
Oahu Beach Front Properties
World's Most
Desired Location
For A New
Investment

Shoreline Properties Require Special Attention.

Rules, Regulations, and Jurisdictions Limit What Can Be Done.

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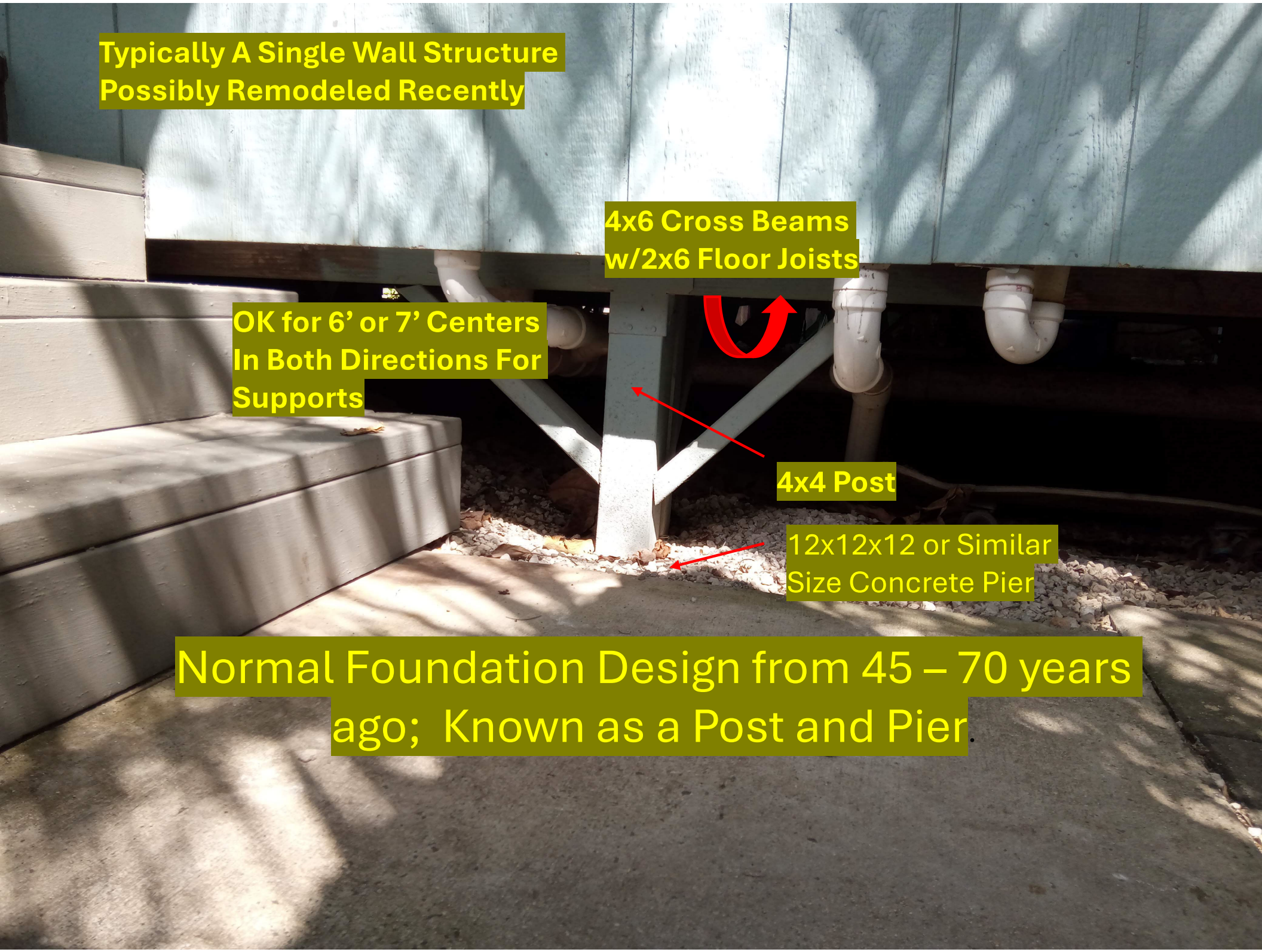
After removal of Revetment or Seawall; Beach Erosion Is Expected To Advance Inward.

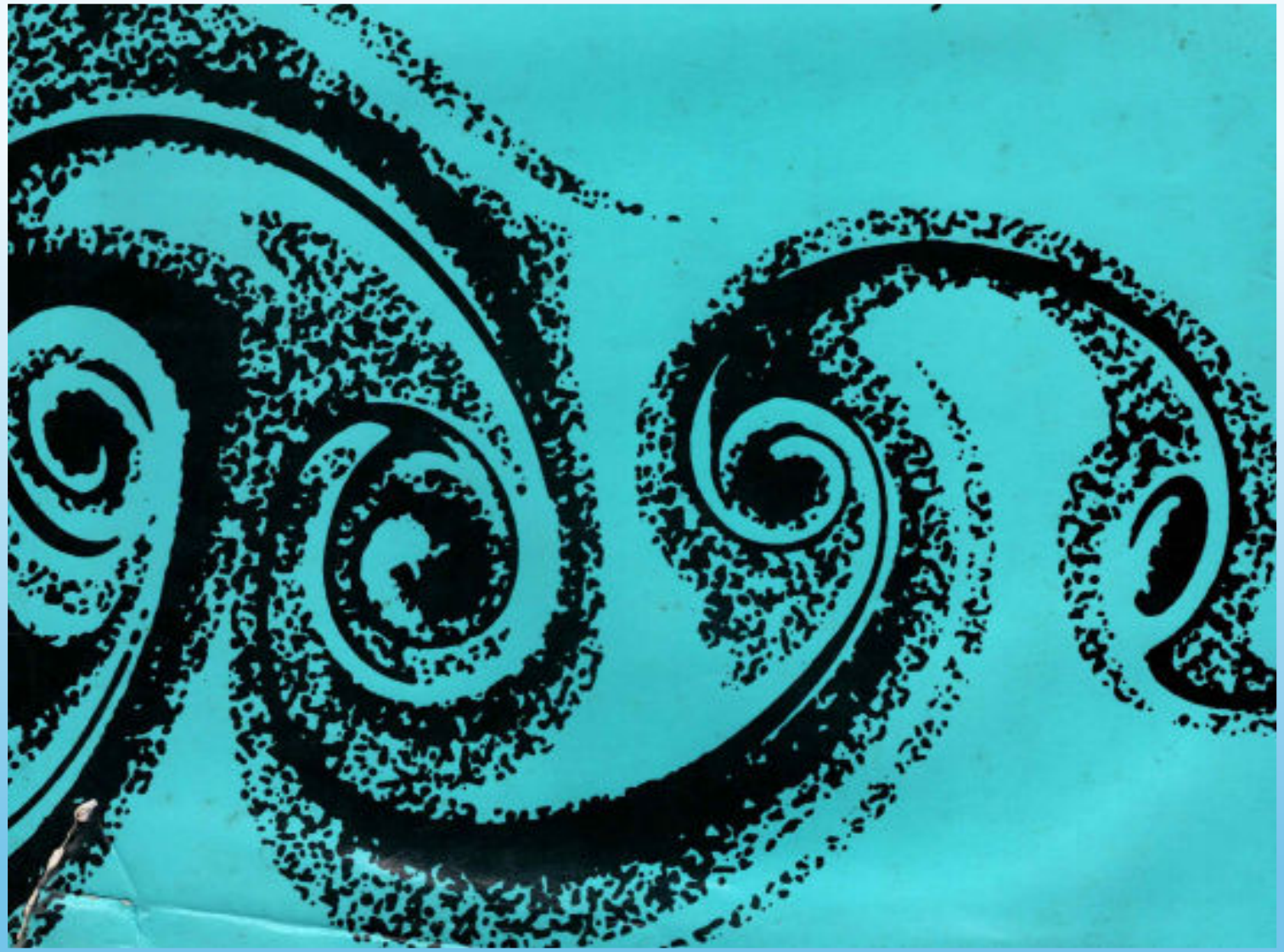
Is this situation possible? Yes…it has happened before.

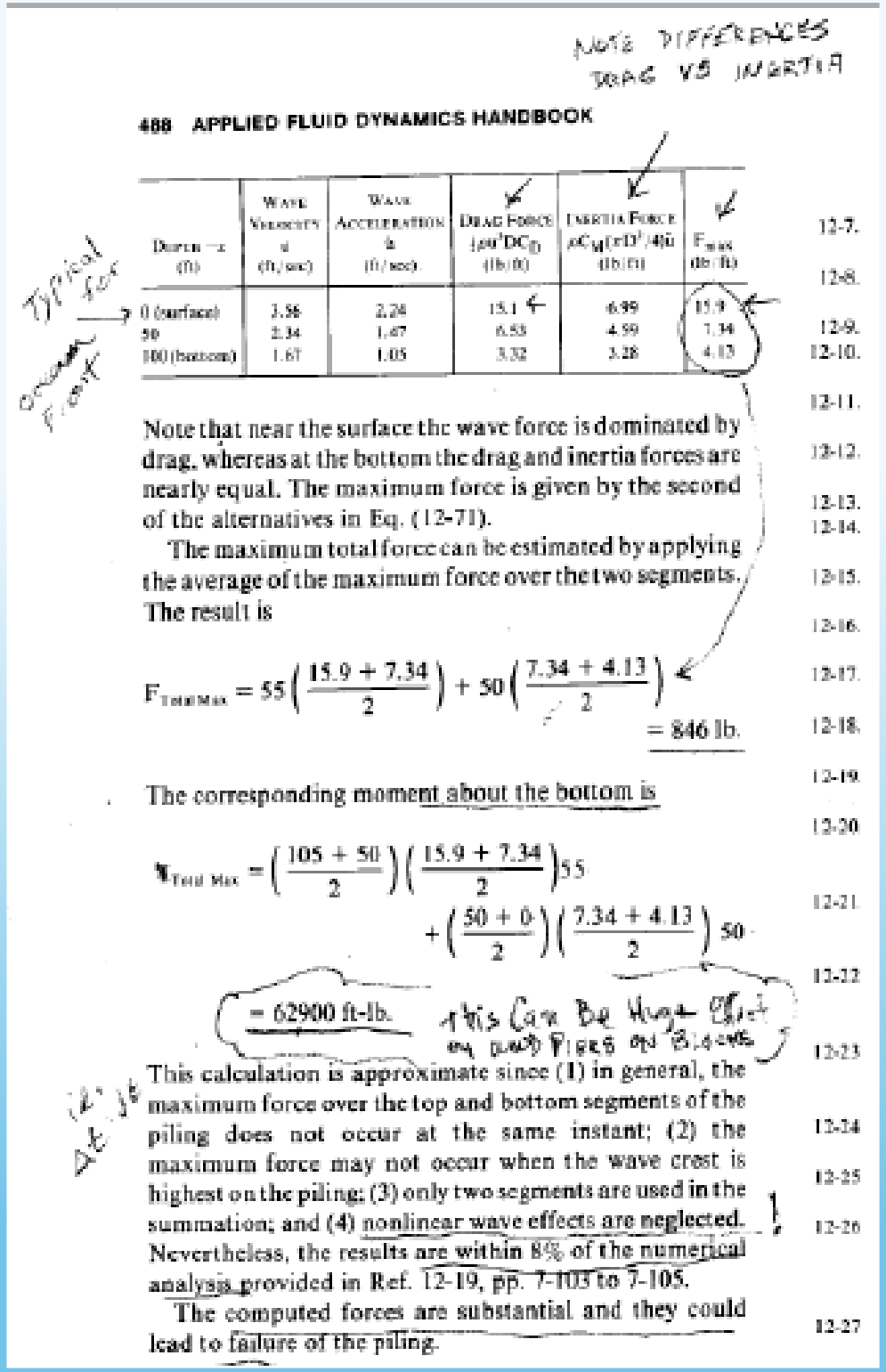
Original Ocean Societies Say…The Ocean is a Living Thing…and Unpredictable. Admittedly this is a worst case event. Most Dwellings Can Suffer Foundation Erosion like this one…but, with thought and effort preventions can be installed.


Typically A Single Wall Structure
Possibly Remodeled Recently
4x6 Cross Beams
w/2x6 Floor Joists
OK for 6’ or 7’ Centers
In Both Directions For
Supports
4x4 Post
12x12x12 or Similar
Size Concrete Pier
Normal Foundation Design from 45 – 70 years ago; Known as a Post and Pier.


A Typical Post and Pier System 6’ on
Centers Both Directions
Typically Sitting On Sand and/or dirt.

All waters when passing by any solid object produce certain forms of TURBULANCE. This example is very typical of the type that swirls around the post and pier foundations of dwellings.
These are Forces that move in circular patterns. When these forces slam into any solid object then the object gets ‘pushed’ around. How strong are these forces?





NOTE DIFFERENCES DRAG VS INERTIA

Depth $-z$ (ft)	Wave Velocity u (ft/sec)	Wave Acceleration $\dot{u}$ (ft/sec²)	Drag Force $\frac{1}{2}\rho u^2 D C_D$ (lb/ft)	Inertia Force $\rho C_M (\pi D^2/4)\dot{u}$ (lb/ft)	F_{max} (lb/ft)
0 (surface)	3.58	2.28	15.1	6.99	15.9
50	2.34	1.67	6.53	4.59	7.34
100 (bottom)	1.67	1.05	3.32	3.28	4.13

Typical for Ocean Piers

Note that near the surface the wave force is dominated by drag, whereas at the bottom the drag and inertia forces are nearly equal. The maximum force is given by the second of the alternatives in Eq. (12-71).

The maximum total force can be estimated by applying the average of the maximum force over the two segments. The result is

$$F_{THRMax} = 55\left(\frac{15.9 + 7.34}{2}\right) + 50\left(\frac{7.34 + 4.13}{2}\right) = 846 \text{ lb.}$$

The corresponding moment about the bottom is

$$M_{THR\,Max} = \left(\frac{105 + 50}{2}\right)\left(\frac{15.9 + 7.34}{2}\right)55 + \left(\frac{50 + 0}{2}\right)\left(\frac{7.34 + 4.13}{2}\right)50$$

$$= 62900 \text{ ft-lb.}$$

This Can Be Huge Effect on Such Piers and Bridges

This calculation is approximate since (1) in general, the maximum force over the top and bottom segments of the piling does not occur at the same instant; (2) the maximum force may not occur when the wave crest is highest on the piling; (3) only two segments are used in the summation; and (4) nonlinear wave effects are neglected. Nevertheless, the results are within 8% of the numerical analysis provided in Ref. 12-19, pp. 7-103 to 7-105.

The computed forces are substantial and they could lead to failure of the piling.

12-7. 12-8. 12-9. 12-10. 12-11. 12-12. 12-13. 12-14. 12-15. 12-16. 12-17. 12-18. 12-19 12-20 12-21 12-22 12-23 12-24 12-25 12-26 12-27

Engineers work with Forces. Things either survive forces or are damaged by forces.

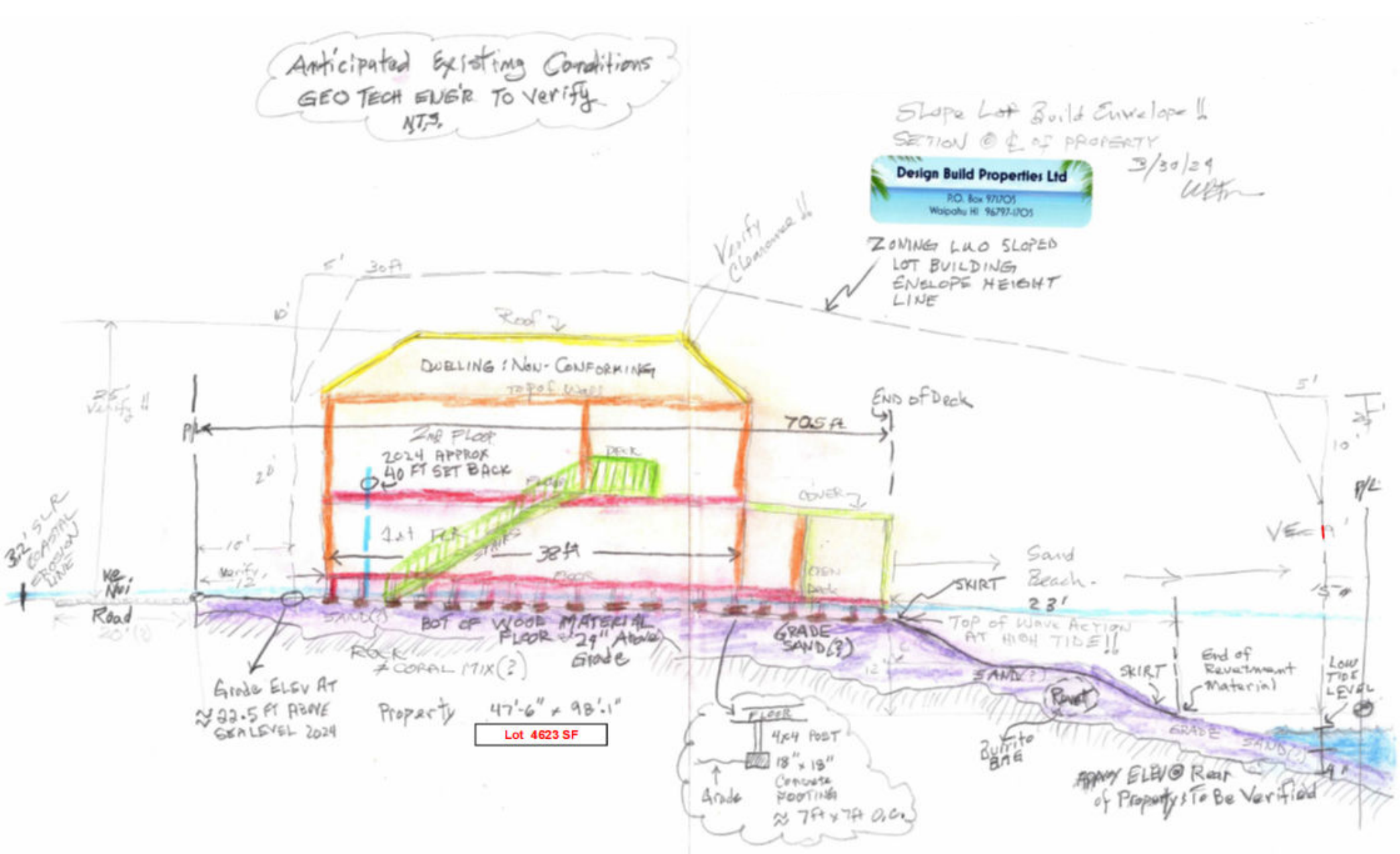
There are a wide variety of forces that engineers have to keep track of…sort of like ‘bookkeeping’ when it comes to cash. And *Forces must balance!*

At right is a page from an engineering ‘Fluid Dynamics’ text from the section on Ocean Wave Actions. The calculation of the force equations demonstrates the amount of force that can be generated from a wave when it ‘washes on shore’ hitting any solid object – i.e. a post & pier.

Notice it will typically be in the zone of 850 lbs of force. Also, this force is a circularly moving force but parallel to the ground and perpendicular to the post and pier. I.E. the post and piers are being ‘pushed’ around with a significant amount of energy.

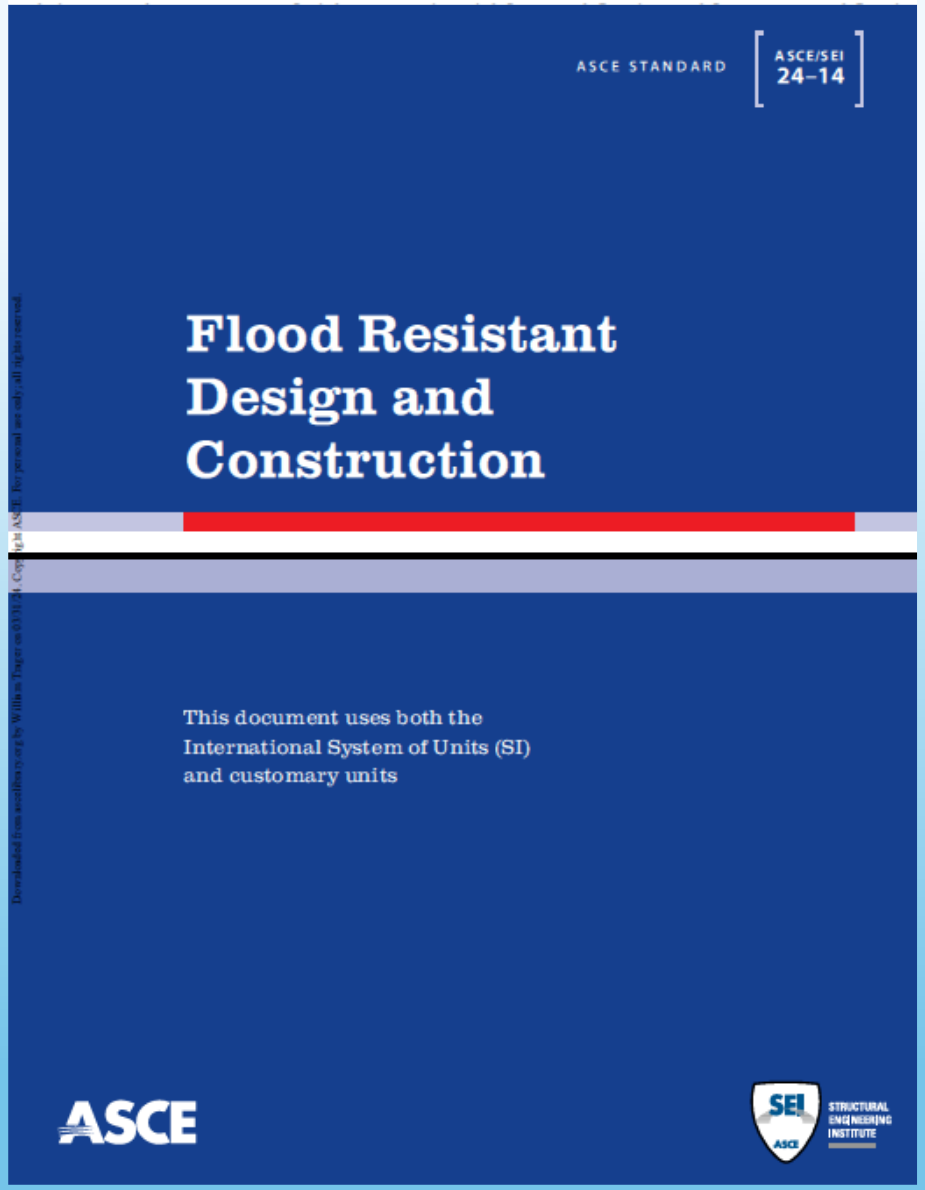
Note; Seawater moving at any velocity = energy. Seawater weights 64 lbs/cubic foot.

The other number shown is a form of energy called Momentum. A 2,500 lb car moving at 25 mph has about the same energy as the wave wash.



This sketch provides a view of the 'sand/earth' materials that lay on top of an underlying 'rock/coral' base. Pacific Ocean islands are really the top layers of very high under water mountains of lava rock. It takes a geo-technical engineer to verify how deep the rock is below the surface of the land. This layer of rock is the ultimate location upon which to reconstruct a foundation. Next, what to construct that has the strength needed?

Design and construction of structures located in flood hazard areas shall consider all flood-related loads and conditions, including the following: hydrostatic loads, hydrodynamic loads, wave action; debris impact; rapid rise and rapid drawdown of floodwaters; prolonged inundation; alluvial fan flooding; wave-induced and flood-related erosion and local scour; deposition of sediments; ice flows and ice jams; and mudslides in accordance



4.5.1.1 Shallow Foundations in Coastal High Hazard Areas In Coastal High Hazard Areas where surface or subsurface conditions consist of nonerodible soils or rock that prevent deep foundations, shallow foundations including spread footing, mat and raft foundations shall be permitted, provided that the foundations (1) meet the requirements of Section 4.5.8; (2) are

4.5.1.2 Shallow Foundations in Coastal A Zones In Coastal A Zones, shallow foundations including spread footing, mat and raft foundations shall be permitted, provided the foundations (1) meet the requirements of Section 4.5.8; and (2) will prevent sliding, uplift, or overturning when exposed to the combination of loads in Section 1.6.2.

4.5.2 Special Geotechnical Considerations In addition to the requirements of Section 1.5.3, foundation design shall account for instability and decreased structural capacity associated with saturated soils and with erosion because of wind, waves, currents, local scour, storm-induced erosion, and shoreline movement.

4.5.3 Foundation Depth The foundation shall extend to a depth sufficient to provide the support required in Section 1.5.3, taking into account the erosion and scour of the supporting soil during the design flood and shoreline movement, as predicted by an erosion analysis.

4.5.7 Posts, Piers, and Columns Columns, including wood posts, reinforced masonry columns and piers, and reinforced concrete columns and piers, as well as associated connections, shall be designed and constructed to resist wind, water, wave, erosion, and other flood-related forces in accordance with Section 1.6. Column spacing shall take into account the design bearing capacity, uplift, and overturning resistance but shall be spaced not less than 8 ft center to center. Where founded on

None of this is New Science. Has been a developing practice 300 + years worldwide "*except in Hawaii*".

To counter act these types of forces structures have to be stronger than these forces.

This type of footing is called a Spread Footing. These are calculated for sizes, depths, and re-bar patterns particular for an applied load. It is today's method of foundation design when building for a 'pier' application. The pier is called a column. The column is also a calculated design depending on its height and the applied load.

These are 24”x24” CMU Block Columns With 24 sticks of Re-Bar and Completely Filled With Concrete; Today’s style of Column; This one is really Stout!

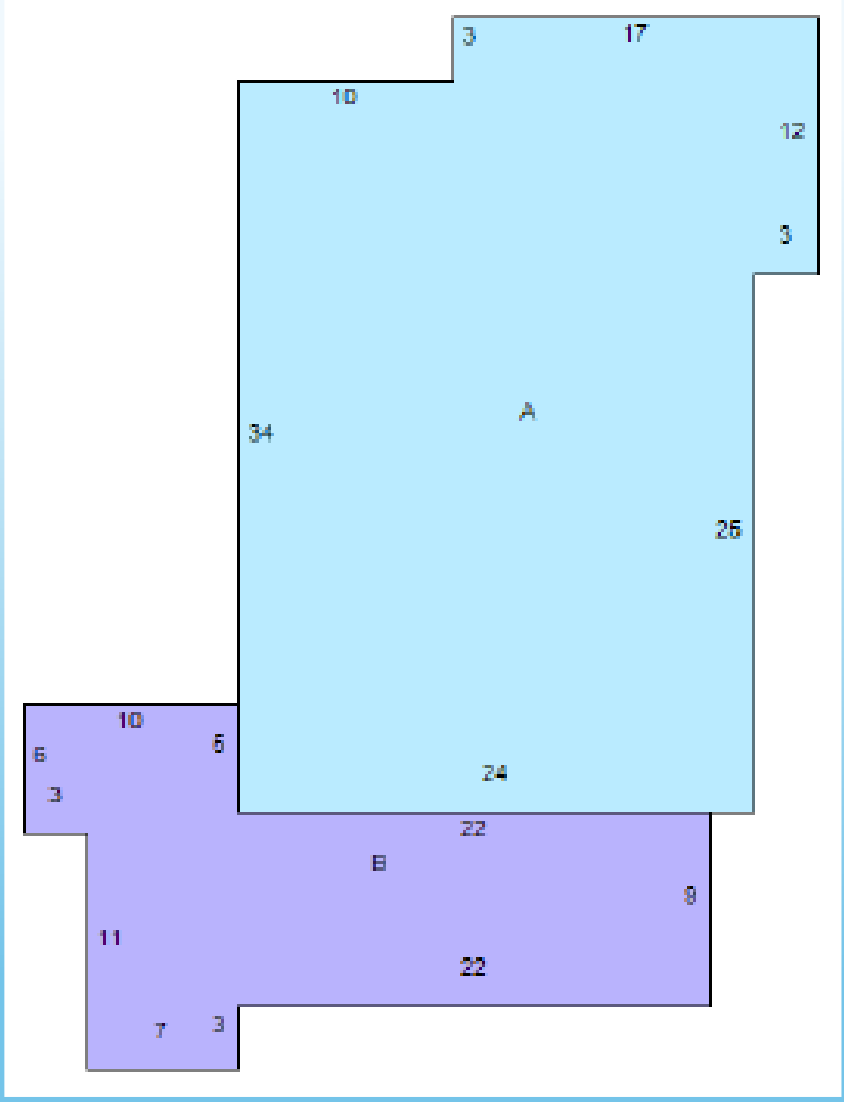
Re-Bar
Re-Enforcement


This is a Wide Based Design For An ‘A’ Flood Zone Property where the property is subject to a 16 foot flood zone.
Design Advantage is: Fewer Vertical Columns = Reduced Lateral Forces Against The Dwelling Supports; Thus the Flowing Water Can Go In-Between The Columns. With Less Flow Resistance.


This Floor System is a 28 foot Clear Span From Beam To Beam. Custom Made Wood I-Beam Style Floor Joists Are Used to Span Between the Support Beams. This Entire System is 17” - 18” Thick top to bottom and these Joists are on 12 inch centers.

This design provides for a flat surface and all weight bearing walls are on the Perimeter Beams. All other interior walls are non-bearing partition walls.

Foundation Layout Will Have To Follow The House Plan; Per Chapter 26 we are restricted to maintain the Tax Map Key layout. For dwellings that have been expanded over the years but where the work was not permitted then the differences in layouts has to be accounted for as part of the permit application process.



To Stay with in the Chapter 26 cost parameters for 'Reconstruction' we want to see if the existing house can be lifted and set on top of the new floor system. We have a few contractors remaining who have experience with this type of work.

But, we will not be able to change the floor plan unless you want to 'reduce' the floor plan – i.e. cannot increase the floor area. Also, cannot change the perimeter shape unless we are reducing the floor area.

Hello. I'm from the government; I am here to help you.

Any shoreline project can be affected by multiple jurisdictions from this list:
OCCL – regulates shoreline development efforts from the Ocean Conservation Point of View
DLNR Land Division – regulates 'sensitive land parcels' from the Land Conservation Point of View
SMA – a regulatory body that reviews many land development efforts to verify conformance to codes
Civil Engineering Board – regulates any changes to the surface profile of a property
DPP – reviews architectural and other engineering plans for any alteration to a property
IRC – regulates flood zone residential construction requirement
IBC – regulates flood resistant construction requirements for any structure in a flood zone
DOH – regulates and reviews all plans that incorporate any form of private sanitary planning design
Clean Water Act – Army Corp of Engineers via the DOH regulates the ocean side of any shoreline
SWQC – regulates all forms of surface water management and soil erosion prevention
Traffic Div – regulates any access connection to any street including sidewalk spaces and gutters
Fire Dept – regulates all Fire Supression Systems as required by NFPA 1 including residences
BWS – regulates all water delivery systems to properties
HECO – regulates all electrical connections and power supply systems to all properties.
Zoning – regulates a wide variety of property related Land Use Ordinances

I am interested in discussing your property.

Every property is unique having its own characteristics to be explored and understood.

To learn more of the options that might be available to your situation please

Send me a text: 808-738-6656 to connect when you are able.

Aloha

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