Particular Concepts™

Anatomy

(& Utility)

Of a Hill

By Elsie Spry

Education
Engineering
Licensing

contact@particularconcepts.org
http://particularconcepts.org
http://particularconcepts.com

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Introduction

The following are concept explanations of Particular Concepts™ technologies:

- The Particular Valve™ -- for precise particulate control
- The Particular Wall™ -- for a stable and cost-effective retaining wall
- The Particular Blanket™ -- for beach/bank/channel stabilization, maintenance, and buildup.

The above listed patented technologies are cumulative. They also are a major shift from traditional approaches -- and eliminate some engineering concerns such as rotation. The Particular Technologies™ are:

- Simpler
- More effective
- Less costly

As the following explanations and illustrations show, the technology tool base is... a hill.

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Contents

Anatomy of a Hill

Don't be fooled by its familiar simplicity -- A hill's structure is unique -- and powerful. Without the qualities of a hill, the natural world would be flat; interrupted only by solid rock formations. Earth particulates -- gravel, silt, loam, clay, sand, etc. -- make up most hills. Hills are made of solid *particles*. They are made of solid *particulate*. What is unique about particulate is that it flows like water -- but water does not pile. Dry sand and water both pour out of a pitcher. Only the sand makes a pile -- or hill.

Why a hill? -- The particles in a hill act against each other due to the friction between their surfaces. The more friction between the particles, the more they push each other, and the higher their hillside slopes. This slope is a particulate's *angle-of-repose*.

Angles-of-Repose are unique -- A piece of gravel is not as round as a grain of dry sand. Gravel does not roll/flow as much as dry sand. Pieces of gravel push/roll/flow against each other to form a steeper hillside -- a higher angle-of-repose. Grains of dry sand push/roll/flow against each other to form a gentler hillside -- a lower angle-of-repose.

Pile of Gravel

Pile of Dry Sand

Angles-of-Repose are constant -- Particulate in a hill flows down the hillside when you add more to the hill. The particulate flows down to fill the hole when you scoop out part of the hillside. In both cases, the particulate piles -- or stops -- when it reaches its natural angle-of-repose -- again. Its "desire" to be at its natural angle-of-repose is unchanging. In some cases, water or other factors can change the particulate's angle of repose to a new "desire". This new "goal" is then an anticipated design constant.

The proof is in the sandbox -- When we add dry sand to our hill, the dry sand slides down the side of the pile. When we dig away or under our hill, the dry sand pile falls into the hole we made. We observe the same outcomes when we witness a landslide or the erosion of a riverbank.

Particular Concepts™ -- The Patented Particular Concepts™ use the unique power of a hill as powerful technology. Designing for angle-of-repose controls when particulates flow (or "GO"), when particulates pile (or "STOP), and when they can move or retain other objects -- or other particulates.

Utility of a Hill 1:
A Particular Valve™ Summary

GB2441073 -- US7341399 -- NZ563219

The Particular Valve™ is the basic building block of the Particular Wall™ and the Particular Blanket™.

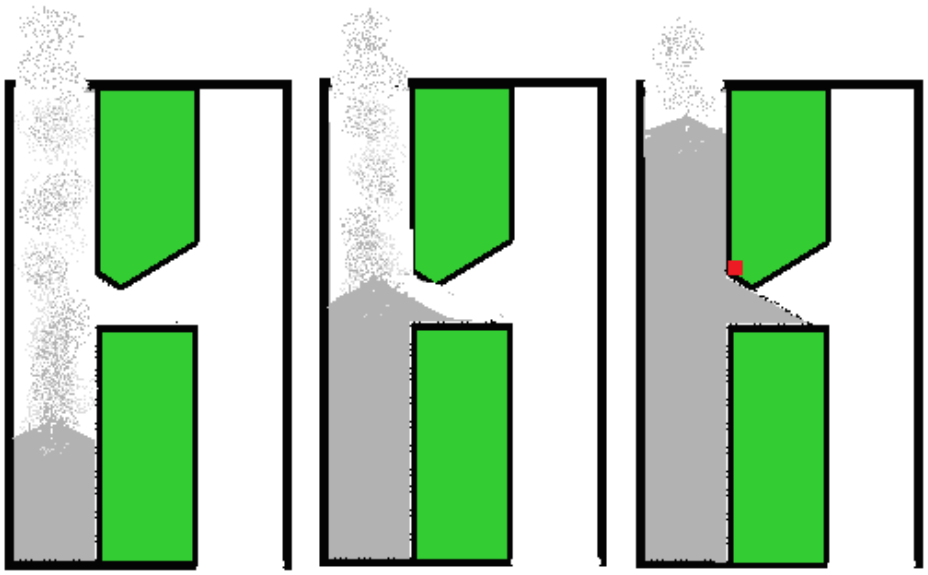
By measuring the angle-of-repose of the particulate you want to control, you can design a permanent, stationary valve to either “Stop” or “Go” a particulate:

- When designed NOT TO support the particulate’s unique angle-of-repose, it is a “GO” valve.
- When designed TO support the particulate’s angle-of-repose, it is a “STOP” valve.

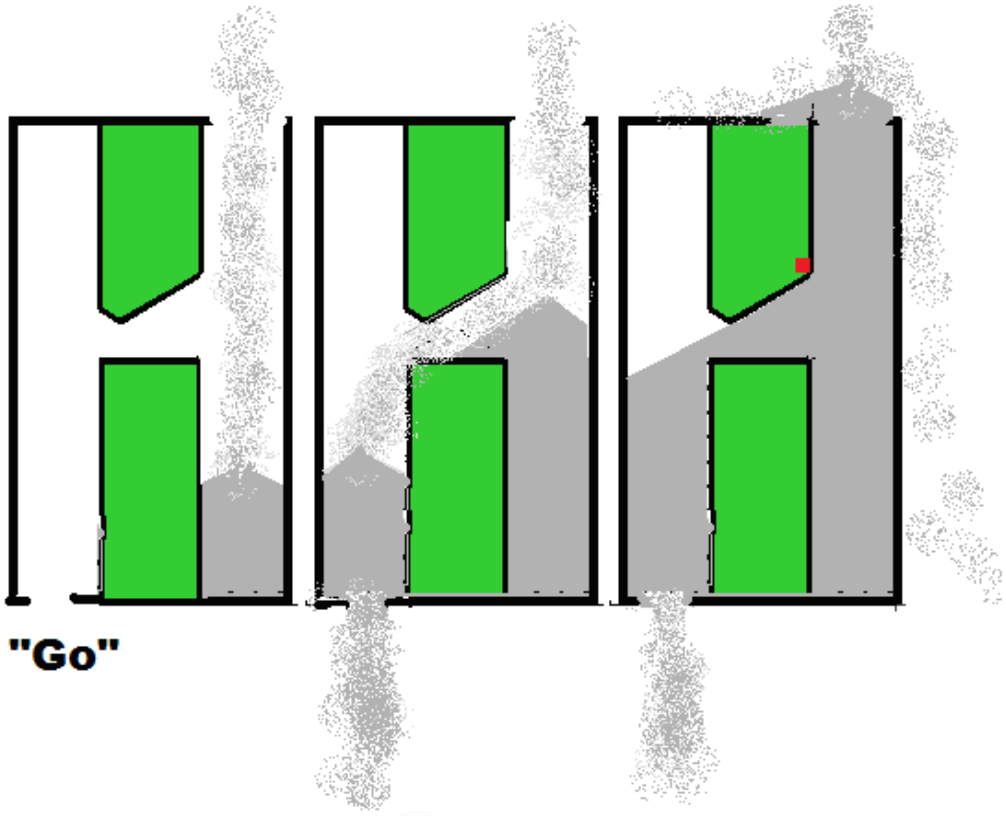
It can mix pharmaceutical powders, control grain storage, and contain road salt.

It also makes a nifty hourglass...

“STOP” and “GO” Diagram



"Stop"



"Go"

Note the red dots (■) for each application.

This is where the angle-of-repose STARTS!

Particular Wall™ technology is as powerful as a landslide -- without the ill effects.

The Particular Wall™ applies the inherent gravitational forces of particulate -- earth, gravel, shell, etc. -- against itself, through the properties of angle-of-repose. Civil Engineers familiar with the forces of particulates (quantified by William McQuorn Rankine) will recognize the motive-turned-retentive applications:

- Eliminating wall rotation
- Stabilizing slopes longer under more circumstances (including soil liquefaction).

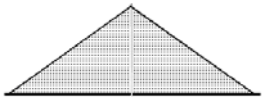
By choosing the particulate used -- either by trucking it in or designing the wall for the economically preferred on-site particulate -- the Particular Wall™ eliminates much of the guesswork when building a traditional retaining wall. With or without heavy mass or intensive earth conditioning, the Particular Wall™ reduces on- and off-site costs. Since the Particular Wall™ structure is more stable BECAUSE of the “holes” it has, it reduces both material and trucking costs (holes do not cost anything to make or haul). Standard earth compaction practices are unnecessary -- for either cost or stability. However, in applications where the Particular Wall™ is used with compacted earth, it will safeguard the system when -- in the future -- the earth un-compacts, increasing the “life” of an otherwise traditional approach.

In addition, a Particular Wall™ can be engineered to have a “forever” steep slope (79 º degrees with a fill angle-of-repose/dfa of 30º) -- or small baffle (11º with a fill angle-of-repose/dfa of 30º).

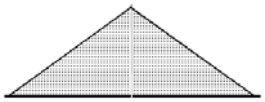
With an increased Stability Factor (SF), no rotation, and at least 40% material savings, retaining walls would benefit from this new technology.

Sandbox Piles

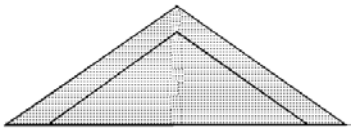
Regular



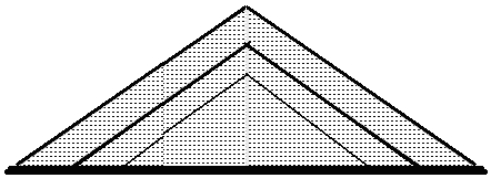
A Pile



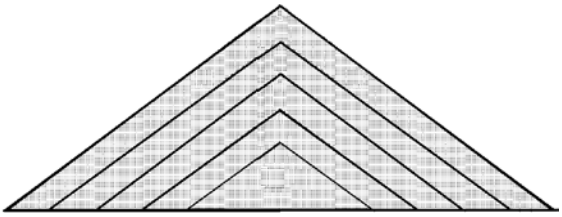
A Pile



Bigger Pile

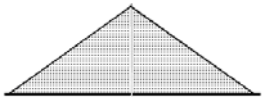


Bigger Bigger Pile

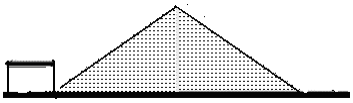


Bigger Bigger Bigger Bigger Pile

Particular Concepts™

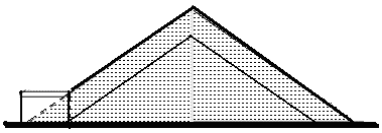


A Pile



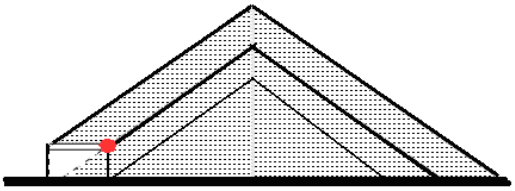
A Pile

With a “Step”



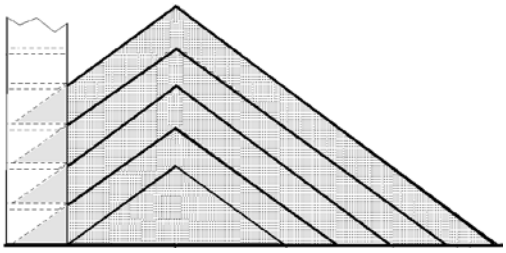
Bigger Pile

With a “Step”



Bigger Bigger Pile

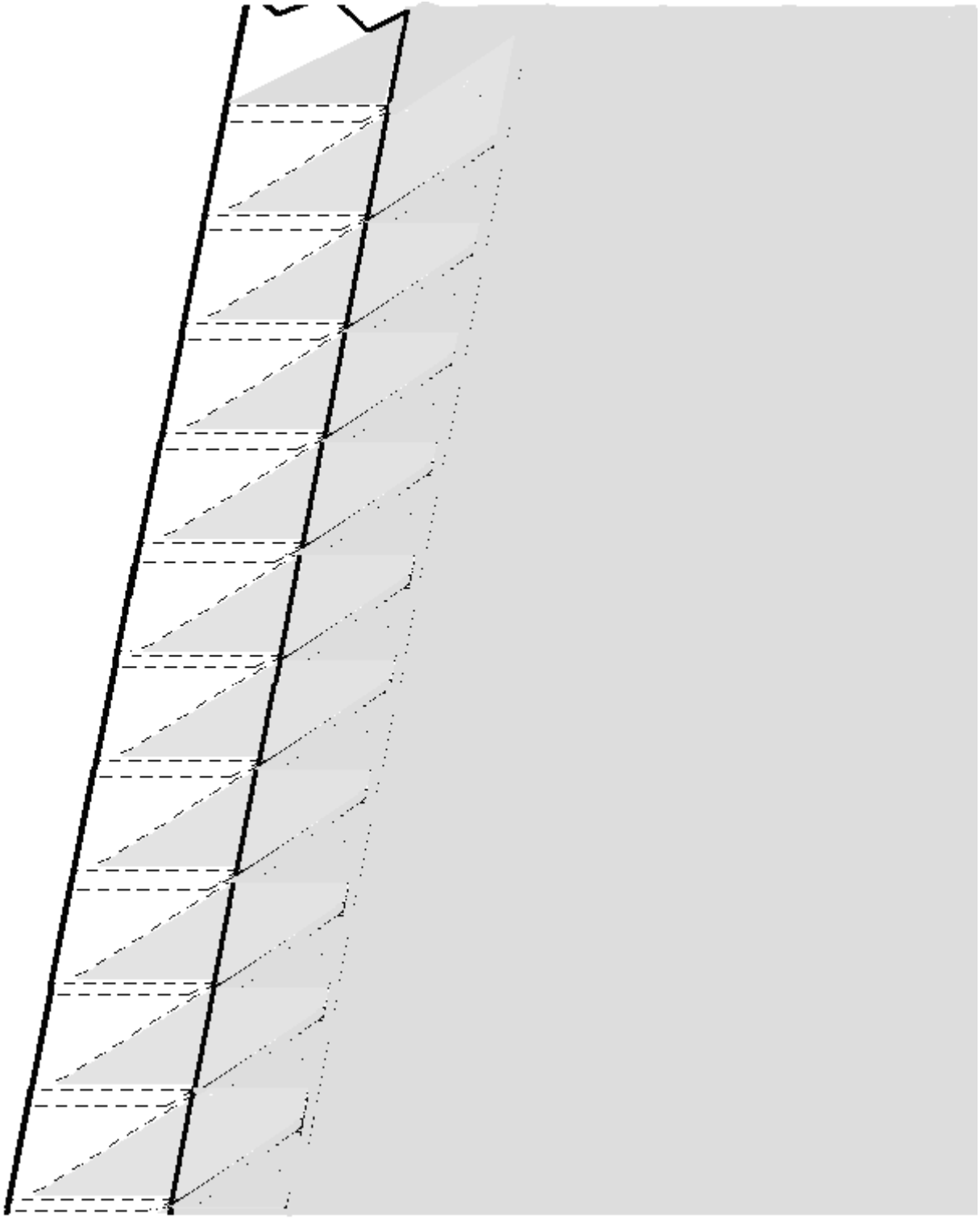
With a Particular Valve™*



Bigger Bigger Bigger Bigger Pile

With a Particular Wall™

REALLY BIG PILE -- (almost forever) Particular Wall™



With the Particular Wall™ Slanted at 11º for angle-of-repose/dfa = 30º

Particular Wall™ (Short Engineering Explanation)

#1 -- A stable "Particular Pile" -- made up of flowable, loose particulate -- at rest at its natural angle of repose.

#2 -- The same pile, with an added layer of particulate. The new layer has the same angle of repose.

#3 -- Same pile, with a "step". The particulate is seen through the "step" supports --  -- at its angle of repose.

#4 -- New layer is stable at its angle of repose. The "step" is the patented Particular Valve™*.

Note: The Right Upper Edge of the Particular Valve™ precisely sets the point where the angle of repose of the first layer starts* (●)

#5 -- The Particular Valve™* is one unit of the patented Particular Wall™**. The Particular Wall™** retains and controls all layers.

NOTE: The top Particular Valves™ -- when left open -- will "catch" and control any future additions (such as landslides).*

#6 -- The Particular Wall™** retains the particulate (R), and the soil behind it.

Density of (R) = or > Density of SOIL

NOTE: Force is even along the wall height, minimizing rotation. Center of gravity (cg) is right of center, due to the weight of particulate.

#7 -- The Particular Valve™ Resultant Force Vector (dotted arrow) must fall within the base.

*Note: "Baffling" -- 11º for particulate with 30º angle-of-repose/**dfa** --* assures an infinitely high stable wall (with gravity).

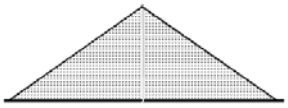
"Infinite" Baffle Angle Tangent =

((1-SIN(RADIANS(dfa)))/ (1+SIN(RADIANS(dfa))))

÷

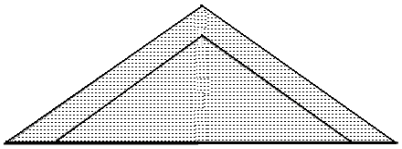
(1/(TAN(RADIANS(dfa))))

#1



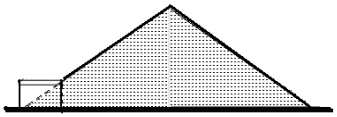
A Pile

#2



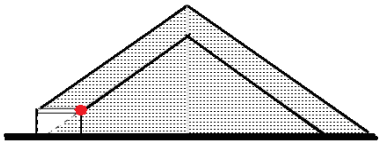
A Bigger Pile (with new layer).

#3



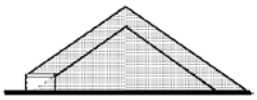
A Pile with a "Step"

#4.

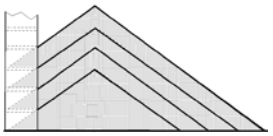


A Bigger Pile with Particular Valve™* (new layer held up)

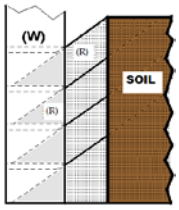
#5



The Particular Valve™ is one unit of the Particular Wall™

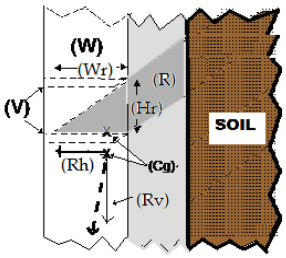


The Particular Wall™ Retains all layers at their angles of repose**



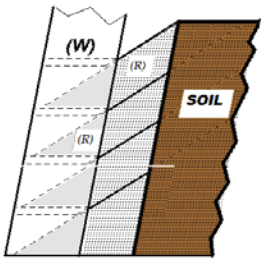
#6

Particular Wall ™** Retains the Particulate (R) and Soil.



#7

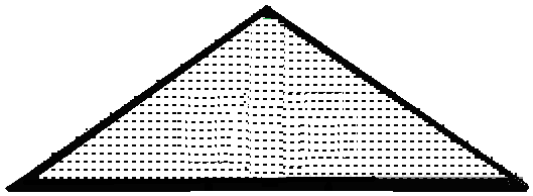
Particular Valve™* Force Diagram



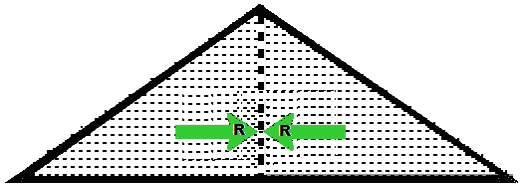
"Infinite" Baffle 11 º

Physics of a Hill

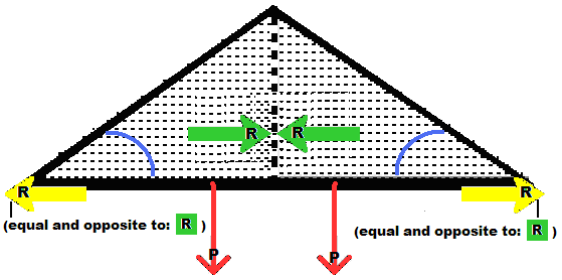
A Hill



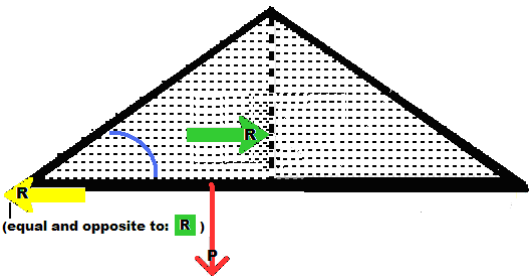
Forces Within a Hill



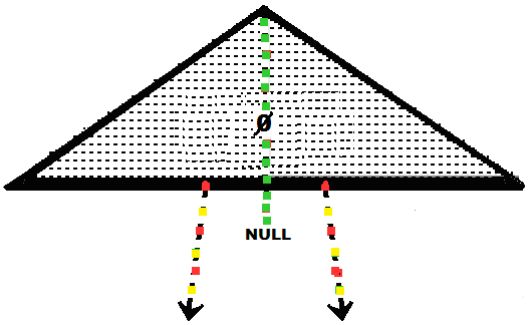
Within a Hill Entire



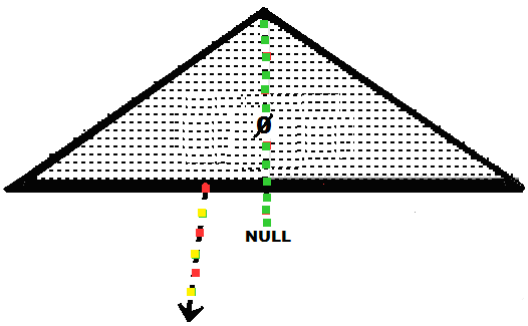
Within ONE Side of a Hill Entire



Resultant Vectors Within a Hill



Resultant Vectors Within ONE Side of a Hill



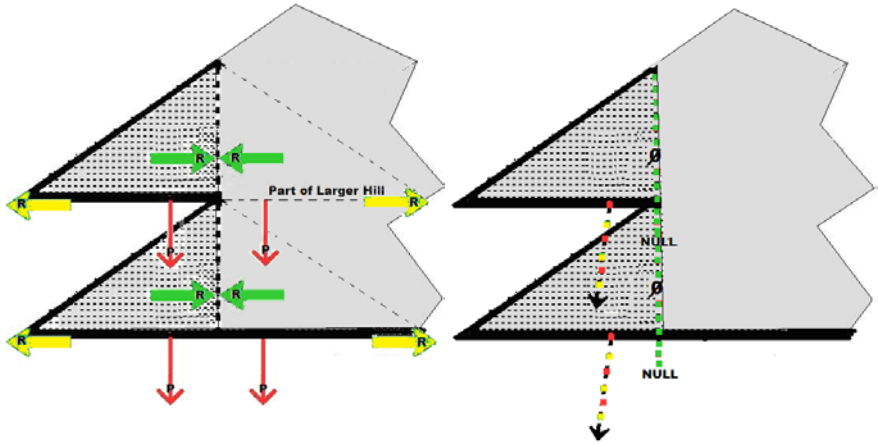
R = Rankine Force

R = Equal and Opposite Rankine Force (Sir Isaac Newton)

P = Particulate Weight

Null / Ø = Balance of Rankine Forces

= Angle-of-Repose



Note: No Rotation beyond single valves

IF

SF is the Stability Factor, equaling :

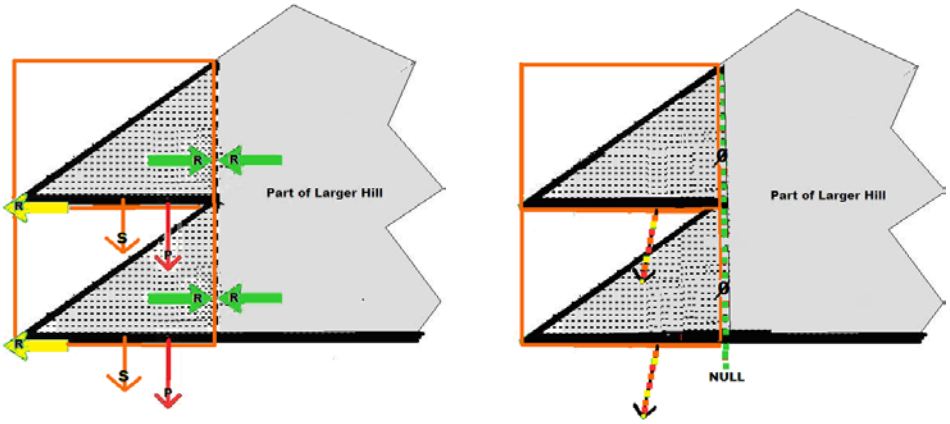
Total Force of the "Hills"

Total Force AGAINST the "Hills" from the "Retained Part of Larger Hill"

THEN

SF for the above diagram with Imaginary Free Floating hills is:

$$SF = \frac{R + P^*}{R}$$



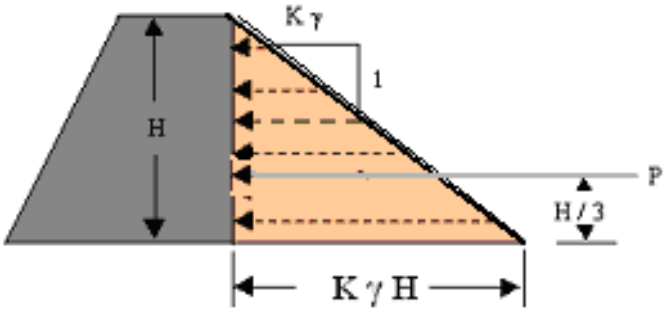
SF for the above diagram with Structure-Supported hills:

$$SF = \frac{R + S + P^*}{R}$$

(material cost is minimum 40% of a traditional wall -- due to less concrete used)

* Refer to proprietary spread sheet results (standard SF required is 1.5)

Rotation -- Traditional Wall vs. Particular Wall™

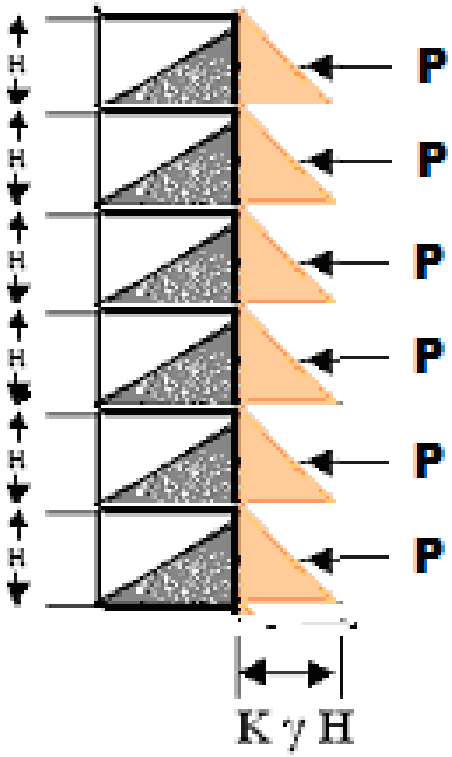


$$P = \frac{H * K\gamma H}{2}$$

$$P = \frac{K H^2 \gamma}{2}$$

$$K = \frac{2P}{H^2 \gamma}$$

Traditional Evaluation



$$P = \frac{H * K\gamma H}{2}$$

$$P = \frac{K H^2 \gamma}{2}$$

$$K = \frac{2P}{H^2 \gamma}$$

(P at H/3 for each valve)

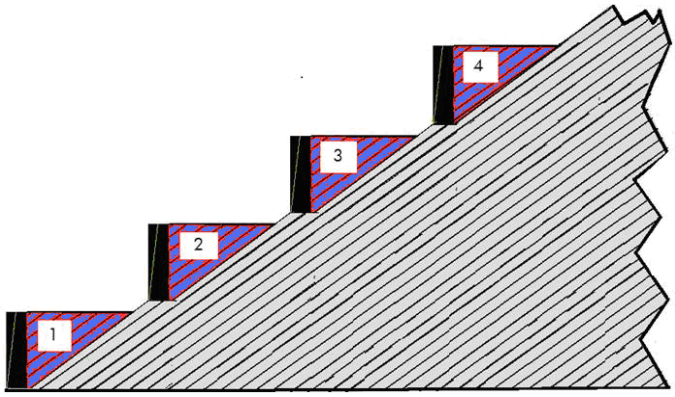
Particular Wall™ Evaluation

No increase of loads due to depth, so NO rotation.

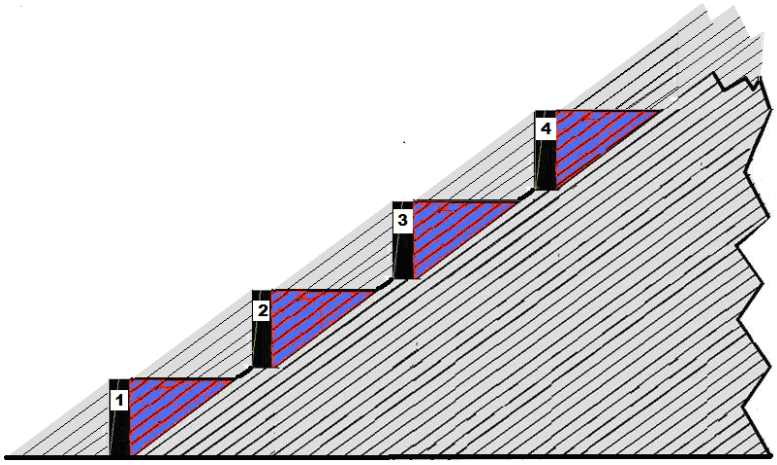
Can You Imagine No Rotation?

IS it challenging to imagine loads NOT Increasing with depth?

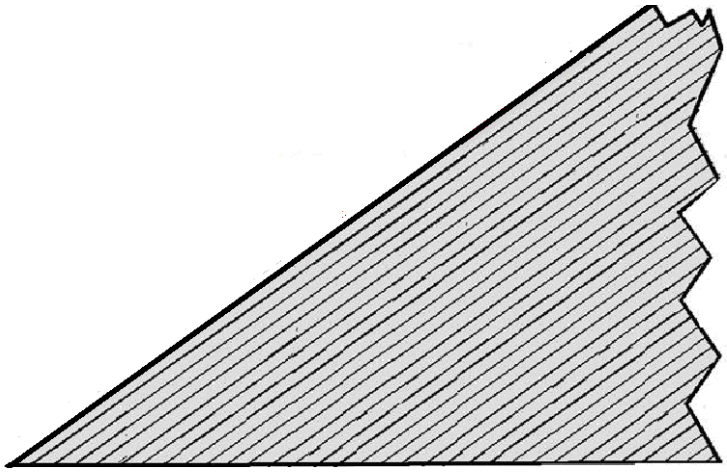
Would a civil engineer analyze loads on these four terraced traditional walls differently, based on depth? In other words, would there be a greater load for Wall 1, and progressively lesser loads for Walls 2 - 4?



Again, would a civil engineer analyze the loads on these traditional four walls on a hill differently, based on depth? In other words, would there be a greater load for Wall 1, and progressively lesser loads for Walls 2 - 4?

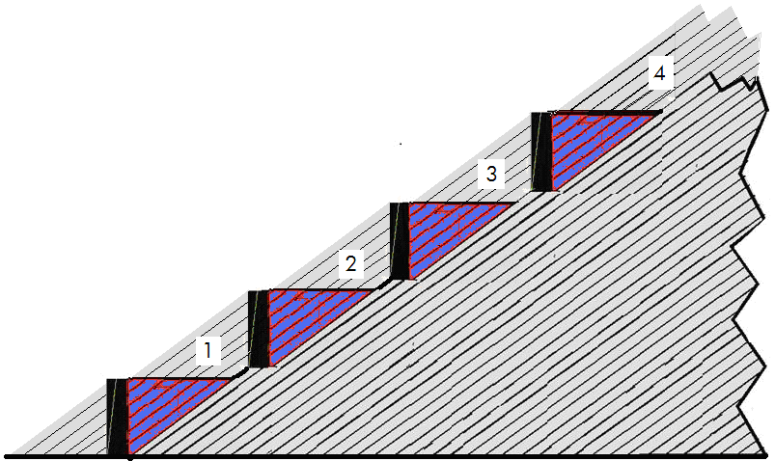


How would a civil engineer analyze the loads in this slope?

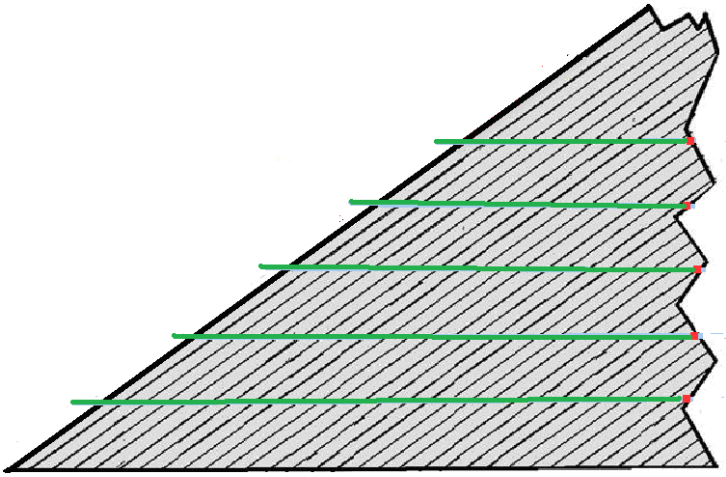


?

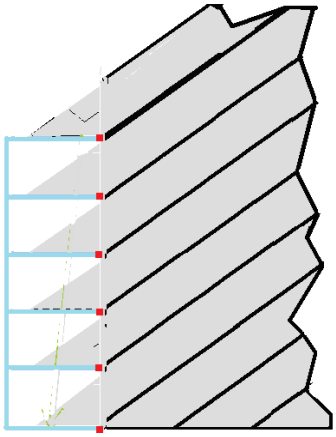
Would a civil engineer analyze the loads in this hill differently, based on depth? In other words, would there be a greater force of Slope 1, and progressively lesser forces for Slopes 2 - 4?



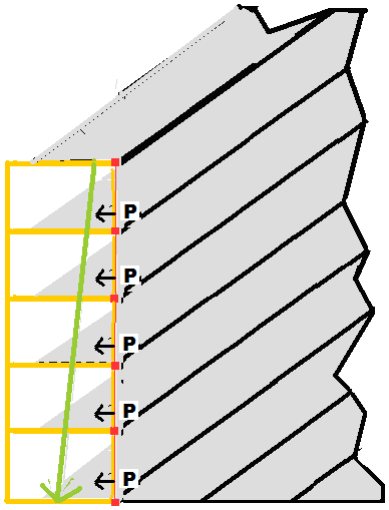
How would a civil engineer analyze the loads on the plates (or MSE/GRS Layers) in this hill?



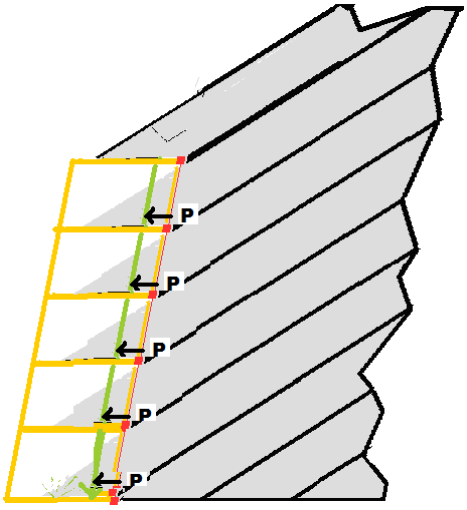
How would you analyze the loads on the Particular Valves™ in this hill?



Could you analyze the loads on the supported valves in a Particular Wall™ this way?



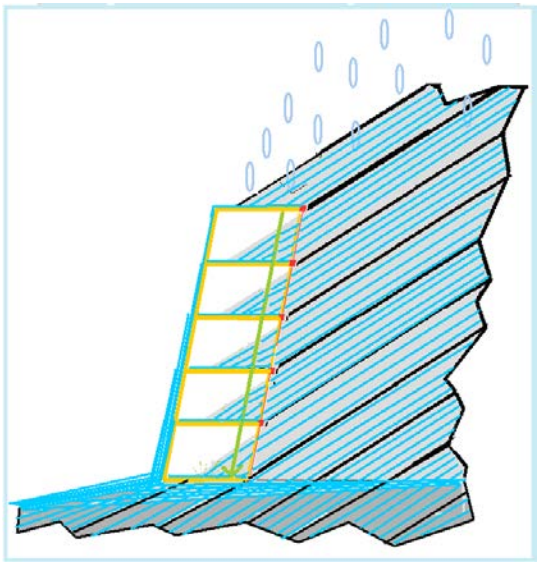
Or this way?



Additional Benefits of a Particular Wall™

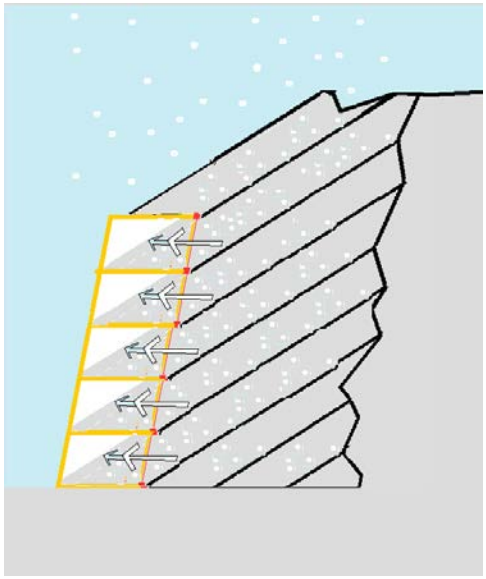
Water Drainage

(For runoff)



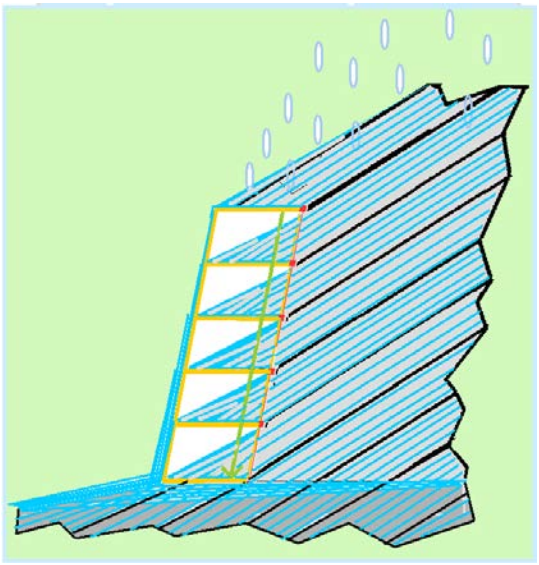
Freeze Hove Adjustment

(For gradual push-out forces)



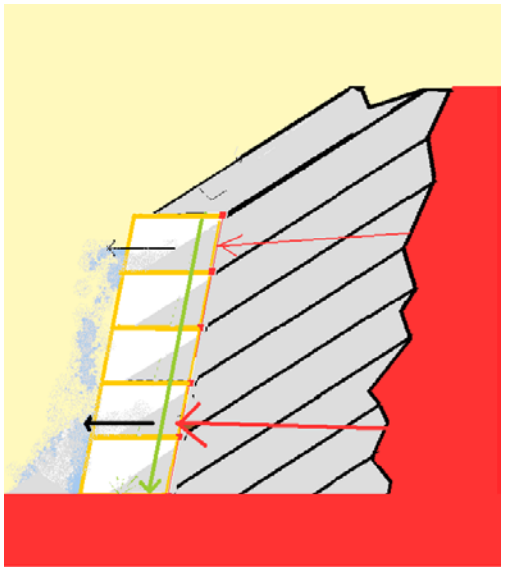
Liquefaction Safeguard

(For angle of repose change)



Uneven Lateral Force Relief

(For intense push-out forces)



Particular Wall™ made of Bricks

(Window Well Retaining Wall Application -- location 801 Fairway Road State College, PA)

Close up of Particular Valves™ in Particular Wall™

Utility of a Hill 3:
Particular Blanket™ Summary

GB2462742 -- US7748929

With the power and physics of particulate (sand, gravel, soil, sewage sludge, runoff sediment, etc.), the Particular Blanket™ is a horizontal application of the Particular Valve™. It catches the particulate suspended in moving water. Particular Blanket ™ takes advantage of the suspended particulate's angle-of-repose to stabilize, maintain, and/or increases banks and beaches through accretion.

It minimizes costs since the majority of the stabilization RELIES on on-site particulate.

Additionally, when pre-filled with gravel, sand, or activated charcoal, it stabilizes the riverbank AND filters the water flowing through the valves. This application benefits the indigenous plants, wildlife, and humans that use the water.

Beach/Bank/Bed Stabilization

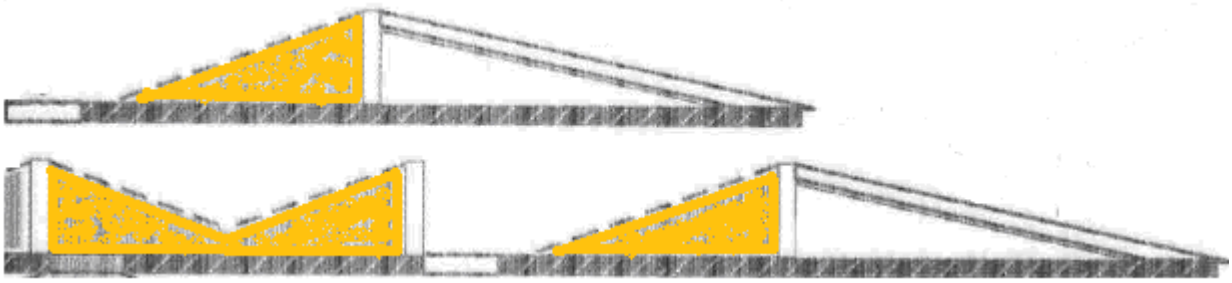
- Particular Blanket™ "catches" some of the particulate in each wave action, maintaining the bank, beach, or channel.

- Anchored with spade attachments, it maintains a specific height/slope. This is useful in channel maintenance.

- Unanchored, it rises as it fills, building up the each/bank/bed automatically.

Basic Particular Blanket™ Unit Diagrams

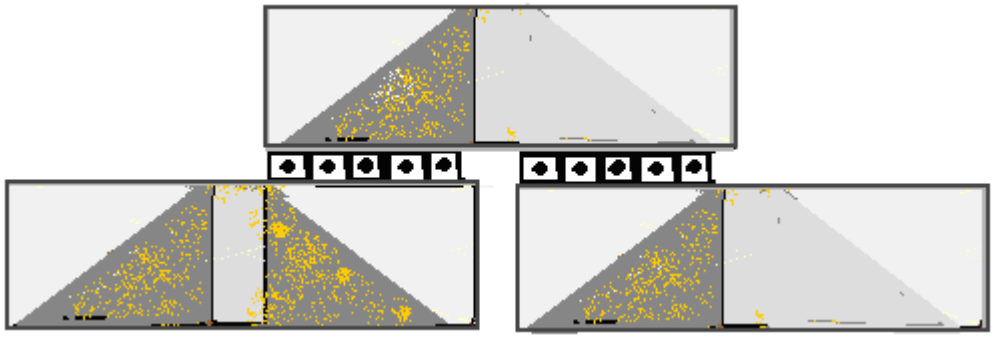
Custom Unit

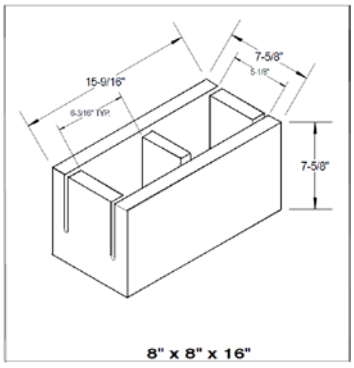


Standard Concrete Block Unit

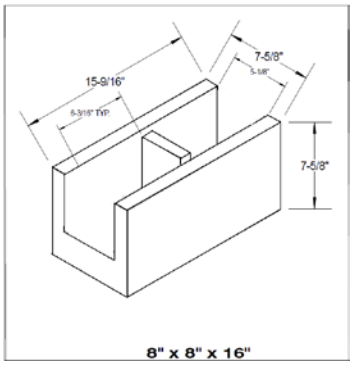
"Knock Out" Bond Beam Blocks

(Facing blocks with one end filled with angled concrete --)

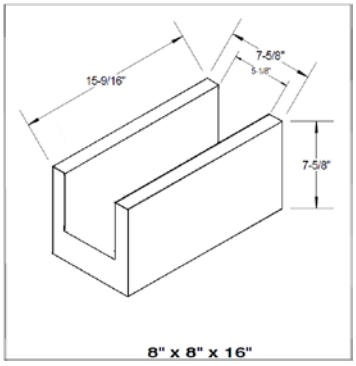




"Knock Out" Bond Beam Block



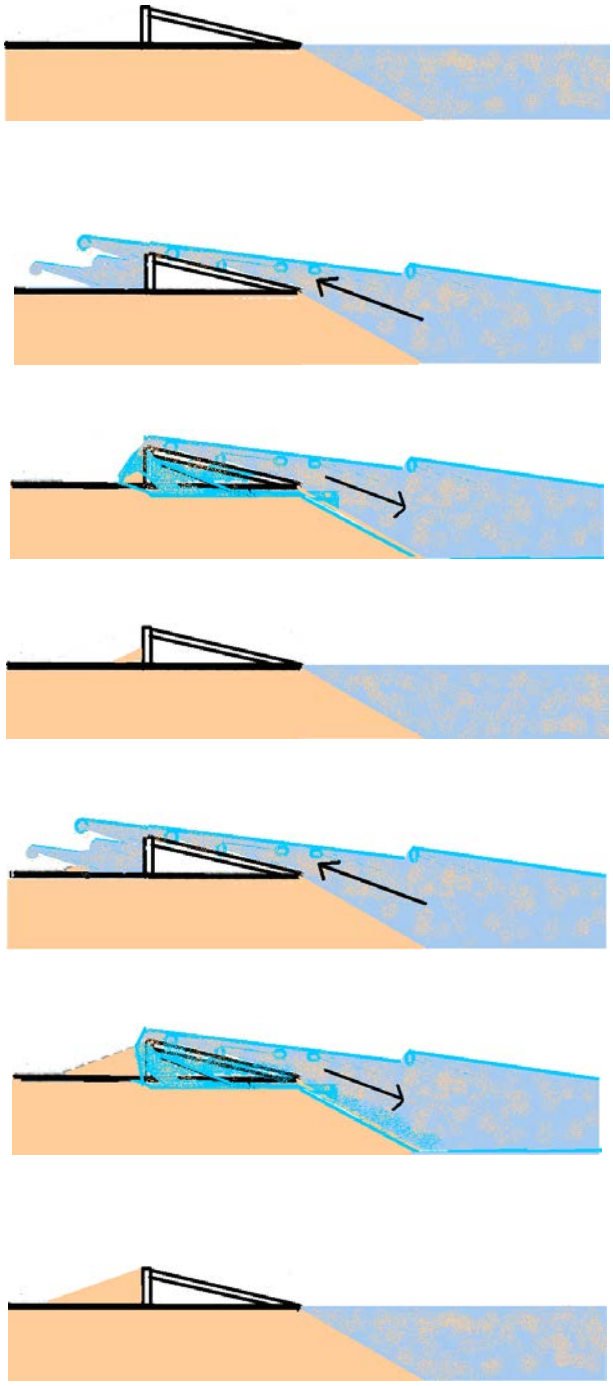
Ends Knocked Out
Portrayed in diagrams)



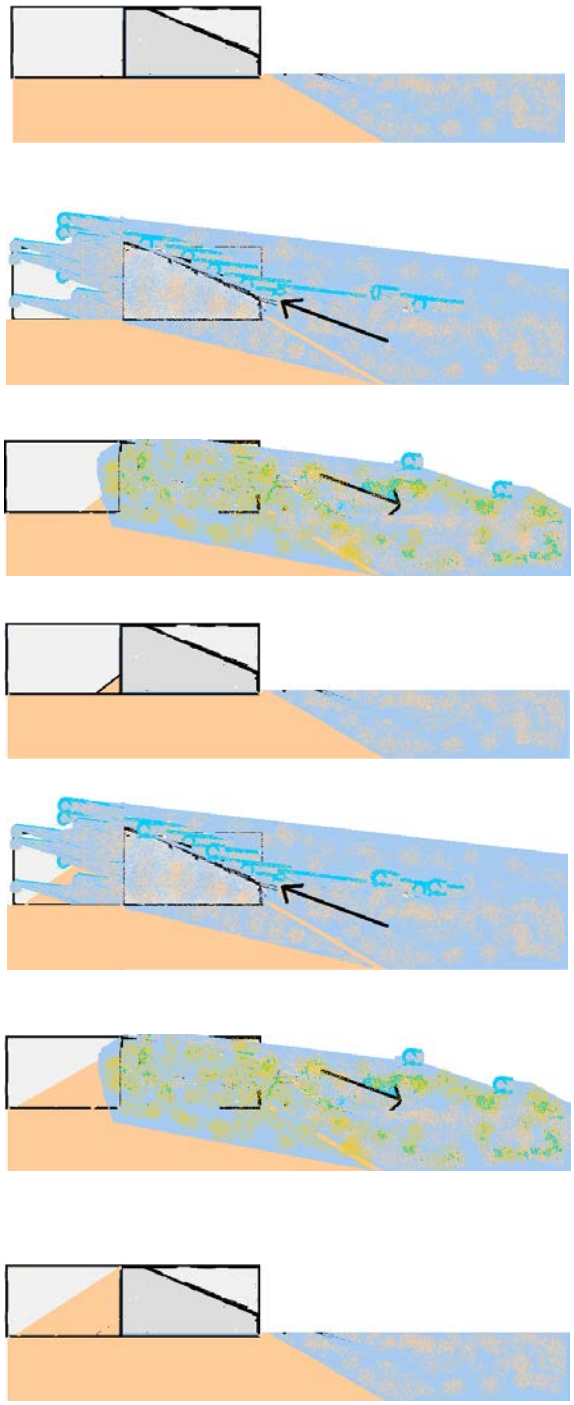
"Beam" Block Extension
(To adjust for lower angles-of-repose)

Particular Blanket™ Wave/Runoff Progressions

Custom Unit

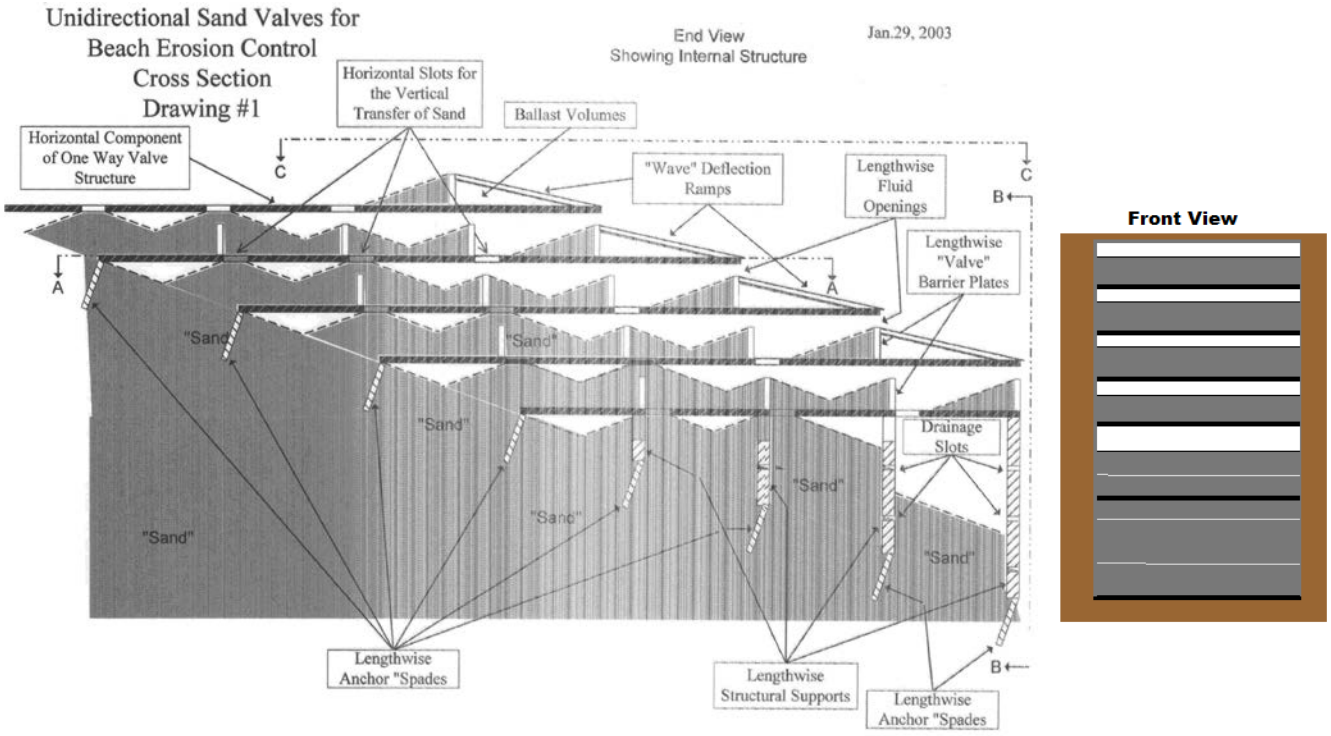


Standard Concrete Block Unit



Anchored Particular Blanket™ Diagrams

Custom Unit System

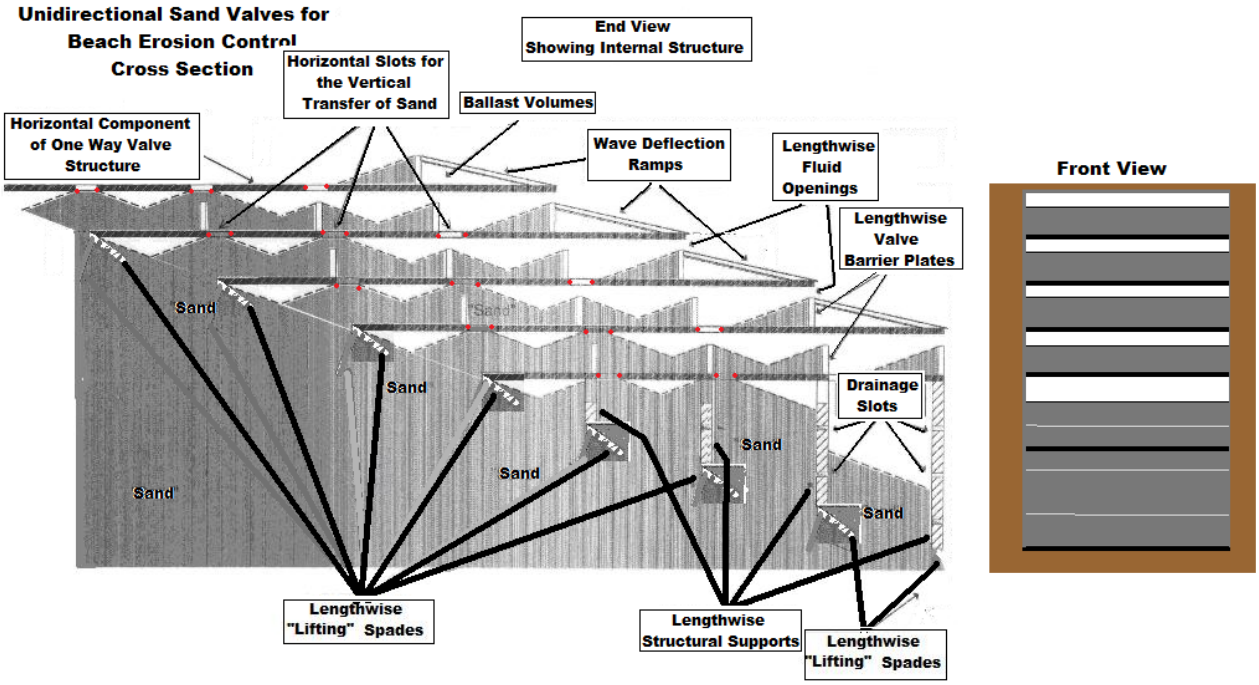


Standard Concrete Block System

"Knock Out" Bond Beam Blocks

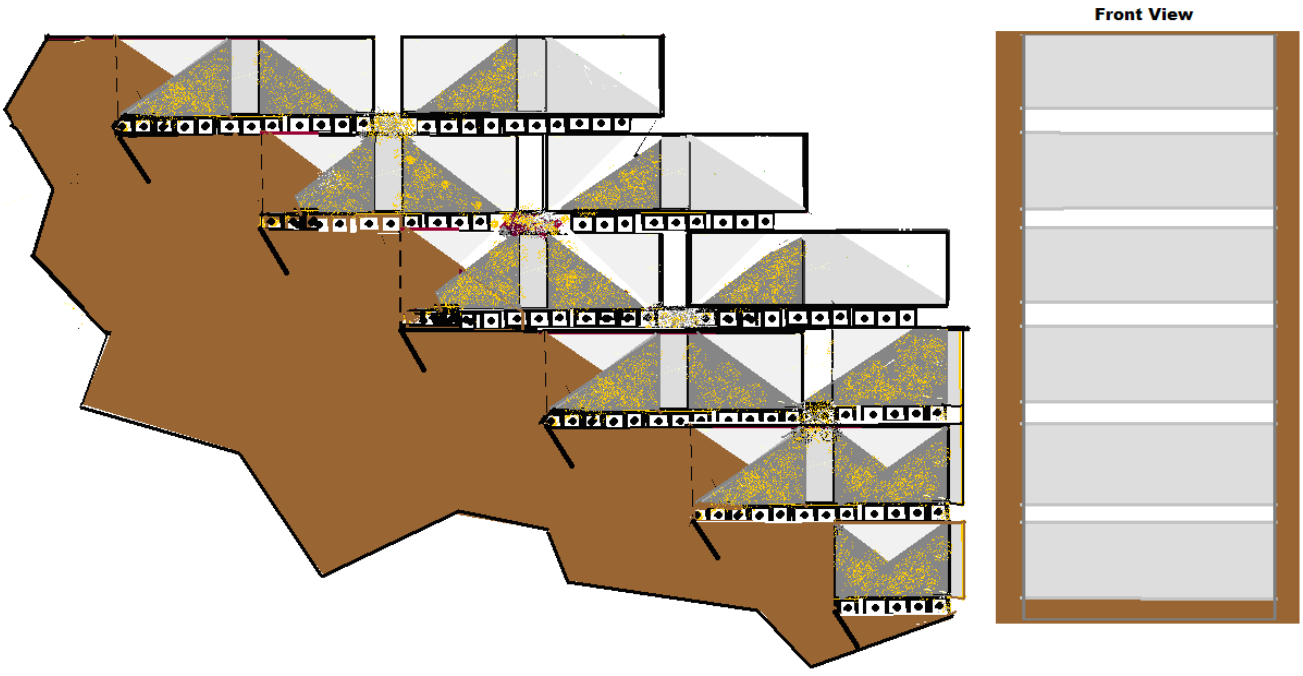
Unanchored Particular Blanket™ Diagrams

Custom Unit System



Standard Concrete Block System

"Knock Out" Bond Beam Blocks



Conclusion

The patented Particular Concepts™ take advantage of the familiar simplicity -- but unique qualities --of a hill:

- The Particular Valve™ precisely controls the ebb and flow of powders, grains, and other commercial particulate.

- The Particular Wall™ turns traditionally threatening forces of particulates into stabilizing ones. Simplifying and improving the construction of retaining walls for various purposes, it performs longer and under more circumstances.

- The Particular Blanket™ maintains banks, safeguarding the navigation and clarity of our waterways. In addition -- when pre-filled with water-filtering gravel, sand, and/or activated charcoal -- it can improve water chemistry, meeting both environmental and commercial goals.

To apply these technologies through licensing, please contact:

Elsie Spry

Particular Concepts ™ LLC

116 Farmingdale Road

Wexford, PA 15090

contact@particularconcepts.org

http://particularconcepts.org

http://particularconcepts.com

"Bringing
Ancient Technologies
To Life"™