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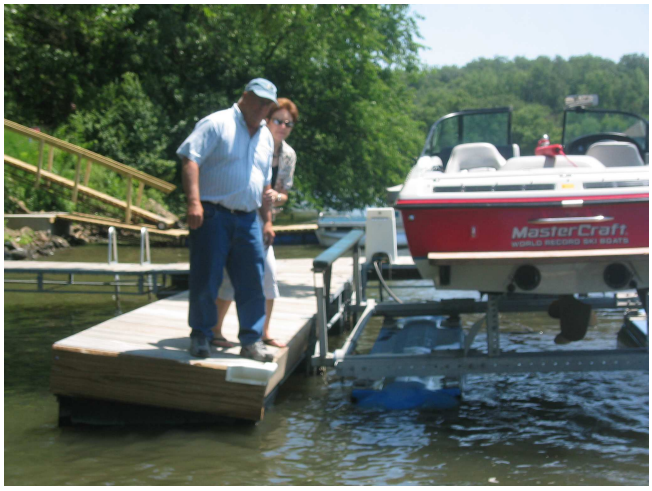
Anti-Sway™ Frame Development:

Pier Genius was started with our dissatisfaction of the stability of floating docks, mainly residential floating, all seemed like an afterthought by manufacturers. Many would lean when a floating lift was installed which was unsightly and unstable for many boating enthusiasts.



In late 2003 we started playing with frame design. We badly wanted to make aluminum work well. We tried no less than 30 design iterations adding more and more aluminum to the design and testing in our custom designed "sway jig". This sway jig held the frame rigid and used a measurement device on one corner to measure how much pressure it took before the frame lifted from perfectly level. The higher the number the better. Ideally we wanted to see 200lbs as that is the ASCE guideline for small berth harbors and really the only guideline available in the industry.
The test results show the different designs some got worse as we went alone and some got better but we never reached the 200lb number and even if we did that was the MINUMUM and not a guarantee of stability so we abandoned the aluminum project after creating thousands of dollars in scrap aluminum.

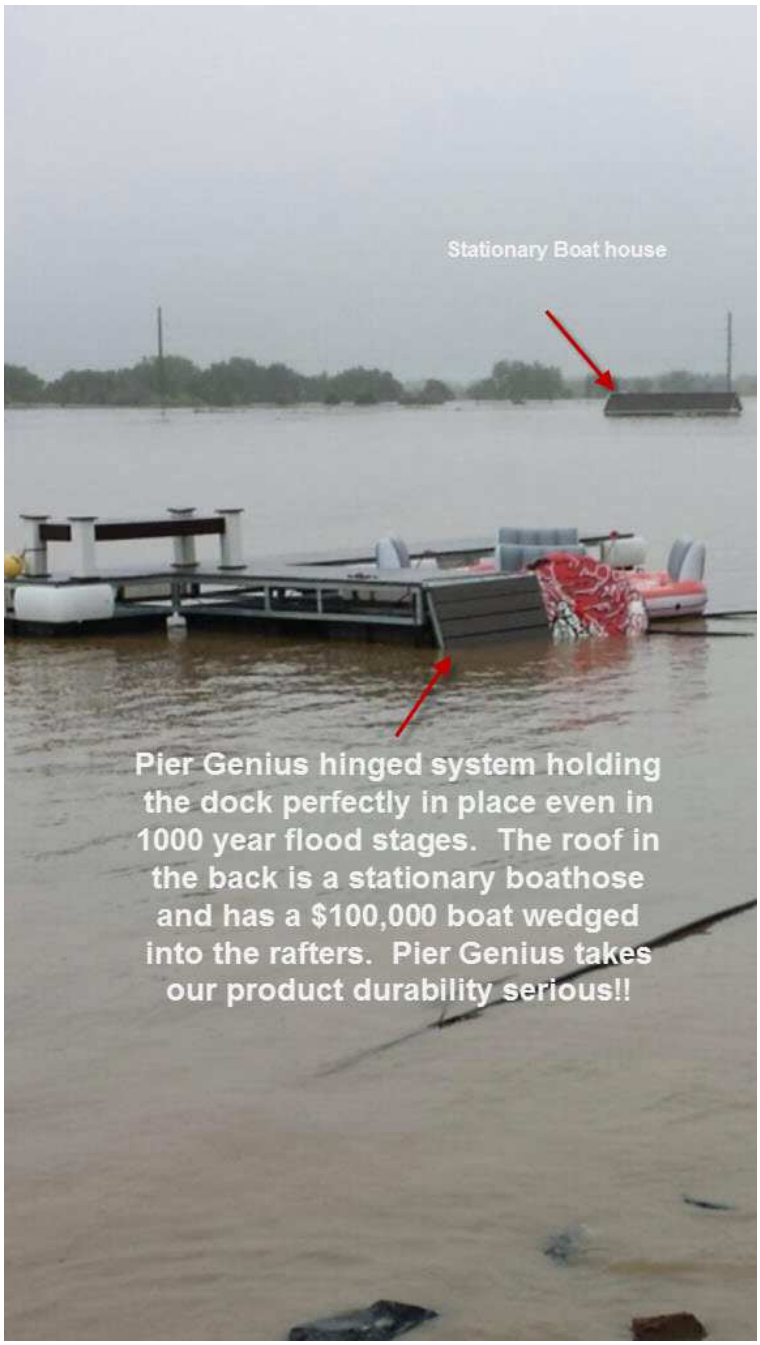
Pier Genius Sway test results summary from 2003-2004		
	Lbs to raise from rest	
Aluminum Frame 1	58.2	lbs
Aluminum Frame 2	69.5	lbs
Aluminum Frame 3	79.8	lbs
Aluminum Frame 4	83.5	lbs
Aluminum Frame 5	91.5	lbs
Aluminum Frame 6	93.7	lbs
Aluminum Frame 7	89.5	lbs
Aluminum Frame 8	96.7	lbs
Aluminum Frame 9	97.6	lbs
Aluminum Frame 10	99.7	lbs
Aluminum Frame 11	100.8	lbs
Aluminum Frame 12	103.4	lbs
Aluminum Frame 13	101.7	lbs
Aluminum Frame 14	104.5	lbs
Aluminum Frame 15	109.4	lbs
Aluminum Frame 16	140.6	lbs
Aluminum Frame 17	150.6	lbs
Aluminum Frame 18	155.2	lbs
Aluminum Frame 19	152.6	lbs
Aluminum Frame 20	157.2	lbs
Aluminum Frame 21	156.3	lbs
Aluminum Frame 22	110.3	lbs
Aluminum Frame 23	119.3	lbs
Aluminum Frame 24	120.3	lbs
Aluminum Frame 25	189.5	lbs
Aluminum Frame 26	188.6	lbs
Aluminum Frame 27	190.6	lbs
Aluminum Frame 28	195.6	lbs
Aluminum Frame 29	197.5	lbs
Aluminum Frame 30	198.2	lbs

The next test we conducted was on an all steel frame. Here the results were much higher out of the gate and met the minimum standard but it was until we reached our first Anti-Sway™ frame 9 to be produced we hit an amazing number! We have actually further refined the product and the last iteration is our current production frame that is still compatible with all earlier models.

	Lbs to raise from rest	
Steel Frame 1	201.5	lbs
Steel Frame 2	210.5	lbs
Steel Frame 3	220.6	lbs
Steel Frame 4	218.5	lbs
Steel Frame 5	235.2	lbs
Steel Frame 6	410.6	lbs
Steel Frame 7	412.5	lbs
Steel Frame 8	420.4	lbs
Steel Frame 9	486.9	lbs
Steel Frame 10	495.2	lbs

With these results in hand we started on the water testing. The results were nothing short of amazing. With a 200lbs corner dead load on a 24' long by 4' wide finger it swayed only 1". Compare that to the picture above for a visual that is truly stunning!

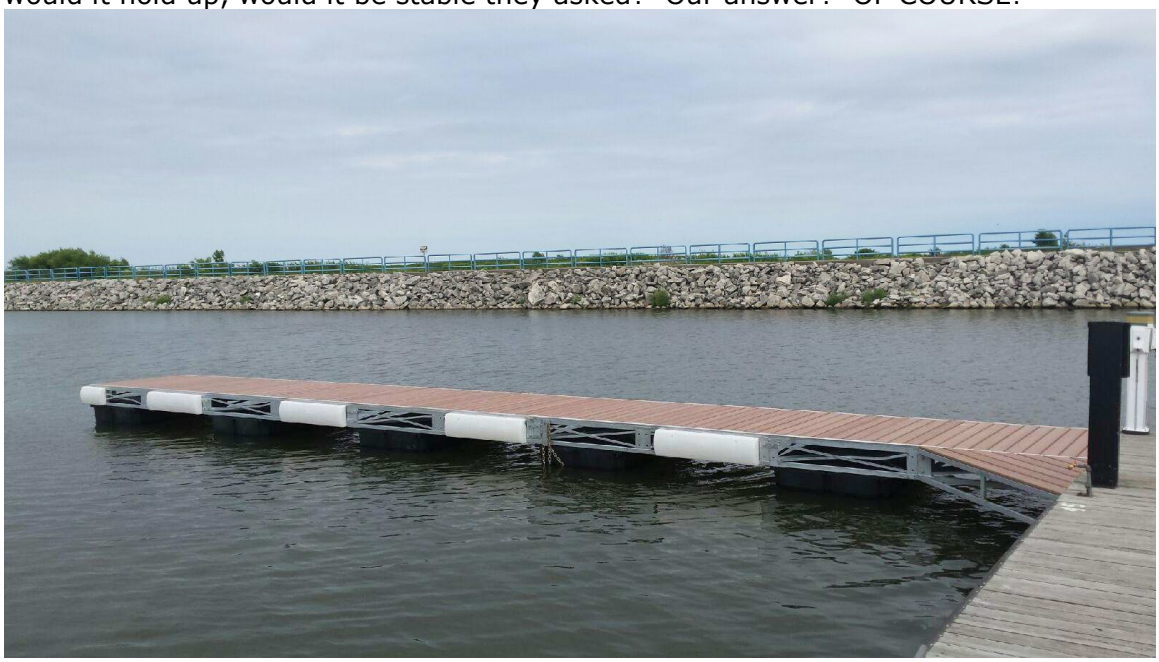
The next series of robust testing occurred from 2004-2006 when the docks were placed in areas all over the US and monitored for durability in both ice, flooding, rough water, and high wind areas. The results for this test was truly astonishing. The docks endured more 1000 year flood levels in different parts of the country then those areas had previously seen. The amazing part not ONE was destroyed or damaged aside from some minor bending that was bent back with a hammer and returned to use after the flood with no expense at all! There are 3 lakes where ALL the docks washed away except the Pier Genius installed systems. Lake Delhi had 4 Pier Genius systems on it and all survived with no damage, a reservoir in Colorado had permeant boat houses that had $100K boats in the rafters, while the PG dock survived. (see picture)



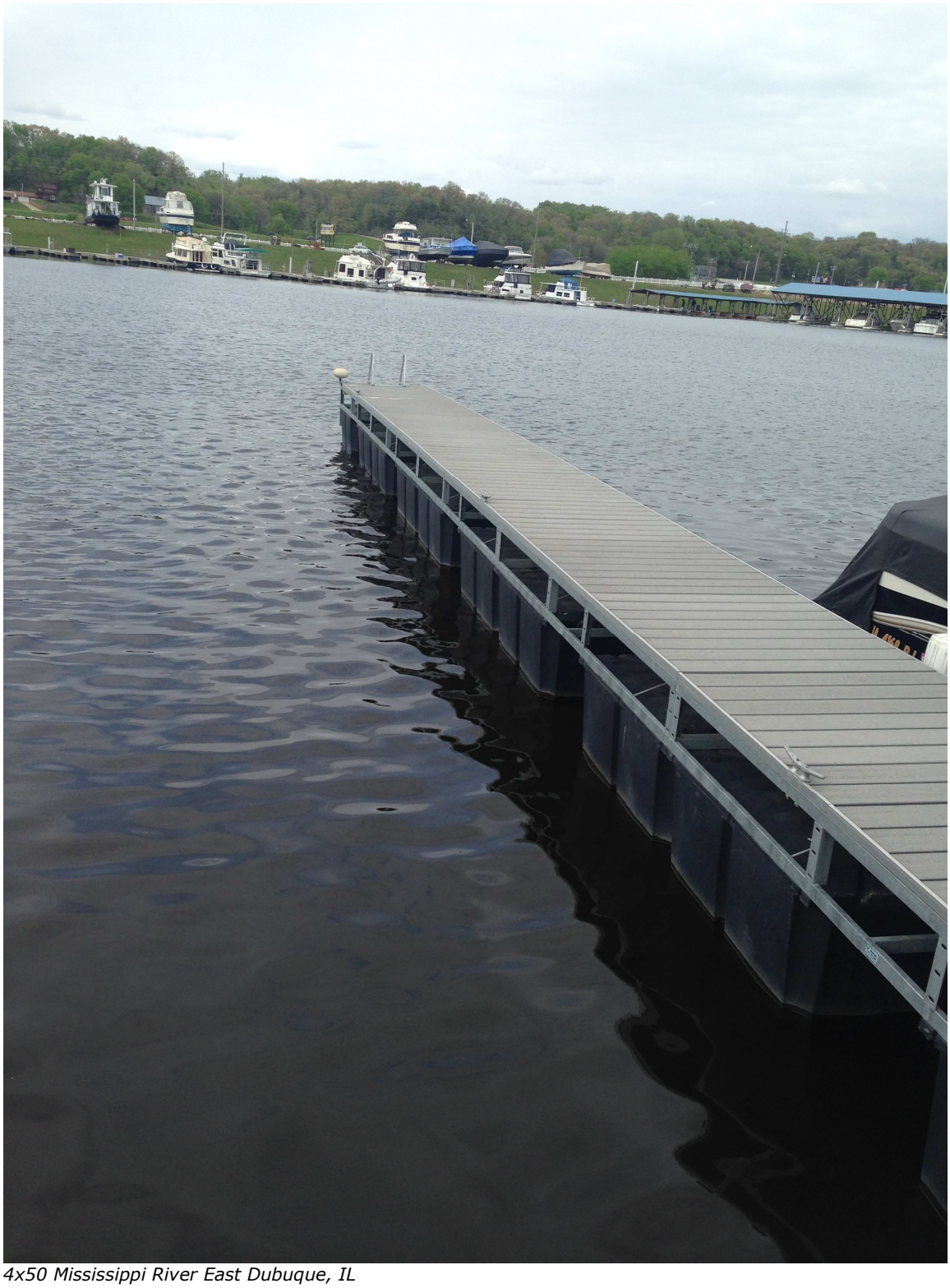
An especially vicious lake in MN which is a dammed up river had a 500 year flood and TWO 1000 year floods in 3 years! We had almost 40 systems installed out there and ALL survived with no frame damage.

As we advanced our testing to larger commercial marinas we found very similar results. The Mississippi river is famous for torturous flooding and debris and we had installed multiple marina projects throughout the northern half of the river. Our patented fastening system is what allowed us to use our standard 8 and 10 foot long sections and create any marina layout we needed with no loss of strength. Many of our marinas not only weathered the storms better than others they simply did it with

no damage and much reduced bracing then most marina manufactures on the market that use 45 degree corners, and underwater trusses to add strength. We got asked to install a 50’ finger with NO bracing, NO piling, just connected at the main, would it hold up, would it be stable they asked? Our answer? OF COURSE!



6x50 on Lake Michigan



4x50 Mississippi River East Dubuque, IL

That last picture was taken 5 years AFTER it was installed! One of our design emphasis was having a dock that looked new year after year with no maintenance. That dock was froze in every year.

Of course we are biased, we are trying to sell you something for profit, so to combat that and also validate all of our data we needed to have an independent engineering company do an assessment and compare our frame to that of a leading marina manufacturer regarded as the standard of strength in the industry. While we were looking for the sway results (which were 70% better by the way) we found something else. The analysis showed that a competitor's conventional truss frame system under wind load from the side (lateral) would actually FRACTURE and break free from the main attachment. This helps us understand why they add underwater bracing and 45 degree triangles as reinforcements. Of course the simpler and less expensive Pier Genius system would hold just fine. Here is an excerpt from the analysis available on our web site under products and then frames.

> Comparison: The analysis showed that the Pier Genius frame was substantially stiffer laterally then the competitors frame. The deflection of the competitors frame is 363% more than the deflection of the Pier Genius frame. This number is conservative because the software analysis makes the assumption that the frames will continue to behave elastically. In reality the steel will only allow elastic behavior up to the yield point of the material, after which the material will deform permanently, possibly to the point of failure of the structure. The high peak stresses shown in the competitors frame indicate that under a similar load an actual dock of this design would most likely sustain permanent damage, possibly failing entirely.

If this was not impressive enough, it's because here is the real genius. The standard frame we make weighs 115lbs, compared to an angle iron truss frame of identical size weighing in at over 180lbs! So pound for pound we have FAR BEYOND the strongest dock made. Making a frame strong with adding metal back in is fairly easy, making it stronger by taking metal OUT is immensely more difficult. That is Pier Genius.

Lastly Pier Genius frames incorporate pre-welded tabs to locate and bolt to the frame with NO drilling after galvanizing. Compare this to angle iron frames that force you to drill after galvanizing by flipping the frame upside down, setting the float on it upside down, locating the holes, drilling the holes, and finally bolting the float down. On the Pier Genius dock, you simply set the frame on top of the float, line up the holes and bolt down with the supplied hardware (which is another genius innovation). Thus preserving the galvanized surface, and creating about 20% LESS work during installation. That is smart and that is why installers love Pier Genius docks!

The connection of the floats to the frames is another aspect where people assume ad some bolts and good enough. We have seen floats loosen up and fall out even after they were tightened by Hercules at install…why? The poly float can expand and contract up to 10% of its nominal size. This has to be accounted for when fastening. Our solution is to insert a large Stainless Steel fender washer on the bolt, then a normal galvanized flat washer, then a galvanized lock washer, then a nut. When tightening go until the SS washer deforms slightly and stop. This is the perfect tension that will allow the float to expand and contract without ever popping loose. If you over tighten you can crack the mounting flange of the float and if you under tighten it will literally wash away in any current. BRILLANT!

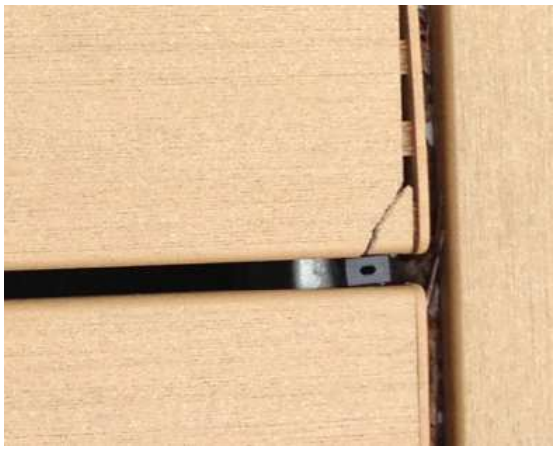
To deck or not to deck…that is the question:

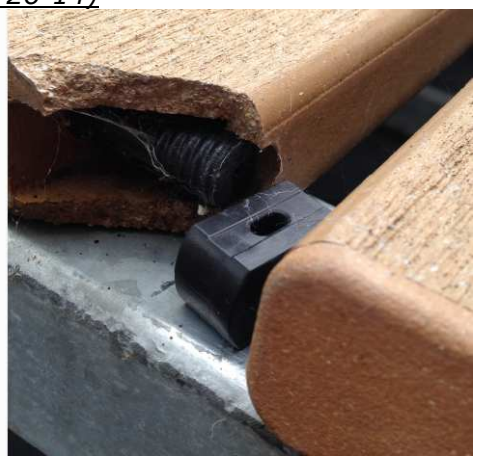
In any dock system the single biggest driver of the total cost is the decking. There are many options on the market today. Your primary choices are wood, plastic, concrete, composite, and aluminum. All of them have pro's and con's but we needed to find out which one offers more value. Whatever decking we elected to install on our dock had to represent our passion for high quality and was inevitably a reflection on our total product. Therefore all materials were investigated to determine the next steps. The results below articulate our findings:

	Price 1,3,9 rating low price is 9	Mass higher the better for 1,3,9	Durability 1,3,9 ratinglasts longer then 15 years=9	Years stays looking new. 9 rating >10 years	Total
Composite	3	3	9	9	**729**
Concrete	9	9	3	1	**243**
Wood	9	3	1	1	**27**
Plastic	3	1	3	3	**27**
Aluminum	1	1	9	3	**27**

As you can see composite was the clear choice besting the next best option by almost 3:1 over 2nd place concrete. That said however we learned that a composite is just that; a composition of many different materials into one decking product. Some of those materials work well together and some did not work well. Examples how many composite decking materials fail:

Composite breaking apart after 1 year (7-26-14)





Within the composite decking sector you will find many different materials such as recycled plastic, wood flour (saw dust), petroleum, rice hulls, nylon, PVC, and fiberglass. There are literally hundreds of options with new options being added to the market every year. So many so that its easily confusing to the consumer so we set out to again rank the options based on ACTUAL experience. We ordered and tested all the major brands on the market and put them head to head in our internal test environment. We have sprinkled these materials in various strategic locations throughout the Midwest and we are finally able to compile the results in to the following table:

Ranking Table of Various Composite Materials:

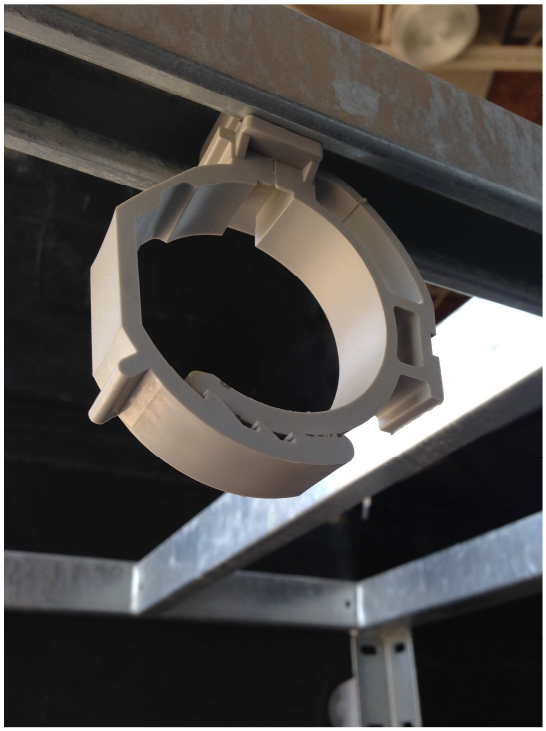
	Price 1,3,9 rating low price is 9	Expansion/ contraction 1,3,9 with 9= lowest number	Durability 1,3,9 rating lasts longer then 15 years=9	Scratch/ Fade resistance 9 rating >10 years	**Total**
Nylon	3	9	9	9	**2187**
Rice Hull	3	9	3	1	**81**
Recycled Plastic	9	1	1	1	**9**
Fiberglass	9	1	1	1	**9**
Wood Flour	3	1	1	1	**3**
Petroleum	3	1	1	1	**3**
PVC	1	1	3	1	**3**

As you can see the clear stand outs are nylon based decking and rice hull decking where rice hulls make up over 50% of the composition in the deck board. We have had great success with both decking materials but ultimately we have settled in on 100% nylon based on recycled carpet. This is a true marine grade substrate that is impervious to mold, mildew, staining, fading, negligible expansion and contraction, and above all spans 24" on center to save costs on the framework and total dock system costs. Also this decking is ICCC certified which adds to the credibility of the product.

Commercial innovations –PG conduit hanging system, Modular wiring harness

Pier Genius does get involved in many commercial projects throughout the US. One of the things that we felt was overlooked and is a LARGE expense on a commercial project was the electrical system. In some cases, the bids for infield wiring of a large facility can cost as much as the docks themselves! So in typical Pier Genius fashion we gathered lots of feedback from our marina manager pool and tried to understand the complexity of this and how could we A) simplify it, B) make it better, and C) make it CHEAPER. The results are two parts.

Part one is the PG conduit hanging system. This system can be used with our modular wiring harness or with typical in-field wiring but make it FASTER and BETTER. The PG conduit hanging system is like nothing else available. Integrated and welded into our frame pre-galvanizing are specialized channels located in the correct locations for the project. These channels/frames then go to be hot dipped galvanized as a unit. Once back on site for the installation we have patented nylon hangers in various sizes that simply insert into the channel rotate 90 degrees to lock in place and your hanger is complete! Compare this to the infield method of screwing straps with self-tapping screws into the frame post galvanizing. We not only preserve the galvanizing and prevent any rust from starting, we also speed up the process by almost 66%, and another innovation that is truly Pier Genius is that we can also color code the hangers so when you lift our decking panel the hangers will tell you want it is, grey is sewer, black is electrical, blue is water, etc. These innovations are what set us apart from everyone else settling for status quo, we want to make the sale easier, the installation easier, and the maintenance easier. The PG conduit system does just that!



Step two of our electrical genius is the modular wiring harness. This is something special and truly unique in the world of commercial dock systems. This is exactly how it sounds a wiring harness pre-engineered, load tested, and fabricated in a specialized UL registered shop by degreed electrical engineers. Pier Genius can now quote you the dock PRE-WIRED for delivery to your site. The best part is we model your dock in a load simulator and we optimize the runs based on length, amps needed, power locations and figure out where we can use aluminum wire, vs copper wire based on resistance loads. Aluminum wire is MUCH cheaper then copper so it makes sense to use of where you can. Most infield wiring project just us all copper because its 'safe' to use and not have a problem later. We can actually design the entire system in a computer generated model and get it exact every time! On average we are seeing a 33% DECREASE in wiring costs purchasing our pre-built harnesses. This is very exciting! We also work with well-known power pedestals manufacturers and can create a plug and play power peds that in some areas do NOT need local electrical inspectors to view the connection. In some areas this can be a fee of $60 PER power point and on a large marina that can cost thousands.

Another great feature is we can break the harness in increments that connect with underwater UL listed connections so in the event of a storm damage or shortages from something and there is damage you can simply remove that 20-100 feet of wire we will build you a replacement and get it out to you as soon as possible to avoid any delays no electrician needed! Now you can purchase a marina with everything you need, everything optimized, delivered on site, and installed MUCH faster, Better, and CHEAPER…that's Pier Genius!