRAINAGE

The final backfill layer shall be sloped to direct surface water away from the face of the retaining wall.

Surface water that is not drained away from the backfill zone of the retaining wall can cause saturation of the select backfill soil. Saturation of select backfill soil will significantly reduce the strength of the engineered backfill zone. Reduced strength of the backfill zone will reduce the wall's designed safety factor. If the designed safety factor is exceeded, wall failure is possible and likely will occur.

BLOCK AND PIN SYSTEMS

VyKing retaining wall stones are designed for the installation of pins as shown in VyKing literature and in the engineer's wall specifications. Walls are designed based upon the proper installation of the VyKing stones and VyKing pins. Failure to follow these directions and utilize the specified VyKing blocks and pins will void the engineer's design and potentially lead to wall failure.



Critical Retaining Wall Factors

Notes

CRITICAL RETAINING WALL FACTORS

The retaining wall site must be void of wall foundation settlement problems and global slope instability. If the proposed wall site includes either or both of these problems, the problem(s) must be cured prior to wall construction to have a structurally sound SRW.

THE FOUNDATION

It may be necessary to remove in-situ soil at the location of the foundation and replace it with competent compactable soil.

Drainage from the area that may result in the saturation of the foundation soils must be considered. The foundation must support the load of the retaining wall blocks (VyKing stones) and the total retaining wall.

The foundation must not move or allow movement horizontally. Horizontal movement at the foundation will result in global failure of the SRW.

AASHTO [American Association of State Highway and Transportation Officials] standards allow bearing capacities to be computed using a minimum factor of safety of 2.5 applied to the calculated ultimate bearing capacity. AASHTO's allowable bearing capacity of abutment footings constructed directly on mechanically stabilized structures shall be limited to 2.5 tons per square foot.

EMBEDMENT

Wall embedment (a toe) is critical to global stability. The embedment depth of wall stones (VyKing stones) provides the resistance to the movement of the base of the retaining wall. In waterfront and submerged wall designs, embedment and prevention of scour that would remove the embedment soil is critical. Riprap is typically placed on the embedment soil to prevent the embedment soil from being washed or scoured away.

To prevent local bearing capacity failures and damage from frost heave, structures shall be designed for the following minimum embedment unless constructed on rock foundations. The minimum embedment is determined as a function of the height of structure [H] above the leveling pad.

SLOPE IN FRONT OF STRUCTURE		MINIMUM EMBEDMENT
Horizontal	- for walls	H/20
	- for abutments	H/10
3H:1V walls		H/10
2H:1V walls		H/07
3H:2V walls		H/05

Embedment should be increased when:

1. There is large settlement potential or weak bearing capacity of underlying soils,
2. Where there are steep slopes near or below the toe of the wall,
3. There is potential of scour at the toe of the wall as in waterfront and submerged wall applications,
4. There is a potential of seismic activity.

These conditions should be addressed by an experienced SRW engineer familiar with site soil and groundwater conditions.

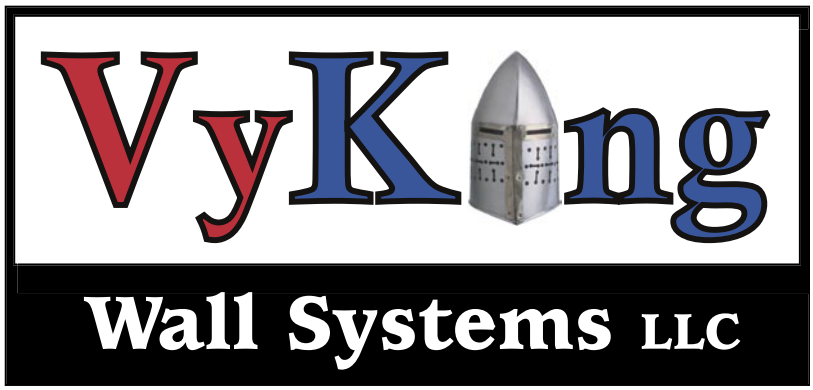
TIERED WALLS

Upper tier walls act to distribute dead load on the underlying walls. If a tiered retaining wall is placed within a horizontal distance less than two times the height of the underlying wall, a surcharge load may be applied to the lower wall. Check the global stability of a combined tiered wall system and surrounding soils for conventional or reinforced earth retaining walls.

STABILITY

Computations are made considering the retaining wall [stones, backfill, grid material and select fill] to be a rigid body subject to overturning forces generated by the in-situ or backfill soil.

Minimum reinforcement length in the select fill shall be approximately 70% of the wall height as measured from the leveling pad (foundation) and not less than 8 feet unless evidence is presented to indicate shorter lengths are acceptable.



VyKing Construction

Notes

ADHESIVE (VOC)

SRW® Stabilization • Reinforcement • Weed Control products

28 oz. • 10.5 oz

SRW VOC RETAINING WALL & PAVER ADHESIVE

SRW VOC Retaining Wall & Paver Adhesive is a professional strength, VOC compliant formula specially designed for masonry, concrete, brick, block, pavers and common landscaping materials. It can even be used to bond wet, frozen or damp surfaces.

- Ideal for wet or frozen surfaces
- Extrudes well in low temperatures
- Provides a strong, durable bond
- Waterproof
- Meets State and Federal VOC regulations

DIRECTIONS

1. Surfaces should be clean and free from oil, grease, excessive water, ice or any other material which may deter adhesion.
2. Cut tip on slant for 1/4" or 3/8" bead. Puncture inner seal with nail or wire. Place cartridge in a caulking gun.
3. Apply adhesive with the caulking gun to only one of the surfaces to be joined. Apply in a continuous bead to ensure complete coverage. Apply no more adhesive than you can cover in 20 minutes.
4. Press surfaces together firmly. For faster curing, lift up top product and immediately reposition. Do not smear adhesive.
5. Vertical or slanted applications may require additional bracing until adhesive has dried.
6. Allow 48-hour cure time and 4-5 days before walking on any steps or heavy traffic areas.

Cleanup • Scrape off dried excess adhesive with a putty knife. Remove residue with mineral spirits. (Note: Test cleaning solvent on an out-of-way area to make sure it will not mar the surface to be cleaned.) Storage life: More than 12 months in tightly closed container at 75°F. Do not store in diect sunlight.

USER TIPS

- On tumbled products, make sure surface is clean of any dust, dirt or material that may deter proper adhesion. We recommend using a 3/8" bead.
- On grooved materials, make sure you have a full positive connection of adhesive to both surfaces.
- Not recommended to apply in temperatures below 10°F.
- Do not use below the waterline or for continuous submersion. Not recommended for fiberglass, rubber, plastic or foam.

PACKAGING

PART NUMBER	SIZE	# PER CARTON OR PALLET	LBS
AP10	10.5 oz	12/case; 64 cases/pallet	12/case 768/pallet
AP29	28 oz	12/case; 38 cases/pallet	30/case 1140/pallet

WARNINGS

KEEP OUT OF REACH OF CHILDREN.

EXTREMELY FLAMMABLE. VAPOR HARMFUL. Contains methyl acetate, xylene and acetone. Keep away from heat, sparks & flame. Use only with positive cross-ventilation. Avoid breathing vapors. Do not swallow. Do not allow eye contact or prolonged skin contact. Uncured product can cause eye and skin irritation. Prolonged or repeated overexposure to solvents in uncured product can cause central nervous system, peripheral nervous system, eye, skin, liver, kidney or respiratory system effects. (See Material Safety Data Sheet)

This product is VOC compliant.

Important Notice:
Since the use of this product is beyond the control of the manufacturer, no guarantee or warranty, expressed or implied is made for the merchantability, fitness or suitability for the use of this product or otherwise extending beyond the description hereof except the obligation to replace that product for portion of shipment proved defective. Furthermore, nothing contained herein shall be construed as a recommendation to use any product in conflict with existing laws and/or patents covering any material or use. Liability is limited to product replacement only.

SRW ADHESIVE
MATERIAL SAFETY DATA SHEET

MSDS Name:	SRW Retaining Wall & Paver Adhesive
MSDS Number:	56441
MSDS Revision Date:	11-09-05
Page Number:	1 of 5

SECTION I - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name:	SRW Retaining Wall & Paver Adhesive
CAS Number:	none
Hazard Rating:	Health: 2 Fire: 3 Reactivity: 0
Company Identification:	SRW Products • Princeton, MN
Contact:	SRW Products
Telephone/Fax:	(800) 752-9326 • (763)389-2725
Emergency Phone (24 Hr):	(614) 445-1300
Chemtrec (24 Hr.):	(800) 424-9300
Chemtrec International:	(703) 527-3887
Product Class:	Solvent based
Product Use:	Construction adhesive
Product Code:	3195
Division:	Construction Adhesives & Sealants

SECTION II - COMPOSITION AND INFORMATION ON INGREDIENTS

Hazardous Ingredients	CAS Number	%
ACETONE	67-64-1	13.35
HEXANE	110-54-3	13.18
TOLUENE	108-88-3	8.31

OSHA PELs & ACGIH TLVs are listed in Section VIII where applicable.

SECTION III - HAZARD IDENTIFICATION

NOTE:
Repeated and prolonged overexposure to the mixture of solvent(s) listed in Section II can result in systemic effects including permanent brain, nervous system, liver, and kidney damage. Intentional misuse by deliberately concentrating & inhaling the contents may be harmful or fatal.

EMERGENCY OVERVIEW:
Product is a beige, medium viscosity mastic. **DANGER: EXTREMELY FLAMMABLE, VAPOR HARMFUL. CONTAINS ACETONE, TOLUENE AND HEXANE.** Vapors can cause flash fire. Vapors can ignite explosively. Prevent buildup of vapors by opening all windows and doors to create cross-ventilation. Keep away from heat, sparks and open flame. Do not smoke. Turn off stoves, heaters and sparking electric motors. Keep container tightly closed when not in use. Avoid prolonged breathing of vapor. **KEEP OUT OF REACH OF CHILDREN.**

ROUTES OF ENTRY:

INHALATION:	Yes
INGESTION:	Yes
SKIN:	Yes
EYE:	Yes

INHALATION:
Avoid breathing vapor or mists. May cause headaches and dizziness. High vapor concentrations are irritating to the nose, throat and lungs and can cause systemic effects. Vapors can readily accumulate in confined or poorly ventilated areas.

INGESTION: Ingestion is not a probable route of exposure. Harmful if swallowed.

SKIN: May be harmful if absorbed through skin, may produce kidney, liver and central nervous system damage. A single exposure is not likely to result in the material being absorbed through the skin in harmful amounts.

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EYE: Substance may cause severe eye irritation.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:
Preexisting neurological conditions, skin disorders, and respiratory disease.
CARCINOGENICITY:
IARC: No
NTP: No
OSHA: No

REPRODUCTIVE TOXICITY:
Toluene may be harmful to the human fetus based on positive test results with laboratory animals. Case studies show that prolonged intentional abuse of toluene during pregnancy can cause birth defects in humans.

TARGET ORGANS:
Prolonged or repeated overexposure may cause eye, skin, respiratory system, central nervous system, peripheral nervous system, liver and kidney damage.

SECTION IV – FIRST AID MEASURES

Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmia's (irregular beating) in persons exposed to high concentrations of hexane (e.g. in enclosed spaces or with deliberate abuse). If used, monitor heart action closely. Consider use of other drugs with less arrhythmogenic potential.

INHALATION:	Remove to fresh air. If difficulty persists seek medical attention.
INGESTION:	Call poison control center immediately. Follow their specific instructions. Do Not induce vomiting.
SKIN:	Wash with soap and water. Contact a physician if irritation develops or persists.
EYE:	Hold eyelids apart and flush with plenty of water for at least 15 minutes. Seek medical attention.

SECTION V - FIRE-FIGHTING MEASURES

Flammability Class (OSHA)	IB
Flash Point:	Less than 0°F Setaflash
Explosive Range:	Lower explosive limit 1.2% Upper explosive limit 12.8%
Flammable liquid:	Can form explosive mixtures at temperatures at or above the flashpoint.

EXTINGUISHING MEDIA:
Use alcohol foam, carbon dioxide, or dry chemical when fighting fires involving this product.
HAZARDOUS COMBUSTION PRODUCTS:
Oxides of carbon may be released during combustion.
FIRE-FIGHTING PROCEDURES:
Wear a NIOSH approved self-contained breathing apparatus. Wear appropriate personal protective equipment. Water may be ineffective, but may be used to cool exposed containers to prevent pressure build-up and possible auto ignition or explosion when exposed to extreme heat.

SECTION VI - ACCIDENTAL RELEASE MEASURES

CONTAINMENT TECHNIQUES:
Use inert absorbent to dike the spill. Keep away from drains.

CLEAN UP: If possible pump liquid into an approved container or spread absorbent over spill and shovel (use non-sparking equipment) product/absorbent mixture into an approved container. If product has dried, scrape up and place in an approved container.

EMERGENCY MEASURES: Isolate hazard area. Keep unnecessary and unprotected personnel from entering area. Wear all appropriate personal protection equipment (PPE) (see Section VIII).

SRW ADHESIVE
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SECTION VII - HANDLING & STORAGE

HANDLING:
Avoid breathing vapors from the headspace of containers.
Keep lid closed when not in use.
Use only in well-ventilated area.
Follow all MSDS/label precautions even after container is emptied.
Containers may retain product residues and vapors.

STORAGE:
Keep away from sources of ignition. Do not store above 110°F.
Store large quantities in buildings designed & protected for storage of NFPA Class 1-B flammable materials.

SECTION VIII - EXPOSURE CONTROLS AND PERSONAL PROTECTION

Occupational Exposure Limits

	ACGIH TLV	ACGIH TLV-C	ACGIH STEL	OSHA STEL	OSHA PEL
ACETONE	500.00 PPM	N/est	1000.00 PPM	N/est	1000.00 PPM
HEXANE	50.00 PPM	N/est	N/est	N/est	500.00 PPM
TOLUENE	50.00 PPM	N/est	N/est	N/est	200.00 PPM

The OSHA Ceiling for toluene is 300 ppm.

ENGINEERING CONTROLS:
Use local exhaust as needed to maintain occupational exposure limits. Maintain standard plant ventilation.

OTHER: Facilities storing or utilizing any chemical should be equipped with an eyewash facility and a safety shower.

RESPIRATORY PROTECTION:
Where exposure limits may be exceeded select a NIOSH approved respirator with appropriate Protection Factor and cartridge for the specific containment. Follow requirements for respiratory protection in OSHA 1910.134.

EYE PROTECTION: Chemical splash goggles (ANSI Z87.1 or approved equivalent).

SKIN PROTECTION: Where skin contact can occur, wear impervious gloves.

SECTION IX – PHYSICAL & CHEMICAL PROPERTIES

Form:	Mastic
Appearance/Color:	Beige
Odor:	Solvent
Solubility (in water):	Nil
pH Value:	Not Applicable
Boiling Range/Point:	121° F
Evaporation Rate:	Faster than n-Butyl Acetate
% Volatile:	34%
Specific Gravity:	1.06
VOC:	282 g/l

SECTION X – STABILITY & REACTIVITY

Stability:	This product is stable.
Hazardous Polymerization:	Hazardous polymerization will not occur.
Conditions To Avoid:	Heat, sparks, open flame.
Incompatibility:	Strong oxidizing agents, acids and bases.
Hazardous Decomposition Products:	Will not occur.

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SECTION XI - TOXICOLOGICAL INFORMATION

Acetone - Acute:
Acetone has a low order of acute and inhalation toxicity. Acetone is a slight skin irritant and moderately severe eye irritant. Excessive inhalation can cause headache, drunkenness, and weakness.
Acetone - Chronic:
Kidney damage and anemia can result from sustained high level exposure. Acetone is reported to potentiate the liver toxicity of chloroform.
Hexane - Acute:
Ingestion of hexane can cause nausea, vomiting, stomach pain, and diarrhea. Hexane can irritate the skin and eyes. Acutely, the most common toxic effects are central nervous system depression and chemical pneumonitis resulting form aspiration into the lungs following ingestion.
Hexane - Chronic:
Dermal irritation and central nervous system depression accompanied by peripheral system damage (polyneuropathy) are common traits of sustained overexposure.
Toluene - Acute:
Toluene is a central nervous system depressant and skin and mucous membrane irritant. Severe dermatitis may result from its drying and defatting action. Toluene is an aspiration hazard causing chemical pneumonitis.
Toluene - Chronic:
Toluene can cause cardiac sensitization. It is toxic to the kidney, liver and can cause effects on the blood system such as increased clotting time.
Toluene may be harmful to the human fetus based on positive test results in laboratory animals. Case studies show that prolonged intentional abuse of toluene during pregnancy can cause birth defects in humans.

SECTION XII - ECOLOGICAL INFORMATION

This formulation has not been tested for environmental effects.

SECTION XIII - DISPOSAL CONSIDERATIONS

WASTE DISPOSAL:
Disposal of this product must comply with all applicable federal, state and local regulations.

CONTAINER DISPOSAL:
Disposal of this container should comply with all applicable federal, state and local regulations.

SECTION XIV – TRANSPORT INFORMATION
For any 10.5-ounce size of this product and for all 29-ounce to 1 gallon sizes of this product not shipped by air:

DOT:	UN Number:	None
	UN Pack Group:	N/A
	UN Class:	ORM-D
	Shipping Name:	CONSUMER COMMODITY
AIR:	UN Number:	ID8000
	UN Pack Group:	N/A
	UN Class:	9
	ICAO/IATA Class:	9
	Shipping Name:	CONSUMER COMMODITY
MARITIME:	UN Number:	UN1133
	UN Pack Group:	III
	UN Class:	3
	IMDG Class:	Limited Quantity
	Shipping Name:	Adhesives, containing a Flammable Liquid, Limited Quantity

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For air shipments of 29-ounce to 1 gallon sizes of this product or any shipment of this product in more than a one gallon container:

UN Number:	UN1133
UN Pack Group:	III
UN Class:	3
ICAO/IATA Class:	3
IMDG Class:	3

Shipping Name: Adhesives containing a Flammable Liquid
Packaging may not be approved for shipping by air.

SECTION XV - REGULATORY INFORMATION
SARA TITLE III SECTION 313:
This product contains the following toxic chemicals subject to the reporting requirements of Section 313 of the Emergency Planning and Community Right to Know Act of 1986 and of 40 CFR 372:

Chemical Name	CAS Number	Percent
HEXANE	110-54-3	13.18
TOLUENE	108-88-3	8.31

-PROP 65 (TERATOGEN)
WARNING: This product contains a chemical known to the state of California to cause birth defects or other reproductive harm.

Chemical Name	CAS Number	Percent
TOLUENE	108-88-3	8.31

TSCA (Toxic Substances Control Act Inventory):
All components of this product are listed on the TSCA inventory except as exempted.

PENNSYLVANIA:
Hazardous components required to be listed at 1% or more:
Acetone; 2-propanone; 67-64-1
Toluene; benzene, methyl-; 108-88-3
Kaolin clay; kaolin; 1332-58-7
Hexane; hexane; 110-54-3
Crystalline silica; quartz; 14808-60-7
Non-hazardous ingredients required to be listed at 3%:
Petroleum hydrocarbon resin 68131-99-7; petroleum hydrocarbon resin 68132-00-3; styrene-butadiene rubber 9003-55-8

NEW JERSEY:
clay 1332-58-7, petroleum hydrocarbon resin 68131-99-7, styrene-butadiene rubber 9003-55-8, acetone 67-64-1, hexane 110-54-3

SECTION XVI - OTHER INFORMATION
DISCLAIMER:
While the information and recommendations set forth herein are believed to be accurate as of the data hereof, SRW Products makes no warranty, express or implied, with respect thereto and disclaims all liability from reliance thereon.

Notes

ADHESIVE

SRW®
Stabilization • Reinforcement • Weed Control
products

29 oz. • 10.5 oz

SRW RETAINING WALL & PAVER ADHESIVE

SRW Retaining Wall & Paver Adhesive is a durable, fast acting, professional strength adhesive with superior time-tested performance. It is formulated especially for masonry, concrete, brick, block, pavers and common landscaping materials. It can even be used to bond wet, frozen or damp surfaces.

- Ideal for wet or frozen surfaces
- Extrudes well in low temperatures
- Provides a strong, durable bond
- Waterproof

DIRECTIONS

1. Surfaces should be clean and free from oil, grease, excessive water, ice or any other material which may deter adhesion.
2. Cut tip on slant for 1/4" or 3/8" bead. Puncture inner seal with nail or wire. Place cartridge in a caulking gun.
3. Apply adhesive with the caulking gun to only one of the surfaces to be joined. Apply in a continuous bead to ensure complete coverage. Apply no more adhesive than you can cover in 20 minutes.
4. Press surfaces together firmly with a slight twisting motion. For faster curing, lift up top product and immediately reposition.
5. Vertical or slanted applications may require additional bracing until adhesive has dried.
6. Allow 48-hour cure time and 4-5 days before walking on any steps or heavy traffic areas.

Cleanup • Scrape off dried excess adhesive with a putty knife. Remove residue with mineral spirits. (Note: Test cleaning solvent on an out-of-way area to make sure it will not mar the surface to be cleaned.) Storage life: More than 12 months in tightly closed container at 75°F. Do not store in diect sunlight.

USER TIPS

- On tumbled products, make sure surface is clean of any dust, dirt or material that may deter proper adhesion. We recommend using a 3/8" bead.
- On grooved materials, make sure you have a full positive connection of adhesive to both surfaces.
- Do not apply in temperatures below 10°F.
- Do not use below the waterline or for continuous submersion. Not recommended for fiberglass, rubber, plastic or foam.

PACKAGING

PART NUMBER	SIZE	# PER CARTON OR PALLET	LBS
A10	10.5 oz	24/case; 32 cases/pallet	22/case 704/pallet
A29	29 oz	12/case; 38 cases/pallet	28/case 1064/pallet

WARNINGS

This product is NOT VOC compliant, if needed, a VOC compliant adhesive is available, please contact SRW.

KEEP OUT OF REACH OF CHILDREN.

EXTREMELY FLAMMABLE. VAPOR HARMFUL. Contains acetone, hexane and toluene. Keep away from heat, sparks & flame. Use only with positive cross-ventilation. Avoid breathing vapors. Do not swallow. Do not allow eye contact or prolonged skin contact. Uncured product can cause eye and skin irritation. Prolonged or repeated overexposure to solvents in uncured product can cause central nervous system, peripheral nervous system, eye, skin, liver, kidney or respiratory system effects. (See Material Safety Data Sheet)

Important Notice:
Since the use of this product is beyond the control of the manufacturer, no guarantee or warranty, expressed or implied is made for the merchantability, fitness or suitability for the use of this product or otherwise extending beyond the description hereof except the obligation to replace that product for portion of shipment proved defective. Furthermore, nothing contained herein shall be construed as a recommendation to use any product in conflict with existing laws and/or patents covering any material or use. Liability is limited to product replacement only.

SRW VOC ADHESIVE
MATERIAL SAFETY DATA SHEET

MSDS Name:	SRW Retaining Wall & Paver Adhesive
MSDS Number:	56461
MSDS Revision Date:	11-09-05
Page Number:	1 of 4

SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name:	SRW VOC Retaining & Paver Adhesive
CAS Number:	none
HMIS Hazard Rating:	Health: 2 Fire: 1 Reactivity: 0
Company Identification:	SRW Products • Princeton, MN
Contact:	SRW Products
Telephone/Fax:	(800)752-9326 • (763)389-2725
Emergency Phone (24 Hr.):	(614) 445-1300
Chemtrec (24 Hr.):	(800) 424–9300
Chemtrec International:	(703) 527-3887
Product Class:	Solvent based
Product Use:	Construction adhesive
Product Code:	3195
Division:	Construction Adhesives & Sealants

SECTION 2 - COMPOSITION AND INFORMATION ON INGREDIENTS

Hazardous Ingredients	CAS Number	Percent
4,4-diphenylmethane diisocyanate	101-68-8	9.93
aliphatic petroleum distillates	64742-47-8	3.80

OSHA PELs & ACGIH TLVs are listed in Section 8 where applicable.

SECTION 3 - HAZARD IDENTIFICATION

NOTE: This product reacts with water, releasing carbon dioxide.

EMERGENCY OVERVIEW:
WARNING: COMBUSTIBLE. EYE AND SKIN IRRITANT. POTENTIAL SKIN AND RESPIRATORY SENSITIZER.
Contains mineral spirits and residual isocyanate. Prolonged or repeated skin exposure may cause skin irritation and sensitization or allergic reaction. Do not swallow or allow eye contact. Material is light brown mastic with a mineral spirits odor.

ROUTES OF ENTRY:

Ingestion:	Yes
Inhalation:	Yes
Skin:	Yes
Eye:	Yes

INHALATION:
At room temperature, vapors are minimal due to low vapor pressure. In some individuals an allergic reaction may occur. May cause respiratory sensitization in susceptible individuals. MDI concentrations below exposure guidelines may cause allergic reactions in individuals already sensitized. Symptoms may include coughing, difficult breathing and a feeling of tightness in the chest. Effects may be delayed. Impaired lung function (decreased ventilation capacity) has been associated with overexposure to isocyanates.

INGESTION: No hazard expected in normal industrial use. Do not eat, drink, or smoke around chemicals. Single dose oral toxicity is considered to be extremely low. No hazards expected from swallowing small amounts incidental to normal handling operations. Ingestion may cause gastrointestinal irritation.

SKIN: May cause skin irritation. Material may be absorbed through the skin leading to allergic reaction or respiratory sensitization. Material may stick to skin causing irritation upon removal. May stain skin.

EYE: May cause slight eye irritation. Corneal injury is unlikely. MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Respiratory conditions such as asthma.

SRW VOC ADHESIVE
MATERIAL SAFETY DATA SHEET

MSDS Name:	SRW Retaining Wall & Paver Adhesive
MSDS Number:	56461
MSDS Revision Date:	11-09-05
Page Number:	2 of 4

CARCINOGENICITY:
IARC: No
NTP: No
OSHA: No
ACGIH: No

REPRODUCTIVE TOXICITY: In laboratory animals, MDI/polymeric MDI do not produce birth defects; other fetal effects occurred only at doses which were toxic to the mother.

TARGET ORGANS: Eyes, skin, and respiratory tract.

SECTION 4 - FIRST AID MEASURES

INHALATION: Remove to fresh air. If not breathing give mouth-to-mouth resuscitation. If breathing is difficult oxygen should be administered by qualified personnel. Call a physician or transport to a medical facility.

INGESTION: If swallowed, seek medical attention. Do not induce vomiting unless directed to do so by medical personnel.

SKIN: Wash off with flowing water or shower. Contact physician if persistent irritation occurs.

EYE: Irrigate with flowing water immediately and continuously for 15 minutes. Consult medical personnel. Material containing MDI may react with moisture of the eye forming thick material, which may be difficult to wash from the eye.

SECTION 5 - FIRE-FIGHTING MEASURES
Flammability Class (OSHA) IIIB
Flash Point: > 200.øF
Setaflash
Explosive Range: Not Applicable

EXTINGUISHING MEDIA:
Carbon dioxide, dry chemical, or foam. For large-scale fires, alcohol resistant foams are preferred if available. General-purpose synthetic foams and protein foams may function, but much less effectively. Water may be used as a blanket for fire extinguishment. If water is used, it should be used in very large quantity. A reaction between water and isocyanate may occur. If possible, contain fire run off water.

HAZARDOUS COMBUSTION PRODUCTS:
When burning, product will release carbon monoxide, carbon dioxide, nitrogen oxide fumes, and isocyanate vapors.

FIRE FIGHTING PROCEDURES:
Fire fighters should use positive pressure self-contained breathing apparatus and full protective clothing. Down-wind personnel must be evacuated.

SECTION 6 - ACCIDENTAL RELEASE MEASURES

CLEAN-UP:
If possible, scrape mastic into an approved container or spread absorbent over spill and shovel product/absorbent mixture into an approved container. If product has dried, scrape up and place in an approved container.

EMERGENCY MEASURES:
Isolate hazard area. Keep unnecessary and unprotected personnel from entering area. Wear all appropriate personal protection equipment (PPE) (see Section 8).

SECTION 7 - HANDLING AND STORAGE

HANDLING:
In accordance with good manufacturing practices, good ventilation of the processing area is recommended. Gloves are recommended, as product is difficult to remove from effected areas if contact with skin occurs.

SRW VOC ADHESIVE
MATERIAL SAFETY DATA SHEET

MSDS Name:	SRW Retaining Wall & Paver Adhesive
MSDS Number:	56461
MSDS Revision Date:	11-09-05
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STORAGE:
Store in tightly closed containers to protect from atmospheric moisture. Replace outage with inert nitrogen.
Store at temperature of 75F to 105F.

SECTION 8 - EXPOSURE CONTROLS AND PERSONAL PROTECTION
Occupational Exposure Limits

	ACGIH TLV	ACGIH TLV-C	ACGIH STEL	OSHA STEL	OSHA PEL
4,4-diphenylmethane diisocyanate	N/est	N/est	N/est	N/est	N/est
aliphatic petroleum distillates	N/est	N/est	N/est	N/est	500.00 mg/M3

The ACGIH TLV for 4,4'-diphenylmethane diisocyanate is .005 ppm. The OSHA Ceiling for 4,4'-diphenylmethane diisocyanate is .02 ppm.

ENGINEERING CONTROLS:
Provide general and/or local exhaust ventilation to control airborne levels below the exposure guidelines.

RESPIRATORY PROTECTION:
Atmospheric levels should be maintained below the exposure guidelines. For emergency and other conditions where exposure guidelines may be exceeded, use an approved positive-pressure self-contained breathing apparatus or supplied air respirator with an auxiliary self-contained air supply.

EYE PROTECTION:
Chemical splash goggles (ANSI Z87.1 or approved equivalent).

SKIN PROTECTION:
Use impervious materials made of butyl or nitrile rubber where skin contact may occur.

GENERAL:
Safety shower and eye wash station.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Form:	Mastic
Appearance/Color:	Light brown
Odor:	Mild
Solubility (in water):	Nil
pH Value:	Not Applicable
Boiling Range/Point:	Not applicable
Evaporation Rate:	Slower than n-Butyl Acetate
% Volatile:	5. %
Specific Gravity: 1.37	
VOC:	70 g/l

SECTION 10 - STABILITY AND REACTIVITY

Stability:	This product is stable
Hazardous Polymerization:	Hazardous polymerization will not occur

CONDITIONS TO AVOID:
Avoid prolonged heating over 160F (71C) or storage below 75F (24C). Stable when stored under normal conditions. Decomposition begins at 350F (177C).

INCOMPATIBLITY:
Water, acids, bases, alcohols, metal compounds, and surface active materials. Avoid water as it reacts to generate heat, CO2, and insoluble urea. Some reactions may be vigorous.

SRW VOC ADHESIVE
MATERIAL SAFETY DATA SHEET

MSDS Name:	SRW Retaining Wall & Paver Adhesive
MSDS Number:	56461
MSDS Revision Date:	11-09-05
Page Number:	4 of 4

HAZARDOUS DECOMPOSITION PRODUCTS:
Excessive heating can produce isocyanate vapor, mist and other hazardous organic compounds. Decomposition may occur with incompatible reactants, especially strong bases, water or temperatures over 320F (160C).

SECTION 11 - TOXICOLOGICAL INFORMATION

Mineral spirits can cause mild skin and eye irritation. Overexposure via inhalation can cause respiratory irritation and central nervous system effects. Mineral spirits can enter the lungs during swallowing or vomiting and cause lung inflammation and chemical pneumonitis. Based on available information, mineral spirits cannot be classified with respect to carcinogenicity.

SECTION 12 - ECOLOGICAL INFORMATION

This formulation has not been tested for environmental effects.

SECTION 13 - DISPOSAL CONSIDERATIONS

WASTE DISPOSAL:
Disposal of this product must comply with all applicable federal, state and local regulations.

CONTAINER DISPOSAL:
Disposal of this container should comply with all applicable federal, state and local regulations.

SECTION 14 - TRANSPORT INFORMATION

UN Number	none
UN Pack Group	N/A
UN Class	Non-hazardous
ICAO/IATA Class	Non-hazardous
IMDG Class	Non-hazardous
Shipping Name	Non-hazardous

Packaging may not be approved for shipping by air. Please contact Franklin International for further information.

SECTION 15 - REGULATORY INFORMATION SARA TITLE III SECTION 313:

This product contains the following toxic chemicals subject to the reporting requirements of Section 313 of the Emergency Planning and Community Right to Know Act of 1986 and of 40 CFR 372:

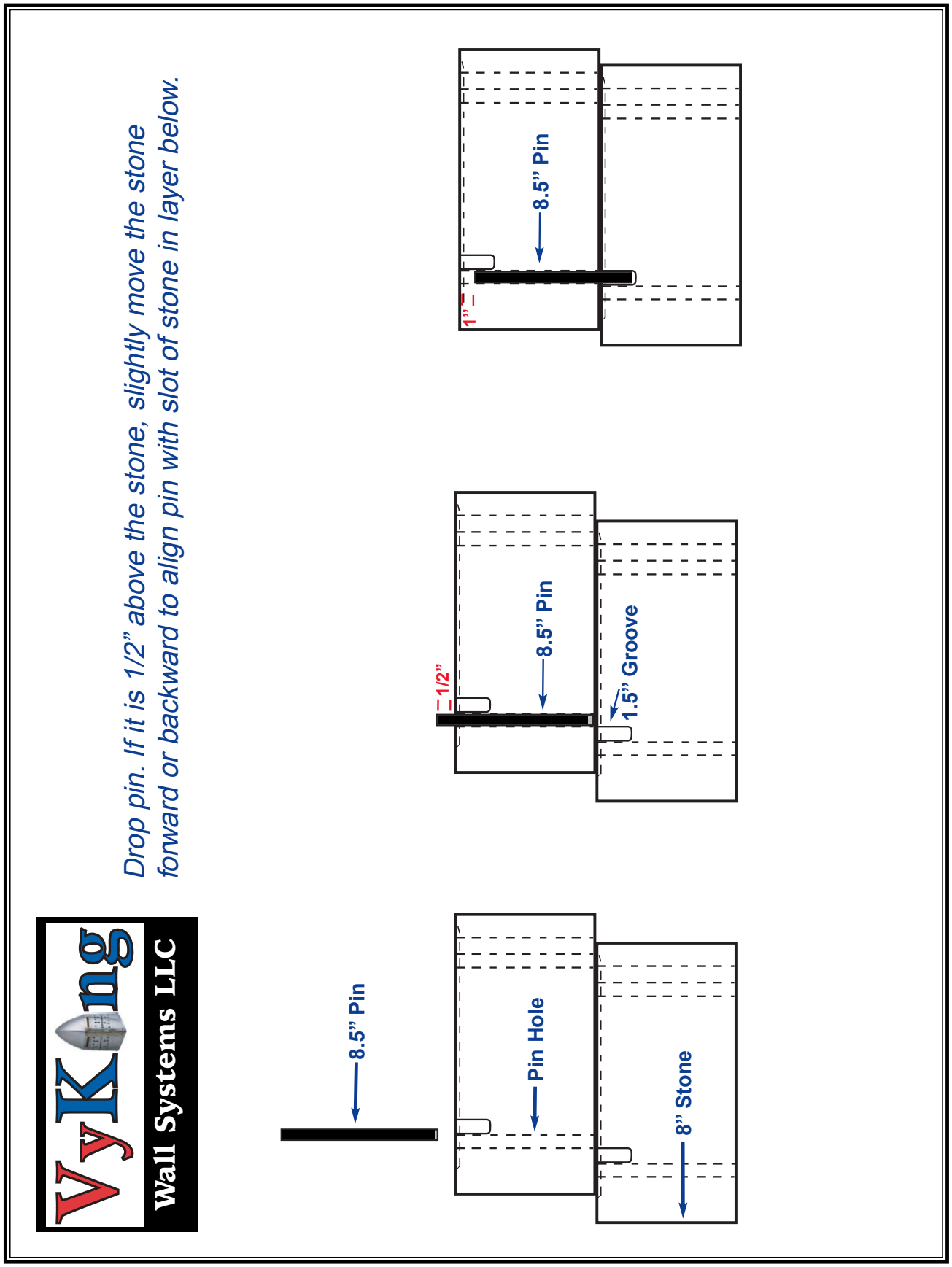
Chemical Name	CAS Number	Percent
4,4-diphenylmethane diisocyanate	101-68-8	9.93

TSCA (Toxic Substances Control Act Inventory): All components of this product are listed on the TSCA inventory except as exempted.

PENNSYLVANIA:
Hazardous components required to be listed at 1% or greater: 4,4'-diphenylmethane diisocyanate 101-68-8
Non-hazardous components required to be listed at 3% or more: mineral spirits 64742-47-8

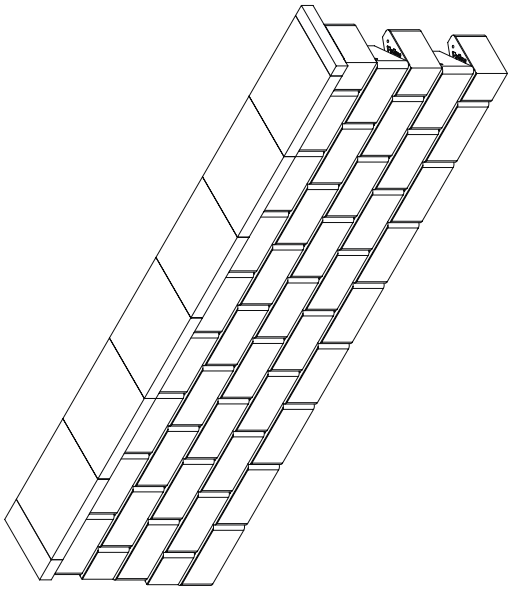
SECTION 16 - OTHER INFORMATION

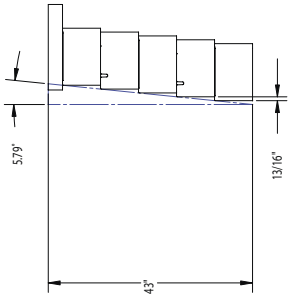
DISCLAIMER:
While the information and recommendations set forth herein are believed to be accurate as of the data hereof, SRW Products makes no warranty, express or implied, with respect thereto and disclaims all liability from reliance thereon.


Drop pin. If it is 1/2" above the stone, slightly move the stone forward or backward to align pin with slot of stone in layer below.
VyKing
Wall Systems LLC
8.5" Pin
Pin Hole
8" Stone
1/2"
8.5" Pin
1.5" Groove
1"
8.5" Pin

VyKing Construction

8” VyKing



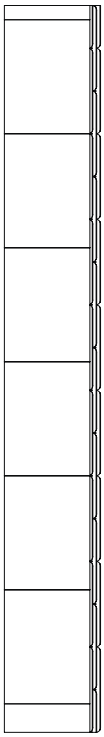


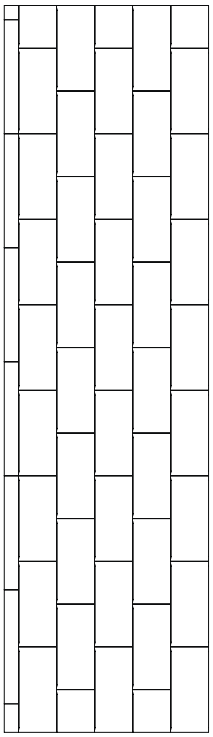
UNGER DESIGN & CONCEPT

8" VYKING WALL SET BACK DETAIL

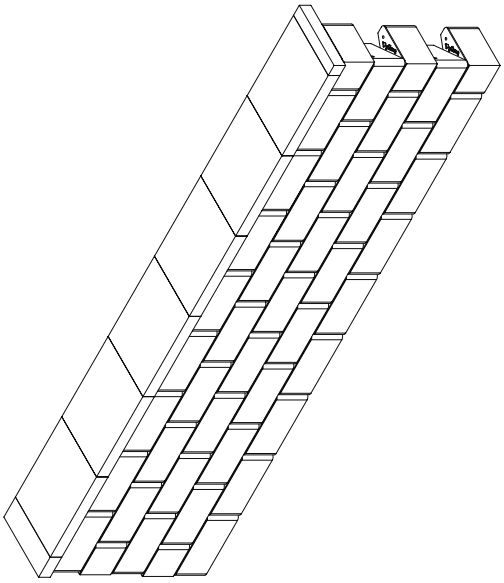
A42-0

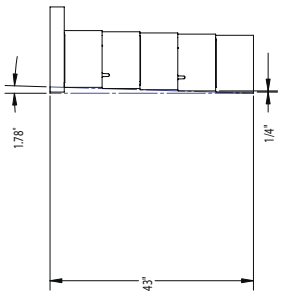
Standard Set Back



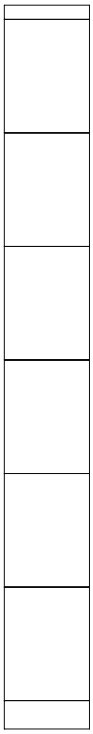


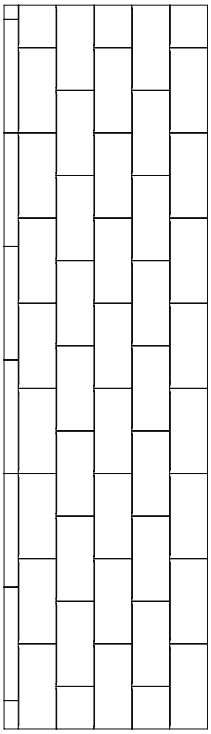
8” VyKing





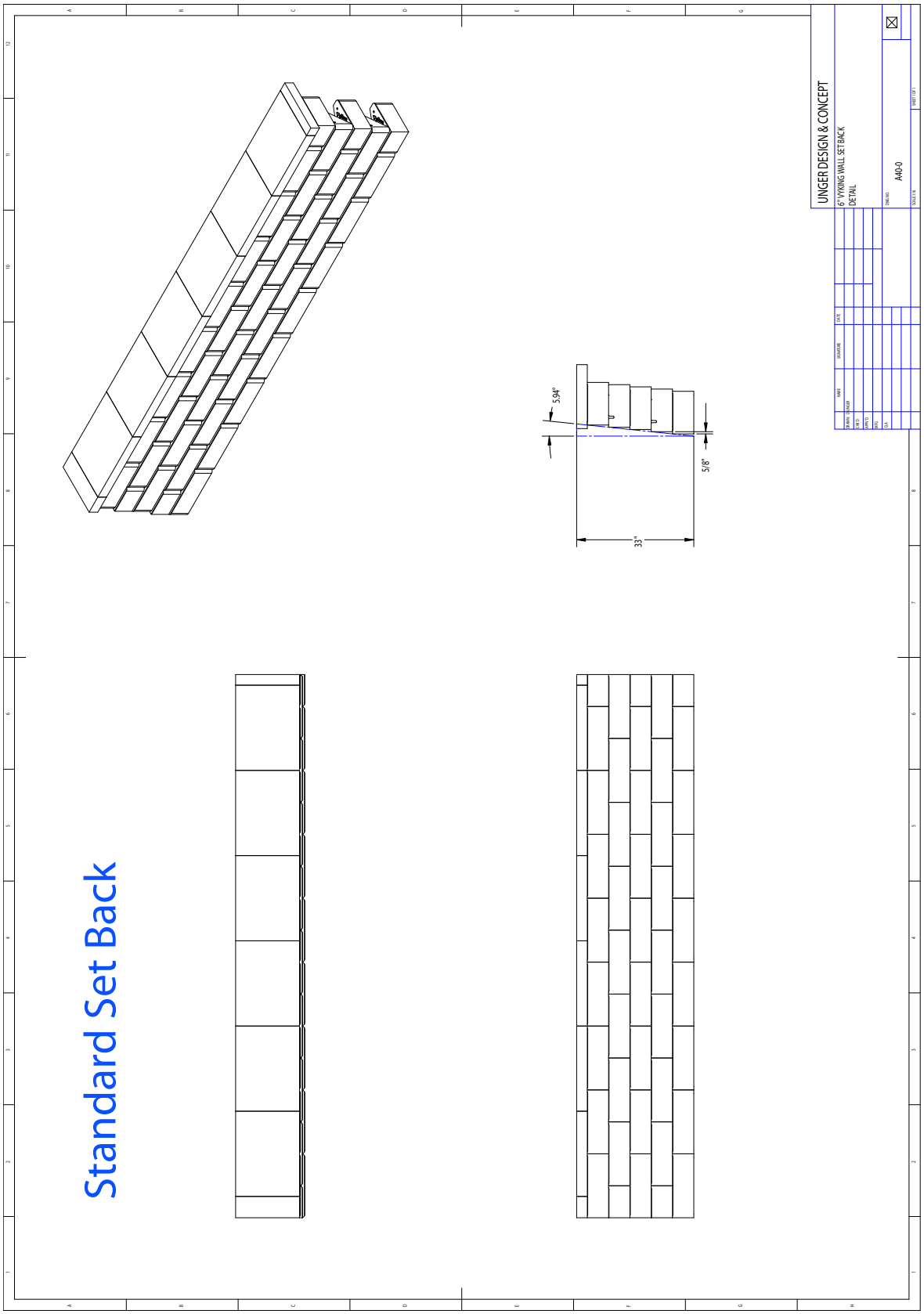
UNGER DESIGN & CONCEPT
8" VYKING WALL ZERO SET BACK
A2
A43-0



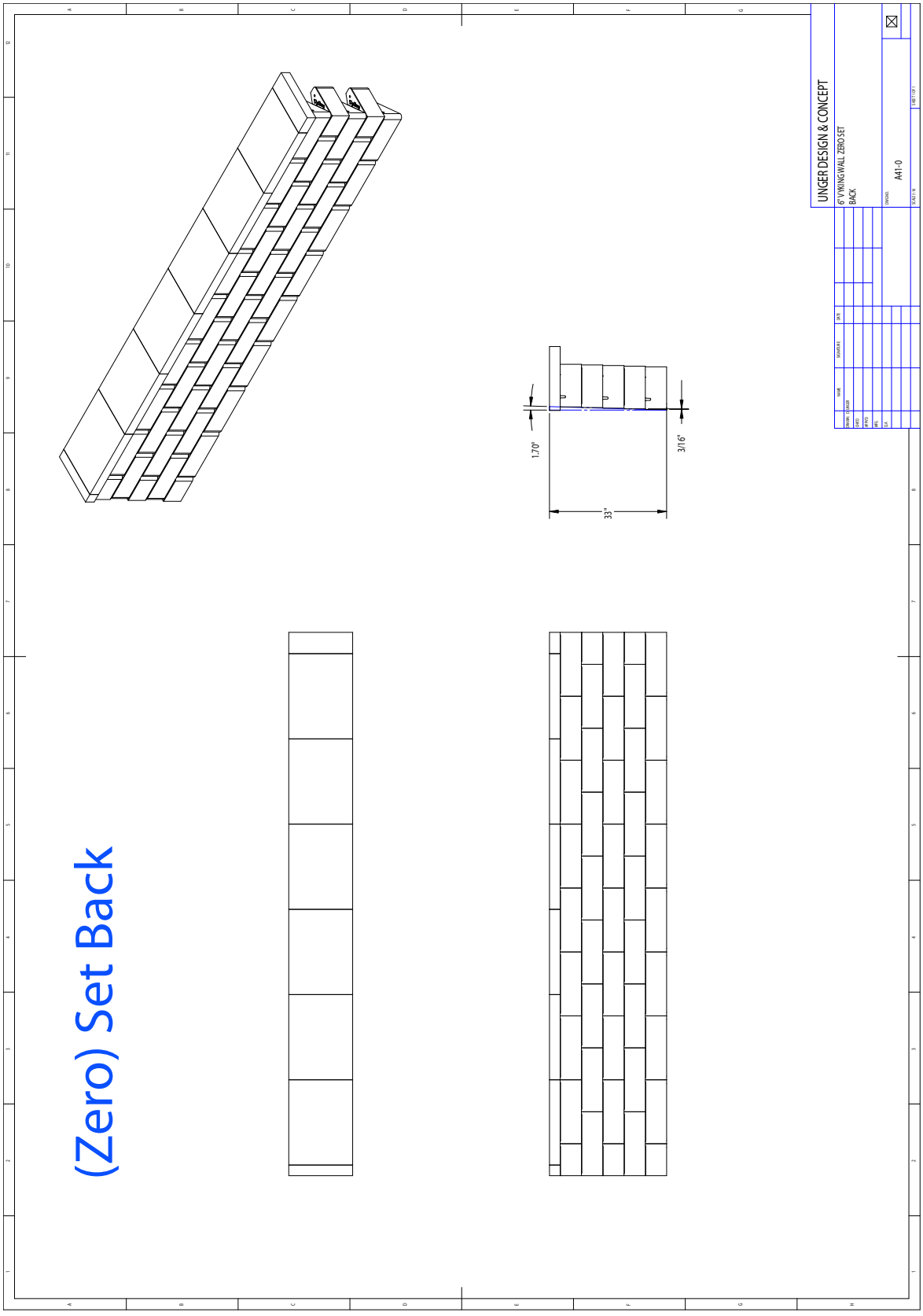


(Zero) Set Back

6” VyKing


UNGER DESIGN & CONCEPT
6" VYKING WALL SET BACK DETAIL
A40-0
5.94°
5/8"
33"
Standard Set Back

6” VyKing

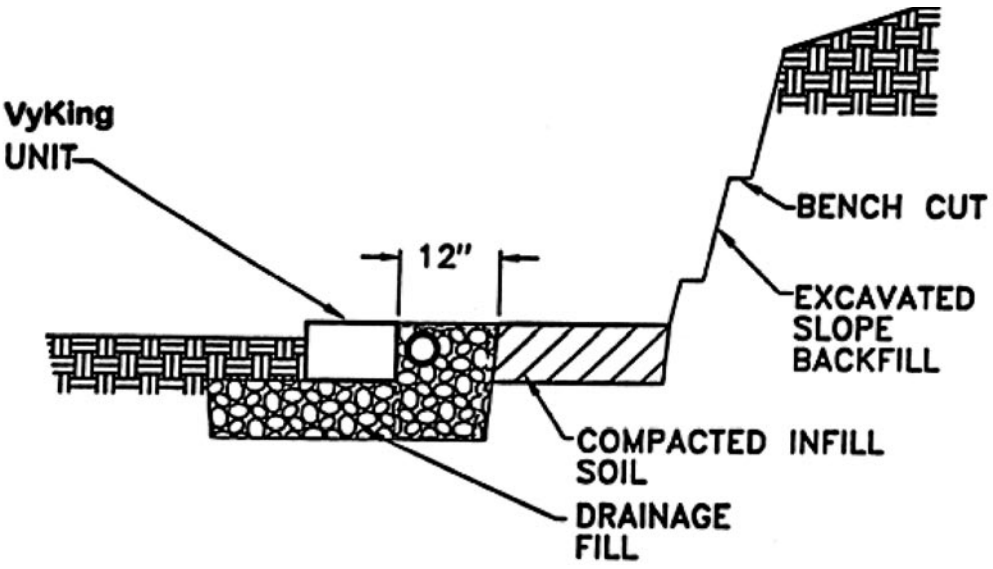

UNGER DESIGN & CONCEPT
6" VYKING WALL ZERO SET BACK
A41-0
1.7/8"
3/16"
33"
(Zero) Set Back

VyKing Wall Construction

Construction of a VyKing retaining wall should generally follow the following steps

1. Verification that the contractor meets all requirements of the SRW engineer's specifications is the owner's responsibility. Submittals of materials, qualifications and ability to properly install and supervise the wall system's construction are included in this step.

2. Excavate to the lines and grades shown on the project grading plans for the foundation and select soil zone. Prevent over-excavation and provide excavation support where required.



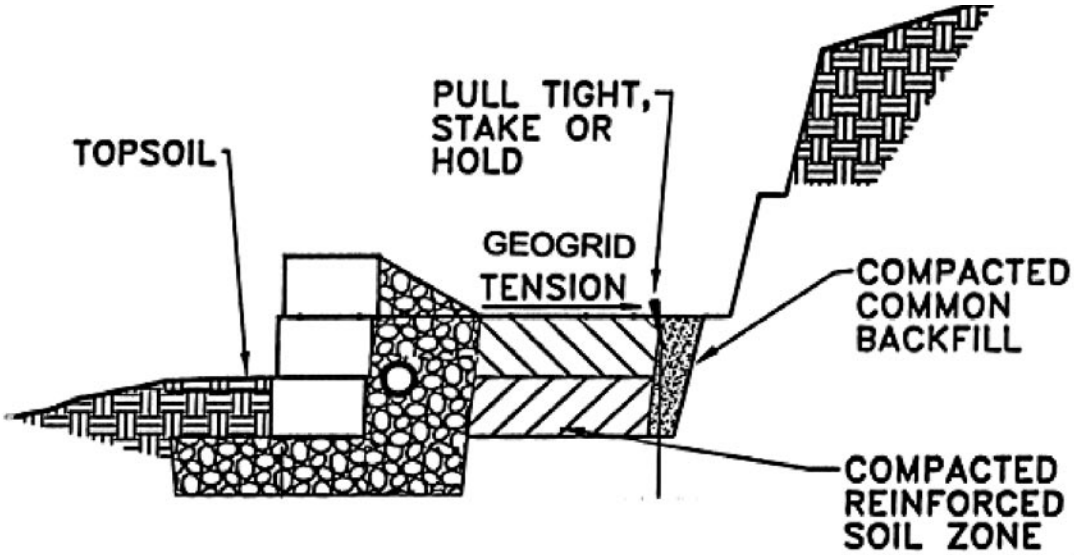
3. Assure that the soil strength in the foundation zone meets or exceeds the designed bearing strength. Soils not meeting the required strength shall be excavated and removed and replaced with soil meeting the designed criteria.

4. A minimum 6 inch layer of compacted granular material shall be placed for use as a leveling pad to the grades shown on the construction drawings. The granular foundation material shall be compacted to provide a firm and level bearing pad on which to place the first layer of VyKing units. Compaction should be performed using a lightweight compactor, such as a mechanical plate compactor, to obtain a minimum of 95% of the maximum standard Proctor density (ASTM D 698).

5. All materials (VyKing units, granular backfill, select soils, geogrid, drainage tubes, etc.) shall be installed as shown in the wall details on the construction plans as designed by the SRW engineer.

Installations shall not conflict with the manufacturer's recommendations for installation of their product. Specifically, VyKing stones should not be shimmed unless approved by the manufacturer and geogrid should be installed as designed without mechanical equipment driving directly on the geogrid material. VyKing stones must be on-gage at all points. This will allow stones to have contact at all points on each stone. Other specifications will be supplied by these manufacturers and other manufacturers.

6. Geogrid must not be overlapped to reach the desired depth behind the VyKing units. All geogrid layers must be one continuous piece of geogrid from the wall face to the designed depth behind the wall. Geogrid must be installed under tension by pulling the geogrid taunt at the depth of the geogrid layer and staking each layer of geogrid at that depth. Tension stakes should not be removed until at least 6 inches of select soil are placed upon the taunt geogrid.



7. Wall tolerances will be specified by the SRW design engineer and must not be exceeded.

8. Select soil backfill shall be placed as shown in the construction plans and compacted in lifts of 10 inches or less to a 95% of standard Proctor density (ASTM D 698) at a moisture content within 2% of optimum. Spread and compact backfill in a manner that eliminates the development of wrinkles or movement of the geogrid reinforcement and the VyKing units.

9. Only hand operated compaction equipment shall be used within 3 feet of the back of the VyKing units. Typically, compaction in this 3 foot area will be achieved by 3 or more passes of lightweight mechanical plate or roller equipment. Soil density shall not be less than 90% standard Proctor density.

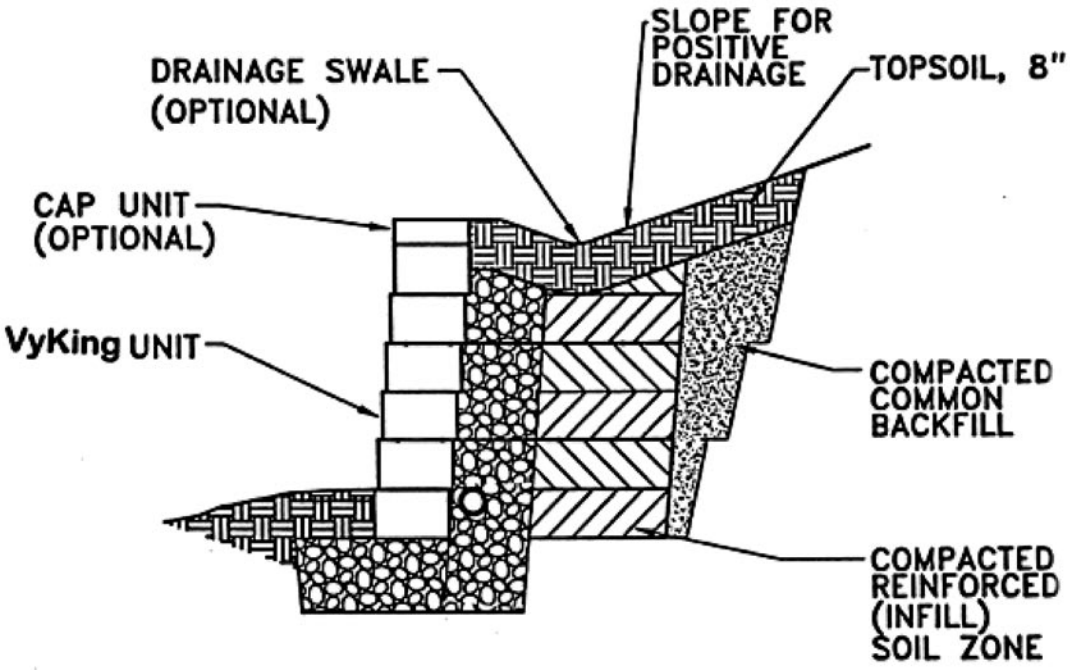
10. Tracked construction equipment shall not be operated directly on geogrid material. A Minimum of 6 inches of select soil fill is required to protect the geogrid material from damage. Turning of tracked

vehicles should be kept to a minimum to prevent displacing the select soil fill and damaging or moving the geogrid reinforcement.

11. Rubber tired equipment may pass directly over geogrid only if allowed by the manufacturer's specifications but this is not recommended. Speeds must be kept slow and sudden braking or sharp turning may damage the geogrid's strength.

12. At the end of each day the site shall have the select backfill sloped away from the wall face to direct water runoff away from the wall. Water runoff from the surrounding area must be directed away from the construction site.

13. Drainage rock shall be placed behind the VyKing units as shown in the construction drawings. Drainage pipes and the main collection drain pipe at the foot of the wall shall be installed to carry water away from the wall face by gravity. A 2% slope is expected in the main drain pipe.



14. Install cap stones as shown in the construction drawings and glue in place with retaining wall adhesive as given in the engineer's directions and adhesive manufacturer's installation directions.

15. Note: Geogrid manufacturers supply geogrids of varying strengths. In walls above 10 feet of height the SRW design engineer may use more than one grade (strength) of geogrid. It is of utmost importance that the geogrid layers be installed as specified on the construction drawings.

VyKing Wall Systems LLC

DRAINAGE MATERIAL

Notes

DRAINAGE MATERIAL

Drainage materials placed in cores and immediately behind the concrete units should be clean and well course graded course aggregate. Drainage pipes should be installed to carry water away from the structure.

A drainage system is designed to:

1. Prevent the buildup of hydrostatic pressure in the retained soils and foundation soils near the toe of the retaining wall.
2. Prevent retained soils from leaching through the face stones (VyKing stones).
3. Provide a stiff leveling pad or footing to support the stacked face units (VyKing stones).

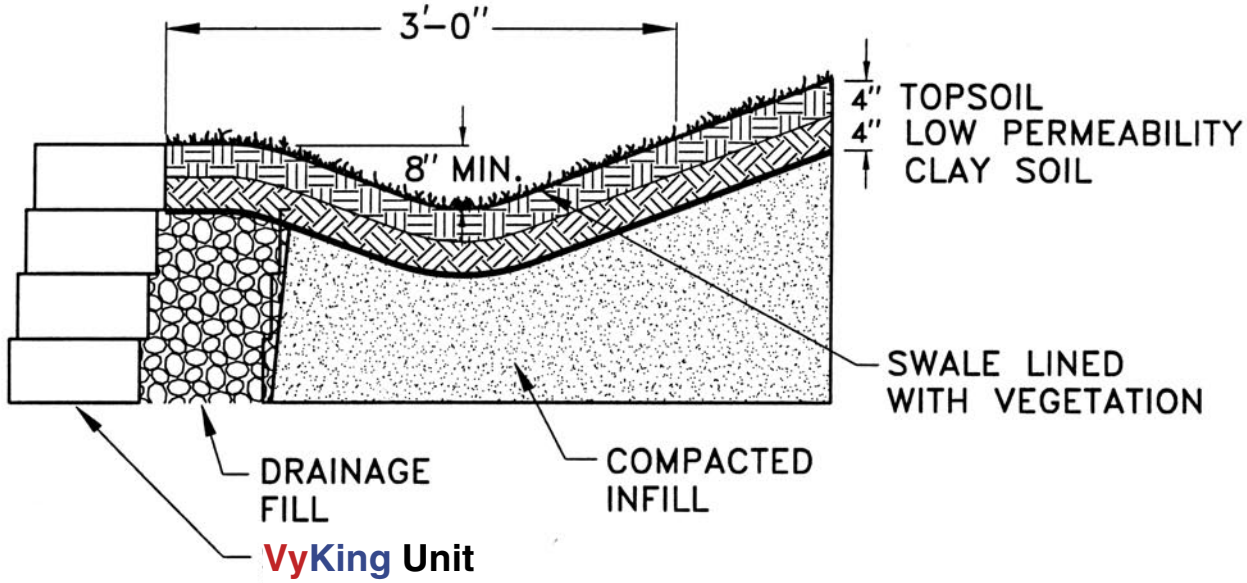
Course grained aggregate used to fill the voids in and between SRW units (VyKing units) is recommended by the SRW manufacturer and design engineer. An example is a crushed stone conforming to AASHTO No. 57 gradation.

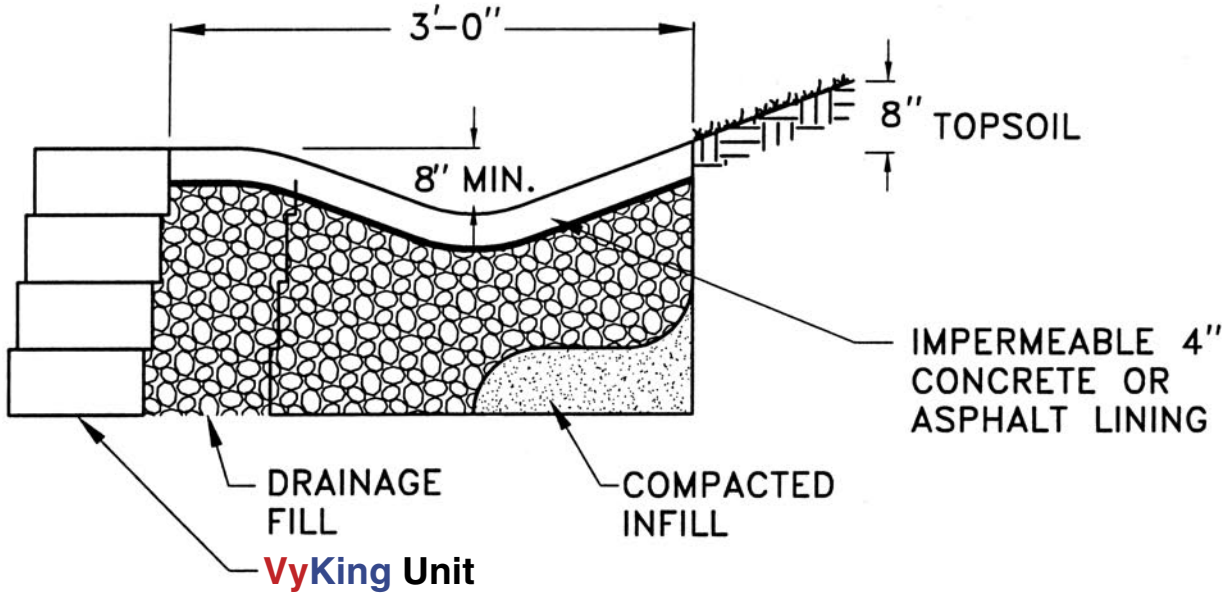
Poor drainage leads to development of hydrostatic pressures that generate additional destabilizing forces on the wall system and can reduce shear strength of the soil.

Surface water run-off should be directed away from the excavation and SWR system to prevent infiltration behind the stone face of the retaining wall. Saturation of the soils behind the retaining wall face may increase lateral pressure on the structure.

The damage or potential failure of a SRW due to water cannot be understated. It is of utmost importance to eliminate water from saturating the fill behind a SRW. Surface water should be directed away from the retaining wall. If the surface grade behind the wall cannot be graded to allow water to flow away from the face of the SRW, there should be a swale constructed behind the face of the retaining wall similar to those shown here.

SEE DRAWINGS ON FOLLOWING PAGE.


3'–0"
8" MIN.
4" TOPSOIL
4" LOW PERMEABILITY CLAY SOIL
SWALE LINED WITH VEGETATION
DRAINAGE FILL
COMPACTED INFILL
VyKing Unit


3'–0"
8" MIN.
8" TOPSOIL
IMPERMEABLE 4" CONCRETE OR ASPHALT LINING
DRAINAGE FILL
COMPACTED INFILL
VyKing Unit

The swale should be designed to catch surface water and carry it away from the SRW such that the water will be removed from the area of the SRW.

For water that may enter into the area behind the SRW, drain pipes or other drainage media must be installed to carry the water fully away from the SRW structure. For those cases where there may be a water bearing layer, either seasonal or constant, at the intersection of the retained soil and the select soil, it is imperative that a drainage system be installed to remove the water and carry the water fully away from the SRW. The design engineer is responsible for design of all drainage from the SRW. The engineer must have knowledge of the area for any water problems that may be present. It is critical that the installer follow the SRW engineers design. Oversight of the installer's work by an onsite engineer or technician that has no formal or informal tie to the installer is a competent way to ensure that the SRW is installed per the engineer's design.

Notes

VyKing Wall Systems LLC

SOIL COMPACTION

Notes

SOIL COMPACTION

Soil fill is compacted during retaining wall construction to develop soil shear strength and stiffness. The degree of compaction is typically specified as 95% of Maximum standard Proctor (ASTM D 698 or AASHTO T-99) or as 90 % of maximum modified Proctor (ASTM D 1557 or AASHTO T-180) density.

Compaction lifts should not exceed the height of the VyKing stone or 12 inches, whichever is less. For VyKing unit heights less that 6 inches, use multiples of unit height that create completed compaction lifts between 6 and 12 inches. Insufficient compaction may lead to less shear strength and result in unsafe SRW performance.

Granular soils are recommended as the select soil infill for SRWs. These soils have higher permeabilities (flow characteristics) than fine soils, greater shear strength and are less susceptible to creep. If fine graded soils are used for the select soil zone special attention to internal and surface drainage is critical.

Compaction of select infill soils during wall construction ensures maximum soil shear strength and stiffness. The degree of compaction is typically 95% of standard Proctor.

The water content of the soils to be compacted is critical to the proper compaction of the soils.

Geosynthetic (geogrids) can be damaged during compaction. Take care to not damage the geogrid material during compaction.

Granular soils are recommended as the reinforced (select fill) soil for SRW structures. [See NCMA's Design Manual for Segmental Retaining Walls for a table listing soil types and specifications].

Select Granular Backfill should be sound, durable material free from organic matter and other deleterious material.

Care must be exercised during compaction of soils to minimize or eliminate potential damage to the geogrid reinforcement during construction of the SRW.

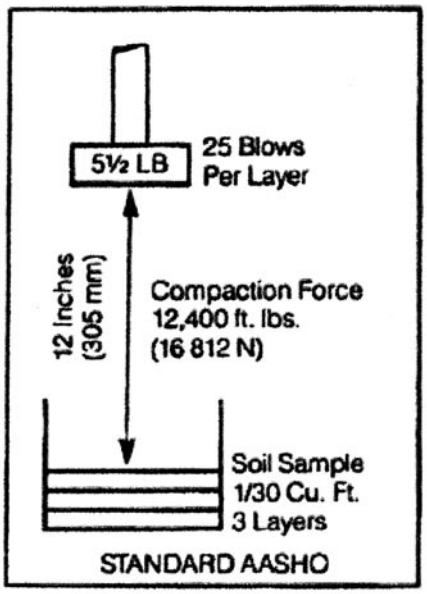
PROCTOR TEST

Various test are used to determine soil type, the proper compaction method and compaction results.

LABORATORY COMPACTION TEST

R. R. Proctor, a former field engineer for the Los Angeles City Bureau of Water Works and Supply, published a series of articles in 1933 describing the results of studies in compaction test procedures. The Proctor method of compaction control became widely used and led to the well known standard AASHTO Method (T-99).

Proctor test are performed to determine the maximum soil density and its optimum moisture content.

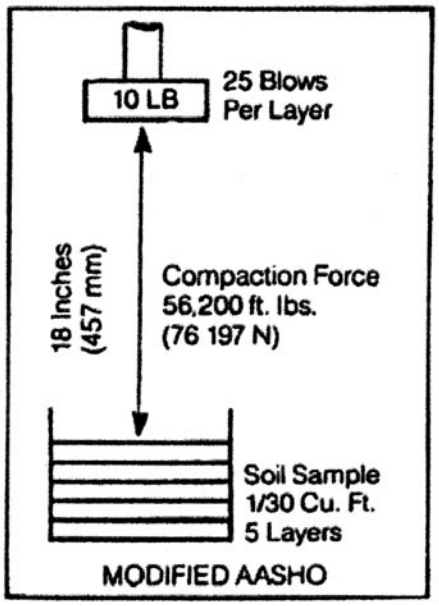


STANDARD PROCTOR TEST

A standard Proctor soil test is conducted as follows:

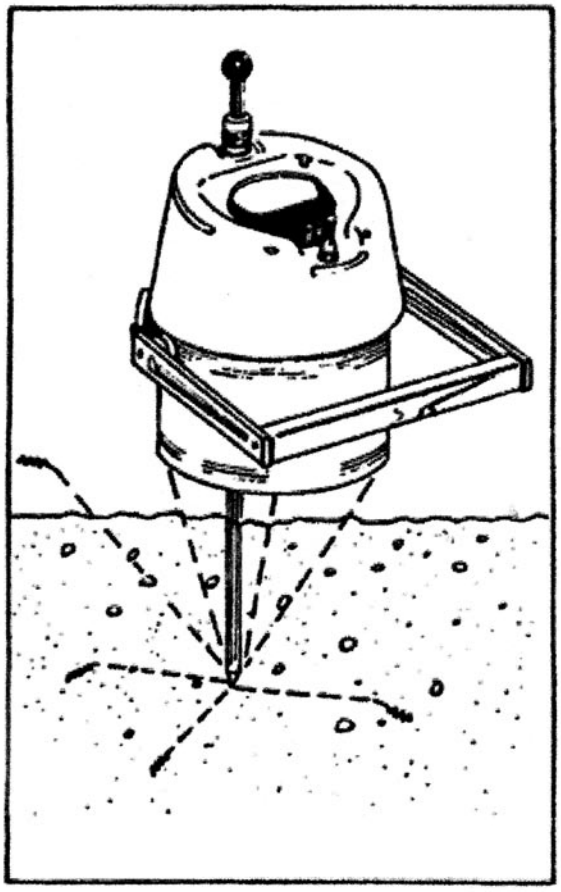
A soil sample is taken from the job location and placed in a container equal to 1/30 cubic foot (.025 cubic meter). A 5 ½ pound (2.5 kg) weight with a striking face of 3.1 square inches (1999 sq mm) is dropped 12 inches (305 mm) for 25 blows on each of three equal layers. The soil material is then weighed, less the mold, and recorded as wet weight per cubic foot.

The material is then oven dried for 12 hours to evaluate water content.



MODIFIED PROCTOR TEST

The modified Proctor test is done in much the same way except a 10 pound (4.53kg) hammer is used and dropped from a distance of 18 inches (457 mm) for 25 blows. The material is tested in a 1/30 cubic foot (0.025 cubic meter) container in five equal layers. The compaction effort produced is 56,200 foot lbs (76197 N), while the standard Proctor test produces 12,400 foot lbs (16812 N). The modified test is normally used to test material for higher shearing strength which support heavier loads.



PERFORMANCE TESTING (ON SITE)

Nuclear Testing for Soil Density

Nuclear testing is the most common test used today. It is also accurate and easy to perform. It is conducted with an instrument designed to measure soil density and moisture. The measuring probe uses a radioactive source in combination with Geiger tubes to measure either density or moisture.

An external detector probe is inserted into the soil to the desired depth. Basically, gamma rays emitted from the probe are absorbed by the soil and water atoms. The denser the soil and the more water present, the more rays are absorbed. Therefore, fewer rays manage to reach the instrument's detector to be counted. Thus, the denser the soil, the lower the count will be.

The density of the soil from the field reading is related to the density of the soil from the lab Proctor test.

For Example:
Lab Proctor test - Weight = 117 #/cu ft
Field test - Weight = 114.7 #/cu ft
Results - 114.7/117 = 98 %
Or 98% of Standard Proctor

Notes

VyKing Wall Systems LLC

VyKing Square Corner

Notes

VyKing Square Corner Construction and Geogrid Installation

The VyKing unit can be split to make square corner units. The solid and core VyKing stones each provide this capability. By using stones from a single manufacturing run to build both the corner units and the wall units there will be no color difference between the corner units and the wall units.

Splitting the solid VyKing unit through the center develops two corner units that are used on successive layers to make square corners. The core version of the VyKing stone requires that the face part of the stone only be used for building the corner (see the following drawings for construction of corner units and corners). Illustrations showing the alternating layers of these stones are on following pages.

Pins are placed in the pin hole on the long side of the corner stone (the back of the stone before it was split) and one of the pin holes on the front of the corner stone. When the pins are in the grooves of the stones below the corner stone, the corner is properly aligned. The “long side” pin holes are only used for corner unit alignment. Otherwise, these pin holes are not used.

Splitting the core VyKing unit thru the center and then breaking off the 2 inch “wing”, which was the rear of the core unit, gives two corner stones for the core version of VyKing. Two pins can be placed through the pin holes for proper alignment of the corner unit. Illustrations showing the alternating layers of these stones are on the following pages.

To maintain a consistent alignment of stones in the wall, an adjustment stone is required in each layer when working away from the corner. The following drawings show an example of the split necessary to adjust alignment at square corners. It is advised that paver grade adhesive be applied to all stones in the construction of a corner to add additional stability to corners.

Drawings that follow show the proper installation of geogrid for inside and outside square corners. It is important to remember that most geogrids are directional and therefore layers of geogrid must be laid on successive VyKing layers for outside square corners to have the directional strength specified by the SWR design engineer.

Also shown is the proper overlap for an inside square corner. The extension of the geogrid past the corner of the VyKing stones assures that proper retention is achieved in the select soil zone. Never allow layers of geogrid to lay directly upon one another. Compacted soil of at least one stone layer’s thickness should be between layers of geogrid at corners or any other location.

VyKing 30 degree and 45 degree corner drawings - solid stones - are shown on following pages.

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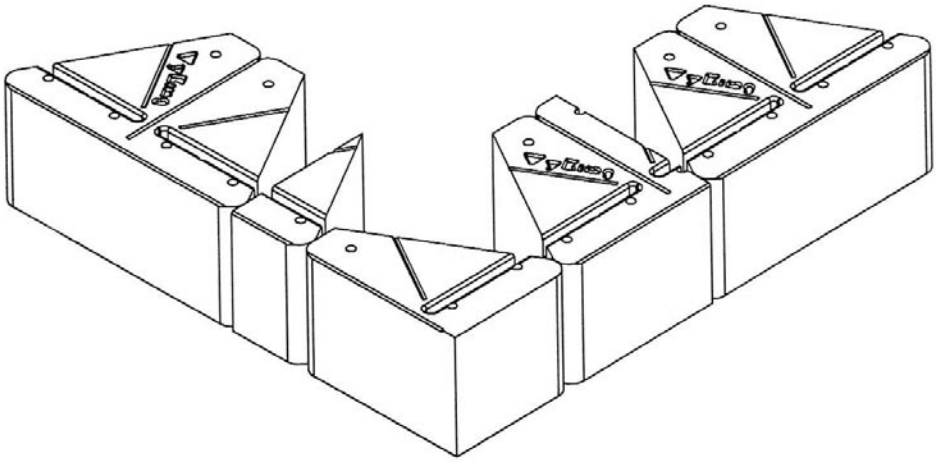
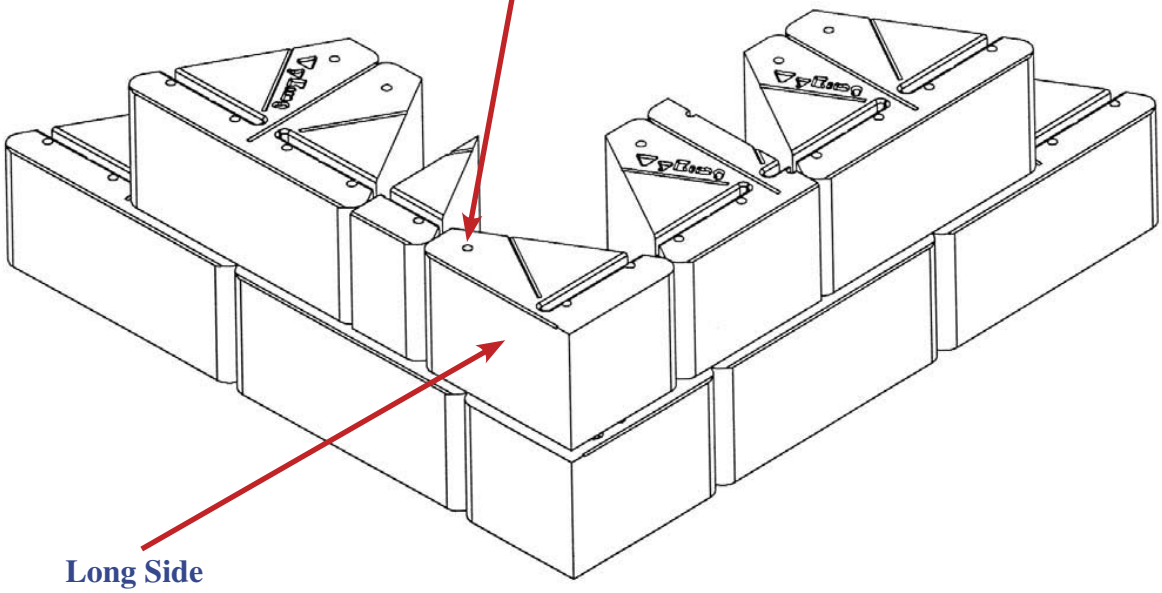


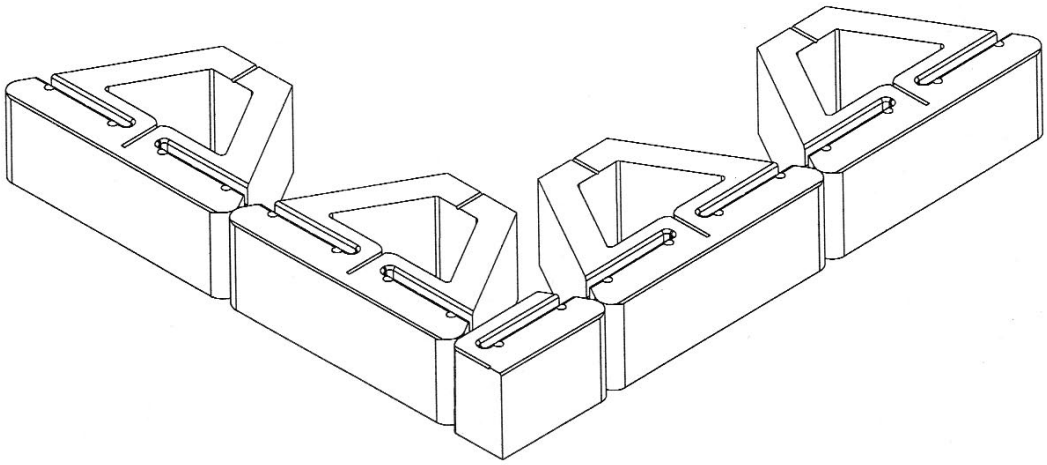
The King of Retaining Wall Stone

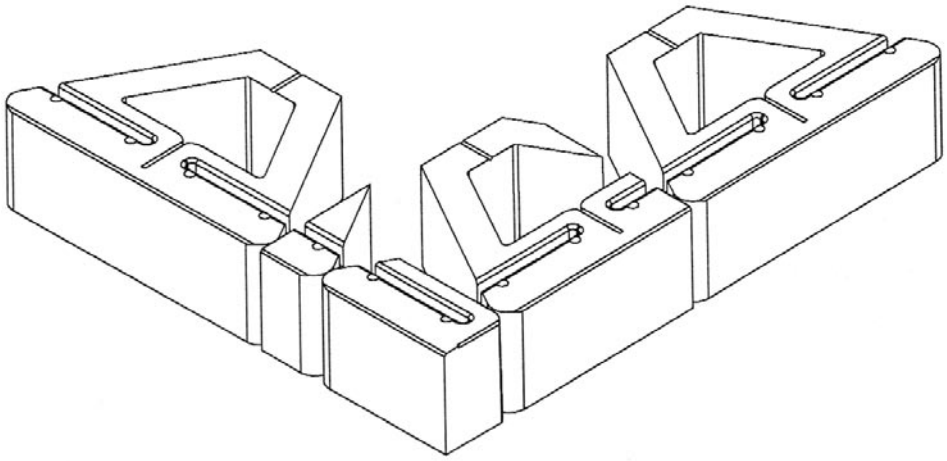
Pin Hole for Corner Unit Alignment
[This is the only use of these pin holes.]

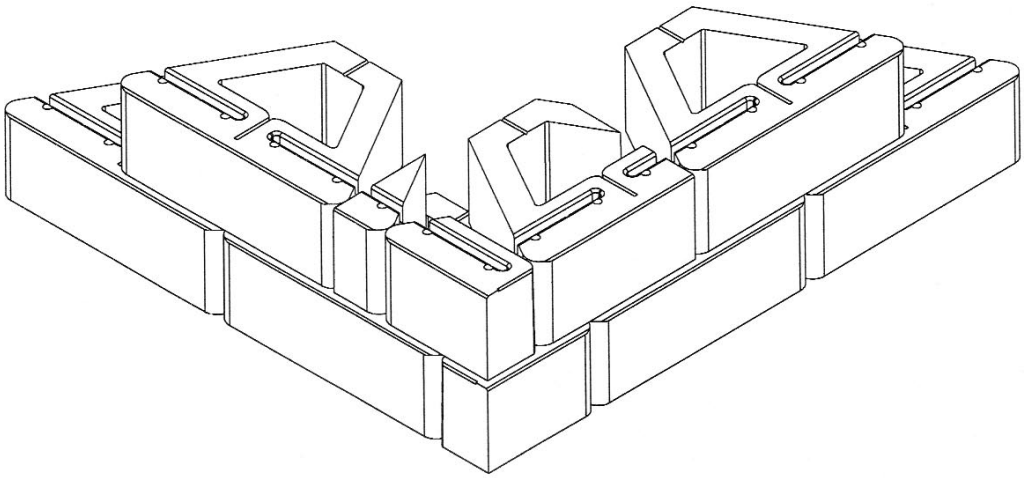


Long Side

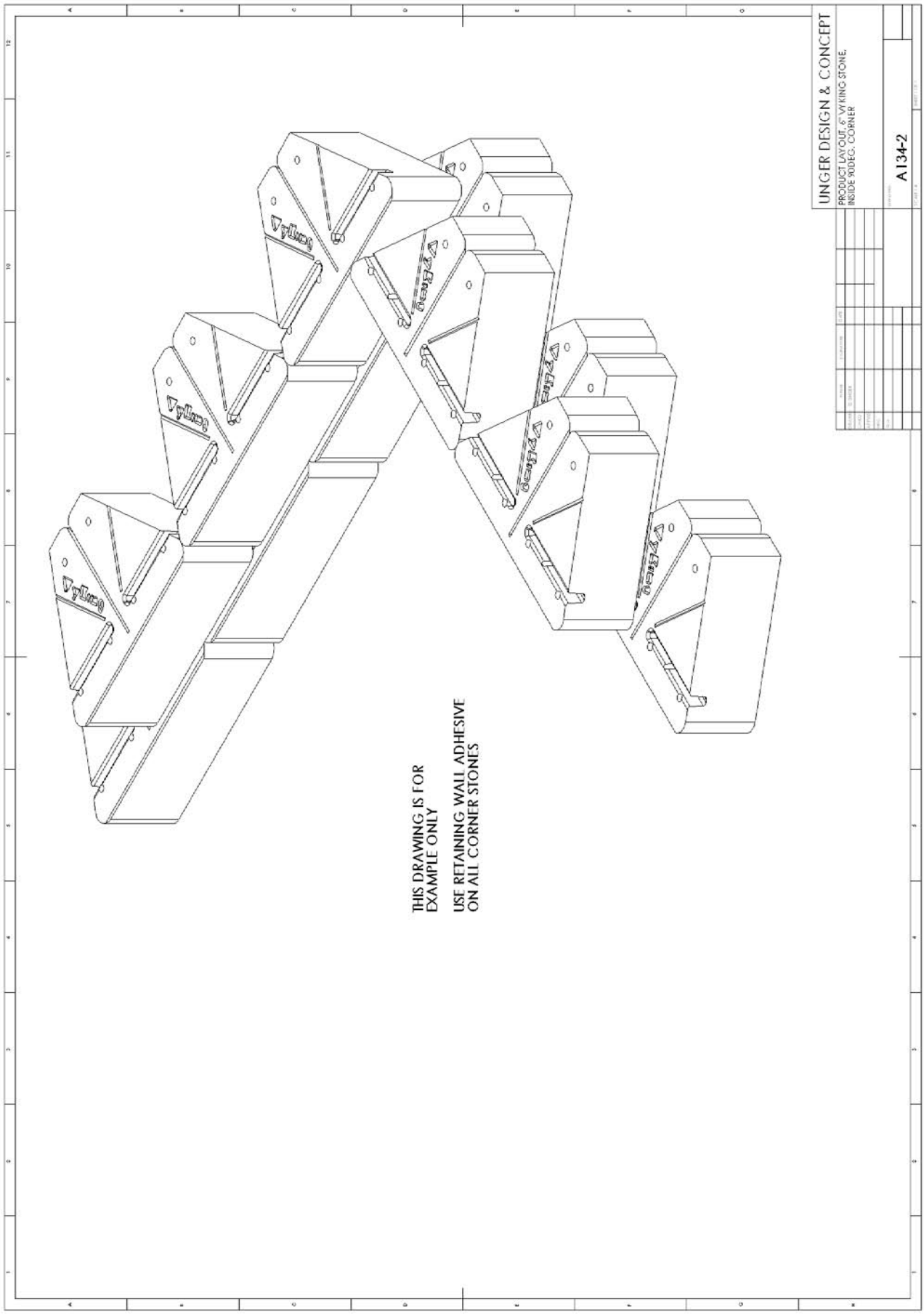
VyKing Wall Systems LLC



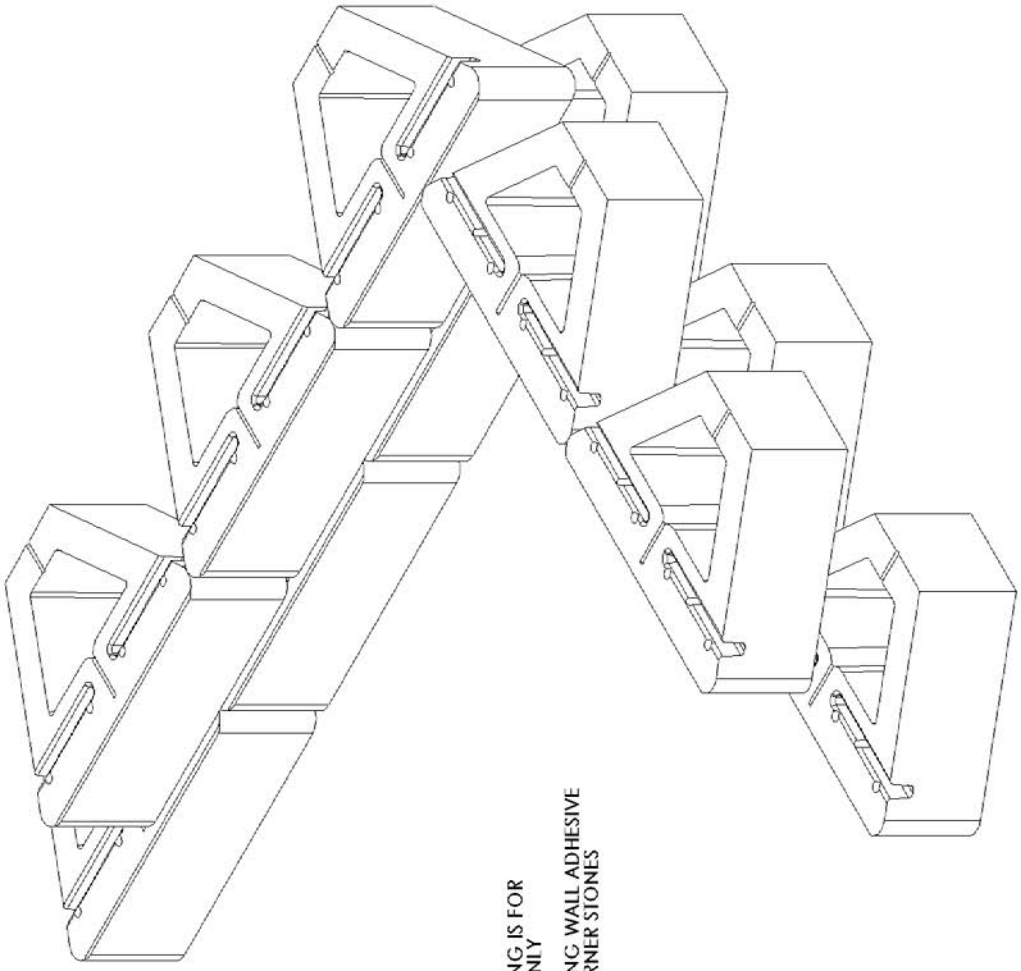




SQUARE CORNER



Square Corner



THIS DRAWING IS FOR EXAMPLE ONLY

USE RETAINING WALL ADHESIVE ON ALL CORNER STONES

UNGER DESIGN & CONCEPT

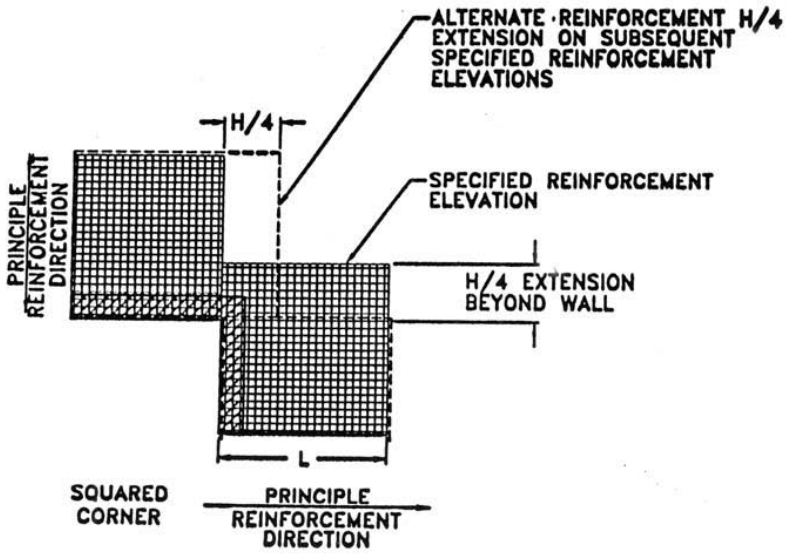
PRODUCT LAYOUT, 6" VYKING CORED STONE. INSIDE 90DEG. CORNER

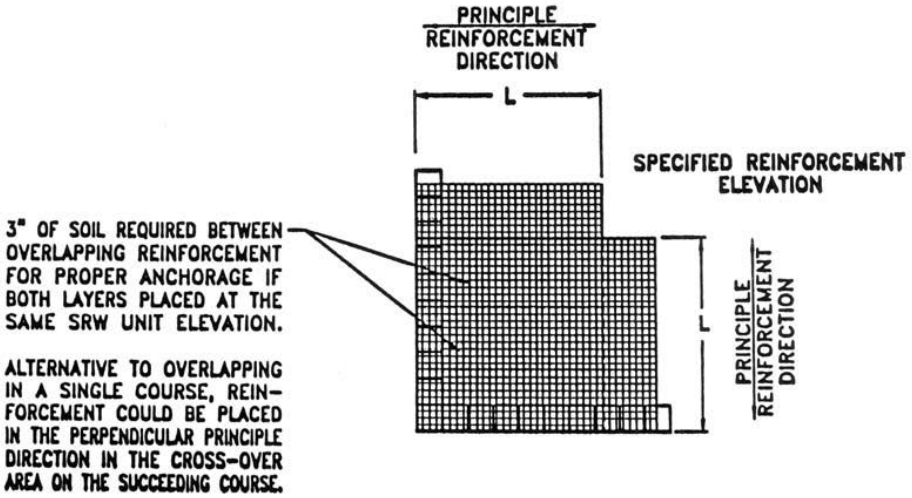
A136-2

SQUARE CORNER

VyKing Wall Systems LLC

NOTES:
ALTERNATE PLACEMENT OF REINFORCEMENT EXTENSION ON SPECIFIED REINFORCEMENT ELEVATIONS.





SQUARED CORNER

VyKing Wall Systems LLC

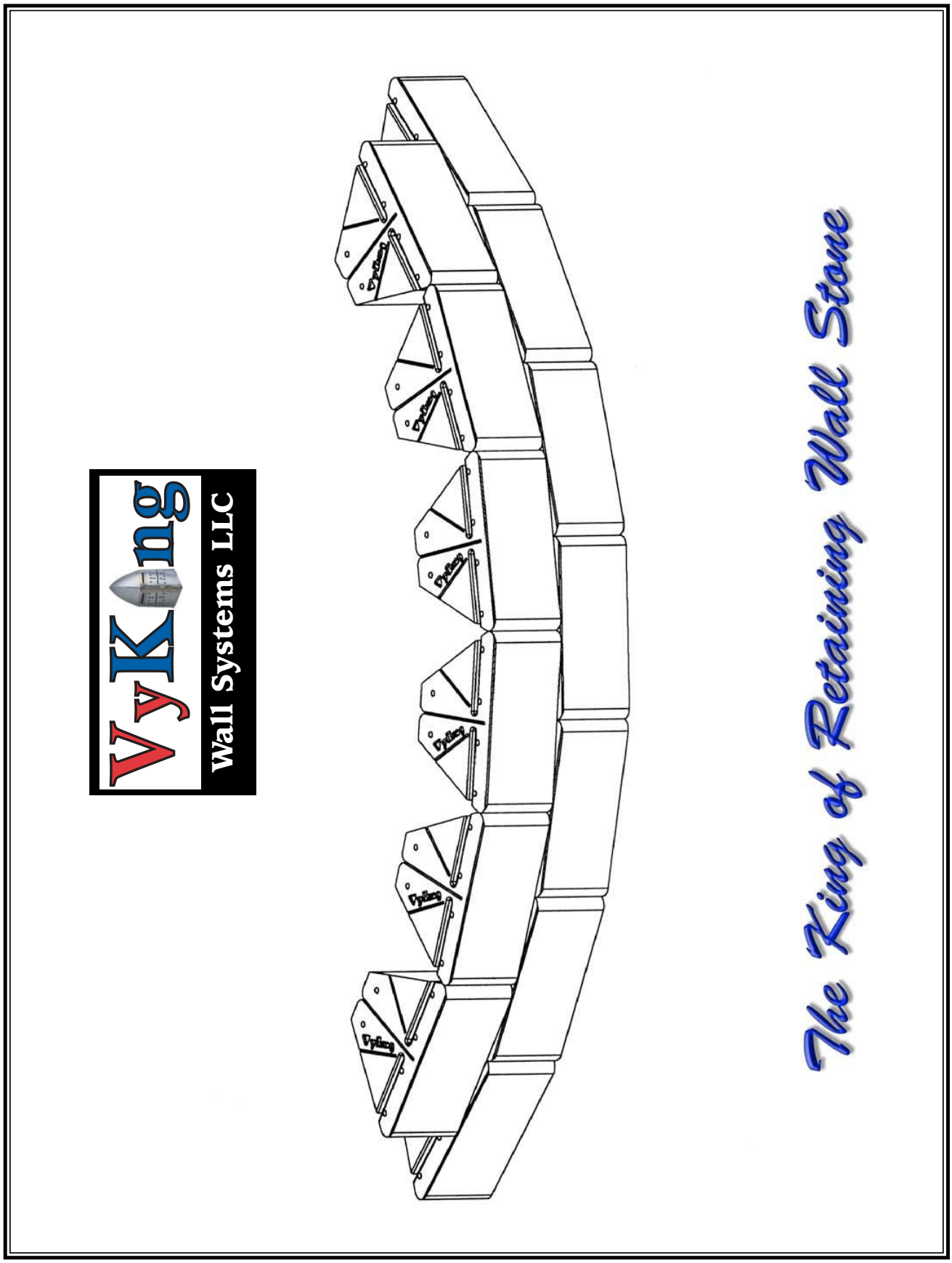
VyKing Radius

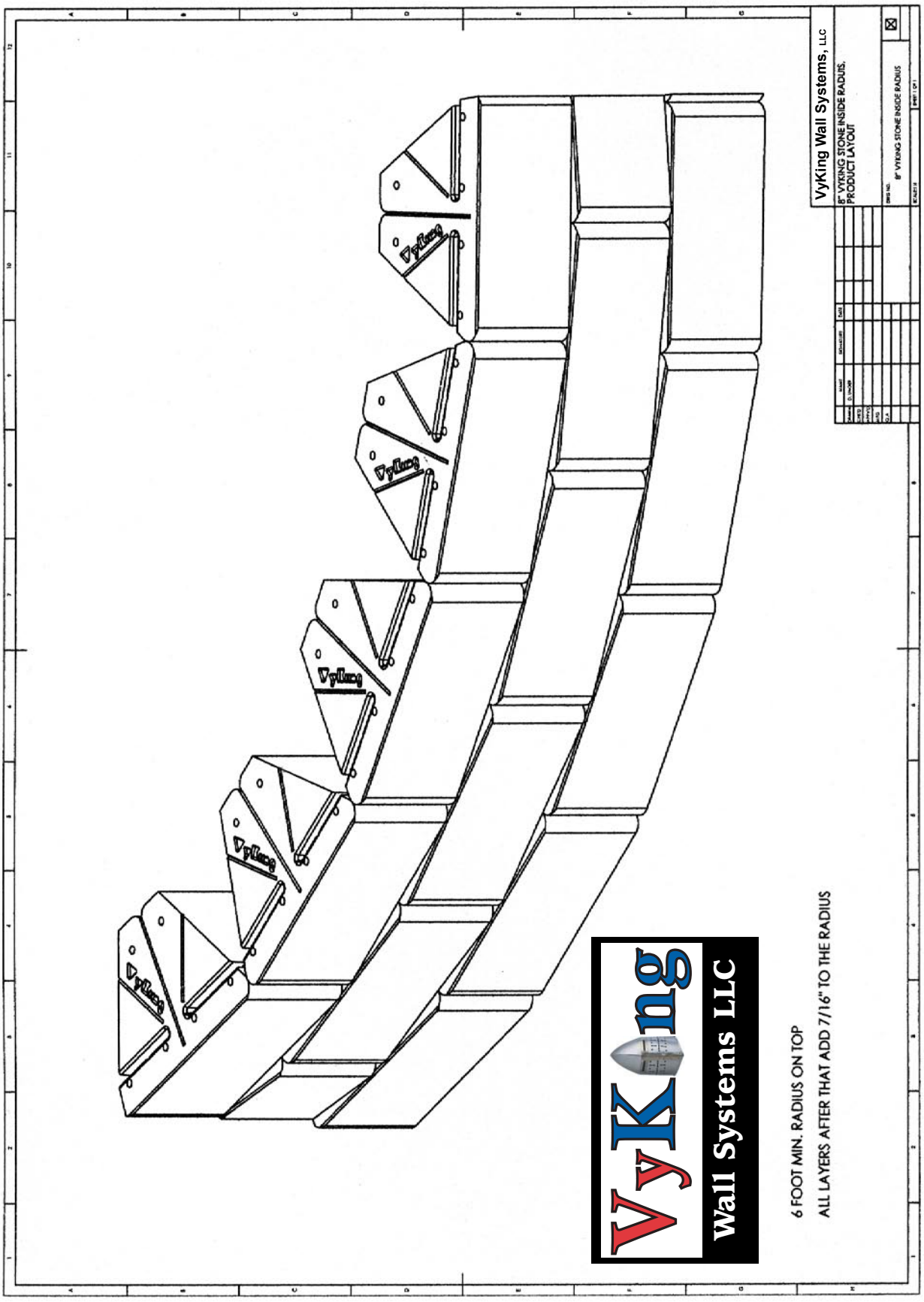
Notes

GEOGRID PLACEMENT FOR RADIUS

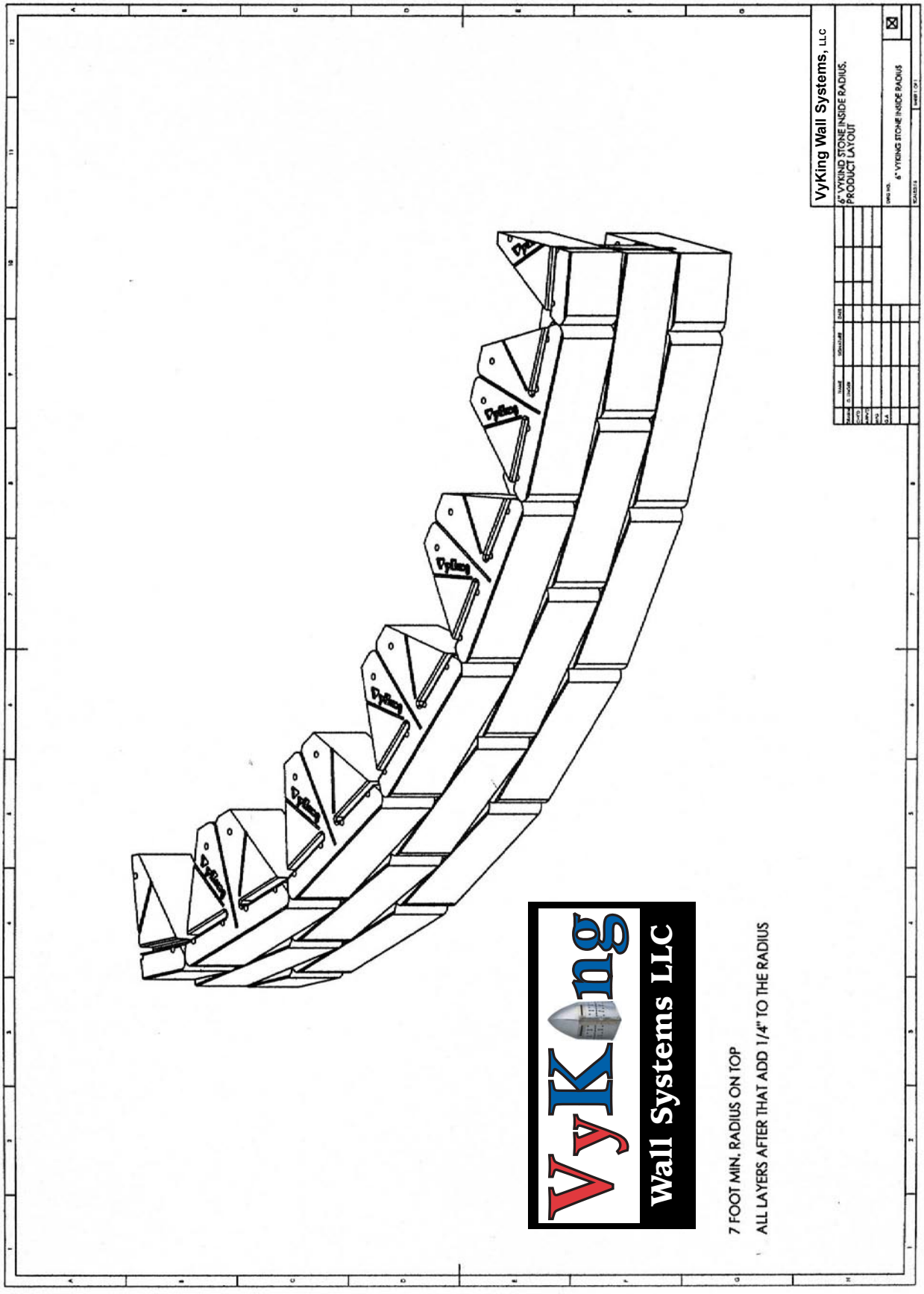
The drawins on the following pages show the installation technique for inside and outside radii. The setback and inclination angles create larger or smaller radii as the VyKing wall increases in height, depending upon either a concave or convex orientation. These potential changes in length and elevations must be accounted for in engineering plans and field construction of the wall to assure the minimum radius is not encroached upon and that project requirements are met.

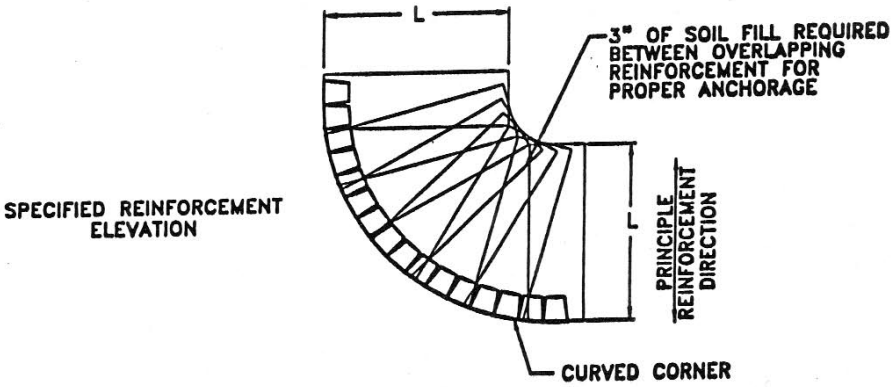
A VyKing inside and outside radius is shown on the following pages. Drawings and information on how to lay geogrid layers behind concave and convex VyKing walls is also shown on the following pages. It is critical to note that, in curves, excess geogrid must be laid to obtain adequate overlap of the geogrid. Laying geogrid on successive layers allows for the overlap that is necessary (as shown in the drawings) while not laying geogrid directly on geogrid.


VyKing
Wall Systems LLC
The King of Retaining Wall Stone

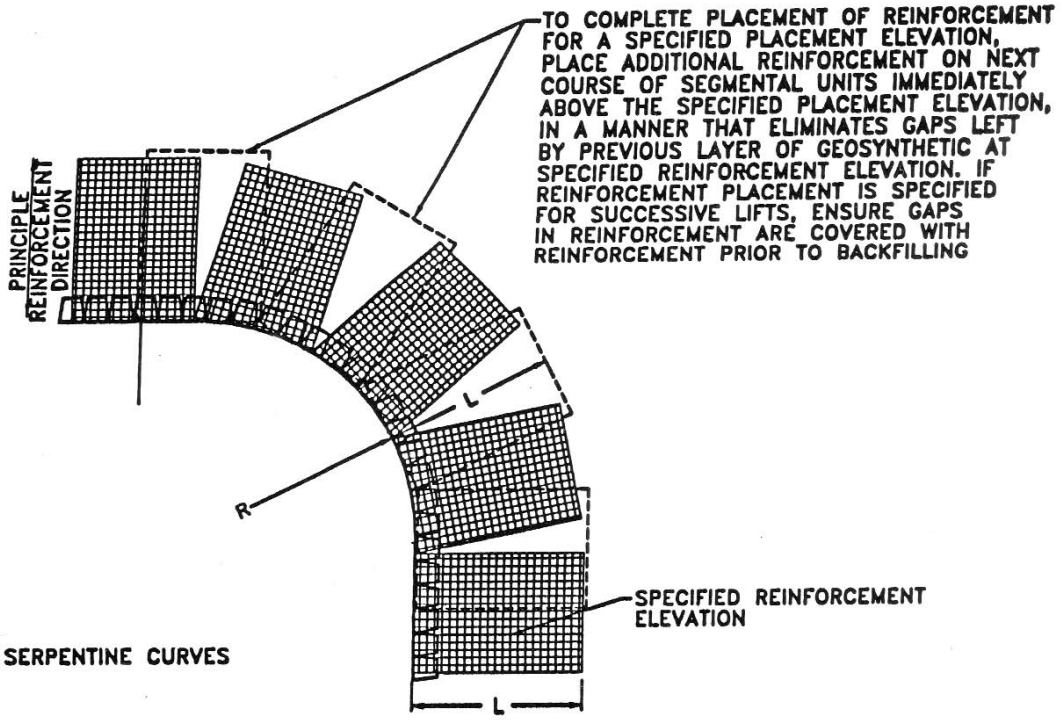

VyKing Wall Systems, LLC
8" VYKING STONE INSIDE RADIUS.
PRODUCT LAYOUT
8" VYKING STONE INSIDE RADIUS
VyKing
Wall Systems LLC
6 FOOT MIN. RADIUS ON TOP
ALL LAYERS AFTER THAT ADD 7/16" TO THE RADIUS

RADIUS


VyKing Wall Systems, LLC
6" VYKIND STONE INSIDE RADIUS.
PRODUCT LAYOUT
6" VYKING STONE INSIDE RADIUS
VyKing
Wall Systems LLC
7 FOOT MIN. RADIUS ON TOP
ALL LAYERS AFTER THAT ADD 1/4" TO THE RADIUS

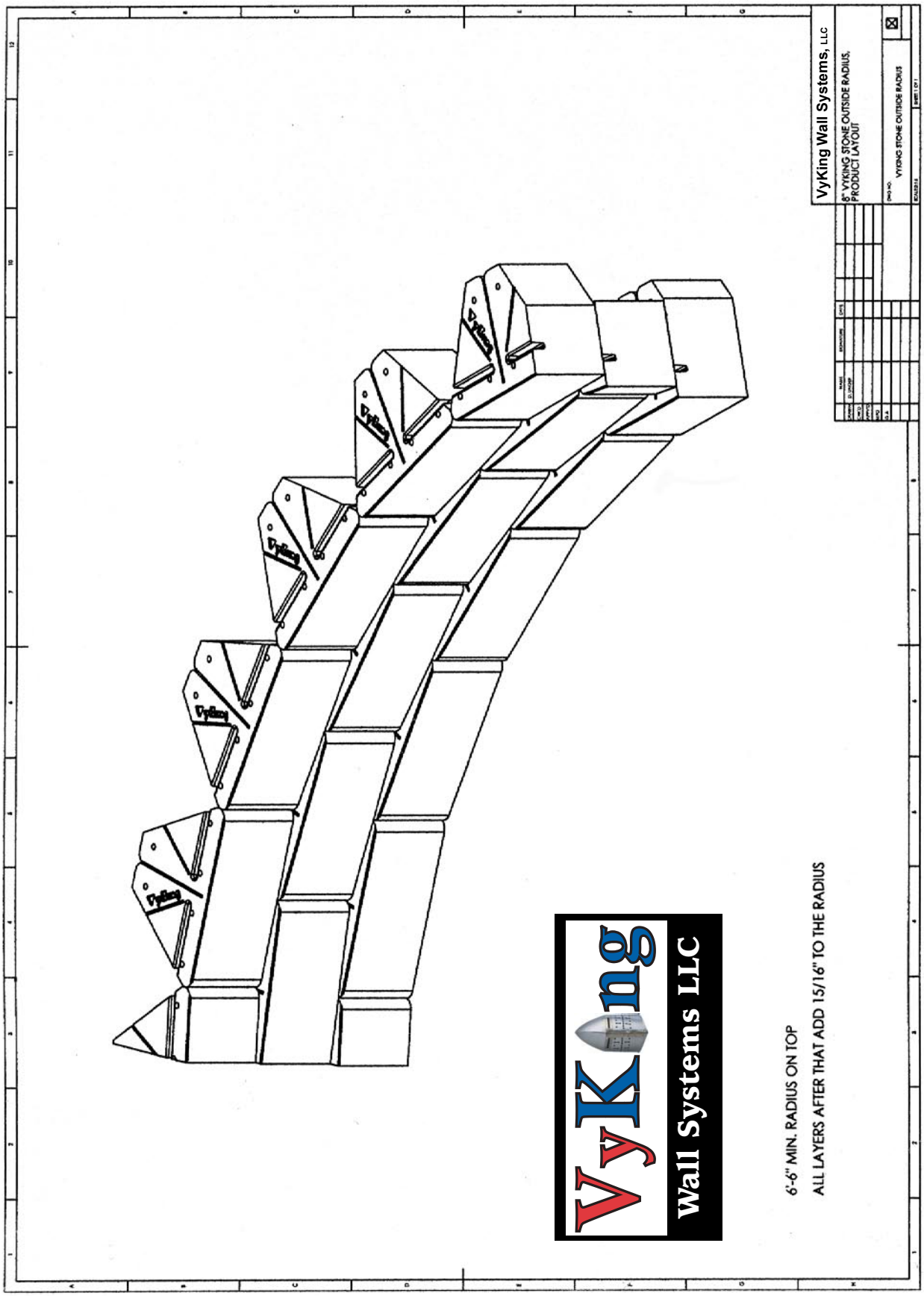


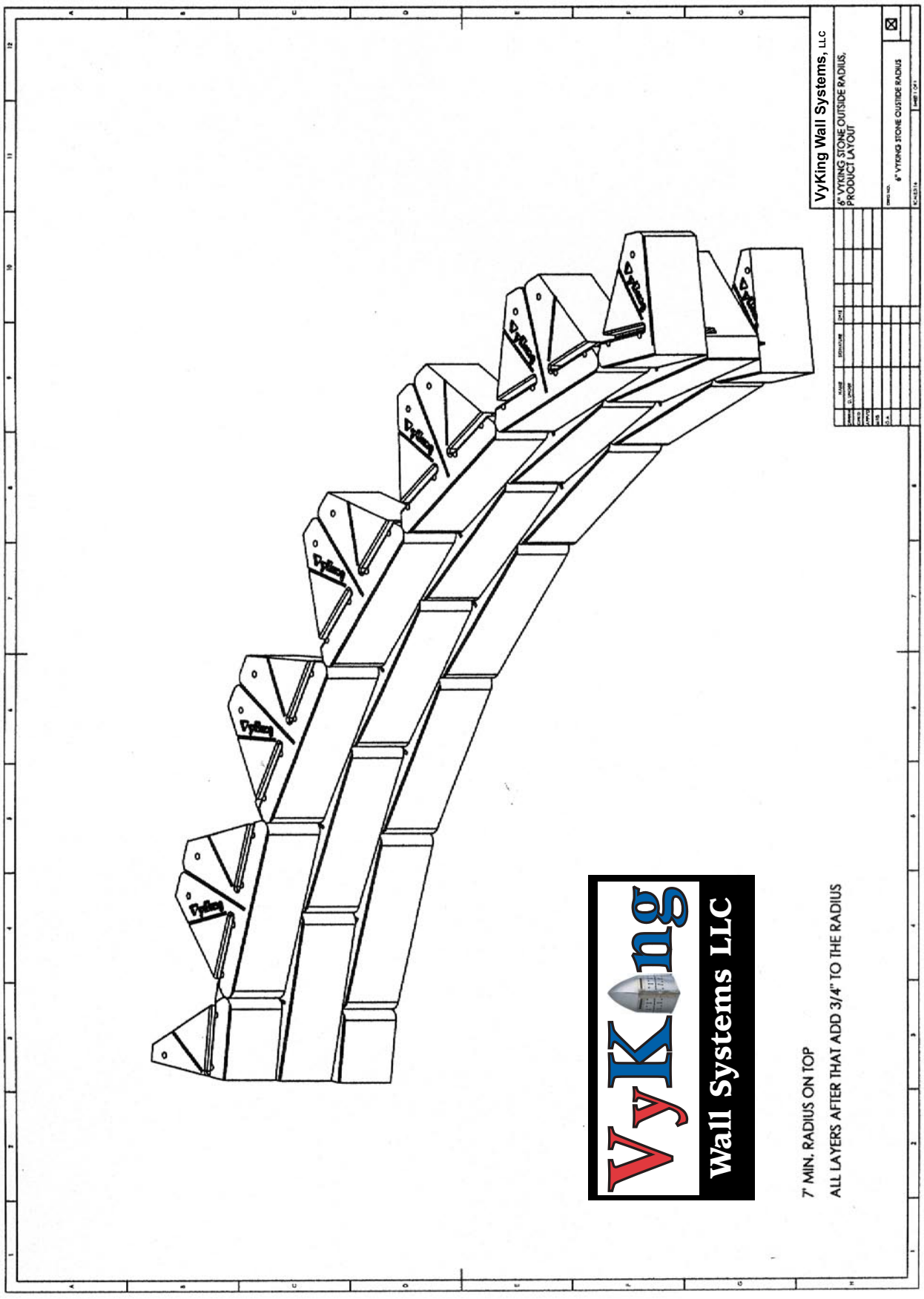
SERPENTINE CURVES



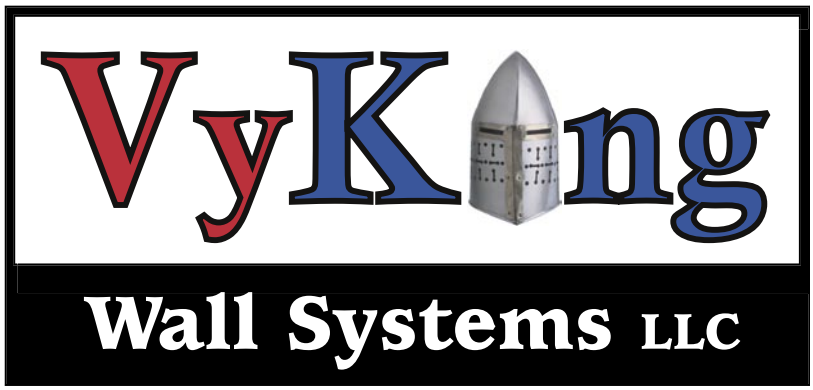
SERPENTINE CURVES

RADIUS


VyKing Wall Systems, LLC
8" VYKING STONE OUTSIDE RADIUS,
PRODUCT LAYOUT
VYKING STONE OUTSIDE RADIUS
VyKing
Wall Systems LLC
6'-6" MIN. RADIUS ON TOP
ALL LAYERS AFTER THAT ADD 15/16" TO THE RADIUS


VyKing Wall Systems, LLC
8" VYKING STONE OUTSIDE RADIUS, PRODUCT LAYOUT
8" VYKING STONE OUTSIDE RADIUS
VyKing Wall Systems LLC
7" MIN. RADIUS ON TOP
ALL LAYERS AFTER THAT ADD 3/4" TO THE RADIUS

Notes



VyKing Stability

Notes

VyKing Wall Stability

The stability of a SRW can be characterized by

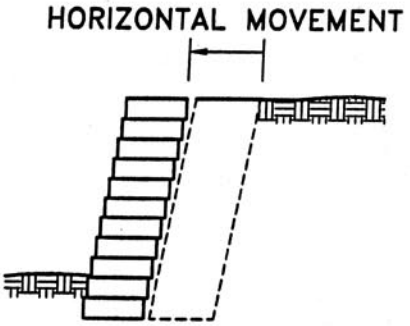
1. Failure through Base Sliding,
2. Overturning or Bearing Capacity and
3. Excessive Settlement.

These mechanisms for a soil-reinforced wall system are illustrated on the following page. Base Sliding is the outward movement along the base of the reinforced soil mass due to insufficient lateral resistance. Overturning is the rotation of the reinforced soil mass about the toe of the wall. Bearing Capacity is the compressive failure or unacceptable deformation of the foundation soils due to excessive foundation pressures.

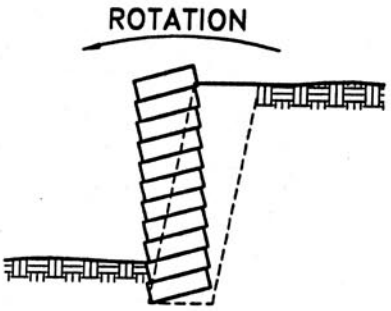
Design of a VyKing wall starts with a determination of the external earth forces for both the retained soil weight and the soil surcharge above the wall. The earth pressure force due to the retained soil weight is based upon the active earth pressure coefficient, the unit weight of the retained soil and the square of the wall height. Soil surcharge loads are dependant upon the same factors but linearly related to the height of the wall.

The analysis for external stability with respect to overturning is determined by comparing the resistance and overturning moments for a reinforced wall system. The important design element is that the ratio of resistance to overturning moments should be greater than 2.0.

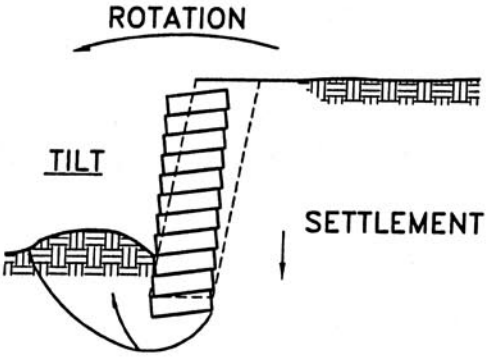
Calculations can be performed for walls where reinforcement is not required. These conventional gravity segmental retaining walls do not incorporate geogrid in the soil behind the wall. The design is based upon the stability provided by a column of segmental retaining wall units alone. In some instances, considering specific load and soil conditions, walls of 4 to 6 feet of height can be constructed without geogrid soil reinforcement.



BASE SLIDING

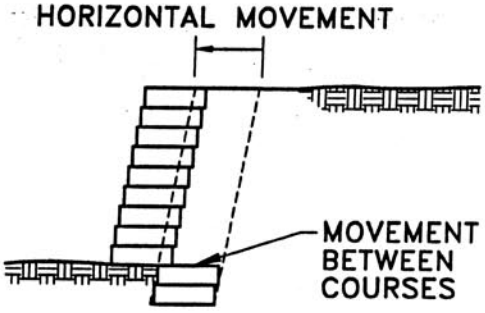


OVERTURNING



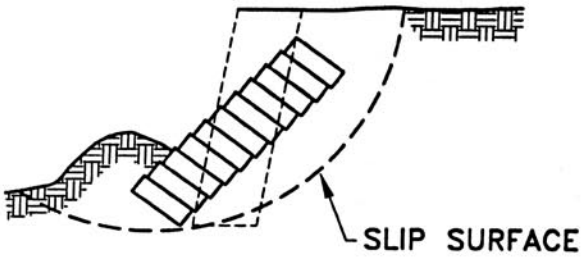
BEARING CAPACITY
& EXCESSIVE SETTLEMENT

A. EXTERNAL



SHEAR

B. INTERNAL

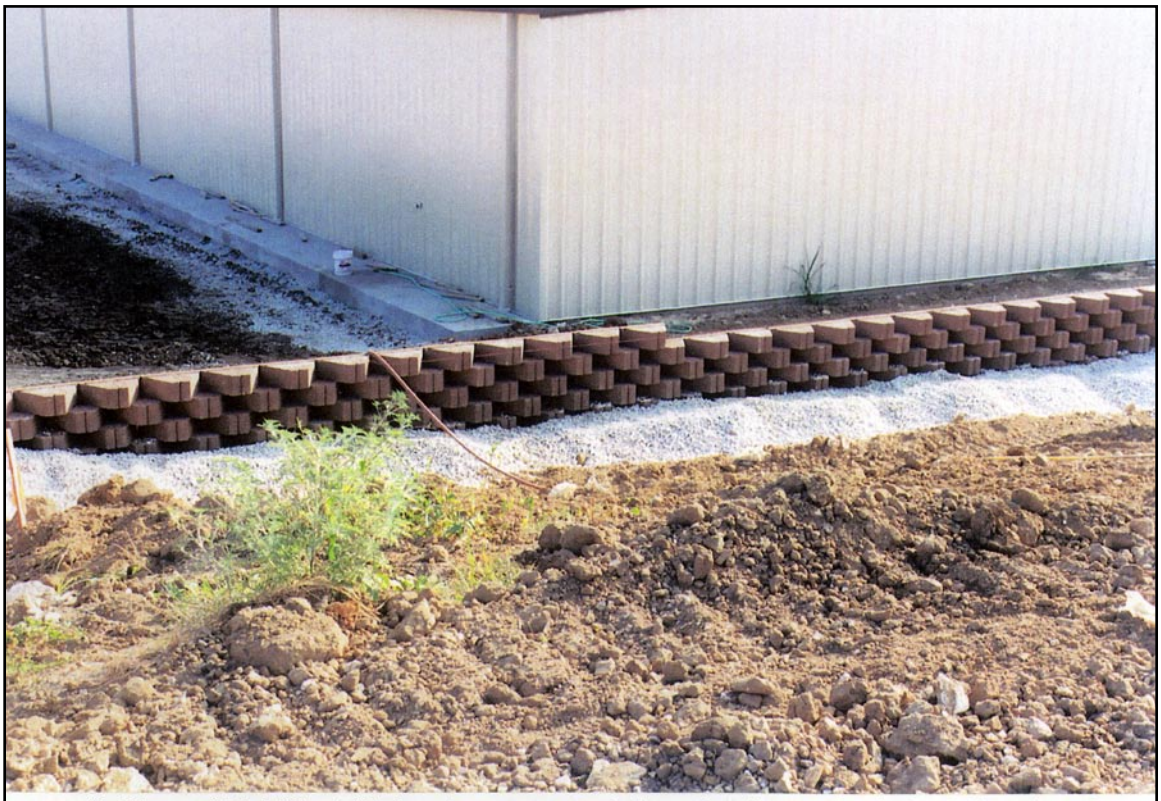


C. GLOBAL/OVERALL
SLOPE STABILITY

VyKing wall Stability – This is not a recommended construction method – Backfill rock and select soil each layer of VyKing stones installed.

VyKing wall Stability – This is not a recommended construction method – Backfill rock and select soil each layer of VyKing stones installed.

STABILITY



VyKing wall Stability – This is not a recommended construction method – Backfill rock and select soil each layer of VyKing stones installed.

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Notes

VyKing Wall Systems LLC

PULLOUT TESTING

Notes

PULLOUT TESTING

TEST METHOD: NCMA (NATIONAL CONCRETE MASONRY ASSOCIATION) TEST METHOD SRWU-1

This test determines the connection strength between geogrids and segmental concrete units (VyKing stones) used in the construction of reinforced earth retaining walls.

Tests are conducted under conditions that reproduce the connection system used in the field at full-scale.

The connection strength is defined based on ultimate strength measured after a prescribed amount of deformation is recorded at the back of the segmental (VyKing) units. The results of a series of test are used to define the relationship between connection strength for a segmental unit (VyKing stone) and geogrid for imposed loads. (See pullout test charts that follow.)

Geogrid is a system of connected polymeric tensile elements used as a horizontal reinforcement material in reinforced earth retaining walls. (This reinforcement may be referred to as geosynthetic or geotextile.)

DESCRIPTION OF PULLOUT TEST

A width of geogrid material is placed between stacked SRW units (VyKing units) as recommended for field installation. The top layer of blocks is then loaded vertically to impose a load and the geogrid is pulled in tension under constant rate of displacement until failure occurs. Failure of the system is defined as sustained loss of connection capacity. Maximum connection capacity (strength) and tensile capacity, after a prescribed deformation has been recorded at the back of the VyKing units, are used to define connection strength based on the maximum strength and service criteria of the grid material. Tensile loads are reported in lb/ft of width of geogrid. (metric units are kN/m.)

The connection strength between the geogrid and the VyKing units is used by the SRW design engineer in the design of the reinforced earth retaining wall.

Test results have verified that: 1. For pin type wall units, the pin strength offers no benefit if the pin is stronger than the junction strength of the geogrid. (See Figure 2 that follows, showing maximum strength between VyKing stones and geogrid as equal using no pins, weak pins, medium strength pins and extra strong fiberglass reinforced pins.) 2. For SRW units that have downward lips on the rear of the stone and downward protrusions that fit in openings of the stone layer below, the geogrid is cut by the lips and protrusions and the connection strength between the stones and the geogrid is minimized to only the contact areas where there are no lips or protrusions.

SHEAR CAPACITY

TEST METHOD: NCMA TEST METHOD SRWU-2

This test determines the shear strength between segmental concrete units (VyKing stones).

The results of these test are required as part of the data necessary for the engineering design of a reinforced earth SRW.

Shear capacity between retaining wall units is defined by simple shear. A single unit is placed atop two underlying units, running bond pattern, confined by an applied normal load and sheared across the underlying units through the application of a horizontal force. Testing is conducted with and without the inclusion of geosynthetic reinforcement in accordance with ASTM D 6919, Standard Test Method for Determining the Shear strength Between Segmental Concrete Units (Modular Concrete Blocks).

Geogrid connection capacity is evaluated in accordance with ASTM D 6638, Standard Test Method for Determining Connection Strength Between Geogrid Reinforcement and Segmental Concrete Units (Modular Concrete Block). Connection capacity is determined by confining geogrid between segmental wall units under normal load similar to expected field conditions then applying a tensile load in the geogrid at a prescribed rate. It is important that the placement of the geogrid during testing is the same placement used in the field. The following charts are example charts of VyKing pullout test. The additional chart showing the horizontal red line is the results of four test which verify that, in a finished SRW the pins that are used for stone alignment and initial placement of geogrid offer no additional strength to the connection between the SRW units and the geogrid.

PIN STRENGTH

The value of pin strength in engineered walls has been tested to verify that the value of pins in retaining wall systems is limited to set back control and the holding of the geogrid in place when it is pulled taunt and staked at the back while only one layer of stones is setting on the geogrid at the front of the section of geogrid being installed.

The following page shows the results of four tests conducted with the exact same conditions; stones, gravel fill, and geogrid while changing the pin type. Three pullout tests were conducted with

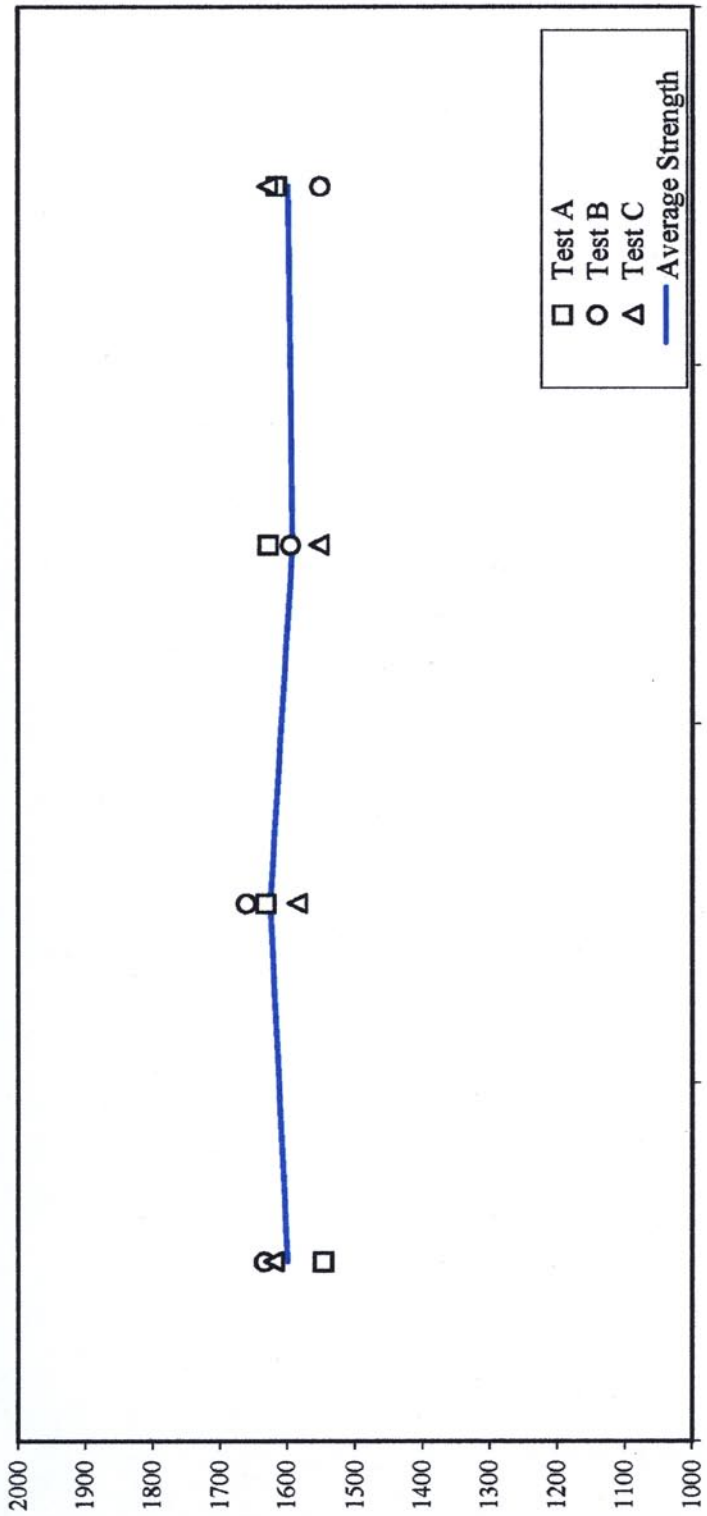
1. No Pins,
2. Low Strength Pins,
3. Medium Strength Pins, and
4. Fiberglass Reinforced High Strength Pins.

The tests verify that the Peak Connection Strength is the same for all four tests.

VyKing's pins are stronger than the junction strength of high strength, high tenacity, and high molecular weight polyester geogrids. The junctions of the geogrid failed with no discernible damage to the VyKing pin during all tests.

VyKing Wall Systems LLC

VYKING WALL SYSTEMS, LLC.
CONNECTION STRENGTH TESTING (ASTM D 6638)

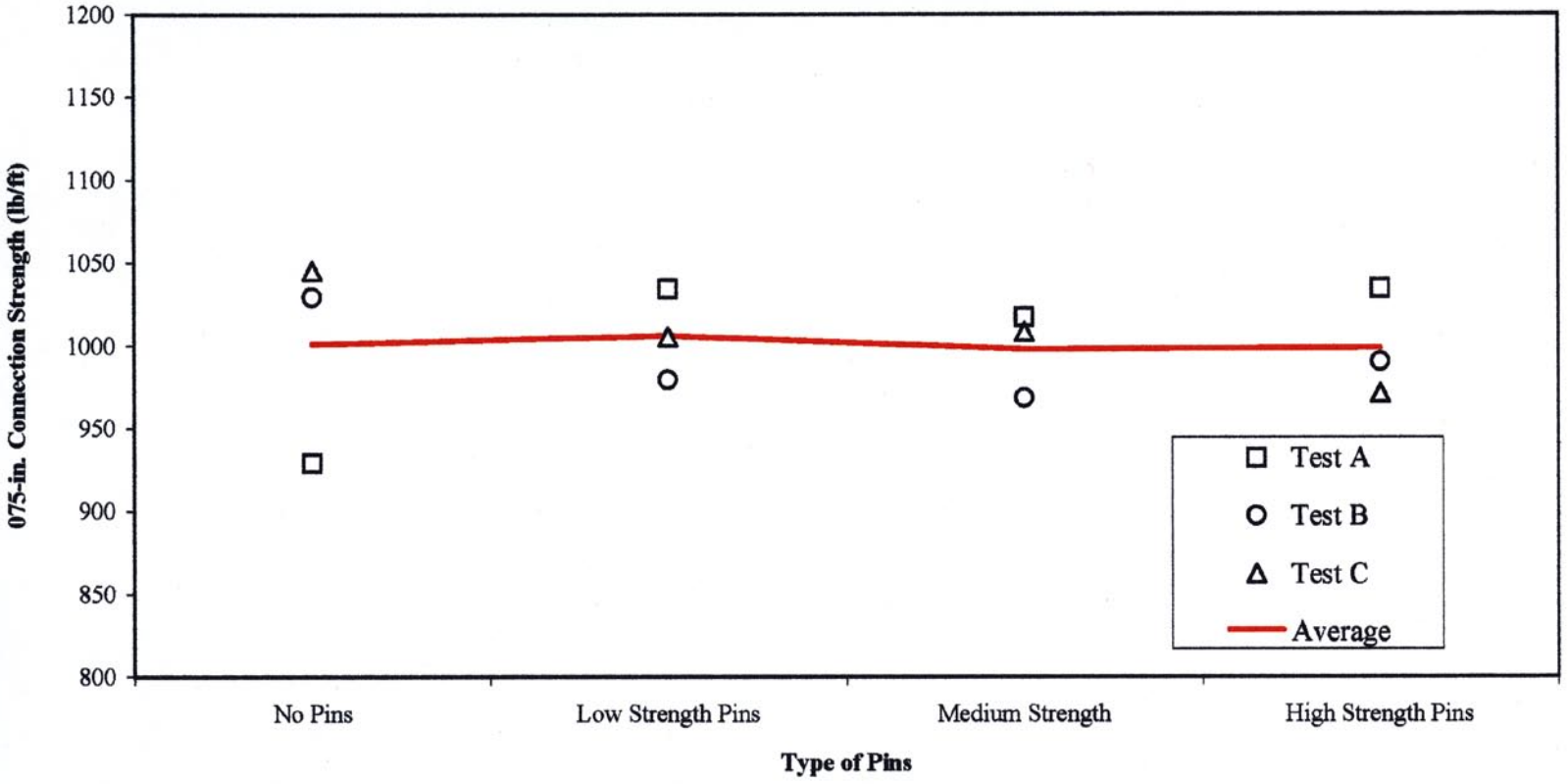


Type of Pins	0.75-in. Strength				Peak Strength			
	Test A (lb/ft)	Test B (lb/ft)	Test C (lb/ft)	Average (lb/ft)	Test A (lb/ft)	Test B (lb/ft)	Test C (lb/ft)	Average (lb/ft)
No Pins	929	1029	1045	1001	1546	1633	1620	1600
Low Strength Pins	1034	979	1005	1006	1631	1660	1585	1625
Medium Strength	1017	968	1008	998	1628	1595	1553	1592
High Strength Pins	1034	990	971	998	1616	1551	1630	1599

SGI TESTING SERVICES, LLC

FIGURE NO.	C-6
PROJECT NO.	SGI3094
DOCUMENT NO.	SGI03122
FILE NO.	

VYKING WALL SYSTEMS, LLC.
CONNECTION STRENGTH TESTING (ASTM D 6638)



Type of Pins	0.75-in. Strength				Peak Strength			
	Test A (lb/ft)	Test B (lb/ft)	Test C (lb/ft)	Average (lb/ft)	Test A (lb/ft)	Test B (lb/ft)	Test C (lb/ft)	Average (lb/ft)
No Pins	929	1029	1045	1001	1546	1633	1620	1600
Low Strength Pins	1034	979	1005	1006	1631	1660	1585	1625
Medium Strength	1017	968	1008	998	1628	1595	1553	1592
High Strength Pins	1034	990	971	998	1616	1551	1630	1599

SGI TESTING SERVICES, LLC

FIGURE NO.	C-5
PROJECT NO.	SGI3094
DOCUMENT NO.	SGI03122
FILE NO.	

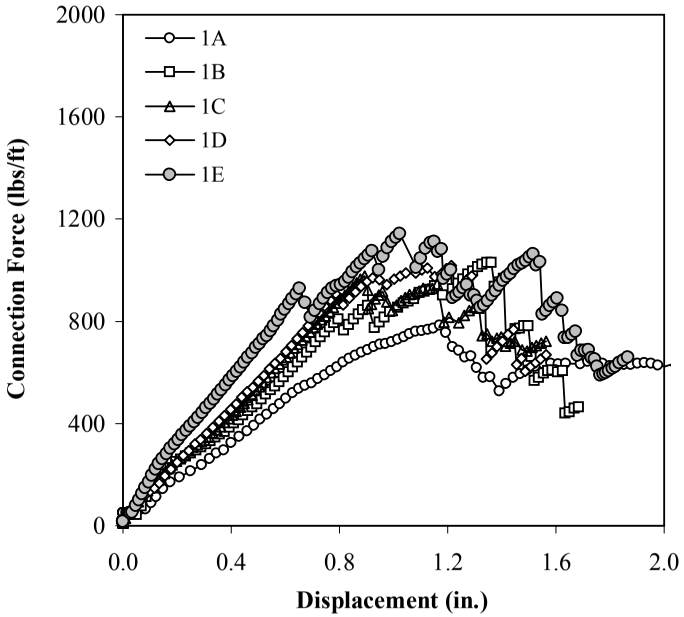
VyKing
Pullout & Shear Test

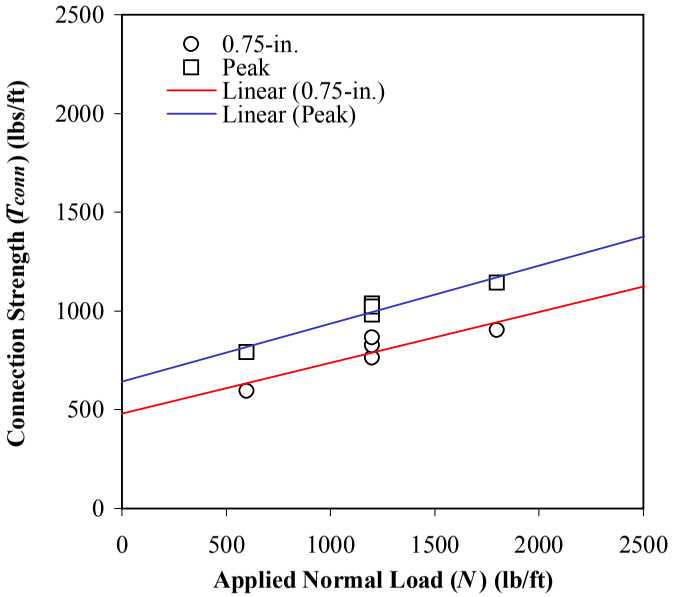
VyKing
Solid Unit

Notes

VYKING WALL SYSTEMS, LLC.
CONNECTION STRENGTH TESTING (ASTM D 6638)

TEST SERIES NO. 2: Synteen SF 20 (SRW3) geogrid in machine direction within Vyking solid block units with 2 Vyking interlocking pins per block (No compacted AASHTO #57 stone)





Test No.	Test Specimen Width (in.)	Test Normal Stress (psi)	Equivalent Normal Load (lb/ft)	Approx. No. of Blocks	Approx. Height (ft)	0.75-in. Strength (lb/ft)	Peak Strength (lb/ft)	Connection Strength Equations (T_{conn})
1A	34.0	4.2	600	13	6.4	594	791	
1B	34.0	8.3	1200	26	12.9	763	1038	$T_{0.75\text{-in.}} = 480 + (N) \tan(14^\circ)$
1C	34.0	8.3	1200	26	12.9	824	981	
1D	34.0	8.3	1200	26	12.9	865	1020	$T_{peak} = 640 + (N) \tan(16^\circ)$
1E	34.0	12.5	1800	39	19.3	903	1144	

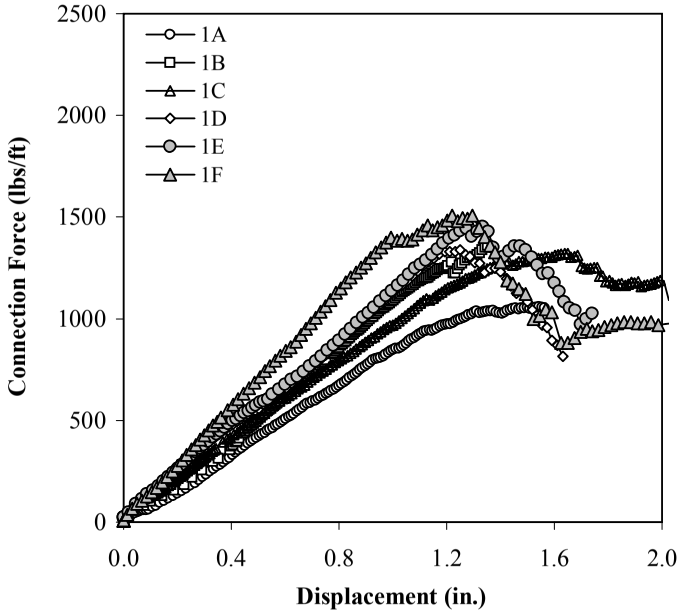
NOTES:
Dimensions of Vyking Block Unit: 18 in. wide by 12 in. long and 6 in. high.
Weight of a Full-Size Block: 70.0 lbs.
Failure Mode of Geogrid: abrasion and rupture of the geogrid ribs in each test.

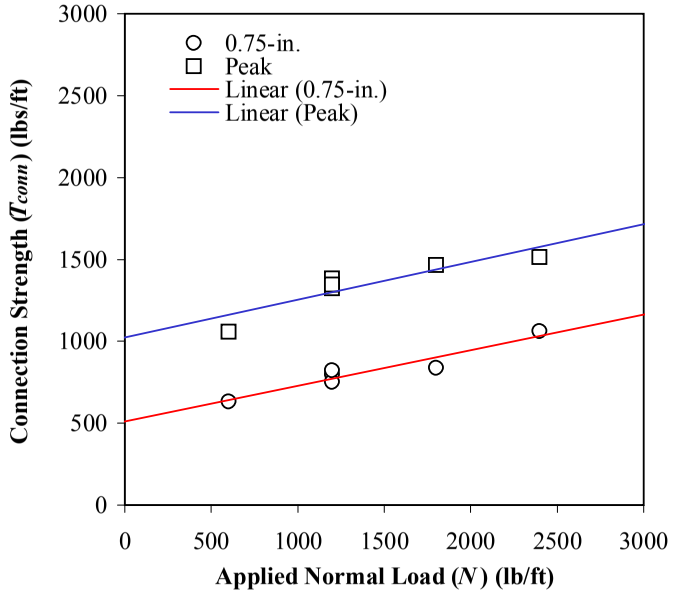
SGI TESTING SERVICES, LLC

DATE TESTED:	23 to 24 January 2005
FIGURE NO.	C-1
PROJECT NO.	SGI3094
DOCUMENT NO.	SGI04052
FILE NO.	

VYKING WALL SYSTEMS, LLC.
CONNECTION STRENGTH TESTING (ASTM D 6638)

TEST SERIES NO. 1: Synteen SF 35 (SRW5) geogrid in machine direction within Vyking solid block units with 2 pins per block and compacted AASHTO #57 stone





Test No.	Test Specimen Width (in.)	Test Normal Stress (psi)	Equivalent Normal Load (lb/ft)	Approx. No. of Blocks	Approx. Height (ft)	0.75-in. Strength (lb/ft)	Peak Strength (lb/ft)	Connection Strength Equations (T_{conn})
1A	35.5	4.2	600	10	5.0	630	1058	$T_{0.75\text{-in.}} = 510 + (N) \tan(12^\circ)$ $T_{peak} = 1025 + (N) \tan(13^\circ)$
1B	35.5	8.3	1200	20	10.0	795	1381	
1C	35.5	8.3	1200	20	10.0	752	1321	
1D	35.5	8.3	1200	20	10.0	822	1346	
1E	35.5	12.5	1800	30	15.0	836	1464	
1F	35.5	16.7	2400	40	20.0	1061	1512	

NOTES:

Dimensions of Vyking Block Unit: 18 in. wide by 12 in. long and 6 in. high.

Weight of a Full-Size Block: 70.0 lbs.

Failure Mode of Geogrid: abrasion and rupture of the geogrid ribs in each test.

DATE TESTED: 27 to 28 February 2004

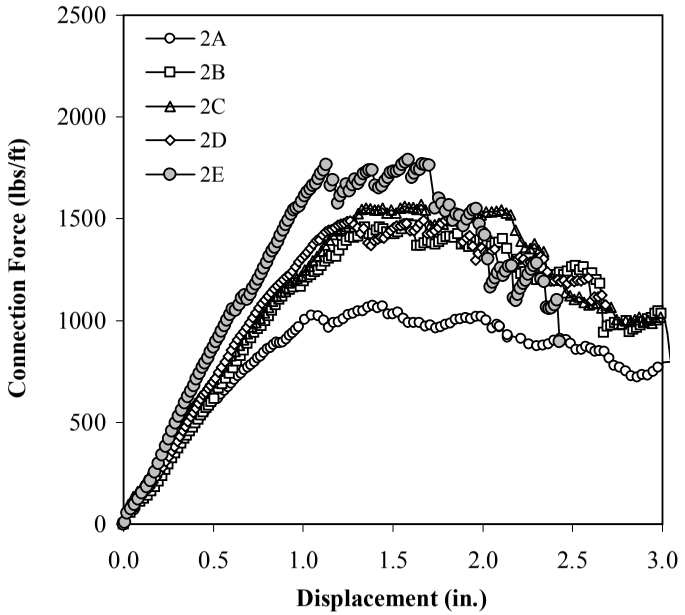
SGI TESTING SERVICES, LLC

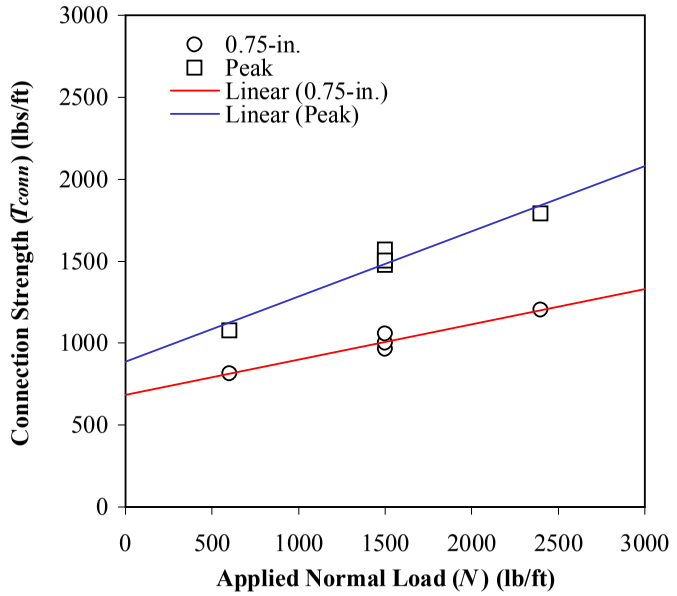
FIGURE NO.	C-1
PROJECT NO.	SGI3094
DOCUMENT NO.	SGI04052
FILE NO.	

SHEAR TEST - SOLID

VYKING WALL SYSTEMS, LLC.
CONNECTION STRENGTH TESTING (ASTM D 6638)

TEST SERIES NO. 2: Synteen SF 55 (SRW7) geogrid in machine direction within Vyking solid block units with 2 per block and compacted AASHTO #57 stone





Test No.	Test Specimen Width (in.)	Test Normal Stress (psi)	Equivalent Normal Load (lb/ft)	Approx. No. of Blocks	Approx. Height (ft)	0.75-in. Strength (lb/ft)	Peak Strength (lb/ft)	Connection Strength Equations (T_{conn})
2A	35.5	4.2	600	10	5.0	816	1075	
2B	35.5	10.4	1500	25	12.5	962	1474	$T_{0.75\text{-in.}} = 685 + (N) \tan(12^\circ)$
2C	35.5	10.4	1500	25	12.5	1002	1571	
2D	35.5	10.4	1500	25	12.5	1056	1502	$T_{peak} = 885 + (N) \tan(22^\circ)$
2E	35.5	16.7	2400	40	20.0	1203	1791	

NOTES:
Dimensions of Vyking Block Unit: 18 in. wide by 12 in. long and 6 in. high.
Weight of a Full-Size Block: 70.0 lbs.
Failure Mode of Geogrid: abrasion and rupture of the geogrid ribs in each test.

SGI TESTING SERVICES, LLC

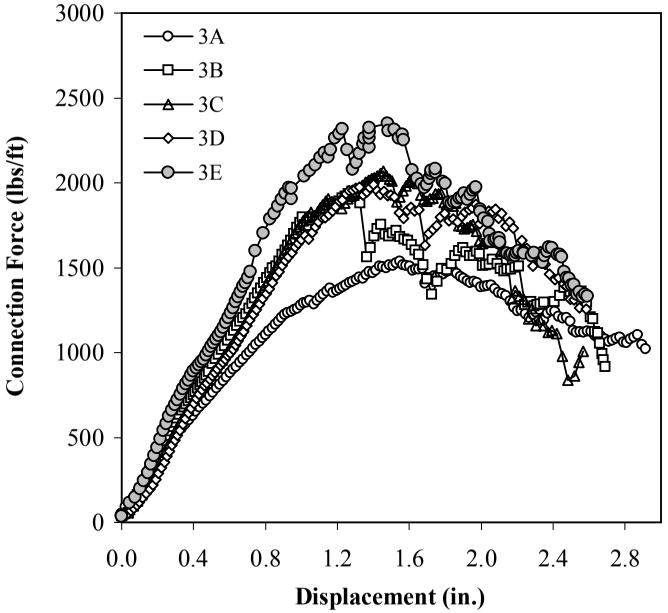
DATE TESTED:	5/27 to 5/28/2004
FIGURE NO.	C-2
PROJECT NO.	SGI3094
DOCUMENT NO.	SGI04052
FILE NO.	

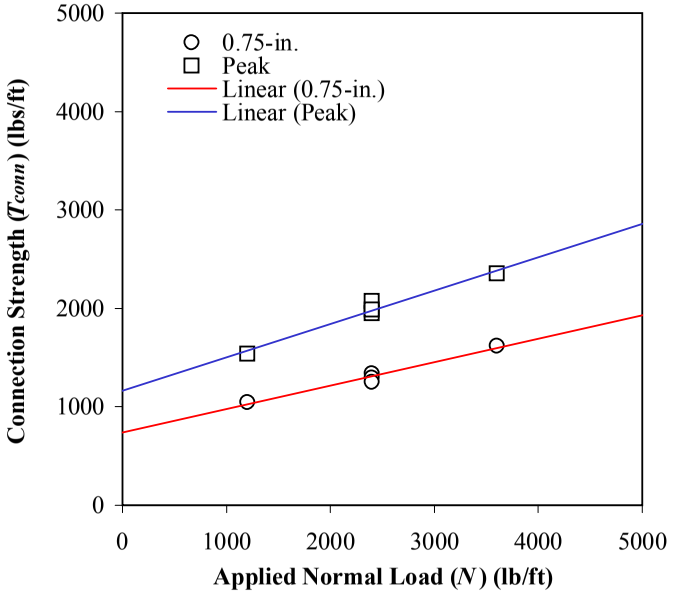
PULLOUT & SHEAR TEST - SOLID

VyKing Wall Systems LLC

VYKING WALL SYSTEMS, LLC.
CONNECTION STRENGTH TESTING (ASTM D 6638)

TEST SERIES NO. 3: Synteen SF 80 (SRW9) geogrid in machine direction within Vyking solid block units with 2 pins per block and compacted AASHTO #57 stone





Test No.	Test Specimen Width (in.)	Test Normal Stress (psi)	Equivalent Normal Load (lb/ft)	Approx. No. of Blocks	Approx. Height (ft)	0.75-in. Strength (lb/ft)	Peak Strength (lb/ft)	Connection Strength Equations (T_{conn})
3A	35.5	8.3	1200	20	10.0	1049	1539	$T_{0.75\text{-in.}} = 740 + (N) \tan(13^\circ)$
3B	35.5	16.7	2400	40	20.0	1338	1949	
3C	35.5	16.7	2400	40	20.0	1293	2071	$T_{peak} = 1165 + (N) \tan(19^\circ)$
3D	35.5	16.7	2400	40	20.0	1254	1988	
3E	35.5	25.0	3600	60	30.0	1619	2352	

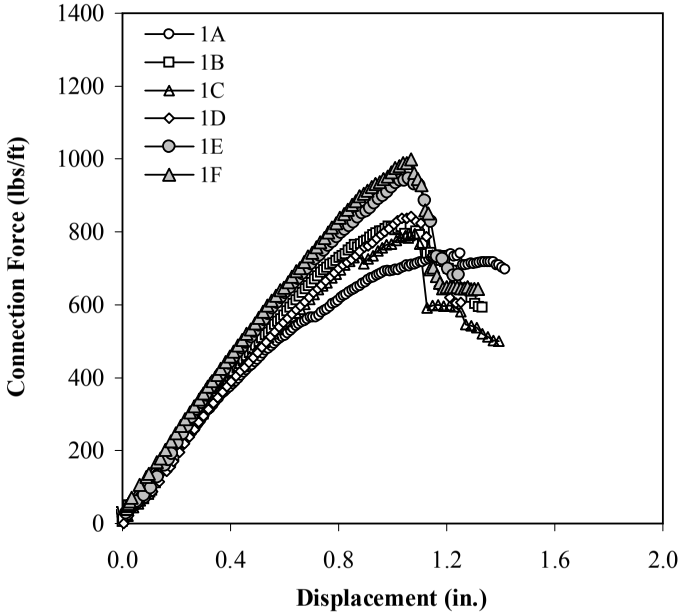
NOTES:
Dimensions of Vyking Block Unit: 18 in. wide by 12 in. long and 6 in. high.
Weight of a Full-Size Block: 70.0 lbs.
Failure Mode of Geogrid: abrasion and rupture of the geogrid ribs in each test.

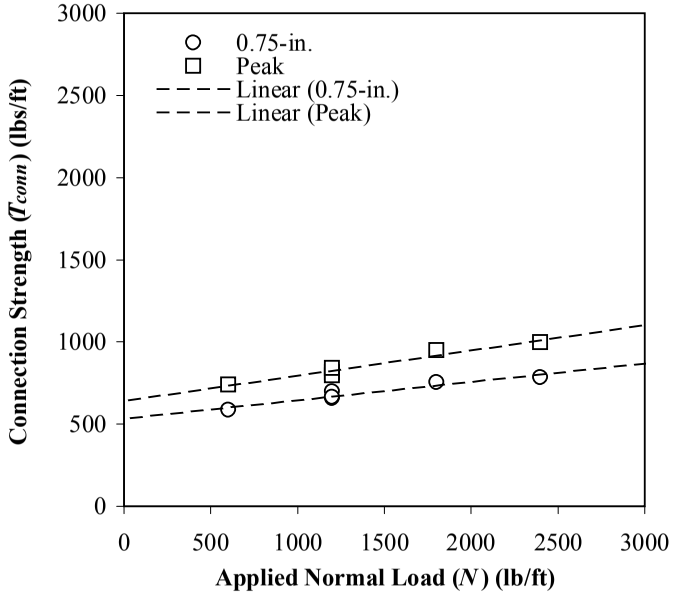
SGI TESTING SERVICES, LLC

DATE TESTED:	5/27 to 5/28/2004
FIGURE NO.	C-3
PROJECT NO.	SGI3094
DOCUMENT NO.	SGI04052
FILE NO.	

VYKING WALL SYSTEMS, LLC.
CONNECTION STRENGTH TESTING (ASTM D 6638)

TEST SERIES NO. 1: Raugrid 3/3-20 geogrid in machine direction within Vyking solid block units with 2 pins per block and compacted AASHTO #57 stone





Test No.	Test Specimen Width (in.)	Test Normal Stress (psi)	Equivalent Normal Load (lb/ft)	Approx. No. of Blocks	Approx. Height (ft)	0.75-in. Strength (lb/ft)	Peak Strength (lb/ft)	Connection Strength Equations (T_{conn})
1A	35.0	4.2	600	10	5.0	585	741	
1B	35.0	8.3	1200	20	10.0	699	815	$T_{0.75\text{-in.}} = 535 + (N) \tan(6^\circ)$
1C	35.0	8.3	1200	20	10.0	656	795	
1D	35.0	8.3	1200	20	10.0	663	842	$T_{peak} = 640 + (N) \tan(9^\circ)$
1E	35.0	12.5	1800	30	15.0	753	948	
1F	35.0	16.7	2400	40	20.0	786	999	

NOTES:

Dimensions of Vyking Block Unit: 18 in. wide by 12 in. long and 6 in. high.

Weight of a Full-Size Block: 70.0 lbs.

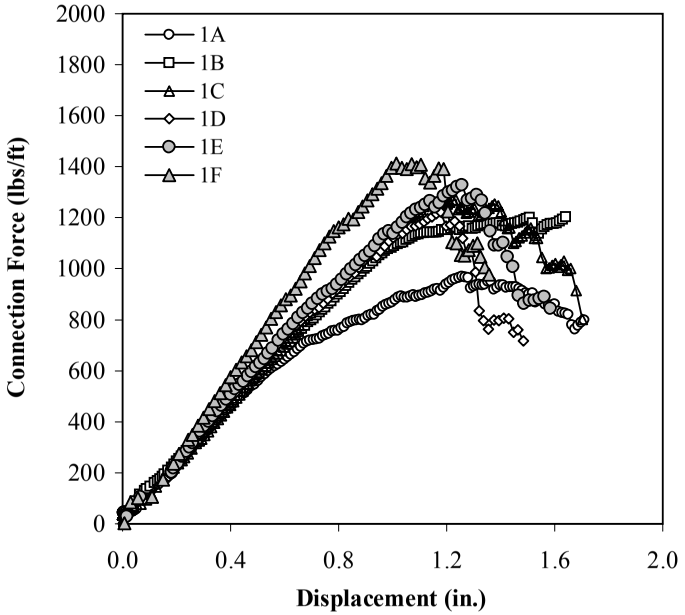
Failure Mode of Geogrid: abrasion and rupture of the geogrid ribs in each test.

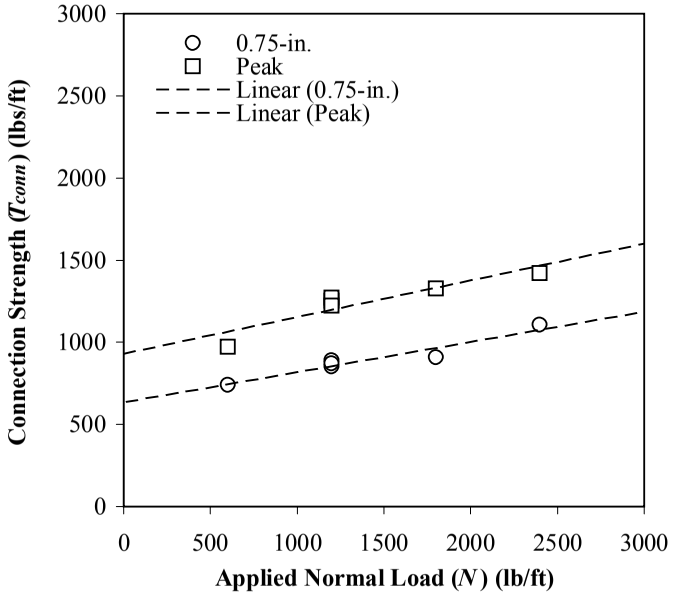
SGI TESTING SERVICES, LLC

DATE TESTED:	22 to 23 March 2004
FIGURE NO.	C-1
PROJECT NO.	SGI3094
DOCUMENT NO.	SGI03122
FILE NO.	

VYKING WALL SYSTEMS, LLC.
CONNECTION STRENGTH TESTING (ASTM D 6638)

TEST SERIES NO. 1: Fortrac 35/20-20 geogrid in machine direction within Vyking solid block units with 2 pins per block and compacted AASHTO #57 stone





Test No.	Test Specimen Width (in.)	Test Normal Stress (psi)	Equivalent Normal Load (lb/ft)	Approx. No. of Blocks	Approx. Height (ft)	0.75-in. Strength (lb/ft)	Peak Strength (lb/ft)	Connection Strength Equations (T_{conn})
1A	35.5	4.2	600	10	5.0	741	970	
1B	35.5	8.3	1200	20	10.0	850	1250	$T_{0.75\text{-in.}} = 635 + (N) \tan(10^\circ)$
1C	35.5	8.3	1200	20	10.0	889	1271	
1D	35.5	8.3	1200	20	10.0	870	1222	$T_{peak} = 930 + (N) \tan(13^\circ)$
1E	35.5	12.5	1800	30	15.0	907	1328	
1F	35.5	16.7	2400	40	20.0	1105	1421	

NOTES:

Dimensions of Vyking Block Unit: 18 in. wide by 12 in. long and 6 in. high.

Weight of a Full-Size Block: 70.0 lbs.

Failure Mode of Geogrid: abrasion and rupture of the geogrid ribs in each test.

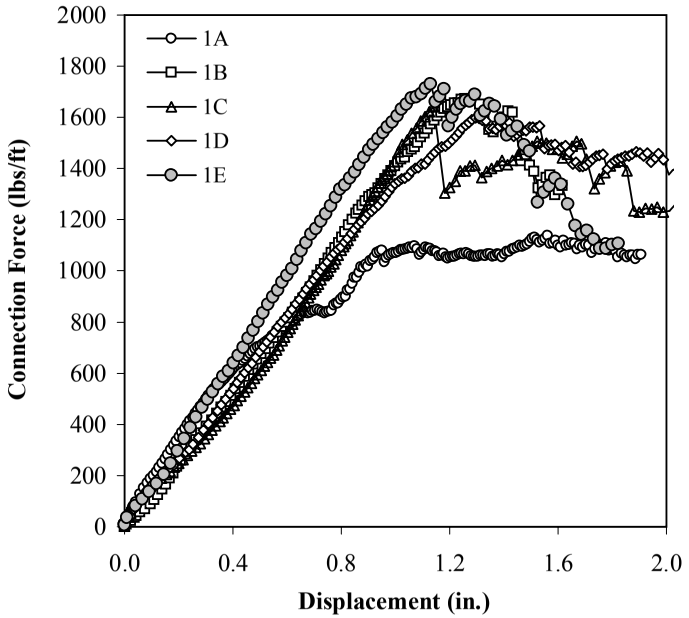
DATE TESTED: 19 to 20 February 2004

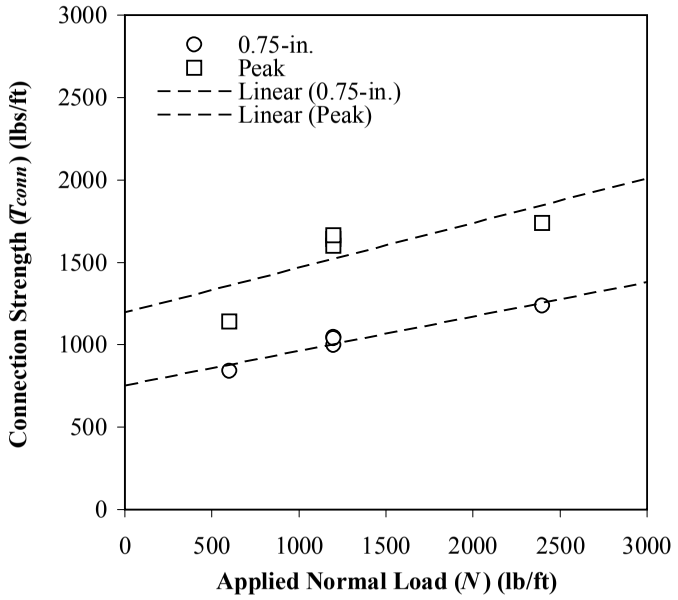
SGI TESTING SERVICES, LLC

FIGURE NO.	C-1
PROJECT NO.	SGI3094
DOCUMENT NO.	SGI03122
FILE NO.	

VYKING WALL SYSTEMS, LLC.
CONNECTION STRENGTH TESTING (ASTM D 6638)

TEST SERIES NO. 1: Miragrid 3XT geogrid in machine direction within Vyking solid block units with 2 pins per block and compacted AASHTO #57 ston





Test No.	Test Specimen Width (in.)	Test Normal Stress (psi)	Equivalent Normal Load (lb/ft)	Approx. No. of Blocks	Approx. Height (ft)	0.75-in. Strength (lb/ft)	Peak Strength (lb/ft)	Connection Strength Equations (T_{conn})
1A	34.5	4.2	600	10	5.0	841	1139	
1B	35.5	8.3	1200	20	10.0	1046	1641	$T_{0.75\text{-in.}} = 755 + (N) \tan(12^\circ)$
1C	35.5	8.3	1200	20	10.0	996	1598	
1D	35.5	8.3	1200	20	10.0	1037	1663	$T_{peak} = 1200 + (N) \tan(15^\circ)$
1E	35.5	16.7	2400	40	20.0	1236	1738	

NOTES:
Dimensions of Vyking Block Unit: 18 in. wide by 12 in. long and 6 in. high.
Weight of a Full-Size Block: 70.0 lbs.
Failure Mode of Geogrid: pullout in Test 1A, abrasion and rupture of the geogrid ribs in Test 1B through 1E.

SGI TESTING SERVICES, LLC

DATE TESTED:	19 to 20 February 2004
FIGURE NO.	C-1
PROJECT NO.	SGI3094
DOCUMENT NO.	SGI03122
FILE NO.	

PULLOUT & SHEAR TEST - SOLID

VyKing Wall Systems LLC

Notes

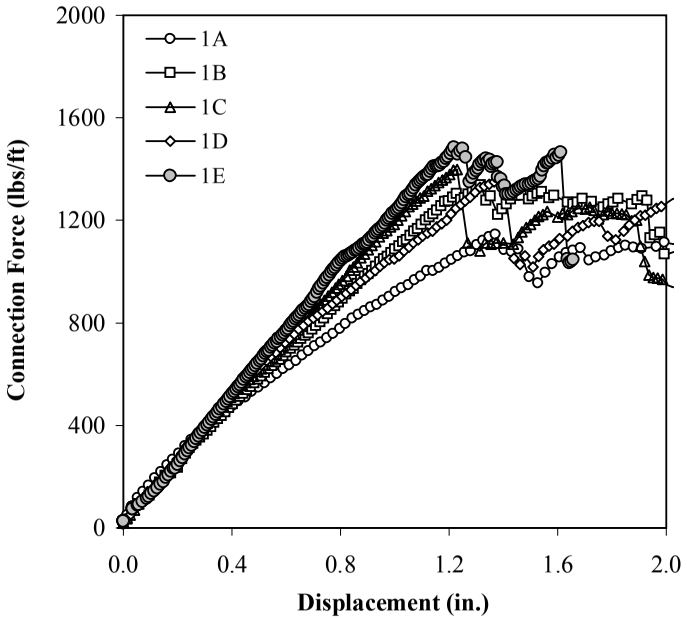
VyKing
Pullout & Shear Test

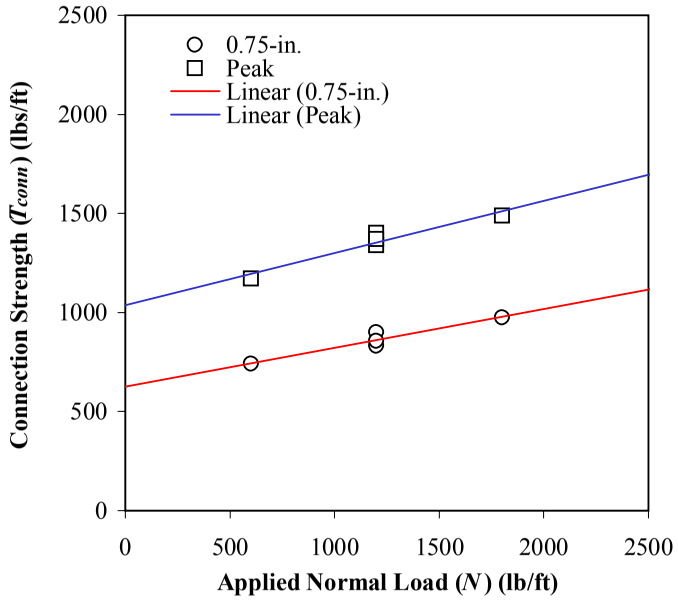
VyKing
Core Unit

Notes

VYKING WALL SYSTEMS, LLC.
CONNECTION STRENGTH TESTING (ASTM D 6638)

TEST SERIES NO. 1: Synteen SF 20 (SRW3) geogrid in machine direction within Vyking core block units with 2 Vyking interlocking pins per block and compacted AASHTO #57 stone





Test No.	Test Specimen Width (in.)	Test Normal Stress (psi)	Equivalent Normal Load (lb/ft)	Approx. No. of Blocks	Approx. Wall Height (ft)	0.75-in. Strength (lb/ft)	Peak Strength (lb/ft)	Connection Strength Equations (T_{conn})
1A	34.0	4.2	600	15	5.0	740	1171	$T_{0.75\text{-in.}} = 625 + (N) \tan(11^\circ)$ $T_{peak} = 1035 + (N) \tan(15^\circ)$
1B	34.0	8.3	1200	30	10.0	833	1337	
1C	34.0	8.3	1200	30	10.0	900	1400	
1D	34.0	8.3	1200	30	10.0	856	1370	
1E	34.0	12.5	1800	45	15.0	976	1487	

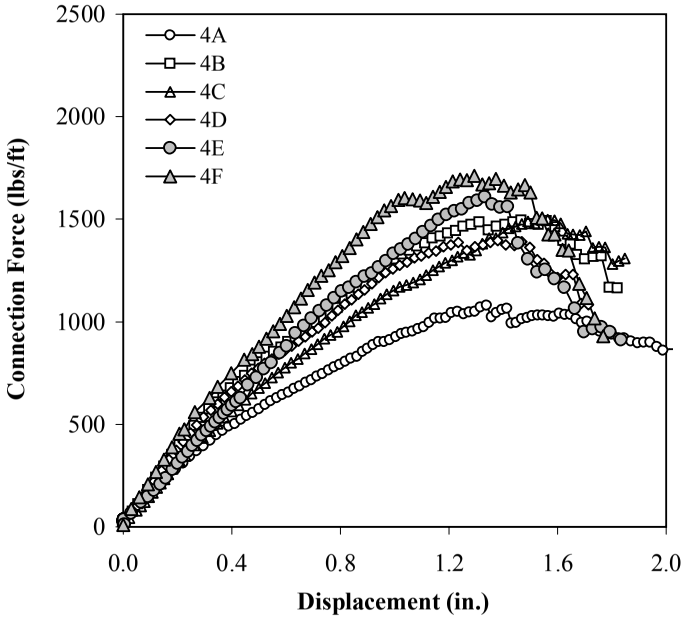
NOTES:
Dimensions of Vyking Block Unit: 18 in. wide by 12 in. long and 4 in. high.
Weight of a Full-Size Block: 33.0 lbs.
Failure Mode of Geogrid: abrasion and rupture of the geogrid ribs in each test.

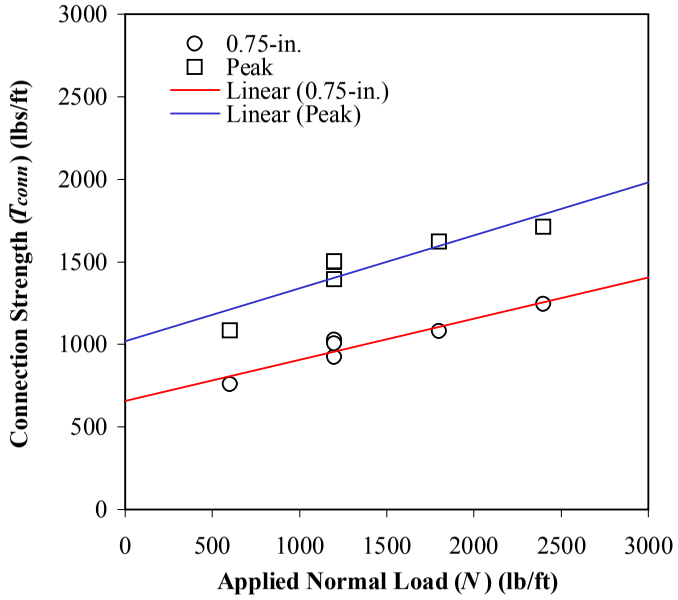
SGI TESTING SERVICES, LLC

DATE TESTED:	14 to 22 April 2005
FIGURE NO.	C-1
PROJECT NO.	SGI3094
DOCUMENT NO.	
FILE NO.	

VYKING WALL SYSTEMS, LLC.
CONNECTION STRENGTH TESTING (ASTM D 6638)

TEST SERIES NO. 4: Synteen SF35 (SRW5) geogrid in machine direction within Vyking core block units with 2 pins per block and compacted AASHTO #57 stone





Test No.	Test Specimen Width (in.)	Test Normal Stress (psi)	Equivalent Normal Load (lb/ft)	Approx. No. of Blocks	Approx. Height (ft)	0.75-in. Strength (lb/ft)	Peak Strength (lb/ft)	Connection Strength Equations (T_{conn})
4A	35.5	4.2	600	10	5.0	759	1083	
4B	35.5	8.3	1200	20	10.0	1028	1497	$T_{0.75\text{-in.}} = 660 + (N) \tan(14^\circ)$
4C	35.5	8.3	1200	20	10.0	923	1503	
4D	35.5	8.3	1200	20	10.0	1005	1395	$T_{peak} = 1020 + (N) \tan(18^\circ)$
4E	35.5	12.5	1800	30	15.0	1080	1623	
4F	35.5	16.7	2400	40	20.0	1245	1711	

NOTES:

Dimensions of Vyking Block Unit: 18 in. wide by 12 in. long and 6 in. high.

Weight of a Full-Size Block: 49.0 lbs.

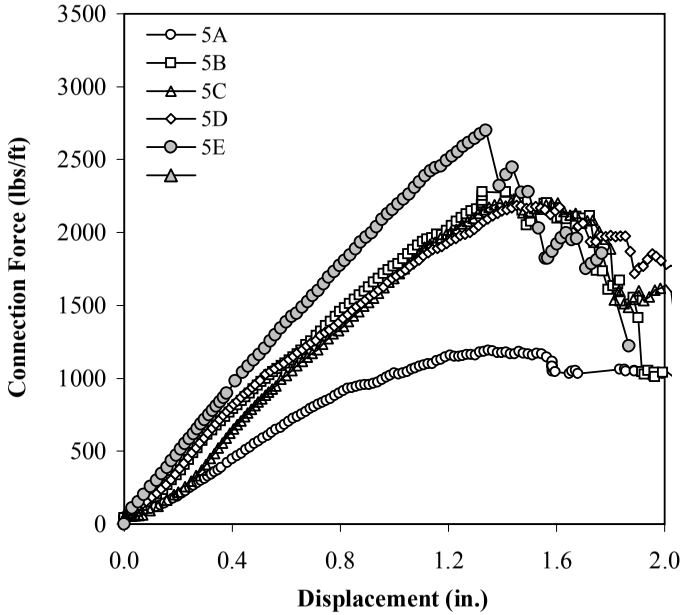
Failure Mode of Geogrid: abrasion and rupture of the geogrid ribs in each test.

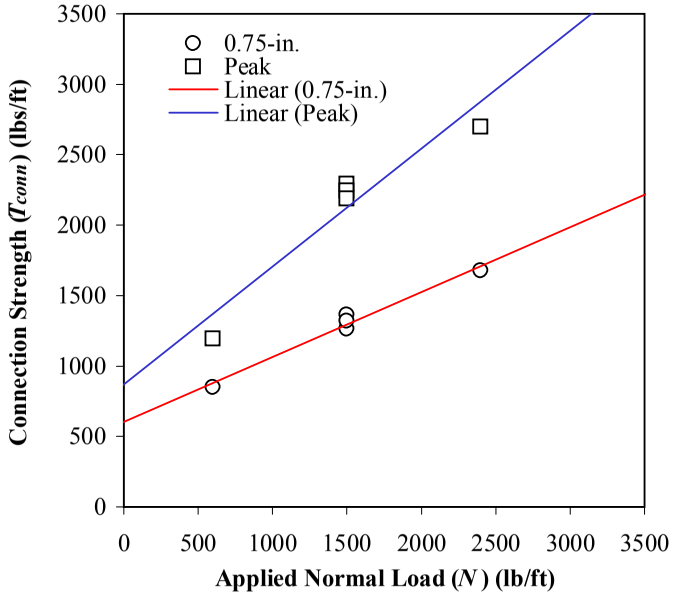
DATE TESTED:	3 to 4 Mrach 2004
FIGURE NO.	C-4
PROJECT NO.	SGI3094
DOCUMENT NO.	SGI04052
FILE NO.	

SGI TESTING SERVICES, LLC

VYKING WALL SYSTEMS, LLC.
CONNECTION STRENGTH TESTING (ASTM D 6638)

TEST SERIES NO. 5: Synteen SF 55 (SRW7) geogrid in machine direction within Vyking core block units with 2 pins per block and compacted AASHTO #57 stone





Test No.	Test Specimen Width (in.)	Test Normal Stress (psi)	Equivalent Normal Load (lb/ft)	Approx. No. of Blocks	Approx. Height (ft)	0.75-in. Strength (lb/ft)	Peak Strength (lb/ft)	Connection Strength Equations (T_{conn})
5A	35.5	4.2	600	10	5.0	849	1195	
5B	35.5	10.4	1500	25	12.5	1366	2291	$T_{0.75\text{-in.}} = 605 + (N) \tan(25^\circ)$
5C	35.5	10.4	1500	25	12.5	1264	2243	
5D	35.5	10.4	1500	25	12.5	1322	2190	$T_{peak} = 870 + (N) \tan(40^\circ)$
5E	35.5	16.7	2400	40	20.0	1677	2700	

NOTES:
Dimensions of Vyking Block Unit: 18 in. wide by 12 in. long and 6 in. high.
Weight of a Full-Size Block: 49.0 lbs.
Failure Mode of Geogrid: abrasion and rupture of the geogrid ribs in each test.

SGI TESTING SERVICES, LLC

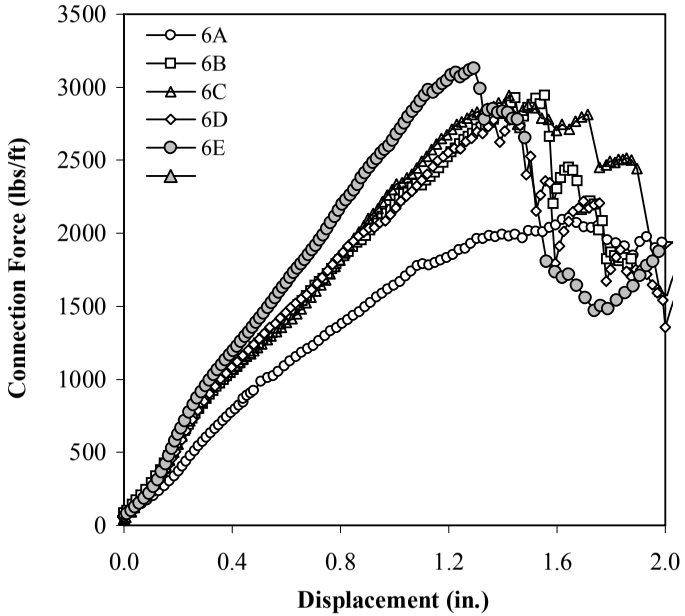
DATE TESTED:	30 to 31 May 2004
FIGURE NO.	C-5
PROJECT NO.	SGI3094
DOCUMENT NO.	SGI04052
FILE NO.	

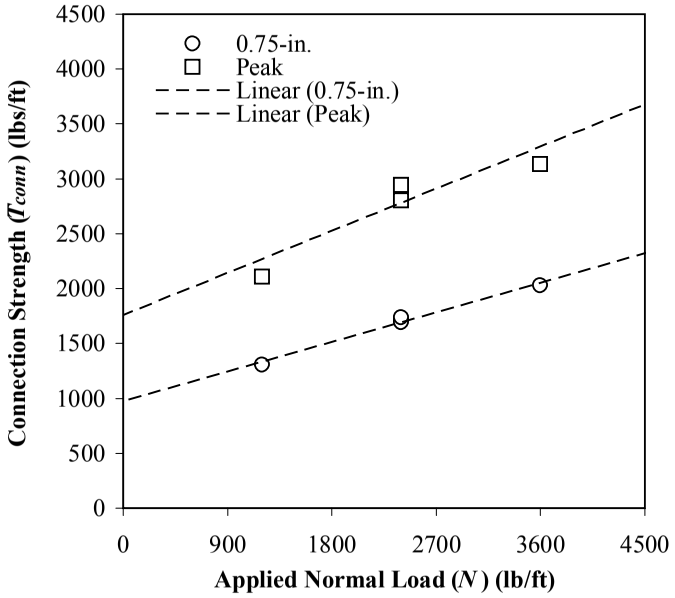
PULLOUT & SHEAR TEST - CORE

VyKing Wall Systems LLC

VYKING WALL SYSTEMS, LLC.
CONNECTION STRENGTH TESTING (ASTM D 6638)

TEST SERIES NO. 6: Synteen SF 80 (SRW9) geogrid in machine direction within Vyking core block units with 2 pins per block and compacted AASHTO #57 stone





Test No.	Test Specimen Width (in.)	Test Normal Stress (psi)	Equivalent Normal Load (lb/ft)	Approx. No. of Blocks	Approx. Height (ft)	0.75-in. Strength (lb/ft)	Peak Strength (lb/ft)	Connection Strength Equations (T_{conn})
6A	35.5	8.3	1200	20	10.0	1308	2107	
6B	35.5	16.7	2400	40	20.0	1717	2943	$T_{0.75\text{-in.}} = 980 + (N) \tan(17^\circ)$
6C	35.5	16.7	2400	40	20.0	1693	2942	
6D	35.5	16.7	2400	40	20.0	1739	2803	$T_{peak} = 1760 + (N) \tan(23^\circ)$
6E	35.5	25.0	3600	60	30.0	2028	3131	

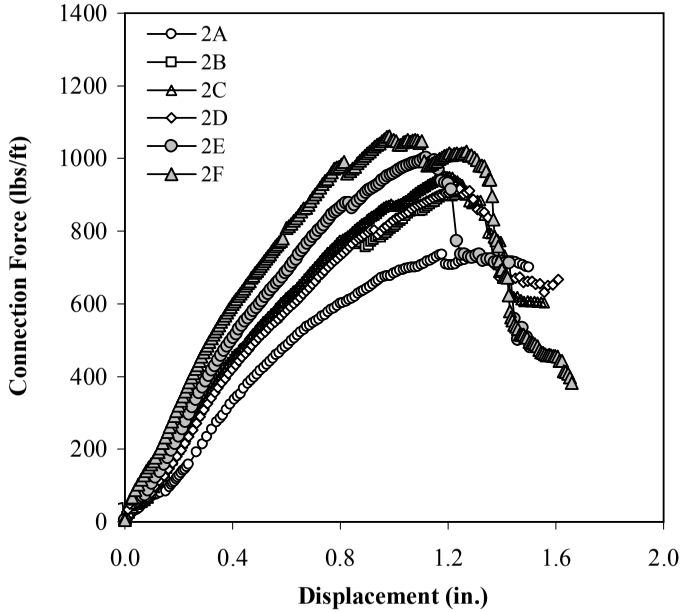
NOTES:
Dimensions of Vyking Block Unit: 18 in. wide by 12 in. long and 6 in. high.
Weight of a Full-Size Block: 49.0 lbs.
Failure Mode of Geogrid: abrasion and rupture of the geogrid ribs in each test.

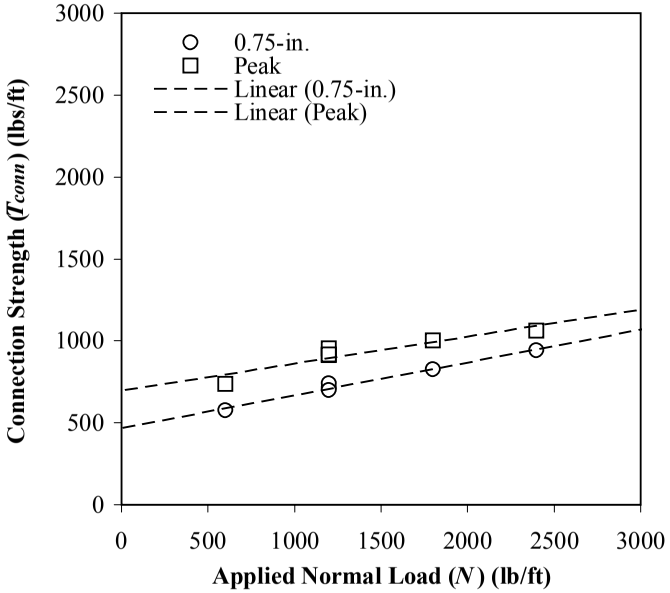
SGI TESTING SERVICES, LLC

DATE TESTED:	30 to 31 May 2004
FIGURE NO.	C-6
PROJECT NO.	SGI3094
DOCUMENT NO.	SGI04052
FILE NO.	

VYKING WALL SYSTEMS, LLC.
CONNECTION STRENGTH TESTING (ASTM D 6638)

TEST SERIES NO. 2: Raugrid 3/3-20 geogrid in machine direction within Vyking core block units with 2 pins per block and compacted AASHTO #57 stone





Test No.	Test Specimen Width (in.)	Test Normal Stress (psi)	Equivalent Normal Load (lb/ft)	Approx. No. of Blocks	Approx. Height (ft)	0.75-in. Strength (lb/ft)	Peak Strength (lb/ft)	Connection Strength Equations (T_{conn})
2A	35.0	4.2	600	10	5.0	574	737	$T_{0.75\text{-in.}} = 470 + (N) \tan(11^\circ)$ $T_{peak} = 700 + (N) \tan(9^\circ)$
2B	35.0	8.3	1200	20	10.0	715	910	
2C	35.0	8.3	1200	20	10.0	738	952	
2D	35.0	8.3	1200	20	10.0	698	917	
2E	35.0	12.5	1800	30	15.0	827	1002	
2F	35.0	16.7	2400	40	20.0	943	1061	

NOTES:

Dimensions of Vyking Block Unit: 18 in. wide by 12 in. long and 6 in. high.

Weight of a Full-Size Block: 49.0 lbs.

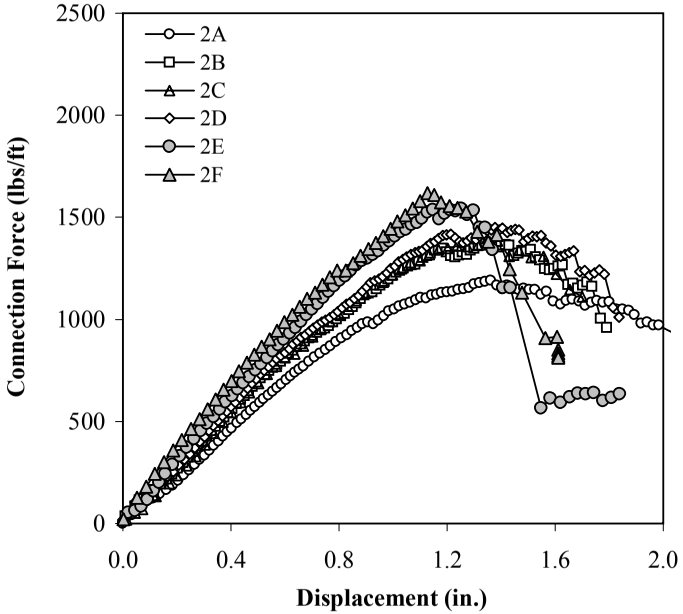
Failure Mode of Geogrid: abrasion and rupture of the geogrid ribs in each test.

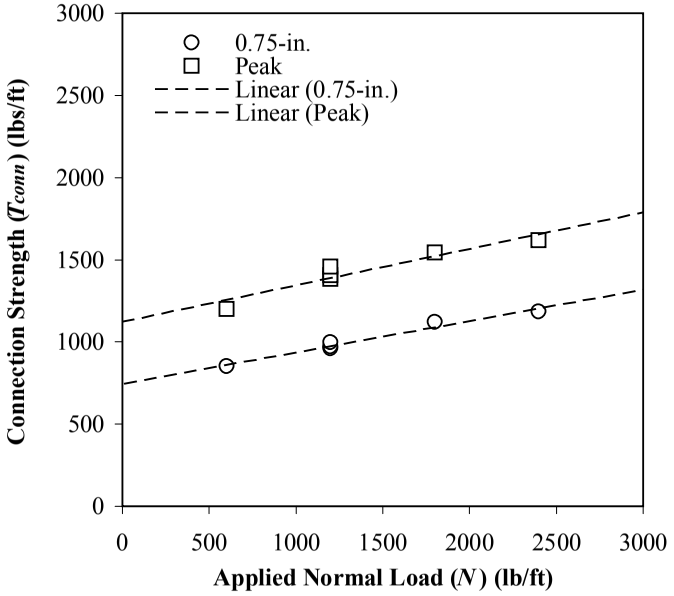
SGI TESTING SERVICES, LLC

DATE TESTED:	23 to 25 March 2004
FIGURE NO.	C-2
PROJECT NO.	SGI3094
DOCUMENT NO.	SGI03122
FILE NO.	

VYKING WALL SYSTEMS, LLC.
CONNECTION STRENGTH TESTING (ASTM D 6638)

TEST SERIES NO. 2: Fortrac 35/20-20 geogrid in machine direction within Vyking core block units with 2 pins per block and compacted AASHTO #57 stone





Test No.	Test Specimen Width (in.)	Test Normal Stress (psi)	Equivalent Normal Load (lb/ft)	Approx. No. of Blocks	Approx. Height (ft)	0.75-in. Strength (lb/ft)	Peak Strength (lb/ft)	Connection Strength Equations (T_{conn})
2A	35.5	4.2	600	10	5.0	852	1199	
2B	35.5	8.3	1200	20	10.0	960	1384	$T_{0.75\text{-in.}} = 745 + (N) \tan(11^\circ)$
2C	35.5	8.3	1200	20	10.0	972	1406	
2D	35.5	8.3	1200	20	10.0	997	1457	$T_{peak} = 1125 + (N) \tan(13^\circ)$
2E	35.5	12.5	1800	30	15.0	1121	1544	
2F	35.5	16.7	2400	40	20.0	1185	1618	

NOTES:

Dimensions of Vyking Block Unit: 18 in. wide by 12 in. long and 6 in. high.

Weight of a Full-Size Block: 49.0 lbs.

Failure Mode of Geogrid: abrasion and rupture of the geogrid ribs in each test.

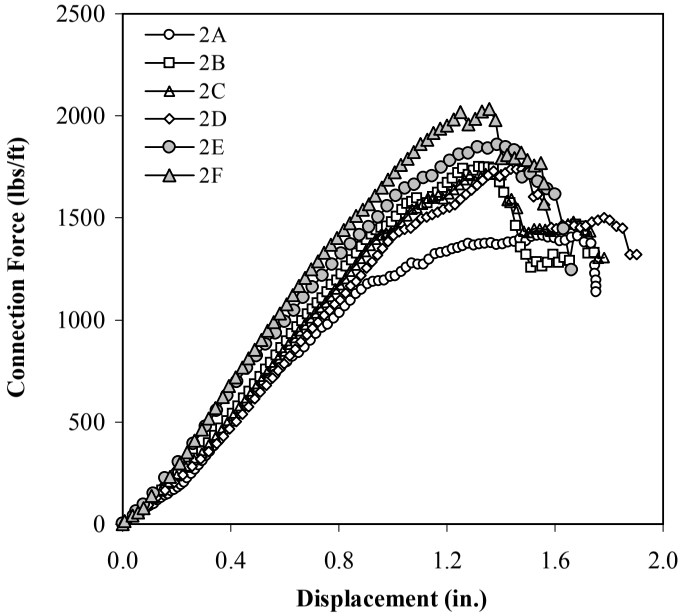
DATE TESTED: 1 to 2 Mrach 2004

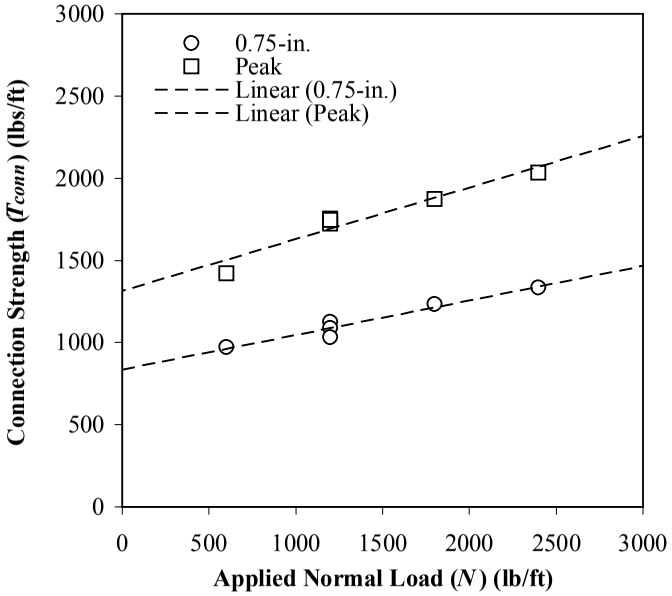
SGI TESTING SERVICES, LLC

FIGURE NO.	C-2
PROJECT NO.	SGI3094
DOCUMENT NO.	SGI03122
FILE NO.	

VYKING WALL SYSTEMS, LLC.
CONNECTION STRENGTH TESTING (ASTM D 6638)

TEST SERIES NO. 2: Miragrid 3XT geogrid in machine direction within Vyking core block units with 2 pins per block and compacted AASHTO #57 stone





Test No.	Test Specimen Width (in.)	Test Normal Stress (psi)	Equivalent Normal Load (lb/ft)	Approx. No. of Blocks	Approx. Height (ft)	0.75-in. Strength (lb/ft)	Peak Strength (lb/ft)	Connection Strength Equations (T_{conn})
2A	35.5	4.2	600	10	5.0	970	1418	
2B	35.5	8.3	1200	20	10.0	1126	1753	$T_{0.75\text{-in.}} = 835 + (N) \tan(12^\circ)$
2C	35.5	8.3	1200	20	10.0	1087	1721	
2D	35.5	8.3	1200	20	10.0	1029	1743	$T_{peak} = 1315 + (N) \tan(17^\circ)$
2E	35.5	12.5	1800	30	15.0	1235	1872	
2F	35.5	16.7	2400	40	20.0	1335	2033	

NOTES:

Dimensions of Vyking Block Unit: 18 in. wide by 12 in. long and 6 in. high.

Weight of a Full-Size Block: 49.0 lbs.

Failure Mode of Geogrid: pullout in Test 1A, abrasion and rupture of the geogrid ribs in Test 1B through 1E.

DATE TESTED:	1 to 2 Mrach 2004
FIGURE NO.	C-2
PROJECT NO.	SGI3094
DOCUMENT NO.	SGI03122
FILE NO.	

SGI TESTING SERVICES, LLC

Notes

VyKing Wall Systems LLC

FREEZE–THAW TEST

Notes

FREEZE-THAW TEST

SRW Unit freeze-thaw durability research considers many variables and is most often conducted in accordance with ASTM C 1262, Standard Test Method for Evaluating the Freeze-Thaw Durability of Manufactured Concrete Masonry Units and related Concrete Units.

Field performance for both structural strength and unit durability has demonstrated that SRW systems are a sound alternative to poured concrete walls, wood walls and masonry walls for earth retention.

SRW Units provide durable concrete equal to or greater than that of traditional concrete products used in highway and other applications when properly installed.

Notes

VyKing Wall Systems LLC

SPECIFICATIONS
VYKING – 8” STONE

Notes

VYKING UNIT'S SPECIFICATIONS

Walls built with the VyKing solid stones will weigh approximately 141 pounds per square face foot of wall when considering gravel fill between stones. These calculations are based on 12 inches total depth and gravel fill at 125 pounds per cubic foot.

Walls built with the VyKing core stones will weigh approximately 135 pounds per square face foot of wall when considering gravel fill between stones and in the core. These calculations are based on 12 inches total depth and gravel fill at 125 pounds per cubic foot.

The Portland cement shall conform to class A (AE) with a 3000 psi minimum compressive strength at 28 days with a maximum adsorption of 10 pcf as determined in accordance with ASTM C 140.

For areas subject to detrimental freeze-thaw cycles the concrete shall have adequate freeze-thaw protection and meet the requirements of ASTM C 1262.

All VyKing units shall be sound, free of cracks or other defects that could interfere with the proper placing of the unit. The manufactured VyKing unit will not impair the strength or permanence of the SRW.

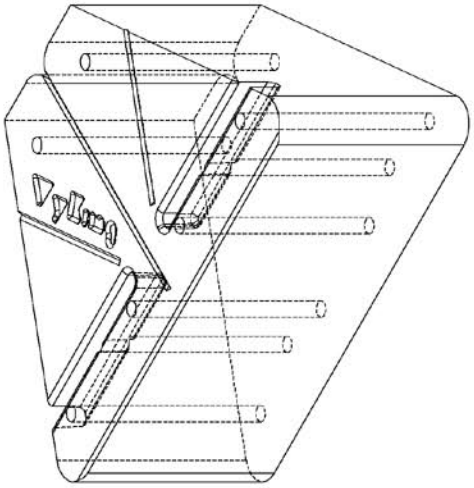
All VyKing SRWs will be constructed with VyKing pins. The VyKing pins used in construction are equal in design and structure to the VyKing pins used in pullout testing.

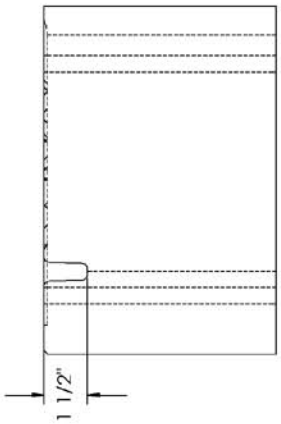
All VyKing units shall be handled, stored and shipped in such a manner as to eliminate the dangers of chipping, discoloration, cracking, fracturing and other excessive stresses.

All VyKing units are to be manufactured to the specified height (4", 6", or 8"). Out of gauge stones result in considerable time wasted during construction to compensate for out of gauge stones. Published tolerances of +/- 1/16 inch can result in a 1/8 inch difference in the height of two adjacent stones. This difference is not acceptable. Units must be on gauge for competent wall construction. Stresses imposed upon VyKing units that are artificially leveled with shims may result in a SRW that does not meet the SRW design engineer's criteria. Pullout test results may not be applicable to SRW's with shimmed units.

SOLID

94 lbs



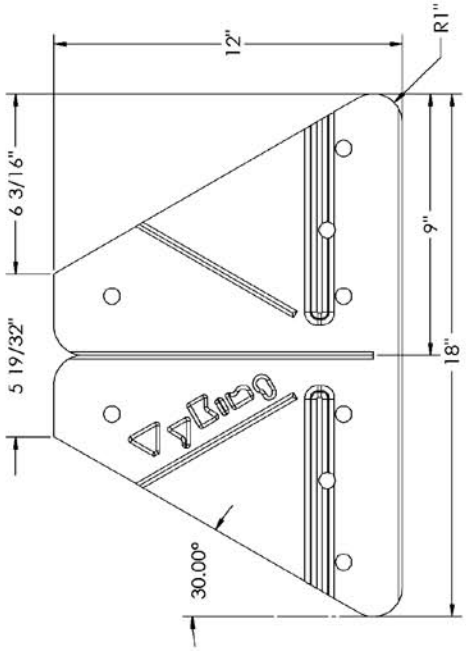


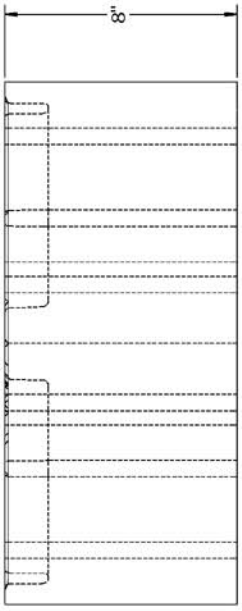
UNGER DESIGN & CONCEPT

PRODUCT ILLUSTRATION, 8" SOLID
VYKING STONE

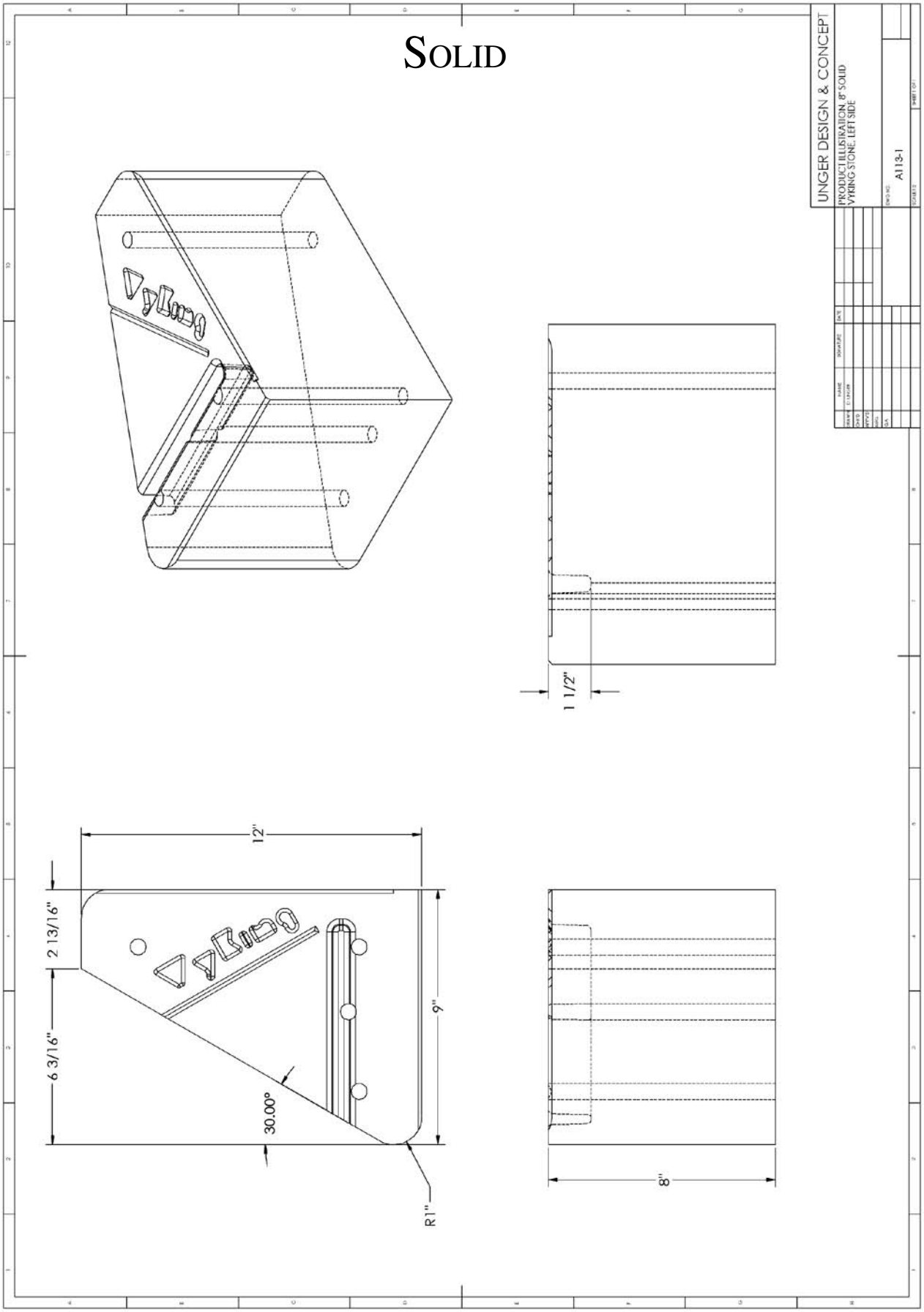
A113-0

APPROX. WEIGHT 94lbs.

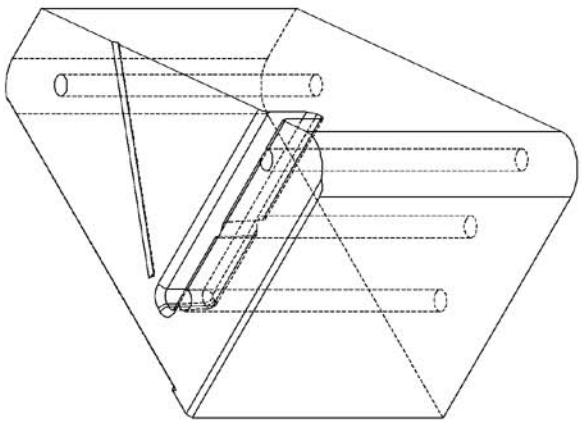


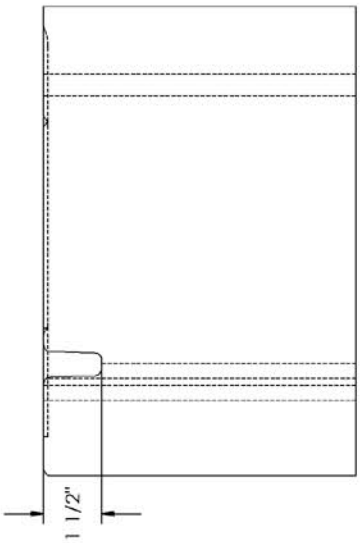


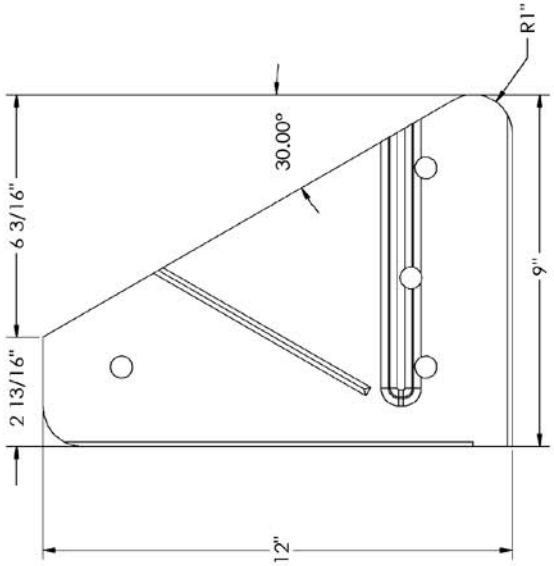
SOLID

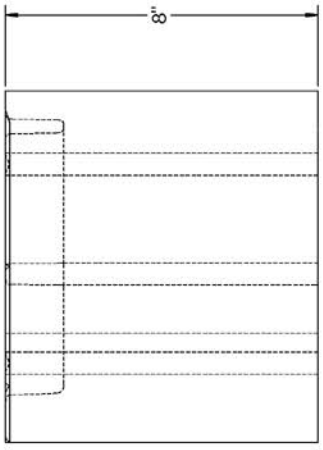

UNGER DESIGN & CONCEPT
PRODUCT ILLUSTRATION, 8" SOLID
VYKING STONE, LEFT SIDE
A113-1
1 1/2"
12"
2 13/16"
6 3/16"
9"
30.00°
R1"
8"

SOLID



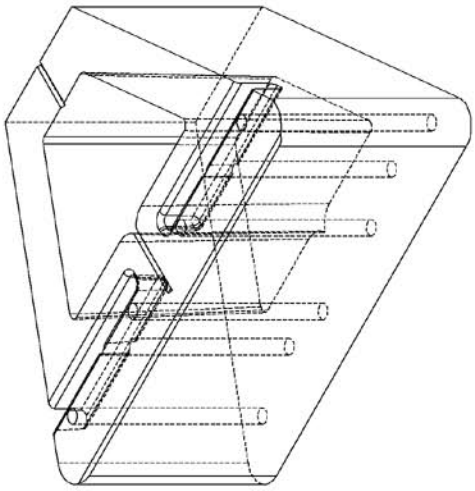


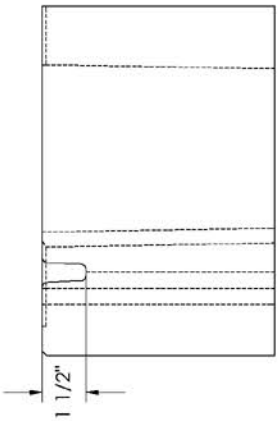




CORE

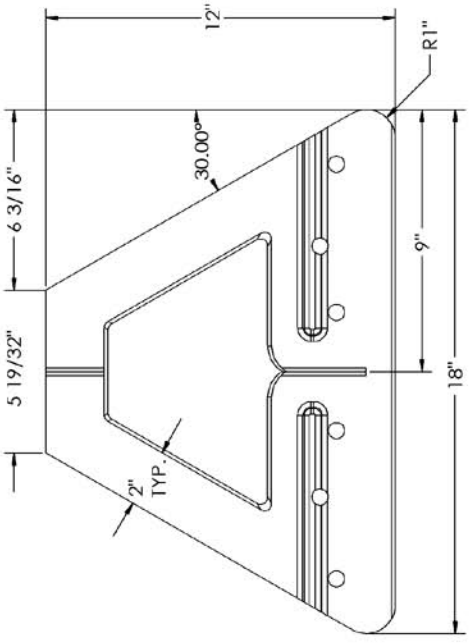
70 lbs

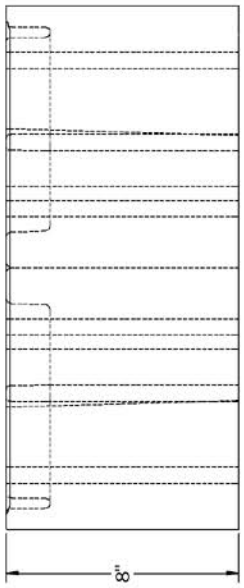




UNGER DESIGN & CONCEPT
PRODUCT ILLUSTRATION 8" CORED VYKING STONE
A114-0

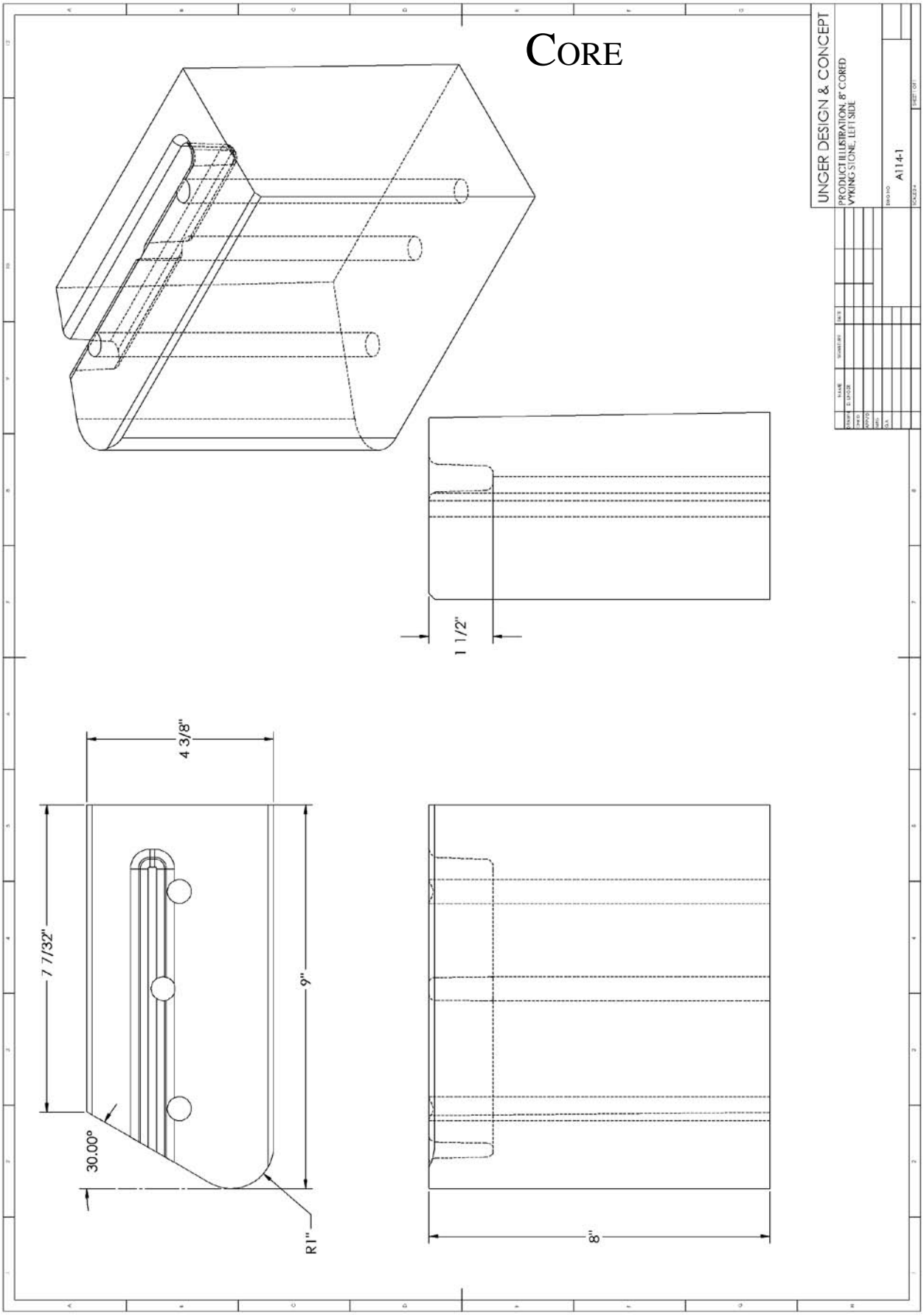
APPROX. WEIGHT 70lbs.



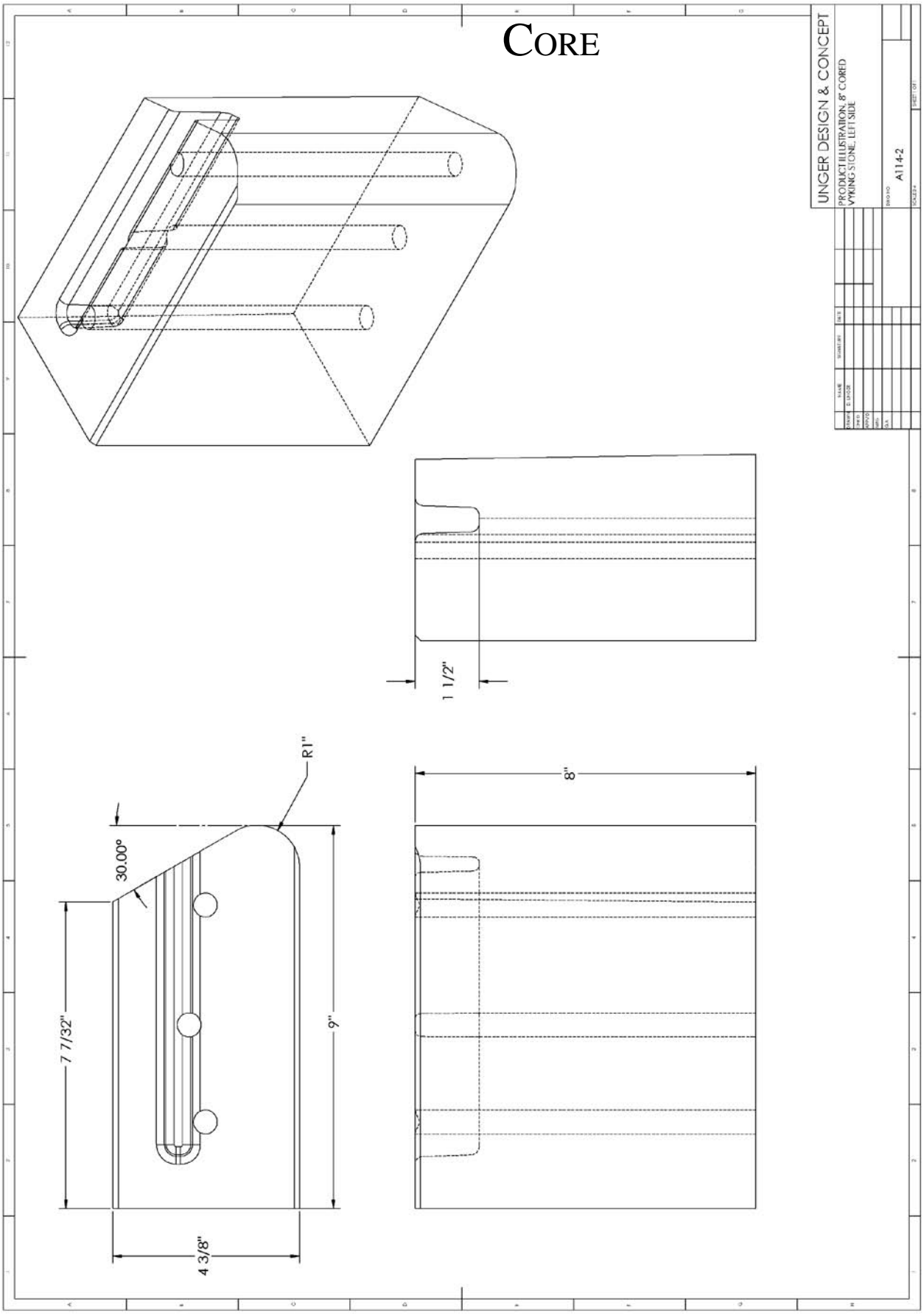


SPECIFICATIONS – 8" VYKING STONE

CORE



CORE


UNGER DESIGN & CONCEPT
PRODUCT ILLUSTRATION, 8" CORED
VYKING STONE, LEFT SIDE
A114-2
1 1/2"
R1"
30.00°
7 7/32"
9"
4 3/8"
8"

Notes

VyKing Wall Systems LLC

SPECIFICATIONS
VYKING – 6” STONE

Notes

VYKING UNIT’S SPECIFICATIONS

Walls built with the VyKing solid stones will weigh approximately 141 pounds per square face foot of wall when considering gravel fill between stones. These calculations are based on 12 inches total depth and gravel fill at 125 pounds per cubic foot.

Walls built with the VyKing core stones will weigh approximately 135 pounds per square face foot of wall when considering gravel fill between stones and in the core. These calculations are based on 12 inches total depth and gravel fill at 125 pounds per cubic foot.

The Portland cement shall conform to class A (AE) with a 3000 psi minimum compressive strength at 28 days with a maximum adsorption of 10 pcf as determined in accordance with ASTM C 140.

For areas subject to detrimental freeze-thaw cycles the concrete shall have adequate freeze-thaw protection and meet the requirements of ASTM C 1262.

All VyKing units shall be sound, free of cracks or other defects that could interfere with the proper placing of the unit. The manufactured VyKing unit will not impair the strength or permanence of the SRW.

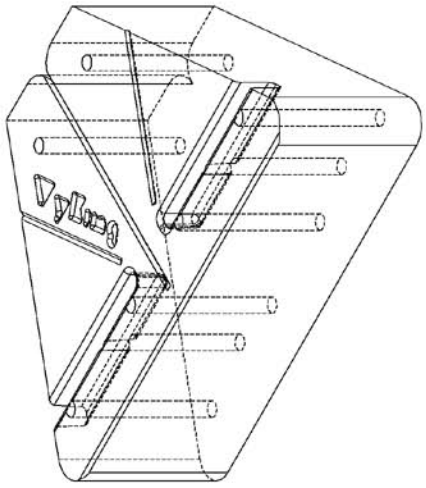
All VyKing SRWs will be constructed with VyKing pins. The VyKing pins used in construction are equal in design and structure to the VyKing pins used in pullout testing.

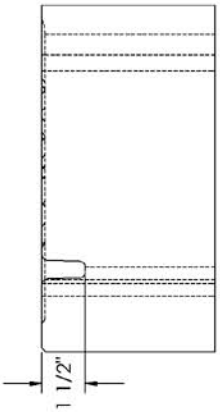
All VyKing units shall be handled, stored and shipped in such a manner as to eliminate the dangers of chipping, discoloration, cracking, fracturing and other excessive stresses.

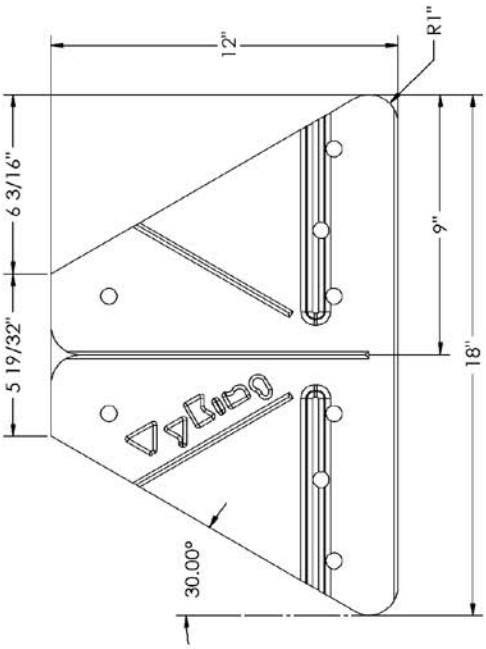
All VyKing units are to be manufactured to the specified height (4”, 6”, or 8”). Out of gauge stones result in considerable time wasted during construction to compensate for out of gauge stones. Published tolerances of +/- 1/16 inch can result in a 1/8 inch difference in the height of two adjacent stones. This difference is not acceptable. Units must be on gauge for competent wall construction. Stresses imposed upon VyKing units that are artificially leveled with shims may result in a SRW that does not meet the SRW design engineer’s criteria. Pullout test results may not be applicable to SRW’s with shimmed units.

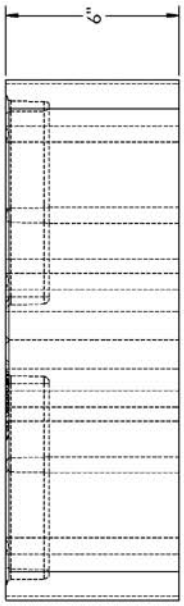
SOLID

72 lbs





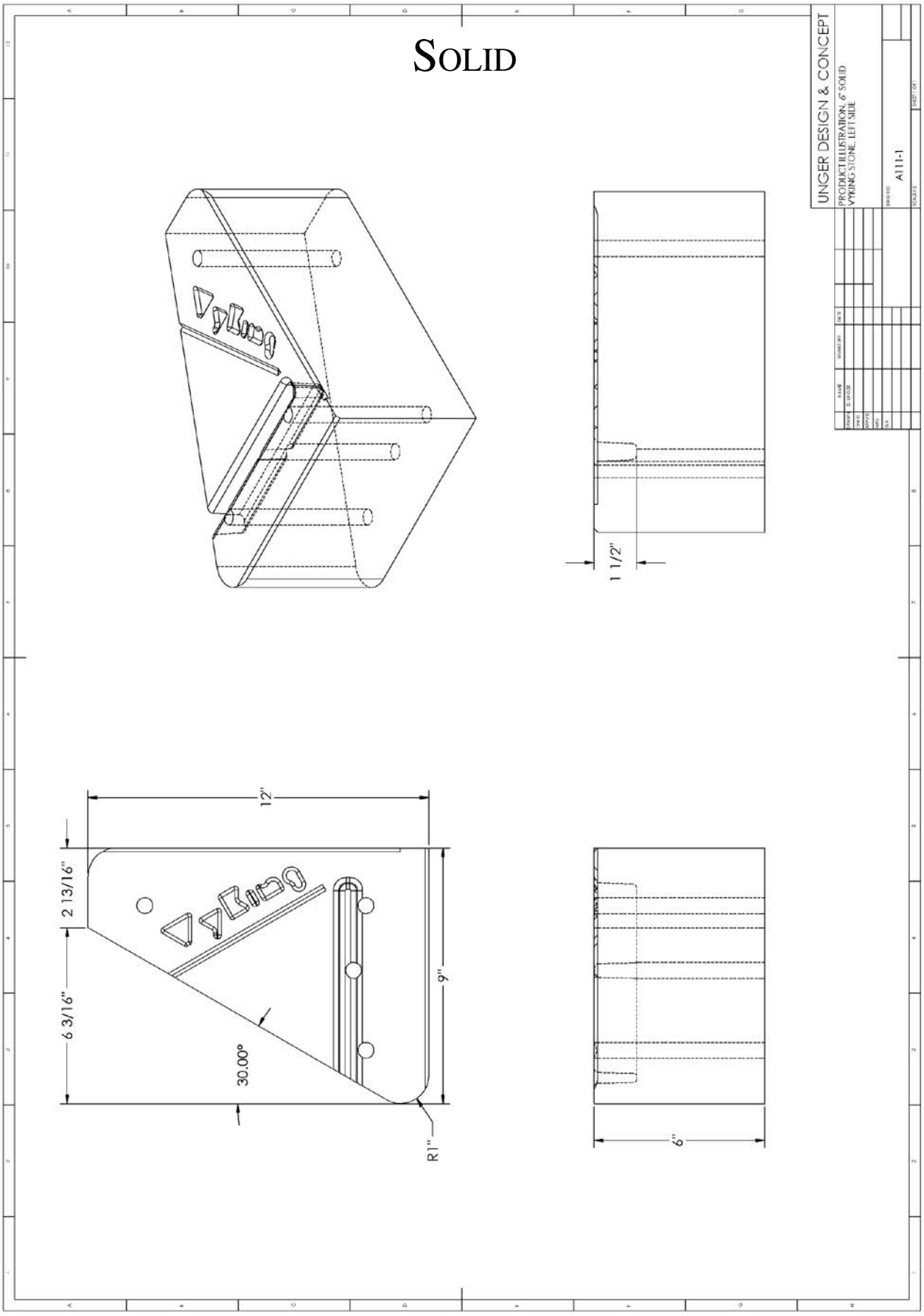




UNGER DESIGN & CONCEPT
PRODUCT ILLUSTRATION, 6" SOLID
VYKING STONE
A111-0

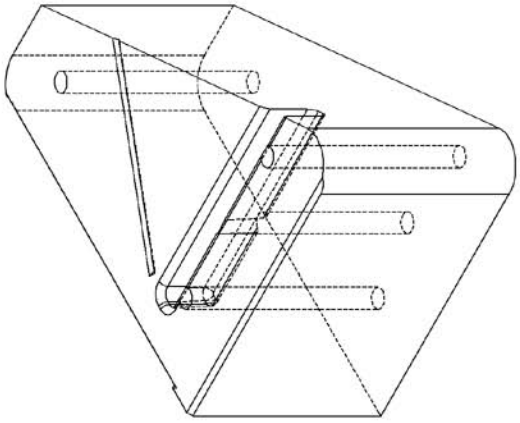
APPROX. WEIGHT 70lbs.

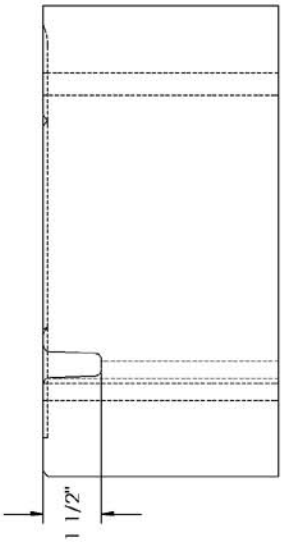
SOLID

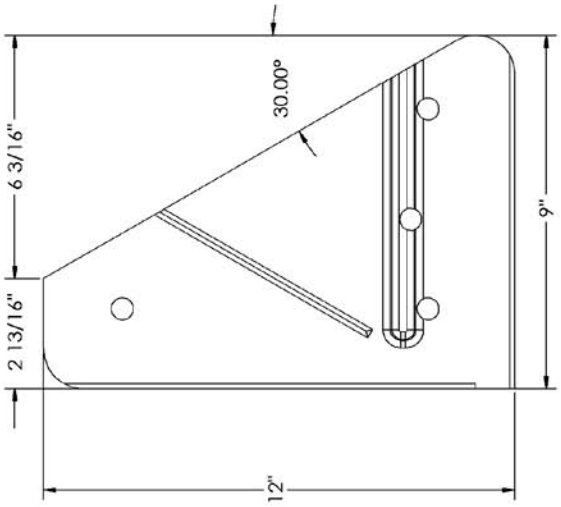

UNGER DESIGN & CONCEPT
PRODUCT ILLUSTRATION, 6" SOLID
VYKING STONE, LEFT SIDE
A111-1
1 1/2"
12"
2 13/16"
6 3/16"
9"
30.00°
R1"
6"

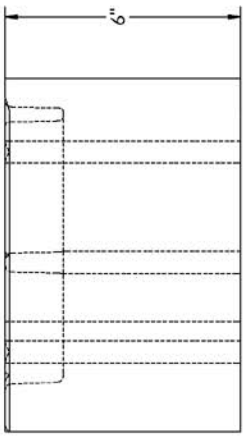
SPECIFICATIONS – 6" VYKING STONE

SOLID



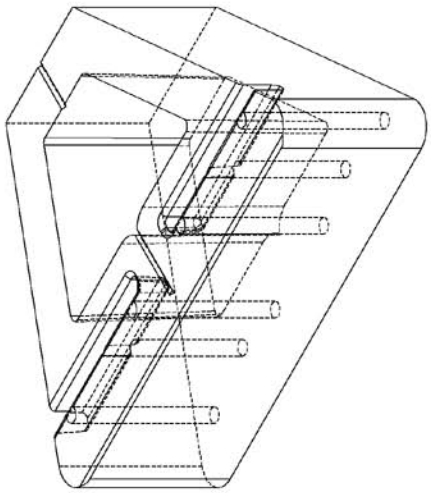


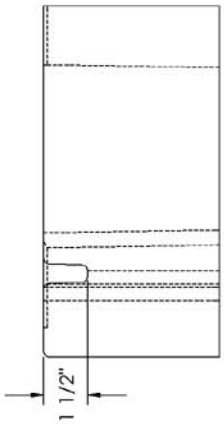




CORE

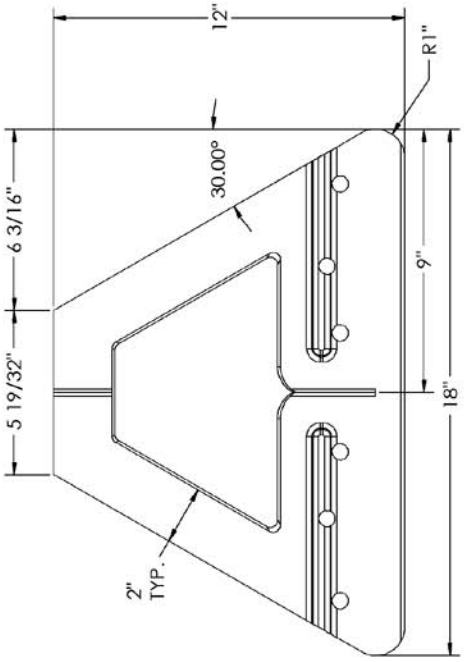
52 lbs

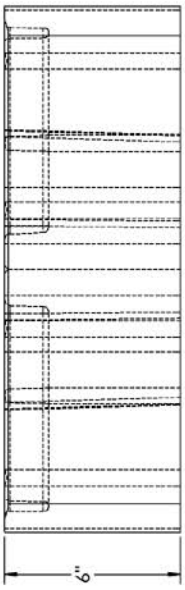




UNGER DESIGN & CONCEPT
PRODUCT ILLUSTRATION, 6" CORED
VYKING STONE
A112-0

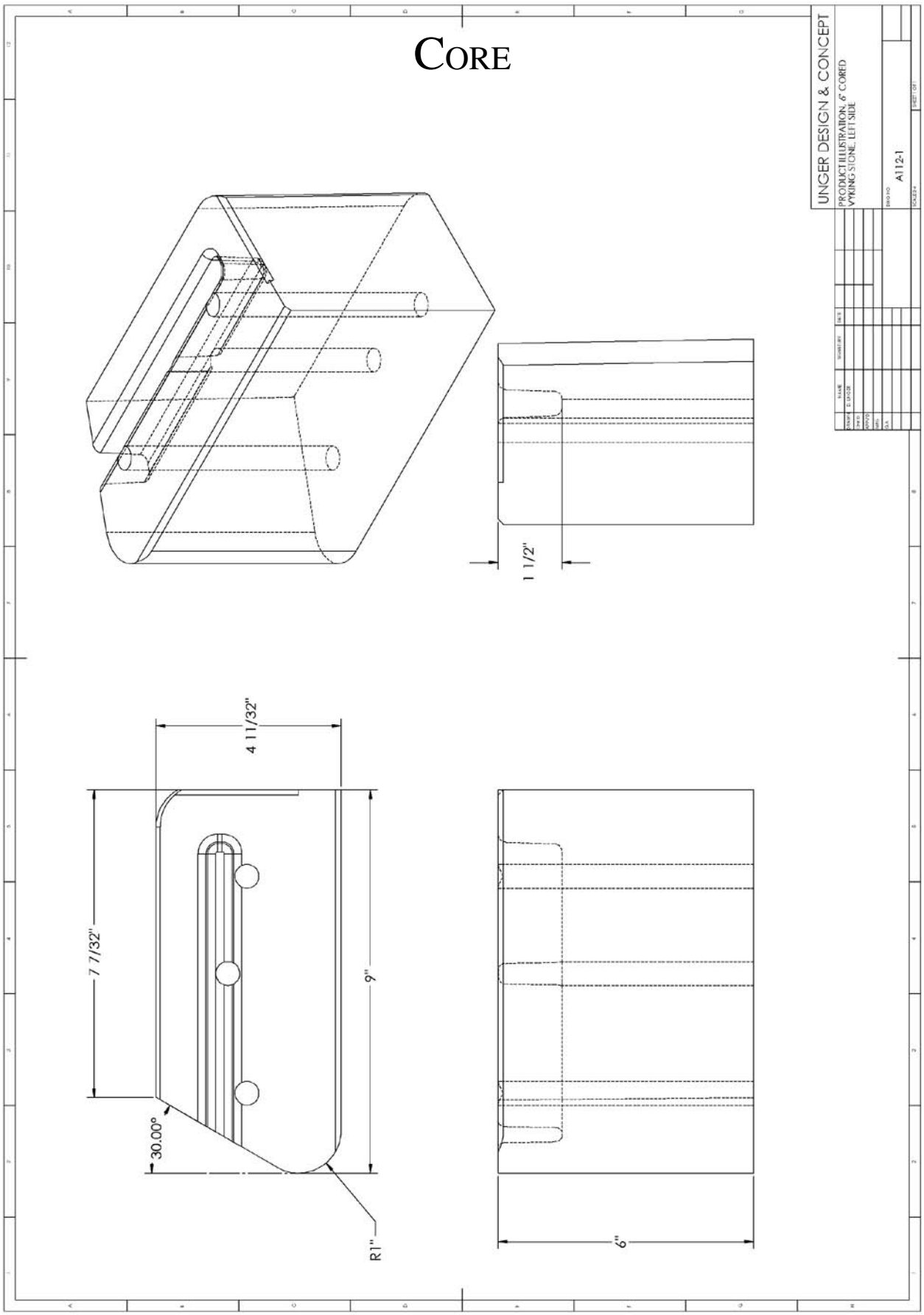
APPROX. WEIGHT 54lbs.





SPECIFICATIONS – 6" VYKING STONE

CORE



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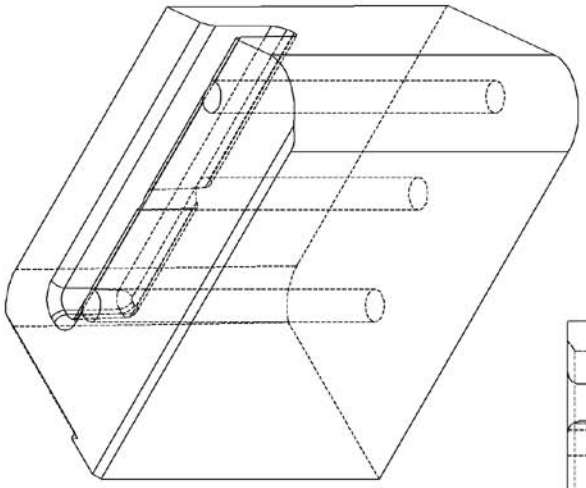
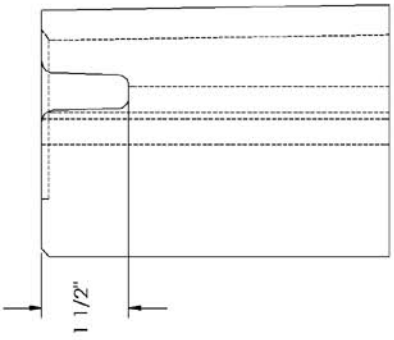
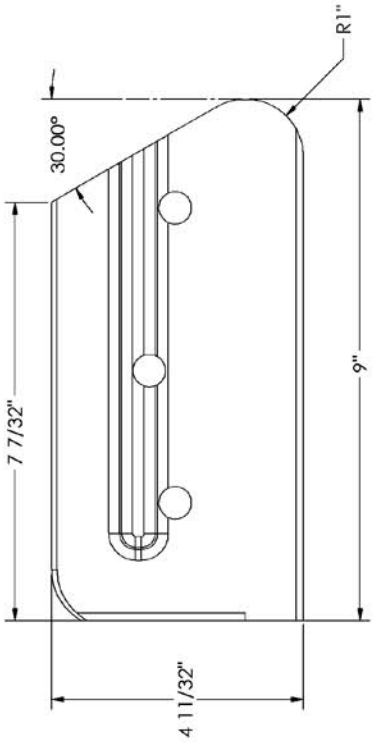
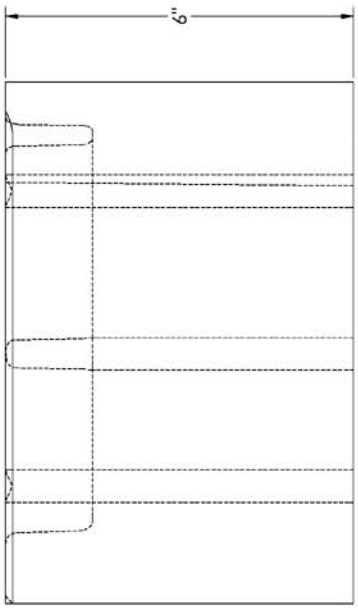








Notes

VyKing Wall Systems LLC

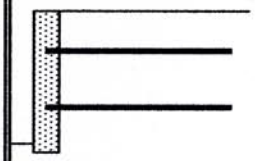
CONSTRUCTION TABLES

Notes

VyKing Wall Systems LLC

GEOGRID ESTIMATION CHART
VyKing Wall Systems, LLC

GEOGRID	SOIL CONDITIONS									
	Zone	Infill	Retained	Found.	Infill	Retained	Found.	Infill	Retained	Found.
Grid A: LTDS>1,300 lb/ft	Weight (lb/ft^3)	120	120	120	120	120	120	120	120	120
d B: LTDS>1,700 lb/ft	Weight (kN/m^3)	18.9	18.9	18.9	18.9	18.9	18.9	18.9	18.9	18.9
	Friction Angle	34°	34°	34°	30°	30°	30°	26°	26°	26°

SURCHARGE ABOVE WALL	WALL HEIGHT		# Layers		Length		# Layers		Length		# Layers		Length	
	(ft)	(m)	A	B	(ft)	(m)	A	B	(ft)	(m)	A	B	(ft)	(m)
No Loading 0 lb/sq.ft (0 kPa) 	12	3.7	6	0	7.5	2.3	5	1	8.0	2.4	5	2	10.0	3.0
	11	3.4	5	0	7.0	2.1	5	1	7.5	2.3	5	1	9.0	2.7
	10	3.0	5	0	6.0	1.8	5	0	6.5	2.0	4	1	8.0	2.4
	9	2.7	4	0	5.5	1.7	4	0	6.0	1.8	4	0	7.5	2.3
	8	2.4	4	0	5.0	1.5	4	0	5.5	1.7	4	0	6.5	2.0
	7	2.1	3	0	4.5	1.4	4	0	5.0	1.5	4	0	6.0	1.8
	6	1.8	3	0	4.0	1.2	3	0	4.0	1.2	3	0	5.0	1.5
	5	1.5	2	0	4.0	1.2	2	0	4.0	1.2	2	0	4.0	1.2
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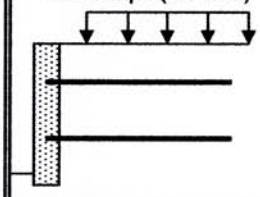
Traffic Loading 100 lb/sq.ft (4.8 kPa) 	12	3.7	6	0	8.0	2.4	5	2	8.5	2.6	4	3	10.5	3.2
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	10	3.0	5	0	6.5	2.0	5	0	7.0	2.1	4	1	8.5	2.6
	9	2.7	4	0	6.0	1.8	5	0	6.5	2.0	4	1	8.0	2.4
	8	2.4	4	0	5.5	1.7	4	0	6.0	1.8	4	0	7.0	2.1
	7	2.1	4	0	5.0	1.5	4	0	5.0	1.5	4	0	6.0	1.8
	6	1.8	3	0	4.0	1.2	4	0	4.5	1.4	4	0	5.5	1.7
	5	1.5	2	0	4.0	1.2	3	0	4.0	1.2	3	0	4.5	1.4
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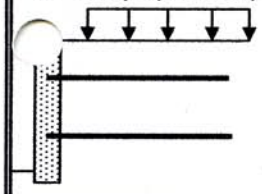
Traffic Loading 250 lb/sq.ft (12.0 kPa) 	12	3.7	5	1	8.0	2.4	5	2	9.0	2.7	5	2	11.0	3.4
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	9	2.7	5	0	6.0	1.8	4	1	7.0	2.1	4	1	8.5	2.6
	8	2.4	4	0	5.5	1.7	4	0	6.0	1.8	4	0	7.5	2.3
	7	2.1	4	0	5.0	1.5	4	0	5.5	1.7	4	0	6.5	2.0
	6	1.8	3	0	4.0	1.2	4	0	4.5	1.4	4	0	5.5	1.7
	5	1.5	2	0	4.0	1.2	3	0	4.0	1.2	3	0	4.5	1.4
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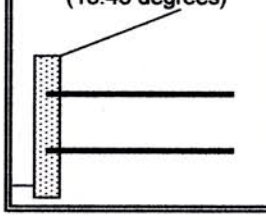
3H : 1V Slope (18.43 degrees) 	12	3.7	5	1	8.5	2.6	5	2	10.5	3.2	5	3	13.0	4.0
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	10	3.0	5	0	7.0	2.1	4	1	9.0	2.7	5	1	10.5	3.2
	9	2.7	5	0	6.5	2.0	4	1	8.0	2.4	5	0	9.5	2.9
	8	2.4	4	0	6.0	1.8	4	0	7.0	2.1	4	0	8.5	2.6
	7	2.1	4	0	5.0	1.5	4	0	6.5	2.0	4	0	7.5	2.3
	6	1.8	3	0	4.5	1.4	3	0	5.5	1.7	3	0	6.5	2.0
	5	1.5	2	0	4.0	1.2	2	0	4.5	1.4	2	0	5.5	1.7
	4	1.2	2	0	4.0	1.2	2	0	4.0	1.2	2	0	4.5	1.4

Notes:

1. Geogrid lengths are approximate for the soil conditions and surcharges as noted.
2. Global stability is site specific and is not accounted for in the geogrid estimation chart.
3. Minimum Factor of Safety for:

External Stability	Internal Stability
Sliding = 1.5	Geogrid Rupture = 1.5
Overturning = 2.0	Pullout = 1.5
Bearing Capacity = 2.0	Connection = 1.5

3. Vertical spacing between successive geogrid layers shall not exceed 2.0 feet.
4. This design chart is intended for preliminary design purposes only. Final designs must be carried out by registered professional engineer familiar with reinforced soil wall design, site and soil conditions.
5. Acceptable geogrid products related to Geogrid A and Geogrid B.

Geogrid A	Geogrid B
Fortrac 35/20	Fortrac 55/30
Miragrid 3XT	Miragrid 5XT
Synteen SF35	Synteen SF55

Notes

VyKing Wall Systems LLC

VyKing Hex Column

Hexagonal Column

VyKing Solid stones can be used to make a massive hexagonal column for drive entries and other locations.

Build a footing using concrete or highly compacted 3/8 inch aggregate, 4 inches to 6 inches thick. Dig below grade approximately 8 inches to install the footing leaving the top of the compacted footing a minimum of 2 inches or 3 inches below grade. If the soil at the bottom of the dig-out is not solid dig to virgin or highly compacted soil before building the footing. Additional compaction or a thicker footing may be required in these cases. The top of the footing must be level in all directions before VyKing stones are set.

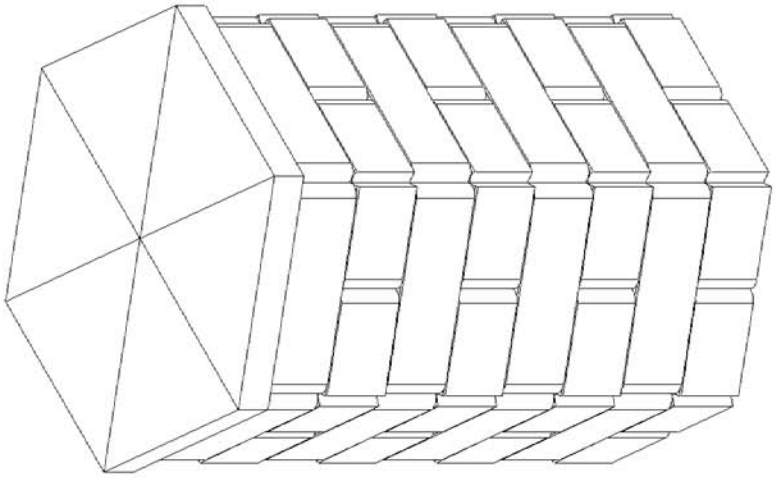
Two layers of VyKing Solid stones are alternated to build a massive hexagonal column. The two layers are shown on the following pages. The solid layer should always be the base or first layer. Layer two will require two steps. First, split a VyKing stone into two halves along the center split groove. Second, cut each half stone with a concrete saw along the 30 degree groove. Place the cut stones as shown in layer two on the drawings that follow. Side glue all stones with paver grade adhesive. Precast hexagonal cap stones are available through the VyKing dealers.

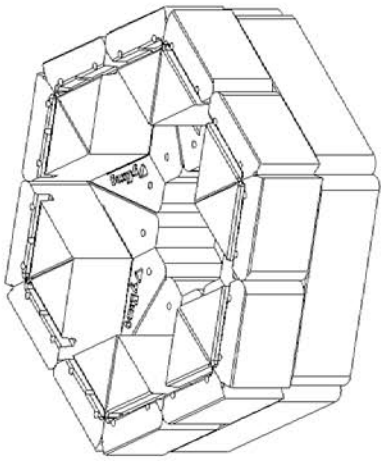
Square Columns

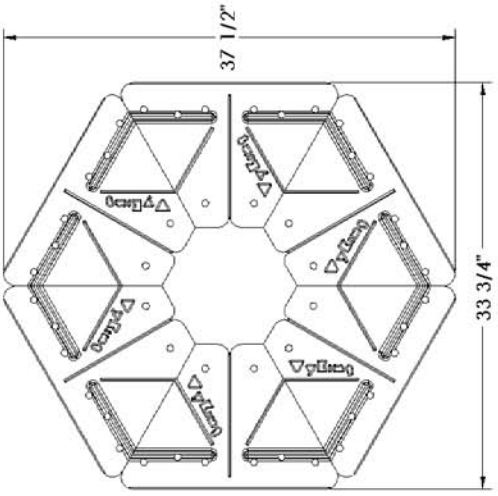
Square VyKing columns of various dimensions can be built with either the VyKing solid or the VyKing core units. The following pages give installation drawings. Footing construction should follow the directions given for hexagonal columns.

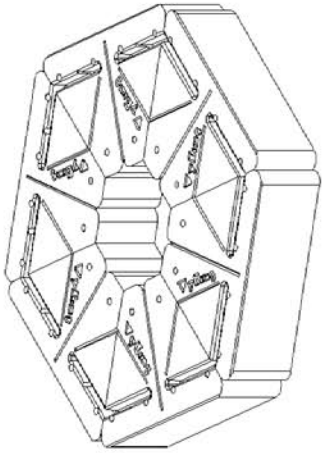
Notes

VyKing Hex Column









THIS DRAWING IS FOR EXAMPLE ONLY

USE RETAINING WALL ADHESIVE ON ALL STONES

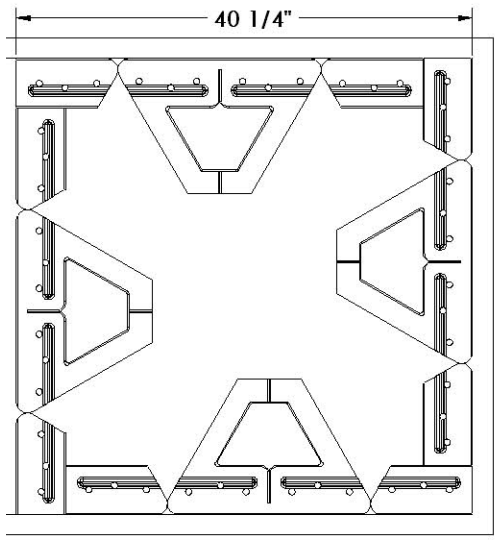
USE DRAWINGS A102-0 SPLIT STONES

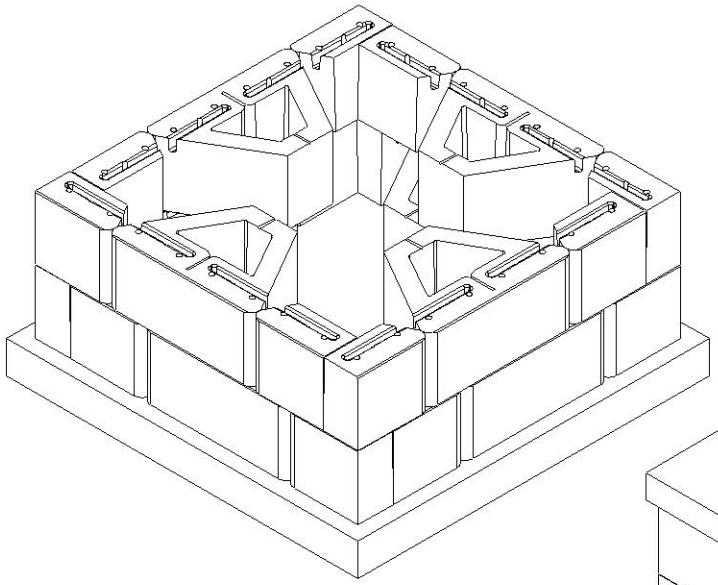
UNGER DESIGN & CONCEPT

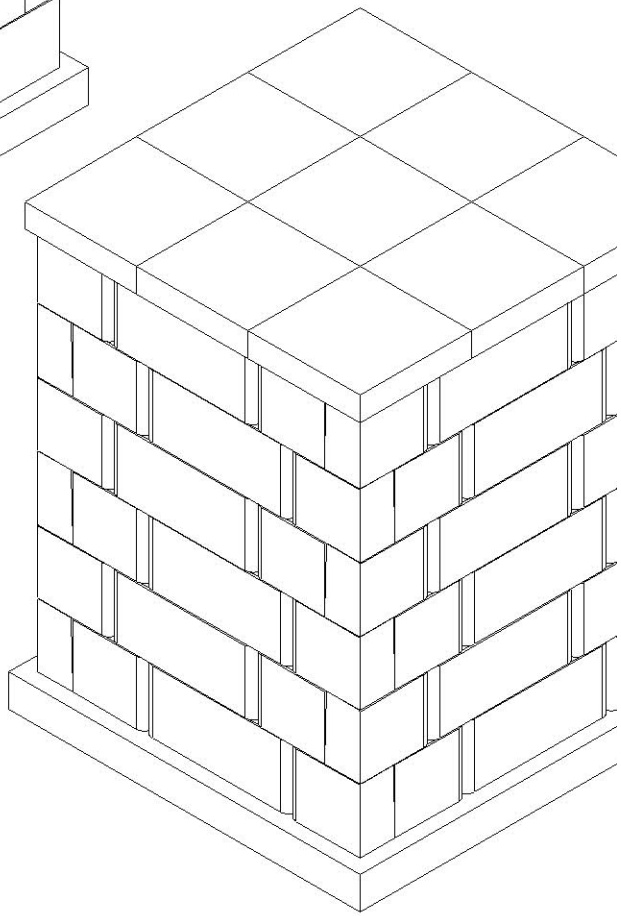
PRODUCT LAYOUT, 6" VYKING STONE
HEXAGON COLUMN

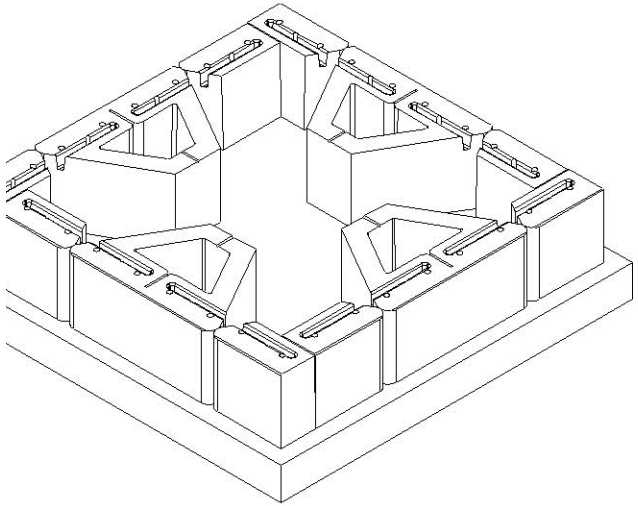
A97.0

VyKing Large Square Column – Core Stone









THIS DRAWING IS FOR EXAMPLE ONLY

USE RETAINING WALL ADHESIVE ON ALL STONES

4" MIN. CONCRETE SLAB TO BE USED UNDER STONES FOR SUPPORT

USE DRAWINGS A114-0 FULL STONE & A114-1 & A114-2 SPLIT STONES

	NAME	SIGNATURE	DATE		
DRAWN	D. UNGER				
CHKD					
APPVD					
MFG					
Q.A.					

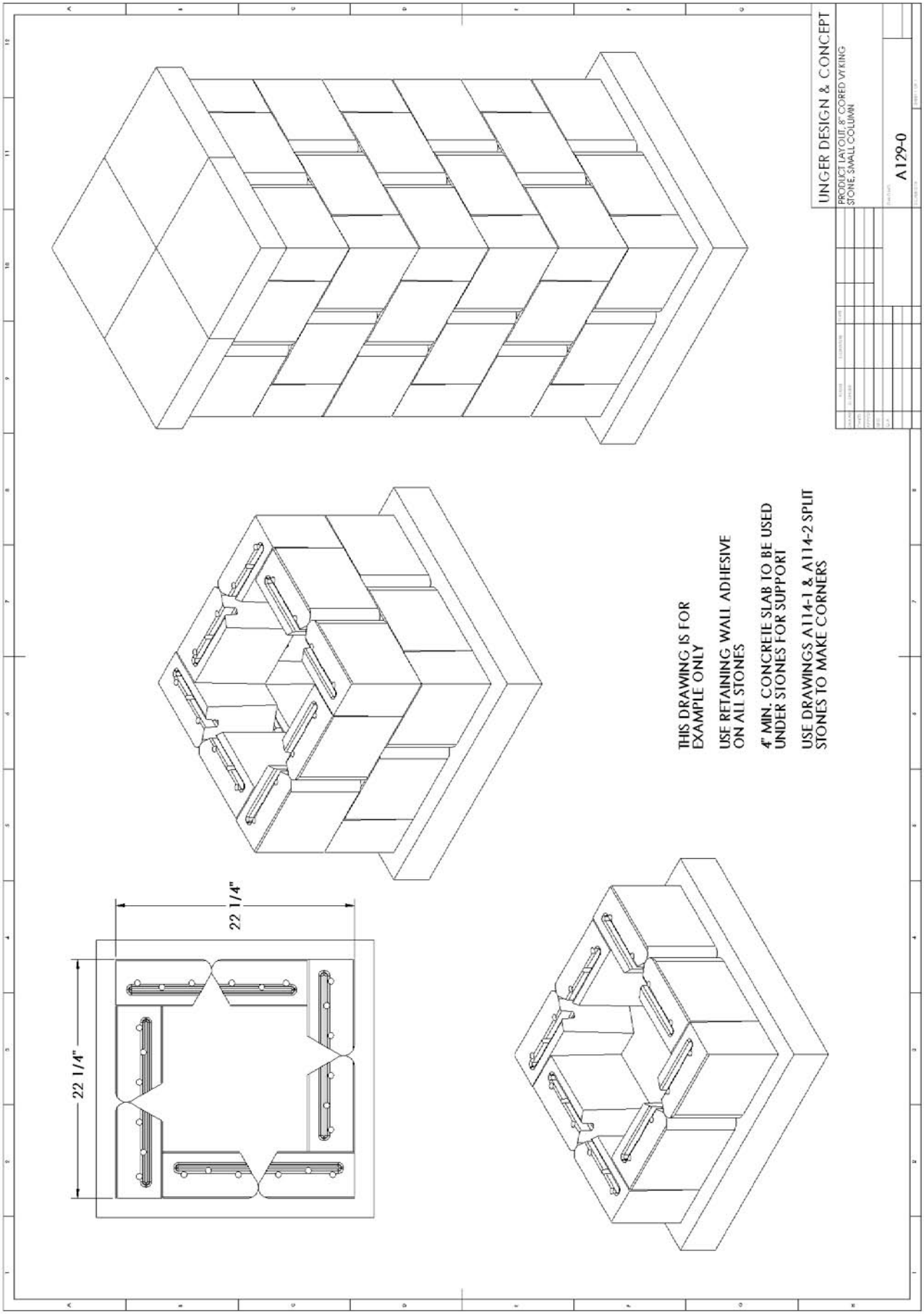
UNGER DESIGN &

PRODUCT LAYOUT, 8" CORE STONE, LARGE COLUMN

DWG NO: A120-0

VyKing Wall Systems LLC

VyKing Small Sqaure Column – Core Stone



VyKing Wall Systems LLC

SRW Terms & Glossary

Notes

SRW TERMS AND GLOSSARY

Batter The angle created by the VyKing unit's setback, measured from a vertical line drawn from the toe of the front of the SRW.

Drain Rock Rock placed within VyKing cores and immediately behind the VyKing stones and in any other areas for drainage.

Drainage Composite A water collection system, usually consisting of dimpled plastic with a geotextile fabric to prevent soil clogging. This system is used to collect water behind the drain rock, from the select soil in the reinforced zone or from under the SRW system.

Foundation Soil The soil that supports the compacted aggregate and the SRW face units.

Geogrid Synthetic material formed in a grid like structure and used to reinforce soil in the select soil zone.

Geosynthetic Generic term used to describe geogrids and other reinforcement material such as fabrics, drainage composites and erosion control mats.

Geotextile A textile-like material used in soil drainage and reinforcement applications.

Global Stability The resistance to overall movement of the SRW system in a circular mode.

HDPE High Density Polyethylene. The material used to manufacture drain pipe or tubes and coat geogrid fibers.

Infill Select soil located behind the VyKing units and drainage fill. May be reinforced with soil reinforcement (geogrid).

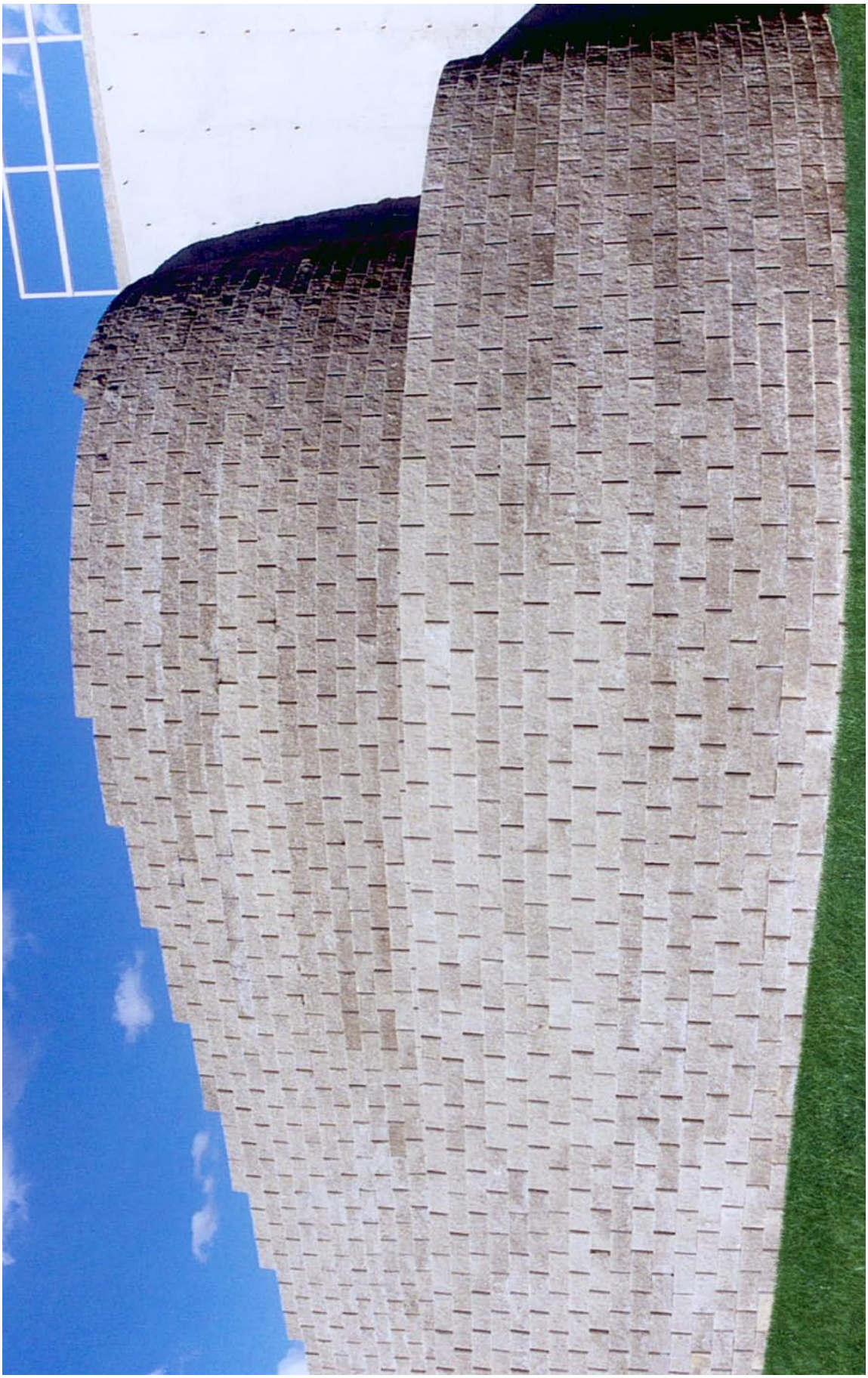
Leveling Pad The level surface (gravel or concrete) used to distribute the weight of the dry-stacked column of VyKing units over a wider foundation area and to provide a working surface during construction. The pad is typically constructed with free draining granular soil to facilitate compaction and drainage.

Long Term Design Strength	The allowable strength in the soil reinforcement at the end of the service life of the soil-reinforced VyKing retaining wall. It is the maximum load that the reinforcement can carry and is taken into account in the design process.
MSE	Mechanically Stabilized Earth. Soil reinforced Segmental Retaining Walls are considered MSE structures.
Overturning	An external stability failure of a SRW whereby lateral external forces cause the entire reinforced soil mass to rotate about the base.
Permeable	The ability of a fluid to pass through a material (soil or aggregate).
Phi Angle	Describes the internal friction angle of strength of a particular soil material. Usually expressed in degrees.
Proctor (density)	A method used to determine the compaction or density of soil materials.
PVC	Polyvinyl Chloride. Usually refers to the material used to manufacture drain pipe.
Reinforced Soil Zone	The area of a soil-reinforced SRW which contains the soil reinforcement.
Sliding	An external stability failure of a SRW whereby lateral external forces cause the entire soil mass to slide forward along its base or internally along a particular layer of soil reinforcement.
Soil-Reinforced	A SRW which uses soil reinforcement to increase the mass of the SRW. Thereby increasing stability.
Surcharge	External load, usually applied at the top of a SRW. A roadway or building foundation can be a surcharge.
Swale	A small ditch or depression formed on top and behind the SRW system to collect water and carry the water away.

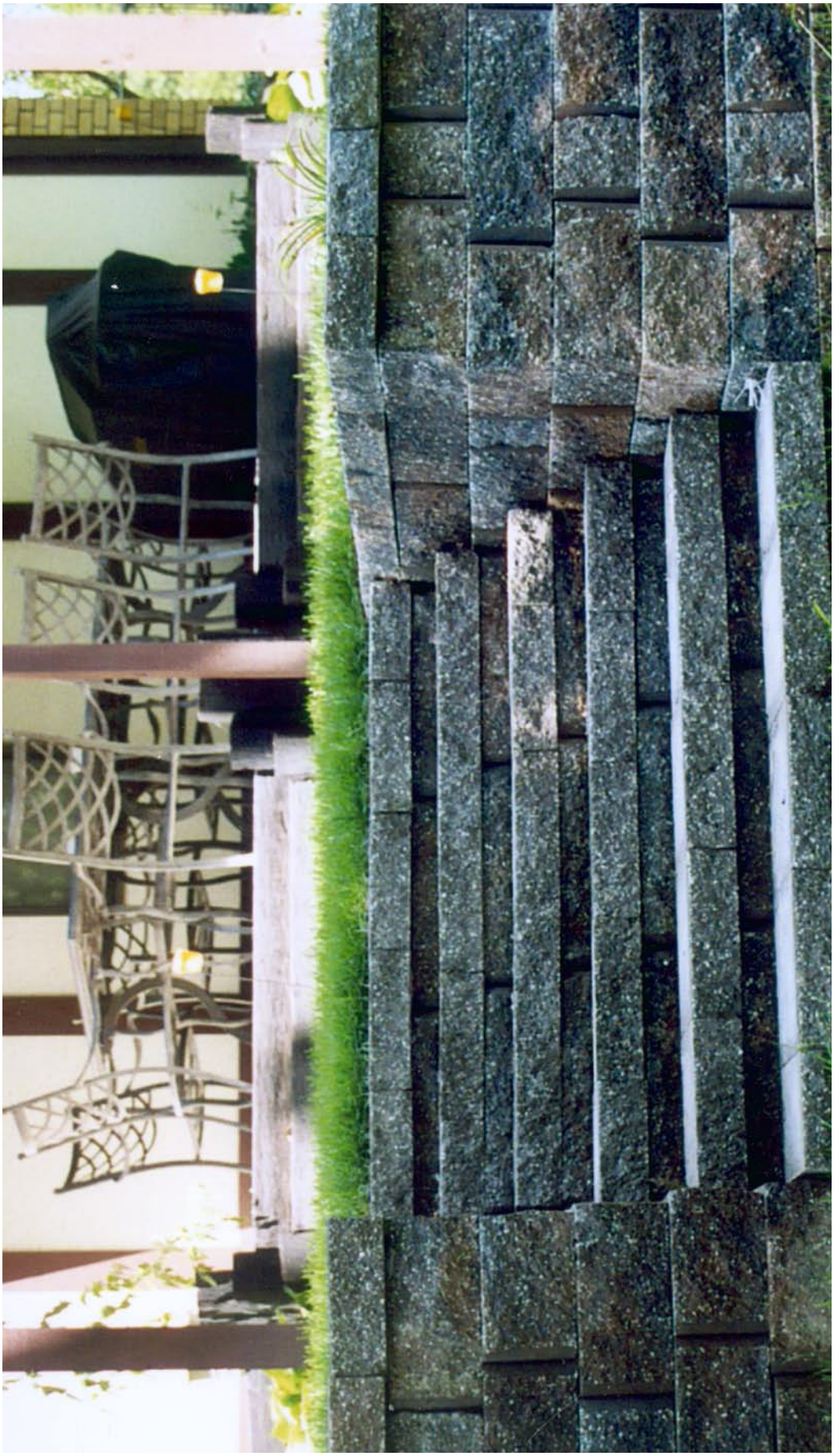
VyKing Wall Systems LLC

VyKing Installations

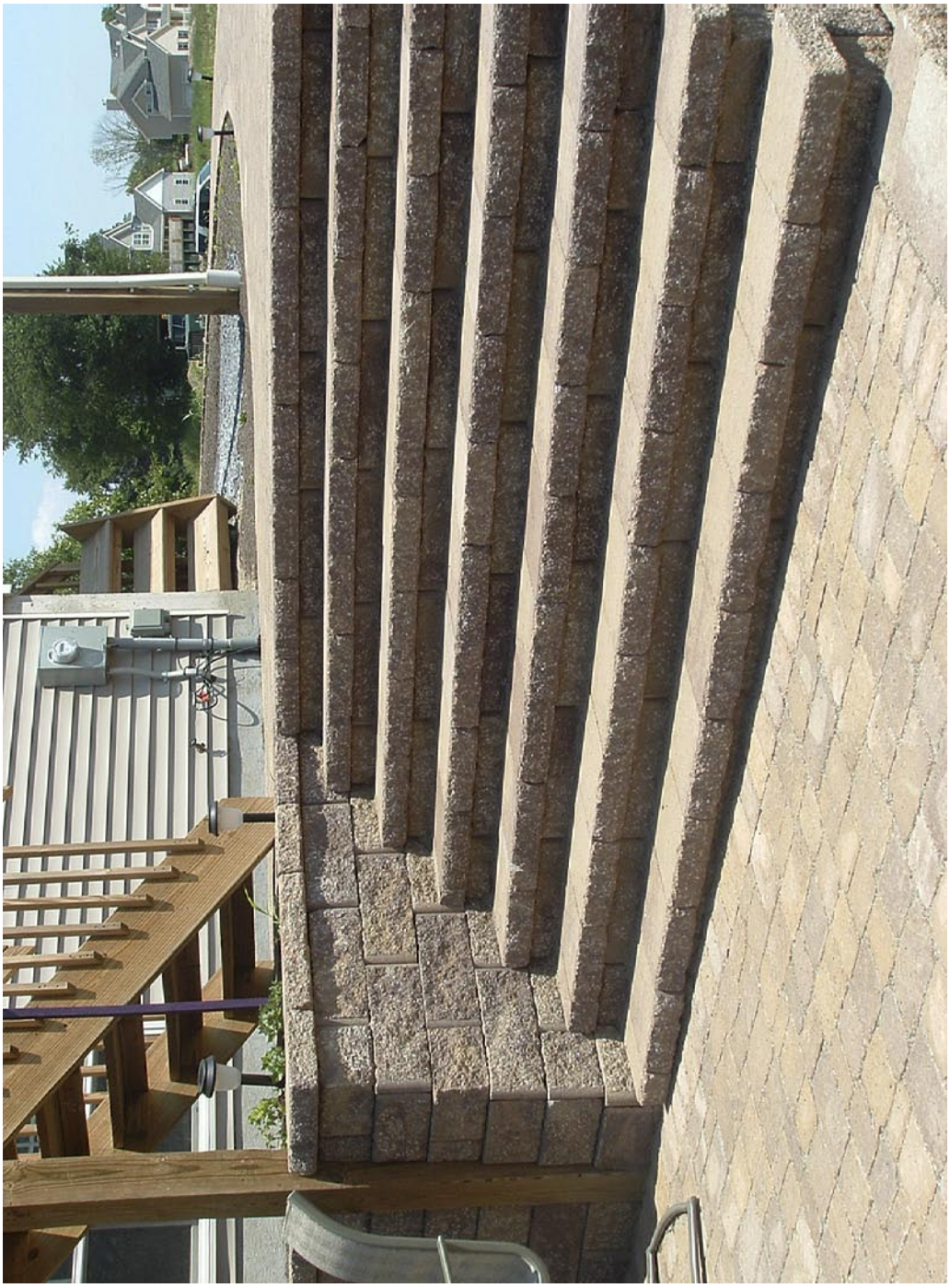
Notes



VyKing Installations



VyKing Installations



VyKing Installations

VyKing Installations

VyKing

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www.vyking.net