August 8, 2012

For backfill options and Particular™ valve design, I compiled the following general tables for weight/density. They show gravel as both dense AND improved by water: draining while countering even wet clay, mud, and sand.

However, wet clay, mud, and sand have a low angle-of-repose, causing liquefaction under extreme circumstances.

So, to make an exceptionally stable, over-safe (i.e. mine use), Particular Retention Wall™:

- Use a water-improved, dense backfill (like 1/4 to 2 inch gravel) to assure drainage and predictability
- Design for wet clay, mud, and sand angle-of-repose (safeguarding further against liquefaction)
- Expect extreme lateral forces and liquefaction to "release" through the valve, settling when the event is over

Best,

Elsie

*PS: -- For design predictability, you don't need uniformly **sized** fill as dense as the embankment -- just uniformly **mixed** fill as dense as the embankment.*

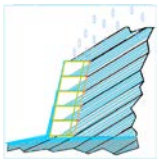
-- For emergency/on-site material application, design for the lowest angle-of-repose expected (wet OR dry can be the lowest angle-of-repose). As long as the fill is AS dense as the embankment material...

-- Unlike current walls, Particular Wall™ technology does NOT rely on compaction (artificial increase of the angle-of-repose). Over time, compacted fill un-compacts...

- *http://centurycity.patch.com/articles/metro-responds-to-media-coverage-of-collapsed-retaining-wall*
- *http://www.teamconference.org/2011/documents/Breakouts/Wendland_RetainingWalls%20.pdf (Check out Failure #5)*
- *http://www.cenews.com/magazine-article-cenews.com-6-2011-when_retaining_walls_fail-8330.html.*

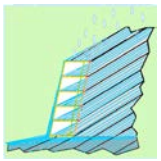
-- Note how the Particular Wall™ design stands longer under more circumstances. Compaction walls predictably fail within their engineers' life span.

Water Drainage
(For runoff)

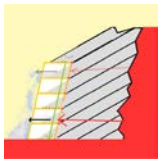


Freeze Hove Adjustment
(For gradual push-out forces)

Liquefaction Safeguard
(For angle-of-repose change)



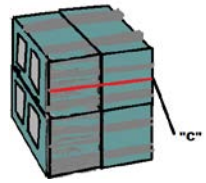
Uneven Lateral Force Relief
(For intense push-out forces)



**The Particular Shear Cell™ accurately measures Angle-of-repose on-site (wall location or trucking yard).

-- Table Site "Key"

- http://www.simetric.co.uk/si_materials.htm;
- http://www.rfcafe.com/references/general/density-building-materials.htm
- http://www.powderandbulk.com/resources/bulk_density/material_bulk_density_chart_a.htm
- **My best 'tho probably flawed guesstimate, translating what I can from engineering blog posts (http://en.wikipedia.org/wiki/Angle_of_repose and others...)**



Back Fill/*Earth Type*	lb/ft^3	kg/m^3	Angle-of-repose**		Valve Depth ("c") Minimum Feet One [1] foot Valve Height
Clay, dry excavated	68		1089	25	2.14
Clay, wet excavated	***114***		***1826***	***15***	***3.73***
Earth, loam dry excavated	90		1440	30	1.73
Earth, moist, excavated	90		1442	45	1.00
Earth, wet, excavated	100		1602	45	1.00
Earth, soft loose mud	***108***		***1730***	***30***	***1.73***
Gravel, loose, dry	95		1520	30	1.73
Gravel, with sand, natural	120		1922	25	2.14
Gravel, dry 1/4 to 2 inch	105		1682	44	1.04
Gravel, wet 1/4 to 2 inch	**125**		**2002**	**44**	**1.04**
Gravel with Sand, wet	126		2020	30	1.73
Sand, wet	120		1922	40	1.19
Sand, dry	100		1602	34	1.48
Sand, loose	90		1442	34	1.48
Sand, water filled	120		1922	15	3.73
Sand with Gravel, dry	103		1650	25	2.14

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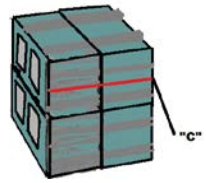

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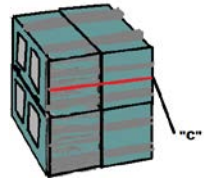

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