Particular Wall™

Sandbox Explanation

(With added evaluations for the Civil/Geo Engineers' Sandboxes)

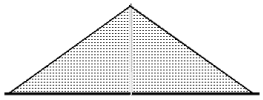
Particular Concepts™

LLC

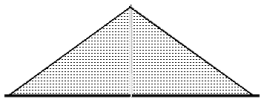
"Bringing
Ancient Technologies
To Life" ™

http://particularconcepts.org
http://particularconcepts.com

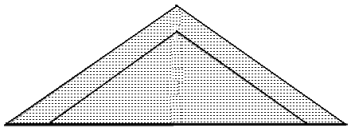
A Regular Sandbox



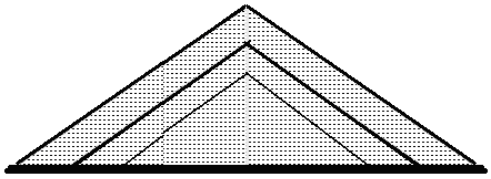
A Pile



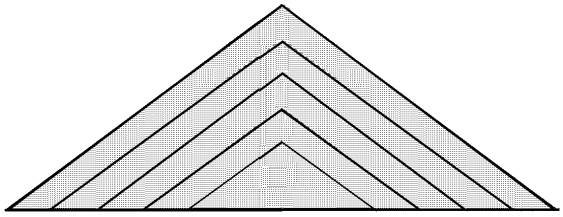
A Pile



Bigger Pile

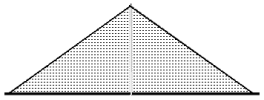


Bigger Bigger Pile

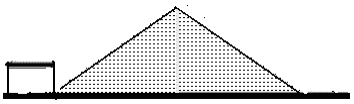


Bigger Bigger Bigger Bigger Pile

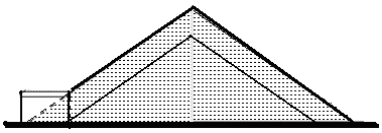
A Particular Concepts™ Sandbox



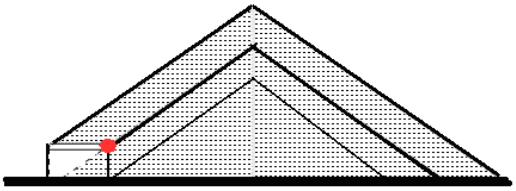
A Pile



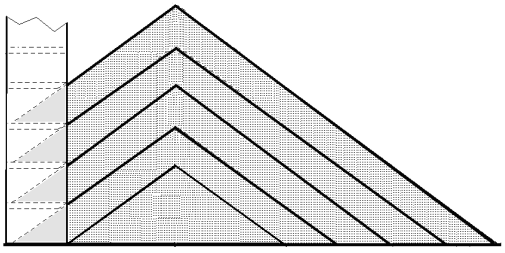
A Pile
With a "Step"



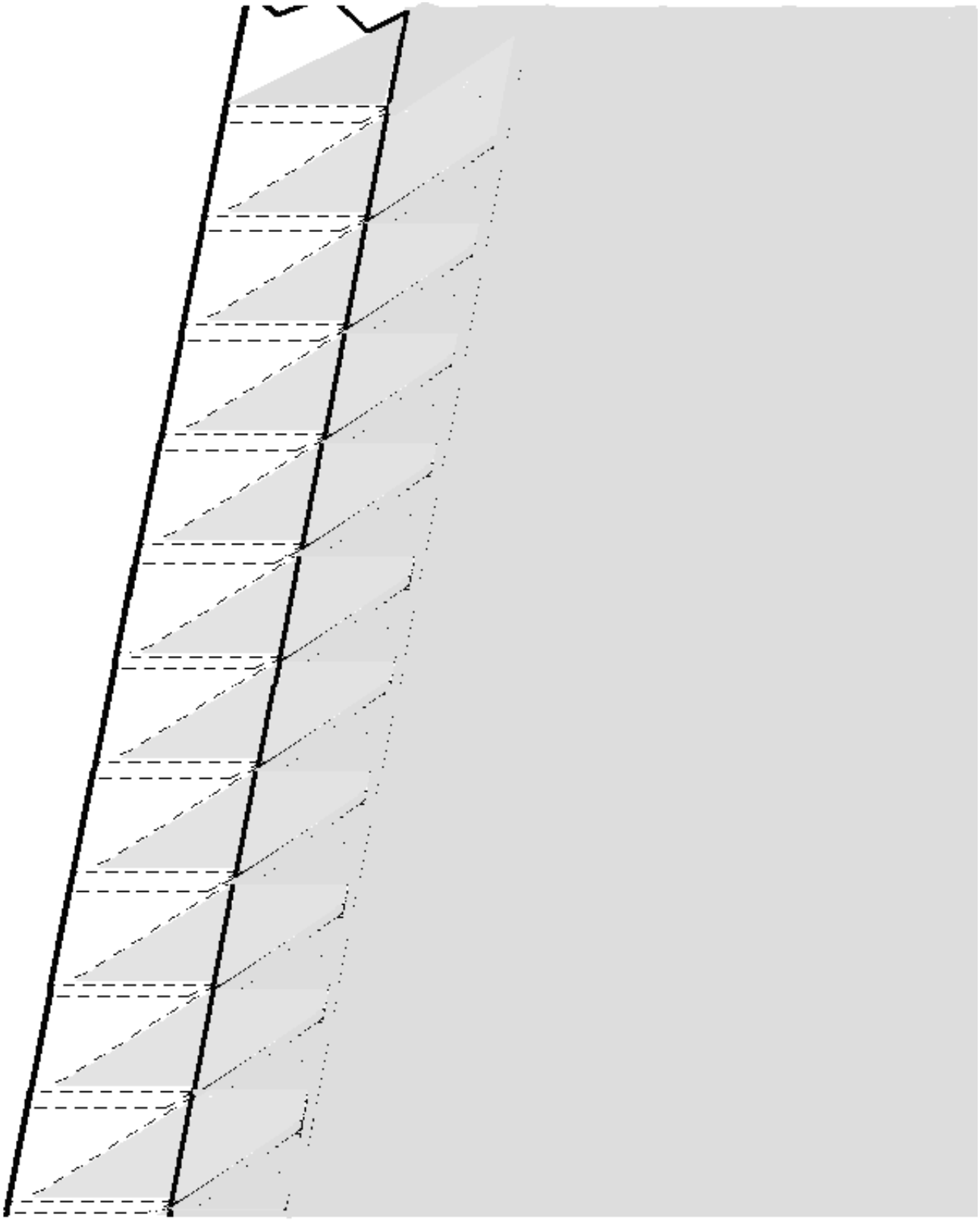
Bigger Pile
With a "Step"



Bigger Bigger Pile
With a Particular Valve™*



Bigger Bigger Bigger Bigger Pile
With a Particular Wall™



REALLY BIG (almost forever) Pile

With the Particular Wall™ Slanted at 11° for dfa = 30°

Particular Wall Short 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" -- 11° for particulate with 30° angle of repose* ***("dfa")*** -- assures an infinitely high stable wall (with gravity).

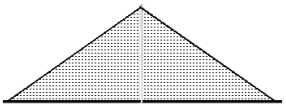
"Infinite" Baffle Angle Tangent =

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

÷

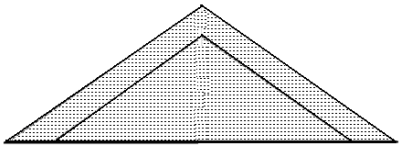
(1/(TAN(RADIANS(dfa))))

#1



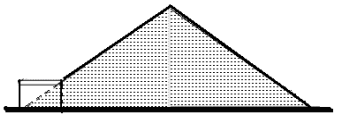
A Pile

#2



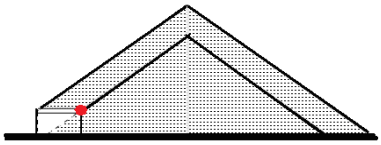
A Bigger Pile (with new layer).

#3



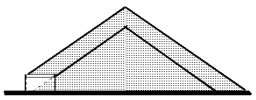
A Pile with a "Step"

#4.

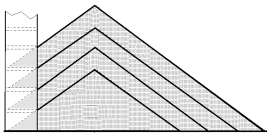


A Bigger Pile with Particular Valve™* (new layer held up)

#5

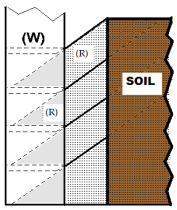


The Particular Valve™ is one unit of the Particular Wall™



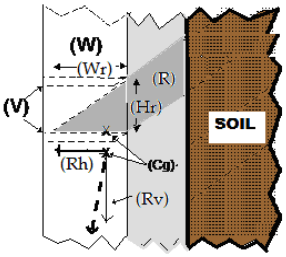
The Particular Wall™ Retains all layers at their angles of repose**

#6

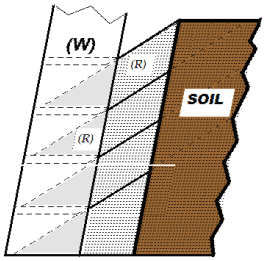


Particular Wall ™ Retains the Particulate (R) and Soil.**

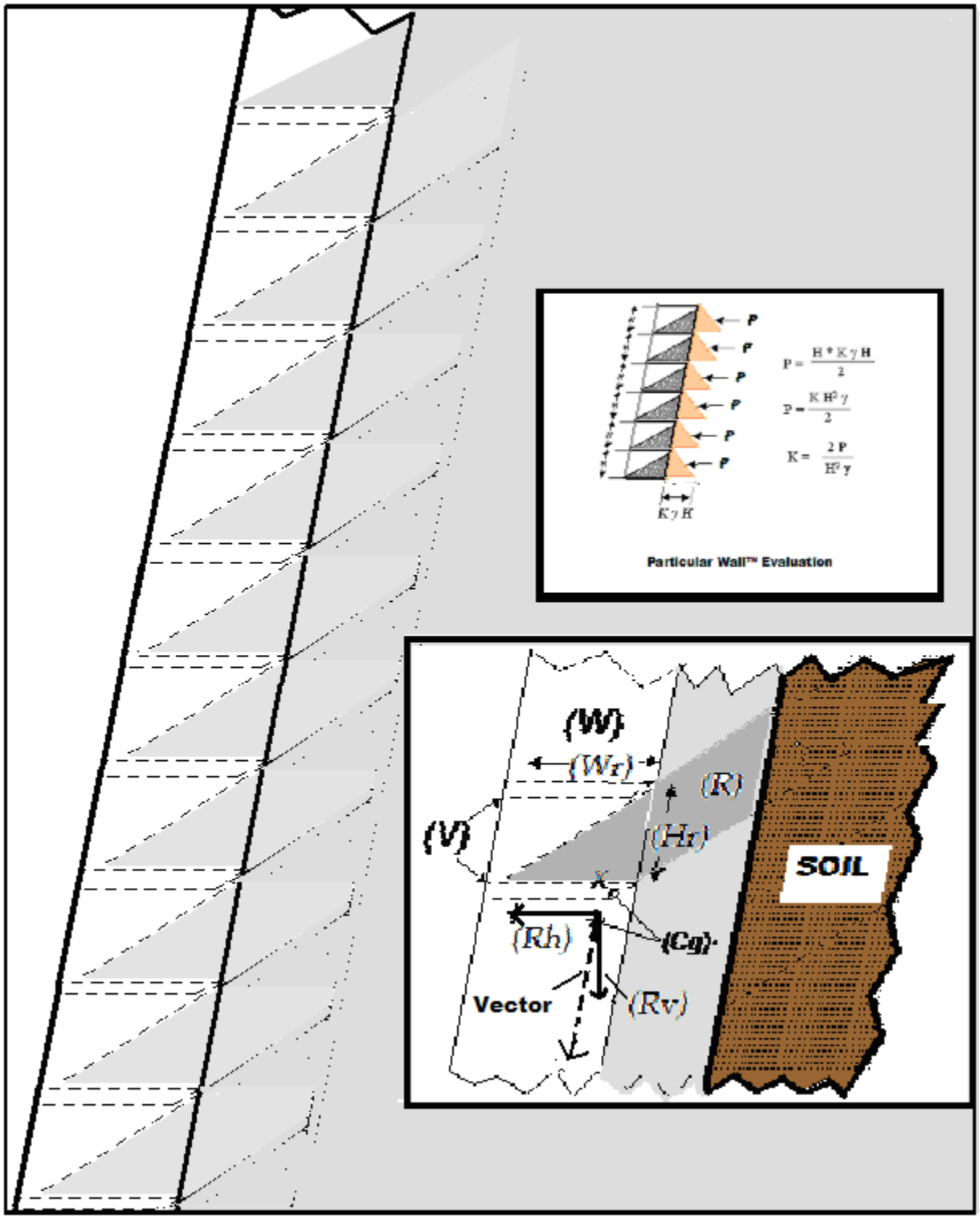
#7



Particular Valve™* Force Diagram



"Infinite" Baffle 11 °



Engineer (almost forever pile) Evaluations

Particular Wall™ Explanation / Evaluation

-- The Particular Wall™ is built from Particular Valves™*.
-- Each valve is an independent and force-relieving unit (refer to Tsagareli as prior -- but not complete -- art).
-- The customary triangular effect of force applies to each unit only -- NOT THE ENTIRE WALL.
-- Forces on a valve at the top of a Particular Wall™ are identical to those on one at the bottom.**
-- This is because the noncohesive particulate is "stopped" at its angle of repose AT EACH LEVEL.
-- If the Particular Valve Units are baffled parallel with the Resultant Vector Angle,
the Particular Wall™ can be built to any height (with gravity) -- for an "infinite" retaining wall.**

Spreadsheet Force Values and Calculations

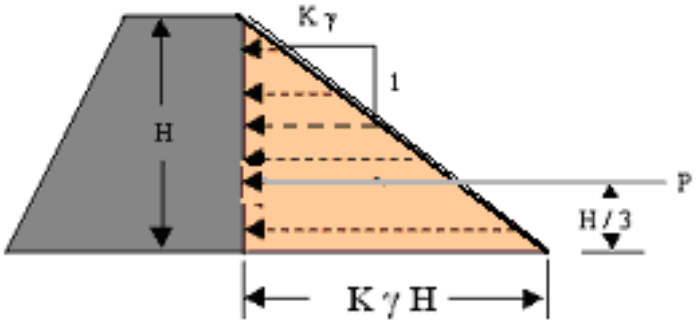
-- Only Rankine is used for evaluation of the Particular Valve™*.
-- Coulomb does not apply since there is no vertical surface of friction.
-- The necessary structure surrounding the valve is not evaluated.
-- The vertical surfaces of the necessary structure would be evaluated conventionally.
-- The necessary structure would shift cg, increase Ka, and increase TOTAL VERTICAL FORCE.
-- Surcharge is not evaluated

		variables		
	Y	**= 120.00**	pcf	Particulate Weight
	dfa	**= 30.00**	degrees	Particulate Angle of Repose or “dfa”
	H	**= 1.50**	feet	Height of particulate in **Particular Valve™***
	W	**= 3.00**	feet	Width of particulate in **Particular Valve™***
	H/2	**= 0.75**	feet	
	H/3	**= 0.5**	feet	
H/TAN(RADIANS(dfa)) =	**D**	**= 2.60**	feet	Depth of particulate in **Particular Valve™***
(1-SIN(RADIANS(dfa)))/(1+SIN(RADIANS(dfa))) =	**Ka**	**= 0.33**		Rankine Coefficient
Ka (Y) (H) (W) =	**pa**	**= 60.00**	psf	Rankine Active pressure / foot
1/2 Ka (Y) (H^2) (W)=	**Pa**	**= 135.00**	#	Total Earth Pressure Force (acting at H/3 from base of valve)
Pa =	**Rh**	**= 135.00**	#	TOTAL HORIZONTAL FORCE
((H x W x D) / 2) x Y =	**Rv**	**= 701.48**	#	TOTAL VERTICAL FORCE (particulate weight in **Valve™***)
Rh / Rv		**= 0.19245**	radians	**Resultant Vector Angle Tangent**
(DEG(ATAN(0.19245))		**= 10.89**	degrees	**Resultant Vector Angle**
SQRT(D2 + Pa^2)		**= 135.02**	#	**Resultant Vector Force**
Rounding UP		**≅ 11.00**	degrees	**Baffle for "Infinite" Particular Wall™****
D / SQRT (2) =	**cg**	**= 1.84**	**feet**	**From front of particulate in Particular Valve™***

Simplified Baffle for “Infinite” Particular Wall™ inserted in Excel® (result is 10.69° ≅ 11°)

DEGREES(ATAN((1-SIN(RADIANS(“dfa”)))/(1+SIN(RADIANS(“dfa”))))/(1/(TAN(RADIANS(“dfa”)))))

Particular Wall™ vs. Traditional Evaluation

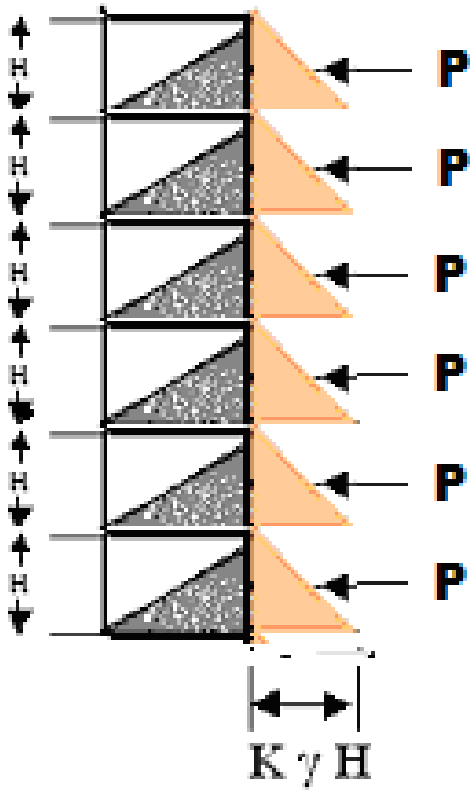


$$P = \frac{H * K\gamma H}{2}$$

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

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

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